3

6-16-2008

New Mexico Environment Department
Ground Water Quality Bureau

Inspection Report

Inspection Report
Ground Water Quality Bureau

Start Date: 06/16/2008 06:30 PM

End Date: 06/16/2008 08:00 PM

Facility Information

Facility Name: Copper Flat Mine, DP-1
Contact: unknown

Type of Operation: Mining
Location: Hillsboro

Inspector(s): Kurt Vollbrecht (NMED), James Hollen (MMD)

Inspection Summary

Purpose: Facility Inspection (GWB)

Activities

Samples Taken: Yes

Observations and Information Obtained

We arrived at the site at approximately 6:30 PM on the way to Silver City. Access to the site was thru well established roads with no gates to prevent access. The pit lake is on the west edge of the site. The tailings impoundment was visible but fairly well vegetated. There are some regarded waste rock piles, and some that have not been reclaimed. We did not spend time investigating the status of waste rock piles but instead drove thru to the pit lake. In general the site is pretty clean.

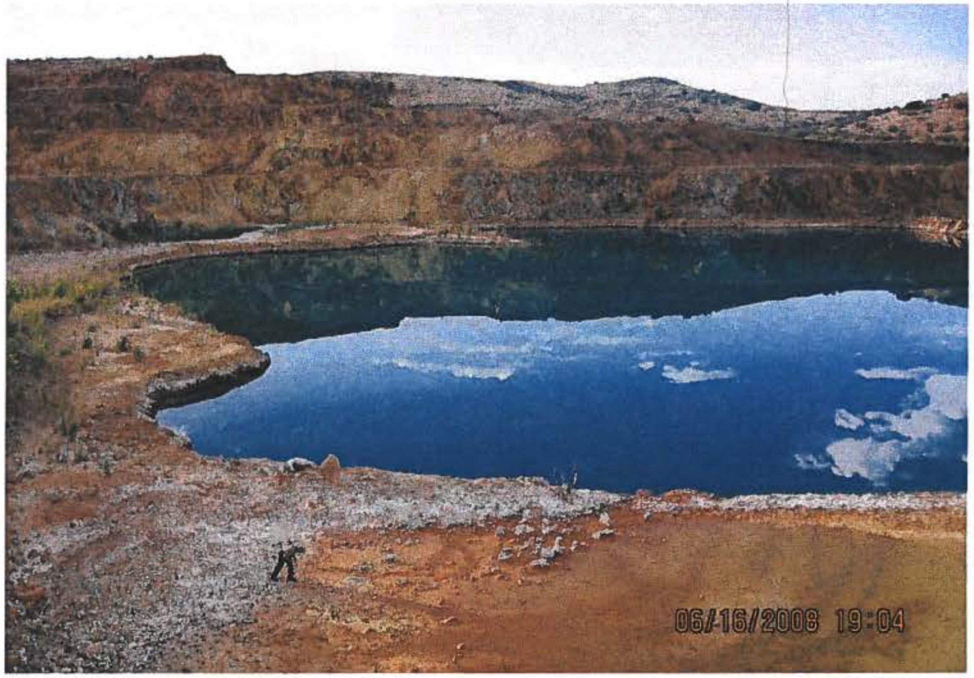
Arriving at the pit lake there were four deer noted at the shoreline. There is evidence of deer, possibly elk, cattle, and coyote tracks around the lake. One cow was noted on the shore, and a rancher has placed salt blocks to lead livestock to the lake.

The lake is a deep blue color with significant sulfate precipitates along the shoreline and at depth in the lake. The lake level appears to have dropped about 2' based on the "bath tub" ring present. We tested pH (pH strips) at several locations and found the pH to be in the 4 to 4.5 range.

Samples were collected from two locations for analysis. One sample was collected along the NW shore and another from the east shore near the "ramp". Samples will be analyzed for total metals, dissolved metals, and general chemistry.

Russ Macrae with the USFWS had visited the site recently and sent an email speculating on ownership of the site. This should be investigated further and a compliance letter sent to the responsible party.


06/16/2008 18:54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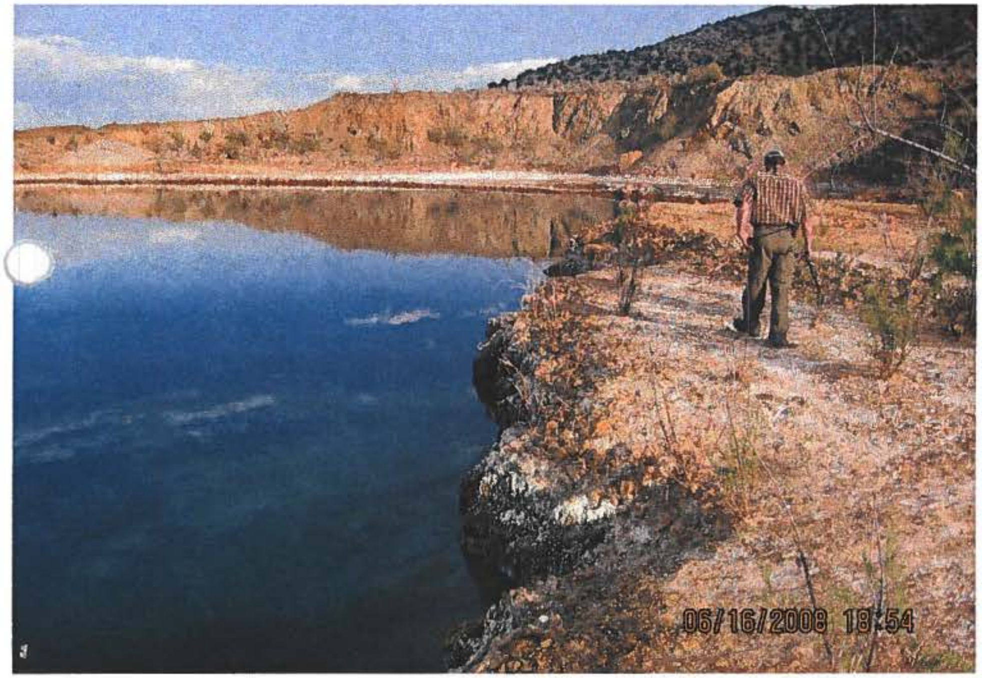
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06/16/2008 19:01

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KMV Called... @ 10:00 AM.

- Sole Responsible Party (George Lotspeich)
  - Explained Concerns
    - Previous GW Cont. associated w/ Tailings
    - unknown condition of wells now
    - Pit lake exceedances 2004
    - Sampled recently (George would like to see results)
    - Potential for further GW cont.
- Require abatement or closure?
- letter or meeting (or both)
- understand he never operated but since he bought the property he has assumed the liability

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

1190 St. Francis Drive
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Sent To George Lotspeich, P
Street, Apt. No.; or PO Box No. Hydro Resources Cor
4011 Mesa Verde Ave
City, State, ZIP+4 Albuquerque, New Me
PS Form 3800, June 2002

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

August 20, 2008

George Lotspeich, President
Hydro Resources Corporation
4011 Mesa Verde Ave. NE
Albuquerque, NM 87110

Re: Abatement Plan Required at Copper Flat Mine Site, DP-1

Dear Mr. Lotspeich:

Pursuant to the New Mexico Water Quality Control Commission (WQCC) Regulations Sections 20.6.2.1203.A(9), 20.6.2.4104 and 20.6.2.4106.A NMAC, the New Mexico Environment Department (NMED) hereby provides notification that you, George Lotspeich and Hydro Resources Corporation (HRC) as a "responsible person", as defined in WQCC regulation 20.6.2.7.00 NMAC, are required to submit an abatement plan for the Copper Flat Mine site, located approximately 6 miles northeast of Hillsboro, New Mexico. The May 1997 Alta Gold submittal entitled "Copper Flat Mine Project Monitoring Plans" lists historical ground water exceedences of WQCC standards through 1994. Additional ground water sampling in 1997 and 1998 confirmed that standards set forth in WQCC regulation 20.6.2.4103 NMAC have been exceeded. Sampling the water quality of the pit lake at Copper Flat in 2004 indicates the pit lake water also exceeds WQCC standards for sulfate, total dissolved solids, chloride, manganese and uranium. Additional sampling of the pit lake was conducted in June 2008. Although analytical data is not yet available from this recent sampling event the field pH was measured at approximately 4.5 which is below the acceptable range of 6 to 9. Field observations indicate high concentrations of sulfate and total dissolved solids.

Within 60 days of receipt of this letter, HRC shall submit to NMED an abatement plan proposal for a Stage 1 Abatement Plan to characterize ground and surface water contamination at the Copper Flat Mine site.

The purpose of the Stage 1 Abatement Plan is to define site conditions and provide the data necessary to select and design an effective abatement alternative. WQCC regulation

20.6.2.4106.C NMAC describes the information that may be required for a Stage 1 Abatement Plan. HRC's abatement plan proposal must include an adequate investigation for the definition of extent and magnitude of ground and surface water contamination as well as characterization of the hydrogeology of the site.

For your reference, a current copy (effective July 16, 2006) of the WQCC Regulations, 20.6.2 NMAC is enclosed.

Please contact Kurt Vollbrecht at 505-827-0195 with any questions.

Sincerely,

Will Olson

William C. Olson, Chief
Ground Water Quality Bureau

Enc.: WQCC Regulations 20.6.2 NMAC

cc: Mary Ann Menetrey, Program Manager, GWQB-MECS
Karen Garcia, Chief, Mine Reclamation Bureau
Russell MacRae, U.S. Fish and Wildlife Service, 2105 Osuna NE, Abq., Nm 87113

12-15-2008 5

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DIANE DENISH
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William C. Olson, Bureau Chief

RON CURRY
Secretary
JON GOLDSTEIN
Deputy Secretary

12/15/08

George,

Here is a copy of Kurt's letter.

I'll call again when I have more information. Thank you.

Greg Huey

phone: (505) 827-1046

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Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

August 20, 2008

George Lotspeich, President
Hydro Resources Corporation
4011 Mesa Verde Ave. NE
Albuquerque, NM 87110

Re: Abatement Plan Required at Copper Flat Mine Site, DP-1

Dear Mr. Lotspeich:

Pursuant to the New Mexico Water Quality Control Commission (WQCC) Regulations Sections 20.6.2.1203.A(9), 20.6.2.4104 and 20.6.2.4106.A NMAC, the New Mexico Environment Department (NMED) hereby provides notification that you, George Lotspeich and Hydro Resources Corporation (HRC) as a "responsible person", as defined in WQCC regulation 20.6.2.7.00 NMAC, are required to submit an abatement plan for the Copper Flat Mine site, located approximately 6 miles northeast of Hillsboro, New Mexico. The May 1997 Alta Gold submittal entitled "Copper Flat Mine Project Monitoring Plans" lists historical ground water exceedences of WQCC standards through 1994. Additional ground water sampling in 1997 and 1998 confirmed that standards set forth in WQCC regulation 20.6.2.4103 NMAC have been exceeded. Sampling the water quality of the pit lake at Copper Flat in 2004 indicates the pit lake water also exceeds WQCC standards for sulfate, total dissolved solids, chloride, manganese and uranium. Additional sampling of the pit lake was conducted in June 2008. Although analytical data is not yet available from this recent sampling event the field pH was measured at approximately 4.5 which is below the acceptable range of 6 to 9. Field observations indicate high concentrations of sulfate and total dissolved solids.

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For your reference, a current copy (effective July 16, 2006) of the WQCC Regulations, 20.6.2 NMAC is enclosed.

Please contact Kurt Vollbrecht at 505-827-0195 with any questions.

Sincerely,

William C. Olson, Chief
Ground Water Quality Bureau

Enc.: WQCC Regulations 20.6.2 NMAC

cc: Mary Ann Menetrey, Program Manager, GWQB-MECS
Karen Garcia, Chief, Mine Reclamation Bureau
Russell MacRae, U.S. Fish and Wildlife Service, 2105 Osuna NE, Abq., Nm 87113

3-18-2009 6

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George Lotspeich, F
Hydro Resources Co
4011 Mesa Verde Ave
Albuquerque, New Me

PS Form 3800, August 2006

7008 0500 0001 1246 3256

CERTIFIED MAIL – RETURN RECEIPT REQUESTI

March 18, 2009

George Lotspeich, President
Hydro Resources Corporation
4011 Mesa Verde Avenue, NE
Albuquerque, NM 87110

RE: Copper Flat Mine Site Information

Dear Mr. Lotspeich:

Thank you for meeting with the New Mexico Environment Department (NMED) regarding the Copper Flat Mine Site Stage 1 Abatement Plan on February 25, 2009. Your cooperation with this project is greatly appreciated.

I've reviewed and inventoried the reports available through NMED. These files are available for review at the NMED Ground Water Quality Bureau Santa Fe offices and include the following:

- Hydrology Impact Evaluation, 1996
- Baseline Data, Volume 1. Copper Flat Project, 1995
- Copper Flat Mine-Mine Permit Application, volumes 1-4, 1996
- Copper Flat Mine Project Monitoring Plans, 1996
- Appendices-volume II of II, Copper Flat Project Soil Cover Modeling Study, 1996 (I cannot locate volume I of II)
- Environmental Impact Statement, Copper Flat Project, 1995
- Response to Closure Plan Comments, Copper Flat Project, 1996
- Final Geotechnical and Design Development Report, Tailings Dam and Disposal Area, Copper Flat Project, 1981

In addition, eight water quality samples were collected from the Pit Lake and submitted for analysis by NMED on 12/09/2004 and 06/16/2008. Copies of the results are attached for your records.

The first step in initiating a Stage 1 Abatement Plan as described in WQCC Regulation 20.6.2.4106 NMAC (page 26) will be to walk the property and identify existing monitoring wells that may be used to collect water quality samples for the assessment of ground water at the site. I have March 24th scheduled to meet you in Hillsborough at 10:30 to conduct that inspection.

Following sample collection and results analysis, NMED and Hydro Resources Corporation will cooperate in the development of an appropriate Stage 1 Abatement Plan for the facility.

Please contact me at (505) 827-1046 with any questions you may have.

Regards,

Greg Huey

Greg Huey
Ground Water Quality Bureau

Enc.: Water Quality Sample Reports

11-30-2009 7

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

1190 St. Francis Drive, P.O. Box 5469
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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

DATE: November 30, 2009

TO: Holland Shepherd, Program Manager, Mining Act Reclamation Program

FROM: Greg Huey, Ground Water Quality Bureau
Neal Schaeffer, Surface Water Quality Bureau

THROUGH: Kurt Vollbrecht, NMED Mining Act Team Leader

RE: New Mexico Copper Corporation, Copper Flat Exploration Project, Minimal Impact Exploration Project Permit Application, Permit No. SI022EM

The New Mexico Environment Department (NMED) received the Copper Flat Exploration Project Minimal Impact Exploration Permit Application from the Mining Act Reclamation Program (MARP) on November 10, 2009. MARP requested that the application be reviewed and all comments returned within 20 days of receipt. A site inspection was conducted on November 17, 2009 and comments were submitted prior to the November 30, 2009 deadline.

Pursuant to Subpart 302.G of the New Mexico Mining Act Rules (NMMA), the NMED Air Quality Bureau, Surface Water Quality Bureau and Ground Water Quality Bureau have reviewed the Copper Flat Exploration Minimal Impact Exploration Project Permit Application. The Surface Water Quality Bureau and Ground Water Quality Bureau are submitting comments jointly in this memorandum. Air Quality Bureau comments are provided under a separate memorandum.

Site Location and Description

The proposed Copper Flat Exploration Project is located in Township 15S, Range 7W of Section 26, Sierra County, NM. Hydro Resources Corporation, Cu Flat LLC and GCM, Inc. of Albuquerque, NM are the joint owners of surface and mineral rights to the property.

The total proposed exploration disturbance is less than 5 acres. Depth to ground water is estimated to be 30 feet.

Three drill sites are proposed, with two drill holes per site to a depth of 600 feet. No access roads or drill pad construction will be necessary, as the drill sites are within a previously excavated and graded bedrock bench remaining from a previous mining operation.

Drilling mud and additives are to be stored in metal tanks during the operational phase. The proposal calls for the disposal of drilling mud and additives into drilling holes after drilling is completed. It is then proposed that the drill holes are to be plugged with drilling mud from total depth to ten feet below ground surface and completed with a cement plug from ten feet below ground surface to the existing ground surface.

Permit Application Requirements and Minimal Impact Status

The permit application states that bore holes will be plugged with drilling mud. According to the New Mexico Office of the State Engineer requirements and New Mexico Mining Act Rules, drill holes must be plugged from the bottom of the hole to the land surface with cement or high density bentonite clay, with the top ten feet of the hole plugged with cement. Drilling mud is not a satisfactory bore hole abandonment material.

New Mexico Mining Act Rules prohibit disposal of drill cuttings, drill mud or additives into excavated drill holes. NMMA §19.10.3.K provides guidance for construction and reclamation of pits for drill waste disposal.

In general, the following measures should be implemented at exploration drill sites to provide for protection of surface and ground water quality:

- A minimum setback from surface water of 100 feet must be maintained for all drill pads and associated activities.

- All exploration activities need to implement Best Management Practices in a manner that prevents direct impacts to surface water and watercourses (ephemeral, intermittent and perennial). For surface disturbances during exploration and reclamation activities, the operator must commit to implementing erosion control measures that are designed, constructed and maintained using professionally recognized standards (e.g. Natural Resource Conservation Service Standards or the Bureau of Land Management "Gold Book").

- All heavy equipment used in the project area must be pressure washed and/or steam cleaned before the start of the project and inspected daily for leaks. A written log of inspections and maintenance should be completed.

- Appropriate spill clean-up materials, such as absorbent pads, must be available on-site at all times during drilling activities to address potential spills.

- Spills must be reported immediately to the NMED as required by the New Mexico Water Quality Control Commission Regulations (20.6.2.1203 NMAC). For non-emergencies during normal business hours, call (505) 428-2500. For non-emergencies after hours, call (866) 428-6535 or (505) 428-6535 (voice mail, twenty-four hours a day). For emergencies only, call (505) 827-9329 twenty-four hours a day (NM Dept of Public Safety).

- The applicant must contain any water produced from the exploration holes at the drill site. Discharge of this water or any drilling fluids to any watercourse may be a violation of the Clean Water Act. All drilling cores should be collected and disposed of properly.
- This project may require coverage under a Clean Water Act §402 permit, such as for construction or industrial storm water, or for an NPDES process wastewater discharge. Failure to receive and implement proper permit coverage would be a violation of the Clean Water Act. A Construction General Permit, Notice of Intent (NOI), Fact Sheet, and Federal Register notice can be downloaded at http//cfpub.epa.gov/npdes/stormwater/cgp.cfm. The Industrial General Permit, NOI, Fact Sheet, and Federal Register notice can be downloaded at http://cfpub.epa.gov/npdes/stormwater/msgp.cfm. If you have questions about this coverage, please contact Rich Powell, NMED SWQB, at (505) 827-2798.
- The applicant should consult with the USACE to verify whether the proposed activity will require Clean Water Act §404 permitting.
- Boreholes must be abandoned in accordance with the New Mexico Office of the State Engineer requirements and New Mexico Mining Act Rules, including complete plugging from the bottom of the hole to the land surface with cement or high density bentonite clay.

NMED finds the proposed exploration activities are likely to have a minimal environmental impact if operated and reclaimed in accordance with the approved permit and requirements listed above.

cc: William C. Olson, Bureau Chief, GWQB
Glenn Saums, Acting Chief, SWQB
Rachel Jankowitz, NMDGF
Mary Ann Menetrey, GWQB-MECS
Charles Thomas, Bureau Chief, EMNRD-MMD

5-5-2010

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

PUBLIC RECORDS RELEASE FORM

* Please complete this form for each facility requested.

Pre-Review ~~Greg Hoeg~~ Cindy Ardito (Intera)

Reviewers Name: ~~Ardito~~ **Facility requested:** Copper Flat mine **DP#** 01

Number of files given out: C- 1-5 **M-** 1-3 **Maps, designs, etc.:** —

Records Inspection (On-site)

Date: 5-5-10 **Time:** 10:20 am/pm **Company:** INTERA **Phone #:** 246-1600

Name: Cindy Ardito **Signature:**

I acknowledge I have read and agree to the attached Notice of Right to Inspect Public Records

Copy Service (Off-site)

Records Check-Out:

Date: 5/12/10 **Time:** 4:35 am/[✓ pm] **Company:** Paper Tiger **Phone #:** ____

Name: ____ **Signature:** ____

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Estimated date of return: 5/14/10

Records Check-In:

Date: 5/14/10 **Time:** 4:35 am/[✓ pm] **Company:** Paper Tiger **Phone #:** ____

Name: ____ **Signature:** ____

Post-Review

Reviewers Name: Cindy Ardito **Facility requested:** Cu Flat **DP#** 1

Number of files given out: C- 1-5 **M-** 1-3 **Maps, designs, etc.:** —

Documents returned in good condition (circle)? [✓ Yes]/No

NEW MEXICO ENVIRONMENT DEPARTMENT
INSPECTION OF PUBLIC RECORDS ACT PRIVATE COPY FACILITY AUTHORIZATION

1. Requestor's name: Cynthia Ardito, Intera Inc.
2. Requestor's email: Cardito@intera.com
3. Requestor's address: 6000 uptown Blvd, NE Suite 100, Albuquerque 87110
4. Requestor's telephone: (505) 379-7330
5. Private copy facility's name:
6. Private copy facility's address:
7. Private copy facility's telephone: ( ) Paper Tiger
8. Documents/files/records to be copied: DP-01 Copper Flat mine
   monitoring FILES 1-3
   Correspondence FILES 1-6
9. Date documents/files/records provided to private copy facility:
10. Department personnel authorizing release: Peg Huey (MECS)
11. Date documents/files/records to be returned to Department:

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5/12/10 4:35 pm
Authorized signature for private copy facility
Print name:

✓ Date documents returned: 5/14/10 4:40pm
Received by: Dona S

New Mexico Copper Corporation

September 3, 2010

Mr. Chris Eustice
Senior Environmental Engineer
Mining Act Reclamation Program
Mining and Mineral Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Dear Mr. Eustice;

On behalf of New Mexico Copper Corporation (NMCC), please accept the enclosed Sampling and Analysis Plan (SAP) for the proposed Copper Flat Mine located approximately 6 miles east of Hillsboro, New Mexico. The SAP has been prepared in accordance to the New Mexico Administrative Code (NMAC) 19.10.6.602.D and the August 2010 Guidance Document for Part 6, New Mining Operation Permitting Under the New Mexico Mining Act.

Also enclosed is a $5,000 check to address the base mine permit application fee.

I, Jon Steven Raugust, certify that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individuals responsible for obtaining the information; I believe the submitted information is true, accurate, and complete.

Please contact me at 505.382.5770 or by email at steve.raugust@gmail.com if you have any questions or comments regarding NMCC's Copper Flat Mine Project.

Respectfully,

J. Steven Raugust, P.G.
Project Manager

Cc: Barrret Sleeman, P.Eng., CEO, New Mexico Copper Corporation

Enclosures:

1. Sampling and Analysis Plan for the Copper Flat Mine Project (6 hard copy, 1 electronic copy)
2. One check for $5,000.

2425 San Pedro, NE, Suite 200
Albuquerque, New Mexico 87110

505.382.5770

Sampling and Analysis Plan
for
Copper Flat Mine

September 2010

Prepared for:
New Mexico Copper Corporation

Submitted to:
Mining and Minerals Division
New Mexico Energy, Minerals and Natural Resources Department

Prepared by:
INTERA

with support from Parametrix and
Class One Technical Services

Table of Contents

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List of Attachments

Acronyms and Abbreviations

ABA	acid base accounting
Alta Gold	Alta Gold Company
amsl	above mean sea level
APE	area of potential effects
AWRM	Active Water Resource Management
bgs	below ground surface
BLM	U.S. Bureau of Land Management
cc	cubic centimeter
CFQM	Copper Flat Quartz Monzonite
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
CRMD	New Mexico State University Cultural Resources Management Division
CTS	Class One Technical Services
^{O}F	degrees Fahrenheit
DTW	depth to water
DVM	digital volt meter
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMNRD	New Mexico Energy, Minerals and Natural Resources Department
EPA	U.S. Environmental Protection Agency
ESD	Ecological Site Description
ft	feet
GIS	Geographic Information System
Gold Express	Gold Express Corporation
gpm	gallons per minute
GPS	Global Positioning System
HCPI	New Mexico Historic Cultural Properties Inventory
HSR	Human Systems Research, Inc.
HSU	hydrostratigraphic unit
IM	isolated manifestation
INTERA	INTERA, Incorporated
JFD	joint frequency distribution
Km	kilometer
kV	Kilovolt
l/min	liters per minute
LA	Laboratory of Anthropology
LOG	lognormal
LRGB	Lower Rio Grande Underground Water Basin
m	meter
Ma	million years ago
mb	millibars
mg/L	milligrams per liter
ml	milliliter

mm	millimeter
MMD	New Mexico Mining and Minerals Division
MSF	Middle Santa Fe Group hydrostratigraphic unit
Mst	million standard tons
MVA	Megavolt-ampere
MWMP	Meteoric Water Mobility Procedure
NAD	North American Datum
NAG	Net Acid Generation
NELAP	National Environmental Laboratory Accreditation Program
NHPA	National Historic Preservation Act
NIST	National Institute of Standards and Technology
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
NMCC	New Mexico Copper Corporation
NMCRIS	New Mexico Cultural Resources Information System
NMED	New Mexico Environment Department
NMED GWQB	New Mexico Environment Department Groundwater Quality Bureau
NMED SWQB	New Mexico Environment Department Surface Water Quality Bureau
NMSRCP	New Mexico State Register of Cultural Properties
NORM	normal
NP	nonparametric
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OSE	New Mexico Office of the State Engineer
oz	ounce
PFEIS	Preliminary Final Environmental Impact Statement
$PM_{[x]}$	particulate matter less than [x] micrometers
PSD	prevention of significant deterioration
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
Quintana	Quintana Minerals Corporation
R	range
RAM	random access memory
RH	relative humidity
Rio Gold	Rio Gold Mining Ltd
ROW	right-of-way
rpm	revolutions per minute
SAP	Sampling and Analysis Plan
SCS	Soil Conservation Service
SHPO	New Mexico State Historic Preservation Officer
Site	Copper Flat Mine Permit Area
SOP	standard operating procedure
SRK	Steffen Robertson and Kirsten, Inc.
st	standard ton
S-W	Shannon-Weiner Index
T	township

TD	total depth
TDS	total dissolved solids
Tenneco	Tenneco Minerals
TSP	total suspended particulates
TSS	total suspended solids
$\mu g/m^3$	micrograms per cubic meter
USBR	U.S. Bureau of Reclamation
USF	Upper Santa Fe Group hydrostratigraphic unit
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VOA	volatile organic analysis
WQCC	New Mexico Water Quality Control Commission

Table of Contents

List of Figures

1 Introduction to the Copper Flat Sampling and Analysis Plan

1.1 Background

The New Mexico Copper Corporation (NMCC) plans to re-open the Copper Flat Mine, a porphyry copper/molybdenum/gold deposit located in the Hillsboro Mining District in South Central New Mexico, in Sierra County. The Cooper Flat Mine is approximately 20 miles southwest from Truth or Consequences, New Mexico and approximately 5 miles northeast of Hillsboro, New Mexico (Figure 1-1). The proposed mining operation is located in Sections 30 and 31, Township 15 South, Range 5 West (T15S, R5W); Sections 30 and 31, T15S, R6W; Sections 23 through 27 and 34 through 36, T15S, R7W; Section 6, T16S, R6W; and Section 2, T16S, R7W (all with reference to the New Mexico Principal Meridian) in Sierra County, New Mexico. The mineralized zone is centered at approximately latitude 32.970300, longitude −107.533527.

Baseline data has been collected at the Copper Flat project starting in the late 1970s by Quintana, followed by Rio Gold Mining Ltd (Rio Gold), Gold Express, and Alta Gold Company (Alta Gold). This data is relevant and provides insights for future permitting activities. The Copper Flat Mine was first permitted by Quintana Minerals (Quintana) during the 1980s. In 1992, a new plan of operations was submitted and an environmental assessment (EA) was begun by Gold Express, but the operation was never restarted. Alta Gold acquired the property in the mid-1990s and reinitiated the permitting and approvals process, collecting significant baseline data and submitting applications for all major state and federal permits. Alta Gold declared bankruptcy in early 1999, but not before a draft environmental impact statement (DEIS, 1996) and preliminary final EIS (PFEIS, 1999) had been prepared and the associated public comments received; a public hearing had also been held on the New Mexico Mining Act Permit and the New Mexico Groundwater Discharge Permit. However, no final permits had been issued and there had been no opportunity for appeals or litigation regarding the operation. Figures 1-2 and 1-3 illustrate the Site permit boundary with topography and the 2009 aerial photo, respectively.

For the purposes of this sampling and analysis plan (SAP), the permit area is defined as the Site as illustrated on Figure 1-2. The Copper Flat project is composed of approximately 3,304.75 acres in contiguous and noncontiguous lands that include patented and unpatented mining claims (lode, placer, and mill site), and fee parcels. The acreage inside the Site permit boundary is 2,190 acres. NMCC will mine copper ore by open pit extraction methods in the area. Molybdenum, gold and silver will be recovered as byproducts.

The following sections provide an overview of the requirements and content of this SAP, a summary of previous mining activity and investigations, and a description of the proposed mining operations, which provide a basis for understanding the baseline data gathering needs related to the planned mine construction and operations. A mine plan will be submitted at a later date with the mine permit application to detail the construction and operation of the mine.

1.2 Applicant Information and General Plan

1.2.1 Name of Permit Applicant

New Mexico Copper Corporation, a New Mexico corporation.

1.2.2 Map of Proposed Site

Figures 1-2 and 1-3 present the Site permit boundary on a topographic map and a 2009 aerial photograph, respectively.

1.2.3 Surface Ownership Map with Mineral Estates at the Proposed Site

Figure 1.4 presents the map of all known owners of surface and mineral estates within the proposed permit area as of September 1, 2010. This map has been prepared by a qualified mineral title specialist working in collaboration with NMCC's legal counsel, Mark K. Adams of Rodey, Dickason, Sloan, and Robb, PA. This land ownership map is preliminary and subject to update and revision as continued title research is performed and evaluated. The final land ownership map will be submitted with the Phase II Permit Application Package.

1.2.4 List of Surface Owners

According to the 2010 property tax schedule of the Sierra County Assessor, Hydro Resources Corporation (Hydro) and Cu Flat, LLC (Cu Flat) own all of the fee lands within the permit area except as follows:

- Edgar E. Greer ("Greer") owns the fee surface estate in the lands within the permit area in Sections 30 and 31, Township 15 South, Range 6 West, and has contracted to sell his fee surface estate to Ryan G. and Wendy M. Fancher (the "Fanchers"). The mineral estate in such lands is owned by the United States and is subject to unpatented mining claims owned by Hydro and GCM, Inc. (GCM).
- Greer owns the fee surface and mineral estates in the Cincinnati, Graf Von Luxenburg, and Prosper patented mining claims in Sections 25 and 36, Township 15 South, Range 7 West, and has contracted to sell such claims to the Fanchers.
- The non-fee lands within the permit area are owned by the United States. All such lands are subject to unpatented mining claims owned by Hydro and GCM.

All of the fee lands and unpatented mining claims within the permit area owned by Hydro, Cu Flat, and GCM are subject to the Option and Purchase Agreement described in 1.2.5 below.

1.2.5 Access Agreements

The Applicant has the right to enter the proposed permit area and conduct mining and reclamation operations on all lands on which such operations will be conducted or cause disturbance under an Option and Purchase Agreement dated July 23, 2009 by and between Applicant, as Optionee, and Hydro, Cu Flat, GCM, as Optionor. The Option and Purchase Agreement has been amended by a First Amendment dated January 20, 2010, a Second Amendment dated April 1, 2010, a Third Amendment and Supplemental Memorandum dated May 28, 2010, and a Fourth Amendment dated August 2, 2010. This agreement and associated amendments are presented in Attachment 2, Access Agreements.

With respect to the Edgar E. Greer lands within the permit boundary and under contract to Ryan and Wendy Fancher, NMCC has initiated formal negotiations with Ryan and Wendy Fancher for use of the fee surface and mineral estates described in Section 1.2.4. There has been a history of land arrangements with Edgar E. Greer with previous mining companies (Quintana Minerals and Alta Gold), however, these negotiations are expected proceed in parallel with the collection of the baseline data and be concluded prior to the submittal of the Permit Application Package.

1.2.6 Contact Information for Surface Owners

The Applicant owns and controls the entire interest in the proposed Copper Flat operation. The Applicant's address is 2425 San Pedro, NE, Suite 200, Albuquerque, New Mexico 87110, and its telephone number is 505-382-5770. THEMAC Resources Group Limited (THEMAC), a Yukon corporation, owns and controls all of the Applicant's shares. THEMAC's address is Suite 2000, 1066 West Hastings Street, Vancouver, British Columbia, Canada, V6E 3X2, and its telephone number is (+1) 604-495-6723.

1.2.7 Statement of U.S.-Based Mining Operations Directly Controlled by Applicant, Owner, or Operator

Neither NMCC nor THEMAC owns, operates, or directly controls any mining operation in the United States.

1.2.8 Contact Information for the Applicant's Designated Agent

Barrett E.G. Sleeman, President and Chief Executive Officer, THEMAC Resources Group Limited, Suite 2000, 1066 West Hastings Street, Vancouver, British Columbia, Canada, V6E 3X2, (+1) 604-495-6723, barrettsleeman@hotmail.com.

1.3 Sampling and Analysis Plan

The permitting of new non-coal mines is governed by 19.10.6 NMAC (New Mexico Administrative Code). This SAP is submitted to the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Mining and Minerals Division (MMD) by NMCC as the first phase in the mine permitting process. The second phase will be submittal of the baseline characterization report and the mine permit application.

The SAP provides the sampling and analysis procedures for the data to be included in the baseline characterization report described in Paragraph (13) of Subsection D of 19.10.6.602 NMAC. As described in Part 6, baseline data include the (1) hydrological, (2) geological, (3) mineralogical, (4) ecological, and (5) cultural components within the proposed Site and the area outside of the Site that will be affected by the proposed mining activity at the Copper Flat Mine.

Pursuant to Paragraph (13) of Subsection D of 19.10.6.602 NMAC, this SAP must contain seven data subcategories, which are further described in Tables 1 and 2 of the MMD draft guidance document (MMD, 2010). These subcategories and their location in this SAP are listed below.

- Climatological factors (Section 2)
- Vegetation survey (Section 4)
- Wildlife survey (Section 5)
- Topsoil survey/sampling (Section 6)
- Surface water sampling (Section 8)
- Groundwater sampling (Section 9)
- Historic and cultural properties survey (Section 10)

An eighth subcategory, radiological survey, is not required for non-uranium mines.

This SAP presents the data requirements identified for each subcategory and describes how these will be addressed, summarizes the sampling objectives, and describes the data collection methods for each subcategory or medium. Specifically, in accordance with Subparagraph (a) of Paragraph (12) of Subsection D of 19.10.6.602 NMAC, the following information is discussed for each of the seven subcategories:

- Sampling objectives
- Sampling frequency (in accordance with Table 2 of the 2010 MMD guidance for new mining operations)
- A list of data to be collected
- Methods of collection
- Parameters to be analyzed (as outlined in Table 1 of the 2010 MMD guidance)
- Maps showing proposed sampling locations

- Laboratory and field quality assurance plans
- A brief discussion supporting the proposed sampling plan and/or use of historical data

Where the methods of collection require the use of a Global Positioning System (GPS) receiver to record site features (e.g., discrete sampling locations, transect locations, surface drainage features, weather station locations, cultural resource locations, etc.), those data will be verified by reference to landscape features and landmarks shown on USGS quadrangle maps. All GPS data will then be differentially corrected for sub-meter accuracy. Shapefiles of these features will be created using a geographic information system (GIS) compatible with ArcGIS. The shapefiles and GPS data will be presented in a baseline summary report in both hard-copy format as report figures and digital format as Microsoft Excel tables and/or ESRI shapefiles.

The following additional information is included in this SAP:

- An overview of major topographic features and topographic maps at a scale of 1-inch equals 2000 feet (1:24,000) (Section 3 and throughout document)
- Conceptual mine layout for proposed operations (Section 1.5)
- Mine operation description (Section 1.5)
- General geology, ore body description, and geologic sampling (Section 7)
- Land use information (Section 11)
- Maps to illustrate all proposed sampling locations (at end of Sections 2, 4, 5, 6, 8, 9, and 10)

Extensive site characterization activities have been performed at the Copper Flat Mine as a result of previous mining activities and attempts to re-open the mine. This SAP presents the historical data that will be incorporated into the baseline characterization report along with procedures for acquiring new data that will be collected to fill data gaps and meet the requirements of 19.10.6 NMAC. All new data collection will be performed in compliance with the procedures defined in this SAP and the Quality Assurance Project Plan included as Attachment 1.

1.4 Summary of Historical Mining Operations

The following history of the Copper Flat Mine and the overview of previous investigations and sampling programs were summarized from BLM (1999), Raugust (2003), and SRK (2010). The results of previous sampling programs are discussed in the applicable sections of this SAP, as relevant.

1.4.1 Mining History

Mining activities in the Hillsboro Mining District, including gold mining from both placer and vein deposits, began in 1877. From 1877 to 1893, numerous shafts and adits were developed along veins that radiate to the southwest and northeast from Copper Flat. Placer workings were developed along most of the major creeks that drain to the east and southwest from Black and Animas Peaks. Between 1911 and 1931, underground deposits were further developed; approximately 65 percent of the $7 million of ore produced from the district before 1931 came from underground veins (BLM, 1999). Placer mining increased after 1932 until World War II; small-scale placer mining continues in the area today (Hedlund, 1985; McLemore, 2003 as cited in Raugust, 2003).

Copper exploration began in the area in the 1950s and continued through the early 1970s. Quintana Minerals Corporation (Quintana) leased the property in 1974 and defined reserves sufficient for mine development through an extensive drilling and sampling program. The Copper Flat Partnership, Ltd., with Quintana acting as mine operator, developed and operated an open pit copper mine at the Copper Flat location in 1982 that included a 15,000 ton-per-day flotation mill and a tailings impoundment. Poor economic conditions led to the termination of mining after only 3 months of operation, although the mine remained on a maintenance status until 1986, at which point the facilities were dismantled and the Site was partially reclaimed (BLM, 1999). The mine produced 7.4 million pounds of copper, approximately 2,300 ounces of gold, and nearly 56,000 ounces of silver during its 3-month operational life (Hedlund, 1985). During the 1990s, several companies submitted plans to reopen the Copper Flat operation; however, none of the plans were realized. No mining activities have occurred at Copper Flat since 1982. More detail about copper exploration activities can be found in Section 11.3.

1.4.2 Surface Features of the Copper Flat Mine

Activity at the Copper Flat Mine in 1982 disturbed 358 acres of BLM-managed public lands and 331 acres of private lands (Figure 1-2). Surface features of the Copper Flat Mine include the following:

- A pit lake that covers approximately 12.8 acres and is about 40 feet (ft) deep.
- Overburden rock storage piles (disposal areas) to the north, west, south, and east of the pit.
- Former mine and mill areas including an unpaved but maintained road from NM Highway 152 to the mill area and a primitive road to the pit area, a 115-kilovolt power line, and a 20-inch welded steel water line.
- A previously state approved and permitted diversion channel re-routing Grayback Arroyo around the mine site.
- A tailings impoundment area, which is dammed by a 6,600-ft-long dam with a maximum crest height of 60 ft, and which includes at least 1.2 million tons of tailings over a 60-acre area (SRK, 1995).

1.4.3 Historical Investigations

A number of investigations and sampling programs have been undertaken at Copper Flat in the past 30 years; several of these provide valuable sources of baseline data as these were related to various permitting processes including EAs and a Draft EIS in 1996 and a Preliminary Final EIS in 1999. For example, in the 8-year period before the 1982 operations began, Quintana collected baseline data at the Site related to climate, soils, vegetation, wildlife, surface water, groundwater, and archeology (Glover, 1977). The geology, mining history, and mineral deposits associated with Copper Flat were described by Hedlund in 1985; the results of a later field investigation that included sampling, water supply information, and ore reserves were documented by Dunn (1992). Aquifer testing was performed as early as the late 1970s and early 1980s, as well as again related to Alta Gold's PFEIS processes in the late 1990s. At least two environmental assessments and one environmental impact statement were prepared for the Site during the 1990s (Raugust, 2003). A number of reports were prepared for Alta Gold in the late 1990s related to the DEIS process; these reports included but are not limited to those summarized by SRK, Adrian Brown Consultants, and ENSR; an independent evaluation was also prepared by Daniel B. Stephens & Associates, Inc. in 1997 (Raugust, 2003). During 2009 and early 2010, a Copper Flat drilling program was undertaken by NMCC to verify the historical Alta Gold data and to expand and refine the existing resources at Copper Flat (SRK, 2010).

Many of these previous investigations have sampled for vegetation, wildlife, soil, potential acid rock drainage, climate and air quality, surface water and groundwater at or near the Site. Between 1989 and 1998, the pit lake was sampled 65 times by various investigators (BLM, 1999). Samples were typically analyzed for pH, major cations and anions, and metals (Raugust, 2003). Attempts were made to measure the flow at local springs and seeps in the 1990s and surface water sampling of creeks began before the 1982 mining operations and continued sporadically until the late 1990s. Before 1996, only one well was available at the Site for groundwater sampling; two additional wells were drilled during 1996 and used for subsequent sampling in the late 1990s (Raugust, 2003). Groundwater samples have also been taken from wells downgradient of the tailings impoundment dam.

Characterization of waste rock from outcrop and storage piles was undertaken in 1994 and again in 1997 to assess existing geochemical characteristics and potential for future acid generation (Raugust, 2003).Test borings in the tailings impoundment area have also been undertaken to investigate the nature of near-surface material and its suitability as borrow material (Raugust, 2003).

1.5 Description of Proposed Mining Operations

A preliminary economic assessment (PEA) was conducted by SRK Engineers and Scientists (SRK 2010) to satisfy the Canadian Securities Administrators National Instrument 43-101. The PEA provides a preliminary overview of the Copper Flat mineral resources and operational mining activities. Mining operations at the Copper Flat deposit will be characterized by a low stripping ratio pit (strip ratio of 0.38, waste to minable resource), with the mining of disseminated porphyry mineralization situated in a moderately mountainous region. The pit was previously pre-stripped of waste prior to ore production when the mine was briefly operated in 1982. The various water diversion structures previously constructed around the pit area are still in place and will be used. Figure 1-5 illustrates the pit, three waste piles, a tailings impoundment area, and a plant-facilities area between the pit to the west and the tailings impoundment to the east.

The preliminary pit design was determined to be approximately 2,500 ft (east-west), 2,500 ft (North-South), and 900 ft deep. The pit design was broken into three phases for scheduling purposes, with 80-foot-wide ramps, 30-foot bench heights, and a maximum haul road grade of 10 percent.

Open pit mining will be conducted using conventional diesel-powered equipment, a combination of blast-hole drills, hydraulic face shovels, rubber-tired wheel loaders, and off-highway haul trucks. Support equipment such as graders, track dozers, and a water truck will aid in the mining of the mineral resources and waste.

Indicated and Inferred mineral resources were considered for all optimization and production scheduling analyses and were based on an internal cut-off grade of 0.14% Cu. (The internal cut-off grade is based on process and general and administrative [G&A] operating costs.) The PEA report includes the Inferred mineral resources that are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves.

A variable cut-off grade strategy, with elevated cut-off grades for the first 14 years of production, increased the mill feed head grades in those years and provided over three years of low-grade stockpile processing after the pit mining operations ended.

Existing infrastructure in preservation includes items such as the primary access road, water systems, electrical power distribution, and the concentrate load-out facility. Where possible, existing serviceable items were presumed to be re-used or upgraded; otherwise new construction will be assumed.

The primary items that were assumed to be re-usable include the mine access road, the water well field, the primary freshwater pipeline, the main electrical substation at I-25, the 115kV power transmission lines, the 25kV power line to the well field, the reclaim tunnel, and the access cutting from the mill site to the tailings area.

Access to the mine site includes approximately 3 miles of all-weather gravel road, which will require re-grading in addition to some widening and work at key points.

The milling and process system will receive fresh water from a series of previously existing wells located about 8 miles east of the site. Additionally, the previously used 20-inch diameter pipeline was left in place. It was assumed that the wells will be uncapped and refitted with new pumps for current use, and that the pipeline will be in serviceable condition and can also be re-used. It was also assumed that the well field and pipeline pump stations powered via a 25kV power line can be reconnected and re-used.

Electrical power in the county is provided by Sierra Electric Co-op. A high-voltage substation is still in existence near Caballo, 13 miles to the east of the Site. This substation supplies a 115kV transmission line to the Site that is currently not live, as well as low-voltage distribution lines to the town of Hillsboro. The 115kV transmission line can be accessed for site power.

A new substation will need to be constructed at the Site. An emergency generator allowance was also included as backup power would be required in the event of power loss to maintain critical systems and to aid in a controlled shut down. NMCC is analyzing the viability of solar power generation to offset the mine's energy demand, along with other energy and water conservation measures.

Product concentrate will be produced on site, and the resulting dried bulk copper concentrate and bagged molybdenum concentrates will need to be shipped to other facilities. An on-site concentrate load-out facility will be required, and two possible off-site load-out facility locations have been identified. The off-site load-out facility would essentially be a fenced-in area adjacent to a new rail siding that has truck off-loading and railcar loading capabilities.

The copper concentrate will be transported via railcar to a smelter facility, such as the Freeport-McMoRan Miami Operation. Molybdenum product would be transported from the mill in "super sacks." A truck scale and scale house will be needed to weigh the copper concentrate and molybdenum concentrate trucks leaving the site en route to the load-out facility (SRK, 2010).

1.6 References

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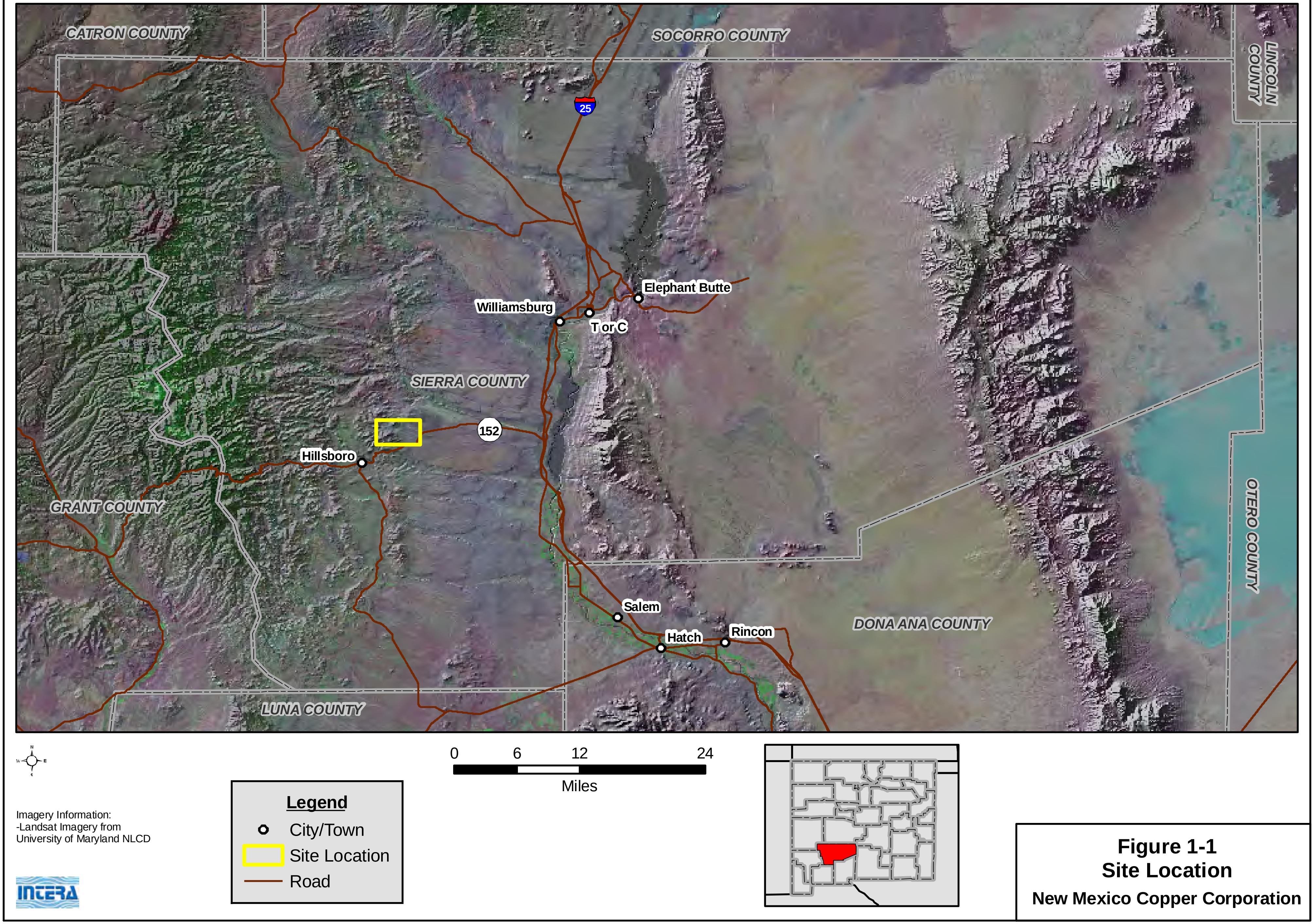
Figures



Imagery Information:
-Landsat Imagery from
University of Maryland NLCD

INTERA

Figure 1-1
Site Location
New Mexico Copper Corporation

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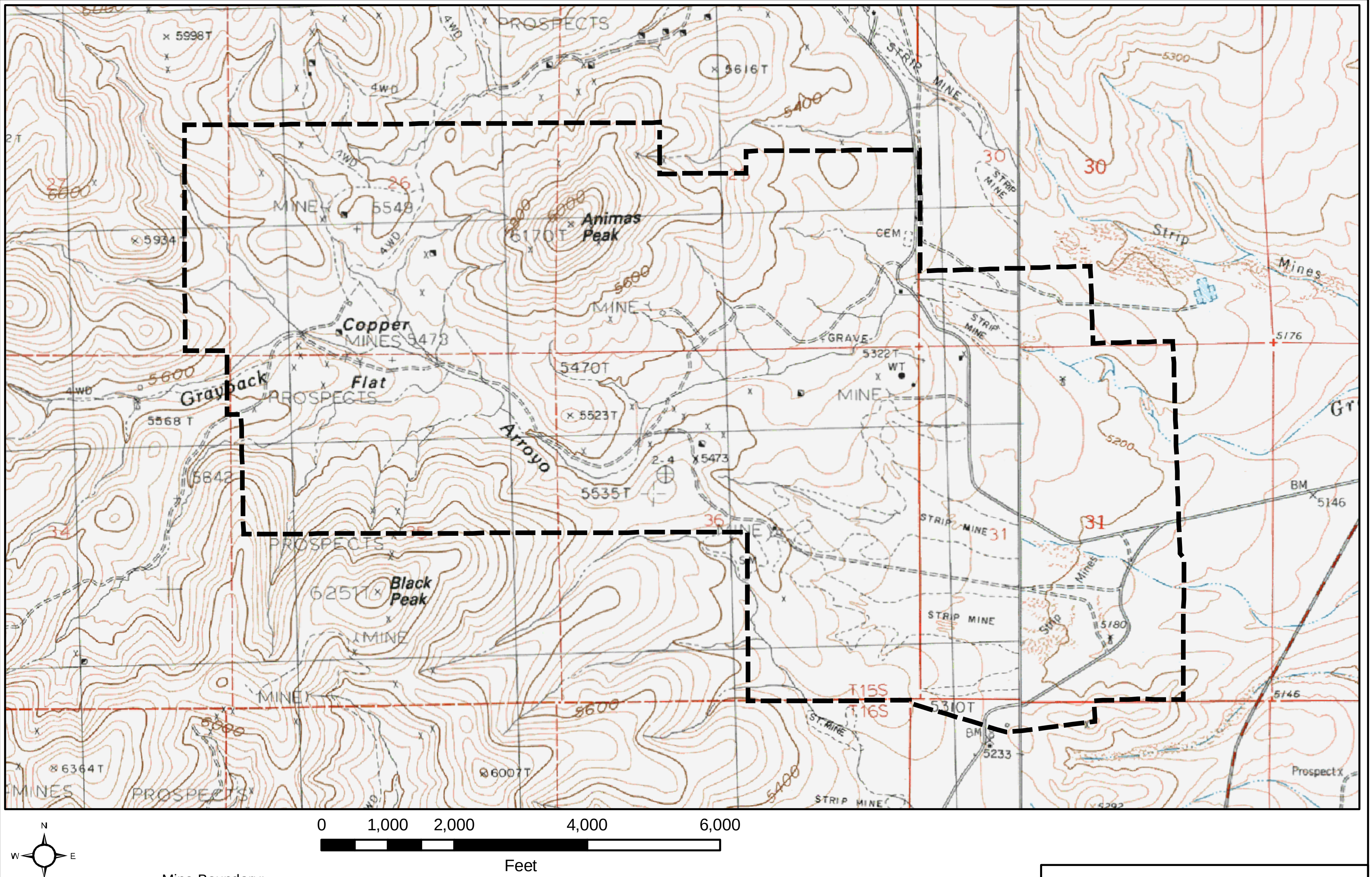

Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes Quads; Skute Stone Arroyo & Hillsboro
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▭ Proposed Mine Permit Boundary

Figure 1-2
Proposed Copper Flat Permit Area with Topography

New Mexico Copper Corporation

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Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ
mosaic Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▭ Proposed Mine Permit Boundary

Figure 1-3
Proposed Copper Flat Permit Area with Air Photography

New Mexico Copper Corporation

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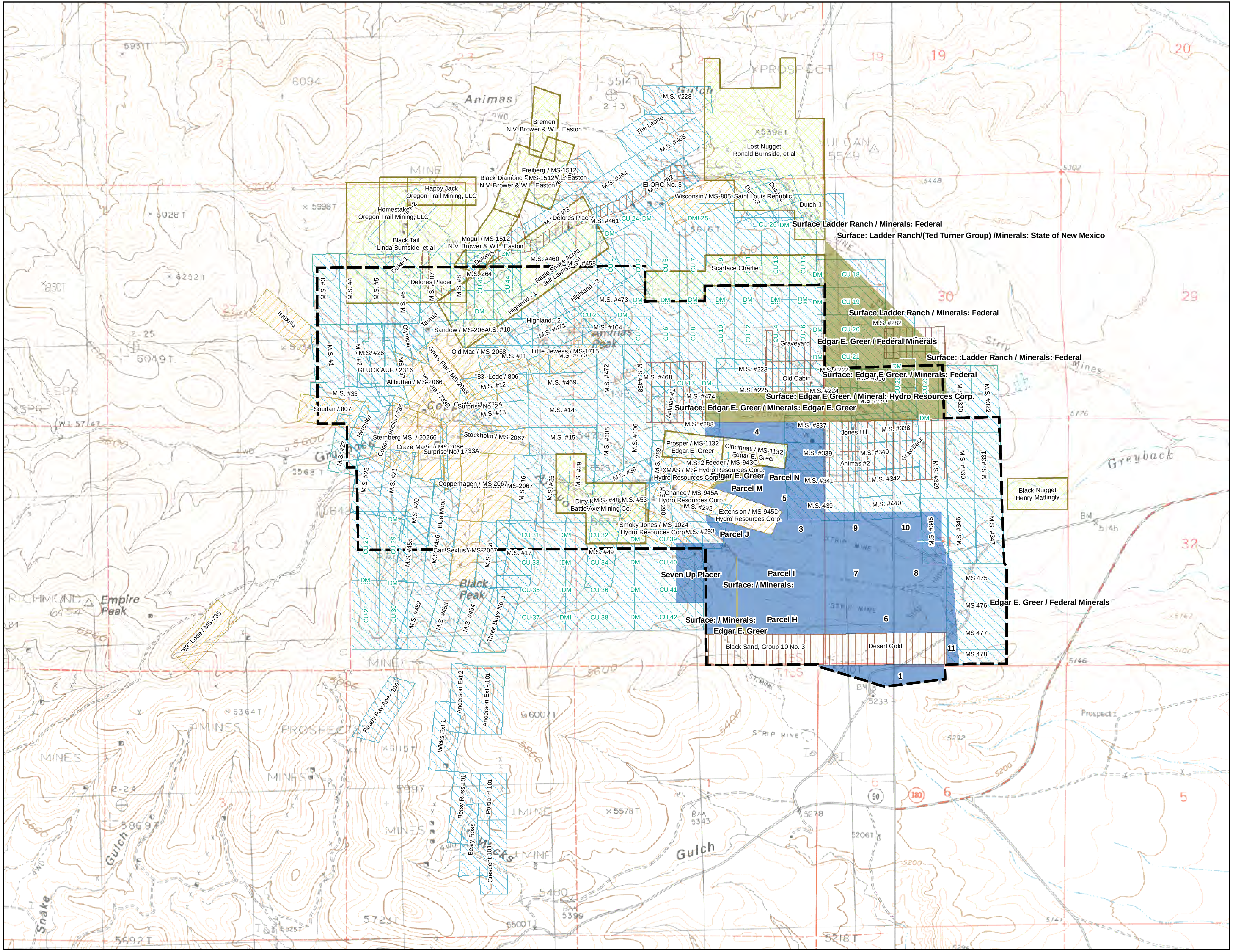

N
W E
S

Mine Boundary:
John Reynolds
Claims & Feelands:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minute Quads; Skute Stone Arroyo & Hillsboro
Projection Information:
-New Mexico State Plane West, NAD 1927

0 1,000 2,000 4,000
Feet

Legend

▭	Mine Permit Boundary
🟫	Fee, Category 3a
🟦	Fee Lands subject to Option Agreement dated July 23, 2009
▭	Fee Lands NOT subject to Option Agreement dated July 23, 2009

Figure 1-4
Proposed Copper Flat Permit Area with Land Ownership and Claims

New Mexico Copper Corporation

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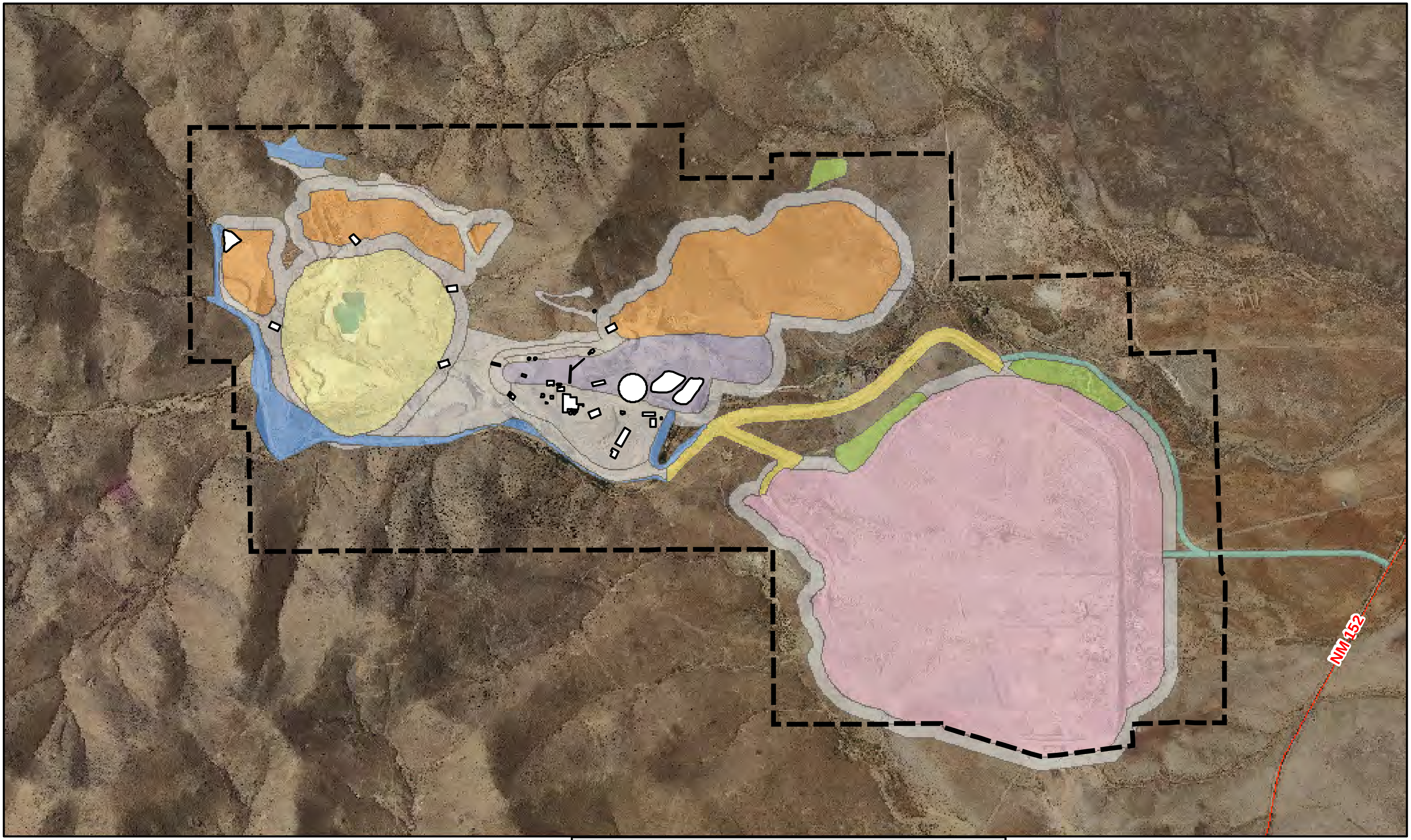

Mine Boundary:
Tom Reynolds
Disturbed areas/mine facilities: SRK, 2010
Imagery Information:
-USGS 7.5-Minutes County DOQQ
mosaic Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

Figure 1-5
Proposed Copper Flat Permit Area with the Pit, Three Waste Piles, a Tailings Impoundment Area, and a Plant-Facilities Area

New Mexico Copper Corporation

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2 Climatological Factors

2.1 Introduction and Background

The Copper Flat Mine Permit Area (Site) lies within the belt of mid-latitude westerlies where the prevailing wind direction is from the west. Winds at the Truth or Consequences, New Mexico, airport, located about 30 miles northeast of the Site, are generally from the northwest; however, the Black Range and foothills cause local variations in the winds. At Copper Flat, the wind direction is predominantly west to east, and secondarily north to south. Local wind speeds average about 10 to 15 miles per hour, although winds in excess of 50 miles per hour may occur at times. Temperature inversions are rare at Copper Flat, but are more common farther east along the Rio Grande valley, especially during the winter months. Vertical air dilution is generally good because of the area's high surface temperatures, creating strong daytime thermal mixing. Thermal mixing and moderate winds generally tend to suppress occasional nighttime inversions. The presence of higher winds and the lack of inversions contribute to a relatively clean atmosphere at the Site since any pollutants are readily mixed and dispersed (BLM, 1999).

Temperature data for the Site show a wide diurnal and seasonal variability, which is typical of dry climates. The warmest temperatures occur in June and July and the coldest temperatures usually occur in December and January. In spring and fall, daily maximum temperatures are moderate, typically averaging 65 to 85 degrees Fahrenheit (°F). Nights are cooler, with low temperatures averaging 32 to 50°F. Winter temperatures are frequently below freezing at night, but can be above 50°F during the day. During summer, temperatures can approach 100°F during the day. Daily temperature fluctuations of 30°F are common throughout the year (BLM, 1999).

Precipitation at the Site averages about 13 inches per year (ranging from nearly 3 inches in 1956 to over 20 inches in 1986). As much as half of the annual precipitation occurs in the form of intense thunderstorms during July, August, and September, when moist air enters the region from the Gulf of Mexico. Summer thunderstorms can result in heavy rainfall and flash floods. Average monthly precipitation in January through June is typically 0.50 inch or less. Snowfall is possible from October through April, but most likely (greater than 1 inch) between December through February (BLM, 1996).

Evaporation exceeds precipitation in southwestern New Mexico. Pan evaporation data, the most commonly collected data, are correlated with lake evaporation (i.e., free water surface evaporation) to predict evaporation from reservoirs and lakes. Lake evaporation at the Site is estimated to be approximately 58 to 65 inches per year, and pan evaporation is estimated to be approximately 80 to 90 inches per year (SRK, 1995).

Prior to the preparation of this Section, two reports from Alta Gold Company baseline meteorological data were reviewed by a subcontractor on behalf of NMCC to collect baseline meteorological data and conduct PM_{10} ambient air monitoring. These reports were prepared for Alta Gold Company by their air quality subcontractors, Air Sciences Inc. (Air Sciences) and present the meteorological protocols used by Air Sciences, including a letter from the New Mexico Air Quality Bureau approving the protocols. They also present the baseline air conditions for six months of on-site data (collected from August 19 to February 20, 1995), and six months of complimentary Truth or Consequences data (collected from February 21 to August 18, 1964), which was used for air dispersion modeling. On July 9, 2010, NMCC and the subcontractor visited the New Mexico Air Quality Bureau to meet with David Heath of the air modeling group, and Norma Perez and Kathy Primm, Environmental and Permit Specialists, respectively, to describe the air monitoring protocols the subcontractor would use, and to discuss the location of the on-site meteorological tower, which is the same location used by Alta Gold in 1994 and 1995. No objections were noted to either the protocols or the tower location (Air Sciences, 1995a and 1995b).

2.2 Sampling Objectives

2.2.1 Meteorological

The monitoring program will operate as a single station for a minimum of one year. The purpose of the monitoring program will be to collect baseline climatological data representative of the Site that satisfies the criteria of the New Mexico Surface Mining Act and the U.S. Environmental Protection Agency (EPA) on-site meteorological program guidance for dispersion modeling (EPA, 1987). The meteorological data will provide input to characterize the following climatological factors on a quarterly and annual basis:

- Wind direction
- Wind speed
- Temperature
- Precipitation
- Relative humidity
- Barometric pressure
- Net radiation
- Evapotranspiration

Additionally, the meteorological data will support the particulate (PM_{10}) air monitoring program to help determine sources of airborne particulate matter and to aid in the validation of monitored data.

The data capture goal will be 90 percent or greater for each meteorological parameter.

2.2.2 Air Quality – Particulate (PM_{10})

Title 19, Part 6 of the New Mexico Surface Mining Act requires the mine permittee to maintain all environmental permits and to be in compliance with other state or federal laws, regulations, or standards. Other applicable ambient air quality laws, regulations, and standards include those promulgated by the New Mexico Environment Department's Air Quality Bureau and the Environmental Protection Agency.

Federal and New Mexico Ambient Air Quality Standards (NMAAQS) exist for three categories of particulate. The categories and standards are as follows:

- Total suspended particulates (TSP) (20.2.3.109 NMAC)
  - 24-hour average: 150 micrograms per cubic meter (µg/m^3)
  - Annual geometric mean: 60 µg/m^3
- Particulate matter less than 10 micrometers (PM_{10}) (40 CFR 50.6(a))
  - 24-hour average: 150 µg/m^3
- Particulate matter less than 2.5 micrometers ($PM_{2.5}$) (40 CFR 50.7(a))
  - 24-hour average: 35 µg/m^3
  - Annual average: 15 µg/m^3

Fugitive dust from material hauling and conveying, stockpiles, and tailings impoundments may contribute air emissions of particulate matter categorized as PM_{10} and TSP. Currently, no monitored data exists characterizing the local ambient air quality particulate concentrations in the vicinity of the Site. Based on the need to determine current background concentrations and to address potential public concern over future air quality impacts, NMCC recommends PM_{10} monitoring at two locations.

PM_{10} monitoring will demonstrate compliance with the NMAAQS health-based standard and help characterize TSP episodes to address the New Mexico standards for nuisance dust and soiling. The PM_{10} monitoring program will follow EPA guidelines for methodology and quality assurance, and will use samplers with equivalence method designation.

The validated data capture goal is 75 percent based on quarterly and annual report periods.

Surface mining and milling for copper are not considered significant sources for $PM_{2.5}$ emissions. Monitoring for this parameter is not recommended due to potential emissions below significant thresholds.

2.3 Sampling Frequency

2.3.1 Meteorological Station

Meteorological sensors are to be scanned once each second. The data are compiled as averages and totals at hourly and 15-minute intervals.

2.3.2 Air Quality Station

PM_{10} samples will be taken once every 6 days. Each scheduled sample will run for a period of 24 hours from midnight to midnight of the scheduled sample date.

2.4 List of Data to Be Collected

2.4.1 Meteorological

Meteorological data will be output hourly; averages and totals will be output every 15 minutes. See Table 2-1 for the meteorological data that will be collected and the instruments that will be used.

2.4.2 Particulate (PM_{10})

In addition to collecting 24-hour average particulate matter as PM_{10}, the following supporting data will be collected:

- Flow rate in liters per minute
- Fluctuation of flow rate
- Average ambient temperature
- Average ambient pressure
- Total run time in minutes
- Total volume of air sampled

2.5 Methods of Collection

2.5.1 Meteorological Monitoring

Data will be collected and stored on a Campbell Scientific CR1000 datalogger. The datalogger will interface with a digital cellular modem allowing daily data downloads to a remote PC and monitoring of real-time meteorological conditions. The datalogger will have the capacity to store approximately 2 months of data on-site.

2.5.2 Air Quality Monitoring

Each sample filter will be collected manually following the end of the sample period and prior to the next scheduled sample. Filters will be labeled with individual serial numbers and tracked with chain-of-custody forms between the field and laboratory. The laboratory will ship pre-exposed filters to the field in individual glassine envelopes. No later than two days following the end of sample period, a field technician will place the exposed filters into the original glassine envelope and return the filters via express mail.

The designated PM_{10} sampler is a model PQ200 manufactured by BGI corporation. The sampler flow controller will maintain flow rate at 16.7 liters per minute. The processor will output hourly and daily values for average ambient temperature and pressure, flow rate, pressure drop, and error alarms. The data log will be downloaded onto a field PC at the time of each filter change.

2.6 Parameters to be Analyzed

2.6.1 Meteorological Parameters

The meteorological tower will report hourly and 15-minute averages for the following parameters:

- Horizontal wind direction
- Horizontal wind speed
- Sigma theta of the wind direction
- Temperature at 10 meters (T10)
- Temperature at 2 meters (T2)
- Delta temperature as T10 minus T2
- Relative humidity
- Barometric pressure
- Net radiation
- Pan evaporation

In addition, the meteorological tower will report hourly and 15-minute totals for precipitation and evaporation.

2.6.2 Air Quality Parameters

PM_{10} will be calculated as a 24-hour average using standard conditions of temperature and pressure to determine flow rates for each sample. The standardized temperature and pressure will be used in combination with net weight gain on the filter to determine the final PM_{10} concentration in $\mu g/m^3$.

2.7 Maps Showing Proposed Sampling Locations

The map provided in Figure 2-1 plots the locations of the proposed particulate (PM_{10}) and meteorological monitoring stations. The air monitoring stations are designated as Site 1 and Site 2. Site 1 consists of one 10-meter meteorological tower and one PM_{10} monitor. Site 2 consists of a single PM_{10} monitor.

The air monitoring site coordinates are as follows:

- Site 1 – 0264721 meters E; 3650403 meters N; Elevation at 5,402 feet
- Site 2 – 0262618 meters E; 3651000 meters N; Elevation at 5,596 feet
- Mill Site – 0264363 meters E; 3650403 meters N; Elevation at 5,457 feet

All coordinates are expressed as Universal Transverse Mercator (UTM) coordinates in the NAD 83 mode.

2.8 Laboratory and Field Quality Assurance Plans

2.8.1 General

2.8.1.1 Data Validation and Reporting

All data will be reviewed by a senior air quality professional retained by NMCC as it is received from the field. Any problems detected during the data review will be immediately communicated to the field technicians and then to the data reduction specialists. Data reduction specialists will compile the data on a monthly basis and produce monthly engineering units, math reports, and data capture summaries of the validated data. A senior air quality professional will prepare an operations summary for each month. The individual monthly reports and summaries will be compiled into an annual database from which an annual report will be produced. PM_{10} data will be reported monthly and quarterly as specified by EPA guidelines and federal regulations.

All procedures for calculation and reporting of data capture and determination of compliance will be performed in accordance with the following, as appropriate:

- Paragraph 13 of Subsection D of 19.10.6.602 NMAC
- Instruction manual for the PQ200 air sampler version 1.83 (BGI, 2007)
- 40 CFR 50, Appendices H, J, and K to Part 50
- 40 CFR 58, Appendix B to Part 58
- EPA *On-Site Meteorological Program Guidance for Regulatory Modeling Applications, Quality Assurance Handbook for Air Pollution Measurement Systems,* Volume II: Ambient Air Specific Methods (Appendix D); and *Quality Assurance Handbook for Air Pollution Measurement Systems,* Volume IV: Meteorological Measurements (EPA 1987, 2008a, 2008b).

2.8.1.2 Quality Assurance/Quality Control

The quality assurance audits will be conducted with personnel and equipment completely independent from the routine field operators and their chain of supervision. Audits of the particulate samplers will be performed every six months, with a total of two proposed for the first year. Monthly flow checks will be performed by the on-site technician. The tower-based meteorological sensors will be audited every six months, with a total of two audits scheduled for the first year. Problems encountered during the audits will be corrected at the time of the audit or immediately referred to the station operator. All audit results will be summarized in a separate report to be issued following each field visit.

All audit procedures and equipment will conform to the federal regulations and guidelines listed in the previous section.

2.8.2 Quality Assurance Procedures for Meteorological Station

The field quality assurance procedures and schedule for the meteorological tower are provided below:

Procedure	Schedule
Perform general station check/visit	2 times per month
Review data on a real time basis	Daily
Audit meteorological tower instruments	Biannually
Check operation of meteorological sensors	Each visit
Check datalogger output against ambient conditions	Each visit
Ship data to Albuquerque (field logs)	1 time per month
Review data (field)	Each visit
Review data (home office)	Daily
Maintain documentation of all field activities	Each visit

The station operator will document the findings and actions taken during each station check on pre-printed and bound station log forms. A guidance document outlining the procedures and required corrective actions, if applicable to maintain properly functioning instruments will accompany the station logbook.

Below is a summary of the meteorological field audit procedures to be followed by all air quality personnel. Although characterized as a summary, the procedures described follow the intent of the published EPA QA/QC guidelines and satisfy the project monitoring obligations. The general guidelines to follow in preparation for a field performance audit are as follows:

1. List all parameters to be audited. Include calculated parameters (e.g., delta T, temp. lapse, sigma theta).
2. List the model type(s) for all sensors to be audited.
3. Compare the standard procedures below with the parameter/sensor model to be audited and prepare an equipment list and an information list.
    a. The equipment list should include:
        i. Actual test equipment.
        ii. Tools and spare parts.
        iii. A computer interface (lap top, keyboard, etc).
    b. The information list should include (most of the information in the first five items can be found in the field quality assurance binders and reports from previous audits):
        i. Expected sensor output values.
        ii. Calibration factors for tower sensors and audit instrumentation (e.g., net radiation).
        iii. Programs and software (LoggerNet, copies of the datalogger program and channel outputs, an audit assistant spreadsheet, and look-up tables).
        iv. Wiring diagrams for the datalogger and other connections, if available.
        v. General data points and results from the previous audit, if available.

   vi. Instruction manuals, including Campbell Scientific CR1000, Raven modem, and sensor manuals as required.
   vii. A field quality assurance binder.

4. Pack-up, review the checklist, and leave.

Each meteorological sensor is evaluated based on the comparison of performance against EPA guidelines and manufacturer specifications. If any performance values are outside the recommended ranges, the results are immediately reported to field personnel so that any field repair and/or recalibrations can be performed expeditiously. The baseline summary report will include these results for documentation purposes.

Each meteorological sensor is calibrated using procedures specifically designed to test its accuracy of response. General descriptions are given below. These procedures reflect the requirements described in the *Quality Assurance Handbook for Air Pollution Measurement Systems* (EPA, 2008b). Upon arrival at the Site, each variable is observed for reasonableness. Next, the audit manipulations to each sensor are conducted. The datalogger outputs are recorded and compared to the audit input values. If the bias between the audit and Site values exceeds the prescribed limits described below, the appropriate troubleshooting is conducted to determine the cause of the discrepancy. At the conclusion of the audit, the sensors are put back on line and are again checked for reasonableness.

See Table 2-2 for a summary of meteorological audit criteria.

2.8.2.1 Sensor Heights

During the Site visit, the height of each sensor above ground is measured with a standard tape measure or using trigonometric methods and a surveyor's transit. The measured heights are then compared to those stated in the air monitoring program plan.

2.8.2.2 Wind Direction

Vane Calibration. Two factors must be checked to assure the wind vane is accurately measuring the wind direction: the azimuth as stated on the wind vane (orientation) and the ability of the wind vane to measure winds from all directions.

The preferred method for checking the wind vane orientation marker’s stated azimuth is the solar azimuth angle technique, which is used to determine a known direction (solar azimuth). This measurement is made using a surveyor’s transit mounted either on a field tripod or directly onto the wind direction sensor mounting plate. A measurement to a local topographical marker is then taken and the difference between that value and the known solar azimuth is used to determine a calculated azimuth angle for the reference marker. The resultant azimuth for the reference marker is used in a like manner to determine the orientation of the sensor crossarm (ideally set at 180 degrees). The solar azimuth check is normally done only once to establish a known direction for measurement of the orientation of the reference marker. A minimum of three bearings will be taken for this test. If the solar azimuth angle technique cannot be used, the azimuth angles will be measured with compass bearings.

A substitute (and second preference) for using the solar angle method is to measure the reference point azimuths from a topographic map. The sensor outputs, when aligned to the chosen reference points, are compared to the azimuths determined from the topographic map. This methodology requires accurate interpretation of the angles from the topographic map and knowledge that the chosen reference points are visible from the tower site. Additionally, at least one of the reference points needs to be greater than 10 kilometers from the tower site.

Regardless of which azimuth determination technique is used, the following should be adhered to by the field staff:

1. Select reference points with as great a distance possible from the tower site. The preferred approach is to have at least one point that is a minimum of 10 kilometers distant. If points of this distance are not available, extra care must be taken during the visual alignments.
2. Always prepare the basic field data before leaving for the Site (solar angle tables, azimuth to reference points, etc.).
3. Complete all preliminary data on the audit log forms. This data includes calibration constants of all audit instrumentation (as applicable) and expected output values for each test (as applicable).
4. Always run an equipment checklist prior to leaving for the Site. The content of the equipment list depends on the methodologies to be used.

The ability of the wind sensor to measure winds from any direction is tested by visually aligning the sensor with the reference markers established above, recording the output from the datalogger, and comparing the previously determined azimuths. To ensure accuracy, the wind vane is aligned with the crossarm and the corresponding output is recorded.

Sensor Linearity and Overall Accuracy. Sensor linearity is checked by removing the wind vane and replacing it with a protractor and angle fixture. Wind direction readings will be taken at 30 degree intervals for a total of 12 readings. This is the preferred method.

In the event a calibrated protractor is not available for a given type of sensor, the linearity will be checked by approximating 45 or 90 degree turns. A volt or ohm meter may be also be used for the alignments. As with the calibrated protractor, readings will be taken at approximately 30 degree intervals.

Sigma Theta Test. The wind direction sigma theta check is a test of the datalogger sigma theta calculation. Any system errors attributable to the program algorithm and/or the signal from the sensors are detected in the outputs at the datalogger. The theta test is conducted by fixing the wind vane at a given direction for a given period of time and then moving the vane approximately 30 degrees and leaving it at this setting for the same time period. The time interval is selected to correspond to one averaging period of the datalogger. During the selected time interval, the wind speed sensor is held stationary to prevent the vector averaging routine from interfering with the sigma theta audit. Sigma theta, average wind direction, and average wind speed are recorded from the datalogger and compared to the expected values.

The following items are important to ensure the accuracy of this test:

1. Ensure that the theta test corresponds to the averaging interval on the datalogger. Most systems calculate the sigma theta over a sub-interval period of either 10 or 15 minutes. Whenever a sub-interval period is in use, the averaging period of the datalogger (i.e., final output instruction) must be modified to correspond to this interval. Remember to always reset all changes made to the program before proceeding to the next audit parameter.
2. Synchronize the timing for the test to the datalogger clock, not necessarily with the auditor’s watch. Repositioning of the wind vane (for the second half of the averaging interval) must occur as closely as

possible to the midpoint of the time interval. For example, the wind vane will be moved after 5 minutes for a 10-minute test and after 7.5 minutes for a 15-minute test.

3. Always record start and end values for time, wind directions, wind speeds, and protractor settings (when applicable).
4. Perform the sigma theta test on each datalogger within a monitoring network. On towers with multiple levels of sigma theta, perform the test on the level of the most significant interest.

Starting Threshold Torque. The wind vane's starting threshold torque is measured using a National Institute of Standards and Technology (NIST)-calibrated torque gauge. The gauge is applied to the wind vane shaft at the center of rotation and a constant force is applied. The test is repeated six to eight times beginning at different points for a 360-degree rotation. The value recorded is the highest value observed during the test.

If a calibrated torque watch is not available, the Jonard leaf torque gauge must be employed. This method requires a ruler (capable of measuring 10 centimeters [cm]) and a protected area where the sensor can be set up and leveled free from any air disturbance.

A manual, qualified, bearing check is acceptable only in combination with the above procedures for the purpose of a QA audit.

2.8.2.3 Horizontal Wind Speed

Sensor Calibration. The sensor is audited by removing the anemometer cups and applying a constant rate of rotation in the normal direction of spin using synchronous motors. This is done by connecting the motor shaft to the anemometer shaft using a non-rigid, non-slip connector. Using the anemometer specifications, revolutions per minute (rpm) are converted to wind speed and compared to the resulting instantaneous datalogger outputs. The following precautions will be taken during the calibration procedure:

1. Avoid applying excessive pressure to the sensor shaft during the motor test. Excessive pressure will slow the rate of rotation.
2. Be certain all connections between the motor shaft and the sensor shaft are secure. Slippage can cause erroneous readings on the sensor.
3. Always have the expected output values and audit criteria recorded on the audit log.

Starting Threshold Torque. The starting threshold torque measurement of the anemometer shaft follows the same procedure as that described for the horizontal wind vane. Due to the lower resistance, a more sensitive torque watch is used.

2.8.2.4 Temperature

The tower-mounted temperature sensor is audited by collocation at three points with an NIST-traceable thermometer in constant temperature water baths. The field thermometer has a range of at least -1° to 51°C in 0.1°C graduations and will be certified by comparison to an NIST-certified thermometer. The tests are conducted in the following temperature ranges: 0° to 5°C, 20° to 30°C, and 40° to 50°C. The equilibrated thermometer reading is compared to the datalogger output. Finally, the aspirator is checked for proper ventilation by inspecting operation of the fans, if applicable, and checking the air pathway for obstructions.

Occasionally, a water bath test is not possible. In this instance, the temperature probes will be audited by collocation with the NIST thermometer. The field (NIST) thermometer is to be collocated, under ambient conditions, in proximity to the tower sensor. If possible, the temperature probe will be placed inside the aspirator shield. Be certain not to contact any nearby surfaces with the field probe while conducting this test and keep in mind the following considerations:

1. In addition to recording readings from the field thermometer and individual tower probes, record the delta temperature and temperature lapse values, as calculated by the datalogger, simultaneously for each of the three water baths.
2. Note that small temperature differences within the water bath tests can induce large differences in the measured lapse rates. The passing criterion is 0.1°C.

2.8.2.5 Precipitation

The precipitation gauges are audited using a 100–milliliter (ml) graduated buret (within 1 percent accuracy). Two types of tests are conducted: a 10-tip test and a bucket test. The 10-tip test is conducted before disturbing the outer housing of the gauge. To conduct the 10-tip test, the buret is opened to deliver water at the approximate rate of 5 seconds per cubic centimeter (cc) of water and allowed to flow until ten tips are identified. The delivered amount of water is converted to equivalent inches of precipitation and the result compared to the datalogger output. During the 10-tip test, it is important that the bucket does not overflow on the final tip (the tenth tip). Carefully monitor the flow rate following the ninth tip and quickly close the stop cock on the final tip of the bucket. The error introduced at this point can be minimized with careful control of the water flow rate and should not have a significant effect on the 10-tip average.

In the bucket test, water is delivered until the bucket tips one time. The delivered water is compared to the theoretical amount of precipitation needed for 0.01 inch of rain in each bucket. The bucket test is repeated at least three times for each bucket. Following the bucket tip tests, the sensor is checked for level and cleanliness.

2.8.2.6 Barometric Pressure

The barometric pressure sensors will be calibrated according to manufacturer specifications. The sensor output will be checked by collocation with an aneroid or digital portable barometer. The portable barometer will be calibrated to an NIST-traceable mercury barometer immediately before the team leaves for the field. The mercury barometer and documentation of the certifications will be located at the NMCC Albuquerque office.

2.8.2.7 Relative Humidity

The relative humidity sensors are audited by collocation under ambient conditions using an aspirated psychrometer or digital relative humidity (RH) meter. Both thermometers used in the psychrometer are certified using the procedures cited above for temperature. The equilibrated dry bulb and wet bulb thermometer readings and the datalogger output values are recorded. The audit relative humidity value is calculated from formulas contained in the Smithsonian Meteorological Tables, corrected for the measured ambient barometric pressure. The audit relative humidity is compared to the datalogger output and the result is considered satisfactory if the difference between the two is ±3 percent RH or less.

When conducting the relative humidity audit, it is important that the following considerations be observed:

1. Position the tower sensor as close to the inlet to the psychrometer thermometers as possible.
2. Be certain to shield the tower sensor and the psychrometer from direct sunlight.
3. Allow 2 or 3 minutes for the psychrometer to stabilize at the beginning of the test.

4. Perform at least two tests, preferably three.

2.8.2.8 Net Radiation

The net radiation audit is accomplished through collocation of an audit pyranometer with the tower pyranometer. The mounting of the audit sensor should closely match that of the tower sensor, accounting for elevation, sun exposure, and level. The audit sensor should be of nearly identical spectral response as that of the tower sensor.

Readings from the two sensors can either be taken as discrete points over a pre-determined time interval or as an extended time average. Discrete readings should be taken over a minimum period of 2 hours with as many as 15 to 20 values distributed over the time interval. Extended averages can be taken with an independent volt meter (capable of collecting average data) over a minimum period of one hour. The following considerations apply:

1. Ensure that discrete readings of the audit and tower sensors are closely synchronized in time.
2. Start the extended averaging period on the digital volt meter (DVM) at the beginning of the corresponding period on the tower datalogger (hourly, 15 minutes, etc.).

2.8.2.9 Station Locations and Orientation

During the field portion of the audit activities, the integrity of the station reference marker is checked by determining the azimuth angle with respect to true north and comparing that value to the value used by the station operator for the meteorological tower. This is accomplished by field measurement of the solar azimuth using a leveled surveyor’s transit. The solar azimuth angle is previously calculated from a computer program and available to the auditor in tables at 5-minute intervals. Once the known azimuth angle of the sun is established, it is used to determine the azimuth of station reference marker(s). These values are compared to values determined by the station operator using other orientation methods.

2.8.2.10 Station Sampling Environs

Part of the system audit is to document instrument fetch and local effects on data. The Site area obstructions, field of view, and local topography are examined. Nearby obstructions are located on the azimuth scale, heights are determined (when possible), and the distance from the tower is measured. All local environs data are evaluated, compared to regulatory guidance, and submitted with the audit report for inclusion in Site documentation files.

Meteorological Data Validation Criteria. The following criteria will be used in preparing the quarterly summaries for the Copper Flat meteorological data for this report:

1. Temperature Summaries (10-m temperature, 2-m temperature, delta temperature, and temperature lapse rate)

   The mean, maximum, and minimum temperatures (in degrees Celsius) are reported for each day in the quarter. The maxima and the minima are based on 1-hour averages. For a 24-hour mean value to be valid, at least 18 hourly values must have been recorded during the 24-hour period. If less than 18 hours of valid data are available, the mean is calculated, but data may not be representative and should be used with care. Similarly, maxima and minima are included for these periods. Even though some data may have been available on these days, the maxima and minima may be misleading if the missing data was for the hottest or coldest part of the day.

For each month in the quarter, the mean temperature for the month is calculated from all of the hourly data, including the data from the days that did not have sufficient data to calculate a 24-hour mean. Monthly averages are calculated for months with less than 4 valid 24-hour means. The monthly maximum and minimum are also reported. Although 4 days of valid data are considered enough to report a mean, means for months with less than 18 days of valid data may not be representative and should be used with care.

A quarterly mean, maximum, and minimum are reported if there is at least one valid month of data in the quarter. However, these values may not be truly representative of the entire quarter if significant amounts of data are missing. The validity of the quarterly values depends on their intended use, and care should be taken with quarters with low data capture.

2. Wind Speed Summary

   The 24-hour mean wind speed and the maximum hourly wind speed are reported for each day of each month (in meters per second). The criterion for a valid 24-hour means is the same as that described above for mean temperatures.

   The monthly mean wind speed and the maximum wind speed are also reported. The criteria for determining the monthly values are the same as those described above for monthly temperature values. Likewise, the mean for the entire quarter and the maximum hourly value in the quarter are reported, using the criteria described above for quarterly temperature values.

3. Wind Data Summary

   The wind data summary report gives a joint frequency distribution (JFD) for wind direction and wind speed. Wind direction is divided into 16 sectors, each representing 22.5 degrees. The north sector covers 348.75 degrees to 11.25 degrees (i.e., its axis of symmetry is zero degrees). Wind speeds are divided into 8 categories. The data in each wind speed/wind direction category are given as a fraction of the total month to the nearest 1 percent. The total fraction for each wind direction sector and each wind speed category is also given.

   A quarterly JFD is printed if at least one valid month of data existed in the quarter. However, the quarterly JFD may not be truly representative of the full quarter if only one month of data is available.

4. Precipitation Summary

   The total daily precipitation in inches is reported for each day in the quarter, along with a running precipitation total beginning on the first day of the quarter. Daily precipitation is reported if at least one hour of data is available during that day.

   The total quarterly precipitation is reported along with the total number of hours during which precipitation occurred. A quarterly precipitation value is reported if there is any valid precipitation data during the quarter. Care must be taken when using quarterly precipitation values if there were significant missing data during the quarter.

5. Relative Humidity Summaries

   The daily mean, maximum, and minimum relative humidity (in percent) are reported for each day in the quarter. The maxima and minima are based on 1-hour averages. For a 24-hour mean value to be valid, at least 18 hourly values must have been recorded during the 24-hour period. If less than 18 hours of valid data are available, the mean is calculated, but data may not be representative and should be used with care. Similarly, maxima and minima are included for these periods. However, the maxima and minima may be misleading if the missing data were for the hottest or coldest part of the day.

The monthly mean relative humidity is calculated from all of the hourly data, including that from the days without sufficient data to calculate a 24-hour mean. Monthly averages are calculated for months with less than 4 valid 24-hour means in the month. The monthly maximum and minimum are also reported. Although 4 valid days are considered sufficient to report a mean, monthly means based on less than 18 days of valid data may not be representative and should be used with care.

A quarterly mean, maximum, and minimum are reported if there is at least one valid month of data in the quarter. However, these values may not be truly representative of the entire quarter if significant amounts of data are missing.

6. Data Capture Summary

The percent of valid data, based on hourly values, is reported for each month and each parameter; the average data capture for the entire month is also reported. In addition, the percent of valid data for the quarter for each parameter and the average data capture for the quarter are provided.

7. Barometric Pressure Summary

Barometric pressure is provided in millibars and represents the actual Site pressures; these data have not been “corrected” to sea level as is typically done with National Weather Service data. The reporting requirements for valid averages, maxima, and minima are the same as those for temperature and relative humidity summaries.

8. Net Radiation Summary

The maximum net radiation in watts per square meter is reported for each day in the quarter. The maxima are based on 1-hour averages.

9. Evaporation Summary

The total, minimum, and maximum evaporation values are reported in inches for each day of the quarter. Minima and maxima are based on 1-hour averages. Positive values indicate evaporation, or loss of water from the evaporation pan, whereas negative values indicate precipitation or addition of water to the evaporation pan for other reasons.

For a 24-hour total value to be valid, at least 18 hourly values must have been recorded during the 24-hour period. If less than 18 hours of valid data are available, the total is calculated, but data may not be representative and should be used with care. Similarly, the maximum and minimum are included for these periods, but may be misleading if the missing data occurred in the hottest or coldest part of the day or during a precipitation event.

The total monthly evaporation is calculated from all the hourly data for each month in the quarter, including the data from days with insufficient data to calculate a 24-hour total. The monthly maximum and minimum are reported as well.

Validated data includes natural precipitation events. Scheduled and manual re-filling events are removed from the reported data set.

2.8.3 Quality Assurance Procedures for Air Quality Station

The field quality assurance procedures and schedule for the air quality station are provided below (EPA, 2008a):

Procedure	Schedule
Change particulate filters	Every 6 days
General station check/visit	At each visit
Flow rate check particulate samplers (PM_{10})	Monthly
Audit flow check of particulate samplers	Every 6 months

During monthly sampler flow checks, the flow rate is adjusted to be within 4 percent of 16.67 liters per minute (l/min) under ambient conditions. Ambient temperature and pressure taken at the time of the flow checks/adjustments are used to calculate a correction factor. The correction factor is used to calculate actual flow rates (Q_{ACT}).

Actual flow rates are converted into standard flow rates (Q_{STD}) at standard temperature (298°K) and pressure (760 mm Hg). The filter weight gain is determined to be the difference between the unexposed filter weight and the exposed filter weight. Both Q_{ACT} and Q_{STD} together with net weight gain are used to determine the 24-hour particulate concentration in micrograms per cubic meter ($\mu g/m^3$).

2.9 Discussion in Support of Proposal

2.9.1 Total Suspended Particulates

Currently no NMAAQS exists for TSP. However, the state of New Mexico retains a TSP ambient air quality standard for nuisance dust and overall welfare type of impacts. Given the lack of residences and restricted public access to the mine areas, NMCC does not anticipate nuisance dust to be a significant problem, at least for the near term of the project. However, the project recognizes potential public concern for TSP impacts. NMCC proposes to use PM_{10} monitoring, as described in the following section, to estimate TSP concentrations based on monitored PM_{10} values.

2.9.2 Particulate Matter Less than 10 Micrometers

In 1987, the EPA adopted PM_{10} as the NMAAQS for particulate matter, replacing TSP. Since that date, PM_{10} has been one of the particulate matter health standards at the federal and state levels. PM_{10} has potential local impacts due to releases from the ground level and elevated stack sources. A review of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Mining and Minerals Division (MMD) regulations (Title 19, Part 6) revealed no specific requirement for an air quality monitoring plan to protect the environment. Additionally, a survey of several non-coal mines in New Mexico revealed no requirements for particulate monitoring.

Fugitive dust from material hauling and conveying, stockpiles, and tailings impoundments may contribute air emissions of particulate matter categorized as PM_{10} and TSP. Currently, no monitoring data exists characterizing the local ambient air quality particulate concentrations in the vicinity of the Site. Based on the need to determine current background concentrations and potential public concern of future air quality impacts, NMCC recommends PM_{10} monitoring at two locations.

PM_{10} monitoring will demonstrate compliance with the NMAAQS health-based standard and help characterize TSP episodes to address the New Mexico standards for nuisance dust and soiling. The PM_{10} monitoring program will follow EPA guidelines for methodology and quality assurance, and will use samplers with equivalence method designation.

NMCC proposes using the PQ200 low-volume (16.67 l/min) sampler manufactured by BGI. The sampler uses a 47-mm Teflon filter and is powered by a 100-amp hour gel cell lead acid battery. It uses a photovoltaic panel for charging. The sampler has EPA equivalence method designation for both PM_{10} and $PM_{2.5}$.

2.10 References

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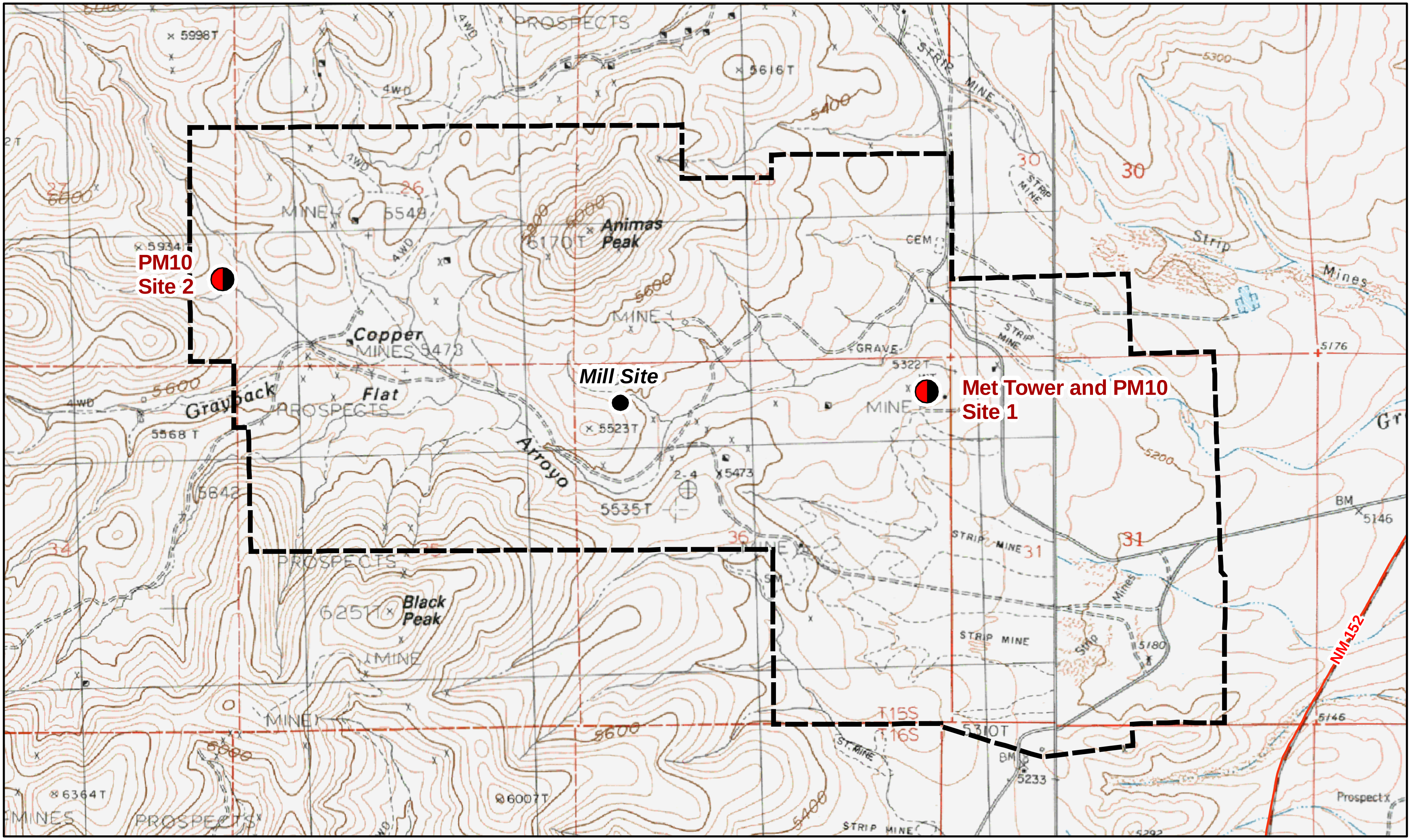
Figure



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W E
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Sample Locations:
Class One Technical Services
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes Quads; Skute
Stone Arroyo & Hillsboro
Projection Information:
-New Mexico State Plane West, NAD 1927

0 1,000 2,000 4,000 6,000
Feet

Legend

▭ Proposed Mine Permit Boundary

Figure 2-1
Topographic Map Showing the Locations of the Proposed Particulate (PM$_{10}$) and Meteorological Monitoring Stations

New Mexico Copper Corporation

Tables

Table 2-1
Meteorological Data to be Collected

Parameter	**Tower Level (m above ground surface)**			**Equipment Manufacturer and Model**
	0	**2**	**10**	
Horizontal Wind Direction			X	Climatronics F460
Horizontal Wind Speed			X	Climatronics F460
Ambient Temperature		X	X	Climatronics 100093 Motor Aspirated
Temperature Lapse (2–10 m)		X	X	Climatronics 100093 Motor Aspirated
Pan Evaporation	X			NovaLynx
Relative Humidity		X		Climatronics 100098 Motor Aspirated
Net Radiation		X		Kipp and Zonen
Precipitation	X			Climatronics Tipping Bucket
Barometric Pressure		X		Setra

Table 2-2
Summary of Meteorological Audit Criteria

Parameter Tested	Acceptable EPA Deviation or Satisfactory Criteria
Wind Direction	
Vane Orientation	± 5° from reference
Sensor Linearity	±3° at any of the 12 points checked
Starting Torque	See manufacturer specifications
Horizontal Wind Speed	
Sensor Calibration	± 0.25 m/s at speeds < 5 m/s 5% at speeds > 5 m/s (max. error 2.5 m/s)
Starting Torque	See manufacturer specifications
Temperature	± 0.5°C at all 3 points checked
Temp. Lapse	± 0.1°C
Precipitation	± 10% difference
Barometric Pressure	± 10.2 millibars (mb)
Relative Humidity	± 3%
Net Radiation	± 5% difference
Evaporation	± 10% difference

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3 Topography

3.1 Introduction and Background

A topographic map of the Copper Flat Mine Permit Area (Site) and the surrounding area at a scale of 1:24,000 (where 1 inch equals 2,000 feet) is shown in Figures 3-1, 3-2, and 3-3. Off-site sampling locations are shown in the respective sections of this SAP at the appropriate scale. In addition to topography, these figures show:

- The boundaries of the Site.
- Various manmade features not enumerated herein.
- Proposed sampling locations for soil characterization analysis.
- Surface water features.
- Groundwater wells.
- Air monitoring stations.
- Weather stations.
- Wildlife and vegetation transects.
- Paved and dirt roads.
- A conceptual mine layout showing the basics of the proposed mining operation, including the proposed locations of all surface features such as structures, stockpiles, tailings, pits, adits, shafts, etc.

An aerial photograph covering the same area as Figure 3-1 is presented in Figure 3-2, illustrating the site boundary, disturbances from previous mining and mineral development activities, including roads, pit, waste dumps, tailings, diversion channel, scraped and developed plant facilities areas, and other disturbed lands.

3.2 Sampling Objectives

The objective of the proposed data collection is to verify the existence, condition, and use of features within and immediately around the Site in advance of mining in order to supplement existing topographic data. This baseline data will assist in the design of the facility and the reclamation and replacement of features.

3.3 List of Data to be Collected

No topographic data other than the global positioning system (GPS) data collected for sampling locations, as described in each individual resources section of this SAP, will be collected. Existing USGS topographic maps and publicly available aerial photography will be used to display the sampling points collected in the field within the context of the Site or project area.

3.4 Methods of Collection

Field surveys will be conducted across the Site and samples will be collected at locations up to 9.2 miles from the Site to establish the existence and location of the features enumerated in Section 3.1 by means of a Global Positioning System (GPS) unit. The surveys will be conducted concurrently with other field work.

Site topography is considered to be well established by U.S. Geological Survey (USGS) topographic maps, and will be verified by comparison between topographic maps and current aerial photographs.

3.5 Parameters to be Analyzed

The parameters to be analyzed are the Site baseline topography and locations of existing manmade features.

3.6 Maps Providing Sampling Locations

See Figure 3-1, 3-3, and 3-4 for a topographic map and manmade features up to 9.2 miles from the Site. See Figure 3-2 for an aerial photographic perspective. Off-site sampling locations are shown in figures included in the respective sections of this SAP.

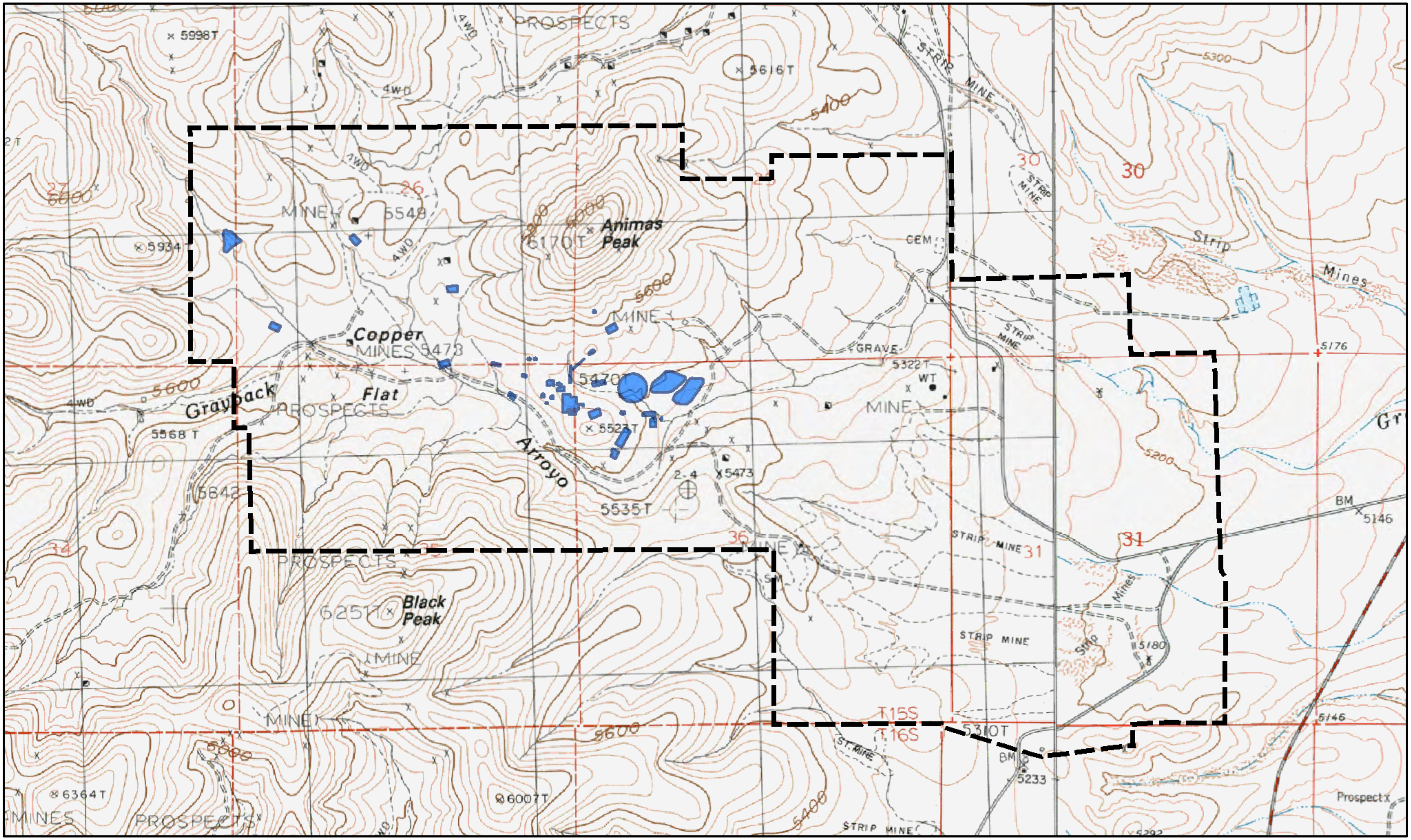
3.7 Sampling Frequency

Field surveys to verify manmade features will be performed concurrent with other field activities during 2010 and 2011.

3.8 Laboratory and Field Quality Assurance Plan

There are no analytical laboratory requirements for topographical field work. New Mexico Copper Corporation (NMCC) may utilize subcontractors to assist with gathering updated information about the baseline topographic condition of the Site. Licensed field surveyors and aerial photographers will be selected based on their qualifications and certifications. Subcontractors and in-house personnel will follow quality assurance/quality control procedures as described in the Quality Assurance Project Plan. The NMCC Task Manager or designee will select a coordinate system consistent with state requirements in order to relate all base maps and surface features to the same system. Field Leaders will verify the existence and location of manmade features as they walk the Site for other data collection activities. If necessary, the features or objects will be tied to the nearest benchmark. Digitized aerial photographs and derived contours will be used for design, baseline data presentation, and baseline conditions for reclamation and re-vegetation.

Figures



Mine Boundary:
Tom Reynolds
Facilities:
SRK, 2010
Imagery Information:
-USGS 7.5-Minutes Quads; Skute Stone Arroyo & Hillsboro
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▭ Proposed Mine Permit Boundary

🟦 Proposed Mine Facilities

Figure 3-1
Topographic Map of the Site and Surrounding Area

New Mexico Copper Corporation

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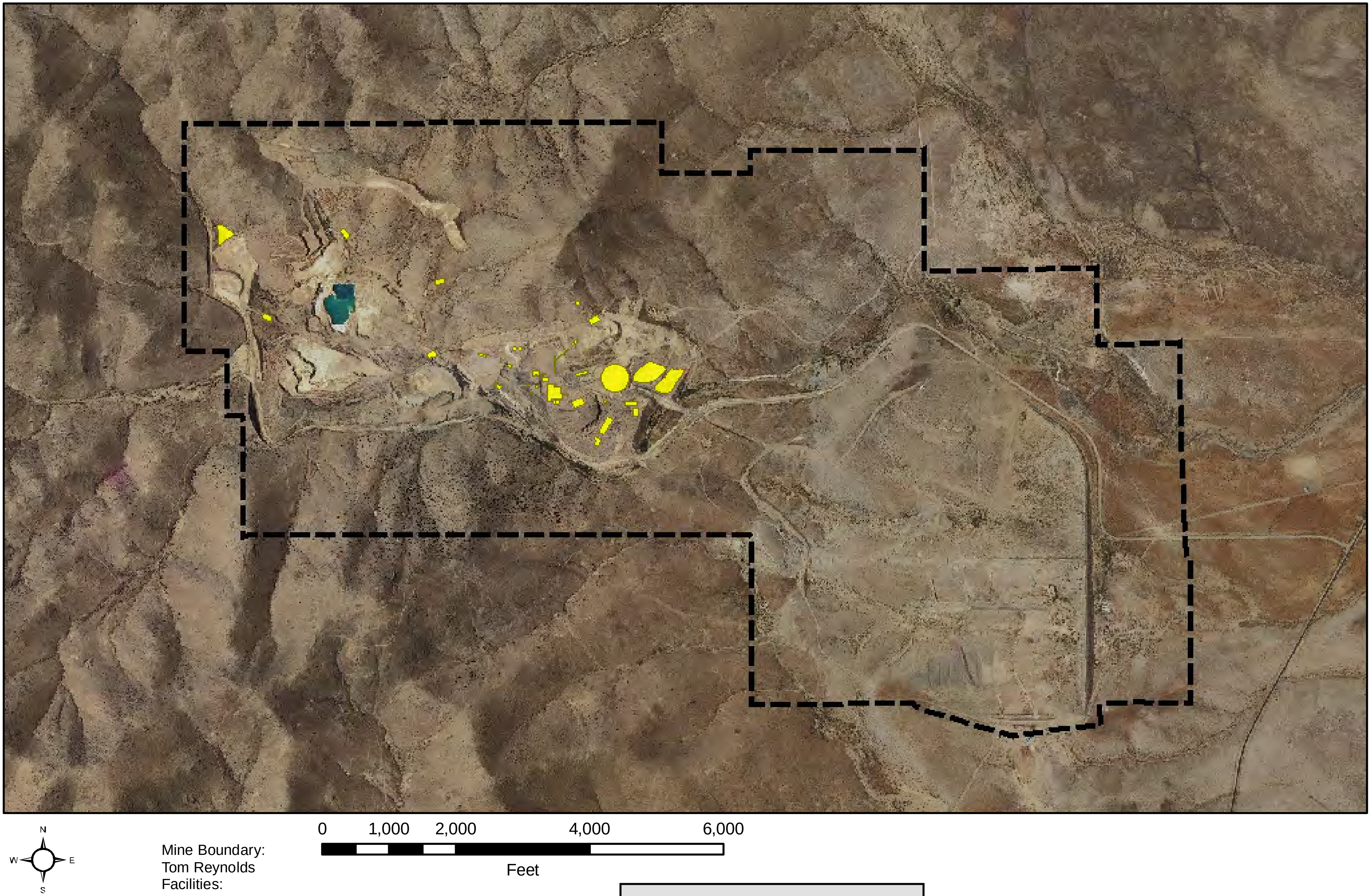

Mine Boundary:
Tom Reynolds
Facilities:
SRK, 2010
Imagery Information:
-USGS 7.5-Minutes County DOQQ
mosaic Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

- ▭ Proposed Mine Permit Boundary
- 🟨 Proposed Mine Facilities

Figure 3-2
Aerial Photograph of the Site
New Mexico Copper Corporation

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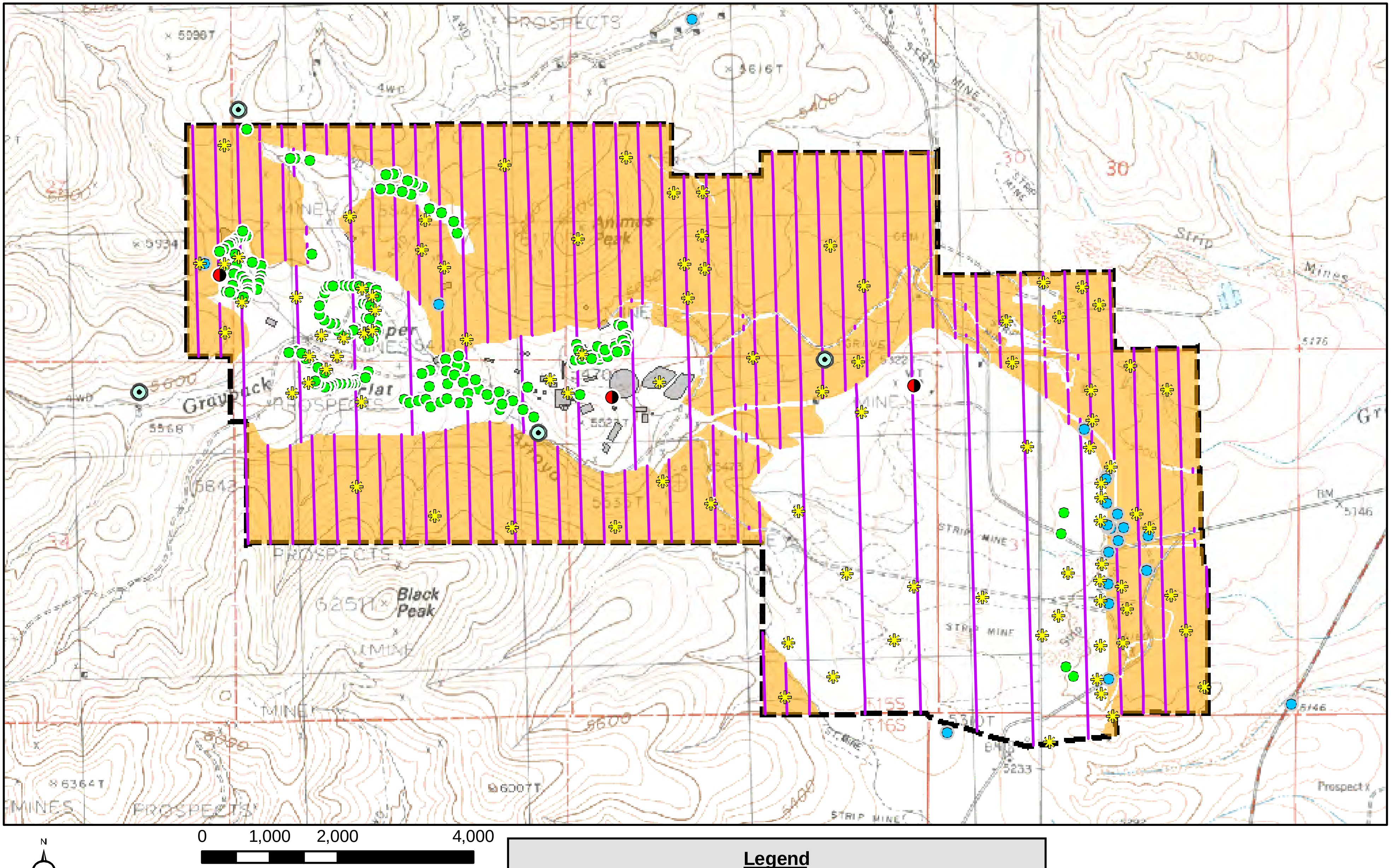

Mine Boundary:
Tom Reynolds
Sample Locations:
SRK, 2010
Imagery Information:
-USGS 7.5-Minutes Quads; Skute
Stone Arroyo & Hillsboro
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

⌜ ⌟ Proposed Mine Permit Boundary	◐ Climate & Air Quality Sample
▭ Proposed Mine Facility	● Monitoring Well
Proposed Sampling Locations	◉ Surface Water Sample
✳ Vegetation Transect	■ Cultural Resources Survey
● Geologic Sample	— Wildlife/Soil Transect

Figure 3-3
Topographical Map with Boundary

New Mexico Copper Corporation

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4 Vegetation

4.1 Introduction and Background

Mining activities and infrastructure constructed by the Copper Flat Partnership, ca. 1982, combined with previous mining-related activities, have contributed to the disturbance of approximately 690 acres within the Copper Flat Mine Permit Area (Site) (BLM, 1999); 358 acres is on public lands and 331 acres is estimated on private lands (according to disturbance acreages listed in BLM, 1999). New calculations by Parametrix total a total disturbed area of 965 acres for the Site, based on digitizing high resolution 2009 aerial photography (Figure 4-2). The Site was reclaimed in 1986, although it appears that only relatively small portions of the Site were actively revegetated. Baseline data has been collected at the Copper Flat project starting in the late 1970s by Quintana, followed by Rio Gold Mining Ltd (Rio Gold), Gold Express, and Alta Gold (related to the 1999 PFEIS). These data are relevant and provide insights for future permitting activity. Information from these previous baseline surveys have been researched and utilized to augment this current sampling process where appropriate.

The history of repeated disturbance at this Site has dramatically impacted vegetation communities. Current vegetation community distribution in the mined areas is more strongly correlated with previous land use than with the biotic or abiotic factors that typically render the distribution of vegetation types or vegetation potential. Given this, the “baseline” vegetation condition for portions of the Site include tailings piles, a tailings dam, barren areas, waste dumps, various roads, diversion channel, pits and pit lake, and other disturbed areas. However, relatively undisturbed areas are also still present within the permit boundary (Figure 4-2).

Biologists surveyed the Copper Flat permit area in April 2010 to assess the relative abundance of individual plant species and perform a preliminary inventory (Parametrix, 2010). During this visit, a total 93 plant species were observed. Additionally, 18 vegetation transects (six each in the control, tailings dam, and tailings piles) were completed to provide a basis for determining vegetation sampling adequacy. The statistical analysis revealed that the data collection methods proposed in this report should achieve the intended sampling objectives for evaluating the important vegetation attributes as outlined in New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Mining and Minerals Division (MMD) guidance documentation (MMD, 2010).

4.2 Sampling Objectives

The proposed sampling and analysis approach intends to capture the current vegetation condition throughout the permit area to meet the following sampling objectives:

1. Delineate a current vegetation map stratified according to disturbance history and Ecological Site Description.
2. Describe specific vegetation attributes for plant communities delineated within the permit area through quantitative measurements of:
    - Basal vegetation cover by species and ground cover.
    - Aerial vegetation cover by species.
    - Woody plant density.
    - Herbaceous productivity.
    - Plant species richness and diversity.
3. Complete a plant species inventory.
4. Perform a threatened or endangered species survey.

4.3 Sampling Frequency

The growing season for warm season (C4) grass species is typically April through August in New Mexico. Since biomass production rates typically increase with precipitation, quantitative data collection transects will be performed during the late summer following monsoons to accurately capture annual biomass production. This time period is also representative of peak vegetation cover during most years and is considered a favorable period to identify many plant species. Plant cover (especially by annuals) can be greatly reduced after the first frost.

As previously mentioned, an additional plant inventory will be performed during the late summer/early fall. The spring survey was completed in April 2010.

4.4 List of Data to be Collected

A vegetation survey was completed at the Site during 1996 (SRK, 1997) in support of Alta Gold Company's proposal to re-open the Copper Flat Project. The survey employed a modified Parker Three-Step method to characterize vegetation composition, density, and biomass production of native perennial plants. The Parker Three-Step method uses a cluster of three transects in a stratum to characterize the desired vegetation attributes. Unfortunately, the original datasheets or data summaries by cluster are no longer available from this effort. The only information currently available pertains to the dominant native species encountered at each cluster. A recent effort to relocate metal stakes marking the 1996 transects was also unsuccessful. Consequently, the previous information cannot be incorporated into the current vegetation assessment for trend analysis or other purposes. Information collected during the April 2010 preliminary vegetation assessment (Parametrix, 2010) will be incorporated into future work, primarily to supplement the plant inventory, and was also used as a basis for estimating sample adequacy for this plan.

In order to meet the sampling objectives, several additional data needs have been identified and are summarized in Table 4-1.

4.5 Methods of Collection

4.5.1 Site Stratification

The permit area lies within the transition zone between Chihuahuan Desert Scrub and the Desert Grassland Ecotone according to Dick-Peddie (1999). Though the entire permit boundary technically lies within the Chihuahuan Desert Scrub type, the delineation line between these two types is only about 200 meters (m) west of the permit boundary. Two Natural Resources Conservation Service (NRCS) Major Land Resources Areas actually converge within the permit area. Much of the western half is considered Mogollon Transitions (Interior Chaparral – Woodlands/Grassland subclass), while the eastern half is predominantly characterized as Southern Desertic Basins, Plains, and Mountains (Chihuahuan Desert Shrubs subclass) (NRCS, 2007). The convergence of two landscape scale vegetation classes under both sources (NRCS, 2007 and Dick-Peddie, 1999) may create a relatively unique ecotone at Copper Flat.

The permit area will be stratified according to existing disturbance, proposed disturbance, and NRCS Ecological Site Description (ESD). This stratification serves as an initial vegetation map and also facilitates a stratified-random sampling design for field data collection. Figure 4-1 outlines a process for stratifying the Site and the total number of transects in each stratum. As already mentioned, previous mining activities have significantly impacted vegetation in portions of Copper Flat. Statistical analyses of the data collected during the 2010 preliminary assessment found significant differences in shrub density, grass cover, and species diversity among the tailings dam, tailings piles, and control areas. In consideration, the disturbed areas will be stratified according to whether the area is a tailings pile, pit, or tailings dam. Some areas (namely previous mining pits) are void of vegetation altogether but reflect the pre-mining vegetation condition in these areas under the current permit application. Consequently, this stratum will also be included in sampling.

Two ESDs are delineated in the permit area, Gravelly and Hills. ESD delineations will form the basis for stratifying currently undisturbed portions of the Site. Some of these areas may become waste rock areas, tailings impoundments, etc. during proposed future mining. The areas that are planned to be disturbed during future mining will be isolated as a separate stratum by ESD during sampling. Meanwhile, areas currently undisturbed where future disturbance is *not* proposed will be sampled and will serve as a control. Transects occurring in the control area will be permanently marked with a survey nail and whisker on both sides of the transect tape.

The ESDs described at Copper Flat include Gravelly (R042XB010NM) and Hills (R038XB102NM). The Gravelly ESD in this portion of New Mexico has been particularly susceptible to desertification and creosote (*Larrea tridentata*) expansion or invasion. Most of the undisturbed Gravelly portions of Copper Flat are still in a shrub savanna condition with diverse grasses, consistent with the historical climax plant community typified for this area. In fact, creosote was not observed at the Site during the preliminary site assessment. Undisturbed portions of the Hills ESD at Copper Flat also match a historical climax condition relatively well. These areas are dominated by sideoats grama (*Bouteloua curtipendula*) and other mixed grasses with well distributed shrubs. Establishing permanent control transects in these areas will assist in monitoring vegetation community change irrespective of mining disturbance in the permit area.

ESD delineations will be particularly useful since it can be difficult to delineate unique vegetation types in grasslands or scrub shrub communities that appear relatively homogenous on the surface (NRCS, 2010). ESDs are also useful for gauging vegetation potential, describing the seral state of the current community, and defining typical plant community transitions under disturbance or climatic conditions (such as drought). Data comprising an ESD is presented in four major categories (NRCS, 2010):

- Site Characteristics: Identifies the Site and describes the physiographic, climate, soil, and water features associated with the Site.
- Plant Communities: Describes the ecological dynamics and the common plant communities comprising the various vegetation states of the Site. The disturbances that can cause a shift from one state to another are also described.
- Site Interpretations: Provides interpretive information pertinent to the use and management of the Site and its related resources.
- Supporting Information: Provides sources of information and data used in developing the Site description and the relationship of the Site to other ecological sites.

4.5.2 Plant Species Inventory

A preliminary plant species list was compiled in April 2010. This list will serve as a spring inventory for the Site. An additional late summer/early fall inventory will be completed in the permit area during September 2010. The intent of these surveys is to capture a complete plant species list at the Site, including fall or spring annuals and species that can be difficult to definitively identify outside of their flowering and/or fruiting period.

4.5.3 Rare, Threatened, or Endangered Plant Species

Inventories will pay particular attention to the presence or absence of agency-,state-, or federally regulated rare, threatened, or endangered species. Field botanists will research documented nearby locations and habitat requirements of species of concern before completing the inventory. If a species of concern is encountered, a

Global Positioning System (GPS) file will be recorded. Species closely resembling a species of concern will be photographed and/or collected following the discretion of the field botanist and appropriate regulations. No species of concern were observed during the April 2010 preliminary assessment.

4.5.4 Noxious Weeds

If state- or federally listed noxious weeds are encountered, the specific location will be documented with a GPS receiver. Noxious weeds were not observed during the preliminary site assessment.

4.5.5 Sampling Methodology

This section describes the sampling methodology proposed for collecting quantitative vegetation data at Copper Flat. A map (supplied by New Mexico Copper Corporation and Steffen Robertson and Kirsten [SRK]) of the lands previously disturbed and proposed disturbance was used in determining the intensity of sampling and the distribution of transects. Sampling adequacy was based on recommendations from the preliminary site assessment (Parametrix, 2010).

4.5.5.1 Transect Distribution

A stratified-random sampling approach will be used to characterize the current vegetation condition throughout the Site. The total number of transects per stratum was determined by reviewing the results of sampling adequacy calculations following the preliminary site assessment (Parametrix, 2010) and weighting the sample size according to total acreage of the stratum. Sample adequacy is a statistical measure used as a means to assist with determining the sample size that is required to statistically evaluate specific monitoring objectives. According to the preliminary assessment (Parametrix, 2010), the transect number needs to be increased to six (a minimum of ten is recommended in this report), and the transect length should be extended to 50 m. Both of these recommendations are captured in the sampling design proposed in this report. Further dividing "control" areas by Ecological Site Description may also help to reduce variability between the ESDs.

Figures 4-1 and 4-2 articulate how the Site will be stratified for random plot generation. The proposed mine permit boundary is just under 2,200 acres. Of this, the total combined acreage of existing disturbance is approximately 965 acres (Figure 4-2). A sample size of 93 transects is recommended within the permit boundary. See Figures 4-1 and 4-2 for the total number of transects per stratum and the overall transect distribution at the Site.

Transect locations were randomly selected using the random point generation function within Hawth's Analysis Tools ArcGIS plug-in. During this process, the required number of random transects was placed in each stratum. A 40-m buffer was enforced at transition lines between strata and also between individual transects to reduce cross sampling. The resulting geographic coordinates will be transferred to a GPS receiver for field navigation to the target locations. If field conditions do not match the stratum intended, the transect will be moved to a nearby location in the target stratum. After arriving at the sample point, personnel will take a digital photograph in the transect location, and then stretch a transect tape to record quantitative information specific to characterizing cover, production, density, and diversity at each individual stratum.

4.5.5.2 Cover

At the beginning point of each transect, a 50-m tape will be stretched along the ground towards a random direction determined by spinning the compass dial without looking. Cover will be measured with a laser device at stations along the transect using the point-intercept method. The device consists of two green-light laser pointers fixed to a piece of angled aluminum beam and mounted on a camera tripod. Each laser produces a point of light 1 to 2 millimeters (mm) in diameter. Readings will be taken to the right and left of the tape 1 m apart along the entire 50-m tape, resulting in a total of 100 points recorded along each transect.

Both aerial vegetation cover and ground cover will be recorded at each sample point. Aerial cover will be recorded by species. In situations where multiple species are intersected by the laser, both species will be recorded. A single species will not be recorded more than once at the same point. Ground cover will also be determined at each sample point according to whether basal vegetation, litter, bare soil, downed wood, or various rock categories (i.e., cobble, gravel, rock, bedrock, etc., separated by size) are intersected at the ground surface.

4.5.5.3 Biomass Production

Production will be assessed by clipping all herbaceous vegetation within 1-m² quadrats placed at 25-m intervals along the transect. Vegetation from the current growing season will be clipped and stored in labeled paper bags by species and transect. Care will be taken to remove and discard vegetation from the previous growing season (which is usually gray and sometimes partially blackened). When a large shrub covers more than 75 percent of the quadrat area, these shrubs will be clipped within a 0.25 m² quadrat nested inside the 1-m² quadrat.

Biomass collections will then be air-dried at room temperature for six to ten weeks. Samples will be weighed regularly during the drying process to monitor when weight loss stops (i.e., the samples are air dry). Following drying, sample bags will be weighed on an Ohaus Scout II electronic balance to the nearest 0.1 gram.

4.5.5.4 Woody plant density

Woody plant density will be determined on belt transects 2 m wide by 50 m long (100 m²) nested along the sample transect. Field personnel will tally all woody plants rooted within the belt by species. Multi-stemmed shrubs will be considered one individual plant if they appear to emerge from a single root crown.

4.5.5.5 Diversity

While the point-intercept method accurately quantifies cover (Elzinga et al., 1998 and sources within) along a transect, this method sometimes neglects incidental or less common species (sources within Elzinga et al., 1998). To alleviate this limitation, a complete list of herbaceous species encountered along the 2-m belt transect (as described in the *Woody plant density* section above) will be compiled. This information will be used to supplement species diversity information recorded from point-intercept.

There are a variety of measures that assess plant species diversity. Measures can be used to describe species richness, species evenness, and/or the structural complexity of a community. Species richness is simply the total number of species that occur within a transect, stratum, or the entire Site. Species evenness expresses how evenly or unevenly species are distributed within the plant community. Evenness can be expressed as the proportion or percentage that each species represents of the whole (sum of all species).

The Shannon-Weiner (S-W) Index is one commonly used measure of species diversity (Krebs, 1989, and Shannon, 1948). Both species richness and species evenness are factors in this index. The greater the number of species, the higher the index value becomes. In addition, the more evenly matched species are with each other with respect to quantities (whether the quantity is cover, production, or other parameter), the higher the index value. In other words, if certain species are too dominant, the index value decreases. If the species have relatively similar dominances, the index value will go up. Statistically, the index is monitoring the probability of whether the next sample will contain the same species as the previous sample or whether the next sample will be a new species (Krebs, 1989, and Shannon, 1948). The S-W equation is given below (Krebs, 1989, and Shannon, 1948):

$$H = -\sum_{i=1}^{s} (p_i) \log_2 (p_i)$$

where:

H	is the diversity index
Σ	means to sum the values for each species
i	refers to the ith species
s	refers to the total number of species
pi	is the proportion of individuals of the total sample (in this case, cover) belonging to the ith species
log2	is the same as the natural log or ln

The absolute plant covers recorded by the point method are converted to relative covers by lifeform (grass, forb, shrub, annual), by perennials, and by all live vegetation (perennials and annuals). In this manner, the relative perennial cover contributions can be compared to the defined values.

4.6 Parameters to be Analyzed

Analysis parameters were designed to measure standard vegetation attributes and also meet the requirements of MMD guidance documents (MMD, 2010). Specific parameters are listed in Table 4-2.

4.7 Maps Showing Proposed Sampling Locations

As previously mentioned, a stratified-random sampling approach will be used to characterize the baseline vegetation at the Site. Figure 4-2 displays the proposed sampling locations randomly plotted in ArcGIS and the preliminary Site strata.

4.8 Laboratory and Field Quality Assurance Plans

4.8.1 Personnel

The approach recommended within this proposal describes a relatively standard, replicable process that can be applied to the Copper Flat permit area to describe and assess existing vegetation. Quantitative field data collection and plant species inventories will only be completed by trained field botanists with a minimum of a Bachelors of Science in Botany or related qualifications, and five years of regional field experience. Each of the botanists will be accompanied by a field technician for recording data and assisting with transect set-up. All staff will also be trained in use of GPS field devices. Names and resumes of field botanists completing field data collection and data analysis will be available for inclusion in annual reports and survey memoranda.

4.8.2 Sampling Protocol

Specific sampling protocols in this report have been reviewed by senior scientists with extensive experience completing vegetation surveys on rangeland and mine lands. This plan will be independently evaluated again before field data collection is initiated.

4.8.3 Data Quality Assurance and Quality Control

A single field crew chief will be assigned to ensure data collection is consistent between crews. This individual will review a sub-set of the field forms following each field day. Formalized data collection training will also be completed prior to field sampling. All field botanists will be familiar with plant systematics and techniques to identify plants using taxonomic keys. Plant species not readily identifiable in the field will be collected and preserved for identification at the University of New Mexico Herbarium.

Vegetation material produced during the previous growing season will be discarded before placing samples into a paper bag. Rocks, soil, and/or litter will not be placed into sample bags. Biomass production will only be calculated as an actual dry-weight sample. No double sampling or estimations will occur.

Field data entered into an electronic format such as MS Excel or Access will be evaluated for integrity, consistency, and completeness before data analysis. Oversights or incorrect entries will be corrected. A sub-set of the field forms will be compared to the electronic version for an accuracy assessment. If significant differences are identified, a thorough re-evaluation of each of the forms will be completed.

4.9 Discussion in Support of Sampling Proposal

The approach recommended in this report conforms to agency sampling guidelines and objectives (MMD, 2010) and provides a methodology for accurately measuring and characterizing current vegetation at Copper Flat. This information will be used to document baseline vegetation before mining operations continue, and will also provide long-term monitoring locations in undisturbed portions of the permit area that may be useful in the future for gauging reclamation success and climatic or other disturbance-driven changes to vegetation in the permit area.

4.10 References

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Figures

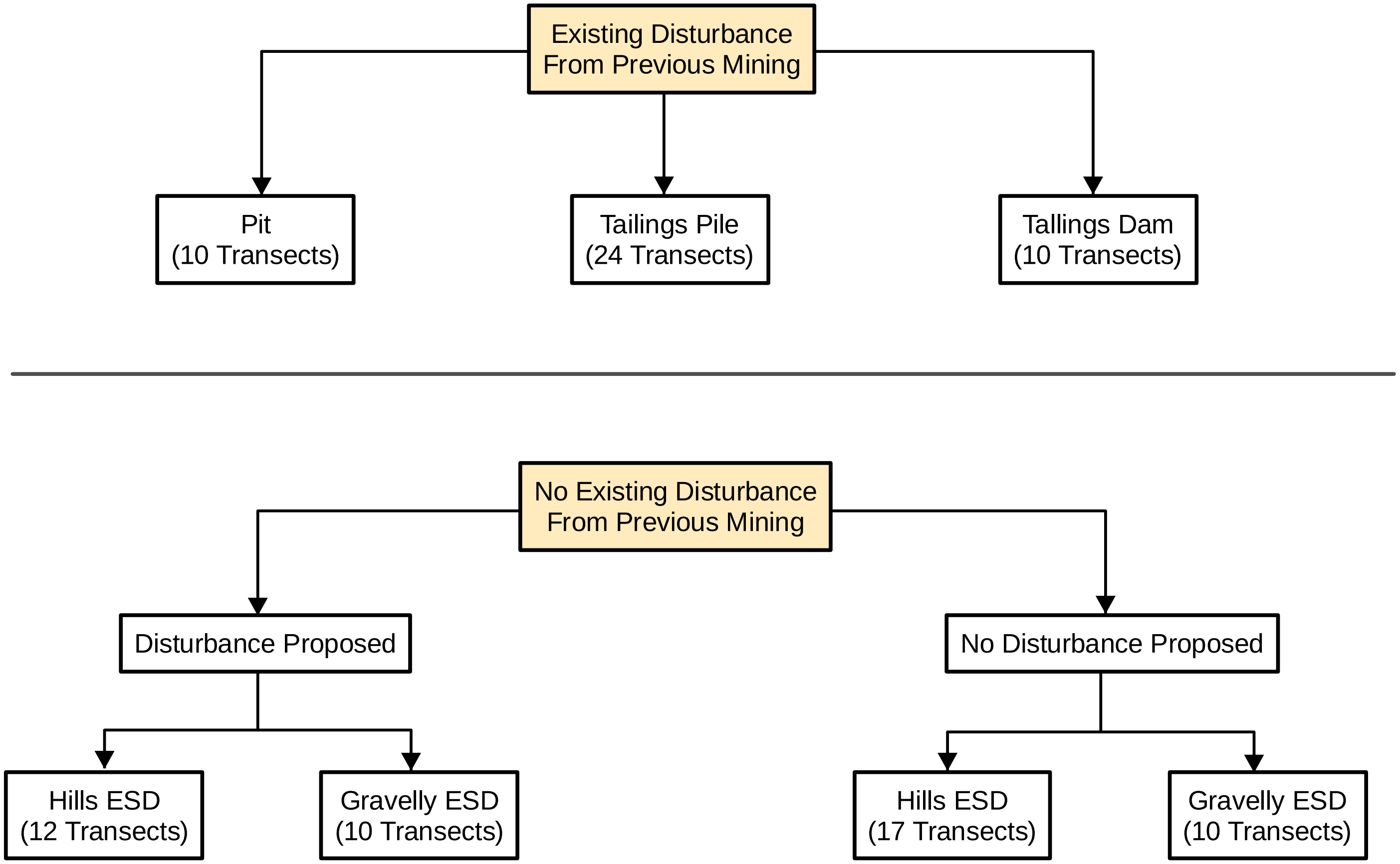

Figure 4-1
Graphical Depiction of the Strata Recommended for Vegetation Sampling and Analysis

New Mexico Copper Corporation

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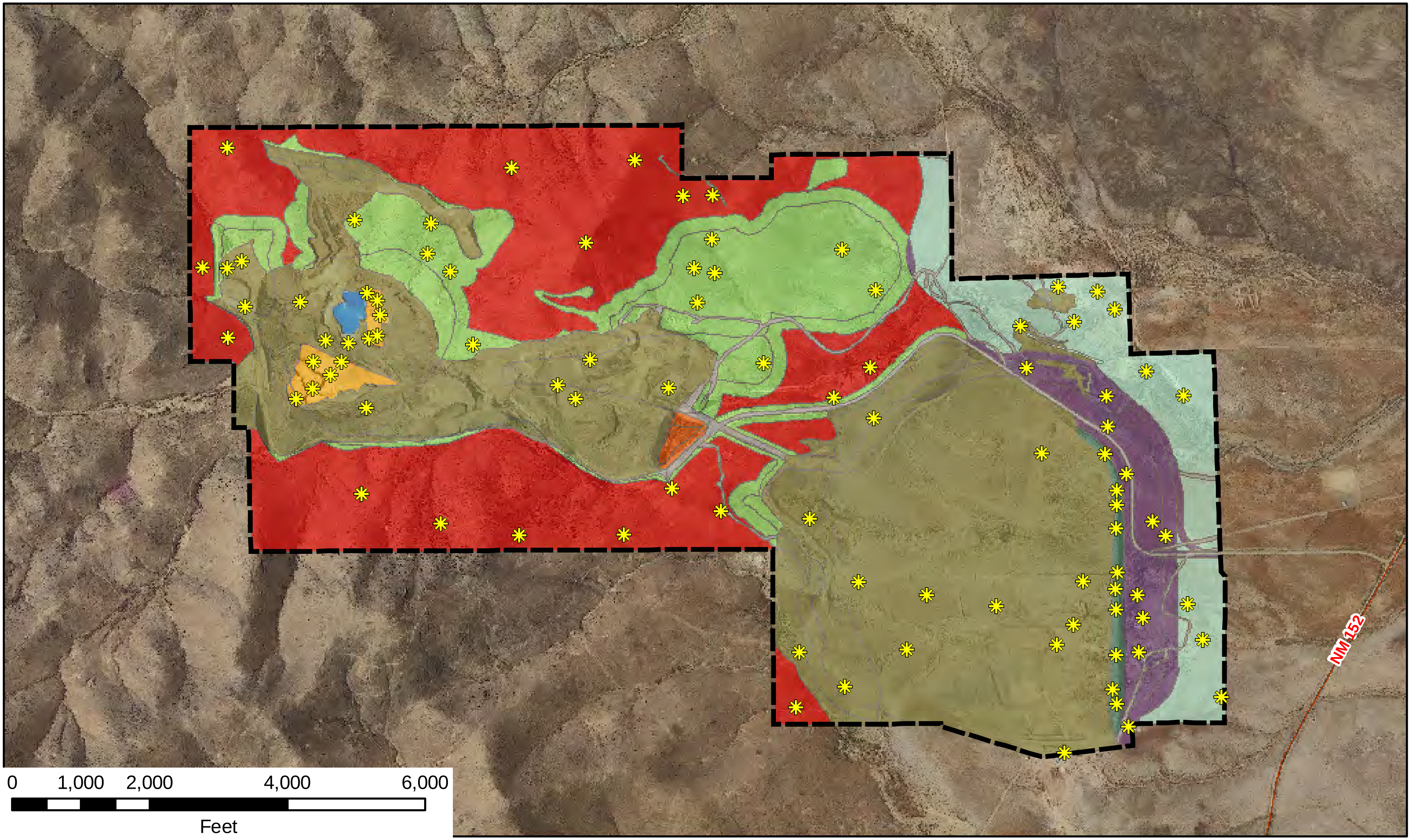

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Mine Boundary:
Tom Van Bebber
Strata/transects:
Parametrix
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

Legend

- ⬚ Proposed Mine Permit Boundary
- ✳ Preliminary Transect Locations
- ■ Access Road
- ■ Baseline No Proposed Disturbance - Gravelly
- ■ Baseline No Proposed Disturbance - Hills
- ■ Baseline Proposed Disturbance - Gravelly
- ■ Baseline Proposed Disturbance - Hills
- ■ Pit
- ■ Pit Lake
- ■ Saltcedar
- ■ Tailings Dam
- ■ Tailings Pile

Figure 4-2
Map of the Proposed Vegetation Transect Sampling Locations and Site Strata

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Tables

Table 4-1
List of the Current Data Needs Addressed in this Report

Data Needs	Plan to Address Data Needs
Vegetation map	A vegetation map will be initially stratified according to the Ecological Site Description and existing disturbance. This source will then be updated based on field observations and further review of aerial photography during quantitative vegetation assessment.
Vegetation survey data	Quantitative assessments of vegetation cover, diversity of plant life form, productivity, and woody plant density will be completed per Mining and Minerals Division Guidance document requirements (MMD, 2010).
Complete plant species inventory	Plant species observed during the April 2010 assessment will be supplemented by additional inventories completed during late summer/early fall per Mining and Minerals Division Guidance document requirements (MMD, 2010).

Table 4-2
List of Vegetation Attributes, Data Sources, and Proposed Analysis Processes

Vegetation Attribute	Source Used for Analysis	Analysis Process
Acreage of existing vegetation community	Vegetation map	Total acreage calculated in ESRI ArcGIS for individual vegetation types in the permit boundary.
Aerial vegetation cover	Quantitative vegetation transects	Parameter calculated from vegetation transects. Results summarized by species and life forms as a weighted average for the Site and also by stratum.
Ground cover	Quantitative vegetation transects	Parameter calculated from vegetation transects. Individual ground cover attributes include basal vegetation (by species, life form, or in total), rock, cobble, gravel, litter, downed wood, and bare soil. Results summarized as a weighted average for the Site and also by stratum.
Species richness and diversity	Plant species inventory and quantitative vegetation transects	Parameter calculated from vegetation transects to summarize diversity by stratum as recorded during this effort. Analysis will employ simply summing the total number of species encountered and Shannon-Weiner Index calculations. Diversity for entire Site supplemented by information collected during the plant species inventory.
Diversity of plant life form	Plant species inventory and quantitative vegetation transects	See description for species richness above. Results also summarized by life form.
Biomass production	Quantitative vegetation transects	Parameter calculated from vegetation transects. Annual production of native grasses summarized by species and in total as a weighted average for the Site and also by stratum.
Woody vegetation density	Quantitative vegetation transects	Parameter calculated from vegetation transects. Results summarized by species and life forms as a weighted average for the Site and also by stratum.

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5 Wildlife

5.1 Introduction and Background

Baseline data has been collected at the Copper Flat project starting in the late 1970s by Quintana, followed by Rio Gold Mining Ltd (Rio Gold), Gold Express, and Alta Gold (related to the 1999 PFEIS). These data are relevant and provide insights for future permitting activity. The previously completed wildlife surveys and studies have been reviewed (SRK, 1997, and BLM, 1999). Relevant information from these previous baseline surveys have been researched and utilized to augment this current sampling process where appropriate. The Chihuahuan desert is a harsh environment home to many birds, reptiles, and mammals. While the actual wildlife diversity is much greater than the list below, some of the more common species are:

- black-chinned sparrow (*Spizella atrogularis*)
- brown thrasher (*Toxostoma rufum*)
- cactus wren (*Campylorhynchus brunneicapillus*)
- roadrunner (*Geococcyx californianus*)
- whiptail lizard (*Cnemidophorus* sp.)
- kangaroo rat (*Dipodomys* sp.)
- western diamondback rattlesnake (*Crotalus atrox*)
- jackrabbit (*Lepus californicus*)
- pronghorn antelope (*Antilocapra americana*)
- and coyote (*Canis latrans*)

Biologists surveyed the Copper Flat permit area on April 15, 2010, to identify migratory bird nests and sensitive habitat areas. This survey was conducted using methods required to fulfill Migratory Bird Treaty Act requirements for the proposed mining activities. During the field survey, numerous bird nests were observed. The most common nests found were cactus wren and brown thrasher nests. These birds build stick and grass nests in cholla cactus (*Opuntia imbricata*) and were common in the tailings pond area as well as around the existing pit.

5.2 Sampling Objectives

The sampling objectives for this project are:

1. Delineate and map current habitat, including disturbed areas.
2. Describe wildlife use of the area through measurements of:
    a. Big game fecal pellet group counts for deer, elk, and antelope.
    b. Call counts for birds and amphibians.
    c. Trend routes for mammals.
    d. Visual sighting transects for birds, mammals, and reptiles.
3. Complete a bird species inventory.

4. Complete a threatened or endangered species survey by comparing known records and habitat requirements with current field conditions to determine the likelihood of occurrence of all federal and state listed wildlife species.
5. Develop a list of species encountered during surveys or deemed likely to occur within the permit area. Species encountered will be given an estimate of relative abundance in the permit area.
6. Determine species distribution by habitat and season. Certain animals, especially birds, use specific habitats during different times of the year.
7. Enumerate other key habitat areas observed (e.g., cliffs, talus slopes, ponds, springs, known nests).

5.3 Sampling Frequency

Wildlife presence and activity surveys will occur twice per year. One survey will be conducted in December or January for overwintering birds (MMD 2010). Another survey will be conducted in late May or June during peak breeding season. Other groups of animals such as mammals, reptiles, and amphibians will also be recorded during the May/June surveys. Habitat features and characteristics will be noted during spring surveys.

5.4 List of Data to be Collected

Data to be collected will include:

1. Counts (sightings) of the various wildlife species including birds, reptiles, amphibians, and mammals.
2. Record signs of species (i.e. scat, feathers, burrows, bones, etc.).
3. Frequency—the number of transects and/or surveys a particular species is encountered.
4. Record key habitat features and characteristics suitable to various wildlife.
5. Survey for threatened or endangered species, including sightings, signs, and potential habitat encountered.

5.5 Methods of Collection

Data will be collected through visual/pedestrian transect surveys to identify nests, burrows, fecal pellets, and other pertinent signs of wildlife. These transects will consist of parallel lines spaced between 100 to 300 meters apart and oriented to capture the entire sampling unit. Smaller sampling units or strata, such as the tailings dam and pit will be surveyed with a closer transect spacing (approximately 100 meters). In larger sampling strata, such as the tailings pile and undisturbed areas, transect spacing will be greater (between 200 to 300 meters). As deemed necessary, these surveys will also be conducted during late evening and early morning to identify potential diurnally active animals and bat roosts, through direct observation or by listening for calls. Some of these wildlife surveys may include "time-constraint" surveys. A “time-constraint” technique uses a controlled or closely monitored amount of time to walk a transect line or survey area to record the total number of occurrences of particular species, such as a horned lizard for example. Such surveys are completed at specific times of the day when target species are more active.

5.6 Parameters to be Analyzed

Parameters to be analyzed include:

1. Bird nest density and distribution.

2. Density of observed avian species.
3. Relative abundance and distribution by habitat and season.
4. Density and distribution of wildlife indicators (e.g. fecal pellet counts) and occurrences (sightings) of wildlife.
5. Acreages and maps of key habitat areas for various wildlife species.
6. Threatened and endangered species survey results.

These parameters will be summarized and evaluated by individual species. Mobile or transient species, referring to those species without fixed habitat needs (such as those without nests or burrows) will similarly be tabulated and analyzed to determine abundance and frequency of occurrence.

5.7 Maps Showing Proposed Sampling Locations

Figure 5.1 shows a map of the sampling areas. These same areas will be surveyed for wildlife activity using the walking transects described above (Section 5.5). Transect spacing will vary as described based on the size of the sampling areas.

5.8 Laboratory and Field Quality Assurance Plans

Biologists will have a minimum of a BA/BS in Biology and five to ten years of field experience conducting a wide variety of animal surveys ranging from reptiles and amphibians, to birds, mammals, insects, and other invertebrates. This includes experience in recognizing and identifying signs of wildlife. All findings and results will be reviewed by senior scientists.

5.9 Discussion in Support of Sampling Proposal

Most of the protocol specific surveys for wildlife involve threatened and endangered species, or species with a "sensitive" status. Although our surveys will assess for the potential occurrence of threatened, endangered, or sensitive species, we are not anticipating that these will occur. Consequently, much of the sampling and analysis plan for wildlife is of a generalized nature. The intent of the sampling and analysis plan for wildlife is to obtain general or basic information on species presence and habitat use within the permitted area of the mine. All qualitative information will be included in the findings. Some of the information gathered will be of a quantitative nature and thus serve as a basis in which to monitor trends in wildlife use of these areas. The sampling approach will be revised if threatened, endangered, or sensitive species are suspected to occur

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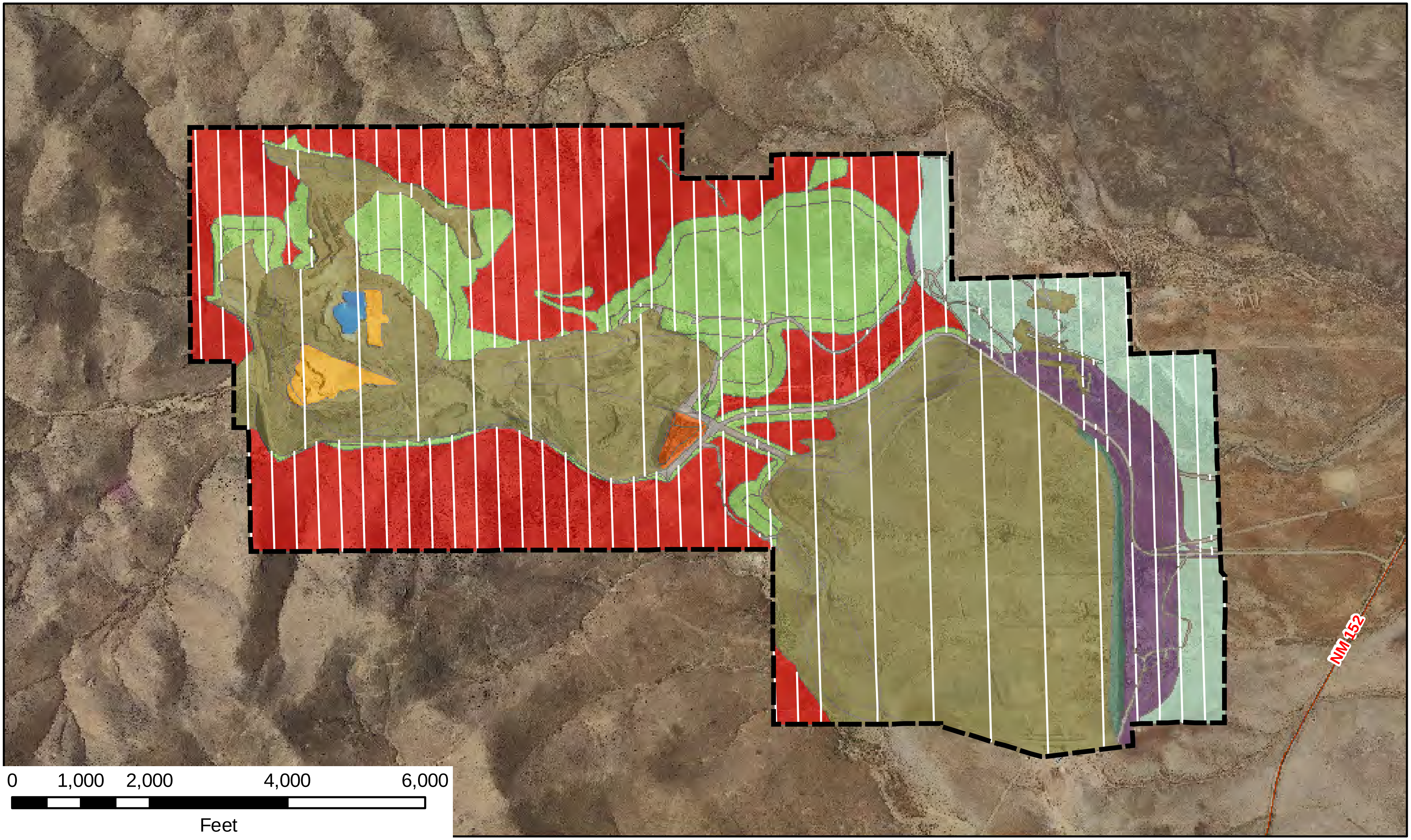
Figure



Legend

▭	Proposed Mine Permit Boundary	🟩	Baseline Proposed Disturbance - Hills
―	Proposed Wildlife Transect Survey Locations	🟨	Pit
⬜	Access Road	🟦	Pit Lake
⬜	Baseline No Proposed Disturbance - Gravelly	🟧	Saltcedar
🟥	Baseline No Proposed Disturbance - Hills	🟩	Tailings Dam
🟪	Baseline Proposed Disturbance - Gravelly	🟫	Tailings Pile

Mine Boundary:
Tom Van Bebber
Strata/transects:
Parametrix
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Figure 5-1
Map of the Proposed Wildlife Transects and Site Strata

New Mexico Copper Corporation

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6 Topsoil Survey and Sampling

6.1 Background and General Description of Topsoil

A successful reclamation program is dependent, in part, upon the quantity and quality of soil available for use during the reclamation process. New Mexico Copper Corporation (NMCC) assessed the quantity and suitability of topsoil present at the Copper Flat Mine Permit Area (Site) in two ways. First, NMCC reviewed current literature concerning soil characteristics, and second, NMCC determined site-specific soil characteristics. The findings are summarized in this section of the SAP. In addition, baseline soil surveys were completed on the project area as recently as the late 1990s, and are briefly summarized and referenced in the PFEIS (BLM, 1999).

The term "topsoil" refers to the A master soil horizon (Soil Survey Staff, 1999), which is the uppermost mineral horizon that contains organic matter and can be salvaged from the areas to be disturbed and is capable of supporting vegetation, or other soil material capable of supporting vegetation. This material is often referred to as "suitable top dressing." NMCC has reviewed previous literature describing the results of soil surveys completed at the Site (BLM, 1999) and is aware that the presence of an A master soil horizon across the Site is limited. The purpose of the soil survey and sampling proposed in this section of the SAP is to evaluate the presence of suitable top dressing. However, in the interest of conforming to the requirements of the Mine Act regulations, the term "topsoil" will be used throughout this section to refer to suitable top dressing.

General information about the soils present at the Site was obtained from a Soil Conservation Service (SCS) survey completed by Neher (1984). The SCS (now the Natural Resources Conservation Service) mapped two major soil types that occur in the Copper Flat area:

1. The Luzena-Rock Outcrop association
2. The Scholle-Ildelfonso association

Figure 6-1 shows the boundary of the two soil types found in the proposed mine area along with the proposed operational areas within the proposed mine permit boundary. All but the easternmost portion of the proposed Site is mapped as Luzena-Rock Outcrop association, which is typically present on the steeper slopes of hills and mountains. These soils are typically shallow, very gravelly and cobbly loams and clay loams. The Scholle-Ildelfonso association occurs on more gentle slopes of the piedmonts and mountain toes and is deep, well-drained, and formed in mixed alluvium. The resulting soil texture in these areas is primarily gravely loams and gravelly clay loams (SRK, 1996).

The soils are thin and of low productive capacity. The soil textures are primarily gravelly loams and gravelly clay loams and are subject to continuing wind and water erosion. Along with the natural erosion, much of the Copper Flat landscape has been severely disturbed by historical placer mining and the 1982 mining operation. Over 63 percent of the areas targeted by the proposed operation were disturbed during the 1982 operation. Soils were replaced in the north cell of the tailings impoundment and over a portion of the plant site during 1986. Much of the remaining 1982 operational area remains disturbed and unvegetated (SRK, 1996).

6.2 Sampling Objectives

The objectives of soil sampling plan are:

- To determine the suitability of in-place soils in areas of proposed disturbance for use as a topsoil material during reclamation. Suitability parameters will be defined. Two key parameters for a topsoil source are soil texture and coarse fragment content because these are the most difficult parameters to amend. Also critical, particularly for soils in the southwestern United States, are soil salinity and sodicity.

Salt and sodium concentrations in soils affect plant growth and soil infiltration characteristics, and are also difficult to amend. Other soil characteristics that are important in reclamation, but which can more easily be amended, are organic matter content, macronutrient concentrations, and micronutrient concentrations.

- To determine the volume of suitable material present and calculate the amount of topsoil that must be obtained from a borrow source to complete Site reclamation.

6.3 Sampling Frequency

In accordance with 19.10.6.602 of the New Mexico Administrative Code (NMAC), there will be one sampling event for topsoil characterization during the 12-month baseline data collection period.

6.4 List of Data to Be Collected

Table 6-1 shows the four data requirements identified for topsoil and the plans for addressing these requirements. NMCC proposes to satisfy the data requirements by characterizing soils in areas that will be disturbed by proposed mining operations and that may be used as topsoil borrow sources. Figure 6-1 shows the proposed mining disturbance areas.

6.5 Methods of Collection

First order (order 1) pedestrian soil surveys will be conducted by a qualified soils scientist within each of the disturbed areas shown on Figure 6-1 to delineate topsoil. First order soil surveys have delineations of 1 hectare (2.5 acres) or less, depending on scale; typically show phases of soil series and miscellaneous areas as components of map units; and typically display results at a scale of 1:15,840 or larger (Soil Survey Division Staff, 1993). Surveys will be conducted by walking along parallel transects defined within the boundary of each disturbed area. The total number of transects per disturbed area will be randomly selected using the random point generation function within Hawth's Analysis Tools ArcGIS plug-in. During this process, the required number of random transects will be placed in each disturbed area. The resulting geographic coordinates will be transferred to a Global Positioning System (GPS) receiver with a horizontal accuracy≤3m for field navigation to the target locations. If field conditions do not match the stratum intended, the transect will be moved to a nearby location within the disturbed area. While walking along each transect, the soils scientist will delineate the boundaries for topsoil by making visual observations of surface soils and confirming those observations with hand-auger holes. Topography, vegetative cover, slope and aspect will all be used to guide the decisions. Boundaries recorded in the GPS receiver will later be downloaded and imported into an ESRI geographic information system (GIS) as a shapefile.

Soil samples will be collected from topsoil within the disturbed areas using a hand auger, shovel, mechanized geoprobe (if permitted), or other means necessary to retrieve samples until bedrock or a hardened surface is reached. A total of six samples will be taken: three from the tailings impoundment and one each from the North, West, and East Waste Rock disposal areas (Figure 6-1). It is anticipated that at each sample location, a soil subsample will be collected at three different depth intervals in the topsoil. The subsamples from each location will be collected and mixed to form a composite sample. Typically, the soil scientist will estimate soil texture visually at 6-inch intervals within the top 2 feet (ft). Below 2 ft, texture will be estimated at 1-ft intervals. Soil features, such as color, presence of calcium carbonates, salt accumulation, volume of coarse fragments, and depth to bedrock or rocky layer, will also be noted. For mapping purposes, the location of the subsample will be documented with a GPS receiver.

Soil samples will be air-dried before submission to the laboratory. Sample handling and chain-of-custody procedures will be followed for the preparation of soil samples for shipment to the off-site analytical laboratory.

6.5.1 Sampling Methods

The sampling methods described below may be used for obtaining the necessary soil samples. The surface soil sample collection procedures discussed in 6.5.1.1 may be used if the soil sampling location is not below a water surface. The procedures discussed in 6.5.1.2 may be used if the soil sampling location is below a water surface.

The following equipment will be assembled before surface-soil sampling begins:

- Coolers
- Sample containers and laboratory-supplied preservatives (if needed)
- Sample labels
- Personal protective equipment
- Custody seals
- Waterproof pens
- Appropriate sampling equipment
- Acetate sleeves (if needed)
- Personnel/equipment decontamination supplies
- Field logbook
- Sample control logs
- Chain-of-custody forms

All sampling equipment will be cleaned before use.

6.5.1.1 Surface Soil Sample Collection Procedure (Dry)

The following procedure will be used for collecting surface soil samples for chemical analysis.

1. If necessary, use a shovel to remove vegetation from the sampling point.
2. Use any of the following three methods to obtain representative samples from the intervals of interest:
    a. Soil samples may be collected using a hydraulic soil sampler or a hand-driven soil sampler, both with acetate sleeves. These samples will be extruded from the acetate sleeve or else the sleeve will be cut to segregate the sample interval of interest.

       Cap the acetate sleeves as quickly as possible and send them intact to the laboratory so that the interval of interest can be tested with a minimum loss of volatile components.

    b. A pit may be excavated with a clean shovel to expose a soil profile, which is a vertical cut in the soils that exposes the genetic layers or horizons. Because the soil samples will be analyzed for metals, samples will not be collected from the surface that was in contact with the shovel. Instead, the surface will be scraped with a clean, non-metal trowel before collection. Soil samples may be collected using a clean, stainless-steel trowel or an appropriate disposable trowel to remove equal portions of the soil from the surface or near the surface to the base of the interval of interest.

    c. Soil samples may be collected using a clean, stainless-steel hand auger. Note the sampling depth. Use a non-metal trowel, spatula, or knife to assist in removing the sample for placement in the sample container.
3. Remove obvious rock material from each sample.

4. Place each sample in a clean, labeled sample container and cap securely as quickly as possible. Ensure that neither the sample nor its container comes into contact with any contaminated surfaces.
5. Provide complete information when filling out the sample label. Labels must include the following information:
   - Project name and/or number
   - Field sample number
   - Depth interval (if applicable)
   - Initials of collector
   - Date and time of collection
   - Sample type and preservative (if any)
6. Immediately place the sealed and labeled sample container in a cooler containing double-bagged ice or frozen ice packs. Store at <4°C, if required. (The use of protective packaging will be dictated by the mode of transport.)
7. Record the sampling data on the sample control log and in the field logbook, as appropriate.
8. Decontaminate the sampling equipment before collecting the next sample. If possible, have a sufficient quantity of clean, decontaminated equipment available so that each sample can be taken with separate equipment and all sampling tools can be decontaminated periodically or at the end of the sampling effort rather than between each sampling event.
9. Complete a chain-of-custody form for laboratory shipment.
10. Place custody seals across the shipping container lids so that the shipping containers cannot be opened without breaking the custody seals. Custody seals must contain the following information:
    - Collector’s signature or initials
    - Date of shipping
11. Ship sample containers to the laboratory for analysis within 24 hours of sample collection, carefully observing all minimum holding time requirements for degradable constituents.

The chain-of-custody form, sample control logs, and field logbook must be completed in accordance with the procedures set forth in the Quality Assurance Project Plan (Attachment 1).

6.5.1.2 Sampling Beneath a Water Surface

The following sampling methods may be used if the soil sampling location is below a water surface.

6.5.1.2.1 Sampling with a Trowel

Sediment samples can be collected using a stainless steel or disposable trowel provided the water depth is very shallow (e.g., a few centimeters). A stainless steel trowel or scoop is recommended because of its inert nature. Single grab samples may be collected or, if the area in question is large, a grid can be used and multiple samples can be collected and composited. The sample collection procedure is as follows:

1. Label all bottles. Fill out all information except the sampler’s name/initials and the actual date and time. Sort bottles according to the sampling locations.
2. Note the sampling location in the logbook, measuring distances and direction from stationary landmarks. If possible, photograph the location.

3. Record the date, time, and sampler’s name/initials on all sample containers and on the sample control log. Cover all container labels with wide transparent waterproof tape to ensure label integrity.
4. Insert the trowel into the sediment and begin to remove material. Avoid collecting large rocks or plant roots as much as possible.
5. Decontaminate the sampling equipment before collecting the next sample by cleaning the equipment with warm water and Liquinox, then rinsing again with warm water. If possible, have a sufficient quantity of clean, decontaminated trowels available so that each of the sediment samples can be taken with a separate trowel and decontamination can be performed on all the trowels at the end of the sampling effort rather than between each sampling event.
6. Store and transport at <4°C, if required, and place custody seals on the cooler lid so that the cooler cannot be opened without breaking the seals.

6.5.1.2.2 Sampling with a Hand Corer

A hand corer is essentially the same type of thin-wall sampler that is used for collecting surface soil samples. It has a handle to facilitate driving the corer into the sediment and a check valve on the top to prevent sample washout during retrieval through an overlying water layer.

Hand corers can be used for the same situations and with the same materials as trowels (see previous section). The advantage of a hand corer is the ability to collect an undisturbed sample that can profile any stratification in the sample as a result of changes in the deposition. Some hand corers can be fitted with extension handles that allow collection of sediment samples in water of moderate depth (6 ft). Most corers can be fitted with liners of brass, polycarbonate plastic, or Teflon. The appropriate liner can be chosen to match the type of contamination expected in the sample and the intended analytical procedures.

The sample collection procedure using a hand corer is as follows:

1. Label all bottles. Fill out all information except the sampler’s name/initials and the actual date and time. Sort bottles into sets: one per sampling location, with additional sets as needed for blanks and duplicates.
2. Note the location of the sample in the logbook, measuring distances and direction from stationary landmarks. If possible, photograph the location.
3. Record the date, time, and sampler’s name/initials on all sample containers and on the sample control log. Cover all container labels with wide transparent waterproof tape to ensure label integrity.
4. Force the corer into the sediment with a smooth, continuous motion.
5. Twist the corer and withdraw in a single smooth motion.
6. Decontaminate the sampling equipment before collecting the next sample.
7. Store and transport at <4°C, if required, and place custody seals on the cooler lid so that the cooler cannot be opened without breaking the seals.

6.6 Parameters to Be Analyzed

Soil samples will be collected and analyzed at a soil testing laboratory accredited by the National Environmental Laboratory Accreditation Program (NELAP) and the New Mexico Environment Department (NMED) for the soil characteristics summarized in Table 6-2. While performing the field sampling, the New Mexico Copper

Corporation (NMCC) representative will measure pH and electrical conductivity as necessary in order to "field-calibrate" for these parameters. Rock fragments will be removed from samples in the field and will be estimated by percentage by the soils scientist. In addition to the analyses outlined in Table 6-2, measurements of electrical conductivity, saturation percentage, and salinity will be collected following USDA guidelines (U.S. Salinity Laboratory Staff, 1954). Sodium adsorption ratio, a measure of the sodicity of the soil, will be calculated from the parameters of paste calcium, magnesium, and sodium in units of milliequivalents per liter.

6.7 Maps Showing Proposed Sampling Locations

A total of six samples will be taken: three from the tailings impoundment and one each from the North, West, and East Waste Rock disposal areas. Figure 6-1 shows the general boundaries of these locations at the Site.

6.8 Laboratory and Field Quality Assurance Plans

Sampling will be conducted in accordance with the sampling procedures described above. Soil sampling will be conducted by a qualified NMCC representative, who will document the sample location on a map, take a GPS reading, and record observations in a logbook. Sample handling and chain-of-custody procedures will be followed to prepare soil samples for shipment to the off-site analytical laboratory. Laboratory analyses will be conducted in accordance with methods described in *Methods of Soil Analysis, Parts 1 and 2* (Klute, 1986, and Weaver, 1994, respectively). NMCC will select a laboratory that operates under a quality program and has expertise and experience with the approved soil analytical methods.

6.9 Discussion in Support of Proposal

The proposed data collection will allow the characterization and establishment of baseline topsoil conditions across the Site in advance of mining and will supplement existing topsoil data. A deficit in volume of topsoil for Site reclamation is expected. The topsoil required to compensate for the deficit is expected to be obtained from within the tailings impoundment area (SRK, 1996).

6.10 References

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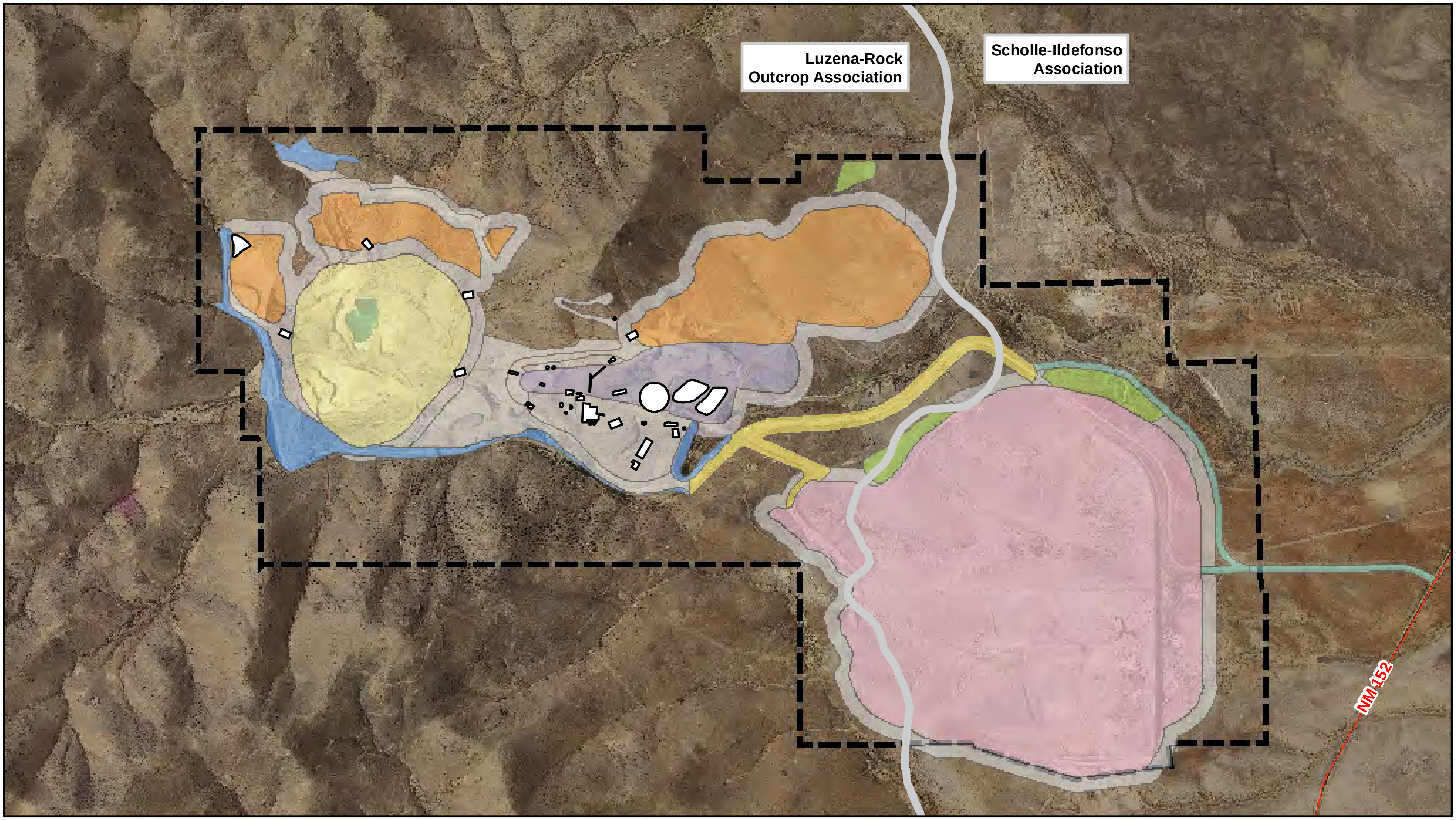
Figure



Legend

- ⬚ Proposed Mine Permit Boundary
- ☐ Proposed Mine Facility
- ▨ Scholle-Ildefonso/Lusena-Rock soil boundary
- 🟧 Waste Rock
- 🟩 Topsoil Stockpile
- ▨ Tailings
- ▨ Stockpile
- ▨ Pit
- 🟨 Haul Road
- 🟦 Diversion
- ☐ Ancillary
- ▨ Access Road

Mine Boundary:
Tom Reynolds
Disturbed areas/mine facilities: SRK, 2010
Imagery Information:
-USGS 7.5-Minutes County DOQQ
mosaic Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Figure 6-1
Topsoil Sampling Locations

New Mexico Copper Corporation

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Tables

Table 6-1
Topsoil Data Needs

Data Need	Plan to Address Data Need
Determine accurate soil depths in areas to be disturbed to ensure proper topsoil volume calculation.	Measure soil depths in areas where planned disturbances will take place (locations will be entered into a GPS unit).
Determine suitability of stripped material for use as topsoil during reclamation.	Send soil samples to a laboratory for analysis to determine characteristics and suitability as topsoil.
Determine need for additional topsoil.	Estimate the available topsoil based on the results of the soil survey and calculate topsoil deficit by subtracting the available topsoil from the topsoil needed. Any topsoil deficit will be addressed identifying additional on-site borrow areas or other potential borrow sources in the immediate vicinity of the mine.
Sample and characterize any material needed from borrow pits to complete reclamation efforts.	Conduct soil characterization and analysis on soils that may be used as a borrow source.

Table 6-2
Soil Characteristics and Methods Used

(Sampling requires 125 ml/4 oz wide mouth glass jar.)

Analytical Parameter	Analysis Method	Lab Detection Limit for Sediments (mg/kg unless noted)
Nitrate-nitrite	EPA Method 353.2	0.05
Phosphorous	EPA Method 365.2	2.5
Arsenic	EPA Method 200.7	1.0
Boron	EPA Method 200.7	2.0
Cadmium	EPA Method 200.7	0.1
Calcium	EPA Method 200.7	5.0
Copper	EPA Method 200.7	0.2
Iron	EPA Method 200.7	1.0
Lead	EPA Method 200.8	0.25
Magnesium	EPA Method 200.7	5.0
Manganese	EPA Method 200.7	0.1
Mercury	M7471A CVAA	0.03
Molybdenum	EPA Method 200.7	0.4
Nickel	EPA Method 200.7	0.5
Potassium	M6010C ICP	10
Selenium	EPA Method 200.7	1.0
Sodium	EPA Method 200.7	5.0
Zinc	EPA Method 200.7	0.25
pH	EPA Method 150.1	NA
Grain size	Plumb, 1981	NA

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7 Geology

This section provides an overview of the regional and local stratigraphy and structural geology, as well as the mineralization at the Copper Flat Mine Permit Area (Site). The information has been summarized primarily from the BLM Preliminary Final Environmental Impact Statement (PFEIS) for Copper Flat (1999), Raugust (2003), and SRK (2010).

7.1 Regional Geologic Setting

The Copper Flat Mine lies within the Mexican Highlands portion of the Basin and Range Physiographic Province. It is located in the Hillsboro Mining District in the Las Animas Hills, which are part of the Animas Uplift, a horst on the western edge of the Rio Grande valley (Raugust, 2003). The Animas Uplift is separated from the Rio Grande by nearly 20 miles of Santa Fe Group alluvial sediments, referred to as the Palomas Basin of the Rio Grande valley. To the west of the Animas Uplift is the Warm Springs valley, a graben that parallels the Rio Grande valley (BLM, 1999; Raugust, 2003). Further west, the Black Mountains form the backbone of the Continental Divide, rising to about 9,000 feet above mean sea level (amsl). The surface geology of the Copper Flat region is shown in Figure 7-1, and a schematic geologic cross section is shown in Figure 7-2.

Basement rocks in the area consist of Precambrian granite and Paleozoic and Mesozoic sandstones, shales, limestones, and evaporites. Sedimentary units that crop out within the Animas Uplift include the Ordovician Montoya Limestone, the Silurian Fusselman Dolomite, and the Devonian Percha Shale. The Cretaceous-age Laramide orogeny, which was characterized by the intrusion of magma associated with the subduction of the Farallon plate beneath the North American plate, affected this region between 75 and 50 million years ago (Ma). Volcanic activity during the late Cretaceous and Tertiary periods resulted in localized flows, dikes, and intrusive bodies, some of which were associated with the development of the nearby Tertiary Emory and Good Sight-Cedar Hills cauldrons (Figure 7-3); later basaltic flows resulted from the tectonic activity associated with the formation of the Rio Grande rift. Tertiary and Quaternary alluvial sediments of the Santa Fe Group and more recent valley fill overlie the older Paleozoic and Mesozoic units in the area. The regional stratigraphy of the lower Rio Grande Valley is summarized in Table 7-1 (BLM, 1999).

The geologic structure of the region is characterized by block and rift faulting (Figure 7-3). The Tertiary cauldrons associated with the earlier block faulting formed between 35 and 45 Ma. Rift faulting and associated north-south block faulting associated with continental extension and the formation of the Rio Grande rift began approximately 25 to 30 Ma. The Las Animas Hills are bounded by faults associated with rifting (Dunn, 1982). Continental extension continues to the present, as evidenced by north-south trending grabens represented by the Rio Grande and Warm Springs valleys.

7.2 Geology of Copper Flat Mine Site

7.2.1 Stratigraphy

As shown in Figure 7-4, the dominant geologic feature of the Animas Hills and Hillsboro district is the Copper Flat strato-volcano, a circular body of Cretaceous andesite that is 4 miles in diameter (Raugust, 2003). The andesite is generally fine-grained with phenocrysts of plagioclase (andesine) and amphibole in a groundmass of plagioclase and potassium feldspar and rare quartz. Some agglomerates or flow breccias are locally present, but the andesite is generally massive. Magnetite is a common association with the mafic phenocrysts, and accessory apatite is found in nearly every thin section (Dunn, 1984).

The strato-volcano is eroded to form a topographic low; the total depth of erosion is uncertain (SRK, 2010). To the east of the Site, this andesite body is in fault contact with Santa Fe Group sediments, which are at least

2,000 feet (ft) thick in the area. Near-vertical faults characterize the contacts on the remaining perimeter of the andesite body; these faults juxtapose the andesite with Paleozoic sedimentary rocks. Drill holes indicate the andesite is more than 3,000 ft thick. This feature, combined with the concentric fault pattern, indicate that the local geology represents a deeply eroded Cretaceous-age volcanic complex (Dunn, 1982).

The core of the volcanic complex is a Cretaceous-age quartz monzonite stock that intruded into the center of the andesite body. Known as the Copper Flat Quartz Monzonite (CFQM), this irregular-shaped stock underlies a surface area of approximately 0.25 square miles and has been dated to approximately 75 million years before present (Raugust, 2003; BLM, 1999; and McLemore et al., 2000). The monzonite crops out in only a few isolated areas, and the andesite at these contacts shows no obvious signs of contact metamorphism (Dunn, 1984). The CFQM is a medium- to coarse-grained, holocrystalline porphyry composed primarily of potassium feldspar, plagioclase, hornblende, and biotite; trace amounts of magnetite, apatite, zircon, and rutile are also present, along with localized mineralized zones containing pyrite, chalcopyrite, and molybdenite (McLemore et al., 2000). About 15 percent of the monzonite is quartz, which occurs both as small phenocrysts and as part of the groundmass; however, quartz is absent in some parts of the stock (Dunn, 1984).

Numerous dikes, mostly latite, radiate from the CFQM stock, some nearly a mile in length. Most of the dikes trend to the northeast or northwest and represent late stage differentiation of the CFQM stock (Raugust, 2003). Immediately south of the quartz monzonite, the andesite is coarse-grained, perhaps indicating a shallow intrusive phase. An irregular mass of andesite breccia along the northwestern contact of the quartz monzonite contains potassium feldspar phenocrysts and andesitic rock fragments in a matrix of sericite with minor quartz; this may represent a pyroclastic unit. Magnetite, chlorite, epidote, and accessory apatite are also present in the andesite breccia (Dunn, 1984).

The southwestern edge of the andesite body was intruded by the Warm Springs Quartz Monzonite pluton, which dates to approximately 73 Ma (Hedlund, 1974). Unlike the CFQM and the andesite, this monzonite body is not cut by the latite dikes (SRK, 2010), indicating that the dikes were emplaced prior to the Warm Springs Quartz Monzonite.

The Sugarlump Tuff (35 Ma) and the Kneeling Nun Tuff (34 Ma) unconformably overlie the local andesite flows. These tuffs erupted from the Emory caldera, and indicate that the Copper Flat volcanic/intrusive complex was buried during the Oligocene and exhumed during Miocene uplift (around 21.7 ±3.6 Ma) (Kelley and Chapin, 1997). Both the andesite and the quartz monzonite intrusions are cut by black, scoriaceous basalt dikes. These dikes remain unaltered, and appear to be associated with locally abundant Pliocene alkali basalt flows from around 4 Ma (Seager et al., 1984).

7.2.2 Structure

Three principal structural zones are present at the Site and surrounding area, the most prominent of which is a northeast-striking fault trend that includes the Hunter and parallel faults. In addition, west-northwest striking zones of structural weakness are marked by the Patten and Greer faults, and east-northeast striking zones are marked by the Olympia and Lewellyn faults. All faults have a near-vertical dip; the Hunter fault system dips 80°W, and both the Olympia and Lewellyn fault systems dip between 80°S and 90°S (SRK, 2010; Dunn, 1984). These three major fault zones appear to have been established prior to the emplacement of the CFQM and controlled subsequent igneous events and mineralization (SRK, 2010).

The CFQM emplacement is largely controlled by the three structural zones. The southern contact parallels and is cut by the Greer fault, although the contact is cut by the fault, and the southeastern and northwestern contacts are roughly parallel to the Olympia and Lewellyn faults, respectively. The elongate neck of the stock parallels the Hunter fault system. Whether there was movement along the fault zones before the emplacement of the stock has not been determined (SRK, 2010; Dunn, 1984).

Although the latite dikes strike in all the three principal fracture directions, most of the dikes strike northeast. A narrow zone of fault gouge commonly occurs along the contact between the dikes and the andesite, with the mineralization post-dating fault movement (Harley, 1934). The northeast fault zones contain a high proportion of wet gouge, often with no recognizable rock fragments. Underground exposures of the Hunter fault zone (in previously existing mine workings) material has the same consistency as wet concrete and has been observed to flow in underground headings. However, the material in the east-northeast fault zones contains only highly broken rock and little obvious gouge. The width of the fault zones in both systems varies along strike from less than a foot to nearly 25 ft in the Patten fault east of the Project. Despite intense brecciation, the total displacement along the faults does not appear to exceed a few tens of feet (Dunn, 1984). At the western edge of the Site, a younger porphyritic dike was emplaced in a fault that had offset an early latite dike, indicating that fault movement occurred during the time that dikes were being emplaced (Dunn, 1984).

Post-dike movement is evident in all the three principal fault zones, and both the Hunter and Patten fault systems show signs of definite post-mineral movement. Fault movement has smeared sulfide deposits and offset the breccia pipe as well as the zones within the breccia pipe. Post-mineral movement along faults has resulted in wide, strongly brecciated fault zones. Some of the post-mineral dikes have been emplaced within these fault zones (SRK, 2010; Dunn, 1984).

NMCC has mapped the pit area and diversion cuts in detail at 1 inch:40 ft (1:480) and has examined the pre- and post-mineral stress orientations in the andesites and CFQM. Findings indicate no significant difference in the stress fields before and after mineralization (SRK, 2010).

7.3 Description of the Ore Body

Copper Flat is an alkalic copper-gold mineralized breccia pipe, associated with and genetically-linked to an alkalic porphyry system. Copper Flat is situated along the eastern edge of the Cretaceous Arizona-Sonora-New Mexico porphyry copper belt, and, along with Tyrone, New Mexico, forms a linear mineralized feature known as the Santa Rita lineament (SRK, 2010; McLemore et al., 2000). Copper Flat is the easternmost and one of the oldest known porphyry deposits in the southwestern U.S. (Hedlund, 1974; Dunn, 1982; Titley, 1982). Analogous deposits include Terrane Metal's Mount Milligan, British Colombia deposit and the Continental breccia pipe located in the Central Mining district of New Mexico (SRK, 2010).

7.3.1 Structure and Model

Mineralization at the Site is concentrated in a breccia pipe within the CFQM stock (Raugust, 2003; BLM, 1999). The eastern portion of the breccia pipe is outside the outline of the main mineralization; however, the rest of the breccia pipe is higher grade than the surrounding CFQM, hosting nearly half of the copper at the Site, but only about one-third of the total resource tonnage (SRK, 2010). Drillholes spaced approximately 100 ft apart within the center of the deposit indicate the breccia pipe occurs as a single, continuous body, approximately 1,300 ft long by approximately 600 ft wide at the surface with the long axis perpendicular to the predominant northeast fracture direction. It is exposed in only a few places, but extends vertically to over 1,000 ft; veins of coarse pegmatitic material have been found at approximately 1,700 ft below ground surface (bgs) in one drillhole (Dunn, 1984).

Mineralized polymetallic quartz veins, commonly associated with the dikes that radiate outward from the central stock, have been the target of historical mining activities in the Hillsboro district. The breccia pipe zone has been cut by numerous, randomly oriented, irregular veins that are thicker and coarser grained than the narrow fracture-controlled veinlets in the surrounding stock.

Mineralization appears to have been contemporaneous with pipe formation (SRK, 2010). The lack of rock flour or gouge in the matrix suggests that brecciation was not the result of tectonic movement, while the apparent lack of appreciable movement between the fragments and the gradational contact between the breccia and the zone of stockwork veining indicate that an explosive mechanism was not the source of the brecciation. Likewise, the process of mineralization stoping described by Locke (1926), which would have resulted in appreciable downward movement and mixing of the fragments, is not supported by field observations. Thus the mechanism responsible for the formation of the Copper Flat mineralized breccia pipe appears to be autobrecciation resulting from retrograde boiling, a phenomenon that occurs when the pressure of the mineralizing hydrothermal fluid exceeds the confining pressure (Phillips, 1973). The matrix of the breccia, the irregular veins in the surrounding crackle breccias, and the open space filling in the breccias consist of hydrothermal minerals and part of the second stage mineralization occurred as replacement, which modified the original breccia texture (SRK, 2010).

Unlike most deposits in the southwestern U.S., Copper Flat shows very little supergene enrichment or the symmetrical and telescoped zoning of alteration types that is considered typical of most porphyry copper deposits. Instead, hypogene mineralization and alteration, including the formation of the breccia pipe, was the result of the final crystallization of the CFQM melt and related dikes (SRK, 2010).

The current model used by NMCC for further exploration at the Site is based on Richards (2003), who interprets the area as an eroded volcano. According to this model, mineralization occurred at similar depths to that found at El Teniente in Chile; since the Copper Flat breccia pipe now crops out at the surface, this assumption indicates that approximately 0.5 to 2 kilometers (km) of volcanic rocks have been eroded from the central zone of mineralization. Fluid inclusion work by Norman et al. (1989) and McLemore et al. (2000) suggest that the breccia pipe and veins formed at a depth of 1 to 2 km bgs and at temperatures ranging from 226° to 360°C.

7.3.2 Mineralization

During the early mining days, a 20- to 50-foot leached oxide zone existed over the ore body, but this material was stripped during the mining activities that occurred in the early 1980s. Most of the remaining ore is unoxidized and consists primarily of chalcopyrite and pyrite with some molybdenite and traces of galena and sphalerite. Appreciable amounts of silver and gold are also present (BLM, 1999; SRK, 2010). The proven and probable reserves are estimated at more than 50 million tons of ore with 0.45 percent copper (Hydro Resources, 2002).

The breccia consists largely of fragments of mineralized CFQM, with locally abundant mineralized latite where dikes exposed in the CFQM projected into the brecciated zone. Andesite occurs only as mixed fragments partially in contact with intrusive CFQM and appears to represent the brecciation of andesite xenoliths in the CFQM (Dunn, 1984). The matrix contains varying proportions of quartz, biotite (phlogopite), potassium feldspar, pyrite, and chalcopyrite, with magnetite, molybdenite, fluorite, anhydrite, and calcite locally common. Apatite is a common accessory mineral. Much of the quartz-feldspar matrix has a pegmatitic texture. Breccia fragments are rimmed with either biotite or potassium feldspar, and the quartz and sulfide minerals have generally formed in the center of the matrix (Dunn, 1984).

The andesite in contact with the CFQM, dikes, and veins is typically altered into one of three types of mineral assemblages: biotite-potassic, potassic, or sericitic alteration (Fowler, 1982). The highest copper grades are associated with the biotite-potassic alteration, which is characterized by hydrothermal biotite, potassium feldspar, quartz, and pyrite, and which occurs in veinlets and as replacement assemblages in the monzonite (McLemore et al., 2000).

The total sulfide content ranges from 1 percent (by volume) in the eastern part of the breccia pipe and the surrounding CFQM to 5 percent in the CFQM to the south and west (SRK, 2010). Sulfide content is highly variable within the breccia, with portions containing as much as 20 percent sulfide minerals. Sulfide mineralization is restricted to the CFQM and breccia pipe, and drops abruptly at the andesite contact. Minor pyrite mineralization extends into the andesite along the pre-mineral dikes (SRK, 2010; Dunn, 1984).

Pyrite and chalcopyrite are disseminated within the CFQM and also occur along fracture-controlled veinlets and as disseminations associated with mafic minerals. Typically, pyrite is more abundant than chalcopyrite in two areas (SRK, 2010):

- A narrow zone that surrounds and overlies the western end of the breccia pipe, which has the highest grade CFQM mineralization, characterized by abundant chalcopyrite in quartz-sulfide veinlets.
- Outcrops to the southeast of the breccia and south of Grayback Wash, where disseminated chalcopyrite is present with no associated pyrite.

Molybdenite occurs occasionally in quartz veins or as thin coatings on fractures. Minor sphalerite and galena are present in both carbonate and quartz veinlets in the CFQM stock (Dunn, 1984).

7.4 Geochemical Sampling

NMCC has hired a contractor to conduct geologic sampling to address the potential for geologic strata to create acid rock drainage, or degradation of the surface or groundwater quality, or cause a hindrance to reclamation. NMCC proposes the use of the following geochemical characterization program at Copper Flat.

An assessment of waste rock geochemistry is proposed to predict the potential geochemical reactivity of waste rock that will be exposed during the proposed mining operation, and to provide input into a future pit lake hydrogeochemical model. This assessment will also include characterization of ore-grade materials that will be processed and deposited as tailings in the tailings impoundment.

The material characterization described in this program will address mineralogy, bulk geochemical characteristics, and the potential of the waste rock and processed ore (tailings) to generate acid or net neutral drainage, as well as a prediction of future water quality that would result from precipitation contacting the material, and what influence this may have on groundwater, surface water, and pit lake quality at the site. As appropriate, the assessment may identify waste rock management measures that would mitigate or reduce future liabilities.

NMCC proposes a phased approach that will ensure that the geologic sampling program applied addresses all the regulatory objectives and requirements. The following is a general breakdown of each step.

7.4.1 Step 1: Data Review and Material Type Delineation

NMCC’s contractor will review all data available from the previous and current exploration drilling programs, including the drill hole database, drill logs, assay data, and bulk element geochemistry. From this review, the main rock types, alteration types, and oxidation states identified by SRK in the late 1990’s will be reviewed and modified as needed. The combination of these parameters will be used to define material types for the project that will be the focus of the characterization program.

The block model and proposed pit outlines prepared by NMCC and its contractor will also be reviewed to identify ore and waste zones within the proposed pit boundaries and ensure that the proposed sample suite is spatially representative (both vertically and horizontally) of waste rock and ore. The estimated tonnages of the waste rock and ore material types will be obtained from the block model in order to define the number of samples required to characterize each material type. The sampling program will focus on the main material types with more samples being collected from the material types with the greatest predicted tonnage. This characterization will include both ore- and waste-grade material.

7.4.2 Step 2: Sample Interval Selection

Several types of geologic material are available from the exploration drill programs for sampling including coarse rejects and half-split core from the core and rotary drilling. However, the core will be the preferred sample material. The half-split core material is currently being stored on-site in a sheltered area and oxidation of this material from weather is anticipated to be minor. A significant amount of the core material from the mineralized zones may have been mostly consumed for metallurgical testing; however, half-split core material should be available for most of the waste intervals. Therefore, the half-split core material from the waste intervals has been identified as the best material available for geochemical testing and will be targeted in the waste rock characterization portion of this sampling program. In addition, exploration drilling is currently ongoing in the expansion areas. This drilling presents an opportunity to collect additional samples for geochemical testing from rotary and core holes, provided the coarse rejects are properly stored prior to sample collection.

In the late 1990s, SRK collected 46 samples for Acid Base Accounting (ABA) testing, 59 for Net Acid Generation (NAG) testing, 1 for short-term leach testing, and 5 for humidity cell kinetic tests. In addition, 14 samples were collected from the historic tailings impoundment for static test analysis, and approximately 130 samples of waste rock and pit walls were collected for field NAG test and paste chemistry. These samples were characterized by lithology, alteration, oxidation, and absence/presence of sulfides. Samples were generated by collecting material from consecutive intervals within the same drill hole, and each sample consisted of a single material type as defined by rock type, alteration type, and oxidation state. These samples were submitted to certified laboratories in Reno, Nevada for sample preparation and laboratory testing.

Additional samples will be required for waste rock characterization in order to create a sample database that is vertically and horizontally representative of waste rock associated with the current project. In addition, ore-grade samples will need to be collected. Following the data review and development of estimated waste rock and ore volumes in Step 1, NMCC’s contractor will select sample intervals from exploration drill holes to fill the identified data gaps.

NMCC’s approach to sample selection is designed to ensure that samples with the end-member reactivity are sufficiently sampled to provide a comprehensive and representative understanding of the full range of geochemical characteristics for each of the material types. To this end, NMCC’s contractor will focus on understanding the geological controls on the geochemical behavior of the different materials as the basis for sample selection. As additional mineralogical and geochemical data become available through sample analysis, these data will be combined with the previous data to define subsequent sample sets.

7.4.3 Step 3: Sample Collection and Field Screening

Samples will be collected by qualified geologists from consecutive intervals within the same drill hole and each sample will consist of a single material type as defined by rock type, alteration type, and oxidation state.

Once the main material types are delineated and sampled, a number of field tests can be performed to assess broad geochemical behavior of the identified material types and confirm the geological classification of the materials. Because these tests are inexpensive and quick, a significant amount of data can be collected quickly with minimal cost. By using the field screening to define a representative sample set, the “representativeness” of the sample set is more defensible and the number of samples selected for the more expensive static test suite can be minimized. This is in contrast to another commonly applied approach of selecting a set number of samples based on the predicted amount of waste rock, which usually results in an unnecessarily large sample set. This method also allows us to focus on materials that the initial geological work and testing indicate may be of concern, or which demonstrate an uncertain or highly variable geochemical behavior.

7.4.4 Step 4: Geochemical Test Work

Based on the geologic logging and field screening, a representative number of larger samples will be selected for standard static testing, including: multi-element analyses, acid base accounting (ABA) with sulfur speciation, Meteoric Water Mobility Procedure (MWMP), and Net Acid Generation (NAG). These static tests are intended to define the potential of a material to generate acid, buffer acid, and/or leach constituents under field conditions.

Based on the results of the field work and static testing, samples of material with an uncertain acid generation potential or leaching characteristics may be selected for kinetic testing. Because the static test work assumes that all minerals that have the potential to generate acid, buffer acid, or leach metals will react completely, they can only define the chemical/mineralogical potential of the rock and do not take into account reaction rates that will ultimately control whether the material will actually generate acid, buffer acid, or leach metals under field conditions.

The samples collected in Step 3 will be submitted to a certified laboratory for sample preparation and the first phase of static testing at Nevada certified laboratories as follows:

1. Whole rock analysis using four-acid digest and ICP analysis to determine total metal and metalloid chemistry for 48 elements (ALS Chemex Method ME-MS61).
2. ABA using the modified Sobek method (Memorandum No. 96-79) with sulfur speciation.
3. NAG test reporting final NAG pH and final NAG value after a two-stage hydrogen peroxide digest.
4. MWMP (ASTM D5744-96) with geochemical analysis of the leachate for applicable constituents.

This work will be supervised by NMCC's contractor at McClelland Laboratories of Sparks, Nevada with analysis by Western Environmental Testing Laboratory (WETLab) of Sparks, Nevada; ALS Chemex of Reno, Nevada; and SVL Laboratories of Kellogg, Idaho.

The first phase of geochemical testing will be completed to assess the range of reactivity of each of the material types and the results will be used to select samples for MWMP testing with geochemical analysis of the leachate for applicable constituents (Table 7-2). Samples demonstrating end-member reactivity, as determined from the first phase of static laboratory testing, will be selected for MWMP testing to provide a comprehensive and representative understanding of the leaching characteristics of the different material types associated with the Copper Flat deposit. It is estimated that 80 samples will be selected for static testing (Figure 7-5), of which 40 samples would be selected for MWMP testing. Mineralogical analysis will also be completed on about 20 samples to provide a better understanding of the influence geologic controls have on the geochemical behavior of the waste rock and ore.

As the additional MWMP and mineralogical data become available, they will be combined with the previous dataset to refine the preliminary geochemical predictions for each material type.

7.4.5 Step 5: Kinetic Testing Program

Based on the results of the static testing described above, any material types that exhibit uncertain or highly variable geochemical behavior will require further characterization using kinetic test methods to determine the rates and character of longer-term leaching. Based on the results of previous static testing and interpretation, representative samples will be selected for kinetic test work. Although the number of samples that will require kinetic testing will be based on the static test results, it is estimated that about 20 samples will be selected from the static test database for humidity cell testing (ASTM D-5744-96-7).

7.4.6 Step 6: Data Validation and Compilation

The geochemical data will be reviewed as it is received to ensure the quality of data and consistency in analyses. NMCC's contractor will then verify the quality of all data and confirm that no anomalies are related to laboratory error prior to interpretation and reporting. At a minimum, NMCC's contractor will utilize their internal standard data validation procedures, although guidance from other sources may also be considered (e.g., U.S. Environmental Protection Agency). All geochemical data collected as part of the static testing program will be compiled into a single database for evaluation.

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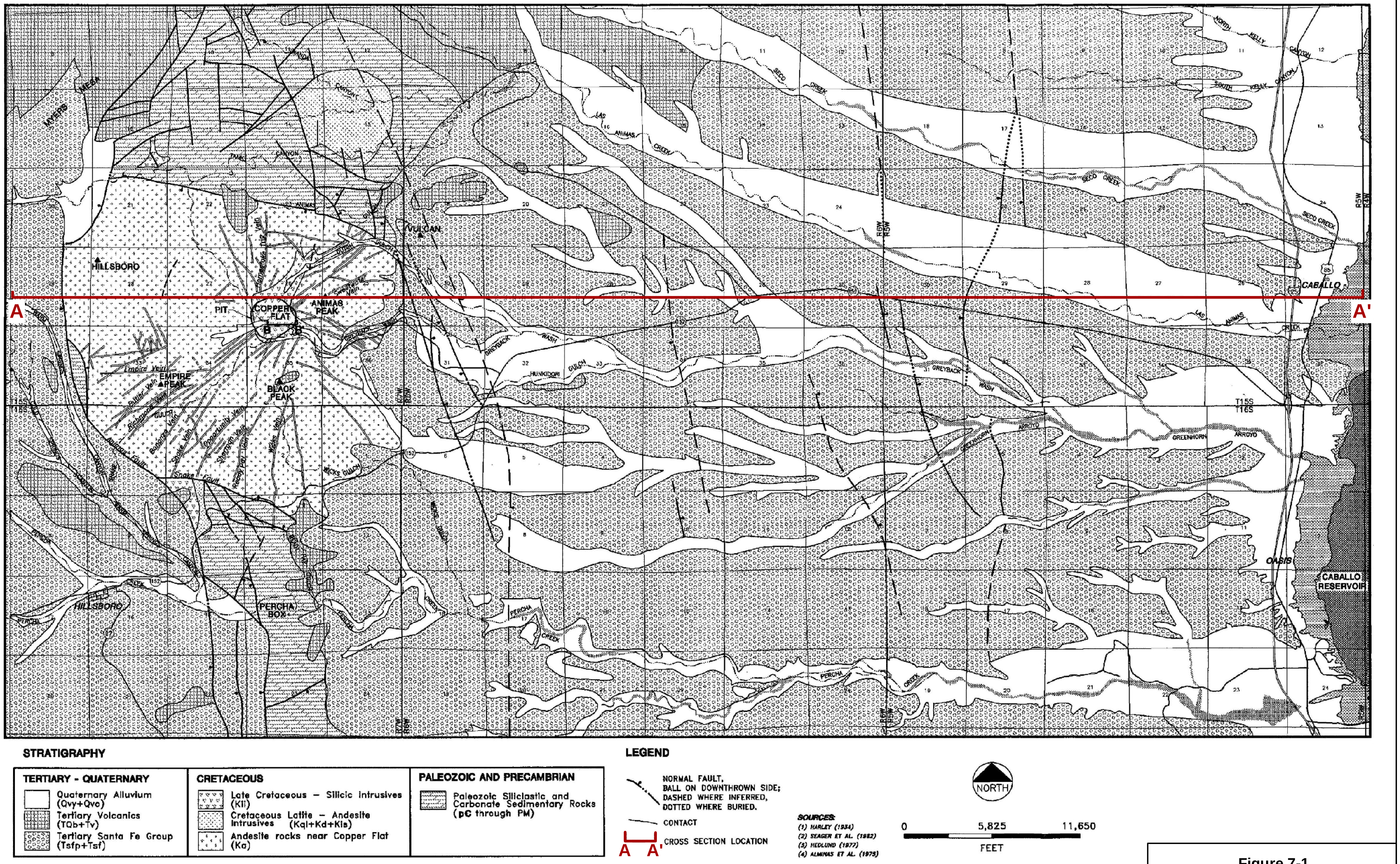
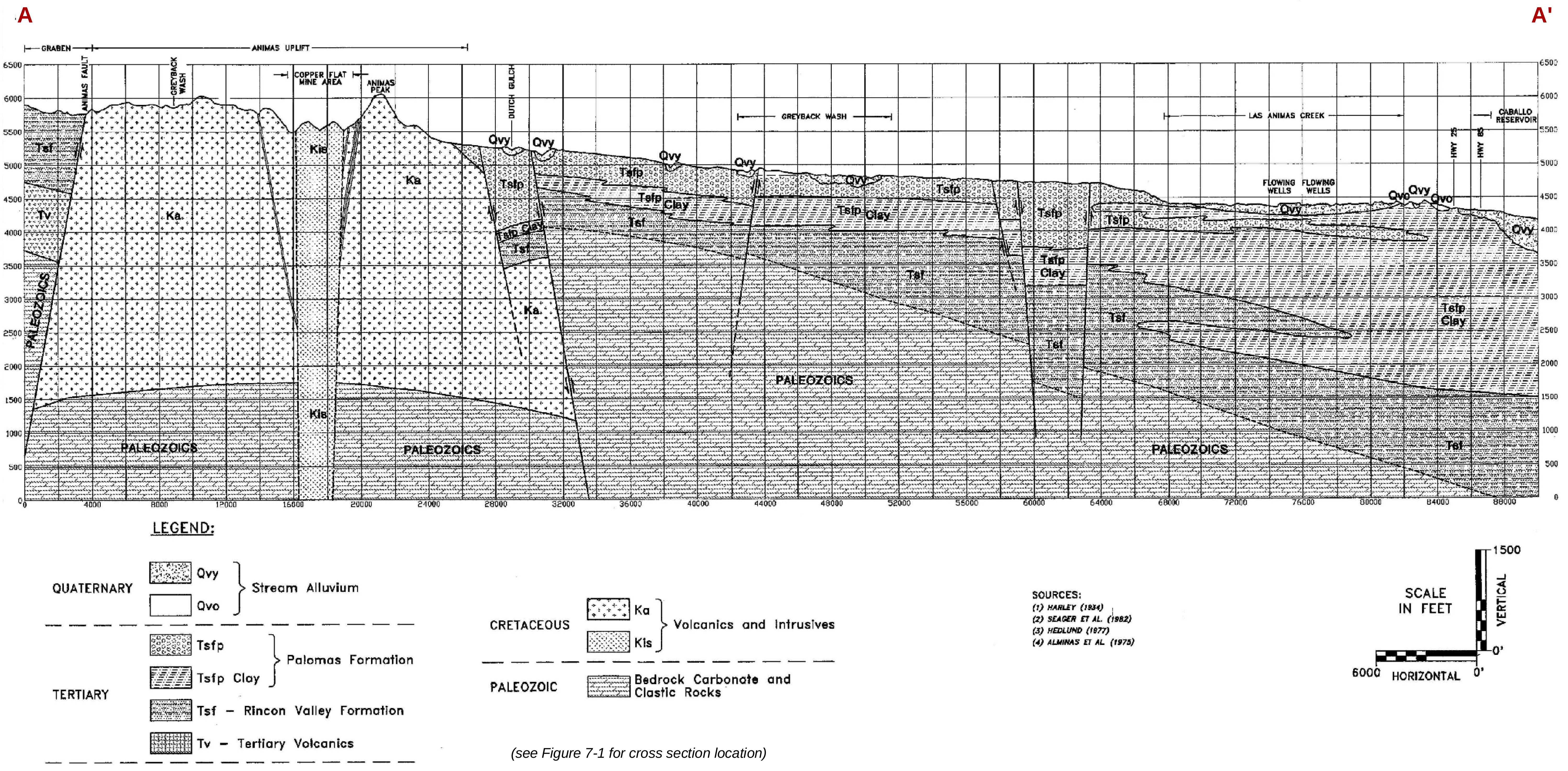


(see Figure 7-2 for cross section detail)

from BLM, 1999

Figure 7-1
Regional Surface Geology
New Mexico Copper Corporation

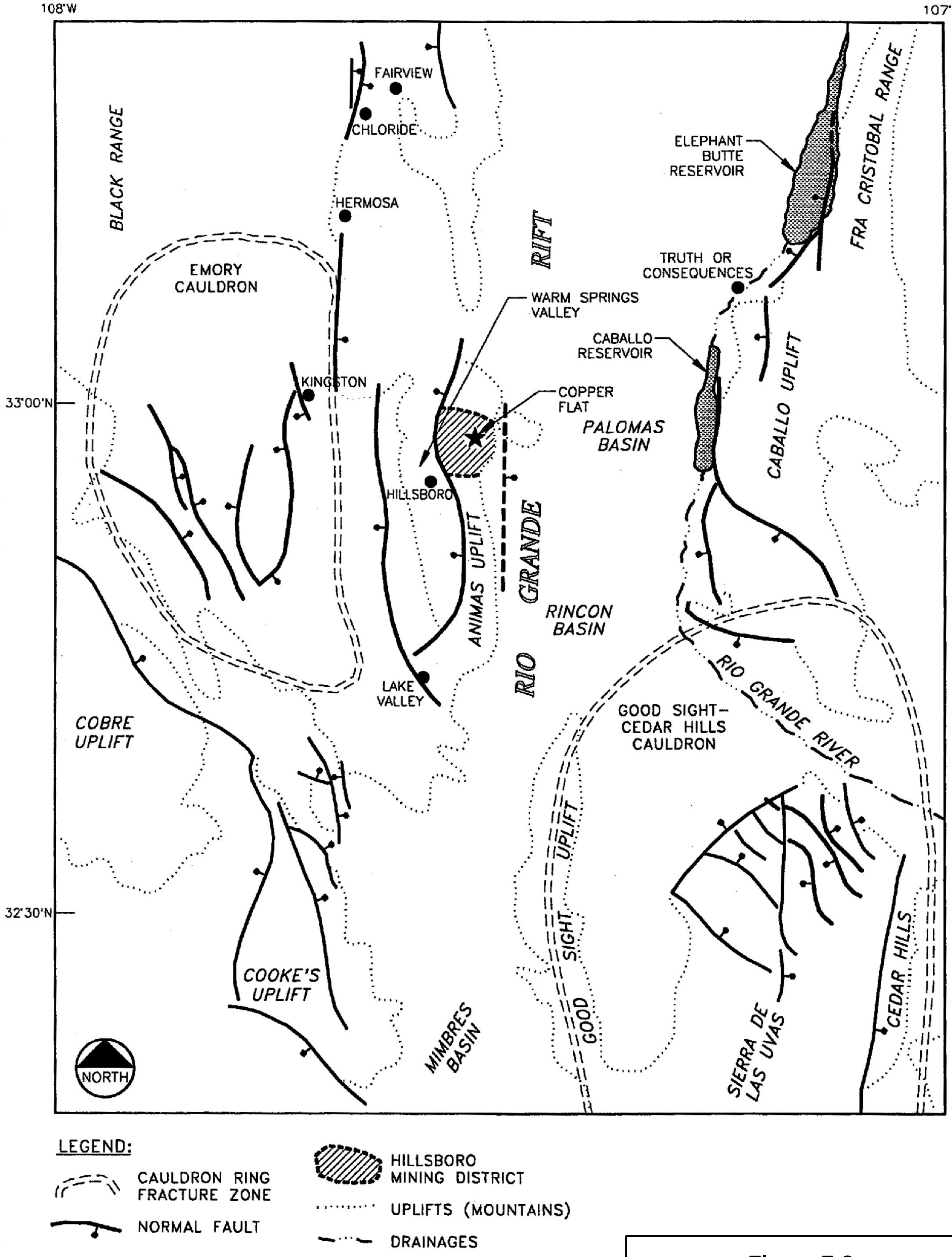
S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\7_geology\7-1_general_surface_geology.mxd 07/22/2010



(see Figure 7-1 for cross section location)

from BLM, 1999

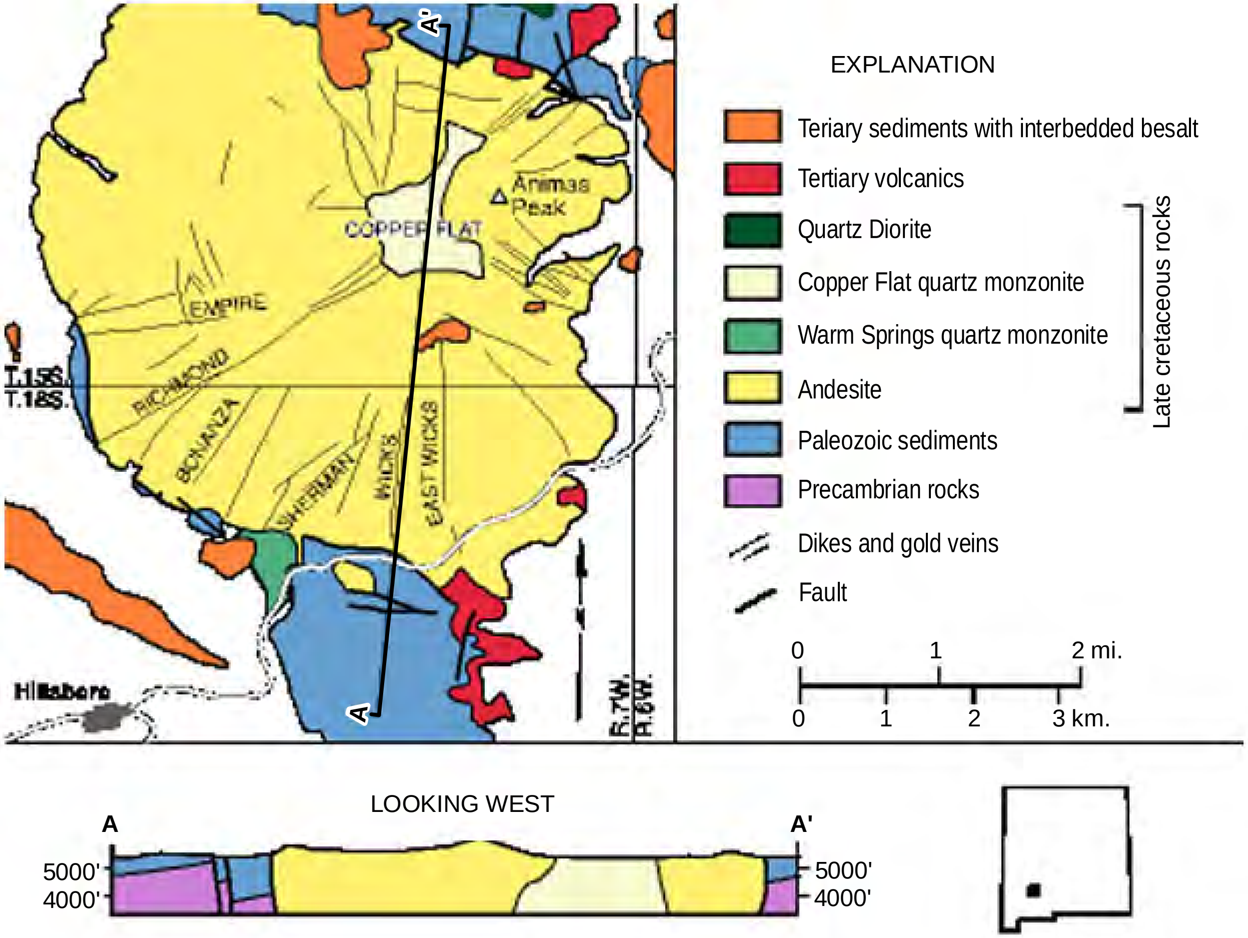
Figure 7-2
Schematic Geologic Cross Section (A-A')
New Mexico Copper Corporation



from BLM, 1999

Figure 7-3
Geologic Structural Features of the Region

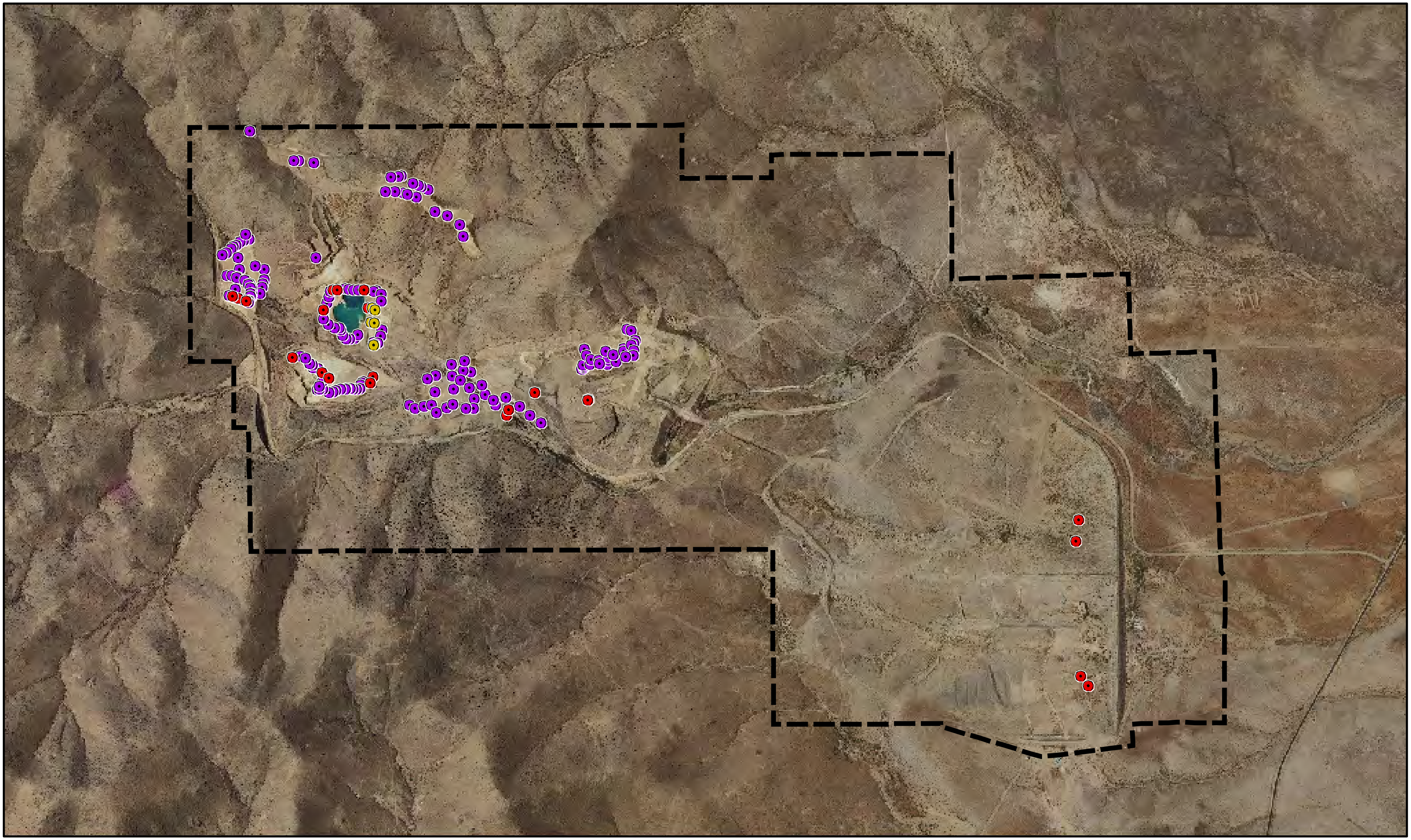
New Mexico Copper Corporation



from McLemore et al., 2000; Dunn, 1982; Hedlund, 1985

Figure 7-4
Geologic Schematic of the Hillsboro Mining District, New Mexico

New Mexico Copper Corporation



Mine Boundary:
Tom Reynolds
Samples:
SRK, 2010
Imagery Information:
-USGS 7.5-Minutes County DOQQ
mosaic Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

Legend

- ▭ Proposed Mine Permit Boundary
- ● Surface Grab Sample
- ● Drillcore Sample
- ● 1997 Sample

Figure 7-5
Locations of Geologic Samples

New Mexico Copper Corporation

Tables

Table 7-1
Stratigraphy of the Copper Flat Area

Age	Geologic Unit	Thickness (ft)
Cenozoic 0–65 million years ago (Ma)	Pleistocene and Holocene valley alluvium	10–70
	Pleistocene river, arroyo, and fan deposits	50–100
	Pliocene basalt flows, dikes, and plugs	50–200
	Upper Santa Fe Group fanglomerates (Palomas Formation)	300–100
	Santa Fe Group, Rincon Formation	1000–2000
	Tertiary volcanics	1000
Mesozoic 65–225 Ma	Quartz latite dikes Intermediate composition intrusive Late Cretaceous andesite dikes Late Cretaceous silicic intrusives **Copper Flat volcanic and intrusive (mineralization associated with emplacement)**	>3000
	Sandstone	
	Mancos Shale (not exposed)	300–400
	Dakota Sandstone (not exposed)	100–200
Paleozoic 225–570 Ma	Manazano Group sedimentary rocks. Abo Sandstone, Yeso Formation shales, sandstones, and gypsum deposits, and San Andres Limestone. Not exposed west of Rio Grande at Site.	1000–2000
	Pennsylvanian carbonate rocks including Syrena, Oswaldo, and Magdalena Groups, minor conglomeratic sandstone and cherty massive limestone.	400–1000
	Devonian and Mississippian carbonate rocks (Kelly Limestone, Lake Valley Limestone, Caballero Formation) and Percha Shale.	200–500
	Ordovician Montoya Group and Fusselman Dolomite.	250–600
	Cambrian-Ordovician Bliss Sandstone and El Paso Group Limestone.	500–700
Precambrian 570–1,500 Ma	Precambrian massive granite	

Source: BLM, 1999, Tables 3-1 and 3-2

Table 7-2

Proposed Analytical Parameters with Method Reporting Limits

Parameter	Method	Method Reporting Limit
Alkalinity, CaCO3 (Acidity)	SM 2320B	1
CO3, CaCO3	SM 2320B	1
HCO3	SM 2320B	1
Aluminum	EPA 200.7	0.045
Antimony	EPA 200.8	0.0025
Arsenic	EPA 200.8	0.005
Barium	EPA 200.7	0.01
Beryllium	EPA 200.7	0.001
Bismuth	EPA 200.7	0.1
Boron	EPA 200.7	0.1
Cadmium	EPA 200.8	0.001
Calcium	EPA 200.7	0.5
Chloride	EPA 300.0	1
Chromium	EPA 200.7	0.005
Cobalt	EPA 200.7	0.01
Copper	EPA 200.8	0.05
Fluoride	EPA 300.0	0.1
Gallium	EPA 200.7	0.1
Iron	EPA 200.7	0.01
Lead	EPA 200.8	0.01
Lithium	EPA 200.7	0.1
Magnesium	EPA 200.7	0.5
Manganese	EPA 200.7	0.005
Mercury	EPA 200.8	0.0001
Molybdenum	EPA 200.7	0.01
Nickel	EPA 200.7	0.01
Nitrate as N	EPA 300.0	1
Nitrite as N	EPA 300.0	1
pH (s.u.)	SM 4500-H+ B	--

Parameter	Method	Method Reporting Limit
Phosphorus	EPA 200.7	0.5
Potassium	EPA 200.7	0.5
Scandium	EPA 200.7	0.1
Selenium	EPA 200.8	0.005
Silver	EPA 200.7	0.005
Sodium	EPA 200.7	0.5
Strontium	EPA 200.7	0.1
Sulfate	EPA 300.0	1
Thallium	EPA 200.8	0.001
Tin	EPA 200.7	0.1
Titanium	EPA 200.7	0.1
Total Dissolved Solids	SM 2540C	10
Uranium	EPA 200.8	0.002
Vanadium	EPA 200.7	0.01
Zinc	EPA 200.7	0.01

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8 Surface Water

The Copper Flat area falls within the Lower Rio Grande watershed, as defined by the New Mexico Water Quality Control Commission (WQCC). This watershed includes approximately 5,000 square miles in Catron, Socorro, Sierra, and Doña Ana Counties and is dominated by the Rio Grande and its tributaries as well as the two large reservoirs of Elephant Butte and Caballo. Numerous ephemeral tributaries feed into the Rio Grande from the west, but none contribute perennial flow to the Rio Grande.

Subsection 8.1 provides background information about surface water resources in the vicinity of the Copper Flat Mine Permit Area (Site), and Subsection 8.2 summarizes resources for pertinent historical data related to surface water sampling. The rest of this section focuses on the proposed sampling plan for surface water at the Site. Surface water baseline studies have been completed in the project area since the 1960s, and relevant information and data are referenced in subsequent sub-sections throughout Section 8.

8.1 Surface Water Characteristics of Site and Vicinity

The Site is drained by ephemeral streams (arroyos) within the Greenhorn Arroyo drainage basin, a 6th level sub-watershed defined by the Hydrologic Unit classification system (Seaber et al., 1987) that drains 29,414 acres of land on the eastern slope of the Animas Uplift to a single outlet into the Rio Grande (Figure 8-1). Flows within the Greenhorn Arroyo drainage basin are ephemeral, as they only occur in direct response to precipitation. As a result, this drainage, similar to others in the region, does not contribute any perennial surface water flow to the Rio Grande.

Numerous arroyos contribute to the trunk channel of Greenhorn Arroyo. Of these, Grayback Arroyo is the primary drainage through the Site. Grayback Arroyo originates west of the Site and drains eastward along the Site axis until it converges with the trunk channel of Greenhorn Arroyo approximately 8 miles east of the Site boundary (Figure 8-1). In pre-mining times, Grayback Arroyo drained directly through the mine area, but was later re-routed around the southern perimeter of the mine area for flood control purposes (Raugust, 2003). Newcomer and Finch (1993) measured flow rates in Grayback Arroyo of 12.5 gallons per minute (gpm) in March 1993 at a point east of the pit and former plant site. Three seeps have been identified along Grayback Arroyo (BLM, 1999). One seep with riparian vegetation is located near a buried storm water collection pond, a second is located downstream from the first seep and supports a small cottonwood/willow stand, and the third is south of the operations area (Figure 8-1).

Two creeks drain basins directly to the north and south of the Greenhorn Arroyo drainage basin: Las Animas Creek in the north and Percha Creek to the south (Figure 8-1). Both Las Animas and Percha Creeks have ephemeral, intermittent, and perennial reaches. Streamflow in Las Animas Creek varies from perennial to intermittent from the area near sampling site MAS (Figure 8-1) to Caballo Reservoir (BLM, 1999). For example, Davie and Spiegel (1967) show flow rates ranging from about 450 to 900 gpm in the upper reach (T14S R7W, Sections 34 through 36, near sampling sites LAC-A and LAC-B in Figure 8-1) and middle reach (within T15S R5W) of the creek; according to Davie and Spiegel, these reaches are “losing reaches” of the creek. Streamflow in Percha Creek is intermittent in the Hillsboro reach and perennial in the area known as the Percha Box, a steep-walled reach of the drainage that has incised into Paleozoic bedrock (BLM, 1996) (Figure 8-1). SRK (1995) reported measurable streamflows just east of the Percha Box of roughly 200 to 250 gpm. This was the only reach of Percha Creek with measurable flows during the SRK sampling period. Though both Las Animas Creek and Percha Creek have perennial reaches, neither creek contributes perennial flow to the Lower Rio Grande Basin.

Two springs are located within the Greenhorn Arroyo drainage basin to the north and west of the Site (Figure 8-1). Other unnamed seeps occur in the pit walls surrounding the pit lake after precipitation events;

these are likely the result of fractured flow through the bedrock exposed in the pit wall. Several springs in the Percha Creek basin and one in the Las Animas Creek basin have been identified for sampling, but have been studied less than those within the Greenhorn Arroyo basin. As a result, there is little information on their flow rates or quality, although Newcomer and Finch (1993) did attempt to measure flow.

The open pit that was mined during the early 1980s now contains a lake. Since 1989, the pit lake has been sampled for water quality approximately 65 times at various locations and depths, including samples collected by past operators of the mine, state regulatory agencies, and academic researchers studying the mine (BLM, 1999). For the proposed operations, the New Mexico Copper Corporation (NMCC) would consume the pit lake waters for mine operations and dust suppression. If necessary, pit water could be temporarily stored in a reservoir in the plant area (SRK, 2010a).

Mine water from milling operations would be discharged into an evaporation pond or re-used for several purposes: (1) plant processing streams, (2) the tailings facility with pump-back to the plant, and/or (3) dust control (SRK, 2010a). Both a National Pollution Discharge Elimination System permit and a New Mexico Environment Department (NMED) groundwater discharge permit are required for NMCC to discharge mine water. In preparation for both permits, NMCC will characterize the water quality of the mine discharge through scheduled gauging and sampling of discharge. In addition, NMCC will design a storm water management system to manage discharge for the proposed facilities. Mine water discharge is not expected to reach the Lower Rio Grande or any lake, spring, reservoir, riparian, or wetland areas.

8.2 Historical Data

Existing surface water data relevant to the NMCC sampling plan are discussed in this section and are summarized in Table 8-1. Surface water at the Site was most recently investigated by ABC (1996), who collected flow and water quality from Percha Creek and Las Animas Creek. Newcomer et al. (1993) performed a hydrologic assessment of the Greenhorn Arroyo drainage basin, measuring flow and water quality along Grayback Arroyo and at a number of seeps and springs. The oldest known surface water investigation at the Site was performed by Davie and Spiegel (1967), who collected flow data for Las Animas Creek. In addition, the surface water chemistry of Grayback Arroyo was initially investigated in 1977 at three locations as part of an environmental assessment prepared by the BLM in response to an application by Quintana Minerals Corporation for an open pit copper mine at the Site (BLM, 1978). The three locations sampled in 1977 generally correspond to the sampling locations proposed in Figure 8-1, with one location upstream of the permit boundary, one within the Site approximately 300 yards from the mine rim, and a third located where the arroyo leaves the Site (BLM, 1978). Water samples were collected in January, March, and July of 1977. Results of these investigations were compiled by Raugust (2003) and are also summarized in the Bureau of Land Management’s (BLM) preliminary final environmental impact statement (PFEIS) for Copper Flat (1999).

Spring and seep flow rates are infrequently reported in the available literature for the Site and surrounding areas. Several springs and seeps have been identified within the Greenhorn Arroyo drainage basin. Two springs, identified as BG and BG-2, are located to the north and west of the Site (Figure 8-1) and several unnamed seeps occur in the walls surrounding the pit lake. BG and BG-2 were judged by Newcomer et al. (1993) to be ephemeral. The seeps along the pit walls are observed to flow in response to precipitation events, and, as mentioned above, are likely the result of fractured flow through the bedrock exposed in the pit wall. All known springs and seeps in the Greenhorn Arroyo drainage basin are upgradient of the proposed mine water discharge location. Other seeps and springs shown in Figure 8-1 have not been measured in the past and thus have no associated historical flow information.

The 12.8-acre lake that has formed in the existing pit (Figure 8-2) is estimated to be about 40 ft deep, based on a pit bottom elevation of 5,380 ft above mean sea level (amsl) and water level elevation of 5,420 ft amsl as measured in 1986 (SRK, 2010b). The water quality of the pit lake has been sampled over 65 times at various depths and locations since the initial samples were collected on April 13, 1989, by the New Mexico Environment Improvement Board (Raugust, 2003); the latest samples were collected in January 2010. Raugust (2003) concluded that the collective data show several trends in the variability of water quality over time, mainly that evapoconcentration and buffering processes are influencing the quality of the lake water. Pit water has historically exceeded the WQCC standards for sulfate, chloride, TDS, manganese, and uranium (20.6.2.4103 of the New Mexico Administrative Code) and has, at times, dropped below the acceptable pH range of 6 to 9.

Other key studies that discuss the water quality are summarized in SRK (1997) and include hydrogeologic and hydrogeochemical studies (SRK, 1995), post-closure pit water balance model calculations (SRK, 1997), water quality and host-rock geochemical studies (SRK, 1997), and post-hearing submittals that followed the 1997 New Mexico Mine Permit public hearing.

Evaluating these existing historical data is essential to completing a comprehensive Baseline Characterization Report. The statistical analysis method proposed to evaluate these historical volumetric flow and water quality data as baseline characterization data is discussed in detail in Section 9.1.5 of the SAP (see Section 9 – Groundwater). This statistical analysis will be used to justify the use of historical data, per the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Mining and Minerals Division (MMD) draft Guidance Document for Part 6 New Mining Operations Permitting under the New Mexico Mining Act (MMD Guidance Document). Additionally, statistical analysis will be used to determine if the current baseline data are significantly different from existing baseline data where temporal data are available for the monitoring wells.

8.3 Sampling Objectives

The objective of sampling surface water is to characterize the volumetric flow and water quality of seeps, springs, streams, and the pit lake. Table 8-2 lists the frequency, location, and method for the proposed sampling program.

This information will be used for the following purposes:

1. Develop the discharge plan application for water produced during dewatering.
2. Further describe the seasonal variations in surface water quantity and quality in the vicinity of the Site.
3. Determine the likely impacts on the hydrologic regime, such as the quality and quantity of surface water systems in the vicinity, including dissolved and suspended solids under seasonal conditions.

Sources that could affect surface water quality include the disposal of mill tailings, acid rock drainage from mine stock piles, and erosion associated with reduced land cover and increased land disturbance. Dewatering activities associated with the pit as well as groundwater development for mine operations could affect surface water quantity. This plan outlines how, when, and where data will be collected to characterize baseline conditions in support of mitigating impacts to surface water quality and quantity.

8.4 Sampling Frequency

Perennial streams, springs, and the pit lake will be sampled four times over a 12-month period. Ephemeral or intermittent streams, springs and seeps will be sampled during opportunistic sampling events after precipitation events. The frequency of samples by location is presented in Table 8-2.

8.5 List of Data to Be Collected

A variety of data needs are associated with surface water. These needs are provided in Table 8-3 along with a plan for how each need will be addressed through this sampling and analysis plan.

8.6 Methods of Collection

In general, the methods used to collect surface water samples will follow the standard operating procedures defined by the NMED Surface Water Quality Bureau (SWQB) (2007) for streamflow measurement and water quality sampling, as described below. Methods deviate from NMED standard operating procedures for sampling volumetric flow and water quality from springs and seeps and water quality and sediment in the pit lake, as described in Section 8.6.2.

8.6.1 Surface Water Samples from Springs and Drainages

8.6.1.1 Volumetric Flow Measurements

Streams. Streamflow measurements will be made using classical techniques for open-channel flow. For reaches with perennial flow (Table 8-2), volumetric flow will be measured using a flow meter such as the Marsh-McBirney Flo-Mate™ 2000, which is designed for characterizing open-channel flow; a top-setting wading rod; and a tape measure or tagline. Assembly, calibration, and operation of the flow meter will follow the procedures described in NMED SWQB (2007). At each stream location listed in Table 8-2 that does not have an auto-sampler installed, a sampling station will be established by identifying (as close to the designated location as possible) a straight reach of the stream where the streambed is uniform and relatively free boulders and aquatic vegetation. The width of the stream will be measured using a tape measure, then subdivided so that each stream section between vertical profiles will contain no more than 10% of discharge (e.g., if the stream is <5-ft wide, vertical profiles would be 0.5 ft apart). Following procedures in NMED SWQB (2007), if the stream depth is greater than 2.5 ft, stream velocity will be measured at 20 percent, 60 percent, and 80 percent of the total depth of the stream at each profile location along the cross-section. If stream depth is more than 0.15 ft but less than 2.5 ft, the velocity measurement will be taken at a depth that is equal to 60 percent of the total depth when measured from the surface of the water (NMED SWQB, 2007). Following the same NMED SWQB procedures, if the stream is less than 0.15 ft deep, flow will be measured using the equation $0.9 \times Umax$, where $Umax$ is the maximum velocity recorded throughout the entire flow (Marsh-McBirney, 1990). Once measurements have been recorded, flow will be calculated in the field and recorded in the field book.

Given the unpredictable nature of flow in intermittent and ephemeral reaches of streams, streamflow in many of these locations will be recorded using deployed, portable, automatic sampling devices (auto-samplers). An auto-sampler, such as the Global Water FSS Flow Sampling System (or similar), will be installed to collect streamflow during periods in which there is measurable flow. A datalogger will record flow measurements in the unit’s random access memory (RAM) and will be available for download onto a laptop computer following the storm event. Five auto-samplers will be installed within and in the vicinity of the Site, three within Greyback Arroyo, one in Percha Creek, and one in Las Animas Creek, as listed in Table 8-2 and shown in Figure 8-1.

Sites were selected for flow measurement following methods presented in NMED SWQB (2010). Established monitoring stations with historical data on each watershed were selected to examine trends in water flow. These include stream sampling stations listed in Table 8-2. Grayback Arroyo SWQ-1, SWQ-2, and SWQ-3 all have historical measurements for streamflow, but the data are sparse because auto-samplers were not installed and measurements were made by hand. These stations, however, are well positioned for the purposes of characterizing upstream, on-site, and downstream conditions because Site SWQ-1 is located upstream of the

Site, SWQ-2 is located within the Site, and SWQ-3 is located downstream of the portion of the Site that has been most disturbed by mining activities and still exhibits ephemeral flow. SWQ-1 is proposed as a reference site, as the water quality at this location has received the least amount of impact from past mining activities and the geology, gradient, and precipitation characteristics of SWQ-1 are similar to the sampling locations within and downstream of the Site, which have been more impacted by past mining operations and are likely to be more affected by the proposed NMCC mining operation. The selection of locations for the installation of auto-samplers in Percha and Las Animas Creeks was based on the criteria for site selection defined in NMED SWQB (2010), and reflects the fact that past measurements at these locations demonstrates that flow has occurred historically within the given reach.

Springs and Seeps. Volumetric flow from springs and seeps can be measured with a portable V-notch weir box or adjustable flume, if sufficient flow exists and channel conditions are appropriate. The V-notch weir box operates under the principle that discharge is related to the height of the water above the bottom of the V-shaped notch; the shape ensures that a small change in the discharge will effect a large change in the height of the water. Flow can be calculated from measurement methods defined for V-notch weirs by the U.S. Bureau of Reclamation (USBR, 2001).

If flows are insufficient for the use of a flume or V-notch weir (e.g., <0.1 cfs [44.8 gpm]), volumetric flow will be estimated using the "timed fill" method, as described by NMED SWQB (2007). This method uses a stopwatch to measure the time it takes to fill a 5-gallon bucket by diverting the entire flow of the spring or seep into the bucket below a weir or waterfall (NMED SWQB, 2007). To calculate flow using this procedure, 5 gallons per unit time may be converted to cfs using the following equation:

$$5 \text{ g} = 0.6684 \text{ ft}^3\text{, thus } 440.6684/\text{elapsed time (seconds)} = \text{cfs}$$

8.6.1.2 Water Quality Sampling

Streams. Individual samples collected over a period of 15 minutes or less (i.e., grab samples) will be collected by the auto-samplers installed in Grayback Arroyo, Percha Creek, and Las Animas Creek at the locations listed in Table 8-2. Each sample will represent water quality conditions at the time the sample was collected. The auto-sampler consists of a 2.5-gallon polyethylene sample bottle, a peristaltic sampling pump, a pickup hose, a circuit board controller, a rechargeable gel cell battery, and a battery charger. With the exception of the pickup hose, the components are housed in a waterproof case mounted aboveground next to the sampling location, which is outside of the ordinary high water mark of channel.

Once the sample is collected, a radio unit in the sampler will communicate to a receiver installed in the meteorological tower (see Section 2), which will in turn notify the NMCC surface water lead via telemetry that a surface water sample has been collected. The sample will be retrieved by on-site mine staff, placed in a laboratory-provided sample container, and shipped overnight to the designated laboratory for analysis. All equipment preparation and cleaning, sample collection, and sample preservation will follow the standard operating procedures defined by NMED (NMED SWQB, 2007).

Springs and Seeps. During quarterly measurements of flow from seeps and springs, water quality samples will be collected using non-isokinetic, open-mouth samplers following U.S. Geological Survey protocols for sample equipment selection described in Lane et al. (2003). Methods will follow the 2007 NMED/SWQB Standard Operating Procedures for Data Collection, §7.3 Routine Water Chemistry Sampling.

Samples will be collected in clean polyethylene Cubitainer® containers. Where water flows at sufficient depth, samples will be collected by immersing the container by hand or by rod beneath the surface. Otherwise, water will be collected in a plastic bucket or disposable bailer held with nylon rope or twine, if necessary. Care will be taken to avoid contamination with debris from the rope or twine and the sampling area. Buckets and bailers will be rinsed three times with source water and sampling personnel will rinse their hands with source water before collecting samples. Samples will be collected immediately following rinsing. Buckets will be rinsed with spring water following use and cleaned with Liquinox and warm water prior to the next use.

Water will be transferred from the collection vessel to the sample container with a peristaltic pump or syringe, filtering as appropriate. Dissolved concentration samples will be filtered; total concentration samples will not be filtered. All samples for dissolved constituent analytes will be filtered with a 0.45-micron pore-size disposable in-line filter cartridge. Filters will be rinsed with sample water according to the manufacturer's recommendations prior to sampling.

Every effort will be made to take sonde readings in flowing water. When this is not possible, sonde readings will be made from the bucket or bailer after the sample has been collected and a note to this effect will be made on the field sheet.

8.6.1.3 Sediment Sampling in Streams

Sediment samples will be collected at each of the surface water sampling locations identified in Table 8-2. Sample collection methodology will depend on sample location. Field personnel will visit the locations and determine the best approach for ensuring collection of samples based on field reconnaissance. The objective in selecting a sample site is to obtain recently deposited fine sediment. Depositional zones include areas on the inside bend of a stream; areas downstream from obstacles such as boulders, islands, or sand bars; or simply shallow waters near the shore. Where possible, fine-grained surficial sediments will be obtained from several depositional zones that represent various flow regimes within a stream reach, and will be composited to yield a sample representing average conditions. However, depositional zones on small, ephemeral drainages may be limited in size, necessitating that a single zone be regarded as representative.

Samples will be collected following NMED SWQB Standard Operating Procedures for Data Collection (NMED SWQB, 2007), as follows:

1. Samples will be collected in a plastic or Nalgene® jar.
2. The sample will be composited from several representative depositional zones into an appropriate mixing container after decanting any excess water over the back of the scoop.
3. The sample will be mixed well.
4. An aliquot of the mixed material will be transferred to the final, labeled sample container (a 4-ounce, wide-mouthed glass jar) and placed on ice for transport to the analytical facility. If shipment cannot be accomplished in a timely manner, the sample will be frozen prior to shipment. (Sediment samples are not preserved.)

If water and sediment samples are to be collected at the same location, water samples will be collected (1) before collecting sediment samples, as sampling sediment will disturb the stream, and (2) downstream of sediment samples, as water sampling may disturb representative depositional zones. Personnel collecting samples will employ proper sample handling techniques, including wearing latex or nitrile gloves, avoiding hand contact with contaminating surfaces, and minimizing the number of sample handling steps. Sample containers will be covered while being moved to minimize the atmospheric input. All sample collection equipment will be rinsed as soon as possible after use and thoroughly rinsed with ambient water at each new sampling station before collecting a sample. Equipment used will be inert with respect to the analytes to be collected.

8.6.2 Pit Lake Sampling

8.6.2.1 Water Sampling

Lake water from a sampling station located at the deepest point in the lake will be sampled four times within a 12-month period, with one set of samples collected during each season. Only one sampling station is proposed, as the size of the lake is less than 100 acres, which is typically the threshold for establishing additional sampling stations (see Section 2.0 of NMED SWQB, 2010). The deepest point of the lake will be identified by surveying the lake bathymetry along predetermined parallel depth profiles. These parallel profiles will be spaced to provide adequate coverage with the addition of two tie lines perpendicular to the profiles to ensure consistency in the interpretation of water depth between each profile. Given the size of the pit lake, 5 profiles and 2 tie lines are proposed, as shown in Figure 8-2. The depth along each profile will be measured using a portable acoustic transducer tethered to the side of the boat 2 inches below the water surface. Each predetermined profile will be pre-loaded into a global positioning system (GPS) with horizontal accuracy of ≤3 meters (9.8 ft) to ensure that depth measurements follow the proposed profile lines in the field.

During each of the four quarterly sampling events, vertical profiles of temperature, pH, oxygen/reduction potential, dissolved oxygen, and conductivity will be measured at a resolution of up to every 12 inches. These profiles will be used to define seasonal trends in the water column and the discrete depths at which surface water quality samples should be collected.

Based on the results from the vertical profile, a surface water sample will be collected from up to three depths at the deepest point within the lake. These three samples, taken quarterly, are needed to determine whether the lake is either thermally or chemically stratified and to support geochemical modeling of the pit lake system. If the vertical temperature profile shows that no thermocline present in the lake (i.e., there is less than 1^{o}C difference between the temperature of the surface and bottom of the lake), then three water-quality samples will be collected from within the euphotic zone. The euphotic zone is defined as the depth of light extinction, which will be measured by lowering a secchi disk into the water and measuring the depth below water at which the disk is no longer visible through a secchi disk viewer. Following the NMED SWQB (2007) procedures for sampling lakes, 5-liter samples from the top, middle, and bottom of the euphotic zone will be collected for the water quality analyses listed in Table 8-4; a rinsed Kemmerer® water bottle will be used for sample collection. The 5-liter samples will be composited in a 5-gallon, acid-washed container. If a thermocline is present (i.e., if there is greater than 1°C difference between the surface and bottom temperatures of the lake), 5-liter samples will be taken from the top, middle, and bottom of the entire water column instead of just the euphotic zone. The 5-liter samples will then be composited in a 5-gallon, acid-washed container.

Each 5-liter water-quality sample will be collected using a Wildco® discrete-depth sampler that is capable of collecting a continuous column of water from a desired depth. A 5-gallon Cubitainer® will be filled with water from each of the three samples to create a composited sample. Following NMED SWQB (2007) sampling protocols for lakes, all water quality samples will be poured off from the composited sample into their respective containers, which will be either individually rinsed, 1-liter Cubitainers® or other containers as prescribed by the analysis to be performed. Dissolved nutrient and metal samples will be filtered prior to being poured into individually rinsed, 1-liter Cubitainers®. After the composited sample is divided into individual containers, the samples for total and dissolved nutrients will be preserved in the field with 2 milliliters (ml) of concentrated sulfuric acid per liter of sample water (to reduce pH to < 2). Samples for total and dissolved metal analyses are preserved with 5 ml of concentrated nitric acid per liter of sample water (to reduce pH to <2). Samples for cyanide are preserved with 8 to 10 tablets of NaOH per liter of sample water (to increase pH to >12).

8.6.2.2 Sediment Sampling

A core of recently deposited fine-grained sediment will be collected from the lake during the first sampling event using a Glew Corer (Glew, 1988; Glew et al., 2001), a gravity-driven coring device composed of cylindrical aluminum alloy and a Teflon body with a nominal diameter of 2.8 inches. The upper part (core body) houses the closing piston, release mechanism, and captive float. The float relays the motion of the messenger to the trigger and gives the corer vertical stability in the water. The core body caries a sleeve and clamping device that secures a 2.5-inch diameter Lexan-core tube capable of collecting up to 24 inches of undisturbed sediment. The Glew Corer is specially designed to collect undisturbed samples from the sediment-water interface where the bed material is loosely consolidated. In contrast to other sediment sampling devices, the flow of water through the Glew Corer is not impeded because the design of the coring device allows water to pass freely through the device with little resistance. As a result, the Glew Corer eliminates the hydraulic pressure that normally forms ahead of other devices. This hydraulic pressure can cause the top sediment to blow out when the device is lowered to the sediment-water interface, which results in sample loss even before the sample is collected by the device.

The sediment sample will be collected from a boat held in position over the deepest point in the lake by at least three anchors. The corer will be assembled and tested according to Glew et al. (2001). First, the messenger weight and Lexan core tube will be attached to the line and core body, respectively. The core tube will be attached flush with the core body to ensure there is a tight seal. Once assembled, the corer will be lowered slowly from the side of the boat approximately 1 to 2 ft above the sediment-water interface. Holding the messenger weight in one hand, the corer will penetrate the sediment by letting the rope slide through the other hand. Once the corer has penetrated the sediment, the messenger weight will be dropped to trigger the closing piston. The corer will then be lifted by hand to a level where the bottom of the core tube remains just the water surface. A rubber stopper will be inserted by a gloved hand into the bottom of the core tube before the core tube is lifted above the water surface.

Once the corer is on the boat, the piston sealer will be lifted from the core body and the tube removed by unscrewing the band clamp that holds the core tube onto the corer. Holding the core tube upright, the core body will be detached from the tube and capped immediately before bringing the core back to shore. On shore, core samples will be extruded from core tubes into sampling jars in the field using an extruding device specifically designed for the Glew Corer (see Glew, 1988 and Glew et al., 2001). The extruding device will push the sediment through the top of the core tube and into sampling jars provided by the laboratory. The sample extruded from the core tube will be homogenized and then sub-sampled into a container submitted to a laboratory for analysis for the parameters listed in Table 8-4. The sediment sample will be collected only after the required water sample has been collected to avoid disturbing or suspending sediment that would contaminate the surface water sample.

8.7 Parameters to Be Analyzed

During the year of sampling, 12 water quality samples from the pit lake (1 sample site x 3 sample depths x 4 quarterly sampling events) will be collected. The samples will be analyzed for the suite of parameters and methods provided in Table 8-4. Additionally, it is assumed that the streams, seeps, and springs listed in Table 8-2 will be analyzed for the same suite of parameters.

8.8 Maps Showing Proposed Sampling Locations

Locations for proposed sampling locations for streams and springs are shown in Figure 8-1. These locations were selected by NMCC because they were sampled in the past (e.g., SWQ series in Grayback Arroyo, PC series in

Percha Creek, and select sites within the LAC series along Las Animas Creek) or represent an area of interest where volumetric flow or water quality data would be of importance to understanding regional characteristics of surface water quality and quantity. The water quality and sediment samples collected from the deepest point in the lake will be based on the results of the depth profiles shown in Figure 8-2.

8.9 Laboratory and Field Quality Assurance Plans

Data collected to characterize the water quality and flow of surface water resources discussed in this section of the Sampling and Analysis Plan will conform to the NMCC Quality Assurance Project Plan (Attachment 1) with respect to field methods, sampling procedures, and recording of field notes. If procedures for sampling or analysis are not specifically defined in Attachment 1, by the sampling method, or by the analytical method, the NMED SWQB (2007) protocols for field data sampling, equipment calibration and cleaning, sample containment and handling, and photographic documentation will be followed as appropriate and/or applicable to the site conditions.

The samples for chemical analysis will be properly preserved and field filtered, if necessary, before shipment to an analytical laboratory certified by the U.S. Environmental Protection Agency. All samples will be shipped within the holding times defined by the analytical method to be used. In addition, containers specific to a given analytical method will be used as appropriate. To provide quality control, duplicates and/or equipment blanks will be collected/used. Analytical results will be stored in a project database that will be provided to the New Mexico Mining and Minerals Division electronically as well as in hard-copy as an attachment to the Baseline Summary Report.

8.10 Discussion in Support of Proposal

The existing water quality and flow data for surface water within and in the vicinity of the Site will be bolstered by the new data collected as outlined in this section of the Sampling and Analysis Plan. New data will establish baseline conditions in that they will represent the nature of flow and quality of surface water and sediment prior to any operations or activities by NMCC. These data will also help guide future planning and designing decisions with regard to mine water discharge.

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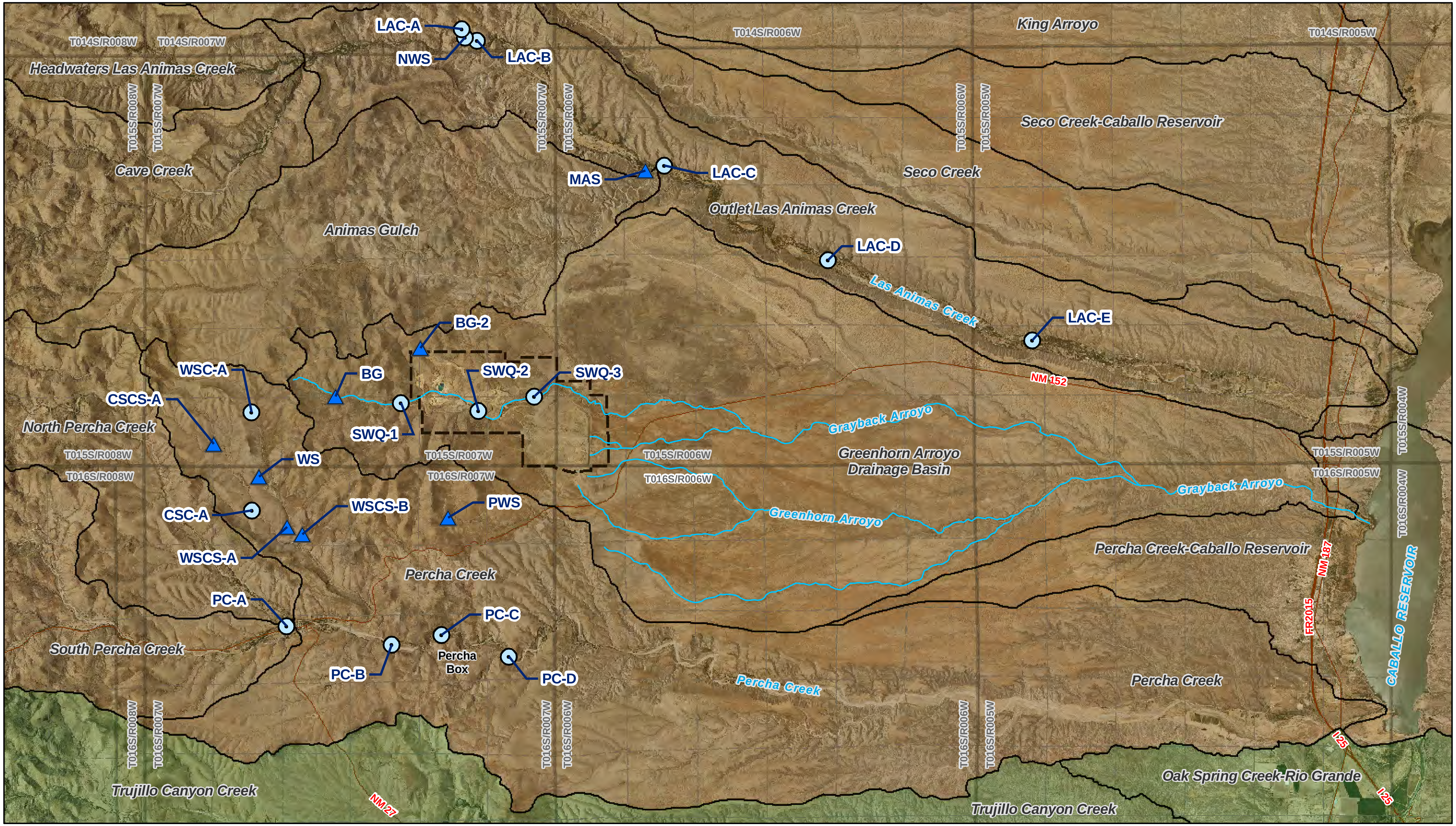

Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

Legend

◉	Stream Sample		Watersheds
▲	Spring Sample	☐	Caballo
⌜⌟	Proposed Mine Permit Boundary	🟩	El Paso-Las Cruces
		◌	Sub-Watershed

Figure 8-1
Proposed Surface Water Sampling Locations
New Mexico Copper Corporation

Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▬ Profile Line

Figure 8-2
Proposed Parallel Profiles for Pit Lake Survey

New Mexico Copper Corporation

Tables

Table 8-1
Historical Flow and Water Quality Parameters

Location	Date	Description	Flow (cfs)	pH	Conductivity (µS/cm)	Temperature (°C)
Las Animas Creek	1967	Upper Reach	1.0 – 2.0	NM	NM	NM
Las Animas Creek	1967	Middle Reach	1.0 – 1.5	NM	NM	NM
Las Animas Creek	1996	LAC-E	0.546	8.2	400	17
Percha Box	1996	1200’ u/s of Box entry	Dry	NA	NA	NA
Percha Box	1996	700’ u/s of Box entry	0	8.1	600	32
Percha Box	1996	400’ u/s of Box entry	Dry	NA	NA	NA
Percha Box	1996	Box entry	0.265	7.7	500	23
Percha Box	1996	1500’ d/s of Box entry	0.446	8.2	500	23
Percha Box	1996	Box exit	1.02	8.4	400	25
Percha Box	1996	2400’ d/s of Box exit	0	9.3	400	32
Percha Box	1996	2500’ d/s of Box exit	Dry	NA	NA	NA
Percha Box	1996	5000’ d/s of Box exit	0.394	9.0	400	28
Percha Box	1996	5400’ d/s of Box exit	0	9.0	400	32
Percha Box	1996	5500’ d/s of Box exit	Dry	NA	NA	NA
Percha Box	1996	3 miles d/s of Box exit	Dry	NA	NA	NA
Percha Box	1996	5 miles d/s of Box exit	Dry	NA	NA	NA
Grayback Arroyo	4/1/93	SWQ-1	1 – 2	8.3	1150	NM
Grayback Arroyo	5/7/93	SWQ-1	Dry	NA	NA	NA
Grayback Arroyo	3/31/93	SWQ-2	< 1	7.7	3150	NM
Grayback Arroyo	3/31/93	SWQ-3	12.5	8.1	3330	NM
Spring/Seep	4/1/93	BG	1 – 2	8.2	1090	NM
Spring/Seep	5/7/93	BG	Dry	NA	NA	NA
Spring/Seep	4/1/93	BG-2	< 1	8.2	1030	NM
Spring/Seep	5/7/93	BG-2	< 1	NM	NM	NM
Spring/Seep	1997	PW-2	NM	8.16	NM	NM
Spring/Seep	1967	WS	0.8	NM	NM	81.5
Spring/Seep	4/2/93	WS	0.00735	8.5	1980	NM

Notes:

Box = Percha Box
u/s = upstream
d/s = downstream
NA = no water present for sampling
NM = parameter not measured or not available

Table 8-2

Proposed Surface Water Monitoring Locations (shown on Figure 8-1) with Method of Measurement and Frequency of Collection

Sample Location	Location Type	Likely Flow Type	Description of Location	Quarterly or Opportunistic Flow Measurement	Method of Collection	Quarterly Water Quality Sample
LAC-A	Stream	Perennial	Las Animas Creek u/s of North Warm Spring (NWS)	Quarterly	Flow meter	
LAC-B	Stream	Perennial	Las Animas Creek d/s of North Warm Spring	Quarterly	Flow meter	
LAC-C	Stream	Intermittent	Las Animas Creek d/s of Meyers Animas Spring (MAS)	Opportunistic	Auto sampler	X
LAC-D	Stream	Intermittent	Las Animas Creek at site previously named STA8	Quarterly	Flow meter	
LAC-E	Stream	Intermittent	Las Animas Creek at site previously named LAC-1	Quarterly	Flow meter	
SWQ-1	Stream	Ephemeral	Grayback Arroyo at site previously named GA-A	Opportunistic	Auto sampler	X
SWQ-2	Stream	Ephemeral	Grayback Arroyo at site previously named GA-B	Opportunistic	Auto sampler	X
SWQ-3	Stream	Ephemeral	Grayback Arroyo at site previously named GA-C	Opportunistic	Auto sampler	X
PC-A	Stream	Intermittent	Percha Creek u/s of Warm Springs Canyon	Quarterly	Flow meter	
PC-B	Stream	Intermittent	Percha Creek u/s of Percha Box	Quarterly	Flow meter	
PC-C	Stream	Perennial	Percha Creek in Percha Box	Opportunistic	Auto sampler	X
PC-D	Stream	Ephemeral	Percha Creek in Sec. 21 T16S R5W	Quarterly	Flow meter	
WSC-A	Stream	Ephemeral	Upper Warm Springs Canyon	Quarterly	Flow meter	
CSC-A	Stream	Ephemeral	Upper Cold Springs Canyon	Quarterly	Flow meter	
NWS	Stream	Perennial	North Warm Spring on Las Animas Creek	Quarterly	Flow meter	
WS	Spring	Ephemeral	Warm Spring	Quarterly	Weir	
BG	Spring	Ephemeral	BG Spring	Quarterly	Weir	X
BG-2	Spring	Ephemeral	BG-2 Spring	Quarterly	Weir	X
PWS	Spring	Ephemeral	Paxton Well Spring	Quarterly	Weir	
MAS	Spring	Ephemeral	Meyers Animas Spring	Quarterly	Weir	X
CSCS-A	Spring	Ephemeral	Cold Spring Canyon spring	Quarterly	Weir	
WSCS-A	Spring	Ephemeral	Warm Spring Canyon spring #1	Quarterly	Weir	X
WSCS-B	Spring	Ephemeral	Warm Spring Canyon spring #2	Quarterly	Weir	X

Table 8-3
Surface Water Resources Data Needs

Data Need	Plan to Address Data Need
Nature of flow and water quality in Grayback Arroyo	Three sampling stations are proposed to characterize streamflow and water quality by collecting opportunistic samples and measurements during storm events. Sites are proposed upstream, within, and downstream of the mine operations at sites that have been sampled in the past. Installation of auto-samplers along this ephemeral reach will enable opportunistic sampling.
Nature of flow and water quality in Percha Creek	Three sampling stations along perennial, intermittent and ephemeral reaches are proposed to characterize streamflow and water quality by collecting quarterly samples and measurements and a fourth sampling station on an intermittent reach is proposed to characterize streamflow and water quality opportunistically. Sites are proposed upstream, within, and downstream of the Percha Box at locations that have been sampled in the past. Installation of an auto-sampler along the intermittent reach will enable opportunistic sampling.
Nature of flow and water quality in Las Animas Creek	Four sampling stations along perennial and intermittent reaches are proposed to characterize streamflow and water quality by collecting quarterly samples and measurements and a fifth sampling station on an intermittent reach is proposed to characterize streamflow and water quality opportunistically. Sites are proposed in the upper, middle, and lower reaches of Las Animas Creek at sites that have been sampled in the past. Installation of an auto-sampler along the intermittent reach will enable opportunistic sampling.
Potential of mine discharge to have a significant, quantifiable effect on intermittent or perennial flow	Opportunistic streamflow and water quality samples collected at three sites Grayback Arroyo.
Seasonal variability in water quality conditions in the pit lake, including stratification	High-resolution, vertical profiles of water quality coupled with discrete-depth samples taken from the epilimnion, metalimnion, and hypolimnion (if present) on a quarterly basis.
Geochemical characteristics of sediment	Sediment samples will be collected concurrently with surface water samples collected from perennial reaches of streams and from the pit lake. The list of sediment parameters to be analyzed is presented in Table 8-4.
Nature of flows from springs and seeps	Eight springs are proposed to characterize spring flow and water quality by collecting quarterly water samples and measurements. Sites are proposed within the Greenhorn Arroyo drainage basin, Percha Creek drainage basin, and Las Animas Creek drainage basin.

Table 8-4

Analytical Parameters and Analysis Methods for Surface Water and Sediment Samples

(Sediment samples will be prepared using EPA Method 1312-SPLP, Synthetic Precipitation Leaching Procedure, to determine the concentrations of water-soluble constituents in the sediments.)

Analytical Parameter	Analysis Method for Water	Lab Detection Limit (mg/L unless noted)	Analysis Method for Sediment	Lab Detection Limit for Sediments (mg/kg unless noted)
Anions				
Fluoride	EPA Method 300.0	0.1	NA	NA
Chloride	EPA Method 300.0	0.1	NA	NA
Nitrogen, Nitrite (as N)	EPA Method 300.0	0.1	NA	NA
Nitrogen, Nitrate (as N)	EPA Method 300.0	0.1	NA	NA
Nitrogen, Ammonia (as N)[§]	EPA Method 300.0	0.1	NA	NA
Sulfate	EPA Method 300.0	0.5	NA	NA
Dissolved Metals				
Aluminum	EPA Method 200.7	0.02	EPA Method 200.7	1.0
Antimony	EPA Method 200.8	0.005	EPA Method 200.8	0.25
Arsenic	EPA Method 200.8	0.02	EPA Method 200.8	1.0
Barium	EPA Method 200.7	0.002	EPA Method 200.7	0.1
Beryllium	EPA Method 200.7	0.002	EPA Method 200.7	0.1
Boron	EPA Method 200.7	0.04	EPA Method 200.7	2.0
Cadmium	EPA Method 200.7	0.002	EPA Method 200.7	0.1
Calcium	EPA Method 200.7	0.50	EPA Method 200.7	5.0
Chromium	EPA Method 200.7	0.006	EPA Method 200.7	0.3
Cobalt	EPA Method 200.7	0.006	EPA Method 200.7	0.3
Copper	EPA Method 200.7	0.0003	EPA Method 200.7	0.2
Iron	EPA Method 200.7	0.02	EPA Method 200.7	1.0
Lead	EPA Method 200.7	0.005	EPA Method 200.7	0.25
Magnesium	EPA Method 200.7	0.50	EPA Method 200.7	5.0
Manganese	EPA Method 200.7	0.002	EPA Method 200.7	0.1
Mercury	EPA Method 7470 CVAA	0.0002	M7471A CVAA	0.03
Molybdenum	EPA Method 200.7	0.008	EPA Method 200.7	0.4
Nickel	EPA Method 200.7	0.01	EPA Method 200.7	0.5
Potassium	EPA Method 200.7	1.0	EPA Method 200.7	10
Selenium	EPA Method 200.8	0.02	EPA Method 200.8	1.0
Silicon	EPA Method 200.7	0.08	EPA Method 200.7	4.0
Silver	EPA Method 200.7	0.005	EPA Method 200.7	0.25

Analytical Parameter	Analysis Method for Water	Lab Detection Limit (mg/L unless noted)	Analysis Method for Sediment	Lab Detection Limit for Sediments (mg/kg unless noted)
Sodium	EPA Method 200.7	0.5	EPA Method 200.7	5.0
Thallium	EPA Method 200.7	0.01	EPA Method 200.7	0.5
Titanium	EPA Method 200.7	0.005	EPA Method 200.7	0.25
Uranium	EPA Method 200.8	0.01	EPA Method 200.8	0.5
Vanadium	EPA Method 200.7	0.005	EPA Method 200.7	0.25
Zinc	EPA Method 200.7	0.005	EPA Method 200.7	0.25
Solids				
Total Suspended Solids (TSS)	SM 2540D	1.0 µg/L	NA	NA
Total Dissolved Solids (TDS)	SM 2540C	10	NA	NA
Percent Solids	NA	NA	CLPSOW290 Part F, D-98	NA
Alkalinity				
Alkalinity, total (as $CaCO_3$)	SM 2320B	20	NA	NA
Carbonate	SM 2320B	20	NA	NA
Bicarbonate	SM 2320B	20	NA	NA
Other				
pH	150.1	12.45	NA	NA
Specific Conductance	120.1	0.01 µS/cm	NA	NA
Cyanide	Kelada-01	0.005	M9012A	0.5
Temperature§	EPA Method 170.1	ND	NA	NA
Dissolved Oxygen§	EPA Method 360.1	ND	NA	NA

Notes:

NA = not applicable as sample will not be analyzed for a given parameter
ND = not determined or dependent on the instrument
§ = run for pit lake sample only and not run for samples from stream, spring, or seep

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9 Groundwater

Groundwater is a major supply of water for domestic and agricultural use in southern New Mexico. The high evaporation rate during the long, hot summers coupled with low average annual precipitation in the area result in surface waters being an unreliable source of water on a year-round basis. The Rio Grande is the only significant surface water resource in the Copper Flat Mine Permit Area (Site). Intermittent streams that feed the Rio Grande, such as Las Animas Creek and Percha Creek in the Site area, are local sources of water for at least part of the year. The river and associated shallow alluvial deposits of its inner valley also served as the ultimate discharge zone for pre-development groundwater flow from the adjacent Greenhorn Arroyo, Las Animas Creek, and Percha Creek drainage basins (Hawley et al., 2005, Wilson et al. 1981). Additional water comes from shallow domestic and agricultural wells. This section provides a description of the regional and local groundwater along with a proposed sampling and analysis approach to characterizing baseline conditions of groundwater resources. Baseline studies have been completed in the project area since the 1960s, and relevant information and data are referenced in subsequent sub-sections throughout Section 9.

9.1 Regional Hydrogeology

The Site is located in the Lower Rio Grande Underground Water Basin (LRGB), which extends from Elephant Butte Dam to the Texas Border near El Paso and is one of New Mexico's principal agricultural regions (Figure 9-1). The LRGB was declared by the NM State Engineer on September 11, 1980. In doing so, the underground waters of the LRGB are administered by the State Engineer. In response to drought conditions in New Mexico, the Office of the State Engineer (OSE) designated the LRGB for Active Water Resource Management (AWRM) in 2004, emplacing additional restrictions on groundwater development. In addition, a water master district that encompasses Hot Springs, Las Animas Creek, and LRGB Underground Water Basins was created to assist with water administration in the region.

Groundwater in the LRGB generally flows from the highlands on either side of the basin through bedrock and valley alluvium to the center of the basin and to the Rio Grande. Figure 9-2 illustrates the conceptual model of groundwater flow at the Site. The bedrock aquifer in the Paleozoic sedimentary rocks are recharged by rainfall and snowmelt through bedrock faults and bedding planes exposed in the highlands west of the site. This water generally flows along a hydraulic gradient toward the approximate center of the Rio Grande Valley. Occasionally, this deep regional flow discharges at the ground surface as springs along faults where the Paleozoic bedrock crops out within the valley. This occurs in at several locations within the Las Animas Creek and Percha Creek drainage basins (Figure 9-3). The water table elevation near the existing pit lies at approximately 5,450 to 5,500 feet (ft) above mean sea level (amsl). Groundwater near Caballo Reservoir lies at about 4,200 ft amsl, indicating a drop of 1,300 ft over approximately 14 to 15 miles.

Valley alluvium is generally recharged by precipitation along mountain fronts where the alluvial fans are exposed and by streams that flow out of the highlands and lose water to the alluvium as they flow toward the Rio Grande. Many intermittent streams in the area are "losing streams" over at least part of their courses and provide recharge to the alluvial groundwater system. This alluvial groundwater then flows downgradient to the Rio Grande. Most areas within the LRGB that have not been significantly disturbed by human activity are in hydraulic equilibrium. That is, water coming into the system by precipitation recharge is balanced by outflow to major streams, evapotranspiration, and interbasin flow.

9.1.1 Hydrogeology of the Permit Area

Three aquifers exist in the Site area, as shown schematically on Figure 9-2. The deepest aquifer is the crystalline bedrock aquifer that receives water from the highlands to the west of Animas Peak and carries this water along bedding planes, faults, and solution cavities toward the center of the LRGB. The crystalline bedrock aquifer consists of Cretaceous andesite and monzonite breccias underlain by Paleozoic rocks in the Animas Uplift area, Tertiary volcanic rocks to the west of the pit lake in the graben associated with the Animas uplift, and Paleozoic sedimentary rocks to the east of the pit lake area in the Palomas Basin (see Section 7.0). The Santa Fe Group aquifer system, which consists of interbedded sandstones, silts, and clays, overlies the Paleozoic bedrock units to the east of the pit lake area within the Palomas Basin. This aquifer system receives water from precipitation and from the losing reaches of streams. The uppermost aquifer at the Site is the Quaternary alluvial aquifer along Las Animas and Percha Creeks (Figure 9-2). This alluvium is up to 40-ft thick in the Las Animas Creek area and carries water that is in hydraulic equilibrium with the water flowing in Las Animas Creek (BLM, 1999). The Percha Creek alluvial aquifer is less studied than the Las Animas Creek alluvial aquifer, and as a result, less historical data about its aquifer characteristics are available. The aquifers of greatest importance in terms of water supply in the area are within the Palomas Basin to the east of the pit lake and include the intermediate Santa Fe Group aquifer system and the alluvial aquifer associated with Las Animas Creek.

Figure 9-4 from the Adrian Brown Consultants (ABC) (1998b) presents a piezometric contour map showing the general configuration of groundwater level elevations at the Site as interpreted at that time. Groundwater levels near the existing pit are approximately 5,450 ft amsl, and at Caballo Reservoir, the levels are about 4,200 ft amsl. The map indicates that groundwater flow is generally to the east toward Caballo Reservoir. Hydraulic gradients are relatively large (closely spaced contours) in the western portion of the Site, reflecting lower transmissivity in the bedrock aquifer and in the western portion of the Palomas Basin in the Santa Fe Group aquifer system. The wider spacing of contours in the eastern portion of the Site suggests that transmissivity of the Santa Fe Group aquifer increases toward Caballo reservoir. The widest spacing of contours (highest transmissivity) appears to occur in the area of the groundwater production wellfield (wells PW-1, 2, 3, and 4 on Figure 9-4). This area coincides with an interpreted graben structure (see Section 7), which reflects an increased thickness of the Santa Fe Group in this area.

9.1.2 Aquifer Characteristics in the Permit Area

9.1.2.1 Crystalline Bedrock Aquifer Characteristics

Groundwater within the mining district and the area of the present open pit occurs in andesitic volcanic rocks and quartz monzonite breccia intrusive rocks (Figure 9-2). The current pit lake was reported by SRK (1997) to be at an elevation of 5,442 ft amsl, which is about 50 to 100 ft below the pre-mining ground elevation (5,500 to 5,540 ft amsl reported in the Preliminary Final Environmental Impact Statement (PFEIS) (BLM, 1999). Groundwater levels measured in the pit and tailings areas as of 1997 are shown on Figure 9-5. Newcomer et al. (1993) reported a pre-mining (1981) water level of 5,370 ft amsl in well GWQ-5, which is approximately 4,000 ft east-southeast from the pit and within the old plant site area. These authors also reported a water level of 5,360 ft amsl in the Hillscher West well (GWQ-6), which lies approximately 2,500 ft southeast from well GWQ-5. These limited groundwater elevation data suggest that the groundwater gradient in the andesitic volcanic rocks may be to the east or southeast from the current pit lake area as shown on Figure 9-5. Within 500 ft of the pit lake (see Figure 9-6, however, groundwater gradients are toward the pit lake, which may act as a local evaporative sink (BLM, 1999).

In January 2010, NMCC resurveyed the pit lake and as many of the groundwater monitoring wells established for the PFEIS as could be located. The pit lake elevation was 5,444 ft amsl in January 2010, revealing that the pit lake elevation remains below the pre-mining water level elevation of 5,500 to 5,540 ft amsl.

9.1.2.2 Santa Fe Group Aquifer System

Overview

Overlying the crystalline bedrock aquifer at the Site is the Santa Fe Group aquifer system, a system that is locally represented by two hydrostratigraphic units (HSUs): (1) the Upper Santa Fe Group hydrostratigraphic unit (USF), and (2) the Middle Santa Fe Group hydrostratigraphic unit (MSF). As defined by Hawley and Kennedy (2004), these hydrostratigraphic units are mappable bodies of basin and valley fill that are grouped according to genesis and position in both lithostratigraphic and chronostratigraphic sequences. Informally, these HSUs comprise the major basin-fill aquifer zones, and correspond roughly to the upper (Palomas) and middle (Rincon valley) lithostratigraphic subdivisions of the Santa Fe Group used in local and regional geologic mapping (Hawley and Kennedy, 2004).

The Santa Fe Group is composed chiefly of coalescing alluvial fan deposits that are discontinuous and locally heterogeneous with inter-bedded sandstones, silts, and clays of varying percentages. The Upper Santa Fe Group Palomas Formation (Lozinsky and Hawley, 1986) represents the USF at the Site. This formation grades eastward from the Animas Uplift from coarse alluvial fan material to braided-stream and deltaic sands and silts to clays near the Rio Grande. The interfingering with clays begins approximately 3 to 5 miles west of the current position of the Rio Grande and is responsible for the flowing wells common in this part of the Site (Murray, 1959; Figure 9-2). A basalt flow dated at 4.2 million years before present caps the Palomas Formation gravels near Copper Flat (Seager et al., 1984).

The Middle Santa Fe Group Rincon Valley Formation (Seager and Hawley, 1973) is exposed near Hillsboro, New Mexico, where the reddish-brown clays and clayey silts characteristic of this basal unit are interbedded with basalts dated at 28 million years before present (Seager et al., 1984). The Rincon Valley Formation represents the MSF at the Site and generally contains water, but the yield is low due to the low hydraulic conductivity of the clays. The Rincon Valley Formation lacustrine red clays underlie the Palomas Formation and thicken southward toward Hatch, New Mexico, and the Rincon Basin (Wilson et al., 1981).

Tailings Dam Vicinity

The present tailings impoundment facility overlies the old placer workings of Greyback Arroyo and Hunkidori Gulch (Figure 9-3). A study of these placer workings by Segerstrom and Antweiler (1975) showed that the placers were found in paleo-stream terrace alluvium approximately 25 to 30 ft thick that is underlain by a calcium carbonate horizon and reddish-brown clay. SRK (1995) and SHB (1980) confirmed and expanded the areal extent of this reddish-brown clay layer and determined that the top of the Palomas Formation is stratigraphically below the red clay layer. According to the studies completed by SRK and SHB, the clay layer and the 25 to 30 ft of paleo-stream terrace gravels that lie above the clay, have acted to prevent downward migration of water draining from the eastern half of the existing tailings. This clay layer has enabled a mound of water beneath the tailings impoundment to develop and was determined by SRK and SHB to extend eastward beyond the tailings dam. This mounding of water, due to drainage of the tailings, became evident in some tailings dam monitor wells completed above the clay layer. The central and western sections of the existing tailings facility appear to communicate hydrologically with the USF that lies beneath the tailings area because the clay zone thins and disappears in this area, as shown in Figure 9-7.

The thickness of the Palomas Formation increases locally over a graben structure (labeled Dutch Gulch in Figure 9-8), which is reflected in higher transmissivity and relatively low hydraulic gradients in the USF. Based on a 7-day aquifer pumping test (ABC, 1996), the transmissivity of the USF in the tailings dam area is about 187 ft^2/day. East of the tailings area (see Figure 9-8) is a 10- to 30-foot thick clayey sand and gravel layer, underlain by a 25- to 100-foot-thick clay layer, which in turn is underlain by a silty sand and gravel layer (SRK, 1995). The lower silty sand and gravel layer is considered by ABC (1996) to be the USF and, based on drilling information, has a thickness of at least 200 ft. The hydraulic gradient in this area is about 30 ft per mile.

East of the graben structure, labeled as Dutch Gulch in Figure 9-8, the Palomas Formation (labeled Tsfp) thins and is interpreted to have significantly reduced transmissivity. The hydraulic gradient in this area ranges from about 130 to 330 ft/mile. The contact between the Palomas Formation and the underlying Rincon Valley Formation clay unit (labeled Tsf in Figure 9-8) is a highly irregular depositional contact. Locally, the Palomas Formation (USF) may be unsaturated, with the water table existing in the underlying Rincon Valley Formation (MSF) (BLM, 1999).

Production Wellfield Vicinity

Farther to the east, the hydraulic gradient decreases from 330 ft/mile to about 34 ft/mile in the vicinity of the production wellfield (identified as PW wells on Figure 9-9). This suggests a progressive increase in transmissivity toward the area of the production wellfield. A graben structure below the production wellfield locally increases the thickness of the Palomas Formation to as much as 1,000 ft (Figure 9-8). The transmissivity of the USF in the production wellfield area ranges from about 2,675 to 5,750 ft^2/day (SRK, 1995). Farther to the east, towards Caballo Reservoir, sands and gravels in the Palomas Formation are interbedded with clays of the ancient Rio Grande. As a consequence, the transmissivity decreases slightly and the hydraulic gradient Increases to 45 ft/mile. In this area, the USF appears to be confined, leading to artesian flow in wells along the lower reaches of both Las Animas Creek and Percha Creek.

Although the Palomas Formation is described as “sand and gravel” (Davie and Spiegel, 1967), there exist numerous discontinuous clay layers within the sequence. This causes the bulk vertical hydraulic conductivity of the USF to be much lower than the horizontal conductivity. As a consequence, groundwater in deeper portions of the USF can be semiconfined, leading to relatively high vertical hydraulic gradients. The low vertical hydraulic conductivity has two important effects on the groundwater flow system. First, within about 4 miles of Caballo Reservoir, confinement of groundwater is sufficient to create artesian conditions in deeper portions of the USF. Wells drilled to these depths have groundwater levels aboveground surface and produce flowing wells, the locations of which are shown on Figure 9-9. Flow rates for uncapped wells range between a few gallons per minute (gpm) to as high as 40 gpm.

The second effect of low vertical conductivity is to reduce downward leakage between the Quaternary alluvial aquifer in the Las Animas Creek drainage basin and the underlying USF. At the location of monitoring wells MW-9, 10, and 11, north of the production wellfield, the groundwater level in the USF is some 58 ft lower than the water level in the overlying Quaternary alluvial aquifer (ABC, 1996). This results in a downward vertical hydraulic gradient from the Quaternary alluvial aquifer in the vicinity of Las Animas Creek drainage basin to the USF approaching 1 ft/ft. Such downward gradients are interpreted to occur along a substantial length of Las Animas Creek (ABC, 1996). In spite of these gradients, the amount of surface water loss from the Quaternary alluvial aquifer in the Las Animas Creek drainage basin is not significant; suggesting that vertical hydraulic conductivity in the USF is relatively low. Analytical calculations (ABC, 1997) suggest that if the vertical conductivity were much greater than 1 ft/year (10^{-6} cm/second), the Las Animas surface water system would lose essentially all of its water and become an intermittent stream, which clearly does not occur.

The hydraulic connection between the USF and the alluvial aquifer of the Rio Grande has not been evaluated, but groundwater gradients at the Site strongly suggest that water flows from the Palomas Formation to the floodplain alluvium of the Rio Grande.

An aquifer pumping test conducted at the locations of monitor wells MW-9, 10, and 11 suggests that the vertical conductivity of the USF is low in this area (ABC, 1997). Pumping of the wells screened in the USF at this location did not affect a well screened in the Quaternary alluvial aquifer in the Las Animas Creek drainage basin, even though the well screened in the USF had 22 ft of drawdown. Also, monitoring of water levels along Las Animas Creek by Alta (Goff, 1998) for wells screened in both aquifers showed that fluctuations in water levels observed in shallow wells (those screened in the Quaternary alluvial aquifer) are not mirrored in the deeper wells (wells screened in the USF). These data are presented in Table A2-10 of the PFEIS (BLM, 1999).

9.1.2.3 Quaternary Alluvial Aquifer

The uppermost aquifer at the Site is the Quaternary alluvial aquifer, which is composed of channel and floodplain gravels, sands, and silts. Locally, these units are generally 30 to 50 ft thick near the mouths of Las Animas and Percha Creeks (Davie and Spiegel, 1967). Cores from monitoring wells drilled along Las Animas Creek indicate that upper alluvial gravels extend from the surface to a depth of approximately 20 to 60 ft depending on the location along the creek (BLM, 1999). There are fewer data available for the thickness of these deposits in and along Percha Creek.

The Las Animas alluvial aquifer consists of local alluvial deposits adjacent to and underlying Las Animas Creek. Groundwater in this narrow, sinuous aquifer is in direct hydraulic communication with Las Animas Creek surface water. Surface water in the creek and groundwater in the aquifer form a single surface-to-groundwater flow system. Surface water flow from one location to the next may be related, in part, to the proportion of total system flow being carried by the aquifer at each location. Along its course, the Las Animas alluvial aquifer receives recharge by rainfall infiltration. Discharge from the aquifer occurs through evaporation and evapotranspiration from riparian vegetation and existing well pumping. Between the Saladone well and an area of the Lower Animas Artesian well (Figure 9-8), the aquifer loses water to the underlying Palomas Basin alluvial aquifer by slow downward seepage. The total flow rate for surface flow plus flow in the alluvium of the creek drops from around 1,800 to 1,900 gpm to around 1,100 gpm, a loss of 800 gpm over the 8-mile stretch of creek bed. The loss is consistent with slow downward seepage of water at a rate of around 1 foot/year (ABC, 1997). This is the approximate saturated hydraulic conductivity of clay. In the area of the Lower Animas Artesian (Figure 9-9) the Las Animas surface/groundwater system may receive recharge from the USF. At Caballo Reservoir, all water in the Las Animas surface/groundwater system discharges to the reservoir. The nature of artesian conditions in the Percha Creek drainage basin have not been studied in as much detail, and therefore less historical data are available.

Upstream of the artesian wells, Las Animas Creek, the alluvial aquifer can be “perched” above the water table in the Santa Fe Group aquifer system by 20 to 60 ft of unsaturated to partially saturated alluvial sediments (SRK, 1995; ABC, 1997). The alluvial aquifer along Las Animas Creek in the lower reaches loses water to the Santa Fe Group aquifer system by slow downward seepage. The upper reach of Las Animas Creek near the Saladone Well (Figure 9-9) also may be perched above the intermediate aquifer (Minton, 1961).

9.1.3 Existing Baseline Groundwater Information

A wealth of groundwater data are available for the Site because the mine was active in the past and was characterized by previous operators that either mined the Site or worked on permit applications to mine the Site. These historical data will be used in conjunction with the baseline groundwater quality data that will be collected under the procedures set forth in this SAP to provide as thorough an understanding as possible of groundwater quality conditions prior to the re-initiation of mining at Copper Flat. Key resources that contain data to be used for the baseline groundwater analysis include: Groundwater monitoring well exceedences provided by SRK (2010); the PFEIS (BLM, 1999); the Hydrologic Assessment, Copper Flat Project Sierra County, New Mexico (Newcomer et. al, 1993); and The Natural Defenses of Copper Flat, Sierra County, New Mexico (Raugust, 2003). A brief summary of the data available in these key reports follows.

The PFEIS (BLM, 1999) provides a summary of groundwater quality data. Summary tables for key wells and key constituents are provided in Table 9-2. The wells identified in this study are illustrated in Figure 9-9. The PFEIS (BLM, 1999) concluded that groundwater quality at the Site was good and generally useable for domestic and agricultural purposes. This document also concluded that past mining in the Hillsboro District, the Copper Flat Mine tailings facility drainage, and the presence of an oxidized sulfide-bearing ore body have impacted groundwater within and immediately adjacent to the area of past mining, resulting in elevated total dissolved solids (TDS) and sulfate that exceed New Mexico Water Quality Control Commission (WQCC) Standards. These impacts were found to be localized within the immediate vicinity of the mine features or associated with wells completed in the ore body.

Newcomer et al. (1993) determined that the quality of groundwater at the Site has changed little since the early 1980s and probably since the 1800s. The authors found that there have been some increases in TDS and sulfate in some wells along Grayback Arroyo below the mine site and down-gradient of the tailings dam, associated with mining and milling activities in the 1980s. Newcomer et al. (1993) determined that the only constituents exceeding the WQCC Standards were barium from a spring sample, and, cadmium and fluoride from a pit lake water sample.

Raugust (2003) compiled historical groundwater data and summarized groundwater quality conditions and, based on his data compilation and analysis, concluded:

- Groundwater pH measurements both up and downgradient of the pit lake range from 7 to 8.2.
- TDS and sulfate values are less than WQCC standards in the wells evaluated for this analysis; however, samples downgradient of the mine have increased gradually over time and are approaching the standards for TDS.
- Historical sampling of well GWQ-5, located east and downgradient of the pit lake, indicates that water quality in the vicinity of the pit lake may have been affected naturally by the presence of the ore body prior to mining in 1982.
- The groundwater upgradient of the mine pit lake is high quality with relatively high proportions of chloride and sulfate. Groundwater downgradient of the pit lake shows relatively higher proportions of bicarbonate and calcium and relatively lower proportions of sulfates.
- Pre-Quintana mining (June 15, 1981) groundwater data collected from wells downgradient of the pit lake show similar anions and cation distributions to post-Quintana mining activities (1996 and 1998). This indicates that groundwater quality downgradient of the ore body reflects the natural weathering of the Copper Flat porphyry system.

9.1.4 NMED Stage 1 Abatement Plan Requirements

On August 20, 2008, the NMED sent a letter to the site owner at that time requiring a Stage 1 Abatement Plan (20.6.2.4101 NMAC). The purpose of the Stage 1 Abatement Plan is to provide the data necessary to select and design an effective abatement alternative. The requirements for the Stage 1 Abatement Plan are described in 20.6.2.4106 NMAC. The abatement plan proposal must include an investigation to define the extent and magnitude of any existing groundwater and surface water contamination and to characterize the hydrogeology of the site. These requirements are similar to the EMNRD requirements for completing a Baseline Characterization Report, and these efforts will be conducted in parallel; therefore, the surface water and groundwater requirements of this SAP are relevant to both characterization efforts.

NMCC's meetings with the NMED concerning the abatement requirements have revealed the following key concerns on the part of the NMED:

- Groundwater impacts from the existing unlined tailings impoundment have been documented, but have not been fully characterized.
- Samples of pit lake water quality reveal exceedances of WQCC standards, and NMED is concerned about migration of this water away from the pit, causing additional groundwater impacts as well as ongoing contact with wildlife.
- Acid leaching could be occurring due to ongoing ore exposure.

9.1.5 Statistical Analysis of Existing Baseline Data

As discussed in this section, enormous amounts of surface water and groundwater data exist for this Site. These existing baseline data are essential to completing a comprehensive Baseline Characterization Report. As discussed in the EMNRD Mining and Minerals Division (MMD) draft, Guidance Document for Part 6 New Mining Operations Permitting under the New Mexico Mining Act (MMD Guidance Document), "If historic data and information are used as part of the baseline data, the SAP will include supporting material to justify the use of this historic data." As discussed in the previous subsection, baseline data collection has been initiated at the Site. The following sections describe how these data will be collected to maintain compliance with the referenced MMD Guidance. To justify the incorporation of the existing baseline data, statistical analysis will be used to determine if the current baseline data are significantly different from existing baseline data. This subsection describes a proposed approach that may be utilized to answer this question.

To statistically evaluate and compare new and existing baseline data, an Access database will be utilized to incorporate data from the sources listed above, as well as from other key sources that are identified during the baseline characterization program. Standardized queries will be used to easily select common location and parameter combinations.

The database will include the following data-entry features:

- A data qualifier to be applied at the time of data entry. This qualifier will be based primarily on the existence of supporting documentation and the indication that the data have been previously validated.
- Fields for entry of chemical parameters and other significant data, including:
  - Well identification (ID)
  - Parameter
  - Result
  - Units
  - Detection limit
  - Method
  - Non-detect qualifier used
  - Date of collection or analysis
  - Laboratory performing analysis
  - Analytical laboratory data qualifier

- Descriptive summary statistics for the compiled existing baseline dataset and a dataset based on data collected from the current baseline monitoring well network, including:
    - Chemical name
    - Number of detections
    - Number of samples
    - Arithmetic mean
    - Geometric mean (the backtransformed mean of the logtransformed data)
    - Standard deviation
    - Arithmetic mean plus two standard deviations
    - 95-percent upper confidence limit on the arithmetic mean (likely upper value of the arithmetic mean)
    - Minimum reported concentration
    - Maximum reported concentration

Descriptive summary statistics will be calculated separately for each historical data set identified and then a historical data set will be developed to represent existing baseline data. These data will be compared to summary descriptive statistics developed for the current baseline monitoring well network. If possible, the historical data set will be classified into pre-mining, mining, and post-mining periods and summary descriptive statistics will be developed for each classification.

Summary descriptive statistics will be developed for any populations identified by the methods described above. Each historical population identified will be separately compared to current baseline data and an interpretive evaluation of the historical and current datasets will be completed.

9.2 Sampling Objectives

The objectives of the baseline groundwater characterization program are as follows:

- Obtain necessary data to evaluate quantity and quality of all aquifers at the Site that could be impacted by mining activities.
- Address data gaps identified during evaluation of the DEIS (BLM, 1996).
- Meet the requirements set forth in the regulations in NMAC Title 19, Chapter 10, Part 6.
- Meet the guidelines set forth in MMD's draft Guidance Document for Part 6 New Mining Operations Permitting under the New Mexico Mining Act.

See Table 9-1 for the activities proposed to meet these objectives.

9.3 Sampling Frequency

The MMD Guidance Document requires a minimum of two sampling events over the required 12-month period for baseline groundwater quality sampling. Quarterly groundwater quality sampling will be necessary to address NMED's Stage 1 Abatement and Discharge Plan requirements; therefore, the baseline groundwater quality sampling will be performed for a minimum of four quarters. Additionally, water levels will be obtained on a quarterly basis to evaluate baseline seasonal fluctuations. Table 9-2 provides the current list of groundwater monitoring wells and the sampling frequency for water quality and water level measurements. The locations for these proposed wells are shown in Figure 9-10. NMCC proposes a phased approach to water quality sampling, where water quality samples will be collected initially from the wells identified in Table 9-2 for water quality sampling, then reduced to a subset of ten wells based on the analytical results and consultation with the MMD.

9.4 List of Data to Be Collected

The two categories of data to be collected for baseline groundwater characterization are groundwater quality and aquifer parameters. Further discussion of these datasets is included in the following subsections.

9.4.1 Groundwater Quality Parameters

The MMD Guidance lists specific groundwater quality parameters that are recommended to comply with the baseline characterization requirements. Table 9-3 shows the list of parameters to be analyzed for and the associated analysis methods and laboratory detection limits.

9.4.2 Aquifer Parameters

Water level measurements will be taken from all wells in the monitoring well network on a quarterly basis during the baseline characterization phase to evaluate the pre-mining potentiometric surface (i.e., steady-state condition). This potentiometric surface will form the basis for future modeling required to evaluate potential impacts from mine dewatering and production well pumping. Based on comments made during Alta Gold’s permit application phase, the need to install additional monitoring wells for water level measurement, particularly outside the permit area, will be evaluated (DBS&A, 1998).

In addition to water level monitoring, groundwater modeling requires hydraulic parameter data, specifically, hydraulic conductivity, transmissivity, and storativity for the key aquifers. Several pumping tests have been performed in the tailings dam, production well, and the Las Animas Creek areas to evaluate the aquifer characteristics (Greene and Halpenny, 1976; Atkins, 1992; ABC, 1996b; and ABC, 1998). The details and analytical results of these tests are summarized by SRK (1995) and in Table 9-4. The existing data and recommendations will be evaluated during the baseline characterization phase, and a determination will be made as to the adequacy of the existing data to support the hydrologic impact analysis. If necessary, additional aquifer tests may be completed.

9.5 Methods of Collection

As discussed in the previous sections, three major categories of data will be collected for the baseline groundwater characterization:

1. Well information (water levels and total depth)
2. Groundwater quality samples for general chemistry and metals
3. Aquifer parameters (hydraulic conductivity, transmissivity and storativity)

The following sections provide general Standard Operating Procedures (SOPs) for water level and total depth measurements, groundwater sampling, and aquifer testing. Procedures will be modified as necessary to conform to site-specific requirements. Additionally, if new wells are added to the monitoring well network, they will be constructed in compliance with the NMED Monitor Well Construction Guidelines.

9.5.1 Water Level and Total Depth Measurements SOP

This SOP is concerned with the measurement of water levels in monitoring wells and the total depth of wells. Step-by-step procedures are outlined in the following sections.

9.5.1.1 Groundwater Level Measurement

If necessary, a plastic sheet can be placed around the well, creating a clean surface onto which the measurement and sampling equipment can be positioned. Do not place meters, tools, equipment, etc., on the sheet unless they have been cleaned first. After unlocking and/or opening a monitoring well, water level measurements will be made using an electric water level meter.

Equipment

- Socket wrenches and/or open-end wrenches
- Screw driver
- Key or combination for monitoring well lock
- Electric water level meter
- Decontamination equipment (buckets, brushes, Alconox™, distilled or deionized water, brushes, and paper towels)
- Safety equipment (sample gloves and other Personal Protective Equipment [PPE] as required for the job)
- Air monitoring equipment as required

Groundwater Level Measurement Procedures

- Unlock and/or open the monitoring well.
- Check for the measuring point at the top of the well. The measuring-point location should be clearly marked on the innermost casing or identified in previous sample-collection records. If no measuring point can be determined, a measuring point should be established. Typically, the top (i.e., the highest point or the north-facing point) of the innermost well casing will be used as the measuring point. The measuring-point location should be described on the monitoring-well gauging data form and should be the same point used for all subsequent sampling efforts.
- Obtain a water level measurement by lowering the probe of the electric water level meter into the monitoring well. Take care that the probe and electric line hang freely in the monitoring well and do not adhere to the wall of the well casing. Lower the probe into the well until the sound and light (if present) on the meter are activated. At this time, the precise measurement should be determined (to a hundredth of a foot) by repeatedly raising and lowering the tape to converge on the exact measurement. The water level measurement should be entered on an appropriate field form (i.e., monitoring-well gauging data form).
- Verify that the water level measurement is indicative of a static water level. The initial water level measurement may not be indicative of static conditions if groundwater pumping recently occured in this vicinity or if the well is screened in a confined aquifer and the well casing does not have a vent hole permitting equilibrium with the atmosphere. A second water level measurement a few minutes after the initial measurement can be used to verify static water level conditions.
- Decontaminate the electric water level meter after use. Generally only the probe and the portion of the tape that enters the well will be cleaned. Ensure that the measuring tape is not placed directly on the ground surface.

9.5.1.2 Total Depth Measurement

If necessary, a plastic sheet can be placed around the well, creating a clean surface on which the measurement equipment can be positioned. Do not place tools, equipment, etc., on the sheet unless they have been cleaned first. Total-depth measurements will be made using a stainless-steel weighted tape.

Equipment

- Socket wrenches and/or open-end wrenches
- Screw driver
- Key or combination for monitoring well lock
- Stainless steel weighted tape
- Decontamination equipment (buckets, brushes, Alconox™, distilled or deionized water, brushes, and paper towels)
- Safety equipment (sample gloves and other PPE as required for job)
- Air monitoring equipments as required

Total Depth Measurement Procedures

- Unlock and/or open the monitoring well.
- Monitor the atmosphere at the wellhead.
- Check for the measuring point of the well. The measuring-point location should be clearly marked on the innermost casing or identified in previous sample-collection records. If no measuring point can be determined, a measuring point should be established. Typically, the top (i.e., the highest point or the north-facing point) of the innermost well casing will be used as the measuring point. The measuring-point location should be described on the water level data form and should be the same point used for all subsequent sampling efforts.
- Obtain a total-depth measurement by lowering a weighted calibrated tape into the monitoring well. Take care that the weighted tape hangs freely in the monitoring well and does not adhere to the wall of the well casing. Lower the weighted tape into the well until the bottom of the well is reached. This can be determined when the weight can no longer be felt and there is slack in the tape. A precise measurement of the total depth of the well should be determined (to a hundredth of a foot) by repeatedly raising and lowering the tape to determine the exact measurement and then adding the probe tip length (e.g., 0.10 ft) that extends below the 0.00-foot mark on the tape/probe. The total-depth measurement and condition of the well bottom (i.e., hard, soft) should be entered on an appropriate field form or field logbook (i.e., water level data form).
- Decontaminate the measurement device after each use. Generally only the portion of the tape that enters the well will be cleaned. Ensure that the measuring tape is not placed directly on the ground surface.

9.5.2 Monitoring Well Sampling for Groundwater SOP

This SOP is concerned with the collection of valid and representative samples from groundwater monitoring wells. Groundwater samples are collected and analyzed to determine the presence, absence, or quantity of various contaminants as part of site characterization, remediation, and/or monitoring activities.

9.5.2.1 Equipment

The following list identifies the types of equipment that may be used for a range of groundwater sampling applications. A project-specific equipment list will be selected from this list based on project objectives and well conditions.

- Bailer with rope or string
- Pump with tubing and power source
- pH meter

- Specific conductance meter
- Temperature meter
- Dissolved oxygen meter
- eH (ORP) meter
- Turbidity meter
- Flow-through cell
- Water level measurement equipment
- Water sampling data form
- Filtration apparatus (project-dependent)
- Personal protective equipment
- Decontamination equipment
- Permanent pens
- Field logbook
- Sample coolers
- Sample containers and laboratory-supplied preservatives (if any)
- Sample labels
- Custody seals (if required by Sampling & Analysis Plan/Work Plan)
- Chain-of-custody forms
- Sample control logs

9.5.2.2 Well Purging

Prior to sample collection, purging must be performed for all groundwater monitoring wells to remove stagnant water from within the well casing and/or to ensure that a representative sample is obtained.

Standard Well Purging. Monitoring wells will be purged of at least three well casing volumes (moderate- to high-yield formations) or at least one well casing volume for low-yield formations unless micropurge methodology is followed (method described below). To determine the volume of water to be removed, the first step is to measure the depth to water (DTW) and the total depth (TD) of the well casing using the procedures described as outlined in Section 9.5.1. DTW measurements should be made within 48-hours of purging and sampling wells. Once these measurements have been obtained, the well casing volume is determined using the following equation:

$$V_{WC} = \frac{\pi D^2 h}{4}$$

where: V_{WC} (ft^3) = well casing volume

D (ft) = internal diameter of the well casing

h (ft) = length of the water column in the well casing (TD-DTW)

As a conservative measure or because of project-specific requirements, total well volumes may be required for purging rather than well casing volumes. Total well volume differs from well casing volume in that it includes the volume of water in the filter pack. Total well volume is calculated using the equation:

$$\text{Total Well Volume} = V_{FP} + V_{WC}$$

where: V_{FP} = volume of water in the filter pack

The volume of water in the filter pack is determined by calculating the volume of the water in the borehole less the well casing volume. Compensation for the porosity of the filter pack is included in the equation, and this relationship is expressed as follows:

$$V_{FP} = \left[\frac{\pi D^2 h}{4} - V_{WC}\right](n)$$

where: V_{FP} (ft^3) = filter pack volume

D (ft) = diameter of the borehole

h (ft) = lesser of (a) length of filter pack, or (b) length of water column in the casing

n = filter pack porosity (assume 30 percent)

V_{WC} (ft^3) = well casing volume

Useful conversions: 1 ft^3 = 7.48 gal

1 gal = 0.134 ft^3

Indicator parameters (pH, temperature, and conductivity) will be monitored and recorded during purging. Generally, well purging will continue until the pH is within 0.2 standard units, temperature is within 1° C, and electrolytic conductivity is within 10 percent in three consecutive measurements.

Low-yield wells are considered purged after a minimum of one well volume is removed. If possible, low-yield wells should be purged at a rate slow enough so as not to purge the well dry. If a well is purged dry, the well should be sampled as soon as it has recovered enough to have sufficient water volume for the sample. The time between purging and sampling should not exceed 24 hours.

For medium or high-yield wells, samples should be collected within two hours of purging if possible. Under no circumstances should there be more than 24 hours between purging and sampling.

Please note that purging and sampling of a well can be done within 12 hours of well installation (i.e., just after well development), if necessary. However, the greater the time lapse between well installation and well sampling, the more representative the sample will be of formation water. It is recommended that, when project schedules and budget allow, wells should be allowed to stand for 24 hours or greater prior to purging and sampling.

Micropurging. Micropurging is an alternate method for purging wells that is distinctly different from the above-mentioned purging methodology. With micropurging, also referred to as low-flow purging, water is withdrawn directly from the screened interval at low enough pumping rates to ensure that the water sampled is formation water just recently entering the screen. As with traditional sampling, the groundwater is not sampled until the water-quality parameters (pH, temperature, and conductivity) have stabilized. Micropurging does not require a certain volume of water to be evacuated from the well. The intake point of the pump or tubing should to be close to the middle of the screen, so the monitoring-well construction details must be known. Micropurging criteria include the following:

- The intake point of the pump or tubing is in the center of the screen.
- Return water is clear and free of debris and has evacuated all major air bubbles in the tubing and flow-through cell.
- The pumping rate does not exceed 1 liter per minute (L/min) (0.1 to 0.5 L/min is usually optimum).
- Drawdown in the well is minimized and does not exceed 10 percent of the screen length.

- Three consecutive measurements of pH, temperature, conductivity, redox potential, and dissolved oxygen have been taken and show changes in value no more than 0.1 for pH, 1°C for temperature, 3 percent for conductivity, 10 millivolts for redox potential, and 10 percent for dissolved oxygen.

9.5.2.3 Well-Purging Methods

Monitoring wells may be developed using either bailers or pumps. It is not recommended that bailers be used for purging, although in many cases bailing may be the most practical method.

Four general types of equipment are used for well purging:

1. Grab samplers (including bailers, Kemmerer samplers, and syringe samplers)
2. Suction-lift pumps (including peristaltic pumps, surface centrifugal pumps, and vacuum pumps)
3. Electric submersible pumps (including centrifugal submersible pumps, helical rotor pumps, and gear pumps)
4. Positive displacement pumps (including gas–drive pumps, piston pumps, inertial lift pumps, and bladder pumps)

Once the type of pump or bailer is selected, the purge rate should be set low enough to avoid turbulent flow that causes entrainment of fines in the sand pack (over development of the well) and potentially causes stripping of volatile organic compounds. As a rule of thumb, the purge rate should not exceed the pumping rate or bailing rate used for well development. In addition, the purge rate should not exceed the recovery rate for the well. Typically, purging rates should not exceed 0.2 to 0.3 L/min.

Bailing. In many cases, bailing is the most convenient method for well purging and sampling. Bailers are constructed using a variety of materials such as PVC, stainless steel, polyethylene, and Teflon®. Care must be taken to select a specific type of bailer that suits a study's particular needs. Teflon® bailers are generally the most "inert," while PVC bailers are less expensive and sufficiently resistant to small-term exposure to most common contaminants. Bailers that are not chemically inert and easily decontaminated should not be used to purge and/or sample more than one well. Typically, a bailer can be dedicated to one well and can be hung in the well for subsequent purging and sampling events Disposable bailers, usually made of polyethylene, are sometimes more practical to use when decontamination time, expense, and the number of sampling events are considered.

Bailing presents three potential problems with well purging and sampling. First, increased suspended solids may be present in samples as a result of the turbulence caused by raising and lowering the bailer through the water column. High solids concentrations may require that total suspended solids (TSS) and the chemical character of the solids be evaluated during sample analyses. In addition, rapid bailing could cause the stripping of volatile organic compounds from the groundwater as a result of bailer agitation and/or groundwater cascading down the sides of the well screen.

Second, bailing may not be practical for wells that require that more than 20 gallons be removed during purging or for wells that are deeper than 50 ft below ground surface. Such bailing conditions mandate that long periods be spent during purging and sample collection, or that centrifugal pumps be used.

Third, bailing typically withdraws water from the top of the water column in the well and this water has already been exposed to the atmosphere. Exposure to the atmosphere can cause volatilization and reactions with carbon dioxide which cause subsequent lowering of the water's pH.

Suction-Lift Pumps. Suction-lift pumps are used to purge and sample groundwater from less than 30 ft below ground surface. Suction–lift pumps include peristaltic pumps, surface centrifugal pumps, and vacuum pumps. Vacuum pumps and surface centrifugal pumps (to a lesser extent) are not as appropriate as peristaltic pumps when collecting volatile-sensitive water samples.

Electric Submersible Pumps. Electric submersible pumps are commonly used to purge and sample groundwater from a variety of depths. Electric submersible pumps include centrifugal submersible pumps, helical rotor pumps, and gear pumps. The centrifugal submersible pumps are most commonly used, yet cause considerable water agitation due to the movement of the impeller(s). The gear pumps are the best-suited electric submersible pumps for groundwater purging and sampling and one of the best overall pumps for minimizing volatilization of groundwater samples.

Positive Displacement Pumps. Positive displacement pumps are widely available pumps often useful for groundwater purging and sampling. Positive displacement pumps include gas-drive pumps, piston pumps, inertial-lift pumps, and bladder pumps. The bladder pump is generally considered the best overall type of pump to collect groundwater samples for inorganic and/or organic analyses. Inertial lift pumps are ideal for well development, but should not be used to collect volatile-sensitive groundwater samples.

9.5.2.4 Purging and Sample-Collection Procedures — Method Specific

Once purging is complete, samples can be collected with either bailers or pumps. In many cases, a well may be purged using a pump and sampled using a bailer. This section discusses specific procedures for collecting samples using bailers and pumps.

Bailer Sampling. Obtain a decontaminated or new bailer and rope or cord made out of nylon, polypropylene, or other equivalent material. Tie a bowline knot or equivalent through the bailer loop. Test the knot for security and the bailer itself to ensure that all parts are intact before inserting the bailer into the well. Remove the protective wrapping from the bailer. Lower the bailer to the bottom of the monitoring well and cut the cord at a proper length. Bailer rope should never touch the ground surface at any time during purging and sampling.

Raise the bailer by grasping a section of cord using each hand alternately in a “windmill” action. This method requires the sampler’s hands to be kept approximately 2 to 3 ft apart and the bailer rope to be alternately looped onto or off each hand as the bailer is raised and lowered. Alternate methods may be used to raise the bailer including use of a reel or a plastic-lined bucket into which the rope is manually fed. Bailed groundwater is poured from the bailer into a graduated container to measure the purged water volume.

For slowly recharging wells, the bailer is generally lowered to the bottom of the monitoring well and withdrawn slowly through the entire water column. If possible, the water should be bailed at a rate slow enough so that it does not cascade down the sides of the well screen, which causes stripping of volatile organic compounds. Groundwater should be allowed to recover to 70 percent or greater of its static volume before a sample is collected.

Typically, water samples should be collected at or near the midpoint of the well screen. To collect a groundwater sample using a bailer, slowly lower the bailer into the water column, allowing the bailer to fill slowly from the bottom. Once the bailer has been lowered to approximately the mid-point of the screen, slowly raise the bailer to minimize creating turbulence in the well and minimize drawing fine-grained sediment into the well. Gently empty water directly from the full bailer into sample containers, taking care not to allow contact between the bailer and the sample container.

Pump Sampling. When selecting the appropriate pump to use for purging and sampling a well, there are two criteria that must be considered. First, the construction material of the pump and tubing should not contain materials that interact with the constituents of interest and/or contain constituents that may cause the sample to have a false positive analysis. Second, if the sample is to be analyzed for volatile organic compounds, a pump that minimizes sample agitation and subsequent volatilization should be used. As noted previously, the most appropriate pumps under these conditions are the gear pump or the bladder pump.

Prior to inserting a pump into a monitoring well, it should be thoroughly decontaminated by pumping an Alconox™ or equivalent potable water mixture through the pump followed by pumping potable water, followed by a distilled or deionized water rinse. Tubing should be dedicated to a single well and should not be re-used.

During the collection of samples, the pumping rate should be approximately 0.1 L/min. If a greater pumping rate is used for purging, the pumping rate should be reduced during sampling. Groundwater should be pumped directly into the sample containers.

9.5.2.5 Sample Collection Procedures — Method Independent

The following are method-independent sample collection procedures:

- Collect samples intended for volatile organic analysis (VOA) first.
- Fill sample containers quickly and smoothly to avoid agitation, aeration, and loss of volatile components.
- To further avoid loss of volatile components, completely fill samples so that no headspace is present and cap securely with a Teflon®-lined lid.
- Collect samples for semivolatile, metal, or other analyses in the proper sample containers.
- Collect duplicate samples when QA/QC samples are needed for VOA. VOA samples typically consist of two sample vials, referred to as the sample set. Alternating between the primary sample set and the replicate sample set, completely fill each vial and cap immediately in the order shown below:
    - Fill vial #1 - primary sample set
    - Fill vial #1 - replicate sample set
    - Fill vial #2 - primary sample set
    - Fill vial #2 - replicate sample set
- Collect duplicate samples when QA/QC samples are required for sample analyses other than VOA by alternately filling the sample containers as in the VOA procedure, but fill containers incrementally instead of completely, continuing the filling procedure until the sample containers are full.
- Label all sample containers with the following information:
    - Project name and/or number
    - Field sample number
    - Depth interval (if applicable)
    - Initials of collector
    - Date and time of collection
    - Sample type and preservative (if any)

  Replicate and duplicate sample labels require only project name and/or number, field sample number, and sample type and preservative (if any).

- Place samples in coolers as soon as possible and, if required, store and transport them at <4°C (39°F), using frozen ice packs or double-bagged ice.
- Use protective packaging as dictated by the mode of transport.

- Record sample information in the field logbook and on the sample control log as soon as possible after sample collection, in accordance with the procedures set forth in the Quality Assurance Project Plan.
- Complete chain-of-custody forms and placed them in the cooler for shipment to the laboratory.
- If required by the SAP, place custody seals across cooler lids so that coolers cannot be opened without breaking the custody seal. Include the following information on the custody seals:
  - Collector's signature or initials
  - Date of sampling
- Ship samples to the laboratory for analysis, carefully observing all minimum holding-time requirements for degradable constituents.
- Set up a decontamination station near the sampling location to decontaminate equipment that will be reused at the next sampling location.

9.5.3 Aquifer Testing and Analysis SOP

All monitoring wells added to the monitoring well network will be installed and completed in accordance with the NMED Monitor Well Construction Guideline.

9.5.3.1 General

An aquifer test or "pumping test" is used to determine the hydraulic properties of an aquifer by pumping one well for a specified length of time while collecting periodic water level measurements. Aquifer properties that can potentially be estimated using a pumping test include transmissivity (i.e., hydraulic conductivity multiplied by aquifer thickness), horizontal or vertical hydraulic conductivity, coefficient of storage, specific yield, and confining layer leakage. The two types of pumping tests most useful in determine aquifer hydraulic properties are the constant rate pumping test and the step-drawdown pumping test. The latter is best suited to determining the well's reduction in specific capacity (i.e., specific yield per unit of drawdown) with increasing yields, while the former is the most widely used pumping test in determining the transmissivity and storage values for an aquifer.

A pumping test can be performed using only the pumping well; however, specific information such as aquifer storage will not be obtainable. The use of observation wells in obtaining additional drawdown and/or recovery data over time is recommended whenever possible, especially when information on aquifer storage, anisotropy, vertical leakage, or the distance to a recharge or no-flow (i.e., barrier) boundary is needed.

In comparison to a slug test, a pumping test is representative of a much larger area and is therefore a better estimation of the hydraulic parameters of an aquifer. Conversely, a pumping test requires a greater commitment of resources (time, money, and equipment) and produces large volumes of water that usually need to be containerized during the test.

Several analytical solution methods are available. Two of the most widely used are the Theis (1935) equation and the Cooper and Jacob (1946) equation (often referred to as the Jacob straight-line method). A multitude of pumping test analysis software is available, though users are cautioned to be sure to understand all model or spreadsheet inputs as well as the assumptions of the governing equations. Far more extensive information on the design and analysis of pumping tests is covered in texts including, to name a few, Driscoll (1986), Kruseman and de Ridder (1991), Dawson and Istok (1991), Osborne (1993), and Fetter (1988).

Analyses of pumping tests require the following assumptions:

- The water-bearing formation is homogeneous, isotropic, uniform in thickness, and infinite in areal extent.
- The formation receives no recharge from any source.
- The pumping well (i.e., the screened section) is fully penetrating the entire thickness of the water-bearing formation.
- The water removed from storage is discharged instantaneously when the head is lowered.
- The pumping well is 100 percent efficient.
- All water removed from the well comes from aquifer storage.
- Laminar flow exists throughout the well and aquifer.
- The water table or potentiometric surface has no slope.

In reality, most pumping tests violate many of the above-mentioned assumptions to some degree or another. However, it is important to take all feasible measures to limit the extent of these violations whenever possible, and discussing these assumptions and any possible violations to them is important to any pumping test report.

Design Considerations. Prior to performing an aquifer pumping test, all available site and regional hydrogeologic information should be assembled and evaluated. If retrievable, such data should include groundwater flow direction(s), hydraulic gradients, other geohydraulic properties, site stratigraphy, well construction details, regional water level trends, and the performance of other pumping wells in the vicinity of the test area. This information is used to select test duration, proposed pumping rates, and pumping well and equipment dimensions.

The precise location of an aquifer test is chosen to be representative of the area under study. In addition, the location is selected on the basis of numerous other criteria, including:

- The size of the investigation area.
- Uniformity and homogeneity of the aquifer.
- Distribution of contaminant sources and dissolved contaminant plumes.
- The location of known or suspected recharge or barrier boundary conditions.
- The availability of pumping and/or observation wells of appropriate dimension and screened at the desired depth.
- Requirements for handling discharge.

The dimensions and screened interval of the pumping well must be appropriate for the tested aquifer. For example, the diameter of the well must be sufficient to accommodate pumping equipment capable of sustaining the desired flow rate at the given water depth. In addition, if testing a confined aquifer that is relatively thin, the pumping well should be screened for the entire thickness of the aquifer. For an unconfined aquifer, the wells should be screened at least in the bottom one- to two-thirds of the saturated zone and they may be screened throughout the entire thickness of the saturated zone.

Any number of observation wells may be used. The number chosen is contingent upon both cost and the need to obtain the maximum amount of accurate and reliable data. If at least three observation wells are to be installed and there is a known boundary condition, the wells should be configured such that water levels can be monitored both perpendicular and parallel to the boundary, with the pumping well at the intersection of the two well lines. If two observation wells are to be installed, they should be placed in a triangular pattern, non–equidistant from the pumping well. If observation wells are placed at 90° angles from the pumping well, radial anisotropy can be easily calculated. When observation wells are installed for aquifer testing purposes, they should be located at distances and depths appropriate for the planned method for analysis of the aquifer test data. Observation well spacing should be determined based upon expected drawdown conditions that are the result of the studies of geohydraulic properties, proposed pumping test duration, and proposed pumping rate.

Equipment. The equipment necessary to conduct a pumping test includes:

- A pump (suited for site conditions and requirements of the test)
- Water level measuring devices (pressure transducers and/or electronic water level indicators) accurate to at least 0.01 ft
- A flow meter with totalizer (something as simple as a graduated bucket can also suffice, especially as backup)
- A digital watch with stopwatch function (used to keep time and to help determine discharge rate when using graduated containers)
- An electrical source (generator or electrical receptacle on site)
- An electronic data recorder programmed to suitable data collection intervals)
- A barometer
- Water quality meter(s) for noting changes as a function of capture zone
- Hose or pipe to route pumped water away from the test area
- A gate valve
- An adequately sized tank/container for storing water
- A portable computer for preliminary analysis of data (optional)
- Field forms and logbook
- Pen and paper
- Backup equipment if feasible

Pumping equipment should conform to the size of the well and be capable of delivering the estimated range of pumping rates. The selection of flow meter, gate valve, and water transfer lines should be based on anticipated rates of water discharge. Both the discharge rate and test duration should be considered when selecting a tank for storing discharge water if the water cannot be released directly to the ground, sanitary sewer, storm sewer, or nearby water treatment facility.

Pumping-Test Preperations. If feasible for the site, slug tests or preliminary pumping tests (constant-rate or step drawdown) should be performed on the pumping well prior to the actual test. The preliminary pumping should determine the maximum drawdown in the well, and the proper pumping rate should be determined by step drawdown testing. If the discharge rate varied by less than 5 percent (i.e., a constant-rate-pumping test), the time versus drawdown data from the pumping well can be used to estimate aquifer transmissivity. The preliminary pumping will also provide redevelopment of the pumping well by removing fines from the adjacent formation and from the filter pack. Redevelopment of the pumping well will improve well efficiency during the pumping test and thus will allow for a better estimation of the aquifer’s hydraulic properties. The aquifer should then be given time to recover before the actual pumping test begins (as a rule–of–thumb, one day). A record should be maintained in the field logbook to track when pumping and discharge of other wells in the area occurs and whether the wells’ radii of influence intersect the cone of depression of the test well.

Barometric changes may affect water levels in wells, particularly in semiconfined and confined aquifers. Therefore, it is advisable to monitor (perhaps hourly) the barometric pressure and water levels in key wells at least 24 hours (if possible) prior to performing a pumping test. If a groundwater fluctuation trend is apparent, the barometric pressure should be used to develop curves depicting the change in water level versus time. These curves should be used to correct the water levels observed during the pumping test. Groundwater levels and barometric pressures in the background should continue to be recorded throughout the duration of the test. If dataloggers with transducers are used, backup field measurements should be collected in case of datalogger malfunction. All measurements and observations should be recorded in a field logbook or on appropriate field forms.

All equipment should receive calibration, function checks, and fresh or charged batteries if needed.

Conducting the Pumping Test. Prior to the start of the pumping test, the following checks should be made:

- Ensure all piping, valves, and flow meters are properly installed.
- Ensure that all containers are in place to capture all pumped water.
- Ensure that the energy needs (batteries, electricity, or gas) for all equipment are provided, including backup energy sources for key equipment.
- Verify all equipment is present and place it at locations where it will be most needed.
- Verify the pump intake is located at the proper interval in the pumping well.
- Verify all transducers are placed at the proper depth and are properly secured so they will not move or be susceptible to contact from site personnel.
- Verify the datalogger is properly programmed to record (typically logarithmically).
- Lower electronic water level tapes to just above the water levels inside each well.
- Warm up all equipment (such as a generator) that perform better after initial operations.
- Ensure all personnel and field forms are in their start-of-test locations.

Immediately prior to starting the pump, the water levels should be measured and recorded for all wells to determine the static-water levels upon which all drawdowns will be based. Dataloggers should be reset for each well to a starting water level of 0.00 foot. At this time, a pumping test is initiated by starting the datalogger and then starting the pump. The datalogger needs to be started at least a split second before the pumping begins. Immediately afterwards, the time that pumping started needs to be recorded along with water level readings, especially at or near the pumping well. A suggested schedule for recording water level measurements made by hand is as follows:

- 0 to 10 minutes – 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, and 10 minutes (It is important in the early part of the test to record with maximum accuracy the time at which readings are taken.)
- 10 to 100 minutes – 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, and 100 minutes
- 120 minutes to end of test – every 1 hour (60 minutes)

At least 10 measurements of drawdown for each log cycle of time should be made both in the test well and the observation wells. Dataloggers can be set to record in log time, which is very useful for data analysis. When logging data by hand, there should initially be sufficient field personnel to station one person at each well used in the pumping test. After the first two hours of pumping, two people are usually sufficient to complete most simplistic tests. It is advisable for at least one field member to have experience in the performance of pumping tests, and for all field personnel to have a basic familiarity with conducting the test and gathering data.

The discharge rate should be measured frequently throughout the test with a flow meter equipped with a totalizer and controlled to maintain a constant pump. This can be achieved, in part, by using a control valve. If used properly, the flow control valve can be pre-set for the test and will not have to be adjusted during pumping. When the pumping is complete, the total gallons pumped are divided by the time of pumping to obtain the average discharge rate for the test.

For a confined aquifer, if possible, the water level in the pumping well should not be allowed to fall below the bottom of the upper confining stratum during a pumping test. The pitch or rhythm of the pump or generator provides a check on performance. If there is a sudden change in pitch, the discharge should be checked immediately and proper adjustments to the control valve or the generator engine speed should be made, if necessary. Do not allow the pump to break suction during the test. If the pump stops working during the test, make necessary adjustments and restart the test after the well has stabilized.

Water pumped from an aquifer during a pumping test should be disposed of in such a manner as to not allow the aquifer to recharge during the test. This means that the water must be piped away from the well and associated observation wells. Also, if contaminated water is pumped during the test, the water must be stored and treated or disposed of according to project specifications. The discharge water may be temporarily stored in drums; a lined, bermed area; or tanks. If necessary, it should be transported and staged in a designated secure area.

Field personnel should be aware that electronic equipment sometimes fails in the field. It is a good idea to record key data in the field logbook or on field forms as the data are produced. That way, the data are not lost should the equipment fail.

The total pumping time for a test depends on the type of aquifer and degree of accuracy desired. Economizing on the duration of pumping may yield less reliable results. It is always recommended to pump long enough to ensure the cone of depression achieves a stabilized condition. The cone of depression will continue to expand at an ever-decreasing rate until recharge of the aquifer equals the pumping rate, and a steady-state condition is established. The time required for steady-state flow to occur varies considerably from site to site. If steady-state conditions cannot be achieved in a reasonable time frame for the project, consider a test duration of at least 24 hours. A longer duration of pumping may reveal the presence of boundary conditions or delayed yield.

Use of portable computers allows time/drawdown plots to be made in the field. If dataloggers are used to monitor water levels, the electronic data can be reviewed by scrolling with the datalogger screen or via a portable computer. It is advisable to download the water level data before transporting the datalogger from the site.

9.5.4 Monitoring Well Installation

If additional monitoring wells are required, SOPs for Monitoring-Well Installation and Hollow-Stem Auger Drilling will be followed. These SOPs will be submitted to the MMD prior to installation of additional wells and will meet state requirements for well installation.

9.6 Parameters to be Analyzed

See Table 9-3 for analytical parameters and analysis methods.

9.7 Maps Showing Proposed Sampling Locations

Figure 9-10 illustrates the current groundwater monitoring network for the baseline characterization study. This network has grown from the initial sampling program conducted in January 2010 (Figure 9-11). The wells have been categorized according to the aquifer being monitored (i.e., Quaternary alluvial aquifer, Santa Fe Group aquifer, or Bedrock aquifer) if known.

9.8 Laboratory and Field Quality Assurance Plans

The groundwater sample and data collection will be conducted in accordance with the Quality Assurance Project Plan (QAPP) (see Attachment 1) and the procedures for sampling and recording observations in a logbook. The samples will be properly preserved and sent to an accredited analytical laboratory. Water samples will be collected from Site wells and private wells. Fieldwork to determine which of these wells exist and can be sampled and measured is subject to owner approval. Comments made by the well users visited will be recorded in the logbook.

The parameters of pH, temperature, dissolved oxygen, turbidity, and specific conductivity will be measured in the field at the time of collection for each well. The field instruments will be calibrated by the manufacturer with calibration checks conducted by the user. The calibration certificates will be filed and the field checks will be recorded in the logbook. Groundwater quality control samples will include random duplicate samples.

The Field Leader for the aquifer pump test will be experienced and the field members will be trained to the procedures. The procedures to be used have been developed by professionals in groundwater hydrology. The instruments used for pump tests will be calibrated by the manufacturer. A calibration certificate will be retained as a record. The main instruments used for the pump test are the pressure transducers, E-tape, vented cable, and barometric pressure gage. A preliminary step drawdown test a few days prior to the pump test will afford the field hydrologists a chance to verify that the meter, discharge system, transducers, and generator are working properly.

Water level measurements will be monitored manually with an E-tape as a check on transducer measurements and to ensure that a back-up set of data are available in case of transducer failure. The E-tape and transducers will be compared several times before the pump test to determine the difference in readings. This difference will be recorded. During and after the pump test, several more checks will be made to compare the reading differences. The differences are typically minimal (inches), but will be used as an adjustment for the data interpretation. A similar comparison will be noted for the vented cable and the barometric pressure gage readings. Prior to installation, the transducer probe and cable will be inspected for damage, un-kinked, and cleaned.

The transducer data will be downloaded to a laptop computer on a regular basis. E-tape comparison readings will be taken, often during the initial pumping and again during the initial recovery period and numerous times during the days of pumping. For safety reasons, at least two people will be on-Site during the entire pumping portion of the test.

Personnel will maintain a field logbook in which are recorded weather, field conditions, nearby pumping wells, and any circumstances which influence test results or would be useful to know during interpretation of test results.

9.9 Discussion in Support of Proposal

The main objective of the proposed groundwater data collection program is to obtain the data necessary to determine potential impacts of mining activities, including mine dewatering, on local and regional groundwater systems. As this Site has been mined before and has been through several permitting cycles, historical data will play an important role in the evaluation of potential impacts caused by new mining. Therefore, all impact analysis performed using data collected in accordance with this SAP will be supported by concurrent evaluation utilizing historical data where available.

The water quality sampling program will provide current water quality data for a monitoring well network that includes wells with a history of sampling. Current and historical data will be statistically evaluated to determine a range of baseline groundwater quality values for key constituents.

The water level measurement program will provide recent baseline data on local water levels. Existing aquifer pumping test data will be used to obtain hydraulic information and additional tests will be performed as necessary.

The potential impacts of groundwater withdrawals from the Bedrock and Santa Fe Group aquifer system on groundwater levels will be determined using a three-dimensional groundwater flow model. The groundwater flow model will incorporate historical data as well as data collected under this SAP. Defensible, site-specific conceptual and numerical flow models are critical to NMCC for securing the necessary permits and stakeholder acceptance for assessment of potential impacts from dewatering, pit lake evolution, and leaching from waste rock facilities and the tailings impoundment. The potential impacts on water supply wells will be evaluated with this model as well as the potential impacts of the discharge of dewatering water on the alluvial aquifers in Las Animas and Percha Creeks. The groundwater model will be calibrated under pre-development and transient conditions and will represent the most reasonable tool available for estimating impacts of dewatering and appropriation of groundwater on both a local and regional scale.

Given that the existing groundwater flow model developed for Alta Gold (ABC, 1996; ABC, 1997; ABC, 1998b) received significant criticism, NMCC will develop a revised conceptual model for groundwater flow that will be used to construct a MODFLOW numerical model which will in turn be used to assess impacts from mine operations. The revised conceptual model will be primarily based on data collected as part of this baseline characterization work, including historical data that are statistically valid.

A new numerical flow model will be constructed, calibrated, and applied to assess potential impacts from mine dewatering and from post-mining groundwater rebound. This model, which we expect will be a sub-regional scale model, will focus on an area sufficiently large enough to defensibly determine water level and flux changes on identified resources. NMCC proposes to use either MODFLOW or MODFLOW–SURFACT as the flow model code because they have been accepted by both state and federal agencies for mining impact assessments, among other uses. The geologic model from the previous flow model will serve as the foundation for a revised geologic model to be developed by NMCC in close collaboration with MMD staff. Estimates of recharge, evapotranspiration, and other boundary conditions from the previous model will also serve as a starting point for the new numerical flow model.

To assess potential impacts, NMCC will develop and calibrate numerical flow models for the sub-regional scale that represent different periods of mine activity. First, NMCC will construct and calibrate a steady state flow model that represents pre-mining conditions. A transient model that represents mining activities to the present day will be constructed from the steady state model and calibrated to available head and flux data. Potential impacts will be determined from the final transient model that simulates mine activities such as pit deepening and dewatering as well as the post-mining period’s groundwater rebound. Changes in fluxes to surface water bodies and water levels will be used as the performance metrics for the impact assessment.

NMCC efforts for the groundwater impact assessment will include:

- Develop a conceptual model for groundwater flow through the site and its vicinity, including groundwater and surface interactions, and construct a water balance for the site vicinity.
- Present the conceptual model and preliminary numerical model domain to relevant agencies.
- Construct and calibrate a steady state flow model to represent pre-mining conditions.
- Construct and calibrate a transient flow model that simulates historical mine development to the present day.

- Construct and calibrate a transient flow model that estimates drawdown from proposed mine dewatering and groundwater rebound following mine reclamation as well as any potential impacts to groundwater and surface water resources.
- Present the preliminary numerical model results to the relevant agencies.

9.10 References

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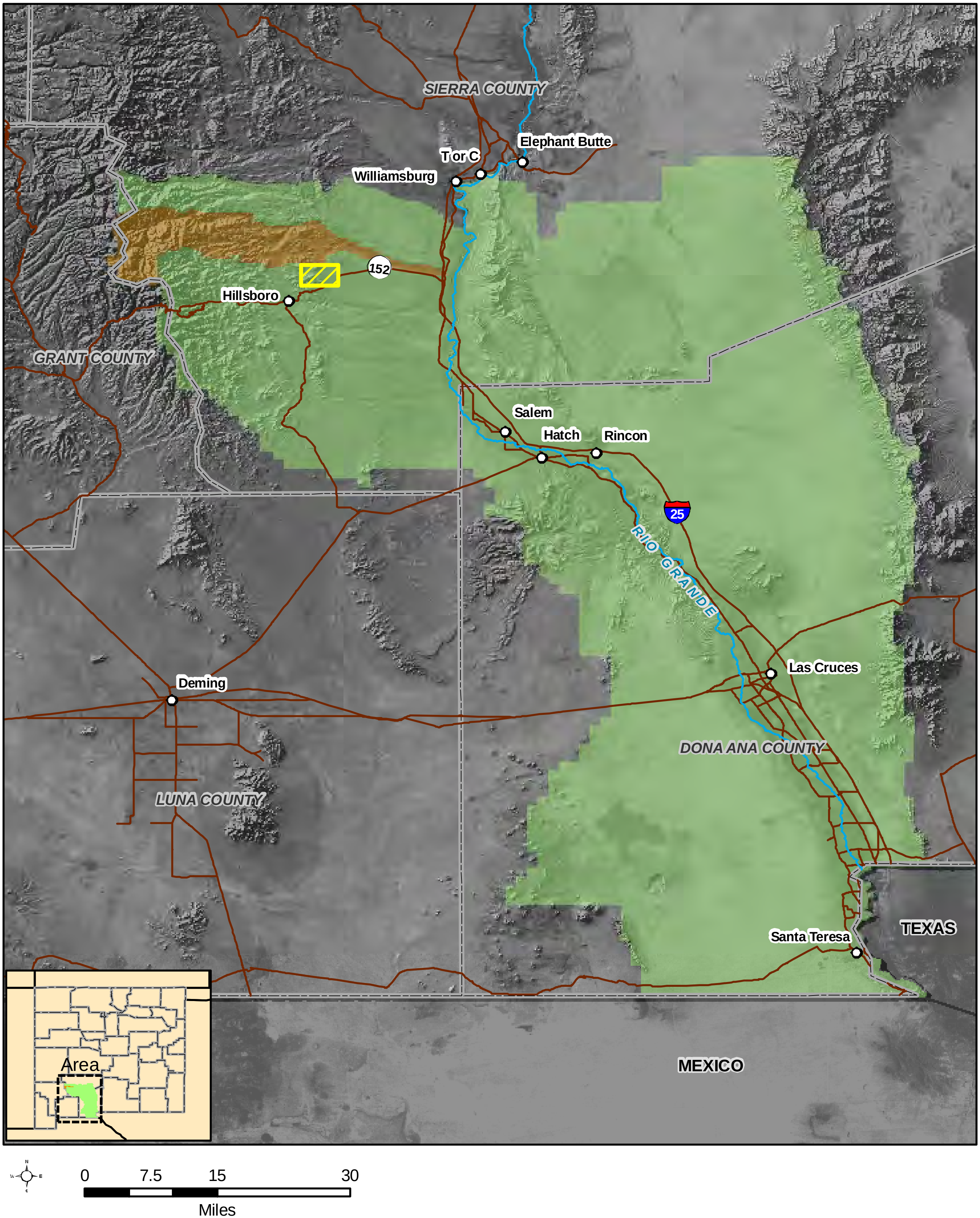
Figures



Basin Boundaries:
RGIS website/NMOSE
Imagery Information:
Landsat imagery from
University of Maryland NLCD

Legend

○ City/Town
▨ Site Location
— Road

OSE Declared Basin
🟩 Lower Rio Grande
🟧 Las Animas

Figure 9-1
Lower Rio Grande Basin
New Mexico Copper Corporation

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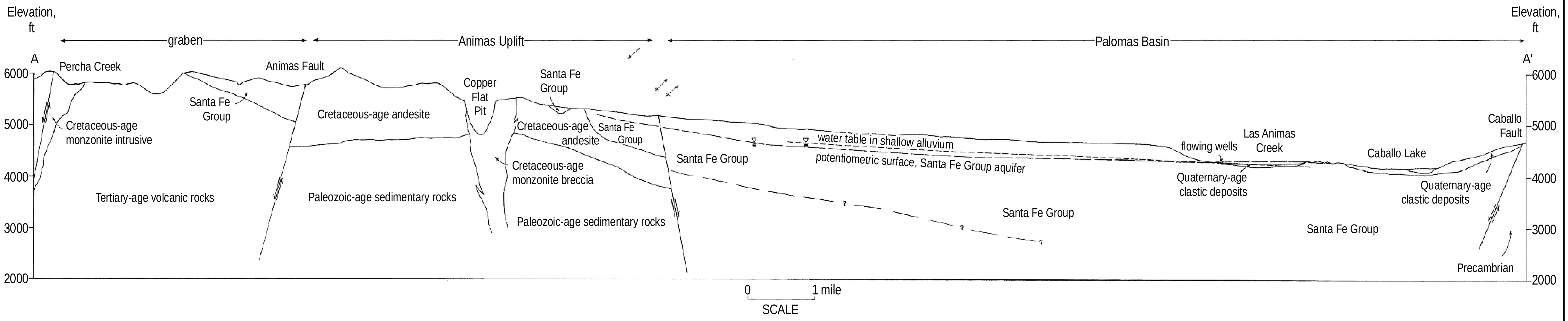
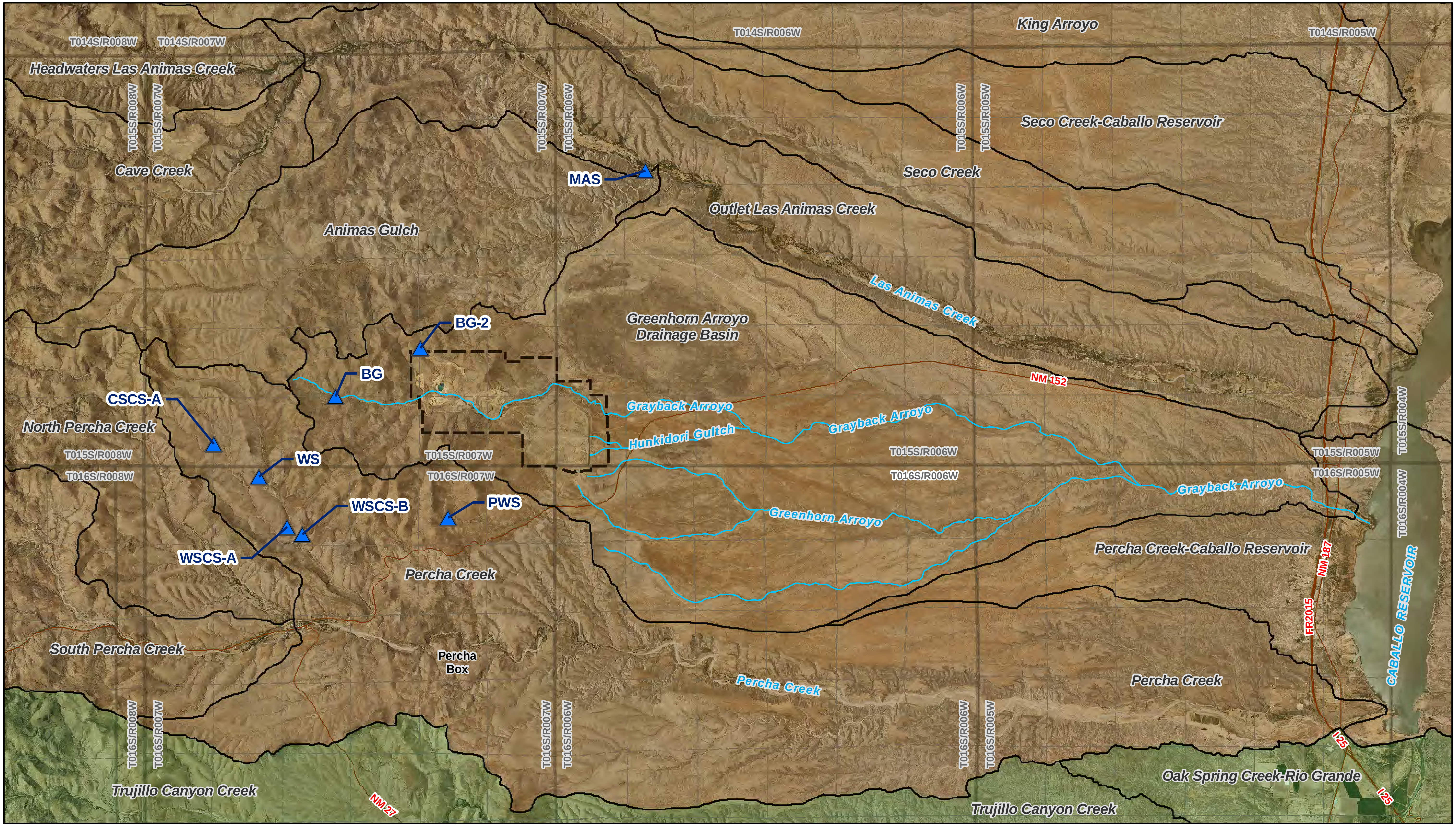


from John W. Shomaker, Inc., 1993

Figure 9-2
Conceptual Model of Groundwater Flow System

New Mexico Copper Corporation



N
W E
S

Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

0 3,500 7,000 14,000 21,000

Feet

Legend

▲ Identified Spring

▭ Proposed Mine Permit Boundary

Watersheds

▭ Caballo

🟩 El Paso-Las Cruces

▭ Sub-Watershed

Figure 9-3
Spring and Stream Locations

New Mexico Copper Corporation

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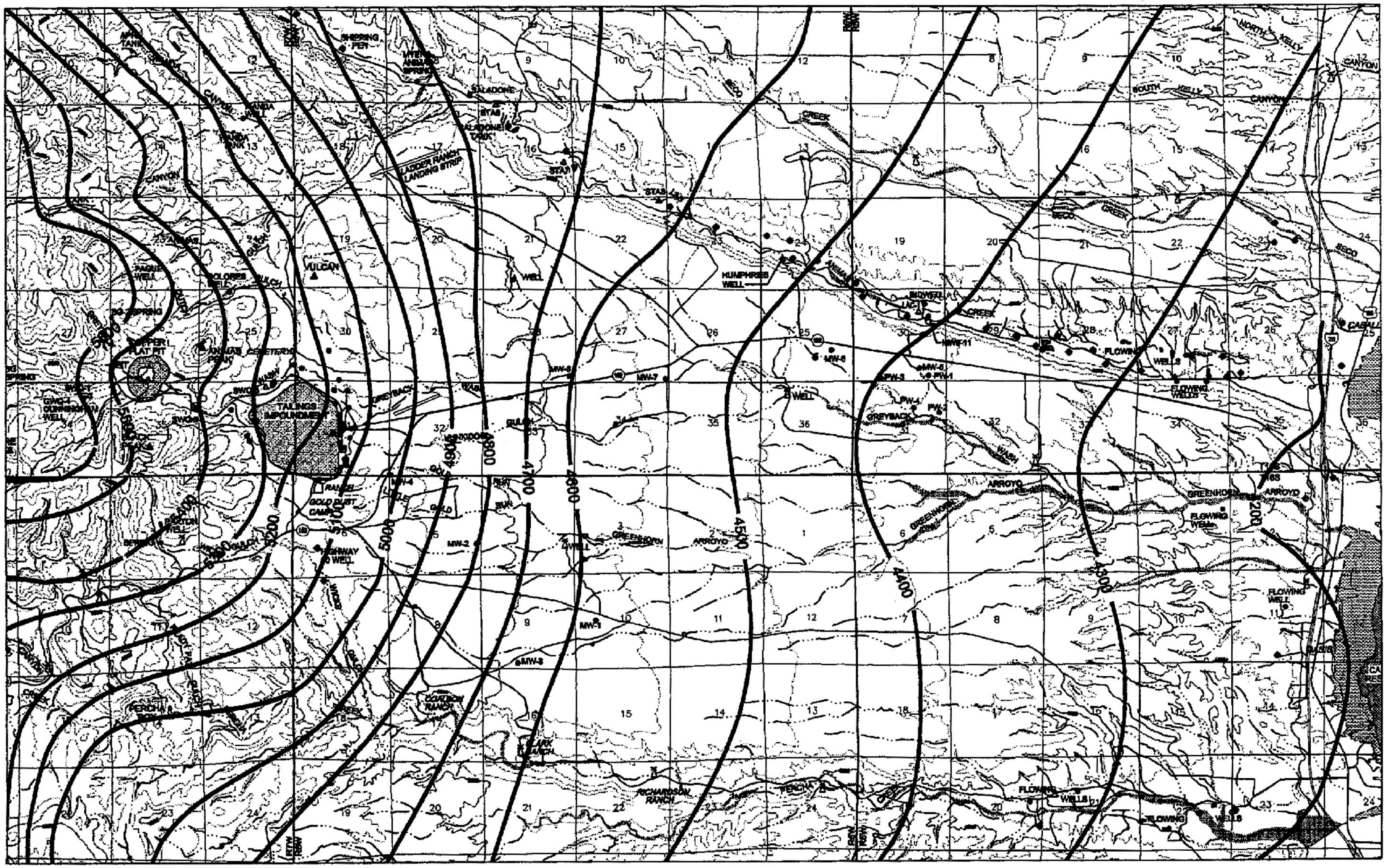
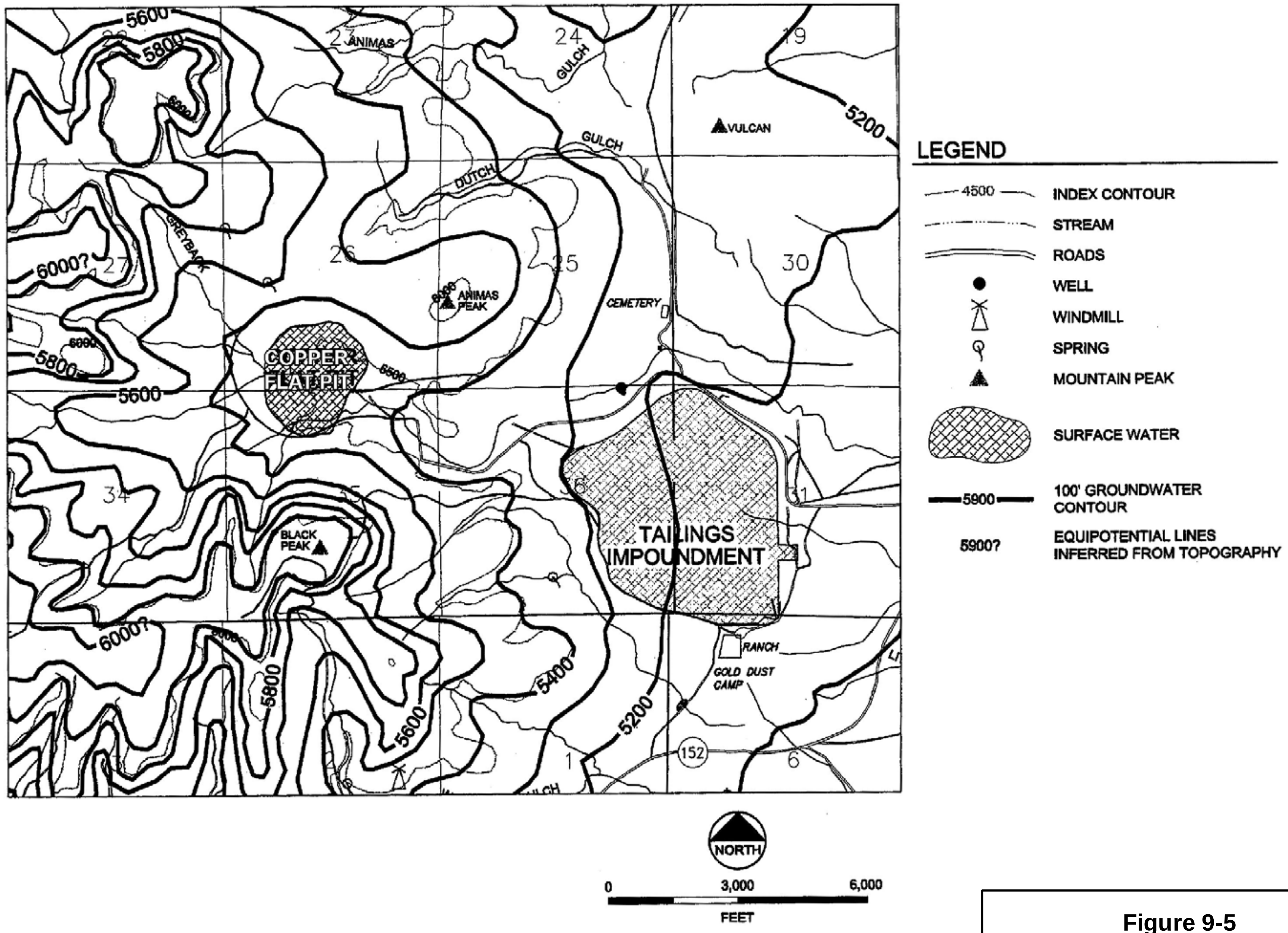


from ABC, 1998B

Figure 9-4
Water Level Contours

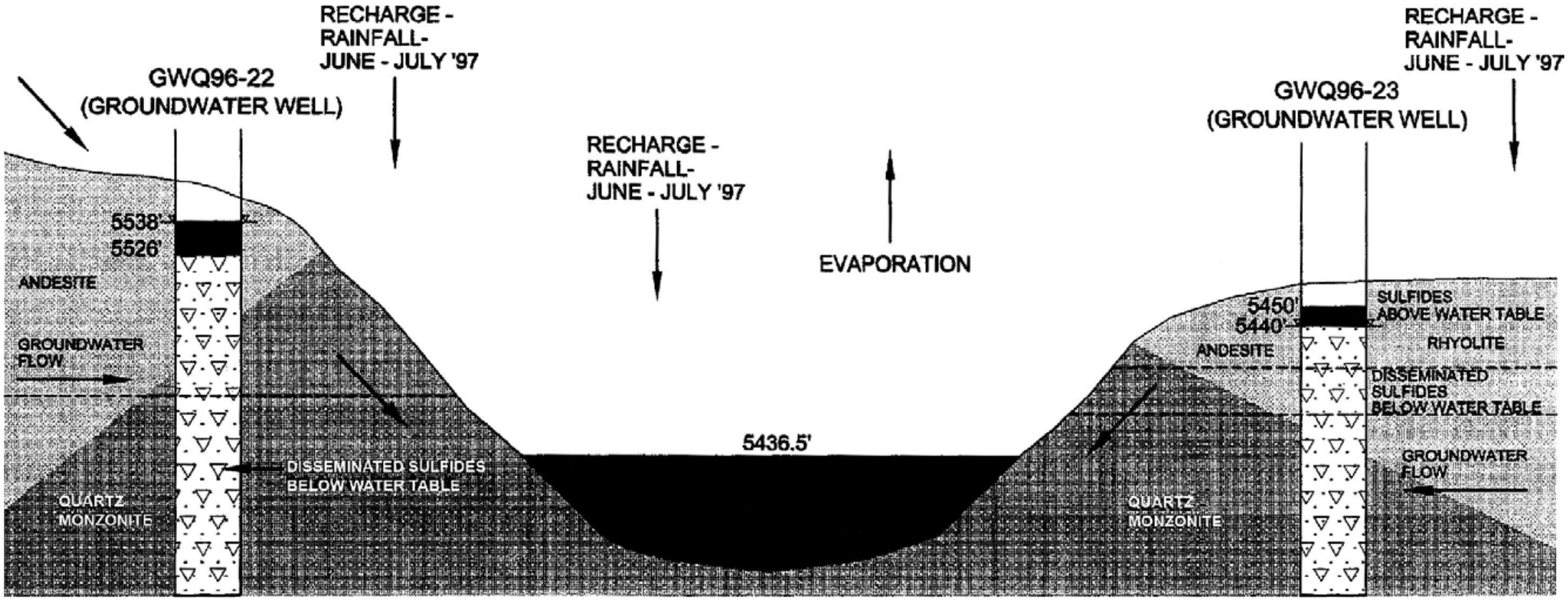
New Mexico Copper Corporation



from ABC, 1997

Figure 9-5
Water Level Map of
Copper Flat Pit Area

New Mexico Copper Corporation

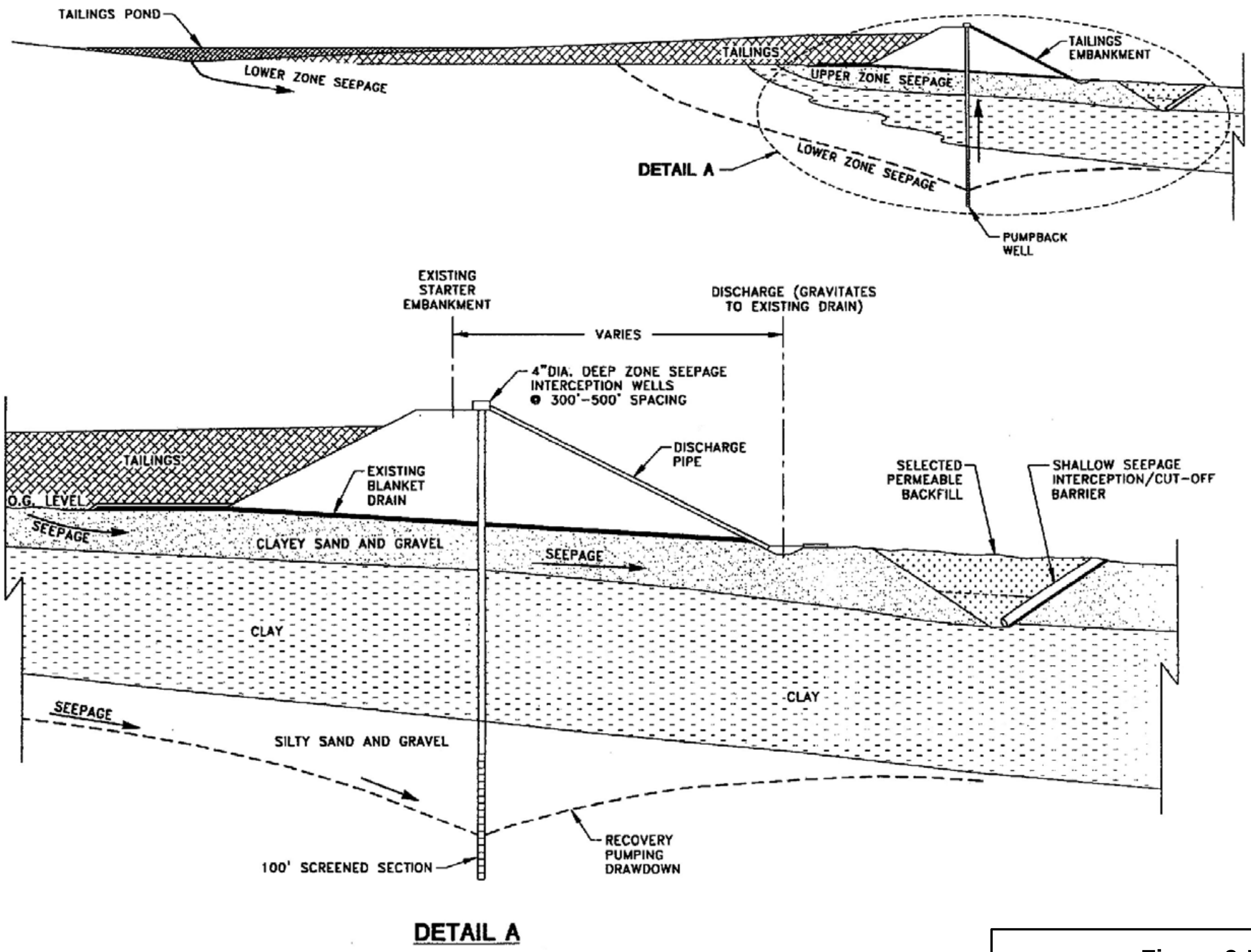


	GWQ96-22		PIT LAKE		GWQ96-23	
	JULY '96	AUG '97	AUG '95	AUG '97	APR '97	AUG '97
pH	7.5	7.65	8.31	8.16	7.89	7.68
TDS	700	700	4707	5021	770	920
SO_4	250	230	3170	3100	150	410
Cu	<0.025	<0.025	<0.025	0.050	<0.025	<0.025
Fe	<0.05	<0.05	<0.025	<0.05	6.5	0.82

from SRK, 1998

Figure 9-6
Conceptual Model of Pit Lake Monitoring Well Relationship with Water Quality Reports

New Mexico Copper Corporation



from SRK, 1995

Figure 9-7
Conceptual Design,
Tailings Seepage Control

New Mexico Copper Corporation

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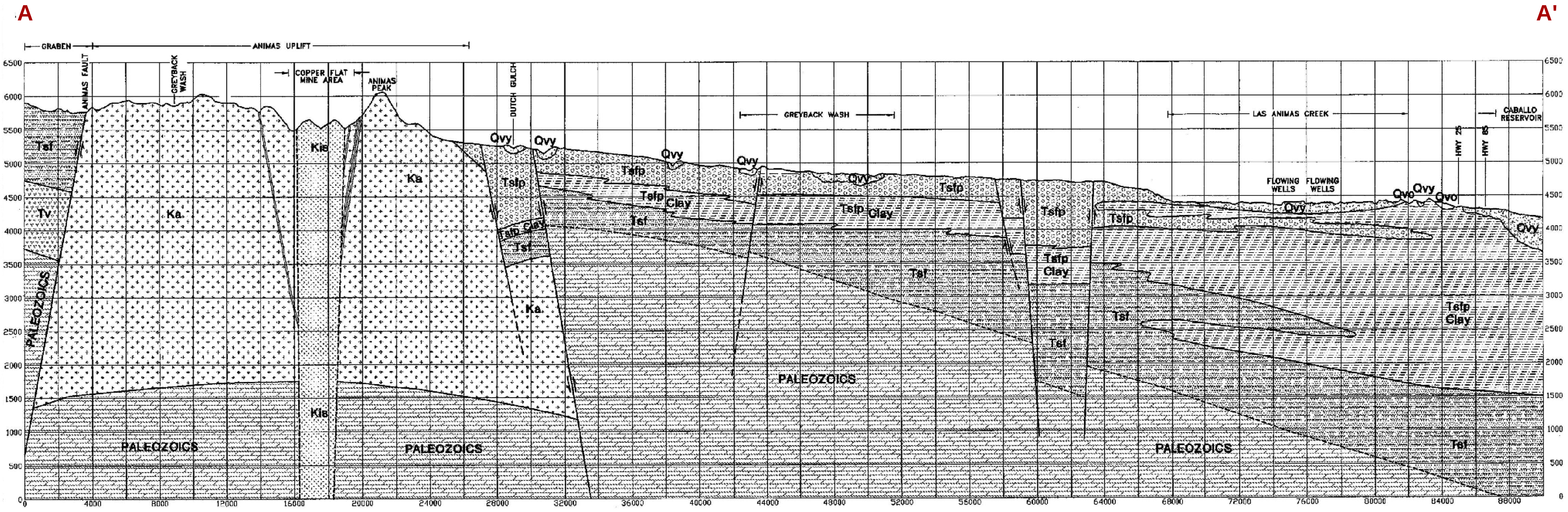


LEGEND:

QUATERNARY
- Qvy } Stream Alluvium
- Qvo

TERTIARY
- Tsfp } Palomas Formation
- Tsfp Clay
- Tsf – Rincon Valley Formation
- Tv – Tertiary Volcanics

CRETACEOUS
- Ka } Volcanics and Intrusives
- Kis

PALEOZOIC
- Bedrock Carbonate and Clastic Rocks

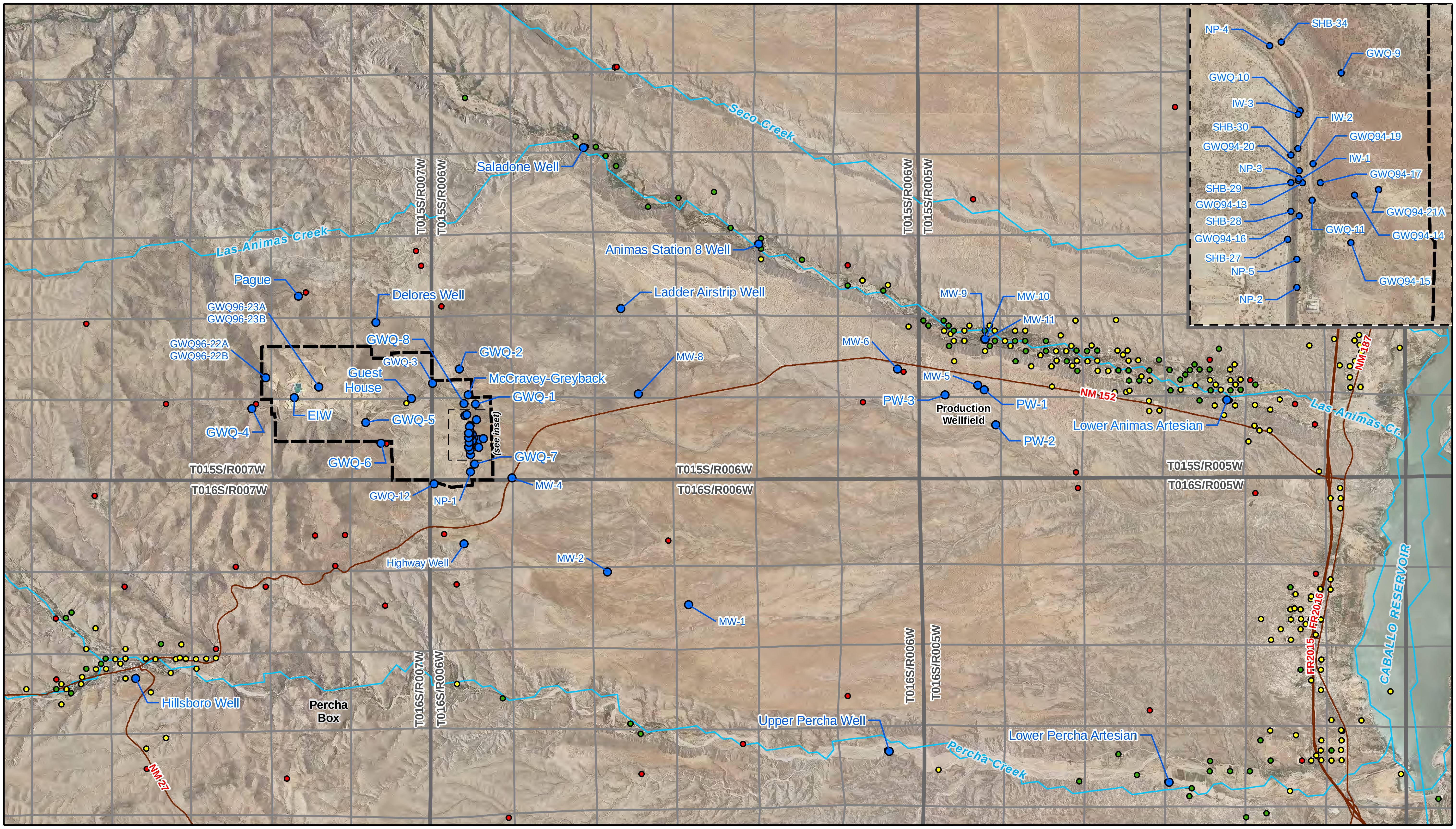
(see Figure 7-1 for cross section location)

SOURCES:
(1) HARLEY (1934)
(2) SEAGER ET AL. (1982)
(3) HEDLUND (1977)
(4) ALMINAS ET AL. (1975)

SCALE IN FEET
1500
0'
VERTICAL
6000 HORIZONTAL 0'

from BLM, 1999

Figure 9-8
Schematic Geologic
Cross Section (A-A')
New Mexico Copper Corporation



Well Locations:
SRK or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

Road	NM OSE Wells (Use)
● Project Well	● Domestic
▭ Proposed Mine Permit Boundary	● Irrigation
	● Stock

INTERA

Figure 9-9
Regional Groundwater
Well Locations
New Mexico Copper Corporation

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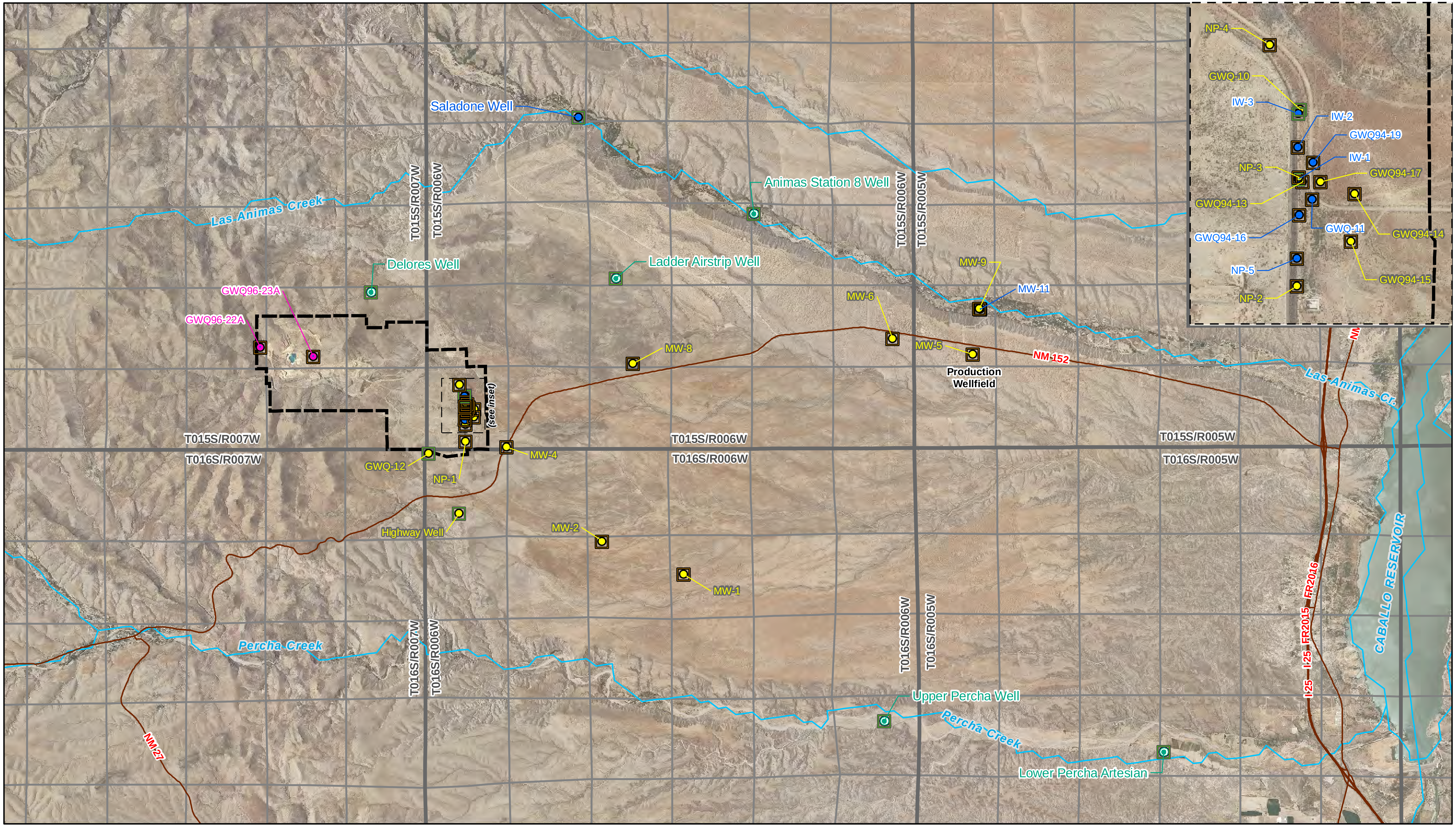

Well Locations:
SRK or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

Proposed Monitoring Well
- ☐ Water Level Only
- ☐ Water Level & Water Quality

Aquifer
- ● Crystalline Bedrock
- ● Qauternary Alluvium
- ● Santa Fe Group
- ● Unknown

- Proposed Mine Permit Boundary
- Road

Figure 9-10
Proposed Monitoring
Well Program
New Mexico Copper Corporation

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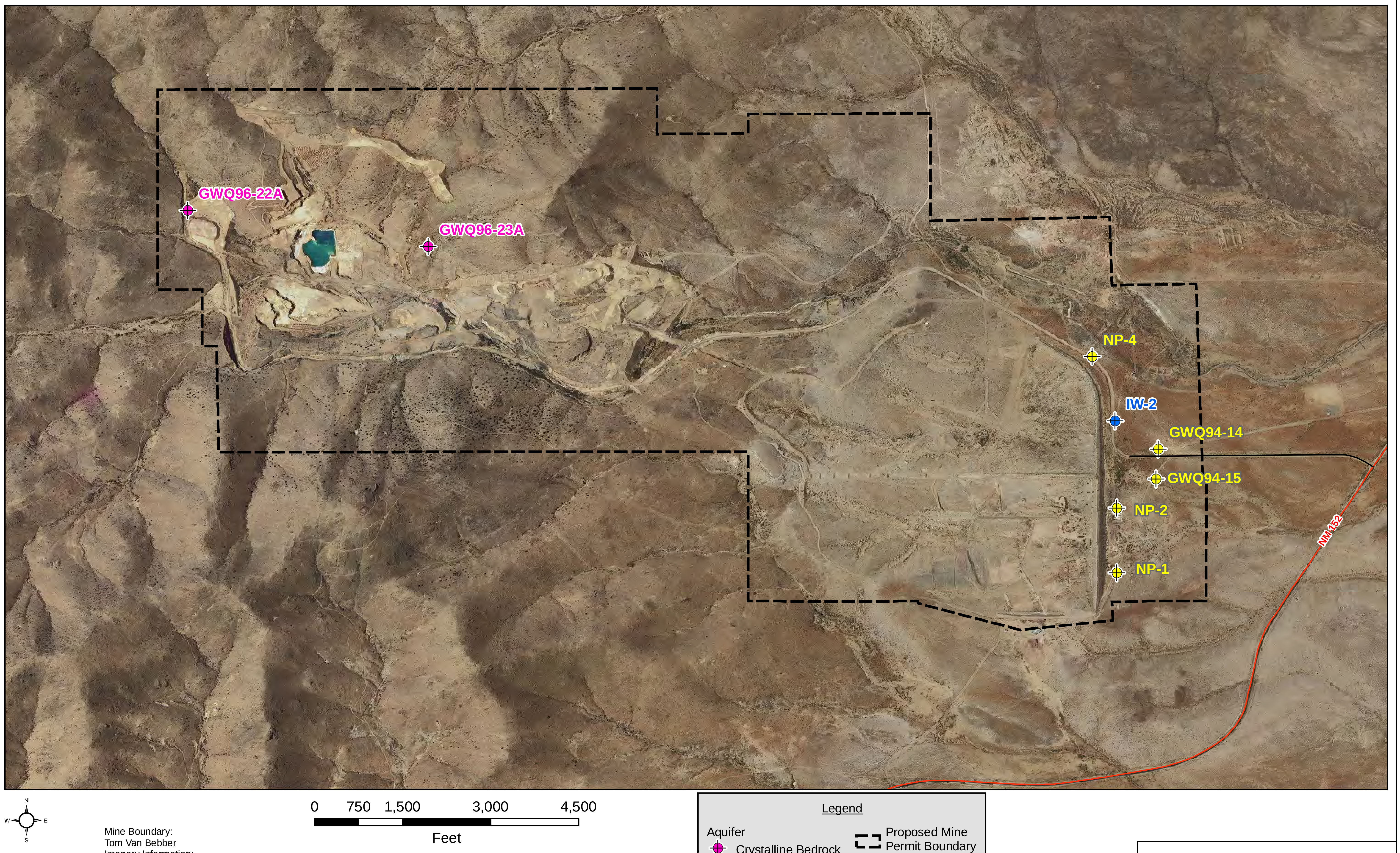

Legend

Aquifer

- ● Crystalline Bedrock
- ● Qaternary Alluvium
- ● Santa Fe Group

- ⬚ Proposed Mine Permit Boundary
- — Road

Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
 Sierra County, 2009
Projection Information:
-Geographic, WGS 1984

INTERA

Figure 9-11
Wells Sampled in January 2010

New Mexico Copper Corporation

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Tables

Table 9-1

Groundwater Sampling and Data Analysis Plan

Proposed Activity	Purpose of Activity
Perform a field verification survey of monitoring wells identified by previous investigators, measure depths to water and total depths of wells.	Confirm existing monitor well network in order to evaluate need for additional wells in key aquifers and finalize baseline monitoring well network
Install background monitoring wells in Santa Fe and alluvial aquifers.	Establish background water quality for Santa Fe Group and alluvial aquifers
Continue water level measurement and sampling of groundwater monitoring network.	Establish baseline (pre-mining) water quality and water levels for the Bedrock, Santa Fe Group, and Alluvial Aquifers
Install additional monitor wells as necessary to meet to address data gaps	Further define potential impacts from earlier mining activities and obtain additional pre-mining water levels
Determine hydraulic parameters for Bedrock, Santa Fe Group, and Alluvial aquifers	Obtain necessary input for groundwater model to evaluate drawdown from mine dewatering and production well activities

Table 9-2
Proposed Monitoring Wells for Water Quality Sampling and Water Level Measurements

Well Name	Total Depth (ft bgs)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Year Drilled	Diameter (inches)	Inferred Aquifer	Water Quality Sample	Water Level Measurement
Animas Station 8 Well	NA	NA	NA	NA	NA	ND		X
Delores Well	NA	NA	NA	1932	NA	ND		X
GWQ-10	121.0	NA	NA	1981	3	Santa Fe Group		X
GWQ-11	84.5	NA	NA	1981	3	Quaternary Alluvium		X
GWQ-12	130.0	NA	NA	1981	3	Santa Fe Group		X
GWQ94-13	112.0	74.0	104.5	1994	5	Santa Fe Group	X	X
GWQ94-14	158.0	127.5	157.5	1994	5	Santa Fe Group	X	X
GWQ94-15	148.0	112.0	142.0	1994	5	Santa Fe Group	X	X
GWQ94-16	45.0	25.0	45.0	1994	5	Quaternary Alluvium	X	X
GWQ94-17	158.0	120.0	150.0	1994	5	Santa Fe Group	X	X
GWQ94-18	60.0	10.0	50.0	1994	4	Quaternary Alluvium	X	X
GWQ94-19	54.0	10.0	50.0	1994	4	Quaternary Alluvium	X	X
GWQ96-22A	240.0	170.0	240.0	1996	2	Bedrock	X	X
GWQ96-23A	100.0	50.0	100.0	1996	2	Bedrock	X	X
Highway Well	NA	NA	NA	1934	NA	Santa Fe Group		X
IW-1	49.0	NA	49.0	1982	4	Quaternary Alluvium		X
IW-2	45.0	NA	45.0	1982	4	Quaternary Alluvium	X	X
IW-3	45.0	NA	45.0	1982	4	Quaternary Alluvium		X
Ladder Airstrip Well	NA	NA	NA	NA	NA	ND		X
Lower Percha Artesian	NA	NA	NA	NA	NA	ND		X
MW-1	1000.0	350.0	1000.0	1975	8	Santa Fe Group	X	X
MW-11	65.0	12.0	32.0	1994	8	Quaternary Alluvium	X	X

Well Name	Total Depth (ft bgs)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Year Drilled	Diameter (inches)	Inferred Aquifer	Water Quality Sample	Water Level Measurement
MW-2	1500.0	133.0	1500.0	1975	8	Santa Fe Group	X	X
MW-4	2000.0	123.0	1500.0	1975	8	Santa Fe Group	X	X
MW-5	1380.0	306.0	1000.0	1975	8	Santa Fe Group	X	X
MW-6	1112.0	310.0	1000.0	1975	8	Santa Fe Group	X	X
MW-8	1004.0	366.0	1000.0	1975	8	Santa Fe Group	X	X
MW-9	250.0	200.0	250.0	1994	8	Santa Fe Group	X	X
NP-1	115.0	NA	106.0	1981	4	Santa Fe Group	X	X
NP-2	115.0	NA	110.0	1981	4	Santa Fe Group	X	X
NP-3	109.5	NA	100.0	1981	4	Santa Fe Group	X	X
NP-4	117.0	NA	117.0	1981	4	Santa Fe Group	X	X
NP-5	44.0	24.0	39.0	1981	4	Quaternary Basalt	X	X
Saladone Well	NA	NA	NA	NA	NA	Quaternary Alluvium		X
Upper Percha Well	NA	NA	NA	NA	NA	ND		X

Notes:

NA = not available
ND = not determined

Table 9-3

Analytical Parameters and Analysis Methods for Groundwater Samples

Analytical Parameter	Analysis Method	Lab Detection Limit (mg/L unless noted)
Anions		
Fluoride	EPA Method 300.0	0.1
Chloride	EPA Method 300.0	0.1
Nitrogen, Nitrite (as N)	EPA Method 300.0	0.1
Nitrogen, Nitrate (as N)	EPA Method 300.0	0.1
Sulfate	EPA Method 300.0	0.5
Dissolved Metals		
Aluminum	EPA Method 200.7	0.02
Antimony	EPA Method 200.8	0.005
Arsenic	EPA Method 200.8	0.02
Barium	EPA Method 200.7	0.002
Beryllium	EPA Method 200.7	0.002
Boron	EPA Method 200.7	0.04
Cadmium	EPA Method 200.7	0.002
Calcium	EPA Method 200.7	0.50
Chromium	EPA Method 200.7	0.006
Cobalt	EPA Method 200.7	0.006
Copper	EPA Method 200.7	0.0003
Iron	EPA Method 200.7	0.02
Lead	EPA Method 200.7	0.005
Magnesium	EPA Method 200.7	0.50
Manganese	EPA Method 200.7	0.002
Mercury	EPA Method 7470 CVAA	0.0002
Molybdenum	EPA Method 200.7	0.008
Nickel	EPA Method 200.7	0.01
Potassium	EPA Method 200.7	1.0
Selenium	EPA Method 200.8	0.02
Silicon	EPA Method 200.7	0.08
Silver	EPA Method 200.7	0.005
Sodium	EPA Method 200.7	0.5

Analytical Parameter	Analysis Method	Lab Detection Limit (mg/L unless noted)
Thallium	EPA Method 200.7	0.01
Titanium	EPA Method 200.7	0.005
Uranium	EPA Method 200.8	0.01
Vanadium	EPA Method 200.7	0.005
Zinc	EPA Method 200.7	0.005
Solids		
Total Suspended Solids (TSS)	SM 2540D	1.0 µg/L
Total Dissolved Solids (TDS)	SM 2540C	10
Alkalinity		
Alkalinity, total (as $CaCO_3$)	SM 2320B	20
Carbonate	SM 2320B	20
Bicarbonate	SM 2320B	20
Other		
pH	150.1	12.45
Specific Conductance	120.1	0.01 µS/cm
Cyanide	Kelada-01	0.005

Note: NA = not applicable as sample will not be analyzed for a given parameter.

Table 9-4
Groundwater System Characteristics (from SRK, 1995)

Unit	Crystalline Bedrock	Santa Fe Group System	Quaternary Alluvium
Material	Rock	Alluvium	Alluvium
K_h (ft/yr)	10	1,000 – 4,000	~78,000
K_v (ft/yr)	10	1-40	~7
Porosity	2%	25%	25%
Storage Coefficient	1%	0.1 – 0.001%	0.1%
Depth of Unit	>2,000’	0 – 2,000’+	~30’
Depth to Water	0’-50’	50’-300’	~5’
Notes	Variable, fractured	Higher K to east; heterogeneous	Perched, low communication

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List of Figures

10 Historical and Cultural Properties Survey

Several cultural resources surveys have been conducted at the Copper Flat Mine Permit Area (Site) since 1976. The initial surveys were conducted for the 1977 and 1978 environmental assessments (Glover, 1977; BLM, 1978). A subsequent Class III (100-percent pedestrian coverage) cultural resources survey was conducted by Mariah Associates for Gold Express in 1991 (Evaskovich and Higgins, 1991). In response to comments from the New Mexico State Historic Preservation Officer (SHPO) in August 1995, Alta contracted with Human Systems Research of Las Cruces to resurvey all of the undisturbed portions of the Project not covered by the 1991 survey. The results of this survey were filed with the SHPO in October 1995 (Sechrist and Laumbach, 1995). SHPO representatives have indicated that a new survey of the undisturbed areas may not be needed at this time. Because the most recent survey was conducted more than 10 years ago, the lead federal agency for cultural resource compliance review (Bureau of Land Management [BLM]) and SHPO will review the previous surveys for sufficiency and consistency with current standards for survey investigations. This review will also consider the probability of new sites having become exposed in the interim through processes such as dune formation or movement. If it is determined that a new pedestrian survey is not needed prior to construction, the fieldwork effort for cultural resources likely will be limited to revisiting previously recorded sites to evaluate their current condition and to reassess potential impacts to these resources from the proposed Project.

A number of prehistoric and historic sites eligible for listing in the National Register of Historic Places have been identified at the Site. Where possible, identified sites will be avoided by modifying the design of project components. For sites that might be impacted by the Project, and for which avoidance is not feasible, the New Mexico Copper Corporation (NMCC) will contract with qualified archaeologists to prepare a recovery plan to collect appropriate data and to minimize and mitigate adverse effects to cultural resources resulting from the Project. The recovery plan will be implemented following approval by the BLM and SHPO and prior to construction.

The following subsections assume that a new Class III survey of the undisturbed areas of the Project will be required. They are not applicable if it is determined that no cultural resources survey of the area is necessary at this time.

10.1 Introduction and Background

By obtaining knowledge of the local cultural history prior to conducting surveys, cultural resource specialists are better able to identify and interpret findings. Understanding the material and spatial correlates of different culture groups through time ensures that cultural items identified during survey are placed and interpreted in the proper context. The cultural-historical sequence for western Sierra County is generally described in terms of five different time periods:

- Paleoindian (9500 to 6000 B.C.)
- Archaic (6000 B.C. to A.D. 200)
- Formative (A.D. 200 to 1400)
- Protohistoric (A.D. 1400 to 1540)
- Historic (A.D. 1540 to 1960)

Paleoindian sites are poorly represented within the archaeological record for western Sierra County, probably because the basins to the east, north, and south provided better hunting grounds for the mobile hunters of this time period, whose subsistence practices were focused on now-extinct Pleistocene megafauna. However, previous archaeological research in the area has documented evidence of relatively consistent prehistoric occupation during the Archaic and Formative periods (Evaskovich and Higgins, 1991; Laumbach and Kirkpatrick, 1983; Lekson, 1985; Sechrist and Laumbach, 1995).

The most prevalent archaeological sites in the general area are related to historical mining activities. Gold was discovered in the Hillsboro area in 1877 (Harley, 1934) and subsequent historical mining sites include test pits, shafts, stone-walled cabins, dugouts, tent bases, and abandoned settlements (Sechrist and Laumbach, 1995).

An historical Apache occupation in the area is indicated by the identification of a chipped-glass artifact during a previous survey (Bussey and Naylor, 1975) and the presence of gun-ports in a stone cabin at another site (Evaskovich and Higgins, 1991).

Four previous surveys have been conducted within the vicinity of the proposed project area:

- A reconnaissance survey of approximately 6 square miles was conducted by the New Mexico State University Cultural Resources Management Division (CRMD) in 1975 (Bussey and Naylor, 1975).
- A survey of the power line and water line corridors providing utilities to the mine, an access road, and related industrial sites was performed by the CRMD in 1977 (Breathauer and Hoyt, 1977).
- A Class III (100-percent coverage) pedestrian survey of 147 hectares (363.3 acres) on the eastern slope of Animas Peak was conducted by Evaskovich and Higgins in 1991.
- A 229-hectare (565-acre) Class III pedestrian survey of the Copper Flat area was conducted by Human Systems Research, Inc. (HSR) in 1995 (Sechrist and Laumbach, 1995).

This latter survey is of particular interest for the purposes of the current investigation, as 16 archaeological sites and 212 isolated occurrences were documented at that time. Ten of these sites are historical artifact scatters with associated mining and/or habitation features. These include one standing structure, one stone foundation, one tent camp, one mine tunnel, two locations identified as potentially containing graves, and several artifact scatters. The remaining sites consist of 4 flaked-stone artifact scatters, 1 site with evidence of both prehistoric and historic occupations, and 1 prehistoric petroglyph site. The flaked-stone artifact scatters were reported as likely representing Archaic remains based on the presence of diagnostic artifacts and the overall technological attributes of the assemblages (Sechrist and Laumbach, 1995).

NMCC expects that the sites recorded during HSR's 1995 survey will comprise the majority of the cultural resources identified during the current investigation. However, a few new sites may be discovered; these will likely be consistent in type to those previously recorded.

10.2 Sampling Objectives

Because the project area includes federally administered land and entails land modification activities, the proposed activity is subject to Section 106 of the National Historic Preservation Act (NHPA, P.L. 89-665, as amended). The NHPA requires consideration of the effects that a proposed undertaking may have on historic properties as defined by this legislation.

The purpose of the cultural resource investigation will be to locate and assess all cultural resources and historic properties within the area of potential effects (APE). The APE—and any potential sampling strategy—will be defined in consultation with the BLM and SHPO. However, surveys conducted for land-modifying undertakings are typically intensive (100-percent pedestrian coverage) and sampling is not a common strategy. That said, standard transect intervals vary between 5 and 15 meters (m) (16 and 49 feet [ft]) and may be considered a limited opportunity to increase or decrease the degree of field review. As with the definition of the APE, the width of the proposed survey intervals will be determined in consultation with the BLM and SHPO. In addition, a large percentage of the project area has been extensively disturbed by previous mining activities and the agencies may consider a less-intensive sampling strategy (e.g., 30-m [98-ft] transects) in these areas, or may eliminate them from the survey entirely.

10.3 Sampling Frequency

As stated above, NMCC anticipates conducting an intensive pedestrian survey of the APE that will be limited to a single-episode field investigation and recording effort. Transects may vary, but are likely to be 15 m (49 ft) in width for the entire APE. This technique is the standard for all cultural resource investigations on BLM property and on lands administered by the State of New Mexico.

10.4 List of Data to be Collected

Unless otherwise directed by the BLM and SHPO, no artifacts or other cultural materials will be collected during the proposed investigation. All data will be recorded in the field and all cultural materials will be left in place.

The types of properties or data that may be encountered during the survey of the Site include, but are not limited to, archaeological sites, historical cultural properties (historical period buildings, structures, or objects over 50 years old), historical districts, and isolated manifestations (IMs). An assessment will be made for each resource as to its potential eligibility for nomination to the National Register of Historic Places (NRHP).

10.5 Methods of Collection

Prior to conducting the survey, cultural resource specialists will complete a pre-field records review of the New Mexico Cultural Resources Information System (NMCRIS) database, to obtain information about previously recorded archaeological sites and surveys in the project area and vicinity. In addition, current listings of the NRHP and the New Mexico State Register of Cultural Properties (NMSRCP) will be consulted to determine the known presence of any listed cultural properties or districts within and in the vicinity of the project area. We will also consult with the BLM Las Cruces Field Office to compare the BLM's records with the findings from the other databases.

Resource locations shown on the Hillsboro, NM (1985) and Skute Stone Arroyo, NM (1961) 7.5-minute U.S. Geological Survey (USGS) quadrangle maps will be obtained through the use of Global Positioning System (GPS) receivers. Universal Transverse Mercator (UTM) coordinates will be obtained using both North American Datum (NAD) 27 and NAD 83 projections on a Trimble GeoXM GPS receiver with a positional accuracy of less than 1 m (3.28 ft). Shapefiles of the project area will be created using a geographic information system (GIS) and uploaded to the Trimble GeoXM for cross-referencing purposes. Using ArcPad software, surveyors will follow project boundaries to ensure adequate coverage of the entire survey area. The survey will be conducted by walking parallel transects spaced 15 m (50 ft) apart throughout the entire survey corridor. The GPS-derived locations for IMs and sites will be verified by reference to landscape features and landmarks shown on the USGS quadrangles. All GPS data will then be differentially corrected for sub-meter accuracy.

10.5.1 Site Definition

The definition of a site will follow current BLM guidelines (BLM, 2005), which state that a site is a physical location of past human activities or events, and which further define IMs as sites with fewer than 10 artifacts or a single, undatable feature. Features that may have datable remains, such as deflated thermal features, are also recorded as IMs if they retain little or no integrity and have no associated artifacts.

Following BLM guidelines, sites will be further classified as to whether they are Category 1 or 2, following the current definition in the above-cited guidelines. Category 1 sites are defined as those whose significance lies solely in their potential to yield information under NRHP eligibility Criterion D. These sites are further defined as having small numbers of artifacts (fewer than 15). In addition, they may be classified as containing few or no features (such as soil stains), with no potential for buried cultural deposits (either demonstrated through limited testing or through surface observations—such as when a given site is on bedrock). Category 2 sites are defined as all other sites not falling under the definition of Category 1 sites (BLM Manual Supplement H-8100-1, New Mexico, Oklahoma, and Texas).

10.5.2 Site Recording

All sites will be recorded on Laboratory of Anthropology (LA) Site Record forms. Previously recorded sites are updated using the same form. Supplemental analysis forms are used to record prehistoric and historic artifacts, provide adequate descriptive information for each assemblage, and assign cultural/temporal affiliation, if possible.

Cultural and temporal affiliations will be assigned to sites with diagnostic artifacts and/or features on the basis of widely accepted type descriptions. Complete projectile points and point fragments will be sketched in the field for later typological classification, or to confirm in-field classification. Personnel do not, as a general practice, sketch all diagnostic sherds in the field. Because typological classification of these artifacts is based on numerous technological attributes (e.g., paste color and texture, temper type and size, surface smoothing or polish, and use of mineral or carbon paint) that cannot be efficiently represented in a field sketch for later analysis (in contrast to the primarily morphological attributes of projectile point types), we rely instead on professional experience to conduct in-field analysis of ceramics. Our field crews use field manuals that provide ceramic type descriptions and completed ceramic analysis forms that include entries for typological classification and for various technological and design attributes for artifacts that cannot be confidently classified as to type.

To facilitate relocation, each site will be plotted on the appropriate 7.5-minute USGS quadrangle map and labeled with its LA site number. The location of IMs, site datums, and site boundaries are recorded using a Trimble GeoXM GPS receiver and plotted on the appropriate 7.5-minute USGS quadrangle. Roadcuts and other forms of disturbance are recorded with the GPS receiver at all sites that were designated as having either an eligible or undetermined status regarding inclusion in the NRHP. All GPS data are post-field processed for sub-meter accuracy. The GPS-derived locations for IMs and sites are also verified by reference to landscape features and landmarks shown on the quadrangle maps.

A planview map, drawn to scale, will be prepared for each site and include the following information:

- The assigned LA site number
- The site boundaries and datum location
- A north arrow, scale, and legend
- The location of identified features and the distribution of artifacts
- The location of temporally diagnostic artifacts
- The relationship of site boundaries and cultural remains to known project impact areas, such as roads, and to surrounding environmental features
- The location of photograph points
- The APE boundary

In addition to photographing an overview of the Site, photographs will be taken when necessary for Site documentation, such as when features are visible on sites. Photographs will be logged and their locations plotted on Site sketch maps. Drawings of features and individual diagnostic artifacts will also be produced when applicable.

A site marker will be placed at each of the newly discovered sites. The marker on each site will consist of an aluminum cap attached to a 12-inch piece of rebar. Each marker will be placed within close proximity of the site and noted on the Site planview map.

10.5.3 Isolated Manifestation Recording

Locations with fewer than 10 artifacts or a single, undatable feature are considered IMs. Features that may have datable remains, such as deflated or poorly defined thermal features, are also recorded as IMs if they retain little or no integrity and have no associated artifacts. IMs are plotted on the appropriate 7.5-minute USGS quadrangle map and verified with a GPS receiver in the same manner as described for site locations. IMs are documented on IM recording forms. Information recorded for IMs include the area (for IMs consisting of more than one artifact), artifact types, measurements, frequencies, and sketches of diagnostic artifacts.

10.5.4 Mapping

Mapping of the project area and its resources will be supported by state-of-the-art equipment, including Trimble GPS receivers with submeter accuracy and a Nikon Total Station, along with the newest software including TerraSync and ArcPad 7x. One of the advantages for this technology is that it allows us to produce archaeological site maps that are more accurate and scalable than those created through traditional methods. Using ArcGIS 9x, geo-referenced digital site data can be related to land-use plans and quickly and cost-effectively display how changes or revisions to any undertaking will affect cultural resources. These highly accurate data will be critical in ensuring that the proposed mining activities are in compliance with Section 106 of the NHPA.

At a minimum, the Universal Transverse Mercator coordinates of all IMs, site datums, features, selected artifacts, and site boundaries will be recorded using a handheld Trimble GPS receiver. All spatial data and descriptive information will be stored on the Trimble unit using TerraSync software and data dictionaries produced with Pathfinder Office software. These files are easily copied to desktop computers in the lab where Site maps and Site plans will be generated using ArcGIS 9x. As directed, all data will be provided in applicable GPS-derived shapefiles. All data distribution and management will be in accordance with applicable regulations such as those found in the BLM Manual (2005), Section 304 of the NHPA, Executive Order 13007, and 43 CFR 7.18.

10.5.5 Historical Cultural Properties

In-use historical buildings, structures, and objects will be recorded using the New Mexico Historic Cultural Properties Inventory (HCPI) form. Each building or structure will be photographed and its location recorded with the GPS receiver. Form 1 of the HCPI will be completed for all historical buildings. Form 2 will be completed only for historical buildings that are recommended as being eligible to the NRHP. Acequias will be recorded on the Historic Water Delivery System Inventory Form. These resources will be photographed and their locations recorded with the GPS receiver.

The APE will be evaluated for potential districts and/or landscapes before, during, and after fieldwork using standards outlined in the New Mexico Register (Volume XVI, Issue Number 15, August 15, 2005) and the National Park Service (NPS) National Register Bulletin 30 (McClelland et al., 1999). Other materials used to guide the identification of districts and landscapes include NPS Preservation Brief 36 (Birnbaum, 1994) and the Historic Transportation Corridors thematic issue of Cultural Resource Management (Reilly, 1993). These documents, developed primarily by the NPS, define “landscape,” as a site or a district (36 CFR 60.2) in contrast to terms related to eligibility for the NRHP.

As suggested by the NPS in Bulletin 30 (McClelland et al., 1999), researchers define any potential landscape through their choices of historical contexts, period or periods of significance, potential boundaries, and contributing or non-contributing elements. Defined landscapes are more difficult to characterize than buildings or structures with readily definable physical features and boundaries. However, many landscapes do have tangible features and landscape characteristics resulting from human use.

10.6 Parameters to be Analyzed

All cultural resources encountered during the investigation will be evaluated in terms of their eligibility for listing in the NRHP, using the implementing regulations provided in 36 CFR Part 60.4. Furthermore, project-specific treatment recommendations will be provided for all NRHP-eligible cultural resources that may be subject to adverse effects from the proposed undertaking. Traditional cultural properties will be evaluated following guidance provided in National Register Bulletin 38 (Parker and King, 1998). Human remains and associated funerary objects will be treated in accordance with the Native American Graves Protection and Repatriation Act. All assessments will be conducted in close consultation with the BLM, SHPO, and other appropriate consulting parties.

In most cases, the treatment recommendations for cultural resources will include the following statement:

It is recommended that all project-related activities avoid any cultural resources determined to be eligible for inclusion in the NRHP. If total avoidance is feasible, subject to consultation and comment, the proposed undertaking will have no effect on the documented cultural resources. If complete avoidance is not possible, but the undertaking only affects portions of the sites that lack integrity, the proposed undertaking should have no adverse effect on the qualities that qualify the resources for inclusion in the NRHP. However, if avoidance of potentially intact portions of the site areas is not feasible, then one of two actions is recommended to minimize and mitigate potential adverse effects: (1) The project proponent should prepare a testing and data recovery plan per the New Mexico Administrative Code (NMAC) 4.10.8 and to the standards within NMAC 4.10.16, or (2) the project proponent should prepare a monitoring plan prior to construction per NMAC 4.10.17.11. Either plan should be implemented per agency standards, the NMAC, and in consultation with the SHPO and the Cultural Properties Review Committee (if warranted).

10.7 Map Showing Proposed Sampling Locations

Figure 10-1 illustrates the extent of the mine property. All shaded (yellow) areas will be recommended as the APE—and thus the extent of field investigations, should the BLM and SHPO determine that a survey is required.

10.8 Laboratory and Field Quality Assurance Plans

Accurate work and timely deliverables will be provided. Reporting will follow the standards in BLM manual H-8100-1, Chapter 1.B.1 and Appendix 2 (2005). In addition, work will be performed in compliance with all aspects of the NMAC, including NMAC 4.10.15.

10.9 Discussion in Support of Sampling Proposal

As stated earlier, sampling is not considered a standard strategy for cultural resource investigations in New Mexico. That said, the extent of recent disturbance at the Site may allow for a reduction in the size of the APE defined by the lead and consulting agencies, or a waiver of the requirement to conduct survey. However, within any area that is determined to require survey, NMCC anticipates using a standard 15-m (49-ft) transect interval, which is otherwise defined as an intensive Class III survey. Any modification to the APE, the survey parameters, or the data collection efforts will be the result of consultation with the BLM and the SHPO.

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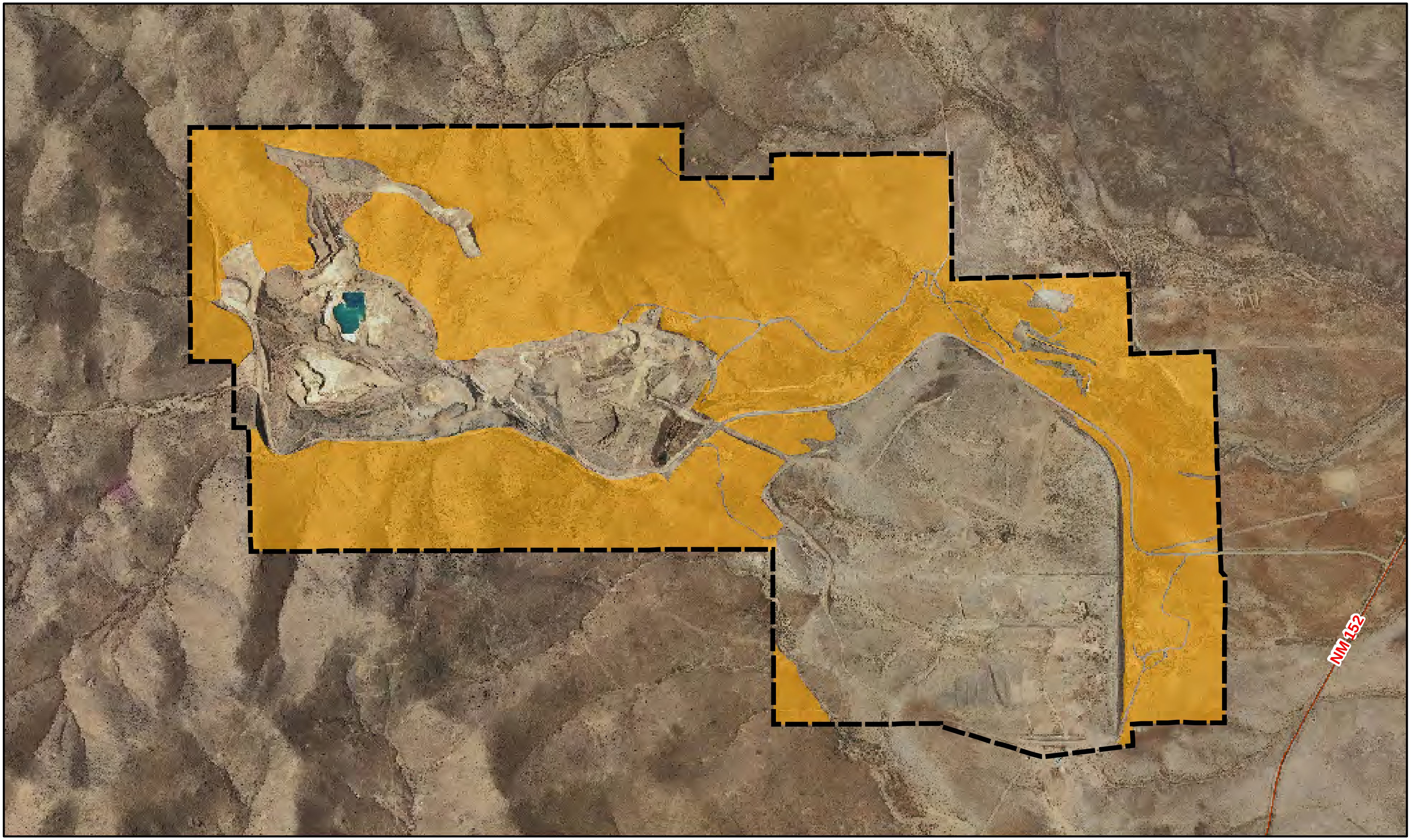
Figure



Mine Boundary:
Tom Van Bebber
Survey:
Parametrix
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
 Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▭ Proposed Mine Permit Boundary

🟧 Proposed Cultural Resources Survey Area

Figure 10-1
Aerial Photograph Showing the Proposed Survey Area for Cultural Resources Investigation

New Mexico Copper Corporation

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11 Present and Historical Land Use

The information in this section is summarized primarily from SRK Consulting (2010) and the U.S. Bureau of Land Management (BLM) (1999). An online review of BLM Master Title Plats and land status on GeoCommunicator, the National Integrated Land System (http://www.geocommunicator.gov/GeoComm/index.shtm) was also performed to check the current status of rights of way (ROW) and other activities on BLM lands.

The Copper Flat Mine Permit Area (Site) and associated noncontiguous mill site claims are located between the communities of Caballo and Hillsboro, north of NM State Highway 152 and south of Animas Peak. It is covered by the Hillsboro 15-minute U.S. Geological Survey (USGS) quadrangle and occupies parts of Sections 30 and 31, Township 15 South, Range 5 West (T15S, R5W); Sections 30 and 31, T15S, R6W; Sections 23 through 27 and 34 through 36, T15S, R7W; Section 6, T16S, R6W; and Section 2, T16S, R7W (all with reference to the New Mexico Principal Meridian). Some of the noncontiguous mill site claims are outside the permit boundary and are associated with water rights and water wells approximately 8 miles east of the Site. The center of the mineralized zone is at approximately latitude 32.970300, longitude −107.533527.

11.1 Present Land Use

11.1.1 Land Ownership and Status

According to the 2010 property tax schedule of the Sierra County Assessor, Hydro Resources Corporation (Hydro) and Cu Flat, LLC (Cu Flat) own all of the fee lands within the permit area except as follows:

- Edgar E. Greer ("Greer") owns the fee surface estate in the lands within the permit area in Sections 30 and 31, Township 15 South, Range 6 West, and has contracted to sell his fee surface estate to Ryan G. and Wendy M. Fancher (the "Fanchers"). The mineral estate in such lands is owned by the United States and is subject to unpatented mining claims owned by Hydro and GCM, Inc. (GCM).
- Greer owns the fee surface and mineral estates in the Cincinnati, Graf Von Luxenburg, and Prosper patented mining claims in Sections 25 and 36, Township 15 South, Range 7 West, and has contracted to sell such claims to the Fanchers.
- The non-fee lands within the permit area are owned by the United States. All such lands are subject to unpatented mining claims owned by Hydro and GCM.

All of the fee lands and unpatented mining claims within the permit area owned by Hydro, Cu Flat, and GCM are subject to the Option and Purchase Agreement described in Section 1.2.5.

NMCC holds an exclusive option to acquire the Copper Flat properties under an Option and Purchase Agreement effective July 23, 2009 (amended on January 10, 2010; April 1, 2010; May 28, 2010; and August 2, 2010). All option payments to date have been made; an additional payment is due in September 2010, and the final payment is to be made in 2011. The Agreement specifies that after its option is exercised NMCC will pay quarterly royalties to Hydro Resources and GCM. The lands covered by the Agreement are not subject to any other royalties, payment obligations, other agreements or encumbrances, or to any back-in rights. However, NMCC must pay New Mexico property taxes on fee and producing the Copper Flat properties and pay the U.S. fees required to maintain the unpatented mining claims and mill sites.

Figure 11-1 shows the property ownership of the Site as of June 23, 2010. Hydro Resources owns the surface and mineral estates the patented mining claims subject to the Option and Purchase Order Agreement. In addition to the surface and mineral estates shown in Figure 11-1, noncontiguous mill site claims located east of the Site that are owned by Hydro Resources and subject to the Option and Purchase agreement are shown in

Figure 11-2. Cu Flat, another of the optioners, owns the surface and mineral estates in the parcels of other fee land included in the Copper Flat property and the surface estate in three other parcels of other fee land. Hydro Resources has title to the surface rights in 132 unpatented mining claims included in the Copper Flat Property and in nine unpatented mill sites outside the permit boundary. Hydro Resources owns an undivided two-thirds interest in the surface rights as well as in the mining rights in 44 unpatented mining claims included in the Copper Flat Property, and GCM, also a vendor to NMCC, owns an undivided one-third interest in the surface and mining rights in those 44 claims. The United States has retained rights to manage and dispose of plant resources and to manage other non-mineral surface resources on the unpatented mining claims.

State lands would not be directly affected by the operation, although a portion of the mine access road in T15S, R6W, Section 32, passes through State Trust lands. Several sections of State land also exist south of the tailings impoundment dam (T16S, R6W, Section 6) and to the west and east of the existing well field (T15S, R6W, Section 36, and T15S, R5W, Section 32, respectively).

Lands adjacent to the Site include federal, state, and private property. Although there are several nearby placer claims held by rock clubs for recreational collecting, there are no known adjacent properties with mineralization similar to that of the Copper Flat Mine.

11.1.2 Land Planning and Regional Land Use

Historically, most of Sierra County has been used for mining, ranching, agriculture, and tourism. The public lands on which the unpatented mining claims and mill sites located at the Copper Flat Site are managed by BLM's Las Cruces Field Office. BLM manages public lands for multiple uses including recreation, range, forestry, mineral extraction and processing, watershed, fish and wildlife habitat, wilderness, and natural, scenic, scientific, and historical values. The current operational land use plan for this region is the 1986 White Sands Resource Management Plan, which covers all BLM-administered lands in Sierra and Otero counties; a new plan, the TriCounty Resource Management Plan, is expected to be approved in early 2011. The White Sands Resource Management Plan identifies the Copper Flat Mine as a mineral resource and recognizes that it could again become a producing mine, although no mining has occurred at the Site since 1982.

The town of Hillsboro, located approximately 5 miles southwest of the Site, has around 100 homes as well as several restaurants, other businesses, and government buildings. Truth or Consequences, approximately 20 miles northeast of the Site, has a population of about 8,000 and is the county seat. Few residences lie within 5 miles of the Copper Flat Mine: the Coalson and Clark ranches are located about 4 miles southeast of the Site and the Golddust Ranch is about 0.1 mile south of the mine and north of Highway 152 (formerly used as Quintana's Site headquarters).

11.1.3 Current Land Use and Structures at Site

Livestock grazing is the primary ongoing land use in the area of the Site. BLM grazing allotments 16040 and 10679 cover the Site, and livestock grazing is permitted in areas adjacent to the Site.

Except for a small viewing structure and a sample storage building, no buildings currently exist on the Site. A state and federally approved water diversion channel exists around the Site area. A 370-acre tailings pond exists at the Site along with two decant towers. Three dumps that were used for waste rock during the 1982 operation of the mine are located near the perimeter of the pit.

11.1.4 Access, Rights of Way, and Water Rights

The Site is accessed from I-25 by 10 miles of paved highway (NM State Highway 152) and about 3 miles of all-weather gravel road. The mine road is gated near the former mine entrance to discourage vehicular access.

Several other unimproved roads provide access to portions of the Site; however, the tailings area is fenced to limit movement of people and cattle.

Electric power in the area is supplied by Sierra Electric Co-op. An existing 115-kilovolt (kV) transmission line is located in a utility corridor that parallels State Highway 152 from the Caballo switching station to the Site. The original mine operation included a 20-megavolt-ampere (MVA) transformer that stepped the power down to 4.16 kV. A 25-kV power line exists that could be used to carry power from the Site to the water well field previously used for the mine (about 8 miles east of the Site). A 20-inch diameter waterline runs from this well field to the Site. This pipeline has no current ROW agreement, having been abandoned by the former owner, Gold Express Corporation (Gold Express). BLM now owns this line; use rights are currently being negotiated. When Hydro Resources reacquired the Site in 2001, 1,019 acre-feet of water rights were also conveyed. If NMCC exercises its option to acquire the Site, these rights will be transferred to NMCC for use at the mine. Many thousands of acre-feet of additional water rights in the area are owned by third parties; negotiations have been initiated by NMCC to acquire some of these rights (SRK, 2010).

11.2 Environmental Liabilities and Permits

The Copper Flat Mine was first permitted by Quintana Minerals (Quintana) during the 1980s. In 1992, a new plan of operations was submitted to BLM and an environmental assessment (EA) was begun by Gold Express, but the operation was never restarted. Alta Gold Company (Alta Gold) acquired the property in the mid-1990s and reinitiated the permitting and approvals process, collecting significant baseline data and submitting applications for all major state and federal permits. Alta Gold declared bankruptcy in early 1999, but not before a draft environmental impact statement (EIS) had been prepared and the associated public comments received; a public hearing had also been held on Alta Gold’s application for a the New Mexico Mining Act Permit and a New Mexico Groundwater Discharge Permit. However, no final permits were issued.

Baseline data collected by Alta Gold, Gold Express, Rio Gold Mining Ltd (Rio Gold), and Quintana is relevant and provides insights for future permitting activity. Five major permits or approvals are needed:

- BLM plan of operation, and subsequent EIS approval
- New Mexico groundwater discharge permit
- New Mexico mining permit
- New Mexico air quality permit
- New Mexico permit for dam construction and operations

These and other permits/approvals are listed in Table 11-1.

11.3 Pertinent Historical Land Use

Ore was first discovered in the Hillsboro district in April 1877, and the town of Hillsboro was established that same year. A number of mining claims were patented for the Site between 1892 and the 1940s; these now form most of the private land occupied by the Copper Flat mine.

In 1952, Newmont began exploration in the district for porphyry copper mineralization by drilling nearly 3,599 ft in six angle holes into the Copper Flat Quartz Monzonite (CFQM) (Kuellmer, 1955). Bear Creek drilled another 9,300+ ft in 1958−1959 in 20 widely spaced core holes, hoping to find an enrichment blanket of secondary copper (which was not found). Both the Newmont and Bear Creek drill and assay data is available (Dunn, 1984). Porphyry copper exploration was advanced by Inspiration again in the late 1960s. Inspiration completed 30 core drill holes by 1973, purchased the patented claims, performed metallurgical work, and completed two water wells on the property (Dunn, 1984).

In 1974, Inspiration leased the property to Quintana, which undertook a comprehensive mine development program with metallurgical work, underground drifting, bulk sampling, and drill hole composite testing (all preformed by the Colorado School of Mines Research Center). The program included detailed geologic investigations into the relationship between the breccia pipe and the quartz monzonite host rocks, as well as the relationship between host rocks and mineralization. An EA was initially prepared for state and federal agencies in 1975, but low copper prices caused the project to be shelved from late 1976 until 1979. At that time, processing methods were reviewed and semi-autogenous grinding and copper-molybdenum flotation separation became the basis for subsequent design work. Mineable reserves were estimated at 60 million standard tons (Mst) with 0.42 percent copper and 0.012 percent molybdenum, plus some gold and silver (SRK, 2010).

With Quintana as the overall project manager, the Copper Flat mine began full production in March 1982 at a rated capacity of 15,000 st a day, a waste-to-ore ratio of 1.8:1, and a cut-off grade of 0.25 percent copper. The combination of low copper prices and high interest rates on the financing loan resulted in the mine closing down just 3 months later, at the end of June. During its short operational period, the mine produced 1.48 million standard tons (Mst) of ore containing 7.4 pounds (lbs) of copper, 2,301 ounces (oz) of gold, and 55,955 oz of silver (SRK, 2010). By the end of 1985, the surface facilities equipment had been sold and the site reclaimed as required by state and federal guidelines. However, all structural foundations, power lines, water wells, and in-ground infrastructure were left in place.

Hydro Resources of Albuquerque, New Mexico, acquired the Copper Flat property, including all royalties, from Inspiration in 1989. Rio Gold and Tenneco Minerals (Tenneco) drilled six large-diameter holes in 1990. Gold Express optioned the property in 1993, and then sold it to Alta Gold in 1994 without performing any exploration or development. A preliminary final EIS for the Alta Gold mining project was issued in March 1999, but Alta Gold went bankrupt (due to financial problems with other assets) before any permits were issued. Hydro Resources reacquired all the properties in 2001 along with all royalties. Hydro Resources maintains an archive of information related to the mine, including over 14,000 sample pulps and skeleton core from the Quintana drilling programs (SRK, 2010).

In 2009 and early 2010, NMCC conducted a sample verification program that included pulp reject analysis and drilling, as part of the requirements for a NI43-101 report on the resources at Copper Flat (SRK, 2010). The program was designed to verify different aspects of the mineralization and geology of the deposit, as well as to comply with new reporting requirements. The drill holes were plugged with bentonite and capped with cement, as required by the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Mining and Minerals Division (MMD). NMCC completed seven drill holes comprising 5,046.5 ft of core. Three of the drill holes terminated prematurely due to bad ground. The drill sites were reclaimed as per MMD requirements (SRK, 2010).

Approximately 60 percent of the proposed Site has been disturbed by previous operations. Remnants of the 1982 mining operation include an open pit and pit lake, a tailings impoundment area, waste rock disposal areas, a number of buried building foundations, and ancillary facilities including decant towers, roads, power transmission lines, and waterlines (Figures 11-3 and 11-4). These features are clearly delineated on BLM geographic information system (GIS) maps and aerial photographs, and have been considered as part of the proposed plan of operations. Although some reclamation was done to the area in 1986, much of the Site remains disturbed (Figure 11-5).

11.4 References

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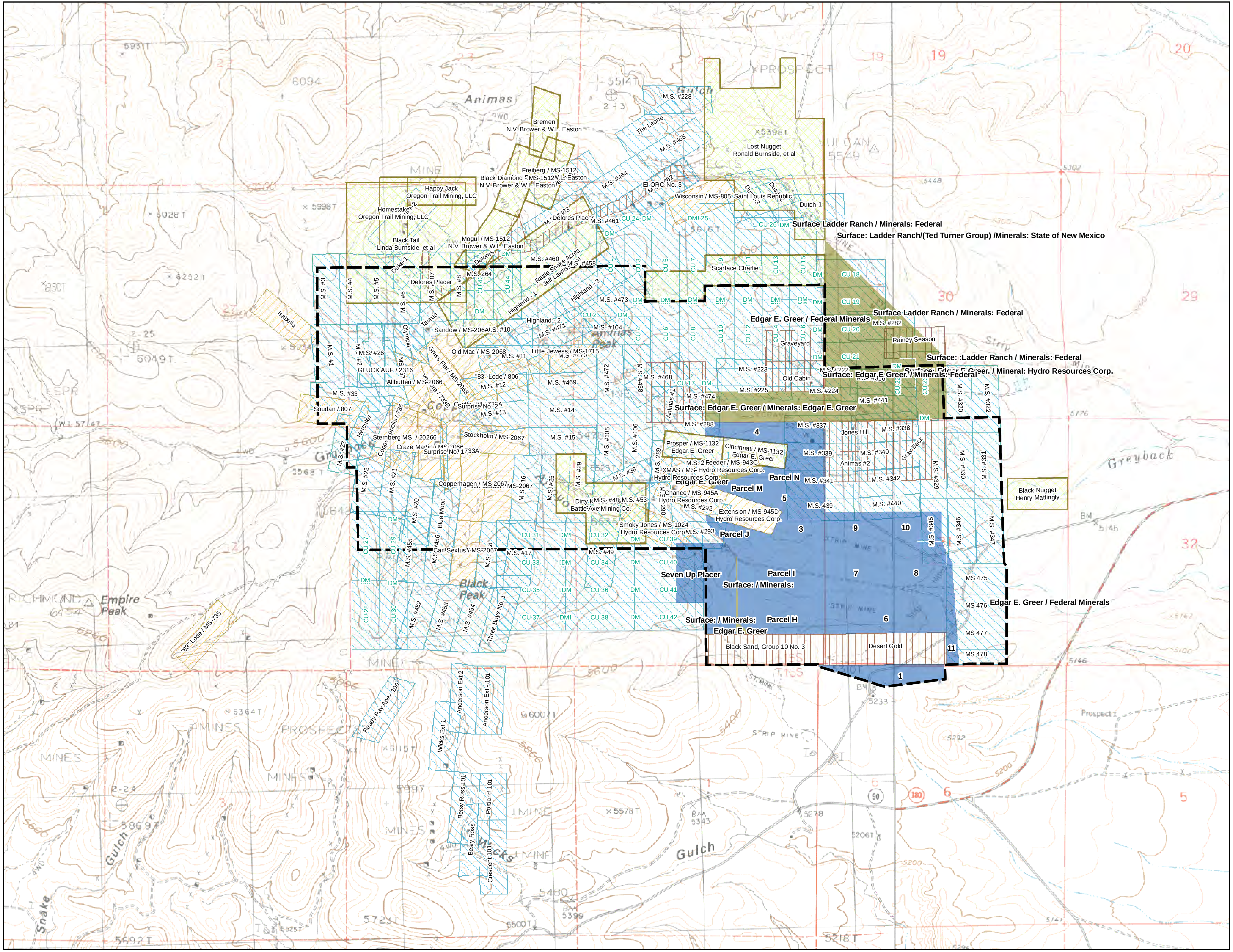
Dunn, P., 1984, Geologic studies during the development of the Copper Flat porphyry deposit: Mining Engineering, February, 1984, p. 151.

Kuellmer, F.J., 1955, Geology of a disseminated copper deposit near Hillsboro, Sierra County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Circular 34, 46 p.

SRK Consulting, 2010, NI-43-101 Preliminary assessment, THEMAC Resources Group Limited, Copper Flat project, Sierra County, New Mexico: Lakewood, Colo. Prepared by SRK Consulting for THEMAC Resource Group Limited, June 30, 2010.

Figures



N

W E

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INTERA

Mine Boundary:
John Reynolds
Claims & Feelands:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minute Quads; Skute
Stone Arroyo & Hillsboro
Projection Information:
-New Mexico State Plane West, NAD 1927

0 1,000 2,000 4,000
Feet

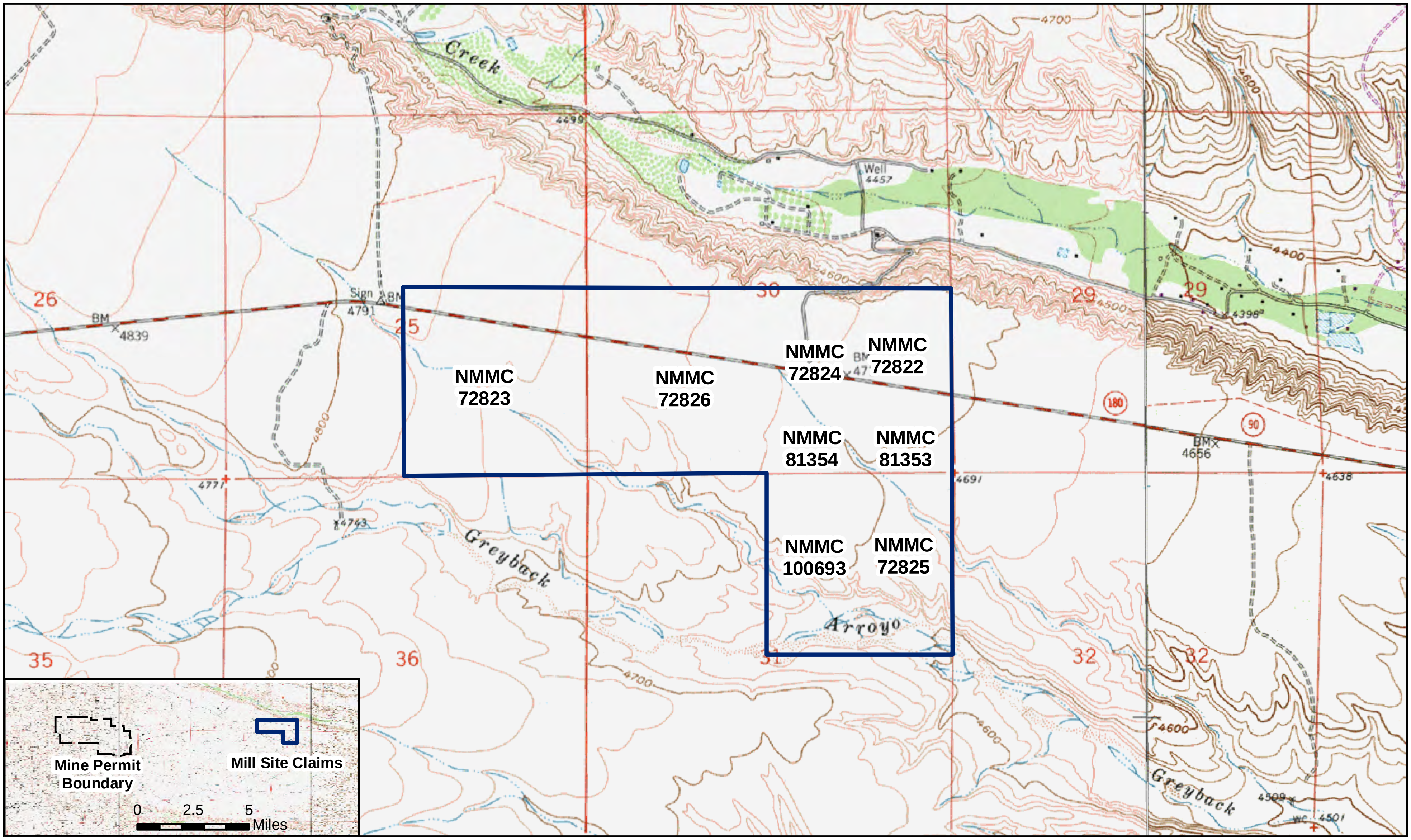
Legend

- ▭ Mine Permit Boundary
- 🟫 Fee, Category 3a
- 🟦 Fee Lands subject to Option Agreement dated July 23, 2009
- ▭ Fee Lands NOT subject to Option Agreement dated July 23, 2009

Figure 11-1
Land Ownership Status

New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\11_Landuse\11-1_land-ownership.mxd 09/03/2010



0 1,000 2,000 4,000 6,000

Feet

Claim Boundary:
SRK, 2010
Imagery Information:
-USGS 7.5-Minutes Quads; Skute Stone Arroyo & Caballo
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▭ Mill Site Claims Boundary

Figure 11-2
Noncontiguous Mill Site Claims
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\11_Landuse\11-2_mill-site-claims.mxd 09/02/2010

from Hydro Resources, Inc.

Figure 11-3
Aerial View to the West at
Copper Flat Mine, 1982

New Mexico Copper Corporation

from Hydro Resources, Inc.

Figure 11-4
Aerial View to the East at
Copper Flat Mine, 1982
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\SAP_7-2010\11_Landuse\11-4_1982photo-east.mxd 07/20/2010

Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ
mosaic Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▭ Proposed Mine Permit Boundary

INTERA

Figure 11-5
Proposed Copper Flat Permit Area with Air Photography

New Mexico Copper Corporation

Table

Table 11-1

Permits and Approvals Required for the Copper Flat Mine

Permit/Approval	Approving/Granting Agency
Federal	
Plan of Operations	U.S. Bureau of Land Management
Nationwide Dredge and Fill Permit (Section 404)	U.S. Army Corps of Engineers
FCC License	Federal Communications Commission
MSHA Registration	Mining Safety and Health Administration
Stormwater Disposal Permit (National Pollutant Discharge Elimination System)	U.S. Environmental Protection Agency
State	
Mining Permit	New Mexico Energy, Mineral and Natural Resources Department-Mining Act Reclamation Bureau
Water Pollution Control Permits	New Mexico Energy, Mineral and Natural Resources Department-Mining Act Reclamation Bureau, Environmental Protection Agency
Surface Disturbance Permit (Air Quality)	New Mexico Environment Department - Air Quality Bureau
Permit to Construct (Air Quality)	New Mexico Environment Department - Air Quality Bureau
Permit to Operate (Air Quality)	New Mexico Environment Department - Air Quality Bureau
Permit to Appropriate Water	New Mexico State Engineer's Office
Permits for Dam Construction and Operations	New Mexico State Engineer's Office
Approval to Operate a Sanitary Landfill	New Mexico Environment Department-Solid Waste Bureau
Tailings Discharge	New Mexico Environment Department-Groundwater Bureau
Cultural Resources Clearance	State Historic Preservation Office

Source: SRK, 2010, Table 2.5.1.1

New Mexico Copper Corporation

Quality Assurance Project Plan

Copper Flat Mine Site

September 2010

Prepared for:

New Mexico Copper Corporation

Submitted to:

Mining and Minerals Division

New Mexico Energy, Minerals and Natural Resources Department

Prepared by:

INTERA

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Abbreviations and Acronyms

CFR	Code of Federal Regulations
COC	chain of custody
CPR	cardiopulmonary resuscitation
DQA	data quality assessment
EPA	United States Environmental Protection Agency
ER	equipment rinsate
FTL	field team leader
ID number	identification number
LCS	laboratory control sample
MDL	method detection limit
MMD	New Mexico Mining and Minerals Division
MQO	measurement quality objectives
MS	matrix spike
NMCC	New Mexico Copper Corporation
NMWQCC	New Mexico Water Quality Control Commission
OSHA	Occupational Safety and Health Administration
PARCC	precision, accuracy, representativeness, completeness, and comparability
PM	Project Manager
PPE	personal protective equipment
PRRL	project-required reporting limits
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RPD	relative percent difference
SAP	sampling and analysis plan
Site	Copper Flat Mine Permit Area
SQL	sample quantitation limits

1 Project Description and Management

This document establishes the quality standards for products and services that have been established within the industry and through government regulations. New Mexico Copper Corporation (NMCC) and its contractors shall meet or exceed these quality standards throughout the duration of this project.

NMCC is currently initiating permitting activities for the re-opening of the Copper Flat Mine located approximately six miles northeast of Hillsboro, New Mexico, in Sierra County (Site). NMCC and its contractors will assess baseline conditions of for climate, vegetation, wildlife, topsoil, surface water, groundwater, and historical and cultural properties.

The project organizational flow chart for NMCC's geosciences and engineering contractor, INTERA Incorporated (INTERA) of Albuquerque, New Mexico, identifies key personnel and their functions (Figure 1). The INTERA Incorporated (INTERA) Program Manager, Cynthia Ardito, is responsible for project direction and quality assurance (QA) for this project. The Project Manager (PM), Peter Castiglia, is responsible for organizing and implementing field activities, project oversight, data management, and report preparation. Mr. Castiglia is also responsible for ensuring that the Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) are appropriately developed and adhered to. The PM, Dr. John Sigda, is responsible for data analysis and modeling. Dr. Sigda will also provide technical support and will assist in data management and report preparation. INTERA's subcontractors include Class One Technical Services, Inc. of Albuquerque, New Mexico, for air quality services, and Hall Environmental Analysis Laboratories (HEAL) for analytical laboratory services. Subcontractor PMs will be responsible for QA, project oversight, data management, and coordination of field activities.

NMCC has contracted with Parametrix Incorporated of Albuquerque, New Mexico, for ecological and cultural resources services. Parametrix will be responsible for data collection for these resource areas. An organizational chart is included as Figure 2. The Parametrix PM, Mr. Jens Deichmann, is responsible for data collection and data quality. For geologic sampling, NMCC has contracted with SRK Consulting Engineers (SRK). The SRK PM is Mr. Mark Willow. The principal geochemist supporting Mr. Willow and overseeing the geologic sampling program is Dr. Robert Bowell.

1.1 Project Definition and Background

A 12-month baseline characterization of pre-mining site conditions must be completed prior to submittal of a Mine Permit Application to the New Mexico Energy, Minerals, and Natural Resources Department Mining and Minerals Division (MMD). As noted previously, this baseline characterization involves sampling, analysis, and assessment of site-specific climatic, vegetation, wildlife, soil, surface water, groundwater, and historical and cultural properties conditions. The MMD requires that a SAP be submitted for agency review. The SAP is a detailed work plan that describes how baseline data will be collected. The SAP must thoroughly describe the proposed sampling methodology and frequency, proposed data sources, and proposed sampling locations to document existing resource conditions within the permit boundary.

1.2 Quality Objectives and Criteria

The following sections present the measurement quality objectives (MQO) identified for this project.

1.2.1 Measurement Quality Objectives for Analytical Laboratory Data

All analytical results for water samples will be evaluated in accordance with precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters to document the quality of the data and promote data that are of sufficient quality to meet the project objectives. With regard to these PARCC parameters, precision and accuracy method blanks will be prepared at the frequency prescribed in the individual analytical method, or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. The subsections below describe each of the PARCC parameters and how they will be assessed for this task.

1.2.1.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

$$\text{RPD} = \frac{\backslash A - B\backslash}{(A + B)} \times 100\%$$

where:

A = First duplicate concentration
B = Second duplicate concentration

Field sampling precision is evaluated by analyzing field duplicates. One duplicate groundwater sample will be collected during the initial groundwater sampling event to establish laboratory analytical precision at the onset of the investigation. The duplicate groundwater sample will be collected by completely filling two separate vials by alternating between the primary sample set and the replicate sample set in the order shown below:

- Fill vial #1 - primary sample set
- Fill vial #1 - replicate sample set
- Fill vial #2 - primary sample set
- Fill vial #2 - replicate sample set

Laboratory analytical precision is evaluated by analyzing matrix (laboratory) duplicates. Results for each laboratory duplicate pair will be used to determine the RPD in order to evaluate precision.

1.2.1.2 Accuracy

A program of sample spiking will be conducted to evaluate laboratory accuracy. This program will include analysis of matrix spike (MS), laboratory control samples (LCS) or blank spikes, and method blanks. The results for the spiked samples will be used to calculate the percent recovery for use in evaluating accuracy.

$$\text{Percent Recovery} = \frac{S - C}{T} \times 100\%$$

where:

S = Measured spike sample concentration
C = Sample concentration
T = True or actual concentration of the spike

Results that fall outside the accuracy goals will be further evaluated on the basis of the results of other quality control (QC) samples.

1.2.1.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent: (1) the characteristics of a population, (2) variations in a parameter at a sampling point, or (3) an environmental condition that they are intended to represent.

Representativeness of data will also be promoted through the consistent application of established field and laboratory procedures. Equipment rinsate (ER) blanks and laboratory blanks will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined to be non-representative by comparison with existing data will be used only if accompanied by appropriate qualifiers.

1.2.1.4 Completeness

Completeness is a measure of the percentage of project-specific data that are valid. Valid data will be obtained when samples are collected and analyzed in accordance with QC procedures as outlined in this QAPP and when none of the QC criteria that affect data usability are exceeded. When all data evaluation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation.

As discussed further in Section 8.0, completeness will also be evaluated as part of the data quality assessment process (EPA, 2000b). This evaluation will help assess whether any limitations are associated with the decisions to be made based on the data collected.

1.2.1.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

1.2.1.6 Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately reproduced in a sample matrix. Project-required reporting limits (PRRL) are contractually specified minimum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for matrix effects. PRRLs, which are established in the project scope of work for subcontract laboratories, are set to establish minimum criteria for laboratory performance. Actual laboratory quantitation limits may be substantially lower.

For this project, analytical methods have been selected so that the PRRL for each target analyte is below the applicable regulatory screening criteria, the New Mexico Water Quality Control Commission (NMWQCC) Standards for groundwater. Also, sample concentrations will be reported as estimated values if concentrations are less than PRRLs but greater than MDLs. The MDL for each analyte will be listed as the detection limit in the laboratory's electronic data deliverable.

1.2.2 Measurement Quality Objectives for Meteorological and Air Quality Data

Laboratory and field quality assurance procedures for meteorological and air quality data are described in detail in Section 2 of the Sampling and Analysis Plan (SAP). Please refer to Section 2.8 of this SAP for more information.

1.2.3 Measurement Quality Objectives for Ecological Data

A single field crew chief will be assigned to ensure data collection is consistent between crews. This individual will review a sub-set of the field forms following each field day. Formalized data collection training will also be completed prior to field sampling. All field botanists will be familiar with plant systematics and techniques to identify plants using taxonomic keys. Plant species not readily identifiable in the field will be collected and preserved for identification at the University of New Mexico Herbarium.

Vegetation material produced during the previous growing season will be discarded before placing samples into a paper bag. Rocks, soil, and/or litter will not be placed into sample bags. Biomass production will only be calculated as an actual dry-weight sample. No double sampling or estimations will occur.

Field data entered into an electronic format such as MS Excel or Access will be evaluated for integrity, consistency, and completeness before data analysis. Oversights or incorrect entries will be corrected. A sub-set of the field forms will be compared to the electronic version for an accuracy assessment. If significant differences are identified, a thorough re-evaluation of each of the forms will be completed.

For wildlife data, field biologists will have a minimum of a BA/BS in Biology and five to ten years of field experience conducting a wide variety of animal surveys ranging from reptiles and amphibians, to birds, mammals, insects, and other invertebrates. This includes experience in recognizing and identifying signs of wildlife. All findings and results will be reviewed by senior scientists.

1.2.4 Measurement Quality Objectives for Cultural Resources Data

Reporting will follow the standards in BLM manual H-8100-1, Chapter 1.B.1 and Appendix 2 (2005). In addition, work will be performed in compliance with all aspects of the NMAC, including NMAC 4.10.15.

1.3 Project Organization

Table 1 presents the roles and responsibilities for key personnel who will be involved in the investigation at the Site. In some cases, more than one responsibility has been assigned to one person.

1.4 Special Training and Certification

This section outlines the training and certifications required to complete the activities described in this QAPP. The following sections describe the requirements for personnel working on-site.

1.4.1 Health and Safety Training

INTERA Personnel who collect water and sediment samples from the Site are required to meet the Occupational Safety and Health Administration (OSHA) training requirements defined in Title 29 of the Code of Federal Regulations (CFR) Part 1910.120(e). These requirements include (1) 40 hours of formal off-site instruction, (2) a minimum of three days of actual on-site field experience under the supervision of a trained and experienced field supervisor, and (3) 8 hours of annual refresher training. Field personnel who directly supervise employees engaged in work at the site shall also receive at least 8 additional hours of specialized supervisor training. The supervisor training covers health and safety program requirements, training requirements, personal protective equipment (PPE) requirements, the spill containment program, and health-hazard monitoring procedures and techniques. Every member of the field team will maintain current certification in the American Red Cross “Multimedia First Aid,” and “Cardiopulmonary Resuscitation (CPR) Modular,” or equivalent.

Copies of health and safety training records, including course completion certificates for the initial and refresher health and safety training, specialized supervisor training, and first aid and CPR training, are maintained in corporate files.

1.5 Documents and Records

Documentation is critical for evaluating the success of any environmental data collection activity. The following sections discuss the requirements for documenting field activities and for preparing laboratory data packages. This section also describes reports that will be generated as a result of this project.

1.5.1 Field Documentation

Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbooks will list a contract name and number, the project number, the site name, the names of subcontractors, the client, and the PM. At a minimum, the following will be recorded in the field logbook:

- Names and affiliations of all on-site personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information
- Discussions of problems encountered and their resolutions
- Discussions of deviations from the SAP or other governing documents
- Descriptions of all photographs taken

The field team may also use the field forms during certain sampling or data collection activities to document field activities. The same level of detail will be required for all field forms used during this investigation. Copies of the completed field forms will be stored in the project file.

2 Data Generation and Acquisition

This section describes the requirements for the following:

- Sampling Design (Section 2.1)
- Field Activities (Section 2.2)
- Sample Handling and Custody (Section 2.3)
- Laboratory Quality Assurance/Quality Control (QA/QC) (Section 2.4)
- Equipment Testing, Inspection, Maintenance, and Calibration (Section 2.5)

2.1 Sampling Design

Samples or data will be collected as outlined in the SAP. The SAP for this project is a collection of quarterly or one-time field sampling or data collection events that were prepared by NMCC and its contractors. Field activities will be implemented to optimize the time spent in the field by adhering to established scientific methods and procedures, leading coordinated field schedules, and sharing data with contractors to minimize duplication of data.

Data collected from these field activities will be used in the mine permitting process. This baseline data will also be useful in the design of mine facilities and as a reference during site reclamation activities.

2.2 Field Activities

Field activities have been broken into eight separate activities. These activities, which are outlined in the SAP, will be used to establish the baseline conditions at the Site:

- Climatological factors – The purpose of the monitoring program will be to collect baseline climatological data representative of the Site that satisfies the criteria of the New Mexico Surface Mining Act and the U.S. Environmental Protection Agency (EPA) on-site meteorological program guidance for dispersion modeling
- Vegetation survey – The purpose of the survey is to delineate current vegetation stratified according to disturbance history and to describe specific vegetation attributes for plant communities delineated within the Site. In addition, the survey will identify the presence of potential habitat for threatened and endangered species.
- Wildlife survey – Delineate and map current habitat, describe wildlife use of the area, complete a bird species inventory, complete a threatened or endangered species survey by comparing known records and habitat requirements with current field conditions to determine the likelihood of occurrence of all federal and state listed wildlife species, and determine species distribution by habitat and season.
- Soil survey and sampling – To determine the suitability of in-place soils in areas of proposed disturbance for use as a topdressing material during reclamation.
- Surface water sampling – To characterize the volumetric flow and water quality of seeps, springs, streams, and the pit lake.
- Groundwater sampling – To obtain necessary data to evaluate quantity and quality of all aquifers at the Site that could be impacted by mining activities, address data gaps identified during evaluation of the Draft EIS (BLM, 1996), meet the requirements set forth in the regulations in NMAC Title 19, Chapter 10, Part 6, and to meet the guidelines set forth in MMD's draft Guidance Document for Part 6 New Mining Operations Permitting under the New Mexico Mining Act.
- Historical and cultural properties survey – To locate and assess all cultural resources and historic properties within the area of potential effects.

2.3 Sample Handling and Custody

The following section describes sample handling procedures, including sample identification and labeling, documentation, chain of custody (COC), and shipping. This section applies to water, sediment, and geologic samples that are submitted to an analytical laboratory. Other sample handling and custody procedures for vegetation and other resources are described, where appropriate, in the SAP.

Each sample collected at the Site will be identified using a unique sample identification (ID) number. The description of the sample type and the point name will be recorded on the COC form, as well as in the field notes. Note that field duplicates and ERs will be given a unique sample ID. The association between primary, duplicate, and ER samples will be noted on the COC form.

A sample label will be affixed to each sample container. The label will be completed with the following information written in indelible ink: project name and location, sample ID number, date and time of collection, preservative used (if applicable), collector's initials, and analysis requested. After labeling, each sample will be refrigerated or placed in a cooler containing ice.

Documentation of sample collection will be completed in permanent black or blue ink in the field logbook. All entries will be legible. The field team leader (FTL) and sampling personnel are responsible for proper documentation of all Site activities.

Standard sample custody procedures will be used to maintain and document sample integrity during collection, transportation, storage, and analysis. COC procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory.

The COC form will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. The laboratory sample custodian will receive all incoming samples, sign the accompanying COC forms, and retain copies of the forms as permanent record. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons delivering the samples, the date and time received, sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks).

All samples will be either hand delivered or shipped to an accredited laboratory. Samples may need to be shipped to the laboratory in order to have them analyzed before the expiration of a particular sample's holding time.

2.4 Laboratory QA/QC

This section applies to water, sediment, and geologic samples submitted to accredited analytical laboratories. To ensure quality of laboratory analysis, the analytical laboratory will be required to analyze QA/QC samples as specified by the analytical methods. The laboratory will analyze method blanks, MSs, and LCSs.

Method blanks will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

MSs will be analyzed at a frequency of 5 percent for soil and aqueous samples. The percent recoveries will be calculated for each of the spiked analytes and used to evaluate analytical accuracy. The RPD between spiked samples will be calculated to evaluate precision.

LCSs, or blank spikes, will be analyzed at the frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to gauge the usability of the data.

Sample quantitation limits (SQL), also referred to as practical quantitation limits, are PRRLs adjusted for the characteristics of individual samples. The PRRLs are chemical-specific levels that a laboratory should be able to routinely detect and quantitate in a given sample matrix. The PRRL is defined in the analytical method or in laboratory method documentation, and incorporates precision (reproducibility) assumptions for the analysis. The SQL takes into account changes in the preparation and analytical methodology that may alter the ability to detect an analyte, including changes such as use of a smaller sample aliquot or dilution of the sample extract. Physical characteristics such as sample matrix and percent moisture that may alter the ability to detect the analyte are also considered. The laboratory will calculate and report SQLs for all environmental samples.

The laboratory activities are overseen by a comprehensive quality assurance program to assure that laboratory practices and results adhere to its policies. The laboratory will provide a standard QA/QC report with all reports. This includes surrogate recoveries, spike recoveries, and method blanks.

The laboratory participates in the Wibby Environmental, third party, proficiency testing program. Wibby is accredited by A2LA and NIST/NVLAP. Results of all proficiency results are sent, by Wibby, to both the laboratory and to their accrediting authorities. The laboratory will also perform proficiency testing on a semiannual basis for all accredited tests. Water proficiencies in the water supply and water pollution studies will be performed in addition to soil proficiencies in hazardous waste pollution studies.

Proficiency results are reviewed by the laboratory manager and all personnel involved in reporting the data. Results that are marked as “check for error” and “unacceptable” are thoroughly reviewed and corrective actions are written for “unacceptable” data.

2.5 Equipment Testing, Inspection, Maintenance, and Calibration

All equipment used during the investigation will be properly tested, inspected, maintained, and calibrated. Samples collected during this investigation will be analyzed using both field and laboratory equipment. Calibration of the field equipment shall be recorded in the field logbook after each calibration event. The calibration procedure for each piece of field equipment used will be outlined in the final report.

The laboratory’s QA plan and written operating procedures describing specific testing, inspection, maintenance, and calibration procedures for equipment will be followed. If required, maintenance procedures and schedules will be performed and documented.

3 Inspection and Acceptance of Supplies and Consumables

PMs have primary responsibility for identifying the types and quantities of supplies and consumables needed to complete projects and are responsible for identifying acceptance criteria for these items.

Supplies and consumables can be received either at the contractor’s office or at a work site. When supplies are received at an office, the PM or FTL will sort them according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before they are accepted for use on a project. If an item does not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order and the item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar. When supplies are received, the PM or FTL will inspect all items against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook and deficient items will be returned for immediate replacement.

Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet EPA standards as described in *Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers* (EPA, 1992).

4 Data Management

All field and analytical data collected during this investigation will be provided to MMD in the Baseline Characterization Report. Field data will be recorded in the logbook and/or field forms and will be included in the appendices. Analytical data will be summarized, tabulated, analyzed, and provided in the body of the final report. The original laboratory data will be provided in an appendix of the final report. Some data may be presented graphically.

5 Assessment, Response Actions, and Reports to Management

NMCC and MMD will oversee collection of environmental data using the appropriate assessment and audit activities. Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. The corrective actions will be discussed with MMD and will be implemented after approval from MMD is received. NMCC will perform routine audits of their subcontractor's performance. In addition, the subcontractor's project managers will ensure that the work done under their assigned tasks complies with the QAPP and will report non compliance, problems, or other issues to NMCC in a timely manner agreed upon between NMCC and its subcontractors.

Effective management of environmental data collection requires: 1) timely assessment and review of all activities, and 2) open communication, interaction, and feedback among all project participants. NMCC and its contractors will use verbal communication with MMD oversight personnel, electronic communication, and monthly status reports to address any project-specific quality issues and to facilitate timely communication of these issues. NMCC and its contractors will develop a communications protocol to communicate with the MMD and solicit the MMD for concurrence with these communication procedures.

6 Data Evaluation and Usability

This section describes the procedures that are planned to review and evaluate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet MQOs for the project.

Review and evaluation of the data generated during field and laboratory activities are essential to obtaining defensible data of acceptable quality. Project team personnel will review field data to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

6.1 Laboratory Data Verification

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any nonconformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

6.2 Laboratory Data Evaluation and Usability

All laboratory data will be evaluated. The data evaluation strategy will not be a full data validation process, but will determine if the analytical results are within the QC limits set for the project. As part of this evaluation, the data usability will be assessed.

7 Reconciliation with User Requirements

After environmental data have been reviewed and evaluated in accordance with the procedures described in Section 7.0, the data must be further evaluated to assess whether MQOs have been met.

To the extent possible, EPA's data quality assessment (DQA) process will be followed to verify that the type, quality, and quantity of data collected are appropriate for their intended use. DQA methods and procedures are outlined in EPA's *Guidance for Data Quality Assessment, Practical Methods for Data Analysis* (EPA, 2000b). The DQA process includes five steps: (1) review the sampling objectives and sampling design, (2) conduct a preliminary data review, (3) select a statistical test, (4) verify the assumptions of the statistical test, and (5) draw conclusions from the data. In the case of water, sediment, and geologic samples, no statistical analysis is planned at this time. Statistical analyses planned for ecological and cultural resources data are defined in Sections 4, 5, and 10 of the SAP.

When the five-step DQA process is not completely followed because the sampling objectives are qualitative, data quality and data usability will be systematically assessed. This assessment will include:

- A review of the sampling design and sampling methods to verify that these were implemented as planned and are adequate to support project objectives.
- A review of project-specific data quality indicators for PARCC and project reporting limits to evaluate whether acceptance criteria have been met.
- A review of project-specific sampling objectives to assess whether they have been achieved by the data collected.
- An evaluation of any limitations associated with the decisions to be made based on the data collected (for example, if data completeness is only 90 percent compared to a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence).

The final report for the project will discuss any potential impacts of these reviews on data usability and will clearly define any limitations associated with the data.

8 References

American Society for Testing and Materials (ASTM), 2000, Standard practice for description and identification of soils (visual-manual procedure): ASTM Standard D 2488-00.

Bureau of Land Management (BLM), 1996, Draft environmental impact statement (DEIS), Copper Flat Project: Las Cruces, N. Mex., U.S. Department of the Interior. Prepared by ENSR, Fort Collins, Colo.

Environmental Protection Agency (EPA), 1992, Specifications and guidance for obtaining contaminant-free sampling containers: Washington, DC, Office of Solid Waste and Emergency Response, EPA/A540/R-93/051. December.

———.2000a, Data quality objectives process for hazardous waste site investigations, EPA QA/G-4HW: Washington, DC, Office of Environmental Information, EPA/600/R-00/007. January.

———.2000b, Guidance for data quality assessment, practical methods for data analysis, EPA QA/G-9, QA00 Update: Washington, DC, Office of Environmental Information, EPA/600/R-96/084. July.

———.2000c, Guidance for the data quality objectives process, EPA QA/G-4: Washington, DC, Office of Environmental Information, EPA/600/R-96/055. August.

Figures

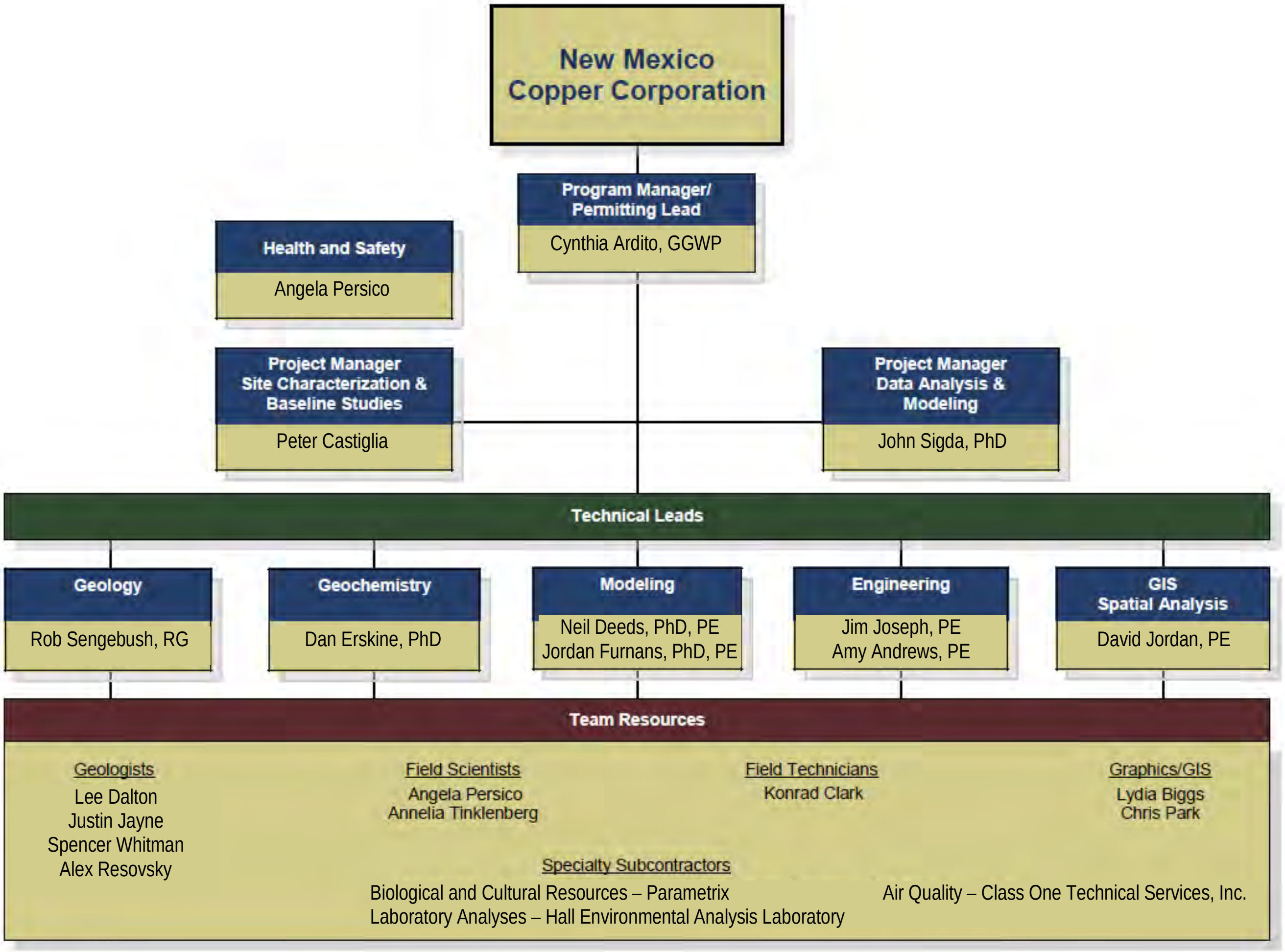

Figure 1. Project Organization

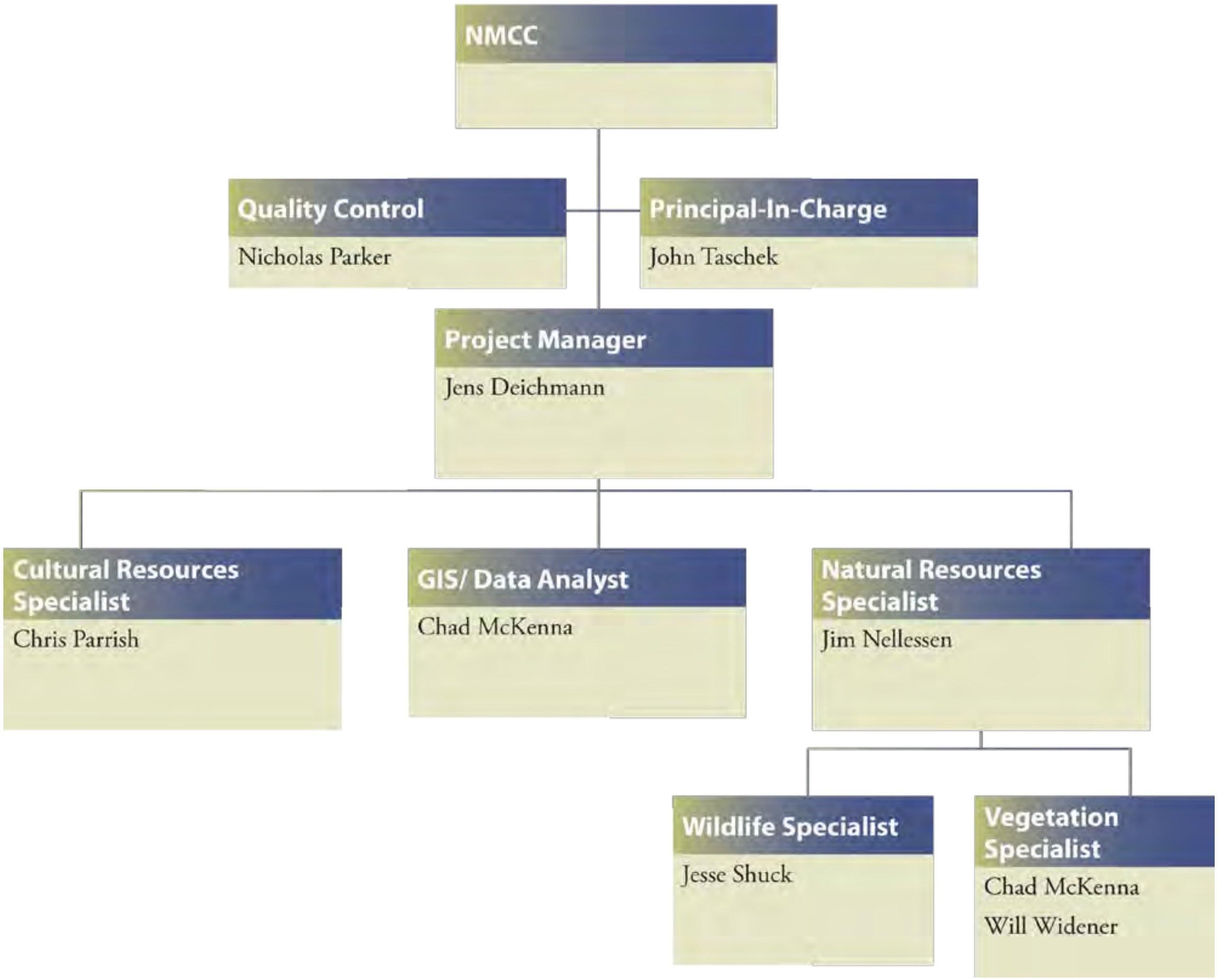

Figure 2. Parametrix Organizational Chart

Table

Table 1
INTERA Key Personnel and Responsibilities

Name	Organization	Role	Responsibilities	Contact Information
Ms. Cindy Ardito	INTERA	Program Quality Assurance (QA) Officer	Participates in development of technical approach. Reviews technical deliverables. Provides technical oversight during data collection	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1206 cardito@intera.com
Mr. Peter Castiglia	INTERA	Project Manager/ Technical Lead	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1217 pcastiglia@intera.com
Mr. Lee Dalton	INTERA	Field Team Leader (FTL) – Groundwater	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1213 ldalton@intera.com
Mr. Justin Jayne	INTERA	Field Team Leader (FTL) – Surface Water	Responsible for directing day-to-day field activities conducted by INTERA and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1220 jjayne@intera.com
Ms. Angela Persico	INTERA	On-Site Safety Officer	Responsible for implementing health and safety plan for determining appropriate site control measures and personal protection levels. Conducts safety briefings for INTERA and subcontractor personnel and site visitors. Can suspend operations that threaten health and safety.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX ext. 1207 apersico@intera.com
Ms. Angela Persico Mr. Spencer Whitman Mr. Konrad Clark Ms. Annelia Tinklenberg	INTERA	Field Sampler(s)	Responsible for collecting representative samples and conducting necessary field activities specified in Sampling and Analysis Plan. Works under supervision of field team leader. Ensures proper sampling and handling procedures.	INTERA Inc. 6000 Uptown Blvd. NE, Suite 220 Albuquerque, NM 87110 (505) 246-1600, (505) 246-2600 FAX

Name	Organization	Role	Responsibilities	Contact Information
Mr. Bob Powell	Class One Technical Services, Inc.	Project Manager	Responsible for overall project execution and for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Class One Technical Services.	Class One Technical Services, Inc. 3500 Comanche Rd. NE Suite G Albuquerque, NM 87107 (505) 830-9680
Mr. Jens Deichmann	Parametrix	Project Manager – Ecological and Cultural Resources	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by Parametrix.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 998-5552 jdeichmann@parametrix.com
Mr. Chris Parrish	Parametrix	FTL - Cultural Resources	Responsible for directing day-to-day field activities conducted for cultural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Jim Nellessen	Parametrix	FTL – Natural Resources	Responsible for directing day-to-day field activities conducted for natural resources by Parametrix and subcontractor personnel. Verifies that field sampling and measurement procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of field activities.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Chad McKenna	Parametrix	Technical Lead – Geographic Information Systems (GIS)	Responsible for directing day-to-day activities conducted for GIS by Parametrix and subcontractor personnel. Verifies that GIS data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of GIS data.	Parametrix Incorporated 8801 Jefferson NE; Bldg. 2 Albuquerque, NM 87113 (505) 821-4700
Mr. Mark Willow	SRK Consulting	Project Manager – Geologic Sampling	Responsible for coordination with regulatory agencies and contractors. Actively participates in Data Quality Objective process. Provides management and technical oversight during data collection by SRK.	SRK Consulting 250 Neil Road, Suite 300 Reno, Nevada 89502 (775) 828-6800 mwillow@srk.com
Dr. Robert Bowell	SRK Consulting	Technical Lead – Geologic Sampling	Responsible for directing day-to-day activities conducted for geologic by SRK and subcontractor personnel. Verifies that geologic data collection procedures follow the Sampling and Analysis Plan. Provides project manager with regular reports on status of geologic data collection and results.	SRK Consulting (UK) Ltd. 5th Floor, Churchill House 17 Churchill Way Cardiff, CF10 2HH, UK +44 (0) 29 2034 8150 egrbowel@srk.co.uk

11-10-2010

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

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Lieutenant Governor

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William C. Olson, Bureau Chief

RON CURRY
Secretary
SARAH COTTRELL
Deputy Secretary

MEMORANDUM

DATE: November 10, 2010

TO: Holland Shepherd, Program Manager, Mining Act Reclamation Program

FROM: Greg Huey, NMED Ground Water Quality Bureau
David Menzie, NMED Surface Water Quality Bureau

THROUGH: Kurt Vollbrecht, NMED Mining Act Team Leader

RE: Comments on New Mexico Copper Corporation, Copper Flat Mine, Sampling and Analysis Plan, Permit no. SI027RN

The New Mexico Environment Department (NMED) received correspondence from the Mining and Minerals Division (MMD) on September 29, 2010 requesting that NMED review and provide comments on the Sampling and Analysis Plan (SAP) referenced above. MMD requested comments be submitted within 30 days of receipt in accordance with the New Mexico Mining Act Requirements. In order to facilitate a sight inspection, that deadline was extended until November 12, 2010. The NMED Surface Water Quality Bureau (SWQB) and Ground Water Quality Bureau (GWQB) have submitted comments in this memorandum jointly.

NMED SWQB Comments:

The introductory paragraph to Section 8, Surface Water, includes the statement "Numerous ephemeral tributaries feed into the Rio Grande from the west, but none contribute perennial flow to the Rio Grande." Lack of perennial flow to the Rio Grande does not negate the fact that both Las Animas Creek and Percha Creek include perennial reaches that support fisheries and water quality must be protected as required under §20.6.4.103 of the New Mexico Administrative Code (NMAC). This paragraph should be reworded to acknowledge the important contribution of these waters of the State as a natural resource.

Section 8.1, Surface Water Characteristics of Site and Vicinity: During the joint agency inspection that was conducted on October 26, 2010 (Inspection), Grayback Arroyo exhibited surface water pools and small flows along a reach of several hundred yards that did not appear to be the result of direct precipitation. In addition, there is significant riparian vegetation indicating that Grayback Arroyo should be classified as an intermittent water of the State pursuant to §20.6.4.98 NMAC. The SAP should acknowledge this classification rather than describing Grayback Arroyo as an ephemeral channel.

Section 8.2, Historical Data: This section states that "Surface water at the Site was most recently investigated by ABC (1996), who collected flow and water quality from Percha Creek and Las Animas Creek." In 2004, the SWQB conducted a water quality survey that included Las Animas Creek and Percha Creek. These data are available from the State through a public records request.

Section 8.6.1.2, Water Quality Sampling: As observed during the Inspection, set up and placement of the automated samplers appeared adequate. SWQB staff did suggest to the applicant that stream sample collection targeting the rising limb of the hydrograph would be preferred since research indicates that the first surge of storm runoff is likely to carry the most pollutants.

Section 9 of the SAP states that the Rio Grande is the only significant surface water resource in the area. This statement is questionable since perennial reaches of the tributaries originating from the eastern side of the Black Range provide important sources of surface water to residents west of the Rio Grande and provide unique riparian and wildlife habitat year round. The SAP then states that Las Animas Creek and Percha Creek are intermittent streams. As previously discussed, these streams contain perennial reaches that support fisheries and should be acknowledged as such.

NMED GWQB Comments:

Section 7.4 of the SAP proposes to review the existing geochemical data prior to determining the locations for collection of additional samples for identification of ore and waste rock zones within the proposed pit outlines. A phased approach is proposed that will contribute to a sampling program focused on the main material types within the proposed pit outlines, with more samples being collected from the material types with the greatest predicted tonnage. NMED agrees that this phased approach is an efficient methodology for identification of geologic strata but requests that addendums to the approved SAP be submitted for agency approval at developmental intervals prior to moving forward with the proceeding stage of geochemical sampling.

Section 7.4.2 states that "exploration drilling is currently ongoing in the expansion areas." During the Inspection, a map of the proposed exploration drilling areas was discussed, but at this time no minimal impact exploration application has been submitted for NMED review. Such an application is necessary before exploratory drilling may proceed.

Section 7.4.3 mentions "a number of field tests" that may be used to determine the geochemistry of specific material types prior to moving on with standard static testing. These field tests should be identified and described in the requested addendum to the SAP for geochemical sampling.

Section 8.6.2.1 discusses using five profiles and two tie lines to determine Pit Lake depth; however, Figure 8-2 shows eight profile lines. This discrepancy should be resolved.

Section 9.1.1 cites Figure 9-2 as depicting three aquifers: the crystalline bedrock aquifer, the Santa Fe Group aquifer system, and the Quaternary alluvial aquifer. Figure 9-2 does not provide any reference to the crystalline bedrock aquifer and does not function as a "conceptual model" of the Site ground water flow system as the title suggests. This figure should be replaced with an appropriately designed diagram.

Section 9.1.2.1 states that ground water elevation data are derived from wells greater than 4,000 feet distance from the Pit Lake, but then states confidently that the ground water gradients in the area are toward the Pit Lake. The section also references Figure 9-6 as demonstrating ground water gradients toward the Pit Lake; however, the vertical scales on opposite sides of this diagram are not coordinated: the scale on the left side of the figure is approximately 80 feet to one inch, while the scale on the right side of the figure is approximately 5 feet to one inch. This gross discrepancy in scale negates the effectiveness of this figure as a tool in ground water gradient interpretation. In addition, the figure, circa 1998, shows the Pit Lake elevation at 5,436.5 ft amsl, while the text in the section reported the Pit Lake elevation at 5,442 ft amsl in 1997 and 5,444 ft amsl in 2010. The section concludes by stating that the Pit Lake elevation remains below the pre-mining **water** level elevation of 5,500 to 5,540 ft amsl. This is in contradiction to the Preliminary Environmental Impact Statement (BLM, 1999) cited previously in the section, which describes pre-mining **ground** elevation as 5,500 to 5,540 ft amsl.

Figure 9-9 shows well EIW as the closest monitoring well to the Pit Lake. However, the SAP does not include water depths in this well or Pit Lake elevations in the monitoring network. A denser monitoring well field may be necessary to delineate a local ground water divide, and the SAP should require that Pit Lake elevation measurements be taken at the same time as water level measurements in adjacent ground water monitoring wells to better define the potentiometric surface across the Site.

Statements regarding site-wide ground water levels should be re-evaluated pending a more thorough hydrological investigation.

Section 9.1.3 states that concentrations of total dissolved solids (TDS) and sulfate down-gradient of the Pit Lake have increased gradually over time and suggests that impacts to water quality in the vicinity of the Pit Lake may be naturally occurring. However, Figure 15 from Raugust (2003) shows an increase in TDS from approximately 550 mg/L to almost 1,000 mg/L between 1996 and 1998 in well GWQ-96-23A. Further review of Raugust (2003) reveals conflicting statements regarding wells in location to the Pit Lake. In the "Study Area Investigations" section, the manuscript states that

> Prior to 1996, only one well was available for sampling groundwater in the vicinity of the pit lake. This monitoring well, GWQ-4, is located approximately one-half mile east of the existing pit.

However, in the "Conclusions" section the manuscript references water quality collected from monitoring well GWQ-5 in 1981. NMED recommends that, rather than adopt conclusions from references not submitted for agency review, NMCC provide appropriate data and develop conclusions based on the analysis of those data.

Section 9.1.5 references the MMD Guidance Document for Part 6 New Mining Operations, stating that the SAP must include supporting material to justify the use of historic data. NMED requests that, regardless of justification, an inventory of all existing data be compiled and reported prior to validation and possible exclusion of these data.

Section 9.3 proposes reducing the number of wells monitored for water quality parameters after the initial four quarters of data collection. NMCC should be aware that under NMED abatement plan requirements and the discharge plan permitting process these wells will require separate evaluation by NMED prior to being removed from any approved sampling plan.

Section 9.4.2 discusses the possible need for installation of additional monitoring wells. New well drilling and installation must meet NMED and NM OSE requirements. New well locations should be proposed to NMED under a Stage One Abatement Plan and/or Discharge Plan proposal. In addition, this section references Table 9-4 for a summary of previous pumping tests and resulting aquifer characteristics. This table does not provide sufficient information to determine the source or validity of the data provided and the SAP should provide for agency review a summary of the individual aquifer tests used to compile these data prior to determination as to the adequacy of the existing data to support the hydrologic impact analysis.

Section 9.7 references Figure 9-9 to provide locations of the wells proposed for sampling in Table 9-2. Well GWQ-12 at the southern end of the tailing disposal facility is not proposed for water quality sampling. As previously stated, well EIW is also not included in the SAP. NMCC should provide justification with supporting data as to why these and other available wells are excluded from the SAP.

During the Inspection, a previously unidentified well was located adjacent to the lower Greyback Arroyo downstream of the tailing dam. It was supposed that this well may be the McCravey-Greyback well. A data review should be conducted for this well and justification for or against its inclusion in the SAP should be included. Furthermore, this well was open to the environment and efforts should be made to properly secure it with an appropriate cap.

Further review and evaluation of the SAP relative to a Ground Water Discharge Permit application and Stage One Abatement Plan may result in additional comments. At this time NMED has not received documentation regarding permitting requirements for the Copper Flat Mine pursuant to the Water Quality Control Commission Regulations (20.6.2 NMAC).

If you have any questions, please contact Greg Huey at (505) 827-1046.

cc: William C. Olson, Chief, GWQB
Marcy Leavitt, Chief, SWQB
Charles Thomas, Chief, Mine Reclamation Bureau
Mary Ann Menetrey, NMED MECS

1-18-2011

New Mexico Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

Harrison H. Schmitt
Cabinet Secretary Designee

Charles Thomas
Acting Division Director
Mining and Minerals Division

7008 1300 0001 6103 4086

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

January 18, 2011

Mr. Steve Raugust
New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110

RE: Review and Comments on Sampling and Analysis Plan, Copper Flat Mine, New Mexico Copper Corporation, Permit No. SI027RN

Dear Mr. Raugust,

Pursuant to 19.10.6.602.D(12) NMAC, the New Mexico Mining and Minerals Division (MMD) has reviewed the submittal from New Mexico Copper Corporation (NMCC) titled, *Sampling and Analysis Plan for Copper Flat Mine* (SAP), dated September 2010, in support of a forthcoming application for a new mine, Permit No. SI027RN, for its proposed Copper Flat copper mine in Sierra County, New Mexico.

After review of the SAP and supporting information, MMD has distributed the SAP and supporting information, Pursuant to 19.10.6.602.D(12)(b) NMAC, to: the New Mexico Environment Department (NMED), the New Mexico Department of Game and Fish (NMDG&F), the New Mexico Office of the State Engineer (NMOSE), the New Mexico Department of Cultural Affairs Historic Preservation Division (NMHPD), the New Mexico State Forestry Division (NMSFD), and the Bureau of Land Management (BLM) for their (Agency) review and comments. MMD has received written comments from NMED, NMOSE, NMDG&F, and the NMHPD, as enclosed. In addition, MMD has reviewed the SAP, and supporting information, and MMD's comments are also enclosed with this letter.

The MMD and Agency review and comments have identified areas where additional information is needed in support of the SAP. Pursuant to 19.10.6.602.D.(12).(b), MMD considers the submittal and evaluation of the SAP complete. NMCC shall address the comments on the SAP in the Baseline Data Report, to be included in the permit application for the Copper Flat Mine. Pursuant to 19.10.6.602.D(12)(c) NMAC, NMCC may request a conference with MMD to discuss the comments on the SAP.

Please be aware that, depending on results of the data collected and development of the operation and reclamation plan yet to be submitted, additional sampling may be required before a permit is issued.

Additionally, please be advised that other permits, from other agencies, will be required regarding the Copper Flat Mine. The information provided by NMCC to MMD may not satisfy the requirements for the eventual approval of any additional permits. NMCC must contact the agencies responsible for those permits, including, but not limited to, the BLM, NMED and NMOSE.

Please contact me at 505-476-3437, or Chris Eustice at 505-476-3438 or at chris.eustice@state.nm.us, if you have any questions.

Sincerely,

Holland Shepherd, Program Manager
Mining Act Reclamation Program (MARP)
Mining and Minerals Division

Enclosures: NMED, Comments on NMCC's Copper Flat SAP, November 10, 2010
NMDG&F, Copper Flat SAP Comments, October 29, 2010
NMHPD, Comments on Copper Flat SAP, October 26, 2010
NMOSE, Comments for Copper Flat SAP, October 12, 2010
MMD Comments on Copper Flat SAP

cc: Chuck Thomas, Executive Manager, Mine Reclamation Bureau
Chris Eustice, Permit Lead, MARP
NMED, Kurt Vollbrecht
DCA, Michelle Ensey
OSE, Kevin Myers
BLM-Las Cruces, Mike Smith
Mine File (SI027RN)

MINING AND MINERALS DIVISION COMMENTS ON THE COPPER FLAT MINE SAMPLING AND ANALYSIS PLAN (SAP)

GENERAL COMMENTS

The SAP needs to commit to collecting appropriate baseline data in conjunction with the planned well field (water supply) and any, and all, associated utility corridor(s).

CHAPTER 1 INTRODUCTION

Figures 1-2 and 1-3 depict the Site permit boundary, but also should depict the associated well field and any related utility corridor(s).

CHAPTER 4 VEGETATION

1. Section 1.1 of the SAP lists approximately 2200 acres as being inside of the Site permit boundary, with a recommended number of 93 randomly selected vegetative transects to be conducted at the Site . MMD recommends additional attention be directed to areas of greater vegetative density and diversity, such as the Greyback Arroyo which intersects the Site from east-to-west. Greyback Arroyo has sections of intermittent wetlands and ephemeral grass/shrub areas. MMD recommends an additional two (2) vegetative transects be conducted in this arroyo region. Additionally, this may be a good area for the sampling of small mammals and reptiles.
2. Section 4.5.1 (page 4-3) of the SAP states, *Some areas (namely previous mining pits) are void of vegetation altogether but reflect the pre-mining vegetation condition in these areas under the current permit application.* NMCC needs to evaluate these areas, taking into consideration that pit areas will will be reclaimed during the reclamation phase of the mining project.

CHAPTER 5 WILDLIFE

1. Live traps, and/or pit-falls, need to be checked early in the day to avoid heat stress in the southern New Mexico climate.
2. In this environment, stick nests are relatively easy to locate in the mesquite, pinon, juniper, and other trees reminiscent of the regional vegetative community. Additionally, raptor surveys will need to be conducted in seasonally appropriate times, as well as diurnally appropriate times, to ensure that adult raptors, that are shading eggs or nestlings, are not frightened away from their nests, thereby risking eggs to be damaged or subject to related heat stresses.

CHAPTER 6 TOPSOIL SURVEY AND SAMPLING

General Comments

Objectives for the Topsoil Survey and Sampling plans are not clear to MMD. In MMD's view, the first objective of the SAP should be to verify and expand upon previous mapping efforts to provide a more detailed map of soil units. After soil units are defined, each unit, assuming that some portion occurs within an area that can be practicably salvaged, should be sampled at least once to provide an estimate of soil quality within that unit. Separate mapping and sampling efforts should lead to estimates of salvageable and suitable soil resources for each mapping unit and a volume estimate of materials across the permit area.

Sections 6.1 and 6.2

1. Section 6.1 notes that "Over 63 percent of the areas targeted by the proposed operation were disturbed" by previous operations. Previously disturbed areas complicate the soil survey. A description of past disturbance impacts to soil seems an important component of any effort to inventory and characterize salvageable resources at the site. For example, the nature and degree of disturbance is not described in the current tailings impoundment, an area that coincides with deeper soils of the Scholle-Ildefonso association, and an area identified in Section 6.9 as a potential source of materials to meet an expected topsoil deficit at the site. Please provide a survey and sampling plan that stratifies major areas, not only by previous mapping information (NRCS), but by the nature and extent of disturbed, versus.native, undisturbed areas, as first step in the construction of a soil inventory.
2. For soils, MMD views the SAP effort as an attempt to inventory soil resources within the permit area in order to enumerate the volumes of suitable and salvageable resources among the various mapped units. Steep slopes that would prohibit safe equipment operation, other areas where salvage would be impractical, as well as unsuitable soil materials, should not be included within this inventory. Further, no assumptions should be made about what amount of soil resources will be required in reclamation. Requirements for soil volumes needed for reclamation will be determined later in the permitting process.

Section 6.5

1. MMD will require that all areas within the permit area be surveyed to provide an estimate of suitable and salvageable soil resources to provide a gross estimate of resources in areas not planned for disturbance, as well as a more refined (Order 1) estimate, supported by sampling, in areas planned for disturbance. Regolith character within soil map units should be described to at least 60 inches in depth, or until materials unsuitable for reclamation or bedrock is encountered. Where soils appear to be deeper and favorable for salvage, such as Scholle-Ildelfonso areas NE of the pit lake, the tailings area and generally along the eastern side of the permit area, additional exploration is warranted to provide a full inventory.
2. Based on the high proportion of gravel and cobble that are common across much of the permit area surface, it seems to MMD that a hand auger may provide little benefit to assess soils, except for the most shallow depths. It is likely that a hand shovel, and/or backhoe tools, may be required to assess soils, to describe "typical" pedons. An experienced soil scientist may often infer soil properties to the full depth of the profile from surface expression if he/she is familiar with soils in the area and how soil is expressed along toposequences. However, some full excavation (shovel/backhoe) will be required to confirm those estimates.
3. Described methods are not clear as to how soil mapping units will be delineated before transects are walked. Using an ArcGIS tool, *the required number of random transects will be placed in each disturbed area*. How is the "required number" of transects determined to produce an Order 1 survey? Are only previously "disturbed" areas to be surveyed, or does this term refer to areas of planned disturbance in the future? The meaning of a statement that "If field conditions do not match the stratum intended, the transect will be moved to a nearby location within the disturbed area" is not clear.

4. The SAP specifies that a total of six soil samples will be obtained. Further, these samples are described as composite samples across the full depth of a sampled profile. Since the NRCS mapping may have missed important map delineations or inclusions that may be important for salvage, this number of samples may be insufficient. Within areas planned for disturbance each mapping unit should be sampled at least once. As is described in the SAP, a high content of carbonates, or excessively high content of coarse fragments, may render a horizon as unsuitable for salvage. Therefore, MMD will not accept samples composited across the full depth of a profile. Each major horizon should be sampled discretely. The appropriate number of soil samples collected should be determined after the mapping units and important inclusions are described by the survey. Methods for description of soil horizons and properties should follow standard methods for soil survey (1993, USDA Soil Survey Manual).
5. Presently, methods to estimate soil texture are described for pre-determined intervals of depth. Visual estimates of soil texture should be limited to gravel and larger-sized fractions only. Hand textures are appropriate for fine-earth fractions. Estimates should be made per distinct pedogenic profile breaks, rather than for fixed depth intervals. Again, methods for description of soil horizons and properties should follow standard methods for soil survey (1993, USDA Soil Survey Manual).
6. Section 6.5.1.2 describes methods to conduct soil sampling where locations are found below a water surface. To MMD, it seems that few, if any, representative samples will be found in these conditions unless some sampling is anticipated in the immediate vicinity of the Grayback drainage. Please clarify.

Section 6.8 and Table 6.2.

1. Potentially conflicting methods are referred to in Section 6.8 and Table 6.2 for laboratory analysis of samples. Section 6.8 refers to more conventional methods used for soils (Methods of Soil Analysis, MOSA) that include important procedures for sample preparation, as well as instrumental analysis. Table 6.2 refers to EPA methods (e.g. 200.7) that are suitable for aqueous samples. Should MMD assume that sample preparation methods described in MOSA will be used for sample preparation and that EPA-described instrumentation will be used for analysis? Please describe sample preparation techniques (filtration, extractants, digestion, etc.) and resolve any conflicts between preparation and analytical methods.
2. Laboratory analytical suite. Please provide both total and plant-available forms of: As, B, Cd, Ca, Cu, Fe, Hg, Mg, Mn, Mo, Ni, P, K, Se, and Zn of fine-earth (<2mm) sample fractions. Soluble forms (only) are sufficient for Cl, Na and nitrate-N ions. Soluble Se should be assessed following hot-water extraction. While high SAR values are not anticipated for this area, SAR may be optionally included in the analytical suite if component ions are measured from paste extracts. The analytical suite should also include calcium carbonate percent, soil paste electrical conductivity, and total organic carbon content. The grain size analysis method proposed (Plumb, 1981) is a non-standard method that may produce results that are difficult to interpret in relation to other data sets. Please select a more standard method for grain size analysis that would utilize sieves (for USDA fine and very fine sand fractions), hydrometer or pipette, and a description of how fractions larger than (USDA, 2 mm) sand will be incorporated to depict full-range particle size description. For particle size analysis, samples containing high content of soluble salts or carbonates may require pre-treatment. USDA classification of particle size is preferred over Unified.

CHAPTER 7 GEOLOGY

1. The summary of the Copper Flat geology in the SAP is excellent and well written. However, the BDR should provide a more specific description of the objective and rational for completing additional geologic sampling to allow a thorough evaluation by MMD and other reviewers. The BDR should provide a clear description of the "professional and scientific judgment" on the part of NMCC and its contractor(s), which would allow for concurrence by MMD or other reviewers. Below is an example of the general nature of the geology section of the sampling and analysis plan:
   a. Page 7-6, paragraph 3, states "additional samples will be required for waste rock characterization in order to create a sample database that is vertically and horizontally representative of waste rock associated with the current project. In addition, ore-grade samples will need to be collected. Following the data review and development of estimated waste rock and ore volumes in Step 1, NMCC's contractor will select sample intervals from exploration drill holes to fill the identified data gaps." Since no analysis of the data gaps appears to have been performed on the historical data prior to submittal of the SAP, nor are the horizontal locations and/or vertical intervals of anticipated future samples clearly identified (see comment No.3 below), MMD is unable to assess whether this plan will result in an adequate horizontal and/or vertical sampling suite for the Baseline Data Report (BDR). The rational for selecting sample intervals must be better described and clarified in the Baseline Data Report.
2. Page 7-5, in the last paragraph, states that the estimated tonnages of waste rock and ore material types will be obtained from a block model, in order to define the number of samples required to characterize each material type, and that the sampling program will focus on the main material types with more samples being collected from the material types with the greatest predicted tonnage. However, Page 7-6, in the last paragraph, states that a field screen will be applied to define a representative sample set, in contrast to selecting a set number of samples based on the predicted amount of waste rock. The statements on these two pages appear contradictory. In the BDR, please clearly state the methodology employed to collect geologic samples and a description of the "field screening" that will be used to define the representative sample set(s).
3. Page 7-7, in the 5th paragraph, states that an estimated 80 samples will be selected for static testing. The SAP then refers the reviewer to Figure 7-5, which shows far more than 80 sampling locations. It is unclear from the description on Page 7-7 and Figure 7-5:
   a. the locations of the ~80 samples that are anticipated to be collected;
   b. the rationale as to why ~80 samples were selected as the appropriate sampling suite (see comment #2 above: was this determined from a tonnage based approach, geologic field screening approach, horizontal spacing, or some combination of these methods?);
   c. whether the samples from 1997 shown in Figure 7-5 represent historic data that already exists or whether these are locations for future laboratory analysis; and
   d. the rationale as to why these locations were selected, if this figure represents future samples to be collected (i.e. data gap in-filling?).

   <u>The BDR should clarify the rationale of the sample locations and sample set size, and correct any inaccuracies in the associated Figures..</u>

CHAPTER 8 SURFACE WATER

1. Section 8.6.1.3 provides a description of stream sediment sampling primarily in conjunction with co-located surface water samples, Pursuant to 602.13.g.(v), the SAP should include a plan to sample

the sediment within drainages, dry or wet, downstream (Greenhorn and Greyback Arroyo's) of the permit area to characterize baseline conditions.

2. The SAP needs to commit to collecting additional sediment samples outside the permit area sufficient to characterize the adjacent drainage systems (e.g. Percha and Los Animas Creeks).
3. To baseline characterize metals in sediment downstream of the site, the surface water drainage systems should be divided into reaches, where appropriate and sampled accordingly. Additionally, the text should provide a description of how the surface water drainages are divided or segmented, and the rational employed.
4. The SAP should include sufficient sediment sampling in adjacent watersheds (e.g. Percha and Los Animas Creeks) to characterize the respective baseline conditions.
5. A figure should be included that depicts the sediment sampling locations.
6. Figure 8.1 seems to have mislabeled the main trunk of Greenhorn Arroyo as "Greyback Arroyo," and should be checked against the text in the second paragraph of Section 8.1

CHAPTER 9 GROUNDWATER

1. The background and regional hydrogeology sections are comprehensive and informative. However, the groundwater section of the SAP is too conceptual in nature. The BDR needs to provide the specifics necessary for MMD to thoroughly evaluate the appropriateness of the plan. The plan appears to rely heavily on professional judgment, on the part of NMCC and/or its contractors, thereby making it difficult for MMD to determine whether the plan will result in a technically complete BDR. Some examples of the general nature of the groundwater sampling plan are listed below:
    a. Page 9-6, Section 9.1.4, describes NMED's concerns about groundwater impacts, and states that "groundwater impacts from the existing unlined tailing impoundment have been documented, but have not been fully characterized." Page 9-9, Section 9.5, states "…if new wells are added to the monitoring well network, they will be constructed in compliance with the NMED Monitor Well Construction Guidelines." The BDR needs to state how this will contribute to defining the baseline conditions.
    b. Page 9-9, Section 9.4.2, states that "based on comments made during Alta Gold's permit application phase, the need to install additional monitoring wells for water level measurement, particularly outside the permit area, will be evaluated."This sentence confuses the reader and needs to be better stated in the BDR
    c. Page 9-9, Section 9.4.2, also states that "the existing [historic aquifer pump test] data and recommendations will be evaluated during the baseline data characterization phase, and a determination will be made as to the adequacy of the existing data to support the hydrologic impact analysis. If necessary, additional aquifer tests may be completed." Again, the BDR should better describe how the "determination will be made as to the adequacy of the existing data to support the hydrologic impact analysis."
    d. The Standard Operating Procedures (SOP) provided in the SAP represent a general methodology and approach to be followed for various tasks, however they do not provide a substitute for specific details to allow evaluation of the adequacy of the sampling plan. For example, while it is generally good to know the SOP for an aquifer pump test, an SOP does not provide the site specific information needed to evaluate the scope of work for a pump test such as which aquifer is being tested, pumping rate (or rates for a step-test) to be utilized, test duration, locations of observation wells, etc. In MMD's opinion, it would have been more

appropriate for NMCC, and/or its contractors, to have reviewed and evaluated the historic groundwater data prior to submittal of the SAP, which would have allowed NMCC and/or its contractors to identify any data gaps that could then be described and subsequently addressed in the SAP. As currently stated in the SAP, it appears that NMCC will be relying on professional and scientific judgment to fill any groundwater data gaps identified in the future (i.e. after submittal and MMD review of the SAP), rather than providing specific details in the SAP for review and comment by MMD. The BDR should describe the "professional judgment" and the rationale of how this will identify data gaps.

2. Section 9.7 and Figure 9-10 illustrate the wells selected for the baseline sampling plan. While the overall groundwater characterization objectives are stated in Section 9.2, the rationale and objective behind selecting the wells listed in Table 9-2 needs to be described in the BDR. For example, only two wells completed within the crystalline bedrock aquifer appear to have been selected for baseline sampling, leading to several questions:
   a. why were these two wells selected as being representative of this aquifer?
   b. are there additional wells completed in the crystalline bedrock aquifer that could have been included or are these the only two completed in this aquifer?
   c. is there reason to believe that additional wells within the crystalline bedrock aquifer are not needed at this time, and if so, why? Figure 9-9 demonstrates that a plethora of wells exist in and around the Copper Flat project area. Without understanding the rationale as to why the wells shown in Figure 9-10 were selected, in lieu of other existing wells, MMD has no way of confirming that the approach proposed by NMCC will result in a technically complete BDR. In the BDR, please provide a general rationale and justification of NMCC's reasoning for selecting the wells listed in Table 9-2 for completion of the baseline sampling.
3. The SAP describes how the monitor wells at or near the toe of the tailings dam, and the Saladone Well north of Las Animas Creek, will be sampled to establish baseline conditions of the Quaternary Alluvial aquifer, but does not provide the rational of how these selected monitor wells will characterize baseline conditions. The proposed eight monitor wells located near the toe of the tailings dam are likely contaminated. NMCC should consider additional Quaternary Alluvium monitor well locations in order to avoid potentially contaminated waters related to the previous mining efforts. Additionally, some rational needs to be provided (in the the BDR) as to why the Saladone Well (or, all monitor well placements) represents baseline Alluvial aquifer conditions. Figure 9-10 and Table 2 (Section 9) do not correlate, as monitor wells GWQ94-18 and MW-11 are not located on Figure 9-10. Please be certain the BDR corrects this, and any other discrepancies.
4. These comments address the requirements of Section 19.10.6.602.(13).(g) NMAC, of the New Mexico Mining Act Rules. Additionally, any information concerning impacts to groundwater, from this project must be addressed through NMED's implementation of the New Mexico Water Quality Commission Regulations 20.6.2 NMAC. MMD will accept any information regarding this subject that has already been, or will be, provided to NMED.

Eustice, Chris, EMNRD

From: Myers, Kevin, OSE
Sent: Tuesday, October 12, 2010 12:01 PM
To: Eustice, Chris, EMNRD
Cc: Johnson, Mike S., OSE; Rappuhn, Doug H., OSE
Subject: NM OSE Comments for Copper Flat SAP - MMD permit No. SI027RN

Chris,

As discussed briefly by phone, here are NM OSE comments related to MMD permit No. SI027RN.

On September 24, 2010 MMD requested that NM OSE comment on the *Sampling and Analysis Plan for Copper Flat Mine* (SAP) dated September 2010 and prepared by INTERA for the New Mexico Copper Corporation (NMCC). The SAP is part of the documentation for a new mine operation, which the applicant proposes to be an open pit copper mine about 5 miles northeast of Hillsboro, NM. As proposed, mine dewatering would take place approximately 14 miles west of Caballo Reservoir, and ground water may be diverted from a well field about 6 miles west of Caballo Reservoir. All diversions will occur within the Lower Rio Grande Underground Water Basin and within the Grayback Arroyo, which is located between Percha and Las Animas Creeks. According to the SAP, molybdenum, gold and silver will be recovered as byproducts.

General Comments:
Overall, the SAP provides a comprehensive overview of the previous studies and details of work to be conducted. Apparently due to the large amount of existing information for some areas, the SAP proposed to complete final decisions through implementation of the plan without additional agency review. Specifically, the SAP implementation will address choices and rationale for the static and kinetic geochemical tests, aquifer tests as well as the location for any additional monitoring wells. The baseline data report may have a higher risk of being incomplete or unsatisfactory because the state agencies would not be involved in the decision process. In general, additional testing or well installation after the baseline data report submittal would take longer than if comments were addressed during the implementation of the SAP. Thus, at a minimum, NMCC should provide state agencies with a draft of these selections and rationales for review before completing the baseline data report.

The SAP mentions involvement of state agencies in the early stages of the flow model development. NM OSE would appreciate inclusion for the NMCC presentations of the conceptual model, and flow model design, calibration and results.

Specific Comments:
NMOSE Hydrology has reviewed the SAP and has the following comments:

1. Page 7-6, Section 7.4.2. Some of the testing completed in the late 1990s included waste rock, tailing and pit wall samples. NMCC should provide a justification (e.g., additional testing or other verification) that previously tested areas have not been significantly changed after an additional 10+ years of weathering.

2. Page 7-7, Sections 7.4.4 and 7.4.5. The SAP defines the number of samples to be selected without providing the distribution or rationale for selecting core samples, rock types and waste types. The SAP proposes to review the existing data before selecting the samples. NMCC should propose a draft rationale and distribution of samples for agency review prior to completing the baseline data report.

3. Page 8-3, Section 8.2. NMCC should provide a tabular summary that shows the historical concentrations measured for pit lake water quality.

4. Page 8-7, Section 8.6.2.1; and Figure 8.2. The text mentions five profiles and two tie lines, while Figure 8.2 shows eight profile lines based on its legend. NMCC should clarify the number of profile lines and tie lines for pit lake sampling.

5. Page 9-2, Section 9.1.2.1; Figure 9-5, Figure 9-6, and Table 9-2. The SAP appears to suggest that previous work pointed toward the pit lake being a hydraulic sink and recent (January 2010) lake levels are below pre-mining water levels. Figures 9-5 and 9-6 do not adequately address or justify the horizontal extent of any hydraulic discontinuity caused by the pit. For Figure 9-5 the 100-foot contour interval and basis (water levels used) do not seem appropriate for making gradient determination that are affected by water level differences of less than 20 feet. The SAP does not include the pit lake or well EIW (closest to the pit lake in Figure 9-9) in the monitoring network. A closely spaced network may be necessary to delineate a local groundwater divide, if a sink exists. NMCC should measure the pit lake level at the same time as water level measurements. NMCC should evaluate the appropriateness of the well network to delineate flow directions and extent if the pit lake is a hydraulic sink or whether the lake exhibits flow through characteristics.

6. Page 9-6, Section 9.1.3; and Figure 9-9. In the SAP, The lower left of Figure 9-9 mentions SRK or OSE mine boundary, yet it's not clear what that may mean or if a symbol should be associated with the text. NMCC should clarify whether wells represented on Figure 9-9 included any wells that may have been drilled since the 1999 BLM study. In order to have a up to date map of wells in the area with water rights, NMCC should revise the map using the online database WATERS through the Water Rights Reporting System http://nmwrrs.ose.state.nm.us/nmwrrs/index.html in conjunction with contacting the NM OSE District IV Office in Las Cruces. The contact is necessary with District IV Office for further research of nearby well records and water rights, which have not yet been fully populated into the WATERS database.

   Andrea Mendoza, Acting District Supervisor

   1680 Hickory Loop - Suite J
   Las Cruces, NM 88004-6598
   (575) 524-6161

7. Figure 9-9. An inset or additional figure is recommended to show the nearby wells that are north of the Production Wellfield (PW-1, PW-2 and PW-3). NMCC should provide well name, well type, diversion amount, location and ownership on a separate table of well information. In order to review the wells

plotted on Figure 9-9, NMCC should label individual wells on a larger format of Figure 9-9 or provide tabular information (e.g., shape file and attribute table with well names).

8. Page 9-6, Section 9.1.3; and Page 1-4, Section 1.4.1. After a cursory review of the Raugust (2003) report presented at American Society of Surface Mining conference, NMCC should review Raugust (2003) in greater detail. For example, the Raugust (2003) concludes a "slight" increase in sulfate concentrations and TDS measured at the pit lake when these parameters doubled (2,000 to 4000 and 3,000 to 6,000 mg/L, respectively) from 1989 to 1997. Raugust (2003) also mentions the "slight" increase in sulfate concentrations and TDS for a down gradient well from the pit lake, when these parameters approximately doubled or more (140 to 450 and 520 to 990 mg/L) at well 96-23A from 1989 to 1997. Doubting the water quality trend shown in the report and citing the ore body as the source of poorer water quality, Raugust (2003) states, "*...Groundwater quality down-gradient of the mine pit deteriorated with respect to sulfate and TDS from 1996 to 1998; however, more time-based sampling data would be required to ascertain whether this is a real trend or transient phenomenon.... It appears from the existing data that the ore body is likely the most significant contributor to water quality down-gradient of the pit, and that additional data would be useful in evaluating this hypothesis.*" The above significant water quality trends should be evaluated further by including NMED samples with laboratory results from 2003 and 2008 as well as SAP results.

9. Pages 9-8 to 9-9, Section 9.3. After the initial minimum of four quarters of water quality and water level data collection, NMCC proposes to reduce the number of wells to ten for water quality sampling and in consultation with MMD. NMCC should note that NMED would also require consultation under discharge plan and abatement plan regulations or permit conditions. NMCC should clarify if it intends to continue water level measurements at the reduced ten wells or some larger network.

10. Page 9-9, Section 9.4.2.; and Page 9-9, Section 9.5. The SAP mentions the possibility or potential need for adding new wells. As the SAP is implemented, the new well locations would be identified. New well drilling and installation must meet NM OSE regulations 19.27.4 NMAC. Prior to the submittal of the baseline data report, NMCC should provide any proposed well locations and rationale to state agencies (e.g., MMD, NMED and NMOSE) for review.

11. Page 9-9, Section 9.4.2; Page 9-23, Section 9-9; and Table 9-4. The SAP provides a summary of previous aquifer test results in the vicinity of the proposed Copper Flat project. The table and text lack enough information to review the aquifer test results or determine how many tests were completed for each aquifer and the location. NMCC should provide a detailed summary of the individual aquifer tests including location, duration of test, type of analyses, number of tests, aquifer, etc. If additional aquifer testing is necessary, NMCC should provide a proposal for further aquifer testing for agency review prior to submittal of the baseline data report.

12. Pages 9-23 & 9-24, Section 9.9. The SAP outlines a process for developing a new numerical model using either MODFLOW or MODFLOW-SURFACT. The SAP mentions presenting the conceptual model, preliminary numerical model domain, preliminary numerical model results to relevant agencies. According to the SAP, water diversions would occur at the mine site and at a well field about eight miles east of the mine. NMCC should clarify in its conceptual model whether the model will address these diversions for mine dewatering and fresh water production.

13. Page 11-3, Section 11.2; and Table 11-1. The SAP list five major permits or approvals (BLM Plan of Operations & EIS, NMED GWQB discharge permit, MMD mining permit, NMED AQB air quality permit, NMOSE Dam Safety permit for dam construction and operations). Table 11-1 includes a NM OSE permit to appropriate water. In Table 11-1, NMCC should include a NM OSE permit for mine dewatering. NMCC should note that, for protested applications or if nearby water rights are significantly affected, the NM OSE permit to appropriate water may require a substantial effort to complete.

If you have any questions about the above, contact me.

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Deputy Secretary

MEMORANDUM

DATE: November 10, 2010

TO: Holland Shepherd, Program Manager, Mining Act Reclamation Program

FROM: Greg Huey, NMED Ground Water Quality Bureau
David Menzie, NMED Surface Water Quality Bureau

THROUGH: Kurt Vollbrecht, NMED Mining Act Team Leader

RE: Comments on New Mexico Copper Corporation, Copper Flat Mine, Sampling and Analysis Plan, Permit no. SI027RN

The New Mexico Environment Department (NMED) received correspondence from the Mining and Minerals Division (MMD) on September 29, 2010 requesting that NMED review and provide comments on the Sampling and Analysis Plan (SAP) referenced above. MMD requested comments be submitted within 30 days of receipt in accordance with the New Mexico Mining Act Requirements. In order to facilitate a sight inspection, that deadline was extended until November 12, 2010. The NMED Surface Water Quality Bureau (SWQB) and Ground Water Quality Bureau (GWQB) have submitted comments in this memorandum jointly.

NMED SWQB Comments:

The introductory paragraph to Section 8, Surface Water, includes the statement "Numerous ephemeral tributaries feed into the Rio Grande from the west, but none contribute perennial flow to the Rio Grande." Lack of perennial flow to the Rio Grande does not negate the fact that both Las Animas Creek and Percha Creek include perennial reaches that support fisheries and water quality must be protected as required under §20.6.4.103 of the New Mexico Administrative Code (NMAC). This paragraph should be reworded to acknowledge the important contribution of these waters of the State as a natural resource.

Section 8.1, Surface Water Characteristics of Site and Vicinity: During the joint agency inspection that was conducted on October 26, 2010 (Inspection), Grayback Arroyo exhibited surface water pools and small flows along a reach of several hundred yards that did not appear to be the result of direct precipitation. In addition, there is significant riparian vegetation indicating that Grayback Arroyo should be classified as an intermittent water of the State pursuant to §20.6.4.98 NMAC. The SAP should acknowledge this classification rather than describing Grayback Arroyo as an ephemeral channel.

Section 8.2, Historical Data: This section states that "Surface water at the Site was most recently investigated by ABC (1996), who collected flow and water quality from Percha Creek and Las Animas Creek." In 2004, the SWQB conducted a water quality survey that included Las Animas Creek and Percha Creek. These data are available from the State through a public records request.

Section 8.6.1.2, Water Quality Sampling: As observed during the Inspection, set up and placement of the automated samplers appeared adequate. SWQB staff did suggest to the applicant that stream sample collection targeting the rising limb of the hydrograph would be preferred since research indicates that the first surge of storm runoff is likely to carry the most pollutants.

Section 9 of the SAP states that the Rio Grande is the only significant surface water resource in the area. This statement is questionable since perennial reaches of the tributaries originating from the eastern side of the Black Range provide important sources of surface water to residents west of the Rio Grande and provide unique riparian and wildlife habitat year round. The SAP then states that Las Animas Creek and Percha Creek are intermittent streams. As previously discussed, these streams contain perennial reaches that support fisheries and should be acknowledged as such.

NMED GWQB Comments:

Section 7.4 of the SAP proposes to review the existing geochemical data prior to determining the locations for collection of additional samples for identification of ore and waste rock zones within the proposed pit outlines. A phased approach is proposed that will contribute to a sampling program focused on the main material types within the proposed pit outlines, with more samples being collected from the material types with the greatest predicted tonnage. NMED agrees that this phased approach is an efficient methodology for identification of geologic strata but requests that addendums to the approved SAP be submitted for agency approval at developmental intervals prior to moving forward with the proceeding stage of geochemical sampling.

Section 7.4.2 states that "exploration drilling is currently ongoing in the expansion areas." During the Inspection, a map of the proposed exploration drilling areas was discussed, but at this time no minimal impact exploration application has been submitted for NMED review. Such an application is necessary before exploratory drilling may proceed.

Section 7.4.3 mentions "a number of field tests" that may be used to determine the geochemistry of specific material types prior to moving on with standard static testing. These field tests should be identified and described in the requested addendum to the SAP for geochemical sampling.

Section 8.6.2.1 discusses using five profiles and two tie lines to determine Pit Lake depth; however, Figure 8-2 shows eight profile lines. This discrepancy should be resolved.

Section 9.1.1 cites Figure 9-2 as depicting three aquifers: the crystalline bedrock aquifer, the Santa Fe Group aquifer system, and the Quaternary alluvial aquifer. Figure 9-2 does not provide any reference to the crystalline bedrock aquifer and does not function as a "conceptual model" of the Site ground water flow system as the title suggests. This figure should be replaced with an appropriately designed diagram.

Section 9.1.2.1 states that ground water elevation data are derived from wells greater than 4,000 feet distance from the Pit Lake, but then states confidently that the ground water gradients in the area are toward the Pit Lake. The section also references Figure 9-6 as demonstrating ground water gradients toward the Pit Lake; however, the vertical scales on opposite sides of this diagram are not coordinated: the scale on the left side of the figure is approximately 80 feet to one inch, while the scale on the right side of the figure is approximately 5 feet to one inch. This gross discrepancy in scale negates the effectiveness of this figure as a tool in ground water gradient interpretation. In addition, the figure, circa 1998, shows the Pit Lake elevation at 5,436.5 ft amsl, while the text in the section reported the Pit Lake elevation at 5,442 ft amsl in 1997 and 5,444 ft amsl in 2010. The section concludes by stating that the Pit Lake elevation remains below the pre-mining **water** level elevation of 5,500 to 5,540 ft amsl. This is in contradiction to the Preliminary Environmental Impact Statement (BLM, 1999) cited previously in the section, which describes pre-mining **ground** elevation as 5,500 to 5,540 ft amsl.

Figure 9-9 shows well EIW as the closest monitoring well to the Pit Lake. However, the SAP does not include water depths in this well or Pit Lake elevations in the monitoring network. A denser monitoring well field may be necessary to delineate a local ground water divide, and the SAP should require that Pit Lake elevation measurements be taken at the same time as water level measurements in adjacent ground water monitoring wells to better define the potentiometric surface across the Site.

Statements regarding site-wide ground water levels should be re-evaluated pending a more thorough hydrological investigation.

Section 9.1.3 states that concentrations of total dissolved solids (TDS) and sulfate down-gradient of the Pit Lake have increased gradually over time and suggests that impacts to water quality in the vicinity of the Pit Lake may be naturally occurring. However, Figure 15 from Raugust (2003) shows an increase in TDS from approximately 550 mg/L to almost 1,000 mg/L between 1996 and 1998 in well GWQ-96-23A. Further review of Raugust (2003) reveals conflicting statements regarding wells in location to the Pit Lake. In the "Study Area Investigations" section, the manuscript states that

> Prior to 1996, only one well was available for sampling groundwater in the vicinity of the pit lake. This monitoring well, GWQ-4, is located approximately one-half mile east of the existing pit.

However, in the "Conclusions" section the manuscript references water quality collected from monitoring well GWQ-5 in 1981. NMED recommends that, rather than adopt conclusions from references not submitted for agency review, NMCC provide appropriate data and develop conclusions based on the analysis of those data.

Section 9.1.5 references the MMD Guidance Document for Part 6 New Mining Operations, stating that the SAP must include supporting material to justify the use of historic data. NMED requests that, regardless of justification, an inventory of all existing data be compiled and reported prior to validation and possible exclusion of these data.

Section 9.3 proposes reducing the number of wells monitored for water quality parameters after the initial four quarters of data collection. NMCC should be aware that under NMED abatement plan requirements and the discharge plan permitting process these wells will require separate evaluation by NMED prior to being removed from any approved sampling plan.

Section 9.4.2 discusses the possible need for installation of additional monitoring wells. New well drilling and installation must meet NMED and NM OSE requirements. New well locations should be proposed to NMED under a Stage One Abatement Plan and/or Discharge Plan proposal. In addition, this section references Table 9-4 for a summary of previous pumping tests and resulting aquifer characteristics. This table does not provide sufficient information to determine the source or validity of the data provided and the SAP should provide for agency review a summary of the individual aquifer tests used to compile these data prior to determination as to the adequacy of the existing data to support the hydrologic impact analysis.

Section 9.7 references Figure 9-9 to provide locations of the wells proposed for sampling in Table 9-2. Well GWQ-12 at the southern end of the tailing disposal facility is not proposed for water quality sampling. As previously stated, well EIW is also not included in the SAP. NMCC should provide justification with supporting data as to why these and other available wells are excluded from the SAP.

During the Inspection, a previously unidentified well was located adjacent to the lower Greyback Arroyo downstream of the tailing dam. It was supposed that this well may be the McCravey-Greyback well. A data review should be conducted for this well and justification for or against its inclusion in the SAP should be included. Furthermore, this well was open to the environment and efforts should be made to properly secure it with an appropriate cap.

Further review and evaluation of the SAP relative to a Ground Water Discharge Permit application and Stage One Abatement Plan may result in additional comments. At this time NMED has not received documentation regarding permitting requirements for the Copper Flat Mine pursuant to the Water Quality Control Commission Regulations (20.6.2 NMAC).

If you have any questions, please contact Greg Huey at (505) 827-1046.

cc: William C. Olson, Chief, GWQB
Marcy Leavitt, Chief, SWQB
Charles Thomas, Chief, Mine Reclamation Bureau
Mary Ann Menetrey, NMED MECS

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RECEIVED
NOV 03 2010
MINING & MINERALS DIVISION

October 29, 2010

Chris Eustice, Permit Lead
EMNRD Mining & Minerals Division
1220 South St. Francis Drive
Santa Fe, NM 87505

Re: Copper Flat Mine Sampling and Analysis Plan, Permit SI027RN; NMDGF Project No. 13803

Dear Mr. Eustice:

In response to your letter dated 24 Sep, 2010, the New Mexico Department of Game and Fish (NMDGF) has reviewed the above referenced document. New Mexico Copper Corporation has submitted the plan in support of a new mine permit application. The project will be a copper mine and mill, located approximately five miles northeast of Hillsboro, NM. The proposed permit area includes 2,190 acres of mixed private and Bureau of Land Management surface ownership. A site visit was conducted on 26 Oct 2010. Persons present included you, Holland Shepherd, Joe Vinson and David Ennis (MMD), Rachel Jankowitz and Pat Mathis (NMDGF), Greg Huey and Dave Menzie (NMED) and Steve Raugust (NMCC). Habitat type on the project area is grass and shrubs with a prominent drainage channel (Greyback Arroyo) running from west to east through the middle. Remnants of previous mining activity include an open pit lake, roads, a drainage channel diversion around the pit and several assorted manmade structures.

The methods proposed for vegetation baseline monitoring are appropriate and sufficient. The following comments pertain to the proposed plan's vegetation type stratification:

1. The selected vegetation type stratification scheme utilizes Natural Resource Conservation Service Ecological Site Descriptions (ESD). If the delineation of the two ESDs present on site, shown in Figure 4-2, is derived from large scale mapping, the boundary should be ground-truthed, using visual observation in conjunction with soil characteristics.

2. The apparent reason for assigning undisturbed areas "planned to be disturbed in the future" to separate strata from those not planned for disturbance, is to verify the similarity between them in the undisturbed condition. If no significant difference in vegetation is discovered by initial monitoring, these data should be combined in the description of baseline pre-mining conditions.

3. Vegetation in the Greyback Arroyo is extensive and distinct enough to constitute one or more distinct monitoring strata. NMDGF recommends that arroyo vegetation be described in a quantitative or semi-quantitative manner, including both the narrow intermittent wetland sections and the ephemeral grass/shrub association on the eastern portion of the project area. Extent mapping and a comprehensive species list might be used to describe wetland areas which are too small for transect monitoring.

4. If noxious weeds are discovered, please document the extent and density of infestation, as well as the point location.

The methods proposed for wildlife baseline monitoring are appropriate, but insufficient to describe the mine site fauna. Detailed recommendations are presented in the NMDGF baseline study guideline, available on the internet at http://wildlife.state.nm.us/conservation/habitat_handbook/documents/WildlifeBaselineStudyGuidelinesand%20Appendix.pdf. A list of special status species known to occur in Sierra County is enclosed with this letter. Please consult the NM Rare Plant Technical Council website (http://nmrareplants.unm.edu/) for a county list of rare plants.

We suggest the following additions to the plan:

1. An off-site reference area should be selected for monitoring similar to that which will be conducted on the mine site. The reference area will serve to provide comparable data for the purpose of identifying and interpreting trends in wildlife usage through the mine operating and reclamation periods.

2. Most reptiles and small mammals are nocturnal. Some are difficult to identify when not in hand. Diurnal observation transects should be supplemented by a trapping or capture program to characterize the reptile and small mammal communities. State or federal permits may be required if monitoring activity is expected to involve handling of listed species

3. The proposed plan will not adequately characterize bat use of the site. Potential roosting habitat is present in rock crevices, and in existing structures or historic mine openings. The pit lake constitutes a large open water source which is likely to attract foraging bats from a wide surrounding area. The applicant should propose a bat monitoring program which utilizes acoustic detection, roost observation and/or netting. As stated above, state or federal permits may be required if monitoring activity is expected to involve handling of listed species

4. NMDGF recommends a survey for raptor nests in all suitable habitat within one mile of any potential mine-related disturbance.

5. In addition to the proposed transects, conduct focused observation of special habitat features. Those features at Copper Flat might include the pit lake and wetland locations. Surveys for amphibians would be appropriate at perennial or ephemeral aquatic locations.

6. Pellet counts and observational transects for large to medium sized animals should be conducted twice per year, to account for variation in seasonal use. Please record the sex and age class of animals observed.

The Mining Act Rules state that the SAP shall "describe the environment of the proposed permit area and, to the extent practicable, the affected area." Studies associated with the previous attempt to permit a mine at this site, in the 1990s, vary widely and are inconclusive regarding the aerial and vertical extent of groundwater drawdown that may result from pit dewatering and wellfield pumping. (for an example, refer to the BLM Draft Environmental Impact Statement dated February 1996 and the Daniel B. Stevens & Associates Environmental Evaluation Report dated February 1998). Wildlife habitat which might be affected include Las Animas Creek and its riparian zone, Percha Creek and riparian habitat in the Percha Box, Warm Springs Canyon and a number of warm- and cold-water springs and seeps in the vicinity. Monitoring of surface flow, groundwater level and water quality at these habitat features will provide most of the information needed to determine whether they are impacted by mine operations. However, biotic and ecological responses to changes in water quantity or quality may not be linear, and baseline information is not currently available. In areas where a risk of potential impact may be identified, and surface access can be obtained, the applicant should monitor and describe the characteristics of riparian vegetation and amphibian, fish and invertebrate communities, with special attention to the potential occurrence of special status species.

Thank you for the opportunity to comment on this baseline data sampling plan. If there are any questions, please contact Rachel Jankowitz at 505-476-8159, or rjankowitz@state.nm.us.

Sincerely,

Matthew Wunder

Matthew Wunder, Ph.D.
Chief, Conservation Services Division

xc: Wally Murphy, Ecological Services Field Supervisor, USFWS
Pat Mathis, SW Area Habitat Specialist, NMGF
Kurt Vollbrecht, NMED Groundwater Quality Bureau

NEW MEXICO WILDLIFE OF CONCERN
SIERRA COUNTY

For complete up-dated information on federal-listed species, including plants, see the US Fish & Wildlife Service NM Ecological Services Field Office website at http://www.fws.gov/ifw2es/NewMexico/SBC.cfm. For information on state-listed plants, contact the NM Energy, Minerals and Natural Resources Department, Division of Forestry, or go to http://nmrareplants.unm.edu/. If your project is on Bureau of Land Management, contact the local BLM Field Office for information on species of particular concern. If your project is on a National Forest, contact the Forest Supervisor's office for species information.

Common Name	Scientific Name	NMGF	US FWS	critical habitat
Rio Grande Cutthroat Trout	Oncorhynchus clarki	s	SOC	
Gila Trout	Oncorhynchus gilae	T	T	
Rio Grande Chub	Gila pandora	s		
Headwater Chub	Gila nigra	E		
White Sands Pupfish	Cyprinodon tularosa	T	SOC	
Arizona Toad	Bufo microscaphus microscaphus	s		
Chiricahua Leopard Frog	Rana chiricahuensis	s	T	
Big Bend Slider	Trachemys gaigeae	s		
Brown Pelican	Pelecanus occidentalis	E		
Neotropic Cormorant	Phalacrocorax brasilianus	T		
Bald Eagle	Haliaeetus leucocephalus	T	T	
Northern Goshawk	Accipiter gentilis	s	SOC	
Common Black-Hawk	Buteogallus anthracinus	T	SOC	
Aplomado Falcon	Falco femoralis	E	Exp	
Peregrine Falcon	Falco peregrinus	T	SOC	
Mountain Plover	Charadrius montanus	s	SOC	
Least Tern	Sterna antillarum	E	E	
Black Tern	Chlidonias niger surinamensis		SOC	
Common Ground-Dove	Columbina passerina	E		
Yellow-billed Cuckoo	Coccyzus americanus	s	C	
Mexican Spotted Owl	Strix occidentalis lucida	s	T	Y
Burrowing Owl	Athene cunicularia		SOC	
Broad-billed Hummingbird	Cynanthus latirostris	T		
Lucifer Hummingbird	Calothorax lucifer	T		
Costa's Hummingbird	Calypte costae	T		
Elegant Trogon	Trogon elegans	E		
Southwestern Willow Flycatcher	Empidonax traillii extimus	E	E	Y
Thick-billed Kingbird	Tyrannus crassirostris	E		
Loggerhead Shrike	Lanius ludovicianus	s		
Bell's Vireo	Vireo bellii	T	SOC	
Gray Vireo	Vireo vicinior	T		
Baird's Sparrow	Ammodramus bairdii	T	SOC	
Varied Bunting	Passerina versicolor	T		
Western Small-footed Myotis Bat	Myotis ciliolabrum melanorhinus	s		
Yuma Myotis Bat	Myotis yumanensis yumanensis	s		
Occult Little Brown Myotis Bat	Myotis lucifugus occultus	s		
Long-legged Myotis Bat	Myotis volans interior	s		
Fringed Myotis Bat	Myotis thysanodes thysanodes	s		
Long-eared Myotis Bat	Myotis evotis evotis	s		
Pale Townsend's Big-eared Bat	Corynorhinus townsendii pallescens	s	SOC	

Gunnison's Prairie Dog	Cynomys gunnisoni	s	
Desert Pocket Gopher	Geomys arenarius	s	SOC
Pecos River Muskrat	Ondatra zibethicus ripensis	s	SOC
Mexican Gray Wolf	Canis lupus baileyi	E	Exp
Ringtail	Bassariscus astutus	s	
Common Hog-nosed Skunk	Conepatus leuconotus	s	
Desert Bighorn Sheep	Ovis canadensis mexicana	E	
Mineral Creek Mountainsnail	Oreohelix pilsbryi	T	SOC
Fairy Shrimp	Streptocephalus moorei	s	
Desert Viceroy Butterfly	Limenitis archippus obsoleta		SOC

STATE OF NEW MEXICO
DEPARTMENT OF CULTURAL AFFAIRS
HISTORIC PRESERVATION DIVISION

BATAAN MEMORIAL BUILDING
407 GALISTEO STREET, SUITE 236
SANTA FE, NEW MEXICO 87501
PHONE (505) 827-6320 FAX (505) 827-6338

BILL RICHARDSON
Governor

RECEIVED
OCT 28 2010
MINING & MINERALS DIVISION

October 26, 2010

Chris Eustice
Permit Lead
Mining Act Reclamation Program
Mining and Minerals Division
1220 South St. Francis Drive
Santa Fe, NM 87505

Re: Request for Review and Comment on the Sampling and Analysis Plan, New Mexico Copper Corporation, Copper Flat Mine, Permit No. SI027RN

Dear Mr. Eustice:

This letter is in response to sampling and analysis plan for Copper Flat Mine located in Sierra County. According to 19.10.6.602 NMAC, a sampling and analysis plan shall include a list and accompanying map indicating all sites on or eligible for listing on either the National Register of Historic Places and/or the State Registers of Cultural Properties and known cemeteries and human burials within the proposed permit area. Included in this list shall be a description of effects the proposed mining operations may have on these sites and any proposed mitigation measures.

Section 10 of the SAP, Historical and Cultural Properties Survey does not indicate whether there are cultural properties listed on or eligible for listing on either the National Register of Historic Places and/or the State Registers of Cultural Properties. However, a review of our records shows there are no historic properties listed on either the National Register of Historic Places or the State Register of Cultural Properties. The SAP does summarize the cultural resource surveys that have been conducted to date, with specific reference to a survey conducted in 1995 by Human Systems Research that recorded 16 archaeological sites and 212 isolated occurrences. Some of these sites are probably eligible for listing to the NRHP or the SRCP.

Under Section 10.2, Sampling Objectives, the SAP states that the project area includes federally administered land and the project is subject to review under Section 106 of the National Historic Preservation Act. In order to assess the effects on historic properties, a cultural resources survey is proposed although the exact survey interval and exact area to the be surveyed will be determined in consultation with the Bureau of Land Management (BLM) and the State Historic Preservation Office (SHPO). It is the SHPO's opinion that the permit area, excluding the areas extensively disturbed by previously mining activities, should be intensively surveyed (class III). It does not appear that the 1995 Human Systems Research Survey covered the entire area so there may be a potential for additional archaeological sites to exist.

The SAP also states that a plan of operations has been submitted to the BLM. The BLM will be reviewing this project under Section 106 of the National Historic Preservation Act (NHPA). As such, they will determine the level of effort for the cultural resources survey lands under their jurisdiction. After the cultural resources survey is conducted, New Mexico Copper, in consultation with the BLM and the SHPO, will be able to determine whether the proposed mining operations will have an effect on cultural resources and determine appropriate mitigation measures if necessary.

If you have any questions regarding these comments, please do not hesitate to contact me at (505) 827-4064.

Sincerely,

Michelle M. Ensey
Archaeologist

Log: 90457
Cc/Email: Chris Parrish, Parametrix

2-3-2011

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

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DAVID MARTIN
Secretary

RAJ SOLOMON, P.E.
Deputy Secretary

DATE: February 3, 2011

TO: Holland Shepherd, Program Manager, Mining Act Reclamation Program

FROM: Greg Huey, Ground Water Quality Bureau
David Menzie, Surface Water Quality Bureau

THROUGH: Kurt Vollbrecht, NMED Mining Act Team Leader

RE: New Mexico Copper Corporation, Copper Flat Exploration 2 Project, Minimal Impact Exploration Project Permit Application, Permit No. SI025EM

The New Mexico Environment Department (NMED) received the Copper Flat Exploration 2 Project Minimal Impact Exploration Permit Application from the Mining Act Reclamation Program (MARP) on January 14, 2011. MARP requested that the application be reviewed and all comments returned within 20 days of receipt. A site inspection was conducted on January 25, 2011 and comments were submitted prior to the February 3, 2011 deadline.

Pursuant to Subpart 302.G of the New Mexico Mining Act Rules (NMMA), the NMED Air Quality Bureau, Surface Water Quality Bureau and Ground Water Quality Bureau have reviewed the Copper Flat Exploration Minimal Impact Exploration 2 Project Permit Application. The Surface Water Quality Bureau and Ground Water Quality Bureau are submitting comments jointly in this memorandum. Air Quality Bureau comments are provided under a separate memorandum.

Site Location and Description

The proposed Copper Flat Exploration 2 Project is located in Township 15S, Range 7W of Section 26, Sierra County, NM. Hydro Resources Corporation, Cu Flat LLC and GCM, Inc. of Albuquerque, NM are the joint owners of surface and mineral rights to the property. The total proposed exploration disturbance is less than 5 acres. The permit states that depth to ground water at the site is between five and fifty feet and total dissolved solids concentration is <1,000 mg/L.

Forty-seven drill holes are proposed at a diameter of 3.8 inches. Forty-five of these will be to a maximum depth of 1200 feet, and two are proposed to a maximum depth of 2,000 feet. The maximum total excavation volume proposed for all holes is estimated to be 5,062 cubic feet (188 cubic yards).

Construction of pads for seventeen drill holes will not be necessary because drilling will occur on previously excavated and graded benches. Four pairs of holes will be drilled from the same drill pad; therefore, surface disturbance will only be necessary at twenty-five locations. Total drill pad construction will require 3.45 acres and new access road construction will require 1 acre for a total of 4.45 acres.

Drilling mud and additives are to be stored in metal tanks during the operational phase. The proposal calls for the disposal of drilling mud and additives into drilling holes after drilling is completed. It is then proposed that the drill holes are to be plugged with drilling mud from total depth to ten feet below ground surface and completed with a cement plug from ten feet below ground surface to the existing ground surface.

Permit Application Requirements and Minimal Impact Status

The permit application states that bore holes will be plugged with drilling mud. According to the New Mexico Office of the State Engineer requirements and New Mexico Mining Act Rules, drill holes must be plugged from the bottom of the hole to the land surface with cement or high density bentonite clay, with the top ten feet of the hole plugged with cement. Drilling mud is not an appropriate bore hole abandonment material.

New Mexico Mining Act Rules prohibit disposal of drill cuttings, drill mud or additives into excavated drill holes. NMMA §19.10.3.K provides guidance for construction and reclamation of pits for drill waste disposal.

In general, the following measures should be implemented at exploration drill sites to provide for protection of surface and ground water quality:

- A minimum setback from surface water channels of 100 feet should be maintained for all drill pads and associated activities. However, on the joint agency inspection conducted on January 25, 2011, the location for drill hole NE-C was discussed. This location is adjacent to an ephemeral wash that drains into the Open Pit Pool, and as such, the setback is not required at this location.

- All exploration activities need to implement Best Management Practices in a manner that prevents direct impacts to surface water and watercourses (ephemeral, intermittent and perennial). For surface disturbances during exploration and reclamation activities, the operator must commit to implementing erosion control measures that are designed, constructed and maintained using professionally recognized standards (e.g. Natural Resource Conservation Service Standards or the Bureau of Land Management "Gold Book").

- All heavy equipment used in the project area must be pressure washed and/or steam cleaned before the start of the project and inspected daily for leaks. A written log of inspections and maintenance should be completed.

- Appropriate spill clean-up materials, such as absorbent pads, must be available on-site at all times during drilling activities to address potential spills.

- Spills must be reported immediately to the NMED as required by the New Mexico Water Quality Control Commission Regulations (20.6.2.1203 NMAC). For non-emergencies during normal business hours, call (505) 428-2500. For non-emergencies after hours, call (866) 428-6535 or (505) 428-6535 (voice mail, twenty-four hours a day). For emergencies only, call (505) 827-9329 twenty-four hours a day (NM Dept of Public Safety).

- The applicant must contain any water produced from the exploration holes at the drill site. Discharge of this water or any drilling fluids to any watercourse may be a violation of the Clean Water Act. All drilling cores and cuttings should be collected and disposed of properly.

- This project may require coverage under a Clean Water Act §402 permit, such as for construction or industrial storm water, or for an NPDES process wastewater discharge. Failure to receive and implement proper permit coverage would be a violation of the Clean Water Act. A Construction General Permit, Notice of Intent (NOI), Fact Sheet, and Federal Register notice can be downloaded at http//cfpub.epa.gov/npdes/stormwater/cgp.cfm. The Industrial General Permit, NOI, Fact Sheet, and Federal Register notice can be downloaded at http://cfpub.epa.gov/npdes/stormwater/msgp.cfm. If you have questions about this coverage, please contact Rich Powell, NMED SWQB, at (505) 827-2798.

- The applicant should consult with the USACE to verify whether the proposed activity will require Clean Water Act §404 permitting.

- Boreholes must be abandoned in accordance with the New Mexico Office of the State Engineer requirements and New Mexico Mining Act Rules, including complete plugging from the bottom of the hole to the land surface with cement or high density bentonite clay.

NMED finds the proposed exploration activities are likely to have a minimal environmental impact if operated and reclaimed in accordance with the approved permit and requirements listed above.

cc: William C. Olson, Bureau Chief, GWQB
Marcy Leavitt, Bureau Chief, SWQB
Rachel Jankowitz, NMDGF
Mary Ann Menetrey, GWQB-MECS

2-4-2011

SURNAME
Initials/Date CR 2/1/2011
Initials/Date MS 2/1/11
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NMNM 125986
3809 (L0310)

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CERTIFIED MAIL -- RETURN RECEIPT REQUESTED
7006 0810 0000 8915 2012

Mr. Steve Raugust
New Mexico Copper Corporation
2425 San Pedro Drive NE
Suite 100
Albuquerque, NM 87110

Dear Mr. Raugust:

On November 8, 2010, the Bureau of Land Management (BLM), Las Cruces District Office (LCDO) received your Mine Plan of Operations (MPO) for mining and mineral benefaction activities on mining claims north of Hillsboro, New Mexico, located in secs. 25, 26, 27, 35 and 36, T. 15 S., R. 7 W.; and in sec. 31, T. 15 S., R. 6 W. (New Mexico Principal Meridian) in Sierra County, New Mexico. This MPO has been assigned BLM serial number NMNM 125986; please refer to this number in future correspondence regarding this MPO.

Our review of the proposed MPO has determined that additional information is necessary for the LCDO to complete review of your proposed operation (43 CFR 3809.411(a)(2)). Please provide the following supplemental information:

1. Proposed Operating Plan (p. 3-1): Will any of the proposed placer mining occur on Federal land? If so, provide a detailed description of the proposed operation. Include a description of the area of placer operations, proposed depth of excavation, production and processing equipment requirements, access routes, sources of water, and duration of placer operations. Also provide a map of placer activity showing locations of excavation areas, waste sediment stockpiles, processing facilities and access routes. If no placer mining will occur on Federal land, describe if it will be necessary to cross Federal lands to reach the placer operations and any planned road improvements under this scenario.

2. Proposed Operating Plan (p. 3-3): Provide additional information regarding the general schedule of operations from start to closure (43 CFR 3809.401(b)(2)(vii)). Include the estimated duration of each phase of the mining operations (site preparation, production, mineral benefaction, reclamation, monitoring) during the projected 17-year mine life. At a minimum, reference Figure 5-1 in this section, the addition of a schedule in table format would also be appropriate.

3. Proposed Operating Plan (p. 3-4) states: "a detailed list of mining equipment will be provided to BLM as the mine plan is finalized." Complete this finalization so a preliminary equipment inventory can be prepared (fleet composition can be altered with a plan modification per 43 CFR 3809.430). Also include any necessary equipment not discussed in this section, such a dozers and road graders.

4. Waste-rock disposal and low grade ore stockpile (p. 3-5): Update the runoff calculations to meet regulatory requirements and design criteria. Provide additional details regarding the runoff collection system (i.e., the placement and estimated size of collection ditches, and the method by which water will be diverted into the process water system). Describe short-term (i.e., not final reclamation) BMPs to minimize sediment loading from the waste-rock piles (i.e., silt fencing, straw application, etc.).

5. Ore processing (p. 3-6): Specify the dimensions and construction of all buildings planned for the project. Specify the number and exact purpose of the ancillary buildings referred to on page 3-8 and map the locations and purposes of all buildings planned for the operation on figure 3-1 (or add a new figure with this map if you prefer).

6. Ore processing (p. 3-7): When does NMCC anticipate completing the feasibility study for in-pit crushing and conveying? Can this be incorporated into the current MPO, or will a plan modification be submitted?

7. Tailings impoundment design (p. 3-7 and Appendix D): Complete determinations regarding the source of materials for the new tailings dam and whether the existing dam will remain in place.

8. Water-supply (p 3-13): Provide the legal locations of the eight wells on BLM land proposed for use in the MPO. Also provide a map showing the location of the wells and the 20-inch pipeline (with existing valves and manholes) relative to the proposed operation.

9. Water-supply (p 3-13): Complete the planned inspection of the 20-inch pipeline to assure it will be suitable for use in the operation. If it is determined to be sufficient, provide the locations and specification of any pipeline improvements (including new valves, pumping stations, manholes, etc.) proposed for location on Federal lands (c.f. 43 CFR 3809.401(b)(2)(viii)). If it is determined that the pipeline cannot be used, describe in detail the alternative water delivery system.

10. Water-supply (p 3-14): Provide an estimate of total water use and an inventory of projected water use by activity (i.e., dust suppression, milling, floatation, etc.). Include estimated volumes of make-up water from pit de-watering and thickener overflow recycling (p. 3-8). (c.f. 43 CFR 3809.401(b)(2)(iii)).

11. Exploration activities (p. 3-18): Specify if exploration activities on Federal lands will be limited to the permits areas defined in Figures 2-1 and 3-1. If exploratory drilling is planned on Federal surface or mineral estate outside of this boundary, specify the locations of the proposed drillholes and access routes.

12. Invasive non-native species (p. 3-22): Provide details on noxious weed prevention and monitoring programs. Include information on BMPs to minimize noxious weed infestation (i.e., washing vehicles and equipment, obtaining seed and mulch from certified suppliers), monitoring strategies (including soil stockpiles), and mitigation measures if an on-site infestation is detected.

13. Reagents (p. 3-24 and Appendix E): Specify the planned retaining volume of the berm for the No. 1 diesel fuel tank and map the location of reagent mixing and storage area. Describe the construction of the reagent mixing and storage area (see #4) including the construction of the flooring. Provide details on the plastic liners (composition and thickness) and proposed depth of gravel cover for the fuel tank linings (p. 2 of Appendix E).

14. Hazardous materials management (p. 3-24 and 3-25): Specify the volumes of diesel fuel and ammonia nitrate that will be stored on site, and the number of bins, tanks, and explosive sheds that will be placed on BLM land. Complete your analysis so you may map the locations of these storage facilities.

15. Reclamation (p. 5-7): Finalize designs for the proposed waste rock facilities so BLM engineers may evaluate your proposal.

16. Reclamation (p. 5-11): Complete evaluations of tailings impoundment area to determine if the gravels and alluvial fill will be used for reclamation, impoundment construction, and/or placer operations. If material from the impoundment area will be used for reclamation on the Federal lands, describe BMPs to minimize invasive or noxious weed contamination or possible transfer of hazardous materials or contaminated soils to Federal lands.

17. Reclamation (p. 5-13): Any natural soil amendments used will have to be certified free of invasive and noxious weeds.

18. Reclamation (p. 5-14): Proposed seed mix is being evaluated by BLM wildlife and range staff and may be modified if necessary.

19. Reclamation (p. 5-14): Interim reclamation – Buildings, is this a proposal to maintain an on-site resident security guard during interruptions in operations?

20. Reclamation (p. 5-20): The reference "SRK 1995" is not listed in the bibliography, are you referring to the "Copper Flat Mine Hydrogeologic Studies" report of May 12, 1995? This report does not make a convincing argument that the pit lake level will be below hydrostatic.

21. Plant site (p. 5-23): Why is it necessary to leave foundations and footing buried on the public land? What would be the total volume of concrete left on site after operations are completed?

22. Reclamation (p. 5-25): Figure 5-3 was inadvertently omitted from the MPO.

23. Estimated reclamation cost (p. 5-25): Reclamation bonding will likely be deferred to the New Mexico Mining and Minerals Division.

Please be aware that the LCDO may require additional information or data collection if required to complete NEPA analysis for this project. Final MPO approval will occur after the BLM completes environmental review required under the National Environmental Policy Act (43 CFR 3809.411(3)(ii)) and completes consultation with the State of New Mexico to ensure your operations will be consistent with State water quality requirements (43 CFR 3809.411(3)(ix)).

Your proposed operations are also subject to regulation by the State of New Mexico. If you have not done so already, you are advised to contact the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department ((505) 476-3400) to determine what type of New Mexico State permit is required for your operation.

Please contact Michael Smith, Geologist, at (575) 525-4421, if you have any questions.

Sincerely,

EDWARD SEUM

Edward Seum
Supervisory Multi-Resources Specialist
Division of Multi-Resources

cc:
Holland Shepard
New Mexico Energy, Minerals
and Natural Resources Department
Mining and Minerals Division
1220 South St. Francis Drive
Santa Fe, NM 87505

L0310:MSmith:cp:2/1/2011:x4375:NMCopper.NM125986MPO.Ltr

2-23-2011

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

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Governor

JOHN SANCHEZ
Lieutenant Governor

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J. Steven Raugust, PG
NM Copper Corp.
2425 San Pedro Dr., NE,
Albuquerque, NM 8711

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

February 23, 2011

J. Steven Raugust, PG
New Mexico Copper Corporation
2425 San Pedro Drive NE, Suite 100
Albuquerque, NM 87110

Dear Mr. Raugust,

Thank you for attending the recent meeting between the New Mexico Environment Department (NMED) and New Mexico Copper Corporation (NMCC) on February 17, 2011. In the meeting, we discussed the progress of the Copper Flat Mine Stage 1 Abatement Plan Proposal and Discharge Permit Application that are being prepared for submittal to NMED. The Copper Flat Mine site (Site) is located approximately 6 miles northeast of Hillsboro, New Mexico.

Pursuant to New Mexico Water Quality Control Commission (WQCC) Regulations Sections 20.6.2.1203.A(9), 20.6.2.4104 and 20.6.2.4106.A NMAC, NMED hereby provides notification that NMCC is a responsible person as defined in WQCC Regulations Sections 20.6.2.7.JJ and 20.6.2.7.OO NMAC and is required to submit an Abatement Plan for the Site. In addition, pursuant to WQCC Regulations Section 20.6.2.3104 NMAC, NMCC must submit a Discharge Permit Application to NMED and receive an approved Discharge Permit prior to initiation of any mining activities at the Site.

As agreed to in the meeting, NMCC will submit a Stage 1 Abatement Plan Proposal and Discharge Permit Application for the Site to NMED by March 31, 2011. Please contact Greg Huey at (505) 827-1046 with any questions or comments you may have regarding this matter.

Sincerely,

William C. Olson
Bureau Chief

cc: Mary Ann Menetrey, GWQB-MECS
Greg Huey, GWQB-MECS
Chris Eustice, MMD

3-9-2011

13

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

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JOHN SANCHEZ
Lieutenant Governor

DAVID MARTIN
Secretary

RAJ SOLOMON, P.E.
Deputy Secretary

March 9, 2011

District Manager Bill Childress
Las Cruces District BLM
1800 Marquess Street
Las Cruces, NM 88005

RE: Request for Cooperating Agency Status, Environmental Impact Statement Development, New Mexico Copper Corporation's Proposed Copper Flat Mine

Dear Mr. Childress,

The New Mexico Environment Department requests Cooperating Agency status and inclusion in development of a Memorandum of Understanding for the purposes of collaborative planning and the production of an Environmental Impact Statement (EIS) for the proposed New Mexico Copper Corporation Copper Flat Mine. NMED is involved in regulation of the Copper Flat Mine through both a Ground Water Discharge Permit and a Stage I Abatement Plan pursuant to the Water Quality Control Commission Regulations 20.6.2.NMAC. Therefore, NMED has mine operational, reclamation and ground water abatement requirements that should be coordinated with any similar BLM requirements. NMED appreciates the opportunity to lend its regulatory and technical expertise to development of the EIS, and to coordinate efforts towards permitting the proposed operations in a manner that is protective of the environment.

If you have any questions please contact Greg Huey at (505) 827-1046.

Sincerely,

William C. Olson, Chief
Ground Water Quality Bureau
New Mexico Environment Department

WCO:gh

Cc: Mary Ann Menetrey, Manager, GWQB MECS
Holland Shepherd, Manager, Mining Act Reclamation Program
Mike Smith, Geologist, Bureau of Land Management, Las Cruces District Office, 1800 Marquess, Las Cruces, NM 88005
Jennifer A. Montoya, Bureau of Land Management, Las Cruces District Office, 1800 Marquess, Las Cruces, NM 88005

3-31-2011

THEMAC
RESOURCES
New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110

GROUND WATER
MAR 31 2011
BUREAU

March 31, 2011

Mr. Greg Huey
New Mexico Environment Department
GWQB-MECS
Harold L. Runnels Building
1190 St. Francis Drive
Santa Fe, New Mexico 87505

Re: New Mexico Copper Corporation's Application for Discharge Plan Modification for DP-001

Dear Mr. Huey,

I am pleased to attach New Mexico Copper Corporation's (NMCC's) application for discharge plan modification for DP-001, including the $100 permit fee. In order to facilitate the New Mexico Environment Department's (NMED's) review of this document, we would like to make note of the status of a few integral projects currently in progress by NMCC and its contractors.

The Plan of Operations (PoO) (Part B-1 of the discharge plan application) has been submitted to the Bureau of Land Management and is currently under review. NMCC will submit the final PoO when it becomes available.

NMED has contributed comments to NMCC's Copper Flat Sampling and Analysis Plan (SAP). Some of these comments have been addressed within the DP-001 application where possible. However, due to time constraints, some will be addressed in upcoming quarterly progress reports after discharge plan approval or in the Stage 1 Abatement Investigation Report. At our meeting on March 21, 2011, NMCC and the state agencies reviewed NMCC's strategy for addressing the SAP comments. It is our understanding from this meeting that NMED concurs with NMCC's strategy for addressing the SAP comments.

Please don't hesitate to call me if you have any questions or if I can be of further assistance. NMCC looks forward to working closely with the NMED to obtain modification of DP-001.

Sincerely,

J. Steven Raugust, PG
Project Manager
New Mexico Copper Corporation

Attachments

GROUND WATER
MAR 31 2011
BUREAU

THEMAC
RESOURCES
New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110

March 31, 2011

Mr. Greg Huey
New Mexico Environment Department
GWQB-MECS
Harold L. Runnels Building
1190 St. Francis Drive
Santa Fe, New Mexico 87505

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Sincerely,

J. Steven Raugust, PG
Project Manager
New Mexico Copper Corporation

Attachments

3-31-2011

New Mexico Environment Department
Ground Water Quality Bureau

DP Processing Form

DP# 1 **Reviewer** Greg	**Date**	**Initial**

Discharge Plan Application	▨	▨
❖ DP Application Received	3/31/11	ds
❖ Filing Fee Received (Amount: 100^{00})	3/31/11	ds
❖ Plans and Specifications Received		

Public Notice	▨	▨
❖ Public Notice 1 Published	6/1/11	ds

New Mexico Environmental Department
Ground Water Quality Bureau

Acknowledgement of Receipt

COPY

Acknowledgement of Receipt of Check/Cash

I hereby acknowledge receipt of Check No. #2068 Dated. 3/31/11
or cash, received in the amount of $ 100.00 from NM Copper Corp
for Copper Flat Mine 1 1535
(Facility Name) (DP No.) (AI ID)

Copy Made for Check Processing ______ Date ______
For Central File Activity PRD20110001 (DP-MOD)

Submitted to ASD by: ______ Date: ______

Received in ASD by: ______ Date: ______

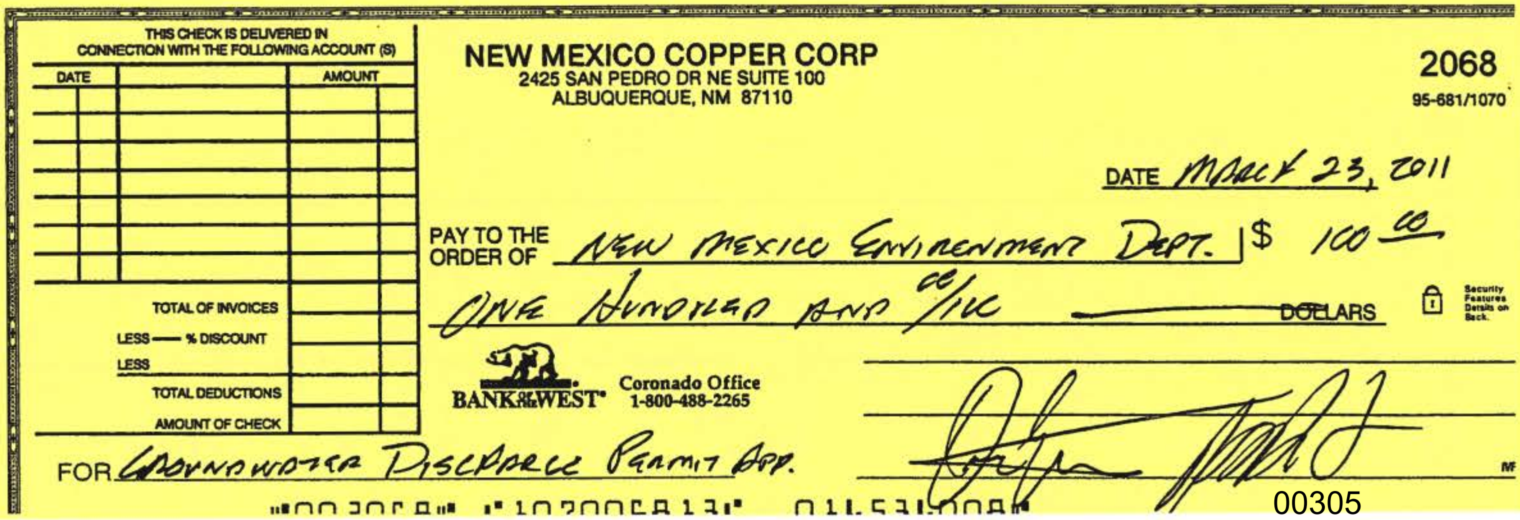
Filing Fee ☐ New Facility ☐ Renewal ☐

Modification ☒ Other ☐ (Explain) ______

Organization Code ______ Application FY ______

To be Deposited in the Ground Water Section Discharge Plan Fees.

Full Payment ☐ or Annual Increment ☐



THIS CHECK IS DELIVERED IN CONNECTION WITH THE FOLLOWING ACCOUNT (S)

DATE		AMOUNT
	TOTAL OF INVOICES	
	LESS — % DISCOUNT	
	LESS	
	TOTAL DEDUCTIONS	
	AMOUNT OF CHECK	

NEW MEXICO COPPER CORP
2425 SAN PEDRO DR NE SUITE 100
ALBUQUERQUE, NM 87110

2068
95-681/1070

DATE MARCH 23, 2011

PAY TO THE ORDER OF NEW MEXICO ENVIRONMENT DEPT. $ 100.00

ONE HUNDRED AND 00/100 DOLLARS

BANK of the WEST Coronado Office 1-800-488-2265

FOR GROUNDWATER DISCHARGE PERMIT APP.

⑈002068⑈ ⑆107006813⑆ 011531008⑈

INTERA Inc.
6000 Uptown Boulevard NE
Suite 220
Albuquerque, NM 87110
Telephone: 505 246 1600
Fax: 505 246 2600

March 31, 2011

Mr. Greg Huey
Ground Water Quality Bureau
Mining Environmental Compliance Section
New Mexico Environment Department
1190 St. Francis Dr.
Santa Fe, NM 87502

Re: Application for Discharge Permit Modification for the Copper Flat Mine, DP-001

Mr. Huey:

On behalf of New Mexico Copper Corporation, INTERA Incorporated (INTERA) is pleased to submit this Application for Discharge Permit Modification for the Copper Flat Mine to the New Mexico Environment Department Ground Water Quality Bureau Mining Environmental Compliance Section.

The following attachments have been included with this letter:

VOLUME 1:
  PART A: ADMINISTRATIVE COMPLETENESS
    Attachment A-1: Proposed Process Circuit
    Attachment A-2: Stage 1 Abatement Plan
VOLUME 2:
  PART B: OPERATIONAL & MONITORING PLANS
    Attachment B-1: Plan of Operations
    Attachment B-2: Proposed Facility Layout
    Attachment B-3: Water Rights Documentation
  PART C: SITE INFORMATION
    Attachment C-1: Project Location Map
    Attachment C-2: Regional Location Map
    Attachment C-3: Topographic Maps
    Attachment C-4: Flood Potential Map
    Attachment C-5: Soil Survey Map

Please let us know if there is additional information that you require or if you have any questions.

Sincerely,
INTERA Inc.

Cynthia Ardito
Program Manager

File: NMC-001

Attachments

THEMAC
RESOURCES
New Mexico Copper Corporation
2425 San Pedro, NE, Suite 100
Albuquerque, New Mexico 87110

March 31, 2011

Mr. Greg Huey
New Mexico Environment Department
GWQB-MECS
Harold L. Runnels Building
1190 St. Francis Drive
Santa Fe, New Mexico 87505

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Sincerely,

J. Steven Raugust, PG
Project Manager
New Mexico Copper Corporation

Attachments

NEW MEXICO ENVIRONMENT DEPARTMENT
GROUND WATER QUALITY BUREAU

DISCHARGE PERMIT APPLICATION

Type of Application. Check appropriate box.

☐ Application for new Discharge Permit -- new facility

☐ Application for new Discharge Permit -- existing (unpermitted) facility

☐ Application for Discharge Permit Renewal

■ Application for Discharge Permit Modification
"Modification" is defined as a change to the permit requirements that result from a change in the location of the discharge, a significant increase in the quantity of the discharge, or a significant change in the quality of the discharge.

☐ Application for Discharge Permit Renewal and Modification

For an existing Discharge Permit, please indicate: DP Number 001 Expiration date NA

Checklist of Application Components.

☐ Part A: Administrative Completeness.	*Instructions for completing the application are included on the form itself and on Supplemental Instructions for Parts A and B.* *You may fill out the application manually, or a Microsoft Word version may be downloaded from www.nmenv.state.nm.us (Ground Water Quality) and filled out electronically.*
☐ Part B: Operational, Monitoring, Contingency and Closure Plans, with required attachments. *Choose appropriate option*: ☐ Septic Tank System ☐ General – Various Facility Types	
☐ Part C: Site Information, with required attachments.	
☐ $100 Filing Fee, payable to the New Mexico Environment Department. *Required from all applicants.* An additional fee will be assessed prior to permit issuance. Permit fees are listed in Section 20.6.2.3114 NMAC.	

Certification. Signature must be that of the person named in Item A-3 of Part A of the application.

I certify under penalty of law that I am knowledgeable about the information contained in this application. The information is, to the best of my knowledge and belief, true, accurate and complete.

Signature: Date: 3/31/2011

Printed Name: Steve Raugust

Title: Project Manager for New Mexico Copper

Send three complete copies of this application and the filing fee to:

Program Manager
Ground Water Pollution Prevention Section
New Mexico Environment Department
PO Box 5469
Santa Fe, NM 87502

Discharge Permit Application
for the
Copper Flat Mine

March 31, 2011

Prepared for:
New Mexico Copper Corporation

Submitted to:
Ground Water Quality Bureau
Mining Environmental Compliance Section
New Mexico Environment Department

Prepared by:
INTERA

NEW MEXICO ENVIRONMENT DEPARTMENT
GROUND WATER QUALITY BUREAU

DISCHARGE PERMIT APPLICATION

Type of Application. Check appropriate box.

☐ Application for new Discharge Permit -- new facility

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☐ Application for Discharge Permit Renewal and Modification

For an existing Discharge Permit, please indicate: DP Number **001** Expiration date **NA**

Checklist of Application Components.

☐ Part A: Administrative Completeness.	*Instructions for completing the application are included on the form itself and on Supplemental Instructions for Parts A and B.* *You may fill out the application manually, or a Microsoft Word version may be downloaded from www.nmenv.state.nm.us (Ground Water Quality) and filled out electronically.*
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Certification. Signature must be that of the person named in Item A-3 of Part A of the application.

I certify under penalty of law that I am knowledgeable about the information contained in this application. The information is, to the best of my knowledge and belief, true, accurate and complete.

Signature: ______________________ Date: ______________

Printed Name: **Steve Raugust**

Title: **Project Manager for New Mexico Copper**

Send three complete copies of this application and the filing fee to:
Program Manager
Ground Water Pollution Prevention Section
New Mexico Environment Department
PO Box 5469
Santa Fe, NM 87502

GROUND WATER DISCHARGE PERMIT APPLICATION

PART A: ADMINISTRATIVE COMPLETENESS

All Facilities

A-1. **Facility Information.** See Supplemental Instructions to determine what constitutes the "facility." The physical location of the facility must be provided. If the facility does not have an address, the location can be described by road intersections, mile posts, or landmarks, as appropriate.

Facility Name	Copper Flat Mine
Former Names (if any)	Copper Flat Mine
Physical address/location *(mandatory)*	Approximately 6 miles NE of Hillsboro, New Mexico in the E ½ of Section 36, T15S, R7W and W ½ of Section 31, T15S, R6W
County	Sierra
Mailing address	2425 San Pedro Dr., Suite 100 Albuquerque, NM 87110
Contact person	Steve Raugust
Title	Project Manager for New Mexico Copper
Telephone number(s)	505-382-5770
Fax number	
E-mail address	steve.raugust@ThemacResourcesGroup.com

A-2. **Type of Discharge and Type of Facility.** See Supplemental Instructions.

Type of discharge: ☐ Domestic ☐ Agricultural ☐ Industrial ■ Mining

Type of facility: Copper/molybdenum/gold mine and mill.

A-3. **Applicant Information.** The applicant is the person or entity (e.g., corporation, partnership, organization, municipality, etc.) legally responsible for the discharge and for complying with the terms of the Discharge Permit. If the applicant is an entity, then the name and title of a contact person must be provided. This application must be signed by the applicant or contact person named here.

Applicant Name	New Mexico Copper Corporation
Mailing address	2425 San Pedro Dr., Suite 100 Albuquerque, NM 87110
Contact person	Steve Raugust
Title	Project Manager
Telephone number(s)	505-382-5770
Fax number	
E-mail address	steve.raugust@ThemacResourcesGroup.com

A-4. **Consultant Information (if applicable).** If the consultant is a company or organization, then the name and title of a contact person must be provided.

Consultant/Firm Name **INTERA Incorporated**

Mailing address **6000 Uptown Blvd. NE, Suite 220**

Albuquerque, NM 87110

Contact person **Cindy Ardito**

Title **Program Manager**

Telephone number(s) **(505) 246-1600**

Fax number **(505) 246-2600** E-mail address **cardito@intera.com**

A-5. **Permit Contact Information (if applicable).** If someone other the applicant listed in Item A-3 or a consultant listed in Item A-4 is a primary contact for this application and/or facility, list here.

Permit Contact Name **(same as A-3 and A-4)**

Title

Mailing address

Telephone number(s)

Fax number E-mail address

A-6. **Ownership.**

The applicant owns (check as appropriate): ■ the facility ■ some discharge sites ☐ all discharge sites

If other parties own the facility or any of the discharge sites, attach their names and contact information.

Hydro Resources Corporation
4011 Mesa Verde Ave., NE
Albuquerque, NM 87110
505-266-2500

THEMAC Resources Group Limited (THEMAC), a Yukon corporation, owns and controls all shares of New Mexico Copper Corporation. THEMAC's address and phone number are:
Suite 2000, 1066 West Hastings Street
Vancouver, British Columbia, Canada, V6E 3X2
(+1) 604-495-6723

Edgar E. Greer owns various fee surface and mineral estates within the facility and has contracted to sell his fee surface and mineral estates to Ryan G. and Wendy M. Fancher.

The non-fee lands within the permit area are owned by the United States (Bureau of Land Management). The BLM can be contacted at the address and phone number below:
Las Cruces District Office, Bureau of Land Management
1800 Marquess Street
Las Cruces, NM 88005-3370
575-525-4300

A-7. Discharge Quantity.

Your Discharge Permit will specify a maximum discharge volume, which is typically expressed as the maximum number of gallons per day that may be treated and/or disposed of. Please indicate below the maximum discharge volume for your facility. You must show how it was determined in Part B of your application. For further explanation, see Supplemental Instructions for Part B.

Maximum discharge volume: **2,875,873** gallons per day

A-8. **Processing, Treatment, Storage and Disposal System.** Briefly describe how wastewater, sludge, etc. is processed, treated, stored, and/or disposed of at your facility. See Supplemental Instructions for examples of system components.

Attachment A-1 contains the Proposed Process Circuit (also Figure 3-5 of the PoO). Sections 3.2.1 through 3.2.3 of Attachment B-1, the Plan of Operations (PoO) describe the processing, treatment, storage and disposal systems for the Copper Flat Mine. Attachment B-2 contains the Proposed Facility Layout, which is also Figure 3-1 of the PoO.

In summary, new ore is mined from the open pit. Blasted rock from the pit is loaded and hauled to the primary crusher (processing plant), the low-grade ore stockpile, or either of four (4) waste rock piles. Processing at the plant involves a flotation process (no leaching). Tailings from the milling process will be conveyed to a lined tailings impoundment.

A-9. **Discharge Locations.** List the locations of your facility and of all components of your processing, treatment, storage and/or disposal system. Examples of components include septic tanks, lagoons, leachfields, irrigation sites, mine stockpiles, etc. Additional examples are listed in the Supplemental Instructions. Latitude and longitude are optional unless township, range and section are not available.

(Detailed designs may result in changes to this list)

Components	Township	Range	Section(s)	Latitude	Longitude
Pit-01	**15S**	**7W**	**26, 35**		
Waste Rock Pile - 01	**15S**	**7W**	**26**		
Waste Rock Pile - 02	**15S**	**7W**	**26, 27**		
Waste Rock Pile - 03	**15S**	**7W**	**26**		
Waste Rock Pile - 04	**15S**	**7W**	**25**		
Ore Stockpile-01	**15S**	**7W**	**25, 26, 35, 36**		
Tailings Impoundment - 01	**15S** **15S** **16S**	**7W** **6W** **6W**	**36** **31** **6**		
Stormwater/Settling Pond – 01	**15S**	**7W**	**36**		
Stormwater/Settling Pond - 02	**15S**	**7W**	**36**		
Septic Tank – 01	**15S**	**7W**	**35**		
Septic Leachfield - 01	**15S**	**7W**	**35**		
Septic Tank – 02	**15S**	**7W**	**35**		
Septic Leachfield - 02	**15S**	**7W**	**35**		

A-10. Discharge Quality.

Indicate the expected quality of the discharge -- wastewater, leachate, sludge, etc. -- generated, stored, treated, processed and/or discharged at your facility. List the contaminants of concern and the expected concentrations. *Not all facilities need to characterize influent quality.* See Supplemental Instructions for typical contaminants and additional guidance.

Expected or Known Contaminants	**Expected or Known Contaminants** Indicate units: mg/L, CFU/100 ml, etc.	
	Incoming (Influent)	Final (Effluent)
Pit-01	**N/A**	**See Sections 3.3, 4.2 and 5.2 of Attachment A-2, the Stage 1 Abatement Plan**
Waste Rock Piles	**N/A**	**See Section 5.3 of Attachment A-2, the Stage 1 Abatement Plan**
Tailings Impoundment - 01	**N/A**	**See Section 5.1 of Attachment A-2, the Stage 1 Abatement Plan**

For **new** septic tank systems, you may either fill out the chart above or simply check one of the following options:

- ☐ typical domestic wastewater
- ☐ low-strength domestic wastewater (large gray water component; e.g., laundromat, spa, etc.)
- ☐ high-strength domestic wastewater (low water use; e.g., RV park, low-flow toilets at campground, etc.)

A-11. Ground Water Conditions.

All applicants must provide the depth to and pre-discharge TDS concentration of the ground water that could be affected by the discharge. Refer to Supplemental Instructions for details on how to obtain these values.

Indicate the depth to the most shallow ground water beneath the discharge site. If there are multiple discharge sites, indicate the range of depths.	Indicate pre-discharge total dissolved solids (TDS) concentration of most shallow ground water beneath the discharge site. Attach copies of analyses.
Depth to water (feet): **40-50 ft** **Groundwater daylights in the open pit, and elevated water levels are present under the tailings impoundment measured at 3.73 ft bgs during the Jan/Feb 2010 monitoring event.** Reference: ☐ Measurement, nearby monitoring well ☐ Measurement, nearby supply well ☐ Well log from nearby well (attach copy) ☐ Office of the State Engineer http://www.ose.state.nm.us/ ■ Report or study (give citation here and attach relevant portion): **See Section 2.3 of Attachment A-2, the Stage 1 Abatement Plan** ☐ Other (describe):	TDS (mg/L): **840 mg/L at SHB-28 in 1976** **1260 mg/L at GWQ-5 in 1981** Reference: ☐ Analysis from upgradient monitoring well ☐ Analysis from on-site supply well ☐ Analysis from shallow nearby supply well ☐ Concentration provided in previous Discharge Permit application ■ Report or study (give citation here and attach relevant portion): **See Section 3.4 and Appendix B-3 of Attachment A-2, the Stage 1 Abatement Plan** ☐ Other (describe):

A-12. **Public Notice.** See Supplemental Instructions.

a) The public notice packet including instructions and materials should be sent to:

■ Applicant ☐ Consultant ☐ Other:

b) Copies of the public notice packet (excluding sign) should be sent to:

☐ Applicant ☐ Consultant ☐ Other:

c) The applicant is required to provide public notice of this application by placing a display ad in a newspaper of general circulation near the location of the proposed discharge. Indicate newspaper you intend to place the ad in:

Newspaper: **The Sierra County Sentinel**

d) *For new or modification applications only:* The applicant must post a sign for 30 days in a conspicuous location at or near the facility, as approved by NMED. One sign must be posted for each 640 contiguous acres or less of the discharge site. An additional notice must be posted at an off-site location conspicuous to the public. Describe the locations below where you intend to post the notices. You may also attach sketches or photographs.

At or near facility:
2 by 3 feet in size
A sign will be posted at the road pull out on the southeast side of New Mexico Highway 152, near the Geronimo Trail Scenic Byway sign (between mile marker 55 and mile marker 56).

Off-site location:
flyer size
A flyer will be posted at the Hillsboro, NM Post Office, located at:
300 Main St.
Hillsboro, NM 88042

Supplemental Instructions for Part A

All Facilities

Please note: Discharge Permits are required for a wide range of facilities that process, treat, store and/or dispose of wastewater, sludge, septage, leachate, contaminated soils, mine tailings, industrial waste, mine ore, waste rock, or other similar materials. For the purposes of this application form, the term "discharge" applies to any of these materials whether they are actually discharged or whether they represent only a potential discharge that could occur due to factors such as poor maintenance, improper installation, equipment failure or accidents.

A-1. Facility Information.

The "facility" may be identified as:

a) a treatment facility, such as a municipal wastewater treatment plant;
b) the source of the discharge, such as a subdivision, dairy, or waste rock pile;
c) a disposal facility or operation, such as for sludge or septage;
d) the discharge location or recipient of reclaimed wastewater for reuse, such as a golf course or cement plant;
e) a storage and/or processing facility with off-site disposal;
f) a collection of facilities, such as numerous comfort stations at a state park; or
g) a project or operation, such as a construction project or a system to distribute reclaimed wastewater throughout a city.

A-2. Type of Discharge and Type of Facility.

Characterize the type of discharge, wastewater, sludge, leachate, etc. generated, processed or received by your facility as domestic, agricultural, industrial or mining. Examples of a variety of facility types are categorized below.

Domestic Waste

"Domestic" waste contains human excreta or originates from typical residential plumbing fixtures.

- Municipal wastewater treatment plant
- Septage disposal

- Sludge disposal
- Mobile home/RV park
- Campground/park
- School/educational facility
- Restaurant
- Subdivision/apartment complex
- Unincorporated community
- Lodging/resort/spa
- Residential facility
- Commercial/shopping complex
- Laundromat
- Facility using reclaimed domestic wastewater

Agricultural Waste

- Dairy
- Food processing
- Slaughter facility
- Nursery/greenhouse
- Manufacture/processing of agricultural chemicals
- Feedlot
- Livestock truck washout

Industrial Waste

- Manufacturing
- Power plant
- Military installation
- Vehicle/equipment wash
- Mortuary
- Hydrocarbon landfarm
- Ground water remediation
- Ethanol plant
- Asphalt plant

Mining Waste

- tailing impoundment
- mine dewatering
- waste rock pile
- smelter slag
- in-situ leach
- leach piles
- pipelines
- collection ponds
- concentrator – other beneficiation

This listing is only a guide, as there can be crossover between categories. For example, a golf course might use treated industrial wastewater for irrigation. The type of facility in that case is "golf course" and the type of waste is "industrial." A mining operation may need a permit for its restroom and shower facilities. In that case, the type of facility is a "mining operation" and the type of discharge is "domestic waste."

A-7. Discharge Quantity.

Refer to the Supplemental Instructions for Part B for information on how to calculate the maximum discharge volume for your facility.

A-8 and A-9. Treatment, Storage, Disposal System.

The following are examples of treatment, storage and disposal methods:

Treatment Methods

- Septic tank
- Grease interceptor
- Oil/water separator
- Manure separator
- Wetlands
- Lagoon (indicate whether aerated and type of liner)
- Trickling filter
- Activated sludge (extended air, SBR, etc.)
- Sand filter
- Membranes
- Sludge drying bed
- Disinfection (specify type)
  - ➢ chlorination
  - ➢ UV/ozone
- Water treatment plant

Storage Methods

- Above/below ground tank
- Storage lagoon (indicate type of liner)
- Holding tank
- Pit toilet
- Stockpile
- Tailing impoundment

Disposal Methods

- Leachfield
- Infiltration gallery
- Evaporation lagoon (indicate type of liner)
- Evaporation tank
- Impoundment
- Discharge to waters of the US (NPDES permit required)
- Ongoing land application (specify type)
  - ➢ subsurface irrigation
  - ➢ sprinkler irrigation
  - ➢ flood irrigation
  - ➢ drip irrigation
  - ➢ surface spreading (solids)
  - ➢ surface injection (solids)
- Temporary uses of reclaimed wastewater

- Ongoing use of reclaimed wastewater for:
    - manufacturing
    - construction or dust control

A-9. Discharge Quality.

Untreated wastewater entering a treatment facility (also referred to as “influent”) must be characterized so that the treatment process can be evaluated. It is not necessary to provide influent quality for systems providing minimal treatment prior to discharge or disposal, such as systems relying on crop uptake for treatment (e.g., dairies), septic tank – leachfield systems, storage/processing facilities or evaporative systems. The final quality of the waste or wastewater disposed of or discharged must be characterized for all facilities.

For most agricultural and domestic facilities, the contaminants of concern include nitrate as nitrogen (NO_3-N), total Kjeldahl nitrogen (TKN), total dissolved solids (TDS), and chloride (Cl). For domestic facilities with advanced treatment, additional contaminants include total suspended solids (TSS), biochemical oxygen demand (BOD_5), and fecal coliform bacteria. Contaminants of concern at industrial and mining sites include pH, metals, and organic compounds. List all that apply.

A-10. Ground Water Conditions.

The depth to ground water beneath your facility and/or discharge site must be provided. This is true even if your facility or operation is intended to have no discharge. Discharge Permits are required for “no-discharge” lagoons, storage tanks, etc. because of the potential for a discharge to occur due to factors such as improper installation, poor maintenance, equipment failure or accidents.

The best way to determine the depth to water is to measure it in an on-site or nearby monitoring well. If a monitoring well is not available, the measurement may be from a water supply well. If there is a well but it is not possible to access it for a measurement, you could refer to the well log for that well and/or others in the vicinity. Well log information is available on the website of the State Engineer’s office:

http://www.ose.state.nm.us/.

Be aware that water levels have dropped in many areas of the state, so more recent well logs in those areas are more reliable.

There may be a significant discrepancy in the depth to water in different wells, even when falling water levels is not a factor. One reason for this is that a water supply well may rely on a deep aquifer rather than water in the “first” or most shallow aquifer. Discharge Permits are intended to protect all ground water, so it is important to report the most shallow depth in the vicinity of your site.

The total dissolved solids (TDS) concentration of the ground water prior to discharge must be provided. As explained for the depth to water, this is true even if your facility or operation is intended to have no discharge. The TDS value provides a general indication of the quality of the ground water that could be affected by your operation.

The best way to obtain a pre-discharge TDS concentration is to sample an on-site or nearby well before your facility begins operating. It is better to sample a shallow rather than a deep well, if possible. It may be that a neighboring facility has existing analytical data for its Discharge Permit. (If so, be sure to obtain data from a non-impacted well.)

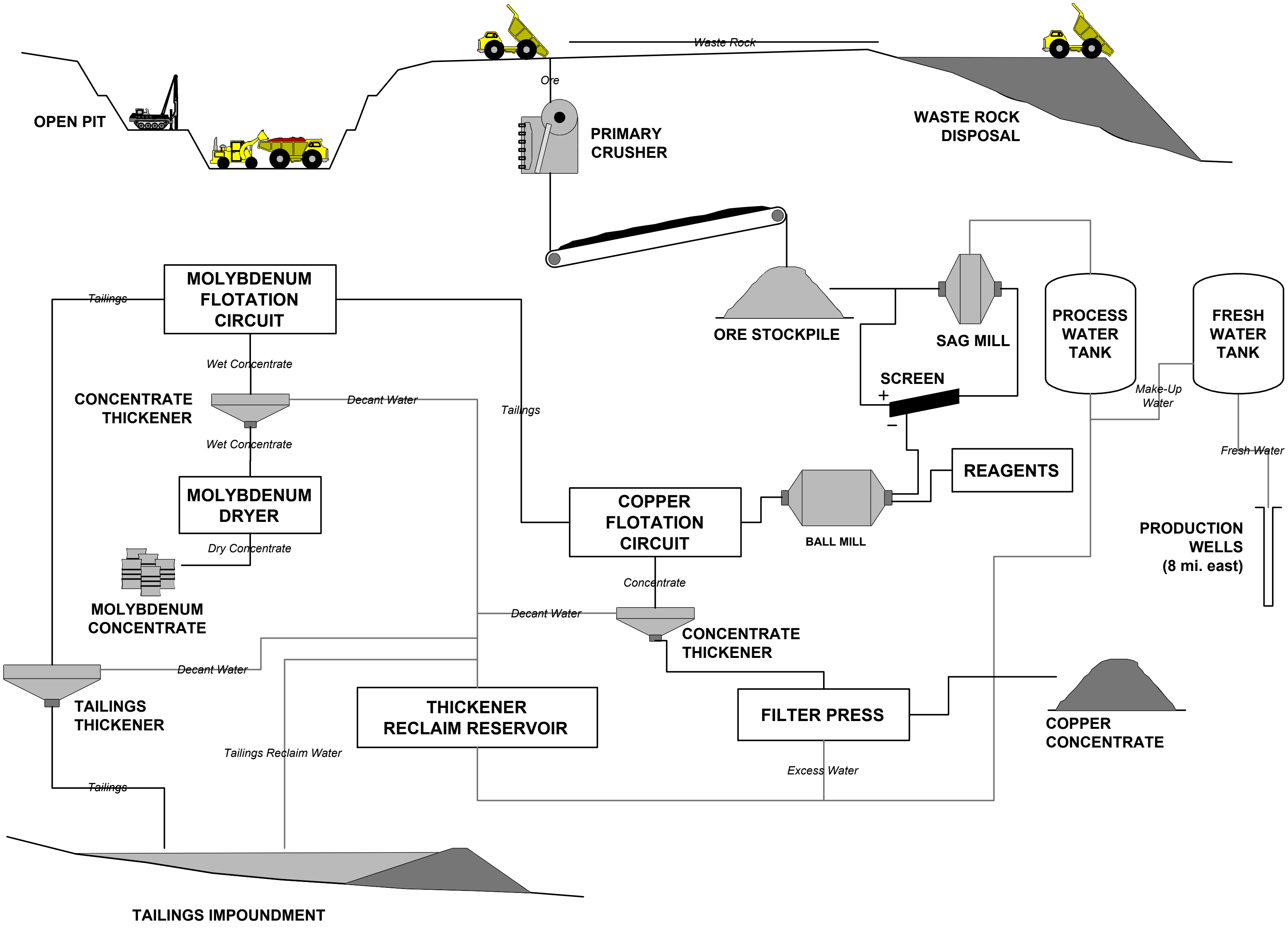
If there are no wells in your vicinity or it is not possible to sample them, you may find general TDS concentrations in reports available from sources such as a university, the State Engineer’s Office (http://www.ose.state.nm.us/) or the US Geological Survey (http://nm.water.usgs.gov/). If you are renewing or modifying your Discharge Permit, you may refer to the TDS concentration previously determined if there was a sound basis for it. Monitoring data or other information obtained since the permit was issued, however, may warrant listing a different value.

A-12. Public Notice.

The latest revision of 20.6.2.3108 NMAC, which specifies the applicant’s public notice requirements, is effective as of July 16, 2006. Once NMED has determined that your application is administratively complete, **the instructions and materials necessary to complete the public notice requirements will be sent to you.**

Attachment A-1

Proposed Process Circuit



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CHECKED: -	APPROVED: -	DATE: 12/6/2010

FILE NAME: PoO_Fig3-05_ProposedProcessCircuit_JQG_20101201.dwg

PREPARED FOR:

NEW MEXICO COPPER CORPORATION

COPPER FLAT PROJECT

DRAWING TITLE:

PROPOSED PROCESS CIRCUIT

DRAWING NO.

FIGURE 3-5

JOB NO.

191000-03

REVISION NO.

A

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Attachment A-2

Stage 1 Abatement Plan

GROUND WATER DISCHARGE PERMIT APPLICATION
PART B: OPERATIONAL, MONITORING, CONTINGENCY AND CLOSURE PLANS
GENERAL FORM (VARIOUS FACILITY TYPES)

Operational Plan *[Section 20.6.2.3106.C, 3109.C NMAC]*

B-1. **Source(s) of the Discharge.** Describe what generates the wastewater, sludge or other discharges processed and/or disposed of at your facility. Identify all sources. Attach additional pages, if needed. See Supplemental Instructions.

See Sections 3.2.1 through 3.2.3 of Attachment B-1, the PoO

B-2. **Discharge Quantity.** Describe the methods/calculations used to determine the maximum discharge volume listed in Item A-6 in Part A of your application. Attach additional pages, if needed. See Supplemental Instructions.

Tailings deposition would be at the rate of approximately 17,500 tons per day (tpd). Tailings going to the impoundment are expected to be 50% solids by weight. Calculations to get gallons per day are:

(0.5 ton liquids x 2000 lb/ton)/(62.4 lb/ft^3 = 16.03 ft^3 liquids in slurry

(0.5 ton solids x 2000 lb/ton)/(62.4 lb/ft^3 x 2.7 SG) = 5.94 ft^3 solids in slurry

16.03 ft^3/ton + 5.94 ft^3/ton = 21.97 ft^3/ton total tailings slurry

(17,500 tons/day x 21.97 ft^3/ton x 7.48 gal/ft^3)

= 2,875,873 gallons per day total slurry going to tailings impoundment

B-3. **Site Map.** Attach a site map showing the components of your proposed system and relevant surrounding features, clearly labeled, such as:

- treatment units
- lagoons
- tanks
- sumps
- manure separators
- land application fields
- domestic wastewater reuse areas
- pits
- stockpiles
- leachfields
- sludge drying beds
- roads
- buildings
- supply wells
- monitoring wells
- extraction/injection wells
- arroyos
- nearby water bodies such as ponds or canals
- property boundaries
- other permitted discharges
- required setbacks
- north arrow

If map is not to scale, mark distances on the map.

■ Site map is attached. **(See maps in Attachment B-2, the Proposed Facility Layout and Well Locations)**

B-4. **Flood Protection**. Describe the methods used to prevent flooding and run-off at the facility (tank protection, berms, diversion channels, etc.)

See Section 3.2.2, Section 5.7.4.2, and Section 5.7.4.3 of Attachment B-1, the PoO.

Water erosion controls, such as berms and diversion ditches, would be installed to divert runoff away from waste rock disposal areas. Water diversion ditches would also be used to control water inflow onto waste rock disposal piles containing partially oxidized and unoxidized material.

Runoff from the waste rock disposal areas and the low-grade ore stockpile would be controlled by diverting the runoff water into a collection ditch and then recycling it into the process water system. No discharge is expected to occur. The final grading plan for the waste rock disposal areas would be designed to eliminate surface water run on, enhance runoff, reduce infiltration, reduce visual impacts, and facilitate revegetation through back-grading or crowned grading. Thirty-foot wide catch benches would be left in place to interrupt surface sheet flow.

The tailings impoundment has been designed to contain the equivalent of 75 percent of the probable maximum precipitation (PMP) during operations. A spillway capable of passing 75 percent of the PMP would be required upon closure.

The mining and concentrating process would not involve any discharge to surface water courses. Surface runoff (stormwater) from the mine and plant site area would be collected in containment (settling) ponds and recycled into the process water system. Stormwater outside the plant and mine site would not come in contact with the proposed operation due to existing diversion ditches, dams, and berms.

B-5. **Plans and Specifications.** For new facilities and for new components of existing systems, attach plans and specifications certified by a New Mexico registered professional engineer. *[Section 20.6.2.1202 NMAC]*

☐ Not applicable because no new facilities are proposed.

■ Plans and specifications are attached.

For Tailings Impoundment Plans see Appendix D of Attachment B-1, the PoO

☐ Plans and specifications were previously submitted. Submittal date(s): ____________________

B-6. **Description of Components.** Provide descriptive details of all components of your processing, treatment, storage and/or disposal system. Include all components listed under Item A-8 in Part A.

(Detailed designs may result in changes to this list)

Component	Description (construction material, liner type, irrigation method, capacity, dimensions, area, etc.)
Pit-01	**See Section 3.2.1 of Attachment B-1, the PoO**
Waste Rock Pile - 01	**See Section 3.2.2 of Attachment B-1, the PoO**
Waste Rock Pile - 02	**See Section 3.2.2 of Attachment B-1, the PoO**
Waste Rock Pile - 03	**See Section 3.2.2 of Attachment B-1, the PoO**
Waste Rock Pile - 04	**See Section 3.2.2 of Attachment B-1, the PoO**
Ore Stockpile-01	**See Section 3.2.2 of Attachment B-1, the PoO**
Tailings Impoundment - 01	**See Sections 3.2.3.4 and 3.2.3.5 of Attachment B-1, the PoO**
Stormwater/Settling Pond – 01	**See Section 3.2.7.1 of Attachment B-1, the PoO**
Stormwater/Settling Pond - 02	**See Section 3.2.7.1 of Attachment B-1, the PoO**
Septic Tank – 01	**See Section 3.4.10.1 and Section 5.16.5.6 of Attachment B-1, the PoO**
Septic Leachfield - 01	**See Section 3.4.10.1 of the PoO**
Septic Tank – 02	**See Section 3.4.10.1 and Section 5.16.5.6 of the PoO**
Septic Leachfield - 02	**See Section 3.4.10.1 of the PoO**

B-7. **Operational Plan.** Attach a detailed description of how you operate your processing, treatment, storage and/or disposal system.

Animal feeding operations: include stormwater management, nutrient management plans, method for mixing irrigation and wastewater.

Domestic wastewater treatment facilities: include pre-treatment, solids management, vegetation management for land application.

Facilities using reclaimed domestic wastewater above ground: include proposed water quality classification(s), effluent monitoring, setbacks, irrigation schedules, etc. that will result in protection of public health and the environment. Please refer to *NMED Ground Water Quality Bureau Guidance: Above-Ground Use of Reclaimed Domestic Wastewater* for further information. A copy of the guidance document is available on the NMED website www.nmenv.state.nm.us under "Ground Water Quality".

■ Operational plan is attached. **See Attachment B-1, the Plan of Operations (PoO), December 2010**

☐ Operational plan was previously submitted. Submittal date(s): ____________________

B-8. **System Maintenance.** Attach a description of the operations and maintenance procedures which ensure that your processing, treatment and disposal system functions properly; e.g., inspections, pumping schedules, equipment maintenance, etc.

■ O & M procedures are attached. **See Section 3.4 in Appendix E of Attachment B-1, the PoO**

☐ O & M procedures were previously submitted. Submittal date(s): ____________________

B-9. **Backflow Prevention.** If wastewater is used for land application or irrigation, describe methods used to protect wells from contamination by wastewater backflow. For new facilities or new systems at an existing facility, only air gap or reduced pressure valve assemblies are acceptable methods.

a) Clearly describe and/or sketch the location of air gaps or devices and attach specifications.

Water supply system is in the process of being designed, but will contain all necessary backflow prevention devices.

b) Describe how devices are maintained.

Water supply system is in the process of being designed.

B-10. **Water Rights.** Animal feeding operations which land apply wastewater must attach documentation of irrigation water rights for the proposed land application fields, sufficient to sustain the intended crop rotation.

Water rights are described in declarations, amended declarations, and supporting documents under New Mexico State Engineer File Nos. LRG-4652 through LRG-4652-S-17 and LRG-4654.

■ Water right documentation is attached. **(See Attachment B-3, Water Rights Documentation)**

☐ Not applicable.

B-11. **Past Ground Water Monitoring Results**. *This item applies only to existing facilities seeking renewal and/or modification of a Discharge Permit that required ground water monitoring.*

a) Attach a graph or a table showing all analytical results from ground water sampling at your facility. If preparing graphs, a separate graph should be developed for each constituent, except that nitrate and TKN may be shown on the same graph. Multiple wells may be shown on the same graph. See Supplemental Instructions for sample table and graph.
(See Section 3.4 of Attachment A-2, the Stage 1 Abatement Plan)

b) If the monitoring results indicate that ground water standards have been violated or that there is an upward trend approaching standards, attach a description of what actions you have taken or will take to address the elevated concentrations. Ground water standards are listed in Section 20.6.2.3103 NMAC. See the Supplemental Instructions for frequently referenced standards.
(See Attachment A-2, the Stage 1 Abatement Plan)

Monitoring Plan *[Section 20.6.2.3107.A NMAC]*

B-12. **Discharge Volumes.** Describe how and where the monthly discharge volume at your facility will be. For all measuring devices, provide type, location, and units of measure including multipliers (e.g., gallons, gallons x 100, acre-ft, etc.) See Supplemental Instructions. Attach additional pages, if necessary.

Water supply system is still in the process of being designed. The volume of discharge going to the tailings impoundment will be measured after it leaves the tailings thickener and before it reaches the tailings impoundment.

B-13. **Discharge Quality Monitoring.** Discharge Permits typically require that the discharge (treated wastewater, sludge, septage, etc.) be sampled on a regular basis. The frequency of sampling varies by type of facility, as do the contaminants of concern. Domestic and agricultural Discharge Permits typically require sampling for total Kjeldahl nitrogen (TKN), nitrate-nitrogen (NO_3-N), total dissolved solids (TDS) and chloride on a quarterly or semi-annual basis. *(continued on next page)*

If reclaimed domestic wastewater will be discharged for above ground uses, testing of the discharge for additional parameters is appropriate. Please refer to the *NMED Ground Water Quality Bureau Guidance: Above-Ground Use of Reclaimed Domestic Wastewater* for further information.

In the space below, provide a description or sketch of the sampling point(s) to be used for sampling the discharge at your facility.

Water supply system is still in the process of being designed. A monitoring program will be part of the Mine Plan. The quality of discharge going to the tailings impoundment will be measured after it leaves the tailings thickener and before it reaches the tailings impoundment.

Optional: In the space below (or as an attachment), you may propose revisions or additions to the standard discharge quality monitoring requirements. If you do, provide the rationale for your proposal.

NA

B-14. **Ground Water Quality Monitoring.** Discharge Permits typically require that ground water samples be collected quarterly from properly constructed monitoring wells located downgradient from discharge locations. The samples must be analyzed for contaminants of concern. For most domestic and agricultural Discharge Permits, the typical contaminants of concern are total Kjeldahl nitrogen (TKN), nitrate-nitrogen (NO_3-N), total dissolved solids (TDS) and chloride.

Optional: In the space below (or as an attachment), you may propose revisions or additions to the standard ground water monitoring requirements. If you do, provide the rationale for your proposal.

A baseline characterization study is in progress (See Attachment A-2, the Stage 1 Abatement Plan).

A groundwater monitoring program will be proposed based on the results.

For existing facilities:

Indicate number of existing monitoring wells: ________

Attach copies of monitoring well logs.

■ Well logs attached. ☐ Well logs cannot be located.

☐ Well logs previously submitted. Submittal date(s): ____________

(See Appendix 4 of Attachment A-2, the Stage 1 Abatement Plan)

Attach copy of monitoring well survey (typically not applicable if fewer than 3 monitoring wells).

☐ Survey attached. ☐ No survey has been conducted.

☐ Survey previously submitted. Submittal date(s): ____________

B-15. **Other Monitoring.** In addition to discharge volumes, discharge quality monitoring and ground water sampling, Discharge Permits typically require the following monitoring, depending on the type of facility:

- inspection and pumping of septic tanks, grease tanks, lift stations
- inspection of leachfields
- inspection of lagoons
- process testing for treatment plants
- land application data sheets (LADS)
- tracking of chemical fertilizer applications to land application areas
- soil sampling (agricultural and selected other facilities land applying wastewater)
- harvested plant material testing (agricultural facilities)

Optional: In the space below (or as an attachment), you may propose revisions or additions to the other standard monitoring requirements for your type of facility. If you do, provide the rationale for your proposal.

(See Appendix E of Attachment B-1, the PoO)

Contingency Plan *[Section 20.6.2.3107.A.10 NMAC]*

B-16. **System Failure.** Describe your contingency plan in the event there is a failure of your wastewater or discharge system (e.g., wastewater back-up, pump failure, pipe breaks, tank overflow, leachfield failure, saturated fields etc.)

(See Appendix E of Attachment B-1, the PoO)

B-17. **Contingency Leachfield Location.** *This item applies only if your disposal system includes a leachfield.* Identify a location on your site map (Item B-3) for a contingency leachfield in the event that your leachfield must be replaced. If no land is available for a contingency leachfield at an existing facility, describe how you will address a failed leachfield. New facilities must provide for a contingency leachfield location.

NA

B-18. **Other Contingencies.** Discharge Permits typically contain standard contingencies to address:

- exceeding wastewater quality limits
- violation of ground water or surface water standards
- spills or illegal releases of wastewater
- migration of soil nitrogen
- loading nitrogen above limit

Propose additional contingency plans, if appropriate:

NA

<u>Closure Plan</u> *[Section 20.6.2.3107(A)11 NMAC]*

B-18. **Facility Closure and Post-Closure Monitoring.** Discharge Permits contain standard requirements to address the closure of part or all of your discharge system, as follows:

- cap or plug lines to prevent the flow of wastewater to treatment or disposal system
- empty and remove or backfill tanks
- empty lagoons, perforate or remove liners, re-grade to surface topography
- appropriately dispose of solids
- regrade and cover stockpiles at mine facilities
- continue ground water monitoring for at least two years, longer as appropriate
- enact contingency plans if ground water standards are violated
- financial assurance may be required.

Propose additional closure plans in the space below or as an attachment, if appropriate:

(See Section 5 of Attachment B-1, the PoO)

Please Note: You must also complete Part C of the application.

Supplemental Instructions for Part B – General Form

B-1. Source(s) of the Discharge.

Be specific in describing all sources. Consider the following examples:

- Municipalities – identify particular industries or specialized facilities contributing wastewater.
- RV Parks – identify showers, dump stations, laundromat, etc.
- Subdivisions – identify homes, apartments, commercial developments, water softener backwash, etc.
- Landfarms or disposal facilities – specify type of materials accepted, e.g., residential septage, car wash grit trap waste, contaminated soils/water, treated municipal sludge, etc.
- Dairies – identify milking parlors, type of washdown used, sources of stormwater runoff, etc.
- Schools – identify cafeteria, gym, showers, etc.
- Truck stops – identify restaurant, showers, car wash, etc.
- Facilities receiving reclaimed wastewater – identify the treatment facility providing the reclaimed wastewater.
- Food processing and industrial facilities – describe the processes which produce the waste stream and chemicals used.
- Mines – identify processes including beneficiation, tailing, waste rock, leach facilities, pipelines, ponds, catchments, booster stations, in-situ leach facilities.

You do not need to include solid wastes, hazardous wastes or discharges being managed under other permits; however, these should be listed under Item C-7 in Part C of the application.

B-2. Discharge Quantity.

Your Discharge Permit will allow for the treatment, processing and/or discharge of up to a specified volume, generally, a maximum number of gallons per day. The flow at your facility on any given day must not exceed this "maximum discharge volume." It is determined based on the expected contributions from the sources you identified in Item B-1.

NMED will carefully review the basis of the maximum discharge volume you propose. Show all your calculations and assumptions.

Animal feeding operations must provide calculations based on the number of animals and water conservation practices in place.

Landfarms, disposal facilities, processing facilities typically identify the expected number of loads to be delivered.

For septic systems and wastewater treatment plants, the maximum discharge volume is also referred to as the "design flow." It includes a peaking or safety factor to guard against back-ups and overflows.

Municipal wastewater treatment facilities should identify the population served, growth assumptions, and expected per capita usage considering any contributing industries.

On-site domestic wastewater treatment facilities should rely on published design flows such as those provided in the NMED Liquid Waste Regulations (20.7.3 NMAC), the Uniform Plumbing Code or the USEPA On-site Wastewater Treatment Systems Manual.

For existing facilities, the maximum discharge volume may be based on a record of measured flows if no changes are anticipated. At least two years of flow data must be submitted, and the highest monthly discharge volume must be multiplied by a peaking factor of 1.5.

NMED will verify that your proposed or existing facility can handle maximum discharge volume you propose.

B-11. Past Monitoring Results.

A complete list of ground water standards can be found in Section 20.6.2.3103 NMAC. The standards for contaminants most frequently monitored under Discharge Permits are as follows:

Nitrate-nitrogen (NO_3-N)	10 mg/L
Chloride	250 mg/L
Total dissolved solids (TDS)	1000 mg/L
Sulfate (SO_4)	600 mg/L
pH	between 6 and 9

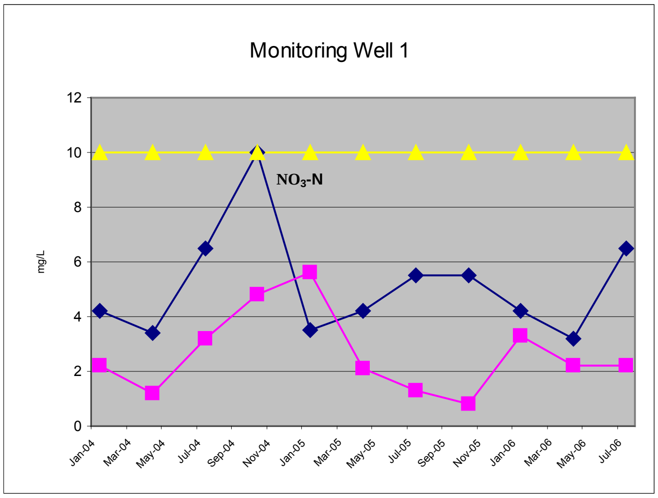
There is no ground water standard for total Kjeldahl nitrogen (TKN). Because TKN converts readily to nitrate as it moves through the vadose zone, however, concentrations approaching or exceeding 10 mg/L are of concern.

Additional parameters typically apply at mining or industrial facilities.

Some ground waters in the state have TDS or chloride concentrations that naturally exceed these standards. In that case, the standard is the naturally occurring level. You must provide documentation of such elevated natural conditions, such as analytical results from a non-impacted well.

An example table and graph follow:

Date	Monitoring Well 1	
	NO3-N	TKN
Jan-04	4.2	2.2
Apr-04	3.4	1.2
Jul-04	6.5	3.2
Oct-04	10	4.8
Jan-05	3.5	5.6
Apr-05	4.2	2.1
Jul-05	5.5	1.3
Oct-05	5.5	0.8
Jan-06	4.2	3.3
Apr-06	3.2	2.2
Jul-06	6.5	2.2



B-12. Discharge Volumes.

You must provide a method for measuring the discharge volume (Section 20.6.2.3109.H.1 NMAC). At facilities with treatment or storage lagoons, it is necessary to measure both the volume entering the treatment system as well as the volume ultimately discharged.

If you land apply wastewater to more that one discharge location, you must be able to track the volume to each location.

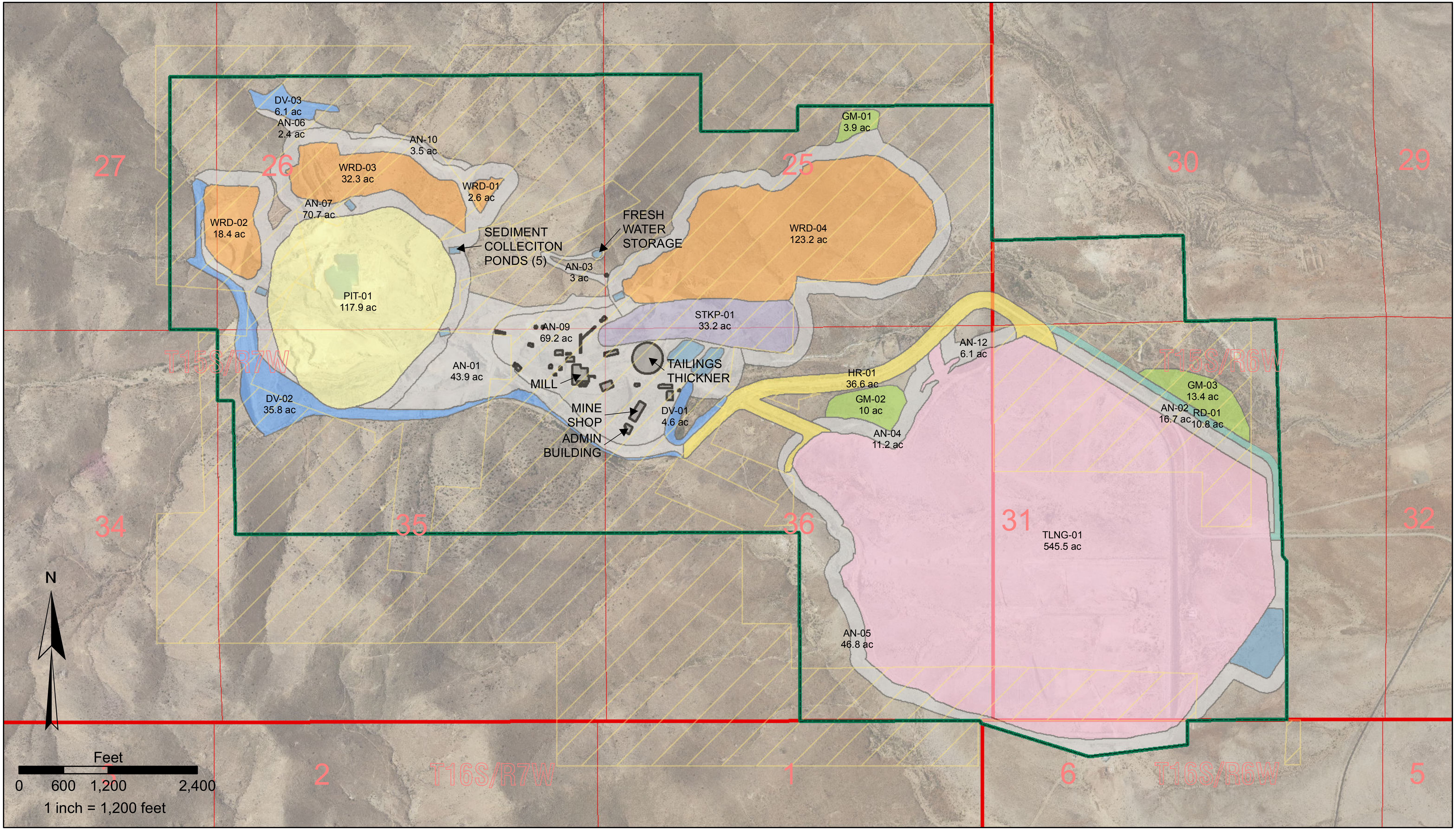
If your facility is small and relies on gravity to carry wastewater to the treatment and disposal system, it may be acceptable to estimate the wastewater flow. This can be done by metering water usage and deducting the volume of water used for fresh-water irrigation, swimming pools, evaporative cooling, livestock watering or other uses that do not result in wastewater flowing to the treatment system.

Attachment B-1

Plan of Operations

Attachment B-2

Proposed Facility Layout



EXPLANATION

☐ Public
▣ Mine Boundary
▣ Plant Facilities
🟦 Pond
🟧 Waste Rock
🟩 Topsoil Stockpile
☐ Tailings
☐ Ore Stockpile
🟨 Pit
🟨 Haul Road
🟦 Diversion
☐ Ancillary
☐ Access Road

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/1/2010

FILE NAME: PoO_Fig3-01_PropFacilities_JQG_20101123

NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

DRAWING TITLE: **PROPOSED FACILITY LAYOUT**

DRAWING NO. **FIGURE 3-1**

SHEET 4 OF 28

REVISION NO. **A**

JOB NO. **191000-03**

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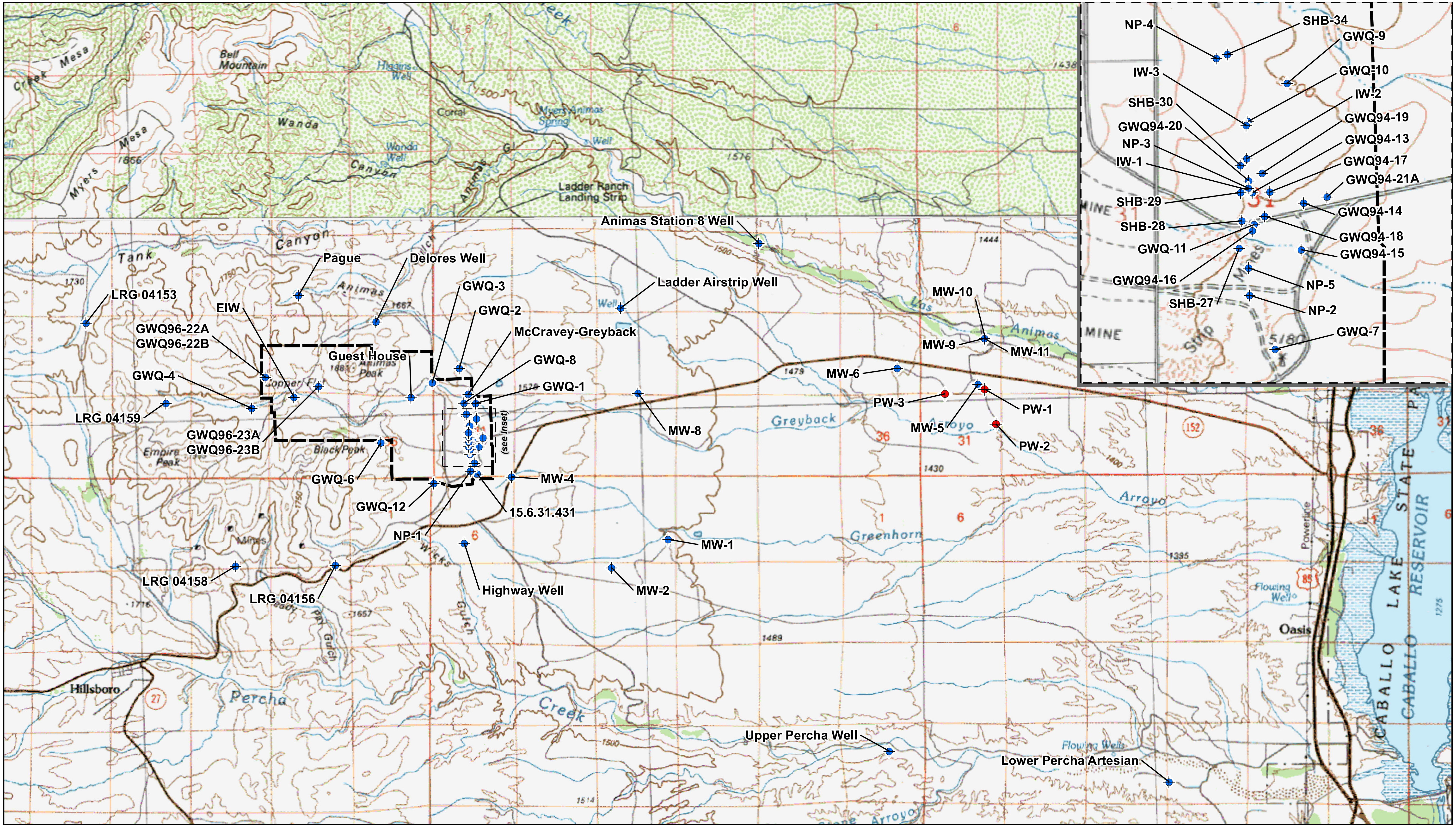

INTERA

Mine Boundary:
Tom Van Bebber
Projection Information:
-New Mexico State Plane West, NAD 1927

Figure B-2b
Well Locations,
Discharge Permit Application
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Discharge_Permit_Figures\FigB2b_Topo.mxd 3/28/2011

Attachment B-3

Water Rights Documentation

OPTION and PURCHASE AGREEMENT

THIS AGREEMENT (this "**Agreement**") is made effective ~~August~~ September 9, 2010 (the "**Effective Date**") by and

BETWEEN

WILLIAM FROST and **LINDA JO FROST**, husband and wife (separately and collectively, "**Frost**"), and **HARRIS GRAY**, a single man ("**Gray**"). In this Agreement, Frost and Gray are separately and collectively called ("**Optionors**");

AND

NEW MEXICO COPPER CORPORATION, a New Mexico corporation ("**Optionee**").

WHEREAS:

(A) Optionors own the water rights and related property described in Schedule A (the "**Water Rights**");

(B) Optionors wish to grant Optionee the exclusive Option (as defined in Section 1.1) to acquire the Water Rights on the terms and conditions set forth in this Agreement; and

(C) Optionee wishes to be granted the exclusive Option to acquire the Water Rights on such terms and conditions.

NOW, THEREFORE, for and in consideration of the sum of [redacted] paid by Optionee to Optionors (which is consideration for this Agreement and not consideration for the grant of the Option) and for other good and valuable consideration (for this Agreement and not for the grant of the Option), the receipt and sufficiency of which consideration is hereby acknowledged by each Party, the Parties agree as follows:

ARTICLE 1
INTERPRETATION

Section 1.1 Definitions

When used in this Agreement, except as otherwise defined herein, the following bold-faced words and phrases shall have the indicated meanings:

Affiliate means any individual, partnership, joint venture, corporation, limited liability company or other form of entity or enterprise that directly or indirectly controls, is controlled by, or is under common control with, a Party. For purposes of the preceding sentence, "control" means possession, directly or indirectly, of the power to direct or cause direction of management through ownership of voting securities, contract, voting trust or otherwise.

Business Day means a day on which commercial banks are open for business in Albuquerque, New Mexico.

Data means all information and materials in the possession of or reasonably available to a Party relating to the Water Rights.

Encumbrance means any mortgage, charge, pledge, hypothecation, security interest, assignment, option, right of first refusal, right of first offer, statutory or other lien, charge, title retention agreement or arrangement, royalty, restrictive covenant or other encumbrance of any nature.

Force Majeure means any cause beyond a Party's control, including acts of God; fire; flood; explosion; strike, lockout or other labor disturbance; terrorist act; military or paramilitary act or order; law, rule, regulation, decree or order of any court or governmental authority; failure of any governmental authority to issue any permit, approval or consent reasonably required for the commercial operation of the Copper Flat Mine (the "**Mine**"); non-availability of materials or transportation; or protests, demonstrations or other activities by environmental activists or other protesters delaying or interfering with exploration, development or mining at the Mine.

Option means the exclusive option granted to Optionee pursuant to Section 3.1.

Option Period means the period beginning on the Effective Date and ending (i) when Optionee exercises the Option pursuant to Section 3.2 or (ii) upon the termination hereof pursuant to Section 3.3, Section 3.4, or otherwise.

Parties means Optionors and Optionee.

Party means Optionors or Optionee.

Section 1.2 Gender and Number

This Agreement will be read with such changes in gender and number as the context requires.

Section 1.3 Headings

The headings of the Articles and Sections hereof and of the Schedules hereto are inserted for convenience only and are not intended to affect the construction or interpretation hereof.

Section 1.4 References

Any reference herein to a numbered or lettered Article, Section or Schedule refers to the Article or Section or Schedule hereto bearing that number or letter. The words "this Agreement", "hereby," "herein," "hereof," "hereto," "hereunder," "herewith," and words of similar meaning mean this entire Agreement and the Schedules, together with any modification and amendments hereof and thereof. Any reference to laws, rules, regulations, permits, licenses, certificates, judgments, injunctions, orders, writs or decrees (separately and collectively, "Laws") shall include all amendments and modifications thereof and replacements therefor. The word "including" shall be deemed to be followed by "but not limited to."

Section 1.5 Currency

All dollar amounts expressed herein refer to the lawful currency of the United States of America.

Section 1.6 Schedules

Schedule A ("The Water Rights"), Schedule B ("Adverse Claims to Water Rights"), Schedule C ("Optionors' Deed"), Schedule D ("Optionee's Deed"), Schedule E ("Memorandum of Agreement"), and Schedule F ("Release of Memorandum of Agreement"), are attached hereto and incorporated herein by reference.

Section 1.7 Governing Law

This Agreement shall be governed by and construed according to the law of New Mexico applicable to contracts made in and relating to water rights in New Mexico.

Section 1.8 Severability

If any provision hereof is or becomes illegal, invalid or unenforceable, in whole or in part, the remaining provisions will (i) nevertheless be and remain valid and subsisting and (ii) be construed as if this Agreement did not contain the illegal, invalid or unenforceable provision.

Section 1.10 Payments to Optionors

All payments to be made hereunder by Optionee to Optionors shall be paid one-half to Frost and one-half to Gray, or as otherwise directed in a writing duly executed by Frost and Gray.

ARTICLE 2

REPRESENTATIONS AND WARRANTIES

Section 2.1 Optionee's Representations and Warranties

Optionee represents and warrants to Optionors that:

(a) it is a corporation duly incorporated and validly subsisting under the laws of New Mexico;

(b) it has full corporate power and authority to enter into this Agreement and perform its obligations hereunder;

(c) neither its execution, delivery or performance hereof nor the consummation of the transactions contemplated hereby will conflict with, result in a violation or breach of or accelerate any performance required by, any Laws or by any agreement, indenture, lease or other instrument to which it is a party or by which it is bound;

(d) the execution, delivery and performance hereof do not violate any of its organizational documents;

(e) all required authorizations have been obtained for its execution, delivery and performance hereof; and

(f) this Agreement constitutes its legal, valid and binding obligation, enforceable against it in accordance with its terms.

Section 2.2 Optionors' Representations and Warranties

Optionors jointly and severally represent and warrant to Optionee that:

(a) he or she is fully qualified and competent to enter into this Agreement and perform his or her obligations hereunder;

(b) neither his or her execution, delivery or performance hereof nor his or her consummation of the transactions contemplated hereby will conflict with, result in a violation or breach of or accelerate any performance required by, any Laws or by any agreement, indenture, lease or other instrument to which he or she is a party or by which he or she is bound;

(c) no third-party authorizations are for his or her execution, delivery and performance hereof;

(d) the Water Rights are all of the Water Rights with points of diversion and/or places of use in Sierra County owned by the Optionors;

(e) they are the sole owners of and are vested with good and merchantable fee simple title to the Water Rights, free from all Encumbrances, and have no knowledge of any action on the part of the State Engineer or otherwise to declare any part of the Water Rights forfeited or abandoned;

(f) they collectively have the exclusive right to enter into this Agreement and all necessary rights and authority to transfer the Water Rights to Optionee in accordance with the terms and conditions hereof;

(g) they have the exclusive rights to receive all amounts that might be paid by Optionee pursuant to Section 3.2;

(h) except as set forth in Schedule B, there are no actual or pending, or to their actual knowledge alleged, threatened or potential, adverse claims, challenges, suits, actions, prosecutions, investigations or proceedings affecting or relating to the Water Rights or any portion thereof that, individually or in the aggregate and directly or indirectly, could at any time adversely affect (A) Optionors' ability to perform each of their obligations hereunder, (B) the correctness of each of their representations and warranties hereunder, or (C) the validity of, title to, quantity or priority of, or authorized points of diversion and/or places of use and/or purposes of use of, the Water Rights; and

(i) this Agreement constitutes his or her legal, valid and binding obligation, enforceable against him or her in accordance with its terms.

Section 2.3 Survival of Representations and Warranties

The representations and warranties set forth in this Article 2 shall survive the Option Period and the acquisition of the Water Rights by Optionee.

ARTICLE 3
OPTION AND PURCHASE

Section 3.1 Grant of Option

For and in consideration of and upon and subject to the terms and conditions hereof and Optionee's payment of [redacted] to Optionors (as consideration for the grant by Optionors of the Option and not as an Option payment), Optionors hereby grant to Optionee the sole and exclusive right and option (the "**Option**"), to acquire the Water Rights in accordance herewith, free and clear of all Encumbrances.

Section 3.2 Exercise of Option

To exercise the Option, shall make, in cash, the non-refundable Option payments set forth in this Section 3.2 on or before the dates indicated (or such later dates as may be applicable pursuant to Article 6):

Amount	On or Before:
$200,000	the written acknowledgment by the Office of the New Mexico State Engineer of the filing by Optionor of amended declarations, with appropriate supporting documents, for the Water Rights based upon the use of approximately 1,900 acre feet of water in prior operations at the Mine.
$300,000	September 30, 2010
$1,000,000	February 14, 2011, when the final option payment is due under the Option and Purchase Agreement dated July 23, 2009 by and between Optionee and Hydro Resources Corporation, et al., unless the due date for said payment is deferred pursuant to said Option and Purchase Agreement to May 16, 2011, in which case the due date for payment pursuant hereto by Optionee to Optionors of said [redacted] shall also be deferred to on or before May 16, 2011.
$700,000	Within 60 days after the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department issues a permit for the commercial operation of the Mine or August 1, 2018, whichever occurs first.

Optionee shall provide semi-annual progress reports to Optionee regarding its progress in obtaining a permit for the commercial operation of the Mine from the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department.

In no event shall Optionee be obligated to make any Option payment provided for in this Section 3.2. However, if Optionee timely makes each Option payment provided for in this Section 3.2, (i) Optionee shall have exercised the Option and (ii) Optionors shall transfer and convey the Water Rights to Optionee pursuant to Section 4.2.

Section 3.3 Optionee's Election to Terminate

Optionee may elect at any time prior to exercising the Option to terminate the Option, this Agreement, and its rights and further obligations hereunder except those set forth in Section 3.5, by delivering a written notice of termination to Optionors.

Section 3.4 Optionors' Election to Terminate

If Optionee fails timely to make any Option payment provided for in Section 3.2, Optionors may elect to give Optionee written notice of their intent to terminate the Option and this Agreement. Unless Optionee thereafter pays Optionors the full amount of such Option payment within ten days after its receipt of such notice, Optionors may terminate the Option and this Agreement and their rights and further obligations hereunder by delivering written notice of termination to Optionee. Upon such delivery, the Option will be of no further force and effect, the Option and this Agreement will terminate, and Optionee will acquire no interest in the Water Rights and neither Party will have further rights or obligations hereunder except those set forth in Section 3.5.

Section 3.5 Rights and Obligations Upon Termination

Upon termination hereof pursuant to Section 3.3 or Section 3.4, (i) Optionors shall be entitled to retain all amounts theretofore paid to Optionors and (ii) Optionee shall return to Optionors all Data previously delivered by Optionors to Optionee. In addition, (i) Rodey, Dickason, Sloan, Akin & Robb, P.A. (the "**Rodey Firm**") shall promptly at the request of Optionors return to Optionors all documents held by it in escrow pursuant to Section 4.2 and (ii) Optionee shall promptly execute and deliver to Optionors such further documents as may necessary or desirable, in Optionors' commercially reasonable opinion, to eliminate Optionee's interest, if any, in the Water Rights and to return the Water Rights to Optionors free and clear of Encumbrances voluntarily or involuntarily created by Optionee's act or failure to act. The respective obligations set forth in this Section 3.5 shall survive termination.

ARTICLE 4
OPTION PERIOD RIGHTS AND OBLIGATIONS; DEFAULT

Section 4.1 Optionee's Rights to Test and Evaluate

During the Option Period, Optionee and its officers, employees, agents and independent contractors may test and evaluate the availability, quality and other characteristics of the water associated with the Water Rights, subject to any requirements and restrictions existing under applicable Laws. Optionee acknowledges that its option to acquire the Water Rights is based on Optionee's own review, investigation, and inspection. The acceptance by the State Engineer Office of the amended declarations does not constitute validation of the right claimed. Except as expressly stated in this Agreement, nothing herein constitutes a warranty, express or implied, of the validity of the water rights or their fitness for a particular purpose.

Section 4.2 Transfer Documents

Forthwith upon the execution hereof by both Parties, (i) Optionors shall execute a special warranty deed in the form attached hereto as Schedule C ("**Optionors' Deed**") transferring and conveying the Water Rights to Optionee, (ii) Optionee shall execute a special warranty deed in the form attached hereto as Schedule D (**"Optionee's Deed"**) retransferring and reconveying the Water Rights to Optionors, and (iii) both Parties shall execute a Memorandum of Agreement in the form attached hereto as Schedule E (the **"Memorandum"**) and a Release of Memorandum of Agreement (the **"Release"**) in the form attached hereto as Schedule F.

The Optionors' Deed, the Optionee's Deed, and the Release shall be deposited with and held in escrow in accordance with the terms hereof by the Rodey Firm, whose address is 315 Paseo de Peralta, Santa Fe, New Mexico 87501 (Attention: Mark K. Adams). The Memorandum shall also be delivered to the Rodey Firm, which shall promptly record it in Sierra County, New Mexico (**"Sierra County"**).

If this Agreement terminates pursuant to Section 3.3 or Section 3.4, the Parties shall instruct the Rodey Firm to promptly (i) file the Release for record in Sierra County and (ii) deliver the Optionors' Deed and the Optionee's Deed to Optionors.

If Optionee exercises the Option in accordance with this Agreement, (i) title to the Water Rights shall vest in Optionee, (ii) the Rodey Firm shall promptly file the Optionors' Deed for record in Sierra County, and (iii) should there be any Encumbrance on the Water Rights which has been incurred voluntarily or involuntarily by Optionors, Optionors shall promptly remove the same at their expense.

Section 4.3 Optionors' Obligations During Option Period

Optionors shall during the Option Period:

(a) make all Data in their possession or readily available to them available to Optionee in Albuquerque, New Mexico;

(b) file amended declarations with the New Mexico Office of the State Engineer, with appropriate supporting documents, for the Water Rights based upon the use of approximately 1,900 acre feet of water in prior operations at the Mine;

(c) not grant, convey, transfer, offer, lease, make or suffer any Encumbrance, or make any other arrangement or agreement or attempt to make any other arrangement or agreement relating in any way to the Water Rights that could adversely affect the rights of Optionee hereunder to (i) exercise the Option and (ii) become absolutely vested with title to the Water Rights, free and clear of all Encumbrances (and any such grant, conveyance, transfer, offer, lease, Encumbrance, arrangement, or agreement, and any such attempted arrangement or agreement, shall be void and without effect;

(d) take all commercially reasonable steps to keep the Water Rights in good standing and in full force and effect and refrain from doing anything to jeopardize the good standing and effectiveness of the Water Rights;

(e) not cause waste of or damage to the Water Rights; and

(f) promptly notify Optionee in writing if any of Optionors' representations and warranties set forth in Section 2.2 becomes untrue or incorrect in any material respect.

Section 4.4 Optionee's Obligation During Option Period

Optionee shall during the Option Period:

(a) not cause waste of or damage to the Water Rights;

(b) take all commercially reasonable steps (i) to keep the Water Rights free and clear of Encumbrances arising from its activities and (ii) to proceed with diligence to contest and discharge any such Encumbrance; and

(c) promptly notify Optionors in writing if any of Optionee's representations and warranties set forth in Section 2.1 becomes untrue or incorrect in any material respect.

Section 4.5 Default

(a) **By Optionor.** If (i) any of Optionors' representations and warranties set forth in Section 2.2 is at any time untrue or incorrect in any material respect or (ii) Optionors fail in any material respect to perform any of their obligations hereunder (unless Optionors' failure is due to the failure of Optionee to perform any of its obligations hereunder), after ten (10) Business Days' notice from Optionee, Optionee may elect to initiate an action for specific performance and/or to recover its actual and reasonable out-of-pocket damages resulting from Optionors' default. Optionee hereby waives any right to seek or recover consequential or punitive damages and damages for lost profits. Optionors acknowledge that the Water Rights are unique and that, accordingly, it would be equitable for any court of competent jurisdiction to order the specific performance by Optionors of Optionors' obligations hereunder.

(b) **By Optionee.** If (i) any of Optionee's representations and warranties set forth in Section 2.1 is at any time untrue or incorrect in any material respect or (ii) Optionee fails in any material respect to perform any of its obligations hereunder (unless Optionee's failure is due to the failure of Optionors to perform any of their obligations hereunder), after ten (10) Business Days' notice from Optionors, Optionors may elect to initiate an action to recover their actual and reasonable out-of-pocket damages resulting from Optionee's default. Optionors hereby waive any right to seek or recover consequential or punitive damages or damages for lost profits.

ARTICLE 5
TRANSFERS

Section 5.1 Limitations on Transfers

During the Option Period, neither Party may in any way transfer, convey, assign, delegate, mortgage, grant an option in respect of or a right to purchase or in any other manner transfer, alienate or otherwise dispose of (each a "**Transfer**") to any non-Party any or all of its rights, titles, and interests in, to or under the Water Rights or hereunder (collectively, "**Interests**") except in compliance with this Article 5.

Section 5.2 Permitted Transfers

During the Option Period, either Party may Transfer its Interests to a non-Party

(a) if all of its Interests are transferred;

(b) when the transferring Party (the "**Transferring Party**") is not in material default of any of its covenants and agreements hereunder; and

(c) after the Transfer has been approved by the non-transferring Party (the "**Non-Transferring Party**"). If within 30 days after it receives a written request for approval of the Transfer from the Transferring Party, the Non-Transferring Party has not given the Transferring Party written notice of whether it has approved or disapproved the Transfer, the Transfer shall be deemed approved.

Section 5.3 Exceptions

Nothing in this Article 5 applies to or restricts in any manner:

(a) a sale by Optionee of all or a substantial part of its interests in the Copper Flat Project;

(b) a Transfer after the Option Period, except as provided in Section 5.5;

(c) a Transfer to an Affiliate of the Transferring Party; or

(d) a merger, amalgamation or corporate reorganization involving the Transferring Party which has the effect of the surviving entity owning all the property, rights and interests and being subject to all the debts, liabilities and obligations of the predecessor entity.

Section 5.4 Conditions of Transfers

As a condition of any Transfer to a non-Party during the Option Period, the non-Party must agree in writing with the Non-Transferring Party to be bound hereby, including this Article 5.

Section 5.5 Sale of Water Rights

If Optionee (i) exercises the Option and (ii) subsequently sells all or part of the Water Rights after mining and reclamation at the Mine are completed, the first [redacted] in the aggregate of the sale proceeds ("**Proceeds**") shall be distributed to Optionee. If and after Optionee has received [redacted] in the aggregate from Proceeds, one-third of any additional Proceeds shall be distributed to Optionors and two-thirds of any additional Proceeds shall be distributed to Optionee.

ARTICLE 6
FORCE MAJEURE

Section 6.1 Effects of Force Majeure

Notwithstanding any other provision hereof, (i) a Party will not be liable for failure to perform any obligation hereunder when the failure results from an event of Force Majeure and (ii) all time limits hereunder shall be extended by a period equal to the period of delay resulting from the event of Force Majeure.

Section 6.2 Obligation to Eliminate Force Majeure

A Party claiming an event of Force Majeure shall take all commercially reasonable steps to eliminate such event and, if commercially reasonable for it to do so, shall perform its obligations hereunder to the extent practicable, but nothing herein will require a Party to settle or adjust any labor dispute or to question or test the validity of any Laws.

Section 6.3 Giving Notice of Force Majeure

A Party relying upon an event of Force Majeure shall give notice to the other Party forthwith upon the (i) occurrence of the event and (ii) elimination of the event.

ARTICLE 7
CONFIDENTIAL DATA

Section 7.1 Non-Disclosure of Data

During the Option Period and except as specifically otherwise provided in Sections 7.2 and 7.3, neither Party shall disclose any Data except if and to the extent (i) required by Laws or the rules and regulations of any stock exchange, (ii) required or desirable to protect or enhance the good standing, validity and/or value of the Water Rights, or (iii) the other Party has consented in writing to disclosure.

Section 7.2 Information in Public Domain

The provisions of this Article 7 do not apply to Data which is or becomes part of the public domain other than through a breach hereof.

ARTICLE 8

NOTICE

Section 8.1 Method of Giving Notice

Each notice, consent, demand or other communication (each a "**Notice**") required or permitted to be given hereunder shall be in writing and (i) personally delivered to the party entitled to receive notice or (ii) transmitted by email to the email address set forth in this Section 8.1. A Notice will be deemed to have been given and received, if personally delivered, on the date of delivery and, if given by email, on the date sent, if sent during normal business hours of the recipient on a Business Day, and otherwise on the next Business Day. For the purposes of this Section 8.1, (i) Optionors' email address is harrismgray@yahoo.com and Billfrost4@aol.com, and (ii) Optionee's email address is mkadams@rodey.com.

Section 8.2 Changing Addresses

Either Party may at any time and from time to time notify the other Party in accordance with this Article 8 of a change in its email address or facsimile number to which Notices will be given to it thereafter until further notice in accordance with this Section 8.2.

ARTICLE 9

GENERAL

Section 9.1 Other Activities and Interests

This Agreement and the respective rights and obligations of the Parties are limited to the express terms and provisions hereof and to the Water Rights. Except as otherwise expressly set forth herein, each Party will have the free and unrestricted right to enter into, conduct and benefit from business ventures of any kind whatsoever, whether or not competitive with any activities undertaken pursuant hereto, without disclosing such activities to the other Party or inviting or allowing the other Party to participate.

Section 9.2 Entire Agreement

This Agreement and the Schedules (i) constitute the entire agreement between the Parties relating to the Water Rights and supersede and replace any and all other prior agreements, understandings and arrangements, whether oral or written or express or implied, between the Parties relating to the Water Rights and (ii) may not be supplemented, amended or modified except by a written instrument duly executed and delivered by both Parties.

Section 9.3 No Waiver

No consent hereunder or waiver of or with respect to any breach, default, term, condition, representation, warranty, covenant or agreement hereof or hereunder shall be (i) effective unless it is in writing and duly executed and delivered by the consenting or waiving Party or (ii) deemed or construed to be consent to or a waiver of any other breach, default, term, condition, representation, warranty, covenant or agreement.

Section 9.4 Further Assurances

Each Party will promptly execute and deliver, or cause to be executed and delivered, such documents, deeds, conveyances and other instruments which may be reasonably necessary or advisable to carry out fully the purposes hereof.

Section 9.5 Manner of Payment

All payments to be made pursuant hereto by a Party to the other Party shall be in immediately available funds for the account of the receiving Party at such bank in the United States as the receiving Party may designate from time to time by Notice to the paying Party. Such bank shall be deemed the agent of the receiving Party for the purposes of receiving, collecting and receipting for such payment.

Section 9.6 Inurnment; No Third Party Beneficiaries

This Agreement will inure to the benefit of and be binding upon the Parties and their respective successors and permitted assigns. There are no third party beneficiaries hereof.

Section 9.7 Injunctive Relief

Each of the Parties agrees that its failure to comply with the provisions of Articles 3, 4, 5, or 7 hereof would result in injury and damage to the other Party that would be impossible to measure monetarily. Therefore, in the event of any such failure, the other Party shall, in addition and without prejudice to any other right or remedy that it may have at law or in equity, be entitled to injunctive relief restraining, enjoining the violation of or specifically enforcing such covenants and the provisions of Articles 3, 4, 5, and 7, and each Party hereby waives any defence it may have at law or in equity to such relief.

Section 9.8 Time of the Essence

Time is of the essence in the performance of each obligation hereunder.

Section 9.9 Counterparts and Fax Execution

This Agreement may be executed and delivered (i) in any number of counterparts, all of which taken together shall be deemed one and the same instrument, and (ii) by facsimile and/or by email.

IN WITNESS WHEREOF, this Agreement has been executed on the respective dates set forth below but effective as of the Effective Date.

OPTIONORS

William Frost
William Frost
Date: Aug. 31, 2010

Linda Jo Frost
Linda Jo Frost
Date: Aug. 31, 2010

Harris Gray
Date: Aug 31, 2010

OPTIONEE

New Mexico Copper Corporation

By: ____________________________
Date: ______________, 2010

5, and 7, and each Party hereby waives any defence it may have at law or in equity to such relief.

Section 9.8 Time of the Essence

Time is of the essence in the performance of each obligation hereunder.

Section 9.9 Counterparts and Fax Execution

This Agreement may be executed and delivered (i) in any number of counterparts, all of which taken together shall be deemed one and the same instrument, and (ii) by facsimile and/or by email.

IN WITNESS WHEREOF, this Agreement has been executed on the respective dates set forth below but effective as of the Effective Date.

OPTIONORS

______________________________ Date: ______________, 2010
William Frost

______________________________ Date: ______________, 2010
Linda Jo Frost

______________________________ Date: ______________, 2010
Harris Gray

OPTIONEE

New Mexico Copper Corporation

By: ______________________________ Date: Sept ~~10~~ 9, 2010
President

Schedule A

The Water Rights

DESCRIPTION OF WATER RIGHTS

All of Optionors' right, title and interest in and to the following declared water rights, as described in the records of the New Mexico Office of the State Engineer ("OSE"):

OSE File No.	Township, Range, Section	Quarters
LRG-4652	T 15S, R5W, Sec. 30	SW 1/4, SE 1/4, SE 1/4
LRG-4652-S	T 15S, R5W, Sec. 31	NE 1/4, SE 1/4, NE 1/4
LRG-4652-S-2	T 15S, R5W, Sec. 30	SW 1/4, SE 1/4, SW 1/4
LRG-4652-S-3	T 15S, R5W, Sec. 31	NW 1/4, SW 1/4, NE 1/4
LRG-4652-S-11	T 16S, R6W, Sec. 10	SE 1/4, SW 1/4, NW 1/4
LRG-4652-S-12	T 16S, R6W, Sec. 9	NE 1/4, NW 1/4, NW 1/4
LRG-4652-S-13	T 15S, R6W, Sec. 31	SE 1/4, SE 1/4, SE 1/4
LRG-4652-S-14	T 15S, R5W, Sec. 30	NE 1/4, SW 1/4, SE 1/4
LRG-4652-S-15	T 15S, R6W, Sec. 25	SW 1/4, NE 1/4, SE 1/4
LRG-4652-S-16	T 15S, R6W, Sec. 28	SW 1/4, SW 1/4, SE 1/4

title to which water rights was quieted by the Seventh Judicial District Court in Sierra County, New Mexico, in *Hydro Resources Corporation v. Harris Gray and William J. Frost*, Case No. D09721 CV 2001-04. *See* attached Judgment and Quiet Title Decree to Water Rights on Mandate attached hereto as Exhibit "A-1."

STATE OF NEW MEXICO
SEVENTH JUDICIAL
DISTRICT COURT
FILED

2008 JAN 22 AM 8 46

Kathy Encinias
COURT CLERK
BY Lisa Frazier DEPUTY

SEVENTH JUDICIAL DISTRICT
STATE OF NEW MEXICO
COUNTY OF SIERRA

HYDRO RESOURCES CORPORATION, a New Mexico Corporation,

Plaintiff,

v. **NO. D-0721 CV 2001-04**

HARRIS GRAY and WILLIAM J. FROST, Individuals,

Defendants.

JUDGMENT AND QUIET TITLE DECREE TO WATER RIGHTS ON MANDATE

THIS MATTER having been remanded from the New Mexico Supreme Court in *Hydro Resources Corp. v. Gray*, 2007-NMSC-061, with instructions to quiet title in the disputed water rights in Defendants,

IT IS THEREFORE ORDERED, ADJUDGED AND DECREED that title in the water rights at issue in this case, described more particularly in the attached Ex. "A" is quieted in the name of Defendants, Harris Gray and William J. Frost, as requested in the Counterclaim of Harris Gray and William Frost filed in this action. It is further ordered that the Notice of Lis Pendens filed in this matter on January 8, 2001 be and hereby is removed.

Edmund H. Kase III

Hon. Edmund H. Kase III
District Court Judge

Exhibit "A-1"

Respectfully submitted,

LAW & RESOURCE PLANNING ASSOCIATES,
A Professional Corporation

By: Christina J. Bruff
Charles T. DuMars
Christina J. Bruff
Tanya L. Scott
Stephen Curtice
Attorneys for Harris Gray and William Frost
Albuquerque Plaza, 201 Third Street NW, Ste. 1750
Albuquerque, NM 87102
(505) 346-0998

APPROVED AS TO FORM:

Telephonically approved 01/16/08

Mr. Stuart R. Butzier, Esq.
Modrall Sperling Roehl Harris & Sisk PA
P.O. Box 2168
Albuquerque NM 87103-2168
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Telephonically approved by Stuart Butzier, 01/16/08

Mr. L. Michael Messina, Esq.
Law Office of L. Michael Messina PA
20 First Plaza NW #306
Albuquerque NM 87102-3352

Telephonically approved by Stuart Butzier, 01/16/08

Ms. Nancy L. Simmons, Esq.
Law Offices of Nancy Simmons
2001 Carlisle Blvd NE #E
Albuquerque NM 87110-4943

Any and all right, title and interest in and to inchoate and beneficially used water rights as such rights are specified in the New Mexico Office of the State Engineer and relating to certain real property all as described below:

SEO FILE	SUBDIVISION	SECTION	TOWNSHIP	RANGE
LRG-4652	SW/4 SE/4 SE/4	30	15S	5W
LRG-4652-S	NE/4 SE/4 NE/4	31	15S	5W
LRG-4652-S-2	SE/4 SE/4 SW/4	30	15S	5W
LRG-4652-S-3	NW/4 SW/4 NE/4	31	15S	5W
LRG-4652-S-11	SE/4 SW/4 NW/4	10	16S	6W
LRG-4652-S-12	NE/4 NW/4 NW/4	9	16S	6W
LRG-4652-S-13	SE/4 SE/4 SE/4	31	15S	6W
LRG-4652-S-14	NE/4 SE/4 SE/4	30	15S	5W
LRG-4652-S-15	SW/4 NE/4 SE/4	25	15S	6W
LRG-4652-S-16	SW/4 SW/4 SE/4	28	1S	6W

EXHIBIT A

Schedule B

Adverse Claims to the Water Rights

None

Schedule C

Optionors' Deed

SPECIAL WARRANTY DEED

Water Rights and Related Property

William Frost and **Linda Jo Frost**, husband and wife, and **Harris Gray**, a single man, for consideration paid, grant to **New Mexico Copper Corporation**, a New Mexico corporation, whose address is 2425 San Pedro NE, Albuquerque, New Mexico 87110, with special warranty covenants, the water rights and related property more particularly described in **Schedule A** attached hereto and incorporated herein by reference, which water rights have points of diversion and places of use in Sierra County, New Mexico.

Witness their hands and seals this _______ day of August, 2010.

____________________	____________________
William Frost	Linda Jo Frost

____
Harris Gray

***

State of New Mexico)
)ss
County of ______________)

The foregoing instrument was acknowledged before me on August ___, 2010 by William Frost and Linda Jo Frost, husband and wife.
SEAL

____
Notary Public

My Commission Expires:_______________

***

State of New Mexico)
)ss
County of ______________)

The foregoing instrument was acknowledged before me on August ___, 2010 by Harris Gray, a single man.
SEAL

____
Notary Public

My Commission Expires: _______________

NM

Schedule A

DESCRIPTION OF WATER RIGHTS

All of Optionors' right, title and interest in and to the following declared water rights, as described in the records of the New Mexico Office of the State Engineer ("OSE"):

OSE File No.	Township, Range, Section	Quarters
LRG-4652	T 15S, R5W, Sec. 30	SW 1/4, SE 1/4, SE 1/4
LRG-4652-S	T 15S, R5W, Sec. 31	NE 1/4, SE 1/4, NE 1/4
LRG-4652-S-2	T 15S, R5W, Sec. 30	SW 1/4, SE 1/4, SW 1/4
LRG-4652-S-3	T 15S, R5W, Sec. 31	NW 1/4, SW 1/4, NE 1/4
LRG-4652-S-11	T 16S, R6W, Sec. 10	SE 1/4, SW 1/4, NW 1/4
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LRG-4652-S-14	T 15S, R5W, Sec. 30	NE 1/4, SW 1/4, SE 1/4
LRG-4652-S-15	T 15S, R6W, Sec. 25	SW 1/4, NE 1/4, SE 1/4
LRG-4652-S-16	T 15S, R6W, Sec. 28	SW 1/4, SW 1/4, SE 1/4

title to which water rights was quieted by the Seventh Judicial District Court in Sierra County, New Mexico, in *Hydro Resources Corporation v. Harris Gray and William J. Frost*, Case No. D09721 CV 2001-04. *See* attached Judgment and Quiet Title Decree to Water Rights on Mandate attached hereto as Exhibit "A-1."

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SEVENTH JUDICIAL DISTRICT
STATE OF NEW MEXICO
COUNTY OF SIERRA

HYDRO RESOURCES CORPORATION, a New Mexico Corporation,

Plaintiff,

v. **NO. D-0721 CV 2001-04**

HARRIS GRAY and WILLIAM J. FROST, Individuals,

Defendants.

JUDGMENT AND QUIET TITLE DECREE TO WATER RIGHTS ON MANDATE

THIS MATTER having been remanded from the New Mexico Supreme Court in *Hydro Resources Corp. v. Gray*, 2007-NMSC-061, with instructions to quiet title in the disputed water rights in Defendants,

IT IS THEREFORE ORDERED, ADJUDGED AND DECREED that title in the water rights at issue in this case, described more particularly in the attached Ex. "A" is quieted in the name of Defendants, Harris Gray and William J. Frost, as requested in the Counterclaim of Harris Gray and William Frost filed in this action. It is further ordered that the Notice of Lis Pendens filed in this matter on January 8, 2001 be and hereby is removed.

Edmund H. Kase III

Hon. Edmund H. Kase III
District Court Judge

Respectfully submitted,

LAW & RESOURCE PLANNING ASSOCIATES,
A Professional Corporation

By: Christina J. Bruff
Charles T. DuMars
Christina J. Bruff
Tanya L. Scott
Stephen Curtice
Attorneys for Harris Gray and William Frost
Albuquerque Plaza, 201 Third Street NW, Ste. 1750
Albuquerque, NM 87102
(505) 346-0998

APPROVED AS TO FORM:

Telephonically approved 01/16/08

Mr. Stuart R. Butzier, Esq.
Modrall Sperling Roehl Harris & Sisk PA
P.O. Box 2168
Albuquerque NM 87103-2168
(505) 848-1832

Telephonically approved by Stuart Butzier, 01/16/08

Mr. L. Michael Messina, Esq.
Law Office of L. Michael Messina PA
20 First Plaza NW #306
Albuquerque NM 87102-3352

Telephonically approved by Stuart Butzier, 01/16/08

Ms. Nancy L. Simmons, Esq.
Law Offices of Nancy Simmons
2001 Carlisle Blvd NE #E
Albuquerque NM 87110-4943

Any and all right, title and interest in and to inchoate and beneficially used water rights as such rights are specified in the New Mexico Office of the State Engineer and relating to certain real property all as described below:

SEO FILE	SUBDIVISION	SECTION	TOWNSHIP	RANGE
LRG-4652	SW/4 SE/4 SE/4	30	15S	5W
LRG-4652-S	NE/4 SE/4 NE/4	31	15S	5W
LRG-4652-S-2	SE/4 SE/4 SW/4	30	15S	5W
LRG-4652-S-3	NW/4 SW/4 NE/4	31	15S	5W
LRG-4652-S-11	SE/4 SW/4 NW/4	10	16S	6W
LRG-4652-S-12	NE/4 NW/4 NW/4	9	16S	6W
LRG-4652-S-13	SE/4 SE/4 SE/4	31	15S	6W
LRG-4652-S-14	NE/4 SE/4 SE/4	30	15S	5W
LRG-4652-S-15	SW/4 NE/4 SE/4	25	15S	6W
LRG-4652-S-16	SW/4 SW/4 SE/4	28	1S	6W

EXHIBIT A

006

Schedule D

Optionee's Deed

SPECIAL WARRANTY DEED

Water Rights and Related Property

New Mexico Copper Corporation, a New Mexico corporation, for consideration paid, grants to **William Frost and Linda Jo Frost**, husband and wife, and **Harris Gray,** a single man, whose address is 1109 West Taylor Road, Las Cruces, NM 88005, with special warranty covenants, New Mexico, the water rights and related property more particularly described in **Schedule A** attached hereto and incorporated herein by reference, which water rights have points of diversion and places of use in Sierra County, New Mexico.

Witness its hand and seal this ___ day of August, 2010.

New Mexico Copper Corporation

By:______________________________
Barrett E. G. Sleeman, its President

***

State of ________________)
)ss
County of ______________)

The foregoing instrument was acknowledged before me on August ___, 2010 by Barrett E. G. Sleeman, as President of New Mexico Copper Corporation, a New Mexico corporation.

SEAL

____
NOTARY PUBLIC

My Commission Expires:________________

Schedule A

DESCRIPTION OF WATER RIGHTS

All of Optionors' right, title and interest in and to the following declared water rights, as described in the records of the New Mexico Office of the State Engineer ("OSE"):

OSE File No.	Township, Range, Section	Quarters
LRG-4652	T 15S, R5W, Sec. 30	SW 1/4, SE 1/4, SE 1/4
LRG-4652-S	T 15S, R5W, Sec. 31	NE 1/4, SE 1/4, NE 1/4
LRG-4652-S-2	T 15S, R5W, Sec. 30	SW 1/4, SE 1/4, SW 1/4
LRG-4652-S-3	T 15S, R5W, Sec. 31	NW 1/4, SW 1/4, NE 1/4
LRG-4652-S-11	T 16S, R6W, Sec. 10	SE 1/4, SW 1/4, NW 1/4
LRG-4652-S-12	T 16S, R6W, Sec. 9	NE 1/4, NW 1/4, NW 1/4
LRG-4652-S-13	T 15S, R6W, Sec. 31	SE 1/4, SE 1/4, SE 1/4
LRG-4652-S-14	T 15S, R5W, Sec. 30	NE 1/4, SW 1/4, SE 1/4
LRG-4652-S-15	T 15S, R6W, Sec. 25	SW 1/4, NE 1/4, SE 1/4
LRG-4652-S-16	T 15S, R6W, Sec. 28	SW 1/4, SW 1/4, SE 1/4

title to which water rights was quieted by the Seventh Judicial District Court in Sierra County, New Mexico, in *Hydro Resources Corporation v. Harris Gray and William J. Frost,* Case No. D09721 CV 2001-04. *See* attached Judgment and Quiet Title Decree to Water Rights on Mandate attached hereto as Exhibit "A-1."

STATE OF NEW MEXICO
SEVENTH JUDICIAL
DISTRICT COURT
FILED

2008 JAN 22 AM 8 46

Kathy Encinias
COURT CLERK
BY Lisa Frazier DEPUTY

SEVENTH JUDICIAL DISTRICT
STATE OF NEW MEXICO
COUNTY OF SIERRA

HYDRO RESOURCES CORPORATION, a New Mexico Corporation,

Plaintiff,

v. **NO. D-0721 CV 2001-04**

HARRIS GRAY and WILLIAM J. FROST, Individuals,

Defendants.

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Edmund H. Kase III

Hon. Edmund H. Kase III
District Court Judge

Respectfully submitted,

LAW & RESOURCE PLANNING ASSOCIATES,
A Professional Corporation

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APPROVED AS TO FORM:

Telephonically approved 01/16/08

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Any and all right, title and interest in and to inchoate and beneficially used water rights as such rights are specified in the New Mexico Office of the State Engineer and relating to certain real property all as described below:

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LRG-4652-S-11	SE/4 SW/4 NW/4	10	16S	6W
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LRG-4652-S-14	NE/4 SE/4 SE/4	30	15S	5W
LRG-4652-S-15	SW/4 NE/4 SE/4	25	15S	6W
LRG-4652-S-16	SW/4 SW/4 SE/4	28	1S	6W

EXHIBIT A

006

Schedule E

Memorandum of Agreement

Memorandum of Agreement

THIS MEMORANDUM of AGREEMENT relates to the Option and Purchase Agreement (the "Agreement") effective as of August ___, 2010 by and between **New Mexico Copper Corporation**, a New Mexico corporation ("Optionee"), and **William Frost** and **Linda Jo Frost**, husband and wife, and **Harris Gray**, a single man (separately and collectively, "Optionors").

1. For and in consideration of [redacted] paid by Optionee to Optionors and other good and valuable consideration, Optionors agreed in the Agreement to grant Optionee the sole and exclusive right and option described in the Agreement (the "Option") to acquire the Water Rights with points of diversion and places of use in Sierra County, New Mexico and related property described in Schedule A to the Agreement and in Schedule A hereto.

2. Upon the exercise of the Option by Optionee pursuant to and in accordance with the Agreement, the Water Rights shall be transferred and conveyed by Optionors to Optionee, free and clear of all Encumbrances. If Optionee fails to so exercise the Option, the Water Rights shall remain the property of Optionor.

3. Optionee has an office at 315 Paseo de Peralta, Santa Fe, New Mexico 87501. Additional information about the Agreement may be obtained from Optionee at such office.

4. This Memorandum has been executed for the purpose of recording in the records of Sierra County, New Mexico and filing in the records of the New Mexico State Engineer to give notice of the Agreement. This Memorandum does not in any way modify, supplement or abridge the Agreement or any of its provisions, as the same are now or may hereafter be in force and effect.

IN WITNESS WHEREOF, Optionors and Optionee have duly executed and delivered this Memorandum of Agreement.

Optionee	Optionors
New Mexico Copper Corporation	____________________________
	____________________________
By: __________________________ Barrett E. G. Sleeman, it President	____________________________

State of __________)
) ss
County of ________)

The foregoing instrument was acknowledged before me on August _______, 2010 by Barrett E. G. Sleeman, as President of New Mexico Copper Corporation, a New Mexico corporation.

____
Notary Public

My Commission expires: ___________

State of New Mexico)
) ss
County of ____________)

The foregoing instrument was acknowledged before me on August ___, 2010 by William Frost and Linda Jo Frost, husband and wife.

____
Notary Public

My Commission expires: ___________

State of New Mexico)
) ss
County of __________)

The foregoing instrument was acknowledged before me on August ___, 2010 by Harris Gray, a single man.

____
Notary Public

My Commission expires: ___________

&

DESCRIPTION OF WATER RIGHTS

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LRG-4652-S-2	T 15S, R5W, Sec. 30	SW 1/4, SE 1/4, SW 1/4
LRG-4652-S-3	T 15S, R5W, Sec. 31	NW 1/4, SW 1/4, NE 1/4
LRG-4652-S-11	T 16S, R6W, Sec. 10	SE 1/4, SW 1/4, NW 1/4
LRG-4652-S-12	T 16S, R6W, Sec. 9	NE 1/4, NW 1/4, NW 1/4
LRG-4652-S-13	T 15S, R6W, Sec. 31	SE 1/4, SE 1/4, SE 1/4
LRG-4652-S-14	T 15S, R5W, Sec. 30	NE 1/4, SW 1/4, SE 1/4
LRG-4652-S-15	T 15S, R6W, Sec. 25	SW 1/4, NE 1/4, SE 1/4
LRG-4652-S-16	T 15S, R6W, Sec. 28	SW 1/4, SW 1/4, SE 1/4

title to which water rights was quieted by the Seventh Judicial District Court in Sierra County, New Mexico, in *Hydro Resources Corporation v. Harris Gray and William J. Frost*, Case No. D09721 CV 2001-04. *See* attached Judgment and Quiet Title Decree to Water Rights on Mandate attached hereto as Exhibit "A-1."

STATE OF NEW MEXICO
SEVENTH JUDICIAL
DISTRICT COURT
FILED

2008 JAN 22 AM 8 46

Kathy Encinias
COURT CLERK
BY Lisa Frazier DEPUTY

SEVENTH JUDICIAL DISTRICT
STATE OF NEW MEXICO
COUNTY OF SIERRA

HYDRO RESOURCES CORPORATION, a New Mexico Corporation,

Plaintiff,

v. **NO. D-0721 CV 2001-04**

HARRIS GRAY and WILLIAM J. FROST, Individuals,

Defendants.

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Edmund H. Kase III

Hon. Edmund H. Kase III
District Court Judge

Respectfully submitted,

LAW & RESOURCE PLANNING ASSOCIATES,
A Professional Corporation

By: Christina J. Bruff
Charles T. DuMars
Christina J. Bruff
Tanya L. Scott
Stephen Curtice
Attorneys for Harris Gray and William Frost
Albuquerque Plaza, 201 Third Street NW, Ste. 1750
Albuquerque, NM 87102
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APPROVED AS TO FORM:

Telephonically approved 01/16/08

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LRG-4652-S-14	NE/4 SE/4 SE/4	30	15S	5W
LRG-4652-S-15	SW/4 NE/4 SE/4	25	15S	6W
LRG-4652-S-16	SW/4 SW/4 SE/4	28	1S	6W

EXHIBIT A

006

Schedule F

Release of Memorandum of Agreement

Release of Memorandum of Agreement

Effective ____________________, the undersigned, as Optionee and Optionors, hereby release the Memorandum of Agreement filed for record in Sierra County, New Mexico on _____, 2010 as Document No. _______________ and recorded in Book __, at Page __, of the real property records of Sierra County.

IN WITNESS WHEREOF, Optionee and Optionors have duly executed this Release of Memorandum of Agreement.

Optionee	Optionors
New Mexico Copper Corporation	______________________________
By: ______________________________ Barrett E. G. Sleeman, its President	______________________________
	______________________________

***

State of ________________)
) ss
County of ______________)

The foregoing instrument was acknowledged before me on August ___, 2010 by Barrett E. G. Sleeman, as President of New Mexico Copper Corporation, a New Mexico corporation.

____
Notary Public

My Commission expires: ____________

***

State of New Mexico)
) ss
County ____________)

The foregoing instrument was acknowledged before me on August ___, 2010 by William Frost and Linda Jo Frost, husband and wife.

____
Notary Public

My Commission expires: ____________

State of New Mexico)
) ss
County of ____________)

The foregoing instrument was acknowledged before me on August ____, 2010 by Harris Gray, a single man.

____
Notary Public

My Commission expires: ______________

&

SECOND AMENDMENT OF OPTION and PURCHASE AGREEMENT

THIS SECOND AMENDMENT OF OPTION and PURCHASE AGREEMENT (this "**Second Amendment**") is made effective April 1, 2010 (the "**Second Amendment Effective Date**") by and

BETWEEN:

NEW MEXICO COPPER CORPORATION, a New Mexico corporation, having an office at 315 Paseo de Peralta, Santa Fe, New Mexico 87501, email address: patrickharford@mercatorgold.com, and facsimile number: +44 (0) 20 7929 1015 ("**Optionee**"),

AND:

HYDRO RESOURCES CORPORATION, a New Mexico corporation, and **CU FLAT, LLC,** a New Mexico limited liability company, both having an office at 4011 Mesa Verde NE, Albuquerque, New Mexico 87110, email address: glotspeich@aol.com, and facsimile number: 505-266-2900, and **GCM, INC.,** a New Mexico corporation, having an office at 2219 Vista Larga NE, Albuquerque, New Mexico 87106, email address: lmmessina99@yahoo.com, and facsimile number: 505-243-3329 (collectively, "**Optionor**").

WHEREAS:

(A) Optionor and Optionee are parties to an Option and Purchase Agreement (the "Original Agreement") effective July 23, 2009 pursuant to which Optionee may acquire certain Property;

(B) Optionor and Optionee amended the Original Agreement by a First Amendment of Option and Purchase Agreement ("First Amendment") effective January 20, 2010 (the Original Agreement, as amended by the First Amendment, is herein called the "Option and Purchase Agreement"); and

(C) Optionor and Optionee wish to further amend the Option and Purchase Agreement as expressly provided in this Second Amendment and, except as so expressly provided, for the Option and Purchase Agreement to remain in full force and effect according to its terms.

NOW, THEREFORE, THIS SECOND AMENDMENT WITNESSES that for and in consideration of the sum of [redacted] paid by Optionee to Optionor and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, which consideration is for this Second Amendment and not for the grant of the Option, Optionee and Optionor agree as follows:

Section 1. **Definitions.** Each capitalized term used in this Second Amendment and not otherwise defined herein shall have the meaning assigned to such term in the Option and Purchase Agreement.

Section 2. **Amendments.** The Option and Purchase Agreement is hereby amended by adding to it the following new Section 3.6:

"Section 3.6 Hydro Water Rights.

In the event that Optionee exercises the Option and makes the final payment of [redacted] pursuant to Section 3.2, Hydro shall by special warranty deed ("the **Hydro Water Rights Deed**") convey and transfer to Optionee all rights, titles, interests and claims now or hereafter existing in, to, under, in connection with or relating to New Mexico State Engineer ("**State Engineer**") Files No. LRG-4652-S-4, LRG-4652-S-5, LRG-4652-S-6, LRG-4652-S-7, LRG-4652-S-8, LRG-4652-S-9, LRG-4652-S-10, LRG-4652-S-17, and LRG-4654 and any and all wells, drill holes, casing, tubing, pipes, pumps, pipelines, electric power lines, tanks, easements, right-of-way, and other equipment, facilities, appurtenances, fixtures, and real and personal property associated, used, or useful in connection with any of said rights, titles, interests or claims (collectively, the "**Hydro Water Rights**"). The Hydro Water Rights Deed shall (i) provide that if and when the Hydro Water Rights are no longer necessary in connection with the development, operation, reclamation or closure of the Mine, Optionee shall convey and transfer an undivided 2/3 interest in the Hydro Water Rights to Hydro and an undivided 1/3 interest in the Hydro Water Rights to GCM and (ii) promptly upon execution and delivery be filed for record in the real property records of Sierra County. Optionee, acting as a prudent operator and with due regard to the interests of itself and Optionor, shall apply water produced pursuant to the Hydro Water Rights to beneficial use at the Mine and may from time-to-time apply to the State Engineer for one or more permits to change the points of diversion of any or all of the Hydro Water Rights to one or more wells on the Real Property, the Patented Mining Claims, the Unpatented Claims, or other real property owned or controlled by Optionee. Optionee shall furnish Optionor with copies of data developed by Optionee or otherwise in its possession relating to the Hydro Water Rights. Optionor hereby consents to any such applications and permits. Optionee may not mortgage, pledge or grant a lien or security interest in the Hydro Water Rights."

Section 3. **Representations and Warranties.** Optionee represents and warrants to Optionor that the representations and warranties by Optionee in Section 2.1 of the Option and Purchase Agreement are true and correct on and as of the Second Amendment Effective Date and apply to this Second Amendment as well as to the Option and Purchase Agreement. Optionor represents and warrants to Optionee that the representations and warranties by Optionor in Section 2.2 of the Option and Purchase Agreement are true and correct as of the Second Amendment Effective Date and apply to this Second Amendment as well as to the Option and Purchase Agreement.

__Section 4.__ **Effectiveness.** This Second Amendment is effective as of the Second Amendment Effective Date. Except as expressly set forth in this Second Amendment, the Option and Purchase Agreement remains unchanged and in full force and effect.

__Section 5.__ **Counterparts and Fax Execution.** This Second Amendment may be executed in any number of counterparts, all of which taken together shall be deemed to constitute one and the same instrument. This Second Amendment may be executed, accepted and delivered by facsimile.

IN WITNESS WHEREOF, this Second Amendment has been executed as of the respective dates set forth below and is effective as of the Second Amendment Effective Date.

New Mexico Copper Corporation

By: ______________________

Its: President, Patrick A. Harford
Date: April ___, 2010

Hydro Resources Corporation

By: George O Lotspeich

Its: President, George O. Lotspeich
Date: April 1, 2010

Cu Flat, LLC

By: George O Lotspeich

Its: Managing Member, George O. Lotspeich
Date: April 1, 2010

GCM, Inc.

By:

Its: President, L. Michael Messina
Date: April 1, 2010

GROUND WATER DISCHARGE PERMIT APPLICATION
PART C: SITE INFORMATION
All Facilities

C-1. **Area Map.** Attach a current area map showing roads and clearly mark the location of your facility.
See Attachment C-1, the Regional Location Map, which is also Figure 1-1 of the PoO

C-2. **Directions to Site.** Provide driving directions to the site from the nearest town or, if located in a town, from an easily identifiable location.

See Attachment C-2, the Regional Location Map, which is also Figure 1-2 of the PoO
The Site can be reached by traveling south 15 miles from Truth or Consequences on Interstate
Highway 25, then 12 miles west on New Mexico Highway 152. The Project area lies two miles
west-northwest from New Mexico Highway 152. Access to the Site is via Gold Dust Rd/Co. Rd. Bo27.

C-3. **Topographic Map.** Attach a copy of the appropriate US Geological Survey topographic map. You may provide just the relevant portion. USGS maps are available at many outdoor equipment stores or bookstores, from the USGS at www.usgs.gov or 1-888-ASKUSGS, and from commercial websites.

On the map clearly indicate the location of your facility. Also identify the approximate locations of all wells within 1,000 feet of your discharge locations. The Office of the State Engineer has a searchable database of supply wells on its website at www.ose.state.nm.us.

■ USGS map attached with facility location and neighboring wells marked.
See Attachment C-3, the Topographic Maps

C-4. **Flood Potential.** Attach a copy of the latest Federal Emergency Management Agency (FEMA) flood map with your facility's location clearly marked, to the best of your ability. Information about how to obtain this map, formally known as a Flood Insurance Rate Map (FIRM) is available at www.fema.gov, insurance agencies or county government offices. A site specific analysis may be substituted.

■ FEMA map or site-specific analysis attached.
See Attachment C-4, the Flood Potential Map

☐ Previously submitted and still up-to-date. Submittal date(s): ________________

C-5. **Soils.** Attach either:

a) A copy of the appropriate Natural Resource Conservation Service (NRCS) soil survey map, with your site clearly identified to the best of your ability. Include the descriptive information for soils associated with the discharge locations. To obtain the map, contact your local NRCS office – there is one in every county.

b) A site-specific assessment showing the soils classifications. This is preferred over the more generalized NRCS surveys.

■ NRCS soil survey or site-specific assessment attached.
See Attachment C-5, the Soil Survey Map

☐ Previously submitted. Submittal date(s): ________________

C-6. **Geology.** Provide information on the geology beneath the site by attaching relevant portions of geologic reports, well logs for on-site or nearby wells, or site specific assessments. A variety of geology publications and resources are available from the New Mexico Bureau of Geology and Mineral Resources at http://geoinfo.nmt.edu or 505-835-5420 (Socorro). Well logs are available from the New Mexico State Engineer's Office at http://www.ose.state.nm.us/.

■ Geologic report attached. ■ Well log(s) attached.

See Section 2.2 of Attachment A-2, the Stage 1 Abatement Plan and

Section 4.2 and Figures 4-1 through 4-4 of Attachment B-1, the PoO

☐ Geologic information previously submitted. Submittal date(s): ______________

C-7. **Ground Water Hydrology.** Ground water hydrology refers to the occurrence, distribution, movement and chemistry of ground water. The ground water hydrology at your site will determine in large part whether your discharge will adversely affect ground water quality. You may need to present detailed information in order to "demonstrate that the Discharge Permit will not result in concentrations in excess of the standards of Section 20.6.2.3103 NMAC or the presence of any toxic pollutant." (20.2.3106.C.7 NMAC)

At a minimum, provide information below on the direction of ground water flow. Ground water may not flow in the same direction as water on the surface of the ground. A monitoring well survey is one of the best methods to determine the direction of ground water flow at a particular site. Such surveys are routinely required for many Discharge Permit locations.

If a survey is not available, check with well drillers, the city water department, staff at the Office of the State Engineer, environmental consultants or other knowledgeable persons in your area. In addition, relevant reports have been published for some areas. See the OSE website at www.ose.state.nm.us or the NMBGMR website at http://geoinfo.nmt.edu.

Direction of ground water flow: **WSW**

If ground water flow shifts seasonally, describe here: ______________

Reference: **See Section 2.3 of Attachment A-2, the Stage 1 Abatement Plan and Section 4.4 and Figures 4-7 through 4-12 of Attachment B-1, the PoO**

■ On-site well survey attached. ☐ Previously submitted. Submittal date(s): ______________

■ Nearby well survey attached. ☐ Previously submitted. Submittal date(s): ______________

☐ Other. Specify: ______________

☐ Relevant portion attached.

☐ Previously submitted. Submittal date(s): ______________

Attach any additional information available about ground water hydrology at the site.

C-8. **Other Permitted Discharge Locations.** If applicable, list other locations of wastewater or stormwater discharges on your site that are not described in this application and indicate what permits apply to them. Examples include discharges from small septic systems (covered by Liquid Waste Permits, discharges to surface waters under a NPDES permit, a discharge covered by a separate Discharge Permit, etc. Be sure these other discharge locations are identified on the site map required in Item B-3.

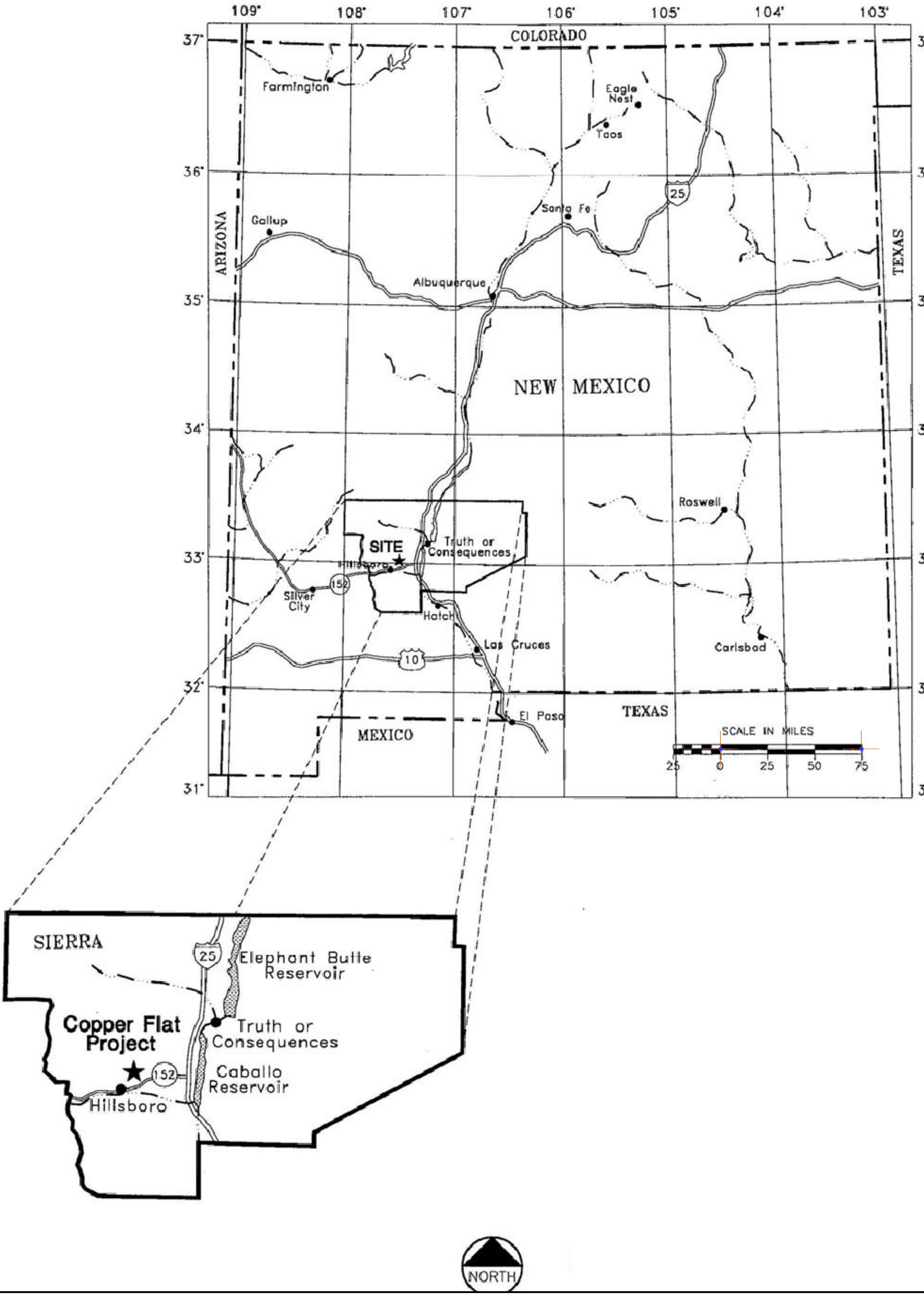
Discharge Type	Permit Identification
(none)	

C-9. **Other Information.** Describe below or attach any additional information to demonstrate that your proposed discharge plan will be protective of ground water quality, public health and property.

Mineral exploration and development drill holes, monitoring, and production wells subject to state regulations would be abandoned in accordance with applicable rules and regulations (NMAC 19.27.4 et seq.). Boreholes would be sealed to prevent cross contamination between aquifers and required shallow seals would be placed to prevent contamination by surface access. Monitoring wells around the tailings impoundment would be maintained until NMCC is released from this requirement by the NMED, MMD, and BLM. These wells would then be plugged and abandoned according to applicable requirements.

Attachment C-1

Project Location Map



NEW MEXICO COPPER CORPORATION

COPPER FLAT MINE

PROJECT LOCATION

DESIGN: -	DRAWN: -	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 12/2/2010
FILE NAME PoO_Fig1-01_Location_JQG_20101202		

DRAWING NO. FIGURE 1-1

SHEET 1 OF 28

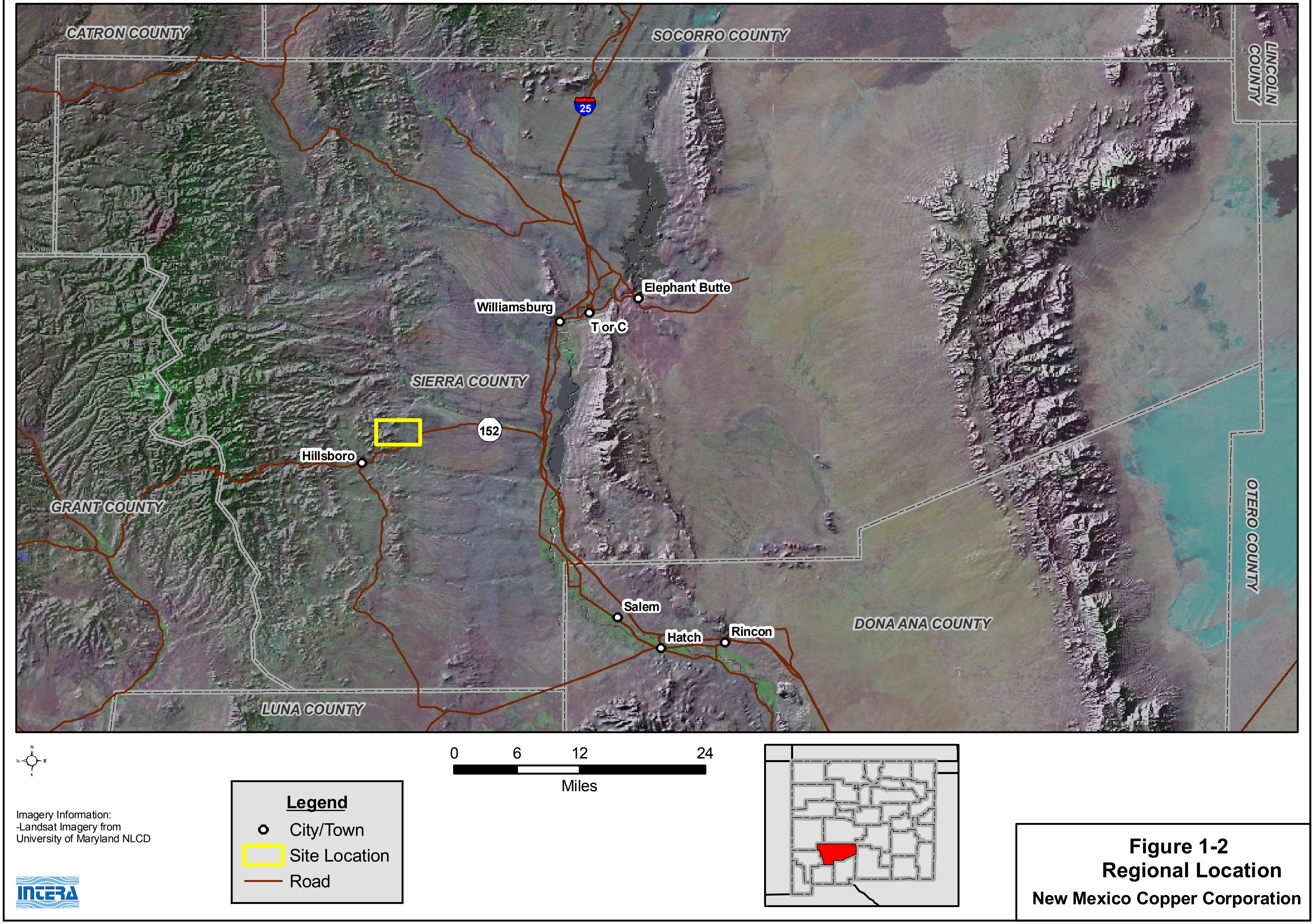
REVISION NO. A

JOB NO. 191000-03

Path: H:\Copper_Flat\New Mexico Copper Corp\191000_03_Copper_Flat_Permitting\040_Drafting\20101115\PoO_Fig1-01_Location_JQG_20101202.mxd

Attachment C-2

Regional Location Map



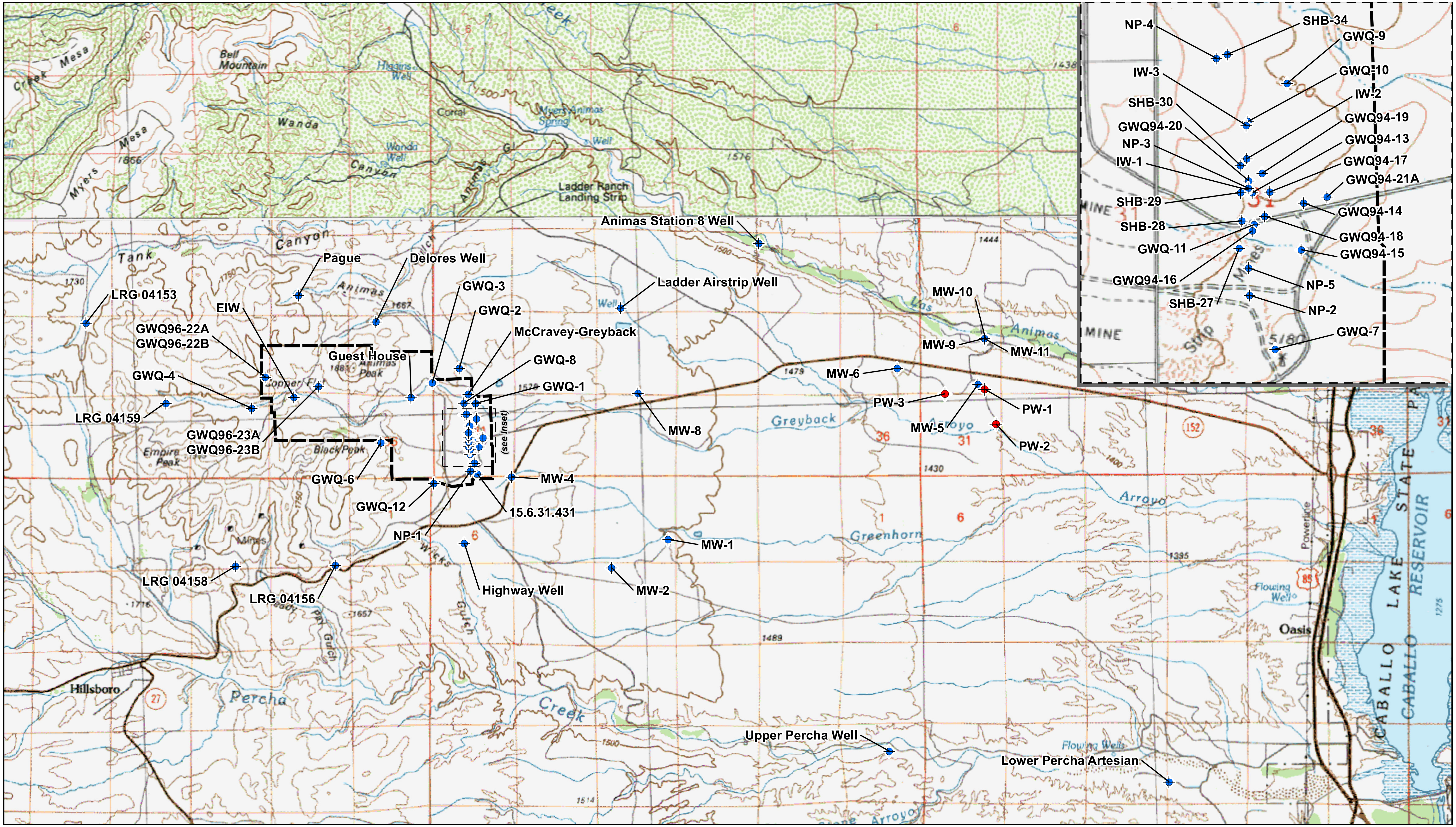
Imagery Information:
-Landsat Imagery from
University of Maryland NLCD

INTERA

Figure 1-2
Regional Location
New Mexico Copper Corporation

Attachment C-3

Topographic Maps



0 3,000 6,000 12,000 18,000

Feet

Legend

- Monitoring Well
- Production Well
- Proposed Mine Permit Boundary

Mine Boundary:
Tom Van Bebber
Projection Information:
-New Mexico State Plane West, NAD 1927

Figure C-3a
USGS Topographic Map
Discharge Permit Application
New Mexico Copper Corporation

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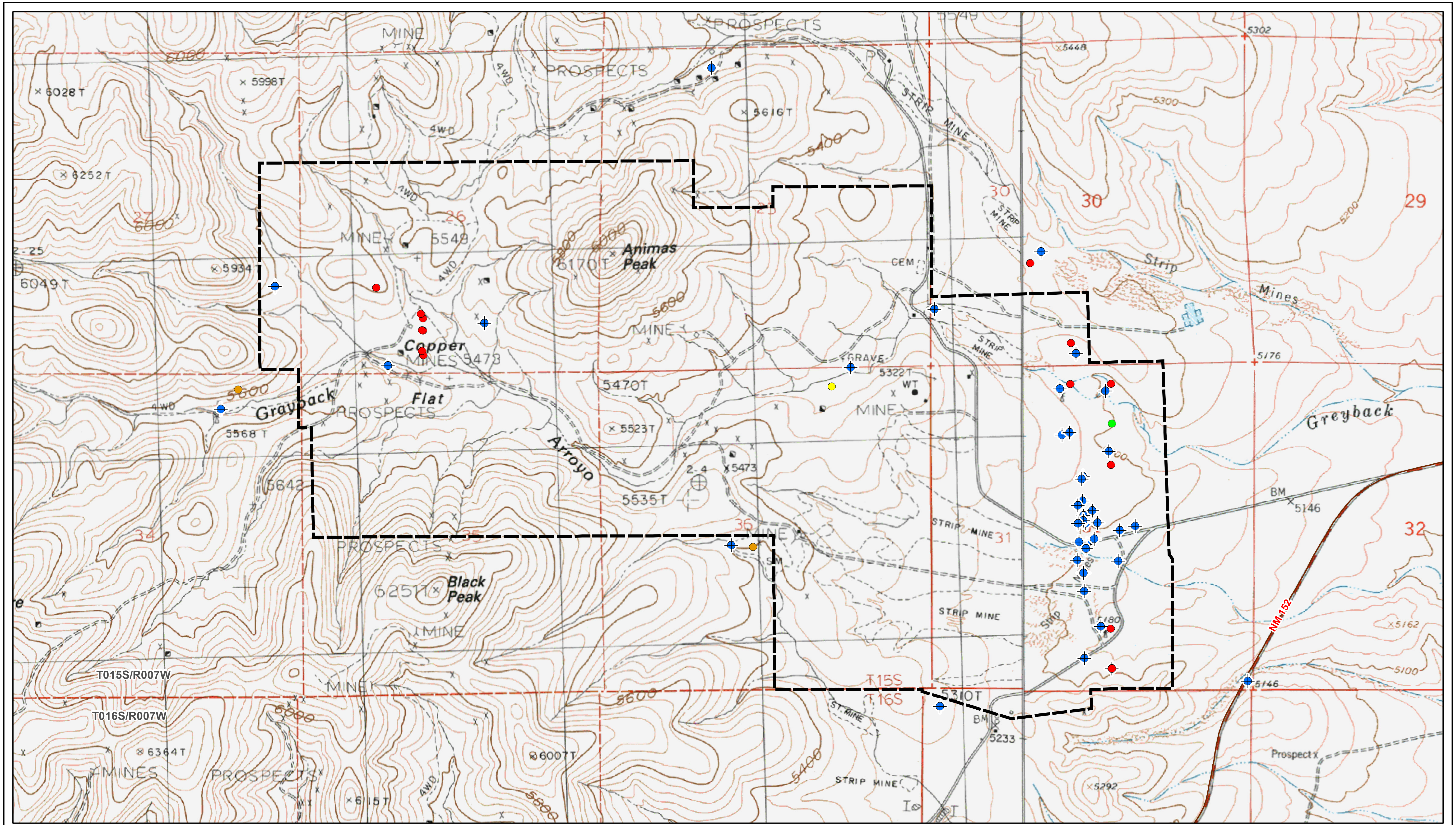


Legend

●	Domestic Well (OSE WATERS)	⊕	Monitoring Well
●	Mining Well (OSE WATERS)	⌐ ⌐	Proposed Mine Permit Boundary
●	Stock Well (OSE WATERS)	—	Road
●	Unknown Well (OSE WATERS)		

INTERA

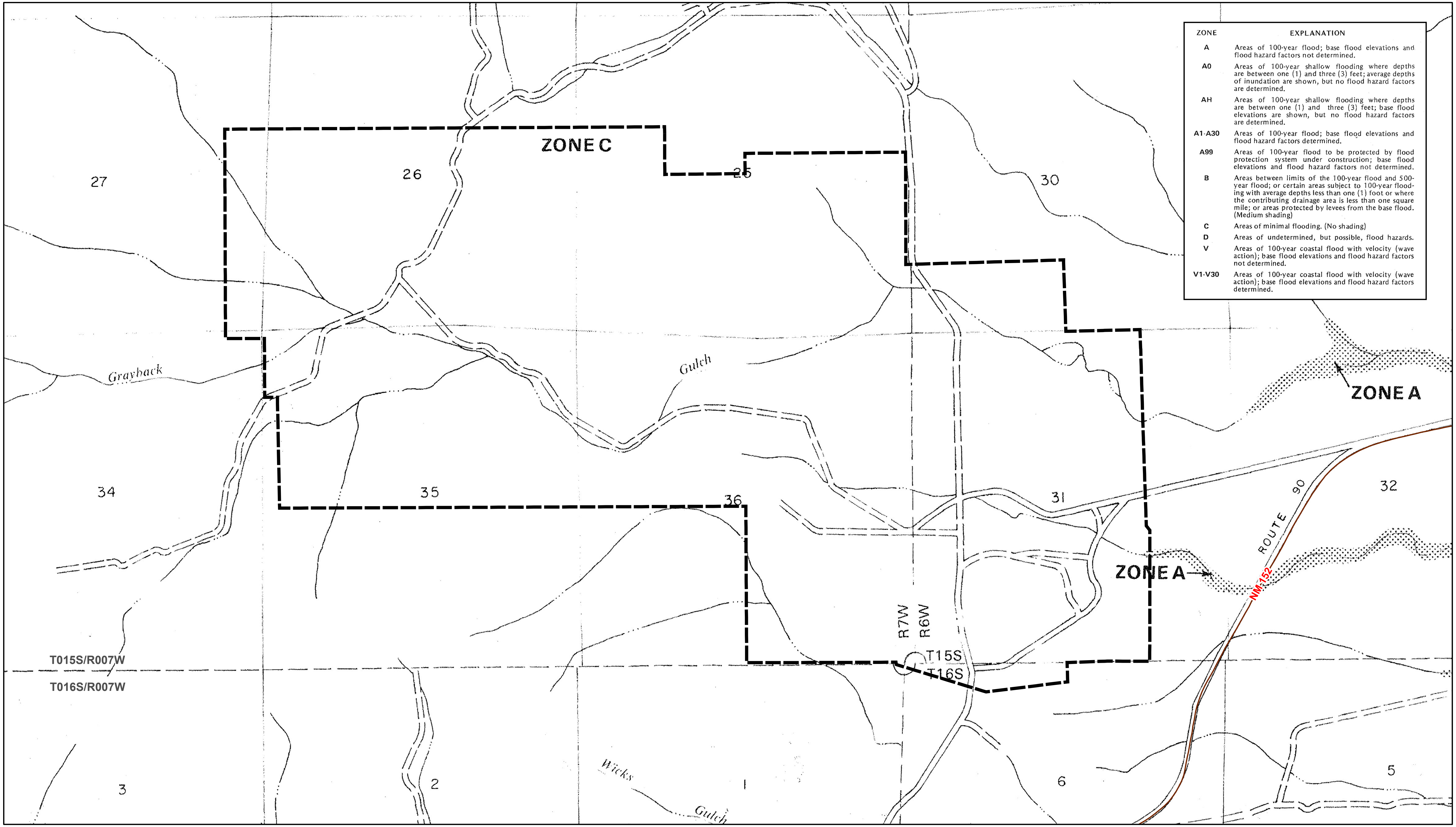
Mine Boundary:
Tom Van Bebber
Projection Information:
-New Mexico State Plane West, NAD 1927

Figure C-3b
USGS Topographic Map Closeup
Discharge Permit Application
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Discharge_Permit_Figures\FigC3b_CloseTopo_rev2.mxd 3/28/2011

Attachment C-4

Flood Potential Map



ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

N

Map Source: Federal Emergency Management Agency
-Flood Insurance Rate Map #350071 0675B.
Mine Boundary:
-Tom Van Bebber
Projection Information:
-New Mexico State Plane West, NAD 1927

0 750 1,500 3,000 4,500
Feet

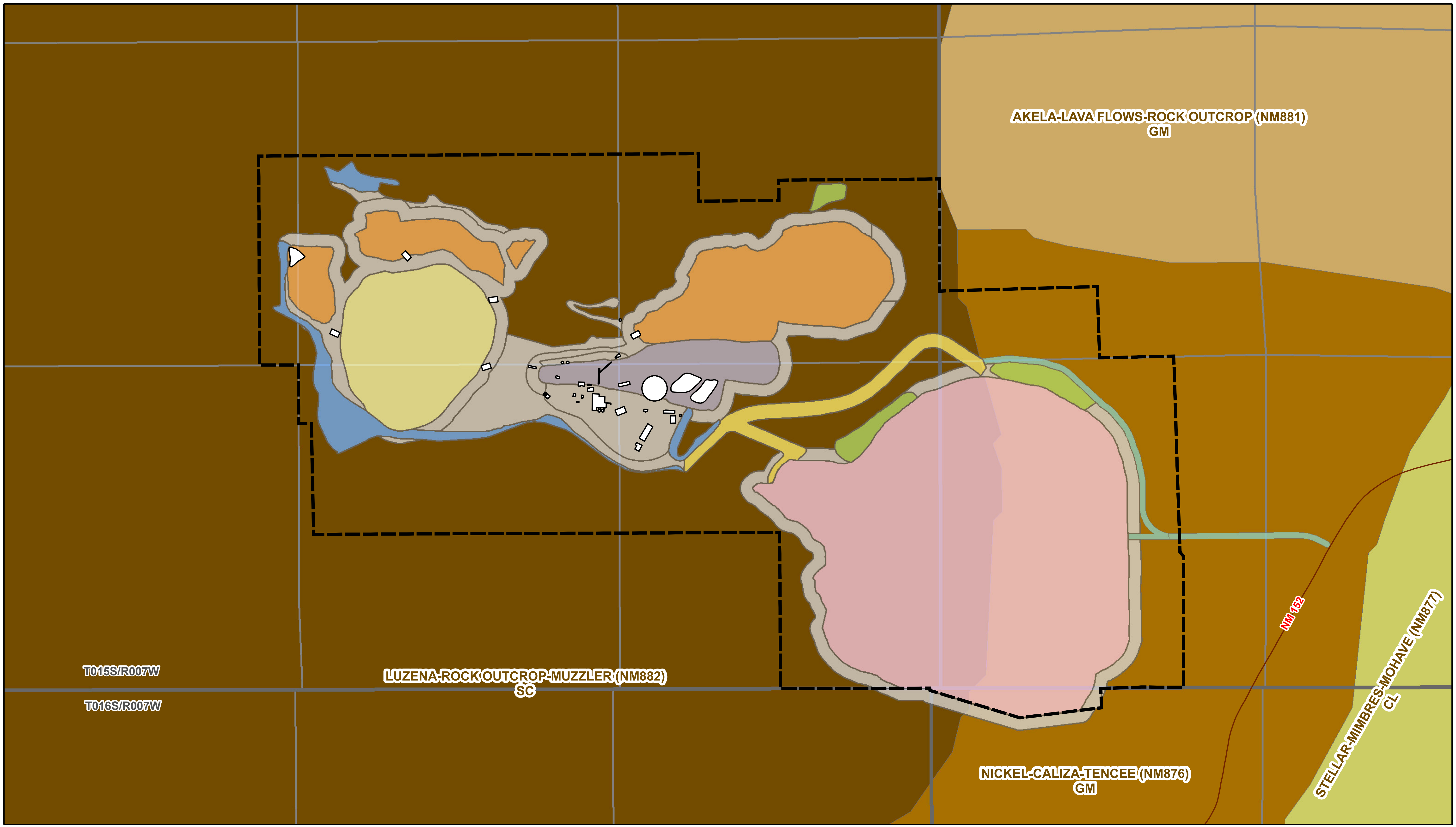
Legend

—	Road
▭	Proposed Mine Permit Boundary

Figure C-4
Flood Potential Map
Discharge Permit Application
New Mexico Copper Corporation

Attachment C-5

Soil Survey Map



Mine Boundary:
Tom Van Bebber
Projection Information:
-New Mexico State Plane West, NAD 1927

Figure C-5
Soil Survey
Discharge Permit Application
New Mexico Copper Corporation

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Stage I Abatement Plan
for the
Copper Flat Mine

March 31, 2011

Prepared for:
New Mexico Copper Corporation

Submitted to:
Ground Water Quality Bureau
Mining Environmental Compliance Section
New Mexico Environment Department

Prepared by:
INTERA

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Acronyms and Abbreviations

ABA	Acid Base Accounting
ABC	Adrian Brown Consultants
Air Sciences	Air Sciences Inc.
Alta Gold	Alta Gold Company
amsl	above mean sea level
ARD	acid rock drainage
BLM	U.S. Bureau of Land Management
CFQM	Copper Flat Quartz Monzonite
cfs	cubic feet per second
CRF	chemical release function
EA	environmental assessment
EIS	environmental impact statement
EMNRD	New Mexico Energy, Minerals and Natural Resources Department
°F	degrees Fahrenheit
ft	feet
GIS	geographic information system
gpm	gallons per minute
GWQB	Ground Water Quality Bureau
HSU	hydrostratigraphic unit
lbs	pounds
Ma	million years ago
MECS	Mining Environmental Compliance Section
mg/L	milligrams per liter
MMD	Mining and Minerals Division
MSF	Middle Santa Fe Group hydrostratigraphic unit
Mst	million standard tons
MWMP	Meteoric Water Mobility Procedure
NAG	Net Acid Generation
NMAC	New Mexico Administrative Code
NMCC	New Mexico Copper Corporation
NMED	New Mexico Environment Department
oz	ounce

PFEIS	Preliminary Final Environmental Impact Statement
Quintana	Quintana Minerals Corporation
Rio Gold	Rio Gold Mining Ltd
SAP	Sampling and Analysis Plan
Site	Copper Flat Mine
TDS	total dissolved solids
Tenneco	Tenneco Minerals
USF	Upper Santa Fe Group hydrostratigraphic unit
WETLab	Western Environmental Testing Laboratory
WQCC	New Mexico Water Quality Control Commission

1 Introduction

The New Mexico Copper Corporation (NMCC) is submitting this Stage 1 Abatement Plan for the Copper Flat Mine in response to the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) Mining Environmental Compliance Section (MECS) letters dated August 20, 2008, and March 18, 2009 (Appendix A). This Stage 1 Abatement Plan was prepared in accordance with the provisions of New Mexico Administrative Code (NMAC) 20.6.2.4103 Abatement Standards and Requirements and relevant regulations, and per discussions with the NMED MECS.

The Copper Flat Mine (Site) is located approximately 20 miles southwest of Truth or Consequences, New Mexico, and approximately 5 miles northeast of Hillsboro, New Mexico (Figure 1-1). The proposed mining operation is located in Sections 30 and 31, Township 15 South, Range 5 West (T15S, R5W); Sections 30 and 31, T15S, R6W; Sections 23 through 27 and 34 through 36, T15S, R7W; Section 6, T16S, R6W; and Section 2, T16S, R7W (all with reference to the New Mexico Principal Meridian) in Sierra County, New Mexico. The mineralized zone is centered at approximately latitude 32.970300, longitude −107.533527.

The Copper Flat properties comprise 3,304.75 acres in contiguous and noncontiguous lands that include patented and unpatented mining claims (lode, placer, and mill site) and fee parcels. The acreage inside the Site permit boundary is 2,190 acres. NMCC will mine copper ore by open pit extraction methods in the area. Molybdenum, gold, and silver will be recovered as byproducts.

The owners of the Copper Flat properties (Hydro Resources Corporation, a New Mexico corporation; Cu Flat, LLC, a New Mexico limited liability company; and GCM, Inc., a New Mexico Corporation) have granted NMCC an exclusive option to acquire the Copper Flat properties per a July 23, 2009 Option and Purchase Agreement, as amended. NMCC is a wholly owned subsidiary of THEMAC Resources Group, Ltd., a Canadian corporation. Because of the exclusive option, NMCC is acting on behalf of the facility owner as the responsible person, as defined in 20.6.2.7 NMAC, regarding all aspects of abatement of subsurface and surface-water pollution.

1.1 Purpose and Objectives of the Abatement Plan

As defined in 20.06.2.4106C NMAC, the purpose of the Stage 1 Abatement Plan is to "…design and conduct a site investigation that will adequately define Site conditions, and provide the data necessary to select and design an effective abatement option." To achieve this purpose, NMCC proposes to design and implement a Site investigation program that will address MECS's concerns, which are summarized as follows:

- Potential groundwater impacts from the existing unlined tailings impoundment.
- Potential groundwater impacts from the existing pit lake.
- Potential impacts to wildlife caused by exposure to the existing pit lake.
- Potential groundwater impacts caused by acid rock drainage (ARD) from existing exposed waste rock.

These concerns were identified in the NMED letters provided in Appendix A and have been discussed in subsequent meetings with NMED MECS staff. The objectives of this plan are to summarize pertinent historical information, describe pertinent ongoing investigations, and propose additional investigations, which, in combination with historical and ongoing investigations, will meet the stated Stage 1 Abatement Plan purpose to address the identified concerns.

1.2 Abatement Plan Organization

This Stage 1 Abatement Plan is divided into ten sections: 1.0 Introduction, 2.0 Site Description, 3.0 Site History and Status, 4.0 Ongoing Investigation Activities, 5.0 Proposed Characterization Activities, 6.0 Quality Assurance Project Plan, 7.0 Site Health and Safety Plan, 8.0 Reporting, 9.0 Schedule, and 10.0 References. The Figures, Tables, and Appendices are included at the end of this document.

2 Site Description

This section provides a description of the Site as identified in Figure 1-1 and includes a discussion of climate, geologic conditions, and hydrologic conditions.

2.1 Climate

The Site lies within the belt of mid-latitude westerlies where the prevailing wind direction is from the west. Winds at the Truth or Consequences, New Mexico, airport, located about 30 miles northeast of the Site, are generally from the northwest; however, the Black Range and foothills cause local variations in the winds. At Copper Flat, the wind direction is predominantly west to east, and secondarily north to south. Local wind speeds average about 10 to 15 miles per hour, although winds in excess of 50 miles per hour may occur at times. Temperature inversions are rare at Copper Flat, but are more common farther east along the Rio Grande valley, especially during the winter months. Vertical air dilution is generally good because of the area’s high surface temperatures, creating strong daytime thermal mixing. Thermal mixing and moderate winds generally tend to suppress occasional nighttime inversions. The presence of higher winds and the lack of inversions contribute to a relatively clean atmosphere at the Site since any pollutants are readily mixed and dispersed (BLM, 1999).

Temperature data for the Site show a wide diurnal and seasonal variability, which is typical of dry climates. The warmest temperatures occur in June and July, and the coldest temperatures usually occur in December and January. In spring and fall, daily maximum temperatures are moderate, typically averaging 65 to 85 degrees Fahrenheit (°F). Nights are cooler, with low temperatures averaging 32° to 50°F. Winter temperatures are frequently below freezing at night, but can be above 50°F during the day. During summer, temperatures can approach 100°F during the day. Daily temperature fluctuations of 30°F are common throughout the year (BLM, 1999).

Precipitation at the Site averages about 13 inches per year (ranging from nearly 3 inches in 1956 to over 20 inches in 1986). As much as half of the annual precipitation occurs in the form of intense thunderstorms during the months of July, August, and September when moist air enters the region from the Gulf of Mexico. Summer thunderstorms can result in heavy rainfall and flash floods. Average monthly precipitation in January through June is typically 0.50 inch or less. Snowfall is possible from October through April, but most likely (greater than 1 inch) from December through February (BLM, 1996).

Evaporation exceeds precipitation in southwestern New Mexico. Pan evaporation data, the most commonly collected data, are correlated with lake evaporation (i.e., free water surface evaporation) to predict evaporation from reservoirs and lakes. Lake evaporation at the Site is estimated to be approximately 58 to 65 inches per year, and pan evaporation is estimated to be approximately 80 to 90 inches per year (SRK, 1995).

Historical baseline meteorological data including PM_{10} ambient air monitoring were completed by Air Sciences, Inc. (Air Sciences), a contractor to Alta Gold Company (Alta Gold) in the mid-90s. Reports of these data were prepared by Air Sciences, and present the meteorological protocols used to collect data, including a letter from the New Mexico Air Quality Bureau approving the protocols. They also present the baseline air conditions for six months of on-Site data (collected from August 19 to February 20, 1995) and six months of complimentary Truth or Consequences data (collected from February 21 to August 18, 1964), which was used for air dispersion modeling.

On July 9, 2010, NMCC and its current air quality contractor, Class One, visited the New Mexico Air Quality Bureau to meet with David Heath of the air modeling group, and Norma Perez and Kathy Primm, Environmental and Permit Specialists, respectively, to describe the air monitoring protocols that Class One would use, and to discuss the location of the on-Site meteorological tower, which is the same location that was used by Alta Gold in 1994 and 1995. No objections were noted to either the protocols or the tower location (Air Sciences, 1995a and 1995b).

The meteorological tower and air quality sampling stations were installed in July 2010 and operations of instrumentation commenced on August 6, 2010. Meteorological data are collected each second. Air quality samples are collected every six days. These data will be used for addressing the requirements of the Mine Permit as well as for geochemical and hydrologic modeling to address permitting and abatement issues (Section 5.0) (INTERA, 2010).

2.2 Geologic Conditions

The Site lies within the Mexican Highlands portion of the Basin and Range Physiographic Province. It is located in the Hillsboro Mining District in the Las Animas Hills, which are part of the Animas Uplift, a horst on the western edge of the Rio Grande valley (Raugust, 2003). The Animas Uplift is separated from the Rio Grande by nearly 20 miles of Santa Fe Group alluvial sediments, referred to as the Palomas Basin of the Rio Grande valley. To the west of the Animas Uplift is the Warm Springs valley, a graben that parallels the Rio Grande valley (BLM, 1999; Raugust, 2003). Further west, the Black Mountains form the backbone of the Continental Divide, rising to about 9,000 feet (ft) above mean sea level (amsl). The surface geology of the Copper Flat region is shown in Figure 2-1, and a schematic geologic cross section is shown in Figure 2-2.

Basement rocks in the area consist of Precambrian granite and Paleozoic and Mesozoic sandstones, shales, limestones, and evaporites. Sedimentary units that crop out within the Animas Uplift include the Ordovician Montoya Limestone, the Silurian Fusselman Dolomite, and the Devonian Percha Shale. The Cretaceous-age Laramide orogeny, which was characterized by the intrusion of magma associated with the subduction of the Farallon plate beneath the North American plate, affected this region between 75 and 50 million years ago (Ma). Volcanic activity during the late Cretaceous and Tertiary periods resulted in localized flows, dikes, and intrusive bodies, some of which were associated with the development of the nearby Tertiary Emory and Good Sight-Cedar Hills cauldrons (Figure 2-3); later basaltic flows resulted from the tectonic activity associated with the formation of the Rio Grande rift. Tertiary and Quaternary alluvial sediments of the Santa Fe Group and more recent valley fill overlie the older Paleozoic and Mesozoic units in the area. The regional stratigraphy of the lower Rio Grande Valley is summarized in Table 2-1 (BLM, 1999).

The geologic structure of the region is characterized by block and rift faulting (Figure 2-3). The Tertiary cauldrons associated with the earlier block faulting formed between 35 and 45 Ma. Rift faulting and associated north-south block faulting associated with continental extension and the formation of the Rio Grande rift began approximately 25 to 30 Ma. The Las Animas Hills are bounded by faults associated with rifting (Dunn, 1982). Continental extension continues to the present, as evidenced by north-south trending grabens represented by the Rio Grande and Warm Springs valleys.

Further details of the Site geology are provided in the Copper Flat Sampling and Analysis Plan (SAP) (INTERA, 2010).

2.3 Hydrologic Conditions

Groundwater is a major source of water for domestic and agricultural use in southern New Mexico. The high evaporation rate during the long, hot summers coupled with low average annual precipitation in the area result in surface waters generally being unreliable sources of water on a year-round basis. The Rio Grande is a significant surface water resource at the Site. At the confluence with the Rio Grande, Las Animas Creek and Percha Creek are intermittent or ephemeral, but both include perennial reaches upstream of the confluence that serve as local sources of water. The river and associated shallow alluvial deposits of its inner valley also served as the ultimate discharge zone for pre-development groundwater flow from the adjacent Greenhorn Arroyo, Las Animas Creek, and Percha Creek drainage basins (Hawley et al., 2004, Wilson et al. 1981). Additional water supply comes from shallow domestic and agricultural wells. This section provides a description of the regional and local groundwater along with a proposed sampling and analysis approach to characterizing baseline conditions of groundwater resources. Baseline studies have been completed in the project area since the 1960s, and relevant information and data are referenced in subsequent sub-sections.

2.3.1 Groundwater Hydrology of the Site

Three aquifers exist in the Site area, as shown schematically on Figure 2-4. The deepest aquifer is the crystalline bedrock aquifer that receives water from the highlands to the west of Animas Peak and carries this water along bedding planes, faults, and solution cavities toward the center of the Lower Rio Grande Basin. The crystalline bedrock aquifer consists of Cretaceous andesite and monzonite breccias underlain by Paleozoic rocks in the Animas Uplift area, Tertiary volcanic rocks to the west of the pit lake area in the graben associated with the Animas uplift, and Paleozoic sedimentary rocks to the east of the pit lake area in the Palomas Basin. The Santa Fe Group aquifer system, which consists of interbedded sandstones, silts, and clays, overlies the Paleozoic bedrock units to the east of the pit lake area within the Palomas Basin. This aquifer system receives water from precipitation and from the losing reaches of streams. The uppermost aquifer at the Site is the Quaternary alluvial aquifer along Las Animas and Percha Creeks (Figure 2-4). This alluvium is up to 40-ft thick in the Las Animas Creek area and carries water that is in hydraulic equilibrium with the water flowing in Las Animas Creek (BLM, 1999). The Percha Creek alluvial aquifer is less studied than the Las Animas Creek alluvial aquifer, and as a result, less historical data about its aquifer characteristics are available. The aquifers of greatest importance in terms of water supply in the area are within the Palomas Basin to the east of the pit lake and include the intermediate Santa Fe Group aquifer system and the alluvial aquifer associated with Las Animas Creek.

Figure 2-5, adapted from the Adrian Brown Consultants (ABC) (1998), presents a piezometric contour map showing the general configuration of groundwater level elevations at the Site as interpreted at that time. Groundwater levels near the existing pit are approximately 5,450 ft amsl, and at Caballo Reservoir, the levels are about 4,200 ft amsl. Figure 2-5 indicates that groundwater flow is generally to the east toward Caballo Reservoir. Hydraulic gradients are relatively large (closely spaced contours) in the western portion of the Site, reflecting lower transmissivity in the bedrock aquifer and in the western portion of the Palomas Basin in the Santa Fe Group aquifer system. The wider spacing of contours in the eastern portion of the Site suggests that transmissivity of the Santa Fe Group aquifer increases toward Caballo reservoir. The widest spacing of contours (highest transmissivity) appears to occur in the area of the groundwater production wellfield (wells PW-1, 2, 3, and 4 on Figure 2-5). This area coincides with an interpreted graben structure, which reflects an increased thickness of the Santa Fe Group in this area.

2.3.2 Aquifer Characteristics in the Permit Area

Characteristics of the three principal aquifers in the area are summarized in this section.

2.3.2.1 Crystalline Bedrock Aquifer Characteristics

Groundwater within the mining district and the area of the present open pit occurs in andesitic volcanic rocks and quartz monzonite breccia intrusive rocks (Figure 2-4). The current pit lake was reported by SRK (1997b) to be at an elevation of 5,442 ft amsl, which is about 50 to 100 ft below the pre-mining ground elevation (5,500 to 5,540 ft amsl reported in the Preliminary Final Environmental Impact Statement [PFEIS][BLM, 1999]). Groundwater levels measured in the pit and tailings areas as of 1997 are shown on Figure 2-6. Newcomer et al. (1993) reported a pre-mining (1981) water level of 5,370 ft amsl in well GWQ-5, which was approximately 4,000 ft east-southeast from the pit and within the old plant site area. These authors also reported a water level of 5,360 ft amsl in the Hillscher West well (GWQ-6), which lies approximately 2,500 ft southeast from well GWQ-5. These limited groundwater elevation data suggest that the groundwater gradient in the andesitic volcanic rocks may be to the east or southeast from the current pit lake area as shown in larger scale on Figure 2-6. Within 500 ft of the pit lake (see Figure 2-7), however, groundwater gradients are toward the pit lake, which may act as a local evaporative sink (BLM, 1999).

In January 2010, NMCC resurveyed the pit lake and as many of the groundwater monitoring wells established for the PFEIS as could be located. The pit lake elevation was 5,444 ft amsl in January 2010, revealing that the pit lake elevation remains below the pre-mining water level elevation of 5,500 to 5,540 ft amsl. Further discussion of the pit lake hydrology and the groundwater sink are provided in Section 5.

2.3.2.2 Santa Fe Group Aquifer System

Overview

Overlying the crystalline bedrock aquifer at the Site is the Santa Fe Group aquifer system, a system that is locally represented by two hydrostratigraphic units (HSUs): (1) the Upper Santa Fe Group HSU (USF), and (2) the Middle Santa Fe Group HSU (MSF). As defined by Hawley et al. (2004), these HSUs are mappable bodies of basin and valley fill that are grouped according to genesis and position in both lithostratigraphic and chronostratigraphic sequences. Informally, these HSUs comprise the major basin-fill aquifer zones and correspond roughly to the upper (Palomas) and middle (Rincon valley) lithostratigraphic subdivisions of the Santa Fe Group used in local and regional geologic mapping (Hawley et al., 2004).

The Santa Fe Group is composed chiefly of coalescing alluvial fan deposits that are discontinuous and locally heterogeneous with inter-bedded sandstones, silts, and clays of varying percentages. The Upper Santa Fe Group Palomas Formation (Lozinsky and Hawley, 1986) represents the USF at the Site. This formation grades eastward from the Animas Uplift from coarse alluvial fan material to braided-stream and deltaic sands and silts to clays near the Rio Grande. The interfingering with clays begins approximately 3 to 5 miles west of the current position of the Rio Grande and is responsible for the flowing wells common in this part of the Site (Murray, 1959; Figure 2-4). A basalt flow dated at 4.2 million years before present caps the Palomas Formation gravels near Copper Flat (Seager et al., 1984).

The Middle Santa Fe Group Rincon Valley Formation (Seager and Hawley, 1973) is exposed near Hillsboro, New Mexico, where the reddish-brown clays and clayey silts characteristic of this basal unit are interbedded with basalts dated at 28 million years before present (Seager et al., 1984). The Rincon Valley Formation represents the MSF at the Site and generally contains water, but the yield is low due to the low hydraulic conductivity of the clays. The Rincon Valley Formation lacustrine red clays underlie the Palomas Formation and thicken southward toward Hatch, New Mexico, and the Rincon Basin (Wilson et al., 1981).

Tailings Dam Vicinity

The present tailings impoundment facility overlies the old placer workings of Grayback Arroyo and Hunkidori Gulch (Figure 2-8). A study of these placer workings by Segerstrom and Antweiler (1975) showed that the placers were found in paleo-stream terrace alluvium, approximately 25 to 30 ft thick, that is underlain by a calcium carbonate horizon and reddish-brown clay. SRK (1995) and SHB (1980) confirmed and expanded the areal extent of this reddish-brown clay layer and determined that the top of the Palomas Formation is stratigraphically below the red clay layer. According to the studies completed by SRK and SHB, the clay layer and the 25 to 30 ft of paleo-stream terrace gravels that lie above the clay have acted to prevent downward migration of water draining from the eastern half of the existing tailings. This clay layer has enabled a mound of water beneath the tailings impoundment to develop, and was determined by SRK (1995) and SHB (1980) to extend eastward beyond the tailings dam. This mounding of water, due to drainage of the tailings according to SRK (1995), became evident in some tailings dam monitor wells completed above the clay layer. The central and western sections of the existing tailings facility appear to communicate hydrologically with the USF that lies beneath the tailings area because the clay zone thins and disappears in this area, as shown in Figure 2-9. Further discussion of tailings seepage impacts and this clay layer are provided in Section 5.0.

The thickness of the Palomas Formation increases locally over a graben structure (labeled Dutch Gulch in Figure 2-2), which is reflected in higher transmissivity and relatively low hydraulic gradients in the USF. Based on a 7-day aquifer pumping test (ABC, 1996), the transmissivity of the USF in the tailings dam area is about 187 ft^2/day. East of the tailings area (see Figure 2-2) is a 10- to 30-foot thick clayey sand and gravel layer, underlain by a 25- to 100-foot-thick clay layer, which in turn is underlain by a silty sand and gravel layer (SRK, 1995). The lower silty sand and gravel layer is considered by ABC (1996) to be the USF and, based on drilling information, has a thickness of at least 200 ft. The hydraulic gradient in this area is about 30 ft per mile.

East of the graben structure, labeled as Dutch Gulch in Figure 2-2, the Palomas Formation (labeled Tsfp) thins and is interpreted to have significantly reduced transmissivity. The hydraulic gradient in this area ranges from about 130 to 330 ft/mile. The contact between the Palomas Formation and the underlying Rincon Valley Formation clay unit (labeled Tsf in Figure 2-2) is a highly irregular depositional contact. Locally, the Palomas Formation (USF) may be unsaturated, with the water table existing in the underlying Rincon Valley Formation (MSF) (BLM, 1999).

2.3.3 Surface Water Hydrology of the Permit Area

The Copper Flat area falls within the Lower Rio Grande watershed, as defined by the New Mexico Water Quality Control Commission (WQCC). This watershed includes approximately 5,000 square miles in Catron, Socorro, Sierra, and Doña Ana Counties, and is dominated by the Rio Grande and its tributaries as well as the two large reservoirs of Elephant Butte and Caballo. Numerous tributaries feed into the Rio Grande from the west, but none contribute perennial flow to the Rio Grande.

The Site is drained by ephemeral streams (arroyos) within the Greenhorn Arroyo drainage basin, a sixth-level sub-watershed defined by the Hydrologic Unit classification system (Seaber et al., 1987) that drains 29,414 acres of land on the eastern slope of the Animas Uplift to a single outlet into the Rio Grande (Figure 2-10). Flows within the Greenhorn Arroyo drainage basin are ephemeral, as they only occur in direct response to precipitation. As a result, this drainage, similar to others in the region, does not contribute any perennial surface water flow to the Rio Grande.

Numerous arroyos contribute to the trunk channel of Greenhorn Arroyo. Of these, Grayback Arroyo is the primary drainage through the Site. Grayback Arroyo originates west of the Site and drains eastward along the Site axis until it converges with the trunk channel of Greenhorn Arroyo approximately 8 miles east of the Site boundary (Figure 2-10). In pre-mining times, Grayback Arroyo drained directly through the mine area, but was later re-routed around the southern perimeter of the mine area for flood control purposes (Raugust, 2003). Newcomer and Finch (1993) measured flow rates in Grayback Arroyo of 12.5 gallons per minute (gpm) in March 1993 at a point east of the pit and former plant site. Three seeps have been identified along Grayback Arroyo (BLM, 1999). One seep with riparian vegetation is located near a buried storm water collection pond, a second is located downstream from the first seep and supports a small cottonwood/willow stand, and the third is south of the operations area (Figure 2-10).

Two creeks drain basins directly to the north and south of the Greenhorn Arroyo drainage basin: Las Animas Creek in the north and Percha Creek to the south (Figure 2-10). Both Las Animas and Percha Creeks have ephemeral, intermittent, and perennial reaches. Streamflow in Las Animas Creek varies from perennial to intermittent from the area near sampling site MAS (Figure 2-8) to Caballo Reservoir (BLM, 1999). For example, Davie and Spiegel (1967) show flow rates ranging from about 450 to 900 gpm in the upper reach (T14S R7W, Sections 34 through 36, near sampling sites LAC-A and LAC-B in Figure 2-10) and middle reach (within T15S R5W) of the creek; according to Davie and Spiegel, these reaches are “losing reaches” of the creek. Streamflow in Percha Creek is intermittent in the Hillsboro reach and perennial in the area known as the Percha Box, a steep-walled reach of the drainage that has incised into Paleozoic bedrock (BLM, 1996) (Figure 2-8). SRK (1995) reported measurable streamflows just east of the Percha Box of roughly 200 to 250 gpm. This was the only reach of Percha Creek with measurable flows during the SRK sampling period. Though both Las Animas Creek and Percha Creek have perennial reaches, neither creek contributes perennial flow to the Lower Rio Grande Basin.

Two springs are located within the Greenhorn Arroyo drainage basin to the north and west of the Site (Figure 2-8). Other unnamed seeps occur in the pit walls surrounding the pit lake after precipitation events; these are likely the result of fractured flow through the bedrock exposed in the pit wall. Several springs in the Percha Creek basin and one in the Las Animas Creek basin have been identified for sampling, but have been studied less than those within the Greenhorn Arroyo basin. As a result, there is little information prior to 2010 on their flow rates or quality, although Newcomer and Finch (1993) did attempt to measure flow.

The open pit that was mined during the early 1980s now contains a lake. Since 1989, the pit lake has been sampled for water quality approximately 65 times at various locations and depths, including by past operators of the mine, state regulatory agencies, and academic researchers studying the mine (BLM, 1999). For the proposed operations, NMCC would consume the pit lake waters for mine operations and dust suppression. If necessary, pit water could be temporarily stored in a reservoir in the plant area (SRK, 2010a).

Mine water from milling operations would be discharged into an evaporation pond or re-used for several purposes: (1) plant processing streams, (2) the tailings facility with pump-back to the plant, and/or (3) dust control (SRK, 2010a). Both a National Pollution Discharge Elimination System permit and an NMED groundwater discharge permit are required for NMCC to discharge mine water. In preparation for both permits, NMCC will characterize the water quality of the mine discharge through scheduled gauging and sampling of discharge. In addition, NMCC will design a storm water management system to manage discharge for the proposed facilities. Mine water discharge is not expected to reach the Lower Rio Grande or any lake, spring, reservoir, riparian, or wetland areas.

3 Site History and Status

The collection of baseline data at the Copper Flat Mine began in the late 1970s with an environmental assessment (EA) prepared for Quintana Minerals Corporation (Quintana) (BLM, 1978), followed by Rio Gold Mining Ltd (Rio Gold), Gold Express, and Alta Gold. These data are relevant and provide insights for future permitting activities. The Copper Flat Mine was first permitted by Quintana during the 1980s. In 1992, a new plan of operations was submitted and an EA was begun by Gold Express, but the operation was never restarted. Alta Gold acquired the property in the mid-1990s and reinitiated the permitting and approvals process, collecting significant baseline data and submitting applications for all major state and federal permits. Alta Gold declared bankruptcy in early 1999, but not before a draft environmental impact statement (EIS) (BLM, 1996) and PFEIS (BLM, 1999) had been prepared and the associated public comments received; a public hearing had also been held on the New Mexico Mining Act Permit and the New Mexico Groundwater Discharge Permit. However, no final permits had been issued and there had been no opportunity for appeals or litigation regarding the operation. Figures 3-1 and 3-2 illustrate the Site permit boundary with topography and the 2009 aerial photo, respectively.

3.1 Historical Mine Activities

Ore was first discovered in the Hillsboro district in April 1877, and the town of Hillsboro was established that same year. A number of mining claims were patented for the Site between 1892 and the 1940s; these now form most of the private land occupied by the Copper Flat mine.

In 1952, Newmont began exploration in the district for porphyry copper mineralization by drilling nearly 3,599 ft in six angle holes into the Copper Flat Quartz Monzonite (CFQM) (Kuellmer, 1955). Bear Creek drilled another 9,300+ ft in 1958−1959 in 20 widely spaced core holes, hoping to find an enrichment blanket of secondary copper (which was not found). Both the Newmont and Bear Creek drill and assay data are available (Dunn, 1984). Porphyry copper exploration was advanced by Inspiration again in the late 1960s. Inspiration completed 30 core drill holes by 1973, purchased the patented claims, performed metallurgical work, and completed two water wells on the property (Dunn, 1984).

In 1974, Inspiration leased the property to Quintana, which undertook a comprehensive mine development program with metallurgical work, underground drifting, bulk sampling, and drill hole composite testing (all preformed by the Colorado School of Mines Research Center). The program included detailed geologic investigations into the relationship between the breccia pipe and the quartz monzonite host rocks, as well as the relationship between host rocks and mineralization. An EA was initially prepared for state and federal agencies in 1975, but low copper prices caused the project to be shelved from late 1976 until 1979. At that time, processing methods were reviewed and semi-autogenous grinding and copper-molybdenum flotation separation became the basis for subsequent design work. Mineable reserves were estimated at 60 million standard tons (Mst) with 0.42 percent copper and 0.012 percent molybdenum, plus some gold and silver (SRK Consulting, 2010).

With Quintana as the overall project manager, the Copper Flat mine began full production in March 1982 at a rated capacity of 15,000 Mst a day, a waste-to-ore ratio of 1.8:1, and a cut-off grade of 0.25 percent copper. The combination of low copper prices and high interest rates on the financing loan resulted in the mine closing down just 3 months later, at the end of June. During its short operational period, the mine produced 1.48 Mst of ore containing 7.4 pounds (lbs) of copper, 2,301 ounces (oz) of gold, and 55,955 oz of silver (SRK Consulting, 2010). By the end of 1985, the surface facilities' equipment had been sold and the site reclaimed as required by state and federal guidelines. However, all structural foundations, power lines, water wells, and in-ground infrastructure were left in place.

Hydro Resources of Albuquerque, New Mexico, acquired the Copper Flat property, including all royalties, from Inspiration in 1989. Rio Gold and Tenneco Minerals (Tenneco) drilled six large-diameter holes in 1990. Gold Express optioned the property in 1993, and then sold it to Alta Gold in 1994 without performing any exploration or development. A PFEIS for the Alta Gold mining project was issued in March 1999, but Alta Gold went bankrupt (due to financial problems with other assets) before any permits were issued. Hydro Resources reacquired all the properties in 2001 along with all royalties. Hydro Resources maintains an archive of information related to the mine, including over 14,000 sample pulps and skeleton core from the Quintana drilling programs (SRK Consulting, 2010).

In 2009 and early 2010, NMCC conducted a sample verification program that included pulp reject analysis and drilling as part of the requirements for a NI43-101 report on the resources at Copper Flat (SRK Consulting, 2010). The program was designed to verify different aspects of the mineralization and geology of the deposit, as well as to comply with new reporting requirements. The drill holes were plugged with bentonite and capped with cement, as required by the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Mining and Minerals Division (MMD). NMCC completed seven drill holes comprising 5,046.5 ft of core. Three of the drill holes terminated prematurely due to bad ground. The drill sites were reclaimed as per MMD requirements (SRK Consulting, 2010).

Approximately 60 percent of the proposed Site has been disturbed by previous operations. Remnants of the 1982 mining operation include an open pit and pit lake, a tailings impoundment area, waste rock disposal areas, a number of buried building foundations, and ancillary facilities including decant towers, roads, power transmission lines, and waterlines (Figures 3-3 and 3-4). These features are clearly delineated on Bureau of Land Management (BLM) geographic information system (GIS) maps and aerial photographs, and have been considered as part of the proposed plan of operations. Although some reclamation was done to the area in 1986, much of the Site remains disturbed (Figure 3-2).

3.2 Previous Surface Water Studies

Existing surface water data are summarized in this section. Surface water at the Site was most recently investigated by SRK (1995), which collected flow and water quality data from Percha Creek and Las Animas Creek (Figure 2-10). Newcomer et al. (1993) performed a hydrologic assessment of the Greenhorn Arroyo drainage basin, measuring flow and water quality along Grayback Arroyo and at a number of seeps and springs. The oldest known surface water investigation at the Site was performed by Davie and Spiegel (1967), who collected flow data for Las Animas Creek. Results of these investigations were compiled by Raugust (2003) and are also summarized in the BLM's PFEIS for Copper Flat (BLM, 1999).

3.2.1 Volumetric Flow

3.2.1.1 Streams

Flow rate data for streams at the Site are limited by the generally intermittent nature of flows. Recent measurements of flows were made by Newcomer et al. (1993) and ABC (1996). Additional historical measurements were compiled in the PFEIS (BLM, 1999). These data are summarized in Table 3-1.

Grayback Arroyo is an ephemeral stream and generally flows only during periods of snow melt or rain events. Flow rates in Grayback Arroyo at SWQ-3 (Figure 2-10) were measured by Newcomer et al. (1993) to be 12.5 gpm (0.028 cubic feet per second [cfs]) in March of 1993.

Two measurements of flow rate are recorded for Las Animas Creek. Davie and Spiegel (1967) reported flows of between 1.0 and 2.0 cfs in the creek's upper reaches, and between 1.0 and 1.5 cfs in its middle reaches (BLM, 1999). ABC made a single flow measurement of 245 gpm (0.546 cfs) at LAC-E (Figure 2-10) in 1996.

Volumetric flow in Percha Creek was measured at 13 locations by ABC (1996) from approximately ¼ mile upstream of the entry to Percha Box to approximately 5 miles downstream of the exit from Percha Box. Flow was found to be localized, occurring within and immediately to the east of Percha Box, and ranging from 456 gpm (1.02 cfs) to 119 gpm (0.265 cfs), with many reaches dry or with standing water only.

3.2.1.2 Springs and Seeps

Spring and seep flow rates are infrequently reported in the available literature for the Site and surrounding areas. Several springs and seeps have been identified within the Greenhorn Arroyo drainage basin. Two springs, identified as BG and BG-2, are located to the north and west of the Site (Figure 2-10), and several unnamed seeps occur in the walls surrounding the pit lake. BG and BG-2 were judged by Newcomer et al. (1993) to be ephemeral. The seeps along the pit walls are observed to flow in response to precipitation events, and as mentioned above, are likely the result of fractured flow through the bedrock exposed in the pit wall. All known springs and seeps in the Greenhorn Arroyo drainage basin are upgradient of the proposed mine water discharge location. Other seeps and springs shown in Figure 2-8 have not been measured in the past and thus have no associated historical flow information.

3.2.2 Water Quality

3.2.2.1 Streams

The surface water chemistry of Grayback Arroyo was initially investigated in 1977 at three locations as part of an EA prepared by the BLM in response to an application by Quintana for an open pit copper mine at the Site (BLM, 1978). The three locations sampled in 1977 generally correspond to the sampling locations SWQ-1, SWQ-2, and SWQ-3 proposed in Figure 2-10, with one location upstream of the permit boundary, one within the Site approximately 300 yards from the mine rim, and a third located where the arroyo leaves the Site (BLM, 1978). Water samples were collected in January, March, and July of 1977.

WQCC standards for metals were not exceeded at any location in any of the 1977 sample events. Results for pH (7.6–8.1) were in the same range as samples collected later at these three locations. Total dissolved solids (TDS) results upstream of the Site (720–1000 milligrams per liter [mg/L]) were comparable to those of samples collected later, but samples taken at locations within and downstream of the Site were comparatively lower (800–1,320 mg/L) than the results for later sampling events, such as those conducted by Newcomer et al. (1993) at SWQ-1 (upgradient of the pit lake), SWQ-2 (downgradient of the pit lake but within the area of mining disturbance), and SWQ-3 (approximately 1 mile downgradient of the pit lake) (Figure 2-10). Field parameters measured by Newcomer et al. are shown in Table 3-1, and complete analytical results are presented in Appendix B1. Water quality in Grayback Arroyo upstream of the pit lake at SWQ-1 had a pH ranging from 7.4 to 8.3, sodium at 107 mg/L, bicarbonate values ranging from 400 to 500 mg/L, sulfate ranging from 275 to 300 mg/L, and TDS ranging from 780 to 965 mg/L. At SWQ-2, sodium concentration increased from the previous sampling event by BLM to 270 mg/L, sulfate increased to between 1,150 and 1,650 mg/L, TDS increased to between 2,300 and 3,300 mg/L, and pH and metal concentrations remained essentially unchanged. Water quality indicators at SWQ-3 fell within the range of values at SWQ-2.

Las Animas Creek water quality was examined by ABC (1996) and for the PFEIS (BLM, 1999). ABC obtained a single sample at LAC-E with a pH of 7.81, sulfate concentration of 18 mg/L, and TDS of 300 mg/L. The PFEIS reports that Las Animas Creek water quality is dominated by calcium or sodium bicarbonate, with pH in the range of 7.0 to 8.0, sulfate in the range of 20 to 70 mg/L, and TDS in the range of 300 to 400 mg/L. Occasionally, sodium and chloride are higher, with chloride concentrations as high as 300 to 400 mg/L, possibly due to agricultural practices along the creek (BLM, 1999). Complete analytical results for Las Animas Creek are compiled in Appendix B1.

Percha Creek water quality was examined by ABC (1996) and for the PFEIS (BLM, 1999). ABC sampled Percha Creek at the entry and exit to Percha Box and 5,000 ft downstream from the exit from Percha Box, and measured field parameters at all seven locations in which water was found (Table 3-1). For the three samples submitted for laboratory analysis, pH ranged from 7.62 to 7.82, sulfate ranged from 63 to 71 mg/L, and TDS ranged from 336 to 406 mg/L. The PFEIS (BLM, 1999) reports that surface water flowing in Percha Creek has a chemistry dominated by calcium bicarbonate, with pH in the range of 7.0 to 8.0, sulfate in the range of 20 to 70 mg/L, and TDS in the range of 300 to 400 mg/L. Complete analytical results for Percha Creek are compiled in Appendix B1.

Sampling of the Caballo Reservoir (the receiving water for these drainages) during November 1994 showed the water to be dominated by sodium bicarbonate with a bicarbonate value of 180 mg/L and a sulfate value of 110 mg/L (SRK, 1995). As summarized in the PFEIS (BLM, 1999) chloride values were less than 100 mg/L, and TDS was 440 mg/L. The water chemistry was within WQCC standards for metals, sulfate, chlorine, pH, and TDS. As a comparison, water samples from the Rio Grande at EI Paso, Texas, were sodium-sulfate-dominated with high TDS in the range of 800 to 1,000 mg/L, sulfate values of 200 to 340 mg/L, and bicarbonate values of around 100 mg/L (Wilson et al., 1981).

3.2.2.2 Springs and Seeps

Newcomer et al. (1993) sampled the BG and BG-2 springs (Figure 2-10) in April 1993, and ABC observed and sampled seeps in the pit wall in August 1997 (ABC, 1997). Field parameters and water chemistry analytical data for these locations are presented in Table 3-1 and Appendix B1, respectively. Samples from BG and BG-2 had pH ranging from 8.0 to 8.2, sodium ranging from 90 to 124 mg/L, bicarbonate ranging from 411 to 535 mg/L, sulfate ranging from 184 to 228 mg/L, and TDS ranging from 680 to 690 mg/L. The pit wall seep sample had a pH of 8.16, a sulfate content of 3,100 mg/L, and TDS of 5,020 mg/L. On the basis of these results, ABC (1997) judged BG and BG-2 to be qualitatively similar to the Grayback Arroyo sample location SWQ-1, while the pit wall location appears to have been subject to a similar process as the locations at SWQ-2 and SWQ-3.

3.3 Previous Pit Lake Studies

The 12.8-acre lake that has formed in the existing pit was estimated to be about 40 ft deep, based on a pit bottom elevation of 5,380 ft amsl and water level elevation of 5,420 ft amsl as measured in 1986 (SRK, 2010b). The water quality of the pit lake has been sampled over 65 times at various depths and locations since the initial samples were collected on April 13, 1989, by the New Mexico Environment Improvement Board (Raugust, 2003); the latest samples were collected in January 2011. Pit water has historically exceeded the WQCC standards for sulfate, chloride, TDS, manganese, and uranium (20.6.2.4103 of the NMAC) and has, at times, dropped below the acceptable pH range of 6 to 9. Figure 3-5 illustrates the current pit lake bathymetry which has been defined by collecting over 400 water-depth measurements along both north-south and east-west transects throughout the pit lake. Analytical results of samples collected from 1989 to 1998 suggest that sulfate, chloride, TDS, manganese, and pH all increased over this period. For example, sulfate increased from a range of 2,250 to 3,000 mg/L to a range of 3,500 to 4,300 mg/L over this time period (Figure 3-6). Chloride increased from an average of around 100 mg/L to around 250 mg/L, which may be attributed to lower average annual precipitation and higher annual temperatures during this period (BLM, 1999). However, the sulfate-to-chloride ratio dropped during this time period, suggesting that sulfate rose at a slower rate than chloride due to the formation of gypsum and the subsequent buffering of the sulfate concentration in pit lake water by gypsum (gypsum is observed along the margins of the pit lake during the summer months when the pit lake level drops). TDS ranged from 2,700 mg/L in 1991 (Newcomer et al., 1993) to about 6,000 mg/L in 1998 (Raugust, 2003; Figure 3-7). Manganese ranged from 1.8 to 4.3 mg/L (BLM, 1999). The measured pH values have generally increased over time to about 8.0 (Figure 3-8). However, in 1992 and again in 2008, pH decreased to 4.4 and 4.5 (NMED GWQB, 2008), respectively, deviating from the overall trend of elevated pH values. The overall rise in the pH may be due to buffering by wall rock. No historical data are available for uranium, other than a sample collected in 2004 that showed the water exceeded the WQCC standard (NMED GWQB, 2008).

Variability in the methods, locations, and depths from which samples were collected may explain many of the differences observed in pit water quality results. However, samples collected in January 2010 confirm that concentrations of sulfate, chloride, TDS, and manganese have increased. The 2010 sampling yielded a sulfate concentration of 5,200 mg/L, a chloride concentration of 390 mg/L, a TDS concentration of 7,770 mg/L, and a manganese concentration of 41 mg/L, all of which were higher than previous measurements from the 1989 to 1998 period. In addition, concentrations of aluminum, copper, cobalt, iron, and fluoride in the 2010 sample all exceeded WQCC standards. In contrast, pH, the most widely variable parameter measured during the 1989 to 1998 period, was 6.3 in January 2010, which is within the acceptable range of 6 to 9.

Other key studies that discuss the water quality of the Site are summarized in SRK (1997b) and include hydrogeologic and hydrogeochemical studies (SRK, 1995), post-closure pit water balance model calculations (SRK, 1997b), water quality and host-rock geochemical studies (SRK, 1997b), and post-hearing submittals that followed the 1997 New Mexico Mine Permit public hearing.

3.4 Previous Groundwater Studies

A wealth of groundwater data are available for the Site because the mine was active in the past and was characterized by previous operators that either mined the Site or worked on permit applications to mine the Site. These historical data are being used in conjunction with the baseline groundwater quality data that are being collected under the procedures set forth in the SAP (INTERA, 2010) and this Stage 1 Abatement Plan to provide a regional understanding of groundwater quality conditions prior to the re-initiation of mining at Copper Flat. These data will provide the foundation for evaluation of required abatement activities. Key resources that contain data to be used for the regional groundwater analysis include: Groundwater monitoring well exceedances provided by SRK Consulting (2010); the PFEIS (BLM, 1999); the Hydrologic Assessment, Copper Flat Project Sierra County, New Mexico (Newcomer et. al, 1993); and The Natural Defenses of Copper Flat, Sierra County, New Mexico (Raugust, 2003). A brief summary of the data available in these key reports follows.

The PFEIS (BLM, 1999) provides a summary of groundwater quality data collected up to through the late 1990’s. The wells identified in this study are illustrated in Figure 3-9. The PFEIS (BLM, 1999) concluded that groundwater quality at the Site was good and generally useable for domestic and agricultural purposes. This document also concluded that past mining in the Hillsboro District, the Copper Flat Mine tailings facility drainage, and the presence of an oxidized sulfide-bearing ore body have impacted groundwater within and immediately adjacent to the area of past mining, resulting in elevated TDS and sulfate that exceed WQCC standards. These impacts were found to be localized within the immediate vicinity of the mine features or associated with wells completed in the ore body.

Newcomer et al. (1993) determined that the quality of groundwater at the Site has changed little since the early 1980s and probably since the 1800s. The authors found that there have been some increases in TDS and sulfate in some wells along Grayback Arroyo below the mine site and down-gradient of the tailings dam, associated with mining and milling activities in the 1980s. Newcomer et al. (1993) determined that the only constituents exceeding the WQCC standards were barium from a spring sample, and, cadmium and fluoride from a pit lake water sample.

Raugust (2003) compiled historical groundwater data and summarized groundwater quality conditions, and based on his data compilation and analysis, concluded:

- Groundwater pH measurements both up and downgradient of the pit lake range from 7 to 8.2.
- TDS and sulfate values are less than WQCC standards in the wells evaluated for this analysis; however, samples downgradient of the mine have increased gradually over time and are approaching the standards for TDS.
- Pre-mine (1981) sampling of well GWQ-5 (now destroyed), located east and downgradient of the pit lake, indicates that water quality in the vicinity of the pit lake may have been affected naturally by the presence of the ore body prior to mining in 1982. Sulfate concentrations taken from GWQ-5 in 1981 were higher (477 mg/L to 575 mg/L) than sulfate concentrations in GWQ-96-23A immediately down-gradient of the pit (<450 mg/L) (Raugust, 2003). Concentrations of TDS revealed similar results (1,070 mg/L to 1,260 mg/L in GWQ-5 and <1,000 mg/L in GWQ-96-23A).
- The groundwater upgradient of the mine pit lake is high quality with relatively high proportions of chloride and sulfate. Groundwater downgradient of the pit lake shows relatively higher proportions of bicarbonate and calcium and relatively lower proportions of sulfates. Pre-Quintana mining (June 15, 1981) groundwater data collected from wells downgradient of the pit lake show similar anions and cation distributions to post-Quintana mining activities (1996 and 1998). This indicates that groundwater quality downgradient of the ore body reflects the natural weathering of the Copper Flat porphyry system.

4 Ongoing Investigation Activities

As discussed in Section 3.0, the Site and surrounding area have been subject to extensive surface water and groundwater quality monitoring. Groundwater has been sampled from a network of wells that remains, in whole or in part, active to the present day since 1975. To emphasize this point, Figure 4-1 illustrates all groundwater monitoring wells, some of which do not exist or could not be located in 2010 (Saladone Well, GWQ-5, and Delores Well), that have been sampled at the Site from 1975 to January 2011. As shown by the key, the amount of times these wells have been sampled is indicated by the size and color of the symbol at the well location. In contrast, surface water has been sampled from a select number of locations since 1981.

NMCC is characterizing surface water and groundwater conditions at the Site in response to baseline monitoring requirements of the EMNRD MMD. These data are an important foundation for addressing the abatement issues identified by MECS. To date, NMCC has collected three quarters of surface water data, two quarters of pit lake data, and three quarters of groundwater data. These data are summarized in the following subsections.

4.1 Surface Water Monitoring

NMCC's baseline surface water monitoring program is described in detail in the SAP (INTERA, 2010). The baseline surface water monitoring program is designed to establish pre-operational flow and water quality conditions of streams, seeps, and springs in the vicinity of the Site (the Pit Lake is addressed separately in Section 4.2, below). The existence and location of significant surface water features were verified by review of historical records and field reconnaissance. Monitoring locations, shown on Figure 4-2, were selected by NMCC to characterize background hydrologic conditions in drainage basins that could directly or indirectly be affected by mining operations.

The surface water monitoring program began in the summer of 2010. Volumetric flow and water quality of streams, seeps, and springs are monitored on a quarterly basis. All surface water features are sampled if flowing water is present. Volumetric flow in streams is calculated using the standard velocity-area approach, where velocity is measured with a Marsh-McBirney electromagnetic current meter (INTERA, 2010). Volumetric discharge of seeps and springs is measured by a variety of timed-fill approaches. In one case, water is bailed out of an artificial spring box of known volume and the recharge time is measured. In another, the sole overflow from a spring box is diverted into a five-gallon container and the time required to fill it is measured. For seeps and springs without spring boxes, flow is diverted into a variety of containers. However, flow is not measured at surface water features where the discharge is very low or diffuse, or when it is otherwise impractical to make measurements.

In addition, automated flow and sampling systems have been installed at three locations on Grayback Arroyo (SWQ-1, SWQ-2 and SWQ-3, Figure 4-2) and on the lowermost reaches of Percha Creek (PC-E) and Las Animas Creek (LAC-E) (Figure 4-2). The auto-samplers on Grayback Arroyo are positioned to allow potential ARD from waste rock to be detected by comparing upgradient, cross-gradient, and downgradient water chemistry. (Further discussion of ARD issues is provided in Section 5.3). SWQ-1 is west and upgradient of the waste rock dumps; SWQ-2 is on the Site, collocated with the waste rock dumps; and SWQ-3 is at the eastern margin of the Site, downgradient of the waste rock dumps. These systems consist of an automated controller, a data logger, a pressure transducer, and a peristaltic sampler. The transducer is installed in the stream bed and is monitored at 30-minute intervals by the automated controller; measurements are stored in the data logger. When streamflow is detected, the controller activates the peristaltic sampler. Samples are then collected and submitted for laboratory analysis. The automated flow and sampling systems on Grayback Arroyo and Percha Creek are installed on intermittent or ephemeral reaches and are programmed to collect a sample of any discharge whatsoever in those drainages. The reach of Las Animas Creek monitored by an automated system has experienced perennial flow since the summer of 2010 and is only sampled during flood stage conditions.

A summary of exceedances to date of the appropriate WQCC standards for surface water is presented in Table 4-1, with exceedances of applicable NMED surface water standards highlighted. These data show the presence of the metals arsenic, barium, boron, calcium, iron, magnesium, manganese, molybdenum, potassium, silicon, sodium, and uranium to be at levels below WQCC standards, and aluminum, beryllium, cadmium, cobalt, copper, selenium, and zinc to be at levels that exceed WQCC standards. The anions chloride, fluoride, sulfate, and nitrate have been detected at levels below the surface water standards; neither nitrite nor ammonia has been detected. No other analytes have been detected in exceedance of surface water standards. Analytical results of all surface water samples for constituents for which WQCC standards exist are provided in Appendix B1.

NMCC is aware of MECS' concern with respect to ARD generation at the Site. These surface water quality data will assist in forming the baseline against which long-term monitoring data can be compared to ensure that ARD is not a problem at this Site when mining activity resumes. If these data indicate there is an existing problem at the Site, they will enable NMCC to develop an appropriate response action. Further discussion of ARD and ongoing work to address this issue is provided in Section 5.3.

4.2 Pit Lake Characterization

The NMCC plan for characterizing the quality of pit lake water is described in detail in Chapter 8 of the SAP (INTERA, 2010). Following the SAP, water quality samples have been collected on a quarterly basis since September 2010. During the first quarter, a bathymetric survey was completed to identify the deepest point of the pit lake where the sampling station was established for collecting all water quality samples. During each of the four sampling events, vertical profiles of temperature, pH, oxygen/reduction potential, dissolved oxygen, and conductivity are measured at intervals not greater than 12 inches. Based on the results from the vertical profile, a surface water sample has been or will be collected from up to three depths at the sampling station. These profiles are used to determine whether the lake is either thermally or chemically stratified and to support geochemical modeling of the pit lake system. If the vertical temperature profile shows that no thermocline is present in the lake (i.e., there is less than 1°C difference between the surface and bottom temperatures of the lake), then three water-quality samples are collected from within the euphotic zone, defined as the depth of light extinction. If a thermocline is present (i.e., if there is greater than 1°C difference between the surface and bottom temperatures of the lake), a sample is taken from the top, middle, and bottom of the entire water column. In either instance, a composite sample of all three discrete samples is also collected. Table 4-2 shows exceedances of all applicable WQCC standards from samples collected from the Pit Lake. Appendix B2 contains the water quality data collected to date for the pit lake.

NMCC is aware that MECS is concerned about groundwater flowing through the pit lake area and impacting groundwater downgradient of the lake, as well as the potential for impacts to wildlife caused by contact with water in the pit lake. These pit lake water quality data, in conjunction with the activities described in Section 5.2, will enable NMCC to address this issue and, as necessary, develop the appropriate response action.

4.3 Groundwater Monitoring

The NMCC plan for baseline groundwater characterization is provided in the SAP (INTERA, 2010). The program is designed to characterize the pre-operational elevation and configuration of the potentiometric surface and the water quality of the aquifers in the permit area. To this end, water levels are measured and groundwater samples are collected from existing wells on a quarterly basis. As discussed in Section 2.3.1, three aquifers exist in the permit area: a lower crystalline bedrock aquifer; the intermediate Santa Fe Group aquifer system that comprises interbedded sandstones, silts, and clays; and an upper Quaternary alluvial aquifer. The aquifers of greatest importance for water supply in the area of the Site are within the Palomas Basin to the east of the Site and include the Santa Fe Group aquifer system and the alluvial aquifer associated with Las Animas Creek. The groundwater monitoring program incorporates sampling and water level measurements from wells screened in all of these aquifers. In response to comments received on the SAP, NMCC met with NMED on March 10, 2011 to discuss this monitoring well network, go over the rationale for the network, and obtain input from the NMED for ongoing regional surface water and groundwater studies. NMED staff stated that further comments on the groundwater monitoring network would be forthcoming after review of the Stage 1 Abatement Plan, but did not disagree with NMCC's approach.

In an effort to fully characterize hydrologic conditions, the network of monitoring wells has expanded over the course of the baseline monitoring program that commenced in January 2010. Groundwater monitoring locations for each of the first three quarterly events are shown in Figures 4-3, 4-4, and 4-5, respectively. Table 4-3 summarizes exceedances of the WQCC groundwater standards to date. Analytical results of all historical groundwater sampling for constituents to which WQCC standards are available are provided in Appendix B3.

The groundwater monitoring well network used to characterize the quality and potentiometric surface within the three principal aquifer systems in the area of the Copper Flat Mine was based on two primary selection criteria: 1) an understanding of well construction details, and 2) agency and public comments on the initial baseline characterization work conducted by Alta Gold in the 1990s in partial fulfillment of the environmental review conducted under the National Environmental Policy Act described in the draft EIS (BLM, 1996).

Alta Gold collected baseline water quality and water level data that primarily focused on the immediate vicinity of the mine permit boundary and production well field defined in the draft EIS. During public review of the draft EIS, Alta Gold's groundwater characterization program received criticism from the public and state agencies in the form of comments on the draft EIS and in DBS&A (1998) for being limited only to the localized areas of the mine and the production well field. In response to these concerns, Alta Gold's consultant, SRK, developed a revised monitoring program to expand the breadth of groundwater sampling and water level measurements to include areas beyond the immediate vicinity of the mine and production well field (SRK, 1997a).

NMCC obtained from SRK all available well construction details for project wells considered as part of the Alta Gold Project. Well construction details, including total depth of well, depth to top and bottom of well screen, well diameter, casing materials and boring logs (where available) were used to identify monitoring wells that were suitable for collecting groundwater quality samples or water level measurements. Based on this information from the 1990s from SRK (1997a) and on well construction details for the wells, NMCC proposed a quarterly sampling program to characterize the Quaternary alluvial, Santa Fe Group, and crystalline bedrock aquifer systems using existing wells. The first quarter of sampling conducted in January 2010 included gauging water levels from 19 wells and sampling water quality from 8 groundwater wells (2 within the crystalline bedrock aquifer, 1 within the Quaternary alluvial aquifer, and 5 within the Santa Fe Group aquifer system) (Figure 4-3). Due to access restrictions that prevented sampling or gauging on private lands, the baseline work was limited to existing wells located within the mine permit boundary.

To expand the breadth of the sampling program, in June through July of 2010 (Quarter 2), NMCC increased the number of water quality samples collected from 8 to 16, and expanded the number of wells proposed for gauging from 19 to 37. This larger set of wells was distributed over a larger area that extended to the north and south of the production well field and included wells on Las Animas and Percha Creeks (Figure 4-4). During this initial second-quarter visit to many of these wells, access issues prevented NMCC from collecting water levels or water quality samples from all of the proposed wells. Instead of the 37 wells proposed for gauging water levels, only 23 were accessible for measuring a water level. For example, continued access restrictions prevented sampling or gauging on some private and public lands (i.e., Saladone well, Airstrip well, MW-1, MW-2, MW-4, MW-5, MW-8, Highway well, Upper Percha well, and Lower Percha well). Restricted access at MW-6 due to the landing plate prevented NMCC from obtaining a water level. However, the owner was available to turn on the pump test that allowed for a water quality sample to be collected.

Working within the limitations of the infrastructure in place at existing monitoring wells proposed for sampling and gauging, NMCC collected 20 water quality samples and gauged 33 wells as part of the third quarter of baseline sampling (Figure 4-5). Further progress with obtaining access agreements permitted NMCC to access additional wells screened in the crystalline bedrock aquifer to the west and to the south of the mine permit boundary and to gain access to wells east of the mine permit boundary in the Santa Fe Group aquifer system and alluvial aquifer. However, during the third-quarter visits to some of these wells, access issues prevented NMCC from collecting water levels or water quality samples from all of the proposed wells:

- Overgrown vegetation on the access road to MW-5 prevented NMCC from collecting a water quality sample.
- A water level could not be collected from the Saladone well at Ladder Ranch because it had been destroyed.
- Water levels and water quality samples could not be collected from MW-4, Highway well, Upper Percha well, and Lower Percha well because equipment in the wells was plumbed directly to a stock tank and there were no well access ports to obtain a water level measurement.
- The Delores well could not be located.
- The absence of an access port large enough to accommodate a water level meter on some of the wells prevented water levels from being measured (in some cases, however, existing pumps or windmills permitted NMCC to collect a water quality sample, e.g., MW-1, MW-2, and MW-6).

The wells used to collect information as part of the fourth quarter of gauging and sampling, planned for April 2011, once again will be proposed based on obtaining permission to access and sample the wells from landowners and land management agencies, as well as well on construction details and well distribution throughout the project area. NMCC will discuss these wells with MMD and NMED to ensure the wells used to collect water level and water quality data, given existing access constraints, are appropriate for characterizing baseline data.

NMCC is aware that MECS is concerned about groundwater impacts associated with the seepage from the unlined tailings impoundment and ARD effects. These data, in conjunction with the activities described in Section 5.0 will enable NMCC to address this issue and, as necessary, develop a response action.

5 Proposed Characterization Activities

As discussed above, the abatement issues identified by MECS are summarized as follows:

- Potential groundwater impacts from the existing unlined tailings impoundment.
- Potential groundwater impacts from the existing pit lake.
- Potential impacts to wildlife caused by exposure to the existing pit lake.
- Potential groundwater impacts caused by ARD from existing exposed waste rock.

The historical and baseline characterization data described in the preceding sections provide important information to help address MECS' concerns. The following subsections describe NMCC's approach to supplementing the historical and baseline data that will provide the basis for (1) determining if implementation of a remedial action is required, and if so, (2) selecting the appropriate abatement technology.

The SAP, which has been reviewed by MECS, contains standard operating procedures for the ongoing baseline characterization field activities as well as the activities discussed in the following subsections. The comments made by NMED on pertinent sections of the SAP will be addressed in the Stage 1 Investigation Report. NMCC attended a meeting with the agencies to discuss these comments as well as NMCC's proposed action plan for these comments on March 21, 2011. The state agencies agreed with NMCC's proposed approach to address these comments. In general, the more significant SAP comments will be addressed as part of the Baseline Characterization Report and the regional hydrologic analysis that will be performed as part of the BLM's EIS process. NMED will be an integral part of this process where water issues are concerned. The activities proposed below relate specifically to the abatement issues identified above.

5.1 Characterization of Tailings Dam Impacts

It is clear from the data described in the preceding sections, that impacts to groundwater have occurred as a result of seepage past the tailings impoundment. This subsection describes the proposed additional data to be collected to further refine NMCC's understanding of this issue.

5.1.1 Geology of the Tailings Dam Area

As described most recently in Raugust (2003), the tailings impoundment (or tailings dam) consists of an earthen embankment constructed across a minor valley. The tailings impoundment is approximately 6,600 ft long with a maximum toe-to-crest height of 60 ft. The impoundment was divided into north and south cells. During the approximate three months of operation, approximately 1.2 million tons of tailings were deposited into the north cell (Figure 5-1). The existing tailings cover an area of approximately 60 acres.

Extensive engineering and hydrogeologic studies have been completed and numerous reports prepared. Table 7 of Raugust (2003) provides a summary of the existing reports, including authors, dates, and purposes. Raugust (2003) also provides an excellent summary of these studies, and this document is provided as Appendix C.

Several conclusions which were drawn from these studies that are pertinent to the Stage 1 Abatement Investigation are summarized as follows:

- The compacted clay liner did not prevent seepage from migrating past the toe of the impoundment.
- A potential paleochannel near the center of the impoundment may be the source for seepage migration beyond the toe of the impoundment.
- There are three hydrologic zones beneath the tailings impoundment (Raugust, 2003):
  - An upper unconfined perched aquifer that contains sands and gravels located adjacent to and down-gradient of the tailings impoundment which dips and thickens to the east where the aquifer becomes confined.
  - An underlying clay layer up to 150 ft thick.
  - An underlying clayey, silty sand aquifer of the upper Santa Fe Group that is confined in the vicinity of the tailings impoundment and becomes unconfined to the west where the unit outcrops at the surface. This unit is believed to be 200 ft thick (SRK, 1998).

Newcomer (1993) attributed downgradient impacts from tailings seepage to a paleochannel, containing gravels and coarse-grained sand and a basalt flow buried about 10 ft below the original land surface in the central part of the tailings impoundment. Based on Newcomer's interpretation, the paleochannel and the basalt create a zone (oriented east-west) of high permeability which was believed to be a preferred pathway for tailings seepage to migrate to the upper alluvial aquifer.

In 1994, ABC/SRK performed a pumping test of monitoring well GWQ94-17 and the results indicated that the upper and lower aquifers described above are not hydraulically connected. Therefore, according to the investigations summarized above, the clay layer affects the hydraulic connection between the shallow alluvial aquifer and deeper zones within the Santa Fe Group and must also have an effect on the migration of tailings seepage in this area.

Review of historical geologic information reveals that of the more than 40 available geologic logs in the vicinity of the tailings impoundment area, the majority of the logs indicate the presence of the clay layer referred to in Raugust (2003) and the PFEIS (BLM, 1999) (Appendix D). Most of these borings are located just east of the tailings impoundment. The clay is typically logged as red in color. The geologic setting includes pyroclastic breccias and flows in some areas that could have been altered to material that includes a proportion of clay Dunn (1984) also notes that there are Santa Fe Group clastics east of the volcanic and intrusive center (east of the Animas Hills), some of which are interbedded with basalt. This is corroborated by the geologic logs referenced above as some of the geologic logs that include clay layers also include thin lenses of basalt within these clay zones. If the clay layer is associated with volcanic or volcano-clastic deposits, the unit may pinch out to the east.

The paleochannel and the clay layer described above have had an influence on the tailings seepage impacts to groundwater in this area. A detailed map and cross section of the stratigraphy in the vicinity of the tailings impoundment employing the numerous borehole data available will be completed. Appendix D contains the borehole logs that will be evaluated to complete this geologic analysis for the Stage I Abatement investigation in order to evaluate the potential impacts to tailings seepage migration and to evaluate the ideal location for a monitoring well. Boreholes will be geo-referenced to the extent possible with the available information. In addition, E-W and N-S cross sections in the vicinity of the tailings impoundment will be developed and references for borehole locations used for the analysis will be provided on the cross sections. These data will be incorporated into the geologic block model for the Site and used to inform the hydrologic modeling that will be completed as part of the EIS.

5.1.2 Groundwater Impacts in the Tailings Dam Area

NMCC acknowledges that additional groundwater characterization data will be needed to define the extent of the tailings seepage impacts. Before deciding on the best locations for new wells, it is important to analyze existing data. The tailings seepage impacts are best illustrated by looking at concentrations of sulfate and TDS in this area as well as groundwater concentrations over time.

Figure 5-2 is a time series plot of sulfate and TDS concentrations in well NP-3 from October 1981 to October 2010. NP-3 is a shallow alluvial monitoring well which is located immediately downgradient from the tailings impoundment, approximately mid-center of the impoundment. Clearly illustrated in this figure is the rise in concentrations in the early 1980s, likely resulting from tailings deposition that began in 1982, and the subsequent seepage impacts causing a rise in sulfate and TDS concentrations. Beginning in about 1987, concentrations in samples from NP-3 appear to level off for both TDS and sulfate and have remained relatively constant. Figure 5-3 is a time series plot of sulfate and TDS concentrations in NP-4, a shallow alluvial well immediately to the north of the tailings impoundment; and Figure 5-4 is a time series plot of sulfate and TDS concentrations for NP-2, a shallow alluvial well to the south of the tailings impoundment. Except for a slight increase above the TDS standard for NP-2 circa 1995 and a slight increase in both sulfate and TDS for NP-4, again circa 1995, these data do not indicate elevated concentrations of sulfate or TDS in these areas, and demonstrate that the sulfate and TDS plumes are bound to the north and south. Therefore, the plume needs to be bound in the downgradient direction.

Figure 5-5 shows the vertical distribution of these constituents in all wells from the tailings impoundment area. As illustrated in Figure 5-5, the WQCC standards are exceeded for TDS and sulfate at two distinct horizons in the groundwater directly downgradient from the tailings impoundment, at approximately 50 ft below ground surface and approximately 80 to 110 ft below ground surface. In order to define the downgradient and vertical extent of the tailings seepage plume, additional characterization data will be needed to the east of the tailings impoundment.

Figure 5-6 illustrates the groundwater monitoring well network at the Site and the proposed location of a new monitoring well pair to characterize the extent of the TDS and sulfate plume. A well pair is proposed in order to evaluate the extent of the plume in the shallow and deep zones described earlier. The exact location for this well pair will be informed by the geologic analysis described in the previous subsection and is subject to change. All new wells at the Site will be installed in accordance with NMED’s guidance for monitoring well construction and the Office of the State Engineer’s requirements for well installation.

The new monitoring well pair will be sampled in accordance with the standard operating procedures provided in the SAP and analyzed for the parameters provided in Table 5-1.

5.2 Characterization of Potential Impacts of the Pit Lake

5.2.1 Pit Lake Hydraulics

Constituent concentrations in pit lake water quality samples exceed WQCC standards. Therefore, the pit lake could be a source for further groundwater impacts if these constituents migrate away from the lake in the direction of regional groundwater flow to the east/southeast (i.e., if the pit lake is a “flow-through” system). Historical and baseline data reveal that the pit lake is a hydraulic sink (i.e., all groundwater flow is towards the pit). This is often the case for pit lakes in the arid southwest as evaporation (i.e., the amount of water leaving the system) is usually greater than precipitation (i.e., the amount of water entering the system). Figure 2-7 adapted from the PFEIS (BLM, 1999) and discussed in Section 2.3.2.1, is a schematic diagram which illustrates this concept. MECS requires further analysis and validation of this conceptual model using current data.

Ongoing baseline data collection to address this concern will enable further confirmation of this conceptual model through the following activities:

- Ongoing data collection from the onsite meteorological station, specifically precipitation and pan evaporation, will be used to complete site-specific water balance calculations.
- New survey data for water levels in monitoring wells near the pit lake and pit lake water elevation will be used to more accurately measure the potentiometric surface in relation to that of the pit lake elevation. Pit lake elevations will be measured at the same time as monitoring well water levels, and groundwater flow directions will be computed.
- Four quarters of water level data will be used to evaluate potential seasonal effects on groundwater flow in the vicinity of the pit lake.
- Evaluation of water quality samples from the pit lake, upgradient and downgradient wells will be completed to analyze potential wildlife exposure and changes to water quality parameters through time.

As described in Section 4, water quality investigations are underway to evaluate the potential for pit lake impacts to water quality. Figures 5-7 and 5-8 are time series plots for sulfate and TDS, and key metals, respectively, from GWQ96-22A, a monitoring well located upgradient of the pit lake (Figure 5-6) based on the established regional gradient. Except for manganese, all constituents of concern are below WQCC standards. Figures 5-9 and 5-10 are time series plots for sulfate and TDS, and key metals, respectively, from GWQ96-23A, a monitoring well located downgradient of the pit lake, based on the established regional gradient. Similarly, except for manganese, all constituents of concern are below WQCC standards. These data support the conceptual model that the pit lake is a hydraulic sink; however, further analysis as described above will be added to validate this important conceptual model.

5.2.2 Wildlife Exposure

Existing and additional water quality data collected from the pit lake will be compared to wildlife habitat standards for water quality. These data will help guide any mitigation or abatement measures necessary to address this concern.

5.3 Characterization of Acid Rock Drainage

NMCC has initiated a geologic sampling program to address the potential for geologic strata and waste rock to create ARD, to degrade surface or groundwater quality, or to cause a hindrance to reclamation. This sampling program is defined in INTERA (2010). This demonstration is a requirement of MMD's Mine Permit and will generate data sufficient to address MECS' concerns about ARD at the Site. Appendix E provides additional detail on the current geochemical characterization program and addresses some of the comments that were generated from MECS' review of the SAP. Appendix F provides a summary with analysis of historical geochemical data, as well as geochemical data and preliminary analysis from the current program. Also included in Appendix F is a memorandum summarizing how the three data sets from 1996, 1997, and 2010 will ultimately provide key information to address the ARD concerns of MECS as well as the requirement of the MMD Mine Permit application.

The geochemical analysis program includes an assessment of waste rock geochemistry designed to predict the potential geochemical reactivity of waste rock that has been and will be exposed during the proposed mining operation, and to provide input into a future pit lake hydrogeochemical model. This assessment includes characterization of ore-grade materials that will be processed and deposited as tailings in the tailings impoundment.

The material characterization component of the this program will address mineralogy, bulk geochemical characteristics, and the potential of the waste rock and processed ore (tailings) to generate acid or net-neutral drainage. This program will also generate data to form the basis for prediction of future water quality that would result from precipitation contacting the material, and prediction of the impacts this water may have on groundwater, surface water, and pit lake quality at the Site. The data generated from this program will provide essential input to the groundwater flow model to be developed for the Site. The geochemical analysis combined with the hydrologic modeling will form the basis for determining whether abatement measures are, or will be required, to mitigate ARD at the Site. The following subsections contain a general description of the program.

5.3.1 Data Review and Material Type Delineation

NMCC's contractor has reviewed all data available from the previous and current exploration drilling programs, including the drill hole database, drill logs, assay data, and bulk element geochemistry. From this review, the main rock types, alteration types, and oxidation states identified by SRK in the late 1990s have been updated and are identified in Appendix E. The combination of these parameters was used to define material types for the project that are the focus of the geochemical characterization program. This program is defined in more detail in the Materials Characterization Program which is Appendix C of the Plan of Operations.

5.3.2 Sample Interval Selection

Several types of geologic material are available from the exploration drill programs for sampling, including coarse rejects and half-split core from the core and rotary drilling. However, the core will be the preferred sample material. The available half-split core material was sampled for geochemical characterization as it was identified as the best material available for geochemical testing. These core intervals were targeted in the waste rock characterization portion of this sampling program.

In late 1997, SRK collected 46 samples for Acid Base Accounting (ABA) testing, 59 for Net Acid Generation (NAG) testing, 1 for short-term leach testing, and 5 for humidity cell kinetic testing. In addition, 14 samples were collected from the historic tailings impoundment for static test analysis, and approximately 130 samples from waste rock and pit walls were collected for field NAG test and paste chemistry. Figure 1 of Appendix E shows the locations of the surface samples taken in 1997.

These 1997 samples were characterized by lithology, alteration, oxidation, and absence/presence of sulfides. Samples were generated by collecting material from consecutive intervals within the same drill hole, and each sample consisted of a single material type as defined by rock type, alteration type, and oxidation state. These samples were submitted to certified laboratories in Reno, Nevada, for sample preparation and laboratory testing.

Twenty-four additional samples were taken in April 2010 to create a sample database that is vertically and horizontally representative of waste rock associated with the current project. All 24 samples were submitted for ABA, NAG, and multi-element analysis. In addition, 50 ore-grade samples were collected from drill core; 40 of these were selected and analyzed using the Meteoric Water Mobility Procedure (MWMP), and 21 samples were selected for humidity cell testing beginning in January 2011. Figure 1 of Appendix E shows the locations of these 2010 samples.

NMCC's approach to sample selection was designed to ensure that samples with end-member reactivity are sufficiently represented in the program to provide a comprehensive and representative understanding of the full range of geochemical characteristics for each of the material types. To this end, NMCC's contractor has focused on understanding the geological controls on the geochemical behavior of the different materials as the basis for sample selection.

5.3.3 Sample Collection and Field Screening

Geochemical characterization samples were collected by qualified geologists from consecutive intervals within the same drill hole. Each sample consisted of a single material type as defined by rock type, alteration type, and oxidation state.

Once the main material types were delineated and sampled, a number of field tests could be performed to assess broad geochemical behavior of the identified material types and confirm the geological classification of the materials.

Field tests were used in the 1997 geochemical characterization program to identify ideal sampling locations. Because these tests are inexpensive and quick, a significant amount of data can be collected quickly with minimal cost. By using the field screening to define a representative sample set, the “representativeness” of the sample set is more defensible and the number of samples selected for the more expensive static test suite can be minimized.

The field method is referred to as “paste pH and EC” and was used in 1996–1997 to characterize samples, particularly from the waste rock dump. Based on the material type and paste results for that material, samples were selected for laboratory analysis. The field method is summarized as follows:

- Sampling: This involved collecting < 5mm chips from a 5kg sample taken in a cubic meter area of the waste rock. The fines were then split into quarters and one quarter was retained for whole rock and mineralogy analysis, one quarter was used for paste test (which often involved cone and quartering again), and one quarter was kept for NAG testing. This method is employed because water quality in a dump is largely controlled by the fines and this is a good indication of reactivity.
- Testing: The paste test comprises mixing a 1:1 of fines with distilled water and measuring TDS and pH of the resulting solution. Where the water went blue, the sample was analyzed for copper and sulfate by a field colormetric spectrometry.
- NAG Testing: This test involved reacting hydrogen peroxide with the fines and then back titrating with NaOH to determine acid generation.

5.3.4 Geochemical Test Work

Based on the geologic logging and field screening, a representative number of larger samples was selected for standard static testing, including: multi-element analyses, ABA with sulfur speciation, MWMP, and NAG. These static tests are intended to define the potential of a material to generate acid, buffer acid, and/or leach constituents under field conditions.

Based on the results of the field work and static testing, samples of material with an uncertain acid generation potential or leaching characteristics were selected for kinetic testing. Because the static test work assumes that all minerals that have the potential to generate acid, buffer acid, or leach metals will react completely, they can only define the chemical/mineralogical potential of the rock and do not take into account reaction rates that will ultimately control whether the material will actually generate acid, buffer acid, or leach metals under field conditions.

The samples collected in Step 3 were submitted to a certified laboratory for sample preparation and the first phase of static testing at Nevada-certified laboratories as follows:

1. Whole rock analysis using four-acid digest and ICP analysis to determine total metal and metalloid chemistry for 48 elements (ALS Chemex Method ME-MS61).
2. ABA using the modified Sobek method (Memorandum No. 96-79) with sulfur speciation.

3. NAG test reporting final NAG pH and final NAG value after a two-stage hydrogen peroxide digest.
4. MWMP (ASTM D5744-96) with geochemical analysis of the leachate for applicable constituents.

This work was supervised by NMCC's contractor at McClelland Laboratories of Sparks, Nevada, with analysis by Western Environmental Testing Laboratory (WETLab) of Sparks, Nevada; ALS Chemex of Reno, Nevada; and SVL Laboratories of Kellogg, Idaho.

The first phase of geochemical testing was completed to assess the range of reactivity of each of the material types and the results were used to select samples for MWMP testing with geochemical analysis of the leachate for applicable constituents. Samples demonstrating end-member reactivity, as determined from the first phase of static laboratory testing, were selected for MWMP testing to provide a comprehensive and representative understanding of the leaching characteristics of the different material types associated with the Copper Flat deposit. Mineralogical analysis was also completed on about 20 samples to provide a better understanding of the influence geologic controls have on the geochemical behavior of the waste rock and ore.

The new MWMP and mineralogical data were completed in November 2010. The results are described in detail in Appendices E and F.

5.3.5 Kinetic Testing Program

Based on the results of the static and MWMP testing described above, any material types that exhibit uncertain or highly variable geochemical behavior will require further characterization using kinetic test methods to determine the rates and character of longer-term leaching. Twenty-one samples were selected for humidity cell testing, which was initiated in January 2011 (ASTM D-5744-96-7).

5.3.6 Data Validation and Compilation

The geochemical data are being reviewed as they are received to ensure the quality of data and consistency in analyses. NMCC's contractor will then verify the quality of all data and confirm that no anomalies are related to laboratory error prior to interpretation and reporting. At a minimum, NMCC's contractor will utilize their internal standard data validation procedures, although guidance from other sources may also be considered (e.g., U.S. Environmental Protection Agency). All geochemical data collected as part of the static testing program will be compiled into a single database for evaluation.

Preliminary results are presented in Appendix F.

5.3.7 Fate and Transport Modeling

The Copper Flat plan of operations calls for leaving waste rock from previous mining activities in place and extending the waste rock facilities to accommodate waste rock from proposed new mining activities.

Existing and new waste rock have the potential to affect land and water resources through mobilization and transport of mine rock materials, whether as solid or dissolved phases, from the facilities to the surrounding environment. Potential receptors include soils, surface water, and groundwater resources near the facilities.

Static testing and geochemical analyses of existing waste rock and potential future waste rock and pit wall materials revealed a range of results. Some samples were characterized as having acid generation potential, whereas other samples demonstrated a potential to be acid consuming or neutral using the BLM waste rock guidelines for static testing. Kinetic testing of a subset of these mine rock samples began in January 2011 and will be used to characterize potential leachate chemistry and provide the basis for generating chemical release functions (CRFs) that are mathematical descriptions of each constituent of interest's observed time-varying leachate concentration. When weighted by the mass of each rock type to be produced, the resulting composite CRFs will serve as quantitative measures of leaching behavior to be used to simulate solute chemistry and transport through the waste rock facilities and the underlying variably saturated sediments, and thereby assess potential impacts.

The overall approach will be to complete the characterization of waste rock and its leachate, then assess the impacts resulting from the flow and chemical transformations of the leachate as it moves through the waste rock facilities and the underlying vadose zone to groundwater in the aquifers beneath the proposed facilities. Potential impacts to groundwater will be evaluated with a numerical flow and solute transport model developed from the Site-specific conceptual model. The objective of the vadose zone flow modeling will be to estimate the volumes and flux rates of water moving through the waste rock facilities and through the underlying vadose zone materials, and ultimately to estimate the water fluxes reaching groundwater. Potential impact criteria included the location and magnitude of water flux leaving the waste rock facility (seepage), the time of travel through the facility, and the total time of travel and magnitude of water flux reaching groundwater resources. The analysis will adopt a conservative approach to simulate flow through the facilities and the vadose zone sediments by weighting uncertainties that increased infiltration over those that decreased infiltration.

The vadose zone transport model will assesses potential impacts to groundwater resources by predicting the concentrations and flux rates of selected solutes from the facilities to those resources. The model focuses on geochemical transformation processes that operate within the vadose zone on solid and dissolved phases of critical solutes, including arsenic, antimony, mercury, and others. Potential impact criteria focus on solute concentrations and time-varying solute flux rates in the leachate from the facility and in the water reaching groundwater resources.

If the appropriate assumptions are met, then the current pit lake chemistry may serve as an analog of future pit water and waste rock leachate. If the pit lake water is in equilibrium with the pit wall rock under saturated conditions, the observed pit lake water quality may be a conservative estimator of leachate chemistry formed under variably saturated conditions for both waste rock and the pit wall materials.

5.3.8 Surface Water Monitoring Program

The surface water monitoring program described in Section 4.1, particularly the opportunistic water and soil sampling, is designed to evaluate baseline conditions and reveal if ARD issues caused by runoff from the waste piles are a problem under current site conditions. Four quarters of data will be combined with historical data to evaluate changes over time to surface water conditions and to determine if an ARD process is causing impacts to water quality under current site conditions.

6 Quality Assurance Project Plan

A Quality Assurance Project Plan was developed for the SAP (INTERA, 2010). It is provided as Appendix G.

7 Site Health and Safety Plan

NMCC's contractor has developed a general Site Health and Safety Plan for all characterization activities conducted pursuant to the Copper Flat Stage 1 Abatement Plan. This document is included as Appendix H.

8 Reporting

A Stage 1 Investigation Report will be developed at the conclusion of all field activities and studies described in this plan. The report will include a detailed description of all field investigations, methodology, data analyses, results, quality assurance, conclusions, and recommendations. In addition, as required by 20.6.2.4106.C(6) NMAC, quarterly progress reports summarizing key activities and preliminary findings will be initiated upon receipt of an approval to this Stage 1 Abatement Plan from the NMED.

9 Schedule

The Stage 1 Abatement Investigation Report will be delivered to NMED at the conclusion of all field activities and data analysis. The projected date for completion of this report is January 31, 2012.

10 References

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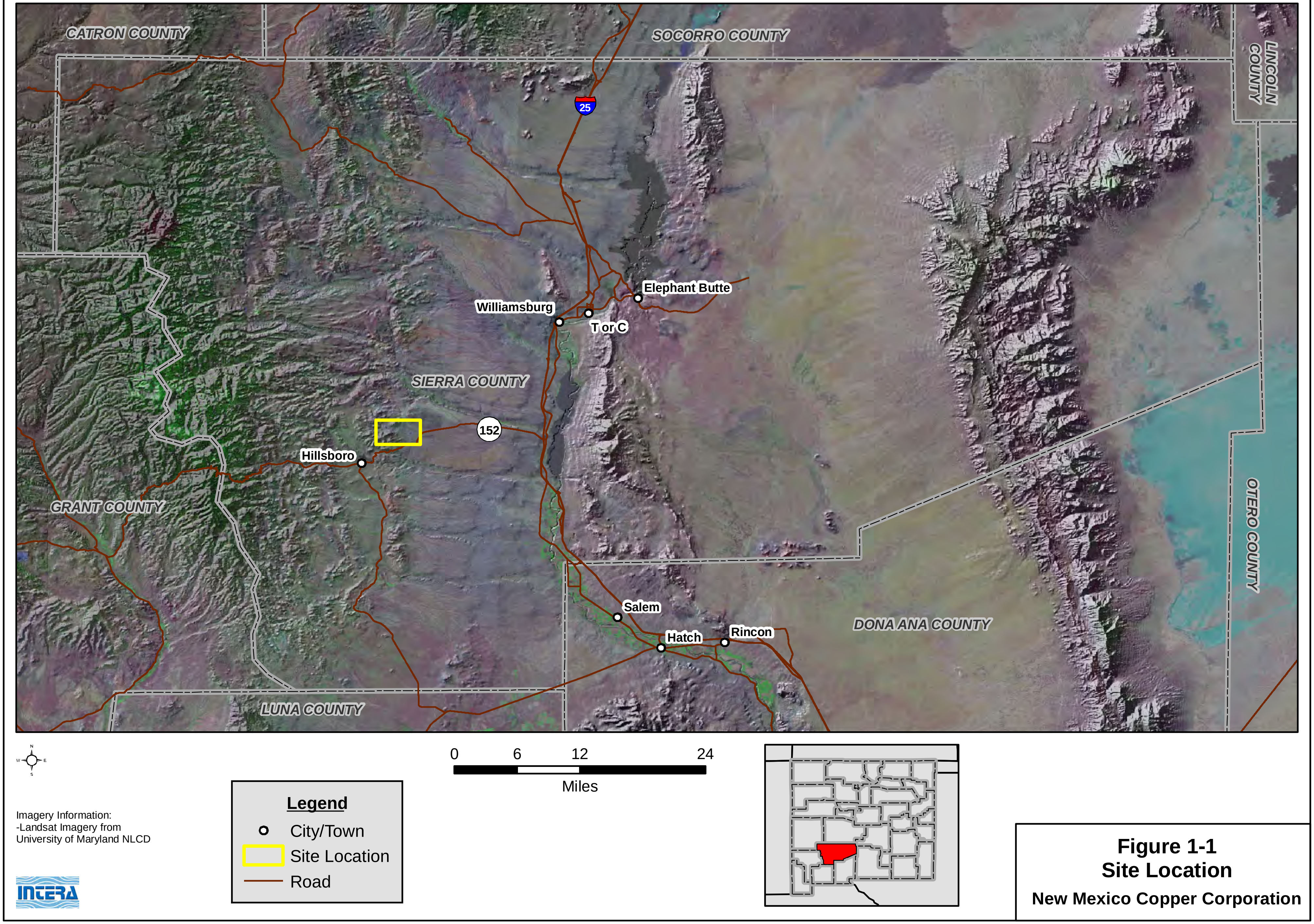
FIGURES



Imagery Information:
-Landsat Imagery from
University of Maryland NLCD

Figure 1-1
Site Location
New Mexico Copper Corporation

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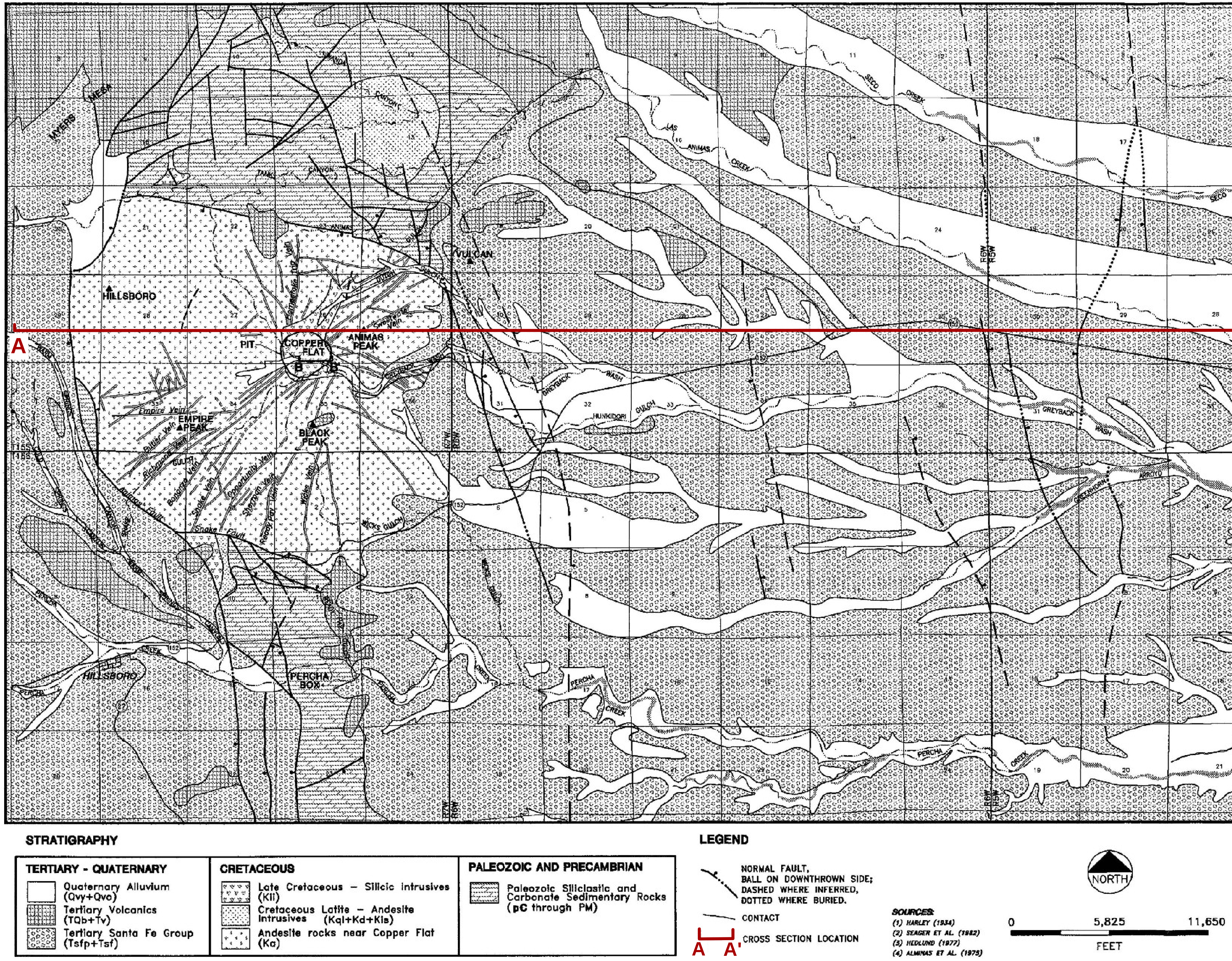
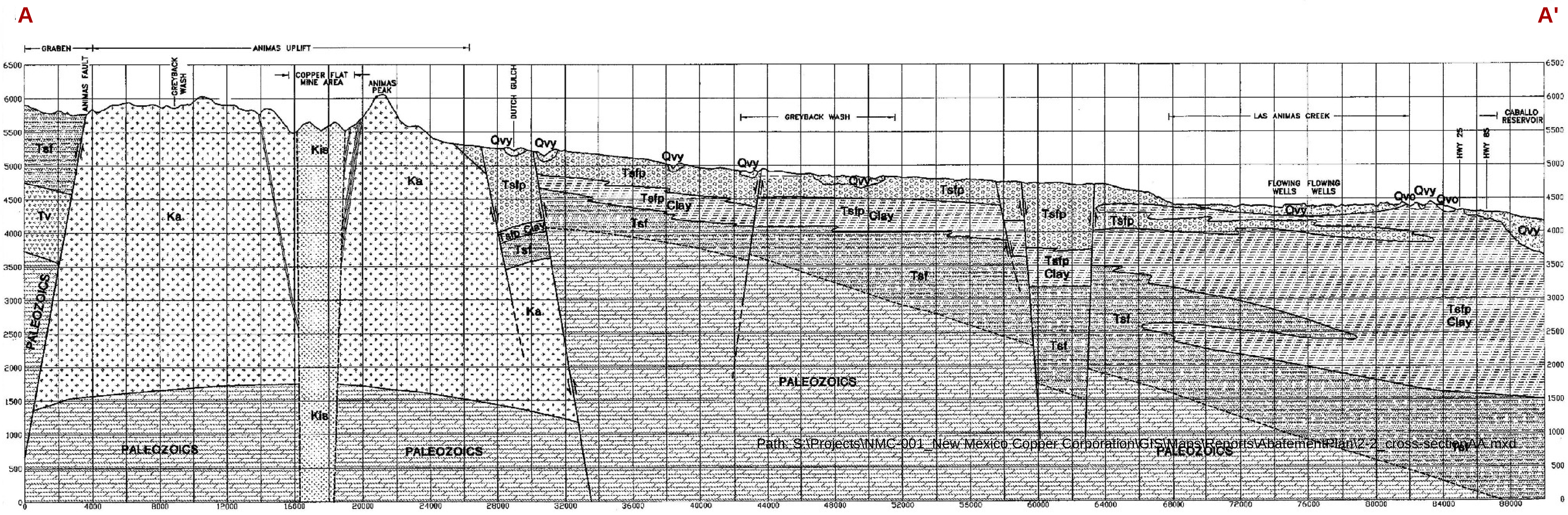


from BLM, 1999

(see Figure 2-2 for cross section detail)

Figure 2-1
Regional Surface Geology

New Mexico Copper Corporation



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LEGEND:

QUATERNARY
- ▨ Qvy } Stream Alluvium
- ☐ Qvo

TERTIARY
- ▨ Tsfp } Palomas Formation
- ▨ Tsfp Clay
- ▨ Tsf – Rincon Valley Formation
- ▨ Tv – Tertiary Volcanics

CRETACEOUS
- ▨ Ka } Volcanics and Intrusives
- ▨ Kis

PALEOZOIC
- ▨ Bedrock Carbonate and Clastic Rocks

(see Figure 2-1 for cross section location)

SOURCES:
(1) HARLEY (1934)
(2) SEAGER ET AL. (1982)
(3) HEDLUND (1977)
(4) ALMINAS ET AL. (1975)

SCALE IN FEET
VERTICAL 1500 – 0'
HORIZONTAL 6000 – 0'

from BLM, 1999

Figure 2-2
Schematic Geologic Cross Section (A-A')
New Mexico Copper Corporation

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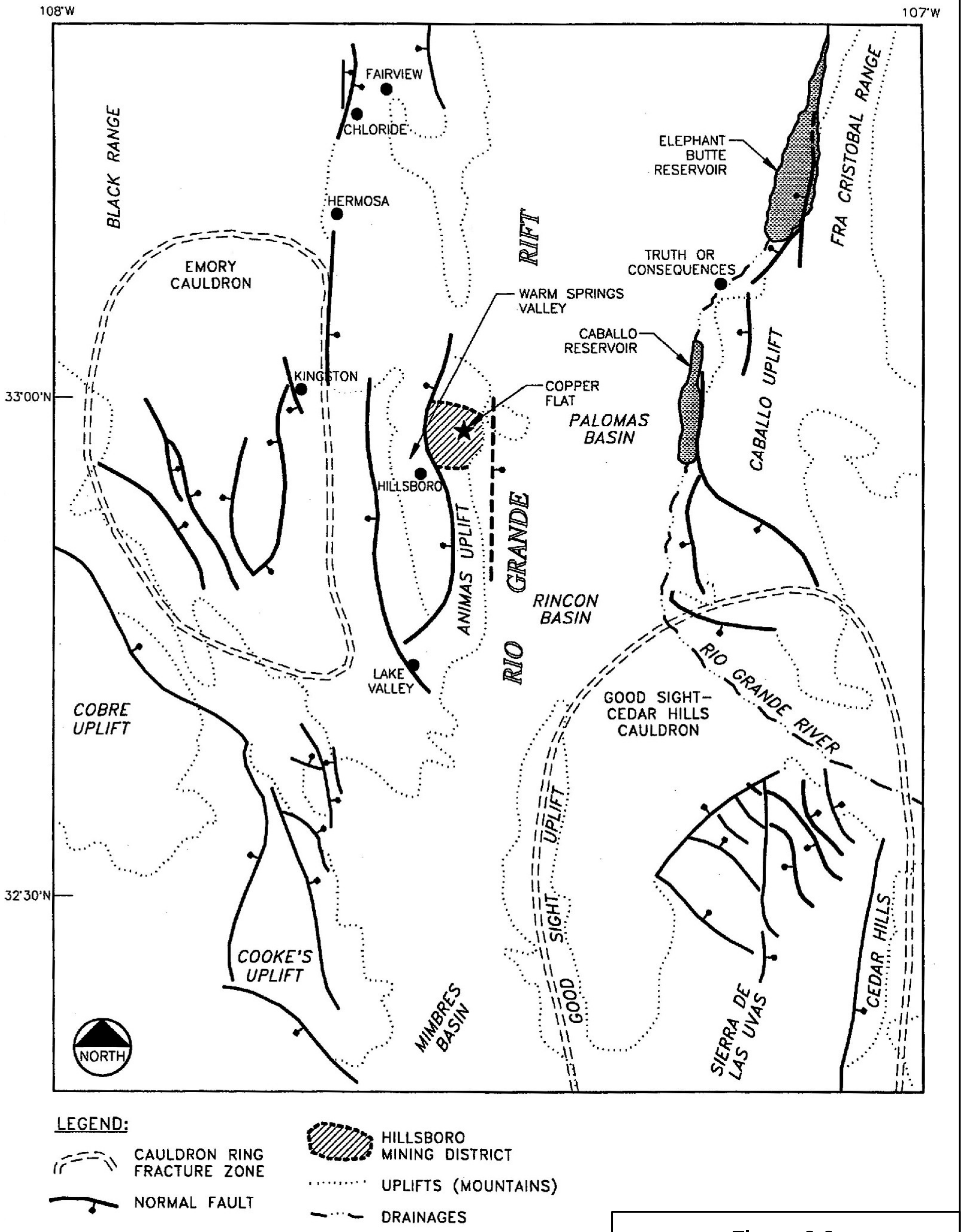

from BLM, 1999

Figure 2-3
Geologic Structural Features of the Region

New Mexico Copper Corporation

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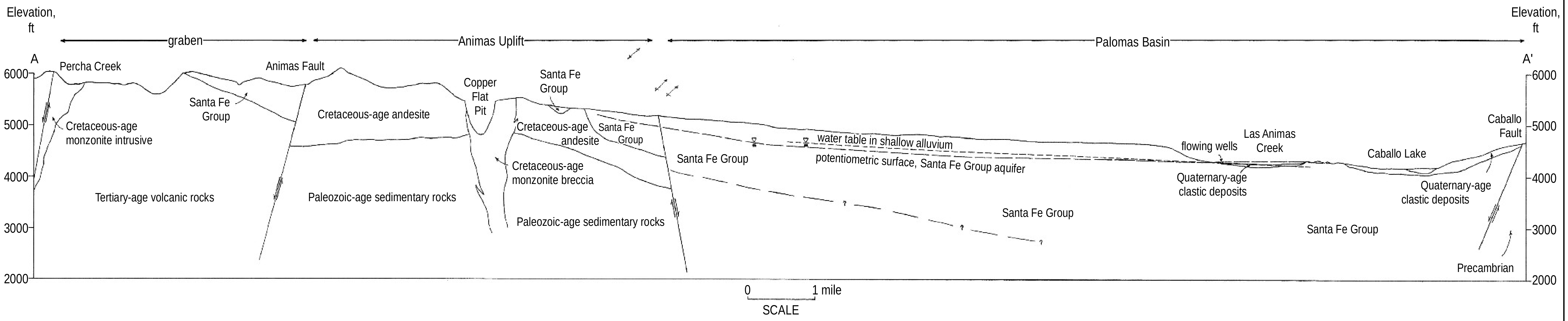

from John W. Shomaker, Inc., 1993

INTERA

Figure 2-4
Schematic of Groundwater Flow System

New Mexico Copper Corporation

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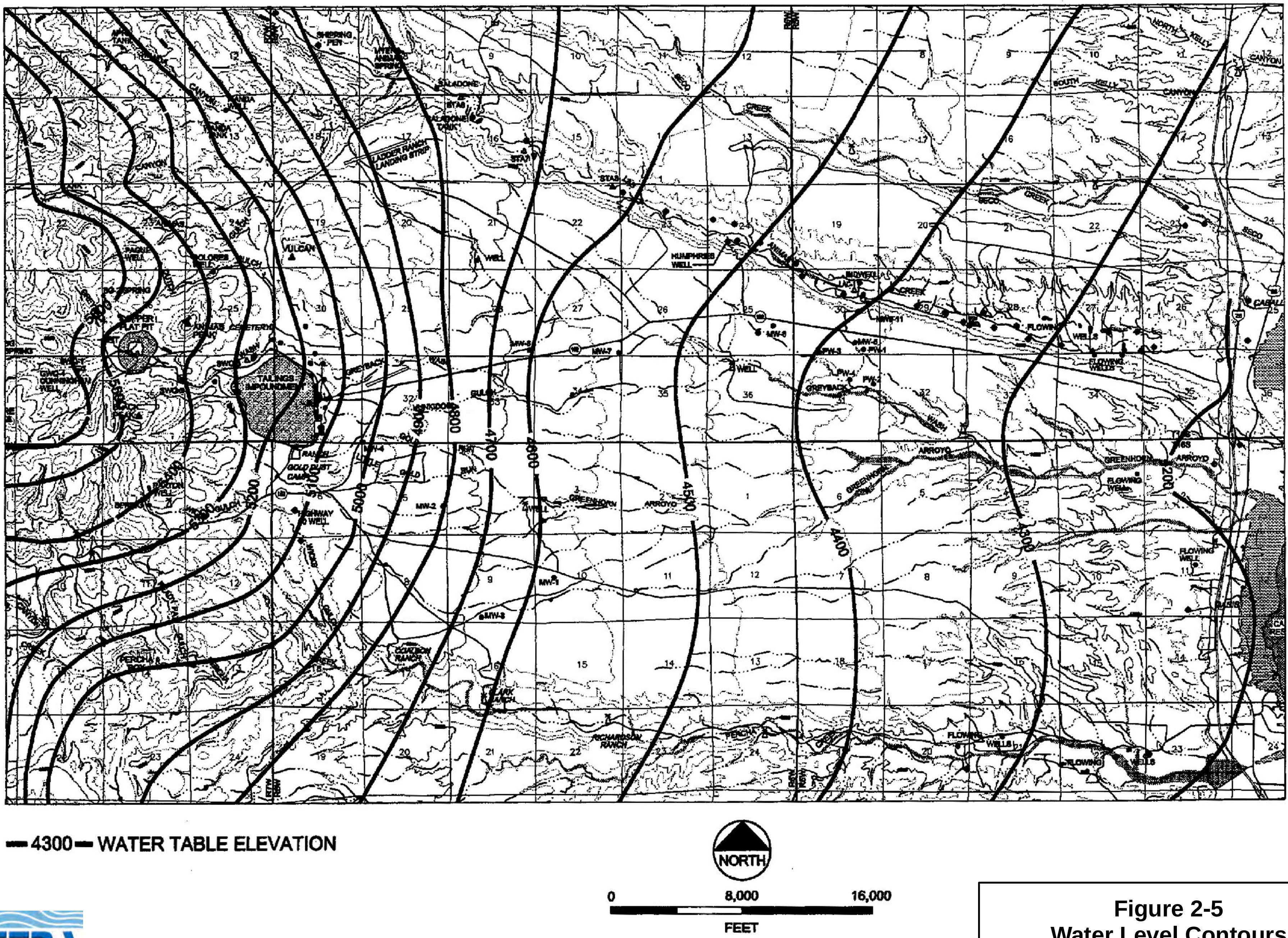

Figure 2-5
Water Level Contours

New Mexico Copper Corporation

from ABC, 1998B

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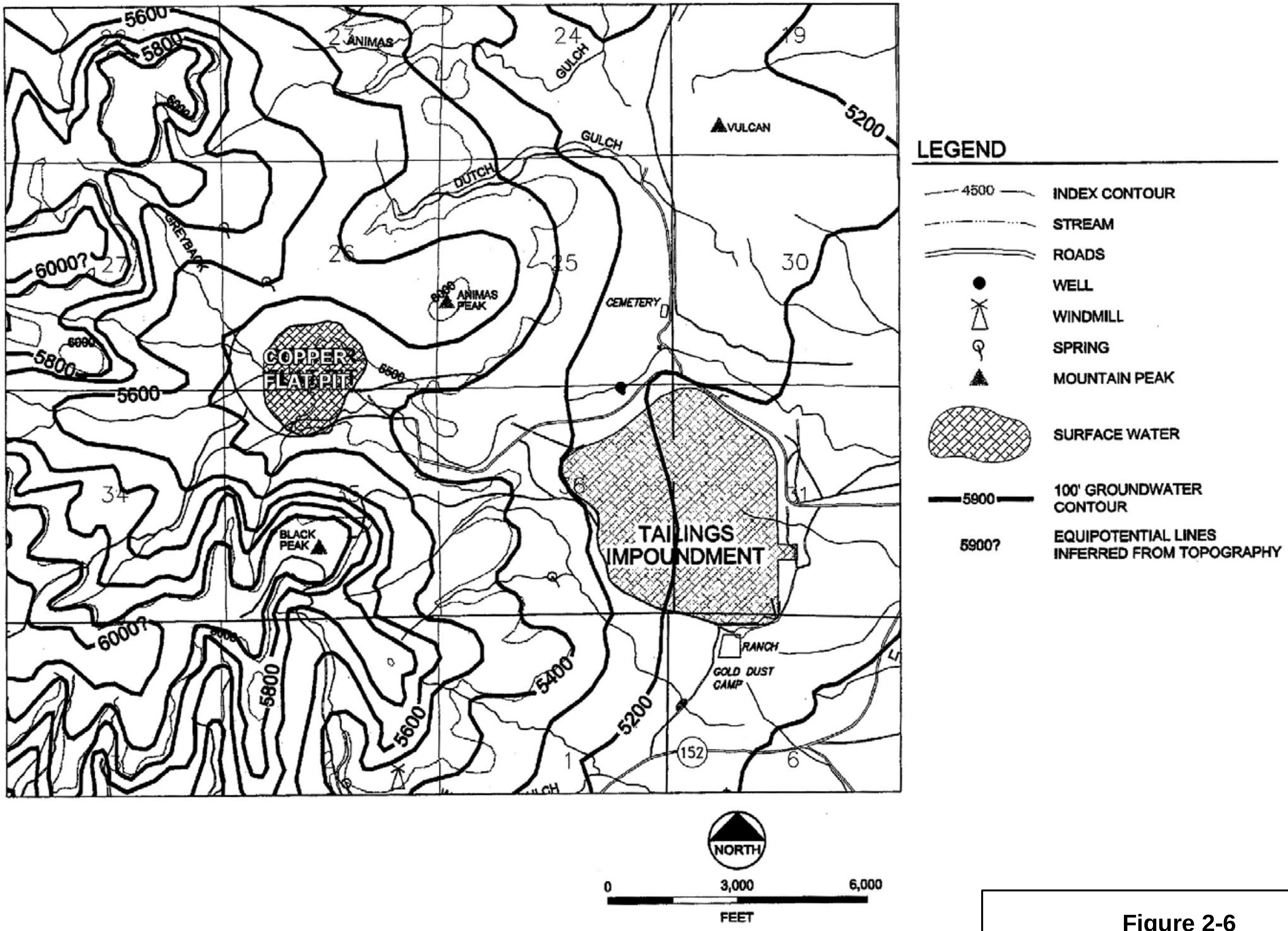

from ABC, 1997

Figure 2-6
Water Level Map of
Copper Flat Pit Area

New Mexico Copper Corporation

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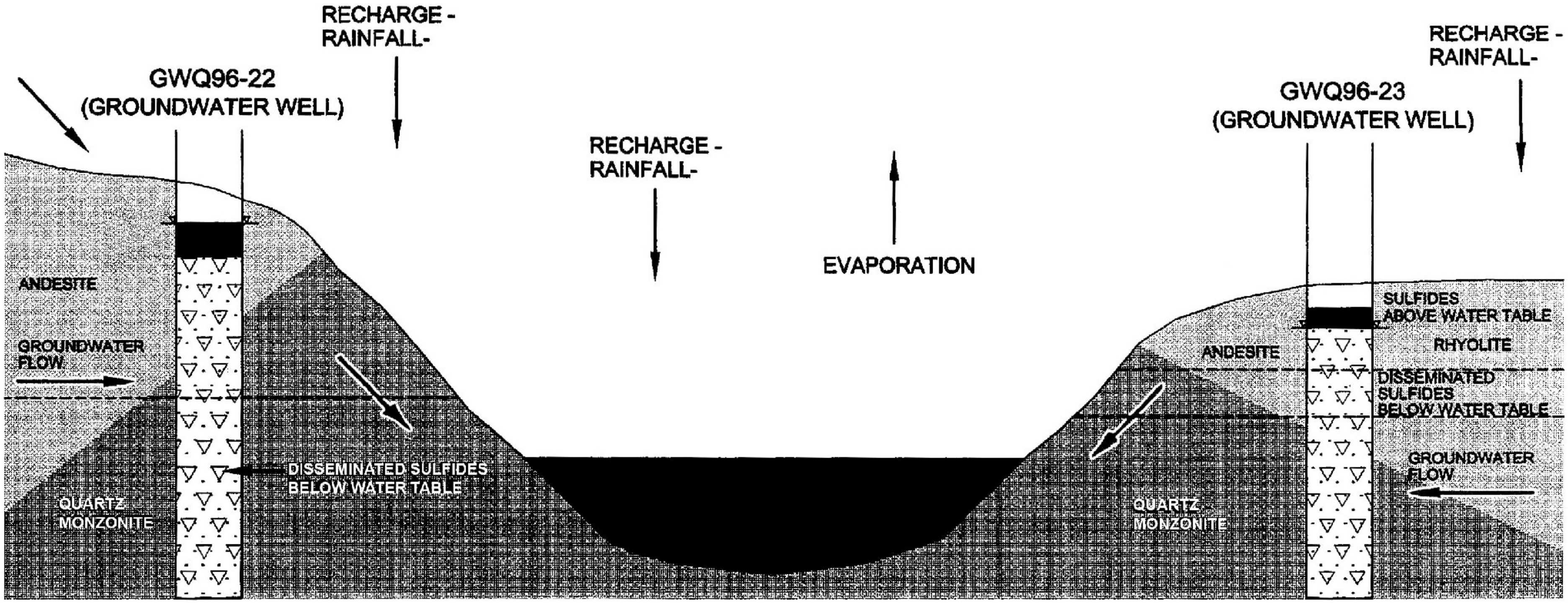
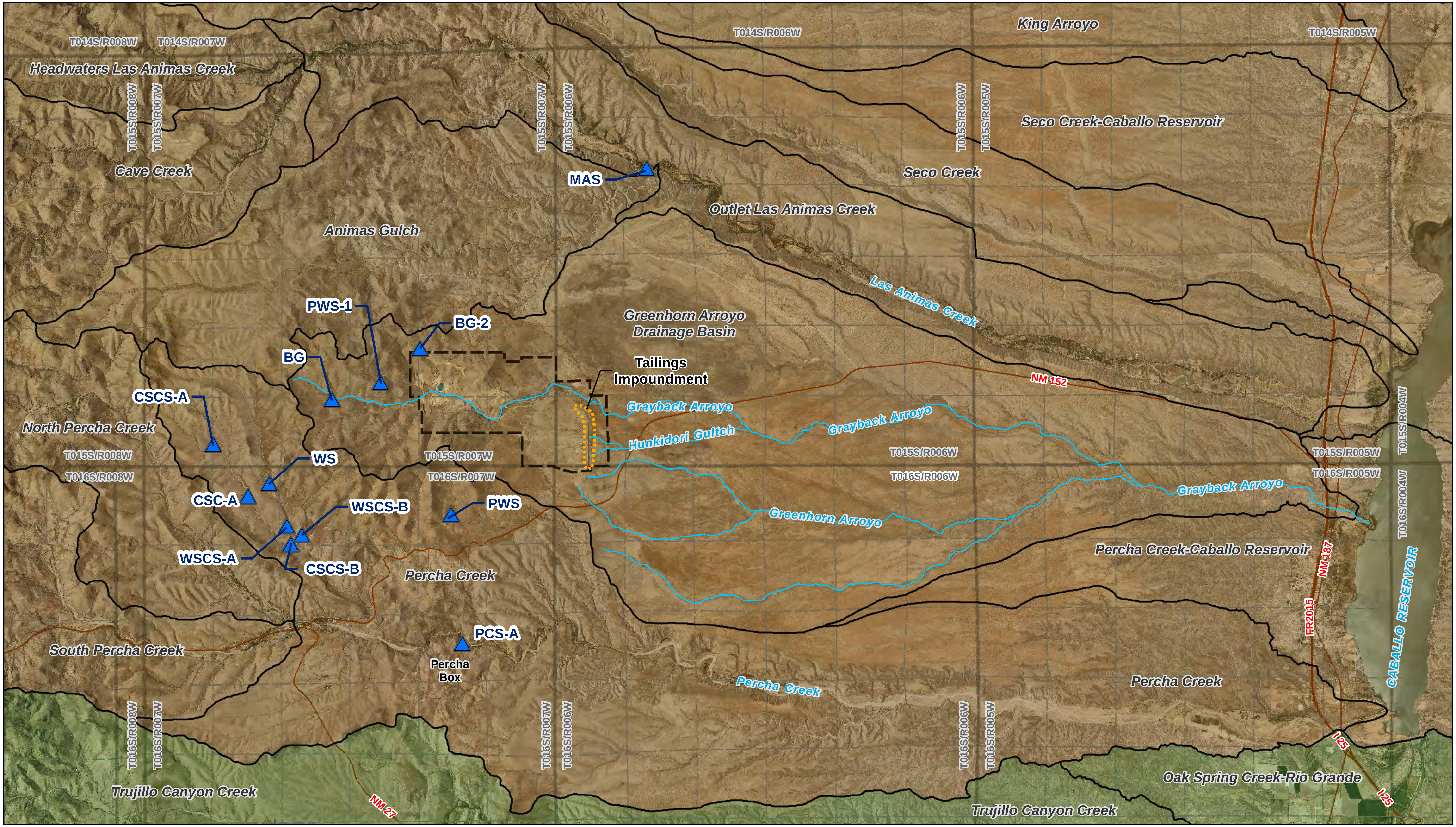


from SRK, 1998

Figure 2-7
Schematic Groundwater Flow Direction in the Vicinity of the Pit Lake

New Mexico Copper Corporation

Path: S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\2-7_well_WQReports.mxd



N
W E
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Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,500 7,000 14,000 21,000
Feet

Legend

▲ Identified Spring
⌜⌟ Proposed Mine Permit Boundary

Watersheds
🟫 Caballo
🟩 El Paso-Las Cruces
○ Sub-Watershed

Figure 2-8
Spring and Stream Locations
New Mexico Copper Corporation

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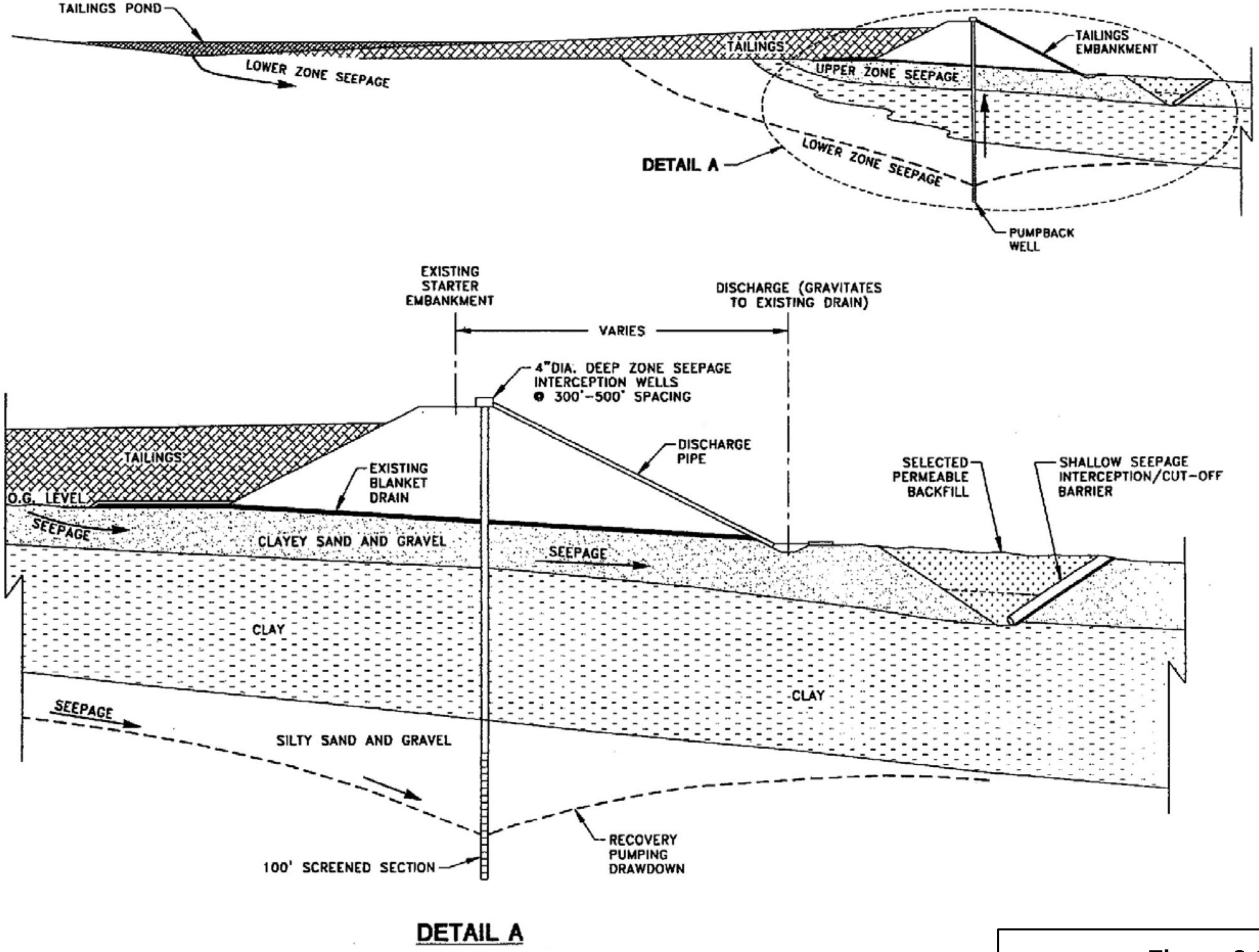
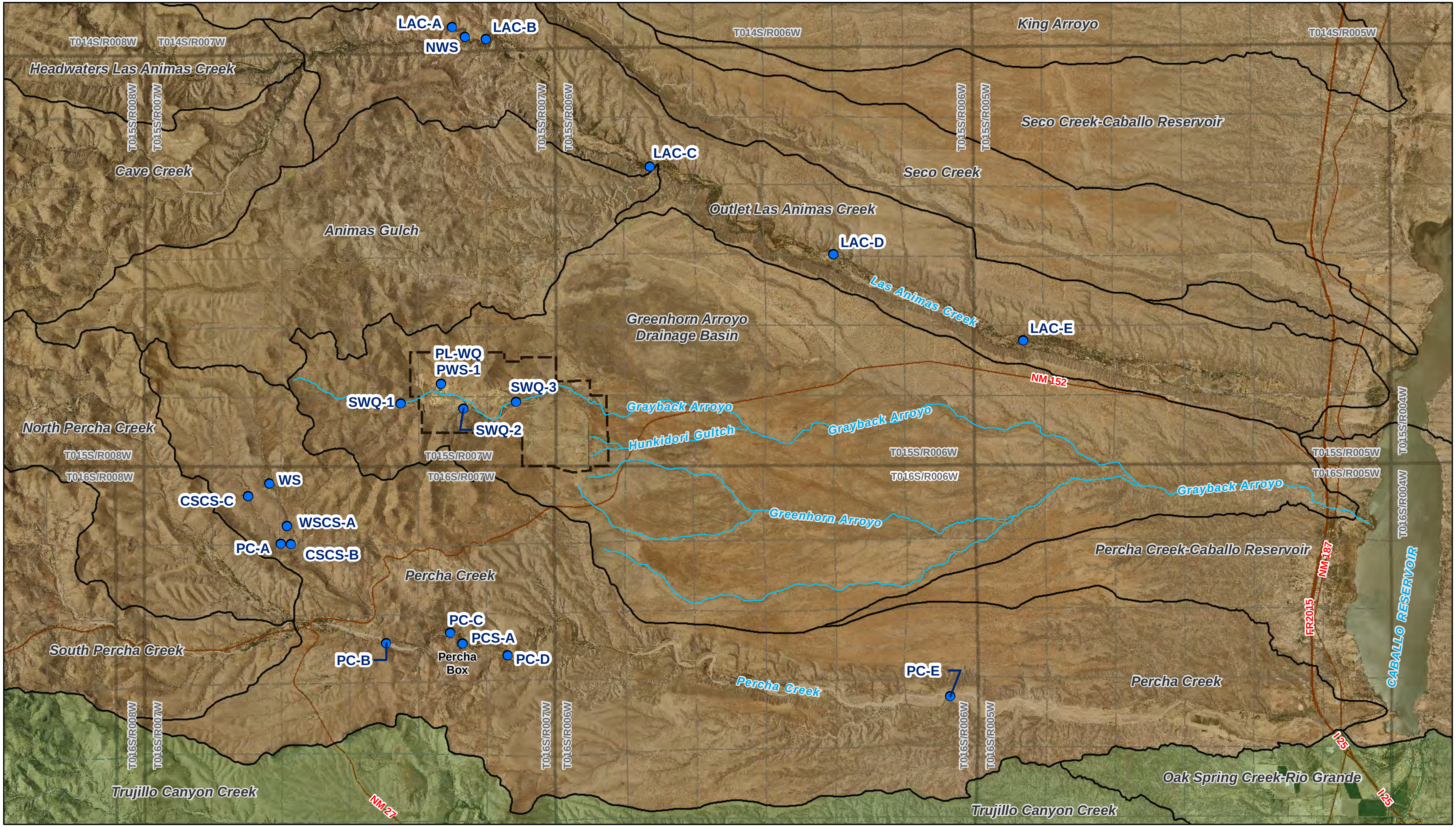


from SRK, 1995

Figure 2-9
Conceptual Design,
Tailings Seepage Control

New Mexico Copper Corporation

Path: S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\2-9_seepage-control.mxd



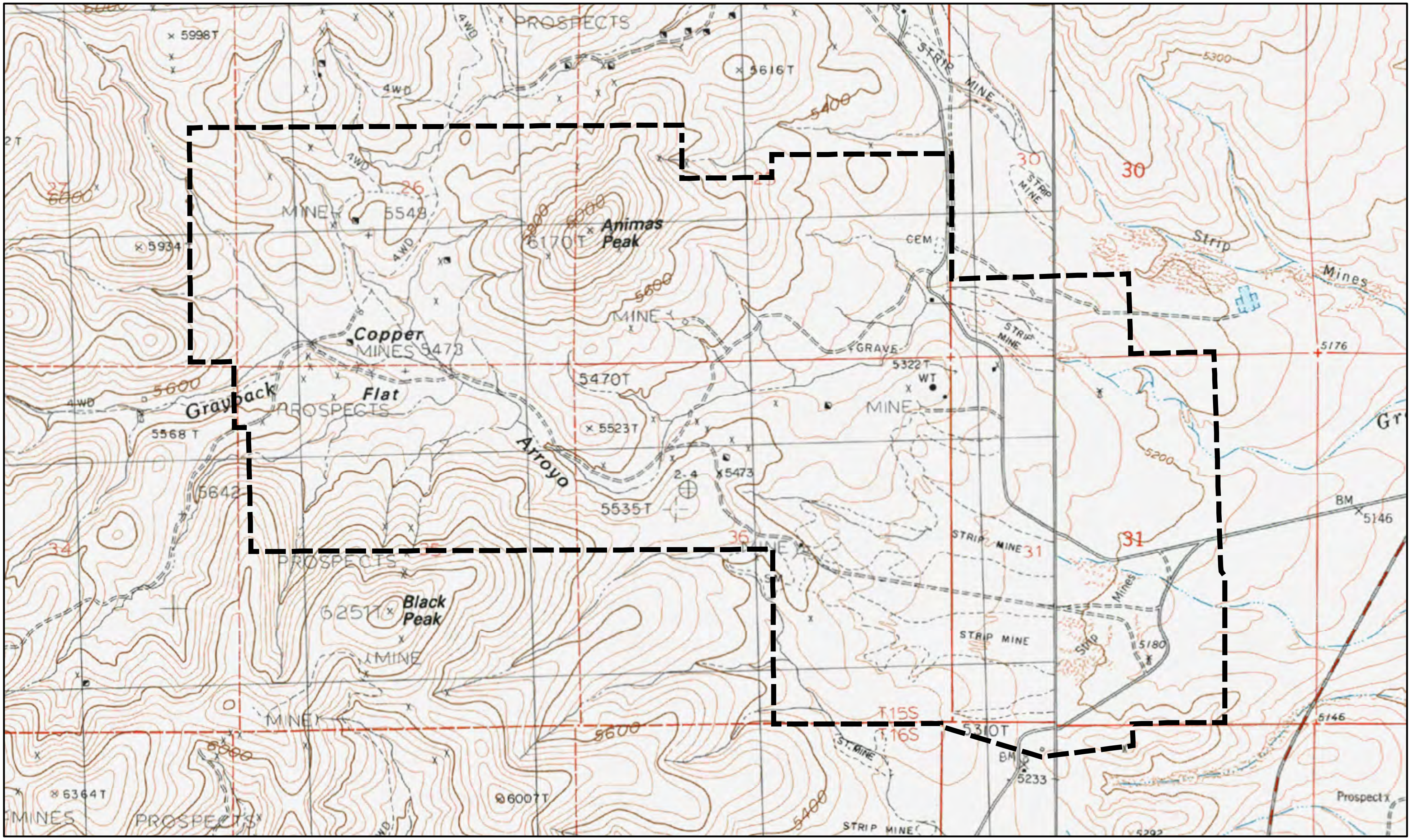
Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

● Surface Water Monitoring Location
⌐ ┘ Proposed Mine Permit Boundary

Watersheds
▭ Caballo
🟩 El Paso-Las Cruces
◯ Sub-Watershed

Figure 2-10
Surface Water Monitoring Locations
New Mexico Copper Corporation



N
W E
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0 1,000 2,000 4,000 6,000

Feet

Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes Quads; Skute Stone Arroyo & Hillsboro
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

▯ Proposed Mine Permit Boundary

Figure 3-1
Proposed Copper Flat Permit Area with Topography

New Mexico Copper Corporation

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Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ
mosaic Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

Legend

▭ Proposed Mine Permit Boundary

Figure 3-2
Proposed Copper Flat Permit Area with Air Photography

New Mexico Copper Corporation

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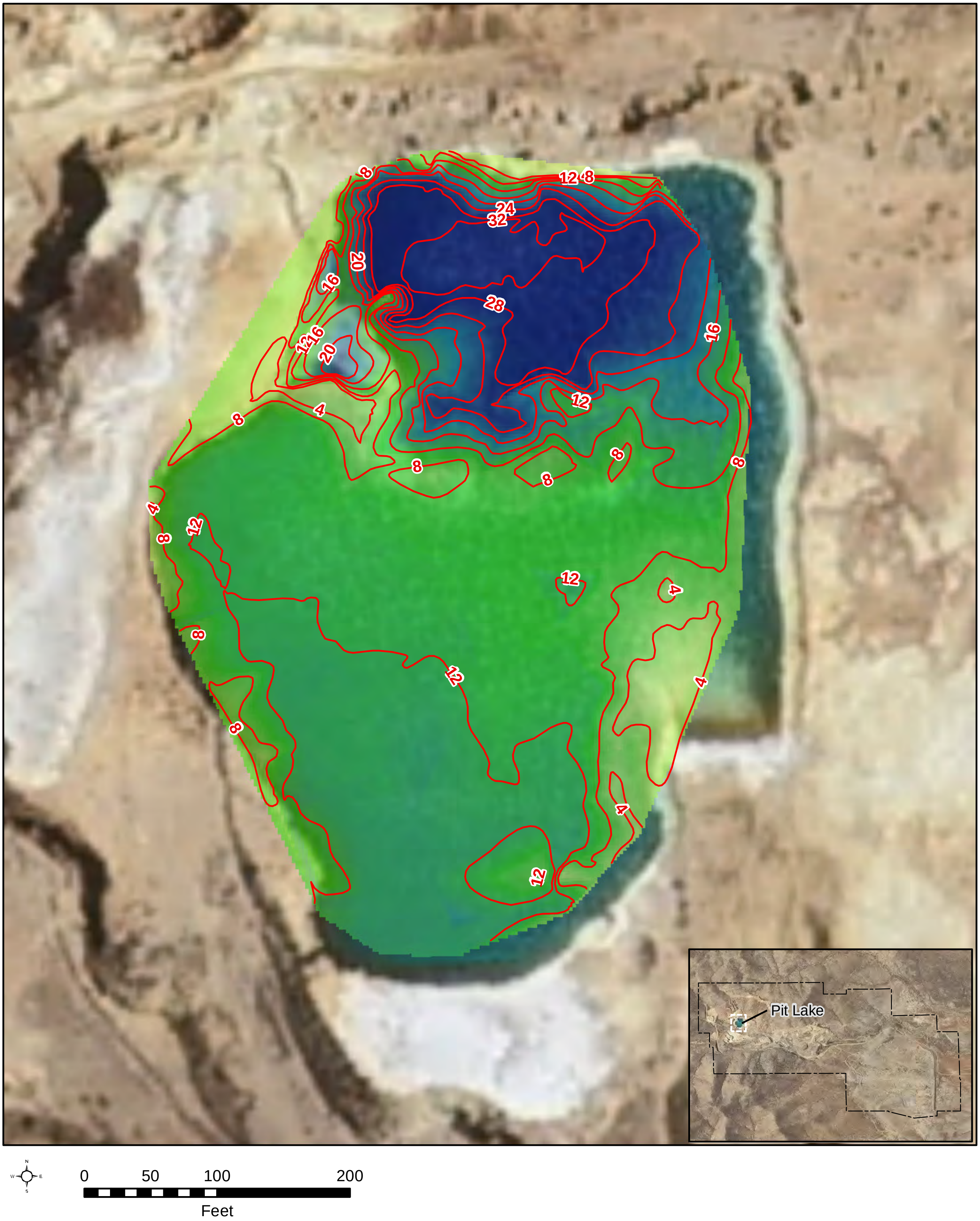
from Hydro Resources, Inc.

Figure 3-3
Aerial View to the West at Copper Flat Mine, 1982

New Mexico Copper Corporation

from Hydro Resources, Inc.

Figure 3-4
Aerial View to the East at
Copper Flat Mine, 1982
New Mexico Copper Corporation



Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

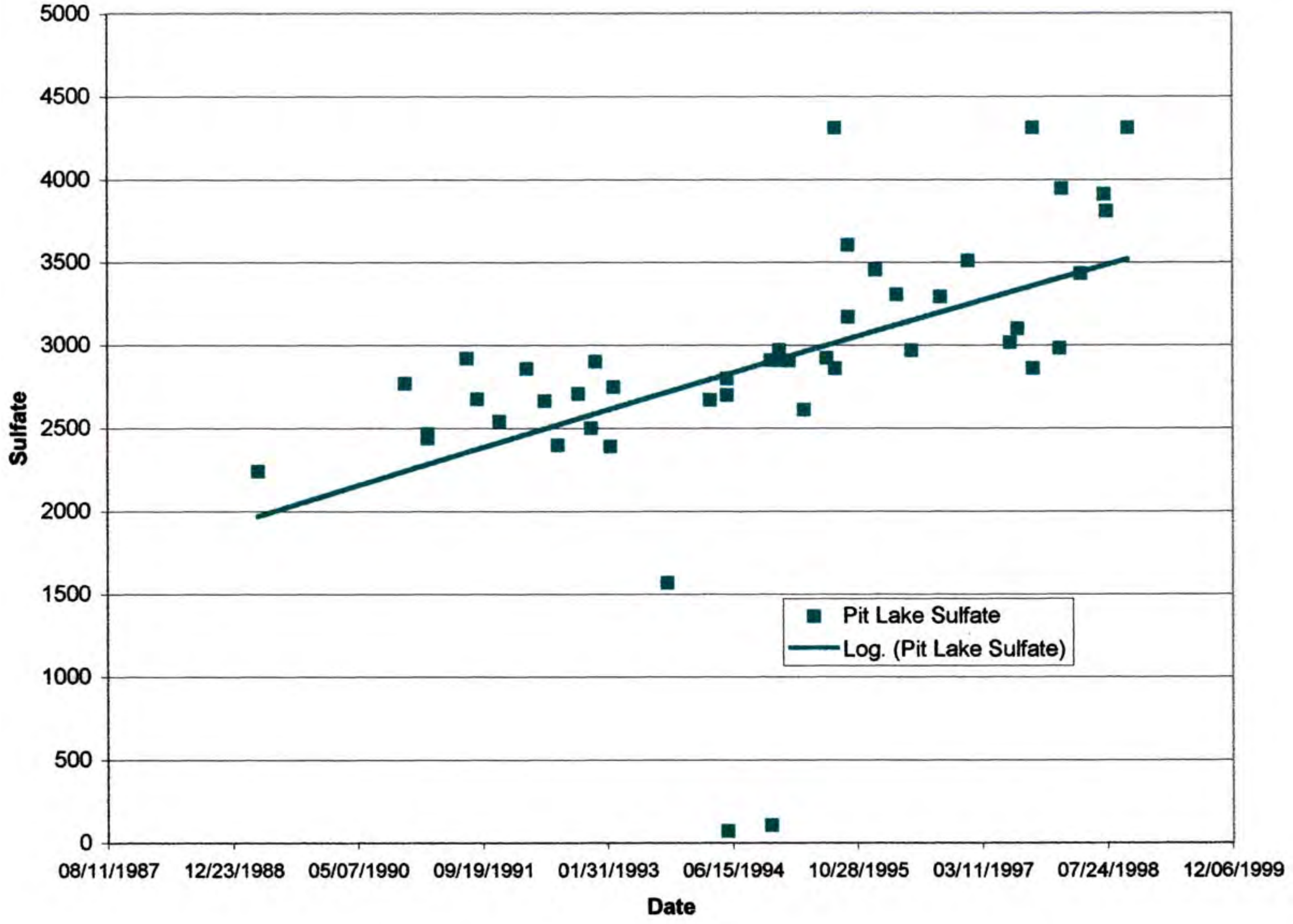
Legend

🟥	Depth of Pit Bottom in Feet

INTERA

Figure 3-5
Bathymetry Map of the Pit Lake

New Mexico Copper Corporation



from Raugust, 2003

Figure 3-6
Sulfate Concentration
in the Mine Pit Lake

New Mexico Copper Corporation

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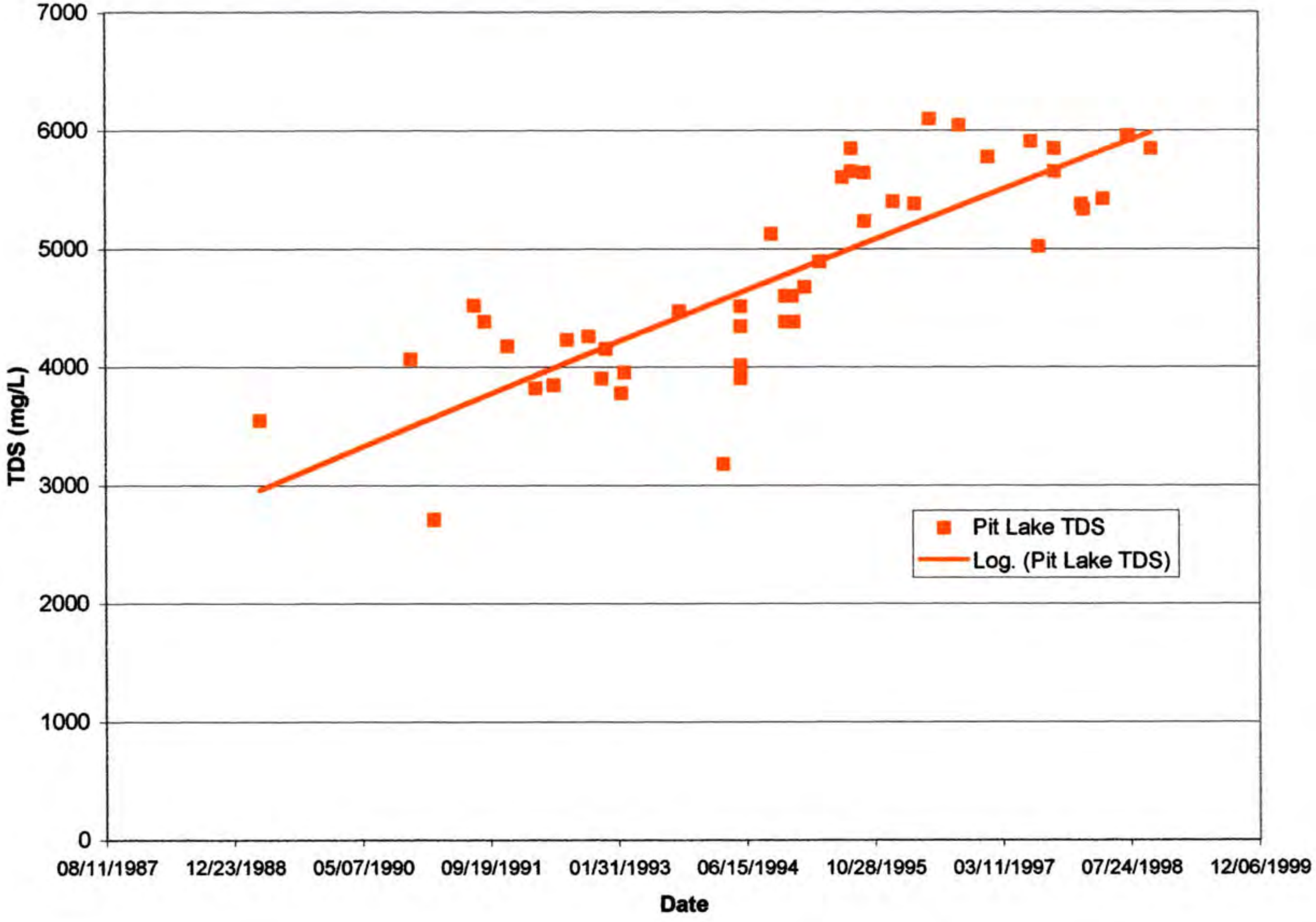
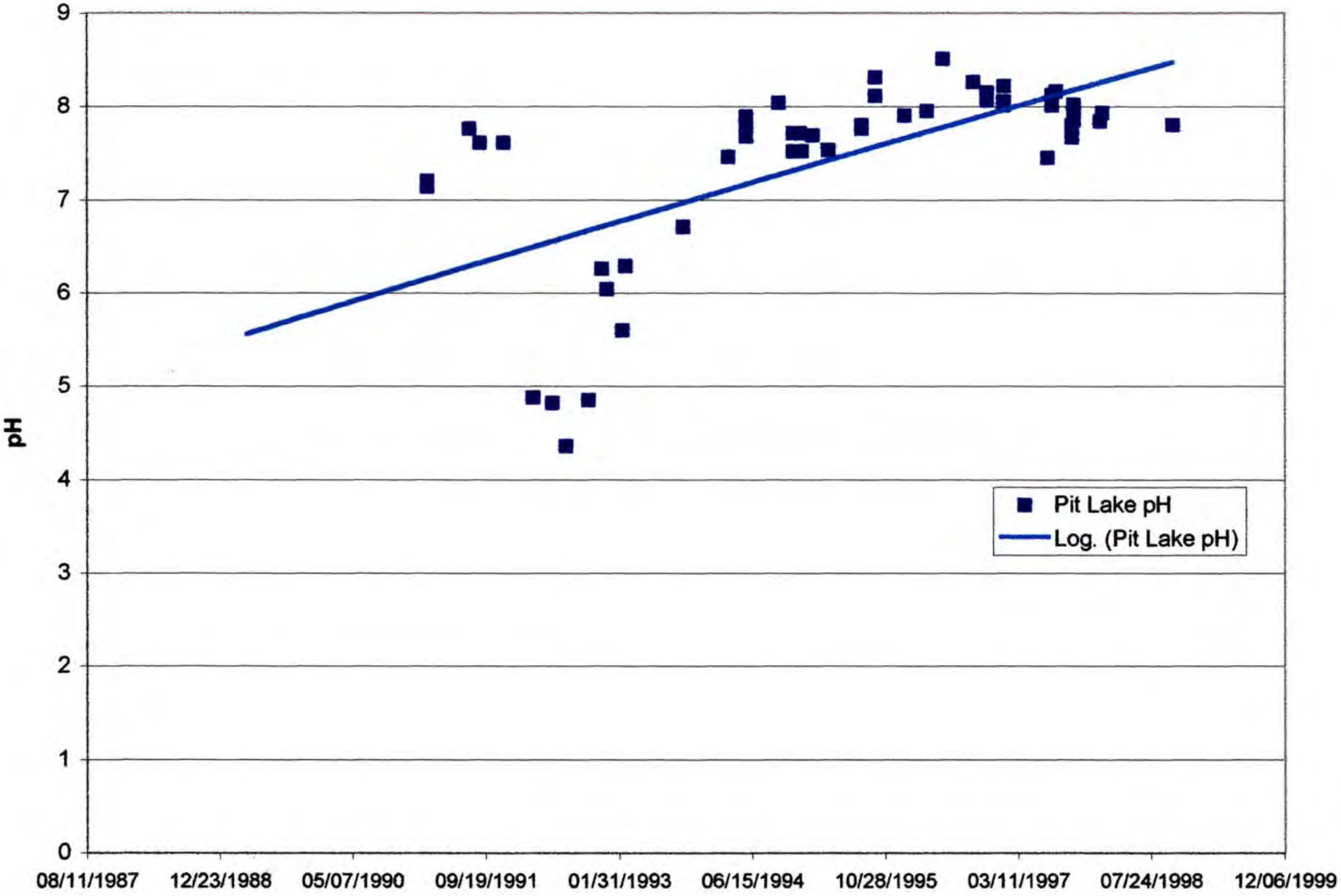


from Raugust, 2003

Figure 3-7
Total Dissolved Solid Concentrations in the Mine Pit Lake

New Mexico Copper Corporation

Path: S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\3-7_TDSTrends.mxd



from Raugust, 2003

Figure 3-8
pH in the Mine Pit Lake
New Mexico Copper Corporation

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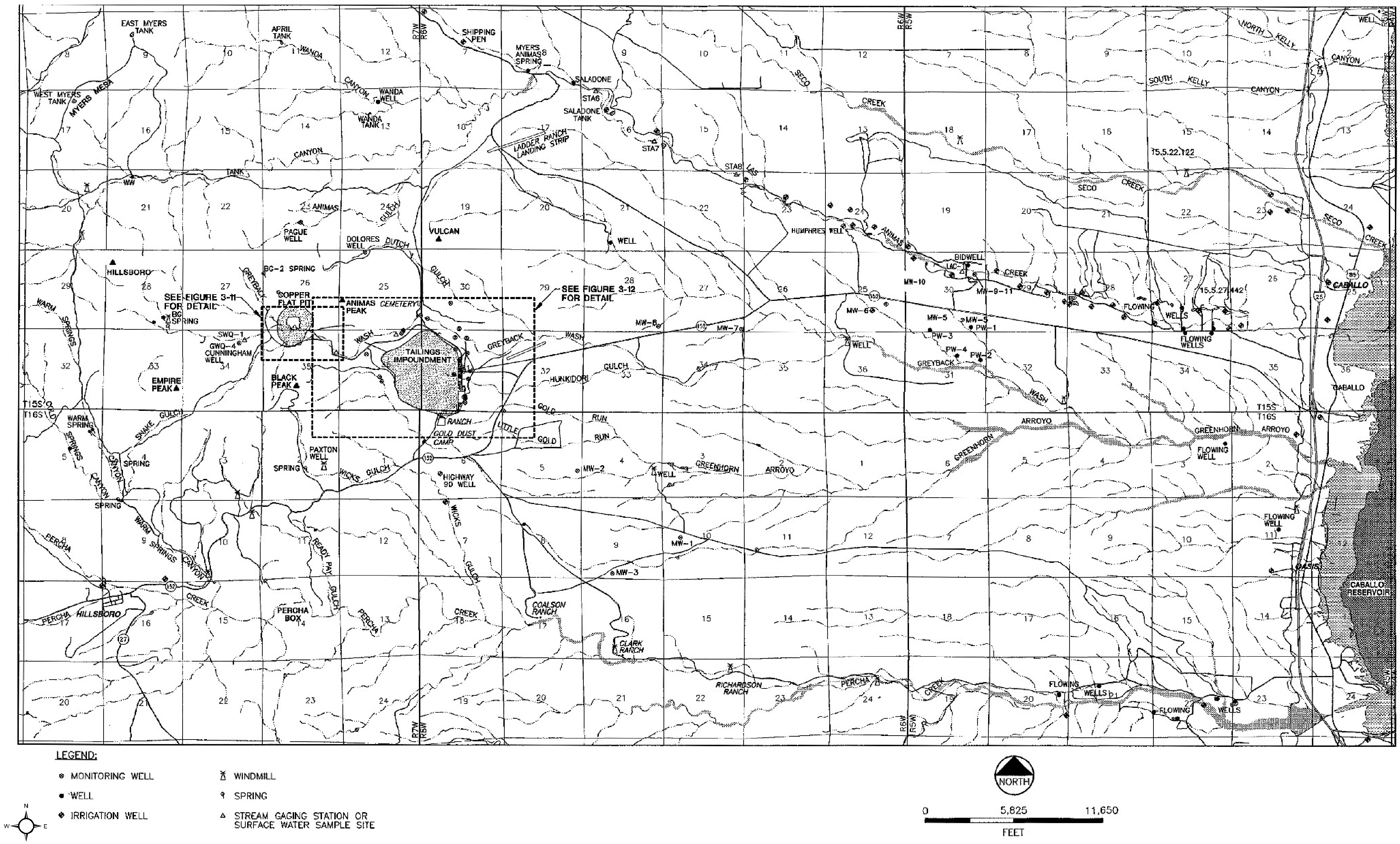

from SRK, Preliminary Final Environmental Impact Statement March 1999

Figure 3-9
Spring and Regional Well Locations
New Mexico Copper Corporation

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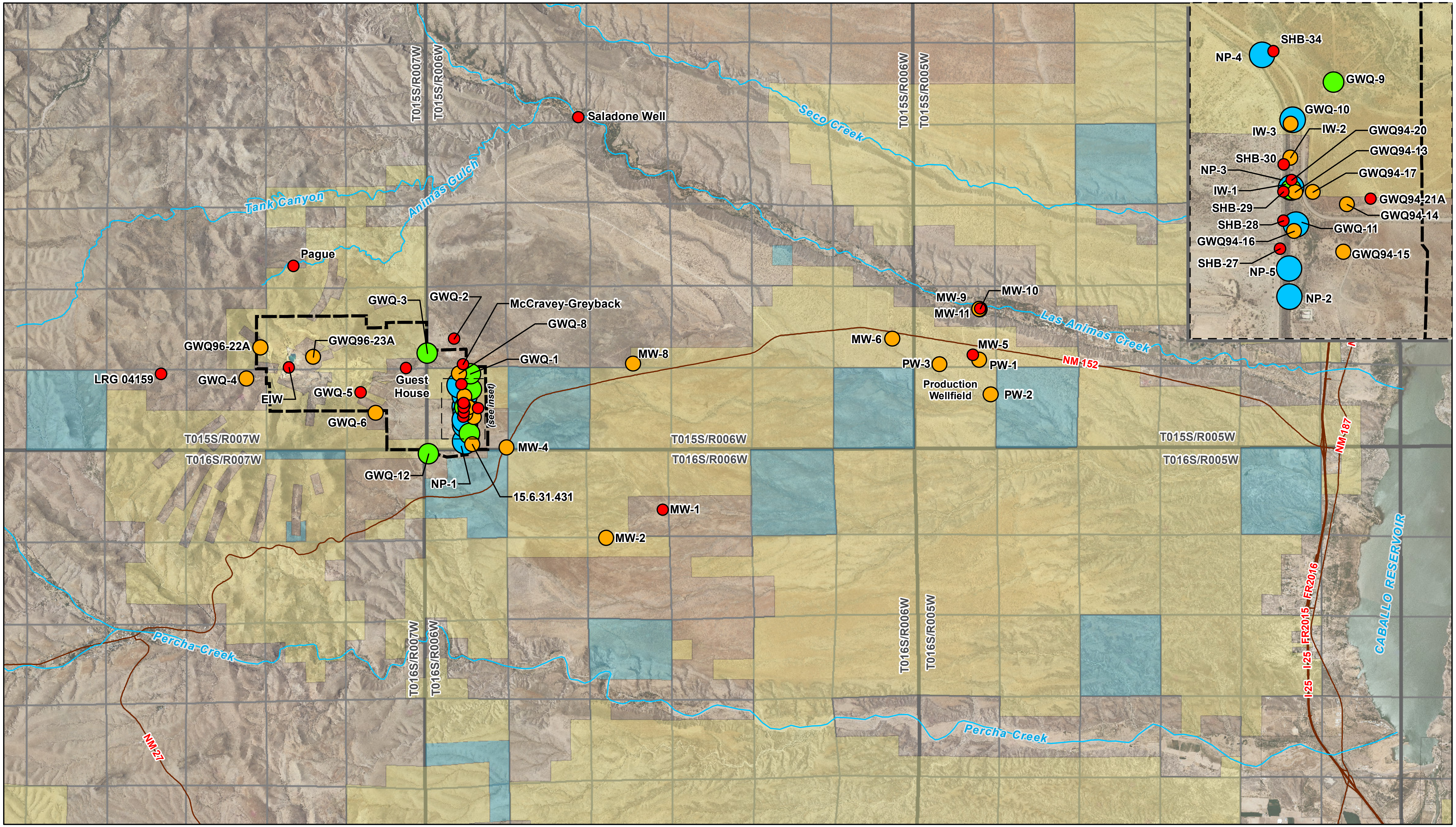


Well Locations:
INTERA, SRK, or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

Legend

Number of Samples Collected from 1975 - 2011

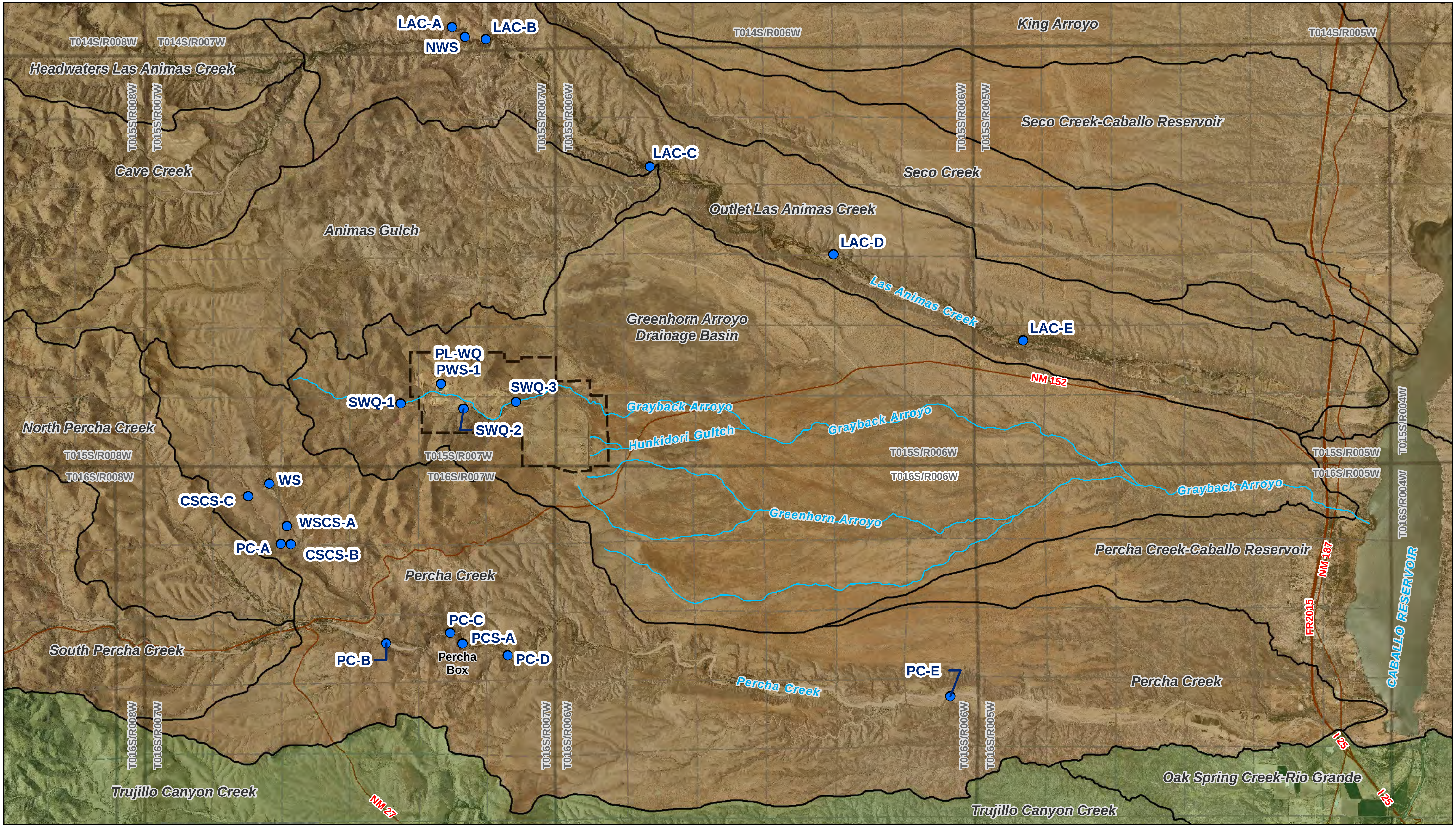
- ● 1 - 2
- ● 3 - 7
- ● 8 - 38
- ● 39 - 99

Proposed Mine Permit Boundary

- BLM
- Private
- State
- Reclamation

Figure 4-1
Historical Groundwater Quality Sampling

New Mexico Copper Corporation



Watersheds:
USGS Hydrologic Unit Map
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

0 3,500 7,000 14,000 21,000
Feet

Legend

● Surface Water Monitoring Location

⌜⌟ Proposed Mine Permit Boundary

Watersheds

🟫 Caballo

🟩 El Paso-Las Cruces

◯ Sub-Watershed

Figure 4-2
Surface Water Monitoring Locations

New Mexico Copper Corporation

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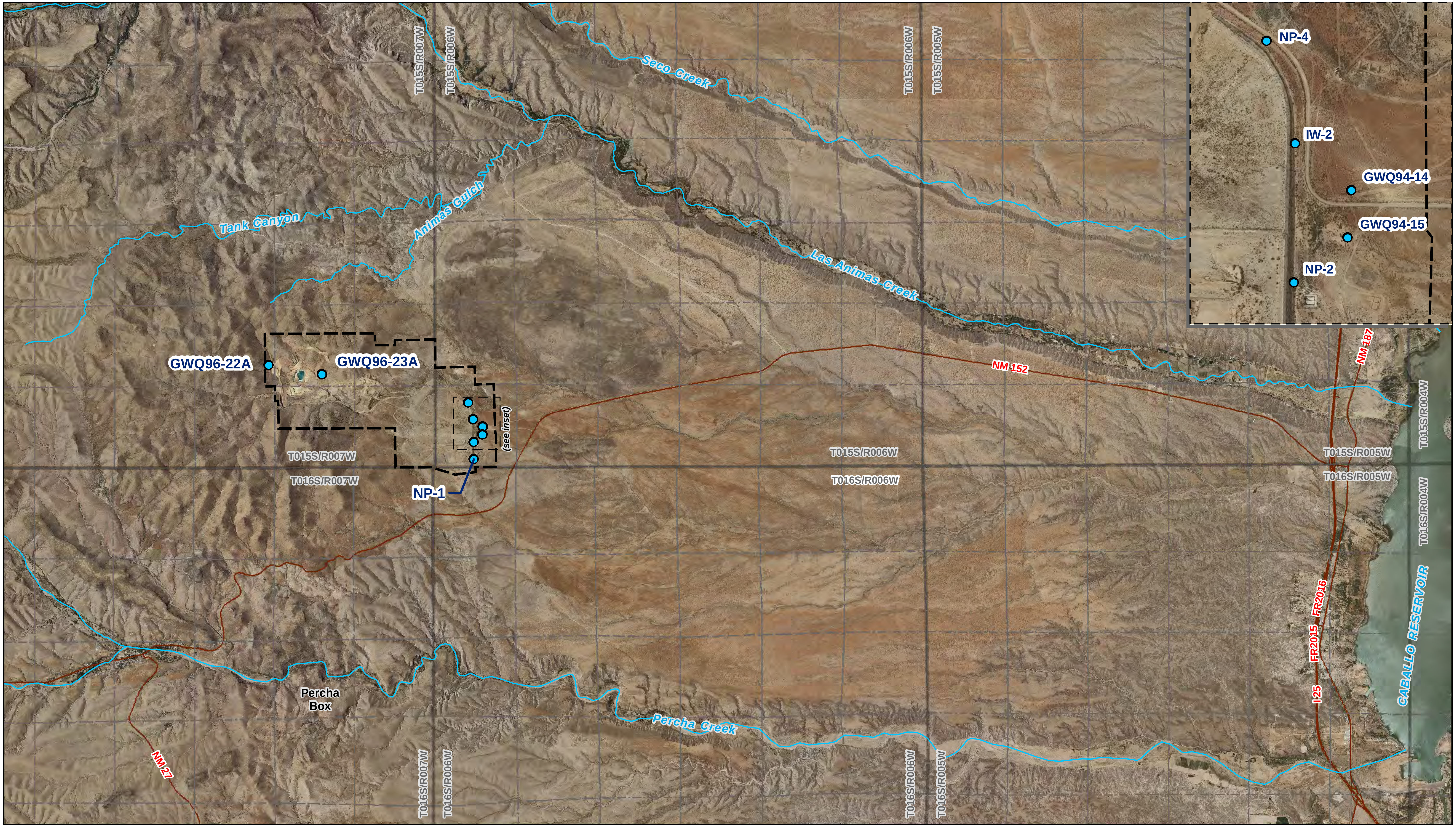

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Well Locations:
INTERA, SRK, or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

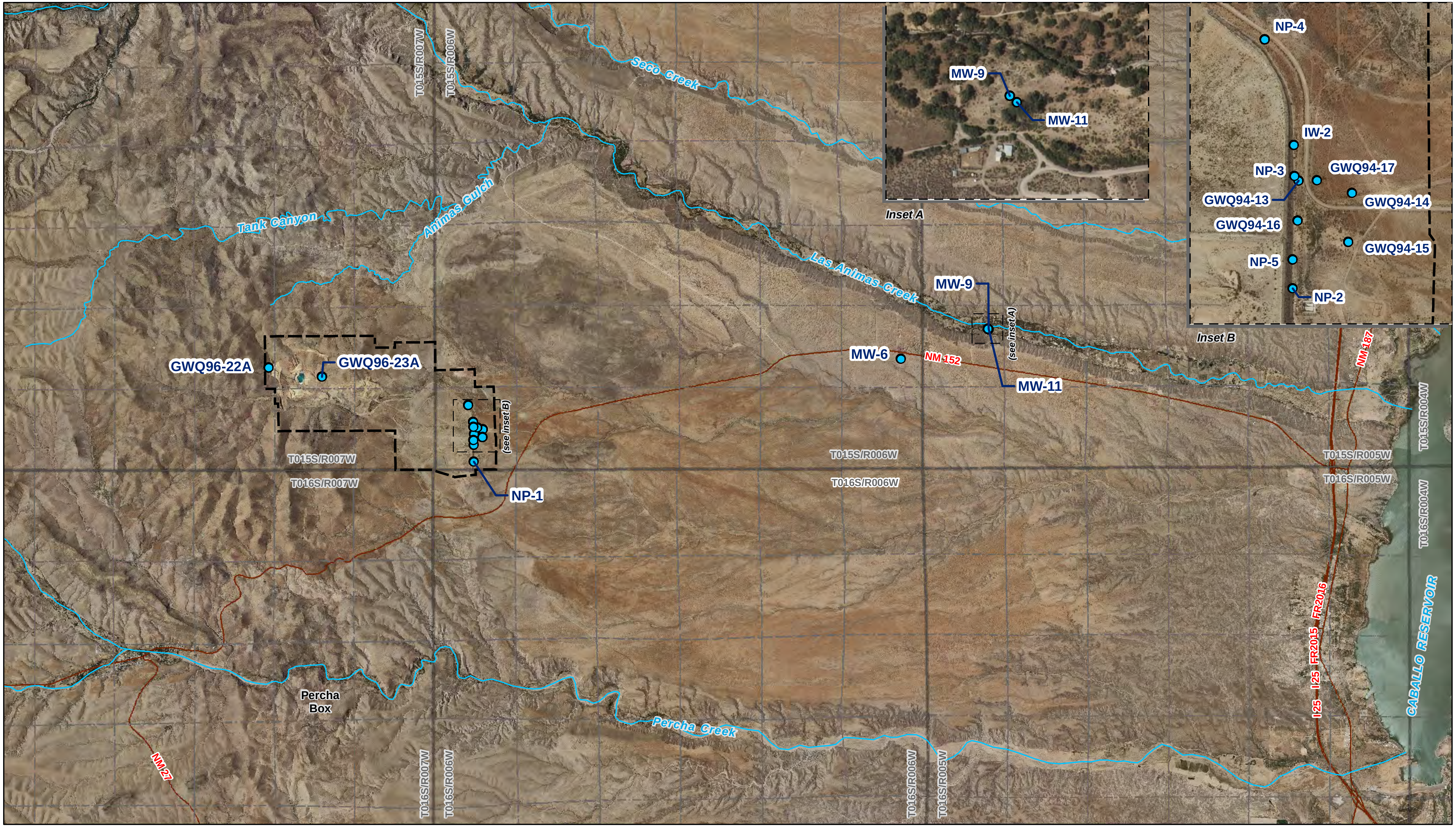
0 3,000 6,000 12,000 18,000
Feet

Legend

● Q1 Groundwater Monitoring Location	⌐¬ Proposed Mine Permit Boundary

Figure 4-3
2010 Q1 Groundwater Monitoring Locations
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\4-3_GWQ1monLocs.mxd



Well Locations:
INTERA, SRK, or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

0 3,000 6,000 12,000 18,000
Feet

Legend

● Q2 Groundwater Monitoring Location

⌐ ┘ Proposed Mine Permit Boundary

Figure 4-4
2010 Q2 Groundwater Monitoring Locations
New Mexico Copper Corporation

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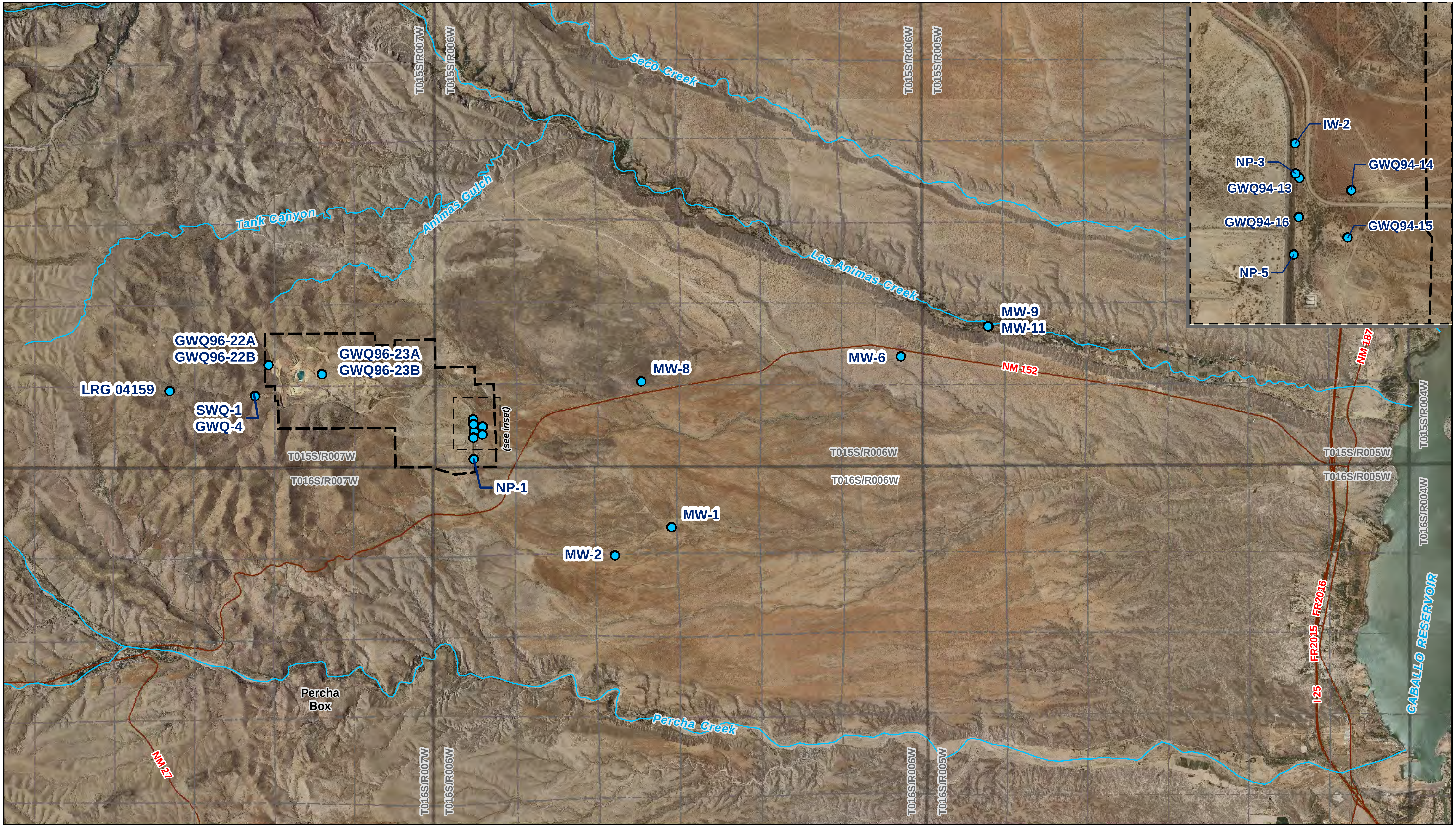


Well Locations:
INTERA, SRK, or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

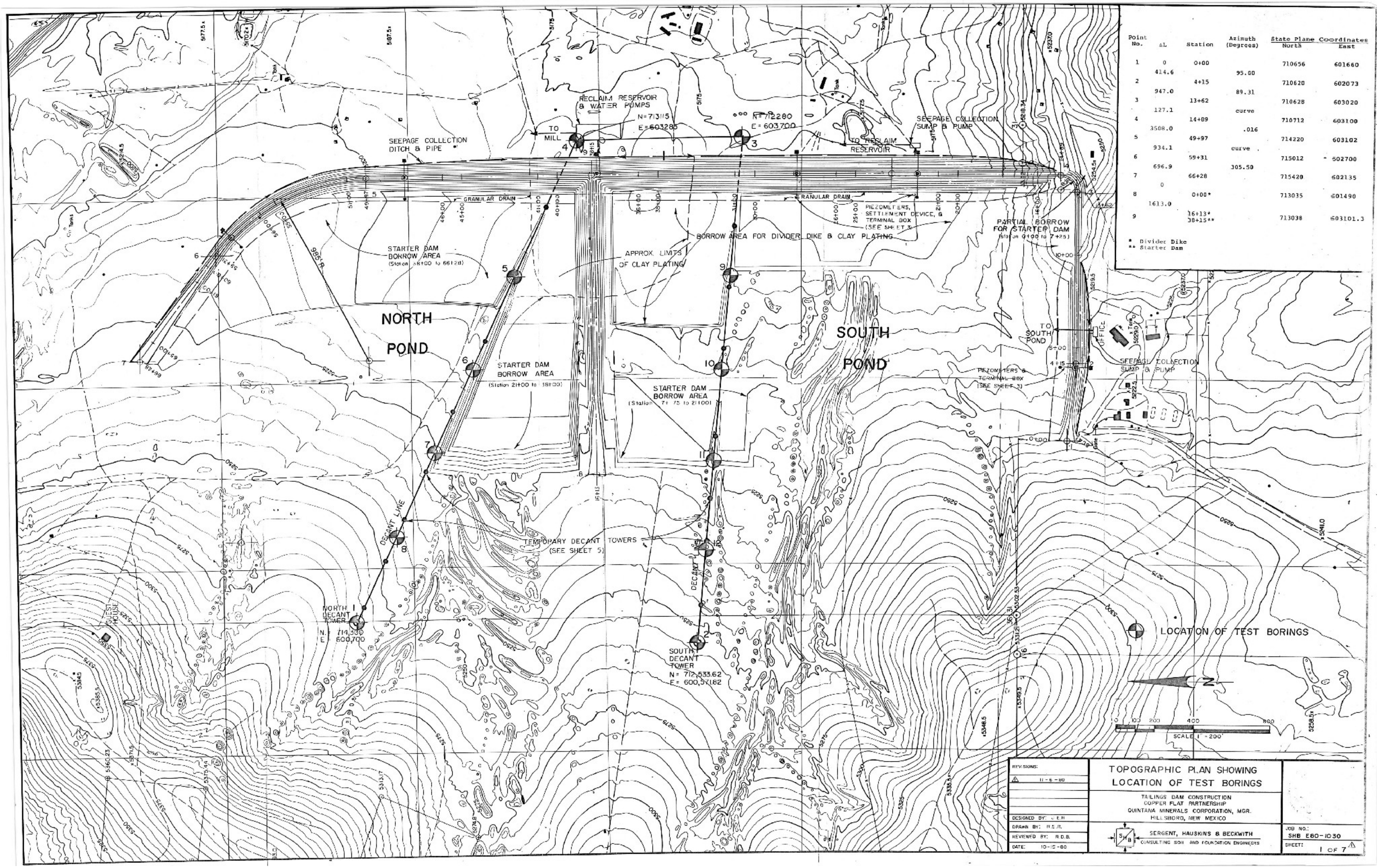
Legend

● Q3 Groundwater Monitoring Location

⌐¬ Proposed Mine Permit Boundary

Figure 4-5
2010 Q3 Groundwater Monitoring Locations

New Mexico Copper Corporation



Point No.	ΔL	Station	Azimuth (Degrees)	State Plane Coordinates North	State Plane Coordinates East
1	0	0+00		710656	601660
	414.6		95.00		
2		4+15		710620	602073
	947.0		89.31		
3		13+62		710628	603020
	127.1		curve		
4		14+89		710712	603100
	3508.0		.016		
5		49+97		714220	603102
	934.1		curve		
6		59+31		715012	602700
	696.9		305.50		
7		66+28		715420	602135
	0				
8		0+00*		713035	601490
	1613.0				
9		16+13* 38+15**		713038	603101.3

* Divider Dike
** Starter Dam

REVISIONS:	
⚠ 11-6-80	
DESIGNED BY: J.E.H.	
DRAWN BY: R.S.R.	
REVIEWED BY: R.D.B.	
DATE: 10-15-80	

TOPOGRAPHIC PLAN SHOWING
LOCATION OF TEST BORINGS

TAILINGS DAM CONSTRUCTION
COPPER FLAT PARTNERSHIP
QUINTANA MINERALS CORPORATION, MGR.
HILLSBORO, NEW MEXICO

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS

JOB NO.: SHB E80-1030
SHEET: 1 OF 7 ⚠

from New Mexico Bureau of Geology and Mineral Resources Open-file report 475;
The Natural Defenses of Copper Flat Sierra County, New Mexico, August 2003

Figure 5-1
Tailings Impoundment Layout
New Mexico Copper Corporation

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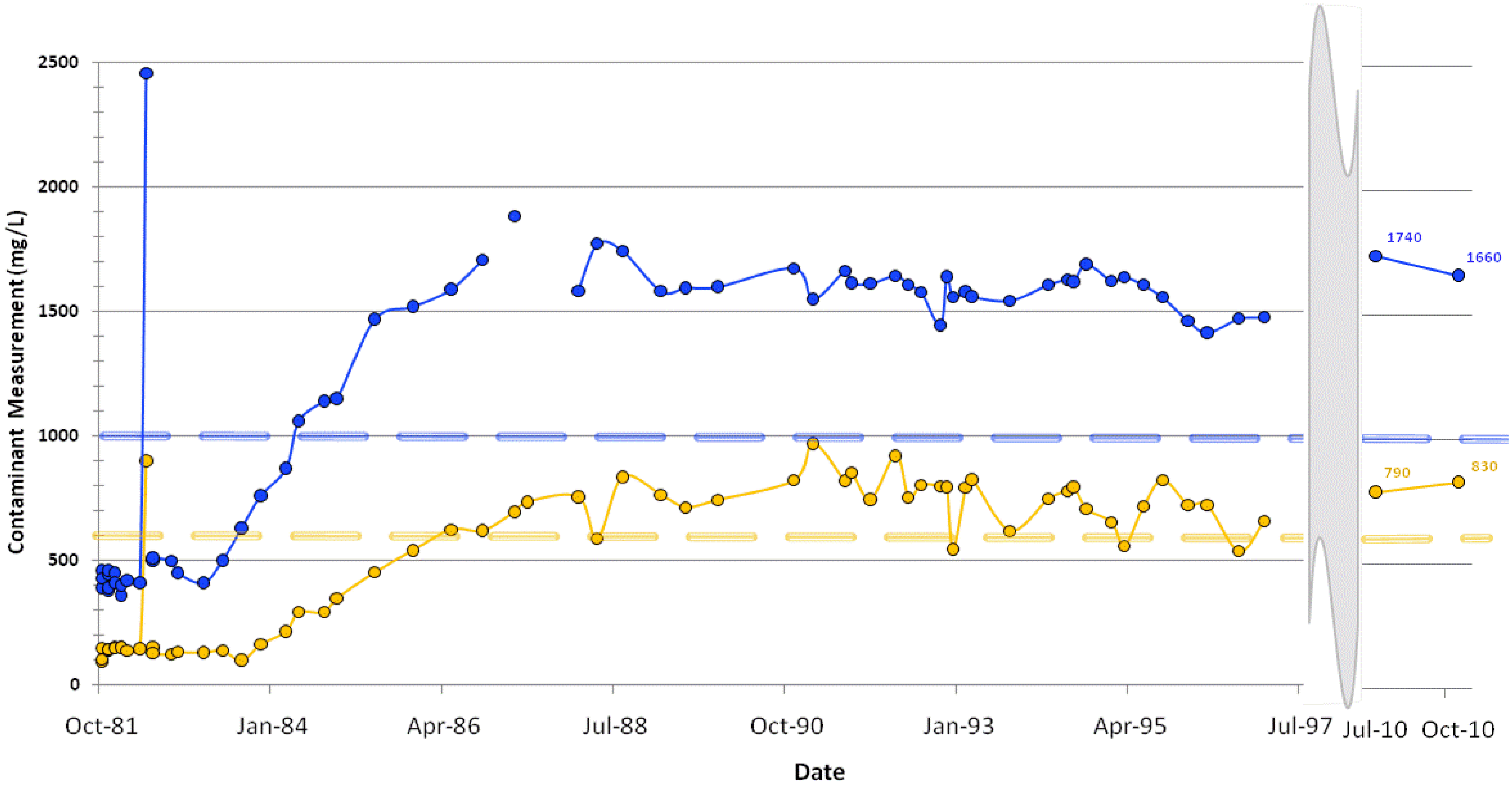


Notes:

NMWQCC = New Mexico Water Quality Control Commission

Non-detect measurements are plotted at half the analyte detection limit.

NMWQCC Standards (mg/L)

Sulfate = 600.0

Total Dissolved Solids = 1000.0

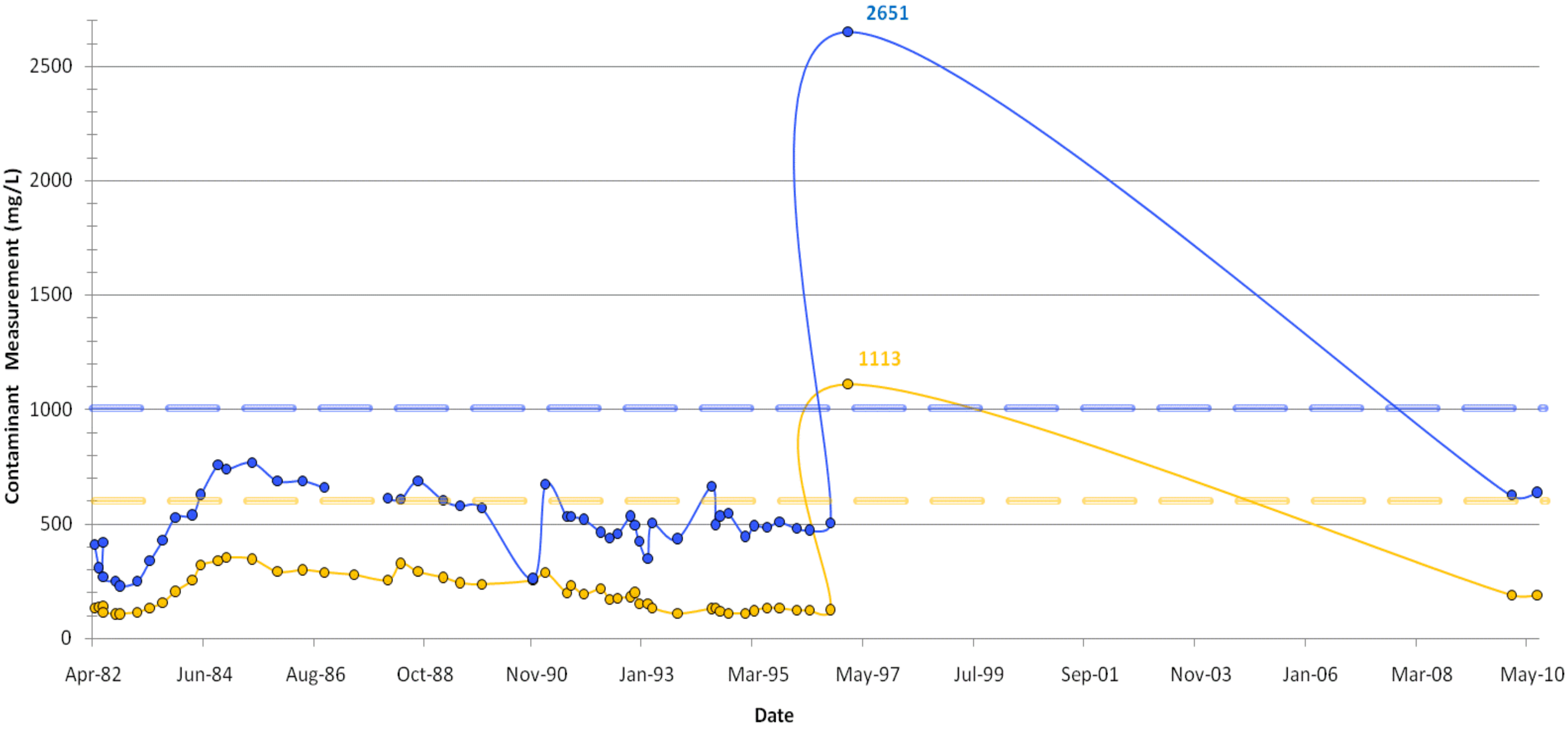
Legend

○	Detect
☒	Non-detect
▬ ▬ ▬	Analyte standard (shown if exceedences are present)

-●- Sulfate

-●- Total Dissolved Solids

Figure 5-2
NP-3 Sulfate and
Total Dissolved Solids
New Mexico Copper Corporation



Notes:
NMWQCC = New Mexico Water Quality Control Commission
Non-detect measurements are plotted at half the analyte detection limit.

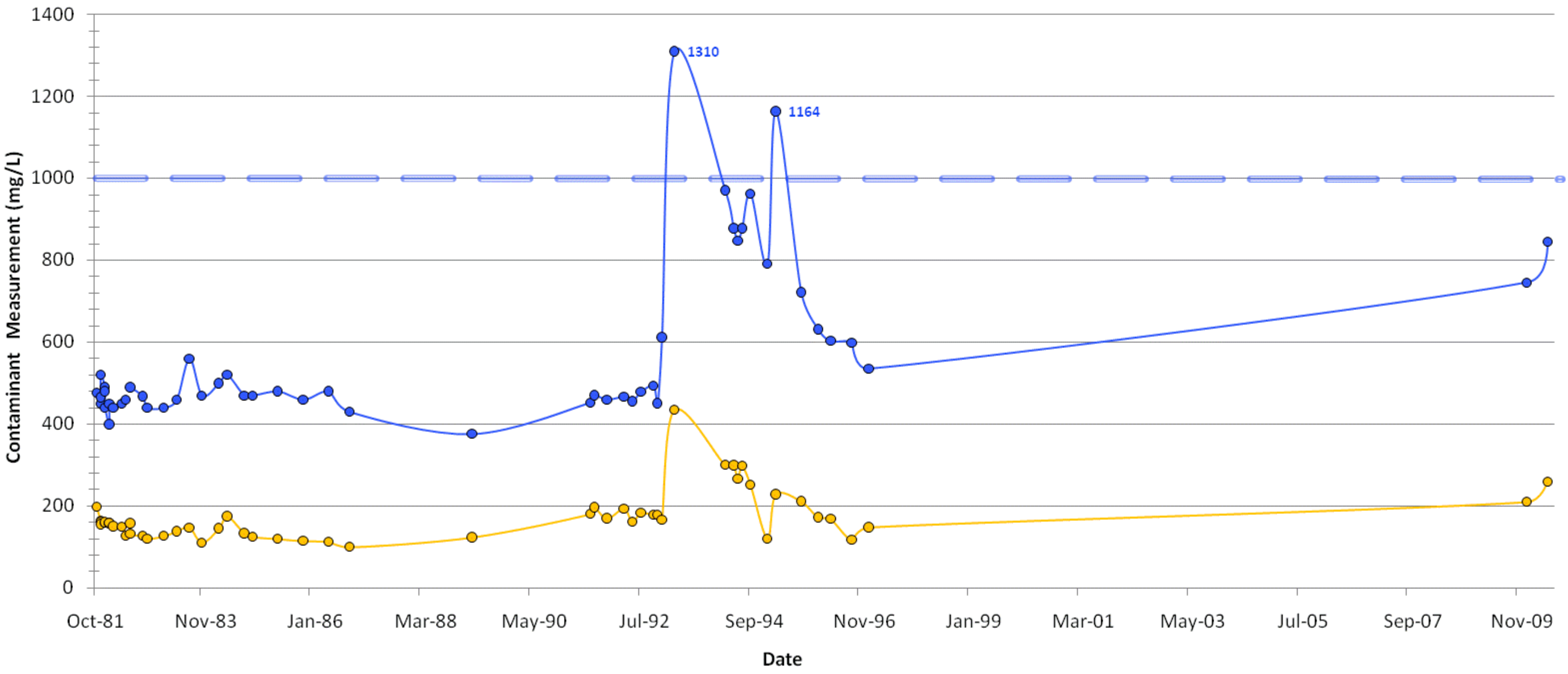
NMWQCC Standards (mg/L)
Sulfate = 600.0
Total Dissolved Solids = 1000.0

Legend

-●- Sulfate
-●- Total Dissolved Solids

○ Detect
☒ Non-detect
▬ ▬ ▬ Analyte standard (shown if exceedences are present)

Figure 5-3
NP-4 Sulfate and
Total Dissolved Solids
New Mexico Copper Corporation



Notes:

NMWQCC = New Mexico Water Quality Control Commission
Non-detect measurements are plotted at half the analyte detection limit.

NMWQCC Standards (mg/L)

Sulfate = 600.0
Total Dissolved Solids = 1000.0

Legend

-●- Sulfate
-●- Total Dissolved Solids

○ Detect
☒ Non-detect
▬ ▬ ▬ Analyte standard (shown if exceedences are present)

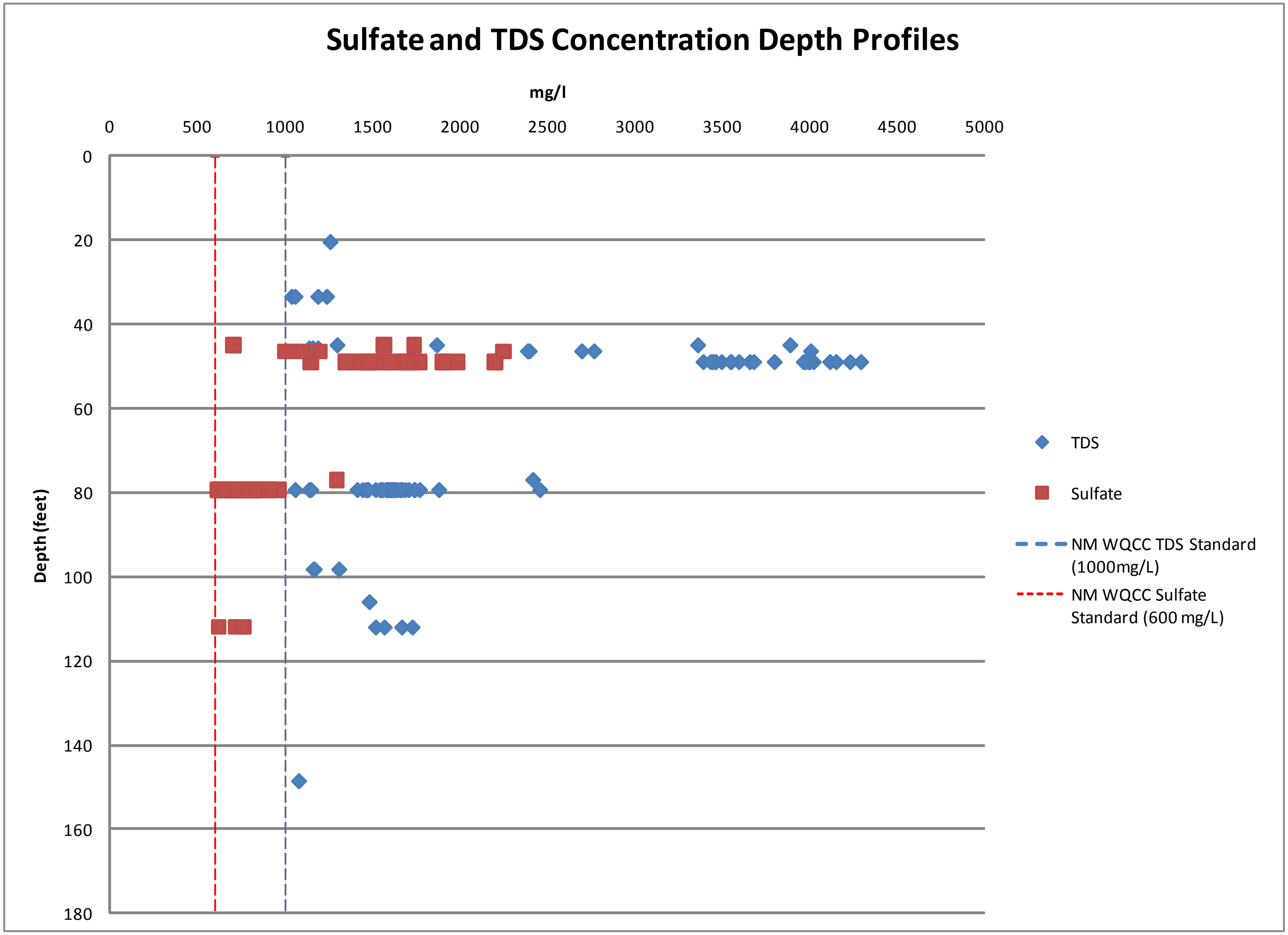
Figure 5-4
NP-2 Sulfate and Total Dissolved Solids

New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\5-2_3_4_8_9_10_11_timeSeries.pptx

Wells

GWQ-10
GWQ-11
GWQ-3
GWQ-5
GWQ-6
GWQ-7
GWQ94-13
GWQ94-15
GWQ94-16
GWQ94-20
GWQ94-21B
GWQ96-22A
GWQ96-22B
GWQ96-23A
GWQ96-23B
IW-1
IW-2
IW-3
NP-1
NP-2
NP-3

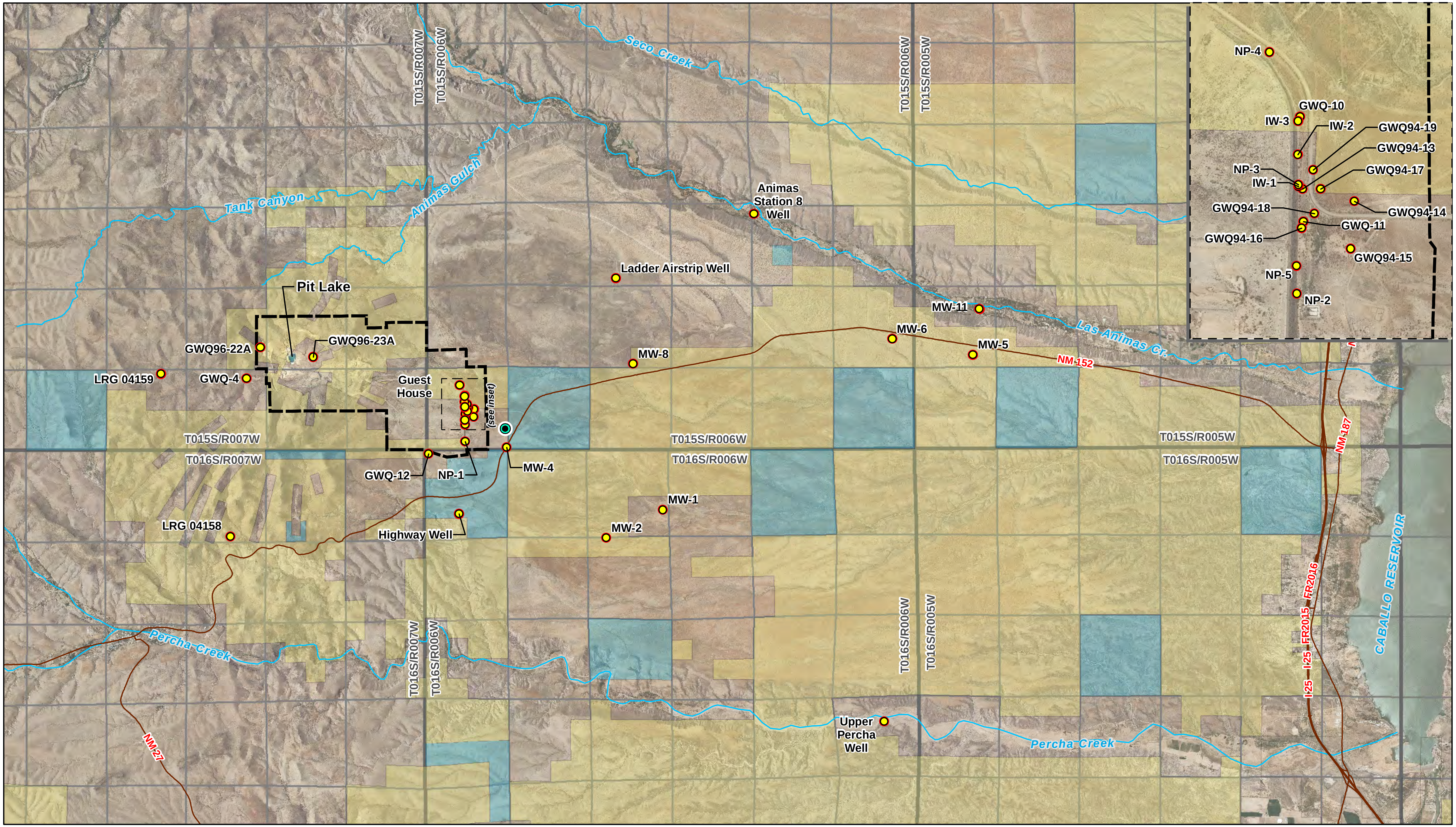


INTERA

Figure 5-5
Sulfate and TDS
Concentration Depth Profiles

New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\5-5_TDSsulfateVSdepth.mxd

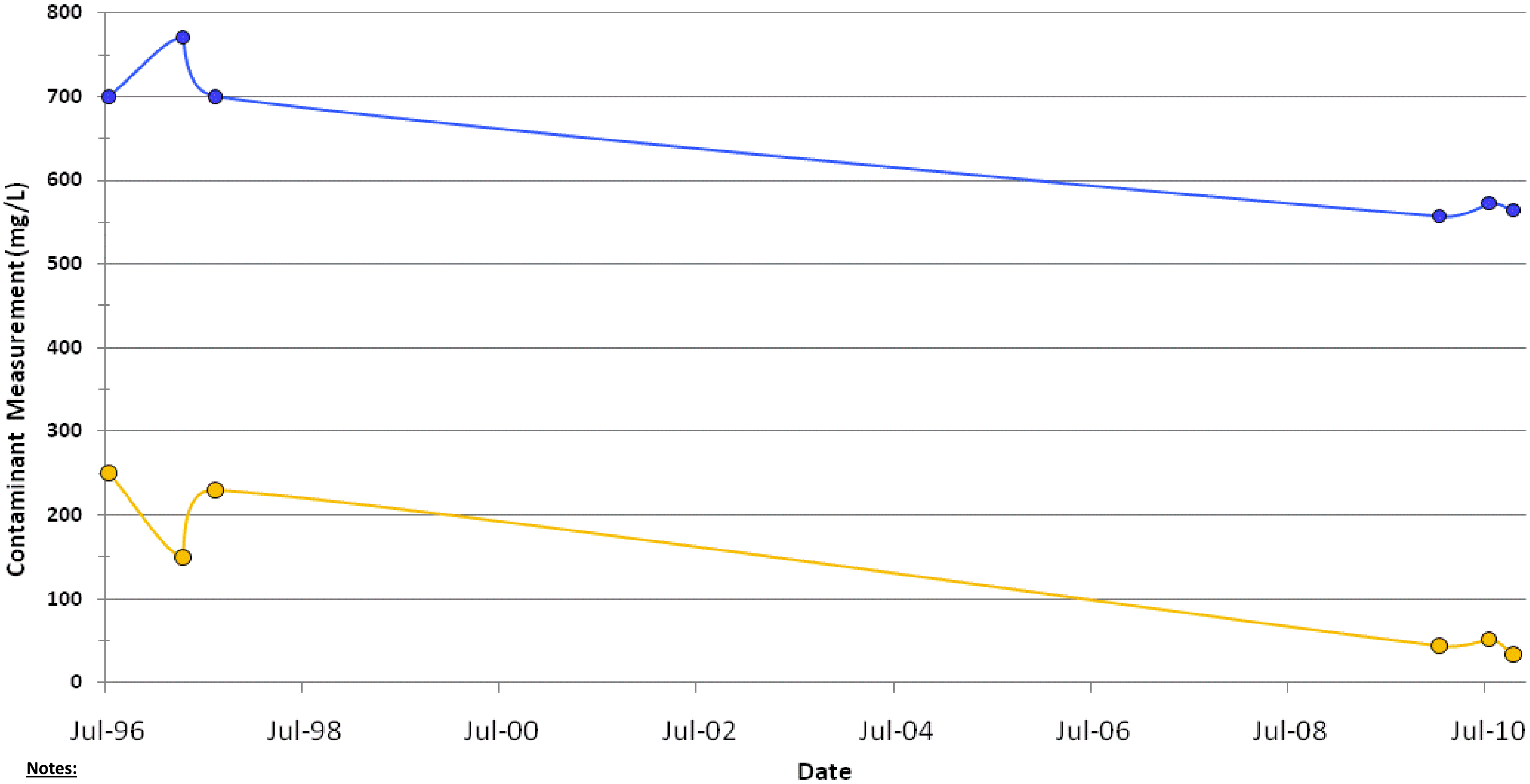


Well Locations:
INTERA, SRK, or OSE
Mine Boundary:
Tom Van Bebber
Imagery Information:
-USGS 7.5-Minutes County DOQQ mosaic
Sierra County, 2009
Projection Information:
-New Mexico State Plane West, NAD 1927

INTERA

Figure 5-6
Actual and Proposed Monitoring Wells
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\5-6_monitoringWells.mxd



Notes:

NMWQCC = New Mexico Water Quality Control Commission

Non-detect measurements are plotted at half the analyte detection limit.

NMWQCC Standards (mg/L)

Sulfate = 600.0

Total Dissolved Solids = 1000.0

Legend

- Sulfate
- Total Dissolved Solids

○ Detect

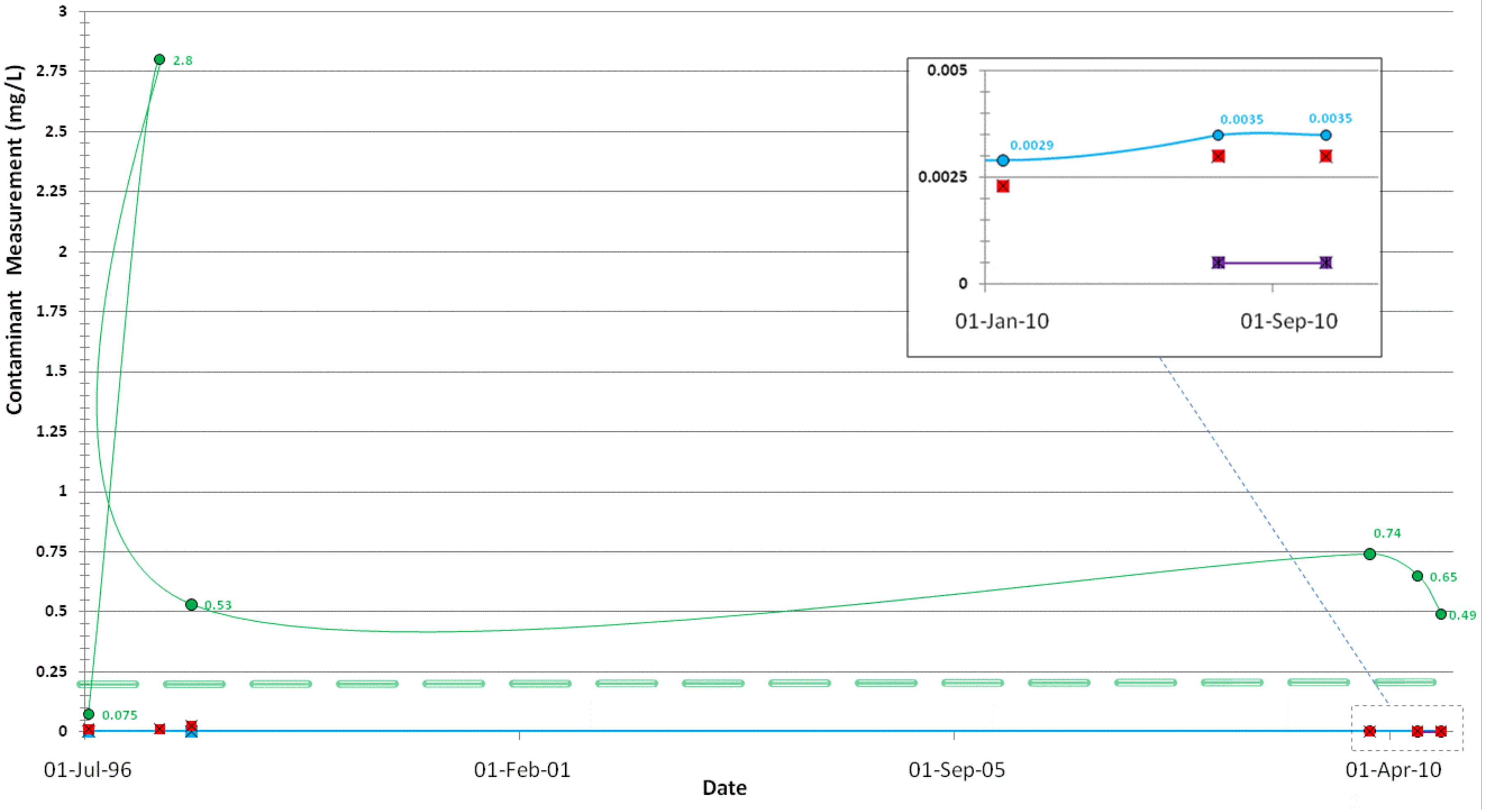
☒ Non-detect

▬ ▬ ▬ Analyte standard (shown if exceedences are present)

Figure 5-7
GWQ96-22A Sulfate and Total Dissolved Solids

New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\5-2_3_4_8_9_10_11_timeSeries.pptx



Notes:

NMWQCC = New Mexico Water Quality Control Commission

Non-detect measurements are plotted at half the analyte detection limit.

NMWQCC Standards (mg/L)

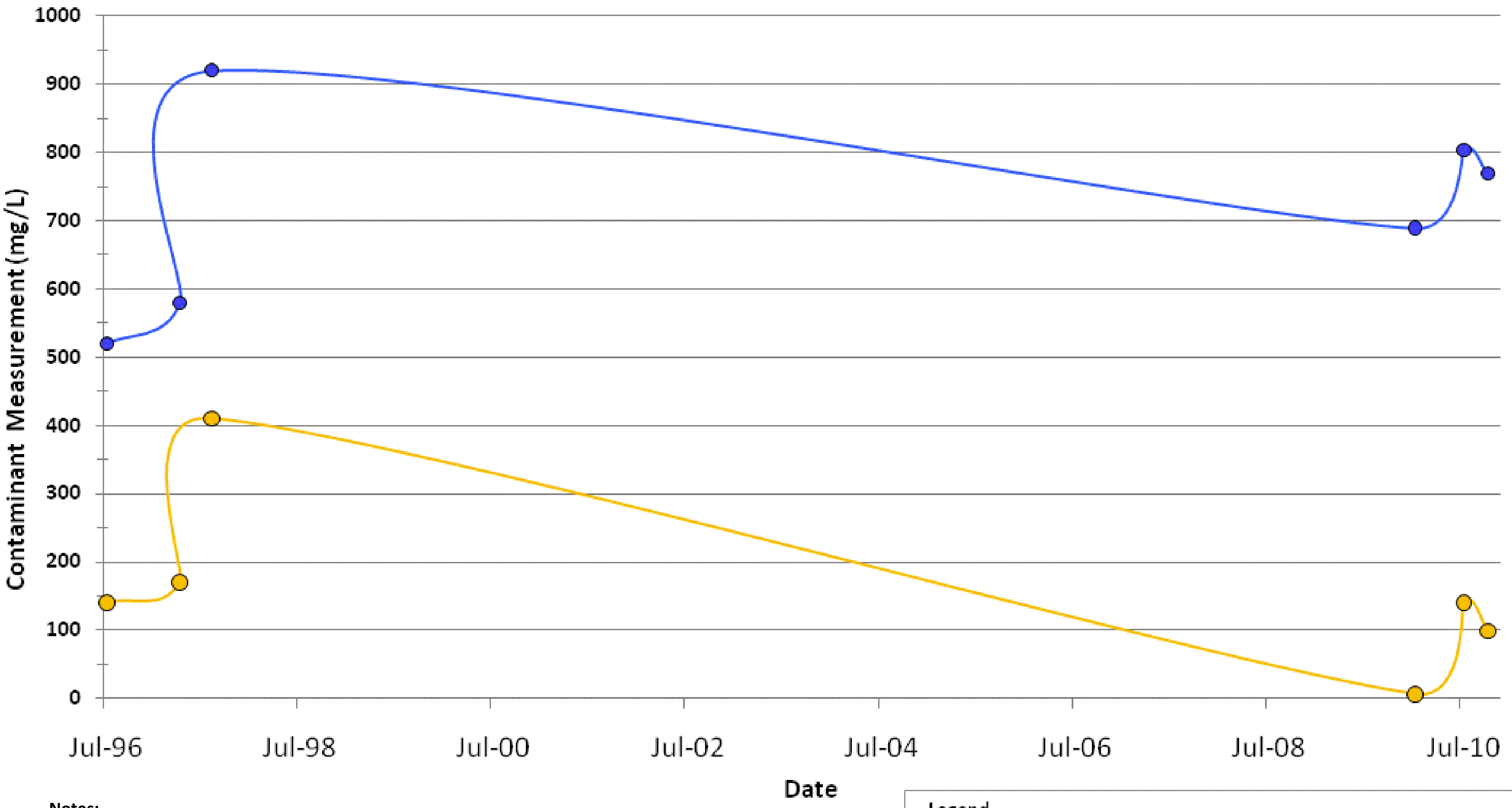
Arsenic = 0.1
Copper = 1.0
Manganese=0.2
Uranium=0.03

Legend

Arsenic	○	Detect
Copper	☒	Non-detect
Manganese	▬ ▬ ▬	Analyte standard (shown if exceedences are present)
Uranium		

Figure 5-8
GWQ96-22A Metals
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\5-2_3_4_8_9_10_11_timeSeries.pptx



Notes:

NMWQCC = New Mexico Water Quality Control Commission

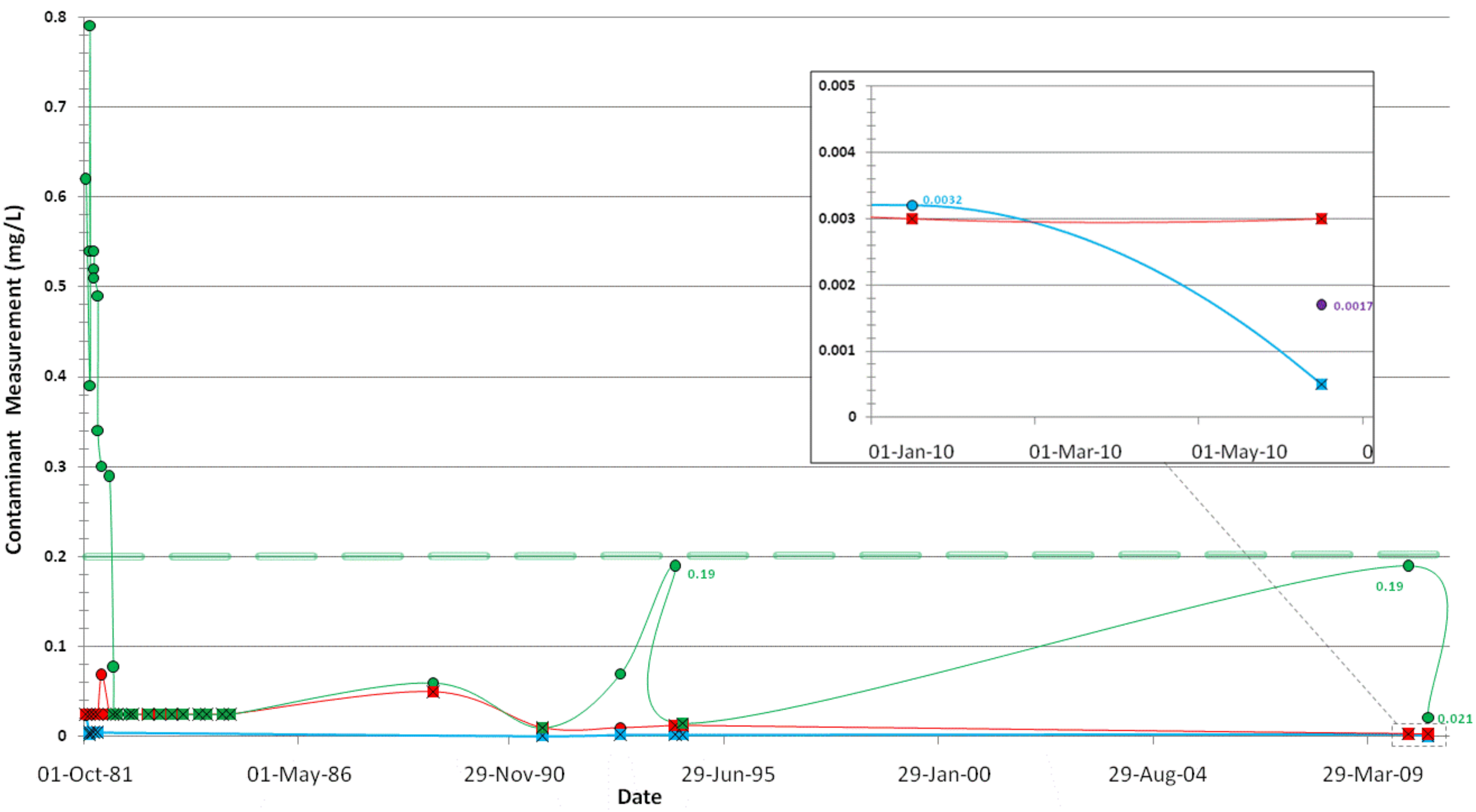
Non-detect measurements are plotted at half the analyte detection limit.

NMWQCC Standards (mg/L)

Sulfate = 600.0

Total Dissolved Solids = 1000.0

Figure 5-9
GWQ96-23A Sulfate and
Total Dissolved Solids
New Mexico Copper Corporation



Notes:

NMWQCC = New Mexico Water Quality Control Commission

Non-detect measurements are plotted at half the analyte detection limit.

NMWQCC Standards (mg/L)

Arsenic = 0.1
Copper = 1.0
Manganese=0.2
Uranium=0.03

Legend

- Arsenic
- Copper
- Manganese
- Uranium

○ Detect

☒ Non-detect

▬ ▬ ▬ Analyte standard (shown if exceedences are present)

Figure 5-10
GWQ96-23A Metals
New Mexico Copper Corporation

S:\Projects\NMC-001_New Mexico Copper Corporation\GIS\Maps\Reports\AbatementPlan\5-2_3_4_8_9_10_11_timeSeries.pptx

TABLES

Table 2-1
Stratigraphy of the Copper Flat Area

Era	Geologic Unit		Thickness (ft)
Cenozoic	Pleistocene and Holocene valley alluvium		10–70
0–65 million years ago (Ma)	Pleistocene river, arroyo, and fan deposits		50–100
	Pliocene basalt flows, dikes, and plugs		50–200
	Upper Santa Fe Group fanglomerates (Palomas Formation)		300–100
	Santa Fe Group, Rincon Formation		1000–2000
	Tertiary volcanics		1000
Mesozoic	Quartz latite dikes	**Copper Flat volcanic and intrusive (mineralization associated with emplacement)**	>3000
65–225 Ma	Intermediate composition intrusive		
	Late Cretaceous andesite dikes		
	Late Cretaceous silicic intrusives		
	Sandstone		
	Mancos Shale (not exposed)		300–400
	Dakota Sandstone (not exposed)		100–200
Paleozoic	Manazano Group sedimentary rocks. Abo Sandstone, Yeso Formation shales, sandstones, and gypsum deposits, and San Andres Limestone. Not exposed west of Rio Grande at Site.		1000–2000
225–570 Ma	Pennsylvanian carbonate rocks including Syrena, Oswaldo, and Magdalena Groups, minor conglomeratic sandstone and cherty massive limestone.		400–1000
	Devonian and Mississippian carbonate rocks (Kelly Limestone, Lake Valley Limestone, Caballero Formation) and Percha Shale.		200–500
	Ordovician Montoya Group and Fusselman Dolomite.		250–600
	Cambrian-Ordovician Bliss Sandstone and El Paso Group Limestone.		500–700
Precambrian 570–1,500 Ma	Precambrian massive granite		

Source: BLM, 1999, Tables 3-1 and 3-2

Table 3-1
Historical Flow and Water Quality Parameters

Location	Date	Description	Flow (cfs)	pH	Conductivity (µS/cm)	Temperature (°C)
Las Animas Creek	1967	Upper Reach	1.0 – 2.0	NM	NM	NM
Las Animas Creek	1967	Middle Reach	1.0 – 1.5	NM	NM	NM
Las Animas Creek	1996	LAC-E	0.546	8.2	400	17
Percha Box	1996	1200’ u/s of Box entry	Dry	NA	NA	NA
Percha Box	1996	700’ u/s of Box entry	0	8.1	600	32
Percha Box	1996	400’ u/s of Box entry	Dry	NA	NA	NA
Percha Box	1996	Box entry	0.265	7.7	500	23
Percha Box	1996	1500’ d/s of Box entry	0.446	8.2	500	23
Percha Box	1996	Box exit	1.02	8.4	400	25
Percha Box	1996	2400’ d/s of Box exit	0	9.3	400	32
Percha Box	1996	2500’ d/s of Box exit	Dry	NA	NA	NA
Percha Box	1996	5000’ d/s of Box exit	0.394	9.0	400	28
Percha Box	1996	5400’ d/s of Box exit	0	9.0	400	32
Percha Box	1996	5500’ d/s of Box exit	Dry	NA	NA	NA
Percha Box	1996	3 miles d/s of Box exit	Dry	NA	NA	NA
Percha Box	1996	5 miles d/s of Box exit	Dry	NA	NA	NA
Grayback Arroyo	4/1/93	SWQ-1	1 – 2	8.3	1150	NM
Grayback Arroyo	5/7/93	SWQ-1	Dry	NA	NA	NA
Grayback Arroyo	3/31/93	SWQ-2	< 1	7.7	3150	NM
Grayback Arroyo	3/31/93	SWQ-3	12.5	8.1	3330	NM
Spring/Seep	4/1/93	BG	1 – 2	8.2	1090	NM
Spring/Seep	5/7/93	BG	Dry	NA	NA	NA
Spring/Seep	4/1/93	BG-2	< 1	8.2	1030	NM
Spring/Seep	5/7/93	BG-2	< 1	NM	NM	NM
Spring/Seep	1997	PW-2	NM	8.16	NM	NM
Spring/Seep	1967	WS	0.8	NM	NM	81.5
Spring/Seep	4/2/93	WS	0.00735	8.5	1980	NM

Notes:

Box = Percha Box
u/s = upstream
d/s = downstream
NA = no water present for sampling
NM = parameter not measured or not available

Table 4-1
NMWQCC Surface Water Standard Exceedances

Sample ID	Collection Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Selenium	Thallium	Uranium	Vanadium	Zinc
NMWQCC SW Standard (mg/L)		**5.0**	**0.006**	**0.01**	**2.0**	**0.004**	**0.75**	**0.005**	**0.1**	**0.05**	**0.2**	**0.0052**	**0.015**	**0.00077**	**1.0**	**0.7**	**10**	**0.05**	**0.002**	**0.**	**0.10**	**2.0**
Category¹		**IRR**	**DWS**	**DWS**	**DWS**	**DWS**	**IRR**	**DWS**	**DWS**	**IRR**	**IRR**	**WH**	**DWS**	**WH**	**IRR**	**DWS**	**DWS**	**DWS**	**DWS**	**DWS**	**LW**	**IRR**
PWS-1	19-Aug-10	540.0				0.140		0.140		1.50	80.0							0.086		1.40		12.0
SWQ-2	27-Oct-81													0.0040								
	23-Dec-83																11					
	19-Jul-91																13					

Notes: ¹Category selection based on most stringent standard for analyte
DWS = Domestic Water Supply
IRR = Irrigation
LW = Livestock Watering
mg/L = milligrams per liter
NMWQCC = New Mexico Water Quality Control Commission
SW = Surface Water
WH = Wildlife Habitat
Metals analyzed using EPA Method 200.7/200.8/245.1/9012B and reported in mg/

Table 4-2
NMWQCC Pit Lake Standard Exceedances

Location	Collection Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Nitrate as N	Nitrite + Nitrate	Selenium	Thallium	Uranium	Vanadium	Zinc
NMWQCC SW Standard (mg/L)		**5**	**0.006**	**0.01**	**2**	**0.004**	**0.75**	**0.005**	**0.1**	**0.05**	**0.2**	**0.0052**	**0.015**	**0.00077**	**1**	**0.7**	**10**	**132**	**0.05**	**0.002**	**0.03**	**0.1**	**2**
Category[1]		**IRR**	**DWS**	**AqL**	**DWS**	**DWS**	**IRR**	**DWS**	**DWS**	**IRR**	**IRR**	**WH**	**DWS**	**AqL**	**IRR**	**DWS**	**DWS**	**LW**	**DWS**	**DWS**	**DWS**	**IRR/LW**	**IRR**
PL-WQ	11-Feb-91							**0.035**															
	29-Aug-91										**0.64**												
	15-Dec-92										**3.208**												
	12-Dec-94							**0.017**															
	19-Dec-94							**0.017**															
	21-Sep-95							**0.014**															
	30-Jan-10	**5.5**				**0.017**		**0.056**		**0.35**	**9.0**								**0.026**				**6.5**
PL-WQ-05	20-Jan-11					**0.016**		**0.062**		**0.39**	**0.61**								**0.025**				**5.8**
PL-WQ-06	20-Jan-11					**0.016**		**0.062**		**0.38**	**0.59**								**0.025**				**5.7**
PL-WQ-07	20-Jan-11					**0.016**		**0.061**		**0.39**	**0.64**		**0.026**						**0.031**				**6**
PL-WQ-08	20-Jan-11					**0.015**		**0.06**		**0.37**	**0.59**								**0.03**				**5.3**

Notes:

[1] Category based on the most stringent applicable standard
AqL = Aquatic Life
DWS = Domestic Water Supply
IRR = Irrigation
LW = Livestock Watering
NMWQCC = New Mexico Water Quality Control Commission
SW = Surface Water
WH = Wildlife Habitat
Metals analyzed using EPA Method 200.7/200.8/245.1/9012B and reported in mg/L

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
GWQ-1	02-Feb-81												1.7													
GWQ-3	15-Jun-81													0.07												
	25-Feb-82																							1040		
	09-Aug-83																							1060		
	01-Nov-83																							1240		
	16-Mar-84																							1190		
GWQ-5	15-Jun-81																							1260		
GWQ-6	15-Jun-81															0.002										
	01-Apr-93												5.1		0.4											
GWQ-7	02-Feb-81												3.8													
	06-Apr-81										0.4															
	10-Aug-81												1.7													
	21-Feb-83														0.3											
	30-Mar-93																		138							
	25-May-94											2.1			1.1								1300.0	2420		
	21-Jul-94											16.0	1.2		0.2											
GWQ-8	04-Jun-76																		17							
	02-Feb-81												1.7						60							
GWQ-9	02-Feb-81												1.8													
GWQ-10	10-Aug-81	10.2											2.3		1.2											
	30-Oct-81				0.77																					
	13-Nov-81														0.5											
	26-May-94												1.1													
GWQ-11	10-Aug-81												1.1		0.5											
	07-Dec-81															0.006										

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
GWQ94-13	15-Nov-94																						720.0	1570		
	01-Jul-96																						620.0	1520		
	02-Jul-10						290																770.0	1730		
	05-Oct-10						280																760.0	1670		
GWQ94-15	29-Jan-10																							1080		
GWQ94-16	13-Nov-94																							1140		
	01-Jul-96																							1160		
	29-Jun-10																							1190		
	30-Sep-10																							1170		
GWQ94-20	15-Nov-94														0.4											
GWQ94-21B	13-Nov-94														0.4											
GWQ96-22A	13-Jul-96											3.3														
	09-Apr-97												6.5		2.8											
	08-Aug-97											2.2			0.5											
	30-Jan-10											2.6	2.1		0.7											
	01-Jul-10											2.7			0.7											
	07-Oct-10											2.7			0.5											
GWQ96-22B	13-Jul-96											1.8			0.4											
	07-Oct-10											3.0	9.3		1.2											
GWQ96-23A	09-Apr-97														0.8											
	08-Aug-97														1.6											
	30-Jan-10											1.7			0.6											
	01-Jul-10														0.4											
	06-Oct-10														0.4											
GWQ96-23B	14-Jul-96	7.4											3.7													
	06-Oct-10											2.1	1.4		0.4											

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
IW-1	04-Mar-87						575																1901.0	3802		
	19-Jul-91						633																1985.0	4235		
	29-Aug-91						642																1917.9	4120		
	26-Nov-91						615																1634.0	3979		
	15-Mar-92						611																2201.0	4026		
	25-May-92						598																2203.0	4155		
	16-Jul-92						585																1775.0	4297		
	08-Oct-92						617																1726.8	3996		
	27-Nov-92						605																1716.6	4004		
	15-Dec-92						609																1414.6	3969		
	28-Sep-93						521																1150.0	3661		
	17-Mar-94						405																1569.0	3684		
	24-May-94						470																1500.0	3500		
	23-Jun-94						474																1444.0	3555		
	22-Jul-94						431																1480.0	3450		
	22-Sep-94						436																1348.0	3466		
	29-Jan-95						663																1478.5	3395		
	29-Mar-95						419																1350.7	3465		
	27-Jun-95						446																1680.1	3599		
	21-Sep-95						459																1710.8			
	10-Jan-96						442																1595.5	3437		
	25-Sep-96						568																1493.0	3551		
	15-Jan-97						410																1694.5			
IW-2	02-Sep-82						409																2252.0	4010		
	25-May-94	22.0					340						16.0		0.8								1000.0	2400		
	22-Jul-94						380																1040.0	2390		
	31-Jan-10						600						1.3		1.6								1200.0	2770		
	29-Jun-10						580								2.2								1100.0	2700		
	30-Sep-10						500								2.2								1000.0	2280		

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
IW-3	02-Sep-82																						707.3	1562		
	25-Feb-93						590																1738.9	3892		
	26-May-94	32.0						0.06		6.0			22.0	0.08	0.4									1870		
	23-Jul-94																							1300		
	03-Apr-96						433																1566.3	3364		
Ladder-Higgins	02-Aug-94											1.9														
Miranda	31-Jul-47						380																			
MW-2	07-May-75											2.3														
	20-Jul-94											3.1														
	28-Sep-10											3.3								9.27						
MW-6	01-Jan-75											3.4														
	08-Jul-10											8.1														
	27-Sep-10											8.2														
MW-8	01-Jan-75																		15							
	12-Oct-10																			9.23						

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
NP-1	08-Oct-81														0.9											
	04-Nov-81														0.6											
	13-Nov-81														1.3											
	17-Nov-81														1.4											
	23-Nov-81														1.2											
	07-Dec-81														1.2											
	15-Dec-81														1.2											
	22-Dec-81														1.0											
	05-Jan-82														0.7											
	26-Jan-82														0.5											
	22-Feb-82														0.3											
	26-Apr-82												1.2													
	24-May-82														0.3											
	28-May-82														0.2											
	08-Jun-82														0.3											
	16-Mar-84															0.008										
	26-Nov-91																							1484		
	24-May-94												9.5													
	21-Jul-94														0.3											

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.05**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**10**
NP-2	08-Oct-81											**1.8**			**0.6**											
	06-Nov-81														**0.4**											
	13-Nov-81														**0.8**											
	23-Nov-81														**0.5**											
	07-Dec-81														**0.5**											
	15-Dec-81														**0.5**											
	22-Dec-81														**0.5**											
	05-Jan-82														**0.5**											
	26-Jan-82														**0.3**											
	22-Feb-82														**0.3**											
	26-Apr-82												**1.2**		**0.3**											
	18-May-82					**0.02**																				
	30-Mar-93												**1.9**											**1310**		
	28-Sep-93																							**1170**		
	24-May-94												**4.5**													
	29-Mar-95																							**1164**		

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
NP-3	08-Oct-81														0.8											
	27-Oct-81											1.9			1.0											
	30-Oct-81														1.0											
	06-Nov-81														0.5											
	13-Nov-81														1.0											
	17-Nov-81														1.0											
	23-Nov-81														1.0											
	07-Dec-81														0.8											
	15-Dec-81														0.9											
	22-Dec-81														0.8											
	05-Jan-82														0.7											
	26-Jan-82														0.7											
	22-Feb-82														0.7											
	26-Apr-82														0.4											
	17-May-82						562								0.2				12				900.0	2460		
	30-May-84																							1060		
	12-Sep-84						270																	1140		
	27-Nov-84						290																	1150		
	17-May-85						310																	1470		
	13-Nov-85						288																	1520		
	23-May-86						282																624.0	1590		
	08-Oct-86						272																620.0	1710		
	03-Mar-87																						695.0			
	04-Mar-87						283																695.0	1882		
	25-May-87																						735.5			
	12-Jan-88						359								0.6								755.0	1584		
	04-Apr-88						254																	1772		
	23-Aug-88						251																835.2	1744		
	09-Feb-89						254																763.4	1583		

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
NP-3	01-Jun-89																						713.6	1596		
	30-Nov-89																						742.9	1600		
	14-Nov-90																						821.6	1675		
	11-Feb-91						256															255.90	970.5	1551		
	19-Jul-91																						820.3	1663		
	29-Aug-91						254																854.1	1616		
	26-Nov-91																						745.2	1613		
	15-Mar-92																						921.3	1644		
	25-May-92																						752.9	1607		
	16-Jul-92																						802.2	1578		
	08-Oct-92																						799.1	1445		
	27-Nov-92						255																796.1	1640		
	15-Dec-92																							1558		
	25-Feb-93																						793.6	1580		
	30-Mar-93												5.0		0.3								825.0	1560		
	28-Sep-93														0.2								619.4	1544		
	17-Mar-94														0.3								746.9	1609		
	23-Jun-94																						778.6	1628		
	22-Jul-94														0.6								796.0	1620		
	22-Sep-94																						707.1	1691		
	29-Jan-95						566																651.9	1623		
	29-Mar-95																							1639		
	27-Jun-95																						717.0	1607		
	21-Sep-95																						822.0	1557		
	10-Jan-96																						724.1	1464		
	03-Apr-96																						722.6	1415		
	25-Sep-96																							1472		
	15-Jan-97																						657.4	1478		
	08-Jul-10						270																790.0	1740		

Table 4-3
NMWQCC Groundwater Standard Exceedances

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.05	0.2	0.002	1.0	0.2	10	6-9	0.05	0.05	600	1000	0.03	10
NP-3	07-Oct-10						290																830.0	1660		
NP-4	26-Apr-82												3.8		0.6											
	17-May-82																			9.40						
	30-Jun-82																			9.50						
	21-Feb-83																			9.30						
	19-Jul-91												5.1													
	08-Oct-92																			9.01						
	15-Dec-92																			9.52						
	25-Feb-93																			9.85						
	31-Mar-93														0.8	0.009										
	26-May-94												15.0													12.00
	15-Jan-97																						1113.0	2651		
NP-5	17-Nov-81														0.3											
	26-Apr-82												3.8		6.9											
	24-May-94												1.2													
O. Williams	19-Dec-45						425																			
	13-Jun-46						418																			
PW-3	14-Aug-81											2.5														
QMC-4	27-Mar-81											2.5														
SHB-28	22-Sep-76														0.4											

Notes: GW = Groundwater
mg/L = milligrams per liter
NMWQCC = New Mexico Water Quality Control Commission
Metals analyzed using EPA Method 200.7/200.8/245.1/9012B and reported in mg/L

Table 5-1
Proposed Analytical Parameters with Method Reporting Limits

Parameter	Method	Method Reporting Limit
Alkalinity, CaCO3 (Acidity)	SM 2320B	1
CO3, CaCO3	SM 2320B	1
HCO3	SM 2320B	1
Aluminum	EPA 200.7	0.045
Antimony	EPA 200.8	0.0025
Arsenic	EPA 200.8	0.005
Barium	EPA 200.7	0.01
Beryllium	EPA 200.7	0.001
Bismuth	EPA 200.7	0.1
Boron	EPA 200.7	0.1
Cadmium	EPA 200.8	0.001
Calcium	EPA 200.7	0.5
Chloride	EPA 300.0	1
Chromium	EPA 200.7	0.005
Cobalt	EPA 200.7	0.01
Copper	EPA 200.8	0.05
Fluoride	EPA 300.0	0.1
Gallium	EPA 200.7	0.1
Iron	EPA 200.7	0.01
Lead	EPA 200.8	0.01
Lithium	EPA 200.7	0.1
Magnesium	EPA 200.7	0.5
Manganese	EPA 200.7	0.005
Mercury	EPA 200.8	0.0001
Molybdenum	EPA 200.7	0.01
Nickel	EPA 200.7	0.01
Nitrate as N	EPA 300.0	1
Nitrite as N	EPA 300.0	1
pH (s.u.)	SM 4500-H+ B	--

Parameter	Method	Method Reporting Limit
Phosphorus	EPA 200.7	0.5
Potassium	EPA 200.7	0.5
Scandium	EPA 200.7	0.1
Selenium	EPA 200.8	0.005
Silver	EPA 200.7	0.005
Sodium	EPA 200.7	0.5
Strontium	EPA 200.7	0.1
Sulfate	EPA 300.0	1
Thallium	EPA 200.8	0.001
Tin	EPA 200.7	0.1
Titanium	EPA 200.7	0.1
Total Dissolved Solids	SM 2540C	10
Uranium	EPA 200.8	0.002
Vanadium	EPA 200.7	0.01
Zinc	EPA 200.7	0.01

Appendix A

New Mexico Environment Department Ground Water Quality Bureau Mining Environmental Compliance Section Letters Dated August 20, 2008 and March 18, 2009

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

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William C. Olson, Bureau Chief

BILL RICHARDSON
Governor
DIANE DENISH
Lieutenant Governor

RON CURRY
Secretary
JON GOLDSTEIN
Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

August 20, 2008

George Lotspeich, President
Hydro Resources Corporation
4011 Mesa Verde Ave. NE
Albuquerque, NM 87110

Re: Abatement Plan Required at Copper Flat Mine Site, DP-1

Dear Mr. Lotspeich:

Pursuant to the New Mexico Water Quality Control Commission (WQCC) Regulations Sections 20.6.2.1203.A(9), 20.6.2.4104 and 20.6.2.4106.A NMAC, the New Mexico Environment Department (NMED) hereby provides notification that you, George Lotspeich and Hydro Resources Corporation (HRC) as a "responsible person", as defined in WQCC regulation 20.6.2.7.00 NMAC, are required to submit an abatement plan for the Copper Flat Mine site, located approximately 6 miles northeast of Hillsboro, New Mexico. The May 1997 Alta Gold submittal entitled "Copper Flat Mine Project Monitoring Plans" lists historical ground water exceedences of WQCC standards through 1994. Additional ground water sampling in 1997 and 1998 confirmed that standards set forth in WQCC regulation 20.6.2.4103 NMAC have been exceeded. Sampling the water quality of the pit lake at Copper Flat in 2004 indicates the pit lake water also exceeds WQCC standards for sulfate, total dissolved solids, chloride, manganese and uranium. Additional sampling of the pit lake was conducted in June 2008. Although analytical data is not yet available from this recent sampling event the field pH was measured at approximately 4.5 which is below the acceptable range of 6 to 9. Field observations indicate high concentrations of sulfate and total dissolved solids.

Within 60 days of receipt of this letter, HRC shall submit to NMED an abatement plan proposal for a Stage 1 Abatement Plan to characterize ground and surface water contamination at the Copper Flat Mine site.

The purpose of the Stage 1 Abatement Plan is to define site conditions and provide the data necessary to select and design an effective abatement alternative. WQCC regulation

20.6.2.4106.C NMAC describes the information that may be required for a Stage 1 Abatement Plan. HRC's abatement plan proposal must include an adequate investigation for the definition of extent and magnitude of ground and surface water contamination as well as characterization of the hydrogeology of the site.

For your reference, a current copy (effective July 16, 2006) of the WQCC Regulations, 20.6.2 NMAC is enclosed.

Please contact Kurt Vollbrecht at 505-827-0195 with any questions.

Sincerely,

William C. Olson, Chief
Ground Water Quality Bureau

Enc.: WQCC Regulations 20.6.2 NMAC

cc: Mary Ann Menetrey, Program Manager, GWQB-MECS
Karen Garcia, Chief, Mine Reclamation Bureau
Russell MacRae, U.S. Fish and Wildlife Service, 2105 Osuna NE, Abq., Nm 87113

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

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George Lotspeich,
Hydro Resources Co
Street, Apt. No., or PO Box No.
4011 Mesa Verde Av
City, State, ZIP+4
Albuquerque, New M
PS Form 3800, August 2006

March 18, 2009

George Lotspeich, President
Hydro Resources Corporation
4011 Mesa Verde Avenue, NE
Albuquerque, NM 87110

RE: Copper Flat Mine Site Information

Dear Mr. Lotspeich:

Thank you for meeting with the New Mexico Environment Department (NMED) regarding the Copper Flat Mine Site Stage 1 Abatement Plan on February 25, 2009. Your cooperation with this project is greatly appreciated.

I've reviewed and inventoried the reports available through NMED. These files are available for review at the NMED Ground Water Quality Bureau Santa Fe offices and include the following:

- Hydrology Impact Evaluation, 1996
- Baseline Data, Volume 1. Copper Flat Project, 1995
- Copper Flat Mine-Mine Permit Application, volumes 1-4, 1996
- Copper Flat Mine Project Monitoring Plans, 1996
- Appendices-volume II of II, Copper Flat Project Soil Cover Modeling Study, 1996 (I cannot locate volume I of II)
- Environmental Impact Statement, Copper Flat Project, 1995
- Response to Closure Plan Comments, Copper Flat Project, 1996
- Final Geotechnical and Design Development Report, Tailings Dam and Disposal Area, Copper Flat Project, 1981

In addition, eight water quality samples were collected from the Pit Lake and submitted for analysis by NMED on 12/09/2004 and 06/16/2008. Copies of the results are attached for your records.

The first step in initiating a Stage 1 Abatement Plan as described in WQCC Regulation 20.6.2.4106 NMAC (page 26) will be to walk the property and identify existing monitoring wells that may be used to collect water quality samples for the assessment of ground water at the site. I have March 24th scheduled to meet you in Hillsborough at 10:30 to conduct that inspection.

Following sample collection and results analysis, NMED and Hydro Resources Corporation will cooperate in the development of an appropriate Stage 1 Abatement Plan for the facility.

Please contact me at (505) 827-1046 with any questions you may have.

Regards,

Greg Huey
Ground Water Quality Bureau

Enc.: Water Quality Sample Reports

Appendix B1

Surface Water Analytical Results

APPENDIX B1
SURFACE WATER ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Selenium	Thallium	Uranium	Vanadium	Zinc
NMWQCC SW Standard (mg/L)		**0.087**	**0.0056**	**0.0023**	**2.0**	**0.004**	**0.75**	**0.005**	**0.1**	**0.05**	**0.2**	**0.2**	**0.05**	**0.00077**	**1.0**	**0.1**	**10**	**0.005**	**0.0017**	**5.0**	**0.10**	**2.0**
***Category**		**AqL**	**DWS**	**DWS**	**DWS**	**DWS**	**IRR**	**DWS**	**DWS**	**IRR**	**IRR**	**DWS**	**DWS**	**AqL**	**IRR**	**DWS**	**DWS**	**DWS**	**DWS**	**DWS**	**IRR**	**IRR**
CSCS-B	8/25/2010	0.035	<0.001	**0.0042**	0.013	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		0.011	<0.01		0.0012	<0.001		<0.05	<0.01
	11/4/2010	<0.02	<0.001	**0.0045**	0.015	<0.002	0.048	<0.002	<0.006	<0.006	<0.006		<0.005		0.012	<0.01	0.36	0.0011	<0.001		<0.05	<0.01
	1/20/2011	0.038	<0.001	**0.0038**	0.013	<0.002	0.045	<0.002	<0.006	<0.006	<0.006		<0.005		0.012	<0.01	0.2	0.0015	<0.001		<0.05	<0.01
CSCS-C	8/25/2010	**0.38**	<0.001	0.0012	0.015	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
LAC-A	8/24/2010	<0.02	<0.001	0.0012	0.011	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.005	<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.015
	11/3/2010	<0.02	<0.001	0.0011	0.016	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.02
LAC-B	8/24/2010	<0.02	<0.001	0.0016	0.012	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.005	<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.014
	11/3/2010	<0.02	<0.001	**0.004**	0.022	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
LAC-C	8/23/2010	<0.020	<0.0010	0.0021	0.014	<0.0020	<0.040	<0.0020	<0.0060	<0.0060	<0.0060	<0.0050	<0.0050		<0.0080	<0.010		<0.0010	<0.0010		<0.050	<0.010
	11/3/2010	<0.02	<0.001	0.0019	0.014	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
	1/18/2011	<0.02	<0.001	0.002	0.015	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.01
LAC-D	8/24/2010	<0.02	<0.001	0.0022	0.018	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.005	<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
	11/4/2010	<0.02	<0.001	0.0022	0.019	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01	<0.1	<0.001	<0.001		<0.05	<0.01
LAC-E	8/20/2010	<0.020	<0.0010	0.0020	0.018	<0.0020	<0.040	<0.0020	<0.0060	<0.0060	<0.0060	<0.0050	<0.0050		<0.0080	<0.010		<0.0010	<0.0010		<0.050	<0.010
	1/19/2011	<0.02	<0.001	0.0017	0.021	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01	<0.1	<0.001	<0.001		<0.05	<0.01
NWS	8/24/2010	<0.02	<0.001	**0.0065**	0.023	<0.002	0.041	<0.002	<0.006	<0.006	<0.006	<0.005	<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.012
	11/3/2010	<0.02	<0.001	**0.0062**	0.024	<0.002	0.043	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
PC-A	8/24/2010	<0.02	<0.001	0.0016	0.04	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006	<0.005	<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
	11/8/2010	<0.02	<0.001	0.0012	0.035	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.013
	11/19/2010											<0.01										
PC-B	8/26/2010	<0.02	<0.001	0.0018	0.032	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.018
	11/8/2010	<0.02	<0.001	0.0013	0.037	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
	11/19/2010											<0.01										
PC-C	8/26/2010	<0.02	<0.001	0.0018	0.032	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.016
	11/9/2010	0.066	<0.001	0.0022	0.032	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.026

APPENDIX B1
SURFACE WATER ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Selenium	Thallium	Uranium	Vanadium	Zinc
NMWQCC SW Standard (mg/L)		0.087	0.0056	0.0023	2.0	0.004	0.75	0.005	0.1	0.05	0.2	0.2	0.05	0.00077	1.0	0.1	10	0.005	0.0017	5.0	0.10	2.0
*Category		AqL	DWS	DWS	DWS	DWS	IRR	DWS	DWS	IRR	IRR	DWS	DWS	AqL	IRR	DWS	DWS	DWS	DWS	DWS	IRR	IRR
PC-D	8/27/2010	<0.02	<0.001	0.002	0.029	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.025
	11/9/2010	<0.02	<0.001	0.0022	0.027	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
PCS-A	8/26/2010	<0.02	<0.001	0.0019	0.0099	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		0.0011	<0.001		<0.05	0.047
PWS-1	8/19/2010	**540**	<0.0010	0.0016	<0.10	**0.14**	<2.0	**0.14**	<0.30	**1.5**	**80**	<0.0050	<0.25		<0.40	<0.50		**0.086**	<0.0010		<2.5	**12**
SWQ-1	12/28/1982							<0.005			<0.05	<0.01		<0.001	<0.05		0.9	<0.005				
	2/21/1983							<0.005			<0.05	<0.01		<0.001	<0.05		4.4	<0.005				
SWQ-2	10/27/1981	<0.01		<0.01	<0.2			<0.005	<0.01	<0.02	<0.05	<0.01	<0.02	**0.004**	<0.05		6.6	<0.005				
	2/25/1982							<0.005			<0.05	<0.01		<0.001	<0.05		4.2	<0.005				
	5/12/1982							<0.005			<0.05	<0.01		<0.001	<0.05		3	<0.005				
	2/21/1983							<0.005			<0.05	<0.01		<0.001	<0.05		0.8	<0.005				
	5/13/1983							<0.005			<0.05	<0.01		<0.001	<0.05		0.3	<0.005				
	8/9/1983							<0.005			<0.05	<0.01		<0.001	<0.05		<0.2	<0.005				
	11/1/1983							<0.005			<0.05	<0.01		<0.001	<0.05		0.3	<0.005				
	12/23/1983							<0.005			<0.05	<0.01		<0.001	<0.05		**11.2**	<0.005				
	3/16/1984							<0.005			<0.05	<0.01		<0.001	<0.05		5.3	<0.005				
	5/30/1984							<0.005			<0.05	<0.01		<0.001	<0.05		0.4	<0.005				
	9/12/1984							<0.005			<0.05	<0.01		<0.001	<0.05		0.4	<0.005				
	11/27/1984							<0.005			<0.05	<0.01		<0.001	<0.05		<0.2	<0.005				
	7/19/1991			<0.002	<0.01			<0.005	<0.02				<0.005	<0.0002			**12.74**	<0.001				
	8/25/2010	**1.5**	<0.001	<0.001	0.01	<0.002	<0.04	<0.002	<0.006	<0.006	0.085		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	<0.01
SWQ-2A	10/27/1981	<0.01		<0.01	<0.2			<0.005	<0.01	<0.02	<0.05	<0.01	<0.02	<0.001	<0.05		0.3	<0.005				
	2/25/1982							<0.005			<0.05	<0.01		<0.001	<0.05		0.2	<0.005				
SWQ-3	7/19/1991			<0.002	0.03			<0.005	<0.02				<0.005	<0.0002			1.39	<0.001				
	8/29/1991										0.015											
	11/26/1991										0.001											
	8/19/2010	<0.020	<0.0010	<0.0010	0.062	<0.0020	0.14	<0.0020	<0.0060	<0.0060	0.062	<0.0050	<0.0050		0.047	<0.010		**0.013**	<0.0010		<0.050	0.023

APPENDIX B1

SURFACE WATER ANALYTICAL RESULTS

Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Selenium	Thallium	Uranium	Vanadium	Zinc
NMWQCC SW Standard (mg/L)		0.087	0.0056	0.0023	2.0	0.004	0.75	0.005	0.1	0.05	0.2	0.2	0.05	0.00077	1.0	0.1	10	0.005	0.0017	5.0	0.10	2.0
*Category		AqL	DWS	DWS	DWS	DWS	IRR	DWS	DWS	IRR	IRR	DWS	DWS	AqL	IRR	DWS	DWS	DWS	DWS	DWS	IRR	IRR
SWQ-3	10/21/2010	<0.02	<0.001	<0.005	0.053	<0.002	0.089	<0.002	<0.006	<0.006	0.023		<0.005		0.03	<0.01		**0.016**	<0.001		<0.05	0.48
WS	8/25/2010	<0.02	<0.001	<0.001	0.01	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01		<0.001	<0.001		<0.05	0.016
	11/4/2010	<0.02	<0.001	<0.001	0.0098	<0.002	0.066	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01	<0.1	<0.001	<0.001		<0.05	<0.01
	1/20/2011	<0.02	<0.001	<0.001	0.011	<0.002	0.069	<0.002	<0.006	<0.006	<0.006		<0.005		<0.008	<0.01	<0.1	<0.001	<0.001		<0.05	<0.01
WSCS-A	8/25/2010	**0.74**	<0.001	**0.0081**	0.016	<0.002	<0.04	<0.002	<0.006	<0.006	<0.006		<0.005		0.011	<0.01		<0.001	<0.001		<0.05	<0.01
	1/20/2011	**0.18**	<0.001	**0.0031**	0.063	<0.002	0.043	<0.002	<0.006	<0.006	<0.006		<0.005		0.011	<0.01	2.7	0.0018	<0.001		<0.05	<0.01

Notes:

NMWQCC = New Mexico Water Quality Commission

Category selection based on most stringent standard for analyte

AqL = Aquatic Life

DWS = Domestic Water Supply

IRR = Irrigation

Measurement values that exceed the NMWQCC standard are in bold

Non-detects are indicated with a "<" & the detection limit

Solid grey indicates 'No Data' or 'Not Measured'

Appendix B2

Pit Lake Analytical Results

APPENDIX B2
PIT LAKE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Selenium	Thallium	Uranium	Vanadium	Zinc
NMWQCC SW Standard (mg/L)		**0.087**	**0.0056**	**0.0023**	**2.0**	**0.004**	**0.75**	**0.005**	**0.1**	**0.05**	**0.2**	**0.2**	**0.05**	**0.00077**	**1.0**	**0.1**	**10**	**0.005**	**0.0017**	**5.0**	**0.10**	**2.0**
***Category**		**AqL**	**DWS**	**DWS**	**DWS**	**DWS**	**IRR**	**DWS**	**DWS**	**IRR**	**IRR**	**DWS**	**DWS**	**AqL**	**IRR**	**DWS**	**DWS**	**DWS**	**DWS**	**DWS**	**IRR**	**IRR**
PL-WQ	4/3/1989	<0.1			<0.1	<0.1		<0.1	<0.1	<0.05	<0.1		<0.1		<0.1							0.4
	2/11/1991			<0.001	<0.01			**0.035**	0.06				0.006	<0.0002			0.1	<0.001				
	7/19/1991			<0.002	<0.01			<0.005	<0.02				<0.005	<0.0002			0.03	<0.001				
	8/29/1991										**0.64**											
	11/26/1991										0.084											
	12/15/1992										**3.208**											
	9/28/1993										0.001											0.01
	3/17/1994										0.089											1.01
	12/12/1994	<0.05	<0.005	<0.005	<0.1	<0.002		**0.017**	<0.025	<0.05	0.03		<0.005	<0.001	<0.05		<5	<0.005				0.095
	12/19/1994	<0.05	<0.005	<0.005	<0.1	<0.002		**0.017**	<0.025	<0.05	0.032		<0.005	<0.001	<0.05		<5	<0.005				0.092
	9/21/1995	**0.13**	<0.005	<0.005	<0.05	<0.002		**0.014**	<0.025	<0.05	<0.025		<0.005	<0.001	<0.05		<5	<0.25				0.071
	1/30/2010	**5.5**	<0.0010	**0.0062**	0.017	**0.017**	<0.20	**0.056**	<0.030	**0.35**	**9.0**		<0.025		<0.040	0.074		**0.026**	<0.0050			**6.5**
PL-WQ-05	1/20/2011	**0.48**	<0.001	<0.001	0.01	**0.016**	<0.2	**0.062**	<0.03	**0.39**	**0.61**		<0.025		<0.04	0.069	<0.1	**0.025**	<0.001		<0.25	**5.8**
PL-WQ-06	1/20/2011	**0.51**	<0.001	<0.001	0.011	**0.016**	<0.2	**0.062**	<0.03	**0.38**	**0.59**		<0.025		<0.04	0.066	<0.1	**0.025**	<0.005		<0.25	**5.7**
PL-WQ-07	1/20/2011	**0.54**	<0.005	<0.005	0.012	**0.016**	<0.2	**0.061**	<0.03	**0.39**	**0.64**		0.026		<0.04	0.068	<0.1	**0.031**	<0.005		<0.25	**6**
PL-WQ-08	1/20/2011	**0.48**	<0.005	<0.005	0.01	**0.015**	<0.2	**0.06**	<0.03	**0.37**	**0.59**		<0.025		<0.04	0.066	<0.1	**0.03**	<0.005		<0.25	**5.3**

Notes:

NMWQCC = New Mexico Water Quality Commission

Category selection based on most stringent standard for analyte

AqL = Aquatic Life

DWS = Domestic Water Supply

IRR = Irrigation

Measurement values that exceed the NMWQCC standard are in bold

Non-detects are indicated with a "<" & the detection limit

Solid grey indicates 'No Data' or 'Not Measured'

Appendix B3

Groundwater Analytical Results

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
15.6.31.431	6/4/1976				<0.1		14.3					0.52	0.002	0.003				1.39		7.78			137	520		
	4/9/1981	<0.1	<0.005	<0.1	0.025	<0.001	22	<0.005		0.7		0.58	<0.25	<0.05		0.005	<0.01	1.14	<0.005		<0.005		144.5			**0.14**
Brannon	7/31/1947						15					0.8						0.4					13	270		
Dawson 1	6/14/1946						18					1.3						0.8					36	219		
	6/7/1947						11					1						1.1					58	283		
Dawson 2	7/31/1947						13					1.2						1.3					52	283		
Eaton	7/31/1947						17					0.2						0.2					21	356		
Folcher	6/20/1946						6					0.4						2.4					19	147		
GWQ-1	1/20/1981						200						0.05							7.3			250	450		
	2/2/1981						20						**1.7**							7.9			156	520		
	3/27/1981		<0.01							<0.05	<0.01	0.6						5.5	<0.02							**0.16**
	6/11/1981	<0.05	<0.005	<0.1	<0.1	<0.0005		<0.025	<0.05	<0.025			<0.05	<0.03	<0.001	<0.05	<0.05		<0.005		<0.005	<0.025				<0.05
	6/15/1981	<0.25	<0.01	<1	0.076	<0.005	16	<0.05	<0.05	<0.05	<0.01	0.51	<0.05	<0.02	<0.001	<0.05	<0.05	3.75	<0.02	7.4	0.0022	<0.02	117	500		**0.12**
	2/25/1982					<0.005	22			<0.05	<0.01	0.3	0.14	0.063	<0.001	<0.05		0.2		7.9	<0.005		84	410		
	3/30/1989	<0.1		<0.1	<0.1	<0.1	20	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1			<0.1	133	512		<0.1
	7/19/1991		0.003	0.01		<0.005	21.1	<0.02		<0.02		0.58	<0.05	<0.02	<0.0002			5.19	<0.005	7.34	<0.002	<0.02	136.4	543		
	3/31/1993	<0.01	<0.005	<0.5	0.03	<0.002	22	<0.02	<0.05	<0.01	<0.01	0.54	<0.05	<0.02	<0.001	<0.02	<0.01	4.9	<0.02	7.7	<0.005	<0.01	160	536		<0.01
	5/25/1994	0.025	<0.005	<0.1		<0.0005	22	<0.025		<0.025		0.52	<0.05	<0.03	<0.001		<0.05	4.3	<0.005	7.9	<0.005	<0.025	150	614		<0.05
	7/21/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	25	<0.025	<0.05	<0.025		0.52	<0.05	<0.03	<0.001	<0.05	<0.05	4.2	<0.005	7.97	<0.005	<0.025	162	558		<0.05
GWQ-2	6/15/1981	<0.01	<0.01	<0.2	<0.1	<0.005	20	<0.01	<0.1	<0.05	<0.01	0.5	<0.1	<0.05	0.0013	<0.05	<0.05	5.6	<0.02	7.3	<0.005	<0.02	140	530		**0.16**
	6/25/1981	<0.025	<0.002	<1	0.162	<0.01	24.8	<0.05	<0.05	<0.02	<0.05	0.48	0.1	<0.02	<0.001	<0.1	<0.05	4.3	<0.05		0.0022	<0.02	111	448		**0.11**
GWQ-3	3/27/1981		<0.01							<0.05	<0.01	0.6						5.5	<0.02							**0.16**
	6/15/1981	<0.25	<0.01	<1	<0.1	<0.005	32	<0.01	<0.05	<0.05	<0.01	0.7	<0.05	0.02	<0.001	<0.1	<0.05	0.25	**0.073**	7	0.0037	<0.02	383	890		**0.32**
	2/25/1982					<0.005	56			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		0.4		7.9	<0.005		490	**1040**		
	5/12/1982					<0.005	56			<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05		0.2		7.9	<0.005		410	930		
	6/30/1982					<0.005	48			<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05		0.4		7.6	<0.005		365	860		
	12/23/1982					<0.005	64			<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05		0.2		8.5	<0.005		340	990		
	2/21/1983					<0.005	68			<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05		0.2		7.7	<0.005		428	970		

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
GWQ-3	5/13/1983					<0.005	82			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	0.11		0.3		8	<0.005		437	980		
	8/9/1983					<0.005	78			<0.05	<0.01	0.7	0.11	<0.05	<0.001	<0.05		<0.2		7.8	<0.005		385	**1060**		
	11/1/1983					<0.005	90			<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05		0.3		8	<0.005		529	**1240**		
	3/16/1984					<0.005	74			<0.05	<0.01	0.3	<0.1	<0.05	<0.001	<0.05		3.4		8.2	<0.005		530	**1190**		
GWQ-4	6/15/1981	<0.01	<0.002	<0.2	0.065	<0.01	30	<0.05	<0.05	<0.05	<0.05	0.68	<0.1	<0.05	<0.001	<0.05	<0.05	0.53	<0.02	7.2	<0.005	<0.02	255	776		<0.025
	11/6/1981	<0.01	<0.01	<0.2	<0.1	<0.005	22	<0.01	<0.02	<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05	<0.05	2	<0.02	7.9	<0.005	<0.02	162	500		**0.28**
	4/1/1993	<0.1	<0.005	1	0.02	<0.002	27	<0.02	<0.05	<0.01	<0.01	0.73	0.2	<0.02	<0.001	<0.02	<0.01	0.1	<0.02	7.6	<0.005	<0.01	235	702		**0.38**
	5/26/1994	<0.025	<0.005	<0.1	<0.1	<0.0005	30	<0.025	<0.05	<0.025		0.63	0.13	<0.03	<0.001	<0.05	<0.05	<1	<0.005	8.08	<0.005	<0.025	220	926		**0.56**
	11/5/2010	<0.02	<0.001	0.057	<0.04	<0.002	72	<0.006	<0.006	0.0075		0.73	0.059	0.029	<0.0002	<0.008	<0.01		<0.005	7.53	0.0059	<0.005	230	798	0.0037	**0.14**
GWQ-5	6/15/1981	<0.25	<0.002	<1	0.054	<0.005	42	<0.01	<0.05	<0.02	<0.01	1.03	<0.1	<0.02	<0.001	<0.05	<0.05	0.37	<0.02	7.3	<0.005	<0.02	575	**1070**		<0.025
GWQ-6	6/15/1981	<0.01	<0.01	<1	0.135	<0.01	32.6	<0.01	<0.05	<0.02	<0.01	1.09	<0.05	0.11	**0.00235**	<0.05	<0.05	3.3	<0.05	7.3	0.0046	<0.02	40.5	400		<0.05
	2/25/1982					<0.005	102			<0.05	<0.01	1.1	<0.1	<0.05	<0.001	<0.05		0.5		8.3	<0.005		220	810		
	4/1/1993	<0.1	<0.005	0.6	0.09	<0.002	22	<0.02	<0.05	0.03	<0.01	0.84	**5.05**	**0.36**	<0.001	<0.02	<0.01	1.1	<0.02	7.7	<0.005	<0.01	10	304		0.03
GWQ-7	1/20/1981						200						0.03							7.2			350	500		
	2/2/1981						20						**3.8**							7.9			156	530		
	3/27/1981		<0.01							<0.05	<0.01	0.6						1.4	<0.02							**0.28**
	4/6/1981		0.003							<0.05	**0.36**	0.59						0.9	<0.01							**0.24**
	6/15/1981	<0.25	<0.01	<1	<0.1	<0.005	20	<0.01	<0.05	<0.02	<0.05	0.5	<0.05	<0.02	<0.001	<0.05	<0.05	1.1	<0.05	7.2	<0.005	<0.02	165	510		**0.38**
	8/7/1981						100						0.02							7.4			150	475		
	8/10/1981		<0.01				24			<0.05	<0.01	0.6	**1.7**					1.2	<0.02	7.7			162	490		**0.63**
	10/23/1981	<0.01	<0.01	<0.02	<0.1	<0.005	26	<0.01	<0.02	<0.05	<0.01	0.5	0.14	<0.05	<0.001	<0.05	<0.05	1.1	<0.02		<0.005	<0.02	160	490		**0.16**
	11/6/1981	<0.01	<0.01	<0.2	<0.1	<0.005	24	<0.01	<0.02	<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05	<0.05	1.2	<0.02	8.1	<0.005	<0.02	158	480		**0.19**
	2/25/1982					<0.005	26			<0.05	<0.01	0.5	0.17	<0.05	<0.001	<0.05		0.8		8	<0.005		162	510		
	12/28/1982					<0.005	20			<0.05	<0.01	0.3	0.26	0.16	<0.001	<0.05		<0.2		8.1	<0.005		40	250		
	2/21/1983					<0.005	22			<0.05	<0.01	0.4	<0.1	**0.27**	<0.001	<0.05		2.8		8.3	<0.005		47	250		
	3/16/1983													<0.05												
	5/13/1983					<0.005	20			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.2		8.1	<0.005		158	470		
	8/9/1983					<0.005	22			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1		8	<0.005		130	490		
	11/1/1983					<0.005	22			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.8		8.1	<0.005		137	500		

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
GWQ-7	3/16/1984					<0.005	20			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	0.08		1		8.3	<0.005		140	450		
	5/30/1984					<0.005	20			<0.05	0.02	0.6	<0.1	<0.05	<0.001	<0.05		0.9		7.7	<0.005		154	470		
	9/12/1984					<0.005	20			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.4		8	<0.005		128	500		
	11/27/1984					<0.005	18			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.4		7.7	<0.005		144	490		
	5/17/1985						20													7.9			144	500		
	11/13/1985						18													7.8			137	450		
	5/23/1986						22													7.9			142	490		
	10/8/1986						22													7.4			116	460		
	3/30/1989	<0.1		<0.1	<0.1	<0.1	15.9	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1			<0.1	131	492		**0.1**
	3/30/1993	<0.1	<0.005	<0.5	0.04	<0.002	21	<0.02	<0.05	<0.01	<0.01	0.56	<0.05	<0.02	<0.001	<0.02	<0.01	**138**	<0.02	7.8	<0.005	<0.01	138	482		**0.1**
	5/25/1994	0.25	<0.005	<0.1		0.00058	20	<0.025		0.11		**2.1**	0.72	**1.1**	<0.001		<0.05	<1	<0.005	7.26	<0.005	<0.025	**1300**	**2420**		<0.05
	7/21/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	22	<0.025	<0.05	<0.025		**16**	**1.2**	**0.21**	<0.001	<0.05	<0.05	<1	<0.005	7.72	<0.005	<0.025	<5	224		<0.05
GWQ-8	6/4/1976				<0.1		16.7					0.51	0.002	0.003				**16.8**		7.48			114	560		
	2/2/1981						20						**1.7**					**60**		7.9			156	520		
	8/19/1981	<0.25	<0.004	<1	0.076	<0.01	24	<0.05	<0.05	<0.05	<0.05	0.59	<0.1	0.047	<1	<0.1	<0.05	2.8	<0.05	7.42	0.004	<0.02	134	608		**0.69**
	2/25/1982					<0.005	38			<0.05	<0.01	1	<0.1	0.17	<0.001	<0.05		0.3		7.6	<0.005		220	380		
	3/31/1993	<0.1	<0.005	<0.5	0.03	<0.002	22	<0.01	<0.05	0.01	<0.01	0.51	<0.05	<0.02	<0.001	<0.02	<0.02	5.7	<0.02	7.7	<0.005	<0.01	283	764		**0.09**
	5/25/1994	<0.025	<0.005	<0.1	<0.1	<0.0005	41	<0.025	<0.05	<0.025		0.5	0.24	<0.03	<0.001	<0.05	<0.05	5.3	<0.005	7.97	<0.005	<0.025	290	792		<0.05
GWQ-9	6/4/1976				<0.1		19.9					0.44	0.004	0.001				4		8.6			34	350		
	1/20/1981						200						0.05							7.4			300	450		
	2/2/1981						20						**1.8**							7.9			156	510		
	3/27/1981		<0.01							<0.05	<0.01	0.6						1.4	<0.02							**0.16**
	4/6/1981		0.002							<0.05	0.15	0.56						1.2	<0.01							**0.13**
	8/7/1981						100						0.06							7.4			140	450		
	8/10/1981		<0.01				22			<0.05	<0.01	0.5	0.49					1.4	0.033	8			148	470		**0.96**
	10/8/1981	<0.25	<0.004	<1	0.044	<0.01	22.4	<0.05	<0.05	<0.05	<0.05	0.6	<0.1	<0.02	<1	<0.1	<0.05	0.96	<0.05	7.22	<0.002	<0.02	133	476		**0.35**
	2/25/1982					<0.005	26			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		0.9		8.3	<0.005		160	430		
	12/28/1982					<0.005	20			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		1		7.8	<0.005		150	480		
	2/21/1983					<0.005	20			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		1.4		8	<0.005		161	480		

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
GWQ-9	5/13/1983					<0.005	20			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		1.1		8.2	<0.005		158	460		
	8/9/1983					<0.005	20			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		0.9		8	<0.005		135	480		
	11/1/1983					<0.005	18			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		0.8		8.2	<0.005		132	460		
	3/16/1984					<0.005	18			<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05		1.7		8.1	<0.005		132	460		
	5/30/1984					<0.005	18			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		0.9		7.6	<0.005		154	450		
	9/12/1984					<0.005	20			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		1.3		8	<0.005		132	470		
	11/27/1984					<0.005	16			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		1.5		7.9	<0.005		132	470		
	5/17/1985						20													8			149	490		
	11/13/1985						20													7.8			142	450		
	5/23/1986						36													7.9			137	490		
	10/8/1986						20													7.6			125	460		
GWQ-10	4/6/1981		0.002			<0.01				<0.05	0.02	0.53			<1			4.6	<0.01							**0.12**
	8/10/1981	**10.2**	<0.004	<1	0.016	<0.01	23.5	<0.05	<0.05	<0.05	<0.05	1.14	**2.31**	**1.18**	<1	<0.1	<0.05	0.22	<0.05	7.48	<0.002	<0.02	143	528		**0.23**
	10/27/1981	<0.01	<0.01	<0.2	<0.1	<0.005	22	<0.01	<0.02	<0.05	<0.01	0.6	<0.01	<0.05	<0.001	<0.05	<0.05	1.1	<0.02	8.2	<0.005	<0.02	168	520		**0.25**
	10/30/1981	<0.25	<0.005	<1	**0.77**	<0.01	22.8	<0.05	<0.05	<0.05	<0.05	0.98	<1	<0.02	<0.001	<0.1	<0.02	0.66	<0.05	8.1	<0.002	<0.02	122	588		**0.24**
	11/6/1981	<0.01	<0.01	<0.2	<0.1	<0.005	22	<0.01	<0.02	<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05	<0.05	2	<0.02	7.9	<0.005	<0.02	162	500		**0.28**
	11/13/1981	0.37	<0.005	0.25	0.037	0.001	22.85	<0.005			0.001	0.62		**0.5**	<0.0005	<0.01	<0.05	1.8	<0.005	7.75	0.01	<0.001	140.9	509		**0.9**
	11/17/1981	<0.01	<0.01	<0.2	<0.1	<0.005	26	<0.01	<0.02	<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05	<0.05	1.8	<0.02	7.9	<0.005	<0.02	156	500		**0.28**
	11/23/1981	<0.01	<0.01	<0.2	<0.1	<0.005	26	<0.01	<0.02	<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05	<0.05	1.8	<0.02	7.7	<0.005	<0.02	161	650		**0.37**
	12/7/1981	<0.01	<0.01	<0.2	<0.1	<0.005	24	<0.01	<0.02	<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05	<0.05	1.8	<0.02	8.2	<0.005	<0.02	168	490		**0.87**
	12/15/1981	<0.01	<0.01	<0.2	<0.1	<0.005	24	<0.01	<0.02	<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05	<0.05	2.6	<0.02	7.9	<0.005	<0.02	181	550		**0.44**
	12/22/1981	<0.01	<0.01	<0.2	<0.1	<0.005	24	<0.01	<0.02	<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05	<0.05	2.5	<0.02	8.1	<0.005	<0.02	168	480		**0.35**
	1/5/1982	<0.01	<0.01	<0.2	<0.1	<0.005	22	<0.01	<0.02	<0.05	<0.01	0.6	0.13	<0.05	<0.001	<0.05	<0.05	2.9	<0.02	7.5	<0.005	<0.02	174	430		**0.31**
	1/26/1982					<0.005	24			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.1		2.3		7.8	<0.005		162	490		
	2/22/1982					<0.005	24			<0.05	<0.01	0.6	0.12	<0.05	<0.001	<0.05		2.1		7.6	<0.005		161	510		
	4/26/1982					<0.005	20			<0.05	<0.01	0.6	0.41	<0.05	<0.001	<0.05		2		7.4	<0.005		168	840		
	5/17/1982					<0.005	28			<0.05	<0.01	0.6	0.1	<0.05	<0.001	<0.05		2.3		7.7	<0.005		175	490		
	6/8/1982					<0.005	22			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		2.2		8	<0.005		162	500		
	6/30/1982					<0.005	20			<0.05	<0.01	0.6	0.62	<0.05	<0.001	<0.05		3.3		8	<0.005		160	510		

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.2	0.002	1.0	0.2	10	0.05	6-9	0.05	0.05	600	1000	0.03	0.03
GWQ-10	9/2/1982					<0.001	22.3					0.54		<0.05		<0.01		2.25		7.3	<0.005		143.4	506		
	12/23/1982					<0.005	26			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.7		8.5	<0.005		138	500		
	2/21/1983					<0.005	24			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		2.4		7.9	<0.005		161	470		
	5/13/1983					<0.005	32			<0.05	0.02	0.6	<0.1	<0.05	<0.001	<0.05		2.4		8	<0.005		161	480		
	8/9/1983					<0.005	36			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		2.4		7.9	<0.005		142	510		
	11/1/1983					<0.005	34			<0.05	<0.01	0.6	0.17	<0.05	<0.001	<0.05		4.8		8.1	<0.005		125	500		
	3/16/1984					<0.005	42			<0.05	<0.01	0.5	0.11	<0.05	<0.001	<0.05		3.5		8.2	<0.005		128	500		
	5/30/1984					<0.005	56			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		3.3		7.5	<0.005		161	530		
	9/12/1984					<0.005	68			<0.05		0.5	<0.1	<0.05	<0.001	<0.05		4.2		7.8	<0.005		158	580		
	11/27/1984					<0.005	64			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		4.9		7.7	<0.005		163	580		
	5/17/1985						52													7.8			163	570		
	11/13/1985						42													7.7			149	500		
	5/23/1986						58													7.9			151	560		
	10/8/1986						54													7.5			137	550		
	3/4/1987	<0.1		<0.1	<0.1	<0.1	59	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1			<0.1	150	568		<0.1
	5/25/1987																						154.2			
	1/12/1988	<0.1		<0.1	<0.1	<0.1	78.8	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1			<0.1	173	648		<0.1
	4/4/1988						65																170.6	552		
	8/23/1988						63																179.2	692		
	2/9/1989						76.3																180.5	618		
	6/1/1989						67.9																162.7	604		
	11/30/1989						72.1																161.7	620		
	11/14/1990						92.7																178	635		
	2/11/1991		<0.001				78.1																213.5	696		
	7/19/1991		0.002	0.02		<0.005	83.3	<0.02				0.51	0.07	<0.02	<0.0002			3.88	<0.005	8.05	0.002	<0.02	166.6	645		
	8/29/1991						84.7													7.44			191.7	665		
	11/26/1991						58.2													7.46			171.2	648		
	3/15/1992						82.5													7.85			191.6	641		
	5/25/1992						83.8													7.41			169.2	621		

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
GWQ-10	7/16/1992						76.3													7.51			166.6	626		
	10/8/1992						83.4													7.43			161.4	659		
	11/27/1992						80.3													7.89			174.4	654		
	12/15/1992						90.9													7.48			168.7	582		
	2/25/1993						95.5													7.39			175.8	620		
	3/30/1993	<0.1	<0.005	<0.5	0.04	<0.002	94	<0.02	<0.05	<0.01	<0.01	0.52	<0.05	<0.02	<0.001	<0.02	<0.01	3.9	<0.02	7.8	<0.005	<0.01	183	642		**0.11**
	9/28/1993						96													7.7			142.6	693		
	5/26/1994	0.85	<0.005	<0.1		<0.0005	92	<0.025		0.026		0.51	**1.1**	0.059	<0.001		<0.05	3.5	<0.005	7.82	<0.005	<0.025	175	1000		**0.55**
	6/23/1994						103.6													7.97			191.6	671		
	7/23/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	98	<0.025	<0.05	<0.025		0.49	<0.05	<0.03	<0.001	<0.05	<0.05	3.5	<0.005	7.97	<0.005	<0.025	184	696		<0.05
	9/22/1994						89.2													7.45			155.8	668		
	1/29/1995						87.5													7.52			65.7	672		
	3/29/1995						84.9													7.67			176	622		
	6/27/1995						84.8													7.29			168.7	677		
	9/21/1995						91.3													7.42			187.4	693		
	1/10/1996						97.7													7.29			197.5	654		
	4/3/1996						97.4													6.95			218.2	628		
	9/25/1996						86.2													7.56			190.8	679		
	1/15/1997						91													7.59			203.67	746		
GWQ-11	8/10/1981	<0.25	<0.004	<1	0.092	<0.01	37	<0.05	<0.05	<0.05	<0.05	0.9	**1.14**	**0.45**	<1	<0.1	<0.05	1.02	<0.05	7.38	0.006	<0.02	123	612		<0.05
	10/27/1981	<0.01	<0.01	<0.2	<0.1	<0.005	36	<0.01	<0.02	<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05	<0.05	0.7	<0.02	8.1	<0.005	<0.02	183	550		**0.17**
	10/30/1981	<0.25	<0.005	<1	0.55	<0.01	39.1	<0.05	<0.05	<0.05	<0.05	0.96	<0.1	<0.02	<0.001	<0.1	<0.02	0.61	<0.05	8.4	<0.011	<0.02	101	536		**0.23**
	11/6/1981	<0.01	<0.01	<0.2	<0.1	<0.005	36	<0.01	<0.02	<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05	<0.05	1.5	<0.02	8.1	<0.005	<0.02	168	520		**0.29**
	11/13/1981	<0.25	<0.005	0.2	0.041	0.001	37.64	<0.005			<0.001	0.99		<0.05	<0.0005	0.12	<0.05	1.33	<0.005	7.7	0.023	<0.001	155.6	544		**0.79**
	11/17/1981	<0.01	<0.01	<0.2	<0.1	<0.005	36	<0.01	<0.02	<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05	<0.05	1.3	<0.02	8	<0.005	<0.02	165	520		**0.64**
	11/23/1981	<0.01	<0.01	<0.2	<0.1	<0.005	36	<0.01	<0.02	<0.05	<0.01	0.9	<0.1	<0.05	<0.001	<0.05	<0.05	1.7	<0.02	7.8	<0.005	<0.02	181	570		**0.53**
	12/7/1981	<0.01	<0.01	<0.2	<0.1	<0.005	56	<0.01	<0.02	<0.05	<0.01	0.9	<0.1	<0.05	**0.0064**	<0.05	<0.05	1.6	<0.02	7.9	<0.005	<0.02	184	560		**1.6**
	12/15/1981	<0.01	<0.01	<0.2	<0.1	<0.005	38	<0.01	<0.02	<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05	<0.05	1.5	<0.02	7.9	<0.005	<0.02	191	570		**1.1**
	12/22/1981	<0.01	<0.01	<0.2	<0.1	<0.005	40	<0.01	<0.02	<0.05	<0.01	0.5	0.27	0.093	<0.001	<0.05	<0.05	1.9	<0.02	8	<0.005	<0.02	185	530		**0.42**

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Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.2	0.002	1.0	0.2	10	0.05	6-9	0.05	0.05	600	1000	0.03	0.03
GWQ-11	1/5/1982	<0.01	<0.01	<0.2	<0.1	<0.005	40	<0.01	<0.02	<0.05	<0.01	1	0.14	<0.05	<0.001	<0.05	<0.05	2.5	<0.02	7.5	<0.005	<0.02	174	480		**0.44**
	1/26/1982					<0.005	40			<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.1		1.7		7.9	<0.005		168	500		
	2/22/1982					<0.005	38			<0.05	<0.01	0.9	0.11	<0.05	<0.001	<0.05		1.4		7.7	<0.005		168	510		
	4/26/1982					<0.005	40			<0.05	<0.01	0.8	0.36	<0.05	<0.001	0.05		1.3		7.6	<0.005		165	510		
	5/17/1982					<0.005	44			<0.05	<0.01	0.8	0.11	<0.05	<0.001	<0.05		1.9		7.8	<0.005		185	510		
	6/8/1982					<0.005	44			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		1.7		7.9	<0.005		185	530		
	6/30/1982					<0.005	44			<0.05	<0.01	0.8	0.39	<0.05	<0.001	<0.05		2.3		7.9	<0.005		198	590		
	9/2/1982					<0.001	52.22					0.78		<0.05		<0.01		1.94		7.3	<0.005		247.6	700		
	12/23/1982					<0.005	52			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		1.6		8.5	<0.005		235	650		
	2/21/1983					<0.005	44			<0.05	<0.01	0.8	0.38	<0.05	<0.001	<0.05		1.7		8	<0.005		218	600		
	5/13/1983					<0.005	44			<0.05	0.01	0.8	<0.1	<0.05	<0.001	<0.05		1.9		8.1	<0.005		206	570		
	8/9/1983					<0.005	46			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		2		7.9	<0.005		168	580		
	11/1/1983					<0.005	46			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		4.8		8	<0.005		174	580		
	3/16/1984					<0.005	52			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		3.8		8.3	<0.005		184	540		
	5/30/1984					<0.005	58			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		1.9		7.5	<0.005		195	550		
	9/12/1984					<0.005	60			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		2.3		7.9	<0.005		181	590		
	11/27/1984					<0.005	60			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		2.3		7.7	<0.005		165	570		
	5/17/1985						64													7.8			197	640		
	11/13/1985						62													7.7			183	600		
	5/23/1986						66													7.8			210	650		
	10/8/1986						70													7.6			200	560		
	3/4/1987	<0.1		<0.1	<0.1	<0.1	69	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1	6.7		<0.1	200	696		<0.1
	5/25/1987																						230			
	1/12/1988	<0.1		<0.1	<0.1	<0.1	77.1	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1			<0.1	253	718		<0.1
	4/4/1988						74.6																277.7	694		
	8/23/1988						73																293.8	772		
	2/9/1989						77																258.4	730		
	6/1/1989						69.7																238.2	708		
	11/30/1989						79.8																254.3	732		

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Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.2	0.002	1.0	0.2	10	0.05	6-9	0.05	0.05	600	1000	0.03	0.03
GWQ-11	11/14/1990						104.4																257.4	746		
	2/11/1991		<0.001				88.9																233.4	790		
	7/19/1991		0.004	0.1		<0.005	89.7	<0.02				0.74	<0.05	<0.02	<0.0002			3.93	<0.002	7.36	0.002	<0.02	210.2	785		
	8/29/1991						92.6													7.46			278.6	771		
	11/26/1991						89.3													7.29			240.7	770		
	3/15/1992						65.1													7.91			260.2	765		
	5/25/1992						96.2													7.45			258.1	761		
	10/8/1992						96													7.42			226.9	755		
	11/27/1992						96													7.85			248.4	763		
	12/15/1992						98.1			0.017										7.59			220	741		
	2/25/1993						104													7.64			273.3	762		
	3/30/1993	0.2	<0.005	<0.5	0.04	<0.002	104	<0.02	<0.05	<0.01	<0.01	0.52	0.33	0.03	<0.001	<0.02	<0.01	4.1	<0.02	7.7	<0.005	<0.01	271	776		0.03
	9/28/1993						105.6													7.57			207.7	800		
	5/25/1994	0.14	<0.005	<0.1		<0.0005	110	<0.025		<0.025		0.72	0.16	<0.03	<0.001		<0.05	3.8	<0.005	7.88	<0.005	<0.025	260	820		<0.05
	6/23/1994						117.2													7.42			274.6	802		
	7/22/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	116	<0.025	<0.05	<0.025		0.7	<0.05	<0.03	<0.001	<0.05	<0.05	3.8	<0.005	7.7	<0.005	<0.025	272	808		<0.05
	9/22/1994						112.3													7.37			234.5	816		
	1/29/1995						199.5													7.6			158.7	861		
	3/29/1995						99.4													7.96			136.9	793		
	6/27/1995						101.7													7.67			278.8	835		
	9/21/1995						112.1													7.58			289.5	865		
	1/10/1996						120.8													7.36			287.5	777		
	4/3/1996						119.2													7.38			276.5	767		
	9/25/1996						116													7.78			229.9	835		
	1/15/1997						127													7.68			303.9	860		
GWQ-12	2/21/1983					<0.005	18			<0.05	<0.01	1	<0.1	<0.05		<0.05		2.2		7.7	<0.005		53	360		
	5/13/1983					<0.005	16			<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05		2.1		8.1	<0.005		37	330		
	8/9/1983					<0.005	22			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.1		7.8	<0.005		130	480		
	11/1/1983					<0.005	14			<0.05	<0.01	1.1	0.32	<0.05	<0.001	<0.05		2.8		8.2	<0.005		38	340		

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Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
GWQ-12	3/16/1984					<0.005	14			<0.05	<0.01	1.1	<0.1	<0.05	<0.001	<0.05		3.8		8.2	<0.005		44	320		
	5/30/1984					<0.005	16			<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05		2.5		8	<0.005		47	320		
	9/12/1984					<0.005	16			<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05		2.2		8	<0.005		38	330		
	11/27/1984					<0.005	14			<0.05	<0.01	1	<0.1	<0.05	<0.001	<0.05		2.3		7.8	<0.005		37	340		
	5/27/1985						14													8			36	370		
	11/13/1985						14													7.8			35	310		
	5/23/1986						16													7.8			31	330		
	10/8/1986						16													7.6			35	310		
	7/21/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	16	<0.025	<0.05	<0.025		0.99	<0.05	<0.03	<0.001	<0.05	<0.05	2.1	<0.005	7.75	<0.005	<0.025	38	358		<0.05
GWQ94-13	11/15/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	190	<0.025	<0.05	<0.025		0.36	0.11	<0.03	<0.001	<0.05	<0.05	4.6	<0.005	7.74	<0.005	<0.025	**720**	**1570**		<0.05
	7/1/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	200	<0.025	<0.05	<0.025		0.34	<0.05	<0.03	<0.001	<0.05	<0.05	5.2	<0.005	7.76	0.0068	<0.05	**620**	**1520**		<0.05
	7/2/2010	<0.020	<0.0010	0.040	<0.040	<0.0020	**290**	<0.0060	<0.0060	<0.0060		0.35	<0.020	<0.0020	0.00026	<0.0080	<0.010		<0.0050	8	0.024	<0.0050	**770**	**1730**	0.0016	<0.010
	10/5/2010	<0.02	<0.005	0.038	<0.04	<0.002	**280**	<0.006	<0.006	<0.006		0.32	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	7.39	0.024	<0.005	**760**	**1670**	0.0015	<0.01
GWQ94-14	1/1/1900	<0.05	<0.005	<0.1	<0.1	<0.0005	22	<0.025	<0.05	<0.025		0.52	<0.05	<0.03	<0.001	<0.05	<0.05	1.3	<0.005	7.95	<0.005	<0.025	140	560		<0.05
	6/30/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	26	<0.025	<0.05	<0.025		0.48	<0.05	<0.03	<0.001	<0.05	<0.05	1.5	<0.005	8.44	<0.005	<0.05	140	520		<0.05
	1/29/2010	<0.020	0.0030	0.045	<0.040	<0.0020	50	<0.0060	<0.0060	<0.0060		0.48	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	0.0061	<0.0050	140	543		0.010
	6/29/2010	<0.020	0.0023	0.048	<0.040	<0.0020	49	<0.0060	<0.0060	<0.0060		0.48	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	0.0052	<0.0050	150	573	0.0014	<0.010
	10/5/2010	<0.02	0.0024	0.045	<0.04	<0.002	50	<0.006	<0.006	<0.006		0.53	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	7.57	0.0053	<0.005	150	563	0.0013	<0.01
GWQ94-15	11/14/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	110	<0.025	<0.05	<0.025		0.46	<0.05	<0.03	<0.001	<0.05	<0.05	2.1	<0.005	7.74	<0.005	<0.025	180	790		<0.05
	7/1/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	130	<0.025	<0.05	<0.025		0.42	0.41	<0.03	<0.001	<0.05	<0.05	2.5	<0.005	7.31	<0.005	<0.05	240	780		<0.05
	1/29/2010	<0.020	0.0042	0.058	<0.040	<0.0020	170	<0.0060	<0.0060	<0.0060		0.30	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	7	0.021	<0.0050	420	**1080**		0.022
	6/29/2010	<0.020	<0.0010	0.059	<0.040	<0.0020	110	<0.0060	<0.0060	<0.0060		0.43	<0.020	0.0049	<0.00020	<0.0080	<0.010		<0.0050	8	0.0095	<0.0050	260	805	0.0017	<0.010
	10/1/2010	<0.02	<0.001	0.056	<0.04	<0.002	110	<0.006	<0.006	<0.006		0.44	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	7.52	0.012	<0.005	260	794	0.0018	<0.01
GWQ94-16	11/13/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	190	<0.025	<0.05	<0.025		0.66	<0.05	0.038	<0.001	<0.05	<0.05	3.8	<0.005	7.55	<0.005	<0.025	410	**1140**		<0.05
	7/1/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	200	<0.025	<0.05	<0.025		0.57	0.22	<0.03	<0.001	<0.05	<0.05	3.7	<0.005	7.95	<0.005	<0.05	500	**1160**		<0.05
	6/29/2010	<0.020	0.0022	0.039	0.048	<0.0020	180	<0.0060	<0.0060	<0.0060		0.62	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	0.011	<0.0050	440	**1190**	0.0025	<0.010
	9/30/2010	<0.02	0.0024	0.038	0.053	<0.002	190	<0.006	<0.006	<0.006		0.67	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	7.5	0.015	<0.005	440	**1170**	0.0024	<0.01
GWQ94-17	11/15/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	110	<0.025	<0.05	<0.025		0.46	<0.05	<0.03	<0.001	<0.05	<0.05	2.4	<0.005	7.71	<0.005	<0.025	240	820		<0.05

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.2	0.002	1.0	0.2	10	0.05	6-9	0.05	0.05	600	1000	0.03	0.03
GWQ94-17	6/30/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	81	<0.025	<0.05	<0.025		0.46	0.062	<0.03	<0.001	<0.05	<0.05	2	<0.005	8.56	<0.005	<0.05	190	690		<0.05
	7/6/2010	<0.020	0.0022	0.047	<0.040	<0.0020	68	<0.0060	<0.0060	<0.0060		0.52	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	0.0062	<0.0050	180	629	0.0016	<0.010
GWQ94-20	11/15/1994	<0.05	<0.005	<0.1	0.11	<0.0005	19	<0.025	<0.05	<0.025		0.36	<0.05	**0.42**	<0.001	<0.05	<0.05	1	<0.005	7.66	<0.005	<0.025	40	370		<0.05
	6/30/1996	<0.025	<0.005	0.12	0.086	<0.0005	21	<0.025	<0.05	<0.025		0.29	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	8.79	<0.005	<0.05	56	390		<0.05
GWQ94-21A	11/13/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	18	<0.025	<0.05	<0.025		0.57	<0.05	0.2	<0.001	<0.05	<0.05	1	<0.005	7.25	<0.005	<0.025	130	480		<0.05
	6/30/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	16	<0.025	<0.05	<0.025		0.51	<0.05	<0.03	<0.001	<0.05	<0.05	1.1	<0.005	8.22	<0.005	<0.05	120	470		<0.05
GWQ94-21B	11/13/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	19	<0.025	<0.05	<0.025		0.39	<0.05	**0.37**	<0.001	<0.05	<0.05	<1	<0.005	7.57	<0.005	<0.025	130	440		<0.05
	6/30/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	17	<0.025	<0.05	<0.025		0.52	<0.05	<0.03	<0.001	<0.05	<0.05	1.1	<0.005	8.6	<0.005	<0.05	120	470		<0.05
GWQ96-22A	7/13/1996	<0.025	<0.005	<0.05	<0.05	<0.0005	89	<0.025	<0.05	<0.025		**3.3**	<0.05	0.075	<0.001	<0.05	<0.05	<1	<0.005	7.5	<0.005	<0.05	250	700		<0.05
	4/9/1997						20			<0.025		0.8	**6.5**	**2.8**	<0.001					7.58	<0.005		150	770		
	8/8/1997	0.028	<0.005	0.057	0.23	<0.002	89	<0.025	<0.05	<0.05		**2.2**	0.13	**0.53**		<0.05	<0.05	<1	<0.005	7.65	<0.005	<0.025	230	700		<0.05
	1/30/2010	<0.020	0.0029	0.094	0.28	<0.0020	81	<0.0060	<0.0060	<0.0060		**2.6**	**2.1**	**0.74**	<0.00020	<0.0080	<0.010		<0.0050	8	<0.0025	<0.0050	44	557		<0.010
	7/1/2010	<0.020	0.0035	0.079	0.28	<0.0020	70	<0.0060	<0.0060	<0.0060		**2.7**	0.021	**0.65**	<0.00020	<0.0080	<0.010		<0.0050	8	0.0011	<0.0050	52	573	<0.0010	<0.010
	10/7/2010	<0.02	0.0035	0.084	0.28	<0.002	75	<0.006	<0.006	<0.006		**2.7**	0.32	**0.49**	<0.0002	<0.008	<0.01		<0.005	8	<0.001	<0.005	34	564	<0.001	<0.01
GWQ96-22B	7/13/1996	<0.025	<0.005	0.096	0.12	<0.0005	210	<0.025	<0.05	<0.025		**1.8**	<0.05	**0.41**	<0.001	<0.05	<0.05	<1	<0.005	7.75	<0.005	<0.05	79	650		<0.05
	10/7/2010	<0.02	0.0057	0.11	0.24	<0.002	110	<0.006	<0.006	<0.006		**3**	**9.3**	**1.2**	<0.0002	<0.008	<0.01		<0.005	7.52	0.0011	<0.005	<0.5	730	<0.001	<0.01
GWQ96-23A	7/14/1996	0.28	<0.005	0.064	<0.05	<0.0005	22	<0.025	<0.05	<0.025		0.84	0.26	0.05	<0.001	<0.05	<0.05	<1	<0.005	7.95	<0.005	<0.05	140	520		<0.05
	4/9/1997						16			<0.025		1.4	0.1	**0.75**	<0.001						<0.005		170	580		
	8/8/1997	0.036	<0.005	0.13	0.067	<0.002	18	<0.025	<0.05	<0.025		1.2	0.82	**1.6**		<0.05	<0.05	<1	<0.005	7.68	<0.005	<0.025	410	920		<0.05
	1/30/2010	<0.020	0.0027	0.091	0.074	<0.0020	12	<0.0060	<0.0060	<0.0060		**1.7**	0.66	**0.63**	<0.00020	<0.0080	<0.010		<0.0050	8	<0.0025	<0.0050	5.6	689		<0.010
	7/1/2010	<0.020	0.0011	0.13	0.068	<0.0020	14	<0.0060	<0.0060	<0.0060		1.5	0.048	**0.37**	<0.00020	<0.0080	<0.010		<0.0050	8	0.0014	<0.0050	140	804	0.0025	<0.010
	10/6/2010	<0.02	<0.001	0.087	0.08	<0.002	12	<0.006	<0.006	<0.006		1.6	0.31	**0.41**	<0.0002	<0.008	<0.01		<0.005	7.89	0.0013	<0.005	99	769	0.0037	<0.01
GWQ96-23B	7/14/1996	**7.4**	<0.005	0.093	0.058	<0.0005	20	<0.025	<0.05	<0.025		1.1	**3.7**	0.13	<0.001	<0.05	<0.05	<1	<0.005	8.15	<0.005	<0.05	170	550		<0.05
	10/6/2010	<0.02	<0.001	0.1	0.14	<0.002	19	<0.006	<0.006	<0.006		**2.1**	**1.4**	**0.36**	<0.0002	<0.008	<0.01		<0.005	7.85	0.0011	<0.005	<0.5	554	<0.001	<0.01
Hill	7/31/1947						10					0.6						0.7					76	320		
IW-1	3/4/1987						**575**													6.6			**1901**	**3802**		
	7/19/1991		<0.002	<0.01		<0.005	**632.6**	<0.02		<0.02		0.69	<0.05	<0.02	0.0005			9.06	<0.005	7.87	0.015	<0.02	**1985**	**4235**		
	8/29/1991						**642.4**													7.13			**1917.9**	**4120**		

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.2	0.002	1.0	0.2	10	0.05	6-9	0.05	0.05	600	1000	0.03	0.03
IW-1	11/26/1991						**615.1**													7.53			**1634**	**3979**		
	3/15/1992						**610.7**													7.88			**2201**	**4026**		
	5/25/1992						**598.2**													7.09			**2203**	**4155**		
	7/16/1992						**584.6**													7.12			**1775**	**4297**		
	10/8/1992						**616.9**													6.96			**1726.8**	**3996**		
	11/27/1992						**604.8**													7.71			**1716.6**	**4004**		
	12/15/1992						**608.9**													7.4			**1414.6**	**3969**		
	9/28/1993						**521.1**													7.12			**1150**	**3661**		
	3/17/1994						**404.8**													7			**1569**	**3684**		
	5/24/1994	0.94	<0.005	<0.1		<0.0005	**470**	<0.025		<0.025		0.7	1	<0.03	<0.001		<0.05	5.8	<0.005	7.84	<0.005	<0.025	**1500**	**3500**		**0.053**
	6/23/1994						**473.8**													7.69			**1444**	**3555**		
	7/22/1994	<0.05	<0.005	<0.1	0.1	<0.0005	**431**	<0.025	<0.05	<0.025		0.72	<0.05	<0.03	<0.001	<0.05	<0.05	5.9	<0.005	7.51	0.018	<0.025	**1480**	**3450**		<0.05
	9/22/1994						**435.9**													7.05			**1348**	**3466**		
	1/29/1995						**663**													7.18			**1478.5**	**3395**		
	3/29/1995						**419.4**													7.49			**1350.7**	**3465**		
	6/27/1995						**446.1**													6.99			**1680.1**	**3599**		
	9/21/1995						**458.7**													6.82			**1710.8**	34.87		
	1/10/1996						**442.2**													7.23			**1595.5**	**3437**		
	9/25/1996						**568**													7.17			**1493**	**3551**		
	1/15/1997						**410**													7.44			**1694.5**	35.97		
IW-2	9/2/1982					<0.001	**409.07**					1.22		<0.05		<0.01		1.38		7.3	<0.005		**2252**	**4010**		
	5/25/1994	**22**	<0.005	0.12		<0.0005	**340**	0.046		<0.025		0.66	**16**	**0.77**	<0.001		0.097	1.5	0.0073	7.75	<0.005	<0.025	**1000**	**2400**		**0.084**
	7/22/1994	<0.05	<0.005	<0.1	0.15	<0.0005	**380**	<0.025	<0.05	<0.025		0.69	<0.05	0.036	<0.001	<0.05	<0.05	<1	<0.005	7.78	0.014	<0.025	**1040**	**2390**		<0.05
	1/31/2010	0.13	0.0092	0.024	0.075	<0.0020	**600**	<0.0060	0.0065	<0.0060		0.74	**1.3**	**1.6**	<0.00020	0.020	<0.010		<0.0050	8	0.033	<0.0050	**1200**	**2770**		<0.010
	6/29/2010	<0.020	<0.0010	0.029	0.061	<0.0020	**580**	<0.0060	<0.0060	<0.0060		0.67	0.87	**2.2**	0.00048	0.024	<0.010		<0.0050	7	0.029	<0.0050	**1100**	**2700**	0.0060	<0.010
	9/30/2010	0.044	<0.001	0.028	0.073	<0.002	**500**	<0.006	<0.006	<0.006		0.68	0.41	**2.2**	<0.0002	0.02	<0.01		<0.005	7.36	0.037	<0.005	**1000**	**2280**	0.0057	0.018
IW-3	9/2/1982					<0.001	159.12					0.42		<0.05		<0.01		4.12		7.2	<0.005		**707.3**	**1562**		
	2/25/1993						**589.5**													7.27			**1738.9**	**3892**		
	5/26/1994	**32**	<0.005	0.2		<0.0005	209	**0.059**		**6**		0.47	**22**	**0.35**	<0.001		0.19	5.7	**0.077**	7.83	<0.005	<0.025	415	**1870**		**0.15**

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
IW-3	7/23/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	206	<0.025	<0.05	0.058		0.48	<0.05	0.13	<0.001	0.062	<0.05	5	<0.005	7.76	0.011	<0.025	437	**1300**		<0.05
	4/3/1996						**432.6**													7.04			**1566.3**	**3364**		
Ladder-Higgins	8/2/1994	<0.05	<0.005	<0.1	0.11	<0.0005	48	<0.025	<0.05	<0.025		**1.9**	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	8.01	<0.005	<0.025	22	286		<0.05
McCravey-Greyback	3/31/1993	<0.1	<0.005	<0.5	<0.04	<0.002	30	<0.02	<0.05	<0.01	<0.01	0.51	0.05	<0.02	<0.001	<0.02	<0.01	3	<0.02	7.8	<0.005	<0.01	207	632		0.01
Miranda	7/31/1947						**380**					0.2						4.2					64	823		
MW-1	1/1/1975						10					0.7						6.1		8.1			73	433		
	9/28/2010	<0.02	0.0039	0.022	0.044	<0.002	14	<0.006	<0.006	<0.006		0.4	0.11	0.0054	<0.0002	<0.008	<0.01		<0.005	8.1	<0.005	<0.005	48	303	0.0016	**0.43**
MW-2	5/7/1975						8					**2.3**								7.9			40	327		
	7/20/1994	<0.05	0.019	<0.1	0.16	<0.0005	5.5	<0.025	<0.05	<0.025		**3.1**	0.069	<0.03	<0.001	<0.05	<0.05	<1	<0.005	9	<0.005	<0.025	18	254		<0.05
	9/28/2010	<0.02	0.02	<0.002	0.15	<0.002	5.8	0.032	<0.006	<0.006		**3.3**	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	**9.27**	<0.005	<0.005	18	274	0.0022	<0.01
MW-4	6/13/1975						15					0.63								7.9			110			
	7/20/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	17	<0.025	<0.05	<0.025		0.28	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	8.34	<0.005	<0.025	66	256		<0.05
MW-5	9/19/1975						30					0.61						<0.5		7.7			26	260		
	7/20/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	17	<0.025	<0.05	<0.025		0.18	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	7.97	<0.005	<0.025	24	440		<0.05
MW-6	1/1/1975						66					**3.4**						4.3		7.6			38	260		
	8/2/1994	<0.05	0.013	<0.1	0.16	<0.0005	75	<0.025	<0.05	<0.025		1.6	0.41	<0.03	<0.001	<0.05	<0.05	<1	<0.005	8.09	<0.005	<0.025	45	436		<0.05
	7/8/2010	<0.020	0.018	0.0095	0.15	<0.0020	75	0.016	<0.0060	<0.0060		**8.1**	0.024	0.0027	<0.00020	0.013	<0.010		<0.0050	8	0.0015	<0.0050	49	456	<0.0010	<0.010
	9/27/2010	<0.02	0.02	0.0093	0.16	<0.002	73	0.016	<0.006	<0.006		**8.2**	0.021	<0.002	<0.0002	0.013	<0.01		<0.005	8.44	<0.005	<0.005	49	468	<0.001	<0.01
MW-8	1/1/1975						10					0.86						**15.4**		7.7			21	293		
	7/21/1994	<0.05	0.012	<0.1	<0.1	<0.0005	6.6	<0.025	<0.05	<0.025		1	0.14	<0.03	<0.001	<0.05	<0.05	<1	<0.005	8.88	<0.005	<0.025	18	290		<0.05
	10/12/2010	<0.02	0.013	<0.002	0.085	<0.002	6.5	<0.006	<0.006	<0.006		1.1	<0.02	0.0033	<0.0002	<0.008	<0.01		<0.005	**9.23**	0.0016	<0.005	16	287	0.0016	<0.01
MW-9	11/16/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	12	<0.025	<0.05	<0.025		1.4	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	8.05	<0.005	<0.025	12	230		<0.05
	7/7/2010	<0.020	0.0039	0.0023	<0.040	<0.0020	13	<0.0060	<0.0060	<0.0060		1.4	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	<0.0010	<0.0050	12	206	0.0012	<0.010
	10/4/2010	<0.02	0.0039	<0.002	0.051	<0.002	13	<0.006	<0.006	<0.006		1.3	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	8.06	<0.001	<0.005	11	194	0.0012	<0.01
MW-10	11/16/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	14	<0.025	<0.05	<0.025		0.43	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	7.84	<0.005	<0.025	25	310		<0.05
MW-11	11/16/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	15	<0.025	<0.05	<0.025		0.45	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	7.79	<0.005	<0.025	21	314		<0.05

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Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
MW-11	7/7/2010	<0.020	0.0015	0.018	<0.040	<0.0020	14	<0.0060	<0.0060	<0.0060		0.49	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	7	<0.0010	<0.0050	15	289	<0.0010	<0.010
	10/4/2010	<0.02	0.0016	0.02	<0.04	<0.002	14	<0.006	<0.006	<0.006		0.49	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	7.32	<0.001	<0.005	14	301	<0.001	<0.01
NP-1	10/8/1981	<0.25	<0.004	<1	<0.004	<0.01	24.9	<0.05	<0.05	<0.05	<0.05	0.84	0.27	**0.92**	<1	<0.1	<0.05	0.47	<0.05	7.6	0.003	<0.02	108	496		**0.4**
	11/4/1981	<0.01	<0.01	<0.2	<0.1	<0.005	28	<0.01	<0.02	<0.05	0.04	1	<0.1	**0.6**	<0.001	<0.05	<0.05	0.3	<0.02	8.1	<0.005	<0.02	148	470		**0.14**
	11/13/1981	<0.25	<0.005	0.2	0.044	0.006	24.08	<0.005			0.001	0.83		**1.34**	<0.0005	0.011	<0.05	0.09	<0.005	7.65	0.029	<0.001	130.7	470		**0.44**
	11/17/1981	<0.01	<0.005	0.24	<0.1	<0.005	24	<0.01	<0.02	0.069	<0.01	0.8	<0.1	**1.4**	<0.001	0.06	<0.05	0.2	<0.02	8	<0.005	<0.02	154	460		**3.9**
	11/23/1981	<0.01	<0.01	0.02	<0.1	<0.005	26	<0.02	<0.02	<0.05	<0.01	0.8	<0.1	**1.2**	<0.001	<0.05	<0.05	0.2	<0.02	7.7	<0.005	<0.02	146	530		**4.1**
	12/7/1981	<0.01	<0.01	<0.2	<0.1	<0.005	24	<0.01	<0.02	<0.05	<0.01	0.8	<0.1	**1.2**	<0.001	<0.05	<0.05	0.2	<0.02	7.3	<0.005	<0.02	158	490		**5.1**
	12/15/1981	<0.01	<0.01	<0.2	<0.1	<0.005	24	<0.01	<0.02	<0.05	<0.01	0.8	<0.1	**1.2**	<0.001	<0.05	<0.05	<0.2	<0.02	7.8	<0.005	<0.02	151	480		**5.3**
	12/22/1981	<0.01	<0.01	<0.2	<0.1	<0.005	22	<0.01	<0.02	<0.05	<0.01	0.8	<0.1	**1**	<0.001	<0.05	<0.05	0.3	<0.02	7.8	<0.005	<0.02	149	450		**4.1**
	1/5/1982	<0.01	<0.01	<0.2	<0.1	<0.005	22	<0.01	<0.02	<0.05	<0.01	0.8	0.14	**0.71**	0.0012	<0.05	<0.05	0.7	<0.02	7.6	<0.02	<0.02	163	400		**4.1**
	1/26/1982					<0.005	22			<0.05	<0.01	0.7	<0.1	**0.45**	<0.001	<0.1		0.5		7.9	<0.005		154	440		
	2/22/1982					<0.005	24			0.48	<0.01	0.7	0.83	**0.26**	<0.001	<0.05		0.6		7.9	<0.005		158	460		
	4/26/1982					<0.005	26			<0.05	<0.01	0.6	**1.2**	0.16	<0.001	<0.05		0.7		7.9	<0.005		154	440		
	5/24/1982												<0.1	**0.28**												
	5/28/1982												<0.1	**0.22**												
	6/8/1982					<0.005	20			<0.05	<0.01	0.6	<0.1	**0.25**	<0.001	<0.05		1.1		7.5	<0.005		162	500		
	6/30/1982					<0.005	18			<0.05	<0.01	0.6	<0.1	0.18	<0.001	<0.05		1.1		7.7	<0.005		143	500		
	10/27/1982					<0.005	20			<0.05	<0.01	0.7	0.45	0.058	<0.001	<0.05		1.3		7.7	<0.005		151	470		
	2/21/1983					<0.005	18			<0.05	<0.01	0.7	<0.1	<0.05	<0.001	<0.05		1.3		7.7	<0.005		156	490		
	5/13/1983					<0.005	24			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.1		7.9	<0.005		149	470		
	8/9/1983					<0.005	22			<0.05	<0.01	0.6	0.22	<0.05	<0.001	<0.05		1.1		7.8	<0.005		130	480		
	11/1/1983					<0.005	18			<0.05	<0.01	0.6	0.14	<0.05	<0.001	<0.05		2.1		7.8	<0.005		125	500		
	3/16/1984					<0.005	22			<0.05	<0.01	0.6	<0.1	<0.05	**0.0083**	<0.05		1.8		8.2	<0.005		124	480		
	4/9/1984														<0.001											
	5/30/1984					<0.005	22			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		0.7		7.5	<0.005		154	510		
	9/12/1984					<0.005	22			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.1		7.7	<0.005		137	480		
	11/27/1984					<0.005	16			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.1		7.8	<0.005		144	480		
	5/17/1985						20													7.6			144	510		

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-1	11/13/1985						16													7.3			149	480		
	5/23/1986						18													7.6			142	500		
	10/8/1986						22													7.4			107	470		
	3/30/1989	<0.1		<0.1	<0.1	<0.1	14.9	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1			<0.1	137	492		**2.6**
	7/19/1991		0.003	0.02		<0.005	21.6	<0.02				0.58	0.59	<0.02	<0.0002			0.99	0.007	8.04	<0.002	<0.02	133.4	530		
	8/29/1991						21.1													7.69			140.7	501		
	11/26/1991						22.7													7.12			136.8	**1484**		
	3/15/1992						22.1													7.8			146.2	510		
	5/25/1992						28.6													7.49			128.2	608		
	7/16/1992						21.7													7.5			142.2	487		
	10/8/1992						21.7													7.35			128.8	517		
	11/27/1992						21.3													7.85			142.4	498		
	12/15/1992						23.7													7.58			125	502		
	2/25/1993						22.6													7.42			138.3	510		
	3/30/1993	<0.1	<0.005	<0.5	0.03	<0.002	22	<0.02	<0.05	<0.01	<0.01	0.59	0.17	<0.02	<0.001	<0.02	<0.01	1.1	<0.02	7.7	<0.005	<0.01	145	496		**1.13**
	9/28/1993						36.2													7.48			110.1	508		
	3/17/1994						24													7.3			134.2	516		
	5/24/1994	0.83	0.005	<0.1		0.0096	22	<0.025		<0.025		0.56	**9.5**	0.1	<0.001		<0.05	1.1	0.016	7.53	<0.005	<0.025	130	510		**5.7**
	6/23/1994						40.3													7.5			142.3	453		
	7/21/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	23	<0.025	<0.05	<0.025		0.65	0.052	**0.27**	<0.001	<0.05	<0.05	<1	<0.005	7.87	<0.005	<0.025	133	464		**4.9**
	9/22/1994						24.3													7.49			118.8	488		
	1/29/1995						26.2													7.94			125.4	407		
	3/29/1995						23.3													7.98			86.2	392		
	6/27/1995						24.1													8.02			113.7	385		
	9/21/1995						27.2													7.96			145	373		
	1/10/1996						26.1													7.73			109.4	277		
	4/3/1996						25.7													7.89			123.3	300		
	9/25/1996						23.6													8.22			94.4	320		
	1/15/1997						25.6													8.42			109.13	318		

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-1	1/31/2010	<0.020	<0.0025	0.037	<0.040	<0.0020	38	<0.0060	<0.0060	<0.0060		0.55	0.10	0.0088	<0.00020	<0.0080	<0.010		<0.0050	8	0.0055	<0.0050	140	514		**0.38**
	6/28/2010	<0.020	0.0034	0.043	<0.040	<0.0020	37	<0.0060	<0.0060	<0.0060		0.61	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	0.0045	<0.0050	150	548	0.0019	**0.047**
	10/5/2010	0.14	0.0035	0.041	0.04	<0.002	35	<0.006	<0.006	<0.006		0.58	<0.02	<0.002	<0.0002	<0.008	<0.01		<0.005	7.63	0.0045	<0.005	140	537	0.0018	**0.055**
NP-2	10/8/1981	<0.25	0.024	<1	0.08	<0.01	45.1	<0.05	<0.05	<0.05	<0.05	**1.78**	<0.1	**0.62**	<1	<0.1	<0.05	0.23	<0.05	7.39	<0.002	<0.02	198	476		**0.31**
	11/6/1981	<0.01	<0.01	<0.2	<0.1	<0.005	35	<0.01	<0.02	<0.05	<0.01	1.4	<0.1	**0.39**	<0.001	0.21	<0.05	0.4	<0.02	7.6	<0.005	<0.02	164	450		**1.7**
	11/13/1981	<0.25	<0.005	<0.1	0.04	<0.001	30.79	<0.005			0.0026	1.14		**0.79**	<0.0005	0.04	<0.01	0.25	<0.005	7.65	0.017	<0.001	162.4	466		**3.18**
	11/23/1981	<0.01	<0.01	0.02	<0.1	<0.005	30	<0.02	<0.02	<0.05	<0.01	0.9	<0.1	**0.54**	<0.001	0.06	<0.05	0.7	<0.02	7.7	<0.005	<0.02	156	520		**3.5**
	12/7/1981	<0.01	<0.01	<0.2	<0.1	<0.005	30	<0.01	<0.02	<0.05	<0.01	0.8	<0.1	**0.54**	<0.001	0.06	<0.05	0.6	<0.02	7.5	<0.005	<0.02	160	490		**4.4**
	12/15/1981	<0.01	<0.01	<0.2	<0.1	<0.005	32	<0.01	<0.02	<0.05	<0.01	0.9	<0.1	**0.52**	<0.001	0.072	<0.05	0.5	<0.02	8	<0.005	<0.02	161	480		**2.9**
	12/22/1981	<0.01	<0.01	0.21	<0.1	<0.005	32	<0.01	<0.02	<0.05	<0.01	0.6	0.12	**0.51**	<0.001	0.053	<0.05	0.8	<0.02	8	<0.005	<0.02	161	440		**2.8**
	1/5/1982	<0.01	<0.01	<0.2	<0.1	<0.005	28	<0.01	<0.02	<0.05	<0.01	0.9	0.14	**0.49**	<0.001	0.07	<0.05	0.9	<0.02	7.6	<0.02	<0.02	158	400		**3.2**
	1/26/1982					<0.005	24			<0.05	<0.01	0.7	<0.1	**0.34**	<0.001	<0.1		1.1		8	<0.005		160	450		
	2/22/1982					<0.005	30			0.069	<0.01	0.7	0.37	**0.3**	<0.001	<0.05		0.8		8	<0.005		151	440		
	4/26/1982					<0.005	42			<0.05	<0.01	1	**1.2**	**0.29**	<0.001	<0.05		2.4		8	<0.005		149	450		
	5/18/1982					**0.015**	34			<0.05	<0.01	0.6	0.68	0.078	<0.001	<0.05		1.8		7.9	<0.005		128	460		
	5/24/1982												<0.1	<0.05												
	5/28/1982												<0.1	<0.05												
	6/8/1982					<0.005	26			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		0.9		7.8	<0.005		158	490		
	6/30/1982					<0.005	26			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.4		7.8	<0.005		133	490		
	9/2/1982					<0.001	26.49					0.54		<0.05		<0.01		1.66		7.4	<0.005		127	468		
	10/27/1982					<0.005	26			<0.05	<0.01	0.6	0.29	<0.05	<0.001	<0.05		1.6		7.9	<0.005		120	440		
	2/21/1983					<0.005	24			<0.05	<0.01	0.6	0.12	<0.05	<0.001	<0.05		1.6		7.8	<0.005		127	440		
	5/13/1983					<0.005	24			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.5		8.1	<0.005		139	460		
	8/9/1983					<0.005	36			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.6		7.9	<0.005		148	560		
	11/1/1983					<0.005	24			<0.05	<0.01	0.6	0.17	<0.05	<0.001	<0.05		2.3		8	<0.005		111	470		
	3/16/1984					<0.005	30			<0.05	<0.01	0.8	<0.1	<0.05	0.001	<0.05		1.6		8.2	<0.005		146	500		
	5/30/1984					<0.005	32			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.4		7.7	<0.005		175	520		
	9/12/1984					<0.005	22			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.7		7.8	<0.005		134	470		
	11/27/1984					<0.005	20			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.7		7.9	<0.005		125	470		

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
Stage 1 Abatement Plan Investigation Report
Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-2	5/17/1985						22													7.8			120	480		
	11/13/1985						22													7.4			115	460		
	5/23/1986						28													7.6			113	480		
	10/8/1986						24													7.4			100	430		
	3/30/1989	<0.1		<0.1	<0.1	<0.1	29.2	<0.1	<0.05	<0.1			<0.1	0.06		<0.1	<0.1		<0.1			<0.1	124	376		**0.5**
	7/19/1991		<0.002	<0.01		<0.005	60.9	<0.02		<0.02		0.64	<0.05	<0.02	<0.0002			0.02	<0.005	7.55	0.018	<0.02	180.8	453		
	8/29/1991						62.8													8.11			197.6	471		
	11/26/1991						63													7.45			170	460		
	3/15/1992						67.6						<0.05							8.07			194.2	467		
	5/25/1992						66.6						<0.05							8.34			161.7	456		
	7/16/1992						65.3						<0.05							8.13			183.7	479		
	10/8/1992						78.2													8.26			178.9	494		
	11/27/1992						63.7													8.38			179.4	451		
	12/15/1992						82.5						<0.05							8.43			166.8	612		
	2/25/1993						77.8													8.62			197.2	475		
	3/30/1993	0.5	<0.005	0.6	0.1	<0.002	239	<0.02	<0.05	0.01	<0.01	1.33	**1.85**	0.07	<0.001	<0.02	<0.01	3.3	<0.02	7.7	0.005	<0.01	436	**1310**		**0.67**
	9/28/1993						207													7.92			299.9	**1170**		
	3/17/1994						118.2													7.65			300.5	971		
	5/24/1994	4.6	<0.005	<0.1		0.00097	130	<0.025		<0.025		0.97	**4.5**	0.19	<0.001		<0.05	<0.1	0.0079	8.03	<0.005	<0.025	300	878		**4.1**
	6/23/1994						124.3													7.69			267.6	848		
	7/22/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	128	<0.025	<0.05	<0.025		0.94	<0.05	<0.03	<0.001	<0.05	<0.05	1.5	<0.005	7.88	<0.005	<0.025	299	878		**1.2**
	9/22/1994						123.8													7.55			252.7	963		
	1/29/1995						94.1													7.57			120.9	791		
	3/29/1995						90.7													7.69			228.7	**1164**		
	6/27/1995						95.9													7.93			247.1	778		
	9/21/1995						86.6													7.36			211.8	722		
	1/10/1996						78.6													7.1			173.1	632		
	4/3/1996						76.8													7.23			168.7	603		
	9/25/1996						57.2													7.68			118	598		

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-2	1/15/1997						56													7.44			148.4	536		
	1/31/2010	<0.020	0.0032	0.058	<0.040	<0.0020	150	<0.0060	<0.0060	<0.0060		0.48	0.089	0.19	<0.00020	<0.0080	<0.010		<0.0050	8	0.017	<0.0050	210	746		**1.1**
	6/28/2010	<0.020	<0.0010	0.057	<0.040	<0.0020	170	<0.0060	<0.0060	<0.0060		0.44	<0.020	0.021	<0.00020	<0.0080	<0.010		<0.0050	7	0.012	<0.0050	260	846	0.0017	**0.26**
NP-3	10/8/1981	<0.25	0.005	<1	0.188	<0.01	28.6	<0.05	<0.05	<0.05	<0.05	1.58	<0.1	**0.81**	<1	<0.1	<0.05	<0.05	<0.05	6.98	0.005	<0.02	94.5	460		**1.25**
	10/27/1981	<0.01	<0.01	0.2	<0.1	<0.005	28	<0.01	<0.02	<0.05	<0.01	**1.9**	0.39	**1**	<0.001	0.16	<0.05	0.4	<0.02	8	<0.005	<0.02	148	390		**0.98**
	10/30/1981	<0.25	<0.005	<1	0.29	<0.01	31.2	<0.05	<0.05	<0.05	<0.05	1.6	<0.1	**1.03**	<0.001	<0.1	<0.02	<0.05	<0.05	7.89	<0.002	<0.02	102	428		**0.93**
	11/6/1981	<0.01	<0.01	<0.2	<0.1	<0.005	28	<0.01	<0.02	<0.05	<0.01	1.6	<0.1	**0.47**	<0.001	0.26	<0.05	0.2	<0.02	7.9	<0.005	<0.02	140	380		**1.1**
	11/13/1981	<0.25	0.009	<0.1	0.034	<0.001	26.71	<0.005				1.39		**1.01**	<0.0005	0.065	<0.05	0.16	<0.005	7.6	0.023	0.023	140.6	446		**1.59**
	11/17/1981	<0.01	<0.01	0.24	<0.1	<0.005	26	<0.01	<0.02	<0.05	<0.01	1.4	<0.1	**1**	<0.001	0.2	<0.05	<0.2	<0.02	8.1	<0.005	<0.02	144	390		**1.2**
	11/23/1981	<0.01	<0.01	0.02	<0.1	<0.005	26	<0.02	<0.02	<0.05	<0.01	1.2	<0.1	**0.96**	<0.001	0.15	<0.05	0.2	<0.02	7.8	<0.005	<0.01	144	460		**1.9**
	12/7/1981	<0.01	<0.01	<0.2	<0.1	<0.005	28	<0.01	<0.02	<0.05	<0.01	1.1	<0.1	**0.78**	<0.001	0.13	<0.05	<0.2	<0.02	7.9	<0.005	<0.02	153	450		**3.5**
	12/15/1981	<0.01	<0.01	<0.2	<0.1	<0.005	26	<0.01	<0.02	<0.05	<0.01	1.1	<0.1	**0.87**	<0.001	0.094	<0.05	0.2	<0.02	7.8	<0.005	<0.02	149	450		**2.5**
	12/22/1981	<0.01	<0.01	<0.2	<0.1	<0.005	26	<0.01	<0.02	<0.05	<0.01	0.9	<0.1	**0.76**	<0.001	0.1	<0.05	0.2	<0.02	7.9	<0.005	<0.02	149	410		**2.1**
	1/5/1982	<0.01	<0.01	<0.2	<0.1	<0.005	26	<0.01	<0.02	<0.05	<0.01	1.1	0.31	**0.72**	<0.001	0.01	<0.05	0.2	<0.02	7.7	<0.02	<0.02	154	360		**1.7**
	1/26/1982					<0.005	30			<0.05	<0.01	1	<0.1	**0.7**	<0.001	<0.1		0.2		8.1	<0.005		151	400		
	2/22/1982					<0.005	28			<0.05	<0.01	0.9	0.14	**0.66**	<0.001	<0.05		<0.2		8	<0.005		137	420		
	4/26/1982					<0.005	28			<0.05	<0.01	0.8	0.24	**0.4**	<0.001	<0.05		<0.2		7.9	<0.005		146	410		
	5/17/1982					<0.005	**562**			<0.05	<0.01	0.7	0.16	**0.23**	<0.001	<0.05		**12**		7.6	<0.005		**900**	**2460**		
	5/24/1982												<0.1	0.053												
	5/28/1982												<0.1	0.063												
	6/8/1982					<0.005	30			<0.05	<0.01	0.5	<0.1	0.1	<0.001	<0.05		1.9		7.9	<0.005		150	500		
	6/30/1982					<0.005	26			<0.05	<0.01	0.5	<0.1	0.081	<0.001	<0.05		1.8		7.9	<0.005		128	510		
	9/2/1982					<0.001	27.82					0.53		<0.05		<0.01		1.94		7.5	<0.005		123.8	498		
	10/27/1982					<0.005	26			<0.05	<0.01	0.6	<0.1	<0.05	<0.001	<0.05		1.6		8	<0.005		132	450		
	2/21/1983					<0.005	26			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		1.4		8.2	<0.005		131	410		
	5/13/1983					<0.005	64			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		2.1		8	<0.005		139	500		
	8/9/1983					<0.005	114			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		2.3		7.8	<0.005		100	630		
	11/1/1983					<0.005	162			<0.05	<0.01	0.5	0.14	<0.05	<0.001	<0.05		3.8		7.9	<0.005		163	760		
	3/16/1984					<0.005	228			<0.05	<0.01	0.6	<0.1	<0.05	0.001	<0.05		3.2		8.1	<0.005		216	870		

APPENDIX B3
GROUNDWATER SAMPLE ANALYTICAL RESULTS
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Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-3	5/30/1984					<0.005	248			<0.05	<0.01	0.4	<0.1	<0.05	<0.001	<0.05		2.9		7.8	<0.005		292	**1060**		
	9/12/1984					<0.005	**270**			<0.05	<0.01	0.4	<0.1	<0.05	<0.001	<0.05		3.1		7.7	<0.005		292	**1140**		
	11/27/1984					<0.005	**290**			<0.05	<0.01	0.4	<0.1	<0.05	<0.001	<0.05		3.5		7.8	<0.005		348	**1150**		
	5/17/1985						**310**													7.7			453	**1470**		
	11/13/1985						**288**													7.2			541	**1520**		
	5/23/1986						**282**													7.5			**624**	**1590**		
	10/8/1986						**272**													7.4			**620**	**1710**		
	3/3/1987																						**695**			
	3/4/1987						**283**													6.8			**695**	**1882**		
	5/25/1987																						**735.5**			
	1/12/1988	<0.1		<0.1	<0.1	<0.1	**359**	<0.1	<0.05	<0.1			<0.1	**0.57**		<0.1	<0.1		<0.1			<0.1	**755**	**1584**		**1.1**
	4/4/1988						**254**																587	**1772**		
	8/23/1988						**251.4**																**835.2**	**1744**		
	2/9/1989						**254.3**																**763.4**	**1583**		
	6/1/1989						241.1																**713.6**	**1596**		
	11/30/1989						158.9																**742.9**	**1600**		
	11/14/1990						228.7																**821.6**	**1675**		
	2/11/1991		<0.001				**255.9**															**255.9**	**970.5**	**1551**		
	7/19/1991		<0.002	<0.01		<0.005	239.2	<0.02		<0.02		0.66	0.28	0.08	0.0002			0.23	<0.005	8.29	0.011	<0.02	**820.3**	**1663**		
	8/29/1991						**254.3**													7.84			**854.1**	**1616**		
	11/26/1991						248.1													7.08			**745.2**	**1613**		
	3/15/1992						227.8													7.63			**921.3**	**1644**		
	5/25/1992						216.4													7.85			**752.9**	**1607**		
	7/16/1992						226.1													7.26			**802.2**	**1578**		
	10/8/1992						211.6													7.69			**799.1**	**1445**		
	11/27/1992						**254.7**													7.49			**796.1**	**1640**		
	12/15/1992						223.2			0.01										7.75			545.3	**1558**		
	2/25/1993						219.3													7.65			**793.6**	**1580**		
	3/30/1993	0.1	<0.005	<0.5	0.02	<0.002	205	<0.02	<0.05	0.01	<0.01	0.54	**4.99**	**0.32**	<0.001	<0.02	<0.01		<0.02	7.4	<0.005	<0.01	**825**	**1560**		**6.98**

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

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Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-3	9/28/1993						210.3			<0.001			<0.05	**0.24**						7.88			**619.4**	**1544**		**1.04**
	3/17/1994						169.5			0.012			0.24	**0.33**						7.46			**746.9**	**1609**		**2.58**
	6/23/1994						205.7													7.77			**778.6**	**1628**		
	7/22/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	194	<0.025	<0.05	<0.025		0.34	<0.05	**0.61**	<0.001	<0.05	<0.05	<1	<0.005	7.83	<0.005	<0.025	**796**	**1620**		**1.8**
	9/22/1994						195.5													7.65			**707.1**	**1691**		
	1/29/1995						**566.4**													7.45			**651.9**	**1623**		
	3/29/1995						185.5													7.48			558	**1639**		
	6/27/1995						202.7													7.38			**717**	**1607**		
	9/21/1995						208.4													7.5			**822**	**1557**		
	1/10/1996						208.5													7.32			**724.1**	**1464**		
	4/3/1996						208.3													7.29			**722.6**	**1415**		
	9/25/1996						190.5													7.72			536.5	**1472**		
	1/15/1997						207													7.51			**657.4**	**1478**		
	7/8/2010	<0.020	<0.0010	0.030	<0.040	<0.0020	**270**	<0.0060	<0.0060	<0.0060		0.36	0.049	0.031	<0.00020	<0.0080	<0.010		<0.0050	8	0.023	<0.0050	**790**	**1740**	0.0014	**0.44**
	10/7/2010	<0.02	<0.005	0.031	<0.04	<0.002	**290**	<0.006	<0.006	<0.006		0.29	0.1	0.015	<0.0002	<0.008	<0.01		<0.005	7.57	0.023	<0.005	**830**	**1660**	0.0015	**0.31**
NP-4	4/26/1982					<0.005	46			0.051	<0.01	1.5	**3.8**	**0.6**	<0.001	0.07		0.6		8.6	<0.005		132	410		
	5/17/1982					<0.005	46			<0.05	<0.01	1	0.11	<0.05	<0.001	<0.05		1.3		**9.4**	<0.005		138	310		
	5/24/1982												<0.1	<0.05												
	5/28/1982												<0.1	<0.05												
	6/8/1982					<0.005	26			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		4.5		8.4	<0.005		140	420		
	6/30/1982					<0.005	28			<0.05	<0.01	0.4	<0.1	<0.05	<0.001	<0.05		<0.2		**9.5**	<0.005		115	270		
	9/2/1982					<0.001	28.72					0.4		<0.05		<0.01		0.03		8.5	<0.005		107.1	252		
	10/27/1982					0.0061	36			<0.05	<0.01	0.4	0.34	<0.05	<0.001	<0.05		<0.2		8.9	<0.005		108	230		
	2/21/1983					<0.005	48			<0.05	<0.01	0.4	0.28	<0.05	0.001	<0.05		0.2		**9.3**	<0.005		115	250		
	5/13/1983					<0.005	76			<0.05	<0.01	0.4	<0.1	<0.05	<0.001	<0.05		<0.2		7.9	<0.005		134	340		
	8/9/1983					<0.005	94			<0.05	<0.01	0.3	<0.1	<0.05	<0.001	<0.05		<0.2		8.8	<0.005		156	430		
	11/1/1983					<0.005	114			<0.05	<0.01	0.3	<0.1	<0.05	<0.001	<0.05		0.6		8.2	<0.005		206	530		
	3/16/1984					<0.005	126			<0.05	<0.01	0.6	<0.1	<0.05	0.001	<0.05		0.2		8	<0.005		256	540		
	5/30/1984					<0.005	134			<0.05	<0.01	0.3	<0.1	<0.05	<0.001	<0.05		<0.2		8	<0.005		320	630		

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Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-4	9/12/1984					<0.005	134			<0.05	<0.01	0.3	<0.1	<0.05	<0.001	<0.05		0.9		8	<0.005		339	760		
	11/27/1984					<0.005	140			<0.05	<0.01	0.3	<0.1	<0.05	<0.001	<0.05		0.2		8.5	<0.005		354	740		
	5/17/1985						146													8.2			348	770		
	11/13/1985						142													8			292	690		
	5/23/1986						136													8			300	690		
	10/8/1986						134													7.8			290	660		
	5/25/1987																						278.5			
	1/12/1988	<0.1		<0.1	<0.1	<0.1	137	<0.1	<0.05	<0.1			<0.1	0.06		<0.1	<0.1		<0.1			<0.1	256	612		**0.1**
	4/4/1988						130.4																328.8	610		
	8/23/1988						132.1																292.2	688		
	2/9/1989						130																266.8	604		
	6/1/1989						116.4																243.5	580		
	11/30/1989						96.9																237.4	572		
	11/14/1990						153.1																254.5	262		
	2/11/1991		<0.001				126.1																288.9	676		
	7/19/1991		<0.002	0.28		<0.005	112.3	<0.02				0.41	**5.14**	<0.02	<0.0002			0.07	<0.005	7.81	<0.002	<0.02	198.5	532		
	8/29/1991						110.7													8.37			232	532		
	11/26/1991						99													8.54			193.6	522		
	3/15/1992						102.9													8.85			216.5	465		
	5/25/1992						106.2													8.62			171.4	439		
	7/16/1992						94.4													7.64			176.8	458		
	10/8/1992						102.9													**9.01**			182.9	535		
	11/27/1992						97.5													8.12			201.7	495		
	12/15/1992						84.4													**9.52**			151.2	424		
	2/25/1993						76.6													**9.85**			150.8	349		
	3/31/1993	0.3	<0.005	<0.5	0.04	<0.002	45	<0.02	<0.05	0.01	<0.01	0.53	0.62	**0.84**	**0.009**	<0.02	<0.01	3.7	<0.02	7.6	<0.005	<0.01	134	504		**2.41**
	9/28/1993						56.9													8.2			108.5	437		
	5/26/1994	3.5	<0.005	<0.1		0.0034	39	<0.025		<0.025		0.46	**15**	0.16	<0.001		<0.05	4.3	0.018	8.1	<0.005	<0.025	131	666		**12**
	6/23/1994						48.5													8.13			133.5	498		

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

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Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-4	7/23/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	34	<0.025	<0.05	<0.025		0.48	<0.05	<0.03	<0.001	<0.05	<0.05	4.6	<0.005	7.9	<0.005	<0.025	120	536		**0.51**
	9/22/1994						36.9													7.73			111	547		
	1/29/1995						34.5													7.88			110.7	447		
	3/29/1995						33.8													7.86			121.7	494		
	6/27/1995						33.2													7.37			134.1	487		
	9/21/1995						35.3													7.51			132.1	509		
	1/10/1996						34.7													7.35			123.1	483		
	4/3/1996						26													7.19			123.3	475		
	9/25/1996						31.7													7.75			125.6	504		
	1/15/1997						98													7.43			**1113**	**2651**		
	1/31/2010	<0.020	<0.0025	0.036	<0.040	<0.0020	40	<0.0060	<0.0060	<0.0060		0.46	0.040	0.0098	<0.00020	<0.0080	<0.010		<0.0050	8	0.0057	<0.0050	190	626		**1.3**
	7/2/2010	<0.020	<0.0010	0.039	<0.040	<0.0020	39	<0.0060	<0.0060	<0.0060		0.46	<0.020	0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	0.0043	<0.0050	190	640	0.0023	**0.82**
NP-5	11/4/1981	<0.01	<0.01	<0.2	<0.1	<0.005	50	<0.01	<0.02	<0.05	<0.01	1.3	<0.1	0.1	<0.001	<0.05	<0.05	4.1	<0.02	8	<0.005	<0.02	196	570		**0.14**
	11/13/1981	0.239	<0.005	0.218	0.07	<0.001	37.89	<0.005		<0.1	0.001	1.28		0.14	<0.0005	0.015	0.019	3.56	<0.005	7.7	0.014	<0.001	162	488		<0.05
	11/17/1981	<0.01	<0.01	<0.2	<0.1	<0.005	42	<0.01	<0.02	<0.05	<0.01	1.3	<0.1	**0.3**	<0.001	0.07	<0.05	2.7	<0.02	8	<0.005	<0.02	158	500		**0.19**
	11/23/1981	<0.01	<0.01	<0.2	<0.1	<0.005	36	<0.02	<0.02	<0.05	<0.01	1.2	<0.1	0.091	<0.001	<0.05	<0.05	4	<0.02	7.8	<0.005	<0.1	161	580		**0.21**
	12/7/1981	<0.01	<0.01	<0.2	<0.1	<0.005	34	<0.01	<0.02	<0.05	<0.01	1.2	<0.1	<0.05	<0.001	<0.05	<0.05	3.1	<0.02	7.9	<0.005	<0.02	172	510		**0.24**
	12/15/1981	<0.01	<0.01	<0.2	<0.1	<0.005	36	<0.01	<0.02	<0.05	<0.01	1.2	<0.1	0.08	<0.001	<0.05	<0.05	3.3	<0.02	7.8	<0.005	<0.02	168	500		**0.37**
	12/22/1981	<0.01	<0.01	<0.2	<0.1	<0.005	36	<0.01	<0.02	<0.05	<0.01	1.1	<0.1	<0.05	<0.001	<0.05	<0.05	3.8	<0.02	7.9	<0.005	<0.02	161	460		**0.32**
	1/5/1982	<0.01	<0.01	<0.2	<0.1	<0.005	34	<0.01	<0.02	<0.05	<0.01	1.1	0.18	<0.05	<0.001	<0.05	<0.05	4.1	<0.02	7.7	<0.02	<0.02	163	420		**0.4**
	1/26/1982					<0.005	32			<0.05	<0.01	1.1	<0.01	<0.05	<0.001	<0.1		2.9		8	<0.005		158	440		
	2/22/1982					<0.005	32			<0.05	<0.01	1	0.12	<0.05	<0.001	<0.05		2		8	<0.005		150	450		
	4/26/1982					<0.005	30			0.31	0.04	1.1	**3.8**	**6.9**	<0.001	<0.05		1.1		7.9	<0.005		154	450		
	5/17/1982					<0.005	36			<0.05	<0.01	1.1	0.14	<0.05	<0.001	<0.05		6.7		8	<0.005		165	490		
	5/24/1982												<0.1	<0.05												
	5/28/1982												<0.1	<0.05												
	6/8/1982					<0.005	30			<0.05	<0.01	0.9	0.44	<0.05	<0.001	<0.05		4.5		8.1	<0.005		150	420		
	6/30/1982					<0.005	28			<0.05	<0.01	0.9	0.36	<0.05	<0.001	<0.05		3.9		8.1	<0.005		133	460		
	9/2/1982					<0.001	33.98					0.82		<0.05		<0.01		4.2		7.6	<0.005		137.2	472		

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Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		5.0	0.1	1.0	0.75	0.01	250	0.05	0.05	1.0	0.2	1.6	1.0	0.2	0.002	1.0	0.2	10	0.05	6-9	0.05	0.05	600	1000	0.03	0.03
NP-5	10/27/1982					<0.005	34			<0.05	<0.01	0.8	0.21	<0.05	<0.001	<0.05		3.7		8	<0.005		139	440		
	2/21/1983					<0.005	26			<0.05	<0.01	0.5	<0.1	<0.05	<0.001	<0.05		1.3		8.3	<0.005		139	420		
	5/13/1983					<0.005	70			<0.05	<0.01	0.4	<0.1	<0.05	<0.001	<0.05		0.2		8.9	<0.005		134	290		
	8/9/1983					<0.005	26			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		3.7		8.1	<0.005		108	460		
	11/1/1983					<0.005	30			<0.05	<0.01	0.8	0.1	<0.05	<0.001	<0.05		5.2		8.2	<0.005		111	440		
	3/16/1984					<0.005	26			<0.05	<0.01	0.4	<0.1	<0.05	<0.001	<0.05		3		8	<0.005		130	380		
	5/30/1984					<0.005	22			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		2.9		7.8	<0.005		139	400		
	9/12/1984					<0.005	28			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		3.4		8	<0.005		125	420		
	11/27/1984					<0.005	28			<0.05	<0.01	0.8	<0.1	<0.05	<0.001	<0.05		3.2		8.2	<0.005		120	420		
	5/17/1985						28													7.9			130	450		
	11/13/1985						24													7.8			134	400		
	5/23/1986						28													7.9			120	430		
	10/8/1986						28													7.8			113	420		
	3/30/1989	<0.1		<0.1	<0.1	<0.1	32	<0.1	<0.05	<0.1			<0.1	<0.05		<0.1	<0.1		<0.1			<0.1	125	458		**0.4**
	8/29/1991						38.7													7.68			152.1	499		
	11/26/1991						37.7													7			129.5	472		
	3/15/1992						46.7													7.89			140.7	456		
	5/25/1992						75.5													7.8			131.1	490		
	7/16/1992						37.8													7.63			132.4	476		
	10/8/1992						39.4													7.64			133.2	431		
	11/27/1992						117.2													8.01			133.9	475		
	12/15/1992						40.4			0.025										7.8			104	402		
	2/25/1993						41.4													7.65			140.8	487		
	3/30/1993	0.2	<0.005	<0.5	0.04	<0.002	39	<0.02	<0.05	<0.01	<0.01	0.77	0.29	0.02	<0.001	<0.02	<0.01	4	<0.02	7.8	<0.005	<0.01	146	488		**0.19**
	9/28/1993						48.1													7.79			109.2	518		
	5/24/1994	1.1	<0.005	<0.1		<0.0005	41	<0.025		<0.025		0.74	**1.2**	0.086	<0.001		<0.05	3.4	0.0077	7.84	<0.005	<0.025	130	520		**2.3**
	6/23/1994						54.1													7.66			142.3	466		
	7/23/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	41	<0.025	<0.05	<0.025		0.71	<0.05	<0.03	<0.001	<0.05	<0.05	3.3	<0.005	7.89	<0.005	<0.025	131	494		<0.05
	9/22/1994						42.8													7.73			117.7	526		

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Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
NP-5	1/29/1995						43.5													7.99			101.2	490		
	3/29/1995						42.4													7.94			130.8	449		
	6/27/1995						43.4													7.64			119.4	525		
	9/21/1995						44.3													7.71			134.6	483		
	1/10/1996						41.6													8.04			136.6	406		
	4/3/1996						31.8													7.67			130	405		
	9/25/1996						42.5													8.09			129.4	504		
	1/15/1997						45.7													7.76			140.69	498		
	6/28/2010	<0.020	0.0014	0.018	<0.040	<0.0020	80	<0.0060	<0.0060	<0.0060		0.68	<0.020	<0.0020	<0.00020	<0.0080	<0.010		<0.0050	8	0.0067	<0.0050	180	623	0.0013	**0.29**
	9/30/2010	<0.02	0.0015	0.018	0.041	<0.002	83	<0.006	<0.006	<0.006		0.71	<0.02	0.005	<0.0002	<0.008	<0.01		<0.005	7.72	0.0079	<0.005	170	629	0.0013	**0.2**
O. Williams	12/19/1945						**425**					0.6						1.9					62	883		
	6/13/1946						**418**					0.4						2.2					66	847		
Pague	8/20/1946						26					1.2						1.2					80	348		
PW-1	12/23/1975						16					0.46						3.5		7.8			10	217		
	8/14/1981		<0.01				32			<0.05	<0.01	0.9	0.2					0.7	<0.02	8.1			24	250		<0.05
PW-2	1/15/1976						17					0.66						3.5		8.1			<5	257		
	11/27/1984					<0.005	20			<0.05	<0.01	0.6	<0.1	<0.05	<0.001			1.7		7.9	<0.005		125	470		
	8/2/1994	<0.05	<0.005	<0.1	<0.1	<0.0005	24	<0.025	<0.05	<0.025		0.39	0.062	0.032	<0.001	<0.05	<0.05	<1	<0.005	7.63	<0.005	<0.025	27	338		<0.05
PW-3	1/27/1976						24					0.64						2.6		8			<5	243		
	8/14/1981		<0.01				66			<0.05	0.01	**2.5**	0.31					0.8	<0.02	8.2			31	300		**0.19**
PW-4	8/2/1994	<0.05	0.0058	<0.1	<0.1	<0.0005	27	<0.025	<0.05	<0.025		0.46	<0.05	<0.03	<0.001	<0.05	<0.05	<1	<0.005	7.57	<0.005	<0.025	17	274		<0.05
QMC-4	3/27/1981		<0.01							<0.05	<0.01	**2.5**						<0.2	<0.02							<0.05
Saladone Well	12/5/1992																	0.19		7.91			23	354		
SHB-27	9/22/1976		<0.01		<0.1	<0.001	20.6	0.002	<0.001	0.002		0.77	0.007	0.039	<0.0004	0.002		0.8	<0.001	7.61	<0.01	<0.001	233	434		0.004
SHB-28	9/22/1976				<0.1	<0.001	51.2	0.002	<0.001	0.005		0.97	0.015	**0.42**	<0.0004	0.003		<0.1	<0.001	7.58	<0.01	<0.001	353	840		0.018
SHB-29	9/22/1976				0.1	0.001		0.004	0.001	0.002			0.52	0.049	<0.0004	0.003		<0.1	0.002	7.98	<0.01	<0.001		384		**0.16**

APPENDIX B3

GROUNDWATER SAMPLE ANALYTICAL RESULTS

Stage 1 Abatement Plan Investigation Report

Copper Flat Mine Site, New Mexico

Sample ID	Collection Date	Aluminum	Arsenic	Barium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide	Fluoride	Iron	Manganese	Mercury	Molybdenum	Nickel	Nitrate as N (NO3)	Lead	pH	Selenium	Silver	Sulfate	Total Dissolved Solids	Uranium	Zinc
NMWQCC GW Standard (mg/L)		**5.0**	**0.1**	**1.0**	**0.75**	**0.01**	**250**	**0.05**	**0.05**	**1.0**	**0.2**	**1.6**	**1.0**	**0.2**	**0.002**	**1.0**	**0.2**	**10**	**0.05**	**6-9**	**0.05**	**0.05**	**600**	**1000**	**0.03**	**0.03**
SHB-30	9/22/1976		0.02		<0.1	<0.001	21	0.004	<0.001	0.002		0.79	0.009	0.036	<0.0004	0.002		0.7	<0.001	7.77	<0.01	<0.001	145	486		0.004
SHB-34	9/22/1976				<0.1	0.001	<1	0.002	<0.001	0.002		0.14	0.009	0.004	<0.0004	<0.001		<0.1	0.001	7.36	<0.01	<0.001	<1	50		0.014
Shipping Pen	12/18/1992																	0.66		7.92			19.2	345		
Stone	7/31/1947						88					0.6						3.3					26	369		
Young 1	7/31/1947						238					0.6						0.8					43	568		
Young 2	7/31/1947						148					1						4.1					32	471		
LRG 04159	11/4/2010	<0.02	<0.001	0.018	<0.04	<0.002	23	<0.006	<0.006	<0.006		0.66	0.036	<0.002	<0.0002	<0.008	<0.01		<0.005	7.31	0.0049	<0.005	220	730	0.004	**0.037**

Notes:

NMWQCC = New Mexico Water Quality Commission

Measurement values that exceed the NMWQCC standard are in bold

Non-detects are indicated with a "<" & the detection limit

Solid grey indicates 'No Data' or 'Not Measured'

Appendix C

The Natural Defenses of Copper Flat, Sierra County, New Mexico
(J.S. Raugust, 2003)

New Mexico Bureau of Geology and Mineral Resources
Open-file report 475

The Natural Defenses of Copper Flat
Sierra County, New Mexico

By

J. Steven Raugust

A technical report submitted in partial
fulfillment for the degree of

Master of Science

in

Mineral Engineering

Department of Mineral Engineering
New Mexico Institute of Mining and Technology, Socorro, New Mexico

August 2003

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Other acknowledgments are due to Mr. George Lotspeich, whom owns the Copper Flat Mine. Mr. Lotspeich allowed me access to both his property and his personal files, which contained a wealth of technical information that he shared with me. I wish to thank Woman's Auxiliary to the American Institute of Mining, Metallurgical, and Petroleum Engineers, whose generous scholarship was essential. Special thanks to Linda Ulbricht, who entered the reams of data contained in these appendices into electronic format just before she died of cancer on March 9, 2003. I'd like to thank Dr. George Austin and Mr. Chris McKee for teaching me the techniques of X-ray diffraction, Mark Mansell and Tim Summers for their tireless and enthusiastic computer support. Thanks to Kathy Glesener, Leo Gabaldon, and Tom Kaus for teaching me how to use a MacIntosh and software to generate my own computer graphics, for which I had no prior experience. Also acknowledgements to Glen Jones for converting State planar coordinates into more useful UTM coordinates for most of the groundwater wells on the property. And to Dr. Maureen Wilks and Lynne Hemenway for converting this document into a Bureau of Geology and Mineral Resources open file report.

Lastly, but not least important, to my wife, Eve Gedanic, for her patience and self sufficiency during my absences in pursuit of this academic adventure.

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µS/cm	microSiemens per centimeter
ABA	acid-base accounting
ABC	Adrian Brawn Consultants
Alta Gold	Alta Gold Corporation
AP	acid generating potential
Ar^{40}/AR^{39}	Argon-Argon age dating technique
BLM	U.S. Bureau of Land Management
$CaCO_3$	calcuium carbonate
CFQM	Copper Flat quartz monzonite
cm/s	centimeters per second
EA	Environmental Assessment
EIS	Environmental Impact Statement
ft	foot
ft/yr	feet per year
gpm	gallons per minute
Hydro Resources	Hydro Resources, Inc.
ICP	inductively coupled plasma
Inspiration	Inspiration Consolidated Copper
mg/L	milligram per liter
NAG	net acid generating
NMEIB	New Mexico Environmental Improvement Board
NMMMD	New Mexico Mining and Minerals Division
NP	acid neutralizing potential

QMC	Quintana Minerals Corporation
SHB	Sergent, Hauskins and Beckwith, Inc.
SRK	Steffen, Robertson, and Kirsten, Inc.
USBR	U.S. Bureau of Reclamation
WQCC	New Mexico Water Quality Control Commission
XRD	X-ray diffraction

The Natural Defenses

Of Copper Flat

Sierra County, New Mexico

Abstract

Copper Flat is located in southwestern New Mexico, approximately 23 miles southwest of Truth or Consequences and 5 miles northeast of Hillsboro. It is a porphyry copper deposit with associated gold, silver, molybdenum, and sulfide minerals. The stock contains a 75 million-year-old quartz monzonite breccia pipe forming the center of an eroded andesite strato-volcano. The breccia pipe is approximately 1,300 feet long, 600 feet wide, and 1,000 feet deep. Records indicated that the Sternberg Mine located at Copper Flat was mined as early as 1911, but it wasn't until 1982 that the mining occurred at a significant scale. Quintana Minerals Corporation mined the property for three months in 1982 producing 7.4 million pounds of copper, 2,306 ounces of gold, and 55,966 ounces of silver. Mining activities ceased because of low copper prices. The mining equipment was dismantled and sold. The Canadian Imperial Bank reclaimed the site. Subsequent efforts to permit mining operations by Gold Express of Denver, Colorado and Alta Gold of Henderson, Nevada were never completed. The property is now owned by Hydro Resources, Inc. of Albuquerque, New Mexico as a combination of fee simple properties and patented mining claims.

Since no mining activities have occurred since 1982, the site is an excellent field laboratory for studying the behavior of metals and sulfide minerals exposed with waste rock and tailings in the southwest. In addition, there is a 12.8-acre pit lake on site that is located near the center of the breccia pipe. This study focuses on the potential impact of the pit lake, the waste rock piles, and the tailing impoundment of the local surface and groundwater quality.

The pit lake has been sampled at least 65 times between 1980 and 1997. The pH of the lake is typically neutral to alkaline, with exception occurring in 1992 and 1993, where the pH dropped as low as 4.4. At least one intermittent seep from the pit wall has been sampled and the results reported a pH of 2.64, a total dissolved solid concentration (TDS) of 12,770 milligrams per liter (mg/L), and a sulfate concentration of 790 mg/L.

However, groundwater inflow into the pit lake is neutral to alkaline with pH ranging from 7.2 to 8, TDS of 920 mg/L, and sulfate less than 410 mg/L. The andesitic host rocks surrounding the ore body have a high acid buffering capacity as shown by the partial dissolution of calcite and the precipitation of gypsum and goethite. The alkalinity of the groundwater and host rocks quickly neutralizes and dilutes acidic discharges into the pit lake.

Samples collected from the waste rock piles and drill core indicated initially that the rocks produce more acid than they can neutralize. However, kinetic testing showed that leachate derived from the waste rock is predominantly alkaline and has low sulfate and metal concentrations. These results indicated that sulfide oxidation is slow and acid buffering through mineral water reactions and groundwater recharge is sufficient to maintain a non-acidic environment.

Samples collected from the tailings dam indicated a moderate potential for acid generation and high metals concentrations. However, paste pH values were all greater than 6.1 and leachate samples indicated the metals are not easily leached. A down-gradient monitoring well showed elevated concentrations of TDS and sulfate soon after tailings were slurried into the impoundment indicating a some leakage into the environment despite significant geotechnical information, which suggested leakage was not likely.

Significant data collection and analyses collected from Copper Flat over the last 35 years indicated that the production of acid mine drainage and metals mobilization is possible. However, because of the high acid neutralization capacity of the natural groundwater and host rocks, coarse, crystalline pyrite, a low volume of disseminated sulfides, and low humidity and precipitation, sulfide oxidation is slow and metal release from all lithologies is low.

1.0 Introduction

1.1 Purpose of the Copper Flat Investigation

The purpose of this investigation is to compile and assess the existing ground- and surface-water quality in the vicinity of an existing mine pit lake, waste rock piles, and mine tailings impoundment at Copper Flat, Hillsboro district, New Mexico, 25 miles southwest of Truth of Consequences and 5 miles northeast of Hillsboro (Fig. 1). Data from existing historical reports and documents have been reviewed and integrated. This report is intended to be a comprehensive source with respect to assessing the potential for environmental impacts of the mine pit lake, waste rock piles, and tailings impoundment based on existing conditions. Water quality data associated with this research have been incorporated into an electronic format that will become part of the New Mexico Mines Database.

1.2 Site Background

1.2.1 Geological History of the Hillsboro Mining District

1.2.1.1 Geology

The predominant geologic feature of the Hillsboro district is the Cretaceous Copper Flat strato-volcano (Fig. 2). This structure is eroded to a topographic low and is approximately 4 miles in diameter (Hedlund, 1985). The Hillsboro district comprises part of the Animas Hills, a low range formed by a horst at the western edge of the Rio Grande rift. The Animas hills are separated from the Black Range to the west by a graben, in which sits the town of Hillsboro. Faults that bound the Animas Hills horst are related to the to the tectonic activity of the Miocene-age Rio Grande rift (Dunn, 1982).

The 4-mile diameter circular block of andesite represents the central part of the Animas Hills, of which the eastern edge of the andesite block forms the eastern edge of the horst. At this location the andesite is in fault contact with Santa Fe Group sediments deposited in the ancestral Rio Grande rift. A drill hole in the southwest corner of T15S, R6W indicates that Santa Fe Group sediments are at least 2,000 ft thick (Dunn, 1982). The remaining periphery of the volcanic terrain is marked by nearly vertical faults along which the andesite has been down-dropped against Paleozoic sedimentary rocks. The vertical displacement along these faults is not known, but drill holes collared in andesite were still in andesite at depths greater than 3,000 ft from the surface. The thickness of the andesite and the concentric fault pattern suggest a deeply eroded Cretaceous-age volcanic complex (Dunn, 1982).

The core of the volcanic complex is intruded by a quartz monzonite stock, the Copper Flat Quartz Monzonite (CFQM). The CFQM stock has a surface expression of approximately 0.4 square miles. The CFQM has been dated by the argon-argon ($^{40}Ar/^{39}Ar$) techniques to be 74.93 +/- 0.66 million years old (McLemore et al., 2000). The surrounding andesites also have been dated using argon-argon techniques to be 75.4 +/- 3.5 million years old (McLemore et al., 2000). At least 34 dikes radiate out from the quartz monzonite intrusion. The quartz latite and low silica rhyolite dikes are generally oriented N 45-55 E and N 40-50 W and represent a late stage differentiation of the CFQM stock. The dikes are as much as 38 meters (m) (125 ft) wide and 1.6 km (5,200 ft) long (Hedlund 1985). The dikes are gray to tan, typically holocrystalline and porphyrytic. Two predominant types of dikes occur: a pohyrytic latite with large orthoclase phenocrysts and an aphanitic latite. The dikes contain quartz, potassium feldspar, plagioclase, biotite, magnetite, locally hornblende, pyrite, apatite, and rutile (McLemore et al., 2000). Polymetallic veins are associated with the latite and quartz latite dikes that radiate outwards from the CFQM. They are subparallel to the dikes.

The Copper Flat porphyry copper deposit is one of the older Laramide porhyry copper deposits in the Arizona-Sonora-New Mexico porphyry copper belt (Fig. 3) and is characterized by low-grade hypogene mineralization that is concentrated within a breccia pipe in the CFQM stock. The CFQM is a medium to coarse-grained, holocrystalline, porphyritic intrusion that consists of potassium feldspar, plagioclase, hornblende, biotite, and trace amounts of magnetite, apatite, zircon, and rutile with local concentrations of pyrite, chalcopyrite, and molybdenite (McLemore et al., 2000). Current proven and probable reserves are 50,210,000 tons of ore containing 0.45 percent copper (Hydro Resources, 2002).

1.2.1.2 Hydrothermal Alteration of Igneous Rocks

Andesite in the study area is typically altered adjacent to the CFQM, the latite/quartz latite dikes, and the polymetallic veins (Table 1). Three types of alteration mineral assemblages are recognized in the Copper Flat porphyry copper deposit: biotite-potassic, potassic, and sericitic alteration (Fowler, 1982). Biotite-potassic alteration coincides with the highest copper grades in the deposit, and is characterized by hydrothermal biotite, potassium feldspar, quartz, and pyrite occurring in veinlets and replacement of monzonite (McLemore et al., 2000). Potassic alteration is peripheral to the deposit and is characterized by large potassium feldspar phenocrysts and as rimming of plagioclase by potassium feldspar, chlorite, quartz, and pyrite (Fowler, 1982). Sericitic alteration is the outermost alteration zone of the deposit and is characterized by replacement of biotite and feldspar by sericite. Veinlets of quartz-sericite (+/- pyrite) are common (McLemore et al., 2000) and represent significant sources of Fe and S from the Copper Flat deposit.

The latite/quartz latite dikes are extensively altered and are commonly associated with polymetallic quartz veins. Quartz, potassium feldspar, chlorite, pyrite and locally epidote characterize alteration in the dikes, which have replaced biotite, hornblende, feldspars, and the groundmass. Local sericitic alteration is common, which consists of quartz and sericite. Two stages of pyrite are common in the dikes. Early pyrite is altered and corroded and later pyrite is fresh and unaltered. Some younger pyrite may contain chalcopyrite. A third stage of pyrite has been observed that is locally present as inclusions within younger chalcopyrite and quartz veinlets (McLemore et al., 2000).

Propylitic alteration is adjacent to the mineralized veins. Epidote, chlorite, sericite, pyrite, and locally magnetite characterize this alteration. Typically, pyrite and magnetite are altered to iron oxides. Epidote and chlorite locally replace plagioclase. Epidote-pyrite and pyrite veinlets are common along fractures within the andesite. Disseminated pyrite occurs in the andesite for a distance of several meters away from the contact with the latite/quartz latite dikes and polymetallic veins. Pyrite locally replaces hornblende and olivine grains (McLemore et al., 2000).

Adjacent to, and overlapping, the propylitic alteration is the argillic alteration zone. Sericite, chlorite, quartz, and pyrite characterize this zone. Chlorite has replaced mafic minerals and the groundmass within the andesite. Disseminated pyrite is present locally in the andesite. Calcite occurs in thin veins and also replaces feldspar crystals. Sercite also replaces potassium feldspar crystals (McLemore et al., 2000).

A second, less common, propylitic alteration is present in the andesite adjacent to a few dikes. This mineral assemblage consists of a white to greenish-gray fault gouge compose of chlorite, kaolinite, sericite, calcite, quartz, and pyrite. As observed in underground workings, these zones are locally thicker where polymetallic veins pinch out or form several small veinlets of quartz and pyrite (McLemore et al., 2000).

The andesite exhibits a variable prophylitic to argillic alteration where adjacent to the CFQM. Typically, the andesite is fractured and locally contains veinlets of chalcopyrite and pyrite in association with chrysocolla, malachite, and azurite. Chlorite, sericite, and iron oxides are common in the andesite (McLemore et al., 2000).

1.2.2 History of Hillsboro Mining District

Ore was first discovered in the Hillsboro district in April 1877 along one of the veins that extend southwest of the Copper Flat stock (Jones, 1904; Dunn, 1982). Placer gold was discovered in November of that same year in Snake and Wick Gulches. The town of Hillsboro was established in 1877 and a tent city named Gold Dust was founded in 1881. Hillsboro was the county seat for Sierra County from 1884 to 1938 (Mclemore et al., 2000). Most underground mining was prior to 1893, but some efforts extended into the early 1990s (Hedlund, 1985; McLemore, 2003). Reflecting an increase in the price of gold, placer mining activity increased from 1932 to 1943 and still continues today on a small scale (Hedlund, 1985; McLemore, 2003).

At Copper Flat, the Sternberg Mine yielded 200 tons of copper ore between 1911 and 1934 from a weakly-developed oxidized zone in the Copper Flat stock (Harley, 1934; Hedlund, 1985). Newmont Mining Company explored the Copper Flat area in 1952 drilling six inclined holes totalling 3,396 feet. Hilltop Mining then operated a copper leach plant for a short time before Bear Creek Mining, in 1958 and 1959, drilled 20 additional holes that totaled 9,346 feet. Bear Creek Mining was credited with recognizing the potential of brecciated mineralized zone of the CFQM and that a supergene-enriched zone probably did not exist. Inspiration Consolidated Copper (Inspiration) drilled an additional 28 holes totaling 23,046 feet of core between 1967 and 1973. In addition, Inspiration proceeded with deep drilling in the andesite, drilled some shallow water wells, and prepared a preliminary feasibility study and mine plan for an open pit mine. Quintana Minerals Corporation (QMC) leased the property from Inspiration in 1974 and from 1974 to 1976, drilled another 127 holes for 94,097 feet of core. QMC developed 2,241 feet of underground workings to provide bulk samples for pilot plant metallurgical studies. Data from the underground workings were used to cross check the ore reserve calculations, which were calculated from the vertical drill holes. QMC also established a water supply and mapped the immediate area of the porphyry deposit at a scale of 1:2,400, completing a feasibility study in 1976 (Dunn, 1982; Hedlund, 1985).

In 1982, the Copper Flat Partnership, Ltd. with QMC as the mine operator, developed and operated an open pit copper mine, including a 15,000-ton-per-day flotation mill and a tailings impoundment, at the Copper Flat site (Figs. 4, 5, 6). The mine operated for 3 months before it ceased operation due to unfavorable economic conditions. During three months of operation, the mine produced 7.4 million pounds of copper, 2,306 ounces of gold, and 55,966 ounces of silver (Hedlund, 1985). The plant was placed on a “care and maintenance” status until 1986 when the facilities were sold and dismantled. The mining leases were returned to Inspiration and the site was partially reclaimed. Figure 7 presents an aerial photograph that shows the contoured property in 1988.

Gold Express Corporation of Denver, Colorado acquired the property from Inspiration in 1991 and prepared a draft environmental assessment (EA). In 1993, the Bureau of Land Management (BLM) notified Gold Express Corporation that an environmental impact statement (EIS) would be required due to concerns related to water resources issues (BLM, 1999).

In 1994, the Alta Gold Company (Alta Gold) of Henderson, Nevada acquired the Copper Flat Project from Gold Express. Alta Gold and consultant, Steffen, Robertson, and Kirsten, Inc. (SRK) of Reno, Nevada, prepared a draft EIS in 1996. Significant comments on the EIS were received and two years of additional study was required to address water resource issues. The final draft of the EIS was prepared for the BLM by ENSR of Fort Collins Colorado and completed in March 1999. However, the EIS was never finalized because Alta Gold declared bankruptcy in 1999 (BLM, 1999). Hydro Resources, Inc. (Hydro Resources) of Albuquerque, New Mexico now owns the property (Hydro Resources, 2002).

1.2.3 Previous Investigations

Some information from these early exploration activities dating to the 1950s is stored at Hydro Resources in Albuquerque, New Mexico. Hedlund (1985), briefly described the geology, mining history, porphyry copper deposit, vein deposits, and placer deposits associated with Copper Flat. Subsequently, Dunn (1992) described the field work done in support of the feasibility study prepared by QMC in 1976 including the diamond drilling results, sample preparation and assaying, ore reserve estimates, metallurgical sampling results, water supply information, and locating non-mineralized areas suitable for the location of the processing facilities. Dunn (1992) determined that the minable reserve is 60 million tons with an average grade of 0.42 percent Cu and 0.012 percent Mo plus trace, but economically significant silver and gold. The cost of the exploration work was estimated at $2.75 million (Dunn, 1992). QMC hired a civil engineering firm, Sergent, Hauskins, and Beckwith (SHB) of Albuquerque, New Mexico to design and to supervise the construction of the tailings starter dam. SHB performed geotechnical investigations and construction oversight activities from 1976 to 1981. The BLM with the assistance of Fred A. Glover of Fort Collins, Colorado prepared an EA on QMC's proposed open pit copper mine (BLM, 1978; Glover, 1977). QMC hired W. K. Summers and Associates of Socorro, New Mexico to perform step pumping test of water well CWQ-7 (Summers, 1981). Also, QMC hired Water Development Corporation of Tucson, Arizona to conduct pumping tests of the production water wells (WDC, 1975, 1976, 1980).

Gold Express prepared an EA for re-opening the copper mine at Copper Flat. The EA is based on the previous EA prepared by the BLM and Glover. Gold Express also contracted John W. Shomaker, Inc. of Albuquerque, New Mexico to complete a hydrologic assessment of the Copper Flat Project (Newcomer et al., 1993).

Alta Gold did a significant amount of work in support of obtaining a mining permit from the New Mexico Mining and Minerals Division (NMMMD) and approval by the BLM. Table 2 presents some of the more significant reports prepared for Alta Gold by their consultants, SRK, Adrian Brown Consultants (ABC), and ENSR. In addition, the NMMMD contracted an independent environmental evaluation report, which was prepared by Daniel B. Stephens and Associates, dated November 17, 1997.

Munroe (1999), Munroe et al. (1999, 2000) examined and reported on the geochemistry, minerology, and physical characteristics of mine waste rock piles in southwestern New Mexico. McLemore et al. (1999, 2000) examined the geology and evolution of the mineral deposits of the Hillsboro district and the geochemistry of the Copper Flat porphyry and the associated deposits. Bakkom and Salvas (1997) proposed a phased reclamation plan for the area of the former processing plant.

2.0 Study Area Investigations

2.1 Surface Features

Surface features of the Copper Flat mine area include a mine pit lake, rock storage piles, the former mine and mill areas, and a tailings impoundment area. Land disturbed by the Copper Flat mine includes 358 acres of public land managed by the BLM and 331 acres of private lands (Fig. 8). The pit lake is approximately 12.8 acres, with a depth of approximately 40 ft. The elevation of the pit bottom in 1986 was 5,380 ft. The surface water elevation in 1999 was 5,420 ft (BLM, 1999). The existing overburden waste rock piles have been identified as the north, west, south, and east (SRK, July 1998) (Fig. 8). The tailings dam is at an approximate elevation of 5220 ft, is 6,600 ft long , and has a maximum crest height of 60 ft. The tailings dam is divided into the north cell and the south cell. Approximately 1.2 million tons of tailings were deposited into the north cell during the 1982 mining activities, and cover an area of 60 acres (km^2) (SRK, May 1995).

There is an unpaved but well maintained road from New Mexico Highway 152 to the mill area and a primitive road to the pit area. A 115-kilovolt-power line exists from Highway 152 to a termination 300 feet short of the former mill facility. A 20-inch welded steel water line still exists for transporting water from the four production wells in the Caballo Basin, east of the area, to the mine site. This pipeline is buried 2 ft deep and was in good condition based on 1990 inspection (BLM, 1999). The primary drainage through the site is Greyback Wash, which has been diverted around the perimeter of the site.

2.2 Mine Pit Lake Investigations

The water chemistry of the waters of the mine pit lake is influenced by:

- surface water discharge to the pit, occurring almost exclusively during times of heavy precipitation,
- geochemistry of the pit wall rock and surrounding rock storage piles, and
- groundwater recharge.

This section presents the investigations and techniques used to collect surface water from springs and seeps and groundwater in the vicinity of the mine pit lake. Pit wall and waste rock sampling will be discussed in Section 2.3. Sample results will be presented and discussed in Section 3.0.

2.2.1 Mine Pit Lake and Grayback Gulch Surface Water

The pit lake has been sampled 65 times between 1989 and 1998 (BLM, 1999; Bakkom and Salvas, 1997). Sampling of the pit lake commenced on April 3, 1989 by the New Mexico Environmental Improvement Board (NMEIB), which collected two pit lake surface water samples. Gold Express funded the analyses of 16 pit lake samples between

February 11, 1991 and March 17, 1994. Following Gold Express, Alta Gold and/or their subcontractors, SRK and ABC, collected and analyzed 37 more samples between May 24, 1994 and October 1, 1997. Bakkom and Salvas (1997) collected 16 samples on a quarterly basis between November 15, 1996 and October 8, 1997, four samples per quarter. The samples were collected at various locations and depths. Typically, the samples were analyzed for pH, major cations and anions, and metals. Sample analytical suites varied and sometimes the samples were filtered and sometimes not. Notes on the surface sample collections accompany the associated sample results, which are tabulated in Appendix A.

There are several unnamed springs and seeps in the area west of the pit in the Animas Hills and along Grayback Gulch. As observed by Newcomer et al. (1993), these springs and seeps were flowing in March, but dry by early May and are therefore ephemeral. The springs west of the pit drain into the bowl-shaped Copper Flat area (Newcomer et al., 1993). In 1993, attempts were made to measure the discharge of these springs and seeps. Where possible, the flows were measured with a 60 degree-notch weir. In cases where the weir could not be used due to lack of flow or proper weir positioning, flow was estimated (Newcomer et al., 1993). Seeps and springs sampled by Newcomer et al (1993) are named SWQ-1, SWQ-2, SWQ-3, BG, BG-2, and Warm Spring (Figs. 9, 10), and a seep denoted as Acid Drainage. This seep appears to have been an intermittent seep slowly discharging from a rock storage pile, however, the map showing the location of this seep is not presently available. Table 3 presents the dates and estimated flow rates in gallons per minute (gpm) for the springs and seeps sampled by Newcomer et al (1993).

Surface-water samples were first collected from Grayback Gulch in 1977, prior to the mining activities of QMC (BLM, 1978). These surface water-samples appear to have been collected quarterly during 1976 and 1977, and sample locations are identified as Station A, where the creek enters the QMC property; Station B, approximately 300 feet east of the present mine pit rim; and Station C, where the creek leaves the QMC property (BLM, 1978). An accurate map showing the locations of Stations A, B, and C is not available.

Alta Gold's consultant, SRK, collected one surface water sample from Grayback Gulch, from the outfall of a culvert in a land bridge built to support the tailings slurry line from the tailings thickener. When the sample was collected on May 26, 1994, there was no visible flow in the creek and the water was stagnant (SRK, May, 1995). In August of 1997, SRK observed and sampled seeps in the pit wall at locations PW-1 and PW-2 (Fig. 11). These seeps are in the vicinity of the Sternberg Lode area. Also in August of 1997, SRK observed and sampled a seep from the toe of the West rock storage pile. These were the first recorded seeps in four years of site study by SRK (SRK, Dec., 1997, and July, 1998).

SRK and others conducted additional surface water sampling along Las Animas Creek, north of the site, and Percha Creek, south of the site. However, those data will not be discussed in this report because Grayback Wash, the principal drainage from Copper Flat, discharges to Greenhorn Arroyo approximately 10 miles east of the mine site. Greenhorn Arroyo discharge directly into the Rio Grande at Caballo Reservoir, approximately 3.5 miles beyond the confluence of Grayback Gulch and Greenhorn Arroyo (BLM, 1999).

2.2.2 Mine Pit Lake and Groundwater

Prior to 1996, only one well was available for sampling groundwater in the vicinity of the pit lake. This monitoring well, GWQ-4, is located approximately one-half mile east of the existing pit. Two other wells, EIW and WIW, are located in the existing pit; however, these wells are thought to have been drilled for in-situ leaching and are not appropriate for the characterization of natural groundwater underlying the pit area. SRK drilled two new monitoring wells, each with dual completion, in 1996. Monitoring well GWQ96-22 was drilled up-gradient of the mine pit and well GWQ96-23 was drilled down-gradient (Fig. 10). GWQ96-22A is the shallow completion and GWQ96-22B is the deep completion of the GWQ96-22 well cluster. GWQ96-23A is the shallow completion and GWQ96-23B is the deep completion of the GWQ96-23 well cluster (SRK, Dec., 1998). GWQ96-22A was sampled 16 times between July 13, 1996 and October 15, 1998. GWQ-22B was sampled twice, once on July 13, 1996 and once on February 5, 1997. GWQ-96-23A was sampled 16 times between July 14, 1996 to October 15, 1998. GWQ-23B was sampled four times from July 14, 1996 to April 1, 1997 (BLM, 1999). Sample dates and sampling notes are tabulated in Appendix B.

2.3 Rock Storage Piles and Pit Wall Investigations

Two phases of rock storage pile characterization have been completed at Copper Flat by SRK. A preliminary assessment of the waste rock was conducted in 1994 and a more detailed study was performed in 1997. Both studies were conducted to assess the existing rock pile geochemical characteristics and the potential for future acid generation.

Work performed in 1994 was to support the EIS. Work done in 1997 was for the preparation of the rock pile management plan (SRK, July, 1998).

In 1994, 19 samples were collected from the existing pit wall rock, rock storage piles, and archived drill core and cuttings (Fig. 11). The samples were subjected to:

- paste pH and conductivity measurements to determine if acid rock drainage is possible,
- determination of total metals concentrations,
- acid-base accounting (ABA) to assess the balance between potentially acid generating and potentially acid neutralizing minerals,
- agitated leach extraction tests to measure the amount of immediately soluble metals,
- humidity column testing to simulate long-term oxidation of the waste rock and evaluate drainage water quality,
- geotechnical testing to estimate the physical and hydraulic properties of the compacted rock storage materials (SRK, July 1998).

All waste rock samples were subjected to static testing, including sulfur speciation and neutralization potential tests, to assess the relationship of acid generating and acid neutralizing potential in the rock piles (Table 4). Samples indicated by the static tests as having the potential to generate acid were selected for kinetic testing. Based on the static tests, five samples were selected for the 29-week long kinetic column testing. These nineteen locations were considered by SRK to be typical of the rocks to be encountered during the mining operations (SRK, May 1995).

Of these 19 samples, five were selected based on paste pH results for further study using the kinetic column testing technique. The five samples selected were

- SW-1 and LGSSP-2 from the sulfide-bearing waste rock piles,
- PW-2, quartz breccia from the pit wall, in the vicinity of the Sternberg Lode,
- IDC24-222-241 and CF10 –190-199, CFQM from archived drill core (SRK, May, 1995).

Table 5 summarizes additional testing that was done on the above samples.

In August of 1997, field work was conducted to produce detailed geologic and geochemical maps of the waste rock piles and the mine pit. One hundred and twelve samples were collected from 6-ft long trenches along benches on the rock storage piles. Figure 13 shows the locations and values of the pH samples collected in the vicinity of the pit lake. Fifty-one samples were analyzed for ABA and 59 samples were analyzed for net acid generation (NAG) (SRK, July, 1998). Table 6 presents the sample numbers of samples analyzed in the rock pile characterization studies.

McLemore et al. (1996) collected 12 samples of pond sediment and sulfide material from the pit walls about the mine pit lake. These samples were run for whole rock analysis using atomic adsorption and inductively coupled plasma spectrometry (Table 8, Fig. 13).

2.4 Tailings Dam Investigations

The tailings impoundment consists of an earthen embankment constructed across a minor valley, and is approximately 6,600 ft long with a maximum toe to crest height of 60 ft (Fig. 14). The impoundment is divided into the north and south cells, into which tailings were to be deposited. During the three months of operation, approximately 1.2 million tons of tailings were deposited into the north cell of the impoundment. The existing tailings cover a surface area of 60 acres in the north cell and have a mean surface elevation of 5220 ft (SRK, May 1995).

Extensive engineering design, construction, and short- and long-term groundwater monitoring work was done on the tailings dam. Numerous reports have been prepared that describe the work conducted at the Copper Flat tailings impoundment. Table 7 summarizes the reports in terms of authors, dates, and purposes.

In 1976, SHB performed 37 soil borings along the starter dam centerline (Fig. 15), with boring depths varying from 45 to 1,100 ft below grade. Borings along the centerline were spaced approximately 300 ft apart. Standard penetration testing and open-end drive sampling were performed at 5-ft intervals in most borings. Five test borings, ranging from 40 to 75 ft in depth, were drilled in the pond area (SHB, Oct.14, 1980).

SHB excavated 46 test pits and one test trench within the pond area to investigate the nature of the near surface materials and explore for borrow sources for the starter dam construction. In 1980, several of the pits were reopened and sampled for additional laboratory testing (SHB, Oct. 14, 1980).

SHB performed three types of permeability tests:

- 15 constant head tests were performed in uncased open auger holes using the U.S. Bureau of Reclamation E-19 Method,
- five double packer tests in accordance to U.S. Bureau of Reclamation Method E-18. Permeability test were performed in both volcanic rock and the overlying soils of the Santa Fe Group, and
- three special in-place permeability tests were made by placing 10-ft long screen in boreholes 5-inches in diameter and filling the annular space with clean filter sand. Annular space above the sand was grouted for at least 25 ft to isolate the screened interval. Long term permeability tests were performed on these piezometers in accordance with the Navy Design Manual. Two of the tests were performed in screened intervals below the water table (SHB, Oct. 14, 1980).

Geotechnical testing during 1976 included moisure-density relations, grain size analysis, Atterberg Limits, permeabilty, consolidation, and direct shear tests. In addition, grain-size analysis, Atterberg Limits, and moisture-density relations were performed on a sample of tailings produced by a project pilot plant operated by the Colorado School of Mines Research Institute. Tailings slimes were tested for moisture-density relations and direct shear to investigate the range of shear strength, which might be present near the dam slope (SHB, Oct. 14, 1980). Laboratory permeability tests were performed on samples of the synthetic drain materials and conventional granular filter materials (SHB, Oct. 14, 1980; SHB, Aug 29, 1980).

During this investigation, SHB collected several samples of water and soils for chemical analyses. These samples included four water samples from wells down-gradient of the dam alignment. Figure 16 presents the locations of groundwater samples 1, 2, 3, and 4; however, the map does not identify the specific wells from which the groundwater samples were collected. SHB also collected a sample of the thickener underflow water, which is assumed to be a groundwater sample collected from below the proposed location of the thickener. These groundwater samples were analyzed for general chemistry and metals. Three soil samples were collected from boring #5 at depths of 4.5, 14.5, and 29.5 feet below grade and two more samples were collected from Pit A-1, and Pit C-2 (Fig. 16). These soil samples were analyzed for cyanide. Soil samples also were collected from test pits A-1, A-2, F-1, and F-2. Aqueous suspensions of these soils were made and the liquid was measured for soluble anions, cations, and metals. Finally, water samples collected from borings 29, 30, 31, 33, and 34 were analyzed for general chemistry and metals. No discussions of how the monitoring wells were constructed are associated with these borings (SHB, Oct., 1980).

In October 1980, an additional geotechnical investigation with respect to the decant line alignments and decant towers was conducted. Twelve additional soil borings were performed (Fig. 14), with borings drilled from 10 to 31 ft below grade. Standard penetration and open-end drive sampling were performed at selected intervals in the borings.

In April 1981, SHB produced a report responding to concerns by the New Mexico State Engineers office regarding potential settlement of the earthen dam structure. SHB elaborated on the original settlement analysis prepared in 1976 with additional dispersivity tests on two soil samples and verification of stress and strain calculations (SHB, Apr. 13, 1981). On September 4, 1981, SHB submitted a Geohydrological Evaluation to support the groundwater discharge to QMC. This report contains the results of the geohydrological field studies and data analyses, recommendations concerning the mitigation and monitoring of water quality effects, and a discussion of contingency measures (SHB, June 29, 1981). Unfortunately, this report was not located for review and incorporation into this study. It was not in the NMEIB files during a file review nor could it be found with the other files stored with Hydro Resources, Inc.

Two reports by SHB address the compacted clay plating that was placed to limit seepage through basaltic flow channels located adjacent to the impoundment divider dike. The exposed basalts were considered to be of higher permeability than the surrounding Santa Fe Group sediments. The purpose of the 1.5-ft thick clay plating was to minimize seepage in the northeast area of the south cell and in the southeast corner of the north cell

(Fig. 14). In addition, compacted clay was placed over six exploratory borings (nos. 4, 9, 10, 11, 14, and 15) to eliminate the possibility of the borings becoming seepage conduits. Monitoring well NP-5 was installed to monitor seepage within the basalt (SHB, Oct 13, 1981, SHB, Oct. 28, 1981).

John W. Shomaker, Inc. studied the ambient water quality underlying the tailings impoundment in 1993, approximately 11 years after the impoundment was filled (Newcomer, et al, 1993). From 1991 to 1993, groundwater samples from monitoring wells NP-1, NP-2, NP-3, NP-4, NP-5, GWQ-1, GWQ6, GWQ-7, GWQ-8, GWQ-10, GWQ-11, and McGravy-Greyback were collected and analyzed for general minerals, metals, and phenols (Fig. 10). Newcomer et al. (1993) identified a potential paleo-channel associated with the basalts noted by SHB near the center of the impoundment. Results are presented in Appendix B.

In 1994, SRK performed a study of the tailings impoundment (SRK, Aug., 1994). The study involved a review and interpretation of the tailings dam design, construction, operation, and monitoring activities and additional field investigations. In May and June 1994, SRK advanced two soil borings through the tailings and underlying alluvial and volcanic deposits (Fig. 10). The borings were converted to monitoring wells denoted as SRKBH-1-94 and SRKBH-2-94. One well was screened in the Santa Fe Group alluvial sediments and one well was screened in the basalts. Falling head permeability testing was done in both of the wells.

In 1994, Adrian Brown Consultants (ABC) was contracted by SRK to perform an aquifer test on well GWQ94-17 in order to estimate the lower of two near surface aquifers that receive recharge from areas impounded by the tailings dam and to determine if the two water bearing zones are hydraulically connected (ABC, 1996). SRK also described the conceptual subsurface hydrology in tailings seepage modeling that the performed in support of the proposed re-use of the tailings impoundment by Alta Gold (SRK, Aug., 1998).

In support of the EIS, SRK sampled numerous wells in tailings impoundment area as well as other wells associated with Copper Flat from 1994 to 1998. Notes on these sampling activities and the sample results are tabulated in Appendix B.

On April 3, 2003, the author and Dr. Virginia McLemore visited the area north of the tailings dam to collect samples clay from an exposure of the clay in an arroyo north of the tailings dam (SHB, Oct. 1976). The principal material that SHB described as using in the clay plating of the basalts exposed in the center of the impoundment appears to have been reddish brown, highly plastic, sandy clay. The author and Dr. McLemore collected three materials, denoted as SR-1, SR-2, and SR-3, in close proximity to each other at latitude of 32.97 degrees and a longitude of 107.50 degrees (R6W, T15S, Section 30) (Fig 11). Sample SR-1 is a red sandy silt; SR-2 is a white cemented material, and SR-3 is a brown sandy silt. Stratigaphically, SR-2 overlies SR-1, which overlies SR-3. These clay samples were analyzed for bulk mineralogy and clay mineralogy. Visual-manual classifications of the clay and the results of the mineralogical analyses are discussed in Section 3.0

3.0 Nature and Extent of Potential Environmental Issues

3.1 Mine Pit Lake Investigative Results

3.1.1 Mine Pit Lake Surface Water

Pit lake water analyses per sample varied from pH only to anions, cations, and metals. Only copper concentrations exceeded the New Mexico Water Quality Control Commission (WQCC) water quality standards for surface water (WQCC, 2001). The WQCC surface water standard for livestock and wildlife is 0.5 milligrams per liter (mg/L). The pit lake was sampled and analyzed for copper 31 times (Fig. 17). Three times the concentration exceeded livestock and wildlife surface water standards; August 29, 1991, December 15, 1992, and February 12, 1993. The concentrations of copper that were reported from these three sampling events are 0.64 mg/L, 3.21 mg/L, and 2.6 mg/L, respectively.

Typically, water pH has been neutral to alkaline and indicates that the pit lake has been in a neutral to alkaline state for the last ten years (Fig. 18). However, from March 1992 to October 1992, the pH of the pit lake dropped below 5, with a low of pH = 4.4 in July 1992 A steady increase in the TDS concentrations of the pit lake was observed from April 1989 to October 1997 from approximately 3500 mg/L to 5850 mg/L (Fig. 19). A gradual increase in sulfate in the pit lake waters over the same time from 2340 mg/L to 4300 mg/L (Fig. 20) was also recorded. The TDS and sulfate results show some water quality degradation; however, the WQCC does not regulate either TDS or sulfate in New Mexico surface waters. The chemistry of the pit lake does not change significantly laterally or with depth (SRK, Dec. 1997). Analytical results of pit lake sampling are tabulated in Appendix A.

Sources of water to the pit lake are groundwater inflow, direct precipitation, and surface runoff. The major sources of dissolved solids are from reactions between oxidizing pit lake waters and reduced minerals in the pit walls, surface water runoff, and evaporation of the pit lake water. The remainder of the sulfate must be derived directly from sulfide oxidation or from the dissolution of secondary minerals such as jarosite and gypsum (SRK, Dec. 1997).

Because the pit lake is a topographic low, it is a hydraulic sink. Historic seeps have been described and sampled along the mine pit wall and rock storage piles. Newcomer et al. (1993) described a seep initiating from a sulfide-bearing rock pile having a discharge rate less than 1 gpm. This seep was sampled on May 7, 1993, but the location of this seep is uncertain because the associated sample location map is apparently not available. However, SRK identified a small area of sulfate precipitation near the base of the East rock storage pile, which they suggest is the site of the seep that Newcomer reported (BLM, 1996). This seep water sample reported a pH of 1.9, a TDS concentration of 17,020 mg/L and a sulfate concentration of 10,000 mg/L (Newcomer et al., 1993); however, no water or evidence of significant flow was observed during the 1995 SRK site visit (BLM, 1996), suggesting that this seep is an ephemeral source of low-pH, sulfate-bearing solution.

Another small seep was identified by SRK during a site visit in 1997. This seep flowed into a small, acidic, ferruginous pool located below the Sternberg Lode. A pit wall sample was collected near this area and denoted as PW-1 (Fig. 11) (SRK, Dec. 1997). The pH of water sampled from this seep was reported to be 2.64; the TDS concentration was 11,430 mg/L; and the sulfate concentration was 16,850 mg/L (BLM, 1999). This seep, observed in August of 1997, was the first recorded seep in the pit wall in four years of study by SRK and is believed to be the result of unusually high precipitation in June and July 1997 (SRK, Dec. 1997). A second pit wall seep was sampled by SRK in August 1997, denoted as PW-2 (Fig. 11). The results of this sample show lower concentrations of sulfate (3,100) and TDS (5020) and a greater pH (8.16) than the PW-1 sample.

SRK collected a seep sample from the West rock storage pile also in August of 1997. This sample has a pH of 3.03, and concentrations of TDS and sulfate at 25,440 mg/L and 22,100 mg/L, respectively (SRK, July, 1998). Full results of the seep sample analytical suites are presented in Appendix A

3.1.2 Greyback Gulch Surface Water

Greyback Gulch is an ephemeral stream that is dry most of the year except for runoff from storm events. The earliest surface water sampling was in 1976 and 1977 in support of the EA prepared for QMC. These surface water samples pre-date the 1982 mining activities by QMC, but post-date less extensive historical mining activities. Surface water results are available for January, March, and July 1977. They were collected from 3 stations described as Station A, where the creek enters the QMC property; Station B, approximately 300 feet east of the estimated mine rim; and Station 3, where the creek leaves the QMC property (BLM, 1978). The water quality of these samples is good compared to post-mining samples collected from similar locations (Table 9).

Three surface water locations have been sampled frequently in Grayback Gulch. These locations are SWQ-1, upstream of the mine pit; SWQ-2, downstream of the pit in the former plant area; and SWQ-3, north of the tailing dam (Fig. 10). The SWQ-1 location was sampled five times between 1982 and 1993, SWQ-2 35 times between 1982 and 1998, and SWQ-3 26 times between 1991 and 1998.

All pH measurements at locations SWQ-1, SWQ-2, and SWQ–3 were neutral to alkaline (Fig. 21). Figure 23 presents the TDS measured in these three locations. Samples collected from SWQ-1 were all less than 1000 mg/L. A logarithmic trend line placed through the five points of the SWQ-1 data set indicates a gradual increase in TDS over time. Samples collected from SWQ-2 ranged from 1000 mg/L in the early 1980s to as high as approximately 4500 mg/L in the late 1990s. A logarithmic trend line placed through the 35 points of the SWQ-2 data set indicates a more pronounced increase in TDS over time. The 26 points from the SWQ-3 data set ranged from 1866 mg/L to 4432 mg/L. Sample frequencies and dates for sulfate are the same as the TDS (Fig. 23). Sulfate results for SWQ-1 were all less than 325 mg/L and the trend line increases slightly over time. The scatter of the data sets from SQW-2 and SWQ-3 was similar to the TDS results. Sulfate concentrations in waters sampled from SWQ-2 ranged from 445 mg/L to 2566 mg/L. The sulfate trend line increases with time. Sulfate concentrations in waters sampled from SWQ-3 ranged from 952 mg/L to 2382 mg/L, and sulfate appears to increase with time. The pH, TDS, sulfate and other constituent results are tabulated in Appendix A.

Figure 24 presents Stiff diagrams developed by Newcomer et al. (1993) from a sampling event that occurred in March and April of 1993. The patterns indicate that the water quality is higher at the up stream location, SWQ-1, not the downstream location SWQ-2 and SWQ-3. The increases in TDS and sulfate appear to be the result of mining, mineral processing, construction, and road building activities during the mining activities of the early 1980s (Newcomer et al., 1993). However, water pH has been consistently neutral to alkaline and the WQCC does not have numeric standards for TDS and sulfate.

3.1.3 Groundwater

A set of nested monitoring wells exists up gradient of the mine pit lake, GWQ-96-22A (shallow) and GWQ-96-22B (deep), and a set of nested wells exist down-gradient, GWQ-96-23A (shallow) and GWQ-96-23B (deep). The down-gradient wells are referred to as Well construction details and surveyed location are not available for these wells; however, they are shown on Figure 10.

Figures 25, 26, and 27 show the results of groundwater sample results for pH, TDS, and sulfate respectively. The wells were sampled several times from 1996 to 1998. The pH is neutral in the GWQ-96-22A and slightly alkaline in GWQ-96-22B (Fig. 25). TDS is below the WQCC groundwater numeric standard of 1000 mg/L (WQCC, 1995) (Fig. 26). TDS concentrations found in the samples collected from both GWQ-96-22A and B are below 700 mg/L. TDS concentrations found in groundwater sampled from GWQ-96-23A and B also are less than 1000 mg/L. However, there may be a trend showing that TDS is increased gradually over time in the shallow down-gradient well. Sulfate concentrations are below the WQCC numeric standard of 600 mg/L in both the up gradient and down-gradient wells both shallow and deep (Fig. 27). In groundwater sampled from GWQ-96-22A, sulfate concentrations do not exceed 300 mg/L. In GWQ-96-22B, the single sulfate concentration was found to be 79 mg/L. In groundwater sampled from GWQ-96-23A, sulfate concentrations do not exceed 450 mg/L. In GWQ-96-23B, the sulfate concentrations were found to be less than 240 mg/L. However, the sulfate concentrations from the down-gradient shallow well indicate that the sulfate concentrations are gradually increasing over time.

3.2 Rock Storage Pile Investigative Results

Section 2.3 describes the pit wall and rock storage pile investigations conducted in 1994 and 1997 for potential sulfide oxidation. Tables 4, 5 and 6 present the analyses done on the samples and Figures 11, 12, and 13 present sample locations.

3.2.1 Metal Content and Mineralogy

The mineralogy of the samples was determined visually. The most common sulfide mineral was coarse crystalline pyrite. Concentrations of pyrite were estimated between less than 1 percent and 10 percent. In one location in the North waste rock pile, the pyrite concentration was estimated to be as high as 20 percent (SRK, July 1998). Sulfides observed were chalcopyrite, bornite, tetrahedrite, enargite, covellite, and molybdenite. Gangue minerals associated with the sulfide mineralization include quartz, feldspars, and biotite. Other minerals include calcite, flourite, siderite, magnitite, sericite, epidote, and chlorite (SRK, July 1998).

Whole rock chemistry analyses of the samples collected by McLemore in 1996 and PW-3 and WD-1 collected by SRK in 1994 indicate high concentrations of aluminum, manganese, copper, and iron (Appendix C). Copper, molybdenum, sulfer, silver, zinc, and cadmium are enriched relative to typical crustal abundance (SRK, July 1998).

An extractable metals analysis was run on the WD-1 sample using EPA Method 1312 leaching method (Table 10). This sample was selected for the extractable metals because it was a transition waste rock that exhibited low field pH. Therefore the leachate constituent concentrations would be expected to be greater than the fresh unoxidized waste rock samples (SRK, July 1998).

3.2.2 Paste pH

Paste pH analysis was performed on 141 samples. The number of paste pH analyses run per rock type was:

- quartz monzonite - 94
- quartz breccia - 28
- biotite breccia – 10
- quartz vein – 8
- andesite – 1.

The pH results range between 3 and 9 for all rock types but the andesite (Fig. 28). The one paste pH result in Andesite was 9. The greater frequencies are acidic.

3.2.3 Acid Base Accounting

Acid Base Accounting tests were done in 1994 and 1997. The ABA tests indirectly estimate acid generation potential (AP) by comparing sulfide sulfur content to the acid neutralizing potential (NP) of the sample. The Sobek method was used to analyze the 1994 samples and the modified Sobek method was used to analyze the 1997 sample. The modified Sobek method is considered to be more conservative for estimating NP (SRK, July 1998). Figure 29 compares the NP versus AP. Figure 30 presents the NP versus AP by rock type for the 1997 data. The diagonal line on Figure 30 represents NP is equivalent to AP. The results of the 1997 acid base accounting indicate that most of the samples have the potential to produce more acid than they can neutralize (SRK, July 1998).

3.2.4 Net Acid Generation Testing

Fifty-nine samples were run for NAG pH. The NAG test underestimates the amount of sulfide in the sample, but assumes complete oxidation of the sulfide. The results provide a realistic indication of the amount of sulfide that may react in the field. For all rock types, the majority of the samples are acidic (Fig. 30) (SRK, July 1998). The raw data for paste pH, ABA, and NAG are found in Appendix D.

3.2.5 Kinetic Testing

Kinetic testing or humidity column testing was conducted on four quartz monzonite samples and a quartz breccia sample:

- samples SW-1 and LGSSP-2 were obtained from the sulfide waste rock piles,
- sample PW-2 was obtained from the pit wall in the vicinity of the former Sternberg Lode,
- samples IDC 24-222-224 and CF10-190-199 were obtained from archived drill core (Fig. 12).

The sulfide waste samples (SW-1 and LGSSP-2) are representative of previously mined unoxidized materials that have been exposed to weathering since 1982. The samples contain fresh pyrite and chalcopyrite which coat fractures and are disseminated throughout the rock. Sample PW-2 was collected from the wall on the south side of the pit. The sample was highly oxidized, but contained residual disseminated pyrite and chalcopyrite. The core samples (IDC 24-222-241 and CF10-190-199) are representative of the unoxidized quartz monzonite that may be mined in the future. They contain fresh pyrite and chalcopyrite.

3.2.5.1 Kinetic Test Results – pH

The kinetic tests were run initially for 19 weeks. A problem occurred in week 20 causing inconsistent results, which was later identified as contaminated deionized leachate water. The kinetic tests were halted for seven weeks while the problem was corrected and the tests were continued in week 27 and 28.

The results from all of the samples except PW-2 were neutral to alkaline ranging from 7 to 8.1 (Fig. 32). Sample PW-2 was slightly acidic with pH results ranging from 5.8 to 6.5 (SRK, July 1998; SRK, May 1995).

3.2.5.2 Kinetic Test Results – Electrical Conductivity

Leachate conductivity is an indicator of soluble metals and sulfate (TDS). Figure 33 indicates that electrical conductivity decreased over time. By week 20, the conductivity of all test leachates was less than 100 microSiemens per centimeter (μS/cm). This low conductivity suggest limited leaching of metals and sulfate (SRK, July 1998; SRK, May 1995).

3.2.5.3 Kinetic Test Results – Sulfate

After 15 weeks, the sulfate concentration in the leachate from all samples is less than 50 mg/L (Fig. 34). These results are well below the WQCC numeric groundwater standard of 600 mg/L.

3.2.5.4 Kinetic Test Results – Copper and Iron

Concentrations of copper and iron in the leachate were recorded during the kinetic testing (Fig. 35). Metal concentrations in both graphs drop off rapidly in all of the samples. Metal concentrations in most samples fall below the detection limits (SRK, July 1998; SRK, May 1995).

3.2.5.5 Kinetic Test Results – Alkalinity and Acidity

Concentrations of alkalinity and acidity (as milligrams of $CaCO_3$ per liter) in the leachate were recorded during the kinetic testing (Fig. 37). The concentrations of alkalinity gradually decrease over time; however, acidity concentrations are several times less than alkalinity and are stable over time. The gradual decrease of alkalinity suggests consumption during the neutralization of acid (SRK, July 1998; SRK, May 1995). The results of the kinetic tests are presented in Appendix D.

3.3 Results of Tailings Dam Investigations

The tailings system was reclaimed in 1986 in accordance with the requirements at that time. The reclamation included covering the existing tailings with topsoil. The topsoil was re-vegetated and the intermediate decant pipe intakes were sealed (SRK, May 1995).

3.3.1 Geochemical Investigative Results

During the 1976 geotechnical investigations conducted by SHB, several samples of groundwater and leachate from native soils were analyzed for chemical constituents. Four groundwater samples were collected from wells down-gradient from the tailings dam. The locations of these samples are shown on Figure 17; however, SHB did not identify the wells by name or reference. Theses samples were analyzed for general mineralogy and some metals. SHB collected soil samples from test pits A-1, A-2, F-1, and F-2 (Fig. 15). Aqueous suspensions containing the soluble components of the soils were made and analyzed for general chemistry and metals. Finally, groundwater was collected from soil borings 29, 30 31, 33, and 34 (Fig. 15) (SHB, Oct. 1980). The results are presented in Appendix B.

In 1996, SRK excavated five test pits in the in the existing tailings impoundment. Eleven tailings samples were collected from the five test pits and were grouped in accordance to their appearance; yellow tailings were assumed to be derived from oxidized or transition oxidized-reduced materials. These samples are identified with "TTLS" in the sample identification. Gray sample colors are assumed to be derived from unoxidized quartz monzonite protolith, and are denoted with "UTLS" in the sample identification. Black tailings are assumed to be derived from biotite breccia, and are denoted with "BTLS".

The reactivity of the tailings samples are low, with paste pH for all of the samples varying from 6.2 to 7.8. ABA analyses indicate that five of the 11 samples had NP:AP ratios less than 1, indicating that these samples have moderate potential to generate acid. The remaining samples had an NP:AP greater than 1, indicating weak potential for generating acid (SRK, July 1998).

In 1994, SRK collected two samples from boring SRKBH-1-94 (Fig. 10). One of two samples, T-10-12, was analyzed for total metals by ICP and extractable metals by EPA Method 1312 (Table 11). The sample had high concentrations of aluminum (2,700 parts per million (ppm), copper (1,600 ppm), iron (19,000 ppm), magnesium (1,800 ppm), potassium (1,400 ppm), and zinc (418 ppm). The results of a single leach test indicate that these metals are not easily leached (SRK, May 1995).

3.3.2 Hydrogeological Investigative Results.

The subsurface hydrology beneath the tailings impoundment consists of three zones Fig. 38):

- The upper “perched” zone contains sands and gravels, which are located adjacent and down-gradient of the tailings impoundment. This unit dips and thickens to the east and groundwater in this zone is unconfined.
- Underlying the upper zone is a clay layer. This unit is up to 150 ft thick.
- The lower zone consists of clayey and silty sands of the Santa Fe Group. Groundwater in this zone is confined beneath the clay, but unconfined to the west, where the unit outcrops at the surface. This zone is assumed to be approximately 200 ft thick (SRK, Aug. 1998).

In 1994, ABC/SRK conducted a pumping test of monitoring well GWQ94-17. The results of this pumping test indicated that upper and lower water bearing zones are not hydraulically connected (ABC, Sept, 1996).

SHB (Oct 1980), Newcomer et al. (1993), and SRK (Aug. 1994) indicate a potential paleochannel buried near the surface in the vicinity of the levee bisecting the impoundment. SHB observed breciated basalts in this area and recommended that a compacted clay liner be installed in these areas (Fig. 14).

3.3.3 Permeability Testing

SHB performed 15 constant head permeability tests in uncased bore holes by the U.S. Bureau of Reclamation (USBR) E-19 Method, 5 USBR Method E-18 double packer permeability tests in volcanic rock and typical soils, and 3 long term falling head permeability tests in constructed piezometers. The results of the E-19 tests performed in the clayey sands and gravel averaged (14.6 ft per year (ft/yr) (1.4 x 10^{-5} centimeters per second (cm/s)). The E-18 tests in clay showed no measurable permeability and the basalts indicated average permeability values of 234 ft/yr (2.3 x 10^{-4} cm/s). The falling head piezometer permeability results in clayey sands and gravel were 61 ft/yr (5.9 x 10^{-5}

cm/s) (SHB, Oct. 1980). Remolded permeability sample results of the clay used in the exposed breccia compacted liner averaged 0.7 ft/yr (7.0 x 10^{-7} cm/s) (SHB, Oct. 1980). Results from the SHB permeability testing are in Appendix E.

SRK performed one additional falling head test in the Santa Fe Group and in the basalts. These tests were done in 1994 in wells SRKBH-1-94 and SRKBH-2-94 (Fig. 10). The results of these permeability tests are 279 ft/yr (2.7 x 10^{-4} cm/s) for the basalts and 383 ft/yr (3.7 x 10^{-4} cm/s) for Santa Fe Group sediments (SHB, Aug. 1994).

3.3.4 Groundwater Impacts

The two wells down-gradient of the tailings impoundment with the longest sampling history are NP-3 and NP-4. They are indicators of the effectiveness of the seepage control engineered for the existing impoundment. Figure 39 shows pH concentrations in NP-3 from October 1981 to July 1998 and in NP-4 from April 1982 to July 1998; this figure shows that groundwater sampled from these wells has always been neutral to alkaline. Figure 40 shows concentrations in TDS in groundwater sampled from the two wells over the same time periods. The TDS concentration from NP-3 groundwater exceeded the WQCC numeric groundwater standard of 1000 mg/L in early 1984 and apparently peaked at 1,880 mg/L in early 1987 and has been gradually decreasing since. However, the latest measurement of 1,433 mg/L taken on July 13, 1998 still exceeds the standard. TDS concentrations in NP-4 have stabilized at approximately 500 mg/L. There are anomalous readings in the TDS concentrations from the samples collected on September 24, 1994 from NP-3 and January 15, 1997 from NP-4. These measurements do not fit the trend of the data and must be suspect. Figure 41 shows similar trends to the TDS for sulfate concentrations. The sulfate concentrations in groundwater collected from NP-3 peaks at 971 mg/L in 1991 and then gradually decreases with time. The most recent measurement collected on July 28, 1998 is 718 mg/L, which is higher than the WQCC numeric standard of 600 mg/L. Sulfate concentrations in NP-4 never exceed the standard and most recently appear stable at less than 200 mg/L. NP-3 is the well that most consistently exceeds any WQCC numeric standards in the vicinity of the tailings impoundment other than GWQ-13. The three samples collected from this well are similar in TDS and sulfate concentration to NP-3, and they are adjacent to each other.

3.3.5 Liner Borrow Material Study

SHB recommended that compacted clay liners (approximately 1.5 ft thick) be placed where brecciated basalts are exposed at the surface in the center of the impoundment. Alta Gold accepted this recommendation and the lined areas are shown on Figure 14. The liner material was borrowed from the site and SHB observed that very similar materials were exposed in an arroyo north of the impoundment (SHB, Oct, 1976). On April 4, 2003, a sample of this material and two additional soils were collected. A global positioning reading was taken at the location of the sample collection (32.97613 degrees latitude and 107.50392 degrees longitude). That latitude and longitude was loaded in the ALL TOPO, a geographic software program, and the location was adjusted slightly to 32.96987 degrees latitude and 107.50239 degrees latitude (Fig. 10). A visual-manual description of the soils and the locations of the materials relative to each other were noted (Table 12).

The red sandy clay material was the predominant material borrowed and used in the compacted clay liner (Table 13). SHB conducted sieve analyses, Atterberg Limits, Proctor maximum density and optimum moisture content, and permeability testing on similar material. Sieve analyses also were performed on the brown sandy clay/silt. The locations of these samples can found on Figures 14 and 15. SHB boring/test pit logs and test worksheets are presented as Appendix F.

From April 28 to May 4, 2003, a hydrometer analysis was conducted to determine the clay fraction of red material (sample SR-1) in accordance with the U. S. Army Laboratory Soils Testing Manual (USACE, 1965). The results show that approximately 3.4 percent of the material is sand, approximately 2.5 percent of the material is clay, and the remainder is silt. A free swell test also was performed by adding 10 milliliters of the dry fines to a graduated cylinder, submerging in water, and allowing the material to expand in the cylinder. After 24 hours, the material had expanded to 16 ml, which is a swell of 60 percent. The natural moisture content on the sample was 6.3 percent (Appendix F).

On April 11, 2003, bulk mineralogy using X-ray diffraction (XRD) was performed on samples SR-1, SR-2, and SR-3. The predominant minerals present in sample SR-1 are quartz, calcite, feldspars and undifferentiated clays. The predominant mineral in sample SR-2 is calcite. The predominant minerals in sample SR-3 are quartz, muscovite, feldspar and undifferentiated clays. Clay slides were prepared for samples SR-1 and SR-3 (Table 14). Clay was not present in sample SR-2. The clay slides for samples SR-1 and SR-2 were run after air drying, after 24 hours in a glycol chamber, and after 30 minutes of heating at approximately 375 degrees centigrade (Hall, no date). The bulk XRD test scans, the clay test scans, and the clay mineralogy distribution calculations are presented as Appendix G.

4.0 Conclusions and Recommendations

4.1 Mine Pit Conclusions

4.1.1 Surface Water Quality, Mine Pit Lake

The water quality of the pit lake does not exceed New Mexico WQCC surface water numeric standards for livestock and wildlife as of 1998 (Table 15). Historically, only copper concentrations exceeded the WQCC numeric standard of 0.5 mg/L. The most recent surface water sample to exceed this standard was collected in February 1993, with a concentration of 2.6 mg/L. No other metal, cation, or anion exceeded any of these standards except chromium, once on November 16, 1994, a pit lake sample had a concentration of 0.2 mg/L, which exceeds the domestic and irrigation use numeric standard of 0.1 mg/L.

Since 1994, pH measurements have consistently remained neutral to alkaline (Fig. 18). Copper has not exceeded the numeric standard for livestock and wildlife since 1993 (Fig. 17). Although sulfate and TDS are gradually increasing over time; there are no numeric surface water quality standards for these parameters (Figs. 19, 20). The drop in the elevation of the surface of the lake in recent years may explain the increase in TDS. From 1993 to 1997, the water level in the lake dropped approximately 10 ft, which has caused the evaporative concentration of salts in the pit lake (SRK, Dec. 1997).

Analysis of the anions and cations from pit water sample data collected on April 3, 1989, September 21, 1995, and July 21, 1998 indicate that even though the water quality is poor, the pit water does not exceed any livestock or wildlife standards. Figure 42 presents a Piper diagram showing that the pit water has consistently high contents of calcium, chloride, and sulfate relative to surface water in Greyback Gulch and local groundwater.

The surface water chemistry found in the lake can be explained by:

- The inflow of neutral to alkaline groundwater has relatively low concentrations of TDS and sulfate.
- The composition of the host rock is acid buffering. The composition of the host rocks includes approximately 5 percent calcite, 30 percent feldspar, and one percent other carbonates. The dissolution of the calcite in the host rocks and the precipitation of gypsum and geothite around the pit lake indicates that acid buffering is occurring.
- There is a typical volume of disseminated pyrite in the rocks surrounding the pit lake, typically 1 to 5 percent. The pyrite is disseminated thoughout the groundmass of the host rock limiting access of water and air to allow oxidation. In addition the pyrite is coarse grained, which limits the surface area pyrite crystal, when it is exposed to oxidation (SRK, Dec. 1997).
- Low precipitation in the area is probably the most important reason for the relatively good quality of the pit lake surface water, with respect to pH and concentration of metals. Low precipitation limits the flushing of the oxidized products into the environment via runoff, seep, and discharges (Chavez, 2003).

The net effect is that while sulfide oxidation is occurring, the transport of the oxidation products is slow, except locally in the Copper Flat area.

4.1.2 Surface Water Quality, Greyback Gulch and Local Seeps

Surface water samples collected from locations along the ephemeral Greyback Gluch, SWQ-1, SWQ-2, and SWQ-3 indicate higher quality runoff upstream of the mine site (SWQ-1) than downstream (SWQ-2 and SWQ-3). Although pH measurements remain neutral to alkaline in samples collected from both upstream and downstream location (Fig. 21), TDS and sulfate concentrations are greater downstream and have increased over time (Figs. 22, 23). In SWQ-2, downstream of the mine pit, nitrate has exceeded domestic use WQCC numeric standard (10 mg/L) four times from 1981 to 1998, with a maximum nitrate concentration of was 14.5 mg/L. No numeric standard for livestock or wildlife has ever been exceeded in samples from these three locations.

The Piper diagram (Fig. 42) indicates that the downstream surface water in Greyback Gulch has higher proportions of calcium, chloride, and sulfate than upstream surface water for one set of data collected from SWQ-1, SWQ-2, and SWQ-3 in March/April 1993. The upstream surface water has a higher proportion of bicarbonate. This may indicate that some of the alkalinity upstream is being consumed by acid via neutralization as surface water move over and through the Copper Flat ore body.

Possible reasons for the lower surface water quality in the downstream sample locations in Greyback Gulch are:

- evaporative concentration of dissolved load of anions and cations,
- gypsum dissolution, which is regionally widespread,
- water-mineral interactions within the copper-porphyry deposit, and
- disturbance from the construction of roads and rock storage piles and stream diversion (SRK, Dec. 1997).

There have been a few intermittent seeps from the pit wall and rock storage piles. Typically, these seeps do not flow except following heavy precipitation. When they do flow, they are typically acidic and have high concentrations of anions, cations, and metals. Historically seeps have been identified on the southern wall of the mine pit (PW-1 and PW-2) and from the East and West waste rock piles (Fig. 11). Typically, surface water from these seeps are characterized with pH concentrations of 2 to 3, except PW-2 with a pH of 8.16, high TDS concentrations of 5,000 to 25,000 mg/L, and high sulfate concentrations of 3,000 to 22,000 mg/L. Concentrations of surface water from these seeps have exceeded WQCC surface water livestock and wildlife numeric standards for aluminum, cadmium, copper, cobalt, selenium, and zinc. Domestic numeric standards have been exceeded for arsenic, beryllium, chromium, cadmium, nickel, and selenium. Irrigation numeric standards have been exceeded for boron, chromium, and cadmium.

4.1.3 Ground Water Quality

The pH measurements both up- and down-gradient range from approximately 7 to 8.2 (Fig. 25). TDS is less than the WQCC numeric groundwater standard of 1,000 mg/L (Fig. 26). However the groundwater down-gradient of the mine pit is increasing gradually over time and approaching the numeric standard. Sulfate concentrations also are lower than the WQCC numeric groundwater standard of 600 mg/L (Fig. 29); however, the sulfate concentrations in the down-gradient well are increasing with time.

An appropriate conceptual model of the Copper Flat mine pit lake is that of a local hydraulic sink. Figure 43 presents groundwater contours below the mine area (BLM, 1999, ABC, 1997). Historical sampling of well GWQ-5, further to the east (Fig. 10), indicate that water quality in the vicinity may have been affected naturally by the presence of the ore body prior to mining in 1982 (BLM, 1999). Concentrations of sulfate sampled in 1981 by SHB from GWQ-5 range from 477 mg/L to 575 mg/L, which is higher than the sulfate concentrations in well GWQ-96-23A immediately down-gradient of the pit (<450 mg/L). Concentrations of TDS also sampled in 1981 by SHB from

GWQ-5 range from 1,070 mg/L to 1,260 mg/L, which is higher than the TDS concentrations in the well GWQ-96-23A (<1,000 mg/L).

The Piper diagram (Fig. 42) indicates that the groundwater up gradient of the mine pit (well GWQ-96-22A and B) is high quality with relatively high proportions of chloride and sulfate. Groundwater down-gradient of the pit (GWQ-96-23A and B) shows relatively higher proportions of bicarbonate and calcium and relatively lower proportions of sulfates. Pre-Quintana mining (June 15, 1981) groundwater data collected from down-gradient wells GWQ-5 and GWQ-6 show similar anions and cation distributions to post Quintana mining activities (1996 and 1998). This indicates that groundwater quality down-gradient of the ore body reflects the natural weathering of the Copper Flat porphyry system.

4.2 Recommendations for the Mine Pit

4.2.1 Mine Pit Lake

The mine pit lake appears to be geochemically stable under existing conditions. Presently, the surface water appears to be fit for livestock and wildlife. Although the surface water does not exceed WQCC domestic or irrigation standards, it is not recommended for that use because of occasional geochemical variability from irregular, heavy precipitation. Such heavy precipitation and water level fluctuation does affect the chemistry of pit lake water; therefore, periodic monitoring of water quality is reasonable, especially because it is currently a source of water for livestock and wildlife.

4.2.2 Surface Water Quality

The surface water quality in Greyback Gulch does not exceed any WQCC numeric standards. However, nitrate has been exceeded in the past at location SWQ-2.

The quality of the surface water is lower downstream of the mine pit; however, the contributing factors to the water quality degradation is probably from naturally occurring processes such as evaporation and weathering exposure to the copper porphyry ore body. Certain re-contouring, re-vegetation, and soil amendments might improve the surface water quality in downstream reaches, but such actions are difficult to justify considering the current land use of cattle grazing and potential mineral development.

Low water quality seeps only occur during times of high precipitation. Although infiltration of rainwater might be arrested by significant restoration program of re-contouring, re-vegetation, and soil amendments, most of the documented seeps drain into the bowl-shaped mine pit lake.

4.2.3 Groundwater

Groundwater quality down-gradient of the mine pit deteriorated with respect to sulfate and TDS from 1996 to 1998; however, more time-based sampling data would be required to ascertain whether this is a real trend or transient phenomenon. Annual monitoring of monitoring wells GWQ-96-22A, GWQ-96-22B, GWQ-96-23A, GWQ-96-23B, GWQ-5, and GWQ-6 would be very useful in establishing groundwater quality trends over time. It appears from the existing data that the ore body is likely the most significant contributor to water quality down-gradient of the pit, and that additional data would be useful in evaluating this hypothesis.

4.3 Rock Storage Pile Conclusions

4.3.1 Extractable Metals From Rock Storage Pile Sample WD-1

The results of the extractable metals analysis from the rock pile sample WD-1 (Fig. 12) indicate low leachate concentrations. This sample was selected because it represents a transition material having a low field pH. Leachate concentrations would be expected to be greater than fresh, unoxidized waste rock (SRK, July 1998). The WD-1 leachate had a pH of 3, a high sulfate concentration of 3,050 mg/L, high acidity (as $CaCO_3$) of 1050 mg/L, and no alkalinity (as $CaCO_3$). WQCC surface water numeric standards for livestock and wildlife were exceeded for two metals, aluminum and copper. The concentration of aluminum was reported as 151 mg/L, which exceeds the numeric standard of 5 mg/L. The concentration of copper was reported as 13.6 mg/L, which exceeded the numeric standard of 0.5 mg/L. Both aluminum and copper exceed the numeric standard by approximately 30 times.

4.3.2 Paste pH, Acid Base Accounting, and Net Acid Generation Testing

One hundred and forty-one paste pH analyses were run on the primary lithologies about the mine site, which include quartz monzonite, quartz breccia, biotite breccia, quartz vein, and andesite. The frequency distribution of pH measurements indicates that all of the rock types except andesite have the potential to generate acidic drainage (Fig. 28).

The 32 rock samples analyzed for acid base accounting by the modified Sobek method indicated that only 5 of the samples could produce enough alkalinity to buffer their potential to generate acid (Fig. 31). The remaining 27 rock samples had the potential to generate more acid than they could neutralize (SRK, July 1998).

The NAG pH frequency distribution (Fig. 32) indicates that the majority of the 59 rock samples have the potential to generate acidic NAG pH values. This is the case for all four rock types involved, quartz monzonite (33 samples), quartz breccia (17), biotite breccia (6), and quartz vein (3).

4.3.3 Kinetic Tests

Kinetic testing was conducted on four quartz monzonite samples and a quartz breccia sample, selected from 19 rock samples collected in 1994 and considered to be representative of unoxidized waste rock exposed to weathering since 1982, highly oxidized pit wall rock, and unoxidized quartz monzonite from within the ore body. The sample locations are presented on Figure 11 and are identified as:

- samples SW-1 and LGSSP-2 were obtained from the sulfide waste rock piles,
- sample PW-2 was obtained from the pit wall in the vicinity of the former Sternberg Lode,
- samples IDC 24-222-224 and CF10-190-199 were obtained from archived drill core.

The results from all of the samples except PW-2 were neutral to alkaline ranging from 7 to 8.1 (Fig. 32). Sample PW-2 was slightly acidic with pH results ranging from 5.8 to 6.5. (SRK, July 1998; SRK, May 1995).

By week 20, the electrical conductivity of all test leachates was less than 100 μS/cm (Fig. 33). This low conductivity suggests limited leaching of metals and sulfate (SRK, July 1998; SRK, May 1995).

After 15 weeks, the sulfate concentration in the leachate from all of samples is less than 50 mg/L (Fig. 34). These results are well below the WQCC numeric groundwater standard of 600 mg/L (SRK, July 1998; SRK, May 1995).

Copper and iron concentrations decrease rapidly over the duration of the tests (Figs. 35, 36). Metal concentrations in most samples fall below the detection limits (SRK, July 1998; SRK, May 1995).

Alkalinity gradually decreases over time; however, acidity values are several times less than alkalinity and are stable over time (Fig. 37). The gradual decrease of alkalinity suggests consumption of anions during the neutralization of acid (SRK, July 1998; SRK, May 1995).

4.4 Recommendations for the Rock Storage Pile

According to the results of the paste pH, acid base accounting, and net acid generating tests, all rock types except the andesite have a significant to moderate potential to generate acid. However, the extractable metals analysis of rock pile sample WD-1 and kinetic test results suggest that sulfide oxidation products are slowly released at the Copper Flat mine site.

Additional evidence of low oxidation rates is the abundance of sulfide minerals on the waste rock pile surfaces despite exposure to weathering since 1982. Potential explanations for the low oxidation rates are:

- low precipitation limits the access of water to the sulfide minerals and the flushing of the oxidation products,
- coarse grained pyrite crystals with low surface area to volume ratios,
- disseminated pyrite within the groundmass limits the opportunity for sulfide oxidation, and
- neutral to alkaline groundwater recharge assists in acid neutralization.

The disturbed area of the existing Copper Flat mine site consists of several hundred acres. Although, five kinetic samples and one extractable metals analysis suggest that sulfide oxidation is low in this environment, six samples is not enough to be representative of this site. The current physical, mineralogical, and climatic conditions are favorable to minimize sulfide oxidation and acid rock drainage; however, wetter seasons and/or land use changes may demand more characterization and monitoring at the Copper Flat site.

4.5 Tailings Dam Conclusions

Under the existing drained conditions, the tailings appear to be geochemically stable. Eleven tailings samples collected in 1994 indicate that tailings pH varies from 6.2 to 7.8. Leachate concentrations of extractable metals from a single tailings sample are low, and WQCC numeric standards for groundwater were only exceeded for sulfate and manganese in the leachate. Sulfate has a WQCC domestic use standard of 600 mg/L, which was exceeded in the leachate sample with a concentration of 940 mg/L. Manganese has a WQCC domestic numeric standard of 0.2 mg/L. The leachate sample was found to have a manganese concentration of 1.5 mg/L. No other metals exceeded WQCC groundwater standards.

Figures 40 and 41 indicate that TDS and sulfate concentrations in groundwater sampled from a down-gradient well (NP-3) exceed the WQCC groundwater numeric standards for domestic use of 600 mg/L and 1,000 mg/L, respectively. The concentrations of sulfate and TDS are very gradually decreasing over time, but still remain above standards, 16 years after initial tailings discharge into the tailings impoundment. This information indicates that the tailings dam leaks contaminants into the groundwater, in-spite of the significant study that accompanied the impoundment design.

Figure 14 shows areas where a compacted clay liner was placed in an effort to control seepage below the impoundment through exposed brecciated basalt. The predominant minerals present in clay liner material, as determined by x-ray diffraction, are quartz, calcite, feldspars and undifferentiated clays. The clays consist of 2/10 smectite, 6/10 mixed-layered smectite and illite, and 2/10 kaolinite.

The liner material appears to have a small clay fraction, approximately 2.5 percent, and a small sand fraction, approximately 3.4 percent. The remainder, 91.1 percent, is silt- sized particles. The material will compact into a low permeability layer with a conductivity of 10^{-6} to 10^{-8} cm/s. The clay is highly active, which is determined by dividing the percent clay by the plasticity index. Based on the plasticity indices (Table 13), the activity of the material is approximately 14. Clay is considered active if the activity is greater than 1.25 (Holtz and Kovacs, 1981). The high plasticity indices correlate with high free swell as shown by Table 16. These parameters combined with the fact that 80 percent of the clay fraction is composed of smectite and mixed layer illite and smectite raise concern with respect to the shrink and swell characteristics of the liner material. Smectite and illite are the most active clays with respect to expansion and contraction due to moisture content (Holtz and Kovacs, 1981). Figure 44 presents a relationship between liquid limit and maximum dry density with respect to swelling and collapse based on work done by the U.S. Bureau of Reclamation (Gibbs, 1969, Mitchell and Gardner, 1975, and Holtz and Kovacs, 1981). In this case, a maximum dry density of 105 pounds per cubic foot (1.7 Mega-gram per cubic meter) and a liquid limit of 50 (Table 13) would place the soil in the medium to high range for expansion. The moisture content of the clay material is unknown, although in 1994, the tailings were approximately 20 percent water at depths up to 12 ft below grade (SRK, Aug. 1994). Desiccation could occur if the clay layer dries out, which would compromise the compacted permeability.

4.6 Recommendations for the Tailings Dam

Both SHB, who designed the tailings impoundment, and SRK, who proposed re-using it, have recognized the potential leakage of the facility. SHB suggested and SRK proposed possible engineering modifications to the facility should leakage occur, which it has. SRK proposed a groundwater pump back system to hydraulically contain groundwater impacted by the tailings.

If the tailings dam is ever considered for reuse in the future, some engineering modification must be implemented to secure the impoundment. If not hydraulic containment, then a constructed liner should be considered. If the local red silt is to be considered for a liner material, additional geotechnical analyses should be performed to fully understand the shrinkage and swelling characteristics of the material and its suitability.

5.0 Summary of Conclusions

5.1 Waters

Analysis of the anions and cations from pit water indicate that even though the pit water does not exceed any WQCC numeric livestock or wildlife standards, the water is of marginal quality. The pit water has a consistently high concentration of calcium, chloride, and sulfate relative to surface water in Greyback Gulch and local groundwater. However, the pH is historically neutral to alkaline with some exceptions. Only copper has occasionally exceeded WQCC numeric standards for livestock and wildlife. The pit lake is a local hydraulic sink; therefore increases in TDS and sulfate concentrations could possibly be due to evaporation of the pit lake water concentrating soluble salts.

The surface water chemistry found in the lake can be explained by:

- The inflow of neutral to alkaline groundwater has relatively low concentrations of TDS and sulfate.
- The composition of the host rock is acid buffering. The composition of the host rocks includes approximately 5 percent calcite, 30 percent feldspar, and one percent other carbonates. The dissolution of the calcite in the host rocks and the precipitation of gypsum and geothite around the pit lake indicates that acid buffering is occurring.
- There is a low volume of disseminated pyrite in the rocks surrounding the pit lake, typically 1 to 5 percent. The pyrite is disseminated thoughout the groundmass of the host rock limiting access of water and air to allow oxidation. In addition the pyrite is coarse grained, which limits the surface area pyrite crystal to oxidation, when it is exposed (SRK, Dec. 1997).
- Low precipitation in the area is probably the most important reason for the relatively good quality of the pit lake surface water, with respect to pH and concentration of metals. Low precipitation limits the flushing of the oxidized products into the environment via runoff, seep, and discharges (Chavez, 2003).

The net effect is that while sulfide oxidation is occurring, the transport of the oxidation products is slow, except locally in the Copper Flat environment.

Surface water samples collected from locations along the perennial Greyback Glulch indicate higher quality runoff upstream of the mine site than downstream. Although pH measurements remain neutral to alkaline in samples collected from both upstream and downstream location, TDS and sulfate concentrations are greater down stream and concentrations have increased over time. No numeric standard for livestock or wildlife has ever been exceeded in samples from these three locations.

The Piper diagram (Fig. 42) indicates that the downstream surface water in Greyback Gulch has higher proportions of calcium, chloride, and sulfate than upstream surface water for one set of data collected from SWQ-1, SWQ-2, and SWQ-3 in March/April 1993. The upstream surface water has a higher proportion of bicarbonate. This may indicate that some of the alkalinity upstream is being consumed by acid neutralization as the water moves over and through the Copper Flat ore body.

Possible reasons for the lower surface water quality in the downstream sample locations in Greyback Gulch are:

- evaporative concentration of the dissolved load of anions and cations,
- gypsum dissolution, which is regionally widespread,
- water-mineral interactions within the copper-porphyry deposit, and
- disturbance from the construction of roads and rock storage piles and stream diversion (SRK, Dec. 1997).

There have been a few intermittent seeps from the pit wall and rock storage piles. Typically, these seeps do not flow except following heavy precipitation. When they do flow, they are typically acidic and have high concentrations of anions, cations, and metals. Historically seeps have been identified on the southern wall of the mine pit and from the East and West waste rock piles. Typically, surface water from these seeps are characterized with pH concentrations of 2 to 3, except PW-2 with a pH of 8.16, high TDS concentrations of 5,000 to 25,000 mg/L, and high sulfate concentrations of 3,000 to 22,000 mg/L. Concentrations of surface water from these seeps have exceeded WQCC surface water livestock and wildlife numeric standards for aluminum, cadmium, copper, cobalt, selenium, and zinc.

Groundwater pH measurements both up and down-gradient range from approximately 7 to 8.2. TDS is less than the WQCC numeric groundwater standard of 1,000 mg/L. However the groundwater down-gradient of the mine pit is increasing gradually over time and approaching the numeric standard. Sulfate concentrations are also lower than the WQCC numeric groundwater standard of 600 mg/L; however, sulfate concentrations in the down-gradient well are increasing with time.

Historical sampling of well GWQ-5, further to the east, indicate that water quality in the vicinity may have been affected naturally by the presence of the ore body prior to mining in 1982. Concentrations of sulfate sampled in 1981 from GWQ-5 range from 477 mg/L to 575 mg/L, which is higher than the sulfate concentrations in well GWQ-96-23A immediately down-gradient of the pit (<450 mg/L). Concentrations of TDS also sampled in 1981 from GWQ-5 range from 1,070 mg/L to 1,260 mg/L, which is also higher than the TDS concentrations in the well GWQ-96-23A (<1,000 mg/L).

The groundwater up gradient of the mine pit (GWQ-9622A and B) is high quality with relatively high proportions of chloride and sulfate. Groundwater down-gradient of the pit (GWQ-96-23A and B) shows relatively higher proportions of bicarbonate and calcium and relatively lower proportions of sulfates. Pre-Quintana mining (June 15, 1981) groundwater data collected from down-gradient wells GWQ-5 and GWQ-6 show similar anions and cation distributions to post Quintana mining activities (1996 and 1998). This indicates that groundwater quality down-gradient of the ore body reflects the natural weathering of the Copper Flat porphyry system.

5.2 Stored Rock and Pit Wall Rock

According to the results of the paste pH, acid base accounting, and net acid generating tests, all rock types except the andesite have a significant to moderate potential to generate acid. However, the extractable metals analysis of rock pile sample

WD-1 and kinetic test results suggest that sulfide oxidation products are slowly released at the Copper Flat mine site.

Additional evidence of low oxidation rates is the abundance of sulfide minerals on the waste rock pile surfaces despite exposure to weathering since 1982. Potential explanations for the low oxidation rates are:

- low precipitation limits the access of water to the sulfide minerals and the flushing of the oxidation products,
- coarse grained pyrite crystals with low surface area to volume ratios,
- disseminated pyrite within the groundmass limits the opportunity for sulfide oxidation, and

neutral to alkaline groundwater recharge assists in acid neutralization.

5.3 Tailings

Under the existing drained conditions, the tailings appear to be geochemically stable. Eleven tailings samples collected in 1994 indicate that tailings pH varies from 6.2 to 7.8. Leachate concentrations of extractable metals from a single tailings sample are low, and WQCC numeric standards for groundwater were only exceeded for sulfate and manganese in the leachate. Sulfate has a WQCC domestic use standard of 600 mg/L, which was exceeded in the leachate sample with a concentration of 940 mg/L. Manganese has a WQCC domestic numeric standard of 0.2 mg/L. The leachate sample was found to have a manganese concentration of 1.5 mg/L. No other metals exceeded WQCC groundwater standards.

TDS and sulfate concentrations in groundwater sampled from a down-gradient well (NP-3) exceed the WQCC groundwater numeric standards for domestic use of 600 mg/L and 1,000 mg/L, respectively. The concentrations of sulfate and TDS are very gradually decreasing over time, but still remain above standards, 16 years after initial tailings discharge into the tailings impoundment. This information indicates that the tailings dam leaks contaminants into the groundwater, in-spite of the significant study that accompanied the impoundment design.

A compacted clay liner was placed in an effort to control seepage below the impoundment through exposed brecciated basalt. The predominant minerals present in clay liner material, as determined by x-ray diffraction, are quartz, calcite, feldspars and undifferentiated clays. The clays consist of 2/10 smectite, 6/10 mixed-layered smectite and illite, and 2/10 kaolinite.

The liner material appears to have a small clay fraction, approximately 2.5 percent, and a small sand fraction, approximately 3.4 percent. The remainder, 91.1 percent, is silt- sized particles. The material will compact into a low permeability layer with a conductivity of 0.01 to 1.0 ft/yr (10^{-6} to 10^{-8} cm/s). The clay is highly active and 80 percent of the clay fraction is composed of smectite and mixed layer illite and smectite, which raises concern with respect to the shrink and swell characteristics of the liner material. Desiccation could occur if the clay layer dries out, which would compromise the compacted permeability.

5.4 Recommendations for Further Study

Further study that could aid in the more complete understanding of the physical processes occurring at Copper Flat are:

- Periodic water quality monitoring of the waters of the pit lake since the lake is a source of water supply for local wildlife and livestock.

- Periodic measurement of water level elevations of the pit lake and local precipitation so that a relationship can be developed between the quality of the pit lake waters and water level elevation and rainfall.
- Periodic observations to locate acidic seeps and determine their relationships with precipitation events, drainage water quality, and to evaluate corrective drainage control by various engineering and vegetation techniques.
- Periodic monitoring of surface and groundwater above and below the Copper Flat ore body to defend the hypothesis that the ore body is naturally contributing to the quality of waters below the mine pit area.
- Additional rock storage pile samples for extractable metals and more kinetic leachate testing of rock storage material, oxidized and unoxidized rock material is appropriate for a sit of this size. Results of previous leachate sample results are favorable with respect to release of oxidation products, but the frequency is inadequate.
- If used again, the tailings dam will require engineered alternatives to eliminate leakage of tailings liquids.
- If used for a tailings impoundment liner material, local materials should be analyzed for particle size distribution through the clay size fraction. The clay fraction should be analyzed by XRD for expansive clay content.

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TABLES 1-16

Table 1
Summary of Hydrothermal Alteration Associated with Mineralization in the Vicinity of Copper Flat
Copper Flat, New Mexico
(From Fowler, 1982; McLemore et al., 2000)

Host Rock/Type of Mineral Deposit	Alteration Mineral Assembly	Alteration Type
Quartz monzonite/porphyry copper deposit	Bitotite, potassium feldspar, quartz, pyrite,	Biotite-potassic
Quartz monzonite/porphyry copper deposit	Potassium feldspar, chlorite, quartz, pyrite	Potassic
Quartz monzonite/porphyry copper deposit	Sericite, quartz, pyrite	Sericitic
Andesites adjacent to latite dikes and polymetallic veins	Epidote, chlorite, sericite, pyrite, magnetite	Propylitic (1)
Andesites adjacent to latite dikes and polymetallic veins	Sericite, calcite, chlorite, quartz, pyrite.	Argillic
Andesites adjacent to latite dikes and polymetallic veins	Chlorite, kaolinite, sericite, quartz, pyrite	Propylitic (2)
Latite dikes associated with polymetallic veins	Quartz, potassium feldspar, pyrite, epidote, and chlorite	Propylitic (1)
Latite dikes associated with polymetallic veins	Quartz, sericite, chlorite, pyrite	Sericitic

Table 2
Investigative Reports Prepared for Alta Gold Corporation
Copper Flat, New Mexico

Copper Flat Tailings Study, Technical Memorandum	SRK	August 30, 1994
Characterization of Post-Closure Pit Water Quality, Copper Flat Project	SRK	December 22, 1994
Copper Flat Mine, Hydrological Studies	SRK	May 12, 1995
Copper Flat Mine Permit Application	SRK	February 20, 1996
Draft Environmental Impact Statement	BLM/SRK	February 1996
Tailings Dam Area Pumping Test	SRK/ABC	September 9, 1996
Copper Flat Mine, Compilation of Pit Lake Studies	SRK	December 1997
Background Groundwater Concentrations, Technical Memorandum	SRK	June 30, 1998
Copper Flat Mine, Waste Rock Management Plan	SRK	July 9, 1998
Tailings Seepage Modeling, Copper Flat Mine	SRK	August 7, 1998
Preliminary Final, Environmental Impact Statement, Copper Flat Project	BLM/ENSR	March 1999

Table 3
Dates and Estimated Flow Rates
For the Springs and Seeps Sampled by Newcomer et al., 1993
Copper Flat, New Mexico

Spring/Seep	Date	Flow (gpm)
SWQ-1	4/1/93	1 to 2
SWQ-1	5/7/93	Dry
SWQ-2	3/31/93	<1
SWQ-3	3/31/93	12.5
BG	4/1/93	1 to 2
BG	5/7/93	Dry
BG-2	4/1/93	<1
BG-2	5/7/93	<1
Acid Drainage	4/1/93	<1
Acid Drainage	5/7/93	<1
Acid Drainage	5/18/93	<1
Warm Spring	4/2/93	3.3

Table 4
Rock Storage Pile, Pit Wall, Drill Core, and Drill Cutting Samples
Copper Flat, New Mexico
(From SRK, May 1995)

Sample Identification	Sample Description
WD-1	West dump area, CFQM waste rock
PW-3	Pit wall, northwest of pit lake
SW-1	Sulfide waste pile, CFQM waste rock
PW-2	Pit wall, oxidized cap rock
PW-4	Pit wall, northeast of pit lake
SWP-1	Sulfide waste pile, CFQM rock
LGSSP-1	Sulfide waste pile, CFQM rock
LGSSP-2	Sulfide waste pile, CFQM rock
WD-2	West dump area, CFQM waste rock
IDC-24-222-241	CFQM from IDC-24 drill hole, 222-241 ft.
CF10-177.8-190	Andesite from CF10 drill hole, 177.8-190 ft.
CF10-177.8-190	CFQM from drill hole CF10, 190-199 ft.
CF10-214-220	CFQM from drill hole CF10, 214-220 ft.
H75-53-42	CFQM reverse circulation cuttings
H75-64-44	CFQM reverse circulation cuttings
H75-51-34	CFQM reverse circulation cuttings
H75-48-58	CFQM reverse circulation cuttings
H75-48-44	CFQM reverse circulation cuttings
PW-1	Pit wall, SW of pit, transition zone, CFQM

Table 5
Additional Sample Analysis Summary
Copper Flat, New Mexico
(From SRK, May 1995)

Sample Identification	Analysis
LGSSP-2	Gradation (ASTM D-422)
LGSSP-2	Atterberg Limits (ASTM D-4318)
LGSSP-2	Modified Procter compaction (ASTM (D-4318)
LGSSP-2	Hydraulic Conductivity in a fixed wall permeameter ant near maximum dry density
PW-3	Whole rock analysis (EPA 3051/ICP)
WD-1	Whole rock analysis (EPA 3051/ICP)
WD-1	Leachable metals (EPA 1312)

Table 6
Rock Storage Pile Characterization Sample Distribution
Copper Flat, New Mexico

Analysis	1994 EIS	1997 WMG	Total	Analytical Laboratory
Paste pH /Conductivity	19	0	19	SRK, Lakewood, Colorado
Paste pH /Conductivity	0	141	141	SRK, Field Parameters
Total Metals (ICP)	2	0	2	ACZ Laboratory, Steamboat Springs, Colorado
Acid-base accounting	19	0	19	ACZ Laboratory, Steamboat Springs, Colorado
Acid-base accounting	0	32	32	Sierra Environmental Monitoring Laboratory, Reno, Nevada
Net acid generating	0	59	59	School of Engineering, University College of Wales, Cardiff, UK
EPA 1312	1	0	1	ACZ Laboratory, Steamboat Springs, Colorado
Kinetic testing	5	0	5	Cominco Engineering Services Laboratory, Vancouver, BC, Canada
Physical testing	1	0	1	?

Table 7
Historical Tailings Impoundment Reports
Copper Flat, New Mexico

Report	Date	Authors	Purpose
Draft Geotechnical Investigation Report, Tailings Dam and Pond	10/14/1976	Sergent, Hauskins and Beckwith (SHB)	Geotechnical Investigation
Permeability Report on Materials Proposed for Impoundment Drains and Filters	8/29/1980	SHB	Geotechnical Investigation
Fianl Geotechnical and Design Development Report	10/14/1980	SHB	Geotechnical Investigation
Report on Filter Fabric Suitability	10/17/1980	SHB	Geotechnical Investigation
Decant System Design Recommendations	12/17/1980	SHB	Geotechnical Investigation
Comment Resolution to the New Mexico State Engineers Regarding Stress and Strain of the Dam Structure	4/13/1981	SHB	Geotechnical Investigation
Permeability, Placement, and Compaction of Clay Liner in South Cell	10/13/81	SHB	Geotechnical Investigation
Permeability, Placement, and Compaction of Clay Liner in South Cell and Monitoring Well Details for NP-5	10/28/81	SHB	Geotechnical Investigation
Hydrologic Assessment	5/1993	John W. Shomaker, Inc.	Hydrologic Assessment
Tailings Study	8/30/1994	SRK	Geological Investigation
Tailings Dam Area Pumping Test	9/9/1996	ABC/SRK	Aquifer Analysis
Tailings Seepage Modeling	8/7/1998	SRK	Hydrogeologic Conceptual Model and Seepage Modeling of Proposed Impoundment Re-use

Table 8
Whole Rock Analyses Summary
Pit Lake Sediment and Wall Rock Samples
Collected on November 20, 1996
Copper Flat, New Mexico
(From McLemore et al., 1996)

Sample ID	Sample Description	Analyses
POND03	brown precipitate	Metals by AA and ICP; Strontium by XRF
POND04	lake sediment, south pit	Metals by AA and ICP; Strontium by XRF
POND05	lake sediment, east pit	Metals by AA and ICP; Strontium by XRF
POND06	lake sediment, north pit	Metals by AA and ICP; Strontium by XRF
POND07	lake sediment, west pit	Metals by AA and ICP; Strontium by XRF
POND08	grab of pit wall, chalcocite veins	Metals by AA and ICP; Strontium by XRF
POND09	grab of pit wall, pyrite veins and disseminated	Metals by AA and ICP; Strontium by XRF
POND10	grab of pit wall, pyrite with molybdenite	Metals by AA and ICP; Strontium by XRF
POND11	select 1-2 inch chalcocite-quartz vein	Metals by AA and ICP; Strontium by XRF
POND12	grab of blue-brown precipitate from pit wall	Metals by AA and ICP; Strontium by XRF

Table 9
Summary of Surface Water Samples From Greyback Gulch Stations A, B, C, 1977
(From BLM 1978)

Para- Meter[1]		Jan 1977			Jan 1977			Mar 1977		July 1977
Station	A	B	C	A	B	C	A	B	C	A
pH	7.7	7.6	7.8	7.8	7.7	7.8	7.9	8.0	8.1	NA[2]
EC[3]	899	1159	7226	899	1178	1212	916.3	916.3	1260	NA
TDS	720	800	840	800	800	880	1000	1080	1320	NA
Alk	317.2	280.6	262.3	305.0	292.8	268.4	240.2	220.2	220.2	NA
Hard	1660.3	2394.8	2554.4	1596.4	2203.0	2477.7	434.53	567.63	667.15	NA
N	5.48	6.8	4.9	5.6	7.5	3.68	3.8	3.3	3.6	NA
P	0.4	0.49	0.47	0.43	0.5	0.47	0.46	0.41	0.38	NA
F	0.4	0.5	0.4	0.4	0.5	0.4	0.2	0.5	0.3	NA
Cu	0.04	0.4	0.03	0.03	0.05	0.05	-0.005	-0.005	-0.005	-0.005
Ag	0.01	0.01	0.01	0.01	0.01	0.01	-0.01	-0.01	-0.01	-0.005
Mo	0.01	0.03	0.03	0.01	0.03	0.02	0.01	0.08	0.08	0.05
Zn	0.05	0.04	0.04	0.04	0.04	0.04	-0.01	0.02	0.02	0.01
Fe	0.23	0.19	0.23	0.3	0.29	0.37	0.10	0.15	0.10	0.14
Mn	0.01	0.01	0.01	0.01	0.01	0.01	-0.01	-0.01	-0.01	0.07
K	3.0	2.9	3.8	2.6	2.7	3.5	3.0	2.5	3.1	1.8
Ca	NA	NA	NA	NA	NA	NA	NA	NA	NA	168.5
Mg	NA	NA	NA	NA	NA	NA	NA	NA	NA	29.0

Notes

1. All parameters except EC are reported in milligrams per liter,
   EC – Electrical Conductivity
   TDS – Total Dissolved Solids
   Alk – Alkalinity (as $CaCO_3$)
   Hard – Hardness (as $CaCO_3$)
   N – Nitrate
   P – Phosphorous
   F – Flouride
   Cu – Copper
   Ag – Silver
   Mo – Molybdenum
   Zn – Zinc
   Fe – Iron
   Mn – Manganese
   K – Potassium
   Ca – Calcium
   Mg – Magnesium.

2. Electrical Conductivity reported in micro ohms per centimeter.
3. NA – Not Analyzed

Table 10
Extractable Metals from Rock Storage Pile Sample WD-1
(From SRK, July 1998)

Parameter	Results (mg/L)
pH	3
Conductivity	5.6 (mmhos/cm)
Sulfate	3050
Acidity (as $CaCO_3$)	1050
Alkalinity (as $CaCO_3$)	0
Aluminum	151
Antimony	N/A
Arsenic	<0.1
Barium	0.09
Boron	0.1
Cadmium	0.019
Calcium	314
Chloride	6
Chromium	0.03
Cobalt	0.29
Copper	13.6
Flouride	1.2
Iron	102
Lead	<0.021
Magnesium	23
Manganese	3.35
Mercury	<0.0002
Molybdenum	<0.01
Nickel	0.11
Potassium	4
Selenium	<0.1
Silver	<0.01
Sodium	13
Vanadium	<0.01
Zinc	0.87

Table 11
Total and Extractable Metals in Tailings Sample T-10-12
(From SRK, July, 1998)

Parameter	Total Metals in Solid (ppm)	Extractable Metals (mg/L)
Aluminum	2,700	<0.05
Antimony	<0.5	N/A
Arsenic	1.3	<0.1
Barium	52	0.10
Boron	<2	0.07
Cadmium	1.8	<0.005
Calcium	8,500	300
Chloride	N/A	6
Chromium	5	<0.01
Cobalt	13	<0.02
Copper	1600	0.03
Flouride	N/A	1.4
Iron	19,000	<0.02
Lead	15	<0.021
Magnesium	1,800	22
Manganese	251	1.5
Mercury	<0.02	<0.0002
Molybdenum	34	0.19
Nickel	3	<0.02
Potassium	1400	44
Selenium	<0.03	<0.1
Silver	<1	<0.01
Sodium	200	44
Sulfate	N/A	940
Vanadium	7	<0.01
Zinc	418	0.42

Table 12
Physical and Relational Characteristics
Copper Flat Tailings Impoundment Liner Material

Sample ID	Lithology (Visual) (ASTM, 1993)	Physical Relationship
SR-1	Sandy Clay/Silt; red; medium plastic; sand fraction fine grained, poorly graded; weakly cemented	Overlies SR-3 and underlies SR-2
SR-2	Clay/Silt; buff; non plastic; < 10 % fine sand, cemented	Overlies SR-1
SR-3	Sandy Clay/Silt; brown, highly plastic, sand fraction fine grained, poorly graded; weakly cemented	Underlies SR-1

Table 13
Summary of Geotechnical Results
Copper Flat Tailings Impoundment Liner Material
(From SHB, Oct. 1980)

Material/ Similar to Sample ID	Location	Percent Passing #200 Sieve	Liquid Limit	Plastic Index	USCS Symbol	Max. Density (lb/ft^3)	Optimum Moisture (%)	Compacted Permeability (cm/s)
Red/ SR-1	Sta. 32 Sta. 13	57	61	38	CH	103.5	19.5	NA
Red/ SR-1	Sta. 0 Sta. 10	63	61	28	MH	98.2	20.9	NA
Red/ SR-1	Clay Borrow	65	46	28	CL	105.3	19.3	NA
Red/ SR-1	Pit A 2.5-6 ft	61	45	25	CL	118.2	11.4	1.8×10^{-6}
Red/ SR-1	Pit E 2-5 ft	76	38	14	CL	104.8	15.6	2.9×10^{-7}
Red/ SR-1	Pit F 2-5	99	58	34	CH	104.7	15.3	2.1×10^{-8}
Brown/ SR-3	Boring #1, 15 ft	74	49	20	ML	NA	NA	NA
Brown/ SR-3	Boring #18, 34.5 ft	68	40	20	CL	NA	NA	NA

Table 14
Clay Mineralogy and Distribution
Of Samples SR-1 and SR-3
Copper Flat Tailings Impoundment Liner Material

Sample ID	**Illite (parts in 10)**	**Smectite (parts in 10)**	**Mixed Layer (I/S) (parts in 10)**	**Kaolinite (Parts in 10)**
SR-1 (Red)	0	2	6	2
SR-3 (Brown)	2	0	6	2

Table 15
New Mexico Water Quality Control Commission Numeric Standards
(From NMWQCC, 1995, 2001)

Discharge to Groundwater (mg/L)[1]/ Surface Water (mg/L)[2]

Parameter	Human Health	Domestic Use	Irrigation Use	Domestic Use	Irrigation Use	Livestock/ Wildlife
Aluminum			5.0		5.0	5.0
Antimony	0.006			0.006		
Arsenic	0.1			0.05	0.10	0.2
Barium	1.0			2.0		
Beryllium				0.004		
Boron			0.75		0.75	5.0
Cadmium	0.01			0.005	0.01	0.05
Chloride		250				
Chromium	0.05			0.1	0.1	1.0
Cobalt			0.05		0.05	1.0
Copper		1.0			0.2	0.5
Cyanide	0.2			0.2		
Fluoride	1.6					
Iron		1.0				
Lead	0.05			0.05	5.0	0.1
Manganese		0.2				
Mercury	0.002			0.002		0.01
Molyb-denum			1.0		1.0	
Nitrate (as N)	10.0			10.0		
Nickel			0.2	0.1		
‘pH		6-9				
Radium	30			5		30
Selenium	0.05			0.05	0.13(0.25)[3]	0.05
Silver	0.05					
Sulfate		600				
Thallium				0.002		
TDS		1000				
Uranite	5.0			5.0		
Vanadium					0.1	0.1
Zinc		10			2.0	25

[1] New Mexico Water Quality Control Commission, Title 20, Chapter 6, Part 2, Ground and Surface Water Protection, December, 1995, Standards for groundwater of 10,000 mg/L or less.

[2] New Mexico Water Quality Control Commission, Title 20, Chapter 6, Part 1, Water Quality Standards for Interstate Streams in New Mexico, December, 2001.

[3] In presence of >500 mg/L sulfate.

Table 16
Probable Expansion Estimated From Classification Test Data
(from Holtz and Kovacs, 1981, after Holtz, 1959 and USBR, 1974)

Degree of Expansion	Probable Expansion as a % of the Total Volume Change (Dry to Saturated Condition)†	Colloidal Content (% −1 μm)	Plasticity Index, PI	Shrinkage Limit, SL
Very high	> 30	> 28	> 35	< 11
High	20–30	20–31	25–41	7–12
Medium	10–20	13–23	15–28	10–16
Low	< 10	< 15	< 18	> 15

FIGURES

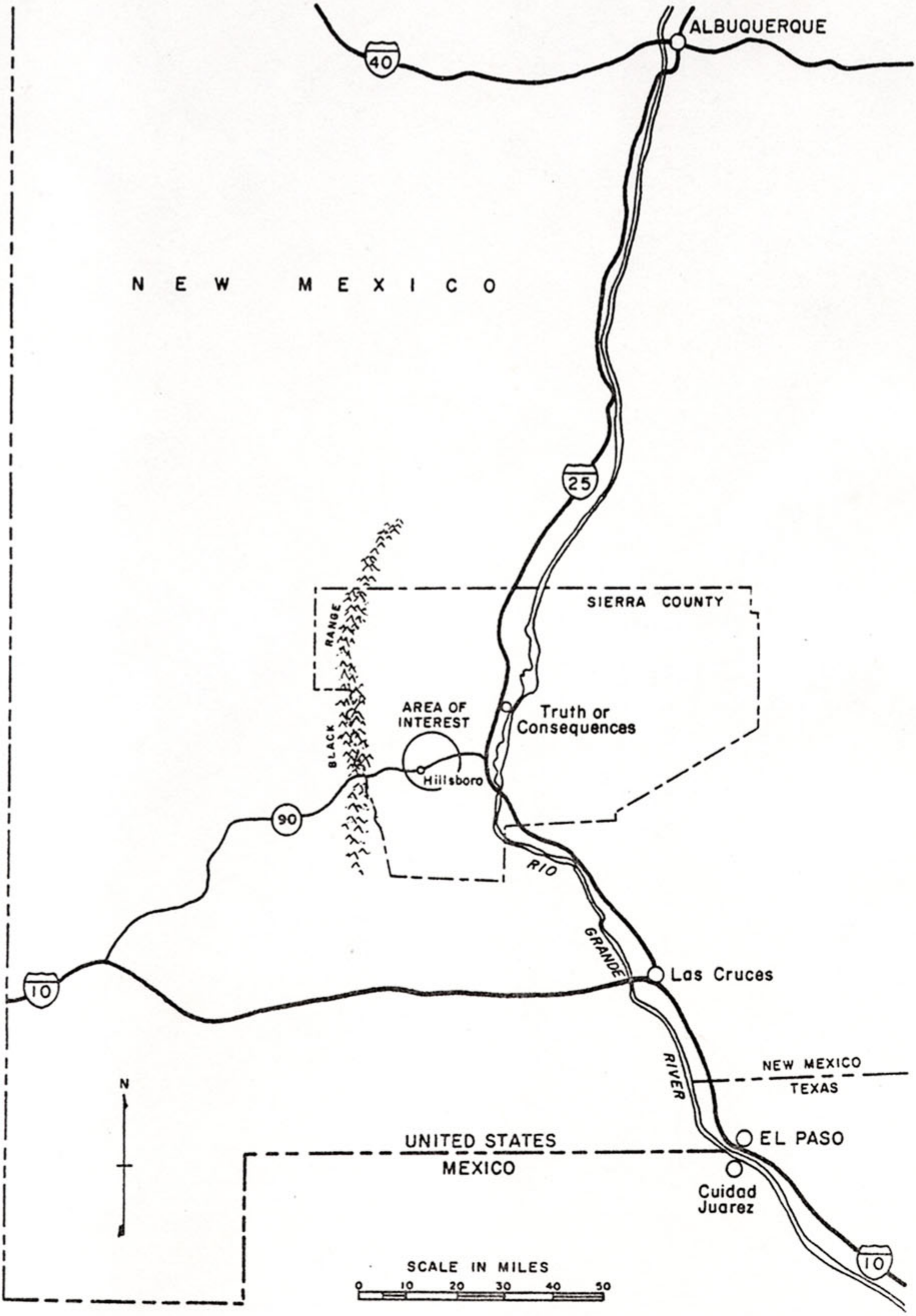


Figure 1
Site Location Map
Copper Flat, New Mexico
(from BLM, 1978)

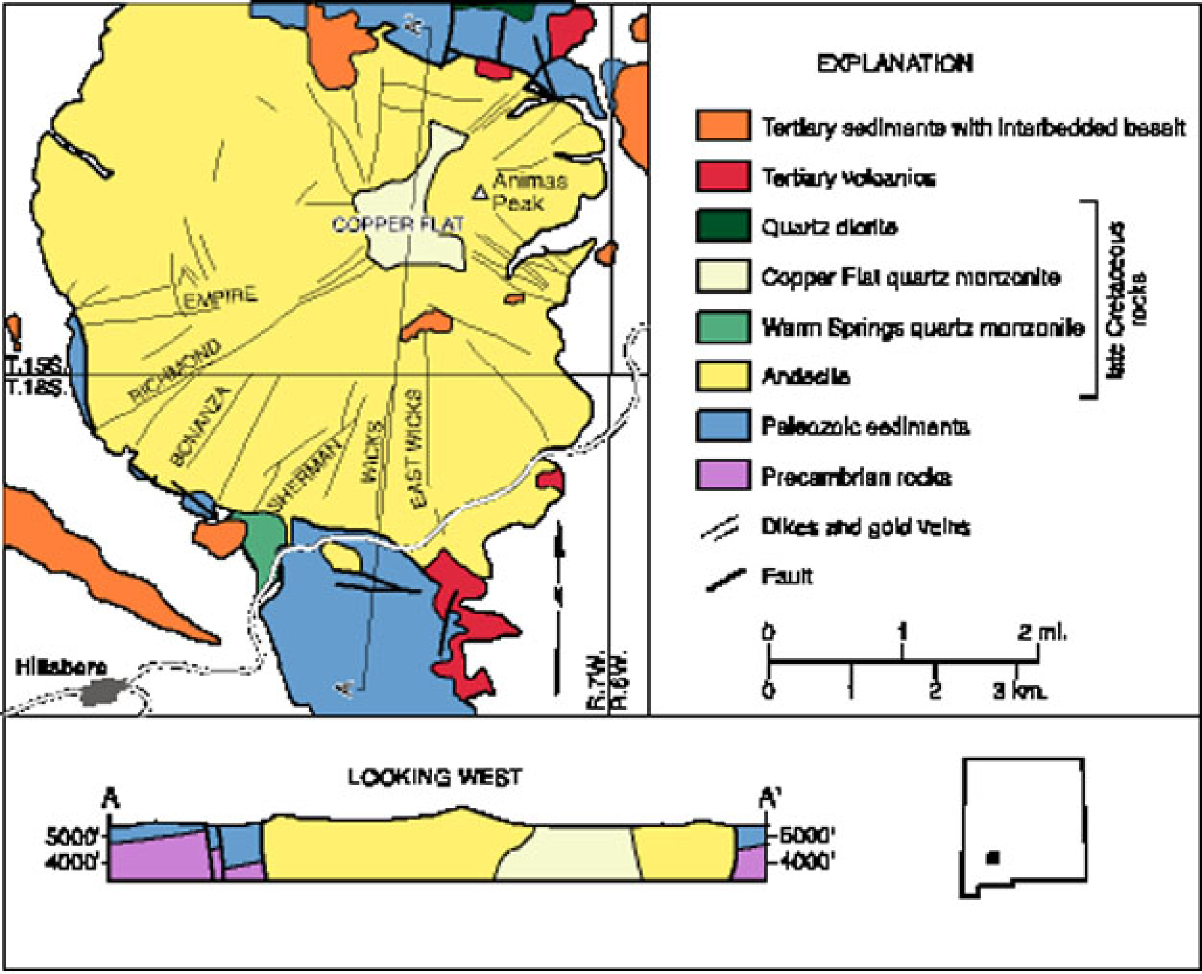


Figure 2
Geologic Schematic of the
Hillsboro Mining District, New Mexico
(from McLemore et al., 2000; Dunn, 1982; Hedlund, 1985)

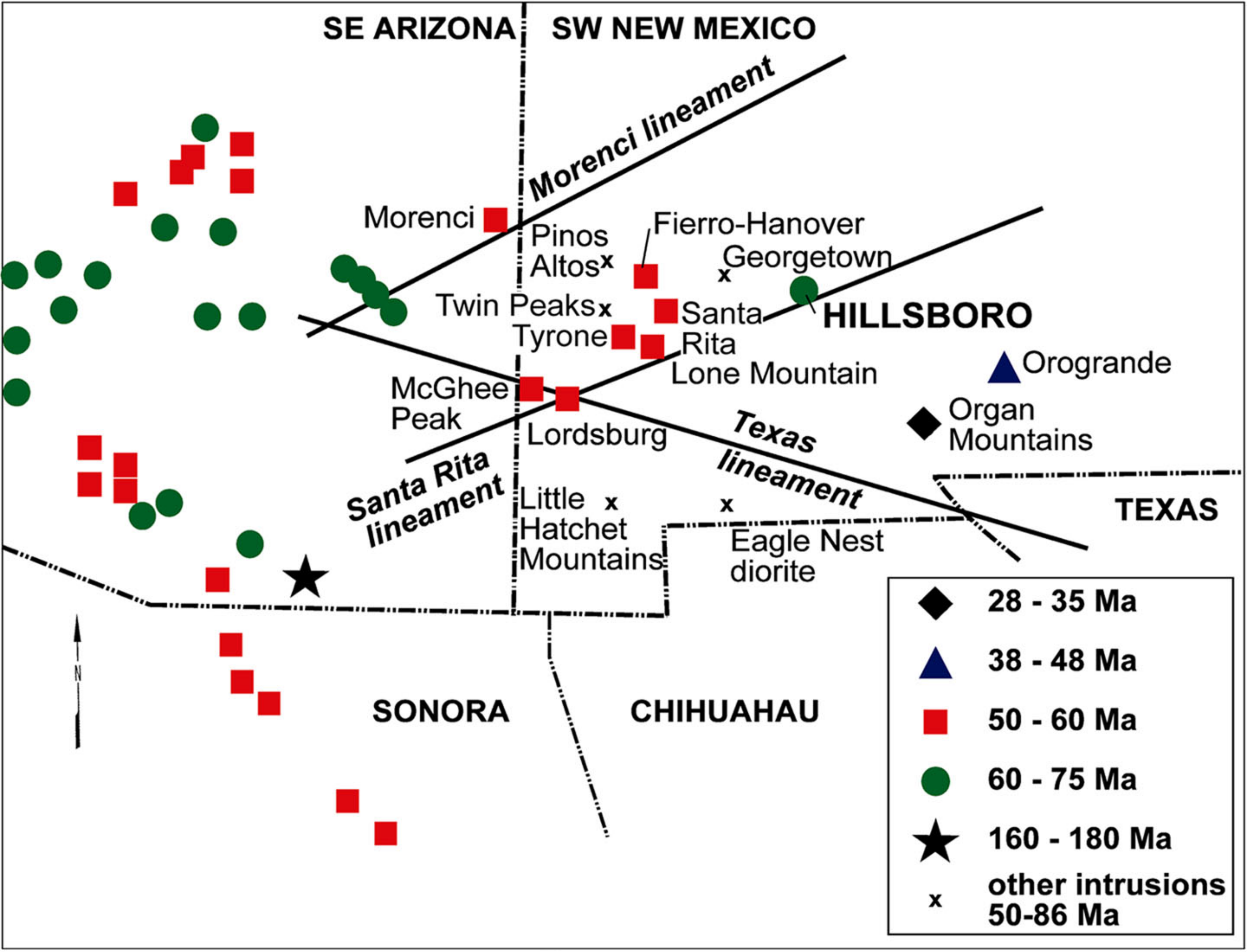


Figure 3
Arizona-Sonora-New Mexico Porphyry Copper Belt
(from McLemore et al., 2000)

Figure 4
Copper Flat Mine, 1982, View West
Copper Flat, New Mexico
(Courtesy of Hydro Resources, Inc.)

Figure 5
Copper Flat Mine, 1982, View East
Copper Flat, New Mexico
(Courtesy of Hydro Resources, Inc.)

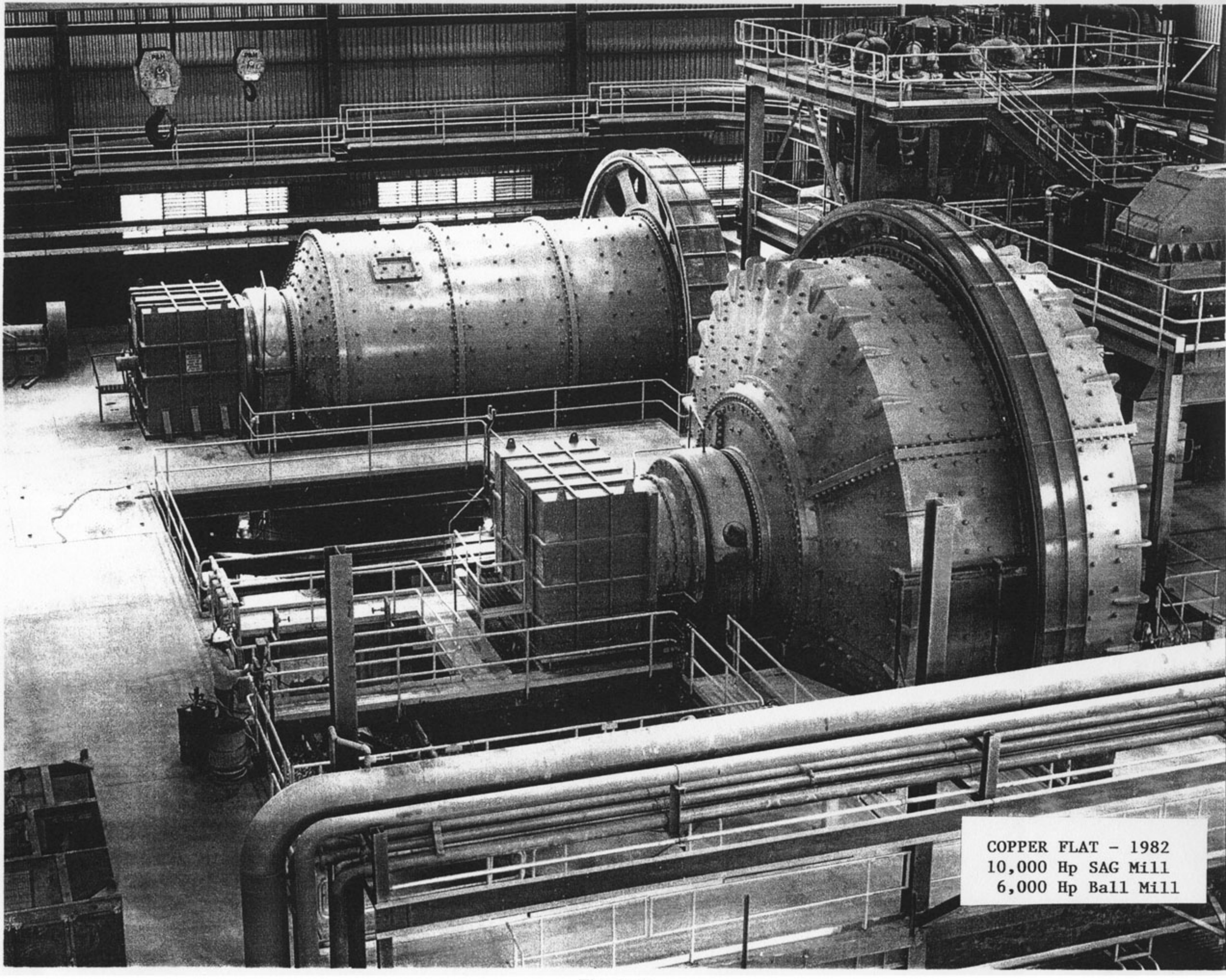


Figure 6
Copper Flat Mills, 1982
Copper Flat, New Mexico
(from Alta Gold Corporation, 1995)

Figure 7
Copper Flat Mine Site, 1988
Copper Flat, New Mexico
(from Alta Gold Corporation, 1995)

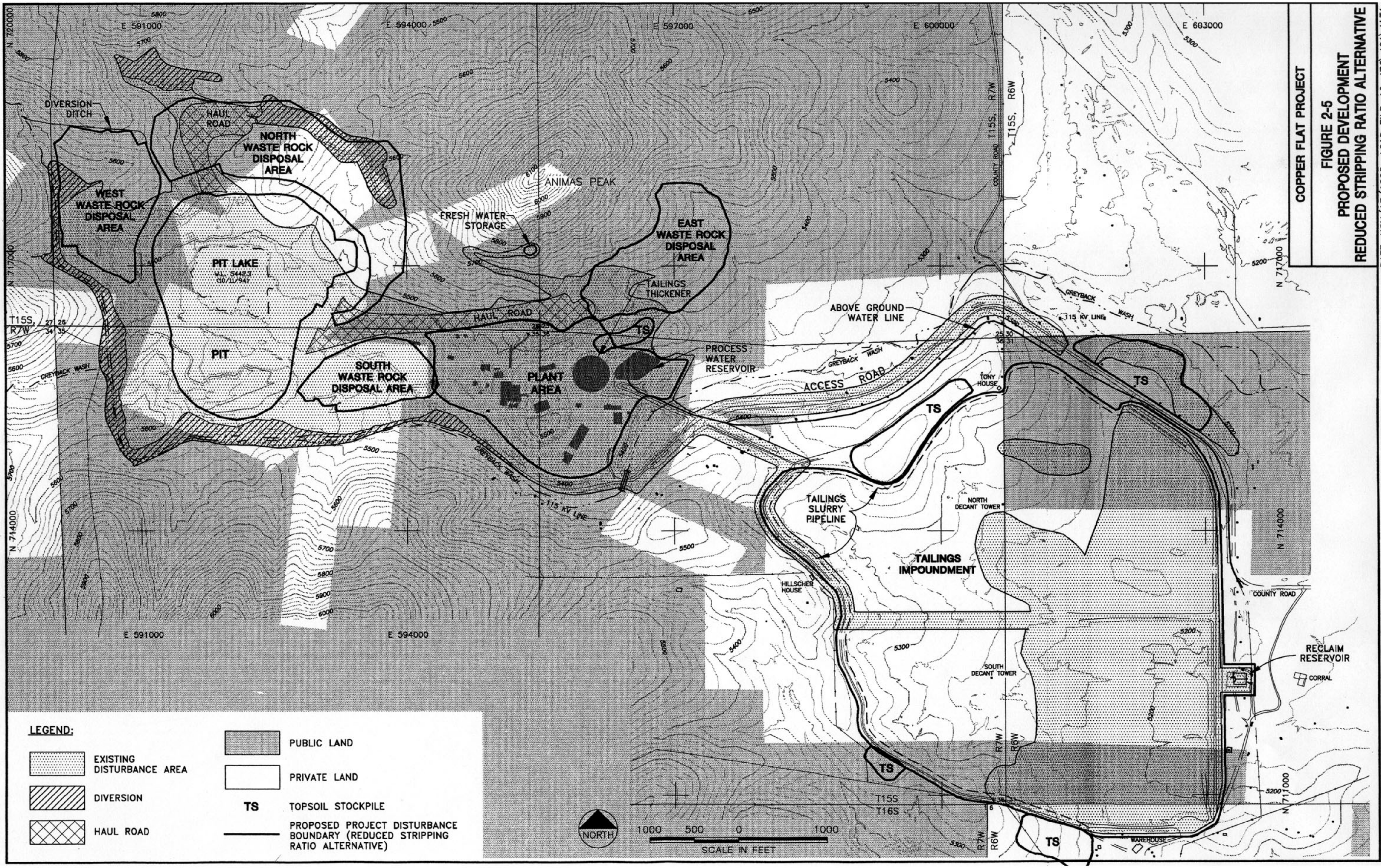


Figure 8
Copper Flat Mine Layout and Property Ownership
Copper Flat, New Mexico
(from BLM, 1999, after SRK)

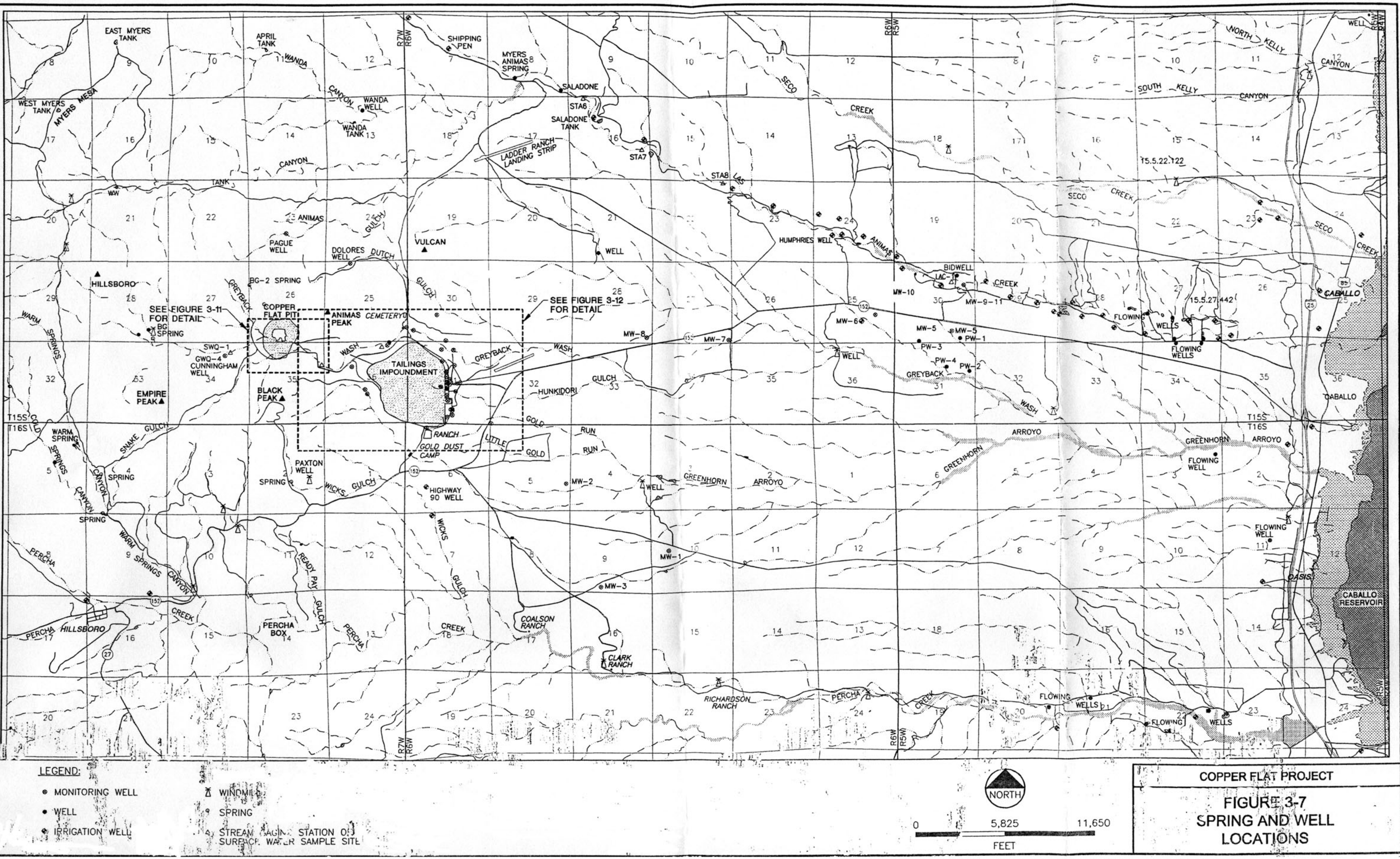


Figure 9
Well and Spring Locations
Copper Flat, New Mexico
(from BLM, 1999, after SRK)

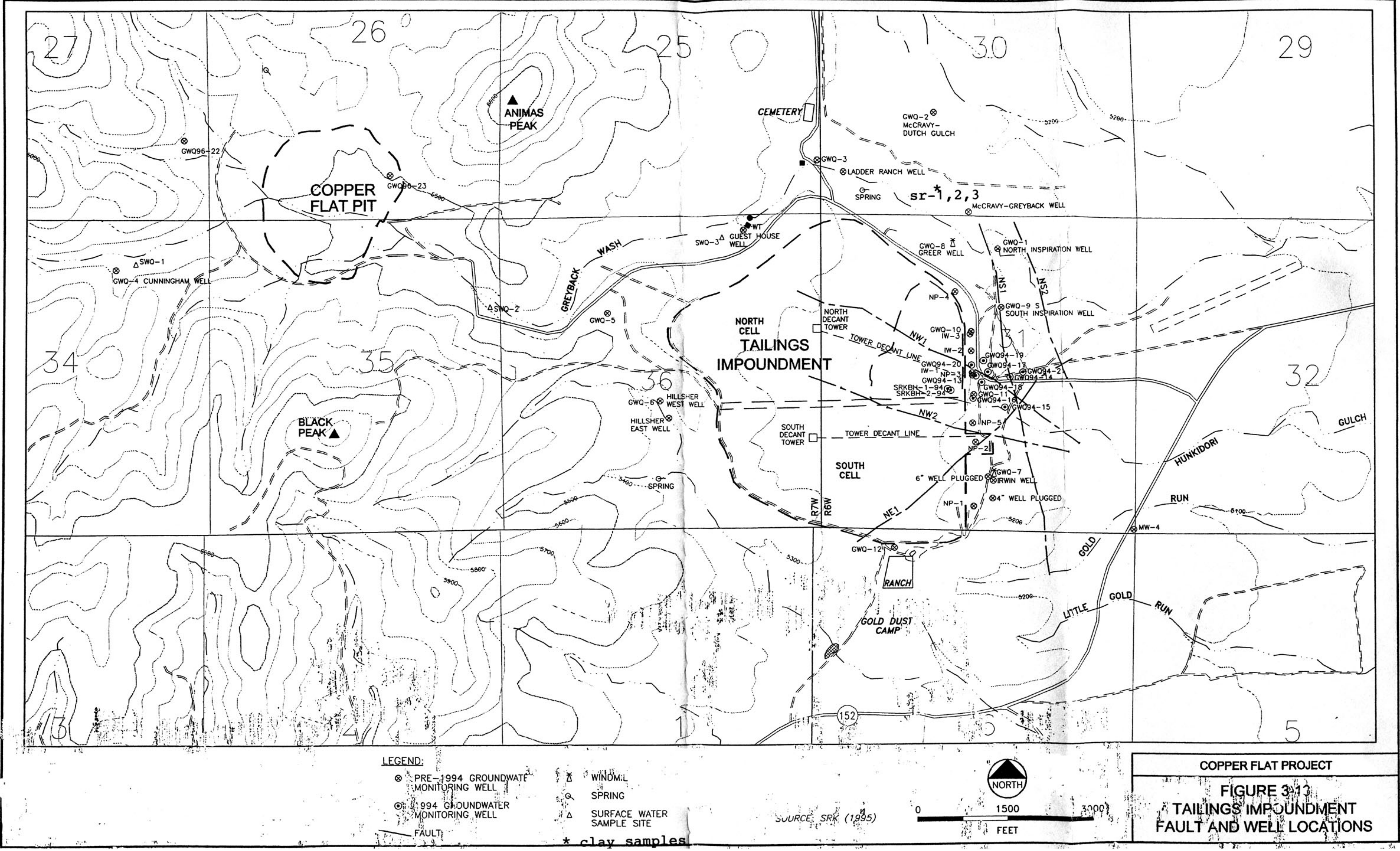


Figure 10
Well and Spring Locations, Pit and Tailings Impoundment Detail
Copper Flat, New Mexico
(from BLM, 1999, after SRK)

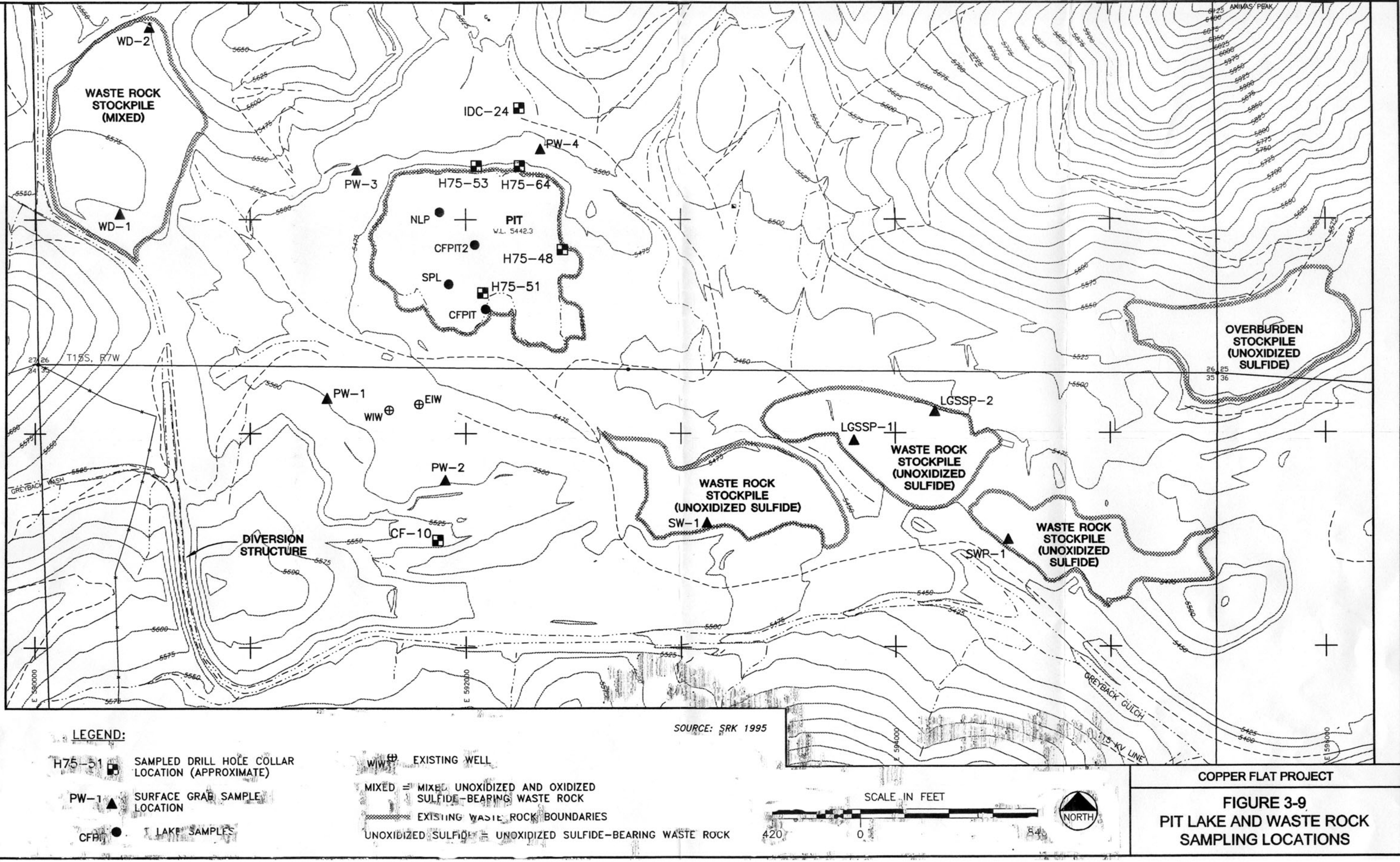


Figure 11
Pit Wall, Waste Rock, and Drill Core Locations
Copper Flat, New Mexico
(from BLM, 1999, after SRK)

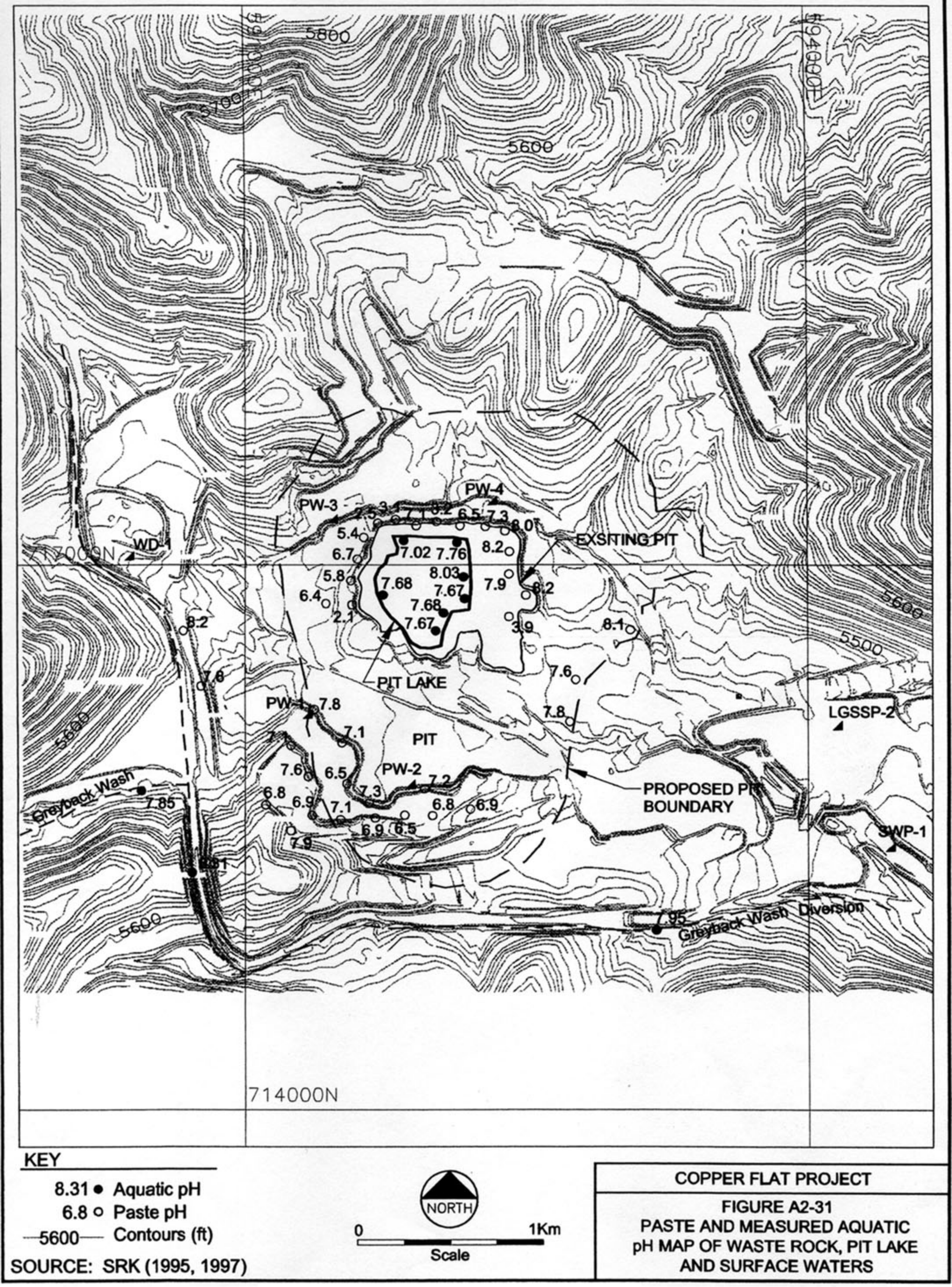


Figure 12
Pit Area Paste pH Sample Locations
Copper Flat, New Mexico
(from BLM 1999, after SRK)

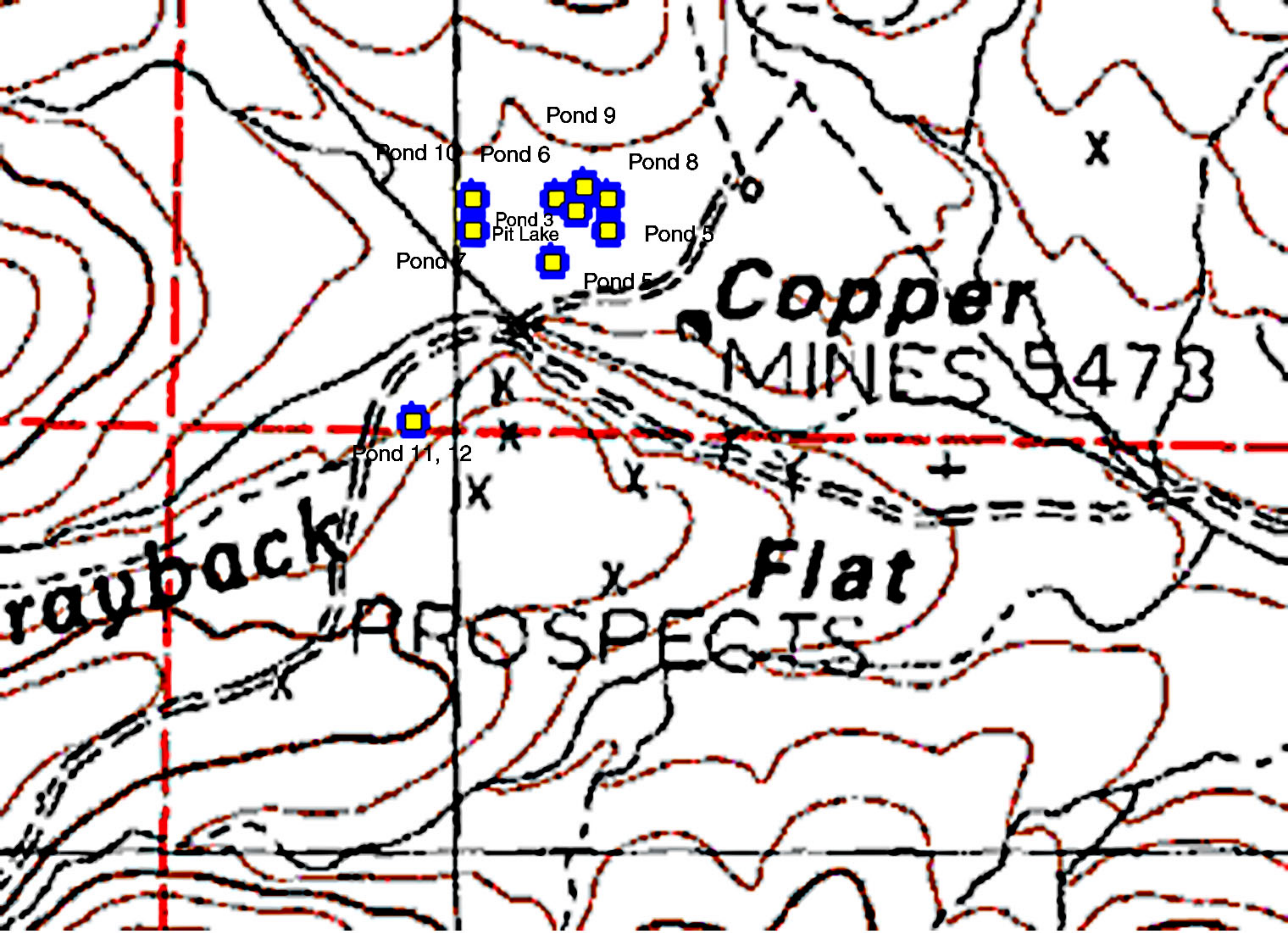
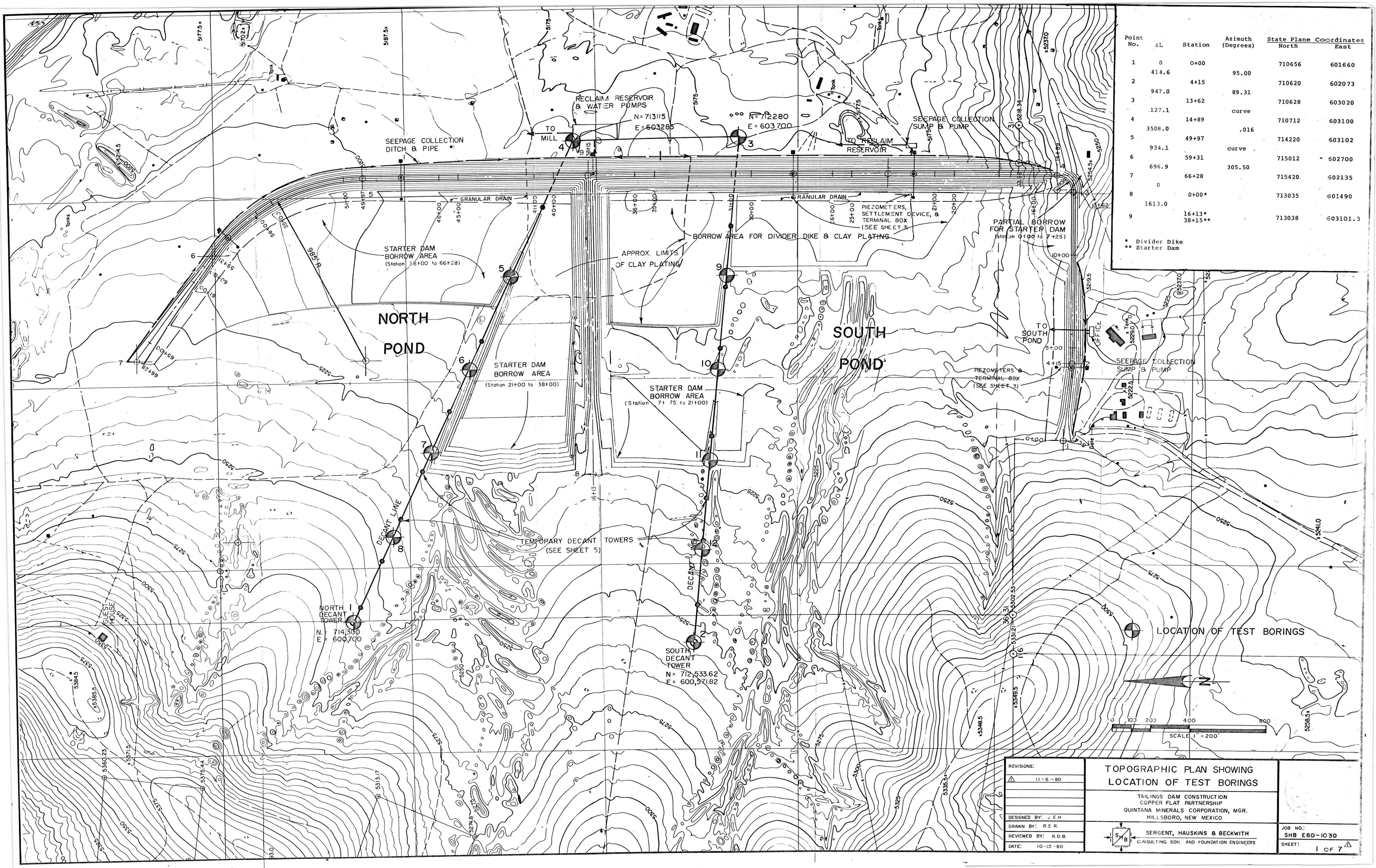


Figure 13
Approximate Pond Rock Sample Locations
Copper Flat, New Mexico
(Approximate Scale: 1": 500')

^
North



Point No.	ΔL	Station	Azimuth (Degrees)	State Plane Coordinates North	State Plane Coordinates East
1	0	0+00		710656	601660
	414.6		95.00		
2		4+15		710620	602073
	947.0		89.31		
3		13+62		710628	603020
	127.1		curve		
4		14+89		710712	603100
	3508.0		.016		
5		49+97		714220	603102
	934.1		curve		
6		59+31		715012	602700
	696.9		305.50		
7		66+28		715420	602135
	0				
8		0+00*		713035	601490
	1613.0				
9		16+13* 38+15**		713038	603101.3

* Divider Dike
** Starter Dam

REVISIONS:
△ 11-6-80

DESIGNED BY: J E.H
DRAWN BY: R.S.R.
REVIEWED BY: R.D.B.
DATE: 10-15-80

TOPOGRAPHIC PLAN SHOWING
LOCATION OF TEST BORINGS

TAILINGS DAM CONSTRUCTION
COPPER FLAT PARTNERSHIP
QUINTANA MINERALS CORPORATION, MGR.
HILLSBORO, NEW MEXICO

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS

JOB NO.: SHB E80-1030
SHEET: 1 OF 7 △

Figure 14
Tailings Impoundment Layout and Decant Alignment Boring Locations
Copper Flat, New Mexico
(from SHB, 1980)

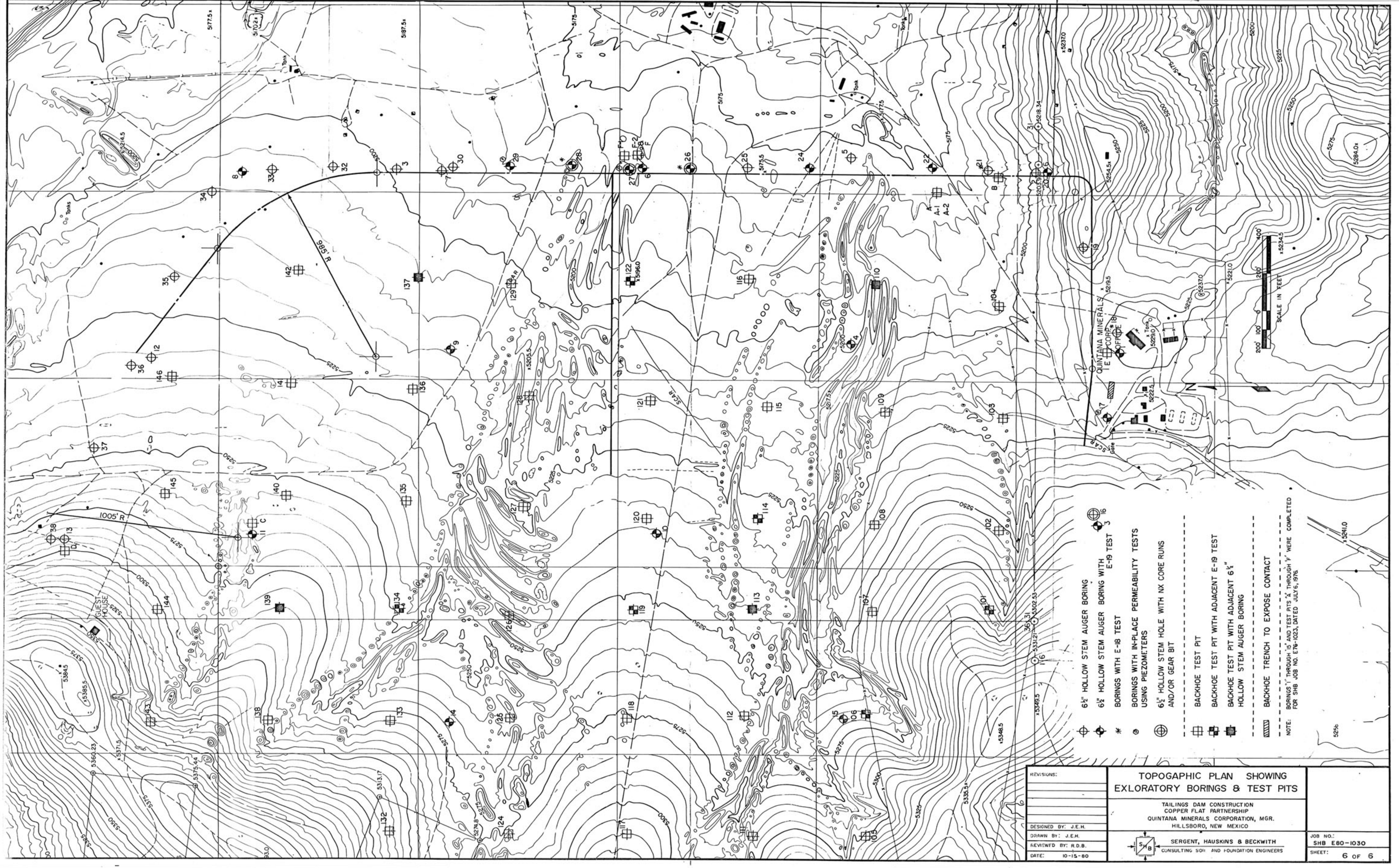


Figure 15
Geotechnical Soil Boring and Test Pit Locations
Copper Flat, New Mexico
(from SHB, 1980)

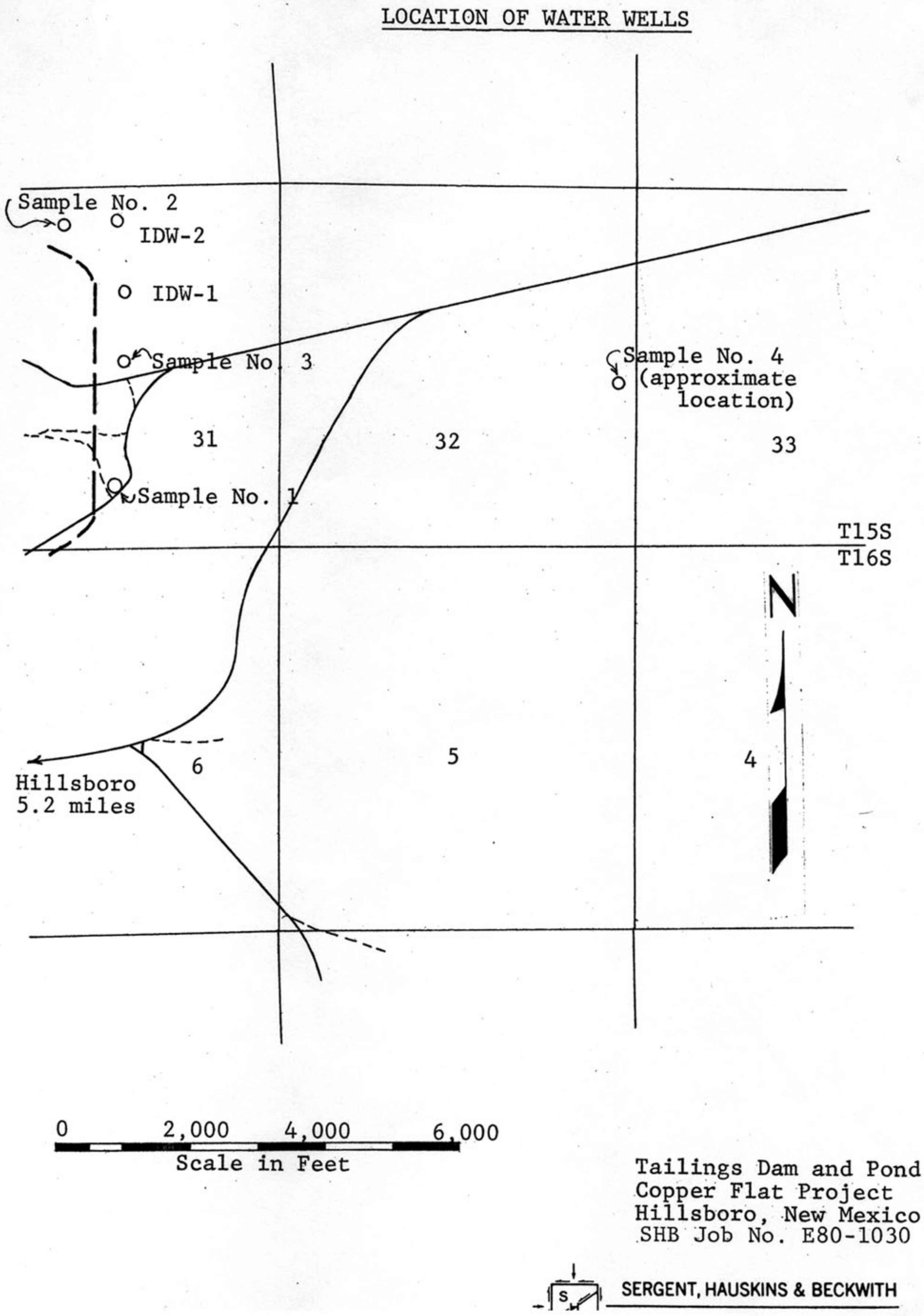


Figure 16
1976 Groundwater and Soil Sample Locations
Copper Flat, New Mexico
(from SHB, 1980)

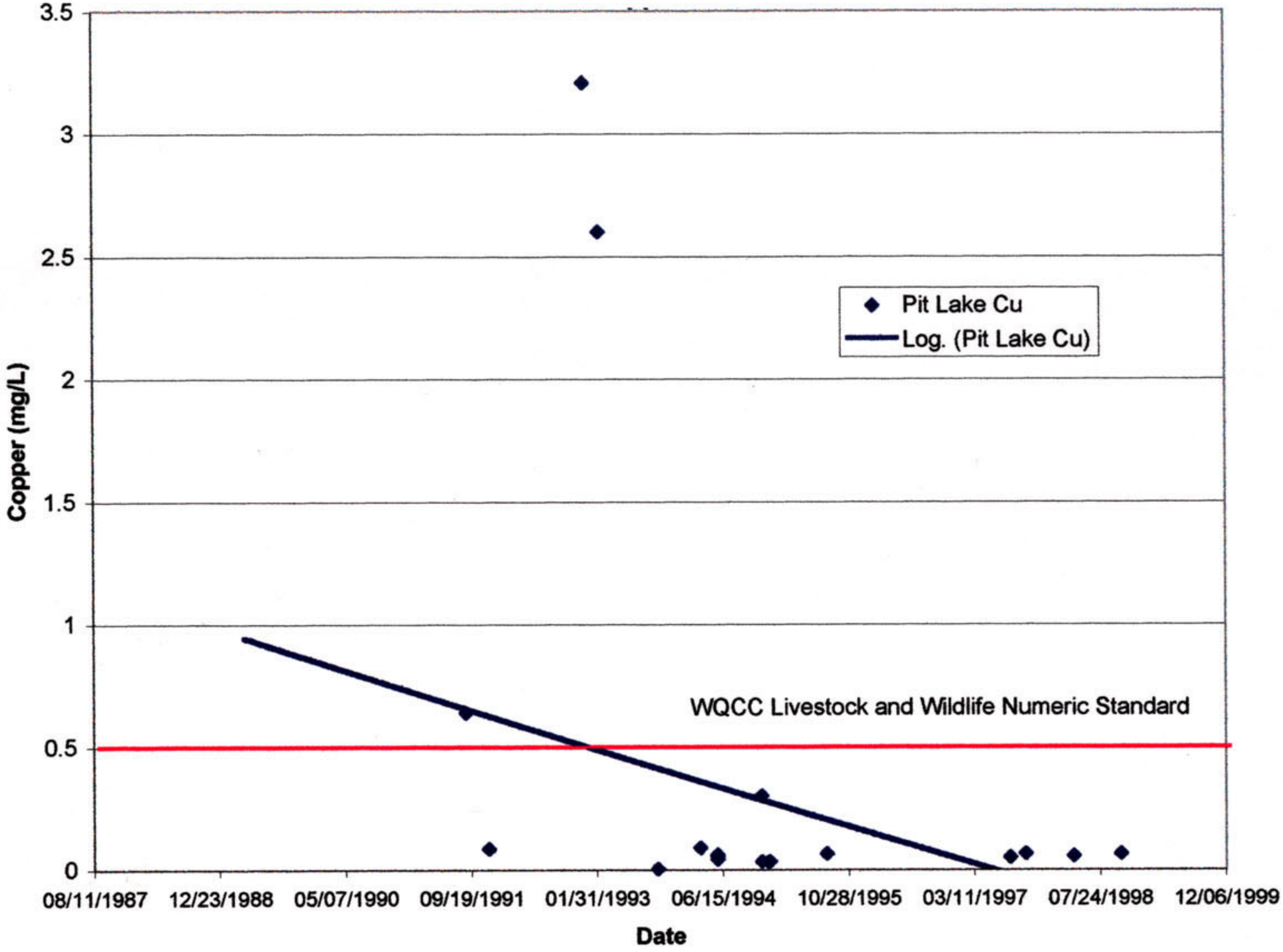


Figure 17
Copper Concentrations in the Mine Pit Lake
Copper Flat, New Mexico

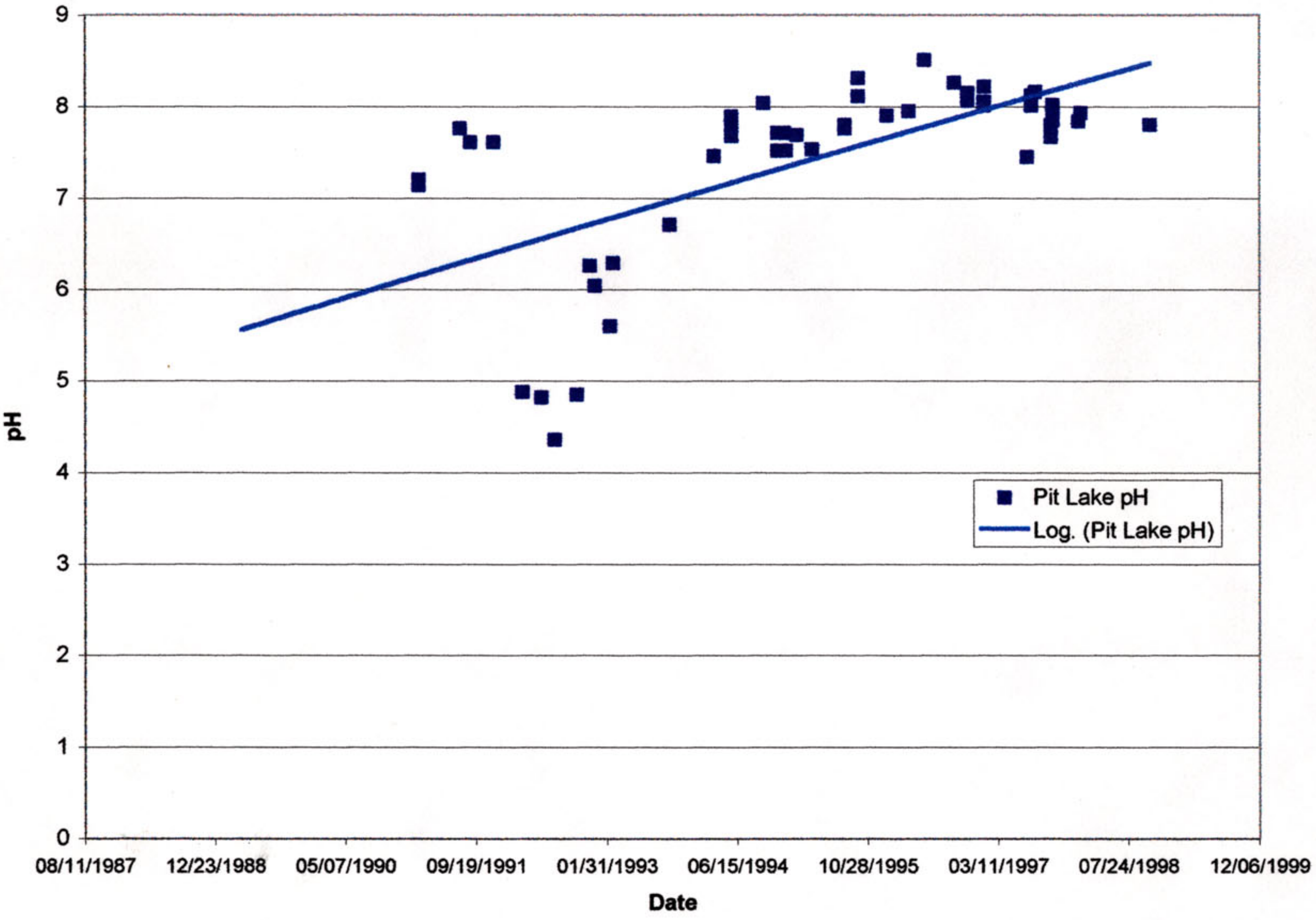


Figure 18
pH in the Mine Pit Lake
Copper Flat, New Mexico

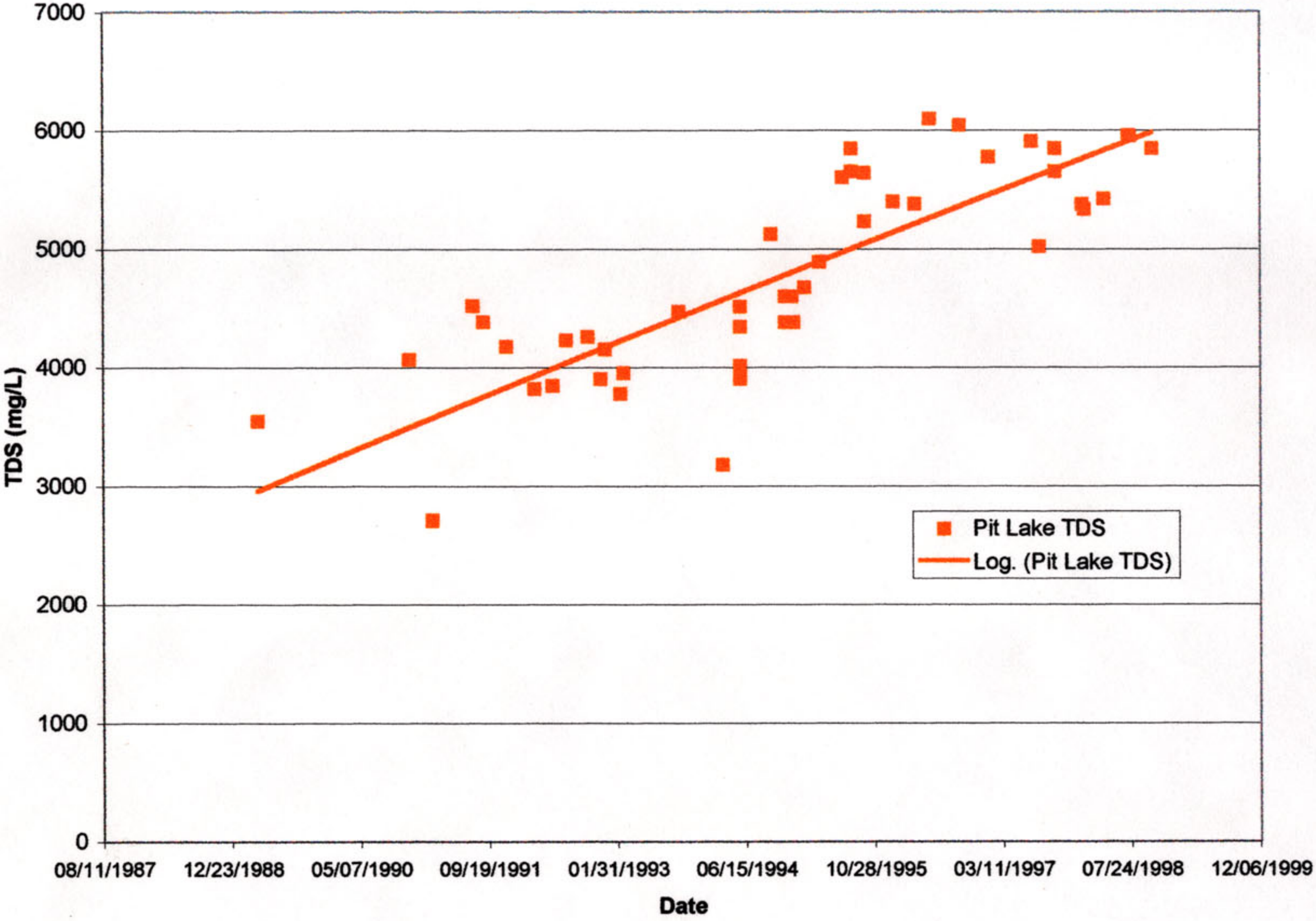


Figure 19
Total Dissolved Solid Concentrations in the Mine Pit Lake
Copper Flat, New Mexico

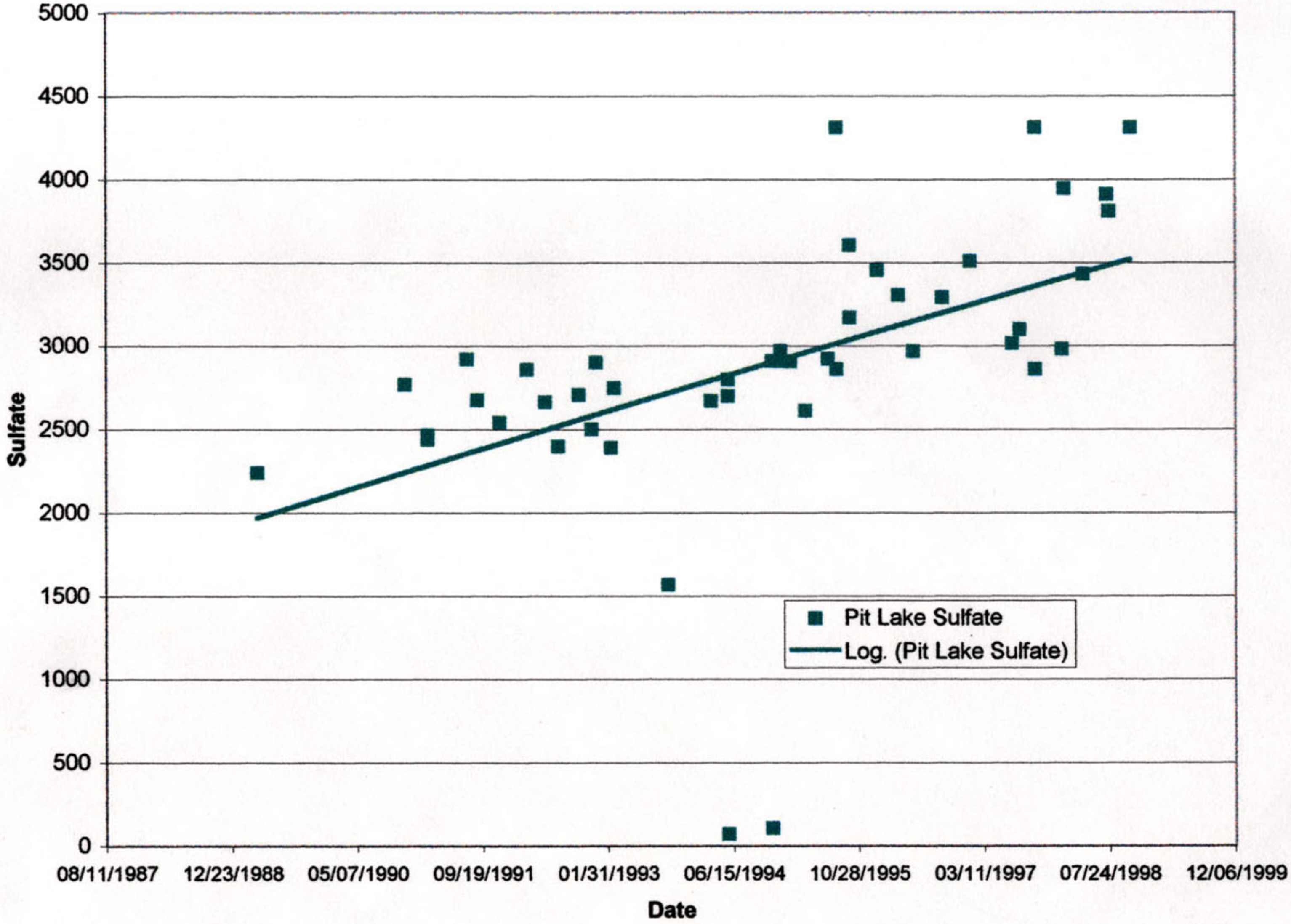


Figure 20
Sulfate Concentration in the Mine Pit Lake
Copper Flat, New Mexico

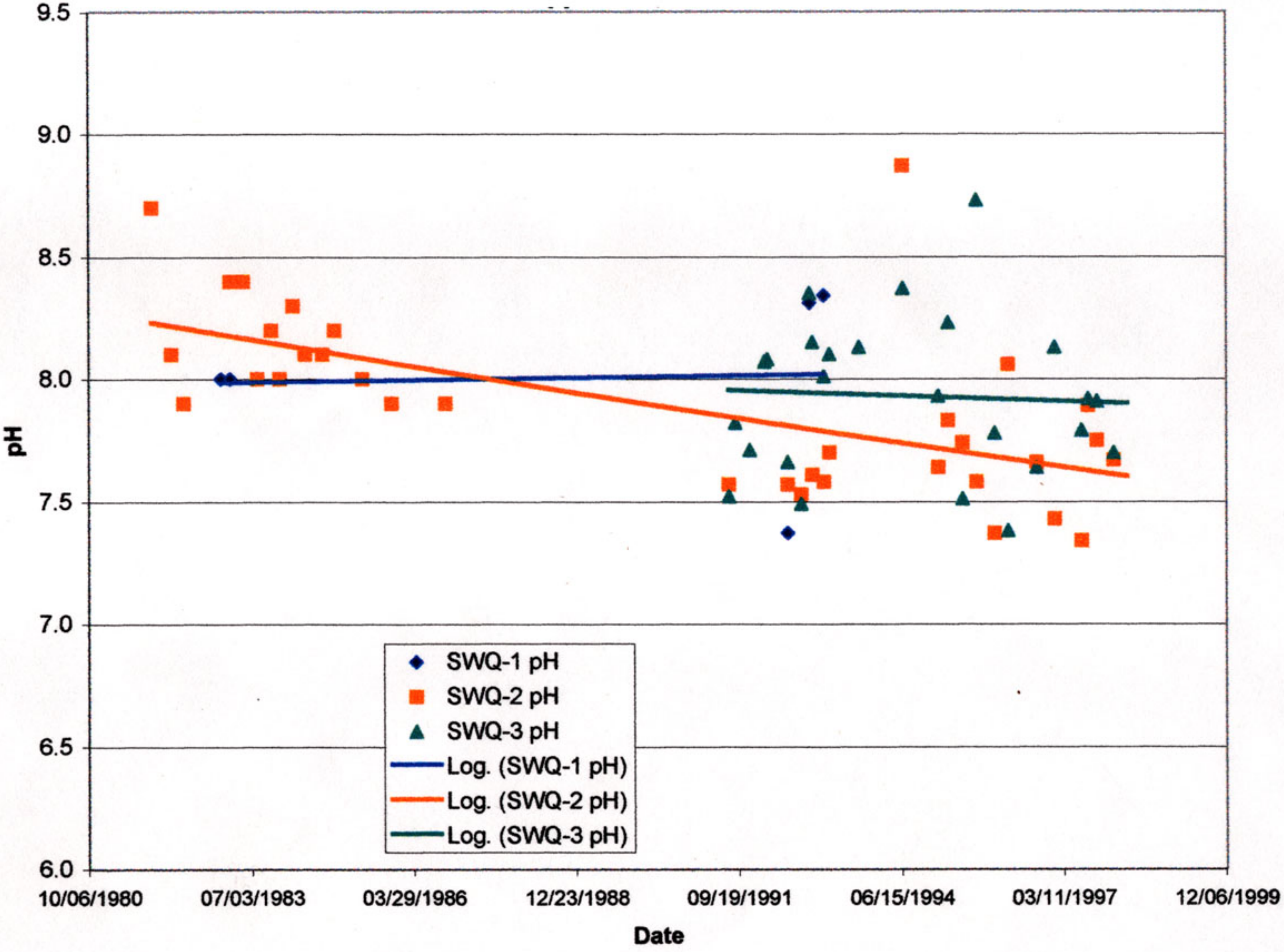


Figure 21
pH from Greyback Gulch Surface Water
Copper Flat, New Mexico

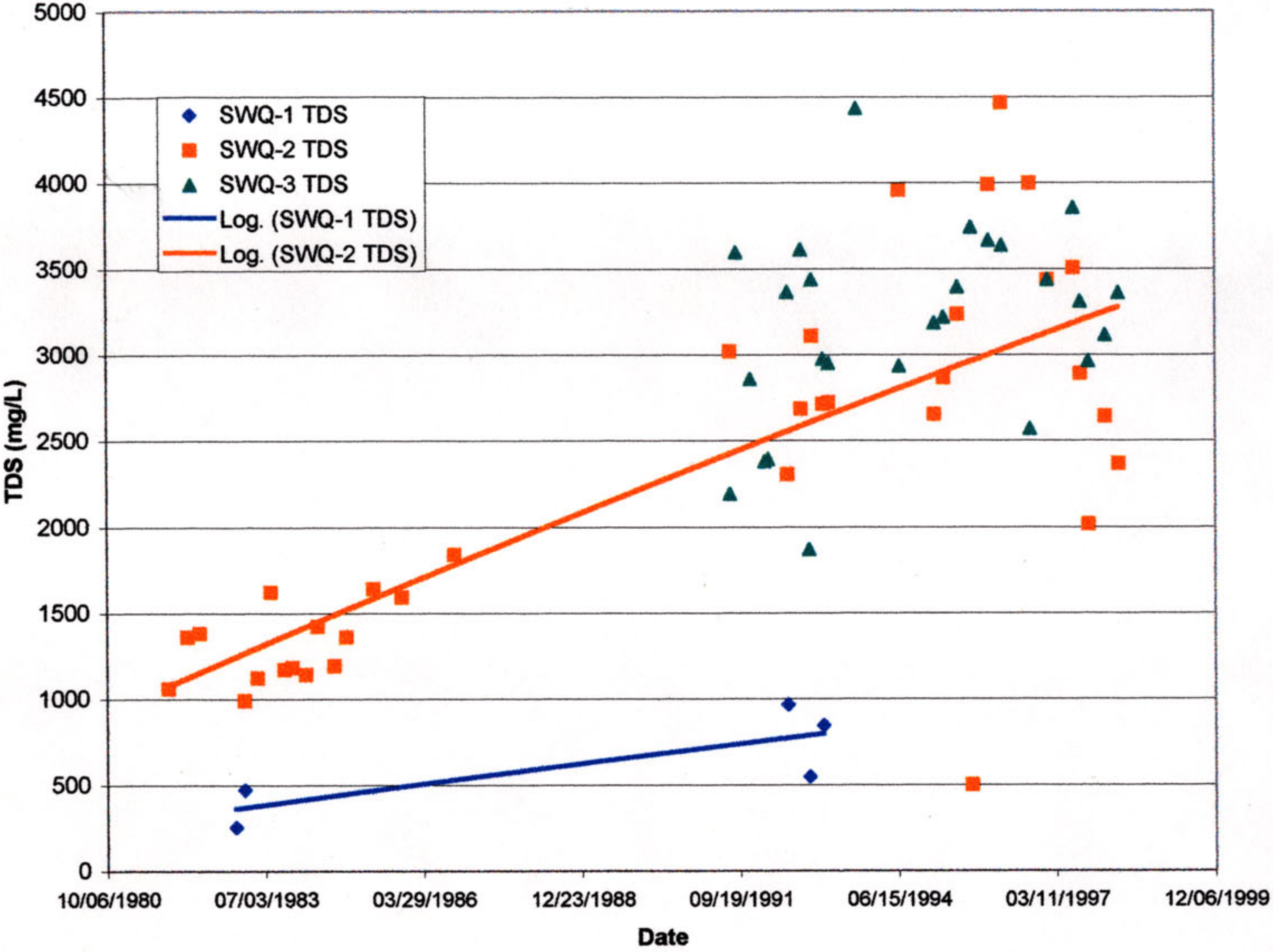


Figure 22
TDS Concentrations from Greyback Gulch Surface Water
Copper Flat, New Mexico

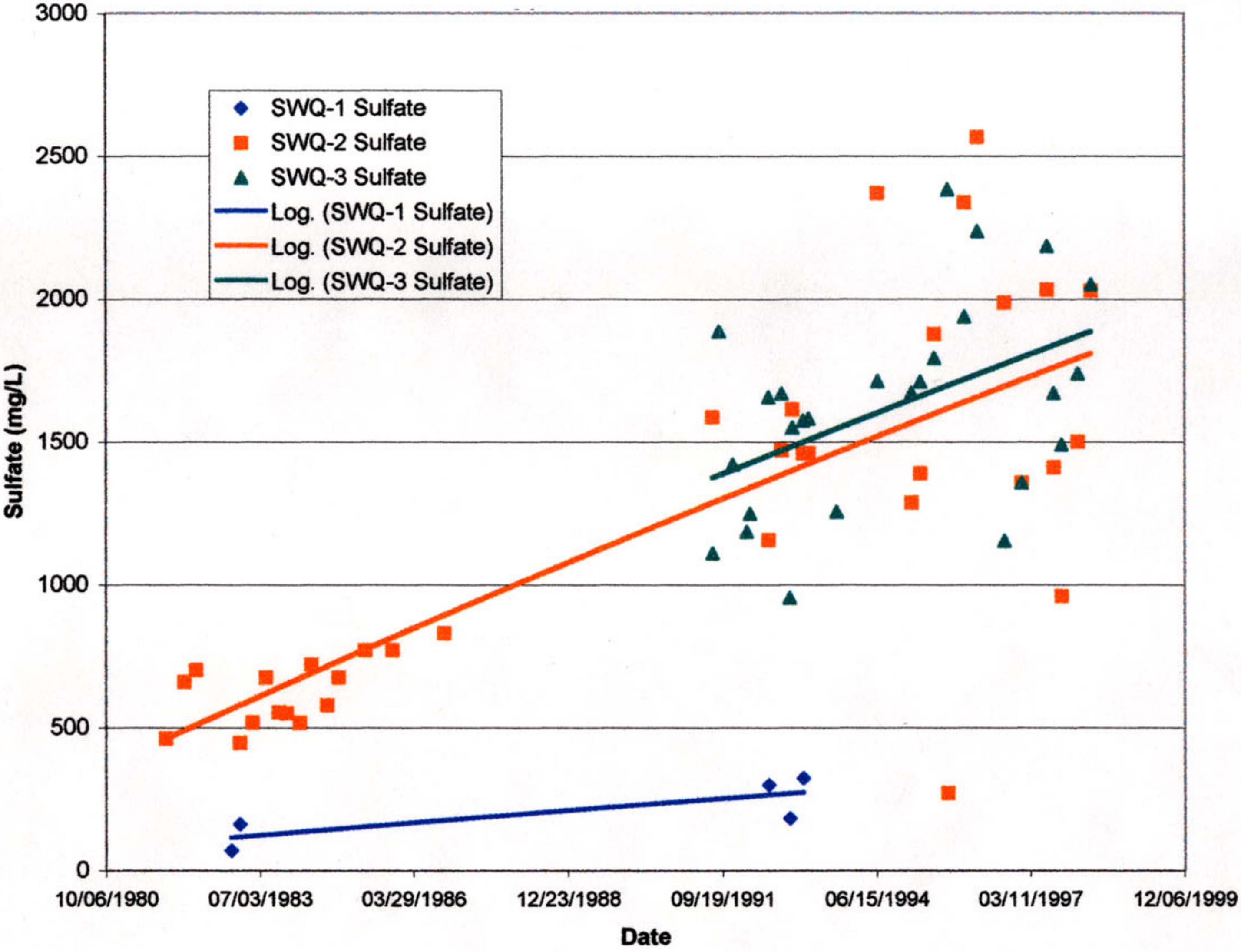


Figure 23
Sulfate Concentrations from Greyback Gulch Surface Water
Copper Flat, New Mexico

Chemical Constituents in Equivalents per Million

Sample	Date	NaK	Ca	Mg	Fe	CO3	SO4	HCO3	Cl
SWQ-1	1/ 4/1993	4.70	5.44	2.96	0.00	0.00	5.75	5.90	0.76
SWQ-2	31/ 3/1993	12.19	21.76	6.83	0.00	0.00	30.40	4.92	3.47
SWQ-3	31/ 3/1993	11.84	22.21	8.97	0.00	0.00	32.90	5.08	3.81

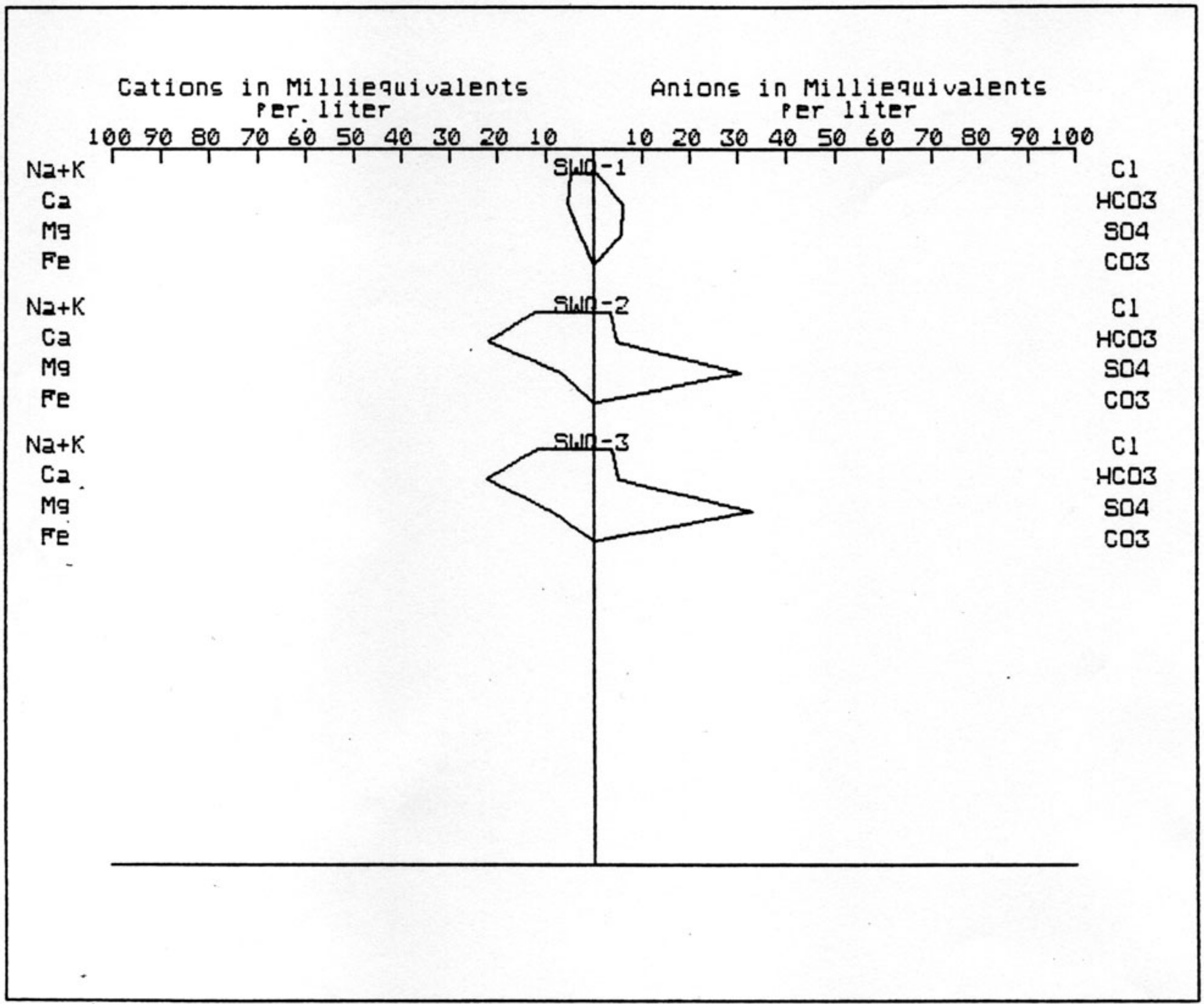


Figure 24
Greyback Gulch Surface Water Stiff Diagrams
Copper Flat, New Mexico
(from Newcomer et al., 1993)

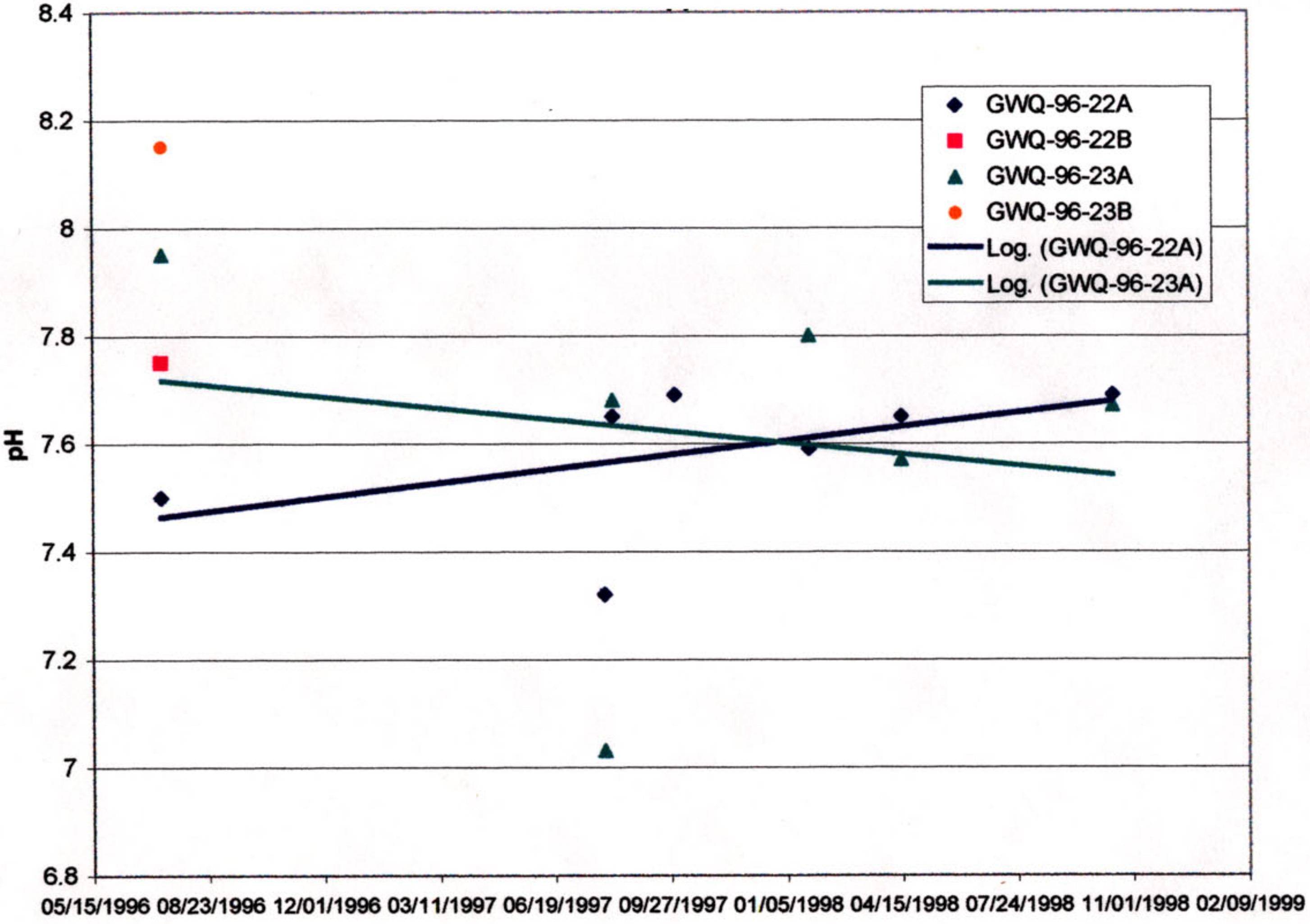


Figure 25
Groundwater pH, Mine Pit Vicinity
Copper Flat, New Mexico

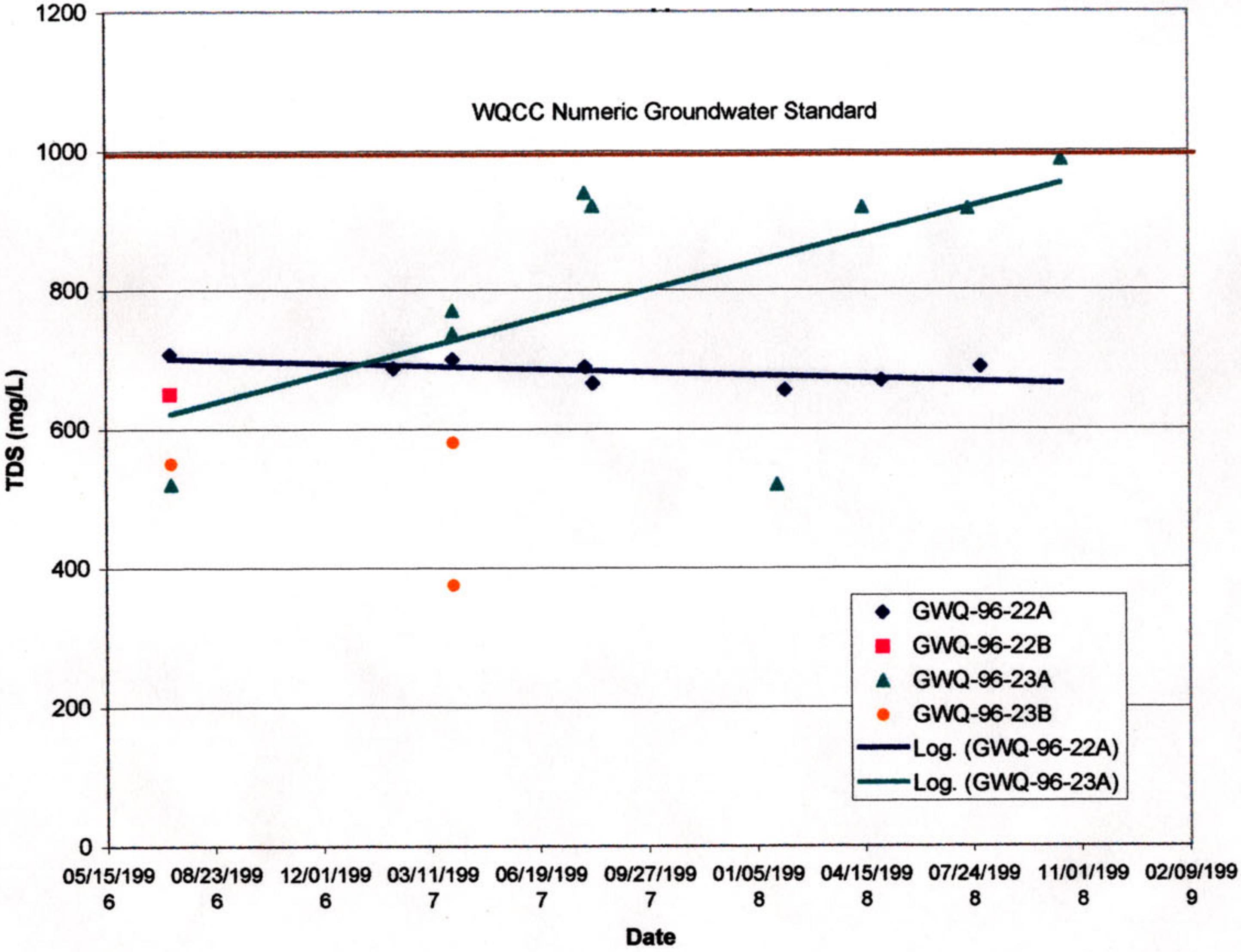


Figure 26
Groundwater TDS Concentrations, Mine Pit Vicinity
Copper Flat, New Mexico

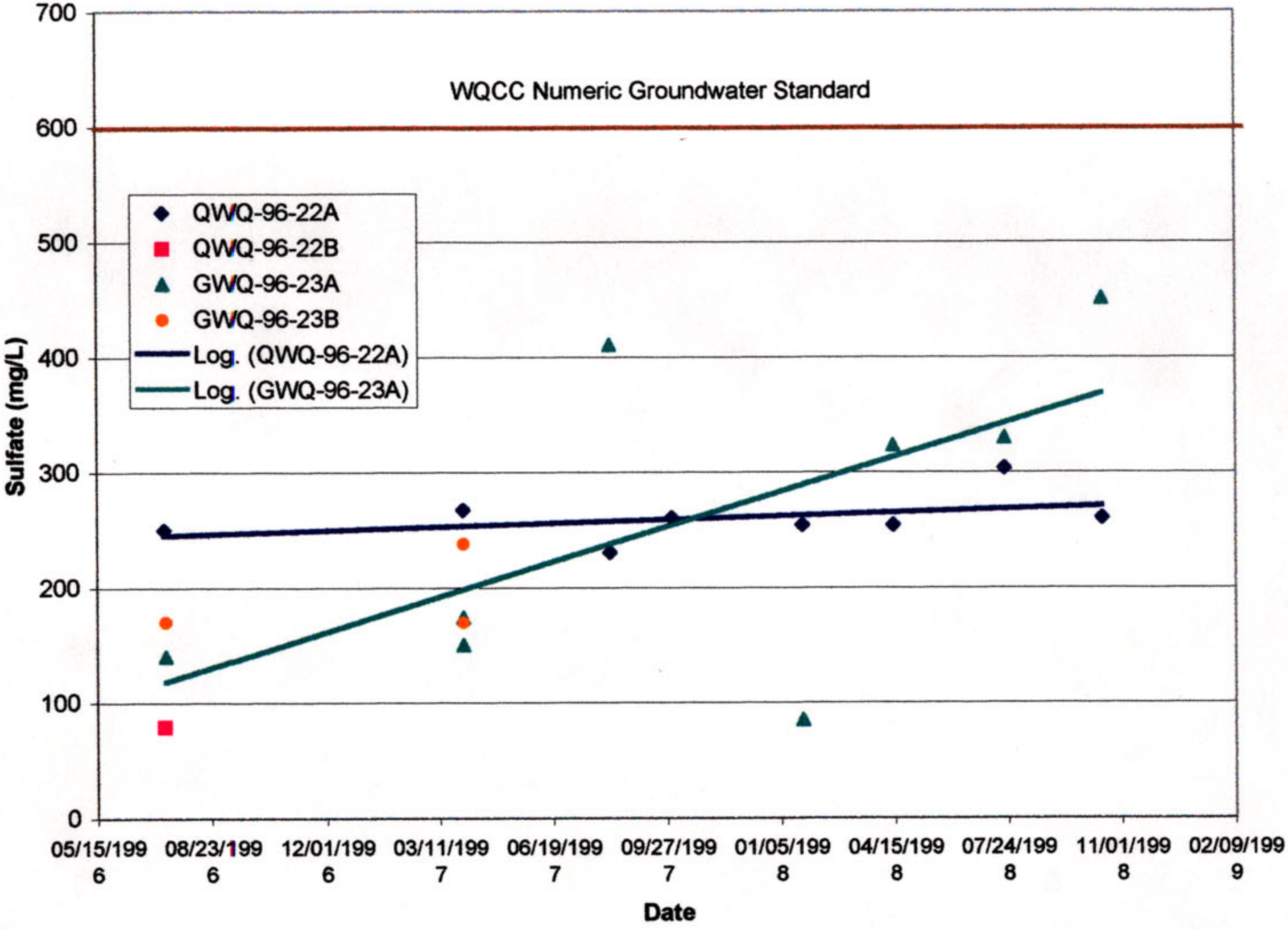


Figure 27
Groundwater Sulfate Concentrations, Mine Pit Vicinity
Copper Flat, New Mexico

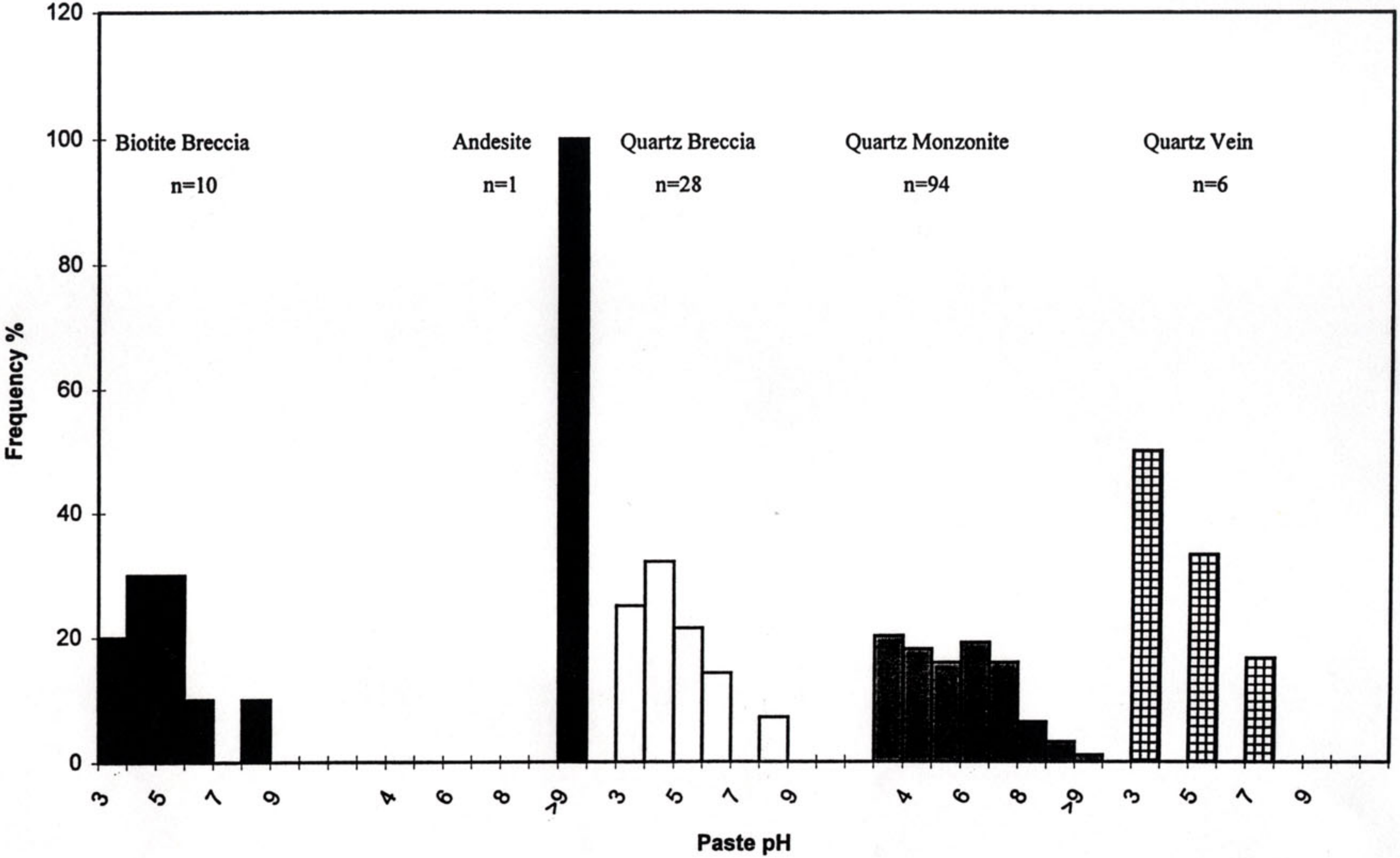


Figure 28
Paste pH Distributions by Rock Type
Copper Flat, New Mexico
(from SRK, July 1998)

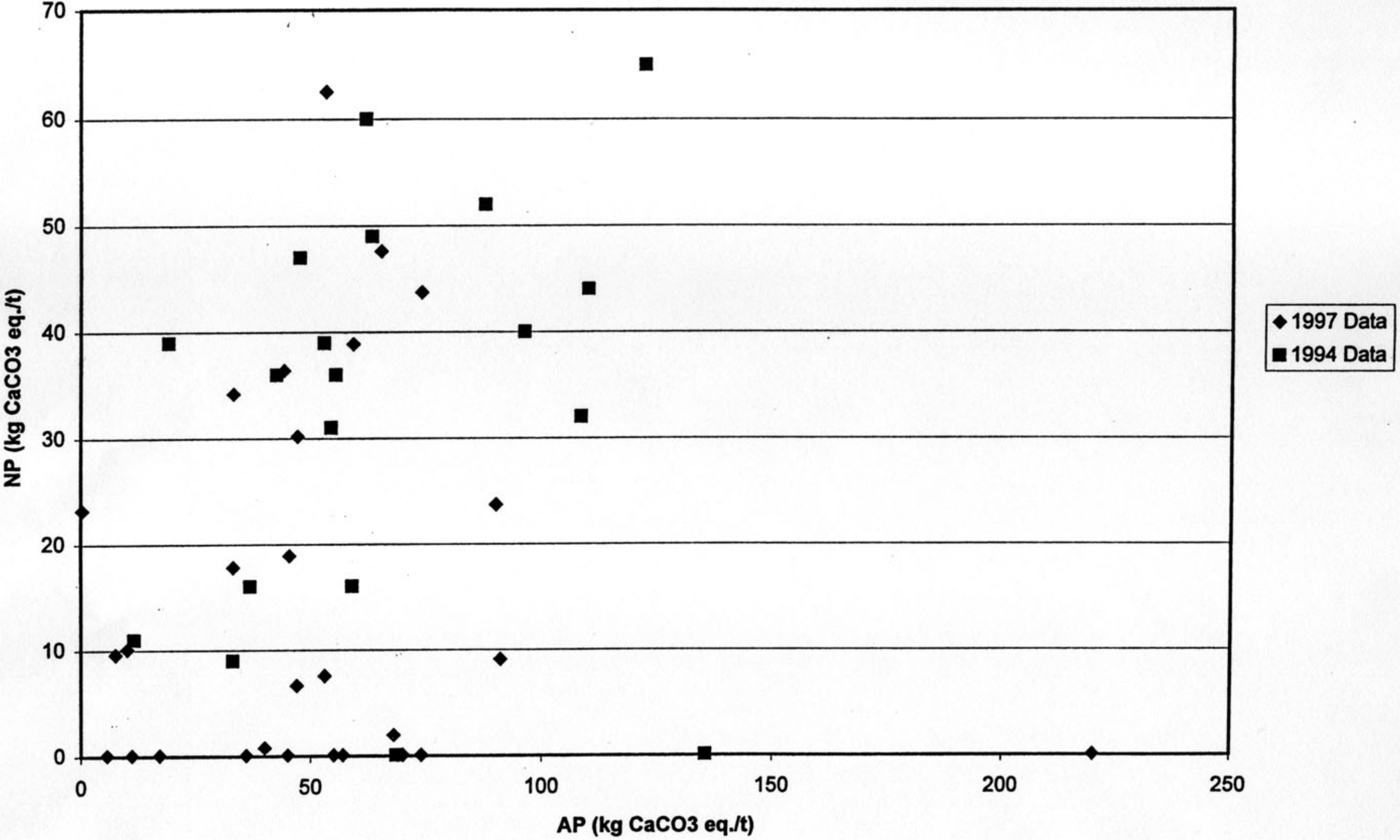


Figure 29
Comparison of Sobek vrs Modified Sobek Methods for
Estimating Acid Generation Potential vrs Neutralization Potential
Copper Flat, New Mexico
(from SRK, July 1998)

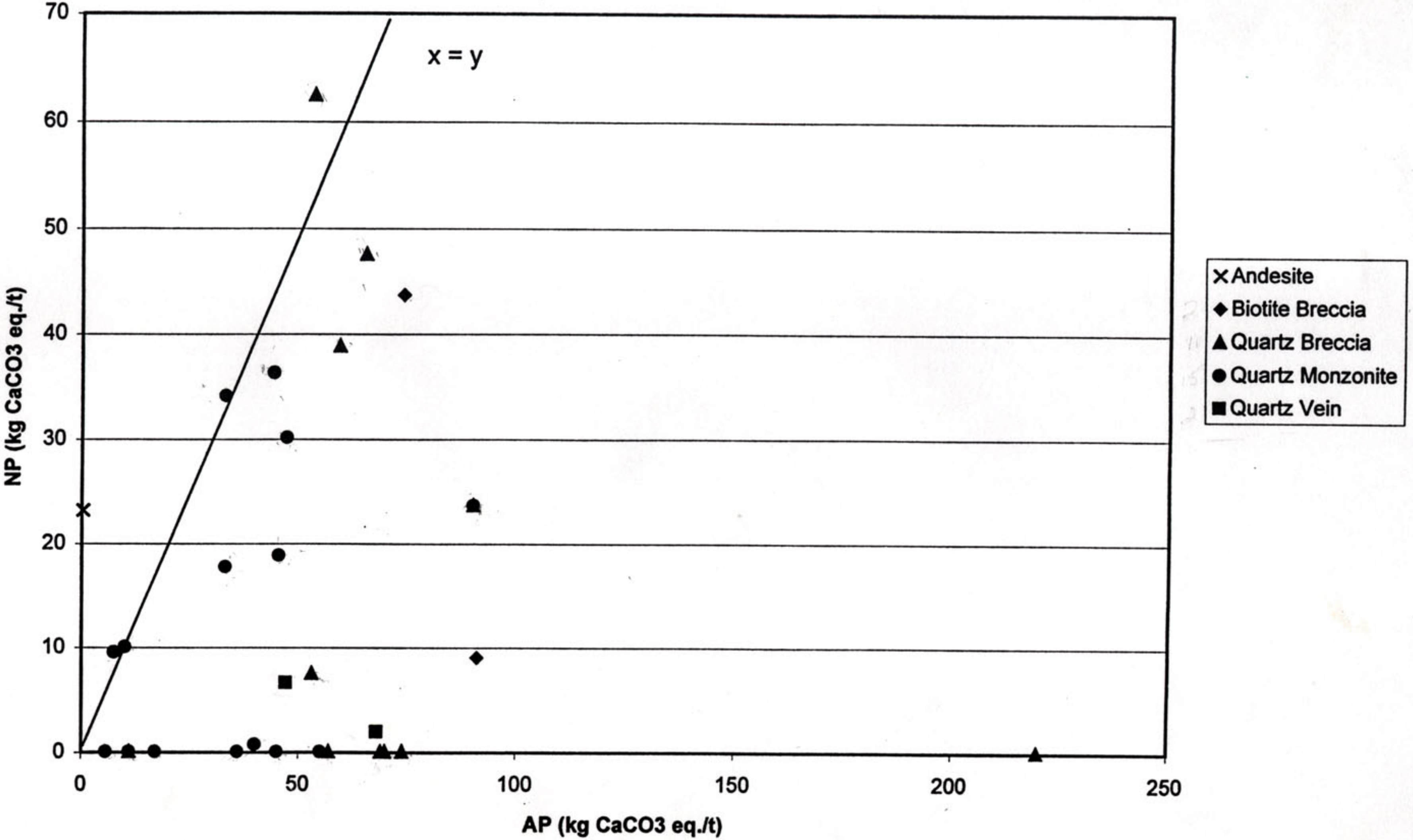


Figure 30
Acid Generation Potential vrs Neutralization Potential
Pit Wall and Waste Rock Samples
Copper Flat, New Mexico
(from SRK, July 1998)

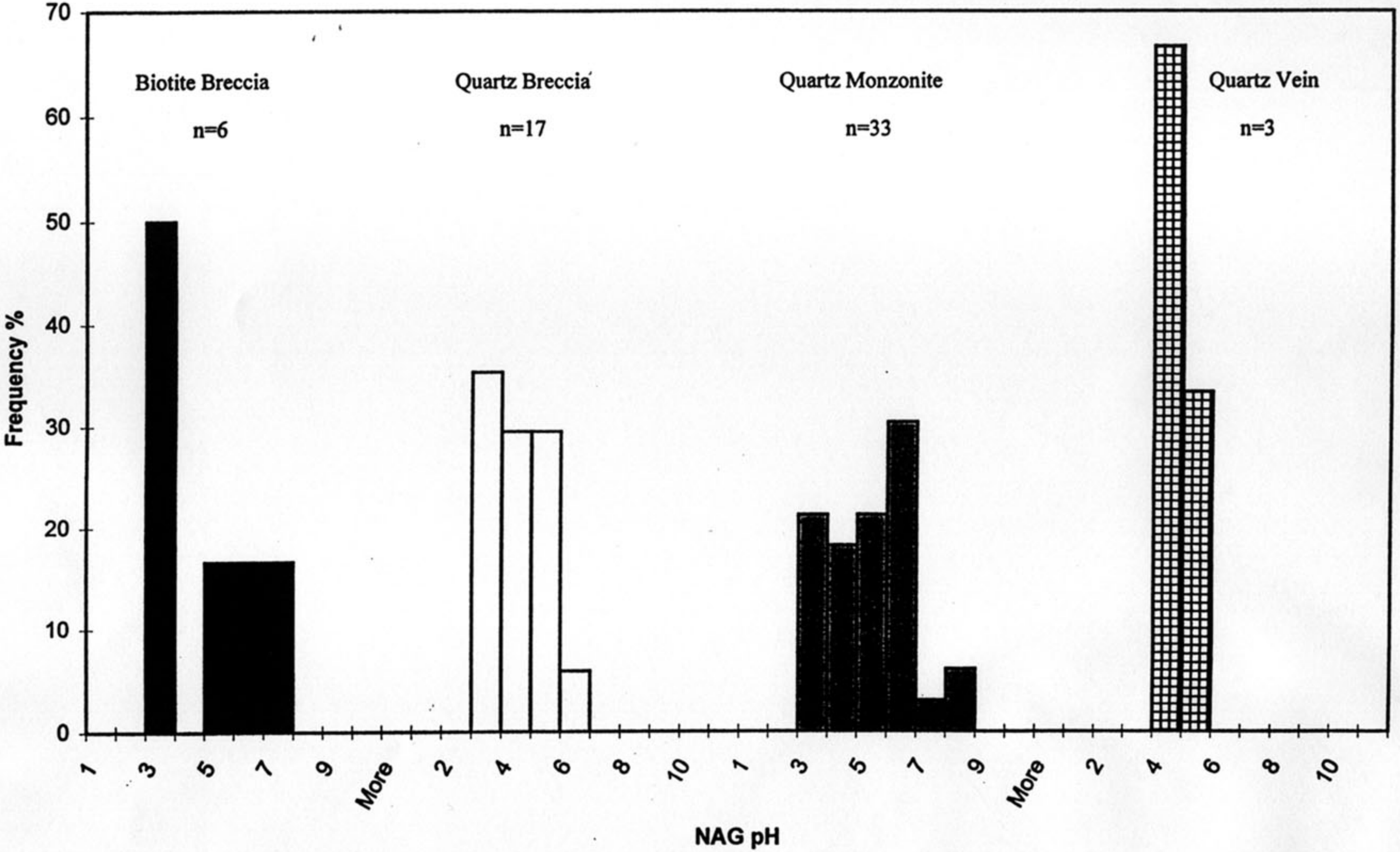


Figure 31
NAG pH Frequency Distribution by Rock Type
Copper Flat, New Mexico
(from SRK, July 1998)

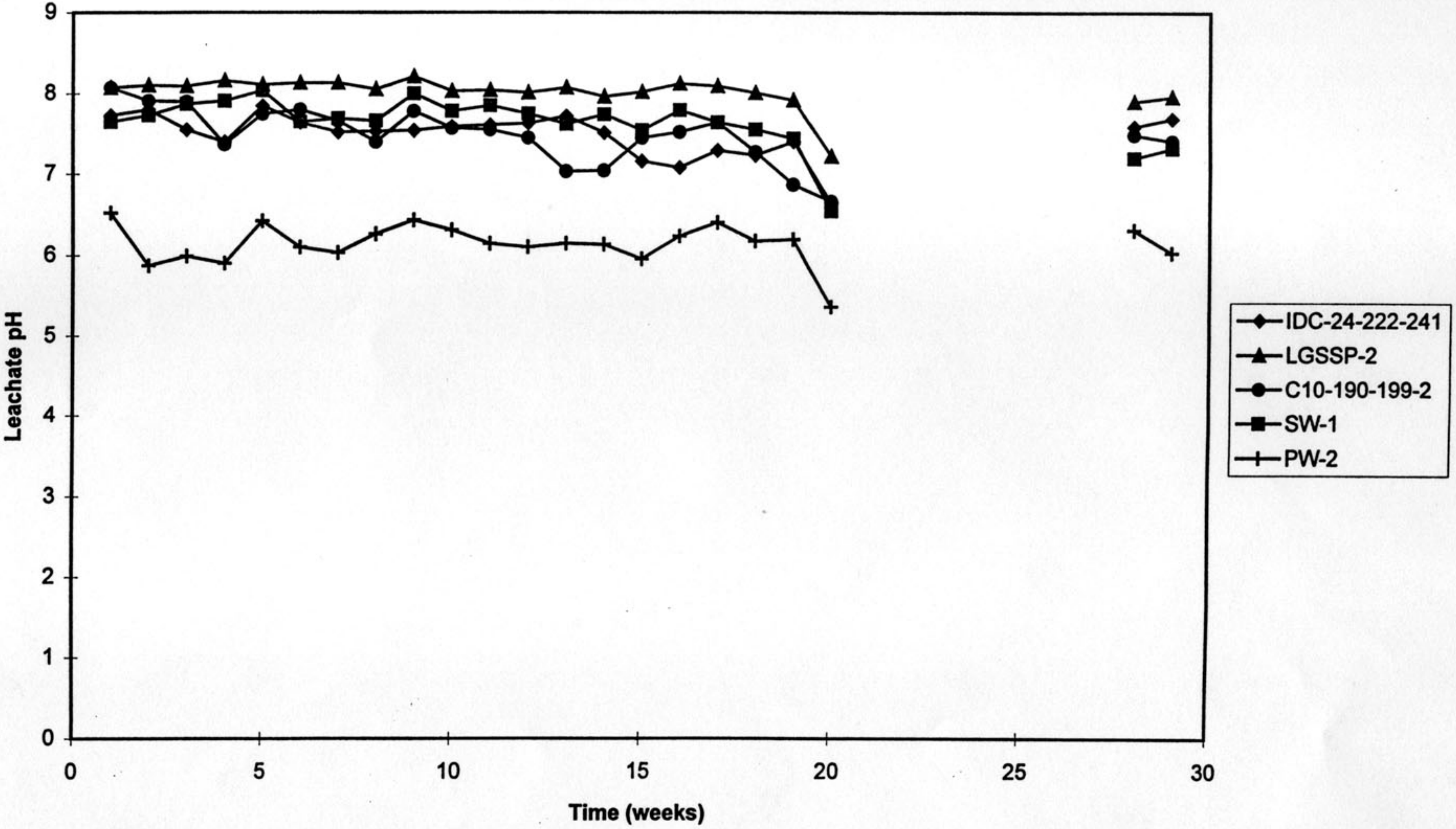


Figure 32
Kinetic Test, pH vrs Time
Copper Flat, New Mexico
(from SRK, July 1998)

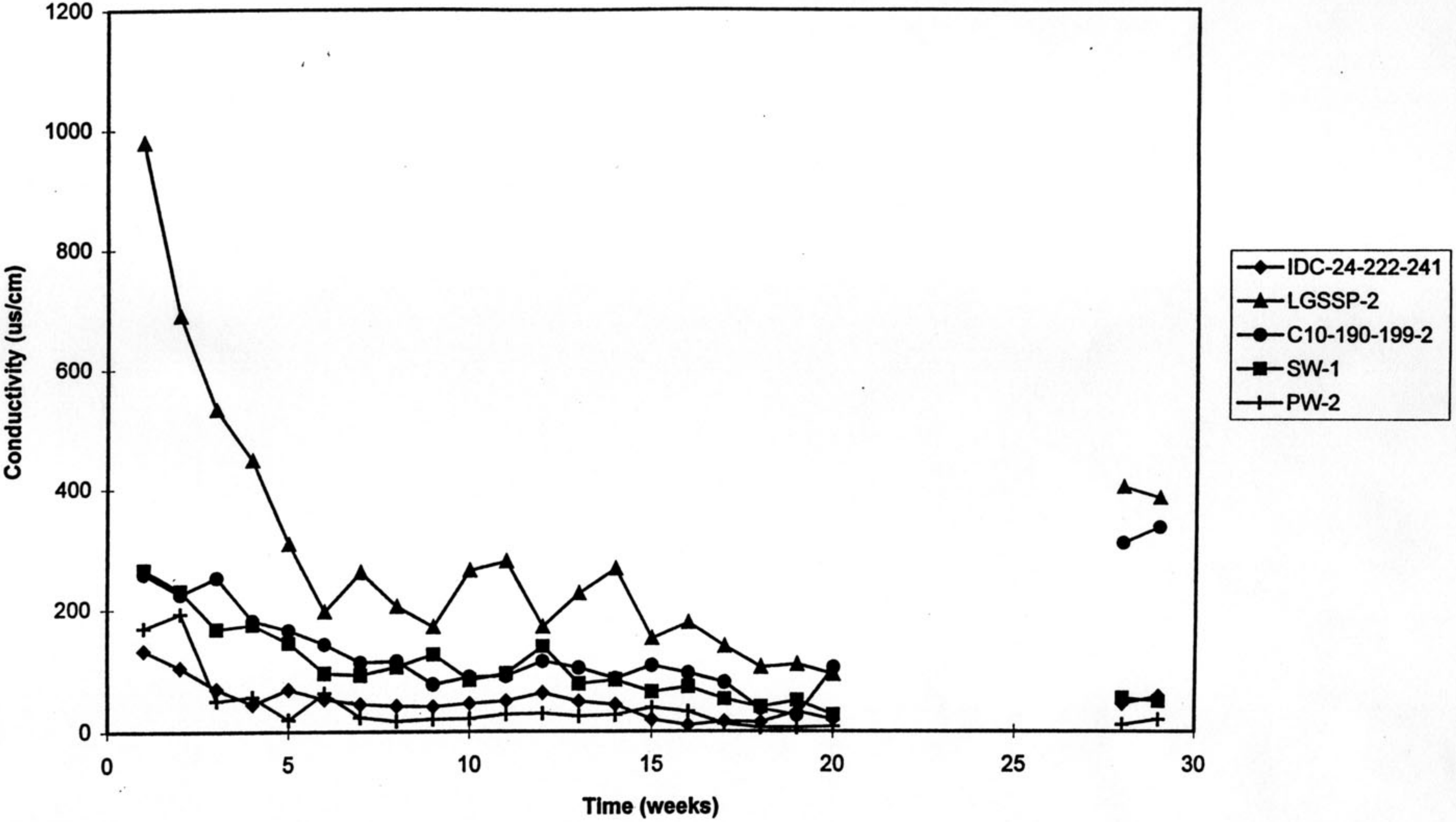


Figure 33
Kinetic Test, Electrical Conductivity vrs Time
Copper Flat, New Mexico
(from SRK, July 1998)

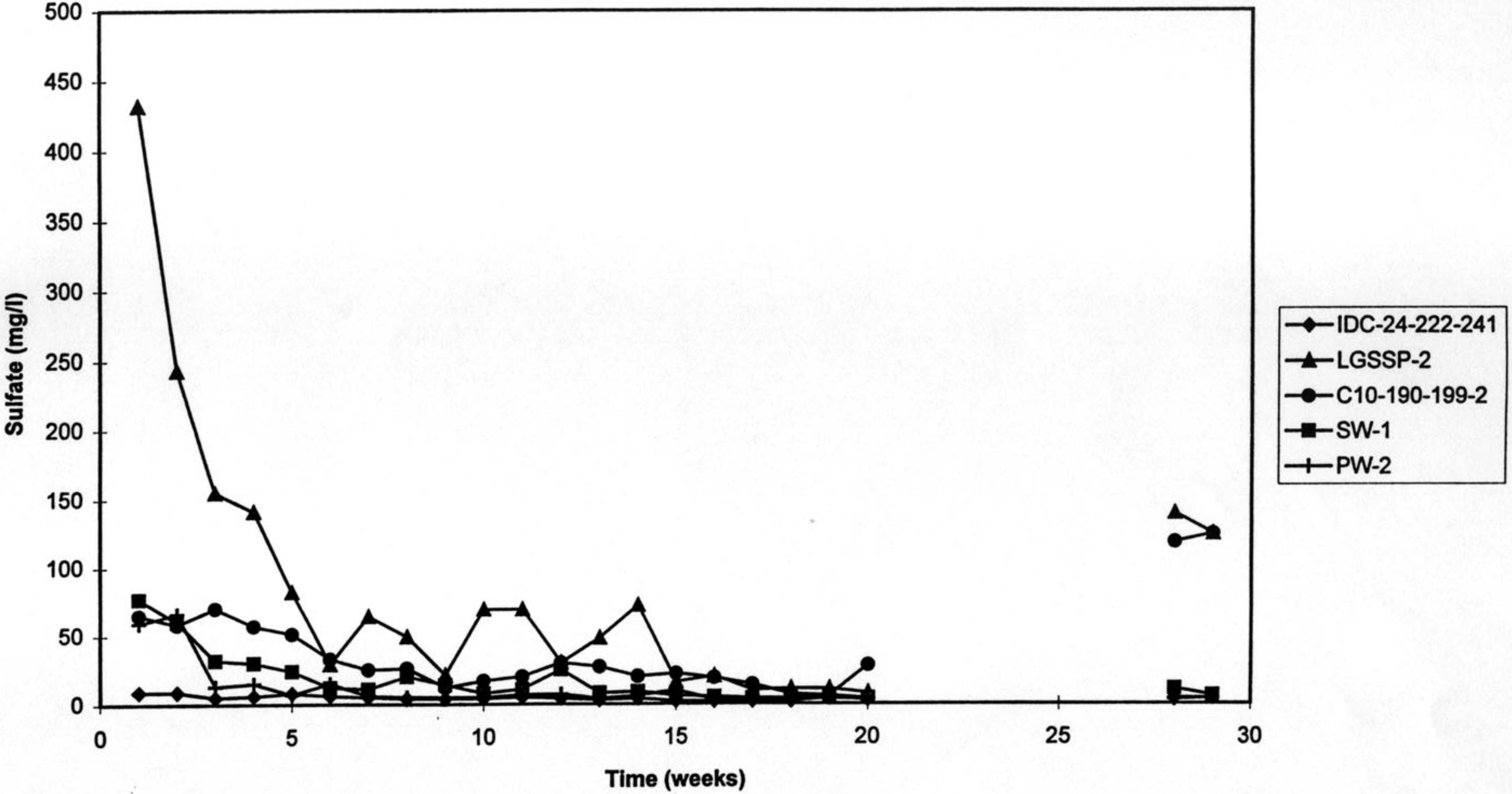


Figure 34
Kinetic Test, Sulfate vrs Time
Copper Flat, New Mexico
(from SRK, July 1998)

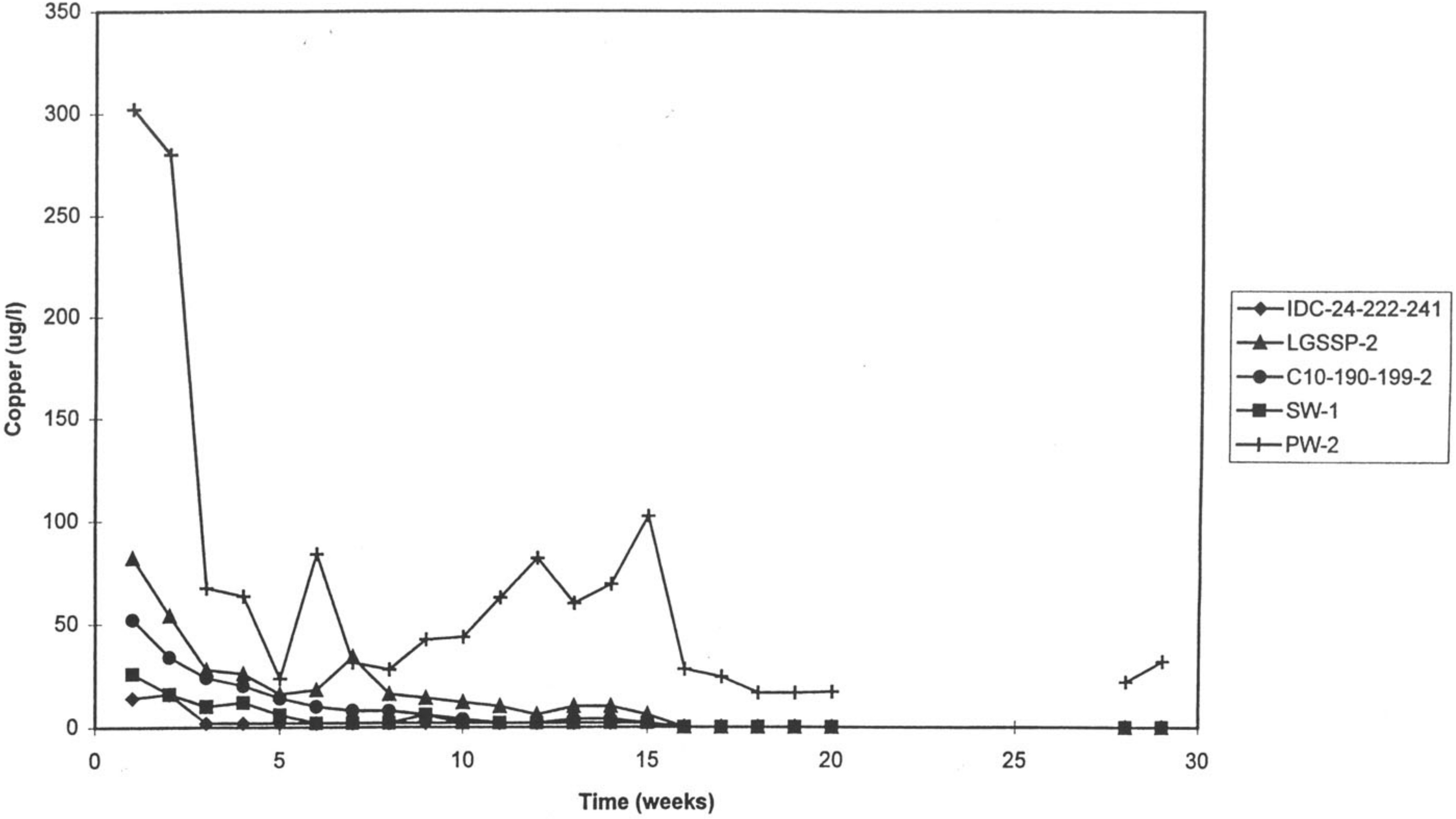


Figure 35
Kinetic Test, Copper vrs Time
Copper Flat, New Mexico
(from SRK, July 1998)

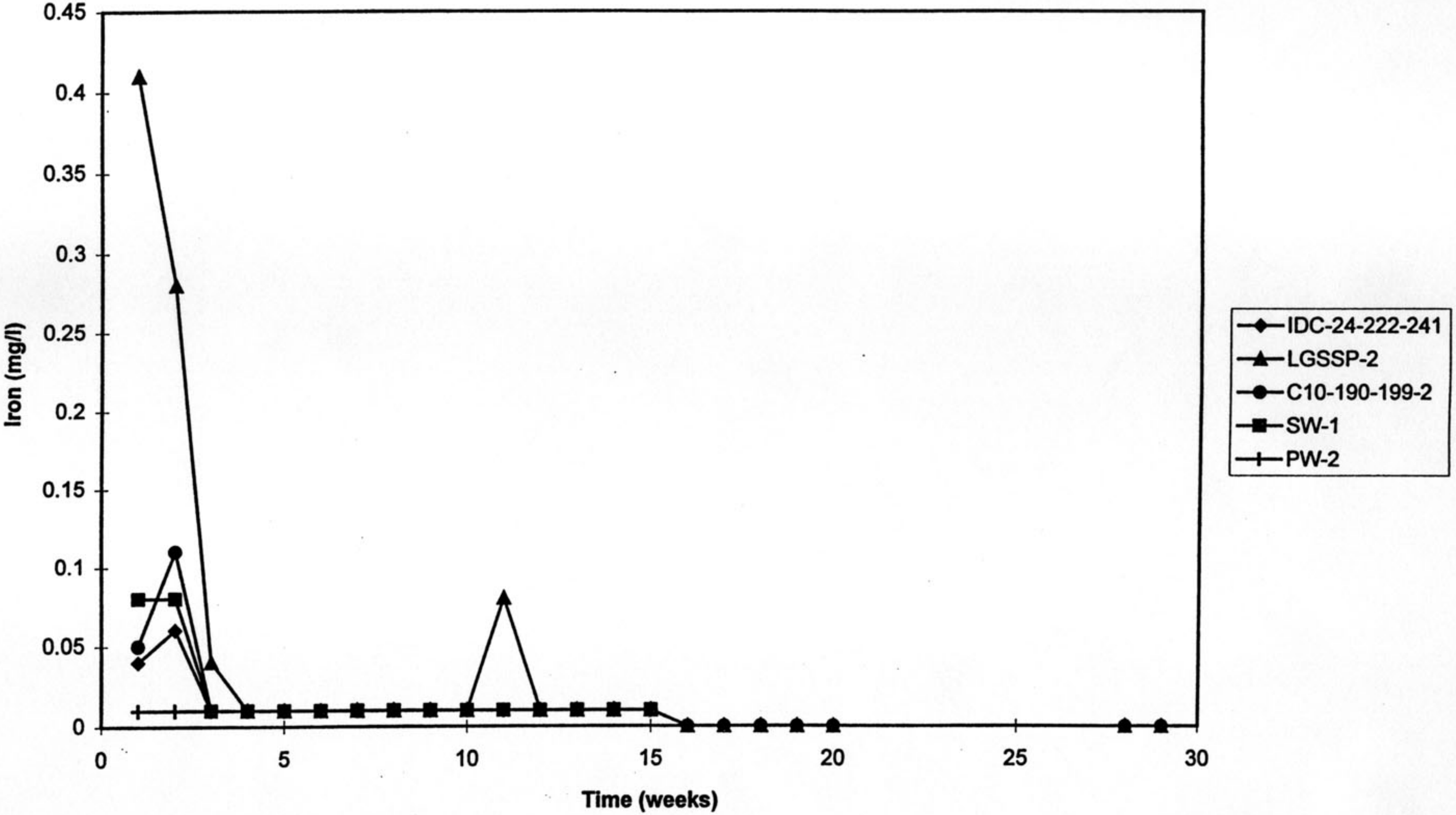
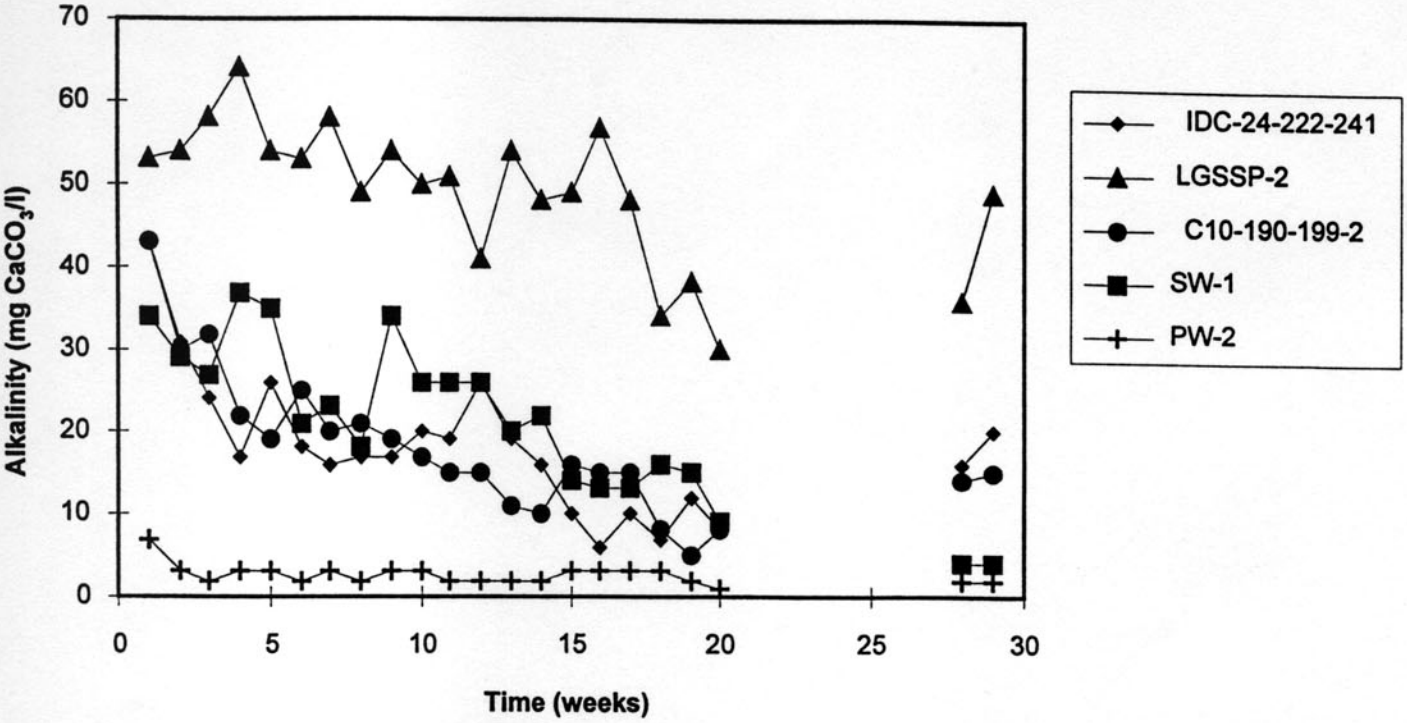


Figure 36
Kinetic Test, Iron vrs Time
Copper Flat, New Mexico
(from SRK, July 1998)



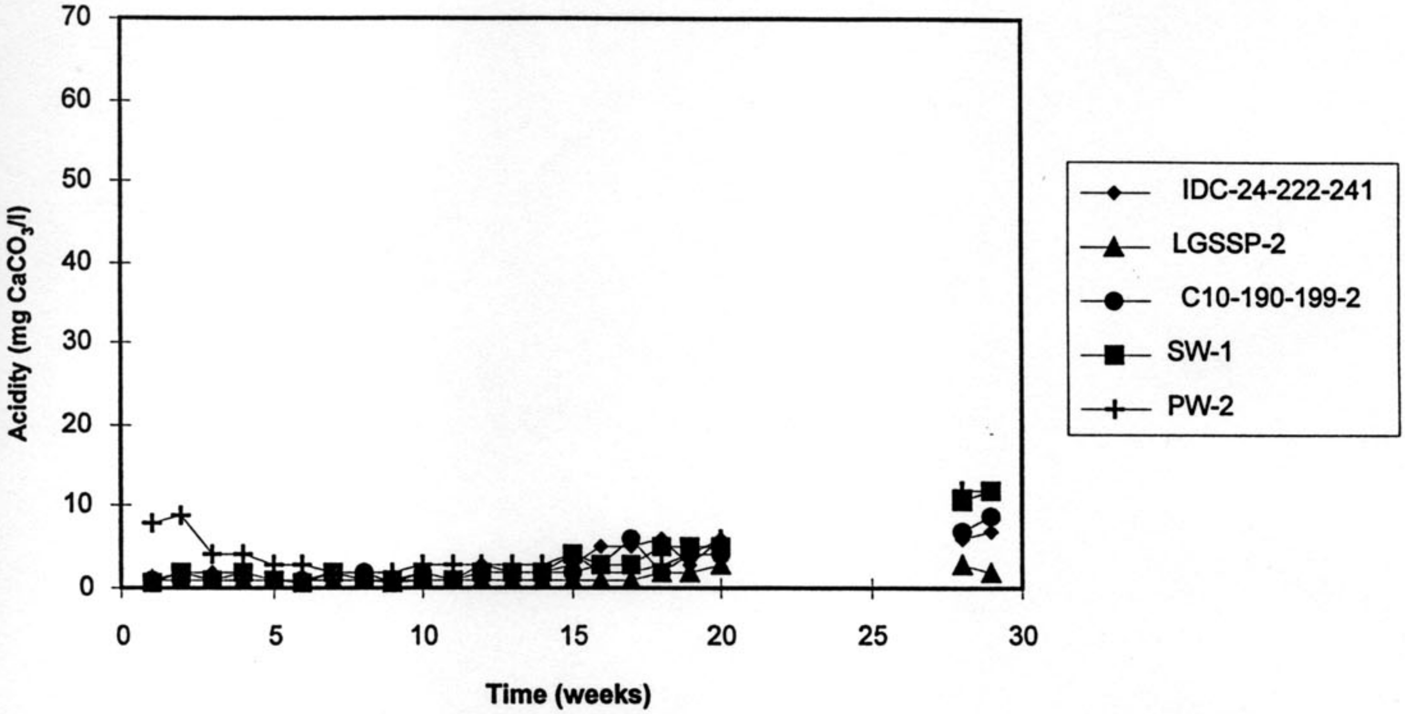
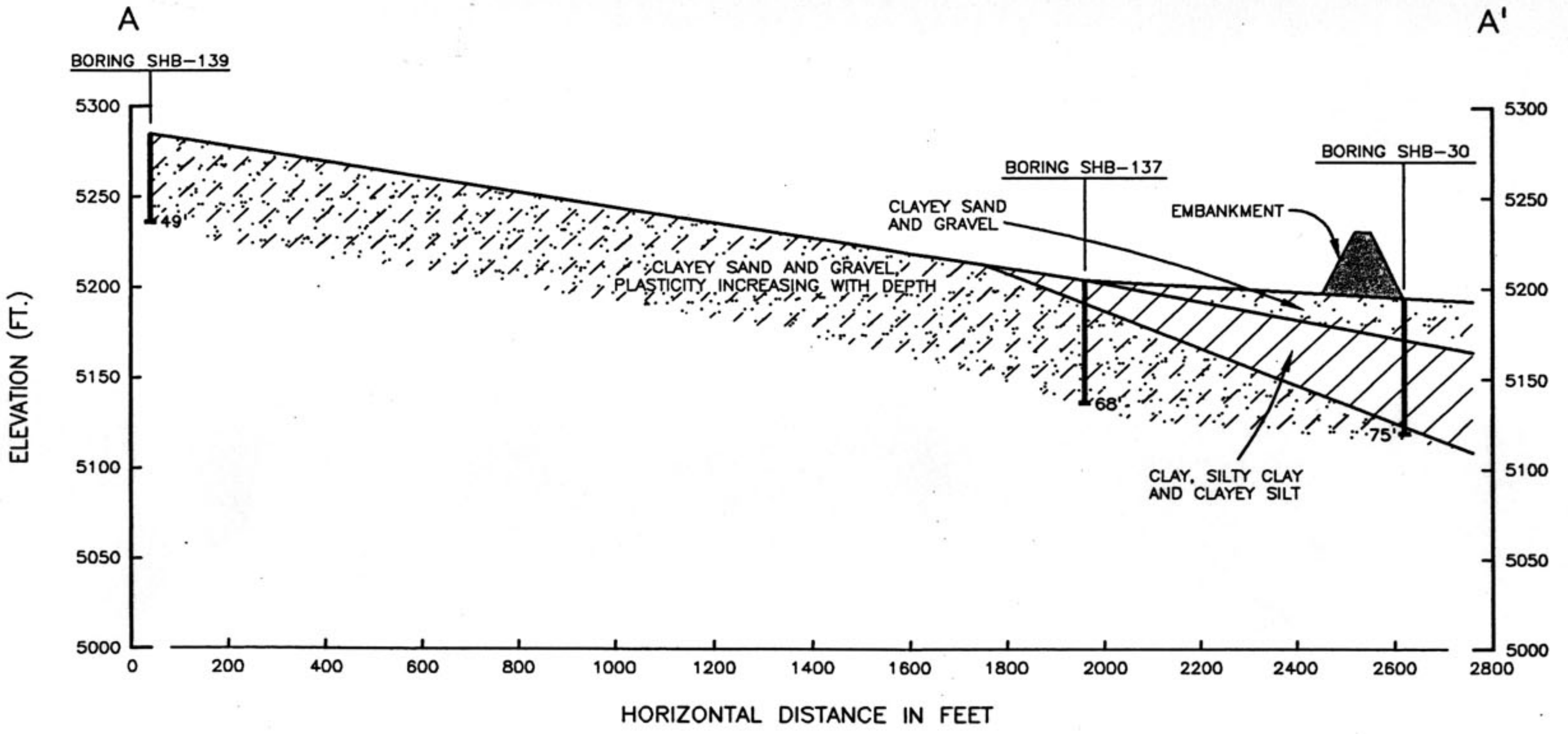
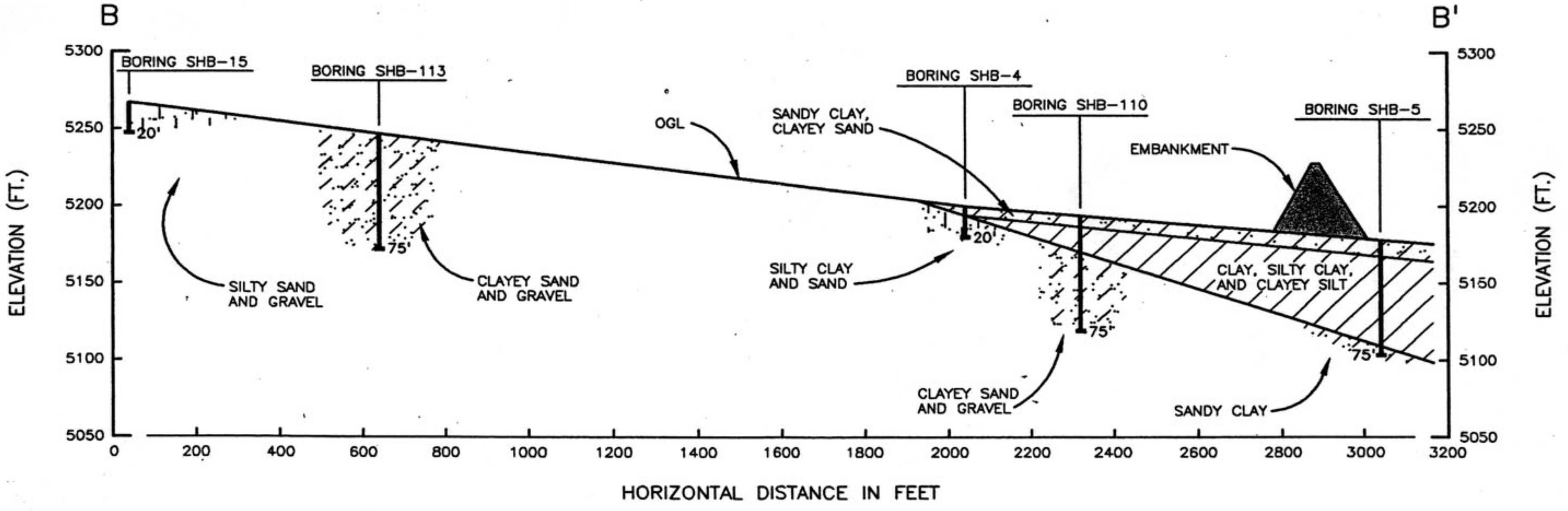


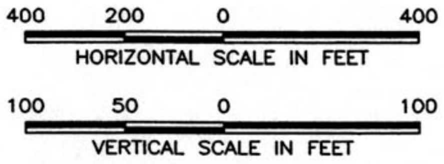
Figure 37
Kinetic Test, Alkalinity vrs Time
Copper Flat, New Mexico
(from SRK, July 1998)



IDEALIZED GEOLOGICAL SECTION A–A' (NORTH CELL)



IDEALIZED GEOLOGICAL SECTION B–B' (SOUTH CELL)



SRK
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

PROJECT NO.	DATE	REVISION
68608	01/95	A

FIGURE 7–1

IDEALIZED GEOLOGIC CROSS SECTIONS,
NORTH AND SOUTH CELLS
Copper Flat Project

Figure 38
Subsurface Cross-Section Through the North and South Cells of the Tailings Impoundment
Copper Flat, New Mexico
(from SRK, May 1995)

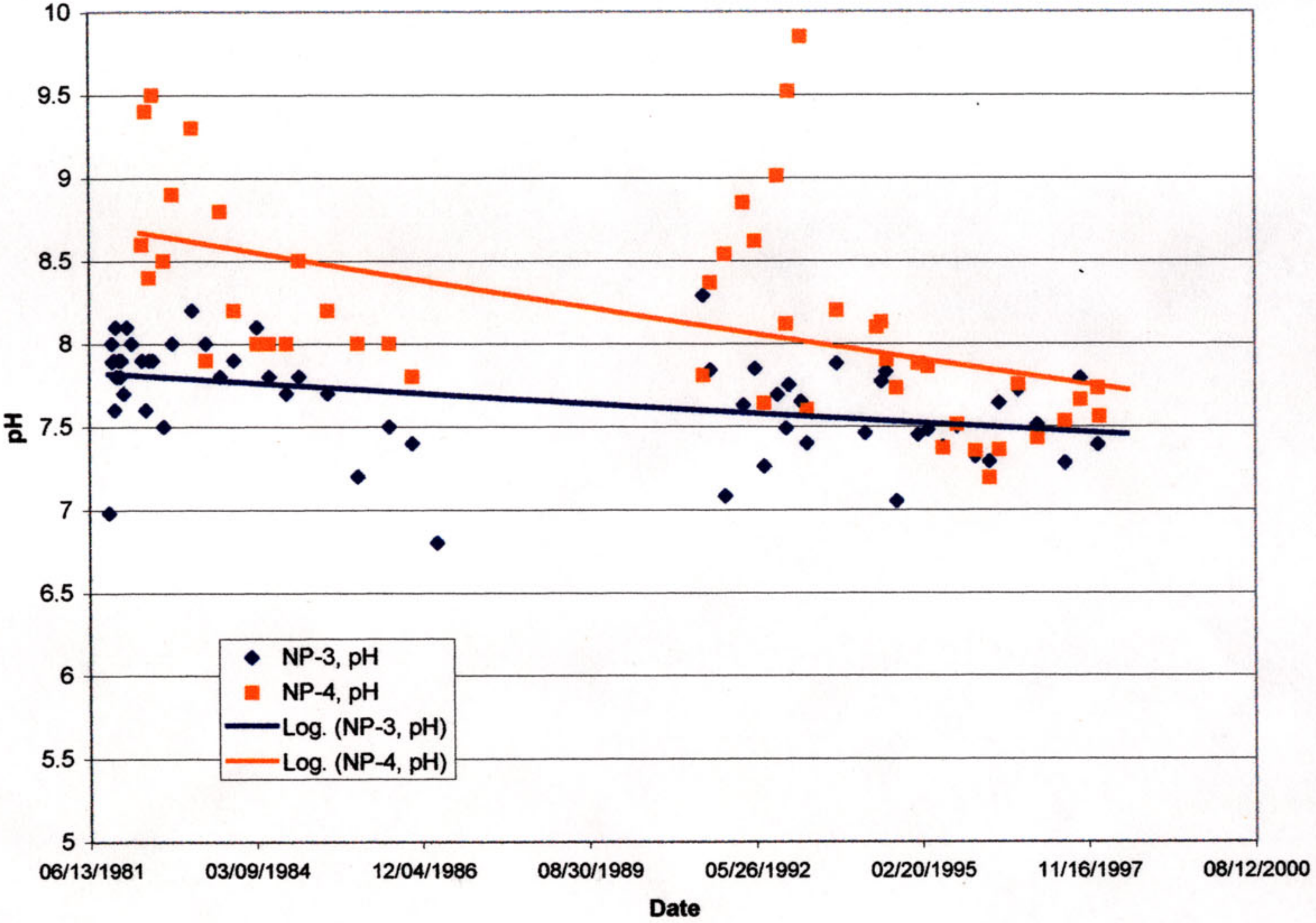


Figure 39
Groundwater pH, NP-3, NP-4
Copper Flat, New Mexico

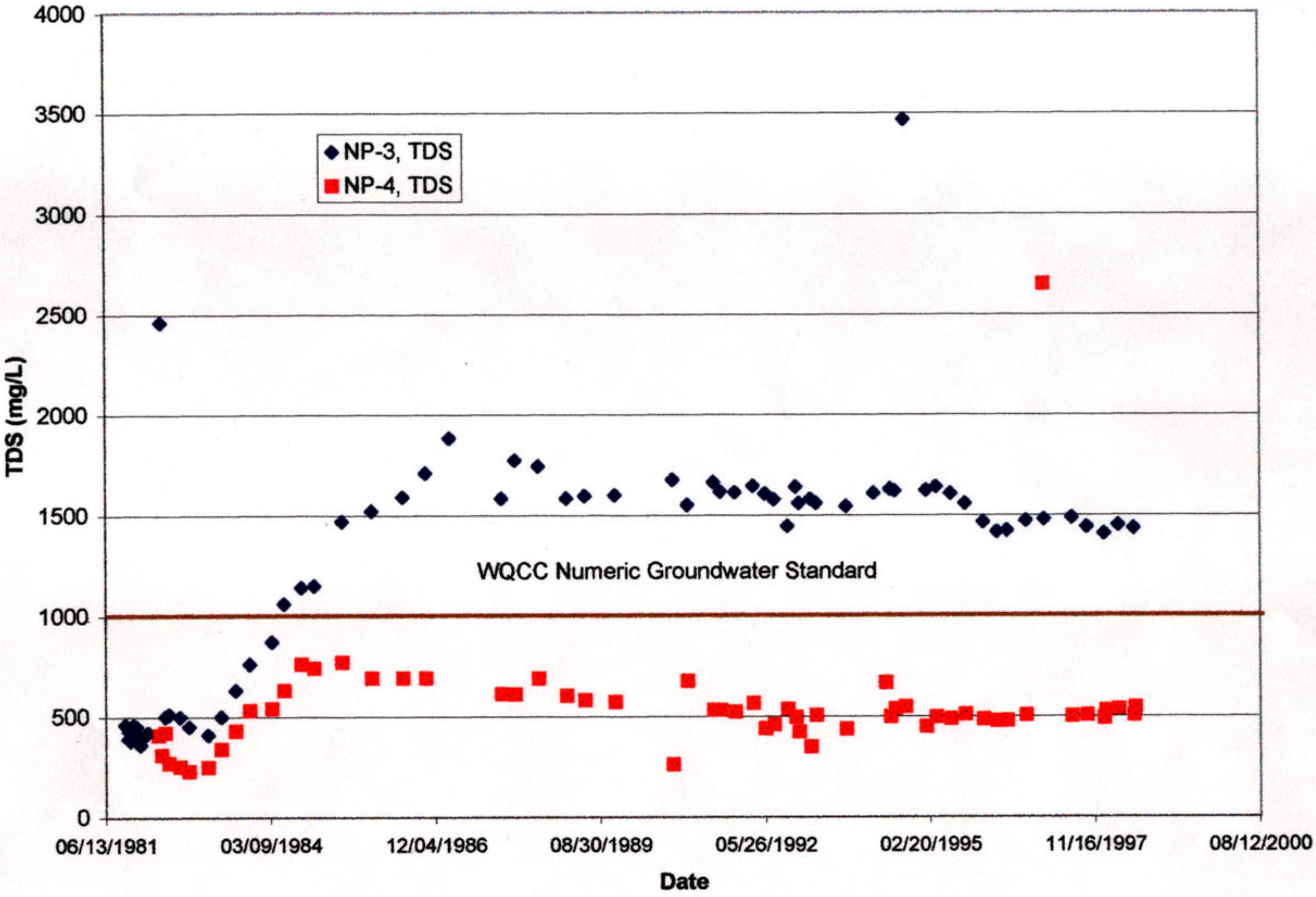


Figure 40
Groundwater TDS Concentrations, NP-3, NP-4
Copper Flat, New Mexico

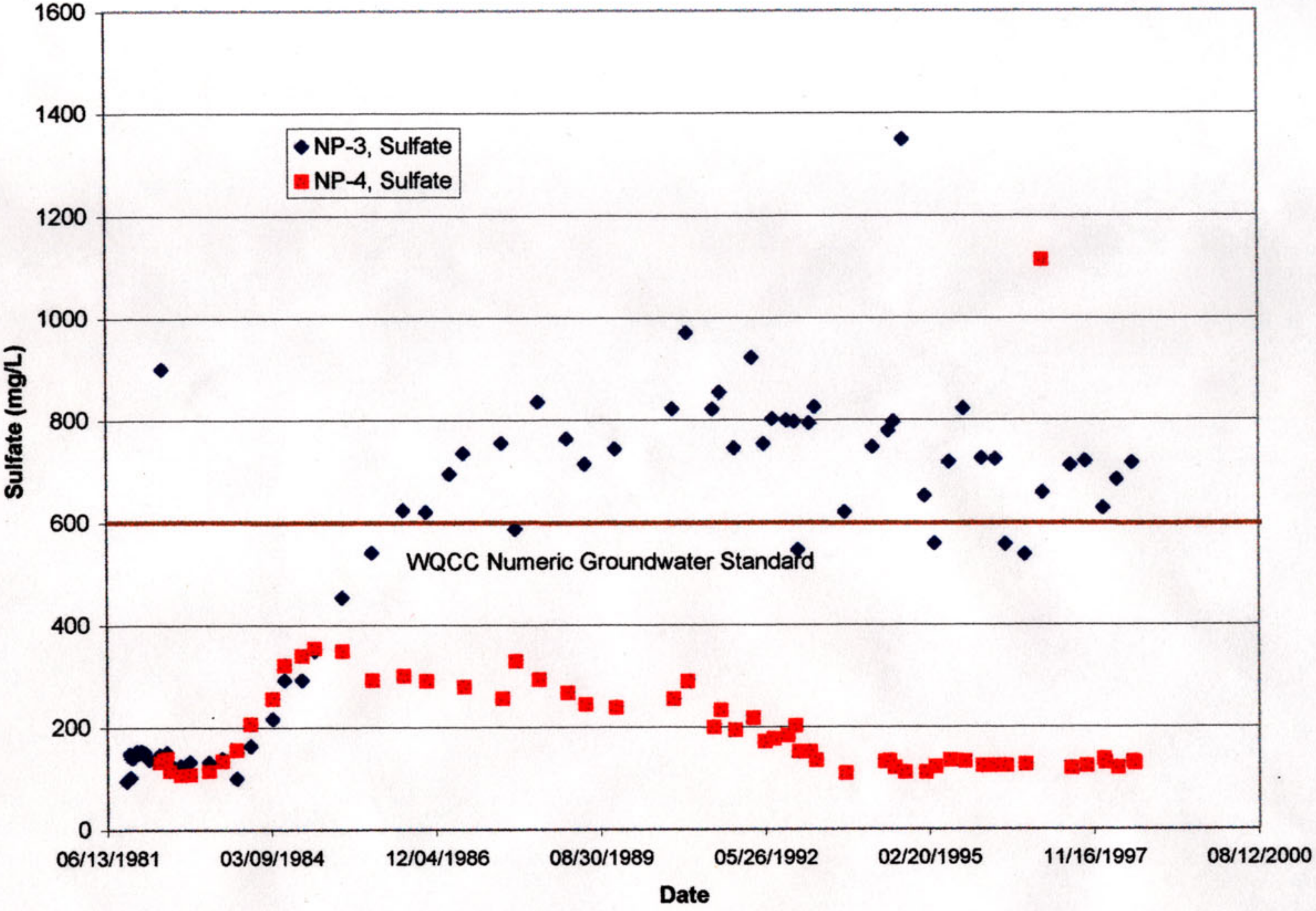


Figure 41
Groundwater Sulfate Concentrations, NP-3, NP-4
Copper Flat, New Mexico

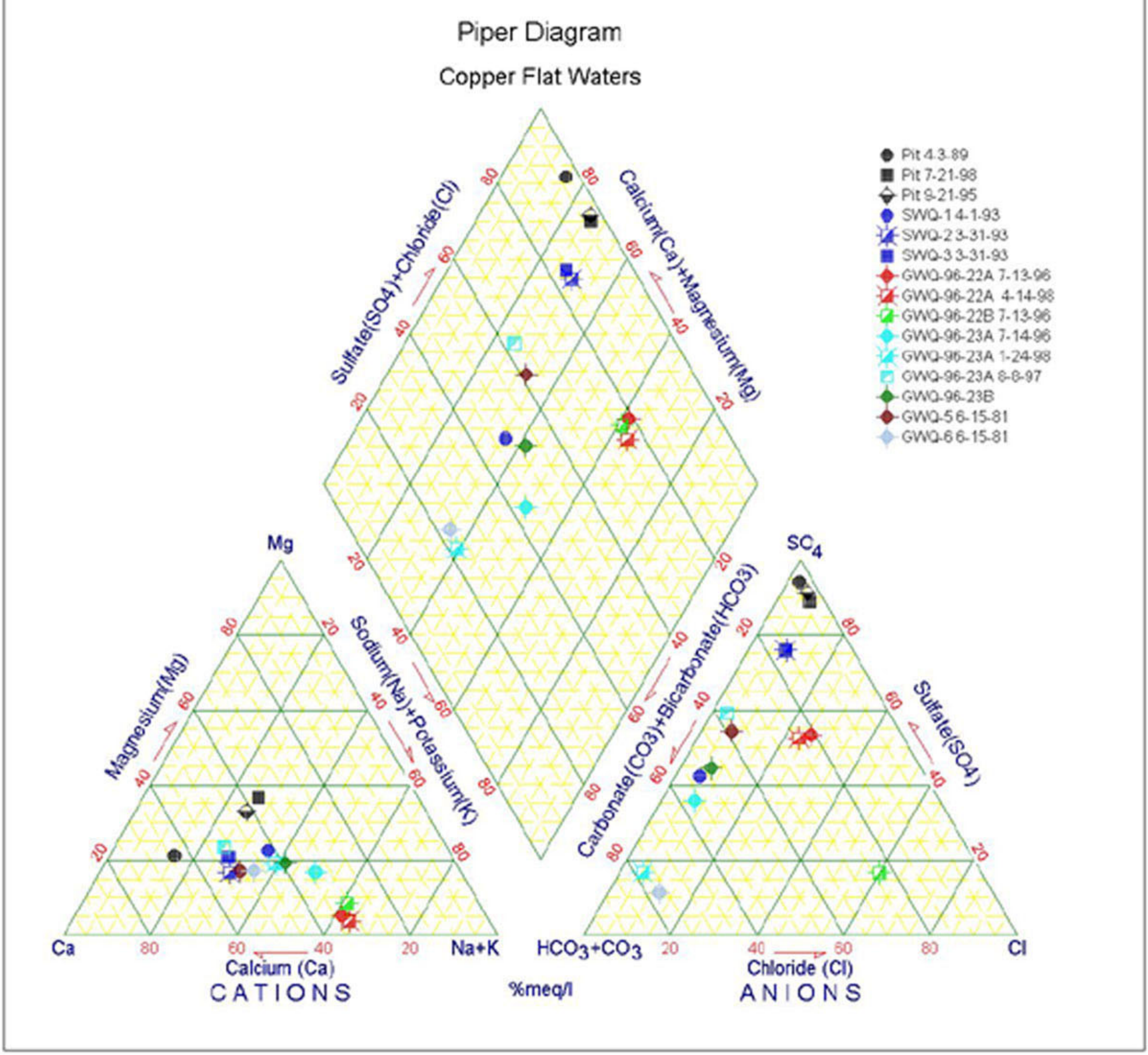
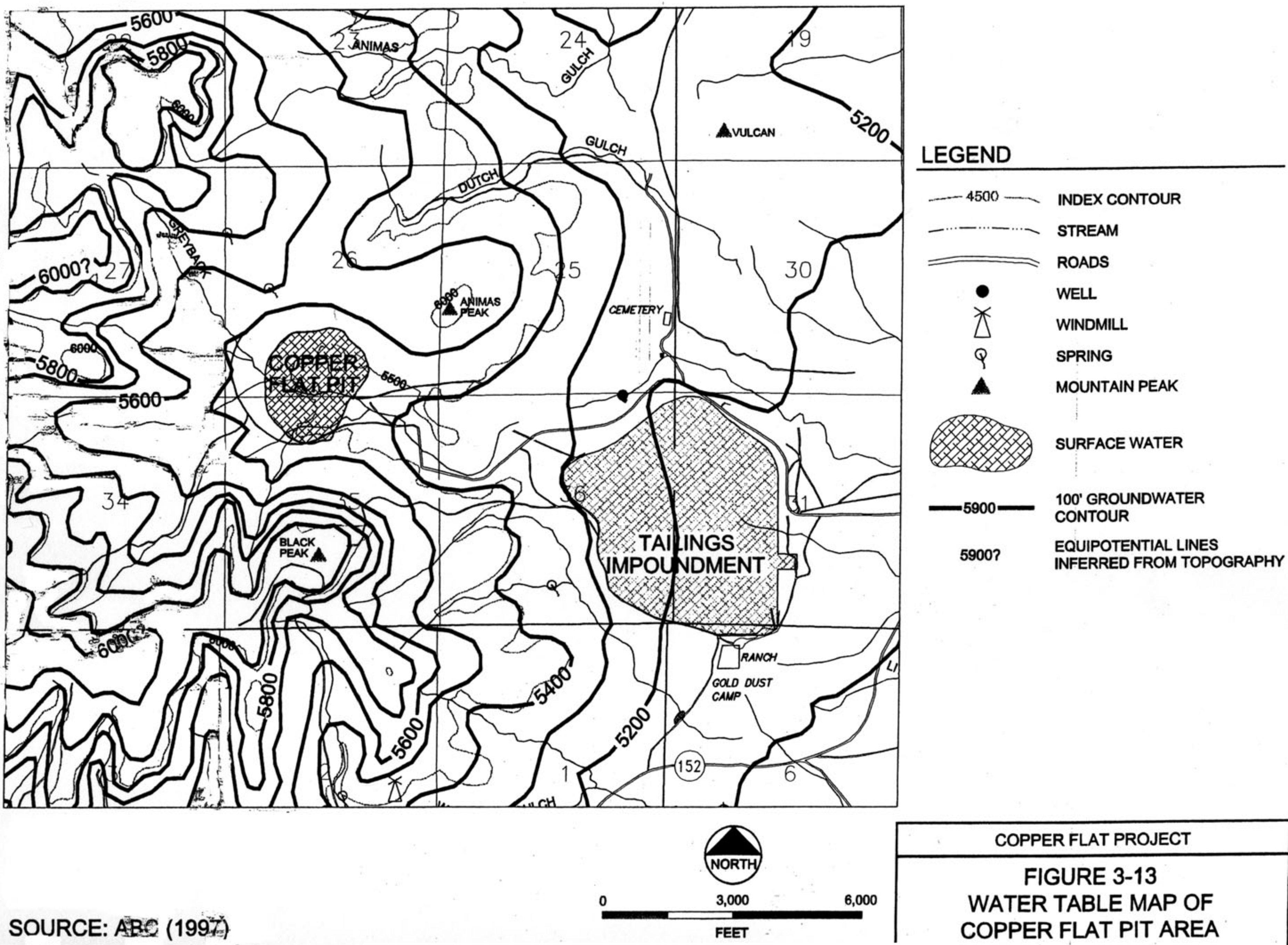


Figure 42
Piper Diagram, Copper Flat Surface Water and Groundwater
Copper Flat, New Mexico
(data from BLM, 1999, after SRK)



SOURCE: ABC (1997)

Figure 43
Groundwater Contours Beneath the Mine Site
Copper Flat, New Mexico
(from BLM, 1999; after ABC, 1997)

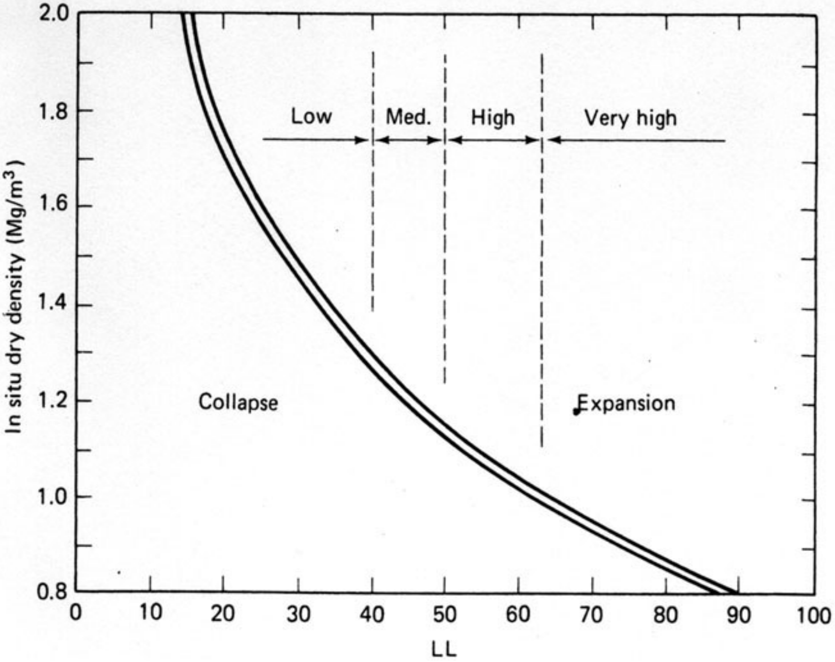


Figure 44
Guide to Collapsibility, Compressibility, and Expansion
Based on Insitu Dry Density and Liquid Limit
(from Holtz and Kovacs, after Mitchell and Gardner, 1975 and Gibbs, 1969)

APPENDIX A Comprehensive Surface Water Chemistry Data

APPENDIX B
- **Appendix B-1**
  - Comprehensive Groundwater Chemistry Data
- **Appendix B-2**
  - Pre 1980 SHB Groundwater Sample Results

APPENDIX C Whole Rock Chemical Analyses for PW-3, WD-1, and November 20, 1996 Pond Rock Samples

APPENDIX D
- **Appendix D-1**
  - Paste pH and Conductivity Data,
  - Acid-Base Accounting Data, and
  - Net Acid Generation Data
- **Appendix D-2**
  - Humidity Cell Data

APPENDIX E
- **Appendix E-1**
  - SHB Permeability Data
- **Appendix E-2**
  - Tailings Impoundment Liner Material Hydrometer Analysis and Gradation Plot,
- **Appendix E-3**
  - Geotechnical Boring Logs and
  - Geotechnical Analytical Data Sheets

APPENDIX F Bulk XRD and Clay Mineralogy Distribution Data Scans and Calculations

Appendix A

Comprehensive Surface Water Chemistry Data

Well Name	Date	Sampler	Notes	Lat	Long
BG-2Spring	4/1/1993	Shomaker			
BG-2 Spring	7/1/1998		15.7.26.1.1.3	32.97897	107.53876
BG-2 Spring	8/1/1998		15.7.26.1.1.3	32.97897	107.53876
BG-2 Spring	9/1/1998		15.7.26.1.1.3	32.97897	107.53876
BG Spring	4/1/1993	Shomaker			
BG Spring	7/1/1998		15.7.28.4.4.3	32.96977	107.55911
BG Spring	8/1/1998		15.7.28.4.4.3	32.96977	107.55911
BG Spring	9/1/1998		15.7.28.4.4.3	32.96977	107.55911
Casa Moya Wier	6/1/1998		15.5.27.4.4.	32.9704	107.54251
Casa Moya Wier	7/1/1998		15.5.27.4.4.	32.9704	107.54251
Casa Moya Wier	8/1/1998		15.5.27.4.4.	32.9704	107.54251
Casa Moya Wier	9/1/1998		15.5.27.4.4.	32.9704	107.54251
Danfelser Spring	1/1/1998				
Danfelser Spring	2/1/1998				
Danfelser Spring	3/1/1998				
Danfelser Spring	4/15/1998	Goff			
Danfelser Spring	5/1/1998				
Danfelser Spring	6/1/1998				
Danfelser Spring	7/22/1998	Brownfield			
Danfelser Spring	8/1/1998				
Danfelser Spring	9/1/1998				
Due South of Pit	8/1/1997				
Erwin Wier	5/1/1998		15.7.30.2.4.2.	32.97627	107.59198
Erwin Wier	6/1/1998		15.7.30.2.4.2.	32.97627	107.59198
Erwin Wier	7/1/1998		15.7.30.2.4.2.	32.97627	107.59198
Erwin Wier	8/1/1998		15.7.30.2.4.2.	32.97627	107.59198
Erwin Wier	9/1/1998		15.7.30.2.4.2.	32.97627	107.59198
Greyback Station A	1/77	BLM	where Greyback enters QMC property		
Greyback Station A	1/77	BLM	where Greyback enters QMC property		
Greyback Station B	1/77	BLM	In greyback, 300 yards east of mine rim		
Greyback Station B	1/77	BLM	In greyback, 300 yards east of mine rim		
Greyback Station C	1/77	BLM	where Greyback leaves QMC property		
Greyback Station C	1/77	BLM	where Greyback leaves QMC property		
Greyback Station A	3/77	BLM	where Greyback enters QMC property		
Greyback Station B	3/77	BLM	In greyback, 300 yards east of mine rim		
Greyback Station C	3/77	BLM	where Greyback leaves QMC property		

Well Name	Date	Sampler	Notes	Lat	Long
Greyback Station B	7/77	BLM	In greyback, 300 yards east of mine rim		
Greyback	5/17/1982	QMC			
Greyback	2/11/1991	FTS/GE	W/mine site Greyback SHB 5		
Greyback	2/11/1991	FTS/GE	West of pit, ds Greyback SHB 2		
Greyback	2/11/1991	FTS/GE	E of GWQ-4, SHB 1	32.96599	107.54639
Greyback Outfall	8/1/1995				
Greyback Outfall	9/21/1995				
Greyback Wash	3/1/1997				
Humphries Wier	6/1/1998		15.6.24.31.1		
Humphries Wier	7/1/1998		15.6.24.31.1		
Humphries Wier	8/1/1998		15.6.24.31.1		
Humphries Wier	9/1/1998		15.6.24.31.1		
Las Animas Creek	10/1/1997		exact date not known		
Las Animas Creek	4/15/1998	Goff	LA Ck. At road crossing at Irwins		
Las Animas Creek	10/22/1998	Goff			
Las Animas/Seco Creek	7/31/1974		15.5.22.122		
Las Animas/Seco Creek	7/12/1974		15.5.27.333		
Las Animas/Seco Creek	5/7/1974		15.5.27.413		
Las Animas/Seco Creek	7/11/1974		15.5.27.442		
Las Animas/Seco Creek	7/11/1974		15.5.27.443		
Las Animas/Seco Creek	5/7/1974		15.5.29.424		
Las Animas/Seco Creek	7/9/1974		15.5.30.213		
Las Animas/Seco Creek	1/1/2001		LAC-1		
Las Animas/Seco Creek	11/16/1994		MW-9		
Las Animas/Seco Creek	11/16/1994		MW-10		
Las Animas/Seco Creek	11/16/1994		MW-11		
Left Side of Haul Road	8/1/1997		exact date not known		
Pit Lake	4/3/1989	EID	Dipped		
Pit Lake	4/3/1989	EID	Dipped, near the drive down to lake		
Pit Lake	11/14/1990	GE			
Pit Lake	2/11/1991	FTS/GE	5' down, SHB 4		
Pit Lake	2/11/1991	FTS/GE	25' down, SHB 3		
Pit Lake	7/19/1991	MT/GE			
Pit Lake	8/29/1991	BI/GE			
Pit Lake	11/26/1991	MH/GE			
Pit Lake	3/15/1992	BI/GE			

Well Name	Date	Sampler	Notes	Lat	Long
Pit Lake	3/15/1992	BI/GE			
Pit Lake	5/25/1992	BI/GE			
Pit Lake	7/16/1992	BI/GE			
Pit Lake	10/8/1992	BI/GE			
Pit Lake	11/27/1992	MH/GE			
Pit Lake	12/15/1992	BI/GE			
Pit Lake	2/12/1993	Shomaker			
Pit Lake	2/25/1993	BI/GE			
Pit Lake	9/28/1993	BI/GE			
Pit Lake	3/17/1994	BI/GE			
Pit Lake	5/24/1994	SRK	NLP8M-North Edge of Pit Lake, Sample at 8 meters, N elev		
Pit Lake	5/24/1994	SRK	SLP3M-South Edge of Pit lake, Sample at 3 meters , N elev		
Pit Lake	5/24/1994	SRK	SPL5M-South Edge of Pit Lake, Sample at 5 meters, N elev		
Pit Lake	5/24/1994	SRK	NLP3M-North Edge of Pit Lake, Sampled at 3 meters, N ele		
Pit Lake	9/22/1994	BI/GE	Sample loss - no sulfate analysis		
Pit Lake	11/16/1994	SRK	Samle at 3 meters		
Pit Lake	11/16/1994	SRK	Sample at 7 meters		
Pit Lake	12/12/1994	ABC	N elevated due to TDS		
Pit Lake	12/19/1994	ABC	N elevated due to TDS		
Pit Lake	1/29/1995	BI/GE			
Pit Lake	3/29/1995	BI/GE			
Pit Lake	6/27/1995	BI/GE			
Pit Lake	8/1/1995	UKN			
Pit Lake	8/1/1995		Duplicate		
Pit Lake	9/21/1995				
Pit Lake	9/21/1995	BI/GE			
Pit Lake	1/10/1996	BI/GE			
Pit Lake	4/3/1996	BI/GE			
Pit Lake	6/1/1996		exact date not known		
Pit Lake	9/25/1996	BI/GE			
Pit Lake	11/15/1996	Bakkom/Salvas	North Shore		
Pit Lake	11/15/1996	Bakkom/Salvas	South Shore		
Pit Lake	11/15/1996	Bakkom/Salvas	East Shore		
Pit Lake	11/15/1996	Bakkom/Salvas	West Shore		
Pit Lake	1/15/1997	BI/GE			
Pit Lake	1/18/1997	Bakkom/Salvas	North Shore		

Well Name	Date	Sampler	Notes	Lat	Long
Pit Lake	1/18/1997	Bakkom/Salvas	South Shore		
Pit Lake	1/18/1997	Bakkom/Salvas	East Shore		
Pit Lake	1/18/1997	Bakkom/Salvas	West Shore		
Pit Lake	7/1/1997		exact date not known		
Pit Lake	7/16/1997	Bakkom/Salvas	North Shore		
Pit Lake	7/16/1997	Bakkom/Salvas	South Shore		
Pit Lake	7/16/1997	Bakkom/Salvas	East Shore		
Pit Lake	7/16/1997	Bakkom/Salvas	West Shore		
Pit Lake	8/1/1997	SRK	exact date not known		
Pit Lake	10/1/1997		Duplicate		
Pit Lake	10/8/1997	Bakkom/Salvas	North Shore		
Pit Lake	10/8/1997	Bakkom/Salvas	South Shore		
Pit Lake	10/8/1997	Bakkom/Salvas	East Shore		
Pit Lake	10/8/1997	Bakkom/Salvas	West Shore		
Pit Lake	1/15/1998	BI			
Pit Lake	1/24/1998	Goff			
Pit Lake	2/1/1998				
Pit Lake	3/1/1998				
Pit Lake	4/9/1998	BI			
Pit Lake	5/1/1998				
Pit Lake	6/1/1998				
Pit Lake	7/13/1998	BI			
Pit Lake	7/21/1998	Brownfield			
Pit Lake	8/1/1998				
Pit Lake	9/1/1998				
Pit Lake	10/15/1998	Goff			
Pit Lake	10/1/1997		exact date not known		
PP	8/9/1997	SRK	Stagnant Water near Petroglyph		
PW-1	8/8/1997	SRK	Seep in NW corner of pit		
PW-1	8/9/1997	SRK	Seep in NW corner of pit		
PW-2	8/9/1997	SRK	Seep in SW corner of pit		
Seep	5/17/1982	QMC			
Seep	9/2/1982	EID			
Seep	12/23/1982	QMC			
Seep	2/21/1983	QMC			
Acid Rock Drianage	5/7/1993	Shomaker			

Bold exceeds livestock/wildlife standard
underline exceeds domestic standard
itlaic exceeds irrigation standard

Well Name	Date	North	East	Flow Rate	Filtered?	pH	Sp. Cond.	TDS	SO4	Bicarbonate
BG-2Spring	4/1/1993					8.2	1090	690	184	535
BG-2 Spring	7/1/1998	262745	3651627	0						
BG-2 Spring	8/1/1998	262745	3651627	0						
BG-2 Spring	9/1/1998	262745	3651627	0						
BG Spring	4/1/1993					8	1030	680	228	411
BG Spring	7/1/1998	260819	3650652	0						
BG Spring	8/1/1998	260819	3650652	0						
BG Spring	9/1/1998	260819	3650652	0						
Casa Moya Wier	6/1/1998	262372	3650684	0						
Casa Moya Wier	7/1/1998	262372	3650684	0						
Casa Moya Wier	8/1/1998	262372	3650684	0						
Casa Moya Wier	9/1/1998	262372	3650684	0						
Danfelser Spring	1/1/1998			26						
Danfelser Spring	2/1/1998			25.25						
Danfelser Spring	3/1/1998			21.25						
Danfelser Spring	4/15/1998			22.7	TRUE	7.66	405	241	33	
Danfelser Spring	5/1/1998			18						
Danfelser Spring	6/1/1998			13.6						
Danfelser Spring	7/22/1998			1.2	TRUE			257	32	
Danfelser Spring	8/1/1998			7.25						
Danfelser Spring	9/1/1998			10.8						
Due South of Pit	8/1/1997				TRUE	8.03		5710		
Erwin Wier	5/1/1998	257763	3651448	193						
Erwin Wier	6/1/1998	257763	3651448	38						
Erwin Wier	7/1/1998	257763	3651448	0						
Erwin Wier	8/1/1998	257763	3651448	367						
Erwin Wier	9/1/1998	257763	3651448	0						
Greyback Station A	1/77					7.7		720		
Greyback Station A	1/77					7.8		800		
Greyback Station B	1/77					7.6		800		
Greyback Station B	1/77					7.7		800		
Greyback Station C	1/77					7.8		840		
Greyback Station C	1/77					7.8		880		
Greyback Station A	3/77					7.9		1000		
Greyback Station B	3/77					8		1080		
Greyback Station C	3/77					8.1		1320		

Well Name	Date	North	East	Flow Rate	Filtered?	pH	Sp. Cond.	TDS	SO4	Bicarbonate
Greyback Station B	7/77									
Greyback	5/17/1982				TRUE	8.3		670	300	
Greyback	2/11/1991					7.83	1504	966	391.8	370
Greyback	2/11/1991					7.51	3380	2178	1510.6	314.8
Greyback	2/11/1991	261998	3650205			7.9	3190	2112	1248.2	338
Greyback Outfall	8/1/1995				TRUE	7.61		3450	1730	620
Greyback Outfall	9/21/1995				TRUE	7.61	3860	3450	1730	620
Greyback Wash	3/1/1997				TRUE	8.08		3200	1930	349
Humphries Wier	6/1/1998			0						
Humphries Wier	7/1/1998			0						
Humphries Wier	8/1/1998			0						
Humphries Wier	9/1/1998			0						
Las Animas Creek	10/1/1997				TRUE	8.31		238	16.6	
Las Animas Creek	4/15/1998				TRUE	8.09	260	190	12	127
Las Animas Creek	10/22/1998				TRUE	8.31	527	238	16.6	
Las Animas/Seco Creek	7/31/1974					8			49	
Las Animas/Seco Creek	7/12/1974					8			16	
Las Animas/Seco Creek	5/7/1974					8			61	
Las Animas/Seco Creek	7/11/1974					8			48	
Las Animas/Seco Creek	7/11/1974					8			25	
Las Animas/Seco Creek	5/7/1974					8.2			13	
Las Animas/Seco Creek	7/9/1974					7.9			29	
Las Animas/Seco Creek	1/1/2001					7.81		300	18	
Las Animas/Seco Creek	11/16/1994					8.11		190	12	
Las Animas/Seco Creek	11/16/1994					7.84		310	25	
Las Animas/Seco Creek	11/16/1994					7.79		314	21	
Left Side of Haul Road	8/1/1997				TRUE	7.91		217		
Pit Lake	4/3/1989				TRUE					
Pit Lake	4/3/1989				TRUE			3546	2240	96.4
Pit Lake	11/14/1990							4064	2770	
Pit Lake	2/11/1991					7.14	3980	2711	2437	54.9
Pit Lake	2/11/1991					7.2	3980	2704	2464	45.1
Pit Lake	7/19/1991					7.76	6340	4520	2920	87.9
Pit Lake	8/29/1991					7.61		4384	2674.2	
Pit Lake	11/26/1991					7.61		4175	2540	
Pit Lake	3/15/1992				TRUE	4.88		3819	2857	

Well Name	Date	North	East	Flow Rate	Filtered?	pH	Sp. Cond.	TDS	SO4	Bicarbonate
Pit Lake	3/15/1992				TRUE	4.88		3819	2857	
Pit Lake	5/25/1992				TRUE	4.82		3846	2665	
Pit Lake	7/16/1992				TRUE	4.36		4229	2397	
Pit Lake	10/8/1992				TRUE	4.85		4258	2706	
Pit Lake	11/27/1992					6.26		3900	2499.5	
Pit Lake	12/15/1992				TRUE	6.04		4151	2902	
Pit Lake	2/12/1993					5.6	3893	3776	2390	7
Pit Lake	2/25/1993				TRUE	6.29		3951	2748	
Pit Lake	9/28/1993				TRUE	6.71		4468	1566	
Pit Lake	3/17/1994				TRUE	7.46		3179	2670	
Pit Lake	5/24/1994				TRUE	7.68	4030	4340	71	550
Pit Lake	5/24/1994				TRUE	7.89	4310	4010	2800	73
Pit Lake	5/24/1994				TRUE	7.85	4320	3900	2700	68
Pit Lake	5/24/1994				TRUE	7.8	4170	4510	2700	72
Pit Lake	9/22/1994				TRUE	8.04		5124		
Pit Lake	11/16/1994					7.52	4690	4380	104	550
Pit Lake	11/16/1994					7.71	4720	4600	2910	102
Pit Lake	12/12/1994				TRUE	7.71	4720	4600	2910	102
Pit Lake	12/19/1994				TRUE	7.52	4690	4380	2970	104
Pit Lake	1/29/1995				TRUE	7.69		4675	2906	
Pit Lake	3/29/1995				TRUE	7.53		4891	2609.5	
Pit Lake	6/27/1995				TRUE			5604	2923.8	
Pit Lake	8/1/1995				TRUE	7.8		5846	4312	
Pit Lake	8/1/1995				TRUE	7.76		5651	2861	
Pit Lake	9/21/1995				TRUE	8.31	5230	5230	3170	122
Pit Lake	9/21/1995				TRUE	8.11		5642	3603.4	
Pit Lake	1/10/1996				TRUE	7.9		5398	3452.1	
Pit Lake	4/3/1996				TRUE	7.95		5378	3304.4	
Pit Lake	6/1/1996				TRUE	8.51		6095	2969	
Pit Lake	9/25/1996				TRUE	8.26		6041	3290	
Pit Lake	11/15/1996					8.15				
Pit Lake	11/15/1996					8.07				
Pit Lake	11/15/1996					8.06				
Pit Lake	11/15/1996					8.09				
Pit Lake	1/15/1997				TRUE	8.05		5772	3509	
Pit Lake	1/18/1997					8.01				

Well Name	Date	North	East	Flow Rate	Filtered?	pH	Sp. Cond.	TDS	SO4	Bicarbonate
Pit Lake	1/18/1997					8.05				
Pit Lake	1/18/1997					8.22				
Pit Lake	1/18/1997					8.04				
Pit Lake	7/1/1997				TRUE	7.45		5905	3017	
Pit Lake	7/16/1997					8.07				
Pit Lake	7/16/1997					8.12				
Pit Lake	7/16/1997					8.09				
Pit Lake	7/16/1997					8.01				
Pit Lake	8/1/1997					8.16	5530	5020	3100	172
Pit Lake	10/1/1997				TRUE	7.67		5651	2861	
Pit Lake	10/8/1997					7.96				
Pit Lake	10/8/1997					8.02				
Pit Lake	10/8/1997					7.87				
Pit Lake	10/8/1997					7.85				
Pit Lake	1/15/1998				TRUE	7.84	6920	5376	2981	
Pit Lake	1/24/1998			5437.48	TRUE	7.93	5720	5334	3946	201.9
Pit Lake	2/1/1998			5437.18						
Pit Lake	3/1/1998			5437.13						
Pit Lake	4/9/1998			5436.67	TRUE		5700	5422	3430	
Pit Lake	5/1/1998			5436.15						
Pit Lake	6/1/1998			5436.8						
Pit Lake	7/13/1998			5435.06	TRUE		7040	5956	3909	
Pit Lake	7/21/1998				TRUE			5952	3808	181
Pit Lake	8/1/1998			5434.72						
Pit Lake	9/1/1998			5435.09						
Pit Lake	10/15/1998				TRUE	7.8	7500	5846	4312	
Pit Lake	10/1/1997				TRUE	7.8		5846	4312	
PP	8/9/1997				TRUE	8.89	237	230	5.1	126
PW-1	8/8/1997				TRUE	2.64				
PW-1	8/9/1997				TRUE					
PW-2	8/9/1997				TRUE	8.16	5530	5020	3100	172
Seep	5/17/1982				TRUE	7.8		790	430	
Seep	9/2/1982				TRUE	7.5	1290	1010	525	219
Seep	12/23/1982				TRUE	8.3		1110	530	
Seep	2/21/1983					8.1		1130	517	
Acid Rock Drianage	5/7/1993					1.9		17020	10000	-1

Well Name	Date	Calcium(Ca)	Cl	Flouride(F)	Nitrate (NO$_3$)	Sodium(Na)	Potassium(K)	Aluminum(Al)
BG-2Spring	4/1/1993	49	15	0.82	0	124	1.1	-0.1
BG-2 Spring	7/1/1998							
BG-2 Spring	8/1/1998							
BG-2 Spring	9/1/1998							
BG Spring	4/1/1993	45	13	0.86	0	90	0.8	-0.1
BG Spring	7/1/1998							
BG Spring	8/1/1998							
BG Spring	9/1/1998							
Casa Moya Wier	6/1/1998							
Casa Moya Wier	7/1/1998							
Casa Moya Wier	8/1/1998							
Casa Moya Wier	9/1/1998							
Danfelser Spring	1/1/1998							
Danfelser Spring	2/1/1998							
Danfelser Spring	3/1/1998							
Danfelser Spring	4/15/1998	42.2	4.4	0.71	0.78	33.9	1.3	
Danfelser Spring	5/1/1998							
Danfelser Spring	6/1/1998							
Danfelser Spring	7/22/1998	40.7	4.8	0.7	0.83	32.5	2.5	
Danfelser Spring	8/1/1998							
Danfelser Spring	9/1/1998							
Due South of Pit	8/1/1997		232.8	10.3				
Erwin Wier	5/1/1998							
Erwin Wier	6/1/1998							
Erwin Wier	7/1/1998							
Erwin Wier	8/1/1998							
Erwin Wier	9/1/1998							
Greyback Station A	1/77			0.4	5.48		3	
Greyback Station A	1/77			0.4	5.6		2.6	
Greyback Station B	1/77			0.5	6.8		2.9	
Greyback Station B	1/77			0.5	7.5		2.7	
Greyback Station C	1/77			0.4	4.9		3.8	
Greyback Station C	1/77			0.4	3.68		3.5	
Greyback Station A	3/77			0.2	3.8		3	
Greyback Station B	3/77			0.5	3.3		2.5	
Greyback Station C	3/77			0.3	3.6		3.1	

Well Name	Date	Calcium(Ca)	Cl	Flouride(F)	Nitrate (NO_3)	Sodium(Na)	Potassium(K)	Aluminum(Al)
Greyback Station B	7/77	168.5					8.9	
Greyback	5/17/1982		46	1.2	0.3			
Greyback	2/11/1991	147.8	59.3	0.69	1.7	128.0	2.0	
Greyback	2/11/1991	443	160.9	0.56	22.0	226.5	5.5	
Greyback	2/11/1991	363.5	129.1	0.89	15.78	230.2	5.9	
Greyback Outfall	8/1/1995	490	94	1.4	6.2	360	2.1	0.033
Greyback Outfall	9/21/1995	490	94	1.4	6.2	360	2.1	0.033
Greyback Wash	3/1/1997		180	0.93	-5			
Humphries Wier	6/1/1998							
Humphries Wier	7/1/1998							
Humphries Wier	8/1/1998							
Humphries Wier	9/1/1998							
Las Animas Creek	10/1/1997		14.9		0.1			
Las Animas Creek	4/15/1998	35.9	9.3	0.46	-0.05	15.6	0.8	
Las Animas Creek	10/22/1998		14.9		0.1			
Las Animas/Seco Creek	7/31/1974	89	330	0.9	0.7	170	9.6	
Las Animas/Seco Creek	7/12/1974	22	26	0.6	0.6	46	4.9	
Las Animas/Seco Creek	5/7/1974		110	420	0.5	180	11.0	
Las Animas/Seco Creek	7/11/1974	85	380	0.7	0.6	200	9.1	
Las Animas/Seco Creek	7/11/1974	38	120	0.7	0.4	80	6.5	
Las Animas/Seco Creek	5/7/1974	43	16	0.4	0.1	46	3.1	
Las Animas/Seco Creek	7/9/1974	75	15	0.5	0.1	32	2.4	
Las Animas/Seco Creek	1/1/2001	72	15	0.46	-1.0	21	1.9	-0.05
Las Animas/Seco Creek	11/16/1994	12	12	1.4	-1.0	54	2.3	-0.05
Las Animas/Seco Creek	11/16/1994	59	14	0.43	-1.0	29	1.9	-0.05
Las Animas/Seco Creek	11/16/1994	63	15	0.45	-1.0	23	1.5	-0.05
Left Side of Haul Road	8/1/1997		4.1	0.96				
Pit Lake	4/3/1989	570						-0.1
Pit Lake	4/3/1989	640	47.3			165	11	
Pit Lake	11/14/1990		102.2					
Pit Lake	2/11/1991	600	79.8	4.58	0.10	223.6	16.4	
Pit Lake	2/11/1991	611.2	82.5	4.77	0.10	223.5	16.4	
Pit Lake	7/19/1991	684.1	88.6	6.25	0.03	248.0	20.3	
Pit Lake	8/29/1991		88.9					
Pit Lake	11/26/1991		86.6					
Pit Lake	3/15/1992		85.3					

Well Name	Date	Calcium(Ca)	Cl	Flouride(F)	Nitrate (NO_3)	Sodium(Na)	Potassium(K)	Aluminum(Al)
Pit Lake	3/15/1992		85.3					
Pit Lake	5/25/1992		89.7					
Pit Lake	7/16/1992		76.1					
Pit Lake	10/8/1992		90.1					
Pit Lake	11/27/1992		730.5					
Pit Lake	12/15/1992		88.5					
Pit Lake	2/12/1993	583	96	6.21		222	10	2
Pit Lake	2/25/1993		92.1					
Pit Lake	9/28/1993		111.2					
Pit Lake	3/17/1994		101.4					
Pit Lake	5/24/1994	100	7		-5	270	15	0.20
Pit Lake	5/24/1994	560	110	7.3	-5	270	15	0.18
Pit Lake	5/24/1994	540	110	7.2	-5	270	15	0.18
Pit Lake	5/24/1994	650	110	7.3	-5	290	16	0.19
Pit Lake	9/22/1994		140.9					
Pit Lake	11/16/1994	130	8.1		-5	320	18	-0.05
Pit Lake	11/16/1994	580	140		-5	350	17	-0.05
Pit Lake	12/12/1994	580	140	8.1	-5	350	17	-0.05
Pit Lake	12/19/1994	550	130	8.1	-5	320	18	-0.05
Pit Lake	1/29/1995		217.6					
Pit Lake	3/29/1995		108.6					
Pit Lake	6/27/1995		161.4					
Pit Lake	8/1/1995		237		-0.05			0.13
Pit Lake	8/1/1995		219					
Pit Lake	9/21/1995	620	150	10	-5	430	21	0.13
Pit Lake	9/21/1995		172.3					
Pit Lake	1/10/1996		182.8					
Pit Lake	4/3/1996		188.9					
Pit Lake	6/1/1996		210.6					
Pit Lake	9/25/1996		199.6					
Pit Lake	11/15/1996							
Pit Lake	11/15/1996							
Pit Lake	11/15/1996							
Pit Lake	11/15/1996							
Pit Lake	1/15/1997		216					
Pit Lake	1/18/1997							

Well Name	Date	Calcium(Ca)	Cl	Flouride(F)	Nitrate (NO_3)	Sodium(Na)	Potassium(K)	Aluminum(Al)
Pit Lake	1/18/1997							
Pit Lake	1/18/1997							
Pit Lake	1/18/1997							
Pit Lake	7/1/1997		228					
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	8/1/1997	440	190	11	-3	410	20	0.14
Pit Lake	10/1/1997		219					
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	1/15/1998		216	11.8	-0.05			
Pit Lake	1/24/1998	615.6	224	10.8		524.3	33.6	
Pit Lake	2/1/1998							
Pit Lake	3/1/1998							
Pit Lake	4/9/1998		222	12.4	-0.05			
Pit Lake	5/1/1998							
Pit Lake	6/1/1998							
Pit Lake	7/13/1998		245	12.85	-0.05			
Pit Lake	7/21/1998	638.3	244	13.6	-0.05	516.8	20.6	
Pit Lake	8/1/1998							
Pit Lake	9/1/1998							
Pit Lake	10/15/1998		237		-0.05			
Pit Lake	10/1/1997		237		-0.05			
PP	8/9/1997	30	1.8	0.37	-1	15	4.7	0.037
PW-1	8/8/1997				-1	10	-1	**410**
PW-1	8/9/1997							**640**
PW-2	8/9/1997	440	190	11	-3	410	20	0.14
Seep	5/17/1982		54	2.1	1.4			
Seep	9/2/1982	160.8	59.96	2.75	0.24	120		
Seep	12/23/1982		54	1.6	1.5			
Seep	2/21/1983		54	1.7	0.9			
Acid Rock Drianage	5/7/1993	446	35	11.1	0.9	93	3.1	**3720**

Well Name	Date	Arsenic(As)	Silver(Ag)	Boron(B)	Berrylium(Be)	Barium(Ba)	Cadmium(Cd)	Chromium(Cr)
BG-2Spring	4/1/1993	-0.005	-0.01	0.03		0.6	-0.002	-0.02
BG-2 Spring	7/1/1998							
BG-2 Spring	8/1/1998							
BG-2 Spring	9/1/1998							
BG Spring	4/1/1993	-0.005	-0.01	0.02		1.2	-0.002	-0.02
BG Spring	7/1/1998							
BG Spring	8/1/1998							
BG Spring	9/1/1998							
Casa Moya Wier	6/1/1998							
Casa Moya Wier	7/1/1998							
Casa Moya Wier	8/1/1998							
Casa Moya Wier	9/1/1998							
Danfelser Spring	1/1/1998							
Danfelser Spring	2/1/1998							
Danfelser Spring	3/1/1998							
Danfelser Spring	4/15/1998							
Danfelser Spring	5/1/1998							
Danfelser Spring	6/1/1998							
Danfelser Spring	7/22/1998							
Danfelser Spring	8/1/1998							
Danfelser Spring	9/1/1998							
Due South of Pit	8/1/1997							
Erwin Wier	5/1/1998							
Erwin Wier	6/1/1998							
Erwin Wier	7/1/1998							
Erwin Wier	8/1/1998							
Erwin Wier	9/1/1998							
Greyback Station A	1/77		0.01					
Greyback Station A	1/77		0.01					
Greyback Station B	1/77		0.01					
Greyback Station B	1/77		0.01					
Greyback Station C	1/77		0.01					
Greyback Station C	1/77		0.01					
Greyback Station A	3/77		0.01					
Greyback Station B	3/77		-0.01					
Greyback Station C	3/77		-0.01					

Well Name	Date	Arsenic(As)	Silver(Ag)	Boron(B)	Berrylium(Be)	Barium(Ba)	Cadmium(Cd)	Chromium(Cr)
Greyback Station B	7/77		-0.005					
Greyback	5/17/1982						-0.005	
Greyback	2/11/1991		0.04			0.04	*0.043*	*0.1*
Greyback	2/11/1991		-0.02			0.03	*0.015*	-0.02
Greyback	2/11/1991		-0.02			0.03	*0.015*	-0.02
Greyback Outfall	8/1/1995		-0.025			-0.05	-0.0025	-0.025
Greyback Outfall	9/21/1995		-0.025	-0.1	-0.002	-0.05	-0.0025	-0.025
Greyback Wash	3/1/1997							-0.025
Humphries Wier	6/1/1998							
Humphries Wier	7/1/1998							
Humphries Wier	8/1/1998							
Humphries Wier	9/1/1998							
Las Animas Creek	10/1/1997							-0.005
Las Animas Creek	4/15/1998							-0.005
Las Animas Creek	10/22/1998							-0.005
Las Animas/Seco Creek	7/31/1974							
Las Animas/Seco Creek	7/12/1974							
Las Animas/Seco Creek	5/7/1974			0.12				
Las Animas/Seco Creek	7/11/1974							
Las Animas/Seco Creek	7/11/1974							
Las Animas/Seco Creek	5/7/1974							
Las Animas/Seco Creek	7/9/1974							
Las Animas/Seco Creek	1/1/2001		-0.03	-0.10		-0.1	-0.001	-0.03
Las Animas/Seco Creek	11/16/1994		-0.03	-0.10		-0.1	-0.005	-0.03
Las Animas/Seco Creek	11/16/1994		-0.03	-0.10		-0.1	-0.005	-0.03
Las Animas/Seco Creek	11/16/1994		-0.03	-0.10		-0.1	-0.005	-0.03
Left Side of Haul Road	8/1/1997							
Pit Lake	4/3/1989		-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Pit Lake	4/3/1989							
Pit Lake	11/14/1990							
Pit Lake	2/11/1991		0.03			-0.01	0.035	0.06
Pit Lake	2/11/1991		-0.02			-0.01	0.015	-0.02
Pit Lake	7/19/1991		-0.02			-0.01	-0.005	-0.02
Pit Lake	8/29/1991							
Pit Lake	11/26/1991							
Pit Lake	3/15/1992							

Well Name	Date	Arsenic(As)	Silver(Ag)	Boron(B)	Berrylium(Be)	Barium(Ba)	Cadmium(Cd)	Chromium(Cr)
Pit Lake	3/15/1992							
Pit Lake	5/25/1992							
Pit Lake	7/16/1992							
Pit Lake	10/8/1992							
Pit Lake	11/27/1992							
Pit Lake	12/15/1992							
Pit Lake	2/12/1993		-0.1	-0.1		-0.1	-0.1	-0.1
Pit Lake	2/25/1993							
Pit Lake	9/28/1993							
Pit Lake	3/17/1994							
Pit Lake	5/24/1994		-0.025	-0.1		-0.01	0.021	-0.025
Pit Lake	5/24/1994		-0.025	-0.1		-0.01	0.021	-0.025
Pit Lake	5/24/1994		-0.025	-0.1		-0.01	0.021	-0.025
Pit Lake	5/24/1994		-0.025	-0.1		-0.01	0.017	-0.025
Pit Lake	9/22/1994							
Pit Lake	11/16/1994		-0.025	-0.1	-0.002	-0.01	0.017	*0.2*
Pit Lake	11/16/1994		-0.025	-0.1	-0.002	-0.01	0.017	-0.025
Pit Lake	12/12/1994		-0.025	-0.1	-0.002	-0.01	0.017	-0.025
Pit Lake	12/19/1994		-0.025	-0.1	-0.002	-0.01	0.017	-0.025
Pit Lake	1/29/1995							
Pit Lake	3/29/1995							
Pit Lake	6/27/1995							
Pit Lake	8/1/1995		-0.05	-0.05		-0.05	0.0014	
Pit Lake	8/1/1995							
Pit Lake	9/21/1995		-0.025	-0.1	-0.002	-0.05	0.014	-0.025
Pit Lake	9/21/1995							
Pit Lake	1/10/1996							
Pit Lake	4/3/1996							
Pit Lake	6/1/1996							
Pit Lake	9/25/1996							
Pit Lake	11/15/1996						-0.01	
Pit Lake	11/15/1996						-0.01	
Pit Lake	11/15/1996						-0.01	
Pit Lake	11/15/1996						-0.01	
Pit Lake	1/15/1997							
Pit Lake	1/18/1997						-0.01	

Well Name	Date	Arsenic(As)	Silver(Ag)	Boron(B)	Berrylium(Be)	Barium(Ba)	Cadmium(Cd)	Chromium(Cr)
Pit Lake	1/18/1997						-0.01	
Pit Lake	1/18/1997						-0.01	
Pit Lake	1/18/1997						-0.01	
Pit Lake	7/1/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	8/1/1997		-0.025	0.12	-0.002	-0.005	-0.002	-0.015
Pit Lake	10/1/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	1/15/1998							
Pit Lake	1/24/1998							
Pit Lake	2/1/1998							
Pit Lake	3/1/1998							
Pit Lake	4/9/1998							
Pit Lake	5/1/1998							
Pit Lake	6/1/1998							
Pit Lake	7/13/1998							
Pit Lake	7/21/1998							
Pit Lake	8/1/1998							
Pit Lake	9/1/1998							
Pit Lake	10/15/1998							
Pit Lake	10/1/1997							
PP	8/9/1997		-0.025	0.064	-0.002	-0.05	-0.002	-0.025
PW-1	8/8/1997		-0.025	*1*	0.22	-0.05	**0.18**	*0.11*
PW-1	8/9/1997		-0.025	*1.6*	0.48	-0.05	**0.19**	*0.15*
PW-2	8/9/1997		-0.025	0.12	-0.002	-0.05	-0.002	-0.025
Seep	5/17/1982						-0.005	
Seep	9/2/1982							
Seep	12/23/1982						-0.005	
Seep	2/21/1983						-0.005	
Acid Rock Drianage	5/7/1993							

Well Name	Date	Copper(Cu)	Cobalt(Co)	Lead(Pb)	Iron(Fe)	Magnesium(Mg)	Molybdenum(Mo)	Manganese(Mn)
BG-2Spring	4/1/1993	-0.01	-0.05	-0.02	-0.05	56	-0.02	0.1
BG-2 Spring	7/1/1998							
BG-2 Spring	8/1/1998							
BG-2 Spring	9/1/1998							
BG Spring	4/1/1993	-0.01	-0.05	-0.02	-0.05	66	-0.02	0.2
BG Spring	7/1/1998							
BG Spring	8/1/1998							
BG Spring	9/1/1998							
Casa Moya Wier	6/1/1998							
Casa Moya Wier	7/1/1998							
Casa Moya Wier	8/1/1998							
Casa Moya Wier	9/1/1998							
Danfelser Spring	1/1/1998							
Danfelser Spring	2/1/1998							
Danfelser Spring	3/1/1998							
Danfelser Spring	4/15/1998	-0.005			-0.05	3.9	-0.5	-0.02
Danfelser Spring	5/1/1998							
Danfelser Spring	6/1/1998							
Danfelser Spring	7/22/1998	-0.005			-0.05	3.6	-0.05	-0.02
Danfelser Spring	8/1/1998							
Danfelser Spring	9/1/1998							
Due South of Pit	8/1/1997							
Erwin Wier	5/1/1998							
Erwin Wier	6/1/1998							
Erwin Wier	7/1/1998							
Erwin Wier	8/1/1998							
Erwin Wier	9/1/1998							
Greyback Station A	1/77	*0.04*			0.23		0.01	0.01
Greyback Station A	1/77	*0.03*			0.3		0.01	0.01
Greyback Station B	1/77	*0.04*			0.19		0.03	0.01
Greyback Station B	1/77	*0.05*			0.29		0.03	0.01
Greyback Station C	1/77	*0.03*			0.23		0.03	0.01
Greyback Station C	1/77	*0.05*			0.37		0.02	0.01
Greyback Station A	3/77	-0.005			0.1		0.01	-0.01
Greyback Station B	3/77	-0.005			0.15		0.08	-0.01
Greyback Station C	3/77	-0.005			0.1		0.08	-0.01

Well Name	Date	Copper(Cu)	Cobalt(Co)	Lead(Pb)	Iron(Fe)	Magnesium(Mg)	Molybdenum(Mo)	Manganese(Mn)
Greyback Station B	7/77	-0.005			0.14	29	0.05	0.07
Greyback	5/17/1982	-0.05			-0.01		0.08	-0.05
Greyback	2/11/1991			0.008	0.36	41.9		0.18
Greyback	2/11/1991			0.009	0.1	103		0.04
Greyback	2/11/1991			0.006	-0.05	98.1		-0.02
Greyback Outfall	8/1/1995	-0.025	-0.05	-0.005	0.057		-0.05	0.17
Greyback Outfall	9/21/1995	-0.025	-0.05	-0.005	0.057	140	-0.05	0.17
Greyback Wash	3/1/1997	-0.025			-0.05			-0.025
Humphries Wier	6/1/1998							
Humphries Wier	7/1/1998							
Humphries Wier	8/1/1998							
Humphries Wier	9/1/1998							
Las Animas Creek	10/1/1997				-0.05			
Las Animas Creek	4/15/1998				0.08	5.1	-0.05	-0.02
Las Animas Creek	10/22/1998				-0.05			
Las Animas/Seco Creek	7/31/1974					12		
Las Animas/Seco Creek	7/12/1974					3		
Las Animas/Seco Creek	5/7/1974				0	13		
Las Animas/Seco Creek	7/11/1974					8		
Las Animas/Seco Creek	7/11/1974				0.05	5		
Las Animas/Seco Creek	5/7/1974				0	6		
Las Animas/Seco Creek	7/9/1974				0.01	11		0.01
Las Animas/Seco Creek	1/1/2001	-0.03	-0.05	-0.01	-0.05	9	-0.05	-0.03
Las Animas/Seco Creek	11/16/1994	-0.03	-0.05	-0.01	-0.05	1	-0.05	-0.03
Las Animas/Seco Creek	11/16/1994	-0.03	-0.05	-0.01	-0.05	9	-0.05	-0.03
Las Animas/Seco Creek	11/16/1994	-0.03	-0.05	-0.01	-0.05	10	-0.05	-0.03
Left Side of Haul Road	8/1/1997							
Pit Lake	4/3/1989	-0.1	-0.05	-0.1	-0.1	130	-0.1	1.1
Pit Lake	4/3/1989					129		
Pit Lake	11/14/1990							
Pit Lake	2/11/1991			0.006	0.16	155.6		1.82
Pit Lake	2/11/1991			0.006	0.18	157.3		1.84
Pit Lake	7/19/1991			-0.005	0.27	209.1		2.03
Pit Lake	8/29/1991	**0.64**						
Pit Lake	11/26/1991	0.084						
Pit Lake	3/15/1992							

Well Name	Date	Copper(Cu)	Cobalt(Co)	Lead(Pb)	Iron(Fe)	Magnesium(Mg)	Molybdenum(Mo)	Manganese(Mn)
Pit Lake	3/15/1992							
Pit Lake	5/25/1992							
Pit Lake	7/16/1992							
Pit Lake	10/8/1992							
Pit Lake	11/27/1992							
Pit Lake	12/15/1992	**3.208**						
Pit Lake	2/12/1993	**2.6**	*0.1*	-0.1	0.1	181	-0.1	4.9
Pit Lake	2/25/1993							
Pit Lake	9/28/1993	0.001						
Pit Lake	3/17/1994	0.089						
Pit Lake	5/24/1994	0.051	-0.05	-0.005	0.19	200	-0.05	3.3
Pit Lake	5/24/1994	0.06	-0.05	-0.005	0.25	210	-0.05	3.9
Pit Lake	5/24/1994	0.06	-0.05	-0.005	0.22	200	-0.05	3.7
Pit Lake	5/24/1994	0.041	-0.05	-0.005	0.26	230	-0.05	0.46
Pit Lake	9/22/1994							
Pit Lake	11/16/1994	0.032	-0.025	-0.005	-0.05	250	-0.05	3.4
Pit Lake	11/16/1994	*0.3*	-0.025	-0.05	-0.05	250	-0.05	3.6
Pit Lake	12/12/1994	0.03	-0.05	0.005	-0.05	250	-0.05	3.6
Pit Lake	12/19/1994	0.032	-0.05	0.005	-0.05	250	-0.05	3.4
Pit Lake	1/29/1995							
Pit Lake	3/29/1995							
Pit Lake	6/27/1995							
Pit Lake	8/1/1995	0.064	-0.05	-0.005	0.23		-0.05	
Pit Lake	8/1/1995							
Pit Lake	9/21/1995	-0.025	-0.05	-0.005	-0.05	300	-0.05	3
Pit Lake	9/21/1995							
Pit Lake	1/10/1996							
Pit Lake	4/3/1996							
Pit Lake	6/1/1996							
Pit Lake	9/25/1996							
Pit Lake	11/15/1996	-0.1		-0.05				
Pit Lake	11/15/1996	-0.1		-0.05				
Pit Lake	11/15/1996	-0.1		-0.05				
Pit Lake	11/15/1996	-0.1		-0.05				
Pit Lake	1/15/1997							
Pit Lake	1/18/1997	-0.1		-0.05				

Well Name	Date	Copper(Cu)	Cobalt(Co)	Lead(Pb)	Iron(Fe)	Magnesium(Mg)	Molybdenum(Mo)	Manganese(Mn)
Pit Lake	1/18/1997	-0.1		-0.05				
Pit Lake	1/18/1997	-0.1		-0.05				
Pit Lake	1/18/1997	-0.1		-0.05				
Pit Lake	7/1/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	7/16/1997							
Pit Lake	8/1/1997	0.05	-0.05	-0.005	-0.5	290	0.058	0.83
Pit Lake	10/1/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	10/8/1997							
Pit Lake	1/15/1998	-0.005			-0.05	331.9	0.05	
Pit Lake	1/24/1998	-0.005				364.8	-0.05	1.76
Pit Lake	2/1/1998							
Pit Lake	3/1/1998							
Pit Lake	4/9/1998	0.055			-0.05		1.5	0.15
Pit Lake	5/1/1998							
Pit Lake	6/1/1998							
Pit Lake	7/13/1998	-0.05			-0.5		-0.5	1.3
Pit Lake	7/21/1998	-0.05			-0.5	386.5	-0.5	0.72
Pit Lake	8/1/1998							
Pit Lake	9/1/1998							
Pit Lake	10/15/1998	0.064			0.23			
Pit Lake	10/1/1997	0.064			0.23			
PP	8/9/1997	-0.025	-0.05	-0.005	-0.05	7.4	-0.05	-0.025
PW-1	8/8/1997	**97**	**1.5**	-0.005	1400	170	0.075	25
PW-1	8/9/1997	**110**	**2.1**	-0.005	1700	200	0.087	30
PW-2	8/9/1997	0.05	-0.05	-0.005	-0.05	290	0.058	0.83
Seep	5/17/1982	-0.05			0.1		1.1	0.15
Seep	9/2/1982					28.2		
Seep	12/23/1982	-0.05			-0.01		1.1	-0.05
Seep	2/21/1983	-0.05			-0.01		1.1	-0.05
Acid Rock Drianage	5/7/1993	**684**			375	236		142

Mercury(Hg)	Well Name	Date	Nickel(Ni)	Antimony(Sb)	Selenium(Se)	Zinc(Zn)
-0.001	BG-2Spring	4/1/1993	-0.01		-0.005	-0.01
	BG-2 Spring	7/1/1998				
	BG-2 Spring	8/1/1998				
	BG-2 Spring	9/1/1998				
-0.001	BG Spring	4/1/1993	-0.01		-0.005	-0.01
	BG Spring	7/1/1998				
	BG Spring	8/1/1998				
	BG Spring	9/1/1998				
	Casa Moya Wier	6/1/1998				
	Casa Moya Wier	7/1/1998				
	Casa Moya Wier	8/1/1998				
	Casa Moya Wier	9/1/1998				
	Danfelser Spring	1/1/1998				
	Danfelser Spring	2/1/1998				
	Danfelser Spring	3/1/1998				
-0.002	Danfelser Spring	4/15/1998				
	Danfelser Spring	5/1/1998				
	Danfelser Spring	6/1/1998				
-0.002	Danfelser Spring	7/22/1998				
	Danfelser Spring	8/1/1998				
	Danfelser Spring	9/1/1998				
	Due South of Pit	8/1/1997				
	Erwin Wier	5/1/1998				
	Erwin Wier	6/1/1998				
	Erwin Wier	7/1/1998				
	Erwin Wier	8/1/1998				
	Erwin Wier	9/1/1998				
	Greyback Station A	1/77				0.05
	Greyback Station A	1/77				0.04
	Greyback Station B	1/77				0.04
	Greyback Station B	1/77				0.04
	Greyback Station C	1/77				0.04
	Greyback Station C	1/77				0.04
	Greyback Station A	3/77				-0.01
	Greyback Station B	3/77				0.02
	Greyback Station C	3/77				0.02

Mercury(Hg)	Well Name	Date	Nickel(Ni)	Antimony(Sb)	Selenium(Se)	Zinc(Zn)
	Greyback Station B	7/77				0.01
-0.001	Greyback	5/17/1982			-0.005	
-0.0002	Greyback	2/11/1991			-0.001	
0.0007	Greyback	2/11/1991			-0.001	
0.0002	Greyback	2/11/1991			-0.001	
-0.001	Greyback Outfall	8/1/1995	-0.05		-0.025	-0.05
-0.001	Greyback Outfall	9/21/1995	-0.05	-0.005	-0.25	-0.05
	Greyback Wash	3/1/1997				-0.05
	Humphries Wier	6/1/1998				
	Humphries Wier	7/1/1998				
	Humphries Wier	8/1/1998				
	Humphries Wier	9/1/1998				
	Las Animas Creek	10/1/1997				
0.002	Las Animas Creek	4/15/1998			-0.05	
	Las Animas Creek	10/22/1998				
	Las Animas/Seco Creek	7/31/1974				
	Las Animas/Seco Creek	7/12/1974				
	Las Animas/Seco Creek	5/7/1974				
	Las Animas/Seco Creek	7/11/1974				
	Las Animas/Seco Creek	7/11/1974				
	Las Animas/Seco Creek	5/7/1974				
	Las Animas/Seco Creek	7/9/1974				
-0.001	Las Animas/Seco Creek	1/1/2001	-0.05			-0.05
-0.001	Las Animas/Seco Creek	11/16/1994	-0.05		-0.005	-0.05
-0.001	Las Animas/Seco Creek	11/16/1994	-0.05		-0.005	-0.05
-0.001	Las Animas/Seco Creek	11/16/1994	-0.05		-0.005	-0.05
	Left Side of Haul Road	8/1/1997				
	Pit Lake	4/3/1989	-0.1			0.4
	Pit Lake	4/3/1989				
	Pit Lake	11/14/1990				
0.0004	Pit Lake	2/11/1991			-0.001	
-0.0002	Pit Lake	2/11/1991			-0.001	
-0.0002	Pit Lake	7/19/1991			-0.001	
	Pit Lake	8/29/1991				
	Pit Lake	11/26/1991				
	Pit Lake	3/15/1992				

Mercury(Hg)	Well Name	Date	Nickel(Ni)	Antimony(Sb)	Selenium(Se)	Zinc(Zn)
	Pit Lake	3/15/1992				
	Pit Lake	5/25/1992				
	Pit Lake	7/16/1992				
	Pit Lake	10/8/1992				
	Pit Lake	11/27/1992				
	Pit Lake	12/15/1992				
-0.0005	Pit Lake	2/12/1993	-0.1		-0.005	1.8
	Pit Lake	2/25/1993				
	Pit Lake	9/28/1993				0.01
	Pit Lake	3/17/1994				1.01
-0.001	Pit Lake	5/24/1994	-0.05	-0.005	-0.005	0.6
-0.001	Pit Lake	5/24/1994	-0.05	-0.005	-0.005	0.56
-0.001	Pit Lake	5/24/1994	-0.05	-0.005	-0.005	0.57
-0.001	Pit Lake	5/24/1994	-0.05	-0.005	-0.005	0.54
	Pit Lake	9/22/1994				
-0.001	Pit Lake	11/16/1994	0.05	-0.005	-0.005	0.092
-0.001	Pit Lake	11/16/1994	-0.05	-0.005	-0.005	0.095
-0.001	Pit Lake	12/12/1994	-0.05	-0.005	-0.005	0.095
-0.001	Pit Lake	12/19/1994	-0.05	-0.005	-0.005	0.092
	Pit Lake	1/29/1995				
	Pit Lake	3/29/1995				
	Pit Lake	6/27/1995				
-0.001	Pit Lake	8/1/1995	-0.05		-0.025	
	Pit Lake	8/1/1995				
-0.001	Pit Lake	9/21/1995	-0.05	-0.005	-0.25	0.071
	Pit Lake	9/21/1995				
	Pit Lake	1/10/1996				
	Pit Lake	4/3/1996				
	Pit Lake	6/1/1996				
	Pit Lake	9/25/1996				
-0.001	Pit Lake	11/15/1996				0.28
-0.001	Pit Lake	11/15/1996				0.17
-0.001	Pit Lake	11/15/1996				0.2
-0.001	Pit Lake	11/15/1996				0.29
	Pit Lake	1/15/1997				
-0.001	Pit Lake	1/18/1997				0.23

Mercury(Hg)	Well Name	Date	Nickel(Ni)	Antimony(Sb)	Selenium(Se)	Zinc(Zn)
-0.001	Pit Lake	1/18/1997				0.23
-0.001	Pit Lake	1/18/1997				0.23
-0.001	Pit Lake	1/18/1997				0.19
	Pit Lake	7/1/1997				
	Pit Lake	7/16/1997				
	Pit Lake	7/16/1997				
	Pit Lake	7/16/1997				
	Pit Lake	7/16/1997				
	Pit Lake	8/1/1997	-0.05	-0.005	-0.005	0.11
	Pit Lake	10/1/1997				
	Pit Lake	10/8/1997				
	Pit Lake	10/8/1997				
	Pit Lake	10/8/1997				
	Pit Lake	10/8/1997				
-0.002	Pit Lake	1/15/1998			-0.05	
	Pit Lake	1/24/1998			-0.05	
	Pit Lake	2/1/1998				
	Pit Lake	3/1/1998				
-0.002	Pit Lake	4/9/1998			-0.05	
	Pit Lake	5/1/1998				
	Pit Lake	6/1/1998				
-0.002	Pit Lake	7/13/1998			-0.05	
-0.002	Pit Lake	7/21/1998			-0.05	
	Pit Lake	8/1/1998				
	Pit Lake	9/1/1998				
	Pit Lake	10/15/1998				
	Pit Lake	10/1/1997				
	PP	8/9/1997	-0.05		-0.005	-0.05
	PW-1	8/8/1997	0.37		**0.043**	16
	PW-1	8/9/1997	0.36		-0.05	19
	PW-2	8/9/1997	-0.05		-0.005	0.11
-0.001	Seep	5/17/1982			-0.005	
	Seep	9/2/1982				
-0.001	Seep	12/23/1982			-0.005	
-0.001	Seep	2/21/1983			-0.005	
	Acid Rock Drianage	5/7/1993				**51**

Well Name	Flow Rate	Date	Sampler	Notes	Lat	Long
Seep		5/13/1983	QMC			
Seep		11/1/1983	QMC			
Seep		3/16/1984	QMC			
Seep		8/9/1993	QMC			
Spring		11/14/1990	GE	Greyback, rock house below cu flat		
Spring		11/14/1990	GE	Wet weather spring		
Spring		2/12/1991	GE	Wet weather spring, SHB #7		
SWQ1		12/28/1982	QMC		32.96645	107.54562
SWQ1		2/21/1983	QMC		32.96645	107.54562
SWQ1		7/16/1992	BI/GE	Mislabeled as GQW1	32.96645	107.54562
SWQ1		11/27/1992	GE	Greyback wash 1/2 mi. w of pit	32.96645	107.54562
SWQ1		2/25/1993	BI/GE	Greyback wash 1/2 mi. w of pit	32.96645	107.54562
SWQ1		4/1/1993	Shomaker		32.96645	107.54562
SWQ2		10/27/1981		BG Arroyo	32.96404	107.52329
SWQ2		2/25/1982	QMC		32.96404	107.52329
SWQ2		5/12/1982	QMC		32.96404	107.52329
SWQ2		2/21/1983	QMC		32.96404	107.52329
SWQ2		5/13/1983	QMC		32.96404	107.52329
SWQ2		8/9/1983	QMC		32.96404	107.52329
SWQ2		11/1/1983	QMC		32.96404	107.52329
SWQ2		12/23/1983	QMC		32.96404	107.52329
SWQ2		3/16/1984	QMC		32.96404	107.52329
SWQ2		5/30/1984	QMC		32.96404	107.52329
SWQ2		9/12/1984	CFP		32.96404	107.52329
SWQ2		11/27/1984	CFP		32.96404	107.52329
SWQ2		5/17/1985	CFP		32.96404	107.52329
SWQ2		11/13/1985	CFP		32.96404	107.52329
SWQ2		6/5/1986	CFP	No flow	32.96404	107.52329
SWQ2		10/13/1986	CFP		32.96404	107.52329
SWQ2		7/19/1991	GE	Greyback wash s of plant	32.96404	107.52329
SWQ2		7/16/1992	BI/GE	Mislabeled as GQW2, greyback wash of plant	32.96404	107.52329
SWQ2		10/8/1992	BI/GE		32.96404	107.52329
SWQ2		12/15/1992	BI/GE	Greyback wash s of plant	32.96404	107.52329
SWQ2		2/25/1993	BI/GE	Greyback wash s of plant	32.96404	107.52329
SWQ2		3/31/1993	Shomaker		32.96404	107.52329
SWQ2		6/23/1994	BI/AG	S on grayback of mill site	32.96404	107.52329

Well Name	Flow Rate	Date	Sampler	Notes	Lat	Long
SWQ2		1/29/1995	BI/AG	Mislabeled as gwq2, grayback s of mill	32.96404	107.52329
SWQ2		3/29/1995	BI/AG	Mislabeled as qwq1, south of mill site	32.96404	107.52329
SWQ2		6/27/1995	BI/AG	Mislabeled as qwq1, south of mill site	32.96404	107.52329
SWQ2		9/21/1995	BI/AG	Mislabeled as qwq1, south of mill site	32.96404	107.52329
SWQ2		1/10/1996	BI/AG	Mislabeled as qwq1, south of mill site	32.96404	107.52329
SWQ2		4/3/1996	BI/AG	Mislabeled as qwq1, south of mill site	32.96404	107.52329
SWQ2		9/25/1996	BI/AG	Mislabeled as qwq2 rock house of grayback	32.96404	107.52329
SWQ2		1/15/1997	BI/AG	Mislabeled as qwq1, south of mill site	32.96404	107.52329
SWQ2		7/1/1997	BI	exact date not known	32.96404	107.52329
SWQ2		8/10/1997	SRK		32.96404	107.52329
SWQ2		10/1/1997	BI	exact date not known	32.96404	107.52329
SWQ2		1/15/1998	BI	Labled GWQ-1 South [of] Mill Site	32.96404	107.52329
SWQ2		4/9/1998	BI	Labled GWQ-1 South [of] Mill Site	32.96404	107.52329
SWQ2A		10/27/1981	QMC	BG Arroyo		
SWQ2A		2/25/1982	QMC			
SWQ3		7/19/1991	GE	Greyback wash E of Rock house	32.96654	107.51597
SWQ3		8/29/1991	BI/GE	Greyback wash Opp. Rock House	32.96654	107.51597
SWQ3		11/26/1991	MH/GE	Greyback wash Opp. Rock House	32.96654	107.51597
SWQ3		3/15/1992	BI/GE		32.96654	107.51597
SWQ3		3/15/1992	BI/GE	Greyback wash Opp. Rock House	32.96654	107.51597
SWQ3		2/25/1992	BI/GE		32.96654	107.51597
SWQ3		7/16/1992	BI/GE	Greyback wash E of plant	32.96654	107.51597
SWQ3		10/8/1992	BI/GE		32.96654	107.51597
SWQ3		11/27/1992	MH/GE	Greyback wash Opp. Rock House	32.96654	107.51597
SWQ3		12/15/1992	BI/GE	Greyback wash e of plant	32.96654	107.51597
SWQ3		2/25/1993	BI/GE	Greyback wash E of plant	32.96654	107.51597
SWQ-3		3/31/1993	Shomaker		32.96654	107.51597
SWQ3		9/28/1993	BI/GE		32.96654	107.51597
SWQ3		6/23/1994	BI/AG	Mislabeled as GWQ3, grayback at rock house	32.96654	107.51597
SWQ3		1/29/1995	BI/AG	Mislabeled as gwq1, grayback at rock house	32.96654	107.51597
SWQ3		3/29/1995	BI/AG	Mislabeled as gwq2, rock house on greyback	32.96654	107.51597
SWQ3		6/27/1995	BI/AG	Mislabeled as gwq2, at rock house on greyback	32.96654	107.51597
SWQ3		9/21/1995	BI/AG	Mislabeled as gwq2 rock house of greyback	32.96654	107.51597
SWQ3		1/10/1996	BI/AG	Mislabeled as gwq2 rock house of greyback	32.96654	107.51597
SWQ3		4/3/1996	BI/AG	Mislabeled as gwq2 rock house of greyback	32.96654	107.51597
SWQ3		9/25/1996	BI/AG	Mislabeled as gwq2 rock house of greyback	32.96654	107.51597

Well Name	Flow Rate	Date	Sampler	Notes	Lat	Long
SWQ3		1/15/1997	BI/AG	Mislabeled as gwq2 rock house of greyback	32.96654	107.51597
SWQ3		7/1/1997	BI	exact date not known		
SWQ3		8/10/1997	SRK			
SWQ3		10/1/1997	BI	exact date not known		
SWQ3		1/15/1998	BI	Labeled GWQ-2 Greyback Rock House		
SWQ3		4/9/1998	BI	Labeled GWQ-2 Greyback Rock House		
US Greyback		2/11/1991	FTS/GE	SHB6		
Warm Springs South	18	4/1/1998		16.7.5.2.2.3	32.94974	107.57747
Warm Springs South	5	7/21/1998	Brownfield	16.7.5.2.2.3	32.94974	107.57747
W.Waste	0.01	8/10/1997	SRK	Seep at E. toe of W. waste rock dump		
Caballo Reservoir		11/16/1994		CF-Caballo		
Rio Grande @ El Paso		1/1/1958				
Rio Grande @ El Paso		1/1/1964				
Rio Grande @ El Paso		1/1/1975				
Rio Grande @ El Paso		12/30/1975				
Warm Springs Canyon		4/2/1993				

Well Name	Date	North	East	Filtered?	pH	Sp. Cond.	TDS	SO4	Bicarbonate
Seep	5/13/1983				8.2		1120	600	
Seep	11/1/1983				8		1160	529	
Seep	3/16/1984				8.3		1300	620	
Seep	8/9/1993				8.0		1210	505	
Spring	11/14/1990						2618	1559.1	
Spring	11/14/1990						541	200.8	
Spring	2/12/1991					1095	679	245.0	
SWQ1	12/28/1982	262071	3650254		8.0		250	68	
SWQ1	2/21/1983	262071	3650254		8.0		470	161	
SWQ1	7/16/1992	262071	3650254	TRUE	7.37		965	298.3	
SWQ1	11/27/1992	262071	3650254		8.31		545	180.8	
SWQ1	2/25/1993	262071	3650254	TRUE	8.34		844	323.1	
SWQ1	4/1/1993	262071	3650254		8.30	1150	782	276	430
SWQ2	10/27/1981	264152	3649937	TRUE	8.7		1060	460	
SWQ2	2/25/1982	264152	3649937	TRUE	8.1		1360	658	
SWQ2	5/12/1982	264152	3649937	TRUE	7.9		1380	700	
SWQ2	2/21/1983	264152	3649937		8.4		990	445	
SWQ2	5/13/1983	264152	3649937		8.4		1120	517	
SWQ2	8/9/1983	264152	3649937		8.0		1620	675	
SWQ2	11/1/1983	264152	3649937		8.2		1170	553	
SWQ2	12/23/1983	264152	3649937	TRUE	8.0		1180	550	
SWQ2	3/16/1984	264152	3649937		8.3		1140	515	
SWQ2	5/30/1984	264152	3649937		8.1		1420	720	
SWQ2	9/12/1984	264152	3649937		8.1		1190	577	
SWQ2	11/27/1984	264152	3649937		8.2		1360	675	
SWQ2	5/17/1985	264152	3649937		8.0		1640	770	
SWQ2	11/13/1985	264152	3649937		7.9		1590	770	
SWQ2	6/5/1986	264152	3649937						
SWQ2	10/13/1986	264152	3649937		7.9		1840	830	
SWQ2	7/19/1991	264152	3649937		7.57	4310	3019	1585.5	
SWQ2	7/16/1992	264152	3649937	TRUE	7.57		2305	1154.9	
SWQ2	10/8/1992	264152	3649937	TRUE	7.53		2685	1470.5	
SWQ2	12/15/1992	264152	3649937	TRUE	7.61		3108	1613.0	
SWQ2	2/25/1993	264152	3649937	TRUE	7.58		2713	1459.3	
SWQ2	3/31/1993	264152	3649937		7.7	3150	2720	1460	376
SWQ2	6/23/1994	264152	3649937	TRUE	8.87		3958	2369	

Well Name	Date	North	East	Filtered?	pH	Sp. Cond.	TDS	SO4	Bicarbonate
SWQ2	1/29/1995	264152	3649937	TRUE	7.64		2653	1286.2	
SWQ2	3/29/1995	264152	3649937	TRUE	7.83		2866	1388.2	
SWQ2	6/27/1995	264152	3649937	TRUE	7.74		3235	1877.0	
SWQ2	9/21/1995	264152	3649937	TRUE	7.58		500	271.2	
SWQ2	1/10/1996	264152	3649937	TRUE	7.37		3991	2336.9	
SWQ2	4/3/1996	264152	3649937	TRUE	8.06		4464	2566.3	
SWQ2	9/25/1996	264152	3649937	TRUE	7.66		3997	1987	
SWQ2	1/15/1997	264152	3649937	TRUE	7.43		3436	1356	
SWQ2	7/1/1997	264152	3649937	TRUE	7.34		3507	2033	
SWQ2	8/10/1997	264152	3649937	TRUE	7.89	3267	2890	1410	
SWQ2	10/1/1997	264152	3649937	TRUE	7.75		2015	960	
SWQ2	1/15/1998	264152	3649937	TRUE	7.67	3380	2643	1500	
SWQ2	4/9/1998	264152	3649937	TRUE		3360	2365	2029	
SWQ2A	10/27/1981			TRUE	8.2		830	360	
SWQ2A	2/25/1982			TRUE	8.4		800	320	
SWQ3	7/19/1991	264842	3650197		7.52	3120	2191	1108.2	
SWQ3	8/29/1991	264842	3650197	TRUE	7.82		3596	1884.2	
SWQ3	11/26/1991	264842	3650197		7.71		2857	1419	
SWQ3	3/15/1992	264842	3650197	TRUE	8.08		2393	1247.6	
SWQ3	3/15/1992	264842	3650197	TRUE	8.08		2393	1247.6	
SWQ3	2/25/1992	264842	3650197	TRUE	8.07		2380	1185.2	
SWQ3	7/16/1992	264842	3650197	TRUE	7.66		3364	1654.0	
SWQ3	10/8/1992	264842	3650197	TRUE	7.49		3611	1667.4	
SWQ3	11/27/1992	264842	3650197		8.35		1866	952.2	
SWQ3	12/15/1992	264842	3650197	TRUE	8.15		3436	1549.4	
SWQ3	2/25/1993	264842	3650197	TRUE	8.01		2974	1573.7	
SWQ-3	3/31/1993	264842	3650197		8.1	3330	2950	1580	409
SWQ3	9/28/1993	264842	3650197	TRUE	8.13		4432	1254	
SWQ3	6/23/1994	264842	3650197	TRUE	8.37		2934	1712	
SWQ3	1/29/1995	264842	3650197	TRUE	7.93		3185	1671.7	
SWQ3	3/29/1995	264842	3650197	TRUE	8.23		3216	1709.7	
SWQ3	6/27/1995	264842	3650197	TRUE	7.51		3393	1792.4	
SWQ3	9/21/1995	264842	3650197	TRUE	8.73		3741	2382.0	
SWQ3	1/10/1996	264842	3650197	TRUE	7.78		3666	1936.6	
SWQ3	4/3/1996	264842	3650197	TRUE	7.38		3635	2236.3	
SWQ3	9/25/1996	264842	3650197	TRUE	7.64		2568	1153	

Well Name	Date	North	East	Filtered?	pH	Sp. Cond.	TDS	SO4	Bicarbonate
SWQ3	1/15/1997	264842	3650197	TRUE	8.13		3436	1356	
SWQ3	7/1/1997			TRUE	7.79		3854	2185	
SWQ3	8/10/1997			TRUE	7.92	3590	3310	1670	
SWQ3	10/1/1997			TRUE	7.91		2964	1489	
SWQ3	1/15/1998			TRUE	7.7	3800	3115	1738	
SWQ3	4/9/1998			TRUE		3570	3361	2050	
US Greyback	2/11/1991				7.78	1418	908	348.6	
Warm Springs South	4/1/1998	259047	3648474						
Warm Springs South	7/21/1998	259047	3648474	TRUE			543	96	
W.Waste	8/10/1997			TRUE	3.03	12280	25440	22100	
Caballo Reservoir	11/16/1994				7.97		440	110	
Rio Grande @ El Paso	1/1/1958						721	260	
Rio Grande @ El Paso	1/1/1964						1058	340	
Rio Grande @ El Paso	1/1/1975						846	275	
Rio Grande @ El Paso	12/30/1975						809	129	
Warm Springs Canyon	4/2/1993				8.5		1370	351	

Well Name	Date	Calcium(Ca)	Cl	Flouride(F)	Nitrate (NO$_3$)	Sodium(Na)	Potassium(K)	Aluminum(Al)
Seep	5/13/1983		52	1.9	0.9			
Seep	11/1/1983		56	1.5	1.1			
Seep	3/16/1984		52	1.7	5.6			
Seep	8/9/1993		52	1.5	1.2			
Spring	11/14/1990		141.2					
Spring	11/14/1990		26.1					
Spring	2/12/1991		43.3	0.3	0.08	78.6	1.6	
SWQ1	12/28/1982		10	0.3	0.9			
SWQ1	2/21/1983		20	0.3	4.4			
SWQ1	7/16/1992		47.2					
SWQ1	11/27/1992		16.7					
SWQ1	2/25/1993		28.9					
SWQ1	4/1/1993	109	27	0.53	0	107	1.8	-0.1
SWQ2	10/27/1981		46	0.8	6.6			-0.01
SWQ2	2/25/1982		80	0.7	4.2			
SWQ2	5/12/1982		108	0.7	3			
SWQ2	2/21/1983		68	0.7	0.8			
SWQ2	5/13/1983		84	0.8	0.3			
SWQ2	8/9/1983		142	0.7	-0.2			
SWQ2	11/1/1983		72	0.8	0.3			
SWQ2	12/23/1983		82	0.5	11.2			
SWQ2	3/16/1984		68	0.8	5.3			
SWQ2	5/30/1984		94	0.8	0.4			
SWQ2	9/12/1984		80	0.9	0.4			
SWQ2	11/27/1984		88	0.8	-0.2			
SWQ2	5/17/1985		102					
SWQ2	11/13/1985		94					
SWQ2	6/5/1986							
SWQ2	10/13/1986		136					
SWQ2	7/19/1991		216.7	0.57	12.74	264.3	10.9	
SWQ2	7/16/1992		93.4					
SWQ2	10/8/1992		130.7					
SWQ2	12/15/1992		192.5					
SWQ2	2/25/1993		135.9					
SWQ2	3/31/1993	436	123	0.63	14.5	279	2.1	-0.1
SWQ2	6/23/1994		197.3					

Well Name	Date	Calcium(Ca)	Cl	Flouride(F)	Nitrate (NO$_3$)	Sodium(Na)	Potassium(K)	Aluminum(Al)
SWQ2	1/29/1995		89.2					
SWQ2	3/29/1995		83.9					
SWQ2	6/27/1995		127.3					
SWQ2	9/21/1995		31.1					
SWQ2	1/10/1996		167.2					
SWQ2	4/3/1996		222.6					
SWQ2	9/25/1996		143.7					
SWQ2	1/15/1997		148					
SWQ2	7/1/1997		168					
SWQ2	8/10/1997		97	0.86	2.1	290	9.6	0.12
SWQ2	10/1/1997		64.1					
SWQ2	1/15/1998		67.2	0.87	11.3			
SWQ2	4/9/1998		88	0.95	6			
SWQ2A	10/27/1981		46	0.6	0.3			-0.01
SWQ2A	2/25/1982		50	0.7	-0.2			
SWQ3	7/19/1991		143.9	0.73	1.39	189.5	7.4	
SWQ3	8/29/1991		231.3					
SWQ3	11/26/1991		141.1					
SWQ3	3/15/1992		99.2					
SWQ3	3/15/1992		99.2					
SWQ3	2/25/1992		102.9					
SWQ3	7/16/1992		128.7					
SWQ3	10/8/1992		174.4					
SWQ3	11/27/1992		160.5					
SWQ3	12/15/1992		221.6					
SWQ3	2/25/1993		150.7					
SWQ-3	3/31/1993	445	135	0.97	6.9	271	2.2	-0.1
SWQ3	9/28/1993		226.9					
SWQ3	6/23/1994		157.4					
SWQ3	1/29/1995		237.6					
SWQ3	3/29/1995		100.6					
SWQ3	6/27/1995		200.3					
SWQ3	9/21/1995		178.5					
SWQ3	1/10/1996		112.0					
SWQ3	4/3/1996		157.0					
SWQ3	9/25/1996		96.7					

Well Name	Date	Calcium(Ca)	Cl	Flouride(F)	Nitrate (NO_3)	Sodium(Na)	Potassium(K)	Aluminum(Al)
SWQ3	1/15/1997		148					
SWQ3	7/1/1997		176					
SWQ3	8/10/1997		130	0.85	-1	300	9	0.032
SWQ3	10/1/1997		118					
SWQ3	1/15/1998		114	0.99	1.6			
SWQ3	4/9/1998		116	1.07	0.12			
US Greyback	2/11/1991		49.9	0.37	0.07	118.5	1.2	
Warm Springs South	4/1/1998							
Warm Springs South	7/21/1998		17	16.15	-0.05	148.3	9.3	
W.Waste	8/10/1997		16	0.31	4.7	20	-1	**2100**
Caballo Reservoir	11/16/1994		71	0.57		79	5.8	-0.05
Rio Grande @ El Paso	1/1/1958		87			116		
Rio Grande @ El Paso	1/1/1964		199			224		
Rio Grande @ El Paso	1/1/1975		124			159		
Rio Grande @ El Paso	12/30/1975					151		
Warm Springs Canyon	4/2/1993		52	22.2	0	457	22	-0.01

Well Name	Date	Arsenic(As)	Silver(Ag)	Boron(B)	Berrylium(Be)	Barium(Ba)	Cadmium(Cd)	Chromium(Cr)
Seep	5/13/1983						-0.005	
Seep	11/1/1983						-0.005	
Seep	3/16/1984						-0.005	
Seep	8/9/1993						-0.005	
Spring	11/14/1990					0.1	*0.027*	
Spring	11/14/1990							
Spring	2/12/1991	-0.001	-0.001			0.1	*0.027*	0.05
SWQ1	12/28/1982						-0.005	
SWQ1	2/21/1983						-0.005	
SWQ1	7/16/1992							
SWQ1	11/27/1992							
SWQ1	2/25/1993							
SWQ1	4/1/1993	-0.005	-0.01	0.02		-0.05	-0.002	-0.02
SWQ2	10/27/1981	-0.01	-0.02	-0.01		-0.02	-0.005	-0.01
SWQ2	2/25/1982						-0.005	
SWQ2	5/12/1982						-0.005	
SWQ2	2/21/1983						-0.005	
SWQ2	5/13/1983						-0.005	
SWQ2	8/9/1983						-0.005	
SWQ2	11/1/1983						-0.005	
SWQ2	12/23/1983						-0.005	
SWQ2	3/16/1984						-0.005	
SWQ2	5/30/1984						-0.005	
SWQ2	9/12/1984						-0.005	
SWQ2	11/27/1984						-0.005	
SWQ2	5/17/1985							
SWQ2	11/13/1985							
SWQ2	6/5/1986							
SWQ2	10/13/1986							
SWQ2	7/19/1991	-0.002	-0.02			-0.01	-0.005	-0.02
SWQ2	7/16/1992							
SWQ2	10/8/1992							
SWQ2	12/15/1992							
SWQ2	2/25/1993							
SWQ2	3/31/1993	-0.005	-0.01	0.08		-0.5	-0.002	-0.02
SWQ2	6/23/1994							

Well Name	Date	Arsenic(As)	Silver(Ag)	Boron(B)	Berrylium(Be)	Barium(Ba)	Cadmium(Cd)	Chromium(Cr)
SWQ2	1/29/1995							
SWQ2	3/29/1995							
SWQ2	6/27/1995							
SWQ2	9/21/1995							
SWQ2	1/10/1996							
SWQ2	4/3/1996							
SWQ2	9/25/1996							
SWQ2	1/15/1997							
SWQ2	7/1/1997							
SWQ2	8/10/1997	-0.005	-0.025	0.11	-0.002	0.12	-0.002	-0.025
SWQ2	10/1/1997							
SWQ2	1/15/1998							
SWQ2	4/9/1998							
SWQ2A	10/27/1981	-0.01	-0.02	-0.01		-0.02	-0.005	-0.01
SWQ2A	2/25/1982						-0.005	
SWQ3	7/19/1991	-0.002	-0.02			0.03	-0.005	-0.02
SWQ3	8/29/1991							
SWQ3	11/26/1991							
SWQ3	3/15/1992							
SWQ3	3/15/1992							
SWQ3	2/25/1992							
SWQ3	7/16/1992							
SWQ3	10/8/1992							
SWQ3	11/27/1992							
SWQ3	12/15/1992							
SWQ3	2/25/1993							
SWQ-3	3/31/1993	-0.005	-0.01	0.06		-0.05	-0.002	-0.02
SWQ3	9/28/1993							
SWQ3	6/23/1994							
SWQ3	1/29/1995							
SWQ3	3/29/1995							
SWQ3	6/27/1995							
SWQ3	9/21/1995							
SWQ3	1/10/1996							
SWQ3	4/3/1996							
SWQ3	9/25/1996							

Well Name	Date	Arsenic(As)	Silver(Ag)	Boron(B)	Berrylium(Be)	Barium(Ba)	Cadmium(Cd)	Chromium(Cr)
SWQ3	1/15/1997							
SWQ3	7/1/1997							
SWQ3	8/10/1997	-0.005	-0.025	0.11	-0.002	0.1	-0.002	-0.025
SWQ3	10/1/1997							
SWQ3	1/15/1998							
SWQ3	4/9/1998							
US Greyback	2/11/1991	-0.001	0.08			0.06	**0.38**	0.07
Warm Springs South	4/1/1998							
Warm Springs South	7/21/1998							
W.Waste	8/10/1997	*0.14*	-0.025	0.21	0.49	-0.05	**0.82**	0.068
Caballo Reservoir	11/16/1994	-0.005	-0.03	0.14		-0.1	-0.005	-0.03
Rio Grande @ El Paso	1/1/1958							
Rio Grande @ El Paso	1/1/1964							
Rio Grande @ El Paso	1/1/1975							
Rio Grande @ El Paso	12/30/1975							
Warm Springs Canyon	4/2/1993	-0.005	-0.01	0.15		-0.5	-0.002	-0.02

Well Name	Date	Copper(Cu)	Cobalt(Co)	Lead(Pb)	Iron(Fe)	Magnesium(Mg)	Molybdenum(Mo)	Manganese(Mn)	Mercury(Hg)
Seep	5/13/1983	0.089			-0.01		1.8	-0.05	-0.001
Seep	11/1/1983	-0.05			-0.01		1.1	-0.05	-0.001
Seep	3/16/1984	-0.05			-0.01		0.88	-0.05	-0.001
Seep	8/9/1993	-0.05			-0.01		0.87	-0.05	0.001
Spring	11/14/1990								
Spring	11/14/1990								
Spring	2/12/1991			-0.005	0.24	24.7		0.07	-0.0002
SWQ1	12/28/1982	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ1	2/21/1983	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ1	7/16/1992								
SWQ1	11/27/1992								
SWQ1	2/25/1993								
SWQ1	4/1/1993	-0.01	-0.05	-0.02	-0.05	36	-0.02	-0.02	-0.001
SWQ2	10/27/1981	-0.05	-0.02	-0.02	-0.05		-0.05	-0.05	0.004
SWQ2	2/25/1982	-0.05			0.13		-0.05	-0.05	-0.001
SWQ2	5/12/1982	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	2/21/1983	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	5/13/1983	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	8/9/1983	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	11/1/1983	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	12/23/1983	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	3/16/1984	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	5/30/1984	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	9/12/1984	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	11/27/1984	-0.05			-0.01		-0.05	-0.05	-0.001
SWQ2	5/17/1985								
SWQ2	11/13/1985								
SWQ2	6/5/1986								
SWQ2	10/13/1986								
SWQ2	7/19/1991			-0.005	-0.05	129.1		-0.02	-0.0002
SWQ2	7/16/1992								
SWQ2	10/8/1992								
SWQ2	12/15/1992								
SWQ2	2/25/1993								
SWQ2	3/31/1993	0.01	-0.05	-0.02	-0.05	83	-0.02	0.03	-0.001
SWQ2	6/23/1994								

Well Name	Date	Copper(Cu)	Cobalt(Co)	Lead(Pb)	Iron(Fe)	Magnesium(Mg)	Molybdenum(Mo)	Manganese(Mn)	Mercury(Hg)
SWQ2	1/29/1995								
SWQ2	3/29/1995								
SWQ2	6/27/1995								
SWQ2	9/21/1995								
SWQ2	1/10/1996								
SWQ2	4/3/1996								
SWQ2	9/25/1996								
SWQ2	1/15/1997								
SWQ2	7/1/1997								
SWQ2	8/10/1997	0.098	-0.05	-0.005	0.068	110	-0.05	1.6	
SWQ2	10/1/1997								
SWQ2	1/15/1998	-0.005			0.15	93.4	-0.05		-0.002
SWQ2	4/9/1998	0.02			-0.2		-0.05	0.03	-0.002
SWQ2A	10/27/1981	-0.05	-0.02	-0.02	-0.05		-0.05	-0.05	-0.001
SWQ2A	2/25/1982	-0.05			0.1		-0.05	-0.05	-0.001
SWQ3	7/19/1991			-0.005	0.14	84.6		-0.02	-0.0002
SWQ3	8/29/1991	0.015							
SWQ3	11/26/1991	0.001							
SWQ3	3/15/1992								
SWQ3	3/15/1992								
SWQ3	2/25/1992								
SWQ3	7/16/1992								
SWQ3	10/8/1992								
SWQ3	11/27/1992								
SWQ3	12/15/1992								
SWQ3	2/25/1993								
SWQ-3	3/31/1993	0.01	-0.05	-0.02	-0.05	109	-0.02	-0.02	-0.001
SWQ3	9/28/1993								
SWQ3	6/23/1994								
SWQ3	1/29/1995								
SWQ3	3/29/1995								
SWQ3	6/27/1995								
SWQ3	9/21/1995								
SWQ3	1/10/1996								
SWQ3	4/3/1996								
SWQ3	9/25/1996								

Well Name	Date	Copper(Cu)	Cobalt(Co)	Lead(Pb)	Iron(Fe)	Magnesium(Mg)	Molybdenum(Mo)	Manganese(Mn)	Mercury(Hg)
SWQ3	1/15/1997								
SWQ3	7/1/1997								
SWQ3	8/10/1997	0.047	-0.05	-0.005	-0.05	140	-0.05	0.17	
SWQ3	10/1/1997								
SWQ3	1/15/1998	-0.005			-0.05	120.9	-0.05		-0.002
SWQ3	4/9/1998	0.011			-0.05		-0.05	0.02	-0.002
US Greyback	2/11/1991			-0.005	-0.05	42.1		0.07	-0.0002
Warm Springs South	4/1/1998								
Warm Springs South	7/21/1998	-0.005			-0.05	7.8	-0.05	0.03	0.0023
W.Waste	8/10/1997	**1800**	**9.9**	-0.005	310	580	0.28	170	
Caballo Reservoir	11/16/1994	-0.03	-0.05	-0.01	-0.05	14	-0.05	-0.03	-0.001
Rio Grande @ El Paso	1/1/1958								
Rio Grande @ El Paso	1/1/1964								
Rio Grande @ El Paso	1/1/1975								
Rio Grande @ El Paso	12/30/1975								
Warm Springs Canyon	4/2/1993	-0.01	-0.05	-0.02	0.09	3	-0.02	-0.02	-0.001

Well Name	Date	Nickel(Ni)	Antimony(Sb)	Selenium(Se)	Zinc(Zn)
Seep	5/13/1983			-0.005	
Seep	11/1/1983			-0.005	
Seep	3/16/1984			-0.005	
Seep	8/9/1993			-0.005	
Spring	11/14/1990				
Spring	11/14/1990				
Spring	2/12/1991			**0.05**	
SWQ1	12/28/1982			-0.005	
SWQ1	2/21/1983			-0.005	
SWQ1	7/16/1992				
SWQ1	11/27/1992				
SWQ1	2/25/1993				
SWQ1	4/1/1993	-0.01		-0.005	-0.01
SWQ2	10/27/1981	-0.05		-0.005	
SWQ2	2/25/1982			-0.005	
SWQ2	5/12/1982			-0.005	
SWQ2	2/21/1983			-0.005	
SWQ2	5/13/1983			-0.005	
SWQ2	8/9/1983			-0.005	
SWQ2	11/1/1983			-0.005	
SWQ2	12/23/1983			-0.005	
SWQ2	3/16/1984			-0.005	
SWQ2	5/30/1984			-0.005	
SWQ2	9/12/1984			-0.005	
SWQ2	11/27/1984			-0.005	
SWQ2	5/17/1985				
SWQ2	11/13/1985				
SWQ2	6/5/1986				
SWQ2	10/13/1986				
SWQ2	7/19/1991			-0.001	
SWQ2	7/16/1992				
SWQ2	10/8/1992				
SWQ2	12/15/1992				
SWQ2	2/25/1993				
SWQ2	3/31/1993	-0.01		0.008	0.01
SWQ2	6/23/1994				

Well Name	Date	Nickel(Ni)	Antimony(Sb)	Selenium(Se)	Zinc(Zn)
SWQ2	1/29/1995				
SWQ2	3/29/1995				
SWQ2	6/27/1995				
SWQ2	9/21/1995				
SWQ2	1/10/1996				
SWQ2	4/3/1996				
SWQ2	9/25/1996				
SWQ2	1/15/1997				
SWQ2	7/1/1997				
SWQ2	8/10/1997	-0.05		-0.005	-0.05
SWQ2	10/1/1997				
SWQ2	1/15/1998			-0.05	
SWQ2	4/9/1998			-0.05	
SWQ2A	10/27/1981	-0.05		-0.005	
SWQ2A	2/25/1982			-0.005	
SWQ3	7/19/1991			-0.001	
SWQ3	8/29/1991				
SWQ3	11/26/1991				
SWQ3	3/15/1992				
SWQ3	3/15/1992				
SWQ3	2/25/1992				
SWQ3	7/16/1992				
SWQ3	10/8/1992				
SWQ3	11/27/1992				
SWQ3	12/15/1992				
SWQ3	2/25/1993				
SWQ-3	3/31/1993	-0.01		-0.005	-0.01
SWQ3	9/28/1993				
SWQ3	6/23/1994				
SWQ3	1/29/1995				
SWQ3	3/29/1995				
SWQ3	6/27/1995				
SWQ3	9/21/1995				
SWQ3	1/10/1996				
SWQ3	4/3/1996				
SWQ3	9/25/1996				

Well Name	Date	Nickel(Ni)	Antimony(Sb)	Selenium(Se)	Zinc(Zn)
SWQ3	1/15/1997				
SWQ3	7/1/1997				
SWQ3	8/10/1997	-0.05		-0.005	-0.05
SWQ3	10/1/1997				
SWQ3	1/15/1998			-0.05	
SWQ3	4/9/1998			-0.05	
US Greyback	2/11/1991			-0.001	
Warm Springs South	4/1/1998				
Warm Springs South	7/21/1998			-0.05	
W.Waste	8/10/1997	1.3		**0.11**	**38**
Caballo Reservoir	11/16/1994	-0.05		-0.005	-0.05
Rio Grande @ El Paso	1/1/1958				
Rio Grande @ El Paso	1/1/1964				
Rio Grande @ El Paso	1/1/1975				
Rio Grande @ El Paso	12/30/1975				
Warm Springs Canyon	4/2/1993	-0.01		-0.005	-0.01

Appendix B

B-1 Comprehensive Groundwater Chemistry Data
B-2 Pre 1980 SHB Groundwater Sample Results

Appendix B-1

Comprehensive Groundwater Chemistry Data

Well Name	Water Depth	USGS Quad	Well Depth	Sample ID	Date	Sampler	Notes
EPA DWS							
NM GWQ-1						Domestic Use	
NM SWQ-1						Domestic Use	
NM GWQ-2						Livestock	
NM SWQ-2						Livestock	
15.6.30.432	190		-1	15.6.30.432-1	6/6/1981	SHB	
15.6.31.343	98.11	Skute Stone Arroyo	-1	15.6.31.343-1	6/6/1981	SHB	
15.6.31.431		Skute Stone Arroyo	-1	15.6.31.431-1	6/4/1976	SHB	
15.6.31.431		Skute Stone Arroyo	-2	15.6.31.431-2	4/9/1981	SHB	
15.6.31.431	76.39	Skute Stone Arroyo	-3	15.6.31.431-3	6/9/1981	SHB	
15.7.26.324	28.4	Hillsboro	-1	15.7.26.324-1	6/11/1981	SHB	
15.7.26.344	56.5	Hillsboro	-1	15.7.26.344-1	1/11/1981	SHB	
15.7.26.431	34.5	Hillsboro	-1	15.7.26.431-1	6/1/1981	SHB	
Adams	4.15		-1	Adams-1	1/1/1998		
Adams	4		-2	Adams-2	2/1/1998		
Adams	3.4		-3	Adams-3	3/1/1998		
Adams	3.25		-4	Adams-4	4/15/1998	Goff	15.5.28.3.1
Adams	3.1		-5	Adams-5	5/1/1998		
Adams	3.4		-6	Adams-6	6/1/1998		
Adams	3.25		-7	Adams-7	7/22/1998	Brownfield	15.5.28.3.1
Adams	2.75		-8	Adams-8	8/1/1998		
Adams	2.75		-9	Adams-9	9/1/1998		
Branno			-1	Branno-1	7/31/1947		
Bussman	12.65		-1	Bussman-1	1/1/1998		
Bussman	12.5		-2	Bussman-2	2/1/1998		
Bussman	12.3		-3	Bussman-3	3/1/1998		
Bussman	12.26		-4	Bussman-4	4/15/1998	Goff	
Bussman	12.73		-5	Bussman-5	5/1/1998		
Bussman	12.86		-6	Bussman-6	6/1/1998		
Bussman	13.35		-7	Bussman-7	7/22/1998	Brownfield	
Bussman	12.45		-8	Bussman-8	8/1/1998		
Bussman	13.16		-9	Bussman-9	9/1/1998		
Casa-Moya	2.9		-1	Casa-Moya-1	1/1/1998		
Casa-Moya	13.1		-2	Casa-Moya-2	2/1/1998		
Casa-Moya	13.3		-3	Casa-Moya-3	3/1/1998		
Casa-Moya	1		-4	Casa-Moya-4	5/1/1998		

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
Casa-Moya	2.75			-5	Casa-Moya-5	6/1/1998		
Casa-Moya	2.2			-6	Casa-Moya-6	7/22/1998	Brownfield	
Casa-Moya	2.25			-7	Casa-Moya-7	8/1/1998		
Casa-Moya	2.6			-8	Casa-Moya-8	9/1/1998		
Dawson 1				-1	Dawson 1-1	6/14/1946		
Dawson 1				-2	Dawson 1-2	6/7/1947		
Dawson 2				-1	Dawson 2-1	7/31/1947		
Delores	31.58	Hillsboro		-1	Delores-1	7/1/1998		15.7.25.1.2.1
Delores	30.64	Hillsboro		-2	Delores-2	8/1/1998		15.7.25.1.2.1
Delores	30.85	Hillsboro		-3	Delores-3	9/1/1998		15.7.25.1.2.1
Eaton				-1	Eaton-1	7/31/1947		
ElW	39.855			-1	ElW-1	2/5/1997	SRK	
El Oro	64.2			-1	El Oro-1	6/11/1981	SHB	
Folcher				-1	Folcher-1	6/20/1946		
Guest House	5.94	Hillsboro		-1	Guest House-1	6/9/1981	SHB	
GWQ-1		Skute Stone Arroyo		-1	GWQ-1-1	5/1/1975		exact data unknown
GWQ-1		Skute Stone Arroyo		-2	GWQ-1-2	1/20/1981	SHB	QMC-3, Cl,Na icon
GWQ-1		Skute Stone Arroyo		-3	GWQ-1-3	2/2/1981	SHB	QMC-3, in SHB (198
GWQ-1		Skute Stone Arroyo		-4	GWQ-1-4	3/27/1981	SHB	QMC-3 in SHB (198
GWQ-1	70.6	Skute Stone Arroyo		-5	GWQ-1-5	6/11/1981	SHB	
GWQ-1		Skute Stone Arroyo		-6	GWQ-1-6	6/15/1981	SHB	
GWQ-1		Skute Stone Arroyo		-7	GWQ-1-7	6/15/1981	SHB	
GWQ-1		Skute Stone Arroyo		-8	GWQ-1-8	2/25/1982	QMC	
GWQ-1		Skute Stone Arroyo		-9	GWQ-1-9	3/30/1989	EID	
GWQ-1	0	Skute Stone Arroyo		-10	GWQ-1-10	7/19/1991	GE	lab pH
GWQ-1		Skute Stone Arroyo		-11	GWQ-1-11	3/31/1993	JWS	
GWQ-1	0	Skute Stone Arroyo		-12	GWQ-1-12	5/25/1994	SRK	Artesian
GWQ-1	0	Skute Stone Arroyo		-13	GWQ-1-13	7/21/1994	SRK	Artesian
GWQ-1		Skute Stone Arroyo		-14	GWQ-1-14	9/1/1995		
GWQ-1	-0.38	Skute Stone Arroyo		-15	GWQ-1-15	1/24/1998	GOFF	Artesian
GWQ-1	-0.4	Skute Stone Arroyo		-16	GWQ-1-16	2/1/1998		
GWQ-1	-0.43	Skute Stone Arroyo		-17	GWQ-1-17	3/1/1998		
GWQ-1	-0.71	Skute Stone Arroyo		-18	GWQ-1-18	4/14/1998	Goff	Artesian
GWQ-1	-0.38	Skute Stone Arroyo		-19	GWQ-1-19	5/1/1998		
GWQ-1	-0.38	Skute Stone Arroyo		-20	GWQ-1-20	6/1/1998		
GWQ-1	-0.23	Skute Stone Arroyo		-21	GWQ-1-21	7/21/1998	Brownfield	

Well Name	Water Depth	USGS Quad	Well Depth	Sample ID	Date	Sampler	Notes
GWQ-1	-0.1	Skute Stone Arroyo	-22	GWQ-1-22	8/1/1998		
GWQ-1	-0.04	Skute Stone Arroyo	-23	GWQ-1-23	9/1/1998		
GWQ-10		Skute Stone Arroyo	-1	GWQ-10-1	4/6/1981	QMC	
GWQ-10	90.62	Skute Stone Arroyo	-2	GWQ-10-2	8/10/1981	QMC	
GWQ-10		Skute Stone Arroyo	-3	GWQ-10-3	10/27/1981	QMC	
GWQ-10		Skute Stone Arroyo	-4	GWQ-10-4	10/30/1981	QMC	
GWQ-10		Skute Stone Arroyo	-5	GWQ-10-5	11/6/1981	QMC	
GWQ-10	84.81	Skute Stone Arroyo	-6	GWQ-10-6	11/12/1981	QMC	
GWQ-10	84.09	Skute Stone Arroyo	-7	GWQ-10-7	11/13/1981	EID	
GWQ-10	83.25	Skute Stone Arroyo	-8	GWQ-10-8	11/17/1981	QMC	
GWQ-10	82.69	Skute Stone Arroyo	-9	GWQ-10-9	11/23/1981	QMC	
GWQ-10	80.04	Skute Stone Arroyo	-10	GWQ-10-10	12/7/1981	QMC	
GWQ-10	81.46	Skute Stone Arroyo	-11	GWQ-10-11	12/15/1981	QMC	
GWQ-10	80.04	Skute Stone Arroyo	-12	GWQ-10-12	12/22/1981	QMC	
GWQ-10		Skute Stone Arroyo	-13	GWQ-10-13	1/5/1982	QMC	
GWQ-10	78.46	Skute Stone Arroyo	-14	GWQ-10-14	1/18/1982	QMC	
GWQ-10	78.4	Skute Stone Arroyo	-15	GWQ-10-15	1/26/1982	QMC	
GWQ-10	77.92	Skute Stone Arroyo	-16	GWQ-10-16	2/16/1982	QMC	
GWQ-10	77.9	Skute Stone Arroyo	-17	GWQ-10-17	2/22/1982	QMC	
GWQ-10	75.5	Skute Stone Arroyo	-18	GWQ-10-18	3/12/1982	QMC	
GWQ-10	70.17	Skute Stone Arroyo	-19	GWQ-10-19	4/16/1982	QMC	
GWQ-10	70.2	Skute Stone Arroyo	-20	GWQ-10-20	4/26/1982	QMC	
GWQ-10	20.58	Skute Stone Arroyo	-21	GWQ-10-21	5/17/1982	QMC	
GWQ-10	6.2	Skute Stone Arroyo	-22	GWQ-10-22	6/8/1982	QMC	
GWQ-10	6.17	Skute Stone Arroyo	-23	GWQ-10-23	6/14/1982	QMC	
GWQ-10	4.5	Skute Stone Arroyo	-24	GWQ-10-24	6/30/1982	QMC	
GWQ-10	4.5	Skute Stone Arroyo	-25	GWQ-10-25	7/26/1982	QMC	
GWQ-10	6.6	Skute Stone Arroyo	-26	GWQ-10-26	7/18/1982	QMC	
GWQ-10	7.7	Skute Stone Arroyo	-27	GWQ-10-27	9/2/1982	EID	
GWQ-10	8.6	Skute Stone Arroyo	-28	GWQ-10-28	9/14/1982	QMC	
GWQ-10	11.8	Skute Stone Arroyo	-29	GWQ-10-29	10/18/1982	QMC	
GWQ-10	14.7	Skute Stone Arroyo	-30	GWQ-10-30	11/11/1982	QMC	
GWQ-10	18.5	Skute Stone Arroyo	-31	GWQ-10-31	12/23/1982	QMC	
GWQ-10	18.5	Skute Stone Arroyo	-32	GWQ-10-32	12/28/1982	QMC	
GWQ-10	21.2	Skute Stone Arroyo	-33	GWQ-10-33	2/21/1983	QMC	
GWQ-10	25.1	Skute Stone Arroyo	-34	GWQ-10-34	5/6/1983	QMC	

Well Name	Water Depth	USGS Quad	Well Depth	Sample ID	Date	Sampler	Notes
GWQ-10	25.1	Skute Stone Arroyo	-35	GWQ-10-35	5/13/1983	QMC	
GWQ-10	26.2	Skute Stone Arroyo	-36	GWQ-10-36	6/2/1983	QMC	
GWQ-10	28	Skute Stone Arroyo	-37	GWQ-10-37	7/5/1983	QMC	
GWQ-10	30.2	Skute Stone Arroyo	-38	GWQ-10-38	8/9/1983	QMC	
GWQ-10	30.2	Skute Stone Arroyo	-39	GWQ-10-39	8/25/83	QMC	
GWQ-10	32.6	Skute Stone Arroyo	-40	GWQ-10-40	10/20/1983	QMC	
GWQ-10	32.6	Skute Stone Arroyo	-41	GWQ-10-41	11/1/1983	QMC	
GWQ-10	33.9	Skute Stone Arroyo	-42	GWQ-10-42	12/7/1983	QMC	
GWQ-10	34.7	Skute Stone Arroyo	-43	GWQ-10-43	1/28/1984	QMC	
GWQ-10	35	Skute Stone Arroyo	-44	GWQ-10-44	2/13/1984	QMC	
GWQ-10	33.1	Skute Stone Arroyo	-45	GWQ-10-45	3/1/1984	QMC	
GWQ-10	33.1	Skute Stone Arroyo	-46	GWQ-10-46	3/16/1984	CFP	
GWQ-10	33.2	Skute Stone Arroyo	-47	GWQ-10-47	4/18/1984	CFP	
GWQ-10	32.4	Skute Stone Arroyo	-48	GWQ-10-48	5/22/1984	CFP	
GWQ-10	32.4	Skute Stone Arroyo	-49	GWQ-10-49	5/30/1984	CFP	
GWQ-10	32.3	Skute Stone Arroyo	-50	GWQ-10-50	6/26/1984	CFP	
GWQ-10	32.2	Skute Stone Arroyo	-51	GWQ-10-51	7/25/1984	CFP	
GWQ-10	32	Skute Stone Arroyo	-52	GWQ-10-52	8/27/1984	CFP	
GWQ-10	31.5	Skute Stone Arroyo	-53	GWQ-10-53	9/12/1984	CFP	
GWQ-10	31.8	Skute Stone Arroyo	-54	GWQ-10-54	9/21/1984	CFP	
GWQ-10	32.1	Skute Stone Arroyo	-55	GWQ-10-55	11/19/1984	CFP	
GWQ-10	32.1	Skute Stone Arroyo	-56	GWQ-10-56	11/27/1984	CFP	
GWQ-10	31.7	Skute Stone Arroyo	-57	GWQ-10-57	12/17/1984	CFP	
GWQ-10	31.5	Skute Stone Arroyo	-58	GWQ-10-58	5/17/1985	CFP	

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride
EPA DWS								FALSE	
NM GWQ-1								FALSE	
NM SWQ-1								FALSE	
NM GWQ-2								FALSE	
NM SWQ-2								FALSE	
15.6.30.432	6/6/1981							TRUE	
15.6.31.343	6/6/1981							TRUE	
15.6.31.431	6/4/1976						5171	TRUE	14.3
15.6.31.431	4/9/1981						5171	TRUE	22
15.6.31.431	6/9/1981						5171	FALSE	
15.7.26.324	6/11/1981						5531	TRUE	
15.7.26.344	1/11/1981						5480	TRUE	
15.7.26.431	6/1/1981						5335	TRUE	
Adams	1/1/1998								
Adams	2/1/1998								
Adams	3/1/1998								
Adams	4/15/1998							TRUE	24.5
Adams	5/1/1998								
Adams	6/1/1998								
Adams	7/22/1998							TRUE	24.4
Adams	8/1/1998								
Adams	9/1/1998								
Branno	7/31/1947							FALSE	15
Bussman	1/1/1998								
Bussman	2/1/1998								
Bussman	3/1/1998								
Bussman	4/15/1998							TRUE	15.3
Bussman	5/1/1998								
Bussman	6/1/1998								
Bussman	7/22/1998							TRUE	14.3
Bussman	8/1/1998								
Bussman	9/1/1998								
Casa-Moya	1/1/1998								
Casa-Moya	2/1/1998								
Casa-Moya	3/1/1998								
Casa-Moya	5/1/1998								

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride
Casa-Moya	6/1/1998								
Casa-Moya	7/22/1998							TRUE	81.6
Casa-Moya	8/1/1998								
Casa-Moya	9/1/1998								
Dawson 1	6/14/1946							FALSE	18
Dawson 1	6/7/1947							FALSE	11
Dawson 2	7/31/1947							FALSE	13
Delores	7/1/1998								
Delores	8/1/1998								
Delores	9/1/1998								
Eaton	7/31/1947							FALSE	17
EIW	2/5/1997							TRUE	
El Oro	6/11/1981							TRUE	
Folcher	6/20/1946							FALSE	6
Guest House	6/9/1981	32.96821	107.50922	265478	3650367	13	5283	TRUE	
GWQ-1	5/1/1975	32.96712	107.49556	266753	3650216	13	5183		20
GWQ-1	1/20/1981	32.96712	107.49556	266753	3650216	13	5183	TRUE	200
GWQ-1	2/2/1981	32.96712	107.49556	266753	3650216	13	5183	TRUE	20
GWQ-1	3/27/1981	32.96712	107.49556	266753	3650216	13	5183	TRUE	
GWQ-1	6/11/1981	32.96712	107.49556	266753	3650216	13	5183	TRUE	
GWQ-1	6/15/1981	32.96712	107.49556	266753	3650216	13	5183	TRUE	16
GWQ-1	6/15/1981	32.96712	107.49556	266753	3650216	13	5183	TRUE	22
GWQ-1	2/25/1982	32.96712	107.49556	266753	3650216	13	5183	TRUE	22
GWQ-1	3/30/1989	32.96712	107.49556	266753	3650216	13	5183	TRUE	20
GWQ-1	7/19/1991	32.96712	107.49556	266753	3650216	13	5183	TRUE	21.1
GWQ-1	3/31/1993	32.96712	107.49556	266753	3650216	13	5183	TRUE	22
GWQ-1	5/25/1994	32.96712	107.49556	266753	3650216	13	5183	FALSE	22
GWQ-1	7/21/1994	32.96712	107.49556	266753	3650216	13	5183	TRUE	25
GWQ-1	9/1/1995	32.96712	107.49556	266753	3650216	13	5183		31.1
GWQ-1	1/24/1998	32.96712	107.49556	266753	3650216	13	5183	TRUE	24.5
GWQ-1	2/1/1998	32.96712	107.49556	266753	3650216	13	5183		
GWQ-1	3/1/1998	32.96712	107.49556	266753	3650216	13	5183		
GWQ-1	4/14/1998	32.96712	107.49556	266753	3650216	13	5183	TRUE	24.9
GWQ-1	5/1/1998	32.96712	107.49556	266753	3650216	13	5183		
GWQ-1	6/1/1998	32.96712	107.49556	266753	3650216	13	5183		
GWQ-1	7/21/1998	32.96712	107.49556	266753	3650216	13	5183	TRUE	25.7

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride
GWQ-1	8/1/1998	32.96712	107.49556	266753	3650216	13	5183		
GWQ-1	9/1/1998	32.96712	107.49556	266753	3650216	13	5183		
GWQ-10	4/6/1981	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	8/10/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	23.5
GWQ-10	10/27/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	22
GWQ-10	10/30/1981	32.96325	107.49677	266630	3649790	13	5200	FALSE	22.8
GWQ-10	11/6/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	22
GWQ-10	11/12/1981	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	11/13/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	22.85
GWQ-10	11/17/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	26
GWQ-10	11/23/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	26
GWQ-10	12/7/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	24
GWQ-10	12/15/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	24
GWQ-10	12/22/1981	32.96325	107.49677	266630	3649790	13	5200	TRUE	24
GWQ-10	1/5/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	22
GWQ-10	1/18/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	
GWQ-10	1/26/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	24
GWQ-10	2/16/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	2/22/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	24
GWQ-10	3/12/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	4/16/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	4/26/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	20
GWQ-10	5/17/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	28
GWQ-10	6/8/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	22
GWQ-10	6/14/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	6/30/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	20
GWQ-10	7/26/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	7/18/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	9/2/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	22.3
GWQ-10	9/14/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	10/18/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	11/11/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	12/23/1982	32.96325	107.49677	266630	3649790	13	5200	TRUE	26
GWQ-10	12/28/1982	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	2/21/1983	32.96325	107.49677	266630	3649790	13	5200	TRUE	24
GWQ-10	5/6/1983	32.96325	107.49677	266630	3649790	13	5200	FALSE	

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride
GWQ-10	5/13/1983	32.96325	107.49677	266630	3649790	13	5200	TRUE	32
GWQ-10	6/2/1983	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	7/5/1983	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	8/9/1983	32.96325	107.49677	266630	3649790	13	5200	TRUE	36
GWQ-10	8/25/83	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	10/20/1983	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	11/1/1983	32.96325	107.49677	266630	3649790	13	5200	TRUE	34
GWQ-10	12/7/1983	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	1/28/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	2/13/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	3/1/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	3/16/1984	32.96325	107.49677	266630	3649790	13	5200	TRUE	42
GWQ-10	4/18/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	5/22/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	5/30/1984	32.96325	107.49677	266630	3649790	13	5200	TRUE	56
GWQ-10	6/26/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	7/25/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	8/27/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	9/12/1984	32.96325	107.49677	266630	3649790	13	5200	TRUE	68
GWQ-10	9/21/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	11/19/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	11/27/1984	32.96325	107.49677	266630	3649790	13	5200	TRUE	64
GWQ-10	12/17/1984	32.96325	107.49677	266630	3649790	13	5200	FALSE	
GWQ-10	5/17/1985	32.96325	107.49677	266630	3649790	13	5200	FALSE	52

Sulfate	Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony
500	EPA DWS								-1	-0.025	-0.005
600	NM GWQ-1		6-9						-1	-0.025	-0.005
600	NM SWQ-1								-1	-0.025	-0.005
600	NM GWQ-2								-1	-0.025	-0.005
	NM SWQ-2								-1	-0.025	-0.005
	15.6.30.432	6/6/1981									
	15.6.31.343	6/6/1981									
137	15.6.31.431	6/4/1976	7.78	520		228	720	0.52	1.39		
144.5	15.6.31.431	4/9/1981				285.7		0.58	1.14	-0.1	
	15.6.31.431	6/9/1981									
	15.7.26.324	6/11/1981									
	15.7.26.344	1/11/1981									
	15.7.26.431	6/1/1981									
	Adams	1/1/1998									
	Adams	2/1/1998									
	Adams	3/1/1998									
16	Adams	4/15/1998	7.87	212			413	0.53	0.5		
	Adams	5/1/1998									
	Adams	6/1/1998									
16	Adams	7/22/1998		194				0.47	0.47		
	Adams	8/1/1998									
	Adams	9/1/1998									
13	Branno	7/31/1947		270		232	404	0.8	0.4		
	Bussman	1/1/1998									
	Bussman	2/1/1998									
	Bussman	3/1/1998									
18	Bussman	4/15/1998	7.45	238			428	0.5	-0.05		
	Bussman	5/1/1998									
	Bussman	6/1/1998									
13	Bussman	7/22/1998		234				0.46	-0.05		
	Bussman	8/1/1998									
	Bussman	9/1/1998									
	Casa-Moya	1/1/1998									
	Casa-Moya	2/1/1998									
	Casa-Moya	3/1/1998									
	Casa-Moya	5/1/1998									

Sulfate	Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony
	Casa-Moya	6/1/1998									
29.3	Casa-Moya	7/22/1998		722				0.68	0.61		
	Casa-Moya	8/1/1998									
	Casa-Moya	9/1/1998									
36	Dawson 1	6/14/1946		219		169	369	1.3	0.8		
58	Dawson 1	6/7/1947		283		180	385	1	1.1		
52	Dawson 2	7/31/1947		283		158	360	1.2	1.3		
	Delores	7/1/1998									
	Delores	8/1/1998									
	Delores	9/1/1998									
21	Eaton	7/31/1947		356		329	546	0.2	0.2		
	ElW	2/5/1997									
	El Oro	6/11/1981									
19	Folcher	6/20/1946		147		126	216	0.4	2.4		
	Guest House	6/9/1981									
130	GWQ-1	5/1/1975				273		0.5	2.8		
250	GWQ-1	1/20/1981	7.3	450		280.6					
156	GWQ-1	2/2/1981	7.9	520		276					
	GWQ-1	3/27/1981						0.6	5.5		
	GWQ-1	6/11/1981								-0.05	-0.005
148	GWQ-1	6/15/1981	7.4	500	220	251	700	0.5	5.1	-0.01	
117	GWQ-1	6/15/1981		500				0.51	3.75	-0.25	
84	GWQ-1	2/25/1982	7.9	410				0.3	0.2		
133	GWQ-1	3/30/1989		512		280				-0.1	
136.4	GWQ-1	7/19/1991	7.34	543	215	262.4	799	0.58	5.19		
160	GWQ-1	3/31/1993	7.7	536		297	822	0.54	4.9	-0.01	
150	GWQ-1	5/25/1994	7.9	614		270	760	0.52	4.3	0.025	-0.005
162	GWQ-1	7/21/1994	7.97	558		278	861	0.52	4.2	-0.05	0.0052
271.2	GWQ-1	9/1/1995	7.58	500							
148	GWQ-1	1/24/1998	7.7	508			901	0.52			
	GWQ-1	2/1/1998									
	GWQ-1	3/1/1998									
155	GWQ-1	4/14/1998	7.68	521			879	0.55	3.8		
	GWQ-1	5/1/1998									
	GWQ-1	6/1/1998									
132	GWQ-1	7/21/1998		460				0.55	1.19		

Sulfate	Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony
	GWQ-1	8/1/1998									
	GWQ-1	9/1/1998									
	GWQ-10	4/6/1981						0.53	4.6		
143	GWQ-10	8/10/1981	7.48	528	179	219		1.14	0.22	10.2	
168	GWQ-10	10/27/1981	8.2	520				0.6	1.1	-0.01	
122	GWQ-10	10/30/1981	8.1	588				0.98	0.66	-0.25	
162	GWQ-10	11/6/1981	7.9	500				0.7	2	-0.01	
	GWQ-10	11/12/1981									
140.9	GWQ-10	11/13/1981	7.75	509		275.6	700	0.62	1.8	0.37	
156	GWQ-10	11/17/1981	7.9	500				0.6	1.8	-0.01	
161	GWQ-10	11/23/1981	7.7	650				0.6	1.8	-0.01	
168	GWQ-10	12/7/1981	8.2	490				0.5	1.8	-0.01	
181	GWQ-10	12/15/1981	7.9	550				0.7	2.6	-0.01	
168	GWQ-10	12/22/1981	8.1	480				0.5	2.5	-0.01	
174	GWQ-10	1/5/1982	7.5	430				0.6	2.9	-0.01	
	GWQ-10	1/18/1982									
162	GWQ-10	1/26/1982	7.8	490				0.6	2.3		
	GWQ-10	2/16/1982									
161	GWQ-10	2/22/1982	7.6	510				0.6	2.1		
	GWQ-10	3/12/1982									
	GWQ-10	4/16/1982									
168	GWQ-10	4/26/1982	7.4	840				0.6	2		
175	GWQ-10	5/17/1982	7.7	490				0.6	2.3		
162	GWQ-10	6/8/1982	8	500				0.5	2.2		
	GWQ-10	6/14/1982									
160	GWQ-10	6/30/1982	8	510				0.6	3.3		
	GWQ-10	7/26/1982									
	GWQ-10	7/18/1982									
143.4	GWQ-10	9/2/1982	7.3	506		278	690	0.54	2.25		
	GWQ-10	9/14/1982									
	GWQ-10	10/18/1982									
	GWQ-10	11/11/1982									
138	GWQ-10	12/23/1982	8.5	500				0.6	1.7		
	GWQ-10	12/28/1982									
161	GWQ-10	2/21/1983	7.9	470				0.6	2.4		
	GWQ-10	5/6/1983									

Sulfate	Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony
161	GWQ-10	5/13/1983	8	480				0.6	2.4		
	GWQ-10	6/2/1983									
	GWQ-10	7/5/1983									
142	GWQ-10	8/9/1983	7.9	510				0.6	2.4		
	GWQ-10	8/25/83									
	GWQ-10	10/20/1983									
125	GWQ-10	11/1/1983	8.1	500				0.6	4.8		
	GWQ-10	12/7/1983									
	GWQ-10	1/28/1984									
	GWQ-10	2/13/1984									
	GWQ-10	3/1/1984									
128	GWQ-10	3/16/1984	8.2	500				0.5	3.5		
	GWQ-10	4/18/1984									
	GWQ-10	5/22/1984									
161	GWQ-10	5/30/1984	7.5	530				0.5	3.3		
	GWQ-10	6/26/1984									
	GWQ-10	7/25/1984									
	GWQ-10	8/27/1984									
158	GWQ-10	9/12/1984	7.8	580				0.5	4.2		
	GWQ-10	9/21/1984									
	GWQ-10	11/19/1984									
163	GWQ-10	11/27/1984	7.7	580				0.6	4.9		
	GWQ-10	12/17/1984									
163	GWQ-10	5/17/1985	7.8	570							

Arsenic	Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
-0.005	EPA DWS			-0.1		-0.0005		-0.025		-0.025	-0.05
-0.005	NM GWQ-1			-0.1		-0.0005		-0.025		-0.025	-0.05
-0.005	NM SWQ-1			-0.1		-0.0005		-0.025		-0.025	-0.05
-0.005	NM GWQ-2			-0.1		-0.0005		-0.025		-0.025	-0.05
-0.005	NM SWQ-2			-0.1		-0.0005		-0.025		-0.025	-0.05
	15.6.30.432	6/6/1981									
	15.6.31.343	6/6/1981									
	15.6.31.431	6/4/1976	-0.1				117				
-0.005	15.6.31.431	4/9/1981	0.025	-0.1		-0.001		-0.005			0.002
	15.6.31.431	6/9/1981								0.7	-0.25
	15.7.26.324	6/11/1981									
	15.7.26.344	1/11/1981									
	15.7.26.431	6/1/1981									
	Adams	1/1/1998									
	Adams	2/1/1998									
	Adams	3/1/1998									
	Adams	4/15/1998					34.2			-0.005	-0.05
	Adams	5/1/1998									
	Adams	6/1/1998									
	Adams	7/22/1998					32.7			-0.005	-0.05
	Adams	8/1/1998									
	Adams	9/1/1998									
	Branno	7/31/1947					28				
	Bussman	1/1/1998									
	Bussman	2/1/1998									
	Bussman	3/1/1998									
	Bussman	4/15/1998					57			0.013	4.09
	Bussman	5/1/1998									
	Bussman	6/1/1998									
	Bussman	7/22/1998					55.5			-0.005	1.33
	Bussman	8/1/1998									
	Bussman	9/1/1998									
	Casa-Moya	1/1/1998									
	Casa-Moya	2/1/1998									
	Casa-Moya	3/1/1998									
	Casa-Moya	5/1/1998									

Arsenic	Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
	Casa-Moya	6/1/1998									
	Casa-Moya	7/22/1998					84.1			-0.005	-0.05
	Casa-Moya	8/1/1998									
	Casa-Moya	9/1/1998									
	Dawson 1	6/14/1946					21				
	Dawson 1	6/7/1947					22				
	Dawson 2	7/31/1947					24				
	Delores	7/1/1998									
	Delores	8/1/1998									
	Delores	9/1/1998									
	Eaton	7/31/1947					71				
	ElW	2/5/1997									
	El Oro	6/11/1981									
	Folcher	6/20/1946					18				
	Guest House	6/9/1981									
	GWQ-1	5/1/1975					81				
	GWQ-1	1/20/1981					84				0.05
	GWQ-1	2/2/1981					74				1.7
-0.01	GWQ-1	3/27/1981								-0.05	
-0.005	GWQ-1	6/11/1981	-0.1	-0.1	-0.002	-0.0005		-0.025	-0.05	-0.025	-0.05
-0.01	GWQ-1	6/15/1981	-0.1	-0.2		-0.005	82	-0.01	-0.05	-0.05	-0.1
-0.002	GWQ-1	6/15/1981	0.076	-1		-0.01	81	-0.05	-0.05	-0.02	-0.05
	GWQ-1	2/25/1982				-0.005				-0.05	0.14
	GWQ-1	3/30/1989	-0.1	-0.1	-0.1	-0.1	84	-0.1	-0.05	-0.1	-0.1
0.003	GWQ-1	7/19/1991		0.01		-0.005	88	-0.02		-0.02	-0.05
-0.005	GWQ-1	3/31/1993	0.03	-0.5		-0.002	82	-0.02	-0.05	-0.01	-0.05
-0.005	GWQ-1	5/25/1994		-0.1		-0.0005	80	-0.025		-0.025	-0.05
-0.005	GWQ-1	7/21/1994	-0.1	-0.1	-0.002	-0.0005	95	-0.025	-0.05	-0.025	-0.05
	GWQ-1	9/1/1995									
	GWQ-1	1/24/1998					76.5			-0.005	
	GWQ-1	2/1/1998									
	GWQ-1	3/1/1998									
	GWQ-1	4/14/1998					90.4			-0.005	0.13
	GWQ-1	5/1/1998									
	GWQ-1	6/1/1998									
	GWQ-1	7/21/1998					71.2			-0.005	0.11

Arsenic	Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
	GWQ-1	8/1/1998									
	GWQ-1	9/1/1998									
0.002	GWQ-10	4/6/1981				-0.01				-0.05	
-0.004	GWQ-10	8/10/1981	0.016	-1		-0.01	74	-0.05	-0.05	-0.05	2.31
-0.01	GWQ-10	10/27/1981	-0.1	-0.2		-0.005	68	-0.01	-0.02	-0.05	-0.01
-0.005	GWQ-10	10/30/1981	0.77	-1		-0.01		-0.05	-0.05	-0.05	-1
-0.01	GWQ-10	11/6/1981	-0.1	-0.2		-0.005	72	-0.01	-0.02	-0.05	-0.1
	GWQ-10	11/12/1981									
-0.005	GWQ-10	11/13/1981	0.037	0.25		0.001	84.2	-0.005			
-0.01	GWQ-10	11/17/1981	-0.1	-0.2		-0.005	70	-0.01	-0.02	-0.05	-0.1
-0.01	GWQ-10	11/23/1981	-0.1	-0.2		-0.005	70	-0.01	-0.02	-0.05	-0.1
-0.01	GWQ-10	12/7/1981	-0.1	-0.2		-0.005	67	-0.01	-0.02	-0.05	-0.1
-0.01	GWQ-10	12/15/1981	-0.1	-0.2		-0.005	89	-0.01	-0.02	-0.05	-0.1
-0.01	GWQ-10	12/22/1981	-0.1	-0.2		-0.005	85	-0.01	-0.02	-0.05	-0.1
-0.01	GWQ-10	1/5/1982	-0.1	-0.2		-0.005	80	-0.01	-0.02	-0.05	0.13
	GWQ-10	1/18/1982									
	GWQ-10	1/26/1982				-0.005				-0.05	-0.1
	GWQ-10	2/16/1982									
	GWQ-10	2/22/1982				-0.005				-0.05	0.12
	GWQ-10	3/12/1982									
	GWQ-10	4/16/1982									
	GWQ-10	4/26/1982				-0.005				-0.05	0.41
	GWQ-10	5/17/1982				-0.005				-0.05	0.1
	GWQ-10	6/8/1982				-0.005				-0.05	-0.1
	GWQ-10	6/14/1982									
	GWQ-10	6/30/1982				-0.005				-0.05	0.62
	GWQ-10	7/26/1982									
	GWQ-10	7/18/1982									
	GWQ-10	9/2/1982				-0.001	82.6				
	GWQ-10	9/14/1982									
	GWQ-10	10/18/1982									
	GWQ-10	11/11/1982									
	GWQ-10	12/23/1982				-0.005				-0.05	-0.1
	GWQ-10	12/28/1982									
	GWQ-10	2/21/1983				-0.005				-0.05	-0.1
	GWQ-10	5/6/1983									

Arsenic	Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
	GWQ-10	5/13/1983				-0.005				-0.05	-0.1
	GWQ-10	6/2/1983									
	GWQ-10	7/5/1983									
	GWQ-10	8/9/1983				-0.005				-0.05	-0.01
	GWQ-10	8/25/83									
	GWQ-10	10/20/1983									
	GWQ-10	11/1/1983				-0.005				-0.05	0.17
	GWQ-10	12/7/1983									
	GWQ-10	1/28/1984									
	GWQ-10	2/13/1984									
	GWQ-10	3/1/1984									
	GWQ-10	3/16/1984				-0.005				-0.05	0.11
	GWQ-10	4/18/1984									
	GWQ-10	5/22/1984									
	GWQ-10	5/30/1984				-0.005				-0.05	-0.1
	GWQ-10	6/26/1984									
	GWQ-10	7/25/1984									
	GWQ-10	8/27/1984									
	GWQ-10	9/12/1984				-0.005				-0.05	-0.1
	GWQ-10	9/21/1984									
	GWQ-10	11/19/1984									
	GWQ-10	11/27/1984				-0.005				-0.05	-0.1
	GWQ-10	12/17/1984									
	GWQ-10	5/17/1985									

Lead	Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
-0.005	EPA DWS			-0.03	-0.001		-0.05		-0.005	-0.025	
-0.005	NM GWQ-1			-0.03	-0.001		-0.05		-0.005	-0.025	
-0.005	NM SWQ-1			-0.03	-0.001		-0.05		-0.005	-0.025	
-0.005	NM GWQ-2			-0.03	-0.001		-0.05		-0.005	-0.025	
-0.005	NM SWQ-2			-0.03	-0.001		-0.05		-0.005	-0.025	
	15.6.30.432	6/6/1981									
	15.6.31.343	6/6/1981									
	15.6.31.431	6/4/1976						1.78			50.4
	15.6.31.431	4/9/1981	25.6	0.003		0.005	-0.01		-0.005		
-0.005	15.6.31.431	6/9/1981		-0.05							
	15.7.26.324	6/11/1981									
	15.7.26.344	1/11/1981									
	15.7.26.431	6/1/1981									
	Adams	1/1/1998									
	Adams	2/1/1998									
	Adams	3/1/1998									
	Adams	4/15/1998	4.7	-0.02	-0.0002	-0.05		4.3	-0.05		38.9
	Adams	5/1/1998									
	Adams	6/1/1998									
	Adams	7/22/1998	4.2	-0.02	-0.0002	-0.05		3.6	-0.05		33.7
	Adams	8/1/1998									
	Adams	9/1/1998									
	Branno	7/31/1947	3.6								
	Bussman	1/1/1998									
	Bussman	2/1/1998									
	Bussman	3/1/1998									
	Bussman	4/15/1998	7.1	-0.02	-0.0002	-0.05		0.9	-0.05		19.9
	Bussman	5/1/1998									
	Bussman	6/1/1998									
	Bussman	7/22/1998	6.7	0.09	0.0002	-0.05		0.5	-0.05		18.3
	Bussman	8/1/1998									
	Bussman	9/1/1998									
	Casa-Moya	1/1/1998									
	Casa-Moya	2/1/1998									
	Casa-Moya	3/1/1998									
	Casa-Moya	5/1/1998									

Lead	Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
	Casa-Moya	6/1/1998									
	Casa-Moya	7/22/1998	8.5	-0.02	0.0004	-0.05		84	-0.05		122.5
	Casa-Moya	8/1/1998									
	Casa-Moya	9/1/1998									
	Dawson 1	6/14/1946	4.4								
	Dawson 1	6/7/1947	2.5								
	Dawson 2	7/31/1947	1.6								
	Delores	7/1/1998									
	Delores	8/1/1998									
	Delores	9/1/1998									
	Eaton	7/31/1947	12								
	ElW	2/5/1997									
	El Oro	6/11/1981									
	Folcher	6/20/1946	3.9								
	Guest House	6/9/1981									
	GWQ-1	5/1/1975	14	0.17				2.1			57
	GWQ-1	1/20/1981	14.6								632
	GWQ-1	2/2/1981	20								60
-0.02	GWQ-1	3/27/1981									
-0.005	GWQ-1	6/11/1981		-0.03	-0.001	-0.05	-0.05		-0.005	-0.025	
-0.02	GWQ-1	6/15/1981	19	-0.05	-0.001	-0.05	-0.05	2	-0.005	-0.02	57
-0.05	GWQ-1	6/15/1981	12	-0.02	-0.001	-0.1	-0.05	3.06	-0.0022	-0.02	49.1
	GWQ-1	2/25/1982		-0.063	-0.001	-0.05			-0.005		
-0.1	GWQ-1	3/30/1989	16	-0.05		-0.1	-0.1	3		-0.1	61
-0.005	GWQ-1	7/19/1991	18	-0.02	-0.0002			2.7	-0.002	-0.2	39.6
-0.02	GWQ-1	3/31/1993	21	-0.02	-0.001	-0.02	-0.01	2.1	-0.005	-0.01	67
-0.005	GWQ-1	5/25/1994	18	-0.03	-0.001		-0.05	2.7	-0.005	-0.025	55
-0.005	GWQ-1	7/21/1994	19	-0.03	-0.001	-0.05	-0.05	2.7	-0.005	-0.025	66
	GWQ-1	9/1/1995									
	GWQ-1	1/24/1998	17.8	-0.02							61.5
	GWQ-1	2/1/1998									
	GWQ-1	3/1/1998									
	GWQ-1	4/14/1998	17.9	-0.02	-0.0002	-0.05		1.7	-0.05		62
	GWQ-1	5/1/1998									
	GWQ-1	6/1/1998									
	GWQ-1	7/21/1998	15.1	0.02	0.0004	-0.05		2.7	-0.05		57.5

Lead	Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
	GWQ-1	8/1/1998									
	GWQ-1	9/1/1998									
-0.01	GWQ-10	4/6/1981			-1			8.25			
-0.05	GWQ-10	8/10/1981	11.3	1.18	-1	-0.1	-0.05	8.32	-0.002	-0.02	58.7
-0.02	GWQ-10	10/27/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
-0.05	GWQ-10	10/30/1981		-0.02	-0.001	-0.1	-0.02		-0.002	-0.02	
-0.02	GWQ-10	11/6/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
	GWQ-10	11/12/1981									
-0.005	GWQ-10	11/13/1981	17.5	0.5	-0.0005	-0.01	-0.05	2.34	0.01	-0.001	39.1
-0.02	GWQ-10	11/17/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
-0.02	GWQ-10	11/23/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
-0.02	GWQ-10	12/7/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
-0.02	GWQ-10	12/15/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
-0.02	GWQ-10	12/22/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
-0.02	GWQ-10	1/5/1982		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
	GWQ-10	1/18/1982									
	GWQ-10	1/26/1982		-0.05	-0.001	-0.1			-0.005		
	GWQ-10	2/16/1982									
	GWQ-10	2/22/1982		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	3/12/1982									
	GWQ-10	4/16/1982									
	GWQ-10	4/26/1982		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	5/17/1982		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	6/8/1982		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	6/14/1982									
	GWQ-10	6/30/1982		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	7/26/1982									
	GWQ-10	7/18/1982									
	GWQ-10	9/2/1982	17	-0.05		-0.01		2.73	-0.005		57.5
	GWQ-10	9/14/1982									
	GWQ-10	10/18/1982									
	GWQ-10	11/11/1982									
	GWQ-10	12/23/1982		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	12/28/1982									
	GWQ-10	2/21/1983		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	5/6/1983									

Lead	Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
	GWQ-10	5/13/1983		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	6/2/1983									
	GWQ-10	7/5/1983									
	GWQ-10	8/9/1983		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	8/25/83									
	GWQ-10	10/20/1983									
	GWQ-10	11/1/1983		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	12/7/1983									
	GWQ-10	1/28/1984									
	GWQ-10	2/13/1984									
	GWQ-10	3/1/1984									
	GWQ-10	3/16/1984		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	4/18/1984									
	GWQ-10	5/22/1984									
	GWQ-10	5/30/1984		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	6/26/1984									
	GWQ-10	7/25/1984									
	GWQ-10	8/27/1984									
	GWQ-10	9/12/1984		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	9/21/1984									
	GWQ-10	11/19/1984									
	GWQ-10	11/27/1984		-0.05	-0.001	-0.05			-0.005		
	GWQ-10	12/17/1984									
	GWQ-10	5/17/1985									

Thallium	Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
	EPA DWS		-0.05			
	NM GWQ-1		-0.05			
	NM SWQ-1		-0.05			
	NM GWQ-2		-0.05			
	NM SWQ-2		-0.05			
	15.6.30.432	6/6/1981				
	15.6.31.343	6/6/1981				
	15.6.31.431	6/4/1976				
	15.6.31.431	4/9/1981	0.14			
	15.6.31.431	6/9/1981				
	15.7.26.324	6/11/1981				
	15.7.26.344	1/11/1981				
	15.7.26.431	6/1/1981				
	Adams	1/1/1998				
	Adams	2/1/1998				
	Adams	3/1/1998				
	Adams	4/15/1998				
	Adams	5/1/1998				
	Adams	6/1/1998				
	Adams	7/22/1998				
	Adams	8/1/1998				
	Adams	9/1/1998				
	Branno	7/31/1947				
	Bussman	1/1/1998				
	Bussman	2/1/1998				
	Bussman	3/1/1998				
	Bussman	4/15/1998				
	Bussman	5/1/1998				
	Bussman	6/1/1998				
	Bussman	7/22/1998				
	Bussman	8/1/1998				
	Bussman	9/1/1998				
	Casa-Moya	1/1/1998				
	Casa-Moya	2/1/1998				
	Casa-Moya	3/1/1998				
	Casa-Moya	5/1/1998				

Thallium	Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
	Casa-Moya	6/1/1998				
	Casa-Moya	7/22/1998				
	Casa-Moya	8/1/1998				
	Casa-Moya	9/1/1998				
	Dawson 1	6/14/1946		23.7999992		
	Dawson 1	6/7/1947				
	Dawson 2	7/31/1947				
	Delores	7/1/1998				
	Delores	8/1/1998				
	Delores	9/1/1998				
	Eaton	7/31/1947				
	ElW	2/5/1997				
	El Oro	6/11/1981				
	Folcher	6/20/1946				
	Guest House	6/9/1981				
	GWQ-1	5/1/1975				
	GWQ-1	1/20/1981				
	GWQ-1	2/2/1981				
	GWQ-1	3/27/1981	0.16			
-0.005	GWQ-1	6/11/1981	-0.05			
	GWQ-1	6/15/1981	0.12	22		
-0.005	GWQ-1	6/15/1981	0.078			
	GWQ-1	2/25/1982				
	GWQ-1	3/30/1989	-0.1		-0.1	-0.1
	GWQ-1	7/19/1991				
	GWQ-1	3/31/1993	-0.01			
	GWQ-1	5/25/1994	-0.05			
-0.005	GWQ-1	7/21/1994	-0.05			
	GWQ-1	9/1/1995				
	GWQ-1	1/24/1998				
	GWQ-1	2/1/1998				
	GWQ-1	3/1/1998				
	GWQ-1	4/14/1998				
	GWQ-1	5/1/1998				
	GWQ-1	6/1/1998				
	GWQ-1	7/21/1998				

Thallium	Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
	GWQ-1	8/1/1998				
	GWQ-1	9/1/1998				
	GWQ-10	4/6/1981	0.12			
	GWQ-10	8/10/1981	0.23			
	GWQ-10	10/27/1981	0.25			
	GWQ-10	10/30/1981	0.24			
	GWQ-10	11/6/1981	0.28			
	GWQ-10	11/12/1981				
-0.005	GWQ-10	11/13/1981	0.9	19.5		
	GWQ-10	11/17/1981	0.28			
	GWQ-10	11/23/1981	0.37			
	GWQ-10	12/7/1981	0.87			
	GWQ-10	12/15/1981	0.44			
	GWQ-10	12/22/1981	0.35			
	GWQ-10	1/5/1982	0.31			
	GWQ-10	1/18/1982				
	GWQ-10	1/26/1982				
	GWQ-10	2/16/1982				
	GWQ-10	2/22/1982				
	GWQ-10	3/12/1982				
	GWQ-10	4/16/1982				
	GWQ-10	4/26/1982				
	GWQ-10	5/17/1982				
	GWQ-10	6/8/1982				
	GWQ-10	6/14/1982				
	GWQ-10	6/30/1982				
	GWQ-10	7/26/1982				
	GWQ-10	7/18/1982				
	GWQ-10	9/2/1982				
	GWQ-10	9/14/1982				
	GWQ-10	10/18/1982				
	GWQ-10	11/11/1982				
	GWQ-10	12/23/1982				
	GWQ-10	12/28/1982				
	GWQ-10	2/21/1983				
	GWQ-10	5/6/1983				

Thallium	Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
	GWQ-10	5/13/1983				
	GWQ-10	6/2/1983				
	GWQ-10	7/5/1983				
	GWQ-10	8/9/1983				
	GWQ-10	8/25/83				
	GWQ-10	10/20/1983				
	GWQ-10	11/1/1983				
	GWQ-10	12/7/1983				
	GWQ-10	1/28/1984				
	GWQ-10	2/13/1984				
	GWQ-10	3/1/1984				
	GWQ-10	3/16/1984				
	GWQ-10	4/18/1984				
	GWQ-10	5/22/1984				
	GWQ-10	5/30/1984				
	GWQ-10	6/26/1984				
	GWQ-10	7/25/1984				
	GWQ-10	8/27/1984				
	GWQ-10	9/12/1984				
	GWQ-10	9/21/1984				
	GWQ-10	11/19/1984				
	GWQ-10	11/27/1984				
	GWQ-10	12/17/1984				
	GWQ-10	5/17/1985				

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
GWQ-10	23.4	Skute Stone Arroyo		-59	GWQ-10-59	11/13/1985	CFP	
GWQ-10	21.2	Skute Stone Arroyo		-60	GWQ-10-60	5/23/1986	CFP	
GWQ-10	20.7	Skute Stone Arroyo		-61	GWQ-10-61	10/8/1986	CFP	
GWQ-10	16	Skute Stone Arroyo		-62	GWQ-10-62	3/4/1987	EID	
GWQ-10		Skute Stone Arroyo		-63	GWQ-10-63	5/25/1987		
GWQ-10	15.5	Skute Stone Arroyo		-64	GWQ-10-64	1/12/1988	EID	
GWQ-10		Skute Stone Arroyo		-65	GWQ-10-65	4/4/1988	Irwin	lab pH
GWQ-10	20.75	Skute Stone Arroyo		-66	GWQ-10-66	8/23/1988	Irwin	lab pH
GWQ-10	17.58	Skute Stone Arroyo		-67	GWQ-10-67	2/9/1989	Irwin	lab pH
GWQ-10	17.2	Skute Stone Arroyo		-68	GWQ-10-68	6/1/1989	Irwin	lab pH
GWQ-10	17.5	Skute Stone Arroyo		-69	GWQ-10-69	11/30/1989	Irwin	lab pH
GWQ-10	17.5	Skute Stone Arroyo		-70	GWQ-10-70	11/14/1990	GE	
GWQ-10	21.2	Skute Stone Arroyo		-71	GWQ-10-71	2/11/1991	SHB	
GWQ-10	15.31	Skute Stone Arroyo		-72	GWQ-10-72	7/19/1991	GE	lab pH
GWQ-10	16.58	Skute Stone Arroyo		-73	GWQ-10-73	8/29/1991	Irwin	lab pH
GWQ-10	14.6	Skute Stone Arroyo		-74	GWQ-10-74	11/26/1991	Hood	lab pH
GWQ-10	15	Skute Stone Arroyo		-75	GWQ-10-75	3/15/1992	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-76	GWQ-10-76	5/25/1992	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-77	GWQ-10-77	7/16/1992	Irwin	lab pH
GWQ-10	14.5	Skute Stone Arroyo		-78	GWQ-10-78	10/8/1992	Irwin	lab pH
GWQ-10	15.58	Skute Stone Arroyo		-79	GWQ-10-79	11/27/1992	Hood	lab pH
GWQ-10		Skute Stone Arroyo		-80	GWQ-10-80	12/15/1992	Irwin	lab pH
GWQ-10	15.42	Skute Stone Arroyo		-81	GWQ-10-81	2/25/1993	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-82	GWQ-10-82	3/30/1993	JWS	
GWQ-10		Skute Stone Arroyo		-83	GWQ-10-83	9/28/1993	Irwin	lab pH
GWQ-10	16.7	Skute Stone Arroyo		-84	GWQ-10-84	5/26/1994	SRK	
GWQ-10		Skute Stone Arroyo		-85	GWQ-10-85	6/23/1994	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-86	GWQ-10-86	7/23/1994	SRK	
GWQ-10		Skute Stone Arroyo		-87	GWQ-10-87	9/22/1994	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-88	GWQ-10-88	1/29/1995	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-89	GWQ-10-89	3/29/1995	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-90	GWQ-10-90	3/29/1995	Irwin	lab pH
GWQ-10	19.58	Skute Stone Arroyo		-91	GWQ-10-91	6/27/1995	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-92	GWQ-10-92	9/21/1995	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-93	GWQ-10-93	1/10/1996	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-94	GWQ-10-94	4/3/1996	Irwin	lab pH

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
GWQ-10		Skute Stone Arroyo		-95	GWQ-10-95	6/1/1996		
GWQ-10		Skute Stone Arroyo		-96	GWQ-10-96	9/25/1996	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-97	GWQ-10-97	1/15/1997	Irwin	lab pH
GWQ-10		Skute Stone Arroyo		-98	GWQ-10-98	4/1/1997		
GWQ-10		Skute Stone Arroyo		-99	GWQ-10-99	7/1/1997		
GWQ-10		Skute Stone Arroyo		-100	GWQ-10-100	8/1/1997		
GWQ-10		Skute Stone Arroyo		-101	GWQ-10-101	10/1/1997		
GWQ-10		Skute Stone Arroyo		-102	GWQ-10-102	10/1/1997		
GWQ-10	22.1	Skute Stone Arroyo		-103	GWQ-10-103	1/15/1998	Irwin	
GWQ-10	22.25	Skute Stone Arroyo		-104	GWQ-10-104	4/9/1998	Irwin	
GWQ-10	22.42	Skute Stone Arroyo		-105	GWQ-10-105	7/13/1998	Irwin	
GWQ-10		Skute Stone Arroyo		-106	GWQ-10-106	10/15/1998	Goff	
GWQ-11	34.83	Skute Stone Arroyo		-1	GWQ-11-1	8/10/1981	QMC	
GWQ-11		Skute Stone Arroyo		-2	GWQ-11-2	10/27/1981	QMC	
GWQ-11		Skute Stone Arroyo		-3	GWQ-11-3	10/30/1981		
GWQ-11	34.85	Skute Stone Arroyo		-4	GWQ-11-4	11/6/1981	QMC	
GWQ-11	34.82	Skute Stone Arroyo		-5	GWQ-11-5	11/13/1981	EID	
GWQ-11	34.17	Skute Stone Arroyo		-6	GWQ-11-6	11/17/1981	QMC	
GWQ-11	36.02	Skute Stone Arroyo		-7	GWQ-11-7	11/23/1981	QMC	
GWQ-11	34.75	Skute Stone Arroyo		-8	GWQ-11-8	12/7/1981	QMC	
GWQ-11	35.02	Skute Stone Arroyo		-9	GWQ-11-9	12/15/1981	QMC	
GWQ-11	35.02	Skute Stone Arroyo		-10	GWQ-11-10	12/22/1981	QMC	
GWQ-11	34.74	Skute Stone Arroyo		-11	GWQ-11-11	1/5/1982	QMC	
GWQ-11	36.67	Skute Stone Arroyo		-12	GWQ-11-12	1/18/1982	QMC	
GWQ-11	36.66	Skute Stone Arroyo		-13	GWQ-11-13	1/26/1982	QMC	
GWQ-11	34.92	Skute Stone Arroyo		-14	GWQ-11-14	2/16/1982	QMC	
GWQ-11	34.91	Skute Stone Arroyo		-15	GWQ-11-15	2/22/1982	QMC	
GWQ-11	35.17	Skute Stone Arroyo		-16	GWQ-11-16	3/12/1982	QMC	
GWQ-11	28.67	Skute Stone Arroyo		-17	GWQ-11-17	4/16/1982	QMC	
GWQ-11	28.16	Skute Stone Arroyo		-18	GWQ-11-18	4/26/1982	QMC	
GWQ-11	23.8	Skute Stone Arroyo		-19	GWQ-11-19	5/17/1982	QMC	
GWQ-11	19.7	Skute Stone Arroyo		-20	GWQ-11-20	6/8/1982	QMC	
GWQ-11	19.67	Skute Stone Arroyo		-21	GWQ-11-21	6/14/1982	QMC	
GWQ-11	15.1	Skute Stone Arroyo		-22	GWQ-11-22	6/30/1982	QMC	
GWQ-11	15.08	Skute Stone Arroyo		-23	GWQ-11-23	7/26/1982	QMC	
GWQ-11	13.2	Skute Stone Arroyo		-24	GWQ-11-24	8/18/1982	QMC	

Well Name	Water Depth	USGS Quad	Well Depth	Sample ID	Date	Sampler	Notes
GWQ-11	12.3	Skute Stone Arroyo	-25	GWQ-11-25	9/2/1982	EID	
GWQ-11	11.8	Skute Stone Arroyo	-26	GWQ-11-26	9/14/1982	QMC	
GWQ-11	11.1	Skute Stone Arroyo	-27	GWQ-11-27	10/18/1982	QMC	
GWQ-11	11.2	Skute Stone Arroyo	-28	GWQ-11-28	11/11/1982	QMC	
GWQ-11	11.2	Skute Stone Arroyo	-29	GWQ-11-29	12/23/1982	QMC	
GWQ-11	11.2	Skute Stone Arroyo	-30	GWQ-11-30	12/28/1982	QMC	
GWQ-11	11.4	Skute Stone Arroyo	-31	GWQ-11-31	2/21/1983	QMC	
GWQ-11	12.5	Skute Stone Arroyo	-32	GWQ-11-32	5/6/1983	QMC	
GWQ-11	12.5	Skute Stone Arroyo	-33	GWQ-11-33	5/13/1983	QMC	
GWQ-11	12.9	Skute Stone Arroyo	-34	GWQ-11-34	6/2/1983	QMC	
GWQ-11	13.6	Skute Stone Arroyo	-35	GWQ-11-35	7/5/1983	QMC	
GWQ-11	14.1	Skute Stone Arroyo	-36	GWQ-11-36	8/9/1983	QMC	
GWQ-11	14.1	Skute Stone Arroyo	-37	GWQ-11-37	8/25/1983	QMC	
GWQ-11	14.6	Skute Stone Arroyo	-38	GWQ-11-38	10/20/1983	QMC	
GWQ-11	14.6	Skute Stone Arroyo	-39	GWQ-11-39	11/1/1983	QMC	
GWQ-11	14.3	Skute Stone Arroyo	-40	GWQ-11-40	12/7/1984	QMC	
GWQ-11	14.8	Skute Stone Arroyo	-41	GWQ-11-41	1/28/1984	QMC	
GWQ-11	14.9	Skute Stone Arroyo	-42	GWQ-11-42	2/13/1984	QMC	
GWQ-11	14.9	Skute Stone Arroyo	-43	GWQ-11-43	3/1/1984	CFP	
GWQ-11	14.9	Skute Stone Arroyo	-44	GWQ-11-44	3/16/1984	CFP	
GWQ-11	15.2	Skute Stone Arroyo	-45	GWQ-11-45	4/18/1984	CFP	
GWQ-11	15.5	Skute Stone Arroyo	-46	GWQ-11-46	5/22/1984	CFP	
GWQ-11	15.5	Skute Stone Arroyo	-47	GWQ-11-47	5/30/1984	CFP	
GWQ-11	15.8	Skute Stone Arroyo	-48	GWQ-11-48	6/26/1984	CFP	
GWQ-11	15.9	Skute Stone Arroyo	-49	GWQ-11-49	7/25/1984	CFP	
GWQ-11	16	Skute Stone Arroyo	-50	GWQ-11-50	8/27/1984	CFP	
GWQ-11	16	Skute Stone Arroyo	-51	GWQ-11-51	9/12/1984	CFP	
GWQ-11	16	Skute Stone Arroyo	-52	GWQ-11-52	9/21/1984	CFP	
GWQ-11	16.3	Skute Stone Arroyo	-53	GWQ-11-53	11/19/1984	CFP	
GWQ-11	16.3	Skute Stone Arroyo	-54	GWQ-11-54	11/27/1984	CFP	
GWQ-11	16.4	Skute Stone Arroyo	-55	GWQ-11-55	12/17/1984	CFP	
GWQ-11	16.4	Skute Stone Arroyo	-56	GWQ-11-56	5/17/1985	CFP	
GWQ-11	16.2	Skute Stone Arroyo	-57	GWQ-11-57	11/13/1985	CFP	
GWQ-11	16.1	Skute Stone Arroyo	-58	GWQ-11-58	5/23/1986	CFP	
GWQ-11	16.1	Skute Stone Arroyo	-59	GWQ-11-59	10/8/1986	CFP	
GWQ-11	14.54	Skute Stone Arroyo	-60	GWQ-11-60	3/4/1987	EID	

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
GWQ-11		Skute Stone Arroyo		-61	GWQ-11-61	5/25/1987		
GWQ-11	15	Skute Stone Arroyo		-62	GWQ-11-62	1/12/1988	EID	
GWQ-11		Skute Stone Arroyo		-63	GWQ-11-63	4/4/1988	Irwin	
GWQ-11	18.2	Skute Stone Arroyo		-64	GWQ-11-64	8/23/1988	Irwin	
GWQ-11	15.66	Skute Stone Arroyo		-65	GWQ-11-65	2/9/1989	Irwin	
GWQ-11	16.25	Skute Stone Arroyo		-66	GWQ-11-66	6/1/1989	Irwin	
GWQ-11	16.25	Skute Stone Arroyo		-67	GWQ-11-67	11/30/1989	Irwin	
GWQ-11	15.75	Skute Stone Arroyo		-68	GWQ-11-68	11/14/1990	GE	
GWQ-11		Skute Stone Arroyo		-69	GWQ-11-69	2/11/1991	SHB	
GWQ-11	17.9	Skute Stone Arroyo		-70	GWQ-11-70	7/19/1991	GE	
GWQ-11	17.42	Skute Stone Arroyo		-71	GWQ-11-71	8/29/1991	Irwin	lab pH
GWQ-11	16	Skute Stone Arroyo		-72	GWQ-11-72	11/26/1991	Hood	lab pH
GWQ-11	16	Skute Stone Arroyo		-73	GWQ-11-73	3/15/1992	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-74	GWQ-11-74	5/25/1992	Irwin	lab pH
GWQ-11	15.75	Skute Stone Arroyo		-75	GWQ-11-75	10/8/1992	Irwin	lab pH
GWQ-11	15.25	Skute Stone Arroyo		-76	GWQ-11-76	11/27/1992	Hood	lab pH
GWQ-11		Skute Stone Arroyo		-77	GWQ-11-77	12/15/1992	Irwin	lab pH
GWQ-11	16.17	Skute Stone Arroyo		-78	GWQ-11-78	2/25/1993	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-79	GWQ-11-79	3/30/1993	JWS	
GWQ-11		Skute Stone Arroyo		-80	GWQ-11-80	9/28/1993	Irwin	lab pH
GWQ-11	15.95	Skute Stone Arroyo		-81	GWQ-11-81	5/25/1994	SRK	
GWQ-11		Skute Stone Arroyo		-82	GWQ-11-82	6/23/1994	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-83	GWQ-11-83	7/22/1994	SRK	
GWQ-11		Skute Stone Arroyo		-84	GWQ-11-84	9/22/1994	Irwin	lab pH

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-10	11/13/1985	32.96325	107.49677	266630	3649790	13	5200	FALSE	42	149
GWQ-10	5/23/1986	32.96325	107.49677	266630	3649790	13	5200	FALSE	58	151
GWQ-10	10/8/1986	32.96325	107.49677	266630	3649790	13	5200	FALSE	54	137
GWQ-10	3/4/1987	32.96325	107.49677	266630	3649790	13	5200	TRUE	59	150
GWQ-10	5/25/1987	32.96325	107.49677	266630	3649790	13	5200	FALSE		154.2
GWQ-10	1/12/1988	32.96325	107.49677	266630	3649790	13	5200	TRUE	78.8	173
GWQ-10	4/4/1988	32.96325	107.49677	266630	3649790	13	5200	FALSE	65	170.6
GWQ-10	8/23/1988	32.96325	107.49677	266630	3649790	13	5200	FALSE	63	179.2
GWQ-10	2/9/1989	32.96325	107.49677	266630	3649790	13	5200	FALSE	76.3	180.5
GWQ-10	6/1/1989	32.96325	107.49677	266630	3649790	13	5200	FALSE	67.9	162.7
GWQ-10	11/30/1989	32.96325	107.49677	266630	3649790	13	5200	FALSE	72.1	161.7
GWQ-10	11/14/1990	32.96325	107.49677	266630	3649790	13	5200	FALSE	92.7	178
GWQ-10	2/11/1991	32.96325	107.49677	266630	3649790	13	5200	FALSE	78.1	213.5
GWQ-10	7/19/1991	32.96325	107.49677	266630	3649790	13	5200	TRUE	83.3	166.6
GWQ-10	8/29/1991	32.96325	107.49677	266630	3649790	13	5200	FALSE	84.7	191.7
GWQ-10	11/26/1991	32.96325	107.49677	266630	3649790	13	5200	FALSE	58.2	171.2
GWQ-10	3/15/1992	32.96325	107.49677	266630	3649790	13	5200	FALSE	82.5	191.6
GWQ-10	5/25/1992	32.96325	107.49677	266630	3649790	13	5200	FALSE	83.8	169.2
GWQ-10	7/16/1992	32.96325	107.49677	266630	3649790	13	5200	FALSE	76.3	166.6
GWQ-10	10/8/1992	32.96325	107.49677	266630	3649790	13	5200	FALSE	83.4	161.4
GWQ-10	11/27/1992	32.96325	107.49677	266630	3649790	13	5200	FALSE	80.3	174.4
GWQ-10	12/15/1992	32.96325	107.49677	266630	3649790	13	5200	FALSE	90.9	168.7
GWQ-10	2/25/1993	32.96325	107.49677	266630	3649790	13	5200	FALSE	95.5	175.8
GWQ-10	3/30/1993	32.96325	107.49677	266630	3649790	13	5200	FALSE	94	183
GWQ-10	9/28/1993	32.96325	107.49677	266630	3649790	13	5200	FALSE	96	142.6
GWQ-10	5/26/1994	32.96325	107.49677	266630	3649790	13	5200	FALSE	92	175
GWQ-10	6/23/1994	32.96325	107.49677	266630	3649790	13	5200	FALSE	103.6	191.6
GWQ-10	7/23/1994	32.96325	107.49677	266630	3649790	13	5200	TRUE	98	184
GWQ-10	9/22/1994	32.96325	107.49677	266630	3649790	13	5200	FALSE	89.2	155.8
GWQ-10	1/29/1995	32.96325	107.49677	266630	3649790	13	5200	FALSE	87.5	65.7
GWQ-10	3/29/1995	32.96325	107.49677	266630	3649790	13	5200	FALSE	84.9	176
GWQ-10	3/29/1995	32.96325	107.49677	266630	3649790	13	5200	FALSE	84.9	176
GWQ-10	6/27/1995	32.96325	107.49677	266630	3649790	13	5200	FALSE	84.8	168.7
GWQ-10	9/21/1995	32.96325	107.49677	266630	3649790	13	5200	FALSE	91.3	187.4
GWQ-10	1/10/1996	32.96325	107.49677	266630	3649790	13	5200	FALSE	97.7	197.5
GWQ-10	4/3/1996	32.96325	107.49677	266630	3649790	13	5200	FALSE	97.4	218.2

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-10	6/1/1996	32.96325	107.49677	266630	3649790	13	5200		94.2	190
GWQ-10	9/25/1996	32.96325	107.49677	266630	3649790	13	5200	TRUE	86.2	190.8
GWQ-10	1/15/1997	32.96325	107.49677	266630	3649790	13	5200	TRUE	91	203.67
GWQ-10	4/1/1997	32.96325	107.49677	266630	3649790	13	5200	TRUE	94.9	205
GWQ-10	7/1/1997	32.96325	107.49677	266630	3649790	13	5200	TRUE	91	197
GWQ-10	8/1/1997	32.96325	107.49677	266630	3649790	13	5200	TRUE	94.5	
GWQ-10	10/1/1997	32.96325	107.49677	266630	3649790	13	5200	TRUE	95	193
GWQ-10	10/1/1997	32.96325	107.49677	266630	3649790	13	5200	TRUE	17.9	19
GWQ-10	1/15/1998	32.96325	107.49677	266630	3649790	13	5200	TRUE	86	201
GWQ-10	4/9/1998	32.96325	107.49677	266630	3649790	13	5200	TRUE	92.2	206
GWQ-10	7/13/1998	32.96325	107.49677	266630	3649790	13	5200	TRUE	85	209
GWQ-10	10/15/1998	32.96325	107.49677	266630	3649790	13	5200	TRUE	17.9	19
GWQ-11	8/10/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	37	123
GWQ-11	10/27/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	36	183
GWQ-11	10/30/1981	32.96027	107.49667	266632	3649459	13	5183	FALSE	39.1	101
GWQ-11	11/6/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	36	168
GWQ-11	11/13/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	37.64	155.6
GWQ-11	11/17/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	36	165
GWQ-11	11/23/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	36	181
GWQ-11	12/7/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	56	184
GWQ-11	12/15/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	38	191
GWQ-11	12/22/1981	32.96027	107.49667	266632	3649459	13	5183	TRUE	40	185
GWQ-11	1/5/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	40	174
GWQ-11	1/18/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	1/26/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	40	168
GWQ-11	2/16/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	2/22/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	38	168
GWQ-11	3/12/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	4/16/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	4/26/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	40	165
GWQ-11	5/17/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	44	185
GWQ-11	6/8/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	44	185
GWQ-11	6/14/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	6/30/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	44	198
GWQ-11	7/26/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	8/18/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-11	9/2/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	52.22	247.6
GWQ-11	9/14/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	10/18/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	11/11/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	12/23/1982	32.96027	107.49667	266632	3649459	13	5183	TRUE	52	235
GWQ-11	12/28/1982	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	2/21/1983	32.96027	107.49667	266632	3649459	13	5183	TRUE	44	218
GWQ-11	5/6/1983	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	5/13/1983	32.96027	107.49667	266632	3649459	13	5183	TRUE	44	206
GWQ-11	6/2/1983	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	7/5/1983	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	8/9/1983	32.96027	107.49667	266632	3649459	13	5183	TRUE	46	168
GWQ-11	8/25/1983	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	10/20/1983	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	11/1/1983	32.96027	107.49667	266632	3649459	13	5183	TRUE	46	174
GWQ-11	12/7/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	1/28/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	2/13/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	3/1/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	3/16/1984	32.96027	107.49667	266632	3649459	13	5183	TRUE	52	184
GWQ-11	4/18/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	5/22/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	5/30/1984	32.96027	107.49667	266632	3649459	13	5183	TRUE	58	195
GWQ-11	6/26/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	7/25/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	8/27/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	9/12/1984	32.96027	107.49667	266632	3649459	13	5183	TRUE	60	181
GWQ-11	9/21/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	11/19/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	11/27/1984	32.96027	107.49667	266632	3649459	13	5183	TRUE	60	165
GWQ-11	12/17/1984	32.96027	107.49667	266632	3649459	13	5183	FALSE		
GWQ-11	5/17/1985	32.96027	107.49667	266632	3649459	13	5183	FALSE	64	197
GWQ-11	11/13/1985	32.96027	107.49667	266632	3649459	13	5183	FALSE	62	183
GWQ-11	5/23/1986	32.96027	107.49667	266632	3649459	13	5183	FALSE	66	210
GWQ-11	10/8/1986	32.96027	107.49667	266632	3649459	13	5183	FALSE	70	200
GWQ-11	3/4/1987	32.96027	107.49667	266632	3649459	13	5183	TRUE	69	200

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-11	5/25/1987	32.96027	107.49667	266632	3649459	13	5183	FALSE		230
GWQ-11	1/12/1988	32.96027	107.49667	266632	3649459	13	5183	TRUE	77.1	253
GWQ-11	4/4/1988	32.96027	107.49667	266632	3649459	13	5183	FALSE	74.6	277.7
GWQ-11	8/23/1988	32.96027	107.49667	266632	3649459	13	5183	FALSE	73	293.8
GWQ-11	2/9/1989	32.96027	107.49667	266632	3649459	13	5183	FALSE	77	258.4
GWQ-11	6/1/1989	32.96027	107.49667	266632	3649459	13	5183	FALSE	69.7	238.2
GWQ-11	11/30/1989	32.96027	107.49667	266632	3649459	13	5183	FALSE	79.8	254.3
GWQ-11	11/14/1990	32.96027	107.49667	266632	3649459	13	5183	FALSE	104.4	257.4
GWQ-11	2/11/1991	32.96027	107.49667	266632	3649459	13	5183	FALSE	88.9	233.4
GWQ-11	7/19/1991	32.96027	107.49667	266632	3649459	13	5183	TRUE	89.7	210.2
GWQ-11	8/29/1991	32.96027	107.49667	266632	3649459	13	5183	FALSE	92.6	278.6
GWQ-11	11/26/1991	32.96027	107.49667	266632	3649459	13	5183	FALSE	89.3	240.7
GWQ-11	3/15/1992	32.96027	107.49667	266632	3649459	13	5183	FALSE	65.1	260.2
GWQ-11	5/25/1992	32.96027	107.49667	266632	3649459	13	5183	FALSE	96.2	258.1
GWQ-11	10/8/1992	32.96027	107.49667	266632	3649459	13	5183	FALSE	96	226.9
GWQ-11	11/27/1992	32.96027	107.49667	266632	3649459	13	5183	FALSE	96	248.4
GWQ-11	12/15/1992	32.96027	107.49667	266632	3649459	13	5183	FALSE	98.1	220
GWQ-11	2/25/1993	32.96027	107.49667	266632	3649459	13	5183	FALSE	104	273.3
GWQ-11	3/30/1993	32.96027	107.49667	266632	3649459	13	5183	FALSE	104	271
GWQ-11	9/28/1993	32.96027	107.49667	266632	3649459	13	5183	FALSE	105.6	207.7
GWQ-11	5/25/1994	32.96027	107.49667	266632	3649459	13	5183	FALSE	110	260
GWQ-11	6/23/1994	32.96027	107.49667	266632	3649459	13	5183	FALSE	117.2	274.6
GWQ-11	7/22/1994	32.96027	107.49667	266632	3649459	13	5183	TRUE	116	272
GWQ-11	9/22/1994	32.96027	107.49667	266632	3649459	13	5183	FALSE	112.3	234.5

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-10	11/13/1985	7.7	500								
GWQ-10	5/23/1986	7.9	560								
GWQ-10	10/8/1986	7.5	550								
GWQ-10	3/4/1987		568		256	740			-0.1	0.9	
GWQ-10	5/25/1987										
GWQ-10	1/12/1988		648		243				-0.1		
GWQ-10	4/4/1988		552								
GWQ-10	8/23/1988		692								
GWQ-10	2/9/1989		618								
GWQ-10	6/1/1989		604								
GWQ-10	11/30/1989		620								
GWQ-10	11/14/1990		635								
GWQ-10	2/11/1991		696								-0.001
GWQ-10	7/19/1991	8.05	645	198	241.6	975	0.51	3.88			0.002
GWQ-10	8/29/1991	7.44	665								
GWQ-10	11/26/1991	7.46	648								
GWQ-10	3/15/1992	7.85	641								
GWQ-10	5/25/1992	7.41	621								
GWQ-10	7/16/1992	7.51	626								
GWQ-10	10/8/1992	7.43	659								
GWQ-10	11/27/1992	7.89	654								
GWQ-10	12/15/1992	7.48	582								
GWQ-10	2/25/1993	7.39	620								
GWQ-10	3/30/1993	7.8	642		254	1020	0.52	3.9	-0.1		-0.005
GWQ-10	9/28/1993	7.7	693								
GWQ-10	5/26/1994	7.82	1000		232	1050	0.51	3.5	0.85	-0.005	-0.005
GWQ-10	6/23/1994	7.97	671								
GWQ-10	7/23/1994	7.97	696		238	1050	0.49	3.5	-0.05	-0.005	-0.005
GWQ-10	9/22/1994	7.45	668								
GWQ-10	1/29/1995	7.52	672								
GWQ-10	3/29/1995	7.67	62								
GWQ-10	3/29/1995	7.67	622								
GWQ-10	6/27/1995	7.29	677								
GWQ-10	9/21/1995	7.42	693								
GWQ-10	1/10/1996	7.29	654								
GWQ-10	4/3/1996	6.95	628								

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-10	6/1/1996	7.29	637								
GWQ-10	9/25/1996	7.56	679								
GWQ-10	1/15/1997	7.59	746								
GWQ-10	4/1/1997		659				0.4				
GWQ-10	7/1/1997	7.34	689								
GWQ-10	8/1/1997	7.23	683				0.6				
GWQ-10	10/1/1997	7.52	662								
GWQ-10	10/1/1997	7.57	304					-0.05			
GWQ-10	1/15/1998	7.45	637			1090	0.56	3.3			
GWQ-10	4/9/1998		674			1200	0.56	3.8			
GWQ-10	7/13/1998		661			973	0.58	3.5			
GWQ-10	10/15/1998	7.57	304			551		-0.05			
GWQ-11	8/10/1981	7.38	612		237		0.9	1.02	-0.25		-0.004
GWQ-11	10/27/1981	8.1	550				1	0.7	-0.01		-0.01
GWQ-11	10/30/1981	8.4	536				0.96	0.61	-0.25		-0.005
GWQ-11	11/6/1981	8.1	520				1	1.5	-0.01		-0.01
GWQ-11	11/13/1981	7.7	544		241.1	700	0.99	1.33	-0.25		-0.005
GWQ-11	11/17/1981	8	520				1	1.3	-0.01		-0.01
GWQ-11	11/23/1981	7.8	570				0.9	1.7	-0.01		-0.01
GWQ-11	12/7/1981	7.9	560				0.9	1.6	-0.01		-0.01
GWQ-11	12/15/1981	7.9	570				1	1.5	-0.01		-0.01
GWQ-11	12/22/1981	8	530				0.5	1.9	-0.01		-0.01
GWQ-11	1/5/1982	7.5	480				1	2.5	-0.01		-0.01
GWQ-11	1/18/1982										
GWQ-11	1/26/1982	7.9	500				1	1.7			
GWQ-11	2/16/1982										
GWQ-11	2/22/1982	7.7	510				0.9	1.4			
GWQ-11	3/12/1982										
GWQ-11	4/16/1982										
GWQ-11	4/26/1982	7.6	510				0.8	1.3			
GWQ-11	5/17/1982	7.8	510				0.8	1.9			
GWQ-11	6/8/1982	7.9	530				0.8	1.7			
GWQ-11	6/14/1982										
GWQ-11	6/30/1982	7.9	590								
GWQ-11	7/26/1982										
GWQ-11	8/18/1982										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-11	9/2/1982	7.3	700		226	940	0.78	1.94			
GWQ-11	9/14/1982										
GWQ-11	10/18/1982										
GWQ-11	11/11/1982										
GWQ-11	12/23/1982	8.5	650				0.8	1.6			
GWQ-11	12/28/1982										
GWQ-11	2/21/1983	8	600				0.8	1.7			
GWQ-11	5/6/1983										
GWQ-11	5/13/1983	8.1	570				0.8	1.9			
GWQ-11	6/2/1983										
GWQ-11	7/5/1983										
GWQ-11	8/9/1983	7.9	580				0.8	2			
GWQ-11	8/25/1983										
GWQ-11	10/20/1983										
GWQ-11	11/1/1983	8	580				0.8	4.8			
GWQ-11	12/7/1984										
GWQ-11	1/28/1984										
GWQ-11	2/13/1984										
GWQ-11	3/1/1984										
GWQ-11	3/16/1984	8.3	540				0.6	3.8			
GWQ-11	4/18/1984										
GWQ-11	5/22/1984										
GWQ-11	5/30/1984	7.5	550				0.8	1.9			
GWQ-11	6/26/1984										
GWQ-11	7/25/1984										
GWQ-11	8/27/1984										
GWQ-11	9/12/1984	7.9	590				0.8	2.3			
GWQ-11	9/21/1984										
GWQ-11	11/19/1984										
GWQ-11	11/27/1984	7.7	570				0.8	2.3			
GWQ-11	12/17/1984										
GWQ-11	5/17/1985	7.8	640								
GWQ-11	11/13/1985	7.7	600								
GWQ-11	5/23/1986	7.8	650								
GWQ-11	10/8/1986	7.6	560								
GWQ-11	3/4/1987	6.7	696		220	820			-0.1	1.1	

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-11	5/25/1987										
GWQ-11	1/12/1988		718		214				-0.1		
GWQ-11	4/4/1988		694								
GWQ-11	8/23/1988		772								
GWQ-11	2/9/1989		730								
GWQ-11	6/1/1989		708								
GWQ-11	11/30/1989		732								
GWQ-11	11/14/1990		746								
GWQ-11	2/11/1991		790								-0.001
GWQ-11	7/19/1991	7.36	785	181	220.9	1100	0.74	3.93			0.004
GWQ-11	8/29/1991	7.46	771								
GWQ-11	11/26/1991	7.29	770								
GWQ-11	3/15/1992	7.91	765								
GWQ-11	5/25/1992	7.45	761								
GWQ-11	10/8/1992	7.42	755								
GWQ-11	11/27/1992	7.85	763								
GWQ-11	12/15/1992	7.59	741								
GWQ-11	2/25/1993	7.64	762								
GWQ-11	3/30/1993	7.7	776		227	1170	0.52	4.1	0.2		-0.005
GWQ-11	9/28/1993	7.57	800								
GWQ-11	5/25/1994	7.88	820		199	1130	0.72	3.8	0.14	-0.005	-0.005
GWQ-11	6/23/1994	7.42	802								
GWQ-11	7/22/1994	7.7	808		207	1210	0.7	3.8	-0.054	0.0055	-0.005
GWQ-11	9/22/1994	7.37	816								

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-10	11/13/1985										
GWQ-10	5/23/1986										
GWQ-10	10/8/1986										
GWQ-10	3/4/1987	-0.1	-0.1	-0.1	-0.1	90	-0.1	-0.05	-0.1	-0.1	-0.1
GWQ-10	5/25/1987	-0.1	-0.1	-0.1	-0.1						
GWQ-10	1/12/1988	-0.1	-0.1	-0.1	-0.1	116	-0.1	-0.05	-0.1	-0.1	-0.1
GWQ-10	4/4/1988										
GWQ-10	8/23/1988										
GWQ-10	2/9/1989										
GWQ-10	6/1/1989										
GWQ-10	11/30/1989										
GWQ-10	11/14/1990										
GWQ-10	2/11/1991										
GWQ-10	7/19/1991		0.02		-0.005	106.3	-0.02			0.07	-0.005
GWQ-10	8/29/1991										
GWQ-10	11/26/1991										
GWQ-10	3/15/1992										
GWQ-10	5/25/1992										
GWQ-10	7/16/1992										
GWQ-10	10/8/1992										
GWQ-10	11/27/1992										
GWQ-10	12/15/1992										
GWQ-10	2/25/1993										
GWQ-10	3/30/1993	0.04	-0.5		-0.002	104	-0.02	-0.05	-0.01	-0.05	-0.02
GWQ-10	9/28/1993										
GWQ-10	5/26/1994		-0.1		-0.0005	100	-0.025		0.026	1.1	-0.005
GWQ-10	6/23/1994										
GWQ-10	7/23/1994	-0.1	-0.1	-0.002	-0.0005	110	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-10	9/22/1994										
GWQ-10	1/29/1995										
GWQ-10	3/29/1995										
GWQ-10	3/29/1995										
GWQ-10	6/27/1995										
GWQ-10	9/21/1995										
GWQ-10	1/10/1996										
GWQ-10	4/3/1996										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-10	6/1/1996										
GWQ-10	9/25/1996										
GWQ-10	1/15/1997										
GWQ-10	4/1/1997								-0.005	0.15	
GWQ-10	7/1/1997										
GWQ-10	8/1/1997										
GWQ-10	10/1/1997										
GWQ-10	10/1/1997								-0.005	-0.05	
GWQ-10	1/15/1998								-0.005	0.05	
GWQ-10	4/9/1998								-0.005	-0.05	
GWQ-10	7/13/1998								-0.005	0.09	
GWQ-10	10/15/1998								-0.005	-0.05	
GWQ-11	8/10/1981	0.092	-1		-0.01	68.3	-0.05	-0.05	-0.05	1.14	-0.05
GWQ-11	10/27/1981	-0.01	-0.2		-0.005	72	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-11	10/30/1981	0.55	-1		-0.01		-0.05	-0.05	-0.05	-0.1	-0.05
GWQ-11	11/6/1981	-0.1	-0.2		-0.005	67	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-11	11/13/1981	0.041	-0.2		0.001	82.6	-0.05				-0.005
GWQ-11	11/17/1981	-0.1	-0.2		-0.005	71	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-11	11/23/1981	-0.1	-0.2		-0.005	67	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-11	12/7/1981	-0.1	-0.2		-0.005	57	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-11	12/15/1981	-0.1	-0.2		-0.005	85	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-11	12/22/1981	-0.1	-0.2		-0.005	82	-0.01	-0.02	-0.05	0.27	-0.02
GWQ-11	1/5/1982	-0.1	-0.2		-0.005	79	-0.01	-0.02	-0.05	0.14	-0.02
GWQ-11	1/18/1982										
GWQ-11	1/26/1982				-0.005				-0.05	-0.1	
GWQ-11	2/16/1982								-0.05		
GWQ-11	2/22/1982				-0.005				-0.05	0.11	
GWQ-11	3/12/1982										
GWQ-11	4/16/1982										
GWQ-11	4/26/1982				-0.005				-0.05	0.36	
GWQ-11	5/17/1982				-0.005				-0.05	0.11	
GWQ-11	6/8/1982				-0.005				-0.05	-0.1	
GWQ-11	6/14/1982										
GWQ-11	6/30/1982								-0.05	0.39	
GWQ-11	7/26/1982										
GWQ-11	8/18/1982										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-11	9/2/1982				-0.001	111.2					
GWQ-11	9/14/1982										
GWQ-11	10/18/1982										
GWQ-11	11/11/1982										
GWQ-11	12/23/1982					-0.005			-0.05	-0.1	
GWQ-11	12/28/1982										
GWQ-11	2/21/1983				-0.005				-0.05	0.38	
GWQ-11	5/6/1983										
GWQ-11	5/13/1983				-0.005				-0.05	-0.1	
GWQ-11	6/2/1983										
GWQ-11	7/5/1983										
GWQ-11	8/9/1983				-0.005				-0.05	-0.1	
GWQ-11	8/25/1983										
GWQ-11	10/20/1983										
GWQ-11	11/1/1983				-0.005				-0.05	-0.1	
GWQ-11	12/7/1984										
GWQ-11	1/28/1984										
GWQ-11	2/13/1984										
GWQ-11	3/1/1984										
GWQ-11	3/16/1984				-0.005				-0.05	-0.1	
GWQ-11	4/18/1984										
GWQ-11	5/22/1984										
GWQ-11	5/30/1984				-0.005				-0.05	-0.1	
GWQ-11	6/26/1984										
GWQ-11	7/25/1984										
GWQ-11	8/27/1984										
GWQ-11	9/12/1984				-0.005				-0.05	-0.1	
GWQ-11	9/21/1984										
GWQ-11	11/19/1984										
GWQ-11	11/27/1984				-0.005				-0.05	-0.1	
GWQ-11	12/17/1984										
GWQ-11	5/17/1985										
GWQ-11	11/13/1985										
GWQ-11	5/23/1986										
GWQ-11	10/8/1986										
GWQ-11	3/4/1987	-0.1	-0.1	-0.1	-0.1	108	-0.1	-0.05	-0.1	-0.1	-0.1

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-11	5/25/1987										
GWQ-11	1/12/1988	-0.1	-0.1	-0.1	-0.1	128	-0.1	-0.05	-0.1	-0.1	-0.1
GWQ-11	4/4/1988										
GWQ-11	8/23/1988										
GWQ-11	2/9/1989										
GWQ-11	6/1/1989										
GWQ-11	11/30/1989										
GWQ-11	11/14/1990										
GWQ-11	2/11/1991										
GWQ-11	7/19/1991		0.1		-0.005	122.5	-0.02			-0.05	-0.002
GWQ-11	8/29/1991										
GWQ-11	11/26/1991										
GWQ-11	3/15/1992										
GWQ-11	5/25/1992										
GWQ-11	10/8/1992										
GWQ-11	11/27/1992										
GWQ-11	12/15/1992								0.017		
GWQ-11	2/25/1993										
GWQ-11	3/30/1993	0.04	-0.5		-0.002	126	-0.02	-0.05	-0.01	0.33	-0.02
GWQ-11	9/28/1993										
GWQ-11	5/25/1994		-0.1		-0.0005	120	-0.025		-0.025	0.16	-0.005
GWQ-11	6/23/1994										
GWQ-11	7/22/1994	-0.1	-0.1	-0.002	-0.0005	140	-0.025	-0.05	-0.25	-0.05	-0.005
GWQ-11	9/22/1994										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-10	11/13/1985										
GWQ-10	5/23/1986										
GWQ-10	10/8/1986										
GWQ-10	3/4/1987	20.7	-0.05		-0.1	-0.1	2.34		-0.1	73.6	
GWQ-10	5/25/1987										
GWQ-10	1/12/1988	24	-0.05		-0.1	-0.01	3		-0.1	64	
GWQ-10	4/4/1988										
GWQ-10	8/23/1988										
GWQ-10	2/9/1989										
GWQ-10	6/1/1989										
GWQ-10	11/30/1989										
GWQ-10	11/14/1990										
GWQ-10	2/11/1991										
GWQ-10	7/19/1991	24.1	-0.02	-0.0002			3.9	0.002	-0.02	46.9	
GWQ-10	8/29/1991										
GWQ-10	11/26/1991										
GWQ-10	3/15/1992										
GWQ-10	5/25/1992										
GWQ-10	7/16/1992										
GWQ-10	10/8/1992										
GWQ-10	11/27/1992										
GWQ-10	12/15/1992										
GWQ-10	2/25/1993										
GWQ-10	3/30/1993	27	-0.02	-0.001	-0.02	-0.01	2.3	-0.005	-0.01	71	
GWQ-10	9/28/1993										
GWQ-10	5/26/1994	25	0.059	-0.001		-0.05	3.1	-0.005	-0.025	56	
GWQ-10	6/23/1994										
GWQ-10	7/23/1994	26	-0.03	-0.001	-0.05	-0.05	2.8	-0.005	-0.025	66	-0.005
GWQ-10	9/22/1994										
GWQ-10	1/29/1995										
GWQ-10	3/29/1995										
GWQ-10	3/29/1995										
GWQ-10	6/27/1995										
GWQ-10	9/21/1995										
GWQ-10	1/10/1996										
GWQ-10	4/3/1996										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-10	6/1/1996										
GWQ-10	9/25/1996										
GWQ-10	1/15/1997										
GWQ-10	4/1/1997		-0.02								
GWQ-10	7/1/1997										
GWQ-10	8/1/1997										
GWQ-10	10/1/1997										
GWQ-10	10/1/1997										
GWQ-10	1/15/1998	25.3		-0.0002	-0.05			-0.05			
GWQ-10	4/9/1998		-0.02	-0.0002	-0.05			-0.05			
GWQ-10	7/13/1998		0.06	-0.0002	-0.05			-0.05			
GWQ-10	10/15/1998										
GWQ-11	8/10/1981	13.5	0.45	0.1	-0.1	-0.05	7.88	0.006	-0.02	48.1	
GWQ-11	10/27/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-11	10/30/1981		-0.02	-0.001	-0.1	-0.02		-0.011	-0.02		
GWQ-11	11/6/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-11	11/13/1981	17.2	-0.05	-0.0005	0.12	-0.05	3.9	0.023	-0.001	43.7	
GWQ-11	11/17/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-11	11/23/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-11	12/7/1981		-0.05	0.0064	-0.05	-0.05		-0.005	-0.02		
GWQ-11	12/15/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-11	12/22/1981		0.093	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-11	1/5/1982		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-11	1/18/1982										
GWQ-11	1/26/1982		-0.05	-0.001	-0.1			-0.005			
GWQ-11	2/16/1982										
GWQ-11	2/22/1982		-0.05	-0.001	-0.05			-0.005			
GWQ-11	3/12/1982										
GWQ-11	4/16/1982										
GWQ-11	4/26/1982		-0.05	-0.001	0.05			-0.005			
GWQ-11	5/17/1982		-0.05	-0.001	-0.05			-0.005			
GWQ-11	6/8/1982		-0.05	-0.001	-0.05			-0.005			
GWQ-11	6/14/1982										
GWQ-11	6/30/1982		-0.05	-0.001	-0.05			-0.005			
GWQ-11	7/26/1982										
GWQ-11	8/18/1982										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-11	9/2/1982	27.6	-0.05		-0.01		3.51	-0.005		57.5	
GWQ-11	9/14/1982										
GWQ-11	10/18/1982										
GWQ-11	11/11/1982										
GWQ-11	12/23/1982		-0.05	-0.001	-0.05			-0.005			
GWQ-11	12/28/1982										
GWQ-11	2/21/1983		-0.05	-0.001	-0.05			-0.005			
GWQ-11	5/6/1983										
GWQ-11	5/13/1983		-0.05	-0.001	-0.05			-0.005			
GWQ-11	6/2/1983										
GWQ-11	7/5/1983										
GWQ-11	8/9/1983		-0.05	-0.001	-0.05			-0.005			
GWQ-11	8/25/1983										
GWQ-11	10/20/1983										
GWQ-11	11/1/1983		-0.05	-0.001	-0.05			-0.005			
GWQ-11	12/7/1984										
GWQ-11	1/28/1984										
GWQ-11	2/13/1984										
GWQ-11	3/1/1984										
GWQ-11	3/16/1984		-0.05	-0.001	-0.05			-0.005			
GWQ-11	4/18/1984										
GWQ-11	5/22/1984										
GWQ-11	5/30/1984		-0.05	-0.001	-0.05			-0.005			
GWQ-11	6/26/1984										
GWQ-11	7/25/1984										
GWQ-11	8/27/1984										
GWQ-11	9/12/1984		-0.05	-0.001	-0.05						
GWQ-11	9/21/1984										
GWQ-11	11/19/1984										
GWQ-11	11/27/1984		-0.05	-0.001	-0.05			-0.005			
GWQ-11	12/17/1984										
GWQ-11	5/17/1985										
GWQ-11	11/13/1985										
GWQ-11	5/23/1986										
GWQ-11	10/8/1986										
GWQ-11	3/4/1987	26.1	-0.05		-0.1	-0.1	3.51		-0.1	62.1	

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-11	5/25/1987										
GWQ-11	1/12/1988	31	-0.005		-0.1	-0.1	4		-0.1	63	
GWQ-11	4/4/1988										
GWQ-11	8/23/1988										
GWQ-11	2/9/1989										
GWQ-11	6/1/1989										
GWQ-11	11/30/1989										
GWQ-11	11/14/1990										
GWQ-11	2/11/1991										
GWQ-11	7/19/1991	33.6	-0.02	-0.0002			3.9	0.002	-0.02	40.1	
GWQ-11	8/29/1991										
GWQ-11	11/26/1991										
GWQ-11	3/15/1992										
GWQ-11	5/25/1992										
GWQ-11	10/8/1992										
GWQ-11	11/27/1992										
GWQ-11	12/15/1992										
GWQ-11	2/25/1993										
GWQ-11	3/30/1993	34	0.03	-0.001	-0.02	-0.01	2.9	-0.005	-0.01	68	
GWQ-11	9/28/1993										
GWQ-11	5/25/1994	34	-0.03	-0.001		-0.05	3.5	-0.005	-0.025	55	
GWQ-11	6/23/1994										
GWQ-11	7/22/1994	37	-0.03	-0.001	-0.05	-0.05	3.4	-0.005	-0.025	66	-0.005
GWQ-11	9/22/1994										

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-10	11/13/1985				
GWQ-10	5/23/1986				
GWQ-10	10/8/1986				
GWQ-10	3/4/1987	-0.1	21.5	-0.1	-0.1
GWQ-10	5/25/1987				
GWQ-10	1/12/1988	-0.1		0.2	-0.1
GWQ-10	4/4/1988				
GWQ-10	8/23/1988				
GWQ-10	2/9/1989				
GWQ-10	6/1/1989				
GWQ-10	11/30/1989				
GWQ-10	11/14/1990				
GWQ-10	2/11/1991				
GWQ-10	7/19/1991				
GWQ-10	8/29/1991				
GWQ-10	11/26/1991				
GWQ-10	3/15/1992				
GWQ-10	5/25/1992				
GWQ-10	7/16/1992				
GWQ-10	10/8/1992				
GWQ-10	11/27/1992				
GWQ-10	12/15/1992				
GWQ-10	2/25/1993				
GWQ-10	3/30/1993	0.11			
GWQ-10	9/28/1993				
GWQ-10	5/26/1994	0.55			
GWQ-10	6/23/1994				
GWQ-10	7/23/1994	-0.05			
GWQ-10	9/22/1994				
GWQ-10	1/29/1995				
GWQ-10	3/29/1995				
GWQ-10	3/29/1995				
GWQ-10	6/27/1995				
GWQ-10	9/21/1995				
GWQ-10	1/10/1996				
GWQ-10	4/3/1996				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-10	6/1/1996				
GWQ-10	9/25/1996				
GWQ-10	1/15/1997				
GWQ-10	4/1/1997				
GWQ-10	7/1/1997				
GWQ-10	8/1/1997				
GWQ-10	10/1/1997				
GWQ-10	10/1/1997				
GWQ-10	1/15/1998				
GWQ-10	4/9/1998				
GWQ-10	7/13/1998				
GWQ-10	10/15/1998				
GWQ-11	8/10/1981	-0.05			
GWQ-11	10/27/1981	0.17			
GWQ-11	10/30/1981	0.23			
GWQ-11	11/6/1981	0.29			
GWQ-11	11/13/1981	0.79	21		
GWQ-11	11/17/1981	0.64			
GWQ-11	11/23/1981	0.53			
GWQ-11	12/7/1981	1.6			
GWQ-11	12/15/1981	1.1			
GWQ-11	12/22/1981	0.42			
GWQ-11	1/5/1982	0.44			
GWQ-11	1/18/1982				
GWQ-11	1/26/1982				
GWQ-11	2/16/1982				
GWQ-11	2/22/1982				
GWQ-11	3/12/1982				
GWQ-11	4/16/1982				
GWQ-11	4/26/1982				
GWQ-11	5/17/1982				
GWQ-11	6/8/1982				
GWQ-11	6/14/1982				
GWQ-11	6/30/1982				
GWQ-11	7/26/1982				
GWQ-11	8/18/1982				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-11	9/2/1982		23		
GWQ-11	9/14/1982				
GWQ-11	10/18/1982				
GWQ-11	11/11/1982				
GWQ-11	12/23/1982				
GWQ-11	12/28/1982				
GWQ-11	2/21/1983				
GWQ-11	5/6/1983				
GWQ-11	5/13/1983				
GWQ-11	6/2/1983				
GWQ-11	7/5/1983				
GWQ-11	8/9/1983				
GWQ-11	8/25/1983				
GWQ-11	10/20/1983				
GWQ-11	11/1/1983				
GWQ-11	12/7/1984				
GWQ-11	1/28/1984				
GWQ-11	2/13/1984				
GWQ-11	3/1/1984				
GWQ-11	3/16/1984				
GWQ-11	4/18/1984				
GWQ-11	5/22/1984				
GWQ-11	5/30/1984				
GWQ-11	6/26/1984				
GWQ-11	7/25/1984				
GWQ-11	8/27/1984				
GWQ-11	9/12/1984				
GWQ-11	9/21/1984				
GWQ-11	11/19/1984				
GWQ-11	11/27/1984				
GWQ-11	12/17/1984				
GWQ-11	5/17/1985				
GWQ-11	11/13/1985				
GWQ-11	5/23/1986				
GWQ-11	10/8/1986				
GWQ-11	3/4/1987	-0.1	15	-0.1	-0.1

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-11	5/25/1987				
GWQ-11	1/12/1988	-0.1		0.2	-0.1
GWQ-11	4/4/1988				
GWQ-11	8/23/1988				
GWQ-11	2/9/1989				
GWQ-11	6/1/1989				
GWQ-11	11/30/1989				
GWQ-11	11/14/1990				
GWQ-11	2/11/1991				
GWQ-11	7/19/1991				
GWQ-11	8/29/1991				
GWQ-11	11/26/1991				
GWQ-11	3/15/1992				
GWQ-11	5/25/1992				
GWQ-11	10/8/1992				
GWQ-11	11/27/1992				
GWQ-11	12/15/1992				
GWQ-11	2/25/1993				
GWQ-11	3/30/1993	0.03			
GWQ-11	9/28/1993				
GWQ-11	5/25/1994	-0.05			
GWQ-11	6/23/1994				
GWQ-11	7/22/1994	-0.05			
GWQ-11	9/22/1994				

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
GWQ-11		Skute Stone Arroyo		-85	GWQ-11-85	01/29/95	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-86	GWQ-11-86	03/29/95	Irwin	lab pH
GWQ-11	17.42	Skute Stone Arroyo		-87	GWQ-11-87	06/27/95	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-88	GWQ-11-88	09/21/95	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-89	GWQ-11-89	01/10/96	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-90	GWQ-11-90	04/03/96	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-91	GWQ-11-91	06/01/96		
GWQ-11		Skute Stone Arroyo		-92	GWQ-11-92	09/25/96	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-93	GWQ-11-93	01/15/97	Irwin	lab pH
GWQ-11		Skute Stone Arroyo		-94	GWQ-11-94	04/01/97		
GWQ-11		Skute Stone Arroyo		-95	GWQ-11-95	04/01/97		
GWQ-11		Skute Stone Arroyo		-96	GWQ-11-96	07/01/97		
GWQ-11		Skute Stone Arroyo		-97	GWQ-11-97	08/01/97		
GWQ-11		Skute Stone Arroyo		-98	GWQ-11-98	10/01/97		
GWQ-11	18.5	Skute Stone Arroyo		-99	GWQ-11-99	01/15/98	Irwin	
GWQ-11	18.5	Skute Stone Arroyo		-100	GWQ-11-100	04/09/98	Irwin	
GWQ-11	18.75	Skute Stone Arroyo		-101	GWQ-11-101	07/13/98	Irwin	
GWQ-12	100.33	Skute Stone Arroyo		-1	GWQ-12-1	05/17/82	QMC	
GWQ-12	100.33	Skute Stone Arroyo		-2	GWQ-12-2	06/14/82	QMC	
GWQ-12	100.25	Skute Stone Arroyo		-3	GWQ-12-3	07/26/82	QMC	
GWQ-12	100.5	Skute Stone Arroyo		-4	GWQ-12-4	08/18/82	QMC	
GWQ-12	100.5	Skute Stone Arroyo		-5	GWQ-12-5	09/14/82	QMC	
GWQ-12	100.6	Skute Stone Arroyo		-6	GWQ-12-6	10/18/82	QMC	
GWQ-12	100.6	Skute Stone Arroyo		-7	GWQ-12-7	11/11/82	QMC	
GWQ-12	100.9	Skute Stone Arroyo		-8	GWQ-12-8	12/28/82	QMC	
GWQ-12		Skute Stone Arroyo		-9	GWQ-12-9	02/21/83	QMC	
GWQ-12	101.2	Skute Stone Arroyo		-10	GWQ-12-10	05/06/83	QMC	
GWQ-12		Skute Stone Arroyo		-11	GWQ-12-11	05/13/83	QMC	
GWQ-12	101.4	Skute Stone Arroyo		-12	GWQ-12-12	06/02/83	QMC	
GWQ-12	101.5	Skute Stone Arroyo		-13	GWQ-12-13	07/05/83	QMC	
GWQ-12		Skute Stone Arroyo		-14	GWQ-12-14	08/09/83	QMC	
GWQ-12	101.6	Skute Stone Arroyo		-15	GWQ-12-15	08/25/83	QMC	
GWQ-12	101.7	Skute Stone Arroyo		-16	GWQ-12-16	10/20/83	QMC	
GWQ-12		Skute Stone Arroyo		-17	GWQ-12-17	11/01/83	QMC	
GWQ-12	101.7	Skute Stone Arroyo		-18	GWQ-12-18	12/07/83	QMC	
GWQ-12	101.7	Skute Stone Arroyo		-19	GWQ-12-19	01/28/84	QMC	

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
GWQ-12	101.9	Skute Stone Arroyo		-20	GWQ-12-20	02/13/84	QMC	
GWQ-12	101.7	Skute Stone Arroyo		-21	GWQ-12-21	03/01/84	QMC	
GWQ-12		Skute Stone Arroyo		-22	GWQ-12-22	03/16/84	CFP	
GWQ-12	101.7	Skute Stone Arroyo		-23	GWQ-12-23	04/18/84	CFP	
GWQ-12	101.8	Skute Stone Arroyo		-24	GWQ-12-24	05/22/84	CFP	
GWQ-12		Skute Stone Arroyo		-25	GWQ-12-25	05/30/84	CFP	
GWQ-12	101.9	Skute Stone Arroyo		-26	GWQ-12-26	06/26/84	CFP	
GWQ-12	101.9	Skute Stone Arroyo		-27	GWQ-12-27	07/25/84	CFP	
GWQ-12	101.8	Skute Stone Arroyo		-28	GWQ-12-28	08/27/84	CFP	
GWQ-12		Skute Stone Arroyo		-29	GWQ-12-29	09/12/84	CFP	
GWQ-12	101.7	Skute Stone Arroyo		-30	GWQ-12-30	09/21/84	CFP	
GWQ-12	101.7	Skute Stone Arroyo		-31	GWQ-12-31	11/19/84	CFP	
GWQ-12		Skute Stone Arroyo		-32	GWQ-12-32	11/27/84	CFP	
GWQ-12	101.6	Skute Stone Arroyo		-33	GWQ-12-33	12/17/84	CFP	
GWQ-12	101.7	Skute Stone Arroyo		-34	GWQ-12-34	05/27/85	CFP	
GWQ-12	100.8	Skute Stone Arroyo		-35	GWQ-12-35	11/13/85	CFP	
GWQ-12	99.3	Skute Stone Arroyo		-36	GWQ-12-36	05/23/86	CFP	
GWQ-12	99	Skute Stone Arroyo		-37	GWQ-12-37	10/08/86	CFP	
GWQ-12		Skute Stone Arroyo		-38	GWQ-12-38	07/21/94	SRK	
GWQ-12		Skute Stone Arroyo		-39	GWQ-12-39	04/01/97		
GWQ-2		Skute Stone Arroyo		-1	GWQ-2-1	06/15/81	SHB	
GWQ-2		Skute Stone Arroyo		-2	GWQ-2-2	06/25/81	SHB	
GWQ-3		Hillsboro		-1	GWQ-3-1	03/27/81		
GWQ-3	8.6	Hillsboro		-2	GWQ-3-2	06/06/81	SHB	
GWQ-3		Hillsboro		-3	GWQ-3-3	06/15/81	SHB	
GWQ-3		Hillsboro		-4	GWQ-3-4	06/15/81	SHB	
GWQ-3		Hillsboro		-5	GWQ-3-5	02/25/82	QMC	
GWQ-3		Hillsboro		-6	GWQ-3-6	05/12/82	QMC	
GWQ-3		Hillsboro		-7	GWQ-3-7	06/30/82	QMC	
GWQ-3		Hillsboro		-8	GWQ-3-8	12/23/82	QMC	
GWQ-3	10.25	Hillsboro		-9	GWQ-3-9	02/21/83	QMC	
GWQ-3		Hillsboro		-10	GWQ-3-10	05/13/83	QMC	
GWQ-3		Hillsboro		-11	GWQ-3-11	08/09/83	QMC	
GWQ-3		Hillsboro		-12	GWQ-3-12	11/01/83	QMC	
GWQ-3		Hillsboro		-13	GWQ-3-13	03/16/84	QMC	
GWQ-3	35	Hillsboro		-14	GWQ-3-14	06/10/81	SHB	

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
GWQ-4		Hillsboro		-1	GWQ-4-1	06/15/81	SHB	Windmill
GWQ-4		Hillsboro		-2	GWQ-4-2	06/15/81	SHB	Windmill
GWQ-4	86.39	Hillsboro		-3	GWQ-4-3	11/06/81		
GWQ-4		Hillsboro		-4	GWQ-4-4	04/01/93	JWS	Windmill
GWQ-4		Hillsboro		-5	GWQ-4-5	05/26/94	SRK	Windmill
GWQ-4	10.45	Hillsboro		-6	GWQ-4-6	06/10/81	SHB	
GWQ-5		Hillsboro		-1	GWQ-5-1	06/15/81	SHB	
GWQ-5		Hillsboro		-2	GWQ-5-2	06/15/81	SHB	
GWQ-5	25.45	Hillsboro		-3	GWQ-5-3	06/09/81	SHB	
GWQ-6		Hillsboro		-4	GWQ-6-4	06/15/81	SHB	
GWQ-6		Hillsboro		-5	GWQ-6-5	06/15/81	SHB	
GWQ-6		Hillsboro		-6	GWQ-6-6	02/25/82	QMC	
GWQ-6		Hillsboro		-7	GWQ-6-7	04/01/93	JWS	
GWQ-6	23.26	Hillsboro		-8	GWQ-6-8		SHB	
GWQ-6		Hillsboro		-9	GWQ-6-9	01/20/81	SHB	QMC-1,Cl,N
GWQ-7				-1	GWQ-7-1	02/02/81		
GWQ-7				-2	GWQ-7-2	02/02/81	SHB	QMC-1,SHE
GWQ-7				-3	GWQ-7-3	03/27/81		
GWQ-7				-4	GWQ-7-4	03/27/81	SHB	QMC-1 in S
GWQ-7				-5	GWQ-7-5	04/06/81		
GWQ-7	77			-6	GWQ-7-6	06/09/81	SHB	
GWQ-7				-7	GWQ-7-7	06/15/81	SHB	
GWQ-7				-8	GWQ-7-8	06/15/81	SHB	
GWQ-7				-9	GWQ-7-9	08/07/81		
GWQ-7				-10	GWQ-7-10	08/10/81		
GWQ-7				-11	GWQ-7-11	10/23/81	QMC	
GWQ-7				-12	GWQ-7-12	10/23/81	QMC	
GWQ-7				-13	GWQ-7-13	11/06/81	QMC	
GWQ-7				-14	GWQ-7-14	02/25/82	QMC	
GWQ-7				-15	GWQ-7-15	12/28/82	QMC	
GWQ-7				-16	GWQ-7-16	02/21/83	QMC	
GWQ-7				-17	GWQ-7-17	03/16/83	QMC	
GWQ-7				-18	GWQ-7-18	05/13/83	QMC	
GWQ-7				-19	GWQ-7-19	08/09/83	QMC	
GWQ-7				-20	GWQ-7-20	11/01/83	QMC	
GWQ-7				-21	GWQ-7-21	03/16/84	CFP	

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
GWQ-7				-22	GWQ-7-22	05/30/84	CFP	
GWQ-7				-23	GWQ-7-23	09/12/84	CFP	
GWQ-7				-24	GWQ-7-24	11/27/84	CFP	
GWQ-7				-25	GWQ-7-25	05/17/85	CFP	
GWQ-7				-26	GWQ-7-26	11/13/85	CFP	
GWQ-7				-27	GWQ-7-27	05/23/86	CFP	
GWQ-7				-28	GWQ-7-28	10/08/86	CFP	
GWQ-7				-29	GWQ-7-29	03/30/89	EID	
GWQ-7				-30	GWQ-7-30	03/30/93	JWS	Electric Pu
GWQ-7	33.9			-31	GWQ-7-31	05/25/94	SRK	
GWQ-7				-32	GWQ-7-32	07/21/94	SRK	Electric Pu
GWQ-8		Skute Stone Arroyo		-1	GWQ-8-1	06/04/76	SHB	
GWQ-8		Skute Stone Arroyo		-2	GWQ-8-2	02/02/81		Windmill
GWQ-8	83.55	Skute Stone Arroyo		-3	GWQ-8-3	06/09/81	SHB	
GWQ-8		Skute Stone Arroyo		-4	GWQ-8-4	08/19/81	QMC	Windmill
GWQ-8		Skute Stone Arroyo		-5	GWQ-8-5	10/01/81		
GWQ-8		Skute Stone Arroyo		-6	GWQ-8-6	02/25/82	QMC	Windmill
GWQ-8		Skute Stone Arroyo		-7	GWQ-8-7	03/01/93		
GWQ-8		Skute Stone Arroyo		-8	GWQ-8-8	03/31/93	JWS	Windmill
GWQ-8		Skute Stone Arroyo		-9	GWQ-8-9	03/31/93	JWS	
GWQ-8		Skute Stone Arroyo		-10	GWQ-8-10	05/25/94	SRK	Windmill
GWQ-8		Skute Stone Arroyo		-11	GWQ-8-11	04/01/97	Goff	
GWQ-8		Skute Stone Arroyo		-12	GWQ-8-12	04/14/98	Goff	
GWQ-8		Skute Stone Arroyo		-13	GWQ-8-13	07/21/98	Brownfield	lab pH

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-11	01/29/95	32.96027	107.49667	266632	3649459	13	5183	FALSE	199.5	158.7
GWQ-11	03/29/95	32.96027	107.49667	266632	3649459	13	5183	FALSE	99.4	136.9
GWQ-11	06/27/95	32.96027	107.49667	266632	3649459	13	5183	FALSE	101.7	278.8
GWQ-11	09/21/95	32.96027	107.49667	266632	3649459	13	5183	FALSE	112.1	289.5
GWQ-11	01/10/96	32.96027	107.49667	266632	3649459	13	5183	FALSE	120.8	287.5
GWQ-11	04/03/96	32.96027	107.49667	266632	3649459	13	5183	FALSE	119.2	276.5
GWQ-11	06/01/96	32.96027	107.49667	266632	3649459	13	5183		122.3	281.4
GWQ-11	09/25/96	32.96027	107.49667	266632	3649459	13	5183	TRUE	116	229.9
GWQ-11	01/15/97	32.96027	107.49667	266632	3649459	13	5183	TRUE	127	303.9
GWQ-11	04/01/97	32.96027	107.49667	266632	3649459	13	5183	TRUE	120	690
GWQ-11	04/01/97	32.96027	107.49667	266632	3649459	13	5183	TRUE	128.1	305
GWQ-11	07/01/97	32.96027	107.49667	266632	3649459	13	5183	TRUE	129	269
GWQ-11	08/01/97	32.96027	107.49667	266632	3649459	13	5183	TRUE	4.1	
GWQ-11	10/01/97	32.96027	107.49667	266632	3649459	13	5183	TRUE	123	284
GWQ-11	01/15/98	32.96027	107.49667	266632	3649459	13	5183	TRUE	130	276
GWQ-11	04/09/98	32.96027	107.49667	266632	3649459	13	5183	TRUE	127.2	294
GWQ-11	07/13/98	32.96027	107.49667	266632	3649459	13	5183	TRUE	127.5	300
GWQ-12	05/17/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	06/14/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	07/26/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	08/18/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	09/14/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	10/18/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	11/11/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	12/28/82	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	02/21/83	32.95278	107.47190	268928	3648574	13	5223	TRUE	18	53
GWQ-12	05/06/83	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	05/13/83	32.95278	107.47190	268928	3648574	13	5223	TRUE	16	37
GWQ-12	06/02/83	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	07/05/83	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	08/09/83	32.95278	107.47190	268928	3648574	13	5223	TRUE	22	130
GWQ-12	08/25/83	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	10/20/83	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	11/01/83	32.95278	107.47190	268928	3648574	13	5223	TRUE	14	38
GWQ-12	12/07/83	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	01/28/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-12	02/13/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	03/01/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	03/16/84	32.95278	107.47190	268928	3648574	13	5223	TRUE	14	44
GWQ-12	04/18/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	05/22/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	05/30/84	32.95278	107.47190	268928	3648574	13	5223	TRUE	16	47
GWQ-12	06/26/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	07/25/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	08/27/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	09/12/84	32.95278	107.47190	268928	3648574	13	5223	TRUE	16	38
GWQ-12	09/21/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	11/19/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	11/27/84	32.95278	107.47190	268928	3648574	13	5223	TRUE	14	37
GWQ-12	12/17/84	32.95278	107.47190	268928	3648574	13	5223	FALSE		
GWQ-12	05/27/85	32.95278	107.47190	268928	3648574	13	5223	FALSE	14	36
GWQ-12	11/13/85	32.95278	107.47190	268928	3648574	13	5223	FALSE	14	35
GWQ-12	05/23/86	32.95278	107.47190	268928	3648574	13	5223	FALSE	16	31
GWQ-12	10/08/86	32.95278	107.47190	268928	3648574	13	5223	FALSE	16	35
GWQ-12	07/21/94	32.95278	107.47190	268928	3648574	13	5223	TRUE	16	38
GWQ-12	04/01/97	32.95278	107.47190	268928	3648574	13	5223	TRUE	36	43
GWQ-2	06/15/81	32.97342	107.49899	266450	3650923	13	5216	TRUE	20	140
GWQ-2	06/25/81	32.97342	107.49899	266450	3650923	13	5216	TRUE	24.8	111
GWQ-3	03/27/81	32.97084	107.50472	265907	3650649	13	5250	FALSE		
GWQ-3	06/06/81	32.97084	107.50472	265907	3650649	13	5250	TRUE		
GWQ-3	06/15/81	32.97084	107.50472	265907	3650649	13	5250	TRUE	32	383
GWQ-3	06/15/81	32.97084	107.50472	265907	3650649	13	5250	TRUE	40.1	335
GWQ-3	02/25/82	32.97084	107.50472	265907	3650649	13	5250	TRUE	56	490
GWQ-3	05/12/82	32.97084	107.50472	265907	3650649	13	5250	TRUE	56	410
GWQ-3	06/30/82	32.97084	107.50472	265907	3650649	13	5250	TRUE	48	365
GWQ-3	12/23/82	32.97084	107.50472	265907	3650649	13	5250	TRUE	64	340
GWQ-3	02/21/83	32.97084	107.50472	265907	3650649	13	5250	TRUE	68	428
GWQ-3	05/13/83	32.97084	107.50472	265907	3650649	13	5250	TRUE	82	437
GWQ-3	08/09/83	32.97084	107.50472	265907	3650649	13	5250	TRUE	78	385
GWQ-3	11/01/83	32.97084	107.50472	265907	3650649	13	5250	TRUE	90	529
GWQ-3	03/16/84	32.97084	107.50472	265907	3650649	13	5250	TRUE	74	530
GWQ-3	06/10/81	32.97084	107.50472	265907	3650649	13	5250	TRUE		

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-4	06/15/81	32.96641	107.54305	262311	3650244	13	5539	FALSE	30	270
GWQ-4	06/15/81	32.96641	107.54305	262311	3650244	13	5539	TRUE	35.1	255
GWQ-4	11/06/81	32.96641	107.54305	262311	3650244	13	5539	FALSE	22	162
GWQ-4	04/01/93	32.96641	107.54305	262311	3650244	13	5539	FALSE	27	235
GWQ-4	05/26/94	32.96641	107.54305	262311	3650244	13	5539	FALSE	30	220
GWQ-4	06/10/81	32.96641	107.54305	262311	3650244	13	5539	TRUE		
GWQ-5	06/15/81							TRUE	42	575
GWQ-5	06/15/81							TRUE	45	477
GWQ-5	06/09/81							TRUE		
GWQ-6	06/15/81							TRUE	32.6	40.5
GWQ-6	06/15/81							TRUE	28	37
GWQ-6	02/25/82							TRUE	102	220
GWQ-6	04/01/93							FALSE	22	10
GWQ-6								TRUE		
GWQ-6	01/20/81							TRUE	200	350
GWQ-7	02/02/81	32.95646	107.49585	266698	3649035	13	5172	FALSE	20	156
GWQ-7	02/02/81	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	156
GWQ-7	03/27/81	32.95646	107.49585	266698	3649035	13	5172	FALSE		
GWQ-7	03/27/81	32.95646	107.49585	266698	3649035	13	5172	TRUE		
GWQ-7	04/06/81	32.95646	107.49585	266698	3649035	13	5172	FALSE		
GWQ-7	06/09/81	32.95646	107.49585	266698	3649035	13	5172	TRUE		
GWQ-7	06/15/81	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	165
GWQ-7	06/15/81	32.95646	107.49585	266698	3649035	13	5172	TRUE	24.5	110
GWQ-7	08/07/81	32.95646	107.49585	266698	3649035	13	5172	FALSE	100	150
GWQ-7	08/10/81	32.95646	107.49585	266698	3649035	13	5172	FALSE	24	162
GWQ-7	10/23/81	32.95646	107.49585	266698	3649035	13	5172	TRUE	26	160
GWQ-7	10/23/81	32.95646	107.49585	266698	3649035	13	5172	TRUE	26	162
GWQ-7	11/06/81	32.95646	107.49585	266698	3649035	13	5172	TRUE	24	158
GWQ-7	02/25/82	32.95646	107.49585	266698	3649035	13	5172	TRUE	26	162
GWQ-7	12/28/82	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	40
GWQ-7	02/21/83	32.95646	107.49585	266698	3649035	13	5172	TRUE	22	47
GWQ-7	03/16/83	32.95646	107.49585	266698	3649035	13	5172	TRUE		
GWQ-7	05/13/83	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	158
GWQ-7	08/09/83	32.95646	107.49585	266698	3649035	13	5172	TRUE	22	130
GWQ-7	11/01/83	32.95646	107.49585	266698	3649035	13	5172	TRUE	22	137
GWQ-7	03/16/84	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	140

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-7	05/30/84	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	154
GWQ-7	09/12/84	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	128
GWQ-7	11/27/84	32.95646	107.49585	266698	3649035	13	5172	TRUE	18	144
GWQ-7	05/17/85	32.95646	107.49585	266698	3649035	13	5172	TRUE	20	144
GWQ-7	11/13/85	32.95646	107.49585	266698	3649035	13	5172	FALSE	18	137
GWQ-7	05/23/86	32.95646	107.49585	266698	3649035	13	5172	FALSE	22	142
GWQ-7	10/08/86	32.95646	107.49585	266698	3649035	13	5172	FALSE	22	116
GWQ-7	03/30/89	32.95646	107.49585	266698	3649035	13	5172	TRUE	15.9	131
GWQ-7	03/30/93	32.95646	107.49585	266698	3649035	13	5172	FALSE	21	138
GWQ-7	05/25/94	32.95646	107.49585	266698	3649035	13	5172	FALSE	20	1300
GWQ-7	07/21/94	32.95646	107.49585	266698	3649035	13	5172	TRUE	22	5
GWQ-8	06/04/76	32.96722	107.49801	266524	3650233	13	5203	TRUE	16.7	114
GWQ-8	02/02/81	32.96722	107.49801	266524	3650233	13	5203	FALSE	20	156
GWQ-8	06/09/81	32.96722	107.49801	266524	3650233	13	5203	TRUE		
GWQ-8	08/19/81	32.96722	107.49801	266524	3650233	13	5203	TRUE	24	134
GWQ-8	10/01/81	32.96722	107.49801	266524	3650233	13	5203		24	134
GWQ-8	02/25/82	32.96722	107.49801	266524	3650233	13	5203	TRUE	38	220
GWQ-8	03/01/93	32.96722	107.49801	266524	3650233	13	5203		38	283
GWQ-8	03/31/93	32.96722	107.49801	266524	3650233	13	5203	FALSE	38	283
GWQ-8	03/31/93	32.96722	107.49801	266524	3650233	13	5203	TRUE	22	260
GWQ-8	05/25/94	32.96722	107.49801	266524	3650233	13	5203	FALSE	41	290
GWQ-8	04/01/97	32.96722	107.49801	266524	3650233	13	5203	TRUE	46.3	318
GWQ-8	04/14/98	32.96722	107.49801	266524	3650233	13	5203	TRUE	55.3	376
GWQ-8	07/21/98	32.96722	107.49801	266524	3650233	13	5203	TRUE	55.2	362

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-11	01/29/95	7.6	861								
GWQ-11	03/29/95	7.96	793								
GWQ-11	06/27/95	7.67	835								
GWQ-11	09/21/95	7.58	865								
GWQ-11	01/10/96	7.36	777								
GWQ-11	04/03/96	7.38	767								
GWQ-11	06/01/96	7.49	848								
GWQ-11	09/25/96	7.78	835								
GWQ-11	01/15/97	7.68	860								
GWQ-11	04/01/97		810				0.65				
GWQ-11	04/01/97		797				0.9				
GWQ-11	07/01/97	7.53	838								
GWQ-11	08/01/97	7.91	217				0.96				
GWQ-11	10/01/97	7.41	820								
GWQ-11	01/15/98	7.54	812			1310	0.84	3.73			
GWQ-11	04/09/98		817			1230	0.79	4			
GWQ-11	07/13/98		796			971	0.85	3.8			
GWQ-12	05/17/82										
GWQ-12	06/14/82										
GWQ-12	07/26/82										
GWQ-12	08/18/82										
GWQ-12	09/14/82										
GWQ-12	10/18/82										
GWQ-12	11/11/82										
GWQ-12	12/28/82										
GWQ-12	02/21/83	7.7	360				1	2.2			
GWQ-12	05/06/83										
GWQ-12	05/13/83	8.1	330				1	2.1			
GWQ-12	06/02/83										
GWQ-12	07/05/83										
GWQ-12	08/09/83	7.8	480				0.6	1.1			
GWQ-12	08/25/83										
GWQ-12	10/20/83										
GWQ-12	11/01/83	8.2	340				1.1	2.8			
GWQ-12	12/07/83										
GWQ-12	01/28/84										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-12	02/13/84										
GWQ-12	03/01/84										
GWQ-12	03/16/84	8.2	320				1.1	3.8			
GWQ-12	04/18/84										
GWQ-12	05/22/84										
GWQ-12	05/30/84	8	320				1	2.5			
GWQ-12	06/26/84										
GWQ-12	07/25/84										
GWQ-12	08/27/84										
GWQ-12	09/12/84	8	330				1	2.2			
GWQ-12	09/21/84										
GWQ-12	11/19/84										
GWQ-12	11/27/84	7.8	340				1	2.3			
GWQ-12	12/17/84										
GWQ-12	05/27/85	8	370								
GWQ-12	11/13/85	7.8	310								
GWQ-12	05/23/86	7.8	330								
GWQ-12	10/08/86	7.6	310								
GWQ-12	07/21/94	7.75	358		262	537	0.99	2.1	-0.05	0.0064	-0.005
GWQ-12	04/01/97		353				1.3				
GWQ-2	06/15/81	7.3	530		242	700	0.5	5.6	-0.01		-0.01
GWQ-2	06/25/81		448		261		0.48	4.3	-0.025		-0.002
GWQ-3	03/27/81						0.6	5.5			-0.01
GWQ-3	06/06/81										
GWQ-3	06/15/81	7	890	275	327	1100	0.7	0.1	-0.01		-0.01
GWQ-3	06/15/81		868		354		0.72	0.25	-0.25		0.004
GWQ-3	02/25/82	7.9	1040				0.6	0.4			
GWQ-3	05/12/82	7.9	930				0.7	0.2			
GWQ-3	06/30/82	7.6	860				0.7	0.4			
GWQ-3	12/23/82	8.5	990				0.7	0.2			
GWQ-3	02/21/83	7.7	970				0.7	0.2			
GWQ-3	05/13/83	8	980				0.6	0.3			
GWQ-3	08/09/83	7.8	1060				0.7	-0.2			
GWQ-3	11/01/83	8	1240				0.7	0.3			
GWQ-3	03/16/84	8.2	1190				0.3	3.4			
GWQ-3	06/10/81										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-4	06/15/81	7.2	770		376	1000	0.6	1.1	-0.01		-0.01
GWQ-4	06/15/81		776		370		0.68	0.53	-0.25		-0.002
GWQ-4	11/06/81	7.9	500				0.7	2	-0.01		-0.01
GWQ-4	04/01/93	7.6	702		404	1060	0.73	0.1	-0.1		-0.005
GWQ-4	05/26/94	8.08	926		316	1010	0.63	-1	-0.025	-0.005	-0.005
GWQ-4	06/10/81										
GWQ-5	06/15/81	7.3	1260	330	398	1500	1	0.6	-0.01		-0.01
GWQ-5	06/15/81		1070		431		1.03	0.37	-0.25		-0.002
GWQ-5	06/09/81										
GWQ-6	06/15/81		400		309		1.09	3.3	-0.25		-0.002
GWQ-6	06/15/81	7.3	420	245	317	600	1.2	3.8	-0.01		-0.01
GWQ-6	02/25/82	8.3	810				1.1	0.5			
GWQ-6	04/01/93	7.7	304		322	597	0.84	1.1	-0.1		-0.005
GWQ-6											
GWQ-6	01/20/81	7.2	500		341.6						
GWQ-7	02/02/81	7.9	530		278						
GWQ-7	02/02/81	7.9	530		278						
GWQ-7	03/27/81						0.6	1.4			-0.01
GWQ-7	03/27/81						0.6	1.4			-0.01
GWQ-7	04/06/81						0.59	0.9			0.003
GWQ-7	06/09/81										
GWQ-7	06/15/81	7.2	510	210	266	700	0.5	1.1	-0.01		-0.01
GWQ-7	06/15/81		496		285		0.53	0.54	-0.25		-0.002
GWQ-7	08/07/81	7.4	475		268.4						
GWQ-7	08/10/81	7.7	490		229		0.6	1.2			-0.01
GWQ-7	10/23/81		490				0.5	1.1	-0.01		-0.01
GWQ-7	10/23/81		500				0.5	1.3	-0.01		-0.01
GWQ-7	11/06/81	8.1	480				0.8	1.2	-0.01		-0.01
GWQ-7	02/25/82	8	510				0.5	0.8			
GWQ-7	12/28/82	8.1	250				0.3	-0.2			
GWQ-7	02/21/83	8.3	250				0.4	2.8			
GWQ-7	03/16/83										
GWQ-7	05/13/83	8.1	470				0.6	1.2			
GWQ-7	08/09/83	8	490				0.6	1			
GWQ-7	11/01/83	8.1	500				0.6	1.8			
GWQ-7	03/16/84	8.3	450				0.8	1			

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-7	05/30/84	7.7	470				0.6	0.9			
GWQ-7	09/12/84	8	500				0.6	1.4			
GWQ-7	11/27/84	7.7	490				0.6	1.4			
GWQ-7	05/17/85	7.9	500								
GWQ-7	11/13/85	7.8	450								
GWQ-7	05/23/86	7.9	490								
GWQ-7	10/08/86	7.4	460								
GWQ-7	03/30/89		492		278				-0.1		
GWQ-7	03/30/93	7.8	482		298	752	0.56	138	-0.1		-0.005
GWQ-7	05/25/94	7.26	2420		480	2630	2.1	-1	0.25	-0.005	-0.005
GWQ-7	07/21/94	7.72	224		349	660	16	-1	-0.05	-0.005	-0.005
GWQ-8	06/04/76	7.48	560		241	780	0.51	16.8			
GWQ-8	02/02/81	7.9	520		276			60			
GWQ-8	06/09/81										
GWQ-8	08/19/81	7.42	608		283		0.59	2.8	-0.25		-0.004
GWQ-8	10/01/81	7.4	608		283		0.59	2.8			
GWQ-8	02/25/82	7.6	380				1	0.3			
GWQ-8	03/01/93	7.6	764		298		0.53	5.7			
GWQ-8	03/31/93	7.6	764		298	1110	0.51	6.3	-0.1		-0.005
GWQ-8	03/31/93	7.7	290		262		0.53	5.7	-0.05		-0.005
GWQ-8	05/25/94	7.97	792		272	1060	0.5	5.3	-0.025	-0.005	-0.005
GWQ-8	04/01/97		854				0.4				
GWQ-8	04/14/98	7.36	871			1290	0.6	4.2			
GWQ-8	07/21/98		887				0.6	4.7			

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-11	01/29/95										
GWQ-11	03/29/95										
GWQ-11	06/27/95										
GWQ-11	09/21/95										
GWQ-11	01/10/96										
GWQ-11	04/03/96										
GWQ-11	06/01/96										
GWQ-11	09/25/96										
GWQ-11	01/15/97										
GWQ-11	04/01/97								-0.025	-0.05	
GWQ-11	04/01/97								-0.005	-0.05	
GWQ-11	07/01/97										
GWQ-11	08/01/97										
GWQ-11	10/01/97										
GWQ-11	01/15/98								-0.005	-0.05	
GWQ-11	04/09/98								-0.005	-0.05	
GWQ-11	07/13/98								-0.005	0.13	
GWQ-12	05/17/82										
GWQ-12	06/14/82										
GWQ-12	07/26/82										
GWQ-12	08/18/82										
GWQ-12	09/14/82										
GWQ-12	10/18/82										
GWQ-12	11/11/82										
GWQ-12	12/28/82										
GWQ-12	02/21/83				-0.005				-0.05	-0.1	
GWQ-12	05/06/83										
GWQ-12	05/13/83				-0.005				-0.05	-0.1	
GWQ-12	06/02/83										
GWQ-12	07/05/83										
GWQ-12	08/09/83				-0.005				-0.05	-0.1	
GWQ-12	08/25/83										
GWQ-12	10/20/83										
GWQ-12	11/01/83				-0.005				-0.05	0.32	
GWQ-12	12/07/83										
GWQ-12	01/28/84										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-12	02/13/84										
GWQ-12	03/01/84										
GWQ-12	03/16/84				-0.005				-0.05	-0.1	
GWQ-12	04/18/84										
GWQ-12	05/22/84										
GWQ-12	05/30/84				-0.005				-0.05	-0.1	
GWQ-12	06/26/84										
GWQ-12	07/25/84										
GWQ-12	08/27/84										
GWQ-12	09/12/84				-0.005				-0.05	-0.1	
GWQ-12	09/21/84										
GWQ-12	11/19/84										
GWQ-12	11/27/84				-0.005				-0.05	-0.1	
GWQ-12	12/17/84										
GWQ-12	05/27/85										
GWQ-12	11/13/85										
GWQ-12	05/23/86										
GWQ-12	10/08/86										
GWQ-12	07/21/94	-0.1	-0.1	-0.002	-0.0005	59	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-12	04/01/97								-0.005	2.2	
GWQ-2	06/15/81	-0.1	-0.2		-0.005	102	-0.01	-0.1	-0.05	-0.1	-0.02
GWQ-2	06/25/81	0.162	-1		-0.01	98	-0.05	-0.05	-0.02	0.1	-0.05
GWQ-3	03/27/81								-0.05		-0.02
GWQ-3	06/06/81										
GWQ-3	06/15/81	-0.1	-0.2		-0.005	146	-0.01	-0.05	-0.05	-0.1	0.073
GWQ-3	06/15/81	0.108	-1		-0.01	138	-0.05	-0.05	-0.02	-0.05	-0.05
GWQ-3	02/25/82				-0.005				-0.05	-0.1	
GWQ-3	05/12/82				-0.005				-0.05	-0.1	
GWQ-3	06/30/82				-0.005				-0.05	-0.1	
GWQ-3	12/23/82				-0.005				-0.05	-0.1	
GWQ-3	02/21/83				-0.005				-0.05	-0.1	
GWQ-3	05/13/83				-0.005				-0.05	-0.1	
GWQ-3	08/09/83				-0.005				-0.05	0.11	
GWQ-3	11/01/83				-0.005				-0.05	-0.1	
GWQ-3	03/16/84				-0.005				-0.05	-0.1	
GWQ-3	06/10/81										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-4	06/15/81	-0.1	-0.2		-0.005	137	-0.01	-0.05	-0.05	-0.1	-0.02
GWQ-4	06/15/81	0.065	-1		-0.01	132	-0.05	-0.05	-0.02	-0.05	-0.05
GWQ-4	11/06/81	-0.1	-0.2		-0.005	72	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-4	04/01/93	0.02	1		-0.002	125	-0.02	-0.05	-0.01	0.2	-0.02
GWQ-4	05/26/94	-0.1	-0.1		-0.0005	93	-0.025	-0.05	-0.025	0.13	-0.005
GWQ-4	06/10/81										
GWQ-5	06/15/81	-0.1	-0.2		-0.005	200	-0.01	-0.05	-0.05	-0.1	-0.02
GWQ-5	06/15/81	0.054	-1		-0.01	175	-0.05	-0.05	0.02	0.07	-0.05
GWQ-5	06/09/81										
GWQ-6	06/15/81	0.135	-1		-0.01	68	-0.05	-0.05	-0.02	-0.05	-0.05
GWQ-6	06/15/81	-0.1	-0.2		-0.005	73	-0.01	-0.05	-0.05	-0.1	-0.02
GWQ-6	02/25/82				-0.005				-0.05	-0.1	
GWQ-6	04/01/93	0.09	0.6		-0.002	49	-0.02	-0.05	0.03	5.05	-0.02
GWQ-6											
GWQ-6	01/20/81					96				0.03	
GWQ-7	02/02/81					74				3.8	
GWQ-7	02/02/81					74				3.8	
GWQ-7	03/27/81								-0.05		-0.02
GWQ-7	03/27/81								-0.05		-0.02
GWQ-7	04/06/81								-0.05		-0.01
GWQ-7	06/09/81										
GWQ-7	06/15/81	-0.1	-0.2		-0.005	86	-0.01	-0.05	-0.05	-0.1	-0.02
GWQ-7	06/15/81	0.065	-1		-0.01	88	-0.05	-0.05	-0.02	-0.05	-0.05
GWQ-7	08/07/81					80				0.02	
GWQ-7	08/10/81					68			-0.05	1.7	-0.02
GWQ-7	10/23/81	-0.1	-0.02		-0.005	71	-0.01	-0.02	-0.05	0.14	-0.02
GWQ-7	10/23/81	-0.1	-0.2		-0.005	70	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-7	11/06/81	-0.1	-0.2		-0.005	71	-0.01	-0.02	-0.05	-0.1	-0.02
GWQ-7	02/25/82				-0.005				-0.05	0.17	
GWQ-7	12/28/82				-0.005				-0.05	0.26	
GWQ-7	02/21/83				-0.005				-0.05	-0.1	
GWQ-7	03/16/83										
GWQ-7	05/13/83				-0.005				-0.05	-0.1	
GWQ-7	08/09/83				-0.005				-0.05	-0.1	
GWQ-7	11/01/83				-0.005				-0.05	-0.1	
GWQ-7	03/16/84				-0.005				-0.05	-0.1	

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-7	05/30/84				-0.005				-0.05	-0.1	
GWQ-7	09/12/84				-0.005				-0.05	-0.1	
GWQ-7	11/27/84				-0.005				-0.05	-0.1	
GWQ-7	05/17/85										
GWQ-7	11/13/85										
GWQ-7	05/23/86										
GWQ-7	10/08/86										
GWQ-7	03/30/89	-0.1	-0.1	-0.1	-0.1	80	-0.1	-0.05	-0.1	-0.1	-0.1
GWQ-7	03/30/93	0.04	-0.5		-0.002	68	-0.02	-0.05	-0.01	-0.05	-0.02
GWQ-7	05/25/94		-0.1		0.00058	490	-0.025		0.11	0.72	-0.005
GWQ-7	07/21/94	-0.1	-0.1	-0.002	-0.0005	14	-0.025	-0.05	-0.025	1.2	-0.005
GWQ-8	06/04/76	-0.1				122				0.002	
GWQ-8	02/02/81					74				1.7	
GWQ-8	06/09/81										
GWQ-8	08/19/81	0.076	-1		-0.01	72.9	-0.05	-0.05	-0.05	-0.1	-0.05
GWQ-8	10/01/81					73					
GWQ-8	02/25/82				-0.005				-0.05	-0.1	
GWQ-8	03/01/93					132					
GWQ-8	03/31/93	0.03	-0.05		-0.002	132	-0.02	-0.05	0.01	-0.05	-0.02
GWQ-8	03/31/93	-0.1	0.042		-0.0005	149	-0.01	-0.01	-0.01	0.038	-0.002
GWQ-8	05/25/94	-0.1	-0.1		-0.0005	120	-0.025	-0.05	-0.025	0.24	-0.005
GWQ-8	04/01/97								-0.005	0.2	
GWQ-8	04/14/98					168.5			-0.005	-0.05	
GWQ-8	07/21/98					162			-0.005	0.23	

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-11	01/29/95										
GWQ-11	03/29/95										
GWQ-11	06/27/95										
GWQ-11	09/21/95										
GWQ-11	01/10/96										
GWQ-11	04/03/96										
GWQ-11	06/01/96										
GWQ-11	09/25/96										
GWQ-11	01/15/97										
GWQ-11	04/01/97		-0.025								
GWQ-11	04/01/97		-0.02								
GWQ-11	07/01/97										
GWQ-11	08/01/97										
GWQ-11	10/01/97										
GWQ-11	01/15/98	37.3		0.0004	-0.05			-0.05			
GWQ-11	04/09/98		-0.02	-0.0002	-0.05			-0.05			
GWQ-11	07/13/98		0.05	0.0004	-0.05			-0.05			
GWQ-12	05/17/82										
GWQ-12	06/14/82										
GWQ-12	07/26/82										
GWQ-12	08/18/82										
GWQ-12	09/14/82										
GWQ-12	10/18/82										
GWQ-12	11/11/82										
GWQ-12	12/28/82										
GWQ-12	02/21/83		-0.05		-0.05			-0.005			
GWQ-12	05/06/83										
GWQ-12	05/13/83		-0.05	-0.001	-0.05			-0.005			
GWQ-12	06/02/83										
GWQ-12	07/05/83										
GWQ-12	08/09/83		-0.05	-0.001	-0.05			-0.005			
GWQ-12	08/25/83										
GWQ-12	10/20/83										
GWQ-12	11/01/83		-0.05	-0.001	-0.05			-0.005			
GWQ-12	12/07/83										
GWQ-12	01/28/84										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-12	02/13/84										
GWQ-12	03/01/84										
GWQ-12	03/16/84		-0.05	-0.001	-0.05			-0.005			
GWQ-12	04/18/84										
GWQ-12	05/22/84										
GWQ-12	05/30/84		-0.05	-0.001	-0.05			-0.005			
GWQ-12	06/26/84										
GWQ-12	07/25/84										
GWQ-12	08/27/84										
GWQ-12	09/12/84		-0.05	-0.001	-0.05			-0.005			
GWQ-12	09/21/84										
GWQ-12	11/19/84										
GWQ-12	11/27/84		-0.05	-0.001	-0.05			-0.005			
GWQ-12	12/17/84										
GWQ-12	05/27/85										
GWQ-12	11/13/85										
GWQ-12	05/23/86										
GWQ-12	10/08/86										
GWQ-12	07/21/94	19	-0.03	-0.001	-0.05	-0.05	3.2	-0.005	-0.025	29	-0.005
GWQ-12	04/01/97		0.14	-0.002							
GWQ-2	06/15/81	16	-0.05	0.0013	-0.05	-0.05	2.3	-0.005	-0.02	42	
GWQ-2	06/25/81	11.4	-0.02	-0.001	-0.1	-0.05	2.96	0.0022	-0.02	41.2	
GWQ-3	03/27/81										
GWQ-3	06/06/81										
GWQ-3	06/15/81	33	-0.05	-0.001	-0.05	-0.05	1.7	-0.005	-0.02	95	
GWQ-3	06/15/81	25.8	0.02	-0.001	-0.1	-0.05	2.66	0.0037	-0.02	86	
GWQ-3	02/25/82		-0.05	-0.001	-0.05			-0.005			
GWQ-3	05/12/82		-0.05	-0.001	-0.05			-0.005			
GWQ-3	06/30/82		-0.05	-0.001	-0.05			-0.005			
GWQ-3	12/23/82		-0.05	-0.001	-0.05			-0.005			
GWQ-3	02/21/83		-0.05	-0.001	-0.05			-0.005			
GWQ-3	05/13/83		-0.05	-0.001	0.11			-0.005			
GWQ-3	08/09/83		-0.05	-0.001	-0.05			-0.005			
GWQ-3	11/01/83		-0.05	-0.001	-0.05			-0.005			
GWQ-3	03/16/84		-0.05	-0.001	-0.05			-0.005			
GWQ-3	06/10/81										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-4	06/15/81	27	-0.05	-0.001	-0.05	-0.05	1.2	-0.005	-0.02	91	
GWQ-4	06/15/81	18.6	-0.02	-0.001	-0.1	-0.05	2.03	0.0025	-0.02	73.8	
GWQ-4	11/06/81		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-4	04/01/93	23	-0.02	-0.001	-0.02	-0.01	1	-0.005	-0.01	86	
GWQ-4	05/26/94	22	-0.03	-0.001	-0.05	-0.05	1.8	-0.005	-0.025	74	
GWQ-4	06/10/81										
GWQ-5	06/15/81	49	-0.05	-0.001	-0.05	-0.05	1.1	-0.005	-0.02	173	
GWQ-5	06/15/81	35.8	-0.02	-0.001	-0.1	-0.05	2.26	0.0062	-0.02	126	
GWQ-5	06/09/81										
GWQ-6	06/15/81	11.1	0.076	0.00235	-0.1	-0.05	2.4	0.0046	-0.02	57	
GWQ-6	06/15/81	16	0.11	-0.001	-0.05	-0.05	1.6	-0.005	-0.02	61	
GWQ-6	02/25/82		-0.05	-0.001	-0.05			-0.005			
GWQ-6	04/01/93	14	0.36	-0.001	-0.02	-0.01	3.1	-0.005	-0.01	53	
GWQ-6											
GWQ-6	01/20/81	14.6								781	
GWQ-7	02/02/81	27								51	
GWQ-7	02/02/81	27								51	
GWQ-7	03/27/81										
GWQ-7	03/27/81										
GWQ-7	04/06/81										
GWQ-7	06/09/81										
GWQ-7	06/15/81	24	-0.05	-0.001	-0.05	-0.05	1.6	-0.005	-0.02	61	
GWQ-7	06/15/81	15.7	-0.02	-0.001	-0.1	-0.05	2.33	-0.0005	-0.02	47.9	
GWQ-7	08/07/81	19.4								138.9	
GWQ-7	08/10/81	21								48	
GWQ-7	10/23/81		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-7	10/23/81		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-7	11/06/81		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		
GWQ-7	02/25/82		-0.05	-0.001	-0.05			-0.005			
GWQ-7	12/28/82		0.16	-0.001	-0.05			-0.005			
GWQ-7	02/21/83		0.27	-0.001	-0.05			-0.005			
GWQ-7	03/16/83		-0.05								
GWQ-7	05/13/83		-0.05	-0.001	-0.05			-0.005			
GWQ-7	08/09/83		-0.05	-0.001	-0.05			-0.005			
GWQ-7	11/01/83		-0.05	-0.001	-0.05			-0.005			
GWQ-7	03/16/84		-0.05	-0.001	0.08			-0.005			

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
GWQ-7	05/30/84		-0.05	-0.001	-0.05			-0.005			
GWQ-7	09/12/84		-0.05	-0.001	-0.05			-0.005			
GWQ-7	11/27/84		-0.05	-0.001	-0.05			-0.005			
GWQ-7	05/17/85										
GWQ-7	11/13/85										
GWQ-7	05/23/86										
GWQ-7	10/08/86										
GWQ-7	03/30/89	22	-0.05		-0.1	-0.1	2		-0.1	47	
GWQ-7	03/30/93	31	-0.02	-0.001	-0.02	-0.01	1.6	-0.005	-0.01	52	
GWQ-7	05/25/94	51	1.1	-0.001		-0.05	14	-0.005	-0.025	80	
GWQ-7	07/21/94	8.2	0.21	-0.001	-0.05	-0.05	13	-0.005	-0.025	47	-0.005
GWQ-8	06/04/76	15.5	0.003				1.72			76.1	
GWQ-8	02/02/81	20									
GWQ-8	06/09/81										
GWQ-8	08/19/81	12.1	0.047	-1	-0.1	-0.05	4.2	0.004	-0.02	84.1	
GWQ-8	10/01/81	12					4.2			84	
GWQ-8	02/25/82		0.17	-0.001	-0.05			-0.005			
GWQ-8	03/01/93	18					3.5			94	
GWQ-8	03/31/93	18	-0.02	-0.001	-0.02	-0.01	1.8	-0.005	-0.01	94	
GWQ-8	03/31/93	21	-0.01	-0.0002	-0.02	-0.02	3.5	-0.005	-0.01	94	
GWQ-8	05/25/94	20	-0.03	-0.001	-0.05	-0.05	2.4	-0.005	-0.025	76	
GWQ-8	04/01/97		-0.02	-0.002				0.056			
GWQ-8	04/14/98	25.2	-0.02	-0.0002	-0.05		1.7	-0.05		91.2	
GWQ-8	07/21/98	23.9	-0.02	0.0003	-0.05		2.3	-0.05		85.3	

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-11	01/29/95				
GWQ-11	03/29/95				
GWQ-11	06/27/95				
GWQ-11	09/21/95				
GWQ-11	01/10/96				
GWQ-11	04/03/96				
GWQ-11	06/01/96				
GWQ-11	09/25/96				
GWQ-11	01/15/97				
GWQ-11	04/01/97				
GWQ-11	04/01/97				
GWQ-11	07/01/97				
GWQ-11	08/01/97				
GWQ-11	10/01/97				
GWQ-11	01/15/98				
GWQ-11	04/09/98				
GWQ-11	07/13/98				
GWQ-12	05/17/82				
GWQ-12	06/14/82				
GWQ-12	07/26/82				
GWQ-12	08/18/82				
GWQ-12	09/14/82				
GWQ-12	10/18/82				
GWQ-12	11/11/82				
GWQ-12	12/28/82				
GWQ-12	02/21/83				
GWQ-12	05/06/83				
GWQ-12	05/13/83				
GWQ-12	06/02/83				
GWQ-12	07/05/83				
GWQ-12	08/09/83				
GWQ-12	08/25/83				
GWQ-12	10/20/83				
GWQ-12	11/01/83				
GWQ-12	12/07/83				
GWQ-12	01/28/84				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-12	02/13/84				
GWQ-12	03/01/84				
GWQ-12	03/16/84				
GWQ-12	04/18/84				
GWQ-12	05/22/84				
GWQ-12	05/30/84				
GWQ-12	06/26/84				
GWQ-12	07/25/84				
GWQ-12	08/27/84				
GWQ-12	09/12/84				
GWQ-12	09/21/84				
GWQ-12	11/19/84				
GWQ-12	11/27/84				
GWQ-12	12/17/84				
GWQ-12	05/27/85				
GWQ-12	11/13/85				
GWQ-12	05/23/86				
GWQ-12	10/08/86				
GWQ-12	07/21/94	-0.05			
GWQ-12	04/01/97				
GWQ-2	06/15/81	0.16	21		
GWQ-2	06/25/81	0.11			
GWQ-3	03/27/81	0.016			
GWQ-3	06/06/81				
GWQ-3	06/15/81	0.32	19		
GWQ-3	06/15/81	0.061			
GWQ-3	02/25/82				
GWQ-3	05/12/82				
GWQ-3	06/30/82				
GWQ-3	12/23/82				
GWQ-3	02/21/83				
GWQ-3	05/13/83				
GWQ-3	08/09/83				
GWQ-3	11/01/83				
GWQ-3	03/16/84				
GWQ-3	06/10/81				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-4	06/15/81	0.056	20		
GWQ-4	06/15/81	-0.025			
GWQ-4	11/06/81	0.28			
GWQ-4	04/01/93	0.38			
GWQ-4	05/26/94	0.56			
GWQ-4	06/10/81				
GWQ-5	06/15/81	0.064	20		
GWQ-5	06/15/81	-0.025			
GWQ-5	06/09/81				
GWQ-6	06/15/81	-0.025			
GWQ-6	06/15/81	-0.05	20.5		
GWQ-6	02/25/82				
GWQ-6	04/01/93	0.03			
GWQ-6					
GWQ-6	01/20/81				
GWQ-7	02/02/81				
GWQ-7	02/02/81				
GWQ-7	03/27/81	0.28			
GWQ-7	03/27/81	0.28			
GWQ-7	04/06/81	0.24			
GWQ-7	06/09/81				
GWQ-7	06/15/81	0.38	22		
GWQ-7	06/15/81	0.278			
GWQ-7	08/07/81				
GWQ-7	08/10/81	0.63			
GWQ-7	10/23/81	0.41			
GWQ-7	10/23/81	0.16			
GWQ-7	11/06/81	0.19			
GWQ-7	02/25/82				
GWQ-7	12/28/82				
GWQ-7	02/21/83				
GWQ-7	03/16/83				
GWQ-7	05/13/83				
GWQ-7	08/09/83				
GWQ-7	11/01/83				
GWQ-7	03/16/84				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
GWQ-7	05/30/84				
GWQ-7	09/12/84				
GWQ-7	11/27/84				
GWQ-7	05/17/85				
GWQ-7	11/13/85				
GWQ-7	05/23/86				
GWQ-7	10/08/86				
GWQ-7	03/30/89	0.1		0.2	-0.1
GWQ-7	03/30/93	0.1			
GWQ-7	05/25/94	-0.05			
GWQ-7	07/21/94	-0.05			
GWQ-8	06/04/76				
GWQ-8	02/02/81				
GWQ-8	06/09/81				
GWQ-8	08/19/81	0.69			
GWQ-8	10/01/81				
GWQ-8	02/25/82				
GWQ-8	03/01/93				
GWQ-8	03/31/93	0.09			
GWQ-8	03/31/93	0.075			
GWQ-8	05/25/94	-0.05			
GWQ-8	04/01/97				
GWQ-8	04/14/98				
GWQ-8	07/21/98				

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Sample Date	Sampler	Notes
GWQ-9				-1	GWQ-9-1	6/4/1976	SHB	
GWQ-9				-2	GWQ-9-2	1/20/1981	SHB	QMC-2,Cl,Na incon
GWQ-9				-3	GWQ-9-3	2/2/1981		
GWQ-9				-4	GWQ-9-4	2/2/1981	SHB	Qmc-2 in SHB (198
GWQ-9				-5	GWQ-9-5	3/27/1981		
GWQ-9				-6	GWQ-9-6	3/27/1981	SHB	Qmc-2 in SHB (198
GWQ-9				-7	GWQ-9-7	4/6/1981		
GWQ-9	197			-8	GWQ-9-8	6/10/1981	SHB	
GWQ-9				-9	GWQ-9-9	8/7/1981		
GWQ-9				-10	GWQ-9-10	8/10/1981		
GWQ-9				-11	GWQ-9-11	10/8/1981	QMC	
GWQ-9				-12	GWQ-9-12	2/25/1982	QMC	
GWQ-9				-13	GWQ-9-13	12/28/1982	QMC	
GWQ-9				-14	GWQ-9-14	2/21/1983	QMC	
GWQ-9				-15	GWQ-9-15	5/13/1983	QMC	
GWQ-9				-16	GWQ-9-16	8/9/1983	QMC	
GWQ-9				-17	GWQ-9-17	11/1/1983	QMC	
GWQ-9				-18	GWQ-9-18	3/16/1984	CFP	
GWQ-9				-19	GWQ-9-19	5/30/1984	CFP	
GWQ-9				-20	GWQ-9-20	9/12/1984	CFP	labeled "GWQ-9a"
GWQ-9				-21	GWQ-9-21	11/27/1984	CFP	
GWQ-9				-22	GWQ-9-22	5/17/1985	CFP	
GWQ-9	20.9			-23	GWQ-9-23	6/27/1985	QMC	
GWQ-9	20			-24	GWQ-9-24	11/13/1985	CFP	
GWQ-9	17.2			-25	GWQ-9-25	5/23/1985	CFP	
GWQ-9	17.4			-26	GWQ-9-26	10/8/1986	CFP	
GWQ-9				-27	GWQ-9-27	8/1/1997		
GWQ-94-13				-1	GWQ-94-13-1	11/15/1994	SRK	
GWQ-94-13				-2	GWQ-94-13-2	7/1/1996	ABC	
GWQ-94-13				-3	GWQ-94-13-3	8/1/1997		
GWQ-94-14				-1	GWQ-94-14-1	11/14/1994	SRK	
GWQ-94-14				-2	GWQ-94-14-2	6/30/1996	ABC	
GWQ-94-14				-3	GWQ-94-14-3	8/1/1997		
GWQ-94-15				-1	GWQ-94-15-1	11/14/1994	SRK	
GWQ-94-15				-2	GWQ-94-15-2	7/1/1996	ABC	
GWQ-94-15				-3	GWQ-94-15-3	8/1/1997		

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Sample Date	Sampler	Notes
GWQ-94-15				-4	GWQ-94-15-4	10/1/1997		
GWQ-94-15	0.54			-5	GWQ-94-15-5	1/24/1998	Goff	
GWQ-94-15	0.49			-6	GWQ-94-15-6	2/1/1998		
GWQ-94-15	0.43			-7	GWQ-94-15-7	3/1/1998		
GWQ-94-15	0.6			-8	GWQ-94-15-8	4/14/1998	Goff	
GWQ-94-15	0.61			-9	GWQ-94-15-9	5/1/1998		
GWQ-94-15	0.83			-10	GWQ-94-15-1	6/1/1998		
GWQ-94-15	1.03			-11	GWQ-94-15-1	7/21/1998	Brownfield	
GWQ-94-15	1.03			-12	GWQ-94-15-1	8/1/1998		
GWQ-94-15	1.1			-13	GWQ-94-15-1	9/1/1998		
GWQ-94-15		Skute Stone Arroyo		-14	GWQ-94-15-1	10/15/1998	Goff	
GWQ-94-16		Skute Stone Arroyo		-1	GWQ-94-16-1	11/13/1994	SRK	
GWQ-94-16		Skute Stone Arroyo		-2	GWQ-94-16-2	7/1/1996	ABC	
GWQ-94-17		Skute Stone Arroyo		-1	GWQ-94-17-1	11/15/1994	SRK	
GWQ-94-17		Skute Stone Arroyo		-2	GWQ-94-17-2	6/30/1996	ABC	
GWQ-94-17		Skute Stone Arroyo		-3	GWQ-94-17-3	5/1/1997		
GWQ-94-17	6.11	Skute Stone Arroyo		-4	GWQ-94-17-4	1/24/1998	Goff	
GWQ-94-17	6.1	Skute Stone Arroyo		-5	GWQ-94-17-5	2/1/1998		
GWQ-94-17	6.8	Skute Stone Arroyo		-6	GWQ-94-17-6	3/1/1998		
GWQ-94-17	6.13	Skute Stone Arroyo		-7	GWQ-94-17-7	4/14/1998	Goff	
GWQ-94-17	6.22	Skute Stone Arroyo		-8	GWQ-94-17-8	5/1/1998		
GWQ-94-17	6.34	Skute Stone Arroyo		-9	GWQ-94-17-9	5/1/1998		
GWQ-94-17	6.55	Skute Stone Arroyo		-10	GWQ-94-17-1	7/21/1998	Brownfield	
GWQ-94-17	6.55	Skute Stone Arroyo		-11	GWQ-94-17-1	8/1/1998		
GWQ-94-17	6.59	Skute Stone Arroyo		-12	GWQ-94-17-1	9/1/1998		
GWQ-94-20		Skute Stone Arroyo		-1	GWQ-94-20-1	11/15/1994	SRK	
GWQ-94-20		Skute Stone Arroyo		-2	GWQ-94-20-2	6/30/1996	ABC	
GWQ-94-20		Skute Stone Arroyo		-3	GWQ-94-20-3	8/1/1997		
GWQ-94-21A		Skute Stone Arroyo		-1	GWQ-94-21A-	11/13/1994	SRK	
GWQ-94-21A		Skute Stone Arroyo		-2	GWQ-94-21A-	6/30/1996	ABC	
GWQ-94-21A	2.41	Skute Stone Arroyo		-3	GWQ-94-21A-	1/24/1998	Goff	
GWQ-94-21A	2.1	Skute Stone Arroyo		-4	GWQ-94-21A-	2/1/1998		
GWQ-94-21A	2.01	Skute Stone Arroyo		-5	GWQ-94-21A-	3/1/1998		
GWQ-94-21A	2.11	Skute Stone Arroyo		-6	GWQ-94-21A-	4/14/1998	Goff	
GWQ-94-21A	2.53	Skute Stone Arroyo		-7	GWQ-94-21A-	5/1/1998		
GWQ-94-21A	2.64	Skute Stone Arroyo		-8	GWQ-94-21A-	6/1/1998		

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Sample Date	Sampler	Notes
GWQ-94-21A	3.44	Skute Stone Arroyo		-9	GWQ-94-21A-	7/21/1998	Brownfield	
GWQ-94-21A	2.8	Skute Stone Arroyo		-10	GWQ-94-21A-	8/1/1998		
GWQ-94-21A	2.86	Skute Stone Arroyo		-11	GWQ-94-21A-	9/1/1998		
GWQ-94-21B		Skute Stone Arroyo		-1	GWQ-94-21B-	11/13/1994	SRK	
GWQ-94-21B		Skute Stone Arroyo		-2	GWQ-94-21B-	6/30/1996	ABC	
GWQ-96-22A				-1	GWQ-96-22A-	7/13/1996	ABC	
GWQ-96-22A	44.93			-2	GWQ-96-22A-	2/5/1997	SRK	
GWQ-96-22A				-3	GWQ-96-22A-	4/1/1997		
GWQ-96-22A				-4	GWQ-96-22A-	8/1/1997		
GWQ-96-22A				-5	GWQ-96-22A-	8/8/1997	SRK	
GWQ-96-22A				-6	GWQ-96-22A-	10/1/1997		
GWQ-96-22A	45.92			-7	GWQ-96-22A-	1/24/1998	Goff	
GWQ-96-22A	46.09			-8	GWQ-96-22A-	2/1/1998		
GWQ-96-22A	46.74			-9	GWQ-96-22A-	3/1/1998		
GWQ-96-22A	47.27			-10	GWQ-96-22A-	4/14/1998	Goff	
GWQ-96-22A	47.89			-11	GWQ-96-22A-	5/1/1998		
GWQ-96-22A	48.24			-12	GWQ-96-22A-	6/1/1998		
GWQ-96-22A	46			-13	GWQ-96-22A-	7/21/1998	Brownfield	
GWQ-96-22A	45.1			-14	GWQ-96-22A-	8/1/1998		
GWQ-96-22A	46.5			-15	GWQ-96-22A-	9/1/1998		
GWQ-96-22A				-16	GWQ-96-22A-	10/15/1998	Goff	
GWQ-96-22B				-1	GWQ-96-22B-	7/13/1996	ABC	
GWQ-96-22B	45.22			-2	GWQ-96-22B-	2/5/1997	SRK	
GWQ-96-23A				-1	GWQ-96-23A-	7/14/1996	ABC	
GWQ-96-23A	35.18			-2	GWQ-96-23A-	2/5/1997	SRK	
GWQ-96-23A				-3	GWQ-96-23A-	4/1/1997		
GWQ-96-23A				-4	GWQ-96-23A-	4/1/1997		
GWQ-96-23A				-5	GWQ-96-23A-	8/1/1997		
GWQ-96-23A				-6	GWQ-96-23A-	8/8/1997	SRK	
GWQ-96-23A	35.89			-7	GWQ-96-23A-	1/24/1998	Goff	Dup sample had v. h
GWQ-96-23A	35.82			-8	GWQ-96-23A-	2/1/1998		
GWQ-96-23A	35.6			-9	GWQ-96-23A-	3/1/1998		
GWQ-96-23A	35.71			-10	GWQ-96-23A-	4/14/1998	Goff	
GWQ-96-23A	34.91			-11	GWQ-96-23A-	5/1/1998		
GWQ-96-23A	34.97			-12	GWQ-96-23A-	6/1/1998		
GWQ-96-23A	36.68			-13	GWQ-96-23A-	7/21/1998	Brownfield	

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Sample Date	Sampler	Notes
GWQ-96-23A	36.32			-14	GWQ-96-23A-	8/1/1998		
GWQ-96-23A	36.35			-15	GWQ-96-23A-	9/1/1998		
GWQ-96-23A				-16	GWQ-96-23A-	10/15/1998	Goff	
GWQ-96-23B				-1	GWQ-96-23B-	7/14/1996	ABC	
GWQ-96-23B	36.745			-2	GWQ-96-23B-	2/5/1997	SRK	
GWQ-96-23B				-3	GWQ-96-23B-	4/1/1997		
GWQ-96-23B				-4	GWQ-96-23B-	4/1/1997		
Hansen	12.6			-1	Hansen-1	1/1/1998		
Hansen	12.5			-2	Hansen-2	2/1/1998		
Hansen	12.2			-3	Hansen-3	3/1/1998		
Hansen	11.3			-4	Hansen-4	4/1/1998		
Hansen	11			-5	Hansen-5	5/1/1998		
Hansen	11.25			-6	Hansen-6	6/1/1998		
Hansen	11.25			-7	Hansen-7	7/22/1998	Brownfield	
Hansen	12			-8	Hansen-8	8/1/1998		
Hansen	11			-9	Hansen-9	9/1/1998		
Highway		Skute Stone Arroyo		-1	Highway-1	5/27/1994	SRK	
Highway		Skute Stone Arroyo		-2	Highway-2	4/14/1998	Goff	Labeled "Birdy Wind"
Hill				-1	Hill-1	7/13/1947		
Humphries-Deep				-1	Humphries-De	10/1/1997		
Humphries-Deep	36.75			-2	Humphries-De	1/23/1998	Goff	
Humphries-Deep	36.5			-3	Humphries-De	2/1/1998		
Humphries-Deep	36.05			-4	Humphries-De	3/1/1998		
Humphries-Deep	36.29			-5	Humphries-De	4/15/1998	Goff	

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-9	6/4/1976	32.96438	107.49539	266762	3649912	13	5195	TRUE	19.9	34
GWQ-9	1/20/1981	32.96438	107.49539	266762	3649912	13	5195	TRUE	200	300
GWQ-9	2/2/1981	32.96438	107.49539	266762	3649912	13	5195	FALSE	20	156
GWQ-9	2/2/1981	32.96438	107.49539	266762	3649912	13	5195	TRUE	20	156
GWQ-9	3/27/1981	32.96438	107.49539	266762	3649912	13	5195	FALSE		
GWQ-9	3/27/1981	32.96438	107.49539	266762	3649912	13	5195	TRUE		
GWQ-9	4/6/1981	32.96438	107.49539	266762	3649912	13	5195	FALSE		
GWQ-9	6/10/1981	32.96438	107.49539	266762	3649912	13	5195	TRUE		
GWQ-9	8/7/1981	32.96438	107.49539	266762	3649912	13	5195	FALSE	100	140
GWQ-9	8/10/1981	32.96438	107.49539	266762	3649912	13	5195	FALSE	22	148
GWQ-9	10/8/1981	32.96438	107.49539	266762	3649912	13	5195	TRUE	22.4	133
GWQ-9	2/25/1982	32.96438	107.49539	266762	3649912	13	5195	TRUE	26	160
GWQ-9	12/28/1982	32.96438	107.49539	266762	3649912	13	5195	TRUE	20	150
GWQ-9	2/21/1983	32.96438	107.49539	266762	3649912	13	5195	TRUE	20	161
GWQ-9	5/13/1983	32.96438	107.49539	266762	3649912	13	5195	TRUE	20	158
GWQ-9	8/9/1983	32.96438	107.49539	266762	3649912	13	5195	TRUE	20	135
GWQ-9	11/1/1983	32.96438	107.49539	266762	3649912	13	5195	TRUE	18	132
GWQ-9	3/16/1984	32.96438	107.49539	266762	3649912	13	5195	TRUE	18	132
GWQ-9	5/30/1984	32.96438	107.49539	266762	3649912	13	5195	TRUE	18	154
GWQ-9	9/12/1984	32.96438	107.49539	266762	3649912	13	5195	TRUE	20	132
GWQ-9	11/27/1984	32.96438	107.49539	266762	3649912	13	5195	TRUE	16	132
GWQ-9	5/17/1985	32.96438	107.49539	266762	3649912	13	5195	TRUE	20	149
GWQ-9	6/27/1985	32.96438	107.49539	266762	3649912	13	5195	FALSE		
GWQ-9	11/13/1985	32.96438	107.49539	266762	3649912	13	5195	FALSE	20	142
GWQ-9	5/23/1985	32.96438	107.49539	266762	3649912	13	5195	FALSE	36	137
GWQ-9	10/8/1986	32.96438	107.49539	266762	3649912	13	5195	FALSE	20	125
GWQ-9	8/1/1997	32.96438	107.49539	266762	3649912	13	5195	TRUE	55.1	
GWQ-94-13	11/15/1994	32.96113	107.49664	266637	3649555	13	5186	TRUE	190	720
GWQ-94-13	7/1/1996	32.96113	107.49664	266637	3649555	13	5186	TRUE	200	620
GWQ-94-13	8/1/1997	32.96113	107.49664	266637	3649555	13	5186	TRUE	196.1	
GWQ-94-14	11/14/1994	32.96082	107.49482	266806	3649515	13	5178	TRUE	22	140
GWQ-94-14	6/30/1996	32.96082	107.49482	266806	3649515	13	5178	TRUE	26	140
GWQ-94-14	8/1/1997	32.96082	107.49482	266806	3649515	13	5178	TRUE	32	
GWQ-94-15	11/14/1994	32.95942	107.49490	266794	3649361	13	5168	TRUE	110	180
GWQ-94-15	7/1/1996	32.95942	107.49490	266794	3649361	13	5168	TRUE	130	240
GWQ-94-15	8/1/1997	32.95942	107.49490	266794	3649361	13	5168	TRUE	51.7	

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-94-15	10/1/1997	32.95942	107.49490	266794	3649361	13	5168	TRUE	53	150.5
GWQ-94-15	1/24/1998	32.95942	107.49490	266794	3649361	13	5168	TRUE	55.2	148
GWQ-94-15	2/1/1998	32.95942	107.49490	266794	3649361	13	5168			
GWQ-94-15	3/1/1998	32.95942	107.49490	266794	3649361	13	5168			
GWQ-94-15	4/14/1998	32.95942	107.49490	266794	3649361	13	5168	TRUE	73.6	158
GWQ-94-15	5/1/1998	32.95942	107.49490	266794	3649361	13	5168			
GWQ-94-15	6/1/1998	32.95942	107.49490	266794	3649361	13	5168			
GWQ-94-15	7/21/1998	32.95942	107.49490	266794	3649361	13	5168	TRUE	57.3	154
GWQ-94-15	8/1/1998	32.95942	107.49490	266794	3649361	13	5168			
GWQ-94-15	9/1/1998	32.95942	107.49490	266794	3649361	13	5168			
GWQ-94-15	10/15/1998	32.95942	107.49490	266794	3649361	13	5168	TRUE	53	150.5
GWQ-94-16	11/13/1994	32.96016	107.49671	266627	3649447	13	5183	TRUE	190	410
GWQ-94-16	7/1/1996	32.96016	107.49671	266627	3649447	13	5183	TRUE	200	500
GWQ-94-17	11/15/1994	32.96115	107.49601	266696	3649555	13	5183	TRUE	110	240
GWQ-94-17	6/30/1996	32.96115	107.49601	266696	3649555	13	5183	TRUE	81	190
GWQ-94-17	5/1/1997	32.96115	107.49601	266696	3649555	13	5183	TRUE	61.2	
GWQ-94-17	1/24/1998	32.96115	107.49601	266696	3649555	13	5183	TRUE	46.5	141
GWQ-94-17	2/1/1998	32.96115	107.49601	266696	3649555	13	5183			
GWQ-94-17	3/1/1998	32.96115	107.49601	266696	3649555	13	5183			
GWQ-94-17	4/14/1998	32.96115	107.49601	266696	3649555	13	5183	TRUE	47.5	136
GWQ-94-17	5/1/1998	32.96115	107.49601	266696	3649555	13	5183			
GWQ-94-17	5/1/1998	32.96115	107.49601	266696	3649555	13	5183			
GWQ-94-17	7/21/1998	32.96115	107.49601	266696	3649555	13	5183	TRUE	48.1	140
GWQ-94-17	8/1/1998	32.96115	107.49601	266696	3649555	13	5183			
GWQ-94-17	9/1/1998	32.96115	107.49601	266696	3649555	13	5183			
GWQ-94-20	11/15/1994	32.96148	107.49676	266626	3649593	13	5189	TRUE	19	40
GWQ-94-20	6/30/1996	32.96148	107.49676	266626	3649593	13	5189	TRUE	21	56
GWQ-94-20	8/1/1997	32.96148	107.49676	266626	3649593	13	5189	TRUE	22	
GWQ-94-21A	11/13/1994	32.96099	107.49399	266884	3649533	13	5177	TRUE	18	130
GWQ-94-21A	6/30/1996	32.96099	107.49399	266884	3649533	13	5177	TRUE	16	120
GWQ-94-21A	1/24/1998	32.96099	107.49399	266884	3649533	13	5177	TRUE	19.1	130
GWQ-94-21A	2/1/1998	32.96099	107.49399	266884	3649533	13	5177			
GWQ-94-21A	3/1/1998	32.96099	107.49399	266884	3649533	13	5177			
GWQ-94-21A	4/14/1998	32.96099	107.49399	266884	3649533	13	5177	TRUE	19.6	142
GWQ-94-21A	5/1/1998	32.96099	107.49399	266884	3649533	13	5177			
GWQ-94-21A	6/1/1998	32.96099	107.49399	266884	3649533	13	5177			

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-94-21A	7/21/1998	32.96099	107.49399	266884	3649533	13	5177	TRUE	19.9	119
GWQ-94-21A	8/1/1998	32.96099	107.49399	266884	3649533	13	5177			
GWQ-94-21A	9/1/1998	32.96099	107.49399	266884	3649533	13	5177			
GWQ-94-21B	11/13/1994	32.96099	107.49399	266884	3649533	13	5177	TRUE	19	130
GWQ-94-21B	6/30/1996	32.96099	107.49399	266884	3649533	13	5177	TRUE	17	120
GWQ-96-22A	7/13/1996							TRUE	89	250
GWQ-96-22A	2/5/1997							TRUE		
GWQ-96-22A	4/1/1997							TRUE	96.5	267
GWQ-96-22A	8/1/1997							TRUE	93.2	
GWQ-96-22A	8/8/1997							TRUE	89	230
GWQ-96-22A	10/1/1997							TRUE	80	260
GWQ-96-22A	1/24/1998							TRUE	80.4	254
GWQ-96-22A	2/1/1998									
GWQ-96-22A	3/1/1998									
GWQ-96-22A	4/14/1998							TRUE	83.8	254
GWQ-96-22A	5/1/1998									
GWQ-96-22A	6/1/1998									
GWQ-96-22A	7/21/1998							TRUE	81.4	303.4
GWQ-96-22A	8/1/1998									
GWQ-96-22A	9/1/1998									
GWQ-96-22A	10/15/1998							TRUE	80	260
GWQ-96-22B	7/13/1996							TRUE	210	79
GWQ-96-22B	2/5/1997							TRUE		
GWQ-96-23A	7/14/1996							TRUE	22	140
GWQ-96-23A	2/5/1997							TRUE		
GWQ-96-23A	4/1/1997							TRUE	20	150
GWQ-96-23A	4/1/1997							TRUE	25	174
GWQ-96-23A	8/1/1997							TRUE	18.2	
GWQ-96-23A	8/8/1997							TRUE	18	410
GWQ-96-23A	1/24/1998							TRUE	19.6	85
GWQ-96-23A	2/1/1998									
GWQ-96-23A	3/1/1998									
GWQ-96-23A	4/14/1998							TRUE	18.9	323
GWQ-96-23A	5/1/1998									
GWQ-96-23A	6/1/1998									
GWQ-96-23A	7/21/1998							TRUE	18.6	330

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
GWQ-96-23A	8/1/1998									
GWQ-96-23A	9/1/1998									
GWQ-96-23A	10/15/1998							TRUE	18.3	450.7
GWQ-96-23B	7/14/1996							TRUE	20	170
GWQ-96-23B	2/5/1997							TRUE		
GWQ-96-23B	4/1/1997							TRUE	16	170
GWQ-96-23B	4/1/1997							TRUE	22.1	238
Hansen	1/1/1998									
Hansen	2/1/1998									
Hansen	3/1/1998									
Hansen	4/1/1998									
Hansen	5/1/1998									
Hansen	6/1/1998									
Hansen	7/22/1998							TRUE	26.5	21
Hansen	8/1/1998									
Hansen	9/1/1998									
Highway	5/27/1994							FALSE	23	42
Highway	4/14/1998							TRUE	22.6	50
Hill	7/13/1947							FALSE	10	76
Humphries-De	10/1/1997							TRUE	19.4	19
Humphries-De	1/23/1998							TRUE	18.6	18
Humphries-De	2/1/1998									
Humphries-De	3/1/1998									
Humphries-De	4/15/1998							TRUE	18.1	19

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-9	6/4/1976	8.6	350		188	480	0.44	4			
GWQ-9	1/20/1981	7.4	450		305						
GWQ-9	2/2/1981	7.9	510		273						
GWQ-9	2/2/1981	7.9	510		273						
GWQ-9	3/27/1981						0.6	1.4			-0.01
GWQ-9	3/27/1981						0.6	1.4			-0.01
GWQ-9	4/6/1981						0.56	1.2			0.002
GWQ-9	6/10/1981										
GWQ-9	8/7/1981	7.4	450		268.4						
GWQ-9	8/10/1981	8	470		268		0.5	1.4			-0.01
GWQ-9	10/8/1981	7.22	476		302		0.6	0.96	-0.25		-0.004
GWQ-9	2/25/1982	8.3	430				0.5	0.9			
GWQ-9	12/28/1982	7.8	480				0.5	1			
GWQ-9	2/21/1983	8	480				0.5	1.4			
GWQ-9	5/13/1983	8.2	460				0.5	1.1			
GWQ-9	8/9/1983	8	480				0.5	0.9			
GWQ-9	11/1/1983	8.2	460				0.5	0.8			
GWQ-9	3/16/1984	8.1	460				0.7	1.7			
GWQ-9	5/30/1984	7.6	450				0.5	0.9			
GWQ-9	9/12/1984	8	470				0.5	1.3			
GWQ-9	11/27/1984	7.9	470				0.5	1.5			
GWQ-9	5/17/1985	8	490								
GWQ-9	6/27/1985										
GWQ-9	11/13/1985	7.8	450								
GWQ-9	5/23/1985	7.9	490								
GWQ-9	10/8/1986	7.6	460								
GWQ-9	8/1/1997	7.3	867				0.58				
GWQ-94-13	11/15/1994	7.74	1570		159	2026	0.36	4.6	-0.05	-0.005	-0.005
GWQ-94-13	7/1/1996	7.76	1520	128	156	2000	0.34	5.2	-0.025	-0.002	-0.005
GWQ-94-13	8/1/1997	7.2	1330				0.55				
GWQ-94-14	11/14/1994	7.95	560		279	745	0.52	1.3	-0.05	-0.005	-0.005
GWQ-94-14	6/30/1996	8.44	520	222	261	641	0.48	1.5	-0.025	-0.002	-0.005
GWQ-94-14	8/1/1997	7.32	475				0.55				
GWQ-94-15	11/14/1994	7.74	790		265	1058	0.46	2.1	-0.05	-0.005	-0.005
GWQ-94-15	7/1/1996	7.31	780	186	227	1190	0.42	2.5	-0.025	-0.002	-0.005
GWQ-94-15	8/1/1997	8.08	441				0.55				

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-94-15	10/1/1997	7.56	530					1.45			
GWQ-94-15	1/24/1998	7.61	567		257.4	900	0.57				
GWQ-94-15	2/1/1998										
GWQ-94-15	3/1/1998										
GWQ-94-15	4/14/1998	7.5	563			872	0.58	1.6			
GWQ-94-15	5/1/1998										
GWQ-94-15	6/1/1998										
GWQ-94-15	7/21/1998		505				0.58	1.7			
GWQ-94-15	8/1/1998										
GWQ-94-15	9/1/1998										
GWQ-94-15	10/15/1998	7.56	530			915		1.45			
GWQ-94-16	11/13/1994	7.55	1140		199	1600	0.66	3.8	-0.05	-0.005	-0.005
GWQ-94-16	7/1/1996	7.95	1160	158	193	1620	0.57	3.7	-0.025	-0.002	-0.005
GWQ-94-17	11/15/1994	7.71	820		232	1147	0.46	2.4	-0.05	-0.005	-0.005
GWQ-94-17	6/30/1996	8.56	690	198	227	925	0.46	2	-0.025	-0.002	-0.005
GWQ-94-17	5/1/1997	7.18	558				0.57				
GWQ-94-17	1/24/1998	7.64	519		262.3	837	0.6				
GWQ-94-17	2/1/1998										
GWQ-94-17	3/1/1998										
GWQ-94-17	4/14/1998	7.51	502			855	0.6	1.4			
GWQ-94-17	5/1/1998										
GWQ-94-17	5/1/1998										
GWQ-94-17	7/21/1998		553				0.67	1.59			
GWQ-94-17	8/1/1998										
GWQ-94-17	9/1/1998										
GWQ-94-20	11/15/1994	7.66	370		296	588	0.36	1	-0.05	-0.005	-0.005
GWQ-94-20	6/30/1996	8.79	390	256	273	597	0.29	-1	-0.025	-0.002	-0.005
GWQ-94-20	8/1/1997	7.31	361				0.37				
GWQ-94-21A	11/13/1994	7.25	480		267	672	0.57	1	-0.05	-0.005	-0.005
GWQ-94-21A	6/30/1996	8.22	470	220	268	649	0.51	1.1	-0.025	-0.002	-0.005
GWQ-94-21A	1/24/1998	7.72	472		258	791	0.61				
GWQ-94-21A	2/1/1998										
GWQ-94-21A	3/1/1998										
GWQ-94-21A	4/14/1998	7.96	474			760	0.71	1.16			
GWQ-94-21A	5/1/1998										
GWQ-94-21A	6/1/1998										

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-94-21A	7/21/1998		464				0.7	1.34			
GWQ-94-21A	8/1/1998										
GWQ-94-21A	9/1/1998										
GWQ-94-21B	11/13/1994	7.57	440		255	669	0.39	-1	-0.05	-0.005	-0.005
GWQ-94-21B	6/30/1996	8.6	470	226	256	648	0.52	1.1	-0.025	-0.002	-0.005
GWQ-96-22A	7/13/1996	7.5	700	102	124	1040	3.3	-1	-0.025	-0.003	-0.005
GWQ-96-22A	2/5/1997										
GWQ-96-22A	4/1/1997		707				1.7				
GWQ-96-22A	8/1/1997	7.32	687				2.5				
GWQ-96-22A	8/8/1997	7.65	700	145	177	1140	2.2	-1	0.028		-0.005
GWQ-96-22A	10/1/1997	7.69	689				0.8	-0.05			
GWQ-96-22A	1/24/1998	7.59	665		154.3	1190	2.53				
GWQ-96-22A	2/1/1998										
GWQ-96-22A	3/1/1998										
GWQ-96-22A	4/14/1998	7.65	655		148	1130	3	0.1			
GWQ-96-22A	5/1/1998										
GWQ-96-22A	6/1/1998										
GWQ-96-22A	7/21/1998		669				2.86	0.07			
GWQ-96-22A	8/1/1998										
GWQ-96-22A	9/1/1998										
GWQ-96-22A	10/15/1998	7.69	689			1120		-0.05			
GWQ-96-22B	7/13/1996	7.75	650	116	141	1070	1.8	-1	-0.025	-0.003	-0.005
GWQ-96-22B	2/5/1997										
GWQ-96-23A	7/14/1996	7.95	520	230	280	760	0.84	-1	0.28	-0.003	-0.005
GWQ-96-23A	2/5/1997										
GWQ-96-23A	4/1/1997		770								
GWQ-96-23A	4/1/1997		737				0.5				
GWQ-96-23A	8/1/1997	7.03	939				1.3				
GWQ-96-23A	8/8/1997	7.68	920	269	328	1130	1.2	-1	0.036		-0.005
GWQ-96-23A	1/24/1998	7.8	519		503.25	933	1.76				
GWQ-96-23A	2/1/1998										
GWQ-96-23A	3/1/1998										
GWQ-96-23A	4/14/1998	7.57	918			1390	1.54	-0.05			
GWQ-96-23A	5/1/1998										
GWQ-96-23A	6/1/1998										
GWQ-96-23A	7/21/1998		916				1.69	-0.05			

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
GWQ-96-23A	8/1/1998										
GWQ-96-23A	9/1/1998										
GWQ-96-23A	10/15/1998	7.67	986			1320		-0.05			
GWQ-96-23B	7/14/1996	8.15	550	200	234	780	1.1	-1	7.4	-0.003	-0.005
GWQ-96-23B	2/5/1997										
GWQ-96-23B	4/1/1997		580				1.4				
GWQ-96-23B	4/1/1997		375				0.8				
Hansen	1/1/1998										
Hansen	2/1/1998										
Hansen	3/1/1998										
Hansen	4/1/1998										
Hansen	5/1/1998										
Hansen	6/1/1998										
Hansen	7/22/1998		232				0.59	0.7			
Hansen	8/1/1998										
Hansen	9/1/1998										
Highway	5/27/1994	8.19	342		227	513	0.89	2.4	-0.05	0.0076	-0.005
Highway	4/14/1998	8.38	304			545	1.1	2.2			
Hill	7/13/1947		320		190	426	0.6	0.7			
Humphries-Deep	10/1/1997	8.05	259					-0.05			
Humphries-Deep	1/23/1998	7.33	267		253.8	539	0.2				
Humphries-Deep	2/1/1998										
Humphries-Deep	3/1/1998										
Humphries-Deep	4/15/1998	7.6	290			501	0.22	0.15			

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-9	6/4/1976	-0.1				69.2				0.004	
GWQ-9	1/20/1981					92				0.05	
GWQ-9	2/2/1981					73				1.8	
GWQ-9	2/2/1981					73				1.8	
GWQ-9	3/27/1981								-0.05		-0.02
GWQ-9	3/27/1981								-0.05		-0.02
GWQ-9	4/6/1981								-0.05		-0.01
GWQ-9	6/10/1981										
GWQ-9	8/7/1981					80				0.06	
GWQ-9	8/10/1981					76			-0.05	0.49	0.033
GWQ-9	10/8/1981	0.044	-1		-0.01	51.8	-0.05	-0.05	-0.05	-0.1	-0.05
GWQ-9	2/25/1982				-0.005				-0.05	-0.1	
GWQ-9	12/28/1982				-0.005				-0.05	-0.1	
GWQ-9	2/21/1983				-0.005				-0.05	-0.1	
GWQ-9	5/13/1983				-0.005				-0.05	-0.1	
GWQ-9	8/9/1983				-0.005				-0.05	-0.1	
GWQ-9	11/1/1983				-0.005				-0.05	-0.1	
GWQ-9	3/16/1984				-0.005				-0.05	-0.1	
GWQ-9	5/30/1984				-0.005				-0.05	-0.1	
GWQ-9	9/12/1984				-0.005				-0.05	-0.1	
GWQ-9	11/27/1984				-0.005				-0.05	-0.1	
GWQ-9	5/17/1985										
GWQ-9	6/27/1985										
GWQ-9	11/13/1985										
GWQ-9	5/23/1985										
GWQ-9	10/8/1986										
GWQ-9	8/1/1997										
GWQ-94-13	11/15/1994	-0.1	-0.1	-0.002	-0.0005	270	-0.025	-0.05	-0.025	0.11	-0.005
GWQ-94-13	7/1/1996	-0.05	-0.05	-0.002	-0.0005	290	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-13	8/1/1997										
GWQ-94-14	11/14/1994	-0.1	-0.1	-0.002	-0.0005	81	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-14	6/30/1996	-0.05	-0.05	-0.002	-0.0005	87	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-14	8/1/1997										
GWQ-94-15	11/14/1994	-0.1	-0.1	-0.002	-0.0005	110	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-15	7/1/1996	-0.05	-0.05	-0.002	-0.0005	140	-0.025	-0.05	-0.025	0.41	-0.005
GWQ-94-15	8/1/1997										

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-94-15	10/1/1997								-0.005	-0.05	
GWQ-94-15	1/24/1998					84			-0.005		
GWQ-94-15	2/1/1998										
GWQ-94-15	3/1/1998										
GWQ-94-15	4/14/1998					99.9			-0.005	-0.05	
GWQ-94-15	5/1/1998										
GWQ-94-15	6/1/1998										
GWQ-94-15	7/21/1998					66.9			-0.005	-0.05	
GWQ-94-15	8/1/1998										
GWQ-94-15	9/1/1998										
GWQ-94-15	10/15/1998								-0.005	-0.05	
GWQ-94-16	11/13/1994	-0.1	-0.1	-0.002	-0.0005	190	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-16	7/1/1996	-0.05	-0.05	-0.002	-0.0005	200	-0.025	-0.05	-0.025	0.22	-0.005
GWQ-94-17	11/15/1994	-0.1	-0.1	-0.002	-0.0005	120	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-17	6/30/1996	-0.05	-0.05	-0.002	-0.0005	120	-0.025	-0.05	-0.025	0.062	-0.005
GWQ-94-17	5/1/1997										
GWQ-94-17	1/24/1998					84.9			-0.005		
GWQ-94-17	2/1/1998										
GWQ-94-17	3/1/1998										
GWQ-94-17	4/14/1998					97.6			-0.005	-0.05	
GWQ-94-17	5/1/1998										
GWQ-94-17	5/1/1998										
GWQ-94-17	7/21/1998					91.2			-0.005	0.23	
GWQ-94-17	8/1/1998										
GWQ-94-17	9/1/1998										
GWQ-94-20	11/15/1994	0.11	-0.1	-0.002	-0.0005	48	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-20	6/30/1996	0.086	0.12	-0.002	-0.0005	58	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-20	8/1/1997										
GWQ-94-21A	11/13/1994	-0.1	-0.1	-0.002	-0.0005	82	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-21A	6/30/1996	-0.05	-0.05	-0.002	-0.0005	86	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-21A	1/24/1998					73.3			-0.005		
GWQ-94-21A	2/1/1998										
GWQ-94-21A	3/1/1998										
GWQ-94-21A	4/14/1998					88.4			-0.005	-0.05	
GWQ-94-21A	5/1/1998										
GWQ-94-21A	6/1/1998										

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-94-21A	7/21/1998					83.9			0.017	-0.05	
GWQ-94-21A	8/1/1998										
GWQ-94-21A	9/1/1998										
GWQ-94-21B	11/13/1994	-0.1	-0.1	-0.002	-0.0005	71	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-94-21B	6/30/1996	-0.05	-0.05	-0.002	-0.0005	87	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-96-22A	7/13/1996	-0.05	-0.05	-0.002	-0.0005	71	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-96-22A	2/5/1997										
GWQ-96-22A	4/1/1997								-0.005	1.2	
GWQ-96-22A	8/1/1997										
GWQ-96-22A	8/8/1997	0.23	0.057	-0.002	-0.002	73	-0.025	-0.05	-0.025	0.13	-0.005
GWQ-96-22A	10/1/1997								-0.005	0.61	
GWQ-96-22A	1/24/1998					60			-0.005		
GWQ-96-22A	2/1/1998										
GWQ-96-22A	3/1/1998										
GWQ-96-22A	4/14/1998					67.3			0.007	0.07	
GWQ-96-22A	5/1/1998										
GWQ-96-22A	6/1/1998										
GWQ-96-22A	7/21/1998					69.3			-0.005	-0.05	
GWQ-96-22A	8/1/1998										
GWQ-96-22A	9/1/1998										
GWQ-96-22A	10/15/1998								-0.005	0.61	
GWQ-96-22B	7/13/1996	0.12	0.096	-0.002	-0.0005	66	-0.025	-0.05	-0.025	-0.05	-0.005
GWQ-96-22B	2/5/1997										
GWQ-96-23A	7/14/1996	-0.05	0.064	-0.002	-0.0005	59	-0.025	-0.05	-0.025	0.26	-0.005
GWQ-96-23A	2/5/1997										
GWQ-96-23A	4/1/1997										
GWQ-96-23A	4/1/1997								-0.005		
GWQ-96-23A	8/1/1997										
GWQ-96-23A	8/8/1997	0.0687	0.13	-0.002	-0.002	130	0.025	-0.05	-0.025	0.82	-0.005
GWQ-96-23A	1/24/1998					80.3			-0.005		
GWQ-96-23A	2/1/1998										
GWQ-96-23A	3/1/1998										
GWQ-96-23A	4/14/1998					169.4			0.019	0.41	
GWQ-96-23A	5/1/1998										
GWQ-96-23A	6/1/1998										
GWQ-96-23A	7/21/1998					168.1			-0.005	2.59	

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
GWQ-96-23A	8/1/1998										
GWQ-96-23A	9/1/1998										
GWQ-96-23A	10/15/1998								-0.005	0.65	
GWQ-96-23B	7/14/1996	0.058	0.093	-0.002	-0.0005	67	-0.025	-0.05	-0.025	3.7	-0.005
GWQ-96-23B	2/5/1997										
GWQ-96-23B	4/1/1997								-0.025	0.1	
GWQ-96-23B	4/1/1997								-0.005	0.25	
Hansen	1/1/1998										
Hansen	2/1/1998										
Hansen	3/1/1998										
Hansen	4/1/1998										
Hansen	5/1/1998										
Hansen	6/1/1998										
Hansen	7/22/1998					19.7			-0.005	-0.05	
Hansen	8/1/1998										
Hansen	9/1/1998										
Highway	5/27/1994	-0.01	-0.1	-0.002	-0.0005	63	-0.025	-0.05	-0.025	-0.05	-0.005
Highway	4/14/1998					63.6			0.014	0.22	
Hill	7/13/1947					37					
Humphries-Deep	10/1/1997								-0.005	0.17	
Humphries-Deep	1/23/1998					61.3			-0.005		
Humphries-Deep	2/1/1998										
Humphries-Deep	3/1/1998										
Humphries-Deep	4/15/1998					66.2			-0.005	-0.05	

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
GWQ-9	6/4/1976	15.2	0.001				1.56			30
GWQ-9	1/20/1981	9.7								703
GWQ-9	2/2/1981	24								49
GWQ-9	2/2/1981	24								49
GWQ-9	3/27/1981									
GWQ-9	3/27/1981									
GWQ-9	4/6/1981									
GWQ-9	6/10/1981									
GWQ-9	8/7/1981	19.4								128.9
GWQ-9	8/10/1981	20								47
GWQ-9	10/8/1981	17.1	-0.02	-1	-0.1	-0.05	3.3	-0.002	-0.02	71
GWQ-9	2/25/1982		-0.05	-0.001	-0.05			-0.005		
GWQ-9	12/28/1982		-0.05	-0.001	-0.05			-0.005		
GWQ-9	2/21/1983		-0.05	-0.001	-0.05			-0.005		
GWQ-9	5/13/1983		-0.05	-0.001	-0.05			-0.005		
GWQ-9	8/9/1983		-0.05	-0.001	-0.05			-0.005		
GWQ-9	11/1/1983		-0.05	-0.001	-0.05			-0.005		
GWQ-9	3/16/1984		-0.05	-0.001	-0.05			-0.005		
GWQ-9	5/30/1984		-0.05	-0.001	-0.05			-0.005		
GWQ-9	9/12/1984		-0.05	-0.001	-0.05			-0.005		
GWQ-9	11/27/1984		-0.05	-0.001	-0.05			-0.005		
GWQ-9	5/17/1985									
GWQ-9	6/27/1985									
GWQ-9	11/13/1985									
GWQ-9	5/23/1985									
GWQ-9	10/8/1986									
GWQ-9	8/1/1997									
GWQ-94-13	11/15/1994	56	-0.03	-0.001	-0.05	-0.05	3.9	-0.005	-0.025	110
GWQ-94-13	7/1/1996	62	-0.03	-0.001	-0.05	-0.05	3.6	0.0068	-0.05	120
GWQ-94-13	8/1/1997									
GWQ-94-14	11/14/1994	23	-0.03	-0.001	-0.05	-0.05	1.9	-0.005	-0.025	46
GWQ-94-14	6/30/1996	23	-0.03	-0.001	-0.05	-0.05	1.9	-0.005	-0.05	51
GWQ-94-14	8/1/1997									
GWQ-94-15	11/14/1994	29	-0.03	-0.001	-0.05	-0.05	2.5	-0.005	-0.025	68
GWQ-94-15	7/1/1996	38	-0.03	-0.001	-0.05	-0.05	2.4	-0.005	-0.05	77
GWQ-94-15	8/1/1997									

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
GWQ-94-15	10/1/1997									
GWQ-94-15	1/24/1998	25.4	-0.02				5.5			54.2
GWQ-94-15	2/1/1998									
GWQ-94-15	3/1/1998									
GWQ-94-15	4/14/1998	25.9	-0.02	-0.0002	-0.05		1.3	-0.05		52.8
GWQ-94-15	5/1/1998									
GWQ-94-15	6/1/1998									
GWQ-94-15	7/21/1998	24	-0.02	0.0003	-0.05		2	-0.05		49.5
GWQ-94-15	8/1/1998									
GWQ-94-15	9/1/1998									
GWQ-94-15	10/15/1998									
GWQ-94-16	11/13/1994	51	0.038	-0.001	-0.05	-0.05	3.7	-0.005	-0.025	78
GWQ-94-16	7/1/1996	54	-0.03	-0.001	-0.05	-0.05	3.4	-0.005	-0.05	80
GWQ-94-17	11/15/1994	33	-0.03	-0.001	-0.05	-0.05	2.4	-0.005	-0.025	62
GWQ-94-17	6/30/1996	28	-0.03	-0.001	-0.05	-0.05	2	-0.005	-0.05	61
GWQ-94-17	5/1/1997									
GWQ-94-17	1/24/1998	23.3	-0.02				5.2			45.7
GWQ-94-17	2/1/1998									
GWQ-94-17	3/1/1998									
GWQ-94-17	4/14/1998	23.5	-0.02	-0.0002	-0.05		1.2	-0.05		44.7
GWQ-94-17	5/1/1998									
GWQ-94-17	5/1/1998									
GWQ-94-17	7/21/1998	22.3	-0.02	0.0004	-0.05		2.1	-0.05		41.8
GWQ-94-17	8/1/1998									
GWQ-94-17	9/1/1998									
GWQ-94-20	11/15/1994	9.8	0.42	-0.001	-0.05	-0.05	3.2	-0.005	-0.025	67
GWQ-94-20	6/30/1996	10	-0.03	-0.001	-0.05	-0.05	3.1	-0.005	-0.05	75
GWQ-94-20	8/1/1997									
GWQ-94-21A	11/13/1994	23	0.2	-0.001	-0.05	-0.05	2.1	-0.005	-0.025	39
GWQ-94-21A	6/30/1996	22	-0.03	-0.001	-0.05	-0.05	1.5	-0.005	-0.05	37
GWQ-94-21A	1/24/1998	22.1	-0.02				4.3			35.3
GWQ-94-21A	2/1/1998									
GWQ-94-21A	3/1/1998									
GWQ-94-21A	4/14/1998	23.2	-0.02	-0.0002	-0.05		1.4	-0.05		35.7
GWQ-94-21A	5/1/1998									
GWQ-94-21A	6/1/1998									

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
GWQ-94-21A	7/21/1998	22	-0.02	0.0002	-0.05		2	-0.05		
GWQ-94-21A	8/1/1998									
GWQ-94-21A	9/1/1998									
GWQ-94-21B	11/13/1994	18	0.37	-0.001	-0.05	-0.05	2.6	-0.005	-0.025	56
GWQ-94-21B	6/30/1996	22	-0.03	-0.001	-0.05	-0.05	1.7	-0.005	-0.05	40
GWQ-96-22A	7/13/1996	6.7	0.075	-0.001	-0.05	-0.05	2.5	-0.005	-0.05	150
GWQ-96-22A	2/5/1997									
GWQ-96-22A	4/1/1997		0.44	-0.002				-0.001		
GWQ-96-22A	8/1/1997									
GWQ-96-22A	8/8/1997	8.2	0.53		-0.05	-0.05	6.2	-0.005	-0.025	170
GWQ-96-22A	10/1/1997									
GWQ-96-22A	1/24/1998	5.5	0.163				7.6			146.3
GWQ-96-22A	2/1/1998									
GWQ-96-22A	3/1/1998									
GWQ-96-22A	4/14/1998	4.8	0.12	-0.0002	-0.05		3.6	-0.05		
GWQ-96-22A	5/1/1998									
GWQ-96-22A	6/1/1998									
GWQ-96-22A	7/21/1998	5.7	0.04	-0.0002	-0.05		3.7	-0.05		143.9
GWQ-96-22A	8/1/1998									
GWQ-96-22A	9/1/1998									
GWQ-96-22A	10/15/1998									
GWQ-96-22B	7/13/1996	10	0.41	-0.001	-0.05	-0.05	10	-0.005	-0.05	130
GWQ-96-22B	2/5/1997									
GWQ-96-23A	7/14/1996	18	0.05	-0.001	-0.05	-0.05	4.2	-0.005	-0.05	98
GWQ-96-23A	2/5/1997									
GWQ-96-23A	4/1/1997									
GWQ-96-23A	4/1/1997		2.56	-0.002				0.043		
GWQ-96-23A	8/1/1997									
GWQ-96-23A	8/8/1997	36	1.6		-0.05	-0.05	2.5	-0.005	-0.025	72
GWQ-96-23A	1/24/1998	22.4	0.36				5.6			83.6
GWQ-96-23A	2/1/1998									
GWQ-96-23A	3/1/1998									
GWQ-96-23A	4/14/1998	43.4	1.4	-0.0002	-0.05		2.5	-0.05		86.6
GWQ-96-23A	5/1/1998									
GWQ-96-23A	6/1/1998									
GWQ-96-23A	7/21/1998	41.8	1.67	-0.0002	-0.05		3.2	-0.05		80

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
GWQ-96-23A	8/1/1998									
GWQ-96-23A	9/1/1998									
GWQ-96-23A	10/15/1998									
GWQ-96-23B	7/14/1996	20	0.13	-0.001	-0.05	-0.05	4	-0.005	-0.05	79
GWQ-96-23B	2/5/1997									
GWQ-96-23B	4/1/1997		0.75							
GWQ-96-23B	4/1/1997		0.72	0.002				0.027		
Hansen	1/1/1998									
Hansen	2/1/1998									
Hansen	3/1/1998									
Hansen	4/1/1998									
Hansen	5/1/1998									
Hansen	6/1/1998									
Hansen	7/22/1998	2.1	-0.02	-0.0002	-0.05		3.9	-0.05		46
Hansen	8/1/1998									
Hansen	9/1/1998									
Highway	5/27/1994	14	-0.03	-0.001	-0.05	-0.05	3	-0.005	-0.025	28
Highway	4/14/1998	13.9	-0.02	-0.0002	-0.05		0.9	-0.05		27.2
Hill	7/13/1947	1.9								
Humphries-Deep	10/1/1997									
Humphries-Deep	1/23/1998	11	-0.02				4.8			22
Humphries-Deep	2/1/1998									
Humphries-Deep	3/1/1998									
Humphries-Deep	4/15/1998	11	-0.02	-0.0002	-0.05		1.8	-0.05		21.8

Thallium	Well Name	Sample Dat	Zinc	Temp (C)	Tin	Vanadium
	GWQ-9	6/4/1976				
	GWQ-9	1/20/1981				
	GWQ-9	2/2/1981				
	GWQ-9	2/2/1981				
	GWQ-9	3/27/1981	0.16			
	GWQ-9	3/27/1981	0.16			
	GWQ-9	4/6/1981	0.13			
	GWQ-9	6/10/1981				
	GWQ-9	8/7/1981				
	GWQ-9	8/10/1981	0.96			
	GWQ-9	10/8/1981	0.35			
	GWQ-9	2/25/1982				
	GWQ-9	12/28/1982				
	GWQ-9	2/21/1983				
	GWQ-9	5/13/1983				
	GWQ-9	8/9/1983				
	GWQ-9	11/1/1983				
	GWQ-9	3/16/1984				
	GWQ-9	5/30/1984				
	GWQ-9	9/12/1984				
	GWQ-9	11/27/1984				
	GWQ-9	5/17/1985				
	GWQ-9	6/27/1985				
	GWQ-9	11/13/1985				
	GWQ-9	5/23/1985				
	GWQ-9	10/8/1986				
	GWQ-9	8/1/1997				
-0.005	GWQ-94-13	11/15/1994	-0.05			
-0.001	GWQ-94-13	7/1/1996	-0.05			
	GWQ-94-13	8/1/1997				
-0.005	GWQ-94-14	11/14/1994	-0.05			
-0.001	GWQ-94-14	6/30/1996	-0.05			
	GWQ-94-14	8/1/1997				
-0.005	GWQ-94-15	11/14/1994	-0.05			
-0.001	GWQ-94-15	7/1/1996	-0.05			
	GWQ-94-15	8/1/1997				

Thallium	Well Name	Sample Dat	Zinc	Temp (C)	Tin	Vanadium
	GWQ-94-15	10/1/1997				
	GWQ-94-15	1/24/1998				
	GWQ-94-15	2/1/1998				
	GWQ-94-15	3/1/1998				
	GWQ-94-15	4/14/1998				
	GWQ-94-15	5/1/1998				
	GWQ-94-15	6/1/1998				
	GWQ-94-15	7/21/1998				
	GWQ-94-15	8/1/1998				
	GWQ-94-15	9/1/1998				
	GWQ-94-15	10/15/1998				
-0.005	GWQ-94-16	11/13/1994	-0.05			
-0.001	GWQ-94-16	7/1/1996	-0.05			
-0.005	GWQ-94-17	11/15/1994	-0.05			
-0.001	GWQ-94-17	6/30/1996	-0.05			
	GWQ-94-17	5/1/1997				
	GWQ-94-17	1/24/1998				
	GWQ-94-17	2/1/1998				
	GWQ-94-17	3/1/1998				
	GWQ-94-17	4/14/1998				
	GWQ-94-17	5/1/1998				
	GWQ-94-17	5/1/1998				
	GWQ-94-17	7/21/1998				
	GWQ-94-17	8/1/1998				
	GWQ-94-17	9/1/1998				
-0.005	GWQ-94-20	11/15/1994	-0.05			
-0.001	GWQ-94-20	6/30/1996	-0.05			
	GWQ-94-20	8/1/1997				
-0.005	GWQ-94-21A	11/13/1994	-0.05			
-0.001	GWQ-94-21A	6/30/1996	-0.05			
	GWQ-94-21A	1/24/1998				
	GWQ-94-21A	2/1/1998				
	GWQ-94-21A	3/1/1998				
	GWQ-94-21A	4/14/1998				
	GWQ-94-21A	5/1/1998				
	GWQ-94-21A	6/1/1998				

Thallium	Well Name	Sample Dat	Zinc	Temp (C)	Tin	Vanadium
33.2	GWQ-94-21A	7/21/1998				
	GWQ-94-21A	8/1/1998				
	GWQ-94-21A	9/1/1998				
-0.005	GWQ-94-21B	11/13/1994	-0.05			
-0.001	GWQ-94-21B	6/30/1996	-0.05			
-0.001	GWQ-96-22A	7/13/1996	-0.05			
	GWQ-96-22A	2/5/1997				
	GWQ-96-22A	4/1/1997				
	GWQ-96-22A	8/1/1997				
-0.001	GWQ-96-22A	8/8/1997	-0.05			
	GWQ-96-22A	10/1/1997				
	GWQ-96-22A	1/24/1998				
	GWQ-96-22A	2/1/1998				
	GWQ-96-22A	3/1/1998				
	GWQ-96-22A	4/14/1998				
	GWQ-96-22A	5/1/1998				
	GWQ-96-22A	6/1/1998				
	GWQ-96-22A	7/21/1998				
	GWQ-96-22A	8/1/1998				
	GWQ-96-22A	9/1/1998				
	GWQ-96-22A	10/15/1998				
-0.001	GWQ-96-22B	7/13/1996	-0.05			
	GWQ-96-22B	2/5/1997				
-0.001	GWQ-96-23A	7/14/1996	-0.05			
	GWQ-96-23A	2/5/1997				
	GWQ-96-23A	4/1/1997				
	GWQ-96-23A	4/1/1997				
	GWQ-96-23A	8/1/1997				
-0.001	GWQ-96-23A	8/8/1997	-0.05			
	GWQ-96-23A	1/24/1998				
	GWQ-96-23A	2/1/1998				
	GWQ-96-23A	3/1/1998				
	GWQ-96-23A	4/14/1998				
	GWQ-96-23A	5/1/1998				
	GWQ-96-23A	6/1/1998				
	GWQ-96-23A	7/21/1998				

Thallium	Well Name	Sample Dat	Zinc	Temp (C)	Tin	Vanadium
	GWQ-96-23A	8/1/1998				
	GWQ-96-23A	9/1/1998				
	GWQ-96-23A	10/15/1998				
-0.001	GWQ-96-23B	7/14/1996	-0.05			
	GWQ-96-23B	2/5/1997				
	GWQ-96-23B	4/1/1997				
	GWQ-96-23B	4/1/1997				
	Hansen	1/1/1998				
	Hansen	2/1/1998				
	Hansen	3/1/1998				
	Hansen	4/1/1998				
	Hansen	5/1/1998				
	Hansen	6/1/1998				
	Hansen	7/22/1998				
	Hansen	8/1/1998				
	Hansen	9/1/1998				
-0.005	Highway	5/27/1994	-0.05			
	Highway	4/14/1998				
	Hill	7/13/1947				
	Humphries-Deep	10/1/1997				
	Humphries-Deep	1/23/1998				
	Humphries-Deep	2/1/1998				
	Humphries-Deep	3/1/1998				
	Humphries-Deep	4/15/1998				

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
Humphries.Deep				-6	Humphries.Deep-6	5/1/1998		
Humphries-Deep				-7	Humphries-Deep-7	6/1/1998		
Humphries-Deep				-8	Humphries-Deep-8	7/22/1998	Brownfield	
Humphries-Deep				-9	Humphries-Deep-9	8/1/1998		
Humphries-Deep				-10	Humphries-Deep-10	9/1/1998		
Humphries-Deep				-11	Humphries-Deep-11	10/15/1998	Goff	
Humphries-Shallow				-1	Humphries-Shallow-1	1/23/1998	Goff	
Humphries-Shallow				-2	Humphries-Shallow-2	2/1/1998		
Humphries-Shallow				-3	Humphries-Shallow-3	3/1/1998		
Humphries-Shallow				-4	Humphries-Shallow-4	4/15/1998	Goff	
Humphries-Shallow				-5	Humphries-Shallow-5	5/1/1998		
Humphries-Shallow				-6	Humphries-Shallow-6	6/1/1998		
Humphries-Shallow				-7	Humphries-Shallow-7	7/22/1998	Brownfield	
Humphries-Shallow				-8	Humphries-Shallow-8	8/1/1998		
Humphries-Shallow				-9	Humphries-Shallow-9	9/1/1998		
IW-1		Skute Stone Arroyo		-1	IW-1-1	3/4/1987	EID	
IW-1		Skute Stone Arroyo		-2	IW-1-2	7/19/1997	GE	lab pH
IW-1		Skute Stone Arroyo		-3	IW-1-3	8/29/1991	Irwin	lab pH
IW-1		Skute Stone Arroyo		-4	IW-1-4	11/26/1991	Hood	lab pH
IW-1		Skute Stone Arroyo		-5	IW-1-5	3/15/1992	Irwin	lab pH
IW-1		Skute Stone Arroyo		-6	IW-1-6	5/25/1992	Irwin	lab pH
IW-1		Skute Stone Arroyo		-7	IW-1-7	7/16/1992	Irwin	lab pH
IW-1		Skute Stone Arroyo		-8	IW-1-8	10/18/1992	Irwin	lab pH
IW-1		Skute Stone Arroyo		-9	IW-1-9	11/27/1992	Hood	lab pH
IW-1		Skute Stone Arroyo		-10	IW-1-10	12/15/1992	Irwin	lab pH
IW-1		Skute Stone Arroyo		-11	IW-1-11	9/28/1993	Irwin	lab pH
IW-1		Skute Stone Arroyo		-12	IW-1-12	3/17/1994	Irwin	lab pH
IW-1		Skute Stone Arroyo		-13	IW-1-13	5/24/1994	SRK	Mislabeled NP-3A
IW-1		Skute Stone Arroyo		-14	IW-1-14	6/23/1994	Irwin	lab pH
IW-1		Skute Stone Arroyo		-15	IW-1-15	7/22/1994	SRK	
IW-1		Skute Stone Arroyo		-16	IW-1-16	9/22/1994	Irwin	lab pH
IW-1		Skute Stone Arroyo		-17	IW-1-17	1/29/1995	Irwin	lab pH
IW-1		Skute Stone Arroyo		-18	IW-1-18	3/29/1995	Irwin	lab pH
IW-1		Skute Stone Arroyo		-19	IW-1-19	6/27/1995	Irwin	lab pH
IW-1		Skute Stone Arroyo		-20	IW-1-20	9/21/1995	Irwin	lab pH
IW-1		Skute Stone Arroyo		-21	IW-1-21	1/10/1996	Irwin	lab pH

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
IW-1		Skute Stone Arroyo		-22	IW-1-22	4/1/1996		
IW-1		Skute Stone Arroyo		-23	IW-1-23	6/1/1996		
IW-1		Skute Stone Arroyo		-24	IW-1-24	9/25/1996	Irwin	lab pH
IW-1		Skute Stone Arroyo		-25	IW-1-25	1/15/1997	Irwin	lab pH
IW-1		Skute Stone Arroyo		-26	IW-1-26	7/1/1997		
IW-1		Skute Stone Arroyo		-27	IW-1-27	10/1/1997		
IW-1		Skute Stone Arroyo		-28	IW-1-28	1/15/1998	Irwin	
IW-1		Skute Stone Arroyo		-29	IW-1-29	4/9/1998	Irwin	
IW-1		Skute Stone Arroyo		-30	IW-1-30	7/13/1998	Irwin	
IW-2		Skute Stone Arroyo		-1	IW-2-1	9/2/1982	EID	
IW-2		Skute Stone Arroyo		-2	IW-2-2	5/25/1994	SRK	Mislabeled NP-3B
IW-2		Skute Stone Arroyo		-3	IW-2-3	7/22/1994	SRK	
IW-3		Skute Stone Arroyo		-1	IW-3-1	9/2/1982	EID	
IW-3		Skute Stone Arroyo		-2	IW-3-2	2/25/1993	Irwin	lab pH
IW-3		Skute Stone Arroyo		-3	IW-3-3	5/26/1994	SRK	Significant sediment
IW-3		Skute Stone Arroyo		-4	IW-3-4	7/23/1994	SRK	
IW-3		Skute Stone Arroyo		-5	IW-3-5	4/3/1996	Irwin	lab pH
Ladder-Higgins				-1	Ladder-Higgins-1	8/2/1994	SRK	
McGarvey-Greyback		Skute Stone Arroyo		-1	McGarvey-Greyback-1	3/31/1993	JWS	
McGarvey-Greyback		Skute Stone Arroyo		-2	McGarvey-Greyback-2	10/1/1997		
McGarvey-Greyback		Skute Stone Arroyo		-3	McGarvey-Greyback-3	1/24/1998	Goff	
McGarvey-Greyback		Skute Stone Arroyo		-4	McGarvey-Greyback-4	2/1/1998		
McGarvey-Greyback		Skute Stone Arroyo		-5	McGarvey-Greyback-5	3/1/1998		
McGarvey-Greyback		Skute Stone Arroyo		-6	McGarvey-Greyback-6	4/15/1998	Goff	
McGarvey-Greyback		Skute Stone Arroyo		-7	McGarvey-Greyback-7	5/1/1998		
McGarvey-Greyback		Skute Stone Arroyo		-8	McGarvey-Greyback-8	6/1/1998		
McGarvey-Greyback		Skute Stone Arroyo		-9	McGarvey-Greyback-9	7/21/1998	Brownfield	
McGarvey-Greyback		Skute Stone Arroyo		-10	McGarvey-Greyback-1	8/1/1998		
McGarvey-Greyback		Skute Stone Arroyo		-11	McGarvey-Greyback-1	9/1/1998		
McGarvey-Greyback		Skute Stone Arroyo		-12	McGarvey-Greyback-1	10/15/1998	Goff	
Miranda				-1	Miranda-1	7/31/1947		
MW-1		Skute Stone Arroyo		-1	MW-1-1	1/1/1975		
MW-10				-1	MW-10-1	11/16/1994	SRK	
MW-10	67.08			-2	MW-10-2	1/23/1998	Goff	
MW-10	66.91			-3	MW-10-3	2/1/1998		
MW-10	66.82			-4	MW-10-4	3/1/1998		

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
MW-10	66.94			-5	MW-10-5	4/15/1998	Goff	
MW-10	66.19			-6	MW-10-6	5/1/1998		
MW-10	66.54			-7	MW-10-7	6/1/1998		
MW-10	66.98			-8	MW-10-8	7/22/1998	Brownfield	
MW-10	67.02			-9	MW-10-9	8/1/1998		
MW-10	66.92			-10	MW-10-10	9/1/1998		
MW-11				-1	MW-11-1	11/16/1994	SRK	
MW-11				-2	MW-11-2	4/1/1997		
MW-11				-3	MW-11-3	4/1/1997		
MW-11				-4	MW-11-4	8/1/1997		
MW-11				-5	MW-11-5	10/1/1997		
MW-11	5.9			-6	MW-11-6	1/24/1998	Goff	
MW-11	5.61			-7	MW-11-7	2/1/1998		
MW-11	5.52			-8	MW-11-8	3/1/1998		
MW-11	5.43			-9	MW-11-9	4/15/1998	Goff	
MW-11	6.32			-10	MW-11-10	5/1/1998		
MW-11	6.76			-11	MW-11-11	6/1/1998		
MW-11	7.61			-12	MW-11-12	7/22/1998	Brownfield	
MW-11	6.21			-13	MW-11-13	8/1/1998		
MW-11	6.84			-14	MW-11-14	9/1/1998	Goff	
MW-11				-15	MW-11-15	10/15/1998		
MW-2		Skute Stone Arroyo		-1	MW-2-1	5/7/1975		
MW-2		Skute Stone Arroyo		-2	MW-2-2	7/20/1994	SRK	
MW-3				-1	MW-3-1	10/15/1998	Goff	
MW-4		Skute Stone Arroyo		-1	MW-4-1	6/13/1975		
MW-4	122.87	Skute Stone Arroyo		-2	MW-4-2	6/9/1981	SHB	
MW-4		Skute Stone Arroyo		-3	MW-4-3	7/20/1994	SRK	
MW-4		Skute Stone Arroyo		-4	MW-4-4	4/1/1997		
MW-4		Skute Stone Arroyo		-5	MW-4-5	4/1/1997		
MW-4		Skute Stone Arroyo		-6	MW-4-6	8/1/1997		
MW-4	79.92	Skute Stone Arroyo		-7	MW-4-7	1/24/1998	Goff	
MW-4	80	Skute Stone Arroyo		-8	MW-4-8	2/1/1998		
MW-4	80.1	Skute Stone Arroyo		-9	MW-4-9	3/1/1998		
MW-4	80.43	Skute Stone Arroyo		-10	MW-4-10	4/14/1998	Goff	
MW-4	80.5	Skute Stone Arroyo		-11	MW-4-11	5/1/1998		
MW-4	80.68	Skute Stone Arroyo		-12	MW-4-12	6/1/1998		

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
MW-4	80.86	Skute Stone Arroyo		-13	MW-4-13	7/21/1998	Brownfield	
MW-4	81.19	Skute Stone Arroyo		-14	MW-4-14	8/1/1998		
MW-4	81.21	Skute Stone Arroyo		-15	MW-4-15	9/1/1998		
MW-5		Skute Stone Arroyo		-1	MW-5-1	9/19/1975		
MW-5		Skute Stone Arroyo		-2	MW-5-2	7/20/1994	SRK	
MW-5	325.04	Skute Stone Arroyo		-3	MW-5-3	1/1/1998		
MW-5	324.74	Skute Stone Arroyo		-4	MW-5-4	2/1/1998		
MW-5	324.11	Skute Stone Arroyo		-5	MW-5-5	3/1/1998		
MW-5	324.27	Skute Stone Arroyo		-6	MW-5-6	4/1/1998		
MW-5	325.08	Skute Stone Arroyo		-7	MW-5-7	5/1/1998		
MW-5	325.2	Skute Stone Arroyo		-8	MW-5-8	6/1/1998		
MW-5	327.88	Skute Stone Arroyo		-9	MW-5-9	7/1/1998		
MW-5	325.42	Skute Stone Arroyo		-10	MW-5-10	8/1/1998		
MW-5	327.87	Skute Stone Arroyo		-11	MW-5-11	9/1/1998		
MW-6		Skute Stone Arroyo		-1	MW-6-1	1/1/1975		
MW-6		Skute Stone Arroyo		-2	MW-6-2	8/2/1994	SRK	
MW-6		Skute Stone Arroyo		-3	MW-6-3	4/1/1997		
MW-6		Skute Stone Arroyo		-4	MW-6-4	8/1/1997		
MW-6		Skute Stone Arroyo		-5	MW-6-5	4/14/1998	Goff	
MW-6		Skute Stone Arroyo		-6	MW-6-6	7/21/1998	Brownfield	
MW-8		Skute Stone Arroyo		-1	MW-8-1	1/1/1975		
MW-8		Skute Stone Arroyo		-2	MW-8-2	7/21/1994	SRK	
MW-8	353.87	Skute Stone Arroyo		-3	MW-8-3	1/1/1998		
MW-8	353.77	Skute Stone Arroyo		-4	MW-8-4	2/1/1998		

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
Humphries.Deep	5/1/1998									
Humphries-Deep	6/1/1998									
Humphries-Deep	7/22/1998							TRUE	18.2	19
Humphries-Deep	8/1/1998									
Humphries-Deep	9/1/1998									
Humphries-Deep	10/15/1998							TRUE	19.4	19
Humphries-Shallow	1/23/1998							TRUE	18	18
Humphries-Shallow	2/1/1998									
Humphries-Shallow	3/1/1998									
Humphries-Shallow	4/15/1998							TRUE	12.4	17
Humphries-Shallow	5/1/1998									
Humphries-Shallow	6/1/1998									
Humphries-Shallow	7/22/1998							TRUE	13.8	19
Humphries-Shallow	8/1/1998									
Humphries-Shallow	9/1/1998									
IW-1	3/4/1987	32.96120	107.49678	266624	3649563	13	5186	TRUE	575	1901
IW-1	7/19/1997	32.96120	107.49678	266624	3649563	13	5186	TRUE	632.6	1985
IW-1	8/29/1991	32.96120	107.49678	266624	3649563	13	5186	FALSE	642.4	1917.9
IW-1	11/26/1991	32.96120	107.49678	266624	3649563	13	5186	FALSE	615.1	1634
IW-1	3/15/1992	32.96120	107.49678	266624	3649563	13	5186	FALSE	598.2	2203
IW-1	5/25/1992	32.96120	107.49678	266624	3649563	13	5186	FALSE	598.2	2203
IW-1	7/16/1992	32.96120	107.49678	266624	3649563	13	5186	FALSE	584.6	1775
IW-1	10/18/1992	32.96120	107.49678	266624	3649563	13	5186	FALSE	616.9	1726.8
IW-1	11/27/1992	32.96120	107.49678	266624	3649563	13	5186	FALSE	604.8	1716.6
IW-1	12/15/1992	32.96120	107.49678	266624	3649563	13	5186	FALSE	608.9	1414.6
IW-1	9/28/1993	32.96120	107.49678	266624	3649563	13	5186	FALSE	521.1	1150
IW-1	3/17/1994	32.96120	107.49678	266624	3649563	13	5186	FALSE	404.8	1569
IW-1	5/24/1994	32.96120	107.49678	266624	3649563	13	5186	FALSE	470	1500
IW-1	6/23/1994	32.96120	107.49678	266624	3649563	13	5186	FALSE	473.8	1444
IW-1	7/22/1994	32.96120	107.49678	266624	3649563	13	5186	TRUE	431	1480
IW-1	9/22/1994	32.96120	107.49678	266624	3649563	13	5186	FALSE	195.5	707.1
IW-1	1/29/1995	32.96120	107.49678	266624	3649563	13	5186	FALSE	663	1478.5
IW-1	3/29/1995	32.96120	107.49678	266624	3649563	13	5186	FALSE	419.4	1350.7
IW-1	6/27/1995	32.96120	107.49678	266624	3649563	13	5186	FALSE	446.1	1680.1
IW-1	9/21/1995	32.96120	107.49678	266624	3649563	13	5186	FALSE	458.7	1710.8
IW-1	1/10/1996	32.96120	107.49678	266624	3649563	13	5186	FALSE	442.2	1595.5

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
IW-1	4/1/1996	32.96120	107.49678	266624	3649563	13	5186		432.6	1566
IW-1	6/1/1996	32.96120	107.49678	266624	3649563	13	5186		426.8	1369.6
IW-1	9/25/1996	32.96120	107.49678	266624	3649563	13	5186	TRUE	568	1493
IW-1	1/15/1997	32.96120	107.49678	266624	3649563	13	5186	TRUE	410	1694.5
IW-1	7/1/1997	32.96120	107.49678	266624	3649563	13	5186	TRUE	375	2185
IW-1	10/1/1997	32.96120	107.49678	266624	3649563	13	5186	TRUE	400	1709
IW-1	1/15/1998	32.96120	107.49678	266624	3649563	13	5186	TRUE	385	1791
IW-1	4/9/1998	32.96120	107.49678	266624	3649563	13	5186	TRUE	373	1865
IW-1	7/13/1998	32.96120	107.49678	266624	3649563	13	5186	TRUE	383	1954
IW-2	9/2/1982	32.96214	107.49682	266622	3649667	13	5195	TRUE	409.07	2252
IW-2	5/25/1994	32.96214	107.49682	266622	3649667	13	5195	FALSE	340	1000
IW-2	7/22/1994	32.96214	107.49682	266622	3649667	13	5195	TRUE	380	1040
IW-3	9/2/1982	32.96313	107.49684	266623	3649776	13	5200	TRUE	159.12	707.3
IW-3	2/25/1993	32.96313	107.49684	266623	3649776	13	5200	FALSE	589.5	1738.9
IW-3	5/26/1994	32.96313	107.49684	266623	3649776	13	5200	FALSE	209	415
IW-3	7/23/1994	32.96313	107.49684	266623	3649776	13	5200	TRUE	206	437
IW-3	4/3/1996	32.96313	107.49684	266623	3649776	13	5200	FALSE	432.6	1566.3
Ladder-Higgins	8/2/1994							TRUE	48	22
McGarvey-Greyback	3/31/1993	32.96882	107.49714	266610	3650408	13	5195	TRUE	30	207
McGarvey-Greyback	10/1/1997	32.96882	107.49714	266610	3650408	13	5195	TRUE	47.2	14.3
McGarvey-Greyback	1/24/1998	32.96882	107.49714	266610	3650408	13	5195	TRUE	51.9	3
McGarvey-Greyback	2/1/1998	32.96882	107.49714	266610	3650408	13	5195			
McGarvey-Greyback	3/1/1998	32.96882	107.49714	266610	3650408	13	5195			
McGarvey-Greyback	4/15/1998	32.96882	107.49714	266610	3650408	13	5195	TRUE	50.5	2
McGarvey-Greyback	5/1/1998	32.96882	107.49714	266610	3650408	13	5195			
McGarvey-Greyback	6/1/1998	32.96882	107.49714	266610	3650408	13	5195			
McGarvey-Greyback	7/21/1998	32.96882	107.49714	266610	3650408	13	5195	TRUE	51	3
McGarvey-Greyback	8/1/1998	32.96882	107.49714	266610	3650408	13	5195			
McGarvey-Greyback	9/1/1998	32.96882	107.49714	266610	3650408	13	5195			
McGarvey-Greyback	10/15/1998	32.96882	107.49714	266610	3650408	13	5195	TRUE	47.2	14.3
Miranda	7/31/1947							FALSE	380	64
MW-1	1/1/1975	32.93787	107.46704	269344	3646910	13	4995	FALSE	10	73
MW-10	11/16/1994	32.97845	107.38743	276891	3651238	13	4443	TRUE	14	25
MW-10	1/23/1998	32.97845	107.38743	276891	3651238	13	4443	TRUE	18	19
MW-10	2/1/1998	32.97845	107.38743	276891	3651238	13	4443			
MW-10	3/1/1998	32.97845	107.38743	276891	3651238	13	4443			

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
MW-10	4/15/1998	32.97845	107.38743	276891	3651238	13	4443	TRUE	18.1	19
MW-10	5/1/1998	32.97845	107.38743	276891	3651238	13	4443			
MW-10	6/1/1998	32.97845	107.38743	276891	3651238	13	4443			
MW-10	7/22/1998	32.97845	107.38743	276891	3651238	13	4443	TRUE	14.83	12
MW-10	8/1/1998	32.97845	107.38743	276891	3651238	13	4443			
MW-10	9/1/1998	32.97845	107.38743	276891	3651238	13	4443			
MW-11	11/16/1994	32.97832	107.38747	276886	3651224	13	4443	TRUE	15	21
MW-11	4/1/1997	32.97832	107.38747	276886	3651224	13	4443	TRUE	18	16
MW-11	4/1/1997	32.97832	107.38747	276886	3651224	13	4443	TRUE	20.2	24
MW-11	8/1/1997	32.97832	107.38747	276886	3651224	13	4443	TRUE	19.9	
MW-11	10/1/1997	32.97832	107.38747	276886	3651224	13	4443	TRUE	17.8	21.6
MW-11	1/24/1998	32.97832	107.38747	276886	3651224	13	4443	TRUE	18.5	19
MW-11	2/1/1998	32.97832	107.38747	276886	3651224	13	4443			
MW-11	3/1/1998	32.97832	107.38747	276886	3651224	13	4443			
MW-11	4/15/1998	32.97832	107.38747	276886	3651224	13	4443	TRUE	17.9	19
MW-11	5/1/1998	32.97832	107.38747	276886	3651224	13	4443			
MW-11	6/1/1998	32.97832	107.38747	276886	3651224	13	4443			
MW-11	7/22/1998	32.97832	107.38747	276886	3651224	13	4443	TRUE	14.5	17
MW-11	8/1/1998	32.97832	107.38747	276886	3651224	13	4443			
MW-11	9/1/1998	32.97832	107.38747	276886	3651224	13	4443			
MW-11	10/15/1998	32.97832	107.38747	276886	3651224	13	4443	TRUE	17.8	21.6
MW-2	5/7/1975	32.92415	107.46436	269558	3645382	13	4980	FALSE	8	40
MW-2	7/20/1994	32.92415	107.46436	269558	3645382	13	4980	TRUE	5.5	18
MW-3	10/15/1998	32.92415	107.46436	269558	3645382	13	4980	TRUE	17	50.2
MW-4	6/13/1975	32.95405	107.48797	267429	3648750	13	5135	FALSE	15	110
MW-4	6/9/1981	32.95405	107.48797	267429	3648750	13	5135	TRUE		
MW-4	7/20/1994	32.95405	107.48797	267429	3648750	13	5135	TRUE	17	66
MW-4	4/1/1997	32.95405	107.48797	267429	3648750	13	5135	TRUE	20	62
MW-4	4/1/1997	32.95405	107.48797	267429	3648750	13	5135	TRUE	17	47
MW-4	8/1/1997	32.95405	107.48797	267429	3648750	13	5135	TRUE	20	
MW-4	1/24/1998	32.95405	107.48797	267429	3648750	13	5135	TRUE	20.1	48
MW-4	2/1/1998	32.95405	107.48797	267429	3648750	13	5135			
MW-4	3/1/1998	32.95405	107.48797	267429	3648750	13	5135			
MW-4	4/14/1998	32.95405	107.48797	267429	3648750	13	5135	TRUE	20.3	48
MW-4	5/1/1998	32.95405	107.48797	267429	3648750	13	5135			
MW-4	6/1/1998	32.95405	107.48797	267429	3648750	13	5135			

Well Name	Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
MW-4	7/21/1998	32.95405	107.48797	267429	3648750	13	5135	TRUE	20.3	46
MW-4	8/1/1998	32.95405	107.48797	267429	3648750	13	5135			
MW-4	9/1/1998	32.95405	107.48797	267429	3648750	13	5135			
MW-5	9/19/1975	32.97023	107.38902	276722	3650330	13	4700	FALSE	30	26
MW-5	7/20/1994	32.97023	107.38902	276722	3650330	13	4700	TRUE	17	24
MW-5	1/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	2/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	3/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	4/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	5/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	6/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	7/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	8/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-5	9/1/1998	32.97023	107.38902	276722	3650330	13	4700			
MW-6	1/1/1975	32.97312	107.40611	275132	3650687	13	4756	FALSE	66	38
MW-6	8/2/1994	32.97312	107.40611	275132	3650687	13	4756	TRUE	75	45
MW-6	4/1/1997	32.97312	107.40611	275132	3650687	13	4756	TRUE	71.4	62
MW-6	8/1/1997	32.97312	107.40611	275132	3650687	13	4756	TRUE	75.7	
MW-6	4/14/1998	32.97312	107.40611	275132	3650687	13	4756	TRUE	75.6	47
MW-6	7/21/1998	32.97312	107.40611	275132	3650687	13	4756	TRUE	78	49
MW-8	1/1/1975	32.96885	107.46111	269979	3650332	13	5012	FALSE	10	21
MW-8	7/21/1994	32.96885	107.46111	269979	3650332	13	5012	TRUE	6.6	18
MW-8	1/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-8	2/1/1998	32.96885	107.46111	269979	3650332	13	5012			

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
Humphries.Deep	5/1/1998										
Humphries-Deep	6/1/1998										
Humphries-Deep	7/22/1998		278				0.2	0.12			
Humphries-Deep	8/1/1998										
Humphries-Deep	9/1/1998										
Humphries-Deep	10/15/1998	8.05	259			544	0	-0.05			
Humphries-Shallow	1/23/1998	7.11	269		238.5	493	0.48				
Humphries-Shallow	2/1/1998										
Humphries-Shallow	3/1/1998										
Humphries-Shallow	4/15/1998	7.54	231			395	0.55	-0.05			
Humphries-Shallow	5/1/1998										
Humphries-Shallow	6/1/1998										
Humphries-Shallow	7/22/1998		262				0.56	-0.05			
Humphries-Shallow	8/1/1998										
Humphries-Shallow	9/1/1998										
IW-1	3/4/1987	6.6	3802		193	3950					
IW-1	7/19/1997	7.87	4235	182	222.1	6460	0.69	9.06			-0.002
IW-1	8/29/1991	7.13	4120								
IW-1	11/26/1991	7.53	3979								
IW-1	3/15/1992	7.09	4155								
IW-1	5/25/1992	7.09	4155								
IW-1	7/16/1992	7.12	4297								
IW-1	10/18/1992	6.96	3996								
IW-1	11/27/1992	7.71	4004								
IW-1	12/15/1992	7.4	3969								
IW-1	9/28/1993	7.12	3661								
IW-1	3/17/1994	7	3684								
IW-1	5/24/1994	7.84	3500		248	3920	0.7	5.8	0.94	-0.005	-0.005
IW-1	6/23/1994	7.69	3555								
IW-1	7/22/1994	7.51	3450		256	4100	0.72	5.9	-0.05	-0.005	-0.005
IW-1	9/22/1994	7.65	1691								
IW-1	1/29/1995	7.18	3395								
IW-1	3/29/1995	7.49	3465								
IW-1	6/27/1995	6.99	3599								
IW-1	9/21/1995	6.82	34.87								
IW-1	1/10/1996	7.32	3437								

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
IW-1	4/1/1996	7.04	3364								
IW-1	6/1/1996	7.17	3570								
IW-1	9/25/1996	7.17	3551								
IW-1	1/15/1997	7.44	35.97								
IW-1	7/1/1997	6.92	3604								
IW-1	10/1/1997	6.95	3576								
IW-1	1/15/1998	7.38	3529			5000	0.72	5.1			
IW-1	4/9/1998		3554			3760	0.74	5.1			
IW-1	7/13/1998		3558			3800	0.77	4.1			
IW-2	9/2/1982	7.3	4010		185	4250	1.22	1.38			
IW-2	5/25/1994	7.75	2400		534	2890	0.66	1.5	22	-0.005	-0.005
IW-2	7/22/1994	7.78	2390		300	3400	0.69	-0.1	-0.05	-0.005	-0.005
IW-3	9/2/1982	7.2	1562		179	1700	0.42	4.12			
IW-3	2/25/1993	7.27	3892								
IW-3	5/26/1994	7.83	1870		341	1790	0.47	5.7	32	-0.005	-0.005
IW-3	7/23/1994	7.76	1300		255	1860	0.48	5	-0.05	0.0055	-0.005
IW-3	4/3/1996	7.04	3364								
Ladder-Higgins	8/2/1994	8.01	286		137	450	1.9	-0.1	-0.05	-0.0082	-0.005
McGarvey-Greyback	3/31/1993	7.8	632		302	927	0.51	3	-0.1		-0.005
McGarvey-Greyback	10/1/1997	7.98	156					0.08			
McGarvey-Greyback	1/24/1998	9.22	166		101.3	385	1.23				
McGarvey-Greyback	2/1/1998										
McGarvey-Greyback	3/1/1998										
McGarvey-Greyback	4/15/1998	9.22	144			414	1.29	-0.05			
McGarvey-Greyback	5/1/1998										
McGarvey-Greyback	6/1/1998										
McGarvey-Greyback	7/21/1998		158				1.19	-0.05			
McGarvey-Greyback	8/1/1998										
McGarvey-Greyback	9/1/1998										
McGarvey-Greyback	10/15/1998	7.89	156			434		0.08			
Miranda	7/31/1947		823		117	1490	0.2	4.2			
MW-1	1/1/1975	8.1	433		215	480	0.7	6.1			
MW-10	11/16/1994	7.84	310		262	473	0.43	-1	-0.05	-0.005	-0.005
MW-10	1/23/1998	7.08	294		248.3	540	0.51				
MW-10	2/1/1998										
MW-10	3/1/1998										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
MW-10	4/15/1998	7.26	287			482	0.53	-0.05			
MW-10	5/1/1998										
MW-10	6/1/1998										
MW-10	7/22/1998		235				0.5	-0.05			
MW-10	8/1/1998										
MW-10	9/1/1998										
MW-11	11/16/1994	7.79	314		263	480	0.45	-1	-0.05	-0.005	-0.005
MW-11	4/1/1997		290				0.41				
MW-11	4/1/1997		275				0.6				
MW-11	8/1/1997	7.03	305				0.51				
MW-11	10/1/1997	7.94	286					-0.05			
MW-11	1/24/1998	6.94	288		245.8	520	0.56				
MW-11	2/1/1998										
MW-11	3/1/1998										
MW-11	4/15/1998	7.21	281			482	0.54	-0.05			
MW-11	5/1/1998										
MW-11	6/1/1998										
MW-11	7/22/1998		240				0.49	-0.05			
MW-11	8/1/1998										
MW-11	9/1/1998										
MW-11	10/15/1998	7.94	286			529		-0.05			
MW-2	5/7/1975	7.9	327		209	400	2.3				
MW-2	7/20/1994	9	254		149	347	3.1	-0.1	-0.05	-0.005	0.019
MW-3	10/15/1998	8.73	212			487		-0.05			
MW-4	6/13/1975	7.9			226	620	0.63				
MW-4	6/9/1981										
MW-4	7/20/1994	8.34	256		139	408	0.28	-1	-0.05	-0.005	-0.005
MW-4	4/1/1997		171				0.5				
MW-4	4/1/1997		200				0.29				
MW-4	8/1/1997	8.78	202				0.38				
MW-4	1/24/1998	8.76	208		141.5	431	0.37				
MW-4	2/1/1998										
MW-4	3/1/1998										
MW-4	4/14/1998	8.83	213			442	0.39	-0.05			
MW-4	5/1/1998										
MW-4	6/1/1998										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
MW-4	7/21/1998		220				0.43	-0.05			
MW-4	8/1/1998										
MW-4	9/1/1998										
MW-5	9/19/1975	7.7	260		157	390	0.61	-0.5			
MW-5	7/20/1994	7.97	440		274	507	0.18	-1	-0.05	-0.005	-0.005
MW-5	1/1/1998										
MW-5	2/1/1998										
MW-5	3/1/1998										
MW-5	4/1/1998										
MW-5	5/1/1998										
MW-5	6/1/1998										
MW-5	7/1/1998										
MW-5	8/1/1998										
MW-5	9/1/1998										
MW-6	1/1/1975	7.6	260		146	520	3.4	4.3			
MW-6	8/2/1994	8.09	436		154	626	1.6	-1	-0.05	0.01	0.013
MW-6	4/1/1997		417				6.9				
MW-6	8/1/1997	8.27	416				8				
MW-6	4/14/1998	8.4	431			667	9.2	0.97			
MW-6	7/21/1998		423				8.4	0.97			
MW-8	1/1/1975	7.7	293		222	440	0.86	15.4			
MW-8	7/21/1994	8.88	290		196	438	1	-1	-0.05	-0.005	0.012
MW-8	1/1/1998										
MW-8	2/1/1998										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
Humphries.Deep	5/1/1998										
Humphries-Deep	6/1/1998										
Humphries-Deep	7/22/1998					64.1			-0.005	-0.05	
Humphries-Deep	8/1/1998										
Humphries-Deep	9/1/1998										
Humphries-Deep	10/15/1998								-0.005	0.17	
Humphries-Shallow	1/23/1998					59.9			-0.005		
Humphries-Shallow	2/1/1998										
Humphries-Shallow	3/1/1998										
Humphries-Shallow	4/15/1998					52.1			-0.005	-0.05	
Humphries-Shallow	5/1/1998										
Humphries-Shallow	6/1/1998										
Humphries-Shallow	7/22/1998					58.3			-0.005	-0.05	
Humphries-Shallow	8/1/1998										
Humphries-Shallow	9/1/1998										
IW-1	3/4/1987					564					
IW-1	7/19/1997		-0.01		-0.005	635.5	-0.02		-0.02	-0.05	-0.005
IW-1	8/29/1991										
IW-1	11/26/1991										
IW-1	3/15/1992										
IW-1	5/25/1992										
IW-1	7/16/1992										
IW-1	10/18/1992										
IW-1	11/27/1992										
IW-1	12/15/1992										
IW-1	9/28/1993										
IW-1	3/17/1994										
IW-1	5/24/1994		-0.1		-0.0005	550	-0.025		-0.025	1	-0.005
IW-1	6/23/1994										
IW-1	7/22/1994	0.1	-0.1	-0.002	-0.0005	570	-0.025	-0.05	-0.025	-0.05	-0.005
IW-1	9/22/1994										
IW-1	1/29/1995										
IW-1	3/29/1995										
IW-1	6/27/1995										
IW-1	9/21/1995										
IW-1	1/10/1996										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
IW-1	4/1/1996										
IW-1	6/1/1996										
IW-1	9/25/1996										
IW-1	1/15/1997										
IW-1	7/1/1997										
IW-1	10/1/1997										
IW-1	1/15/1998								-0.005	-0.05	
IW-1	4/9/1998								-0.005	-0.2	
IW-1	7/13/1998								-0.005	-0.05	
IW-2	9/2/1982				-0.001	320					
IW-2	5/25/1994		0.12		-0.0005	430	0.046		-0.025	16	0.0073
IW-2	7/22/1994	0.15	-0.1	-0.002	-0.0005	390	-0.025	-0.05	-0.025	-0.05	-0.005
IW-3	9/2/1982			0	-0.001	233.6					
IW-3	2/25/1993										
IW-3	5/26/1994		0.2		-0.0005	240	0.059		6	22	0.077
IW-3	7/23/1994	-0.1	-0.1	-0.002	-0.0005	200	-0.025	-0.05	0.058	-0.05	-0.005
IW-3	4/3/1996	0	0	0							
Ladder-Higgins	8/2/1994	0.11	-0.1	-0.002	-0.0005	51	-0.025	-0.05	-0.025	-0.05	-0.005
McGarvey-Greyback	3/31/1993	-0.04	-0.5	0	-0.0002	97	-0.02	-0.05	-0.01	0.05	-0.02
McGarvey-Greyback	10/1/1997	-0.005	0.43						-0.005	0.43	
McGarvey-Greyback	1/24/1998					4.5			-0.005		
McGarvey-Greyback	2/1/1998										
McGarvey-Greyback	3/1/1998										
McGarvey-Greyback	4/15/1998					2.8			-0.005	0.24	
McGarvey-Greyback	5/1/1998										
McGarvey-Greyback	6/1/1998										
McGarvey-Greyback	7/21/1998					5			-0.005	0.35	
McGarvey-Greyback	8/1/1998										
McGarvey-Greyback	9/1/1998										
McGarvey-Greyback	10/15/1998								-0.005	0.43	
Miranda	7/31/1947					126					
MW-1	1/1/1975					28					
MW-10	11/16/1994	-0.1	-0.1	-0.002	-0.0005	59	-0.025	-0.05	-0.025	-0.05	-0.005
MW-10	1/23/1998					54.3			-0.005		
MW-10	2/1/1998										
MW-10	3/1/1998										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW-10	4/15/1998					67.4			-0.005	-0.05	
MW-10	5/1/1998										
MW-10	6/1/1998										
MW-10	7/22/1998					57.7			-0.005	-0.05	
MW-10	8/1/1998										
MW-10	9/1/1998										
MW-11	11/16/1994	-0.1	-0.1	-0.002	-0.0005	63	-0.025	-0.05	-0.025	-0.05	-0.005
MW-11	4/1/1997								-0.025	-0.05	
MW-11	4/1/1997								-0.005	-0.05	
MW-11	8/1/1997										
MW-11	10/1/1997								0.09	-0.05	
MW-11	1/24/1998					64.1			-0.005		
MW-11	2/1/1998										
MW-11	3/1/1998										
MW-11	4/15/1998					65.8			-0.005	-0.05	
MW-11	5/1/1998										
MW-11	6/1/1998										
MW-11	7/22/1998					56			-0.005	-0.05	
MW-11	8/1/1998										
MW-11	9/1/1998										
MW-11	10/15/1998								0.09	-0.05	
MW-2	5/7/1975					9					
MW-2	7/20/1994	0.16	-0.1	-0.002	-0.0005	2.5	-0.025	-0.05	-0.025	0.069	-0.005
MW-3	10/15/1998								-0.005	1.68	
MW-4	6/13/1975					46					
MW-4	6/9/1981										
MW-4	7/20/1994	-0.1	-0.1	-0.002	-0.0005	15	-0.025	-0.05	-0.025	-0.05	-0.005
MW-4	4/1/1997								-0.005	9.9	
MW-4	4/1/1997								-0.025	-0.05	
MW-4	8/1/1997										
MW-4	1/24/1998					11.7			-0.005		
MW-4	2/1/1998										
MW-4	3/1/1998										
MW-4	4/14/1998					11.5			-0.005	0.88	
MW-4	5/1/1998										
MW-4	6/1/1998										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW-4	7/21/1998					11.6			-0.005	3.43	
MW-4	8/1/1998										
MW-4	9/1/1998										
MW-5	9/19/1975					26					
MW-5	7/20/1994	-0.1	-0.1	-0.002	-0.0005	71	-0.025	-0.05	-0.025	-0.05	-0.005
MW-5	1/1/1998										
MW-5	2/1/1998										
MW-5	3/1/1998										
MW-5	4/1/1998										
MW-5	5/1/1998										
MW-5	6/1/1998										
MW-5	7/1/1998										
MW-5	8/1/1998										
MW-5	9/1/1998										
MW-6	1/1/1975					19					
MW-6	8/2/1994	0.16	-0.1	-0.002	-0.0005	14	-0.025	-0.025	-0.025	0.41	-0.005
MW-6	4/1/1997								-0.005	0.45	
MW-6	8/1/1997										
MW-6	4/14/1998					13.5			-0.005	0.24	
MW-6	7/21/1998					14.3			-0.005	0.36	
MW-8	1/1/1975					34					
MW-8	7/21/1994	-0.1	-0.1	-0.002	-0.0005	4.8	-0.025	-0.05	-0.025	0.14	-0.005
MW-8	1/1/1998										
MW-8	2/1/1998										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
Humphries.Deep	5/1/1998										
Humphries-Deep	6/1/1998										
Humphries-Deep	7/22/1998	10.2	-0.02	-0.0002	-0.05		1.5	-0.05		19.3	
Humphries-Deep	8/1/1998										
Humphries-Deep	9/1/1998										
Humphries-Deep	10/15/1998										
Humphries-Shallow	1/23/1998	8.5	-0.02				3.7			22.4	
Humphries-Shallow	2/1/1998										
Humphries-Shallow	3/1/1998										
Humphries-Shallow	4/15/1998	6.7	-0.02	-0.0002	-0.05		1.1	-0.05		19.5	
Humphries-Shallow	5/1/1998										
Humphries-Shallow	6/1/1998										
Humphries-Shallow	7/22/1998	7.1	-0.02	0.0005	-0.05		1	-0.05		19.6	
Humphries-Shallow	8/1/1998										
Humphries-Shallow	9/1/1998										
IW-1	3/4/1987						3.12			273.7	
IW-1	7/19/1997	181.6	-0.02	0.0005			7	0.015	-0.02	375	
IW-1	8/29/1991										
IW-1	11/26/1991										
IW-1	3/15/1992										
IW-1	5/25/1992										
IW-1	7/16/1992										
IW-1	10/18/1992										
IW-1	11/27/1992										
IW-1	12/15/1992										
IW-1	9/28/1993										
IW-1	3/17/1994										
IW-1	5/24/1994	170	-0.03	-0.001		-0.05	2.9	-0.005	-0.025	250	
IW-1	6/23/1994										
IW-1	7/22/1994	200	-0.03	-0.001	-0.05	-0.05	2.5	0.018	-0.025	280	0.0063
IW-1	9/22/1994										
IW-1	1/29/1995										
IW-1	3/29/1995										
IW-1	6/27/1995										
IW-1	9/21/1995										
IW-1	1/10/1996										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
IW-1	4/1/1996										
IW-1	6/1/1996										
IW-1	9/25/1996										
IW-1	1/15/1997										
IW-1	7/1/1997										
IW-1	10/1/1997										
IW-1	1/15/1998	160.9		0.0004	-0.05						
IW-1	4/9/1998		-0.02	0.0003	-0.05			-0.05			
IW-1	7/13/1998		0.2	0.0008	-0.05			-0.05			
IW-2	9/2/1982	173.7	-0.05		-0.01		234	-0.005		720	
IW-2	5/25/1994	94	0.77	-0.001		0.097	3.2	-0.005	-0.025	290	
IW-2	7/22/1994	110	0.036	-0.001	-0.05	-0.05	1.3	0.014	-0.025	360	0.0073
IW-3	9/2/1982	42.1	-0.05		-0.01		3.51	-0.005		168	
IW-3	2/25/1993										
IW-3	5/26/1994	51	0.35	-0.001		0.19	4	-0.005	-0.025	69	
IW-3	7/23/1994	66	0.13	-0.001	0.062	-0.05	3.5	0.011	-0.025	89	-0.005
IW-3	4/3/1996										
Ladder-Higgins	8/2/1994	9	-0.03	-0.001	-0.05	-0.05	3	-0.005	-0.025	24	-0.005
McGarvey-Greyback	3/31/1993	24	-0.02	-0.001	-0.02	-0.01	2	-0.005	-0.01	78	
McGarvey-Greyback	10/1/1997										
McGarvey-Greyback	1/24/1998	1.6	-0.02				6			64.9	
McGarvey-Greyback	2/1/1998										
McGarvey-Greyback	3/1/1998										
McGarvey-Greyback	4/15/1998	0.7	-0.02	-0.0002	-0.05		2.3	-0.05		64.3	
McGarvey-Greyback	5/1/1998										
McGarvey-Greyback	6/1/1998										
McGarvey-Greyback	7/21/1998	1.1	-0.02	-0.0002	-0.05		4.4	-0.05		58	
McGarvey-Greyback	8/1/1998										
McGarvey-Greyback	9/1/1998										
McGarvey-Greyback	10/15/1998										
Miranda	7/31/1947	17									
MW-1	1/1/1975	1					10.6			85	
MW-10	11/16/1994	9.4	-0.03	-0.001	-0.05	-0.05	1.9	-0.005	-0.025	29	-0.005
MW-10	1/23/1998	11.1	-0.02				8.6			23.9	
MW-10	2/1/1998										
MW-10	3/1/1998										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
MW-10	4/15/1998	8.3	-0.02	0.0002	-0.05		1.1	-0.05		22	
MW-10	5/1/1998										
MW-10	6/1/1998										
MW-10	7/22/1998	6.7	-0.02	-0.0002	-0.05		0.9	-0.05		18.3	
MW-10	8/1/1998										
MW-10	9/1/1998										
MW-11	11/16/1994	9.7	-0.03	-0.001	-0.05	-0.05	1.5	-0.005	-0.025	23	-0.005
MW-11	4/1/1997		-0.025								
MW-11	4/1/1997		-0.02	-0.002				-0.001			
MW-11	8/1/1997										
MW-11	10/1/1997										
MW-11	1/24/1998	9.2	-0.02				3.3			23.2	
MW-11	2/1/1998										
MW-11	3/1/1998										
MW-11	4/15/1998	8.1	-0.02	-0.0002	-0.05		0.9	-0.05		2.1	
MW-11	5/1/1998										
MW-11	6/1/1998										
MW-11	7/22/1998	6.6	-0.02	0.0006	-0.05		0.5	-0.05		18.1	
MW-11	8/1/1998										
MW-11	9/1/1998										
MW-11	10/15/1998										
MW-2	5/7/1975	0					5.3			89	
MW-2	7/20/1994	0.16	-0.03	-0.001	-0.05	-0.05	-1	-0.005	-0.025	79	-0.005
MW-3	10/15/1998										
MW-4	6/13/1975	10					4.4			73	
MW-4	6/9/1981										
MW-4	7/20/1994	13	-0.03	-0.001	-0.05	-0.05	3.4	-0.005	-0.025	56	-0.005
MW-4	4/1/1997		-0.02	-0.002				0.019			
MW-4	4/1/1997		-0.025								
MW-4	8/1/1997										
MW-4	1/24/1998	10.9	0.06				5.9			56.2	
MW-4	2/1/1998										
MW-4	3/1/1998										
MW-4	4/14/1998	10.5	-0.02	0.0003	-0.05		2.2	-0.05		54.8	
MW-4	5/1/1998										
MW-4	6/1/1998										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
MW-4	7/21/1998	9.5	-0.02	-0.0002	-0.05		2.7	-0.05		51.3	
MW-4	8/1/1998										
MW-4	9/1/1998										
MW-5	9/19/1975	3					4.1			54	
MW-5	7/20/1994	11	-0.03	-0.001	-0.05	-0.05	3.6	-0.005	-0.025	33	-0.005
MW-5	1/1/1998										
MW-5	2/1/1998										
MW-5	3/1/1998										
MW-5	4/1/1998										
MW-5	5/1/1998										
MW-5	6/1/1998										
MW-5	7/1/1998										
MW-5	8/1/1998										
MW-5	9/1/1998										
MW-6	1/1/1975	1					7.3			90	
MW-6	8/2/1994	0.95	-0.03	-0.001	-0.05	-0.05	6.2	-0.005	-0.025	120	-0.005
MW-6	4/1/1997		-0.02								
MW-6	8/1/1997										
MW-6	4/14/1998	0.6	-0.02	0.0003	-0.05		5.4	-0.05		116.6	
MW-6	7/21/1998	0.5	-0.02	0.0008	-0.05		5.8	-0.05		105.9	
MW-8	1/1/1975	10					6.2			45	
MW-8	7/21/1994	1	-0.03	-0.001	-0.05	-0.05	3.4	-0.005	-0.025	89	-0.005
MW-8	1/1/1998										
MW-8	2/1/1998										

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
Humphries.Deep	5/1/1998				
Humphries-Deep	6/1/1998				
Humphries-Deep	7/22/1998				
Humphries-Deep	8/1/1998				
Humphries-Deep	9/1/1998				
Humphries-Deep	10/15/1998				
Humphries-Shallow	1/23/1998				
Humphries-Shallow	2/1/1998				
Humphries-Shallow	3/1/1998				
Humphries-Shallow	4/15/1998				
Humphries-Shallow	5/1/1998				
Humphries-Shallow	6/1/1998				
Humphries-Shallow	7/22/1998				
Humphries-Shallow	8/1/1998				
Humphries-Shallow	9/1/1998				
IW-1	3/4/1987		22.5		
IW-1	7/19/1997				
IW-1	8/29/1991				
IW-1	11/26/1991				
IW-1	3/15/1992				
IW-1	5/25/1992				
IW-1	7/16/1992				
IW-1	10/18/1992				
IW-1	11/27/1992				
IW-1	12/15/1992				
IW-1	9/28/1993				
IW-1	3/17/1994				
IW-1	5/24/1994	0.053			
IW-1	6/23/1994				
IW-1	7/22/1994	-0.05			
IW-1	9/22/1994				
IW-1	1/29/1995				
IW-1	3/29/1995				
IW-1	6/27/1995				
IW-1	9/21/1995				
IW-1	1/10/1996				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
IW-1	4/1/1996				
IW-1	6/1/1996				
IW-1	9/25/1996				
IW-1	1/15/1997				
IW-1	7/1/1997				
IW-1	10/1/1997				
IW-1	1/15/1998				
IW-1	4/9/1998				
IW-1	7/13/1998				
IW-2	9/2/1982				
IW-2	5/25/1994	0.084			
IW-2	7/22/1994	-0.05			
IW-3	9/2/1982				
IW-3	2/25/1993				
IW-3	5/26/1994	0.15			
IW-3	7/23/1994	-0.05			
IW-3	4/3/1996				
Ladder-Higgins	8/2/1994	-0.05			
McGarvey-Greyback	3/31/1993	0.01			
McGarvey-Greyback	10/1/1997				
McGarvey-Greyback	1/24/1998				
McGarvey-Greyback	2/1/1998				
McGarvey-Greyback	3/1/1998				
McGarvey-Greyback	4/15/1998				
McGarvey-Greyback	5/1/1998				
McGarvey-Greyback	6/1/1998				
McGarvey-Greyback	7/21/1998				
McGarvey-Greyback	8/1/1998				
McGarvey-Greyback	9/1/1998				
McGarvey-Greyback	10/15/1998				
Miranda	7/31/1947				
MW-1	1/1/1975				
MW-10	11/16/1994	-0.05			
MW-10	1/23/1998				
MW-10	2/1/1998				
MW-10	3/1/1998				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
MW-10	4/15/1998				
MW-10	5/1/1998				
MW-10	6/1/1998				
MW-10	7/22/1998				
MW-10	8/1/1998				
MW-10	9/1/1998				
MW-11	11/16/1994	-0.05			
MW-11	4/1/1997				
MW-11	4/1/1997				
MW-11	8/1/1997				
MW-11	10/1/1997				
MW-11	1/24/1998				
MW-11	2/1/1998				
MW-11	3/1/1998				
MW-11	4/15/1998				
MW-11	5/1/1998				
MW-11	6/1/1998				
MW-11	7/22/1998				
MW-11	8/1/1998				
MW-11	9/1/1998				
MW-11	10/15/1998				
MW-2	5/7/1975				
MW-2	7/20/1994	-0.05			
MW-3	10/15/1998				
MW-4	6/13/1975				
MW-4	6/9/1981				
MW-4	7/20/1994	-0.05			
MW-4	4/1/1997				
MW-4	4/1/1997				
MW-4	8/1/1997				
MW-4	1/24/1998				
MW-4	2/1/1998				
MW-4	3/1/1998				
MW-4	4/14/1998				
MW-4	5/1/1998				
MW-4	6/1/1998				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
MW-4	7/21/1998				
MW-4	8/1/1998				
MW-4	9/1/1998				
MW-5	9/19/1975				
MW-5	7/20/1994	-0.05			
MW-5	1/1/1998				
MW-5	2/1/1998				
MW-5	3/1/1998				
MW-5	4/1/1998				
MW-5	5/1/1998				
MW-5	6/1/1998				
MW-5	7/1/1998				
MW-5	8/1/1998				
MW-5	9/1/1998				
MW-6	1/1/1975				
MW-6	8/2/1994	-0.05			
MW-6	4/1/1997				
MW-6	8/1/1997				
MW-6	4/14/1998				
MW-6	7/21/1998				
MW-8	1/1/1975				
MW-8	7/21/1994	-0.05			
MW-8	1/1/1998				
MW-8	2/1/1998				

Well Name	Water Depth	USGS Quad	Well Depth		Sample Date	Sampler	Notes
MW-8	353.7	Skute Stone Arroyo	-5	MW-8-5	3/1/1998		
MW-8	353.7	Skute Stone Arroyo	-6	MW-8-6	4/1/1998		
MW-8	352.19	Skute Stone Arroyo	-7	MW-8-7	5/1/1998		
MW-8	353.43	Skute Stone Arroyo	-8	MW-8-8	6/1/1998		
MW-8	355.06	Skute Stone Arroyo	-9	MW-8-9	7/1/1998		
MW-8	354.55	Skute Stone Arroyo	-10	MW-8-10	8/1/1998		
MW-8	356.11	Skute Stone Arroyo	-11	MW-8-11	9/1/1998		
MW-9			-1	MW-9-1	11/16/1994	SRK	Animas Ck.
MW-9			-2	MW-9-2	8/1/1997		
MW-9	67.74		-3	MW-9-3	1/23/1998	Goff	
MW-9	67.72		-4	MW-9-4	2/1/1998		
MW-9	67.71		-5	MW-9-5	3/1/1998		
MW-9	67.75		-6	MW-9-6	4/15/1998	Goff	
MW-9	67.94		-7	MW-9-7	5/1/1998		
MW-9	68.7		-8	MW-9-8	6/1/1998		
MW-9	68375		-9	MW-9-9	7/22/1998	Brownfield	
MW-9	68.72		-10	MW-9-10	8/1/1998		
MW-9	68.65		-11	MW-9-11	9/1/1998		
MW-9			-12	MW-9-12	10/15/1998	Goff	
NP-1	83.7	Skute Stone Arroyo	-1	NP-1-1	10/8/1981	QMC	
NP-1	85.6	Skute Stone Arroyo	-2	NP-1-2	11/4/1981	QMC	
NP-1	85.67	Skute Stone Arroyo	-3	NP-1-3	11/13/1981	EID	
NP-1	84.5	Skute Stone Arroyo	-4	NP-1-4	11/17/1981	QMC	
NP-1	84.1	Skute Stone Arroyo	-5	NP-1-5	11/23/1981	QMC	
NP-1	88.2	Skute Stone Arroyo	-6	NP-1-6	12/7/1981	QMC	
NP-1	84	Skute Stone Arroyo	-7	NP-1-7	12/15/1981	QMC	
NP-1	84	Skute Stone Arroyo	-8	NP-1-8	12/22/1981	QMC	
NP-1	85.5	Skute Stone Arroyo	-9	NP-1-9	1/5/1982	QMC	
NP-1	84.42	Skute Stone Arroyo	-10	NP-1-10	1/18/1982	QMC	
NP-1	84.4	Skute Stone Arroyo	-11	NP-1-11	1/26/1982	QMC	
NP-1	85.17	Skute Stone Arroyo	-12	NP-1-12	2/16/1982	QMC	
NP-1	85.2	Skute Stone Arroyo	-13	NP-1-13	2/22/1982	QMC	
NP-1	84.83	Skute Stone Arroyo	-14	NP-1-14	3/12/1982	QMC	
NP-1	84.5	Skute Stone Arroyo	-15	NP-1-15	4/16/1982	QMC	
NP-1	84.5	Skute Stone Arroyo	-16	NP-1-16	4/26/1982	QMC	
NP-1	84.08	Skute Stone Arroyo	-17	NP-1-17	5/17/1982	QMC	

Well Name	Water Depth	USGS Quad	Well Depth		Sample Date	Sampler	Notes
NP-1		Skute Stone Arroyo	-18	NP-1-18	5/24/1982	QMC	
NP-1		Skute Stone Arroyo	-19	NP-1-19	5/28/1982	QMC	
NP-1	83.3	Skute Stone Arroyo	-20	NP-1-20	6/8/1982	QMC	
NP-1	83.33	Skute Stone Arroyo	-21	NP-1-21	6/14/1982	QMC	
NP-1	82.1	Skute Stone Arroyo	-22	NP-1-22	6/30/1982	QMC	
NP-1	82.08	Skute Stone Arroyo	-23	NP-1-23	7/26/1982	QMC	
NP-1	81.5	Skute Stone Arroyo	-24	NP-1-24	8/18/1982	QMC	
NP-1	80.6	Skute Stone Arroyo	-25	NP-1-25	9/14/1982	QMC	
NP-1	79.1	Skute Stone Arroyo	-26	NP-1-26	10/18/1982	QMC	
NP-1	79.1	Skute Stone Arroyo	-27	NP-1-27	10/27/1982	QMC	
NP-1	78	Skute Stone Arroyo	-28	NP-1-28	11/11/1982	QMC	
NP-1	76.1	Skute Stone Arroyo	-29	NP-1-29	12/28/1982	QMC	
NP-1	74.4	Skute Stone Arroyo	-30	NP-1-30	2/21/1983	QMC	
NP-1	72.1	Skute Stone Arroyo	-31	NP-1-31	5/6/1983	QMC	
NP-1	72.1	Skute Stone Arroyo	-32	NP-1-32	5/13/1983	QMC	
NP-1	71.5	Skute Stone Arroyo	-33	NP-1-33	6/2/1983	QMC	
NP-1	71.2	Skute Stone Arroyo	-34	NP-1-34	7/5/1983	QMC	
NP-1	70.7	Skute Stone Arroyo	-35	NP-1-35	8/9/1983	QMC	
NP-1	70.7	Skute Stone Arroyo	-36	NP-1-36	8/25/1983	QMC	
NP-1	69.6	Skute Stone Arroyo	-37	NP-1-37	10/20/1983	QMC	
NP-1	69.6	Skute Stone Arroyo	-38	NP-1-38	11/1/1983	QMC	
NP-1	68.3	Skute Stone Arroyo	-39	NP-1-39	12/7/1983	QMC	
NP-1	67.3	Skute Stone Arroyo	-40	NP-1-40	1/28/1984	QMC	
NP-1	67.1	Skute Stone Arroyo	-41	NP-1-41	2/13/1984	QMC	
NP-1	66.6	Skute Stone Arroyo	-42	NP-1-42	3/1/1984	QMC	
NP-1	66.6	Skute Stone Arroyo	-43	NP-1-43	3/16/1984	CFP	
NP-1		Skute Stone Arroyo	-44	NP-1-44	4/9/1984	CFP	
NP-1	66.1	Skute Stone Arroyo	-45	NP-1-45	4/18/1984	CFP	
NP-1	65.7	Skute Stone Arroyo	-46	NP-1-46	5/22/1984	CFP	
NP-1	65.7	Skute Stone Arroyo	-47	NP-1-47	5/30/1984	CFP	
NP-1	65.6	Skute Stone Arroyo	-48	NP-1-48	6/26/1984	CFP	
NP-1	65.4	Skute Stone Arroyo	-49	NP-1-49	7/25/1984	CFP	
NP-1	65.2	Skute Stone Arroyo	-50	NP-1-50	8/27/1984	CFP	
NP-1	64.4	Skute Stone Arroyo	-51	NP-1-51	9/12/1984	CFP	
NP-1	64.4	Skute Stone Arroyo	-52	NP-1-52	9/21/1984	CFP	
NP-1	64.1	Skute Stone Arroyo	-53	NP-1-53	11/19/1984	CFP	

Well Name	Water Depth	USGS Quad	Well Depth		Sample Date	Sampler	Notes
NP-1	64.1	Skute Stone Arroyo	-54	NP-1-54	11/27/1984	CFP	
NP-1	63.6	Skute Stone Arroyo	-55	NP-1-55	12/17/1984	CFP	
NP-1	62.3	Skute Stone Arroyo	-56	NP-1-56	5/17/1985	CFP	
NP-1	54.9	Skute Stone Arroyo	-57	NP-1-57	11/13/1985	CFP	
NP-1	52.9	Skute Stone Arroyo	-58	NP-1-58	5/23/1986	CFP	
NP-1	52.9	Skute Stone Arroyo	-59	NP-1-59	10/8/1986	CFP	
NP-1		Skute Stone Arroyo	-60	NP-1-60	3/30/1989	EID	
NP-1	29	Skute Stone Arroyo	-61	NP-1-61	7/19/1991	GE	lab pH
NP-1	29.17	Skute Stone Arroyo	-62	NP-1-62	8/29/1991	Irwin	lab pH
NP-1	28	Skute Stone Arroyo	-63	NP-1-63	11/26/1991	Hood	lab pH
NP-1	16.17	Skute Stone Arroyo	-64	NP-1-64	3/15/1992	Irwin	lab pH
NP-1		Skute Stone Arroyo	-65	NP-1-65	5/25/1992	Irwin	lab pH
NP-1		Skute Stone Arroyo	-66	NP-1-66	7/16/1992	Irwin	lab pH
NP-1	26.17	Skute Stone Arroyo	-67	NP-1-67	10/8/1992	Irwin	lab pH
NP-1	25.25	Skute Stone Arroyo	-68	NP-1-68	11/27/1992	Hood	lab pH
NP-1		Skute Stone Arroyo	-69	NP-1-69	12/15/1992	Irwin	lab pH
NP-1	26.17	Skute Stone Arroyo	-70	NP-1-70	2/25/1993	Irwin	lab pH
NP-1		Skute Stone Arroyo	-71	NP-1-71	3/30/1993	JWS	
NP-1		Skute Stone Arroyo	-72	NP-1-72	9/28/1993	Irwin	lab pH
NP-1	27	Skute Stone Arroyo	-73	NP-1-73	3/17/1994	Irwin	lab pH
NP-1	26.45	Skute Stone Arroyo	-74	NP-1-74	5/24/1994	SRK	
NP-1		Skute Stone Arroyo	-75	NP-1-75	6/23/1994	Irwin	lab pH
NP-1		Skute Stone Arroyo	-76	NP-1-76	7/21/1994	SRK	
NP-1		Skute Stone Arroyo	-77	NP-1-77	9/22/1994	Irwin	lab pH
NP-1		Skute Stone Arroyo	-78	NP-1-78	1/29/1995	Irwin	lab pH
NP-1		Skute Stone Arroyo	-79	NP-1-79	3/29/1995	Irwin	lab pH
NP-1	28.33	Skute Stone Arroyo	-80	NP-1-80	6/27/1995	Irwin	lab pH
NP-1		Skute Stone Arroyo	-81	NP-1-81	9/21/1995	Irwin	lab pH
NP-1		Skute Stone Arroyo	-82	NP-1-82	1/10/1996	Irwin	lab pH
NP-1		Skute Stone Arroyo	-83	NP-1-83	4/3/1996	Irwin	lab pH
NP-1		Skute Stone Arroyo	-84	NP-1-84	6/1/1996		
NP-1		Skute Stone Arroyo	-85	NP-1-85	9/25/1996	Irwin	lab pH
NP-1		Skute Stone Arroyo	-86	NP-1-86	1/15/1997	Irwin	lab pH
NP-1		Skute Stone Arroyo	-87	NP-1-87	4/1/1997		
NP-1		Skute Stone Arroyo	-88	NP-1-88	7/1/1997		
NP-1		Skute Stone Arroyo	-89	NP-1-89	10/1/1997		

Well Name	Water Depth	USGS Quad	Well Depth		Sample Date	Sampler	Notes
NP-1	30.42	Skute Stone Arroyo	-90	NP-1-90	1/15/1998	Irwin	
NP-1	30.33	Skute Stone Arroyo	-91	NP-1-91	4/9/1998	Irwin	
NP-1	30.92	Skute Stone Arroyo	-92	NP-1-92	7/13/1998	Irwin	
NP-2	87.29	Skute Stone Arroyo	-1	NP-2-1	10/8/1981	QMC	
NP-2	87	Skute Stone Arroyo	-2	NP-2-2	11/6/1981	QMC	
NP-2	87.5	Skute Stone Arroyo	-3	NP-2-3	11/13/1981	EID	
NP-2	90.1	Skute Stone Arroyo	-4	NP-2-4	11/23/1981	QMC	
NP-2	87.83	Skute Stone Arroyo	-5	NP-2-5	12/7/1981	QMC	
NP-2	87.39	Skute Stone Arroyo	-6	NP-2-6	12/15/1981	QMC	
NP-2	87.12	Skute Stone Arroyo	-7	NP-2-7	12/22/1981	QMC	
NP-2	87.125	Skute Stone Arroyo	-8	NP-2-8	1/5/1982	QMC	
NP-2	86.67	Skute Stone Arroyo	-9	NP-2-9	1/18/1982	QMC	
NP-2	86.66	Skute Stone Arroyo	-10	NP-2-10	1/25/1982	QMC	
NP-2	86.5	Skute Stone Arroyo	-11	NP-2-11	2/16/1982	QMC	
NP-2	86.45	Skute Stone Arroyo	-12	NP-2-12	2/22/1982	QMC	
NP-2	86	Skute Stone Arroyo	-13	NP-2-13	3/12/1982	QMC	
NP-2	85.75	Skute Stone Arroyo	-14	NP-2-14	4/16/1982	QMC	
NP-2	85.45	Skute Stone Arroyo	-15	NP-2-15	4/26/1982	QMC	
NP-2	84	Skute Stone Arroyo	-16	NP-2-16	5/15/1982	QMC	
NP-2		Skute Stone Arroyo	-17	NP-2-17	5/24/1982	QMC	
NP-2		Skute Stone Arroyo	-18	NP-2-18	5/28/1982	QMC	
NP-2	81.91	Skute Stone Arroyo	-19	NP-2-19	6/8/1982	QMC	
NP-2	80.5	Skute Stone Arroyo	-20	NP-2-20	6/14/1982	QMC	
NP-2	77.8	Skute Stone Arroyo	-21	NP-2-21	6/30/1982		

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
MW-8	3/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-8	4/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-8	5/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-8	6/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-8	7/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-8	8/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-8	9/1/1998	32.96885	107.46111	269979	3650332	13	5012			
MW-9	11/16/1994	32.97841	107.38760	276875	3651234	13	4444	TRUE	12	12
MW-9	8/1/1997	32.97841	107.38760	276875	3651234	13	4444	TRUE	13.7	
MW-9	1/23/1998	32.97841	107.38760	276875	3651234	13	4444	TRUE	13.7	14
MW-9	2/1/1998	32.97841	107.38760	276875	3651234	13	4444			
MW-9	3/1/1998	32.97841	107.38760	276875	3651234	13	4444			
MW-9	4/15/1998	32.97841	107.38760	276875	3651234	13	4444	TRUE	13.1	13
MW-9	5/1/1998	32.97841	107.38760	276875	3651234	13	4444			
MW-9	6/1/1998	32.97841	107.38760	276875	3651234	13	4444			
MW-9	7/22/1998	32.97841	107.38760	276875	3651234	13	4444	TRUE	13.9	13
MW-9	8/1/1998	32.97841	107.38760	276875	3651234	13	4444			
MW-9	9/1/1998	32.97841	107.38760	276875	3651234	13	4444			
MW-9	10/15/1998	32.97841	107.38760	276875	3651234	13	4444	TRUE	10.2	14.5
NP-1	10/8/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	24.9	108
NP-1	11/4/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	28	148
NP-1	11/13/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	24.08	130.7
NP-1	11/17/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	24	154
NP-1	11/23/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	26	146
NP-1	12/7/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	24	158
NP-1	12/15/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	24	151
NP-1	12/22/1981	32.95503	107.49676	266610	3648878	13	5176	TRUE	22	149
NP-1	1/5/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE	22	163
NP-1	1/18/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	1/26/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE	22	154
NP-1	2/16/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	2/22/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE	24	158
NP-1	3/12/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	4/16/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	4/26/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE	26	154
NP-1	5/17/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
NP-1	5/24/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE		
NP-1	5/28/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE		
NP-1	6/8/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE	20	162
NP-1	6/14/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE		
NP-1	6/30/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE	18	143
NP-1	7/26/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	8/18/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	9/14/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	10/18/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	10/27/1982	32.95503	107.49676	266610	3648878	13	5176	TRUE	20	151
NP-1	11/11/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	12/28/1982	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	2/21/1983	32.95503	107.49676	266610	3648878	13	5176	TRUE	18	156
NP-1	5/6/1983	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	5/13/1983	32.95503	107.49676	266610	3648878	13	5176	TRUE	24	149
NP-1	6/2/1983	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	7/5/1983	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	8/9/1983	32.95503	107.49676	266610	3648878	13	5176	TRUE	22	130
NP-1	8/25/1983	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	10/20/1983	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	11/1/1983	32.95503	107.49676	266610	3648878	13	5176	TRUE	18	125
NP-1	12/7/1983	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	1/28/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	2/13/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	3/1/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	3/16/1984	32.95503	107.49676	266610	3648878	13	5176	TRUE	22	124
NP-1	4/9/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	4/18/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	5/22/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	5/30/1984	32.95503	107.49676	266610	3648878	13	5176	TRUE	22	154
NP-1	6/26/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	7/25/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	8/27/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	9/12/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE	22	137
NP-1	9/21/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	11/19/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
NP-1	11/27/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE	16	144
NP-1	12/17/1984	32.95503	107.49676	266610	3648878	13	5176	FALSE		
NP-1	5/17/1985	32.95503	107.49676	266610	3648878	13	5176	FALSE	20	144
NP-1	11/13/1985	32.95503	107.49676	266610	3648878	13	5176	FALSE	16	149
NP-1	5/23/1986	32.95503	107.49676	266610	3648878	13	5176	FALSE	18	142
NP-1	10/8/1986	32.95503	107.49676	266610	3648878	13	5176	FALSE	22	107
NP-1	3/30/1989	32.95503	107.49676	266610	3648878	13	5176	TRUE	14.9	137
NP-1	7/19/1991	32.95503	107.49676	266610	3648878	13	5176	TRUE	21.6	133.4
NP-1	8/29/1991	32.95503	107.49676	266610	3648878	13	5176	FALSE	21.1	140.7
NP-1	11/26/1991	32.95503	107.49676	266610	3648878	13	5176	FALSE	22.7	136.8
NP-1	3/15/1992	32.95503	107.49676	266610	3648878	13	5176	FALSE	22.1	146.2
NP-1	5/25/1992	32.95503	107.49676	266610	3648878	13	5176	FALSE	28.6	128.2
NP-1	7/16/1992	32.95503	107.49676	266610	3648878	13	5176	FALSE	21.7	142.2
NP-1	10/8/1992	32.95503	107.49676	266610	3648878	13	5176	FALSE	21.7	128.8
NP-1	11/27/1992	32.95503	107.49676	266610	3648878	13	5176	FALSE	21.3	142.4
NP-1	12/15/1992	32.95503	107.49676	266610	3648878	13	5176	FALSE	23.7	125
NP-1	2/25/1993	32.95503	107.49676	266610	3648878	13	5176	FALSE	22.6	138.3
NP-1	3/30/1993	32.95503	107.49676	266610	3648878	13	5176	FALSE	22	145
NP-1	9/28/1993	32.95503	107.49676	266610	3648878	13	5176	FALSE	36.2	110.1
NP-1	3/17/1994	32.95503	107.49676	266610	3648878	13	5176	FALSE	24	134.2
NP-1	5/24/1994	32.95503	107.49676	266610	3648878	13	5176	FALSE	22	130
NP-1	6/23/1994	32.95503	107.49676	266610	3648878	13	5176	FALSE	40.3	142.3
NP-1	7/21/1994	32.95503	107.49676	266610	3648878	13	5176	TRUE	23	133
NP-1	9/22/1994	32.95503	107.49676	266610	3648878	13	5176	FALSE	24.3	118.8
NP-1	1/29/1995	32.95503	107.49676	266610	3648878	13	5176	FALSE	26.2	125.4
NP-1	3/29/1995	32.95503	107.49676	266610	3648878	13	5176	FALSE	23.3	86.2
NP-1	6/27/1995	32.95503	107.49676	266610	3648878	13	5176	FALSE	24.1	113.7
NP-1	9/21/1995	32.95503	107.49676	266610	3648878	13	5176	FALSE	27.2	145
NP-1	1/10/1996	32.95503	107.49676	266610	3648878	13	5176	FALSE	26.1	109.4
NP-1	4/3/1996	32.95503	107.49676	266610	3648878	13	5176	FALSE	25.7	123.3
NP-1	6/1/1996	32.95503	107.49676	266610	3648878	13	5176		26.6	126.3
NP-1	9/25/1996	32.95503	107.49676	266610	3648878	13	5176	TRUE	23.6	94.4
NP-1	1/15/1997	32.95503	107.49676	266610	3648878	13	5176	TRUE	25.6	109.13
NP-1	4/1/1997	32.95503	107.49676	266610	3648878	13	5176	TRUE	26	114
NP-1	7/1/1997	32.95503	107.49676	266610	3648878	13	5176	TRUE	25.9	112
NP-1	10/1/1997	32.95503	107.49676	266610	3648878	13	5176	TRUE	26.2	119

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
NP-1	1/15/1998	32.95503	107.49676	266610	3648878	13	5176	TRUE	25.2	111
NP-1	4/9/1998	32.95503	107.49676	266610	3648878	13	5176	TRUE	26.8	120
NP-1	7/13/1998	32.95503	107.49676	266610	3648878	13	5176	TRUE	25	110
NP-2	10/8/1981	32.95807	107.49674	266619	3649215	13	5179	TRUE	45.1	198
NP-2	11/6/1981	32.95807	107.49674	266619	3649215	13	5179	TRUE	35	164
NP-2	11/13/1981	32.95807	107.49674	266619	3649215	13	5179	TRUE	30.79	162.4
NP-2	11/23/1981	32.95807	107.49674	266619	3649215	13	5179	TRUE	30	156
NP-2	12/7/1981	32.95807	107.49674	266619	3649215	13	5179	TRUE	30	160
NP-2	12/15/1981	32.95807	107.49674	266619	3649215	13	5179	TRUE	32	161
NP-2	12/22/1981	32.95807	107.49674	266619	3649215	13	5179	TRUE	32	161
NP-2	1/5/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	28	158
NP-2	1/18/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	1/25/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	24	160
NP-2	2/16/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	2/22/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	30	151
NP-2	3/12/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	4/16/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	4/26/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	42	149
NP-2	5/15/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	34	128
NP-2	5/24/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE		
NP-2	5/28/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE		
NP-2	6/8/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	26	158
NP-2	6/14/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	6/30/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	26	133

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
MW-8	3/1/1998										
MW-8	4/1/1998										
MW-8	5/1/1998										
MW-8	6/1/1998										
MW-8	7/1/1998										
MW-8	8/1/1998										
MW-8	9/1/1998										
MW-9	11/16/1994	8.05	230		149	293	1.4	-1	-0.05	-0.005	-0.005
MW-9	8/1/1997	8.13	174				1.33				
MW-9	1/23/1998	7.96	189		146.4	350	1.43				
MW-9	2/1/1998										
MW-9	3/1/1998										
MW-9	4/15/1998	8.07	189			336	1.53	0.91			
MW-9	5/1/1998										
MW-9	6/1/1998										
MW-9	7/22/1998		172				1.96	0.95			
MW-9	8/1/1998										
MW-9	9/1/1998										
MW-9	10/15/1998	7.79	175			382		0.83			
NP-1	10/8/1981	7.6	496		266		0.84	0.47	-0.25		-0.004
NP-1	11/4/1981	8.1	470				1	0.3	-0.01		-0.01
NP-1	11/13/1981	7.65	470		274.4	625	0.83	0.09	-0.25		-0.005
NP-1	11/17/1981	8	460				0.8	0.2	-0.01		-0.005
NP-1	11/23/1981	7.7	530				0.8	0.2	-0.01		-0.01
NP-1	12/7/1981	7.3	490				0.8	0.2	-0.01		-0.01
NP-1	12/15/1981	7.8	480				0.8	-0.2	-0.01		-0.01
NP-1	12/22/1981	7.8	450				0.8	0.3	-0.01		-0.01
NP-1	1/5/1982	7.6	400				0.8	0.7	-0.01		-0.01
NP-1	1/18/1982										
NP-1	1/26/1982	7.9	440				0.7	0.5			
NP-1	2/16/1982										
NP-1	2/22/1982	7.9	460				0.7	0.6			
NP-1	3/12/1982										
NP-1	4/16/1982										
NP-1	4/26/1982	7.9	440				0.6	0.7			
NP-1	5/17/1982										

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-1	5/24/1982										
NP-1	5/28/1982										
NP-1	6/8/1982	7.5	500				0.6	1.1			
NP-1	6/14/1982										
NP-1	6/30/1982	7.7	500				0.6	1.1			
NP-1	7/26/1982										
NP-1	8/18/1982										
NP-1	9/14/1982										
NP-1	10/18/1982										
NP-1	10/27/1982	7.7	470				0.7	1.3			
NP-1	11/11/1982										
NP-1	12/28/1982										
NP-1	2/21/1983	7.7	490				0.7	1.3			
NP-1	5/6/1983										
NP-1	5/13/1983	7.9	470				0.6	1.1			
NP-1	6/2/1983										
NP-1	7/5/1983										
NP-1	8/9/1983	7.8	480				0.6	1.1			
NP-1	8/25/1983										
NP-1	10/20/1983										
NP-1	11/1/1983	7.8	500				0.6	2.1			
NP-1	12/7/1983										
NP-1	1/28/1984										
NP-1	2/13/1984										
NP-1	3/1/1984										
NP-1	3/16/1984	8.2	480				0.6	1.8			
NP-1	4/9/1984										
NP-1	4/18/1984										
NP-1	5/22/1984										
NP-1	5/30/1984	7.5	510				0.6	0.7			
NP-1	6/26/1984										
NP-1	7/25/1984										
NP-1	8/27/1984										
NP-1	9/12/1984	7.7	480				0.6	1.1			
NP-1	9/21/1984										
NP-1	11/19/1984										

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-1	11/27/1984	7.8	480				0.6	1.1			
NP-1	12/17/1984										
NP-1	5/17/1985	7.6	510								
NP-1	11/13/1985	7.3	480								
NP-1	5/23/1986	7.6	500								
NP-1	10/8/1986	7.4	470								
NP-1	3/30/1989		492		279				0.1		
NP-1	7/19/1991	8.04	530	210	256.3	761	0.58	0.99			0.003
NP-1	8/29/1991	7.69	501								
NP-1	11/26/1991	7.12	1484								
NP-1	3/15/1992	7.8	510								
NP-1	5/25/1992	7.49	608								
NP-1	7/16/1992	7.5	487								
NP-1	10/8/1992	7.35	517								
NP-1	11/27/1992	7.85	498								
NP-1	12/15/1992	7.58	502								
NP-1	2/25/1993	7.42	510								
NP-1	3/30/1993	7.7	496		306	767	0.59	1.1	-0.1		-0.005
NP-1	9/28/1993	7.48	508								
NP-1	3/17/1994	7.3	516								
NP-1	5/24/1994	7.53	510		263	680	0.56	1.1	0.83	-0.005	0.005
NP-1	6/23/1994	7.5	453								
NP-1	7/21/1994	7.87	464		249	698	0.65	-1	-0.05	-0.005	-0.005
NP-1	9/22/1994	7.49	488								
NP-1	1/29/1995	7.94	407								
NP-1	3/29/1995	7.98	392								
NP-1	6/27/1995	8.02	385								
NP-1	9/21/1995	7.96	373								
NP-1	1/10/1996	7.73	277								
NP-1	4/3/1996	7.89	300								
NP-1	6/1/1996	7.73	312								
NP-1	9/25/1996	8.22	320								
NP-1	1/15/1997	8.42	318								
NP-1	4/1/1997		280				0.8				
NP-1	7/1/1997	8.06	288								
NP-1	10/1/1997	8.31	296								

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-1	1/15/1998	7.87	276			582	0.63	-0.05			
NP-1	4/9/1998		319			564	0.58	0.11			
NP-1	7/13/1998		301			531	0.61	-0.05			
NP-2	10/8/1981	7.39	476		159		1.75	0.23	-0.25		0.024
NP-2	11/6/1981	7.6	450				1.4	0.4	-0.01		-0.1
NP-2	11/13/1981	7.65	466		221.3	675	1.14	0.25	-0.25		-0.005
NP-2	11/23/1981	7.7	520				0.9	0.7	-0.01		-0.01
NP-2	12/7/1981	7.5	490				0.8	0.6	-0.01		-0.01
NP-2	12/15/1981	8	480				0.09	0.5	-0.01		-0.01
NP-2	12/22/1981	8	440				0.6	0.8	-0.01		-0.01
NP-2	1/5/1982	7.6	400				0.9	0.9	-0.01		-0.01
NP-2	1/18/1982										
NP-2	1/25/1982	8	450				0.7	1.1			
NP-2	2/16/1982										
NP-2	2/22/1982	8	440				0.7	0.8			
NP-2	3/12/1982										
NP-2	4/16/1982										
NP-2	4/26/1982	8	450				1	2.4			
NP-2	5/15/1982	7.9	480				0.6	1.8			
NP-2	5/24/1982										
NP-2	5/28/1982										
NP-2	6/8/1982	7.8	490				0.5	0.9			
NP-2	6/14/1982										
NP-2	6/30/1982	7.8	490				0.6	1.4			

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
MW-8	3/1/1998										
MW-8	4/1/1998										
MW-8	5/1/1998										
MW-8	6/1/1998										
MW-8	7/1/1998										
MW-8	8/1/1998										
MW-8	9/1/1998										
MW-9	11/16/1994	-0.1	-0.1	-0.002	-0.0005	12	-0.025	-0.05	-0.025	-0.05	-0.005
MW-9	8/1/1997										
MW-9	1/23/1998					12.1			-0.005		
MW-9	2/1/1998										
MW-9	3/1/1998										
MW-9	4/15/1998					13.5			-0.005		
MW-9	5/1/1998										
MW-9	6/1/1998										
MW-9	7/22/1998					13			-0.005	-0.05	
MW-9	8/1/1998										
MW-9	9/1/1998										
MW-9	10/15/1998								-0.005	0.07	
NP-1	10/8/1981	-0.004	-1		-0.01	55.7	-0.05	-0.05	-0.05	0.27	-0.05
NP-1	11/4/1981	-0.1	-0.2		-0.005	54	-0.01	-0.02	-0.05	-0.1	-0.02
NP-1	11/13/1981	0.044	0.2		0.006	71.6	-0.005				-0.005
NP-1	11/17/1981	-0.1	0.24		-0.005	59	-0.01	-0.02	0.069	-0.1	-0.02
NP-1	11/23/1981	-0.1	0.02		-0.005	58	-0.02	-0.02	-0.05	-0.1	-0.02
NP-1	12/7/1981	-0.1	-0.2		-0.005	58	-0.01	-0.02	-0.05	-0.1	-0.02
NP-1	12/15/1981	-0.1	-0.2		-0.005	68	-0.01	-0.02	-0.05	-0.1	-0.02
NP-1	12/22/1981	-0.1	-0.2		-0.005	66	-0.01	-0.02	-0.05	-0.1	-0.02
NP-1	1/5/1982	-0.1	-0.2		-0.005	67	-0.01	-0.02	-0.05	0.14	-0.02
NP-1	1/18/1982										
NP-1	1/26/1982				-0.005				-0.05	-0.1	
NP-1	2/16/1982										
NP-1	2/22/1982				-0.005				0.48	0.83	
NP-1	3/12/1982										
NP-1	4/16/1982										
NP-1	4/26/1982				-0.005				-0.05	1.2	
NP-1	5/17/1982										

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-1	5/24/1982									-0.1	
NP-1	5/28/1982									-0.1	
NP-1	6/8/1982				-0.005				-0.05	-0.1	
NP-1	6/14/1982										
NP-1	6/30/1982				-0.005				-0.05	-0.1	
NP-1	7/26/1982										
NP-1	8/18/1982										
NP-1	9/14/1982										
NP-1	10/18/1982										
NP-1	10/27/1982				-0.005				-0.05	0.45	
NP-1	11/11/1982										
NP-1	12/28/1982										
NP-1	2/21/1983				-0.005				-0.05	-0.1	
NP-1	5/6/1983										
NP-1	5/13/1983				-0.005				-0.05	-0.1	
NP-1	6/2/1983										
NP-1	7/5/1983										
NP-1	8/9/1983				-0.005				-0.05	0.22	
NP-1	8/25/1983										
NP-1	10/20/1983										
NP-1	11/1/1983				-0.005				-0.05	0.14	
NP-1	12/7/1983										
NP-1	1/28/1984										
NP-1	2/13/1984										
NP-1	3/1/1984										
NP-1	3/16/1984				-0.005				-0.05	-0.1	
NP-1	4/9/1984										
NP-1	4/18/1984										
NP-1	5/22/1984										
NP-1	5/30/1984				-0.005				-0.05	-0.1	
NP-1	6/26/1984										
NP-1	7/25/1984										
NP-1	8/27/1984										
NP-1	9/12/1984				-0.005				-0.05	-0.1	
NP-1	9/21/1984										
NP-1	11/19/1984										

Well Name	Sample Date	Boron	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-1	11/27/1984				-0.005				-0.05	-0.1	
NP-1	12/17/1984										
NP-1	5/17/1985										
NP-1	11/13/1985										
NP-1	5/23/1986										
NP-1	10/8/1986										
NP-1	3/30/1989	-0.1	-0.1	-0.01	-0.1	88	-0.1	-0.05	-0.1	-0.1	-0.1
NP-1	7/19/1991			0.02	-0.005	81.1	-0.02			-0.59	0.007
NP-1	8/29/1991										
NP-1	11/26/1991										
NP-1	3/15/1992										
NP-1	5/25/1992										
NP-1	7/16/1992										
NP-1	10/8/1992										
NP-1	11/27/1992										
NP-1	12/15/1992										
NP-1	2/25/1993										
NP-1	3/30/1993	0.03	-0.5		-0.002	79	-0.02	-0.05	-0.01	0.17	-0.02
NP-1	9/28/1993										
NP-1	3/17/1994										
NP-1	5/24/1994		-0.1		0.0096	79	-0.025		-0.025	9.5	0.016
NP-1	6/23/1994										
NP-1	7/21/1994	-0.1	-0.1	-0.002	-0.0005	71	-0.025	-0.05	-0.025	0.052	-0.005
NP-1	9/22/1994			-0.002							
NP-1	1/29/1995										
NP-1	3/29/1995										
NP-1	6/27/1995										
NP-1	9/21/1995										
NP-1	1/10/1996										
NP-1	4/3/1996										
NP-1	6/1/1996										
NP-1	9/25/1996										
NP-1	1/15/1997										
NP-1	4/1/1997								-0.005	1.2	
NP-1	7/1/1997										
NP-1	10/1/1997										

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-1	1/15/1998								-0.005	1.3	
NP-1	4/9/1998								0.01	2.11	
NP-1	7/13/1998								-0.005	0.32	
NP-2	10/8/1981	0.08	-1		-0.01	46	-0.05	-0.05	-0.05	-0.1	-0.05
NP-2	11/6/1981	-0.1	-0.2		-0.005	53	-0.01	-0.02	-0.05	-0.1	-0.02
NP-2	11/13/1981	0.04	-0.1		-0.001	65.1	-0.005				-0.005
NP-2	11/23/1981	-0.1	0.02		-0.005	57	-0.02	-0.02	-0.05	-0.1	-0.02
NP-2	12/7/1981	-0.1	-0.2		-0.005	53	-0.01	-0.02	-0.05	-0.1	-0.02
NP-2	12/15/1981	-0.1	-0.2		-0.005	62	-0.01	-0.02	-0.05	-0.1	-0.02
NP-2	12/22/1981	-0.1	0.21		-0.005	73	-0.01	-0.02	-0.05	0.12	-0.02
NP-2	1/5/1982	-0.1	-0.2		-0.005	65	-0.01	-0.02	-0.05	0.14	-0.02
NP-2	1/18/1982										
NP-2	1/25/1982				-0.005				-0.05	-0.1	
NP-2	2/16/1982										
NP-2	2/22/1982				-0.005				0.069	0.37	
NP-2	3/12/1982										
NP-2	4/16/1982										
NP-2	4/26/1982				-0.005				-0.05	1.2	
NP-2	5/15/1982				0.015				-0.05	0.68	
NP-2	5/24/1982									-0.1	
NP-2	5/28/1982									-0.1	
NP-2	6/8/1982				-0.005				-0.05	-0.1	
NP-2	6/14/1982										
NP-2	6/30/1982				-0.005				-0.05	-0.1	

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
MW-8	3/1/1998										
MW-8	4/1/1998										
MW-8	5/1/1998										
MW-8	6/1/1998										
MW-8	7/1/1998										
MW-8	8/1/1998										
MW-8	9/1/1998										
MW-9	11/16/1994	1	-0.03	-0.001	-0.05	-0.05	2.3	-0.005	-0.025	52	-0.005
MW-9	8/1/1997										
MW-9	1/23/1998	1.6	-0.02				4.6			50.1	
MW-9	2/1/1998										
MW-9	3/1/1998										
MW-9	4/15/1998	0.8	-0.02	-0.0002	-0.05		1.5	-0.05		51.2	
MW-9	5/1/1998										
MW-9	6/1/1998										
MW-9	7/22/1998	0.6	-0.02	0.0004	-0.05		1.6	-0.05		45.8	
MW-9	8/1/1998										
MW-9	9/1/1998										
MW-9	10/15/1998										
NP-1	10/8/1981	13.7	0.92	-1	-0.1	-0.05	8.25	0.003	-0.02	61.7	
NP-1	11/4/1981		0.6	-0.001	-0.05	-0.05		-0.005	-0.02		
NP-1	11/13/1981	19.28	1.34	-0.0005	0.011	-0.05	5.85	0.029	-0.001	39.1	
NP-1	11/17/1981		1.4	-0.001	0.06	-0.05		-0.005	-0.02		
NP-1	11/23/1981		1.2	-0.001	-0.05	-0.05		-0.005	-0.02		
NP-1	12/7/1981		1.2	-0.001	-0.05	-0.05		-0.005	-0.02		
NP-1	12/15/1981		1.2	-0.001	-0.05	-0.05		-0.005	-0.02		
NP-1	12/22/1981		1	-0.001	-0.05	-0.05		-0.005	-0.02		
NP-1	1/5/1982		0.71	0.0012	-0.05	-0.05		-0.02	-0.02		
NP-1	1/18/1982										
NP-1	1/26/1982		0.45	-0.001	-0.1			-0.005			
NP-1	2/16/1982										
NP-1	2/22/1982		0.26	-0.001	-0.05			-0.005			
NP-1	3/12/1982										
NP-1	4/16/1982										
NP-1	4/26/1982		0.16	-0.001	-0.05			-0.005			
NP-1	5/17/1982										

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-1	5/24/1982		0.28								
NP-1	5/28/1982		0.022								
NP-1	6/8/1982		0.025	-0.001	-0.05			-0.005			
NP-1	6/14/1982										
NP-1	6/30/1982		0.18	-0.001	-0.05			-0.005			
NP-1	7/26/1982										
NP-1	8/18/1982							-0.005			
NP-1	9/14/1982										
NP-1	10/18/1982										
NP-1	10/27/1982		0.058	-0.001	-0.05			-0.005			
NP-1	11/11/1982										
NP-1	12/28/1982										
NP-1	2/21/1983		-0.05	-0.001	-0.05			-0.005			
NP-1	5/6/1983										
NP-1	5/13/1983		-0.05	-0.001	-0.05			-0.005			
NP-1	6/2/1983										
NP-1	7/5/1983										
NP-1	8/9/1983		-0.05	-0.001	-0.05			-0.005			
NP-1	8/25/1983										
NP-1	10/20/1983										
NP-1	11/1/1983		-0.05	-0.001	-0.05			-0.005			
NP-1	12/7/1983										
NP-1	1/28/1984										
NP-1	2/13/1984										
NP-1	3/1/1984										
NP-1	3/16/1984		-0.05	0.0083	-0.05			-0.005			
NP-1	4/9/1984			-0.001							
NP-1	4/18/1984										
NP-1	5/22/1984										
NP-1	5/30/1984		-0.05	-0.001	-0.05			-0.005			
NP-1	6/26/1984										
NP-1	7/25/1984										
NP-1	8/27/1984										
NP-1	9/12/1984		-0.05	-0.001	-0.05			-0.005			
NP-1	9/21/1984										
NP-1	11/19/1984										

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-1	11/27/1984		-0.05	-0.001	-0.05			-0.005			
NP-1	12/17/1984										
NP-1	5/17/1985										
NP-1	11/13/1985										
NP-1	5/23/1986										
NP-1	10/8/1986										
NP-1	3/30/1989	23	-0.05		-0.1	-0.1	3		-0.1	46	
NP-1	7/19/1991	23.9	-0.02	-0.0002			2	-0.002	-0.02	31.2	
NP-1	8/29/1991										
NP-1	11/26/1991										
NP-1	3/15/1992										
NP-1	5/25/1992										
NP-1	7/16/1992										
NP-1	10/8/1992										
NP-1	11/27/1992										
NP-1	12/15/1992										
NP-1	2/25/1993										
NP-1	3/30/1993	27	-0.02	-0.001	-0.02	-0.01	1.8	-0.005	-0.01	52	
NP-1	9/28/1993										
NP-1	3/17/1994										
NP-1	5/24/1994	23	0.1	-0.001		-0.05	2.5	-0.005	-0.025	48	
NP-1	6/23/1994										
NP-1	7/21/1994	23	0.27	-0.001	-0.05	-0.05	2.2	-0.005	-0.025	47	-0.005
NP-1	9/22/1994										
NP-1	1/29/1995										
NP-1	3/29/1995										
NP-1	6/27/1995										
NP-1	9/21/1995										
NP-1	1/10/1996										
NP-1	4/3/1996										
NP-1	6/1/1996										
NP-1	9/25/1996										
NP-1	1/15/1997										
NP-1	4/1/1997		-0.02	-0.002				0.0026			
NP-1	7/1/1997										
NP-1	10/1/1997										

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-1	1/15/1998	19.7		-0.0002	-0.05			-0.05			
NP-1	4/9/1998		0.02	-0.0002	-0.05			-0.05			
NP-1	7/13/1998		0.05	0.0007	-0.05			-0.05			
NP-2	10/8/1981	14.6	0.62	-1	-0.1	-0.05	9.57	-0.002	-0.02	93.5	
NP-2	11/6/1981		0.39	-0.001	0.21	-0.05		-0.005	-0.02		
NP-2	11/13/1981	18.67	0.79	-0.0005	0.04	-0.01	3.9	0.017	-0.001	59.8	
NP-2	11/23/1981		0.54	-0.001	0.06	-0.05		-0.005	-0.02		
NP-2	12/7/1981		0.54	-0.001	0.06	-0.05		-0.005	-0.02		
NP-2	12/15/1981		0.52	-0.001	0.072	-0.05		-0.005	-0.02		
NP-2	12/22/1981		0.51	-0.001	0.053	-0.05		-0.005	-0.02		
NP-2	1/5/1982		0.49	-0.001	0.07	-0.05		-0.02	-0.02		
NP-2	1/18/1982										
NP-2	1/25/1982		0.34	-0.001	-0.1			-0.005			
NP-2	2/16/1982										
NP-2	2/22/1982		0.3	-0.001	-0.05			-0.005			
NP-2	3/12/1982										
NP-2	4/16/1982										
NP-2	4/26/1982		0.29	-0.001	-0.05			-0.005			
NP-2	5/15/1982		0.078	-0.001	-0.05			-0.005			
NP-2	5/24/1982		-0.05								
NP-2	5/28/1982		-0.05								
NP-2	6/8/1982		-0.05	-0.001	-0.05			-0.005			
NP-2	6/14/1982										
NP-2	6/30/1982		-0.05	-0.001	-0.05			-0.005			

Well Name	Sample Date	Zinc	Temp (C)	Tin	Vanadium
MW-8	3/1/1998				
MW-8	4/1/1998				
MW-8	5/1/1998				
MW-8	6/1/1998				
MW-8	7/1/1998				
MW-8	8/1/1998				
MW-8	9/1/1998				
MW-9	11/16/1994	-0.05			
MW-9	8/1/1997				
MW-9	1/23/1998				
MW-9	2/1/1998				
MW-9	3/1/1998				
MW-9	4/15/1998				
MW-9	5/1/1998				
MW-9	6/1/1998				
MW-9	7/22/1998				
MW-9	8/1/1998				
MW-9	9/1/1998				
MW-9	10/15/1998				
NP-1	10/8/1981	0.4			
NP-1	11/4/1981	0.14			
NP-1	11/13/1981	0.44	20		
NP-1	11/17/1981	3.9			
NP-1	11/23/1981	4.1			
NP-1	12/7/1981	5.1			
NP-1	12/15/1981	5.3			
NP-1	12/22/1981	4.1			
NP-1	1/5/1982	4.1			
NP-1	1/18/1982				
NP-1	1/26/1982				
NP-1	2/16/1982				
NP-1	2/22/1982				
NP-1	3/12/1982				
NP-1	4/16/1982				
NP-1	4/26/1982				
NP-1	5/17/1982				

Well Name	Sample Date	Zinc	Temp (C)	Tin	Vanadium
NP-1	5/24/1982				
NP-1	5/28/1982				
NP-1	6/8/1982				
NP-1	6/14/1982				
NP-1	6/30/1982				
NP-1	7/26/1982				
NP-1	8/18/1982				
NP-1	9/14/1982				
NP-1	10/18/1982				
NP-1	10/27/1982				
NP-1	11/11/1982				
NP-1	12/28/1982				
NP-1	2/21/1983				
NP-1	5/6/1983				
NP-1	5/13/1983				
NP-1	6/2/1983				
NP-1	7/5/1983				
NP-1	8/9/1983				
NP-1	8/25/1983				
NP-1	10/20/1983				
NP-1	11/1/1983				
NP-1	12/7/1983				
NP-1	1/28/1984				
NP-1	2/13/1984				
NP-1	3/1/1984				
NP-1	3/16/1984				
NP-1	4/9/1984				
NP-1	4/18/1984				
NP-1	5/22/1984				
NP-1	5/30/1984				
NP-1	6/26/1984				
NP-1	7/25/1984				
NP-1	8/27/1984				
NP-1	9/12/1984				
NP-1	9/21/1984				
NP-1	11/19/1984				

Well Name	Sample Date	Zinc	Temp (C)	Tin	Vanadium
NP-1	11/27/1984				
NP-1	12/17/1984				
NP-1	5/17/1985				
NP-1	11/13/1985				
NP-1	5/23/1986				
NP-1	10/8/1986				
NP-1	3/30/1989	2.6		0.2	-0.1
NP-1	7/19/1991				
NP-1	8/29/1991				
NP-1	11/26/1991				
NP-1	3/15/1992				
NP-1	5/25/1992				
NP-1	7/16/1992				
NP-1	10/8/1992				
NP-1	11/27/1992				
NP-1	12/15/1992				
NP-1	2/25/1993				
NP-1	3/30/1993	1.13			
NP-1	9/28/1993				
NP-1	3/17/1994				
NP-1	5/24/1994	5.7			
NP-1	6/23/1994				
NP-1	7/21/1994	4.9			
NP-1	9/22/1994				
NP-1	1/29/1995				
NP-1	3/29/1995				
NP-1	6/27/1995				
NP-1	9/21/1995				
NP-1	1/10/1996				
NP-1	4/3/1996				
NP-1	6/1/1996				
NP-1	9/25/1996				
NP-1	1/15/1997				
NP-1	4/1/1997				
NP-1	7/1/1997				
NP-1	10/1/1997				

Well Name	Sample Date	Zinc	Temp (C)	Tin	Vanadium
NP-1	1/15/1998				
NP-1	4/9/1998				
NP-1	7/13/1998				
NP-2	10/8/1981	0.31			
NP-2	11/6/1981	1.7			
NP-2	11/13/1981	3.18	21		
NP-2	11/23/1981	3.5			
NP-2	12/7/1981	4.4			
NP-2	12/15/1981	2.9			
NP-2	12/22/1981	2.8			
NP-2	1/5/1982	3.2			
NP-2	1/18/1982				
NP-2	1/25/1982				
NP-2	2/16/1982				
NP-2	2/22/1982				
NP-2	3/12/1982				
NP-2	4/16/1982				
NP-2	4/26/1982				
NP-2	5/15/1982				
NP-2	5/24/1982				
NP-2	5/28/1982				
NP-2	6/8/1982				
NP-2	6/14/1982				
NP-2	6/30/1982				

Well Name	Water Depth	USGS Quad	Well Depth	Sample ID	Sample Date	Sampler	Notes
NP-2	77.83	Skute Stone Arroyo	-22	NP-2-22	7/26/1982	QMC	
NP-2	76.6	Skute Stone Arroyo	-23	NP-2-23	8/18/1982	QMC	
NP-2	75.6	Skute Stone Arroyo	-24	NP-2-24	9/2/1982	EID	
NP-2	75.1	Skute Stone Arroyo	-25	NP-2-25	9/14/1982	QMC	
NP-2	72.9	Skute Stone Arroyo	-26	NP-2-26	10/18/1982	QMC	
NP-2	72.9	Skute Stone Arroyo	-27	NP-2-27	10/27/1982	QMC	
NP-2	71.6	Skute Stone Arroyo	-28	NP-2-28	11/11/1982	QMC	
NP-2	69.7	Skute Stone Arroyo	-29	NP-2-29	12/28/1982	QMC	
NP-2	67.8	Skute Stone Arroyo	-30	NP-2-30	2/21/1983	QMC	
NP-2	67	Skute Stone Arroyo	-31	NP-2-31	5/6/1983	QMC	
NP-2	67	Skute Stone Arroyo	-32	NP-2-32	5/13/1983	QMC	
NP-2	66.8	Skute Stone Arroyo	-33	NP-2-33	6/2/1983	QMC	
NP-2	66.8	Skute Stone Arroyo	-34	NP-2-34	7/5/1983	QMC	
NP-2	66.9	Skute Stone Arroyo	-35	NP-2-35	8/9/1983	QMC	
NP-2	66.9	Skute Stone Arroyo	-36	NP-2-36	8/25/1983	QMC	
NP-2	66.2	Skute Stone Arroyo	-37	NP-2-37	10/20/1983	QMC	
NP-2	66.2	Skute Stone Arroyo	-38	NP-2-38	11/1/1983	QMC	
NP-2	65	Skute Stone Arroyo	-39	NP-2-39	12/7/1983	QMC	
NP-2	64.4	Skute Stone Arroyo	-40	NP-2-40	1/28/1984	QMC	
NP-2	64.2	Skute Stone Arroyo	-41	NP-2-41	2/13/1984	QMC	
NP-2	63.8	Skute Stone Arroyo	-42	NP-2-42	3/84	QMC	
NP-2	63.8	Skute Stone Arroyo	-43	NP-2-43	3/16/1984	CFP	
NP-2	63.8	Skute Stone Arroyo	-44	NP-2-44	4/18/1984	CFP	
NP-2	63.7	Skute Stone Arroyo	-45	NP-2-45	5/22/1984	CFP	
NP-2	63.7	Skute Stone Arroyo	-46	NP-2-46	5/30/1984	CFP	
NP-2	63.4	Skute Stone Arroyo	-47	NP-2-47	6/26/1984	CFP	
NP-2	63.4	Skute Stone Arroyo	-48	NP-2-48	7/25/1984	CFP	
NP-2	63.3	Skute Stone Arroyo	-49	NP-2-49	8/27/1984	CFP	
NP-2	62.5	Skute Stone Arroyo	-50	NP-2-50	9/12/1984	CFP	
NP-2	62.5	Skute Stone Arroyo	-51	NP-2-51	9/21/1984	CFP	
NP-2	62.6	Skute Stone Arroyo	-52	NP-2-52	11/19/1984	CFP	
NP-2	62.6	Skute Stone Arroyo	-53	NP-2-53	12/27/1984	CFP	
NP-2	61.9	Skute Stone Arroyo	-54	NP-2-54	12/17/1984	CFP	
NP-2	61.4	Skute Stone Arroyo	-55	NP-2-55	5/17/1985	CFP	
NP-2	53.1	Skute Stone Arroyo	-56	NP-2-56	11/13/1985	CFP	
NP-2	51	Skute Stone Arroyo	-57	NP-2-57	5/23/1986	CFP	

Well Name	Water Depth	USGS Quad	Well Depth	Sample ID	Sample Date	Sampler	Notes
NP-2	51.6	Skute Stone Arroyo	-58	NP-2-58	10/8/1986	CFP	
NP-2		Skute Stone Arroyo	-59	NP-2-59	3/30/1989	EID	
NP-2	3.9	Skute Stone Arroyo	-60	NP-2-60	7/19/1991	GE	Lab NP-3- mixed w/
NP-2	30	Skute Stone Arroyo	-61	NP-2-61	8/29/1991	Irwin	lab pH
NP-2		Skute Stone Arroyo	-62	NP-2-62	10/26/1991	Hood	lab pH
NP-2	28.33	Skute Stone Arroyo	-63	NP-2-63	3/15/1992	Irwin	lab pH
NP-2		Skute Stone Arroyo	-64	NP-2-64	5/25/1992	Irwin	lab pH
NP-2		Skute Stone Arroyo	-65	NP-2-65	7/16/1992	Irwin	lab pH
NP-2	27.33	Skute Stone Arroyo	-66	NP-2-66	10/8/1992	Irwin	lab pH
NP-2	25.58	Skute Stone Arroyo	-67	NP-2-67	11/27/1992	Hood	lab pH
NP-2		Skute Stone Arroyo	-68	NP-2-68	12/15/1992	Irwin	lab pH
NP-2	27.5	Skute Stone Arroyo	-69	NP-2-69	2/25/1993	Irwin	lab pH
NP-2		Skute Stone Arroyo	-70	NP-2-70	3/30/1993	JWS	
NP-2		Skute Stone Arroyo	-71	NP-2-71	9/28/1993	Irwin	lab pH
NP-2	18.67	Skute Stone Arroyo	-72	NP-2-72	3/17/1994	Irwin	lab pH
NP-2	26.7	Skute Stone Arroyo	-73	NP-2-73	5/24/1994	SRK	
NP-2		Skute Stone Arroyo	-74	NP-2-74	6/23/1994	Irwin	lab pH
NP-2		Skute Stone Arroyo	-75	NP-2-75	7/22/1994	SRK	
NP-2		Skute Stone Arroyo	-76	NP-2-76	9/22/1994	Irwin	lab pH
NP-2		Skute Stone Arroyo	-77	NP-2-77	1/29/1995	Irwin	lab pH
NP-2		Skute Stone Arroyo	-78	NP-2-78	3/29/1995	Irwin	lab pH
NP-2	30.25	Skute Stone Arroyo	-79	NP-2-79	6/27/1995	Irwin	lab pH
NP-2		Skute Stone Arroyo	-80	NP-2-80	9/21/1995	Irwin	lab pH
NP-2		Skute Stone Arroyo	-81	NP-2-81	1/10/1996	Irwin	lab pH
NP-2		Skute Stone Arroyo	-82	NP-2-82	4/3/1996	Irwin	lab pH
NP-2		Skute Stone Arroyo	-83	NP-2-83	6/1/1996		
NP-2		Skute Stone Arroyo	-84	NP-2-84	9/25/1996	Irwin	lab pH
NP-2		Skute Stone Arroyo	-85	NP-2-85	1/15/1997	Irwin	lab pH
NP-2		Skute Stone Arroyo	-86	NP-2-86	7/1/1997		
NP-2		Skute Stone Arroyo	-87	NP-2-87	10/1/1997		
NP-2	33.25	Skute Stone Arroyo	-88	NP-2-88	1/15/1998	Irwin	
NP-2	32.75	Skute Stone Arroyo	-89	NP-2-89	4/9/1998	Irwin	
NP-2	33	Skute Stone Arroyo	-90	NP-2-90	7/13/1998	Irwin	

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
NP-2	7/26/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	8/18/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	9/2/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	26.49	127
NP-2	9/14/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	10/18/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	10/27/1982	32.95807	107.49674	266619	3649215	13	5179	TRUE	26	120
NP-2	11/11/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	12/28/1982	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	2/21/1983	32.95807	107.49674	266619	3649215	13	5179	TRUE	24	127
NP-2	5/6/1983	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	5/13/1983	32.95807	107.49674	266619	3649215	13	5179	TRUE	24	139
NP-2	6/2/1983	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	7/5/1983	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	8/9/1983	32.95807	107.49674	266619	3649215	13	5179	TRUE	36	148
NP-2	8/25/1983	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	10/20/1983	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	11/1/1983	32.95807	107.49674	266619	3649215	13	5179	TRUE	24	111
NP-2	12/7/1983	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	1/28/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	2/13/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	3/84	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	3/16/1984	32.95807	107.49674	266619	3649215	13	5179	TRUE	30	146
NP-2	4/18/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	5/22/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	5/30/1984	32.95807	107.49674	266619	3649215	13	5179	TRUE	32	175
NP-2	6/26/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	7/25/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	8/27/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	9/12/1984	32.95807	107.49674	266619	3649215	13	5179	TRUE	22	134
NP-2	9/21/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	11/19/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	12/27/1984	32.95807	107.49674	266619	3649215	13	5179	TRUE	20	125
NP-2	12/17/1984	32.95807	107.49674	266619	3649215	13	5179	FALSE		
NP-2	5/17/1985	32.95807	107.49674	266619	3649215	13	5179	FALSE	22	120
NP-2	11/13/1985	32.95807	107.49674	266619	3649215	13	5179	FALSE	22	115
NP-2	5/23/1986	32.95807	107.49674	266619	3649215	13	5179	FALSE	28	113

Well Name	Sample Date	Latitude	Longitude	UTM Easting	UTM Northing	UTM Zone	Elevation	Filtered?	Chloride	Sulfate
NP-2	10/8/1986	32.95807	107.49674	266619	3649215	13	5179	FALSE	24	100
NP-2	3/30/1989	32.95807	107.49674	266619	3649215	13	5179	TRUE	29.2	124
NP-2	7/19/1991	32.95807	107.49674	266619	3649215	13	5179	TRUE	60.9	180.8
NP-2	8/29/1991	32.95807	107.49674	266619	3649215	13	5179	FALSE	62.8	197.6
NP-2	10/26/1991	32.95807	107.49674	266619	3649215	13	5179	FALSE	63	170
NP-2	3/15/1992	32.95807	107.49674	266619	3649215	13	5179	FALSE	67.6	194.2
NP-2	5/25/1992	32.95807	107.49674	266619	3649215	13	5179	FALSE	66.6	161.7
NP-2	7/16/1992	32.95807	107.49674	266619	3649215	13	5179	FALSE	65.3	183.7
NP-2	10/8/1992	32.95807	107.49674	266619	3649215	13	5179	FALSE	78.2	178.9
NP-2	11/27/1992	32.95807	107.49674	266619	3649215	13	5179	FALSE	63.7	179.4
NP-2	12/15/1992	32.95807	107.49674	266619	3649215	13	5179	FALSE	82.5	166.8
NP-2	2/25/1993	32.95807	107.49674	266619	3649215	13	5179	FALSE	77.8	197.2
NP-2	3/30/1993	32.95807	107.49674	266619	3649215	13	5179	FALSE	239	436
NP-2	9/28/1993	32.95807	107.49674	266619	3649215	13	5179	FALSE	207	299.9
NP-2	3/17/1994	32.95807	107.49674	266619	3649215	13	5179	FALSE	118.2	300.5
NP-2	5/24/1994	32.95807	107.49674	266619	3649215	13	5179	FALSE	130	300
NP-2	6/23/1994	32.95807	107.49674	266619	3649215	13	5179	FALSE	124.3	267.5
NP-2	7/22/1994	32.95807	107.49674	266619	3649215	13	5179	TRUE	128	299
NP-2	9/22/1994	32.95807	107.49674	266619	3649215	13	5179	FALSE	123.8	252.7
NP-2	1/29/1995	32.95807	107.49674	266619	3649215	13	5179	FALSE	94.1	120.9
NP-2	3/29/1995	32.95807	107.49674	266619	3649215	13	5179	FALSE	90.7	228.7
NP-2	6/27/1995	32.95807	107.49674	266619	3649215	13	5179	FALSE	95.9	247.1
NP-2	9/21/1995	32.95807	107.49674	266619	3649215	13	5179	FALSE	86.6	211.8
NP-2	1/10/1996	32.95807	107.49674	266619	3649215	13	5179	FALSE	78.6	173.1
NP-2	4/3/1996	32.95807	107.49674	266619	3649215	13	5179	FALSE	76.8	168.7
NP-2	6/1/1996	32.95807	107.49674	266619	3649215	13	5179		74.4	181
NP-2	9/25/1996	32.95807	107.49674	266619	3649215	13	5179	TRUE	57.2	118
NP-2	1/15/1997	32.95807	107.49674	266619	3649215	13	5179	TRUE	56	148.4
NP-2	7/1/1997	32.95807	107.49674	266619	3649215	13	5179	TRUE	55.8	121
NP-2	10/1/1997	32.95807	107.49674	266619	3649215	13	5179	TRUE	55	127
NP-2	1/15/1998	32.95807	107.49674	266619	3649215	13	5179	TRUE	59	121
NP-2	4/9/1998	32.95807	107.49674	266619	3649215	13	5179	TRUE	61.8	122
NP-2	7/13/1998	32.95807	107.49674	266619	3649215	13	5179	TRUE	64.6	120

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-2	7/26/1982										
NP-2	8/18/1982										
NP-2	9/2/1982	7.4	468		316	650	0.54	1.66			
NP-2	9/14/1982										
NP-2	10/18/1982										
NP-2	10/27/1982	7.9	440				0.6	1.6			
NP-2	11/11/1982										
NP-2	12/28/1982										
NP-2	2/21/1983	7.8	440				0.6	1.6			
NP-2	5/6/1983										
NP-2	5/13/1983	8.1	460				0.6	1.5			
NP-2	6/2/1983										
NP-2	7/5/1983										
NP-2	8/9/1983	7.9	560				0.6	1.6			
NP-2	8/25/1983										
NP-2	10/20/1983										
NP-2	11/1/1983	8	470				0.6	2.3			
NP-2	12/7/1983										
NP-2	1/28/1984										
NP-2	2/13/1984										
NP-2	3/84										
NP-2	3/16/1984	8.2	500				0.8	1.6			
NP-2	4/18/1984										
NP-2	5/22/1984										
NP-2	5/30/1984	7.7	520				0.6	1.4			
NP-2	6/26/1984										
NP-2	7/25/1984										
NP-2	8/27/1984										
NP-2	9/12/1984	7.8	470				0.6	1.7			
NP-2	9/21/1984										
NP-2	11/19/1984										
NP-2	12/27/1984	7.9	470				0.6	1.7			
NP-2	12/17/1984										
NP-2	5/17/1985	7.8	480								
NP-2	11/13/1985	7.4	460								
NP-2	5/23/1986	7.6	480								

Well Name	Sample Date	pH	TDS	Alkalinity	Bicarb	Spec.Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-2	10/8/1986	7.4	430								
NP-2	3/30/1989		376		183				-0.1		
NP-2	7/19/1991	7.55	453	46	56.1	726	0.64	0.02			-0.002
NP-2	8/29/1991	8.11	471								
NP-2	10/26/1991	7.45	460								
NP-2	3/15/1992	8.07	467								
NP-2	5/25/1992	8.34	456								
NP-2	7/16/1992	8.13	479								
NP-2	10/8/1992	8.26	494								
NP-2	11/27/1992	8.38	451								
NP-2	12/15/1992	8.43	612								
NP-2	2/25/1993	8.62	475								
NP-2	3/30/1993	7.7	1310		289	1910	1.33	3.3	0.5		-0.005
NP-2	9/28/1993	7.92	1170								
NP-2	3/17/1994	7.65	971								
NP-2	5/24/1994	8.03	878		261	1250	0.97	-0.1	4.6	-0.005	-0.005
NP-2	6/23/1994	7.69	848								
NP-2	7/22/1994	7.88	878		270	1360	0.94	1.5	-0.05	0.0059	-0.005
NP-2	9/22/1994	7.55	963								
NP-2	1/29/1995	7.57	791								
NP-2	3/29/1995	7.69	1164								
NP-2	6/27/1995	7.93	778								
NP-2	9/21/1995	7.36	772								
NP-2	1/10/1996	7.1	632								
NP-2	4/3/1996	7.23	603								
NP-2	6/1/1996	6.91	642								
NP-2	9/25/1996	7.68	598								
NP-2	1/15/1997	7.44	536								
NP-2	7/1/1997	7.41	496								
NP-2	10/1/1997	7.49	489								
NP-2	1/15/1998	7.54	486			853	0.61	1.8			
NP-2	4/9/1998		536			802	0.56	1.9			
NP-2	7/13/1998		500			795	0.62	1.5			

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-2	7/26/1982										
NP-2	8/18/1982										
NP-2	9/2/1982				-0.001	73.8					
NP-2	9/14/1982										
NP-2	10/18/1982										
NP-2	10/27/1982				-0.005				-0.05	0.29	
NP-2	11/11/1982										
NP-2	12/28/1982										
NP-2	2/21/1983				-0.005				-0.05	0.12	
NP-2	5/6/1983										
NP-2	5/13/1983				-0.005				-0.05	-0.1	
NP-2	6/2/1983										
NP-2	7/5/1983										
NP-2	8/9/1983				-0.005				-0.05	-0.1	
NP-2	8/25/1983										
NP-2	10/20/1983										
NP-2	11/1/1983				-0.005				-0.05	0.17	
NP-2	12/7/1983										
NP-2	1/28/1984										
NP-2	2/13/1984										
NP-2	3/84										
NP-2	3/16/1984				-0.005				-0.05	-0.1	
NP-2	4/18/1984										
NP-2	5/22/1984										
NP-2	5/30/1984				-0.005				-0.05	-0.1	
NP-2	6/26/1984										
NP-2	7/25/1984										
NP-2	8/27/1984										
NP-2	9/12/1984				-0.005				-0.05	-0.1	
NP-2	9/21/1984										
NP-2	11/19/1984										
NP-2	12/27/1984				-0.005				-0.05	-0.1	
NP-2	12/17/1984										
NP-2	5/17/1985										
NP-2	11/13/1985										
NP-2	5/23/1986										

Well Name	Sample Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-2	10/8/1986										
NP-2	3/30/1989	-0.1	-0.1	-0.1	-0.1	52	-0.1	-0.05	-0.1	-0.1	-0.1
NP-2	7/19/1991		-0.01		-0.005	34.2	-0.02		-0.02	-0.05	-0.005
NP-2	8/29/1991										
NP-2	10/26/1991										
NP-2	3/15/1992									-0.05	
NP-2	5/25/1992									-0.05	
NP-2	7/16/1992									-0.05	
NP-2	10/8/1992										
NP-2	11/27/1992										
NP-2	12/15/1992									-0.05	
NP-2	2/25/1993										
NP-2	3/30/1993	0.1	0.6		-0.002	163	-0.02	-0.05	0.01	1.85	-0.02
NP-2	9/28/1993										
NP-2	3/17/1994										
NP-2	5/24/1994		-0.1		0.00097	120	-0.025		-0.025	4.5	0.0079
NP-2	6/23/1994										
NP-2	7/22/1994	-0.1	-0.1	-0.002	-0.0005	120	-0.025	-0.05	-0.025	-0.05	-0.005
NP-2	9/22/1994										
NP-2	1/29/1995										
NP-2	3/29/1995										
NP-2	6/27/1995										
NP-2	9/21/1995										
NP-2	1/10/1996										
NP-2	4/3/1996										
NP-2	6/1/1996										
NP-2	9/25/1996										
NP-2	1/15/1997										
NP-2	7/1/1997										
NP-2	10/1/1997										
NP-2	1/15/1998								-0.005	0.25	
NP-2	4/9/1998								0.005	0.24	
NP-2	7/13/1998								-0.005	0.11	

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-2	7/26/1982										
NP-2	8/18/1982										
NP-2	9/2/1982	17.9	-0.05		-0.01		1.95	-0.005		57.5	
NP-2	9/14/1982										
NP-2	10/18/1982										
NP-2	10/27/1982		-0.05	-0.001	-0.05			-0.005			
NP-2	11/11/1982										
NP-2	12/28/1982										
NP-2	2/21/1983		-0.05	-0.001	-0.05			-0.005			
NP-2	5/6/1983										
NP-2	5/13/1983		-0.05	-0.001	-0.05			-0.005			
NP-2	6/2/1983										
NP-2	7/5/1983										
NP-2	8/9/1983		-0.05	-0.001	-0.05			-0.005			
NP-2	8/25/1983										
NP-2	10/20/1983										
NP-2	11/1/1983		-0.05	-0.001	-0.05			-0.005			
NP-2	12/7/1983										
NP-2	1/28/1984										
NP-2	2/13/1984										
NP-2	3/84										
NP-2	3/16/1984		-0.05	-0.001	-0.05			-0.005			
NP-2	4/18/1984										
NP-2	5/22/1984										
NP-2	5/30/1984		-0.05	-0.001	-0.05			-0.005			
NP-2	6/26/1984										
NP-2	7/25/1984										
NP-2	8/27/1984										
NP-2	9/12/1984		-0.05	-0.001	-0.05			-0.005			
NP-2	9/21/1984										
NP-2	11/19/1984										
NP-2	12/27/1984		-0.05	-0.001	-0.05			-0.005			
NP-2	12/17/1984										
NP-2	5/17/1985										
NP-2	11/13/1985										
NP-2	5/23/1986										

Well Name	Sample Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-2	10/8/1986										
NP-2	3/30/1989	18	0.06		-0.1	-0.1	3		-0.1	65	
NP-2	7/19/1991	24	-0.02	-0.0002			0.8	0.018	-0.02	47.8	
NP-2	8/29/1991										
NP-2	10/26/1991										
NP-2	3/15/1992										
NP-2	5/25/1992										
NP-2	7/16/1992										
NP-2	10/8/1992										
NP-2	11/27/1992										
NP-2	12/15/1992										
NP-2	2/25/1993										
NP-2	3/30/1993	61	0.07	-0.001	-0.02	-0.01	0.9	0.005	-0.01	163	
NP-2	9/28/1993										
NP-2	3/17/1994										
NP-2	5/24/1994	47	0.19	-0.001		-0.05	2.3	-0.005	-0.025	100	
NP-2	6/23/1994										
NP-2	7/22/1994	43	-0.03	-0.001	-0.05	-0.05	1.3	-0.005	-0.025	120	-0.005
NP-2	9/22/1994										
NP-2	1/29/1995										
NP-2	3/29/1995										
NP-2	6/27/1995										
NP-2	9/21/1995										
NP-2	1/10/1996										
NP-2	4/3/1996										
NP-2	6/1/1996										
NP-2	9/25/1996										
NP-2	1/15/1997										
NP-2	7/1/1997										
NP-2	10/1/1997										
NP-2	1/15/1998	20.4		-0.0002	-0.05			-0.05			
NP-2	4/9/1998		-0.02	-0.0002	-0.05			-0.05			
NP-2	7/13/1998		0.05	0.0005	-0.05			-0.05			

Well Name	Sample Date	Zinc	Temp (C)	Tin	Vanadium
NP-2	7/26/1982				
NP-2	8/18/1982				
NP-2	9/2/1982		22		
NP-2	9/14/1982				
NP-2	10/18/1982				
NP-2	10/27/1982				
NP-2	11/11/1982				
NP-2	12/28/1982				
NP-2	2/21/1983				
NP-2	5/6/1983				
NP-2	5/13/1983				
NP-2	6/2/1983				
NP-2	7/5/1983				
NP-2	8/9/1983				
NP-2	8/25/1983				
NP-2	10/20/1983				
NP-2	11/1/1983				
NP-2	12/7/1983				
NP-2	1/28/1984				
NP-2	2/13/1984				
NP-2	3/84				
NP-2	3/16/1984				
NP-2	4/18/1984				
NP-2	5/22/1984				
NP-2	5/30/1984				
NP-2	6/26/1984				
NP-2	7/25/1984				
NP-2	8/27/1984				
NP-2	9/12/1984				
NP-2	9/21/1984				
NP-2	11/19/1984				
NP-2	12/27/1984				
NP-2	12/17/1984				
NP-2	5/17/1985				
NP-2	11/13/1985				
NP-2	5/23/1986				

Well Name	Sample Date	Zinc	Temp (C)	Tin	Vanadium
NP-2	10/8/1986				
NP-2	3/30/1989	0.5		-0.1	-0.1
NP-2	7/19/1991				
NP-2	8/29/1991				
NP-2	10/26/1991				
NP-2	3/15/1992				
NP-2	5/25/1992				
NP-2	7/16/1992				
NP-2	10/8/1992				
NP-2	11/27/1992				
NP-2	12/15/1992				
NP-2	2/25/1993				
NP-2	3/30/1993	0.67			
NP-2	9/28/1993				
NP-2	3/17/1994				
NP-2	5/24/1994	4.1			
NP-2	6/23/1994				
NP-2	7/22/1994	1.2			
NP-2	9/22/1994				
NP-2	1/29/1995				
NP-2	3/29/1995				
NP-2	6/27/1995				
NP-2	9/21/1995				
NP-2	1/10/1996				
NP-2	4/3/1996				
NP-2	6/1/1996				
NP-2	9/25/1996				
NP-2	1/15/1997				
NP-2	7/1/1997				
NP-2	10/1/1997				
NP-2	1/15/1998				
NP-2	4/9/1998				
NP-2	7/13/1998				

Well Name	Water Depth	USGS Quad	Well Depth		sample ID	Date	Sampler	Notes
NP-3	73.45	Skute Stone Arroyo		-1	NP-3-1	10/8/1981	QMC	
NP-3		Skute Stone Arroyo		-2	NP-3-2	10/27/1981	QMC	
NP-3		Skute Stone Arroyo		-3	NP-3-3	10/30/1981		
NP-3	71.58	Skute Stone Arroyo		-4	NP-3-4	11/6/1981	QMC	
NP-3	71.58	Skute Stone Arroyo		-5	NP-3-5	11/12/1981	QMC	
NP-3	71.4	Skute Stone Arroyo		-6	NP-3-6	11/13/1981	EID	
NP-3	69	Skute Stone Arroyo		-7	NP-3-7	11/17/1981	QMC	
NP-3	69.85	Skute Stone Arroyo		-8	NP-3-8	11/23/1981	QMC	
NP-3	70.1	Skute Stone Arroyo		-9	NP-3-9	12/7/1981	QMC	
NP-3	68.67	Skute Stone Arroyo		-10	NP-3-10	12/15/1981	QMC	
NP-3	77.67	Skute Stone Arroyo		-11	NP-3-11	12/22/1981	QMC	
NP-3		Skute Stone Arroyo		-12	NP-3-12	1/5/1982	QMC	
NP-3	66.17	Skute Stone Arroyo		-13	NP-3-13	1/18/1982	QMC	
NP-3	66.16	Skute Stone Arroyo		-14	NP-3-14	1/26/1982	QMC	
NP-3	64.67	Skute Stone Arroyo		-15	NP-3-15	2/16/1982	QMC	
NP-3	64.62	Skute Stone Arroyo		-16	NP-3-16	2/22/1982	QMC	
NP-3	63.42	Skute Stone Arroyo		-17	NP-3-17	3/12/1982	QMC	
NP-3	57.67	Skute Stone Arroyo		-18	NP-3-18	4/16/1982	QMC	
NP-3	57.5	Skute Stone Arroyo		-19	NP-3-19	4/26/1982	QMC	
NP-3	5.75	Skute Stone Arroyo		-20	NP-3-20	5/17/1982	QMC	
NP-3		Skute Stone Arroyo		-21	NP-3-21	5/24/1982	QMC	
NP-3		Skute Stone Arroyo		-22	NP-3-22	5/28/1982	QMC	
NP-3	0	Skute Stone Arroyo		-23	NP-3-23	6/8/1982	QMC	
NP-3	0	Skute Stone Arroyo		-24	NP-3-24	6/14/1982	QMC	
NP-3	0	Skute Stone Arroyo		-25	NP-3-25	6/30/1982	QMC	
NP-3	0	Skute Stone Arroyo		-26	NP-3-26	7/26/1982	QMC	
NP-3	0	Skute Stone Arroyo		-27	NP-3-27	8/18/1982	QMC	
NP-3	0	Skute Stone Arroyo		-28	NP-3-28	9/2/1982	EID	
NP-3	0	Skute Stone Arroyo		-29	NP-3-29	9/14/1982	QMC	
NP-3	0.8	Skute Stone Arroyo		-30	NP-3-30	10/18/1982	QMC	
NP-3	0.8	Skute Stone Arroyo		-31	NP-3-31	10/27/1982	QMC	
NP-3	2.7	Skute Stone Arroyo		-32	NP-3-32	11/11/1982	QMC	
NP-3	6.6	Skute Stone Arroyo		-33	NP-3-33	12/28/1982	QMC	
NP-3	9.2	Skute Stone Arroyo		-34	NP-3-34	2/21/1983	QMC	
NP-3	14.4	Skute Stone Arroyo		-35	NP-3-35	5/6/1983	QMC	
NP-3	14.4	Skute Stone Arroyo		-36	NP-3-36	5/13/1983	QMC	

Well Name	Water Depth	USGS Quad	Well Depth		sample ID	Date	Sampler	Notes
NP-3	15.7	Skute Stone Arroyo		-37	NP-3-37	6/2/1983	QMC	
NP-3	17	Skute Stone Arroyo		-38	NP-3-38	7/5/1983	QMC	
NP-3	19.1	Skute Stone Arroyo		-39	NP-3-39	8/9/1983	QMC	
NP-3	19.1	Skute Stone Arroyo		-40	NP-3-40	8/25/1983	QMC	
NP-3	21.5	Skute Stone Arroyo		-41	NP-3-41	10/20/1983	QMC	
NP-3	21.5	Skute Stone Arroyo		-42	NP-3-42	11/1/1983	QMC	
NP-3	22.7	Skute Stone Arroyo		-43	NP-3-43	12/7/1983	QMC	
NP-3	22.5	Skute Stone Arroyo		-44	NP-3-44	1/28/1984	QMC	
NP-3	22.5	Skute Stone Arroyo		-45	NP-3-45	2/13/1984	QMC	
NP-3	22.4	Skute Stone Arroyo		-46	NP-3-46	3/1/1984	QMC	
NP-3	22.4	Skute Stone Arroyo		-47	NP-3-47	3/16/1984	CFP	
NP-3	22.4	Skute Stone Arroyo		-48	NP-3-48	4/18/1984	CFP	
NP-3	22.4	Skute Stone Arroyo		-49	NP-3-49	5/22/1984	CFP	
NP-3	22.4	Skute Stone Arroyo		-50	NP-3-50	5/30/1984	CFP	
NP-3	22.8	Skute Stone Arroyo		-51	NP-3-51	6/26/1984	CFP	
NP-3	22.9	Skute Stone Arroyo		-52	NP-3-52	7/25/1984	CFP	
NP-3	22.9	Skute Stone Arroyo		-53	NP-3-53	8/27/1984	CFP	
NP-3	22.4	Skute Stone Arroyo		-54	NP-3-54	9/12/1984	CFP	
NP-3	22.4	Skute Stone Arroyo		-55	NP-3-55	9/21/1984	CFP	
NP-3	22.6	Skute Stone Arroyo		-56	NP-3-56	11/19/1984	CFP	
NP-3	22.6	Skute Stone Arroyo		-57	NP-3-57	11/27/1984	CFP	
NP-3	22.5	Skute Stone Arroyo		-58	NP-3-58	12/17/1984	CFP	
NP-3	22.4	Skute Stone Arroyo		-59	NP-3-59	5/17/1985	CFP	
NP-3	12.5	Skute Stone Arroyo		-60	NP-3-60	11/13/1985	CFP	
NP-3	11.1	Skute Stone Arroyo		-61	NP-3-61	5/23/1986	CFP	
NP-3	10.9	Skute Stone Arroyo		-62	NP-3-62	10/8/1986	CFP	
NP-3	5.12	Skute Stone Arroyo		-63	NP-3-63	3/3/1987		
NP-3	5.12	Skute Stone Arroyo		-64	NP-3-64	3/4/1987	EID	
NP-3		Skute Stone Arroyo		-65	NP-3-65	5/25/1987		
NP-3	6.5	Skute Stone Arroyo		-66	NP-3-66	1/12/1988	EID	
NP-3		Skute Stone Arroyo		-67	NP-3-67	4/4/1988	Irwin	lab pH
NP-3	7.58	Skute Stone Arroyo		-68	NP-3-68	8/23/1988	Irwin	lab pH
NP-3	6.5	Skute Stone Arroyo		-69	NP-3-69	2/9/1989	Irwin	lab pH
NP-3	6.8	Skute Stone Arroyo		-70	NP-3-70	6/1/1989	Irwin	lab pH
NP-3	5.66	Skute Stone Arroyo		-71	NP-3-71	11/30/1989	Irwin	lab pH
NP-3	4.9	Skute Stone Arroyo		-72	NP-3-72	11/14/1990	GE	

Well Name	Water Depth	USGS Quad	Well Depth		sample ID	Date	Sampler	Notes
NP-3	10.9	Skute Stone Arroyo		-73	NP-3-73	2/11/1991	SHB	
NP-3	30.3	Skute Stone Arroyo		-74	NP-3-74	7/19/1991	GE	Lab NP-2-mixed w/
NP-3	3.92	Skute Stone Arroyo		-75	NP-3-75	8/29/1991	Irwin	lab pH
NP-3	3.67	Skute Stone Arroyo		-76	NP-3-76	11/26/1991	Hood	lab pH
NP-3	3.42	Skute Stone Arroyo		-77	NP-3-77	3/15/1992	Irwin	lab pH
NP-3		Skute Stone Arroyo		-78	NP-3-78	5/25/1992	Irwin	lab pH
NP-3		Skute Stone Arroyo		-79	NP-3-79	7/16/1992	Irwin	lab pH
NP-3	2.42	Skute Stone Arroyo		-80	NP-3-80	10/8/1992	Irwin	lab pH
NP-3	3.58	Skute Stone Arroyo		-81	NP-3-81	11/27/1992	Hood	lab pH
NP-3		Skute Stone Arroyo		-82	NP-3-82	12/15/1992	Irwin	lab pH
NP-3	3.58	Skute Stone Arroyo		-83	NP-3-83	2/25/1993	Irwin	lab pH
NP-3		Skute Stone Arroyo		-84	NP-3-84	3/30/1993	JWS	
NP-3		Skute Stone Arroyo		-85	NP-3-85	9/28/1993	Irwin	lab pH
NP-3	3.56	Skute Stone Arroyo		-86	NP-3-86	3/17/1994	Irwin	lab pH
NP-3		Skute Stone Arroyo		-87	NP-3-87	6/23/1994	Irwin	lab pH
NP-3		Skute Stone Arroyo		-88	NP-3-88	7/22/1994	SRK	25 ft of sediment I
NP-3		Skute Stone Arroyo		-89	NP-3-89	9/22/1994	Irwin	lab pH
NP-3		Skute Stone Arroyo		-90	NP-3-90	1/29/1995	Irwin	lab pH
NP-3		Skute Stone Arroyo		-91	NP-3-91	3/29/1995	Irwin	lab pH
NP-3	7.58	Skute Stone Arroyo		-92	NP-3-92	6/27/1995	Irwin	lab pH
NP-3		Skute Stone Arroyo		-93	NP-3-93	9/21/1995	Irwin	lab pH
NP-3		Skute Stone Arroyo		-94	NP-3-94	1/10/1996	Irwin	lab pH
NP-3		Skute Stone Arroyo		-95	NP-3-95	4/3/1996	Irwin	lab pH
NP-3		Skute Stone Arroyo		-96	NP-3-96	6/1/1996		
NP-3		Skute Stone Arroyo		-97	NP-3-97	9/25/1996	Irwin	lab pH
NP-3		Skute Stone Arroyo		-98	NP-3-98	1/15/1997	Irwin	lab pH
NP-3		Skute Stone Arroyo		-99	NP-3-99	7/1/1997		
NP-3		Skute Stone Arroyo		-100	NP-3-100	10/1/1997		
NP-3	10.5	Skute Stone Arroyo		-101	NP-3-101	1/15/1998	Irwin	
NP-3	10.35	Skute Stone Arroyo		-102	NP-3-102	4/9/1998	Irwin	
NP-3	10.5	Skute Stone Arroyo		-103	NP-3-103	7/13/1998	Irwin	
NP-4	82.25	Skute Stone Arroyo		-1	NP-4-1	4/16/1982	QMC	
NP-4	82.2	Skute Stone Arroyo		-2	NP-4-2	4/26/1982	QMC	
NP-4	68.5	Skute Stone Arroyo		-3	NP-4-3	5/17/1982	QMC	
NP-4		Skute Stone Arroyo		-4	NP-4-4	5/24/1982	QMC	
NP-4		Skute Stone Arroyo		-5	NP-4-5	5/28/1982	QMC	

Well Name	Water Depth	USGS Quad	Well Depth		sample ID	Date	Sampler	Notes
NP-4	42.5	Skute Stone Arroyo		-6	NP-4-6	6/8/1982	QMC	
NP-4	42.5	Skute Stone Arroyo		-7	NP-4-7	6/14/1982	QMC	
NP-4		Skute Stone Arroyo		-8	NP-4-8	6/30/1982	QMC	
NP-4	31.62	Skute Stone Arroyo		-9	NP-4-9	7/26/1982	QMC	
NP-4	31.3	Skute Stone Arroyo		-10	NP-4-10	8/18/1982	QMC	
NP-4	31.2	Skute Stone Arroyo		-11	NP-4-11	9/2/1982	EID	
NP-4	31.1	Skute Stone Arroyo		-12	NP-4-12	9/14/1982	QMC	
NP-4	31.6	Skute Stone Arroyo		-13	NP-4-13	10/18/1982	QMC	
NP-4	31.6	Skute Stone Arroyo		-14	NP-4-14	10/27/1982	QMC	
NP-4	33.1	Skute Stone Arroyo		-15	NP-4-15	11/11/1982	QMC	
NP-4	35.1	Skute Stone Arroyo		-16	NP-4-16	12/28/1982	QMC	
NP-4	38.9	Skute Stone Arroyo		-17	NP-4-17	2/21/1983	QMC	
NP-4	39.7	Skute Stone Arroyo		-18	NP-4-18	5/6/1983	QMC	
NP-4	39.7	Skute Stone Arroyo		-19	NP-4-19	5/13/1983	QMC	
NP-4	40.6	Skute Stone Arroyo		-20	NP-4-20	6/2/1983	QMC	
NP-4	41.8	Skute Stone Arroyo		-21	NP-4-21	7/5/1983	QMC	
NP-4	43.7	Skute Stone Arroyo		-22	NP-4-22	8/9/1983	QMC	
NP-4	43.7	Skute Stone Arroyo		-23	NP-4-23	8/25/1983	QMC	
NP-4	45.2	Skute Stone Arroyo		-24	NP-4-24	10/20/1983	QMC	
NP-4	45.2	Skute Stone Arroyo		-25	NP-4-25	11/1/1983	QMC	
NP-4	48.4	Skute Stone Arroyo		-26	NP-4-26	12/7/1983	QMC	
NP-4	47.1	Skute Stone Arroyo		-27	NP-4-27	1/28/1984	QMC	
NP-4	46.8	Skute Stone Arroyo		-28	NP-4-28	2/13/1984	QMC	
NP-4	46.6	Skute Stone Arroyo		-29	NP-4-29	3/1/1984	QMC	
NP-4	46.6	Skute Stone Arroyo		-30	NP-4-30	3/16/1984	CFP	
NP-4	46.7	Skute Stone Arroyo		-31	NP-4-31	4/18/1984	CFP	
NP-4	44.9	Skute Stone Arroyo		-32	NP-4-32	5/22/1984	CFP	
NP-4	44.9	Skute Stone Arroyo		-33	NP-4-33	5/30/1984	CFP	
NP-4	44.6	Skute Stone Arroyo		-34	NP-4-34	6/26/1984	CFP	
NP-4	44.3	Skute Stone Arroyo		-35	NP-4-35	7/25/1984	CFP	
NP-4	44.1	Skute Stone Arroyo		-36	NP-4-36	8/27/1984	CFP	
NP-4	43.8	Skute Stone Arroyo		-37	NP-4-37	9/12/1984	CFP	
NP-4	43.8	Skute Stone Arroyo		-38	NP-4-38	9/21/1984	CFP	
NP-4	43.1	Skute Stone Arroyo		-39	NP-4-39	11/19/1984	CFP	
NP-4	42.1	Skute Stone Arroyo		-40	NP-4-40	11/27/1984	CFP	
NP-4	42.9	Skute Stone Arroyo		-41	NP-4-41	12/17/1984	CFP	

Well Name	Water Depth	USGS Quad	Well Depth	sample ID	Date	Sampler	Notes
NP-4	42.7	Skute Stone Arroyo	-42	NP-4-42	5/17/1985	CFP	
NP-4	37.3	Skute Stone Arroyo	-43	NP-4-43	11/13/1985	CFP	
NP-4	34.4	Skute Stone Arroyo	-44	NP-4-44	5/23/1986	CFP	
NP-4	34.5	Skute Stone Arroyo	-45	NP-4-45	10/8/1986	CFP	
NP-4		Skute Stone Arroyo	-46	NP-4-46	5/25/1987		
NP-4	29.8	Skute Stone Arroyo	-47	NP-4-47	1/12/1988	EID	
NP-4		Skute Stone Arroyo	-48	NP-4-48	4/4/1988	Irwin	lab pH
NP-4	29.33	Skute Stone Arroyo	-49	NP-4-49	8/23/1988	Irwin	lab pH
NP-4	29.25	Skute Stone Arroyo	-50	NP-4-50	2/9/1989	Irwin	lab pH
NP-4	27.3	Skute Stone Arroyo	-51	NP-4-51	6/1/1989	Irwin	lab pH
NP-4	29.2	Skute Stone Arroyo	-52	NP-4-52	11/30/1989	Irwin	lab pH
NP-4	29.75	Skute Stone Arroyo	-53	NP-4-53	11/14/1990		
NP-4		Skute Stone Arroyo	-54	NP-4-54	2/11/1991		
NP-4		Skute Stone Arroyo	-55	NP-4-55	7/19/1991	GE	lab pH
NP-4	27.5	Skute Stone Arroyo	-56	NP-4-56	8/29/1991	Irwin	lab pH
NP-4	27	Skute Stone Arroyo	-57	NP-4-57	11/26/1991	Hood	lab pH
NP-4	26.42	Skute Stone Arroyo	-58	NP-4-58	3/15/1992	Irwin	lab pH
NP-4		Skute Stone Arroyo	-59	NP-4-59	5/25/1992	Irwin	lab pH
NP-4		Skute Stone Arroyo	-60	NP-4-60	7/16/1992	Irwin	lab pH
NP-4	26	Skute Stone Arroyo	-61	NP-4-61	10/8/1992	Irwin	lab pH
NP-4	26.92	Skute Stone Arroyo	-62	NP-4-62	11/27/1992	Hood	lab pH
NP-4		Skute Stone Arroyo	-63	NP-4-63	12/15/1992	Irwin	lab pH
NP-4	27.08	Skute Stone Arroyo	-64	NP-4-64	2/25/1993	Irwin	lab pH
NP-4		Skute Stone Arroyo	-65	NP-4-65	3/31/1993	JWS	
NP-4		Skute Stone Arroyo	-66	NP-4-66	9/28/1993	Irwin	lab pH
NP-4	27.85	Skute Stone Arroyo	-67	NP-4-67	5/26/1994	SRK	
NP-4		Skute Stone Arroyo	-68	NP-4-68	6/23/1994	Irwin	lab pH
NP-4		Skute Stone Arroyo	-69	NP-4-69	7/23/1994	SRK	
NP-4		Skute Stone Arroyo	-70	NP-4-70	9/22/1994	Irwin	lab pH
NP-4		Skute Stone Arroyo	-71	NP-4-71	1/29/1995	Irwin	lab pH
NP-4		Skute Stone Arroyo	-72	NP-4-72	3/29/1995	Irwin	lab pH
NP-4	30.75	Skute Stone Arroyo	-73	NP-4-73	6/27/1995	Irwin	lab pH
NP-4		Skute Stone Arroyo	-74	NP-4-74	9/21/1995	Irwin	lab pH
NP-4		Skute Stone Arroyo	-75	NP-4-75	1/10/1996	Irwin	lab pH
NP-4		Skute Stone Arroyo	-76	NP-4-76	4/3/1996	Irwin	lab pH
NP-4		Skute Stone Arroyo	-77	NP-4-77	6/1/1996		

Well Name	Water Depth	USGS Quad	Well Depth		sample ID	Date	Sampler	Notes
NP-4		Skute Stone Arroyo		-78	NP-4-78	9/25/1996	Irwin	lab pH
NP-4		Skute Stone Arroyo		-79	NP-4-79	1/15/1997	Irwin	lab pH
NP-4		Skute Stone Arroyo		-80	NP-4-80	7/1/1997		
NP-4		Skute Stone Arroyo		-81	NP-4-81	10/1/1997		
NP-4	33.3	Skute Stone Arroyo		-82	NP-4-82	1/15/1998	Irwin	
NP-4		Skute Stone Arroyo		-83	NP-4-83	1/24/1998	Goff	
NP-4	33.75	Skute Stone Arroyo		-84	NP-4-84	4/9/1998	Irwin	
NP-4	33.75	Skute Stone Arroyo		-85	NP-4-85	7/13/1998	Irwin	
NP-4		Skute Stone Arroyo		-86	NP-4-86	7/21/1998	Brownfield	
NP-5	37.56	Skute Stone Arroyo		-1	NP-5-1	11/4/1981	QMC	
NP-5	34.83	Skute Stone Arroyo		-2	NP-5-2	11/11/1981	QMC	
NP-5	37.49	Skute Stone Arroyo		-3	NP-5-3	11/13/1981	EID	
NP-5	34.83	Skute Stone Arroyo		-4	NP-5-4	11/17/1981	QMC	
NP-5	33	Skute Stone Arroyo		-5	NP-5-5	11/23/1981	QMC	
NP-5	37.56	Skute Stone Arroyo		-6	NP-5-6	12/7/1981	QMC	

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-3	10/8/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	28.6	94.5
NP-3	10/27/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	28	148
NP-3	10/30/1981	32.96126	107.49678	266624	3649569	13	5200	FALSE	31.2	102
NP-3	11/6/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	28	140
NP-3	11/12/1981	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	11/13/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	26.71	140.6
NP-3	11/17/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	144
NP-3	11/23/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	144
NP-3	12/7/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	28	153
NP-3	12/15/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	149
NP-3	12/22/1981	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	149
NP-3	1/5/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	154
NP-3	1/18/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	1/26/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	30	151
NP-3	2/16/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	2/22/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	28	137
NP-3	3/12/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	4/16/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	4/26/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	28	146
NP-3	5/17/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	562	900
NP-3	5/24/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE		
NP-3	5/28/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE		
NP-3	6/8/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	30	150
NP-3	6/14/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	6/30/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	128
NP-3	7/26/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	8/18/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	9/2/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	27.82	123.8
NP-3	9/14/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	10/18/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	10/27/1982	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	132
NP-3	11/11/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	12/28/1982	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	2/21/1983	32.96126	107.49678	266624	3649569	13	5200	TRUE	26	131
NP-3	5/6/1983	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	5/13/1983	32.96126	107.49678	266624	3649569	13	5200	TRUE	64	139

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-3	6/2/1983	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	7/5/1983	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	8/9/1983	32.96126	107.49678	266624	3649569	13	5200	TRUE	114	100
NP-3	8/25/1983	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	10/20/1983	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	11/1/1983	32.96126	107.49678	266624	3649569	13	5200	TRUE	162	163
NP-3	12/7/1983	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	1/28/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	2/13/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	3/1/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	3/16/1984	32.96126	107.49678	266624	3649569	13	5200	TRUE	228	216
NP-3	4/18/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	5/22/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	5/30/1984	32.96126	107.49678	266624	3649569	13	5200	TRUE	248	292
NP-3	6/26/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	7/25/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	8/27/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	9/12/1984	32.96126	107.49678	266624	3649569	13	5200	TRUE	270	292
NP-3	9/21/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	11/19/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	11/27/1984	32.96126	107.49678	266624	3649569	13	5200	TRUE	290	348
NP-3	12/17/1984	32.96126	107.49678	266624	3649569	13	5200	FALSE		
NP-3	5/17/1985	32.96126	107.49678	266624	3649569	13	5200	FALSE	310	453
NP-3	11/13/1985	32.96126	107.49678	266624	3649569	13	5200	FALSE	288	541
NP-3	5/23/1986	32.96126	107.49678	266624	3649569	13	5200	FALSE	282	624
NP-3	10/8/1986	32.96126	107.49678	266624	3649569	13	5200	FALSE	272	620
NP-3	3/3/1987	32.96126	107.49678	266624	3649569	13	5200	FALSE		695
NP-3	3/4/1987	32.96126	107.49678	266624	3649569	13	5200	TRUE	283	695
NP-3	5/25/1987	32.96126	107.49678	266624	3649569	13	5200	FALSE		735.5
NP-3	1/12/1988	32.96126	107.49678	266624	3649569	13	5200	TRUE	359	755
NP-3	4/4/1988	32.96126	107.49678	266624	3649569	13	5200	FALSE	254	587
NP-3	8/23/1988	32.96126	107.49678	266624	3649569	13	5200	FALSE	251.4	835.2
NP-3	2/9/1989	32.96126	107.49678	266624	3649569	13	5200	FALSE	254.3	763.4
NP-3	6/1/1989	32.96126	107.49678	266624	3649569	13	5200	FALSE	241.1	713.6
NP-3	11/30/1989	32.96126	107.49678	266624	3649569	13	5200	FALSE	158.9	742.9
NP-3	11/14/1990	32.96126	107.49678	266624	3649569	13	5200	FALSE	228.7	821.6

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-3	2/11/1991	32.96126	107.49678	266624	3649569	13	5200	FALSE	255.9	970.5
NP-3	7/19/1991	32.96126	107.49678	266624	3649569	13	5200	TRUE	239.2	820.3
NP-3	8/29/1991	32.96126	107.49678	266624	3649569	13	5200	FALSE	254.3	854.1
NP-3	11/26/1991	32.96126	107.49678	266624	3649569	13	5200	FALSE	248.1	745.2
NP-3	3/15/1992	32.96126	107.49678	266624	3649569	13	5200	FALSE	227.8	921.3
NP-3	5/25/1992	32.96126	107.49678	266624	3649569	13	5200	FALSE	216.4	752.9
NP-3	7/16/1992	32.96126	107.49678	266624	3649569	13	5200	FALSE	226.1	802.2
NP-3	10/8/1992	32.96126	107.49678	266624	3649569	13	5200	FALSE	211.6	799.1
NP-3	11/27/1992	32.96126	107.49678	266624	3649569	13	5200	FALSE	254.7	796.1
NP-3	12/15/1992	32.96126	107.49678	266624	3649569	13	5200	FALSE	223.2	545.3
NP-3	2/25/1993	32.96126	107.49678	266624	3649569	13	5200	FALSE	219.3	793.6
NP-3	3/30/1993	32.96126	107.49678	266624	3649569	13	5200	FALSE	205	825
NP-3	9/28/1993	32.96126	107.49678	266624	3649569	13	5200	FALSE	210.3	619.4
NP-3	3/17/1994	32.96126	107.49678	266624	3649569	13	5200	FALSE	169.5	746.9
NP-3	6/23/1994	32.96126	107.49678	266624	3649569	13	5200	FALSE	205.7	778.6
NP-3	7/22/1994	32.96126	107.49678	266624	3649569	13	5200	TRUE	194	796
NP-3	9/22/1994	32.96126	107.49678	266624	3649569	13	5200	FALSE	435.9	1348
NP-3	1/29/1995	32.96126	107.49678	266624	3649569	13	5200	FALSE	566.4	651.9
NP-3	3/29/1995	32.96126	107.49678	266624	3649569	13	5200	FALSE	185.5	558
NP-3	6/27/1995	32.96126	107.49678	266624	3649569	13	5200	FALSE	202.7	717
NP-3	9/21/1995	32.96126	107.49678	266624	3649569	13	5200	FALSE	208.4	822
NP-3	1/10/1996	32.96126	107.49678	266624	3649569	13	5200	FALSE	208.5	724.1
NP-3	4/3/1996	32.96126	107.49678	266624	3649569	13	5200	FALSE	208.3	722.6
NP-3	6/1/1996	32.96126	107.49678	266624	3649569	13	5200		210.6	556.5
NP-3	9/25/1996	32.96126	107.49678	266624	3649569	13	5200	TRUE	190.5	536.5
NP-3	1/15/1997	32.96126	107.49678	266624	3649569	13	5200	TRUE	207	657.4
NP-3	7/1/1997	32.96126	107.49678	266624	3649569	13	5200	TRUE	211	711
NP-3	10/1/1997	32.96126	107.49678	266624	3649569	13	5200	TRUE	226	719
NP-3	1/15/1998	32.96126	107.49678	266624	3649569	13	5200	TRUE	217	627
NP-3	4/9/1998	32.96126	107.49678	266624	3649569	13	5200	TRUE	219	683
NP-3	7/13/1998	32.96126	107.49678	266624	3649569	13	5200	TRUE	220	715
NP-4	4/16/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	4/26/1982	32.96513	107.49789	266530	3650000	13	5187	TRUE	46	132
NP-4	5/17/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE	46	138
NP-4	5/24/1982	32.96513	107.49789	266530	3650000	13	5187	TRUE		
NP-4	5/28/1982	32.96513	107.49789	266530	3650000	13	5187	TRUE		

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-4	6/8/1982	32.96513	107.49789	266530	3650000	13	5187	TRUE	26	140
NP-4	6/14/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	6/30/1982	32.96513	107.49789	266530	3650000	13	5187	TRUE	28	115
NP-4	7/26/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	8/18/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	9/2/1982	32.96513	107.49789	266530	3650000	13	5187	TRUE	28.72	107.1
NP-4	9/14/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	10/18/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	10/27/1982	32.96513	107.49789	266530	3650000	13	5187	TRUE	36	108
NP-4	11/11/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	12/28/1982	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	2/21/1983	32.96513	107.49789	266530	3650000	13	5187	TRUE	48	115
NP-4	5/6/1983	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	5/13/1983	32.96513	107.49789	266530	3650000	13	5187	TRUE	76	134
NP-4	6/2/1983	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	7/5/1983	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	8/9/1983	32.96513	107.49789	266530	3650000	13	5187	TRUE	94	156
NP-4	8/25/1983	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	10/20/1983	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	11/1/1983	32.96513	107.49789	266530	3650000	13	5187	TRUE	114	206
NP-4	12/7/1983	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	1/28/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	2/13/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	3/1/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	3/16/1984	32.96513	107.49789	266530	3650000	13	5187	TRUE	126	256
NP-4	4/18/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	5/22/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	5/30/1984	32.96513	107.49789	266530	3650000	13	5187	TRUE	134	320
NP-4	6/26/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	7/25/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	8/27/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	9/12/1984	32.96513	107.49789	266530	3650000	13	5187	TRUE	134	339
NP-4	9/21/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	11/19/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		
NP-4	11/27/1984	32.96513	107.49789	266530	3650000	13	5187	TRUE	140	354
NP-4	12/17/1984	32.96513	107.49789	266530	3650000	13	5187	FALSE		

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-4	5/17/1985	32.96513	107.49789	266530	3650000	13	5187	FALSE	146	348
NP-4	11/13/1985	32.96513	107.49789	266530	3650000	13	5187	FALSE	142	292
NP-4	5/23/1986	32.96513	107.49789	266530	3650000	13	5187	FALSE	136	300
NP-4	10/8/1986	32.96513	107.49789	266530	3650000	13	5187	FALSE	134	290
NP-4	5/25/1987	32.96513	107.49789	266530	3650000	13	5187	FALSE		278.5
NP-4	1/12/1988	32.96513	107.49789	266530	3650000	13	5187	TRUE	137	256
NP-4	4/4/1988	32.96513	107.49789	266530	3650000	13	5187	FALSE	130.4	328.8
NP-4	8/23/1988	32.96513	107.49789	266530	3650000	13	5187	FALSE	132.1	292.2
NP-4	2/9/1989	32.96513	107.49789	266530	3650000	13	5187	FALSE	130	266.8
NP-4	6/1/1989	32.96513	107.49789	266530	3650000	13	5187	FALSE	116.4	243.5
NP-4	11/30/1989	32.96513	107.49789	266530	3650000	13	5187	FALSE	96.9	237.4
NP-4	11/14/1990	32.96513	107.49789	266530	3650000	13	5187	FALSE	153.1	254.5
NP-4	2/11/1991	32.96513	107.49789	266530	3650000	13	5187	FALSE	126.1	288.9
NP-4	7/19/1991	32.96513	107.49789	266530	3650000	13	5187	TRUE	112.3	198.5
NP-4	8/29/1991	32.96513	107.49789	266530	3650000	13	5187	FALSE	110.7	232
NP-4	11/26/1991	32.96513	107.49789	266530	3650000	13	5187	FALSE	99	193.6
NP-4	3/15/1992	32.96513	107.49789	266530	3650000	13	5187	FALSE	102.9	216.5
NP-4	5/25/1992	32.96513	107.49789	266530	3650000	13	5187	FALSE	106.2	171.4
NP-4	7/16/1992	32.96513	107.49789	266530	3650000	13	5187	FALSE	94.4	176.8
NP-4	10/8/1992	32.96513	107.49789	266530	3650000	13	5187	FALSE	102.9	182.9
NP-4	11/27/1992	32.96513	107.49789	266530	3650000	13	5187	FALSE	97.5	201.7
NP-4	12/15/1992	32.96513	107.49789	266530	3650000	13	5187	FALSE	84.4	151.2
NP-4	2/25/1993	32.96513	107.49789	266530	3650000	13	5187	FALSE	76.6	150.8
NP-4	3/31/1993	32.96513	107.49789	266530	3650000	13	5187	FALSE	45	134
NP-4	9/28/1993	32.96513	107.49789	266530	3650000	13	5187	FALSE	56.9	108.5
NP-4	5/26/1994	32.96513	107.49789	266530	3650000	13	5187	FALSE	39	131
NP-4	6/23/1994	32.96513	107.49789	266530	3650000	13	5187	FALSE	48.5	133.5
NP-4	7/23/1994	32.96513	107.49789	266530	3650000	13	5187	TRUE	34	120
NP-4	9/22/1994	32.96513	107.49789	266530	3650000	13	5187	FALSE	36.9	111
NP-4	1/29/1995	32.96513	107.49789	266530	3650000	13	5187	FALSE	34.5	110.7
NP-4	3/29/1995	32.96513	107.49789	266530	3650000	13	5187	FALSE	33.8	121.7
NP-4	6/27/1995	32.96513	107.49789	266530	3650000	13	5187	FALSE	33.2	134.1
NP-4	9/21/1995	32.96513	107.49789	266530	3650000	13	5187	FALSE	35.3	132.1
NP-4	1/10/1996	32.96513	107.49789	266530	3650000	13	5187	FALSE	34.7	123.1
NP-4	4/3/1996	32.96513	107.49789	266530	3650000	13	5187	FALSE	26	123.3
NP-4	6/1/1996	32.96513	107.49789	266530	3650000	13	5187		34.4	123

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-4	9/25/1996	32.96513	107.49789	266530	3650000	13	5187	TRUE	31.7	125.6
NP-4	1/15/1997	32.96513	107.49789	266530	3650000	13	5187	TRUE	98	1113
NP-4	7/1/1997	32.96513	107.49789	266530	3650000	13	5187	TRUE	33.2	119
NP-4	10/1/1997	32.96513	107.49789	266530	3650000	13	5187	TRUE	34.3	123
NP-4	1/15/1998	32.96513	107.49789	266530	3650000	13	5187	TRUE	33.4	137
NP-4	1/24/1998	32.96513	107.49789	266530	3650000	13	5187	TRUE	35.8	130
NP-4	4/9/1998	32.96513	107.49789	266530	3650000	13	5187	TRUE	34.2	120
NP-4	7/13/1998	32.96513	107.49789	266530	3650000	13	5187	TRUE	32.9	131
NP-4	7/21/1998	32.96513	107.49789	266530	3650000	13	5187	TRUE	33.2	128
NP-5	11/4/1981	32.95888	107.49677	266618	3649305	13	5186	TRUE	50	196
NP-5	11/11/1981	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	11/13/1981	32.95888	107.49677	266618	3649305	13	5186	TRUE	37.89	162
NP-5	11/17/1981	32.95888	107.49677	266618	3649305	13	5186	TRUE	42	158
NP-5	11/23/1981	32.95888	107.49677	266618	3649305	13	5186	TRUE	36	161
NP-5	12/7/1981	32.95888	107.49677	266618	3649305	13	5186	TRUE	34	172

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-3	10/8/1981	6.98	460		211		1.58	-0.5	-0.25		0.005
NP-3	10/27/1981	8	390				1.9	0.4	-0.01		-0.01
NP-3	10/30/1981	7.89	428				1.6	-0.5	-0.25		-0.005
NP-3	11/6/1981	7.9	380				1.6	0.2	-0.01		-0.01
NP-3	11/12/1981										
NP-3	11/13/1981	7.6	446		190.3	600	1.39	0.16	-0.25		0.009
NP-3	11/17/1981	8.1	390				1.4	-0.2	-0.01		-0.01
NP-3	11/23/1981	7.8	460				1.2	0.2	-0.01		-0.01
NP-3	12/7/1981	7.9	450				1.1	-0.2	-0.01		-0.01
NP-3	12/15/1981	7.8	450				1.1	0.2	-0.01		-0.01
NP-3	12/22/1981	7.9	410				0.9	0.2	-0.01		-0.01
NP-3	1/5/1982	7.7	360				1.1	0.2	-0.01		-0.01
NP-3	1/18/1982										
NP-3	1/26/1982	8.1	400				1	0.2			
NP-3	2/16/1982										
NP-3	2/22/1982	8	420				0.9	-0.2			
NP-3	3/12/1982										
NP-3	4/16/1982										
NP-3	4/26/1982	7.9	410				0.8	-0.2			
NP-3	5/17/1982	7.6	2460				0.7	12			
NP-3	5/24/1982										
NP-3	5/28/1982										
NP-3	6/8/1982	7.9	500				0.5	1.9			
NP-3	6/14/1982										
NP-3	6/30/1982	7.9	510				0.5	1.8			
NP-3	7/26/1982										
NP-3	8/18/1982										
NP-3	9/2/1982	7.5	498		308	750	0.53	1.94			
NP-3	9/14/1982										
NP-3	10/18/1982										
NP-3	10/27/1982	8	450				0.6	1.6			
NP-3	11/11/1982										
NP-3	12/28/1982										
NP-3	2/21/1983	8.2	410				0.5	1.4			
NP-3	5/6/1983										
NP-3	5/13/1983	8	500				0.5	2.1			

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-3	6/2/1983										
NP-3	7/5/1983										
NP-3	8/9/1983	7.8	630				0.5	2.3			
NP-3	8/25/1983										
NP-3	10/20/1983										
NP-3	11/1/1983	7.9	760				0.5	3.8			
NP-3	12/7/1983										
NP-3	1/28/1984										
NP-3	2/13/1984										
NP-3	3/1/1984										
NP-3	3/16/1984	8.1	870				0.6	3.2			
NP-3	4/18/1984										
NP-3	5/22/1984										
NP-3	5/30/1984	7.8	1060				0.4	2.9			
NP-3	6/26/1984										
NP-3	7/25/1984										
NP-3	8/27/1984										
NP-3	9/12/1984	7.7	1140				0.4	3.1			
NP-3	9/21/1984										
NP-3	11/19/1984										
NP-3	11/27/1984	7.8	1150				0.4	3.5			
NP-3	12/17/1984										
NP-3	5/17/1985	7.7	1470								
NP-3	11/13/1985	7.2	1520								
NP-3	5/23/1986	7.5	1590								
NP-3	10/8/1986	7.4	1710								
NP-3	3/3/1987										
NP-3	3/4/1987	6.8	1882		188						
NP-3	5/25/1987										
NP-3	1/12/1988		1584		30				-0.1		
NP-3	4/4/1988		1772								
NP-3	8/23/1988		1744								
NP-3	2/9/1989		1583								
NP-3	6/1/1989		1596								
NP-3	11/30/1989		1600								
NP-3	11/14/1990		1675								

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-3	2/11/1991		1551								-0.001
NP-3	7/19/1991	8.29	1663	167	191.6	2520	0.66	0.23			-0.002
NP-3	8/29/1991	7.84	1616								
NP-3	11/26/1991	7.08	1613								
NP-3	3/15/1992	7.63	1644								
NP-3	5/25/1992	7.85	1607								
NP-3	7/16/1992	7.26	1578								
NP-3	10/8/1992	7.69	1445								
NP-3	11/27/1992	7.49	1640								
NP-3	12/15/1992	7.75	1558								
NP-3	2/25/1993	7.65	1580								
NP-3	3/30/1993	7.4	1560		29	2070	0.54		0.1		-0.005
NP-3	9/28/1993	7.88	1544								
NP-3	3/17/1994	7.46	1609								
NP-3	6/23/1994	7.77	1628								
NP-3	7/22/1994	7.83	1620		118	2160	0.34	-1	-0.05	-0.005	-0.005
NP-3	9/22/1994	7.05	3466								
NP-3	1/29/1995	7.45	1623								
NP-3	3/29/1995	7.48	1639								
NP-3	6/27/1995	7.38	1607								
NP-3	9/21/1995	7.5	1557								
NP-3	1/10/1996	7.32	1464								
NP-3	4/3/1996	7.29	1415								
NP-3	6/1/1996	7.64	1422								
NP-3	9/25/1996	7.72	1472								
NP-3	1/15/1997	7.51	1478								
NP-3	7/1/1997	7.28	1486								
NP-3	10/1/1997	7.79	1440								
NP-3	1/15/1998	7.39	1406			1980	0.29	-0.05			
NP-3	4/9/1998		1448			1810	0.028	-0.05			
NP-3	7/13/1998		1433			1830	0.031	0.06			
NP-4	4/16/1982										
NP-4	4/26/1982	8.6	410				1.5	0.6			
NP-4	5/17/1982	9.4	310				1	1.3			
NP-4	5/24/1982										
NP-4	5/28/1982										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-4	6/8/1982	8.4	420				0.5	4.5			
NP-4	6/14/1982										
NP-4	6/30/1982	9.5	270				0.4	-0.2			
NP-4	7/26/1982										
NP-4	8/18/1982										
NP-4	9/2/1982	8.5	252		63.1	410	0.4	0.03			
NP-4	9/14/1982										
NP-4	10/18/1982										
NP-4	10/27/1982	8.9	230				0.4	-0.2			
NP-4	11/11/1982										
NP-4	12/28/1982										
NP-4	2/21/1983	9.3	250				0.4	0.2			
NP-4	5/6/1983										
NP-4	5/13/1983	7.9	340				0.4	-0.2			
NP-4	6/2/1983										
NP-4	7/5/1983										
NP-4	8/9/1983	8.8	430				0.3	-0.2			
NP-4	8/25/1983										
NP-4	10/20/1983										
NP-4	11/1/1983	8.2	530				0.3	0.6			
NP-4	12/7/1983										
NP-4	1/28/1984										
NP-4	2/13/1984										
NP-4	3/1/1984										
NP-4	3/16/1984	8	540				0.6	0.2			
NP-4	4/18/1984										
NP-4	5/22/1984										
NP-4	5/30/1984	8	630				0.3	-0.2			
NP-4	6/26/1984										
NP-4	7/25/1984										
NP-4	8/27/1984										
NP-4	9/12/1984	8	760				0.3	0.9			
NP-4	9/21/1984										
NP-4	11/19/1984										
NP-4	11/27/1984	8.5	740				0.3	0.2			
NP-4	12/17/1984										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-4	5/17/1985	8.2	770								
NP-4	11/13/1985	8	690								
NP-4	5/23/1986	8	690								
NP-4	10/8/1986	7.8	690								
NP-4	5/25/1987										
NP-4	1/12/1988		612		24.4				-0.1		
NP-4	4/4/1988		610								
NP-4	8/23/1988		688								
NP-4	2/9/1989		604								
NP-4	6/1/1989		580								
NP-4	11/30/1989		572								
NP-4	11/14/1990		262								
NP-4	2/11/1991		676								-0.001
NP-4	7/19/1991	7.81	532	45	54.9	802	0.41	0.07			-0.002
NP-4	8/29/1991	8.37	532								
NP-4	11/26/1991	8.54	522								
NP-4	3/15/1992	8.85	565								
NP-4	5/25/1992	8.62	439								
NP-4	7/16/1992	7.64	458								
NP-4	10/8/1992	9.01	535								
NP-4	11/27/1992	8.12	495								
NP-4	12/15/1992	9.52	424								
NP-4	2/25/1993	9.85	349								
NP-4	3/31/1993	7.6	504		275	813	0.53	3.7	0.3		-0.005
NP-4	9/28/1993	8.2	437								
NP-4	5/26/1994	8.1	666		320	800	0.46	4.3	3.5	-0.005	-0.005
NP-4	6/23/1994	8.13	498								
NP-4	7/23/1994	7.9	536		279	828	0.48	4.6	-0.05	0.01	-0.005
NP-4	9/22/1994	7.73	547								
NP-4	1/29/1995	7.88	447								
NP-4	3/29/1995	7.86	494								
NP-4	6/27/1995	7.37	487								
NP-4	9/21/1995	7.51	509								
NP-4	1/10/1996	7.35	483								
NP-4	4/3/1996	7.19	475								
NP-4	6/1/1996	7.36	478								

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-4	9/25/1996	7.75	504								
NP-4	1/15/1997	7.43	2651								
NP-4	7/1/1997	7.53	500								
NP-4	10/1/1997	7.66	503								
NP-4	1/15/1998	7.73	489			847	0.56	5.97			
NP-4	1/24/1998	7.56	527		287.9	864	0.058				
NP-4	4/9/1998		534			850	0.54	6.3			
NP-4	7/13/1998		503			784	0.58	6			
NP-4	7/21/1998		543				0.61	6.2			
NP-5	11/4/1981	8	570				1.3	4.1	-0.01		-0.01
NP-5	11/11/1981										
NP-5	11/13/1981	7.7	488		186.7	650	1.28	3.56	0.239		-0.005
NP-5	11/17/1981	8	500				1.3	2.7	-0.01		-0.01
NP-5	11/23/1981	7.8	580				1.2	4	-0.01		-0.01
NP-5	12/7/1981	7.9	510				1.2	3.1	-0.01		-0.01

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-3	10/8/1981	0.188	-1		-0.01	40.9	-0.05	-0.05	-0.05	-0.1	-0.05
NP-3	10/27/1981	-0.01	0.2		-0.005	41	-0.01	-0.02	-0.05	0.39	-0.02
NP-3	10/30/1981	0.29	-1		-0.01		-0.05	-0.05	-0.05	-0.1	-0.05
NP-3	11/6/1981	-0.01	-0.2		-0.005	39	-0.01	-0.02	-0.05	-0.1	-0.02
NP-3	11/12/1981										
NP-3	11/13/1981	0.034	-0.1		-0.001	55.2	-0.005				-0.005
NP-3	11/17/1981	-0.1	0.24		-0.005	44	-0.01	-0.02	-0.05	-0.1	-0.02
NP-3	11/23/1981	-0.1	0.02		-0.005	47	-0.02	-0.02	-0.05	-0.1	-0.02
NP-3	12/7/1981	-0.1	-0.2		-0.005	47	-0.01	-0.02	-0.05	-0.1	-0.02
NP-3	12/15/1981	-0.1	-0.2		-0.005	56	-0.01	-0.02	-0.05	-0.1	-0.02
NP-3	12/22/1981	-0.1	-0.2		-0.005	73	-0.01	-0.02	-0.05	-0.1	-0.02
NP-3	1/5/1982	-0.1	-0.2		-0.005	56	-0.01	-0.02	-0.05	0.31	-0.02
NP-3	1/18/1982										
NP-3	1/26/1982				-0.005				-0.05	-0.1	
NP-3	2/16/1982										
NP-3	2/22/1982				-0.005				-0.05	0.14	
NP-3	3/12/1982										
NP-3	4/16/1982										
NP-3	4/26/1982				-0.005				-0.05	0.24	
NP-3	5/17/1982				-0.005				-0.05	0.016	
NP-3	5/24/1982									-0.1	
NP-3	5/28/1982									-0.1	
NP-3	6/8/1982				-0.005				-0.05	-0.1	
NP-3	6/14/1982										
NP-3	6/30/1982				-0.005				-0.05	-0.1	
NP-3	7/26/1982										
NP-3	8/18/1982										
NP-3	9/2/1982				-0.001	77.4					
NP-3	9/14/1982										
NP-3	10/18/1982										
NP-3	10/27/1982				-0.005				-0.05	-0.1	
NP-3	11/11/1982										
NP-3	12/28/1982										
NP-3	2/21/1983				-0.005				-0.05	-0.1	
NP-3	5/6/1983										
NP-3	5/13/1983				-0.005				-0.05	-0.1	

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-3	6/2/1983										
NP-3	7/5/1983										
NP-3	8/9/1983				-0.005				-0.05	-0.1	
NP-3	8/25/1983										
NP-3	10/20/1983										
NP-3	11/1/1983				-0.005				-0.05	0.14	
NP-3	12/7/1983										
NP-3	1/28/1984										
NP-3	2/13/1984										
NP-3	3/1/1984										
NP-3	3/16/1984				-0.005				-0.05	-0.1	
NP-3	4/18/1984										
NP-3	5/22/1984										
NP-3	5/30/1984				-0.005				-0.05	-0.1	
NP-3	6/26/1984										
NP-3	7/25/1984										
NP-3	8/27/1984										
NP-3	9/12/1984				-0.005				-0.05	-0.1	
NP-3	9/21/1984										
NP-3	11/19/1984										
NP-3	11/27/1984				-0.005				-0.05	-0.1	
NP-3	12/17/1984										
NP-3	5/17/1985										
NP-3	11/13/1985										
NP-3	5/23/1986										
NP-3	10/8/1986										
NP-3	3/3/1987										
NP-3	3/4/1987					320					
NP-3	5/25/1987										
NP-3	1/12/1988	-0.1	-0.1	-0.1	-0.1	268	-0.1	-0.05	-0.1	-0.1	-0.1
NP-3	4/4/1988										
NP-3	8/23/1988										
NP-3	2/9/1989										
NP-3	6/1/1989										
NP-3	11/30/1989										
NP-3	11/14/1990										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-3	2/11/1991										
NP-3	7/19/1991		-0.01		-0.005	287	-0.02		-0.02	0.28	-0.005
NP-3	8/29/1991										
NP-3	11/26/1991										
NP-3	3/15/1992										
NP-3	5/25/1992										
NP-3	7/16/1992										
NP-3	10/8/1992										
NP-3	11/27/1992										
NP-3	12/15/1992								0.01		
NP-3	2/25/1993										
NP-3	3/30/1993	0.02	-0.5		-0.002	296	-0.02	-0.05	0.01	4.99	-0.02
NP-3	9/28/1993								-0.001	-0.05	
NP-3	3/17/1994								0.012	0.24	
NP-3	6/23/1994										
NP-3	7/22/1994	-0.1	-0.1	-0.002	-0.0005	320	-0.025	-0.05	-0.025	-0.05	-0.005
NP-3	9/22/1994										
NP-3	1/29/1995										
NP-3	3/29/1995										
NP-3	6/27/1995										
NP-3	9/21/1995										
NP-3	1/10/1996										
NP-3	4/3/1996										
NP-3	6/1/1996										
NP-3	9/25/1996										
NP-3	1/15/1997										
NP-3	7/1/1997										
NP-3	10/1/1997										
NP-3	1/15/1998								-0.005	0.2	
NP-3	4/9/1998								-0.005	-0.2	
NP-3	7/13/1998								-0.005	-0.05	
NP-4	4/16/1982										
NP-4	4/26/1982				-0.005				0.051	3.8	
NP-4	5/17/1982				-0.005				-0.05	0.11	
NP-4	5/24/1982									-0.1	
NP-4	5/28/1982									-0.1	

Well Name	Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-4	6/8/1982				-0.005				-0.05	-0.1	
NP-4	6/14/1982										
NP-4	6/30/1982				-0.005				-0.05	-0.1	
NP-4	7/26/1982										
NP-4	8/18/1982										
NP-4	9/2/1982				-0.001	7.2					
NP-4	9/14/1982										
NP-4	10/18/1982										
NP-4	10/27/1982				0.0061				-0.05	0.34	
NP-4	11/11/1982										
NP-4	12/28/1982										
NP-4	2/21/1983				-0.005				-0.05	0.28	
NP-4	5/6/1983										
NP-4	5/13/1983				-0.005				-0.05	-0.1	
NP-4	6/2/1983										
NP-4	7/5/1983										
NP-4	8/9/1983				-0.005				-0.05	-0.1	
NP-4	8/25/1983										
NP-4	10/20/1983										
NP-4	11/1/1983				-0.005				-0.05	-0.1	
NP-4	12/7/1983										
NP-4	1/28/1984										
NP-4	2/13/1984										
NP-4	3/1/1984										
NP-4	3/16/1984				-0.005				-0.05	-0.1	
NP-4	4/18/1984										
NP-4	5/22/1984										
NP-4	5/30/1984				-0.005				-0.05	-0.1	
NP-4	6/26/1984										
NP-4	7/25/1984										
NP-4	8/27/1984										
NP-4	9/12/1984				-0.005				-0.05	-0.1	
NP-4	9/21/1984										
NP-4	11/19/1984										
NP-4	11/27/1984				-0.005				-0.05	-0.1	
NP-4	12/17/1984										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-4	5/17/1985										
NP-4	11/13/1985										
NP-4	5/23/1986										
NP-4	10/8/1986										
NP-4	5/25/1987										
NP-4	1/12/1988	-0.1	-0.1	-0.1	-0.1	76	-0.1	-0.05	-0.1	-0.1	-0.1
NP-4	4/4/1988										
NP-4	8/23/1988										
NP-4	2/9/1989										
NP-4	6/1/1989										
NP-4	11/30/1989										
NP-4	11/14/1990										
NP-4	2/11/1991										
NP-4	7/19/1991		0.28		-0.005	63.4	-0.02			5.14	-0.005
NP-4	8/29/1991										
NP-4	11/26/1991										
NP-4	3/15/1992										
NP-4	5/25/1992										
NP-4	7/16/1992										
NP-4	10/8/1992										
NP-4	11/27/1992										
NP-4	12/15/1992										
NP-4	2/25/1993										
NP-4	3/31/1993	0.04	-0.5		-0.002	76	-0.02	-0.05	0.01	0.62	-0.02
NP-4	9/28/1993										
NP-4	5/26/1994		-0.1		0.0034	73	-0.025		-0.025	15	0.018
NP-4	6/23/1994										
NP-4	7/23/1994	-0.1	-0.1	-0.002	-0.0005	88	-0.025	-0.05	-0.025	-0.05	-0.005
NP-4	9/22/1994										
NP-4	1/29/1995										
NP-4	3/29/1995										
NP-4	6/27/1995										
NP-4	9/21/1995										
NP-4	1/10/1996										
NP-4	4/3/1996										
NP-4	6/1/1996										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-4	9/25/1996										
NP-4	1/15/1997										
NP-4	7/1/1997										
NP-4	10/1/1997										
NP-4	1/15/1998								-0.005	1	
NP-4	1/24/1998					77			-0.005		
NP-4	4/9/1998								0.009	-0.2	
NP-4	7/13/1998								-0.005	0.76	
NP-4	7/21/1998					87			-0.005	0.42	
NP-5	11/4/1981	-0.01	-0.2		-0.005	86	-0.01	-0.02	-0.05	-0.1	-0.02
NP-5	11/11/1981										
NP-5	11/13/1981	0.07	0.218		-0.001	88.6	-0.005		-0.1		-0.005
NP-5	11/17/1981	-0.1	-0.2		-0.005	72	-0.01	-0.02	-0.05	-0.1	-0.02
NP-5	11/23/1981	-0.1	-0.2		-0.005	73	-0.02	-0.02	-0.05	-0.1	-0.02
NP-5	12/7/1981	-0.1	-0.2		-0.005	66	-0.01	-0.02	-0.05	-0.1	-0.02

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-3	10/8/1981	9.55	0.81	-1	-0.1	-0.05	9.71	0.005	-0.02	79	
NP-3	10/27/1981		1	-0.001	0.16	-0.05		-0.005	-0.02		
NP-3	10/30/1981		1.03	-0.001	-0.1	-0.02		-0.002	-0.02		
NP-3	11/6/1981		0.47	-0.001	0.26	-0.05		-0.005	-0.02		
NP-3	11/12/1981										
NP-3	11/13/1981	13.05	1.01	-0.0005	0.65	-0.05	5.85	0.023	0.023	43.7	
NP-3	11/17/1981		1	-0.001	0.2	-0.05		-0.005	-0.02		
NP-3	11/23/1981		0.96	-0.001	0.15	-0.05		-0.005	-0.01		
NP-3	12/7/1981		0.78	-0.001	0.13	-0.05		-0.005	-0.02		
NP-3	12/15/1981		0.87	-0.001	0.094	-0.05		-0.005	-0.02		
NP-3	12/22/1981		0.76	-0.001	0.1	-0.05		-0.005	-0.02		
NP-3	1/5/1982		0.72	-0.001	0.01	-0.05		-0.02	-0.02		
NP-3	1/18/1982										
NP-3	1/26/1982		0.7	-0.001	-0.1			-0.005			
NP-3	2/16/1982										
NP-3	2/22/1982		0.66	-0.001	-0.05			-0.005			
NP-3	3/12/1982										
NP-3	4/16/1982										
NP-3	4/26/1982		0.4	-0.001	-0.05			-0.005			
NP-3	5/17/1982		0.23	-0.001	-0.05			-0.005			
NP-3	5/24/1982		0.053								
NP-3	5/28/1982		0.063								
NP-3	6/8/1982		0.1	-0.001	-0.05			-0.005			
NP-3	6/14/1982										
NP-3	6/30/1982		0.081	-0.001	-0.05			-0.005			
NP-3	7/26/1982										
NP-3	8/18/1982										
NP-3	9/2/1982	15.1	-0.05		-0.01		3.9	-0.005		64.4	
NP-3	9/14/1982										
NP-3	10/18/1982										
NP-3	10/27/1982		-0.05	-0.001	-0.05			-0.005			
NP-3	11/11/1982										
NP-3	12/28/1982										
NP-3	2/21/1983		-0.05	-0.001	-0.05			-0.005			
NP-3	5/6/1983										
NP-3	5/13/1983		-0.05	-0.001	-0.05			-0.005			

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-3	6/2/1983										
NP-3	7/5/1983										
NP-3	8/9/1983		-0.05	-0.001	-0.05			-0.005			
NP-3	8/25/1983										
NP-3	10/20/1983										
NP-3	11/1/1983		-0.05	-0.001	-0.05			-0.005			
NP-3	12/7/1983										
NP-3	1/28/1984										
NP-3	2/13/1984										
NP-3	3/1/1984										
NP-3	3/16/1984		-0.05	-0.001	-0.05			-0.005			
NP-3	4/18/1984										
NP-3	5/22/1984										
NP-3	5/30/1984		-0.05	-0.001	-0.05			-0.005			
NP-3	6/26/1984										
NP-3	7/25/1984										
NP-3	8/27/1984										
NP-3	9/12/1984		-0.05	-0.001	-0.05			-0.005			
NP-3	9/21/1984										
NP-3	11/19/1984										
NP-3	11/27/1984		-0.05	-0.001	-0.05			-0.005			
NP-3	12/17/1984										
NP-3	5/17/1985										
NP-3	11/13/1985										
NP-3	5/23/1986										
NP-3	10/8/1986										
NP-3	3/3/1987										
NP-3	3/4/1987	67.1					4.29			117.3	
NP-3	5/25/1987										
NP-3	1/12/1988	57	0.57		-0.1	-0.1	38		-0.1	142	
NP-3	4/4/1988										
NP-3	8/23/1988										
NP-3	2/9/1989										
NP-3	6/1/1989										
NP-3	11/30/1989										
NP-3	11/14/1990										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-3	2/11/1991								255.9		
NP-3	7/19/1991	53.4	0.08	0.0002			7	0.011	-0.02	189.7	
NP-3	8/29/1991										
NP-3	11/26/1991										
NP-3	3/15/1992										
NP-3	5/25/1992										
NP-3	7/16/1992										
NP-3	10/8/1992										
NP-3	11/27/1992										
NP-3	12/15/1992										
NP-3	2/25/1993										
NP-3	3/30/1993	35	0.32	-0.001	-0.02	-0.01	4.1	-0.005	-0.01	129	
NP-3	9/28/1993		0.24								
NP-3	3/17/1994		0.33								
NP-3	6/23/1994										
NP-3	7/22/1994	73	0.61	-0.001	-0.05	-0.05	4.5	-0.005	-0.025	120	-0.005
NP-3	9/22/1994										
NP-3	1/29/1995										
NP-3	3/29/1995										
NP-3	6/27/1995										
NP-3	9/21/1995										
NP-3	1/10/1996										
NP-3	4/3/1996										
NP-3	6/1/1996										
NP-3	9/25/1996										
NP-3	1/15/1997										
NP-3	7/1/1997										
NP-3	10/1/1997										
NP-3	1/15/1998	54.8		-0.0002	-0.05			-0.05			
NP-3	4/9/1998		0.15	-0.0002	-0.05			-0.05			
NP-3	7/13/1998		0.33	-0.0002	-0.05			-0.05			
NP-4	4/16/1982										
NP-4	4/26/1982		0.6	-0.001	0.07			-0.005			
NP-4	5/17/1982		-0.05	-0.001	-0.05			-0.005			
NP-4	5/24/1982		-0.05								
NP-4	5/28/1982		-0.05								

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-4	6/8/1982		-0.05	-0.001	-0.05			-0.005			
NP-4	6/14/1982										
NP-4	6/30/1982		-0.05	-0.001	-0.05			-0.005			
NP-4	7/26/1982										
NP-4	8/18/1982										
NP-4	9/2/1982	3.5	-0.05		-0.01		3.9	-0.005		71.3	
NP-4	9/14/1982										
NP-4	10/18/1982										
NP-4	10/27/1982		-0.05	-0.001	-0.05			-0.005			
NP-4	11/11/1982										
NP-4	12/28/1982										
NP-4	2/21/1983		-0.05	-0.001	-0.05			-0.005			
NP-4	5/6/1983										
NP-4	5/13/1983		-0.05	-0.001	-0.05			-0.005			
NP-4	6/2/1983										
NP-4	7/5/1983										
NP-4	8/9/1983		-0.05	-0.001	-0.05			-0.005			
NP-4	8/25/1983										
NP-4	10/20/1983										
NP-4	11/1/1983		-0.05	-0.001	-0.05			-0.005			
NP-4	12/7/1983										
NP-4	1/28/1984										
NP-4	2/13/1984										
NP-4	3/1/1984										
NP-4	3/16/1984		-0.05	0.001	-0.05			-0.005			
NP-4	4/18/1984										
NP-4	5/22/1984										
NP-4	5/30/1984		-0.05	-0.001	-0.05			-0.005			
NP-4	6/26/1984										
NP-4	7/25/1984										
NP-4	8/27/1984										
NP-4	9/12/1984		-0.05	-0.001	-0.05			-0.005			
NP-4	9/21/1984										
NP-4	11/19/1984										
NP-4	11/27/1984		-0.05	-0.001	-0.05			-0.005			
NP-4	12/17/1984										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-4	5/17/1985										
NP-4	11/13/1985										
NP-4	5/23/1986										
NP-4	10/8/1986										
NP-4	5/25/1987										
NP-4	1/12/1988	21	0.06		-0.1	-0.1	5		-0.1	86	
NP-4	4/4/1988										
NP-4	8/23/1988										
NP-4	2/9/1989										
NP-4	6/1/1989										
NP-4	11/30/1989										
NP-4	11/14/1990										
NP-4	2/11/1991										
NP-4	7/19/1991	20.8	-0.02	-0.0002			3.1	-0.002	-0.02	66.7	
NP-4	8/29/1991										
NP-4	11/26/1991										
NP-4	3/15/1992										
NP-4	5/25/1992										
NP-4	7/16/1992										
NP-4	10/8/1992										
NP-4	11/27/1992										
NP-4	12/15/1992										
NP-4	2/25/1993										
NP-4	3/31/1993	17	0.84	0.009	-0.02	-0.01	2.2	-0.005	-0.01	79	
NP-4	9/28/1993										
NP-4	5/26/1994	15	0.16	-0.001		-0.05	3	-0.005	-0.025	62	
NP-4	6/23/1994										
NP-4	7/23/1994	16	-0.03	-0.001	-0.05	-0.05	2.5	-0.005	-0.025	72	-0.005
NP-4	9/22/1994										
NP-4	1/29/1995										
NP-4	3/29/1995										
NP-4	6/27/1995										
NP-4	9/21/1995										
NP-4	1/10/1996										
NP-4	4/3/1996										
NP-4	6/1/1996										

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium
NP-4	9/25/1996										
NP-4	1/15/1997										
NP-4	7/1/1997										
NP-4	10/1/1997										
NP-4	1/15/1998	13.8		-0.0002	-0.05			-0.05			
NP-4	1/24/1998	14.8	-0.02				5.3			70.1	
NP-4	4/9/1998		0.03	-0.0002	-0.05			-0.05			
NP-4	7/13/1998		0.08	-0.0002	-0.05			-0.05			
NP-4	7/21/1998	13.8	-0.02	0.0004	-0.05		2.2	-0.05		64.6	
NP-5	11/4/1981		0.1	-0.001	-0.05	-0.05		-0.005	-0.02		
NP-5	11/11/1981										
NP-5	11/13/1981	14.4	0.14	-0.0005	0.015	0.019	5.07	0.014	-0.001	43.7	
NP-5	11/17/1981		0.3	-0.001	0.07	-0.05		-0.005	-0.02		
NP-5	11/23/1981		0.091	-0.001	-0.05	-0.05		-0.005	-0.1		
NP-5	12/7/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02		

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
NP-3	10/8/1981	1.25			
NP-3	10/27/1981	0.98			
NP-3	10/30/1981	0.93			
NP-3	11/6/1981	1.1			
NP-3	11/12/1981				
NP-3	11/13/1981	1.59	20.5		
NP-3	11/17/1981	1.2			
NP-3	11/23/1981	1.9			
NP-3	12/7/1981	3.5			
NP-3	12/15/1981	2.5			
NP-3	12/22/1981	2.1			
NP-3	1/5/1982	1.7			
NP-3	1/18/1982				
NP-3	1/26/1982				
NP-3	2/16/1982				
NP-3	2/22/1982				
NP-3	3/12/1982				
NP-3	4/16/1982				
NP-3	4/26/1982				
NP-3	5/17/1982				
NP-3	5/24/1982				
NP-3	5/28/1982				
NP-3	6/8/1982				
NP-3	6/14/1982				
NP-3	6/30/1982				
NP-3	7/26/1982				
NP-3	8/18/1982				
NP-3	9/2/1982		26		
NP-3	9/14/1982				
NP-3	10/18/1982				
NP-3	10/27/1982				
NP-3	11/11/1982				
NP-3	12/28/1982				
NP-3	2/21/1983				
NP-3	5/6/1983				
NP-3	5/13/1983				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
NP-3	6/2/1983				
NP-3	7/5/1983				
NP-3	8/9/1983				
NP-3	8/25/1983				
NP-3	10/20/1983				
NP-3	11/1/1983				
NP-3	12/7/1983				
NP-3	1/28/1984				
NP-3	2/13/1984				
NP-3	3/1/1984				
NP-3	3/16/1984				
NP-3	4/18/1984				
NP-3	5/22/1984				
NP-3	5/30/1984				
NP-3	6/26/1984				
NP-3	7/25/1984				
NP-3	8/27/1984				
NP-3	9/12/1984				
NP-3	9/21/1984				
NP-3	11/19/1984				
NP-3	11/27/1984				
NP-3	12/17/1984				
NP-3	5/17/1985				
NP-3	11/13/1985				
NP-3	5/23/1986				
NP-3	10/8/1986				
NP-3	3/3/1987				
NP-3	3/4/1987		17.5		
NP-3	5/25/1987				
NP-3	1/12/1988	1.1		0.2	-0.1
NP-3	4/4/1988				
NP-3	8/23/1988				
NP-3	2/9/1989				
NP-3	6/1/1989				
NP-3	11/30/1989				
NP-3	11/14/1990				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
NP-3	2/11/1991				
NP-3	7/19/1991				
NP-3	8/29/1991				
NP-3	11/26/1991				
NP-3	3/15/1992				
NP-3	5/25/1992				
NP-3	7/16/1992				
NP-3	10/8/1992				
NP-3	11/27/1992				
NP-3	12/15/1992				
NP-3	2/25/1993				
NP-3	3/30/1993	6.98			
NP-3	9/28/1993	1.04			
NP-3	3/17/1994	2.58			
NP-3	6/23/1994				
NP-3	7/22/1994	1.8			
NP-3	9/22/1994				
NP-3	1/29/1995				
NP-3	3/29/1995				
NP-3	6/27/1995				
NP-3	9/21/1995				
NP-3	1/10/1996				
NP-3	4/3/1996				
NP-3	6/1/1996				
NP-3	9/25/1996				
NP-3	1/15/1997				
NP-3	7/1/1997				
NP-3	10/1/1997				
NP-3	1/15/1998				
NP-3	4/9/1998				
NP-3	7/13/1998				
NP-4	4/16/1982				
NP-4	4/26/1982				
NP-4	5/17/1982				
NP-4	5/24/1982				
NP-4	5/28/1982				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
NP-4	6/8/1982				
NP-4	6/14/1982				
NP-4	6/30/1982				
NP-4	7/26/1982				
NP-4	8/18/1982				
NP-4	9/2/1982				
NP-4	9/14/1982				
NP-4	10/18/1982				
NP-4	10/27/1982				
NP-4	11/11/1982				
NP-4	12/28/1982				
NP-4	2/21/1983				
NP-4	5/6/1983				
NP-4	5/13/1983				
NP-4	6/2/1983				
NP-4	7/5/1983				
NP-4	8/9/1983				
NP-4	8/25/1983				
NP-4	10/20/1983				
NP-4	11/1/1983				
NP-4	12/7/1983				
NP-4	1/28/1984				
NP-4	2/13/1984				
NP-4	3/1/1984				
NP-4	3/16/1984				
NP-4	4/18/1984				
NP-4	5/22/1984				
NP-4	5/30/1984				
NP-4	6/26/1984				
NP-4	7/25/1984				
NP-4	8/27/1984				
NP-4	9/12/1984				
NP-4	9/21/1984				
NP-4	11/19/1984				
NP-4	11/27/1984				
NP-4	12/17/1984				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
NP-4	5/17/1985				
NP-4	11/13/1985				
NP-4	5/23/1986				
NP-4	10/8/1986				
NP-4	5/25/1987				
NP-4	1/12/1988	0.1		0.5	-0.1
NP-4	4/4/1988				
NP-4	8/23/1988				
NP-4	2/9/1989				
NP-4	6/1/1989				
NP-4	11/30/1989				
NP-4	11/14/1990				
NP-4	2/11/1991				
NP-4	7/19/1991				
NP-4	8/29/1991				
NP-4	11/26/1991				
NP-4	3/15/1992				
NP-4	5/25/1992				
NP-4	7/16/1992				
NP-4	10/8/1992				
NP-4	11/27/1992				
NP-4	12/15/1992				
NP-4	2/25/1993				
NP-4	3/31/1993	241			
NP-4	9/28/1993				
NP-4	5/26/1994	12			
NP-4	6/23/1994				
NP-4	7/23/1994	0.51			
NP-4	9/22/1994				
NP-4	1/29/1995				
NP-4	3/29/1995				
NP-4	6/27/1995				
NP-4	9/21/1995				
NP-4	1/10/1996				
NP-4	4/3/1996				
NP-4	6/1/1996				

Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
NP-4	9/25/1996				
NP-4	1/15/1997				
NP-4	7/1/1997				
NP-4	10/1/1997				
NP-4	1/15/1998				
NP-4	1/24/1998				
NP-4	4/9/1998				
NP-4	7/13/1998				
NP-4	7/21/1998				
NP-5	11/4/1981	0.14			
NP-5	11/11/1981				
NP-5	11/13/1981	-0.05	20		
NP-5	11/17/1981	0.19			
NP-5	11/23/1981	0.21			
NP-5	12/7/1981	0.24			

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
NP-5	37.95	Skute Stone Arroyo		-7	NP-5-7	12/15/1981	QMC	
NP-5	37.58	Skute Stone Arroyo		-8	NP-5-8	12/22/1981	QMC	
NP-5	37.66	Skute Stone Arroyo		-9	NP-5-9	1/5/1982	QMC	
NP-5	37.58	Skute Stone Arroyo		-10	NP-5-10	1/18/1982	QMC	
NP-5	37.58	Skute Stone Arroyo		-11	NP-5-11	1/26/1982	QMC	
NP-5	37.75	Skute Stone Arroyo		-12	NP-5-12	2/16/1982	QMC	
NP-5	37.7	Skute Stone Arroyo		-13	NP-5-13	2/22/1982	QMC	
NP-5	37.83	Skute Stone Arroyo		-14	NP-5-14	3/1/1982	QMC	
NP-5	34.08	Skute Stone Arroyo		-15	NP-5-15	4/16/1982	QMC	
NP-5	33.58	Skute Stone Arroyo		-16	NP-5-16	4/26/1982	QMC	
NP-5	27.16	Skute Stone Arroyo		-17	NP-5-17	5/17/1982	QMC	
NP-5	28.5	Skute Stone Arroyo		-18	NP-5-18	5/17/1982	QMC	
NP-5		Skute Stone Arroyo		-19	NP-5-19	5/24/1982	QMC	
NP-5		Skute Stone Arroyo		-20	NP-5-20	5/28/1982	QMC	
NP-5	23.7	Skute Stone Arroyo		-21	NP-5-21	6/8/1982	QMC	
NP-5	23.67	Skute Stone Arroyo		-22	NP-5-22	6/14/1982	QMC	
NP-5	18	Skute Stone Arroyo		-23	NP-5-23	6/30/1982	QMC	
NP-5	18	Skute Stone Arroyo		-24	NP-5-24	7/26/1982	QMC	
NP-5	15.9	Skute Stone Arroyo		-25	NP-5-25	8/18/1982	QMC	
NP-5	14.9	Skute Stone Arroyo		-26	NP-5-26	9/2/1982	EID	
NP-5	14.4	Skute Stone Arroyo		-27	NP-5-27	9/14/1982	QMC	
NP-5	13.6	Skute Stone Arroyo		-28	NP-5-28	10/18/1982	QMC	
NP-5	13.6	Skute Stone Arroyo		-29	NP-5-29	10/27/1982	QMC	
NP-5	13.4	Skute Stone Arroyo		-30	NP-5-30	11/11/1982	QMC	
NP-5	13.6	Skute Stone Arroyo		-31	NP-5-31	12/28/1982	QMC	
NP-5	13.9	Skute Stone Arroyo		-32	NP-5-32	2/21/1983	QMC	
NP-5	14.8	Skute Stone Arroyo		-33	NP-5-33	5/6/1983	QMC	
NP-5	14.8	Skute Stone Arroyo		-34	NP-5-34	5/13/1983	QMC	
NP-5	15.3	Skute Stone Arroyo		-35	NP-5-35	6/2/1983	QMC	
NP-5	15.9	Skute Stone Arroyo		-36	NP-5-36	7/5/1983	QMC	
NP-5	16.6	Skute Stone Arroyo		-37	NP-5-37	8/9/1983	QMC	
NP-5	16.6	Skute Stone Arroyo		-38	NP-5-38	8/25/1983	QMC	
NP-5	17	Skute Stone Arroyo		-39	NP-5-39	10/20/1983	QMC	
NP-5	17	Skute Stone Arroyo		-40	NP-5-40	11/1/1983	QMC	
NP-5	16.8	Skute Stone Arroyo		-41	NP-5-41	12/7/1983	QMC	
NP-5	17.3	Skute Stone Arroyo		-42	NP-5-42	1/28/1984	QMC	

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
NP-5	17.4	Skute Stone Arroyo		-43	NP-5-43	2/13/1984	QMC	
NP-5	17.5	Skute Stone Arroyo		-44	NP-5-44	3/1/1984	QMC	
NP-5	17.5	Skute Stone Arroyo		-45	NP-5-45	3/16/1984	CFP	
NP-5	17.8	Skute Stone Arroyo		-46	NP-5-46	4/18/1984	CFP	
NP-5	18.1	Skute Stone Arroyo		-47	NP-5-47	5/22/1984	CFP	
NP-5	18.1	Skute Stone Arroyo		-48	NP-5-48	5/30/1984	CFP	
NP-5	18.2	Skute Stone Arroyo		-49	NP-5-49	6/26/1984	CFP	
NP-5	18.3	Skute Stone Arroyo		-50	NP-5-50	7/25/1984	CFP	
NP-5	18.5	Skute Stone Arroyo		-51	NP-5-51	8/27/1984	CFP	
NP-5	18.6	Skute Stone Arroyo		-52	NP-5-52	9/12/1984	CFP	
NP-5	18.6	Skute Stone Arroyo		-53	NP-5-53	9/21/1984	CFP	
NP-5	19	Skute Stone Arroyo		-54	NP-5-54	11/19/1984	CFP	
NP-5	19	Skute Stone Arroyo		-55	NP-5-55	11/27/1984	CFP	
NP-5	19	Skute Stone Arroyo		-56	NP-5-56	12/17/1984	CFP	
NP-5	18.9	Skute Stone Arroyo		-57	NP-5-57	5/17/1985	CFP	
NP-5	18.9	Skute Stone Arroyo		-58	NP-5-58	11/13/1985	CFP	
NP-5	18	Skute Stone Arroyo		-59	NP-5-59	5/23/1986	CFP	
NP-5	18.3	Skute Stone Arroyo		-60	NP-5-60	10/8/1986	CFP	
NP-5		Skute Stone Arroyo		-61	NP-5-61	3/30/1989	EID	
NP-5	17.17	Skute Stone Arroyo		-62	NP-5-62	8/29/1991	Irwin	lab pH
NP-5	18.75	Skute Stone Arroyo		-63	NP-5-63	11/26/1991	Hood	lab pH
NP-5	18.33	Skute Stone Arroyo		-64	NP-5-64	3/15/1992	Irwin	lab pH
NP-5		Skute Stone Arroyo		-65	NP-5-65	5/25/1992	Irwin	lab pH
NP-5		Skute Stone Arroyo		-66	NP-5-66	7/16/1992	Irwin	lab pH
NP-5	18.58	Skute Stone Arroyo		-67	NP-5-67	10/8/1992	Irwin	lab pH
NP-5	18.5	Skute Stone Arroyo		-68	NP-5-68	11/27/1992	Hood	lab pH
NP-5		Skute Stone Arroyo		-69	NP-5-69	12/15/1992	Irwin	lab pH
NP-5	18.58	Skute Stone Arroyo		-70	NP-5-70	2/25/1993	Irwin	lab pH
NP-5		Skute Stone Arroyo		-71	NP-5-71	3/30/1993	JWS	
NP-5		Skute Stone Arroyo		-72	NP-5-72	9/28/1993	Irwin	lab pH
NP-5	18.74	Skute Stone Arroyo		-73	NP-5-73	5/24/1994	SRK	
NP-5		Skute Stone Arroyo		-74	NP-5-74	6/23/1994	Irwin	lab pH
NP-5		Skute Stone Arroyo		-75	NP-5-75	7/23/1994	SRK	
NP-5		Skute Stone Arroyo		-76	NP-5-76	9/22/1994	Irwin	lab pH
NP-5		Skute Stone Arroyo		-77	NP-5-77	1/29/1995	Irwin	lab pH
NP-5		Skute Stone Arroyo		-78	NP-5-78	3/29/1995	Irwin	lab pH

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
NP-5	20.08	Skute Stone Arroyo		-79	NP-5-79	6/27/1995	Irwin	lab pH
NP-5		Skute Stone Arroyo		-80	NP-5-80	9/21/1995	Irwin	lab pH
NP-5		Skute Stone Arroyo		-81	NP-5-81	1/10/1996	Irwin	lab pH
NP-5		Skute Stone Arroyo		-82	NP-5-82	4/3/1996	Irwin	lab pH
NP-5		Skute Stone Arroyo		-83	NP-5-83	6/1/1996		
NP-5		Skute Stone Arroyo		-84	NP-5-84	9/25/1996	Irwin	lab pH
NP-5		Skute Stone Arroyo		-85	NP-5-85	1/15/1997	Irwin	lab pH
NP-5		Skute Stone Arroyo		-86	NP-5-86	4/1/1997		
NP-5		Skute Stone Arroyo		-87	NP-5-87	7/1/1997		
NP-5		Skute Stone Arroyo		-88	NP-5-88	10/1/1997		
NP-5	21.58	Skute Stone Arroyo		-89	NP-5-89	1/15/1998	Irwin	
NP-5	21.25	Skute Stone Arroyo		-90	NP-5-90	4/9/1998	Irwin	
NP-5	21.5	Skute Stone Arroyo		-91	NP-5-91	7/13/1998	Irwin	
O. Williams				-1	O. Williams-1	12/19/1945		
O. Williams				-2	O. Williams-2	6/13/1946		
Pague		Hillsboro		-1	Pague-1	8/20/1946		
Paxton		Hillsboro		-1	Paxton-1	4/14/1998	Goff	
Paxton		Hillsboro		-2	Paxton-2	7/21/1998	Brownfield	
PW-1		Skute Stone Arroyo		-1	PW-1-1	12/23/1975		Production Well
PW-1		Skute Stone Arroyo		-2	PW-1-2	8/14/1981	SHB	Production Well
PW-1	325.02	Skute Stone Arroyo		-3	PW-1-3	8/2/1994	SRK	
PW-2		Skute Stone Arroyo		-1	PW-2-1	1/15/1976	SHB	Production Well
PW-2		Skute Stone Arroyo		-2	PW-2-2	11/27/1984	SHB	Production Well
PW-2	302.92	Skute Stone Arroyo		-3	PW-2-3	8/2/1994	SRK	Production Well
PW-3		Skute Stone Arroyo		-1	PW-3-1	1/27/1976	SHB	Production Well
PW-3		Skute Stone Arroyo		-2	PW-3-2	8/14/1981	SHB	Production Well
PW-3	347.1	Skute Stone Arroyo		-3	PW-3-3	8/2/1994	SRK	
PW-4	285.42	Skute Stone Arroyo		-1	PW-4-1	8/2/1994	SRK	Production Well
QMC-4				-1	QMC-4-1	3/27/1981	SHB	Unknown-SHB (19
Saladone Well		Saladone Tank		-1	Saladone Well-1	12/5/1992	Adkins	
SHB-27	38			-1	SHB-27-1	9/22/1976	SHB	geotech boring, water
SHB-28	29			-1	SHB-28-1	9/22/1976	SHB	geotech boring, water
SHB-29	67			-1	SHB-29-1	9/22/1976	SHB	geotech boring, water
SHB-30	73			-1	SHB-30 -1	9/22/1976	SHB	geotech boring, water
SHB-34	72			-1	SHB-34-1	9/22/1976	SHB	HCO3, cond, SO4, Cl
Shipping Pen		Saladone Tank		-1	Shipping Pen-1	12/18/1992	Adkins	

Well Name	Water Depth	USGS Quad	Well Depth		Sample ID	Date	Sampler	Notes
Stone				-1	Stone-1	7/31/1947		
Young 1				-1	Young 1-1	7/31/1947		
Young 2				-1	Young 2-1	7/31/1947		

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-5	12/15/1981	32.95888	107.49677	266618	3649305	13	5186	TRUE	36	168
NP-5	12/22/1981	32.95888	107.49677	266618	3649305	13	5186	TRUE	36	161
NP-5	1/5/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	34	163
NP-5	1/18/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	1/26/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	32	158
NP-5	2/16/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	2/22/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	32	150
NP-5	3/1/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	4/16/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	4/26/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	30	154
NP-5	5/17/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	36	165
NP-5	5/17/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	5/24/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE		
NP-5	5/28/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE		
NP-5	6/8/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	30	150
NP-5	6/14/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	6/30/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	28	133
NP-5	7/26/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	8/18/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	9/2/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	33.98	137.2
NP-5	9/14/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	10/18/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	10/27/1982	32.95888	107.49677	266618	3649305	13	5186	TRUE	34	139
NP-5	11/11/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	12/28/1982	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	2/21/1983	32.95888	107.49677	266618	3649305	13	5186	TRUE	26	139
NP-5	5/6/1983	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	5/13/1983	32.95888	107.49677	266618	3649305	13	5186	TRUE	70	134
NP-5	6/2/1983	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	7/5/1983	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	8/9/1983	32.95888	107.49677	266618	3649305	13	5186	TRUE	26	108
NP-5	8/25/1983	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	10/20/1983	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	11/1/1983	32.95888	107.49677	266618	3649305	13	5186	TRUE	30	111
NP-5	12/7/1983	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	1/28/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-5	2/13/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	3/1/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	3/16/1984	32.95888	107.49677	266618	3649305	13	5186	TRUE	26	130
NP-5	4/18/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	5/22/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	5/30/1984	32.95888	107.49677	266618	3649305	13	5186	TRUE	22	139
NP-5	6/26/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	7/25/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	8/27/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	9/12/1984	32.95888	107.49677	266618	3649305	13	5186	TRUE	28	125
NP-5	9/21/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	11/19/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	11/27/1984	32.95888	107.49677	266618	3649305	13	5186	TRUE	28	120
NP-5	12/17/1984	32.95888	107.49677	266618	3649305	13	5186	FALSE		
NP-5	5/17/1985	32.95888	107.49677	266618	3649305	13	5186	FALSE	28	130
NP-5	11/13/1985	32.95888	107.49677	266618	3649305	13	5186	FALSE	24	134
NP-5	5/23/1986	32.95888	107.49677	266618	3649305	13	5186	FALSE	28	120
NP-5	10/8/1986	32.95888	107.49677	266618	3649305	13	5186	FALSE	28	113
NP-5	3/30/1989	32.95888	107.49677	266618	3649305	13	5186	TRUE	32	125
NP-5	8/29/1991	32.95888	107.49677	266618	3649305	13	5186	FALSE	38.7	152.1
NP-5	11/26/1991	32.95888	107.49677	266618	3649305	13	5186	FALSE	37.7	129.5
NP-5	3/15/1992	32.95888	107.49677	266618	3649305	13	5186	FALSE	46.7	140.7
NP-5	5/25/1992	32.95888	107.49677	266618	3649305	13	5186	FALSE	75.5	131.1
NP-5	7/16/1992	32.95888	107.49677	266618	3649305	13	5186	FALSE	37.8	132.4
NP-5	10/8/1992	32.95888	107.49677	266618	3649305	13	5186	FALSE	39.4	133.2
NP-5	11/27/1992	32.95888	107.49677	266618	3649305	13	5186	FALSE	117.2	133.9
NP-5	12/15/1992	32.95888	107.49677	266618	3649305	13	5186	FALSE	40.4	104
NP-5	2/25/1993	32.95888	107.49677	266618	3649305	13	5186	FALSE	41.4	140.8
NP-5	3/30/1993	32.95888	107.49677	266618	3649305	13	5186	FALSE	39	146
NP-5	9/28/1993	32.95888	107.49677	266618	3649305	13	5186	FALSE	48.1	109.2
NP-5	5/24/1994	32.95888	107.49677	266618	3649305	13	5186	FALSE	41	130
NP-5	6/23/1994	32.95888	107.49677	266618	3649305	13	5186	FALSE	54.1	142.3
NP-5	7/23/1994	32.95888	107.49677	266618	3649305	13	5186	TRUE	41	131
NP-5	9/22/1994	32.95888	107.49677	266618	3649305	13	5186	FALSE	42.8	117.7
NP-5	1/29/1995	32.95888	107.49677	266618	3649305	13	5186	FALSE	43.5	101.2
NP-5	3/29/1995	32.95888	107.49677	266618	3649305	13	5186	FALSE	42.4	130.8

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
NP-5	6/27/1995	32.95888	107.49677	266618	3649305	13	5186	FALSE	43.4	119.4
NP-5	9/21/1995	32.95888	107.49677	266618	3649305	13	5186	FALSE	44.3	134.6
NP-5	1/10/1996	32.95888	107.49677	266618	3649305	13	5186	FALSE	41.6	136.6
NP-5	4/3/1996	32.95888	107.49677	266618	3649305	13	5186	FALSE	31.8	130
NP-5	6/1/1996	32.95888	107.49677	266618	3649305	13	5186		47.3	118.1
NP-5	9/25/1996	32.95888	107.49677	266618	3649305	13	5186	TRUE	42.5	129.4
NP-5	1/15/1997	32.95888	107.49677	266618	3649305	13	5186	TRUE	45.7	140.69
NP-5	4/1/1997	32.95888	107.49677	266618	3649305	13	5186	TRUE	47	151
NP-5	7/1/1997	32.95888	107.49677	266618	3649305	13	5186	TRUE	44.8	134
NP-5	10/1/1997	32.95888	107.49677	266618	3649305	13	5186	TRUE	45.3	132
NP-5	1/15/1998	32.95888	107.49677	266618	3649305	13	5186	TRUE	47.9	147
NP-5	4/9/1998	32.95888	107.49677	266618	3649305	13	5186	TRUE	47.8	135
NP-5	7/13/1998	32.95888	107.49677	266618	3649305	13	5186	TRUE	45.2	141
O. Williams	12/19/1945							FALSE	425	62
O. Williams	6/13/1946							FALSE	418	66
Pague	8/20/1946							FALSE	26	80
Paxton	4/14/1998	32.94392	107.53059	263416	3647722	13	5500	TRUE	25.5	163
Paxton	7/21/1998	32.94392	107.53059	263416	3647722	13	5500	TRUE	49.7	265
PW-1	12/23/1975	32.96935	107.38766	276846	3650229	13	4693	FALSE	16	10
PW-1	8/14/1981	32.96935	107.38766	276846	3650229	13	4693	FALSE	32	24
PW-1	8/2/1994	32.96935	107.38766	276846	3650229	13	4693	FALSE		
PW-2	1/15/1976	32.96311	107.38526	277055	3649533	13	4670	FALSE	17	-5
PW-2	11/27/1984	32.96311	107.38526	277055	3649533	13	4670	FALSE	20	125
PW-2	8/2/1994	32.96311	107.38526	277055	3649533	13	4670	TRUE	24	27
PW-3	1/27/1976	32.96851	107.39606	276059	3650155	13	4717	FALSE	24	-5
PW-3	8/14/1981	32.96851	107.39606	276059	3650155	13	4717	FALSE	66	31
PW-3	8/2/1994	32.96851	107.39606	276059	3650155	13	4717	FALSE		
PW-4	8/2/1994	32.96856	107.40469	275252	3650178	13	4645	TRUE	27	17
QMC-4	3/27/1981							TRUE		
Saladone Well	12/5/1992							FALSE		23
SHB-27	9/22/1976							TRUE	20.6	233
SHB-28	9/22/1976							TRUE	51.2	353
SHB-29	9/22/1976							TRUE		
SHB-30	9/22/1976							TRUE	21	145
SHB-34	9/22/1976							TRUE	-1	-1
Shipping Pen	12/18/1992							FALSE		19.2

Well Name	Date	Latitude	Longitude	UTM_easting	UTM_northing	UTM_zone	Elevation	Filtered?	Chloride	Sulfate
Stone	7/31/1947							FALSE	88	26
Young 1	7/31/1947							FALSE	238	43
Young 2	7/31/1947							FALSE	148	32

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-5	12/15/1981	7.8	500				1.2	3.3	-0.01		-0.01
NP-5	12/22/1981	7.9	460				1.1	3.8	-0.01		-0.01
NP-5	1/5/1982	7.7	420				1.1	4.1	-0.01		-0.01
NP-5	1/18/1982										
NP-5	1/26/1982	8	440				1.1	2.9			
NP-5	2/16/1982										
NP-5	2/22/1982	8	450				1	2			
NP-5	3/1/1982										
NP-5	4/16/1982										
NP-5	4/26/1982	7.9	450				1.1	1.1			
NP-5	5/17/1982	8	490				1.1	6.7			
NP-5	5/17/1982										
NP-5	5/24/1982										
NP-5	5/28/1982										
NP-5	6/8/1982	8.1	420				0.9	4.5			
NP-5	6/14/1982										
NP-5	6/30/1982	8.1	460				0.9	3.9			
NP-5	7/26/1982										
NP-5	8/18/1982										
NP-5	9/2/1982	7.6	472		206	650	0.82	4.2			
NP-5	9/14/1982										
NP-5	10/18/1982										
NP-5	10/27/1982	8	440				0.8	3.7			
NP-5	11/11/1982										
NP-5	12/28/1982										
NP-5	2/21/1983	8.3	420				0.5	1.3			
NP-5	5/6/1983										
NP-5	5/13/1983	8.9	290				0.4	0.2			
NP-5	6/2/1983										
NP-5	7/5/1983										
NP-5	8/9/1983	8.1	460				0.8	3.7			
NP-5	8/25/1983										
NP-5	10/20/1983										
NP-5	11/1/1983	8.2	440				0.8	5.2			
NP-5	12/7/1983										
NP-5	1/28/1984										

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-5	2/13/1984										
NP-5	3/1/1984										
NP-5	3/16/1984	8	380				0.4	3			
NP-5	4/18/1984										
NP-5	5/22/1984										
NP-5	5/30/1984	7.8	400				0.8	2.9			
NP-5	6/26/1984										
NP-5	7/25/1984										
NP-5	8/27/1984										
NP-5	9/12/1984	8	420				0.8	3.4			
NP-5	9/21/1984										
NP-5	11/19/1984										
NP-5	11/27/1984	8.2	420				0.8	3.2			
NP-5	12/17/1984										
NP-5	5/17/1985	7.9	450								
NP-5	11/13/1985	7.8	400								
NP-5	5/23/1986	7.9	430								
NP-5	10/8/1986	7.8	420								
NP-5	3/30/1989		458		211				-0.1		
NP-5	8/29/1991	7.68	499								
NP-5	11/26/1991	7	472								
NP-5	3/15/1992	7.89	456								
NP-5	5/25/1992	7.8	490								
NP-5	7/16/1992	7.63	476								
NP-5	10/8/1992	7.64	431								
NP-5	11/27/1992	8.01	475								
NP-5	12/15/1992	7.8	402								
NP-5	2/25/1993	7.65	487								
NP-5	3/30/1993	7.8	488		221	746	0.77	4	0.2		-0.005
NP-5	9/28/1993	7.79	518								
NP-5	5/24/1994	7.84	520		211	680	0.74	3.4	1.1	-0.005	-0.005
NP-5	6/23/1994	7.66	466								
NP-5	7/23/1994	7.89	494		206	749	0.71	3.3	-0.05	-0.005	-0.005
NP-5	9/22/1994	7.73	526								
NP-5	1/29/1995	7.99	490								
NP-5	3/29/1995	7.94	449								

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
NP-5	6/27/1995	7.64	525								
NP-5	9/21/1995	7.71	483								
NP-5	1/10/1996	8.04	406								
NP-5	4/3/1996	7.67	405								
NP-5	6/1/1996	7.52	457								
NP-5	9/25/1996	8.09	504								
NP-5	1/15/1997	7.76	498								
NP-5	4/1/1997		526				0.7				
NP-5	7/1/1997	7.58	478								
NP-5	10/1/1997	7.79	473								
NP-5	1/15/1998	7.41	489			824	0.86	3.73			
NP-5	4/9/1998		493			770	0.8	3.7			
NP-5	7/13/1998		503			605	0.86	3.5			
O. Williams	12/19/1945		883		96	1609	0.6	1.9			
O. Williams	6/13/1946		847		98	1620	0.4	2.2			
Pague	8/20/1946		348		242	409	1.2	1.2			
Paxton	4/14/1998	7.77	773			936	0.83	1.9			
Paxton	7/21/1998		741				1.04	0.09			
PW-1	12/23/1975	7.8	217		145	340	0.46	3.5			
PW-1	8/14/1981	8.1	250		171		0.9	0.7			-0.01
PW-1	8/2/1994										
PW-2	1/15/1976	8.1	257		153	310	0.66	3.5			
PW-2	11/27/1984	7.9	470				0.6	1.7			
PW-2	8/2/1994	7.63	338		273	506	0.39	-1	-0.05	0.011	-0.005
PW-3	1/27/1976	8	243		158	330	0.64	2.6			
PW-3	8/14/1981	8.2	300		139		2.5	0.8			-0.01
PW-3	8/2/1994										
PW-4	8/2/1994	7.57	274		190	398	0.46	-1	-0.05	0.0062	0.0058
QMC-4	3/27/1981						2.5	-0.2			-0.01
Saladone Well	12/5/1992	7.91	354	174.8	213.2	429		0.19			
SHB-27	9/22/1976	7.61	434		205	720	0.77	0.8			-0.01
SHB-28	9/22/1976	7.58	840		264	1260	0.97	-0.1			
SHB-29	9/22/1976	7.98	384			640		-0.1			
SHB-30	9/22/1976	7.77	486		211	720	0.79	0.7			0.02
SHB-34	9/22/1976	7.36	50		12	41	0.14	-0.1			
Shipping Pen	12/18/1992	7.92	345	160	195	484		0.66			

Well Name	Date	pH	TDS	Alkalinity	Bicarb	Spec. Cond.	Flouride	Nitrate	Aluminum	Antimony	Arsenic
Stone	7/31/1947		369		188	607	0.6	3.3			
Young 1	7/31/1947		568		122	1030	0.6	0.8			
Young 2	7/31/1947		471		177	800	1	4.1			

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-5	12/15/1981	-0.1	-0.2		-0.005	90	-0.01	-0.02	-0.05	-0.1	-0.02
NP-5	12/22/1981	-0.1	-0.2		-0.005	101	-0.01	-0.02	-0.05	-0.1	-0.02
NP-5	1/5/1982	-0.1	-0.2		-0.005	87	-0.01	-0.02	-0.05	0.18	-0.02
NP-5	1/18/1982										
NP-5	1/26/1982				-0.005				-0.05	-0.01	
NP-5	2/16/1982										
NP-5	2/22/1982				-0.005				-0.05	0.12	
NP-5	3/1/1982										
NP-5	4/16/1982										
NP-5	4/26/1982				-0.005				0.31	3.8	
NP-5	5/17/1982				-0.005				-0.05	0.14	
NP-5	5/17/1982										
NP-5	5/24/1982									-0.1	
NP-5	5/28/1982									-0.1	
NP-5	6/8/1982				-0.005				-0.05	0.44	
NP-5	6/14/1982										
NP-5	6/30/1982				-0.005				-0.05	0.36	
NP-5	7/26/1982										
NP-5	8/18/1982										
NP-5	9/2/1982				-0.001	72.6					
NP-5	9/14/1982										
NP-5	10/18/1982										
NP-5	10/27/1982				-0.005				-0.05	0.21	
NP-5	11/11/1982										
NP-5	12/28/1982										
NP-5	2/21/1983				-0.005				-0.05	-0.1	
NP-5	5/6/1983										
NP-5	5/13/1983				-0.005				-0.05	-0.1	
NP-5	6/2/1983										
NP-5	7/5/1983										
NP-5	8/9/1983				-0.005				-0.05	-0.1	
NP-5	8/25/1983										
NP-5	10/20/1983										
NP-5	11/1/1983				-0.005				-0.05	-0.1	
NP-5	12/7/1983										
NP-5	1/28/1984										

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-5	2/13/1984										
NP-5	3/1/1984										
NP-5	3/16/1984				-0.005				-0.05	-0.1	
NP-5	4/18/1984										
NP-5	5/22/1984										
NP-5	5/30/1984				-0.005				-0.05	-0.1	
NP-5	6/26/1984										
NP-5	7/25/1984										
NP-5	8/27/1984										
NP-5	9/12/1984				-0.005				-0.05	-0.1	
NP-5	9/21/1984										
NP-5	11/19/1984										
NP-5	11/27/1984				-0.005				-0.05	-0.1	
NP-5	12/17/1984										
NP-5	5/17/1985										
NP-5	11/13/1985										
NP-5	5/23/1986										
NP-5	10/8/1986										
NP-5	3/30/1989	-0.1	-0.1	-0.1	-0.1	82	-0.1	-0.05	-0.1	-0.1	-0.1
NP-5	8/29/1991										
NP-5	11/26/1991										
NP-5	3/15/1992										
NP-5	5/25/1992										
NP-5	7/16/1992										
NP-5	10/8/1992										
NP-5	11/27/1992										
NP-5	12/15/1992								0.025		
NP-5	2/25/1993										
NP-5	3/30/1993	0.04	-0.5		-0.002	76	-0.02	-0.05	-0.01	0.29	-0.02
NP-5	9/28/1993										
NP-5	5/24/1994		-0.1		-0.0005	86	-0.025		-0.025	1.2	0.0077
NP-5	6/23/1994										
NP-5	7/23/1994	-0.1	-0.1	-0.002	-0.0005	79	-0.025	-0.05	-0.025	-0.05	-0.005
NP-5	9/22/1994										
NP-5	1/29/1995										
NP-5	3/29/1995										

Well Name	Date	Boron	Barium	Berylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
NP-5	6/27/1995										
NP-5	9/21/1995										
NP-5	1/10/1996										
NP-5	4/3/1996										
NP-5	6/1/1996										
NP-5	9/25/1996										
NP-5	1/15/1997										
NP-5	4/1/1997								-0.005	0.25	
NP-5	7/1/1997										
NP-5	10/1/1997										
NP-5	1/15/1998								-0.005	0.15	
NP-5	4/9/1998								-0.005	-0.05	
NP-5	7/13/1998								-0.005	0.02	
O. Williams	12/19/1945					105					
O. Williams	6/13/1946					108					
Pague	8/20/1946					63					
Paxton	4/14/1998					140.5			0.038	0.85	
Paxton	7/21/1998					69			-0.005	0.17	
PW-1	12/23/1975					22					
PW-1	8/14/1981					28			-0.05	0.2	-0.02
PW-1	8/2/1994										
PW-2	1/15/1976					21					
PW-2	11/27/1984				-0.005				-0.05	-0.1	
PW-2	8/2/1994	-0.1	-0.1	-0.002	-0.0005	60	-0.025	-0.05	-0.025	0.062	-0.005
PW-3	1/27/1976					23					
PW-3	8/14/1981					16			-0.05	0.31	-0.02
PW-3	8/2/1994										
PW-4	8/2/1994	-0.1	-0.1	-0.002	-0.0005	21	-0.025	-0.05	-0.025	-0.05	-0.005
QMC-4	3/27/1981								-0.05		-0.02
Saladone Well	12/5/1992					54.8					
SHB-27	9/22/1976	-0.1			-0.001	5.86	0.002	-0.001	0.002	0.007	-0.001
SHB-28	9/22/1976	-0.1			-0.001	163	0.002	-0.001	0.005	0.015	-0.001
SHB-29	9/22/1976	-0.1			0.001	65.1	0.004	-0.001	0.002	0.52	0.002
SHB-30	9/22/1976	-0.1			-0.001	84.8	0.004	-0.001	0.002	0.009	-0.001
SHB-34	9/22/1976	-0.1			0.001	3.67	0.002	-0.001	0.002	0.009	-0.001
Shipping Pen	12/18/1992					54					

Well Name	Date	Boron	Barium	Berrylium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
Stone	7/31/1947					39					
Young 1	7/31/1947					66					
Young 2	7/31/1947					44					

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
NP-5	12/15/1981		0.08	-0.001	-0.05	-0.05		-0.005	-0.02	
NP-5	12/22/1981		-0.05	-0.001	-0.05	-0.05		-0.005	-0.02	
NP-5	1/5/1982		-0.05	-0.001	-0.05	-0.05		-0.02	-0.02	
NP-5	1/18/1982									
NP-5	1/26/1982		-0.05	-0.001	-0.1			-0.005		
NP-5	2/16/1982									
NP-5	2/22/1982		-0.05	-0.001	-0.05	-0.05		-0.005		
NP-5	3/1/1982									
NP-5	4/16/1982									
NP-5	4/26/1982		6.9	-0.001	-0.05			-0.005		
NP-5	5/17/1982		-0.05	-0.001	-0.05			-0.005		
NP-5	5/17/1982									
NP-5	5/24/1982		-0.05							
NP-5	5/28/1982		-0.05							
NP-5	6/8/1982		-0.05	-0.001	-0.05			-0.005		
NP-5	6/14/1982									
NP-5	6/30/1982		-0.05	-0.001	-0.05			-0.005		
NP-5	7/26/1982									
NP-5	8/18/1982									
NP-5	9/2/1982	21.8	-0.05		-0.01		3.9	-0.005		46
NP-5	9/14/1982									
NP-5	10/18/1982									
NP-5	10/27/1982		-0.05	-0.001	-0.05			-0.005		
NP-5	11/11/1982									
NP-5	12/28/1982									
NP-5	2/21/1983		-0.05	-0.001	-0.05			-0.005		
NP-5	5/6/1983									
NP-5	5/13/1983		-0.05	-0.001	-0.05			-0.005		
NP-5	6/2/1983									
NP-5	7/5/1983									
NP-5	8/9/1983		-0.05	-0.001	-0.05			-0.005		
NP-5	8/25/1983									
NP-5	10/20/1983									
NP-5	11/1/1983		-0.05	-0.001	-0.05			-0.005		
NP-5	12/7/1983									
NP-5	1/28/1984									

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
NP-5	2/13/1984									
NP-5	3/1/1984									
NP-5	3/16/1984		-0.05	-0.001	-0.05			-0.005		
NP-5	4/18/1984									
NP-5	5/22/1984									
NP-5	5/30/1984		-0.05	-0.001	-0.05			-0.005		
NP-5	6/26/1984									
NP-5	7/25/1984									
NP-5	8/27/1984									
NP-5	9/12/1984		-0.05	-0.001	-0.05			-0.005		
NP-5	9/21/1984									
NP-5	11/19/1984									
NP-5	11/27/1984		-0.05	-0.001	-0.05			-0.005		
NP-5	12/17/1984									
NP-5	5/17/1985									
NP-5	11/13/1985									
NP-5	5/23/1986									
NP-5	10/8/1986									
NP-5	3/30/1989	22	-0.05		-0.1	-0.1	3		-0.1	39
NP-5	8/29/1991									
NP-5	11/26/1991									
NP-5	3/15/1992									
NP-5	5/25/1992									
NP-5	7/16/1992									
NP-5	10/8/1992									
NP-5	11/27/1992									
NP-5	12/15/1992									
NP-5	2/25/1993									
NP-5	3/30/1993	26	0.02	-0.001	-0.02	-0.01	2.5	-0.005	-0.01	43
NP-5	9/28/1993									
NP-5	5/24/1994	26	0.086	-0.001		-0.05	3.4	-0.005	-0.025	40
NP-5	6/23/1994									
NP-5	7/23/1994	24	-0.03	-0.001	-0.05	-0.05	3.1	-0.005	-0.025	45
NP-5	9/22/1994									
NP-5	1/29/1995									
NP-5	3/29/1995									

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
NP-5	6/27/1995									
NP-5	9/21/1995									
NP-5	1/10/1996									
NP-5	4/3/1996									
NP-5	6/1/1996									
NP-5	9/25/1996									
NP-5	1/15/1997									
NP-5	4/1/1997		-0.02	-0.002				0.0076		
NP-5	7/1/1997									
NP-5	10/1/1997									
NP-5	1/15/1998	24.2		-0.0002	-0.05			-0.05		
NP-5	4/9/1998		-0.02	-0.0002	-0.05			-0.05		
NP-5	7/13/1998		0.05	-0.0002	-0.05			-0.05		
O. Williams	12/19/1945	14								
O. Williams	6/13/1946	15								
Pague	8/20/1946	21								
Paxton	4/14/1998	17.4	-0.02	0.0003	-0.05		0.7	-0.05		66.9
Paxton	7/21/1998	23.5	-0.02	-0.0002	-0.05		4.09	-0.05		110.6
PW-1	12/23/1975	3					4.5			38
PW-1	8/14/1981	4								53
PW-1	8/2/1994									
PW-2	1/15/1976	3					4.3			39
PW-2	11/27/1984		-0.05	-0.001				-0.005		
PW-2	8/2/1994	8.4	0.032	-0.001	-0.05	-0.05	3.4	-0.005	-0.025	46
PW-3	1/27/1976	3					5.1			44
PW-3	8/14/1981	1								87
PW-3	8/2/1994									
PW-4	8/2/1994	1.7	-0.03	-0.001	-0.05	-0.05	3.5	-0.005	-0.025	73
QMC-4	3/27/1981									
Saladone Well	12/5/1992	23					2.16			22.4
SHB-27	9/22/1976	21.4	0.039	-0.0004	0.002		5.86	-0.01	-0.001	51.1
SHB-28	9/22/1976	32	0.42	-0.0004	0.003		11.5	-0.01	-0.001	81.7
SHB-29	9/22/1976	14.5	0.049	-0.0004	0.003		5.02	-0.01	-0.001	60.3
SHB-30	9/22/1976	21.3	0.036	-0.0004	0.002		4.88	-0.01	-0.001	50.6
SHB-34	9/22/1976	0.52	0.004	-0.0004	-0.001		0.63	-0.01	-0.001	2.55
Shipping Pen	12/18/1992	11.4					2.51			29.6

Well Name	Date	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium
Stone	7/31/1947	5.7								
Young 1	7/31/1947	7.9								
Young 2	7/31/1947	6.7								

Thallium	Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
	NP-5	12/15/1981	0.37			
	NP-5	12/22/1981	0.32			
	NP-5	1/5/1982	0.4			
	NP-5	1/18/1982				
	NP-5	1/26/1982				
	NP-5	2/16/1982				
	NP-5	2/22/1982				
	NP-5	3/1/1982				
	NP-5	4/16/1982				
	NP-5	4/26/1982				
	NP-5	5/17/1982				
	NP-5	5/17/1982				
	NP-5	5/24/1982				
	NP-5	5/28/1982				
	NP-5	6/8/1982				
	NP-5	6/14/1982				
	NP-5	6/30/1982				
	NP-5	7/26/1982				
	NP-5	8/18/1982				
	NP-5	9/2/1982				
	NP-5	9/14/1982				
	NP-5	10/18/1982				
	NP-5	10/27/1982				
	NP-5	11/11/1982				
	NP-5	12/28/1982				
	NP-5	2/21/1983				
	NP-5	5/6/1983				
	NP-5	5/13/1983				
	NP-5	6/2/1983				
	NP-5	7/5/1983				
	NP-5	8/9/1983				
	NP-5	8/25/1983				
	NP-5	10/20/1983				
	NP-5	11/1/1983				
	NP-5	12/7/1983				
	NP-5	1/28/1984				

Thallium	Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
	NP-5	2/13/1984				
	NP-5	3/1/1984				
	NP-5	3/16/1984				
	NP-5	4/18/1984				
	NP-5	5/22/1984				
	NP-5	5/30/1984				
	NP-5	6/26/1984				
	NP-5	7/25/1984				
	NP-5	8/27/1984				
	NP-5	9/12/1984				
	NP-5	9/21/1984				
	NP-5	11/19/1984				
	NP-5	11/27/1984				
	NP-5	12/17/1984				
	NP-5	5/17/1985				
	NP-5	11/13/1985				
	NP-5	5/23/1986				
	NP-5	10/8/1986				
	NP-5	3/30/1989	0.4		0.1	-0.1
	NP-5	8/29/1991				
	NP-5	11/26/1991				
	NP-5	3/15/1992				
	NP-5	5/25/1992				
	NP-5	7/16/1992				
	NP-5	10/8/1992				
	NP-5	11/27/1992				
	NP-5	12/15/1992				
	NP-5	2/25/1993				
	NP-5	3/30/1993	0.19			
	NP-5	9/28/1993				
	NP-5	5/24/1994	2.3			
	NP-5	6/23/1994				
-0.005	NP-5	7/23/1994	-0.05			
	NP-5	9/22/1994				
	NP-5	1/29/1995				
	NP-5	3/29/1995				

Thallium	Well Name	Date	Zinc	Temp (C)	Tin
	NP-5	6/27/1995			
	NP-5	9/21/1995			
	NP-5	1/10/1996			
	NP-5	4/3/1996			
	NP-5	6/1/1996			
	NP-5	9/25/1996			
	NP-5	1/15/1997			
	NP-5	4/1/1997			
	NP-5	7/1/1997			
	NP-5	10/1/1997			
	NP-5	1/15/1998			
	NP-5	4/9/1998			
	NP-5	7/13/1998			
	O. Williams	12/19/1945		22.2000008	
	O. Williams	6/13/1946			
	Pague	8/20/1946			
	Paxton	4/14/1998			
	Paxton	7/21/1998			
	PW-1	12/23/1975			
	PW-1	8/14/1981	-0.05		
	PW-1	8/2/1994			
	PW-2	1/15/1976			
	PW-2	11/27/1984			
-0.005	PW-2	8/2/1994	-0.05		
	PW-3	1/27/1976			
	PW-3	8/14/1981	0.19		
	PW-3	8/2/1994			
-0.005	PW-4	8/2/1994	-0.05		
	QMC-4	3/27/1981	-0.05		
	Saladone Well	12/5/1992			
	SHB-27	9/22/1976	0.004		
	SHB-28	9/22/1976	0.018		
	SHB-29	9/22/1976	0.16		
	SHB-30	9/22/1976	0.004		
	SHB-34	9/22/1976	0.014		
	Shipping Pen	12/18/1992			

Thallium	Well Name	Date	Zinc	Temp (C)	Tin	Vanadium
	Stone	7/31/1947				
	Young 1	7/31/1947				
	Young 2	7/31/1947				

Appendix B-2

Pre 1980 SHB Groundwater Sample Results

CUSTOMER Sergent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2821 Girard N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 606081

REPORT OF ANALYSIS

SAMPLES RECEIVED 6-4-76

CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Water Analysis

Analysis	Sample #1	Sample #2	Sample #4
Calcium	117	122	692
Magnesium	25.6	15.5	15.2
Sodium	50.4	76.1	30.0
Potassium	1.78	1.72	1.56
Bicarbonate	228	241	188
Sulfate	137	114	34
Chloride	14.3	16.7	19.9
Fluoride	0.52	0.51	0.44
Boron	< 0.1	< 0.1	< 0.1
Nitrate	1.39	16.8	4.0
Silica	40.9	36.3	41.9
Iron	0.002	0.002	0.004
Manganese	0.003	0.003	0.001
Total Dissolved Solids	520	560	350
Specific Conductance umhos	720	780	480
pH Units	7.78	7.48	8.60
Hardness	301	269	211

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REPORT OF ANALYSIS

CUSTOMER Sergent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2821 Girard N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 606081

SAMPLES RECEIVED 6-4-76
CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Water Analysis

Analysis	Sample #3	Underflow	Underflow Percolate
Calcium	64.1	80.1	34.5
Magnesium	22.4	4.6	22.1
Sodium	47.2	69.7	106
Potassium	1.75	55.4	2.10
Bicarbonate	137	43.7	120
Sulfate	544	299	258
Chloride	18.9	36.1	41.8
Fluoride	0.77	2.94	1.97
Boron	< 0.1	< 0.1	0.3
Nitrate	1.1	17.7	< 0.1
Silica	42.4	4.2	24.4
Iron	0.017	0.75	0.007
Manganese	0.001	0.095	0.22
Total Dissolved Solids	409	654	672
Specific Conductance umhos	570	960	900
pH	8.16	8.35	7.61
Hardness	215	217	274
Arsenic	0.02	0.02	0.08
Cadmium	< 0.001	< 0.001	< 0.001
Chromium	0.002	0.003	0.002
Cobalt	< 0.001	< 0.001	< 0.001
Copper	< 0.001	0.004	0.002
Cyanide	< 0.01	0.30	9.03

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ADDRESS 2821 Girard N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 606081

REPORT OF ANALYSIS

SAMPLES RECEIVED 6-4-76

CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Water Analysis

Analysis	Sample #3	Underflow	Underflow Percolate
Lead	0.023	0.002	0.015
Mercury	< 0.0004	< 0.0004	0.0013
Molybdenum	0.001	0.020	0.073
Selenium	< 0.01	< 0.01	0.04
Silver	< 0.001	< 0.001	< 0.001
Zinc	< 0.01	0.01	0.54

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CUSTOMER Sergent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2821 Girard NE
CITY Albuquerque, NM 87107
INVOICE NO. 606112

SAMPLES RECEIVED	6/18/76	CUSTOMER ORDER NUMBER	
TYPE OF ANALYSIS	Water and Soils Analysis - Cyanide RUSH		

Sample Identification	mg/l
Underflow Percolate Pit C 5½ - 9'	0.57
	ug/gm
Job No. E76 - 1023 Boring 5 Depth 4½' Blows 25-25-33	0.15
Job N. E76-1023 Boring 5 Depth 14½' Blows 14-15-16	0.98
Job No. E76-1023 Boring 5 Depth 29½' Blows 15-22-29	1.06
Job No. E76-1023 Pit A-1 2' - 15½'	0.32
Job No. E76-1023 Pit C#2 5½ - 9'	0.15

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CUSTOMER Sargent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2501 Candelaria Road N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 609066

SAMPLES RECEIVED 9/9/76
CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Soil Analysis -

Analysis	A-1 BH 2½ - 6' mg/l	A-2 BH 2½ - 6' mg/l
Calcium	11.6	8.89
Magnesium	1.8	1.6
Sodium	8.9	9.6
Potassium	1.3	1.2
Bicarbonate (as$CaCO_3$)	40.3	40.8
Sulfate	7	6
Chloride	1.06	< 0.05
Fluoride	0.64	1.08
Boron	0.3	0.1
Nitrate (as N)	3.11	1.14
Silica	6.8	6.8
Iron	0.27	0.33
Manganese	0.01	0.02
Total Dissolved Solids	127	142
Specific Conductance (umhos)	131	109
pH (Units)	8.18	8.20
Hardness (as $CaCO_3$)	51.4	42.5
Arsenic	< 0.01	< 0.01
Cadmium	< 0.001	< 0.001
Chromium	< 0.001	< 0.001
Cobalt	< 0.001	< 0.001
Copper	0.003	0.003
Cyanide	< 0.1	< 0.1
Lead	< 0.001	< 0.001
Mercury	< 0.0004	< 0.0004
Molybdenum	< 0.001	< 0.001
Selenium	< 0.01	< 0.01
Silver	< 0.001	< 0.001
Zinc	0.004	0.004

APPROVED BY
James J. Mueller, President
9/14/76

PAGE 1 OF 1 PAGE

Controls for Environmental Pollution, Inc.

CUSTOMER Sargent Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2501 Candelari Road NE
CITY Albuquerque, NM 87107
INVOICE NO. 610073

REPORT OF ANALYSIS

SAMPLES RECEIVED 9/1/76

CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Soil Analysis -

Analysis	BH F-1 mg/l	BH F-2 mg/l
Calcium	21.4	23.0
Magnesium	1.19	1.57
Sodium	23.7	28.5
Potassium	1.26	1.11
Bicarbonate (as $CaCO_3$)	42.8	42.2
Sulfate	19.4	2.3
Chloride	5.0	10.5
Fluoride	0.66	0.74
Boron	0.2	0.2
Nitrogen Nitrate	5.7	3.7
Silica	48.9	42.7
Iron	0.048	0.063
Manganese	0.002	0.002
Total Dissolved Solids	204	208
Specific Conductance umhos	230	268
pH	7.88	7.80
Hardness (as$CaCO_3$)	56.7	75.7
Arsenic	0.01	< 0.01
Cadmium	0.005	0.005
Chromium	0.004	0.003
Cobalt	< 0.001	< 0.001
Copper	0.008	0.006
Cyanide	< 0.1	< 0.1
Lead	< 0.001	< 0.001
Mercury	< 0.0004	< 0.0004
Molybdenum	0.001	< 0.001
Selenium	< 0.01	< 0.01
Silver	0.009	0.002
Zinc	0.018	0.014

APPROVED BY
James J. Mueller, President
10/14/76

PAGE 1 OF 1 PAGE

Controls for Environmental Pollution, Inc.

CONSULTANTS ON
WATER QUALITY

BACTERIA AND
CHEMICAL ANALYSES

Environmental Biochemists

4115 SILVER AVE., S. E.
ALBUQUERQUE, NEW MEXICO 87108
Telephone (505) 266-9106 – Night 296-6164

E.B. No. 76911
Revised

Sept. 21, 1976

Sergent Hauskins & Beckwith
2821 Gerard N.E.
Albuquerque, N.M.

Sergent, Hauskins & Beckwith
Sep 1976

Att:Gary Allen

In our recent telephone conversation you asked that our previous report be revised to reflect milligrams per liter of the soluble components from soil samples that we analyzed for you. Aqueous suspensions of the soils were made as previously described and were 10;1 ml/g.

	Milligrams per liter	
	BH A-1	BH A-2
Moisture, %	4.22	4.35
pH	6.9	6.5
Hardness	26	26
Cyanide	<0.01	<0.01
Calcium	7.5	7.5
Magnesium	1.8	1.7
Sodium	7.3	9.2
Potassium	1.8	3.4
Iron	0.4	0.5
Manganese	<0.05	<0.05
Arsenic	<0.02	<0.02
Cadmium	<0.05	<0.05
Chromium	<0.05	<0.05
Cobalt	<0.025	<0.025
Copper	<0.01	<0.01
Lead	<0.025	<0.025
Mercury	<0.001	<0.001
Molybdemum	<0.05	<0.05
Selenium	<0.02	<0.02
Silver	<0.01	<0.01
Zinc	<0.025	<0.025
Bicarbonate	41	37.3
Sulfate	<0.05	<0.05
Chloride	7.0	6.0
Fluoride	1.28	1.75
Boron	<0.05	0.2
Nitrate	14.3	11.4
Silica	2.4	2.5
Tot. Diss. Solids	24	68
Conductance, umhos	110	135

R C Pfleger
Raymond C. Pfleger, Ph.D.

CONSULTANTS ON
WATER QUALITY

BACTERIA AND
CHEMICAL ANALYSES

Environmental Biochemists
4115 SILVER AVE., S. E.
ALBUQUERQUE, NEW MEXICO 87108
Telephone (505) 266-9106 — Night 296-6164

E.B. No. 76925A

Sept. 25, 1976

Sergent-Hauskins & Beckwith
2821 Gerard N.E.
Albuquerque, N.M.

Att: Gary Allen

SEP 1976
Sergent, Hauskins & Beckwith

On Sept. 2, 1976, two soil samples were delivered to our laboratory for analysis. A 10:1 aqueous:soil suspension was made and the components analyzed in the aqueous phase after filtration through a 0.45 um membrane. The soil was screened through a 2mm sieve.

Sample	F 1		F 2
	ppm		ppm
Moisture, %	2.0		2.2
pH	7.56		6.67
Cyanide	0.02		0.03
Bicarbonate	4.91		4.33
Sulfate	31.2		29.2
Chloride	7.5		15.5
Fluoride	0.96		0.98
Nitrate	9.7		5.5
Calcium	11.4		15.0
Magnesium	1.1		0.75
Sodium	8.1		9.1
Potassium	3.2		2.4
Iron	0.3		0.3
Manganese	<0.05		<0.05
Arsenic	<0.02		<0.02
Cadmium	<0.004		<0.004
Chromium	<0.05		<0.05
Cobalt	<0.025		<0.025
Lead	<0.025		<0.025
Molybdemum	<0.05		<0.05
Selenium	<0.02		<0.02
Silver	<0.01		<0.01
Zinc	<0.025		<0.025
Mercury	<0.001		<0.001
Copper	0.02		0.02
Boron	<0.1		<0.1
Conductance	115	(umhos/cm)	125
Silica	11.75		11.0
Hardness	33		40
Total Dissolved Solids	106		96

ppm = parts per million in aqueous phase = milligrams per liter.

Thank you.

R G Pfleger

Raymond G. Pfleger, Ph.D

CUSTOMER Sargent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2501 Candelaria Road, N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 610090

REPORT OF ANALYSIS

SAMPLES RECEIVED 9-22-76	CUSTOMER ORDER NUMBER
TYPE OF ANALYSIS Water Analysis	

Analysis	E76-1100 #29 mg/l	E76-1100 #34 mg/l
Calcium	65.1	3.67
Magnesium	14.5	0.52
Sodium	60.3	2.55
Potassium	5.02	0.63
Bicarbonate (as $CaCO_3$)	QNS	12
Sulfate	QNS	<1
Chloride	QNS	<1.0
Fluoride	QNS	0.14
Boron	0.1	<0.1
Nitrate	<0.1	<0.1
Silica	54.0	51.2
Iron	0.052	0.009
Manganese	0.049	0.004
Total Dissolved Solids	384	50
Specific Conductance (umhos)	640	41
pH Units	7.98	7.36
Hardness (as $CaCO_3$)	QNS	517
Arsenic	QNS	QNS
Cadmium	0.001	0.001
Chromium	0.004	0.002
Cobalt	0.001	<0.001
Copper	0.002	0.002

APPROVED BY James J. Mueller
James J. Mueller, President
10-20-76 PAGE 1 OF 2 PAGE

Controls for Environmental Pollution, Inc.

CUSTOMER Sargent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2501 Candelaria Road, N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 610090

REPORT OF ANALYSIS

SAMPLES RECEIVED 9-22-76

CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Water Analysis

Analysis	E76-1100 #29 mg/l	E76-1100 #34 mg/l
Cyanide	QNS	QNS
Lead	0.002	0.001
Mercury	< 0.0004	< 0.0004
Molybdenum	0.003	< 0.001
Selenium	< 0.01	< 0.01
Silver	< 0.001	< 0.001
Zinc	0.016	0.014

QNS = Quantity of Water not Sufficient for Analysis.

APPROVED BY James J Mueller /EDM
James J. Mueller, President
10-20-76 PAGE 2 OF 2 PAGE

CUSTOMER Sargent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2501 Candelaria Road, N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 610090

REPORT OF ANALYSIS

SAMPLES RECEIVED 9-22-76

CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Water Analysis

Analysis	E76-1100 #30 mg/l	E76-1100 #31 mg/l	E76-1100 #33 mg/l
Calcium	84.8	87.5	163
Magnesium	21.3	21.4	32.0
Sodium	50.6	51.1	81.7
Potassium	4.88	5.86	11.5
Bicarbonate (as $CaCO_3$)	211	205	264
Sulfate	145	233	353
Chloride	21.0	20.6	51.2
Fluoride	0.79	0.77	0.97
Boron	< 0.1	< 0.1	< 0.1
Nitrate	0.7	0.8	< 0.1
Silica	50.7	58.3	53.8
Iron	0.009	0.007	0.015
Manganese	0.036	0.039	0.42
Total Dissolved Solids	486	434	840
Specific Conductance (umhos)	720	720	1260
pH	7.77	7.61	7.58
Hardness (as $CaCO_3$)	318	279	530
Arsenic	0.02	< 0.01	QNS
Cadmium	< 0.001	< 0.001	< 0.001
Chromium	0.004	0.002	0.002
Cobalt	< 0.001	< 0.001	< 0.001
Copper	0.002	0.002	0.005

APPROVED BY James J. Mueller/EDM
James J. Mueller, President
10-20-76 PAGE 1 OF 2 PAGE

Controls for Environmental Pollution, Inc.

CUSTOMER Sargent, Hauskins & Beckwith
ATTENTION Mr. Booth
ADDRESS 2501 Candelaria Road, N.E.
CITY Albuquerque, NM 87107
INVOICE NO. 610090

REPORT OF ANALYSIS

SAMPLES RECEIVED 9-22-76

CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Water Analysis

Analysis	E76-1100 #30 mg/l	E76-1100 #31 mg/l	E76-1100 #33 mg/l
Cyanide	< 0.01	< 0.01	QNS
Lead	< 0.001	< 0.001	< 0.001
Mercury	< 0.0004	< 0.0004	< 0.0004
Molybdenum	0.002	0.002	0.003
Selenium	< 0.01	< 0.01	< 0.01
Silver	< 0.001	< 0.001	< 0.001
Zinc	0.004	0.004	0.018

QNS = Quantity of Water not Sufficient for Analysis.

APPROVED BY James J. Mueller
James J. Mueller, President
10-20-76 PAGE 2 OF 2 PAGE

Controls for Environmental Pollution, Inc.

REPORT OF ANALYSIS

CUSTOMER	Sergent, Hauskins & Beckwith
ATTENTION	Mr. Booth
ADDRESS	2821 Girard NE
CITY	Albuquerque, NM 87107
INVOICE NO.	606081

SAMPLES RECEIVED 6/4/76

CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Water Analysis - Corrected Report

Analysis	Sample ~~#2~~ #1	Sample ~~#3~~ #2	Sample ~~#7~~ #4
Calcium	117	122	69.2
Magnesium	25.6	15.5	15.2
Sodium	50.4	76.1	30.0
Potassium	1.78	1.72	1.56
Bicarbonate	228	241	188
Sulfate	137	114	34
Chloride	14.3	16.7	19.9
Fluoride	0.52	0.51	0.44
Boron	< 0.1	< 0.1	< 0.1
Nitrate	1.39	16.8	4.0
Silica	40.9	36.3	41.9
Iron	0.002	0.002	0.004
Manganese	0.003	0.003	0.001
Total Dissolved Solids	520	560	350
Specific Conductance umhos	720	780	480
pH Units	7.78	7.48	8.60
Hardness	301	269	211

APPROVED BY JMueller

James J. Mueller, President

6/16/76

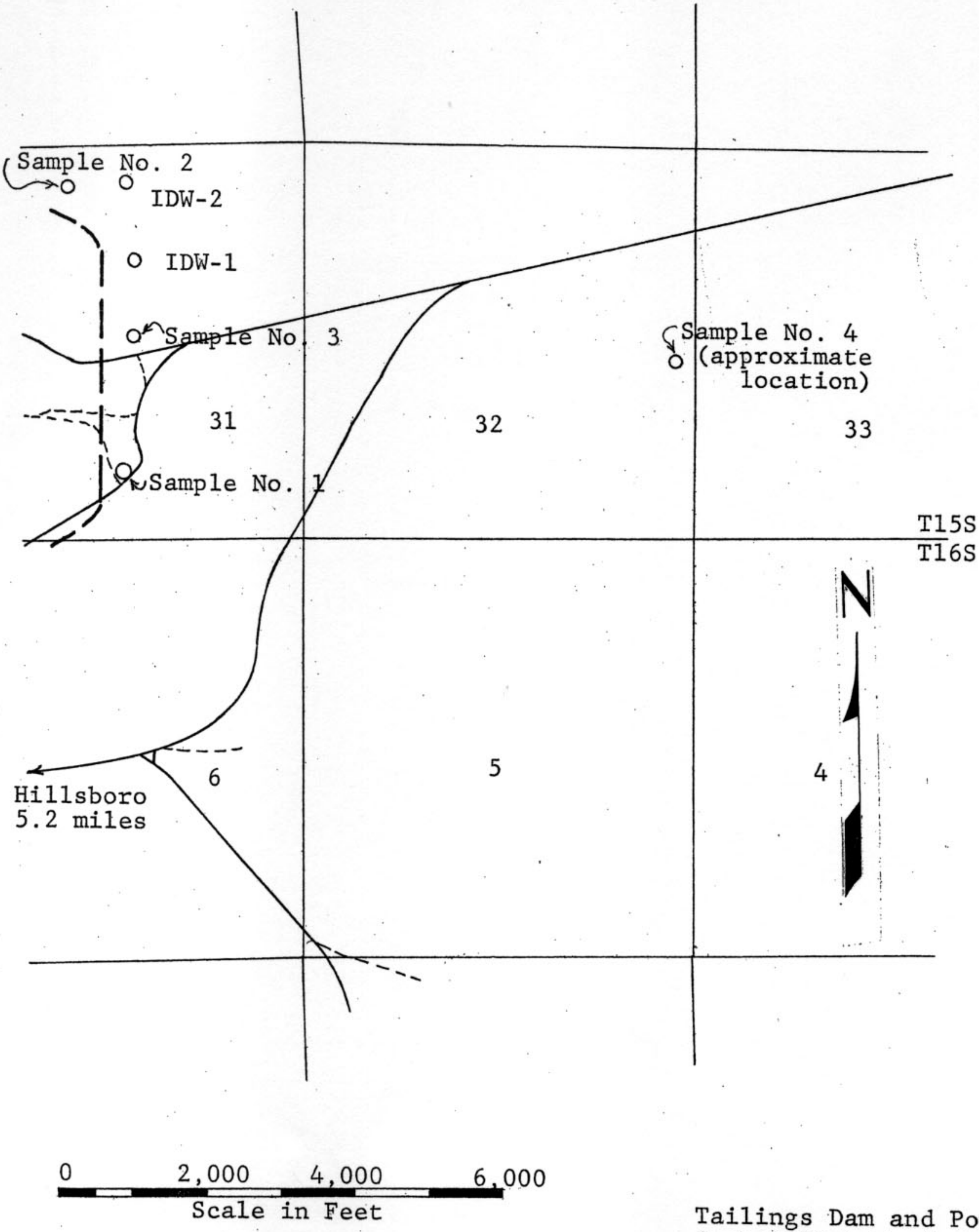
PAGE 1 OF 1 PAGE

Controls for Environmental Pollution, Inc.

1925 Rosina • P. O. Box 5351 • Santa Fe New Mexico

Figure 4

LOCATION OF WATER WELLS



Tailings Dam and Pond
Copper Flat Project
Hillsboro, New Mexico
SHB Job No. E80-1030

SERGENT, HAUSKINS & BECKWITH

Appendix C

Whole Rock Chemical Analyses for PW-3, WD-1, and November 20, 1996 Pond Rock Samples

ACZ LABORATORIES INC DATA MANAGEMENT SYSTEM

07/25/94 ANALYTICAL REPORT 12:36

lient : Steffen Robertson and Kirsten
ress : 3232 S. Vance St., Ste. 210
Lakewood, CO 80227
ttn. : Gene Muller
roject : 68605, Copper Flat

ample Matrix: Waste Rock
ample ID: 68605, PW-3
ample Date Time: Unknown

Lab No. : 94-RT/00595
Date Received: 06/10/94

Parameters			
Moisture %	0.3	%	
Phosphorus, total	0.04	%	
Aluminum, total	2950.	mg/kg	4
Antimony, total	-0.10	mg/kg	4
Arsenic, total	1.9	mg/kg	4
Barium, total	24.	mg/kg	4
Boron, total	-2.	mg/kg	4
Cadmium, total	-0.5	mg/kg	4
Calcium, total	700.	mg/kg	4
Chromium, total	-1.	mg/kg	4
Cobalt, total	9.	mg/kg	4
Copper, total	226.	mg/kg	4
Iron, total	40800.	mg/kg	4
Lead, total	4.	mg/kg	4
Magnesium, total	800.	mg/kg	4
Manganese, total	39.	mg/kg	4
Mercury, total	-0.02	mg/kg	4
Molybdenum, total	57.	mg/kg	4
Nickel, total	3.	mg/kg	4
Potassium, total	1300.	mg/kg	4
Selenium, total	9.0	mg/kg	4
Silver, total	-1.	mg/kg	4
Sodium, total	200.	mg/kg	4
Vanadium, total	5.	mg/kg	4
Zinc, total	14.	mg/kg	4

EPA SW846, Method 3051 Digestion.

emarks:

ote: Negative sign "-" denotes that the value is less than "<"

cott Habermehl, Project Manager/SH.

rank E. Polniak, Inorganic Laboratory Supervisor/

! ACZ LABORATORIES INC DATA MANAGEMENT SYSTEM !
! 06/30/94 ANALYTICAL REPORT 15:12 !

Client : Steffen Robertson and Kirsten
Address : 3232 S. Vance St., Ste. 210
Lakewood, CO 80227
Attn. : Gene Muller
Project : 68605, Copper Flat

Sample Matrix: Waste Rock
Sample ID: 68605, PW-3
Sample Date Time: Unknown

Lab No. : 94-SI/00595
Date Received: 06/10/94

Parameters		
Acid-Base Potent.(CaCO3)	-69.	Tons/1000T
Conductivity, sat. paste	5.94	mmhos/cm 1
pH, saturated paste	2.6	units 1
Neutralization Potential	-0.1	% as CaCO3
Sulfur, total	2.20	%
Sulfur, sulfate	-0.01	%
Sulfur, pyritic	0.84	%

1 Saturated Paste Extraction

Remarks: Negative (-) sign on ABP denotes a negative value

Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Project Manager

Frank E. Polniak, Inorganic Laboratory Supervisor / SH.

ACZ LABORATORIES INC — DATA MANAGEMENT SYSTEM
07/25/94 — ANALYTICAL REPORT — 12:36
Page 1

lient : Steffen Robertson and Kirsten
ddress : 3232 S. Vance St., Ste. 210
Lakewood, CO 80227
ttn. : Gene Muller
roject : 68605, Copper Flat

JUL 28 1994

ample Matrix: Waste Rock
ample ID: 68605, WD 1
ample Date Time: Unknown

Lab No. : 94 RT/00594
Date Received: 06/10/94

Parameters			
Moisture %	0.2	%	
Phosphorus, total	0.01	%	
Aluminum, total	1890.	mg/kg	4
Antimony, total	-0.10	mg/kg	4
Arsenic, total	0.4	mg/kg	4
Barium, total	10.	mg/kg	4
Boron, total	-2.	mg/kg	4
Cadmium, total	-0.5	mg/kg	4
Calcium, total	700.	mg/kg	4
Chromium, total	-1.	mg/kg	4
Cobalt, total	11.	mg/kg	4
Copper, total	186.	mg/kg	4
Iron, total	41600.	mg/kg	4
Lead, total	2.	mg/kg	4
Magnesium, total	200.	mg/kg	4
Manganese, total	8.	mg/kg	4
Mercury, total	-0.02	mg/kg	4
Molybdenum, total	7.	mg/kg	4
Nickel, total	-2.	mg/kg	4
Potassium, total	1200.	mg/kg	4
Selenium, total	3.9	mg/kg	4
Silver, total	-1.	mg/kg	4
Sodium, total	200.	mg/kg	4
Vanadium, total	1.	mg/kg	4
Zinc, total	7.	mg/kg	4

4 EPA SW846, Method 3051 Digestion.

emarks:

ote: Negative sign "-" denotes that the value is less than "<"

cott Habermehl, Project Manager

rank E. Polniak, Inorganic Laboratory Supervisor

| ACZ LABORATORIES INC DATA MANAGEMENT SYSTEM |
| 06/30/94 ANALYTICAL REPORT 15:16 |

Client : Steffen Robertson and Kirsten
Address : 3232 S. Vance St., Ste. 210
Lakewood, CO 80227
Attn. : Gene Muller
Project : 68605, Copper Flat

Sample Matrix: Waste Rock
Sample ID: 68605, PW-1
Sample Date Time: Unknown

Lab No. : 94-SI/00612
Date Received: 06/10/94

Parameters		
Acid-Base Potent.(CaCO3)	-81.	Tons/1000T
Neutralization Potential	3.2	% as CaCO3
Sulfur, total	3.61	%
Sulfur, sulfate	0.14	%
Sulfur, pyritic	2.00	%

Remarks: Negative (-) sign on ABP denotes a negative Value
Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Project Manager

Frank E. Polniak, Inorganic Laboratory Supervisor /S.H.

Appendix D

D-1

Paste pH and Conductivity Data
Acid-Base Accounting Data
Net Acid Generation Data

D-2

Humidity Cell Data

Appendix D-1

Paste pH and Conductivity Data
Acid-Base Accounting Data
Net Acid Generation Data

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide	EC	Paste	NAG kg/T	NAG pH	Sulfate	Sulfide	Sulfur	SO_4/S	AGP	NP	NNP	NP:AP
			%		pH	H_2SO_4		%	%	Total %	%	m/g $CaCO_3$			
WRC 5480 019	HS	QM	2	3020	2.66										
WRC 5480 020	HS	QM	2	878	3.96										
WRC 5480 021	HS	QM	2	1009	4.38										
WRC 5480 022	HS	QM	2	1850	2.97										
WRC 5480 023	HS	QM	2	1880	2.64										
WRC 5480 024	HS	QM	1.5	1190	2.71										
WRC 5480 025	LS	QM	1	637	8.6										
WRC 5480 026	LS	QM	1	129	9.65										
WRC 5480 027	HS	QM	2	1580	2.12										
WRC 5480 028	HS	QM	2	964	4.89										
WRC 5480 029	HS	QM	2	580	3.59										
WRC 5480 030	HS	QM	2	258	5.85										
WRC 5580 005	T	QV(Sternberg)pw2	2	19000	3.79										
WRD 4480 010	LS	QM	1	50	6.06										
WRD 5560 020	LS	QM	1	64	6.72										
WRD 5560 027	HS	QM	2	3990	2.56										
WRD 5560 028	HS	QM	2	730	2.95										
WRD 5560 029	HS	QM	2	1552	2.53										
WRD 5560 030	HS	QM	2	321	4.64										
WRD 5560 031	HS	QM	2	282	4.4										
WRD 5560 032	HS	QM	2	620	2.99										
WRD 5560 034	HS	QM	2	201	3.95										
WRD 5560 035	HS	QM	2	833	4.35										
WRD 5560 036	HS	QM	2	171	3.79										
WRD 5560 037	HS	QM	2	164	7.8										
WRD 5560 038	HS	QM	5	54	6.59	18.33	7.92	0.3	1.2	1.5	20.00	47	30.2	-16.8	0.64
WRD 5560 039	HS	QB	6	1848	2.81	72.13	3.92	0.1	2.1	2.2	4.55	70	0.1	-69.9	0.00
WRD 5560 040	HS	QB	3	456	3.97	36.46	2.98								
WRD 5560 041	HS	QB	4	2190	3.31	50.57	4.18	0.3	1.4	1.7	17.65	53	7.6	-45.4	0.14
WRD 5580 001	LS	QM	1	133	4	21.56	2.27	0.3	0.8	1.1	27.27	33	17.8	-15.2	0.54
WRD 5580 002	HS	QM	3	1422	2.77	34.01	6.00								
WRD 5580 004	O	QB			4.82			0.33	0.1	0.34	97.06	11	0.1	-10.9	0.01
WRD 5580 005	LS	QM	2	93	6.72	29.40	5.01								
WRD 5580 006	T	QM	0.5	212	3.2	30.77	5.06								
WRD 5580 007	HS	QB	2	345	3.02	31.07	4.87								
WRD 5580 008	HS	QB	2	230	5.55	29.01	5.15								
WRD 5580 009	HS	QM	2	325	3.14	28.62	5.01								
WRD 5580 011	HS	QM	2	8	5.6	28.03	5.29								
WRD 5580 012	HS	QM	2	305	5.4	29.11	5.1								
WRD 5580 013	HS	BB	7	2860	2.45	47.14	2.09								
WRD 5580 014	HS	BB	4	21	5	31.85	5.27	0.2	1.96	2.16	9.26	73.8	43.7	-30.1	0.59
WRD 5580 015	HS	QB	4	156	4.45	31.16	3.05								
WRD 5580 016	HS	QM	2	45.6	5.72	22.74	4.06								
WRD 5580 017	HS	QM	2	41	5.54	30.48	5.04								

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide	EC	Paste	NAG kg/T	NAG pH	Sulfate	Sulfide	Sulfur	SO_4/S	AGP	NP	NNP	NP:AP
			%		pH	H_2SO_4		%	%	Total %	%	m/g $CaCO_3$			
NRD 5650 017	LS	QM	1	41.4	6.09	23.72	4.11	0.13	0.22	0.35	37.14	11	0.1	-10.9	0.01
NRD 5650 018	HS	QM	2	89	4.82										
NRD 5650 019	HS	QM	2	3620	2.79	46.35	4.40	0.1	1.3	1.4	7.14	45	0.1	-44.9	0.00
SRD 5470 006	HS	QM	2	63	5.94										
SRD 5470 010	LS	QM	1	196	7.05	8.72	2.51								
SRD 5470 011	HS	QV	5	2200	2.54	43.51	3.10	0.21	1.3	1.5	14.00	47	6.7	-40.3	0.14
SRD 5470 012	HS	QB	6	182	7.63			0.46	1.4	1.9	24.21	59	38.9	-20.1	0.66
SRD 5470 013	HS	QM	3	821	4.4										
SRD 5470 014	HS	QB	4	62.9	5.26	5.88	2.29								
SRD 5470 015	HS	QM	3	118.5	5.55										
SRD 5470 016	HS	QM	4	89.6	7.06										
SRD 5470 016	HS	QV	5	6570	2.66										
SRD 5470 017	HS	QB	4	27	5.02	21.56	2.27								
SRD 5470 018	HS	QB	5	1703	3.08										
SRD 5470 019	HS	QV	5	229	4.55										
SRD 5470 020	HS	QM	3	162	7.83	12.74	2.47	0.31	1.1	1.4	22.14	44	36.4	-7.6	0.83
SRD 5470 021	HS	QB	4	321	4.32										
SRD 5470 022	HS	QM	2	386	6.03										
SRD 5470 023	HS	QM	4	27	5.51										
SRD 5470 024	HS	QM	5	3970	2.52										
SRD 5470 025	HS	QM	3	172.2	5.21										
SRD 5470 027	HS	QM	2	3520	2.72	15.78	2.52								
SRD 5490 007	O	QM		42	8.76	19.70	3.32								
SRD 5500 001	HS	QM	2	831	5.31	8.23	4.10	0.37	0.7	1.1	33.64	33	34.2	1.2	1.04
SRD 5500 002	HS	BB	4	33	7.38	22.05	4.63								
SRD 5500 003	O	BB		58.7	4.75										
SRD 5500 004	HS	QB	4	231	5.5										
SRD 5500 005	HS	QV	5	292	6.05	19.01	3.96								
WRC 5440 30	HS	QM	2	227	4.1	15.88									
WRC 5440 31A	LS	QM	0.5		7.91			0.23	0.32	0.55	41.82	33	34.2	1.2	1.04
WRC 5440 31B	T	QM	0.5		8.35			0.21	0.11	0.32	65.63	10	10.1	0.1	1.01
WRC 5440 32	O	QM		347	6.55			0.19	0.05	0.24	79.17	7.5	9.6	2.1	1.28
WRC 5480 006	HS	QB	5	3680	3.7	31.46									
WRC 5480 007	HS	QB	5	1643	3.18	33.52									
WRC 5480 007	HS	QV	5	550	3.41	32.73									
WRC 5480 008	HS	QM	2	785	3.67	15.09									
WRC 5480 009	HS	BB	3	764	3.73	32.54									
WRC 5480 010	HS	BB	4	1338	3.76	28.71									
WRC 5480 012	LS	QB	1	589	4.01	33.81									
WRC 5480 013	LS	QM	1	297	6.95	15.19									
WRC 5480 014	T	QB	0.5	801	4.12	20.19		1.25	0.89	2.08	60.10	65	47.6	-17.4	0.73
WRC 5480 015	HS	QM	2	826	3.42										
WRC 5480 016	LS	QM	1	470	6.26										
WRC 5480 018	HS	QM	2	4840	3.02										

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide	EC	Paste	NAG kg/T	NAG pH	Sulfate	Sulfide	Sulfur	SO$_4$/S	AGP	NP	NNP	NP:AP
			%		pH	H$_2$SO$_4$		%	%	Total %	%	m/g CaCO$_3$			
ERD 5500 001	T	QM	1	3140	3.63	29.60	5.11	0.71	0.74	1.45	48.97	45.3	18.9	-26.4	0.42
ERD 5500 002	HS	QB	4	19	7.94	15.48	2.48	0.44	2.46	2.9	15.17	53.1	62.5	9.4	1.18
ERD 5500 004	LS	QM	1	430	5.31										
ERD 5500 005	LS	QM	1	595	3.31										
ERD 5500 006	LS	QM	1.5	891	5.72										
ERD 5500 009	HS	BB	10	4000	2.71	80.75	6.30	0.6	2.3	2.9	20.69	91	9.1	-81.9	0.10
ERD 5500 010	LS	QM	1.5	471	4.55	19.99	3.92								
ERD 5500 012	HS	QM	2	1928	2.71										
ERD 5500 014	HS	QM	2	4370	2.73										
ERD 5510 002	LS	QM	1.5	257	4.71										
ERD 5560 001	O	AN			9.14			0.01	0.005	0.01	100.00	0.3	23.2	22.9	77.33
ERD 5560 002	HS	QM	8	467	6.76			0.3	2.6	2.9	10.34	90	23.7	-66.3	0.26
ERD 5560 006	HS	QB	2	1305	3.38										
ERD 5560 008	HS	QV	5	330	4.08			0.47	1.7	2.2	21.36	68	2	-66	0.03
ERD 5560 010	LS	QM	1.5	708	4.55	23.62	3.87								
ERD 5560 011	HS	QB	3	1565	4.54	22.05	4.07								
ERD 5600 001	LS	QM	1	450	4.44			0.1	0.43	0.53	18.87	17	0.1	-16.9	0.01
ERD 5600 003	HS	QB	3	4230	2.9	33.81	3.19	0.96	1.3	2.2	43.64	69	0.1	-68.9	0.00
ERD 5600 005	T	QB	0.5	2700	3.23	27.05	4.34								
ERD 5600 007	T	QM	0.5	174	6.88	14.31	2.68								
ERD 5600 009	T	QM	0.5	657	4.73										
ERD 5600 011	T	QM	0.5	847	5.43										
ERD 5600 012	T	QM	0.5	254	6.82										
ERD 5600 013	HS	QM	2	321	5.17										
ERD 5600 014	HS	BB	2	2080	3.55										
ERD 5600 070	HS	BB	4	227	4.92	11.27	2.45								
NRD 5620 001	HS	BB	4	41	5.05	10.68	3.41								
NRD 5620 001	HS	QB	5	1193	2.91	19.80	2.45								
NRD 5620 002	HS	QB	6	1717	2.68	77.62	2.98	0.3	2.6	2.9	10.34	90	23.7	-66.3	0.26
NRD 5620 003	HS	QM	4	1111	3.56	57.33	4.12	0.2	1.6	1.8	11.11	55	0.1	-54.9	0.00
NRD 5620 004	O	QM			4.75			0.17	0.1	0.18	94.44	5.6	0.1	-5.5	0.02
NRD 5620 005	T	QV	1	2170	2.81	9.60	4.81								
NRD 5620 006	HS	QM	2	260	3.68										
NRD 5620 007	HS	QM	2	1009	2.98										
NRD 5620 008	HS	QM	3	235	4.13	42.63	5.90	0.15	1.1	1.3	11.54	40	0.8	-39.2	0.02
NRD 5620 009	HS	QM	2	663	3.28										
NRD 5620 010	HS	QM	2	128	3.86										
NRD 5620 011	HS	QM	2	1219	2.68	39.69	3.51	0.28	0.92	1.2	23.33	36	0.1	-35.9	0.00
NRD 5620 012	HS	QB	4	997	2.75	58.80	4.08	0.2	1.6	1.8	11.11	57	0.1	-56.9	0.00
NRD 5620 013	HS	QM	2	2240	2.62										
NRD 5620 014	HS	QB	20	4860	2.5	223.44	3.65	0.9	6.2	7.1	12.68	220	0.1	-219.9	0.00
NRD 5620 015	HS	QB	2	1075	3.71										
NRD 5620 016	HS	QM	2	3390	2.51										

1997 Surface Sample Analyses

Sample	Type	Lithology	Visible sulfide %	EC	Paste pH	NAG kg/T H_2SO_4	NAG pH	Sulfate %	Sulfide %	Sulfur Total %	SO_4/S %	AGP	NP	NNP	NP:AP
												m/g $CaCO_3$			
WRD 5580 018	HS	QM	2	112	6.4	32.93	5.55								
WRD 5580 019	HS	QM	2	42	6.14	19.60	3.91								
WRD 5580 021	HS	QM	2	65	5.87	19.89	3.98								
WRD 5580 022	HS	QM	2	170	5.61	39.79	3.00								
WRD 5580 023	HS	QM	2	103	7.67	21.17	4.63								
WRD 5580 024	HS	QM	1.5	183	5.39	21.56	4.07								
WRD 5580 025	HS	QM	1.5	42	5.74	15.78	2.52								
WRD 5580 026	HS	QM	2	84	6.1	34.79	6.42								
WRD 5580 033	HS	QM	1.5	237	3.82	38.71	7.74								
WRD 5580 042	HS	QB	5	1080	2.35	76.93	2.10	0.15	2.2	2.4	6.25	74	0.1	-73.9	0.00

KEY

Lithology QM= Quartz Monzonite QB= Quartz Breccia BB= Biotite Breccia QV = Quartz Vein AN = Andesite

Visible sulfide (%) = Observed pyrite/sulfide content in hand specimen

Type HS=High Sulfide (>2% visible sulfide) LS= Low Sulfide (<2% visible sulfide) T=Transitional (trace sulfide & acidic paste pH) O=Oxide (no observed sulfide)

NAG (eqkg H2SO4/T)= 49xVolume of NaOH titrated x molality of NaOH (0.1M)
weight of sample (5g)

APPENDIX A.2

PASTE pH AND CONDUCTIVITY DATA

ACID BASE ACCOUNTING DATA

and

NET ACID GENERATION DATA

Copper Flat Project
Static Test on Wall Rock and Drill Core from the Pit Area
1994 Sampling

Sample	Paste PH	Total	Sulfide	Sulfate	NP	AP	NNP	NP/AP
PW-1 SW pitwall transition	6.1	3.61	3.47	0.14	32	108.44	-76.44	0.3
PW-2 Oxidized pitwall	–	0.37	0.365	0.005	11	11.41	-0.41	0.96
PW-3 NW pitwall	2.6	2.2	2.195	0.005	0.1	68.59	-68.49	–
PW-4 NE pitwall	3.9	1.89	1.885	0.005	16	58.91	-42.91	0.27
IDC24-222-241, QM – core	–	1.74	1.735	0.005	31	54.22	-23.22	0.57
CF10-177-190, andesite – core	–	2.86	2.8	0.06	52	87.5	-35.5	0.59
CF10-190-199 QM—core	–	3.59	3.52	0.07	44	110	-66	0.4
CF10-214-220, QM – core	–	3.92	3.915	0.005	65	122.34	-57.34	0.53
H75-53-42, QM - reverse circ.	8.2	1.77	1.765	0.005	36	55.16	-19.16	0.65
H75-64-44, QM - reverse circ.	7.2	1.69	1.685	0.005	39	52.66	-13.66	0.74
H75-51-34, QM - reverse circ.	8.6	2.02	2.015	0.005	49	62.97	-13.97	0.78
H75-48-58, QM - reverse circ.	7.2	1.18	1.175	0.005	16	36.72	-20.72	0.44
H75-48-44, QM - reverse circ.	7.4	1.06	1.055	0.005	9	32.97	-23.97	0.27

SOURCE: *Copper Flat Mine - Compliation of Pit Lake Studies (SRK 1997)*

Appendix D-2

Humidity Cell Data

DRAFT

APPENDIX A.3

HUMIDITY COLUMN TEST DATA

IDC-24-222-241 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	1.	4.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.03	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	30.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	50.	50.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	75.	60.	30.	15.	35.	45.	35.	40.	40.	45.	40.	45.	35.	35.	15.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	26.	2.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	2.
Ca mg/l	30.48	23.76	18.11	12.95	18.44	15.01	13.24	13.16	13.42	15.01	13.19	15.92	13.85	11.87	5.47
Cd ug/l	1.	2.	1.	1.	3.	1.	1.	3.	1.	1.	1.	1.	1.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	5.	20.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	14.	16.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
Fe mg/l	0.04	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	1.56	1.47	0.65	0.13	0.47	0.61	0.12	0.79	0.9	0.22	0.68	0.94	0.34	0.75	0.18
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	1.26	1.04	0.59	0.36	0.58	0.42	0.39	0.39	0.37	0.34	0.52	0.65	0.48	0.48	0.18
Mn mg/l	0.07	0.03	0.02	0.02	0.035	0.03	0.025	0.025	0.025	0.02	0.015	0.02	0.015	0.01	0.005
Mo ug/l	6.	4.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	4.
Na mg/l	5.24	4.63	2.19	1.26	2.38	1.79	1.65	1.82	1.27	1.57	2.34	2.98	2.05	2.12	0.52
Ni ug/l	10.	15.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	10.
P ug/l	40.	110.	10.	10.	10.	10.	30.	10.	10.	10.	10.	10.	10.	30.	10.
Pb ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	8.	10.	2.	2.	2.
Sb ug/l	10.	34.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	4.	2.
Se ug/l	85.	150.	5.	5.	5.	5.	50.	25.	15.	15.	30.	40.	5.	30.	15.
Si mg/l	0.87	0.6	0.53	0.3	0.6	0.39	0.51	0.52	0.5	0.53	0.56	0.73	0.48	0.57	0.28
Sn ug/l	100.	174.	2.	2.	2.	2.	2.	2.	6.	22.	46.	2.	2.	80.	2.
Sr ug/l	124.	104.	50.	28.	44.	32.	32.	34.	34.	32.	34.	46.	36.	34.	18.
Tl ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	2.	5.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Zn ug/l	28.	25.	12.	3.	9.	20.	11.	16.	1.	1.	2.	6.	8.	5.	9.
pH	7.73	7.8	7.55	7.4	7.85	7.64	7.52	7.53	7.54	7.59	7.61	7.63	7.72	7.51	7.16
Redox (mV)	300.	289.	307.	321.	295.	311.	318.	321.	341.	287.	272.	264.	265.	265.	296.
Conductivity (uS/cm)	132.	104.	70.	45.	69.	53.	45.	42.	41.	46.	50.	63.	49.	44.	19.
Alkalinity (mg $CaCO_3$/l)	43.	31.	24.	17.	26.	18.	16.	17.	17.	20.	19.	26.	19.	16.	10.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	2.	2.	2.	1.	1.	2.	1.	1.	2.	1.	2.9	2.	2.	3.
Cum Acidity (pH 8.3)	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.9	1.	1.1	1.2
Sulphate (mg/l)	9.	9.	5.	6.	8.	6.	5.	4.	4.	4.	5.	4.	3.	4.	2.
Cum Sulphate (mg/kg)	0.5	0.8	1.	1.2	1.6	1.9	2.2	2.4	2.6	2.8	3.	3.2	3.4	3.6	3.7
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.214	0.144	0.184	0.148	0.188	0.218	0.169	0.23	0.188	0.231	0.189	0.191	0.212	0.21	0.194
Cumulative Iron	0.04	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23
Cumulative Copper	14.	30.	32.	34.	36.	38.	40.	42.	44.	46.	48.	50.	52.	54.	56.

IDC-24-222-241 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.014	0.022	0.018	0.046	0.033								0.061	0.057
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.1	<0.1	<0.1	<0.1								<0.1	<0.1
Ca mg/l	1.5	2.75	2.2	4.49	2.7								6.21	8.
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	0.091	0.12	0.12	0.323	0.16								0.453	0.621
Mn mg/l	0.008	0.005	0.005	0.007	<0.005								0.016	0.012
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.143	0.207	0.171	0.377	0.231								0.432	0.596
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.011	0.016	0.015	0.03	0.022								0.04	0.053
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.01	0.006	0.009	0.012	0.015								0.022	0.024
pH	7.08	7.29	7.23	7.4	6.64								7.59	7.69
Redox (mV)	304.	284.	295.	288.	281.								291.	293.
Conductivity (uS/cm)	10.	16.	15.	32.	19.								45.	58.
Alkalinity (mg $CaCO_3$/l)	6.	10.	7.	12.	8.								16.	20.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	5.	5.	6.	3.	6.								5.9	6.9
Cum Acidity (pH 8.3)	1.4	1.6	1.9	2.1	2.4								2.6	3.
Sulphate (mg/l)	2.	2.	2.	4.	3.								4.	4.
Cum Sulphate (mg/kg)	3.8	3.9	3.9	4.1	4.3								4.5	4.7
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.151	0.175	0.198	0.181	0.205								0.185	0.216
Cumulative Iron	0.23	0.23	0.23	0.23	0.23								0.23	0.23
Cumulative Copper	56.	56.	56.	56.	56.								56.	56.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

LGSSP-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	7.	6.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	60.	70.	40.	30.	10.	10.	30.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	200.	105.	60.	55.	60.	40.	70.	75.	50.	90.	80.	60.	60.	75.	45.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	26.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Ca mg/l	155.59	115.41	85.41	76.19	55.92	41.91	51.46	44.1	38.78	54.5	52.94	37.69	45.46	51.56	32.69
Cd ug/l	18.	13.	5.	1.	5.	1.	3.	5.	1.	1.	6.	1.	7.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	20.	25.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	82.	54.	28.	26.	16.	18.	34.	16.	14.	12.	10.	6.	10.	10.	6.
Fe mg/l	0.41	0.28	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.01	0.01	0.01	0.01
K mg/l	7.07	7.1	7.65	7.2	4.99	4.56	5.84	4.95	4.58	4.64	5.79	4.85	5.52	6.79	4.62
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	16.36	11.17	8.56	7.12	4.48	2.92	4.14	3.22	2.68	4.25	4.34	2.58	3.58	4.32	2.2
Mn mg/l	0.04	0.035	0.02	0.01	0.03	0.015	0.01	0.015	0.005	0.01	0.015	0.01	0.005	0.005	0.005
Mo ug/l	242.	308.	288.	282.	176.	122.	140.	96.	74.	126.	126.	60.	90.	98.	66.
Na mg/l	7.5	7.94	7.2	6.55	3.88	2.91	3.15	2.04	1.79	2.48	2.69	1.54	2.31	2.5	1.63
Ni ug/l	5.	15.	10.	5.	5.	5.	5.	5.	5.	5.	10.	5.	5.	5.	5.
P ug/l	230.	270.	300.	340.	220.	200.	240.	190.	120.	200.	220.	180.	200.	270.	150.
Pb ug/l	32.	20.	2.	2.	2.	2.	2.	2.	2.	2.	2.	6.	12.	2.	2.
Sb ug/l	18.	22.	2.	2.	2.	2.	2.	2.	2.	2.	10.	2.	2.	2.	2.
Se ug/l	530.	405.	285.	245.	125.	30.	210.	145.	160.	225.	170.	110.	125.	115.	70.
Si mg/l	5.53	6.71	7.61	8.57	6.18	7.08	7.17	5.79	6.24	5.6	5.38	4.81	5.66	5.39	5.
Sn ug/l	574.	508.	2.	2.	2.	2.	26.	92.	60.	64.	90.	44.	44.	52.	2.
Sr ug/l	1,018.	680.	492.	418.	270.	178.	252.	204.	168.	262.	234.	142.	216.	224.	126.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	11.	10.	5.	4.	2.	1.	4.	1.	1.	1.	6.	3.	2.	2.	2.
Zn ug/l	28.	14.	12.	13.	6.	17.	13.	14.	1.	1.	1.	1.	9.	1.	3.
pH	8.07	8.1	8.09	8.16	8.11	8.13	8.13	8.05	8.21	8.03	8.04	8.01	8.07	7.96	8.02
Redox (mV)	325.	306.	318.	330.	310.	322.	335.	337.	344.	294.	281.	271.	268.	269.	296.
Conductivity (uS/cm)	979.	690.	533.	448.	308.	196.	261.	204.	170.	264.	279.	170.	226.	267.	151.
Alkalinity (mg $CaCO_3$/l)	53.	54.	58.	64.	54.	53.	58.	49.	54.	50.	51.	41.	54.	48.	49.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	1.	1.	1.	1.	1.	1.	1.	0.5	1.	1.	1.	1.	1.	1.
Cum Acidity (pH 8.3)	0.	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5
Sulphate (mg/l)	432.	243.	155.	141.	82.	29.	64.	49.	21.	69.	69.	30.	48.	72.	16.
Cum Sulphate (mg/kg)	10.4	17.5	22.6	25.9	28.7	29.6	32.	33.6	34.2	36.8	39.5	40.5	42.3	45.7	46.2
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.102	0.122	0.139	0.101	0.144	0.119	0.162	0.138	0.112	0.158	0.165	0.153	0.158	0.198	0.127
Cumulative Iron	0.41	0.69	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.8	0.88	0.89	0.9	0.91	0.92
Cumulative Copper	82.	136.	164.	190.	206.	224.	258.	274.	288.	300.	310.	316.	326.	336.	342.

LGSSP-2 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.058	0.048	0.037	0.038	0.044								0.101	0.084
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	27.3	22.4	16.4	17.	14.6								66.2	65.3
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.019	0.016	0.011	0.011	<0.010								0.014	0.018
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	4.	3.4	2.2	2.8	<2.0								4.4	4.2
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	2.7	2.11	1.49	1.55	1.29								6.2	6.19
Mn mg/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Mo ug/l	0.066	0.041	<0.030	0.03	<0.030								0.065	0.093
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	5.55	4.58	3.18	3.22	2.26								4.12	5.03
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.179	0.14	0.104	0.108	0.093								0.409	0.393
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.005	0.009	<0.005	<0.005	<0.005								0.008	0.005
pH	8.12	8.09	8.01	7.92	7.22								7.9	7.96
Redox (mV)	288.	298.	294.	290.	280.								313.	296.
Conductivity (uS/cm)	177.	138.	104.	109.	93.								402.	384.
Alkalinity (mg $CaCO_3$/l)	57.	48.	34.	38.	30.								36.	49.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	1.	1.	2.	2.	3.								3.	2.
Cum Acidity (pH 8.3)	0.5	0.5	0.6	0.7	0.8								1.	1.
Sulphate (mg/l)	20.	10.	11.	11.	8.								139.	124.
Cum Sulphate (mg/kg)	46.8	47.1	47.5	47.9	48.3								54.4	59.3
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.127	0.131	0.16	0.158	0.203								0.183	0.67
Cumulative Iron	0.92	0.92	0.92	0.92	0.92								0.92	0.92
Cumulative Copper	342.	342.	342.	342.	342.								342.	342.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

C10-190-199-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	5.	5.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	50.	30.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	50.	30.	45.	35.	15.	25.	15.	15.	15.	25.	20.	35.	35.	15.	30.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	16.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	8.
Ca mg/l	48.27	40.54	43.47	34.16	32.33	30.47	23.86	25.61	19.7	22.26	20.91	23.92	22.28	18.03	22.24
Cd ug/l	3.	8.	2.	1.	1.	3.	3.	3.	1.	1.	1.	1.	4.	4.	3.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	10.	15.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	52.	34.	24.	20.	14.	10.	8.	8.	6.	4.	2.	2.	4.	4.	2.
Fe mg/l	0.05	0.11	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	3.95	3.56	4.39	2.98	2.07	1.51	2.13	2.16	1.36	0.77	1.5	1.78	1.35	1.31	2.1
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	4.25	3.86	4.68	3.49	3.06	2.59	2.22	2.35	1.47	1.79	1.83	2.5	2.3	2.04	2.4
Mn mg/l	0.11	0.065	0.05	0.035	0.045	0.04	0.035	0.035	0.025	0.025	0.025	0.025	0.025	0.02	0.03
Mo ug/l	10.	12.	6.	4.	6.	2.	2.	2.	2.	2.	2.	4.	2.	4.	4.
Na mg/l	3.83	4.18	4.35	3.16	2.22	2.01	1.98	1.78	1.24	1.01	1.09	1.82	1.61	1.66	1.87
Ni ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
P ug/l	60.	100.	10.	30.	10.	10.	10.	30.	10.	10.	10.	10.	10.	10.	20.
Pb ug/l	6.	22.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	2.	4.
Sb ug/l	14.	22.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
Se ug/l	205.	200.	80.	75.	40.	5.	50.	95.	95.	75.	15.	70.	10.	35.	60.
Si mg/l	0.85	0.7	1.02	0.82	0.71	0.78	0.9	0.81	0.57	0.53	0.5	0.66	0.3	0.41	0.74
Sn ug/l	66.	316.	2.	2.	148.	2.	18.	66.	24.	50.	2.	2.	8.	58.	2.
Sr ug/l	372.	320.	324.	244.	194.	184.	136.	150.	100.	110.	94.	132.	120.	80.	140.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	5.	6.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	2.
Zn ug/l	31.	29.	21.	16.	13.	13.	14.	8.	1.	1.	10.	30.	19.	17.	36.
pH	8.07	7.91	7.9	7.37	7.75	7.8	7.66	7.4	7.78	7.57	7.55	7.45	7.03	7.04	7.45
Redox (mV)	306.	297.	315.	327.	303.	320.	326.	329.	346.	292.	279.	276.	277.	281.	304.
Conductivity (uS/cm)	259.	225.	253.	181.	165.	142.	112.	114.	77.	89.	90.	114.	103.	86.	107.
Alkalinity (mg CaCO$_3$/l)	43.	30.	32.	22.	19.	25.	20.	21.	19.	17.	15.	15.	11.	10.	16.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	1.	1.	1.	2.	1.	1.	2.	2.	0.5	2.	1.	2.	2.	2.	2.
Cum Acidity (pH 8.3)	0.	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.9	0.9
Sulphate (mg/l)	65.	58.	70.	57.	51.	33.	25.	26.	12.	17.	20.	30.	27.	20.	22.
Cum Sulphate (mg/kg)	3.2	5.5	7.8	9.5	12.	13.4	14.2	15.4	15.9	16.7	17.6	19.	20.3	21.2	22.1
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.228	0.175	0.149	0.139	0.224	0.19	0.158	0.198	0.195	0.219	0.215	0.208	0.219	0.206	0.194
Cumulative Iron	0.05	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
Cumulative Copper	52.	86.	110.	130.	144.	154.	162.	170.	176.	180.	182.	184.	188.	192.	194.

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.026	0.022	0.013	0.011	0.023								0.096	0.066
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	11.8	10.8	4.76	3.15	14.3								45.3	50.7
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.017	0.015	0.012	0.015	0.016								0.036	0.034
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	2.05	1.75	0.749	0.456	1.48								6.05	7.52
Mn mg/l	0.032	0.029	0.013	0.012	0.035								0.083	0.089
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.541	0.547	0.275	0.169	0.346								0.614	0.679
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.131	0.108	0.047	0.03	0.112								0.393	0.427
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.02	0.02	0.016	0.015	0.041								0.078	0.058
pH	7.52	7.64	7.27	6.87	6.66								7.49	7.41
Redox (mV)	309.	290.	301.	297.	290.								320.	307.
Conductivity (uS/cm)	95.	80.	37.	26.	104.								309.	335.
Alkalinity (mg $CaCO_3$/l)	15.	15.	8.	5.	8.								14.	15.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	3.	6.	2.	4.	4.								6.9	8.9
Cum Acidity (pH 8.3)	1.1	1.3	1.4	1.6	1.8								2.1	2.5
Sulphate (mg/l)	19.	14.	7.	6.	28.								118.	124.
Cum Sulphate (mg/kg)	22.9	23.5	23.8	24.1	25.3								30.2	35.5
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.177	0.205	0.194	0.219	0.197								0.188	0.198
Cumulative Iron	0.29	0.29	0.29	0.29	0.29								0.29	0.29
Cumulative Copper	194.	194.	194.	194.	194.								194.	194.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Sample SW-1 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	2.	4.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	50.	30.	20.	20.	10.	10.	20.	25.	25.	15.	20.	25.	15.	20.	15.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	6.	6.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Ca mg/l	53.15	45.51	34.83	36.28	31.01	23.67	23.36	24.87	30.06	23.22	23.31	30.56	20.57	22.22	17.45
Cd ug/l	2.	2.	1.	1.	1.	1.	7.	1.	1.	1.	4.	5.	1.	1.	5.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	15.	15.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	26.	16.	10.	12.	6.	2.	2.	2.	6.	2.	2.	2.	2.	2.	2.
Fe mg/l	0.08	0.08	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	2.98	2.71	2.19	2.94	2.35	1.69	1.41	1.07	2.17	0.15	1.7	2.14	1.98	1.47	1.28
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	4.46	3.72	2.5	2.78	2.19	1.24	1.38	1.49	2.02	1.32	1.42	2.38	1.26	1.37	1.02
Mn mg/l	0.04	0.015	0.01	0.015	0.01	0.005	0.005	0.005	0.015	0.005	0.005	0.005	0.005	0.005	0.005
Mo ug/l	102.	84.	50.	62.	44.	26.	22.	32.	32.	14.	32.	32.	10.	26.	20.
Na mg/l	1.57	1.17	0.82	1.01	0.79	0.28	0.47	0.43	0.66	0.36	0.43	0.7	0.41	0.52	0.34
Ni ug/l	10.	10.	5.	10.	5.	5.	5.	5.	5.	5.	5.	15.	5.	5.	5.
P ug/l	120.	140.	40.	150.	100.	90.	180.	140.	130.	100.	140.	180.	50.	140.	80.
Pb ug/l	4.	8.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	4.	2.	12.
Sb ug/l	14.	20.	2.	2.	2.	2.	2.	2.	2.	2.	6.	2.	2.	60.	2.
Se ug/l	210.	155.	65.	110.	25.	5.	80.	45.	80.	40.	70.	85.	20.	2.06	35.
Si mg/l	3.69	3.95	3.56	4.88	4.05	1.99	2.6	1.99	3.74	2.51	2.31	2.82	1.93	2.	1.98
Sn ug/l	300.	376.	2.	2.	2.	2.	80.	2.	44.	12.	2.	8.	50.	60.	2.
Sr ug/l	194.	166.	104.	110.	82.	56.	62.	68.	88.	56.	60.	78.	48.	2.	38.
Ti ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	5.	6.	1.	1.	1.	1.	1.	1.	1.	1.	2.	1.	1.	1.	1.
Zn ug/l	27.	9.	7.	7.	4.	8.	4.	9.	1.	1.	7.	3.	11.	1.	4.
pH	7.65	7.73	7.87	7.91	8.04	7.65	7.69	7.66	8.	7.78	7.85	7.75	7.62	7.74	7.54
Redox (mV)	287.	265.	280.	305.	296.	302.	320.	317.	309.	260.	251.	241.	233.	233.	278.
Conductivity (uS/cm)	266.	231.	167.	174.	144.	95.	92.	105.	125.	84.	94.	138.	78.	84.	65.
Alkalinity (mg $CaCO_3$/l)	34.	29.	27.	37.	35.	21.	23.	18.	34.	26.	26.	26.	20.	22.	14.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	0.5	2.	1.	2.	1.	0.5	2.	1.	1.	1.	1.	2.	2.	2.	4.
Cum Acidity (pH 8.3)	0.	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.9
Sulphate (mg/l)	77.	60.	32.	30.	24.	12.	11.	20.	14.	8.	11.	25.	8.	9.	6.
Cum Sulphate (mg/kg)	3.9	6.7	8.2	8.2	8.2	8.8	9.3	10.3	10.7	11.1	11.6	12.9	13.2	13.6	13.9
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.166	0.207	0.157	0.128	0.181	0.168	0.188	0.194	0.162	0.209	0.198	0.206	0.179	0.186	0.206
Cumulative Iron	0.08	0.16	0.17	0.18	0.19	0.2	0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29
Cumulative Copper	26.	42.	52.	64.	70.	72.	74.	76.	82.	84.	86.	88.	90.	92.	94.

Sample SW-1 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.018	0.014	<0.010	0.012	0.013								0.021	0.021
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	10.9	8.36	6.44	7.72	4.2								7.65	7.26
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	0.011	<0.010	<0.010	0.01	<0.010								0.011	0.012
Fe mg/l	<0.030	<0.031	<0.032	<0.033	<0.034								<0.035	<0.036
K mg/l	<2.0	<2.1	<2.2	<2.3	<2.4								<2.5	<2.6
Li ug/l	<0.015	<0.016	<0.017	<0.018	<0.019								<0.020	<0.021
Mg mg/l	1.14	0.766	0.636	0.782	0.414								0.851	0.775
Mn mg/l	<0.005	<0.005	0.005	0.006	0.007								0.022	0.013
Mo ug/l	<0.030	<0.031	<0.032	<0.033	<0.034								<0.035	<0.036
Na mg/l	<2.0	<2.1	<2.2	<2.3	<2.4								<2.5	<2.6
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	1.99	1.33	1.25	1.38	0.705								0.581	0.928
Sn ug/l	<0.30	<0.31	<0.32	<0.33	<0.34								<0.35	<0.36
Sr ug/l	0.055	0.044	0.034	0.039	0.026								0.037	0.035
Ti ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.006	0.005	0.007	0.008	0.011								0.026	0.014
pH	7.79	7.64	7.55	7.44	6.54								7.2	7.32
Redox (mV)	261.	280.	283.	274.	260.								298.	277.
Conductivity (uS/cm)	73.	53.	40.	51.	27.								55.	49.
Alkalinity (mg $CaCO_3$/l)	13.	13.	16.	15.	9.								4.	4.
Acidity (pH 4.5)	0.													
Acidity (pH 8.3)	3.	3.	5.	5.	5.								10.9	11.9
Cum Acidity (pH 8.3)	1.	1.2	1.4	1.6	1.9								2.3	3.
Sulphate (mg/l)	5.	4.	4.	6.	4.								11.	6.
Cum Sulphate (mg/kg)	14.1	14.3	14.5	14.7	14.9								15.4	15.7
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.171	0.178	0.188	0.177	0.211								0.175	0.22
Cumulative Iron	0.29	0.29	0.29	0.29	0.29								0.29	0.29
Cumulative Copper	94.	94.	94.	94.	94.								94.	94.

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Sample PW-2 - Kinetic Test Data

Parameter	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8	Cycle 9	Cycle 10	Cycle 11	Cycle 12	Cycle 13	Cycle 14	Cycle 15
Ag ug/l	36.	3.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Al mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
As ug/l	30.	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
B ug/l	10.	20.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Ba ug/l	110.	75.	25.	45.	15.	60.	25.	25.	25.	30.	35.	60.	30.	35.	35.
Be ug/l	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Bi ug/l	26.	42.	2.	2.	2.	2.	2.	2.	2.	2.	8.	8.	2.	2.	16.
Ca mg/l	30.55	33.63	9.45	11.3	3.49	12.99	4.86	4.17	3.87	4.01	5.17	5.19	4.91	4.48	7.33
Cd ug/l	26.	25.	12.	1.	1.	8.	7.	7.	1.	1.	4.	1.	4.	1.	1.
Co ug/l	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cr ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
Cu ug/l	302.2	280.	67.4	63.4	23.6	83.8	31.4	28.	42.4	43.6	62.6	81.8	59.8	69.	102.2
Fe mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K mg/l	5.11	5.88	1.53	2.22	0.3	2.22	0.58	0.62	0.01	0.4	1.42	1.26	1.61	1.46	1.51
Li ug/l	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
Mg mg/l	1.6	2.03	0.44	0.52	0.11	0.58	0.18	0.15	0.13	0.13	0.27	0.26	0.19	0.22	0.37
Mn mg/l	0.1	0.145	0.045	0.055	0.02	0.07	0.03	0.02	0.025	0.03	0.035	0.04	0.035	0.035	0.065
Mo ug/l	24.	14.	8.	10.	2.	6.	2.	2.	2.	2.	6.	4.	2.	4.	6.
Na mg/l	1.29	1.64	0.38	0.55	0.06	0.56	0.18	0.16	0.12	0.13	0.23	0.2	0.2	0.39	0.33
Ni ug/l	5.	10.	5.	5.	5.	5.	5.	5.	5.	5.	5.	10.	5.	5.	5.
P ug/l	70.	80.	10.	10.	30.	30.	20.	30.	10.	10.	40.	10.	10.	10.	70.
Pb ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	28.	8.	2.	2.	2.
Sb ug/l	2.	16.	2.	2.	2.	2.	2.	2.	2.	2.	8.	2.	2.	2.	2.
Se ug/l	120.	125.	5.	5.	5.	5.	5.	5.	25.	10.	45.	5.	5.	10.	5.
Si mg/l	7.32	9.68	2.54	4.08	1.	4.73	1.54	1.42	1.4	1.46	1.76	1.79	1.28	1.41	1.71
Sn ug/l	2.	328.	88.	2.	2.	2.	2.	2.	58.	50.	2.	2.	34.	12.	2.
Sr ug/l	98.	114.	18.	20.	2.	30.	8.	10.	8.	6.	14.	12.	8.	10.	14.
Tl ug/l	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
V ug/l	1.	3.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
Zn ug/l	473.	492.	114.	126.	43.	176.	58.	51.	3.	1.	66.	96.	68.	64.	145.
pH	6.52	5.87	5.99	5.9	6.42	6.1	6.03	6.26	6.43	6.31	6.14	6.1	6.14	6.13	5.95
Redox (mV)	367.	332.	306.	321.	281.	335.	310.	316.	362.	297.	315.	307.	312.	315.	352.
Conductivity (uS/cm)	169.	193.	51.	57.	19.	63.	23.	17.	20.	21.	28.	29.	25.	27.	39.
Alkalinity (mg $CaCO_3$/l)	7.	3.	2.	3.	3.	2.	3.	2.	3.	3.	2.	2.	2.	2.	3.
Acidity (pH 4.5)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Acidity (pH 8.3)	8.	9.	4.	4.	3.	3.	2.	2.	2.	2.9	2.9	2.9	3.	3.	4.
Cum Acidity (pH 8.3)	0.4	0.9	1.	1.2	1.3	1.5	1.6	1.7	1.7	1.9	2.1	2.2	2.4	2.5	2.7
Sulphate (mg/l)	59.	66.	13.	15.	7.	15.	6.	5.	5.	5.	7.	7.	4.	6.	10.
Cum Sulphate (mg/kg)	2.6	6.3	6.9	7.4	7.7	8.4	8.7	9.	9.2	9.5	9.9	10.3	10.4	10.7	11.3
Water added (L)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
pH of water added	5.45	6.26	5.98	5.59	6.15	6.03	5.83	5.98	6.15	6.05	5.96	6.04	6.06	6.56	6.23
Leachate collected (L)	0.166	0.207	0.157	0.128	0.181	0.168	0.188	0.194	0.162	0.209	0.198	0.206	0.179	0.186	0.206
Cumulative Iron	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15
Cumulative Copper	302.2	582.2	649.6	713.	736.6	820.4	851.8	879.8	922.2	965.8	1,028.4	1,110.2	1,170.	1,239.	1,341.2

Sample PW-2 - Kinetic Test Data

Parameter	Cycle 16	Cycle 17	Cycle 18	Cycle 19	Cycle 20	Cycle 21	Cycle 22	Cycle 23	Cycle 24	Cycle 25	Cycle 26	Cycle 27	Cycle 28	Cycle 29
Ag ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Al mg/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
As ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
B ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ba ug/l	0.014	0.015	0.011	0.012	0.015								0.025	0.035
Be ug/l	<0.005	<0.005	<0.005	<0.005	<0.005								<0.005	<0.005
Bi ug/l	<0.10	<0.10	<0.10	<0.10	<0.10								<0.10	<0.10
Ca mg/l	1.06	1.09	0.51	0.548	0.761								1.02	2.02
Cd ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
Co ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cr ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Cu ug/l	28.1	24.4	16.5	16.4	17.								22.	32.
Fe mg/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
K mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Li ug/l	<0.015	<0.015	<0.015	<0.015	<0.015								<0.015	<0.015
Mg mg/l	0.097	0.101	0.054	<0.050	0.093								0.086	0.188
Mn mg/l	0.02	0.021	0.013	0.017	0.019								0.03	0.044
Mo ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Na mg/l	<2.0	<2.0	<2.0	<2.0	<2.0								<2.0	<2.0
Ni ug/l	<0.020	<0.020	<0.020	<0.020	<0.020								<0.020	<0.020
P ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Pb ug/l	<0.050	<0.050	<0.050	<0.050	<0.050								<0.050	<0.050
Sb ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Se ug/l	<0.20	<0.20	<0.20	<0.20	<0.20								<0.20	<0.20
Si mg/l	0.685	0.991	0.377	0.458	0.567								0.364	0.686
Sn ug/l	<0.30	<0.30	<0.30	<0.30	<0.30								<0.30	<0.30
Sr ug/l	0.008	0.009	0.006	<0.001	0.011								0.007	0.013
Tl ug/l	<0.010	<0.010	<0.010	<0.010	<0.010								<0.010	<0.010
V ug/l	<0.030	<0.030	<0.030	<0.030	<0.030								<0.030	<0.030
Zn ug/l	0.038	0.04	0.023	0.027	0.04								0.058	0.077
pH	6.23	6.4	6.17	6.19	5.35								6.31	6.03
Redox (mV)	327.	326.	316.	308.	294.								340.	332.
Conductivity (uS/cm)	32.	12.	6.	6.	8.								11.	19.
Alkalinity (mg $CaCO_3$/l)	3.	3.	3.	2.	1.								2.	2.
Acidity (pH 4.5)	0.	0.	0.	0.	0.								0.	0.
Acidity (pH 8.3)	2.	2.	3.	4.	6.								11.9	11.9
Cum Acidity (pH 8.3)	2.9	3.	3.1	3.3	3.7								4.3	5.
Sulphate (mg/l)	3.	3.	3.	4.	4.								3.	4.
Cum Sulphate (mg/kg)	11.5	11.6	11.8	12.	12.2								12.4	12.6
Water added (L)	0.2	0.2	0.2	0.2	0.2								0.2	0.2
pH of water added	5.92	5.57	5.66	6.09	5.23								5.93	5.7
Leachate collected (L)	0.171	0.178	0.188	0.177	0.211								0.175	0.22
Cumulative Iron	0.15	0.15	0.15	0.15	0.15								0.15	0.15
Cumulative Copper	1,369.3	1,393.7	1,410.2	1;426.6	1,443.6								1,465.6	1,497.6

Laboratory Equipment Failure
Weeks 21-27
No Samples Collected

Appendix E

Appendix E-1
SHB Permeability Data

Appendix E-2
Tailings Impoundment Liner Material Hydrometer Analysis and Gradation Plot

Appendix E-3
Geotechnical Boring Logs andGeotechnical Analytical Data Sheets

Appendix E-1

SHB Permeability Data

Tailings Dam & Pond
Quintana Minerals Corporation
Copper Flat Project
Hillsboro, New Mexico
SHB Job No. E76-1100

TABLE 1A - RESULTS OF IN-PLACE PERMEABILITY TESTS

Well Permeameter Tests,
U. S. Bureau of Reclamation Designation E-19

Boring No.	Soil Description	Interval Tested	Permeability (ft/yr)
17A	clayey sand	5'-15'	12.0
20A	clayey sand	10'-25'	3.0
22A	sandy clay	1'-9'	7.5
24A	silty clay	15'-25'	18.0
26A	silty clay, basalt	5'-15'	11.0
27A	silty sand, gravel	15'-30'	2.2
28A	clayey sand & gravel, basalt	5'-12½'	46.0
29A	sandy clay, silty sand, clayey sand & gravel	5'-13'	18.0
101A	clayey sand & gravel	1'-12'	32.0
106A	clayey sand & gravel	1'-15'	2.0
111A	sand, gravel, cobbles with clay	2'-15'	2.3
114A	sand, gravel & cobbles	5'-12½'	17.0
119A	sand & gravel with clay	5'-15'	6.6
122A	basalt	5'-11'	38.0
134A	sand, gravel, cobbles with clay	5'-15'	7.0

Tailings Dam & Pond
Quintana Minerals Corporation
Copper Flat Project
Hillsboro, New Mexico
SHB Job No. E76-1100

TABLE 1A - FIELD PERMEABILITY TESTS IN BORINGS

U. S. Bureau of Reclamation Designation E-18

Boring No.	Soil Description	Interval Tested	Equivalent Head	Permeability (ft/yr)
18	silty clay	10'-20'	38.0'	0
21	silty clay	15'-25'	43.0'	0
		15'-25'	55.0'	0
		15'-25'	66.0'	0
24	silty clay	15'-25'	43.0'	72.0*
		15'-25'	55.0'	114.0*
		15'-25'	66.0'	135.0*
26	basalt	10'-20'	61.0'	46.0
	brecciated basalt	22½'-32½'	50.0'	169.0
		22½'-32½'	62.0'	192.0
		22½'-32½'	74.0'	372.0
28	basalt	41'-51'	69.0'	410.0
	basalt	45'-55'	73.0'	212.0

*Packer leakage noted

TABLE 1A - LONG-TERM FALLING HEAD TESTS

(Piezometer Method)

Navy Design Manual - NAVFAL DM-7

Boring No.	Soil Description	Interval Tested	Permeability (ft/yr)
17	clayey sand	20'-30'	61.0**
27B	clayey sand & gravel	31'-41'	6.0
29B	clayey sand	70'-80'	5.0

**Calculated by modified U. S. Bureau of Reclamation Designation E-18

Appendix E-2

Tailings Impoundment Liner Material Hydrometer Analysis and Gradation Plot

HYDROMETER ANALYSIS DATA SHEET

Name RAUGUST/KEDANIC **Group No.** 1

Project COPPER FLAT

Visual Description RED SILTY CLAY

Dispersing Agent: 0.4 N Calgon - 15 ml

Soil Specific Gravity________

Date 5/3/03

Specimen________

Hydrometer No. B

Calibration line________

Weight of dry soil 50.2 **g**

Corrections to readings: **Dispersing Agent:** **- 1.0**

Meniscus: **- 1.0 (read top of meniscus)**

Elapsed Time (min)	Temp. EC	Hydrometer Reading R'	Temperature Correction m	Corrected Reading R	Reading Height From Neck H_R	Particle Diameter (mm)	Percent Finer	
							Partial PPF %	Total TPF %
0.5	20°C	40 43 43	0	42	10.44	0.058	83.4	80.6
1.0	20°C	42 42 41	0	41.67	10.50	0.044	82.8	80.0
2.0	20°C	38 38 38	0	38	11.16	0.031	75.5	72.9
4.0	20°C	35	0	35	11.70	0.022	69.5	67.1
8.0 8½	20°C	32	0	32	12.24	0.016	63.5	61.3
15.0 15.35	20°C	29	0	29	12.78	0.013	57.6	55.6
30.15	20°C	27	0	27	13.14	0.009	53.6	51.8
60.0	19.5	22	-0.1	21.9	14.06	0.0065	43.2	42.2
120.0	19	6	-0.2	5.8	16.96	0.0052	11.0	10.6
240.0	19	2	-0.2	1.8	17.68	0.0037	3.0	2.9
543.0	18.5	2	-0.3	1.7	17.69	0.0024	2.6	2.5
1217	18.5	1	-0.3	0.7	17.87	0.0016	0.6	0.6

Weight of dry soil used in hydrometer test **W_s** 50.2 **g**

Weight of dry soil used for sieving and hydrometer tests (combined analysis) **W** ______ **g**

Total weight of dry soil retained on the no. 200 sieve (combined anlaysis) **W_r** ______ **g**

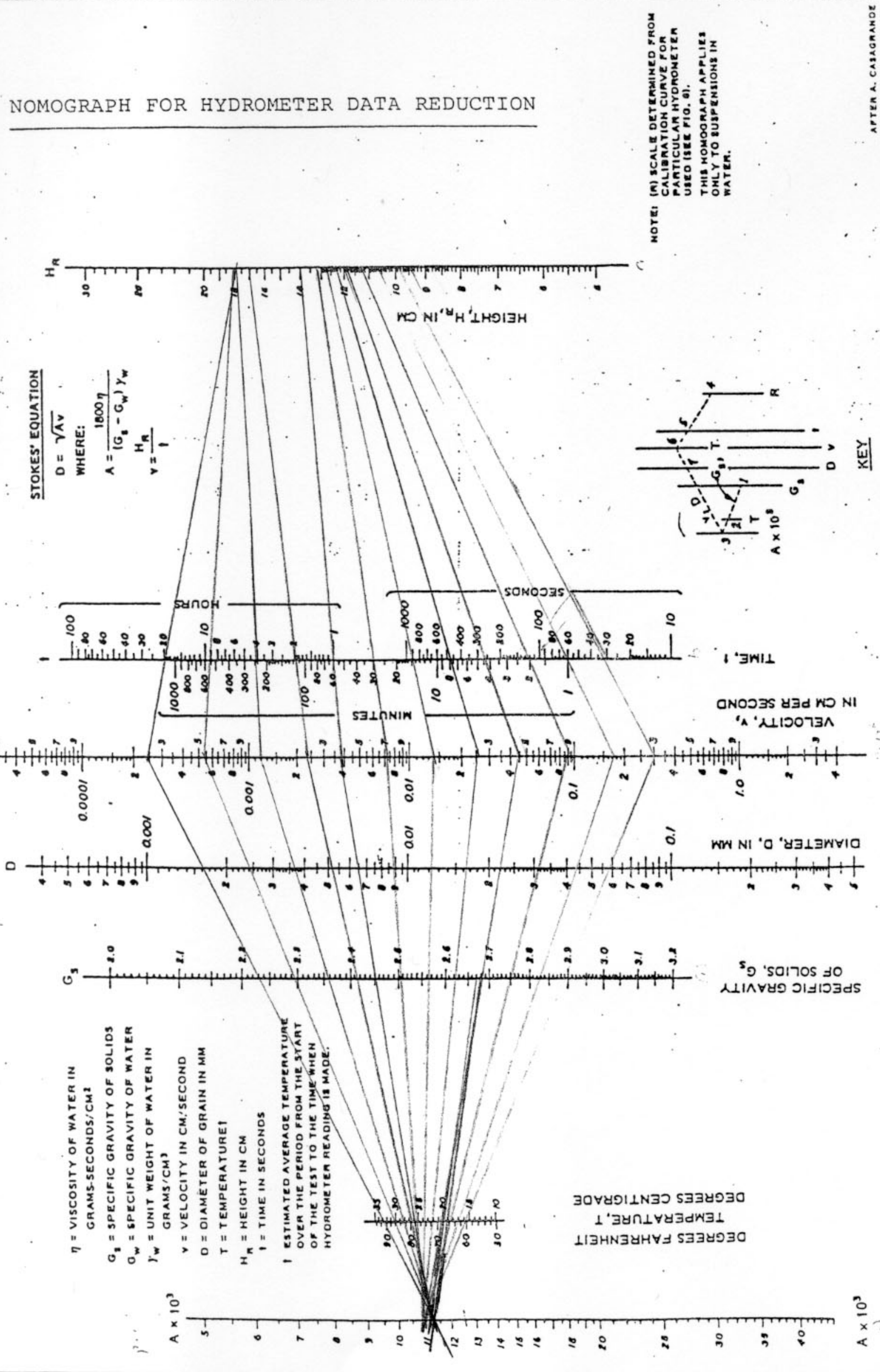
NOTE: PPF is used when only the hydrometer test is performed on the sample
TPF is computed only for combined analysis

Partial Percent Finer **PPF = R (100) / W_s** **Total Percent Finer** **TPF = PPF (W - W_r) / W**

Remarks:

Checked by________ **Date**________

NOMOGRAPH FOR HYDROMETER DATA REDUCTION



STOKES' EQUATION

$$D = \sqrt{Av}$$

WHERE:

$$A = \frac{1800\,\eta}{(G_s - G_w)\,\gamma_w}$$

$$v = \frac{H_R}{t}$$

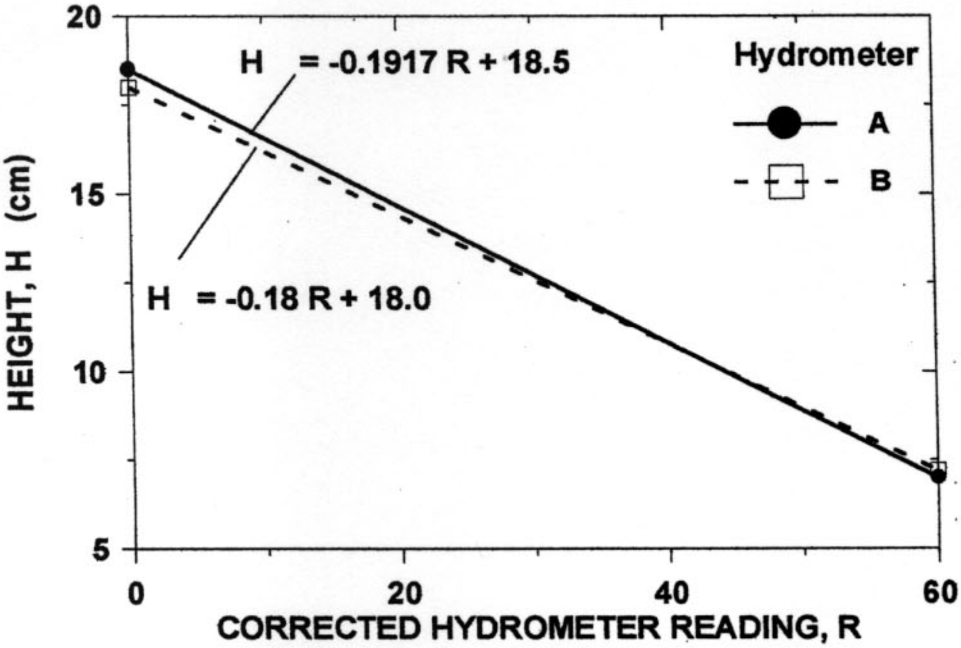
η = VISCOSITY OF WATER IN GRAMS-SECONDS/CM²
G_s = SPECIFIC GRAVITY OF SOLIDS
G_w = SPECIFIC GRAVITY OF WATER
γ_w = UNIT WEIGHT OF WATER IN GRAMS/CM³
v = VELOCITY IN CM/SECOND
D = DIAMETER OF GRAIN IN MM
T = TEMPERATURE†
H_R = HEIGHT IN CM
t = TIME IN SECONDS

† ESTIMATED AVERAGE TEMPERATURE OVER THE PERIOD FROM THE START OF THE TEST TO THE TIME WHEN HYDROMETER READING IS MADE.

NOTE: (R) SCALE DETERMINED FROM CALIBRATION CURVE FOR PARTICULAR HYDROMETER USED (SEE FIG. 6).

THIS NOMOGRAPH APPLIES ONLY TO SUSPENSIONS IN WATER.

HYROMETER CALIBRATION EQUATIONS



TEMPERATURE CURRECTION FACTORS, m
FOR HYDROMETER DATA REDUCTION

Degrees	Degrees	Correction	Degrees	Degrees	Correction	Degrees	Degrees	Correction
C	F	m	C	F		C	F	m
14	57.2	-0.9	21	69.8	0.2	28	82.4	1.8
14.5	58.1	-0.8	21.5	70.7	0.3	29	84.2	2.1
15	59	-0.8	22	71.6	0.4	29.5	85.1	2.2
15.5	59.9	-0.7	22.5	72.5	0.5	30	86	2.3
16	60.8	-0.6	23	73.4	0.6	30.5	86.9	2.5
16.5	61.7	-0.6	23.5	74.3	0.7	31	87.8	2.6
17	62.6	-0.5	24	75.2	0.8	31.5	88.7	2.8
17.5	63.5	-0.4	24.5	76.1	0.9	32	89.6	2.9
18	64.4	-0.4	25	77	1	32.5	90.5	3
18.5	65.3	-0.3	25.5	77.9	1.1	33	91.4	3.2
19	66.2	-0.2	26	78.8	1.3	33.5	92.3	3.3
19.5	67.1	-0.1	26.5	79.7	1.4	34	93.2	3.5
20	68	0	27	80.6	1.5			
20.5	68.9	0.1	27.5	81.5	1.6			

SIEVE ANALYSIS DATA SHEET

Name	Tailings Impoundment Liner Material	**Date**	5/5/03
Project	Copper Flat	**Specimen No.**	SR-1
Visual Description	Red clayey silt		
Total Sample Mass (g)	94.30	**Group No.**	NA

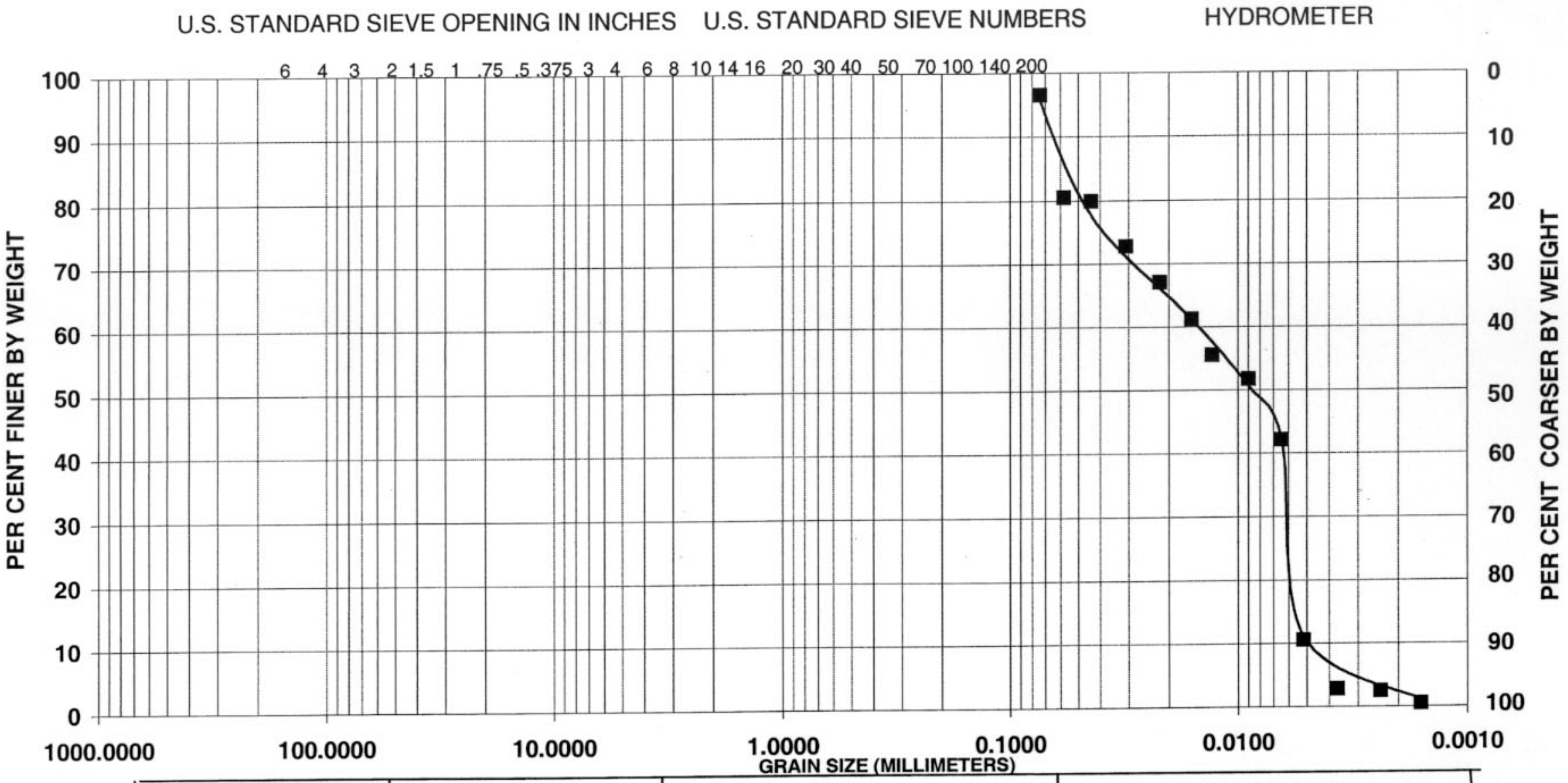
Sieve Opening		**U.S. Standar**	**Weight**	**Percent Retained**		**Percent Finer**
(in)	**(mm)**	**Seive No.**	**Retained**	**Partial**	**Cumulative**	**by weight**
0.187	**4.76**	**4**	0	0.00	0.00	100.00
0.0029	**0.074**	**200**	3.2	3.39	3.39	96.61
	0.058					80.60
	0.044					80.00
	0.031					72.90
	0.022					67.10
	0.016					61.30
	0.013					55.60
	0.009					51.80
	0.0065					42.20
	0.0052					10.60
	0.0037					2.90
	0.0024					2.50
	0.0016					0.60
	Pan		91.1			
	Total mass (g)		94.3			

Partial percent retained= weight retained on a sieve/total weigl
Cumulative percent retained=cumulative partial percent retain
Percent finer by weight=100-cumulative percent retained

D_{60} NA
D_{30} NA
D_{10} NA

C_u NA
C_c NA

Checked By ____________________ **Date** ________________



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE	DEPTH	W %	LL	PL	PI	VISUAL DISCRIPTION	USCS	NEW MEXICO TECH
						Red clayey silt		PROJECT: Copper Flat Liner Material LOCATION: NM Tech BORING NO.: DATE: 5/5/03 TECHNICIAN: Raugust

Percent Sand and Fines
And Swell Test

Total soil (Dry) = 94.3 g

>#200 = 3.2 g

< #200 = 91.1 g

percent retained #200 = 3.2/94.3 X 100 = 3.4 percent

Percent passing #200 = 91.1/94.3 x 100 = 96.6 percent.

Swell Test

original dry material = 10 ml

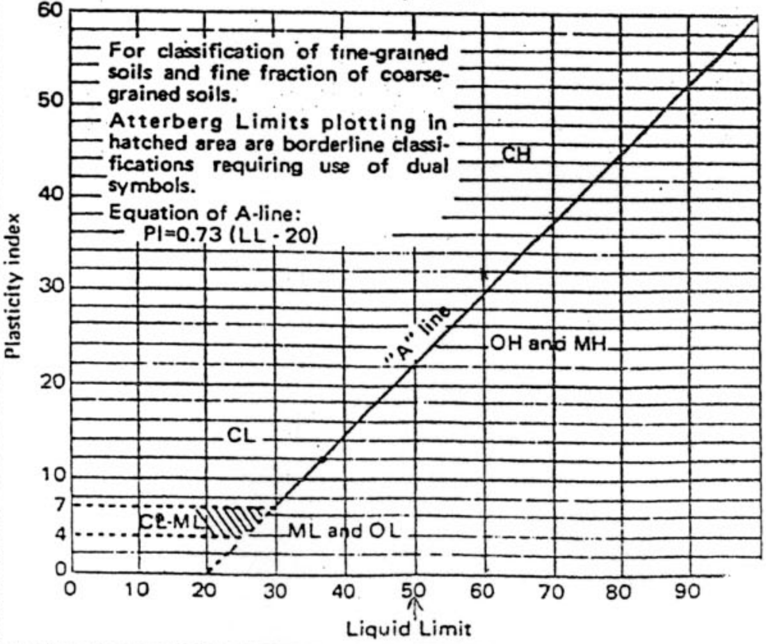
after 24 hours submerged by water = 16 ml

Percent difference = (16-10)/10 x 100 = 60 percent.

Appendix E-3

Geotechnical Boring Logs andGeotechnical Analytical Data Sheets

UNIFIED SOIL CLASSIFICATION SYSTEM

Major divisions			Group symbols		Typical names	Laboratory classification criteria		
Coarse-grained soils (More than half of material is *larger* than No. 200 sieve size)	Gravels (More than half of coarse fraction larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 per cent . . . . GW, GP, SW, SP More than 12 per cent . . . . GM, GC, SM, SC 5 to 12 per cent . . . . *Borderline* cases requiring dual symbols	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM	d	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with between 4 and 7 are *derline* cases requiring of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM	d	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatch zone with P.I. between and 7 are *borderline* ca requiring use of dual sy bols.
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half of material is *smaller* than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart 		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays of high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
Highly organic soils			Pt		Peat and other highly organic soils	SOIL TESTING SERVICES, INC. NORTHBROOK ILLINOIS 60062		

For classification of fine-grained soils and fine fraction of coarse-grained soils.

Atterberg Limits plotting in hatched area are borderline classifications requiring use of dual symbols.

Equation of A-line:

PI=0.73 (LL - 20)

PROJECT Tailings Dam Investigation Copper Flat Project

LOG OF TEST PIT NO. A

JOB NO. E76-1023 DATE 4-2-76

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM

Depth in Ft.	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM		SILTY SAND, predominantly fine, low plasticity, brown
5			☒	A				CL		SILTY CLAY, medium to high plasticity, reddish brown
10			☒	A				GC		CLAYEY SAND & GRAVEL, predominantly medium, interbedded with caliche, medium plasticity, reddish brown mottled with white
15										Stopped backhoe at 14'6"
20										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

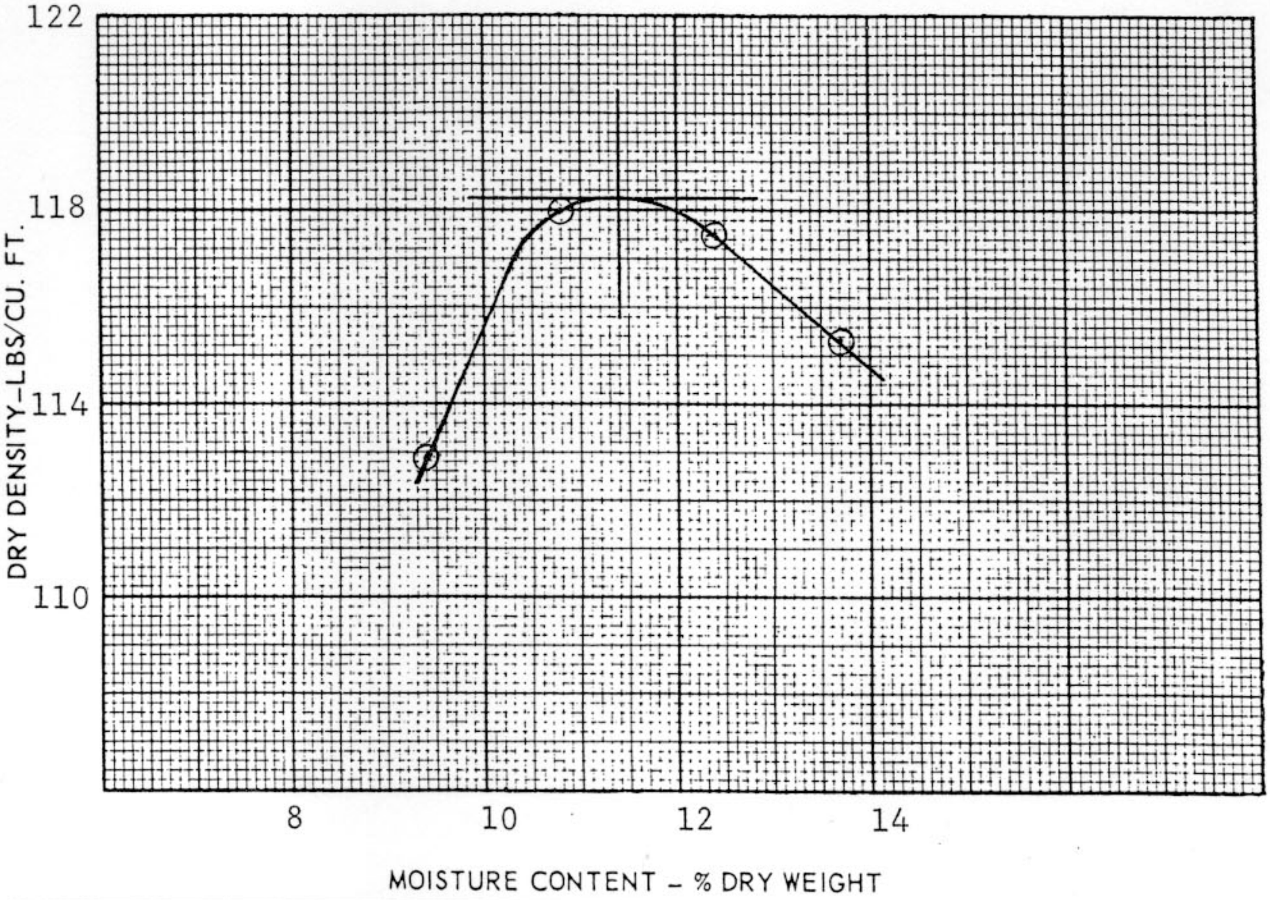
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.

SERGENT, HAUSKINS & BECKWI
CONSULTING SOIL AND FOUNDATION ENGINEE

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT Tailings Dam Investigation Copper Flat Project **JOB NO.** E76-1023

CLIENT ______ **LAB NO.** 1023-1



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
	Pit A @ 2½'-6'	11.4	118.2	ASTM D1557	D	1023-1

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHTO T 99-74 and ASTM D 698-70 (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

AASHTO T 180-74 and ASTM D 1557-70 (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

REPORT OF LABORATORY TESTS

DATE

PROJECT Tailings Dam Investigation Copper Flat Project
JOB NO. E76-1023
LOCATION Hillsboro, New Mexico
LAB NO. 1023-1
SAMPLE Test Pit A @ 2½'-6'

REMOLDED PERMEABILITY

INITIAL DATA

Maximum Dry Density	118.2	PCF
Optimum Moisture	11.4	%
Initial Dry Density	112.0	PCF
Initial Moisture Content	11.4	%
Degree of Maximum Density	94.8	%
Specific Gravity	2.675	
Volume of Specimen	1016	cc
Head	319.2	inches

AFTER TEST DATA

Moisture Content	26.1	%
Dry Density	108.2	PCF
Percent Saturation	100.0+	%
Coefficient of Permeability	$1.77\text{x}10^{-6}$	cm/sec
	1.83	ft/yr

Note: Thickener underflow from the breccia bulk flotation pilot plant studies used in test.

Tailings Dam Investigation
ROJECT Copper Flat Project
OB NO. E76-1023 DATE 4-2-76

LOG OF TEST PIT NO. E

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM

Depth, eet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CH -		CLAY, high plasticity, reddish brown
		▨	☒	A				CL		SANDY CLAY, low to medium plasticity, reddish brown
5										Stopped backhoe at 5'
10										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2'' O.D. 1.38'' I.D. tube sample.
U – 3'' O.D. 2.42'' I.D. tube sample.
T – 2'' O.D. thin-walled Shelby tube.

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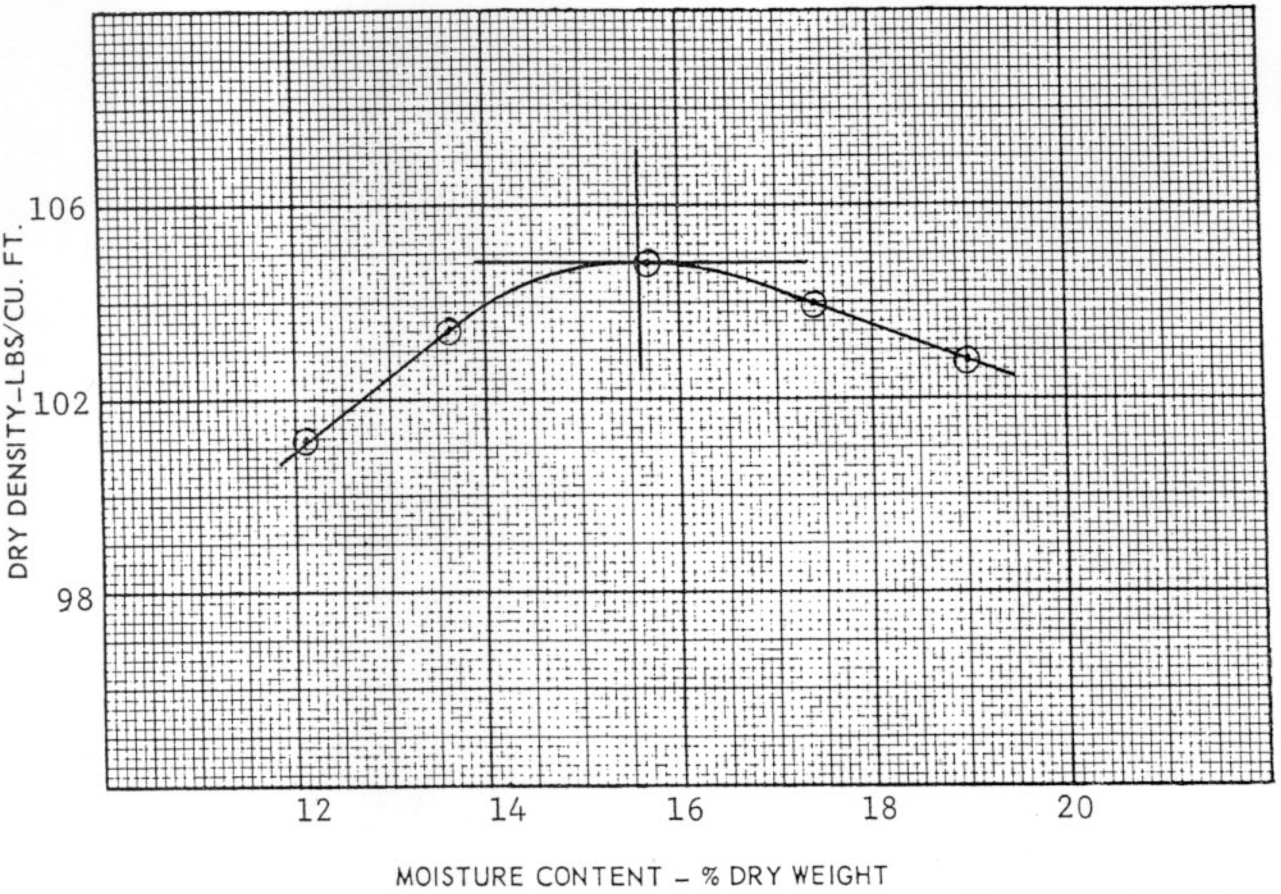
SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT Tailings Dam Investigation Copper Flat Project JOB NO. E76-1023

CLIENT LAB NO. 1023-6



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
	Pit E @ 2'-5'	15.6	104.8	ASTM D1557	D	1023-6

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHTO T 99-74 and ASTM D 698-70 (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4''	4.58''	3	25	5.5 LBS.	12''	12,375
B	-#4	6''	4.58''	3	56	5.5 LBS.	12''	12,317
C	-3/4	4''	4.58''	3	25	5.5 LBS.	12''	12,375
D	-3/4	6''	4.58''	3	56	5.5 LBS.	12''	12,317

AASHTO T 180-74 and ASTM D 1557-70 (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4''	4.58''	5	25	10.0 LBS.	18''	56,250
B	-#4	6''	4.58''	5	56	10.0 LBS.	18''	55,986
C	-3/4	4''	4.58''	5	25	10.0 LBS.	18''	56,250
D	-3/4	6''	4.58''	5	56	10.0 LBS.	18''	55,986

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REPORT OF LABORATORY TESTS

DATE

PROJECT Tailings Dam Investigation Copper Flat Project JOB NO. E76-1023

LOCATION Hillsboro, New Mexico LAB NO. 1023-1

SAMPLE Test Pit E @ 2'-5'

REMOLDED PERMEABILITY

INITIAL DATA

Maximum Dry Density	104.8	PCF
Optimum Moisture	15.6	%
Initial Dry Density	99.6	PCF
Initial Moisture Content	15.6	%
Degree of Maximum Density	95.0	%
Specific Gravity	2.675	
Volume of Specimen	2085	cc
Head	316.1	inches

AFTER TEST DATA

Moisture Content	28.9	%
Dry Density	96.9	PCF
Percent Saturation	100.0+	%
Coefficient of Permeability	$2.86 \mathrm{x} 10^{-7}$	cm/sec
	0.29	ft/yr
Time Duration of Testing	198	hours

Note: Thickener underflow from the breccia bulk flotation pilot plant studies used in test.

PROJECT Tailings Dam Investigation
Copper Flat Project

JOB NO. E76-1023 DATE 4-2-76

LOG OF TEST PIT NO. F

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML		SILT, very fine, low plasticity, light brown
5			☒	A				CH		alternating layers of CLAY & SILT, high plasticity, dark reddish brown
								GM⁻		SILTY SAND & GRAVEL, predominantly fine, occasional basaltic boulders, subangular, nonplastic, brown
10										Stopped backhoe at 10'
15										

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample

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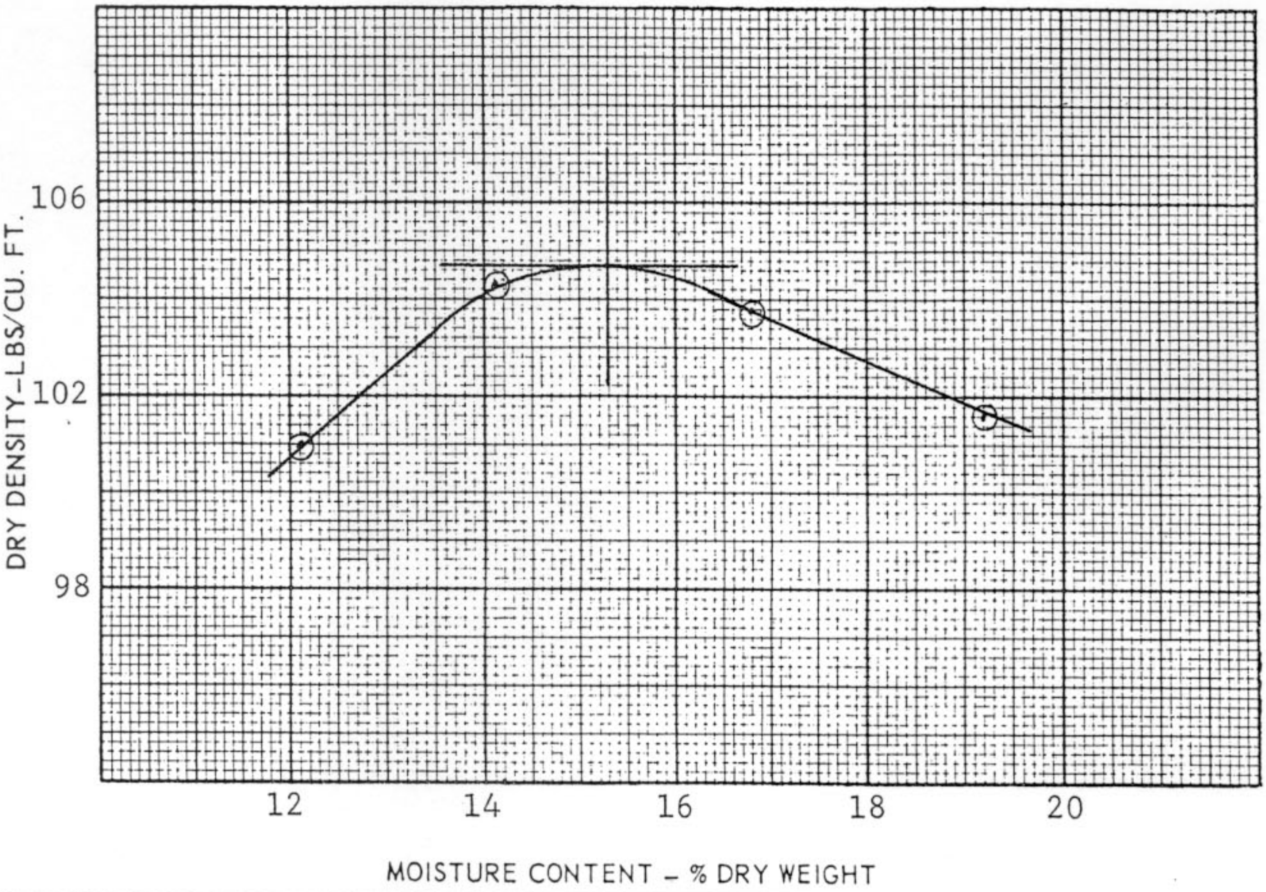
SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT Tailings Dam Investigation Copper Flat Project JOB NO. E76-1023

CLIENT LAB NO. 1023-7



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
	Pit F @ 2'-5'	15.3	104.7	ASTM D1557	D	1023-7

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHTO T 99-74 and ASTM D 698-70 (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4''	4.58''	3	25	5.5 LBS.	12''	12,375
B	-#4	6''	4.58''	3	56	5.5 LBS.	12''	12,317
C	-3/4	4''	4.58''	3	25	5.5 LBS.	12''	12,375
D	-3/4	6''	4.58''	3	56	5.5 LBS.	12''	12,317

AASHTO T 180-74 and ASTM D 1557-70 (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4''	4.58''	5	25	10.0 LBS.	18''	56,250
B	-#4	6''	4.58''	5	56	10.0 LBS.	18''	55,986
C	-3/4	4''	4.58''	5	25	10.0 LBS.	18''	56,250
D	-3/4	6''	4.58''	5	56	10.0 LBS.	18''	55,986

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REPORT OF LABORATORY TESTS

DATE

PROJECT Tailings Dam Investigation
Copper Flat Project
JOB NO. E76-1023

LOCATION Hillsboro, New Mexico
LAB NO. 1023-2

SAMPLE Test Pit F @ 2'-5'

REMOLDED PERMEABILITY

INITIAL DATA

Maximum Dry Density	104.7	PCF
Optimum Moisture	15.3	%
Initial Dry Density	99.5	PCF
Initial Moisture Content	15.3	%
Degree of Maximum Density	95.0	%
Specific Gravity	2.675	
Volume of Specimen	2085	cc
Head	881.8	inches

AFTER TEST DATA

Moisture Content	32.1	%
Dry Density	98.02	PCF
Percent Saturation	100.0+	%
Coefficient of Permeability	2.11×10^{-8}	cm/sec
	0.022	ft/yr
Time Duration of Testing	198	hours

Note: Thickener underflow from the breccia bulk flotation pilot plant studies used in test.

PROJECT Tailings Dam Investigation

JOB NO. E76-1023 DATE 3-24-76

LOG OF TEST BORING NO. 1

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in ft	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	30		16	CH	firm	CLAY, high plasticity, reddish brown
									hard	SILTY CLAY, medium plasticity, reddish brown
5			☒	S	73		16	CL		
10			☒	U	67		13			
									hard	CLAYEY SILT, medium plasticity, brown
15			☒	S	92		17			
20			☒	S	50/5"		11	ML		
25			☒	S	50/3"		9			
			☒	S	50/4"		11			
30										Stopped auger at 29'6" Sampler refused at 29'10"
35										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

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TABULATION OF TEST RESULTS

Job No. E76-1023

Project Tailings Dam Investigation, Copper Flat Project
Hillsboro, New Mexico

Material

Source

HOLE NO.	LOCATION	DEPTH	UNIFIED CLASS.	LL	PI	SIEVE ANALYSIS – ACCUM. % PASSING												LAB. NO.
						200	100	40	16	10	4	1/4	3/8	3/4	1	1½	2	
1	See Site Plan	5'	CL	42	18	72	89	100										23-8
1	See Site Plan	15'	ML	49	20	74	89	98		100								23-9
2	See Site Plan	1'	GC	55	28	23	30	38		51	61		74	84	100			23-10
2	See Site Plan	20'	SC	33	13	34	47	61		76	84		92	100				23-11
2	See Site Plan	35'	SC	32	13	36	51	67		84	94		100					23-12
4	See Site Plan	1'	CL	41	22	72	78	86		98	100							23-13
5	See Site Plan	1'	SC	32	16	46	53	63		78	86		93	100				23-14
5	See Site Plan	10'	ML	39	14	93	96	98		99	100							23-15
5	See Site Plan	20'	CH	79	47	82	92	98		100								23-16
5	See Site Plan	35'	ML	40	14	74	89	99		100								23-17
5	See Site Plan	60'	CH	55	29	96	99	100										23-18
6	See Site Plan	1'	CL	41	19	83	93	99		100								23-19
6	See Site Plan	5'	CL	35	16	56	64	75		90	96		98	100				23-20
7	See Site Plan	42'	CH	54	27	91	96	99		100								23-21
9	See Site Plan	1'	SC	33	13	44	52	62		78	88		96	100				23-23

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PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 9-1-76

LOG OF TEST BORING NO. 18

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	S	20		17	CH	firm to hard	GRAVEL littered surface SILTY CLAY, some sand, medium to high plasticity, reddish-brown note: occasional seam of clayey silt, medium plasticity, reddish-tan
5		▨	☒	S	33		18			
10		▨	☒	S	38					
15		▨	☒	S	50/5½"		22			
20		▨	☒	S	50/5½"		16			
25		▥	☒	S	85		23	ML	hard	CLAYEY SILT, some fine sand, medium plasticity, light brown
30		▥	☒	S	50/4"		20	ML	hard	SANDY SILT, considerable lime, low plasticity, light tan
35		▧	☒	S	50/4"			CL	hard	SILTY CLAY, some fine sand, medium plasticity, light brown
40		▧	☒	S	50/5½"		13		hard	SANDY SILT, low plasticity, light brown CLAYEY SAND & GRAVEL, occasional cobble, decomposed, low plasticity, brown
45		▥	☒	S	50/2"		11	ML		
50		▩	☒	S	50/2"		19	SC		Stopped auger at 49'6" Sampler refused at 49'8"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.

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Job No. E76-1100 **Date** ______

Client:

Project Copper Flat Tailings Dam & Pond
Hillsboro, New Mexico

Material ______

Source ______

HOLE NO.	LOCATION	DEPTH	UNIFIED CLASS.	L L	P I	SIEVE ANALYSIS – ACCUM. % PASSING												LAB. NO.
						200	100	40	16	10	4	¼	⅜	¾	1	1½	moist.	
17	See Site Plan	½'	SC	35	18	43	50	64	78	84	92	94	97	100			5.2	1100-6
17	See Site Plan	9½'	SC	39	19	35	42	51	61	66	78	81	86	100			5.3	1100-8
17	See Site Plan	24½'	SC	39	20	20	24	32	45	53	66	70	78	100			4.5	1100-11
18	See Site Plan	9½'	CH	60	34	87	94	99	99	99	100						13.4	1100-20
18	See Site Plan	34½'	CL	40	20	68	82	91	95	96	98	99	100				8.2	1100-25
19	See Site Plan	14½-16'	SC	39	16	28	41	56		74	84		91	100				1100-3-1
19	See Site Plan	34½'-36'	SM-SC	35	10	21	35	84		99	100							1100-3-2
19	See Site Plan	49½-51'	MH	66	29	70	87	99		100								1100-3-3
20	See Site Plan	9½'	SC	36	14	23	30	41	52	59	74	80	88	97	100		4.3	1100-31
20	See Site Plan	39½'	CH	67	41	93	95	98	99	100							20.3	1100-37
20	See Site Plan	64½'	CH	57	31	79	95	99	100								21.3	1100-42
21	See Site Plan	29½'	CH-MH	51	23	67	83	98	99	100							14.5	1100-51
21	See Site Plan	54½'	CH-MH	60	30	92	98	99	100								16.9	1100-56
21	See Site Plan	74½'	CH	56	30	95	99	99	100								16.7	1100-60
21	See Site Plan	104½'	GC	40	20	22	25	32	42	48	61	64	72	100			9.5	1100-66

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TABULATION OF TEST RESULTS

Job No. E76-1023

Project Tailings Dam Investigation, Copper Flat Project
Hillsboro, New Mexico

Material

Source Backhoe Test Pits

HOLE NO.	LOCATION	DEPTH	UNIFIED CLASS.	LL	PI	SIEVE ANALYSIS – ACCUM. % PASSING												LAB. NO.
						200	100	40	16	10	4	¼	⅜	¾	1	2	3	
A	See Site Plan	2'-6½'	CL	45	25	61	67	76		91	97		99		100			23-1
A	See Site Plan	7'-9'	GC	45	24	17	20	26		39	48		57	69	72	76	100	23-2
B	See Site Plan	2'-5'	SC	34	16	47	54	86		98	99		100					23-3
C	See Site Plan	1'-5'	CL	43	22	67	77	90		98	99		100					23-4
C	See 'Site Plan	5½'-9'	SC	31	10	26	30	39		61	75		85		86	100		23-5
E	See Site Plan	2'-5'	CL	38	14	76	90	99		100								23-6
F	See Site Plan	2'-5'	CH	58	34	99	100											23-7

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Appendix F

Bulk XRD and Clay Mineralogy Distribution Data Scans and Calculations

Clay Mineralogy Calcualtions

General Calculation

T = total counts
S1g = smectite/mixed (glycolated)
I1g = Illite (glycolated)
K1 = Kaolinite (glycolated)
I1h = Illite (heated)

T = I1h + K1

Illite = I1g/T x 10

Smectite = (S1g/4)/T x 10

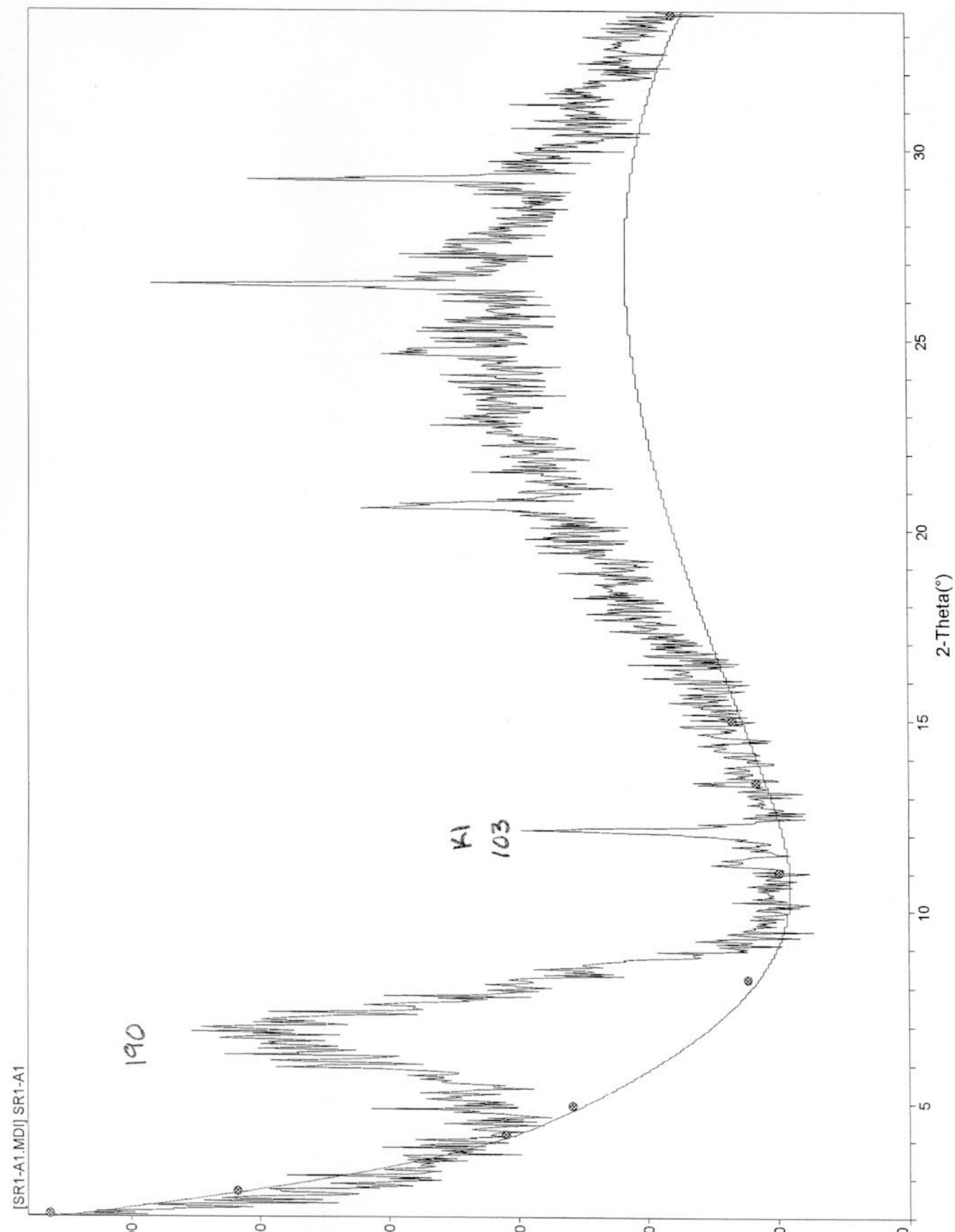
Mixed Layer (I/S) = (I1h - I1g - (S1g/4))/T x 10

Kaolinite = K1/T x10

Results are in parts in 10.

Calculations

Sample ID	I1h	K1	I1g	S1g	T	Illite	Smectite	Mixed layer (I/S)	Kaolinite	Total
SR-1, Calc1	327	103	0	267	430	0.0	1.6	6.1	2.4	10
SR-1, Calc2	318	100	0	245	418	0.0	1.5	6.1	2.4	10
SR-1, Calc3	363	100	0	253	463	0.0	1.4	6.5	2.2	10
SR3	156	35	42	0	191	2.2	0.0	6.0	1.8	10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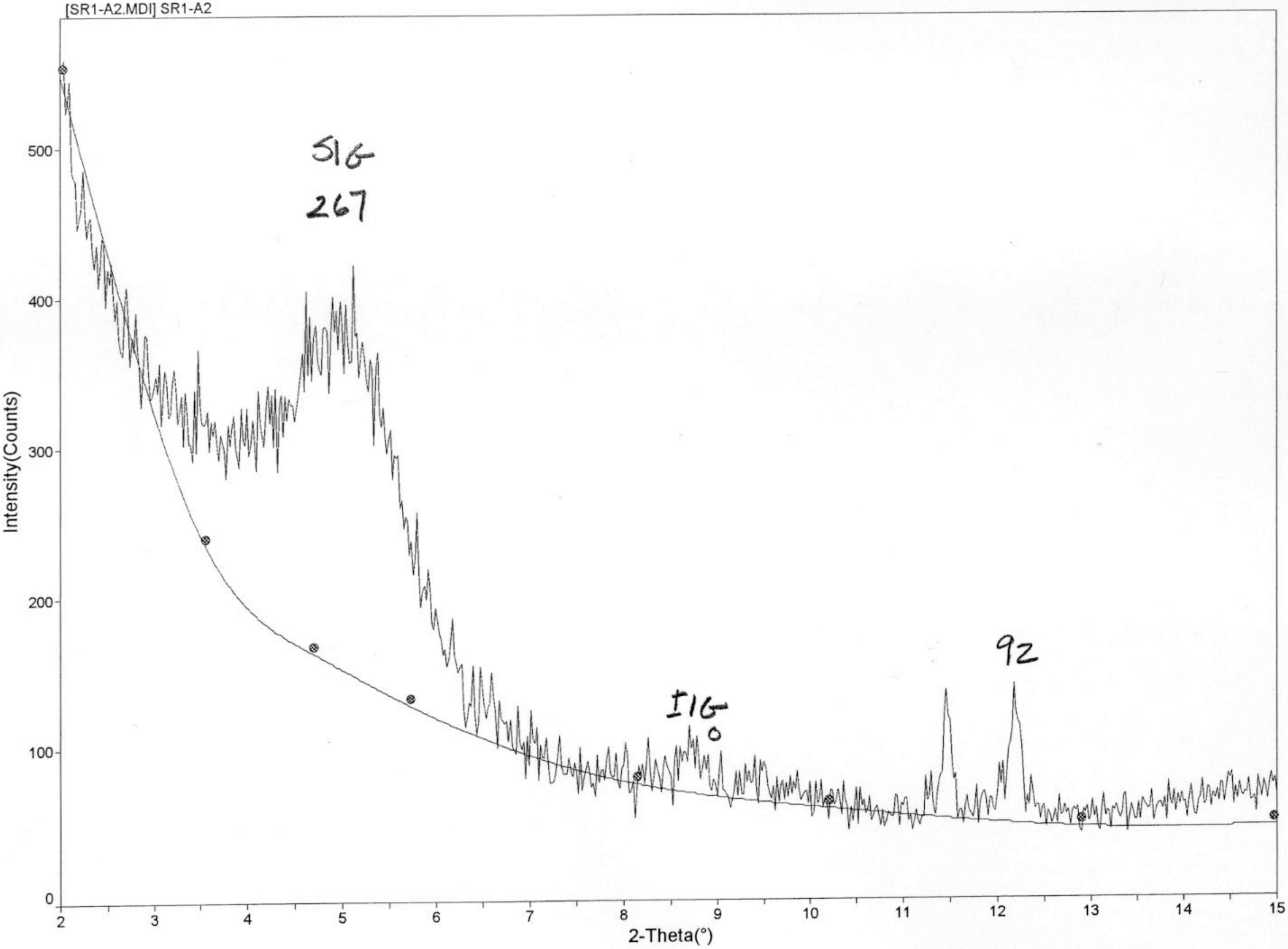
Intensity(Counts)
0
50
100
150
200
250
300
2-Theta(°)
5
10
15
20
25
30
190
K1
103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Intensity(Counts)
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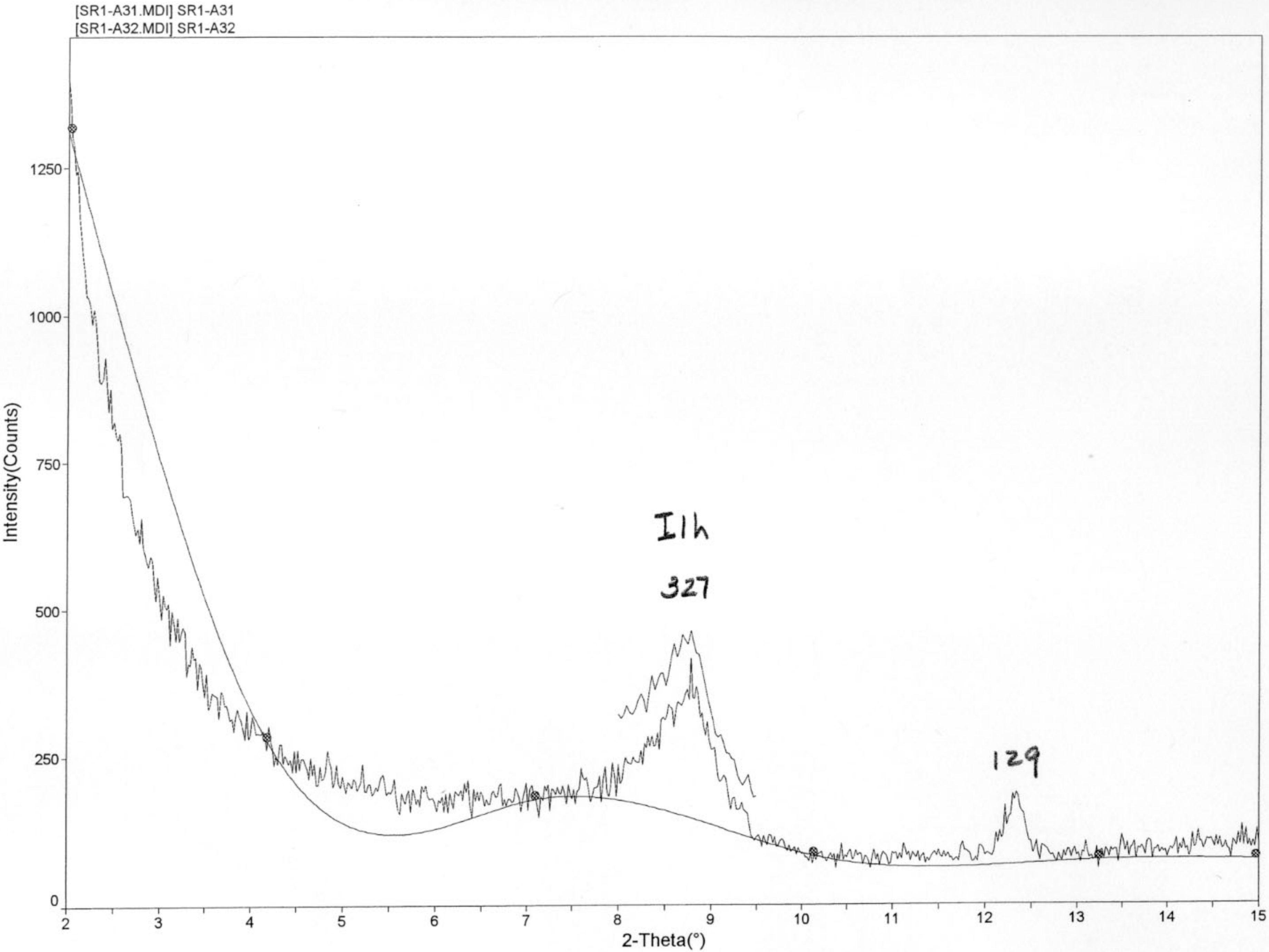
100
200
300
400
500
2-Theta(°)
2
3
4
5
6
7
8
9
10
11
12
13
14
15
516
267
116
0
92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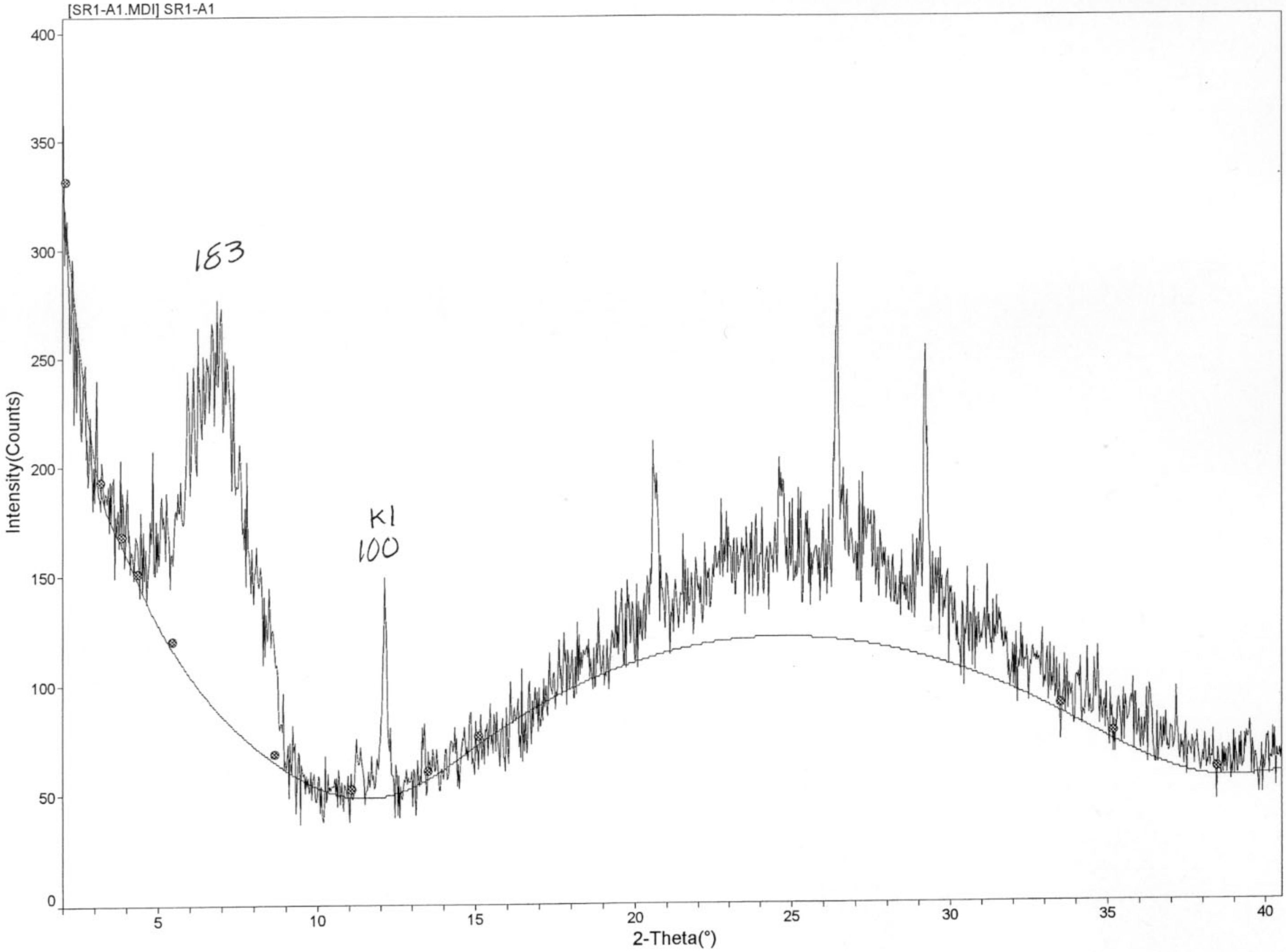
[SR1-A32.MDI] SR1-A32
Intensity(Counts)
0
250
500
750
1000
1250
2
3
4
5
6
7
8
9
10
11
12
13
14
15
2-Theta(°)

I1h

327

129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K1
100
Intensity(Counts)
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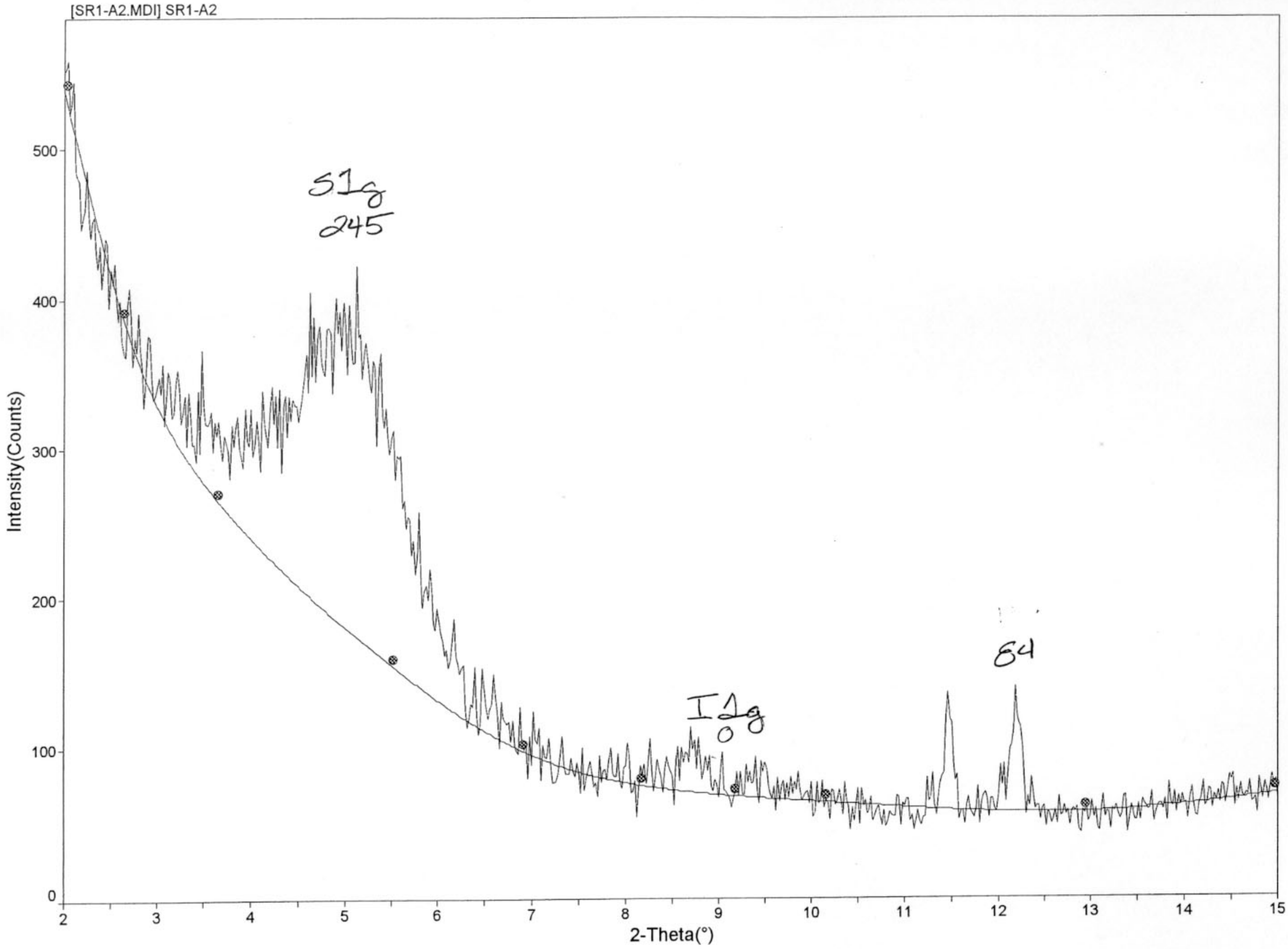
200
150
100
50
0
5
10
15
20
25
30
35
40
2-Theta(°)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Intensity(Counts)
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200
300
400
500
2-Theta(°)
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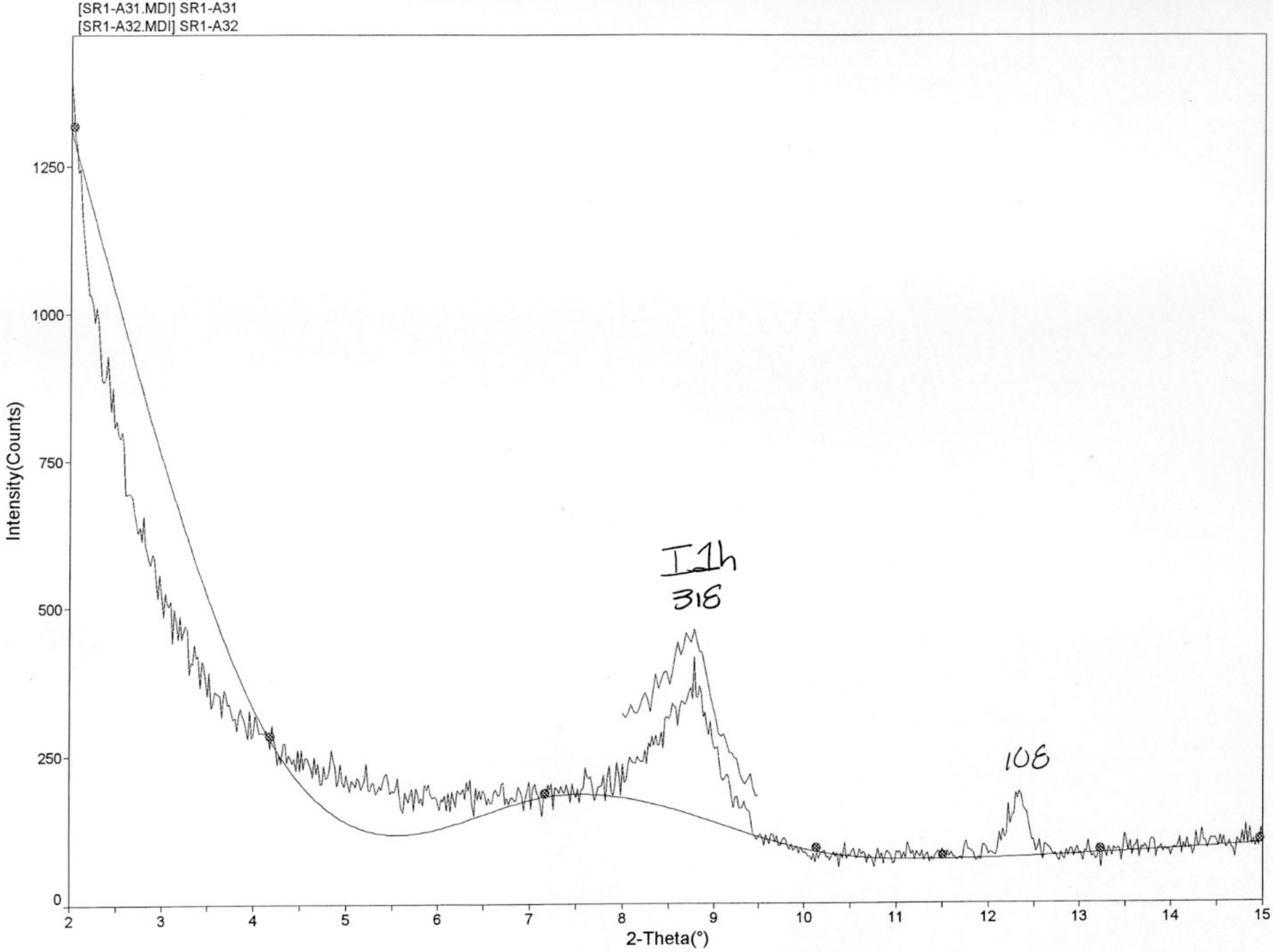
3
4
5
6
7
8
9
10
11
12
13
14
15
S1g
245
I1g
0
84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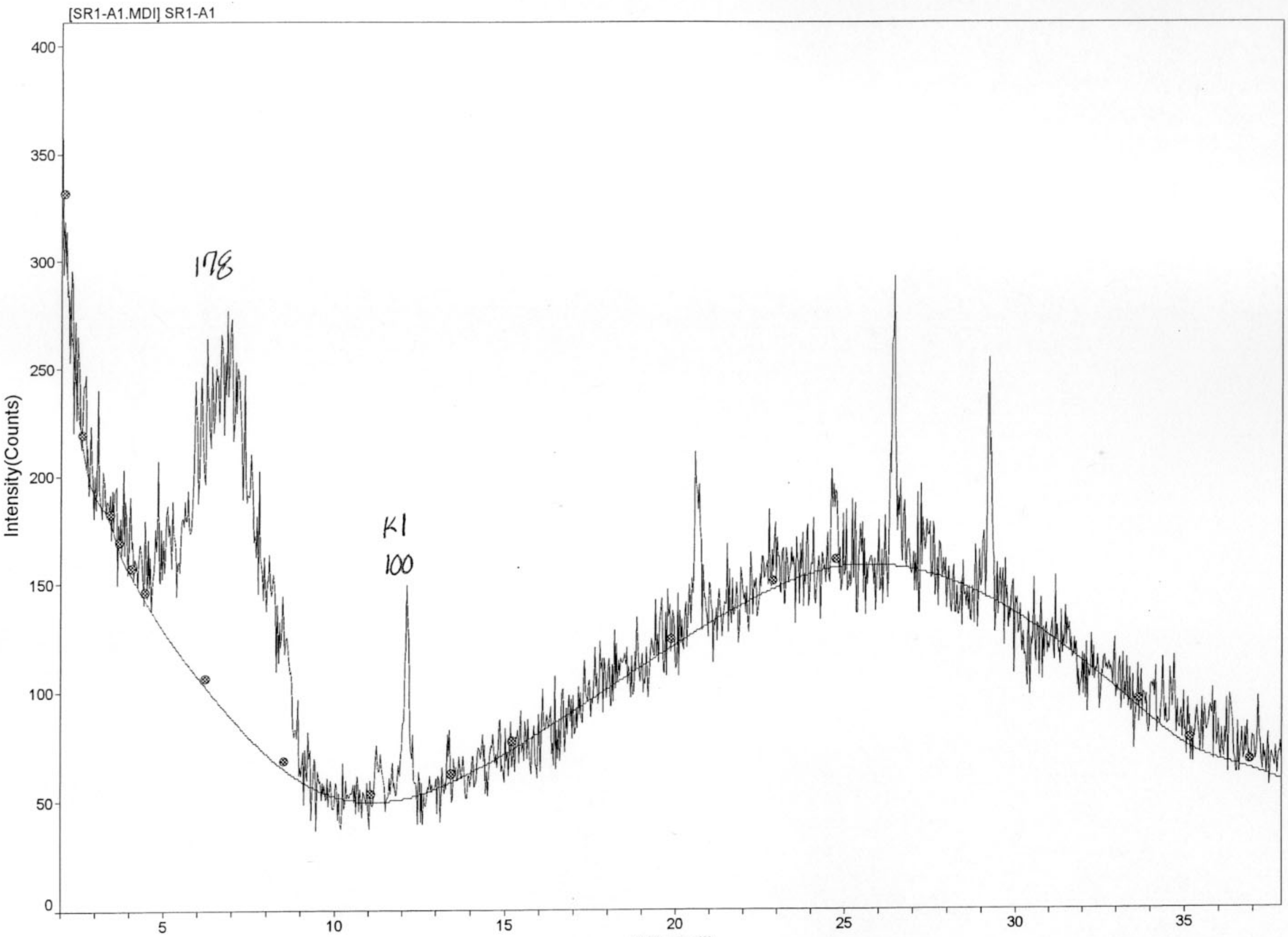
[SR1-A32.MDI] SR1-A32
Intensity(Counts)
0
250
500
750
1000
1250
2-Theta(°)
2
3
4
5
6
7
8
9
10
11
12
13
14
15
I 1h
318
108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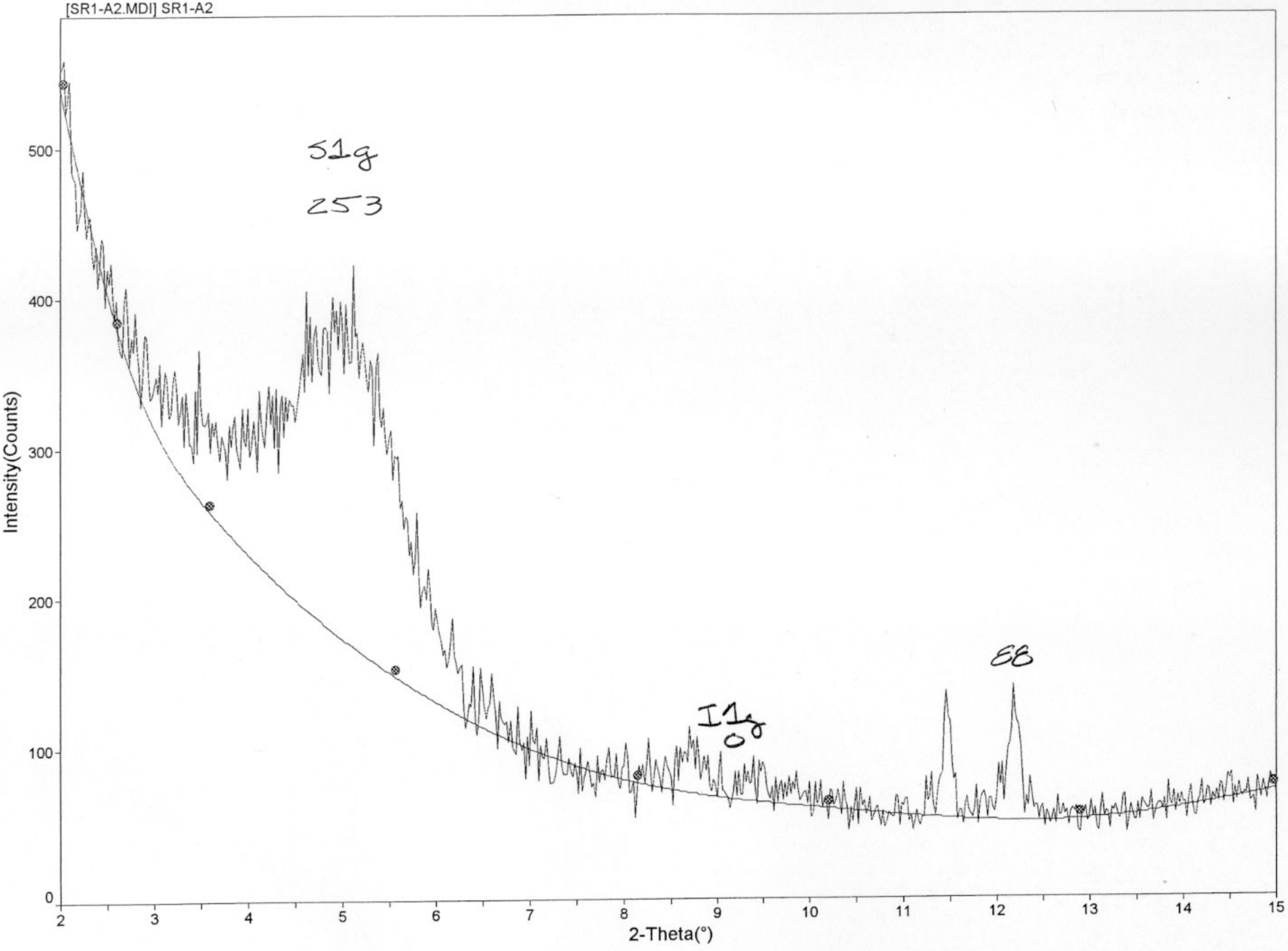
178
K1
100
Intensity(Counts)
0
50
100
150
200
250
300
350
400
2-Theta(°)
5
10
15
20
25
30
35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Intensity(Counts)
0
100
200
300
400
500
2-Theta(°)
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3
4
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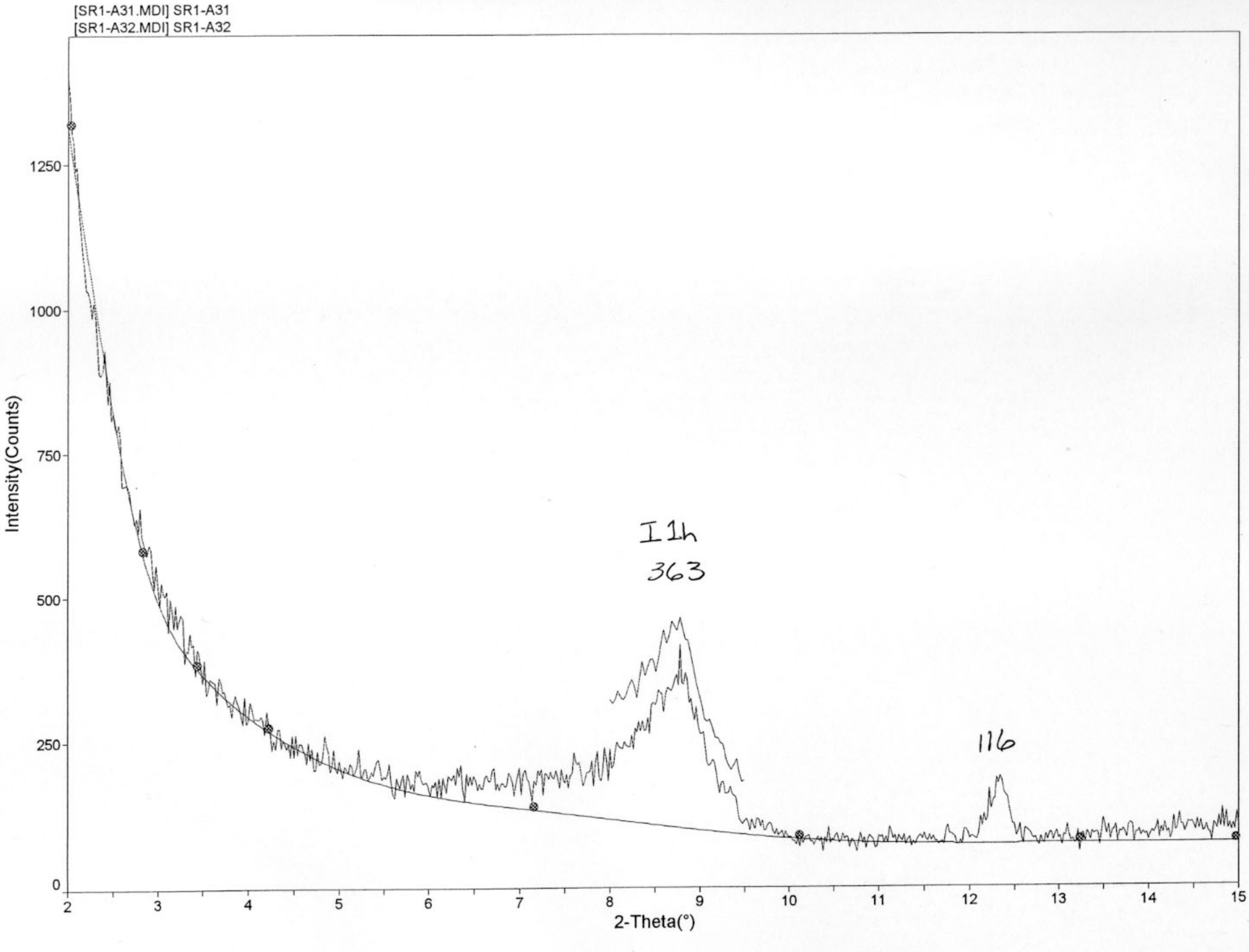
7
8
9
10
11
12
13
14
15
51g
253
I1g
0
E8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[SR1-A32.MDI] SR1-A32
Intensity(Counts)
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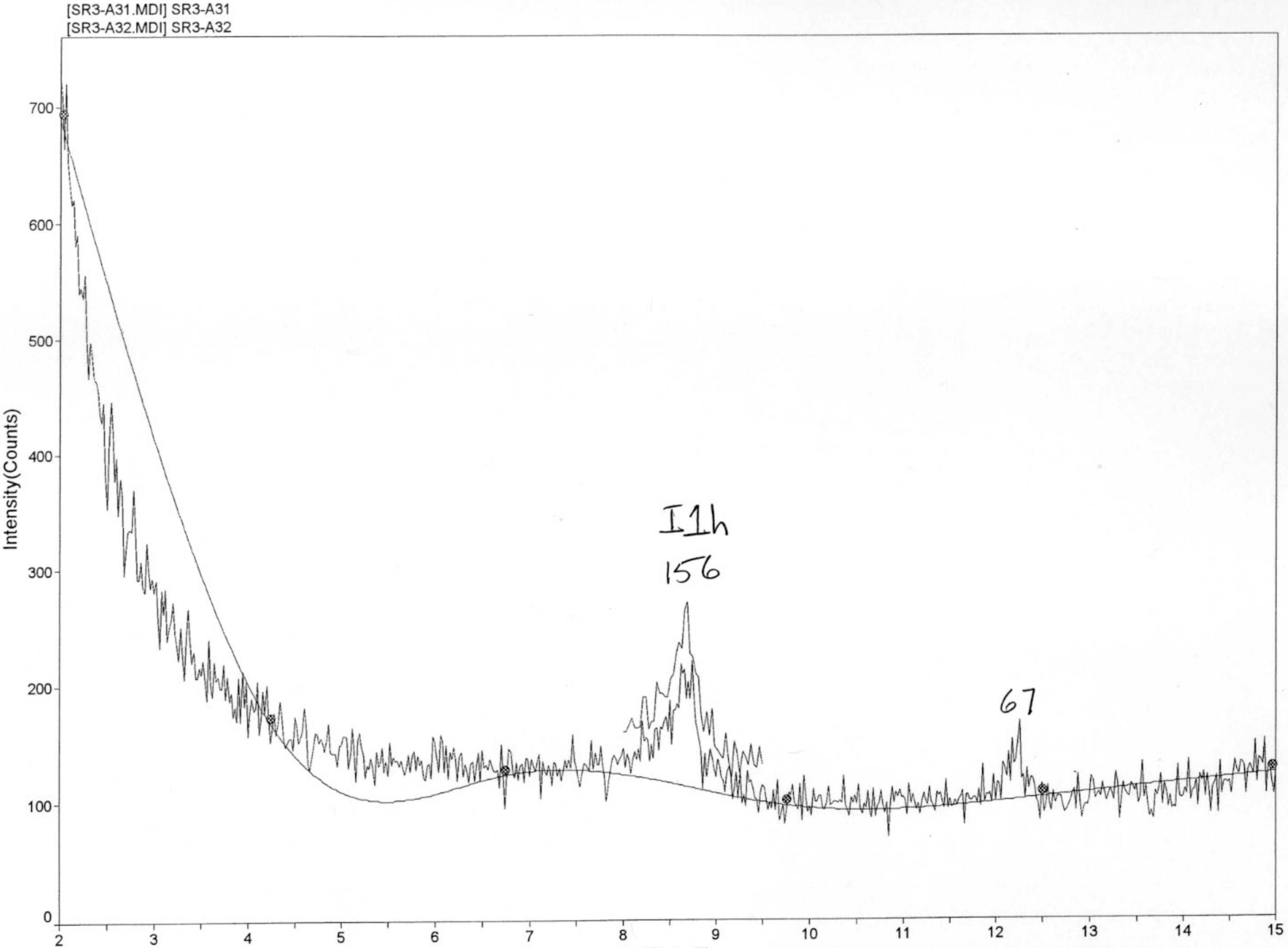
250
500
750
1000
1250
2-Theta(°)
2
3
4
5
6
7
8
9
10
11
12
13
14
15

I1h
363

116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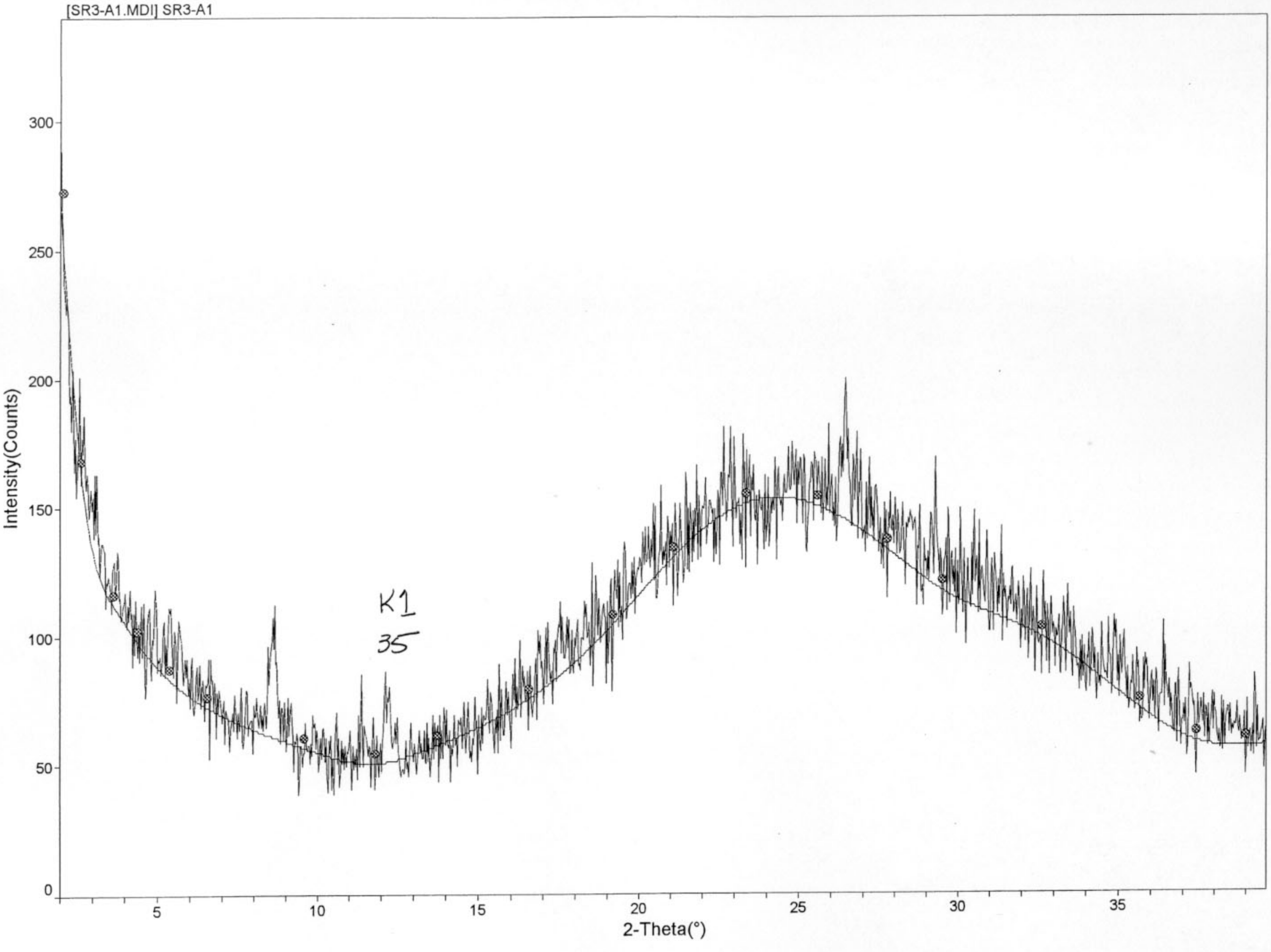
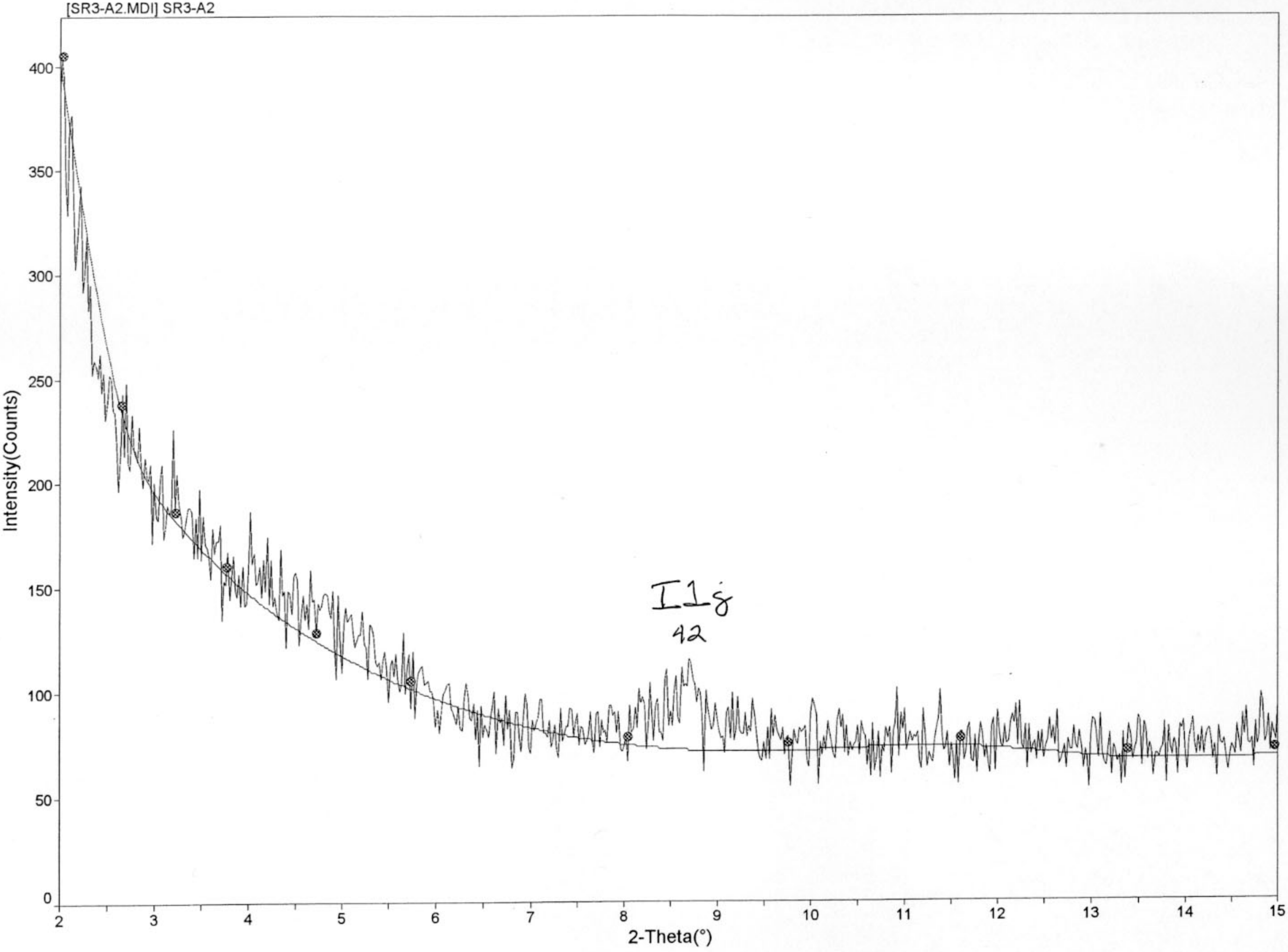
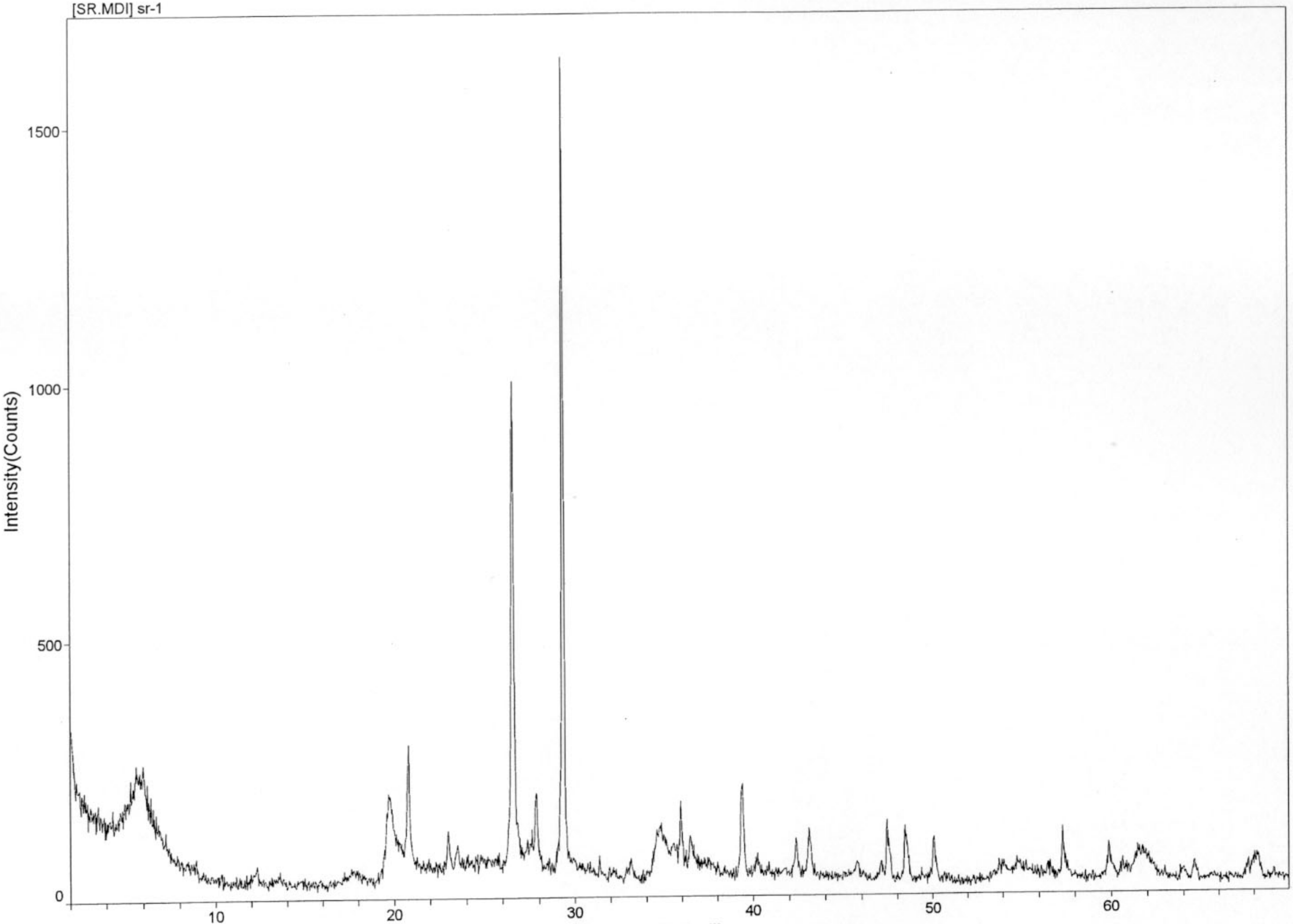
Intensity(Counts)
700
600
500
400
300
200
100
0
2
3
4
5
6
7
8
9
10
11
12
13
14
15
2-Theta(°)
I1h
156
67


[SR3-A1.MDI] SR3-A1
Intensity(Counts)
300
250
200
150
100
50
0
5
10
15
20
25
30
35
2-Theta(°)
K1
35


[SR3-A2.MDI] SR3-A2
Intensity(Counts)
0
50
100
150
200
250
300
350
400
2-Theta(°)
2
3
4
5
6
7
8
9
10
11
12
13
14
15

I1g
42


[SR.MDI] sr-1
Intensity(Counts)
0
500
1000
1500
10
20
30
40
50
60
2-Theta(°)

[SR.MDI] sr-1 **Peak ID Report**

SCAN: 2.0/69.98/0.03/0.5(sec), Cu, I(max)=1465, 04/11/03 11:42

PEAK: 17-pts/Parabolic Filter, Threshold=1.0, Cutoff=0.5%, BG=2/1.0, Peak-Top=Centroid Fit

NOTE: Intensity = Counts, 2T(0)=0.0(°), Wavelength to Compute d-Spacing = 1.54056Å (Cu/K-alpha1)

#	2-Theta	d(Å)	Height%	Quartz, syn	Calcite, syn					
1	5.649	15.6313	5.1							
2	6.002	14.7133	4.9							
3	12.313	7.1824	1.3							
4	19.704	4.5019	8.2							
5	20.779	4.2712	11.3	-0.010 (22.0%)						
6	23.485	3.7850	1.8							
7	26.551	3.3544	48.3	0.020 (100.0%)						
8	27.837	3.2023	7.0							
9	29.333	3.0423	100.0		0.072 (100.0%)					
10	33.089	2.7050	1.9							
11	34.754	2.5792	3.8							
12	35.916	2.4983	6.1		0.050 (14.0%)					
13	36.460	2.4623	2.5	0.001 (8.0%)						
14	39.354	2.2876	9.4	0.020 (8.0%)	0.046 (18.0%)					
15	40.208	2.2410	1.9	-0.005 (4.0%)						
16	42.357	2.1321	3.6	0.027 (6.0%)						
17	43.091	2.0975	5.0		0.053 (18.0%)					
18	45.757	1.9813	1.9	-0.030 (4.0%)						
19	47.062	1.9293	2.1		0.060 (5.0%)					
20	47.443	1.9147	7.9		0.045 (17.0%)					
21	48.443	1.8775	6.6		0.069 (17.0%)					
22	50.041	1.8212	5.5	0.018 (14.0%)						
23	54.801	1.6738	1.8	-0.013 (4.0%)						
24	56.541	1.6263	1.5		0.012 (4.0%)					
25	57.337	1.6056	6.0	-0.181 (1.0%)	0.063 (8.0%)					
26	59.864	1.5437	4.2	0.003 (9.0%)						
27	60.609	1.5265	2.1		0.068 (5.0%)					
28	61.475	1.5071	2.7		-0.131 (3.0%)					
29	63.971	1.4542	1.0	-0.052 (1.0%)						
30	67.692	1.3830	2.3	-0.024 (6.0%)						

[SR.MDI] sr-1 **Peak ID Report**

SCAN: 2.0/69.98/0.03/0.5(sec), Cu, I(max)=1465, 04/11/03 11:42

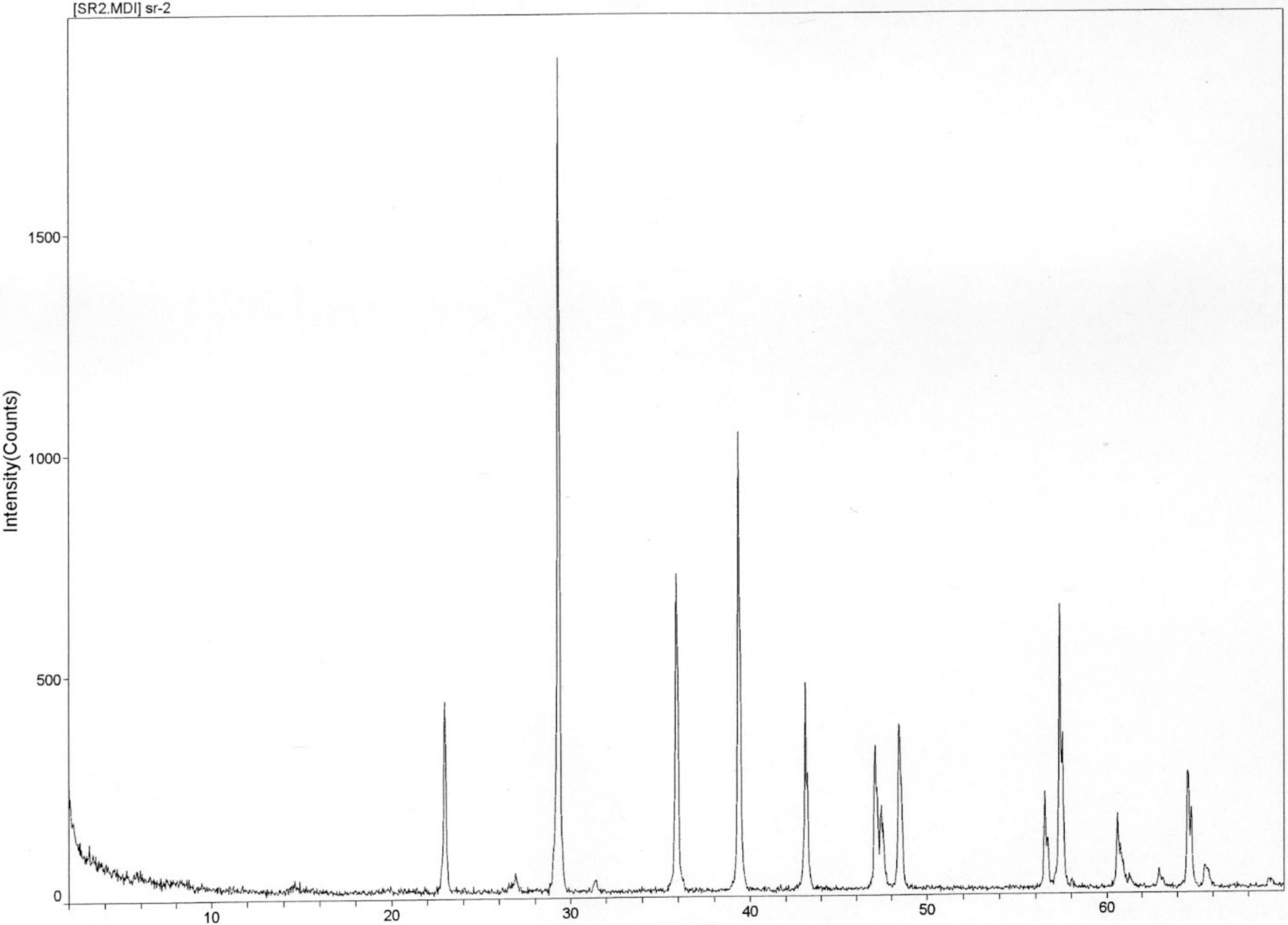
PEAK: 17-pts/Parabolic Filter, Threshold=1.0, Cutoff=0.5%, BG=2/1.0, Peak-Top=Centroid Fit

NOTE: Intensity = Counts, 2T(0)=0.0(°), Wavelength to Compute d-Spacing = 1.54056Å (Cu/K-alpha1)

#	2-Theta	d(Å)	Height%	Quartz, syn	Calcite, syn
31	68.090	1.3759	2.9	-0.042 (7.0%)	
32	69.134	1.3576	1.3		0.095 (1.0%)
?	Unmatched Line			55.247 (2.0%)	23.022 (12.0%)
?	Unmatched Line			68.241 (8.0%)	31.418 (3.0%)
?	Unmatched Line				58.073 (2.0%)
?	Unmatched Line				60.986 (4.0%)
?	Unmatched Line				63.058 (2.0%)
?	Unmatched Line				64.677 (5.0%)
?	Unmatched Line				65.597 (3.0%)

PDF#33-1161 - Quartz, syn <2T(0) = -0.08, d/d(0) = 1.0>

PDF#05-0586 - Calcite, syn <2T(0) = 0.0, d/d(0) = 1.0>


[SR2.MDI] sr-2
Intensity(Counts)
1500
1000
500
0
10
20
30
40
50
60
2-Theta(°)

[SR2.MDI] sr-2 **Peak ID Report**

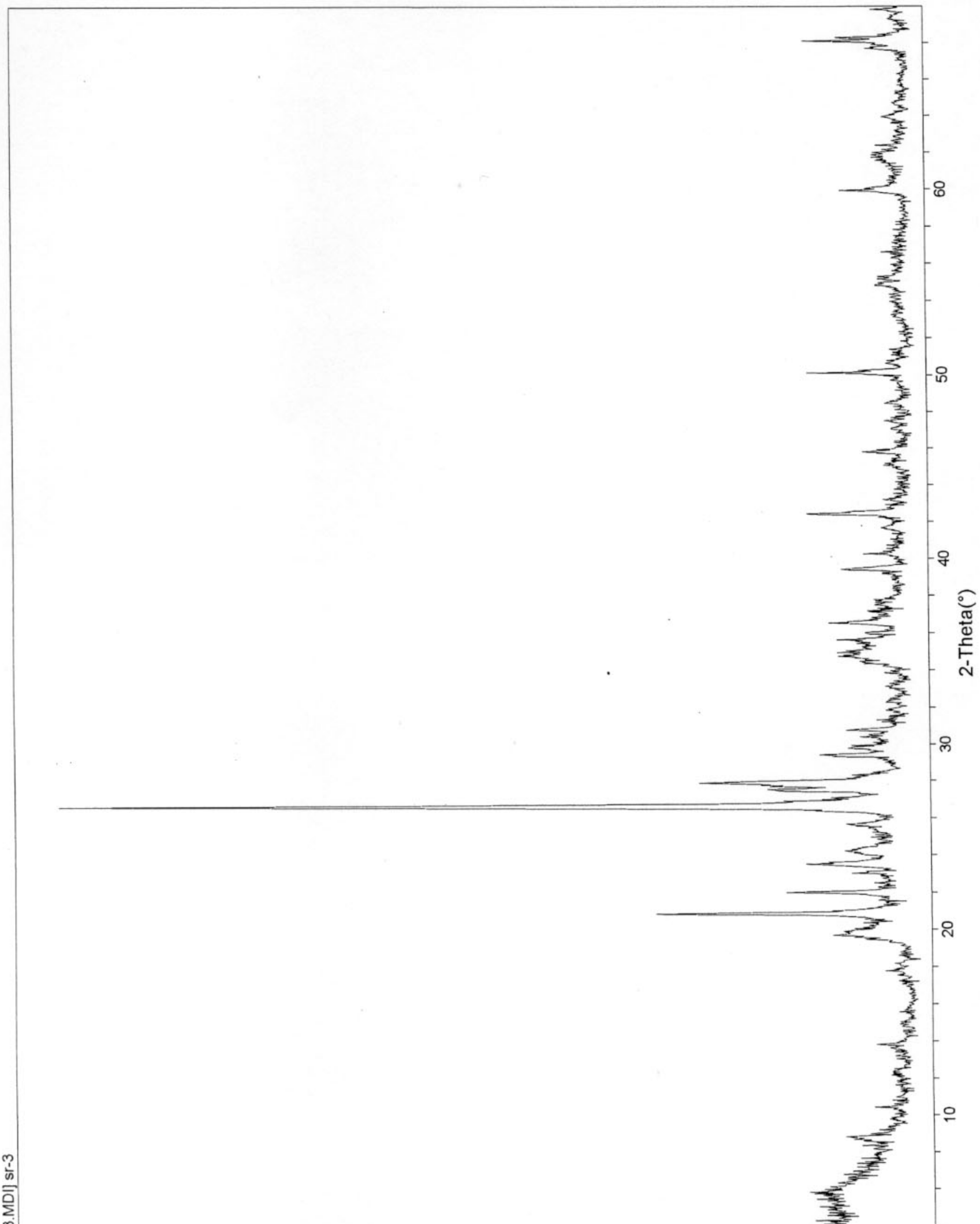
SCAN: 2.0/69.98/0.03/0.5(sec), Cu, I(max)=1557, 04/11/03 12:11

PEAK: 17-pts/Parabolic Filter, Threshold=1.0, Cutoff=0.5%, BG=2/1.0, Peak-Top=Centroid Fit

NOTE: Intensity = Counts, 2T(0)=0.0(°), Wavelength to Compute d-Spacing = 1.54056Å (Cu/K-alpha1)

#	2-Theta	d(Å)	Height%	Calcite, syn						
1	22.951	3.8717	21.5	0.011 (12.0%)						
2	26.869	3.3155	2.1							
3	29.313	3.0443	100.0	0.032 (100.0%)						
4	31.376	2.8487	1.1	-0.018 (3.0%)						
5	35.893	2.4998	39.8	0.012 (14.0%)						
6	39.353	2.2877	61.5	-0.012 (18.0%)						
7	43.098	2.0972	27.1	-0.013 (18.0%)						
8	47.099	1.9279	19.0	-0.037 (5.0%)						
9	47.427	1.9153	10.3	0.001 (17.0%)						
10	48.451	1.8772	22.1	0.001 (17.0%)						
11	56.518	1.6269	13.1	-0.025 (4.0%)						
12	57.354	1.6052	39.6	-0.014 (8.0%)						
13	60.625	1.5262	10.2	-0.009 (5.0%)						
14	60.898	1.5200	3.5							
15	61.304	1.5109	1.9	-0.020 (3.0%)						
16	62.973	1.4748	2.8	0.025 (2.0%)						
17	64.616	1.4412	16.6	0.000 (5.0%)						
18	65.596	1.4220	2.7	-0.058 (3.0%)						
19	69.174	1.3570	1.2	-0.004 (1.0%)						
?	Unmatched Line			58.013 (2.0%)						
?	Unmatched Line			60.926 (4.0%)						

PDF#05-0586 - Calcite, syn <2T(0) = -0.06, d/d(0) = 1.0>


[SR-3.MDI] sr-3
Intensity(Counts)
1250
1000
750
500
250
0
10
20
30
40
50
60
2-Theta(°)

[SR-3,MDI] sr-3 **Peak ID Report**

SCAN: 2.0/69.98/0.03/0.5(sec), Cu, I(max)=873, 04/11/03 12:50

PEAK: 17-pts/Parabolic Filter, Threshold=1.0, Cutoff=0.5%, BG=2/1.0, Peak-Top=Centroid Fit

NOTE: Intensity = Counts, 2T(0)=0.0(°), Wavelength to Compute d-Spacing = 1.54056Å (Cu/K-alpha1)

#	2-Theta	d(Å)	Height%	Quartz, syn	Muscovite-1M, ..					
1	8.799	10.0416	4.6		0.009 (100.0%)					
2	13.827	6.3991	3.1							
3	19.682	4.5067	7.6		0.134 (90.0%)					
4	20.840	4.2589	26.8	-0.011 (22.0%)						
5	21.993	4.0383	10.6							
6	23.520	3.7794	7.7							
7	24.207	3.6737	3.9		0.152 (60.0%)					
8	26.617	3.3462	100.0	0.014 (100.0%)	-0.051 (100.0%)					
9	27.505	3.2401	11.4							
10	27.856	3.2002	22.0							
11	29.350	3.0406	8.2		-0.227 (50.0%)					
12	29.780	2.9976	5.8							
13	30.742	2.9060	6.7		-0.188 (6.0%)					
14	34.432	2.6025	4.6							
15	34.907	2.5682	7.3		0.104 (90.0%)					
16	35.609	2.5191	6.6							
17	35.979	2.4941	4.4							
18	36.507	2.4592	7.7	0.014 (8.0%)	0.202 (12.0%)					
19	37.131	2.4193	3.7		0.289 (4.0%)					
20	39.421	2.2839	8.1	0.014 (8.0%)						
21	42.424	2.1289	12.7	0.020 (6.0%)						
22	45.783	1.9802	5.7	0.005 (4.0%)						
23	50.104	1.8191	13.8	0.016 (14.0%)						
24	50.656	1.8006	2.2	-0.066 (1.0%)						
25	54.827	1.6730	3.3	0.021 (4.0%)						
26	55.208	1.6624	3.1	0.099 (2.0%)	-0.141 (18.0%)					
27	59.928	1.5422	8.9	-0.001 (9.0%)						
28	61.819	1.4995	3.0		0.084 (35.0%)					
29	63.912	1.4554	3.0	0.067 (1.0%)						
30	67.687	1.3831	5.2	0.041 (6.0%)						

[SR-3.MDI] sr-3 **Peak ID Report**

SCAN: 2.0/69.98/0.03/0.5(sec), Cu, I(max)=873, 04/11/03 12:50

PEAK: 17-pts/Parabolic Filter, Threshold=1.0, Cutoff=0.5%, BG=2/1.0, Peak-Top=Centroid Fit

NOTE: Intensity = Counts, 2T(0)=0.0(°), Wavelength to Compute d-Spacing = 1.54056Å (Cu/K-alpha1)

#	2-Theta	d(Å)	Height%	Quartz, syn	Muscovite-1M, ..					
31	68.113	1.3755	14.2	-0.004 (7.0%)						
?	Unmatched Line			40.263 (4.0%)	17.642 (35.0%)					
?	Unmatched Line			68.301 (8.0%)	20.459 (25.0%)					
?	Unmatched Line				21.664 (16.0%)					
?	Unmatched Line				33.352 (16.0%)					
?	Unmatched Line				34.774 (50.0%)					
?	Unmatched Line				35.224 (20.0%)					
?	Unmatched Line				37.827 (12.0%)					
?	Unmatched Line				40.174 (8.0%)					
?	Unmatched Line				40.684 (8.0%)					
?	Unmatched Line				41.226 (4.0%)					
?	Unmatched Line				41.926 (20.0%)					
?	Unmatched Line				42.904 (6.0%)					
?	Unmatched Line				45.056 (30.0%)					
?	Unmatched Line				46.418 (8.0%)					
?	Unmatched Line				47.894 (4.0%)					
?	Unmatched Line				55.609 (12.0%)					
?	Unmatched Line				56.274 (12.0%)					
?	Unmatched Line				61.224 (4.0%)					

PDF#33-1161 - Quartz, syn <2T(0) = -0.02, d/d(0) = 1.0>

PDF#07-0025 - Muscovite-1M, syn <2T(0) = 0.06, d/d(0) = 1.0>

Appendix D

Geologic Logs

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9

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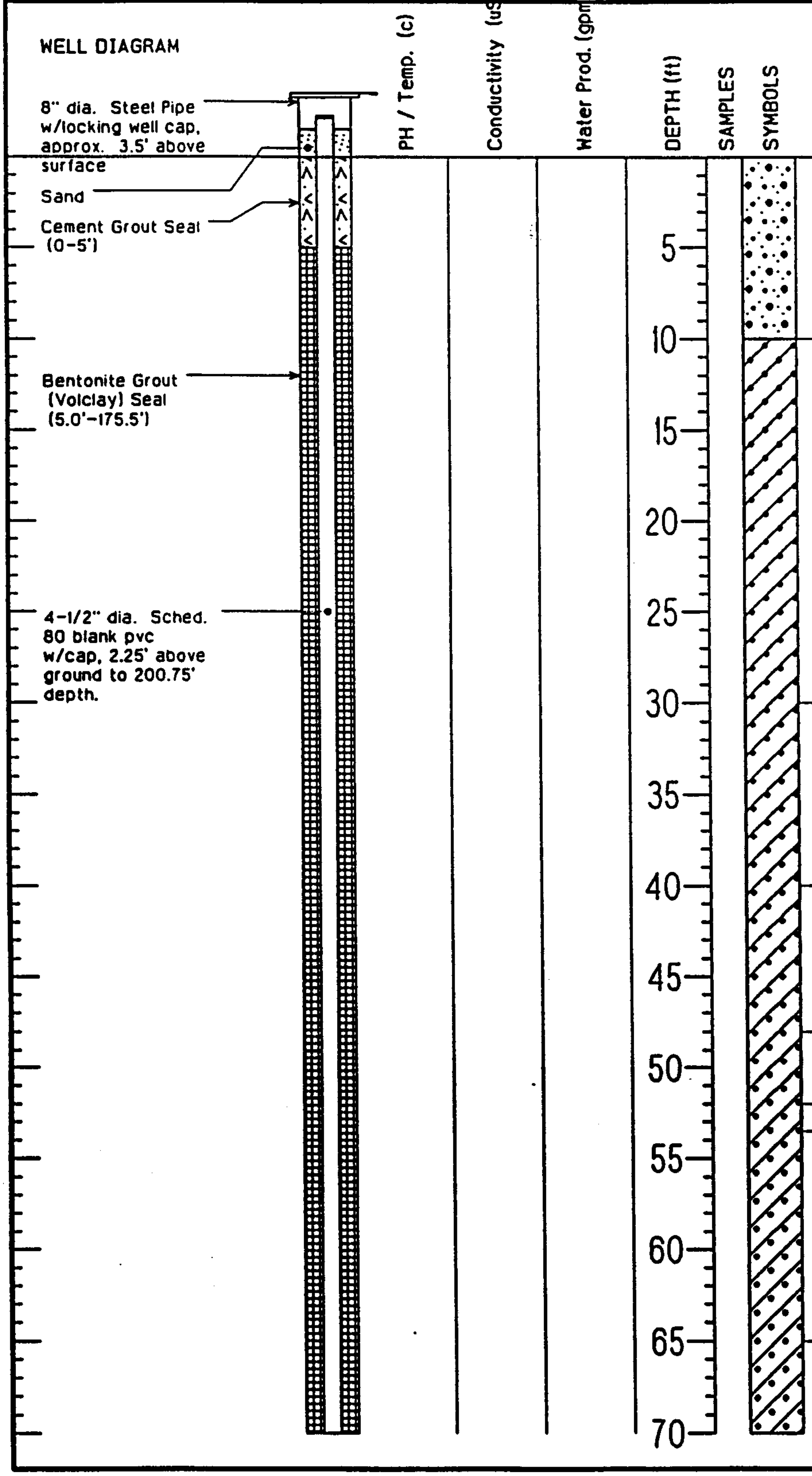


MATERIALS DESCRIPTION

0-10', Soil/gravel, dark brown, w/abundant, silt, sand, cobbles/pebbles, wet @ 8'

7.75', ENCOUNTERED GROUNDWATER

10'-30', Alluvial gravels, varying amounts of silt/clay, sand & silt, abundant pebbles/cobbles very poorly sorted, Oxidized, wet

30'-40', Gravel, brown-slightly red brown, within clayey matrix very poorly sorted, min.-mod. sand, Oxidized, wet

40'-48', Gravel, as above with less clay/silt matrix.

48'-52', Gravel, brown-red brown within clay/silt matrix, min.-mod. sand very poorly sorted, wet.

52'-53.5', Gravel, as at 40'-48', relatively clean

53.5'-65', Gravel, brown-red brown, moderate-abundant clay/silt matrix, minor sand, very poorly sorted; wet

65'-75', clay, dark red-brown, w/min.-mod. sand & pebbles, no cobbles, moist-wet, very smooth drilling

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N713191.10, E603249.22 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M9)
GEOLOGIST C.W.
DRILL RIG Air Rotary

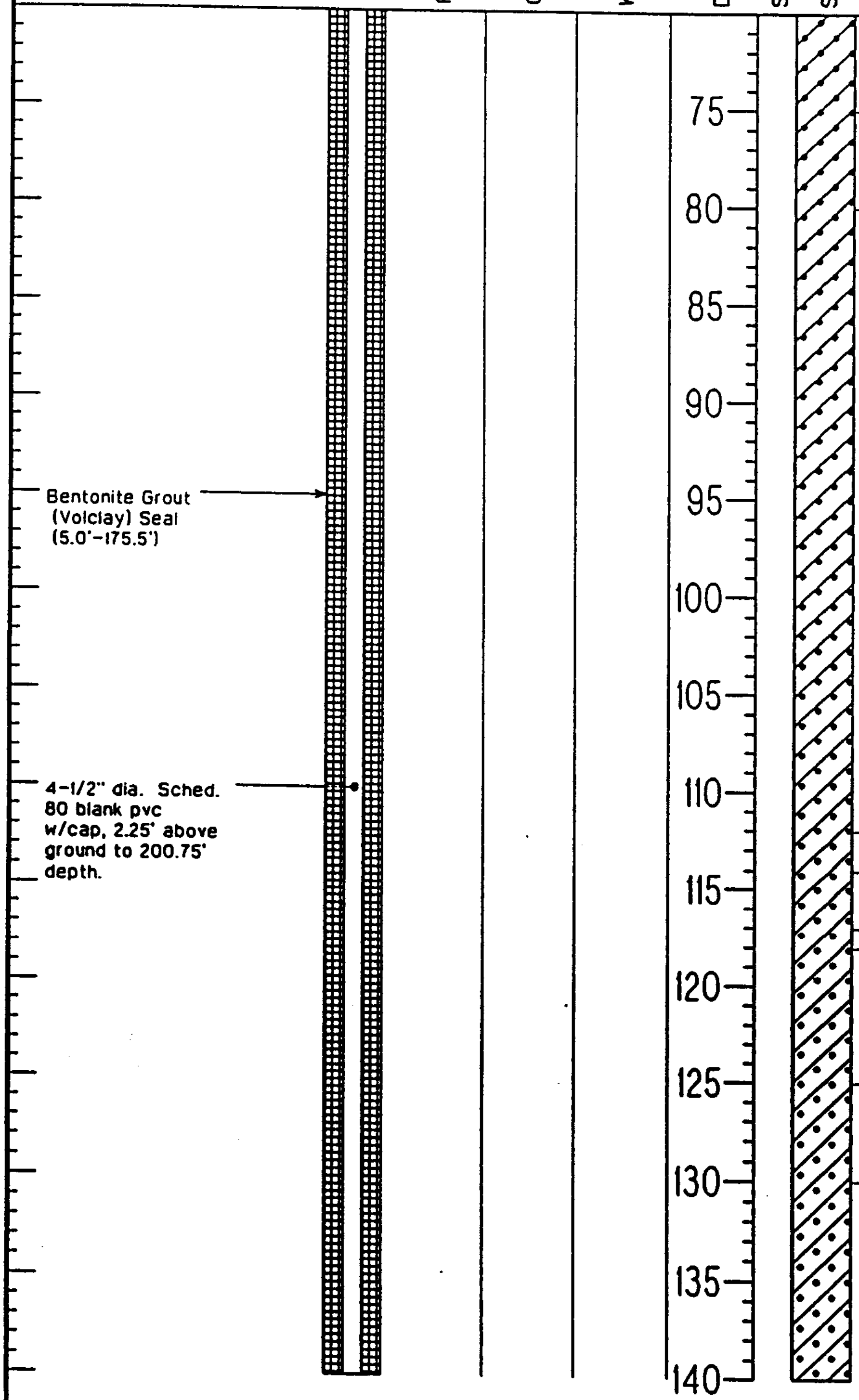
DRILLING COMPANY Beylik Drilling
DATE DRILLED 09/20/94 - 09/26/94
SURFACE ELEVATION 4440.14
TOTAL DEPTH OF HOLE 252.50 Feet
WATER LEVEL Static, from TOC on 11/7/94: 71.05 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9

Page 2 of

WELL DIAGRAM	PH / Temp. (c)	Conductivity (uS/m)	Water Prod. (gpm)	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION



75'-80', Gravel, very clayey/silty matrix, red-brown, trace-min. sand, very poorly sorted, wet

80'-112', Gravel, light-med brown-grey brown, min.-mod. dry/silt, min.-mod. sand, wet. Very clayey zone @ 80'-82'.

112'-114', Gravel, med. brown-red brown in clayey matrix, min.-mod. sand, wet.

114'-117', Gravel, dark brown-red brown, min.- mod. clay/silt, trace sand, wet.

117'-118', As at 114-117 with abundant clay/silt.

118'-125', Gravel, med. red brown, min.-mod. clay/silt matrix, trace-min. sand, Oxidized.

125'-130', Gravel, dark brown-red brown, abundant clay/silt matrix, min. sand, Oxidized

130'-150', Gravel, med. red brown, mod. silt/clay matrix, very poorly sorted, Oxidized.

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N713191.10, E603249.22 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M9)
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DRILL RIG Air Rotary
DRILLING COMPANY Beylik Drilling
DATE DRILLED 09/20/94 - 09/26/94
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Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9

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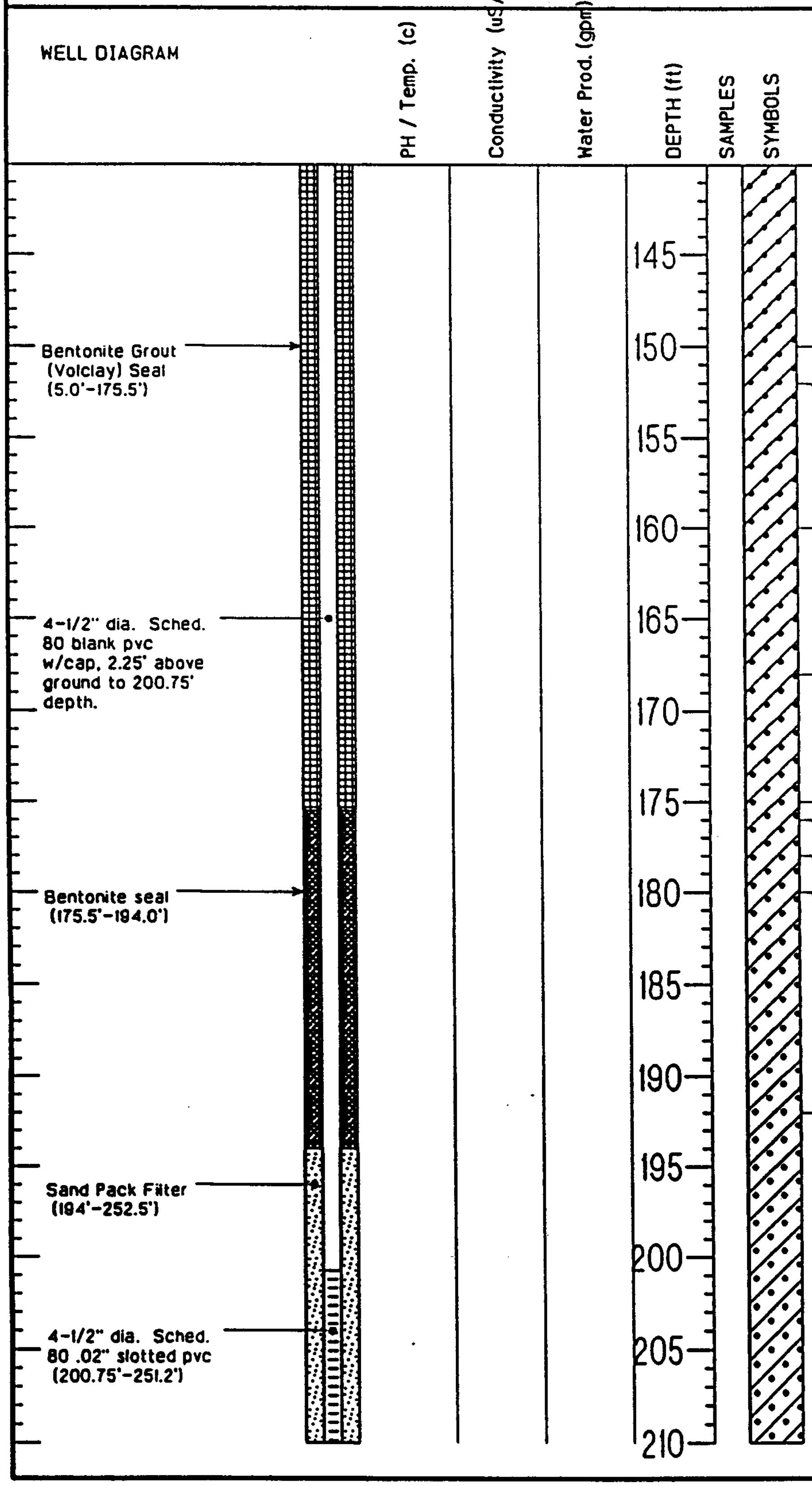


MATERIALS DESCRIPTION

130'-150', Gravel, med. red brown, mod. silt/clay matrix, very poorly sorted, Oxidized.

150'-152', Gravel as above w/abundant clay/silt matrix.

152'-160', Gravel, med. red brown, mod. clay/silt matrix material (less than @ 150-152)

160'-168', Gravel, dark red brown, abundant clay/silt matrix

168'-175', Gravel, medium brown-red brown, min.- mod. clay/silt matrix (most of matrix material washed out of cuttings)

175'-176', Sand in clay/silt matrix, med-very coarse, minor pebbles.

176'-178', Gravel, dark grey brown - red brown, w/min. - mod. clay/silt matrix, wet w/mod. sand.

178'-180', Gravel, brown-red brown, mod. sand, mod.-abundant clay/silt, Oxidized.

180'-192', Gravel, red brown, min.- mod. sand, min.- mod. clay/silt matrix, wet.

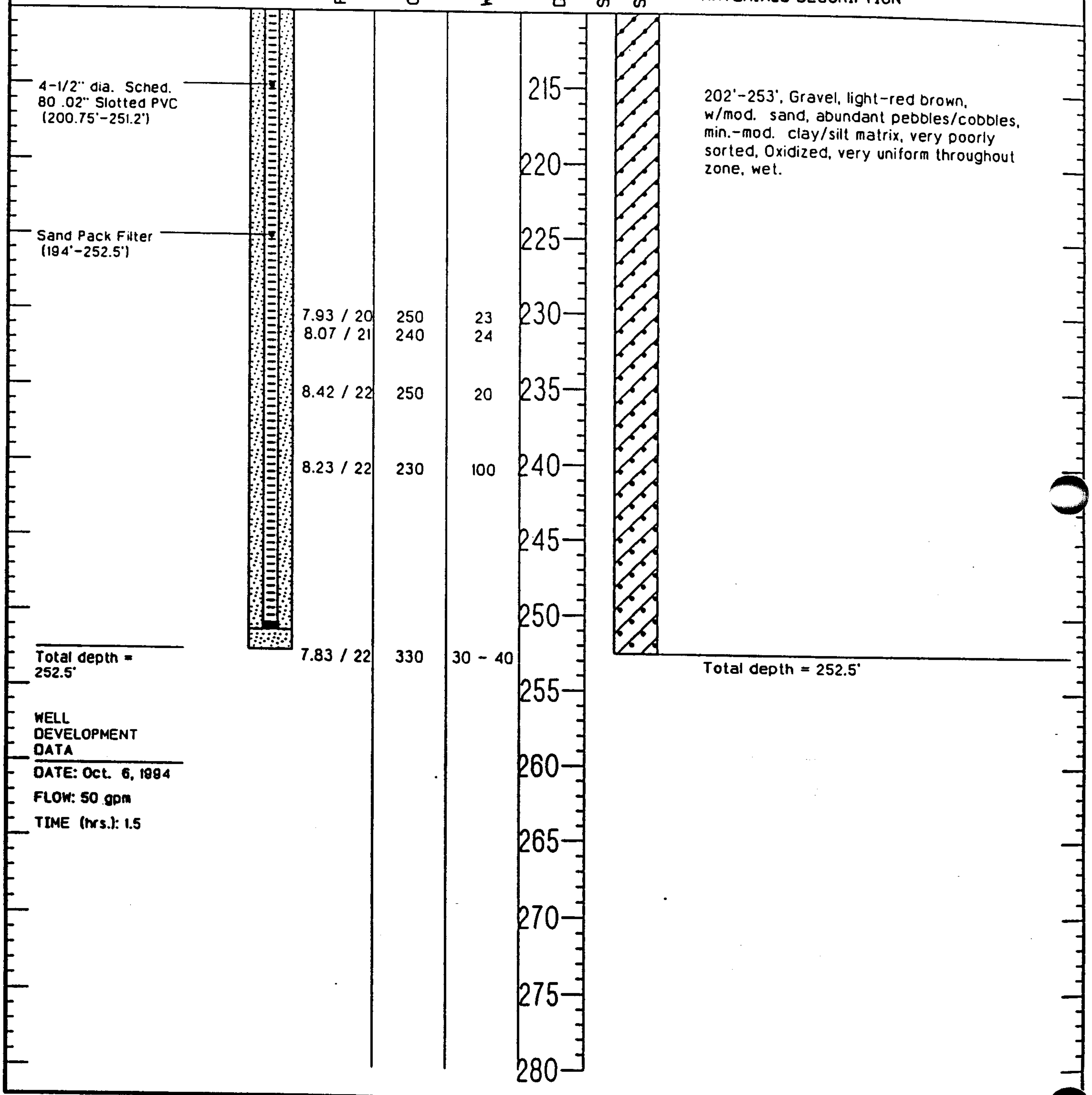
192'-202', Gravel, dark brown-red brown, mod.- abundant clay/silt matrix.

202'-253', Gravel, light-red brown, w/mod. sand, abundant pebbles/cobbles, min.- mod. clay/silt matrix, very poorly sorted, Oxidized, very uniform throughout zone, wet.

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N713191.10, E603249.22 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M9)
GEOLOGIST C.W.
DRILL RIG Air Rotary
DRILLING COMPANY Beylik Drilling
DATE DRILLED 09/20/94 - 09/26/94
SURFACE ELEVATION 4440.14
TOTAL DEPTH OF HOLE 252.50 Feet
WATER LEVEL Static, from TOC on 11/7/94: 71.05 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9



PH / Temp. (c)	Conductivity (uS/m)	Water Prod. (gpm)
7.93 / 20	250	23
8.07 / 21	240	24
8.42 / 22	250	20
8.23 / 22	230	100
7.83 / 22	330	30 - 40

MATERIALS DESCRIPTION

202'-253', Gravel, light-red brown, w/mod. sand, abundant pebbles/cobbles, min.-mod. clay/silt matrix, very poorly sorted, Oxidized, very uniform throughout zone, wet.

Total depth = 252.5'

WELL DEVELOPMENT DATA

DATE: Oct. 6, 1994
FLOW: 50 gpm
TIME (hrs.): 1.5

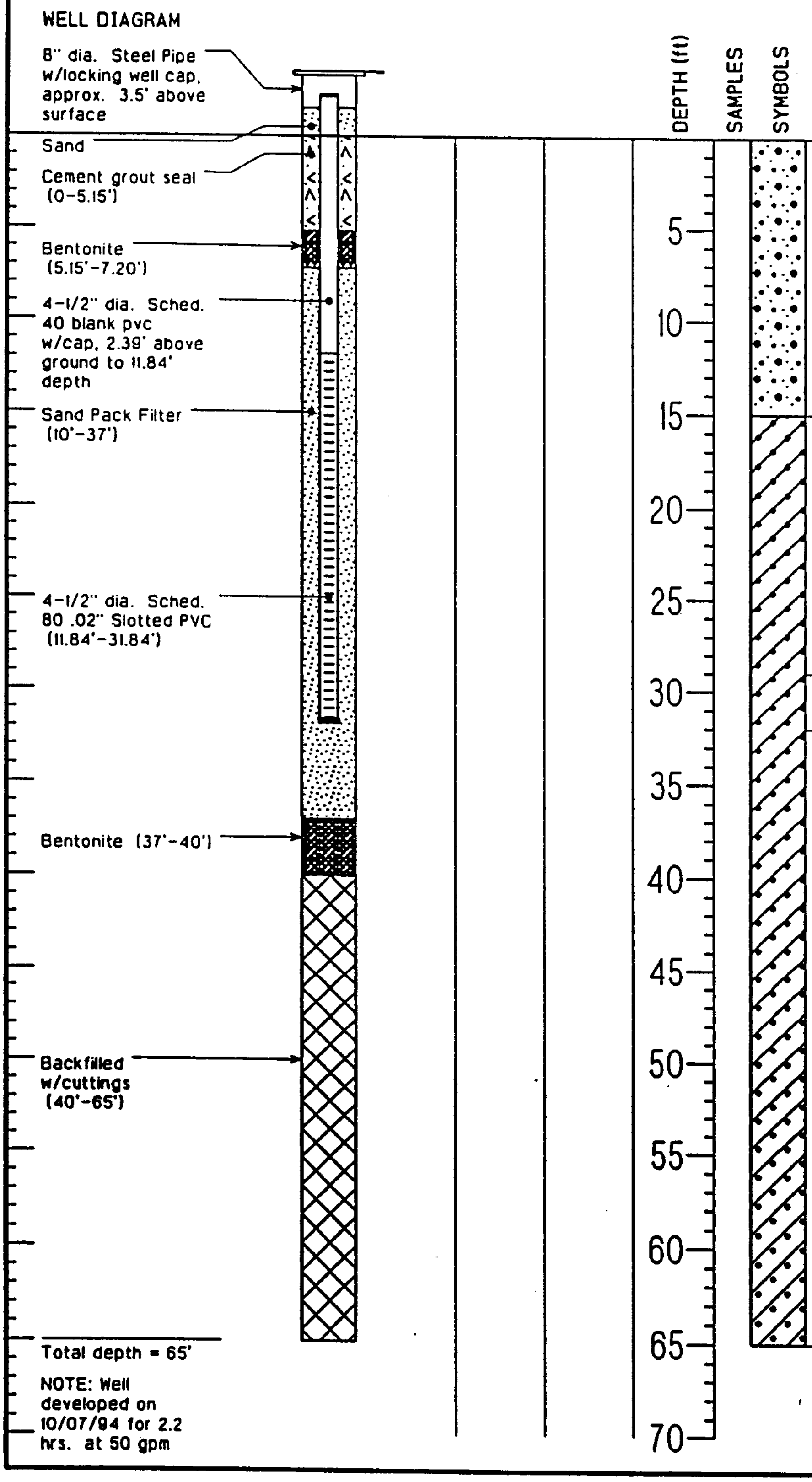
PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N713191.10, E603249.22 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M9)
GEOLOGIST C.W.
DRILL RIG Air Rotary

DRILLING COMPANY Beylik Drilling
DATE DRILLED 09/20/94 - 09/26/94
SURFACE ELEVATION 4440.14
TOTAL DEPTH OF HOLE 252.50 Feet
WATER LEVEL Static, from TOC on 11/7/94: 71.05 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-11

Page 1 of 1



MATERIALS DESCRIPTION

0-15', Soil and gravel, dark brown, abundant cobbles, min.- mod. sand, wet @ 15'.

15'-29', Gravel: med. dark brown, silty soil matrix w/mod. clay, wet.

29'-32', Clay/silt, med. dark brown, moist - damp, (not saturated) abundant cobbles/pebbles, min.- mod. sand.

32'-65', Clay, as above but "dry"

Total depth = 65'

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N713751.31, E603378.24 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M11)
GEOLOGIST CW
DRILL RIG Air Rotary
DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/11/94
SURFACE ELEVATION 4439.48
TOTAL DEPTH OF HOLE 65 Feet
WATER LEVEL Static, from TOC on 11/7/94: 10.65 Feet

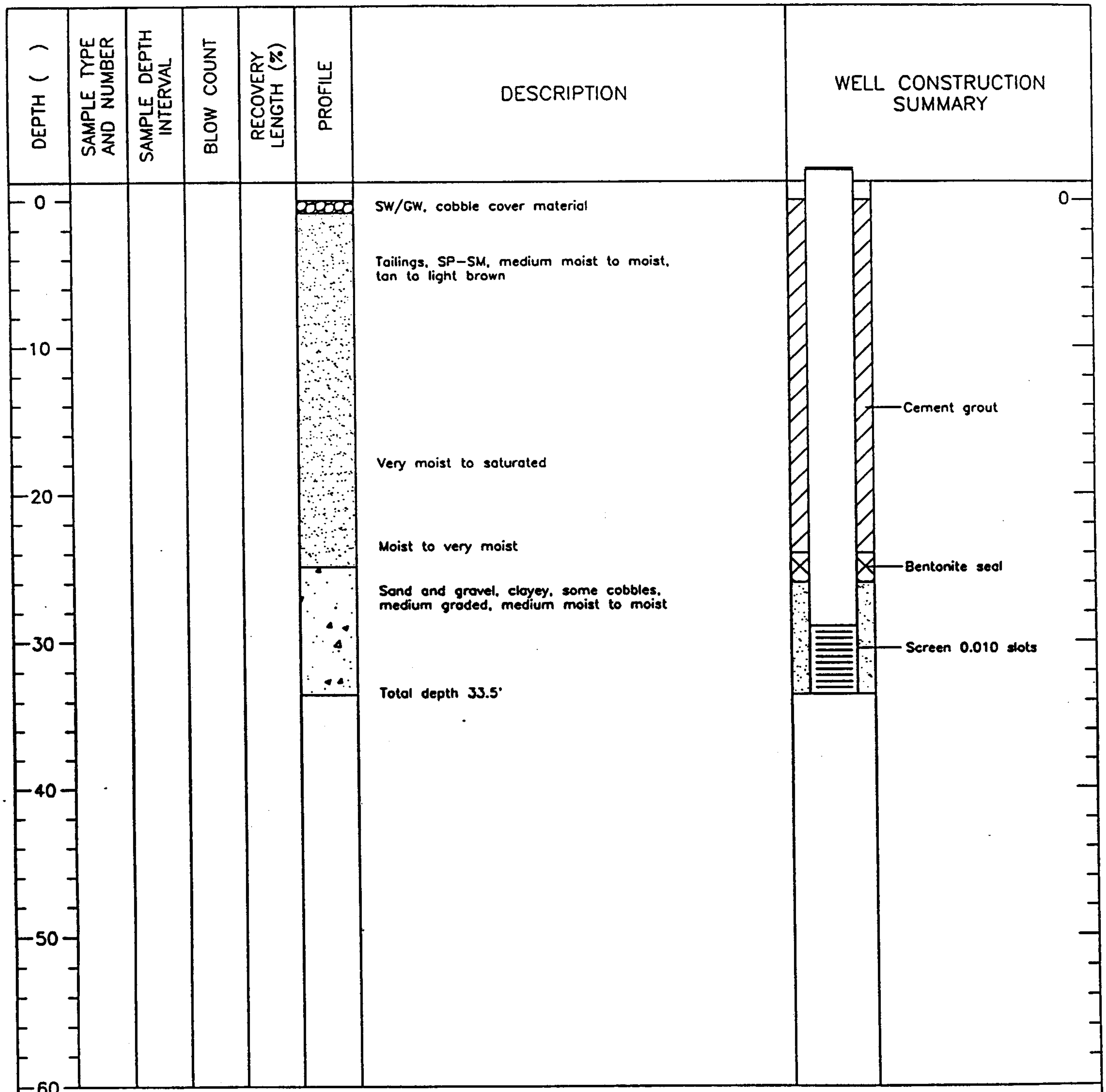
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

LOG OF MONITORING WELL

PAGE 1 OF 1

PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: SRK BH-2-94	COORDINATES OR LOCATION:
LOGGED BY: HKP CHECKED BY:	SURFACE ELEVATION: PENDING	GWL DEPTH: 18' (ENCOUNTERED) GWL DEPTH: N/A (STATIC)
DRILLING METHOD: CME-75 HOLLOW STEM AUGER HOLE DIAMETER: 8" FLUID USED: NONE		DATE STARTED: 5/26/94 DATE COMPLETED: 5/26/94

CASING TYPE AND SIZE: 2" dia. Sched. 40 pvc	FROM ±3' A.G.S. TO 28.5' B.G.S.
SCREEN TYPE AND SIZE: 2" dia. Sched. 40 pvc, 0.010" slots	FROM 28.5' TO 33.5'



SW/GW, cobble cover material

Tailings, SP-SM, medium moist to moist, tan to light brown

Very moist to saturated

Moist to very moist

Sand and gravel, clayey, some cobbles, medium graded, medium moist to moist

Total depth 33.5'

NOTES

Stand pipe piezometer 2" schedule 40 pvc flush thread

Well head protected with steel pipe w/locking cap

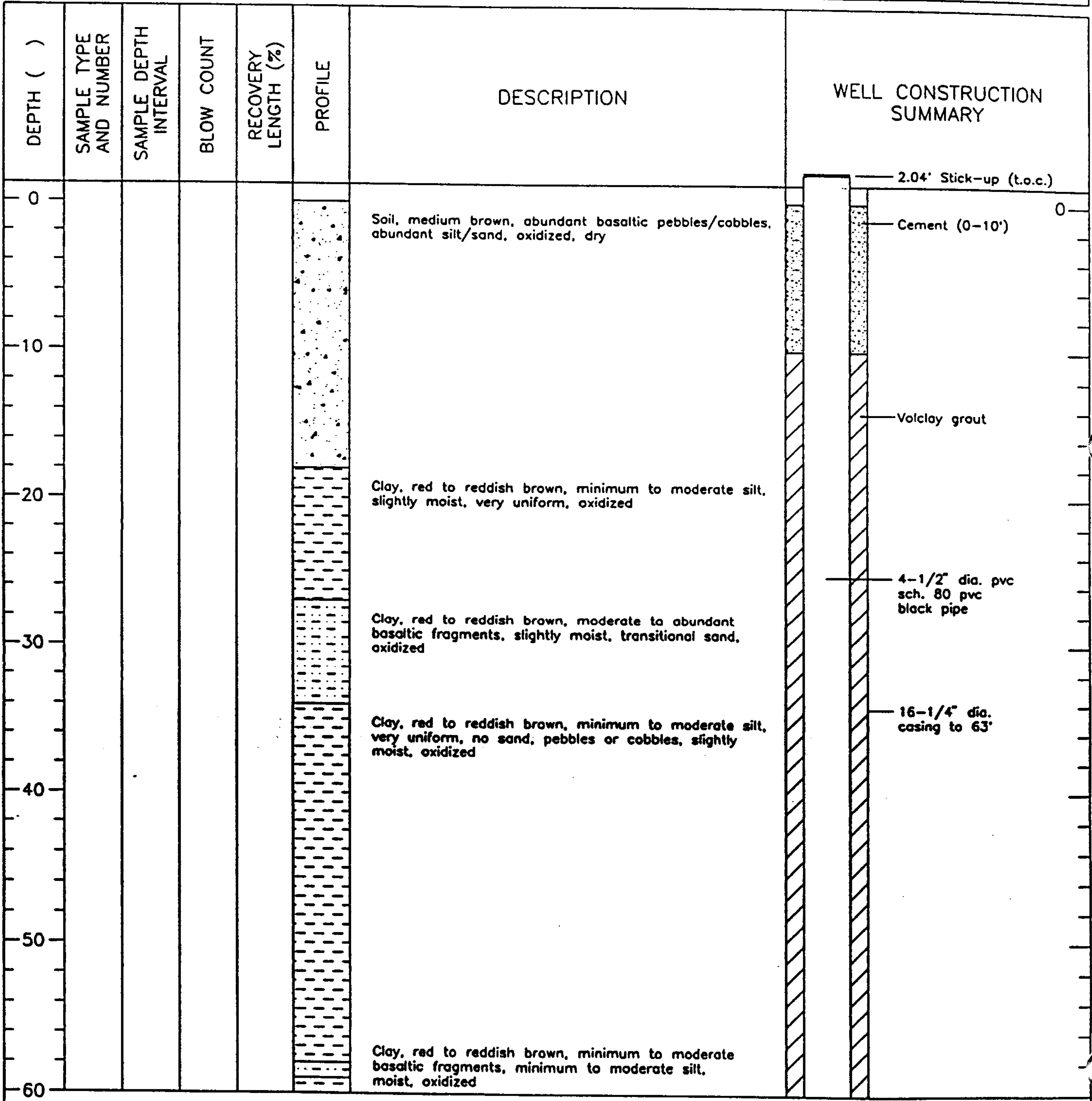
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

LOG OF MONITORING WELL

PAGE 1 OF 2

PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-13	COORDINATES OR LOCATION: 713,543.43 N 603,270.64 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5177.01'	GWL DEPTH: 80.0 (ENCOUNTERED) DEPTH: 7.58 (STATIC)
DRILLING METHOD: ROTARY HOLE DIAMETER: 12 1/4" & 9 7/8"	FLUID USED: AIR/MUD	DATE STARTED: 9/14/94 COMPLETED: 9/19/94

CASING TYPE AND SIZE: 4 1/2" dia. Sched. 80 pvc — FROM 2.04 A.G.S. TO 73.95 B.G.S.
SCREEN TYPE AND SIZE: 4 1/2" dia. Sched. 80 pvc, 0.02" slots — FROM 73.95 TO 104.5



Soil, medium brown, abundant basaltic pebbles/cobbles, abundant silt/sand, oxidized, dry

Clay, red to reddish brown, minimum to moderate silt, slightly moist, very uniform, oxidized

Clay, red to reddish brown, moderate to abundant basaltic fragments, slightly moist, transitional sand, oxidized

Clay, red to reddish brown, minimum to moderate silt, very uniform, no sand, pebbles or cobbles, slightly moist, oxidized

Clay, red to reddish brown, minimum to moderate basaltic fragments, minimum to moderate silt, moist, oxidized

NOTES

Development time = 8.8 hours
Average flow = 18.75 gpm
Dates: 9/30/94 and 10/1/94

Static water = 8.02 from toc (11/07/94)

Well head protection – 8" dia. steel pipe w/locking well cap, approx. 3.5' above surface.

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Consulting Engineers & Scientists

LOG OF MONITORING WELL

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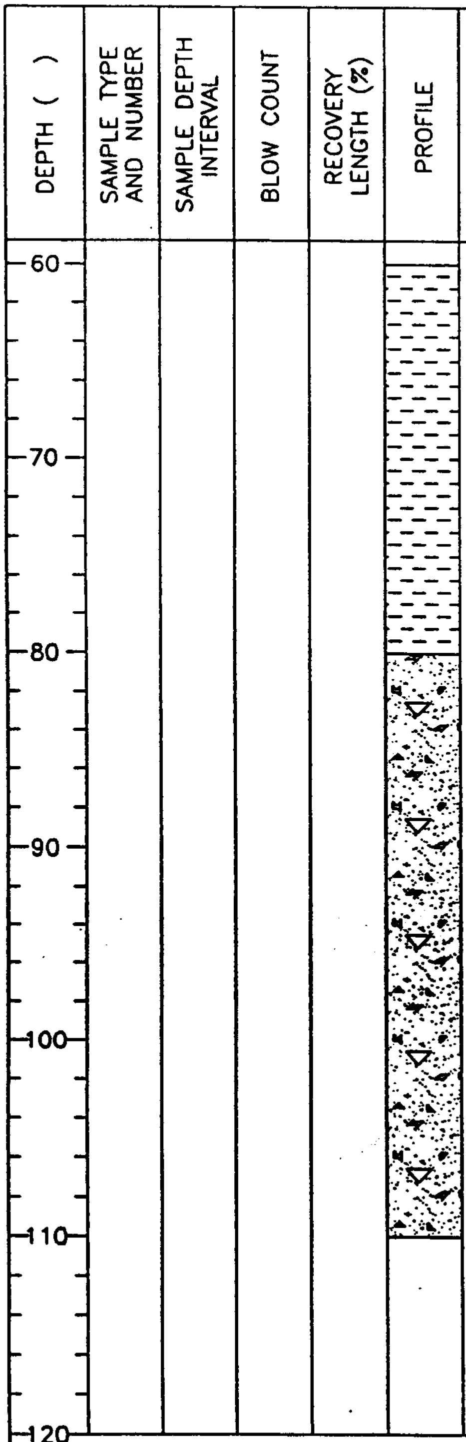
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-13	COORDINATES OR LOCATION: 713,543.64 N 603,270.64 E	
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5177.01'	GWL DEPTH: 80.0 (ENCOUNTERED) DEPTH: 7.58 (STATIC)	
DRILLING METHOD: ROTARY	HOLE DIAMETER: 12 1/4" & 9 7/8"	FLUID USED: AIR/MUD	DATE STARTED: 9/14/94 COMPLETED: 9/19/94

CASING TYPE AND SIZE: 4 1/2" dia. Sched. 80 pvc — FROM 2.04 A.G.S. TO 73.95 B.G.S.
SCREEN TYPE AND SIZE: 4 1/2" dia. Sched. 80 pvc, 0.02" slots — FROM 73.95 TO 104.5

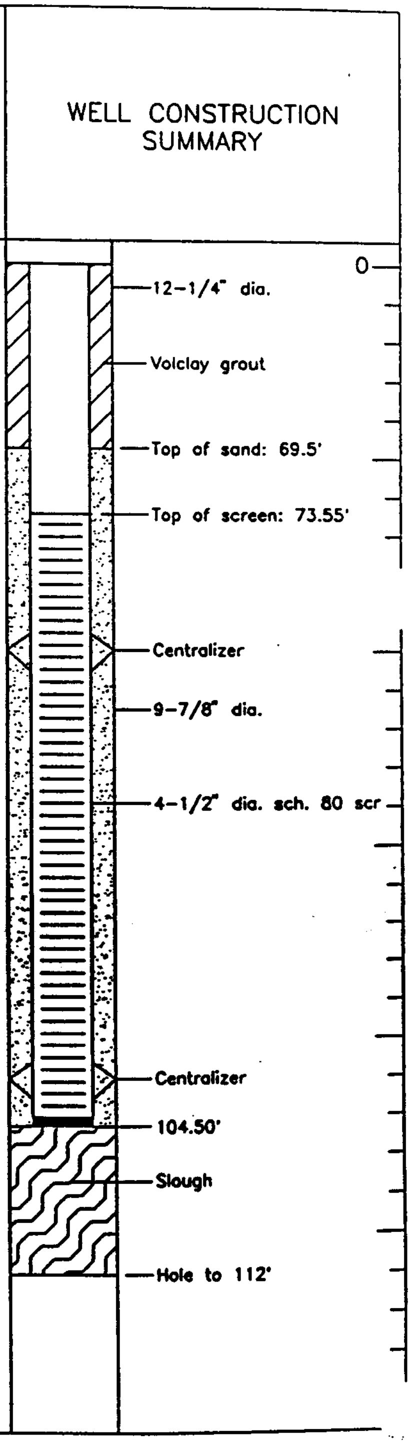


DESCRIPTION

Clay, red to reddish brown, minimum to moderate silt, very uniform, slightly moist, oxidized

Gravel, medium grayish brown, trace to minimum silt/clay, round to very angular grains, minimum to moderate sand

96' to 110' – same as above, but slightly more coarse matrix



NOTES

Conductor casing remains in hole to 63' (12-1/4") below 63', 9-7/8" dia. hole

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LOG OF MONITORING WELL

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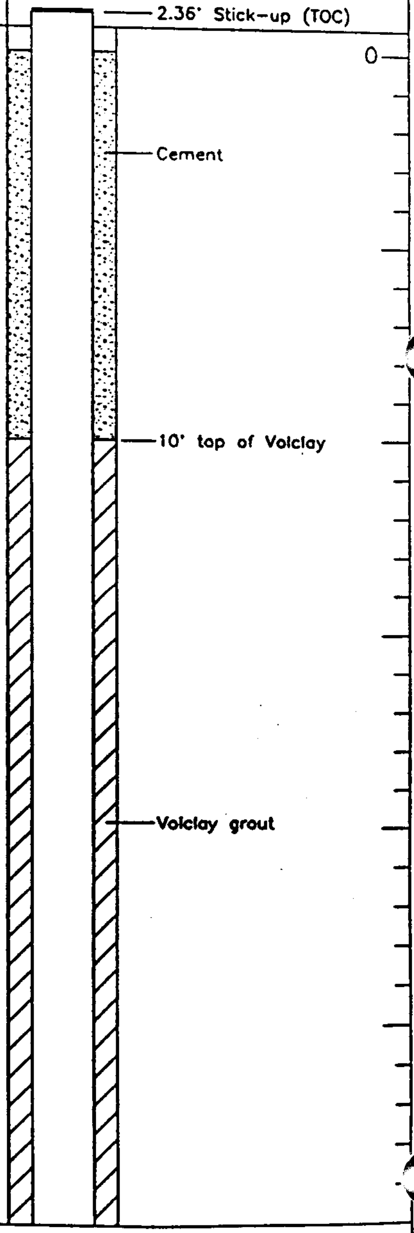
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-14 (SITE #11)	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E
LOGGED BY: PTA CHECKED BY:	SURFACE ELEVATION: 5169.05'	GWL DEPTH: 140' (ENCOUNTERED) DEPTH: 1.585' (STATIC)

DRILLING METHOD: AUGER TO 94' ROTARY 94' +	HOLE DIAMETER: 6"	FLUID USED: MUD @ 94'	DATE STARTED: 9/27/94 COMPLETED:

CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc — FROM 2.36 A.G.S. TO 127.5 B.G.S.
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots — FROM 127.5' TO 157.5'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	DESCRIPTION
0	Auger cuttings	0-5'			Light brown silty fine to medium sand and fine gravel, very poorly sorted with gravel ranging up to 3" in size, contains clay lenses and some small pieces of basalt
5	Auger cuttings	5-10'			
10	Auger cuttings	10-15'			Same as above - moist, thin basalt flows, gravel sizes smaller
15	Auger cuttings	15-20'			Between 15' and 20' - a thin (~~8" thick) dike
20	Auger cuttings	20-25'			Same as above - lighter in color, almost white
25	Auger cuttings	25-30'			Red clay containing minor silt and sand
30					

WELL CONSTRUCTION SUMMARY



NOTES

Used 8 bags of volclay
Development time = 6.62 hours
Average flow = 12 gpm
Date: 10/2/94

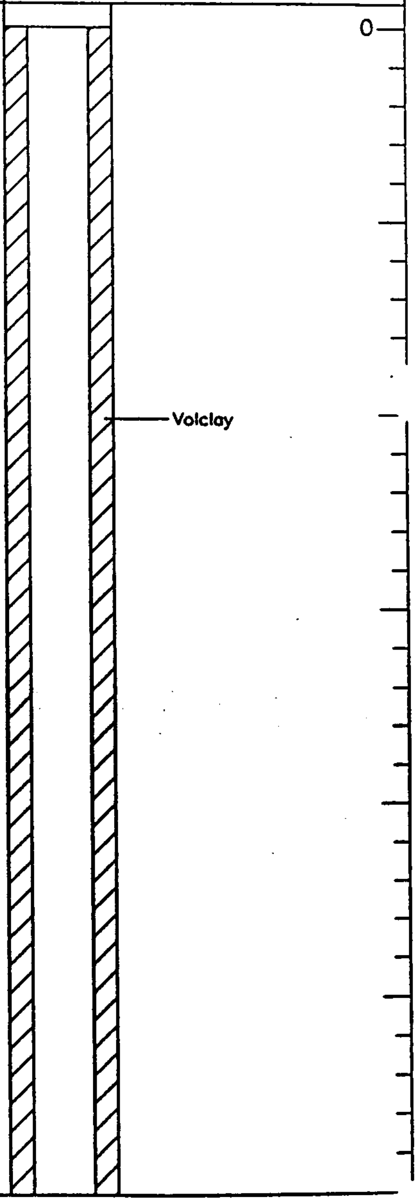
Static water = 1,585 from TOC (11/7/94)

Well head protection - 8" dia. steel pipe w/locking well cap, approx. 3.5' above surface.

LOG OF MONITORING WELL

PAGE 2 OF 6

PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-14 (SITE #11)	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E	
LOGGED BY: PTA CHECKED BY:	SURFACE ELEVATION: 5169.05'	GWL DEPTH: 140' (ENCOUNTERED) DEPTH: 1.585' (STATIC)	
DRILLING METHOD: AUGER TO 94' ROTARY 94' +	HOLE DIAMETER: 6"	FLUID USED: MUD	DATE STARTED: 9/27/94 COMPLETED:
CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc	FROM 2.36 A.G.S. TO 127.5 B.G.S.		
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots	FROM 127.5' TO 157.5'		

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY
30	Auger cuttings	30–35'				Red clay containing little silt and coarse sand	
35	Auger cuttings	35–40'					
40	Auger cuttings	40–45'					
45	Auger cuttings	45–50'				Red clay as above, appears to be drier and siltier	
50	Auger cuttings	50–55'					
55	Auger cuttings	55–60'					
60							

NOTES

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LOG OF MONITORING WELL

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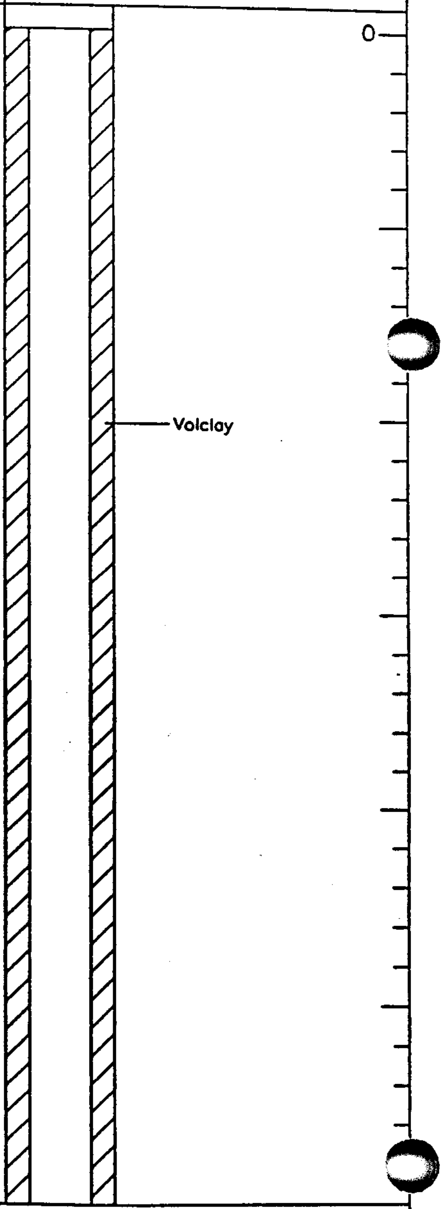
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-14 (SITE #11)	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E	
LOGGED BY: PTA CHECKED BY:	SURFACE ELEVATION: 5169.05'	GWL DEPTH: 140' (ENCOUNTERED) DEPTH: 1.585' (STATIC)	
DRILLING METHOD: AUGER TO 94' ROTARY 94' +	HOLE DIAMETER: 6"	FLUID USED: MUD	DATE STARTED: 9/27/94 COMPLETED:

CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc — FROM 2.36 A.G.S. TO 127.5 B.G.S.
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots — FROM 127.5' TO 157.5'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
60	Auger cuttings	60–65'				Red clay with some silt and rare coarse sand as above
65	Auger cuttings	65–70'				
70	Auger cuttings	70–75'				Red clay as above, appears to have less silty material and more moisture
75	Auger cuttings	75–80'				
80	Auger cuttings	80–85'				
85	Auger cuttings	85–90'				
90						

WELL CONSTRUCTION SUMMARY



NOTES

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LOG OF MONITORING WELL

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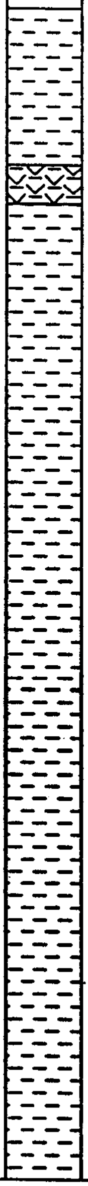
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94–14 (SITE #11)	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E
LOGGED BY: PTA CHECKED BY:	SURFACE ELEVATION: 5169.05'	GWL DEPTH: 140' (ENCOUNTERED) DEPTH: 1.585' (STATIC)

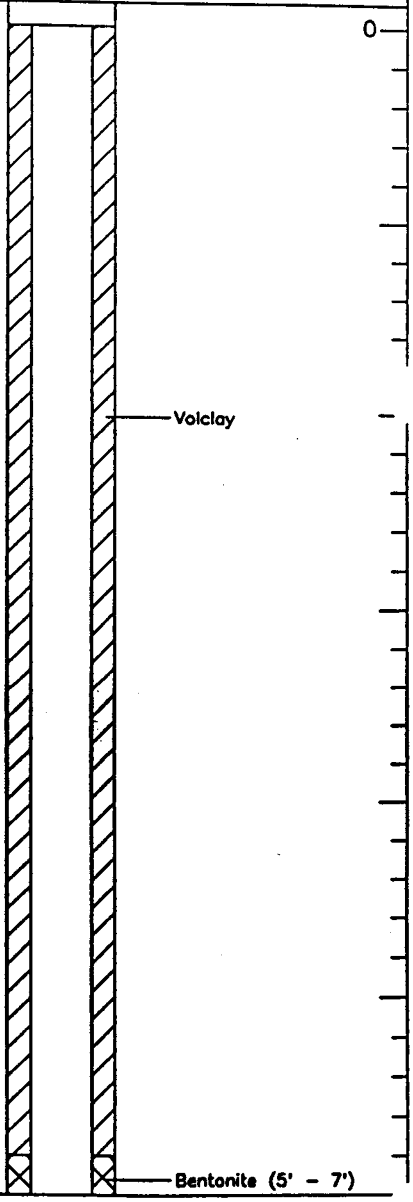
DRILLING METHOD: AUGER TO 94' ROTARY 94' +	HOLE DIAMETER: 6"	FLUID USED: MUD	DATE STARTED: 9/27/94 COMPLETED:

CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc — FROM 2.36 A.G.S. TO 127.5 B.G.S.
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots — FROM 127.5' TO 157.5'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
90						Red clay (continued)
95	Rotary cuttings w/mud	95–100' sample not washed				Basalt, changed to rotary w/mud Red Clay
100	Rotary cuttings w/mud	100–105'				
105	Rotary cuttings w/mud	105–110'				
110	Rotary cuttings w/mud	110–115'				
115	Rotary cuttings w/mud	115–120'				
120						



WELL CONSTRUCTION SUMMARY



NOTES

6' sample from 94' – 100' not washed. From 100' on samples are washed.

Bentonite was placed by mixing with water and pumping down the hole in a slurry.
50 pounds of bentonite was used.

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LOG OF MONITORING WELL

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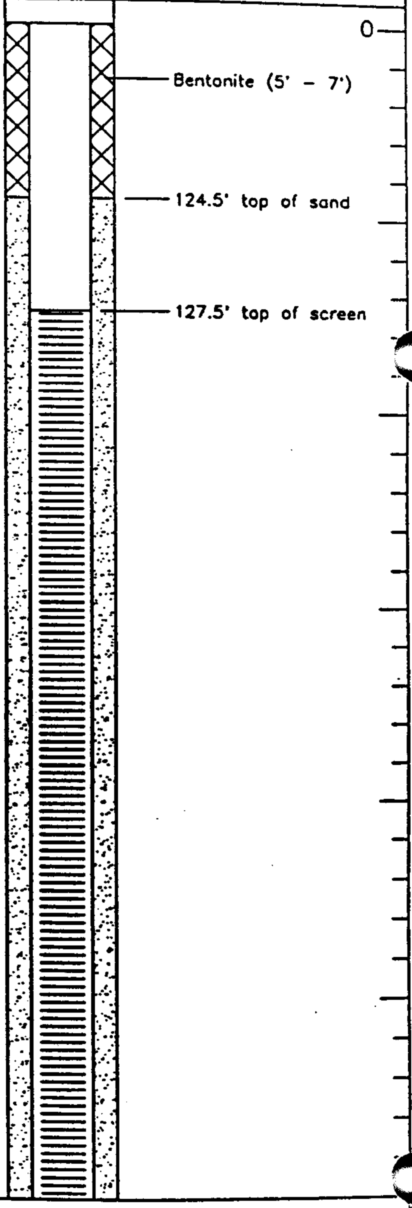
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-14 (SITE #11)	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E
LOGGED BY: PTA CHECKED BY:	SURFACE ELEVATION: 5169.05'	GWL DEPTH: 140' (ENCOUNTERED) DEPTH: 1.585' (STATIC)
DRILLING METHOD: AUGER TO 94' ROTARY 94' +	HOLE DIAMETER: 6"	FLUID USED: MUD
		DATE STARTED: 9/27/94 COMPLETED:
CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc	FROM 2.36 A.G.S. TO 127.5 B.G.S.	
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots	FROM 127.5' TO 157.5'	

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
120	Rotary cuttings w/mud	120-125'				Gravel, driller calls this "rock" so must be cemented
125	Rotary cuttings w/mud	125-128'				
	Rotary cuttings w/mud	128-130'				Interbedded clay and cemented gravel
130	Rotary cuttings w/mud	130-135'				Red clay (note: this is from information from driller, cuttings are gravel and clay)
135	Rotary cuttings w/mud	135-140'				Gravel and clay, interbedded clay layers are ~2' thick
140	Rotary cuttings w/mud	140-145'				Gravel, driller thinks he hit water
145	Rotary cuttings w/mud	145-150'				
150						

WELL CONSTRUCTION SUMMARY



NOTES

Sand is CSSI silica sand - environmental media
4 bags of sand were used

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LOG OF MONITORING WELL

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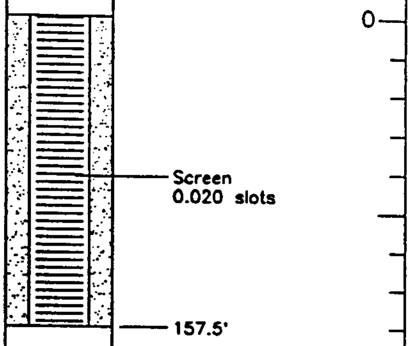
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-14 (SITE #11)	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E	
LOGGED BY: PTA CHECKED BY:	SURFACE ELEVATION: 5169.05'	GWL DEPTH: 140' (ENCOUNTERED) GWL DEPTH: 1.585' (STATIC)	
DRILLING METHOD: AUGER TO 94' ROTARY 94' +	HOLE DIAMETER: 6"	FLUID USED: MUD	DATE STARTED: 9/27/94 DATE COMPLETED:
CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc	FROM 2.36' A.G.S. TO 127.5' B.G.S.		
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots	FROM 127.5' TO 157.5'		

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
150						Gravel (continued)
	Rotary cuttings w/mud	95-100'				
155	Rotary cuttings w/mud	95-100'				
						Plugged bit Total depth = 158'
160						
165						
170						
175						
180						

WELL CONSTRUCTION SUMMARY



NOTES

Screen is 4" dia. sch. 40 pvc

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LOG OF MONITORING WELL GWQ94-15

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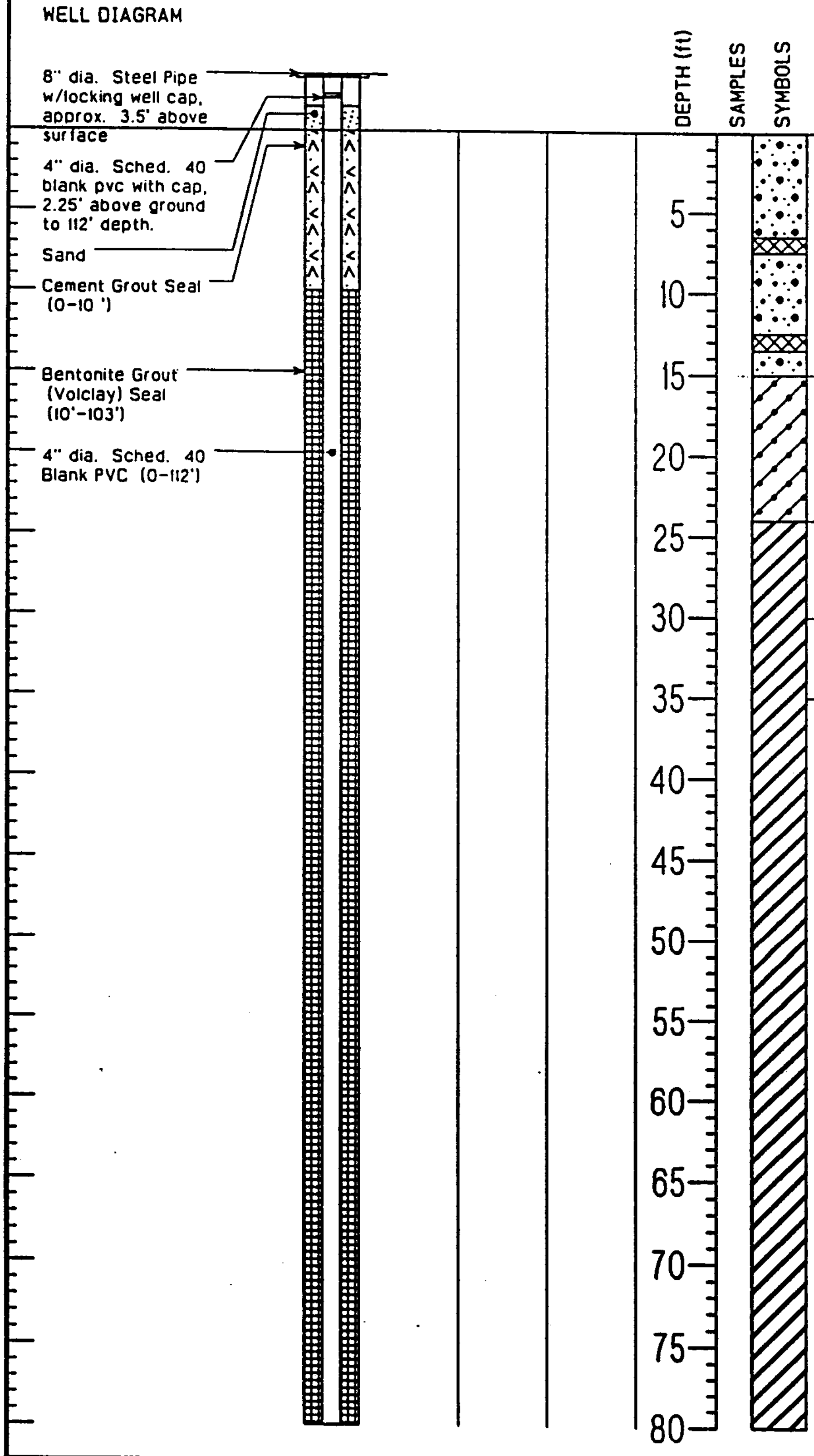

MATERIALS DESCRIPTION

0-15', Light brown silty-sandy gravel. Very poorly sorted. Sand size is medium and finer. Gravel is poorly sorted with most size pebble or smaller (mostly < 10mm but some large pebbles. Note: 6.5'-7.5'± and 12.5'-13.5'± Basalt layers

15'-24', Clayey, silty sand and gravel - similar to above with clay layers. Sand and gravel is light brown; clay is red.

24'-30', Red silty clay with fragments of basalt in cuttings. Dry.

30'-35', Red, silty, sandy clay.

35'-89', Red, silty clay. Dry.

Moist at 60'.

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N712922.14, E603803.73 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607Q15)
GEOLOGIST P.T.A.
DRILL RIG Auger to 89', Rotary 89'+

DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/01/94 - 10/04/94
SURFACE ELEVATION 5159.35
TOTAL DEPTH OF HOLE 148.0 Feet
WATER LEVEL Static, from TOC on 11/7/94: 0.93 Feet

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LOG OF MONITORING WELL GWQ94-15

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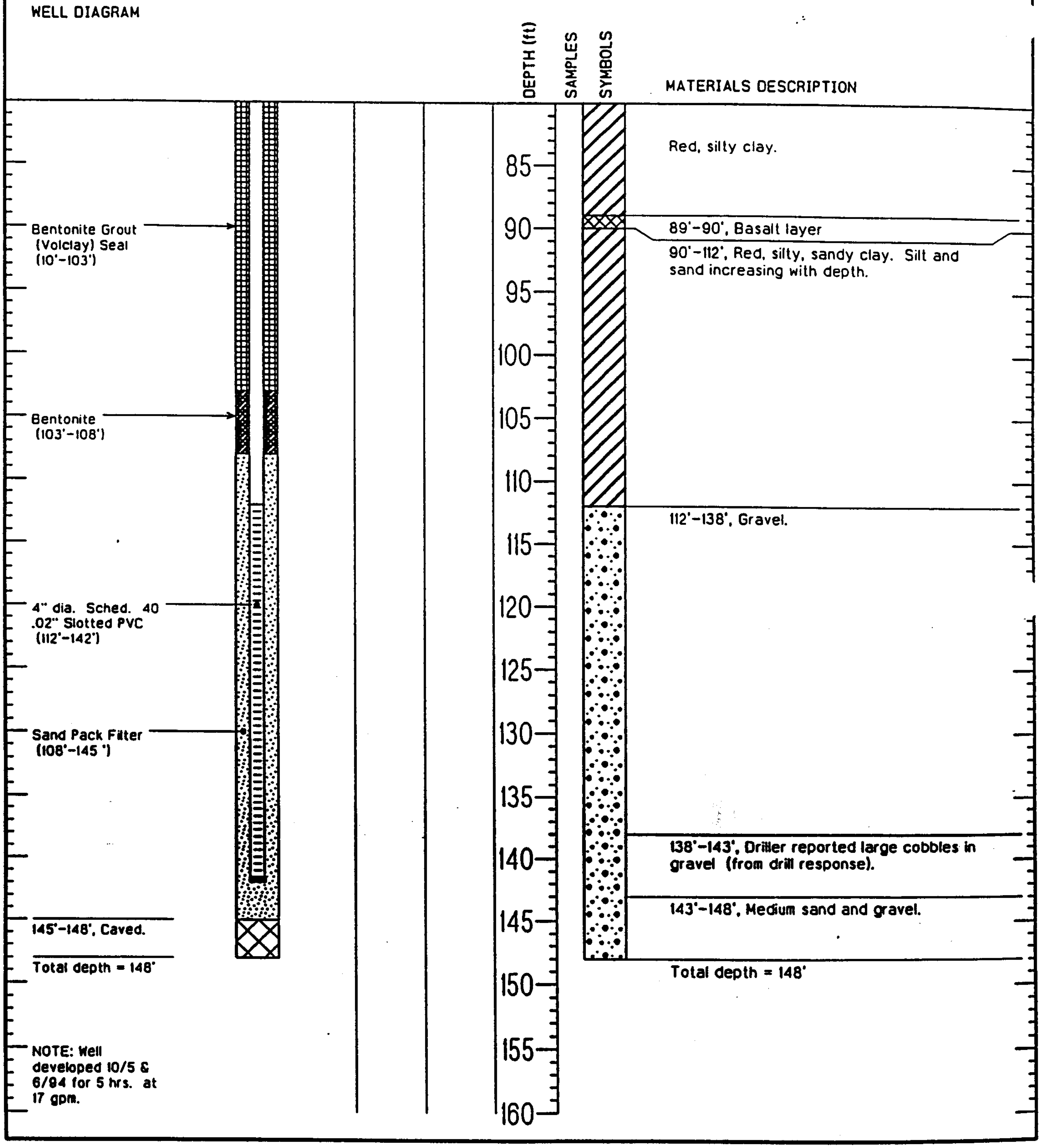

Bentonite Grout (Volclay) Seal (10'-103')

Bentonite (103'-108')

4" dia. Sched. 40 .02" Slotted PVC (112'-142')

Sand Pack Filter (108'-145 ')

145'-148', Caved.

Total depth = 148'

NOTE: Well developed 10/5 & 6/94 for 5 hrs. at 17 gpm.

Red, silty clay.

89'-90', Basalt layer

90'-112', Red, silty, sandy clay. Silt and sand increasing with depth.

112'-138', Gravel.

138'-143', Driller reported large cobbles in gravel (from drill response).

143'-148', Medium sand and gravel.

Total depth = 148'

PROJECT Copper Flat - Hillsboro, N.M.

LOCATION N712922.14, E603803.73 N.M. S.P.C.

JOB NUMBER 68607 (ref: 68607Q15)

GEOLOGIST P.T.A.

DRILL RIG Auger to 89', Rotary 89'+

DRILLING COMPANY Beylik Drilling

DATE DRILLED 10/01/94 - 10/04/94

SURFACE ELEVATION 5159.35

TOTAL DEPTH OF HOLE 148.0 Feet

WATER LEVEL Static, from TOC on 11/7/94: 0.63 Feet

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LOG OF MONITORING WELL GWQ94-16

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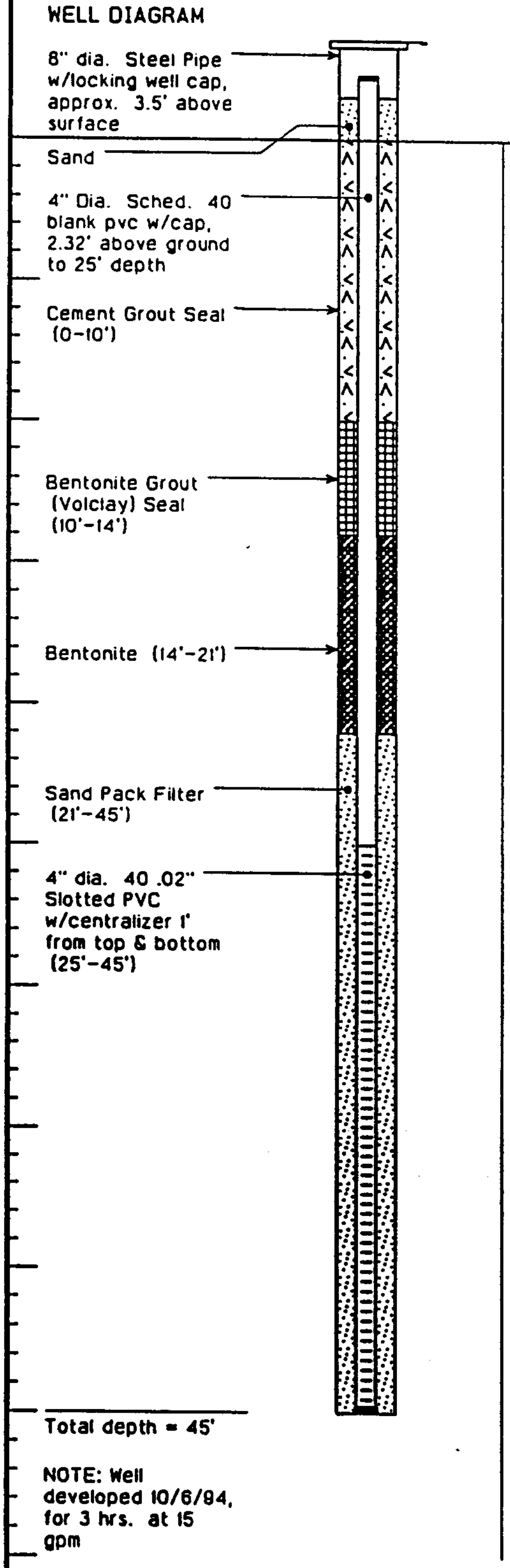
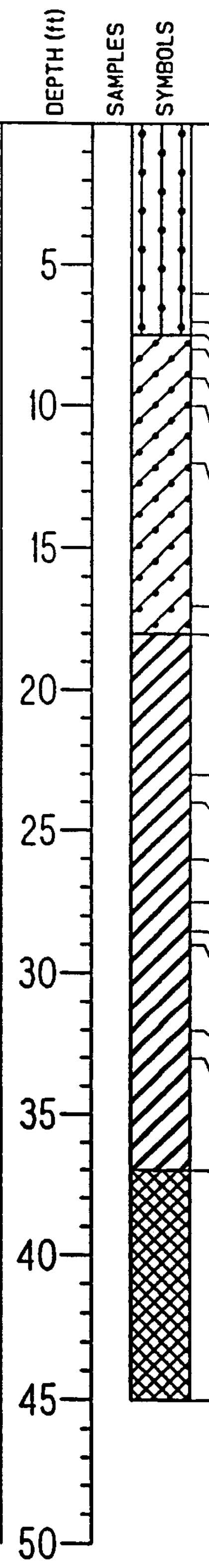
WELL DIAGRAM



NOTE: Well developed 10/6/94, for 3 hrs. at 15 gpm



MATERIALS DESCRIPTION

0-6', Gravel w/minor sand and grey clay, increasing pebble size from 1/8"-1/4" to 1/4"-3/4"

6'-7', Pea size gravel

7'-7.5', Sandy gravel

7.5'-8', Red, clayey, sandy gravel

8'-9', clayey gravel (red)

9'-10', Coarser gravel w/red clay @ 9' (GM)

10'-12', Thin (<4") layer of white clay fragments in red clay matrix

12'-17', Red clay minor gravel

17'-18', Gravel w/red clay matrix

18'-23', Red clay w/minor gravel, soft w/ some moisture (CH)

23'-24', Increasing gravel in red clay. (1/4-3/4")

24'-26', Red clay w/pea size gravel

26'-27.5', Larger gravel +1"

27.5'-28.5', Red clay w/minor gravel

28.5'-29', 6" grey green clay increasing in moisture - clay dark

29'-32', Red sticky clay w/minor gravel, slightly moist.

32'-33', Increase in moisture, consistency of potters clay

33'-37', Red clay, v. moist.

37'-45', basalt

Total depth = 45'

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N713191.10, E603249.22 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607Q16)
GEOLOGIST J.V. Parshley
DRILL RIG Auger

DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/04/94
SURFACE ELEVATION 5173.71
TOTAL DEPTH OF HOLE 45 Feet
WATER LEVEL Static, from TOC on 11/7/94: 18.23 Feet

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LOG OF MONITORING WELL

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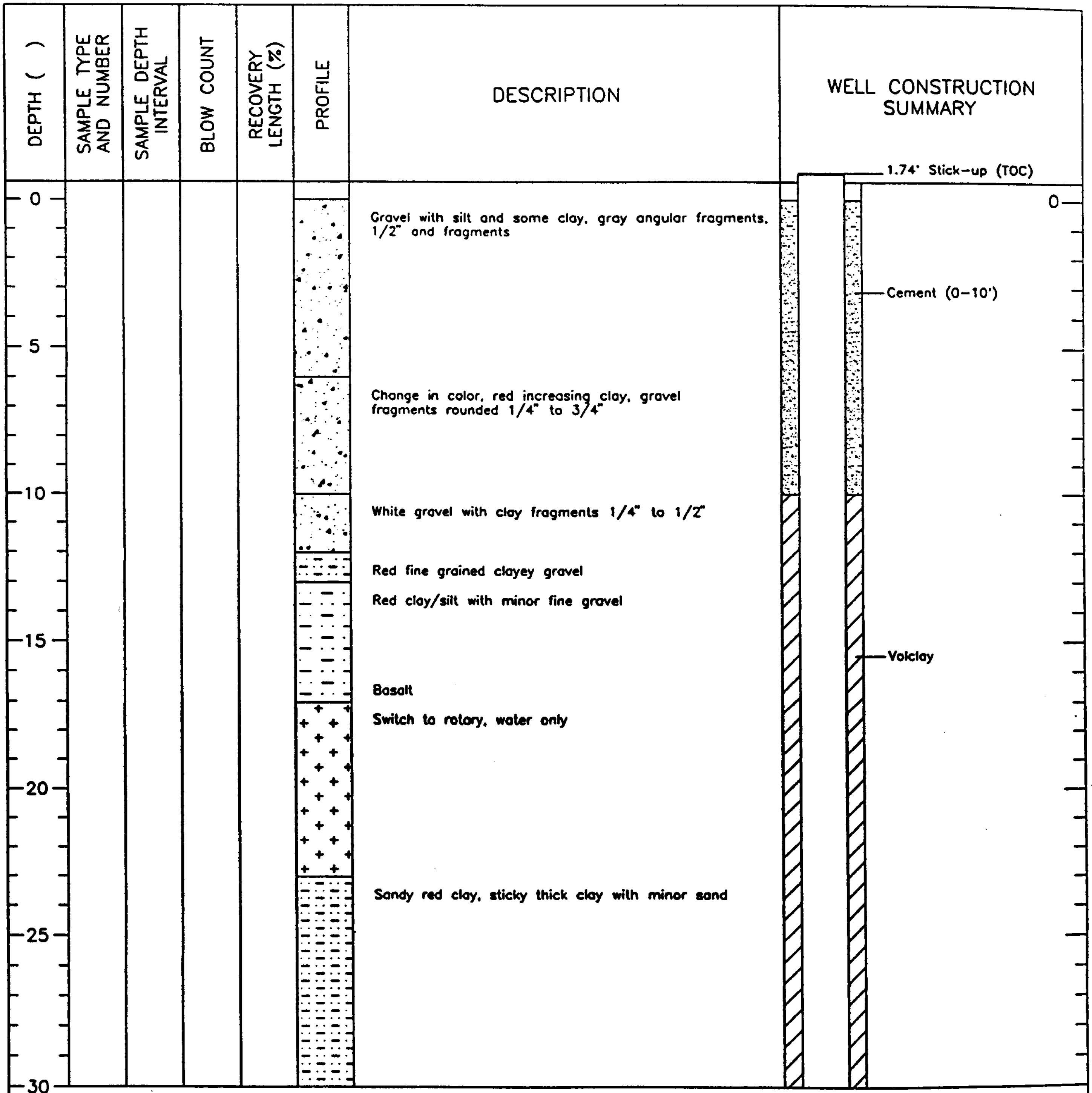
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-17	COORDINATES OR LOCATION: 713,549.66 N 603,465.41 E
LOGGED BY: JVP CHECKED BY:	SURFACE ELEVATION: 5175.23'	GWL DEPTH: 50' & 121' (ENCOUNTERED) DEPTH: 5.32' (STATIC)

DRILLING METHOD: AUGER/ROTARY	HOLE DIAMETER: 12"	FLUID USED: MUD @ 18'	DATE STARTED: 10/5/94 COMPLETED: 10/09/94

CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc	FROM 1.74' A.G.S. TO 120' B.G.S.
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots	FROM 120' TO 150'



Gravel with silt and some clay, gray angular fragments, 1/2" and fragments

Change in color, red increasing clay, gravel fragments rounded 1/4" to 3/4"

White gravel with clay fragments 1/4" to 1/2"

Red fine grained clayey gravel

Red clay/silt with minor fine gravel

Basalt

Switch to rotary, water only

Sandy red clay, sticky thick clay with minor sand

NOTES

Development time = 2.15 hours
Average flow = 15 gpm
Date: 10/21/94

Static water = 5.32 from TOC (11/7/94)

Well head protection - 8" dia. steel pipe w/locking well cap, approx. 3.5' above surface.

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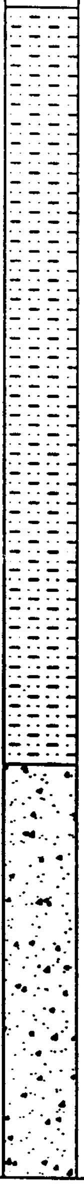
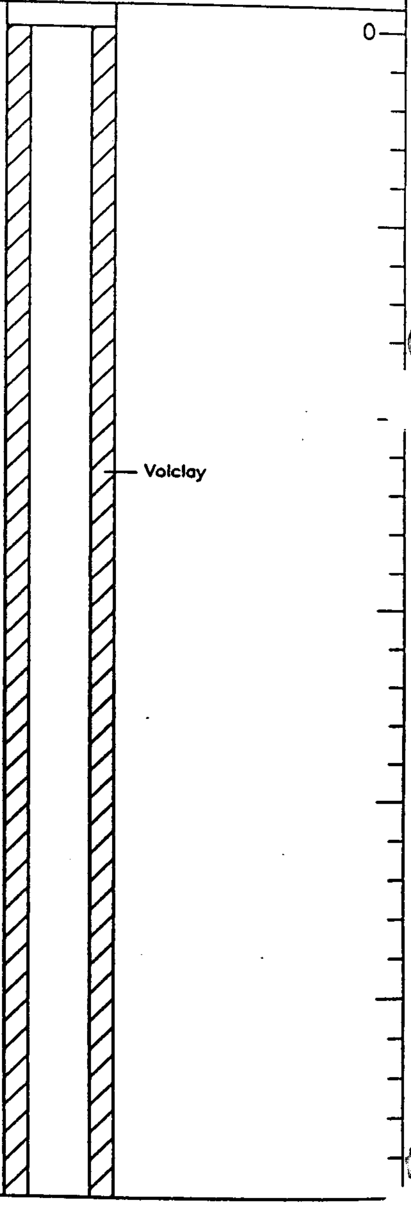
LOG OF MONITORING WELL

PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-17	COORDINATES OR LOCATION: 713,549.41 N 603,465.61 E	
LOGGED BY: JVP CHECKED BY:	SURFACE ELEVATION: 5175.23'	GWL DEPTH: 50' & 121' (ENCOUNTERED DEPTH: 5.32' (STATIC)	
DRILLING METHOD: AUGER/ROTARY	HOLE DIAMETER: 12"	FLUID USED: MUD @ 18'	DATE STARTED: 10/5/94 COMPLETED: 10/09/94
CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc	FROM 1.74' A.G.S.	TO 120' B.G.S.	
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots	FROM 120'	TO 150'	

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
30						Red clay with minor sand (coarse)
35						Some fragments of fine gravel 1/2" to 3/4"
40						Red clay with coarse sand (minor), occasional gravel fragments +1/2", sample seems wetter, but may just be sampling procedure
45						Some coarse sand (@ 47' – 49'?)
50						Clayey gravel, red clay matrix and clasts of volc, etc. including basalt May have hit water at lithology change, quit drilling, temporarily sit pvc screen, bailed well dry and let sit for 2 hours, water level recovered to 47'
55						
60						Stop drilling 10/6/94, wait overnight to see if water



WELL CONSTRUCTION SUMMARY



NOTES

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LOG OF MONITORING WELL

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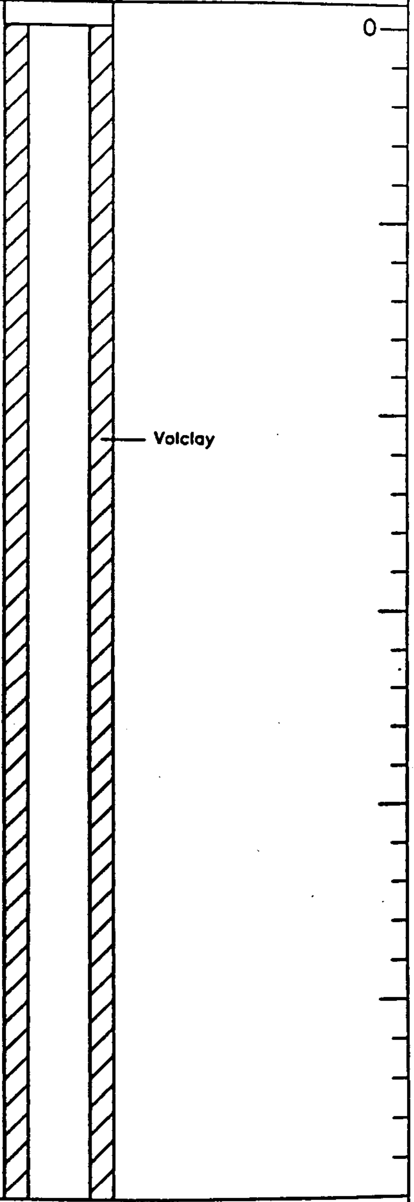
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-17		COORDINATES OR LOCATION: 713,549.44 N 603,465.41 E
LOGGED BY: JVP CHECKED BY:	SURFACE ELEVATION: 5175.23'		GWL DEPTH: 50' & 121' (ENCOUNTERED) DEPTH: 5.32' (STATIC)
DRILLING METHOD: AUGER/ROTARY	HOLE DIAMETER: 12"	FLUID USED: MUD @ 18'	DATE STARTED: 10/5/94 COMPLETED: 10/09/94
CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc			FROM 1.74' A.G.S. TO 120' B.G.S.
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots			FROM 120' TO 150'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
60						Sandy clay with occasional gravel, red sticky clay abundant, occasional white clay fragments
65						
70						Sand very minor, clay in small fragments even in wet hole
75						White clay fragments (sand-size) increasing to 1 – 2%
80						
85						Clay coming up as small fragments (coarse sand size) still some white clay fragments, minor sand
90						

WELL CONSTRUCTION SUMMARY



NOTES

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LOG OF MONITORING WELL

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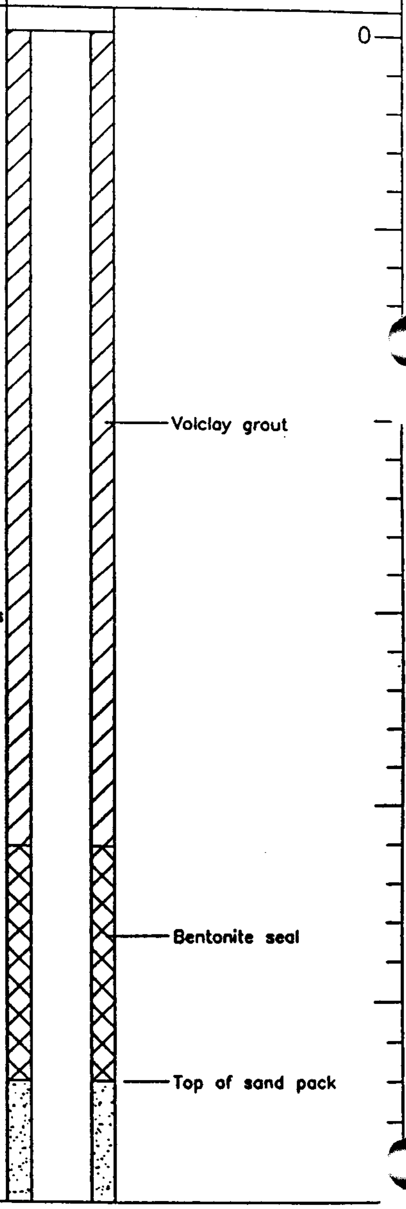
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-17	COORDINATES OR LOCATION: 713,549.41 N 603,465.61 E	
LOGGED BY: JVP CHECKED BY:	SURFACE ELEVATION: 5175.23'	GWL DEPTH: 50' & 121' (ENCOUNTERED DEPTH: 5.32' (STATIC)	
DRILLING METHOD: AUGER/ROTARY	HOLE DIAMETER: 12"	FLUID USED: MUD @ 18'	DATE STARTED: 10/5/94 COMPLETED: 10/09/94

CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc — FROM 1.74' A.G.S. TO 120' B.G.S.
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots — FROM 120' TO 150'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
90						Red clay with very minor sand, clay breaking into coarse sand size fragments, some white clay fragments
95						
100						
105						Increase in sand or sand interbeds, white clay fragments common (sand sized)
110						Increasing sand to clayey sand
115						Less sandy-clayey sand (red)
120						

WELL CONSTRUCTION SUMMARY



NOTES
12 bags of sand (50 pound bags)
50 pounds of bentonite

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LOG OF MONITORING WELL

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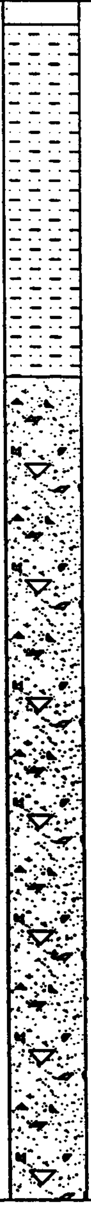
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-17	COORDINATES OR LOCATION: 713,549.44 N 603,465.41 E
LOGGED BY: JVP CHECKED BY:	SURFACE ELEVATION: 5175.23'	GWL DEPTH: 50' & 121' (ENCOUNTERED) DEPTH: 5.32' (STATIC)

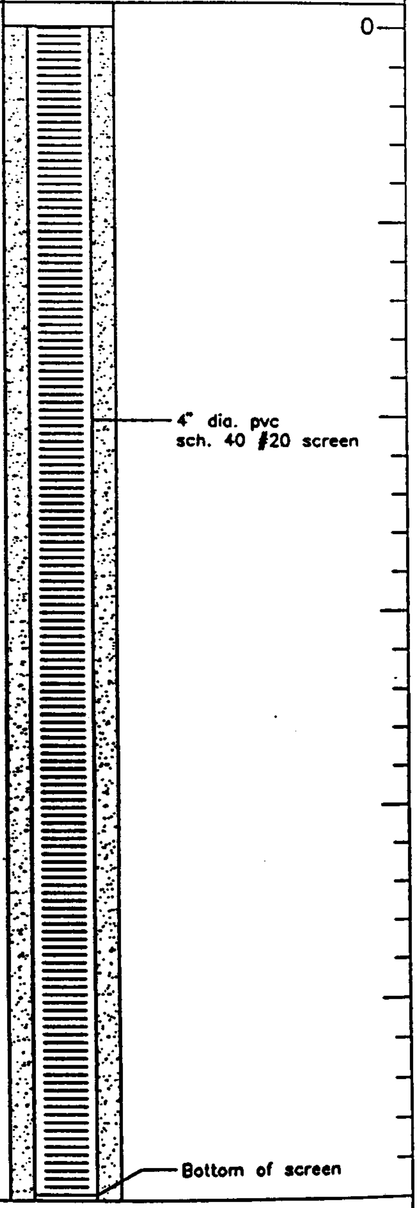
DRILLING METHOD: AUGER/ROTARY	HOLE DIAMETER: 12"	FLUID USED: MUD @ 18'	DATE STARTED: 10/5/94 COMPLETED: 10/09/94

CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc FROM 1.74' A.G.S. TO 120' B.G.S.
SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots FROM 120' TO 150'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
120						Clayey sand, red clay occasional, white clay fragments, possible water at 121'?
125						
130						Stopped 10/7/94, spent 10/8/94 trying to complete hole. Had to add bentonite, start drilling again 10/9/94 Gravel, very minimal clay, pea gravel, definitely hit water, mostly dark and green fragments propylitized volcanic fragments 1/2" to +1", gravel size increasing
135						
140						
145						
150						



WELL CONSTRUCTION SUMMARY



NOTES

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LOG OF MONITORING WELL

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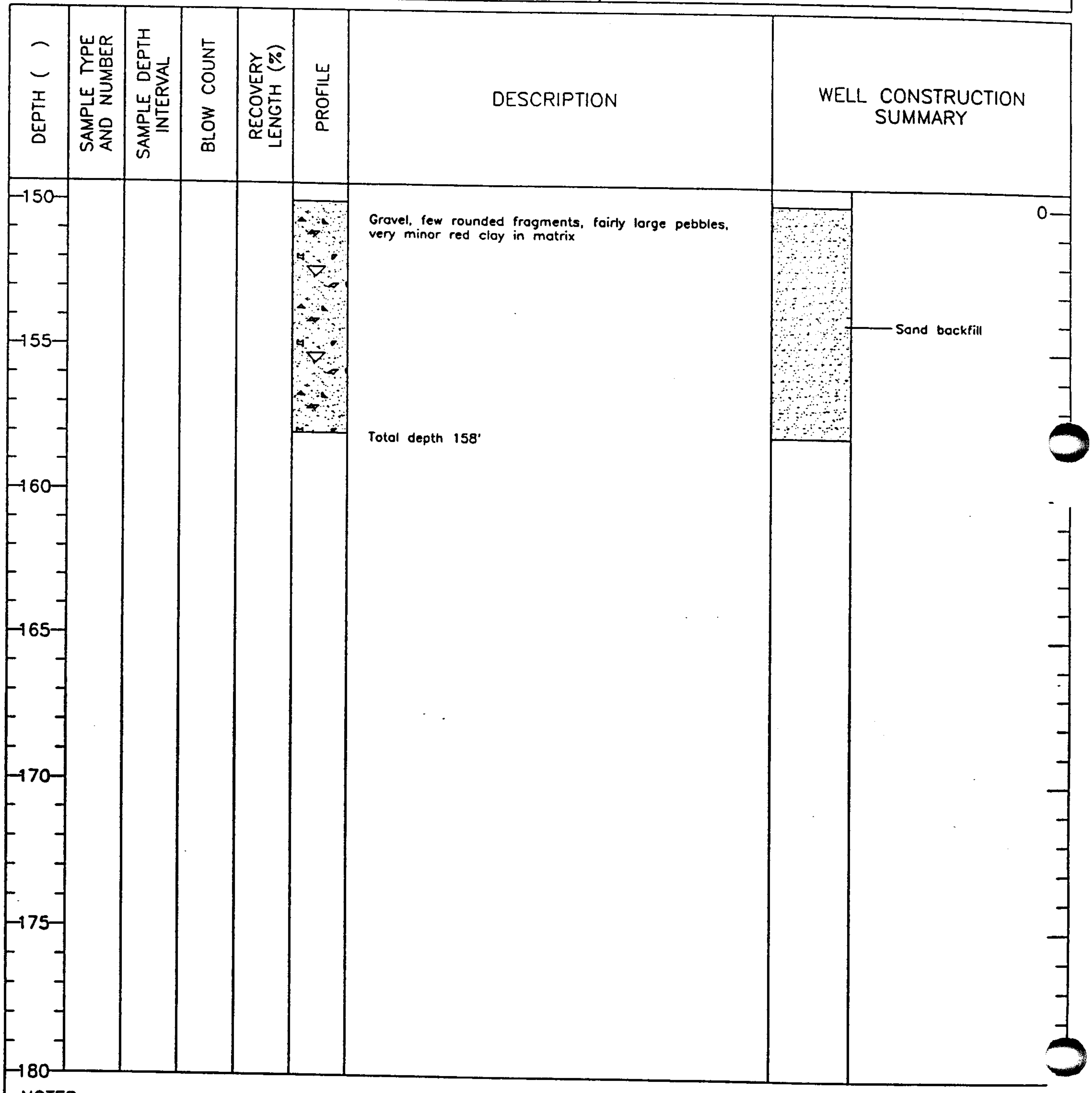
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-17	COORDINATES OR LOCATION: 713,549.44 N 603,465.41 E
LOGGED BY: JVP CHECKED BY:	SURFACE ELEVATION: 5175.23'	GWL DEPTH: 50' & 121' (ENCOUNTERE DEPTH: 5.32' (STATIC)
DRILLING METHOD: AUGER/ROTARY HOLE DIAMETER: 12"	FLUID USED: MUD @ 18'	DATE STARTED: 10/5/94 COMPLETED: 10/09/94
CASING TYPE AND SIZE: 4" dia. Sched. 40 pvc SCREEN TYPE AND SIZE: 4" dia. Sched. 40 pvc, 0.02" slots	FROM 1.74' A.G.S. TO 120' B.G.S. FROM 120' TO 150'	



Gravel, few rounded fragments, fairly large pebbles, very minor red clay in matrix

Total depth 158'

NOTES

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LOG OF MONITORING WELL GWQ94-19

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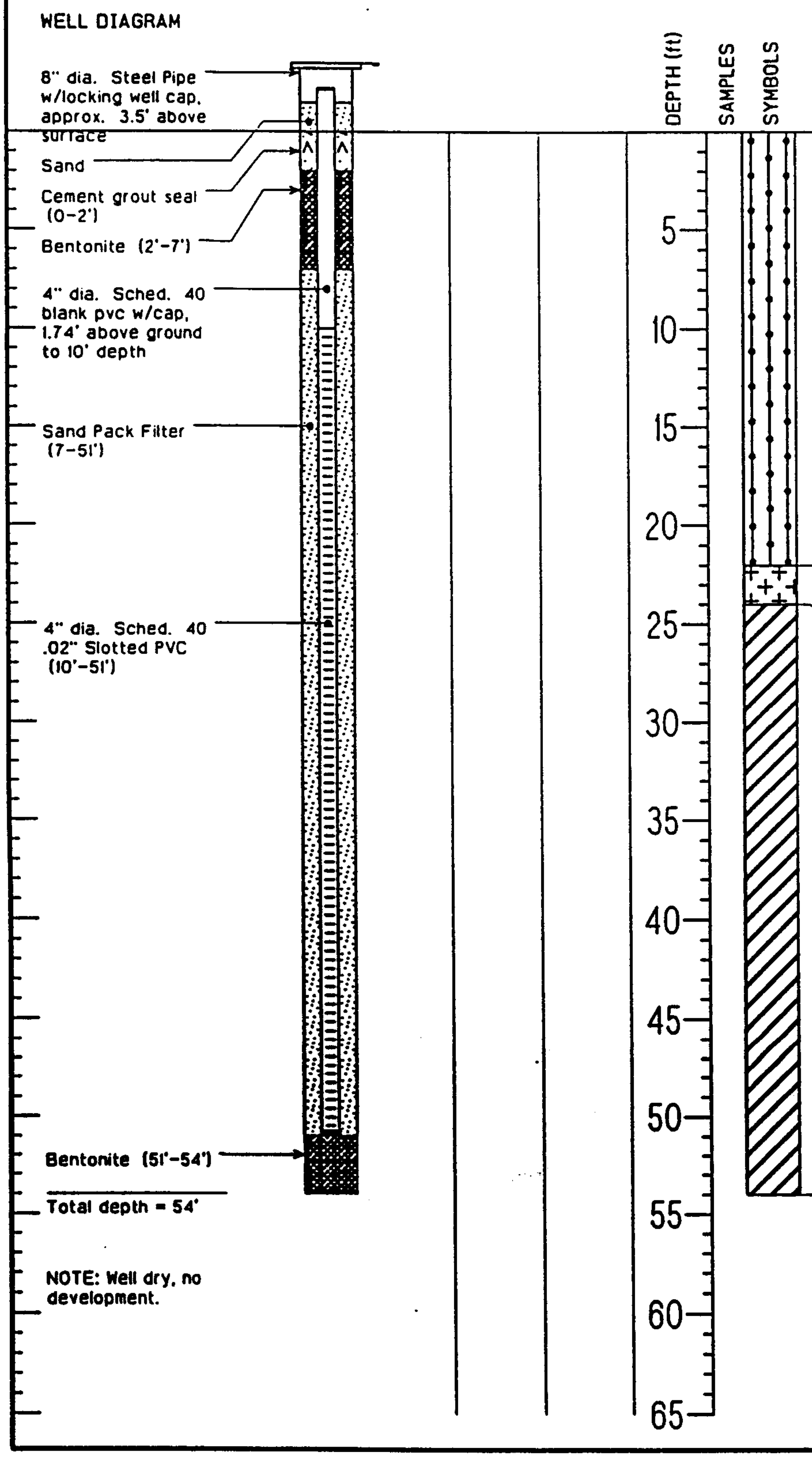

MATERIALS DESCRIPTION

0-22', Soil, gravel w/basaltic material, cobbles/pebbles, sand/silt, Oxidized, very poorly sorted.

22'-24', Rhyolite, buff-cream, very hard, brittle, dry, minor phenocrysts.

24'-54', Clay/silt, red brown-brown, with trace to minor sand in zones, no pebbles/cobbles, dry.

Total depth = 54'

No groundwater encountered.

PROJECT Copper Flat - Hillsboro, N.M.
DRILLING COMPANY Beylik Drilling
LOCATION N713751.31, E603378.24 N.M. S.P.C.
DATE DRILLED 10/11/94
JOB NUMBER 68607 (ref: 68607Q19)
SURFACE ELEVATION 5180.29
GEOLOGIST CW
TOTAL DEPTH OF HOLE 54 Feet
DRILL RIG Auger
WATER LEVEL DRY

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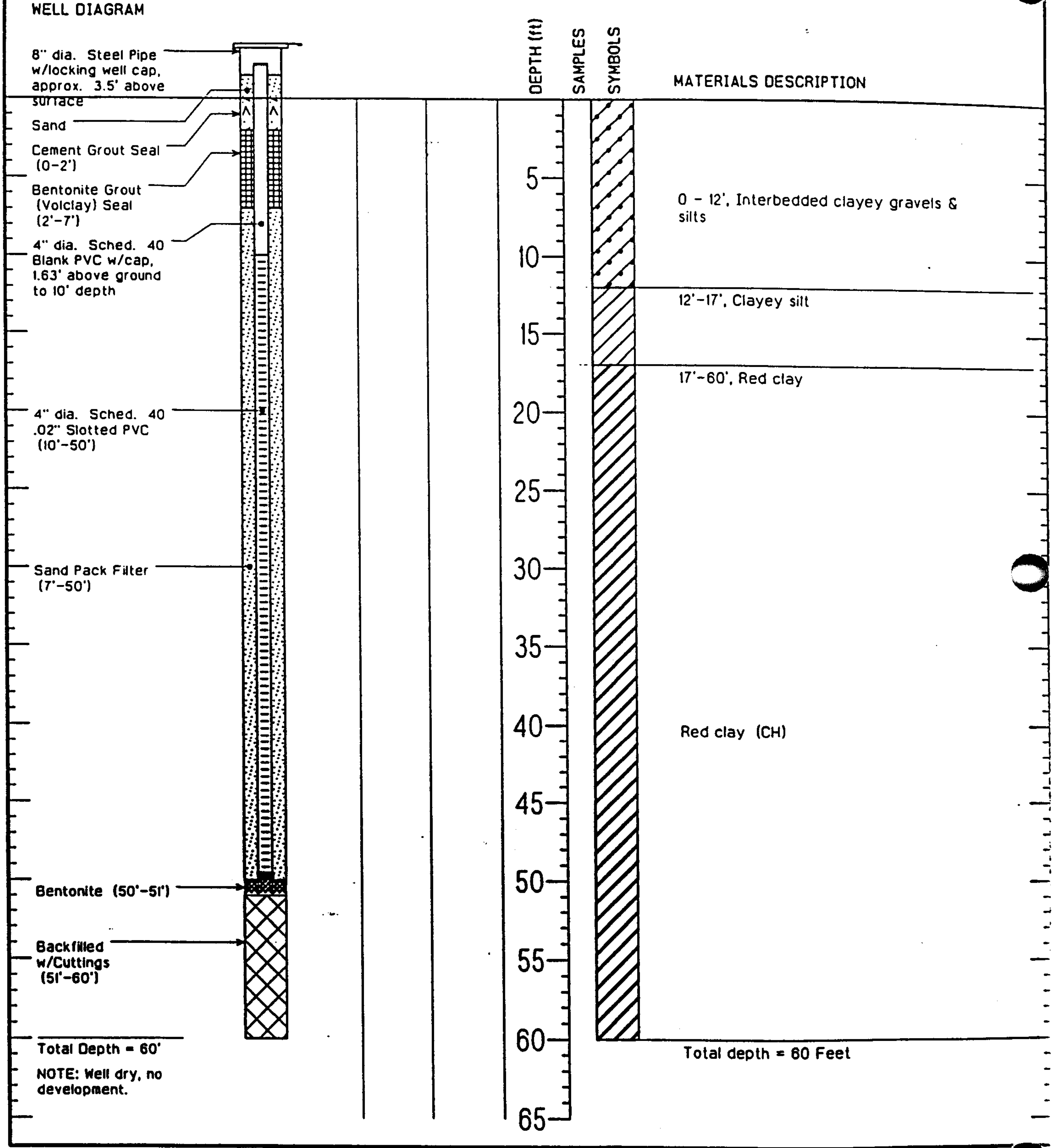
Engineering and Environmental Consultants

LOG OF MONITORING WELL GWQ94-18

Page 1 o



MATERIALS DESCRIPTION

0 - 12', Interbedded clayey gravels & silts

12'-17', Clayey silt

17'-60', Red clay

Red clay (CH)

Total depth = 60 Feet

PROJECT	Copper Flat - Hillsboro, N.M.	DRILLING COMPANY	Beylik Drilling
LOCATION	N713356.22, E603381.90 N.M. S.P.C.	DATE DRILLED	10/94
JOB NUMBER	68607 (ref: 68607Q18)	SURFACE ELEVATION	5171.94
GEOLOGIST	J.V. Parshley	TOTAL DEPTH OF HOLE	60.0 Feet
DRILL RIG	Auger	WATER LEVEL	DRY

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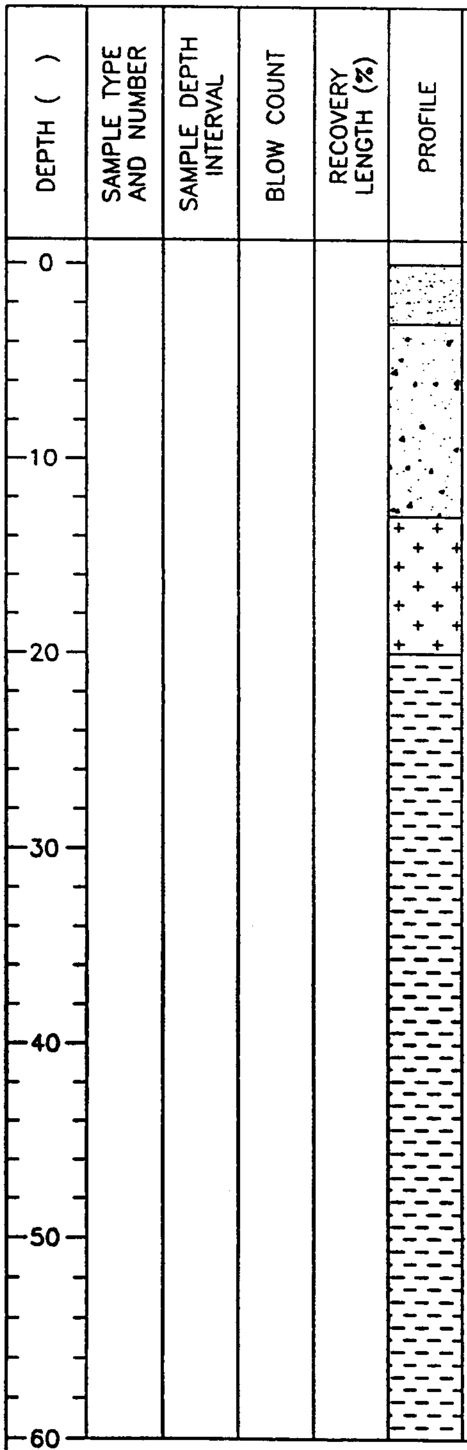
LOG OF MONITORING WELL

PAGE 1 OF 6

PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-20	COORDINATES OR LOCATION: 713,671.45 N 603,230.91 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5180.12	GWL DEPTH: 55.0 (ENCOUNTERED) DEPTH: 10.53' (STATIC)
DRILLING METHOD: ROTARY HOLE DIAMETER: 8 3/8" FLUID USED: AIR		DATE STARTED: 10/10/94 COMPLETED: 10/24/94

CASING TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc — FROM 1.85' A.G.S. TO 288' B.G.S.
SCREEN TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc, 0.02" slots — FROM 288' TO 338'



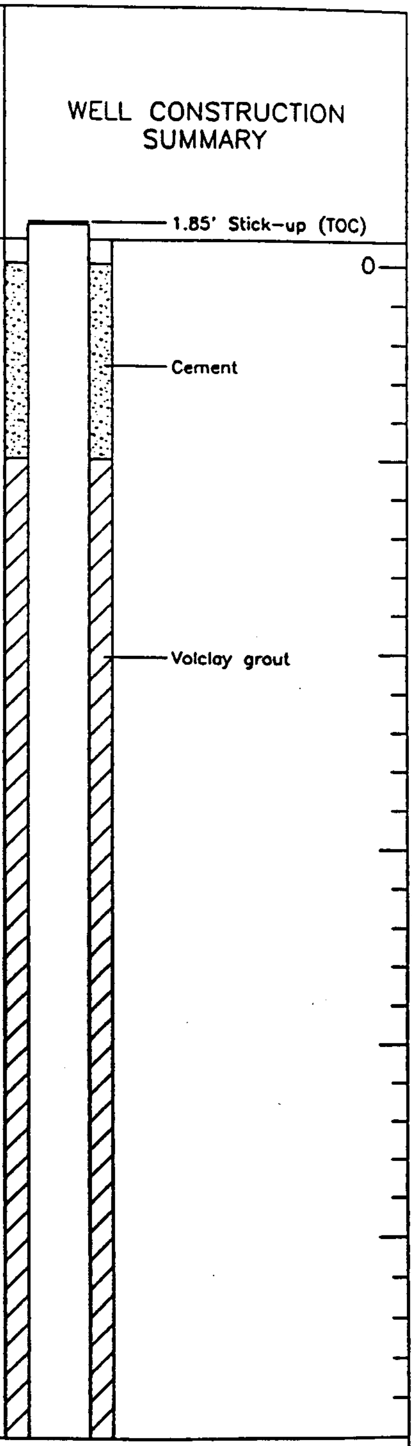
DESCRIPTION

Soil, medium to dark brown, abundant pebbles and cobbles, abundant sand/silt, weathered material

Gravel/fill, light to medium brown, abundant pebbles and cobbles, minimum to moderate sand, trace to minimum silt, weathered, oxidized, dry, very choppy drilling

Rhyolite, buff to light brown, very hard, smooth drilling, minor phenocrysts on fresh surfaces

Clay, reddish brown, trace pebbles and cobbles, medium to abundant silt, very smooth drilling, slightly moist, oxidized, (1st water @ 55'), trace sand



NOTES

Development time = 1.65 hours
Date: 10/26/94 Time = 0.65 hrs Avg. flow = 15 gpm
Date: 10/31/94 Time = 0.50 hrs Avg. flow = 10 gpm
Date: 11/03/94 Time = 0.50 hrs Avg. flow = 11 gpm

Static water = 24.32' from TOC (11/07/94)

Well head protection - 8" dia. steel pipe w/locking well cap, approx. 3.5' above surface.

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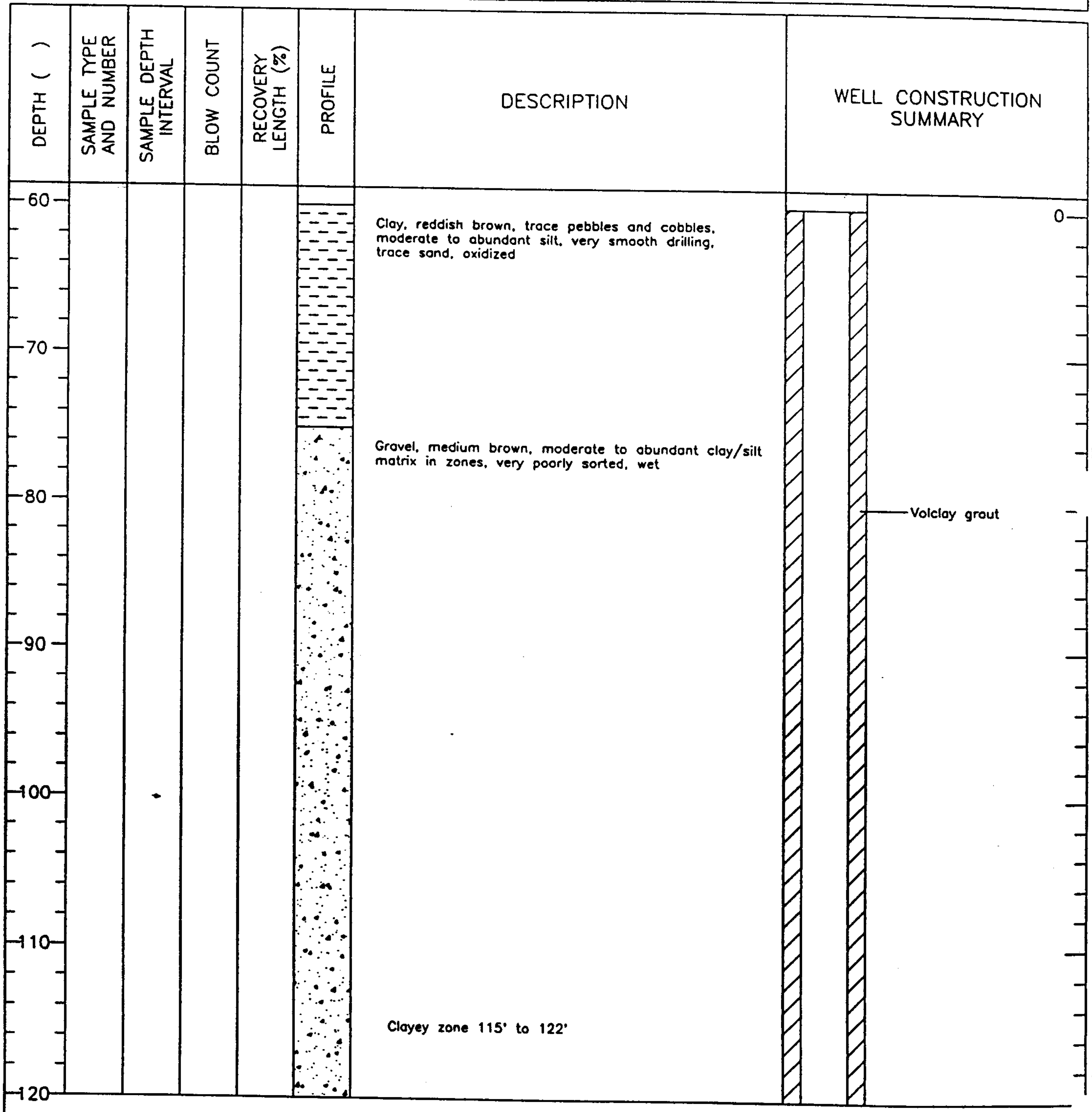
LOG OF MONITORING WELL

PAGE 2 OF 6

PROJECT NAME: COPPER FLATS PROJECT NO.: 68607		BORING NUMBER: GWQ 94-20	COORDINATES OR LOCATION: 713,671.45 N 603,230.91 E
LOGGED BY: CW CHECKED BY:		SURFACE ELEVATION: 5180.12	GWL DEPTH: 55.0 (ENCOUNTERED) DEPTH: 10.53 (STATIC)
DRILLING METHOD: ROTARY	HOLE DIAMETER: 8 3/8"	FLUID USED: AIR	DATE STARTED: 10/10/94 COMPLETED: 10/24/94

CASING TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc — FROM 1.85' A.G.S. TO 288' B.G.S.
SCREEN TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc, 0.02" slots — FROM 288' TO 338'



Clay, reddish brown, trace pebbles and cobbles, moderate to abundant silt, very smooth drilling, trace sand, oxidized

Gravel, medium brown, moderate to abundant clay/silt matrix in zones, very poorly sorted, wet

Clayey zone 115' to 122'

NOTES

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LOG OF MONITORING WELL

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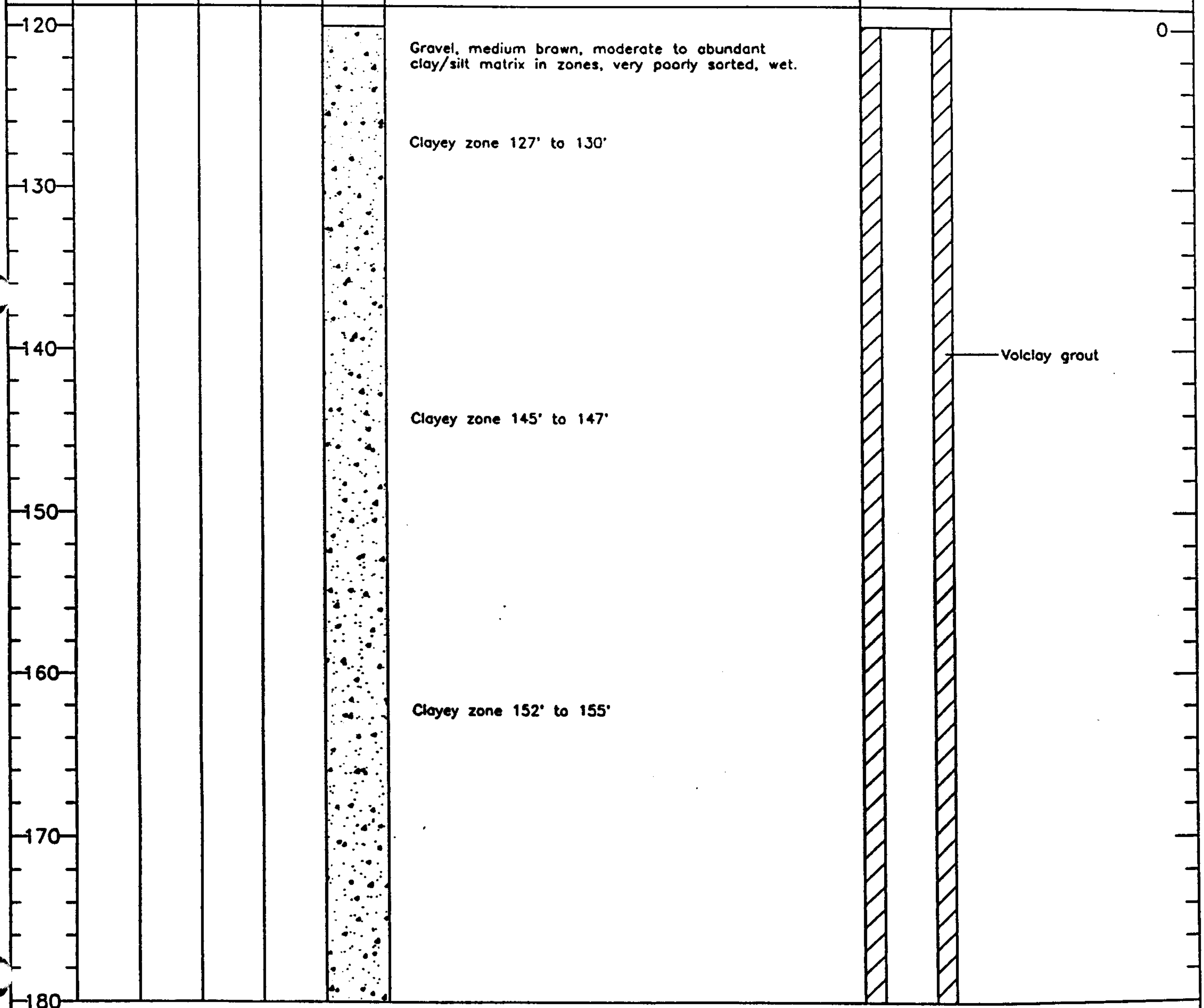
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-20	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E	
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5180.12	GWL DEPTH: 55.0 (ENCOUNTERED) DEPTH: 10.53 (STATIC)	
DRILLING METHOD: ROTARY	HOLE DIAMETER: 8 3/8"	FLUID USED: AIR	DATE STARTED: 10/10/94 COMPLETED: 10/24/94

CASING TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc — FROM 1.85' A.G.S. TO 127.5' B.G.S.
SCREEN TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc, 0.02" slots — FROM 288' TO 338'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY



Gravel, medium brown, moderate to abundant clay/silt matrix in zones, very poorly sorted, wet.

Clayey zone 127' to 130'

Clayey zone 145' to 147'

Clayey zone 152' to 155'

NOTES

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LOG OF MONITORING WELL

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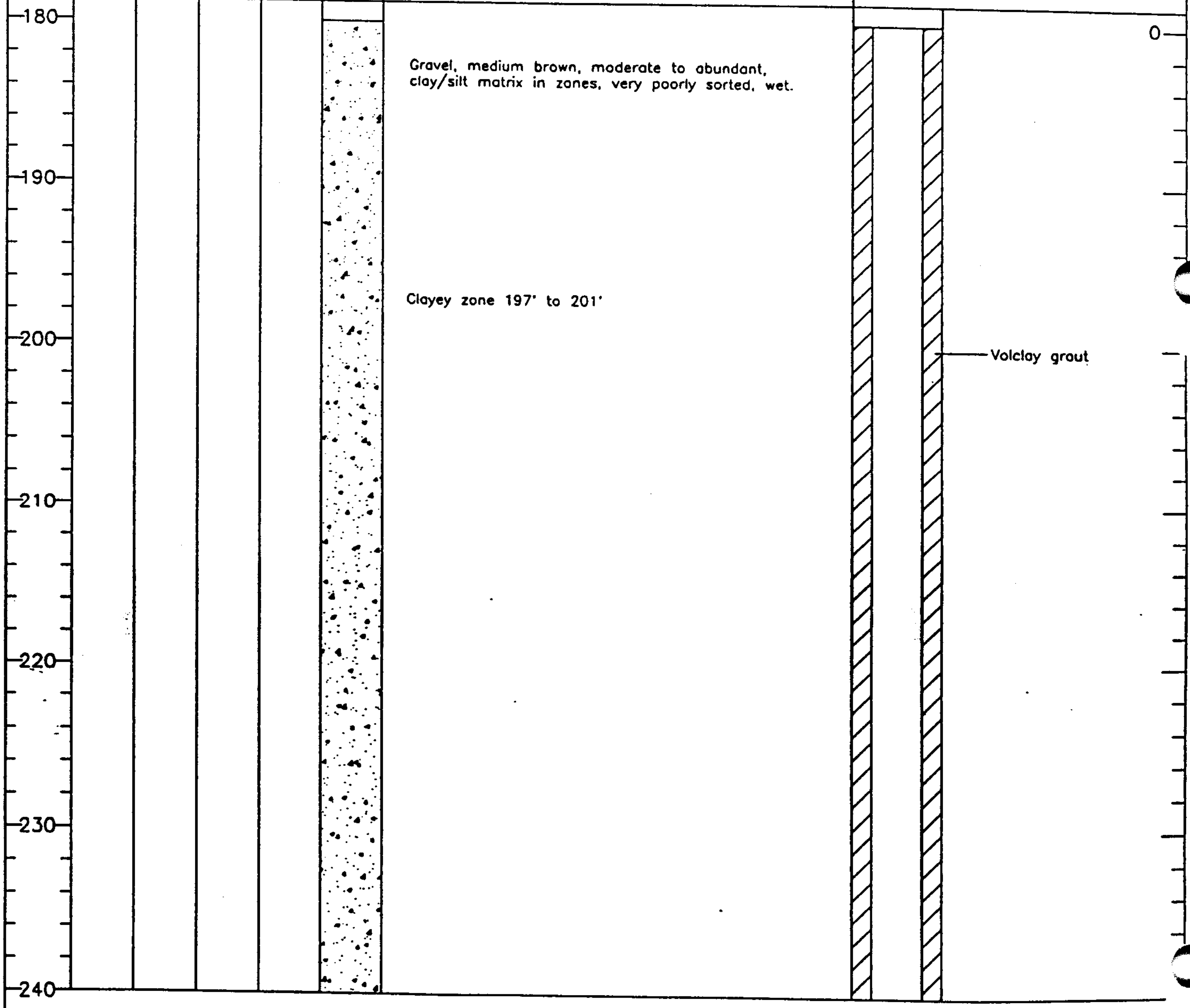
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-20	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5180.12	GWL DEPTH: 55,0 (ENCOUNTERED) DEPTH: 10.53 (STATIC)

DRILLING METHOD: ROTARY	HOLE DIAMETER: 8 3/8"	FLUID USED: AIR	DATE STARTED: 10/10/94 COMPLETED: 10/24/94

CASING TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc	FROM 1.85' A.G.S. TO 127.5' B.G.S.
SCREEN TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc, 0.02" slots	FROM 288' TO 338'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY



Gravel, medium brown, moderate to abundant, clay/silt matrix in zones, very poorly sorted, wet.

Clayey zone 197' to 201'

NOTES

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LOG OF MONITORING WELL

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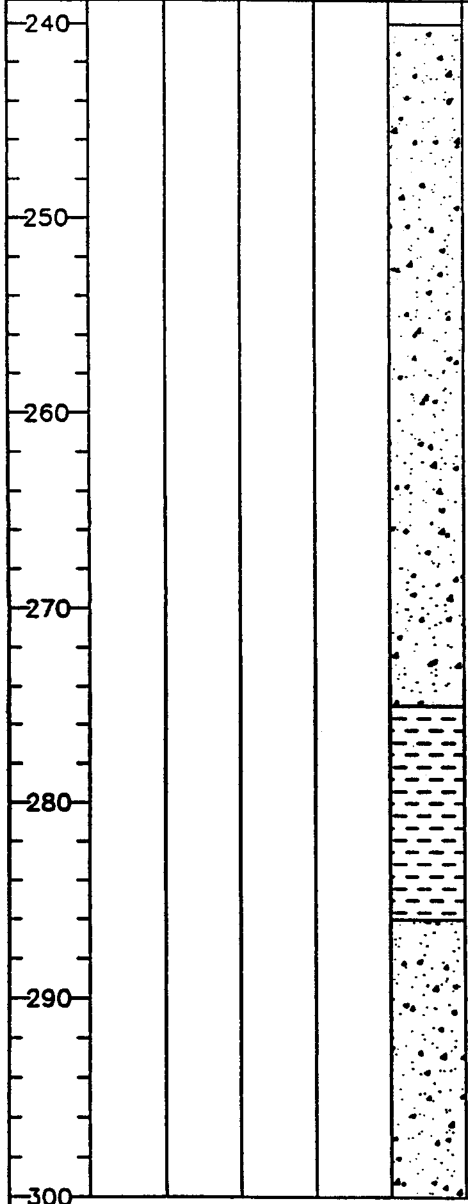
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-20	COORDINATES OR LOCATION:	713,428.61 N 603,827.45 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5180.12	GWL DEPTH: 55.0 (ENCOUNTERED) DEPTH: 10.53 (STATIC)	
DRILLING METHOD: ROTARY	HOLE DIAMETER: 8 3/8"	FLUID USED: AIR	DATE STARTED: 10/10/94 COMPLETED: 10/24/94

CASING TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc — FROM 1.85' A.G.S. TO 127.5' B.G.S.
SCREEN TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc, 0.02" slots — FROM 288' TO 338'

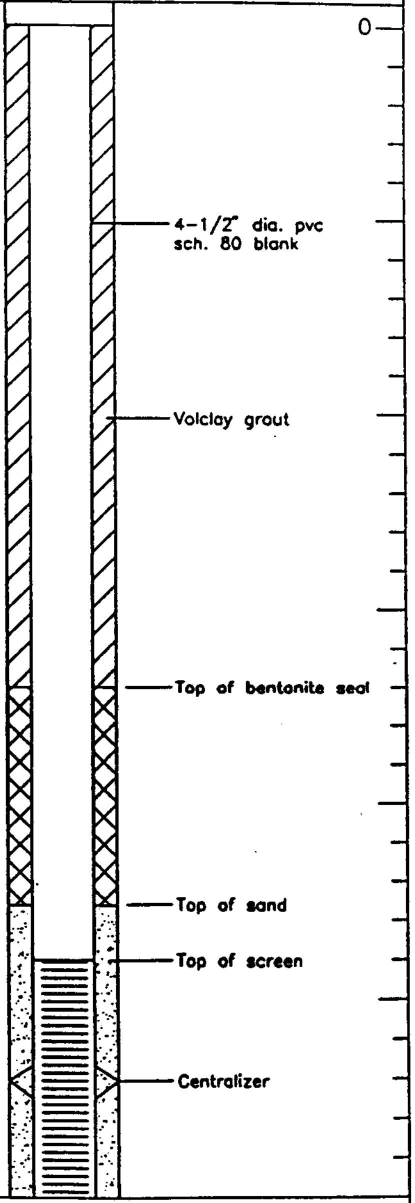
DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY



Gravel, medium brown, moderate to abundant clay/silt matrix, very poorly sorted, abundant pebbles and cobbles, minimum to moderate sand, wet

Clay, medium brown with minimum to moderate sand, minimum to moderate pebbles and cobbles, smooth drilling, little to no water production

Gravel, medium brown, abundant pebbles and cobbles, minimum to moderate sand, moderate to abundant clay/silt matrix, wet



NOTES

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LOG OF MONITORING WELL

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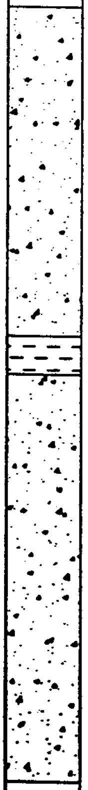
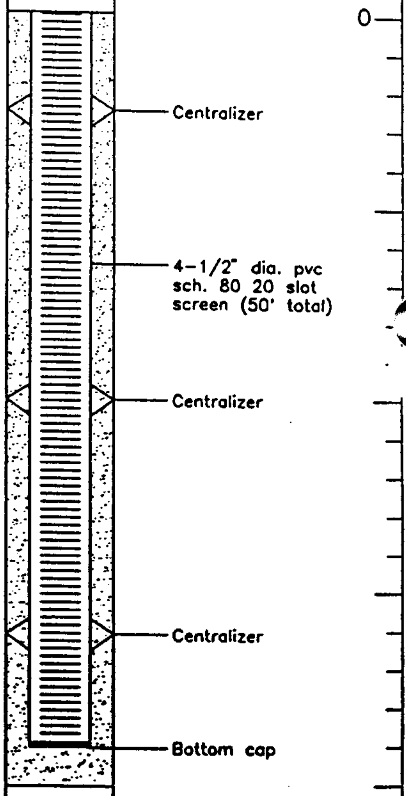
PROJECT NAME: COPPER FLATS PROJECT NO.: 68607	BORING NUMBER: GWQ 94-20	COORDINATES OR LOCATION: 713,428.61 N 603,827.45 E	
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5180.12	GWL DEPTH: 55.0 (ENCOUNTERED) DEPTH: 10.53 (STATIC)	
DRILLING METHOD: ROTARY	HOLE DIAMETER: 8 3/8"	FLUID USED: AIR	DATE STARTED: 10/10/94 COMPLETED: 10/24/94

CASING TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc — FROM 1.85' A.G.S. TO 127.5' B.G.S.
SCREEN TYPE AND SIZE: 4-1/2" dia. Sched. 80 pvc, 0.02" slots — FROM 288' TO 338'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
300						Gravel, medium brown, abundant pebbles and cobbles, minimum to moderate sand, moderate to abundant clay/silt matrix, wet
310						Clay lense, medium brown with minimum to moderate pebbles and cobbles, little to no water production
320						Gravel, medium brown, abundant pebbles and cobbles, minimum to moderate sand, moderate to abundant clay/silt matrix, wet
330						
340						Total depth 340'
350						
360						



WELL CONSTRUCTION SUMMARY



NOTES

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LOG OF MONITORING WELL

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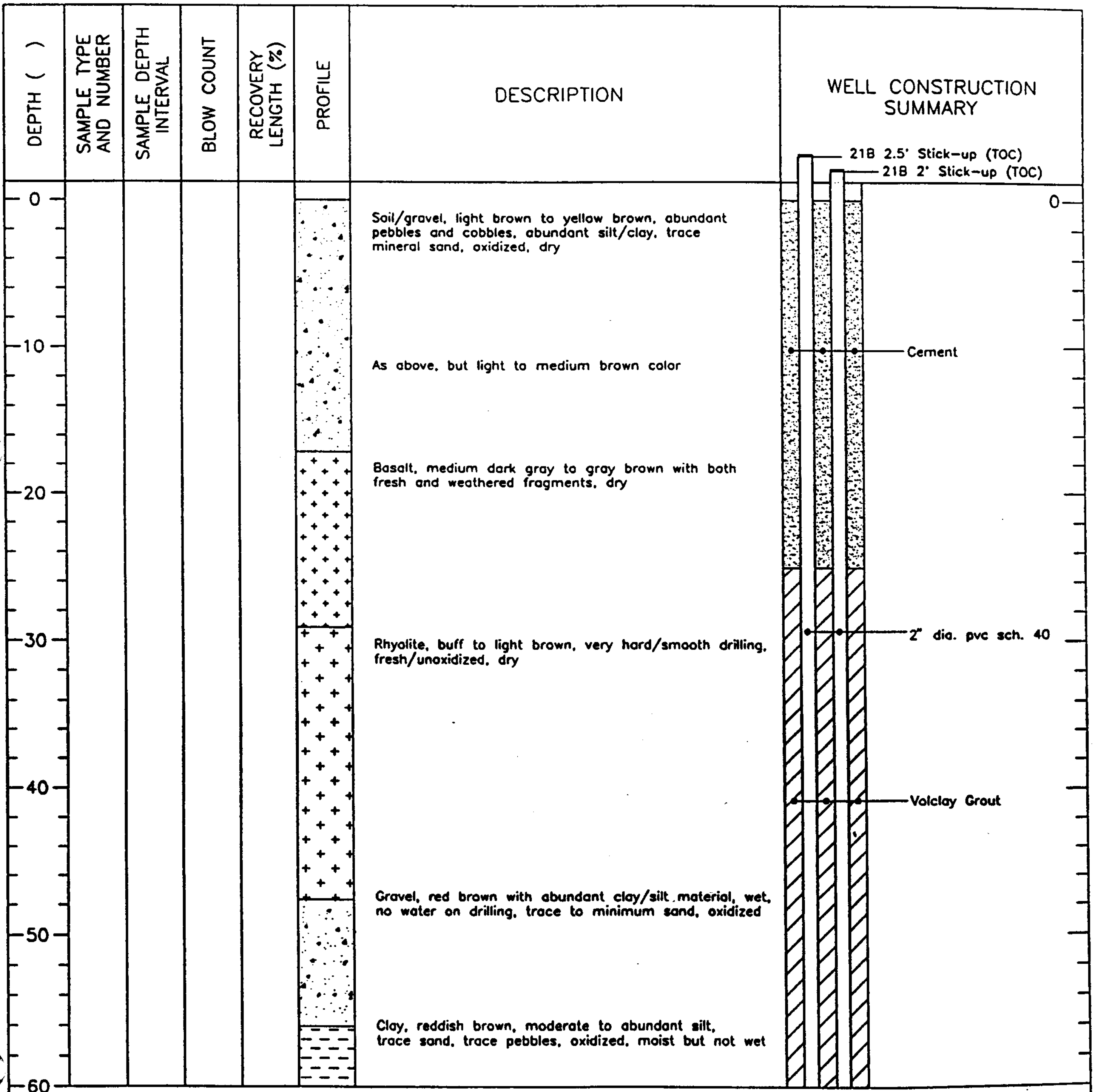
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-21A GWQ 94-21B	COORDINATES OR LOCATION: 713,492.54 N 604,084.48 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5168.8	GWL DEPTH: 210 (ENCOUNTERED) DEPTH: SEE BELOW (STATIC)

DRILLING METHOD: ROTARY	HOLE DIAMETER: 9 5/8"	FLUID USED: AIR	DATE STARTED: 10/25/94 COMPLETED: 11/05/94

CASING TYPE AND SIZE: 2" dia. Sched. 40 PVC — FROM 2.5'/2' A.G.S. TO 213'/285' B.G.S.
SCREEN TYPE AND SIZE: 2" dia. Sched. 40 PVC 0.02" slot — FROM 213'/285' TO 263'/315'



Soil/gravel, light brown to yellow brown, abundant pebbles and cobbles, abundant silt/clay, trace mineral sand, oxidized, dry

As above, but light to medium brown color

Basalt, medium dark gray to gray brown with both fresh and weathered fragments, dry

Rhyolite, buff to light brown, very hard/smooth drilling, fresh/unoxidized, dry

Gravel, red brown with abundant clay/silt material, wet, no water on drilling, trace to minimum sand, oxidized

Clay, reddish brown, moderate to abundant silt, trace sand, trace pebbles, oxidized, moist but not wet

NOTES

Dual completion
Development time 21A = 8.5 hours
Development time 21B = 33 hours
Average flow 21A = 25 gpm Date: 11/7/94
Average flow 21B = 2 gpm Date: 11/7/94

Static water 21A = 4.58' from TOC (11/07/94)
Static water 21B = 3.95' from TOC (11/07/94)

Well head protection – 8" dia. steel pipe w/locking well cap approx. 3.5' above surface.

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LOG OF MONITORING WELL

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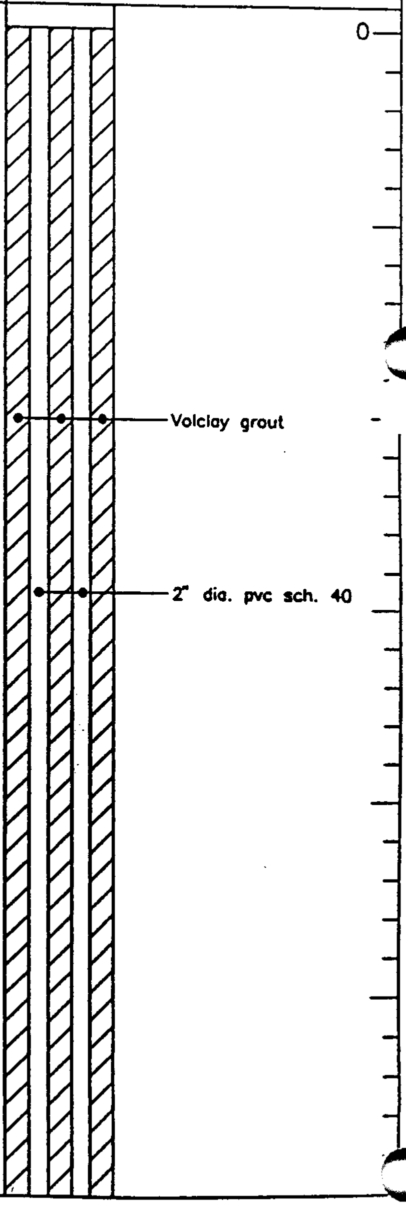
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-21A GWQ 94-21B	COORDINATES OR LOCATION: 713,492.54 N 604,084.48 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5168.8	GWL DEPTH: 210 (ENCOUNTERED) DEPTH: (STATIC)
DRILLING METHOD: ROTARY	HOLE DIAMETER: 9 5/8" FLUID USED: AIR	DATE STARTED: 10/25/94 COMPLETED: 11/05/94
CASING TYPE AND SIZE: 2" dia. Sched. 40 PVC SCREEN TYPE AND SIZE: 2" dia. Sched. 40 PVC 0.02" slot	FROM 2.5'/2' A.G.S. TO 213'/285' B.G.S. FROM 213'/285' TO 263'/315'	

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
60						Clay, reddish brown, moderate to abundant silt, trace sand, trace pebbles, oxidized, moist but not wet
70						
80						
90						
100						Large chips, silty, moist, at 100'
110						
120						

WELL CONSTRUCTION SUMMARY



NOTES

Start of clay (reddish brown) shown as 47' on geophysical log

LOG OF MONITORING WELL

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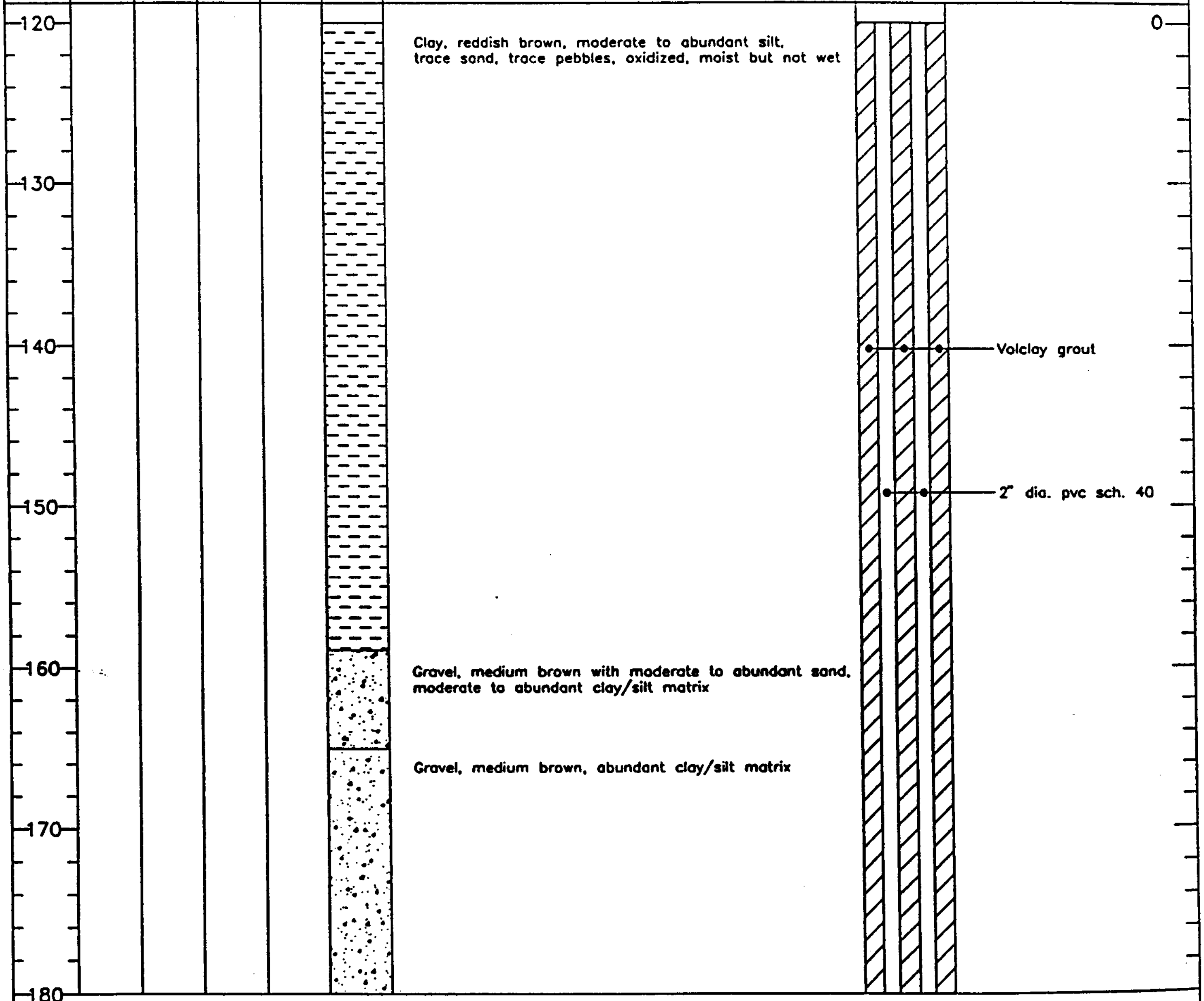
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-21A GWQ 94-21B	COORDINATES OR LOCATION: 713,492.54 N 604,084.48 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5168.8	GWL DEPTH: 210 (ENCOUNTERED) DEPTH: (STATIC)

DRILLING METHOD: ROTARY	HOLE DIAMETER: 9 5/8"	FLUID USED: AIR	DATE STARTED: 10/25/94 COMPLETED: 11/05/94

CASING TYPE AND SIZE: 2" dia. Sched. 40 PVC	FROM 2.5'/2' A.G.S. TO 213'/285' B.G.S.
SCREEN TYPE AND SIZE: 2" dia. Sched. 40 PVC 0.02" slot	FROM 213'/285' TO 263'/315'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION	WELL CONSTRUCTION SUMMARY



Clay, reddish brown, moderate to abundant silt, trace sand, trace pebbles, oxidized, moist but not wet

Gravel, medium brown with moderate to abundant sand, moderate to abundant clay/silt matrix

Gravel, medium brown, abundant clay/silt matrix

NOTES

Red clay/gravel interface at 149' on geophysical log

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LOG OF MONITORING WELL

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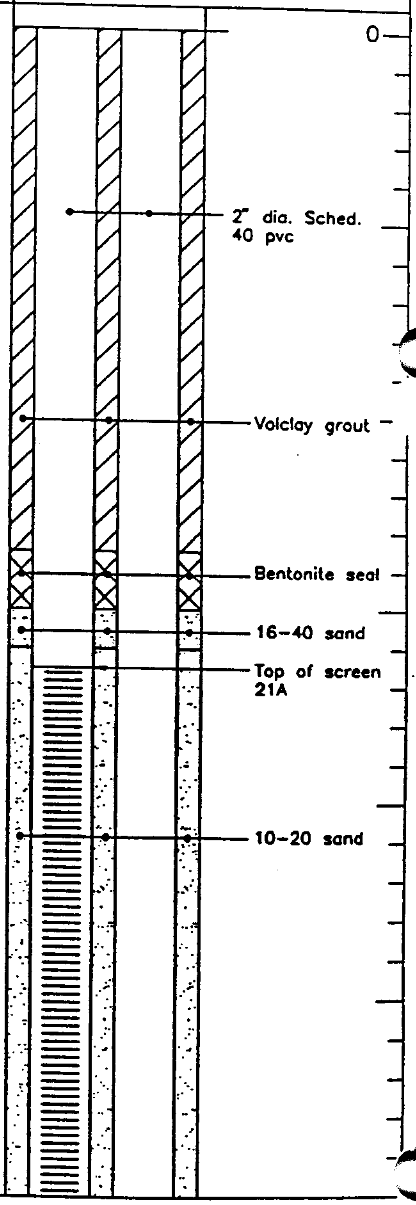
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607		BORING NUMBER: GWQ 94-21A GWQ 94-21B	COORDINATES OR LOCATION: 713,492.54 N 604,084.48 E
LOGGED BY: CW CHECKED BY:		SURFACE ELEVATION: 5168.8	GWL DEPTH: 210 (ENCOUNTERED) DEPTH: (STATIC)
DRILLING METHOD: ROTARY	HOLE DIAMETER: 9 5/8"	FLUID USED: AIR	DATE STARTED: 10/25/94 COMPLETED: 11/05/94
CASING TYPE AND SIZE: 2" dia. Sched. 40 PVC SCREEN TYPE AND SIZE: 2" dia. Sched. 40 PVC 0.02" slot		FROM 2.5'/2' A.G.S. TO 213'/285' B.G.S. FROM 213'/285' TO 263'/315'	

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
180						Gravel, medium brown with abundant sand, moderate clay/silt matrix.
						Gravel, medium brown to grey brown, moderate sand, abundant clay/silt matrix
190						
200						
210						Gravel, gray to gray brown, minimum to moderate clay/silt, abundant pebbles and cobbles, minimum to moderate sand (medium to coarse) (makes 20 to 30 gpm on drilling)
220						
230						
240						

WELL CONSTRUCTION SUMMARY



NOTES

Well construction summary enlarged.

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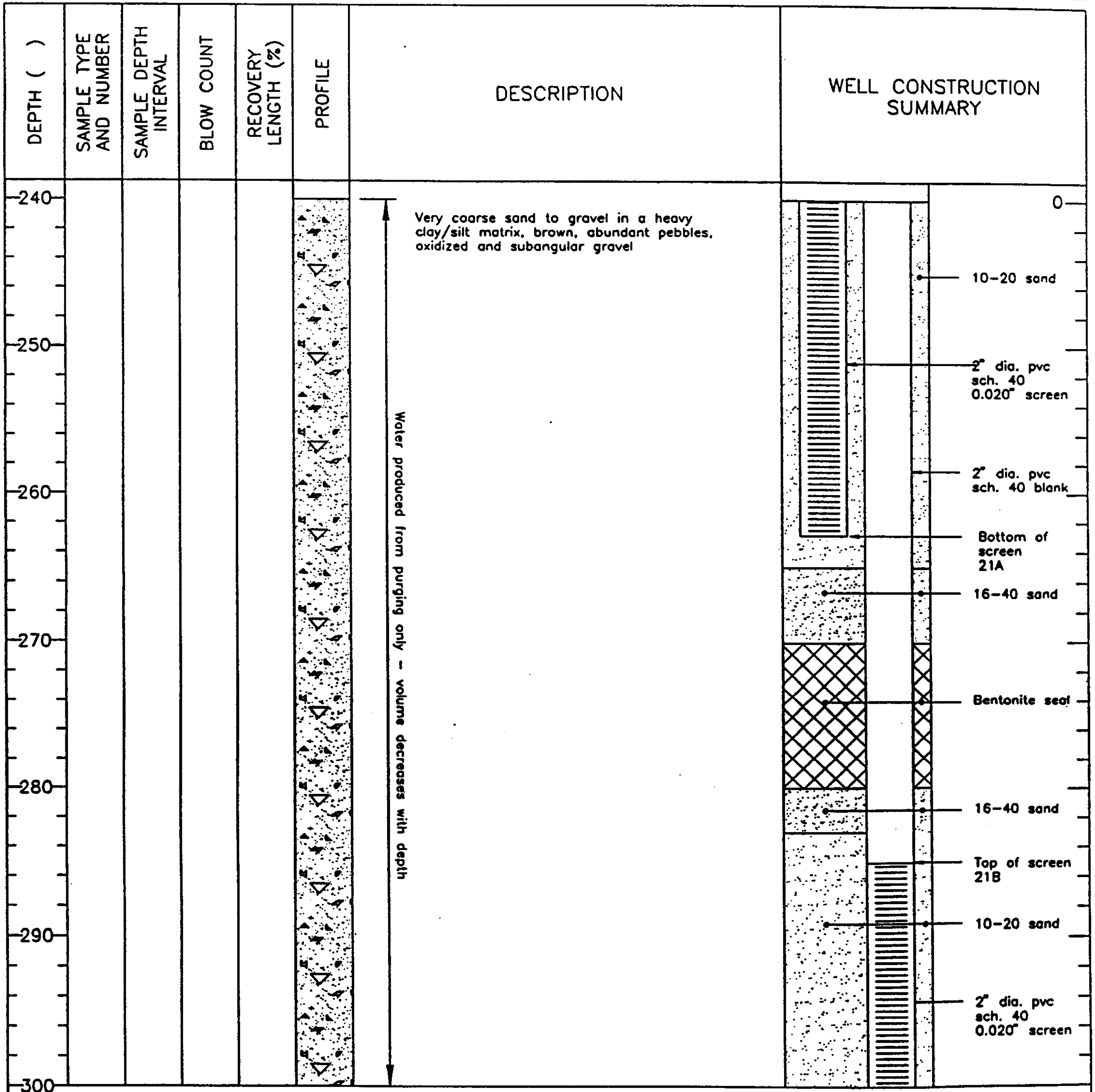
LOG OF MONITORING WELL

PAGE 5 OF 6

PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-21A GWQ 94-21B	COORDINATES OR LOCATION: 713,492.54 N 604,084.48 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5168.8	GWL DEPTH: 210 (ENCOUNTERED) GWL DEPTH: SEE BELOW (STATIC)
DRILLING METHOD: ROTARY HOLE DIAMETER: 9 5/8" FLUID USED: AIR		DATE STARTED: 10/25/94 DATE COMPLETED: 11/05/94

CASING TYPE AND SIZE: 2" dia. Sched. 40 PVC — FROM 2.5'/2' A.G.S. TO 213'/285' B.G.S.
SCREEN TYPE AND SIZE: 2" dia. Sched. 40 PVC 0.02" slot — FROM 213'/285' TO 263'/315'



Very coarse sand to gravel in a heavy clay/silt matrix, brown, abundant pebbles, oxidized and subangular gravel

Water produced from purging only – volume decreases with depth

NOTES

From 240' down, the clay/silt matrix appears to grow progressively less permeable.

Well contruction summary enlarged.

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

LOG OF MONITORING WELL

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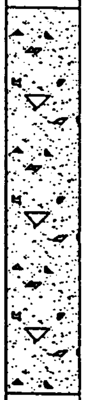
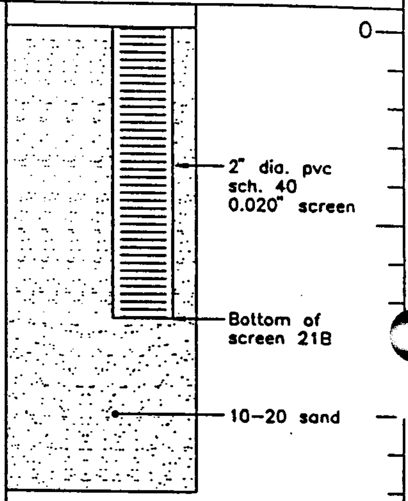
PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: GWQ 94-21A GWQ 94-21B	COORDINATES OR LOCATION: 713,492.54 N 604,084.48 E
LOGGED BY: CW CHECKED BY:	SURFACE ELEVATION: 5168.8	GWL DEPTH: 210 (ENCOUNTEREC DEPTH: (STATIC)
DRILLING METHOD: ROTARY	HOLE DIAMETER: 9 5/8"	FLUID USED: AIR
DATE STARTED: 10/25/94 COMPLETED: 11/05/94		

CASING TYPE AND SIZE: 2" dia. Sched. 40 PVC — FROM 2.5'/2' A.G.S. TO 213'/285' B.G.S.
SCREEN TYPE AND SIZE: 2" dia. Sched. 40 PVC 0.02" slot — FROM 213'/285' TO 263'/315'



DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
300						Very coarse sand to gravel in a clay/silt matrix, brown, abundant pebbles, subangular and oxidized
						As above, but with larger water produced when purged
310						As above but water beginning to thicken
320						T.D. = 320.
330						
340						
350						
360						

WELL CONSTRUCTION SUMMARY

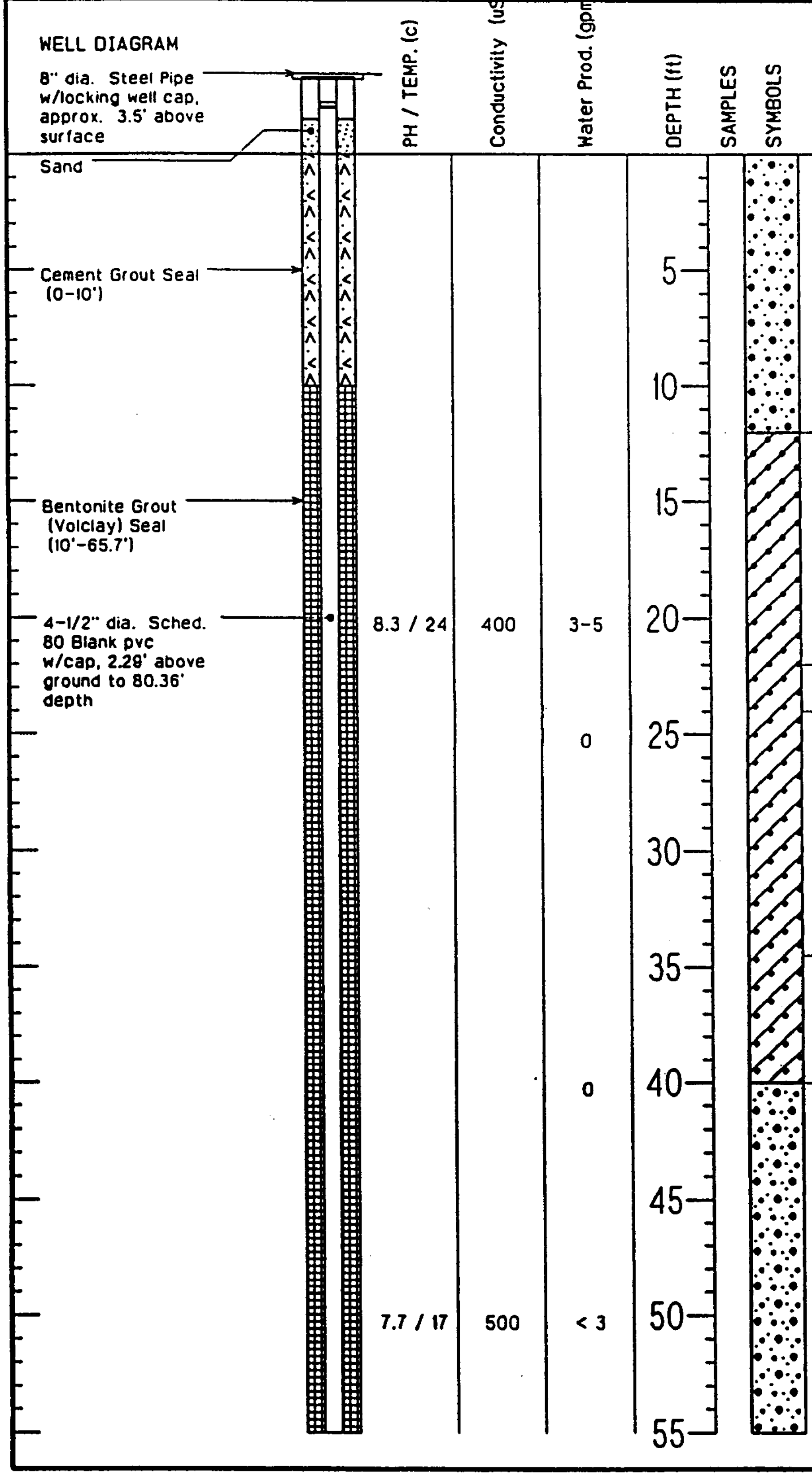


NOTES
Well construction summary enlarged.

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-10

Page 1 of 3



DEPTH (ft)	PH / TEMP. (c)	Conductivity (uS/m)	Water Prod. (gpm)
20	8.3 / 24	400	3-5
25			0
40			0
50	7.7 / 17	500	< 3

MATERIALS DESCRIPTION

0 - 12', Gravelly soil, dark brown w/abundant cobbles & pebbles, and moderately abundant sand, silt soil, very poorly sorted, Oxidized, dry to 7.75'

Groundwater encountered @ 7.75'

12'-22', Gravel - medium brown-light red brown, min-mod clay/silt, Oxidized, wet

22'-24', Red-brown, abundant cobbles/pebbles, min-mod sand, abundant silt, Oxidized, no water

24-34.5', clay, brown-red brown, min pebbles, min-mod cobbles, "dry"

34.5-40', Gravel, grey brown, abundant brown-red brown clay/silt, Oxidized, "dry", tr-min sand

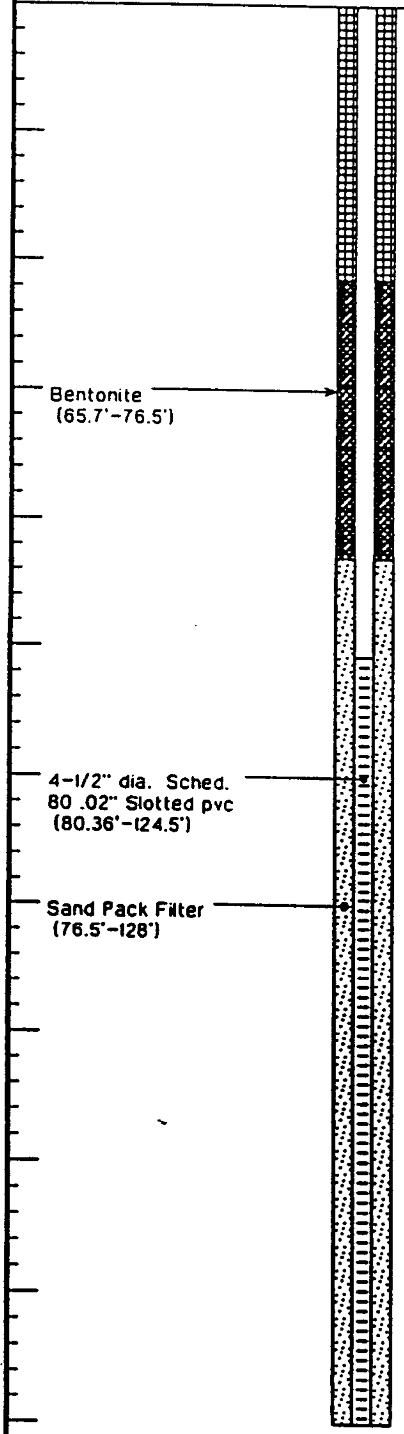
40-60', Gravel: med brown-red brown, abundant cobbles/pebbles, min-mod med-very coarse sand, "dry", Oxidized

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N719968.25, E636740.99 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M10)
GEOLOGIST CW
DRILL RIG Air Rotary
DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/94
SURFACE ELEVATION 4439.27
TOTAL DEPTH OF HOLE 128.0 Feet
WATER LEVEL Static, from TOC on 11/7/94: 70.625 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-10

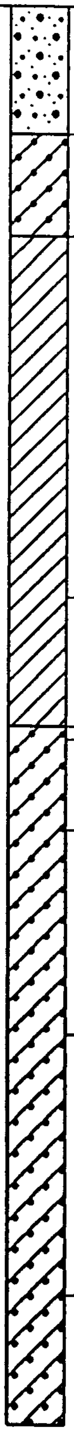
WELL DIAGRAM



PH / TEMP. (c)	Conductivity (uS/m)	Water Prod. (gpm)	DEPTH (ft)
		0	60
			65
			70
			75
7.6 / 19	400	< .5	80
			85
7.8 / 21	300	< 1	90
			95
7.8 / 20	300	1.5-2	100
7.6 / 20	300	2 - 2.5	
7.3 / 20	300	3 - 3.5	
			105
7.8 / 19	300	1 - 1.5	110

SAMPLES

SYMBOLS



MATERIALS DESCRIPTION

40'-60', Gravel: med brown-red brown, abundant cobbles/pebbles, min-mod med-very coarse sand, "dry", Oxidized

60-64', Gravel, med brown, within clay/silt matrix, WET (not saturated)

64-78', Clay med brown-grey brown, w/some red brown zones, min-mod sand, wet (not saturated) does not produce water on drilling

78-83', Clay, as above w/slight increase in cobbles/pebbles & trace water

83-83.5', Gravel, medium brown-grey brown w/clay/silt matrix, produces 2-3 gpm water on drilling

83.5-87', Gravel, medium brown-red brown, abundant clay/silt matrix, mod sand, Oxidized

87-95', Gravel: medium brown, abundant clay/silt matrix produces 1/2-1 gpm on drilling

95-105', Gravel - medium brown - w/abundant clay/silt, mod-abundant sand, 1 1/2-2 gpm water when blowing

105-115', Gravel - medium brown-grey brown, abundant clay/silt matrix, minor sand, produces 1 1/2-2 gpm on drilling

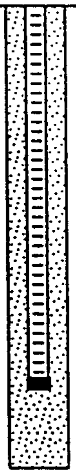
PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N719968.25, E636740.99 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M10)
GEOLOGIST CW
DRILL RIG Air Rotary
DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/94
SURFACE ELEVATION 4439.27
TOTAL DEPTH OF HOLE 128.0 Feet
WATER LEVEL Static, from TOC on 11/7/94: 79.625 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-10

Page 3 of 3

WELL DIAGRAM



4-1/2" dia. Sched. 80 .02" Slotted pvc (80.36'-124.5')

Sand Pack Filter (76.5'-128')

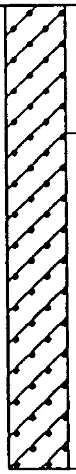
Total depth = 128'

NOTE: Well developed 10/07/94 for 2.25 hrs. at 25 to 30 gpm

PH / TEMP. (c)	Conductivity (uS/m)	Water Prod. (gpm)	DEPTH (ft)
7.6 / 19	300	< .5	
			115
7.9 / 19.5	300	< .5	120
7.8 / 20.5	300	< 1	125
			130
			135
			140
			145
			150
			155
			160
			165

SAMPLES

SYMBOLS



MATERIALS DESCRIPTION

105-115', Gravel - medium brown-grey brown, abundant clay/silt matrix, minor sand, produces 1 1/2-2 gpm on drilling

115-128, Gravel - medium brown-grey brown, abundant clay/silt matrix, mod-abundant sand, produces less than 1 gpm on drilling

Total depth = 128'

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N719968.25, E636740.99 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M10)
GEOLOGIST CW
DRILL RIG Air Rotary
DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/94
SURFACE ELEVATION 4439.27
TOTAL DEPTH OF HOLE 128.0 Feet
WATER LEVEL Static, from TOC on 11/7/94: 70.625 Feet

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

LOG OF MONITORING WELL

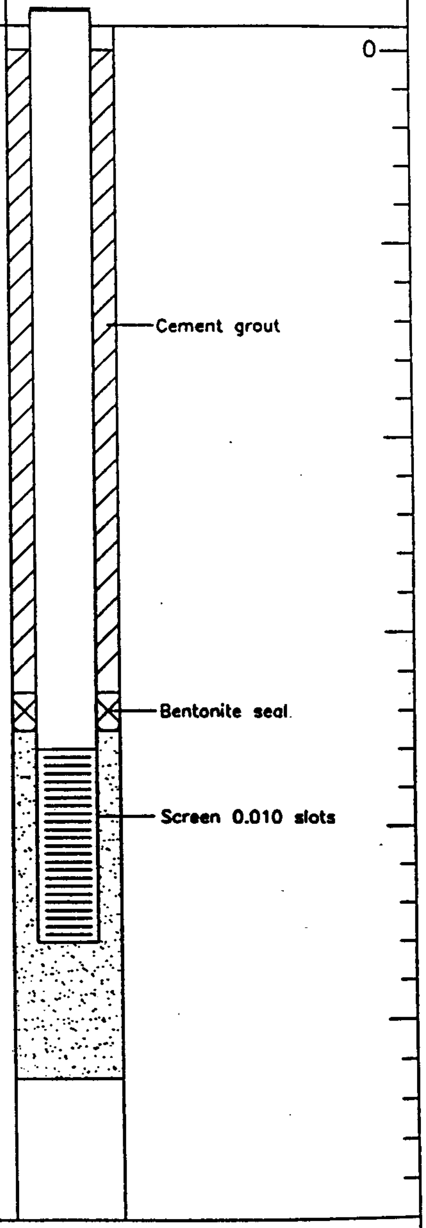
PAGE 1 OF 1

PROJECT NAME: COPPER FLAT PROJECT NO.: 68607	BORING NUMBER: SRK BH-1-94	COORDINATES OR LOCATION:	
LOGGED BY: HKP CHECKED BY:	SURFACE ELEVATION: PENDING	GWL DEPTH: 18' (ENCOUNTERED) DEPTH: N/A (STATIC)	
DRILLING METHOD: CME-75 AUGER AND CORE	HOLE DIAMETER: 8"	FLUID USED: NONE	DATE STARTED: 5/26/94 COMPLETED: 5/27/94

CASING TYPE AND SIZE: 2" dia. Sched. 40 pvc — FROM ±3' A.G.S. TO 36' B.G.S.
SCREEN TYPE AND SIZE: 2" dia. Sched. 40 pvc, 0.010" slots — FROM 36' TO 46'

DEPTH ( )	SAMPLE TYPE AND NUMBER	SAMPLE DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	PROFILE	DESCRIPTION
0						SW/GW, cobble (cover material)
	SS	5'–9'				Tailings, SP-SM, medium moist to moist, tan to light brown
10	SS	10'–12'				
	SS	15'–17'				
						Very moist to saturated
20	SS	20'–22'				
						Moist to very moist
	SS	25'–26'				Sand and gravel, clayey, some cobbles, clayey, medium graded, medium moist to moist
30	SS	30'–31.5'	11/6 6/6 8/6			
	SS	35'–36.5'	50/5.5			Basalt, basalt was drillable with hollow stem augers
						Refused at 47'
40						
	A	40'–45'				
						Cored 48' to 53'
50	Core	48'± – 53'±				Total depth 53'
60						

WELL CONSTRUCTION SUMMARY



NOTES

Stand pipe piezometer 2" schedule 40 pvc flush thread

Well head protected with steel pipe w/locking cap

Prepared by:

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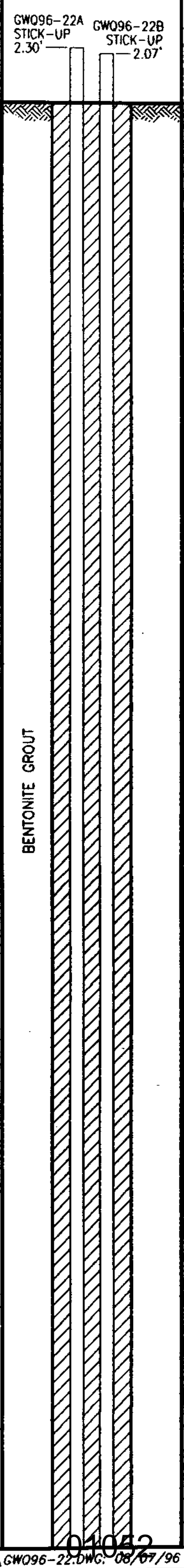
LOG OF MONITORING WELL

PAGE 1 OF 7

PROJECT NAME: COPPER FLAT PROJECT NO.: 1356A	BORING NUMBER: GWQ96-22	COORDINATES N 717440 (APPROX.) OR LOCATION: E 589,920 (APPROX.)		
LOGGED BY: SW CHECKED BY:	SURFACE ELEVATION: 5590.0' AMSL	GWL DEPTH: ~ (ENCOUNTERED) GWL DEPTH: ~ (STATIC)	A CASING: 2" SCH. 40 A SCREEN: 2", 20 SLOT SCH. 40	FROM: 2.30' A.G.S. TO 174' B.G.S. FROM: 174' TO 244' B.G.S.
DRILLING METHOD: AIR ROTARY	HOLE DIAMETER: 8 3/4"	FLUID USED: WATER DATE STARTED: 6/24/96 DATE COMPLETED: 6/30/96	B CASING: 2" SCH. 40 B SCREEN: 2", 20 SLOT SCH. 40	FROM: 2.07' A.G.S. TO 340' B.G.S. FROM: 340' B.G.S. TO 380' B.G.S.

Depth	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
0					APPEARED DRY DURING DRILLING		ANDESITE; GRAYISH GREEN, FINE GRAINED, <5% OX., COMPETENT, PLAG. WEATHERED 5% MAFICS (PHENOCRYSTS AND MATRIX)
5							ANDESITE; DRK. GRAYISH GREEN, FINE GRAINED, <2% ox.
10							ANDESITE; DRK. GRAYISH GREEN, WITH RED CLAY
15							ANDESITE (BASALTIC?); OXIDATION, RINDS., OVERALL < 3% OX.
20							ANDESITE; VERY FINE GRAINED, LOCAL PLAG. PHENOCRYSTS UP TO 2 MM
25							ANDESITE W/MINOR CALCITE VEINLETS AND BLEBS., <1% SULFIDES, FINE GRAINED, .5-3MM PLAG., <3% OX.
30							ANDESITE; FINE GRAINED, <1% OX., 0.5-1.5MM SUBHEDRAL PLAG. AND RARE 3MM ANHEDRAL PLAG., DARK GREEN
35							ANDESITE; DRK GRAY, FINE GRAINED, 1MM CALCITE COATINGS ON FRX., <2% OX.
40							ANDESITE; DRK GRAY W/MINOR CALCITE FRX. FILLING UP TO 2MM WIDE, <1% OX.
45							ANDESITE; DRK GRAY, CALCITE FILLING, <2% OX.
50							ANDESITE; WITH CALCITE FILLINGS, OXIDATION ALONG FRACTURES NEAR COMPLETE
55							ANDESITE; PYRITE VEINLETS, <1% SULFIDES
60							

WELL COMPLETION DIAGRAM



Prepared by:

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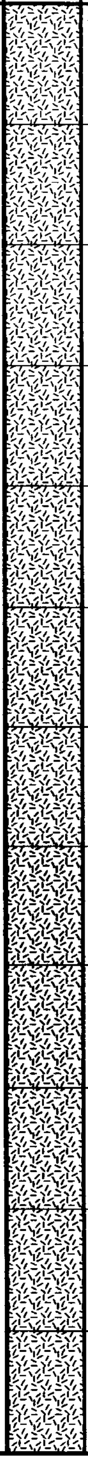
LOG OF MONITORING WELL

PAGE 2 OF 7

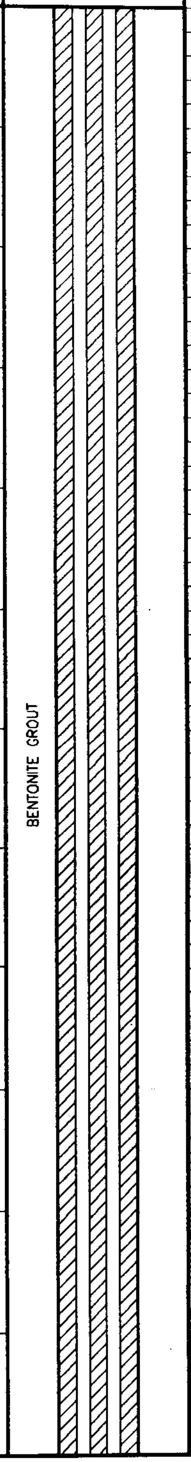
PROJECT NAME: COPPER FLAT PROJECT NO.: 1356A	BORING NUMBER: GWQ96-22	COORDINATES OR LOCATION: N 717440 (APPROX.) E 589,920 (APPROX.)	

Depth	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	DESCRIPTION
60					APPEARED DRY DURING DRILLING	ANDESITE; TRACE CALCITE AND CHALCOPYRITE (OR PYRITE)
65						ANDESITE W/CHALCOPYRITE; SLOW DRILLING, SILICIFIED (?)
70						ANDESITE; POSSIBLY SILICIFIED W/DISSEMINATED CHALCOPYRITE <1%
75						ANDESITE AND THIN LATITE DIKE LATITE NOT ABUNDAN T, BUT CONTAINS 2-3MM EUHEDRAL-SUBHEDRAL PLAG., OXIDATION CONTATCT, EPIDOTE AND PROPYLITIC ALTERATION ALONG FRX.
80						ANDESITE AND THIN LATITE DIKE
85						ANDESITE W/INCREASING PYRITE/CHALCOPYRITE
90						ANDESITE; TRACE PYRITE, MINOR CALCITE, FRESH, 0% OX.
95						ANDESITE AS ABOVE
100						ANDESITE; FRESH, 0% OX., GREEN CHLORITE AND CALCITE ALONG FRACTURES, AND TRACE VEINED PYRITE
105						ANDESITE AS ABOVE; <1% OX.
110						ANDESITE; LT. GREEN TO DRK. GREENISH GRAY, PYRITE VEINLETS UP TO 1MM WIDE, 1% OX.
115						ANDESITE AS ABOVE;; 0% OX.
120						

GRAPHIC LOG



WELL COMPLETION DIAGRAM



NOTES:

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LOG OF MONITORING WELL

PAGE 3 OF 7

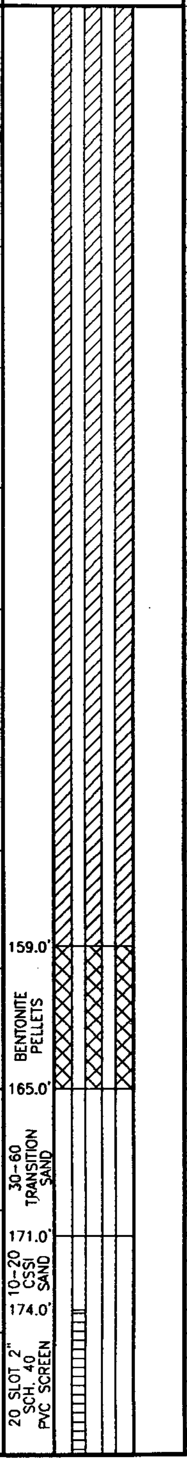
PROJECT NAME: COPPER FLAT
PROJECT NO.: 1356A

BORING NUMBER: GWQ96-22

COORDINATES OR LOCATION: N 717440 (APPROX.) E 589,920(APPROX.)

	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
120					APPEARED DRY DURING DRILLING		ANDESITE AS ABOVE; 0% OX.
125							ANDESITE AS ABOVE (DRK. GREENISH BLACK, SUBHEDERAL-ANHEDERAL 0.5-2MM PLAG., FINE-MED. GRAINED, CALCITE AND PYRITE VEINLETS)
130							ANDESITE W/PYRITE VEINLETS, 0% OX.
135							ANDESITE AS ABOVE
140							ANDESITE AS ABOVE
145							ANDESITE AS ABOVE
150							ANDESITE AS ABOVE
155							ANDESITE AS ABOVE
160							ANDESITE AS ABOVE
165							ANDESITE; W/TRACE LATITE (SMALL DIKE?) LATITE HAS WEATHERED CONTACT, 2-3MM PLAG., LT. GRAY GROUND MASS., CHLORIDE/ALTERATION ALONG FRX.
170							ANDESITE; GRAYISH BLACK, W/SULFIDE AND CALCITE VEINLETS
175							ANDESITE AS ABOVE; 0% OX.
180							

WELL COMPLETION DIAGRAM



NOTES:

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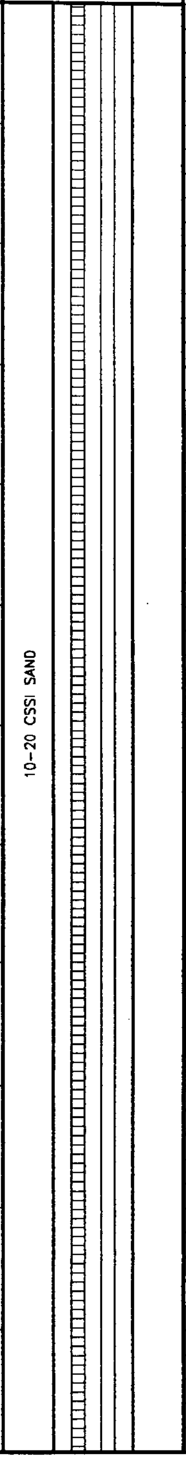
LOG OF MONITORING WELL

PAGE 4 OF 7

PROJECT NAME: COPPER FLAT
PROJECT NO.: 1356A
BORING NUMBER: GWQ96-22
COORDINATES OR LOCATION: N 717440 (APPROX.) E 589,920 (APPROX.)

DEPTH	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
180					APPEARED DRY DURING DRILLING		ANDESITE; W/VUGGY CALCITE AND PROPYLITIC (CHLORIDE ALTERATION) 3-5% AS ABOVE; 0% OX.
185							ANDESITE AND LATITE DIKE
190							ANDESITE; VERY FINE GRAINED, GRAYISH BLACK, MODERATE-ABUNDANT CALCITE VEINLETS AND DENDRITIC PYRITE
195							ANDESITE; DIKE(?) 1-2.5MM ANHEDRAL PLAG., PYRITE, CALCITE VEINLETS
200							ANDESITE AS ABOVE
205							ANDESITE AS ABOVE
210							ANDESITE AS ABOVE
215							ANDESITE AS ABOVE
220							ANDESITE AS ABOVE
225							ANDESITE AS ABOVE
230							ANDESITE; AS ABOVE, <1% OX. ALONG FRX.
235							ANDESITE
240							

WELL COMPLETION DIAGRAM



NOTES:

E:\1356A\1996\GWQ96-22.DWG; 08/07/96

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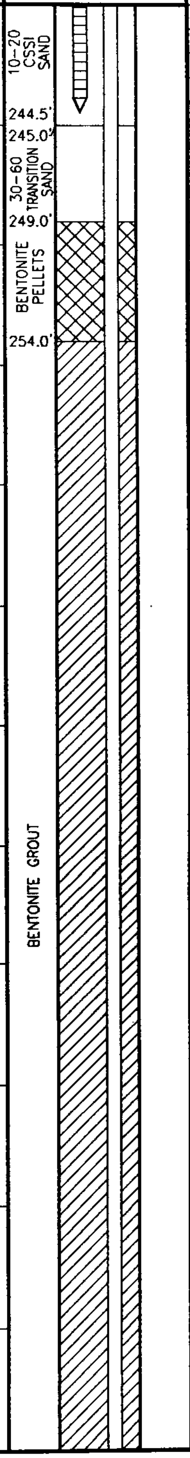
LOG OF MONITORING WELL

PAGE 5 OF 7

PROJECT NAME: COPPER FLAT
PROJECT NO.: 1356A
BORING NUMBER: GWQ96-22
COORDINATES OR LOCATION: N 717440 (APPROX.) E 589,920 (APPROX.)

Depth	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
240					APPEARED DRY DURING DRILLING		ANDESITE
245							ANDESITE AS ABOVE W/CALCITE VEINLETS
250							ANDESITE; VERY FINE GRAINED, GRAY TO BLACK, CALCITE AND QUARTZ VEINLETS, PYRITE
255							ANDESITE; VERY FINE GRAINED, GRAY TO BLACK, CALCITE, QUARTZ AND PYRITE VEINLETS >7MM WIDE
260							ANDESITE; GRAY TO BLACK, W/FINELY DISSEMINATED PYRITE
265							ANDESITE; AS ABOVE W/PYRITE AND CALCITE VEINLETS
270							ANDESITE AS ABOVE
275							ANDESITE; AS ABOVE W/TRACE CRYSTALLINE PYRITE ON CALCITE
280							ANDESITE AS ABOVE
285							ANDESITE
290							ANDESITE
295							ANDESITE
300							

WELL COMPLETION DIAGRAM



NOTES:

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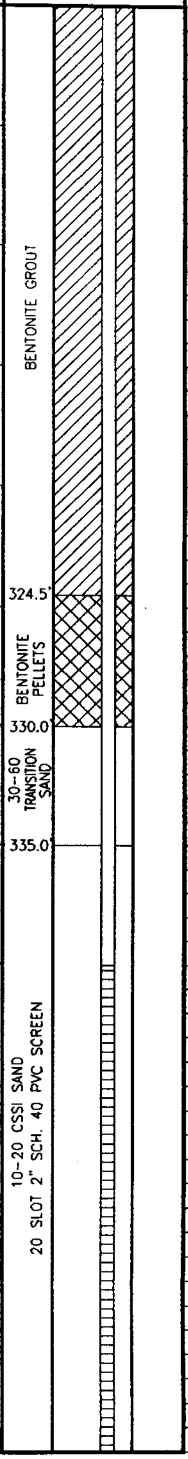
LOG OF MONITORING WELL

PROJECT NAME: COPPER FLAT PROJECT NO.: 1356A	BORING NUMBER: GWQ96-22	COORDINATES OR LOCATION:	N 717440 (APPROX.) E 589,920 (APPROX.)

Depth	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
300							ANDESITE
305							ANDESITE
310							ANDESITE
315							ANDESITE
320							ANDESITE
325					APPEARED DRY DURING DRILLING		ANDESITE
330							ANDESITE
335							ANDESITE
340							ANDESITE (70%) AND 30% (RHYOLITE) FELSIC ROCK; LIGHT PINKISH GRAY, FINE-MEDIUM GRAINED, ALTERED AND PYRITIZED
345							ANDESITE AS ABOVE
350							ANDESITE AS ABOVE
355							50% RHYOLITE (FELSIC) 50% MAFIC ANDESITE, ABUNDANT PYRITE; SOFT DRILLING
360							

WELL COMPLETION DIAGRAM



NOTES:

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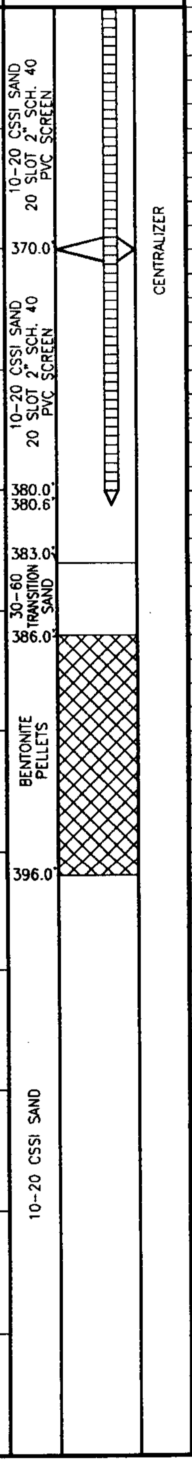
LOG OF MONITORING WELL

PAGE 7 OF 7

PROJECT NAME: COPPER FLAT
PROJECT NO.: 1356A
BORING NUMBER: GWQ96-22
COORDINATES OR LOCATION: N 717440 (APPROX.) E 589,920 (APPROX.)

	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
360					APPEARED DRY DURING DRILLING		RHYOLITE W/QUARTZ VEINS >8MM, RHYOLITE IS LIGHT REDDISH BROWN, VERY FINE GRAINED, <5% QUARTZ, ABUNDANT PYRITE
365							60% RHYOLITE AND 38% ANDESITE W/QUARTZ AND CALCITE VEINLETS; ABUNDANT PYRITIZATION AND PROPYLITIC ALTERATION, PYRITE STOCKWORK
370							40% RHYOLITE AND 60% ANDESITE; MINOR FREE QUARTZ (VEINED?), ABUNDANT PYRITE
375							90% ANDESITE <10% RYHOLITE; ANDESITE IS ALTERED, ABUNDANT PYRITE
380							ANDESITE; FINE GRAINED, GRAYISH BLACK, MODERATELY ABUNDANT PYRITE, ALTERED LOCALLY
385							ANDESITE AS ABOVE; DECREASING ALTERATION
390							ANDESITE AS ABOVE
395							ANDESITE AS ABOVE
400							ANDESITE AS ABOVE W/MINOR CALCITE VEINLETS AND PROPYLLITIC ALTERATION
405							ANDESITE; VERY FINE GRAINED, DECREASING ALTERATION
410							ANDESITE AS ABOVE
415							ANDESITE; VERY FINE GRAINED, VERY FINELY DISSEMINATED PYRITE AND CHALCOPYRITE
420							TOTAL DEPTH – 420'

WELL COMPLETION DIAGRAM



NOTES:

E:\1356A\1996\GWQ96-22.DWG; 08/07/96

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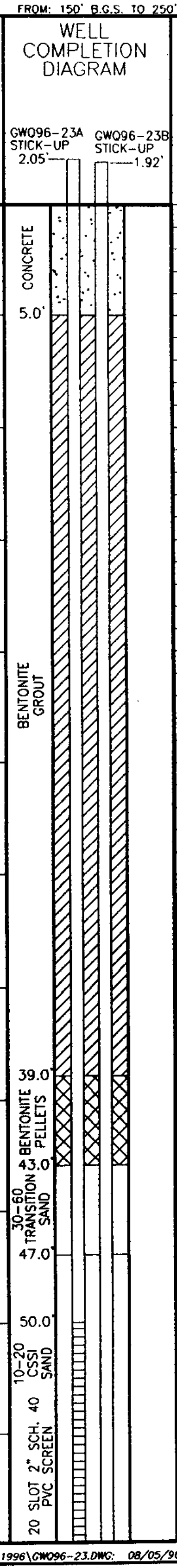
LOG OF MONITORING WELL

PROJECT NAME: COPPER FLAT PROJECT NO.: 1356A	BORING NUMBER: GWQ96-23	COORDINATES N 716.835 (APPROX.) OR LOCATION: E 593.370 (APPROX.)		
LOGGED BY: SW CHECKED BY:	SURFACE ELEVATION: 5483'	GWL DEPTH: ~ (ENCOUNTERED) DEPTH: ~ (STATIC)	CASING: A 2" SCH. 40 SCREEN: 2", 20 SLOT SCH. 40	FROM: 2.05' A.G.S. TO 50' B.G.S. FROM: 50' B.G.S. TO 100' B.G.S.
DRILLING METHOD: AIR ROTARY	HOLE DIAMETER: 8 3/4"	FLUID USED: FOAM DATE STARTED: 7/1/96 COMPLETED: 7/12/96	CASING: B 2" SCH. 40 SCREEN: 2", 20 SLOT SCH. 40	FROM: 1.92' A.G.S. TO 150' B.G.S. FROM: 150' B.G.S. TO 250' B.G.S.

Depth	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
0					APPEARED DRY DURING DRILLING		RHYOLITE; WEATHERED, LIGHT TAN TO GRAY, 60% OX.
5							RHYOLITE/ANDESITE; LIGHT GRAY TO TAN; 60% OX., CALCITE COATINGS
10							RHYOLITE; MUSCOVITE AND HORNBLENDE, <1MM IN SIZE, 55% OX.
15							RHYOLITE; LIGHT TAN, MEDIUM-FINE GRAINED
20							AS ABOVE; 30% OX.
25							AS ABOVE; 30% OX.
30							ANDESITE; GRAY, MEDIUM GRAINED, ALTERED (CHLORITE), ANHEDERAL, "GHOST" PLAG. <15% OX.
35							ANDESITE; LIGHT TO DARK GRAY, PYRITE CHALCOPYRITE VEINLETS, PROPYLITIC ALTERATION (CHLORITE), <5% OX.
40							ANDESITE AS ABOVE; TRACE PYRITE VEINLETS, <5% OX.
45							ANDESITE AS ABOVE
50							ANDESITE W/PYRITE VEINLETS; MINOR CHLORITE ALTERATION, CALCITE ON FRX., <2% OX.
55							ANDESITE AS ABOVE; W/INCREASING PYRITE
60							

WELL COMPLETION DIAGRAM



E:\1356A\1996\GWQ96-23.DWG: 08/05/96

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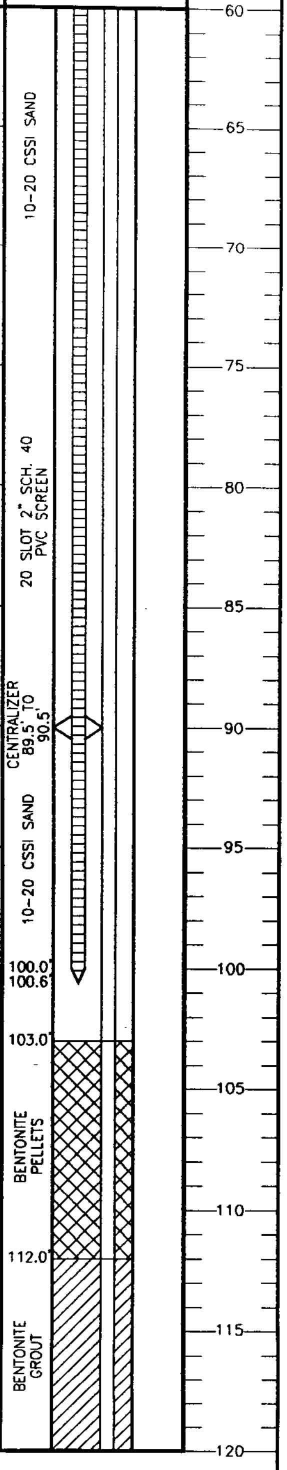
LOG OF MONITORING WELL

PROJECT NAME: COPPER FLAT
PROJECT NO.: 1356A
BORING NUMBER: GWQ96-23
COORDINATES OR LOCATION:

	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
60					APPEARED DRY DURING DRILLING		ANDESITE AS ABOVE; 0% OX.
65							ANDESITE AS ABOVE; CALCITE FRX. FILLINGS UP TO 5MM
70							ANDESITE AS ABOVE
75							ANDESITE AS ABOVE
80							ANDESITE; FINE GRAINED, 0% OX.
85							ANDESITE; MODERATELY TO ABUNDANT PYRITE AND CHLORITE
90							ANDESITE AS ABOVE; <1% OX.
95							ANDESITE; <3% OX.
100							RHYOLITE/MONZONITE
105							70% RHYOLITE/MONZONITE, 30% ANDESITE; 15% OX.;
110							90% RHYOLITE/MONZONITE; LIGHT TAN, MEDIUM TO FINE GRAINED, ABUNDANT PYRITE
115							QUARTZ MONZONITE; MEDIUM GRAINED, EUHEDERAL FELDSPARS, ABUNDANT PYRITE, 10% MAFICS, 0% OX.
120							

WELL COMPLETION DIAGRAM



NOTES:

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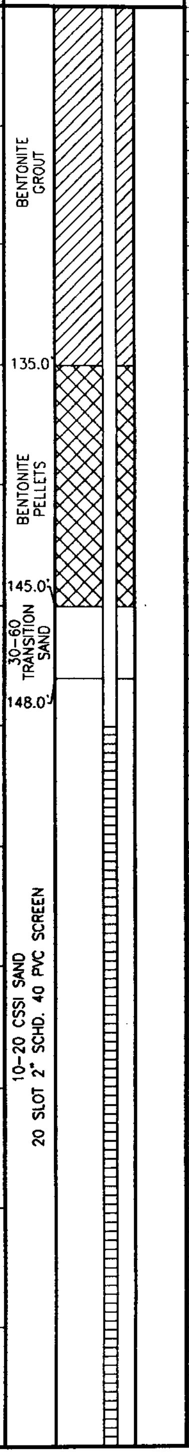
LOG OF MONITORING WELL

PAGE 3 OF 9

PROJECT NAME: COPPER FLAT PROJECT NO.: 1356A	BORING NUMBER: GWQ96-23	COORDINATES OR LOCATION:	N 716,835 (APPROX.) E 593,370 (APPROX.)

DEPTH	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
120					APPEARED DRY DURING DRILLING		QUARTZ MONZONITE AS ABOVE
125							QUARTZ MONZONITE AS ABOVE
130							QUARTZ MONZONITE AS ABOVE
135							QUARTZ MONZONITE
140							QUARTZ MONZONITE; <1% OX.
145							QUARTZ MONZONITE AS ABOVE
150							QUARTZ MONZONITE AS ABOVE
155							QUARTZ MONZONITE
160							QUARTZ MONZONITE AS ABOVE
165							QUARTZ MONZONITE AS ABOVE
170							QUARTZ MONZONITE AS ABOVE
175							QUARTZ MONZONITE; MEDIUM TO COARSE GRAINED, BEIGE/TAN TO WHITE, 15% MAFICS, ABUNDANT PYRITE AND CALCITE VEINLETS, <1% OX.
180							

WELL COMPLETION DIAGRAM



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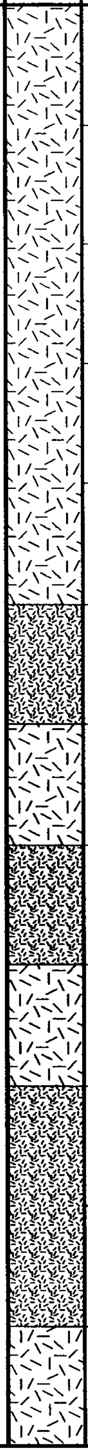
LOG OF MONITORING WELL

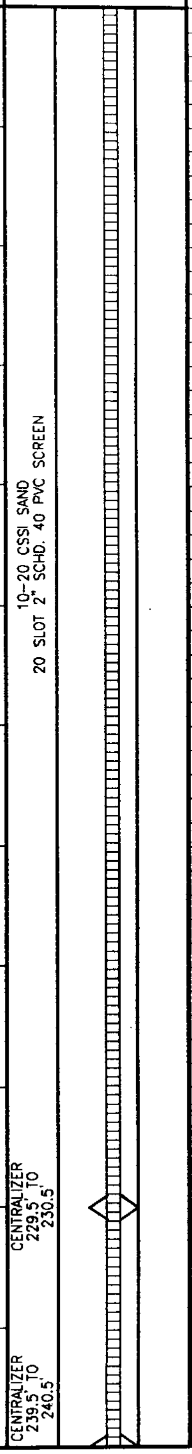
PROJECT NAME: COPPER FLAT
PROJECT NO.: 1356A
BORING NUMBER: GWQ96-23
COORDINATES OR LOCATION: N 716,835 (APPROX.) E 593,370 (APPROX.)

	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
180					APPEARED DRY DURING DRILLING		AS ABOVE
185							QUARTZ MONZONITE
190							QUARTZ MONZONITE
195							QUARTZ MONZONITE
200							QUARTZ MONZONITE; 0% OX.
205							ANDESITE; 0% OX.
210							60% GRANITE/MONZONITE, 40% ANDESITE; 0% OX.
215							80% ANDESITE, 20% GRANITE/MONZONITE; MINOR PYRITE FRX. ALONG ANDESITE
220							70% GRANITE/MONZONITE, 30% ANDESITE; CHLORITE ALTERATION ALONG FRX., 0% OX.
225							ANDESITE; ABUNDANT PYRITE VEINLETS, VERY FINE GRAINED, CHLORITC/PROPYLLITIC ALTERATION, QUARTZ VEIN UP TO 4MM WIDE
230							70% ANDESITE; TRACE PYRITE STOCKWORK, <20% GRANITE, QUARTZ VEINLETS AND EXTENSIVE CHLORITE ALTERATION ON FRX., 10% RHYOLITE
235							60% RHYOLITE, 35% ANDESITE, <5% GRANITE/MONZONITE; SILICA STOCKWORK IN RHYOLITE
240							

GRAPHIC LOG



WELL COMPLETION DIAGRAM



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LOG OF MONITORING WELL

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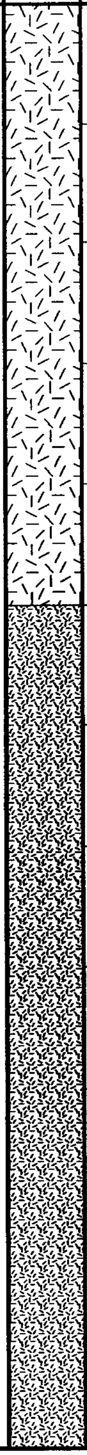
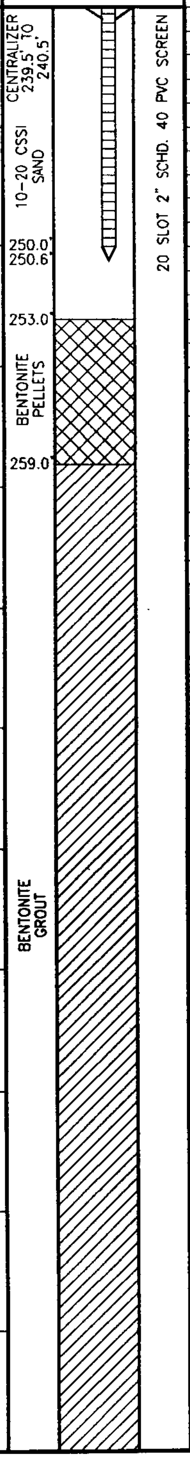
BORING NUMBER: GWQ96-23
COORDINATES OR LOCATION: N 716.835 (APPROX.) E 593.370 (APPROX.)

DEPTH	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	DESCRIPTION
240					APPEARED DRY DURING DRILLING	80% GRANITE/MONZONITE, <155% ANDESITE; MINOR RHYOLITE, EXTENSIVE PRYITIZATION
245						AS ABOVE WITH INCREASING CHLORITE ALTERATION
250						RHYOLITE
255						RHYOLITE/QUARTZ MONZONITE; ABUNDANT PYRITE AND CHLORITE ALTERATION
260						RHYOLITE OR LEUCO ANDESITE; CALCITE AND PYRITE FRX. FILLINGS, FINE GRAINED, TAN TO REDDISH TAN, GHOST PLAG.
265						ANDESITE; TAN TO DARK GRAY, VERY FINE GRAINED, MINOR CALCITE VEIN LETS AND PYRITE
270						ANDESITE; DARK GREENISH GRAY, EXTENSIVE PYRITE VEINLETS, RED SPHALERITE (?) ON FRX.
275						ANDESITE AS ABOVE
280						90% ANDESITE, 10% GRANITE/MONZONITE
285						80% ANDESITE; DARK GREENISH GRAY, FINE GRAINED PYRITIC; 10% GRANITE OR QUARTZ MONZONITE (2 FELDSPARS, PALE GREEN MIN., 10% MAFICS
290						85% ANDESITE; DARK GREENISH GRAY W/EXTENSIVE ALTERATION AND RED SPHALERITE (?) FRX. COATINGS; 10% GRANITE
295						AS ABOVE
300						

GRAPHIC LOG



WELL COMPLETION DIAGRAM



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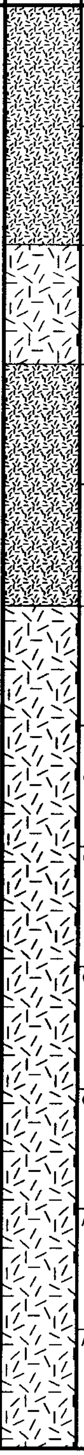

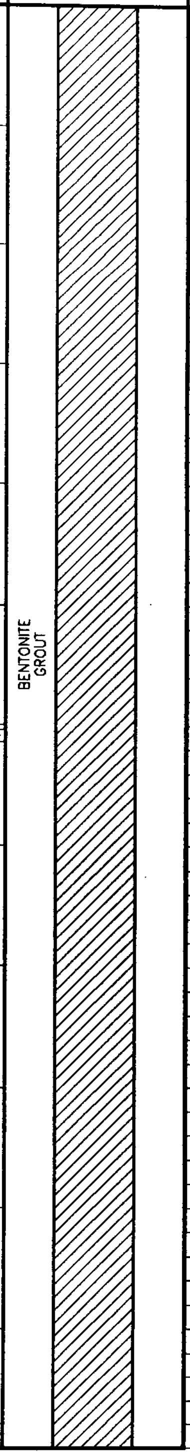

	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION	WELL COMPLETION DIAGRAM
300							75% ANDESITE, 25% GRANITE/MONZONITE	
305							75% ANDESITE, 25% GRANITE/MONZONITE; SPHALERITE (?) AND COPPER COATINGS FRX.	
310							85% PINK GRANITE/MONZONITE; <15% ANDESITE; DARK GREENISH GRAY	
315							85% ANDESITE <10% GRANITE/MONZONITE	
320							AS ABOVE	
325							GRANITE/MONZONITE; TAN TO PINK, MEDIUM TO COARSE GRAINED, FINELY DISSEMINATED PYRITE, 10-15% MAFICS	
330							GRANITE/MONZONITE; TAN TO PINK, MODERATELY COARSE GRAINED, GRANITE WITH EXTENSIVE PYRITIZATION AND GREEN ALTERATION, 3% ANDESITE; DARK GRAY, FINE GRAINED	
335							GRANITE/MONZONITE, <5% ANDESITE	
340							GRANITE/MONZONITE	
345							GRANITE AS ABOVE; MEDIUM COARSE GRAINED, ALTERED AND PYRITIZED	
350							AS ABOVE	
355							AS ABOVE	
360								

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PROJECT NAME: COPPER FLAT
PROJECT NO.: 1356A
BORING NUMBER: GWQ96-23
COORDINATES OR LOCATION: N 716,835 (APPROX.) E 593,370 (APPROX.)

Depth	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION	WELL COMPLETION DIAGRAM
360							95% GRANITE/MONZONITE; 5% ANDESITE; DARK BLACK	BENTONITE GROUT
365							40% WHITE GRANITE/MONZONITE; 45% PINK GRANITE/MONZONITE; 5% DARK ANDESITE; ABUNDANT PYRITE	
370							70% PINK GRANITE/MONZONITE; 30% WHITE GRANITE/MONZONITE	
375							AS ABOVE	
380							60% PINK GRANITE/MONZONITE; MODERATELY COARSE GRAINED; 40% WHITE GRANITE/MONZONITE; PYRITE, 0% OX.	
385							GRANITE/MONZONITE AS ABOVE; 0% OX.	
390							95% GRANITE/MONZONITE; 5% ANDESITE; <5% OX.	
395							AS ABOVE	
400							70% GRANITE/MONZONITE; 20% ANDESITE; 10% RHYOLITE (?); 0% OX.	
405							80% GRANITE/MONZONITE, 20% ANDESITE (DACITE?) DIKE; 2% OX.	
410							GRANITE W/MINOR RHYOLITE OR ANDESITE DIKE; OXIDATION ALONG CONTACT, TRACE TO MINOR PYRITE	
415							GRANITE; TRACE PYRITE, CALCITE (GYPSUM?) ALONG FRX. UP TO 3MM WIDE	
420								

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LOG OF MONITORING WELL

PAGE 8 OF 9

PROJECT NAME: COPPER FLAT
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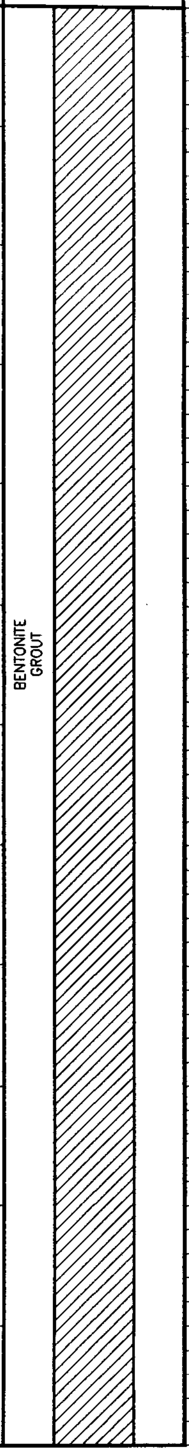

DEPTH	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
420							GRANITE/MONZONITE; <2% OX. MINOR RHYOLITE DIKE
425							GRANITE/MONZONITE; PYRITE VEINLETS ABUNDANT ON FRX. >1MM
430							GRANITE/MONZONITE; VEINED PYRITE 1-2MM. ORTHOCLASE MEGACRYSTS (PINK MICROCLINE)
435							GRANITE/MONZONITE; PYRITE VEINLETS ABUNDANT
440							GRANITE/MONZONITE; VERY COARSE GRAINED
445							80% GRANITE/MONZONITE; <20% ANDESITE DIKE; <1% OX., OXIDE ZONE >10 MM DEEP ALONG FRX.
350							GRANITE/MONZONITE; W/ABUNDANT PYRITE
455							AS ABOVE
460							GRANITE/MONZONITE; COARSE GRAINED, EUHEDRAL FELDSPAR, 10-15% MAFICS, 0% OX.
465							AS ABOVE
470							AS ABOVE
415							GRANITE/MONZONITE AS ABOVE; ABUNDANT PYRITE AND TRACE FILLED FRX.
480							

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PROJECT NO.: 1356A

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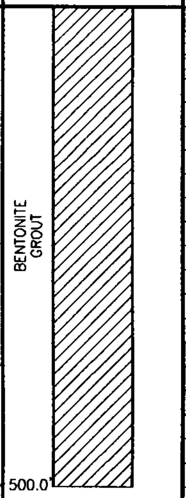
COORDINATES OR LOCATION: N 716,835 (APPROX.) E 593,370 (APPROX.)

DEPTH	SAMPLER TYPE AND NUMBER	SAMPLER DEPTH INTERVAL	BLOW COUNT	RECOVERY LENGTH (%)	WATER	GRAPHIC LOG	DESCRIPTION
480							AS ABOVE
485							AS ABOVE
490							GRANITE/MONZONITE AS ABOVE
495							QUARTZ/MONZONITE; ABUNDANT PYRITE AND CHLORITE
500							TOAL DEPTH 500'

WELL COMPLETION DIAGRAM



NOTES:

TEST DRILLING EQUIPMENT & PROCEDURES

Drilling Equipment Truck-mounted CME-55 drill rigs powered with 6 cylinder Ford industrial engines are used in advancing test borings. The 6 cylinder engines are capable of delivering about 6,500 foot/pounds torque to the drill spindle. The spindle is advanced with twin hydraulic rams capable of exerting 12,000 pounds downward force. Drilling through soil or softer rock is performed with 6-1/2 inch O.D., 3-1/4 I.D. hollow stem auger or 4-1/2 inch continuous flight auger. Carbide insert teeth are normally used on the auger bits so they can often penetrate rock or very strongly cemented soils which require blasting or very heavy equipment for excavation. Where refusal is experienced in auger drilling, the holes are sometimes advanced with tricone gear bits and NX rods using water or air as a drilling fluid.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 procedures. In most cases, 2" O.D., 1-3/8" I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140 pound 30 inch free fall drop hammer required to advance the samplers in 6 inch increments. However, in stratified soils, driving resistance is sometimes recorded in 2 or 3 inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per foot on the logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587). Where samples of rock are required, they are obtained by NX diamond core drilling (ASTM D2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings.

Continuous Penetration Tests Continuous penetration tests are performed by driving a 2" O.D. blunt nosed penetrometer adjacent to or in the bottom of borings. The penetrometer is attached to 1-5/8" O.D. drill rods to provide clearance to minimize side friction so that penetration values are as nearly as possible a measure of end resistance. Penetration values are recorded as the number of blows of a 140 pound 30 inch free fall drop hammer required to advance the penetrometer in one foot increments or less.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487) with appropriate group symbols being shown on the logs.

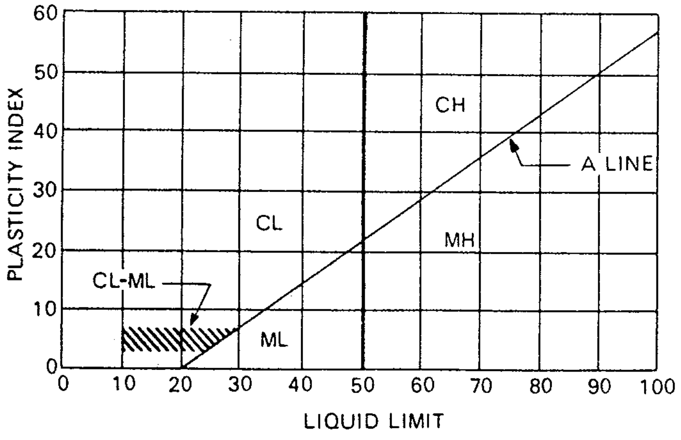
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)		◦	GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
				•	GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart	●	GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart	▨	GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)		○	SW	Well graded sands, gravelly sands.
				•	SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart	○	SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart	▨	SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)		┆	ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)		▮	MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)		▧	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)		▨	CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY, OR FIRMNESS, OF SOILS

The terminology used on the boring logs to describe the relative density, consistency, or firmness of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blows per foot is obtained by ASTM D1586 procedure using 2" O.D., 1-3/8" I.D. samplers.

1. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand-gravel mixtures.

N	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency. Terms for the description of clays which are saturated or near saturation.

N	Relative Consistency	Remarks
0-2	Very soft	Easily penetrated several inches with fist
3-4	Soft	Easily penetrated several inches with thumb
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort
16-30	Very stiff	Readily indented with thumbnail
30+	Hard	Indented only with difficulty by thumbnail

3. Relative Firmness. Terms for the description of partially saturated and/or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils:

N	Relative Density
0-4	Very soft
5-8	Soft
9-15	Moderately firm
16-30	Firm
31-50	Very firm
50+	Hard

TERMINOLOGY FOR THE DESCRIPTION OF ROCK

General Property	Descriptive Term	Visual or Physical Properties
WEATHERING	VERY WEATHERED	Abundant fractures coated with oxides, carbonates, sulfates, mud, etc., thorough discoloration, rock disintegration, mineral decomposition
	MODERATELY WEATHERED	Some fracture coating, moderate or localized discoloration, little to no effect on cementation, slight mineral decomposition
	SLIGHTLY WEATHERED	A few stained fractures, slight discoloration, little to no effect on cementation, no mineral decomposition
	FRESH	Unaffected by weathering agents, no appreciable change with depth
FRACTURING	INTENSELY FRACTURED	Less than 1" spacing
	VERY FRACTURED	1" to 6" spacing
	MODERATELY FRACTURED	6" to 12" spacing
	SLIGHTLY FRACTURED	12" to 36" spacing
	SOLID	36" spacing or greater
STRATIFICATION	THINLY LAMINATED	less than 1/10"
	LAMINATED	1/10" to 1/2"
	VERY THINLY BEDDED	1/2" to 2"
	THINLY BEDDED	2" to 2 feet
	THICKLY BEDDED	more than 2 feet
HARDNESS	SOFT	Can be dug by hand and crushed by fingers
	MODERATELY HARD	Friable, can be gouged deeply with knife and will crumble readily under light hammer blows
	HARD	Knife scratch leaves dust trace, will withstand a few hammer blows before breaking
	VERY HARD	Scratched with knife with difficulty, difficult to break with hammer blows

PROJECT Tailings Dam Investigation

JOB NO. E76-1023 DATE 3-24-76

LOG OF TEST BORING NO. 1

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	S	30		16	CH	firm	CLAY, high plasticity, reddish brown
5		▨	☒	S	73		16	CL	hard	SILTY CLAY, medium plasticity, reddish brown
10		▨	☒	U	67		13			
15		‖	☒	S	92		17	ML	hard	CLAYEY SILT, medium plasticity, brown
20		‖	☒	S	50/5"		11			
25		‖	☒	S	50/3"		9			
30		‖	☒	S	50/4"		11			
										Stopped auger at 29'6" Sampler refused at 29'10"
35										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Tailings Dam Investigation

JOB NO. E76-1023 DATE 3-24-76

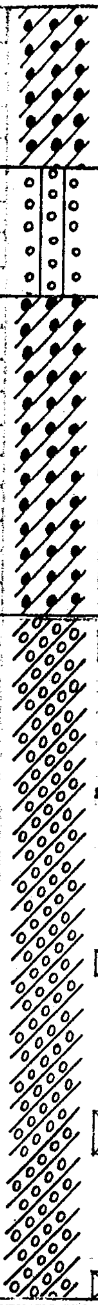
LOG OF TEST BORING NO. 2

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	20		10	GC	firm	SANDY CLAY, some gravel, medium to high plasticity, dark brown
5			☒	S	65		6	SM	hard	SANDY SILT, very fine, some gravel, some clay, low plasticity, brown
10			☒	S	50/5"		3	GC	hard	CLAYEY SAND & GRAVEL, coarse, low plasticity, brown
15			▬	S	50/2"(no recovery)					
20			☒	S	90		12		hard	CLAYEY SAND, medium plasticity, brown
25			☒	S	50/4"		7			
30			☒	S	50/2"		12	SC		
35			☒	S	107		13			
40			☒	S	103		12			
45										Stopped auger at 39'6" Sampler refused at 40'4"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Tailings Dam Investigation

LOG OF TEST BORING NO. 3

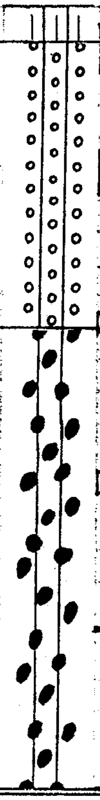
JOB NO. E76-1023 DATE 3-25-76

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger & 4½" Flight Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0							ML	soft	CLAYEY SILT, very fine, some sand, medium plasticity, brown
		☒	S	22		6			
5		☒	S	75		5	SM	hard	SILTY SAND, predominantly fine, some clay, occasional gravel & cobble, low plasticity, brown
10		☒	S	50/2"		3		hard	SILTY SAND & GRAVEL, predominantly coarse, some cobbles, nonplastic, grayish brown
15		☒	S	50/2"		3			
							GM		
20		—	S	50/1"(no recovery)					
25		—	S	50/0"(no recovery)					Stopped auger at 24'6" Sampler refused at 24'6"
30									

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1023 DATE 3-30-76

LOG OF TEST BORING NO. 4

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		☒	S	23		12	CL	firm	SILTY CLAY, moderately cemented, medium to high plasticity, brown
5		☒	S	35		11			
							GM	hard	SILTY GRAVEL, subangular, nonplastic, gray
10		☒	S	90		6			
15		▬	S	50/2"		5			
20		▬	S	50/3"		3			Stopped auger at 19'6" Sampler refused at 19'9"
25									

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Tailings Dam Investigation

LOG OF TEST BORING NO. 5

JOB NO. E76-1023 DATE 3-29-76

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										
			☒	S	26		7	CL	firm to hard	SILTY CLAY, some coarse sand, trace of gravel, lightly cemented, medium plasticity, light brown
5			☒	S	58		12			
								ML	hard	CLAYEY SILT, highly cemented, medium plasticity, tan
10			☒	S	72		12			
								CH		SANDY CLAY, high plasticity, tan & red
									very firm to hard	CLAY, high plasticity, red & gray
15			☒	S	31		15			
20			☒	U	80		18	CH		
25			☒	U	100/10"		23			
30			☒	S	51		17			
									hard	CLAYEY SILT, medium plasticity, red
35			☒	S	51		25			
40			☒	S	73		19	ML		
45			☒	S	77 (no recovery)					
50			☒							

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST BORING NO. 5

PROJECT Tailings Dam Investigation

JOB NO. E76-1023 DATE 3-30-76

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	95		17			
55			☒	S	82		21		hard	CLAY, medium to high plasticity, red
60			☒	S	66		24			
								CH		
65			☒	S	75		18			
70			☒	S	50/5"		14		hard	SANDY CLAY, with very weathered gravel, medium plasticity, red
								CH		
75			☒	S	50/4"		10			Stopped auger at 74'6" Sampler refused at 74'10"
80										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1023 DATE 3-25-76

LOG OF TEST BORING NO. 6

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨								
		▨	☒	S	14		13	CL	moderately firm to firm	SILTY CLAY, medium plasticity, brown
5		▨	☒	S	29		10			
10		∘∘∘	☒	S	105		11	SM	hard	SILTY SAND, predominantly fine, some gravel, nonplastic, brown
15		∘∘∘	☒	S	85		10			
20			☒	S	62		13			probably CONGLOMERATE composed of andesite, gravel or cobbles
25			▬	S	50/3"(no recovery)					
30			▬	S	50/3"(no recovery)					
35			▬	S	50/1"(no recovery)					Auger refused at 34'6" Sampler refused at 34'7"
40										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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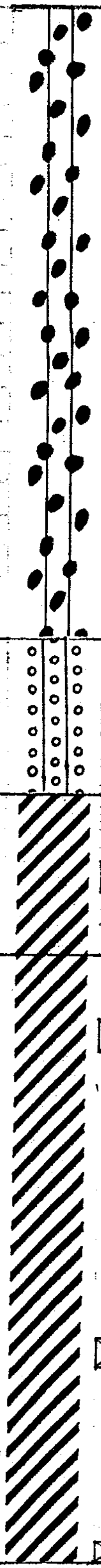
JOB NO. E76-1023 DATE 3-26-76

LOG OF TEST BORING NO. 7

RIG TYPE CME-55
BORING TYPE 4½" Flight Auger
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										SILTY SAND & GRAVEL, predominantly fine, occasional cobbles, angular, nonplastic, light brown
5										
			☒	A			2			
10								GM		
			☒	A			2			
15										
20										SILTY SAND, predominantly fine, nonplastic, tan
			☒	A			7	SM		
25										SANDY CLAY, medium to high plasticity, tan
			☒	A			5	CH		
30										CLAY, high plasticity, red
			☒	A			13			
35										
40								CH		
			☒	A			21			
45										
			☒	U	100/7"	110	20			Stopped auger at 48'6" Sampler refused at 49'1"
50										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube

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LOG OF TEST BORING NO. 8

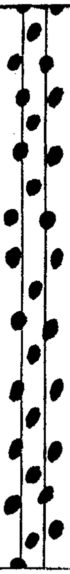
JOB NO. E76-1023 DATE 3-26-76

RIG TYPE CME-55

BORING TYPE 4½" Flight Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										SILTY SAND & GRAVEL, predominantly, angular, nonplastic, light brown
5										
			☒	A			2	GM		
10										
			☒	A						
15										
										Auger refused at 16'6"
20										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube

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JOB NO. E76-1023 DATE 3-31-76

LOG OF TEST BORING NO. 9

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	S	10		8	SC	moderately firm to hard	CLAYEY SAND, predominantly fine, moderately cemented, low plasticity, light brown
5		▨	☒	S	53		4			
10		●	☒	S	50/5"		4	GM	hard	SILTY SAND & GRAVEL, predominantly fine, low plasticity, light brown
15		●	☒	S	98		3			
20		●	☒	S	70		7	GM	hard	SILTY SAND & GRAVEL, predominantly fine, some conglomerate rock, low plasticity, light brown
25										Stopped auger at 19'6" Sampler refused at 20'5"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

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JOB NO. E76-1023 DATE 3-30-76

LOG OF TEST BORING NO. 10

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	16		10	ML	firm	CLAYEY SILT, medium plasticity, tan
5			☒	S	44		17	CH	very firm	SANDY CLAY, medium to high plasticity, tan
10			☒	S	73		10	ML	hard	CLAYEY SILT, some gravel, nonplastic, brown
15			—	S	50/0"(no recovery)					
			—	S	50/0"(no recovery)			GM	hard	SILTY SAND & GRAVEL, predominantly fine, nonplastic, brown
20										Auger refused at 17' Sampler refused at 17'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube

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JOB NO. E76-1023 DATE 3-31-76

LOG OF TEST BORING NO. 11

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	8		8		soft to very firm	CLAYEY SAND, moderately cemented, medium plasticity, brown
5			☒	S	32		9	SC		
10			☒	S	90		7		hard	SILTY SAND, predominantly medium, occasional gravel, highly cemented, nonplastic, brown
15			▬	S	50/3"		5	SM		
20			▬	S	50/5"		7			
										Stopped auger at 19'6" Sampler refused at 19'11"
25										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube

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JOB NO. E76-1023 DATE 3-31-76

LOG OF TEST BORING NO. 12

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger & 4½" Flight Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	S	15		13	CL	moderately firm	SANDY CLAY, medium to high plasticity, dark reddish brown
5		●	☒	S	58		2	GM	hard	SILTY SAND & GRAVEL, predominantly fine, nonplastic, brown
10		●	☒	S	83		4	GM-GP	hard	SILTY SAND & GRAVEL, poorly graded, lightly cemented layers, subrounded, nonplastic, light brown
15		●	☒	S	93		6		hard	SILTY SAND, predominantly fine, some gravel, low plasticity, light brown
20		●	▬	S	50/4"		17	GM		
25		●	▬	S	50/3"		5			
30		●						GM	6½" Hollow Stem Auger refused at 25'6"	
35		●								
40		●								
45		●								
50										4½" Flight Auger refused at 46'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube

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JOB NO. E76-1023 DATE 3-25-76

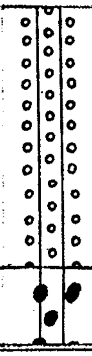
LOG OF TEST BORING NO. 13

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	25		8	SM	firm to hard	SILTY SAND, predominantly coarse, some clay & gravel, low plasticity, grayish brown
5			☒	S	98		4			
			—	S	50/0"(no recovery)			GM	hard	SILTY SAND & GRAVEL, predominantly fine, subangular, nonplastic, light brown
10										
										Auger refused at 10'6" Sampler refused at 10'6"
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube

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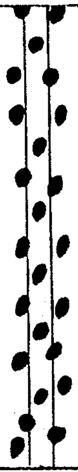
JOB NO. E76-1023 DATE 3-31-76

LOG OF TEST BORING NO. 14

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	17		3		firm to hard	SILTY SAND & GRAVEL, predominantly fine, occasional cobbles, subangular, nonplastic, brown
5			▨	S	50/5"		5			
								GM		
10			—	S	50/0"(no recovery)					
			—	S	50/0"(no recovery)					
15										Auger refused at 15'6" Sampler refused at 15'6"
20										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube

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PROJECT Tailings Dam Investigation

JOB NO. E76-1023 DATE 3-31-76

LOG OF TEST BORING NO. 15

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	15		3	SM	moderately firm	SILTY SAND, predominantly fine, moderately cemented, medium plasticity, dark brown
5			☒	S	78		5		hard	SILTY SAND & GRAVEL, subrounded, nonplastic, brown
10			▬	S	50/3" (no recovery)					
								GM		
15			▬	S	50/3"		4			
			—	S	50/1" (no recovery)					
20										Stopped auger at 19'6" Sampler refused at 19'7"
25										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

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JOB NO. E76-1100 DATE 9-6-76

LOG OF TEST BORING NO. 16

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger, NX

SURFACE ELEV. Diamond Core & Tricone

DATUM Gear Bit

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	49		5		dry very hard	SILTY SAND, GRAVEL & COBBLES, some clays, poorly graded, moderately to highly cemented, low plasticity, light tan to white
5			☒	S	55		4	GM		
									HSA refusal at 8' Begin Tricone Gear Bit	
10			☒	GB			26		dry very hard	CLAYEY SAND, GRAVEL & COBBLES, poorly graded, moderately to highly lime cemented, medium plasticity, light tan to white
15								GM		
			☒	GB						
20				S	50/1"		20		dry very hard	SILTY SAND, GRAVEL & COBBLES, poorly graded, moderately cemented, low plasticity to non-plastic, light tan
			☒	A			3			
25				S	50/½"		11			
			☒	A			4 3			
30				S	50/1"		7			
35				S	50/1"		4	GM		
			☒	A			4			
40				S	50/1"		3			
			☒	A			2			
45				S	50/2"		4			
				S	50/1"					Stopped auger at 49'6" Sampler refused at 49'7"
50										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

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JOB NO. E76-1100 DATE 8-30-76

1 of 2

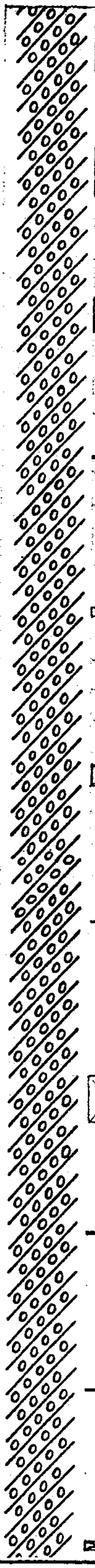
LOG OF TEST BORING NO. 17

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										
			☒	S	29				dry hard	CLAYEY SAND, considerable gravel, trace of cobbles, moderately cemented, medium plasticity, light gray
5			☒	S	48		7			
10			☒	S	50/5"					
15			—	S	50/1"		5			
20			☒	S	50/3"		9			note: becomes highly cemented below 21'
25			☒	S	50/2"			SC		
30			—	S	50/¾"		5			
35			☒	S	105		5			
40			—	S	50/½"(no recovery)					
45			—	S	50/0"(no recovery)					
50			☒	S	100/3"		7			

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" i.D. tube sample.
T – 3" O.D. thin-walled Shelby tube

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 17

JOB NO. E76-1100 DATE 8-20-76

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		▨								
55		▨	▭	S	50/3"		10			
		▨						SC		note: occasional seam of silty clay, medium to high plasticity, light brown
60		▨	▭	S	50/2½"		11			
65		▨	—	S	100/1"		9			
										Auger refused at 65'
70										

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-22-76

LOG OF TEST BORING NO. 17B

RIG TYPE CME-75

BORING TYPE 4½" Flight Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CL-CH		SANDY CLAY, some gravel, medium plasticity, light brown
5 10 15 20 25		○						SM & GM		SILTY SAND & GRAVEL, slightly lime cemented, nonplastic, gray note: occasional cobble
30										Stopped auger at 30'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 9-1-76

LOG OF TEST BORING NO. 18

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										GRAVEL littered surface
			☒	S	20		17		firm to hard	SILTY CLAY, some sand, medium to high plasticity, reddish-brown note: occasional seam of clayey silt, medium plasticity, reddish-tan
5			☒	S	33		18			
10			☒	S	38					
								CH		
15			☒	S	50/5½"		22			
20			☒	S	50/5½"		16			
25			☒	S	85		23	ML	hard	CLAYEY SILT, some fine sand, medium plasticity, light brown
30			☒	S	50/4"		20	ML	hard	SANDY SILT, considerable lime, low plasticity, light tan
35			☒	S	50/4"				hard	SILTY CLAY, some fine sand, medium plasticity, light brown
								CL		
40			☒	S	50/5½"		13		hard	SANDY SILT, low plasticity, light brown
										CLAYEY SAND & GRAVEL, occasional cobble, decomposed, low plasticity, brown
45			☒	S	50/2"		11	ML		
								SC		Stopped auger at 49'6" Sampler refused at 49'8"
50			☒	S	50/2"		19			

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 9-4-76

1 of 2

LOG OF TEST BORING NO. 19

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		●	☒	S	28			GM	dry firm to hard	SILTY SAND & GRAVEL, cobbles to 6", skip graded, moderately to strongly lime cemented, low plasticity, light tan note: no cobbles below 10'
5		●	☒	S	50/4"					
10		●	▭	S	50/1½"		5			
15		○	▭	S	50/5"			SM	slightly moist hard	SILTY SAND, some gravel, trace of stratified silty clay, sand, predominantly fine to medium, slightly to moderately cemented, low plasticity, light reddish-tan
20		○	▭	S	50/4"		8			
25		○	▭	S	50/5"		10			
30		○	▭	S	50/4½"		10	SM	slightly moist hard	SILTY SAND, trace of gravel & silty clay, stratified, sand, fairly well graded, slightly cemented, nonplastic to low plasticity, light reddish-brown note: considerable silty clay lenses at 37'
35		○	☒	S	50/3"					
40		○	☒	S	50/4½"		11			
45		▨	☒	S	92		20	CH	moist hard	SILTY CLAY, some fine sands, medium to high plasticity, bright reddish-brown
50		▨	☒							

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube

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LOG OF TEST BORING NO. 19

JOB NO. E76-1100 DATE 9-4-76

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		▨	☒	S	68					
		▨						CH		
55		▨	☒	S	50/4½"		19			
										Stopped auger at 54'6" Sampler refused at 55'4½"
60										

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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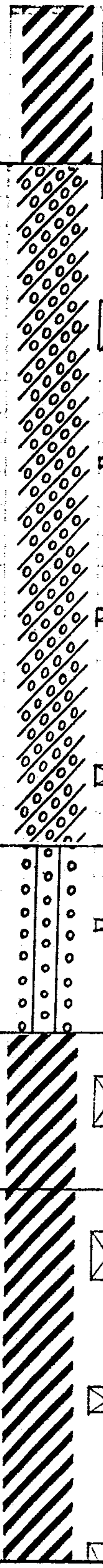
PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 8-29-76

LOG OF TEST BORING NO. 20

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	16		14	CH	slightly moist stiff to hard	SILTY CLAY, considerable sand, some cobbles, medium to high plasticity, bright reddish-brown
5			☒	S	75		18		dry hard	CLAYEY SAND, considerable gravel, some stratified cobbles, well graded, slightly lime cemented, nonplastic, light gray note: some clays decomposed from weathering granitic gravels, light reddish-brown
10			☒	S	62					
15			☒	S	50/4"		9	SC		
20			☒	S	50/5½"		8			
25			☒	S	50/2"		11			
30			☒	S	50/5"		14	SM & CL	slightly moist hard	SILTY SAND, with laminations of silty clay, sand, predominantly medium to fine, clays, medium to high plasticity, light reddish-brown
35			☒	S	67		32	CH	slightly moist hard	SILTY CLAY, some sand, medium to high plasticity, bright reddish-brown, interbedded with sand, predominantly medium to fine, nonplastic, light gray
40			☒	S	46				moist hard	SILTY CLAY, some sand, medium to high plasticity, bright reddish-brown
45			☒	U	50/3½"		24	CH		
50			☒							

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 20

JOB NO. E76-1100 DATE 8-29-76

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		▨	☒	S	100					
55		▨	☒	S	50/5½"		21			
60		▨	☒	S	50/5½"		20			
		▨						CH		
65		▨	☒	S	79					note: occasional seam of sandy silt, low plasticity, brown
70		▨	☒	S	84		26			
75		▨	☒	S	85		21			
										Stopped auger at 74'6" Sampler refused at 75'11½"
80										

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-24-76

LOG OF TEST BORING NO. 21

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	15		8	CH	firm	SANDY CLAY, high plasticity, reddish-brown
5			☒	S	35		11	SC	very firm	CLAYEY SAND, predominantly fine, some lime cementation, low to medium plasticity, tan
10			☒	S	49		21	CL	very firm to hard	SILTY CLAY, medium to high plasticity, red note: plasticity highly variable between 7½'-18'
15			☒	S	56		19			
20			☒	S	75		19	CH	hard	SILTY CLAY, high plasticity, red
25			☒	S	98		15			
30			☒	S	96				hard	SILTY CLAY, marbled with clayey silt, little fine sand, medium plasticity, red
35			☒	S	60		20	CH & ML		
40			☒	S	73		17			
45			☒	S	56		30			
50			☒							

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST BORING NO. 21

JOB NO. E76-1100 DATE 8-24-76

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		▨	☒	S	62		31			
55		▨	☒	S	107			CH & ML		
60		▨	☒	S	115		24			
65		▨	☒	S	50/5"		25			
70		▨	☒	S	50/4"		21		hard	SILTY CLAY, medium to high plasticity, reddish-brown
75		▨	☒	S	167			CH		
80		▨	☒	S	119		17			
85		▨	☒	S	88		23			
		▨						CH	hard	SANDY CLAY, medium to high plasticity, reddish-brown
90		▨	▬	S	50/2½"		13	CL	hard	SANDY CLAY, some fine gravel, low plasticity, reddish-tan
95		▨	▬	S	50/5"		10	GC	hard	CLAYEY SAND & GRAVEL, poorly graded to 1", low to medium plasticity, tan note: gravel highly decomposed
100		▨	▬	S	50/3½"		15			

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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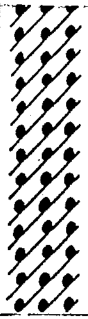
PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 21

JOB NO. E76-1100 DATE 8-25-76

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
100										
105			☒	S	50/3"			GC		
				S	50/½"(no recovery)					
110										Stopped auger at 109'6" Sampler refused at 109'6½"
115										

GROUND WATER

DEPTH	HOUR	DATE
105'	9:30	8-25
	a.m.	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 22

JOB NO. E76-1100 DATE 8-24-76

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	28		11		firm to hard	SANDY CLAY, trace of weathered gravel, sand, skip graded, medium plasticity, light reddish-brown note: moderately white cementation begins at 10'
5			☒	S	77		7	CL		
10			☒	S	37		16			
15			☒	S	30		23		firm to hard	SILTY CLAY, some fine sands, medium to high plasticity, bright reddish-brown
20			☒	S	48		21	CH		
25			☒	S	68		22			
30			☒	S	50/5½"		16	SC	hard	CLAYEY SAND, sand, predominantly fine, low plasticity, light reddish-brown note: possibly small stratifications interbedded with silty clay
35			☒	S	104					
40			☒	S	71		22	CL	hard	SILTY CLAY, some fine sand, medium plasticity, bright reddish-brown note: some 2" thick lenses of clayey sand interbedded with silty clay
45			☒	S	62		25			
50			☒							

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 22

JOB NO. E76-1100 DATE 8-24-76

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		▨	☒	S	58		20			
55		▨	☒	S	70		21	CL		note: increased amount of sandy clay lenses between 53'-57', 5" thick
60		▨	☒	S	63		20			
65		▨	☒	S	50/5"		20	CL-CH	slightly moist hard	SILTY CLAY equally interbedded with sandy clay, sand, predominantly fine, medium to high plasticity, bright reddish-brown
70		▨	☒	S	69		21	CH	slightly moist hard	SILTY CLAY, trace of sand, predominantly fine, medium to high plasticity, bright reddish-brown
				S	50/1"		16	GC	hard	CLAYEY SAND & GRAVEL, trace of cobbles, skip graded, highly weathered, clay, medium plasticity, greenish-gray
75										
80										Stopped auger at 74'6" Sampler refused at 74'7"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 23

JOB NO. E76-1100 DATE

RIG TYPE
BORING TYPE
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30'' free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
									Boring 23 was not drilled. Boring 5 from preliminary investigation (Ref. 1) at planned location of Boring 23.	

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2'' O.D. 1.38'' I.D. tube sample.
U – 3'' O.D. 2.42'' I.D. tube sample.
T – 3'' O.D. thin-walled Shelby tube.

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LOG OF TEST BORING NO. 24

PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-29 & 30-76

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	30		7	SC	firm	CLAYEY SAND, predominantly fine, some gravel, low plasticity, brown
5			☒	S	31		10	CL	hard	SILTY CLAY, some sand, moderately lime cemented, medium plasticity, white
10			☒	S	97		9			
15			☒	U	50			CH	very firm	SILTY CLAY, high plasticity, reddish-brown to green
20			☒	U	82					
25			☒	S	86		19	CL	hard	SILTY CLAY, medium plasticity, reddish-brown
30			☒	S	50/6"		16	SC	hard	CLAYEY SAND, predominantly fine, very low plasticity, light brown
35			☒	S	50/5½"		10	CL	hard	SILTY CLAY, medium to high plasticity, reddish-brown
40			☒	S	88			CH	hard	SILTY CLAY, high plasticity, reddish-brown
45			☒	S	50/5½"		17	ML	hard	CLAYEY SILT, little fine sand, low to medium plasticity, light brown
50			☒	S	50/3"		15			

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 24

JOB NO. E76-100 DATE 8-29 & 30-76

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			⊠					ML		
		▨							hard	SILTY CLAY, high plasticity, reddish-brown
55		▨	☒	S	77		21			
		▨						CH		
60		▨	☒	S	54		24			
65		▨	⊠	S	50/5"		7			
		▨						GC	hard	CLAYEY SAND & GRAVEL, highly decomposed, low plasticity, brown to light brown
70										Stopped auger at 66'

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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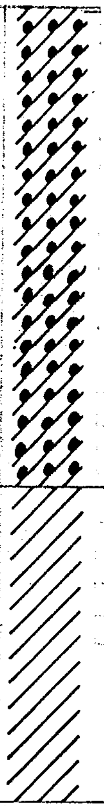
PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 9-13-76

LOG OF TEST BORING NO. 24B

RIG TYPE CME-55
BORING TYPE 4½" Flight Auger
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0 5 10								GC		CLAYEY SAND & GRAVEL, some silt, moderately lime cemented, low plasticity, white
15 20								CL		SANDY CLAY, medium plasticity, reddish-brown
25										Stopped auger at 25'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-24 & 25-76

LOG OF TEST BORING NO. 25

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0 5			☒ ☒ ☒	S A S	15 37		6 8 14	GM	dry very firm	SILTY SAND & GRAVEL, sand, medium to fine, subangular gravel, slightly cemented, stratified, low plasticity, light gray
10			☒	S	50/5"		8	ML	slightly moist hard	CLAYEY SILT, some stratified gravel, slightly to moderately cemented, low plasticity, white
15			☒	S	36		21	CL-CH	slightly moist very firm	SANDY CLAY interbedded with silty clay, sand, predominantly fine, trace of gravel, weathered, clays, medium plasticity, mottled bright yellow & gray
20			☒	S	43		20	CL	slightly moist very firm	SANDY CLAY, sands, predominantly fine, medium to high plasticity, bright reddish-brown
25 30 35 40 45 50			☒ ☒ ☒ ☒ ☒ ☒	S S S S S S	32 44 43 82 134 50/3½"		 25 21 25 19 12	CH	slightly moist very firm to hard	SILTY CLAY, some interbedded silty sands, medium to high plasticity, reddish-brown

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-24 & 25-76

LOG OF TEST BORING NO. 25

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		ǀ ǀ ǀ						ML	slightly moist very dense	SILTY SAND, some laminated silty clay, sand, predominantly fine, low plasticity, light gray
55		▨	☒	S	65		20	CH	moist to very moist hard	SILTY CLAY, medium to high plasticity, bright reddish-brown interbedded with silty sand, sand, predominantly fine, low plasticity, light grayish-brown
60		▨	☒	S	67		23			
65		▨	▭	S	50/3½"		12	GC	moist very dense	CLAYEY SAND & GRAVEL, trace of stratified cobbles, skip graded, gravel, highly weathered, clay, medium plasticity, grayish-green to brown
70		▨	▭	S	50/4"		8			
75		▨	☒	S	78 (no recovery)					
80										Stopped auger at 74'6" Stopped sampler at 76'

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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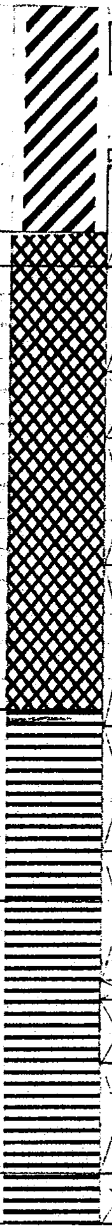
JOB NO. E76-1100 DATE 8-26-76

LOG OF TEST BORING NO. 26

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	110		16		slightly moist hard	SILTY CLAY, some sand & gravel, medium to high plasticity, purple to reddish-brown
								CH		
5			☒	S	50/4"		4			
			☒	A						
									HSA refusal at 8' Begin NX coring	BASALT, slightly weathered, moderately fractured, thickly bedded, hard to very hard, light gray note: some calcite in fractures, fracturing & weathering increases with depth, upper 8' mottled
10			☒	NX	90% Core Recovery 100% Water Return					
			☒	NX	100% Core Recovery 100% Water Return					
15			☒	NX	100% Core Recovery 90% Water Return					
20			☒	NX	95% Core Recovery 90% Water Return					
25			☒	NX	70% Core Recovery 90% Water Return					BASALT, brecciated, containing some foreign diorite & granitic fragments, very weathered, soft, purple note: becomes calcite cemented at 28'
			☒	NX	75% Core Recovery 85% Water Return					
30			☒	NX	80% Core Recovery					CONGLOMERATE, very weathered, highly fractured, calcite cementation, soft, gray
			☒	NX	70% Core Recovery 40% Water Return					
35			☒	NX	0% Core Recovery 50% Water Return					
			☒	S	53				Stopped NX coring at 36'6"	
40										Stopped coring at 36'6" Stopped auger at 38'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-29-76

LOG OF TEST BORING NO. 27

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		☒	S	7		11	ML	soft	SANDY SILT, some clay, little fine gravel, low plasticity, tan
5		☒	S	26			CH	firm	SILTY CLAY, medium to high plasticity, brown
10		—	S	50/2"		10	CL	hard	SANDY CLAY, considerable gravels, some cobbles, moderately lime cemented, medium plasticity, reddish-brown
15		—	S	50/2"		9		hard	SILTY SAND & GRAVEL, composed of volcanic fragments, moderately cemented, nonplastic, light tan to reddish-brown
20		—	S	50/2"		12			
25		☒	S	50/5½"			GM		
30		☒	S	50/3"		13			
35		—	S	50/2"		11			
40		☒	S	50/5"		20	GM	slightly moist to wet hard	SILTY SAND & GRAVEL, some clays, trace of cobbles, skip graded, subangular, tan to reddish-brown
45		☒	S	47		23			
50		☒							

GROUND WATER

DEPTH	HOUR	DATE
38'	11:30 a.m.	8-29

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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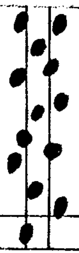
PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 8-29-76

LOG OF TEST BORING NO. 27

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	187		19			
								GM		
55			▭	S	50/3"(no recovery)				HSA refusal at 56'6"	note: large cobbles at 55'+
				NX	~~100% Core Recovery~~ ~~100% Water Return~~				~~Begin NX coring~~	
60										Auger refused at 56'6" Stopped coring at 57'6"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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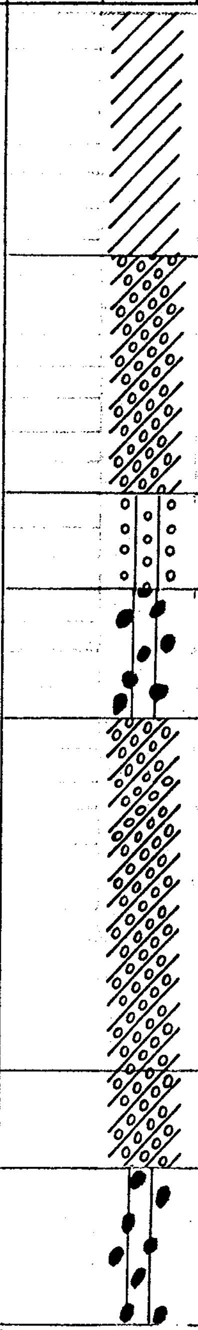
PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 27B

JOB NO. E76-1100 DATE 9-23-76

RIG TYPE CME-75
BORING TYPE 4½" Flight Auger
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
								CL-CH		SANDY CLAY, medium plasticity, brown
								SC & GC		CLAYEY SAND & GRAVEL, some cobbles, low plasticity, brown
								SM & GM		SILTY SAND & GRAVEL, some cobbles, nonplastic, light brown
								GM-GC		SILTY SAND & GRAVEL, some cobbles, trace of clay, nonplastic to low plasticity, brown
								SC & GC		CLAYEY SAND & GRAVEL, some lime cementation, low plasticity, brown
								SC & GC		CLAYEY SAND & GRAVEL, medium plasticity, dark brown
								GM-GC		SILTY SAND & GRAVEL, some cobbles, trace of clay, nonplastic, brown
										Stopped auger at 41'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-26-76

LOG OF TEST BORING NO. 28

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	15		5	SM	dry	FILL SILTY SAND, well graded, nonplastic, light grayish-brown
5			☒	S	59		4	GC	dry hard	CLAYEY SAND & GRAVEL, some cobbles, skip graded, slightly cemented with high calcium content, light gray to white note: samples contain considerable amounts of porous basalt fragments
10			☒	S	50/1"		7			
			☒	A			6			
15			☒	S	50/1"(no recovery)				moist to very moist	BASALT, moderately to highly weathered, moderately fractured, ribboned with calcite, black to greenish-black note: alternating zones which are brecciated & calcified; highly decomposed & porous forming silty sand & gravel, skip graded, nonplastic, gray to black
20				S	50/0"					
25				S	50/3"		10			
30				S	50/½"		12			
			☒	A						
35				S	50/0"					
40				S	50/0"					BASALT, slightly to moderately weathered, very fractured, thickly bedded, hard, light gray note: fractures & voids contain crystalline calcite; becomes highly competent, moderately fractured, very hard at 47'6"
					HSA refusal at 42'6" Begin NX coring					
45			☒	NX	100% Core Recovery 100% Water Return					
50			☒	NX	100% Core Recovery 100% Water Return					

GROUND WATER

DEPTH	HOUR	DATE
29'	9:00 a.m.	10-26

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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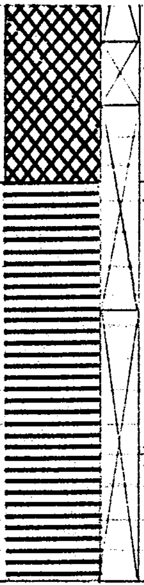
PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-26-76

LOG OF TEST BORING NO. 28

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50				NX	100% Core Recovery 100% Water Return 100% Core Recovery 90% Water Return					
55				NX	25% Core Recovery 50% Water Return					CONGLOMERATE, very weathered, moderately fractured, thinly bedded, alternately hard & soft, light gray note: calcite cementation, fragments subangular; becomes clayey & highly decomposed, competent at 65'6"-67'
60										
65				~~NX~~	~~100% Core Recovery~~ 50% Water Return					
70										Stopped coring at 68'

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 8-25-76

LOG OF TEST BORING NO. 29

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	26		11	CL	firm	SANDY CLAY, some silt, medium plasticity, brown
5			☒	S	50			SC-SM	hard	SILTY SAND, considerable clay, some gravel, moderately to strongly cemented, low plasticity, light tan
10			☒	S	50/4"		3			
								GC	very hard to hard	CLAYEY SAND, GRAVEL & COBBLES, poorly graded to 8", subrounded, low plasticity, light brown
15			☒	S	54		8			
								CH	hard to very firm	SILTY CLAY, medium to high plasticity, reddish-brown note: occasional seam of silty clay
20			☒	S	63					
25			☒	S	58		20			
30			☒	S	105		13			
35			☒	S	88		14			
40			☒	S	83					
45			☒	S	43		15			
								CL	very firm	SANDY CLAY, low to medium plasticity, brown
50			☐							

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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CONSULTING SOIL AND FOUNDATION ENGINEERS
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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-25-76

LOG OF TEST BORING NO. 29

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	65		16	CL		
55			☒	S	69		15	CH	hard	SILTY CLAY, high plasticity, reddish-brown note: occasional seam of clayey sand
60			☒	S	59		22			
65			☒	S	50/5½"		9			
70			☒	S	50/5"		12	SC	hard	CLAYEY SAND, considerable gravel (decomposed), low to medium plasticity, reddish-brown to gray
75			☒	S	50/4"		10			

Stopped auger at 74'6"
Sampler refused at
74'10"

GROUND WATER

DEPTH	HOUR	DATE
67'+	5:45	8-25
	p.m.	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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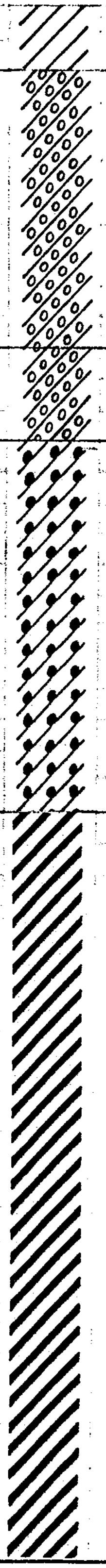
PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 9-23-76

LOG OF TEST BORING NO. 29B

RIG TYPE CME-75
BORING TYPE 4½" Flight Auger
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL-CH		SANDY CLAY, some silt, medium plasticity, brown
5 10								SC & GC		SANDY CLAY & GRAVEL, some lime cementation, medium plasticity, light brown
								SC & GC		CLAYEY SAND & GRAVEL, some cobbles, lime cemented, low plasticity, light brown
15 20 25								GC-GM		SANDY CLAY, some silt, medium plasticity, reddish-brown
30 35 40 45 50								CH		SANDY CLAY, high plasticity, reddish-brown note: occasional layers of clay

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-23-76

LOG OF TEST BORING NO. 29B

RIG TYPE CME-75

BORING TYPE 4½" Flight Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50										
55								CH		
60										
65										CLAYEY SAND, some gravel
70								SC		
75										
80										Stopped auger at 79'

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 8-28 & 29-76

LOG OF TEST BORING NO. 30

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	50/5½"		3	CH	hard	SANDY CLAY, some gravel, medium to high plasticity, reddish-brown
5			☒	S	50/5"		4		hard	CLAYEY SAND, GRAVEL & COBBLES, poorly graded to 10", moderately to strongly lime cemented, subangular to subrounded, low to medium plasticity, light tan
10			—	S	50/0"(no recovery)					
								GC		
15			—	S	50/0"(no recovery)					
20										
25			☒	S	50/5½"		20	CH	hard	SILTY CLAY, considerable lime, medium to high plasticity, reddish-brown
30			☒	S	57			CH	hard	SILTY CLAY, some lime, high plasticity, reddish-brown
35			☒	S	78		20	ML	hard	CLAYEY SILT, medium plasticity, reddish-brown
40			☒	S	75		19	CH	hard	SILTY CLAY, high plasticity, reddish-brown
45			☒	S	72			CH	hard	SILTY CLAY, medium to high plasticity, reddish-brown note: occasional seam of sandy clay, medium plasticity, brown
50										

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 8-28 & 29-76

LOG OF TEST BORING NO. 30

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	53		17	CH		
55			☒	S	167		14	SC	hard	CLAYEY SAND, predominantly fine, low plasticity, brown
60			☒	S	50/6"		19			
									hard	SILTY CLAY, high plasticity, reddish-brown
65			☒	S	65			CH		
70			☒	S	50/5½"		10	GC	hard	CLAYEY SAND & GRAVEL, poorly graded to 1", highly decomposed, low to medium plasticity, greenish-tan
75			☒	S	50/5"		12			

Stopped auger at 74'6"
Sampler refused at
74'11"

GROUND WATER

DEPTH	HOUR	DATE
73'	5:00 p.m.	8-29

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

1 of 2

PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-25 & 26-76

LOG OF TEST BORING NO. 31

RIG TYPE CME-55

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	44		9	GC	dry dense	CLAYEY SAND & GRAVEL, trace of cobbles, skip graded, low to medium plasticity, reddish-brown
5			☒	S	104					
10			☒	S	50/5"			SC	dry hard	CLAYEY SAND, considerable gravel, trace of cobbles, well graded, medium plasticity, light gray
15			☒	S	50/3"		7			
20			☒	S	50/3"		6		dry hard	SANDY CLAY, considerable silt, some stratified gravel, moderately cemented with high calcium content, low plasticity, white
			☒	A				CL-ML		
25			☒	S	50/2½"		6			
30			☒	S	40		20		slightly moist firm	SILTY CLAY, interbedded clayey sands, sand, predominantly fine, medium to high plasticity, reddish-brown
35			☒	S	97					
40			☒	S	50/5"		16	CH		note: clayey sand becoming sandy clays
45			☒	S	125		19			
50			☒							

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-25 & 26-76

LOG OF TEST BORING NO. 31

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		▨	☒	S	102		19			
55		▨	☒	S	72		18	CH		note: interbedded clayey sands
60		▨	▭	S	50/3"		9	GC	moist hard	CLAYEY SAND, some gravel, sand, predominantly medium to fine, clays, medium plasticity, light gray to greenish-gray
65		▨	☒	S	50/3½"		22	CH & SC	moist hard	SILTY CLAY, interbedded clayey sands, sand, predominantly fine, medium to high plasticity, bright reddish-brown
70		▨	☒	S	56		25			
75		▨	☒	S	50/4"		12	GC	slightly moist hard	CLAYEY SAND & GRAVEL, skip graded, highly weathered, medium to high plasticity, reddish-brown to grayish-green
80										Stopped auger at 74'6" Sampler refused at 75'4"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-26-76

LOG OF TEST BORING NO. 32

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	24		11	CH	firm	SILTY CLAY, medium to high plasticity, reddish-brown
								CL	firm	SANDY CLAY, medium plasticity, reddish-brown
5			☒	S	50/5"		3			
								SC-SM	hard	CLAYEY SAND, considerable silt, gravel & cobbles, poorly graded to 8", strongly lime cemented, subangular, low plasticity, light tan note: occasional layer of clayey sand, considerable gravel
10			☒	S	71					
15			☒	S	76		3			
								GC	hard	CLAYEY SAND & GRAVEL, poorly graded to 6", subrounded, low plasticity, brown
20			☒	S	50/4"		4			
25			☒	S	125				hard	SILTY CLAY, high plasticity, reddish-brown note: occasional seam of lime
								CH		
30			☒	S	50/5½"		13			
									very firm	SILTY CLAY, medium to high plasticity, reddish-brown
35			☒	S	44		30			
40			☒	S	38		45	CL-CH		
45			☒	S	50					
50			☒							

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-26-76

LOG OF TEST BORING NO. 32

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50		▨	☒	S	70		21			
55		▨	☒	S	39		29			note: occasional seam of clayey sand
60		▨	☒	S	50/5½"					
		▨						CL- CH		
65		▨	☒	S	50/5"		23			
70		▨	☒	S	96		22			
		▨								note: small amount of fine gravel at 75'
75		▨	☒	S	50/5"		16			
										Stopped auger at 74'6" Sampler refused at 74'11"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 33

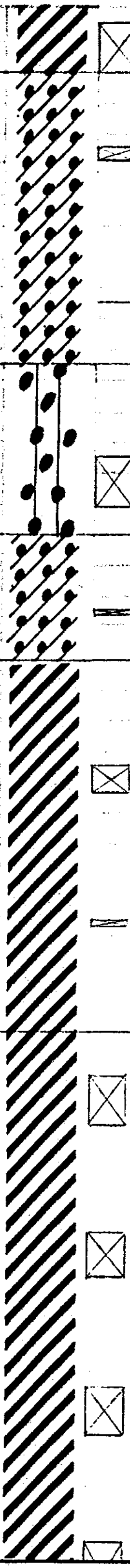
JOB NO. E76-1100 DATE 8-27-76

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	50		7	CH	hard	SANDY CLAY, some gravel, medium to high plasticity, reddish-brown
5			▭	S	50/5½"		3	GC	hard	CLAYEY SAND, GRAVEL & COBBLES, poorly graded to 10", moderately to strongly lime cemented, subangular to subrounded, low to medium plasticity, reddish-tan
10			—	S	50/0" (no recovery)					
15			☒	S	68		3	GM	dense	SILTY SAND & GRAVEL, poorly graded to 2", little clay, very low plasticity to nonplastic, brown
20			▭	S	50/2"		2	GC	hard	CLAYEY SAND, GRAVEL & COBBLES, poorly graded to 6", subangular, low to medium plasticity, reddish-brown
25			☒	S	50/5½"		18	CH	hard	SILTY CLAY, considerable lime, medium to high plasticity, light tan to white
30			▭	S	50/2"		10			
35			☒	S	70				hard	SILTY CLAY, considerable lime, high plasticity, reddish-brown note: occasional seam of clayey silt, medium plasticity
40			☒	S	103		21	CH		
45			☒	S	105		19			
50			☒							

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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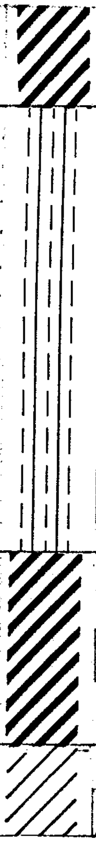
PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 8-27-76

LOG OF TEST BORING NO. 33

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	87		17	CH		
55			☒	S	182		16		hard	CLAYEY SILT, low to medium plasticity, reddish-brown note: occasional seam of clayey sand, predominantly fine, low plasticity, light tan
60			☒	S	50/3"		10	ML		
65			☒	S	70		18			
70			☒	S	82			CH	hard	SILTY CLAY, high plasticity, reddish-brown
75			☒	S	84		16	CL	hard	SANDY CLAY, some fine gravel, medium plasticity, reddish-brown
80										Stopped auger at 74'6" Sampler refused at 75'11½"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-26 & 27-76

LOG OF TEST BORING NO. 34

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	80		7	CH	firm	SANDY CLAY, small amount of gravel, medium to high plasticity, reddish-brown
5			☒	S	99		3	GC	hard	CLAYEY SAND & GRAVEL, well graded to 2", occasional cobble, subrounded, low plasticity, light brown
10			☒	S	50/3½"		4	GC	hard	CLAYEY SAND, GRAVEL & COBBLES, poorly graded to 8" moderately to strongly lime cemented, subangular to subrounded, low plasticity, light brown
15			☒	S	50/6"			CL	hard	SANDY CLAY, considerable lime, medium plasticity, brown to white
20			☒	S	123		8		hard	SILTY CLAY, some sand, considerable lime, little fine gravel, high plasticity, light tan to white
25			☒	S	50/2"(no recovery)			CH		
30			☒	S	50/5½"		12			
35			☒	S	60				hard	SILTY CLAY, high plasticity, reddish-brown
40			☒	S	84		18	CH		
45			☒	S	59		24			
								ML	hard	CLAYEY SILT, low to medium plasticity, reddish-brown note: occasional seam of silty sand
50			☒							

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 34

JOB NO. E76-1100 DATE 8-26 & 27-76

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	80		19	ML		
55			☒	S	87		17	CL	hard	SANDY CLAY, some silt, low to medium plasticity, tan
60			☒	S	50			CH	hard	SILTY CLAY, high plasticity, reddish-brown note: occasional seam of sandy clay, medium plasticity, reddish-tan
65			☒	S	50		25			
70			☒	S	50/5½"		11	GC	hard	CLAYEY SAND & GRAVEL, highly decomposed, low plasticity, brown
75			☒	S	50/4"		12			
80										Stopped auger at 74'6" Sampler refused at 75'4"

GROUND WATER

DEPTH	HOUR	DATE
72'	12:30 p.m.	8-27

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-7 & 8-76

LOG OF TEST BORING NO. 35

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	58		5	SC	slightly moist hard	CLAYEY SAND, GRAVEL & COBBLES, poorly graded, medium plasticity, reddish-brown
5			☒	S	50/3"		4		dry hard	SILTY SAND, GRAVEL, COBBLES & BOULDERS, boulders to +18", poorly graded, moderately cemented, nonplastic to low plasticity, light tan to white note: heavy lime content at 14'-16', sample white
			☒	A			3	GM		
10			☒	S	50/1"		4			
			☒	A						
15			☒	S	50/3"		2			
			☒	A			6	SC	dry hard	CLAYEY SAND, considerable gravel, moderately lime cemented, sand, skip graded, low to medium plasticity, light tan to gray
20			☒	S	135		8			
25			☒	S	50/5"		7	GC	dry hard	CLAYEY SAND & GRAVEL, skip graded, moderately cemented, low to medium plasticity, light reddish-tan
30			☒	S	50/4"				dry hard	SILTY SAND, considerable gravel, poorly graded, moderately cemented, low plasticity, light tan note: shows alteration due to possible ground water, greenish gray to reddish-brown at 40', heavy lime cementation at 35', moist at 40'
35			—	S	50/1"		3			
40			☒	S	50/5"		10	GM		
45			—	S	50/1"		6			
50			☒	S	50/5½"		7			

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-7 & 8-76

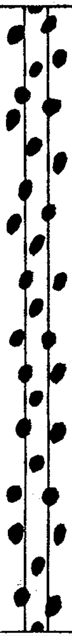
LOG OF TEST BORING NO. 35

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50									slightly moist hard	CLAYEY SAND & GRAVEL, alternating content of silt & clay, skip graded, moderately lime cemented, low to medium plasticity, light greenish-gray to reddish-brown note: trace of cobbles at 55'-60'
55			☒	S	91					
60			☒	S	50/4½"		7	GC		
65			☒	S	50/5"		7			
			—	S	50/1½"		12			
70										Stopped auger at 69'6" Sampler refused at 69'7½"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

LOG OF TEST BORING NO. 36

PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 9-10-76

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		☒	S	88				dry hard	SILTY SAND, GRAVEL & COBBLES, trace of boulders, skip graded, moderately lime cemented below 5', sugangular to angular, nonplastic to low plasticity, light brown at 0-5', light tan to gray at 5'+
5		☒	S	50/4"		3			
10		▭	S	50/3½"		4	GM		
15		☒	S	118		7			
20		☒	S	50/5½"		4			
25		▭	S	50/4"		9	GC	dry hard	CLAYEY SAND & GRAVEL, fairly well graded, moderately lime cemented, subangular, low plasticity, light gray note: highly cemented at 32' with cobbles
30		▭	S	50/2"		9			
35		— —	S S	50/1" 50/½" (no recovery)				hard to moderately hard	CLAYEY SAND, GRAVEL & COBBLES, probable skip graded, highly cemented, subangular, low to medium plasticity, light gray
40		—	S	50/0"			GC		
45		—	S	50/0"					
50		☒	NX	25% Core Recovery 100% Water Return					

HSA refusal at 47'6"
Begin NX coring

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-10-76

LOG OF TEST BORING NO. 36

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50				NX	20% Core Recovery ~~100% Water Return~~				Stopped NX coring at 53' Advance HSA	
55				S	50/1"					
60				S	50/2"		6			
										Auger refused at 59'6" Sampler refused at 59'8"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO E76-1100 DATE 9-13 & 15-76

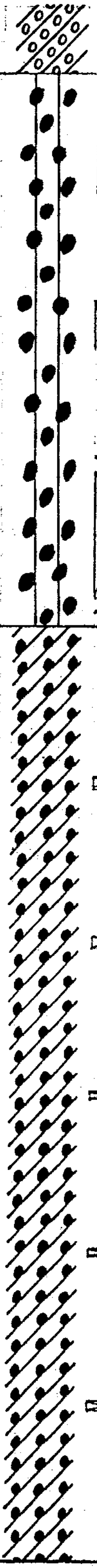
LOG OF TEST BORING NO. 37

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	15		9	SC	slightly moist	CLAYEY SAND, some gravel, sand, skip graded, medium plasticity, reddish-brown
5			☒	S	54				dry	SILTY SAND & GRAVEL, some cobbles, fairly well graded, moderately lime cemented, nonplastic, light gray note: considerable clay at 9'6"
10			☒	S	75		5	GM		
15			—	S	50/1½"		4			
			☒	A			5			
			—	S	50/½"					
20									hard	CLAYEY SAND & GRAVEL, strongly cemented, subrounded to angular, medium plasticity, gray
25			☒	S	50/4"		5			
30			☒	S	50/4"		5			
35			☒	S	50/2"		6	GC		
40			☒	S	50/2½"					
45			☒	S	50/3"		11			
50										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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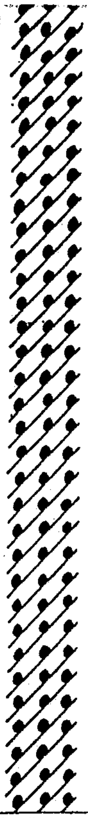
PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 9-13 & 15-76

LOG OF TEST BORING NO. 37

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	50/5"		9			
55			☒	S	132					
60			—	S	50/1"		10			
								GC		
65			▬	S	50/2"		7			
70			—	S	50/1"		4			
75			☒	S	50/5"		11			
										Stopped auger at 75' Sampler refused at 75'5"
80										

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-12 & 13-76

LOG OF TEST BORING NO. 38

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50										
55			—	S	50/½" (no recovery)					
								GC		
60			—	S	50/1"		10			
65			—	S	50/1"					
										Auger refused at 64'6" Sampler refused at 64'7"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-12 & 13-76

LOG OF TEST BORING NO. 38

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	25		6		dry hard	SILTY SAND & GRAVEL, considerable cobbles, skip graded, moderately lime cemented below 3", nonplastic to low plasticity, angular to subangular, light brown at 0-3', light gray at 3'+
5			☒	S	101		9	GM		
10			☒	S	50/5"		6			
			☒	A					slightly moist hard	CLAYEY SAND, GRAVEL & COBBLES, skip graded, moderately to highly lime cemented, angular, low plasticity, light gray note: considerable amount of gravel, particle decomposition taking place below 35' forming reddish-brown clay
15			—	S	50/1½"(no recovery)					
			☒	A						
20			☒	S	50/4"		5			
25			☒	S	50/2"					
30			☒	S	50/2½"		6	GC		
35			—	S	50/1"		3			
40			☒	S	50/3"		9			
45			—	S	50/1"		8			
50			—	S	50/1"					

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Tailings Dam Investigation
Copper Flat Project
JOB NO. E76-1023 DATE 4-2-76

LOG OF TEST PIT NO. A

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM		SILTY SAND, predominantly fine, low plasticity, brown
5			☒	A				CL		SILTY CLAY, medium to high plasticity, reddish brown
10			☒	A				GC		CLAYEY SAND & GRAVEL, predominantly medium, interbedded with caliche, medium plasticity, reddish brown mottled with white
15										Stopped backhoe at 14'6"
20										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. B

JOB NO. E76-1023 DATE 4-2-76

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML		CLAYEY SILT, some sand, low plasticity, dark brown
5			☒	A				SC		CLAYEY SAND, fine, medium plasticity, pink
										Stopped backhoe at 6'
10										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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Copper Flat Project
JOB NO. E76-1023 DATE 4-2-76

LOG OF TEST PIT NO. C

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	A				CL		SILTY CLAY, medium plasticity, brown
5		▨	☒	A				SC		CLAYEY SAND, predominantly medium to coarse, interbedded with caliche, some gravel & cobbles, subangular, medium plasticity, brown to white
10										Stopped backhoe at 10'
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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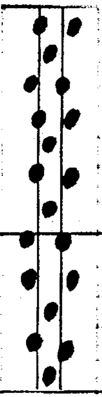
Copper Flat Project
JOB NO. E76-1023 DATE 4-2-76

LOG OF TEST PIT NO. D

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0 5								GM		SILTY SAND & GRAVEL, predominantly medium, subangular, nonplastic to low plasticity, brown
10								GM		SILTY SAND & GRAVEL, interbedded with caliche, large cobbles & boulders, nonplastic, light brown
15										Stopped backhoe at 12'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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Copper Flat Project

LOG OF TEST PIT NO. E

JOB NO. E76-1023 DATE 4-2-76

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CH		CLAY, high plasticity, reddish brown
		▨	☒	A				CL		SANDY CLAY, low to medium plasticity, reddish brown
5										Stopped backhoe at 5'
10										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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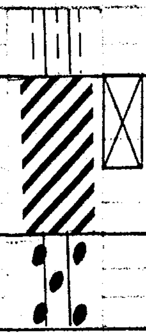
Copper Flat Project

JOB NO. E76-1023 DATE 4-2-76

LOG OF TEST PIT NO. F

RIG TYPE Ford
BORING TYPE Backhoe test pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML		SILT, very fine, low plasticity, light brown
5			☒	A				CH		alternating layers of CLAY & SILT, high plasticity, dark reddish brown
								GM		SILTY SAND & GRAVEL, predominantly fine, occasional basaltic boulders, subangular, nonplastic, brown
10										Stopped backhoe at 10'
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. A-1

JOB NO. E76-1100 DATE 9-2-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CL	dry	SANDY CLAY, medium plasticity, brown
5		▨	☒	G				CL	dry	SILTY CLAY, some clayey sand lenses, medium plasticity, reddish-brown
10										Stopped backhoe at 6'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 9-2-76

LOG OF TEST PIT NO. A-2

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CL	dry	SANDY CLAY, trace of gravel, medium plasticity, brown
5		▨	☒	G				CL	dry	SILTY CLAY, some clayey sand lenses, medium plasticity, reddish-brown
10										Stopped backhoe at 6'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-26-76

LOG OF TEST PIT NO. F-1

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30'' free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒					GC-GM	dry	CLAYEY SAND & GRAVEL, trace of cobbles & sand, predominantly medium to fine, low plasticity, light brown
5		▨	☒	G				CL	dry	SILTY CLAY, interbedded with sandy clay, some cobbles, highly laminated, slightly cemented, medium to high plasticity, light tan
		▩							dry	BASALT BRECCIA, moderately to highly weathered, unfractured, highly stratified, moderately hard, purple & white
10										
										Backhoe refused at 7'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2'' O.D. 1.38'' I.D. tube sample.

U – 3'' O.D. 2.42'' I.D. tube sample.

T – 3'' O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. F-2

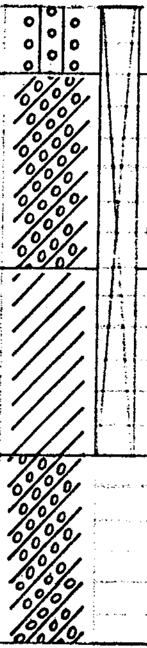
JOB NO. E76-1100 DATE 8-26-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM	dry	SILTY SAND, some stratified gravel, sand, predominantly fine, nonplastic, light tan
				G				SC-CL	dry	CLAYEY SAND interbedded with silty sand, sand, predominantly fine, weakly cemented, medium plasticity, light brown
5								CL-CH	slightly moist	SILTY CLAY, medium to high plasticity, light brown
								SC	dry	CLAYEY SAND, some gravel, well graded, moderately cemented, stratified, medium plasticity, gray
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST PIT NO. 101

JOB NO. E76-1100 DATE 8-31-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒						dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, medium plasticity, light brown
								SC		
				G						
5										
										Stopped backhoe at 6'8"
10										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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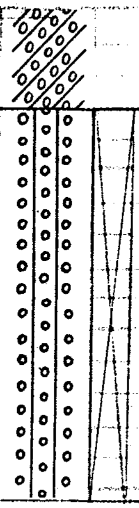
LOG OF TEST PIT NO. 102

JOB NO. E76-1100 DATE 8-31-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SC	dry	CLAYEY SAND & GRAVEL, well graded, medium plasticity, brown
5				G				SM	dry	SILTY SAND & GRAVEL, some cobbles, moderately lime cemented, nonplastic to low plasticity, light brown
										Stopped backhoe at 7'9"
10										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-31-76

LOG OF TEST PIT NO. 103

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CL	dry	SANDY CLAY, trace of gravel, medium plasticity, brown
		▨						SC	dry	CLAYEY SAND & GRAVEL, strongly lime cemented, light brown
5		●	☒	G				GP	dry	SAND & GRAVEL, some cobbles, trace of silt, predominantly coarse, moderately caliche cemented, nonplastic, brown
		▨						CL		SANDY CLAY, medium plasticity, brown
10										Stopped backhoe at 9'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 104

JOB NO. E76-1100 DATE 8-28-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SM-SC	dry	SILTY SAND, some gravel, little clay, low plasticity, brown
								CH	slightly damp to damp	SILTY CLAY, some sand, medium to high plasticity, reddish-brown to reddish-tan
5								CL	slightly damp to damp	SANDY CLAY, considerable gravel, occasional cobble, some layers of lime cementation, medium plasticity, light tan to reddish-brown
10										
										Stopped backhoe at 10'6"
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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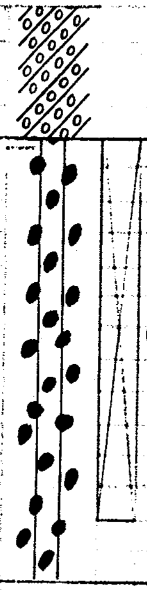
JOB NO. E76-1100 DATE 9-1-76

LOG OF TEST PIT NO. 105

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, low to medium plasticity, brown
5				G				GM-GP	dry	SILTY SAND & GRAVEL, trace of cobbles, poorly graded, weakly to moderately lime cemented, low plasticity, light brown
10										Stopped backhoe at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 106

JOB NO. E76-1100 DATE 9-2-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, low plasticity, brown
5				G				SC-SM	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, moderately lime cemented, low plasticity, light brown & white
10										Stopped backhoe at 8'5"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 107

JOB NO. E76-1100 DATE 9-2-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						SC	dry	CLAYEY SAND & GRAVEL, some cobbles & boulders, well graded, low plasticity, brown
5		▨	☒	G				SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, moderately lime cemented, medium plasticity, brown & white
10										Stopped backhoe at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-31-76

LOG OF TEST PIT NO. 108

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						SC	dry	CLAYEY SAND, some gravel & cobbles, well graded, medium plasticity, brown
5		▨		G				SC-SW	dry	SAND & GRAVEL, some cobbles & clay, occasional small boulder, well graded, low plasticity, light brown
10										Stopped backhoe at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-31-76

LOG OF TEST PIT NO. 109

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									dry	SAND & GRAVEL, some cobbles, occasional boulder, well graded, medium plasticity, light brown
5				G				SW-SC		
10										Stopped backhoe at 10'3"
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings.   B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 8-28-76

LOG OF TEST PIT NO. 110

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		●	☒	G				GP	dry	SAND & GRAVEL, little silt, poorly graded to 1", nonplastic, tan
5	☒ G	▨	☒	G				SC	slightly damp	CLAYEY SAND, some gravel, well graded, low to medium plasticity, brown
10		▨	☒	G				CH	damp	SILTY CLAY, moderately lime cemented, high plasticity, light purple
										Stopped backhoe at 10'0"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-19-76

LOG OF TEST BORING NO. 110

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0										
			☒	S	4		27	CL	moist very soft	SANDY CLAY, trace of gravel, medium plasticity, brown
5										
			☒	S	15		20	CL	moist moderately firm	SILTY CLAY, trace of sand, medium plasticity, brown
10										
			☒	S	17					
								CL	slightly damp firm	SILTY CLAY, trace of sand, medium plasticity, light reddish-brown
15										
			☒	S	24		23	ML	slightly damp firm	CLAYEY SILT, low plasticity, reddish-brown
20										
			☒	S	47		13	SM	slightly damp very firm	SILTY SAND, some gravel, predominantly fine, nonplastic, grayish-brown
25										
			☒	S	97		11	CL	slightly damp hard	SILTY CLAY, some sand & gravel, medium plasticity, reddish-brown
30										
			☒	S	63				moist hard	CLAYEY SAND & GRAVEL, angular to subangular, medium plasticity, grayish-brown
35										
			☒	S	93		7			
								GC		
40										
			☒	S	121		9			
45										
			☒	S	91		11			
50										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond
JOB NO. E76-1100 DATE 9-19-76

LOG OF TEST BORING NO. 110

RIG TYPE CME-55
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			☒	S	50/3"					
55			—	S	50/1"		10			
60			▬	S	50/2"		7			
								GC		
65			☒	S	50/6"		7			
70			☒	S	50/3"		7			
75			▬	S	50/3"		14			
										Stopped auger at 75' Sampler refused at 75'3"
80										

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 111

JOB NO. E76-1100 DATE 9-1-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30'' free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, medium plasticity, brown
5		▨	☒	G				GC-GP	dry	SAND & GRAVEL, some cobbles & clay, occasional boulder, poorly graded, moderately lime cemented, low plasticity, light brown
10										Stopped backhoe at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2'' O.D. 1.38'' I.D. tube sample.

U – 3'' O.D. 2.42'' I.D. tube sample.

T – 3'' O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 9-1-76

LOG OF TEST PIT NO. 112

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, low plasticity, brown
5		▨	☒	G				SC-SM	dry	SAND & GRAVEL, some cobbles & clay, well graded, moderately lime cemented, low plasticity, light brown
10										Stopped backhoe at 9'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 113

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒						dry	SAND & GRAVEL, some clay, occasional cobble, well graded, moderately lime cemented, medium plasticity, light tan
5		▨		G				GC-GW		
10		▨								
										Stopped backhoe at 10'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 113

JOB NO. E76-1100 DATE 9-17-76

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification
0								
			☒	S	35		9	
5			☒	S	53		1	
10			☒	S	50/5½"			
15			—	S	50/½"		6	
20			☒	S	50/5"		7	
25			☒	S	50/5"		9	GC
30			☒	S	50/3"		9	
35			☒	S	50/5"			
40			☒	S	50/4"		8	
45			☒	S	50/5½"		11	
50			☒	S	50/2"			

REMARKS	VISUAL CLASSIFICATION
dry dense to very dense	CLAYEY SAND, GRAVEL & COBBLES, fine to coarse, moderately to strongly cemented, subangular to subrounded, medium plasticity, tan to grayish-brown

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-17-76

LOG OF TEST BORING NO. 113

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50										
55			☒	S	50/3"		6			
60			☒	S	50/6"		13			
								GC		
65			☒	S	50/5"		10			
70			☒	S	50/2"		10			
75			☒	S	50/5"					
										Stopped auger at 74'6" Sampler refused at 74'11"

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 114

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨							dry	SAND, GRAVEL & COBBLES, poorly graded to 8", some clay, moderately lime cemented, low plasticity, light tan
5		▨	☒	G				GC-GP		
10		▨								
										Stopped backhoe at 10'6"
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 115

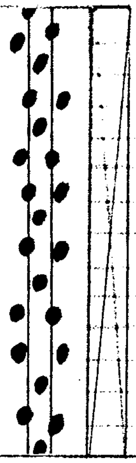
JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0 5				G				GM	dry	SILTY SAND, GRAVEL & COBBLES, well graded to 4", occasional cobble to 10"+, poorly graded, moderately to strongly lime cemented, low plasticity, light tan
10										Backhoe refused at 7'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 116

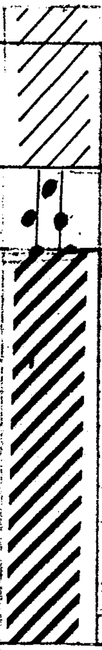
JOB NO. E76-1100 DATE 8-28-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL	dry	SANDY CLAY, some gravel, medium plasticity, brown
				G				CL	dry	SANDY CLAY, considerable gravel, moderately lime cemented, considerable lime nodules, medium plasticity, white to light tan
				G				GM	slightly damp	SILTY SAND & GRAVEL, occasional cobble, little clay, poorly graded to 2"+, very low plasticity to nonplastic, reddish-tan
5 10				G				CH	slightly damp to damp	SILTY CLAY, high plasticity, reddish-brown note: occasional lense of lime cementation and occasional seam of sandy clay

Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 117

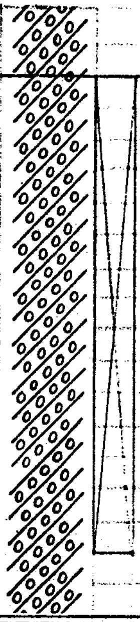
JOB NO. E76-1100 DATE 9-1-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, medium plasticity, brown
5				G				SC-SW	dry	SAND & GRAVEL, some clay, trace of cobbles, well graded, moderately lime cemented, low plasticity, light brown
10										Stopped backhoe at 9'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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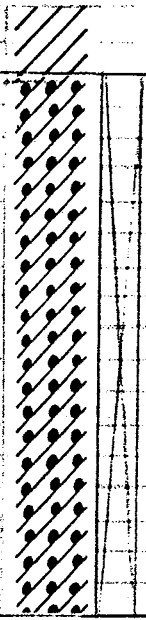
LOG OF TEST PIT NO. 118

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL	dry	SILTY CLAY, some sand, little gravel, medium plasticity, brown
5				G				GC-GP	dry	SAND & GRAVEL, some clay, occasional cobble, poorly graded, moderately to strongly lime cemented, medium plasticity, light tan
10										Stopped backhoe at 9'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 119

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	G				CH	dry	SANDY CLAY, some gravel, medium to high plasticity, reddish-brown
		▨	☒						dry	SAND & GRAVEL, some clay, occasional cobble, well graded, moderately to strongly lime cemented, medium plasticity, light tan
5		▨	☒	G				SC-SW		
10										Stopped backhoe at 9'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 120

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30'' free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CL	dry	SANDY CLAY, considerable gravel, medium plasticity, brown
5		▨		G				SC	dry	CLAYEY SAND, little gravel, few cobbles to 8"+, poorly graded, moderately to strongly lime cemented, medium plasticity, light tan
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 121

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML	dry	SANDY SILT, some gravel, very low plasticity, brown
									dry	CLAYEY SAND, GRAVEL & COBBLES, poorly graded to 8"+, considerably lime cemented, medium plasticity, light tan
5				G				GC		
										Backhoe refused at 8'3"
10										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-30-76

LOG OF TEST PIT NO. 122

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		⋮	☒	G				ML	dry	SANDY SILT, some gravel, very low plasticity to nonplastic, brown
5		▩								BASALT, highly fractured, moderately weathered, thinly bedded, lime in fractures, black
10										Backhoe refused at 5'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 123

JOB NO. E76-1100 DATE 9-1-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	G				SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, medium plasticity, dark brown
										Backhoe refused at 1'6"
5										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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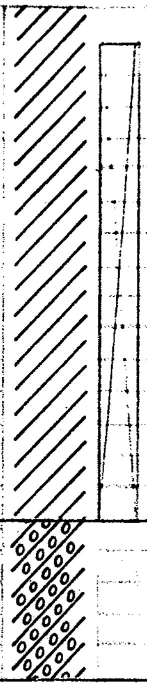
LOG OF TEST PIT NO. 124

JOB NO. E76-1100 DATE 9-1-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0 5				G				CL	dry	SILTY CLAY, medium plasticity, brown
10								SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, moderately lime cemented, low plasticity, light brown
15										Stopped backhoe at 10'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 9-19-76

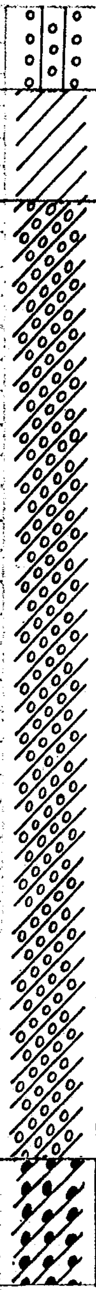
LOG OF TEST BORING NO. 124

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger & NX Diamond Core

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	9			SM		SILTY SAND, trace of clay, predominantly fine, low plasticity, light brown
5			☒	S	45			CL		SANDY CLAY, medium plasticity, brown
10			☒	S	54					CLAYEY SAND & GRAVEL, considerable lime & calcareous deposits, some cobbles, medium to high plasticity, brown
15			☒	S	50/5"					
20			☒	S	50/4"			SC-GC		
25			☒	S	50/5½"					
30			☒	S	50/5"					
35			☒	S	50/4½"				HSA refusal at 36' Begin NX coring	
			☒	NX				GC		CLAYEY SAND, GRAVEL & COBBLES, small boulders
40										Stopped coring at 40'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 125

JOB NO. E76-1100 DATE 8-31-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0 5				G				CL	dry	SANDY CLAY, medium plasticity, brown
								SC	dry	CLAYEY SAND & GRAVEL, well graded, moderately lime cemented, medium plasticity, brown
10										Stopped backhoe at 10'5"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 126

JOB NO. E76-1100 DATE 8-31-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨		G				SC	dry	CLAYEY SAND, trace of gravel, predominantly fine to medium, low to medium plasticity, brown
5		▨								
		▨						CL	dry	SANDY CLAY, medium plasticity, brown
		▨						SC	dry	CLAYEY SAND & GRAVEL, well graded, low plasticity, light brown
10										Stopped backhoe at 9'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 127

JOB NO. E76-1100 DATE 8-31-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						CL	dry	SANDY CLAY, medium plasticity, brown
5		▨	☒	G				SC-SP	dry	SAND & GRAVEL, some clay, poorly graded, low plasticity, light brown
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 128

JOB NO. E76-1100 DATE 8-29-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		○○○						SM	dry	SILTY SAND, trace of clay, predominantly medium to fine, non-plastic to very low plasticity, light brown
		////						CL	dry	SANDY CLAY, some gravel, medium plasticity, light reddish-brown
5		○○○						SM-SC	dry	SILTY SAND, GRAVEL & COBBLES, considerable calcite, some clay, poorly graded, weakly cemented, low plasticity, light gray to white
10										Backhoe refused at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-29-76

LOG OF TEST PIT NO. 129

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								ML-CL	dry	SANDY SILT, some clay, low plasticity, light brown
5								GC-GP	dry	SAND & GRAVEL, some clay & cobbles, poorly graded, strongly lime cemented, low plasticity, white
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 130

JOB NO. E76-1100 DATE 9-2-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨						SC	dry	CLAYEY SAND, trace of gravel & cobbles, medium plasticity, brown
5		▨	☒	G				SC	dry	CLAYEY SAND, some gravel, well graded, medium plasticity, reddish-brown
10										Stopped backhoe at 9'10"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 131

JOB NO. E76-1100 DATE 9-2-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	G				SC	dry	CLAYEY SAND & GRAVEL, trace of cobbles, well graded, medium plasticity, brown
		☰								CONGLOMERATE, moderately weathered, tan
5										Backhoe refused at 3'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 132

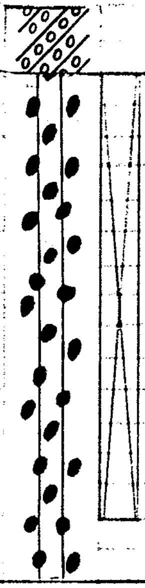
JOB NO. E76-1100 DATE 9-2-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SC	dry	CLAYEY SAND & GRAVEL, some cobbles, well graded, low plasticity, brown
5				G				GM-GW	dry	SAND & COBBLES, some silt, trace of clay, moderately lime cemented, very low plasticity, light brown to brown
10										Stopped backhoe at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 133

JOB NO. E76-1100 DATE 9-2-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SC		CLAYEY SAND & GRAVEL, some cobbles, well graded, low plasticity, brown
5				G				SC-SW		SAND & GRAVEL, some cobbles & clay, well graded, moderately lime cemented, low plasticity, light brown to brown
										Stopped backhoe at 7'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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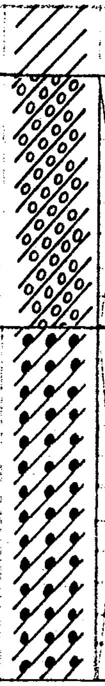
PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST PIT NO. 134

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30'' free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL	dry	SILTY CLAY, some sand, medium plasticity, light tan
				G				SC	dry	CLAYEY SAND, trace of gravel, predominantly fine to medium, low plasticity, reddish-tan
5				G				GC-GW		SAND, GRAVEL & COBBLES, some clay, well graded to 6", considerably lime cemented, low to medium plasticity, light tan
10										
										Stopped backhoe at 10'6"
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 135

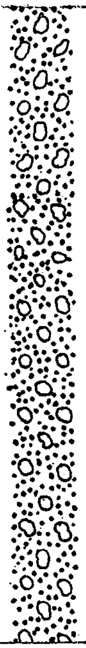
JOB NO. E76-1100 DATE 8-29-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									dry	SAND, GRAVEL & COBBLES, some clay, well graded, angular to subangular gravel & cobbles, moderately cemented with pockets of calcite, low to medium plasticity, light gray
5				G				GW		
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-29-76

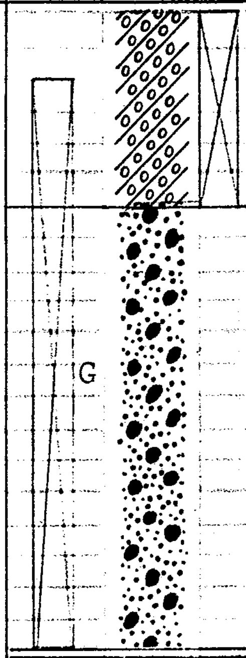
LOG OF TEST PIT NO. 136

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	G				SC	dry	CLAYEY SAND, some gravel, few cobbles, medium plasticity, reddish-brown
5	G							GP	dry	SAND, GRAVEL & COBBLES, little clay, poorly graded to 4"±, strongly lime cemented, medium plasticity, white
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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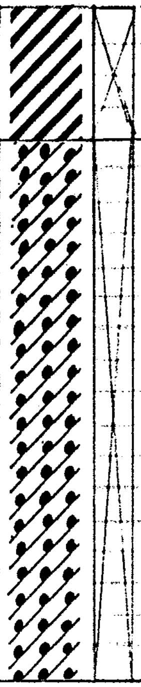
LOG OF TEST PIT NO. 137

JOB NO. E76-1100 DATE 8-29-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				G				CH	dry	SILTY CLAY, some sand, medium to high plasticity, reddish-brown
									dry	SAND, GRAVEL & COBBLES, some clay, poorly graded, medium plasticity, white
5				G				GC-GW		
10										
										Stopped backhoe at 10'6"
15										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 9-19 & 20-76

1 of 2

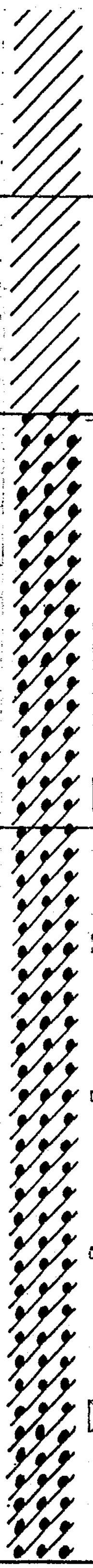
LOG OF TEST BORING NO. 137

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	22			CL-CH	slightly moist firm	CLAY, medium to high plasticity, brown
5			☒	S	30					
10			☒	S	74			CL	dry hard	SILTY CLAY, trace of sand, caliche cemented, medium plasticity, tan to white
15			☒	S	70			GC	hard	CLAYEY SAND & GRAVEL, fine to medium, angular to subrounded, medium plasticity, grayish-brown
20			☒	S	50/2"					
25			☒	S	50/6"					
30			☒	S	50/5¾"			GC		CLAYEY SAND & GRAVEL, few cobbles, medium plasticity, reddish-brown note: occasional layer of clayey sand, nonplastic; also layers of calcareous cementation
35			☒	S	50/3"					
40			☒	S	50/3½"					
45			☒	S	50/4"					
50										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube

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2 of 2

PROJECT Copper Flat Tailings Dam & Pond

LOG OF TEST BORING NO. 137

JOB NO. E76-1100 DATE 9-19 & 20-76

RIG TYPE CME-75

BORING TYPE 6½" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50			—	S	50/½" (no recovery)					
55			☒	S	50/3¾"					
60			☒	S	50/4½"			GC		
65			☒	S	50/5"					
70										Auger refused at 68'

GROUND WATER

DEPTH	HOUR	DATE

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube

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PROJECT Copper Flat Tailings Dam & Pond

JOB NO. E76-1100 DATE 8-30-76

LOG OF TEST PIT NO. 138

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	G				SC	dry	CLAYEY SAND, some gravel, well graded, predominantly fine to medium, low plasticity, reddish-tan
5		▨	☒	G				GC	dry	SAND, GRAVEL & COBBLES, some clay, well graded to 6", moderately lime cemented, medium plasticity, light tan
10										Stopped backhoe at 9'8"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 139

JOB NO. E76-1100 DATE 8-31-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30'' free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								CL	dry	SANDY CLAY, some gravel, medium plasticity, brown
5				G				SC-SW	dry	SAND, GRAVEL & COBBLES, some clay, well graded to 5"+, moderately to strongly lime cemented, medium plasticity, light tan
10										Stopped backhoe at 9'9"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2'' O.D. 1.38'' I.D. tube sample.

U – 3'' O.D. 2.42'' I.D. tube sample.

T – 3'' O.D. thin-walled Shelby tube

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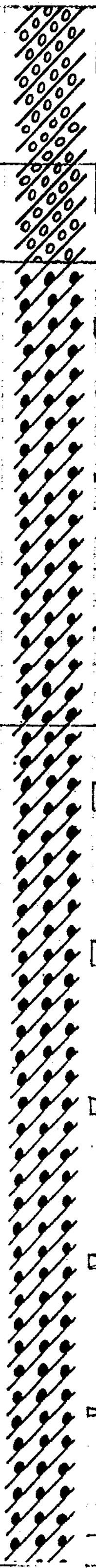
JOB NO. E76-1100 DATE 9-21-76

LOG OF TEST BORING NO. 139

RIG TYPE CME-75
BORING TYPE 6½" Hollow Stem Auger
SURFACE ELEV.
DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			☒	S	18			SC & GC		CLAYEY SAND & GRAVEL, some cobbles, medium plasticity, light brown
5			☒	S	93			SC & GC		CLAYEY SAND & GRAVEL, some cobbles, moderately lime cemented, low plasticity, tan
10			☒	S	50/5"					CLAYEY SAND & GRAVEL, some cobbles, low to medium plasticity, light brown
15			☒	S	50/2"			GC		
20			—	S	50/1¼" (no recovery)					
25			☒	S	50/4"					CLAYEY SAND & GRAVEL, medium to high plasticity, reddish-brown
30			☒	S	50/3"					
35			☒	S	50/5"			GC		
40			☒	S	50/4½"					
45			☒	S	50/2½"					
			—	S	50/0"					Auger refused at 49' Sampler refused at 49'
50										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube

SHB
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JOB NO. E76-1100 DATE 8-29-76

LOG OF TEST PIT NO. 140

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30'' free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0 5		▨	☒	G				SC-SW	dry	SAND, GRAVEL & COBBLES, some clay, poorly graded, stratified, weakly cemented, medium plasticity, light gray
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2'' O.D. 1.38'' I.D. tube sample.
U – 3'' O.D. 2.42'' I.D. tube sample.
T – 3'' O.D. thin-walled Shelby tube

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JOB NO. E76-1100 DATE 8-29-76

LOG OF TEST PIT NO. 141

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	G					dry	CLAYEY SAND, considerable subangular gravel, poorly graded, stratified, moderately cemented at 2-7½', highly cemented at 7½-9', very gravelly at 5-7', low plasticity, light reddish-brown at 0-2', grayish-white at 2-9'
		▨	☒					SC-SM		
5		▨	☒	G						
10										Backhoe refused at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-29-76

LOG OF TEST PIT NO. 142

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	G				SC	slightly moist	CLAYEY SAND & GRAVEL, poorly graded, stratified, moderately cemented at 2-3', medium to high plasticity, reddish-brown becoming light grayish-white
5		▨	☒	G				GC	dry	CLAYEY SAND, GRAVEL & COBBLES, poorly graded, highly stratified, moderately to strongly cemented, medium plasticity, light tan to white
10										Backhoe refused at 9'6"

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 143

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				G				GM-GW		SAND, GRAVEL & COBBLES, some silt, poorly graded to 5"±, moderately to strongly lime cemented, low plasticity, light tan
5										
10										Stopped backhoe at 9'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 144

JOB NO. E76-1100 DATE 8-30-76

RIG TYPE Ford 6500 Backhoe
BORING TYPE Test Pit
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0								SC	dry	CLAYEY SAND, some gravel, low plasticity, light brown
				G				SM-SW	dry	SAND, GRAVEL & COBBLES, some silt, well graded, moderately to strongly lime cemented, nonplastic to low plasticity, light tan
5										
										Backhoe refused at 4'6"
10										

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LOG OF TEST PIT NO. 145

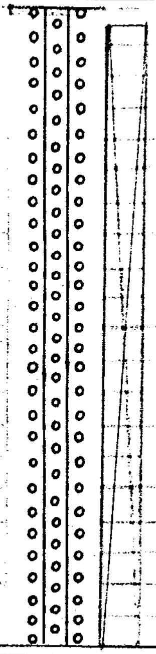
JOB NO. E76-1100 DATE 8-29-76

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM



Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									dry	SAND, GRAVEL & COBBLES, some clay, poorly graded, stratified, weakly cemented, medium plasticity, light gray
5				G				SM-SW		
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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JOB NO. E76-1100 DATE 8-2 -76

LOG OF TEST PIT NO. 146

RIG TYPE Ford 6500 Backhoe

BORING TYPE Test Pit

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Percent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0		▨	☒	G				SC	slightly moist to dry	CLAYEY SAND, considerable gravel & cobbles, considerable gravel below 5', well graded, subangular, stratified, medium plasticity, light reddish-brown
5		▨	☒	G						
		▨	☒	G				GC	dry	CLAYEY SAND, GRAVEL & COBBLES, poorly graded, stratified, moderately cemented, low plasticity, light gray to white
10										Stopped backhoe at 10'

GROUND WATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

T – 3" O.D. thin-walled Shelby tube.

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Appendix E

Copper Flat Geochemical Characterization Program

SRK Consulting
Engineers and Scientists

SRK Consulting (U.S.), Inc.
5250 Neil Road, Suite 300
Reno, Nevada
USA 89502

reno@srk.com
www.srk.com

Tel: 775.828.6800
Fax: 775.828.6820

Memorandum

To:	Steve Raugust, NMCC Cynthia Ardito, INTERA Incorporated	**Date:**	February 7, 2011
		From:	Amy Prestia, Rob Bowell, Ruth Warrender
Subject:	Copper Flat Geochemical Characterization Program	**Project #:**	191000.03

This memorandum has been prepared by SRK Consulting (SRK) to provide New Mexico Copper Corporation (NMCC) with a description of the objectives, approach and test methods applied during the Copper Flat geochemical characterization study. This information is needed to address comments from NMED and MMD on the SAP that are relevant to the Abatement Plan. A summary of the preliminary results of the characterization program is also provided below. The preliminary results are described in greater detail in a separate memo submitted to NMCC in December 2010.

The primary purpose of the geochemical characterization program is to provide an understanding of the geochemical characteristics of materials specific to the Copper Flat deposit and define the potential for waste rock, pit walls and tailings material to generate acid or leach deleterious constituents. In order to accomplish the objectives of the study, samples representative of waste rock, pit walls and tailings material were collected and characterized following guidelines set forth in the *Bureau of Land Management Instruction Memorandum NV-2010-014, Nevada Bureau of Land Management Rock Characterization Resources and Water Analysis Guidance for Mining Activities (BLM, January 8, 2010).*

The following activities were completed as part of the geochemical characterization program:

- Review of site geology and identification of the primary material types for the project;
- Collection of drill core samples representative of waste rock;
- Collection of surface samples from existing waste rock dump, pit wall and tailings impoundment surfaces; and
- Static and kinetic laboratory testing of representative samples.

The two main considerations of this baseline geochemical characterization are:

- Acid generation due to oxidation of sulfide minerals, which can potentially lead to development of Acid Rock Drainage (ARD); and
- Potential for leaching of metals (e.g., copper) and salts (e.g., sulfate).

The processes of acid generation and metal leaching can operate independently, although the development of acidic conditions enhances the solubility of many metals.

At the time this memorandum was prepared, the geochemical testing program was not complete. Consequently, the conclusions concerning acid generation potential presented herein are preliminary and are based upon the results of the static testwork only. These conclusions may change pending the final characterization results upon completion of the kinetic humidity cell program. Upon completion of the data collection and evaluation, the final waste rock characterization results will be submitted in a comprehensive report.

1 Copper Flat Material Types

Waste rock is typically classified and tested according to material type and the number of samples selected for geochemical testing is based on the relative percentage of each material type predicted to be mined from the geologic block model. At this time a block model is not available for the Copper Flat project. Therefore, material types for the Copper Flat project were delineated from a review of data available from the recent exploration drilling program including the drillhole database, drill logs, assay data and bulk element geochemistry (limited to copper, molybdenum, gold silver).

The term 'rock type' refers to the basic lithological description of the rock, 'alteration type' refers to the type of mineral assemblage that has been formed as a result of hydrothermal alteration and 'oxidation state' refers to the degree of oxidation of the rock. The term 'material type' denotes a unique combination of rock type, alteration type and oxidation state.

The main rock types for the Copper Flat project include:

1. Alluvium/Overburden
2. Andesite
3. Quartz Monzonite Breccia
4. Quartz Monzonite
5. Dolerite

Alteration type is determined by visual identification of characteristic secondary mineralogy. The four alteration types for the Copper Flat deposit include:

1. Leach Cap
2. Propylitic
3. Argillic
4. Silicification

Oxidation can be determined from color and a visual estimate of sulfide mineral content and oxidation state can be broken into three categories including:

1. Oxide: material has been mostly oxidized and there are no remaining sulfide minerals.
2. Mixed: material has been partially oxidized and some sulfide minerals are still remaining.
3. Non-Oxide: sulfide minerals are not oxidized and there is no evidence of oxidation.

For the purposes of the material characterization and testing, SRK have identified a total of fourteen material types for the Copper Flat project as summarized in Table 1 below. Sample intervals in the exploration database were not coded with information on oxidation of the material. Therefore, the material type delineations are based on rock type and alteration only and do not account for oxidation state.

Table 1: Copper Flat Material Types

Material Type	Rock Type	Alteration
1	Andesite	Propylitic
2	Breccia	Argillic
3		Biotite
4		Leach cap
5		Potassic
6		Propylitic
7		Quartz
8	Dolerite	Propylitic
9	Quartz Monzonite	Argillic
10		Biotite
11		Leach cap
12		Potassic
13		Propylitic
14		Quartz sericite

2 Geochemistry Sample Selection

During the April 2010 site visit, two types of samples were collected including:

1. Drill hole samples collected at depth from recent exploration core holes.
2. Bulk surface grab samples from pit wall exposures, existing waste rock dumps and the tailings impoundment.

A description of the sample collection approach and methodology for each of the sample sources for the current investigation is provided in the following sections. The location of the recent exploration drill holes are shown in Figure 1 along with the recent geochemistry samples collected from the surface of the waste rock dumps, pit walls and tailings impoundment . Figure 1 also shows locations of samples collected in the late 1990s from pit walls and waste rock dumps in support of developing a Waste Rock Management Plan.

2.1 Drill Core Sample Selection

For this investigation, a total of fifty sample intervals were selected from six diamond core holes drilled within the footprint of the Copper Flat pit in 2009 and 2010. The sample intervals were selected to represent the range of waste rock material types that will be encountered in the Copper Flat pit and samples were classified according to rock type and alteration. Typically, drill hole intervals are reviewed in the context of the final pit boundaries in order to identify ore and waste zones within the proposed pit boundaries and ensure that the proposed sample suite is spatially representative (both vertically and horizontally) of waste rock. However, because a block model and pit outline is not available at this time for the Copper Flat project, sample intervals were selected based on the frequency of occurrence of each material within the drill holes, drill hole distribution and known geology of the deposit. For each sample interval, the coarse reject material was collected and sent to the laboratory for sample preparation and testing as described below.

2.2 Bulk Surface Samples

To augment the drill core sample set, twenty four samples were collected from the surface of the existing waste rock dumps and pit wall exposures for geochemical testing. Existing waste rock dumps and pit walls provide an opportunity to compare fresh rock samples to weathered rock samples of the same material types that have been exposed to oxygen and water for over 20 years. Samples of the main material types were collected based on the geology observed on the waste rock dumps and pit areas. In addition, four samples of tailings material were collected from the surface of the North tailings impoundment. These samples were submitted to McClelland Laboratories for testing as described below.

3 Geochemical Test Methods

The static and kinetic testing methods selected for this project were designed to address mineralogy, bulk geochemical characteristics, and the potential of the waste rock and pit walls to generate acid or release metals. “Static testing” is a general term describing those analytical methods applied to characterize acid generation and metal leaching characteristics of material at the time of testing and does not account for temporal changes that may occur in the material as chemical weathering proceeds. Static tests provide a balance of acid generating and acid consuming reactions at an end point and also may be used to determine the potential magnitude of leaching metals from a given material.

Static testing is distinguished from “kinetic tests”, which evaluate the rate of sulfide oxidation and metal release over time. Static testing provides a conservative approximation of acid generation and trace metal release potential, which is used to determine where more comprehensive kinetic testing is warranted. Based on the results of the static test work, materials that exhibit uncertain or highly variable geochemical behavior may require further characterization using kinetic test methods to determine the rates and character of longer-term leaching.

The static test methods identified for this project were selected to address total acid generating or neutralizing potential of the samples and concentration of constituents in leachates derived from the material. Static testing methodologies include the following:

- Multi-element analysis using four-acid digest and ICP analysis to determine total metal and metalloid content;

- Examination of material by optical microscopy and X-Ray diffraction (XRD) to assess mineralogy and to identify sulfide and carbonate minerals present within the material types;
- Acid Base Accounting (ABA) using the modified Sobek method (Memorandum No. 96-79) with sulfur speciation by hydrochloric acid and nitric acid extraction;
- Net Acid Generating (NAG) test that reports the final NAG pH and final NAG value after a two-stage hydrogen peroxide digest; and
- Nevada Meteoric Water Mobility Procedure (MWMP - ASTM E2242-02) and Profile II analysis of leachate.

These test methods and the criteria commonly used in the evaluation of the resulting data set are described in the following sections. Samples were submitted to McClelland Laboratories (MLI) in Sparks, Nevada for sample preparation and MWMP extraction. The MWMP extracts were then sent to WetLabs, a Nevada Certified laboratory, in Sparks, Nevada for chemical analysis. Splits of each sample were submitted to SVL Laboratories in Kellogg, Idaho for ABA and NAG testing and ALS Chemex in Reno, Nevada for multi-element analysis (respectively).

Upon completion of the static test work, a small sub-set of samples representing the most significant waste rock types were selected from the static test database for kinetic testing. The kinetic testing method selected for this project is the standard humidity cell test procedure (ASTM D-5744-96).

A sample matrix summarizing the number of samples collected for the main material types (as defined by rock type and alteration) is provided in Table 3. Typically, the number of samples selected for testing based on the relative percentage of each material type predicted to be mined according to the current resource and geologic block models. However, because a bock model and relative percentage of the different material types are not available at this time, the number of samples selected is based on our experience with this type of deposit as well as the occurrence of each material type on the waste rock dump surfaces and in the drill hole database.

Table 3: Copper Flat Sample Frequency

Lithology	**Alteration**	**ABA/NAG/Multi-Element**			**MWMP**			**HCT**		
		Drillcore	Grab	Total	Drillcore	Grab	Total	Drillcore	Grab	Total
Dolerite	Propylitic		2	2		2	2			0
Andesite	Propylitic		4	4		2	2		2	2
Quartz Monzonite	Argillic	6	2	8	3	2	5	2		2
	Biotite	3	1	4	1	1	2	1		1
	Leach Cap	5	4	9	2	2	4	1	1	2
	Potassic	6		6	3		3	2		2
	Propylitic	3		3	1		1	1		1
	Quartz Sericite	5	4	9	2	2	4	1	1	2
Quartz Monzonite Breccia	Argillic	5	1	6	2	1	3	1	1	2
	Biotite	6		6	2		2	2		2
	Leach Cap	2	1	3	1	1	2		1	1
	Potassic	2	1	3	2	1	3	1		1
	Propylitic	4		4	3		3	2		2
	Quartz	3		3	2		2	1		1
Tailings	-		4	4		2	2			0
Total		50	24	74	24	16	40	15	6	21

4 Preliminary Findings

Below are the preliminary conclusions that can be drawn from the geochemical data available to date. These conclusions are preliminary based on the results of the static testwork program and may change depending upon the HCT results, once available.

- Multi-element results show that all material types are characterized by elevated concentrations of silver, cadmium, copper, molybdenum, rhenium, sulfur, selenium, tellurium and tungsten. The elevation of these elements can be explained by the common association of these elements with porphyry copper deposits (Rose, Hawkes and Webb, 1979). The greatest levels of enrichment were observed in the Breccia-Leach Cap material.
- The BLM considers waste rock to be non-acid generating without kinetic testing if there is 300 percent excess neutralizing capacity (i.e., NP:AP> 3) and the NNP is greater than 20 eq. kg CaCO3/ton. Based on the results of the ABA testwork, the majority of the Copper Flat samples demonstrate an uncertain potential for acid generation with NP:AP values less than 3 and NNP values less than 20 eq. kg CaCO3/ton. However samples tend towards net acid generating rather than net neutralizing, with an average AP of 27.2 kg $CaCO_3$/ton and an average NP of 24 kg $CaCO_3$/ton. The exception to this is the propylitically altered material that generally exhibited non-acid forming (NAF) characteristics based on NPR values greater than 3.
- The results of the static testwork demonstrated that samples with sulfide sulfur content greater than 1% are most likely to be acid forming (AF) based on NNP values less than -20 eq. kg $CaCO_3$/ton (Figure 2). However, comparison of ABA and static NAG testwork results suggests that sulfide sulfur content is not the sole control on the acid generating potential of the Copper Flat materials.

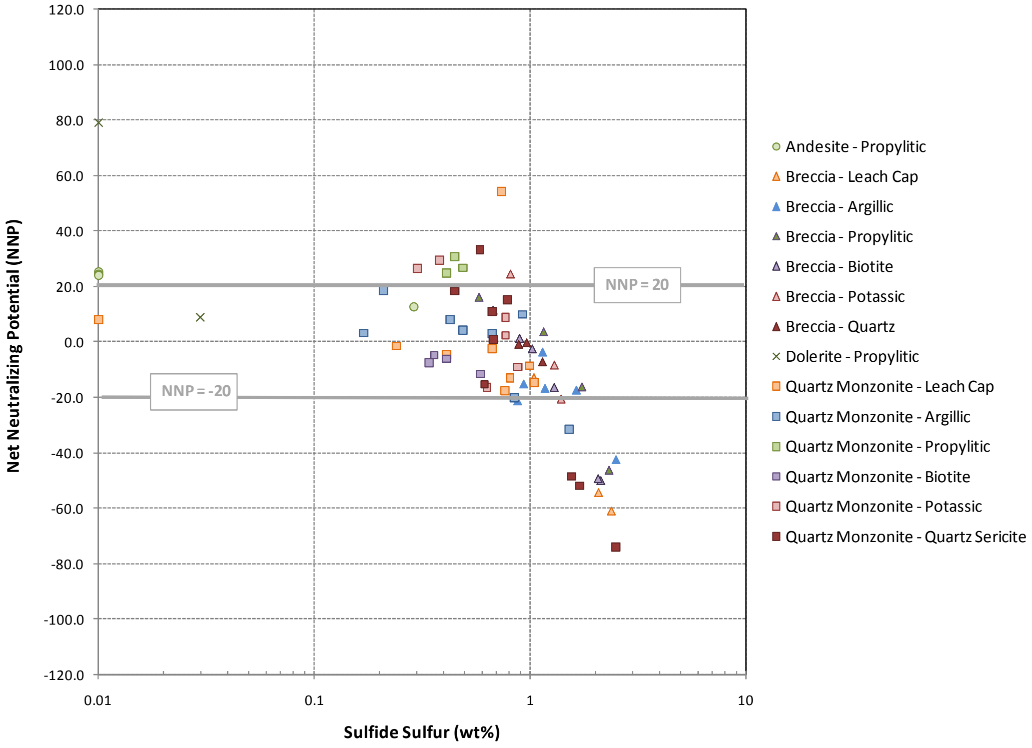

Figure 2: Scatter plot of sulfide sulfur vs. NNP

- The results of the static NAG testing demonstrate that only the Breccia-Leach Cap and Quartz Monzonite-Quartz Sericite material types show high capacity PAF characteristics. Most other materials are unlikely to be problematic in terms of long-term acid generation based on the results of the NAG testwork.
- In general, metal mobility and metal leaching from the Copper Flat materials was found to be low, with constituents generally being released at concentrations below analytical detection limits in the MWMP leachates under circum-neutral to moderately alkaline pH (pH 6.9 – 8.8 s.u.) conditions.
- Samples that showed the highest levels of metal and acidity release were observed in grab samples collected from the waste rock dumps and pit walls (rather than core samples). Furthermore, the majority of the metal load from the grab samples was found to be made up of copper, suggesting that the elevated metal release was related to the flushing of soluble copper salts from the surface of the materials rather than the oxidation of sulfide minerals. This hypothesis is further supported by the poor correlation between metal release and the sulfide sulfur content of the materials.
- Historic tailings material collected from the North tailings dam has a residual sulfide (pyritic) sulfur content of approximately 0.75 percent by weight. However, the material was also found to have available buffering capacity, and NAG testwork confirms that this material is unlikely to be acid forming in the long-term. MWMP leach test results indicate that some copper leaching may occur from the tailings material at neutral pH.

5 Additional Work

Humidity cell testing has been initiated on 21 samples of representative waste rock and is currently in Week 1 of a multi-week kinetic testwork program (40+ weeks). The results of the humidity cell testing will be used to define and quantify rates of metal release from the material types and will be used as source terms for geochemical prediction modeling. This will utilize site-specific knowledge about hydrology, climate, hydrogeology, topography and engineering in order to allow prediction of future water quality in the pit lake and waste rock dump run-off.

A geologic block model is required to determine the relative percentages of each material type and determine if the number of samples selected for each material type is adequate for the characterization program. In addition, the sample intervals need to be reviewed in context of the anticipated pit boundary in order to determine if the current dataset is spatially representative of the deposit, or determine if additional sample collection is required. Future exploration drilling presents an opportunity to collect additional samples for geochemical testing from core holes to provide adequate spatial coverage of the deposit as the resource is expanded.

EXPLANATION

- ● 2010 Surface Samples
- ● 2010 Drillcore Samples
- ● 1997 Surface Samples

Feet

0 500 1,000

1 inch = 500 feet

IF THE ABOVE BAR DOES NOT SCALE 1 INCH, THE DRAWING SCALE IS ALTERED

SRK Consulting
Engineers and Scientists

DESIGN: JP	DRAWN: JQG	REVIEWED: -
CHECKED: -	APPROVED: -	DATE: 2/4/2011
FILE NAME: GIS_Database_Samples_AP_JQG_20110202		

COPPER FLAT

NEW MEXICO
COPPER CORP

COPPER FLAT SAMPLES

DRAWING NO. FIGURE 1	SHEET 1 OF 1	REVISION NO. A
SRK JOB NO. 191000-03		

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Appendix F

Copper Flat Static and Kinetic Geochemical Testwork

Alta Gold Co.

Copper Flat Mine

Geochemical Review of Waste Rock, Pit Lake Water Quality and Tailings

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November 1996
SRK Project No. 68609

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FIGURES

1 INTRODUCTION

A review of the pit lake chemistry and geochemical test work and observation data of the waste rock piles and tailings impoundment at the Copper Flat project, New Mexico, is presented herein. The review is based upon previous laboratory data collected by SRK (US), Inc., a geochemical model devised by SRK (US), Inc. and field data collected during a site visit in November 1996.

Mitigation options for water quality are also discussed and recommendations made for future areas of focus and long term monitoring.

2 PROJECT DESCRIPTION AND LOCAL GEOLOGY

The Copper Flat redevelopment project is located approximately 23 miles southwest of Truth or Consequences and 5 miles northeast of Hillsboro, Sierra County, New Mexico (Figure 2.1). Alta Gold proposes to rebuild the mine site, as it existed in 1986 when owned by Quintana Minerals. Mining in the area began in 1877 with primarily alluvial gold operations with the main period of copper extraction from 1911 to 1931 (Harley, 1934).

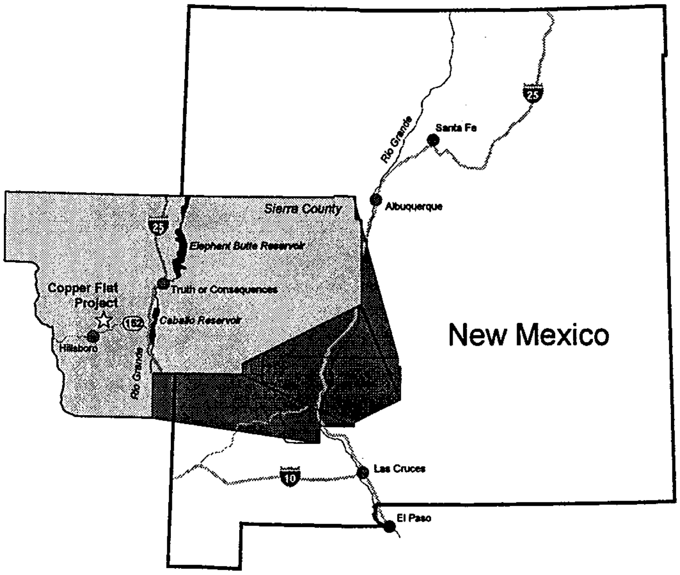


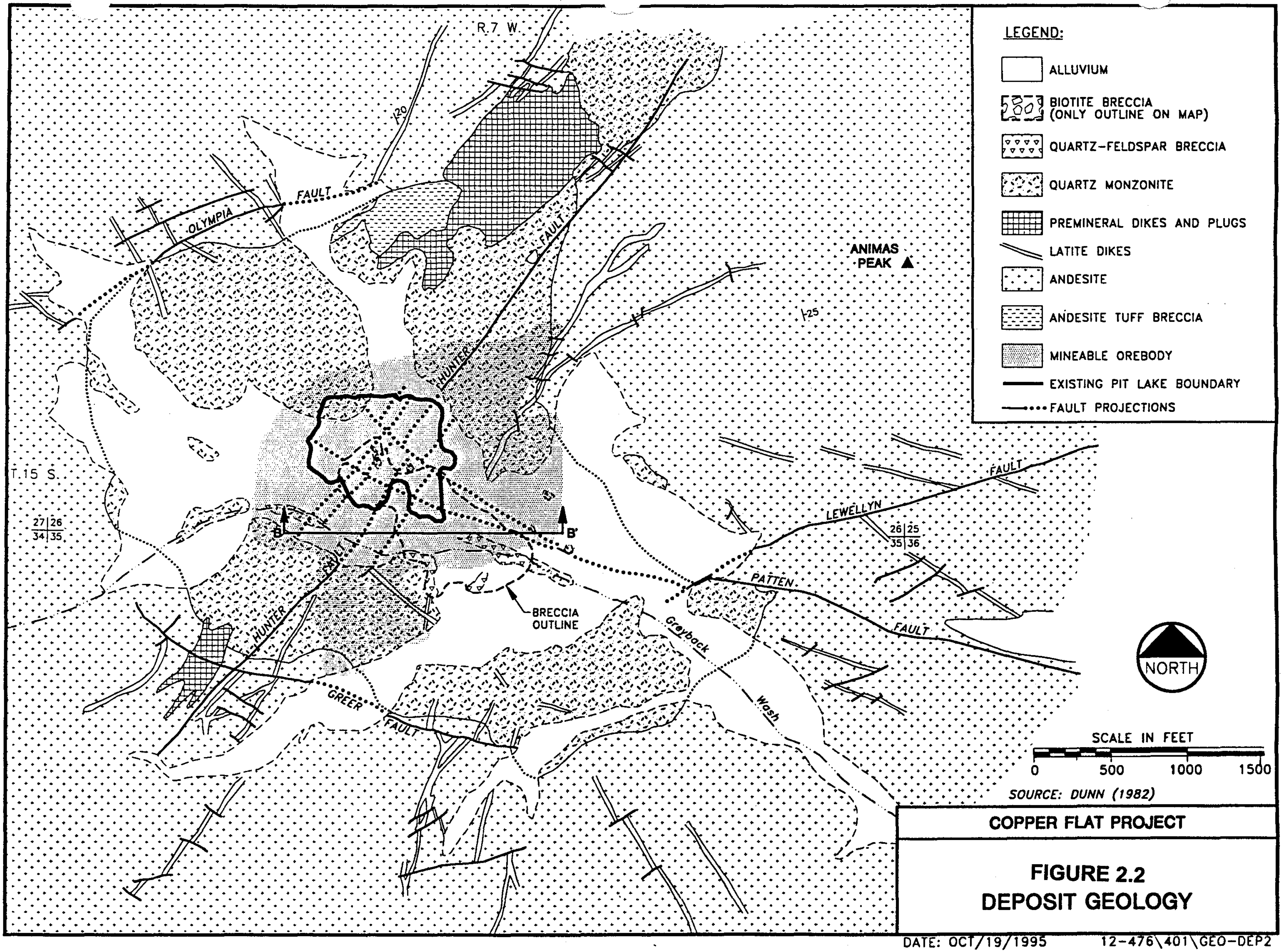
Figure 2.1 Project Location

During the 1950's and mid-1980's, attempts were made along the Sternberg lode to extract copper by *in-situ* acid leaching. The current plans propose to produce a sulfide concentrate by flotation with the operational life expectancy of approximately 10-12 years.

The Copper Flat deposit is located within a Cretaceous age caldera which intruded into the Paleozoic marine sediments and Precambrian basement rocks exposed in the upthrust Black Range and Animas Hills west of the project boundary (Figure 2.2). To the east the Rio Grande Rift forms a prominent geographical feature. The rift created a graben which has subsequently been infilled by a 700 m thick layered gravel alluvium of the Santa Fe Group.

The oldest sedimentary unit exposed in the immediate area is the Ordovician age Montoya Limestone Group which outcrops in the southeast of the concession area. Overlying the group is the Fusselman Dolomite, a massive 70 m thick dolomite-limestone unit of Silurian age. Unconformably resting on the dolomite sequence is the Percha shale unit which comprises 50-90 m thick unit of argillceous sedimentary rocks.

Magmatic activity in the Copper Flat area began with andesitic volcanic activity, and included the placement of quartz monzonite pluton stocks and latite dykes, and culminated in the hydrothermal activity which formed the copper deposit.



SOURCE: DUNN (1982)

COPPER FLAT PROJECT

FIGURE 2.2
DEPOSIT GEOLOGY

DATE: OCT/19/1995 12-476\401\GEO-DEP2

The andesite is a fine grained porphyritic rock with phenocrysts of plagioclase (andesine) and Ca-Mg-Fe amphibole in a groundmass of plagioclase and orthoclase. The andesite is massive with occasional agglomerates and is coarse grained in the vicinity of the Copper Flat pit. Magnetite and apatite have been observed as common accessories in the andesite.

The mineralization at Copper Flat is similar to copper porphyry style deposits with the exceptions that zonation is relatively poor and no appreciable supergene enrichment zone is observed. Both features are common in copper porphyrys elsewhere in the world. Sulfide content in the disseminated mineralized lodes in the monzonite stock varies up to 5%, with the majority being pyrite. Radiating from the stock are mineralized veins with the highest Cu grades developed in brecciated monzonite. The leached oxide cap is relatively thin (5-15 m) and sulfides are relatively unaltered in the deposit. The major sulfides are pyrite and chalcopyrite with accessory molybdenite and bornite. Trace amounts of enargite, acanthite, tetrahedrite, sphalerite and galena also occur. Gangue mineralogy includes quartz, feldspar, muscovite, biotite, apatite, calcite and fluorite. The deposit also contains appreciable gold, presumably held as a trace element in primary sulfides.

Whilst being similar to classic Copper Porphyry (Dunn, 1992; Einaudi, 1982; Titley, 1982) the deposit at Copper Flat has no appreciable supergene enrichment and is poorly zoned, but has a well developed skarn halo. The lack of supergene enrichment suggests that sulfides in the deposit are not very reactive or that environmental conditions existing at the site since formation do not significantly effect sulfide stability. The low humidity in the area has probably slowed down any potential water-rock interactions, but it is the highly crystalline nature of the sulfides which is the dominant control over sulfide stability in the deposit. By contrast, in many copper porphyrys, such as Mamut in Malaysia or Butte in Montana, sulfide grain size is smaller, total sulfide concentrations are higher, and sulfide connection is better than at Copper Flat, so electrical conductivity is maintained through sulfide material over a greater distance, increasing the distance between cathode and anode causing more intense weathering (see Section 3).

The type of zoned alteration halo and degree to which they are developed in porphyry deposits is a reflection of host rock. Here, Ca-rich andesite and basalt are dominant as opposed to more silica-rich host rocks (such as dacite) observed at other porphyry locations. The skarn reflects the wide availability of Ca and Mg in the tertiary extrusives and the high volatile CO_2 content of the original deposit. This is beneficial as the skarn contains a high proportion of acid consuming minerals which assist in maintaining an alkaline pH.

3 SULFIDE OXIDATION, ACID GENERATION AND CONSUMPTION

3.1. *Primary source of acidity*

The mechanisms of sulfide oxidation involve the transfer of electrons. Because most sulfide minerals are electrical conductors in the semiconductor to metallic range (Table 3.1), they can be considered as electrochemical "corrosion" cells similar to galvanic corrosion of metal alloys (Bailey & Peters, 1976; Thornber, 1975, 1983, 1992; Sato, 1992). Sulfides may be thought of as "geo-batteries" with the emphasis on "self-corrosion" by sulfide ores.

Table 3.1: A comparison of the Resistivities of Various Minerals (data from Thornber 1992)

Mineral/Rock	$\log_{10}$ resistivity in ohm/m	Conducting nature
Metals	-8 to -6	metallic
Graphite, C	-7.5 to -5	metallic
Arsenopyrite FeAsS	-6 to -3	semi-conductor
Chalcocite Cu_2S	-4.2 to -3.9	semi-conductor
Chalcopyrite $CuFeS_2$	-4.1 to -0.3	semi-conductor
Covellite CuS	-6.8 to -4.1	semi-conductor
Galena PbS	-5.8 to -0.2	semi-conductor
Hematite Fe_2O_3	>10	insulator
Manganite MnOOH	-0.9 to -0.1	semi-conductor
Pyrite FeS_2	-5.6 to 0.5	semi-conductor
Pyrolusite MnO_2	-3.1 to 1.2	semi-conductor
Sphalerite ZnS	-2.7 to 4.2	insulator
Realgar As_2S_3	-5 to -3.2	semi-conductor
Orpiment As_4S_4	-3 to 0.2	semi-conductor/insulator
Stibnite Sb_2S_3	-2 to 2.1	insulator
Sulfide-massive	-6.6 to -1.7	semi-conductor
Sulfide-massive, weathered	-3.1 to 0.4	semi-conductor/insulator
Sulfide-matrix supported	-4.4 to 0.8	semi-conductor/insulator
Sulfide-disseminated	-0.9 to 2.9	insulator

These electrochemical reactions are a combination of a reduction reaction at a cathode and an oxidation reaction at the anode. The cathodic reduction of dissolved oxygen can be generalized as:

$$O_2 + 2H_2O + 4e^- \rightarrow 4OH^- \qquad (1)$$

combined with sulfide oxidation:

$$MS + 4H_2O \rightarrow M^{2+} + SO_4^{2-} + 8H^+ - 8e^- \qquad (2)$$

where M is a divalent metal

to give the total reaction:

$$MS + 2O_2 \rightarrow M^{2+} + SO_4^{2-} \qquad (3)$$

Galvanic "corrosion" has been confirmed in numerous experimental studies (Bailey & Peters, 1976; Thornber, 1975; 1983; Lowson, 1982; McKibben & Barnes, 1986)

Additionally hydrogen ions are released in the process of metal hydrolysis:

$$M^{2+} + H_2O \rightarrow M(OH)^+ + H^+ \qquad (4)$$

and

$$M(OH)^+ + H_2O \rightarrow M(OH)_2 + H^+ \qquad (5)$$

When iron is the cation, then production of acidic solutions is most pronounced (Table 3.2). However, it should be noted that not all sulfides generate acidity on oxidation(Thornber, 1992). Indeed sulfides of the type M_2S such as Arsenopyrite and Chalcocite actually consume H+ on oxidation:

$$2Cu_2S + 6H_2O + 5O_2 = 4Cu^{2+} + 2SO_4^{2-} + 2H^+ + 8OH^-$$

Dissolution or oxidation of pyrite initially produces Fe^{2+}, which is immediately oxidized to Fe^{3+} which is either precipitated as an oxyhydroxide or reduced by pyrite generating more Fe^{2+} and increased acidity. The rate at which these reactions occur are first order (McKibben & Barnes, 1986) and fairly rapid. For example at pH 1, $3m^2$ of pyrite per litre of solution will reduce 50% of the initial ferric concentration in approximately 50 minutes.

Oxidation of ferrous iron by oxygen has been shown to be a function of pH and can be defined by the reaction rate:

$$-d[Fe^{2+}] = k' [Fe^{2+}] [O_2]$$

where $k=10^{-7}$ $atm^{-1}min^{-1}$ at 298 K.

The rate of sulfide oxidation can be controlled by the rate at which oxygen is supplied and reduced at the cathode-solution interface. The separation of the cathodic oxygen-consuming, alkali-producing reaction from the anodic, oxidizing, dissolution, acid-producing reaction will have a major control on the mineralogy of the resulting assemblage. The greater the distance between cathode and anode, the more extensive the conducting area and consequently the greater the potential for sulfide oxidation. Anodic reactions can occur deep within cracks, fissures and along grain boundaries where solutions can penetrate without the necessity for substantial dissolved oxygen (Lowson, 1982; Thornber, 1975; 1992).

The cathodic oxygen reduction reaction will be favoured on the more resistant sulfide grains, such as pyrite, chalcocite and covellite or on various gangue minerals. These resistant sulfide grains will become isolated with continued oxidation and form separate cells which will oxidize more slowly. Where the cathodic reaction dominates, water pH increases and released metals will react to form metal salts. A general sequence for pyrite oxidation, as an example of sulfide oxidation, is given in Table 3.2

Table 3.2: Oxidation Reactions of Iron Sulfide and Sulfate Minerals Generating Acidity (after Kleinnman and Pacelli, 1991; Thornber, 1992)

Reaction 1	a) $FeS_2 + 3\tfrac{1}{2}O_2 + H_2O = Fe^{2+} + 2SO_4^{2-} + 2H^+$ b) $2FeS_2 + 7O_2 + 2H_2O = 2Fe(SO_4) + 2H_2(SO_4)$
Reaction 2	a) $Fe^{2+} + 2\tfrac{1}{2}H_2O + \tfrac{1}{4}O_2 = Fe(OH)_3 + 2H^+$ b) $2Fe(SO_4) + H_2(SO_4) + \tfrac{1}{2}O_2 = Fe_2(SO_4)_3 + H_2O$
Reaction 3	$Fe^{2+} + \tfrac{1}{2}O_2 + H^+ = Fe^{3+} + \tfrac{1}{2}H_2O$
Reaction 4	$FeS_2 + 14Fe^{3+} + 8H_2O = 15Fe^{2+} + 2SO_4^{2-} + 16H^+$
Stage 1	Reaction 1: proceeds abiotically and by bacterial oxidation (reaction b more common with bacterial oxidation) Reaction 2: proceeds abiotically, slows as pH falls (reaction b more common with bacterial oxidation) pH approximately 4.5 or higher, high sulphate, low Fe, low pH
Stage 2	Reaction 1: proceeds abiotically and by bacterial oxidation (reaction b more common with bacterial oxidation) Reaction 2: proceeds at rate determined primarily by activity of bacteria such as *T.ferrooxidans* pH approximately 2.5-4.5, high sulphate, Fe and low pH. Low Fe^{3+}/Fe^{2+} ratio
Stage 3	Reaction 3: proceeds at rate determined by activity of *T.ferrooxidans* Reaction 4: proceeds at rate determined by rate of reaction 3 pH generally below 2.5, high sulphate, total Fe and low pH. High Fe^{3+}/Fe^{2+} ratio

Consequently, massive sulfide ores are generally good conductors; however, those which contain major amounts of sphalerite and/or significant pyrite are much poorer as both minerals have moderate resistivities (Thornber, 1992). With increased acidity most metals such as Fe, Cu or Al will become more soluble.

Where sulfides are more dispersed, such as in the Copper Flat ores, the distance between oxidizing sulfides is greater and conduction is reduced so the extent of oxidation is not as great. Each sulfide grain weathers as an isolated cell and the only influence that one sulfide grain can have on another is via aqueous solution. Access by dissolved oxygen will determine leaching, and sulfide composition will influence pH, water chemistry, reaction rate, and secondary mineralogy. Generally, leaching is greatest near the surface.

3.2. Secondary source of acidity

During weathering, sulfides produce a range of sulfates, hydroxides and oxides which are stable in oxidizing acidic pH, for example the formation of jarosite (Figure 3.1).

A good example is the formation of römerite from the oxidation of pyrite:

$$3FeS_2 + 11O_2 + 16H_2O = Fe^{2+}Fe^{3+}{}_2(SO_4)_4.14H_2O + 2SO_4^{2-} + 4H^+$$

For each mole of FeS_2 oxidized, only a third of the available sulfate and "one-eighth" of the available hydrogen is released. The rest is stored as unhydrolized, partly oxidized iron mineral. These sulfate minerals are termed **Acid Volatile Sulfates**. The most common of these salts are given in Table 3.3. Not all release hydrogen and sulfate on dissolution, but all release sulfate anions.

These minerals are highly soluble, therefore, they represent an instantaneous source of acidic sulfate-rich water upon dissolution and hydrolysis, for example the dissolution of römerite:

$$Fe^{2+}Fe^{3+}{}_2(SO_4)_4{\cdot}14H_2O = 2FeO.OH + Fe^{2+} + 4SO_4^{2-} + 6H^+ + 9H_2O$$

Subsequent oxidation of ferrous iron and hydrolysis of ferric iron at $pH > 2$ provides an additional source of acidity (Table 3.2). Hence, iron-sulfate hydrate minerals are important as both sinks and sources of acidity, sulfate, and possibly metal ions on precipitation and rapid release on exposure to moisture (Cravotta, 1994).

Optical microscopy of field samples suggests that precipitates collected in November 1996 consist of chalcanthite, coqumibite, gypsum, aragonite, jarosite, alunite andbrochanthite. Langite and melanterite are present as pit wall precipitates close to the current pit lake level. Azurite, malachite, pseudomalachite, beaverite, legrandite, atacamite and turquoise are also present in the south wall of the pit and on the higher benches to the east. Within an andesite intrusive in the east wall vesicles associated with the contact margin of the dyke with the monzonite are infilled with azurite, malachite, scorodite, libethenite, atacamite, schlumbergite and cuprite along with zeolites, calcite and quartz. The results of X-Ray diffraction analysis are forthcoming to confirm the mineralogy.

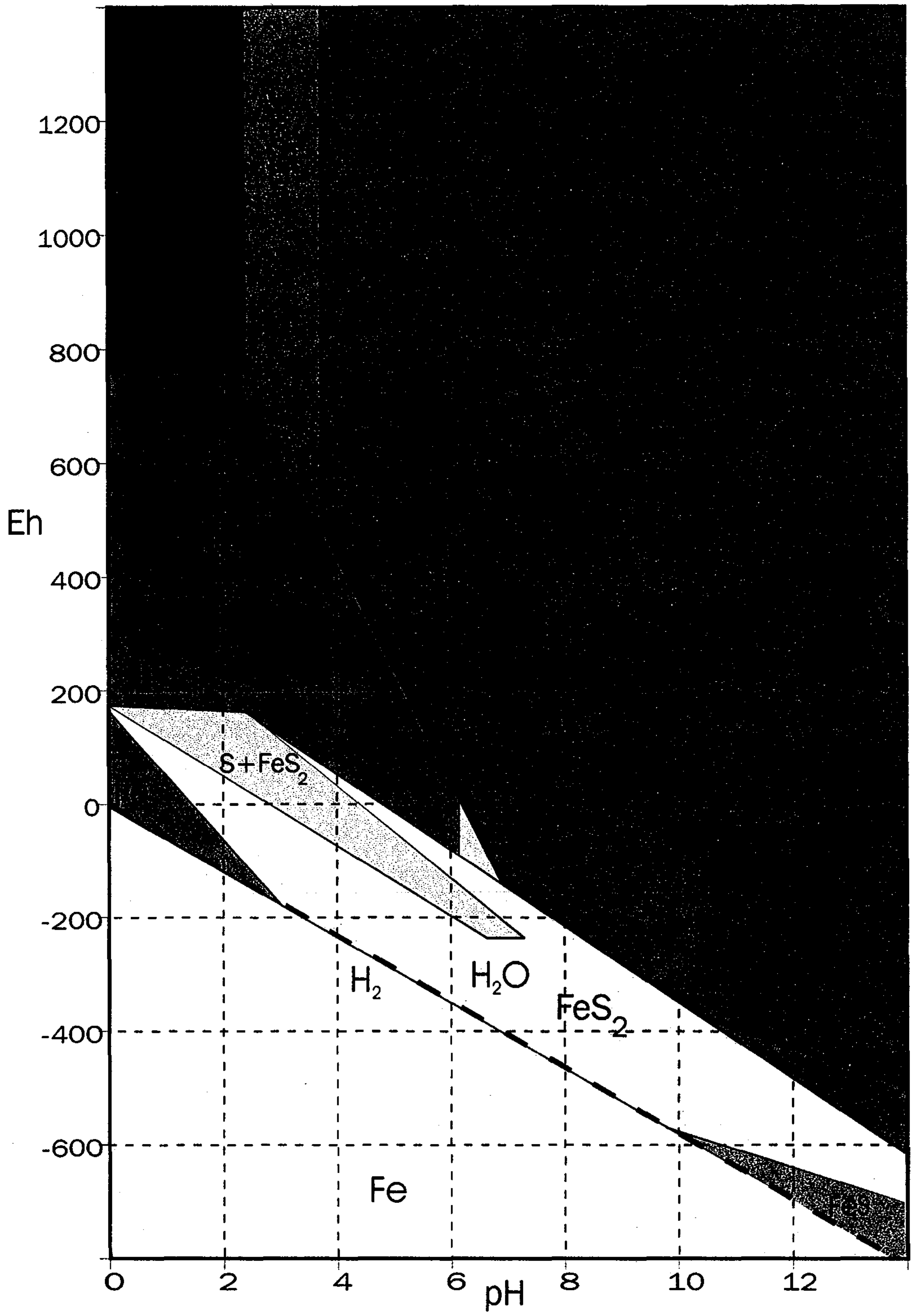
3.3. Acid Consumption or Neutralization

Acid-neutralization reactions results from mineral buffering of H^+ in drainage. This buffering is frequently accompanied by the precipitation of metal-hydroxides, hydroxy-sulfates and oxyhydroxide minerals. These reactions can reduce the rate of acid generation by forming an inhibitory surface coating to the reactive sulfides. The major buffering minerals for ARD are shown in Table 3.4

The major mineral phase which consumes acidity is calcite by the reaction:

$$CaCO_3 + H_2SO_4 + H_2O = CaSO_4.\ 2H_2O + CO_2$$

Carbonate minerals possess varying degrees of acid neutralization. In the case of siderite and to a lesser extent ankerite, the reason for the limited neutralizing capacity is that ferrous iron in these minerals is an additional source of acidity due to the strong hydrolysis of ferrous iron in solution .



Eh-pH DIAGRAM FOR Fe- C -S - H O - O SYSTEM
(Fe,S $=10^{-6}$M and $P_{CO} = 10^{-2}$)

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Eh-pH DIAGRAM FOR THE Fe-S-C-O-H AT 298 K

Figure
3.1

Table 3.3: Acid Volatile Salts

Selected soluble sulfates		Selected less soluble sulfates	
	Iron minerals		
copiapite	$Fe^{2+}Fe_4^{3+}(SO_4)_6(OH)_2.20H_2O$	amerantite	$Fe^{3+}(SO_4)OH.3H_2O$
coquimbite	$Fe_2^{3+}(SO_4)_3.9H_2O$	fibroferrite	$Fe^{3+}(SO_4)OH.5H_2O$
ferricopiapite	$Fe_{2/3}^{2+}Fe_4^{3+}(SO_4)_6(OH)_2.20H_2O$		
melanterite	$Fe^{2+}SO_4.7H_2O$	schwertmannite	$Fe_8O_8(SO_4)(OH)_6$
ferrohexahydrite	$Fe^{2+}SO_4.5H_2O$		
paracoquimbite	$Fe_2^{3+}(SO_4)_3.9H_2O$		
rhomboclase	$HFe(SO_4)_2.4H_2O$		
rozenite	$Fe^{2+}SO_4.4H_2O$		
siderotil	$Fe^{2+}SO_4.6H_2O$		
szomolnokite	$Fe^{2+}SO_4.H_2O$		
	Other transition metals		
Alunogen	$Al_2(SO_4)_3.17H_2O$	Anglesite	$PbSO_4$
Bianchite	$ZnSO_4.6H_2O$	Antlerite	$Cu_3(SO_4)(OH)_4$
Chalcanthite	$CuSO_4.5H_2O$	Basalumite	$Al(SO_4)(OH)_{10}.H_2O$
Goslarite	$ZnSO_4.7H_2O$	Brochantite	$Cu_4(SO_4)(OH)_6$
Gunningite	$ZnSO_4.H_2O$	Jurbanite	$Al(SO_4)(OH).5H_2O$
Retgesite $.2H_2O$	$NiSO_4.6H_2O$	Langite	$Cu_4(SO_4)(OH)_6$

Alunite-Jarosite Group

Very common group of Acid Mine Drainage & Gossan minerals. Can incorporate many trace metals and oxyanions.

$A^{2+}Fe_4^{3+}(SO_4)_6(OH)_2.20H_2O$ *or* $B_{2/3}^{3+}Fe_4^{3+}(SO_4)_6(OH)_2.20H_2O$

A= Ca, Cu, Fe, Mn, Mg, Zn, Co, Ni

B= Al, Fe, Cr.

Sulfate group can be partially replaced by selenite, phosphate, arsenate oxyanions.

Some examples:

argentojarosite	$(K,Ag)\ Fe_3^{3+}(SO_4)_2(OH)_6$
alunite	$K\ Al_3^{3+}(SO_4)_2(OH)_6$
jarosite	$K\ Fe_3^{3+}(SO_4)_2(OH)_6$
plumbojarosite	$(Pb,K)\ Fe_3^{3+}(SO_4)_2(OH)_6$
osarizawaite-beaverite	$(Pb,Cu)_2(Al,Fe^{3+})_2\ (SO_4)_2(OH)_6$

---

[1] Or equivalent amorphous phase

[2] Acid consuming potential is given as being the weight of the mineral required to have the same neutralizing capacity as 100 g of calcite.

Table 3.4: Principal pH-buffering phases for ARD observed in this study

Mineral	Formula	Acid Consumption Potential[2]
Carbonates		
Calcite	$CaCO_3$	100
Dolomite	$CaMg(CO_3)_2$	92
Siderite	$FeCO_3$	120
Ankerite	$Ca(Fe,Mg)(CO_3)_2$	108
Hydroxides		
Gibbsite[1]	$Al(OH)_3$	26
Goethite	$FeO\square OH$	89
Ferrihydrite[1]	$Fe(OH)_3$	96
Manganite	$MnOOH$	88
Aluminosilicates		
Chlorite	$(Mg,Al,Fe)_6(Si,Al)_4O_{10}(OH)_8$	124
Muscovite	$KAl_2(Si_3Al)O_{10}(OH,F)_2$	154
Alkali Feldspars	$(K,Na)AlSi_3O_8$	169
Plagioclase Feldspars	$NaAlSi_3O_8$-$CaAl_2Si_2O_8$	137
Pyroxene group		120-155
Amphibole group		110-150
Clay mineral groups		105->200

The order of carbonate neutralizing capacity is dolomite>calcite>ankerite> siderite. This order of reactivity is partly controlled by equilibrium mass-action constraints and partly by kinetic limitations. In the case of calcite, dissolution is rapid (Garrels & Christ, 1965; Appelo & Postma, 1993). Generally, the rate of dissolution is sufficient to maintain water pH in the range 7.5-7.8. Dolomite dissolution is slower, and in the case of ankerite and siderite disequilibrium is common.

If all available calcite is removed then pH will decrease to a dolomite buffer range of pH 6.9-7.9. When dolomite is depleted pH will fall to the siderite buffer regime of pH 4.8-6.3. In the carbonate buffer zones the precipitation of metal hydroxides is promoted with dissolved Fe derived from sulfides, Mn and Al from wallrock oxides and silicates. As acid generation continues and carbonate minerals are depleted, pH will fall until the hydroxide buffer zones are reached, for $Al(OH)_3$ this is the pH range 4-4.3 and for $Fe(OH)_3$ the pH range 2-4.

Under very low pH conditions, the dissolution of aluminosilicates can be an important acid neutralization mechanism. Dissolution is slow and also involve the additional contribution of dissolved secondary minerals as well.

3.4. Adsorption and Coprecipitation

This is the process of element binding at the mineral solution interface and like solubility is pH dependent. For example, the adsorption of arsenic species by goethite. Many oxide surfaces change from positive at low pH (thus attracting anions) to negative at high pH (attracting cations). This occurs through adsorption at the surface of hydroxyl groups with increasing pH. The pH at which the change occurs is termed the *point of zero charge* or pH_{pzc} (Table 3.5). This is a measure of a surface's ability to sorb ions from solution (Parfait, 1978; Bowell, 1994). Mine drainage chemistry and particularly, the level of As and heavy metals has been shown to be influenced by adsorption onto precipitated iron oxyhydroxides or "ochres" (Bowell et al., 1996).

Table 3.5: pH_{pzc} for Common Minerals Associated with Mine Ochres (Parfait, 1978)

Mineral	pH_{pzc}
Quartz	1.8-3.5
Kaolinite/Illite	3.3-6
Smectite	2.5-6
Hematite	6.5-8.6
Goethite	6.5-7.3
Ferrihydrite	6.9
Jarosite	6.7-8

The presence of other adsorbents, such as humic substances, will also affect adsorption potential by competing for available sites on the mineral surface or for dissolved species. Precipitation of insoluble salts can lead to reduced solubility due to co-precipitation. For example, anhydrite when Ca is added to a sulfate-rich solution, especially at high pH. Co-precipitation is influenced by solubility and adsorption properties indicating a similar bonding mechanism. An important control on the diversity of the precipitated mineral assemblage is pH For example, in the oxidation of sulfides at low pH, only Fe oxides and oxyhydroxides are formed while at higher pH other salts such as covellite, smithsonite and malachite are also precipitated.

Only a small proportion of the base metals present in low pH waters will be retained, sorbed onto the Fe hydroxide; however, elements such as As, Sb, W and Mo will be retained, adsorbed as oxyanions. During sulfide oxidation there is a tendency for Fe and base metals to diffuse towards the surface of the gangue minerals and precipitate by hydrolysis reactions, lowering pH and continuing the leaching process. These reactions occur some distance from the leaching surface to form Fe oxyhydroxide crusts. Precipitated Fe oxyhydroxides can adsorb substantial concentrations of liberated metals from the mine waters depending on solution pH. Many oxide surfaces including those of goethite, are positively charged at low pH and become negatively charged at higher pH due to the increased binding of hydroxyl groups. Consequently, at low pH, oxyanions such arsenate will be adsorbed while with a pH increase metal ions will be adsorbed when the mineral surface charge is negative. The point at which this change occurs, i.e. the point at which the surface has a net zero charge can be used as a measure of the adsorption potential at another pH. The presence of smectite $(Na_3(Al,Mg)_2Si_4O_{10}(OH)_2$⍰$H_2O)$ and kaolinite $(2[Al_2Si_2O_5(OH)_4])$ in the flocculated material could explain the higher retention of base metals, even in very acidic waters, than has been recorded in ochres from other mine sites. Both of these clay minerals can have a pH_{zpc} (zero point charge) as low as 2.2 and up to 5. Consequently, they could provide negatively charged Helmholtz layers at their surfaces, leading to favourable conditions for sorption of positively charged base metals at pHs as low as 2.2. The surface properties of the different minerals will also be affected by other influences such as the presence of organic acids which can reduce metal adsorption by competitive adsorption and by complexation (Tipping and Cooke, 1990; Bowell, 1994).

Although pH is a major control, the structure of the precipitated ochres may also influence element adsorption as it is also variable with Eh-pH changes. Mineral precipitates formed in highly acidic waters tend to be more crystalline and as a result have a lower surface area, and consequently a lower adsorptive capacity. Conversely, mineral precipitates from lower acidity waters are poorly crystalline and as such will have a larger surface area and greater capacity to retain ions at mineral surfaces.

Fe^{2+} and SO_4^{2-} are most likely released through bacterially catalysed decomposition of iron sulfides. A variety of intermediate phases, such as melanterite, can be formed depending on conditions being stabilized during humid or arid conditions. For example, where evaporation occurs ferric sulfates have been shown to precipitate; and these intermediate phases, if accumulated over time, may form their own source of iron, sulfate and acidity if remobilised[16]. On oxidation and hydrolysis, or ferrolysis, ferric minerals are formed. If conditions involve low-pH, high dissolved sulfate and sustained bacterial activity jarosite, ferricopiapite, schwertmannite or coquimite may be formed. With jarosite precipitation controlled by the level of Na, K, and possibly sulfate as well as pH. Mildly acidic solutions may form ferrihydrite or lepidocrocite while higher alkalinity levels will influence the precipitation of goethite. The ubiquitous presence of goethite in mine ochres would suggest that most phases are only transient with respect to goethite. The mineral speciation of the produced ochres is important in influencing the retention of metals from drainage. The presence of clay minerals in the ochres may accelerate the oxidation of ferrous iron and production of ochres by polymerization of ferric oxyhydroxides.

The mineral speciation of precipitated ochres will influence the surface chemistry of the ochres, and the ability of the ochre to accumulate available metals or oxyanions. Surface reactions may also influence mineralogy with some transient phases stabilized by complexing outside the predicted environment from the above model. For example, the transformation of ferrihydrite may be temporarily delayed by stabilization through adsorption of SiO_4 or organic compounds. The pH of drainage waters will influence the prevailing surface chemistry of the ochres depending on the pH_{pzc} of constituent minerals in the ochres.

The presence of clays like montmorillonite would greatly increase the potential for adsorption of cations at acidic pHs due to the low pH_{pzc} (Table 3.4). However, mineralogy is not the only consideration. The immobilization of metals released from associated sulfides through gangue neutralization, and their availability and speciation will influence the extent to which they are attracted to the surface of the ochres. Below pH_{pzc}, mineral surfaces will be slightly positively charged and, therefore, attract oxyanion species; above this point, they will become more negative in character and, therefore, more likely to attract cations.

4 GROUND WATER CHEMISTRY

Ground water chemistry from the Copper Flat project area is shown in Table 4.1 for water around the pit and from the ground water monitor wells shown in Figure 2.1.

The data indicate that all ground water in the vicinity of the project area is alkaline (pH> 7) with alkalinity greater than 100 mg/l. The data plot on a Piper diagram as Mg-Ca-HCO3 waters (Figure 4.1) and on a Younger diagram (Younger, 1995) as sulfate-rich to sulfate-poor alkaline waters (Figure 4.2). The dominant Ca-Mg-bicarbonate signature of ground water is most likely a reflection of rock-water interactions with the regional host rocks - andesite, dolomite and limestone. (Hem, 1985; Postma & Appelo, 1993). The elevated F levels of 0.5-3 mg/l is characteristic of ground water leaching of calc-alkaline magmatic rocks (Bowell et al., 1996).

Table 4.1: Summary of Ground Water Chemistry of Copper Flat Area

Parameter	Range (in mg/l except where stated otherwise)
pH	7.25-8.11
Conductivity, µm/cm	293-2026
Bicarbonate	149-279
Nitrate	<1-5
Sulfate	12-720
Fluoride	0.36-1.4
Chloride	12-190
Total Dissolved Solid	190-1570
Calcium	48-270
Copper	<0.025-0.03
Iron	<0.05-3.7
Magnesium	1-56
Manganese	<0.03-4
Molybdenum	<0.05
Potassium	1-10
Sodium	28-460

Despite the presence of mineralized lithologies around the pit, no evidence of metal leaching or of acid generation is reflected in ground water chemistry, up or down gradient of the pit lake (Table 4.1). This observation would support the hydrogeological model proposed for the site which indicates the pit acts as a sump below the water table with no leakage into the ground water. The sulfate levels observed in ground waters is probably a combination of two factors:

- Some oxidation of sulfide to sulfate
- Conservative behaviour of sulfate where gypsum is undersaturated.

For the ground water chemistry reported in Table 4.1, the saturation indices of calcite, gypsum and anhydrite has been calculated (Table 4.2).

The minerals most likely to form can be predicted from their Saturation Indices. Saturation Indices can be used to predict mineral phases likely to precipitate with respect to water chemistry (SI>0). Indices which are low negative values are likely to precipitate if one or more of the constituents is increased slightly. Values which are large negative SIs (<-3) are unlikely to form and if present are most probably dissolving. From the above information it can be observed that the alkaline, Ca-rich nature of ground water is reflected in the prediction that calcite is very likely to precipitate, and if sulfate is only slightly elevated, anhydrite and gypsum will precipitate. Chalcanthite, however, is unlikely to be stable and would not be expected to form in the aquifer. This suggests that high levels of sulfate in ground water are unlikely to occur long term as active precipitation will take place. It is also unlikely that secondary acid volatile sulfates will form in the aquifer as they will be unstable with respect to gypsum and anhydrite and dissolved constituents.

Table 4.2: Saturation Indices for selected minerals in ground water wells

Mineral	Saturation Indices			
	GWQ96-22	GWQ96-23	GWQ94-13	MW-11
Anhydrite	-1.252	-1.416	-0.495	-2.234
Calcite	0.299	0.771	0.619	0.536
Chalcanthite	-8.937	-9.515	-8.298	-12.337
Gypsum	-1.041	-1.206	-0.284	-2.303

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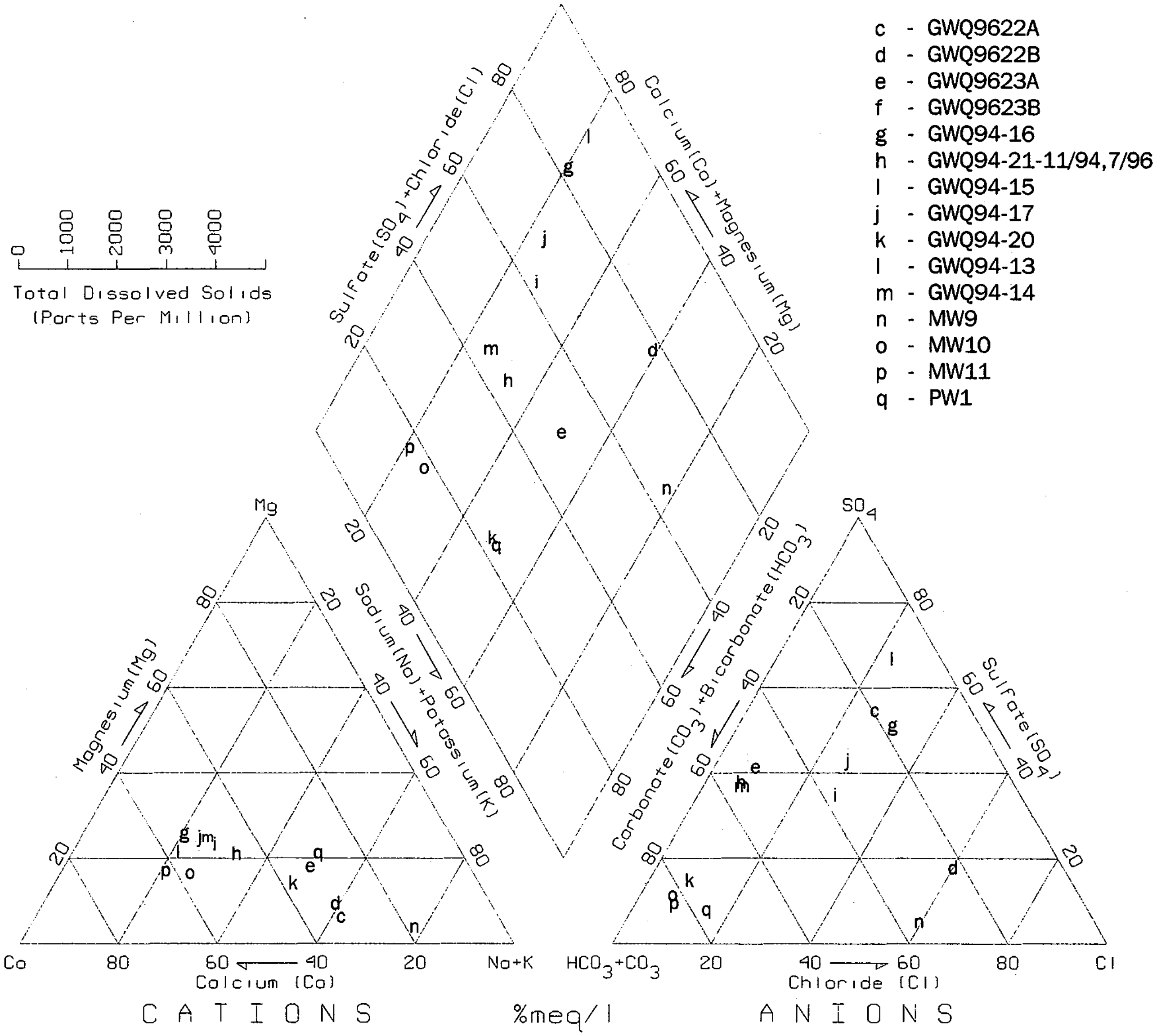

c	-	GWQ9622A
d	-	GWQ9622B
e	-	GWQ9623A
f	-	GWQ9623B
g	-	GWQ94-16
h	-	GWQ94-21-11/94,7/96
I	-	GWQ94-15
j	-	GWQ94-17
k	-	GWQ94-20
l	-	GWQ94-13
m	-	GWQ94-14
n	-	MW9
o	-	MW10
p	-	MW11
q	-	PW1

DATE: 12/3/96	PROJ. No. U857	COPPER FLAT	
SRK		**PIPER DIAGRAM OF GROUNDWATER FROM THE COPPER FLAT AREA**	Figure 4.1

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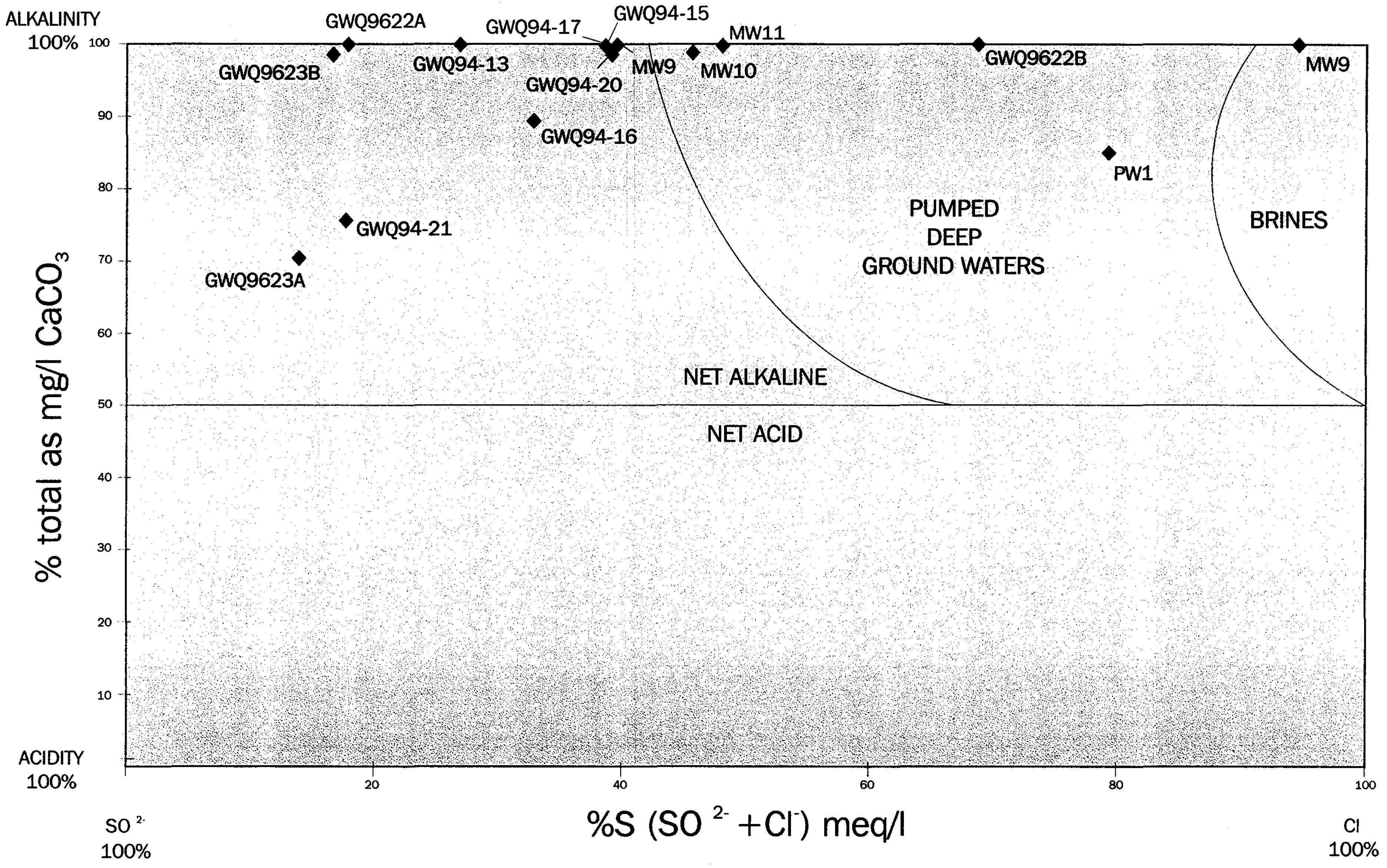


DATE: 4/12/96	PROJ. No. U857	COPPER FLAT	
SRK		YOUNGER DIAGRAM FOR COPPER FLAT GROUNDWATER	Figure 4.2

5 WASTE ROCK GEOCHEMISTRY

An assessment of the potential of waste rock to produce Acid Rock Drainage (ARD) has been made in the Hydrogeological investigations at Copper Flat by SRK (SRK, 1995 *Copper Flat Mine: Hydrogeological Studies*). Information on sampling and analytical protocol is given in that report and is not repeated herein.

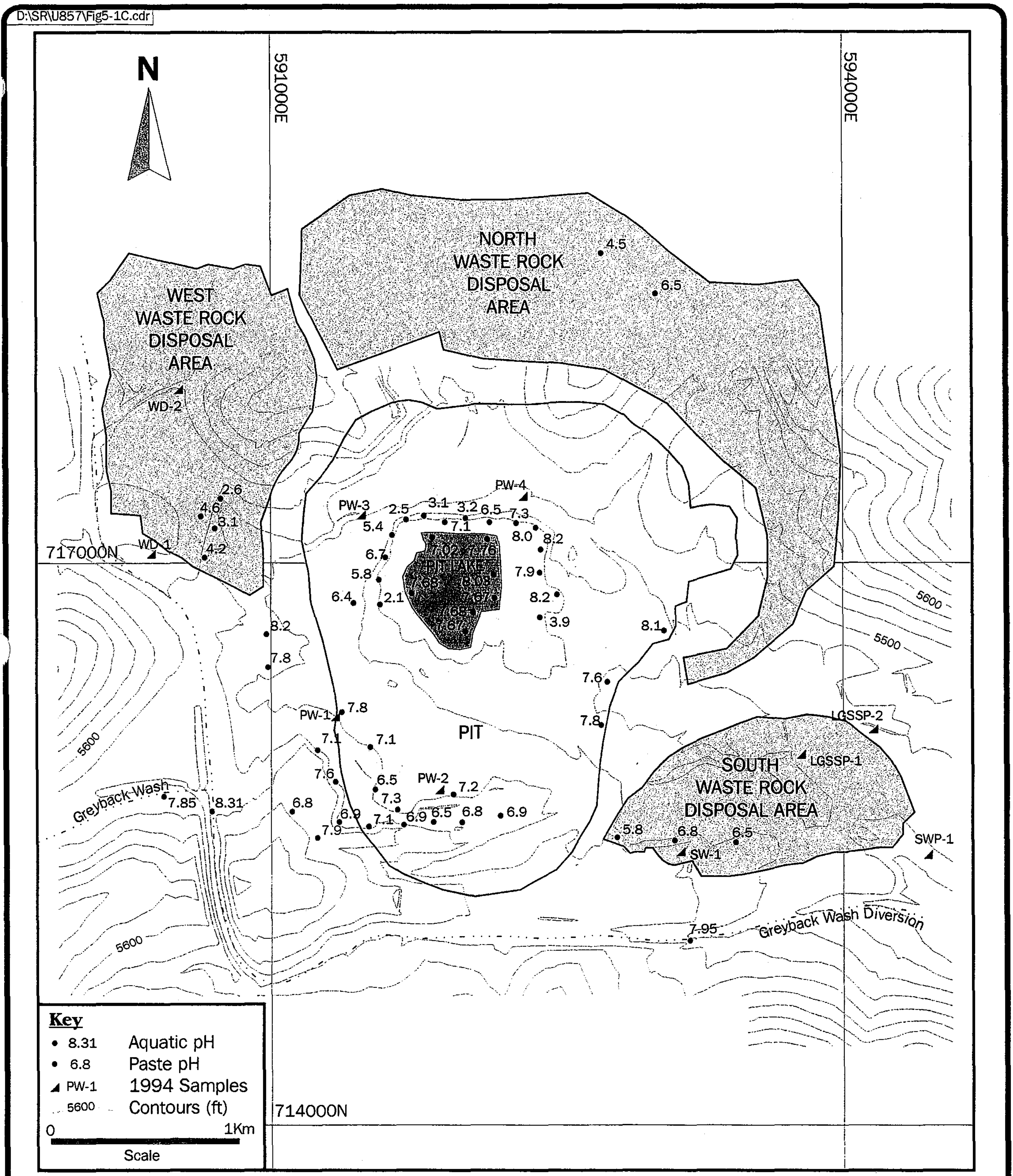
5.1. Bulk geochemistry of waste rock

From whole rock analysis of waste rock samples (Appendix A), the primary constituents are Al, Ca, Fe, Mg and K. Trace metals of significance (> 10 ppm) are Ba, Cu, Co, Mn, Mo and Zn). Several million tons of waste rock are currently piled around the pit and along the southeast slope of Animas Peak. Although small seeps have been reported from these rock piles, none were observed during the present study. SRK has previously classified the waste rock in the area as oxidized, transitional and unoxidized (SRK, 1995). The difference is the proportion of pyrite observed in the material. The rock piles have been classed on the proportion of each type of material present with the west pile being primarily transitional waste, the north rock pile being a combination of unoxidized and oxidized waste and the south and eastern rock piles comprising essentially unoxidized sulfidic waste.

5.2. Static test results

Paste pH tests involving the mixing of approximately equal portions of solid sample and deionized water to produce a saturated paste are shown for material from the pit walls and waste rock dumps in Figure 5.1. Similar to the results reported in the 1995 study, low pH areas are observed in the West and North Waste Rock Dumps indicating release of stored acidity from ongoing oxidation and/or consumption of alkalinity from previous oxidation events. In the East dump material paste pH results suggest that insignificant oxidation has or is taking place with relatively neutral pH values recorded (Table 5.1). The acidic pH's from the West dump (pH 2.5) were observed in partially oxidized material which forms a cap to the sulfide mineralization. The values suggest that these materials are still undergoing oxidation.

Using a modified leach test, the total acid generating and consuming potential of material from the different waste rock piles has been assessed (Table 5.1). The results show that much of the material tested is acid generating in the waste rock piles and has the **potential** to produce an acidic metal-sulfate seep. An exception in the East Dump area is acid consuming and is primarily comprised of sulfidic quartz monzonite. This is reflected in the historical data on these dumps. With the exception of the small seep observed at the East Waste Rock Disposal Area, no other acidic seeps have been reported on any of the disposal areas, despite being exposed to water and oxygen for over 12 years.



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SRK

PASTE AND MEASURED AQUATIC pH MAPS OF WASTE ROCK, PIT LAKEN AND SURFACE WATERS

Figure 5.1

Table 5-1: Summary of Static Test Results

Sample ID	Sample Description	Paste pH	Total Sulfur (%)	Pyritic Sulfur (%)	Sulfate Sulfur (%)	Neutralizing Potential (t/kt)	Sulfide Sulfur (%)	Undefined Sulfur (%)	Pyrite			Sulfide		
									AP (t/kt)	NNP (t/kt)	NP/AP (t/kt)	AP (t/kt)	NNP (t/kt)	NP/AP (t/kt)
Tailings														
T-10-12	Tailings from borehole SRKBH-1-94	7.8	1.26	0.68	0.03	24	1.23	0.55	21.25	2.75	1.13	38.44	-14.44	0.62
T-5-7	Tailings from borehole SRKBH-1-94	7.5	1.10	0.53	0.18	31	0.92	0.39	16.56	14.44	1.87	28.75	2.25	1.08
	Average		**1.18**	**0.61**	**0.11**	**28**	**1.08**	**0.47**	**18.91**	**8.59**	**1.50**	**33.59**	**-6.10**	**0.85**
Waste Rock														
WD-1	West Dump Area, QM Waste Rock	2.7	4.34	2.12	0.005	0.1	4.34	2.22	66.25	-66.15	0.00	135.47	-135.37	0.00
PW-3	Pit Wall, Northwest of Pit Lake	2.6	2.20	0.84	0.005	0.1	2.20	1.36	26.25	-26.15	0.00	68.59	-68.49	0.00
SW-1	***Sulfide Waste Pile, QM Waste Rock***		***1.36***	***0.47***	***0.005***	***36***	***1.36***	***0.89***	***24.69***	***21.31***	***2.45***	***42.34***	***-6.34***	***0.85***
PW-2	***Pit Wall, Oxidized Cap Rock***		***0.37***	***0.04***	***0.005***	***11***	***0.37***	***0.33***	***1.25***	***9.75***	***8.80***	***11.41***	***-0.41***	***0.96***
PW-4	Pit Wall, Northeast of Pit Lake	3.9	1.89	0.78	0.005	16	1.89	1.11	24.38	-8.38	0.66	58.91	-42.91	0.27
SWP-1	Sulfide Waste Pile, QM Rock	6.8	3.08	1.46	0.005	40	3.08	1.62	45.63	-5.62	0.88	96.09	-56.09	0.42
LGSSP-1	Sulfide Waste Pile, QM Rock	6.6	1.52	0.61	0.005	47	1.52	0.91	19.06	27.94	2.47	47.34	-0.34	0.99
LGSSP-2	***Sulfide Waste Pile, QM Rock***	***6.9***	***0.61***	***0.20***	***0.005***	***39***	***0.61***	***0.41***	***6.25***	***32.75***	***6.24***	***18.91***	***20.09***	***2.06***
WD-2	West Dump Area, QM Waste Rock		1.98	0.87	0.005	60	1.98	1.11	27.19	32.81	2.21	61.72	-1.72	0.97
IDC-24-222-241	***QM From IDC Drillhole 24, 222-241 Feet***		***1.74***	***0.75***	***0.005***	***31***	***1.74***	***0.99***	***23.44***	***7.56***	***1.32***	***54.22***	***-23.22***	***0.57***
CF10-177.8-190	Andesite From Drillhole CF10, 177.8-190		2.86	1.77	0.06	52	2.80	1.03	55.31	-3.31	0.94	87.50	-35.50	0.59
CF10-190-199	***QM From Drillhole CF10, 190-199***		***3.59***	***1.09***	***0.07***	***44***	***3.52***	***2.43***	***34.06***	***9.94***	***1.29***	***110.00***	***-66.00***	***0.40***
CF10-214-220	QM From Drillhole CF10, 214-220		3.92	2.05	0.005	65	3.92	1.87	64.06	0.94	1.01	122.34	-57.34	0.53
H75-53-42	QM, Reverse Circulation Cuttings	8.2	1.77	0.88	0.005	36	1.77	0.89	27.50	8.50	1.31	55.16	-19.16	0.65
H75-64-44	QM, Reverse Circulation Cuttings	7.2	1.69	0.69	0.005	39	1.69	1.00	21.56	17.44	1.81	52.66	-13.66	0.74
H75-51-34	QM, Reverse Circulation Cuttings	8.6	2.02	0.72	0.005	49	2.02	1.30	22.50	26.50	2.18	62.97	-13.97	0.78
H75-48-58	QM, Reverse Circulation Cuttings	7.2	1.18	0.38	0.005	16	1.18	0.80	11.88	4.13	1.35	36.72	-20.72	0.44
H75-48-44	QM, Reverse Circulation Cuttings	7.4	1.06	0.15	0.005	9	1.06	0.91	4.69	4.31	1.92	32.97	-23.97	0.27
PW-1	Pit Wall, SW of Pit, Transition Zone, QM	6.1	3.61	2.00	0.14	32	3.47	1.47	62.50	-30.50	0.51	108.44	-76.44	0.30
	Average		**2.15**	**0.94**	**0.02**	**33**	**2.13**	**1.19**	**29.39**	**3.36**	**1.97**	**66.51**	**-33.77**	**0.62**

Notes:
Sulfate sulfur non-detect reported as 1/2 of the detection limit
Neutralization potential non-detect reported as 1/10 of the detection limit
Sulfide Sulfur = Total Sulfur - Sulfate Sulfur
Samples in *italics* selected for kinetic testing

AP pyrite) = Pyritic Sulfur x 31.25
AP (sulfide) = (Total Sulfur - Sulfate Sulfur) x 31.25

5.3. *Kinetic test results*

Kinetic testing on a representative suite of samples in a humidity cell (Figure 5.2) using 29-7 day cycles with 3 days humidified air, 3 days dry air.

The results of these tests are presented in the 1995 hydrogeological report and only those of significance will be discussed herein. In both samples collected from the waste rock disposal areas, pH was above 7 except at week 20 when a sharp decrease occurred, believed to be in response to contamination of the distilled water used in the experiments. When tests resumed in week 27 pH levels were again above 7. Oxidizing conditions were indicated to have occurred throughout the experiments, based on the positive Eh readings.

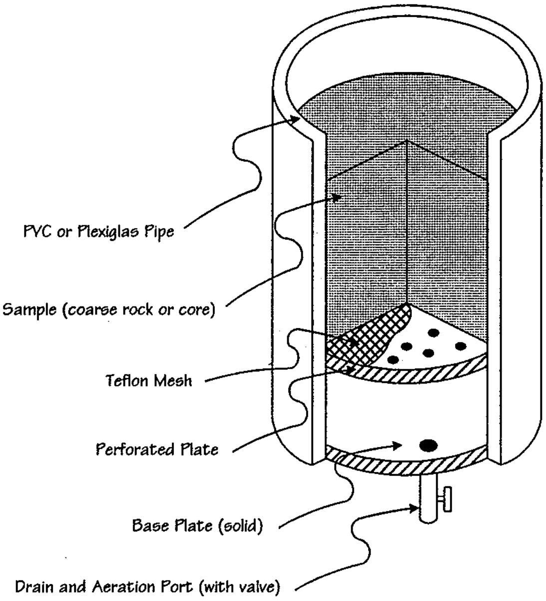


Figure 5.2 Humidity Column Design

The initially high conductivity in sample LGSSP-2 gradually dropped, possibly due to dissolution of sulfate salts (a similar pattern in leached sulfate, and initially Fe and acidity, are also observed suggesting initially dissolution of Fe-sulfates followed by dissolution of Na-, Mg- or Ca-salts). Alkalinity shows a gradual decrease with time, suggesting any contained alkalinity is used up, possibly to buffer acid generation. However acid generation from the samples is slow and is always an order of magnitude lower than alkalinity trends.

Initially acid generation shows a rapid increase (up to 8 mg/l total acidity), possibly due to dissolution of some Fe-sulfates.

The data indicate that if these materials are left exposed indefinitely, then the neutralizing potential will be consumed before the acid potential.

5.4. *Water Quality and Environmental Implications*

In the waste rock material it would be predicted that acidic seeps should be observed based on the static tests and the abundance of pyrite in the material. However, this is not reflected in water chemistry from this area or in the kinetic test work.

Acid generation is taking place in the waste rock material at slow rates and, if left unmanaged, it may ultimately produce acidic seepage. However, the rate of acid

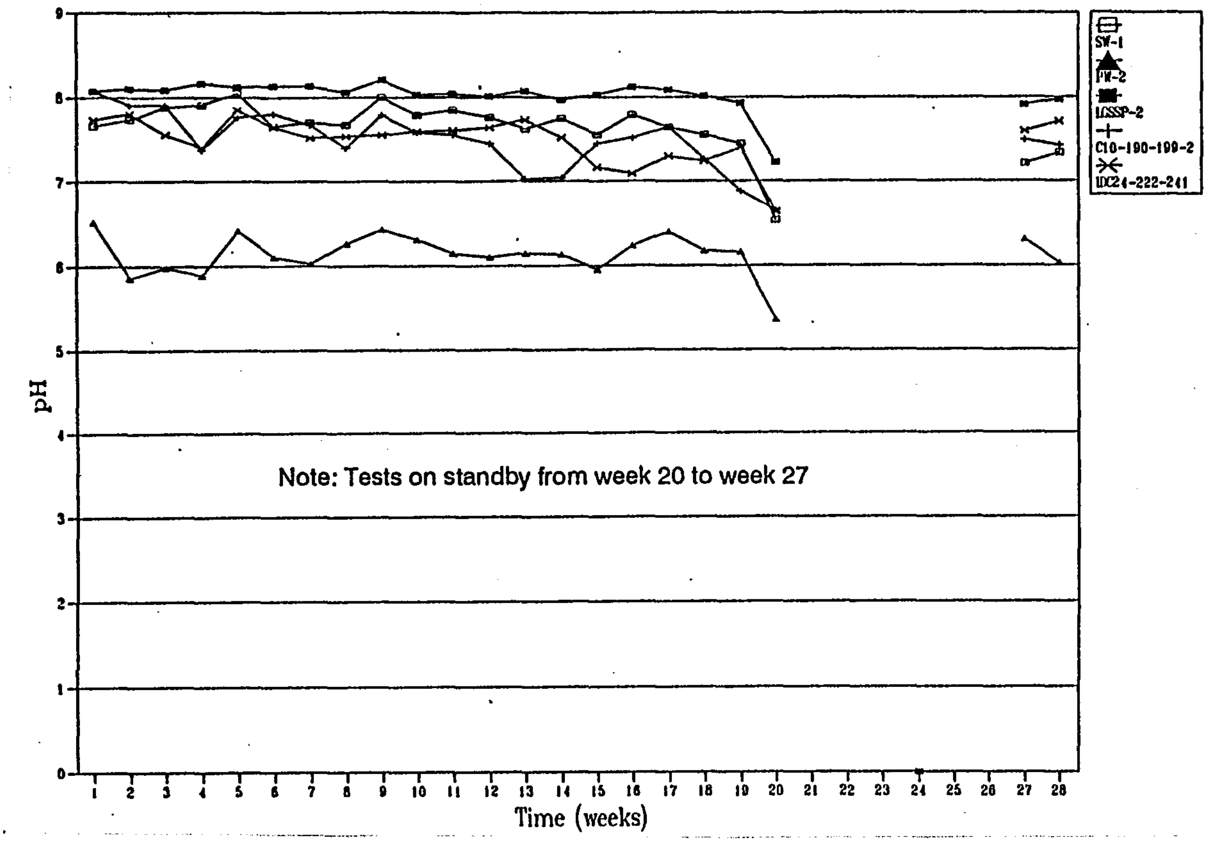


Figure 5.3 Kinetic Test Results - pH vs. Time

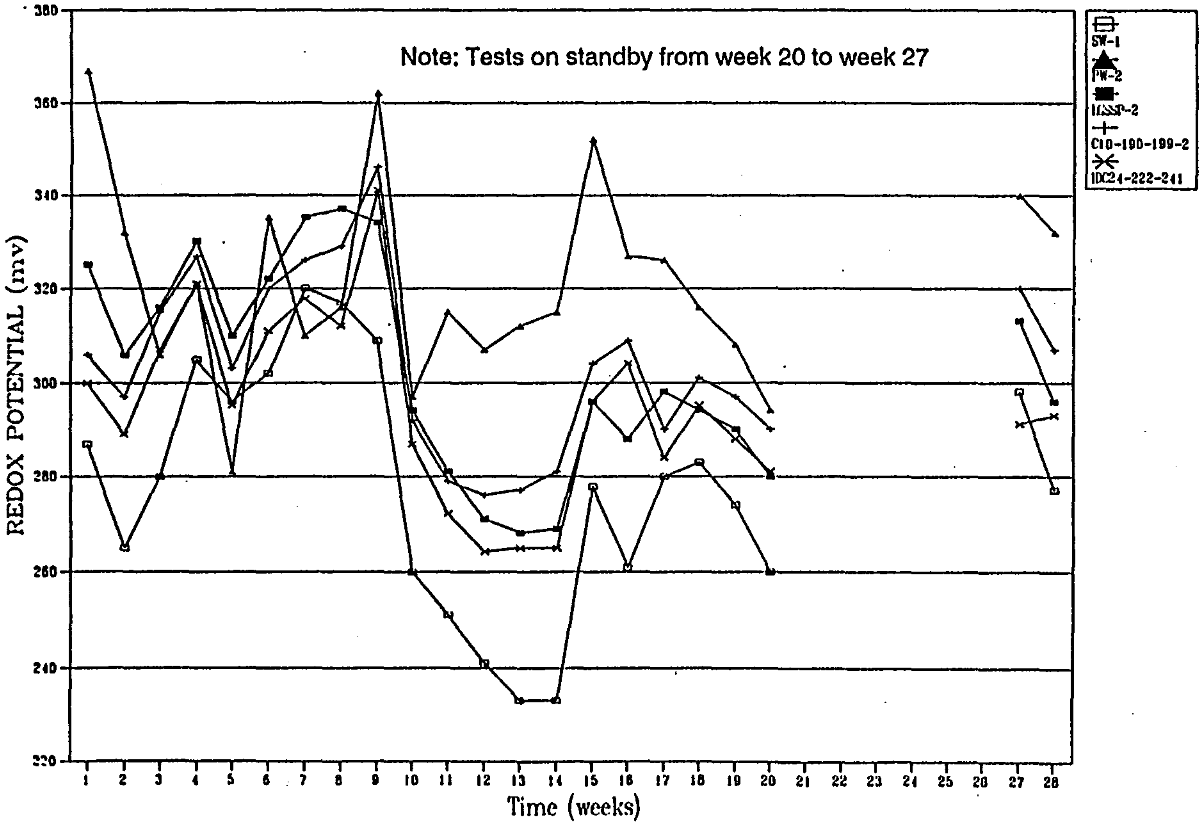


Figure 5.4 Kinetic Test Results - Redox Potential vs. Time

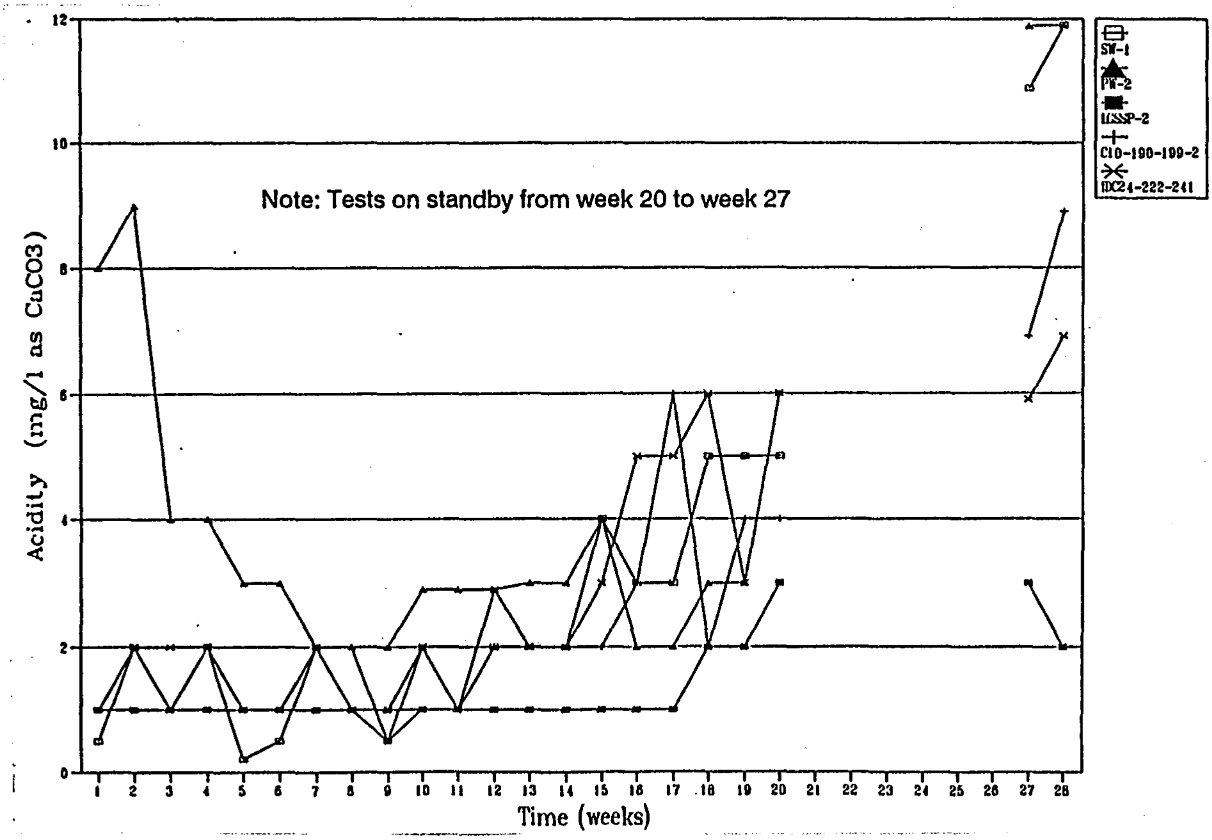


Figure 5.5 Kinetic Test Results - Acidity vs. Time

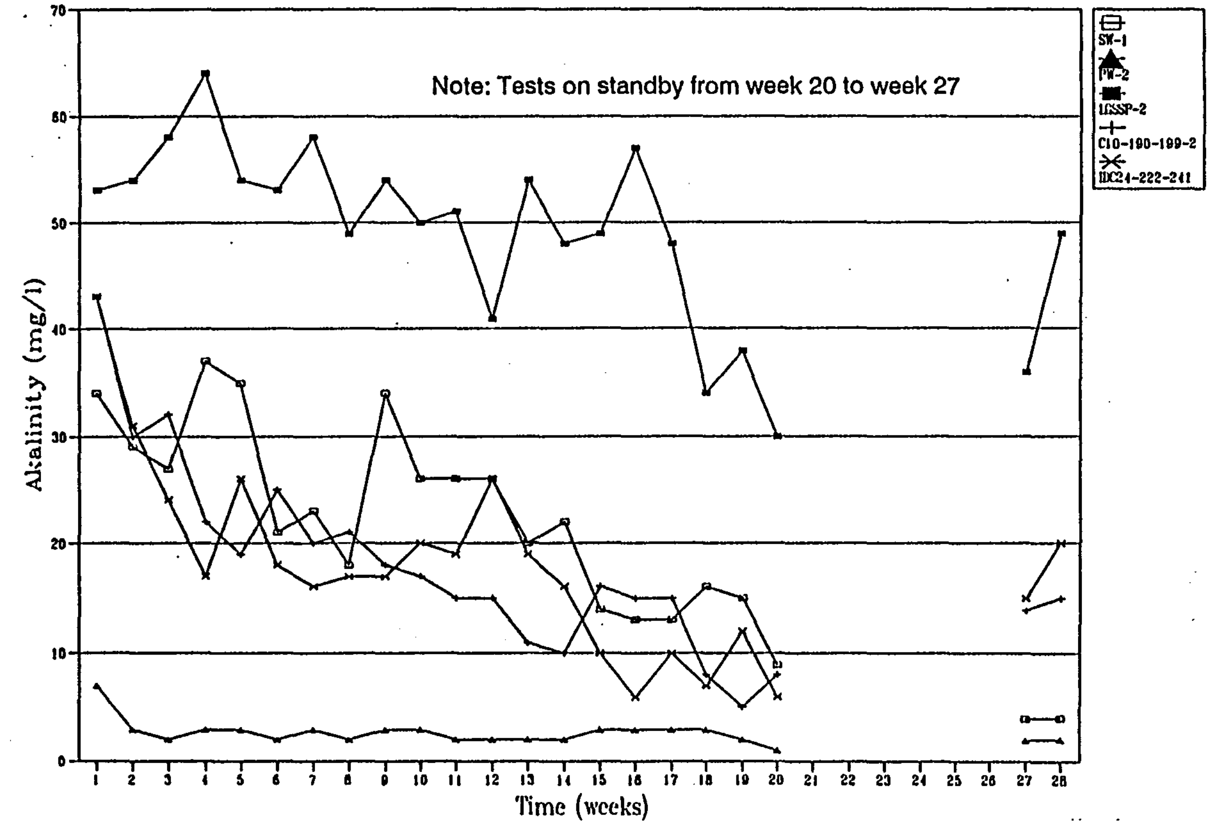


Figure 5.6 Kinetic Test Results - Alkalinity vs. Time

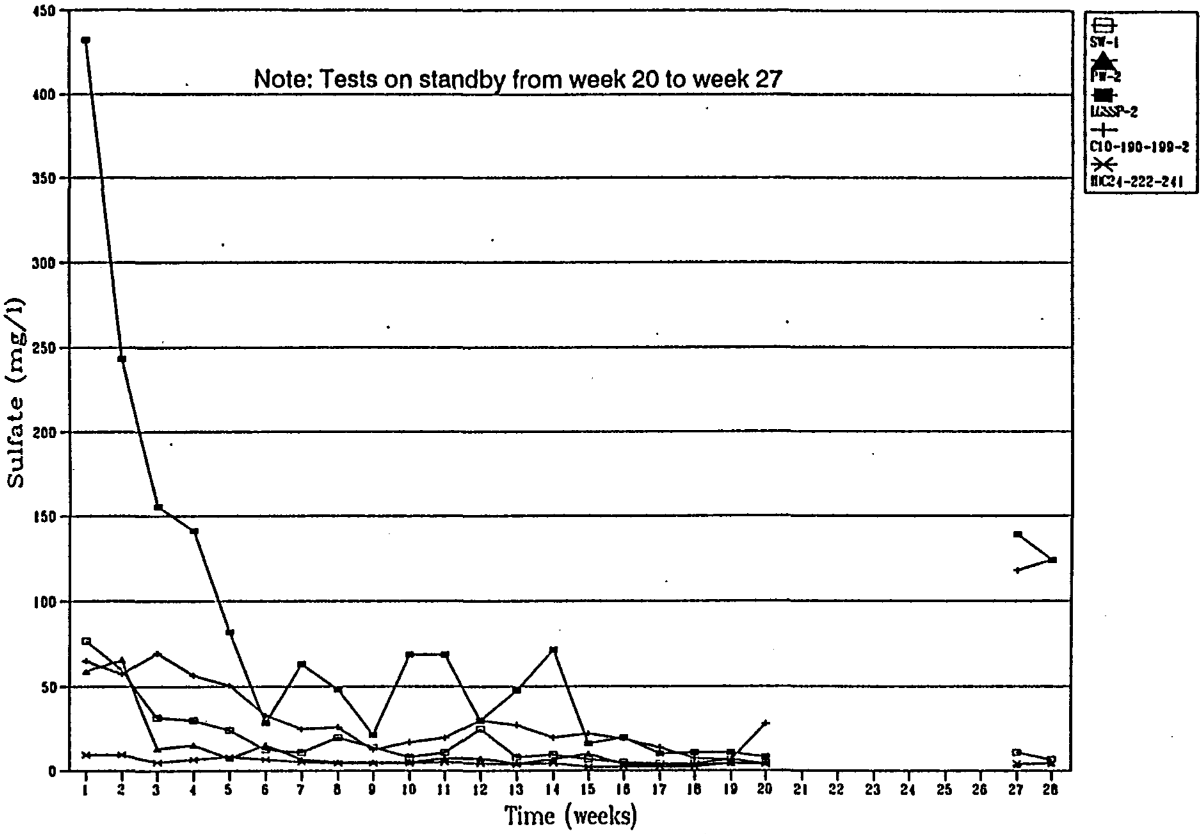


Figure 5.7 Kinetic Test Results - Sulfate vs. Time

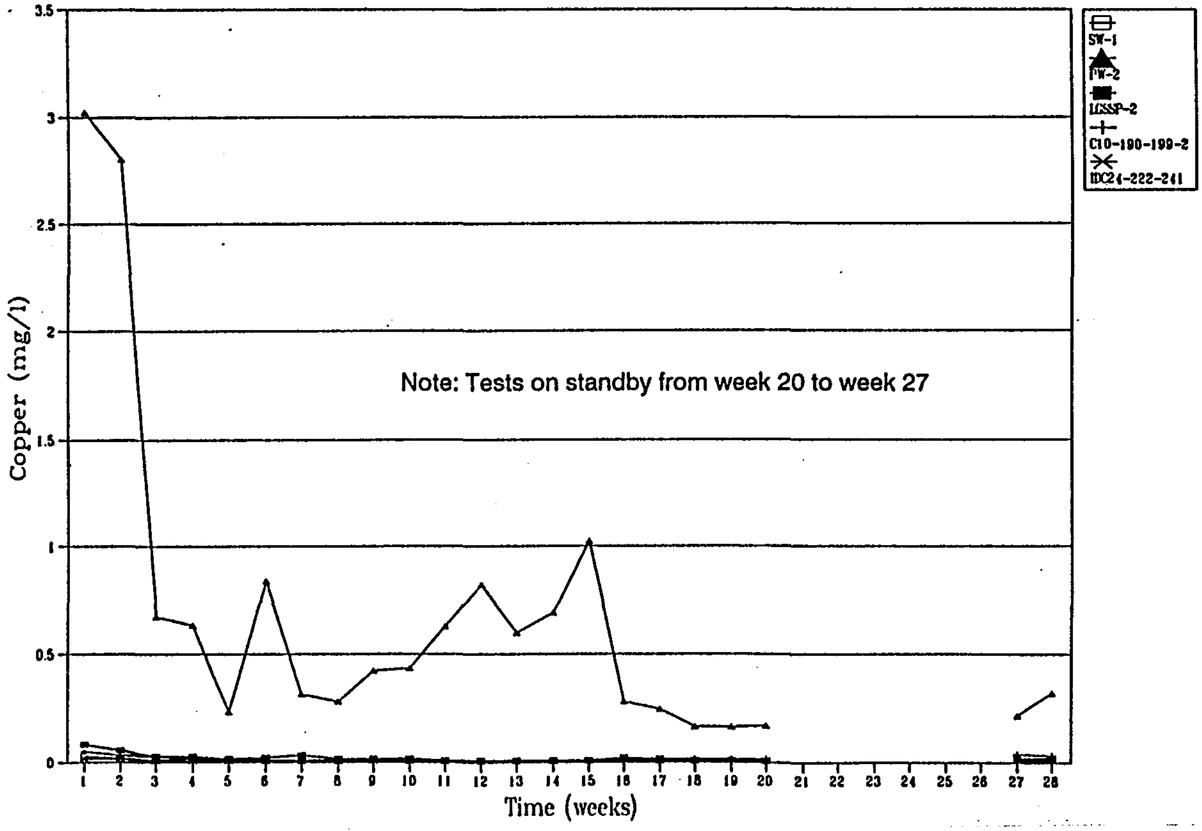


Figure 5.8 Kinetic Test Results - Copper vs. Time

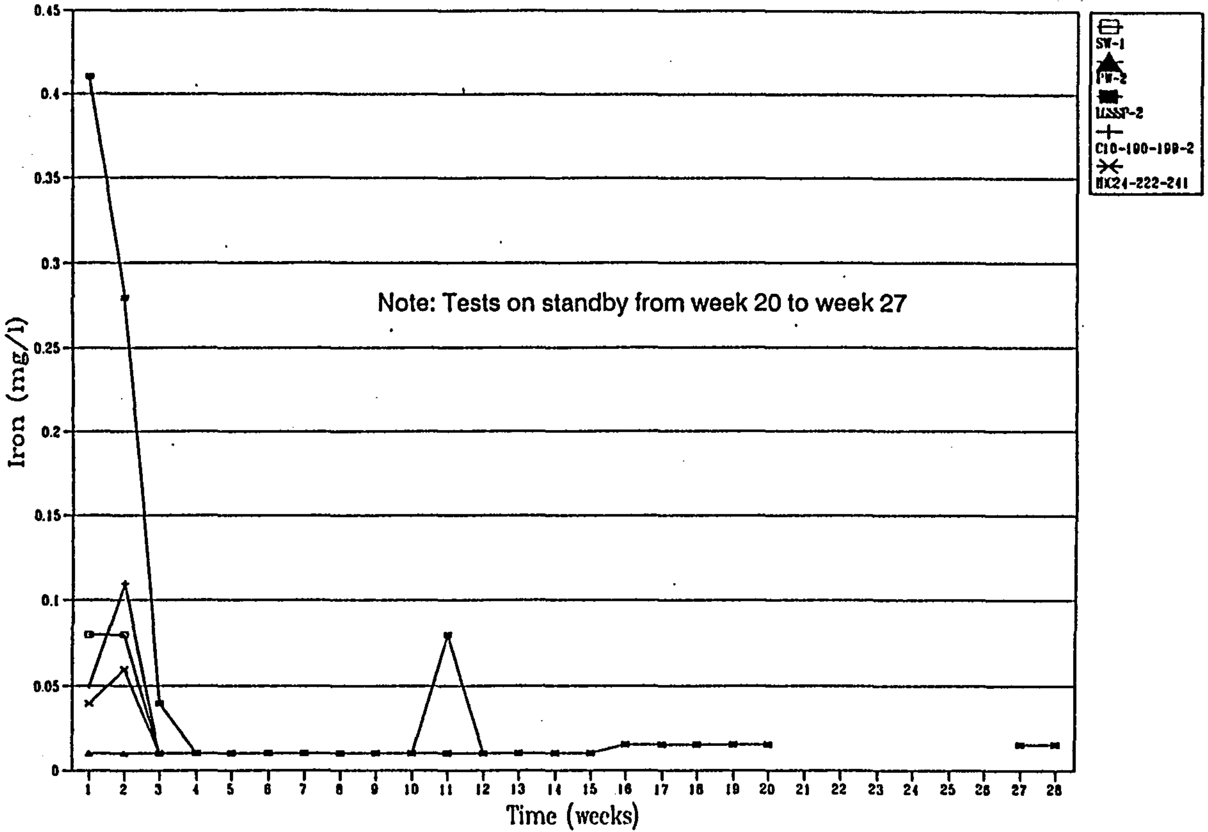


Figure 5.9 Kinetic Test Results - Iron vs. Time

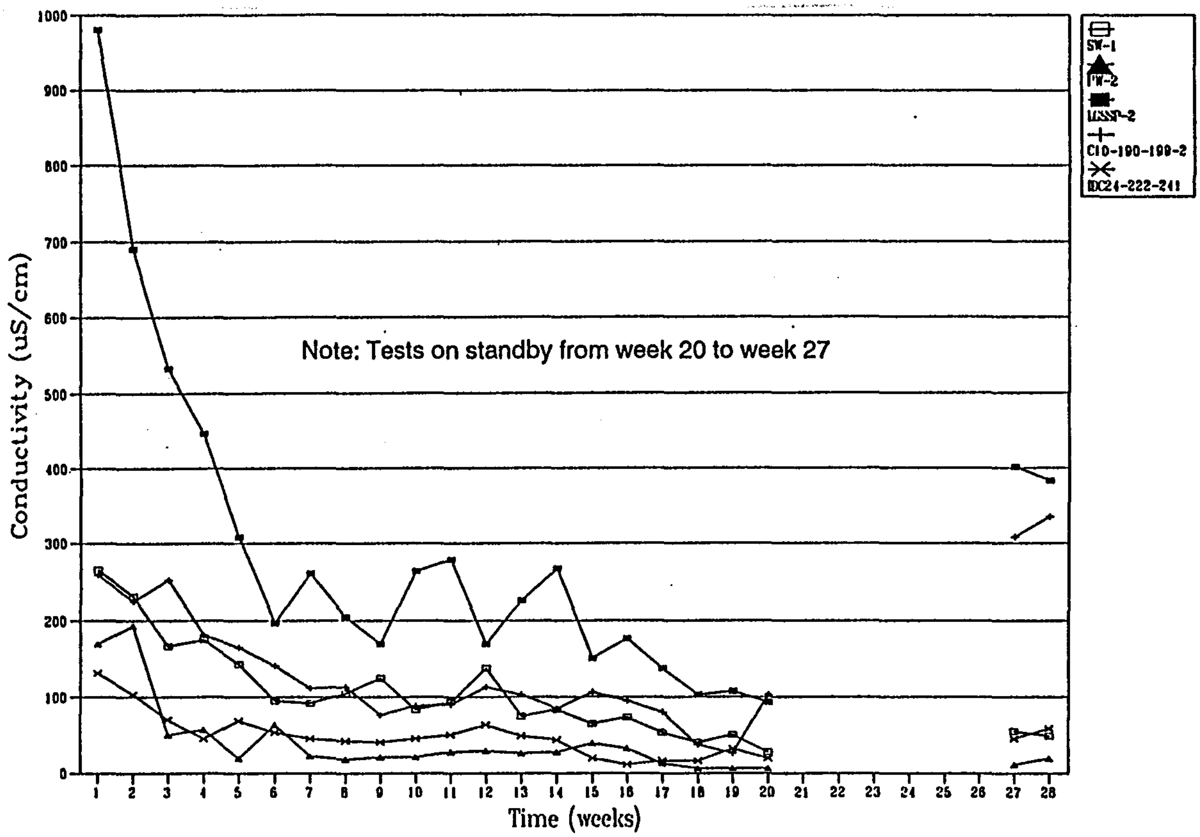


Figure 5.10 Kinetic Test Results - Conductivity vs. Time

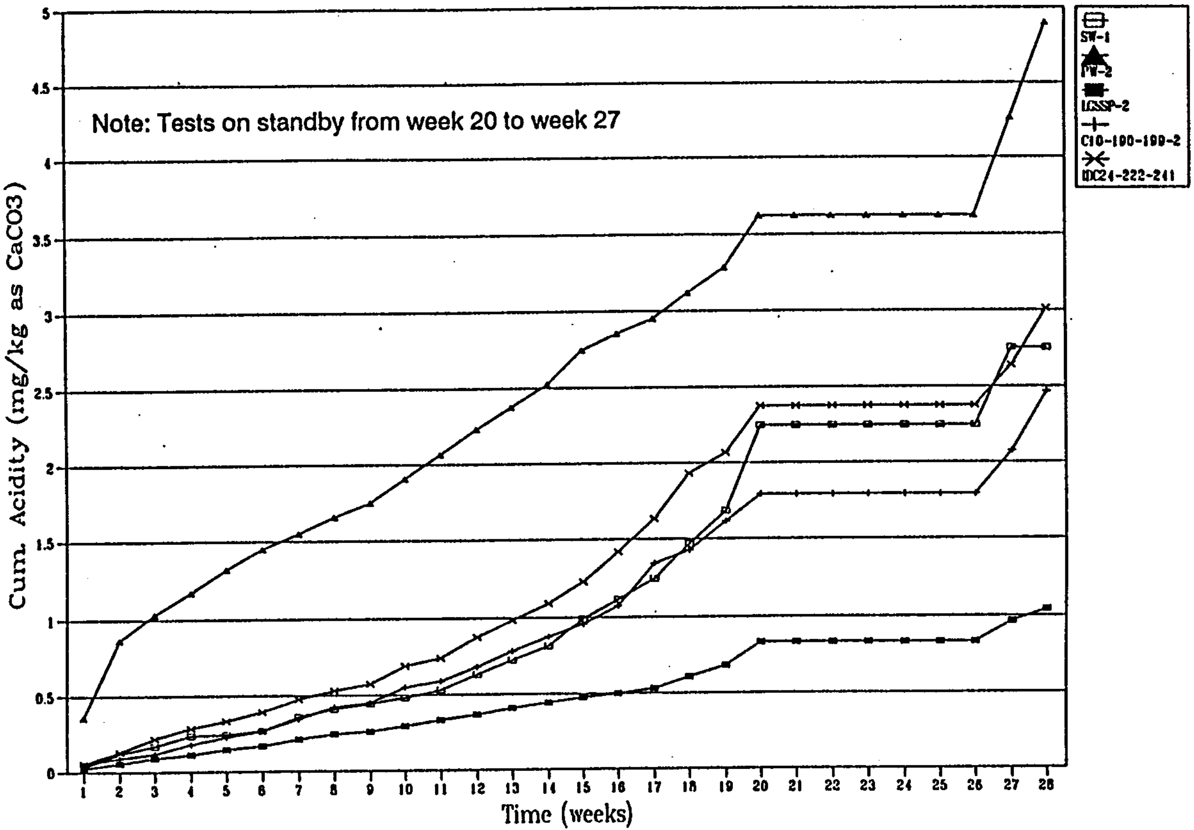


Figure 5.11 Kinetic Test Results - Cumulative Acidity vs. Time

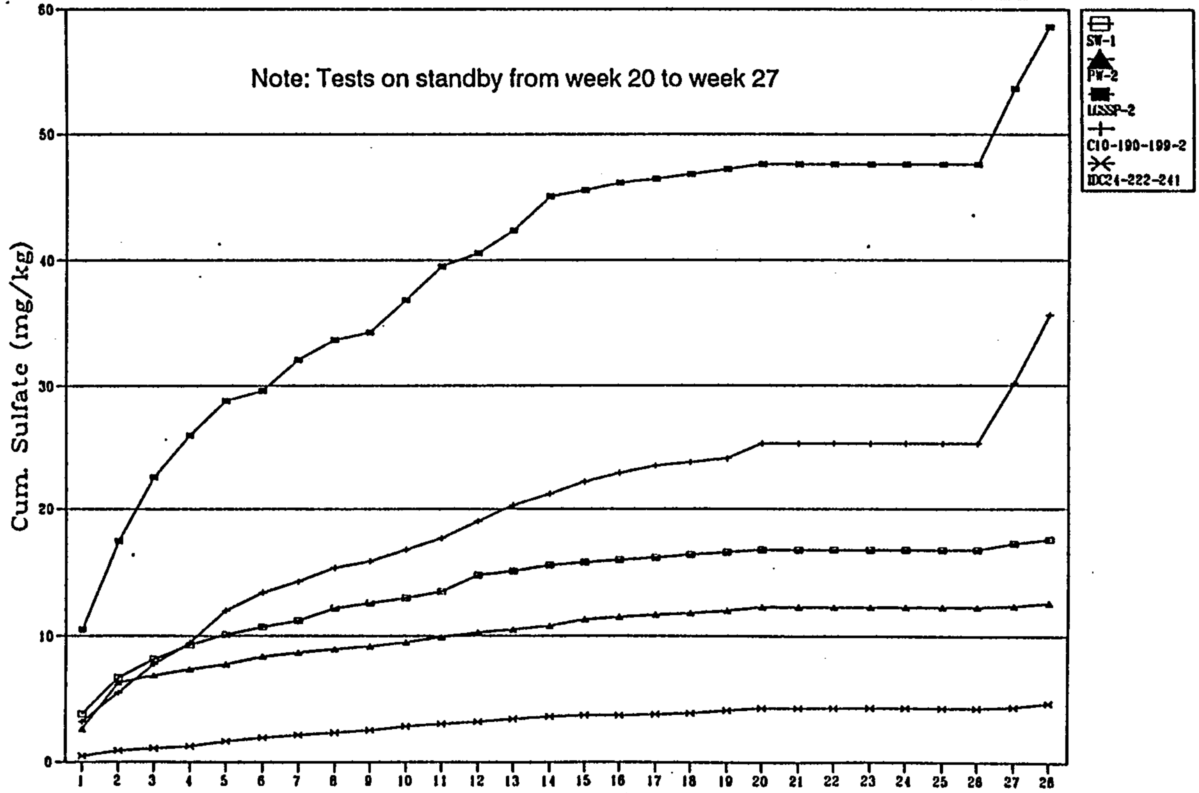


Figure 5.12 Kinetic Test Results - Cumulative Sulfate vs. Time

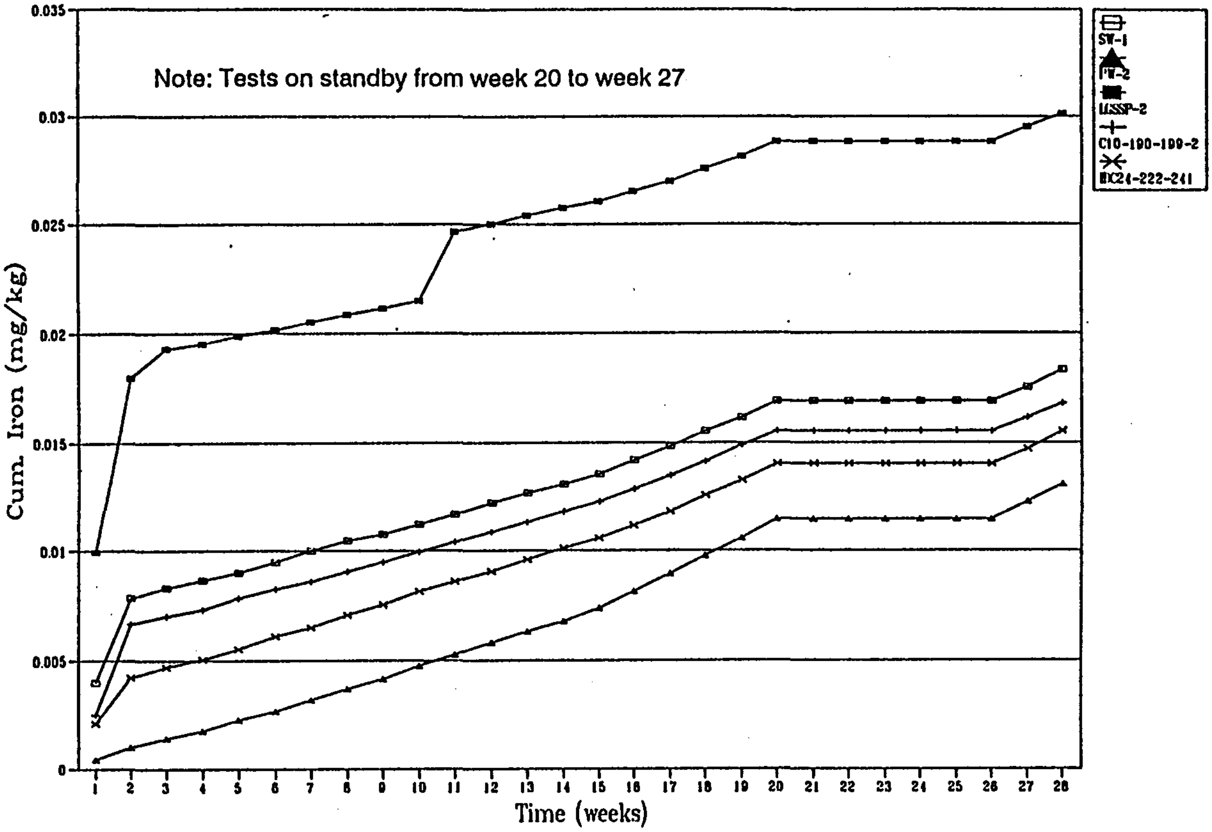


Figure 5.13 Kinetic Test Results - Cumulative Iron vs. Time

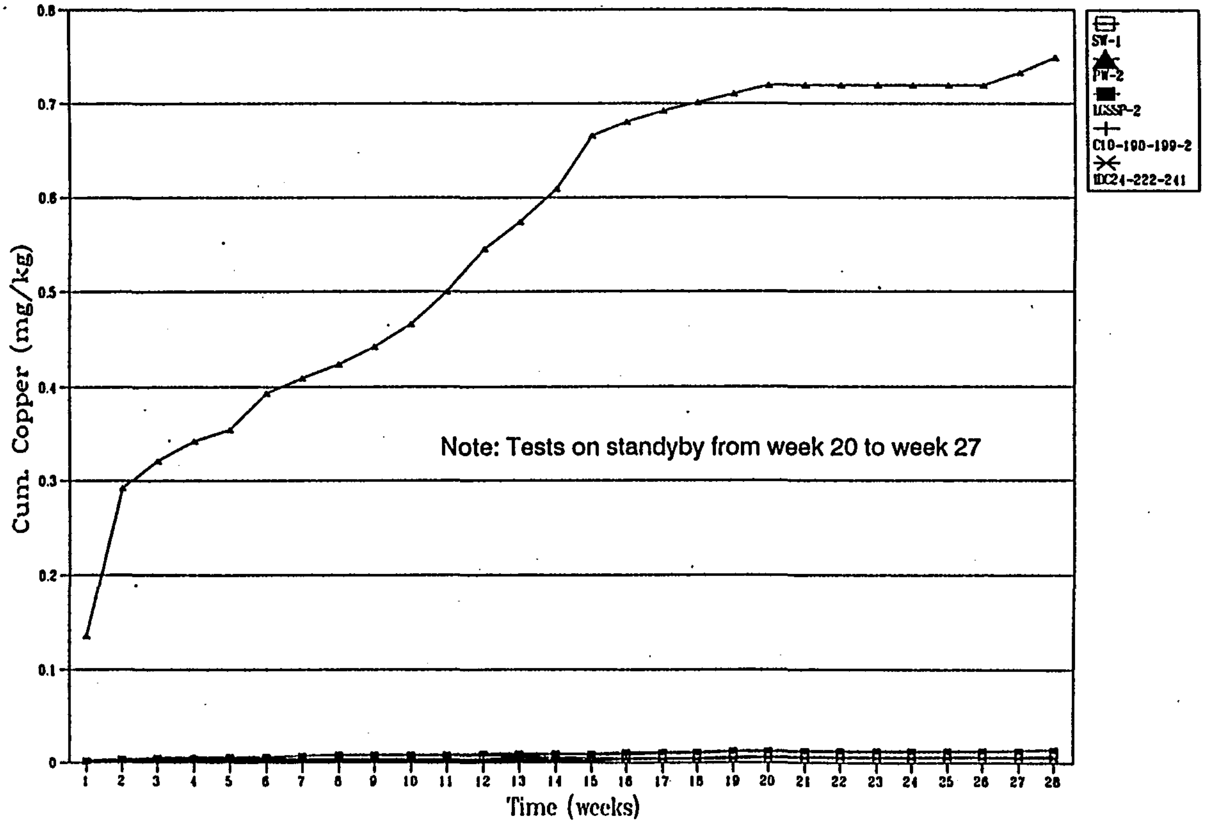


Figure 5.14 Kinetic Test Results - Cumulative Copper vs. Time

generation is much slower than the rate of acid consumption and consequently any acid generated is neutralized. The reasons for this are a combination of the:

- high crystallinity and coarse grain size of the pyrite
- isolated disseminated nature of the sulfide grains in the silicate-carbonate groundmass
- high evaporation over precipitation in the project area
- high levels of available phosphate fixing some of liberated iron as insoluble phosphate minerals.

However, there is only a finite volume of acidity and alkalinity in the material, and total acidity does exceed total alkalinity. The proposed closure activities for the water rock (regrading, covering and revegetating) will limit infiltration of water and diffusion of oxygen thereby slowing the rates of reaction and reducing the rate of seepage to insignificant levels.

To prevent acidic seepage in the long term, the waste rock will have to be covered by soil and vegetation to reduce oxygen diffusion. In addition, some of the highly sulfidic waste rock would make a useful substrate if Sulfur Reducing Bacteria (SRB) are introduced to the pit lake to encourage precipitation of sulfides. The storage under water would additionally reduce oxygen diffusion reducing or even preventing further sulfide oxidation or acid generation from this material. Any available oxygen would be utilized on sulfide surfaces assisting in the formation of an anoxic environment for the SRBs. The use of some sulfide in the manner would primarily be to assist in encouraging sulfide precipitation from the SRB process and in providing a bacterial substrate.

6 TAILINGS GEOCHEMISTRY

During 1982, approximately 1.2 million tons of tailings were deposited in existing tailings impoundments by Quintana Minerals. The material consisted of equal proportions of water and sand sized crushed rock and minerals. The facility is unlined and has largely drained. Samples from monitor wells located down gradient of the tailings indicate a noticeable increase in TDS and sulfate has occurred over time (see section 6.3).

To date, the evaluation of tailings behaviour has focused on the current condition of the tailings because it was not considered feasible, in the short term, to duplicate the field weathering and oxidizing conditions the tailings have been exposed to since deposition in the early 1980's. Testing and evaluations previously completed to assess tailings behavior included static (ABA) testing, paste pH tests, synthetic leaching tests and review of local monitoring well water quality data. These data are reported in the *Copper Flat Project, Hydrologic Studies* (SRK, 1995).

6.1. Static test results

Material has been taken from two boreholes into the 1982 tailings material and subjected to modified EPA 1312 static acid-base accounting tests. The average pyritic sulfur content for this material is 0.61 wt% (Table 5.2). From acid-base accounting the tailings material would be predicted to have a strong to moderate potential for net acid generation. Additional geochemical testing has been conducted on tailings samples obtained from five test pits in the existing tailings disposal area in July, 1996. Results of all static testing of tailings samples to date are summarized in table 5.2.

In general, two tailings materials were recovered from the test pits in July. These include gray, and yellow-brown tailings. The gray tailings (UTLS samples) are inferred to be derived from fresh quartz monzonite similar to that which will be mined in the future. The yellow-brown tailings (TTLS samples) are assumed to be derived from the oxidized and transition zone materials that formed the cap zone over the unoxidized quartz monzonite, and were mined concurrently with unoxidized rock during earlier operations. A bleached tailings sample (P5-BTLS) was also collected. The source of this material is unknown, however, it was likely derived from an alteration zone of limited extent.

Paste pH values in the July 1996 samples range from 6.2 to 7.8 with the majority of samples exhibiting a paste pH above 7.0. Paste conductivity is also low ranging from 298 to 686 μS/cm. In field tests performed in November 1996, paste pH ranged from 6 to 6.7 and paste pH from 502 to 691 μS/cm. The paste test data indicate low concentrations of stored acidity or oxidation products, and non-acidic to weakly acidic generating behaviour in the old tailings material.

The July tailings samples exhibit net neutralization values that range from 15.69 to -7.81 T/KT based on sulfide sulfur (total minus sulfate) content. The average acid neutralization to acid generating potential ratio (NP/AP) values are 1.21:1 and 0.94:1 for the unoxidized and transition tailings, respectively, based on sulfide sulfur content. The average reduction in the NP/AP ratio of the transition tailings is assumed to be a result of weathering and oxidation of the parent rock, and the depletion of neutralizing potential during weathering over geologic time. A sample of bleached tailings obtained from an isolated exposure in one of the test pits exhibited an NP/AP ratio of 1.72:1.

Values for NNP and NP/AP calculated on the basis of pyritic sulfur content are also shown on the attached table. Based on pyritic sulfur content, NP/AP ratios range from 1.07:1 to 3.73:1, with most samples exhibiting ratios near 1.5:1.

Four tailings samples (three UTLS samples and 1 TTLS sample) were subjected to modified EPA method 1312 synthetic leaching tests to assess leachable metal concentrations. Tests were modified to include a 2:1 liquid to solids ratio to enhance detection of leachable metals. Deionized water was used as the leaching agent to simulate leaching under field conditions (Appendix A).

Test results indicate the primary leachable constituents are calcium, magnesium, potassium and sodium. Metals detected in the leach test extracts in trace concentrations (less that 0.5 mg/l) include aluminum, barium, copper, iron, manganese, molybdenum and zinc. These metals occur at concentrations that are not anticipated to be of concern, considering the aggressive nature of the 1312 leach test procedure.

In general, leachable metal concentrations are low in the tailings samples collected to date, and together with the paste pH and conductivity data, do not indicate that the tailings are currently acid generating.

Based on the results of the testing presented above, the existing tailings do not appear to be acid generating at present. NNP values in the range of -20 to +20 T/KT are generally considered indicative of materials with undefined potential for acid generation.

6.2. *Kinetic test results*

Kinetic testing of these materials is typically required to evaluate field behaviour. Disposal under field conditions is in essence, a large scale and extended duration kinetic test. On the basis of the extended period of weathering which the tailings have been exposed to, and the results of the static tests presented in Table 5.1, the tailings appear to have a low potential for acid generation, or are very slowly reactive.

Due to the fine grained nature of the tailings the acid generating potential may be enhanced in comparison to the waste rock. Testing completed to date indicates that the behaviour of the waste rock and tailings are very similar following an extended period of exposure to identical potential oxidizing conditions. Future tailings are expected to exhibit similar characteristics, as the ore will be derived from the same source, and it will be subjected to processing by similar methods.

Alta will conduct ongoing field scale kinetic testing of future tailings as well as waste rock piles in order to provide greater confidence in the existing geochemical models constructed from the present information.

6.3. *Water quality and Environmental implications*

Subsurface seepage recorded from the tailings monitor wells continues to show high levels of sulfate (~1200-1500 mg/l). This reflects the continued dispersion of water by subsurface seepage from the deposited tailings.

During the time of operations by Quintana the decant liquid from the tailings impoundment had a pH of 7.8, a TDS of 2230 mg/l, sulfate of 1440 mg/l and fluoride of 1.46 mg/l. The water appears to be a Ca-sulfate water, and paste pH of the material suggests it is non-acid generating or has a slow rate of acid generation.

The proposal to cover the tailings to prevent water penetration will lead to pore waters supersaturated with Ca and sulfate which will precipitate out gypsum within the tailings further reducing porosity. Any Ca and sulfate leachate will be collected in the leachate channels and used as part of the reclaimed water in the process plant.

7 PIT LAKE CHEMISTRY

7.1. Surface Water Chemistry

Surface water quality has already been discussed in detail previously in the 1995 Hydrogeological report and will not be discussed again here except for the Pit lake and Greyback wash.

Water quality in the Greyback wash is good. Upstream of the mining area TDS is in the range 780-965 mg/l, sulfate 275-300 mg/l, bicarbonate, 400-500 mg/l and pH is in the range 7.4-8.3.

Downstream of the mining area surface water quality has been modified with TDS increased to the range 2300-3000 mg/l and sulfate to 1150-1650 mg/l but pH remained unchanged and metal levels were all very low. The increases in TDS and sulfate are most likely due to evapo-concentration of surface water, but may also be affected by runoff from the plant area and by rock-water interactions within the Greyback channel.

In 1991 the pit lake had a pH of 7.2, in 1992 a sample taken along the margin of the lake during a period of high precipitation indicated this had fallen to 4.4-4.9 and the rose in 1993 to pH 5.6 (Newcomer et al., 1993). Current pH levels in the pit lake are at pH 7.7-8.3 and appear to have attained an equilibrium (Table 7.1). Total dissolved solids in the lake has increased from 1991 levels of 2700 mg/l, to 4200 mg/l in 1993, peaked in 1995 at around 5000 mg/l and currently have fallen to around 3500 mg/l. This is a reflection of the increased Ca (580 mg/l in 1991 to 620 mg/l in 1995) and sulfate (2800 mg/l in 1991 and 3170 mg/l in 1995) levels in the pit. The recent drop in TDS may be in response to a drop in water level, thus increasing salinity in residual water and consequently precipitation of gypsum. This is supported by recent field observations of the abundance of gypsum precipitated around the pit walls and at the edge of the pit lake.

At the present time, the pit water exceeds the current New Mexico human health drinking water standards for pH, sulfate, TDS, fluoride, manganese, zinc, copper and cadmium, but meets surface water standards for livestock and wildlife watering, the current use.

Table 7.1: Pit Lake Water Quality (all values in mg/l except where stated otherwise)

Parameter	Pit lake, 1994	Pit Lake, 1996	Greyback, 1996
pH	7.52	8.31	7.61
Conductivity, µm/cm	4690	5230	3860
Bicarbonate	104	122	620
Nitrate	5	<5	6.2
Sulfate	2970	3170	1730
Fluoride	8.1	10	1.4
Chloride	130	150	94
TDS	4380	5230	3450
Sodium	320	430	360
Magnesium	250	300	140
Aluminium	<0.05	0.13	0.033
Potassium	18	21	2.1
Calcium	550	620	490
Manganese	3.4	3	0.17
Iron	<0.05	<0.05	0.057
Copper	0.032	<0.025	<0.025
Molybdenum	<0.05	<0.05	<0.05
Cadmium	0.017	0.014	<0.0025

7.2. *Geochemical Model of Pit Lake Chemistry*

There are two parts to the modelling approach used in analyzing pit water quality at the Copper Flat site. The first part of the model requires calibration to reproduce the current conditions in the existing pit. Physiochemical parameters derived from the first part of the modelling effort are used in the second part of the modelling procedure. The purpose of the second part was to predict future pit water chemistry after mine closure.

7.2.1. Model Description

After cessation of historical mining activity, the existing mine pit received inflows from ground water and surface runoff. Most of the surface runoff in the catchment area probably discharges to the mine pit within a short period of time after a major rainfall event, allowing only minimal time in contact with sulfide bearing material. A fraction of the runoff, however, infiltrates rocks in the vicinity of the pit and flows into the pit as seepage. These oxygenated waters react with sulfides to form Acid Rock Drainage (ARD). All dissolved species contributed by ground water, unreacted surface runoff and ARD contact water are then concentrated by evaporation. As the pit water becomes saturated with respect to minerals or amorphous solid phases, some dissolved constituents are removed from solution by precipitation. The concentrations of these constituents are thus limited by the solubility of certain minerals.

Based on the model described above, the chemical evolution of the existing pit water can be simulated by mixing three types of water, concentrating the mixture by evaporating pure water and equilibrating the resultant solution with an assemblage of gases and solid phases. The model calibration process involved adjusting evaporation rate and volumes of component waters until the simulated water chemistry from the model approximates to the analytical measurements for pit water chemistry. Specifically, there are four parameters that were determined during model calibration. These parameters are:

- Groundwater inflow rate
- Surface water inflow rate
- Contact water (ARD) inflow rate
- Net evaporation rate

To determine values for these parameters, there must be four constraints to the geochemical model. These constraints can be physical or chemical. The following criteria were used in the calibration of the Copper Flat pit water model:

- At the end of 6 years, the volume of water accumulated by the model must approximate the volume determined from pit geometry and the 1994 water level in the pit.
- At steady state, the net evaporation rate must equal the sum of the inflow rates. Steady state must be reached in six years.
- At the end of 12 years, the solution chemistry simulated by the model must be similar to the average chemistry of the pit water, particularly with respect to pH, calcium, and sulfate.
- The pit rocks are assumed to offer no buffering capacity to the solution (i.e. no mineral phase can precipitate unless it is precipitated first).

7.2.1.1. Calibration Procedure

A modified version of PHREEQE was used to simulate chemical changes over time in a sequential batch mode. Each batch represented an increment of time and consisted of five operations:

- Addition of groundwater
- Addition of surface water
- Addition of contact water
- Evaporation of pure water
- Solution equilibration

The first step of the procedure was to compute solution volumes using constraints 1 and 2.

$$G_s + G_i + 2S_t - 2E = V / t \qquad \text{Constraint 1}$$

and

$$S_t + G_s = E \qquad \text{Constraint 2}$$

Where: E = net evaporation rate (ft^3/yr)
G_i = initial groundwater inflow rate (ft^3/yr)
G_s = steady-state groundwater inflow rate (ft^3/yr)
S_t = total surface inflow rate (ft^3/yr)
V = volume of pit water (ft^3)
t = time to fill pit half way (yr)
= 3.0 yr

Three mixing models were considered:

1. Low evaporation (Table 7.2)
2. Moderate evaporation (Table 7.2)
3. High evaporation (Table 7.2)

The second step of the procedure was to define chemical compositions for three types of water that comprise the components of inflow to the chemical model:

1) Groundwater inflow (Table 7.3)
2) Uncontaminated surface inflow (Table 7.3)
3) Contact water (Table 7.3)

The third step of the procedure was to use PHREEQE to model the chemical evolution of pit water for each mixing model developed in the first step. Because Mixing Model 1 produced a net groundwater outflow from the pit, it was eliminated from further consideration, and geochemical modeling was restricted to Mixing Models 2 and 3. Mixing Model 1 is unlikely to produce any significant evaporative effects and is inconsistent with hydrologic data, which indicate that groundwater flows into the pit. During this step of the analytical procedure, four chemical calibration models were developed and evaluated:

TABLE 7.2: 6-Year Water Budget

Low Evaporation

Year	Ground Water	Surface	Net Evaporation	Volume Change	Total Volume
1	2,097,539.840	2,446,329.600	2,414,269.440	2,129,600	2,129,600
2	1,710,339.840	2,446,329.600	2,414,269.440	1,742,400	3,872,000
3	1,323,139.840	2,446,329.600	2,414,269.440	1,355,200	5,227,200
4	935,939.840	2,446,329.600	2,414,269.440	968,000	6,195,200
5	548,739.840	2,446,329.600	2,414,269.440	580,800	6,776,000
6	161,539.840	2,446,329.600	2,414,269.440	193,600	6,969,600
ss	-64,120.320	4,892,659.200	4,828,538.880	0	6,969,600

Precipitation Rate = 13 in/yr
Evaporation Rate = 65 in/yr
Runoff Coefficient = 0.500

Moderate Evaporation

Year	Ground Water	Surface	Net Evaporation	Volume Change	Total Volume
1	3,244,736	1,812,096	2,927,232	2,129,600	2,129,600
2	2,857,536	1,812,096	2,927,232	1,742,400	3,872,000
3	2,470,336	1,812,096	2,927,232	1,355,200	5,227,200
4	2,083,136	1,812,096	2,927,232	968,000	6,195,200
5	1,695,936	1,812,096	2,927,232	580,800	6,776,000
6	1,308,736	1,812,096	2,927,232	193,600	6,969,600
ss	2,230,272	3,624,192	5,854,464	0	6,969,600

Precipitation Rate = 12 in/yr
Evaporation Rate = 75 in/yr
Runoff Coefficient = 0.400

High Evaporation

Year	Ground Water	Surface	Net Evaporation	Volume Change	Total Volume
1	4,621,232	1,132,560	3,624,192	2,129,600	2,129,600
2	4,234,032	1,132,560	3,624,192	1,742400	3,872,000
3	3,846,832	1,132,560	3,624,192	1,355,200	5,227,200
4	3,459,632	1,132,560	3,624,192	968,000	6,195,200
5	3,072,432	1,132,560	3,624,192	580,800	6,776,000
6	2,685,232	1,132,560	3,624,192	193,600	6,969,600
ss	4,983,264	2,265,120	7,248,384	0	6,969,600

Precipitation Rate = 10 in/yr
Evaporation Rate = 88 in/yr
Runoff Coefficient = 0.300

NOTE: Steady state is indicated by the symbol "ss". A steady-state condition is reached at the end of the sixth year.

TABLE 7.3: Solution Chemistry

Parameter	Units	Concentration
Type 1 - Inflow Ground Water		
Calcium (Ca)	mg/l	92.065
Magnesium (Mg)	mg/l	25.018
Sodium (Na)	mg/l	74.052
Potassium (K)	mg/l	2.001
Iron (Fe)	mg/l	< 0.001
Bicarbonate (HCO_3)	mg/l	260.183
Sulfate (SO_4)	mg/l	220.155
Chloride (Cl)	mg/l	30.021
pH	-log	7.200
pE	-log	5.071
pO_2	-log	34.036
NOTE: This water is supersaturated with respect to CO_2 gas; undersaturated with respect to magnesite and gypsum; and in equilibrium with calcite and $Fe(OH)_3$.		
Type 2 Inflow - Uncontaminated Surface Water		
Calcium (Ca)	mg/l	50.019
Magnesium (Mg)	mg/l	8.003
Sodium (Na)	mg/l	40.015
Potassium (K)	mg/l	2.001
Iron (Fe)	mg/l	< 0.001
Bicarbonate (HCO_3)	mg/l	200.075
Sulfate (SO_4)	mg/l	66.025
Chloride (Cl)	mg/l	10.004
pH	-log	7.200
pE	-log	13.167
pO_2	-log	1.652
NOTE: This water is supersaturated with respect to CO2 gas; undersaturated with respect to calcite, magnesite and gypsum; and in equilibrium with $Fe(OH)_3$.		
Type 3 Inflow - Acid Rock Drainage (Contact Water)		
Calcium (Ca)	mg/l	360.203
Magnesium (Mg)	mg/l	25.014
Sodium (Na)	mg/l	10.006
Potassium (K)	mg/l	4.002
Iron (Fe)	mg/l	100.056
Bicarbonate (HCO_3)	mg/l	0.000
Sulfate (SO_4)	mg/l	3,051.718
Chloride (Cl)	mg/l	14.008
pH	-log	1.700
pE	-log	18.661
pO_2	-log	1.677
NOTE: This water is supersaturated with respect to CO_2 gas; undersaturated with respect to magnesite and calcite; and in equilibrium with gypsum and Na-Jarosite.		

TABLE 7.4: Simulated Solution Chemistry after 12 Years Scenario 2 - Unbuffered

Parameter	**Units**	**Concentration**
Calcium (Ca)	mg/l	547.073
Magnesium (Mg)	mg/l	110.620
Sodium (Na)	mg/l	321.715
Potassium (K)	mg/l	13.564
Iron (Fe)	mg/l	61.261
Bicarbonate (HCO_3)	mg/l	20.432
Sulfate (SO_4)	mg/l	2,844.870
Chloride (Cl)	mg/l	122.600
pH	-log	2.342
pE	-log	9.938
pO_2	-log	34.000
pCO_2	-log	2.000
ARD added (Percent)		22.196
Na-Jarosite precipitated (kg):		4,685.616
Gypsum precipitated (kg):		81,455.882
NOTE: Equilibrium was imposed for CO_2 and O_2. Equilibrium was imposed for gypsum and Na-Jarosite after saturation was exceeded.		

TABLE 7.5: Simulated Solution Chemistry after 12 Years Scenario 2 - Buffered by $Fe(OH)_3$

Parameter	Units	Concentration
Calcium (Ca)	mg/l	581.273
Magnesium (Mg)	mg/l	124.558
Sodium (Na)	mg/l	< 0.001
Potassium (K)	mg/l	0.006
Iron (Fe)	mg/l	362.441
Bicarbonate (HCO_3)	mg/l	20.680
Sulfate (SO_4)	mg/l	2,345.046
Chloride (Cl)	mg/l	125.120
pH	-log	4.183
pE	-log	8.097
pO_2	-log	34.000
pCO_2	-log	2.000
ARD added (Percent)		50.000
$Fe(OH)_{3a}$ dissolved (kg):		915,878.864
Na-Jarosite precipitated (kg):		1,229,041.843
K-Jarosite precipitated (kg):		38,577.514
Gypsum precipitated (kg):		278,699.113
NOTE: Equilibrium was imposed for CO_2, O_2 and $Fe(OH)_3$. Equilibrium was imposed for gypsum, Na-Jarosite and K-Jarosite after saturation was exceeded.		

TABLE 7.6: Simulated Solution Chemistry after 12 Years Scenario 2 - Buffered by Calcite

Parameter	Units	Concentration
Calcium (Ca)	mg/l	360.203
Magnesium (Mg)	mg/l	25.014
Sodium (Na)	mg/	10.006
Potassium (K)	mg/l	4.002
Iron (Fe)	mg/l	100.056
Bicarbonate (HCO3)	mg/l	152.701
Sulfate (SO4)	mg/l	3051.718
Chloride (Cl)	mg/l	14.008
pH	-log	7.035
pE	-log	5.245
pO_2	-log	34.000
pCO_2	-log	2.000
ARD added (Percent)		50.000
$Fe(OH)_{3a}$ precipitated (kg):		59,170.365
Calcite dissolved (kg):		543,688.794
Gypsum precipitated (kg):		1,221,524.884
NOTE: Equilibrium was imposed for CO_2, O_2, calcite and $Fe(OH)_3$. Equilibrium was imposed for gypsum after saturation was exceeded.		

TABLE 7.7: Simulated Solution Chemistry after 12 Scenario 3 - Unbuffered

Parameter	Units	Concentration
Calcium (Ca)	mg/l	647.399
Magnesium (Mg)	mg/l	155.271
Sodium (Na)	mg/l	456.848
Potassium (K)	mg/	15.350
Iron (Fe)	mg/l	0.003
Bicarbonate (HCO_3)	mg/l	153.380
Sulfate (SO_4)	mg/l	2,789.615
Chloride (Cl)	mg/l	180.042
pH	-log	7.028
pE	-log	5.252
pO_2	-log	34.000
pCO_2	-log	2.000
ARD added	Percent	22.074
Fe(OH)3 precipitated (kg):		16,325.674
Calcite precipitated (kg):		34,964.369
NOTE: Equilibrium was imposed for CO_2, O_2, calcite and $Fe(OH)_3$. In the 12th year, the solution was in equilibrium with gypsum.		

- Chemical Model 1: Unbuffered Mixing Model 2 (Table 7.4)
- Chemical Model 2: Mixing Model 2 Buffered by Fe(OH)3 (Table 7.5)
- Chemical Model 3: Mixing Model 2 Buffered by Calcite (Table 7.6)
- Chemical Model 4: Unbuffered Mixing Model 3 (Table 7.7)

The output of each chemical model was compared to water-quality analyses to determine the validity of the model with respect to the third calibration criterion. The water quality analysis most representative of average pit water is summarized in Table 7.8. Table 7.9 presents data that represent localized conditions that occur along the pit shore where pit water contains a high concentration of acid rock drainage from seepage after a precipitation event.

7.2.1.2. Calibration Results

Results of model calibration indicate that acid rock drainage constitutes an important source of sulfate to the existing pit water, but a high evaporation rate is necessary to concentrate the sulfate to observed levels without lowering solution pH. Specific results for each calibration model are discussed below:

- **Chemical Model 1 (rejected):**

The output for this model run is the result of several iterations. In the iterative process, the percent ARD was adjusted until the model simulated a sulfate concentration within the analytical range of 2700 to 2900 mg/l. Model results indicate that an ARD inflow of 22 percent would produce about 2800 mg/l of sulfate, which is within the analytical range for average pit conditions. However, the simulated pH for the unbuffered model is very much lower than any analyzed pH. For this reason, this run does not satisfy calibration criteria.

- **Chemical Model 2 (rejected):**

The second calibration model assumes the presence of amorphous ferric hydroxide in the system. Because this assumption contradicts the fourth calibration criterion, the second model cannot represent the pit as a whole. However, it may provide some insight into some localized conditions that have been observed along the pit shore. The output for this model was generated with a single run using an ARD inflow volume of 50 percent. This produced a sulfate concentration of only 2300 mg/l. Additional ARD would affect this value very little because the precipitation of gypsum and jarosite limit sulfate concentration. The simulated values of pH, calcium, bicarbonate and sulfate are all consistent with analytical values for pit shore samples. In addition, all precipitates simulated by this model have been observed locally within the pit.

- **Chemical Model 3 (rejected):**

The third calibration model assumes the presence of calcite within the system. This assumption is not realistic for the Copper Flat pit because the rocks at Copper Flat contain virtually no carbonate minerals. Nevertheless, this model is the only Scenario 2 model capable of generating sulfate concentrations above

TABLE 7.8: Average Pit Water Solution Chemistry Sample NLP 3m

Parameter	Units	Concentration
Calcium (Ca)	mg/l	650
Magnesium (Mg)	mg/l	230
Sodium (Na)	mg/l	290
Potassium (K)	mg/l	16
Iron (Fe)	mg/l	0.26
Bicarbonate (HCO_3)	mg/l	72
Sulfate (SO_4)	mg/l	2,700
Chloride (Cl)	mg/l	110
pH	-log	7.8

TABLE 7.9: Local Pit Water Solution Chemistry - Pit Shore Average

Parameter	Units	Concentration
Calcium (Ca)	mg/l	597
Magnesium (Mg)	mg/l	169
Sodium (Na)	mg/l	223
Potassium (K)	mg/l	13
Iron (Fe)	mg/l	0.2
Bicarbonate (HCO3)	mg/l	35
Sulfate (SO4)	mg/l	2,400
Chloride (Cl)	mg/l	76
pH	-log	4.4
NOTE: Average concentrations were weighted to reflect the lowest pH solution. This solution represents the greatest contribution of acid rock drainage.		

2500 mg/l at near neutral pH. This model was eliminated from further consideration because it did not satisfy the fourth calibration criterion. In addition, the calcium concentration simulated by the model is considerably lower than analytical values representing average pit water chemistry.

- **Chemical Model 4 (accepted):**

The fourth calibration model represents an evaporative system. The surface-inflow and evaporation rates for this model are consistent with climatological data from the Caballo Reservoir. The chemical model did not require the presence of any solid phases in the system and was able to generate sulfate, calcium and pH levels that were very close to analytical values. All calibration criteria were satisfied. This model required 22 percent ARD to establish observed sulfate concentrations.

7.2.2. Water-Quality Predictions

The geochemical model used to predict post-closure water quality in the proposed pit incorporated data from several sources. The assumptions and data employed by the predictive geochemical model are summarized below:

- The initial rate of groundwater inflow to the proposed pit is approximately 115 gpm based on the numerical groundwater flow model;
- The rate of groundwater inflow at a pit-water level of 5440 ft msl (pre-1982 water table) is 0.06 gpm;
- The surface area and volume of the pit lake are computed from pit-water level using pit-geometry functions determined from the design of the proposed pit under the reduced stripping alternative;
- The net evaporation rate (evaporation rate minus precipitation rate) is 5.92 ft/yr based on model calibration and Caballo Reservoir data;
- The surface runoff coefficient is 0.30 based on model calibration and independent surface-runoff calculations using the SCS Method;
- The precipitation rate is 0.83 ft/yr based on model calibration and Caballo Reservoir data;
- The surface-runoff catchment area for the proposed pit is 152 acres based on surface topography;
- The inflow rate from Greyback Wash is 77.4 gpm based on a hydrologic analysis of Greyback Gulch;
- All inflow from Greyback Wash was assumed to enter the pit without contacting acid-generating material;
- ARD (i.e. contact water) was assumed to comprise 25 percent of local surface runoff, and
- Waste rock piles were assumed to be uncovered.

The inflow rate of acid rock drainage for the existing pit was estimated to be approximately 22 percent of the surface runoff rate based on geochemical model calibration. In the proposed mine closure scenario, it is unlikely that the ARD content of surface water will exceed 25 percent. This assumption considers the following factors:

- Although surface inflow to the proposed pit may potentially contact more wall rock, the wall rock remaining after mine closure will likely have a much lower ARD potential than the wall rock in the existing pit;
- Observations made during site inspections indicate that most of the ARD in the existing pit is probably generated when surface runoff contacts highly reactive "transition" waste rock. The proposed mine closure plan minimizes the amount of this material exposed to runoff; and
- The proposed mine site will be reclaimed in a manner that will minimize surface water contact with sulfide-bearing material. The model assumes that the amount runoff contacting potentially acid-generating waste rock following closure will be similar to current conditions. Covering of the waste during mine closure should preclude surface water runoff from contacting waste rock in the disposal areas.
- 1996 field paste pH sampling of representative materials currently exposed in the pit walls indicate that approximately 25% of the material will generate low pH solutions when contacted by water (Figure 5.1).

Subsequent to model calibration, water-quality analyses were received for new monitor wells, which were drilled in proximity to the existing pit. For predictive simulations of pit water quality, the chemical composition of the Type 1 inflow was revised to be consistent with the water quality analysis for Well GWQ 96-22a (Table 7.10). This analysis was considered to be more representative of ground water in the vicinity of the mine pit.

Results of predictive simulations (Tables 7.11 and 7.12) indicate that the water quality in the proposed pit should be better than existing pit-water quality for about 120 years after mine closure. This improvement in water quality can be attributed to the proposed pit's relatively low ratio of surface area to volume. The best water quality can be obtained by diverting runoff from Greyback Wash into the proposed pit. The resulting dilution will tend to further offset the effects of evaporation. Figure 7.1 illustrates the time-dependent changes in sulfate concentration and pH for the post-closure scenario involving the diversion of Greyback Wash.

The results of the predictive geochemical model indicate a trend towards increasing sulfate concentration with time, and in the absence of inflow from Greyback Wash, a trend towards decreasing pH. These trends are considered to be realistic for the physical and geochemical environment analyzed. Although the long term trends and general behavior of pit lake geochemistry can be reasonably modeled, the estimate of precise values of simulated future concentrations may vary according to field conditions.

TABLE 7.10: Revised Solution Chemistry for Type 1 Inflow Ground Water

Parameter	Units	Concentration
Calcium (Ca)	mg/l	71.049
Magnesium (Mg)	mg/l	6.705
Sodium (Na)	mg/l	130.089
Potassium (K)	mg/l	2.502
Iron (Fe)	mg/l	< 0.001
Bicarbonate (HCO_3)	mg/l	135.092
Sulfate (SO_4)	mg/l	250.171
Chloride (Cl)	mg/l	89.061
pH	-log	7.500
pE	-log	5.071
pO_2	-log	32.836

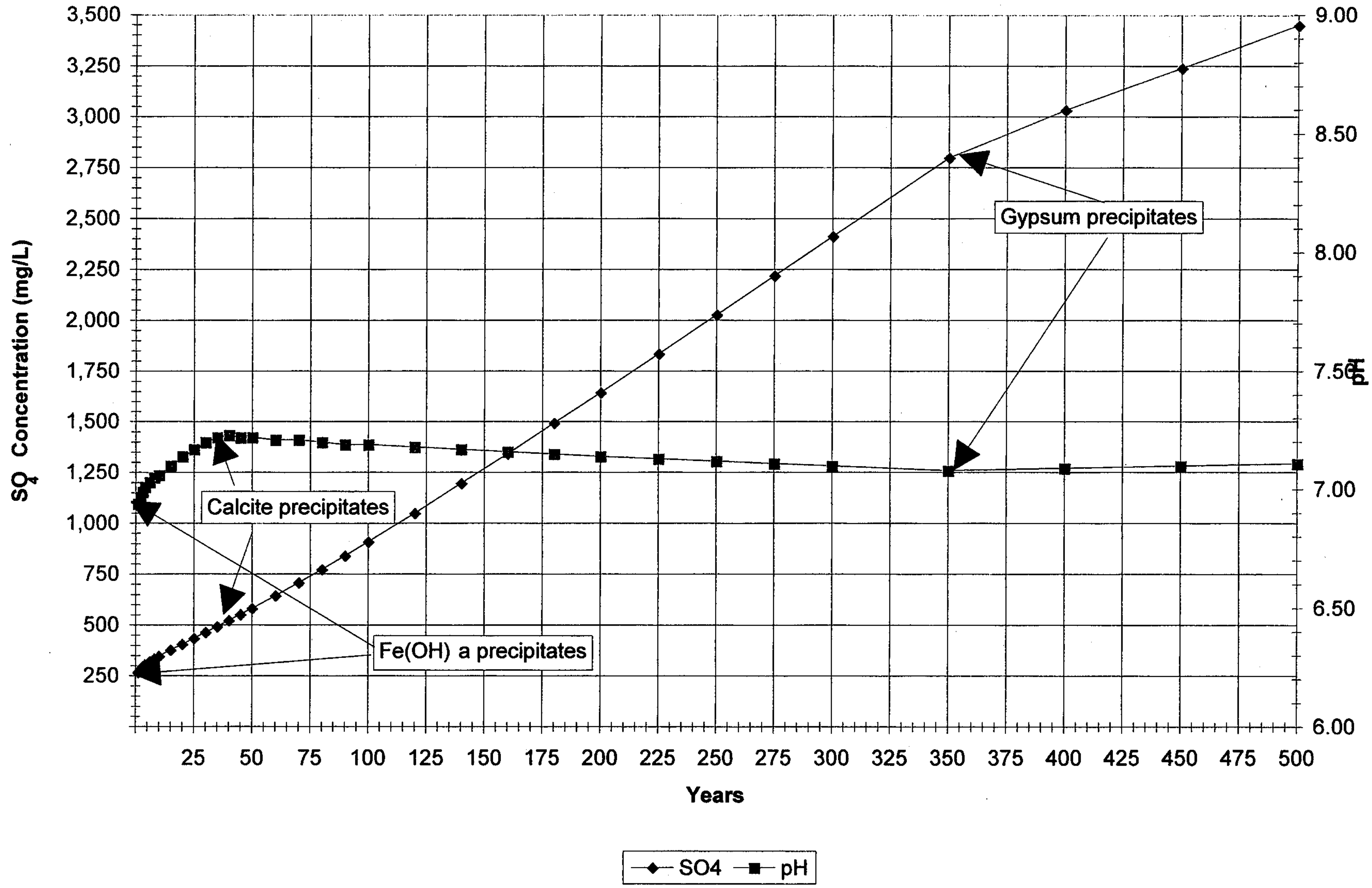
TABLE 7.11: Simulated Solution Chemistry after 120 Years Post Closure, Scenario 1 - Greyback Wash Diversion In Place

Parameter	Units	Concentration
Calcium (Ca)	mg/l	554.030
Magnesium (Mg)	mg/l	54.359
Sodium (Na)	mg/l	750.399
Potassium (K)	mg/l	17.260
Iron (Fe)	mg/l	1.303
Bicarbonate (HCO_3)	mg/l	20.487
Sulfate (SO_4)	mg/l	2,469.052
Chloride (Cl)	mg/l	500.622
pH	-log	3.885
pE	-log	8.395
pO_2	-log	34.000
pCO_2	-log	2.000
Na-Jarosite precipitated (kg):		336,526
Gypsum precipitated (kg):		264,744
NOTE: Equilibrium was imposed for CO_2, O_2, Na-jarosite, and gypsum.		

TABLE 7.12: Simulated Solution Chemistry after 120 Years Post Closure, Scenario 2 - Greyback Wash Diversion Removed

Parameter	Units	Concentration
Calcium (Ca)	mg/l	235.965
Magnesium (Mg)	mg/l	37.374
Sodium (Na)	mg/l	342.032
Potassium (K)	mg/l	10.494
Iron (Fe)	mg/l	0.002
Bicarbonate (HCO_3)	mg/l	192.112
Sulfate (SO_4)	mg/l	1,051.469
Chloride (Cl)	mg/l	187.301
pH	-log	7.177
pE	-log	5.104
pO_2	-log	34.000
pCO_2	-log	2.000
$Fe(OH)_{3a}$ precipitated (kg):		211,335
Calcite precipitated (kg):		1,540,726
NOTE: Equilibrium was imposed for CO_2, O_2, calcite and $Fe(OH)_3$.		

D:\SR\U857\Fig7-1.cdr



DATE: 4/12/96	PROJ. No. U857	COPPER FLAT	
SRK		Copper Flat Pit Water Chemistry Estimation 25% Acid Rock Drainage Case (Greyback diverted)	Figure 7.1

These variations may include ARD content, runoff coefficient, precipitation and evaporation. To assure conservative predictions, parameters were selected to favor low runoff, high evaporation and high ARD generation. These conditions over-predict solute concentrations.

7.3. Future Trends

In planning the future operating and closure activities to minimize geochemical impact of the operation on the environment, it should be noted that:

- As mining progresses the most acid producing material, the ore, will be removed and processed.
- It has been agreed already by Alta that the waste rock disposal areas will be covered by 12 inches of soil and revegetated to limit infiltration by water, reduce oxygen diffusion and reduce seepage from the pile to insignificant levels. Based on the geochemical work, this cover will be acceptable to reduce acid generation and leakage from the waste rock piles.

Based on the review of the historical data and the above geochemical model it is recommended that the Greyback Wash be diverted into the pit following cessation of mining. This dilution will occur only during high rainfall which is when acidic seepage would be greatest. The dilution will also assist in the lowering of sulfate levels in the pond.

The relatively high sulfate levels could be reduced by encouraging communities of Sulfate Reducing Bacteria in the pit. Desulfovibrio desulfuricans readily reduce sulfate to sulfide and can participate in secondary sulfide production (Kleinnman and Pacelli, 1991).

The mechanisms resulting in dissolved metal immobilization are two stages:

$$CH_2O + SO_4^{2-} = HS^- + HCO_3^-$$

where CH_2O is the labile organic material. Bisulfide is produced which reacts with dissolved metals (Me=divalent metal cation) by a mechanism such as:

$$Me^{2+} + HS^- = MeS_s + H^+$$

Organic carbon is replenished by annual growth of aquatic plants and degradation products. Cattails (*Typha laxifolia*) are currently established along the northern part of the pit). In the first few years while the community is immature it will be necessary to add a nutrient supplement such as sewage waste or the mulch produced by brewing or cider production. The local apple farms should be a good source of this material.

As a bi-product, bicarbonate is produced assisting in neutralizing any acid seepage. This mechanism has been used extensively in wetlands and treatment of heaps, waste rock piles and tailings effluent to remove pollutants (Klienmann and Pacilli, 1991; Bowell et al., 1996).

8 RECOMMENDATIONS

From the studies conducted at the site, an understanding of the geochemistry of the Copper Flat environment can be gained. During the operations at Copper Flat it will be useful to further validate the geochemical model discussed above through the use of field-sized kinetic test work.

From the hydrogeological studies undertaken by Adrian Brown it is known that the pit acts as a water sump with no outlet into ground water. Consequently, on closure the pit will refill. In order to prevent a long term build up of sulfate in the pit lake, the feasibility of in-situ sulfate reduction and/or continuous gypsum precipitation as possible reclamation options after closure should be investigated.

9 CONCLUSIONS

The mineralization at Copper Flat contains acid generating sulfide and sulfate minerals and acid consuming minerals such as carbonates, silicates and hydroxides.

From the static tests it can be observed that pyritic material in the waste rock, pit walls and tailings material have the potential to generate substantial acidity. However, some host rocks will consume significant levels of acidity.

Regional ground water is good quality and is well buffered with high alkalinity reflecting the dominance of dolomite and limestone country rocks.

Kinetic testing of acid generation reflects the high crystallinity of pyrite, the low humidity and high buffering potential of the Copper Flat environment. Test work demonstrates that acid generation is extremely slow and is more than compensated by rock buffering and ground water input.

The diversion of the Greyback Wash will assure in the long term, that pit water quality will remain good with well buffered water of reasonable quality. The dilution will reduce all constituents, except sulfate to below New Mexico human health and domestic use levels. The potential benefit of Sulfate Reducing Bacteria to water quality strongly supports the need for further investigation during operations.

The controlled precipitation of gypsum from pumped water from the tailings will assist management of the floatation circuit and provide an additional useful geological cover on closure. Field testing of this material should be undertaken during operations.

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T. Braun PE
Sr. Hydrogeologist

G.Mudder PE
Project Engineer

K.Peterson MSc PE
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Appendix A - Waste Rock Tests

ACZ LABORATORIES INC   DATA MANAGEMENT SYSTEM |
07/25/94   ANALYTICAL REPORT   12:36 |
Page 1

lient : Steffen Robertson and Kirsten
ddress : 3232 S. Vance St., Ste. 210
Lakewood, CO 80227
ttn. : Gene Muller
roject : 68605, Copper Flat

JUL 28 1994

ample Matrix: Waste Rock
ample ID: 68605, WD 1
ample Date Time: Unknown

Lab No. : 94 RT/00594
Date Received: 06/10/94

Parameters

Moisture %	0.2	%	
Phosphorus, total	0.01	%	
Aluminum, total	1890.	mg/kg	4
Antimony, total	-0.10	mg/kg	4
Arsenic, total	0.4	mg/kg	4
Barium, total	10.	mg/kg	4
Boron, total	-2.	mg/kg	4
Cadmium, total	-0.5	mg/kg	4
Calcium, total	700.	mg/kg	4
Chromium, total	-1.	mg/kg	4
Cobalt, total	11.	mg/kg	4
Copper, total	186.	mg/kg	4
Iron, total	41600.	mg/kg	4
Lead, total	2.	mg/kg	4
Magnesium, total	200.	mg/kg	4
Manganese, total	8.	mg/kg	4
Mercury, total	-0.02	mg/kg	4
Molybdenum, total	7.	mg/kg	4
Nickel, total	-2.	mg/kg	4
Potassium, total	1200.	mg/kg	4
Selenium, total	3.9	mg/kg	4
Silver, total	-1.	mg/kg	4
Sodium, total	200.	mg/kg	4
Vanadium, total	1.	mg/kg	4
Zinc, total	7.	mg/kg	4

4 EPA SW846, Method 3051 Digestion.

Remarks:

Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Project Manager

rank E. Polniak, Inorganic Laboratory Supervisor

Client : Steffen Robertson and Kirsten
Address : 3232 S. Vance St., Ste. 210
Lakewood, CO 80227
Attn. : Gene Muller
Project : 68605, Copper Flat

Sample Matrix: Waste Rock
Sample ID: 68605, PW-3
Sample Date Time: Unknown

Lab No. : 94-RT/00595
Date Received: 06/10/94

Parameters			
Moisture %	0.3	%	
Phosphorus, total	0.04	%	
Aluminum, total	2950.	mg/kg	4
Antimony, total	-0.10	mg/kg	4
Arsenic, total	1.9	mg/kg	4
Barium, total	24.	mg/kg	4
Boron, total	-2.	mg/kg	4
Cadmium, total	-0.5	mg/kg	4
Calcium, total	700.	mg/kg	4
Chromium, total	-1.	mg/kg	4
Cobalt, total	9.	mg/kg	4
Copper, total	226.	mg/kg	4
Iron, total	40800.	mg/kg	4
Lead, total	4.	mg/kg	4
Magnesium, total	800.	mg/kg	4
Manganese, total	39.	mg/kg	4
Mercury, total	-0.02	mg/kg	4
Molybdenum, total	57.	mg/kg	4
Nickel, total	3.	mg/kg	4
Potassium, total	1300.	mg/kg	4
Selenium, total	9.0	mg/kg	4
Silver, total	-1.	mg/kg	4
Sodium, total	200.	mg/kg	4
Vanadium, total	5.	mg/kg	4
Zinc, total	14.	mg/kg	4

4 EPA SW846, Method 3051 Digestion.

Remarks:

Note: Negative sign "-" denotes that the value is less than "<"

Scott Habermehl, Project Manager/SH.

Frank E. Polniak, Inorganic Laboratory Supervisor/FP

ACZ

Analytical Results

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Lab Sample ID: *L10307-12*
Client Sample ID: *P5-TTLS*
Client Project ID: *68610*
ACZ Report ID: *RG29617*

Steffen Robertson And Kirsten
7175 W. Jefferson Ave. Suite 3000
Lakewood, CO 80235
Tony Melon

Date Sampled: *7/8/96 00:00*
Date Received: *7/12/96*
Date Reported: *8/14/96*

Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Aluminum (1312-DI)	M6010 ICP	0.04	B	mg/L	0.03	0.2	8/12/96	rs
Antimony (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Arsenic (1312-DI)	M7060 GFAA		U	mg/L	0.001	0.006	7/18/96	sh
Barium (1312-DI)	M200.7 ICP	0.026		mg/L	0.003	0.01	8/12/96	rs
Boron (1312-DI)	M6010 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Cadmium (1312-DI)	M200.7 ICP		U	mg/L	0.003	0.02	8/12/96	rs
Calcium (1312-DI)	M200.7 ICP	177.0		mg/L	0.2	1	8/12/96	rs
Chromium (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Cobalt (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Copper (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs
Iron (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs
Lead (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Magnesium (1312-DI)	M200.7 ICP	12.4		mg/L	0.2	1	8/12/96	rs
Manganese (1312-DI)	M6010 ICP	0.157		mg/L	0.006	0.03	8/12/96	rs
Molybdenum (1312-DI)	M200.7 ICP	0.14		mg/L	0.01	0.06	8/12/96	rs
Nickel (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Potassium (1312-DI)	M200.7 ICP	10.9		mg/L	0.3	1	8/12/96	rs
Selenium, (1312-DI)	M7742 Modified, AA-Hydride	0.004	B	mg/L	0.001	0.005	7/22/96	rd
Silver (1312-DI)	M200.7 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Sodium (1312-DI)	M200.7 ICP	1.6		mg/L	0.3	1	8/12/96	rs
Vanadium (1312-DI)	M6010 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Zinc (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054	37		tons/KT	1	5	7/29/96	as
Acid Neutralization Potential	Calc. M600/2-78-054	26		tons/KT	1	5	7/29/96	as
Acid-Base Potential (calc)	M600/2-78-054 1.	-11		tons/KT	1	5	7/29/96	as
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	2.6		%	0.1	0.5	7/29/96	jm
Sulfur Forms	M600/2-78-054 3.2.4							
Sulfur Organic		0.29		%	0.01	0.1	7/27/96	jb
Sulfur Pyritic		0.53		%	0.01	0.1	7/27/96	jb
Sulfur Sulfate		0.37		%	0.01	0.1	7/27/96	jb
Sulfur Total		1.19		%	0.01	0.1	7/27/96	jb

Inorganic Qualifiers (based on EPA CLP 3/90)

= Analyte was analyzed for but not detected at the indicated MDL
B = Analyte concentration detected at a value between MDL and PQL
PQL = Practical Quantitation Limit

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Tony Melon

Lab Sample ID: *L10307-11*
Client Sample ID: *P4-UTLS*
Client Project ID: *68610*
ACZ Report ID: *RG29616*

Date Sampled: *7/8/96 00:00*
Date Received: *7/12/96*
Date Reported: *8/14/96*

Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Aluminum (1312-DI)	M6010 ICP	0.05	B	mg/L	0.03	0.2	8/12/96	rs
Antimony (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Arsenic (1312-DI)	M7060 GFAA		U	mg/L	0.001	0.006	7/18/96	sh
Barium (1312-DI)	M200.7 ICP	0.019		mg/L	0.003	0.01	8/12/96	rs
Boron (1312-DI)	M6010 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Cadmium (1312-DI)	M200.7 ICP		U	mg/L	0.003	0.02	8/12/96	rs
Calcium (1312-DI)	M200.7 ICP	60.4		mg/L	0.2	1	8/12/96	rs
Chromium (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Cobalt (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Copper (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Iron (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs
Lead (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Magnesium (1312-DI)	M200.7 ICP	6.4		mg/L	0.2	1	8/12/96	rs
Manganese (1312-DI)	M6010 ICP	0.013	B	mg/L	0.006	0.03	8/12/96	rs
Molybdenum (1312-DI)	M200.7 ICP	0.10		mg/L	0.01	0.06	8/12/96	rs
Nickel (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Potassium (1312-DI)	M200.7 ICP	6.8		mg/L	0.3	1	8/12/96	rs
Selenium, (1312-DI)	M7742 Modified, AA-Hydride	0.003	B	mg/L	0.001	0.005	7/22/96	rd
Silver (1312-DI)	M200.7 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Sodium (1312-DI)	M200.7 ICP	3.2		mg/L	0.3	1	8/12/96	rs
Vanadium (1312-DI)	M6010 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Zinc (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054	42		tons/KT	1	5	7/29/96	as
Acid Neutralization Potential	Calc. M600/2-78-054	25		tons/KT	1	5	7/29/96	as
Acid-Base Potential (calc)	M600/2-78-054 1.	-17		tons/KT	1	5	7/29/96	as
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	2.5		%	0.1	0.5	7/29/96	jm
Sulfur Forms	M600/2-78-054 3.2.4							
Sulfur Organic		0.41		%	0.01	0.1	7/27/96	jb
Sulfur Pyritic		0.46		%	0.01	0.1	7/27/96	jb
Sulfur Sulfate		0.47		%	0.01	0.1	7/27/96	jb
Sulfur Total		1.34		%	0.01	0.1	7/27/96	jb

Inorganic Qualifiers (based on EPA CLP 3/90)

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B = Analyte concentration detected at a value between MDL and PQL
PQL = Practical Quantitation Limit

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Vice President of Operations: Ralph Poulsen

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Lab Sample ID:	*L10307-10*
Client Sample ID:	*P3-UTLS*
Client Project ID:	*68610*
ACZ Report ID:	*RG29615*
Date Sampled:	*7/8/96 00:00*
Date Received:	*7/12/96*
Date Reported:	*8/14/96*
Sample Matrix:	*Soil*

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7175 W. Jefferson Ave. Suite 3000
Lakewood, CO 80235
Tony Melon

Metals Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Aluminum (1312-DI)	M6010 ICP	0.12	B	mg/L	0.03	0.2	8/12/96	rs
Antimony (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Arsenic (1312-DI)	M7060 GFAA		U	mg/L	0.001	0.006	7/18/96	sh
Barium (1312-DI)	M200.7 ICP	0.023		mg/L	0.003	0.01	8/12/96	rs
Boron (1312-DI)	M6010 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Cadmium (1312-DI)	M200.7 ICP		U	mg/L	0.003	0.02	8/12/96	rs
Calcium (1312-DI)	M200.7 ICP	14.9		mg/L	0.2	1	8/12/96	rs
Chromium (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Cobalt (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Copper (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Iron (1312-DI)	M200.7 ICP	0.02	B	mg/L	0.01	0.06	8/12/96	rs
Lead (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Magnesium (1312-DI)	M200.7 ICP	0.8	B	mg/L	0.2	1	8/12/96	rs
Manganese (1312-DI)	M6010 ICP	0.010	B	mg/L	0.006	0.03	8/12/96	rs
Molybdenum (1312-DI)	M200.7 ICP	0.06		mg/L	0.01	0.06	8/12/96	rs
Nickel (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Potassium (1312-DI)	M200.7 ICP	8.2		mg/L	0.3	1	8/12/96	rs
Selenium (1312-DI)	M7742 Modified, AA-Hydride	0.003	B	mg/L	0.001	0.005	7/22/96	rd
Silver (1312-DI)	M200.7 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Sodium (1312-DI)	M200.7 ICP	6.0		mg/L	0.3	1	8/12/96	rs
Vanadium (1312-DI)	M6010 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Zinc (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054	44		tons/KT	1	5	7/29/96	as
Acid Neutralization Potential	Calc. M600/2-78-054	23		tons/KT	1	5	7/29/96	as
Acid-Base Potential (calc)	M600/2-78-054 1.	-21		tons/KT	1	5	7/29/96	as
Neutralization Potential as CaCO3	M600/2-78-054 3.2.3	2.3		%	0.1	0.5	7/29/96	jm
Sulfur Forms	M600/2-78-054 3.2.4							
Sulfur Organic		0.45		%	0.01	0.1	7/27/96	jb
Sulfur Pyritic		0.69		%	0.01	0.1	7/27/96	jb
Sulfur Sulfate		0.26		%	0.01	0.1	7/27/96	jb
Sulfur Total		1.40		%	0.01	0.1	7/27/96	jb

Inorganic Qualifiers (based on EPA CLP 3/90)

U = Analyte was analyzed for but not detected at the indicated MDL
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PQL = Practical Quantitation Limit

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Vice President of Operations: Ralph Poulsen

Analytical Results

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Lab Sample ID: *L10307-09*
Client Sample ID: *P2-UTLS*
Client Project ID: *68610*
ACZ Report ID: *RG29614*

Date Sampled: *7/8/96 00:00*
Date Received: *7/12/96*
Date Reported: *8/14/96*

Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Aluminum (1312-DI)	M6010 ICP	0.05	B	mg/L	0.03	0.2	8/12/96	rs
Antimony (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Arsenic (1312-DI)	M7060 GFAA		U	mg/L	0.001	0.006	7/18/96	sh
Barium (1312-DI)	M200.7 ICP	0.024		mg/L	0.003	0.01	8/12/96	rs
Boron (1312-DI)	M6010 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs
Cadmium (1312-DI)	M200.7 ICP		U	mg/L	0.003	0.02	8/12/96	rs
Calcium (1312-DI)	M200.7 ICP	216.0		mg/L	0.2	1	8/12/96	rs
Chromium (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs
Cobalt (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Copper (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs
Iron (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs
Lead (1312-DI)	M200.7 ICP		U	mg/L	0.02	0.1	8/12/96	rs
Magnesium (1312-DI)	M200.7 ICP	10.4		mg/L	0.2	1	8/12/96	rs
Manganese (1312-DI)	M6010 ICP	0.084		mg/L	0.006	0.03	8/12/96	rs
Molybdenum (1312-DI)	M200.7 ICP	0.09		mg/L	0.01	0.06	8/12/96	rs
ickel (1312-DI)	M200.7 ICP		U	mg/L	0.01	0.06	8/12/96	rs
Potassium (1312-DI)	M200.7 ICP	13.1		mg/L	0.3	1	8/12/96	rs
Selenium (1312-DI)	M7742 Modified, AA-Hydride	0.003	B	mg/L	0.001	0.005	7/22/96	rd
Silver (1312-DI)	M200.7 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Sodium (1312-DI)	M200.7 ICP	7.9		mg/L	0.3	1	8/12/96	rs
Vanadium (1312-DI)	M6010 ICP		U	mg/L	0.006	0.03	8/12/96	rs
Zinc (1312-DI)	M200.7 ICP	0.01	B	mg/L	0.01	0.06	8/12/96	rs

Soil Analysis

Parameter	EPA Method	Result	Qual	Units	MDL	PQL	Date	Analyst
Acid Generation Potential	Calc. M600/2-78-054	34		tons/KT	1	5	7/29/96	as
Acid Neutralization Potential	Calc. M600/2-78-054	27		tons/KT	1	5	7/29/96	as
Acid-Base Potential (calc)	M600/2-78-054 1.	-7		tons/KT	1	5	7/29/96	as
Neutralization Potential as $CaCO_3$	M600/2-78-054 3.2.3	2.7		%	0.1	0.5	7/29/96	jm
Sulfur Forms	M600/2-78-054 3.2.4							
Sulfur Organic		0.21		%	0.01	0.1	7/27/96	jb
Sulfur Pyritic		0.43		%	0.01	0.1	7/27/96	jb
Sulfur Sulfate		0.46		%	0.01	0.1	7/27/96	jb
Sulfur Total		1.10		%	0.01	0.1	7/27/96	jb

norganic Qualifiers (based on EPA CLP 3/90)

= Analyte was analyzed for but not detected at the indicated MDL
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PQL = Practical Quantitation Limit

Ralph V. Poulsen
Vice President of Operations: Ralph Poulsen

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TECHNICAL MEMORANDUM

TO: Steve Raugust, New Mexico Copper Corporation

COPY TO: Ann Carpenter, Remote Energy Solutions

FROM: Rob Bowell, Ruth Warrender, Amy Prestia **DATE:** 06 December 2010

SUBJECT: **Copper Flat Static Testwork Summary and Kinetic Test Recommendations**

1. INTRODUCTION

SRK Consulting has undertaken a geochemical characterization study to assess the Acid Rock Drainage and Metal Leaching (ARDML) potential of the Copper Flat deposit, New Mexico. This memorandum details the results of the initial characterization of the collected materials and includes recommendations for additional kinetic testwork.

A total of 74 representative grab and core samples were collected by SRK during a site visit in April 2010. A sample matrix summarising the main material types (as defined by rock and alteration type) is provided in Table 1. The collected samples were subject to a number of static geochemical tests in order to characterize the nature of materials on site and to determine their potential for ARDML generation. This included Multi Element Analysis, Acid Base Accounting (ABA), Net Acid Generation (NAG) testing and an assessment of the potential short-term metal mobility (MWMP testing). A summary of the methods used and the results of this testwork are provided below. In addition, the complete geochemical database detailing the results of the ARDML assessment has been included as an attachment to this memorandum.

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Offices in:
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Asia
Australia
North America
South America
United Kingdom

Table 1: Details of samples collected for the ARDML assessment

Lithology	**Alteration**	**ABA/NAG/Multi-Element**			**MWMP**		
		Drillcore	Grab	Total	Drillcore	Grab	Total
Dolerite	Propylitic		2	**2**		2	**2**
Andesite	Propylitic		4	**4**		2	**2**
Quartz Monzonite	Argillic	6	2	**8**	3	2	**5**
	Biotite	3	1	**4**	1	1	**2**
	Leach Cap	5	4	**9**	2	2	**4**
	Potassic	6		**6**	3		**3**
	Propylitic	3		**3**	1		**1**
	Quartz Sericite	5	4	**9**	2	2	**4**
Quartz Monzonite Breccia	Argillic	5	1	**6**	2	1	**3**
	Biotite	6		**6**	2		**2**
	Leach Cap	2	1	**3**	1	1	**2**
	Potassic	2	1	**3**	2	1	**3**
	Propylitic	4		**4**	3		**3**
	Quartz	3		**3**	2		**2**
Tailings	-		4	**4**		2	**2**
Total		**50**	**24**	**74**	**24**	**16**	**40**

2. MULTI-ELEMENT ANALYSIS

Multi-element analysis was carried out to allow comprehensive geochemical characterisation of the 74 samples. The analysis was carried out by ALS Chemex, Reno, Nevada and involved a strong multi-acid digestion followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) analysis. This included determination of major elements (e.g. aluminium, calcium, magnesium, sodium, potassium, iron, sulfur) and trace elements (e.g. zinc, copper, cadmium, lead).

The data were analyzed using the Geochemical Abundance Index (GAI) (INAP, 2002), which compares the concentration of an element in a given sample to its average crustal abundance. GAI values are particularly useful in determining the relative enrichment of elements based on lithology and may be used to identify elements enriched above average crustal concentrations (‘ECA elements’). GAI values were calculated as follows:

$$GAI = \log_2 [C/(1.5*S)]$$

Where C is the concentration of an element as determined from the WRA and S is the average crustal abundance of the element of interest (Mason, 1966). Materials are then assigned a GAI value between zero and six based on the degree of enrichment (Table 2). According to the INAP (2002) protocol, a GAI value greater than three indicates significant enrichment.

Table 2: Interpretation of GAI values for WRA data

GAI Value	Interpretation
0	<3 times average crustal concentration
1	3 to 6 times average crustal concentration
2	6 to 12 times average crustal concentration
3	12 to 24 times average crustal concentration
4	24 to 48 times average crustal concentration
5	48 to 96 times average crustal concentration
6	>96 times average crustal concentration

The results of the multi-element analysis are provided in full in the attached database and are summarized in Table 3. The results show that all material types are characterized by elevated concentrations of silver, cadmium, copper, molybdenum, rhenium, sulfur, selenium, tellurium and tungsten, with GAI values between 1 and 6 representing up to 96 times enrichment of average crustal concentrations. Copper concentrations were elevated up to 1 wt% in the samples and sulfur concentrations reached 3.34 wt%, with particular enrichment occurring in the Argillic Breccia and the Breccia-Leach Cap materials. These elevated concentrations are associated with the sulfide mineralization, whilst the elevated concentrations of molybdenum, silver, rhenium, arsenic and zinc in the materials can be explained by the common association of these elements with porphyry copper deposits (Rose, Hawkes and Webb, 1979). The leachability of ECA elements from the material types will be examined from metal mobility (MWMP) tests, which will account for site-specific factors affecting mineral solubility.

Table 3: Summary of Multi Element Analysis Results

	#	Multi Element Anlysis - average concentrations per lithology/alteration type (mg/kg)																			
		Ag	**As**	**Bi**	**Ca**	**Cd**	**Cs**	**Cu**	**Mo**	**Pb**	**Rb**	**Re**	**S**	**Sb**	**Se**	**Te**	**Th**	**Tl**	**U**	**W**	**Zn**
Average crustal abundance (mg/kg)		*0.07*	*1.8*	*0.2*	*36,300*	*0.2*	*3*	*55*	*1.5*	*13*	*90*	*0.001*	*260*	*0.2*	*0.05*	*0.01*	*7.2*	*0.5*	*1.8*	*1.5*	*70*
Andesite - Propylitic	4	0.3	0.9	0.6	39,650	0.6	6.4	217	5.4	8.7	138	0.005	925	0.4	2.0	0.2	6.4	1.3	2.1	2.2	60
Breccia - Argillic	6	3.8	10.9	1.8	10,400	1.0	7.4	3,882	197	127.6	225	0.287	17,267	0.6	4.3	0.8	22.3	1.7	5.8	9.5	134
Breccia - Biotite	6	2.3	6.5	1.3	10,700	1.0	10.2	2,701	38	39.2	222	0.061	16,950	0.4	3.3	0.6	26.3	1.7	8.4	7.1	133
Breccia - Leach Cap	3	4.3	18.7	1.6	4,533	2.9	12.2	4,000	88	90.8	211	0.145	23,333	2.7	4.0	0.8	29.2	2.1	6.7	6.5	316
Breccia - Potassic	3	1.9	28.3	0.8	15,333	0.9	7.4	2,549	162	25.5	216	0.241	16,567	0.8	4.3	0.2	20.1	2.0	6.7	9.8	108
Breccia - Propylitic	4	5.2	3.6	9.2	12,725	2.5	16.3	4,796	308	46.9	245	0.269	17,250	0.4	5.0	1.3	38.0	1.9	4.3	8.6	337
Breccia - Quartz	3	4.0	24.7	1.3	11,967	1.0	7.7	4,580	114	69.9	245	0.096	14,000	0.8	4.0	0.4	26.4	1.7	10.1	8.7	127
Dolerite - Propylitic	2	0.2	0.4	0.0	58,550	2.3	6.5	1,664	4.4	6.1	62	0.028	1,350	0.2	2.5	0.1	4.7	0.3	4.9	1.0	213
Quartz Monzonite - Argillic	8	2.4	1.6	1.1	13,563	1.1	9.8	2,480	54	72.4	242	0.050	9,213	0.4	3.1	0.3	21.2	1.8	5.0	11.9	146
Quartz Monzonite - Biotite	4	1.0	1.1	0.5	4,900	0.8	7.8	1,734	109	43.7	270	0.133	6,225	0.2	2.0	0.1	31.8	1.9	8.6	8.4	119
Quartz Monzonite - Leach Cap	9	3.0	1.9	2.1	11,811	1.6	8.7	3,784	47	63.8	264	0.055	9,267	0.5	3.6	0.7	23.6	1.8	6.2	12.2	181
Quartz Monzonite - Potassic	6	1.3	1.3	1.0	14,467	0.6	8.5	1,788	52	38.1	227	0.065	8,700	0.3	2.5	0.2	21.7	1.4	5.7	9.2	96
Quartz Monzonite - Propylitic	3	0.7	1.4	0.5	21,100	1.3	13.0	856	20	29.5	216	0.017	5,167	0.3	1.0	0.1	11.5	1.2	3.6	5.6	186
Quartz Monzonite - Quartz Sericite	9	1.1	1.2	0.8	11,278	0.2	6.9	1,407	143	31.6	250	0.072	14,311	0.3	3.0	0.2	17.6	1.6	5.1	9.1	47
Tailings-North Dam	2	1.3	5.1	1.6	16,400	0.4	8.9	1,175	44	28.9	286	0.062	13,100	0.4	3.5	0.4	25.4	2.1	7.5	9.7	69
Tailings - South Dam	2	0.1	6.0	0.3	168,500	0.1	5.7	53	1	12.3	73	0.002	400	0.4	1.5	0.1	6.5	0.6	4.1	1.6	53
Average (all lithologies)	74	2.2	5.6	1.6	18,980	1.1	8.9	2,489	92	51.4	226	0.099	11,458	0.5	3.2	0.4	21.6	1.6	5.9	8.6	140

# = number of samples representing material type
GAI = 0 represents < 3 times average crustal concentrations
GAI = 1 represents 3 to 6 times average crustal concentrations
GAI = 2 represents 6 to 12 times average crustal concentrations
GAI = 3 represents 12 to 24 times average crustal concentrations
GAI = 4 represents 24 to 48 times average crustal concentrations
GAI = 5 represents 48 to 96 times average crustal concentrations
GAI = 6 represents greater than 86 times average crustal concentrations

3. ACID BASE ACCOUNTING

Acid Base Accounting (ABA) testwork was carried out by SVL laboratories using a modified Sobek method. The testwork was carried out in order to evaluate the acid generating (AP) based on speciated sulfur analysis and neutralizing potential (NP) of the samples was determined by using the modified Sobek protocol that includes a digestion to expel any CO_2 followed by a back titration with NaOH to a pH of 8.3 s.u.

The balance between the acid generating mineral phases and acid neutralizing mineral phases is referred to as the net neutralization potential (NNP), which is equal to the difference between NP and AP. The NNP allows classification of the samples as potentially acid consuming or acid producing. A positive value of NNP indicates the sample neutralizes more acid than is produced during oxidation. A negative NNP value indicates there are more acid producing constituents than acid neutralizing constituents. Material that would be considered to have a high potential for acid neutralization produce a net neutralizing potential of greater than 20 eq. kg $CaCO_3$/ton. Acid Base Accounting data is also described using the neutralization potential ratio, which is calculated by dividing the NP by the AP (i.e., NP:AP).

Acid Base Accounting results are typically compared to criteria provided by the BLM (2004) in order to determine the potential for the waste rock material to generate acid. The Nevada BLM Water Resource Data and Analysis Guide for Mining Activities (BLM 2004) establishes the following guidelines for the evaluation of ABA test results:

- NP:AP values greater than 3 and NNP values greater than 20 eq. kg CaCO3/ton are not acid generating and do not require further testing; and
- NP:AP values less than 3 and/or NNP values less than 20 eq. kg CaCO3/ton have uncertain potential and require further evaluation using kinetic test methods.

The criteria used for the assessment of acid generation for Copper Flat materials are outlined in Table 4.

Table 4: Interpretation of Copper Flat ABA data

	NNP (kg $CaCO_3$ eq/t)	NPR
Potentially Acid Forming (PAF)	NNP < -20	NPR < 1
Non Acid Forming (NAF)	NNP > +20	NPR > 3
Area of Uncertainty	NNP between -20 and +20	NPR between 1 and 3

The ABA testwork results for the Copper Flat samples are provided in full in the attached database and are summarized in Table 5. The samples were found to have an average acid generating potential of 27.7 kg $CaCO_3$ eq/t and an average neutralizing potential of 24 kg $CaCO_3$ eq/t, indicating a slight surplus of acidity in the samples. This is supported by Figure 1, which shows the samples generally tend towards net acid generating rather than net neutralising. A scatter plot comparing the acid generating and neutralizing potential of the samples as a function of material type is given in Figure 2. This demonstrates that the samples are variable in terms of their acid generating potential. Fifty-four percent of samples exhibited potentially acid forming (PAF) characteristics based on NPR values less than 1 (Figure 2). This included all samples of Biotite Breccia, Breccia-Leach Cap, Argillic Breccia, Quartz Breccia, Quartz Monzonite–Leach Cap and Quartz Monzonite–Biotite materials. In contrast, the propylitically altered materials (Andesite – Propylitic, Breccia – Propylitic, Dolerite – Propylitic and Quartz Monzonite – Propylitic) generally exhibited non-acid forming (NAF) characteristics based on NPR values greater than 3.

Figure 3 shows that the net neutralizing capacity of the Copper Flat samples is largely dependent on the sulfide sulfur content of the materials. Samples with a high sulfide sulfur content (up to 2.52 wt%) are generally characterized by a lower net neutralizing potential.

Table 5: Summary of Acid Base Accounting results

Lithology	Alteration	#	Sulfide sulfur (wt%)	AP ($CaCO_3$ eq/t)		NP ($CaCO_3$ eq/t)		NNP ($CaCO_3$ eq/t)		NPR	
				Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Andesite	Propylitic	4	0.08	2.50	4.40	23.8	1.58	21.5	6.04	61.9	39.7
Breccia	Argillic	6	1.39	43.4	19.3	23.7	12.3	-19.7	12.7	0.54	0.22
Breccia	Biotite	6	1.35	42.3	19.2	24.6	7.11	-17.7	26.2	0.76	0.50
Breccia	Leach cap	3	1.84	57.4	21.8	14.7	4.66	-42.7	26.0	0.31	0.25
Breccia	Potassic	3	1.17	36.6	9.89	35.0	13.4	-1.57	23.2	1.09	0.76
Breccia	Propylitic	4	1.46	45.6	23.7	34.8	5.80	-10.8	27.1	1.01	0.65
Breccia	Quartz	3	1.00	31.3	4.15	28.6	1.55	-2.73	3.88	0.92	0.10
Dolerite	Propylitic	2	0.02	0.60	0.42	44.4	49.1	43.9	49.8	137	179
Quartz monzonite	Argillic	8	0.66	20.6	13.9	19.9	10.21	-0.74	16.6	1.41	1.09
Quartz monzonite	Biotite	4	0.43	13.3	3.54	5.88	1.79	-7.40	2.93	0.45	0.13
Quartz monzonite	Leach cap	9	0.63	19.8	10.9	19.8	22.4	-0.01	21.8	3.93	8.95
Quartz monzonite	Potassic	6	0.62	19.5	7.30	26.4	13.9	6.97	18.6	1.77	1.52
Quartz monzonite	Propylitic	3	0.45	14.1	1.25	41.5	3.77	27.4	3.16	2.96	0.22
Quartz monzonite	Quartz sericite	9	1.07	33.3	22.0	21.0	19.1	-12.4	37.5	1.07	1.06
All lithologies		**74**	**0.86**	**27.7**	**19.8**	**24.0**	**62.9**	**6.92**	**70.4**	**43.3**	**217**

\# Number of samples representing material type
🟥 Potentially acid forming (PAF)
🟨 Potentially acid forming (lower capacity)
🟩 Non Acid Forming (NAF)

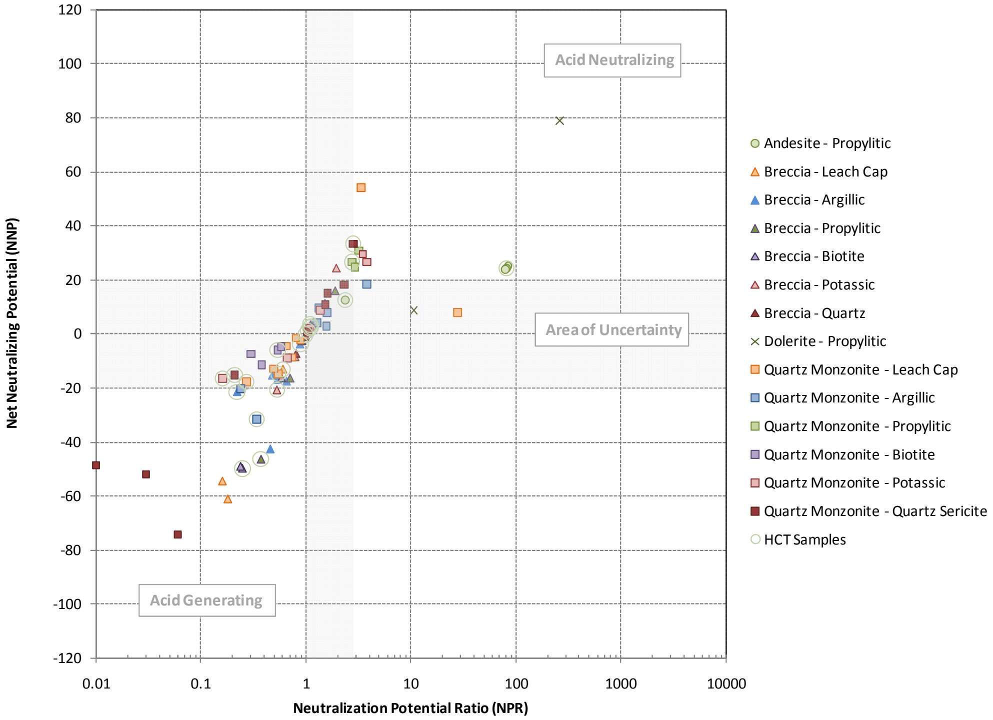

Figure 1: Neutralization Potential Ratio (NPR) vs. Net Neutralizing Potential (NNP)

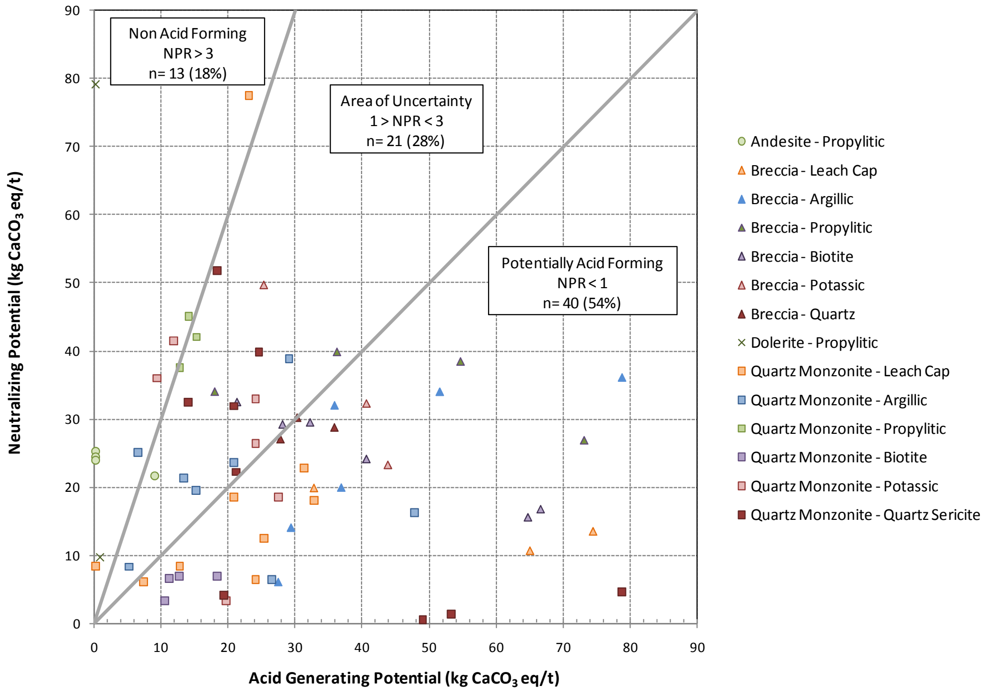

Figure 2: Scatter Plot of Acid Generating Potential vs. Neutralizing Potential

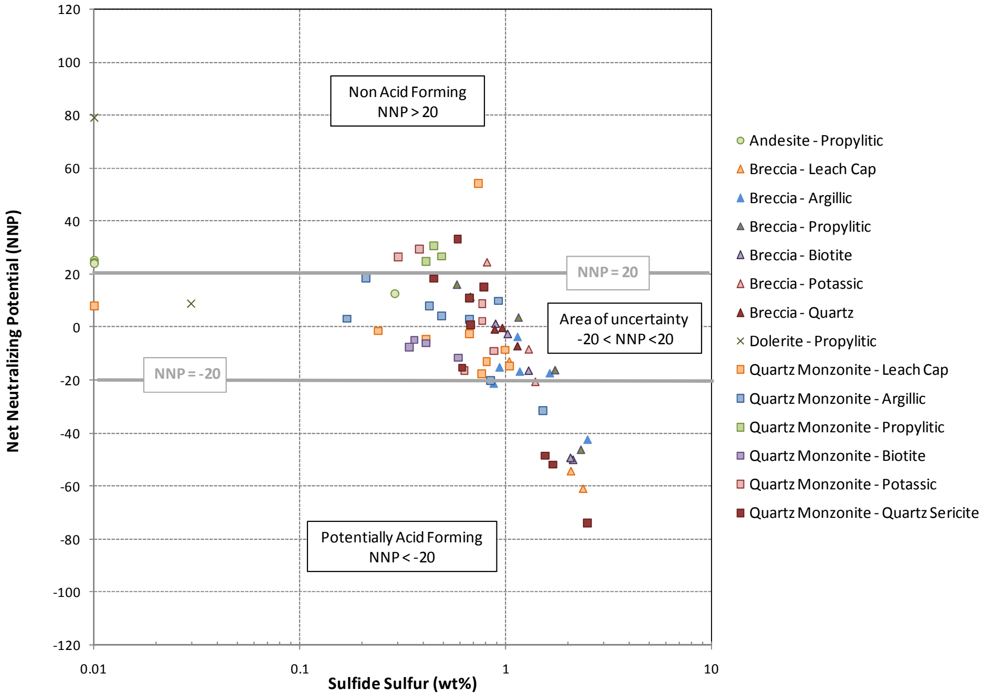

Figure 3: Scatter Plot of Sulfide Sulfur vs. Net Neutralizing Potential (NNP)

4. STATIC NAG TESTING

Static Net Acid Generation (NAG) testwork was carried out in order to determine the maximum potential for acid generation from the Copper Flat samples. The static NAG test differs from the ABA test in that it provides a direct empirical estimate of the overall sample reactivity, including any acid generated by semi-soluble sulfate minerals (i.e., jarosite) as well as other potentially acid-generating sulfate and sulfide minerals. As such, the NAG test often provides a better estimate of field acid generation than the more widely-used ABA method, which defines acid potential based solely on sulfide content.

NAG testing was carried out by SVL laboratories in accordance with the method described by Miller et al. (1997). The method essentially involved intensive oxidation of the sample using hydrogen peroxide (H_2O_2), which accelerates the dissolution of sulfide minerals and has the net result that acid production and neutralisation can be measured directly.

The leachate was then titrated with sodium hydroxide in two stages (to pH 4.5 and to pH 7) to determine the NAG value, which was calculated as follows:

$$NAG = (V_{Init} / X)\ (49 * V_{NaOH} * M) / W$$

Where:
NAG = net acid generation (kg H2SO4/tonne);
V_{Init} = volume of initial hydrogen peroxide solution (mL);
X = volume used to determine NAG by titration (mL);
V_{NaOH} = volume of NaOH used in titration (mL);
M = concentration of NaOH used in titration (moles/litre); and
W = weight of sample reacted (g).

In general a NAG pH less than 4.5 and a NAG value greater than 5 kg H_2SO_4 per tonne are indicative of a potentially acid forming material.

The static NAG data for the Copper Flat samples are provided in full in the attached database and are summarized in Table 6. A scatter plot comparing NAG pH with net acid generation (in kg H_2SO_4 equivalents per ton) according to material type is given in Figure 4. Most material types were found to be characterized by a NAG pH greater than 4.5 and a NAG value of zero, indicating that they are unlikely to be problematic in terms of long-term acid generation. However, several material types were characterized by lower NAG pH values (2.26 – 3.76 s.u.) and indicated the potential to generate up to 44 kg H_2SO_4 per ton. In particular the Breccia-Leach Cap and the Quartz Monzonite-Quartz Sericite materials can be classified as higher capacity PAF materials based on static NAG values generally greater than 20 kg H_2SO_4 eq/t. In addition, two samples of Biotite Breccia material and two samples of Argillic Breccia material exhibited higher capacity PAF characteristics based on a NAG pH between 2.98 and 3.77 s.u. and static NAG values up to 20.5 kg H_2SO_4 eq/t. The Quartz Monzonite-Biotite material exhibited lower capacity PAF characteristics based on NAG values between 5 and 10 kg H_2SO_4 eq/t.

Comparison of ABA and static NAG testwork results suggests that sulfide sulfur content is not the sole control on the acid generating potential of the Copper Flat materials; the net neutralizing potential (NNP) of the materials was also found to influence the long-term potential for acid generation (see Figure 5 and Figure 6). Samples with a high sulfide sulfur content and high NNP were generally found to be non-acid forming based on NAG testwork results, whereas samples with a low NNP were generally found to show a greater potential for acid formation (Figure 5).

Table 6: Summary of Static NAG results

Lithology	Alteration	#	NAG pH		NAG value (kg H_2SO_4 eq/t)	
			Mean	S.D.	Mean	S.D.
Andesite	Propylitic	4	6.50	2.23	1.23	2.45
Breccia	Argillic	6	6.60	2.52	4.74	7.62
Breccia	Biotite	6	6.61	2.71	6.29	9.79
Breccia	Leach cap	3	2.98	0.20	19.5	9.27
Breccia	Potassic	3	7.50	2.14	0	0
Breccia	Propylitic	4	7.53	2.22	0	0
Breccia	Quartz	3	8.62	0.59	0	0
Dolerite	Propylitic	2	8.69	1.94	0	0
Quartz monzonite	Argillic	8	7.70	2.57	1.13	3.19
Quartz monzonite	Biotite	4	4.88	2.38	4.07	2.73
Quartz monzonite	Leach cap	9	6.69	2.01	0.75	2.25
Quartz monzonite	Potassic	6	8.01	2.17	0	0
Quartz monzonite	Propylitic	3	8.37	0.20	0	0
Quartz monzonite	Quartz sericite	9	5.84	3.19	14.2	19.3
Tailings - North Dam	-	2	8.78	0.33	0	0
Tailings - South Dam	-	2	10.32	0.87	0	0
All lithologies		**74**	**6.96**	**2.50**	**3.91**	**9.33**

#	Number of samples representing material type
🟥	Potentially Acid Forming (PAF)
🟨	Potentially Acid Forming Lower Capacity

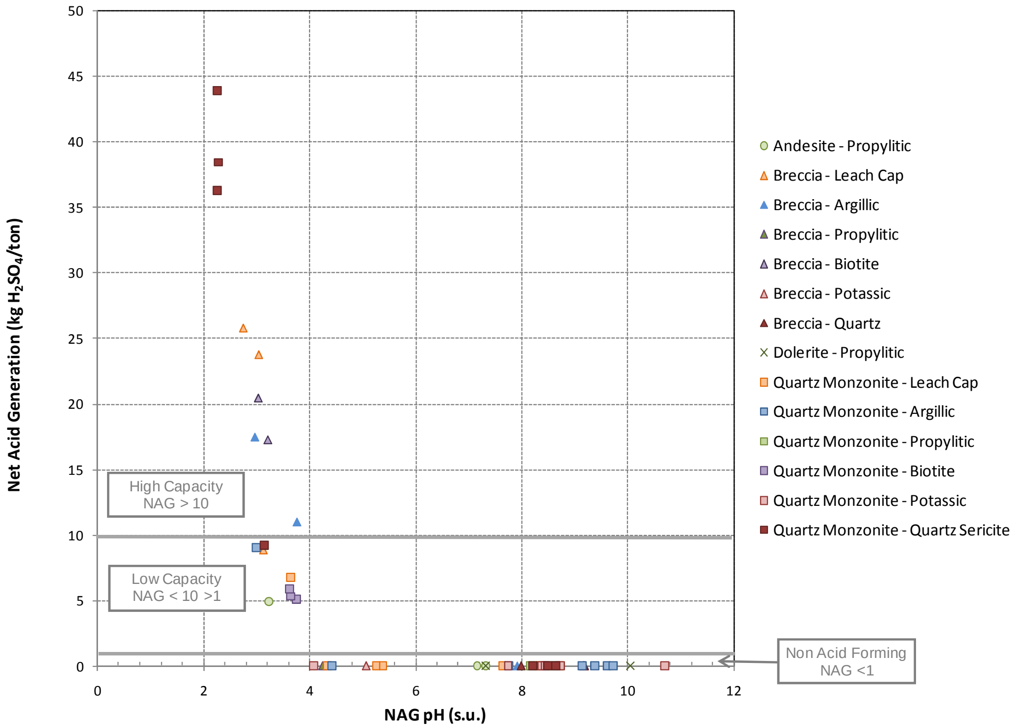

Figure 4: Scatter Plot of NAG pH vs. Net Acid Generation Potential

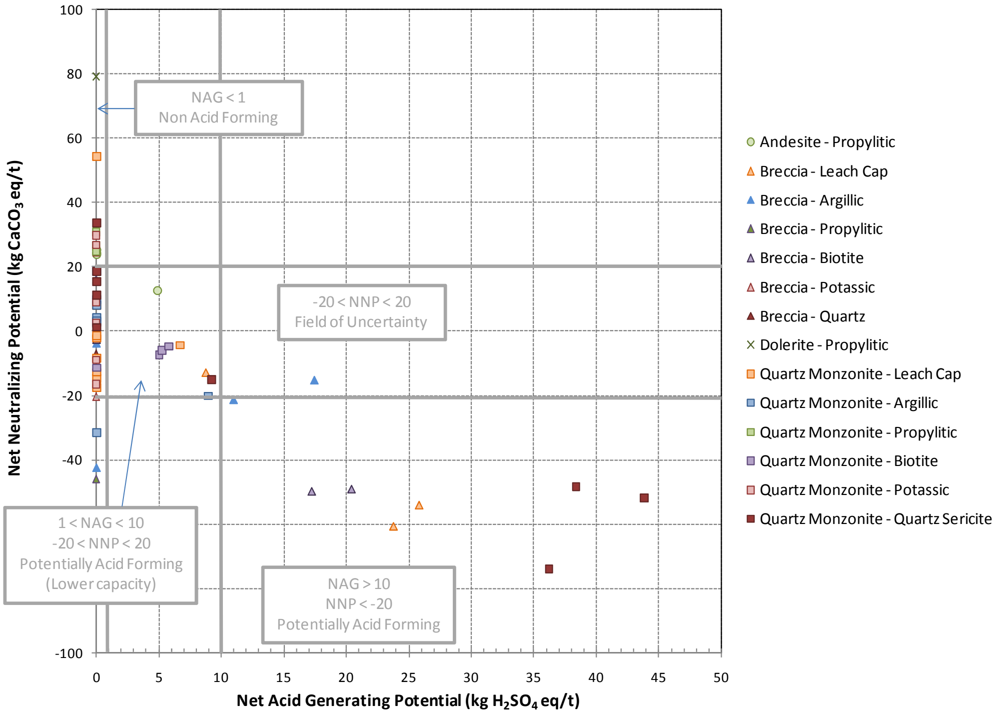

Figure 5: Scatter Plot of Net Acid Generation Potential vs. Net Neutralizing Potential

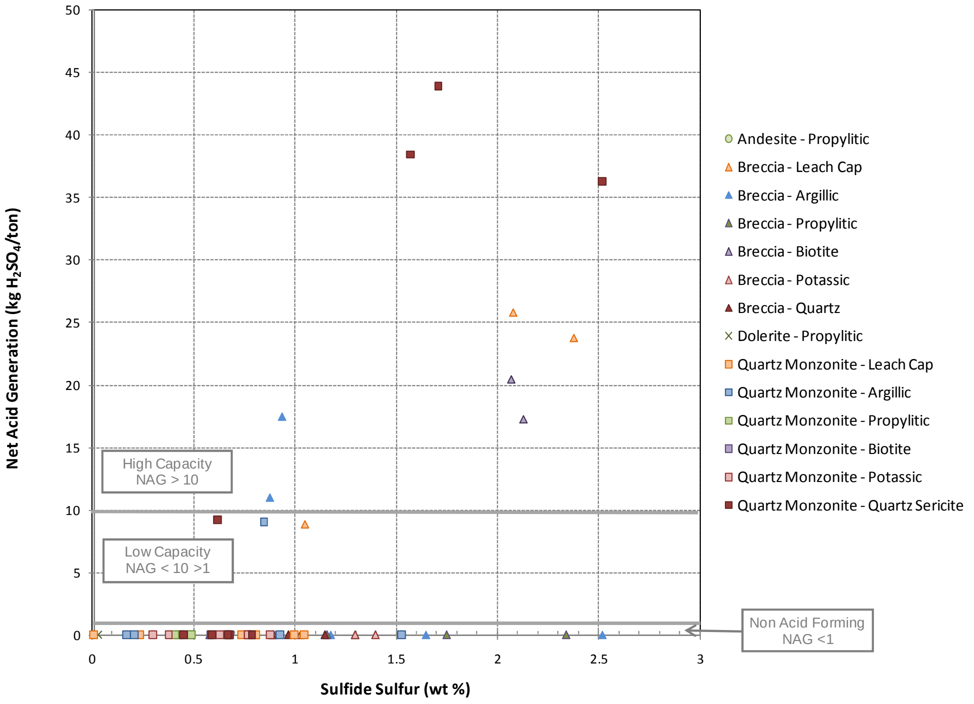

Figure 6: Scatter Plot of Sulfide Sulfur vs. Net Acid Generation Potential

5. SHORT-TERM METAL LEACHING (MWMP)

Meteoric Water Mobility Procedure (MWMP) testing was carried out by ALS Chemex, Reno, Nevada to give an indication of short-term metal mobility from the Copper Flat materials. In particular the release of ECA elements (elements identified as being present at concentrations above average crustal abundance) was studied. The MWMP test was developed to simulate the leaching of weather mine waste materials with meteoric water during precipitation events. The results of the MWMP test can be used to identify the presence of leachable metals and readily soluble salts stored in the material as well as provide an indication of their availability for dissolution and transport in response to a precipitation event. A total of 40 representative samples were selected for MWMP testing (Table 1) based on the results of ABA and NAG testwork.

The results of the MWMP testing are provided in full in the attached database and the main findings are summarized below. In general, metal mobility and metal leaching from the Copper Flat materials was found to be low, with ECA elements generally being released at concentrations below analytical detection limits in the MWMP leachates. Furthermore, the leachates were generally characterized by circum-neutral to moderately alkaline pH (pH 6.9 – 8.8 s.u.).

Scatter plots of Ficklin metal release as a function of leachate pH and sulfide sulfur content are given in Figure 7 and Figure 8, respectively. The Ficklin plot in Figure 7 demonstrates that most leachates can be classified as ‘near-neutral, low metal’ solutions based on an MWMP pH between 6.9 and 8.8 s.u. However, 20% of leachates can be classified as acid with moderate to high metal concentrations based on a leachate pH between 3.02 and 5.5 and total Ficklin metal concentrations up to 292 mg/L (cadmium + cobalt + copper + nickel + lead + zinc). Further analysis of the static data demonstrated that the samples which showed higher levels of metal and acidity release were grab samples collected from the waste rock dumps (rather than core material). Furthermore, the majority of the metal load from the grab samples was found to be made up of copper (Figure 9), thus suggesting that the elevated metal release was related to the flushing of soluble copper salts from the surface of the waste rock materials rather than the oxidation of sulfide minerals. This hypothesis is further supported by the poor correlation between Ficklin metal release and the sulfide sulfur content of the materials (Figure 8).

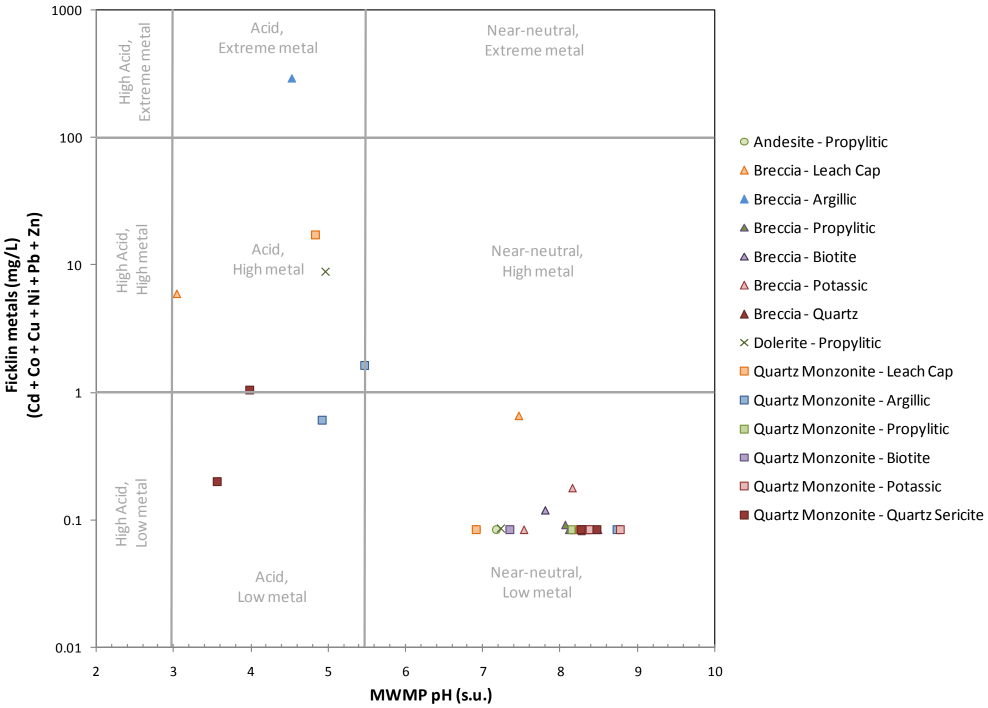

Figure 7: Scatter Plot of MWMP pH vs. Ficklin Metal Release

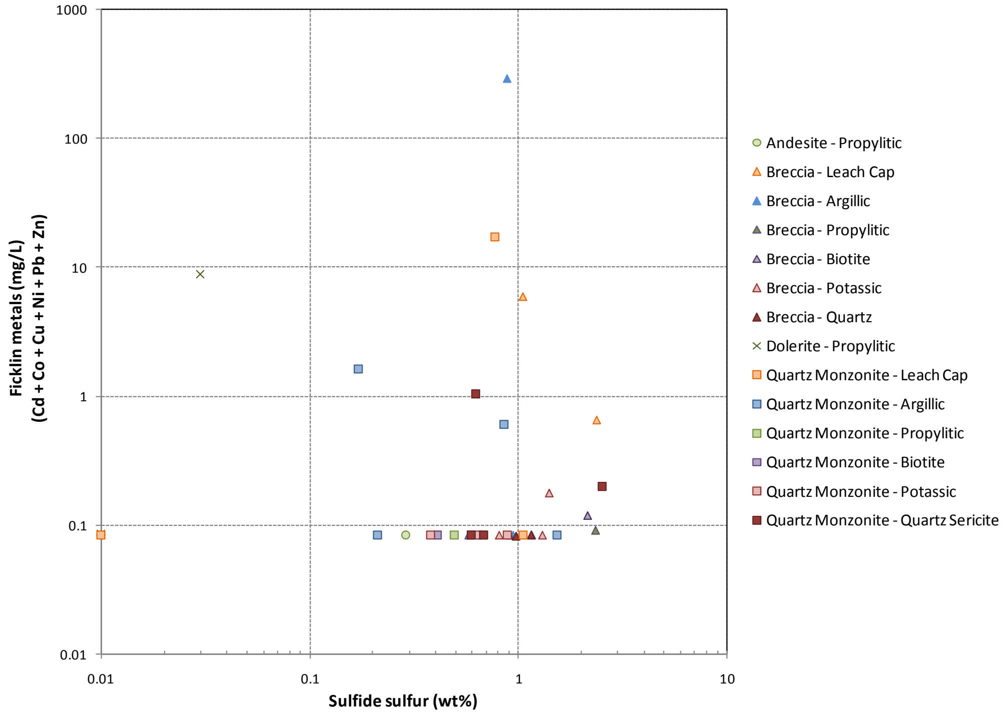

Figure 8: Scatter Plot of Sulfide Sulfur vs. MWMP Ficklin Metal Release

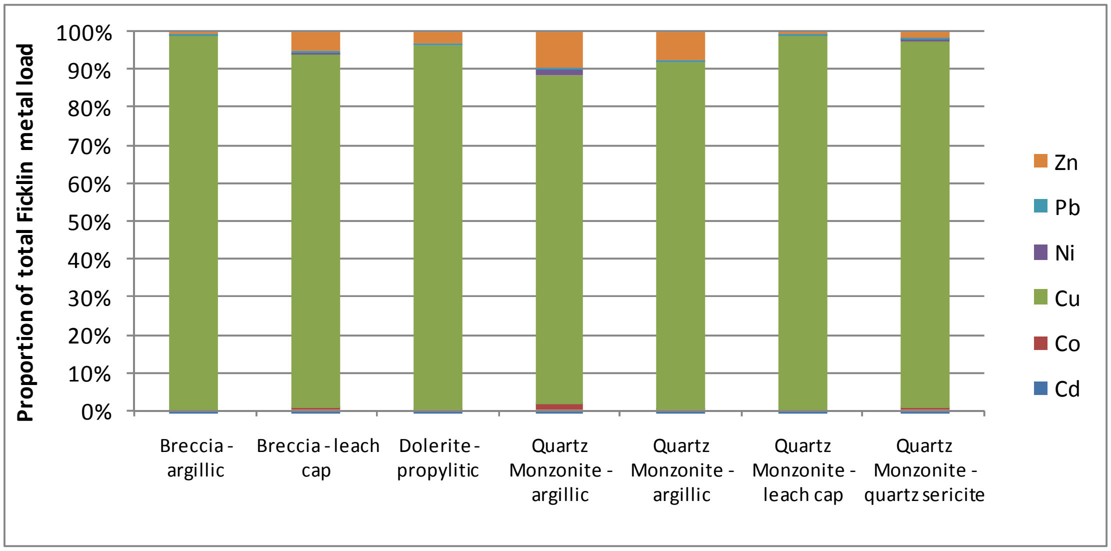

Figure 9: Histogram of Percentage Contribution of Parameters to Total Ficklin Metal Release in MWMP test (Grab Samples)

6. REMAINING TESTWORK

The objective of the static testing was to allow rapid assessment of the acid generating and metal leaching characteristics of the main lithological units that will be exposed on site at Copper Flat. However, these static tests do not consider the temporal variations that may occur in leachate chemistry as a result of long-term changes in oxidation, dissolution and desorption reaction rates. Because chemical weathering kinetics is known to strongly affect solute release over time, the results of these static tests ideally need to be confirmed using kinetic methods. Kinetic tests (e.g. laboratory humidity cell tests) evaluate temporal changes in leachate chemistry, through the sequential leaching of the rock weathered in a regular cycle of exposure to dry and wet air in a controlled laboratory environment. These cycles simulate and accelerate the chemical weathering rates observed under field conditions, using test conditions that are specifically designed to target oxidation of sulfide minerals. The goal of kinetic testing is to provide reaction rate data to support prediction of the leachate chemistry that would likely develop during meteoric rinsing of waste rock storage area facilities. Kinetic test data can also be used to predict concentrations of constituents that would be released from pit wall rock in response to meteoric rinsing and to develop a prediction of future pit lake water quality.

A sub-set of samples from the Copper Flat static test database have been selected for kinetic testing. The samples selected for HCT testing are summarized in Table 7 below along with the prediction of acid and metal release from the static test data (i.e., ABA, NAG and MWMP tests). These samples represent the range of predicted geochemistry for the waste rock and pit wall rock types for Copper Flat.

As discussed above, the BLM only considers waste rock to be non-acid generating without kinetic testing if there is 300 percent excess neutralizing capacity (i.e., NP:AP> 3) and the NNP is greater than 20 eq. kg $CaCO_3$/ton. According to the BLM guidance (2004) samples that do not meet these criteria require kinetic testing to define the acid generating potential. The majority of the Copper Flat samples demonstrate an uncertain potential for acid generation with NP:AP values less than 3 and NNP values less than 20 eq. kg $CaCO_3$/ton.

Kinetic testing proposed for this project is the standard humidity cell test procedure designed to simulate water-rock interactions (ASTM D-5744-96). This test runs for a minimum of 20 weeks and follows a seven-day cycle until steady state conditions are achieved. During the seven-day cycle, water is trickled over the rock for two days. Air that is humidified slightly above room temperature is introduced at the bottom of the column for two days of each cycle followed by two days of dry air. On the seventh day, the sample is rinsed with distilled water and the extracted solution is collected for analysis. Key parameters including; pH, alkalinity, acidity, electrical conductivity, iron and sulfate are measured on a weekly basis. Metals are typically measured on a weekly basis for the first 4 weeks of testing. After this, the frequency of metals analysis can be reduced to every fourth week.

Table 7: Samples selected for kinetic testing

Lithology	Alteration	Sample ID	Type	Pyritic Sulfur	NNP	NPR	NAG pH	Total NAG	MWMP pH	Metals Release
Andesite	Propylitic	SRK 0864	Grab	0.01	24.4	81.3	8.29	0	7.18	Low
		SRK 0866	Grab	0.29	12.5	2.37	3.23	4.9	6.92	Low
Breccia	Argillic	604811	Core	1.15	-3.9	0.89	8.42	0	8.24	Low
		SRK 0854	Grab	0.88	-21.5	0.22	3.77	10.98	4.54	High
	Biotite	604767	Core	2.13	-49.9	0.25	3.21	17.26	7.8	Low
		605033	Core	0.9	1.1	1.04	8.3	0	8.37	Low
	Leach Cap	SRK 0872	Grab	1.05	-13.0	0.60	3.14	8.82	3.05	Moderate
	Propylitic	604862	Core	1.16	3.5	1.10	8.28	0	8.11	Low
		604867	Core	2.34	-46.2	0.37	4.24	0	8.06	Low
	Quartz	604787	Core	0.97	-0.2	0.99	8	0	8.28	Low
	Potassic	604854	Core	1.4	-20.6	0.53	5.08	0	8.16	Low
Quartz Monzonite	Argillic	604562	Core	1.53	-31.6	0.34	7.75	0	8.28	Low
		604606	Core	0.67	2.7	1.13	9.6	0	8.31	Low
	Biotite	604673	Core	0.41	-5.9	0.54	3.66	5.29	8.33	Low
	Leach Cap	604569	Core	1.05	-14.8	0.55	8.33	0	8.25	Low
		SRK 0867	Grab	0.77	-17.7	0.27	4.35	0	4.84	Moderate
	Potassic	604669	Core	0.63	-16.5	0.16	4.08	0	8.39	Low
		604653	Core	0.77	2.3	1.10	8.38	0	--	--
	Propylitic	605153	Core	0.49	26.7	2.75	8.56	0	8.15	Low
	Quartz Sericite	SRK 0858	Grab	0.62	-15.3	0.21	3.15	9.22	3.99	Moderate
		604656	Core	0.59	33.4	2.82	8.2	0	8.27	Low

HCTs are run until steady state effluent chemistry is observed. At which time the tests will be terminated. Steady state is reached once constituent concentrations remain constant for more than four consecutive weeks following evidence of sulfide leaching in previous leaching cycles. After the leaching reactions have been adequately characterized in the HCT, the cell will be rested for two weeks and rinsed again to determine if significant salt accumulation has occurred during the resting period. SRK will also conduct pre-leach and post-leach, ABA, multi-element analysis, and mineralogy on all samples selected for kinetic tests. This further defines the mineralogical processes that occur as the materials are exposed to oxygen and water.

7. LABORATORY COSTS AND SCHEDULE

A total of 21 samples have been selected from the Copper Flat database for kinetic testing. These samples have already been prepared and are being stored at McClelland Laboratories awaiting further instruction. The estimated laboratory costs for the HCTs are summarized in Table 8 below.

Table 8: Estimated kinetic test laboratory costs

Kinetic Test Cost Estimate	Lab	# of samples	Cost Per Sample	Total Cost
Pre-Leach Mineralogy	SRK UK	21	$150	$3,150
Humidity Cell Test Set-up	McClelland	21	$130	$2,730
Humidity Cell Test [1]	McClelland	21	$2,200	$46,200
Profile II for HCT Extracts [1]	WetLAB	21	$3,200	$67,200
Termination Testing (4-Acid Digest, ABA, Min)	SVL	21	$285	$5,985
Reporting	McClelland	21	$750	$15,750
			Total	$141,015

[1] Assumes the HCT will be run for 20 weeks and that samples will be collected for Weeks 0, 1, 2, 3, 4, 8, 12, 16, 20 and final rinse for Profile II testing (10 Profile II tests per sample @ $320/test).

The HCTs will be run until the data indicate that the reactions have stabilized. This can take a minimum of 20 weeks but can take longer depending upon the results. For the purposes of this cost estimate we are assuming that the data we need should be available in 20 weeks. Once the cells have reached a steady-state, the cells will be rested for two weeks and rinsed again to determine if significant salt accumulation has occurred during the resting period. Following the final rinse, a split of the post-leach sample material will be collected for mineralogy, ABA and multi-element analysis. The cost estimate also assumes mineralogy testing will be conducted on the pre-leach samples.

While the kinetic tests are being performed, SRK will continue with the data compilation from the static tests and the analysis of those data. After the final data are available, it will take about six to eight weeks to finalize the analysis of the characterization results and complete the draft report.

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