BHP Navajo Coal Company





BHP Billiton Limited BHP Navajo Coal Company PO Box 1717 16 Miles South of Fruitland on CR 6675 Fruitland, New Mexico 87416 USA Tel +1 505 598 4200 Fax +1 505 598 3361 bhpbilliton.com

22 March 2011

Ms. Brenda Steele, Navajo Mine Coordinator Indian and Federal Programs Team Office of Surface Mining/Western Regional Coordinating Center P.O. Box 46667 Denver, Colorado 80201-6667

Re: Navajo Mine Permit Number NM-0003F; Rev1105 Addendum BNCC Area IV North Mine Plan Resubmittal (OSM ID No. 11/02/18-01)

Dear Ms. Steele,

Enclosed please find eight (8) copies of a proposed addendum to the Area IV North Mine Plan Resubmittal (BNCC Permit Revision 11-05 and OSM ID No. 11/02/18-01) for your review and approval. The addendum includes proposed additions to the groundwater resources information and probable hydrologic consequences (PHC) sections of the BHP Navajo Coal Company (BNCC) Navajo Mine Permit NM-0003F.

The proposed revisions to Chapter 6 (Groundwater Resources) include updates to text and Appendix 6-G that was previously submitted to OSM on 15 February 2011. The proposed revisions to the PHC include updated text and the addition of new tables (11-14a through 11-14k), figures (F 11-24 and 11-30 through 11-54), appendices (11-VV), and exhibits (11-166 and 11-167) to Chapter 11.

Revisions	Comments/Instructions
NM-0003F Permit Table of Contents	Remove and Replace the Permit NM-0003F Table of Contents with the updated table of contents.
Ch. 6 Vol. 7, <i>Text</i>	Remove and Replace pg. 6-46 (Table 6-3) with revised page.
Ch. 6 Vol. 7, Appendices	Remove and replace pages 6.G-1 through 6.G-17 (Baseline Groundwater Update for Navajo Mine Area IV North) with revised pages 6.G-1 through 6.G-17.
	Remove and replace Appendix 6.G Table 6.G-9 (labeled as Table 6.6-9 Baseline Water Quality in the Fruitland Coals at the BNCC Coal Lease) with revised Table 6.G-9 Baseline Water Quality in the Fruitland Coals at the BNCC Coal Lease.

Instructions for the replacement of updated permit contents follow:

Revisions	Comments/Instructions
Ch. 11 Vol. 12, <i>Text</i>	Remove and replace pages 11-144 through 11-228 (Section 11.6 Probable Hydrologic Consequences and 11.7 References) with revised pages 11-144 through 11-313. Pages 11-144 through 11- 313 include all text, tables and figures in the PHC as described in the next two sections of this table.
Ch. 11 Vol. 12, <i>Tables</i>	No Action . New Tables 11-14a through 11-14k are included with the Chapter 11 text replacement listed above. The Chapter 11 text changes also effects existing Table 11-14a (table replaced) and Tables 11-14c (Coal Combustion By-product (CCB) Analysis Summary); 11-14d (Spoils and Overburden Analysis Summary); 11-15 (Topdressing Types And Quantities); 11-16 (Land Types And Curve Numbers); 11-16a (Topdressing Type, Quantities, And Curve Numbers For Area I) 11-16b (Topdressing Type, Quantities, And Curve Numbers For Area II); 11-16c (Topdressing Type, Quantities, And Curve Numbers For Area II); 11-16c (Topdressing Type, Quantities, And Curve Numbers For Area II); 11-16c (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16d (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16d (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16d (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16d (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16d (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16d (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16d (Topdressing Type, Quantities, And Curve Numbers For Area III); 11-16c (Comparison Of Pre- & Postmining Areas, Peak Flows And Sediment Yields Hosteen Wash); 11-19 (Comparison Of Pre- & Postmining Areas, Peak Flows And Sediment Yields Lowe Wash); 11-20 (Comparison Of Pre- & Postmining Areas, Peak Flows And Sediment Yields Cottonwood Wash); 11-23 (Comparison Of Pre- & Postmining Areas, Peak Flows And Sediment Yields Cottonwood Wash); 11-24 (Surface Water Monitoring Reference Criteria Station: CD-1); 11-24b (Surface Water Monitoring Reference Criteria Station: CD-2); 11-24c (Surface Water Monitoring Reference Criteria Station: CD-2); 11-24d (Surface Water Monitoring Reference Criteria Station: CD-2); 11-24d (Surface Water Monitoring Reference Criteria Station: CD-1); 11-24g (Surface Water Monitoring Reference Criteria Station: CD-2); 11-24d (Surface Water Monitorin
Ch. 11 Vol. 12, <i>Figures</i>	No Action. New Figures 11-24 and 11-30 through 11-54 are included with the Chapter 11 text replacement instruction listed above. The Chapter 11 text changes also affect existing Figures 11-25 (Well/Spring Locations); 11-27 (Typical Reclaimed Incised

Revisions	Comments/Instructions
	Pilot Channel Section); 11-29 (Typical Reclaimed Channel Section) which were relocated within the pages of the revised PHC and had their page numbers renumbered.
Ch. 11 Vol. 13B, Appendices	Add new Appendix 11-VV (Navajo Mine: Mine Spoil Leachate Test Analyses)
Ch. 11 Vol. 18A 3of3, Exhibits	Add new Exhibit 11-166 (Navajo Mine Pits with Monitoring Wells and PCS Potentiometric Surface)
	Add new Exhibit 11-167 (Navajo Mines Monitoring Well Locations and Hydrologic Sections)

Additionally, BNCC would like to clarify a few items from the 15 February 2011 Area IV North Mine Plan Resubmittal letter. Upon internal review of the cover letter and package after submittal, BNCC noted some additional changes. These changes do not significantly alter the content of the proposed revision application. A description of the changes is provided below:

Revisions	Comments/Instructions
Ch. 11 Vol. 14, <i>Exhibits</i>	Remove and replace Exhibit 11-13E (Area III Impoundment and Pond Location/Watershed Areas) and replace with updated exhibits submitted on 15 Feb 2011. Exhibit was included in the original submittal, however the 15 Feb 2011 cover letter did not include any instructions for removal and replacement.
Ch. 11 Vol. 12, <i>Tables</i>	Remove pg. 202a (Table 11-30 Comparison Of Pre- & Postmining Areas, Peak Flows And Sediment Yields Tributaries To The Chaco And Pinabete). This table is no longer referenced in the proposed permit text.

Should you have any comments, questions, or concerns, please contact Kent Applegate at (505) 598-3269.

Yours sincerely,

thinky for

Kent Applegate Superintendent Environmental Projects

Cc: Jane Howe, Superintendent Environmental Permitting and Technical Services

CHAPTER 1 ADJUDICATION Table of Contents

- 1.1 IDENTIFICATION OF INTERESTS
- **1.2 VIOLATION INFORMATION**
- **1.3 RIGHT OF ENTRY INFORMATION**
- 1.4 STATUS OF UNSUITABILITY CLAIMS
- **1.5 PERMIT TERM**
- 1.6 INSURANCE
- 1.7 NEWSPAPER ADVERTISEMENT AND PROOF OF PUBLICATION
- 1.8 PUBLIC OFFICE AND LOCATION FOR FILING APPLICATION -
- ADDRESS OF PUBLIC LOCATIONS
- **1.9 FACILITIES OR STRUCTURES USED IN COMMON**

LIST OF APPENDICES

- 1-A BHP Ownership and Control.
- 1-B Notice of Violations
- 1-B-A Navajo Mine, San Juan County, NM
- 1-B-B San Juan Mine, San Juan County, NM
- 1-B-C La Plata Mine, San Juan County, NM
- 1-B-D Black Diamond Mine Violations
- 1-C Legal description of the original Mining Lease and Amendments 2, 3, 4, and 4-A.
- 1-D Grants of Easement for Right of Way
- 1-E Certificate of Liability Insurance.
- 1-F Affidavit of Publication.

LIST OF TABLES

- 1-1 Information for Entities with Ownership and Control Interest in Navajo Mine
- 1-2 Other Permits maintained by Navajo Mine, Navajo Coal Company
- 1-3 Other Permits maintained by San Juan Mine, San Juan Coal Company
- 1-4 Other Permits maintained by La Plata Mine, San Juan Coal Company

LIST OF FIGURES

1-A BHP New Mexico Coal Operations Corporate Organizational Structure

- 1-1 Surface and Minerals Ownership Coal Leasehold Interest (Sheets 1 and 2)
- 1-2 Customary Use Area (Sheets 1 and 2)
- 1-3 Rights-of-Way and Easements (Sheets 1 and 2)
- 1-4 Area I Permit Areas Pre-Law, Interim, Permanent Program (Sheet 1)

CHAPTER 1 ADJUDICATION Table of Contents

Area II Permit Areas Pre-Law, Interim, Permanent Program (Sheets 2 through 4) Area III Permit Areas Pre-Law, Interim, Permanent Program (Sheets 5 and 6) LIST OF EXHIBITS (Continued)

- 1-5 OPEN
- 1-6 Navajo Mine Lease Base Map (Sheets 1 through 9)

CHAPTER 2 LAND USE Table of Contents

2.1 PRE-MINING AND EXISTING LAND USE

- 2.2 **POSTMINING LAND USE**
- 2.3 SOCIOECONOMIC IMPACT ASSESSMENT
- 2.4 **REFERENCES**

LIST OF APPENDICES

- 2-A Land Use Correspondence: IOC, A. King to A.F. Geiger. "Ref. Contract No. 14-20-603-2505 Mining Lease -Tribal Indian Lands". April 5, 1971. Letter J.W. Thomas, BIA, Shiprock, to W. Skeet, UII. "Ref. Clarify the land use status of the area presently under lease by UII...". March 4, 1983 Huskon, B., Presiding Chairmans, Resources Committee. Resolution of the Resources Committee of the Navajo Tribal Council "Adopting the Grazing Concept of the Holistic Resources Management or Other Adequate Practices on Strip Mine Lands and Other Disturbed Rangelands". October, 1983
 2-B Navajo Mine Grazing Management Plan.
 2-C Letter to OSMBE from PHP LIL dated August 25, 1087 with respect to Navajo
- 2-C Letter to OSMRE from BHP-UII, dated August 25, 1987, with respect to Navajo Mine being exempt from obtaining waivers to conduct coal mining and reclamation operations within 300 feet of an occupied dwelling or 100 feet of a public road.

LIST OF TABLES

- 2-1 Recommended Nutrient Requirements for Cattle and Sheep Under Range Conditions During Gestation and Lactation On A Dry-Matter Basis.
- 2-2 Nutrient Content Nutrient Content At Various Stages of Growth For Forage Species in Revegetation Seed Mix.

CHAPTER 3 CULTURAL RESOURCES Table of Contents

3.1	INTRODUCTION
3.1	INTRODUCTION

- 3.2 CULTURAL/HISTORICAL BACKGROUND
- 3.3 PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES
- 3.4 **REFERENCES**

LIST OF TABLES

3-1 Navajo Mine Archaeological Clearance

LIST OF EXHIBITS

3-1 Archaeological Clearance Status Map

CHAPTER 4 CLIMATE AND AIR QUALITY Table of Contents

4.1 CLIMATOLOGICAL CHARACTERISTICS

- 4.2 METEOROLOGICAL MONITORING
- 4.3 AIR POLLUTION CONTROL PLAN
- 4.4 **REFERENCES**

LIST OF APPENDICES

4-A Met 1 and Met 2 Wind Direction vs. Wind Speed back-up data

LIST OF TABLES

4-1	Navajo Mine Regional Precipitation Data
4-2	NMSU Temperature Extremes and Frost Free Periods
4-3	Navajo Mine 2003 Temperature Summary
4-4	Air Monitoring Stations and Locations
4-5	Air Monitoring Siting Information

LIST OF FIGURES

4-1	Navajo Mine Met I – 10 Meter Tower Wind Rose
4-2	Navajo Mine Met 2 – 10 Meter Tower Wind Rose

LIST OF EXHIBITS

4-1 Air Quality and Meteorological Monitoring Station

- 5.2 SEAM CHARACTERISTICS
- 5.3 GEOLOGIC HAZARDS
- 5.4 OVERBURDEN CHARACTERISTICS
- 5.5 **REFERENCES**

LIST OF APPENDICES

- 5-A Drill Hole Core Logs
- 5-B Overburden Chemical and Physical Analyses
- 5-C 1987 Methods of Analysis
- 5-D 1989 Methods of Analysis

LIST OF FIGURES

- 5-1 General Structural Features of the San Juan Basin of Northwestern New Mexico.
- 5-2 Stratigraphic Nomenclature and Generalized Stratigraphy of the Upper Cretaceous and Tertiary Sediments Found on the Navajo Mine Coal Lease.
- 5-3 Surface Expression of Geologic Units on and Surrounding the Navajo Mine Coal Lease.
- 5-4 Overburden Drill Hole Locations.

LIST OF TABLES

- 5-1 Overburden Drill Site Locations.
- 5-2 Weighted Average of Overburden Analyses.

- 5-1 Area I drill hole data.
- 5-2 Area II drill hole data.
- 5-3 Area III drill hole data.
- 5-4 Area IV N drill hole data.
- 5-5 Areas I, II, III cross section index map.
- 5-5a Areas I, II, III cross section index map.
- 5-5b Areas I, II, III cross section index map.
- 5-5c Areas I, II, III cross section index map.
- 5-6 Area IV N cross section index map.
- 5-7 Areas I and II East-West drill hole correlation section A-A', B-B', C-C', D-D', E-E', F-F'.
- 5-7a Drill Hole Correlation Block "A".

LIST OF EXHIBITS (Continued)

Area III Cross Section T-T' Overburden Correlation. 5-7b 5-7c Drill Hole Correlation Block "C". 5-7d Area III Cross Section X-X' Overburden Correlation. Area III East-West drill hole correlation section G-G', H-H'. 5-8 Drill Hole Correlation Block "D". 5-8a 5-8b Drill Hole Correlation Block "D". Area III Cross Section U-U' Overburden Correlation. 5-8c 5-9 Areas III and IV N East-West drill hole correlation section I-I', J-J'. Areas II, III, and IV N North-South drill hole correlation section K-K', L-La'. 5 - 10Areas I and II North-South drill hole correlation section La'-L', M-M', N-N'. 5-11 5-12 Area IV N East-West, North-South correlation section O-O', P-P', Q-Q'. 5-13 Area III Seam 2A top of seam structure & iso-overburden map. 5-13a Area III Seam 2A thickness map. 5-14 Area IV N Seam 2A thickness map. 5-14a Area IV N Seam 2A top of seam structure. Area IV N Seam 2A iso-overburden map. 5-14b 5-15 Area III Seam 2B top of seam structure and iso-overburden map. 5-15a Area III Seam 2B thickness map. 5-16 Area IV N Seam 2B thickness map. 5-16a Area IV N Seam 2B top of seam structure. 5-16b Area IV N Seam 2B iso-overburden map. Area III Seam 3 top of seam structure and iso-overburden map. 5-17 5-17a Area III Seam 3 thickness map. Area IV N Seam 3 thickness map. 5-18 Area IV N Seam 3 top of seam structure. 5-18a 5-18b Area IV N Seam 3 iso-overburden map. 5-19 Area III Seam 4 top of seam structure and iso-overburden map. 5-19a Area III Seam 4 coal thickness map. 5-20 Area IV N Seam 4 thickness map. 5-20a Area IV N Seam 4 top of seam structure. 5-20b Area IV N Seam 4 iso-overburden map. 5-21 Area IV N Seam 5 thickness map. 5-21a Area IV N Seam 5 top of seam structure. 5-21b Area IV N Seam 5 iso-overburden map. 5-22 Area II Seam 6A top structure and iso-overburden map. 5-22a Area II Seam 6A thickness map. 5-23 Area III Seam 6A top of structure and iso-overburden map. 5-23a Area III Seam 6A thickness map.

- 5-24 Area II Seam 6B top of seam structure and iso-overburden map.
- 5-24a Area II Seam 6B thickness map.
- 5-25 Area III Seam 6B top of seam structure and iso-overburden map.
- 5-25a Area III Seam 6B thickness map.
- 5-26 Area IV N Seam 6 thickness map.
- 5-26a Area IV N Seam 6 top of seam structure.
- 5-26b Area IV N Seam 6 iso-overburden map.
- 5-27 Area II Seam 7 top of seam structure and iso-overburden map.
- 5-27a Area II Seam 7 thickness map.
- 5-28 Area III Seam 7 top of seam structure and iso-overburden map.
- 5-28a Area III Seam 7 thickness map.
- 5-29 Area IV N Seam 7 thickness map.
- 5-29a Area IV N Seam 7 top of seam structure.
- 5-29b Area IV N Seam 7 iso-overburden map.
- 5-30 Area II Seam 8A top of seam structure and iso-overburden map.
- 5-30a Area II Seam 8A thickness map.
- 5-31 Area III Seam 8A top of seam structure and iso-overburden map.
- 5-31a Area III Seam 8A thickness map.
- 5-32 Area IV N Seam 8A thickness map.
- 5-32a Area IV N Seam 8A top of seam structure.
- 5-32b Area IV N Seam 8A iso-overburden map.
- 5-33 Area I Seam 8B top of seam structure and iso-overburden map.
- 5-33a Area I Seam 8B thickness map.
- 5-34 Area II Seam 8B top of seam structure and iso-overburden map.
- 5-34a Area II Seam 8B thickness map.
- 5-35 Area III Seam 8B top of seam structure and iso-overburden map.
- 5-35a Area III Seam 8B thickness map.
- 5-36 Area IV N Seam 8B thickness map.
- 5-36a Area IV N Seam 8B top of seam structure.
- 5-36b Area IV N Seam 8B iso-overburden map.
- 5-37 Area I Rider seam above Seam 8B top of seam structure and iso-overburden map.
- 5-37a Area I Rider seam above Seam 8B coal thickness.

6.1	AQUIFER DELINEATION
-----	---------------------

- 6.2 **GROUNDWATER QUANTITY**
- 6.3 **GROUNDWATER QUALITY**
- 6.4 **GROUNDWATER USES**
- 6.5 ALLUVIAL VALLEY FLOOR ASSESSMENT
- 6.6 GROUNDWATER MONITORING PLAN
- 6.7 **REFERENCES**

LIST OF APPENDICES

- 6-A Quality Assurance and Quality Control Water Quality
- 6-B Well Completion Records
- 6-C Pictured Cliff and Alluvial Water Quality Records
- 6-D Solutions to OSMRE Concerns and Deficiencies Related to the Groundwater Sections of the Navajo Mine Permit Application Package
- 6-E Wells On Or Near the Permit Area
- 6-F Special Condition (11/89)
- 6-G Baseline Groundwater Update for Navajo Mine Area IV North

LIST OF FIGURES

- 6-1 Completion Diagram
- 6-2 Slug Test Well GM30
- 6-3 Recovery Test Well T4-1
- 6-4 Vertical Head No. 8 Seam
- 6-5 Vertical Head No. 7 Seam
- 6-6 Vertical Head No. 4 No. 6 Seams
- 6-7 Vertical Head No. 2 No. 3 Seams
- 6-8 Method of Calculation, Recovery Test SJKF-84-3, Seam 8
- 6-9 Method of Calculation, Recovery Test SJKF-84-4, Seam 8
- 6-10 Method of Calculation, Recovery Test SJKF-84-5, Seam 8
- 6-11 Method of Calculation, Recovery Test KF84-21(c), Seam 7
- 6-12 Method of Calculation, Recovery Test KF84-22 (b), Seam 7
- 6-13 Method of Calculation, Recovery Test KF84-20 (a), Seam 2
- 6-14 Method of Calculation, Recovery Test KF84-22(c), Seam 4
- 6-15 Method of Calculation, Recovery Test KF84-22 (d), Seam 3
- 6-16 Method of Calculation, Recovery Test KF84-22 (e), Seam 2
- 6-17 Method of Calculation, Recovery Test KF84-20 (d), Seam 7

LIST OF TABLES

- 6-1 Aquifer Discharge Characteristics
- 6-2 Groundwater Water Quality Summary
- 6-3 Navajo Mine Groundwater Wells
- 6-4 Groundwater Sampling Parameter List
- 6-4.1 Non-Navajo Mine Wells Adjacnet to Lease Boundary
- 6-5 Groundwater Monitoring Reference Criteria
- 6-6 Analytical Methods and Detection Limits

- 6-1 Well Location Map
- 6-2 No. 8 Potentiometric Surface
- 6-3 No. 7 Potentiometric Surface
- 6-4 No. 4-6 Potentiometric Surface
- 6-5 No. 2-3 Potentiometric Surface
- 6-6 Location of Well/Piezometer sites
- 6-7 Compliance Monitoring Well, NPDES Outfall and Surface Water Monitoring Stations Locations

CHAPTER 7 SURFACE WATER HYDROLOGY Table of Contents

7.1	GENERAL	DESCRIPTION
7.1	GENERAL	DESCRIPTION

- 7.2 SURFACE WATER DRAINAGES
- 7.3 SURFACE WATER QUALITY
- 7.4 SURFACE WATER MONITORING PLAN
- 7.5 **REFERENCES**

LIST OF APPENDICES

- 7-A Hosteen Wash Pre-Mine Hydrology and Sedimentology SEDCAD+ Files. 2-Yr., 6-Hr.; 10-Yr., 6-Hr.; 25-Yr., 6-Hr.; and 100-Yr., 6-Hr.
- 7-B Barber Wash Pre-Mine Hydrology and Sedimentology SEDCAD+ Files. 2-Yr., 6-Hr.; 10-Yr., 6-Hr.; 25-Yr., 6-Hr.; and 100-Yr., 6-Hr.
- 7-C Neck Arroyo Pre-Mine Hydrology and Sedimentology SEDCAD+ Files. 2-Yr., 6-Hr.; 10-Yr., 6-Hr.; 25-Yr., 6-Hr.; and 100-Yr., 6-Hr.
- 7-D Lowe Arroyo Pre-Mine Hydrology and Sedimentology SEDCAD+ Files. 2-Yr., 6-Hr.; 10-Yr., 6-Hr.; 25-Yr., 6-Hr.; and 100-Yr., 6-Hr.
- 7-E Geochemical Signature Summary
- 7-F Total Sediment Analysis Procedure
- 7-G Chinde Arroyo Pre-Mine Hydrology and Sedimentology SEDCAD+ Files. 2-Yr., 6-Hr.; 10-Yr., 6-Hr.; 25-Yr., 6-Hr.; and 100-Yr., 6-Hr.
- 7-H Cottonwood Arroyo Pre-mine Hydrology and Sedimentology SEDCAD⁺ Files
- 7-I Cottonwood Arroyo Automated Samplers Total Sediment Laboratory Data
- 7-J Cottonwood Arroyo Automated Samplers Total Sediment Graphs, Particle Size Distribution Graphs, Texture Graphs
- 7-K Cottonwood Arroyo Automated Samplers Chemistry Data
- 7-L Cottonwood Arroyo Storm Hydrographs
- 7-M Surface Water Quality Monitoring Data Analysis For Stations CD-1 & CD-2 (1996-2003)
- 7-N South Barber Pre-Mine Hydrology & Sedimentology
- 7-O Chaco and Pinabete Tributaries Pre-Mining Hydrology and Sedimentology

LIST OF FIGURES

- 7-1 Existing and Pre-Mine Longitudinal Profiles For Chinde Arroyos.
- 7-2 Location Map, Surface Water Monitoring Stations
- 7-3 OPEN
- 7-4 OPEN

CHAPTER 7 SURFACE WATER HYDROLOGY Table of Contents

LIST OF TABLES

- 7-1 Drainage Basin Characteristics San Juan River at Shiprock, NM.
- 7-2 Drainage Basin Characteristics Chaco River Near Waterflow, NM.
- 7-3 Precipitation Values (in inches) for Design Storms, Navajo Mine Drainage Basins.
- 7-4 Cottonwood Arroyo 1997 -1999 Monitoring Data
- 7-5 Cottonwood Arroyo 1997 -1999 Surface Water Data from Automated Stations
- 7-6 Cottonwood Sedcad Pre-mine Results Outlet at Chaco Wash Junction J4
- 7-7 Summary of Surface Water Monitoring Data Average Values
- 7-8 Navajo Mine Surface Water Monitoring
- 7-9 Watershed Areas Associated with Navajo Mine
- 7-10 Surface Water Quality Parameters

- 7-1 OPEN
- 7-2 OPEN
- 7-3 Chinde Arroyo Pre-Mining SEDCAD Drainage Subdivision
- 7-4 Lowe, Cottonwood, and Pinabete Arroyo Pre-mining Sedcad Drainage Subdivisions
- 7-4c Hosteen and Barber Pre-Mining SEDCAD Drainage Subdivision
- 7-5 OPEN
- 7-6 Cross-Sections Cottonwood Wash Surface Water Monitoring Stations CN-1, CS-1, CNS-1 June 1999 and January 2000 Surfaces

CHAPTER 8 SOIL RESOURCES Table of Contents

8.1 INTRODUCTION

- 8.2 GENERAL NATURE OF THE SURVEY AREA
- 8.3 SOIL SURVEY PROCEDURES
- 8.4 GENERAL SOILS MAP
- 8.5 DETAILED SOILS MAP
- 8.6 CLASSIFICATION OF THE SOILS
- 8.7 KEY TO SOILS
- 8.8 SOIL SERIES DESCRIPTIONS AND LABORATORY DATA
- 8.9 PRIME FARMLAND DETERMINATION
- 8.10 **REGOLITH SAMPLING PROGRAM**
- 8.11 **REFERENCES**

LIST OF APPENDICES

lvsis

- 8-B Soil Sample Characteristic by Mine Area
- 8-C Sample Characteristics of the Soil Series
- 8-D Availability of Topdressing Material by Mine Area
- 8-E Availability of Topdressing Material by Mapping Delineation of Each Mapping Unit
- 8-F Soil Series Descriptions and Laboratory Data.
- 8-G BIA-Land Operations letter and USDA-SCS letter.
- 8-H Soil Survey of the Lowe Boxcut Exchange Area

LIST OF TABLES

- 8-1 Extent and Proportion of each Mapping Unit for the Total Survey Area.
- 8-2 Topsoil Suitability Rating Guide.
- 8-3 Available and Salvageable Topdressing for the Survey Areas.

LIST OF EXHIBITS

8-1 Detailed Soils Map, Area I, II, III & IV, Navajo Mine (7 Sheets)

CHAPTER 9 VEGETATION INFORMATION Table of Contents

- 9.1 INTRODUCTION
- 9.2 VEGETATION MAPPING AND SAMPLING
- 9.3 METHODOLOGY
- 9.4 **RESULTS AND DISCUSSION**
- 9.5 WILDLIFE HABITATS
- 9.6 THREATENED AND ENDANGERED PLANT SPECIES SURVEYS
- 9.7 **REFERENCES**

LIST OF TABLES

- 9-1 1985-86 Cover, Production and Shrub Density Data By Range Site For Navajo Mine (Area I III).
- 9-2 1987 Cover, Production and Shrub Density Data By Range Site For Navajo Mine Area IVN.

LIST OF EXHIBITS

- 9-1a Navajo Mine Range Sites (sheet 1 of 6).
- 9-1b Navajo Mine Range Sites (sheet 2 of 6).
- 9-1c Navajo Mine Range Sites (sheet 3 of 6).
- 9-1d Navajo Mine Range Sites (sheet 4 of 6).
- 9-1e Navajo Mine Range Sites (sheet 5 of 6).
- 9-1f Navajo Mine Range Sites (sheet 6 of 6).

LIST OF APPENDICES

- 9-A A Survey for Threatened, Endangered and Sensitive Species Report for South Dixon Extension Area
- 9-B Threatened, and Endangered, and Sensitive (TES) Flora Survey Report, BHP Billiton – Navajo Mine; Area IV North San Juan County, New Mexico

CHAPTER 10 WILDLIFE Table of Contents

10.1 INTRODUCTION

- **10.2 SURVEY METHODS**
- 10.3 **RESULTS AND DISCUSSIONS**
- 10.4 SUMMARY AND CONCLUSIONS
- 10.5 ASSESSMENT OF IMPACTS TO WILDLIFE
- 10.6 FISH AND WILDLIFE MITIGATION PLAN
- 10.7 MONITORING PLAN
- **10.8 REFERENCES**

LIST OF TABLES

- 10-1Sampling Intensities for Various Habitats Sampled During Small Mammal
Trapping in the WESCO Study Area, Northwestern New Mexico, 1973 and 1974.
- 10-2 Summary of Black-footed Ferret Survey Effort on the Navajo Mine, Northwestern New Mexico, 1983-87.
- 10-3 Mammal Species Observed On and Adjacent to the Navajo Mine Lease, and Other Species that may occur in Northwestern, New Mexico.
- 10-4 Relative Abundance of Small Mammals (#/100 Trapnights) Trapped in Several Habitats on and near the Navajo Mine, Northwestern New Mexico, 1973 and 1974.
- 10-5 Birds Observed on or near the Navajo Mine Lease and Other Species that may occur in Northwestern New Mexico.
- 10-6 Summary of Roadside Breeding Birds Surveys Conducted on Areas IV and V of the Navajo Mine Lease and Adjacent Areas in Northwestern New Mexico.
- 10-7 Summary of Roadside Breeding Bird Surveys Conducted on Areas I, II, and III of the Navajo Mine Lease in Northwestern New Mexico.
- 10-8 Species of Birds Observed During General Reconnaissance Around Stock Ponds and Arroyos on the Navajo Mine Lease and Adjacent Habitats, Northwestern New Mexico.
- 10-9 Number and Relative Abundance of Non-Waterfowl Birds Observed on the Navajo Mine Lease and Adjacent Habitats, Northwestern New Mexico.
- 10-10 Summary of Waterfowl Observed on Natural or Man-made Stock Ponds on or Adjacent to the Navajo Mine Lease, Northwestern New Mexico.
- 10-11 Summary of Waterfowl Observed on Morgan Lake, Adjacent to the Navajo Mine Lease, Northwestern New Mexico.
- 10-12 Raptor Nests on the Navajo Mine Lease Within Approximately One-Quarter Mile of Adjacent Area, Northwestern New Mexico.
- 10-13 Relative Abundance of Amphibians and Reptiles Observed on and Adjacent to the Navajo Mine Lease and Other Species that may occur in Northwest New Mexico.
- 10-14 Water Sources Ponds

CHAPTER 10 WILDLIFE Table of Contents

LIST OF FIGURES

- 10-1 Matrix Used to Identify Relative Impacts for Wildlife on the Navajo Mine Permit Area, Northwestern New Mexico.
- 10-2 Impact on Wildlife Caused by the Navajo Mine, Northwestern New Mexico.

LIST OF APPENDICES

10-A Wildlife Baseline Report (for Area IV North)

- 10-1 Wildlife Survey Areas 1973 1987
- 10-2 Important Wildlife Habitats
- 10-3 Stock Watering Pond Sites On and Near the Permit Area
- 10-4 Navajo Mine Permit and Buffer Zone Raptor Survey Area

- 11.1 LAND STATUS AND MARKERS
- 11.2 MINING PROCEDURES AND TECHNIQUES
- 11.3 ANNUAL COAL PRODUCTION
- 11.4 MAJOR MINING EQUIPMENT
- 11.5 MINE FACILITIES
- 11.6 PROBABLE HYDROLOGIC CONSEQUENCES
- 11.7 **REFERENCES**

LIST OF APPENDICES

11-A	List of Residents
11-B	Public Blast Notice
11-C	Sample Blast Report and Scale Distance Factor Approvals, and Blast Reporting
11-D	Emma's Pond Design & As Built
11-E	Spur D Drainage/Sediment Control
11-F	Barber By-Pass Road
11-G	North Pinto Modification Design & As Built
11-H	Northeast Hosteen Outslopes Hydrology
11-I	Stability Analyses
11 - J	NPDES Permit I.D. #NN0028193
11-K	Leach Study
11 - L	North Pond Expansion – Cell A2
11-M	Area III Main Access Road
11-N	Diversion Berm Design Data
11 - O	Lowe-Dixon Diversion Sediment Control
11-P	OPEN
11-Q	Lowe Railroad Embankments
11-R	OPEN
11-S	Lowe Boxcut Road Proposal, SEDCAD Calculations.
11 - T	South Dixon Ponds 1, 2 & 3 Hydrology
11-U	Navajo Mine Railroad Sediment and Drainage Control Structures
11-V	Culverts Navajo Mine Hydrology Backup
11-W	Lowe/Dixon Temporary Diversion, Inlet Redesigns SEDCAD Backup
11-X	Lowe Arroyo Post-mining Hydrology & Sedimentology
11-X1	HEC-RAS Results for Lowe Reclaimed Drainage Channels
11-X2	HEC-RAS Results for Lowe Pre-mining Drainage Channels
11-X3	Area III Reclaimed Channels Rip-rapped Drop Structures
11-Y	Cottonwood Arroyo Post-mining Hydrology & Sedimentology
11-Y1	HEC-RAS Results for Cottonwood Reclaimed Drainage Channels
11-Y2	HEC-RAS Results for Cottonwood Pre-mining Drainage Channels
11-Z	Miscellaneous Hydrologic Structures

LIST OF APPENDICES (Continued)

11-AA	Sediment Ponds/Impoundments Hydrology Calculations		
11-BB	Chinde Arroyo Post-Mining Hydrology and Sedimentology		
11-CC	Hosteen Wash Post-Mining Hydrology and Sedimentology		
11-DD	Barber Wash Post-Mining Hydrology and Sedimentology		
11-EE	South Barber Channel Post-Mine Hydrology & Sedimentology		
11-FF	Area I South Reclaimed Channels		
11-GG	OPEN		
11-HH	Landfarm Hydrology Data		
11-II	Highwall Impoundment Design and As-Built Information		
11-JJ	Chinde Crossing-Design and As-Built Information		
11-KK	Certificate of Registration for San Juan Regional Landfill		
11-LL	Navajo Mine RCRA Permit and Hazardous Waste Generator Status Permits		
11-MM	Supplemental Groundwater Monitoring Study (November 1996 and Update Through		
	March 1998)		
11-NN	HEC-RAS Results for Area II Reclaimed Channels		
11-00	Chinde Wash Surface Water Gain/Loss Report		
11-PP	HEC-RAS Results for Area II Pre-Mine Channels		
11-QQ	North Fork Diversion Channel		
11 - RR	Lowe/Dixon Diversion Channel Extension		
11 - TT	Cottonwood Crossing Design by MWH Americas		
11-UU	Doby North Channel Post-Mining Hydrology		
11-VV	Navajo Mine: Mine Spoil Leachate Test Analyses		

LIST OF FIGURES

- 11-1 Typical Operation-Navajo Mine
- 11-2 Typical Strip Layout
- 11-3 Lowe/Dixon Diversion Channel Extension Drainage Control for Excess Material Dump
- 11-4 North Fork Diversion Channel Drainage Control for Excess Material Dump
- 11-5 OPEN
- 11-6 OPEN
- 11-6b Typical Berm Reclamation Storage Yard
- 11-7 Coal Stockpile Area Typical Sections
- 11-8 Coal Stockpile Area Typical Plan
- 11-9 Topdressing/Regolith Berm Typical Section
- 11-10 OPEN
- 11-11 OPEN
- 11-11.1 Drill Pad Typical Sections
- 11-12 OPEN

LIST OF FIGURES (Continued)

11-13	OPEN	
11-14	OPEN	
11-15	OPEN	
11-13	OPEN	
11-14	OPEN	
11-15	OPEN	
11-16	OPEN	
11-17	OPEN	
11-18	OPEN	
11-19	OPEN	
11-20	OPEN	
11-21	OPEN	
11-22	Railroad Culverts CP-14 and CP-13 Cross-section	
11-23	Railroad Culverts CP-8 and CP-9 Cross-section	
11-24	Area I Groundwater Models	
11-25	Well/Spring Locations	
11-26	OPEN	
11-27	Typical Reclaimed Incised Pilot Channel Section	
11-28	Area III Employee Coal Dump Access Road	
11-29	Typical Reclaimed Channel Section	
11-30	Water Elevations in Coal Monitoring Wells in the Vicinity of the Bitsui Pit	
11-31	Time Series of TDS and Sulfate in Coal Wells Located Near the Bitsui Pit	
11-32	Time Series of Boron Concentrations in Coal Wells Located Near the Bitsui Pit	
11-33	TDS Concentrations in Bitsui and Watson Wells	
11-34	Sulfate and Chloride Concentrations in Bitsui and Watson Wells	
11-35	Boron Concentrations in Bitsui and Watson Wells	
11-36	Predicted Sulfate Concentrations at well Bitsui-2	
11-37	Model Predicted Sulfate Concentrations at Specified Prediction Points	
11-38	Predicted Sulfate Concentrations with Order of Magnitude Lower Sulfate Decay Rate	
11-39	Mining Block Sequences for Proposed Mining in Area IV North	
11-40	Drawdown in the No. 8 Coal under Proposed Mining in Area IV North	
11-41	Drawdown in the No. 3 Coal under Proposed Mining in Area IV North	
11-42	Drawdown in the PCS under Proposed Mining in Area IV North	
11-43	Drawdown and Recovery in the PCS and Backfill with Area IV North Mining	
11-44	Drawdown and Recovery in the PCS, the No. 3 Coal and the No. 8 Coal at GM-19	
11-45	Drawdown and Recovery in the PCS, the No. 3 Coal and the No. 8 Coal at GM-28	
11-46	PCS Steady-State Post-Mining Potentiometric Surface	
11-47	TDS Transport in the L1 after 500-years with Constant Source of 11,850 mg/l	
11-48	TDS Transport in the L1 after 500-years with Constant Source of 3,550 mg/l	

LIST OF FIGURES (Continued)

11-49	TDS Transport in the PCS after 500-years with Constant Source of 11,850 mg/l
11-50	TDS Transport in the PCS after 500-years with Constant Source of 3,550 mg/l
11-51	TDS Transport in the No. 8 Coal after 500-years with Constant Source of 11,850 mg/l
11-52	TDS Transport in the No. 8 Coal after 500-years with Constant Source of 3,550 mg/l
11-53	TDS Transport in the No. 3 Coal after 500-years with Constant Source of 11,850 mg/l
11-54	TDS Transport in the No. 3 Coal after 500-years with Constant Source of 3,550 mg/l

LIST OF TABLES

11-1	Methods of Soil Analysis		
11-2	Navajo Mine Topsoil and Topsoil Substitute Suitability Criteria		
11-2a	Sediment Controls		
11-3	Topdressing Stockpile Capacities, Regolith Stockpile Inventories		
11-3A	Miscellaneous Mitigation Area Capacities		
11-4A	Sewer and Loadout Facility Ponds		
11-4 B	Sewer and Loadout Ponds Hydrology Information		
11-4C	Barber Loadout		
11-4D	Lowe Loadout		
11-4E	North Sewer Pond		
11-5	Pond Cross Reference		
11-5A - 11-5A	L Sediment Ponds General Information		
11-6	Alternate Sediment Control Facilities		
11-7	Highwall Impoundments and Impoundments Hazard Classification		
11-8	Update of Structures Submitted for Permit Condition 1.B.		
11-9	OPEN		
11-10	OPEN		
11-11	Primary Road Segments		
11-11a	Ancillary Road Segments		
11-12	OPEN		
11-12a	Primary Road Culverts		
11-12b	Ancillary Road Culverts		
11-12c	Downdrains		
11-13	Railroad Culverts		
11-14	Comparison of Natural Groundwater Quality Before and After Leaching Through		
	Spoil Mixture		
11-14a	Concentrations for Selected Constituents in Navajo Mine Monitoring Wells		
11-14b	Selective Results of Batch Leach Tests		
11-14c	Coal Combustion by Product Analysis Summary		
11-14d	Spoils and Overburden Analysis Summary		

LIST OF TABLES (Continued)

- 11-14e Trace Constituent Concentrations in Spoil and CCB Wells
- 11-14f Batch Leaching Test Results
- 11-14g Water Quality of the San Juan River Alluvium in Comparison with Mine Spoil Water and Coal Water
- 11-14h Recharge Rates and Hydraulic Properties of Mine Spoils for Groundwater Modeling
- 11-14i Estimated Source Concentrations in Mine Spoils
- 11-14j Modeled Result for Alluvium at Mouth of Cottonwood
- 11-14k Estimated Post-Reclamation TDS in Cottonwood Alluvium
- 11-15 Topdressing Types and Quantities
- 11-16 Topdressing Types, Quantities, and Curve Numbers
- 11-16a Topdressing Type, Quantities, and Curve Numbers for Area I
- 11-16b Topdressing Type, Quantities, and Curve Numbers for Area II
- 11-16c Topdressing Type, Quantities, and Curve Numbers for Area III
- 11-16d Topdressing Type, Quantities, and Curve Numbers for Area IV North
- 11-17 Comparison of Pre- & Postmining Areas, Peak Flows and Sediment Yields: Chinde Wash
- 11-18 Comparison of Pre- and Postmining Peak Flow and Sediment Yields: Hosteen Wash, 10-Yr., 6-Hr. Precipitation Event
- 11-19 Comparison of Pre- and Postmining Areas Peak Flow and Sediment Yields: Barber Wash, 10-Yr., 6-Hr. Precipitation Event
- 11-20 Comparison of Pre- and Postmining Peak Flow and Sediment Yields: Neck Arroyo, 10-Yr., 6-Hr. Precipitation Event
- 11-21 Comparison of Pre- and Postmining Areas, Peak Flows and Sediment Yields: Lowe Wash, 10-Yr., 6-Hr. Precipitation Event
- 11-22 Comparison of Pre- and Postmining Areas, Peak Flows and Sediment Yields: Cottonwood Wash, 10-Yr., 6-Hr Precipitation Event
- 11-23 Comparison of Pre- and Postmining Areas Peak Flow and Sediment Yields: Barber Wash, 10-Yr., 6-Hr. Precipitation Event
- 11-24aSurface Water Monitoring Reference Criteria Station: CD-1
- 11-24b Surface Water Monitoring Reference Criteria Station: CD-2
- 11-24c Surface Water Monitoring Reference Criteria Station: CN-1
- 11-24d Surface Water Monitoring Reference Criteria Station: CNS-1
- 11-24eSurface Water Monitoring Reference Criteria Station: CS-1
- 11-24f Surface Water Monitoring Reference Criteria Station: NB-1
- 11-24g Surface Water Monitoring Reference Criteria Station: NB-2
- 11-25 Areas Mined by Year
- 11-26 Pre-mine and Post-mining Channel Velocities (Chinde, Hosteen, and Barber Washes)
- 11-27 HEC-RAS Results (Chinde, Hosteen, and Barber Washes)
- 11-28 Pre-mine and Post-mining Channel Velocities (Lowe and North Fork Drainages)

LIST OF TABLES (Continued)

11-29 HEC-RAS Results (Lowe and North Fork Drainages)

11-1	Area 4 North Pond 401 As-Built		
11-1D	Area 4 North Pond 401 Design		
11-2	Area 4 North Pond 402 As-Built		
11-2D	Area 4 North Pond 402 Design		
11-3	OPEN		
11-4	Area 4 North Pond 404 As-Built		
11-4D	Area 4 North Pond 404 Design		
11-5	Area 4 North Pond 405 As-Built		
11-5D	Area 4 North Pond 405 Design11-6 Area 4 North Pond 413		
11-6D	Area 4 North Pond 413 Design		
11-7	Yazzie Silos Site Plan and Access Road		
11-7A	Yazzie Silos Access Road As-Built		
11-8	Blasting Area Location Map		
11-9	Mine Structures Location Map		
11-10	Mine Structures Location Map		
11-10	Mine Structures Location Map		
11-12	OPEN		
11-12B	Area-I Culvert/Dropbox Structure Locations and Watershed Areas		
11-12C	Area II Culvert/Down Drainage Structure Locations and Watershed Areas		
11-12C-1	Area II Culvert/Down Drainage Structure Locations and Watershed Areas		
11-12C-2	Area II Watershed Area Yazzie "Y" Culverts (CP-31, 32, 33, & 34)		
11-12D	Area II Culvert/Down Drainage Structure Locations and Watershed Areas		
11-12E	Area III Culvert/Down Drainage Structure Locations and Watershed Areas		
11-12F	Area III/4N Culvert/Down Drainage Structure Locations and Watershed Areas		
11-13	OPEN		
11-13B	Area I Impoundment and Pond Locations/Watershed Areas		
11-13C	Area II Impoundment and Pond Locations/Watershed Areas		
11-13D	Area II Impoundment and Pond Locations/Watershed Areas		
11-13E & E-1	Area III Impoundment and Pond Locations/Watershed Areas		
11-13F	Area III/4N Impoundment and Pond Location/Watershed Areas		
11-14	OPEN		
11-14A-T	Navajo Mine Rail Road Erosion and Drainage Control Structures		
11-15A	Coal Stockpile Runoff Control Plan As-Built		
11-16	Phase 2 Layout As-Built		

11-17	Phase 2 Wastewater Collection/Treatment Plot, Grading and Drainage Plan-Sheet No. 1 As-Built		
11-18	Phase 2 Wastewater Collection/Treatment Plot. Grading and Drainage Plan – Sheet No.		
	3 As-Built		
11-19	Phase 2 Wastewater Collection/Treatment System – Misc. Civil Details As-Built		
11-20	Phase 2 Wastewater Collection/Treatment System – Misc. Structure Details As-Built		
11-21	Phase 2 Wastewater Collection/Treatment General Arrangement and Mechanical for		
	Lift Stations No. 1, 2, 3, and 4 As-Built		
11-22	Sanitary Sewage Treatment Pond and Pumping Facilities As-Built		
11-23	Phase 2 Wastewater Collection/Treatment Electrical Installation As-Built		
11-24	Phase 2 Wastewater Collection/Treatment Plot, Grading and Drainage Plan No. 3 As-		
	Built		
11-25	Phase 2 Wastewater Collection/Treatment Pond No. 1 Expansion & Channel Sections and Details As-Built		
11-26	Navajo Mine Area III Sewer Shop and Complex Ponds As-Built		
11-27	Navajo Mine Area III Sewage Pond Plan & Section As-Built		
11-28	Barber Loadout Pond As-Built		
11-29	OPEN		
11-30	Mason Drainage Along Railroad "As-built"		
11-31	North Industrial Facilities Ponds, Emma Yazzie's Pond As-Built		
11-32	North Industrial Facilities Ponds Storm Pipe Drainage As-Built		
11-33	Emma's Pond As-Built		
11-34	Emma's Pond Hydrology and Pond Design		
11-35	North Pinto Pond As-Built		
11-36	OPEN		
11-37	OPEN		
11-38	OPEN		
11-38A	OPEN		
11-39	Hosteen Pond #1 As-Built		
11-40	Hosteen Pond 2 As-Built		
11-41	Hosteen Pond 3 As-Built		
11-42	North Fork Highwall Impoundment As-Built		
11-43	As-Built Barber Coal Stockpile Sedimentation Pond #2		
11-44	As-Built Baber Coal Stockpile Detention Pond #3		
11-45	Lowe Stockpile Pond As-Built		
11-46	Vinnel Hydrology Plan		
11-46A	Vinnel Pond As-Built		
11-47	As-Built Northwest Dixon Pond		
11-48	As-Built Southwest Dixon Pond		

11-49	North Pond 1 Modification Proposed Cell A2 Design	
11-49a	Cell A-2 As-Built	
11-50	South Barber Pond Design	
11-50A	South Barber Pond As-Built	
11-51	OPEN	
11-51A	Area III Design Modifications South Dixon Pond #1	
11-51B	Area III Design South Dixon Pond #3	
11-51C	Area III As-Built South Dixon Pond #1	
11-51D	Area III As-Built South Dixon Pond #3	
11-52	NE Hosteen Outslopes Hydrology	
11-53	Spur D Watersheds	
11-54	Area III Lowe Pit Lowe Ramp-1 Haulroad Design	
11-55	Doby/Pinto Reroute Haulroad	
11-55A	Doby/Pinto Reroute Haulroad As-built (Sheet 1 of 3)	
11-55B	Doby/Pinto Reroute Haulroad As-built (Sheet 2 of 3)	
11-55C	Doby/Pinto Reroute Haulroad As-built (Sheet 3 of 3)	
11-56	Yazzie Skyline Road As-built (Sheet 1 of 3)	
11-56A	Yazzie Skyline Road As-built (Sheet 2 of 3)	
11-56B	Yazzie Skyline Road As-built (Sheet 3 of 3)	
11-57	Lowe Silos Facilities Access Road Design Rev	
11-58	North Industrial Area Pump House Site	
11-60, A - C	Burnham Road Temporary Reroute #2 Design (4 Sheets)	
11-61	Shop By-Pass Road Design	
11-62,A,B	Hosteen Road Design (3 Sheets)	
11-62C	Hosteen Road As-Built	
11-62D	Area II Hosteen Area Haulroad As-built Location Map (3 Sheets)	
11-63,A,B	Block "B" Road Modification Design	
11-63C, D, E	E Block "B" Road Modification As-Built	
11-64	Burns Pass Road Re-alignment Design	
11-64A	Burns Pass Road As-Built	
11-65	Railroad Side Ditch\Channel at CP-2 Culvert	
11-65A	As-built CP-2 Channel	
11-65	OPEN	
11-66	Lowe Railroad Impoundment #1 As-Built Design	
11-67A	Lowe Railroad Impoundment #2	
11-67B	Lowe Railroad Impoundment #2 As-Built	
11-67	Area III Plan and Profile Lowe Diversion Channel Sta. 0+00 to Sta. 31+50	
11-68A	As-Built Plan and Profile Lowe Diversion Channel Sta. 0+00 to Sta. 31+50	
11-68	Area III Plan and Profile Lowe Diversion Channel Sta. 31+50 to Sta. 63+50	

11-69A	As-Built Plan and Profile Lowe Diversion Channel Sta. 31+50 to Sta. 63+50		
11-72	Area III Lowe Diversion General Arrangements Main and Inlet Channels and Typical		
	Sections		
11-72A	As-Built Lowe Dixon Diversion General Arrangements and Typical Sections		
11-72B	As-Built Lowe Dixon Diversion General Arrangements Main & Inlet Channels		
11-73	Lowe-Dixon Diversion Spoil Pile Sediment Control		
11-73A	As-Built Lowe-Dixon Diversion Spoil Pile Sediment Control		
11-73B	As-Built Lowe-Dixon Diversion North Pond		
11-74A	Lowe-Dixon Diversion Channel Extension – SEDCAD Watershed Subdivisions		
11-75	Chinde Arroyo Post-mining Sedcad Drainage Subdivision		
11-75A	Hosteen and Barber Post-mining Sedcad Drainage Subdivision.		
11-76	Area II Reclaimed Channel Alignment		
11-76A	Area II Reclaimed Channel Chinde Branch 1 (4 sheets)		
11-76B	Area II Reclaimed Channel Hosteen Branch 1 (2 sheets)		
11-76C	Area II Reclaimed Channel South Barber Channel (2 sheets)		
11-76D	OPEN		
11-76E	Area II Reclaimed AND Pre-Mine Channel		
11-76F	Area II Pre-mining Channel Alignment		
11-76G	Area II Pre-mining Channel Hosteen Branch 1 (2 sheets)		
11-76H	Area II Pre-mining Channel South Barber Channel		
11-76J	OPEN		
11-77	Lowe, Cottonwood and Pinabete Arroyo Post-mining Sedcad Drainage Subdivisions		
11-78	Area III Reclaimed Channel Alignment HEC-RAS X-Section Locations (4 sheets)		
11-78A	Area III Pre-mine Channel Alignment HEC-RAS X-Section Locations (3 sheets)		
11-78B	Area III Reclaimed and Pre-mining Channel Profiles (3 sheets)		
11-78C	Area III Reclaimed Channels Typical Sections and Details		
11-79 to 83	Roads and Railroads		
11-84	Area 4-N Roads and Railroads		
11-84A	Typical Cross Sections for Primary Roads and Culverts		
11-84B	Ancillary Roads Typical Cross-Sections		
11-85	Area-1 Doby North Channel and Drop Structure Plan and Typical X-Sections		
11-85A	Doby Channel Design (4 Sheets)		
11-86	Area 3 Facilities Sandy Hill Drainage Control Design Location Map		
11-87	Plan/Profile Gorman Road		
11-87A	Gorman Road As-Built		
11-88	OPEN		
11-89	OPEN		
11-90	Area III Bypass Road – General Layout, Surface Hydrology and Drainage		
11-90A	OPEN		

11-91	Plan and Profile of Area III Bypass Road (STA 0+00 to STA 28+50)	
11-91A	OPEN	
11-91B	OPEN	
11-92	Plan and Profile of Area III Bypass Road (STA 28+50 to STA 59+25)	
11-93	Open	
11-94A-C	A4N East & West Perimeter Road Design	
11-95	Yazzie Spoil Side Road Design	
11-95A	Yazzie Spoil Side Road As-Built	
11-96	OPEN	
11-97	OPEN	
11-98	Cottonwood Wash: Surveyed Channel Cross Section Locations	
11-99	OPEN	
11-100	Barber Bypass Road Design	
11-100A&B	Barber Bypass Road Design – Plan, Profile, and Sections	
11-100C	Barber By-pass Road As-Built	
11-100D	Area II Barber Area Haulroad As-built Location Map (2 Sheets)	
11-100E	Area II South Barber By-Pass Extension Road Plan/Profile Asbuilt	
11-101	Area III Facilities Drainage	
11-102A	Lowe By-pass Road Modification Design	
11-102B	Lowe By-pass Road Modification As-built	
11-103A	Lowe Boxcut Road Plan/Profile Designs	
11-103B	Lowe Boxcut Road Design Cross-Sections	
11-103C	Lowe Boxcut Road Planned Watershed	
11-103D-H	Lowe Boxcut Road Plan and Profile As-Builts	
11-104	Typical Diversion Berm Plan and Sections	
11-105	North Sewer Pond As-Built	
11-105A	Pond 5 As-built	
11-106	"As-Builts" North Pond 1 (North Cells)	
11-107	As Built Area III Sewer Pond	
11-108	Lowe Loadout Pond As-Builts	
11-109	CR Pond 4 As-built	
11-111	Area 4 North Pond 412 As-Built	
11-111D	Area 4 North Pond 412 Design	
11-112	Index Sheet	
11-112A-G	Shop/Office Access Road	
11-113	Pre-Mining SEDCAD+ Drainage Subdivision for Area I	
11-114	Post-Mining SEDCAD+ Drainage Subdivision for Area I	
11-115	Area 4 North Pond 3 As-Built	
11-115D	Area 4 North Pond 3 Design	

11-116	Area III Shop Temporary Diversion Plan, Profile and Cross-Section		
11-117	South Dixon Pond 2 As-Built		
11-117A	South Dixon Pond 2 Modification Design		
11-117B	As-Built South Dixon Pond 2		
11-118	Area 4 North Pond 4 As-Built		
11-118D	Area 4 North Pond 4 Design		
11-119	Ramp 7 Road Re-Alignment, Location and Watershed Map		
11-119A	Ramp 7 Road Re-Alignment, Plan/Profile		
11-119B	Ramp 7 Road Re-Alignment, Plan/Profile Typical Sections		
11-119C	As-Built Ramp 7 Road Re-Alignment Location Map		
11-119D,E	As-Built Ramp 7 Road Re-Alignment Plan/Profile		
11-119F	As-Built Ramp 7 Road Re-Alignment Cross Sections		
11-120	OPEN		
11-121	OPEN		
11-122	OPEN		
11-122A-D	Area I As-Built Coal Plant Road		
11-123	Culverts CP-103 & CP-104 Plans, Sections & Details		
11-124	West Hosteen Landfarm Design – Location and Plan		
11-124A	West Hosteen Landfarm Design – Section and Profile		
11-124B	West Hosteen Landfarm As-Built		
11-125	Area 4 North Pond 7		
11-126	OPEN		
11-127	OPEN		
11-127A	Area III Design, Lowe Hole 3 Pond 2		
11-127B	Area III Design, Lowe Hole 3 Pond 3		
11-127C	Lowe Hole 3 Pond 3 As-built		
11-127D	Lowe Hole 3 Pond 2 As-built		
11-128	OPEN		
11-129	Area II Design Barber Haulroad Modification		
11-129A-C	Barber Haulroad Modification As-Built		
11-130	OPEN		
11-131	OPEN		
11-132	Employee Coal Dump Relocation		
11-132A	Employee Coal Dump Relocation As-Built		
11-132B	Employee Coal Dump Design		
11-132C	Employee Coal Dump Modification As-built		
11-133	Block C Pond 1 Design		
11-133A	Block C Pond 1 As-Built		
11-134	Block C Pond 2 Design		

11-134A	Block C Pond 2 As-Built		
11-135	Block C Pond 3 Design		
11-135A	Block C Pond 3 As-Built		
11-135B	Block C Pond 3 Typical Section and Profile of Modified Surface Drainage As-Built		
11-136	Block C Pond 4 DesignDixon Haul Road Design		
11-137A & B	Dixon Haulroad As-built		
11-137	Mason Haulroad Location Map, Plan, Profile, and Sections		
11-139	Mason Pond Design		
11-139A	Mason Pond As-Built		
11-140	Dixon Reclamation Area As-built Plan, Profile and Sections		
11-141	Hosteen Yazzie Haulroad Design, Location & Typical Cross Sections		
11-141A & B	Hosteen Yazzie Haulroad Design, Plan & Profile		
11-141C	Hosteen/Yazzie Haulroad As-built – Plan		
11-141D	Hosteen/Yazzie Haulroad As-built – Plan and Profile		
11-141E	Hosteen/Yazzie Haulroad As-built – Cross Section		
11-142	North Fork Diversion Channel Location and Pit Layout Map		
11-142A	North Fork Diversion Channel SEDCAD Watershed Subdivisions		
11-142B & C	North Fork Diversion Channel Plan, Profile, and Sections		
11-142D & E	North Fork Diversion Channel As-built		
11-143	Area III South Dixon Pit Extension Burnham Road Reroute Location Map		
11-149	Historic Coal Combustion Byproduct Placement on Interim and Permanent Program		
	Lands		
11-150-A, B	11-150-A, B Pond NLH and LD-Div North Pond A, P&P		
11-151-A, B,	C Lowe-Dixon Diversion Pond, Plan, Profile, and Sections (4 sheets)		
11-152	North Fork Pond Design		
11-153	Lowe Ramp 2 Haulroad As-built – Plan, Profile and Section		
11-154	Dixon Ramp 2 Haulroad As-built – Plan, Profile and Section		
11-155	Area-I North Facilities Access Road As-built Location Map (3 Sheets)		
11-156	Area 4 North Pond 406 Design		
11-157	Area 4 North Pond 407 Design		
11-158	Area 4 North Pond 408 As-Built		
11-158D	Area 4 North Pond 408 Design		
11-159	Area 4 North Pond 409 & 410 As-Built		
11-159D	Area 4 North Pond 409 & 410 Design		
11-161	Area 4 North Pond 411 As-Built		
11-161D	Area 4 North Pond 411 Design		
11-162	Area 3 Proposed South Dixon Ponds 301 and 302 Design		
11 163	Doby North Channel (Sheets 1-4)		
11-105	Doby North Channel (Sheets 1-4)		

- 11-165 Lowe Ramp 4 Haulroad Design
- 11-166 Navajo Mine Pits with Monitoring Wells and PCS Potentiometric Surface
- 11-167 Navajo Mines Monitoring Well Locations and Hydrologic Sections

- 12.1 RECLAMATION OBJECTIVES
- **12.2 RECLAMATION TIMETABLE**
- **12.3 BACKFILLING AND GRADING**
- 12.4 DISPOSAL OF EXCESS SPOIL
- 12.5 TOPDRESSING
- 12.5 **REVEGETATION PLAN**
- 12.6 SUBSIDENCE PLAN
- 12.7 CASING AND SEALING OF DRILL HOLES
- 12.8 DETERMINATION OF BOND
- 12.9 PRE-MINE TOPOGRAPHY
- 12.10 HYDROLOGIC RECLAMATION PLAN
- 12.11 REFERENCES

LIST OF APPENDICES

- 12-A Quality Assurance and Quality Control (QA/QC) Program, Soil and Overburden Sample Analysis. (Special Condition 12/91, 26-I)
- 12-B Bond Calculation Worksheets, Worse Case Bond Scenario 2009
- 12-C Riprap Requirements for Bond Reclamation Topography Channel Stabilization Bond Scenario 2009
- 12-D Reclamation Bond Adjustment Worksheets
- 12-E Permanent Impoundments Hydrology Calculations
- 12-F Lowe Corner 3 East and North Drop Structures
- 12-G BHP Navajo Coal Company Noxious Weed Management Plan

LIST OF TABLES

- 12-1 Annual Reclamation Timetable
- 12-2 Approximate Permit Area Regrade Schedule
- 12-3 OSMRE Root-Zone Suitability Criteria for Navajo Mine
- 12-4 Topdressing Resources at Navajo Mine March 2000
- 12-5 <u>Original Navajo Mine Reclamation Seed Mixture</u>
- 12-5A Cool Season Reclamation Seed Mixture
- 12-5B Warm Season Reclamation Seed Mixture
- 12-5C High Shrub Reclamation Seed Mixture
- 12-6 Range Site/Community Identification
- 12-7 Reclamation Bond Summary Sheet
- 12-7A Reclamation Bond Adjustment Summary Out for review
- 12-8 Slope Distribution by Area for Pre and Post-mining Topography
- 12-9 Mitigation Resources at Navajo Mine
- 12.3.4-1 Permanent Impoundments

LIST OF FIGURES

12-1	Spoil Sampling	Layout
		2

- 12-2 Composite Sampling Procedures
- 12.2-1 Reclamation Volume Available for Fill and Volume Regraded by Fiscal Year
- 12.2-2 Regrade Schedule by Year and Pit
- 12.2-3 Topsoil and Mitigation Schedule by Year and Pit
- 12.2-4 Revegetation by Year and Pit
- 12-3 Conceptual Design of North Block C Bluff
- 12.3-1 Area 1 (South of Ramp 7) Slope Histogram
- 12.3-2 Area 2 Slope Histogram
- 12.3-3 Area 3 Slope Histogram
- 12.3-4 Area 4 North Slope Histogram
- 12.8-1 Typical Drill Hole Seal/Plug
- 12.10-1 Open
- 12.10-2 Open
- 12.10-3 Open

12-1	OPEN
12-1	UPEN

- 12-2 Area-II Permit Term Disturbance Schedule
- 12-3 Area-III & 4N Permit Term Disturbance Schedules
- 12-4 Area-I Final Surface Configuration
- 12-5 Area-I Final Surface Configuration
- 12-5A Area 1 South Final Surface Configuration
- 12-6 OPEN
- 12-6A Area II Final Surface Configuration
- 12-6B Area II Final Surface Configuration
- 12-7 Area-III FSC (Final Surface Configuration)
- 12-7A Area 4N Final Surface Configuration
- 12-8 Area-1 Revegetated Areas
- 12-9 Area-2 Revegetated Areas
- 12-10 Area-3 Revegetated Areas
- 12-11 Area II (Hosteen and Yazzie Area) Post Mining Configuration Bond Scenario 9/2009
- 12-12 Area II (Mason and Barber Area) Post Mining Configuration Bond Scenario 9/2009
- 12-13 Area III Post Mining Configuration Bond Scenario 9/2009
- 12-14 Area II North Bond Surface Configuration Bond Scenario 9/2009
- 12-15 Area II South Bond Surface Configuration Bond Scenario 9/2009
- 12-16 Area III Bond Surface Configuration Bond Scenario 9/2009

12-17	Area II (Hosteen and Yazzie Area) Cut Fill Contours Bond Scenario 9/2009
12-18	Area II (Mason and Barber Area) Cut Fill Contours Bond Scenario 9/2009
12-19	Area III Cut Fill Contours Bond Scenario 9/2009
12-20	Area II (Hosteen and Yazzie Area) Cut Fill Blocks Bond Scenario 9/2009
12-21	Area II (Mason and Barber Area) Cut Fill Blocks Bond Scenario 9/2009
12-22	Area III Cut/Fill Blocks Bond Scenario 9/2009
12-23	Area II (Hosteen and Yazzie Area) Topdressing Replacement Bond Scenario
	9/2009
12-24	Area II (Mason and Barber Area) Topdressing Replacement Bond Scenario
	9/2009
12-25	Area III Topdressing Replacement Bond Scenario 9/2009
12-26	Area II (Hosteen and Yazzie Area) Bond Spoil Mitigation Bond Scenario 9/2009
12-27	Area II (Mason and Barber Area) Bond Spoil Mitigation Bond Scenario 9/2009
12-28	Area III Bond Spoil Mitigation Bond Scenario 9/2009
12-29	Navajo Mine Reference Areas
12-30	Area 4N Cut/Fill Contours Bond Scenario 9/2009
12-30A	Area 4N Post-Mine Configuration Bond Scenario 9/2009
12-30B	Area 4N Bond Surface Configuration Bond Scenario 9/2009
12-30C	Area 4N Cut/Fill Block Bond Scenario 9/2009
12-30D	Area 4N Topdressing Replacement Bond Scenario 9/2009
12-30E	Area 4N Bond Spoil Mitigation Bond Scenario 9/2009
12-31	Lowe Holes 1 & 2 Reclamation Stabilization Structures Plan View – Asbuilt
12-31A	Lowe Reclamation As-Built
12-32	A3 Life of Mine Plan for Contemporaneous Reclamation
12-32A	Annual Regrade, Mitigation, and Topsoil Schedule
12-32B	Annual Revegetation Schedule
12-33	Lowe Corner 3, East Drop Structure Design
12-33A	Lowe Corner 3, East Drop Structure As-built
12-33B	Lowe Corner 3, North Drop Structure As-built
12-34	Area I Pre-mine Area
12-34A	Area II Pre-mine Area-A
12-34B	Area II Pre-mine Area-B
12-34C	Area III Pre-mine Area
12-35	Area 1 Pre-Mining Surface and Post-Mining Surface Cross-Sections
12-36	Area I Cut Fill Blocks Bond Scenario 9/2009
12-37	Area I Topdressing Replacement Bond Scenario 9/2009
12-38	Area I Bond Spoil Mitigation Bond Scenario 9/2009
12-39	Area I Post Mining Configuration Bond Scenario 9/2009
12-40	40Area I Bond Surface Configuration Bond Scenario 9/2009

- 12-41 Area I Cut Fill Contours Bond Scenario 9/2009
- 12-42 Area II Permit Area Block C Pre Mine Bluffs
- 12-43 Lowe Permanent Impoundment 1
- 12-43A Lowe Permanent Impoundment 1 As-Built
- 12-44 As-Built Barber & Block C Reclamation
- 12-45 Doby Ramps 12, 13, and 14 Postmine Topography and Depicted Areas for RUSLE 1.06 Analysis
- 12-45A Doby Ramps 12, 13, and 14 Premine Topography and Depicted Areas for RUSLE 1.06 Analysis
- 12-46 Chinde Sub Drainage Location Map for 434 Standard Assessment
| That ago thine Groundwater Wens | | | | | | | | | | | | |
|---------------------------------|-------|----------------|------------|-----------|-----------|------------|-----------|------|--|--|--|--|
| | | | | Date | | Completed | Aquifer | | | | | |
| Well Number | Owner | Location | Status | Installed | Well Case | Depth (ft) | Formation | Use | | | | |
| | | E: 304310.70 | | | | | | | | | | |
| KF84-20C | BHP | N: 2017093.50 | active | 03/07/84 | PVC 2" | 187.00 | Kf CS# 7 | Env. | | | | |
| | | E: 307822.16 | | | | | | | | | | |
| KF84-22A | BHP | N: 2009510.05 | active | 05/03/95 | PVC 2" | 126.00 | Kf CS# 8 | Env. | | | | |
| | | E: 307829.36 | | | | | | | | | | |
| KF84-22B | BHP | N: 2009513.79 | active | 04/26/84 | PVC 2" | 142.00 | Kf CS# 7 | Env. | | | | |
| | | E: 310080.00 | | | | | | | | | | |
| QAC-1 | BHP | N: 2053200.00 | active | 01/01/84 | PVC 2" | 19.00 | Qal | Env. | | | | |
| | | E: 287032.58 | | | | | | | | | | |
| QACW-2 | BHP | N: 2009420.7 | active | n/a | PVC 2" | Ν | Qal | Env. | | | | |
| | | E: 32928.13 N: | | | | | | | | | | |
| Watson-1 | BHP | 2085893.97 | Non active | 06/08/94 | PVC 2" | 66.00 | Ash | Env. | | | | |
| | | E: 328648.35 | | | | | | | | | | |
| Watson-4 | BHP | N: 2083899.52 | Non active | 06/07/94 | PVC 2" | 93.00 | Ash | Env. | | | | |
| | | E: 317,638.62 | | | | | | | | | | |
| Doby-1-BH | BHP | N: 2,059,940 | Active | | PVC 2" | | ASH | Env. | | | | |

Table 6-3 cont. Navajo Mine Groundwater Wells

Kf = Cretaceous Fruitland Formation

CS# = Coal Seam Number

Qal = Quanternary Alluvium

n/a = not available

Appendix 6-G

Baseline Groundwater Update for Navajo Mine Area IV North

TABLE OF CONTENTS

6.G-1	Introduction	l
6.G-2	Alluvial Groundwater	l
6.G-3	Fruitland Coal Seams	3
6.G-4	Pictured Cliffs Sandstone	7
6.G-5	Hydrologic Model)
6.G-6	Numerical Groundwater Model	l
6.G-7	References1'	7

LIST OF TABLES

6.G-1	Baseline Water Quality at Cottonwood Arroyo Alluvial Wells
6.G-2	Relevant Water Quality Standards
6.G-3	Water Levels in Pinabete Alluvial Monitoring Wells
6.G-4	Alluvial Monitoring Well Summary and Aquifer Test Results
6.G-5	Water Quality at Pinabete Arroyo Alluvial Well PA-1
6.G-6	Water Quality at Pinabete Arroyo Alluvial Well PA-2
6.G-7	Potentiometric Elevations in Coal Monitoring Wells and Piezometers
6.G-8	Coal Monitoring Well Summary and Aquifer Test Results
6.G-9	Baseline Water Quality in the Fruitland Coals at the BNCC Coal Lease
6.G-10	Water Depths and Potentiometric Elevations in the Pictured Cliffs Sandstone Monitoring
	Wells and Piezometers
6.G-11	Pictured Cliffs Sandstone Monitoring Well Summary and Aquifer Test Results
6.G-12	Water Quality at Pictured Cliffs Sandstone Monitoring Well KPC-98-01
6.G-13	Water Quality at Pictured Cliffs Sandstone Monitoring Well KPC2007-01
6.G-14	Water Quality at Pictured Cliffs Sandstone Monitoring Well GM-19
6.G-15	Water Quality at Pictured Cliffs Sandstone Monitoring Well GM-20
6.G-16	Water Quality at Pictured Cliffs Sandstone Monitoring Well GM-30A
6.G-17	Water Quality at Pictured Cliffs Sandstone Monitoring Well GM-21
6.G-18	Measured and Modeled Recharge Rates

LIST OF FIGURES

6.G-1	Modeled Potentiometric Surface for the PCS
6.G-2	Modeled Potentiometric Surface for the No.3 Coal
6.G-3	Modeled Potentiometric Surface for the No. Coal
6.G-4	Modeled Saturation for a N-S Section

LIST OF EXHIBITS

6.G-1	Hydrogeologic Cross-sections, Monitoring Wells & Piezometers for Areas III, Iv and V
6.G-2	Coal Seam No. 3 Potentiometry
6.G-3	Coal Seam No. 8 Potentiometry
6.G-4	Navajo Mine PCS Potentiometry

LIST OF ATTACHMENTS

6.G-1 Completion Diagrams and Logs for Monitoring Wells and Vibrating Wire Piezometers

6.G-1 Introduction

This Appendix has been prepared to summarize and interpret the additional baseline data obtained from monitoring wells and vibrating wire piezometers (VWPs) that were installed in the Fruitland coals and in the underlying Pictured Cliffs Sandstone (PCS) for baseline hydrogeology characterization of Area IV and Area V of the BHP Navajo Coal Company (BNCC) coal lease. Completion diagrams and lithologic logs for these monitoring wells and VWPs are provided in Attachment 6.G-1. The data from these wells and VWPs locations provide additional information on groundwater levels, aquifer characteristics, and groundwater quality within and adjacent to the Navajo Mine permit area. Geologic information as well as data from monitoring wells installed in Area III of the BNCC lease are also included in this Appendix to support the hydrogeologic interpretations. This Appendix also provides the baseline data that are used to support the development and calibration of multilayer, numerical, groundwater flow model of the hydrogeologic system of Areas IV and V of the BNCC coal lease.

The hydrogeologic units within and adjacent to Navajo Mine Area IV North include:

- The alluvial groundwater of the Chaco River, Pinabete Arroyo, and Cottonwood arroyo
- The coal seams of the Fruitland Formation
- The Pictured Cliffs Sandstone (PCS), located below the Fruitland Formation

The location of baseline monitoring wells and VWPs completed within or adjacent to Areas III, IV and V of the BNCC coal lease are shown in Exhibit 6.G-1. This exhibit also provides hydrogeologic sections, depicting the various coal seams of the Fruitland Formation and the top of the PCS. Water level elevations measured in the monitored coal units and in the underlying PCS are plotted in the hydrogeologic sections in Exhibit 6.G-5 to depict both horizontal and vertical gradients.

6.G-2 Alluvial Groundwater

Alluvial fill deposits occur in the valley bottom of Cottonwood Arroyo within the permit area and along the Chaco River and Pinabete Arroyo, to the west and south of the permit area. However, these deposits are not considered Alluvial Valley Floors (AVF). Refer to of Chapter 6.5 for information on the negative determination for AVF within and adjacent to the permit area. The Chaco River alluvium is saturated and provides limited stock water supply at several dug wells. Likewise, portions of the alluvium of Cottonwood and Pinabete Arroyos are saturated and will yield water to wells, as evidenced by the dug wells completed in the alluvium of both Cottonwood and Pinabete Arroyos

Baseline monitoring of the alluvium of Cottonwood Arroyo was conducted at four alluvial well monitoring locations shown on Exhibit 6.G-1. Baseline water quality information obtained prior to year 1983 from the monitoring wells GM-17 and QACQ-2 (GM-18) are included in Appendix 6-C. Well GM-17 is completed

in the alluvium of North Fork of Cottonwood Arroyo. A dug well, GM-18, completed in the alluvium of Cottonwood Arroyo west of the permit area, was converted for use as a monitoring well and is designated as QACW-2 in Exhibit 6.G-1. This well was included in the Navajo Mine quarterly monitoring program. However, the well is usually dry and relatively few samples have been obtained during baseline monitoring. Water quality samples could not be obtained from alluvial monitoring well QACW-1 because it was dry during baseline monitoring from 1989 through 1998. The well was subsequently removed by the advance of mining operations in Area III. BNCC has also performed baseline monitoring of well QACW-2B completed in the alluvium of Cottonwood Arroyo west of the permit area as shown in Exhibit 6.G-1. This well is a dug well that has been used for stock water supply and is not owned by BNCC.

The baseline water quality monitoring results for these Cottonwood alluvial wells are summarized in Table 6.G-1. These results show the water quality of the alluvium of Cottonwood Arroyo to be a sodium-sulfate type with variable TDS concentrations. Water within the Cottonwood alluvium is unsuitable for drinking water use because of TDS, sulfate, fluoride, iron, and manganese exceedances of the criteria listed Table 6.G-2. The water in the alluvium of the mainstem of Cottonwood is marginally suitable for its current stock watering use, although the TDS, sulfate, and fluoride concentrations often exceed the Navajo Nation water quality criteria for livestock (Table 6.G-2). Also, the alluvium is variably saturated and often will not yield sufficient water for sampling.

Two alluvial monitoring wells, PA-1 and PA-2, were installed in 1998 within the alluvium of Pinabete Arroyo at the locations shown in Exhibit 6.G-1. Table 6.G-3 summarizes the baseline water level readings and aquifer test results are summarized in Table 6.G-4. The estimated hydraulic conductivities for the Pinabete Arroyo alluvium of 51.3 ft per day (ft/day) (1.8×10^{-2} cm per second (cm/sec)) and 10.7 ft/day (3.8×10^{-3} cm/sec) are within the range expected for clean sand and are considerably higher than the bedrock values in the area. Well yields from the alluvium, however, are limited by a very low saturated thickness of about 5 ft or less.

Water quality analytical results from the baseline sampling of alluvial wells PA-1 and PA-2 are provided in Table 6.G-5 and Table 6.G-6, respectively. These results show the water quality to be a sodium-sulfate type with TDS concentrations ranging from 1,500 to 4,310 mg/L. Water within the alluvium is unsuitable for drinking water use due to TDS, sulfate, fluoride, iron, and manganese concentrations above drinking water criteria. The water is marginally suitable for its current use for stock watering, although the TDS, sulfate, and fluoride concentrations usually exceed the Navajo Nation water quality criteria for livestock and wildlife use and selenium concentrations exceed the Navajo Nation water quality criteria for wildlife use.

Some information on the baseline water quality in the Chaco River Alluvium is provided in the well inventory included in Appendix 6E –Addendum 12-D-A of the PAP. The available water quality information from this well inventory show TDS concentrations ranging from 1,950 mg/l to 3,110 mg/l and sulfate concentrations ranging from 1,100 to 1,790 mg/l at wells located west of Areas II, III and IV at the Navajo Mine. Limited groundwater quality baseline data are also provided by Thorn (1993) for the Chaco River alluvium. The results show considerable variability in the alluvial water quality with TDS concentrations ranging from 742 to 11,900 mg/L, sulfate concentrations from 350 to 6,600 mg/L, and fluoride concentrations ranging from 0.4 to 1.7 mg/L.

6.G-3 Fruitland Coal Seams

Groundwater is also found in the coal units of the Fruitland Formation and in the PCS, which underlies the Fruitland Formation at the Navajo Mine site. The geologic strata within the permit and adjacent area dip gently to the east toward the center of the San Juan Basin at an angle of 1 to 2 degrees as depicted in the cross sections provided in Exhibit 6.G-1. Based on both regional and site-specific information, the Fruitland Formation and associated coal units, and the PCS are unsaturated or partially saturated near the outcrop of these units on the western side of the Navajo Mine permit area but become saturated to the east and down dip of the outcrop. The pre-mine groundwater in the Fruitland Formation throughout most of the BNCC coal lease will not support beneficial use because of the very low well yields and poor water quality. There are no known water supply wells completed in the Fruitland Formation within or adjacent to the BNCC coal lease.

Based on baseline information obtained from water level elevations measured in the wells and piezometers, the general groundwater flow directions in the Fruitland Formation within Areas III, IV and V of the BNCC coal lease are vertically downward through the interbedded shale and coal units of the Fruitland Formation and into the PCS and laterally within individual coal seams toward the north-northeast with some localized flow toward the topographic lows along Cottonwood and Pinabete Arroyos. Direct recharge rates measured by chloride mass balance methods on undisturbed areas at the Navajo Mine ranged from 0.002 to 0.09 in/yr (Stone 1987). The highest recharge rate of 0.09 in/yr was for valley terraces while the lowest recharge rate of 0.002 in/yr was for badland areas. Recharge from upland flats averaged 0.03 in/yr. Recharge is expected to be higher from saturated alluvium and surface impoundments. Although Stone's research (1986 and 1987) did not include recharge estimates for surface impoundments, it does provide an estimate of an average recharge rate of 0.16 in/yr from depressions within reclaimed mine areas at the Navajo Mine.

Based on the previous mining experience at the Navajo Mine, the coals, the overburden, and the interburden in the Fruitland Formation are not expected to yield much water during mining. The mine pit has remained dry except on rare occasions when surface flows are captured. Groundwater seeps are rarely

observed along the highwall as any groundwater in the Fruitland overburden and coals is consumed by evaporation along the highwall. The few seeps that have been observed during mining were at locations within Area I where the highwall was near Navajo Agricultural Products Industry (NAPI) irrigation plots. NAPI irrigation plots do not occur within the drainages associated with proposed Area IV mining, although Cottonwood Arroyo does receive direct discharges of water from irrigation canals. The direct discharges occur when an over supply of water in the canal is released directly to the stream channel. Direct discharge is highly variable, occurs quickly, and can last up to 12 hours. However, usually there is no flow in Cottonwood Arroyo and it retains the characteristics of an ephemeral stream

One conceptualization of the hydrogeology of the Navajo Mine site is to consider the Fruitland Formation as a single hydrogeologic unit. The single hydrogeologic unit approach was previously proposed by Billings and Associates (Appendix 6.D) for modeling groundwater at the Navajo Mine because of the complexity of the individual coal seams, which often split or pinch out. This conceptualization has been used for predicting steady-state post mining flow in the Fruitland Formation from the Navajo Mine to the discharge locations along the subcrop with the San Juan River alluvium. This conceptualization may be best for regional modeling and is the appropriate conceptualization when baseline hydrogeologic information does not exist to calibrate a more complex hydrogeologic model.

However, given the extensive baseline hydrogologic information that was available within areas IV and V of the BNCC lease, a conceptual hydrogeologic model and the numerical groundwater model that delineates the coal beds as distinct hydrogeologic units was developed to assess the baseline hydrogeologic conditions and to simulate the effects of mining within Area IV North. This conceptualization supports the calibration of a numerical model because the potentiometric information is developed from monitoring wells and piezometers completed in specific coal units. This conceptualization is also better for evaluating local influences and the potential changes in vertical and horizontal groundwater flows that may occur as a result of mining and reclamation.

The potentiometric elevations in the specific coal units decline with depth within Areas III, IV and V of the BNCC lease as shown in Exhibit 6.G-1, indicating a vertical downward component of flow through the Fruitland Formation. One of the primary hydrogeologic changes to occur as a result of mining is the removal of the coals, interbedded shales, and sandstone strata, thus resulting in more homogeneous and isotropic conditions within the mine backfill. This change is expected to result in a steady-state postmining water table that is lower than pre-mining but steady-state potentiometric elevations at the base of the mine backfill that are higher than the potentiometric elevations that occurred in the lowest coal seam prior to mining. The result of this change would be an increase in vertical flow from the mine backfill into the PCS under steady-state post-mining conditions relative to the vertical flow from the Fruitland Formation to the PCS prior to mining.

However, these changes would not be expected within Area I. The pre-mine vertical downward gradient may not have occurred in the Fruitland Formation within Area I because of its closer proximity to the San Juan River, a location for regional groundwater discharge where upward gradients would be expected. Also, Morgan Lake has increased potentiometric elevations in the PCS, which further limits the potential for downward flow into the PCS from the Fruitland Formation.

The PCS, the first hydrogeologic unit below the Fruitland Formation, has been included in the groundwater flow model. The top of the Lewis Shale, the first hydrogeologic unit below the PCS, has been included as the base of the model domain. The delineation of these hydrogeologic units within the model domain was created from the extensive geologic and groundwater information developed for Areas IV and V. Information was also obtained from a variety of sources to help delineate the hydrogeologic units and define groundwater conditions for the portions of the model domain that are beyond the limits of Areas IV and V. Norwest Corporation (2011) provides a description of the hydrogeologic model that was developed to characterize the baseline hydrogeology and to support the probable hydrologic consequences assessment.

Baseline potentiometric elevations measured in the wells and in the VWPs completed in specific coal seams within Areas IV and V are summarized in Table 6.G-7. The potentiometric surface for the No. 3 coal seam is provided in Exhibit 6.G-2. This potentiometric surface was constructed from the baseline potentiometric elevations for the No. 3 coal seam presented in Table 6.G-7 and the July 1989 baseline potentiometric elevations measured in the No. 3 coal wells located within Area III. The modeled baseline potentiometric surface for the No. 3 coal in Figure 6.G-2 was also used to estimate the potentiometric contours beyond the limits of the monitoring data. The potentiometric gradient in the No. 3 coal indicates groundwater flow components toward the north-northeast with local gradients toward Pinabete Arroyo and Cottonwood Arroyo. The lower coal seams pinch out and do not extend north of Area III. The groundwater moving along the potentiometric gradients to the northeast flows through the undifferentiated Fruitland Formation into either the upper coal units or into the underlying PCS.

Potentiometric gradients in the other coal seams within Areas III, IV, and V of the BNCC coal lease are expected to be generally toward the northeast, similar to the gradients shown for No. 3 coal. However, the upper coal seams (No. 6, No. 7, and No. 8) outcrop to a greater extent within the valleys of Pinabete Arroyo, No Name Arroyo, and Cottonwood Arroyo within the BNCC coal lease. The groundwater associated with these upper coal seams is expected to show greater local influence from the topographic lower elevations along the arroyos. The baseline hydrogeologic model generated to support the probable hydrologic consequences assessment simulated local potentiometric gradients toward the topographic lows along Pinabete Arroyo, No Name Arroyo, and Cottonwood Arroyo in all of the Fruitland coal units. The local influence of topography on potentiometric gradients was greatest for the shallowest coal, the No. 8 seam (Norwest Corporation, 2011). Field observations of salt deposits and enhanced vegetation production

also indicate that local discharge may occur from the No. 8 coal at the coal outcrop along Pinabete Arroyo. Baseline groundwater model simulations in Figure 6.G-3 and potentiometric elevations at wells KF-2007-01, KF84-22A, and KF83-10A were used to prepare the potentiometric surface of the No. 8 coal seam that is provided in Exhibit 6.G-3.

A displacement (slug) test was performed at well KF-98-02 and bailed recovery tests were conducted at wells KF-98-03 and KF-98-04 to determine transmissivity and hydraulic conductivity in the No. 3 coal seam within Area IV South. Test results in Table 6.G-8 show very low hydraulic conductivity values for the No. 3 coal consistent with the low hydraulic conductivity values reported in Table 6-1 for the No. 2, No. 3, and No. 4-6 coal seam wells located within Area IV North. A pumping test of the No. 8 coal seam well KF2007-01 was also performed and interpreted using the Papadopulos-Cooper method as shown in Table 6.G-8. The higher hydraulic conductivity for the No. 8 coal seam relative to the No. 3 seam is consistent with the results in Table 6-1, which show higher hydraulic conductivities for the No. 7 and No. 8 coal units relative to the lower coal units.

In a separate set of tests, the transmissivity and hydraulic conductivity values calculated from the observation well response during a pumping test of the No. 8 coal seam well, G-20, located at the San Juan Mine were 0.017 ft²/day and 0.001 ft/day (3.5×10^{-7} cm/sec), respectively (San Juan Coal Company, 2009). These results for the hydraulic conductivity from G-20 are lower than the values from well tests at Navajo Mine. However, the observation well response from well G-20 pumping test is useful because it provides a reliable estimate for the storage coefficient (4.2×10^{-4}) associated with the No. 8 coal seam.

Water quality monitoring data from Fruitland Formation coal wells at the Navajo Mine and BNCC coal lease monitoring locations show that baseline groundwater in the coals is very saline. Table 6.G-9 provides a summary of the baseline water quality obtained from coal wells located within Areas II, III, and IV at the BNCC coal lease. This table provides median baseline concentrations measured at the coal wells along with the number of baseline analyses obtained for each constituent at each well. Given the variability in some of the analytical results, the median provides a good representation of baseline water quality at each well location. The median, unlike the mean, is not biased by an anomalous value resulting from analytical or transcription errors or by a sample that may not be representative due to sampling method or impact by drilling fluids or annular grout seal.

The TDS concentrations in Table 6.G-9 for the coal water at the Navajo Mine monitoring locations exceed the Navajo Nation and EPA Water Quality criteria for both drinking water and livestock use The chloride concentrations also exceed the Navajo Nation Water Quality criteria for both drinking water and livestock use in most of the wells. Fluoride concentrations are quite variable but the median values in several of the wells exceed the Navajo Nation Water Quality criteria for both drinking water and livestock. Sulfate is also quite variable among coal wells with concentrations above the Navajo Nation Water Quality criteria for both drinking water and livestock in the shallow coal wells near the outcrop but very low sulfate concentrations in the coal water in the deeper coal units and down dip of the outcrop. The low sulfate in these deeper coals is due to apparent sulfate reduction in the groundwater.

Groundwater monitoring results in Table 6.G-9 show that sodium is the dominant cation in the coal water and that bicarbonate-chloride are typically the dominant anions except for the relatively high sulfate in the shallow coals near the outcrop. The TDS concentrations in the coal units at the Navajo Mine typically increase from south to north and from shallow to deep. Furthermore, baseline TDS concentrations in excess of 40,000 mg/L have been reported in Table 6-2 of Navajo Mine Permit Application for the Fruitland coal monitoring wells SJKF84#2 and SJKF84#3 installed in the No. 8 coal northeast of the Navajo Mine as shown in Exhibit 6-6 of the Navajo Mine Permit Application.

Groundwater chemistry can change or evolve along its flow path from the recharge area to the discharge area. Precipitation is low in TDS, is naturally weakly acidic, and contains bicarbonate due to the solution of carbon dioxide in the air. In this portion of the San Juan Basin, the precipitation reaching the ground is immediately neutralized and acquires sodium, sulfate, and other ions. Water that has only a short residence time in the ground is still typically high in TDS concentrations, with sodium, sulfate, and bicarbonate the dominant ions as indicated by both the surface water and alluvial groundwater samples. Calcium is also present due to dissolution of calcium carbonate, but at concentrations that are considerably lower than sodium. Chloride concentrations in precipitation are low. Chloride concentrations in groundwater increase due to evapotranspiration and are typically lower in groundwater in the alluvium and in shallow bedrock near recharge areas. As groundwater migrates through the saturated zones it is no longer in contact with atmospheric carbon dioxide and its capacity to dissolve carbonates diminishes. The chemistry of the groundwater continues to evolve as other soluble minerals dissolve and cation exchange processes reduce the proportion of calcium and increase the proportion of sodium in solution. Sulfate reduction also occurs when groundwater transitions from oxidizing to reducing conditions, particularly within the coal units.

6.G-4 Pictured Cliffs Sandstone

The PCS is a well-cemented, low-permeability, marine sand and is the first water-bearing unit below the Fruitland Formation. Based on the geologic information presented in Section 5 of the Navajo Mine Permit, the PCS is approximately 110 to 120 ft thick and follows the structure of the Fruitland Formation, dipping to the east at approximately 2 degrees, although the structure varies locally. The PCS conformably overlies the Lewis Shale, with the contact marked by a zone of interbedded sandstones and mudstones in the lower part of the PCS (Stone et al. 1983). It outcrops just west of the mine lease and east of the Chaco River. The PCS is a marginal water resource due to low permeabilities, poor water quality, gas production, and low yields (Stone et al. 1983). The PCS is also a natural gas reservoir in the San Juan Basin. Stone et al.

(1983) state that the PCS cannot be considered a major aquifer and it is important only because it is the water-bearing horizon immediately underlying the coals in the Fruitland Formation.

Well KPC-98-01 was installed in 1998 near the PCS outcrop at the location shown in Exhibit 6.G-1. In 2007, wells KPC2007-01, KPC2007-02, and KPC2007-03 were completed in the PCS at locations around the perimeter of Area IV South (Exhibit 6.G-1). VWPs were installed in the PCS at four of the five VWP locations as shown on Exhibit 6.G-1. A VWP was not installed in the PCS at the VWP2007-03 location because monitoring well KPC2007-02 was installed in the PCS at this location. Potentiometric elevations measured at the PCS wells and the VWPs are summarized in Table 6.G-10.

The water levels measured in the PCS well KPC2007-01 at the VWP2007-01 location show elevations in the PCS monitoring well that are consistently about 6 feet lower than the potentiometric elevation measured in the PCS at the VWP. The VWP in the PCS at this location is installed at the top of the PCS, while the well screen and filter pack extends through about 75 ft of the PCS. The difference between the two measurements suggests that hydrostatic heads are higher at the top of the PCS at this location and decline with depth. Thus, downward gradients are believed to continue through the PCS at this location.

Historical water level data are also available for six PCS wells that were completed within or adjacent to BNCC lease Areas IV and V during the mid-1970s. Data from these well are included in a report by Science Application, Inc. (1979) that was prepared for a proposed coal gasification project. These PCS monitoring wells are designated as the GM wells with water elevations shown on Exhibit 6.G-4. These PCS monitoring wells and piezometers were plugged and abandoned in 1994.

The modeled baseline potentiometric surface for the PCS in Figure 6.G-1 together with the baseline potentiometric elevations from the PCS wells and VWPs were used to prepare the PCS potentiometric surface provided in Exhibit 6.G-4. The measurements of the baseline potentiometric elevations for the abandoned GM wells were obtained in June 1989. The potentiometric surface for the PCS shows overall gradients to the north. The highest potentiometric elevations for the PCS shown in Exhibit 6.G-4 correspond with a structural high in the PCS located within the southeast portion of Area V of the BNCC coal lease. There are also local gradients toward the topographic lows along No Name Arroyo, Pinabete Arroyo and Cottonwood Arroyo.

Water yields are quite low from these PCS monitoring wells completed around BNCC lease Area IV South. Two of the PCS wells were quickly pumped or bailed dry during conventional sampling. The yield from one of the PCS wells was sufficient to sustain a rate of about 0.4 gallons per minute (gpm) during a constant rate pumping test. The fourth PCS monitoring well was pumped dry after about 140 minutes during a constant-rate pumping test at a rate of about 1 gpm. An aquifer test was also conducted in 1975 at well T4-1 installed in the PCS near the western side of the Navajo Mine lease boundary as shown in Exhibit 6.G-4. The drawdown and recovery measurements were recorded at the pumped well and at observation well GM30A, located 55.8 ft from the pumping well, and at observation well T4-2 located 12.5 ft from the pumping well (Science Application Inc. 1979). The results of this aquifer test and those performed at the PCS monitoring wells installed within or adjacent to Area IV South are summarized on Table 6.G-11.

Water quality analytical results from the baseline sampling of KPC-98-01 are provided in Table 6.G-12. The initial sample collected from this well in 1998 showed some influence from drilling fluids based on elevated pH and nitrate in the well sample results (Table 6.G-12). It is suspected that the well was not fully developed due to low permeability and limited saturation. Sampling results starting in 2007 are more consistent and representative of baseline conditions within the PCS at this location. Based on the recent samples, the PCS groundwater at this location is a sodium-sulfate type with TDS concentrations slightly above 6,000 mg/L.

The baseline water quality results from PCS well KPC2007-01 are summarized in Table 6.G-13. The PCS groundwater at this location is similar to the groundwater at well KPC-98-01 with TDS concentrations slightly below 6,000 mg/l. Baseline water quality information was also collected during the mid-1970s from PCS wells GM-19, GM-20, GM-30A and GM21 located within or in close proximity to the BNCC coal lease as shown in Exhibit 6.G-1. Water quality data from these wells are summarized in Tables 6.G-14 through 6.G-17. Baseline water quality data for these PCS monitoring wells indicate a sodium-sulfate type with TDS concentrations between 5,000 and 9,000 mg/l. The water quality results are consistent with the results from wells KPC-98-01 and KPC2007-01, although the initial well samples from a number of the PCS wells is suspect due to either poor ion balance or insufficient well development.

In summary, groundwater quality data from monitoring wells located within and adjacent to the Navajo Mine indicate that the groundwater in the PCS has high TDS concentrations, ranging from 5,000 mg/L to over 9,000 mg/L. Sulfate is the dominant anion, although the concentrations of chloride and bicarbonate are also relatively high. Sodium is the dominant cation. Magnesium and calcium concentrations are quite low and are typically less than the potassium concentrations. Generally, water quality changes are observed in the first few samples obtained from PCS monitoring wells, apparently due to the difficulty in developing these low-yield wells. Thus, samples obtained after the initial two samples are believed to provide a better representation of baseline conditions.

The groundwater in the PCS groundwater within Areas IV and V of the BNCC coal lease is unsuitable for either domestic or livestock use. The concentrations of TDS, sulfate, chloride, and boron in the PCS wells are considerably higher than the domestic use criteria provided in Table 6.G-2. The TDS and sulfate

concentrations in the PCS are also considerably higher than the livestock use criteria provided in Table 6.G-2. The low permeability and low yield of the PCS also limits the potential for groundwater use from the PCS. There are no known water supply wells completed in the PCS within or adjacent to Navajo Mine Permit Area.

6.G-5 Hydrologic Model

Conceptual and numerical groundwater models are useful to support the interpretation of baseline hydrogeologic information. Furthermore, conceptual or numerical groundwater models are required for the predictive evaluations needed to prepare a probable hydrologic consequence (PHC) assessment of proposed mining and reclamation activities. Groundwater models used for a PHC assessment can range from conceptual depictions, to simple empirical equations, to complex numerical computer simulations of groundwater flow and chemistry.

Site-specific data or data representative of the site conditions are needed to apply groundwater models. Numerical groundwater flow models can help develop a better understanding of the hydrogeologic system, including the groundwater flow relationships between hydrogeologic units and between surface water and groundwater. Extrapolation of data from adjacent or nearby areas or using typical values for parameters from similar hydrogeologic environments is often used in developing numerical flow models. Model calibration can also serve to revise the conceptual model of the groundwater system and provide a better assessment of the properties of hydrogeologic units on a regional scale that cannot be obtained solely from local pumping testing results.

The first step in developing a groundwater model is to establish the objectives of the study. There are three primary objectives for the development of a groundwater model for Area IV North mine permit revision application:

- To provide a better understanding of the baseline groundwater flow systems within and adjacent to the proposed mine area.
- To predict the steady state groundwater flow system that is expected to occur long after mining and reclamation activities have been completed in the area. In particular, this evaluation will need to estimate the expected level of saturation within the mine backfill and the groundwater flow rates and directions into and from the mine backfill.
- To predict the transient groundwater changes that are expected during and after mining. In particular, these evaluations will assess the extent of drawdown in the Fruitland coals and the PCS, and the approximate time frames for recovery to steady state conditions following mining.

Potentiometric elevations in the monitored coal units and in the underlying PCS are plotted in the hydrogeologic sections in Exhibit 6.G-1, to depict vertical gradients. Quarterly monitoring performed on

many of these wells and VWPs show no seasonal changes but occasional fluctuation in some wells due to slow recovery following bailing, purging and sampling. Results show downward potentiometric gradients through the Fruitland formation. Generally the gradients are downward from the Fruitland to the PCS except at locations VWP2007-02 and VWP2007-05. The slightly higher potentiometric elevation in the PCS at these locations indicates a slight upward gradient from the PCS to the No. 2 and 3 coal units of the Fruitland Formation.

6.G-6 Numerical Groundwater Model

A multilayer, numerical, groundwater flow model has been developed to model the groundwater flow systems within and adjacent to Navajo Mine Area IV. Norwest Corporation (2011) provides a detailed description of the numerical groundwater flow model. This numerical model is based on the conceptual model of the hydrogeology of the Fruitland coals, the PCS and the alluvial groundwater systems within and adjacent to Navajo Mine Area IV. A conceptual groundwater model is a complex hypothesis of the characteristics and functions of a hydrogeologic system, including recharge and discharge relationships, groundwater flow within and between hydrogeologic units, and the expected properties of these hydrogeologic units. An essential part of the both the conceptual and numerical models is a graphical representation of the hydrogeologic units within the model domain that are believed to have the primary controlling influence on groundwater flows. Another element of the conceptual model is to define, to the extent possible, the properties of these hydrogeologic units, and storage characteristics across the model domain. The conceptual model also includes the hydrogeologist's understanding of spatial relationships between and approximate rates of recharge and discharge and discharge rates of recharge and discharge including the groundwater inflows and outflows from the model domain.

The delineation of the hydrogeologic units within and adjacent to Navajo Mine Area IV was based on the extensive geologic and groundwater information obtained from a variety of sources, including the baseline information presented in this Appendix. The multilayer groundwater model was calibrated to obtain a good match with potentiometric surfaces and water levels established from the baseline groundwater information while maintaining consistency with the site-specific recharge estimates from Stone (1986) and the range of hydraulic conductivities associated with each hydrogeologic unit. During model calibration, hydraulic conductivities were applied only for the entire hydrogeologic unit and not spatially within a unit. Without a consistent geologic basis, spatial adjustments in hydrologic conductivities would lead to over-parameterization of the model to match modeled potentiometric levels with observed values. Although some of the differences between the modeled and observed potentiometric levels may be associated with spatial variation in hydrogeologic properties within a hydrogeologic unit, the chosen method for model calibration allows for the overall groundwater flow within each hydrogeologic unit and between units to be represented by the calibrated groundwater model.

Generally, a shale zone such as the Lewis Shale would be considered as an impermeable boundary. However, given the low recharge rates at the Navajo Mine site, the overall low permeability of the Fruitland Formation shales and coals, and the relatively low permeability of the PCS, the flow conditions at the boundary between the PCS and Lewis Shale were found to be significant for calibrating the groundwater flow model. Providing for downward flow from the PCS into the Lewis Shale was required in order to reach an adequate calibration with recharge rates consistent with the measurements from Stone (1987). Downward flow and downward gradients are also indicated by hydrogeologic studies and tests of the Lewis Shale and the PCS immediately west of Area V of the Navajo Mine lease (Science Application, Inc. 1979). Also, as discussed in Section 6.G-4, the water levels measured in the PCS well KPC2007-01 and in the PCS VWP at the same location show that downward gradients continue through the PCS at this location.

Table 6.G-18 shows the relationship between the modeled recharge rates and the measurements by Stone (1987). Outside of the alluvial valleys, recharge rates were adjusted by slope within the range of estimates from Stone (1987) for badland areas and for upland flats. The modeled potentiometric surface for the PCS, the No. 3 coal seam, and the No. 8 coal seam are provided in Figure 6.G-1, Figure 6.G-2, and Figure 6.G-3, respectively. These results are consistent with the baseline potentiometric elevations obtained from monitoring wells completed in these hydrogeologic units. However, the modeled potentiometric surfaces extend beyond the limits that could be depicted from well measurements. These potentiometric surfaces and flow patterns are consistent with the conceptual model and all the geologic and hydrogeologic information and the specified boundary conditions.

The results in Figure 6.G-1 show a component of groundwater flow from the PCS to the topographic lows along the west side of the model domain in the valleys of Brimhall Wash, No Name Arroyo, Pinabete Arroyo, and Cottonwood Arroyo. The results for the No. 3 coal seam in Figure 6.G-2 also show a component of groundwater flow to the topographic lows along the west side of the model domain in the valleys of No Name Arroyo, Pinabete Arroyo, and Cottonwood Arroyo. The No. 3 coal seam is not present over a portion of the Brimhall Wash drainage or along the western portion of the model domain. Also, the No 3 coal seam is unsaturated in areas along the western outcrop and remains unsaturated in the modeled potentiometric surface as indicated in Figure 6.G-2. A similar pattern is observed in Figure 6.G-3 for the No. 8 coal seam, although this coal is not present over a large portion of the Brimhall drainage or within a large portion of the No Name, Pinabete, and Cottonwood valleys within the BNCC coal lease. In addition to the flow toward the topographic lows, there is a component of flow down dip to the northeast. Portions of the No. 8 coal seam near the western outcrop are unsaturated. Not shown in these figures for individual hydrogeologic units are the overall downward gradients and downward flow between units. In fact, the model predicts perched groundwater conditions in the shallower coals along the western portion of the lease area as depicted by the north-south section in Figure 6.G-4.



Figure 6.G-1. Modeled Potentiometric Surface for the PCS



Figure 6.G-2. Modeled Potentiometric Surface for the No.3 Coal



Figure 6.G-3. Modeled Potentiometric Surface for the No. 8 Coal



Figure 6.G-4. Modeled Saturation for a N-S Section

The calibrated numerical model helps confirm the conceptual model. The numerical model is well constrained and consistent with the recharge rates measured by Stone (1987) and with the hydraulic conductivities and heads measured within the various hydrogeologic units in the model domain.

6.G-7 References

- Billings and Associates Inc. 1987. Solutions to OSMRE Concerns and Deficiencies Related to the Ground Water Sections of the Navajo Mine Permit Application Package. OSM Permit NM-0003C, Chapter 12, Appendix 12-C.
- BHP Navajo Coal Company (BNCC). 2004. Navajo Mine Permit Application Package. OSM Permit No. NM-0003F. On file at Office of Surface Mining Reclamation and Enforcement- Western Region Technical Office. Denver, Colorado.
- Navajo Nation Environmental Protection Agency Water Quality Program. 2004. Navajo Nation Surface Water Quality Standards, passed by Navajo Nation Resources Committee 30 July 2004.
- Norwest Corporation, 2011. Navajo Mine Area IV Groundwater Modeling Report. Unpublished report submitted to BHP Navajo Coal Company.
- San Juan Coal Company 2009. San Juan Mine Permit 09 01, page 804-9
- Science Application, Inc. 1979. Ground and Surface Water Hydrology of the Navajo Coal Mine and Adjacent Areas. Natural Resources Division of Science Application, Inc. Albuquerque, New Mexico. (Copy on file in the Office of Surface Mining library in Denver, Colorado).
- Stone, W.J., F.P Lyford, P.F.Frenzel, N.H. Mizell, and E. T. Padgett. 1983. Hydrogeology and Water Resources of San Juan Basin, New Mexico. Hydrology Report 6. New Mexico Bureau of Mines & Mineral Resources, Socorro, New Mexico.
- Stone, W.J. 1986. Phase II Recharge Study at the Navajo Mine Based on Chloride, Stable Isotopes, and Tritium in the Unsaturated Zone. Open File Report 216. New Mexico Bureau of Mines & Mineral Resources, Socorro, New Mexico.
- Stone, William J. 1987. Phase-III Recharge Study at the Navajo Mine Impact of Mining on Recharge. New Mexico Bureau of Mines and Mineral Resources. Open-File Report 282. <u>http://geoinfo.nmt.edu/publications/openfile/downloads/OFR200-299/276-299/282/ofr_282.pdf</u> (Verified 06 October 2009).
- Thorn, Conde R. 1993. Water-Quality Data from the San Juan and Chaco Rivers and Selected Alluvial Aquifers, San Juan County, New Mexico. USGS Open-File Report 93-84. Available online at: http://pubs.er.usgs.gov/usgspubs/ofr/ofr9384 (Verified 27 January 2011).

Well	Well Depth	Baseline Monitoring	pl	H (SU)	TI	DS -180° (mg/L)	Bicar HCC	rbonate as D_3 (mg/L)	Cart CO	sonate as (mg/L)	(Chloride (mg/L)	Sulfa	ate (mg/L)	Ca (r	alcium ng/L)	Ma (gnesium mg/L)	Po)tassium (mg/L)
	(feet)	Period	n	median	n	median	n	median	n	median	n	median	n	median	n	median	n	median	n	median
KF2007-01 (No. 8)	118	2007-2008	5	8.75	5	3460	5	1490	5	260	5	338	5	740	5	3.2	5	1.6	5	17.9
KF98-02 (No. 3)	216.5	1998 2007-2008	8	8.06	8	3160	8	1329	8	40	8	925	8	119	8	6.9	8	1.0	8	12.6
KF84-21A (No 2)	119.3	1985-2001	31	7.9	31	14200	31	1191	31	ND	31	4440	31	64	31	13.4	31	15.0	31	13.4
KF84-22A (No 8)	125.5	1991-2001	30	8.02	30	4615	21	1190	21	ND	30	273	30	2050	30	15.5	30	3.5	30	6.3
KF84-22B (No 7)	141.65	1991-2001	25	7.4	25	6010	24	865	24	ND	24	3215	25	5	25	45.0	25	13.1	25	11.7
KF84-20A (No 3)	190	1985-2001	24	7.93	24	7260	24	1082	24	ND	24	3715	24	5	24	18.4	24	11.0	24	11.9
KF84-20B (No 4)	216	1986	1	12.31	1	6660	1	2464	1	ND	1	79	1	172	1	16.5	1	0.0	1	337.0
KF84-20C (No 7)	236	1985-2001	23	7.9	23	2770	23	1562	23	ND	23	715	23	7	23	9.6	23	5.8	23	2.9
KF84-18B (No 8)	134.7	1985-2000	24	7.1	24	9270	24	1030	24	ND	24	4890	24	5	24	113.0	24	24.2	24	14.6
KF84-18A (No. 6)	180.2	1985-2001	25	7.43	25	13400	25	448	25	ND	25	7900	25	5	25	159.0	25	51.2	25	22.5
		5.11			-								-	-					1	
Well	Well Depth	Monitoring	S ($\frac{\text{odium}}{\text{mg/I}}$		(mg/I)	Niti	rate as N	Boro	n (mg/L)		ron, total	dis	Iron, s (mg/L)	Mar tota	iganese,	Ma	nganese,		
() OII	(feet)	Period	n	median	n	median	n	median	n	median	n	median	n	median	n	median	n	median		
KF2007-01 (No. 8)	118	2007-2008	5	1180	5	2.70	5	0.29	5	0.329	5	0.310	5	ND	5	0.017	5	0.008		
KF98-02 (No. 3)	216.5	1998 2007-2008	8	1170.0	8	1.65	8	0.03	8	0.4	8	0.485	8	0.080	8	0.035	8	0.017		
KF84-21A (No 2)	119.3	1985-2001	31	3090	31	1.57	5	0.1	30	0.61	31	0.100	18	0.220	23	0.030	23	0.100		
KF84-22A (No 8)	125.5	1991-2001	30	1600	30	2.20	4	0.88	26	0.26	26	0.360	30	0.080	26	0.023	30	0.012		
KF84-22B (No 7)	141.65	1991-2001	25	2330	25	0.88	1	0.08	22	0.39	23	1.130	25	0.200	23	0.300	25	0.300		
KF84-20A (No 7)	190	1985-2001	24	2690	24	1.39	2	0.12	23	0.56	16	2.670	24	0.250	16	0.175	24	0.100		
KF84-20B (No 4)	216	1986	1	904	1	0.80	0		1	0.13	0		1	0.037	0		1	ND		
KF84-20C (No 2 & 3)	236	1985-2001	23	1040	23	1.74	2	0.18	23	0.42	16	0.640	23	0.180	16	0.075	23	0.082		
KF84-18B (No 8)	134.7	1985-2000	24	3365	24	0.44	3	0.1	23	0.74	16	11.550	24	0.555	16	0.375	23	0.082		
KF84-18A (No. 6)	180.2	1985-2001	25	4660	25	0.67	2	0.1	24	0.72	15	5.09	25	0.25	17	1.33	25	1.33		

Table 6.G-9. Baseline Water Quality in the Fruitland Coals at the BNCC Coal Lease

Attachment 6.G-1

Completion Diagrams and Logs for Monitoring Wells and Vibrating Wire Piezometers




























NORWEST		VWP2007-03						
Applied Hydrology	PAGE	1 OF 2	COMPLETION DIAGRAM & LITHOLOGIC LOG					
PROJECT: <u>NAVAJO MINE EXTENSION</u> DRILLING CO: <u>MO-TE</u> DRILLER: <u>BOB</u> CLIENT SUPERVISER: <u>COLLETTE BROWN</u> GEOLOGIST/SUPERVISOR: <u>JOEL SOBOL</u> AHA JOB # : <u>4010-00060-10</u> DRILLING METHOD: <u>AIR ROTARY</u> BORING STARTED: <u>7/24/07</u>	WELL TYPE: <u>TEST HOLE</u> WELLHEAD TYPE: <u>PROTE</u> WELL COMPLETED: <u>7/24</u> WELL DEVELOPED: <u>7/24</u> DATE SURVEYED: <u>8/29/</u> SCREEN SLOT SIZE: <u>N/A</u> SCREEN TYPE: <u>N/A</u> FILTER PACK: <u>N/A</u>	FOR PIEZOMETERS CTIVE HEAD COVER /07 /07 07	CASING DIAMETER: <u>1-1/4</u> " CASING MATERIAL: <u>20' STEEL TREMIE PIPE</u> BORING DIAMETER: <u>5-1/8</u> " TOP OF CASING ELEV. (FT): <u>5514.63</u> GROUND ELEVATION (FT): <u>5512.63</u> LOCATION: <u>AREA 4 SOUTH</u> NORTHING (FT): <u>1975124.6347</u> EASTING (FT): <u>303891.1617</u>					
LITHOLOGY LOG				6" x 5' STEEL WELL PROTECTOR W/ LOCKING CAP				
	0- 5- 10- 15- 20- 25- 30- 35- 40- 45- 50- 55- 60- 65- 70- 75- 80- 85- 90- 95- 100- 105- 110- 115- 120- 135- 130-	7	∕o<	 CEMENT BENTONITE GROUT (See Spec. Sheet) 1 1/4"STEEL TREMIE PIPE (To be Grouted in Place) STAINLESS STEEL BAND CENTRALIZERS TO BE SET 50' ON CENTER VIBRATING WIRE CABLE STRAPPED TO TREMIE PIPE 				
	145– 150–							

NORWEST			VWP2007-03					
Applied Hydrology	PAGE 2	OF 2 COMPLE	TION DIAGRAM & LITHOLOGIC LOG					
PROJECT: <u>NAVAJO MINE EXTENSION</u> DRILLING CO: <u>MO-TE</u> DRILLER: <u>BOB</u> CLIENT SUPERVISER: <u>COLLETTE BROWN</u> GEOLOGIST/SUPERVISOR: <u>JOEL SOBOL</u> AHA JOB # : <u>4010-00060-10</u> DRILLING METHOD: <u>AIR ROTARY</u> BORING STARTED: <u>7/24/07</u>	WELL TYPE: <u>TEST HOLE F</u> WELLHEAD TYPE: <u>PROTECT</u> WELL COMPLETED: <u>7/24/()</u> WELL DEVELOPED: <u>7/24/()</u> DATE SURVEYED: <u>8/29/07</u> SCREEN SLOT SIZE: <u>N/A</u> SCREEN TYPE: <u>N/A</u> FILTER PACK: <u>N/A</u>	FOR PIEZOMETERS CASING ID TIVE HEAD COVER CASING ID D7 BORING ID BORING ID D7 TOP OF ID GROUND TOP LOCATION NORTHING EASTING EASTING	CASING DIAMETER: <u>1-1/4</u> " CASING MATERIAL: <u>20' STEEL TREMIE PIPE</u> BORING DIAMETER: <u>5-1/8</u> " TOP OF CASING ELEV. (FT): <u>5514.63</u> GROUND ELEVATION (FT): <u>5512.63</u> LOCATION: <u>AREA 4 SOUTH</u> NORTHING (FT): <u>1975124.6347</u> EASTING (FT): <u>303891.1617</u>					
LITHOLOGY LOG								
	150- 155- 160- 165- 170- 175- 180- 185- 190- 195- 200- 205- 210- 215- 220- 225- 230- 235- 240- 245- 255- 260- 265- 270- 265- 260- 260-		CEMENT BENTONITE GROUT (See Spec. Sheet) VIBRATING WIRE CABLE STRAPPED TO TREMIE PIPE 1 1/4"STEEL TREMIE PIPE (To be Grouted in Place) 3/4" DIA. VIBRATING WIRE PIEZOMETER (VWP) STRAPPED TO TREMIE PIPE - DEPTH VARIES: STAINLESS STEEL BAND CENTRALIZERS TO BE SET S0" ON CENTER					





11.6 PROBABLE HYDROLOGIC CONSEQUENCES

This section provides a detailed assessment of the probable hydrologic consequences (PHC) of mining and reclamation activities at the Navajo Mine. The primary focus of the PHC is to predict the effects of proposed mining and reclamation activities on the prevailing hydrologic balance with respect to the quality and quantity of water in surface water and groundwater systems both during mining and after reclamation.

Disruption of the surface and geologic conditions and associated surface water and groundwater flow systems is necessary in order to extract the coal resource by surface mining. Surface coal mining and reclamation operations may affect the hydrologic balance in several ways, including:

- changing groundwater levels, recharge rates, and flow directions by removal of overburden and interburden materials and mining of the coal and by backfilling mine pits;
- exposing unweathered mineral surfaces in overburden and interburden to weathering processes during mining and backfilling operations;
- past placement of coal combustion by-product (CCB) materials in mine backfill;
- changing the quantity and quality of surface runoff and stream flows by construction of diversions, surface disturbance, sediment control structures, and construction and operation of best management practices (BMPs);
- altering surface topography and stream channels during mining and reclamation; and
- changing sediment loads and concentrations and flow rates within stream channels downstream of mining and thereby altering stream channel morphology.

The PHC is a process for identifying these potential changes in the hydrologic balance that may result from mining and reclamation. This PHC assessment builds on the geologic information, the baseline groundwater information, and the baseline surface water information contained in Chapters 5, 6, and 7 respectively. The baseline hydrologic information also identifies any water resource or water use that could be affected by the proposed mining and reclamation operation.

The PHC also identifies the appropriate preventive and mitigating measures to minimize the impacts to water resources and water uses. Regulations require the replacement of a water supply in use that is contaminated, diminished, interrupted, or destroyed by mining and reclamation activities. Alternate water supplies are identified in the PHC and Section 12.11, Hydrologic Reclamation Plan, to provide a suitable replacement for existing water uses that may impacted by mining and reclamation activities. The PHC lays the groundwork for the proposed monitoring plans.

Literature sources for this study include published and unpublished reports, papers, and data authored or developed by several state and federal natural resource management agencies. Reports published by private consultants and academic institutions were also used. Site-specific data were developed through drilling, monitor/piezometer well installations, and pump testing as described in Chapter 6. Additional data were obtained from past geological investigations, observations made by BHP Navajo Coal Company (BNCC) staff during the day-to-day operations of the mine, and surface water and groundwater monitoring performed in conjunction with historic and on-going mining and reclamation activities at Navajo Mine. The PHC also couples these data with detailed SEDCAD[™] 4 (SEDCAD) modeling of surface flows and sediment yields, spoil and CCB leaching test results, and groundwater flow and chemical transport modeling in order to develop projections about potential hydrologic impacts of proposed mining and reclamation at Navajo Mine.

11.6.1 Summary of Probable Hydrologic Consequences

11.6.1.1 <u>Groundwater Summary</u>

Groundwater use in the vicinity of the Navajo Mine is limited in extent and is mostly derived from wells completed within surficial valley-fill deposits of Quaternary age, herein referred to as alluvium. An inventory of wells and springs is included in Appendix 6-E. This inventory was extended several miles beyond the Navajo Mine permit boundary and includes wells completed in the alluvium of the Chaco River and the San Juan River. The inventory found no water supply wells completed in the Fruitland Formation or the Pictured Cliffs Sandstone (PCS) within or adjacent to the Navajo Mine permit area. The inventory did identify a number of monitoring wells completed in these formations by BNCC. The groundwater monitoring results from these wells showed that well yields are quite low and well are typically pumped dry during sampling. The sampling also shows that the water quality in the PCS and Fruitland Formation is poor and generally not suitable for either livestock or domestic use (Appendix 6-G).

Two PCS water wells, Numbers 38 and 44, were identified at a location nearly six miles east of Area III in Township 27N, Range 15W. These wells will not be affected by mining due to the distance from the mine. The water quality in these wells is poor and unsuitable for use with total dissolved solids (TDS) concentrations above the New Mexico regulatory threshold for current or future use of 10,000 mg/l as referenced in 20.6.2.3101(A) New Mexico Administrative Code (NMAC) and 20.6.2.3103NMAC. Well No. 38 has been abandoned. Spring No. 56 was also reported to be issuing from the PCS at a location adjacent to the San Juan River alluvium. The TDS was 624 mg/l which is acceptable for livestock use but exceeds the Environmental Protection Agency (EPA) Drinking Water Criteria. This spring is located to the north and down gradient of Morgan Lake and may be the result of seepage from Morgan Lake as suggested by its location and the TDS of the water, which is considerably lower than the concentrations observed elsewhere in the PCS as described in Appendix 6-G.

The inventory of wells and springs included in Appendix 6-E also identified a number of water wells completed within the alluvium of the San Juan River, the Chaco River, and Chaco tributaries including Pinabete Arroyo, Cottonwood Arroyo, and Chinde Arroyo. The water wells in the San Juan River alluvium are completed at varying depths and varying yields. Available water quality information provided in the Appendix 6-E Addendum shows that water quality in San Juan River alluvium is also quite variable with TDS concentrations above the EPA drinking water use criterion in all wells sampled. Several water wells completed in the Chaco River alluvium are also shown on Figure 11-25. Most of these wells are dug wells and the available water quality information shows variable water quality with TDS and sulfate concentrations often above both the Navajo Nation livestock use criteria and the EPA drinking water use criteria.

The water wells within the Navajo Mine lease completed in the alluvium of Pinabete and Cottonwood Arroyos support marginal stock water use, although the baseline TDS and sulfate concentrations exceed guidelines for livestock use. The baseline fluoride concentrations fluctuate in the alluvial groundwater and are often above Navajo Nation livestock use criterion (Appendix 6-G).

Changes in groundwater flow and groundwater quality will occur as a result of mining and reclamation at Navajo Mine. During mining operations, all strata overlying the Fruitland coal seams are stripped to expose the coal for mining. Each successive open cut serves as a sink for groundwater causing drawdown of potentiometric heads in the adjacent coals. Some drawdown in the potentiometric heads in the underlying PCS may also occur, depending upon the baseline heads in the PCS relative to the base of the mine pit. Model simulations of the advance of proposed open pit mining in Area IV North show very limited extent of drawdown in the Fruitland Coals and underlying PCS as discussed in Section 11.6.2.4. Groundwater inflows to the mine pits in Area II and Area III have been too low to saturate or pond within the mine pit and are seldom observed as seeps along the highwall. The pit floors remain dry except on rare occasions when storm runoff is captured. The alluvium in the North Fork of Cottonwood Arroyo has been mined through in Area III, depleting the groundwater in the North Fork alluvium immediately up gradient and down gradient of the mine. Mining will not occur within the alluvium along the main stem of Cottonwood Arroyo. The advance of the mine pit in Area IV North will result in limited drawdown in the adjacent coal units and the underlying PCS but is not expected to result in a drawdown of groundwater levels in the alluvium within the main stem of Cottonwood Arroyo (Section 11.6.2.4).

As a result of mining and reclamation, the interbedded structure of the pre-mine Fruitland Formation is replaced with backfill spoil of overburden and interburden materials. As discussed in Section 11.6.2.4, the backfill spoil is more homogeneous and has a higher porosity and higher hydraulic conductivity than the pre-mine in-situ interbedded sedimentary deposits of the Fruitland Formation. Mining is also expected to result in higher recharge rates during and following reclamation as a result of removal of the badland topography that occurs over portions

of the mine area and placement of topdressing materials within reclaimed areas that permit higher rates of infiltration and groundwater recharge relative to baseline conditions

Despite an increase in recharge rates, the rate of recharge will still be quite low and the time period required for water levels to recover to a near steady-state level in the mine backfill is estimated to be on the order of several centuries or longer unless there is an imported source of water that enhances recharge. One such imported source is irrigation seepage and return flows from the Navajo Agricultural Products Industry (NAPI) irrigation sites located adjacent to Areas I and II. The NAPI irrigation seepage water has resulted in re-saturation of the Bitsui Pit starting in the early 1980's while other backfilled pits that are not located near external sources of water have remained dry.

No toxic materials are present in the mine spoil or in the CCB materials that were previously placed in mine backfill as demonstrated by the toxicity tests in Appendix 11-K. The characterization of overburden and interburden materials provided in Section 5 indicates that there is no widespread occurrence of potentially acid-forming overburden or interburden materials. The strata are mostly highly alkaline, although there are some limited locations where the acid-base potential values indicate potentially acid-forming material. However, the overburden and interburden materials that will be used to backfill the pit show a substantial net alkaline environment. The mining process for removal and backfilling of overburden and interburden materials provides sufficient blending and mixing of the strata so that acidic spoil water conditions will not occur within mine backfill. This conclusion is supported by the neutral to alkaline pH levels observed in the Bitsui spoil monitoring wells.

Characterization investigations conducted on mine spoil and CCB materials contained in Appendix 11-K together with analysis of groundwater samples from wells completed in mine spoil and in CCB materials show that TDS and sulfate concentrations are lower in saturated CCBs in comparison with saturated mine spoils. Arsenic, boron, fluoride, and selenium concentrations increased in fly ash leachate and also showed higher concentrations in CCB wells Bitsui-1 and Watson-4 in comparison with the concentrations in spoil wells. Other trace constituents were below detection limits in the majority of the samples from both CCB wells and spoil wells. The leaching tests, reported in Appendix 11-K, show that arsenic, boron, and fluoride are all attenuated in flow through mine spoil. Furthermore, arsenic and selenium were below detection limits in the spoil leaching tests reported in Appendix 11-UU and in all of the Bitsui spoil monitoring wells, including the well immediately down gradient of CCB material. Thus, both the leaching tests and the observations in the Bitsui backfill monitoring wells indicate that, if CCBs become saturated, the probable result is that concentrations of arsenic, boron, fluoride, and selenium may increase but these concentrations will decrease due to attenuation as this water migrates from the CCB material through the spoil. Also, the TDS and sulfate concentrations are not expected to increase in CCBs that become saturated with spoil water. As a result, the quality of groundwater that migrates from backfilled pits is not expected to measurably change due to the presence of CCB materials in mine backfill.

The concentrations of TDS, sulfate, boron, and manganese are expected to increase in the mine spoil water relative to the concentrations in the recharge water sources. Concentrations of boron in mine spoil are expected to remain below the livestock use criterion of 5 mg/l while the boron concentrations in CCB material exceed the livestock use criterion. TDS and sulfate concentrations exceed Navajo Nation livestock use criteria of 2,212 mg/l and 1,000 mg/l, respectively, in the baseline groundwater and are expected to exceed these livestock criteria in the spoil water. Concentrations of other trace constituents are expected to remain below detection limits or comparable to the concentrations observed in the recharge water sources.

The constituent concentrations in mine spoil water will also vary with the chemistry of the water sources recharging the mine spoil. In Area I these sources include the No. 8 coal seam water with TDS concentrations ranging from 5,000 to 10,000 mg/l and seepage from adjacent NAPI irrigation plots with unknown TDS concentrations. Precipitation recharge rates are very low relative to the other sources of recharge at the Bitsui Pit and probably account for less than 1% spoil water present in this pit. In Areas II through IV recharge from NAPI irrigation will be negligible and the primary sources of recharge of mine spoils include precipitation recharge with low TDS concentrations and inflows from the various coal units which show TDS concentrations ranging from 14,200 mg/l at the No. 2 coal seam well KF84-21A to 2,770 mg/l at the No. 7 coal seam well KF84-20C. Some inflow from the PCS with high TDS concentrations may also occur

in Areas II through IV but the inflow will cease once the hydraulic head in the backfill rises sufficiently to reverse the flow from the PCS to the Fruitland Formation.

Section 11.6.2.3.1 provides an assessment of potential transport of spoil water from the mine in Area I through the Fruitland Formation to its discharge location at formation subcrop beneath the alluvium of San Juan River. Based on estimates of groundwater flow velocities, the projected travel time from the mine to the formation subcrop is expected to be on the order of 290 years. Measurable changes in TDS and sulfate concentrations in the San Juan River alluvial groundwater at the Fruitland Formation subcrop are not expected to occur because sulfate reduction in the coal functions to attenuate transport of sulfate and TDS from spoil water. Furthermore groundwater flow in the San Juan River alluvium is more than two orders of magnitude higher than groundwater flow estimated to be discharging to the alluvium from the Fruitland Formation.

When water levels in the mine backfill recover sufficiently, groundwater will migrate from the mine backfill vertically into the PCS and laterally toward potential discharge locations. These discharge locations include the Fruitland Formation subcrop at the San Juan River alluvium, the coal bed methane depressurization areas in the Fruitland Formation and PCS located east and northeast of the mine, the Fruitland Formation and PCS subcrop locations along the Cottonwood Arroyo valley, and Fruitland Formation and PCS outcrop locations to the west of Areas II and III. The discharge at the Fruitland Formation and PCS outcrop will be removed by evapotranspiration like it does under baseline conditions.

Groundwater flow and transport rates are extremely slow as demonstrated in Section 11.6.2.4. Modeling of mine water transport from Area IV North found that long-term post-reclamation TDS concentrations in the groundwater in the alluvium of Cottonwood Arroyo are expected to increase down gradient of the mine area. An increase in TDS concentrations of the magnitude predicted by the PHC assessment is not expected to materially impact the suitability of the alluvial groundwater for livestock use as indicated in Section 11.6.2.4. Furthermore, alluvial groundwater flows in Cottonwood Arroyo are extremely low and vary with space and time.

Baseline monitoring of the wells in the Cottonwood alluvium demonstrate groundwater in the alluvium is an unreliable supply, which limits its potential for livestock use.

The TDS and sulfate concentrations in the alluvium of Cottonwood Arroyo down gradient of mining are expected to increase by about 20% over a 500 year period following mining. These changes could impact water supply well QACW–2B (BIA No. 13R-28A) completed in the alluvium of Cottonwood Arroyo west of the permit area as shown on Exhibit 11-163. This is a dug well that has been used for stock water supply. It is not owned by BNCC but has been sampled by BNCC for baseline water quality and water levels. However, the quantity of water in the Cottonwood alluvium is limited and this well and several other water monitoring wells in the Cottonwood alluvium are often dry. Mining activities are not expected to adversely impact any other developed water sources (Section 11.6.2.5).

BNCC has surface water rights on the San Juan River, New Mexico Office of State Engineer Permit 2838, which can be used to offset any adverse impacts to the State of New Mexico and present users. These rights will be maintained throughout the mining operation and a period thereafter, for retirement, if required to any affected San Juan Basin water users. For temporary impacts to water users, BNCC may provide water to local permitees in tanks for livestock use in areas around the lease. Permanent impacts to surface water users may be mitigated by the construction of impoundments incorporated into the post-mining landscape (Chapter 12 Sections 12.11 Hydrologic Reclamation Plan and 12.3.4.1 Permanent Impoundments).

11.6.1.2 Surface Water Summary

The surface water resources in the mine permit area and adjacent area are described in Chapter 7. Six named ephemeral streams are directly affected by mining. These drain from east to west across the mine permit area and into the Chaco River, located west of the Navajo Mine permit area. Chinde Arroyo, located furthest north, and Cottonwood Arroyo, located furthest to the south have the largest drainage areas. These ephemeral stream channels drain into the Chaco River, which flows north into the San Juan River.

Surface drainage from the mine permit area is contained until reclamation standards have been met and then will drain via the tributary channels into the Chaco River. Diversions have been constructed on the Chinde and Cottonwood Arroyos to enable flows in these Chaco tributaries to pass through the permit area. The flow in Neck Arroyo also passes through the mine permit area as the main Neck channel and most of its drainage area has not been and will not be affected by mining other than by the transportation corridors. Hosteen Wash, Barber Wash, and Lowe Arroyos have been interrupted by mining and no flow from these drainages passes through the mine permit area. Instead, flows are retained by check dams and containment structures located upstream of mining. Bitsui Wash drains to the north into the San Juan River. Bitsui receives drainage from pre-law jurisdictional lands on the northern area of the mine lease but no drainage from the reclaimed areas or from sediment ponds within the Navajo Mine permit area.

The Chaco River, which flows north into the San Juan River, drains an area of more than 4,000 square miles. Flow in the Chaco River is ephemeral except for the last 12.5 miles of the river, where perennial flow is the result of spillway overflows from Morgan Lake and discharge from the Four Corners Power Plant (FCPP). One other prominent surface water feature adjacent to the Navajo Mine is Morgan Lake, which is manmade and used as cooling water for FCPP. The San Juan River serves as the primary source of water for Morgan Lake. Water from Morgan Lake is also used by BNCC for mine operations.

Prior to mining and the construction of Morgan Lake, surface water use within the Navajo Mine permit area and adjacent area was limited to surface water captured in stock watering ponds, which were constructed to catch surface flows from some of the small tributary drainages. The location of stock watering ponds on and near the permit area is shown on Exhibit 10-3. Due to the unreliable nature of water supplies at stock watering ponds, BNCC also provides water to local permitees in permanent tanks for livestock use at locations around the lease. Additional information on post-mining water sources is provided in the Hydrologic Reclamation Plan Section 12.11.

Almost all of the surface water use in the vicinity of the Navajo Mine is from the San Juan River. The largest use is for irrigation, which accounts for 78 percent of the water use in San Juan County while power generation and associated mining accounts for only about 10 percent of water use (Blanchard et al. 1993). Other than the San Juan River, surface water is not used for drinking or irrigation.

Surface water impacts associated with mining are related to water quantity, water quality, or water use. Surface water within the area of mine disturbance is contained until reclamation standards and water discharge criteria have been met. Then containment structures are removed and surface runoff from precipitation events will drain to the Chaco River tributaries that cross the permit area. Under baseline conditions, these tributary channels carry very high concentrations of suspended solids and bed loads during storm runoff events. Sediment control measures, as outlined in Section 11.2.10, will prevent additional contributions of sediment to stream flow or to runoff outside the permit area during operations. Surface reclamation plans and associated modeling demonstrate that total suspended solids concentrations and sediment yields will be lower than pre-mining levels following reclamation.

Changes in peak flows due to the presence of upstream containment berms, diversions and highwall impoundments, coupled with retention of water within pits and down gradient sediment ponds will reduce peak flows and runoff volumes down gradient of the mine during operations. As areas are reclaimed, BNCC expects to see better retention of surface water runoff within the permit area compared with pre-mining conditions, due to lower slopes and the placement of topdressing materials with more permeable textures than occurred naturally pre-mine. Following successful reclamation and stabilization, flows should be comparable with pre-mining conditions with, perhaps, a slight decrease in peak flows and runoff volumes due to the improved infiltration following reclamation (Section 11.6.3).

Prior to mining and before the development of up gradient agricultural lands, surface flows in channels traversing the permit area were predominantly ephemeral. It is anticipated that postmining flows will also be ephemeral, due to the limited precipitation regime coupled with marginal development of alluvium. The ephemeral surface flows are unpredictable and carry such high sediment loads that essentially no use is made of the water for agricultural or other purposes (Chapters 6 and 7). Stock watering ponds are the principal use of surface water on or near the permit area, and these are not located on the larger tributaries where pond embankments are susceptible to failure due to flash floods.

Surface water quality after mine reclamation is expected to support existing uses prior to mining as a result of the revegetation practices outlined in Section 12.6. As discussed in the previous subsection, the overburden and interburden materials that will be used to backfill the pit show a substantial net alkaline environment. An extensive program of sampling regraded spoils has been developed for Navajo Mine to ensure that the regraded spoils are suitable for revegetation and surface drainage reclamation. Water quality changes that could occur include increases in TDS, sulfate and iron as discussed in Appendix 11-K, Table 11-14f, and Section 11.6.3.

11.6.2 Assessment of Potential Groundwater Changes

An inventory of wells and springs is included in Appendix 6-E. The results show that most of the wells completed in the Fruitland Formation or the PCS within the study area were installed for the purposes of monitoring. These monitoring wells demonstrate that groundwater yields from the Fruitland Formation and the PCS, which underlies the Fruitland Formation at the Navajo Mine, are quite low and most monitoring wells are pumped dry during sampling. Furthermore, the water quality in the PCS and Fruitland Formation is poor and generally not suitable for either livestock or domestic use (Appendix 6-G). There are no known water supply wells completed in the Fruitland Formation or the PCS within or adjacent to the Navajo Mine are completed within alluvium.

The inventory of wells and springs included in Appendix 6-E identified a number of water wells completed within the alluvium of the San Juan River, the Chaco River, and Chaco tributaries including Pinabete Arroyo, Cottonwood Arroyo, and Chinde Arroyo. The water wells in the San Juan River alluvium are completed at varying depths and have varying yields. Available water quality information provided in the Appendix 6-E Addendum shows that water quality in San Juan River alluvium is quite variable with TDS concentrations ranging from 528 mg/l to 5,880 mg/l. These water quality results are consistent with the data reported by Thorn (1993), which

found TDS concentrations ranging from 1,860 mg/l to 3,940 mg/l in four wells completed in the San Juan River alluvium. Several water wells completed in the Chaco River alluvium are shown on Figure 11-25. Most of these wells are dug wells and the available water quality information shows variable TDS concentrations ranging from 1,950 mg/l to 3,110 mg/l. Limited groundwater quality baseline data for the Chaco River alluvium are also provided by Thorn (1993). The results show considerable variability in the alluvial water quality with TDS concentrations ranging from 742 to 11,900 mg/l, sulfate concentrations ranging from 350 to 6,600 mg/l, and fluoride concentrations ranging from 0.4 to 1.7 mg/l.

The water wells within the BNCC coal lease completed in the alluvium of Pinabete and Cottonwood Arroyos support marginal stock water use, although the baseline TDS and sulfate concentrations exceed guidelines for livestock use. The baseline fluoride concentrations fluctuate in the alluvial groundwater and are often above the Navajo Nation water quality criterion for livestock and wildlife use and the EPA drinking water use criterion (Appendix 6-G).

11.6.2.1 Observations During Previous Mining And Reclamation At Navajo Mine

The location of the pits previously mined or currently being mined at the Navajo Mine are shown on Exhibit 11-163. The Bitsui and Watson Pits were mined in the mid-1960s and backfilled in the 1970s before the promulgation of regulations under the Surface Mining Control and Reclamation Act of 1977 (SMCRA). Some of the backfill in this area consisted of CCBs from the FCPP. CCBs were placed at discrete locations within the backfill and surrounded by and covered by overburden removed during mining of the coal. Approximate CCB placement locations within the Bitsui and Watson Pits are shown on Exhibit 11-164. CCB placement within these mine pits also preceded the NAPI irrigation activities which began at locations adjacent to the Bitsui Pit in the early 1980s. The NAPI irrigated plot that is closest to Bitsui Pit is shown on Exhibit 11-164. NAPI irrigation has had a significant influence on both nearby groundwater elevations and flow directions.

Since mining at the Navajo Mine started long before SMCRA became law, baseline hydrologic monitoring data generally does not exist for Area I and portions of Area II of the Navajo Mine.

Nevertheless, the "GM-" monitoring wells shown on Exhibit 11-163 were installed during the period from 1975 to 1977 and provide baseline information for Areas III, IV, V, and portions of Area II. Many of the GM wells have been mined through or abandoned and additional monitoring wells were installed, most in 1983 and 1984. Monitoring wells were installed in 1998 and in 2007 for baseline characterization of Areas IV South and V.

BNCC also collected groundwater data from historic CCB disposal on pre-law and interim lands (Supplemental Groundwater Study (SGS), Appendix 11-MM) to investigate possible impacts to groundwater from mine placement of CCBs at Navajo Mine. The Bitsui Pit is in the northeastern portion of the mine lease area, as shown on Exhibit 11-163. The Bitsui Pit location was selected for the study for the following reasons:

Unlike other CCB placement locations at the mine, the CCBs at the Bitsui Pit were expected to be largely saturated based on the close proximity to center pivot irrigation conducted by NAPI east of the coal lease, and

The Bitsui Pit is closest to the San Juan River of all the backfilled pits at Navajo Mine.

The SGS, which was undertaken in 1995, was accomplished by installing six groundwater monitoring wells within mine backfill and CCB disposal areas in the Bitsui Pit. Other wells were installed during the mid-1990s to monitor backfill and CCB placement in locations not influenced by NAPI irrigation. Wells Watson-1 and Watson-4 were installed in the CCBs placed within the Watson Pit and wells Custer 2 and Custer 3 were installed in the CCBs placed in the Custer Pit to monitor the influence of Morgan Lake. Custer 1 was drilled in shallow Fruitland Formation sands west of Custer Pit Ramp 4 to monitor the influence of Morgan Lake. The new wells at the Bitsui, Watson and Custer Pits and No. 8 coal seam wells KF-84, KF83-1 and KF84-16 were monitored for static water levels and water quality on a quarterly basis from 1995 through 1998 and then annually. These wells are shown on Exhibit 11-164 along with other monitoring wells in the vicinity

Navajo Mine also monitored static water level (SWL) and collected water quality samples from several No. 8 seam coal wells in the vicinity of Bitsui Pit starting in 1985 and 1986. Time plots

of water elevations measured in the nearest coal wells are provided in Figure 11-30. Over an 11year period from 1985 to 1996, SWL in the No. 8 coal seam rose 11 feet in well KF83-1, which is near the southeast corner of the Bitsui Pit. During that same period of time, water levels rose 5 feet in well KF84-16, which is also completed in the No. 8 coal seam further east of Bitsui Pit as shown in Exhibit 11-164. The Bitsui-3 well is completed in the No. 8 coal seam east of the Bitsui Pit but west of the well KF84-16. The Bitsui-2 well is completed in the No. 8 coal seam approximately 300-feet north of the Bitsui Pit as shown on Exhibit 11-164. Water elevations initially increased in both the Bitsui-2 and -3 wells after they were installed in 1995. The water levels in these coal wells would have been drawn down considerably during mining at the Bitsui Pit but the magnitude of drawdown and recovery prior to installation of the wells is uncertain. Water elevations in all of these wells appear to have reached an equilibrium stage with relatively little change in water elevations since 1996, as indicated in Figure 11-30.



Figure 11-30. Water Elevations in Coal Monitoring Wells in the Vicinity of the Bitsui Pit

The rise in water levels is associated with NAPI irrigation and the No. 8 Coal recharging the Bitsui Pit. Observations of seepage from nearby NAPI irrigation emerging from the highwall at the northeast end of the Dodge Pit adjacent to and southwest of the backfilled Bitsui Pit support the conclusion that seepage from NAPI irrigation provides a source of the recharge water for the Bitsui Pit and the Dodge Pit. Also, the NAPI irrigation has produced return flows sufficient to maintain perennial flows in Bitsui Wash upstream of the mine and to provide a water source for the perennial pond located on a branch of Bitsui Wash and referred to as "NAPI Pond" on Exhibit 11-163. These sources of water from NAPI irrigation return flows are sufficient to migrate down gradient and saturate the backfilled Bitsui Pit.

Three geologic sections through selected monitoring well locations were prepared to examine groundwater conditions in three dimensions. These geologic sections along with the map

showing the locations of the sections are provided Exhibit 11-164. Measured water levels in monitoring wells are shown on the sections.

The water level measurements depicted in the geologic sections show minimal influence from Morgan Lake on the adjacent Custer Pit. The wells completed in the CCBs of the Custer Pit remained dry. Approximately one foot of saturation was observed in June 1989 at the No. 8 coal well KF83-2 located adjacent to the Custer Pit. Also, the Custer Pit and ramps remained dry during mining operations. The ten to twenty-five foot thick shale layer separating the bottom of the lowest mineable coal seam and the PCS (see Chapter 6) acts to isolate the mine pits from groundwater in the PCS. No noticeable upward seepage through the mine floor (shale layer) has been observed, even though, prior to backfilling, the mine pits in the vicinity of Morgan Lake were well below the potentiometric levels in the PCS as projected in Exhibit 11-163.

Saturated conditions developed within the backfill of the Dodge Pit as indicated by the water level rise in spoil well KF83-14. The water source for saturation of both the Dodge Pit and the Bitsui Pit is believed to be primarily from NAPI irrigation with perhaps very minor contribution from the PCS, although the dry conditions observed in the backfilled Custer Pit located closer to Morgan Lake indicates little influence from the relatively high potentiometric surface in the PCS near Morgan Lake.

Watson-1 well, completed in the CCBs at the Watson Pit, also remained dry. A couple of feet of saturation was present in the Watson-4 well, which may be the result of upward seepage from the PCS as recharge rates are extremely slow and the well is upgradient of the saturation in the Bitsui Pit and not near NAPI irrigation as shown Exhibit 11-164.

TDS and sulfate concentrations observed in monitoring wells completed in the No. 8 coal seam near the Bitsui Pit are plotted in Figure 11-31. The increase in sulfate in well KF83-1 corresponds with a decrease in alkalinity such that TDS concentrations did not change. TDS concentrations in wells KF84-16 and in Bitsui-3 show no consistent trends, although sulfate concentrations appeared to temporarily increase in both of these wells in the mid-1990's.



Figure 11-31. Time Series of TDS and Sulfate in Coal Wells Located Near the Bitsui Pit

The increase in sulfate started in 1995 in well KF83-1 and was above 400 mg/l when Bitsui-3 was first sampled in 1996. The sulfate in these wells is thought to be due to migration of spoil water from the adjacent Bitsui Pit. Spoil water migration may have been enhanced by frequent purging and sampling of these wells, which increases gradients toward the monitoring well with corresponding increases in flow velocities in the fractured (cleated) coal. Well KF84-16 is located about 1,400 feet to the east of the Bitsui Pit and has much higher TDS concentrations in comparison with coal wells KF83-1 and Bitsui-3, which are located close to the Bitsui Pit. This is consistent with the baseline characterization, which found that TDS concentrations in the coals increased with depth and distance from the outcrop. The decline in sulfate in these wells may be related to a reduction in gradients and perhaps due to attenuation by sulfate reduction. Sulfate reduction accounts for the absence of sulfate in the deeper coals located further from recharge locations.

Sulfate and TDS both increased in the coal well Bitsui-2, although the magnitude of the TDS increase was less than the magnitude of the sulfate increase. The increase in sulfate in well Bitsui-2 started in 1995 reaching a maximum in year 2004. Sulfate concentrations in this well have fluctuated since year 2004 but have centered around 1,400 mg/l. While the leveling off of sulfate concentrations suggests breakthrough of a sulfate plume, the sulfate concentrations in this well are about 27 percent of the median value of approximately 5,115 mg/l measured in the nearest spoil monitoring well Bitsui-5. The lower and relatively steady concentrations of sulfate measured in coal monitor well Bitsui-2 samples can be related to dispersion and bacterially mediated sulfate reduction and subsequent metal sulfide precipitation resulting in an overall removal of dissolved sulfur species.

Sulfate reduction was found to explain the large reduction in sulfate concentrations in groundwater transport from mine spoil through a coal seam at the West Decker surface coal mine in Montana (Clark, 1995). The geochemical process postulated to explain the observations included bacterial reduction of sulfate utilizing coal as a source of organic matter, reverse ion exchange of sodium for calcium and magnesium ions with transport through the coal, and precipitation of calcium and magnesium carbonates and sulfide metals. These same processes also explain the observations in the coal at the Bitsui-2 well located down gradient of the Bitsui Pit. Sulfate reduction is necessary to explain the lower concentrations of sulfate observed in the Bitsui-2 well.

Bacterially mediated sulfate reduction in groundwater systems is a well known and documented process (Freeze and Cherry, 1979; Drever, 1988; Schwarzenbach et al., 1993; Clark, 1995; Stumm and Morgan, 1996; Clark and Fritz, 1997; Benner et al., 2002; Doshi, 2006; Appelo and Postma, 2007; Praharaj and Fortin, 2008). Overall bacterially mediated sulfate reduction mass action can be described as follows:

$$SO_4^{2-} + 2C_{organic} + 2H_2O = H_2S + 2HCO_3^{--}$$

The produced hydrogen sulfide is then involved in chemical reaction with metals (Me) resulting in precipitation:

$$H_2S + Me^{+2} \rightarrow MeS + 2H^{+2}$$

Metals that readily form metal sulfide precipitates include cadmium, copper, iron, lead, manganese, mercury, nickel, and zinc. Other metals including arsenic, antimony, and molybdenum can form complex sulfide minerals (Doshi, 2006) and manganese, iron, nickel, copper, zinc, cadmium, mercury, and lead may also be co-precipitation with other metal sulfides (Doshi, 2006). Bacterially mediated sulfate reduction also consumes acidity by generating bicarbonate as a product which in turn raises the pH. The increased pH facilitates the precipitation of metal sulfides (Gadd, 2004).

The sulfide concentrations in the Bitsui-2 monitor well samples vary significantly from nondetect to over 60 mg/l supporting a dynamic system of sulfate reduction and sulfide removal. Additionally, the Bitsui-2 iron and manganese concentrations are several orders of magnitude lower than the concentrations observed in the Bitsui spoil wells. This observation supports the removal of sulfide generated from sulfate reduction as iron and manganese sulfides. Also, the pH values at Bitsui-2 have been maintained at approximately 8.13 on average since October 2003, while the incoming spoil water is lower with median values at spoil monitoring wells Bitsui-4, Bitsui-5, and Bitsui-6 ranging from 6.8 to 7.50, indicating an increase in pH that supports the reduction of sulfate.

Bicarbonate values are not increased as expected based on general sulfate reduction processes. Instead bicarbonate concentrations are decreasing. While the calcium concentrations are low (~8 mg/l), the high bicarbonate values (~3,000 mg/l) result in saturation with respect to calcite causing calcite precipitation in order to reach equilibrium and lowering the bicarbonate concentration.

Bacterially mediated sulfate reduction rates are dependent on sulfate concentrations, amount of available organic carbon and temperature (Benner et al., 2002; Appelo and Postma, 2007; Praharaj and Fortin, 2008). The sulfate concentrations at the Bitsui-2 monitor well have sustained values equal to or greater than 1,000 mg/l or 10 milli-moles (mM) since October 2003.

This well is also completed in coal which provides the source of organic carbon necessary for bacterial mediated sulfate reduction. The high sulfate concentrations and large pool of organic carbon result in high sulfate reduction rates (Benner et al., 2002; Appelo and Postma, 2007; Praharaj and Fortin, 2008). The highest rates found in the literature are on the order of 0.92 mM/day which are noted as being achievable under laboratory conditions at sulfate concentrations above 2 mM (Appelo and Postma, 2007). Doshi (2006) also reports sulfate reduction rates between 0.553 mM/day and 1.052 mM/day in laboratory scale bioreactors. However, use of laboratory sulfate reduction rates in transport modeling results in no sulfate reaching the Bitsui-2 well from the Bitsui Pit. Since field conditions are not as favorable as the laboratory experiments, a more realistic reduction rate of 0.11 mM/day was observed in the field (Benner et al., 2002).

A study of geochemical processes in groundwater impacted by coal mine water showed that bacterially mediated sulfate reduction decreased sulfate concentrations from 1,100 mg/l to less than 100 mg/l (Clark, 1995). Clark (1995) also found simultaneously decreasing bicarbonate values from approximately 3,000 mg/l to less than 2,400 mg/l as a result of saturation with respect to calcite and subsequent calcite precipitation. While Clark (1995) does not present a sulfate reduction rate, a rate can be back calculated from the data provided. Using the reduced amount of sulfate (~1,000 mg/l) and the approximate time for sulfate reduction in observation wells of 50 to 228 days, the sulfate reduction rate is estimated to range between 0.21 to 0.046 mM/day similar to those reported by Benner et al (2002). The sulfate reduction rates from field studies have been used to provide bounds for sulfate reduction in the calibration of the sulfate transport model developed in Section 11.6.2.3.1.

Finally, boron, a constituent at elevated concentrations in CCB leachate, shows no concentration change in the coal wells located near the Bitsui Pit as shown in Figure 11-32. Very high concentrations of boron may be an indicator of CCB leachate but high sulfate is not. Backfill, rather than CCBs, is the cause of increased sulfate concentrations in coal wells KF83-1 and Bitsui-2.



Figure 11-32. Time Series of Boron Concentrations in Coal Wells Located Near the Bitsui

The results of time series plots of TDS, sulfate/chloride, and boron concentrations from the Bitsui backfill monitoring wells and the Watson-4 CCB well are provided in Figures 11-33, 11-The results show similar TDS concentrations in the CCB 34, and 11-35, respectively. monitoring well Bitsui-1 and in mine backfill wells Bitsui-4 and Bitsui-6 but lower TDS concentrations in backfill monitoring well Bitsui-5. The Bitsui-5 well has lower concentrations of sulfate and higher concentrations of chloride in comparison with the spoil wells Bitsui 4 and Bitsui-6 as shown in Figure 11-33. These differences may partly be explained by the proximity to water recharge sources. Bitsui-5 is closer to the down gradient coal and may have initially received more recharge of low sulfate and higher chloride water from the down gradient coal. With water level recovery in the backfill, the sulfate concentrations have increased and the chloride concentrations have declined in well Bitsui-5 and are starting to approach the Wells Bitsui-4 and Bitsui-6 are concentrations observed in wells Bitsui-4 and Bitsui-6. completed in the Bitsui Pit mine backfill approximately 280 feet and 170 feet, respectively, north of CCB monitoring well Bitsui-1 as shown in Exhibit 11-164. Water elevations in these three wells show a very slight gradient to the north, estimated at 0.0025 ft/ft between Bitsui-1 and Bitsui-4. The Bitsui-6 well is completed in the mine spoils at a location approximately 33 feet from an identified CCB backfill placement location.



Figure 11-33. TDS Concentrations in Bitsui and Watson Wells

The lowest TDS concentrations were observed in the Watson-4 well, which can be used to characterize leachate from CCB disposal at a location that is not influenced by NAPI irrigation, spoil water, or pit inflows from the coals. The relatively low TDS observed in the Watson-4 CCB well demonstrates that CCBs are not a source for the relatively high TDS observed in spoil monitoring wells Bitsui-4 and Bitsui-6.

The sulfate concentration plots in Figure 11-34 show highest levels in the mine backfill wells Bitsui-4, and Bitsui-6 and slightly lower levels in the CCB well Bitsui-1 and in spoil well Bitsui-5. The sulfate concentrations observed in the Watson-4 well are much lower than the concentrations observed in the backfill wells, but are higher than the concentrations observed in the nearby coal wells.



Figure 11-34. Sulfate and Chloride Concentrations in Bitsui and Watson Wells

The boron concentrations plotted in Figure 11-35 show highest levels in the Watson-4 CCB well, which can be used to characterize leachate from CCBs at a location that is not influenced by NAPI irrigation or pit inflows from the coals. The boron concentrations in the Bitsui-1 CCB well are significantly higher than in the other backfill wells and in the coal wells (Figure 11-32), but lower than the concentrations observed in the Watson-4 CCB well. On the other hand, the sulfate in Bitsui-1 was similar to the sulfate in the backfill spoil wells. This suggests that mine spoil water is the source of the water in the Bitsui-1 CCB well. The boron concentrations in the coals and do not show any influence from CCBs. The boron concentrations observed in well Bitsui-6 are slightly higher than the concentration observed in Bitsui-4, and Bitsui-6 are slightly higher than the concentration observed in Bitsui-4, and Bitsui-5 influence of groundwater from the CCBs located approximately 33 feet south of this backfill monitoring well.



Figure 11-35. Boron Concentrations in Bitsui and Watson Wells

The sulfate, TDS, and boron concentrations are higher in the Bitsui spoil wells in comparison with the concentrations observed from mine spoil leached with surface water and with coal water as presented in Table 11-14c. The higher concentrations in the Bitsui spoils in comparison with the leaching tests may be due to higher concentrations in the NAPI irrigation source water after it has leached the overburden materials between the irrigation site and the Bitsui Pit or it may be due to chemical evolution within the mine spoil linked to ion exchange and precipitation. Calcium and sulfate concentrations increase in spoil leachate from the dissolution of gypsum. Precipitation of calcite and ion exchange of calcium for sodium results in a larger increase in sulfate and a smaller increase in calcium. As shown in Table 11-14a, the calcium concentrations are lower and sodium and sulfate concentrations are higher in spoil wells Bitsui-4, Bitsui-5, and Bitsui-6 in comparison with concentrations observed from mine spoil leached with coal water as presented in Table 11-14b. These results suggest that ion exchange and precipitation in mine

spoil permit sulfate concentrations to increase above gypsum solubility limits and above observations from short-term leaching tests.

Table 11-14a also provides a comparison of concentrations in spoil wells, CCB wells and potentially affected coal wells with the median baseline concentrations observed in Fruitland coal wells at the mine site and with median baseline concentrations observed in No. 8 coal wells down dip and down gradient near the subcrop with the San Juan River alluvium. Median concentrations are summarized in Table 11-14a along with the number of analyses available for each constituent at each well for calculating the median. Less than detection results are entered at 1/2 the detection limit for calculating the median concentration.

The baseline concentrations of TDS, calcium, and sodium in wells KF84-18a and KF84-18b were comparable with the concentrations observed in spoil wells, while the baseline concentrations for sulfate and boron were lower. The TDS, calcium, and sodium concentrations in the spoil wells are also lower than the concentrations observed in two of the three down gradient baseline coal wells. Sulfate concentrations in the spoil wells are higher than the baseline sulfate concentrations observed in coal wells. Boron concentrations in spoil wells Bitsui-4 and Bitsui-5 are comparable with the baseline boron concentrations in the down gradient coal wells. As discussed previously, the boron in spoil well Bitsui-6 is higher, due to influence from CCB placement immediately upgradient of this well. Bitsui-1, which is completed in the CCBs at this location, exhibits higher boron concentrations and lower sulfate concentrations in comparison with spoil well Bitsui-6.

Table 11-14a.

		TDS (mg/L)		SO4 (mg/L)		Ca (mg/L)		Na (mg/L)		B (mg/L)	
Location	Well	n	median	n	median	n	median	n	median	n	median
al lease	KF2007-01	5	3460	5	740	5	3.2	5	1180	5	0.33
	KF98-02	8	3160	8	119	8	6.9	8	1170	8	0.40
	KF84-18a	25	13400	25	5	25	159	25	4660	24	0.72
, co	KF84-18b	24	9270	24	5	24	113	24	3365	24	0.74
thin ons	KF84-20A	24	7260	24	5	24	18.4	24	2690	24	0.56
s wit	KF84-20B	1	6660	1	172	1	16.5	1	904	1	0.13
oals ent	KF84-20C	23	2770	23	7	23	9.6	23	1040	23	0.42
d Co	KF84-21A	31	14200	31	64	31	13.4	31	3090	30	0.61
anc n c	KF84-22a	30	4615	30	2050	30	15.5	30	1600	26	0.26
uitl	KF84-22b	25	6010	25	5	25	45	25	2330	22	0.39
e Fr	KF84-21C	1	8505	1	184	1	14.6	1	2858	1	0.63
)	KF84-22c	1	8035	1	5	1	44.4	1	2716	1	0.46
ase	KF84-22d	1	8610	1	5	1	27.4	1	2866	1	0.50
ш	KF84-22e	1	8275	1	44	1	26.8	1	2890	1	0.56
	Median		7648		26		17		2703		0.48
seline Coal vngradient median)	SJKF#2	1	43035	1	5	1	515	1	13456	1	1.23
	SJKF#3	1	50810	1	5	1	700	1	15632	1	1.43
	SJKF#4	1	7370	1	5	1	217	1	2642	1	1.57
Bas dov (Median		43035		5		515		13456		1.43
poil an)	Bitsui-4	20	15150	20	8900	20	290	20	4630	20	1.69
ne s Iedia	Bitsui-5	22	11850	24	5115	24	60	24	3860	24	1.12
Mir (m	Bitsui-6	21	14800	21	8800	21	360	21	4250	21	2.04
CB ellis idian)	Bitsui-1	25	14600	26	6995	25	70	26	4845	25	10.50
Ű we	Watson-4	11	3620	11	2020	11	688	11	445	11	17.40
fected ls)	Bitsui-2	25	5130	25	95	25	6.4	25	2060	25	0.97
	Bitsui-3	17	7960	21	317	21	22.4	21	3130	21	1.07
/ Af Wel dian	KF83-1	34	7120	34	346	34	19.5	34	2625	34	1.02
ially al V nec	KF84	24	7760	24	3955	24	48	24	2565	24	1.30
CC CC	KF84-16	28	9955	28	16	28	39	28	3815	28	1.27
Pot	SJKF#5	1	4470	1	5	1	6	1	1668	1	1.23

Concentrations for Selected Constituents in Navajo Mine Monitoring Wells

All wells are shown on Exhibit 11-163 except for KF2007-1 and KF98-02 which lie outside of the area shown on Exhibit 11-163 and are shown on Appendix 6-G Exhibit 6-G-1

Table 11-14b.

Selective Results of Batch Leach Tests

Comparison of leaching water (surface water from Chinde Arroyo and groundwater from Coal seam #4-6) and leachate water

produced (Data from IT Corporation Leach Report, Appendix 11-K, Tables 27.B13 through 27B.29)

Water Source	PH	TDS	Ca	Na	Cl	SO4	Fe	Mn	В	F	Se	As	Cd
Surface Water from													
Chinde Arroyo	7.8	1,900	230	280	15	1,200	0.45	0.08	0.31	1.0	< 0.001	< 0.001	< 0.001
Surface Water Leachate:													
Spoils S-4	7.8	4,600	640	850	43	2,700	0.06	0.7	< 0.5	0.6	0.20	0.002	< 0.001
Spoils S-5	8.2	3,500	320	750	27	2,300	0.02	0.26	< 0.5	0.9	0.018	0.002	< 0.001
Fly Ash	12.2	2,000	290	380	16	590	0.02	0.02	1.0	1.9	0.09	0.009	< 0.001
Bottom Ash	8.5	2,000	260	330	22	940	0.03	0.07	< 0.5	0.9	0.046	< 0.001	< 0.001
CCB w/ S-4	7.7	5,300	670	850	37	3,200	0.02	1.4	< 0.5	1.0	0.018	< 0.003	< 0.001
CCB w/ S-5	8.1	4,500	550	800	29	3,000	0.08	0.39	< 0.5	1.8	0.010	< 0.003	< 0.001
Groundwater from coal													
seams 4-6 (Composite #4)	8.2	9,800	140	3,500	5,200	120	0.15	0.03	0.53	0.3	0.011	0.015	0.001
Groundwater Leachate:													
Spoils S-4	7.8	12,000	730	3,200	5,500	2,700	0.06	0.7	< 0.5	0.5	0.20	0.002	< 0.001
Spoils S-5	8.2	11,000	530	3,200	5,600	2,300	0.02	0.26	< 0.5	0.6	0.018	0.002	< 0.001
Fly Ash	12	10,000	520	3,000	5,600	320	0.02	0.02	6.2	3.1	0.22	0.017	< 0.001
Bottom Ash	8.5	8,700	170	3,500	5,500	170	0.03	0.07	0.6	0.7	0.020	< 0.001	< 0.001
CCB w/ S-4	7.9	12,000	790	3,100	5,700	2,000	0.04	1.3	< 0.5	0.9	0.016	0.009	< 0.001
CCB w/ S-5	7.9	12,000	740	3,700	5,600	2,000	0.09	0.64	0.9	1.3	0.009	0.008	< 0.001

(Concentrations in milligrams per liter).

The potentially affected coal wells are all located adjacent to the pre-SMCRA mined locations within Area 1 as shown on Exhibit 11-164. KF84 is located adjacent to the Custer Pit while the other potentially affected coal wells in Table 11-14a are down gradient of the Bitsui Pit. The TDS, calcium, and sodium concentrations in these wells are generally consistent with the corresponding baseline concentrations in the coals while the sulfate and boron concentrations are slightly higher (see Table 11-14a).

Outside of these groundwater level and water quality changes that have been observed in the coals adjacent to the Bitsui Pit, the only other groundwater change that has been observed at the Navajo Mine is the drawdown in water levels in several of the coal wells adjacent to mining within Area II and Area III. The 2006-07 Navajo Mine Hydrology Report (BNCC, 2009) shows declines in water levels in No. 8 coal seam well KF84-18b and No 7 coal seam wells KF84-20C and KF84-22b. Water levels have fluctuated in the No. 8 coal seam well KF84-18b but this well has been dry or has had insufficient water for sampling for most of the monitoring events since year 2003. Water levels in several of the other coal seam wells listed in Table 11-14a have been dry or have insufficient water for sampling since year 2001, these include wells KF84-20C, KF84-22b, KF84-18a, KF84-20B, KF84-20A, and KF84-21A.

Although drawdown effects have been observed prior to year 2002 in several of the baseline coal monitoring wells listed in Table 11-14a, the water quality monitoring through year 2001 at these wells has been selected to represent baseline water quality. There could be no influence from the mine on water quality of these wells because the hydraulic gradients at these well locations would have been toward the mine pit after the start of mining.

During mining operations, all strata overlying the Fruitland coal seams are stripped to expose the coal for mining. Each successive open cut serves as a sink for groundwater causing drawdown of potentiometric levels in the adjacent coals and the underlying PCS. The potential impact of mining activities on groundwater quantity was addressed in Chapter 6. In that analysis, a three dimensional model was used to evaluate hydrologic consequences due to stress propagation from pit advance. The analysis showed that the stress propagation resulted in minimal impacts to the hydraulic regime as drawdown of only two to three feet were computed near the mine area for

the coal seams and interbedded lithologic units of the Fruitland Formation. The effects of mining on the water bearing strata decrease by orders of magnitude within a few miles of the mine area (Appendix 6-D).

Average inflow to the entire mine area was estimated to be approximately 239 acre-feet per year over a model simulation time of 12 years. Observations during actual mining have shown that these model estimates of mine inflow were too high. Groundwater inflows to the mine pits in Area II and Area III have rarely been sufficient to be observed as seeps along the highwall. The pit floors remain dry except on rare occasions when storm runoff is captured. It appears that any groundwater flow to the mine pits from the Fruitland Formation is consumed by evaporation from the highwall. Also, no noticeable upward seepage through the pit floor or significant disruption of the mine floor (shale layer) has been observed in the mine pits.

11.6.2.2 Groundwater Impacts due to CCB Placement and Mine Spoil

The mine spoils are the non coal overburden and interburden materials of the Fruitland Formation that are removed to allow access to the coals and then placed within the mined pit to achieve approximate original contour. The overburden and interburden is generally comprised of fine to medium grained sandstones, siltstones, sandy and silty claystones, carbonaceous claystones, and bentonitic claystones, although the mostly tan or gray shale dominates. The clays are commonly highly expansive and are believed to be smectites. The potential to form acidic material from the oxidation of sulfur is not common and pH values are typically highly alkaline (pH > 8.0). Removal and backfilling of overburden and interburden materials provides for adequate blending and mixing of overburden materials ensuring that potential acid forming materials are blended with neutralizing materials such that acidic water will not occur within the mine spoil. This conclusion is supported by acid-base accounting of mine spoil samples which show average total sulfur acid base potential of 18.87 and by the neutral to alkaline pH levels observed in the Bitsui backfill monitoring wells.

Between 1971 and 2008, BNCC placed CCBs from FCPP in mined out pits or ramps at Navajo Mine. BNCC does not have any current operational plans to place CCB materials in the mine

backfill for future reclamation within the permit boundary. Historic placement locations are primarily within Area I with limited placement in Area II. As discussed in Section 11.6.2.1, the SGS (Appendix 11-MM) was implemented to assess possible impacts to groundwater from historic mine placement of CCBs at Navajo Mine. BNCC has also completed detailed studies of the constituents leached from CCBs and mine spoil for the PHC determination. The results of these studies are provided in Appendix 11-K. No toxic materials are present in the spoil or CCB as demonstrated by the toxicity tests in Appendix 11-K. Characterization investigations conducted on CCB and mine spoil at Navajo Mine contained in Appendix 11-K show that, except for boron, CCBs and spoil material have similar leaching concentrations. A subsequent spoil testing program was also completed in year 2008 to generate additional information on spoil properties and leaching characteristics of mine spoil. These testing results are presented in Appendix 11-UU and are used to support the PHC assessment for proposed spoil placement as mine backfill within Area IV North at Navajo Mine.

Parameter concentrations (mg/kg) of a solid matrix of CCB and of spoil disposed of at Navajo Mine are presented in Tables 11-14c and 11-14d (taken from the Appendix 11-K, Tables 27-B3 and 27-B4). The only notable parameter differences with the spoil is that fly ash has elevated concentrations of boron, and slightly higher concentrations of selenium and barium. For the remainder of the trace metals, the concentrations of spoil, fly ash, and bottom ash are similar. Both bottom ash and fly ash have lower concentrations of sulfate, sodium, and calcium when compared to spoil.

Per EPA's 1993 final regulatory determination CCB materials (fly ash, bottom ash, boiler slag, and flue gas emission control waste) are exempt from regulation as a hazardous waste under Subtitle C of the Resource Conservation and Recovery Act (RCRA, 58 FR 42466, 9 Aug 1993). Solid samples of fly ash, bottom ash, and spoil were subjected to the Extraction Procedure (EP) Toxicity Test and the extract from this procedure was subsequently analyzed for a suite of metals and general chemistry. The results (Appendix 11-K, Table 27.B11) were all below the limits for EP toxicity used to classify a material as toxic.

Table 11-14b is a comparison of surface and groundwater concentrations before and after they have been leached through different mixtures of spoil and CCB. The data presented in Table 11-14b was selectively extracted from data tables contained in Appendix 11-K. Several general relationships are evident from Table 11-14b for both groundwater and surface water as follows.

- Surface water and groundwater leached through fly ash or bottom ash had lower TDS than when leached through spoil and is similar to the original concentration of the pre-leach water.
- 2. In general, the leachates produced do not widely differ from that of coal seam groundwater. TDS concentrations in the leachate have increased (except for bottom ash, which had a lower TDS than the groundwater) due to increases in sulfate, calcium, and chloride concentrations. However, the increased TDS concentration is small in comparison to the concentration of the coal groundwater.
- Trace constituent concentrations are similar for all the leachates produced, with the exception of fly ash alone, which showed increases in arsenic, boron, and fluoride and selenium concentrations.
- 4. Spoil serves to attenuate arsenic, boron, and fluoride when concentrations are slightly elevated in fly ash leachate, in baseline surface water and in baseline coal seam water.
- 5. The iron concentration in both surface water and groundwater decreased following leaching through spoil, CCB, or a mixture of the two. Manganese concentrations increased in both surface and groundwater leaching of mine spoil but not in leaching of fly ash or bottom ash.
Table 11-14c

Coal Combustion By-product (CCB) Analysis Summary

(Table 27-B3, Appendix K)

PARAMETER	UNIT	С	CCB
		FLY ASH	BOTTOM ASH
		(No sludge)	
Acidity ⁽¹⁾	mg/kg CaCO ₃	$< 100^{(3)}$	397
Alkalinity ⁽¹⁾	mg/kg CaCO ₃	11,577	2,976
Chloride	mg/kg	100	124
Cyanide	mg/kg	0.20	0.22
Fluoride	mg/kg	176	81
Nitrate ⁽¹⁾	mg/kg No ₃ -N	<1	2
pН		$NA^{(2)}$	NA
Phenolics	mg/kg	1.29	1.36
Residue:			
Filterable @ 180 ⁰ C	mg/kg	NA	NA
Specific Conductance	µmhos/cm	NA	NA
$@ 25 {}^{0}C$			
Sulfate ⁽¹⁾	mg/kg SO_4^{-2}	1,667	<100
Metals:			
Aluminum	mg/kg	6,600	2,000
Arsenic	mg/kg	11	0.38
Barium	mg/kg	850	420
Boron	mg/kg	160	10
Cadmium	mg/kg	0.4	<0.1
Calcium	mg/kg	12,000	3,000
Chromium	mg/kg	5	<1
Cobalt	mg/kg	2	1
Copper	mg/kg	0.063	0.023
Iron	mg/kg	5,300	2,100
Lead	mg/kg	26	<1
Magnesium	mg/kg	530	150
Manganese	mg/kg	99	32
Mercury	mg/kg	0.2	<0.1
Molybdenum	mg/kg	<6	<6
Nickel	mg/kg	2	<1
Potassium	mg/kg	162	44
Selenium	mg/kg	6.5	$< 2^{(4)}$
Silver	mg/kg	<0.2	<0.2
Sodium	mg/kg	430	84
Zinc	mg/kg	13	5

(1) Water leachable.

(2) NA – not analyzed.

(3) < - Less than.

(4) Higher detection limits due to matrix interference.

Table 11-14d

Spoils and Overburden Analysis Summary

(Table 27-B4 Appendix K)

PARAMETER	UNIT	S–1	S–2	S–3	S-4	S-5	D-1	D-2
(1)								
Acidity ⁽¹⁾	mg/kg CaCO ₃	399	299	197	399	298	399	398
Alkalinity	mg/kg CaCO ₃	3,293	3,693	3,945	3,593	3,777	7,186	3,877
Chloride ⁽¹⁾	mg/kg	250	150	246	200	248	399	149
Cyanide	mg/kg	0.17	1.18	0.20	0.25	0.20	0.08	0.20
Fluoride	mg/kg	471	463	420	575	503	403	332
Nitrate ⁽¹⁾	mg/kg NO ₃ -N	29	16	12	20	24	15	20
pH		$NA^{(2)}$	NA	NA	NA	NA	NA	NA
Phenolics	mg/kg	1.09	1.19	1.09	1.18	1.05	0.90	1.98
Residue:								
Filterable @ 180 ⁰ C	mg/kg	NA	NA	NA	NA	NA	NA	NA
Specific Conductance	µmhos/cm	NA	NA	NA	NA	NA	NA	NA
@ 25 ° C								
Sulfate	mg/kg SO4 ⁻²	8,982	7,236	6,410	12,724	6,610	1,946	3,529
Metals:								
Aluminum	mg/kg	8,100	7,400	5,500	6,600	6,600	9,200	6,200
Arsenic	mg/kg	6.5	6.0	36	17	4.3	4.5	4.6
Barium	mg/kg	180	42	130	520	150	110	120
Boron	mg/kg	9	8	4	<3(3)	4	<3	<3
Cadmium	mg/kg	1.0	0.9	1.1	0.9	0.8	1.1	0.9
Calcium	mg/kg	16,000	17,000	7,9000	9,500	27,000	14,000	11,000
Chromium	mg/kg	3	3	2	3	3	6	6
Cobalt	mg/kg	7	7	8	7	9	7	6
Copper	mg/kg	11	6	6	15	9	10	0.143
Iron	mg/kg	14,000	13,000	39,000	27,000	14,000	20,000	18,000
Lead	mg/kg	35	32	58	35	32	42	72
Magnesium	mg/kg	2,900	3,100	2,300	2,100	2,900	4,100	6,200
Manganese	mg/kg	200	200	360	190	470	350	250
Mercury	mg/kg	<0.1	<0.1	0.2	0.8	<0.1	0.2	0.2
Molybdenum	mg/kg	<6	<6	<6	<6	<6	<6	<6
Nickel	mg/kg	10	9	13	10	13	10	9
Potassium	mg/kg	1,100	1,400	906	1,200	1,400	903	801
Selenium	mg/kg	<1 ⁽⁴⁾	$<2^{(4)}$	$< 2^{(4)}$	$< 2^{(4)}$	$< 2^{(4)}$	$< 1^{(4)}$	$< 1^{(4)}$
Silver	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Sodium	mg/kg	2,600	2,700	2,700	3,500	2,700	2,900	1,400
Zinc	mg/kg	66	63	58	71	69	63	56

(1) Water leachable.

(2) NA – not analyzed.

(3) < - Less than.

(4) Higher detection limits due to matrix interference.

6. Selenium concentrations in surface water and groundwater leached through a mixture of CCB and spoil are similar to the selenium concentrations in leachate produced by spoil alone. Boron concentrations in groundwater leached through a mixture of CCB and spoil are similar to the original concentration of the groundwater. Boron concentrations declined in surface water leached through a mixture of CCB and spoil. Fluoride concentrations also declined in surface water leached through spoil.

These leaching test results together with the data collected from the SGS that were presented in Section 11.6.2.1 show that some increase in TDS concentrations would be expected in mine spoil water in comparison with the TDS concentrations in the original source of water (i.e. groundwater or surface water). The leaching tests indicate that the increase in TDS is due primarily to increases in calcium, sodium, and sulfate while the field monitoring results from the SGS indicate that the increase in TDS is due primarily to increases in sodium and sulfate. Apparently, precipitation of calcite allows sulfate to increase above gypsum solubility limits accounting for the increase in sulfate and decrease in calcium in saturated mine spoils in comparison with leaching test results. The groundwater monitoring data from the Navajo Mine show that baseline groundwater in the coals is very saline. TDS levels have remained at or near baseline concentrations in the potentially affected coal seam wells located near the backfilled mine pits as discussed in Section 11.6.2.1.

The leach study, as well as the data from the SGS, shows that TDS and sulfate concentrations are lower in saturated CCBs in comparison with mine spoils when the source of saturation is surface water or groundwater. Also, TDS and sulfate concentrations do not increase in CCBs that become saturated with spoil water. Arsenic, boron, fluoride, and selenium concentrations increased in fly ash leachate and also showed higher concentrations in CCB wells Bitsui-1 and Watson-4 in comparison with the concentrations in spoil wells (see Table 11-14e). Selenium concentrations in the CCB wells were below the livestock criterion of 0.05 mg/l. Boron and fluoride in the CCB wells were above the livestock criteria of 5 mg/l and 2 mg/l, respectively. Arsenic concentrations in the CCB wells were close to the livestock criteria of 0.02 mg/l. Other trace constituents were below detection limits in the majority of the samples from both CCB and spoil wells and are not listed in Table 11-14e.

Table 11-14e

		As	s (mg/L)	B (mg/L)		Fe (mg/L)		Mn (mg/L)		F (mg/L)		NO3-N (mg/L)		Se (mg/L)	
Location	Well	n	median	n	median	n	median	n	median	n	median	n	median	n	median
ioil n)	Bitsui-4	20	0.0025	20	1.69	20	0.51	20	3.650	20	0.30	19	0.025	20	0.0025
ne sp rediar	Bitsui-5	25	0.0025	24	1.12	25	0.11	25	0.108	24	1.00	22	0.105	25	0.0025
Mi n	Bitsui-6	21	0.0025	21	2.04	21	0.49	21	4.620	21	0.28	20	0.033	21	0.0025
wellls dian)	Bitsui-1	25	0.0210	25	10.50	26	0.10	26	0.195	26	2.35	20	0.025	26	0.0060
CCB (mea	Watson-4	5	0.0200	11	17.40	6	0.01	6	0.025	6	3.63	2	0.070	6	0.0170

Trace Constituent Concentrations in Spoil and CCB Wells

The arsenic, boron, and fluoride concentrations in spoil well Bitsui-6 located immediately down gradient of CCB well Bitsui-1 confirm the leaching tests results which found that spoil attenuates or reduces the concentrations of arsenic, boron, and fluoride. The CCB and spoil well monitoring results in Table 11-14e also indicate likely attenuation of selenium in saturated mine spoils. Attenuation of metals in mine spoil occurs as a result of adsorption associated with the high cation-exchange-capacity (CEC) of mine spoils and geochemical precipitation and co-precipitation. Also, when groundwater containing low sulfate levels interacts with the spoil, sulfate concentrations increase. Laboratory data suggest that colloidal hydroxides are formed when the spoils and water interact. This geochemical interaction and mixing facilitates the adsorption and precipitation of metals, thus reducing their concentrations. The attenuation data from the leach study (Appendix 11-K) also shows that the concentrations of many parameters would be reduced after contact with the coal seam.

Mine spoil does not appear to be a source for selenium as concentrations were below the 0.005 mg/l detection limit in the groundwater samples obtained from the three spoil monitoring wells Bitsui-4, Bitsui-5 and Bitsui-6. On the other hand, mine spoil does appear to be a source for manganese, which increased in spoil leachate and also showed higher concentrations in spoil wells in comparison with CCB wells as shown Table 11-14e and with baseline coal wells as shown in Appendix 6-G Table 6.G-9. The concentrations of other constituents in the spoil water are comparable to the concentrations in the baseline groundwater in the PCS and Fruitland coals. The water quality in the mine spoils and in the baseline groundwater are both poor and exceed

the chloride, sulfate, and TDS criteria for drinking water and livestock use based on Navajo Nation and EPA standards (Appendix 6-G). Based on the Table 11-14e results, the arsenic, boron, fluoride, and selenium concentrations in the mine spoils are expected to meet livestock use criteria (Appendix 6-G). The fluoride concentrations fluctuate in the baseline groundwater and are often above the water quality criteria for livestock and drinking water use.

Additional leaching tests were performed on Navajo Mine spoils to support the PHC assessment for proposed spoil placement as mine backfill within Area IV North at Navajo Mine. These testing results are presented in Appendix 11-UU These leaching tests included 18-hour batch leaching tests of composite mine spoils performed in accordance with the EPA Synthetic Precipitation Leaching Procedure (SPLP, SW-846 Method 1312) and with the Synthetic Groundwater Leaching Procedure (SGLP). Also, 45-day leaching tests were included along with the standard 18-hour leaching procedure, in order to assess any changes associated with longer exposure to the leachant.

Composite spoil samples were obtained from Navajo Mine Area III in accordance with the regraded spoil sampling plan (Chapter 12 Section 12.3.1). A composite sample of coal seam water was comprised of equal proportions of water extracted from the No. 8 coal seam well KF2007-01 and from the No. 3 coal seam well KF98-02, located within Area IV. Two duplicate samples of the composite coal water were obtained and analysis results are presented in Table 11-14f as "Initial Coal Water Sample" and "Initial Coal Water DUP."

Synthetic precipitation was prepared in the laboratory and used as a surrogate for field site precipitation that could percolate through the spoil backfill and provide recharge to groundwater and potentially surface water discharge. The prepared solution is highly purified water with strong solvating properties. The water quality is presented in Table 11-14f under the heading "Initial Synthetic Precipitation".

The composite spoil was leached in duplicate (18-hr tests) with coal well water (Spoil Leachate 1 and Spoil Leachate 1 DUP; a test in which spoil is exposed to coal water for 45 days according to the long-term leaching procedure described above (Spoil 45-Day). Finally, an 18-hour

leaching test of spoil was performed using the synthetic leaching fluid described in the SPLP (Spoil SPLP).

The leaching test results indicate that the pH of leachate using the expected field site materials and waters remains neutral to alkaline, indicating that low pH values that are typically responsible for enhanced trace metals transport will not exist with the mine backfill at the Navajo Mine. This finding is supported by data collected and conclusions reported for site wide geologic and hydrologic conditions. The synthetic precipitation leaching solution started with an initial pH of 5.0 and increased to a pH value of 7.5 for the spoil 18-hour batch samples, indicating the buffering influence of these materials to slightly alkaline conditions. An initial flush of salts, principally calcium and sulfate, occurs with leaching of these spoil along with detectable concentrations of some metals and trace constituents as indicated in Table 11-14f.

Fluoride was at a concentration of 2.4 mg/l in the background composite coal groundwater sample used in the leaching test. However, fluoride concentrations are attenuated in mine spoils as demonstrated by the leaching test results of mine spoil, which showed fluoride concentrations dropping from the concentration of 2.4 mg/l in the composite coal water used for leaching to concentrations of 1.6 and 1.5 mg/l in the in 18-hour and 45-day spoil leachates, respectively.

Thus, if spoil water does saturate CCB, the probable result is that concentrations of arsenic, boron, fluoride, and selenium may increase in the CCB material but these concentrations should decrease due to attenuation as this water migrates through the spoil. TDS and sulfate concentrations are not expected to increase in CCBs that become saturated with spoil water. The concentrations of sulfate, sodium, TDS, boron, and manganese are expected to increase in spoils that become saturated with surface water infiltration or groundwater. Sulfate concentrations are likely to increase in the coal seam water adjacent to the mine pit as shown in Figure 11-31 for the coal wells adjacent to the Bitsui Pit. TDS would also increase in the coals adjacent to the mine pit but by less than the increase in sulfate as demonstrated in Figure 11-31.

Table 11-14f

Batch Leaching Test Results

Analyte (mg/L)	EPA Drinking Water Criteria	Livestock & Wildlife Watering Criteria ¹	Initial Coal Water Sample	Initial Coal Water DUP	Initial Synthetic Precipitation	Spoil SPLP	Spoil 45-Day	Spoil Leachate	Spoil Leachate Dup
Al		0.5	0.13	0.14	0.056	< 0.05	0.38	0.29	0.3
Sb	0.0056		<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067
As	0.01	0.02	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015
Ba	1	10	0.093	0.088		0.07	0.079	0.25	0.2
Be	0.004		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
HCO ₃			1300	1200		33	960	1000	1000
В	0.63	5	0.31	0.29		0.084	0.36	0.44	0.45
Cd	0.005	0.05	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	< 0.006, 0.00087*	<< 0.00051
Са			3.4	3.3	0.27	150	56	64	69
CO ₃			260	300	< 7	14	< 7	< 7	< 7
Cl	250 ³	600	710	700		1.5	600	610	610
Cr	0.1	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Со		1	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cu	1.3	0.5	< 0.005	< 0.005	< 0.005	< 0.005	0.053	< 0.005	< 0.005
F	2	2	2.4	2.5	0.0067	0.54	1.5	1.6	1.6
Fe	0.3		0.067	0.073	< 0.05	< 0.05	< 0.05	0.17	0.18
PB	0.015	0.1	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011
Li			< 0.1	< 0.1	< 0.1	< 0.1	0.11	0.1	0.1
Mg			1.3	1.2		15	12	13	13
Mn	0.053		< 0.01	< 0.01	< 0.01	0.19	0.098	0.11	0.1
Hg	0.002	0.01	<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	< 0.00024, 0.0001*	< 0.0002, 0.00008*
Мо			0.012	< 0.01	< 0.01	< 0.01	0.015	0.014	0.014
Ni	0.61		< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
pH (standard units)	6.5 - 9.0		9	8.9	5	7.5	8	8	7.9
K			11	10	< 1	7	14	14	14
Se	0.05	0.05	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026
Ag	0.035		< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
Na			1200	1100	5.7	150	1200	1200	1200
SO_4	250	1000	300	260	3.4	670	930	970	990
Tl	0.0017		<< 0.011	<< 0.011	<< 0.011	<< 0.011	< 0.4, 0.014*	<< 0.011	<< 0.011
TDS	500	2212	3100	3000	28	1200	3500	3500	3600
V		0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zn	5	25	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0095
	¹ Navajo Nation Water Quality Program, 2004, Navajo Nation	Surface Water Quality Standard	ds. (Wildlife standard	0.002 mg/l for total seler	nium and 0.000012 mg	/l for mercury)			

<< Reported value is less than the MDL

*Above MDL, but below PQL

11.6.2.3Potential Migration of Spoil and CCB Leachate in Groundwater From CurrentMining and Reclamation Operations

As discussed, re-saturation of a portion of mine spoil within the Bitsui and Dodge pits has occurred over a period of about 25 years due to the contribution of seepage flow from adjacent NAPI irrigation. The Doby Pit is also located adjacent to NAPI irrigation plots. However, BNCC installed the Doby French drain adjacent to the Doby highwall to intercept seepage from the NAPI irrigation plots in order to curtail the resaturation of the Doby Pit. A backfill monitoring well, Doby-1-BF, was completed in the Doby Pit to monitor the rate of re-saturation of the Doby Pit and to assess the effectiveness of the Doby French Drain. The well has been monitored annually since September 2002 and has been dry during every monitoring event.

The rate of re-saturation is expected to be extremely slow at the other mine pits at Navajo Mine. This conclusion is based on the following:

- Groundwater modeling described in Section 11.6.2.4.1 found that resaturation of the backfilled pit within Area IV North will be very slow and will take several centuries or longer to approach steady state post-mining levels.
- Groundwater in the coal monitoring wells KF84-18a and KF84-18b located adjacent to the backfilled Yazzie Pit have remained nearly dry, indicating little or no water level recovery in the backfill.
- Well Doby-1-BF installed in the Doby Pit backfill has remained dry over the period from to 2002 to 2010. These results show that without the influence of NAPI irrigation the rate of re-saturation of mine backfill will be extremely slow.

The Yazzie Pit is the only pit at Navajo Mine, other than the mine pits within Area I, which is located near a potential source of water in Chinde Arroyo and the Chinde Diversion that could re-saturate the backfill more quickly than the extremely slow rates predicted for the Area IV North mine backfill in Section 11.6.2.4.1. A gain-loss evaluation of Chinde Arroyo and the Chinde Diversion found that there was water loss within Segment 3, the uppermost segment of the Chide Diversion (see Appendix 11-OO). The Chinde Diversion routes flow around the Yazzie Pit. The uppermost segment routes flow to the north along the east side of the Yazzie Pit.

It then bends to the west and flows between the backfilled Yazzie and Doby Pits. Chinde Arroyo at the point of the diversion was originally an ephemeral stream but now exhibits perennial flow due to irrigation return flows and seepage along with occasional flows caused by discharge from the Navajo Indian Irrigation Project (NIIP) Ojo Amarillo canal and storm runoff events.

According to the Chinde Wash Surface Water Gain/Loss report (Appendix 11-OO), the water loss within Reach 3 of the Chinde Diversion is largely the result of evapotranspiration losses from the wetlands and salt cedar thickets that exist at the head of the diversion and to a lesser extent the result of seepage from the diversion that can be seen in the Yazzie highwall immediately below this wetland area at the head of the diversion. Although most of this seepage from the Chinde Diversion is currently lost to evaporation, it is likely that a portion of the seepage enters the Yazzie Pit backfill. This seepage contribution could increase the rate of resaturation of the backfill in the Yazzie Pit, although rates of re-saturation should be slower than was observed for the Bitsui Pit because the seepage contribution is thought to be relatively small based on the following:

- both the Yazzie and Doby Pits, located adjacent to the Chinde Diversion, remained dry during mining and reclamation operations,
- the Doby-1-BF monitoring well installed in the backfill of the Doby Pit adjacent to the Chinde Diversion has remained dry, and
- little recovery of groundwater levels has been observed in coal wells KF84-18a and KF84-18b located adjacent to the Yazzie Pit.

Potentiometric surface maps for the Fruitland coal units (Exhibits 6-2 through 6-5 and Exhibits 6.G-2 and 6.G-3) all show general gradients toward the east in the direction of the dip of the coal and toward the northeast in the direction of the subcrop of the Fruitland Formation with the San Juan River alluvium. Both groundwater modeling and water level measurements from the network of monitor/piezometer wells installed by BNCC also indicate local gradients in the Fruitland coals toward Cottonwood and Pinabete Arroyos within Areas III and IV as shown in Exhibits 6.G-2 and 6.G-3. Potentiometric gradients were found to be quite flat across Area III while the coal units within and adjacent to Area II were dry or nearly dry.

11.6.2.3.1 Area I Groundwater Migration

Based on the potentiometric surface for the No. 8 coal, the discharge locations for the resaturated mine spoil within Area I are projected to be:

the subcrop of the No. 8 coal and the Fruitland Formation beneath the alluvium of San Juan River Valley to the northeast of Area I and

down dip in the No. 8 coal Seam toward the drawdown influences of nearby coal bed methane wells.

The subcrop of the No. 8 coal seam and the Fruitland Formation beneath the alluvium in the San Juan River Valley occurs at elevations below the water levels in the coal seam to the south. The San Juan River alluvium, herein, refers to the unconsolidated Quaternary deposits of alluvium and Pleistocene outwash materials. The characteristics of the deposit varies but is largely comprised of either a gravel or sand matrix containing varying combinations of boulders, cobbles, pebbles, and silt. The approximate location for the coal subcrop is depicted in Exhibit 11-163. The approximate extent of the San Juan River alluvium along the Fruitland Formation subcrop is also mapped out in this exhibit. This subcrop location along the alluvium of the San Juan River is thought to be the primary discharge location for groundwater in the No. 8 coal and in the undifferentiated Fruitland Formation.

Discharge from the coal seam may also occur as leakage into the units above or below the coal. Although the potential rate of leakage through the shale, mudstone, and siltstones which overlie and underlie the coal seam is very low, the area of contact above and below the coal is sufficiently large that the potential discharge via leakage can be significant. However, the higher potentiometric elevations in the PCS in the vicinity of Morgan Lake, as depicted in Exhibit 11-163, function to limit or preclude vertical downward leakage into the PCS from the coal and the mine backfill and may even provide a source of water for recharging the backfill. Upward vertical gradients will diminish as water levels rise in the pit backfill. However, it is expected that gradient reversal will be limited to locations more distant from Morgan Lake such that little spoil water within Area 1 will enter the PCS. Lateral groundwater flow is expected to occur

from the saturated mine backfill in the direction toward the subcrop in both the No. 8 coal and in the undifferentiated Fruitland Formation.

A groundwater transport model was applied to assess the potential impact of mine spoil and CCB placement within Area 1 on the water quality in the down gradient coal seam and on the water quality in the alluvium of the San Juan River valley. This model represents a simplification of the groundwater flow system. Estimates of hydraulic variables and physical relationships used for the model are based on presently available data. For the purpose of this evaluation, it is assumed that the primary path for groundwater flow from the mine spoil will be through the coal in a north-north east direction toward the coal formation subcrop in the San Juan River alluvial aquifer (see Figure 11-24). Some groundwater flow will also occur through the undifferentiated Fruitland Formation but the rate and magnitude of this flow is expected to be lower than in the coal due to the lower hydraulic conductivity and higher porosity of the undifferentiated Fruitland Formation relative to the coal.

A steady-state MODFLOW model of groundwater flow through the coal was set up to support the groundwater transport modeling. The MT3DMS model was applied in conjunction with the steady state MODFLOW model to simulate advection, dispersion/diffusion, and sulfate reduction in order to estimate transport through the coal to the subcrop location along the San Juan River alluvium. The mass transport parameters for dispersion and decay (sulfate reduction) were estimated based on calibration to the sulfate breakthrough concentrations observed in the down gradient coal well Bitsui-2. Sulfate decay rates estimated from model calibration were found to be at the lower bound of the estimated decay rates reported in the literature.

As shown from Figure 11-24, the most northern portion of the mine area, where spoils have been placed, is the Bitsui Pit located more than 5,000 feet from the coal subcrop with the San Juan River alluvial aquifer. Saturation within the Bitsui Pit extends for a distance of approximately 2,000 feet perpendicular to the estimated direction of flow as depicted in Figure 11-24. The water elevation in the Bitsui Pit backfill is estimated at 5,164 feet based on water level measurements in the Bitsui backfill wells. The water elevations in these wells have been within about 1-foot of this estimate over the period from 2001 through 2010. The 5,164 elevation was

specified as a constant head in the along the south boundary of the MODFLOW model domain shown in Figure 11-24. Head levels in the coal beneath the San Juan River alluvium along the northern boundary of the MODEFLOW model domain shown in Figure 11-24 were estimated based on the heads in the alluvium. These alluvial heads were estimated to vary linearly from the San Juan River elevation of 5,087 feet at the west end to the river elevation of 5,132 at the east end of the specified head boundary. No flow model boundaries were specified on the west and east sides of the MODFLOW model domain shown in Figure 11-24. The boundary on the west side extends to the approximate outcrop of the coal and beyond limits of saturation in the backfill. The no flow boundary on the east side was set at a sufficient distance from the Bitsui Pit to have minimal influence on the dispersion calculations.

A summary of hydraulic conductivity estimates for the Fruitland Formation coal seams is provided in Table 6-1 (Chapter 6). A hydraulic conductivity of 0.08 feet per day from this table is considered a reasonably conservative estimate for the No. 8 coal based on the test results for wells SJKF84 #3, SJKF84 #4 and SJKF84 #5 located in the coal down gradient of the Bitsui Pit. The porosity of coal seams is primarily associated with cleating and small scale fracturing of the coal. Porosity estimates ranging from 0.02 to 0.007 were obtained for the Fruitland Formation coals from tests conducted for the Western Cretaceous Coal Seam Project (Mavor et al., 1992). An estimate of coal porosity of 0.01 was used for modeling. This estimate also appears to match the rate of transport from the Bitsui Pit to well Bitsui-2 and has been used in the model calibration and simulations.

Sorption of sulfate was assumed to be near zero and was not included in the transport model. The longitudinal dispersivity value of 10 feet was estimated from model calibration using well Bitsui-2 located approximately 300 feet from the Bitsui Pit. Lateral dispersivity was estimated as 0.1 x longitudinal and vertical dispersivity was estimated at 0.01 x longitudinal dispersivity. These are standard dispersivity factors that are often used in transport modeling. The model calibration is not very sensitive to the dispersivity values.

The source concentration of sulfate in the Bitsui Pit was assumed to be constant after resaturation of the Bitsui Pit. A sulfate source concentration of 7,000 mg/l was estimated based

on the average of the median sulfate concentrations in backfill wells Bitsui-4 and Bitsui-5, the two backfill wells nearest the Bitsui-2 well.

The sulfate reduction rate is represented in the MT3DMS model as a first-order decay process with a constant decay rate throughout the coal unit. The sulfate reduction decay rate of 3×10^{-4} day⁻¹ was estimated by model calibration to the sulfate breakthrough in well Bitsui-2. A comparison of the sulfate concentrations observed at the Bitsui-2 coal well with the predicted sulfate breakthrough curve from the calibrated model is provided in Figure 11-36. The calibrated sulfate reduction decay rate determined by model calibration is near the lower bound of sulfate reduction values found in the literature, including the study of sulfate reduction in coals down gradient of mine spoilt (Clark, 1995). Using data from Clark (1995) for sulfate reduction in groundwater down gradient of mine spoil at the West Decker Mine in Montana, sulfate decay rates were estimated to range from 3 x 10^{-3} day⁻¹ to 6 x 10^{-4} day⁻¹.





Figure 11-36. Predicted Sulfate Concentrations at well Bitsui-2

The model predicts sulfate concentrations over time anywhere in the model domain. Prediction points were established at the Bitsui-2 well located down gradient of the Bitsui Pit, at well SJKF84#5, at SJKF84#4 and at the coal subcrop on the model boundary. These prediction locations are shown on Figure 11-24. Predicted sulfate concentrations for the specified prediction points are plotted in Figure 11-37. These results show that sulfate concentrations in the Bitsui-2 well approach a steady state value of about 1,600 mg/l assuming that source concentrations remain at 7,000 mg/l. These results also show that sulfate concentrations remain below the 10 mg/l detection limit at the down gradient coal wells SJKF84#5 and SJKF84#4 and at the coal subcrop with the alluvium at the model boundary.



Figure 11-37. Model Predicted Sulfate Concentrations at Specified Prediction Points

A sensitivity analysis was performed for longitudinal dispersivities and sulfate decay coefficients. These results found that the predicted sulfate results are not sensitive to the dispersivity but the results are sensitive to the sulfate reduction rate. Figure 11-38 shows the sulfate concentrations for the specified prediction points estimated from the model using a sulfate reduction decay rate of $3x \ 10^{-5} \ day^{-1}$, which is an order of magnitude lower than the value estimated from model calibration to the sulfate observed in well Bitsui-2. These results show that sulfate concentration at the coal subcrop approach a steady state value of about 113 mg/l after about 500 years. Continued monitoring of sulfate concentrations in the Bitsui-2 well will serve to further verify the sulfate decay rate and permit, if warranted, any modifications to the model predictions.

The modeling results indicate that there will be no sulfate transport to the San Juan River. Also, as a result of sulfate reduction, TDS levels are not expected to increase in the coal water at the subcrop with the alluvium. While the TDS concentrations did increase in the Bitsui-2 well as indicated in Figure 11-31, this increase is the result of the increase in sulfate concentrations.

Alkalinity and chloride concentrations decreased in this well as a result of transport of water from the mine spoils through the coal. As sulfate reduction is expected to continue under reducing condition in the coal down gradient of the Bitsui-2 well, the magnitude of TDS increase will also drop and is expected to be negligible at the coal subcrop.





Some groundwater transport will also occur through the undifferentiated Fruitland Formation as suggested by Cross Section A-A' in Exhibit 11-164. The undifferentiated Fruitland formation is comprised of interbedded sequences of shales, carbonaceous shales, sandstones, mudstones, claystones, and coal stringers. While carbon sources and reducing environments are present in the undifferentiated Fruitland formation due to the carbonaceous shales and coal stringers, sulfate reduction rates could be lower than in the coal. On the other hand, the rate of groundwater flow is expected to be lower through the undifferentiated Fruitland due to the lower hydraulic conductivity expected for these interbedded sequences of shales, carbonaceous shale

sandstones, mudstones, claystones, and coal stringers in comparison with the coal. Furthermore, groundwater velocities in the undifferentiated Fruitland Formation will be lower because the overall porosity is expected to be higher than in the coal. Thus, even if sulfate reduction rates are lower in the undifferentiated Fruitland formation, transport times are expected to be longer, allowing more time for sulfate reduction.

A simple calculation of flow velocities and transport times has been performed to demonstrate the likely differences that can be expected based on the expected differences in effective porosity. The effective porosity of the coal was estimated to be approximately 1% based on both the literature for the Fruitland coals and the transport model calibrations. The effective porosity in the undifferentiated Fruitland will vary with materials in the Fruitland Formation and is lower in the clays and shales than in the sandstones even though clay has higher porosity than sandstone. Effective porosity can be determined for the specific yield of the material. Johnson (1967) provides a comprehensive review of specific yields for sedimentary materials. The specific yield decreases with the particle size of the sediments. The specific yields were reported to range from 10% to 32% for unconsolidated sands. Johnson (1967) provides a specific yield estimate of 10% for tight and partially cemented sandstones. Johnson (1967) provides average specific yield estimate of 3% for clays and 8% for silts. The effective porosity of coal stringers may be higher than 1% effective porosity estimated for the No. 8 coal, particularly if the shallower stringers are more weathered. Typically, higher porosity is usually present in the shallow coals in the San Juan Basin (Questa Engineering Corporation, 2000). Based on these results an overall porosity of the undifferentiated Fruitland is likely to be on the order of 5% or higher.

An elevation difference of 63 feet is calculated for the water elevation of 5,164 feet measured in the Bitsui Pit and the water elevation of 5,101 feet estimate in the alluvium at the coal subcrop. The distance between the Bitsui Pit and the coal subcrop is approximately 7,300 feet resulting in an average hydraulic gradient between the Bitsui Pit and the groundwater at the coal subcrop of 0.0086 ft/ft.

The average groundwater velocity between the Bitsui Pit and the coal subcrop can be estimated using the following equation:

$$v = kI/N_e$$

where:

v = Velocity of groundwater in the Fruitland Formation (feet per day).

 $N_e = Effective porosity (dimensionless)$

K = Hydraulic conductivity (feet per day)

I = Hydraulic Gradient (dimensionless)

Thus, based on the porosity and hydraulic conductivity for the coal, the groundwater velocity is estimated to be 0.069 feet per day and it would take 290 years for water from the mine pit to flow the 7,300 foot distance through the coal from the Bitsui Pit to the coal subcrop with the San Juan River alluvial aquifer. The groundwater velocity in the undifferentiated Fruitland Formation is expected to be at least 5 times lower based on an estimated effective porosity of 5%. Also, the hydraulic conductivity of the undifferentiated Fruitland Formation is expected to be lower based on the extent of shale and claystone within the unit and the observations from mining and exploration drilling that the coals in the Fruitland will typically yield some water while very little water will flow from the undifferentiated Fruitland.

Even if the TDS and sulfate were to increase in the Fruitland Formation at the coal subcrop several hundred years from now, it is unlikely that it would result in a significant increase in the alluvial groundwater due to the much higher flow rates in the alluvial groundwater relative to the flow in the Fruitland Formation. A groundwater mixing calculation has been performed to provide upper bound estimates for the magnitude of the potential increase in TDS concentrations in the San Juan River alluvium. The lateral extent of the Navajo Mine perpendicular to the direction of flow toward the Fruitland Formation subcrop at the San Juan River alluvium is estimated at approximately 6,500 feet as indicated by the mine water flow projection shown in Figure 11-24. The maximum volume of groundwater from the reclaimed mine that can discharge to the San Juan River alluvium can be estimated using the following equation:

Q = k I. L. M

where:

- Q = Estimated discharge of mine-affected groundwater to the San Juan River alluvial aquifer (ft³/year)
- K = Hydraulic conductivity of the Fruitland Formation, which is assumed to be 0.08 ft/day based on the hydraulic conductivity of the coal
- I = Hydraulic gradient from the Navajo Mine to the Fruitland Formation subcrop, which is conservatively estimated to be 0.01 ft/ft
- L = Lateral extent of the mine normal to the general direction of flow in the coal seam = 2,000 ft
- M = Estimated average saturated thickness of the Fruitland Formation between the Bitsui Pit and the San Juan River alluvium estimated to be on the order of 50 to 60 feet as suggested by Cross Section A-A' in Exhibit 11-164.

Assuming a gradient of 0.01 ft/ft based on measurements at the Bitsui Pit and a hydraulic conductivity of 0.08 feet per day for both the coal and the undifferentiated Fruitland Formation, the discharge to the San Juan River alluvium (Q) is estimated as:

 $Q = [0.08 \text{ feet per day}] \cdot [0.01] \cdot [6,500 \text{ ft}] \cdot [60 \text{ ft}]$

 $Q = 312 \text{ feet}^3/\text{day}$

This is likely the upper bound estimate as the hydraulic conductivity of 0.08 ft/day is considered to be upper bound estimate for combined coal and undifferentiated Fruitland Formation. The results of these calculations, nonetheless, demonstrate that the annual production of mine-affected groundwater that could reach to the San Juan River alluvium is small when compared to the flow in the San Juan River alluvium as discussed below.

The thickness of the San Juan River alluvial deposits varies but appears to range from about 20 to 65 feet based on the alluvial well depths reported in Appendix 6-E. The depth of saturation reported for these wells range from about 10 to 45 feet with most on the order of 15 feet. A

conceptual model of the San Juan River and the floodplain alluvium is presented in a report by the United States Department of Energy (2009) for the Shiprock Uranium Mill Tailings Site. This report lists the San Juan River as the major source of groundwater in the alluvial aquifer with less significant sources of alluvial water which include infiltration and recharge of precipitation on the floodplain and discharge of bedrock groundwater to the alluvium. There is also considerable mixing of river water and alluvial groundwater. This occurs seasonally as well as with distance along the length of the river with river water recharging the groundwater system near the downstream end of a pool and then discharging back to the river near the downstream end of the riffle (United States Department of Energy, 2009).

A hydraulic conductivity of the San Juan River alluvium of 85 feet per day was found to provide the best overall estimate for the alluvial aquifer based on a series of groundwater model calibration runs with a uniform hydraulic conductivity (United States Department of Energy, 2009). Hydraulic gradients in the alluvium vary across the floodplain but are approximately the same as the valley gradient. The valley gradient of 0.0034 ft/ft was measured for the San Juan River valley along the Fruitland Formation subcrop as depicted in Exhibit 11-163. An average width of the alluvium of 6,851 feet was estimated by dividing the mapped area of the San Juan River alluvium in this Exhibit by the length of the valley segment. Using a hydraulic gradient of 0.0034 ft/ft, a valley width of 6,851 feet, a hydraulic conductivity of 85 feet per day, and a saturated thickness of 15 feet, the average flow in the alluvial aquifer is estimated as:

$$Q = [85 \text{ feet per day}] \cdot [0.0034] \cdot [6,851 \text{ ft}] \cdot [15 \text{ ft}]$$

 $Q = 29,413 \text{ ft}^3/\text{day}.$

Thus, the ratio of the groundwater discharge from the Fruitland Formation to the alluvium across the maximum mine water flow projection to the groundwater flow in the San Juan River Alluvium is:

$$Ratio = 312/29, 413 = 0.0106$$

The existing water quality in the San Juan River alluvial aquifer is quite variable as indicated by the available water quality data from San Juan River alluvial wells provided in Appendix 6-E. TDS, sulfate concentrations, and fluoride concentrations for these wells are provided in Table 11-14g, along with water quality data for San Juan River alluvial well G-7 provided by Thorn (1993). Thorn's report also provides information on boron concentrations in the alluvial groundwater. Table 11-14g provides a comparison of water quality data for San Juan River alluviate for San Juan River alluviate for San Juan River quality data for San Juan River quality data for San Juan River alluviate for San Juan River alluviate for San Juan River alluviate for San Juan River quality data for San Juan River quality data for San Juan River alluviate for San Juan River quality data for San Juan River alluviate for San Juan River quality data for San Juan River alluviate for San

The baseline No. 8 coal well SJKF #4 is located closest to the coal subcrop as shown in Exhibit 11-163. The TDS concentration of 7,370 mg/l observed in this well is considered to be representative of the TDS in the coal water reaching the San Juan River alluvial aquifer, although TDS concentrations in excess of 40,000 mg/l have been observed at wells SJKF #2 and SJKF #3 located further down dip. The TDS concentration observed in this well is higher than TDS concentration of 6,160 mg/l observed in the Bitsui-2 well in years 2009 and 2010 so that there would need to be a considerable increase in TDS concentrations along the entire groundwater transport path from the Bitsui Pit to the subcrop in order for mine water transport to increase the TDS loadings to the San Jun River alluvium.

Based on the dilution ratio of 0.01, a TDS increase from the 6,160 mg/l observed in the Bitsui-2 well to 10,370 mg/l across the entire transport zone would result in a TDS increase in the San Juan River alluvium of only 30 mg/L. Not only is such an increase in TDS concentrations unlikely and inconsistent with observations and modeling calculations, but a 30 mg/l change in alluvial concentrations is far below the natural variation observed in the San Juan River alluvial wells as represented by the standard deviation calculated from the alluvial well results presented in Table 11-14g.

Table 11-14g

Water Quality of the San Juan River Alluvium in Comparison with Mine Spoil Water and Coal Water

Location	Well	TDS (mg/L)	SO4 (mg/L)	B (mg/L)	Mn (mg/L)
bal	SJKF#2	43,035	5	1.23	2.93
e Cc ian)	SJKF#3	50,810	5	1.43	0.71
selin med	SJKF#4	7,370	5	1.57	0.11
Bas (I	Composite #4 [*]	9,800	120	0.53	0.03
ii o	Bitsui-4	15150	8900	1.69	3.650
spo dian)	Bitsui-5	11850	5115	1.12	0.108
Mine (mec	Bitsui-6	14800	8800	2.04	4.620
	mean	13,933	7,605	2	3
Bitsui-2 (Year 2010)		6,160	1,300	1.00	0.01
	G-7	3,940	1,700	0.32	0.02
* *	BIA# 147	842	310	na	na
Rive uife	BIA# 148	528	174	na	na
an F Aq	BIA# 150	5,880	3,600	na	na
San Jua Alluvial	BIA# 151	2,140	1,300	na	na
	BIA# 152	2,140	1,300	na	na
	BIA# 45	1,270	456	na	na
	Average	2,391	1,263	0.32	0.02
Standard Deviation		1,766	1,095	na	na

*Composite #4 from Coal No 4 and 6 in Table 11-14b

Table 11-14g also provides a comparison of the TDS, sulfate, boron, and manganese concentrations in the San Juan River alluvial groundwater with the concentrations in the Bitsui Pit, in the Bitsui-2 coal well located immediately down gradient of the Bitsui Pit and in the baseline coal water samples.

As discussed earlier, potentiometric surface maps for the Fruitland coal units (Exhibits 6-2 through 6-5 and Exhibits 6.G-2 and 6.G-3) all show general gradients toward the east. Thus,

some of the groundwater flowing through Area I mine spoils may not discharge along the San Juan River valley but rather will flow down dip in response to coal depressurization from coal bed methane extraction.

The data and associated modeling calculations all show that water in the backfill within Area I at the Navajo Mine will not measurably affect the water quality in the San Juan River alluvial groundwater.

11.6.2.3.2 Area II Groundwater Migration

All of Area II coal seams were found to be mostly dry, with minor saturation along the eastern lease boundary. Coal wells KF84-18a and KF84-18b, located near the Yazzie Pit highwall have been dry or have had limited saturation throughout mining and following mine backfilling. Thus, little groundwater inflow to the backfilled Area II mine pits is expected from the coals adjacent to the highwall. Water sources that could potentially saturate the backfilled mine pits within Area II include precipitation recharge and water flowing in the Chinde Arroyo. Recharge rates are extremely low based on the studies by Stone (1987) and the dry conditions in the Fruitland Formation within Area II prior to mining.

The Chinde Diversion routes flows in Chinde Arroyo around the Yazzie Pit. Chinde Arroyo was originally an ephemeral stream but now exhibits perennial flow due to NAPI irrigation. It is likely that a small portion of the flow in Chinde Diversion seeps into the Yazzie backfill. This seepage contribution is believed to be small because saturation has not been observed in the backfill in the Doby Pit, which is also located adjacent to the Chinde Diversion. Nevertheless, this additional source of water could increase the rate and level of re-saturation of the backfill in the Yazzie Pit.

The potentiometric elevations in the PCS within Area II (Exhibit 11-163) are projected to be at or near the base of the mine pits. As the mine spoils begin to saturate over the long-term, the buildup of heads in the mine spoil will increase the rate of vertical flow to the PCS. A build up of head in the mine backfill would also result in lateral flow into the adjacent Fruitland Formation. Thus, transport directions for mine spoil water would be vertical downward into the PCS and laterally down dip in the Fruitland Formation. Lateral flow through the Fruitland Formation will flow down dip to the east in the direction of coal depressurization from coal bed methane extraction or will flow to the northeast toward the Fruitland Formation subcrop beneath the alluvium of San Juan River valley. This component of flow and transport has been addressed in the Area I assessment in Section 11.6.2.3.1.

Lateral flow through the PCS within Area II is expected to be generally toward the northeast as indicated by the potentiometric surface provided in Exhibit 11-163. There could also be a component of flow west toward the PCS outcrop located east of the Chaco River. Groundwater flow rates through the PCS would be very low due to the very low hydraulic conductivity of the PCS. Any discharge along the PCS outcrop to the west of Area II would be removed by evapotranspiration. Based on pre-mine observations along the PCS outcrop adjacent to Areas III and IV North, flow rates in the PCS are expected to be insufficient to sustain flow at a seep. PCS water may also flow vertically downward into the Lewis Shale as was found in groundwater studies performed within lease Areas IV North and South and V.

11.6.2.3.3 Area III Groundwater Migration

In the southern part of Area III, all of the coal seams, but the No. 8 coal seam, were found to be saturated. As discussed in Chapter 6, the lower coal units (No. 2, No 3) pinch out just north of Area III. Discharge locations for the Fruitland coal seams within Area III include:

- the outcrop locations along the Cottonwood Arroyo valley to the south and the Chaco River valley to the west,
- down dip toward the center of the San Juan Basin where the groundwater flow joins the regional flow to the northeast toward the subcrop at the San Juan River alluvium and the coal bed methane depressurization areas, and
- into the PCS and Lewis Shale via vertical flow from the Fruitland Formation.

Groundwater flow rates through the Fruitland coals within Area III are believed to be extremely low because of the low hydraulic conductivities of the coal and the relatively flat potentiometric gradients.

For a long period following mining within Area III gradients will be toward the mine backfill. As the mine spoils begin to saturate over the long-term, the buildup of heads in the mine spoil will increase reversing the gradients with respect to the mine spoils. Based on model estimates of Area IV North it could take as long as 80 years for gradient reversal to occur. Transport directions for mine spoil water at that time would be laterally down dip in the Fruitland Formation, laterally toward the outcrop areas to the south and west of Area III and vertically into the PCS. Lateral flow from the mine spoils through the Fruitland Formation and PCS will be very low due to the low hydraulic conductivity of these units as indicated by the test results in Appendix -G and due to the relatively flat gradients that can be expected based on pre-mine conditions. Most discharge to the PCS and Fruitland Formation outcrops to the south and west of Area III is expected to be removed by evapotranspiration, although a portion of this groundwater flow could reach the Cottonwood Arroyo alluvium.

BNCC is proposing to conduct surface coal mining and reclamation activities within a 704 acre mining block in Area IV North of its coal lease with the Navajo Nation. The No. 8 coal seam extends over a little more than half of the proposed mine area. Perched groundwater appears to occur in the No. 8 and No. 7 coal seams as indicated in Figure 6.G-4 in Appendix 6-G. Groundwater encountered during mining within Area IV North will be quite small based on observations from exploration drilling within Area IV North and on observations at Area III mining which found that groundwater in the coals and overburden was insufficient to sustain pit inflows during mining. Instead, any groundwater observed as seepage along the face of the highwall was removed by evaporation and did not pool within the mine pit.

The calibrated steady-state groundwater model of Areas IV North and South and V of the BNCC's coal lease was used to simulate drawdown and recovery of groundwater levels during and after mining and reclamation (Norwest, 2011). Figure 11-39 shows the groundwater model domain and the location for proposed mining within Area IV North.

Groundwater flow in the Fruitland coals and in the underlying PCS in the area of proposed mining is north toward Cottonwood Arroyo as indicated in Figures 6.G-1 through 6.G-3 in Appendix 6-G. However, the rate of groundwater flow from bedrock units to the alluvium along Cottonwood Arroyo is known to be very low because the alluvium is only marginally saturated. Cottonwood alluvial well QACW-2 located west of the permit area was usually dry during baseline monitoring and Cottonwood alluvial well QACW-1 was dry throughout the baseline monitoring from 1989 through 1998.



Figure 11-39. Mining Block Sequences for Proposed Mining in Area IV North

Groundwater was observed during baseline monitoring at well GM-17 completed in the alluvium of North Fork of Cottonwood Arroyo. In the limited areas where partial saturation of the alluvium occurs, groundwater flows are too low to support base flow in the channel at any time. The limited saturation found within the Cottonwood alluvium is recharge from direct precipitation, from ephemeral surface water flows in Cottonwood Arroyo and from periodic discharges of excess flows from the NIIP Ojo Amarillo canal into the North Fork of Cottonwood Arroyo.

One of the primary hydrogeologic changes to occur as a result of mining is the removal of the coal, the interbedded shales, and the sandstone strata, resulting in more homogeneous and isotropic conditions within the mine backfill. When broken up during mining, the overburden and interburden material placed in the mine pit as backfill have higher porosity and hydraulic conductivity than the pre-mine in-situ interbedded sedimentary deposits of the Fruitland Formation. Laboratory measurements of pre-mine overburden core indicate porosity values of about 0.35 while porosity of mine spoils is on the order of 0.4. These laboratory porosity measurements are consistent with the long-term swell factor of 12% estimated based on experience in mining the same formation at the Navajo Mine. The higher porosity will result in higher hydraulic conductivity in comparison with the pre-mine interburden and overburden material.

Horizontal hydraulic conductivity values of pre-mine overburden and interburden strata are expected to be in the range from 8.63 x 10^{-3} ft/day to 2.8 x 10^{-5} ft/day based on regional information from Kaiser et al. (1994) and Frenzel (1983). The hydraulic conductivity estimates from laboratory measurements of two pre-mine overburden samples from the Navajo Mine are also within this range (Physical Testing Laboratory Data provided in Appendix 11-K). A horizontal hydraulic conductivity of 5.0 x 10^{-4} ft/day was used for unweathered interburden and overburden materials in the calibrated model.

A hydraulic conductivity value of 5.63×10^{-2} ft/day has been used in the post-reclamation model for the mine spoils in the backfill below 10 ft of the final reclaimed surface at Area IV North. This estimate of hydraulic conductivity for mine spoils was between the average of 1.13×10^{-2}

ft/day estimated from laboratory tests on five mine spoil samples from the Navajo Mine (Physical Testing Laboratory Data provided in Appendix 11-K) and the estimate of 2.27 x 10^{-1} ft/day obtained by Rehm et al. (1980) from the geometric mean of 40 hydraulic conductivity values measured for mine spoils in the Northern Great Plains. A hydraulic conductivity value of 5.63 x 10^{-1} ft/day has been used to represent the model layer for the upper 10 ft within the mine backfill, which will be comprised of weathered spoil and topdressing material.

Hydraulic parameters for mine backfill and topdressing materials that were used for modeling post-reclamation conditions are summarized in Table 11-14h. Given some degree of uncertainty in the ultimate hydraulic conductivity of Navajo Mine spoil materials, the value selected for steady-state modeling was considered to be a reasonable upper bound for the hydraulic conductivity of the spoils over the long term. This value is approximately 5 times higher than the average of the laboratory measurements on representative spoil samples, 10 times higher than the model calibrated hydraulic conductivity of the weathered overburden and 100 times higher than the model calibrated hydraulic conductivity of the unweathered interburden material. The hydraulic conductivity of 1.13×10^{-2} ft/day estimated from laboratory tests on Navajo Mine spoils was considered to be a reasonable lower-bound estimate for hydraulic conductivity of mine spoils and was used to represent mine spoils in the transient model. This lower-bound estimate provides more conservative estimates of the water recovery rates in mine spoils.

Another primary hydrogeologic change that is expected to occur as a result of mining in Area IV North is the removal of the badland surfaces that cover much of the proposed mine area and the establishment of reclaimed surface conditions that provide for more groundwater recharge. The recharge rate estimates used for modeling post-reclamation conditions are also summarized in Table 11-14h. Lower slopes and placement of topdressing materials within reclaimed areas are expected to result in higher recharge for reclaimed surfaces compared to the relatively steep slope badland surfaces that currently exist within the proposed Area IV North mine area. The pre-mine recharge rate for this area averages only about 0.0069 in/year based on the estimates from Stone (1987) that were assigned to these pre-mine surfaces based on slope categories.

Table 11-14h.

Surface characterization	Recharge range ¹ (in/yr)	Mean recharge ¹ (in/yr)	Modeled recharge (in/yr)
Reclaimed areas	0.01 to 0.23	0.04	
Reclaimed depression areas		0.16	
Reclaimed areas-transient			0.1
Alluvium- pre-mine and reclaimed	0.09		0.09
Pre-mine surfaces (excluding alluvial terraces)	0.002 to 0.04		0.002 to 0.03
Reclamation materials	Porosity (%)	Ksat (cm/sec)	Ksat (ft/day)
Surface mine spoils (L1)	40.6	2.0E-04	5.6E-01
Mine spoils < L1	40.6	2.0E-05	5.6E-02
Geometric mean of mine spoils in northern Great Plains (Rehm et al. 1980)		8.0E-05	2.3E-01
Lab tests of Navajo Mine spoil samples	40.6	4.0E-06	1.1E-02

Recharge Rates and Hydraulic Properties of Mine Spoils for Groundwater Modeling

¹ Estimates from Stone (1987)

L1- Uppermost layer in model

Ksat - Saturated hydraulic conductivity

For steady-state modeling, the recharge rate of 0.04 in/year measured by Stone (1987) for upland flats was assumed to be a reasonable estimate of recharge rate over the long term following reclamation. This recharge rate is more than five times the average pre-mine rate and reflects the improved surface and soil conditions resulting from mine reclamation. An even higher recharge rate of 0.10 in/year was used for mine spoils in the transient modeling until final reclamation, after which the long-term recharge rate of 0.10 in/year was used for no 0.10 in/year represents an average rate for the mine backfill in various stages of reclamation and is based on the average between Stone's estimate of 0.16 in/year for depressions during mine reclamation and the 0.4 in/year for final reclamation.

11.6.2.4.1 Water Level Drawdown and Recovery

The open mine pit acts as a drain for drawdown of any groundwater in the overburden/interburden, in the coal seams, and in the underlying PCS. Model simulations of the advance of proposed open pit mining in Area IV North have been performed to provide estimates of drawdown and recovery in the Fruitland coals and in the PCS during mining and reclamation.

These simulations were performed for the proposed annual mining block sequences as depicted in Figure 11-39.

The estimated 5 foot drawdown in the No. 8 coal seam in Year 2016 at the completion of proposed mining is provided in Figure 11-40. The corresponding 5 foot drawdown in the No. 3 coal in Year 2016 is provided in Figure 11-41. Based on the very limited extent of drawdown in the coal units, surface mining in Area IV North is not expected to result in a drawdown in water levels or depletion of water in the alluvium of Cottonwood Arroyo.

There will also be some depressurization of the PCS below the mine pit. Figure 11-42 shows the estimated 5 foot drawdown in the PCS in Year 2016 at the completion of proposed mining in Area IV North. The layer of shale separating the bottom of the lowest coal seam and the PCS serves to restrict groundwater inflow from the PCS during mining. The thickness of shale layer between the No. 2 coal and the PCS averages about 8.7 feet over the Area IV North mine block but is absent in some places. This variation in the shale thickness has been included in the groundwater model and the associated estimates of drawdown within the PCS. Artesian pressures in the PCS occur in the eastern portion of the Area IV North mine block where the shale thickness separating the coal from the PCS is greater. Likewise, the drawdown in the PCS is dampened, particularly in these locations where the shale thickness is greater.

The groundwater model was also applied to simulate the rate of recovery of water levels in mine backfill and the drawdown and recovery of potentiometric levels in the PCS and in the Fruitland coals adjacent to the mining block. The water level drawdown and recovery plots for point A4N Y3, located within the proposed Area IV North mine area, is shown on Figure 11-43. At this location the shale separating the coal from the PCS is projected to be 15.3 feet thick based on the geologic model.

The plot shows the large downward gradients that occur from the No. 8 coal seam to the PCS. With advance of mining to this location in Year 3, the drawdown level in the Fruitland coals is essentially the base of the mine pit at an elevation of about 5,203 feet. Drawdown in the underlying PCS at the same location is damped. Maximum drawdown is less than 17 feet,

occurring approximately 30 years following the start of mining. Upward gradients from the PCS to the mine backfill occur until about 85 years after the start of mining. After that time, the recovery in the backfill is sufficient that gradients are vertically downward from the backfill to the PCS.



Figure 11-40. Drawdown in the No. 8 Coal under Proposed Mining in Area IV North



Figure 11-41. Drawdown in the No. 3 Coal under Proposed Mining in Area IV North



Figure 11-42. Drawdown in the PCS under Proposed Mining in Area IV North


Figure 11-43. Drawdown and Recovery in the PCS and Backfill with Area IV North Mining

The transient model simulations show that it takes over 400 years for recovery of water levels to approach steady-state conditions in the PCS and in the mine backfill. It is possible that actual recovery rates may be slightly faster than the estimates shown in these figures if the recharge rates are higher than the estimates used for modeling. However, it is more likely that recovery rates will be slower than estimated as recharge rates for post-mining may be lower than estimated herein and closer to the pre-mine rates. As discussed previously, the recharge rates used to represent conditions for long-term reclamation were more than five times the average recharge rate for the mine area prior to mining and are believed to be upper-bound estimates based on the recharge measurements by Stone (1987).

The results in Figure 11-43 also show that final steady-state water level in the mine backfill is considerably lower than the pre-mine level of perched groundwater in the No. 8 coal. On the other hand, the final steady-state water level in the mine backfill is higher than the pre-mine potentiometric level in the No. 3 coal at this location. Likewise, the final steady-state water level

in the PCS is higher than the pre-mine potentiometric level in the PCS at this location. The heads in the mine spoil are much more uniform with depth, although the vertically downward head gradient between the mine backfill and the PCS is greater than the vertically downward head gradient between the No. 3 coal and the PCS prior to mining. The higher vertical downward gradients and the higher potentiometric levels mean that the vertical downward flows are higher under steady state conditions following mining. The increase in the rate of vertical flow into the PCS from the post-reclamation backfill in Area IV North occurs in response to the increase in the recharge rate that was applied to the reclaimed surface for post-reclamation conditions. As indicated in Table 11-14h, the average recharge rate of 0.04 in/year for post-reclamation conditions within the Area IV North Mine Area is more than five times the average pre-mine recharge rate of 0.0069 in/year estimated based on predominance of badland surfaces at the proposed mine area.

Figure 11-39 shows locations selected as prediction points for presenting water level drawdown and recovery results from modeling, including the A4N Y3 location that was previously discussed. The other two locations correspond with the locations of the now abandoned PCS wells, GM-19 and GM-28. The drawdown and recovery results for the GM-19 and GM-28 locations are provided in Figures 11-44 and 11-45, respectively. These results show very little change in the potentiometric level or head in the No. 8 coal seam, the No. 3 coal seam or in the PCS during and following mining at these locations within the permit area.

These results together with the 5-foot drawdown plots show that the hydrogeologic effects of proposed mining within Area IV North are localized and occur over a long time period. The long-term change resulting from the removal of the interbedded coal, shales, mudstones, and sandstone strata and replacement with a relatively homogeneous and isotropic mine backfill will be an increase in the rate of vertical flow into the PCS from the mine backfill compared with the vertical flow into the PCS from the Fruitland formation prior to mining.

The model simulated steady-state post mining potentiometric surface in the PCS is provided in Figure 11-46. This surface is similar to the pre-mining PCS potentiometric surface in Appendix 6-G Figure 6.G-1 except for the localized increase in the heads in the PCS below the mine

backfill within Area IV North. The higher head in the PCS below the mine backfill is due to the higher heads at the base of the mine backfill. Very little change in heads is predicted at locations away from mine backfill, including at the former PCS wells GM-19 and GM-28, located within the permit area at distances of about 3,500 and 3,000 feet from the Area IV North mine pit. This localized increase in heads in the PCS results in an increase in gradients toward the northwest and toward the northeast as depict in Figure 11-46.







Figure 11-45. Drawdown and Recovery in the PCS, the No. 3 Coal and the No. 8 Coal at GM-28

11.6.2.4.2 Potential Impacts to Alluvial Groundwater Flow

In both the pre-mining and post-reclamation groundwater flow models, there is a component of groundwater flow from Area IV North toward the alluvium within the topographic low along Cottonwood Arroyo. The increase in the post-reclamation recharge rate within the mine areas also increases the rate of the groundwater flow in the alluvium. The model estimates for the steady-state post-reclamation alluvial groundwater flow at the mouth of Cottonwood Arroyo is 4.58 gallons per minute (gpm) compared to the pre-mine alluvial groundwater flow estimate of 4.3 gpm.

However, the increase in flow is not expected to measurably change the potential well yield from the alluvium for several reasons. First, the estimated pre-mine steady state groundwater flow on the order of 4.3 gpm in the alluvium and underlying PCS was insufficient to sustain water supply at the two dug wells that were monitored for baseline conditions. Actual groundwater flows in the alluvium are variable in space and time and a modeled steady state flow of 4.3 gpm does not

translate into a reliable water supply of 4.3 gpm. Likewise, an increase in the steady state flow by 0.3 gpm does not imply that this increase would be available as a reliable water supply at alluvial wells. Finally, groundwater recovery to the post-mining steady state conditions with the slight increase in groundwater flow is estimated to take more than 400 years.

The road crossings of Cottonwood Arroyo are not expected to affect the groundwater in the Cottonwood alluvium. The alluvium in the North Fork of Cottonwood has been mined through in Area III. Thus, the groundwater in the alluvium of the North Fork Cottonwood has most likely been depleted immediately up gradient and down gradient of the mine. The loss of alluvial groundwater flow from the North Fork may result in a decrease in groundwater flow in the Cottonwood alluvium below the confluence with the North Fork. The alluvium along the main stem of Cottonwood will not be mined through and advance of the pit in Area IV North and drawdown in the coal units and the PCS are not expected to affect groundwater levels in the alluvium of Cottonwood Arroyo.



Figure 11-46. PCS Steady-State Post-Mining Potentiometric Surface

.

11.6.2.4.3 Potential Groundwater Quality Changes

Groundwater quality changes beyond the active mine area at Area IV North will be minimal during mining and reclamation operations. During active mining, hydraulic gradients, and groundwater flow directions in the Fruitland Formation and in the underlying PCS will be toward the mine pits and backfill areas. Thus, it is expected that there will be little change in the quality of groundwater beyond the limits of the mine pit and mine backfill during mining and reclamation operations.

The water quality in the mine backfill materials will evolve as these materials begin to resaturate with recharge from precipitation and groundwater inflows from the adjacent Fruitland Formation coal seams and from the underlying PCS. Upward flow into the mine backfill from the PCS will be relatively low and will cease once saturation levels in the backfill rise sufficiently to reverse directions of flow after about 85 years following the start of mining. Dissolved solids present in the pore water of mine overburden and interburden materials (spoil) that are used to backfill the pit may be concentrated by evaporation during mining. There may also be some enhanced weathering of the minerals within the newly fractured and broken interburden strata that are removed during mining of the coals and placed within the mine backfill. The characteristics of the overburden and interburden strata within Area IV North were determined from an extensive drilling, coring, and testing program described in Chapter 5.

It is expected that TDS and sulfate concentrations will increase in the Area IV North mine spoil relative to the baseline concentrations in the Fruitland Formation coals based on both spoil leaching tests results and the water quality analysis of spoil water samples taken from the Bitsui Pit as presented in Section 11.6.2.2. Concentrations of boron and manganese may also increase but other trace constituents are expected to remain below detection limits or comparable to the concentrations observed in the baseline coal water.

The TDS concentrations are lower in the Fruitland coals in the vicinity of Area IV North in comparison with the baseline TDS concentrations further north in the vicinity of Areas I and II. The groundwater leaching test results presented in Table 11-14b showed TDS concentrations of

11,000 and 12,000 mg/L in leachate generated from two spoil samples using composite coal groundwater samples from Area II wells KF84-18a and KF84-18b with a TDS concentration of 9,800 mg/L. A comparable TDS concentration of 11,850 mg/l was observed in spoil water in the Bitsui Pit at well Bitsui-5. This well is most representative of concentrations from spoil only in the Bitsui Pit because it is not located near or down gradient of any CCB placement locations.

The water sources for leaching of mine spoil in the Bitsui Pit in Area I include the No. 8 coal water with TDS concentrations ranging from 5,000 to 10,000 mg/L, seepage from the PCS and from adjacent NAPI irrigation plots with unknown TDS concentrations and some precipitation recharge with low TDS concentrations. The water sources for recharge of the Area IV North mine spoils include:

- inflows from the various coal units with average TDS concentrations of approximately 3,000 mg/l as found for the composite coal sample used in the leaching test results presented in Table 11-14f;
- precipitation recharge with TDS concentrations of approximately 1,200 mg/l based on the SPLP leaching test results presented in Table 11-14f; and
- upward flow from the PCS with average TDS concentrations in the range from 7,800 to 9,200 mg/l based on samples obtained from nearby PCS well GM-19 (Appendix 6-G Table 6.G-14).

Inflow from the PCS is estimated to be very low and temporary so that backfill recharge over the long-term is expected be primarily from the coals and from precipitation recharge. Since the TDS concentrations are lower in the coal water at Area IV North in comparison with the coals near the Bitsui Pit, the TDS concentrations in the spoil water in Area IV North should also be lower than the concentrations observed at the Bitsui spoils or in the Table 11-14b spoil leaching test results.

The spoil leaching test results presented in Table 11-14f using coal water representative of Area IV North may be viewed as a lower bound estimate for the TDS in spoil water in Area IV North. The TDS and sulfate concentrations in the spoil water at the Area IV North mine may be higher than these leaching test results due to calcite precipitation and ion exchange which results in

increased sulfate and sodium concentrations and decreased calcium concentrations in saturated mine spoils in comparison with leaching test results. While the TDS observed in the spoil well Bitsui-5 was within the limits of the TDS in Table 11-14b for the two spoil leaching tests performed using the composite coal groundwater, the sulfate concentrations in Bitsui-5 were about two times the concentrations observed in the spoil leaching tests. For this PHC analysis, the TDS concentrations in the Bitsui-5 well were used as an upper bound estimate for the postmine TDS concentrations in the mine spoils in Area IV North.

Table 11-14i provides a range of concentrations for constituents of concern that might be expected in Area IV North mine spoils based on leaching tests and water quality monitoring at spoil well Bitsui-5. These results show TDS and sulfate to be the primary constituents of concern with respect to spoil leachate. Arsenic and selenium were below detection in the spoil water sample and in most of the leaching test results. Fluoride is lower in the spoil water than in the coals and is attenuated in flow through mine spoil. Boron and manganese concentrations are elevated in mine spoil but concentrations are below criteria for livestock use.

Table 11-14i.

		Estimated Source Concentrations in Mine Spoils (mg/L)						
	Area IV			Spoil leached with	S-4 Spoil			
	North coal	Spoil Well		Area IV N coal	leached with			
Constituent	water	Bitsui #5	Spoil SPLP	water	coal water			
Arsenic	<0.015	<0.005	<0.015	<0.015	0.002			
Boron	0.31	1.12	0.084	0.45	<0.5			
Calcium	3.4	60	150	67	730			
Manganese	<0.01	0.108	0.19	0.11	0.70			
Fluoride	2.4	1.0	0.54	1.6	0.50			
Sodium	1200	3860	150	1200	3200			
Selenium	<0.026	<0.005	<0.026	<0.026	0.2			
Sulfate	300	5,115	670	980	2700			
TDS	3100	11,850	1200	3550	12000			

Estimated Source Concentrations in Mine Spoils

SPLP= Synthetic Precipitation Leaching Procedure

Consequently, TDS was selected for transport modeling simulations using a lower bound source concentration of 3,550 mg/l and an upper bound TDS concentration of 11,850 mg/l. TDS was assumed to behave conservatively, that is with no attenuation due to adsorption or chemical transformation. Sulfate was not modeled separately but was assumed to vary with TDS based on the sulfate-TDS ratio in the source. Based on the observations at the spoil well Bitsui-5, sulfate concentrations are expected to comprise about 41% of the TDS.

The FEFLOW[™] software used for groundwater flow modeling includes features that simulate both conservative and reactive transport. The FEFLOW[™] transport routines were applied to simulate the transport of TDS from the Area IV North mine spoil. The chemical transport model was applied to the steady-state post-reclamation groundwater flow conditions to provide predictions of long-term post-reclamation TDS transport from the mine spoil in Area IV North.

The transport model solves advection-dispersion-adsorption equations for constituent transport processes in groundwater flow. Two transport scenarios were performed. The first assumed that the TDS source concentration was 3,350 mg/l and remained constant throughout the 500-year

transport modeling period. The second scenario specified a TDS source concentration of 11,600 mg/l that remained constant throughout the 500-year transport modeling period. The 500-year transport simulation was performed using the post-mine steady-state groundwater flow conditions as the initial condition for transport modeling. A 500-year simulation period was considered reasonable for modeling the fate and transport from a constant TDS source concentration in the backfill. After 500 years it is expected that the source concentrations in the mine backfill will decline as groundwater flows through the mine backfill and flushes salts that may have been concentrated in the mine spoils as a result of weathering and evaporation during mining and backfilling operations.

Natural background concentrations were not included in the transport modeling because the objective of the transport modeling is to simulate the direction and rate of transport of TDS from the mine spoils. However, natural background concentrations have been considered in the subsequent interpretations drawn from the transport modeling results.

FEFLOW[™] transient modeling results are presented for the following selected model layers:

- L1 corresponding with the alluvium, with the upper 10 ft of soil and overburden in unmined areas and with the upper 10 ft of backfill and topdressing materials in reclaimed areas;
- L4 corresponding with the No. 8 coal seam in unmined areas and the same elevation as the No. 8 coal in the mine backfill;
- L20 corresponding with the No. 3 coal seam in unmined areas and same elevation as the No. 3 coal seam in the mine backfill areas;
- L28 corresponding with the PCS throughout the model domain.

The simulation results at the end of the 500-year simulation period for L1, assuming that the constituent source concentrations remained constant throughout the 500-year transport modeling period are presented for the upper and lower bound TDS source concentrations in Figures 11-47 and 11-48, respectively. The results for the upper bound TDS source concentration of 11,600 mg/l show that concentrations greater than 5,000 mg/l do not extend very far from the mine spoil. The primary horizontal direction of TDS migration from the mine spoil in L1 is toward

the alluvium and topographic lows along Cottonwood Arroyo. Elevated TDS concentrations extend down gradient within the alluvium of Cottonwood Arroyo but are less than 1,000 mg/l near the mouth of Cottonwood.

The L28 simulation results for TDS transport in the PCS are presented in Figures 11-49 and 11-50, respectively, for the upper and lower bound TDS source concentrations. These results show that the primary direction for TDS transport from the mine spoils is vertically into the PCS. Thus, the primary direction for spoilwater migration is into a water-bearing zone that has TDS concentrations similar to, if not higher than, the TDS levels expected for spoil water. The results for the upper bound TDS source concentrations show that the TDS concentrations in the PCS directly below the mine spoils are generally within the range from 5,000 to 10,000 mg/L. The higher TDS concentrations occur where the shale separating the backfill from the PCS is the thinnest or absent. Groundwater flow and TDS transport in the PCS in the vicinity of the Area IV North mine is predominantly laterally toward the alluvium and topographic low along Cottonwood Arroyo. TDS transport in the PCS to the north and east is limited as shown in these figures.

The simulation results at the end of the 500 year simulation period for the No. 8 coal (L4) are presented in Figures 11-51 and 11-52, respectively, for the upper and lower bound TDS source concentrations. Likewise, the No. 3 coal (L20) results at the end of the 500 year simulation period for the upper and lower bound TDS source concentrations are presented in Figures 11-53 and 11-54, respectively. These results show groundwater flow and TDS transport from the mine spoil to the north toward the Fruitland Formation outcrop along Cottonwood Arroyo. Lateral transport to the northeast in the No. 8 coal is restricted due to the lower heads in the mine backfill relative to the heads in the No. 8 coal prior to mining. Lateral transport in the No. 3 coal is restricted due to the lower permeability of the No. 3 coal relative to the No. 8 coal.



Figure 11-47. TDS Transport in the L1 after 500-years with Constant Source of 11,850 mg/l



Figure 11-48. TDS Transport in the L1 after 500-years with Constant Source of 3,550 mg/l



Figure 11-49. TDS Transport in the PCS after 500-years with Constant Source of 11,850 mg/l



Figure 11-50. TDS Transport in the PCS after 500-years with Constant Source of 3,550 mg/l



Figure 11-51. TDS Transport in the No. 8 Coal after 500-years with Constant Source of 11,850 mg/l



Figure 11-52. TDS Transport in the No. 8 Coal after 500-years with Constant Source of 3,550 mg/l



Figure 11-53. TDS Transport in the No. 3 Coal after 500-years with Constant Source of 11,850 mg/l



Figure 11-54. TDS Transport in the No. 3 Coal after 500-years with Constant Source of 3,550 mg/l

The transport modeling simulations show that lateral migration of groundwater flow and constituents from the mine spoil within Area IV North is largely toward the alluvium and the topographic lows along Cottonwood Arroyo. However, there is also a large vertical component of flow and constituent migration from the mine spoils to the PCS, where the baseline TDS concentrations may be similar to or higher than the TDS concentrations in mine spoil.

The steady-state pre-mine calibrated model and the steady-state post-reclamation model were used to provide estimates of groundwater flow in the alluvium at the mouth of Cottonwood Arroyo, where the Cottonwood alluvium meets the Chaco River alluvium. Table 11-14j provides the model predictions of pre-mine and post-reclamation steady-state groundwater flow in the alluvium at the mouth of Cottonwood Arroyo. The increase in the steady state groundwater flow under post-reclamation conditions occurs as the result of the higher recharge rate estimated for post-reclamation conditions. Table 11-14j also provides the modeled TDS concentrations in the alluvium at the mouth of Cottonwood Arroyo after 500 years. The TDS results are shown for both the upper bound and lower bound TDS source concentrations in the mine spoil.

	Post-mine model	Pre-mine model
	flow	flow
Flow ft ³ /day	882	827
	Post-mine	
TDS upper bound (mg/L)	300-y1 Kesuits	
TDS lower bound (mg/L)	338	

Table 11-14j. Modeled Result for Alluvium at Mouth of Cottonwood

It should also be noted that the modeled post-reclamation TDS concentrations do not include any contribution of TDS to the alluvial and PCS groundwater from outside the mine area. Transport modeling was performed to assess the fate of mine spoil water. It is apparent that spoil water from Area IV North will disperse laterally and vertically but that a major component of flow and transport will be toward the alluvium within the topographic low along valley of Cottonwood Arroyo, where it will mix with groundwater flow in the Cottonwood alluvium. Transport

modeling has also demonstrated the large vertical component of groundwater flow and constituents from the mine backfill flow vertically to the PCS, where it will mix with groundwater in the PCS and disperse with components of flow laterally toward the topographic low along the outcrop, laterally toward the northeast in the direction of regional groundwater flow, and vertically into the Lewis Shale.

Mixing calculations were performed using post-reclamation modeled concentrations together with actual background concentrations to arrive at better estimates of the post-reclamation groundwater concentrations in the alluvium at the mouth of Cottonwood Arroyo. The estimates in Table 11-14k of the post-reclamation concentrations in the alluvium at the mouth of Cottonwood Arroyo were obtained by adding the estimated pre-mine constituent mass flux in the Cottonwood alluvium to the model-predicted post-reclamation constituent mass flux in the alluvium at the mouth of Cottonwood Arroyo, and dividing by the predicted post-reclamation groundwater flow in the alluvium at the mouth of Cottonwood Arroyo. These mixing calculations are expected to slightly overestimate the post-mine concentrations because the baseline mass flux includes the pre-mine mass flux contribution from all areas including the mine area. Thus, the calculated post-mine TDS concentration in the Cottonwood alluvium includes both the TDS contribution from the mine area.

The median TDS concentration of 3,015 mg/L obtained from baseline monitoring of Cottonwood alluvial well QACW-2B located in the Cottonwood alluvium west and down gradient of the Permit Area was used to estimate the pre-mine constituent mass flux in the Cottonwood alluvium. The Table 11-14j estimates of post-mine TDS concentrations in the alluvium at the mouth of Cottonwood Arroyo were used to estimate the constituent mass flux in the alluvium at the mouth of Cottonwood Arroyo associated from the Area IV North mine spoil for both upper and lower bound mine spoil source concentrations.

Comparisons of the estimated post-reclamation concentrations in the alluvium at the mouth of Cottonwood with the baseline estimates in Table 11-14k show that the estimated increase in TDS concentrations in alluvium at the mouth of Cottonwood ranges from 150 mg/l to 672 mg/l, for

the lower and upper bound limits, respectively, of the estimated TDS concentrations in mine spoil.

	Flow (ft ³ /day)	TDS (mg/L)	mass flux (kg/day)
Pre mine estimates	827	3015	70.61
Mine contribution (lower bound TDS)	882	338	8.44
Mine contribution (upper bound TDS)	882	860	21.48
Estimated Cottonwood Alluvium (lower bound)	882	3165	79.05
Estimated Cottonwood Alluvium (upper bound)	882	3687	92.08

Table 11-14k. Estimated Post-Reclamation TDS in Cottonwood Alluvium

Based on these results, the long-term post-reclamation TDS concentrations in the groundwater in the alluvium of Cottonwood Arroyo may be expected to increase down gradient of the mine area. Worst-case estimates based on upper bound source concentrations indicated TDS concentration increases on the order of 22%. An increase in TDS concentrations of the magnitude predicted by this PHC assessment is not expected to materially impact the suitability of the alluvial groundwater for livestock use. Furthermore, alluvial groundwater flows in Cottonwood are extremely low and vary with space and time. Baseline monitoring of the dug wells in the Cottonwood alluvium demonstrates groundwater in the alluvium is an unreliable supply, which limits its potential for livestock use.

In summary, the mine spoils are expected to have higher concentrations of TDS and sulfate than the pre-mine Fruitland Formation coals. Concentrations of boron and manganese may also increase in the spoils but are unlikely to exceed livestock use criteria. Upper- and lower-bound estimates from mixing calculations found TDS concentrations in the Cottonwood alluvium are likely to increase over the long-term but not sufficiently to materially impact the suitability of alluvial groundwater for livestock use.

11.6.2.5 Assessment of Impact on Adjacent Groundwater Users

Wells located on or near the permit area are shown on Figure 11-25. No use is made of BNCC's wells located on or near the permit except for taking water measurements. Other wells which could potentially be impacted by mining are located to the west, east, and north of the permit area. Wells located to the south of the Permit Area cannot be impacted as the groundwater flow directions in the Fruitland Formation and the PCS are toward the northeast with localized flow toward the west near the mouth of the Cottonwood Arroyo.



Wells are evaluated on a case by case basis to assess whether the quantity or quality of the water supply to the well could potentially be affected. Numbers 70, 93, and 91 (Figure 11-25) of Township 26N, Range 16W are non-BNCC wells located south and east of the permit boundary. All three are alluvial, hand dug wells. They will not be affected as their source of water is derived from a formation geologically above those potentially impacted by mining (i.e., Fruitland Formation and PCS).

Numbers 38 and 44 PCS water wells located nearly six miles east of Area III in Township 27N, Range 15W. These wells will not be affected by mining due to the distance from the mine. Well No. 38 was shown to have a total depth of 1,505 feet and completed in both the PCS and the Cliff House Sandstone. The depth of water in the well was listed at 470 feet below ground surface (bgs) and the water quality was poor with a TDS of 18,300 mg/l, a specific conductance of 28,900 uS/cm, and a chloride concentration of 11,000 mg/l. Nearby, Well No. 44 is shown to be completed in the PCS at a total depth of 804 feet. The depth of water was listed at 475 feet bgs and the quality was poor with a specific conductance of 25,600 uS/cm and a chloride concentration of 9,160 mg/l. The yield of this well was reported at 2-3 gpm. Poor water quality in the PCS has caused No. 38 to be abandoned and No. 44 to be classified unfit for human consumption. Well No. 46 is a hand dug alluvial well located in Township 27N, Range 15W. The alluvium at this location is up gradient of mining and therefore cannot be impacted. Well No. 51 and 41 (Township 28N, Range 15W), are several miles east of the permit boundary, and both have been abandoned.

Well No. 149, shown in the southeast corner of Township 29N, Range 15W, was listed as Fruitland well PNM GT-2 installed by Public Service Company of New Mexico. This well appears to have been mapped at the wrong location as Fruitland Well PNM GT-2 is an underground coal gasification test well that was installed by Public Service Company of New Mexico at a location north of the San Juan River and east of the San Juan Mine.

Between the mining area and the San Juan River in Township 29N, Range 15W, there exist only three non-BNCC wells with associated beneficial uses (Well No. 54, 56, and 146). Wells north of the San Juan River are not considered, as the San Juan River acts as an aquifer discharge point

in this vicinity (Chapter 6). Well No. 146 is an alluvial well, approximately 28 feet deep. Ownership and usage is unknown, but the well appears to be attached to a windmill. The quality and quantity of the groundwater in the San Juan River alluvium that supplies water for this well will not be affected by mining at Navajo Mine as demonstrated in 11.6.2.3.1. Well No. 54 and 56 are springs owned by the Navajo Nation. It is unknown whether the springs are currently flowing. Spring No. 56 was reported to be issuing from the PCS at a location adjacent to the San Juan River alluvium. The TDS was reported at 624 mg/l which is acceptable for livestock use but exceeds the USEPA Drinking Water Criteria. This spring is located to the north and downgradient of Morgan Lake. This spring is located more than 2 miles northeast of BNCC's Navajo Mine North Facilities Area. It is unlikely that this spring could be affected by mining because Morgan Lake, which is the likely source of water for this spring, lies between the North Facilities Area and the spring. Spring No. 54 issues from a terrace. The TDS was reported at 703 mg/l which is acceptable for livestock use but exceeds the EPA Drinking Water Criteria. This spring does not appear to derive its water source from the Fruitland Formation because TDS concentrations are more than one order of magnitude lower than the TDS concentrations observed in Fruitland Formation wells located within several miles of this spring. Uses reported for both springs include domestic, stock, and/or irrigation.

QACW-2B completed in the alluvium of Cottonwood Arroyo west of the permit area is a dug well that has been used for stock water supply and is not owned by BNCC. This well is shown on Exhibit 11-163 and appears to correspond with BIA well No. 13-R-28A in the permit file at the Navajo Nation, Water Resource Management office in Fort Defiance, Arizona. The TDS and sulfate concentrations in the alluvium of Cottonwood Arroyo down gradient of mining are expected to increase by about 22% over a 500 year period following proposed mining within Area IV North. The increase in TDS in this well could be greater than estimated due to influences from Area III mining that were not included in the transport model. However, the quantity of water in the Cottonwood alluvium is limited and this well and several water monitoring wells in the alluvium are often dry.

Thus, within the permit area and adjacent area the only water supply wells or springs could be potentially affected by previous or proposed mining at Navajo Mine is well QACW–2B completed in the alluvium of Cottonwood Arroyo west of the permit area.

BNCC has water rights on the San Juan River, New Mexico Office of State Engineer Permit 2838, which can be used to offset any adverse impacts to the State of New Mexico and present users. These rights will be maintained throughout the mining operation and a period thereafter, for retirement, if required to any affected San Juan Basin water users. For temporary impacts to surface water users, BNCC may provide water to local permitees in tanks for livestock use in areas around the lease. Permanent impacts to surface water users may be mitigated by the construction of impoundments incorporated into the post-mining landscape (Chapter 12 Sections 12.11 Hydrologic Reclamation Plan and 12.3.4.1 Permanent Impoundments).

Minimization of impacts to the hydrologic balance are focused on reducing the disturbance footprint to the extent practical, limiting the amount of upgradient water commingled with disturbed area drainage, utilizing BMPs to limit migration of sediment during storm events, and containment or treatment of flows downgradient of the mine site. Hydrologic water management is integrated into mine planning. Stream buffer zones have been demarcated to limit disturbance in channel reaches unaffected by mining. Temporary diversions have been constructed to route upgradient flows around active mining pits into downgradient natural channels, when possible. In other situations, upgradient impoundments have been established to contain upstream water runoff.

There will be periods when precipitation runoff from the drainages that normally flowed across the areas intersected by mining will not make it to the Chaco River during operations, but will either be intercepted by the mine pit or captured in temporary pit protection ponds (highwall impoundments) located up gradient of mining. Precipitation runoff collected in the pit or in the pit protection ponds may be utilized for dust suppression, other mine needs, or will naturally diminish from evaporation, and seepage. Once reclamation is completed within the mining area, precipitation runoff from these reclaimed areas will flow through channels in the reconstructed topography and then to the Chaco River. Precipitation runoff from reclaimed areas may be reduced somewhat from pre-mine levels due to any of the following factors: lower slopes, enhanced vegetative growth, engineered traditional or geomorphic drainage designs, and the use of sediment-control BMPs that operate to retain water in the reclaimed areas reducing storm-water runoff to the channels.

There is a direct relationship between the maximum peak flows and total runoff volume and sediment yield; the management of water flow through the site during operations is designed to reduce peak sediment concentrations through the use of storm water management plans and the containment of sediment associated with storm flows. Post-reclamation water management is focused towards establishment of a stable post-mine topography enhanced by vegetative stabilization which will decrease storm water runoff and sediment yield. The post-mine topography is designed to replicate the approximate original contour.

The probable hydrologic consequences analysis was developed with the support of site-specific data and modeling. Surface water and sediment modeling was performed using SEDCAD to model peak flows, yield and sediment concentrations. Key assumptions on soil and cover were derived from soil and vegetation mapping at the site (Tables 11-15, 11-16, 11-16A, 11-16B, 11-16C, and 11-16D).

11.6.3.1 Stream Buffer Zone Protection

Six major tributaries to the Chaco River have been identified within the Navajo Mine permit area and are discussed in Chapter 7 Section 7.2, and shown on Exhibits 7-3, 7-4, and 7-4C. The six drainages are: Chinde Arroyo, Hosteen Wash, Barber Wash, Neck Arroyo, Lowe Arroyo, and Cottonwood Arroyo. Mining or support activities are projected to occur in all the listed drainages. Mining will not occur in the Neck Arroyo, however, transportation roads and facilities are present.

Diversions are employed to route water around the mining area to minimize impacts to the hydrologic balance. North, in Area I, the Doby North and Dodge diversions route water away from the pit. Further south in Area II, the Chinde and Hosteen diversions are employed. Area III diversions include the North Fork of Cottonwood Arroyo (Section 11.5.5.3).

Those areas identified as stream buffer zones (Exhibits 11-9 through 11-11) outside the approved mining disturbance (see Chapter 12, Exhibits 12-1, 12-2, and 12-3 for scheduled mining disturbance) will not be disturbed by surface mining activities (30 CFR 816.57(b)) and will be marked as described in Section 11.1.1. The remaining drainages will not be marked since none of the sub-watersheds within the identified drainages meet the definition of buffer zone stream.

11.6.3.2 <u>Water Quality Effects during Operations</u>

Potential surface water quality changes that could occur during mining and reclamation operations include the generation of additional sediment. BMPs at the site include the use of perimeter berms and containment features. Topdressing and regolith stockpiles are protected by berms to minimize migration of solids into undisturbed areas. Typical berm cross-sections are shown in Figure 11-9. The coal stockpiles will be partially enclosed and surrounded by containment berms to minimize migration of coal fines (Figure 11-7), and divert surface runoff into either directly into a sediment pond or into a ditch or channel that leads to a sediment pond. In areas subject to containment berms, such as topdressing stockpiles, berms will be able to contain the runoff from a 10-year 6-hour (10-yr 6-hr) storm. See Section 11.5.4.5 for further discussion on containment berms.

When runoff does occur, the newly exposed overburden, interburden, and coals and mine spoils may result in increases in TDS, sulfate, iron, and manganese in surface runoff from these disturbed areas. The analyses of overburden and interburden materials presented in Tables 5-2, Tables 11-14, 11-14b, 11-14c, and Appendix 11-K show that these materials are not acid forming. The water quality of newly exposed strata and mine spoils is best characterized by the SPLP test results for Navajo Mine spoils Table 11-14f. The spoil leachate results presented in Table 11-14f describe TDS and sulfate concentrations of 1,200 mg/l and 670 mg/l, respectively.

These concentrations are above the median concentrations observed in surface water baseline samples but are well below the highest concentrations observed in the baseline surface water quality samples (Table 7-7). Surface runoff from disturbed areas will be retained by BMPs and is unlikely to reach the downgradient tributaries to Chaco or the Chaco River itself except during extreme precipitation events that exceed the design requirements of the structures. Trace constituents in SPLP spoil leachate are below detection limits except for fluoride, boron, and barium. These parameters are well below their corresponding Navajo Nation livestock and wildlife use criteria (NNEPA WQP, 2008). Manganese was also detected, but has no livestock and wildlife use criterion (Table 11-14f).

There is the potential for increases in salinity in water that might be flushed from sediment ponds and containment berms during large storm events that produce spillway overflows. However, any increased salinity in water from ponds or berms is unlikely to produce a measurable change in the salinity of flows in tributaries to the Chaco River due to dilution from high flows in the drainages during the storm events.

Motor fuel storage and equipment maintenance will be provided at the industrial facilities areas shown on Exhibits 11-9 through 11-11. Nevertheless, equipment repair may on occasion, need to be performed within the active mining or reclamation areas. BNCC maintains and implements a Spill Prevention, Control, and Countermeasure (SPCC) plan that identifies areas of risk, specifies appropriate controls for bulk storage areas, identifies control strategies for managing a spill, should it occur, and lists procedures for safely disposing of any contaminated materials. Appendix 11-HH includes hydrologic data for the landfarm used to treat materials contaminated with petroleum hydrocarbons.

Federal and state or tribal water quality standards will be met during surface coal mining and reclamation operations at the applicable compliance point, whether that is the furthest down gradient sediment pond or the permit boundary. This is achieved through the use of perimeter berms and sediment ponds to contain or treat runoff within the permit area. The Navajo Nation Environmental Protection Agency (NNEPA) has identified four uses of drainages within the

permit area, including livestock and wildlife watering, aquatic habitat, fish consumption and secondary human contact (NNEPA WQP, 2008).

In conclusion, the water and sediment control measures, as outlined in Section 11.5.4, not only prevent additional contributions of sediment but also serve to contain mine water that may have higher concentrations of TDS and sulfate than in the baseline flow in the tributaries to Chaco or in the Chaco River. Thus, these measures also serve to minimize potential changes in water quality of receiving streams outside the permit area.

11.6.3.3 Runoff and Erosion during Mining and Reclamation Operations

Mining and reclamation operations are designed to minimize impacts to undisturbed upland flows through the mining operation and to contain or treat all sediment-laden waters that have interacted with disturbed area runoff. BNCC has engineered the mine plan and supporting facilities to limit effects to the hydrologic balance and surface water quality. Additionally, upland flows are routed around mining pits through diversions or impounded in highwall impoundments. Typically these features are located east or south of the mining area.

Diversions associated with Area I include Doby North and Dodge. Further south in Area II are the Chinde and Hosteen diversions. Area III diversions include the North Fork of Cottonwood (Exhibits 11-13E).

Appendix 11-N provides conceptual engineering design data. Designs for the Chinde Diversion crossing are found in Appendix 11-JJ. Engineering designs for the North Fork Cottonwood Diversion are found in Exhibits 11-74, -74A through 74E. The diversion designs are described in Appendix 11-QQ.

Highwall impoundments have also been designed and constructed to prevent water from entering active mining pits. Locations are shown on Exhibits 11-13B through 11-13E. Appendix 11-II includes pre-approved designs as highwall impoundments that do not require approval prior to construction. As-built information is submitted and retained in Appendix 11-II. Highwall

impoundment design includes a hazard assessment to ensure the safety of the miners and structures within the pit (Table 11-7). Impoundments are designed to contain the 2-yr 6-hr storm at a minimum, and the 100-yr 6-hr storm whenever possible. It should be noted that water from highwall impoundments will never leave the permit area, as discharged water will be intercepted by the pits. A number of upland ponds protecting the various mine areas are included in Table 11-7.

The PHC analysis includes a characterization and evaluation of reclaimed channels and surface topography. The post-mining topography has been engineered to be stable over time, through the reclamation and establishment of a final surface configuration which includes drainages. From a hydrologic perspective, the post-mining topography is evaluated on the basis of adequate drainage density.

Drainage density is an integrated measure of drainage basin morphology. Drainage density is the length of stream channels per unit area within a drainage basin. The restoration of post-mine drainage networks within the range of pre-mine drainage densities and configurations or regional norms will ensure that pre-mine conditions are achieved.

Drainage densities are calculated by measuring the total stream length in miles and dividing that length by the drainage area in square miles. Pre-mining and post-mining stream lengths were measured for the total drainage area of each stream as well as the area within the lease boundary only. U.S.G.S. 7.5 minute quadrangles were used to determine the pre-mining drainage densities. Post-mining drainage densities were determined from the 1:6000 scale final surface configuration topography maps provided in Chapter 12.

Peak flow, runoff volume, sediment yield, and peak sediment concentrations were predicted for both pre- and post-mine drainages for Chinde Arroyo, Hosteen Wash, Barber Wash, South Barber Drainage, Neck Arroyo, Lowe Arroyo, and Cottonwood Arroyo and the tributaries to the Chaco River that are projected to be disturbed. These estimates were developed using the SEDCAD modeling technique as described in Chapter 7. Pre-mine and undisturbed runoff curve numbers were developed from the soil cover complexes within each drainage. For areas disturbed by mining, an analysis of the available topdressing types and quantities was made to determine an appropriate curve number (Tables 11-15 and 11-16 through 11-16d). This analysis indicated that, as a whole, the available topdressing material has a curve number close to that of the Shiprock Soil Complex "Sk" in Tables 11-15 and 11-16 through 11-16d. The curve number of reclaimed areas was based on this soil type.

The Chinde Arroyo and Cottonwood Arroyo are also impacted by the activities of the NAPI located hydraulically up gradient from the mine. These impacts include direct discharges of water from irrigation canals and indirect discharges from irrigation return flows. The impacts are similar to both streams with the exception that the Chinde is a perennial stream.

TABLE 11-15 TOPDRESSING TYPES AND QUANTITIES $_{\rm (1)}$

			Soil volume (cubic yards)						
Soil Maping		Percent of						Title of SCS Soil	Hydrologic
Unit Symbol	Soil Mapping Units	Map Unit ₍₃₎	Area I	Area II	Area III	Area IV North	Total	Survey (4)	Group
Ва	Badland	-	0	0	0	0	0		
Bb (2)	Bacobi and	39	37,061	20,523	201,579	342,305	601,468	1	С
	Monierco soils	61	57,967	32,101	315,290	535,401	940,759	2	D
Bc	Blancot	-	0	0	664,484	0	664,484	2	В
Bh	Blancot, very hard	-	0	0	307,680	0	307,680	2	В
Fa	Faro and Persayo Soils	-	8,024	83,158	0	161,922	253,104	2	D/D
Gr	Grieta	-	0	0	0	69,104	69,104	3	В
Jc	Jocity -Gilco	-	503,634	183,596	481,270	1,525,313	2,693,813	3	B/B
Jh	Jocity, very hard	-	0	0	103,722	46,339	150,061	3	В
Ma	Mack	-	0	0	1,433,038	176,992	1,610,030	5	С
Mn	Mayqueen	-	295,981	55,176	0	23,851	375,008	2	В
Ms	Mayqueen -Shiprock	-	421,971	341,951	614,672	333,565	1,712,159	2	В
Mv	Mayqueen -Shiprock, very hard	-	85,805	0	61,024	0	146,829	2	В
Na	Nakai	-	0	0	0	53,010	53,010	4	В
Nt	Natrargids	-	0	6,628	0	0	6,628	2	D
Nv	Natrargids, overblown	-	2,159	82,861	97,028	218,490	400,538	2	D
Ra	Razito	-	599,753	521,804	458,595	311,260	1,891,412	5	А
Rh	Razito. very hard	-	73,893	0	21,089	196,707	291,689	5	А
RI	Redlands Variant	-	19,683	33,505	945,193	331,678	1,330,059	5	В
Rv	Redlands Variant, very hard	-	0	0	105,452	61,901	167,353	5	В
Sc	Shiprock	-	192,636	540,865	868,130	160,006	1,761,637	2	В
Sh	Shiprock, very hard	-	22,430	21,812	67,523	143,239	255,004	2	В
SI	Shiprock -Blancot	-	278,724	0	23,813	0	302,537	2	B/B
Sv	Shiprock Variant	-	0	0	416,510	70,420	486,930	2	В
Sz	Stumble	-	0	0	15,596	105,082	120,678	2	А
Та	Trail	-	0	23,210	0	0	23,210	5	А
Th	Trail. very hard		0	16,144	0	4,538	20,682	5	А
TOTAL:			2,599,721	1,963,334	7,201,688	4,871,123	16,635,866		

 $_{\rm (1)}$ This information was generated from Chapter 8 Soil Resources, Approved PAP for Navajo Mine.

(2) Undifferentiated groups and complex SOil mapping units were delineated if the major components had contrasting hydrologic groups. (3) Percentages of each major mapping unit component were derived from Chapter 8.5.2 Soil Mapping Unit Descriptions, Approved PAP for Navajo Mine.

(4) 1 = Soil Survey Coconino County, Arizona; 2= Soil Survey San Juan County, New Mexico, Eastern Part; 3= Soil Survey Sandoval County, New Mexico; 4= Soil Survey San Juan County, Utah; 5= Soil Survey Shiprock Area, Parts Of San Juan County, New Mexico and Apache County, Arizona.

TABLE 11-16

LAND TYPES AND CURVE NUMBERS

Land Use/Condition (1)	Curve Numbers for Hydrologic Groups (5)				
	А	В	С	D	
Reclaimed Lands (2)	65	78	86	91	
Undisturbed Lands (3)	65	78	86	91	
NAPI Caltivated lands (4)	67	78	85	89	

- (1) Land use/conditions and the associated curve numbers were taken from Ms. Pamela J. Schwab and Dr. Richard Warner (1987), "SEOCAO+ User's Manual", Civil Software Design, Table 5.3, pages 110-112.
- (2) (2) From reference (1) the land use/condition for reclaimed lands is between "Herbaceous" and "Desert Shrub", each with poor hydrologic condition. The curve numbers were determined by interpolating between the curve numbers associated with the two land use/conditions.
- (3) (3) The type of land use/condition for undisturbed areas will be identical to reclaimed lands (same curve numbers).
- (4) (4) The type of land use/conditions selected form reference (1) is "Row crops, Straight row" with good hydrologic conditions.
- (5) (5) The hydrologic group classification for the soil types will be obtained from the NRCS soil surveys.
TABLE 11-16A

TOPDRESSING TYPE, QUANTITIES, AND CURVE NUMBERS FOR AREA I

Soil Mapping		Volume	Percent	Hydrologic	Curve	Weighted
Unit Symbol	Soil Mapping Unit	(cu yds)	(%)	Group ⁽²⁾	Number ⁽³⁾	Value
Bb (1)	Bacobi and	37,061	1.43%	С	86	1.23
-	Monierco soils	57,967	2.23%	D	91	2.03
Вс	Blancot	0	0.00%	В	78	0.00
Bh	Blancot, very hard	0	0.00%	В	78	0.00
Fa	Faro and Persayo Soils	8,024	0.31%	D/D	91	0.28
Gr	Grieta	0	0.00%	В	78	0.00
JC	Jocity -Gilco	503,634	19.37%	B/B	78	15.11
Jh	Jocity, very hard	0	0.00%	В	78	0.00
Ma	Mack	0	0.00%	С	86	0.00
Mn	Mayqueen	295,981	11.39%	В	78	8.88
Ms	Mayqueen -Shiprock	421,971	16.23%	В	78	12.66
Mv	Mayqueen -Shiprock, very hard	85,805	3.30%	В	78	2.57
Na	Nakai	0	0.00%	В	78	0.00
Nt	Natrargids	0	0.00%	D	91	0.00
Nv	Natrargids, overblown	2,159	0.08%	D	91	0.08
Ra	Razito	599,753	23.07%	А	65	15.00
Rh	Razito. very hard	73,893	2.84%	А	65	1.85
RI	Redlands Variant	19,683	0.76%	В	78	0.59
Rv	Redlands Variant, very hard	0	0.00%	В	78	0.00
Sc	Shiprock	192,636	7.41%	В	78	5.78
Sh	Shiprock, very hard	22,430	0.86%	В	78	0.67
SI	Shiprock -Blancot	278,724	10.72%	B/B	78	8.36
Sv	Shiprock Variant	0	0.00%	В	78	0.00
Sz	Stumble	0	0.00%	А	65	0.00
Та	Trail	0	0.00%	А	65	0.00
Th	Trail. very hard	0	0.00%	A	65	0.00
Totals		2,599,721	100.00%			75.09

(1) Undifferentiated groups and complex soil mapping units were delineated if the major components had contrasting hydrologic groups.

(2) Hydrologic groups were taken from SCS soil surveys, see Table 11-15 for the respective location and title of each survey .

TABLE 11-16B

TOPDRESSING TYPE, QUANTITIES, AND CURVE NUMBERS FOR AREA II

Soil Mapping		Volume	Percent	Hydrologic	Curve	Weighted
Unit Symbol	Soil Mapping Unit	(cu yds)	(%)	Group ⁽²⁾	Number ⁽³⁾	Value
Bb (1)	Bacobi and	20,523	1.05%	С	86	0.90
-	Monierco soils	32,101	1.64%	D	91	1.49
Вс	Blancot	0	0.00%	В	78	0.00
Bh	Blancot, very hard	0	0.00%	В	78	0.00
Fa	Faro and Persayo Soils	83,158	4.24%	D/D	91	3.85
Gr	Grieta	0	0.00%	В	78	0.00
JC	Jocity -Gilco	183,596	9.35%	B/B	78	7.29
Jh	Jocity, very hard	0	0.00%	В	78	0.00
Ma	Mack	0	0.00%	С	86	0.00
Mn	Mayqueen	55,176	2.81%	В	78	2.19
Ms	Mayqueen -Shiprock	341,951	17.42%	В	78	13.59
Mv	Mayqueen -Shiprock, very hard	0	0.00%	В	78	0.00
Na	Nakai	0	0.00%	В	78	0.00
Nt	Natrargids	6,628	0.34%	D	91	0.31
Nv	Natrargids, overblown	82,861	4.22%	D	91	3.84
Ra	Razito	521,804	26.58%	А	65	17.28
Rh	Razito. very hard	0	0.00%	А	65	0.00
RI	Redlands Variant	33,505	1.71%	В	78	1.33
Rv	Redlands Variant, very hard	0	0.00%	В	78	0.00
Sc	Shiprock	540,865	27.55%	В	78	21.49
Sh	Shiprock, very hard	21,812	1.11%	В	78	0.87
SI	Shiprock -Blancot	0	0.00%	B/B	78	0.00
Sv	Shiprock Variant	0	0.00%	В	78	0.00
Sz	Stumble	0	0.00%	А	65	0.00
Та	Trail	23,210	1.18%	A	65	0.77
Th	Trail. very hard	16,144	0.82%	A	65	0.53
Totals		1,963,334	100.00%			75.72

(1) Undifferentiated groups and complex soil mapping units were delineated if the major components had contrasting hydrologic groups.

(2) Hydrologic groups were taken from SCS soil surveys, see Table 11-15 for the respective location and title of each survey .

TABLE 11-16C

TOPDRESSING TYPE, QUANTITIES, AND CURVE NUMBERS FOR AREA III

Soil Mapping		Volume	Percent	Hydrologic	Curve	Weighted
Unit Symbol	Soil Mapping Unit	(cu yds)	(%)	Group ⁽²⁾	Number ⁽³⁾	Value
Bb (1)	Bacobi and	201,579	2.80%	С	86	2.41
-	Monierco soils	315,290	4.38%	D	91	3.98
Вс	Blancot	664,484	9.23%	В	78	7.20
Bh	Blancot, very hard	307,680	4.27%	В	78	3.33
Fa	Faro and Persayo Soils	0	0.00%	D/D	91	0.00
Gr	Grieta	0	0.00%	В	78	0.00
JC	Jocity -Gilco	481,270	6.68%	B/B	78	5.21
Jh	Jocity, very hard	103,722	1.44%	В	78	1.12
Ma	Mack	1,433,038	19.90%	С	86	17.11
Mn	Mayqueen	0	0.00%	В	78	0.00
Ms	Mayqueen -Shiprock	614,672	8.54%	В	78	6.66
Mv	Mayqueen -Shiprock, very hard	61,024	0.85%	В	78	0.66
Na	Nakai	0	0.00%	В	78	0.00
Nt	Natrargids	0	0.00%	D	91	0.00
Nv	Natrargids, overblown	97,028	1.35%	D	91	1.23
Ra	Razito	458,595	6.37%	А	65	4.14
Rh	Razito. very hard	21,089	0.29%	А	65	0.19
RI	Redlands Variant	945,193	13.12%	В	78	10.24
Rv	Redlands Variant, very hard	105,452	1.46%	В	78	1.14
Sc	Shiprock	868,130	12.05%	В	78	9.40
Sh	Shiprock, very hard	67,523	0.94%	В	78	0.73
SI	Shiprock -Blancot	23,813	0.33%	B/B	78	0.26
Sv	Shiprock Variant	416,510	5.78%	В	78	4.51
Sz	Stumble	15,596	0.22%	А	65	0.14
Та	Trail	0	0.00%	A	65	0.00
Th	Trail. very hard	0	0.00%	A	65	0.00
Totals		7,201,688	100.00%			79.67

(1) Undifferentiated groups and complex soil mapping units were delineated if the major components had contrasting hydrologic groups.

(2) Hydrologic groups were taken from SCS soil surveys, see Table 11-15 for the respective location and title of each survey .

TABLE 11-16D

TOPDRESSING TYPE, QUANTITIES, AND CURVE NUMBERS FOR AREA IV NORTH

Soil Mapping		Volume	Percent	Hydrologic	Curve	Weighted
Unit Symbol	Soil Mapping Unit	(cu yds)	(%)	Group ⁽²⁾	Number ⁽³⁾	Value
Bb (1)	Bacobi and	342,305	7.03%	С	86	6.04
-	Monierco soils	535,401	10.99%	D	91	10.00
Вс	Blancot	0	0.00%	В	78	0.00
Bh	Blancot, very hard	0	0.00%	В	78	0.00
Fa	Faro and Persayo Soils	161,922	3.32%	D/D	91	3.02
Gr	Grieta	69,104	1.42%	В	78	1.11
JC	Jocity -Gilco	1,525,313	31.31%	B/B	78	24.42
Jh	Jocity, very hard	46,339	0.95%	В	78	0.74
Ma	Mack	176,992	3.63%	С	86	3.12
Mn	Mayqueen	23,851	0.49%	В	78	0.38
Ms	Mayqueen -Shiprock	333,565	6.85%	В	78	5.34
Mv	Mayqueen -Shiprock, very hard	0	0.00%	В	78	0.00
Na	Nakai	53,010	1.09%	В	78	0.85
Nt	Natrargids	0	0.00%	D	91	0.00
Nv	Natrargids, overblown	218,490	4.49%	D	91	4.08
Ra	Razito	311,260	6.39%	А	65	4.15
Rh	Razito. very hard	196,707	4.04%	А	65	2.62
RI	Redlands Variant	331,678	6.81%	В	78	5.31
Rv	Redlands Variant, very hard	61,901	1.27%	В	78	0.99
Sc	Shiprock	160,006	3.28%	В	78	2.56
Sh	Shiprock, very hard	143,239	2.94%	В	78	2.29
SI	Shiprock -Blancot	0	0.00%	B/B	78	0.00
Sv	Shiprock Variant	70,420	1.45%	В	78	1.13
Sz	Stumble	105,082	2.16%	А	65	1.40
Та	Trail	0	0.00%	A	65	0.00
Th	Trail. very hard	4,538	0.09%	A	65	0.06
Totals		4,871,123	100.00%			79.65

(1) Undifferentiated groups and complex soil mapping units were delineated if the major components had contrasting hydrologic groups.

(2) Hydrologic groups were taken from SCS soil surveys, see Table 11-15 for the respective location and title of each survey .

NAPI direct discharges are a result of an over supply of water in the canal that is released directly to the wash. NAPI discharge events for both streams are highly variable, occur quickly, and can last up to 12 hours causing significant erosion and sediment transport in the channel. The indirect NAPI related discharges are a result of return flows to the washes caused by the infiltrating irrigation water. The irrigation return waters have changed the Chinde Arroyo into a perennial stream with a base flow containing elevated dissolved solids concentrations from irrigation return waters leaching the unconfined surface formations. The Cottonwood Arroyo is not impacted by perennial flows but increased mineralization is deposited on the stream banks as a result of seeps in the upper reaches that are carried down stream during precipitation flow The impacts of the NAPI activities on the baseline hydrologic balance of the events. Cottonwood Arroyo will be highly variable increases in the flow, discharge, and water quality concentrations of the channel's hydrologic balance. Moreover, these impacts increase the already highly variable hydrologic balance and further decrease the potential for post mining changes to the hydrologic balance as a result of mining. Quantitative data to characterize the NAPI impacts to these drainages is found in Section 11.6.3.2.2.1 and Appendix 11-OO and is also being collected as part of the surface water monitoring plan.

Specific probable hydrologic consequences for each major tributary to the Chaco River are described by watershed in the following sections. Channels are listed from north to south within the permit area.

11.6.3.3.1 Chinde Arroyo

The present watershed area of Chinde Arroyo is about 42.4 square miles (sq mile) (27,130 acres). An area of additional 11 square miles does not contribute to the present Chinde watershed as it is diverted by NIIP's Ojo Amarillo canal into Cottonwood Arroyo. About 4.86 square miles of the Chinde Arroyo drainage basin is disturbed by mining activities (Table 7-9). The post-mining Chinde Arroyo watershed increases in size by 1.7 sq miles (1,124 acres) primarily because of changes in the drainage divide between Hosteen Wash and Chinde Arroyo, and the drainage divide between Dodge Diversion and Chinde Arroyo.

The pre-mining drainage density of Chinde Arroyo was estimated to be 1.4 miles/sq mile for the entire drainage area and 2.8 miles/sq mile for the area disturbed by mining. Higher drainage density within the mine area reflects the greater relief in this area. Post-mining drainage density for Chinde Arroyo is 4.7 miles/sq mile over the area disturbed by mining. Both pre- and post-mining drainage densities appear to be relatively low. However, the calculated drainage density is dependent upon the criteria for measuring drainage length. The criterion used in this analysis was to include only stream channels identified on the topographic maps. Thus, conservatively, contour crenulations associated with badlands topography did not enter into the drainage density measurement, as they reflect an unstable geomorphic regime.

These results indicate a higher post-mining drainage density for the area disturbed by mining. This higher drainage density will be adequate to prevent gullies forming in light of the lower relief associated with the post-mining surface. Final surface configuration designs were developed in Chapter 12 (see Section 12.3, Exhibits 12-5A, 12-6A, and 12-6B). For design of reclaimed channels, see Section 11.6.5.

The largest hydrologic change to Chinde Arroyo is in the Doby reclamation area to the north, where the westward drainages from the off lease undisturbed surface are diverted towards the south via a post-mine channel (Doby North Channel) that runs north to south along the eastern lease boundary. The pre-mine topography had no major channel; the surface sloped down towards the west with primarily sheet flow drainages and some small channels. The post-mine channel also collects surface runoff from a portion of the reclaimed surface to the west and diverts the flow into a tributary of the Chinde Diversion. Refer to Exhibit 11-76A and 12-5A for the location and alignment of the post-mine channel.

Comparison of SEDCAD predictions for pre- (see Chapter 7, Appendix 7-G) and post-mining (see Chapter 11, Appendix 11-BB) flows and sedimentology from a 10-yr 6-hr event are provided in Table 11-17. Sediment yields for the 10-yr 6-hr event at the downstream outlet (Structure 24) are predicted to decline, despite an increase of 1,124 acres in watershed size post-mining, from a pre-mining yield of 8,657 tons to a post-mining yield of 8,159 tons. The

predicted decreases in sediment yield are due to the lower slopes and better vegetation cover on reclaimed areas.

The peak flow resulting from a 10-yr 6-hr precipitation event was predicted to decrease from a pre-mining estimate of 715 cubic feet per second (cfs) to a post-mining estimate of 705 cfs for Chinde Arroyo below the lease boundary (Structure 24). The runoff volume was predicted to decline from 502 acre-feet, pre-mining, to 488 acre-feet, post-mining. The post-mining SEDCAD modeling for the 10-yr 6-hr event indicates that although the total sediment is less than the pre-mine, the peak sediment concentration (mg/l) and peak settleable concentration (milliliters per liter or ml/l) increased following mining. The peak sediment concentration increased from 50,387 mg/l to 77,099 mg/l and the peak settleable concentration from 4.16 ml/l to 13.24 ml/l.

Baseline water quality in Chinde Arroyo indicates that TDS, total iron, total manganese, and sulfate concentrations usually exceed drinking water standards, but the average water quality appears to be suitable for livestock watering (see Chapter 7, Table 7-7). Maximum values associated with baseline water quality at CD-1A, the upstream Chinde monitoring site, exceed the Navajo Nation's livestock watering standards for sulfate, and selenium for one of the 93 samples collected between 1999 and 2010. The water quality at CD-1 exceeded the fluoride livestock watering standard of 2.0 mg/l 26 times. Secondary drinking water standards for TDS, fluoride, sulfate, total iron, and total manganese were also exceeded. Sulfate and total iron concentrations exceed the standards more than 50 percent of the samples. The maximum selenium concentration reported exceeded the 0.033 mg/l acute aquatic life standard and the 0.002 mg/l chronic aquatic life standard. This site is influenced by return flows from the NAPI fields upstream which have produced perennial flows in the Chinde Arroyo.

Downstream, at CD-2A, the comparisons of water quality with the standards were similar to the observations described for CD-1A. When contrasting the upstream and downstream sites, electrical conductivity, TDS, sulfate, and chloride are elevated downstream compared with the upstream samples. TSS, total iron, dissolved manganese, fluoride, and boron levels are often

lower downstream at CD-2A. In general, it appears that dissolved iron, total manganese, and selenium are the same upstream and downstream.

Post-mining concentrations of sulfate, iron, manganese, and TDS parameters may actually decrease slightly, due to more favorable vegetative stabilization associated with better distribution of topdressing over the disturbed areas and lower concentrations of sediment in stream flows. However, any change would be marginal and chemical quality of surface water following mining would be expected to approximate pre-mining conditions. Acid forming or toxic materials are not present in the drainage.

TABLE 11-17COMPARISON OF PRE- & POSTMINING AREAS, PEAK FLOWS AND SEDIMENT YIELDS
CHINDE ARROYO10-YEAR, 6-HOUR PRECIPITATION EVENT

Sedcad 4. Watershe Designati	.0 ed ion		Pre-	Mine			Post-	Mine		Difference From Pre-Mine			
Pre	Post	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield
			(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)
S24	S24	27,130	715	8,657	0.3	28,254	705	8,159	0.3	1,124	-10	-498	0.0
S17 SW1	S17 SW1	1,100	34	141	0.1	824	40	66	0.1	-276	6	-75	0.0
S15 SW1	S15 SW1	595	43	92	0.2	600	26	45	0.1	5	-17	-47	-0.1
S11	S27	446	172	1,380	3.1	1,726	332	2,757	1.6	1,280	160	1,377	-1.5
S18 SW1	S18 SW1	146	10	24	0.2	120	10	15	0.1	-26	0	-9	0.0

11.6.3.3.1.1 Surface Water Gain/Loss in Chinde Arroyo

The results of a gain/loss study conducted from April 1999 through March 2000 are reported in Appendix 11-OO, Chinde Wash Surface Water Gain/Loss Report. The synoptic, NAPI, and continuous surface water monitoring data collected during the monitoring year for Chinde Arroyo finds that during base flow and NAPI operational spills there is a net loss of surface water from the NAPI discharge point to Navajo Mine monitoring station CD-2A, a distance of nine miles. For example, on April 18, 1999, flow volume declined from 8.0 acre-feet at CD-1A to 0.5 acre-feet at CD-2A during a NAPI operational discharge. Similar instances of flow volume decreases between CD-1A and CD-2A (Chapter 7 Figure 7-2) occurred throughout the year, such as on July 1, 1999 in which CD-1A recorded 11.11 acre-feet and CD-2A recorded only 0.82 acre-feet of volume for the same NAPI operational spill.

However, by dividing this nine-mile reach into smaller reaches and measuring flow between these reaches, the reach (Reach 3) above the Yazzie highwall and upstream of reclaimed lands was identified as losing a significant amount of flow. In addition, the synoptic data documents that surface flows across reclaimed lands consisting of spoil (Reach 4) change very little and in fact are dominated by a slight increase. Thus, the conclusion of the report is that the effects of mining on surface water flow volumes both during and after mining are minimal.

Changes in surface flows are minimal in the regraded spoil reach (Reach 4) because the spoil at Navajo Mine is comprised dominantly of sodic mudstone and siltstone that have a very low permeability. Synoptic monitoring identified that base flow increased across the reclaimed land during three measurements by 119 gpm (202 to 321 gpm), 11 gpm (0 to 11 gpm), and 49 gpm (458 to 507 gpm) and decreased during one measurement by 30 gpm (115 to 85 gpm) along Reach 4. Pit run spoil permeability was determined in the Leach Study (Appendix 11-K) to be 3.97 X 10⁻⁶ centimeters/second (cm/sec) (five samples that ranged from 1.66 X 10⁻⁶ to 5.4 X 10⁻⁶ cm/sec), which is a similar permeability to that of a compacted soil liner. Based on the data from the Chinde Wash Surface Water Gain/Loss Report and permeability values, future surface water losses along the permanent Chinde Arroyo diversion are expected to be negligible.

Losses of surface water from the NAPI discharge point to Navajo Mine monitoring station CD-2A are occurring above the Yazzie highwall due to a large and highly vegetated area upstream of the Yazzie highwall, and to a lesser extent due to seeps along the highwall itself immediately below the diversion. Synoptic monitoring recorded a decrease in flow of surface water during three measurements along Reach 3 for the first three-quarters of the study, $(Q2 - Q4 \ 1999)$ with a decrease in flow of 772 gpm (974 to 202 gpm), 283 gpm (283 to 0 gpm) and 275 gpm (390 to 115 gpm), respectively.

The effect that the large and densely vegetated area has on surface water flow is two-fold: 1) it reduces peak flows, and 2) it enhances surface water loss. Surface water losses occur due to the flows spreading out, creating a larger surface area for infiltration and evaporation. The extensive and dense vegetated area will consume water by transpiration during the majority of the year. In addition, un-quantified seeps have been observed on the Yazzie highwall face beneath the Chinde temporary diversion confirming that surface water is infiltrating in the vegetated area. The cumulative effects of these processes, without an additional source of incoming water, is to reduce the amount of available surface water for downstream flows.

Following backfilling of the Yazzie pit, the periodic seeps on the face of the highwall beneath the temporary diversion will decrease significantly or stop due to the placement of lowpermeability spoil against the highwall.

The continuous monitoring data also recorded that during large storm events, for example the events between August 3 and 4, 1999, and August 5 and 6, 1999, there was an increase in flow volume from CD-1A to CD-2A (Figure 7-2). This flow volume increase is typical of an ephemeral channel and is the result of increasing watershed size and contributions of additional flow from tributaries progressively producing an increasing volume of flow downstream.

Synoptic flow measurements and continuous flow data collected and reported in the Chinde Wash Surface Water Gain/Loss Report (Appendix 11-OO) have characterized and documented gains and losses of surface water flows along specific reaches of Chinde Arroyo. Specifically,

the data collected support the conclusion that future reconstructed channels built in spoils will not significantly alter surface water flows due to vertical infiltration.

11.6.3.3.2 Hosteen Wash

The Hosteen Wash watershed area is about 9.1 sq miles. Mining activities disturb approximately 3.7 sq miles of this drainage. The Hosteen Wash watershed will decrease in size by 1.7 sq miles or 1,274 acres post-mining. This is largely a result of post-mining changes in the drainage divide between Hosteen and Chinde Arroyo, in which Chinde Arroyo increases by 844 acres.

Pre-mining drainage density for Hosteen Wash was estimated to be 3.18 miles/sq mile for the entire drainage area and 2.8 miles/sq mile for the area disturbed by mining. Post-mining drainage density for Hosteen Wash is 6.1 miles/sq mile over the area disturbed by mining. These results indicate a higher post-mining drainage density for the wash. This higher drainage density is to ensure that gullying would not develop on this watershed due to insufficient drainage.

Final surface configuration designs were developed in Chapter 12 (see Section 12.3, Exhibits 12-6A and 12-6B). For design of reclaimed channels, see Section 11.6.5 and Appendix 11-H. Drainage geometry and grade were selected to maximize stability. Similar to a natural channel, sediment deposition may produce local convexities as a result of the aggrading conditions in the channel. These convexities may be reworked, exhibiting down cutting following larger storm events, and redistributing some of the sediment further downstream. Some channel aggradation or channel degradation are expected to develop from natural conditions, despite the design of a graded longitudinal profile and channel cross-section.

With the post-mining channel, some reworking of channel materials will occur, especially during the large flood events. However, channel aggradation or channel degradation would not develop within the reclaimed channel because the graded profile and channel dimensions will be designed to maintain dynamic equilibrium. See the Reclamation Surface Stabilization Handbook (BNCC, 1992) for information regarding the design of reclamation structures.

Comparison of SEDCAD predictions for pre- (see Chapter 7 Appendix 7-A) and post-mining (see Chapter 11 Appendix 11-CC) flows and sedimentology are provided in Table 11-18. This comparison indicates decreases in flow and sediment yields associated with post-mining conditions. These predicted decreases are due to a reduction in the badlands area and a slightly lower curve number attributed to reclaimed areas.

The peak flow resulting from a 10-yr 6-hr precipitation event is predicted to decline from a premining estimate of 1,417 cfs (Structure 9) to a post-mining estimate of 538 cfs (Structure 18) for the entire Hosteen drainage. The runoff volume was predicted to decline from 247 acre-feet, pre-mining, to 126 acre-feet, post-mining.

The SEDCAD modeling for the 10-yr 6-hr event indicates that the predicted peak sediment concentration for post-mining will decrease and the peak settleable concentration will increase. The peak sediment concentration decreased from 45,433 mg/l to 37,159 mg/l and the peak settleable concentration increased from 1.11 ml/l to 2.30 ml/l. The increase in peak settleable solids is attributable to replacement of pre-mining badland areas (clay-rich) with a post-mining topdressing material, typically a sandy loam soil. The clay rich areas will increase the suspended solids concentration, while sandy loam areas will decrease the suspended solids concentration and increase the settable solids (sand) concentration. The SEDCAD analysis also indicates that the total sediment yield will decrease from a pre-mine yield of 8,658 tons to a post-mine yield of 3,400 tons.

Comparison of pre-mining and post-mining flows and sediment yields resulting from a 10-yr 6hr precipitation event were performed separately for several sub-watersheds disturbed by mining within the Hosteen Drainage (Table 11-18). In all of the sub-watersheds compared, with one exception, the flows and sediment yields declined as a result of mining, even in sub-watersheds that increased in size following mining.

Baseline water quality in Hosteen Wash should be similar to that of Chinde Arroyo because of the similar soils, geology, and vegetation found within the basins (see Chapter 7). Post-mining

concentrations for sulfate, iron, manganese, and TDS should decrease slightly due to reduction of badlands area and better distribution of topsoil over the disturbed areas.

TABLE 11-18COMPARISON OF PRE- & POSTMINING AREAS, PEAK FLOWS AND SEDIMENT YIELDS
HOSTEEN WASH10-YEAR, 6-HOUR PRECIPITATION EVENT

Sedcad 4.	.0		Pre-	Mine			Post-	Mine		Dif	ference Fr	om Pre-M	line
Pre	Post	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield
			(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)
S9	S18	5,833	1,417	8,658	1.5	4,518	538	3400	0.8	-1,316	-879	-5,258	-0.7
S2	S11	2,379	640	3,617	1.5	2,264	414	1843	0.8	-115	-226	-1,774	-0.7
S6	S15	1,964	668	3,655	1.9	818	64	181	0.2	-1,146	-604	-3,474	-1.6
S12SW1	S5SW1	279	144	479	1.7	240	15	30	0.1	-39	-129	-449	-1.6
S2SW2	S11SW1	146	79	259	1.8	213	13	31	0.1	67	-66	-228	-1.6
S6SW6	S14SW1	178	79	273	1.5	143	8	18	0.1	-36	-71	-255	-1.4
S6SW5	S13SW1	194	91	269	1.4	94	7	11	0.1	-100	-84	-258	-1.3
S12SW2	S6SW1	107	49	84	0.8	169	13	29	0.2	62	-36	-55	-0.6
S2SW1	S11SW2	203	25	49	0.2	86	14	34	0.4	-117	-11	-15	0.2
S13SW2	S9SW1	275	146	569	2.1	410	20	46	0.1	135	-126	-523	-2.0

11.6.3.3.3 Barber Wash

The Barber Wash watershed area is about 5.3 sq miles. Mining activities disturbs approximately 1.4 sq miles of this drainage. Barber Wash will decrease in size by 1.3 sq miles (849 acres) postmining. This is largely due to post-mining topography changes at the drainage divide between the Barber and South Barber drainages, in which the South Barber drainage increases by 1.45 sq miles (928 acres) (see Exhibits 7-4C and 11-75A).

Pre-mining drainage density for Barber Wash was estimated to be 1.75 miles/sq mile for the entire drainage area and 1.46 miles/sq mile for the area disturbed by mining. Post-mining drainage density for Barber Wash is 6.7 miles/sq mile over the area disturbed by mining.

These results indicate a higher post-mining drainage density over the area disturbed by mining. The post-mining drainage density may be greater than necessary to achieve a stable topographic condition. The increased drainage density was deemed necessary to avoid excessive overland flow lengths. In the event the drainage network is too extensive for the associated flows and sediment yields, the drainage density would decrease where channel flows are insufficient to transport sediment yield from overland flow and upstream contributions. This may occur in the upper reaches of some channels. As these headwater channels fill with sediment, drainage density will decrease as the channel network approaches equilibrium with the flow and sediment yield regime of the contributing watershed.

Final surface configuration designs were developed in Chapter 12 (Section 12.3 and Exhibits 12-6A and 12-6B). For design of reclaimed channels, see Section 11.6.5. Drainage geometry and grade were selected to encourage stability without causing excess sediment deposition. Sediment deposition may produce local convexities as a result of the aggrading conditions in the channel. These convexities may in turn exhibit down cutting following larger storm events, resulting in migration of re-worked sediments downstream. Natural forces will cause aggregation, degradation and down cutting. Comparison of SEDCAD predictions for pre- (Chapter 7 Appendix 7-B) and post-mining (Chapter 11 Appendix 11-DD) peak flows and sediment yields resulting from a 10-yr 6-hr precipitation event are provided in Table 11-19. In all cases, the comparison indicates a decrease in flow and sediment yields associated with post-mining conditions. These predicted decreases are due to a reduction in the badlands area and a lower curve number attributed to reclaimed areas.

The peak flow resulting from a 10-yr 6-hr precipitation event was predicted to decline from a pre-mining estimate of 404 cfs to a post-mining estimate of 284 cfs for the entire Barber drainage. The runoff volume was predicted to decline from 101 acre-feet, pre-mining, to 59 acre-feet, post-mining.

The SEDCAD modeling for the 10-yr 6-hr event indicates that the predicted peak sediment concentration for post-mine (24,586 mg/l) decreased compared to pre-mine (27,241 mg/l). Total sediment yields (tons) decreased for post-mining conditions while the predicted settleable solid concentrations increased. Sediment yields declined from a pre-mining yield of 1,672 tons to a post-mining yield of 1,076 tons. The settleable solids concentration for the post-mine is 2.2 ml/l compared to the pre-mine concentration of 0.36 ml/l. The change is attributable to replacement of pre-mining badland areas (clay-rich) with a post-mining topdressing material which is typically a sandy loam soil. The clay rich areas will increase the suspended solids concentration, while sandy loam areas may decrease the suspended solids concentration and increase the settable solids concentration.

The peak concentrations of suspended solids and settleable solids are only order-of-magnitude predictions, it is concluded that there should be no significant change between pre- and post-mining in the peak concentrations of TSS and total settleable solids.

Baseline water quality in Barber Wash should be similar to Chinde Arroyo because of similar soils, geology, and vegetation found within the basins (see Chapter 7). Post-mining concentrations for sulfate, iron, and manganese should decrease slightly due to a reduction of badlands area and better distribution of topsoil over the disturbed areas.

11.6.3.3.4 South Barber Drainage

The South Barber Drainage has a watershed of about 0.8 sq miles. Mining activities will disturb approximately 0.03 sq miles (17 acres) of this drainage area. The post-mine topography will increase the South Barber drainage by 928 acres. This is largely due to the post-mining topography changes at the drainage divide between the Barber and South Barber drainages that increases the South Barber drainage by 928 acres. The most significant change from pre-mine is that the upper portion of the Barber drainage will be diverted into the South Barber Channel (see Exhibits 7-4C and 11-75A).

Pre-mining drainage density for the South Barber drainage was estimated to be 5.93 miles/sq mile for the entire drainage area. Post-mining drainage density for the South Barber drainage is 5.98 miles/sq mile over the area disturbed by mining. These results indicate that the post-mining and pre-mining drainage densities are about equal. This along with other erosion control practices on the reclaimed areas will ensure that the sediment yield from the post-mining surface will be less than pre-mine. Final surface configuration designs are presented in Chapter 12 (see Sections 12.3, Exhibits 12-6A and 12-6B). For design of reclaimed channels, see Section 11.6.5. Drainage geometry and grade were selected to maximize stability without causing sediment deposition. Sediment deposition may produce local convexities as a result of the aggrading conditions in the channel. These convexities may in turn develop headcuts and begin to erode.

Comparison of SEDCAD predictions for pre-mining (Appendix 7-N) and post-mining (Appendix 11-EE) flows and sedimentology is provided in Table 11-23 for a 10-yr 6-hr event. The comparison indicates an increase in the total sediment yield for post-mining and the peak flows remain about equal. The predicted sediment yield is 765 tons for post-mine and 599 tons for premine. The predicted peak flows are approximately equal at 166 cfs. The increase in sediment yield for post-mine condition is primarily due to the increased drainage area; the yield in tons per acre is 1.1 tons/acre for pre-mine and 0.5 tons/acre for post-mine. The SEDCAD modeling also indicates for the post-mine condition a decrease in peak sediment concentration and an increase in peak settleable concentration. The predicted peak sediment concentration is 39,347 mg/l for

post-mine and 40,564 mg/l for pre-mine. The predicted peak settleable concentration is 1.36 ml/l for post-mine and 0.0 ml/l for pre-mine. The change is attributable to replacement of pre-mining badland areas (clay-rich) with a post-mining sandy loam soil. The clay rich areas will increase the suspended solids concentration, while sandy loam areas may decrease the suspended solids concentration and increase the settable solids concentration. The comparison indicates there is no significant change between the pre and post-mine peak sediment and peak settleable concentrations. For the same storm event the total sediment yield in tons per acre declined for the post-mine condition.

11.6.3.3.5 Neck Arroyo

The Neck Arroyo watershed area is about 1.88 square miles. Approximately 14 percent of this drainage (0.26 square miles or 168 acres) lies within the permit area. Within the permit area, pit disturbance extends across about three percent of the drainage (0.06 square miles or 36 acres), while about one percent of the drainage (0.19 square miles or 132 acres) will be directly disturbed by the location of roads.

TABLE 11-23COMPARISON OF PRE- & POSTMINING AREAS, PEAK FLOWS AND SEDIMENT YIELDS
SOUTH BARBER DRAINAGE
10-YEAR, 6-HOUR PRECIPITATION EVENT

Sedcad 4. Watershe	.0 ed													
Designati	on		Pre-Mine			Post-Mine				Difference From Pre-Mine				
Pre	Post	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	
			(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)	
S2	S6	526	166	599	1.1	1,454	166	765	0.5	928	0	166	-0.6	

TABLE 11-19COMPARISON OF PRE- & POSTMINING AREAS, PEAK FLOWS AND SEDIMENT YIELDS
BARBER WASH10-YEAR, 6-HOUR PRECIPITATION EVENT

Sedcad 4. Watershe	.0 ed												
Designation Pre-Mine					Post-	Mine		Dif	ference Fr	om Pre-M	line		
Pre	Post	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield
			(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)		(cfs)	(tons)	(tons/acre)
S2	S9	3,364	404	1,672	0.5	2,515	284	1,076	0.4	-849	-120	-596	-0.1
S 7	S 8	1,716	285	831	0.5	849	86	336	0.4	-867	-199	-495	-0.1
S6SW1	S5	678	175	503	0.7	437	23	44	0.1	-241	-152	-459	-0.6

It is possible that road crossings and rail crossings could slightly alter the flow and sediment equilibrium resulting in either temporary aggrading or degrading conditions developing in the stream channel above or below the road crossing. After removal of the road crossing the affected channel reach will return to the approximate pre-mine condition.

Comparison of SEDCAD predictions for pre- (see Chapter 7) and post-mining flows and sedimentology are provided in Table 11-20. This comparison suggests slight decreases in flow and sediment yields under post-mining conditions. These decreases are due to the lower curve number attributed to reclaimed areas and also lower slopes and better vegetation cover on reclaimed areas.

Table 11-20 Comparison of Pre- & Post-Mining Flows and Sediment Yields Neck Arroyo 10-Year 6-Hour Precipitation Event

								Differe	ence from	
	SEI	DCAD		Pre-	Mining	Post	-Mining	Pre-Mining		
	Subwatershed		d	Flow	Sediment	Flow	Sediment	Flow	Sediment	
J	В	S	SW	(cfs)	(Tons)	(cfs) (Tons)		(cfs)	(Tons)	
1	1	1	1	31.18	348.00	30.79	343.69	-0.39	-4.31	
1	1	1	5	31.38	402.34	27.52	361.5	-3.86	-40.84	

The peak flow resulting from a 10-yr 6-hr precipitation event was predicted to decline from a pre-mining estimate of 247 cfs to a post-mining estimate of 244 cfs for the entire Neck drainage. Likewise, the runoff volume was predicted to decline from 39.0 acre-feet, pre-mining, to 38.7 acre-feet, post-mining. Sediment yields for the same event declined from a pre-mining yield of 14,351 tons to a post-mining yield of 14,284 tons.

The SEDCAD modeling for the 10-yr 6-hr event indicates that predicted peak concentration of TSS increased slightly for post-mining conditions even though peak settleable solids

concentrations and sediment yields decreased. This slight increase in total suspended solid concentrations appears to result from numerical error associated with routing high concentrations of sediment in flood flows. Since the peak concentrations of suspended solids and settleable solids are only order-of-magnitude predictions, it can be concluded that there should be no significant change between pre- and post-mining in the peak concentrations of TSS and total settleable solids.

Comparison of pre-mining and post-mining flows and sediment yields resulting from 10-yr 6-hr precipitation event were performed separately for each sub-watershed disturbed by mining within the Neck Arroyo drainage (Table 11-20). In all cases, the flows and sediment yields remained the same or declined as a result of mining.

Pre-mining drainage density for Neck Arroyo was estimated to be 3.11 miles/sq mile for the entire drainage area and should not change as a result of mining.

11.6.3.3.6 Lowe Arroyo

The Lowe Arroyo watershed area is about 11.00 sq miles. Approximately 4.00 sq miles of this drainage lies within the permit area, and 2.18 sq miles is expected to be disturbed. Final surface configuration and drainage designs have been developed as discussed in Chapter 12 (Section 12.3and Section 11.6.5.1).

Drainage geometry and grade were selected to maximize stability without causing sediment deposition. Such sediment deposition may subsequently develop headcuts and erode as local convexities in the channel develop as a result of aggrading conditions. With the post-mining channel, some reworking of channel materials will occur especially during the large flood events. Similar to natural channels in the area, major channel aggradation or channel degradation may develop within the reclaimed channel despite the engineered graded profile and channel dimensions designed for stability. Channel instabilities could develop as a result of headcuts working upstream from changes in base level on Chaco River or the San Juan River.

The largest hydrologic change is the routing of undisturbed drainages east of the permit boundary. Pre-mine, the drainages east of the permit formed the main branch of the Lowe channel that flowed east to west toward SEDCAD structure 10 (Exhibit 7-4). In the post-mine, these drainages are routed to the south initially before flowing west and north toward SEDCAD structure 11 (Exhibit 11-77). As shown on Table 11-21, the watershed area to Structure 7 decreases by 1,808 acres in the post-mine while the watershed area to Structure 11 increases by 1,584 acres. The outlet for the Lowe Arroyo drainage is the same location (lease boundary) as the pre-mine at Structure 12.

The southern post-mining drainage that flows to Structure 11 differs from the pre-mine channel alignment in order to accommodate a lower gradient in the reclaimed channel. The post mining drainage that flows to Structure 10 has a similar alignment as the pre-mine channel.

In the post-mine, the Lowe Arroyo watershed increases by 93 acres due to a change in the drainage divide with Cottonwood Arroyo. This change in watershed acres occurs along the southern boundary between Lowe and Cottonwood drainages. The shifting of 93 acres from Cottonwood Arroyo to Lowe Arroyo will have no appreciable effect on the peak flows or sediment yields of either watershed due to their large size and reclamation practices.

Comparison of SEDCAD predictions for pre-mining (Appendix 7-D and Appendix11-X) and post-mining flows and sedimentology provided in Table 11-21 for a 10-yr 6-hr event. Overall, there is a slight decrease in peak flow and sediment yields from pre-mining conditions to post-mining. Sediment yields for the 10-yr 6-hr event at the downstream outlet (Structure 12, lease line) are predicted to decline, despite an increase of 93 acres in watershed size post-mining, from a pre-mining yield of 3,682 tons to a post-mining yield of 3,227 tons. The decline in sediment yields and peak flows is due primarily to a lower curve number resulting from reclaiming with sandy loam topdressing material, better vegetation cover on reclaimed areas and terraces that reduce the slope lengths for the post-mine drainage.

TABLE 11-21

COMPARISON OF PRE- & POSTMINING AREAS, PEAK FLOWS AND SEDIMENT YIELDS LOWE WASH 10-YEAR, 6-HOUR PRECIPITATION EVENT

SEDC WATE DESIGI	CAD 4.0 RSHED NATION		Pre-]	Mine			Post	Mine		Diffe	Difference From Pre-Mine			
Pre-mine	Post-mine	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	
		(acres)	(cfs)	(tons)	(tons/acre)	(acres)	(cfs)	(tons)	(tons/acre)	(acres)	(cfs)	(tons)	(tons/acre)	
S5	S5	386	55	76	0.2	2,074	317.93	1,071	0.5	1,688	263	996	0.3	
S7	S 7	2,087	382	1,132	0.5	279	38.37	63	0.2	-1,808	-344	-1,069	-0.3	
S8	S6	609	96	166	0.3	2,599	371.51	1,279	0.5	1,990	276	1,113	0.2	
S9	S9	541	241	1,005	1.9	341	124.17	416	1.2	-200	-117	-589	-0.6	
S10	S10	4,659	735	2,431	0.5	6,798	490	2,811	0.4	2,139	-245	380	-0.1	
S11	S11	1,846	129	246	0.1	3,430	329	1,313	0.4	1,584	200	1,067	0.2	
S12 (Lease Line)	S12	7,046	926	3,682	0.5	7,139	514	3,227	0.5	93	-412	-455	-0.1	
S13 (Outlet)	S13	7,855	919	3,951	0.5	7,945	527	3,426	0.4	90	-392	-525	-0.1	

The peak flow resulting from a 10-yr 6-hr precipitation event was predicted to decrease from a pre-mining estimate of 926 cfs to a post-mining estimate 514 cfs for Lowe Arroyo below the lease boundary (Structure 12). The runoff volume at structure 12 is predicted to decline from 238 acre-feet, pre-mining, to 192 acre-feet, post-mining.

11.6.3.3.7 Cottonwood Arroyo

The Cottonwood Arroyo watershed area is about 80 square miles. The pre-mining watershed areas are shown on Exhibit 7-4A. The final surface topography and drainage configuration has been developed and is discussed in Section 11.6.5.1 and Chapter 12.3.

The primary hydrologic change to Cottonwood Arroyo is the disturbance of the North Fork of Cottonwood Arroyo. Approximately 10,662 feet of the North Fork will be permanently realigned from the pre-mine orientation due to reclamation (See Exhibit 11-77). As noted in the discussion of Lowe Arroyo, the Cottonwood Arroyo watershed will slightly increase from the pre-mine but with no appreciable hydrologic effects.

Table 11-22 shows the comparison of flow and sediment yield for the 10-yr 6-hr precipitation event for the portions of Cottonwood tributaries that drain the proposed Area 4 North mine area. These results reflect disturbance conditions for the entire sub-watershed even though proposed mining affects only a portion of the sub-watershed. Yet the differences in sediment yields (tons) and peak flow are negligible between pre and post-mining at the lease line (Structure 36). Sediment yields for the 10-yr 6-hr event at the downstream lease line are predicted to slightly increase from a pre-mining yield of 26,947 tons to a post-mining yield of 27,017 tons (Structure 37). The small changes in the sediment and peak flow figures reflect the small amount of mining disturbance in the Cottonwood watershed as a whole.

The peak flow resulting from a 10-yr 6-hr precipitation event at the lease line (Structure 36) is predicted to slightly increase from a pre-mining estimate of 2,879 cfs to a post-mining estimate 2,855 cfs. The runoff volume at Structure 36 is predicted to decline from 1,473 acre-feet, pre-mining, to 1,150 acre-feet, post-mining.

TABLE 11-22

COMPARISON OF PRE- & POSTMINING AREAS, PEAK FLOWS AND SEDIMENT YIELDS COTTONWOOD WASH 10-YEAR, 6-HOUR PRECIPITATION EVENT

SEDCAD 4.0 WATERSHED DESIGNATION			Pre	-Mine			Post	t-Mine		Difference From Pre-Mine				
Pre	Post	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	Area	Peak Flow	Sediment	Yield	
		(acres)	(cfs)	(tons)	(tons/acre)	(acres)	(cfs)	(tons)	(tons/acre)	(acres)	(cfs)	(tons)	(tons/acre)	
S21	S21	13,492	1,551	11,133	0.8	13,532	1,546	11,417	0.8	40	-5	284	0.0	
S34	S34	18,191	674	7,201	0.4	18,279	665	7,298	0.4	88	-9	97	0.0	
S36 (lease line)	S36	49,060	2,879	26,803	0.5	49,184	2,903	27,364	0.6	124	24	561	0.0	
S37(Outlet)	S37	51,269	2,842	26,947	0.5	51,477	2,855	27,017	0.5	208	13	70	0.0	

The pre-mining drainage density for Cottonwood Arroyo was estimated to be 2.64 miles/sq mile for the entire drainage area and 2.33 miles/sq mile for the permit area. Drainage densities will not change significantly as a result of mining. Final surface configuration design for Area III has allowed for a higher post-mining drainage density for the area disturbed by mining (see Exhibit 11-77). Furthermore, the gradient terraces to be installed according the Reclamation Surface Stabilization Handbook (BNCC, 1992) along with the lower relief associated with the post-mining surface should minimize gullies forming on the reclaimed surface.

Baseline water quality data in Cottonwood Arroyo indicate TDS, total iron, total manganese, and sulfate average concentrations usually exceed secondary drinking water standards but generally are suitable for livestock watering (see Chapter 7 Table 7-7). BNCC monitored three sites along the Cottonwood Arroyo between 1997 and 1999. Upstream NAPI discharges heavily influenced the water quality at two of the sites, as the flows were eroding and mobilizing sediment from surficial eolian sand dunes. Active channel widening and head cut development followed discharges from NAPI and storm events. Multiple storm events in 1999 resulted in the destruction of the downstream monitoring station CNS-1. During the monitoring period, when flows occurred, sediment loss resulted in significant concentrations of TSS, which resulted in elevated salinity, iron, and manganese concentrations. Water quality parameter levels were often elevated at CN-1 which is located upstream of the mine on the North Fork of Cottonwood, and at the downstream site CNS-1. Average TSS concentrations ranged from 74,009 mg/l at the upstream site, CS-1, to 123,097 mg/l at the upstream site, CN-1. Average selenium concentrations exceeded chronic aquatic habitat standards. Post-mining concentrations of TDS, total iron, total manganese, sulfate, and TSS may actually decrease slightly due to better distribution of topdressing over the disturbed areas and lower concentrations of sediment in stream flows. However, any change would be marginal and chemical quality of surface water following mining would be expected to approximate pre-mining conditions.

11.6.3.3.8 San Juan River and Chaco River

The San Juan River Basin covers an area of about 12,900 sq miles. Approximately 0.2 percent of this drainage lies within the permit area. The Chaco River has a watershed area of 4,350 sq miles. The mine permit area occupies about 0.6 percent of the total drainage area.

The San Juan River and Chaco River channels and flood plains will not be directly impacted by mining activities. The only possible impact on these rivers would be through the discharge of surface or groundwater from the mine area or from reclaimed surface and backfill.

The Chaco River does not receive groundwater base flow and thus would not be impacted by changes in groundwater quality. A relatively small amount of groundwater from backfill areas could reach the San Juan River after a period of about 200 years. As explained in Section 11.6.2.3.1, this quantity is so small relative to flows in the San Juan River that little change in the water quality of the San Juan River would be expected. Furthermore, based on leaching studies of overburden and spoils, chemical quality expected from backfill leachate would be very similar to baseline quality in coal seams. Consequently, no change in water quality in the San Juan River would be expected from the mine area.

Storm runoff from the active mine area is contained within the mine and is not directly discharged to surface water drainage courses. Consequently there would be no impact on surface water quality of the San Juan and Chaco Rivers as a result of mine water discharges.

Diversion of flows in the major channels such as Chinde Arroyo may result in minor disruption of dynamic equilibrium within the stream channel. These changes could increase or decrease sediment loads along segments of the channel but are usually unlikely to change sediment loads to the San Juan or Chaco Rivers. The diversion of Chinde Arroyo through the Big Fill culvert is one example where flood attenuation may reduce sediment loads downstream to the Chaco River. The hydrologic consequences of such changes are temporary adjustments in channel grade and geometry until a new equilibrium is reached. From field observations it appears that channel adjustments have already occurred downstream of the Big Fill culvert and the channel is approaching equilibrium conditions. Analysis of impacts of reclamation of drainages and stream channels, as described in Section 11.6.3.1 through 11.6.3.8, indicates only minor changes in flow and sedimentology that are likely to have minimal impact on channel conditions and sediment loads in the San Juan and Chaco Rivers.

11.6.4 Post-Reclamation Probable Hydrologic Consequences

BNCC's objectives in establishing the post-reclamation topography are to restore the affected land to a condition supporting the land uses it was capable of supporting prior to mining. This is achieved by minimizing the disturbance to the hydrologic balance, restoring prominent drainage features of the permit area to approximate the pre-mining conditions, and establishing a diverse, effective, and long lasting vegetative cover of the same seasonal variety as the native vegetation (Chapter 12 Section 12.1). All reclamation strategies are implemented to reduce surface erosion and sediment yield. BNCC has designed the post-reclamation topography and drainages to conform with existing drainages along the perimeter of the mine in order to safely convey water from upstream, off-lease watersheds to area drainages. BNCC will use appropriate channel types, slopes, and drainage densities to construct landforms appropriate to the area.

BNCC is planning to reclaim all of the sediment and drainage control ponds utilized during the operation, except for impoundments designated as permanent impoundments (Chapter 12 Section 12.3.4.1). At some future date, the Navajo Nation may request that some or all of the ponds remain. Future discussions may result in the retention or construction of ponds replacing the original livestock ponds. Should pond retention occur, ponds located on-channel will modify the hydrograph associated with the storm event by lowering the peak flows, extending the runoff over a longer period of time, and reducing storm runoff volumes. For small runoff events, the ponds may retain all of the storm capacity and surface area of the original pre-mine impoundment. The spoil material at each pond location will be compacted under appropriate moisture conditions in order to reduce permeability and, thereby, prevent excess pond infiltration. Specific discussions of temporary and permanent sediment ponds and the

replacement of surface water sources are presented in Chapter 11 Section 11.2.10 and Chapter 12 Section 12.3.4 and 12.11.

The mining and reclamation plan for the Navajo Mine includes the development of a post-mine topography that minimizes the disturbance to the hydrologic balance and restores prominent drainage features of the permit area to approximate the pre-mining conditions. This post-mining topography may incorporate diversion channels developed during operations. BNCC will meet all the regulatory requirements for diversions as specified in 30 CFR 816.43. Ideally, these diversions will not employ channel lining, artificial channel roughness features, or retention basins, unless approved by the regulatory agency. The diversions will not diminish downstream water rights. The ephemeral channels traversing the post-mine topography are designed, located, and constructed to be stable within a condition of dynamic equilibrium, and will not increase the potential for downstream flooding or endanger property or public safety. The channels will be designed to minimize additional contributions of suspended solids to stream flows using features such as appropriate gradients, channel linings, and roughness features. Lastly, these channels will not be constructed to divert water into underground mines.

11.6.4.1 Post-Reclamation Erosion, Sediment Yields, and Water Quality

The Reclamation Surface Stabilization Handbook (BNCC, 1992) includes a description of the sediment control measures that will be used on the reclaimed lands to prevent additional contributions of suspended solids to stream flow to meet applicable federal, state, and tribal water quality laws, regulations, and standards.

Reclamation of disturbed areas and replacement of poor quality sodic soils with suitable topdressing materials is expected to result in improvement in surface water quality under post-reclamation conditions. SEDCAD modeling results presented in the previous section indicate reductions in post-reclamation sediment yields relative to baseline conditions. TDS, sulfate, iron, and manganese concentrations in surface runoff from reclaimed areas are expected to decline with time to concentrations well below the SPLP leaching test results for mine spoils in Table 11-14f. Also, trace constituents in surface runoff are expected to be well below the SPLP

spoil leachate results, which are less than detection limits or livestock and wildlife use criteria as shown in Table 11-14f. Groundwater flow and transport modeling presented in Section 11.6.2.4.3 project the transport of dissolved solids and several trace constituents toward the topographic lows along the pre-mining channels. The rates of groundwater flow are very slow relative to storm water runoff volumes, and groundwater flows are expected to be retained within the alluvium and not contribute to surface water.

Following reclamation, surface water quality in drainages throughout the permit area is expected to improve from pre-mine water quality for the following reasons:

Sediment contribution from reclaimed areas is likely to decrease relative to baseline due to the overall reduction in slopes and improvement in the permanent vegetation cover.

Sediment contribution from channel erosion is likely to decrease as incised unstable channels are replaced by stable channel configurations.

Poor quality and sodic soils will be buried within the backfill, thus overland flow from the reclaimed areas is expected to exhibit lower concentrations of sodium and TDS.

Dissolved aluminum concentrations should decline with the reduction in suspended solids associated with reduced surface and channel erosion.

Section 11.6.5 addresses the potential short-term and long-term impacts to surface water sources that have existing uses.

11.6.4.2 Site Channels

The reclaimed channels are engineered to have flow velocities equal to or less than the pre-mine channels. Some erosion is anticipated, particularly in the pilot channels shown on Figures 11-27 and 11-29. All natural channels erode because they are in constant state of flux depending the magnitude of flows conveyed. During low flows, deposition will occur in some reaches of the channel and erosion in other reaches. Deposition will occur in reaches of lower slopes or where the channel bed widens and the flow spreads out, thus reducing the velocity. Erosion (down cutting with some lateral movement) will happen in reaches where the channel bed narrows and

confines the flow, thereby increasing the velocity. This generally occurs in reaches with increases in channel bed slopes.

During elevated flows the storm deposited sediment from low flows will be washed down stream in natural channels. Some lateral movement of the channel banks is expected as well as some down cutting of the channel bed. This process is also expected to occur in the reclaimed channels. Lateral movement of the low flow pilot channel is projected but will be confined within the banks of the main channel. The pilot channel is expected to resemble the surrounding natural channels in time. It could be incised in some reaches of the channel with depths as deep as 5 feet at the floodplain. The existing, incised channel depths in the existing or natural channels directly downstream of the lease are much deeper (See Exhibit 11-76E). Erosion is expected to occur in the reclaimed channels but the erosion rate will be less since the flow velocities in the reclaimed channels are less than the pre-mine (See Tables 11-26 and 11-27).

Low frequency (10-yr 6-hr or greater) large storm flows with corresponding higher velocities are required to transport coarse materials. Inversely for the higher frequency (2-yr 6-hr) smaller flows, the abundant coarse materials in combination with vegetation will serve to stabilize the grade and minimize erosion and down cutting.

Cut bank depths up to 5 feet deep could result if a 3-foot deep incised pilot channel should migrate and abut against a 1.5 to 2.0 feet thick floodplain bank (See Figure 11-27). The erosion depth or incised pilot channel depth of three feet was selected based on observations of channel erosion in adjacent, pre-law mine spoils. Usually at a scour depth of three feet or less into the spoil material, a protective shielding of the channel bottom has occurred as the finer-grained sediments are winnowed away. If the incised pilot channel excavates deeper than three feet or should erode beyond the toe of the main channel into the reclaimed slope, the area/erosion will be mitigated by stabilizing the channel. Among the options used stabilize the channel include armoring the channel consists with coarse material that range in size from pea – sized gravel (>0.63 inches) up to large (3 foot length of the long axis) sandstone cobbles and boulders.

11.6.4.2.1 Area I South Reclaimed Channels

There is one reclaimed channel in the Area I South final surface configuration (FSC) with a watershed larger than 640 acres, which requires detailed designs according to the Reclamation Surface Stabilization Handbook (BNCC, 1992). The reclaimed channel is designated as the Doby North Channel. The alignment of the reclaimed channel is shown on Exhibits 11-85 and 85A.

11.6.4.2.1.1 Analysis of Pre-Mine Channels

In the vicinity of Doby Pit, the pre-mine surface sloped down towards the west with primarily sheet flow drainages and some small channels. The post-mine topography changed the pre-mine drainage pattern by diverting the westward drainages from the off lease undisturbed surface towards the south via a post-mine channel that runs north to south along the eastern lease boundary. The channel also collects surface runoff from a portion of the reclaimed surface to the west.

Since there was no main channel in the pre-mine surface, the pre and post-mine flow velocities cannot be compared. The design of the reclaimed channel was based on maintaining the flow velocity less than the erosive velocity of the channel bed material, which in this case is the spoil material. The spoil material is primarily composed of shale/clay with sandstone cobbles that has an erosive velocity of approximately 5 feet per second (fps). Specifically, the design philosophy was to design a channel that is: 1) stable by demonstrating that the flow velocities are less than 5 fps, and 2) able to safely convey the flow from the 100-yr 6-hr event.

11.6.4.2.1.2 Analysis of Reclaimed Channels

The SEDCAD hydrology software was utilized to design the reclaimed channel. The hydrology for the Doby North Channel was modeled in SEDCAD to simulate the 2-, 10-, 25- and 100-yr 6-hr storm events. The channel was designed to retain the 10-yr 6-hr peak flow without overflowing the banks. The watershed subdivisions used in the model are presented in Exhibit 11-85 and 85A. The results from the SEDCAD runs are presented in Appendix 11-FF. During

storms greater than the 10-yr 6-hr event over bank flow will occur at the upper reach of the channel. For all the storm events simulated the flow velocities are less than 5 fps, indicating that the channel will be hydraulically stable.

The profile of the Doby North Channel at the south end of the Doby reclamation area has a significant drop; this reach of channel will require a riprapped drop structure to control erosion. The drop structure will be designed for a 25-yr 6-hr stability and 100-yr 6-hr capacity. The design of the drop structure is included in the SEDCAD hydrology model (Appendix 11-FF).

The location and design details for the Doby North Channel are presented on Exhibit 11-85.

11.6.4.2.2 Area II Reclaimed Channels

Four reclaimed channels in the Area II FSC have watersheds that are larger than 640 acres, which require detailed designs according to the Reclamation Surface Stabilization Handbook (BNCC, 1992). The three reclaimed channels are Chinde Arroyo Branch 1, Hosteen Wash Branch 1, Barber Reclaimed Channel, and South Barber Channel. The alignments of the reclaimed channels are shown on Exhibits 11-75, 11-76, 11-76A, 11-76B, 11-76C and the premine surface configuration with channels is shown on Exhibits 11-76F, 11-76G, and 11-76H.

The design of the reclaimed channels was based on a comparison of pre-mine channel flow velocities with post-mine channel flow velocities using HEC-RAS. Specifically, the design philosophy was to design a channel that is: 1) equally or more stable than the pre-mine channel (by demonstrating that the post-mine flow velocities are less than the pre-mine), and 2) able to convey the 100-yr 6-hr event.

Table 11-26 compares pre-mining and post-mining channel velocities for the entire channel reach that was modeled. Both the maximum and average flow velocities are provided for each of the four drainages modeled. Table 11-27 provides a detailed breakdown between channel reaches (channel stations) by listing the design flows that were input at each station and the corresponding flow velocities for that particular channel reach. For all design storm events, the

reclaimed channels have a lower maximum and average flow velocity than the pre-mine channels as noted in Table 11-26. Results of the HEC-RAS analysis also indicate that the reclaimed channels will convey the peak flows generated by the 100-yr 6-hr precipitation event. Complete HEC-RAS output files for all four modeled channels by design storm events (2-, 10-, 25-, 100-yr 6-hr peak flows) are provided in Appendix 11-NN (post-mine) and Appendix 11-PP (pre-mine).

The lower post-mine flow velocities are attributed to lower peak flows and different channel geometries in the reclaimed channel versus the pre-mine channel. The lower peak flows result from replacement of pre-mine badlands with reclaimed areas that have lower curve numbers. Generally, the pre-mine channels that were modeled are incised, which confines the flow and increases the flow depth, producing higher channel velocities than the reclaimed channel. The grades of the pre-mine channels were also steeper. The reclaimed channel section consists of a pilot channel and a main channel or a floodplain (See Figures 11-27 and 11-29, and Exhibit 11-76E). The geometry of the design sections for the reclaimed channels were proportioned from upstream to downstream depending on the magnitude of the flows.

Pre-mine and post-mine channel peak flows were estimated using SEDCAD for the 2-, 10-, 25-, and 100-yr 6-hr events. The supporting documentation for the pre-mine peak flow estimations are in Appendix 7-A (Hosteen Wash), 7-B (Barber Wash), 7-G (Chinde Arroyo) and 7-N (South Barber Channel). The supporting documentation for the post-mine peak flow estimations are in Appendix 11-BB (Chinde Arroyo), 11-CC (Hosteen Wash), 11-DD (Barber Wash), and 11-EE (South Barber Channel).

The pre-mining SEDCAD drainage subdivision for Chinde Arroyo is shown on Exhibit 7-3; the post-mining drainage subdivision is shown on Exhibit 11-75. The pre-mining SEDCAD drainage subdivision for Hosteen, Barber, and South Barber drainages is shown on Exhibit 7-4C, the post-mining drainage subdivision is shown on Exhibit 11-75A.

The peak flows were input upstream of the prediction points or SEDCAD structures for both the pre-mine and post-mine HEC-RAS analysis. Entering the peak flows in this manner will
generate conservative results. The results of the HEC-RAS pre-mine analysis for the 2-, 10-, 25-, and 100-yr, 6-hr peak flow for the modeled channels are in Appendix 11-PP, HEC-RAS Results for Area II Pre-Mine Channels.

11.6.4.2.2.1 Analysis of Pre-mine Channels

Due to the lack of detailed cross-sectional channel data within the lease, the development of the pre-mine channel sections used in the HEC-RAS is based on one representative surveyed cross-section. This cross-section is taken from both upstream and downstream of the lease for each respective drainage. The surveyed downstream cross-section was repetitively projected upstream across the lease to a transition zone for that particular channel. Similarly, the surveyed upstream cross-section was repetitively projected downstream across the lease to the transition zone.

The transition zone, 1,300 to 1,500 feet in length, connects the upstream and downstream channel configuration. The length and location of the transition between the upstream and downstream cross-sections was based on topographic information. Natural pre-mine transitions (i.e. incised badland channel to a broad valley channel) are evident from the topography and these approximate locations determined the location of the modeled transitions.

This method of interpolation across the permit area for development of the pre-mine channel for the HEC-RAS analysis was applied for modeling Hosteen Wash Branch 1. Locations of the transitions and the representative upstream and downstream cross-sections used in the HEC-RAS modeling are shown on the pre-mine plan and profile sheets, Exhibit 11-76G.

The channel profiles used in the HEC-RAS pre-mine analysis were extracted from U.S. Geological Survey (USGS) and aerial surveys at 10-foot contours.

11.6.4.2.2.1 Analysis of Reclaimed Channels

The flow velocities in the reclaimed channels were determined by inputting the reclaimed channel sections into HEC-RAS. The reclaimed channel reaches are transitioned into the existing natural channel at the upstream and downstream ends. The transitions of the reclaimed channel to the natural channel generally occurred over a 500 to 700 foot reach. The post-mine peak flows and gradient for that particular drainage dictated the geometry of the reclaimed channel. The reclaimed channel cross-sections are shown on Exhibit 11-76E, Sheet 1. The locations of the transition reaches and the design sections used in the HEC-RAS model are shown on the plan and profile sheets Exhibit 11-76A, 11-76B, and 11-76C.

The reclaimed channel profiles are generally uniform, which was stipulated by the elevation of the channel bottom at the upstream and downstream lease boundaries, except where the reclamation has been completed, such as the downstream reach of the Barber Reclaimed Channel. In this case, the elevation of the channel just up-stream of the completed reclamation and the channel elevation downstream at the lease line will determine the grade.

Due to the completed reclamation in Up Dip Barber the grade of the Barber Reclaimed Channel is set and will not change. Because this area is reclaimed and includes an existing vegetated channel, the necessity of constructing a reclaimed channel and resultant disturbance to the area across the reclamation should be evaluated. Specifically, the natural channel that has developed and which will continue to develop during the time prior to final reclamation will likely have a similar geometry to the reclaimed channel, particularly the pilot channel. The lower reach of the Barber Reclaimed Channel will be monitored for channel development and stability in order to determine if construction of the reclaimed channel is required.

The profile of the Barber Reclaimed Channel just east of the rail line will have a significant drop; this reach of channel will require a riprapped drop structure to control erosion. The drop structure will be designed for a 25-yr 6-hr stability and 100-yr 6-hr capacity. The reclamation of the channel will be done during the final reclamation of the railroad embankment. The embankment material will be used to reduce the grade of the drop structure.

Chinde Branch 1 in the post-mining topography is a tributary of the Chinde Arroyo, which did not occur in the pre-mine topography. The post-mining topography changes the pre-mine drainage pattern by diverting the upstream watersheds of the Hosteen Wash into the Chinde Arroyo watershed. Consequently, the results of the HEC-RAS analysis could not be compared to a corresponding pre-mine channel. However, the flow velocities can be compared to velocities in the other pre-mine channels analyzed. The flow velocities in Chinde Branch 1 are all less than the velocities in the other pre-mine channels, except for the Barber Wash 2-yr 6-hr average velocity (see Table 11-26).

The Chinde Branch 1 Reclaimed Channel converges with the Chinde Arroyo at approximately Station 0+00, see Exhibit 11-76A. The HEC-RAS analysis for Chinde Branch 1 includes this station and the subsequent stations upstream. The channel reach downstream of Station 0+00 to the western permit boundary will be a part of the Chinde Permanent Diversion. The design section for Chinde Branch 1 is shown on Exhibit 11-76E, Sheet 1.

South Barber Channel in the post-mining topography is a tributary to the Neck Arroyo. The post-mining topography changes the pre-mine drainage pattern by diverting the upstream watersheds of the Barber Wash into the South Barber watershed. The reclaimed South Barber Channel will have a riprapped drop structure from Station 13+91 to 20+70. Refer to Appendix 11-EE for riprap size design and Exhibit 11-76C and 11-76E for the profile and typical section. The flow velocities in South Barber Channel are less than or equal to the velocities of the pre-mine channel (see Table 11-26).

11.6.4.2.3 Area III Reclaimed Channels

Seven post-mining or reclaimed channels in the Area III FSC have watersheds that are larger than 640 acres, which require detailed designs according to the Reclamation Surface Stabilization Handbook (BNCC, 1992). The alignment of the seven post-mining/reclaimed channels are shown on Exhibit 11-78 and are designated as Lowe, Lowe North, Lowe North R2, Lowe North R3, Lowe North R4, Lowe South, and North Fork. The pre-mine surface configuration with channels is shown on Exhibit 11-78A.

The design of the reclaimed channel was based on a comparison of pre-mine channel flow velocities with post-mine channel flow velocities using HEC-RAS. Specifically, the design philosophy was to design a channel that is: 1) equally or more stable than the pre-mine channel by demonstrating that the post-mine flow velocities are less than the pre-mine, and 2) able to convey the 100-yr 6-hr event.

Mining has disturbed the main channel and tributaries of Lowe North and Lowe South Branches; therefore detailed cross-sections of the pre-mine channels are not available to perform a HEC-RAS analysis for comparison with the reclaimed channels. In lieu of a comparison with premining channel conditions, the reclaimed channels were designed to have average flow velocities less than 5 fps during the peak flow from a 2-yr 6-hr storm event. The limiting criterion of 5 fps is based on the erosive velocity of the spoils, which is 5 fps. The bottom and banks of the reclaimed channels will be in the regraded spoils. The channel bottoms and banks will not be topsoiled. Only the North Fork pre-mine channel and the downstream reach of the Lowe Arroyo near the western permit boundary were analyzed as pre-mine channels for comparisons with the post-mining channel.

TABLE 11-26

PRE-MINE AND POST-MINING CHANNEL VELOCITIES

Chinde Branch 1

	Pre-	Mine	Post-Mining			
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity		
Storm Event	(fps)	(fps)	(fps)	(fps)		
2-Year	n/a	n/a	4.43	4.02		
10-Year	n/a	n/a	6.80	4.50		
25-Year	n/a	n/a	7.62	4.88		
100-Year	n/a	n/a	8.09	5.19		

Hosteen Wash Branch 1

	Pre-	Mine	Post-Mining			
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity		
Storm Event	(fps)	(fps)	(fps)	(fps)		
2-Year	9.56	4.81	6.65	5.10		
10-Year	12.91	6.23	9.42	4.63		
25-Year	14.38	6.92	9.58	4.97		
100-Year	15.97	7.62	10.63	5.42		

South Barber Channel

	Pre-	Mine	Post-	Mining
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity
Storm Event	(fps)	(fps)	(fps)	(fps)
2-Year	7.65	5.13	7.65	3.53
10-Year	10.25	6.78	10.25	4.41
25-Year	11.05	7.42	11.05	4.85
100-Year	12.25	7.92	12.21	5.30

TABLE 11-27

HEC-RAS RESULTS

Chinde Branch 1 Post-mining

		2-Year			10-Year			25-Year			100-Year	
Flow Change		Veloci	ty (fps)		Velocit	ty (fps)		Velocit	y (fps)		Velocit	ty (fps)
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg
192.92	38	3.59	3.47	104	4.92	4.76	149	5.61	4.82	213	6.19	4.85
170.00	101	4.22	4.18	258	6.80	4.31	468	7.62	4.88	511	7.75	4.93
123.00	112	4.43	4.10	332	6.21	4.49	496	7.04	4.92	741	8.05	5.41
37.00	108	4.33	4.19	333	6.17	4.48	503	7.06	4.89	758	8.09	5.36

Hosteen Branch 1 Pre-mine

		2-Year			10-Year			25-Year			100-Year	
Flow Change		Velocit	ty (fps)		Velocit	y (fps)		Velocit	y (fps)		Velocit	y (fps)
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg
104.00	62	6.46	2.20	192	7.91	2.72	286	12.90	3.22	423	8.94	3.23
74.00	135	8.76	4.28	395	10.39	4.91	583	11.00	5.16	854	11.77	5.51
46.00	180	8.79	7.01	511	11.87	9.58	748	13.27	10.70	1,089	14.73	12.17
6.00	226	9.56	8.91	640	12.91	12.16	937	14.38	13.53	1,366	15.97	15.03

Hosteen Branch 1 Post-mining

		2-Year			10-Year			25-Year			100-Year	
Flow Change		Velocit	ty (fps)		Velocit	ty (fps)		Velocit	ty (fps)		Velocit	ty (fps)
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg
86.00	121	6.30	4.83	364	8.43	4.52	540	9.26	4.91	793	10.17	5.37
28.00	125	6.65	6.33	409	9.42	5.16	627	9.58	5.24	951	10.63	5.64

South Barber Channel Pre-mine

		2-Year			10-Year			25-Year			100-Year	
Flow Change		Velocit	ty (fps)		Velocit	ty (fps)		Velocit	ty (fps)		Velocit	ty (fps)
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg
15.42	51	7.65	5.13	166	10.25	6.78	251	11.05	7.42	375	12.25	7.92

South Barber Channel Post-mining

		2-Year			10-Year			25-Year			100-Year	
Flow Change		Velocit	ty (fps)		Velocit	y (fps)		Velocit	y (fps)		Velocit	ty (fps)
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg
107.54	24	3.23	3.14	73	4.56	3.76	110	5.28	4.08	164	6.04	4.51
87.54	22	3.16	2.80	78	4.81	3.42	123	5.52	3.82	192	6.27	4.26
27.00	31	2.98	2.87	103	4.43	3.38	159	5.09	3.68	243	5.87	3.97
20.70	51	7.65	5.06	166	10.25	6.58	251	11.05	7.19	377	12.21	7.71



(3/11)

Table 11-28 compares pre-mining and post-mining channel velocities for the entire channel reaches that were modeled. Both the maximum and average flow velocities are provided for each of the drainages modeled. Table 11-29 provides a detailed breakdown between channel reaches (channel stations) by listing the design flows that were input at each station and the corresponding flow velocities for that particular channel reach. For all design storm events the reclaimed channels have a lower maximum and average flow velocity than the pre-mine channels. For all the reclaimed channels not compared to a pre-mining channel the average flow velocities during the 2-yr 6-hr storm event are less than 5 fps. Results of the HEC-RAS analysis also indicate that the reclaimed channels will convey the peak flows generated by the 100-yr 6-hr precipitation event. The HEC-RAS output files for all the reclaimed and pre-mining channels modeled are provided in Appendix 11-X1 and 11-Y1 (post-mining); and Appendix 11-X2 and 11-Y2 (pre-mining).

The lower post-mine flow velocities are attributed to lower peak flows and different channel geometries in the reclaimed channel versus the pre-mine channel. The lower peak flows result from the replacement of pre-mine badlands with reclaimed areas that have lower curve numbers. Generally, the pre-mine channels that were modeled are incised, which confines the flow and increases the flow depth, producing higher channel velocities than the reclaimed channel. The grades of the pre-mine channels were also steeper. The reclaimed typical channel section consists of a main channel that will retain the 2-yr 6-hr peak flow with a floodplain. The flows larger than the 2-yr 6-hr peak flow will overflow into the floodplain (See Exhibit 11-78C). The geometry of the design sections for the reclaimed channels was proportioned depending on the magnitude of the flows.

Pre-mine and post-mine channel peak flows were estimated using SEDCAD for the 2-, 10-, 25-, and 100-yr 6-hr events. The peak flows were input at the prediction points or SEDCAD structures for both the pre-mine and post-mine HEC-RAS analysis. The supporting documentation for the pre-mining peak flow estimations are in Appendix 7-D (Lowe Arroyo), and 7-H (Cottonwood Arroyo). The supporting documentation for the post-mining peak flow estimations are in Appendix 11-X (Lowe Arroyo), and 11-Y (Cottonwood Arroyo).

The pre-mining SEDCAD drainage subdivision for Lowe and Cottonwood Arroyo is shown on Exhibit 7-4, the post-mining drainage subdivision is shown on Exhibit 11-77. 11.6.4.2.3.1 Analysis of Pre-mine Channels

Prior to the construction of the North Fork Diversion, the North Fork of the Cottonwood Arroyo reach inside the permit boundary was field surveyed to obtain cross-sections on approximately 100-foot intervals. The locations of the cross-sections are shown on Exhibit 11-78A, Sheet 3. The cross-section data and the predicted peak flows from SEDCAD were input into HEC-RAS to obtain pre-mining channel flow velocities and depths. The HEC-RAS results are presented in Appendix 11-Y2 and summarized on Tables 11-28 and 11-29 in this section.

The downstream reach of the Lowe Arroyo at the western permit boundary was also surveyed to obtain cross-sections on approximately 100-foot intervals. Mining has not disturbed this reach of channel. The cross-section data and the predicted peak flows were input into HEC-RAS to obtain both pre-mining and post-mining channel flow velocities and depths for comparative purposes. The HEC-RAS results are presented in Appendix 11-X2 (pre-mining) and Appendix 11-X1 (post-mining) with results summarized on Table 11-28 and 11-29 in this section.

The Manning's roughness coefficients (n) used for the North Fork pre-mine channel in the HEC-RAS analysis were as follows: 0.045 for the floodplain, 0.035 for the channel banks, and 0.030 for the channel bottom. For the Lowe Arroyo pre-mine channel, the reach in the vicinity of the western permit boundary, the n values used were: 0.045 for the floodplain and a composite n of 0.033 for the channel bottom and channel banks.

Due to the lack of detailed cross-sectional data of the North Lowe and Lowe South main channels including its tributaries, the pre-mine HEC-RAS analysis were not performed for these channels.

11.6.4.2.3.2 Analysis of Reclaimed Channels

The flow velocities in the reclaimed channels were determined by entering the reclaimed channel sections into HEC-RAS. The reclaimed channel sections were taken from the Area III FSC on approximately 200-foot intervals. The reclaimed channel reaches are transitioned into the existing natural channel at the upstream and downstream ends. The transitions of the reclaimed channel to the natural channel generally occurred over a 100 to 200-foot reach. The post-mine peak flows and the gradient of that particular drainage channel dictated the geometry of the reclaimed channel. The locations of reclaimed channel cross-sections used in HEC-RAS are shown on Exhibit 11-78, Sheets 2-4. The typical reclaimed channel sections are shown on Exhibit 11-78B.

The Manning's roughness coefficients (n) used for the reclaimed channels in the HEC-RAS analysis were as follows: 0.045 for the floodplain and a composite n of 0.033 for the channel bottom and channel banks. For the configuration of the reclaimed channels analyzed the composite n is approximately equivalent to a channel having n values of 0.030 for the channel bottom and 0.035 for the channel banks.

Due to lack of detailed cross-sections of the pre-mine channels in the Lowe Arroyo watershed a comparative analysis could not be made between pre-mining and post-mining conditions. In lieu of a comparative analysis, the reclaimed channels in the Lowe drainage area were designed to have flow velocities less than 5 fps during the 2-yr 6-hr peak flow. The gradients of the reclaimed channels in the Lowe drainage area are also generally less than pre-mine, except in the steep reaches where drop structures are required. This coupled with the cross-sectional configuration of the reclaimed channel strongly indicates that the post-mine flow velocities could possibly be less than the pre-mine. The HEC-RAS results for the reclaimed channels within the Lowe watershed are in Appendix 11-X1 and summarized on Table 11-28 and 11-29.

Drop structures will be utilized in the steep reaches of the reclaimed channels to control erosion. The drop structures will be designed to remain stable during the 25-yr 6-hr peak flow and pass the 100-yr 6-hr peak flow with a 1-foot freeboard. A computer software, Rip-rap Design Systems, Version 2; WEST Consultants, Inc.; San Diego, Ca, which calculates rip-rap size utilizing seven different methods was used to determine the rip-rap size. Four design methods (ASCE, USBR, Isbash, and HEC-11) were used to determine the D_{50} rock size. For the selected D_{50} rock size refer to the drop structure schedule on Exhibit 11-78C. The supporting design data for the drop structures is presented in Appendix 11-X3. The locations of the drop structures are shown on the plan and profile drawings, Exhibit 11-78, Sheets 2 and 3; and Exhibit 78B, Sheets 1 and 2, respectively.

Tributaries having less than 640 acres of watershed may require rip-rap down drains depending on the grade at the entrance into the main reclaimed channel. The designs for these down drains will be done during the final regrading process and will be presented on reclamation as-built drawings. The as-built drawings will be submitted to the regulatory agency.

TABLE 11-28PRE-MINE AND POST-MINING CHANNEL VELOCITIES

North Fork

	Pre-	Mine	Post-	Post-Mining			
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity			
Storm Event	(fps)	(fps)	(fps)	(fps)			
2-Year	9.34	5.18	6.42	4.79			
10-Year	12.08	6.46	8.71	4.73			
25-Year	12.58	6.88	9.47	4.66			
100-Year	13.48	7.20	10.73	4.70			

Lowe

	Pre-	Mine	Post-Mining			
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity		
Storm Event	(fps)	(fps)	(fps)	(fps)		
2-Year	8.80	4.46	7.76	3.87		
10-Year	11.59	5.95	8.70	5.20		
25-Year	12.95	6.55	10.18	5.90		
100-Year	14.51	7.13	12.03	6.56		

Lowe North

	Pre-	Vine	Post-Mining				
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity			
Storm Event	(fps)	(fps)	(fps)	(fps)			
2-Year	n/a	n/a	5.58	4.32			
10-Year	n/a	n/a	7.94	4.40			
25-Year	n/a	n/a	8.38	4.42			
100-Year	n/a	n/a	9.35	4.50			

Lowe North R1 Post-Mining Maximum Velocity Average Velocity Pre-Mine Maximum Velocity Average Velocity Storm Event (fps) (fps) (fps) (fps) 2-Year n/a n/a 2.21 2.02 10-Year 3.76 3.40 n/a n/a 4.41 3.97 25-Year n/a n/a 100-Year 5.11 4.57 n/a n/a

	Lowe North R2										
	Pre-l	Mine	Post-Mining								
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity							
Storm Event	(fps)	(fps)	(fps)	(fps)							
2-Year	n/a	n/a	3.93	3.83							
10-Year	n/a	n/a	5.99	4.11							
25-Year	n/a	n/a	7.06	4.03							
100-Year	n/a	n/a	8.03	3.98							

		Lowe North R3	}	
	Pre-	Mine	Post-	/lining
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity
Storm Event	(fps)	(fps)	(fps)	(fps)
2-Year	n/a	n/a	5.24	4.47
10-Year	n/a	n/a	7.15	6.14
25-Year	n/a	n/a	7.98	6.76
100-Year	n/a	n/a	9.09	7.49

Lowe North R4

	Pre-	Mine	Post-M	lining*
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity
Storm Event	(fps)	(fps)	(fps)	(fps)
2-Year	n/a	n/a	n/a	n/a
10-Year	n/a	n/a	n/a	n/a
25-Year	n/a	n/a	n/a	n/a
100-Year	n/a	n/a	n/a	n/a

Lowe South

	Pre-	Mine	Post-N	Aining
	Maximum Velocity	Average Velocity	Maximum Velocity	Average Velocity
Storm Event	(fps)	(fps)	(fps)	(fps)
2-Year	n/a	n/a	4.87	3.38
10-Year	n/a	n/a	7.09	3.55
25-Year	n/a	n/a	7.39	3.57
100-Year	n/a	n/a	8.24	3.68

* The reclaimed reach is riprapped.

TABLE 11-29 HEC-RAS RESULTS

North Fork Pre-mining

		2-Year			10-Year			25-Year		1	00-Year	
Flow Change		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg
150.00	256.0	9.34	5.18	674.0	12.08	6.46	971.0	12.58	6.88	1,401.0	13.48	7.20

_	North Fork Post-mining														
	2-Year 10-Year 25-Year 100-Year														
Flow Change	Velocity (fps) Velocity (fps)										Velocit	ty (fps)			
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg			
142.24	249	6.42	4.79	665	8.71	4.73	962	9.47	4.66	1,393	10.73	4.70			
13.03*	1,050	N/A	N/A	2,880	N/A	N/A	4,196	N/A	N/A	6,107	N/A	N/A			

* For the flow change the reach is undisturbed.

	0				Lowe	Pre-mini	ng									
		2-Year 10-Year 25-Year 100-Year														
Flow Change		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)				
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg				
38.83	253.0	8.80	5.00	735.0	11.59	7.13	1,089.0	12.95	8.07	1,597.0	14.32	9.09				
15.95	315.0	7.35	5.77	926.0	10.96	8.05	1,370.0	12.67	9.04	2,017.0	14.51	10.01				

	Lowe Post-mining														
		2-Year 10-Year 25-Year 100-Year													
Flow Change		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)			
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg			
38.83	127.0	7.76	3.94	386.0	7.09	4.56	578.0	8.25	5.08	859.0	9.66	5.47			
33.20	146.0	7.09	3.60	490.0	8.47	5.33	755.0	9.97	6.20	1,156.0	11.21	7.02			
15.95	155.0	7.09	3.87	514.0	8.70	5.29	791.0	10.18	6.01	1,206.0	12.03	6.72			

				Lo	owe Nor	th Post-r	nining								
	2-Year 10-Year 25-Year 100-Year														
Flow Change		Velocit	y (fps)		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)			
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg			
90.01	125.00	5.26	4.14	372.0	7.03	4.24	553.0	7.69	4.35	820.0	8.78	4.46			
53.09	127.00	5.58	4.73	386.0	7.94	4.77	578.0	8.38	4.59	859.0	9.35	4.58			

	Lowe North R1 Post-mining														
	2-Year 10-Year 25-Year 100-Year														
Flow Change	Velocity (fps) Velocity (fps)							Veloci	ty (fps)		Veloci	ty (fps)			
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg			
12.73	17.0	2.21	2.02	77.0	3.76	3.40	126.0	4.41	3.97	202.0	5.11	4.57			

	Lowe North R2 Post-mining														
	2-Year 10-Year 25-Year 100-Year														
Flow Change		Velocity (fps) Velocity (fps) Velocity (fps)													
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg			
14.00	112.0	3.93	3.83	307.0	5.99	4.11	445.0	7.06	4.03	643.0	8.03	3.98			

				Lov	ve North	R3 Post	-mining								
	2-Year 10-Year 25-Year 100-Year														
Flow Change		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)			
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg			
15.89	33.0	5.24	4.04	98.0	7.15	5.42	144.0	7.98	5.96	210.0	9.09	6.60			

	Lowe North R4 Post-mining														
		2-Year			10-Year			25-Year		1	100-Year				
Flow Change		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)		Veloci	ty (fps)			
Location (Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg			
11.71*	86.0	N/A	N/A	230.0	N/A	N/A	331.0	N/A	N/A	475.0	N/A	N/A			

Lowe South Post-mining												
Flow	2-Year			10-Year		25-Year		100-Year				
Change		Veloci	ty (fps)		Velocit	ty (fps)		Velocit	ty (fps)		Velocit	ty (fps)
(Sta)	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg	Q (cfs)	Max	Avg
258.72*	83	N/A	N/A	209	N/A	N/A	296	N/A	N/A	418	N/A	N/A
243.0	106	3.62	3.07	318	5.78	2.98	473	6.32	3.01	701	7.39	3.13
178.00	106	4.87	3.56	329	7.09	3.86	495	7.39	3.89	739	8.24	3.99
33.2*	106	N/A	N/A	490	N/A	N/A	755	N/A	N/A	1,156	N/A	N/A
15.95*	155	N/A	N/A	514	N/A	N/A	791	N/A	N/A	1,206	N/A	N/A

* For the flow change the entire reach is either undisturbed or riprapped.

(10/06; 3/11)



11.6.4.2.4 Ephemeral Stream Diversion Designs

All streams within the Navajo Mine permit area with the possible exception of Chinde Arroyo are hydrologically ephemeral streams. Nevertheless, OSM regulations classify all streams with drainage areas greater than one square mile as intermittent streams regardless of flow conditions. Reclamation features and structures will be designed in accordance with the Reclamation Surface Stabilization Handbook (BNCC, 1992), which provides information concerning design of permanent diversions for ephemeral streams and addresses low order stream segments with drainage areas less than one square mile.

Design flows were developed using the SEDCAD computer model following the procedures and assumptions described in Chapter 7.

11.6.4.2.5 Area IV North Reclaimed Channels

All of the drainage basins in post-mining topography are less than one square mile (640 acres). Per the Reclamation Surface Stabilization Handbook (BNCC, 1992) the channels for these drainage basins will not require detail designs. The detail designs will be developed during the final regrading and reclamation process.

11.6.5 Impacts to Surface Water Availability

Ephemeral surface flows are unpredictable and of such poor water quality that essentially no use is made of the water for agricultural or other purposes (Chapters 6 and 7). Stock watering ponds are the principal use made of water on or near the permit area. Steps are taken to assure that this use is not impaired. During surface coal mining operations there will be a temporary reduction in surface water flows in the mined out drainages.

Following reclamation, the water supplies for existing livestock use will be replaced. Water levels in the alluvium downstream of mining are expected to recover following mining and flows

may actually be higher than in pre-mine conditions due to enhanced recharge rates within reclaimed areas.

The ponds found in the permit areas during the baseline surveys do not appear to have waterright filings (Chapter 7); however, the small basins are periodically utilized by livestock and wildlife when water collects in them following a storm. Pond reconstruction, if executed, will be performed to generally reproduce the storage capacity and surface area of the original impoundment. The water availability at the reconstructed ponds should be comparable to premine conditions, as SEDCAD modeling presented in Section 11.6.3.3 shows little change in surface flows and sediment yields following reclamation relative to baseline conditions. Additional water supplies may be available if new ponds are constructed or some of the sediment and/or drainage control ponds are converted to permanent stock water use at the request of the Navajo Nation.

BNCC has designed the Navajo Mine operations plan to minimize impacts to surface water through the use of sediment control measures for storm water runoff. These include reducing the disturbance area footprint, backfilling and stabilizing the pit areas as soon as practicable, and use of multiple hydrologic structures. The structures range from berms established around isolated areas of disturbance and coal stockpiles, to sedimentation ponds downgradient of mining, to armoring of channels in steep gradients. The Navajo Mine operations plan minimizes the potential for upland waters to commingle with runoff from disturbed areas through the diversion of streams upgradient of the operation around the active mining areas, and construction of upgradient or highwall impoundments. In addition, the BNCC implements a stream buffer zone policy to protect perennial and intermittent streams.

Sediment concentrations are predicted to be the same or less than pre-mining, however modeling suggests that post-mining, there may be increases in settleable solids concentrations from the mobilization of fine-grained materials. The best management practices are focused towards minimizing sediment, which will limit the dissolution of salts from fine particles entrained by runoff events. There is the potential for increases in TDS, sulfates, iron, and manganese in waters leaving the permit area, but concentrations of these parameters will not exceed water

quality standards and criteria associated with the predominant use of surface waters for livestock watering. In addition, BNCC has an SPCC plan that identifies areas of risk, specifies specific locations for containment structures, and has spill management protocols to minimize impacts from accidental releases of petroleum hydrocarbons.

The mining and reclamation plan re-establishes a final surface configuration which is comparable to the pre-mine topography. The calculated drainage density is equal or greater than the pre-mining topography, except in areas of pre-mine badlands. Reclaimed channels will have a small pilot channel within a floodplain. The reclamation plan has been engineered to minimize the potential for long-term badland development through the design of stable post-mining reclamation channels which have the potential for self-armoring and through the use of topdressing that is a suitable plant growth medium. The latter should better support the establishment of a sustaining and stabilizing vegetative cover. These reclamation strategies will minimize the potential for gully establishment and head cutting should destructive storm flows drain through the reclaimed watersheds. Modeling predicts post-mining peak flows similar or lower than pre-mining flows.

The probable hydrologic projections suggest that mining will not have a deleterious impact on the hydrologic balance within the area, and BNCC will verify this through the hydrologic monitoring program and assessments prepared for bond release.

11.6.6 <u>Hydrologic Monitoring Reporting</u>

Hydrologic monitoring reports will be submitted to OSM on a quarterly frequency and a detailed monitoring report will be submitted twice during the permit term. The quarterly monitoring report will consist of a summary of the data collected and events for the quarter, identification of anomalies, inconsistencies, or non-compliances, and include an electronic copy of the raw analytical data on disk.

In addition to the quarterly hydrologic monitoring report, an in-depth hydrology report will be submitted twice during the permit term to OSM. This detailed hydrologic monitoring report will provide a detailed reduction, analysis, and interpretation of surface water and groundwater data collected to date, in addition to the raw data. The analysis will include plotting hydrographs, parameter concentration vs. time graphs, trilinear graphs, and statistical summaries. The monitoring data is then compared against historical data trends and water quality standards to identify changes in water quality or quantity. Specifically for the detailed report, flow and water quality data will be provided as detailed below.

<u>Flow</u>: For the nearly perennial Chinde Arroyo stations, CD-1A and CD-2A, quarterly hydrographs will be plotted. A comparison of the flow between the upstream and downstream stations will be provided.

<u>Water Quality and Sediment</u>: Stage and discharge corresponding to each sample will be reported along with the measured concentrations. For Chinde Arroyo, summary statistics will include water yield and sediment and analyte concentrations for each month. A comparison of water quality and sediment concentrations between the upstream and downstream stations will be provided.

A comparison will be made between surface water quality concentrations collected and the applicable water quality State of New Mexico for Interstate and Intrastate Streams standards and Navajo Nation Stream Standards for both the biannual report and the quarterly reports.

Discussion on requirements of the Clean Water Act, National Pollutant Discharge Elimination System, (NPDES) and the Stormwater Pollution Prevention Plan (SWPPP) is found in Section 11.2.6.

11.6.6.1 Surface Water Reference Criteria

Surface water reference criteria were developed from 8 years of surface water monitoring data to aid in the evaluation of future surface water monitoring data.

Each reference criteria value at each station (Table 11-24a through 11-24g) was determined by selecting the larger of the mean plus two (2) standard deviations, which was determined from the baseline data, the maximum value in the data set or the standard. The standard was determined as the smallest of the following three (3) categories:

- Irrigation Water Criteria
- Livestock Water Criteria
- 40 CFR Part 434 Coal Mining Point Source Effluent Limitations

Reference criteria were not determined for calcium, magnesium, sodium, potassium, carbonate, bicarbonate, and sulfate because these parameters will be used to calculate an ion balance.

The reference criteria will be adjusted based on changing technical information and regulations and new field data. The criteria will be re-evaluated at permit renewal time.

TABLE 11-24A SURFACE WATER MONITORING REFERENCE CRITERIA SATAION CD-1^{1,2}

PARAMETER	UNIT	SELECTED CRITERIA	MAX DETECT LIMIT
Conductivity	µmhos/cm	3189	10
pH	Units	8.7	-
TDS	mg/l	2284	25
TSS	mg/l	1265	25
Calcium	mg/l	120	10
Magnesium	mg/l	32.4	10
Sodium	mg/l	586	25
Potassium	mg/l	5.23	0.5
Carbonate	mg/l	44.3	2
Bicarbonate	mg/l	572	10
Sulfate	mg/l	986	10
Chloride	mg/l	139	10
Fluoride	mg/l	4.3	0.1
Iron	mg/l	20.7	0.25
Boron	mg/l	0.90	0.1
Selenium	mg/l	0.015	0.001

(1) Data set includes NAPI irrigation, seasonal seepage, and precipitation runoff samples.
 (2) Data set represents samples from 1996-2003

TABLE 11-24bSURFACE WATER MONITORING REFERENCE CRITERIASTATION CD-2^{1,2}

PARAMETER	UNIT	SELECTED CRITERIA	MAX DETECT LIMIT
Conductivity	µmhos/cm	4187	10
pH	Units	8.5	-
TDS	mg/l	3328	25
TSS	mg/l	365	25
Calcium	mg/l	624	10
Magnesium	mg/l	56.4	10
Sodium	mg/l	727	25
Potassium	mg/l	11.0	0.5
Carbonate	mg/l	36.8	2
Bicarbonate	mg/l	398	10
Sulfate	mg/l	1763	10
Chloride	mg/l	176	10
Fluoride	mg/l	2.14	0.1
Iron	mg/l	6.1	0.25
Boron	mg/l	0.55	0.1
Selenium	mg/l	0.013	0.001

(1) Data set includes NAPI irrigation, seasonal seepage, and precipitation runoff samples.

(2) Data set represents samples from 1996-2003

TABLE 11-24c SURFACE WATER MONITORING REFERENCE CRITERIA STATION CN-1^{3,4,5}

PARAMETER	UNIT	SELECTED CRITERIA	MAX DETECT LIMIT
Conductivity	µmhos/cm	2019	1
pН	Units	8.6	-
TDS	mg/l	1611	25
TSS	mg/l	293,000	1
Calcium	mg/l	-	0.5
Magnesium	mg/l	-	0.5
Sodium	mg/l	-	0.5
Potassium	mg/l	-	0.5
Carbonate	mg/l	-	2
Bicarbonate	mg/l	-	10
Sulfate	mg/l	-	10
Chloride	mg/l	1500	10
Fluoride	mg/l	1.84	0.1
Nitrate	mg/l	_5	0.05
Iron	mg/l	7.0	0.25
Manganese	mg/l	4.0	0.25
Boron	mg/l	0.78	0.1
Selenium	mg/l	0.02	0.001

(3) Data set includes irrigation and precipitation runoff samples.(4) Data set represents eight (8) years of data collection, 1985-1992

TABLE 11-24d SURFACE WATER MONITORING REFERENCE CRITERIA STATION CNS-1^{3,4,5}

PARAMETER	UNIT	SELECTED CRITERIA	MAX DETECT LIMIT
Conductivity	µmhos/cm	2300	1
pН	Units	8.7	-
TDS	mg/l	1669	25
TSS	mg/l	1,120,000	1
Calcium	mg/l	-	0.5
Magnesium	mg/l	-	0.5
Sodium	mg/l	-	0.5
Potassium	mg/l	-	0.5
Carbonate	mg/l	-	2
Bicarbonate	mg/l	-	10
Sulfate	mg/l	-	10
Chloride	mg/l	1500	10
Fluoride	mg/l	1.84	0.1
Nitrate	mg/l	_5	0.05
Iron	mg/l	7.0	0.25
Manganese	mg/l	4.0	0.25
Boron	mg/l	1.02	0.1
Selenium	mg/l	0.02	0.001

(3) Data set includes irrigation and precipitation runoff samples.(4) Data set represents eight (8) years of data collection, 1985-1992

TABLE 11-24eSURFACE WATER MONITORING REFERENCE CRITERIASTATION CS-1^{3,4,5}

PARAMETER	UNIT	SELECTED CRITERIA	MAX DETECT LIMIT
Conductivity	µmhos/cm	5620	1
pН	Units	8.62	-
TDS	mg/l	1240	25
TSS	mg/l	1,030,000	1
Calcium	mg/l	-	0.5
Magnesium	mg/l	-	0.5
Sodium	mg/l	-	0.5
Potassium	mg/l	-	0.5
Carbonate	mg/l	-	2
Bicarbonate	mg/l	-	10
Sulfate	mg/l	-	10
Chloride	mg/l	1500	10
Fluoride	mg/l	1.32	0.1
Nitrate	mg/l	_5	0.05
Iron	mg/l	17.6	0.25
Manganese	mg/l	4.0	0.25
Boron	mg/l	1.10	0.1
Selenium	mg/l	0.02	0.001

(3) Data set includes irrigation and precipitation runoff samples.

(4) Data set represents eight (8) years of data collection, 1985-1992

TABLE 11-24fSURFACE WATER MONITORING REFERENCE CRITERIASTATION NB-1^{3,4, 5}

PARAMETER	UNIT	SELECTED CRITERIA	MAX DETECT LIMIT
Conductivity	µmhos/cm	8200	1
pH	Units	8.6	-
TDS	mg/l	8260	25
TSS	mg/l	67,300	1
Calcium	mg/l	-	0.5
Magnesium	mg/l	-	0.5
Sodium	mg/l	-	0.5
Potassium	mg/l	-	0.5
Carbonate	mg/l	-	2
Bicarbonate	mg/l	-	10
Sulfate	mg/l	-	10
Chloride	mg/l	1500	10
Fluoride	mg/l	2.96	0.1
Nitrate	mg/l	_5	0.05
Iron	mg/l	7.0	0.25
Manganese	mg/l	4.0	0.25
Boron	mg/l	0.98	0.1
Selenium	mg/l	0.02	0.001

(3) Data set includes irrigation and precipitation runoff samples.

(4) Data set represents eight (8) years of data collection, 1985-1992

TABLE 11-24gSURFACE WATER MONITORING REFERENCE CRITERIASTATION NB-2^{3,4, 5}

PARAMETER	UNIT	SELECTED CRITERIA	MAX DETECT LIMIT
Conductivity	µmhos/cm	4200	1
pН	Units	8.6	-
TDS	mg/l	3840	25
TSS	mg/l	64,500	1
Calcium	mg/l	-	0.5
Magnesium	mg/l	-	0.5
Sodium	mg/l	-	0.5
Potassium	mg/l	-	0.5
Carbonate	mg/l	-	2
Bicarbonate	mg/l	-	10
Sulfate	mg/l	-	10
Chloride	mg/l	1500	10
Fluoride	mg/l	1.86	0.1
Nitrate	mg/l	_5	0.05
Iron	mg/l	7.0	0.25
Manganese	mg/l	4.0	0.25
Boron	mg/l	0.75	0.1
Selenium	mg/l	0.022	0.001

(3) Data set includes irrigation and precipitation runoff samples.

(4) Data set represents eight (8) years of data collection, 1985-1992

11.7 **REFERENCES**

- Appelo, C. A. J. and Postma, D., 2007. Geochemistry, Groundwater and Pollution, 2nd ed. A.A. Balkema Publishers.
- Benner, S.G., Blowes, D.W., Ptacek, C.J., and Mayer, K.U., 2002. Rates of Sulfate Reduction and Metal Sulfide Precipitation in a Permeable Reactive Barrier. Applied Geochemistry, 17, 301–320.
- BHP Navajo Coal Company (BNCC). 1992. <u>Reclamation Surface Stabilization Handbook.</u> <u>Unpublished report, available for review at the Navajo Mine Environmental Quality</u> <u>Department</u>
- BHP Navajo Coal Company (BNCC). 2007. 2006-2007 Navajo Mine Hydrology Report. Unpublished report submitted to the Office of Surface Mining Reclamation and Enforcement. Submitted 29 Feb 2009.
- Clark, D.W. 1995. Geochemical processes in ground water resulting from surface mining of coal at the Big Sky and West Decker Mine areas, southeastern Montana: <u>USGS Water-</u> <u>Resources Investigations Report 95-4097</u>, 80p

Clark, I. and Fritz, P., 1997. Environmental isotopes in hydrogeology. Lewis, Boca Raton.

- Doshi, S. M., 2006. Bioremediation of Acid Mine Drainage Using Sulfate-Reducing Bacteria. US EPA Office of Solid Waste and Emergency Response, Office of Superfund Remediation and Technology Innovation.
- Drever, J. I., 1988. The Geochemistry of Natural Waters. Englewood Cliffs, New Jersey, Prentice Hall.

- Freeze, A. R. and Cherry, J. A., 1979. Groundwater. Englewood Cliffs, New Jersey, Prentice Hall.
- Frenzel, P.F. 1983. Simulated changes in ground-water levels related to proposed development of Federal coal leases, San Juan Basin, New Mexico: <u>U.S. Geological Survey Open-File</u> <u>Report 83-949</u>, 65 p.
- Gadd, G.M. 2004. Microbial influence on metal mobility and application for bioremediation. Geoderma 122, 2-4, 109-119.
- Gray. 1970. Handbook on the Principles of Hydrology, Section VIII.7.2.
- Johnson, A.J. 1967. Specific Yield Compilation of Specific Yields for Various Materials. USGS Water-Supply Paper 1662-D.
- Kaiser, W.R., Swartz, T.E., and Hawkins, G.J. 1994. Hydrologic framework of the Fruitland Formation, San Juan Basin. New Mexico Bureau of Mines and Minerals Bulletin 146: <u>Coalbed methane in the upper Cretaceous Fruitland Formation, San Juan Basin, New</u> <u>Mexico and Colorado</u>, pp. 133-164.
- Leopold and Maddock. 1953. The Hydraulic Geometry of Stream Channels and Some Physiographic Implications, <u>USGS Professional Paper 242</u>.
- M.A.R.C. and Hess and Fisher Engineers, Inc. 1985. <u>Handbook of Alternative Sediment</u> <u>Control Methodologies for Mined land</u>, for USDOI/OSMRE. [Permit NM-0003C, Chapter 27, Appendix 27-J]
- Miller, Dean; E. L. Boeker; R. S. Thorsell; R. R. Olendorff. 1975. <u>Suggested Practices for</u> <u>Raptor Protection on Powerlines</u>. Raptor Research Foundation, Inc., for Edison Electric Institute.

- Mavor, M.J., Robinson, T.J., Pratt, J.C., and Close, J.C., 1992. Western Cretaceous Coal Seam Project. Summary of the Vertical COAL Site, San Juan Basin. <u>Gas Research Institute</u> <u>Topical Report No. GRI-92/0504</u>. Prepared by Resource Enterprises Inc., Salt Lake City, Utah.
- Navajo Nation Environmental Protection Agency Water Quality Program (NNEPA WQP), 2008. Navajo Nation Surface Water Quality Standards 2007, passed by Navajo Nation Resources Committee May 13, 2008.
- Niemczyk, T.M. and E.A. Walters, 1980, Assessment of water supply contamination due to underground coal gasification. <u>New Mexico Water Resources Research Institute Report</u> <u>No. 128,</u> 94 p.
- Norwest Corporation (Norwest). 2011. Navajo Mine Area IV Groundwater Modeling Report. Unpublished report submitted to BHP Navajo Coal Company.
- O'Brien, Thomas and Richard Roy. 1991. Reconnaissance Investigation of Irrigation Drainage in the San Juan River Area, San Juan County, Northwestern New Mexico. The Department of the Interior, U.S. Fish and Wildlife Service, Ecological Services. 20 p. Available online at: <u>http://www.fws.gov/southwest/es/Documents/R2ES/SJRiverRecon1991.pdf</u>
- Praharaj, T. and Fortin, D., 2008. Seasonal Variations of Microbial Sulfate and Iron Reduction in Alkaline Pb–Zn Mine Tailings (Ontario, Canada) Applied Geochemistry, 23, 3728–3740.
- Questa Engineering Corp. (December 2000). <u>The 3M CBM Final Report. Volume I: Analysis</u> <u>and Results.</u>
- Rehm, B.W., G.H. Groenewold, and K.A. Morin, 1980. Hydraulic properties of coal and related materials, Northern Great Plains. <u>GROUNDWATER</u>, v. 20, p. 217-236.

- San Juan Coal Company (SJCC). 1982. <u>Mining Permit Application</u>. Chapter 12. BNCC Utah International Inc.
- San Juan Coal Company (SJCC). 1983. <u>Mining Permit Application</u>. Chapter 12. BNCC Utah International Inc.
- San Juan Coal Company (SJCC). 2009. San Juan Mine Permit 09 01, Appendix 907-E. Assessment of Potential Surface and Groundwater Quality and Quantity Impacts.
- Schwarzenbach, R. P., Gschwend, P. M., and Imboden, D. M., 1993. Environmental Organic Chemistry. Wiley-Interscience.
- Stone, W. J. et al. 1983. Hydrogeology and water resources of San Juan Basin, New Mexico. Hydrologic Report 6, New Mexico Bureau of Mines and Mineral Resources.
- Stone, W. J. 1984. Recharge at the Navajo Mine Based on Chloride, Stable Isotopes, and Tritium in the Unsaturated Zone. <u>Open File Report 213</u>. New Mexico Bureau of Mines <u>and Mineral Resources</u>.
- Stone, W. J. 1986. Phase II Recharge Study at the Navajo Mine Based on Chloride, Stable Isotopes, and Tritium in the Unsaturated Zone. <u>Open File Report 216. New Mexico</u> <u>Bureau of Mines and Mineral Resources.</u> [Permit NM-0003C, Chapter 27, Appendix 27-A]
- Stone, W. J. 1987. Phase III Recharge Study at the Navajo Mine-Impact of Mining on Recharge. <u>Open file Report 282, New Mexico Bureau of Mines and Mineral Resources.</u> [Permit NM-0003C, Chapter 27, Appendix 27-A]
- Stumm, W. and Morgan, J. J., 1996. Aquatic Chemistry, Chemical Equilibria and Rates in Natural Waters, 3rd ed. John Wiley & Sons, Inc., New York.

- Thorn, Conde R. 1993. Water-Quality Data from the San Juan and Chaco Rivers and Selected Alluvial Aquifers, San Juan County, New Mexico. <u>USGS Open-File Report 93-84</u>. Available online at: <u>http://pubs.er.usgs.gov/usgspubs/ofr/ofr9384</u>(Verified 27 January 2011).
- United States Department of Agriculture, Soil Conservation Service. 1980. <u>Soil Survey of San</u> Juan County, New Mexico, Eastern Part.
- U.S. Department of Energy, 2009. Evaluation of the Trench 2 Groundwater Remediation System at the Shiprock, New Mexico, Legacy Management Site, LMS/SHP/S05037, Office of Legacy Management, Grand Junction, Colorado, March.
- Van Voast, Wayne A., R. B. Hedges and J. J. McDermot. 1976. Hydrologic Aspects of Spring Mining in Subbituminous Coal Fields of Montana. In Proceed. <u>Fourth Symposium of Surface Mining and Reclamation</u>, Louisville, KY. National Coal Assn. and Bituminous Coal Research, Inc.
- White Industrial Seismology, Inc. 1985. Letter report from David S. Bowley, consulting geophysicist, to George Gilfillan, blasting engineer, Navajo Mine, dated April 27, 1985.
 [Permit NM-0003C, Chapter 23, Appendix 23-D]

Appendix 11-VV

Navajo Mine: Spoil Leachate Test Analysis

NAVAJO MINE: MINE SPOIL LEACHATE TEST ANALYSES

Submitted to: BHP BILLITON NAVAJO COAL COMPANY

Date: March 2, 2011

Norwest Corporation

950 South Cherry Street Suite 800 Denver, CO 80246 Telephone (303) 782-0164 FAX (303) 782-2560 www.norwestcorp.com

Author: Art O'Hayre and Konrad Quast





TABLE OF CONTENTS

1	INTF	RODUCT	ΓΙΟΝ	1-1
2	MIN	E SPOIL	_ TESTING PROGRAM	2-2
	2.1	COLLE	CTION OF REPRESENTATIVE SAMPLES	2-2
		2.1.1	Mine Spoil Samples	2-2
		2.1.2	Groundwater Samples	2-2
	2.2	LABOR	ATORY LEACHING TEST PROCEDURES	2-3
	2.3	SOLIDS	S ANALYSES	2-4
		2.3.1	Rietveld X-ray Diffraction Results	2-4
		2.3.2	Total Metals Results	2-6
		2.3.3	Cation Exchange Capacity	2-6
3	LEA	CHATE	TEST RESULTS OVERVIEW	3-1
	3.1	LEACH	ATE SOLUTIONS	3-1
		3.1.1	Synthetic Precipitation Leachate Solution Chemistry	3-1
		3.1.2	Coal Groundwater Leachate Solution Chemistry	3-3
	3.2	LEACH	ATE MAJOR ION CHANGES AND TRACE ELEMENT DETECTIONS	3-3
		3.2.1	Leachate Major Ion Changes	3-3
		3.2.2	Leachate Trace Element Detections	3-5
		3.2.3	Distribution Ratios	3-5

LIST OF TABLES

Table 2-1. Results of Composite Mine Spoil Samples Quantitative Phase Analysis (wt. %).	2-5
Table 2-2. Results of Composite Mine Spoil Samples Smectite Model Quantitative I	Phase
Analysis (wt. %)	2-5
Table 2-3. Total Metals Analysis Results for Composite Spoil Samples	2-7
Table 2-4. Cation Exchange Capacity Laboratory Results Summarized	2-8
Table 3-1. Batch Leaching Test Results	3-2
Table 3-2. Major Ion Water Types	3-4
Table 3-3. Calculated Distribution Ratios for Selected Trace Metals	3-6

LIST OF FIGURES



LIST OF ATTACHMENTS

ATTACHMENT A	Rietveld X-ray Diffraction Laboratory Results
ATTACHMENT B	Total Analyses Laboratory Results
ATTACHMENT C	Cation Exchange Capacity Laboratory Results
ATTACHMENT D	Leachate Water Quality Laboratory Results



1 INTRODUCTION

This document has been prepared to provide results of mine spoil leaching tests performed to support the Probable Hydrologic Consequences (PHC) assessment of the planned placement of spoil generated from the mining of coal at the Navajo Mine. The mine spoil is the non coal overburden and interburden materials removed to allow access to the coals of the Fruitland Formation. The spoil is generally rock of varying sizes. Placement of spoil within the mine pit as backfill is an accepted practice for handling of the spoils and necessary to achieve approximate original contour requirements for mine reclamation. The probable hydrologic consequences of placement of spoil materials for mine backfill is dependent on the hydrologic properties of mine spoil, the surface and groundwater conditions at the mine following reclamation and the inorganic chemistry of mine spoil including the potential for leaching or adsorption of constituents of concern.

A spoil testing program was completed to generate the information on spoil properties and leaching characteristics. The resulting information is used to support the PHC assessment for proposed spoil placement as mine backfill at the Navajo Mine. The spoils used for testing in this study were collected from the Area III mine spoils. The same coal units mined at Area III will be mined at Area IV so the interburden and overburden rock characteristics are expected to be essentially the same between the two areas.


2 MINE SPOIL TESTING PROGRAM

The following discussion summarizes the sampling and testing procedures followed in this study in order to provide a background and understanding for interpreting the results presented in Section 3.

2.1 COLLECTION OF REPRESENTATIVE SAMPLES

The geochemical testing was conducted using available materials that are representative of expected mine spoil in Area IV. Representative samples of backfill spoils from Area III were obtained and used for the testing. Likewise a composite coal water samples from wells completed in the upper and lower coal seams at Area IV were obtained for the spoil leaching test study.

2.1.1 Mine Spoil Samples

Composite spoil samples were obtained from the Navajo Mine Area III in accordance with the regraded spoil sampling plan. Samples were collected on a 2.5-acre (ac) square grid. The 2.5-acplot was divided into four equal subplots (0.625 ac each). A four-foot deep sample pit was then excavated in the center of each subplot. In order to obtain a representative sample of composite spoil material, sub-samples were collected over the interval from zero to four feet at each of the four subplot locations and one composite sample was prepared from the four sub-samples. The composite sample was be comprised of a minimum of 2 kg of spoil material and was split in the field using a corner to corner sampling technique (USDA-NRCS 1996).

Composite samples were collected, following the same procedure, at three additional 2.5-ac plot locations. Solids analysis was conducted on sample splits from each of the four 2.5-acre grid locations. The other split samples from the four 2.5-ac plots were combined and mixed to form a single composite sample of approximately 4 kg. This composite sample and the four splits were sent to the laboratory for geochemical testing.

The four individual sample splits were analyzed for trace metals and major ions in order to characterize the broad spatial variability in spoil material. The composite sample was mixed again in the lab and reduced in particle size as required by EPA Method 1312. Three subsamples of the composite sample were obtained for chemical and mineralogical analysis.

2.1.2 Groundwater Samples

A composite sample of coal water was be obtained from equal proportions of water extracted from the No. 8 coal seam well KF-2007-01 and from the No. 3 coal seam well KF-98-02 located within Area IV. Two 5-gallon containers of coal water sample were obtained from each well. The 5-gallon containers were sent to the laboratory where composite coal water was prepared for use



in the batch tests. Two duplicate samples were obtained from the composite coal water and submitted for chemical analysis.

2.2 LABORATORY LEACHING TEST PROCEDURES

The leaching tests were conducted using the EPA Synthetic Precipitation Leaching Procedure (SPLP, SW-846 Method 1312), the Synthetic Groundwater Leaching Procedure (SGLP), and modifications of these tests. Modifications to the standard test were performed to address site specific conditions. The modifications were as follows:

- 1. Use of leaching fluids that are appropriate to the site through collection of groundwater samples in addition to the synthetic rainwater that is specified in the SPLP method.
- 2. Inclusion of a 45-day leach test in addition to the method specified 18-hour leaching procedure, in order to assess the impacts of longer exposure to the leachant.
- 3. For the 45-day leach test, it was not practical for the laboratory to tumble the sample for the entire period. Thus the procedure was modified to include periodic 18-hour tumble of the sample: at the start of the test, after 15-days, after 30 days and with a final 18-hour tumble at the end of the 45-day period. The periodic tumbling was followed by an extended period of time during which the solids remain in contact with the fluid without tumbling intended to provide an indication of any leaching changes due to mineral aging, hydrolysis, and or diffusion.

Proposed leaching procedures consist of the following components. The leachate name as used in the discussions in Section 3 is included in bold in the discussion below.

- A sequence in which spoil was leached in duplicate (18-hr tests) with coal well water (Spoil Leachate 1 and Spoil Leachate 1 DUP). Analyses of all leachates were performed, providing a duplicate analysis of the spoil leaching and a single analysis of the final leach with spoil-exposed coal water.
- 2. A test in which spoil is exposed to coal water for 45 days according to the long-term leaching procedure described above (**Spoil 45-Day**).
- 3. 18-hour leaching tests of spoil using the synthetic leaching fluid described in the SPLP (**Spoil SPLP**).



2.3 SOLIDS ANALYSES

The spoil composites were analyzed using Rietveld XRD for mineral identification, total metals analysis for major element identification, and cation exchange capacity (CEC) for determining the amount of exchange of cations between solution and solids. As discussed in Section 2.2.1, the spoil composites are comprised of samples collected from spoil backfill from the Navajo Mine Area III.

Solids analysis was performed on sample splits from each of the four composite samples from the 2.5-ac grid locations. The individual sample splits (four samples) were analyzed for total trace metals and major ions in order to characterize the broad spatial variability in spoil material. The other split samples from the four 2.5-ac plots were combined and mixed to form a single composite sample of spoil material that was used for the leaching tests. Three splits of this composite spoil sample were taken for replicate for chemical and mineralogical analysis in order to assess homogeneity of the composite spoil sample. The four individual sample split results are contained in Attachment A and Attachment B. The following discussions focus on the three splits analyzed for the mixed composite sample discussed above.

2.3.1 Rietveld X-ray Diffraction Results

Rietveld XRD analysis was carried out in triplicate for the spoil composite samples at the Department of Earth and Ocean Sciences, The University of British Columbia, Vancouver, British Columbia under the direction of Professor Mati Raudsepp. The laboratory results are provided in Attachment A.

A summary of the Rietveld XRD data for the composite spoil sample is presented in Table 2-1. The spoil composite samples were analyzed in triplicate and the results summarized in Table 2-1 as Spoil A, Spoil B and Spoil C indicate good reproducibility. The spoils contain a large amount of amorphous material with no definite crystalline structure. The mineralogical composition of the amorphous material is not included in Table 2-1. The spoil samples were modeled by the XRD laboratory to fit a smectite model in order to characterize the amorphous material. These results are provided in Table 2-2. The initial spoil model without a smectite fit indicates that the spoil is primarily comprised of quartz, kaolinite, and K-feldspar with lesser amounts (<5%) of gypsum, anhydrite, and calcite. Fitting the smectite model to the XRD data resulted in additional minerals montmorillonite, albite, and orthoclase. Although gypsum, anhydrite, and calcite were found in smaller relative amounts (<5%) in both interpretative results, their role in reactive chemistry is very important. This is due to their high solubility and relatively quick dissolution and precipitation rates as well as the buffering capacity of calcite on pH where pH controls the sorption of trace metals and other potentially important constituents.



TABLE 2-1. RESULTS OF COMPOSITE MINE SPOIL SAMPLES QUANTITATIVE PHASE ANALYSIS (WT. %)

	First Model without Fit to Amorphous Material									
Mineral	Ideal Formula	Spoil A	Spoil B	Spoil C	Average (wt %)					
Quartz	SiO ₂	36.5	35.4	35.4	36					
Plagioclase	NaAlSi ₃ O ₈ - CaAl ₂ Si ₂ O ₈	10.3	10.1	10.1	10					
K-feldspar	KAlSi ₃ O ₈	6	6.5	7	7					
Kaolinite	$Al_2Si_2O_5(OH)_4$	40.8	40.8	40.6	41					
Gypsum	CaSO ₄ ·2H ₂ O	2.6	3.1	2.8	3					
Anhydrite	CaSO ₄	0.9	1	1.1	1					
Calcite	CaCO ₃	2.9	3.1	2.9	3					

 TABLE 2-2.

 RESULTS OF COMPOSITE MINE SPOIL SAMPLES SMECTITE MODEL QUANTITATIVE PHASE ANALYSIS (WT. %)

Smectite Model Fit to Amorphous Material										
					Average					
Mineral	Ideal formula	Spoil A	Spoil B	Spoil C	(wt %)					
Quartz	SiO ₂	29.68	27.56	28.28	29					
Calcite	CaCO ₃	0.9	2.03	2.14	2					
Gypsum	CaSO ₄ ·2H ₂ O	2.9	3.12	2.69	3					
Albite low, calcium	$Na_{0.95}Ca_{0.05}Al_{1.05}Si_{2.95}O_8$, NaAlSi ₃ O ₈	6.41	5.92	6.05	6					
Anhydrite	$CaSO_4$	0.83	0.67	0.88	1					
Orthoclase	KAlSi ₃ O ₈	3.87	2.39	3.32	3					
Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	11.68	12.08	10.46	11					
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot n(H2O)$	43.74	46.24	46.18	45					



2.3.2 Total Metals Results

Total metals analysis was carried out in triplicate for the spoil composite samples using method 6010B at Analytica Environmental Laboratories, 12189 Pennsylvania Street, Thornton, Colorado. Laboratory results are provided in Attachment B.

The composite spoil samples were analyzed for metals (Table 2-3) The composite spoils are primarily comprised of Ca, Fe, Al, Na, Mg, and K. There are trace amounts (<1%) of several other trace metals. However, the results for all three analyses indicate As and thallium (Tl) are not present. The major cations also correlate with the primary minerals identified in the Rietveld XRD analyses:

- Ca with gypsum, calcite, and montmorillonite;
- Al with plagioclase, K-feldspar, kaolinite, albite, orthoclase, and montmorillonite;
- Na with plagioclase, albite, and montmorillonite;
- K with K-feldspar and orthoclase; and
- Mg with montmorillonite.

Although relatively high Fe concentrations are observed in the total Fe, no Fe containing minerals were identified in the XRD analyses. The Fe is associated with the non-identifiable amorphous material in the XRD analyses, most likely as amorphous Fe hydroxide. Additionally, siderite has been identified in the literature by Lucas et al. (2006) in the form of sideritic concretions.

2.3.3 Cation Exchange Capacity

The CEC was measured for spoil composites by Colorado Analytical Laboratories, Inc. using EPA method 9081 (US EPA 2007). The laboratory results are provided in Attachment C. Table 2-4 provides a summary of the results. The analyses were carried out for the seven collected spoil samples; including the four individual samples from each plot and the three composited samples.

The CEC value for the spoil samples ranged between 8.7 and 9.9 milli-equivalents per 100 grams (meq/100g) with an average of 9.3 meq/100g. These results indicate the relative ability of spoil materials to sorb and exchange different cations. The CEC is an indicator of major cation and trace metal attenuation the spoil may provide.



		Spoil A			Spoil B	0210101		Spoil C				
Analyte (mg/Kg)	Result	PQL	MDL	Result	PQL	MDL	Result	PQL	MDL	RPD 1	RPD 2	RPD3
Al	10000	7.4	1.8	9500	6.8	1.7	9400	7.7	1.9	5%	6%	3%
Sb	0	10	0.58	0.052	9.3	0.52	0.9	11	0.59	-200%	-284%	159%
As	0	12	1.6	0	11	1.5	0	12	1.7			
Ba	170	0.37	0.029	180	0.34	0.026	170	0.38	0.03	-6%	0%	3%
Be	1	0.19	0.0082	1	0.17	0.0075	1	0.19	0.0085	0%	0%	0%
В	13	4.7	0.63	12	4.2	0.57	12	4.8	0.64	8%	8%	5%
Cd	0.64	0.74	0.054	0.63	0.68	0.049	0.59	0.77	0.055	2%	8%	4%
Ca	20000	13	5	22000	12	4.5	20000	13	5.1	-10%	0%	6%
Cr	6.7	1.9	0.28	6	1.7	0.25	6.1	1.9	0.28	11%	10%	6%
Со	11	2.8	0.24	11	2.5	0.22	11	2.9	0.25	0%	0%	0%
Cu	26	0.56	0.15	23	0.51	0.13	24	0.57	0.15	12%	8%	6%
Fe	20000	5.6	0.41	20000	5.1	0.37	20000	5.7	0.42	0%	0%	0%
Pb	16	5.6	0.98	17	5.1	0.89	18	5.7	1	-6%	-12%	6%
Mg	3100	9.3	0.89	2900	8.5	0.81	3000	9.6	0.92	7%	3%	3%
Mn	440	0.93	0.1	430	0.85	0.094	390	0.96	0.11	2%	12%	6%
Мо	0	1.9	0.22	0.0034	1.7	0.2	0	1.9	0.23	-200%	0%	173%
Ni	13	3.7	0.4	13	3.4	0.36	14	3.8	0.41	0%	-8%	4%
К	1900	93	29	1700	85	27	1800	96	30	11%	6%	6%
Se	2.9	9.3	2.3	2.7	8.5	2.1	2.9	9.6	2.4	7%	0%	4%
Na	4000	280	0.95	3900	250	0.86	4100	290	0.98	3%	-3%	3%
Tl	0	19	1.1	0	17	1	0	19	1.1			
V	23	0.93	0.18	22	0.85	0.16	22	0.96	0.19	4%	4%	3%
Zn	62	0.56	0.21	65	0.51	0.19	62	0.57	0.21	-5%	0%	3%
Li	8.6	4.7	0.045	8.2	4.2	0.041	8.1	4.8	0.047	5%	6%	3%
Hg	0.087	0.044	0.0061	0.073	0.044	0.006	0.068	0.044	0.006	18%	25%	13%
Moisture %	7.98	0.0465	0.0093	8.13	0.0465	0.0093	7.87	0.0466	0.00933	-2%	1%	2%

TABLE 2 2 TOTAL METALS ANALYSIS BESULTS FOR COMPOSITE SPOL SAMPLES



TABLE 2-4.
CATION EXCHANGE CAPACITY LABORATORY RESULTS SUMMARIZED

Sample ID	Sample Name	CEC (meq/100g)
B0711172-2B	123 S 87W 0-4' Spoil	9.7
B0711172-3B	123 S 89W 0-4' Spoil	8.7
B0711172-4B	125 S 88W 0-4' Spoil	9.4
B0711172-5B	120 S 89W 0-4' Spoil	9.0
B0711172-6B	Spoil A	9.0
B0711172-7B	Spoil B	9.6
B0711172-8B	Spoil C	9.9



3 LEACHATE TEST RESULTS OVERVIEW

3.1 LEACHATE SOLUTIONS

The solutions used as the beginning leachant solutions included groundwater collected and composited from two coal monitoring wells in Area IV and synthetic precipitation prepared in the laboratory. The laboratory water quality analysis reports for beginning leachant solutions and spoil leachate solutions are provide in Attachment D. These results are summarized in Table 3-1. The EPA drinking water standards and health advisories and the Navajo Nation livestock and wildlife watering criteria are also included in Table 3-1 for comparison.

Table 3-1 presents all reported values above the PQL from the laboratory with the exception of quality assurance quality control analyses. The data below the PQL are listed with a "<" sign followed by the PQL value and data below the method detection limit (MDL) are presented with "<<" followed by the MDL. The Navajo Nation wildlife watering criteria for Hg and the EPA domestic use criteria for antimony Sb, As, and Tl are below the laboratory method MDL. Additionally, the reported PQL values for Cd, Pb, and Se are above the EPA drinking water criteria. Detected values below the EPA drinking water criteria are included in Table 3-1 with the reported value listed in the table after the PQL value. However, the PQL is the lowest level of quantification that a laboratory can reliably achieve based on specified limits of precision and accuracy relating to instrumentation and sample interferences. Thus, the values below the PQL reported in Table 3-1 are not considered reliable and should be considered non-detect.

3.1.1 Synthetic Precipitation Leachate Solution Chemistry

Synthetic precipitation was prepared in the laboratory and used as a surrogate for field site precipitation that could percolate through the backfill and provide recharge to groundwater and potentially surface water discharge. The prepared solution is highly purified water with strong solvating properties. The water quality for the synthetic precipitation solution is presented in Table 3-1 under the heading "Initial Synthetic Precipitation".

Analyte (mg/L)	EPA Drinking Water Criteria	Livestock & Wildlife Watering Criteria ¹	Initial Coal Water Sample	Initial Coal Water DUP	Initial Synthetic Precipitation	Spoil SPLP	Spoil 45-Day	Spoil Leachate	Spoil Leachate Dup
Al		0.5	0.13	0.14	0.056	< 0.05	0.38	0.29	0.3
Sb	0.0056		<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067	<< 0.0067
As	0.01	0.02	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015	<< 0.015
Ba	1	10	0.093	0.088		0.07	0.079	0.25	0.2
Be	0.004		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
HCO ₃			1300	1200		33	960	1000	1000
В	0.63	5	0.31	0.29		0.084	0.36	0.44	0.45
Cd	0.005	0.05	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	<< 0.00051	< 0.006, 0.00087*	<< 0.00051
Ca			3.4	3.3	0.27	150	56	64	69
CO ₃			260	300	< 7	14	< 7	< 7	< 7
Cl	250 ³	600	710	700		1.5	600	610	610
Cr	0.1	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Со		1	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cu	1.3	0.5	< 0.005	< 0.005	< 0.005	< 0.005	0.053	< 0.005	< 0.005
F	2	2	2.4	2.5	0.0067	0.54	1.5	1.6	1.6
Fe	0.3		0.067	0.073	< 0.05	< 0.05	< 0.05	0.17	0.18
РВ	0.015	0.1	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011	<< 0.011
Li			< 0.1	< 0.1	< 0.1	< 0.1	0.11	0.1	0.1
Mg			1.3	1.2		15	12	13	13
Mn	0.053		< 0.01	< 0.01	< 0.01	0.19	0.098	0.11	0.1
Hg	0.002	0.01	<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	<< 0.00005	< 0.00024, 0.0001*	< 0.0002, 0.00008*
Мо			0.012	< 0.01	< 0.01	< 0.01	0.015	0.014	0.014
Ni	0.61		< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
pH (standard units)	6.5 - 9.0		9	8.9	5	7.5	8	8	7.9
K			11	10	< 1	7	14	14	14
Se	0.05	0.05	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026	<< 0.026
Ag	0.035		< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015
Na			1200	1100	5.7	150	1200	1200	1200
SO_4	250	1000	300	260	3.4	670	930	970	990
Tl	0.0017		<< 0.011	<< 0.011	<< 0.011	<< 0.011	< 0.4, 0.014*	<< 0.011	<< 0.011
TDS	500	2212	3100	3000	28	1200	3500	3500	3600
V		0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zn	5	25	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0095

TABLE 3-1. BATCH LEACHING TEST RESULTS

¹ Navajo Nation Water Quality Program, 2004, Navajo Nation Surface Water Quality Standards. (Wildlife standard 0.002 mg/l for total selenium and 0.000012 mg/l for mercury)

<< Reported value is less than the MDL

*Above MDL, but below PQL



3.1.2 Coal Groundwater Leachate Solution Chemistry

In order to simulate the effects of natural background groundwater interaction and flow through the backfill, batch leachate tests were performed using groundwater collected from the site. The composite groundwater sample was obtained from samples collected from well KF2007-01, completed in the No. 8 coal seam of the Fruitland Formation, and from well KF-98-02, completed in the No. 3 coal seam of the Fruitland Formation. Each sample was combined to form a composite sample for use as the leachant in leachate batch testing. The groundwater from the coal zones and precipitation recharge represent the water sources that are expected to re-saturate the backfill materials after mining. The groundwater quality data for the composite coal water sample is presented in Table 3-1 under the field heading "Initial Coal Water".

The composite coal groundwater sample results indicate that the TDS, chloride, and fluoride concentrations are above the Navajo Nation Criteria for livestock and wildlife watering (Table 3-1). The groundwater would not be suitable for drinking water due to elevated TDS, chloride, fluoride, and sulfate concentrations above the regulatory standards for drinking water. The composite coal water sampling results are consistent with the sampling results reported in Appendix 6.G of the PAP for coal monitoring wells in Area III and IV.

3.2 LEACHATE MAJOR ION CHANGES AND TRACE ELEMENT DETECTIONS

The data was plotted and reviewed for overall general geochemical changes between initial groundwater and the final leachates.

3.2.1 Leachate Major Ion Changes

Major ion changes can be observed in the Durov diagram provided in Figure 3-1 and as major ion water types (Table 3-2). The TDS in the leachate from spoil only increases by approximately 500 mg/L from 3,027 mg/L in coal groundwater to approximately 3,525 mg/L in the supernatant. The TDS increases in spoil leachates resulted primarily as a function of leaching of Ca and sulfate. For those tests performed using coal water, the water changes from a Na bicarbonate water-type to a Na sulfate water-type.

For the leaching tests performed using synthetic precipitation, the water changes from a Na bicarbonate water type to a Ca sulfate water type. These results indicate a significant source of sulfate in the spoil materials.



FIGURE 3-1. DUROV DIAGRAM OF SPOIL LEACHATE ANALYSES AND INITIAL WATER COMPOSITIONS



TABLE 3-2. MAJOR ION WATER TYPES

Sample ID	Water Type	Simple Water Type
Initial Synthetic Precipitation	Na-CO3-HCO3	Sodium Bicarbonate
Initial Coal Water	Na-HCO3-Cl	Sodium Bicarbonate
Spoil Leachate 1	Na-SO4-HC03-Cl	Sodium Sulfate
Spoil 45-Day	Na-SO4-HCO3-Cl	Sodium Sulfate
Spoil SPLP	Ca-Na-SO4	Calcium Sulfate

As the sulfate is increased both bicarbonate and carbonate in the initial coal groundwater are reduced in spoil leachates. Reduction in carbonate concentrations is reflected by a pH drop from approximately 9.0 in the coal groundwater to 8.0 in the spoil leachates. The sulfate and TDS in all the leachates exceed criteria for the Navajo Nation domestic use and or the Navajo Nation livestock and wildlife watering criteria.

The EPA secondary drinking water limits for chloride are exceeded in all samples except for SPLP leachate. Additionally, chloride does not increase in value in groundwater leachates and



increases from non-detect to 1.5 mg/L in spoil leachate. Chloride is removed in all final leachates compared to background groundwater when groundwater is used as the initial solution. The loss of chloride is significant (as much as 104 mg/L) and not attributed to sampling or analytical error. Typically, chloride is considered conservative meaning that it is not involved in sorption, oxidation, reduction, or degradation reactions. However, sorption of chloride on soils has been documented in the literature (Yu and Li 1997, Wang et al. 1987, Borggaard 1984). Sorption is a possible mechanism for the removal of chloride in these leachate tests. The leachate test results indicate spoil is not a source of chloride and that chloride is elevated in the natural groundwater at the site.

3.2.2 Leachate Trace Element Detections

Concentrations of Sb, beryllium (Be), Cd, cobalt (Co), Hg, Ni, Pb, Ag, and Tl are non-detect at levels reported below the PQL in all samples, while the Pb results for all samples were below the MDL (Table 3-1). Trace elements detected at concentrations above the PQL and above one or more of the relevant water quality criteria are as follows:

- Mn was detected at values above the PQL and above the EPA secondary drinking water criteria in all leachates.
- Zn was found in a duplicate split Spoil Leachate sample. The results for Zn indicate that it is potentially present in trace amounts in both spoil and is spatially variable but significantly below relevant Navajo Nation and EPA water quality criteria.

The reported values for Cd (only in one 18 hour duplicate), Hg, and Tl (only in the 45 day test) are above the MDL but below the PQL and are included in Table 3-1 for comparison with the Navajo Nation and EPA water quality criteria. Since the PQL is the lowest level of quantification that a laboratory can reliably achieve based on specified limits of precision and accuracy relating to instrumentation and sample interferences, the values below the PQL reported in Table 3-1 are not considered reliable and should be considered non-detect below the PQL. The non-detect analytes in leachate are not considered for further investigation.

3.2.3 Distribution Ratios

A distribution ratio (K_r) was calculated for Ba and F. The distribution ratio is similar to a sorption isotherm where the concentration in solution is related to the concentration associated with the mass in or on the solid phase. The distribution ratio is defined in equation 3.1.

eq. 3.1 $K_r = \frac{\text{mass of solute on solid phase per unit mass of solute}}{\text{concentration of solute in solution}}$

The calculated K_r values (Table 3-3) reflect overall geochemical reactions of sorption and precipitation that result in attenuation of the solutes. As discussed in detail within the literature



review section, the pH, redox conditions, temperature, solids characteristics, and the constituents in solution will affect the distribution of solutes on the solid phase. The precipitation of oxides and oxyhydroxides, such as Fe and Mn oxides, can significantly increase sorption capacity. Thus, as precipitation reactions occur the number of sorption sites also increases providing greater attenuation. The results indicate that the majority of constituents show either no attenuation or are below detection limits such that a value could not be calculated (Table 3-1). However, the spoil showed the ability to attenuate Ba and F. The spoil attenuation was observed for leachate from coal groundwater.

Analyte	Spoil Leachate	Spoil 45- Day	Spoil SPLP
Al			BD
As	BD	BD	BD
В			
Ba		2.91	
Cr	BD	BD	BD
Cu	BD		BD
Fe		BD	BD
F	10.63	12.67	
Mn			
Мо			BD
Se	BD	BD	BD
SO4			
V	BD	BD	BD
Zn		BD	BD
SO4 V Zn	BD ved attenuation	BD BD	 BD BD

TABLE 3-3. **CALCULATED DISTRIBUTION RATIOS FOR SELECTED TRACE METALS**

No observed attenuation

BD is below detection limit (PQL)



ATTACHMENT A Rietveld X-ray Diffraction Laboratory Results

QUANTITATIVE PHASE ANALYSIS OF TWO POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

Project: NavajoMine Extension Leaching Study – P.O. 62651

Art O'Hayre, Ph.D NORWEST Applied Hydrology USA 950 S. Cherry St., Suite 810 Denver, Colorado 80246 USA

Mati Raudsepp, Ph.D. Elisabetta Pani, Ph.D.

Dept. of Earth & Ocean Sciences 6339 Stores Road The University of British Columbia Vancouver, BC V6T 1Z4

January 18, 2008

EXPERIMENTAL METHODS

The six samples from Project Navajo Mine were reduced to the optimum grain-size range for quantitative X-ray analysis ($<5 \mu$ m) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Fine grain-size is an important factor in reducing micro-absorption contrast between phases.

Step-scan X-ray powder-diffraction data were collected over a range $3-80^{\circ}2\theta$ with CoK α radiation on a standard Siemens (Bruker) D5000 Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a Vantec-1 strip detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Siemens (Bruker). X-ray powder-diffraction data were refined with Rietveld program Topas 3 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1-6.

The patterns of the three "Spoil" samples show a hump between about 6 and 10°20 that likely corresponds to either amorphous or nanoscale material (disordered clays?) we cannot identify. Therefore, the related results must be considerate approximate.

Mineral	Ideal formula	BR3* Composite Spoil A	BR3* Composite Spoil B	BR3* Composite Spoil C	Ash Composite 70% FA	Ash Composite DUP 1 70%FA	Ash Composite DUP 2 70%FA
Quartz	SiO ₂	36.5	35.4	35.4	21.3	26.3	24.8
Plagioclase	$NaAlSi_3O_8 - CaAl_2Si_2O_8$	10.3	10.1	10.1			
K-feldspar	KAlSi ₃ O ₈	6.0	6.5	7.0			
Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	40.8	40.8	40.6			
Gypsum	CaSO ₄ ·2H ₂ O	2.6	3.1	2.8	50.1	38.5	45.2
Anhydrite	CaSO ₄	0.9	1.0	1.1			
Calcite	CaCO ₃	2.9	3.1	2.9	1.8	1.4	
Dolomite	CaMg(CO ₃) ₂				3.4	1.8	
Mullite	Al ₆ Si ₂ O ₁₃				23.4	29.5	30.0
Magnetite	Fe ₃ O ₄					2.4	
Total		100.0	100.0	100.0	100.0	100.0	100.0

Table 1. Results of quantitative phase analysis (wt. %) – NORWEST Applied Hydrology - Project Navajo Mine

* Semi-quantitative results



Figure 1. Rietveld refinement plot of sample **Norwest B.R.Composite Spoil A** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 2. Rietveld refinement plot of sample Norwest B.R. Composite Spoil B (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 3. Rietveld refinement plot of sample Norwest B.R. Composite Spoil C (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 4. Rietveld refinement plot of sample Norwest Ash Composite 70% FA (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 5. Rietveld refinement plot of sample **Norwest Ash Composite DUP 1 70% FA** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 6. Rietveld refinement plot of sample Norwest Ash Composite DUP 2 70% FA (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 1. Rietveld refinement plot of sample **Norwest B.R.Composite Spoil A** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 2. Rietveld refinement plot of sample Norwest B.R. Composite Spoil B (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



Figure 3. Rietveld refinement plot of sample Norwest B.R. Composite Spoil C (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.



ATTACHMENT B Total Analyses Laboratory Results

Detailed Ana	lytical Report		Ana	lytica Enviro	onmental Laboratories	, Inc.	
Workorder (SDG):	B0711172						
Project:	Navajo Mir	e Extension	h Leaching Stu	ıdy			
Client:	Applied Hy	drology Ass	sociates. Inc.				
Client Project Number	r none		,,,,,,,, .				
Report Section	: Clie	nt Samn	le Renort				
		nt Samp			-		
Client Sample Name:	KF2007	7-01(58) a	nd KF-98-0	2(53)			
Matrix:	Aqueous				Collection Date:	11/15/2007	4:30:00PM
The following test was	conducted by: Analytica	a - Thornton					
Lab Sample Number: Prep Date:	B0711172-01A 11/30/2007				Analysis Date: Instrument:	11/30/20 CVAA_1	07 4:07:17PM
Analytical Method ID:	SW7470A - Mercury i	n Liquid Was	te by CVAA - 7	Total Hg	File Name:	B113007	W.W
Prep Method ID:	7470A				Dilution Factor:	1	
Prep Batch Number:	T071130013						
Report Basis:	As Received				Analyst Initials:	DL	
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00	ml
<u>Analyte</u> Mercury	<u>CASNo</u> 7439-97-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> <u>MI</u> 0.00020 0.00	<u>DL</u> 00050		<u>run #:</u> 1
The following test was	conducted by: Analytics	- Thornton					
Lab Sample Number:	B0711172-01A	i monton			Analysis Date:	12/3/200	7 6.01.00PM
Pren Date:	12/3/2007				Instrument.	ICP 2	/ 0.01.001 WI
Analytical Method ID [.]	SW6010B - ICP - Tota	վ			File Name:	E12037A	
Pren Method ID:	3010 ICP				Dilution Factor	1	
Prep Batch Number:	T071203011				Dilution i detoi.	1	
Report Basis:	As Received				Analyst Initials	rm	
Sample prep wt /vol·	50.00 ml				Pren Extract Vol	50.00	ml
		D				20.00	
<u>Analyte</u>	<u>CASNo</u> 7420-00-5	Result 0.13	<u>Flags</u> <u>Units</u>	<u>POL</u> <u>MI</u>	<u>DL</u> 014		<u>run #:</u>
Antimony	7429-90-5	ND	mg/L	0.050 0.	0067		1
Arsenic	7440-38-2	ND	mg/L	0.10 0	015		
Barium	7440-38-2	0.093	mg/L	0.010 0.0	0016		
Bervllium	7440-41-7	ND	mg/L	0.0010.0.00	00060		
Cadmium	7440-43-9	ND	mg/L	0.0060_0.0	0051		
Calcium	7440-70-2	3.4	mg/L	0.10 0	013		
Chromium	7440-47-3	ND	mg/L	0.010 0.0	0018		
Cobalt	7440-48-4	ND	mg/L	0.0050 0.0	0016		
Copper	7440-50-8	ND	mg/L	0.0050 0.0	0019		
Iron	7439-89-6	0.067	mg/L	0.050 0.0	0027		
Lead	7439-92-1	ND	mg/L	0.050 0.	.011		
Lithium	7439-93-2	ND	mg/L	0.10 0.0	0072		
Magnesium	7439-96-4	1.3	mg/L	0.10 0.	.012		
Manganese	7439-96-5	ND	mg/L	0.010 0.0	0066		
Molybdenum	7439-98-7	0.012	mg/L	0.010 0.0	0018		
Nickel	7440-02-0	ND	mg/L	0.040 0.0	0027		
Potassium	7440-09-7	11	mg/L	1.0 0	.31		
Selenium	7784-49-2	ND	mg/L	0.10 0.	.026		
Silver	7440-22-4	ND	mg/L	0.015 0.0	00066		
Sodium	7440-23-5	1,200	mg/L	3.0 0.	.028		
Thallium	7440-28-0	ND	mg/L	0.40 0.	.011		
Vanadium	7440-62-2	ND	mg/L	0.010 0.0	00072		
Page 8 of 62							

Detailed Analytical Report				Analytica Environmental Laboratories, Inc.				
Workorder (SDG):	B0711172							
Project:	Navajo Mine	Extension	Leaching Stu	dy				
Client:	Applied Hydr	ology Asso	ociates, Inc.					
Client Project Number	r: none							
Report Section	: Client	Sampl	e Report					
Client Sample Name:	KF2007-0	01(58) ar	nd KF-98-02	2(53)	7			
Matrix:	Aqueous				Collection Date:	11/15/2007 4:30:00PM		
Lab Sample Number:	B0711172-01A				Analysis Date:	12/3/2007 6:01:00PM		
Prep Date:	12/3/2007				Instrument:	ICP_2		
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12037A		
Prep Method ID:	3010_ICP				Dilution Factor:	1		
Prep Batch Number:	T071203011							
Report Basis:	As Received				Analyst Initials:	rm		
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml		
Analyte Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	POL MI 0.0050 0.0	<u>DL</u> 0010	<u>run #:</u> 1		
Lab Sample Number:	B0711172-01A				Analysis Date:	12/4/2007 5:19:00PM		
Prep Date:	12/3/2007				Instrument:	ICP_2		
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12047A		
Prep Method ID:	3010_ICP				Dilution Factor:	1		
Prep Batch Number:	T071203011							
Report Basis:	As Received				Analyst Initials:	rm		
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml		
<u>Analyte</u> Boron	<u>CASNo</u> 7440-42-8	<u>Result</u> 0.31	<u>Flags</u> <u>Units</u> mg/L	<u>POL</u> <u>MI</u> 0.050 0.0	<u>DL</u> 0018	<u>run #:</u> 2		

Detailed Ana	lytical F	Report		Analy	ytica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B07111	72							
Project:	Ň	lavajo Mine	Extension	Leaching Stu	dy				
Client:	А	pplied Hyd	rology Ass	ociates, Inc.					
Client Project Number	n	one	80	,					
Report Section	•	Clien	t Sampl	e Report					
Client Sample Name:		123 S 87	W 0-4' SI	POIL					
Matrix:	Solid					C	Collection Date:	11/15/2007	12:00:00PM
The following test was	conducted b	y: Analytica -	Thornton						
Lab Sample Number:	B0711172	2-02A					Analysis Date:	12/4/200	07 3:25:10PM
Prep Date:	12/4/2007	7					Instrument:	CVAA_	1
Analytical Method ID:	SW7471A	- Mercury in	Solid or Sen	nisolid Waste by	CVAA -	Total	HFile Name:	B120407	7S.WK
Prep Method ID:	7471A						Dilution Factor:	1	
Prep Batch Number:	T0712040	013					Percent Moisture	7.06	
Report Basis:	Dry Weigh	t Basis					Analyst Initials:	DL	
Sample prep wt./vol:	0.67	g					Prep Extract Vol:	50.00	ml
Analyta	C	ASNo	Result	Flage Units	POL	MDL.	L		
Mercury	<u></u> 74	39-97-6	0.12	mg/Kg	0.040	0.005	5		<u>1 un #:</u> 1
The following test was	conducted b	y: Analytica -	Thornton						
Lab Sample Number:	B0711172	2-02A					Analysis Date:	12/3/200	07 1:27:00PM
Prep Date:	12/3/2007	7					Instrument:	ICP_2	
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E12037A	4
Prep Method ID:	3050B						Dilution Factor:	1	
Prep Batch Number:	T0712030	005					Percent Moisture	7.06	
Report Basis:	Dry Weigh	nt Basis					Analyst Initials:	rm	
Sample prep wt./vol:	0.60	g					Prep Extract Vol:	50.00	ml
Analyte	<u>C</u>	ASNo	<u>Result</u>	Flags Units	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>
Aluminum	74	29-90-5	9,700	mg/Kg	7.1	1.8			1
Antimony	74	40-36-0	ND	mg/Kg	9.8	0.55			
Arsenic	74	40-38-2	ND	mg/Kg	12	1.6			
Barium	74	40-39-3	150	mg/Kg	0.36	0.028			
Beryllium	74	40-41-7	1.0	mg/Kg	0.18	0.0079	9		
Boron	74	40-42-8	13	mg/Kg	4.5	0.60			
Cadmium	74	40-43-9	0.74	mg/Kg	0.71	0.051			
Calcium	74	40-70-2	14,000	mg/Kg	12	4.8			
Chromium	74	40-47-3	0.7	mg/Kg	1.8	0.20			
Copper	74	40-48-4	12	mg/Kg	2.7	0.25			
Iron	74	30 80 6	20	mg/Kg	5.4	0.14			
Lead	74	30 02 1	17	mg/Kg	5.4	0.94			
Magnesium	- י 74	39-96-4	3.100	mg/Kg	8.9	0.85			
Manganese	74	39-96-5	360	mg/Kg	0.89	0.099)		
Molybdenum	74	39-98-7	ND	mg/Kg	1.8	0.21			
Nickel	74	40-02-0	15	mg/Kg	3.6	0.38			
Potassium	74	40-09-7	1,800	mg/Kg	89	28			
Selenium	77	84-49-2	ND	mg/Kg	8.9	2.2			
Silver	74	40-22-4	ND	mg/Kg	1.3	0.14			
Sodium	74	40-23-5	3,900	mg/Kg	270	0.91			
Thallium	74	40-28-0	ND	mg/Kg	18	1.1			
Vanadium	74	40-62-2	22	mg/Kg	0.89	0.17			
Page 10 of 62									

Detailed Ana	lytical Re	eport		Ana	lytica En	vironr	conmental Laboratories, Inc.			
Workorder (SDG):	B0711172									
Project:	Na	wajo Mine l	Extension	Leaching St	ıdy					
Client:	Ар	oplied Hydro								
Client Project Number	no:	ne		_						
Report Section	:	Client	Sample	e Report						
Client Sample Name:		123 S 87V	V 0-4' SI	POIL						
Matrix:	Solid					C	Collection Date:	11/15/2007	12:00:00PM	
Lab Sample Number:	B0711172-	-02A					Analysis Date:	12/3/2007	1:27:00PM	
Prep Date:	12/3/2007						Instrument:	ICP_2		
Analytical Method ID:	SW6010B -	ICP - Total					File Name:	E12037A		
Prep Method ID:	3050B						Dilution Factor:	1		
Prep Batch Number:	T07120300	05					Percent Moisture	7.06		
Report Basis:	Dry Weight	Basis					Analyst Initials:	rm		
Sample prep wt./vol:	0.60	g					Prep Extract Vol:	50.00	ml	
Analyte Zinc	<u>CA</u> 744	<u>.SNo</u> 0-66-6	<u>Result</u> 73	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 0.54	<u>MDL</u> 0.20			<u>run #:</u> 1	
Lab Sample Number:	B0711172-	-02A					Analysis Date:	12/4/2007	3:03:00PM	
Prep Date:	12/3/2007						Instrument:	ICP_2		
Analytical Method ID:	SW6010B -	ICP - Total					File Name:	E12047A		
Prep Method ID:	3050B						Dilution Factor:	1		
Prep Batch Number:	T07120300	05					Percent Moisture	7.06		
Report Basis:	Dry Weight	Basis					Analyst Initials:	rm		
Sample prep wt./vol:	0.60	g					Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Lithium	<u>CA</u> 743	<u>SNo</u> 9-93-2	<u>Result</u> 9.1	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 4.5	<u>MDL</u> 0.043	3		<u>run #:</u> 2	

Detailed Ana	lytical Report		Anal	ytica En	vironn	nental Laboratories	, Inc.
Workorder (SDG):	B0711172						
Project:	Navajo Min	e Extension	Leaching Stu	dy			
Client:	Applied Hy	drology Ass	sociates. Inc.	-			
Client Project Number	none	ar 01085 1100					
Report Section		nt Samn	la Donart				
Report Section		n Samp	ie Keport				
Client Sample Name:	123 S 8	9W 0-4' S	POIL				
Matrix:	Solid				С	ollection Date:	11/15/2007 12:00:00PM
The following test was	conducted by: Analytica	a - Thornton					
Lab Sample Number: Prep Date:	B0711172-03A 12/4/2007 SW7471A - Mercury in	n Solid or Ser	nisolid Waste hv	CVAA	Total	Analysis Date: Instrument:	12/4/2007 4:05:31PM CVAA_1 B120407S WK
Anaryucai Method ID.	7471 A		insona waste by	CVIII-	Total	Flie Name.	1
	74/1A T071204012					Dilution Factor.	1
Prep Batch Number:	10/1204013					Percent Moisture	8.04 DI
Report Basis:	Dry weight basis					Analyst Initials:	DL 50.00 ml
Sample prep wt./vol:	0.03 g					Prep Extract Vol:	50.00 mi
Analyte Mercury	<u>CASNo</u> 7439-97-6	<u>Result</u> 0.075	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 0.044	<u>MDL</u> 0.0060)	<u>run #:</u> 1
The following test was	conducted by: Analytica	a - Thornton					
Lab Sample Number:	B0711172-03A					Analysis Date:	12/3/2007 1:32:00PM
Prep Date:	12/3/2007					Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Tota	ıl				File Name:	E12037A
Prep Method ID:	3050B					Dilution Factor:	1
Prep Batch Number:	T071203005					Percent Moisture	8.64
Report Basis:	Dry Weight Basis					Analyst Initials:	rm
Sample prep wt./vol:	0.59 g					Prep Extract Vol:	50.00 ml
Analyte	<u>CASNo</u>	<u>Result</u> 9 600	Flags Units	<u>PQL</u> 75	<u>MDL</u>		<u>run #:</u>
Antimony	7429-90-3	ND	mg/Kg	10	0.58		1
Arsenic	7440-38-2	ND	mg/Kg	12	1.6		
Barium	7440-39-3	170	mg/Kg	0.37	0.029		
Bervllium	7440-41-7	1.0	mg/Kg	0.19	0.0083	3	
Boron	7440-42-8	13	mg/Kg	4.7	0.63	, ,	
Cadmium	7440-43-9	0.85	mg/Kg	0.75	0.054		
Calcium	7440-70-2	21.000	mg/Kg	13	5.0		
Chromium	7440-47-3	6.6	mg/Kg	1.9	0.28		
Cobalt	7440-48-4	11	mg/Kg	2.8	0.24		
Copper	7440-50-8	25	mg/Kg	0.56	0.15		
Iron	7439-89-6	24.000	mg/Kg	5.6	0.41		
Lead	7439-92-1	17	mg/Kg	5.6	0.98		
Magnesium	7439-96-4	3,100	mg/Kg	9.3	0.89		
Manganese	7439-96-5	590	mg/Kg	0.93	0.10		
Molybdenum	7439-98-7	ND	mg/Kg	1.9	0.22		
Nickel	7440-02-0	15	mg/Kg	3.7	0.40		
Potassium	7440-09-7	1,800	mg/Kg	93	29		
Selenium	7784-49-2	ND	mg/Kg	9.3	2.3		
Silver	7440-22-4	ND	mg/Kg	1.4	0.14		
Sodium	7440-23-5	3,800	mg/Kg	280	0.95		
Thallium	7440-28-0	ND	mg/Kg	19	1.1		
Vanadium	7440-62-2	24	mg/Kg	0.93	0.18		
Page 12 of 62							

-

Detailed Ana	lytical R	eport		Ana	lytica En	vironr	ronmental Laboratories, Inc.			
Workorder (SDG):	B0711172									
Project:	Na	avajo Mine l	Extension	Leaching Stu	ıdy					
Client:	Ap	oplied Hydro								
Client Project Number Report Section	no: :	ne Client	Sample	e Report						
Client Sample Name:		123 S 89V	V 0-4' SI	POIL						
Matrix:	Solid					C	Collection Date:	11/15/2007	12:00:00PM	
Lab Sample Number:	B0711172	-03A					Analysis Date:	12/3/2007	1:32:00PM	
Prep Date:	12/3/2007						Instrument:	ICP_2		
Analytical Method ID:	SW6010B -	ICP - Total					File Name:	E12037A		
Prep Method ID:	3050B						Dilution Factor:	1		
Prep Batch Number:	T0712030	05					Percent Moisture	8.64		
Report Basis:	Dry Weight	Basis					Analyst Initials:	rm		
Sample prep wt./vol:	0.59	g					Prep Extract Vol:	50.00	ml	
Analyte Zinc	<u>CA</u> 744	. <u>SNo</u> 0-66-6	<u>Result</u> 69	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 0.56	<u>MDL</u> 0.21			<u>run #:</u> 1	
Lab Sample Number:	B0711172	-03A					Analysis Date:	12/4/2007	3:08:00PM	
Prep Date:	12/3/2007						Instrument:	ICP_2		
Analytical Method ID:	SW6010B -	ICP - Total					File Name:	E12047A		
Prep Method ID:	3050B						Dilution Factor:	1		
Prep Batch Number:	T0712030	05					Percent Moisture	8.64		
Report Basis:	Dry Weight	Basis					Analyst Initials:	rm		
Sample prep wt./vol:	0.59	g					Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Lithium	<u>CA</u> 743	SNo 9-93-2	<u>Result</u> 9.0	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 4.7	<u>MDL</u> 0.045	5		<u>run #:</u> 2	

Detailed Ana	lytical R	eport		Anal	ytica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B071117	2							
Project:	Na	vajo Mine	Extension	Leaching Stu	dy				
Client:	Ar	oplied Hvd	rology Ass	ociates. Inc.					
Client Project Number	no	ne		,					
Report Section	•	Clien	t Sampl	e Report					
Client Sample Name:		125 S 88	W 0-4' S	POIL					
Matrix:	Solid					C	collection Date:	11/15/2007	12:00:00PM
The following test was	conducted by	: Analvtica -	• Thornton						
Lab Sample Number:	B0711172-	-04A					Analysis Date:	12/4/200	07 4:13:55PM
Prep Date:	12/4/2007						Instrument:	CVAA_	1
Analytical Method ID:	SW7471A -	Mercury in	Solid or Sen	nisolid Waste by	CVAA -	Total l	File Name:	B120407	7S.WK
Prep Method ID:	7471A						Dilution Factor:	1	
Prep Batch Number:	T0712040	13					Percent Moisture	7.60	
Report Basis:	Dry Weight	Basis					Analyst Initials:	DL	
Sample prep wt./vol:	0.62	g					Prep Extract Vol:	50.00	ml
Analyte	СА	SNo	Result	Flags Units	POL	MDL			mm #•
Mercury	743	9-97-6	0.053	mg/Kg	0.044	0.0060)		<u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>
The following test was	conducted by	: Analytica -	Thornton						
Lab Sample Number:	B0711172-	-04A					Analysis Date:	12/3/200	07 1:37:00PM
Prep Date:	12/3/2007						Instrument:	ICP_2	
Analytical Method ID:	SW6010B -	ICP - Total					File Name:	E12037A	4
Prep Method ID:	3050B						Dilution Factor:	1	
Prep Batch Number:	T07120300	05					Percent Moisture	7.60	
Report Basis:	Dry Weight	Basis					Analyst Initials:	rm	
Sample prep wt./vol:	0.61	g					Prep Extract Vol:	50.00	ml
Analyte	<u>CA</u>	<u>SNo</u>	<u>Result</u>	Flags Units	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>
Aluminum	742	9-90-5	10,000	mg/Kg	7.1	1.7			1
Antimony	744	0-36-0	ND	mg/Kg	9.7	0.55			
Arsenic	744	0-38-2	ND	mg/Kg	12	1.6			
Barium	744	0-39-3	220	mg/Kg	0.35	0.027	,		
Beryllium	744	0-41-7	1.1	mg/Kg	0.18	0.0078	8		
Boron	744	0-42-8	13	mg/Kg	4.4	0.60			
Cadmium	744	0-43-9	ND	mg/Kg	0.71	0.051			
Charantian	744	0-70-2	16,000	mg/Kg	12	4.7			
Cobalt	744	0-47-3	0.8	mg/Kg	1.8	0.20			
Copper	744	0-48-4	28	mg/Kg	0.53	0.23			
Iron	744	0.80.6	20	mg/Kg	53	0.14			
Lead	743	9-09-0	18	mg/Kg	53	0.93			
Magnesium	743	9-96-4	3.100	mg/Kg	8.9	0.85			
Manganese	743	9-96-5	380	mg/Kg	0.89	0.098			
Molybdenum	743	9-98-7	ND	mg/Kg	1.8	0.21			
Nickel	744	0-02-0	14	mg/Kg	3.5	0.38			
Potassium	744	0-09-7	1,900	mg/Kg	89	28			
Selenium	778	4-49-2	ND	mg/Kg	8.9	2.2			
Silver	744	0-22-4	ND	mg/Kg	1.3	0.14			
Sodium	744	0-23-5	4,200	mg/Kg	270	0.90			
Thallium	744	0-28-0	ND	mg/Kg	18	1.0			
Vanadium	744	0-62-2	25	mg/Kg	0.89	0.17			
Page 14 of 62									

Detailed Ana	lytical R	eport		Ana	lytica En	vironr	onmental Laboratories, Inc.			
Workorder (SDG):	B071117	72								
Project:	Na	avajo Mine l	Extension	Leaching St	udy					
Client:	Aj	pplied Hydr	ology Asso	ociates, Inc.						
Client Project Number	no no	one	C	D						
Report Section	•	Client	Sampl	e keport						
Client Sample Name:		125 S 88V	V 0-4' SI	POIL						
Matrix:	Solid					C	Collection Date:	11/15/2007	12:00:00PM	
Lab Sample Number:	B0711172	-04A					Analysis Date:	12/3/2007	7 1:37:00PM	
Prep Date:	12/3/2007						Instrument:	ICP_2		
Analytical Method ID:	SW6010B -	- ICP - Total					File Name:	E12037A		
Prep Method ID:	3050B						Dilution Factor:	1		
Prep Batch Number:	T0712030	05					Percent Moisture	7.60		
Report Basis:	Dry Weight	Basis					Analyst Initials:	rm		
Sample prep wt./vol:	0.61	g					Prep Extract Vol:	50.00	ml	
Analyte Zinc	<u>CA</u> 744	ASNo 40-66-6	<u>Result</u> 66	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 0.53	<u>MDL</u> 0.20			<u>run #:</u> 1	
Lab Sample Number:	B0711172	-04A					Analysis Date:	12/4/2007	7 3:13:00PM	
Prep Date:	12/3/2007						Instrument:	ICP_2		
Analytical Method ID:	SW6010B -	- ICP - Total					File Name:	E12047A		
Prep Method ID:	3050B						Dilution Factor:	1		
Prep Batch Number:	T0712030	05					Percent Moisture	7.60		
Report Basis:	Dry Weight	Basis					Analyst Initials:	rm		
Sample prep wt./vol:	0.61	g					Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Lithium	<u>CA</u> 743	ASNo 39-93-2	<u>Result</u> 8.8	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 4.4	<u>MDL</u> 0.043	3		<u>run #:</u> 2	

Detailed Analytical Report				Analy	Analytica Environmental Laboratories, Inc.					
Workorder (SDG):	B07111	72								
Project:	Ν	avajo Mine	Extension	Leaching Stud	ły					
Client:	Α	pplied Hvd	rology Asso	ociates, Inc.						
Client Project Number		one	80	,						
Report Section		Clien	t Sampl	e Report						
Client Sample Name:		120 S 89	W 0-4' SI	POIL						
Matrix:	Solid					C	Collection Date:	11/15/2007 1	2:00:00PM	
The following test was	conducted b	v: Analytica -	Thornton							
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0711172 12/4/2007 SW7471A 7471A	2-05A - Mercury in	Solid or Sem	isolid Waste by	CVAA -	Total 1	Analysis Date: Instrument: HFile Name: Dilution Factor:	12/5/2007 CVAA_1 B120407S 1	9:42:00AM WK	
Prep Batch Number:	10/12040 Dry Weigh	JI3 t Basis					A polyet Initialat	0.80 DI		
Sample prep wt /vol:	0.62	d Dasis					Prep Extract Vol:	50.00 n	al	
Sample prep wi./voi.	0.02	g					Flep Extract vol.	50.00 1	11	
<u>Analyte</u> Mercury	<u>C</u> 74	<u>ASNo</u> 39-97-6	<u>Result</u> 0.12	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> 0.044	<u>MDL</u> 0.0060	0		<u>run #:</u> 1	
The following test was	conducted b	y: Analytica -	Thornton							
Lab Sample Number: Prep Date:	B0711172 12/3/2007	2-05A					Analysis Date: Instrument:	12/3/2007 ICP_2	1:43:00PM	
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E12037A		
Prep Method ID:	3050B						Dilution Factor:	1		
Prep Batch Number:	T0712030	005					Percent Moisture	6.86		
Report Basis:	Dry Weigh	t Basis					Analyst Initials:	rm		
Sample prep wt./vol:	0.56	g					Prep Extract Vol:	50.00 n	nl	
Analyte	<u>C</u>	ASNo	<u>Result</u>	Flags Units	POL	MDL			<u>run #:</u>	
Antimony	74	29-90-5 40-26-0	9,200 ND	mg/Kg	/./	1.9			1	
Arsenic	74	40-30-0	ND	mg/Kg	11	1.7				
Barium	74	40-38-2	140	mg/Kg	0.39	0.030)			
Bervllium	74	40-41-7	0.84	mg/Kg	0.19	0.008	5			
Boron	74	40-42-8	11	mg/Kg	4.8	0.65	-			
Cadmium	74	40-43-9	ND	mg/Kg	0.77	0.056)			
Calcium	74	40-70-2	27,000	mg/Kg	13	5.1				
Chromium	74	40-47-3	6.1	mg/Kg	1.9	0.29				
Cobalt	74	40-48-4	11	mg/Kg	2.9	0.25				
Copper	74	40-50-8	20	mg/Kg	0.58	0.15				
Iron	74	39-89-6	19,000	mg/Kg	5.8	0.42				
Lead	74	39-92-1	17	mg/Kg	5.8	1.0				
Molybdenum	74	39-98-7	ND	mg/Kg	1.9	0.23				
Nickel	74	40-02-0	14	mg/Kg	3.9	0.41				
Potassium	74	40-09-7	1,900	mg/Kg	96	30				
Selenium	77	84-49-2	ND	mg/Kg	9.6	2.4				
Silver	74	40-22-4	ND	mg/Kg	1.4	0.15				
Sodium	74	40-23-5	4,100	mg/Kg	290	0.98				
Thallium	74	40-28-0	ND	mg/Kg	19	1.1				
Vanadium	74	40-62-2	18	mg/Kg	0.96	0.19				
Zinc	74	40-66-6	59	mg/Kg	0.58	0.21				
Lab Sample Number:	B0711172	2-05A					Analysis Date:	12/4/2007	3:18:00PM	

Page 16 of 62
Detailed Analytical Report Analytica En						vironmental Laboratories, Inc.					
Workorder (SDG):	B07111	72									
Project:	Ν	avajo Mine	Extension	Leaching Stud	ly						
Client:	А	pplied Hyd	rology Ass	ociates, Inc.							
Client Project Number	r: n	one									
Report Section	:	Clien	t Sampl	e Report							
Client Sample Name:		120 S 89	W 0-4' S	POIL							
Matrix:	Solid					C	Collection Date:	11/15/2007	12:00:00PM		
Prep Date:	12/3/2007	7					Instrument:	ICP_2			
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E12047A	L		
Prep Method ID:	3050B						Dilution Factor:	1			
Prep Batch Number:	T0712030	005					Percent Moisture	6.86			
Report Basis:	Dry Weigh	t Basis					Analyst Initials:	rm			
Sample prep wt./vol:	0.56	g					Prep Extract Vol:	50.00	ml		
<u>Analyte</u>	<u>C</u>	<u>ASNo</u>	<u>Result</u>	Flags Units	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>		
Lithium	74	39-93-2	8.2	mg/Kg	4.8	0.047	7		3		
Magnesium	74	39-96-4	3,200	mg/Kg	9.6	0.92					
Manganese	74	39-96-5	370	mg/Kg	0.96	0.11					

Detailed Ana	lytical Report		Analy	ytica En	vironn	nental Laboratories,	, Inc.	
Workorder (SDG):	B0711172							
Project:	Navajo Mir	ne Extension	Leaching Stu	dy				
Client:	Applied Hy	drology Ass	ociates, Inc.					
Client Project Number	:: none							
Report Section	: Clie	nt Samp	le Report					
Client Sample Name:	Barber	Ramp 3 (Composite S	poil A				
Matrix:	Solid				C	collection Date:	11/15/2007 12	:00:00PM
The following test was	conducted by: Analytic	a - Thornton						
Lab Sample Number:	B0711172-06A					Analysis Date:	12/5/2007	9:49:39AM
Prep Date:	12/4/2007					Instrument:	CVAA_1	
Analytical Method ID:	SW7471A - Mercury i	n Solid or Ser	nisolid Waste by	CVAA -	Total l	File Name:	B120407S.V	VK
Prep Method ID:	7471A					Dilution Factor:	1	
Prep Batch Number:	T071204013					Percent Moisture	7.98	
Report Basis:	Dry Weight Basis					Analyst Initials:	DL	
Sample prep wt./vol:	0.61 g					Prep Extract Vol:	50.00 ml	
Analyte	CASNo	Result	Flags Units	PQL	MDL			run #:
Mercury	7439-97-6	0.087	mg/Kg	0.044	0.006	1		1
The following test was	conducted by: Analytic	a - Thornton						
Lab Sample Number:	B0711172-06A					Analysis Date:	12/3/2007	2:28:00PM
Prep Date:	12/3/2007					Instrument:	ICP_2	
Analytical Method ID:	SW6010B - ICP - Tota	al				File Name:	E12037A	
Prep Method ID:	3050B					Dilution Factor:	1	
Prep Batch Number:	T071203005					Percent Moisture	7.98	
Report Basis:	Dry Weight Basis					Analyst Initials:	rm	
Sample prep wt./vol:	0.58 g					Prep Extract Vol:	50.00 ml	
Analyte	CASNo	<u>Result</u>	Flags Units	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>
Aluminum	7429-90-5	10,000	mg/Kg	7.4	1.8			1
Antimony	7440-36-0	ND	mg/Kg	10	0.58			
Arsenic	7440-38-2	ND	mg/Kg	12	1.6			
Barium	7440-39-3	170	mg/Kg	0.37	0.029			
Berymum	7440-41-7	1.0	mg/Kg	0.19	0.0082	2		
Cadmium	7440-42-8	ND	mg/Kg	4.7	0.054			
Calcium	7440-43-9	20.000	mg/Kg	13	5.0			
Chromium	7440-47-3	6.7	mg/Kg	1.9	0.28			
Cobalt	7440-48-4	11	mg/Kg	2.8	0.24			
Copper	7440-50-8	26	mg/Kg	0.56	0.15			
Iron	7439-89-6	20,000	mg/Kg	5.6	0.41			
Lead	7439-92-1	16	mg/Kg	5.6	0.98			
Magnesium	7439-96-4	3,100	mg/Kg	9.3	0.89			
Manganese	7439-96-5	440	mg/Kg	0.93	0.10			
Molybdenum	7439-98-7	ND	mg/Kg	1.9	0.22			
Nickel	7440-02-0	13	mg/Kg	3.7	0.40			
Potassium	7440-09-7	1,900	mg/Kg	93	29			
Selenium	7784-49-2	ND	mg/Kg	9.3	2.3			
Silver	7440-22-4	ND	mg/Kg	1.4	0.14			
Sodium	7440-23-5	4,000	mg/Kg	280	0.95			
Thallium Mana dian	7440-28-0	ND	mg/Kg	19	1.1			
vanadium	7440-62-2	23	mg/Kg	0.93	0.18			
Page 18 of 62								

Detailed Analytical Report			Analy	Analytica Environmental Laboratories, Inc.					
Workorder (SDG):	B0711172								
Project:	Navajo Mine	Extension	Leaching Stud	У					
Client:	Applied Hydi	ology Ass	ociates, Inc.						
Client Project Number	r: none								
Report Section	: Client	t Samp	le Report						
Client Sample Name:	Barber F	Ramp 3 (Composite Sp	oil A	1				
Matrix:	Solid				Collection Date:	11/15/2007 12:00:00PM			
Lab Sample Number:	B0711172-06A				Analysis Date:	12/3/2007 2:28:00PM			
Prep Date:	12/3/2007				Instrument:	ICP_2			
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12037A			
Prep Method ID:	3050B				Dilution Factor:	1			
Prep Batch Number:	T071203005				Percent Moisture	7.98			
Report Basis:	Dry Weight Basis				Analyst Initials:	rm			
Sample prep wt./vol:	0.58 g				Prep Extract Vol:	50.00 ml			
Analyte Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> 62	<u>Flags</u> <u>Units</u> mg/Kg	POL MD 0.56 0.2	<u>L</u> 21	<u>run #:</u> 1			
Lab Sample Number:	B0711172-06A				Analysis Date:	12/4/2007 4:04:00PM			
Prep Date:	12/3/2007				Instrument:	ICP_2			
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12047A			
Prep Method ID:	3050B				Dilution Factor:	1			
Prep Batch Number:	T071203005				Percent Moisture	7.98			
Report Basis:	Dry Weight Basis				Analyst Initials:	rm			
Sample prep wt./vol:	0.58 g				Prep Extract Vol:	50.00 ml			
<u>Analyte</u> Lithium	<u>CASNo</u> 7439-93-2	<u>Result</u> 8.6	<u>Flags</u> <u>Units</u> mg/Kg	POL MD 4.7 0.04	<u>L</u> 45	<u>run #:</u> 2			

Detailed Ana	lytical Report		Analy	tica En	vironn	nental Laboratories,	, Inc.
Workorder (SDG):	B0711172						
Project:	Navajo Mi	ne Extension	Leaching Stu	dy			
Client:	Applied H	vdrology Ass	ociates, Inc.				
Client Project Number	none		,				
Report Section:	clie	ent Samp	le Report				
Client Sample Name:	Barbe	r Ramp 3 (Composite S	poil B			
Matrix:	Solid				C	collection Date:	11/15/2007 12:00:00PM
The following test was	conducted by: Analytic	ca - Thornton					
Lab Sample Number:	B0711172-07A					Analysis Date:	12/5/2007 9:57:26AM
Prep Date:	12/4/2007					Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury	in Solid or Ser	nisolid Waste by	CVAA -	Total l	File Name:	B120407S.WK
Prep Method ID:	7471A					Dilution Factor:	1
Prep Batch Number:	T071204013					Percent Moisture	8.13
Report Basis:	Dry Weight Basis					Analyst Initials:	DL
Sample prep wt./vol:	0.62 g					Prep Extract Vol:	50.00 ml
Analyta	CASNo	Result	Flage Units	POL	MDL		P1117 #•
Mercury	7439-97-6	0.073	mg/Kg	0.044	0.0060)	<u>1</u>
The following test was	conducted by: Analytic	ca - Thornton					
Lab Sample Number:	B0711172-07A					Analysis Date:	12/3/2007 2:33:00PM
Prep Date:	12/3/2007					Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - To	tal				File Name:	E12037A
Prep Method ID:	3050B					Dilution Factor:	1
Prep Batch Number:	T071203005					Percent Moisture	8.13
Report Basis:	Dry Weight Basis					Analyst Initials:	rm
Sample prep wt./vol:	0.64 g					Prep Extract Vol:	50.00 ml
Analyte	CASNo	Result	Flags Units	<u>PQL</u>	<u>MDL</u>		<u>run #:</u>
Aluminum	7429-90-5	9,500	mg/Kg	6.8	1.7		1
Antimony	7440-36-0	ND	mg/Kg	9.3	0.52		
Arsenic	7440-38-2	ND	mg/Kg	11	1.5		
Barium	7440-39-3	180	mg/Kg	0.34	0.026	-	
Beryllium	7440-41-7	1.0	mg/Kg	0.17	0.007:	5	
Boron	7440-42-8	12 ND	mg/Kg	4.2	0.57		
Calcium	7440-43-9	22.000	mg/Kg	12	4.5		
Chromium	7440-70-2	22,000 6 0	mg/Kg	12	4.5		
Cobalt	7440-47-3	11	mg/Kg	2.5	0.23		
Copper	7440-50-8	23	mg/Kg	0.51	0.13		
Iron	7439-89-6	20,000	mg/Kg	5.1	0.37		
Lead	7439-92-1	17	mg/Kg	5.1	0.89		
Magnesium	7439-96-4	2,900	mg/Kg	8.5	0.81		
Manganese	7439-96-5	430	mg/Kg	0.85	0.094		
Molybdenum	7439-98-7	ND	mg/Kg	1.7	0.20		
Nickel	7440-02-0	13	mg/Kg	3.4	0.36		
Potassium	7440-09-7	1,700	mg/Kg	85	27		
Selenium	7784-49-2	ND	mg/Kg	8.5	2.1		
Silver	7440-22-4	ND	mg/Kg	1.3	0.13		
Sodium	7440-23-5	3,900	mg/Kg	250	0.86		
Thallium	7440-28-0	ND	mg/Kg	17	1.00		
Vanadium	7440-62-2	22	mg/Kg	0.85	0.16		
Page 20 of 62							

Detailed Ana	lytical Report		Analyti	ca Environr	nental Laboratories,	Inc.
Workorder (SDG):	B0711172					
Project:	Navajo Mine I	Extension Le	eaching Study			
Client:	Applied Hydro	ology Associ	ates, Inc.			
Client Project Number	r: none					
Report Section	: Client	Sample	Report			
Client Sample Name:	Barber R	amp 3 Cor	mposite Spo	oil B		
Matrix:	Solid			(Collection Date:	11/15/2007 12:00:00PM
Lab Sample Number:	B0711172-07A				Analysis Date:	12/3/2007 2:33:00PM
Prep Date:	12/3/2007				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12037A
Prep Method ID:	3050B				Dilution Factor:	1
Prep Batch Number:	T071203005				Percent Moisture	8.13
Report Basis:	Dry Weight Basis				Analyst Initials:	rm
Sample prep wt./vol:	0.64 g				Prep Extract Vol:	50.00 ml
Analyte Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> <u>F</u> 65	F lags <u>Units</u> mg/Kg	PQL MDL 0.51 0.19		<u>run #:</u> 1
Lab Sample Number:	B0711172-07A				Analysis Date:	12/4/2007 4:09:00PM
Prep Date:	12/3/2007				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12047A
Prep Method ID:	3050B				Dilution Factor:	1
Prep Batch Number:	T071203005				Percent Moisture	8.13
Report Basis:	Dry Weight Basis				Analyst Initials:	rm
Sample prep wt./vol:	0.64 g				Prep Extract Vol:	50.00 ml
<u>Analyte</u> Lithium	<u>CASNo</u> 7439-93-2	<u>Result</u> <u>F</u> 8.2	F lags <u>Units</u> mg/Kg	PQL MDL 4.2 0.041	L	<u>run #:</u> 2

Detailed Ana	lytical Rep	ort	Anal	ytica En	vironn	nental Laboratories,	, Inc.	
Workorder (SDG):	B0711172							
Project:	Nava	jo Mine Extensi	on Leaching Stu	ıdy				
Client:	Appl	ied Hydrology A	ssociates, Inc.					
Client Project Number	none :							
Report Section	:	Client Sam	ple Report					
Client Sample Name:	Ba	arber Ramp 3	Composite S	spoil C				
Matrix:	Solid				С	ollection Date:	11/15/2007 12	:00:00PM
The following test was	conducted by: A	nalvtica - Thornton	1					
Lab Sample Number: Prep Date:	B0711172-08 12/4/2007 SW7471A - M	A ercury in Solid or S	Semisolid Waste by	CVAA -	Total I	Analysis Date: Instrument: File Name:	12/5/2007 1 CVAA_1 B1204075 V	0:05:12AM
Pren Method ID:	7471A		, eningenia (rabie eg	0,111	100001	Dilution Factor:	1	, IX
Prep Batch Number: Report Basis:	T071204013 Dry Weight Ba	sis				Percent Moisture Analyst Initials:	7.87 DL	
Sample prep wt./vol:	0.02 g					Prep Extract vol:	30.00 mi	
<u>Analyte</u> Mercury	<u>CASN</u> 7439-9	<u>o Result</u> 7-6 0.068	Flags <u>Units</u> mg/Kg	<u>PQL</u> 0.044	<u>MDL</u> 0.0060)		<u>run #:</u> 1
The following test was	conducted by: A	nalytica - Thornton	1					
Lab Sample Number:	B0711172-08	А				Analysis Date:	12/3/2007	2:38:00PM
Prep Date:	12/3/2007					Instrument:	ICP_2	
Analytical Method ID:	SW6010B - IC	P - Total				File Name:	E12037A	
Prep Method ID:	3050B					Dilution Factor:	1	
Prep Batch Number:	T071203005					Percent Moisture	7.87	
Report Basis:	Dry Weight Ba	sis				Analyst Initials:	rm	
Sample prep wt./vol:	0.57 g					Prep Extract Vol:	50.00 ml	
Analyte	CASN	<u>o Result</u>	Flags Units	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>
Aluminum	7429-9	0-5 9,400	mg/Kg	7.7	1.9			1
Antimony	7440-3	6-0 ND	mg/Kg	11	0.59			
Arsenic	7440-3	8-2 ND	mg/Kg	12	1.7			
Barium	7440-3	9-3 170	mg/Kg	0.38	0.030	_		
Beryllium	7440-4	1-7 I.0	mg/Kg	0.19	0.0083	b		
Boron	7440-4	2-8 12	mg/Kg	4.8	0.04			
Calcium	7440-4	3-9 ND	mg/Kg	13	5.1			
Chromium	7440-7	7 2 6 1	mg/Kg	10	0.28			
Cobalt	7440-4	8-A 11	mg/Kg	2.9	0.20			
Copper	7440-5	0-8 24	mg/Kg	0.57	0.15			
Iron	7439-8	9-6 20.000	mg/Kg	5.7	0.42			
Lead	7439-9	2-1 18	mg/Kg	5.7	1.0			
Magnesium	7439-9	6-4 3,000	mg/Kg	9.6	0.92			
Manganese	7439-9	6-5 390	mg/Kg	0.96	0.11			
Molybdenum	7439-9	8-7 ND	mg/Kg	1.9	0.23			
Nickel	7440-0	2-0 14	mg/Kg	3.8	0.41			
Potassium	7440-0	9-7 1,800	mg/Kg	96	30			
Selenium	7784-4	9-2 ND	mg/Kg	9.6	2.4			
Silver	7440-2	2-4 ND	mg/Kg	1.4	0.15			
Sodium	7440-2	4,100	mg/Kg	290	0.98			
Thallium	7440-2	8-0 ND	mg/Kg	19	1.1			
Vanadium	7440-6	2-2 22	mg/Kg	0.96	0.19			
Page 22 of 62								

-

Detailed Analytical Report			Analy	Analytica Environmental Laboratories, Inc.					
Workorder (SDG):	B0711172								
Project:	Navajo Min	e Extension	Leaching Stud	ly					
Client:	Applied Hy	drology Ass	ociates, Inc.						
Client Project Number	:: none								
Report Section	: Clier	nt Samp	le Report						
Client Sample Name:	Barber	Ramp 3 (Composite Sp	ooil C	1				
Matrix:	Solid				Collection Date:	11/15/2007 12:00:00PM			
Lab Sample Number:	B0711172-08A				Analysis Date:	12/3/2007 2:38:00PM			
Prep Date:	12/3/2007				Instrument:	ICP_2			
Analytical Method ID:	SW6010B - ICP - Tota	1			File Name:	E12037A			
Prep Method ID:	3050B				Dilution Factor:	1			
Prep Batch Number:	T071203005				Percent Moisture	7.87			
Report Basis:	Dry Weight Basis				Analyst Initials:	rm			
Sample prep wt./vol:	0.57 g				Prep Extract Vol:	50.00 ml			
Analyte Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> 62	<u>Flags</u> <u>Units</u> mg/Kg	POL MD 0.57 0.2	<u>L</u> 11	<u>run #:</u> 1			
Lab Sample Number:	B0711172-08A				Analysis Date:	12/4/2007 4:14:00PM			
Prep Date:	12/3/2007 SW6010D_LCD_Tate	1			Instrument:	ICP_2			
Analytical Method ID:	SW0010B - ICP - 10ta	I			File Name:	E12047A			
Prep Method ID:	3050B				Dilution Factor:	1			
Prep Batch Number:	T071203005				Percent Moisture	7.87			
Report Basis:	Dry Weight Basis				Analyst Initials:	rm			
Sample prep wt./vol:	0.57 g				Prep Extract Vol:	50.00 ml			
<u>Analyte</u> Lithium	<u>CASNo</u> 7439-93-2	<u>Result</u> 8.1	<u>Flags</u> <u>Units</u> mg/Kg	PQL MD 4.8 0.04	<u>L</u> 47	<u>run #:</u> 2			

Detailed Ana	lytical Report		A	Analytica Er	nvironn	nental Laboratories	, Inc.	
Workorder (SDG):	B0711172							
Project:	Navajo Mine	Extension	Leaching	Study				
Client:	Applied Hyd	rology Ass	ociates. In	с.				
Client Project Number		8,						
Report Section	· Clion	t Samn	la Dana	nt				
Report Section	· Chen	t Samp	le Kepo	11				
Client Sample Name:	KF2007-	-01(58) D	UP and					
Matrix:	Aqueo KF-98-0	2(53)DU	Р		-	Collection Date:	11/15/2007	4:30:00PM
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number: Prep Date: Analytical Method ID:	B0711172-12A 11/30/2007 SW7470A - Mercury in	Liquid Wast	te by CVAA	- Total Hg		Analysis Date: Instrument: File Name:	11/30/200 CVAA_1 B113007	07 4:09:34PM W.W
Prep Method ID:	7470A					Dilution Factor:	1	
Prep Batch Number:	T071130013							
Report Basis:	As Received					Analyst Initials:	DL	
Sample prep wt./vol:	30.00 ml					Prep Extract Vol:	30.00	ml
	CAEN	Decerel4			MDI	Trop Ender Four		
Analyte Mercury	<u>CASNo</u> 7439-97-6	<u>Result</u> ND	<u>Flags</u> <u>Un</u> mg	<u>rol</u> /L 0.00020	0.0000	50		<u>run #:</u> 1
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number:	B0711172-12A					Analysis Date:	12/3/2007	6:06:00PM
Prep Date:	12/3/2007					Instrument:	ICP_2	
Analytical Method ID:	SW6010B - ICP - Total					File Name:	E12037A	
Prep Method ID:	3010_ICP					Dilution Factor:	1	
Prep Batch Number:	T071203011							
Report Basis:	As Received					Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml					Prep Extract Vol:	50.00	ml
<u>Analyte</u>	<u>CASNo</u>	<u>Result</u>	<u>Flags</u> <u>Un</u>	its POL	<u>MDL</u>			<u>run #:</u>
Antimony	7429-90-5	0.14 ND	nig. ma	/L 0.050	0.014	F 7		1
Arsenic	7440-30-0	ND	mg	/L 0.050	0.000	, ,		
Barium	7440-38-2	0.088	mg	/L 0.10	0.0013	6		
Beryllium	7440-39-3	ND	ma	/L 0.010	0.0001	60		
Cadmium	7440-41-7	ND	mg	/L 0.0010	0.0000	51		
Calcium	7440-43-9	33	mg	/L 0.0000	0.0003	3		
Chromium	7440-70-2	ND	mg	/L 0.010	0.0013	, 8		
Cobalt	7440-47-5	ND	mg	/I 0.0050	0.001	6		
Copper	7440-50-8	ND	mg	L 0.0050	0.001	9		
Iron	7439-89-6	0.073	mg	L 0.050	0.002	7		
Lead	7439-92-1	ND	mg	/L 0.050	0.011			
Lithium	7439-93-2	ND	mg	/L 0.10	0.0007	12		
Magnesium	7439-96-4	1.2	mg	/L 0.10	0.012	2		
Manganese	7439-96-5	ND	mg	/L 0.010	0.0006	66		
Molybdenum	7439-98-7	ND	mg	/L 0.010	0.001	8		
Nickel	7440-02-0	ND	mg	/L 0.040	0.002	7		
Potassium	7440-09-7	10	mg	/L 1.0	0.31			
Selenium	7784-49-2	ND	mg	/L 0.10	0.026	5		
Silver	7440-22-4	ND	mg	/L 0.015	0.0006	66		
Sodium	7440-23-5	1,100	mg	/L 3.0	0.028	3		
Thallium	7440-28-0	ND	mg	/L 0.40	0.011			
Vanadium	7440-62-2	ND	mg,	/L 0.010	0.0007	72		
Page 30 of 62			-					

_

Detailed Ana	lytical Report		Analytica Environmental Laboratories, Inc.			
Workorder (SDG):	B0711172					
Project:	Navajo Mine	Extension L	eaching Stu	dy		
Client:	Applied Hydr	ology Assoc	ciates, Inc.			
Client Project Number Report Section	none Client	Sample	Report			
Client Sample Name:	KF2007-0	01(58) DU	P and		7	
Matrix:	Aqueo KF-98-02	2(53)DUP			Collection Date:	11/15/2007 4:30:00PM
Lab Sample Number:	B0711172-12A				Analysis Date:	12/3/2007 6:06:00PM
Prep Date:	12/3/2007				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12037A
Prep Method ID:	3010_ICP				Dilution Factor:	1
Prep Batch Number:	T071203011					
Report Basis:	As Received				Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml
<u>Analyte</u> Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	POL <u>MI</u> 0.0050 0.0	<u>DL</u> 0010	<u>run #:</u> 1
Lab Sample Number:	B0711172-12A				Analysis Date:	12/4/2007 5:24:00PM
Prep Date:	12/3/2007				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12047A
Prep Method ID:	3010_ICP				Dilution Factor:	1
Prep Batch Number:	T071203011					
Report Basis:	As Received				Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml
<u>Analyte</u> Boron	<u>CASNo</u> 7440-42-8	<u>Result</u> 0.29	<u>Flags</u> <u>Units</u> mg/L	<u>POL</u> <u>MI</u> 0.050 0.0	<u>DL</u> 0018	<u>run #:</u> 2

Detailed Ana	lytical R	leport		Anal	ytica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B07111	72							
Project:	Ν	avajo Mine I	Extension	Leaching Stu	ıdy				
Client:	Α	pplied Hvdr	ology Asso	ociates. Inc.					
Client Project Number	n	nne ja		· · · · · · · · · · · · · · · · · · ·					
Report Sections	:	Metho	d Blan	k Report					
Client Sample Name:		MB							
Matrix:	Solid	L.				C	ollection Date:	12/4/2007	12:00:00AM
The following test was	conducted b	v: Analytica - '	Thornton						
Lab Sample Number:	T0712040)13-MB					Analysis Date:	12/4/200	7 3:00:38PM
Prep Date:	12/4/2007						Instrument:	CVAA_	1
Analytical Method ID:	SW7471A	- Mercury in S	olid or Sem	isolid Waste by	CVAA -	Total l	File Name:	B120407	7S.WK
Prep Method ID:	7471A						Dilution Factor:	1	
Prep Batch Number:	T0712040)13					Percent Moisture	NA	
Report Basis:	Dry Weigh	t Basis					Analyst Initials:	DL	
Sample prep wt./vol:	0.60	g					Prep Extract Vol:	50.00	ml
1 I I Analyta	C	ASNo	Recult	Flags Units	POI	MDI	1		
Mercury	<u></u> 74	39-97-6	ND	mg/Kg	0.042	0.0057	7		<u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>
The following test was	conducted b	y: Analytica - '	Thornton						
Lab Sample Number:	T0712030	005-MB					Analysis Date:	12/3/200	07 1:12:00PM
Prep Date:	12/3/2007	,					Instrument:	ICP_2	
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E12037A	4
Prep Method ID:	3050B						Dilution Factor:	1	
Prep Batch Number:	T0712030)05					Percent Moisture	NA	
Report Basis:	Dry Weigh	t Basis					Analyst Initials:	rm	
Sample prep wt./vol:	0.50	g					Prep Extract Vol:	50.00	ml
Analyte	<u>C</u> .	ASNo	Result	<u>Flags</u> <u>Units</u>	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>
Aluminum	74	29-90-5	ND	mg/Kg	8.0	2.0			1
Antimony	74	40-36-0	ND	mg/Kg	11	0.62			
Arsenic	74	40-38-2	ND	mg/Kg	13	1.8			
Barium	74	40-39-3	ND	mg/Kg	0.40	0.031			
Beryllium	74	40-41-7	ND	mg/Kg	0.20	0.0089)		
Boron	74	40-42-8	ND	mg/Kg	5.0	0.67			
Cadmium	74	40-43-9	ND	mg/Kg	0.80	0.058			
Characteria	/4	40-70-2		mg/Kg	14	5.5 0.20			
Cobalt	74	40-47-3	ND	mg/Kg	2.0	0.30			
Copper	74	40-48-4	ND	mg/Kg	0.60	0.20			
Iron	74	30 80 6	ND	mg/Kg	6.0	0.10			
Lead	74	30-02-1	ND	mg/Kg	6.0	1 1			
Magnesium	74	39-96-4	ND	mg/Kg	10	0.96			
Manganese	74	39-96-5	ND	mg/Kg	1.0	0.11			
Molybdenum	74	39-98-7	ND	mg/Kg	2.0	0.24			
Nickel	74	40-02-0	ND	mg/Kg	4.0	0.43			
Potassium	74	40-09-7	ND	mg/Kg	100	31			
Selenium	77	84-49-2	ND	mg/Kg	10	2.5			
Silver	74	40-22-4	ND	mg/Kg	1.5	0.15			
Sodium	74	40-23-5	ND	mg/Kg	300	1.0			
Thallium	74	40-28-0	ND	mg/Kg	20	1.2			
Vanadium	74	40-62-2	ND	mg/Kg	1.0	0.20			
Page 32 of 62									

Detailed Ana	lytical Report		Analy	ytica Envi	ironmental Laborator	ies, Inc.
Workorder (SDG):	B0711172					
Project:	Navajo Mine l	Extension	Leaching Stu	dy		
Client:	Applied Hydro	ology Ass	ociates, Inc.			
Client Project Number	r: none		,			
Report Section	: Metho	d Blan	k Report			
Client Sample Name:	MB					
Matrix:	Solid				Collection Date:	12/3/2007 12:00:00AM
Lab Sample Number:	T071203005-MB				Analysis Date:	12/4/2007 2:48:00PM
Prep Date:	12/3/2007				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12047A
Prep Method ID:	3050B				Dilution Factor:	1
Prep Batch Number:	T071203005				Percent Moisture	NA
Report Basis:	Dry Weight Basis				Analyst Initials:	rm
Sample prep wt./vol:	0.50 g				Prep Extract Vo	ol: 50.00 ml
<u>Analyte</u> Lithium	<u>CASNo</u> 7439-93-2	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/Kg	<u>POL</u> <u>1</u> 5.0	<u>MDL</u> 0.049	<u>run #:</u> 2
Lab Sample Number:	T071203005-MB				Analysis Date:	12/5/2007 1:51:00PM
Prep Date:	12/3/2007				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E12057A
Prep Method ID:	3050B				Dilution Factor:	1
Prep Batch Number:	T071203005				Percent Moisture	NA
Report Basis:	Dry Weight Basis				Analyst Initials:	rm
Sample prep wt./vol:	0.50 g				Prep Extract Vo	ol: 50.00 ml
<u>Analyte</u> Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> <u>N</u> 0.60	<u>MDL</u> 0.22	<u>run #:</u> 3
Analyte Zinc The following test was	<u>CASNo</u> 7440-66-6 conducted by: Analytica - ⁷	<u>Result</u> ND Thornton	<u>Flags</u> <u>Units</u> mg/Kg	<u>POL</u> <u>N</u> 0.60	<u>MDL</u> 0.22	<u>run #:</u> 3
Analyte Zinc The following test was Lab Sample Number:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB	<u>Result</u> ND Thornton	Flags <u>Units</u> mg/Kg	<u>POL</u> <u>N</u> 0.60	MDL 0.22 Analysis Date:	<u>run #:</u> 3 11/30/2007 4:00:22PM
Analyte Zinc The following test was Lab Sample Number: Prep Date:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007	<u>Result</u> ND Thornton	<u>Flags</u> <u>Units</u> mg/Kg	<u>PQL</u> <u>N</u> 0.60	MDL 0.22 Analysis Date: Instrument:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L	Result ND Thornton	<u>Flags</u> <u>Units</u> mg/Kg	POL MOL 100000	MDL 0.22 Analysis Date: Instrument: File Name:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A	Result ND Thornton iquid Waste	<u>Flags</u> <u>Units</u> mg/Kg e by CVAA - To	POL 1	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013	Result ND Thornton iquid Wast	Flags Units mg/Kg	POL 1	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis	<u>Result</u> ND Thornton iquid Wast	<u>Flags</u> <u>Units</u> mg/Kg e by CVAA - To	POL 1	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml	Result ND Thornton	<u>Flags</u> <u>Units</u> mg/Kg	POL 1	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL 0L 0L 30.00 ml
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6	Result ND Thornton iquid Waste <u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/Kg e by CVAA - To <u>Flags</u> <u>Units</u> mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>PQL <u>1</u> 0.00020 0</u>	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL JL JL JL MI MI MI MI MI MI MI MI MI MI
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7	Result ND Thornton iquid Waste MD Thornton	Flags Units mg/Kg e by CVAA - To Flags Units mg/L	<u>POL</u> <u>1</u> 0.60 otal Hg <u>PQL <u>1</u> 0.00020 0</u>	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL bl: 30.00 ml <u>run #:</u> 1
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB	Result ND Thornton iquid Waste <u>Result</u> ND Thornton	Flags Units mg/Kg e by CVAA - To Flags Units mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>POL 1</u> 0.00020 0	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL JL 30.00 ml <u>run #:</u> 1 12/3/2007 5:46:00PM
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007	Result ND Thornton iquid Waste <u>Result</u> ND Thornton	Flags Units mg/Kg e by CVAA - To Flags Units mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>PQL <u>1</u> 0.00020 0</u>	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL JL 30.00 ml <u>run #:</u> 1 12/3/2007 5:46:00PM ICP_2
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date: Analytical Method ID:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007 SW6010B - ICP - Total	Result ND Thornton iquid Waste iquid Waste ND Thornton	Flags Units mg/Kg e by CVAA - To Flags Units mg/L	<u>POL</u> <u>1</u> 0.60 otal Hg <u>PQL <u>1</u> 0.00020 0</u>	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument: File Name:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL DL 30.00 ml <u>run #:</u> 1 12/3/2007 5:46:00PM ICP_2 E12037A
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007 SW6010B - ICP - Total 3010_ICP	Result ND Thornton iquid Waste <u>Result</u> ND Thornton	Flags Units mg/Kg e by CVAA - To <u>Flags Units</u> mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>POL 1</u> 0.00020 0	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument: File Name: Dilution Factor:	$\frac{\text{run #:}{3}}{11/30/2007 4:00:22PM}$ CVAA_1 B113007W.W 1 DL DL 30.00 ml $\frac{\text{run #:}{1}}{1}$ 12/3/2007 5:46:00PM ICP_2 E12037A 1
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007 SW6010B - ICP - Total 3010_ICP T071203011	Result ND Thornton iquid Waste <u>Result</u> ND Thornton	Flags Units mg/Kg e by CVAA - To Flags Units mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>PQL <u>1</u> 0.00020 0</u>	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument: File Name: Dilution Factor:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL JL 30.00 ml <u>run #:</u> 1 12/3/2007 5:46:00PM ICP_2 E12037A 1
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007 SW6010B - ICP - Total 3010_ICP T071203011 Dry Weight Basis	Result ND Thornton iquid Waste <u>Result</u> ND Thornton	Flags Units mg/Kg e by CVAA - To <u>Flags Units</u> mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>PQL 1</u> 0.00020 0	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials:	<u>run #:</u> 3 11/30/2007 4:00:22PM CVAA_1 B113007W.W 1 DL DL 30.00 ml <u>run #:</u> 1 12/3/2007 5:46:00PM ICP_2 E12037A 1 m
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol:	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007 SW6010B - ICP - Total 3010_ICP T071203011 Dry Weight Basis 50.00 ml	Result ND Thornton iquid Wast Result ND Thornton	Flags Units mg/Kg e by CVAA - To <u>Flags Units</u> mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>POL 1</u> 0.00020 0	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo	$\frac{\operatorname{run \#:}{3}}{11/30/2007 4:00:22PM}$ CVAA_1 B113007W.W 1 DL DL 30.00 ml $\frac{\operatorname{run \#:}{1}}{1}$ 12/3/2007 5:46:00PM ICP_2 E12037A 1 m d: 50.00 ml
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Auminum	<u>CASNo</u> 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml <u>CASNo</u> 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007 SW6010B - ICP - Total 3010_ICP T071203011 Dry Weight Basis 50.00 ml <u>CASNo</u> 7429-90-5	Result ND Thornton iquid Waste <u>Result</u> ND Thornton	Flags Units mg/Kg e by CVAA - To Flags Units mg/L	<u>POL</u> <u>1</u> 0.60 Dtal Hg <u>PQL <u>1</u> 0.00020 0</u>	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.014	$\frac{\operatorname{run \#:}{3}}{11/30/2007 \ 4:00:22PM}$ CVAA_1 B113007W.W 1 DL DL 30.00 ml $\frac{\operatorname{run \#:}{1}}{1}$ 12/3/2007 5:46:00PM ICP_2 E12037A 1 m ol: 50.00 ml $\frac{\operatorname{run \#:}{1}}{1}$
Analyte Zinc The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Mercury The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: Analyte Aluminum Antimony	CASNo 7440-66-6 conducted by: Analytica - 7 T071130013-MB 11/30/2007 SW7470A - Mercury in L 7470A T071130013 Dry Weight Basis 30.00 ml CASNo 7439-97-6 conducted by: Analytica - 7 T071203011-MB 12/3/2007 SW6010B - ICP - Total 3010_ICP T071203011 Dry Weight Basis 50.00 ml CASNo 7429-90-5 7440-36-0	Result ND Thornton iquid Waste <u>Result</u> ND Thornton <u>Result</u> ND	Flags Units mg/Kg e by CVAA - To Flags Units mg/L Flags Units mg/L mg/L	<u>POL</u> <u>1</u> 0.60 <u>1</u> 0.00020 0 <u>POL <u>1</u> 0.00020 0</u>	MDL 0.22 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.000050 Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vo MDL 0.014 0.0067	$\frac{\operatorname{run \#:}{3}}{11/30/2007 \ 4:00:22PM \\ CVAA_1 \\ B113007W.W \\ 1 \\ 1 \\ DL \\ 0!: 30.00 \ ml \\ \underline{\operatorname{run \#:}}{1} \\ 12/3/2007 \ 5:46:00PM \\ ICP_2 \\ E12037A \\ 1 \\ 1 \\ m \\ 0!: 50.00 \ ml \\ \underline{\operatorname{run \#:}}{1} \\ 1 \\ 1 \\ \end{array}$

Detailed Anal	lytical Report		An	alytica En	vironment	tal Laboratories,	Inc.	
Workorder (SDG):	B0711172			5		,		
Project:	Navaio Mine I	Extension	Leaching St	udv				
Client:	Applied Hydro	nlagy Assa	ciates. Inc.	J				
Client Project Number	none	510 <u>5</u> <u>7</u> 1550	ciutes, inc.					
Report Section:	Metho	d Blanl	k Report	ţ				
Client Sample Name:	MB							
Matrix:	Aqueous				Colle	ection Date:	12/3/2007 12	:00:00AM
Lab Sample Number:	T071203011-MB				An	alysis Date:	12/3/2007	5:46:00PM
Prep Date:	12/3/2007				Inst	trument:	ICP_2	
Analytical Method ID:	SW6010B - ICP - Total				File	e Name:	E12037A	
Prep Method ID:	3010_ICP				Dil	ution Factor:	1	
Prep Batch Number:	T071203011							
Report Basis:	Dry Weight Basis				An	alyst Initials:	rm	
Sample prep wt./vol:	50.00 ml				Pre	ep Extract Vol:	50.00 r	nl
Analyte	CASNo	Result	Flags Units	POL	MDL			run #•
Barium	7440-39-3	ND	mg/L	0.010	0.00016			<u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>
Beryllium	7440-41-7	ND	mg/L	0.0010	0.000060			
Cadmium	7440-43-9	ND	mg/L	0.0060	0.00051			
Calcium	7440-70-2	ND	mg/L	0.10	0.013			
Chromium	7440-47-3	ND	mg/L	0.010	0.0018			
Cobalt	7440-48-4	ND	mg/L	0.0050	0.0016			
Copper	7440-50-8	ND	mg/L	0.0050	0.0019			
Iron	7439-89-6	ND	mg/L	0.050	0.0027			
Lead	7439-92-1	ND	mg/L	0.050	0.011			
Lithium	7439-93-2	ND	mg/L	0.10	0.00072			
Magnesium	7439-96-4	ND	mg/L	0.10	0.012			
Manganese	7439-96-5	ND	mg/L	0.010	0.00066			
Molybdenum	7439-98-7	ND	mg/L	0.010	0.0018			
Nickel	7440-02-0	ND	mg/L	0.040	0.0027			
Potassium	7440-09-7	ND	mg/L	1.0	0.31			
Selenium	7784-49-2	ND	mg/L	0.10	0.026			
Silver	7440-22-4	ND	mg/L	0.015	0.00066			
Sodium	7440-23-5	ND	mg/L	3.0	0.028			
Thallium	7440-28-0	ND	mg/L	0.40	0.011			
Vanadium	7440-62-2	ND	mg/L	0.010	0.00072			
Lab Sample Number: Prep Date:	T071203011-MB 12/3/2007				An: Ins	alysis Date: trument:	12/4/2007 ICP 2	5:04:00PM
Analytical Method ID:	SW6010B - ICP - Total				File	e Name:	E12047A	
Prep Method ID:	3010 ICP				Dil	ution Factor:	1	
Pren Batch Number:	T071203011							
Report Basis:	Dry Weight Basis				An	alvst Initials.	rm	
Sample prep wt /vol	50.00 ml				Pre	en Extract Vol	50.00 r	nl
		D		DOI			20.00 1	
<u>Analyte</u> Boron	<u>CASNo</u> 7440-42-8	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>POL</u> 0.050	<u>MDL</u> 0.0018			<u>run #:</u> 2
Lab Sample Number: Prep Date:	T071203011-MB 12/3/2007				An: Ins	alysis Date: trument:	12/5/2007 ICP_2	1:41:00PM
Analytical Method ID:	SW6010B - ICP - Total				File	e Name:	E12057A	
Prep Method ID:	3010_ICP				Dil	ution Factor:	1	
Prep Batch Number:	T071203011							
Page 34 of 6°								
1 460 5 1 01 02								

Detailed Ana	lytical Report		Analy	tica Environn/	nental Laboratories	, Inc.	
Workorder (SDG):	B0711172						
Project:	Navajo Min	e Extension	Leaching Stue	dy			
Client:	Applied Hy	drology Ass	ociates, Inc.				
Client Project Number Report Section :	none none Metl	10d Blan	k Report				
Client Sample Name:	MB						
Matrix:	Aqueous			C	ollection Date:	12/3/2007	12:00:00AM
Report Basis:	Dry Weight Basis				Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00	ml
<u>Analyte</u> Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	PQL MDL 0.0050 0.0010)		<u>run #:</u> 3

Detailed Ana	lytical Report	vironn	nental Laboratories,	Inc.				
Workorder (SDG):	B0711172							
Project:	Navajo Min	e Extension	Leaching Stud	У				
Client:	Applied Hy	drology Ass	ociates, Inc.					
Client Project Number	: none							
Report Section	: Clier	nt Sampl	e Report					
Client Sample Name:	KF2007	'-01(58) ar	nd KF-98-02((53)				
Matrix:	Aqueous				C	Collection Date:	11/15/2007 4:30:0	00PM
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number:	B0711172-01B					Analysis Date:	11/29/2007 10:0	08:49AM
Prep Date:	11/29/2007					Instrument:	Titrametric	
Analytical Method ID:	310.1 - Alkalinity, Titr	metric (pH 4.	5) - Alkalinity			File Name:		
Prep Method ID:	Alkalinity_W					Dilution Factor:	1	
Prep Batch Number:	T071203006							
Report Basis:	As Received					Analyst Initials:	kl	
Sample prep wt./vol:	25.00 ml					Prep Extract Vol:	25.00 ml	
Analyte	CASNo	<u>Result</u>	Flags Units	<u>PQL</u>	MDL		ru	n #:
Bicarbonate		1,300	mg/L	5.0	1.5			1
Carbonate		260	mg/L	7.0	1.2			
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number:	B0711172-01B					Analysis Date:	11/28/2007 10:0	05:27AM
Prep Date:	11/28/2007					Instrument:	Probe	
Analytical Method ID:	150.1 - pH, Elecrometr	ic - pH				File Name:		
Prep Method ID:	150.1					Dilution Factor:	1	
Prep Batch Number:	T071203004							
Report Basis:	As Received					Analyst Initials:	kl	
Sample prep wt./vol:	10.00 ml					Prep Extract Vol:	10.00 ml	
<u>Analyte</u> pH	<u>CASNo</u>	<u>Result</u> 9.0	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10		<u>ru</u>	<u>n #:</u> 1
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number:	B0711172-01B					Analysis Date:	12/4/2007 9:06	:42AM
Prep Date:	11/29/2007					Instrument:	SCALE	
Analytical Method ID:	160.1 - Total Dissolved	l Solids dried	at 180°C - TDS			File Name:		
Prep Method ID:	160.1					Dilution Factor:	1	
Prep Batch Number:	T071203008							
Report Basis:	As Received					Analyst Initials:	kl	
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00 ml	
Analyte Total Dissolved Solids	<u>CASNo</u>	<u>Result</u> 3,100	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2		<u>ru</u>	<u>n #:</u> 1
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number:	B0711172-01B					Analysis Date:	11/29/2007 1:5	4:49PM
Prep Date:	11/29/2007					Instrument:	IC	
Analytical Method ID:	Inorganic Anions by Io	n Chromatogi	aphy - Anions by	IC		File Name:	071129_013.D	
Prep Method ID:	300.0					Dilution Factor:	1	
Prep Batch Number:	T071130001							
Report Basis:	As Received					Analyst Initials:	KB	
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00 ml	
<u>Analyte</u>	<u>CASNo</u>	<u>Result</u>	<u>Flags</u> <u>Units</u>	<u>PQL</u>	<u>MDL</u>		<u>ru</u>	<u>n #:</u>

Page 36 of 62

Detailed Ana	lytical Report		Anal	Analytica Environmental Laboratories, Inc.					
Workorder (SDG):	B0711172								
Project:	Navajo M	ine Extension	Leaching Stu	dy					
Client:	Applied H	ydrology Asso	ociates, Inc.						
Client Project Number	r: none								
Report Section	: Clie	ent Sampl	e Report						
Client Sample Name:	KF20	07-01(58) an	d KF-98-02	2(53)					
Matrix:	Aqueous	. ,		. ,	С	ollection Date:	11/15/2007	4:30:00PM	
Lab Sample Number:	B0711172-01B					Analysis Date:	11/29/20	07 1:54:49PM	
Prep Date:	11/29/2007	I CI		10		Instrument:	IC		
Analytical Method ID:	Inorganic Anions by	Ion Chromatogr	aphy - Anions b	by IC		File Name:	0/1129_	013.D	
Prep Method ID:	300.0					Dilution Factor:	1		
Prep Batch Number:	T071130001								
Report Basis:	As Received					Analyst Initials:	KB		
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml	
<u>Analyte</u>	<u>CASNo</u>	<u>Result</u>	Flags Units	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>	
Fluoride		2.4	mg/L	0.40	0.031			2	
Sulfate		300	mg/L	1.5	0.11				
Lab Sample Number:	B0711172-01B					Analysis Date:	11/30/20	07 12:00:01PM	
Prep Date:	11/29/2007					Instrument:	IC		
Analytical Method ID:	Inorganic Anions by	Ion Chromatogr	aphy - Anions b	y IC		File Name:	071130_	007.D	
Prep Method ID:	300.0					Dilution Factor:	27		
Prep Batch Number:	T071130001								
Report Basis:	As Received					Analyst Initials:	KB		
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml	
Analyte Chloride	<u>CASNo</u>	<u>Result</u> 710	<u>Flags</u> <u>Units</u> mg/L	<u>POL</u> 21	<u>MDL</u> 1.1			<u>run #:</u> 1	

Detailed Ana	Detailed Analytical Report Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B0711172								
Project:	Navajo Mine	e Extension	Leaching St	tudy					
Client:	Applied Hyd	rology Ass	ociates, Inc.						
Client Project Number	:: none								
Report Section	: Clien	t Sampl	e Report	ţ					
Client Sample Name:	KE2007	01(59) D	I IID and						
r in r	KF 2007 KE 08 0	·VI(30) D 2(52)DIII	OP and						
Matrix:	Aqueous F-98- 0	2(55)DUI	ſ			Collection Date:	11/15/2007	4:30:00PM	
The following test was	conducted by: Analytica	- Thornton							
Lab Sample Number:	B0711172-12B					Analysis Date:	11/29/200	07 10:08:49AM	
Prep Date:	11/29/2007					Instrument:	Titrametr	ic	
Analytical Method ID:	310.1 - Alkalinity, Titrin	netric (pH 4.	5) - Alkalinity			File Name:			
Prep Method ID:	Alkalinity_W					Dilution Factor:	1		
Prep Batch Number:	T071203006								
Report Basis:	As Received					Analyst Initials:	kl		
Sample prep wt./vol:	25.00 ml					Prep Extract Vol:	25.00	ml	
Analyte	CASNo	Result	Flags Units	PQL	MDL			run #:	
Bicarbonate		1,200	mg/L	5.0	1.5			1	
Carbonate		300	mg/L	7.0	1.2				
The following test was	conducted by: Analytica	- Thornton							
Lab Sample Number:	B0711172-12B					Analysis Date:	11/28/200	07 10:05:27AM	
Prep Date:	11/28/2007					Instrument:	Probe		
Analytical Method ID:	150.1 - pH, Elecrometri	c - pH				File Name:			
Prep Method ID:	150.1					Dilution Factor:	1		
Prep Batch Number:	T071203004								
Report Basis:	As Received					Analyst Initials:	kl		
Sample prep wt./vol:	10.00 ml					Prep Extract Vol:	10.00	ml	
Analyte	CASNo	Result	Flags Units	POL	MDL			run #•	
pH		8.9	pH	0.10	0.10			1	
The following test was	conducted by: Analytica	- Thornton							
Lab Sample Number:	B0711172-12B					Analysis Date:	12/4/2007	7 9:06:42AM	
Prep Date:	11/29/2007					Instrument:	SCALE	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Analytical Method ID:	160.1 - Total Dissolved	Solids dried	at 180°C - TD	S		File Name:			
Prep Method ID:	160.1					Dilution Factor:	1		
Prep Batch Number:	T071203008								
Report Basis:	As Received					Analyst Initials:	kl		
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00	ml	
Analyta	CASNo	Result	Flogs Units	ΡΟΙ	MDI	1			
Total Dissolved Solids	<u>enono</u>	3,000	mg/L	10	8.2			<u>run #:</u> 1	
The following test was	conducted by: Analytica	- Thornton							
Lab Sample Number:	B0711172-12B	rnormon				Analysis Date:	11/29/200	07 2·11·40PM	
Prep Date:	11/29/2007					Instrument:	IC	. 2.11.101.01	
Analytical Method ID:	Inorganic Anions by Ior	h Chromatogr	aphy - Anions	s by IC		File Name:	071129 ()14.D	
Prep Method ID:	300.0	U		-		Dilution Factor:	1		
Prep Batch Number	T071130001								
Report Basis:	As Received					Analyst Initials:	KB		
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml	
Analyte	<u>CASNo</u>	<u>Result</u>	Flags Units	POL	<u>MDL</u>	1		<u>run #:</u>	

Detailed Ana	lytical l	Report			Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B07111	172										
Project:	ľ	Navajo M	ine Extension	Leach	ing Stuc	ly						
Client:	A	Applied H	ydrology Asso	ociates	, Inc.							
Client Project Number	:: r	none										
Report Section	:	Clie	ent Sampl	e Rej	port							
Client Sample Name:		KF200)7-01(58) D	UP ar	nd							
Matrix:	Aque	eor KF-98	8-02(53)DUI	2				Collection Date:	11/15/2007	4:30:00PM		
Lab Sample Number:	B071117	2-12B						Analysis Date:	11/29/20	07 2:11:40PM		
Prep Date:	11/29/20	07						Instrument:	IC			
Analytical Method ID:	Inorganic	Anions by	Ion Chromatogr	aphy - A	Anions by	IC IC		File Name:	071129_	014.D		
Prep Method ID:	300.0							Dilution Factor:	1			
Prep Batch Number:	T071130	001										
Report Basis:	As Receiv	red						Analyst Initials:	KB			
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml		
<u>Analyte</u> Fluoride	<u>(</u>	<u>CASNo</u>	<u>Result</u> 2.5	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031	l		<u>run #:</u> 2		
Lab Sample Number:	B071117	2-12B						Analysis Date:	11/29/20	07 10:36:20PM		
Prep Date:	11/29/20	07						Instrument:	IC			
Analytical Method ID:	Inorganic	Anions by	Ion Chromatogr	aphy - A	Anions by	' IC		File Name:	071129_	044.D		
Prep Method ID:	300.0							Dilution Factor:	10			
Prep Batch Number:	T071130	001										
Report Basis:	As Receiv	ved						Analyst Initials:	KB			
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml		
<u>Analyte</u> Sulfate	<u>(</u>	<u>CASNo</u>	<u>Result</u> 260	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 15	<u>MDL</u> 1.1			<u>run #:</u> 3		
Lab Sample Number:	B071117	2-12B						Analysis Date:	11/30/20	07 12:16:51PM		
Prep Date:	11/29/20	07						Instrument:	IC			
Analytical Method ID:	Inorganic	Anions by	Ion Chromatogr	aphy - A	Anions by	' IC		File Name:	071130_	008.D		
Prep Method ID:	300.0							Dilution Factor:	27			
Prep Batch Number:	T071130	001										
Report Basis:	As Receiv	red						Analyst Initials:	KB			
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml		
Analyte Chloride	<u>(</u>	CASNo	<u>Result</u> 700	<u>Flags</u>	<u>Units</u> mg/L	<u>РОL</u> 21	<u>MDL</u> 1.1			<u>run #:</u> 1		

Detailed Analytical Report					Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0711172										
Project:	Navajo Mine I	Extension	Leach	ing Stud	у						
Client:	Applied Hydro	ology Asso	ciates	, Inc.							
Client Project Number	r: none										
Report Section	: Metho	d Blan	k Re	port							
Client Sample Name:	MB										
Matrix:	Aqueous					C	collection Date:	11/29/2007	12:00:00AM		
The following test was	conducted by: Analytica - '	Thornton									
Lab Sample Number: Prep Date: Analytical Method ID:	T071203006-MB 11/29/2007 310.1 - Alkalinity, Titrimo	etric (pH 4.5	i) - Alk	alinity			Analysis Date: Instrument: File Name:	11/29/200 Titrametri	7 10:08:49AM c		
Prep Method ID:	Alkalinity_W						Dilution Factor:	1			
Prep Batch Number:	T071203006										
Report Basis:	Dry Weight Basis						Analyst Initials:	kl			
Sample prep wt./vol:	100.00 ml						Prep Extract Vol:	100.00	ml		
<u>Analyte</u> Bicarbonate Carbonate	<u>CASNo</u>	<u>Result</u> ND ND	<u>Flags</u>	<u>Units</u> mg/L mg/L	<u>PQL</u> 5.0 7.0	MDL 1.5 1.2			<u>run #:</u> 1		
The following test was	conducted by: Analytica - '	Thornton									
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	T071203008-MB 11/29/2007 160.1 - Total Dissolved S 160.1	olids dried a	ut 180° (C - TDS			Analysis Date: Instrument: File Name: Dilution Factor:	12/4/2007 SCALE 1	9:06:42AM		
Prep Batch Number: Report Basis: Sample prep wt./vol:	T071203008 Dry Weight Basis 100.00 ml						Analyst Initials: Prep Extract Vol:	kl 1.00	ml		
<u>Analyte</u> Total Dissolved Solids	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1		
The following test was	conducted by: Analytica - '	Thornton									
Lab Sample Number: Prep Date:	T071130001-MB 11/29/2007						Analysis Date: Instrument:	11/29/200 IC	7 1:04:19PM		
Analytical Method ID:	Inorganic Anions by Ion (Chromatogra	aphy - A	Anions by	IC		File Name:	071129_0	10.D		
Prep Method ID:	300.0						Dilution Factor:	1			
Prep Batch Number:	T071130001										
Report Basis:	Dry Weight Basis						Analyst Initials:	KB	1		
Sample prep wt./vol:	20.00 ml						Prep Extract Vol:	20.00	ml		
<u>Analyte</u> Chloride	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.80	<u>MDL</u> 0.042			<u>run #:</u> 1		
Fluoride		ND		mg/L	0.40	0.031					
Sulfate		ND		mg/L	1.5	0.11					

Detailed An	Detailed Analytical ReportAnalytica Environmental Laboratories, Inc.										
Workorder (SDG):	B0711172										
Project:	Navaj	o Mine Ex	xtension	Leachir	ng Study						
Client:	Applie	ed Hydrol	ogy Asso	ociates, I	Inc.						
Client Project Numb	ber: none										
Tests Run at:	Analytica Enviro	nmental L	aborator	ies - Tho	ornton, Col	orado					
Workorder (SDG):	B0711172										
Project:	Navajo Mine Ext	tension Le	aching S	tudy ∐ ∆∐I T	Y CON	TROI	REPOR'	г			
Project Number:	T071202011		Q	UALII		IKOL	KLI UK	1			
Prep Batch:	10/1203011										
		m 1		LC	S/LCSD R	REPORT					
Analysis:	SW6010B - ICP	- Total					MB:		T0712030	11-MB	
		0.001					Prep	Date:	12/3/2007		
MB Anal. Date:	12/3/2007 5:46:	00PM			10/2/2007		Units	:	mg/L		
LCS Anal. Date:	12/3/2007 5:51:	UUPM LC	SD Ana	I. Date:	12/3/2007	5:56:0	OPM Matri	X:	Aqueous		
Analyte Name	SampResult	<u>LCSRes.</u>	<u>SDRes.</u>	<u>SPLev</u>	<u>SPDLev</u>	<u>Recov.</u>	SD Recov	1 0	Recov Lim	<u>RPDLim</u> 20	<u>Flag</u>
Antimony	ND	0.504	0.491	0.500	0.500	104.5	98.2	2.6	82 - 117	20	
Arsenic	ND	2.04	2.00	2.00	2.00	102.0	100.0	2.0	86 - 116	20	
Barium	ND	2.00	1.97	2.00	2.00	102.0	98.5	1.5	86 - 116	20	
Bervllium	ND	0.0511	0.0500	0.0500	0.0500	102.2	100.0	2.2	87 - 111	20	
Boron	ND	0.650	0.638	0.500	0.500	130.0	127.6	1.9	76 - 130	20	
Cadmium	ND	0.0500	0.0482	0.0500	0.0500	100.0	96.4	3.7	79 - 113	20	
Calcium	ND	10.0	9.85	10.0	10.0	100.0	98.5	1.5	79 - 119	20	
Chromium	ND	0.202	0.197	0.200	0.200	101.0	98.5	2.5	86 - 117	20	
Cobalt	ND	0.506	0.494	0.500	0.500	101.2	98.8	2.4	82 - 118	20	
Copper	ND	0.252	0.247	0.250	0.250	100.8	98.8	2.0	86 - 117	20	
Iron	ND	1.02	1.02	1.00	1.00	102.0	102.0	0.0	83 - 121	20	
Lead	ND	0.511	0.505	0.500	0.500	102.2	101.0	1.2	83 - 121	20	
Magnesium	ND	10.6	10.4	10.0	10.0	106.0	104.0	1.9	83 - 118	20	
Manganese	ND	0.507	0.497	0.500	0.500	101.4	99.4	2.0	82 - 121	20	
Molybdenum	ND	0.508	0.496	0.500	0.500	101.6	99.2	2.4	82 - 120	20	
Nickel	ND	0.510	0.496	0.500	0.500	102.0	99.2	2.8	84 - 117	20	
Potassium	ND	9.04	8.48	10.0	10.0	90.4	84.8	6.4	74 - 110	20	
Selenium	ND	2.01	1.96	2.00	2.00	100.5	98.0	2.5	87 - 117	20	
Silver	ND	0.266	0.259	0.250	0.250	106.4	103.6	2.7	80 - 127	20	
Sodium	ND	9.67	9.69	10.0	10.0	96.7	96.9	0.2	87 - 113	20	
Thallium	ND	0.204	0.189	0.200	0.200	102.0	94.5	7.6	89 - 113	20	
Vanadium	ND	0.514	0.503	0.500	0.500	102.8	100.6	2.2	87 - 119	20	
Zinc	ND	0.495	0.478	0.500	0.500	99.0	95.6	3.5	81 - 120	20	
	ND	0.479	0.475	0.500	0.500	95.8	95.0	0.8	80 - 120	20	
Prep Batch:	T071130013										
				LC	S/LCSD R	REPORT					

Detailed Ar	Detailed Analytical Report Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B0711172								
Project:	Navajo Min	e Extension	Leaching	Study					
Client:	Applied Hy	drology Asso	ociates, In	ic.					
Client Project Num	ber: none								
Tests Run at:	Analytica Environment	al Laboratori	es - Thor	nton, Colorad	lo				
Workorder (SDG):	B0711172								
Project: Project Number:	Navajo Mine Extensio	n Leaching S QU	tudy JALITY	Y CONTR	OL RE	PORT			
Prep Batch:	T071130013								
A	SW7470A Marana :	. I :: d W/	LCS/	LCSD REP	ORT	MD	T071120012 MD		
Analysis:	Sw/4/0A - Mercury II	i Liquid was	te by CV	AA - Iotal H	lg	MB: Prep Date:	11/30/2007		
MB Anal. Date:	11/30/2007 4:00:22P	М				Units:	mg/L		
LCS Anal. Date:	11/30/2007 4:02:28P	MLCSD Anal	. Date: 1	1/30/2007 4	1:05:02PI	MMatrix:	Aqueous		
Analyte Name	SampResult LCS	Res. SDRes.	<u>SPLev</u> S	PDLev Rec	ov. <u>SD</u>	Recov RPD	Recov Lim RPDLim Flag		
Mercury	ND 0.0	0233 0.00196	0.00200	0.0020 1	16.5	98.0 17.2	80 - 120 20		
Prep Batch:	T071203005								
		SA	MPLE I	DUPLICATE	E REPOI	RT			
Analysis:	SW6010B - ICP - Tota	1				Base Sample Prep Date:	::B0711172-05A 12/3/2007		
Samp. Anal. Date: DUP Anal. Date:	12/3/2007 1:43:00PM 12/3/2007 1:48:00PM	[[Units: Matrix:	mg/Kg Solid		
Analyte Name	SampResult	DUPRes.	RPD	<u>RPDLim</u>	<u>Flag</u>				
Aluminum	9,240	10,500	12.8	35	-				
Antimony	ND	ND	0.0	35					
Arsenic	ND	ND	0.0	35					
Barium	141	142	0.7	35					
Beryllium	0.838	0.943	11.8	35					
Boron	10.8	11.9	9.7	35					
Cadmium	ND	ND	0.0	35					
Calcium	27,500	25,500	7.5	35					
Chromium	6.15	0.34	3.0	35					
Cobalt	11.1	10.0	4.0	35					
Lion	20.3	19.2	0.0	25					
Lead	19,200	16.9	0.0	35					
Magnesium	2 160	3 310	4.6	35					
Magnese	374	461	20.8	35					
Molyhdenum	ND	ND	0.0	35					
Nickel	14.3	13.6	5.0	35					
Potassium	1 880	1,980	5.2	35					
Selenium		ND	0.0	35					
Silver	ND	ND	0.0	35					
L									

Detailed An	nalytical Report		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0711172									
Project:	Navajo N	Mine Extension	Leachir	ng Study						
Client:	Applied	Hydrology Ass	ociates, I	Inc.						
Client Project Numl	ber: none									
Tests Run at:	Analytica Environm	nental Laborator	ies - Tho	ornton, Colo	orado					
Workorder (SDG):	B0711172									
Project:	Navajo Mine Exten	sion Leaching S	Study [] A I 17	Y CON	LBUI	REPOR'	г			
Project Number:	T071202005	Q	UALII		INOL	KLI UK	L			
Prep Batch:	10/1203005									
		S	AMPLE	DUPLICA	ATE RE	PORT				
Analysis:	SW6010B - ICP - 7	otal				Base S	Sample	:B0711172-	-05A	
						Prep	Jate:	12/3/2007		
Samp. Anal. Date:	12/3/2007 1:43:00	PM				Units	:	mg/Kg		
DUP Anal. Date:	12/3/2007 1:48:00	PM				Matri	x:	Solid		
Analyte Name	SampResul	t <u>DUPRes.</u>	RPD	<u>RPDLin</u>	<u>1 I</u>	Flag				
Sodium	4,090	3,880	5.3	35		-				
Thallium	ND	ND	0.0	35						
Vanadium	17.9	19.5	8.6	35						
Zinc	59.4	60.1	1.2	35						
Lithium	8.19	9.07	10.2	35						
Analysis:	SW6010B - ICP - 1	`otal	LC	S/LCSD R	EPORT	MB: Prep l	Date:	T07120300	05-MB	
MB Anal Date:	12/3/2007 1.12.00	PM				Units	suite.	mg/Kg		
LCS Anal Date:	12/3/2007 1:12:00	PM LCSD Anal	1 Date:	12/3/2007	1.22.0	0PM Matri	x·	Solid		
Analyte Name	SampPasult I	CSPac SDPac	SDI av		Decov	SD Pecov	RPD	Recov Lim	RPDI im	Flag
Aluminum	ND	204 203	200	200	102.0	<u>3D Recov</u> 101.5	0.5	70 - 130	35	<u>1 105</u>
Antimony	ND	47.2 47.7	50.0	50.0	94.4	95.4	1.1	70 - 130	35	
Arsenic	ND	192 193	200	200	96.0	96.5	0.5	70 - 130	35	
Barium	ND	199 199	200	200	99.5	99.5	0.0	70 - 130	35	
Beryllium	ND	4.82 4.82	5.00	5.00	96.4	96.4	0.0	70 - 130	35	
Boron	ND	60.2 64.5	50.0	50.0	120.4	129.0	6.9	70 - 130	35	
Cadmium	ND	5.06 5.01	5.00	5.00	101.2	100.2	1.0	70 - 130	35	
Calcium	ND	954 947	1,000	1,000	95.4	94.7	0.7	70 - 130	35	
Chromium	ND	19.6 19.6	20.0	20.0	98.0	98.0	0.0	70 - 130	35	
Cobalt	ND	48.2 48.3	50.0	50.0	96.4	96.6	0.2	70 - 130	35	
Copper	ND	24.7 24.9	25.0	25.0	98.8	99.6	0.8	70 - 130	35	
Iron	ND	99.4 98.7	100	100	99.4	98.7	0.7	70 - 130	35	
Lead	ND	48.1 48.7	50.0	50.0	96.2	97.4	1.2	70 - 130	35	
Magnesium	ND	994 992	1,000	1,000	99.4	99.2	0.2	70 - 130	35	
Manganese	ND	49.0 48.8	50.0	50.0	98.0	97.6	0.4	70 - 130	35	
Molybdenum	ND	48.6 48.4	50.0	50.0	97.2	96.8	0.4	70 - 130	35	
Nickel	ND	47.9 48.1	50.0	50.0	95.8	96.2	0.4	70 - 130	35	
Potassium	ND	937 954	1,000	1,000	93.7	95.4	1.8	70 - 130	35	

Detailed An	Analytical Report Analytica Environmental Laboratories, Inc.										
Workorder (SDG):	B0711172										
Project:	Navajo	Mine Ex	xtension L	eaching	g Study						
Client:	Applie	d Hydrol	ogy Assoc	ciates, Iı	nc.						
Client Project Numb	ber: none										
Tests Run at:	Analytica Enviror	nmental L	aboratorie	s - Thor	nton, Colo	orado					
Workorder (SDG):	B0711172 Navaio Mine Ext	ension I e	eaching St	ıdv							
Project: Project Number:	Navajo Wille Ext		QU	ÄLIT	Y CON	TROL	REPOR	Т			
Prep Batch:	T071203005										
				ICS	/I CSD R	FPORT					
Analysis:	SW6010B - ICP -	Total		LCS	LCSD K		MB:		T071203	005-MB	
							Prep	Date:	12/3/2007	7	
MB Anal. Date:	12/3/2007 1:12:0	D0PM					Units	:	mg/Kg		
LCS Anal. Date:	12/3/2007 1:17:0	OOPM LC	CSD Anal.	Date:	12/3/2007	1:22:00	PM Matri	x:	Solid		
Analyte Name	SampResult	LCSRes.	SDRes.	SPLev S	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lin	n <u>RPDLim</u>	<u>Flag</u>
Selenium	ND	189	191	200	200	94.5	95.5	1.1	70 - 130	35	
Silver	ND	24.9	25.0	25.0	25.0	99.6	100.0	0.4	70 - 130	35	
Sodium	ND	1,010	1,000	1,000	1,000	101.0	100.0	1.0	70 - 130	35	
Thallium	ND	20.4	18.6	20.0	20.0	102.0	93.0	9.2	70 - 130	35	
Vanadium	ND	49.9	49.6	50.0	50.0	99.8	99.2	0.6	70 - 130	35	
	ND	54.1	62.4	50.0	50.0	108.2	124.8	14.2	70 - 130	35	
	ND	47.3	47.0	50.0	50.0	94.0	94.0	0.6	70 - 130	35	
				MS	/MSD RE	PORT					
Analysis:	SW6010B - ICP -	Total		IVIS			Paren	t:	B071117	2-05A	
5							Prep	Date:	12/3/2007	7	
Samp. Anal. Date:	12/3/2007 1:43:0	D0PM					Units	:	mg/Kg		
MS Anal. Date:	12/3/2007 1:53:0	OOPM MS	SD Anal. I	Date:	12/3/2007	1:58:00	PM Matri	x:	Solid		
Analyte Name	SampDecult	MSDas	MSDDa	c CDI as		Pacov		R D L	Recov Lim I	RPDI im	Flag
Aluminum	<u>9.240</u>	<u>13.400</u>	13.700	<u>s srite</u> 192	<u>191 - 191 -</u>	2.171.5	2.334.7	2.2	70 - 130	<u>а Denii</u> 35 <i>NOTE</i> 2 Л	IOTE 2
Antimony	ND	19.7	18.6	47.9	47.8	41.1	38.9	5.7	70 - 130	35 lowMS lov	vMSD
Arsenic	ND	158	157	192	191	82.5	82.2	0.6	70 - 130	35	
Barium	141	319	320	192	191	92.9	93.7	0.3	70 - 130	35	
Bervllium	0.838	5 47	5 46	4 79	4 78	96.7	96.8	0.2	70 - 130	35	
Boron	10.8	67.1	66.8	47.9	47.8	117.6	117.3	0.4	70 - 130	35	
Cadmium	ND	5 48	5 44	4 79	4 78	114.4	113.9	0.7	70 - 130	35	
Calcium	27,500	25 900	25 900	958	955	-167.0	-167.5	0.7	70 - 130	35 NOTE 2 Ν	IOTE 2
Chromium	6 15	25,900	25,900	10.2	10.1	102.6	105.0	1.5	70 - 130 - 70 - 130 - 70	35	0122
Cabalt	11.1	23.0	54.2	19.2	19.1	102.0	105.0	0.4	70 120	35	
Connor	20.2	J4.1	12.0	47.9	47.0	07.0	90.3	1.4	70 - 130 -	25	
Copper	20.3	42.4	43.0	23.9	23.9	92.3	95.1	1.4	70 - 130 -	25 NOTE 2 3	
Iron	19,200	18,800	20,200	95.8	95.5	-417.6	1,046.9	1.2	70 - 130	55 NUIE2 N	OIE 2
Lead	17.0	60.7	61.4	47.9	47.8	91.2	93.0	1.1	70 - 130	33	11/02
Magnesium	3,160	4,370	4,600	1,030	955	117.7	150.8	5.1	70 - 130	55 hig	ghMSD

Detailed An	alytical Report		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0711172									
Project:	Navajo M	ine Extensior	1 Leaching	Study						
Client:	Applied H	ydrology Ass	sociates, In	с.						
Client Project Numb	ber: none									
Tests Run at:	Analytica Environme	ental Laborato	ries - Thorn	nton, Colo	rado					
Workorder (SDG):	B0711172 Novoio Mino Extens	ion Loophing	Chida							
Project: Project Number:	Navajo Mine Extens	O Leaching	UALITY	CONT	ROL	REPOR	Г			
Pren Batch:	T071203005		-							
Tiep Duten.										
			MC	MCD DE	рорт					
Analysis	SW6010B - ICP - To	atal	IV15/	MSD KE	PUKI	Parent	+•	B071117	72-054	
Anarysis.	5 W 0010D - ICI - IC	hai				Pren	Date:	12/3/200	72-03A	
Samp Anal Date:	12/4/2007 3·18·00P	PM				Units		mg/Kg		
MS Anal. Date:	12/4/2007 3:28:00P	M MSD Anal	I. Date: 1	2/4/2007	3:33:00	PM Matri	x:	Solid		
Analyte Name	SampResult M	SRes MSD	Res SPLev	SPDI ev	Recov	MSD Rec	RPD	Recov Lim	RPDLim Flag	
Manganese	<u>374</u> 4	<u>31 419</u>	<u>51.4</u>	47.8	110.9	<u>94.2</u>	2.8	70 - 130	35 NOTE 2 NOTE 2	
Molybdenum	ND 4	3.2 42.4	47.9	47.8	90.2	88.8	1.9	70 - 130	35	
Nickel	14.3 5	6.9 58.1	47.9	47.8	88.9	91.7	2.1	70 - 130	35	
Potassium	1,880 2	.870 2,920	958	955	103.4	108.9	1.7	70 - 130	35	
Selenium	ND 1	89 187	192	191	98.7	97.9	1.1	70 - 130	35	
Silver	ND 2	3.6 23.3	23.9	23.9	98.6	97.6	1.3	70 - 130	35	
Sodium	4,090 4	,710 5,020	958	955	64.7	97.4	6.4	70 - 130	35 NOTE 2 NOTE 2	
Thallium	ND 1	3.6 12.1	19.2	19.1	71.0	63.3	11.7	70 - 130	35 lowMSD	
Vanadium	17.9 6	7.0 67.8	47.9	47.8	102.5	104.5	1.2	70 - 130	35	
Zinc	59.4 9	7.6 105	47.9	47.8	79.8	95.5	7.3	70 - 130	35	
Lithium	8.19 5	8.0 54.6	51.4	47.8	96.9	97.2	6.0	70 - 130	35	
		PC	OST DIGES	STION SI	PIKE R	EPORT				
Analysis:	SW6010B - ICP - To	otal				Base S	Sampl	le:B071117	72-05A	
						Prep	Date:	12/3/200	17	
Samp. Anal. Date:	12/3/2007 1:43:00P	ΡM				Units	:	mg/Kg		
PDS Anal. Date:	12/3/2007 2:18:00P	'M				Matri	x:	Solid		
Analyte Name	SampResult	PDSRes.	SPLev R	ecov.	Reco	ov Lim		Flag		
Aluminum	9,240	14,100	206	2,369.3	7	0 - 130		Note	2	
Antimony	ND	20.7	51.4	39.5	70	0 - 130		lowP	DS	
Arsenic	ND	168	206	93.7	7	0 - 130				
Barium	141	334	206	94.1	7	0 - 130		Note	2	
Beryllium	0.838	5.72	5.14	95.0	70	0 - 130				
Boron	10.8	70.3	51.4	115.6	7	0 - 130				
Cadmium	ND	5.59	5.14	96.6	7	0 - 130				
Calcium	27,500	27,300	1,030	-23.3	70	0 - 130		Note	2	
Chromium	6.15	27.1	20.6	102.0	7	0 - 130		Note	2	

Detailed An	d Analytical Report Analytica Environmental Laboratories, Inc.									
Workorder (SDG):	B0711	172								
Project:	ľ	Navajo Min	e Extensio	n Leachi	ng Study					
Client:	A	Applied Hy	drology As	sociates,	Inc.					
Client Project Numb	er: r	none								
Tests Run at:	Analytica E	Environment	tal Laborato	ories - Th	ornton, Colorad	0				
Workorder (SDG):	B0711172									
Project:	Navajo Mi	ne Extensio	n Leaching	Study MI∆II'	TY CONTR	OI REPO) R T			
Project Number:	T07120200	15	~				JNI			
Prep Batch:	10/120300]5								
			PO	OST DIG	ESTION SPIK	E REPOR	Т			
Analysis:	SW6010B	- ICP - Tota	1			Ba	ase Sample	e:B0711172-05A		
						P	rep Date:	12/3/2007		
Samp. Anal. Date:	12/3/2007	1:43:00PM	[U	nits:	mg/Kg		
PDS Anal. Date:	12/3/2007	2:18:00PM	[Ν	latrix:	Solid		
Analyte Name	Sampl	Qocult	DDSDas	SDI ev	Pecov	Pecov Lim		Flog		
Cobalt	<u>Sampr</u>	11 1	<u>1 DSRes.</u> 57.0	<u>51.4</u>	<u>89.3</u>	70 - 130		<u>r tag</u>		
Copper		20.3	44.2	25.7	93.2	70 - 130	1	Note 2		
Iron		19.200	19.800	103	569.3	70 - 130)	Note 2		
Lead		17.0	64.3	51.4	92.0	70 - 130	1	Note 2		
Magnesium		3.160	4,600	1,030	139.6	70 - 130		Note 2		
Manganese		374	446	51.4	139.5	70 - 130		Note 2		
Molybdenum		ND	45.1	51.4	87.9	70 - 130)			
Nickel		14.3	59.6	51.4	88.1	70 - 130		Note 2		
Potassium		1,880	3,030	1,030	111.8	70 - 130		Note 2		
Selenium		ND	203	206	98.3	70 - 130				
Silver		ND	24.9	25.7	98.3	70 - 130				
Sodium		4,090	4,990	1,030	87.3	70 - 130		Note 2		
Thallium		ND	13.7	20.6	83.1	70 - 130				
Vanadium		17.9	70.3	51.4	102.0	70 - 130		Note 2		
Zinc		59.4	103	51.4	84.3	70 - 130		Note 2		
Lithium		8.19	59.1	51.4	99.0	70 - 130				
				SERIA	L DILUTION	REPORT				
Analysis:	SW6010B	- ICP - Tota	1			Ba	ase Sample	e:B0711172-05A		
						P	rep Date:	12/3/2007		
Samp. Anal. Date:	12/3/2007	7 1:43:00P	M			U	nits:	mg/Kg		
SER DIL. Date:	12/4/2007	3:59:00PM	[Ν	latrix:	Solid		
Analyte Name	Same	Pecult	POI	MDI	SerielDec	SerDOI	רוסק	Flag		
Aluminum	<u>Sampr</u>	9.240	7.7	1.9	<u>9.470</u>	<u>39</u>	<u>2.4</u>	<u>1 105</u>		
Antimony		ND	11	0.60	ND	53				
Arsenic		ND	13	1.7	ND	63				
Barium		141	0.39	0.030	128	1.9	9.6			
Beryllium		0.838	0.19	0.0085	ND	0.96				
Boron		10.8	4.8	0.65	ND	24				

Page 46 of 62

Detailed Analytical Report				Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0711172				-					
Project:	Ν	Navajo Mii	ne Extensio	n Leaching	Study					
Client:	Applied Hydrology Associates, Inc.									
Client Project Numb	er: r	-pp								
Tests Run at	Analytica F	Invironmen	tal Laborate	ories - Thorr	ton Colorad	0				
Workorder (SDG):	R0711172		nai Laboran	1101	non, colorad	10				
Project:	Navajo Mi	ne Extensio	on Leaching	Study						
Project Number:	5		Ç	QUÁLITY	CONTR	OL RE	PORT			
Prep Batch:	T07120300)5								
1100 2000										
				SERIAL I	DILUTION	REPORT				
Analysis:	SW6010B	- ICP - Tot	al				Base Sample	:B0711172-05A		
							Prep Date:	12/3/2007		
Samp. Anal. Date:	12/3/2007	/ 1:43:00P	ΡM				Units:	mg/Kg		
SER DIL. Date:	12/4/2007	3:59:00PM	Λ				Matrix:	Solid		
Analyte Name	<u>SampF</u>	Result	<u>PQL.</u>	MDL.	SerialRes.	<u>SerPQL</u>	<u> RPD</u>	<u>Flag</u>		
Cadmium		ND	0.77	0.056	ND	3.9				
Calcium		27,500	13	5.1	23,800	67	14.4	OUT		
Chromium		6.15	1.9	0.29	ND	9.6				
Cobalt		11.1	2.9	0.25	ND	14	10.4			
Copper		20.3	0.58	0.15	16.7	2.9	19.4			
Iron		19,200	5.8	0.42	16,500	29	15.1	001		
Lead		17.0	5.8	1.0	ND	29	<i></i>			
Magnesium		3,160	9.0	0.92	2,990	48	<u> </u>	OUT		
Manganese		3/4 ND	1.0	0.11	429	4.0	15.7	001		
Nolybdenum		ND 14.3	3.0	0.23	ND	9.0				
Dotacsium		1 880	96	30	1 720	480	8.8			
Salanium		ND	96	24	1,720 ND	48	0.0			
Silver		ND	1.4	0.15	ND	7.2				
Sodium		4 090	290	0.98	3 400	1.400	18.4	OUT		
Thallium		ND	19	1.1	<u>,400</u> ND	96	10.1	001		
Vanadium		17.9	0.96	0.19	19.6	4.8	9.0			
Zinc		59.4	0.58	0.21	55.1	2.9	7.5			
Lithium		8.19	4.8	0.047	ND	24				
					112					
Pren Batch	T07120401	3								
Trep Daten.	10/120101									
			;	SAMPLE D	UPLICATH	E REPOR	ХT			
Analysis:	SW7471A	- Mercury i	in Solid or S	emisolid W	aste by CVA	A - Tot	Base Sample	:B0711172-02A		
		-					Prep Date:	12/4/2007		
Samp. Anal. Date:	12/4/2007	3:25:10PM	Л				Units:	mg/Kg		
DUP Anal. Date:	12/4/2007	3:33:00PM	Λ				Matrix:	Solid		
Amelanta NTerror	C	un Dass 14		רותם		1 21				
Analyte Name	Sai	<u>npkesult</u>	$\frac{DUPKes}{0.134}$	<u>KPD</u> 7 8	<u>RPDLim</u> 25	Flag				
wiercury		0.124	0.134	1.0	33					
				TOO		ODT				
				LCS/	LCSD REP	UKT				

Detailed An	Analytical Report Analytica Environmental Laboratories, Inc.
Workorder (SDG):	B0711172
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Numl	per: none
Tests Run at:	Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG):	B0711172
Project:	Navajo Mine Extension Leaching Study OUALITY CONTROL REPORT
Project Number:	T071204012
Prep Batch:	10/1204013
	LCS/LCSD REPORT
Analysis:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Tot MB: T071204013-MB
	Prep Date: 12/4/2007
MB Anal. Date:	12/4/2007 3:00:38PM Units: mg/Kg
LCS Anal. Date:	12/4/2007 3:08:17PM LCSD Anal. Date: 12/4/2007 3:16:19PM Matrix: Solid
Analyte Name	SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag
Mercury	ND 0.845 0.843 0.833 0.833 101.4 101.2 0.2 70 - 130 35
	MCMCD DEDODT
Analysis	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Tot Parent: B0711172-02A
Anarysis.	Pren Date: 12/4/2007
Samp Anal Data:	12/4/2007 3:25:10PM Units: mg/Kg
MS Anal Date:	12/4/2007 = 3.23.101 M SD Anal Date: $12/4/2007 = 3.40.21 PM$ Matrix: Solid
WIS Anal. Date.	12/4/2007 5.41.001 WI MSD Andi. Date. 12/4/2007 5.47.211 WI Wattix. Solid
Analyte Name	SampResult MSRes. MSDRes SPLev SPDLev Recov. MSD Rec. RPD Recov Lim RPDLim Flag
Mercury	0.124 0.966 0.999 0.845 0.873 99.7 100.2 3.4 70 - 130 35
	POST DIGESTION SPIKE REPORT
Analysis:	SW/4/1A - Mercury in Solid or Semisolid Waste by CVAA - Tot Base Sample: B0/111/2-02A
Company And Data	12/4/2007 - 2.25 10DM
Samp. Anal. Date:	12/4/2007 3:25:10PM Units: mg/Kg
PDS Anal. Date:	12/4/2007 5:57:59PM Matrix: Solid
Analyte Name	SampResult PDSRes. SPLev Recov. Recov Lim Flag
Mercury	0.124 1.01 0.876 101.3 80 - 130

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0711172 Navajo Mine Extension Leaching Study **Project: Client:** Applied Hydrology Associates, Inc. none

Client Project Number:

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed An	alytical Report	Analytica Environmental Laboratories, Inc.					
Workorder (SDG):	B0711172						
Project:	Navajo Mine Extensio	n Leaching Study					
Client:	Applied Hydrology As	sociates, Inc.					
Client Project Num	ber: none						
Tests Run at: Workorder (SDG): Project: Project Number: Prep Batch:	Analytica Environmental Laborato B0711172 Navajo Mine Extension Leaching T071207005	ories - Thornton, Color Study QUALITY CONT	rado				
	,	SAMPLE DUPLICA'	TE REPORT				
Analysis:	ASTM D2216 - Pmoist		Base Sample: B0711172- Prep Date: 12/6/2007	11A			
Samp. Anal. Date: DUP Anal. Date:	12/7/2007 9:39:41AM 12/7/2007 9:39:41AM		Units: % Matrix: Solid				
<u>Analyte Name</u> Moisture	SampResultDUPRes.6.986.39	RPD RPDLim 8.8 20	Flag				
		FOOTNOTES T	TO QC REPORT				
Note 1: Results are	shown to three significant figures to av	void rounding errors in ca	alculations.				
Note 2: If the samp should be used as a sample result itself.	The concentration is greater than 4 times a replicate. In such cases the spike is not.	the spike level, a recove ot as high as expected rar	ery is not meaningful, and the result ndom measurement variability of the				
Note 3: For sample five times the PQL of the absolute differen other matrices. Note 4: For serial d	duplicates, if the result is less than the or greater, then the RPD is not expected ace. Analytica uses the criterion that th dilutions, if the result is less than the PC	PQL, the duplicate RPD I to fall within the windo e absolute difference sho QL, the duplicate RPD is	is not applicable. If the sample and duplic w shown and the comparison should be mo- build be less than the PQL for water or less a not applicable. If the sample result is not	cate results are not ade on the basis of than 2XPQL for 50 times the MDL			

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report			Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B0711172										
Project:	Navajo	Mine Ex	xtension	Leachin	g Study						
Client:	Applied Hydrology Associates, Inc.										
Client Project Numb	ber: none										
Tests Run at:	Analytica Environ	mental L	aborator	ies - Tho	rnton, Co	lorado					
Workorder (SDG):	B0711172	· •	1.	. 1							
Project:	Navajo Mine Exte	ension Le	aching S	IJALIT	Y CON	TROL	REPOR'	Т			
Project Nulliber.	T071130001		X	011211	1 001			-			
Prep Batch:	10/1130001										
			S	AMPLE	DUPLIC	ATE RE	PORT				
Analysis:	Inorganic Anions	by Ion Cl	nromatog	graphy - A	Anions by	' IC	Base Prep	Sample Date:	e:B0711172 11/29/2007	-12B 7	
Samp. Anal. Date:	11/29/2007 2:11	40PM					Units	:	mg/L		
DUP Anal. Date:	11/29/2007 2:28	30PM					Matri	x:	Aqueous		
Analyte Name	SampResi	ılt DU	JPRes.	RPD	<u>RPDLi</u>	<u>m</u> F	lag				
Fluoride	2.46	2.4	.5	0.4	30		-				
Chloride	700	702	2	0.3	30						
Sulfate	263	263	3	0.0	30						
				LCS	S/LCSD I	REPORT					
Analysis:	Inorganic Anions	by Ion Cl	nromatog	graphy - A	Anions by	' IC	MB:	-	T0711300	01-MB	
							Prep	Date:	11/29/2007	7	
MB Anal. Date:	11/29/2007 1:04	19PM					Units	:	mg/L		
LCS Anal. Date:	11/29/2007 1:21	08PMLC	SD Ana	l. Date:	11/29/20	07 1:37:5	58PMMatri	x:	Aqueous		
Analyte Name	<u>SampResult</u>	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Fluoride	ND	2.62	2.55	2.50	2.50	104.8	102.0	2.7	90 - 110	20	
Chloride	ND	5.13	5.12	5.00	5.00	102.6	102.4	0.2	90 - 110	20	
Sulfate	ND	39.0	39.1	37.5	37.5	104.0	104.3	0.3	90 - 110	20	
					MC DED	ODT					
Analysis	Inorganic Anions	by Ion Cl	romator	ranhy	MIS KEP		Daran	t •	B0711172	12B	
Anarysis.	morganic Amons	by Ion Ci	nomatog	graphy - 7	Allions by	IC .	Pren	u. Date:	11/29/2007	-12D 7	
Samp Anal Data	11/20/2007 2.11	40DM					Unito		та/I		
Samp. Anal. Date:	11/29/2007 2:11	40PM					Units	•	Ing/L		
wis Allal. Date.	11/29/2007 2.43	21111					Iviaui	х.	Aqueous		
Analyte Name	<u>SampResult</u>	MSRes.		SPLe	<u>v</u>	Recov.			Recov Lim		<u>Flag</u>
Fluoride	2.46	5.28		2.50		112.8			70 - 130		
Chloride	700	845		133		108.8			70 - 130	NOTE 2	
Sulfate	263	693		375		114.7			70 - 130		
Prep Batch:	T071203008										
			S	AMPLE	DUPLIC	ATE RE	PORT				

S0711172 Project: Navajo Mine Extension Leaching Study Clienti : Applied Hydrology Associates, Inc. Client Project Number: none Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0711172 Project: Navajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Project: Navajo Mine Extension Leaching Study Project Number: OUT203008 SAMPLE DUPLICATE REPORT Base Sample: B0711172-01B Project Number: Units: mg/L Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Base Sample: B0711172-01B Samp Anal. Date: 12/4/2007 9:06:42AM Units: mg/L Out Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte SampResult DUPRes. RPD RPDLim Elaw T071203008-MB MB 12/4/2007 9:06:42AM Units: mg/L Quality Sample Aqueous Analyte SampResult 12/8/2007 9:06:42AM Ree Ort MB: 1071203008-MB	Detailed An	alytical Report		Analytica Enviror	mental Laborator	ies, Inc.		
Project: Applied Hydrology Associates, Inc. Client: Applied Hydrology Associates, Inc. Client: Applied Hydrology Associates, Inc. Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDC): B0711172 Project: Navajo Mine Extension Leaching Study Project: Navajo Mine Extension Leaching Mine Extension Leaching Stu	Workorder (SDG):	B0711172						
Applied Hydrology Associates, Inc. Client Project Number: not Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SOG): B011172 Project Number: QUALITY CONTROL REPORT Project Number: OUPLICATE REPORT Prep Batch: Tot1203008 SAMPLE DUPLICATE REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS BaseSample: B0711172-01B Prep Date: 11/29/2007 Samp Anal. Date: 12/4/2007 9:06:42AM Units: mg/L Matrix: Aqueous Analyte Name Total Dissolved Solids 3:070 DUPRes, RPD RT Plag MB Anal. Date: 12/4/2007 9:06:42AM Units: mg/L MB Anal. Date: 12/4/2007 9:06:42AM NB TOT1203008-MB MB Anal. Date: 12/4/2007 9:06:42AM LES/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB <th colspan<="" td=""><td>Project:</td><td>Navajo Mine</td><td>e Extension Leachin</td><td>g Study</td><td></td><td></td><td></td></th>	<td>Project:</td> <td>Navajo Mine</td> <td>e Extension Leachin</td> <td>g Study</td> <td></td> <td></td> <td></td>	Project:	Navajo Mine	e Extension Leachin	g Study			
One Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG) BOTIT2 Project: Navajo Mine Extension Leaching Study Project: VENTROL REPORT Project: Navajo Mine Extension Leaching Study Project: Navajo Mine Extension Leaching Study Proj Date: Navajo Mine Extens	Client:	Applied Hyd	rology Associates, I	nc.				
Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0711172 Project: Navajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Prep Batch: T071203008 SAMPLE DUPLICATE REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Base Sample: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Units: mg/L Analyte Name SampResult DUPRes, SPLey SPDLey Recov, SD Recov Lim RPDLim Flag Total Dissolved Solids ND 730 735 744 96.8 70 - 130 NOTE 2	Client Project Numb	er: none						
Workorder (SDG): B0711172 Project: Navajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Project Number: T071203008 SAMPLE DUPLICATE REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Base Sample: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Units: mg/L DUP Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult DUPRes, RPD RPDLim Flag Total Dissolved Solids 3,070 2.980 3.0 20 LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T071203008-MB Prep Date: 11/29/2007 MB Anal. Date: 12/4/2007 9:06:42AM Units: mg/L LCS Anal. Date: 12/4/2007 9:06:42AM Units: mg/L LCS Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLey SPDLey Recov, SD Recov RP Recov Lim RPDLim Flag Total Dissolved Solids model at 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 MB Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLey SPDLey Recov, SD Recov RP Recov Lim RPDLim Flag Total Dissolved Solids dried at 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult MSRes, SPLey Recov, Constant Aqueous Analyte Name SampResult MSRes, SPLey Recov, Recov, Recov Lim RPDLim Flag Total Dissolved Solids 3,070 3,790 744 96.8 70 - 130 NOTE 2	Tests Run at:	Analytica Environmenta	al Laboratories - Tho	rnton, Colorado				
Project: Narvajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Project Number: T071203008 SAMPLE DUPLICATE REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Base Sample: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Units: mg/L DUP Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD 20 LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T071203008-MB Prep Date: 11/29/2007 MB Anal. Date: 12/4/2007 9:06:42AM Units: mg/L LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T071203008-MB Prep Date: 11/29/2007 MB Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult LCSRes. SPLex SPDLey Recov. SD Recov END Analyte Name SampResult LCSRes. SDRes. SPLey SPDLey Recov. SD Recov Lim RPDLim Elag Total Dissolved Solids ND 730 735 744 744 98.1 98.8 0.7 80 - 120 20 MS REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult MSRes. SPLey Recov. Recov. Matrix: Aqueous Analyte Name SampResult MSRes. SPLey Recov	Workorder (SDG):	B0711172	L 1 0(1					
Inder Funder.Total Dissolved Solids dried at 180°C - TDSBase Sample: B0711172-01B Prep Date: 11/29/2007Samp. Anal. Date: $12/4/2007$ $9:06:42AM$ Units: Matrix: $2:980$ mg/L LCS/LCSD REPORTAnalysis: 160.1 - Total Dissolved Solids dried at 180° C - TDSBase Sample: B0711172-01B Prep Date: $2:0^{\circ}$ LCS/LCSD REPORTAnalysis: 160.1 - Total Dissolved Solids dried at 180° C - TDSMB: Prep Date: $11/29/2007$ MB: T071203008-MB Prep Date:MB: T071203008-MB Prep Date: $11/29/2007$ MB: T071203008-MB Prep Date:Prep Date: $11/29/2007$ MB: T071203008-MB Prep Date:Prep Date:MB: T0711172-01B Prep Date:Prep Date: <th cols<="" td=""><td>Project: Project Number:</td><td>Navajo Mine Extension</td><td>OUALIT</td><td>Y CONTROL</td><td>REPORT</td><td></td><td></td></th>	<td>Project: Project Number:</td> <td>Navajo Mine Extension</td> <td>OUALIT</td> <td>Y CONTROL</td> <td>REPORT</td> <td></td> <td></td>	Project: Project Number:	Navajo Mine Extension	OUALIT	Y CONTROL	REPORT		
SAMPLE DUPLICATE REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Base Sample: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Units: mg/L DUP Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD Im Flag Total Dissolved Solids 3,070 2,980 3.0 20 MB: T071203008-MB Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T071203008-MB Prep Date: 11/29/2007 MB Anal. Date: 12/4/2007 9:06:42AM Units: mg/L LCS Anal. Date: 12/4/2007 9:06:42AM Units: mg/L LCS Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult LCSRes. SPLey SPDLey Recov SD Recov Lim RPDLim Flag Total Dissolved Solids ND 730 735 744 744 98.1 98.8 0.7 80 - 120 20<	Pren Batch:	T071203008			-			
SAMPLE DUPLICATE REPORTAnalysis: $160.1 - Total Dissolved Solids dried at 180^{\circ}C - TDSBase Sample: B0711172-01BPrep Date: 11/29/2007Samp, Anal, Date:12/4/20079:06:42AMUnits:mg/LMatrix:DUP Anal, Date:12/4/20079:06:42AMMatrix:AqueousAnalyte NameTotal Dissolved Solids\underline{SampResult}3,070\underline{PDD}2.980\underline{RPD}3.0\underline{RPDI}20\underline{Rus}20LES/LCSD REPORTMB:TOT1203008-MBPrep Date:Analysis:160.1 - Total Dissolved Solids dried at 180^{\circ}C - TDSMB:Prep Date:11/29/2007MB Anal, Date:12/4/20079:06:42AM LCSD Anal. Date:12/4/20079:06:42AM LCSD Anal. Date:12/4/20079:06:42AM LCSD Anal. Date:12/4/20079:06:42AM LCSD Anal. Date:12/4/20079:06:42AM Matrix:AqueousAmalyte NameTotal Dissolved Solids\underline{CSRes}730\underline{SPLev}735\underline{RepOt}744\underline{SPDLev}98.8\underline{RPD}98.8\underline{RPD}Recov LimRot N\underline{RPDLim}Recov LimRot N\underline{RPDLim}20Analyte NameTotal Dissolved Solids dried at 180^{\circ}C - TDS\underline{SDRecv}REPORT\underline{RPD}Recov LimRecov Lim\underline{RPDLim}Recov LimRecov Lim\underline{RPDLim}Recov LimRecov $	Thep Baten.	10/1200000						
SAMPLE DUPLICATE REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Base Sample: B0711172-01B Prep Date: I1/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Units: mg/L DUP Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPDLim Flag Total Dissolved Solids 3,070 2,980 3.0 20 Sample: 17/203008-MB Matrix: Ioon Ioon Ioon Ioon Ioon Ioon Ioon MB Anal. Date: 12/4/2007 9:06:42AM Ioon Ioon <thi< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thi<>								
Analysis:160.1 - 1 otal Dissolved Solids dried at 180°C - 1DSBase Sample: B0711172-01B Prep Date:Samp. Anal. Date:12/4/20079:06:42AMUnits:mg/LDUP Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalyte NameSampResultDUPRes.RPD 2,980RPDLim 3.0ElagICS/LCSD REPORTAnalysis:160.1 - Total Dissolved Solids dried at 180°C - TDSMB:T071203008-MB Prep Date:MB Anal. Date:12/4/20079:06:42AMUnits:mg/LLCS Anal. Date:12/4/20079:06:42AMUnits:mg/LLCS Anal. Date:12/4/20079:06:42AM LCSD Anal. Date:12/4/20079:06:42AM Matrix:Analyte NameSampResultLCSRes. SDRes.SPLevRecov.SD RecovRPD Recov LimAnalyte NameSampResultLCSRes. SDRes.SPLevRecov.SD Recov LimRPDLimAnalyte NameSampResultLCSRes. SDRes.SPLevRecov.SD Recov LimRPDLimFlagAnalysis:160.1 - Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01B Prep Date:11/29/2007Samp. Anal. Date:12/4/20079:06:42AMUnits:mg/LMS Anal. Date:12/4/20079:06:42AMUnits:mg/LMS Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalysis:160.1 - Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01B Prep Date:MS Anal. Date:12/4/20079:06:			SAMPLE	DUPLICATE RE	EPORT			
Samp. Anal. Date: $12/4/2007$ $9:06:42AM$ Units: mg/L Matrix:DUP Anal. Date: $12/4/2007$ $9:06:42AM$ $Matrix$:AqueousAnalyte Name Total Dissolved SolidsSampResult 3,070DUPRes. 2,980RPD im 3.0FlagLCS/LCSD REPORTAnalyte Name Total Dissolved Solids $3,070$ $2,980$ 3.0 20 LCS/LCSD REPORTAnalysis: $160.1 - Total Dissolved Solids dried at 180^{\circ}C - TDSMB:Prep Date:11/29/2007MB Anal. Date:12/4/20079:06:42AMLCSD Anal. Date:12/4/2007LCS Anal. Date:12/4/20079:06:42AMLCSD Anal. Date:12/4/2007MB Anal. Date:12/4/20079:06:42AMLCSD Anal. Date:12/4/2007Matrix:AqueousAqueousMatrix:AqueousAnalyte NameTotal Dissolved SolidsSDRes.NDSDRes.730SPLevSDRecv.SDRes.SDRes.SDRes.SD Recv.SDRecv.SDRecv.SD Recv LimRPDLimRecvMS REPORTAnalysis:160.1 - Total Dissolved Solids dried at 180^{\circ}C - TDSParent:Parent:Parent:B0711172-01BPrep Date:Prep Date:11/29/2007MS REPORTAnalyte NameSamp. Anal. Date:12/4/20079:06:42AMUnits:MS Anal. Date:12/4/20079:06:42AMMS Anal. Date:12/4/20079:06:42AMSDRecv.MS Recv.Parent:Matrix:Matrix:Matrix:Aqueous$	Analysis:	160.1 - Total Dissolved	Solids dried at 180°	C - TDS	Base Sampl Prep Date:	e:B0711172-01B 11/29/2007		
DUP Anal. Date: $12/4/2007$ $9:06:42AM$ Matrix:AqueousAnalyte Name Total Dissolved SolidsSampResult $3,070$ DUPRes. $2,980$ RPD 3.0 RPDLim 20 FlagLCS/LCSD REPORTAnalysis: 160.1 - Total Dissolved Solids dried at $180^{\circ}C$ - TDSMB: $Prep Date:$ T071203008-MB 	Samp. Anal. Date:	12/4/2007 9:06:42AM			Units:	mg/L		
Analyte Name Total Dissolved SolidsSampResult 3,070DUPRes. 2,980RPD 3.0RPDLim 20FlagLCS/LCSD REPORTAnalyte Name Total Dissolved Solids dried at 180°C - TDSMB:T071203008-MB Prep Date:MB Anal. Date:12/4/20079:06:42AMUnits:mg/LLCS Anal. Date:12/4/20079:06:42AM LCSD Anal. Date:12/4/20079:06:42AM Matrix:AqueousAnalyte Name Total Dissolved SolidsSDRes. NDSDRes. 730SDLev 744SPDLev 744SD Recov. 98.1SD Recov Lim 80.1RPDLim 80.120ElizAnalyte Name Total Dissolved Solids dried at 180°C - TDSMB Recov. SD Recov.Analyte Name Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01B Prep Date:Analysis:160.1 - Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01B Prep Date:Analyte Name MS Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalyte Name Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01B Recov.Analyte Name Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01B Recov.Analyte Name Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01B Recov.Analyte Name Total Dissolved SolidsS00S06:42AMMatr	DUP Anal. Date:	12/4/2007 9:06:42AM			Matrix:	Aqueous		
Total Dissolved Solids $3,070$ $2,980$ 3.0 20 LCS/LCSD REPORTAnalysis: 160.1 - Total Dissolved Solids dried at 180° C - TDSMB: $T071203008$ -MB Prep Date:MB Anal. Date: $12/4/2007$ $9:06:42$ AMUnits: mg/L LCS Anal. Date: $12/4/2007$ $9:06:42$ AM LCSD Anal. Date: $12/4/2007$ $9:06:42$ AM Matrix:AqueousAnalyte NameSampResultLCSRes.SDRes.SPLevSPDLevRecov.SD RecovRPDRecov LimRPDLimFlagTotal Dissolved SolidsND 730 735 744 744 98.1 98.8 0.7 $80 \cdot 120$ 20 MS REPORTAnalysis:160.1 - Total Dissolved Solids dried at 180° C - TDSParent:B0711172-01B Prep Date:Prep Date: $11/29/2007$ 9:06:42AMUnits: mg/L MS Anal. Date: $12/4/2007$ 9:06:42AMMatrix:AqueousAnalysis: 160.1 - Total Dissolved Solids dried at 180° C - TDSParent:B0711172-01B Prep Date:Samp. Anal. Date: $12/4/2007$ $9:06:42AM$ Units: mg/L MS Anal. Date: $12/4/2007$ $9:06:42AM$ Matrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov.Colspan="4">Condet Solids $3,070$ $3,790$ 744 96.8 $70 - 130$	Analyte Name	<u>SampResult</u>	DUPRes. RPD	<u>RPDLim</u>	Flag			
LCS/LCSD REPORTAnalysis: $160.1 - Total Dissolved Solids dried at 180°C - TDS$ MB: $T071203008-MB$ Prep Date: $11/29/2007$ MB Anal. Date: $12/4/2007$ $9:06:42AM$ Units: mg/L LCS Anal. Date: $12/4/2007$ $9:06:42AM$ LCSD Anal. Date: $12/4/2007$ $9:06:42AM$ LCS Anal. Date: $12/4/2007$ $9:06:42AM$ LCSD Anal. Date: $12/4/2007$ $9:06:42AM$ Matrix:AqueousAnalyte Name Total Dissolved Solids $\underline{SampResult}$ $\underline{LCSRes. SDRes. SPLes}$ 730 \underline{SPLes} 735 \underline{SPLes} $\underline{SDRecov}$ 98.1 \underline{RPD} 98.8 $\underline{Recov. Lim}$ 0.7 \underline{RPDLim} $80 - 120$ \underline{Flag} Analysis: $160.1 - Total Dissolved Solids dried at 180°C - TDS$ Parent: $B0711172-01B$ $Prep Date:11/29/2007Samp. Anal. Date:12/4/20079:06:42AMUnits:mg/LMatrix:AqueousAnalyte NameTotal Dissolved Solids\underline{SampResult}\underline{MSRes.}\underline{SPLev}Recov.\underline{Recov.}\underline{Recov.Lim}\underline{Flag}Total Dissolved SolidsAnalyte NameTotal Dissolved Solids\underline{SanpResult}\underline{MSRes.}\underline{SPLev}Recov.\underline{Recov.}\underline{Recov.Lim}\underline{Flag}$	Total Dissolved So	olids 3,070	2,980 3.0	20				
LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T071203008-MB Prep Date: 11/29/2007 MB Anal. Date: 12/4/2007 9:06:42AM Units: mg/L LCS Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLey SPDLey Recov. SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 730 735 744 744 98.8 0.7 80 - 120 20 MS REPORT Analyte Name SampResult LCSRes. SDRes. SPLev 88.0 0.7 80 - 120 20 MS REPORT Analyte Name 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 SampA. Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Di								
Analysis:160.1 - Total Dissolved Solids dried at 180°C - TDSMB: $1071203008-MB$ Prep Date:MB Anal. Date: $12/4/2007$ $9:06:42AM$ Units: mg/L LCS Anal. Date: $12/4/2007$ $9:06:42AM$ LCSD Anal. Date: $12/4/2007$ $9:06:42AM$ Matrix:AqueousAnalyte NameSampResultLCSRes.SDRes.SPLevSPDLevRecov.SD RecovRPDRecov LimRPDLimFlagTotal Dissolved SolidsND730735744744 98.1 98.8 0.7 $80 - 120$ 20 MS REPORTAnalysis: 160.1 - Total Dissolved Solids dried at $180°C$ - TDSParent: $B0711172-01B$ Prep Date: $11/29/2007$ Samp. Anal. Date: $12/4/2007$ $9:06:42AM$ Units: mg/L Matrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov.Recov. LimFlagTotal Dissolved Solids $3,070$ $3,790$ 744 96.8 $70 - 130$ NOTE 2			LCS	S/LCSD REPORT				
MB Anal. Date: 12/4/2007 9:06:42AM Units: mg/L LCS Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 730 735 744 744 98.1 98.8 0.7 80 - 120 20 MS REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 9:06:42AM Matrix: Aqueous Samp. Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous MS Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Dissolved Solids 3,070 3,790 744 96.8 70 - 130 NOTE 2	Analysis:	160.1 - Total Dissolved	Solids dried at 180°	C - TDS	MB:	T071203008-MB		
MB Anal. Date: $12/4/2007$ $9:06:42AM$ Units: mg/L LCS Anal. Date: $12/4/2007$ $9:06:42AM$ LCSD Anal. Date: $12/4/2007$ $9:06:42AM$ Matrix:AqueousAnalyte NameSampResultLCSRes.SDRes.SPLevRecov.SD Recov.SD RecovRPDRecov LimRPDLimFlagTotal Dissolved SolidsND73073574474498.198.8 0.7 $80 - 120$ 20 MS REPORTAnalysis: 160.1 - Total Dissolved Solids dried at 180° C - TDSParent:B0711172-01BPrep Date: $11/29/2007$ Samp. Anal. Date: $12/4/2007$ $9:06:42AM$ Units: mg/L MS Anal. Date: $12/4/2007$ $9:06:42AM$ Matrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov.Recov LimFlagTotal Dissolved Solids $3,070$ $3,790$ 74496.8 $70 - 130$ NOTE 2					Prep Date:	11/29/2007		
LCS Anal. Date: 12/4/2007 9:06:42AM LCSD Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 730 735 744 744 98.1 98.8 0.7 80 - 120 20 MS REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Units: mg/L MS Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov. Recov Lim Flag Total Dissolved Solids 3,070 3,790 744 96.8 70 - 130 NOTE 2	MB Anal. Date:	12/4/2007 9:06:42AM			Units:	mg/L		
Analyte NameSampResultLCSRes.SDRes.SPLevSPDLevRecov.SD RecovRPDRecov LimRPDLimFlagTotal Dissolved SolidsND73073574474498.198.80.780 - 12020MS REPORTAnalysis:160.1 - Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01BPrep Date:11/29/2007Samp. Anal. Date:12/4/20079:06:42AMUnits:mg/LMS Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov.Recov LimTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2	LCS Anal. Date:	12/4/2007 9:06:42AM	LCSD Anal. Date:	12/4/2007 9:06:4	2AM Matrix:	Aqueous		
Iteration ND 730 733 744 744 98.1 98.8 0.7 80 - 120 20 MS REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0711172-01B Prep Date: 11/29/2007 Samp. Anal. Date: 12/4/2007 9:06:42AM Units: mg/L MS Anal. Date: 12/4/2007 9:06:42AM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Dissolved Solids 3,070 3,790 744 96.8 70 - 130 NOTE 2	Analyte Name	SampResult LCSR	Res. SDRes. SPLev	<u>SPDLev</u> <u>Recov.</u>	SD Recov RPD	<u>Recov Lim</u> <u>RPDLim</u>	<u>Flag</u>	
MS REPORTAnalysis:160.1 - Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01BPrep Date:11/29/2007Samp. Anal. Date:12/4/20079:06:42AMUnits:mg/LMS Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov LimFlagTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2		us ND 750	755 744	/44 98.1	98.8 0.7	80 - 120 20		
Analysis:160.1 - Total Dissolved Solids dried at 180°C - TDSParent:B0711172-01BPrep Date:11/29/2007Samp. Anal. Date:12/4/20079:06:42AMUnits:mg/LMS Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov LimFlagTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2				MS REPORT				
Prep Date:11/29/2007Samp. Anal. Date:12/4/20079:06:42AMUnits:MS Anal. Date:12/4/20079:06:42AMMatrix:Analyte NameSampResultMSRes.SPLevRecov.Recov LimFlagTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2	Analysis:	160.1 - Total Dissolved	Solids dried at 180°	C - TDS	Parent:	B0711172-01B		
Samp. Anal. Date:12/4/20079:06:42AMUnits:mg/LMS Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov LimFlagTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2	1 1111 9 0101				Prep Date:	11/29/2007		
MS Anal. Date:12/4/20079:06:42AMMatrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov LimFlagTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2	Samp. Anal. Date:	12/4/2007 9:06:42AM			Units:	mg/L		
Analyte NameSampResultMSRes.SPLevRecov.Recov LimFlagTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2	MS Anal. Date:	12/4/2007 9:06:42AM			Matrix:	Aqueous		
Analyte NameSampResultMSRes.SPLevRecov.Recov LimFlagTotal Dissolved Solids3,0703,79074496.870 - 130NOTE 2	Angleta N			5		Land Line	El	
Total Dissolved Solids 5,070 5,790 744 90.8 70 - 150 NOTE 2	Analyte Name	SampResult MSR	es. <u>SPLe</u>	$\frac{\text{Recov.}}{06.8}$		70 120 NOTE 2	<u>Flag</u>	
		us 3,070 3,79	0 /44	90.8		70 - 150 NOIL 2		
Prep Batch: T071203004	Prep Batch:	T071203004						
SAMDI E DUDI ICATE DEDODT			CAMDI F	DIDI ICATE DI	толот			
Analysis: 150.1 - nH Electometric - nH Base Sample: P0711172.01P	Analysis	150 1 - pH Flearamatri	SAMITLE c - pH	DUFLICATE KI	Raca Comm ¹	e·B0711172 01P		
Prep Date: 11/28/2007	¹ mary 515.	150.1 - p11, Electometh	C PII		Prep Date:	11/28/2007		
Samp, Anal. Date: 11/28/2007 10:05:27AM Units: pH	Samp, Anal. Date:	11/28/2007 10:05:27A	М		Units:	рH		
DUP Anal. Date:11/28/200710:05:27AMMatrix:Aqueous	DUP Anal. Date:	11/28/2007 10:05:27A	М		Matrix:	Aqueous		
Analyte Name SampResult DUPRes DD RDD1 im Elag	Analyte Name	SampPacult		RPDI im	Flag	-		
pH 8.97 8.95 0.2 20	pH	<u>8.97</u>	8.95 0.2	20	<u>uz</u>			
	·							

Detantea	татупсат керо	11			Analytic	a Enviror	mental Lab	oratorie	es, Inc.		
Workorder (SDG):	B0711172										
Project:	Navajo) Mine Ex	tension	Leachiı	ng Study						
Client:	Applie	d Hydrola	ogy Asso	ociates,	Inc.						
Client Project Num	ber: none										
Tests Run at:	Analytica Enviro	nmental La	aborator	ies - Tho	ornton, Co	lorado					
Workorder (SDG)	: B0711172										
Project: Project Number:	Navajo Mine Ext	ension Lea	aching S QU	tudy JALI	ГҮ CON	TROL	REPOR	Г			
Prep Batch:	T071203004										
Prep Batch:	T071203006										
			SA	AMPLE	DUPLIC	CATE RE	PORT	~ .			
Analysis:	310.1 - Alkalinity	, Titrimetr	ric (pH 4	4.5) - All	kalinity		Base S Prep	Sample Date:	:B0711172 11/29/2007	-01B 7	
Samp. Anal. Date	: 11/29/2007 10:0	8:49AM					Units	:	mg/L		
DUP Anal. Date:	11/29/2007 10:0	8:49AM					Matri	x:	Aqueous		
Analvte Name	SampRes	sult DU	PRes.	RPD	RPDL	m	Flag				
Bicarbonate	1,28	0 1,22	30	4.0	20		<u> </u>				
		266	8	11.8	20						
Carbonate	256	200									
Carbonate Analysis:	256 310.1 - Alkalinity	, Titrimetr	ric (pH 4	LC 4.5) - All	S/LCSD kalinity	REPORT	ſ MB: Prep]	Date:	T0712030 11/29/200'	06-MB 7	
Carbonate Analysis: MB Anal. Date:	256 310.1 - Alkalinity 11/29/2007 10:0	7, Titrimetr 8:49AM	ric (pH 4	LC 4.5) - All	S/LCSD	REPORT	Г MB: Prep I Units	Date:	T0712030 11/29/200' mg/L	06-MB 7	
Carbonate Analysis: MB Anal. Date: LCS Anal. Date:	256 310.1 - Alkalinity 11/29/2007 10:0 11/29/2007 10:0	7, Titrimetr 8:49AM 8:49A M IC	ric (pH 4 SD Anal	LC 4.5) - All	S/LCSD kalinity	REPOR 7	r MB: Prep Units :49A M atri	Date: : x:	T0712030 11/29/200' mg/L Aqueous	06-MB 7	
Carbonate Analysis: MB Anal. Date: LCS Anal. Date: Analyte Name	256 310.1 - Alkalinity 11/29/2007 10:0 11/29/2007 10:0 SampResult	7, Titrimeti 8:49AM 8:49AMCS LCSRes.	ric (pH 4 SD Anal SDRes.	LC I.5) - All I. Date: SPLev	S/LCSD kalinity 11/29/20 SPDLev	REPOR 07 10:08 Recov.	T MB: Prep Units H9AMMatri SD Recov	Date: : x: <u>RPD</u>	T0712030 11/29/2007 mg/L Aqueous <u>Recov Lim</u>	06-MB 7 <u>RPDLim</u>	Flag
Carbonate Analysis: MB Anal. Date: LCS Anal. Date: <u>Analyte Name</u> Bicarbonate	256 310.1 - Alkalinity 11/29/2007 10:0 11/29/2007 10:0 <u>SampResult</u> ND	7, Titrimetr 8:49AM 8:49A M C <u>LCSRes.</u> 24.0	ric (pH ⁴ SD Anal <u>SDRes.</u> 26.0	LC 1.5) - All 1. Date: <u>SPLev</u> 25.0	S/LCSD kalinity 11/29/20 <u>SPDLev</u> 25.0	REPOR 07 10:08 <u>Recov.</u> 96.0	T MB: Prep Units HAMMatri SD Recov 104.0	Date: x: <u>RPD</u> 8.0	T0712030 11/29/200' mg/L Aqueous <u>Recov Lim</u> 80 - 120	06-MB 7 <u>RPDLim</u> 20	Flag

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Workorder (SDG):	B0711172
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Number:	none

Workower (SDG): B0711172 Project: Navajo Mine Extension Leaching Study Client: Applied Hydrology Associates, Inc. Client Project Number: none QC BATCH ASSOCIATIONS - BY METHOD BLANK Lab Project ID: 81,530 Lab Project Number: B0711172 Lab Method Blank Id: T071130001-MB Prep Date: 11/29/2007 Prep Batch ID: T071130001 Burneria Barlile Analysis/Date This Method Blank Id: T071130001 Burneria Barlile Analysis/Date Tori 130001-LCS LCSD 071129_011.DXD 11/29/2007 1:21.08PR T071130001-LCSD LCSD 071129_013.DXD 11/29/2007 1:37.58PR B0711172-12B KF2007-01(58) and KF-98-02(53) 071129_013.DXD 11/29/2007 1:21.08PR B0711172-12B KF2007-01(58) DUP and KF-98-02(53) 071129_015.DXD 11/29/2007 2:24.30PR B0711172-12B KF2007-01(58) DUP and KF-98-02(53) 071129_044.DXD 11/29/2007 1:0:35:0PR B0711172-12B-MS MS 071129_045.DXD 1	Detailed Analytical Report		Analytica E	nvironmental Labora	tories, Inc.	
Image: Image: Applied Hydrology Associates, Inc. Stent Project Number: none CC BATCH ASSOCIATIONS - BY METHOD BLANK Lab Project ID: 81,530 Lab Project Number: B0711172 Lab Method Blank Id: T071130001-MB Prep Date: 11/29/2007 Prep Batch ID: T071130001-MB Prep Date: 11/29/2007 Method: Inorganic Anions by Ion Chromatography - Anions by IC This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNam ClientSampleNam East 7071130001-ICS LCS 071129_011.DXD 11/29/2007 1:21.08P 7071130001-ICS LCS 071129_012.DXD 11/29/2007 1:37.58P 7071130001-ICS LCS 071129_012.DXD 11/29/2007 1:37.58P 80711172-1B KF2007-01(58) and KF-98-02(53) 071129_013.DXD 11/29/2007 2:45.21P 80711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP071129_014.DXD 11/29/2007 2:45.21P 80711172-12B KF2007-01(58) and KF-98-02(53) 071130_007.DXD 11/30/2007 1:2:0:02P 80711172-12B KF2007-01(58) and KF-98-02(53)	Workorder (SDG): B	0711172				
Hent: Applied Hydrology Associates, Inc. Jient Project Number: none QC BATCH ASSOCIATIONS - BY METHOD BLANK Lab Project ID: 81,530 Lab Project Number: B0711172 Lab Method Blank Id: T071130001-MB Prep Date: 11/29/2007 Method: T071130001 T071130001 Prep Date: 11/29/2007 SampleNum ClientSampleNane DataFile AnalysisDate T071130001-LCS LCSD 071129_011.DXD 11/29/2007 1:37:58PP B0711172-018 KF2007-01(58) and KF-98-02(53) DUP071129_014.DXD 11/29/2007 2:45:449PP B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_016.DXD 11/29/2007 2:45:21PM B0711172-12B-MS MS 071129_015.DXD 11/29/2007 2:45:21PM B0711172-12B-MS MS 071129_046.DXD 11/29/2007 1:45:449PP B0711172-12B-MS MS 071129_016.DXD 11/29/2007 2:45:21PM B0711172-12B-MS MS 071129_046.DXD 11/29/2007 1:45:0207 B0711172-12B-MS MS 0711	roject:	Navajo Mine Ex	tension Leaching Study			
Hent Project Number: none QC BATCH ASSOCIATIONS - BY METHOD BLANK Lab Project ID: 81,530 Lab Project Number: B0711172 Lab Method Blank Id: T071130001-MB Prep Date: 11/29/2007 Method: Inorganit: Anions by Ion Chromatography - Anions by IC AnalysisDate Inorganit: Anions by Ion Chromatography - Anions by IC This Method Blank Id: Inorganit: Anions by Ion Chromatography - Anions by IC AnalysisDate Tori 130001-LCS LCS 071129_011.DXD 11/29/2007 1:37.58PH B0711172-0118 KF2007-01(58) and KF-98-02(53) 071129_013.DXD 11/29/2007 2:38.30PH B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_044.DXD 11/29/2007 2:38.30PH B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_044.DXD 11/29/2007 1:36.310PH B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_007.DXD 11/29/2007 1:36.310PH B0711172-12B KF2007-01(58) and KF-98-02(53)DUP071130_007.DXD 11/30/2007 1:36.20PH B0711172-12B KF2007-01(58) and KF-98-02(53) 071130_018.CXD 1:300/20PH 1:30.20PH	lient:	Applied Hydrolo	ogy Associates, Inc.			
Add Project ID: 81,530 Lab Project Number: B0711172 Lab Method Blank Li: T071130001-MB Prep Date: 11/29/2007 Prep Batch ID: T071130001 T071130001 T071130001 Method: Inorganic Anions by Ion Chromatography - Anions by IC Tnis Tnis SampleNum ClientSampleNume Palaritic AnivsiDate T071130001-LCS LCS 071129_011.DXD 11/29/2007 1:21.08PA T071130001-LCS LCS 071129_013.DXD 11/29/2007 1:54.49PA B0711172-12B KF2007-01(58) and KF-98-02(53) DUP71129_014.DXD 11/29/2007 2:21:30PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP71129_045.DXD 11/29/2007 2:28:30PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP71129_045.DXD 11/29/2007 1:26:30PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP71130_007.DXD 11/29/2007 1:26:30PA B0711172-12B KF2007-01(58) and KF-98-02(53) DUP71130_007.DXD 11/30/2007 1:26:30PA B0711172-12B-MS MS 071129_045.DXD 11/29/2007 1:26:30PA <th>lient Project Number:</th> <th>none</th> <th></th> <th></th> <th></th> <th></th>	lient Project Number:	none				
Lab Project ID: 81,530 Lab Project Number: B0711172 Lab Method Blank Id: T071130001-MB Prep Batch ID: T071130001 Method: Inorganic Anions by Ion Chromatography - Anions by IC This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleAnion ClientSampleAnion EnaliseDate Formation T071130001-LCS LCS 071129_012_DXD 11/29/2007 1:37:58PA B0711172-01B KF2007-01(58) and KF-98-02(53) 071129_013_DXD 11/29/2007 2:13:08PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_014_DXD 11/29/2007 2:45:21PA B0711172-12B-DUP DUP 071129_016_DXD 11/29/2007 1:37:58PA B0711172-12B-MS MS 071129_016_DXD 11/29/2007 2:45:21PA B0711172-12B-MS MS 071129_046_DXD 11/29/2007 1:26:30PD B0711172-12B-MS MS 071130_007_DXD 11/29/2007 1:26:30PD B0711172-12B-MS MS 071130_000_DXD 11/30/2007 1:26:30PD B0711172-12B-MS MS 0711		QQ	C BATCH ASSOCIATIONS -	BY METHOD BLAN	К	
Prep Date: I1/29/2007 Prep Bach ID: T071130001-MB Method: Inorganic Anions by Ion Chromatography - Anions by IC This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile Analysis/Date T071130001-LCS LCS 071129_011.DXD 11/29/2007 1:21:08PM B0711172-101B KF2007-01(58) and KF-98-02(53) 071129_013.DXD 11/29/2007 1:24:39PM B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_014.DXD 11/29/2007 2:28:30PM B0711172-12B-DUP DUP 071129_016.DXD 11/29/2007 2:38:30PM B0711172-12B-MS MS 071129_044.DXD 11/29/2007 1:53:10P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 1:53:10P B0711172-12B-MS MS 071130_008.DXD 11/30/2007 1:2:0:01P B0711172-12B-MS MS 071130_008.DXD 11/30/2007 1:2:0:02P B0711172-12B-MS MS	Lab Project ID:	81,530	Lab Project Number:	B0711172		
Lab Method Blank Id: T071130001-MB Prep Batch ID: T071130001 Method: Inorganic Anions by Ion Chromatography - Anions by IC This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile AnalysisDate T071130001-LCS LCS 071129_011.DXD 11/29/2007 1:21:08PA T071130001-LCS LCSD 071129_012.DXD 11/29/2007 1:37:S8PA B0711172-01B KF2007-01(58) DUP and KF-98-02(53) 071129_013.DXD 11/29/2007 1:54:49PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_014.DXD 11/29/2007 2:28:30PA B0711172-12B-MS MS 071129_016.DXD 11/29/2007 2:28:30PA B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:36:20P B0711172-12B-MS MS 071129_045.DXD 11/29/2007 10:36:20P B0711172-12B-MS MS 071129_045.DXD 11/29/2007 10:36:20P B0711172-12B-MS MS 071129_045.DXD 11/29/2007 10:36:20P B0711172-12B-MS MS 071120_045.DXD 11/29/2007 10:36:30P B0711172-12B-MS MS 071120_045.DXD 11/29/2007 12:06:310P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP071130_008.DXD 11/30/2007 12:06:1P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_008.DXD 11/30/2007 12:33:40P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_008.DXD 11/30/2007 12:35:40P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_018.DXD 11/30/2007 12:35:40P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP07130_008.DXD 11/30/2007 12:35:40P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP07130_008.DXD 11/30/2007 12:35:40P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17P Method Blank Id: T071130013-MB Prep Date: 11/30/2007 4:07:17P B0711172-12A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17P B0711172-12A KF2007-01(58) DUP and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17P B0711112-01B Batch QC B113007W.WKS 11/30/2007 4:07:17P B0711112-01B Batch QC B113007W.WKS 11/30/2007 4:07:17P B0711112-01B Batch QC B113007W.WKS 11/30/2007 4:07:17P B0711112-01B-MS MS B113007W.WKS 11/30/2007 4:19:11P J0711112-01B-MS MS B113007W.WK					Prep Date:	11/29/2007
Prep natr. D. 10/1130001 Method: Inorganic Anions by Ion Chromatography - Anions by IC This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile AnalysisDate T071130001-LCS LCS 071129_011_DXD 11/29/2007 1:21:08PT B0711172-01B KF2007-01(58) and KF-98-02(53) 071129_013_DXD 11/29/2007 2:24:30PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUPO71129_014_DXD 11/29/2007 2:24:30PA B0711172-12B-DUP DUP 071129_044_DXD 11/29/2007 2:24:521PA B0711172-12B-MS MS 071129_044_DXD 11/29/2007 1:36:20P B0711172-12B-MS MS 071129_046_DXD 11/29/2007 1:36:20P B0711172-12B-MS MS 071129_046_DXD 11/29/2007 1:0:35:10P B0711172-12B-MS MS 071129_046_DXD 11/30/2007 1:2:0:01P B0711172-12B-MS MS 071130_009_DXD 11/30/2007 1:2:0:01P B0711172-12B KF2007-01(58) and KF-98-02(53)	Lab Method Blank Id: Prop Patch ID:	T071130001-MB				
Method: Introgram e Antonis of the Chromolograph of Antonis antonis of the Chromologra	Flep Batch ID.	10/1130001 Inorganic Anions	hy Ion Chromatography An	ions by IC		
This Method bank and sample preparation batch are associated with the following samples, spikes, and duplicates: ChientSampleName DataFile Analysis/Date SampleNum ClientSampleName DataFile Analysis/Date 1:129/2007 1:21:08PM T071130001-LCS LCS 0711129_012.DXD 11/29/2007 1:37:58PA B0711172-01B KF2007-01(58) and KF-98-02(53) 071129_013.DXD 11/29/2007 2:28:30PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_014.DXD 11/29/2007 2:28:30PA B0711172-12B-MS MS 071129_04.DXD 11/29/2007 2:45:21PA B0711172-12B-MS MS 071129_046.DXD 11/29/2007 1:0:53:10P B0711172-12B KF2007-01(58) and KF-98-02(53) 071130_07.DXD 11/30/2007 1:0:55:10P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 1:0:55:10P B0711172-12B KF2007-01(58) and KF-98-02(53) 071130_007.DXD 11/30/2007 1:2:3:40P B0711172-12B KF2007-01(58) and KF-98-02(53) 071130_009.DXD 11/30/2007 1:2:3:40P B0711172-12B KF2007-01(58)	Method:				1 1. /	
Samplexium Litentsamplexame Datarrie Analysis/Date T071130001-LCS LCS 071129_011.DXD 11/29/2007 1:21:08PA T071130001-LCSD LCSD 071129_012.DXD 11/29/2007 1:37:58PA B0711172-01B KF2007-01(58) DUP and KF-98-02(53) DUP071129_014.DXD 11/29/2007 2:45:30PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP071129_014.DXD 11/29/2007 2:45:21PA B0711172-12B-MS MS 071129_015.DXD 11/29/2007 2:45:21PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP071129_044.DXD 11/29/2007 10:53:10P B0711172-12B KF2007-01(58) and KF-98-02(53) 071130_07.DXD 11/29/2007 10:53:10P B0711172-12B KF2007-01(58) and KF-98-02(53) 071130_07.DXD 11/30/2007 12:6:51P B0711172-12B KF2007-01(58) and KF-98-02(53) DUP071130_008.DXD 11/30/2007 12:3:40P B0711172-12B KF2007-01(58) and KF-98-02(53) DUP07130_008.DXD 11/30/2007 12:3:24P B0711172-12B KF2007-01(58) and KF-98-02(53) DUP07130_008.DXD 11/30/2007 12:3:2502P Prep Batch I	I his Method blank and	sample preparation batch	are associated with the following	ng samples, spikes, and	auplicates:	
1071130001-LCS LCS 071129_011.DXD 11/29/2007 1:21:08-R T071130001-LCSD LCSD 071129_012.DXD 11/29/2007 1:37:58P B0711172-01B KF2007-01(58) and KF-98-02(53) 071129_013.DXD 11/29/2007 2:37:58P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_014.DXD 11/29/2007 2:28:30P B0711172-12B-MS MS 071129_016.DXD 11/29/2007 2:45:21P B0711172-12B-MS MS 071129_044.DXD 11/29/2007 10:36:20P B0711172-12B-DUP DUP 071129_045.DXD 11/29/2007 10:36:20P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:36:20P B0711172-12B-MS MS 071130_007.DXD 11/30/2007 12:00:01P B0711172-12B-MS MS 071130_008.DXD 11/30/2007 12:00:01P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP071130_080.DXD 11/30/2007 12:00:01P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP071130_080.DXD 11/30/2007 12:03:340P B0711172-12B-MS MS	SampleNum	LCS	Datar		<u>AnarysisDate</u>	1.01.09DM
1071130001-1CSD 1129/2007 1137:580 B0711172-01B KF2007-01(58) and KF-98-02(53) 071129_013.DXD 11/29/2007 1:57:5847 B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_014.DXD 11/29/2007 2:28:30P B0711172-12B-DUP DUP 071129_015.DXD 11/29/2007 2:28:30P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 2:28:30P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:36:20P B0711172-12B-MS MS 071130_007.DXD 11/30/2007 12:00:01P B0711172-12B-MS KF2007-01(58) DUP and KF-98-02(53) DUP071130_008.DXD 11/30/2007 12:0:0:01P B0711172-12B-MS MS 071130_009.DXD 11/30/2007 12:3:40P B0711172-12B-MS MS 071130_009.DXD 11/30/2007	10/1130001-LCS		0/11	29_011.DXD	11/29/2007	1.21.08PM
B0/11172-01B KF2007-01(58) and KF-98-02(53) 0/1129_014.DXD 11/29/007 12:4:39PN B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_014.DXD 11/29/2007 2:28:30PN B0711172-12B-DUP DUP 071129_016.DXD 11/29/2007 2:34:30PN B0711172-12B-MS MS 071129_046.DXD 11/29/2007 2:45:21PN B0711172-12B-DUP DUP 071129_046.DXD 11/29/2007 10:63:20P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:63:20P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:53:10P B0711172-12B-MS MS 071130_007.DXD 11/30/2007 12:00:01P B0711172-12B-MS MS 071130_008.DXD 11/30/2007 12:16:51P B0711172-12B-MS KF2007-01(58) DUP and KF-98-02(53) DUP071130_008.DXD 11/30/2007 12:6:529P B0711172-12B-MS MS 071130_013.MB Prep Date: 11/30/2007 12:50:29P Lab Method Blank Id: T071130013 Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NalysisDate	10/1130001-LCSD	LCSD KE2007 01(59)11	U/11	29_012.DXD	11/29/2007	1:57:58PM
B0/11172-12B KF2007-01(58) DUP and KF-98-02(53)DUP0/1129_014.DXD 11/29/2007 2:28:30PX B0711172-12B-DUP DUP 071129_016.DXD 11/29/2007 2:28:30PX B0711172-12B-MS MS 071129_044.DXD 11/29/2007 2:45:21PX B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_044.DXD 11/29/2007 10:53:10P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:53:10P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:53:10P B0711172-12B KF2007-01(58) and KF-98-02(53) 071130_007.DXD 11/30/2007 12:0:01P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_008.DXD 11/30/2007 12:16:51P B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:3:40P B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:50:29P B0711172-12B-MS MS 071130_013.MB Prep Date: 11/30/2007 11/30/2007 4:07:17PN B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PN	B0/111/2-01B	KF2007-01(58) and I	KF-98-02(53) 0711	29_013.DXD	11/29/2007	1:54:49PM
B0711172-12B-DDP DUP 071129_015,DXD 11/29/2007 2:28:30PA B0711172-12B-MS MS 071129_016,DXD 11/29/2007 2:45:21PA B0711172-12B-MS KF2007-01(58) DUP and KF-98-02(53)DUP071129_044,DXD 11/29/2007 10:53:10P B0711172-12B-DUP DUP 071129_045,DXD 11/29/2007 10:53:10P B0711172-12B-MS MS 071129_046,DXD 11/29/2007 12:00:01P B0711172-12B-MS MS 071130_007,DXD 11/30/2007 12:00:01P B0711172-12B-DUP DUP 071130_007,DXD 11/30/2007 12:65:1P B0711172-12B-DUP DUP 071130_009,DXD 11/30/2007 12:50:29P B0711172-12B-MS MS 071130_010,DXD 11/30/2007 4:07:17PA B0711172-12B-MS MS 071130_010,MS 11/30/2007 4:07:17PA B0711172-12A KF2007-01(58) and KF-98-0	B0/111/2-12B	KF2007-01(58) DUP	and KF-98-02(53)DUP(7/1]	29_014.DXD	11/29/2007	2:11:40PM
B0711172-12B-MS MS 071129_06.DXD 11/29/2007 2:3:21PA B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_044.DXD 11/29/2007 10:36:20PI B0711172-12B-DUP DUP 071129_045.DXD 11/29/2007 10:36:20PI B0711172-12B-MS MS 071129_046.DXD 11/29/2007 10:36:20PI B0711172-12B-MS MS 071129_046.DXD 11/29/2007 12:00:01PI B0711172-12B-MS KF2007-01(58) and KF-98-02(53) 071130_008.DXD 11/30/2007 12:10:0:01PI B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_008.DXD 11/30/2007 12:16:51PI B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:50:29PI Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 12:50:29PI Lab Method Blank Id: T071130013 SW7470A - Mercury in Liquid Waste by CVAA - Total Hg This Method SW7470A - Mercury in Liquid Waste by CVAA - Total Hg This Method SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Tot1130/02007 4:07:17PA B0711172-01A KF2007-01(58) DUP and KF-98-02(53) DUP MI MOTW.WKS 11/30	B0711172-12B-DUP	DUP	0711	29_015.DXD	11/29/2007	2:28:30PM
B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071129_044,DXD 11/29/2007 10:36:20P B0711172-12B-DUP DUP 071129_045,DXD 11/29/2007 10:35:10P B0711172-12B-MS MS 071129_046,DXD 11/29/2007 10:35:10P B0711172-12B-MS MS 071129_046,DXD 11/29/2007 12:00:01P B0711172-01B KF2007-01(58) DUP and KF-98-02(53) DUP071130_008,DXD 11/30/2007 12:16:51P B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_009,DXD 11/30/2007 12:33:40P B0711172-12B-MS MS 071130_010,DXD 11/30/2007 12:50:29P B0711172-12B-MS MS 071130_010,DXD 11/30/2007 12:50:29P Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 12:50:29P Lab Method Blank Id: T071130013 MS 0711120_01,DXD 11/30/2007 4:07:17PM B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PM B0711172-01A KF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS 11/30/2007 4:07:17PM	B0711172-12B-MS	MS	0711	29_016.DXD	11/29/2007	2:45:21PM
B0711172-12B-DUP DUP 071129_045.DXD 11/29/2007 10:53:10P B0711172-12B-MS MS 071129_046.DXD 11/29/2007 11:09:59P B0711172-01B KF2007-01(58) and KF-98-02(53) 071130_007.DXD 11/30/2007 12:00:01P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) 071130_008.DXD 11/30/2007 12:16:51P B0711172-12B-DUP DUP 071130_009.DXD 11/30/2007 12:33:40P B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:50:29P Lab Method Blank Id: T071130013-MB T071130013 Prep Date: 11/30/2007 12:50:29P Lab Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PN B0711172-01A KF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS 11/30/2007 4:07:17PN B0711112-01B Batch QC B113007W.WKS 11/30/2007 4:07:17PN B0711112-01B <td>B0711172-12B</td> <td>KF2007-01(58) DUP</td> <td>and KF-98-02(53)DUP(0711</td> <td>29_044.DXD</td> <td>11/29/2007</td> <td>10:36:20PM</td>	B0711172-12B	KF2007-01(58) DUP	and KF-98-02(53)DUP(0711	29_044.DXD	11/29/2007	10:36:20PM
B0711172-12B-MS MS 071129_046.DXD 11/29/2007 11:09:59P B0711172-01B KF2007-01(58) and KF-98-02(53) 071130_007.DXD 11/30/2007 12:00:01P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) 071130_008.DXD 11/30/2007 12:16:51P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) 071130_009.DXD 11/30/2007 12:33:40P B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:50:29P B0711172-12B-MS MS 071130013-MB Prep Date: 11/30/2007 Prep Batch ID: T071130013 T071130013 Prep Date: 11/30/2007 Method Blank Id: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg I1/30/2007 4:07:17PN B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:09:34PN B0711172-12A KF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS 11/30/2007 4:09:34PN J071112-01B Batch QC B113007W.WKS 11/30/2007 4:02:28PN T071130013-LCSD LCSD B113007W.WKS 11/30/2007 4:02:28PN </td <td>B0711172-12B-DUP</td> <td>DUP</td> <td>0711</td> <td>29_045.DXD</td> <td>11/29/2007</td> <td>10:53:10PM</td>	B0711172-12B-DUP	DUP	0711	29_045.DXD	11/29/2007	10:53:10PM
B0711172-01B KF2007-01(58) and KF-98-02(53) 071130_007.DXD 11/30/2007 12:00:01P B0711172-12B KF2007-01(58) DUP and KF-98-02(53) DUP071130_008.DXD 11/30/2007 12:16:51P B0711172-12B-DUP DUP 071130_009.DXD 11/30/2007 12:33:40P B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:30:20P B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:50:29P Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 12:50:29P Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Total Hg Tot71130013 Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg AnalysisDate MalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PM B071112-01B Batch QC B113007W.WKS 11/30/2007 4:02:28PM T071130013-LCS LCS B113007W.WKS 11/30/2007 4:02:28PM T071130013-LCSD LCSD B113007W.WKS 11/30/2007 4:02:28PM T071112-01B-MS </td <td>B0711172-12B-MS</td> <td>MS</td> <td>0711</td> <td>29_046.DXD</td> <td>11/29/2007</td> <td>11:09:59PM</td>	B0711172-12B-MS	MS	0711	29_046.DXD	11/29/2007	11:09:59PM
B0711172-12B KF2007-01(58) DUP and KF-98-02(53)DUP071130_008,DXD 11/30/2007 12:16:51P. B0711172-12B-DUP DUP 071130_009,DXD 11/30/2007 12:33:40P. B0711172-12B-MS MS 071130_010,DXD 11/30/2007 12:50:29P. Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 12:50:29P. Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 12:50:29P. This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) DUP and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17P. B0711172-01B Batch QC B113007W.WKS 11/30/2007 4:02:28P. T071130013-LCS LCS B113007W.WKS 11/30/2007 4:02:28P. T071130013-LCS LCSD B113007W.WKS 11/30/2007 4:02:28P. T071130013-LCS LCSD B113007W.WKS 11/30/2007 4:01:2:35P. J0711112-01B-MS MS B113007W.WKS	B0711172-01B	KF2007-01(58) and 1	KF-98-02(53) 0711	30_007.DXD	11/30/2007	12:00:01PM
B0711172-12B-DUP DUP 071130_009.DXD 11/30/2007 12:33:40P. B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:50:29P. Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 12:50:29P. Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Prep Date: 11/30/2007 12:50:29P. This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PN B0711172-12A KF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS 11/30/2007 4:09:34PN J071112-01B Batch QC B113007W.WKS 11/30/2007 4:02:28PN T071130013-LCS LCS B113007W.WKS 11/30/2007 4:02:28PN J0711112-01B-DUP DUP B113007W.WKS 11/30/2007 4:19:11PN J0711112-01B-MSD MS B113007W.WKS 11/30/2007 4:21:35PN J0711112-01B-MSD MSD B113007W.WKS	B0711172-12B	KF2007-01(58) DUP	and KF-98-02(53)DUP0711	30_008.DXD	11/30/2007	12:16:51PM
B0711172-12B-MS MS 071130_010.DXD 11/30/2007 12:50:29P Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 12:50:29P Lab Method Blank Id: T071130013-MB T071130013 Prep Date: 11/30/2007 Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:09:34PM B0711172-12A KF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS 11/30/2007 4:09:34PM J0711112-01B Batch QC B113007W.WKS 11/30/2007 4:09:34PM T071130013-LCS LCS B113007W.WKS 11/30/2007 4:02:28PM T071112-01B-DUP DUP B113007W.WKS 11/30/2007 4:02:28PM T0711112-01B-MSD MS B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-M	B0711172-12B-DUP	DUP	0711	30_009.DXD	11/30/2007	12:33:40PM
Lab Method Blank Id: T071130013-MB Prep Date: 11/30/2007 Prep Batch ID: T071130013 T071130013 Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: Nethod: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Nethod: SW7470A - Mercury in Liquid Was	B0711172-12B-MS	MS	0711	30_010.DXD	11/30/2007	12:50:29PM
Lab Method Blank Id: 10/1130013-MB Prep Batch ID: T071130013 Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: AnalysisDate SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PM B0711172-12A KF2007-01(58) DUP and KF-98-02(53) B113007W.WKS 11/30/2007 4:09:34PM J0711112-01B Batch QC B113007W.WKS 11/30/2007 4:09:34PM T071130013-LCS LCS B113007W.WKS 11/30/2007 4:09:34PM J0711112-01B Batch QC B113007W.WKS 11/30/2007 4:09:34PM J0711130013-LCS LCS B113007W.WKS 11/30/2007 4:09:28PM J0711112-01B-DUP DUP B113007W.WKS 11/30/2007 4:19:11PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J07111112-01B-MSD MSD		T071120012 ND			Prep Date:	11/30/2007
Integration Introduction Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:09:34PM B0711172-01B Batch QC B113007W.WKS 11/30/2007 4:09:34PM J0711130013-LCS LCS B113007W.WKS 11/30/2007 4:02:28PM J0711112-01B-DUP DUP B113007W.WKS 11/30/2007 4:05:02PM J0711112-01B-MS MS B113007W.WKS 11/30/2007 4:05:02PM J0711112-01B-MS MS B113007W.WKS 11/30/2007 4:17:01PM J0711112-01B-MS MS B113007W.WKS 11/30/2007 4:19:11PM J0711112-01B-MS MS B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-PDS PD	Lab Method Blank Id: Prep Batch ID:	T071130013-MB				
Method. Diversion Properties of With Cherculy in Exquite Wase of CVIII Charling This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates: AnalysisDate SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PM B0711172-12A KF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS 11/30/2007 4:09:34PM J0711112-01B Batch QC B113007W.WKS 11/30/2007 4:02:28PM T071130013-LCS LCS B113007W.WKS 11/30/2007 4:02:28PM J0711112-01B-DUP DUP B113007W.WKS 11/30/2007 4:05:02PM J0711112-01B-DUP DUP B113007W.WKS 11/30/2007 4:19:11PM J0711112-01B-MSD MS B113007W.WKS 11/30/2007 4:19:11PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-PDS PDS B113007W.WKS 11/30/2007 <	Mathadi	SW7470A - Merc	ury in Liquid Waste by CVA	A - Total Ho		
SampleNum ClientSampleName DataFile AnalysisDate B0711172-01A KF2007-01(58) and KF-98-02(53) B113007W.WKS 11/30/2007 4:07:17PM B0711172-12A KF2007-01(58) DUP and KF-98-02(53) B113007W.WKS 11/30/2007 4:09:34PM J0711112-01B Batch QC B113007W.WKS 11/30/2007 4:02:28PM T071130013-LCS LCS B113007W.WKS 11/30/2007 4:02:28PM J0711112-01B-DUP DUP B113007W.WKS 11/30/2007 4:05:02PM J0711112-01B-MS MS B113007W.WKS 11/30/2007 4:19:11PM J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-PDS PDS B113007W.WKS 11/30/2007 4:21:35PM	This Method blank and	sample preparation batch	are associated with the followi	ng samples spikes and	duplicates:	
DimpersionChemistryDescriptionB0711172-01AKF2007-01(58) and KF-98-02(53)B113007W.WKS11/30/2007B0711172-12AKF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS11/30/20074:09:34PMJ0711112-01BBatch QCB113007W.WKS11/30/20074:14:48PMT071130013-LCSLCSB113007W.WKS11/30/20074:02:28PMJ0711112-01B-DUPDUPB113007W.WKS11/30/20074:05:02PMJ0711112-01B-MSMSB113007W.WKS11/30/20074:19:11PMJ0711112-01B-MSDMSDB113007W.WKS11/30/20074:21:35PMJ0711112-01B-PDSPDSB113007W.WKS11/30/20074:23:43PM	SampleNum	ClientSampleName	DataF	ile	AnalysisDate	
B0711172-01AIX 2007 01(50) and IX 75 02(55)B113007W.WKS11/30/20074:07:1171B0711172-12AKF2007-01(58) DUP and KF-98-02(53)DUPB113007W.WKS11/30/20074:09:34PMJ0711112-01BBatch QCB113007W.WKS11/30/20074:14:48PMT071130013-LCSLCSB113007W.WKS11/30/20074:02:28PMJ0711112-01B-DUPDUPB113007W.WKS11/30/20074:05:02PMJ0711112-01B-MSMSB113007W.WKS11/30/20074:17:01PMJ0711112-01B-MSDMSDB113007W.WKS11/30/20074:21:35PMJ0711112-01B-PDSPDSB113007W.WKS11/30/20074:21:35PM	B0711172 01A	$\frac{\text{ChentSamplervalue}}{\text{KF2007-01(58) and 1}}$	KF-98-02(53) B11	3007W WKS	11/30/2007	4.07.17PM
J0711112-01BBatch QCB113007W.WKS11/30/20074:14:48PMT071130013-LCSLCSB113007W.WKS11/30/20074:02:28PMT071130013-LCSDLCSDB113007W.WKS11/30/20074:05:02PMJ0711112-01B-DUPDUPB113007W.WKS11/30/20074:17:01PMJ0711112-01B-MSMSB113007W.WKS11/30/20074:19:11PMJ0711112-01B-MSDMSDB113007W.WKS11/30/20074:21:35PMJ0711112-01B-PDSPDSB113007W.WKS11/30/20074:23:43PM	B0711172-01A	KF2007-01(58) DUP	and KE-98-02(53)DUPB11	3007W.WKS	11/30/2007	4.09.34PM
30711112-01BDaten QCB113007W.WKS11/30/20074:02:28PNT071130013-LCSLCSB113007W.WKS11/30/20074:05:02PNJ0711112-01B-DUPDUPB113007W.WKS11/30/20074:17:01PNJ0711112-01B-MSMSB113007W.WKS11/30/20074:19:11PNJ0711112-01B-MSDMSDB113007W.WKS11/30/20074:21:35PNJ0711112-01B-PDSPDSB113007W.WKS11/30/20074:23:43PN	10711112 01B	Ri 2007 01(50) DOI	B11	3007W WKS	11/30/2007	4.09.941 M
1071130013-LCSDLCSDB113007W.WKS11/30/20074:02:28FNJ0711112-01B-DUPDUPB113007W.WKS11/30/20074:17:01PNJ0711112-01B-MSMSB113007W.WKS11/30/20074:19:11PNJ0711112-01B-MSDMSDB113007W.WKS11/30/20074:21:35PNJ0711112-01B-PDSPDSB113007W.WKS11/30/20074:23:43PN	T071130012 LCS	LCS	D11, D11/	SOOT W. WKS	11/30/2007	4.02.28PM
J071112-01B-DUPDUPB113007W.WKS11/30/20074:17:01PMJ0711112-01B-MSMSB113007W.WKS11/30/20074:19:11PMJ0711112-01B-MSDMSDB113007W.WKS11/30/20074:21:35PMJ0711112-01B-PDSPDSB113007W.WKS11/30/20074:23:43PM	T071130013-LCS	LCSD	DII. D11	SOOT W. WKS	11/30/2007	4.05.02PM
J0711112-01B-MSMSB113007W.WKS11/30/20074:19:11PMJ0711112-01B-MSDMSDB113007W.WKS11/30/20074:21:35PMJ0711112-01B-PDSPDSB113007W.WKS11/30/20074:23:43PM		DUP	DII. D11/		11/30/2007	4·17·01PM
J0711112-01B-MSD MSD B113007W.WKS 11/30/2007 4:21:35PM J0711112-01B-PDS PDS B113007W.WKS 11/30/2007 4:23:43PM	10711112-01D-DUP	MS	DII. D11/	$\frac{1}{2}$	11/30/2007	4.10.11DM
J0711112-01B-PDS PDS B113007W.WKS 11/30/2007 4:23:43PN J0711112-01B-PDS PDS B113007W.WKS 11/30/2007 4:23:43PN	JU/11112-UID-WIS	MSD	DII.	$\frac{1}{2007W} W E$	11/20/2007	т.19.11Г WI Л.91.25DM
JU/11112-01D-PD5 FD5 B11300/W.WKS 11/30/2007 4:23:43PM	JU/11112-UIB-WISD	סטע	BII.	$300 / W \cdot W KS$	11/20/2007	4.22.42DM
	J0/11112-01B-PDS	1 00	BII.	000 / W . W KS	11/30/2007	7.23.43F IVI

.

. ..

Detailed Analyti	cal Report	Analytica Environmental Laboratories, Inc.						
Workorder (SDG): B	0711172							
Project:	Navajo Mine Extension Lea	aching Study						
Client:	Applied Hydrology Associa							
Client Project Number:	none							
	QC BATCH A	SSOCIATIONS - BY METHOD BLAN	K					
Lab Project ID:	81,530 Lab Pro	ject Number: B0711172						
	T07100005 MD		Prep Date: 12/3/2007					
Lab Method Blank Id: Prep Batch ID:	T071203005-MB							
Method:	SW6010B - ICP - Total							
This Method blank and	sample preparation batch are associat	ed with the following samples, spikes, and	duplicates:					
SampleNum	ClientSampleName	DataFile	AnalysisDate					
B0711172-02A	123 S 87W 0-4' SPOIL	E12037A	12/3/2007 1:27:00PM					
B0711172-03A	123 S 89W 0-4' SPOIL	E12037A	12/3/2007 1:32:00PM					
B0711172-04A	125 S 88W 0-4' SPOIL	E12037A	12/3/2007 1:37:00PM					
B0711172-05A	120 S 89W 0-4' SPOIL	E12037A	12/3/2007 1:43:00PM					
B0711172-06A	Barber Ramp 3 Composite Spoil	A E12037A	12/3/2007 2:28:00PM					
B0711172-07A	Barber Ramp 3 Composite Spoil	B E12037A	12/3/2007 2:33:00PM					
B0711172-08A	Barber Ramp 3 Composite Spoil	C E12037A	12/3/2007 2:38:00PM					
B0711172-09A	Ash Composite 70% FA	E12037A	12/3/2007 2:43:00PM					
B0711172-10A	Ash Composite Dup 1 70% FA	E12037A	12/3/2007 2:48:00PM					
B0711172-11A	Ash Composite Dup2 70% FA	E12037A	12/3/2007 2:53:00PM					
T071203005-LCS	LCS	E12037A	12/3/2007 1:17:00PM					
T071203005-LCS	LCS	E12037A	12/3/2007 2:58:00PM					
T071203005-LCSD	LCSD	E12037A	12/3/2007 1:22:00PM					
B0711172-05A-DUP	DUP	E12037A	12/3/2007 1:48:00PM					
B0711172-05A-MS	MS	E12037A	12/3/2007 1:53:00PM					
B0711172-05A-MSD	MSD	E12037A	12/3/2007 1:58:00PM					
B0711172-05A-PDS	PDS	E12037A	12/3/2007 2:18:00PM					
B0711172-02A	123 S 87W 0-4' SPOIL	E12047A	12/4/2007 3:03:00PM					
B0711172-03A	123 S 89W 0-4' SPOIL	E12047A	12/4/2007 3:08:00PM					
B0711172-04A	125 S 88W 0-4' SPOIL	E12047A	12/4/2007 3:13:00PM					
B0711172-05A	120 S 89W 0-4' SPOIL	E12047A	12/4/2007 3:18:00PM					
B0711172-06A	Barber Ramp 3 Composite Spoil	A E12047A	12/4/2007 4:04:00PM					
B0711172-07A	Barber Ramp 3 Composite Spoil	B E12047A	12/4/2007 4:09:00PM					
B0711172-08A	Barber Ramp 3 Composite Spoil	C E12047A	12/4/2007 4:14:00PM					
B0711172-09A	Ash Composite 70% FA	E12047A	12/4/2007 4:19:00PM					
B0711172-10A	Ash Composite Dup 1 70% FA	E12047A	12/4/2007 4:24:00PM					
B0/111/2-11A	Ash Composite Dup2 70% FA	E12047A	12/4/2007 4:29:00PM					
T0/1203005-LCS		E12047A	12/4/2007 2:53:00PM					
10/1203005-LCSD		E12047A	12/4/2007 2:38:00PM					
BU/111/2-05A-DUP	MS	E12047A	12/4/2007 = 3:23:00PM 12/4/2007 = 3:29:00DM					
DU/111/2-USA-MS	MSD	E12047A	12/4/2007 = 3:28:00PW 12/4/2007 = 2:22:00PW					
DU/111/2-U3A-MSD	עכויי	E12047A	12/4/2007 = 3.55.00PW 12/4/2007 = 3.54.00DM					
BU/111/2-05A-PDS	5U 1	E1204/A	12/4/2007 3:54:00PM					

Page 56 of 62

Detailed Analyti	cal Report	Analytica Environmental Laboratories, Inc.						
Workorder (SDG): B	0711172							
Project:	Navajo Mine I	Extension Leaching Study						
Client:	Applied Hydro	ology Associates, Inc.						
Client Project Number:	none							
	(QC BATCH ASSOCIATIONS	- BY METHOD BLANK					
Lab Project ID:	81,530	Lab Project Number:	B0711172					
	TOTIO	D		Prep Date: 11/29/2007				
Lab Method Blank Id: Prep Batch ID:	T071203006-M	В						
Method:	310.1 - Alkalini	tv. Titrimetric (pH 4.5) - Alka	linity					
This Method blank and	sample preparation bat	tch are associated with the follow	ing samples, spikes, and d	luplicates:				
SampleNum	ClientSampleName	Data	File	AnalysisDate				
B0711172-01B	KF2007-01(58) and	1 KF-98-02(53)		11/29/2007 10:08:49AM				
B0711172-12B	KF2007-01(58) DU	JP and KF-98-02(53)DUP		11/29/2007 10:08:49AM				
T071203006-LCS	LCS			11/29/2007 10:08:49AM				
T071203006-LCSD	LCSD			11/29/2007 10:08:49AM				
B0711172-01B-DUP	DUP			11/29/2007 10:08:49AM				
				Prep Date: 11/29/2007				
Lab Method Blank Id: Prep Batch ID:	T071203008-M T071203008	В						
Method:	160.1 - Total Di	ssolved Solids dried at 180°C	- TDS					
This Method blank and	sample preparation bat	tch are associated with the follow	ing samples, spikes, and d	luplicates:				
<u>SampleNum</u>	ClientSampleName	Data	File	AnalysisDate				
B0711172-01B	KF2007-01(58) and	d KF-98-02(53)		12/4/2007 9:06:42AM				
B0711172-12B	KF2007-01(58) DU	JP and KF-98-02(53)DUP		12/4/2007 9:06:42AM				
T071203008-LCS	LCS			12/4/2007 9:06:42AM				
T071203008-LCSD	LCSD			12/4/2007 9:06:42AM				
B0711172-01B-DUP	DUP			12/4/2007 9:06:42AM				
B0711172-01B-MS	MS			12/4/2007 9:06:42AM				

Detailed Analytical Report		Analytica Environmental Laboratories, Inc.						
Workorder (SDG): B	0711172							
Project:	Navajo Mine Ex	tension Leaching Study						
Client:	Applied Hydrolo	ogy Associates, Inc.						
Client Project Number:	none							
	QC	C BATCH ASSOCIATIONS - BY	Y METHOD BLANK					
Lab Project ID:	81,530	Lab Project Number:	B0711172					
			Prep Date	: 12/3/2007				
Lab Method Blank Id:	T071203011-MB							
	T0/1203011 SW6010B_LCP	Total						
Method:	Swoolob - ICr -	I Otal						
SampleNum	ClientSempleNeme	are associated with the following	samples, spikes, and duplicates:	te				
<u>Samplenum</u>	KE2007 01(58) and 1	$E = \frac{Datar nc}{2}$	7 A 12/3/2007	6.01.00PM				
B0711172-01A	KF2007-01(58) DUP	E_{1203} E1203 and KE-98-02(53) DI IPE 1203	7A 12/3/2007	6:06:00PM				
E0711221 01A	Ri 2007-01(00) DOI	E1203	7A 12/3/2007	6:11:00PM				
T071221-01A		E1203	7A 12/3/2007	5:51:00PM				
T071203011-LCS	LCSD	E1203	7A 12/3/2007	5:56:00PM				
F0711221-01A-DUP	DUP	E1203	7A 12/3/2007	6:16:00PM				
F0711221-01A-MS	MS	E1203	7A 12/3/2007	6:21:00PM				
F0711221-01A-MSD	MSD	E1203	7A 12/3/2007	6:26:00PM				
F0711221-01A-PDS	PDS	E1203	7A 12/3/2007	6:31:00PM				
B0711172-01A	KF2007-01(58) and I	KF-98-02(53) E1204	7A 12/4/2007	5:19:00PM				
B0711172-12A	KF2007-01(58) DUP	and KF-98-02(53)DUPE1204	7A 12/4/2007	5:24:00PM				
F0711221-01A	Batch QC	E1204	7A 12/5/2007	9:03:00AM				
T071203011-LCS	LCS	E1204	7A 12/4/2007	5:09:00PM				
T071203011-LCSD	LCSD	E1204	7A 12/4/2007	5:14:00PM				
F0711221-01A-DUP	DUP	E1204	7A 12/5/2007	9:08:00AM				
F0711221-01A-MS	MS	E1204	7A 12/5/2007	9:13:00AM				
F0711221-01A-MSD	MSD	E1204	7A 12/5/2007	9:18:00AM				
F0711221-01A-PDS	PDS	E1204	7A 12/5/2007	9:23:00AM				
F0711221-01A-MS	MS	E1205	7A 12/5/2007	6:20:00PM				
F0711221-01A-MSD	MSD	E1205	7A 12/6/2007	10:14:00AM				
Detailed Analyti	ical Report	A	nalytica Environmental La	boratories, Inc.				
------------------------	-------------------------	---	------------------------------	-------------------	------------			
Workorder (SDG): E	80711172							
Project:	Navajo Mine Ex	tension Leaching S	Study					
Client:	Applied Hydrol	ogy Associates, Inc						
Client Project Number:	none							
	0	C BATCH ASSOCIA	TIONS - BY METHOD BI	LANK				
	-							
Lab Project ID:	81,530	Lab Project Nun	ber: B0711172					
				Prep Date:	12/4/2007			
Lab Method Blank Id:	T071204013-MB							
Prep Batch ID:	T0/1204013	and a construction of the	icalid Wasta by CVAA	Lot.				
Method:	5 w /4/1A - Mer	cury in Sond or Sem	Isoliu waste by CVAA - I					
This Method blank and	sample preparation batc	h are associated with t	he following samples, spikes	, and duplicates:				
<u>SampleNum</u>	<u>ClientSampleName</u>		DataFile	AnalysisDat	<u>e</u>			
B0711172-02A	123 S 87W 0-4' SPC	DIL	B120407S.WKS	12/4/2007	3:25:10PM			
B0711172-03A	123 S 89W 0-4' SPC	OIL	B120407S.WKS	12/4/2007	4:05:31PM			
B0711172-04A	125 S 88W 0-4' SPC	NL	B120407S.WKS	12/4/2007	4:13:55PM			
B0711172-05A	120 S 89W 0-4' SPC	OIL	B120407S.WKS	12/5/2007	9:42:00AM			
B0711172-06A	Barber Ramp 3 Com	posite Spoil A	B120407S.WKS	12/5/2007	9:49:39AM			
B0711172-07A	Barber Ramp 3 Com	posite Spoil B	B120407S.WKS	12/5/2007	9:57:26AM			
B0711172-08A	Barber Ramp 3 Com	posite Spoil C	B120407S.WKS	12/5/2007	10:05:12AM			
B0711172-09A	Ash Composite 70%	FA	B120407S.WKS	12/5/2007	10:21:36AM			
B0711172-10A	Ash Composite Dup	1 70% FA	B120407S.WKS	12/5/2007	10:31:17AM			
B0711172-11A	Ash Composite Dup	2 70% FA	B120407S.WKS	12/5/2007	10:40:18AM			
T071204013-LCS	LCS		B120407S.WKS	12/4/2007	3:08:17PM			
T071204013-LCSD	LCSD		B120407S.WKS	12/4/2007	3:16:19PM			
B0711172-02A-DUP	DUP		B120407S.WKS	12/4/2007	3:33:00PM			
B0711172-02A-MS	MS		B120407S.WKS	12/4/2007	3:41:00PM			
B0711172-02A-MSD	MSD		B120407S.WKS	12/4/2007	3:49:21PM			
B0711172-02A-PDS	PDS		B120407S WKS	12/4/2007	3:57:39PM			
			_ 1_0 .0, 5, 10					

.

Detailed Analy	tical Report	Analytica E	Invironmental Laborat	ories, Inc.	
Workorder (SDG):	B0711172				
Project:	Navajo Mine Ex	tension Leaching Study			
Client:	Applied Hydrol	ogy Associates, Inc.			
Client Project Number:	none				
	Q	C BATCH ASSOCIATIONS -	BY METHOD BLANI	X	
Lab Project ID:	81,530	Lab Project Number:	B0711172		
				Prep Date: 12	/6/2007
Lab Method Blank Id	: T071207005-MB				
	10/120/005 ASTM D2216 - F	moist			
Method:	d complementation hotel	noise	na complex spiltes and	dualiaataa	
	Cli in the sample preparation batch	h are associated with the following	ng samples, spikes, and	AnalysisData	
Sampleinum	<u>ClientSampleName</u>	Datar	<u>nie</u>	AnarysisDate	
B0711172-02A	123 S 87W 0-4' SPO	IL		12/7/2007 9:3	9:41AM
B0711172-03A	123 S 89W 0-4' SPO	IL		12/7/2007 9:3	9:41AM
B0711172-04A	125 S 88W 0-4' SPO	IL		12/7/2007 9:3	9:41AM
B0711172-05A	120 S 89W 0-4' SPO	IL		12/7/2007 9:3	9:41AM
B0711172-06A	Barber Ramp 3 Com	posite Spoil A		12/7/2007 9:3	9:41AM
B0711172-07A	Barber Ramp 3 Com	posite Spoil B		12/7/2007 9:3	9:41AM
B0711172-08A	Barber Ramp 3 Com	posite Spoil C		12/7/2007 9:3	9:41AM
B0711172-09A	Ash Composite 70%	FA		12/7/2007 9:3	9:41AM
B0711172-10A	Ash Composite Dup	1 70% FA		12/7/2007 9:3	9:41AM
B0711172-11A	Ash Composite Dup2	2 70% FA		12/7/2007 9:3	9:41AM
B0711172-11A-DU	P DUP			12/7/2007 9:3	9:41AM

Detailed Analytical Report

Workorder (SDG): B0711172 Navajo Mine Extension Leaching Study **Project: Client:** Applied Hydrology Associates, Inc. none

Client Project Number:

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.

Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

ND = Not Detected at or above the Reporting Limit

NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit

HIGH = Recovery, RPD, or other parameter is above Upper Control Limit

E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank

J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)

W = Post digestion spike did not meet criteria

S = Reported value determined by the Method of Standard Additions (MSA)

Other Flags may be applied. See Case Narrative for Description

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Sig Figs

Workorder (SDG):

B0711172

none

Project: Client: Navajo Mine Extension Leaching Study

Applied Hydrology Associates, Inc.

Client Project Number:

REPORTING CONVENTIONS FOR THIS REPORT

B0711172

TestPkgName

150.1/150.1 (Aqueous) - pH 160.1/160.1 (Aqueous) - TDS 300.0/300.0 (Aqueous) - Anions by IC 310.1/310.1 (Aqueous) - Alkalinity 6010B/3010A (Aqueous) - Total 6010B/3050B (Solid) - Total 7470A/7470A (Aqueous) - Total Hg 7471A/7471A (Solid) - Total Hg ASTMD2216/ASTMD2216 (Solid) - Pmoist Basis As Received As Received As Received As Received As Received Dry Weight Basis As Received Dry Weight Basis As Received

Reporting Limit

Report to PQL Report to MDL, J qual below PQL



ATTACHMENT C Cation Exchange Capacity Laboratory Results

COLORADO ANALYTICAL



Analytical Results

Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

tomer Sample ID 123 S 87W 0-4 Sample Date/Time: 11/15/07 12	' Spoil (B0711172-2B) :00 PM	Lab Number: 07112932-01 Matrix: Soil - Environmental		
Test	Result	Reporting Limit	Method	
<u>Drv Weight Basis</u> Cation Exchange Capacity	9.7 meq/100g	0.1	EPA 9081	

 ASA = "Methods of Sall Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soll Science Society of America. Madinon, 97, 1982.
 SW-866 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
 AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility. Salinity and Trace Element Toxicity": Colorado State University Technical Builterin LTB/8-2: Jan 1998; SM Workman, PN Soluanpour and RH Follen.

Aich

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 1 of 10



Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

ner Sample ID Sample Date/Time:	123 S 89V 11/15/07	/ 0-4' Spoil (B0711172-3B) 12:00 PM	Lab Number: 07112932-02 Matrix: Soil - Environmental	
Test		Result	Reporting Limit	Method
<u>)ry Weight Basis</u> Cation Exchange (Capacity	8.7 meg/100a	0.1	FPA 9081

 ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Medison. W1. 1982.
 SW-846 = "Text Methods for Evaluating Solid Waste"; USEPA; November 1986
 AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility. Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTB88-2: Jan 1998: SM Workman. PN Soltanpour and RH Follett.

hove Nielso

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 2 of 10



Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115

 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

ustomer Sample ID Sample Date/Time:	125 S 88V 11/15/07	V 0-4' Spoil (80711172-48) 12:00 PM	Lab Number: 07 Matrix: Soi	112932-03 il - Environmental
Test		Result	Reporting Limit	Method
<u>Dry Weight Basis</u> Cation Exchange (Capacity	9.4 meq/100g	0.1	EPA 9081

 ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Medison. W1. 1982.
 SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA: November 1986
 AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Builtan LTB88-2; Jan 1998; SM Workman. PN Soltanpour and RH Pollen,

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 3 of 10



Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

Customer Sample ID Sample Date/Time:	120 S 89W 0- 4 11/15/07 12	4' Špoil (80711172-58) 2:00 PM	Lab Number: 07112932-04 Matrix: Soil - Environmental	
Test		Result	Reporting Limit	Method
<u>Drv Weight Basis</u> Cation Exchange (Capacity	9.0 meq/100g	0.1	EPA 9081

 ASA ~ "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Medison, WI. 1982.
 SW-846 - "Text Methods for Evaluating Soild Waster": USEPA: November 1986
 AB-DTPA - "Soil Texting Methods Used at Colorado State University for the Svaluation of Fertility, Salinity and Trace Element Toxicity": Colorado State University Technical Bulletin LTBR8-2; Jan 1998; SM Warkman, PN Soltanpour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 4 of 10

COLORADO ANALYTICAL



Analytical Results

Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

Ustomer Sample ID Barber Ramp 3 Composite Soil A (B0711172 Lab Sample Date/Time: 11/15/07 12:00 PM		Lab Number: 07 Matrix: So	Number: 07112932-05 Matrix: Soil - Environmental	
Test		Result	Reporting Limit	Method
<u>Dry Weight Basis</u> Cation Exchange (Capacity	9.0 meq/100g	0.1	EPA 9081

 ASA = "Methods of Soll Analysis, Paris 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America, Madison, W7, 1982.
 SW-866 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
 AB-DTPA = "Soll Testing Methods Used at Colorado State University for the Evaluation of Pertity, Salinity and Trace Element Toxicity", Colorado State University Technical Bulletin LTB88-2; Jan 1998; SM Workman, PN Salianpour and RH Foller,

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 5 of 10

COLORADO ANALYTICAL



Analytical Results

Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 80711172

omer Sample ID Sample Date/Time:	Barber R a 11/15/07	amp 3 Composite Soil B (B0711172 12:00 PM	Lab Number: 07112932-06 Matrix: Soil - Environmental	
Test	· · · · ·	Result	Reporting Limit	Method
<u>Dry Weight Basis</u> Cation Exchange (Capacity	9.6 meq/100g	0.1	EPA 9081

 A\$A = "Methods of Sali Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soli Science. Society of America. Madison. W1, 1982,
 SW-866 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
 AB-DTPA = "Soli Testing Methods Used at Coloredo State University for the Evaluation of Fertility, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTBR8-2; Jan 1998; SM Workman. PN Soliampour and RH Foliett.

hove Nielso

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 6 of 10



Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

Sustomer Sample ID Sample Date/Time:	Barber R a 11/15/07	amp 3 Composite Soil C (80711172 12:00 PM	2 Lab Number: 07112932-07 Matrix: Soil - Environmental	
Test		Result	Reporting Limit	Method
<u>Drv Weight Basis</u> Cation Exchange (Capacity	9.9 meq/100g	0.1	EPA 9081

 ASA = "Methoda of Soli Analysia, Parts 1 and 2", Second Edition, American Society of Agronomy and Soli Science Society of America. Madison, W7, 1982,
 SW-866 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
 AB-DTPA = "Soli Testing Methods Used at Colorado State University for the Evaluation of Perlity, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LIB88-2; Jan 1998; SM Workman, PN Solianpour and PH Foliett,

hove Nielso

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 7 of 10



Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

omer Sample ID Ash Comp Sample Date/Time: 11/26/07		oosite 70% FA (B0711172-9B) 10:00 AM	Lab Number: 07112932-08 Matrix: Soil - Environmental		
Test		Result	Reporting Limit	Method	
<u>Dry Weight Basis</u> Cation Exchange C	apacity	0.4 meq/100g	0.1	EPA 9081	

 ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soil Science Society of America. Madison, W7, 1982.
 SW-846 = "Test Methods for Evaluating Solid Waste"; USEPA; November 1986
 AB-DTPA = "Soil Testing Methods Used at Colorado State University for the Evaluation of Fertility, Salinity and Trace Element Toxicliy", Colorado State University Technical Bulletin LTB88-2: Jan 1998; SM Workman, PN Solutapour and RH Follett.

hove Thicks

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 8 of 10



Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

ustomer Sample ID Sample Date/Time:	Ash Composi 11/26/07 10	ite Dup 1 70% FA (B0711172-10 0:00 AM	Lab Number: 07 Matrix: So	112932-09 bil - Environmental
Test		Result	Reporting Limit	Method
<u>Dry Weight Basis</u> Cation Exchange (Capacity	0.2 meq/100g	0.1	EPA 9081

 ASA = "Methods of Soli Analysis, Parts 1 and 2", Second Edition, American Society of Agronomy and Soli Science Society of America, Medison, W1, 1982.
 SW-846 = "Test Methods for Evaluating Solid Waster"; USEPA: November 1986
 AB-DTPA - "Soli Testing Methods Used at Colorado State University for the Evaluation of Ferliny, Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTBR8-2; Jan 1998; SM Workman, PN Solianpour and RH Follett.

home Nicho

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 9 of 10



Report To: Claire Toon Company: Analytica Environmental Labs 12189 Pennsylvania Street Thornton CO 80241-3115
 Task No:
 07112932

 Date Received
 11/29/07

 Reported:
 12/13/07

 Client PO:
 T13190

 Client Project:
 B0711172

tomer Sample ID Ash Co Sample Date/Time: 11/26/0		osite Dup 2 70% FA (B0711172-11 10:00 AM	Lab Number: 07112932-10 Matrix: Soil - Environmental	
Test		Result	Reporting Limit	Method
<u>Drv Weight Basis</u> Cation Exchange C	apacity	0.2 meq/100g	0.1	EPA 9081

ASA = "Methods of Soil Analysis, Parts 1 and 2", Second Edition. American Society of Agronomy and Soil Science Society of America. Madison. W7. 1982. SW-866 = "Test Methods for Evaluating Solid Waste": USEPA: November 1986 AR DETA = "Test Methods Included Conception Society for the Society of Evaluation of Evaluation of Society of Test Society of Soc

AB-DTFA = "Soll Testing Methods Used at Calorado State University for the Evaluation of Fertility. Salinity and Trace Element Toxicity"; Colorado State University Technical Bulletin LTBR8-2; Jan 1998; SM Workman, FN Soltamour and RH Follett.

DATA APPROVED FOR RELEASE BY

240 South Main Street / Brighton, CO 80601-0507 / 303-659-2313 Mailing Address: P.O. Box 507 / Brighton, CO 80601-0507 / Fax: 303-659-2315

Page 10 of 10

ANALYTICA	2 189 Pennsylvanie SI Thomten, CO 80241 Thomten, CO 80241	Anchone (907 An	Chain Chain Store Bouleyard Jac. AK 99508 Jac. AK 99508	of Custody 475 Hal SI Failbanks, AK 987 (907) 456 - 3116	/ Form 5438 Shale M Juneau, AK (907) 780	le Drive 199801 4668	chain o	1293		-
WINDER MAINTE & ARGINESS:	Public Water	System (PW)	S) [D#:		119034					
7	Project Name				0)uote ID;	روا ند مردود مردود مردوم مردود مردود	GN:		
omi	ل م	21112	دو							
Report to: Claire Toon		Urnaround	Time for	Possilie (TAT)	.)	voutrai m.	C.	- Ise	Credit Card	
Phone No: 303 - 301 - 2237	Stand	lard	Expedi	ted (* 10 čejs, pricrastroja	Shon requised		or Madress			
E-mail: a track of 11				(please specify due date add?if charges may ap	nebus; ply	ر مربع	s Cirs	}.		
Special Instructions/Comments:	Requested Due	Date for Resu	lls:							
					P	O, or Contract A	ter 7/13	190		
いてもらくし						Requested	Analysis/Meth	od		
Kit Prep/Shipping Charge: \$			er)	tion					ved	ed ?
Client Sample Identification / Location	Data Sampled	Time Sampled	Matrix (S-DW-WW-Ot) No. of Containe	908 Ca 908 Excl	ET L		lu, en transista		Field Prese	Field Filter M\$/MSD
123587W0-4 5pm:1 (B0711172-28)	11/15/07	00:61	561:4 1	Х						
100 HOW 200 HOW CEN				X						
9h) 1206 H-0 A 30 5 CV 1		<u> </u>	-	X						
26 10 20 - 1 Spoil (SB		-		X						
Derber Hamp Scompass, k Scort AL 66				X						
Prive Kimp S Lempscik Spail ISC 78				X						
Derber Kimp 2 Lampes K Spill (88)	4	-		×						
Al control 12 and a l AB	11/26/07	10:00	┥╼	. X						
Ash (ombaine Owa Toto FA (+ 1/a)	€	╉-	€ <u></u>							
Relinquished by: Date Time	Received by:									
A 10 10 10 10 10	Class	-	Cost-1	655		THO	ANC	INI .		
Relinquished by: Date Time	Received by: //		Dale	Time	Custody Seal?			1	ł	
					Initialed By:					
Reinquished by: Date Time	Received by:		Date	Time	Temp/Loc:					
Name of Sampler: (printed)										
Version 2.0					subbed via:					

PAGE 12/12

12/13/2007 16:58 3036592315

COLORADO ANALYTICAL



ATTACHMENT D Leachate Water Quality Laboratory Results



1/3/2008 Applied Hydrology Associates, Inc. 950 South Cherry Street Suite 810 Denver, CO 80246 Attn: Art O'Hayre Analytica Environmental Laboratories, Inc. 12189 Pennsylvania Street Thornton, CO 80241 Phone: 303-469-8868 Fax: 303-469-5254

Work Order #: B0712127 Date: 1/3/2008 Work ID: Navajo Mine Extension Leaching Study Date Received: 12/17/2007 Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0712127-01	MB Leachate 1	B0712127-02	Ash Leachate 1
B0712127-03	Ash Leachate 1 Dup	B0712127-04	Spoil Leachate 1
B0712127-05	Spoil Leachate 1 Dup		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Claire Toon Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0712127

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT: Five (5) samples were received on 12/17/2007 3:10:00 PM., at a temperature of 20 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: 150.1 - pH, Elecrometric - pH - Aqueous

Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous

Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous

Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous

MS/MSD and DUP OUTLIERS: As shown below, the MS/MSD was outside of limits for Sodium. The sample had Sodium concentrations greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate.

Туре	e C	lient Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	MB	Leachate 1	B0712127-01A	Sodium	418	75	125	1180	10.0
MSD	MB	Leachate 1	B0712127-01A	Sodium	-76.	75	125	1180	10.0

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0712127 (continued) Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous

Detailed Ana	lytical	Report			Ana	lytica En	vironn	nental Laboratories	, Inc.		
Workorder (SDG):	B0712	2127									
Project:		Navajo Mine	Extension	Leach	ing Stu	ıdy					
Client:		Applied Hydr	ology Ass	ociates	, Inc.						
Client Project Number	r:	none			<i>.</i>						
Report Section	:	Client	Samp	le Re	port						
Client Sample Name:		MB Leac	hate 1								
Matrix:	Aqu	ieous					С	ollection Date:	12/17/2007	9:4	40:00AM
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	B07121	27-01A						Analysis Date:	12/18/20	07	5:51:20PM
Prep Date:	12/18/20	007						Instrument:	CVAA_1	_	
Analytical Method ID:	SW7470.	A - Mercury in I	Liquid Wast	te by CV	AA - T	Гotal Hg		File Name:	B121807	W.	W
Prep Method ID:	7470A							Dilution Factor:	1		
Prep Batch Number:	T07121	8023									
Report Basis:	As Recei	ved						Analyst Initials:	DL		
Sample prep wt./vol:	30.00	ml						Prep Extract Vol:	30.00	ml	
Analyta		CASNo	Docult	Floge	Unite	ΡΟΙ	MDI	-			run #•
Mercury	-	<u>CASI10</u> 7439-97-6	ND	<u>r tags</u>	mg/L	0.00020	0.00005	50			1
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	B07121	27-01A						Analysis Date:	12/19/20	07	4:17:00PM
Prep Date:	12/18/20	007						Instrument:	ICP_2		
Analytical Method ID:	SW6010	B - ICP - Total						File Name:	E12197A	۱.	
Prep Method ID:	3010_IC	CP						Dilution Factor:	1		
Prep Batch Number:	T07121	8012									
Report Basis:	As Recei	ved						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml	
Analyte		CASNo	<u>Result</u>	<u>Flags</u>	<u>Units</u>	POL	<u>MDL</u>				<u>run #:</u>
Aluminum		7429-90-5	0.056		mg/L	0.050	0.014	7			1
Antimony		7440-36-0	ND		mg/L	0.050	0.0067				
Arsenic		/440-38-2	ND		mg/L	0.10	0.015				
Barium		/440-39-3	0.12 ND		mg/L	0.010	0.0001	6			
Beryllium		/440-41-/	ND		mg/L	0.0010	0.00000	50			
Boron		7440-42-8	0.33 ND		mg/L	0.050	0.0018	1			
Caulinum		7440-43-9	ND		mg/L	0.0000	0.0005	1			
Chromium		7440-70-2	2.9		mg/L	0.10	0.015)			
Cabalt		7440-47-3			mg/L	0.010	0.0016				
Copper		7440-48-4	ND		mg/L	0.0050	0.0010)			
Luon		7440-30-8	ND		mg/L	0.0050	0.0015				
Lead		7439-89-0	0.073 ND		mg/L	0.050	0.0027				
Lithium		7420 02 2	ND		mg/L	0.050	0.0011	2			
Magnesium		1439-93-2 7420 06 4			mg/L	0.10	0.0007	4			
Manganasa		7439-90-4	1.2 ND		mg/L	0.10	0.012	6			
Malubdorum		/439-96-5			mg/L	0.010	0.0006	0)			
woiybdenum		/439-98-7	0.014		mg/L	0.010	0.0018				
NICKEI	-	/440-02-0	ND		mg/L	0.040	0.0027	1			
Potassium		/440-09-7	11 ND		mg/L	1.0	0.31				
Selenium		//84-49-2	ND		mg/L	0.10	0.026	<i>(</i>			
Silver		/440-22-4	ND		mg/L	0.015	0.0006	D			

Detailed Ana	lytical 🛛	Report			Anal	ytica En	vironn	nental Laboratories	, Inc.	
Workorder (SDG):	B0712	127								
Project:]	Navajo Mine	Extensior	n Leachin	g Stu	dy				
Client:		Applied Hyd	rology Ass	sociates, I	nc.					
Client Project Number	:: 1	none								
Report Section	:	Clien	t Samp	le Repo	ort					
Client Sample Name:		MB Lea	chate 1							
Matrix:	Aqu	eous					С	ollection Date:	12/17/2007	9:40:00AM
Lab Sample Number:	B071212	27-01A						Analysis Date:	12/19/200	7 4:17:00PM
Prep Date:	12/18/20	007						Instrument:	ICP_2	
Analytical Method ID:	SW6010I	B - ICP - Total						File Name:	E12197A	
Prep Method ID:	3010_IC	P						Dilution Factor:	1	
Prep Batch Number:	T071218	8012								
Report Basis:	As Receiv	ved						Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml
<u>Analyte</u> Sodium	7	<u>CASNo</u> /440-23-5	<u>Result</u> 1,200	<u>Flags</u> U m	i <mark>nits</mark> ig/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1
Thallium	7	440-28-0	ND	m	ıg/L	0.40	0.011			
Vanadium	7	440-62-2	ND	m	ıg/L	0.010	0.0007	2		
Zinc	7	440-66-6	ND	m	ıg/L	0.0050	0.0010)		
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	conducted B071212 12/19/20 310.1 - A Alkalinit T071219	by: Analytica - 27-01B 007 Ikalinity, Titrin y_W 0013	- Thornton netric (pH 4	.5) - Alkali	nity			Analysis Date: Instrument: File Name: Dilution Factor:	12/19/200 Titrametri 1	7 2:30:16PM c
Report Basis:	As Receiv	ved						Analyst Initials:	kl	_
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	100.00	ml
<u>Analyte</u> Bicarbonate Carbonate		<u>CASNo</u>	<u>Result</u> 1,300 260	<u>Flags</u> <u>U</u> m	i <mark>nits</mark> ig/L	<u>POL</u> 5.0 7.0	<u>MDL</u> 1.5			<u>run #:</u> 1
			200		8-					
The following test was	conducted	by: Analytica - 27-01B	- Thornton					Analysis Date:	12/18/200	9·45·23AM
Prep Date:	12/18/20	007						Instrument:	Probe	, <u>), (), ()</u>
Analytical Method ID:	150.1 - pl	H, Elecrometric	c - pH					File Name:		
Prep Method ID:	150.1							Dilution Factor:	1	
Prep Batch Number:	T071218	8019								
Report Basis:	As Receiv	ved						Analyst Initials:	kl	
Sample prep wt./vol:	10.00	ml						Prep Extract Vol:	10.00	ml
<u>Analyte</u> pH		CASNo	<u>Result</u> 9.0	<u>Flags</u> U	nits oH	POL 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Ana	lytical	Report			Analy	tica En	vironr	nental Laboratories	, Inc.		
Workorder (SDG):	B0712	2127									
Project:		Navajo N	line Extensio	n Leach	ing Stud	ły					
Client:		Applied I	Hydrology As	sociates	, Inc.						
Client Project Number	::	none									
Report Section	:	Cli	ent Samp	le Re	port						
Client Sample Name:		MB I	Leachate 1		A						
Matrix:	Aqı	ieous					C	Collection Date:	12/17/2007	9:4	40:00AM
Lab Sample Number: Prep Date: Analytical Method ID:	B07121 12/21/20 160.1 - T	27-01B 007 Fotal Dissol	ved Solids drie	d at 180°	C - TDS			Analysis Date: Instrument: File Name:	12/31/200 SCALE	07 :	10:51:30AM
Prep Batch Number:	T07122	1010						Difution Factor:	1		
Report Basis:	As Recei	ived						Analyst Initials:	kl		
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	1.00	ml	
<u>Analyte</u> Total Dissolved Solids		<u>CASNo</u>	<u>Result</u> 3,000	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2				run #: 1
The following test was	conducted	l by: Analy	tica - Thornton								
Lab Sample Number: Prep Date:	B07121 12/18/20	27-01B 007 c Anions by	/ Ion Chromato	oranhy -	Anions by			Analysis Date: Instrument:	12/18/200 IC	07	8:44:03PM
Pren Method ID:	300.0	c Allolis by		graphy - I	Amons by	, ic		Dilution Eastor:	1	J20.	.D
Prop Potch Number	T07121	8016						Dilution Pactor.	1		
Report Basis: Sample prep wt./vol:	As Recei 20.00	ived ml						Analyst Initials: Prep Extract Vol:	КВ 20.00	ml	
<u>Analyte</u> Fluoride		<u>CASNo</u>	<u>Result</u> 2.2	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031				run #: 1
Sulfate			280		mg/L	1.5	0.11				
Lab Sample Number: Prep Date: Analytical Method ID:	B07121 12/18/2 Inorgani	27-01B 007 c Anions by	v Ion Chromato	graphy - J	Anions by	y IC		Analysis Date: Instrument: File Name:	12/20/20 IC 071220 (07 003.	5:51:04PM D
Prep Method ID:	300.0							Dilution Factor:	20		
Prep Batch Number: Report Basis:	T07121 As Recei	8016 ived						Analyst Initials:	KB		
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml	
Analyte Chloride		<u>CASNo</u>	<u>Result</u> 620	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 16	<u>MDL</u> 0.84	-			<u>run #:</u> 3

Norvice Norvice Norvice National Leader States in Leade	Detailed Ana	lytical	Report			Ana	lytica En	vironn	nental Laboratories	, Inc.		
Projec: Client: Applied Hydrolog: Associates, Inc.Client: Applied Hydrolog: Associates, Inc.VVVClient Sample Number: BornoreClient: Sample ReportClient: Sample Report12/17/20709:40:00AMThe following test were-tweeter by standytics: Prop Date: Date: Prop Bach Number:B0712127-02A-AqueonsCollection Date: Instrument: Instrument: CVAA_I12/18/20075:58:45PMAnalysica Method Dis: Prop Bach Number: Prop Bach Number: Prop Bach Number: Prop Bach Number: Prop Bach Number: Prop Bach Number: B071212702ANoResult by Structure in Instrument: method Dis: TV1218023Prop Bach Number: method Dis: TV1218023DLInstrument: Prop Extract Vol: Structure in Instrument: Number: Number: Prop Bach Number: Prop Bach Number: B071218023NoResult by Structure in Instrument: method Number: Number: Number: Number:NoProp Date: method Number: Number:DLInstrument: Instrument: Instrument: Instrument:Instrument: Instrument: Instrument:Instrument: Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrument: Instrument:Instrumen	Workorder (SDG):	B0712	2127									
Client: Applied Hydrology Associates, Inc. Client: Client: Client: Summer Report Section: Client: Summer Summer <td< th=""><th>Project:</th><th></th><th>Navajo Mine</th><th>Extension</th><th>l Leach</th><th>ing Stu</th><th>ıdy</th><th></th><th></th><th></th><th></th><th></th></td<>	Project:		Navajo Mine	Extension	l Leach	ing Stu	ıdy					
Client Project Number: Index Report Section: Client Sample Report Client Sample Name: Ash Leachate 1 Marix: Aqueous Collection Date: 12/17/2007 9:40:00AM The following test was conducted by: Analytica - Thornton Analysis Date: 12/18/2007 5:58:45PM The following test was conducted by: Analytica - Thornton Instrument: CVAA_1 Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg File Name: B1218007 5:58:45PM Perp Batch Number: T07/1218023 Assectived Analysis Date: 12/17/2007 4:58:00PM Sample prep wt./vol: 30:00 ml Prop Batch Number: 01/17/10/2 Prop Extract Vol: 30:00 ml Los Sample Number: B07/1218/207 ND Prop Mark Prop Mark Collowing test was conducted by: Analytica - Thornton Los Sample Number: B07/1217-02A Tornton Las Sample Number: B07/1218/007 Analysis Method D: Prop 7/128/007 Analysis Method D: Prop 7/128/007 Assectived Analysis Date: 12/19/2007 4:58:00PM Storntowins test was conducted by: Analytica - Thornton Los	Client:		Applied Hydr	ology Ass	ociates	, Inc.						
Client Sample Report Client Sample Name: Ash Leachate 1 Matrix: Aqueous Collection Date: 12/17/2007 9:40:00AM The following test was conducted by: Analytica - Thornton Lab Sample Number: 12/18/2007 Analytica Phone: 12/18/2007 S:58:45PM Analytical Method ID: SW370A Collection Date: 12/18/2007 S:58:45PM Analytical Method ID: SW370A Analytical Fielwame: B121807W.W Pep Method ID: 7470A Collection Date: 12/19/2007 S:58:45PM Analytica A Mercury in Liquid Waste by CVA - Total H File Name: B121807W.W Supple Struct Vol: 30.00 mdf Analytica - Thornton Lab Sample Number: D712127-02A Analytica - Thornton Lab Sample Number: D712128/027 Analytica - Thornton </th <th>Client Project Number</th> <th>r:</th> <th>none</th> <th></th> <th></th> <th>·</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>	Client Project Number	r:	none			·						
Antrix: Aqueous Collection Date: $12/17/2007$ $9:40:00AM$ The following test was conducted by: Analytica - Thornton Lab Sample Number: $12/18/2007$ Analysis Date: $12/18/2007$ SSR345PM Lab Sample Number: $12/18/2007$ Analysis Date: $12/18/2007$ B121807W.W Prep Date: $12/18/2007$ Analysis Date: $12/18/2007$ SSR345PM Prep Method ID: $87470A$ Mercury in Liquid Waste by CVAA - Toral Hg File Name: B121807W.W Prep Method ID: 7470A Assectived Analysis Date: $12/18/2007$ Sample prep wL/rol: 30.00 ml Prep Extract Vol: 30.00 ml Anabrix CASNe Result Instr Manalysis Date: $12/19/2007$ $4:58:00PM$ Mexary CASNe Result Instr Analysis Date: $12/19/2007$ $4:58:00PM$ Prep Date: $12/18/2007$ Hord: Instrument: ICP_2 $12/19/2007$ $4:58:00PM$ Prep Date: $12/18/2007$ Minis PMI Analysis Da	Report Section	:	Client	t Samp	le Re	port						
Marrix: Aqueous Collection Date: 12/17/2007 9:40:00AM The following test was conducted by: Analytica - Thornton Hah Sample Number: 10712137-02A Instrument: CVIAA_1 Lah Sample Number: 10712137-02A Instrument: CVIAA_1 Prep Date: 12/18/2007 Instrument: CVIAA_1 Prep Match Number: T071218023 Instrument: DL Sample prep wit./vol: 30.0 ml Prep Satch Number: DL Sample prep wit./vol: 30.0 ml Prep Satch Number: DL Lab Sample Number: 6071218023 ND mark Prep Satch Number: B1218/07 Analytica - Thornton Lab Sample Number: B071217-02A ND mark Prep Satch Number: DL Lab Sample Number: B1718012 ND mstrument: ICP - 2 Analytica - Thornton Lab Sample Number: B121870-02 Analytica - Thornton Lab Sample Number: B1718012 ND Instrument: ICP - 2 Analytica Hornton K40907 Acantre Nonton ICP - 2	Client Sample Name:		Ash Leac	chate 1								
The following test was conducted by: Analytica - Thornton Analysis Date: 12/18/2007 5:58:45PM Lab Sample Number: 107/1127-02A Instrument: CVAA_L Instrument: CVAA_L Analytical Method ID: SW470A - Mercury in Liquid Waste by CVAA - Total Hg File Name: B121807W.W Prep Match Number: TO7/1218023 Analysis Date: 1 Prep Match Number: To 7/1218023 Report Basis: As Received Analysis Date: DL Prep Fatract Vol: 30.00 ml Analysis CASNo Resealt Flags Ensit Prep Fatract Vol: 30.00 ml Mecury 7439-97.6 Resealt Flags Ensit Prep Fatract Vol: 30.00 ml The following test was conducted by: Analytica - Thornton Lab Sample Number: 12/18/2007 LisStooPM File Name: E12/197A Prep Date: 10/1CP Dilution Factor: 1 Prep Patract Number: 12/19/2007 4:58:00PM Prep Basis As Received Analysis Date: 12/19/2007 4:58:00PM Amalyst Initials: m mstrument: ICP_2 12/19/2007	Matrix:	Aqu	ieous					С	ollection Date:	12/17/2007	9:	40:00AM
Lab Sample Number: B0712127-02A Analysis Date: 12/18/2007 5:58:45PM Prep Date: 12/18/2007 Analysis Date: 12/18/2007 5:58:45PM Analytical Method ID: 7470.A Mereny in Liquid Waste by CVAA - Total Hg File Name: B121807W.W Prep Method ID: 7470.A Analysis Date: Dilution Factor: 1 Prep Method ID: 7470.A Mereny Analysis Date: Dilution Factor: 1 Sample prep wt./vol: 30.00 ml Prep Extract Vol: 30.00 ml #f: Mereny CASSo Result Fold MDL 30.00 ml #f: The following test was conducted by: Analytica - Thormon Lab Sample Number: B0712127-02A File Name: E12197.A Prep Date: 1071218012 File Name: E12197.A 12/14/2007 4:58:00PM Prep Batch Number: T071218012 File Name: B1/14/14 Tm #f: 12/14/207 5:0.0 ml #f: Prep Batch Number: T071218012 File Name: B1/14/14 ND mf #f:	The following test was	conducted	l by: Analytica -	Thornton								
Prep Date: 12/18/2007 Instrument: CVAA.1 Analytical Method ID: SW7470 - Mercury in Liquid Waste by CVAA - Total IS File Name: B1218070000000000000000000000000000000000	Lab Sample Number:	B07121	27-02A						Analysis Date:	12/18/20	07	5:58:45PM
Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg File Name: Bl 21807W.W Prep Method ID: 7470A Diluion Factor: 1 Prep Match Number: T071218023 Analyst Initials: DIL Report Basis: As Received Mailyst Initials: DIL Sample prep wt./vol: 30.00 ml mg/L MoN Mg/L MUL Traffic Mecruy 7439 S7-6 NO Mg/L MUL Traffic Traffic Mecruy 7349 S7-6 NO Mg/L MUL Traffic Traffic The following test was conducted by: Analytica - Thornton Lassample Number: B0712127-02A Analytical MeshoatE: I2/19/2007 4:58:00PM Prep Date: 12/18/2007 Analytical MeshoatE: File Name: I2/19/2007 4:58:00PM Analytical Method ID: S010_LCP Total Kg Mg/L No Multiantal: rm Prep Batch Number: R0712182007 Mg/L 0.055 00067 1 file Analytical Method ID: S010_LCP Total Kg Mg/L 0.055 0.006 1 <td>Prep Date:</td> <td>12/18/2</td> <td>007</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Instrument:</td> <td>CVAA_1</td> <td>ĺ</td> <td></td>	Prep Date:	12/18/2	007						Instrument:	CVAA_1	ĺ	
Prep Method Dir. 7470 A Image of Maximum 1 Image of Maximum 1 Prep Bakh Numes 0.701 218023 Analyst initials: 0.1 Prep Extract Vol: 30.0 ml Sample prep Mt/M 0.300 ml Prep Extract Vol: 30.0 ml ml <td>Analytical Method ID:</td> <td>SW7470</td> <td>A - Mercury in I</td> <td>Liquid Was</td> <td>te by CV</td> <td>AA - T</td> <td>Fotal Hg</td> <td></td> <td>File Name:</td> <td>B121807</td> <td>W.</td> <td>W</td>	Analytical Method ID:	SW7470	A - Mercury in I	Liquid Was	te by CV	AA - T	Fotal Hg		File Name:	B121807	W.	W
Prep Basis: N0 Flag Landyst Mardyst Initials: DL Sample prep wt.v/vol: 30.00 ndl Prep Extract Vol: 30.00 ml Marcury \overline{CASSo} Recut Flag Inits \mathbb{PU} \mathbb{PU} \mathbb{PU} \mathbb{PU} Anabré $\overline{D712127-02A}$ - - - - \mathbb{PU}	Prep Method ID:	7470A							Dilution Factor:	1		
Report Basis: As Received Analyst Initials: DL Sample prep wt/vol; 30.00 ml ml Prep Extract Vol; 30.00 ml Amalyst CASson Nob Rog First mu/L ROU MDU/L DU/L Prep Extract Vol; 30.00 ml Amalyst Micrury 7439-97.6 Nob Nob NOU MDU/L NOU NOU <td>Prep Batch Number:</td> <td>T07121</td> <td>8023</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Prep Batch Number:	T07121	8023									
Sample prep wL/vol: 30.00 ml Prep Extract Vol: 30.00 ml ft Amabing CASNo Roull ND Mind POI NDU OU0020.000050 Mind Mind Amabing CASNo ND ND ND OU0020.000050 NDU	Report Basis:	As Recei	ved						Analyst Initials:	DL		
Analytic Mercury CASN 7439-97-6 Result ND Engs ND Units mg/L POL 0.00020 0.000050 Term H 1 Analytic Amerury CASN 7439-97-6 Result ND Files ND Units 0.00020 0.000050 Term H 1 The following test was conducted by: Analytica - Thormton Lab Sample Number: B0712127-02A Analysis Date: 12/19/2007 4:58:00PM Prep Date: 12/18/2007 Analysis Date: 12/19/2007 4:58:00PM Prep Date: 101 SW6010B - ICP - Total File Name: E12197A Prep Bateh Number: T071218012 Resort Basis As Received Analysis Initials: rm Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml Analinomy 7440-38-0 ND mg/L 0.050 0.0014 rm fl: Antimomy 7440-38-0 ND mg/L 0.005 0.0016 1 Barium 7440-38-0 ND mg/L 0.0010 0.0016 1 1 Cadmium 7440-42-3 ND mg/L 0.0	Sample prep wt./vol:	30.00	ml						Prep Extract Vol:	30.00	ml	l
Matrix Mercury CASNO KNM Page 2005 VID MD/L 0.00020 0.00020 I The following test was conducted by: Analytica - Thornton Lab Sample Number: B0712127-02A Analysia Analysia Analysia Instrument: ICP2-3 Analytical Method ID: S01010B - ICP - Total File Name: E12197A File Name: E12197A Prep Method ID: 3010_ICP Viet Number: T071218012 Analysis Initials: rm Report Basis: As Received Analysis Initials: rm Prep Extract Vol: 50.00 ml Anaminum 7429-90-5 0.053 mg/L 0.0050 0.014 1 Anatice CASNo Result Fing Units md/L 0.0067 Arencic 7440-36-0 ND mg/L 0.0010 0.00060 1 Barium 7440-38-2 ND mg/L 0.00016 1 1 Cadmium 7440-42-8 2.6 mg/L $0.00000000000000000000000000000000000$	Analyta		CASNo	Docult	Floga	Unita	DOI	MDI	1			
The following test was conducted by: Analytica - Thornton Lab Sample Number: B0712127-02A Analysis Date: 12/19/2007 4.58:00PM Prep Date: 12/18/2007 SW6010B - ICP - Total File Name: ICP_2 Prep Method ID: 3010_ICP Dilution Factor: 1 Prep Match ID: T071218012 Tm Prep Eatch Number: T071218012 Report Basis: As Received Analyst Initials: rm Sample prep wt./vol: 50.00 ml Prep Eatch Number: Tom#: Analytic CASNo Result Flags MgL 0.050 0.014 rm Analytica 7440-36-0 ND mg/L 0.050 0.0067 1 1 Asrenic 7440-38-2 ND mg/L 0.0010 0.00016 1 1 Barium 7440-43-9 ND mg/L 0.000 0.00016 1 1 Cadmium 7440-43-9 ND mg/L 0.0010 0.00016 1 1 Cadmium 7440-43-8 Q.6 mg/L 0.0010 0.0013 1 </td <td>Mercury</td> <td></td> <td><u>CASINO</u> 7439-97-6</td> <td><u>Result</u> ND</td> <td><u>Flags</u></td> <td><u>units</u> mg/L</td> <td>0.00020</td> <td>0.00005</td> <td>50</td> <td></td> <td></td> <td><u>run #:</u> 1</td>	Mercury		<u>CASINO</u> 7439-97-6	<u>Result</u> ND	<u>Flags</u>	<u>units</u> mg/L	0.00020	0.00005	50			<u>run #:</u> 1
Analysis Date: B0712127-02 Analysis Date: 12/19/2007 4:58:00PM Prep Date: 12/18/2007 SW010B - ICP - Total File Name: E12197A Prep Method ID: 3010_ICP File Name: E12197A File Name: E12197A Prep Method ID: 3010_ICP File Name: N File Name: E12197A Prep Batch Number: T071218012 T File Name: N File Name: S0.00 ml Amalytic As Received So.00 ml T Prep Extract Vol: 50.00 ml T Intermational Context Prep Extract Vol: 50.00 ml Intermational Context Prep Natholes: File Name:	The following test was	conducted	l by: Analytica -	Thornton								
Prep Date 12/18/2007 Instrument: ICP_2 Analytical Method ID SW6010B - ICP - Total File Name: E12197A Prep Method ID: 3010_ICP File Name: E12197A Prep Batch Number: T071218012 Tm Tm Report Basis: As Received Analyst Initials: rm Aminony 50.00 ml Tm Prep Extract Vol: 50.00 ml Anaimony 7440-36-0 NO mg/L 0.050 0.0067 Ansenic 7440-36-0 NO mg/L 0.010 0.00016 Barium 7440-36-0 NO mg/L 0.010 0.00060 Imstrument: Imstrument: Barium 7440-36-0 ND mg/L 0.010 0.00016 Imstrument:	Lab Sample Number:	B07121	27-02A						Analysis Date:	12/19/20	07	4:58:00PM
Analytical Method ID: SW6010B - ICP - Total File Name: F12197A Prep Method ID: 3010_ICP Dilution Factor: 1 Prep Batch Number: TOT1218012 T Analytical Method ID: As Received T Sample prep wt./vol: 50.0 ml Prep Extract Vol: 50.00 ml Analytic CASNo Result Flag Vnits PUL Molytinitals: rm Auminum 7429-90.5 0.053 mg/L 0.050 0.014 Imm#: 1 Autimony 7440-38-0 ND mg/L 0.050 0.0067 Imm#: 1 Autimony 7440-38-0 ND mg/L 0.010 0.00016 Imm#: 1 Barium 7440-43-8 2.6 mg/L 0.000 0.00051 Imm#:	Prep Date:	12/18/2	007						Instrument:	ICP 2	0,	
Prep Method ID: 3010_{-} ICP Prep Batch Number: TO71218012 Report Basis: As Received Sample prep wt./vol: 50.00 ml Anlayst Initials: m Auminum $7429-90.5$ Autominum $7429-90.5$ Autominum $7429-90.5$ Autominum $7440-36.0$ ND mg/L 0.050 Arsenic $7440-36.0$ ND mg/L 0.0016 Barium $7440-36.0$ ND mg/L 0.001 0.00016 Barium $7440-36.0$ ND mg/L 0.001 0.00016 Barium $7440-36.0$ ND mg/L 0.001 0.00016 Barium $7440-47.7$ ND mg/L 0.001 0.00016 Boron $7440-47.3$ 0.011 mg/L 0.000 0.00051 Cadium $7440-47.3$ 0.011 mg/L 0.002 0.0016 Cobalt $7440-47.3$ 0.011 mg/L 0.005 0.0016 Cobalt $7440-47.3$	Analytical Method ID:	SW6010	B - ICP - Total						File Name:	E12197A	1	
new besit Number: Norlaise As Received Analyst Initials: m Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml Analyte CASNo Result Flag Mult Pot MDt Prep Extract Vol: 50.00 ml#: Auminum $7429-90.5$ 0.053 mg/L 0.050 0.0067 1 1 Assenic 7440-38-2 ND mg/L 0.010 0.0016 1 1 Barium 7440-38-2 ND mg/L 0.010 0.00060 0 1 1 Assenic 7440-43-8 2.6 mg/L 0.010 0.00060 0 1 1 1 Cadmium 7440-42-8 2.6 mg/L 0.010 0.0118 1	Prep Method ID:	3010 IC	CP						Dilution Factor:	1		
Construction As Received Analyst Initials: m Sample prep wt./vol: 50.00 ml Prep Extract Vol: 50.00 ml Analyte CASNo Result Flags Units MUL Prep Extract Vol: 50.00 ml Antimony 7440-36-0 ND mg/L 0.050 0.0067 1 1 Antimony 7440-38-2 ND mg/L 0.010 0.0067 1 1 Arsenic 7440-38-2 ND mg/L 0.010 0.00060 1 1 Barium 7440-41-7 ND mg/L 0.000 0.00060 1 1 Boron 7440-42-8 2.6 mg/L 0.000 0.00050 1 1 Cadmium 7440-42-8 2.6 mg/L 0.000 0.0018 1 1 Cadmium 7440-42-8 2.6 mg/L 0.000 0.0016 1 1 1 1 1 1 1 1 1 1 1 <td>Prep Batch Number:</td> <td>T07121</td> <td>8012</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Prep Batch Number:	T07121	8012									
Analyte Sample prep wt./vol:50.0nlPrep Extract Vol:50.00nlAnalyte Aluminum $7429-90.5$ 0.053 mg/L 0.050 0.014 $mnffttttttttttttttttttttttttttttttttttt$	Report Basis:	As Recei	ved						Analyst Initials:	rm		
Analyte AluminumCASNo 7429-90-5Result 0.053Flags mg/LUnit, 0.050MDL 0.014run #: 1Antimony7440-36-0NDmg/L0.0500.0067Arsenic7440-38-2NDmg/L0.100.015Barium7440-39-30.099mg/L0.0100.00016Beryllium7440-41-7NDmg/L0.0010.000060Boron7440-42-82.6mg/L0.0000.00051Cadmium7440-43-9NDmg/L0.0000.0018Cadmium7440-47-30.011mg/L0.0100.0018Chromium7440-47-30.011mg/L0.0050.0016Copper7440-58-8NDmg/L0.0050.0016Copper7439-89-6NDmg/L0.0050.0017Ithium7439-92-1NDmg/L0.0500.0017Lithium7439-93-20.13mg/L0.0100.0072Maganesium7439-95-40.77mg/L0.010.0018Nickel740-02-0NDmg/L0.0100.0018Nickel7439-95-70.15mg/L0.0100.0018Nickel7439-95-70.15mg/L0.0100.0018Nickel740-02-0NDmg/L0.0100.0018Nickel7440-02-0NDmg/L0.0100.0018Nickel7440-02-0NDmg/L0.0100.0018Nickel <t< td=""><td>Sample prep wt./vol:</td><td>50.00</td><td>ml</td><td></td><td></td><td></td><td></td><td></td><td>Prep Extract Vol:</td><td>50.00</td><td>ml</td><td>l</td></t<>	Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml	l
Aluminum 7429-90-5 0.053 mg/L 0.050 0.014 I Antimony 7440-36-0 ND mg/L 0.050 0.0067 Arsenic 7440-38-2 ND mg/L 0.10 0.015 Barium 7440-39-3 0.099 mg/L 0.010 0.00060 Beryllum 7440-41-7 ND mg/L 0.001 0.00060 Boron 7440-42-8 2.6 mg/L 0.000 0.0018 Cadmium 7440-47-3 ND mg/L 0.010 0.0018 Cadmium 7440-47-3 0.011 mg/L 0.005 0.0014 Cadmium 7440-47-3 0.011 mg/L 0.000 0.0018 Cabin 7440-48-4 ND mg/L 0.050 0.0019 Cobalt 7440-48-4 ND mg/L 0.050 0.0017 Lead 7439-89-6 ND mg/L 0.050 0.0012 Iron 7439-92-1 ND mg/L	Analyte		CASNo	Result	Flags	Units	PQL	MDL				run #:
Animony7440-36-0NDmg/L0.0500.0067Arsenic7440-38-2NDmg/L0.100.015Barium7440-39-30.099mg/L0.0100.00016Beryllium7440-41-7NDmg/L0.0000.00060Boron7440-42-82.6mg/L0.0000.00051Cadmium7440-43-9NDmg/L0.000.0018Cadrium7440-47-30.011mg/L0.0100.0018Chormium7440-47-30.011mg/L0.0050.0016Cobalt7440-84NDmg/L0.0050.0017Coper7440-50-8NDmg/L0.0050.0017Iron7439-89-6NDmg/L0.0500.0017Iron7439-89-6NDmg/L0.0500.0017Iron7439-92-1NDmg/L0.0500.0017Iraga7439-93-20.13mg/L0.0100.0066Maganese7439-96-47.7mg/L0.100.0017Maganese7439-96-70.05mg/L0.0010.0066Molybdenum7439-96-70.05mg/L0.0100.0027Potasium7440-02-0NDmg/L0.040.0027Potasium7440-9712mg/L1.00.31Silver7440-22NDmg/L0.000.0066Silver7440-22NDmg/L0.000.0026	Aluminum		7429-90-5	0.053		mg/L	0.050	0.014				1
Arsenic 7440-38-2 ND mg/L 0.10 0.015 Barium 7440-39-3 0.099 mg/L 0.010 0.00016 Beryllium 7440-41-7 ND mg/L 0.005 0.0018 Boron 7440-42-8 2.6 mg/L 0.006 0.0051 Cadmium 7440-43-9 ND mg/L 0.010 0.0018 Calcium 7440-47-3 0.011 mg/L 0.010 0.013 Chromium 7440-47-3 0.011 mg/L 0.005 0.0016 Cobalt 7440-48-4 ND mg/L 0.005 0.0016 Cobalt 7440-48-4 ND mg/L 0.050 0.0116 Cobalt 7440-50-8 ND mg/L 0.050 0.0027 Iron 7439-89-6 ND mg/L 0.010 0.0066 Magnese 7439-96-7 0.15 mg/L 0.010 0.0018 Molybdenum 7439-96-7 0.15 mg/L 0.010 0.0027 Nickel 7440-020 ND mg/L <t< td=""><td>Antimony</td><td></td><td>7440-36-0</td><td>ND</td><td></td><td>mg/L</td><td>0.050</td><td>0.0067</td><td>7</td><td></td><td></td><td></td></t<>	Antimony		7440-36-0	ND		mg/L	0.050	0.0067	7			
Barium 7440-39-3 0.099 mg/L 0.010 0.00016 Beryllium 7440-41-7 ND mg/L 0.0010 0.00060 Boron 7440-42-8 2.6 mg/L 0.000 0.0018 Cadmium 7440-43-9 ND mg/L 0.000 0.00051 Calcium 7440-70-2 570 mg/L 0.01 0.013 Chromium 7440-47-3 0.011 mg/L 0.005 0.0016 Cobalt 7440-484 ND mg/L 0.005 0.0016 Copper 7440-50-8 ND mg/L 0.050 0.012 Iron 7439-89-6 ND mg/L 0.050 0.011 Iron 7439-89-7 ND mg/L 0.050 0.0027 Lead 7439-96-1 ND mg/L 0.10 0.00072 Maganese 7439-96-5 0.095 mg/L 0.10 0.0016 Molybdenum 7439-96-7 ng/L 0.10 0.0027 0.0018 Nickel 740-02-0 ND mg/L 0.	Arsenic		7440-38-2	ND		mg/L	0.10	0.015				
Beryllium 7440-41-7 ND mg/L 0.0010 0.00060 Boron 7440-42-8 2.6 mg/L 0.050 0.0018 Cadmium 7440-43-9 ND mg/L 0.000 0.0051 Calcium 7440-70-2 570 mg/L 0.01 0.013 Chromium 7440-47-3 0.011 mg/L 0.005 0.0016 Cobalt 7440-48-4 ND mg/L 0.005 0.0019 Cobalt 7440-50-8 ND mg/L 0.050 0.0017 Iron 7439-89-6 ND mg/L 0.050 0.011 Lead 7439-92-1 ND mg/L 0.050 0.011 Lithium 7439-93-2 0.13 mg/L 0.10 0.0072 Maganesium 7439-96-4 7.7 mg/L 0.10 0.018 Nickel 7440-02-0 ND mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040	Barium		7440-39-3	0.099		mg/L	0.010	0.0001	6			
Boron 7440-42-8 2.6 mg/L 0.050 0.0018 Cadmium 7440-43-9 ND mg/L 0.0060 0.00051 Calcium 7440-70-2 570 mg/L 0.10 0.013 Chromium 7440-47-3 0.011 mg/L 0.010 0.0018 Cobalt 7440-48-4 ND mg/L 0.0050 0.0016 Copper 7440-50-8 ND mg/L 0.0050 0.0017 Iron 7439-89-6 ND mg/L 0.050 0.0017 Lead 7439-92-1 ND mg/L 0.10 0.0072 Maganesium 7439-96-5 0.095 mg/L 0.10 0.0016 Molybdenum 7439-96-7 0.15 mg/L 0.10 0.0017 Maganese 7439-96-7 0.15 mg/L 0.10 0.0016 Nickel 7440-02-0 ND mg/L 0.10 0.0018 Nickel 7440-02-0 ND mg/L 0.10	Beryllium		7440-41-7	ND		mg/L	0.0010	0.00006	50			
Cadmium 7440-43-9 ND mg/L 0.0060 0.00051 Calcium 7440-70-2 570 mg/L 0.01 0.013 Chromium 7440-47-3 0.011 mg/L 0.005 0.0018 Cobalt 7440-50-8 ND mg/L 0.005 0.0016 Copper 7440-50-8 ND mg/L 0.005 0.0019 Iron 7439-89-6 ND mg/L 0.050 0.0012 Lead 7439-92-1 ND mg/L 0.050 0.0072 Magnesium 7439-96-4 7.7 mg/L 0.10 0.0066 Molybdenum 7439-98-7 0.15 mg/L 0.01 0.0018 Nickel 7440-02-0 ND mg/L 0.01 0.0018 Molybdenum 7439-98-7 0.15 mg/L 0.010 0.0027 Potassium 7440-02-0 ND mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 784-49-2 0.14 mg/	Boron		7440-42-8	2.6		mg/L	0.050	0.0018	3			
Calcium 7440-70-2 570 mg/L 0.01 0.013 Chromium 7440-47-3 0.011 mg/L 0.010 0.0018 Cobalt 7440-48-4 ND mg/L 0.005 0.0016 Copper 7440-50-8 ND mg/L 0.005 0.0019 Iron 7439-89-6 ND mg/L 0.050 0.0027 Lead 7439-92-1 ND mg/L 0.050 0.0017 Lithium 7439-93-2 0.13 mg/L 0.10 0.00072 Magnesium 7439-96-4 7.7 mg/L 0.10 0.0018 Molybdenum 7439-96-5 0.095 mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.010 0.0027 Potassium 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-02-7 12 mg/L 1.0 0.31 Selenium 7784-49-2 0.14 mg/L	Cadmium		7440-43-9	ND		mg/L	0.0060	0.0005	1			
Chromium 7440-47-3 0.011 mg/L 0.010 0.0018 Cobalt 7440-48-4 ND mg/L 0.0050 0.0016 Copper 7440-50-8 ND mg/L 0.0050 0.0019 Iron 7439-89-6 ND mg/L 0.050 0.0027 Lead 7439-92-1 ND mg/L 0.050 0.0072 Magnesium 7439-93-2 0.13 mg/L 0.10 0.0072 Magnesium 7439-96-4 7.7 mg/L 0.10 0.012 Manganese 7439-96-5 0.095 mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-02-0 ND mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 784-49-2 0.14 mg/L 0.010 0.026 Silver 7440-02-7 12 mg/L 0.00 0.026	Calcium		7440-70-2	570		mg/L	0.10	0.013				
Cobalt 7440-88-4 ND mg/L 0.0050 0.0016 Copper 7440-50-8 ND mg/L 0.0050 0.0019 Iron 7439-89-6 ND mg/L 0.050 0.0027 Lead 7439-92-1 ND mg/L 0.050 0.011 Lithium 7439-92-1 ND mg/L 0.10 0.0072 Magnesium 7439-96-4 7.7 mg/L 0.10 0.012 Magnese 7439-96-5 0.095 mg/L 0.010 0.0018 Molybdenum 7439-98-7 0.15 mg/L 0.040 0.0027 Potassium 7440-02-0 ND mg/L 0.010 0.0018 Stenium 7440-02-7 12 mg/L 0.040 0.0027 Stenium 784-49-2 0.14 mg/L 0.10 0.012 Stilver 7440-02-7 12 mg/L 1.0 0.31 Stilver 7440-22-4 ND mg/L 0.015 0.00066	Chromium		7440-47-3	0.011		mg/L	0.010	0.0018	3			
Copper 7440-50-8 ND mg/L 0.0050 0.0019 Iron 7439-89-6 ND mg/L 0.050 0.0027 Lead 7439-92-1 ND mg/L 0.050 0.011 Lithium 7439-93-2 0.13 mg/L 0.10 0.0072 Magnesium 7439-96-4 7.7 mg/L 0.10 0.012 Magnese 7439-96-5 0.095 mg/L 0.010 0.0066 Molybdenum 7439-98-7 0.15 mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-09-7 12 mg/L 0.040 0.0027 Stelenium 7784-49-2 0.14 mg/L 0.10 0.31 Stiver 7440-22-4 ND mg/L 0.10 0.026	Cobalt		7440-48-4	ND		mg/L	0.0050	0.0016	ó			
Iron7439-89-6NDmg/L0.0500.0027Lead7439-92-1NDmg/L0.0500.011Lithium7439-93-20.13mg/L0.100.00072Magnesium7439-96-47.7mg/L0.100.012Manganese7439-96-50.095mg/L0.0100.00066Molybdenum7439-98-70.15mg/L0.0100.0018Nickel7440-02-0NDmg/L0.0400.0027Potassium7440-09-712mg/L1.00.31Selenium7784-49-20.14mg/L0.150.0066Silver7440-22-4NDmg/L0.0150.00066	Copper		7440-50-8	ND		mg/L	0.0050	0.0019)			
Lead7439-92-1NDmg/L0.0500.011Lithium7439-93-20.13mg/L0.100.00072Magnesium7439-96-47.7mg/L0.100.012Manganese7439-96-50.095mg/L0.0100.0066Molybdenum7439-98-70.15mg/L0.0100.0018Nickel7440-02-0NDmg/L0.0400.0027Potassium7440-09-712mg/L1.00.31Selenium784-49-20.14mg/L0.100.026Silver7440-22-4NDmg/L0.0150.00066	Iron		7439-89-6	ND		mg/L	0.050	0.0027	7			
Lithium7439-93-20.13mg/L0.100.00072Magnesium7439-96-47.7mg/L0.100.012Manganese7439-96-50.095mg/L0.0100.00066Molybdenum7439-98-70.15mg/L0.0100.0018Nickel7440-02-0NDmg/L0.0400.0027Potassium7440-09-712mg/L1.00.31Selenium7784-49-20.14mg/L0.100.026Silver7440-22-4NDmg/L0.0150.00066	Lead		7439-92-1	ND		mg/L	0.050	0.011				
Magnesium7439-96-47.7mg/L0.100.012Manganese7439-96-50.095mg/L0.0100.00066Molybdenum7439-98-70.15mg/L0.0100.0018Nickel7440-02-0NDmg/L0.0400.0027Potassium7440-09-712mg/L1.00.31Selenium7784-49-20.14mg/L0.100.026Silver7440-22-4NDmg/L0.0150.00066	Lithium		7439-93-2	0.13		mg/L	0.10	0.0007	2			
Manganese7439-96-50.095mg/L0.0100.00066Molybdenum7439-98-70.15mg/L0.0100.0018Nickel7440-02-0NDmg/L0.0400.0027Potassium7440-09-712mg/L1.00.31Selenium7784-49-20.14mg/L0.100.026Silver7440-22-4NDmg/L0.0150.00066	Magnesium		7439-96-4	7.7		mg/L	0.10	0.012				
Molybdenum 7439-98-7 0.15 mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-09-7 12 mg/L 1.0 0.31 Selenium 7784-49-2 0.14 mg/L 0.10 0.026 Silver 7440-22-4 ND mg/L 0.015 0.00066	Manganese		7439-96-5	0.095		mg/L	0.010	0.0006	6			
Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-09-7 12 mg/L 1.0 0.31 Selenium 7784-49-2 0.14 mg/L 0.10 0.026 Silver 7440-22-4 ND mg/L 0.015 0.00066	Molybdenum		7439-98-7	0.15		mg/L	0.010	0.0018	3			
Potassium 7440-09-7 12 mg/L 1.0 0.31 Selenium 7784-49-2 0.14 mg/L 0.10 0.026 Silver 7440-22-4 ND mg/L 0.015 0.00066	Nickel		7440-02-0	ND		mg/L	0.040	0.0027	7			
Selenium 7784-49-2 0.14 mg/L 0.10 0.026 Silver 7440-22-4 ND mg/L 0.015 0.00066	Potassium		7440-09-7	12		mg/L	1.0	0.31				
Silver 7440-22-4 ND mg/L 0.015 0.00066	Selenium		7784-49-2	0.14		mg/L	0.10	0.026				
	Silver		7440-22-4	ND		mg/L	0.015	0.0006	6			

Detailed Ana	lytical]	Report			Anal	ytica En	vironn	nental Laboratories	, Inc.	
Workorder (SDG):	B0712	127								
Project:	I	Navajo Mine	Extensior	1 Leachi	ng Stu	ıdy				
Client:	1	Applied Hyd	rology Ass	sociates,	Inc.					
Client Project Number	:: 1	none								
Report Section	:	Clien	t Samp	le Rer	ort					
Client Sample Name:		Ash Lea	chate 1	•						
Matrix:	Aqu	eous					C	Collection Date:	12/17/2007	9:40:00AM
Lab Sample Number:	B071212	27-02A						Analysis Date:	12/19/200	07 4:58:00PM
Prep Date:	12/18/20	007						Instrument:	ICP_2	
Analytical Method ID:	SW6010E	B - ICP - Total						File Name:	E12197A	
Prep Method ID:	3010_IC	P						Dilution Factor:	1	
Prep Batch Number:	T071218	3012								
Report Basis:	As Receiv	ved						Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml
<u>Analyte</u> Sodium	7	<u>CASNo</u> /440-23-5	<u>Result</u> 1,200	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1
Thallium	7	440-28-0	ND		mg/L	0.40	0.011			
Vanadium	7	440-62-2	0.12		mg/L	0.010	0.0007	2		
Zinc	7	440-66-6	ND		mg/L	0.0050	0.0010	0		
The following test was	conducted	by: Analytica -	- Thornton							
Lab Sample Number:	B071212	27-02B						Analysis Date:	12/19/200	7 2:30:16PM
Prep Date:	12/19/20	007						Instrument:	Titrametr	c
Analytical Method ID:	310.1 - A	lkalinity, Titrin	netric (pH 4	.5) - Alka	linity			File Name:		
Prep Method ID:	Alkalinit	ty_W						Dilution Factor:	1	
Prep Batch Number:	T071219	0013								
Report Basis:	As Receiv	ved						Analyst Initials:	kl	
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	100.00	ml
<u>Analyte</u> Bicarbonate		<u>CASNo</u>	<u>Result</u> 810	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 5.0	<u>MDL</u> 1.5			<u>run #:</u> 1
Carbonate			ND		mg/L	7.0	1.2			
The following test was	conducted	by: Analytica -	- Thornton							
Lab Sample Number:	B071212	27-02B						Analysis Date:	12/18/200	9:45:23AM
Prep Date:	12/18/20	007						Instrument:	Probe	
Analytical Method ID:	150.1 - pl	H, Elecrometric	c - pH					File Name:		
Prep Method ID:	150.1							Dilution Factor:	1	
Prep Batch Number:	T071218	3019								
Report Basis:	As Receiv	ved						Analyst Initials:	kl	
Sample prep wt./vol:	10.00	ml						Prep Extract Vol:	10.00	ml
Analyte pH		CASNo	<u>Result</u> 7.7	<u>Flags</u>	<u>Units</u> pH	PQL 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Ana	lytical	Report			Analyt	ica En	vironn	nental Laboratories,	, Inc.		
Workorder (SDG):	B0712	2127									
Project:		Navajo Mi	ine Extension I	Leach	ing Stud	y					
Client:		Applied H	ydrology Asso	ciates	, Inc.						
Client Project Number	:	none									
Report Section	:	Clie	ent Sample	Re	port						
Client Sample Name:		Ash L	eachate 1		-						
Matrix:	Aqu	ieous					C	Collection Date:	12/17/2007	9:4	40:00AM
Lab Sample Number: Prep Date: Analytical Method ID:	B071212 12/21/20 160.1 - T	27-02B 007 °otal Dissolv	ed Solids dried a	t 180°	C - TDS			Analysis Date: Instrument: File Name:	12/31/20 SCALE	07	10:51:30AM
Prep Method ID:	T00.1	1010						Dilution Factor:	1		
Report Basis: Sample prep wt./vol:	As Recei 100.00	ved ml						Analyst Initials: Prep Extract Vol:	kl 1.00	ml	
<u>Analyte</u> Total Dissolved Solids		<u>CASNo</u>	<u>Result</u> 5,400	<u>Flags</u>	<u>Units</u> mg/L	<u>POL</u> 10	<u>MDL</u> 8.2				<u>run #:</u> 1
The following test was	conducted	l by: Analyti	ca - Thornton								
Lab Sample Number: Prep Date:	B071212 12/18/20 Inorganic	27-02B 007 2 Anions by	Ion Chromatogra	nhv -	Anions by	IC		Analysis Date: Instrument: File Name:	12/19/20 IC 071218	07 027	9:50:23AM
Pren Method ID:	300.0	, minons of	ion emonuogiu	pirj	i intonis oʻy	10		Dilution Factor:	1	027	.D
Prop Datah Number	T071219	8016						Dilution Pactor.	1		
Report Basis:	As Recei	ved						Analyst Initials	KB		
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml	
<u>Analyte</u> Fluoride		<u>CASNo</u>	<u>Result</u> 5.0	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031				<u>run #:</u> 1
Lab Sample Number: Prep Date:	B071212 12/18/20	27-02B 007						Analysis Date: Instrument:	12/20/20 IC	07	6:27:50PM
Analytical Method ID:	Inorganic	c Anions by	Ion Chromatogra	phy	Anions by	IC		File Name:	071220_	.005	.D
Prep Method ID:	300.0							Dilution Factor:	20		
Prep Batch Number:	T071218	8016									
Report Basis:	As Recei	ved						Analyst Initials:	KB		
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml	
<u>Analyte</u> Chloride		<u>CASNo</u>	<u>Result</u> 620	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 16	<u>MDL</u> 0.84				<u>run #:</u> 4
Sulfate			2,400		mg/L	30	2.2				

Detailed Ana	lytical	Report			Ana	lytica En	vironn	nental Laboratories	, Inc.		
Workorder (SDG):	B0712	.127									
Project:		Navajo Mine	Extension	Leach	ing Stu	ıdy					
Client:		Applied Hydr	ology Ass	ociates	, Inc.						
Client Project Number	r:	none			<i>.</i>						
Report Section	:	Client	t Sampl	le Re	port						
Client Sample Name:		Ash Leac	chate 1 I	Dup							
Matrix:	Aqu	eous					С	ollection Date:	12/17/2007	9:4	40:00AM
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	B071212	27-03A						Analysis Date:	12/18/20	07	6:00:49PM
Prep Date:	12/18/20	007						Instrument:	CVAA_1	l	
Analytical Method ID:	SW74704	A - Mercury in I	Liquid Wast	te by CV	'AA - 7	Fotal Hg		File Name:	B121807	W.	W
Prep Method ID:	7470A							Dilution Factor:	1		
Prep Batch Number:	T071218	8023									
Report Basis:	As Recei	ved						Analyst Initials:	DL		
Sample prep wt./vol:	30.00	ml						Prep Extract Vol:	30.00	ml	
Analyta		CASNO	Docult	Floge	Unite	ΡΟΙ	MDI	-			run #•
Mercury	7	<u>CASINO</u> 7439-97-6	<u>Result</u> ND	<u>r tags</u>	mg/L	0.00020	0.00005	50			1
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	B071212	27-03A						Analysis Date:	12/19/20	07	5:03:00PM
Prep Date:	12/18/20	007						Instrument:	ICP_2		
Analytical Method ID:	SW60101	B - ICP - Total						File Name:	E12197A	1	
Prep Method ID:	3010_IC	CP						Dilution Factor:	1		
Prep Batch Number:	T071218	8012									
Report Basis:	As Receiv	ved						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Aluminum	-	<u>CASNo</u> 7429-90-5	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>POL</u> 0.050	<u>MDL</u> 0.014				<u>run #:</u> 1
Antimony	-	7440-36-0	ND		mg/L	0.050	0.0067	7			-
Arsenic		7440-38-2	ND		mg/L	0.10	0.015				
Barium	-	7440-39-3	0.10		mg/L	0.010	0.0001	6			
Bervllium		7440-41-7	ND		mg/L	0.0010	0.00006	50			
Boron	-	7440-42-8	2.5		mg/L	0.050	0.0018	3			
Cadmium		7440-43-9	ND		mg/L	0.0060	0.0005	1			
Calcium	-	7440-70-2	560		mg/L	0.10	0.013				
Chromium		7440-47-3	0.011		mg/L	0.010	0.0018	3			
Cobalt	-	7440-48-4	ND		mg/L	0.0050	0.0016	6			
Copper	5	7440-50-8	ND		mg/L	0.0050	0.0019)			
Iron	-	7439-89-6	ND		mg/L	0.050	0.0027	7			
Lead	7	7439-92-1	ND		mg/L	0.050	0.011				
Lithium	7	7439-93-2	0.13		- mg/L	0.10	0.0007	2			
Magnesium	7	7439-96-4	7.6		- mg/L	0.10	0.012				
Manganese	5	7439-96-5	0.095		- mg/L	0.010	0.0006	6			
Molybdenum		7439-98-7	0.14		mg/L	0.010	0.0018	3			
Nickel		7440-02-0	ND		mg/L	0.040	0.0027	7			
Potassium	,	7440-09-7	12		mg/L	1.0	0.31				
Selenium	, -	7784-49-2	0.13		mg/I	0.10	0.026				
Silver	-	7440-22-4	ND		mg/L	0.015	0.0006	6			
					₉ .L	0.015	0.0000	~			

Detailed Ana	lytical]	Report			Anal	ytica En	vironn	nental Laboratories	, Inc.	
Workorder (SDG):	B0712	127								
Project:	I	Navajo Mine I	Extensior	1 Leachi	ng Stu	ıdy				
Client:	1	Applied Hydr	ology Ass	sociates,	Inc.					
Client Project Number	r: 1	none								
Report Section	:	Client	Samp	le Rep	ort					
Client Sample Name:		Ash Leac	hate 1 I	Jup						
Matrix:	Aqu	eous					C	Collection Date:	12/17/2007	9:40:00AM
Lab Sample Number:	B071212	27-03A						Analysis Date:	12/19/200	7 5:03:00PM
Prep Date:	12/18/20	007						Instrument:	ICP_2	
Analytical Method ID:	SW6010E	B - ICP - Total						File Name:	E12197A	
Prep Method ID:	3010_IC	Р						Dilution Factor:	1	
Prep Batch Number:	T071218	3012								
Report Basis:	As Receiv	ved						Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00 1	nl
<u>Analyte</u> Sodium	7	<u>CASNo</u> 440-23-5	<u>Result</u> 1,200	<u>Flags</u>	<u>Units</u> mg/L	<u>POL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1
Thallium	7	440-28-0	ND		mg/L	0.40	0.011			
Vanadium	7	440-62-2	0.12		mg/L	0.010	0.0007	2		
Zinc	7	440-66-6	ND		mg/L	0.0050	0.0010)		
The following test was	conducted	by: Analytica -	Thornton							
Lab Sample Number:	B071212	27-03B						Analysis Date:	12/19/200	7 2:30:16PM
Prep Date:	12/19/20	07						Instrument:	Titrametrie	2
Analytical Method ID:	310.1 - A	lkalinity, Titrim	etric (pH 4	.5) - Alka	linity			File Name:		
Prep Method ID:	Alkalinit	y_W						Dilution Factor:	1	
Prep Batch Number:	T071219	0013								
Report Basis:	As Receiv	ved						Analyst Initials:	kl	
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	100.00 1	nl
<u>Analyte</u>	<u>-</u>	CASNo	Result	Flags	<u>Units</u>	<u>PQL</u>	MDL			<u>run #:</u>
Bicarbonate			820		mg/L	5.0	1.5			1
Carbonate			ND		mg/L	7.0	1.2			
The following test was	conducted	by: Analytica -	Thornton							
Lab Sample Number:	B071212	27-03B						Analysis Date:	12/18/200	7 9:45:23AM
Prep Date:	12/18/20	007						Instrument:	Probe	
Analytical Method ID:	150.1 - pł	H, Elecrometric	- pH					File Name:		
Prep Method ID:	150.1							Dilution Factor:	1	
Prep Batch Number:	T071218	3019								
Report Basis:	As Receiv	ved						Analyst Initials:	kl	
Sample prep wt./vol:	10.00	ml						Prep Extract Vol:	10.00 1	nl
<u>Analyte</u> pH		<u>CASNo</u>	<u>Result</u> 7.6	<u>Flags</u>	<u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Ana	lytical l	Report			Analy	tica En	vironr	mental Laboratories	, Inc.	
Workorder (SDG):	B0712	127								
Project:	ľ	Navajo Mir	ne Extension	Leach	ing Stud	y				
Client:	I	Applied Hy	drology Ass	ociates	, Inc.					
Client Project Number	: г	ione								
Report Section	:	Clie	nt Sampl	e Re	port					
Client Sample Name:		Ash Le	achate 1 D	up						
Matrix:	Aque	eous					C	Collection Date:	12/17/2007	9:40:00AM
Lab Sample Number: Prep Date: Analytical Method ID:	B071212 12/21/20 160.1 - To	27-03B 07 otal Dissolve	d Solids dried	at 180°	C - TDS			Analysis Date: Instrument: File Name:	12/31/20 SCALE	07 10:51:30AM
Prep Method ID: Prep Batch Number: Report Basis:	T071221 As Receiv	010 ved						Analyst Initials:	l kl	
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	1.00	ml
<u>Analyte</u> Total Dissolved Solids	<u>.</u>	<u>CASNo</u>	<u>Result</u> 5,400	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			run #: 1
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: <u>Analyte</u>	conducted B071212 12/18/20 Inorganic 300.0 T071218 As Receiv 20.00	by: Analytic: 27-03B 07 Anions by Id 2016 /ed ml CASNo	a - Thornton on Chromatogr <u>Result</u>	aphy <u>Flags</u>	Anions by <u>Units</u>	IC <u>POL</u>	MDL	Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vol:	12/19/20 IC 071218_0 1 KB 20.00	07 10:08:47AM 028.D ml <u>run #:</u>
Fluoride Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol:	B071212 12/18/20 Inorganic 300.0 T071218 As Receiv 20.00	27-03B 07 Anions by Io 016 red ml	5.0 on Chromatogr	aphy - 2	mg/L Anions by	0.40 IC	0.031	Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vol:	12/20/20 IC 071219_0 10 KB 20.00	1 07 5:57:55AM 058.D ml
<u>Analyte</u> Sulfate	<u>.</u>	<u>CASNo</u>	<u>Result</u> 2,500	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 15	<u>MDL</u> 1.1			<u>run #:</u> 2
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol:	B071212 12/18/20 Inorganic 300.0 T071218 As Receiv 20.00	27-03B 07 Anions by Io 2016 ved ml	on Chromatogi	aphy	Anions by	IC		Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vol:	12/20/20 IC 071220_0 27 KB 20.00	07 7:04:36PM 007.D ml
<u>Analyte</u> Chloride	9	<u>CASNo</u>	<u>Result</u> 610	<u>Flags</u>	<u>Units</u> mg/L	<u>РОL</u> 21	<u>MDL</u> 1.1	•		<u>run #:</u> 3

Detailed Ana	lytical	Report			Ana	lytica En	vironn	nental Laboratories	, Inc.		
Workorder (SDG):	B0712	2127									
Project:		Navajo Mine	Extension	Leach	ing Stu	ıdy					
Client:		Applied Hydr	ology Ass	ociates	, Inc.						
Client Project Number	r:	none			·						
Report Section	:	Client	Samp	le Rej	port						
Client Sample Name:		Spoil Lea	ichate 1								
Matrix:	Aqu	ieous					С	ollection Date:	12/17/2007	9:	40:00AM
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	B07121	27-04A						Analysis Date:	12/18/20	07	6:03:02PM
Prep Date:	12/18/20	007						Instrument:	CVAA_1	Ĺ	
Analytical Method ID:	SW7470	A - Mercury in I	Liquid Wast	e by CV	'AA - 1	Fotal Hg		File Name:	B121807	W.	W
Prep Method ID:	7470A							Dilution Factor:	1		
Prep Batch Number:	T07121	8023									
Report Basis:	As Recei	ved						Analyst Initials:	DL		
Sample prep wt./vol:	25.00	ml						Prep Extract Vol:	30.00	ml	l
Analvte		CASNo	Result	Flags	Units	POL	MDL				run #:
Mercury		7439-97-6	ND		mg/L	0.00024	0.00006	50			1
The following test was	conducted	l by: Analytica -	Thornton								
Lab Sample Number:	B07121	27-04A						Analysis Date:	12/19/20	07	5:08:00PM
Prep Date:	12/18/20	007						Instrument:	ICP_2		
Analytical Method ID:	SW6010	B - ICP - Total						File Name:	E12197A	1	
Prep Method ID:	3010_IC	CP						Dilution Factor:	1		
Prep Batch Number:	T07121	8012									
Report Basis:	As Recei	ved						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml	l
Analyte		<u>CASNo</u>	<u>Result</u>	<u>Flags</u>	<u>Units</u>	<u>PQL</u>	<u>MDL</u>				<u>run #:</u>
Aluminum	,	7429-90-5	0.29		mg/L	0.050	0.014				1
Antimony		7440-36-0	ND		mg/L	0.050	0.0067	7			
Arsenic	,	7440-38-2	ND		mg/L	0.10	0.015				
Barium		7440-39-3	0.25		mg/L	0.010	0.0001	6			
Beryllium		7440-41-7	ND		mg/L	0.0010	0.00006	50			
Boron		7440-42-8	0.44		mg/L	0.050	0.0018	3			
Cadmium		7440-43-9	ND		mg/L	0.0060	0.0005	1			
Calcium	,	7440-70-2	64		mg/L	0.10	0.013				
Chromium		7440-47-3	ND		mg/L	0.010	0.0018	3			
Cobalt		7440-48-4	ND		mg/L	0.0050	0.0016	6			
Copper		7440-50-8	ND		mg/L	0.0050	0.0019)			
Iron		7439-89-6	0.17		mg/L	0.050	0.0027	7			
Lead		7439-92-1	ND		mg/L	0.050	0.011				
Lithium	,	7439-93-2	0.10		mg/L	0.10	0.0007	2			
Magnesium	,	7439-96-4	13		mg/L	0.10	0.012				
Manganese		7439-96-5	0.11		mg/L	0.010	0.0006	6			
Molybdenum		7439-98-7	0.014		mg/L	0.010	0.0018	3			
Nickel		7440-02-0	ND		mg/L	0.040	0.0027	7			
Potassium		7440-09-7	14		mg/L	1.0	0.31				
Selenium		7784-49-2	ND		mg/L	0.10	0.026				
Silver		7440-22-4	ND		mg/L	0.015	0.0006	6			

Detailed Ana	lytical	Report	Analytica Environmental Laboratories, Inc.										
Workorder (SDG):	B0712	2127											
Project:		Navajo Mine	Extension	Leachi	ng Stu	ıdy							
Client:		Applied Hydr	ology Ass	ociates,	Inc.								
Client Project Number	r:	none											
Report Section	:	Client	t Samp	le Rep	ort								
Client Sample Name:		Spoil Lea	achate 1										
Matrix:	Aqu	ieous					C	ollection Date:	12/17/2007 9	:40:00AM			
Lab Sample Number:	B071212	27-04A						Analysis Date:	12/19/2007	5:08:00PM			
Prep Date:	12/18/20	007						Instrument:	ICP_2				
Analytical Method ID:	SW6010	B - ICP - Total						File Name:	E12197A				
Prep Method ID:	3010_IC	CP						Dilution Factor:	1				
Prep Batch Number:	T071218	8012											
Report Basis:	As Recei	ved						Analyst Initials:	rm				
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00 n	ป			
<u>Analyte</u> Sodium	2	<u>CASNo</u> 7440-23-5	<u>Result</u> 1,200	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1			
Thallium		7440-28-0	ND		mg/L	0.40	0.011						
Vanadium	-	7440-62-2	ND		mg/L	0.010	0.0007	2					
Zinc	-	7440-66-6	ND		mg/L	0.0050	0.0010)					
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	conducted B071212 12/19/20 310.1 - A Alkalini	by: Analytica - 27-04B 007 Ikalinity, Titrim ty_W	Thornton netric (pH 4	.5) - Alka	linity			Analysis Date: Instrument: File Name: Dilution Factor:	12/19/2007 Titrametric 1	2:30:16PM			
Prep Batch Number: Report Basis: Sample prep wt./vol:	T071219 As Recei 100.00	9013 ved ml						Analyst Initials: Prep Extract Vol:	kl 100.00 n	ıl			
<u>Analyte</u> Bicarbonate Carbonate		<u>CASNo</u>	<u>Result</u> 1,000 ND	<u>Flags</u>	<u>Units</u> mg/L mg/L	<u>PQL</u> 5.0 7.0	MDL 1.5 1.2			<u>run #:</u> 1			
The following test was	conducted	by: Analytica -	Thornton										
Lab Sample Number:	B071212	27-04B						Analysis Date:	12/18/2007	9:45:23AM			
Prep Date:	12/18/20	007						Instrument:	Probe				
Analytical Method ID:	150.1 - p	H, Elecrometric	- pH					File Name:					
Prep Method ID:	150.1							Dilution Factor:	1				
Prep Batch Number:	T071218	8019											
Report Basis:	As Recei	ved						Analyst Initials:	kl	_			
Sample prep wt./vol:	10.00	ml						Prep Extract Vol:	10.00 n	ป			
<u>Analyte</u> pH		<u>CASNo</u>	<u>Result</u> 8.0	<u>Flags</u>	<u>Units</u> pH	POL 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1			

Detailed Analytical Report					Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0712	127										
Project:	I	Navajo Min	e Extension	Leach	ing Stud	y						
Client:	1	Applied Hyd	Irology Ass	ociates	, Inc.							
Client Project Number	: 1	none										
Report Section	:	Clien	t Sampl	e Re	port							
Client Sample Name:		Spoil Le	eachate 1									
Matrix:	Aque	eous					C	Collection Date:	12/17/2007	9:40:00AM		
Lab Sample Number: Prep Date: Analytical Method ID:	B071212 12/21/20 160.1 - To	27-04B 07 otal Dissolved	Solids dried	at 180°	C - TDS			Analysis Date: Instrument: File Name:	12/31/200 SCALE	07 10:51:30AM		
Prep Method ID:	160.1	010						Dilution Factor:	1			
Report Basis: Sample prep wt./vol:	As Receiv 100.00	ved ml						Analyst Initials: Prep Extract Vol:	kl 1.00	ml		
<u>Analyte</u> Total Dissolved Solids		<u>CASNo</u>	<u>Result</u> 3,500	<u>Flags</u>	<u>Units</u> mg/L	<u>POL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1		
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol: <u>Analyte</u> Fluoride Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis:	conducted B071212 12/18/20 Inorganic 300.0 T071218 As Receiv 20.00 B071212 12/18/20 Inorganic 300.0 T071218 As Receiv 20.00	by: Analytica 27-04B 07 Anions by Ion 2016 red ml CASNo 27-04B 07 Anions by Ion 2016 red	- Thornton n Chromatogr <u>Result</u> 1.6	aphy - , Flags aphy - ,	Anions by <u>Units</u> mg/L Anions by	IC <u>POL</u> 0.40 IC	<u>MDL</u> 0.031	Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vol: Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials:	12/19/200 IC 071218_0 1 KB 20.00 12/20/200 IC 071219_0 10 KB 20.00	07 10:27:11AM 029.D ml <u>run #:</u> 1 07 6:16:18AM 059.D		
Analyte Sulfate	20.00	CASNo	<u>Result</u>	<u>Flags</u>	<u>Units</u>	<u>POL</u>	<u>MDL</u>		20.00	<u>run #:</u>		
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt./vol:	B071212 12/18/20 Inorganic 300.0 T071218 As Receiv 20.00	27-04B 07 Anions by Ion 2016 red ml	n Chromatogr	aphy	Anions by	IC		Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vol:	12/20/200 IC 071220_0 27 KB 20.00	07 7:23:00PM 008.D		
<u>Analyte</u> Chloride		<u>CASNo</u>	<u>Result</u> 610	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 21	<u>MDL</u> 1.1	-		<u>run #:</u> 3		

Detailed Ana	lytical	Report			Ana	lytica En	vironn	nental Laboratories	, Inc.		
Workorder (SDG):	B0712	2127									
Project:		Navajo Mine	Extension	Leach	ing Stu	ıdy					
Client:		Applied Hydr	ology Ass	ociates	, Inc.						
Client Project Number	r:	none									
Report Section	•	Client	Sampl	e Re	port						
Client Sample Name:		Spoil Lea	chate 1	Dup							
Matrix:	Aqu	ieous					С	ollection Date:	12/17/2007	9:4	40:00AM
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	B071212	27-05A						Analysis Date:	12/18/20	07	6:05:14PM
Prep Date:	12/18/20	007						Instrument:	CVAA_1	l	
Analytical Method ID:	SW7470.	A - Mercury in I	Liquid Wast	e by CV	'AA - 1	Total Hg		File Name:	B121807	W.	W
Prep Method ID:	7470A							Dilution Factor:	1		
Prep Batch Number:	T071218	8023									
Report Basis:	As Recei	ved						Analyst Initials:	DL		
Sample prep wt./vol:	30.00	ml						Prep Extract Vol:	30.00	ml	
Analyta		CASNo	Docult	Floor	Unita	DOI	MDI				
Mercury	2	<u>CASINO</u> 7439-97-6	<u>Result</u> ND	<u>r lags</u>	mg/L	0.00020	0.00005	50			<u>run #:</u> 1
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	B071212	27-05A						Analysis Date:	12/19/20	07	5:13:00PM
Prep Date:	12/18/20	007						Instrument:	ICP_2		
Analytical Method ID:	SW6010	B - ICP - Total						File Name:	E12197A	•	
Prep Method ID:	3010_IC	CP						Dilution Factor:	1		
Prep Batch Number:	T071218	8012									
Report Basis:	As Recei	ved						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Aluminum	~	<u>CASNo</u> 7429-90-5	<u>Result</u>	<u>Flags</u>	<u>Units</u> mg/L	POL 0.050	<u>MDL</u> 0.014				<u>run #:</u> 1
Antimony		7429-90-5	0.50 ND		mg/I	0.050	0.0067	7			1
Arsenic	-	7440-30-0	ND		mg/L	0.050	0.0007				
Barium		7440-38-2	0.20		mg/L	0.10	0.001	6			
Bervllium	-	7440-39-3	0.20 ND		mg/L	0.0010	0.0001	6 50			
Boron		7440-41-7	ND 0.45		mg/L	0.050	0.00000	2			
Cadmium		7440-42-8	0.45 ND		mg/L	0.050	0.0010	1			
Calcium		7440-43-9			mg/L	0.0000	0.0005	1			
Chromium		7440-70-2	69 ND		mg/L	0.10	0.015	2			
Cabalt		7440-47-3	ND		mg/L	0.010	0.0016	5			
Copper		7440-48-4	ND		mg/L	0.0050	0.0010)			
Iron		7440-30-8	ND		mg/L	0.0050	0.0012	7			
Lead		7439-89-0	0.18 ND		mg/L	0.050	0.0027				
Lithium		7439-92-1			mg/L	0.050	0.0011	2			
Magnasium		1439-93-2	0.10		mg/L	0.10	0.0007	2			
Magnesium	-	1439-90-4	13		mg/L	0.10	0.012	(
Malyhdar	-	1439-96-5	0.10		mg/L	0.010	0.0006	0			
Molybaenum		/439-98-7	0.014		mg/L	0.010	0.0018				
Nickel		7440-02-0	ND		mg/L	0.040	0.0027	/			
Potassium		7440-09-7	14		mg/L	1.0	0.31				
Selenium		7784-49-2	ND		mg/L	0.10	0.026				
Silver		7440-22-4	ND		mg/L	0.015	0.0006	0			

Detailed Ana	Analytica Environmental Laboratories, Inc.										
Workorder (SDG):	B0712	127									
Project:		Navajo Mi	ne Extension	Leachin	g Stuc	dy					
Client:		Applied Hy	drology Ass	ociates, I	nc.						
Client Project Number	:	none									
Report Section	:	Clie	nt Sampl	e Rep	ort						
Client Sample Name:		Spoil I	Leachate 1	Dup							
Matrix:	Aqu	eous					C	ollection Date:	12/17/2007	9:40:00AM	
Lab Sample Number: Prep Date: Analytical Method ID:	B071212 12/18/20 SW60101	27-05A)07 B - ICP - Tot	al					Analysis Date: Instrument: File Name:	12/19/200' ICP_2 E12197A	7 5:13:00PM	
Prep Method ID:	3010_IC	CP						Dilution Factor:	1		
Prep Batch Number:	T071218	8012									
Report Basis:	As Recei	ved						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00 1	nl	
<u>Analyte</u> Sodium	7	<u>CASNo</u> 7440-23-5	<u>Result</u> 1,200	<u>Flags</u> U m	i <mark>nits</mark> ig/L	<u>POL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1	
Thallium	7	7440-28-0	ND	m	ıg/L	0.40	0.011				
Vanadium	7	7440-62-2	ND	n	ıg/L	0.010	0.0007	2			
Zinc	7	7440-66-6	0.0095	n	ıg/L	0.0050	0.0010)			
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	conducted B071212 12/19/20 310.1 - A Alkalinit T071219	by: Analytic 27-05B 007 .lkalinity, Tit ty_W 9013	a - Thornton rimetric (pH 4.	5) - Alkali	nity			Analysis Date: Instrument: File Name: Dilution Factor:	12/19/200 Titrametric 1	7 2:30:16PM	
Report Basis: Sample prep wt./vol:	As Recei 100.00	ved ml						Analyst Initials: Prep Extract Vol:	kl 100.00 t	nl	
Analyte Bicarbonate Carbonate		<u>CASNo</u>	<u>Result</u> 1,000 ND	<u>Flags</u> <u>U</u> m	i <mark>nits</mark> 1g/L 1g/L	<u>PQL</u> 5.0 7.0	<u>MDL</u> 1.5 1.2	.r		<u>run #:</u> 1	
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	conducted B071212 12/18/20 150.1 - p 150.1	by: Analytic 27-05B 007 H, Elecrome	a - Thornton tric - pH					Analysis Date: Instrument: File Name: Dilution Factor:	12/18/200 Probe 1	7 9:45:23AM	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T071218 As Receiv 10.00	8019 ved ml						Analyst Initials: Prep Extract Vol:	kl 10.00 1	nl	
Analyte pH		<u>CASNo</u>	<u>Result</u> 7.9	<u>Flags</u> U	nits oH	POL 0.10	<u>MDL</u> 0.10	-F =====		run #: 1	

Detailed Ana	lytical l	Report			Analy	tica En	vironr	nental Laboratories	, Inc.		
Workorder (SDG):	B0712	127									
Project:	ľ	Navajo Mi	ne Extension	Leach	ing Stud	ly					
Client:	I	Applied Hy	ydrology Asso	ociates	, Inc.						
Client Project Number	: г	ione									
Report Section	:	Clie	nt Sampl	e Re	port						
Client Sample Name:		Spoil I	eachate 1	Dup							
Matrix:	Aque	eous					(Collection Date:	12/17/2007	9:40:00Al	Μ
Lab Sample Number: Prep Date: Analytical Method ID:	B071212 12/21/20 160.1 - To	27-05B 07 otal Dissolve	ed Solids dried	at 180°	C - TDS			Analysis Date: Instrument: File Name:	12/31/20 SCALE	07 10:51:3	80AM
Prep Method ID:	160.1							Dilution Factor:	1		
Prep Batch Number: Report Basis: Sample prep wt./vol:	T071221 As Receiv 100.00	010 ved ml						Analyst Initials: Prep Extract Vol:	kl 1.00	ml	
<u>Analyte</u> Total Dissolved Solids	9	<u>CASNo</u>	<u>Result</u> 3,600	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1	
The following test was	conducted	by: Analytic	a - Thornton								
Lab Sample Number: Prep Date:	B071212 12/18/20	27-05B 07						Analysis Date: Instrument:	12/19/20 IC	07 10:45:3	4AM
Analytical Method ID:	Inorganic Anions by Ion Chromatography - Anions by IC							File Name:	071218_030.D		
Prep Method ID:	300.0							Dilution Factor:	1		
Prep Batch Number:	T071218	016									
Report Basis:	As Receiv	ved						Analyst Initials:	KB		
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml	
<u>Analyte</u> Fluoride	<u>.</u>	<u>CASNo</u>	<u>Result</u> 1.6	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031	l		run #: 1	
Lab Sample Number: Prep Date:	B071212 12/18/20	27-05B 07						Analysis Date: Instrument:	12/20/20 IC	07 6:34:42	2AM
Analytical Method ID:	Inorganic	Anions by I	on Chromatogr	aphy - A	Anions by	/ IC		File Name:	071219_	060.D	
Prep Method ID:	300.0							Dilution Factor:	10		
Prep Batch Number:	T071218	016									
Report Basis:	As Receiv	ved						Analyst Initials:	KB		
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml	
Analyte Sulfate	<u>.</u>	<u>CASNo</u>	<u>Result</u> 990	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 15	<u>MDL</u> 1.1			<u>run #:</u> 2	
Lab Sample Number: Prep Date:	B071212 12/18/20	27-05B 07						Analysis Date: Instrument:	12/20/20 IC	07 7:41:22	2PM
Analytical Method ID:	Inorganic	Anions by I	on Chromatogr	aphy - A	Anions by	IC		File Name:	071220	009.D	
Prep Method ID:	300.0	-	U		,			Dilution Factor:	27		
Prep Batch Number:	T071218	016									
Report Basis:	As Receiv	ved						Analyst Initials:	KB		
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml	
<u>Analyte</u> Chloride	9	<u>CASNo</u>	<u>Result</u> 610	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 21	<u>MDL</u> 1.1			<u>run #:</u> 3	

Detailed Ana	lytical	Report			Ana	lytica En	vironn	nental Laboratories	, Inc.		
Workorder (SDG):	B0712	2127									
Project:		Navajo Mine	Extension	Leach	ing Stu	udy					
Client:		Applied Hydr	ology Ass	ociates	, Inc.						
Client Project Number	r:	none									
Report Section	:	Metho	od Blan	ık Re	port						
Client Sample Name:		MB									
Matrix:	Aqı	ueous					С	ollection Date:	12/18/2007	12	:00:00AM
The following test was	conducted	d by: Analytica -	Thornton								
Lab Sample Number:	T07121	8023-MB						Analysis Date:	12/18/20	07	5:28:28PM
Prep Date:	12/18/2	007						Instrument:	CVAA_1	1	
Analytical Method ID:	SW7470	A - Mercury in I	Liquid Was	te by CV	AA - T	Fotal Hg		File Name:	B121807	W.	W
Prep Method ID:	7470A							Dilution Factor:	1		
Prep Batch Number:	T07121	8023									
Report Basis:	As Recei	ived						Analyst Initials:	DL		
Sample prep wt./vol:	30.00	ml						Prep Extract Vol:	30.00	ml	l
Analyta		CASNo	Docult	Floga	Unita	DOI	MDI	I.			
Mercury		<u>CASN0</u> 7439-97-6	ND	<u>r lags</u>	mg/L	0.00020	0.00005	50			1 1
The following test was	conducted	1 by: Analytica -	Thornton								
Lab Sample Number:	T07121	8012-MB						Analysis Date:	12/19/20	07	3:57:00PM
Prep Date:	12/18/2	007						Instrument:	ICP 2	0,	
Analytical Method ID:	SW6010	B - ICP - Total						File Name:	E12197A	ł	
Prep Method ID:	3010 IC	СР						Dilution Factor:	1		
Prep Batch Number:		8012									
Report Basis:	As Recei	ived						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml	l
Analyte		CASNo	<u>Result</u>	Flags	<u>Units</u>	PQL	<u>MDL</u>				run #:
Aluminum		7429-90-5	ND	_	mg/L	0.050	0.014				1
Antimony		7440-36-0	ND		mg/L	0.050	0.0067	7			
Arsenic		7440-38-2	ND		mg/L	0.10	0.015				
Barium		7440-39-3	ND		mg/L	0.010	0.0001	6			
Beryllium		7440-41-7	ND		mg/L	0.0010	0.00006	50			
Boron		7440-42-8	ND		mg/L	0.050	0.0018	3			
Cadmium		7440-43-9	ND		mg/L	0.0060	0.0005	1			
Calcium		7440-70-2	ND		mg/L	0.10	0.013				
Chromium		7440-47-3	ND		mg/L	0.010	0.0018	3			
Cobalt		7440-48-4	ND		mg/L	0.0050	0.0016	5			
Copper		7440-50-8	ND		mg/L	0.0050	0.0019)			
Iron		7439-89-6	ND		mg/L	0.050	0.0027	7			
Lead		7439-92-1	ND		mg/L	0.050	0.011				
Lithium		7439-93-2	ND		mg/L	0.10	0.0007	2			
Magnesium		7439-96-4	ND		mg/L	0.10	0.012				
Manganese		7439-96-5	ND		mg/L	0.010	0.0006	6			
Molybdenum		7439-98-7	ND		mg/L	0.010	0.0018	3			
Nickel		7440-02-0	ND		mg/L	0.040	0.0027	7			
Potassium		7440-09-7	ND		mg/L	1.0	0.31				
Selenium		7784-49-2	ND		mg/L	0.10	0.026				
Silver		7440-22-4	ND		mg/L	0.015	0.0006	6			
Detailed Ana	Analytica Environmental Laboratories, Inc.										
--	--	--------------------------	---------------------	------------------	----------------------	-------------------	---------------------	-------------------	------------	-----	--------------------
Workorder (SDG):	B0712	127									
Project:	ľ	Navajo Mine	Extension	Leach	ing Stu	dy					
Client:	A	Applied Hydr	ology Ass	ociates	, Inc.						
Client Project Number	:: r	none									
Report Section	:	Metho	od Blan	k Re	port						
Client Sample Name:		MB			•						
Matrix:	Aque	eous					С	ollection Date:	12/18/2007	12:	00:00AM
Lab Sample Number:	T071218	012-MB						Analysis Date:	12/19/200	07	3:57:00PM
Prep Date:	12/18/20	07						Instrument:	ICP_2		
Analytical Method ID:	SW6010E	8 - ICP - Total						File Name:	E12197A		
Prep Method ID:	3010_IC	Р						Dilution Factor:	1		
Prep Batch Number:	T071218	012									
Report Basis:	As Receiv	ved						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Sodium	<u>(</u> 7.	<u>CASNo</u> 440-23-5	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028				run #: 1
Thallium	7-	440-28-0	ND		mg/L	0.40	0.011				
Vanadium	7-	440-62-2	ND		mg/L	0.010	0.0007	2			
Zinc	7-	440-66-6	ND		mg/L	0.0050	0.0010)			
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	T071219	013-MB						Analysis Date:	12/19/200	07	2:30:16PM
Prep Date:	12/19/20	07						Instrument:	Titrametr	ic	
Analytical Method ID:	310.1 - Al	lkalinity, Titrim	etric (pH 4.	5) - Alk	alinity			File Name:			
Prep Method ID:	Alkalinit	y_W						Dilution Factor:	1		
Prep Batch Number:	T071219	013									
Report Basis:	As Receiv	ved						Analyst Initials:	kl		
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	100.00	ml	
<u>Analyte</u>	<u>9</u>	<u>CASNo</u>	<u>Result</u>	<u>Flags</u>	<u>Units</u>	PQL	MDL				<u>run #:</u>
Bicarbonate			ND		mg/L	5.0	1.5				1
Carbonate			ND		mg/L	7.0	1.2				
The following test was	conducted	by: Analytica -	Thornton								
Lab Sample Number:	T071221	010-MB						Analysis Date:	12/31/200)7	10:51:30AM
Prep Date:	12/21/20	07						Instrument:	SCALE		
Analytical Method ID:	160.1 - To	otal Dissolved S	olids dried	at 180° (C - TDS			File Name:			
Prep Method ID:	160.1							Dilution Factor:	1		
Prep Batch Number:	T071221	010									
Report Basis:	As Receiv	ved						Analyst Initials:	kl		
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	1.00	ml	
<u>Analyte</u> Total Dissolved Solids	<u>9</u>	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2				run #: 1

The following test was conducted by: Analytica - Thornton

Detailed Ana	t	ronmental Laboratories, Inc.					
Workorder (SDG):	B0712127						
Project:	Navajo	Mine Extension	Leaching Stu	dy			
Client:	Applied	Hydrology Ass	ociates, Inc.				
Client Project Number	r: none						
Report Section	: M	lethod Blan	k Report				
Client Sample Name:	MB						
Matrix:	Aqueous				Collection Date:	12/18/2007	7 12:00:00AM
Lab Sample Number:	T071218016-MI	3			Analysis Date:	12/18/2	007 6:17:08PM
Prep Date:	12/18/2007				Instrument:	IC	
Analytical Method ID:	Inorganic Anions I	by Ion Chromatog	raphy - Anions by	y IC	File Name:	071218	_018.D
Prep Method ID:	300.0				Dilution Factor	: 1	
Prep Batch Number:	T071218016						
Report Basis:	As Received				Analyst Initials	: KB	
Sample prep wt./vol:	20.00 ml				Prep Extract V	Vol: 20.00	ml
Analyte	<u>CASNo</u>	Result	<u>Flags</u> <u>Units</u>	<u>PQL</u>	MDL		<u>run #:</u>
Chloride		ND	mg/L	0.80	0.042		1
Fluoride		ND	mg/L	0.40	0.031		
Sulfate		ND	mg/L	1.5	0.11		

Detailed An		Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0712127							
Project:	Navajo Mi	ne Extension	Leaching	s Study				
Client:	Applied Hy	drology Ass	ociates, In	nc.				
Client Project Num	per: none							
Tests Run at: Workorder (SDG): Project: Project Number: Prep Batch:	Analytica Environmer B0712127 Navajo Mine Extensio T071218012	ntal Laborator on Leaching S Q	ies - Thor Study UALITY	nton, Colorad Y CONTR	lo OL RE	PORT		
		S	AMPLE I	DUPLICAT	E REPOI	кт		
Analysis:	SW6010B - ICP - Tot	al				Base Samp Prep Date	ble:B0712127-01A : 12/18/2007	
Samp. Anal. Date: DUP Anal. Date:	12/19/2007 4:17:00F 12/19/2007 4:22:00F	PM PM				Units: Matrix:	mg/L Aqueous	
<u>Analyte Name</u> Aluminum	<u>SampResult</u> 0.0556	<u>DUPRes.</u> 0.211	<u>RPD</u> 116.6	<u>RPDLim</u> 20	<u>Flag</u> OUT			
Antimony	ND	ND	0.0	20				
Arsenic	ND	ND	0.0	20				
Barium	0.118	0.143	19.2	20				
Beryllium	ND	ND	0.0	20				
Boron	0.331	0.340	2.7	20				
Cadmium	ND	ND	0.0	20				
Calcium	2.89	3.28	12.6	20				
Chromium	ND	ND	0.0	20				
Cobalt	ND	0.00726	0.0	20				
Copper	ND	0.00783	0.0	20				
Iron	0.0733	0.313	124.1	20	OUT			
Lead	ND	ND	0.0	20				
Magnesium	1.24	1.42	13.5	20				
Manganese	ND	0.0116	0.0	20				
Molybdenum	0.0141	0.0180	24.3	20	OUT			
Nickel	ND	ND	0.0	20				
Potassium	11.0	11.6	5.3	20				
Selenium	ND	ND	0.0	20				
Silver	ND	ND	0.0	20				
Sodium	1,180	1,200	1.7	20				
Thallium	ND	ND	0.0	20				
Vanadium	ND	ND	0.0	20				
Zinc	ND	0.00930	0.0	20				
Lithium	ND	ND	0.0	20				
			LCS	/LCSD REP	ORT			

Detailed Analytical Report					Analytica	Environ	mental Lab	oratorie	es, Inc.		
Workorder (SDG):	B0712127										
Project:	Navajo) Mine Ex	tension	Leachin	ig Study						
Client:	Applie	d Hydrol	ogy Asso	ciates, 1	Inc.						
Client Project Numb	er: none										
Tests Run at:	Analytica Enviror	nmental L	aboratori	es - Tho	rnton, Col	orado					
Workorder (SDG):	B0712127										
Project: Project Number:	Navajo Mine Ext	ension Le	aching S QU	tudy JALIT	Y CON	TROL	REPOR	Г			
Prep Batch:	T071218012										
				LC	S/LCSD R	EPORT	,				
Analysis:	SW6010B - ICP -	- Total		LC	S/LCSD I		MB:		T07121801	2-MB	
							Prep	Date:	12/18/2007	1	
MB Anal. Date:	12/19/2007 3:57	2:00PM					Units	•	mg/L		
LCS Anal. Date:	12/19/2007 4:02	2:00PMLC	SD Anal	. Date:	12/19/200	07 4:07:	00PMMatri	x:	Aqueous		
Analyte Name	SampResult	I CSRes	SDRes	SPI ev	SPDI ev	Recov	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	<u>2.06</u>	<u>3DRes.</u> 2.08	2.00	2.00	103.0	<u>104.0</u>	1.0	89 - 117	20	<u></u>
Antimony	ND	0.487	0.492	0.500	0.500	97.4	98.4	1.0	82 - 117	20	
Arsenic	ND	1.96	1.97	2.00	2.00	98.0	98.5	0.5	86 - 116	20	
Barium	ND	1.95	1.98	2.00	2.00	97.5	99.0	1.5	86 - 116	20	
Beryllium	ND	0.0507	0.0517	0.0500	0.0500	101.4	103.4	2.0	87 - 111	20	
Boron	ND	0.648	0.616	0.500	0.500	129.6	123.2	5.1	76 - 130	20	
Cadmium	ND	0.0434	0.0442	0.0500	0.0500	86.8	88.4	1.8	79 - 113	20	
Calcium	ND	9.92	10.2	10.0	10.0	99.2	102.0	2.8	79 - 119	20	
Chromium	ND	0.200	0.200	0.200	0.200	100.0	100.0	0.0	86 - 117	20	
Cobalt	ND	0.494	0.500	0.500	0.500	98.8	100.0	1.2	82 - 118	20	
Copper	ND	0.244	0.249	0.250	0.250	97.6	99.6	2.0	86 - 117	20	
Iron	ND	1.03	1.07	1.00	1.00	103.0	107.0	3.8	83 - 121	20	
Lead	ND	0.497	0.493	0.500	0.500	99.4	98.6	0.8	83 - 121	20	
Magnesium	ND	10.1	10.2	10.0	10.0	101.0	102.0	1.0	83 - 118	20	
Manganese	ND	0.497	0.505	0.500	0.500	99.4	101.0	1.6	82 - 121	20	
Molybdenum	ND	0.491	0.501	0.500	0.500	98.2	100.2	2.0	82 - 120	20	
Nickel	ND	0.490	0.496	0.500	0.500	98.0	99.2	1.2	84 - 117	20	
Potassium	ND	9.25	8.89	10.0	10.0	92.5	88.9	4.0	74 - 110	20	
Selenium	ND	1.93	1.97	2.00	2.00	96.5	98.5	2.1	87 - 117	20	
Silver	ND	0.256	0.259	0.250	0.250	102.4	103.6	1.2	80 - 127	20	
Sodium	ND	9.79	9.97	10.0	10.0	97.9	99.7	1.8	87 - 113	20	
Thallium	ND	0.199	0.207	0.200	0.200	99.5	103.5	3.9	89 - 113	20	
Vanadium	ND	0.504	0.512	0.500	0.500	100.8	102.4	1.6	87 - 119	20	
Zinc	ND	0.476	0.495	0.500	0.500	95.2	99.0	3.9	81 - 120	20	
Lithium	ND	0.492	0.500	0.500	0.500	98.4	100.0	1.6	80 - 120	20	
				M	S/MSD RI	EPORT					

Detailed Analytical Report				А	Analytica I	Environr	nental Labo	orator	ies, Inc.		
Workorder (SDG):	B0712127				·						
Project:	Navajo	• Mine Ex	tension Le	eaching	Study						
Client:	Applie	d Hydrolo	ogy Associ	ates, In	с.						
Client Project Numb	ber: none										
Tests Run at:	Analytica Environ	imental La	aboratories	- Thorn	ton, Colo	rado					
Workorder (SDG):	B0712127 Navaio Mine Extr	ension Le	aching Stu	dv							
Project Number:	1 (a , ajo 1	U II01011	QUA	ÄLITY	CONT	ROL	REPOR	Γ			
Prep Batch:	T071218012										
				MS/	MSD RE	PORT					
Analysis:	SW6010B - ICP -	Total					Parent Prep 1	:: Date:	B071212 12/18/20	27-01A 007	
Samp. Anal. Date:	12/19/2007 4:17	:00PM					Units	:	mg/L		
MS Anal. Date:	12/19/2007 4:27	:00PMMS	D Anal. D	ate: 12	2/19/2007	4:42:0	0PMMatri	x:	Aqueous	1	
Analyte Name	<u>SampResult</u>	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	<u>RPD</u>	Recov Lim	<u>RPDLim</u> <u>Flag</u>	
Aluminum	0.0556	2.11	2.04	2.00	2.00	102.7	99.2	3.4	75 - 125	20	
Antimony	ND	0.497	0.482	0.500	0.500	99.4	96.4	3.1	75 - 125	20	
Arsenic	ND	2.04	1.98	2.00	2.00	102.0	99.0	3.0	75 - 125	20	
Barium	0.118	2.03	1.93	2.00	2.00	95.6	90.6	5.1	75 - 125	20	
Beryllium	ND	0.0510	0.0495	0.0500	0.0500	102.0	99.0	3.0	75 - 125	20	
Boron	0.331								75 - 125		
Cadmium	ND	0.0445	0.0459	0.0500	0.0500	89.0	91.8	3.1	75 - 125	20	
Calcium	2.89	12.9	12.7	10.0	10.0	100.1	98.1	1.6	75 - 125	20	
Chromium	ND	0.198	0.196	0.200	0.200	99.0	98.0	1.0	75 - 125	20	
Cobalt	ND	0.490	0.482	0.500	0.500	98.0	96.4	1.6	75 - 125	20	
Copper	ND	0.244	0.234	0.250	0.250	97.6	93.6	4.2	75 - 125	20	
Iron	0.0733	1.05	1.02	1.00	1.00	97.7	94.7	2.9	75 - 125	20	—
Lead	ND	0.499	0.484	0.500	0.500	99.8	96.8	3.1	75 - 125	20	—
Magnesium	1.24	11.4	10.9	10.0	10.0	101.6	96.6	4.5	75 - 125	20	—
Manganese	ND	0.499	0.484	0.500	0.500	99.8	96.8	3.1	75 - 125	20	—
Molybdenum	0.0141	0.508	0.496	0.500	0.500	98.8	96.4	2.4	75 - 125	20	_
Nickel	ND	0.487	0.478	0.500	0.500	97.4	95.6	1.9	75 - 125	20	—
Potassium	11.0	21.0	20.3	10.0	10.0	100.0	93.0	3.4	75 - 125	20	_
Selenium	ND	2.03	1.97	2.00	2.00	101.5	98.5	3.0	75 - 125	20	_
Silver	ND	0.251	0.245	0.250	0.250	100.4	98.0	2.4	75 - 125	20	
Sodium	1,180	1,230	1,180	10.0	10.0	500.0	0.0	4.1	75 - 125	20 NOTE 2 NOTE 2	
Thallium	ND		0.167		0.200		83.5		75 - 125	20	
Vanadium	ND	0.509	0.494	0.500	0.500	101.8	98.8	3.0	75 - 125	20	
Zinc	ND	0.492	0.484	0.500	0.500	98.4	96.8	1.6	75 - 125	20	_
Lithium	ND	0.578	0.548	0.500	0.500	115.6	109.6	5.3	75 - 125	20	—

Detailed An	alytical Report			Analytica E	nvironmental Laborato	ries, Inc.	
Workorder (SDG):	B0712127						
Project:	Navajo Mir	e Extensio	n Leachi	ng Study			
Client:	Applied Hy	drology As	sociates,	Inc.			
Client Project Numl	ber: none						
Tests Run at:	Analytica Environmen	tal Laborato	ories - Th	ornton, Colora	ado		
Workorder (SDG):	B0712127						
Project: Project Number:	Navajo Mine Extensio	n Leaching C	Study UALI	TY CONT	ROL REPORT		
Prep Batch:	T071218012						
		Р	OST DIG	ESTION SP	IKE REPORT		
Analysis	SW6010B - ICP - Tot	1			Rase Samp	le·B0712127-014	4
r mary 515.				Prep Date:	12/18/2007	•	
Samp. Anal. Date:	12/19/2007 4:17:00P	М			Units:	mg/L	
PDS Anal. Date:	12/19/2007 4:48:00P	М			Matrix:	Aqueous	
						1	
Analyte Name	SampResult	PDSRes.	SPLev	Recov.	Recov Lim	<u>Flag</u>	
Aluminum	0.0556	2.04	2.00	99.3	75 - 117		
Antimony	ND	0.485	0.500	96.5	75 - 117		
Arsenic	ND	1.99	2.00	99.3	75 - 116		
Barium	0.118	1.93	2.00	90.7	75 - 116		
Beryllium	ND	0.0492	0.0500	98.0	75 - 111		
Cadmium	ND	0.0447	0.0500	89.7	75 - 113		
Calcium	2.89	12.6	10.0	97.4	75 - 119		
Chromium	ND	0.193	0.200	96.4	75 - 117		
Cobalt	ND	0.477	0.500	95.0	75 - 118		
Copper	ND	0.234	0.250	93.4	75 - 117		
Iron	0.0733	1.02	1.00	94.6	75 - 121		
Lead	ND	0.487	0.500	97.1	75 - 121		
Magnesium	1.24	11.0	10.0	97.3	75 - 118		
Manganese	ND	0.482	0.500	95.9	75 - 121		
Molybdenum	0.0141	0.494	0.500	96.1	75 - 120		
Nickel	ND	0.473	0.500	94.4	75 - 117		
Potassium	11.0	20.6	10.0	96.2	75 - 110		
Selenium	ND	1.98	2.00	99.7	75 - 117		
Silver	ND	0.245	0.250	98.4	75 - 127		
Sodium	1,180	1,180	10.0	-54.9	75 - 113	lowPDS	Note 2
Thallium	ND	0.191	0.200	90.7	75 - 113		
Vanadium	ND	0.492	0.500	98.0	75 - 119		
Zinc	ND	0.482	0.500	98.8	75 - 120		
Lithium	ND	0.553	0.500	94.5	75 - 120		
			SERIA	L DILUTION	N REPORT		

SERIAL DILUTION REPORT

Detailed An		A	Analytica Env	vironmenta	al Laboratori	es, Inc.		
Workorder (SDG):	B0712127							
Project:	Navajo Min	e Extensio	on Leaching	Study				
Client:	Applied Hy	drology A	ssociates, In	c.				
Client Project Numl	ber: none		,					
Tests Run at:	Analytica Environmen	tal Laborat	ories - Thorr	ton, Colorad	lo			
Workorder (SDG):	B0712127			,				
Project: Project Number:	Navajo Mine Extensio	n Leaching (g Study QUALITY	CONTR	OL REI	PORT		
Prep Batch:	T071218012							
			SERIAL I	DILUTION	REPORT			
Analysis:	SW6010B - ICP - Tota	ıl				Base Sample	e:B0712127-01A	
						Prep Date:	12/18/2007	
Samp. Anal. Date:	12/19/2007 4:17:00	PM				Units:	mg/L	
SER DIL. Date:	12/19/2007 4:53:00P	М				Matrix:	Aqueous	
Analyte Name	SampResult	<u>PQL.</u>	<u>MDL.</u>	<u>SerialRes.</u>	<u>SerPQL</u>	RPD	Flag	
Aluminum	0.0556	0.050	0.014	ND	0.25			
Antimony	ND	0.050	0.0067	ND	0.25			
Arsenic	ND	0.10	0.015	ND	0.50	11.0	OUT	
Barium	0.118	0.0100	0.00016	0.133	0.050	11.9	001	
Beryllium	ND 0.221	0.0010	0.000000	ND 0.265	0.0030	0.7		
Boron	0.331	0.030	0.0018	0.365	0.23	9.7		
Cadmium	2.80	0.0000	0.00031	ND 2.22	0.030	12.9	OUT	
Chromium	2.09 ND	0.10	0.013	<u>3.32</u>	0.050	13.0	001	
Cobalt	ND	0.0050	0.0016		0.025			
Copper	ND	0.0050	0.0019		0.025			
Iron	0.0733	0.050	0.0027	ND	0.25			
Lead	ND	0.050	0.011	ND	0.25			
Magnesium	1.24	0.10	0.012	1 32	0.50	6.2		
Manganese	ND	0.0100	0.00066	ND	0.050			
Molybdenum	0.0141	0.0100	0.0018	ND	0.050			
Nickel	ND	0.040	0.0027	ND	0.20			
Potassium	11.0	1.0	0.31	12.1	5.0	9.5		
Selenium	ND	0.10	0.026	ND	0.50			
Silver	ND	0.015	0.00066	ND	0.075			
Sodium	1,180	3.0	0.028	1,310	15	10.4	OUT	
Thallium	ND	0.40	0.011	ND	2.0			
Vanadium	ND	0.0100	0.00072	ND	0.050			
Zinc	ND	0.0050	0.0010	ND	0.025			
Lithium	ND	0.10	0.00072	ND	0.50			
Prep Batch:	T071218023							
			T 00		ODT			
			LCS/	LCSD REP	UKT			

Detailed Ar	alytical Report	ica Environ	mental Laboratori	es, Inc.					
Workorder (SDG):	B0712127								
Project:	Navajo Mine Extens	ion Leaching Stud	У						
Client:	Applied Hydrology	Associates, Inc.							
Client Project Num	oer: none								
Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado									
Workorder (SDG):	B0712127								
Project: Project Number:	Navajo Mine Extension Leachin	ng Study QUALITY CC	NTROL	REPORT					
Prep Batch:	T071218023								
		LCS/LCSI) REPORT	- -					
Analysis:	SW7470A - Mercury in Liquid	Waste by CVAA - '	Total Hg	MB:	T071218023-MB				
				Prep Date:	12/18/2007				
MB Anal. Date:	12/18/2007 5:28:28PM			Units:	mg/L				
LCS Anal. Date:	12/18/2007 5:31:45PMLCSD	Anal. Date: 12/18/2	2007 5:33:	52PMMatrix:	Aqueous				
<u>Analyte Name</u> Mercury	SampResultLCSRes.SDRND0.002180.00	<u>es. SPLev</u> <u>SPDLev</u> 214 0.00200 0.00	<u>/ Recov.</u> 20 109.0	SD Recov RPD 107.0 1.9	Recov Lim RPDLim 80 - 120 20	<u>Flag</u>			
		FOOTNOT	ES TO OC	REPORT					

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report Analytica Environmental Laboratories, Inc.											
Workorder (SDG):	B0712127										
Project:	Navajo	Mine Ex	xtension	Leachi	ng Study						
Client:	Applie	d Hydrol	ogy Asso	ciates,	Inc.						
Client Project Numb	oer: none										
Tests Run at:	Analytica Enviror	nmental L	aboratori	es - The	ornton, Col	lorado					
Workorder (SDG):	B0712127										
Project:	Navajo Mine Ext	ension Le	aching S	tudy ∐ AI I]	TY CON	TROL	REPOR	г			
Project Number:	T071218016		Υ.			INCL		1			
Prep Balch:	10/1210010										
				LC	S/LCSD I	REPORT					
Analysis:	Inorganic Anions	by Ion C	hromatog	raphy -	Anions by	IC	MB:		T0712180	16-MB	
							Prep I	Date:	12/18/2007	/	
MB Anal. Date:	12/18/2007 6:17	:08PM		-			Units		mg/L		
LCS Anal. Date:	12/18/2007 6:35	:30PMLC	CSD Anal	. Date:	12/18/200	07 6:53:5	53PMMatri	x:	Aqueous		
Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Fluoride	ND	2.25	2.29	2.50	2.50	90.0	91.6	1.8	90 - 110	20	
	ND	4.68	4.68	5.00	5.00	93.6	93.6	0.0	90 - 110	20	
Sunate	ND	38.0	30.4	37.3	37.5	102.9	97.1	5.9	90 - 110	20	
Prep Batch:	T071221010										
			SA	MPLE	E DUPLIC	ATE REI	PORT				
Analysis:	160.1 - Total Diss	solved So	lids dried	at 180°	°C - TDS		Base S Prep I	Sample Date:	e:B0712127- 12/21/2007	-01B 7	
Samp. Anal. Date:	12/31/2007 10:5	1:30AM					Units	:	mg/L		
DUP Anal. Date:	12/31/2007 10:5	1:30AM					Matri	x:	Aqueous		
Analyte Name	SampRes	ult DI	JPRes.	RPD	RPDLi	m F	lag				
Total Dissolved So	olids 3,030	$\frac{1}{3,0}$	030	0.0	20	<u> </u>	<u></u>				
				LC	S/LCSD I	REPORT					
Analysis:	160.1 - Total Diss	solved So	lids dried	at 180°	°C - TDS		MB:		T0712210	10-MB	
							Prep l	Date:	12/21/2007	7	
MB Anal. Date:	12/31/2007 10:5	1:30AM		_			Units:	:	mg/L		
LCS Anal. Date:	12/31/2007 10:5	1:30AMLC	SD Anal	. Date:	12/31/200)/ 10:51:	30AMMatri	x:	Aqueous		
Analyte Name	SampResult	LCSRes.	SDRes.	SPLev 744	SPDLev 744	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
	ds ND	742	133	/44	/44	99.7	101.2	1.3	80 - 120	20	
					MS REP	ORT					
Analysis:	160.1 - Total Diss	solved So	lids dried	at 180°	°C - TDS	ONI	Parent	t:	B0712127-	-01B	
							Prep 1	Date:	12/21/2007	7	
Samp. Anal. Date:	12/31/2007 10:5	1:30AM					Units	:	mg/L		
MS Anal. Date:	12/31/2007 10:5	1:30AM					Matri	x:	Aqueous		
Analyte Name	SampDagult	MSPac		CDI	av	Decov		1	Recovlim		Flag
Total Dissolved Soli	ds 3 030	<u>3.820</u>		<u>5rl</u> 744		106.2		Ī	70 - 130	NOTE 2	<u>1 105</u>
		2,020				100.2					

Detailed An	alytical Report			Analytica	Environn	nental Labo	oratorio	es, Inc.		
Workorder (SDG):	B0712127									
Project:	Navajo Mine	Extension	Leachin	g Study						
Client:	Applied Hyd	rology Asso	ociates, I	nc.						
Client Project Numl	oer: none									
Tests Run at:	Analytica Environmenta	l Laboratori	es - Tho	rnton, Colo	orado					
Workorder (SDG):	B0712127									
Project: Project Number:	Navajo Mine Extension	Leaching S	JALIT	Y CON	TROL	REPORT	Γ			
Prop Ratch	T071221010	Č.								
riep Batell.	10/1221010									
				MS REPO	ORT					
Prep Batch:	T071218019									
		SA	AMPLE	DUPLICA	ATE REI	PORT				
Analysis:	150.1 - pH, Elecrometrie	c - pH				Base S	ample	:B0712127-	-01B	
						Prep I	Date:	12/18/2007	7	
Samp. Anal. Date:	12/18/2007 9:45:23AN	1				Units:		pН		
DUP Anal. Date:	12/18/2007 9:45:23AN	1				Matrix	c :	Aqueous		
<u>Analyte Name</u> pH	SampResult 9.01	<u>DUPRes.</u> 8.95	<u>RPD</u> 0.7	<u>RPDLin</u> 20	<u>n F</u>	lag				
Prep Batch:	T071219013									
Prep Batch:	T071219013									
Prep Batch:	T071219013	SA		DUPLICA	ATE REF	PORT		D0710107	015	
Prep Batch: Analysis:	T071219013 310.1 - Alkalinity, Titrir	SA metric (pH 4	AMPLE (.5) - Alk	DUPLIC alinity	ATE REI	PORT Base S Prep I	ample Date:	::B0712127- 12/19/2007	-01B	
Prep Batch: Analysis:	T071219013 310.1 - Alkalinity, Titrir	SA metric (pH 4	AMPLE	DUPLIC A calinity	ATE REI	PORT Base S Prep I Units:	ample Date:	:: B0712127- 12/19/2007	-01B 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date:	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM	SA netric (pH 4 1	AMPLE .5) - Alk	DUPLIC A alinity	ATE REI	PORT Base S Prep I Units: Matriz	ample Date:	:: B0712127- 12/19/2007 mg/L Aqueous	-01B 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: Analyta Name	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM	SA metric (pH 4 1 1	AMPLE .5) - Alk	DUPLIC calinity	ATE REI	PORT Base S Prep I Units: Matriv	ample Date: c:	:: B0712127- 12/19/2007 mg/L Aqueous	-01B 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> Bicarbonate	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM SampResult 1 270	SA netric (pH 4 1 1 <u>DUPRes.</u> 1,230	AMPLE (4.5) - Alk (8.5) - Alk	DUPLICA alinity <u>RPDLin</u> 20	ATE REI	PORT Base S Prep I Units: Matriv	ample Date: K:	:: B0712127- 12/19/2007 mg/L Aqueous	-01B 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> Bicarbonate Carbonate	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM SampResult 1,270 264	SA metric (pH 4 1 1 <u>DUPRes.</u> 1,230 284	AMPLE (1.5) - Alk (1.5) - Alk	DUPLICA alinity <u>RPDLin</u> 20 20	ATE REI	PORT Base S Prep I Units: Matriv	ample Date: c:	:: B0712127- 12/19/2007 mg/L Aqueous	-01B 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> Bicarbonate Carbonate	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM SampResult 1,270 264 264	SA netric (pH 4 1 <u>DUPRes.</u> 1,230 284	AMPLE 4.5) - Alk <u>RPD</u> 3.2 7.3	DUPLICA alinity <u>RPDLin</u> 20 20	ATE REI	PORT Base S Prep I Units: Matriv	cample Date:	:: B0712127- 12/19/2007 mg/L Aqueous	-01B 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> <u>Bicarbonate</u> Carbonate	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM <u>SampResult</u> 1,270 264	SA metric (pH 4 1 1 <u>DUPRes.</u> 1,230 284	AMPLE 5) - Alk <u>RPD</u> <u>3.2</u> 7.3 LCS	DUPLICA alinity <u>RPDLin</u> 20 20 S/LCSD R	ATE REI	PORT Base S Prep I Units: Matriv	ample Date: c:	:: B0712127- 12/19/2007 mg/L Aqueous	-01B 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> Bicarbonate Carbonate Analysis:	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM SampResult 1,270 264 310.1 - Alkalinity, Titrir	SA netric (pH 4 1 <u>DUPRes.</u> 1,230 284 netric (pH 4	AMPLE 4.5) - Alk <u>RPD</u> 3.2 7.3 LCS 4.5) - Alk	DUPLIC alinity <u>RPDLin</u> 20 20 S/LCSD R calinity	ATE REI	PORT Base S Prep I Units: Matriv lag MB: Prep I	Cample Date:	:: B0712127- 12/19/2007 mg/L Aqueous T07121901 12/19/2007	-01B 7 13-MB	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> <u>Bicarbonate</u> Carbonate Analysis: MB Anal. Date:	T071219013 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM SampResult 1,270 264 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM	SA metric (pH 4 1 1 <u>DUPRes.</u> 1,230 284 metric (pH 4	AMPLE (.5) - Alk (.5) - Alk (.5) - Alk (.5) - Alk	DUPLICA talinity <u>RPDLin</u> 20 20 S/LCSD R talinity	ATE REI	PORT Base S Prep I Units: Matriv lag MB: Prep I Units:	Cample Date:	2: B0712127- 12/19/2007 mg/L Aqueous T07121901 12/19/2007 mg/L	-01B 7 13-MB	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> Bicarbonate Carbonate Analysis: MB Anal. Date: LCS Anal. Date:	SampResult 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM 310.1 - Alkalinity, Titrir 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM	SA metric (pH 4 1 1 <u>DUPRes.</u> 1,230 284 metric (pH 4 1 LCSD Anal	AMPLE (.5) - Alk (.5) - Alk (.5) - Alk (.5) - Alk (.5) - Alk (.5) - Alk	DUPLICA alinity <u>RPDLin</u> 20 20 S/LCSD R falinity 12/19/200	ATE REI <u>F</u> EPORT 7 2:30:1	PORT Base S Prep I Units: Matriv lag MB: Prep I Units: 6PMMatriv	Cample Date:	E: B0712127- 12/19/2007 mg/L Aqueous T07121901 12/19/2007 mg/L Aqueous	-01B 7 13-MB 7	
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: <u>Analyte Name</u> Bicarbonate Carbonate Carbonate MB Anal. Date: LCS Anal. Date: <u>Analyte Name</u>	T071219013 310.1 - Alkalinity, Titrin 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM SampResult 1,270 264 310.1 - Alkalinity, Titrin 12/19/2007 2:30:16PM 310.1 - Alkalinity, Titrin 12/19/2007 2:30:16PM 2:30:16PM 310.1 - Alkalinity, Titrin 12/19/2007 2:30:16PM 2:30:16PM 12/19/2007 2:30:16PM SampResult LCSR	SA metric (pH 4 1 1 <u>DUPRes.</u> 1,230 284 metric (pH 4 1 1 LCSD Anal kes. SDRes.	AMPLE .5) - Alk <u>RPD</u> 3.2 7.3 LCS .5) - Alk . Date: <u>SPLev</u>	DUPLICA alinity <u>RPDLin</u> 20 20 S/LCSD R alinity 12/19/200' <u>SPDLev</u>	ATE REI <u>1</u> <u>F</u> EPORT 7 2:30:1 <u>Recov.</u>	PORT Base S Prep I Units: Matriv lag MB: Prep I Units: 6PMMatriv SD Recov	Cample Date: c: Date: c: <u>RPD</u>	2: B0712127- 12/19/2007 mg/L Aqueous T07121901 12/19/2007 mg/L Aqueous Recov Lim	-01B 7 13-MB 7 <u>RPDLim</u>	Flag
Prep Batch: Analysis: Samp. Anal. Date: DUP Anal. Date: DUP Anal. Date: <u>Analyte Name</u> Bicarbonate Carbonate Analysis: MB Anal. Date: LCS Anal. Date: Analyte Name Bicarbonate	T071219013 310.1 - Alkalinity, Titrin 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM SampResult 1.270 264 310.1 - Alkalinity, Titrin 12/19/2007 2:30:16PM 12/19/2007 2:30:16PM	SA metric (pH 4 1 1 <u>DUPRes.</u> 1,230 284 metric (pH 4 1 L CSD Anal LCSD Anal LCSD Anal 25.0	AMPLE (.5) - Alk (.5) - Alk	DUPLICA alinity <u>RPDLin</u> 20 20 S/LCSD R alinity 12/19/2007 <u>SPDLev</u> 25.0	ATE REI <u> <u> </u> </u>	PORT Base S Prep I Units: Matriv lag MB: Prep I Units: 6PMMatriv SD Recov 100.0	Date: Cate:	2: B0712127- 12/19/2007 mg/L Aqueous T07121901 12/19/2007 mg/L Aqueous <u>Recov Lim</u> 80 - 120	-01B 7 13-MB 7 <u>RPDLim</u> 20	Flag

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0712127 Navajo Mine Extension Leaching Study **Project: Client:** Applied Hydrology Associates, Inc. none

Client Project Number:

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analyti	cal Report	Analytica Env	ironmental Laborat	ories, Inc.	
Workorder (SDG): B	0712127				
Project:	Navajo Mine Exte	nsion Leaching Study			
Client:	Applied Hydrology	y Associates, Inc.			
Client Project Number:	none				
	OC H	BATCH ASSOCIATIONS - BY	METHOD BLANK	ζ.	
	C				
Lab Project ID:	82,236	Lab Project Number:	B0712127		
				Prep Date:	12/18/2007
Lab Method Blank Id:	T071218012-MB				
Prep Batch ID:	T071218012				
Method:	SW6010B - ICP - T	otal			
This Method blank and	sample preparation batch a	re associated with the following	samples, spikes, and	duplicates:	
SampleNum	ClientSampleName	DataFile		<u>AnalysisDate</u>	
B0712127-01A	MB Leachate 1	E12197	7A	12/19/2007	4:17:00PM
B0712127-02A	Ash Leachate 1	E12197	7A	12/19/2007	4:58:00PM
B0712127-03A	Ash Leachate 1 Dup	E12197	7A	12/19/2007	5:03:00PM
B0712127-04A	Spoil Leachate 1	E12197	7A	12/19/2007	5:08:00PM
B0712127-05A	Spoil Leachate 1 Dup	E12197	7A	12/19/2007	5:13:00PM
T071218012-LCS	LCS	E12197	7A	12/19/2007	4:02:00PM
T071218012-LCSD	LCSD	E12197	7A	12/19/2007	4:07:00PM
B0712127-01A-DUP	DUP	E12197	7A	12/19/2007	4:22:00PM
B0712127-01A-MS	MS	E12197	7A	12/19/2007	4:27:00PM
B0712127-01A-MSD	MSD	E12197	7A	12/19/2007	4:42:00PM
B0712127-01A-PDS	PDS	E12197	7A	12/19/2007	4:48:00PM
T071218012-LCSD	LCSD	E12207	7A	12/20/2007	12:58:00PM

Detailed Analyti	cal Report	Analytica Environmental Laboratories, Inc.						
Workorder (SDG): B	0712127							
Project:	Navajo Mine Exte	ension Leaching Study						
Client:	Applied Hydrolog	y Associates, Inc.						
Client Project Number:	none							
	QC	BATCH ASSOCIATIONS -	BY METHOD BLAN	K				
Lab Project ID:	82,236	Lab Project Number:	B0712127					
				Prep Date:	12/18/2007			
Lab Method Blank Id: Prep Batch ID:	T071218016-MB							
Mathadi	IU/1218016 Inorganic Anions by	y Ion Chromatography - At	ions by IC					
This Method blank and	sample preparation batch a	re associated with the followi	ng samples spikes and	duplicates:				
SampleNum	ClientSampleName	Datal	File	AnalysisDate				
T071218016-LCS		071	218 019 DXD	12/18/2007	6:35:30PM			
T071218016-LCS	LCSD	071	218_019.DXD	12/18/2007	6:53:53PM			
B0712136-01C	Batch OC	071	218_022 DXD	12/18/2007	7:30:41PM			
B0712136-01C-DUP	DUP	071	218_023 DXD	12/18/2007	7:49:04PM			
B0712136-01C-MS	MS	071	218_024 DXD	12/18/2007	8:07:29PM			
B0712127-01B	MB Leachate 1	071	218_026.DXD	12/18/2007	8:44:03PM			
B0712127-02B	Ash Leachate 1	071	218_027.DXD	12/19/2007	9:50:23AM			
B0712127-03B	Ash Leachate 1 Dup	071	218 028.DXD	12/19/2007	10:08:47AM			
B0712127-04B	Spoil Leachate 1	071	218 029.DXD	12/19/2007	10:27:11AM			
B0712127-05B	Spoil Leachate 1 Dup	071	218 030.DXD	12/19/2007	10:45:34AM			
T071218016-LCS	LCS	071		12/20/2007	3:12:25AM			
T071218016-LCSD	LCSD	071		12/20/2007	3:30:48AM			
B0712136-01C	Batch QC	0712	219_052.DXD	12/20/2007	4:07:34AM			
B0712136-01C-DUP	DUP	0712	219_053.DXD	12/20/2007	4:25:58AM			
B0712136-01C-MS	MS	0712	219_054.DXD	12/20/2007	4:44:21AM			
B0712127-03B	Ash Leachate 1 Dup	0712	219_058.DXD	12/20/2007	5:57:55AM			
B0712127-04B	Spoil Leachate 1	071	219_059.DXD	12/20/2007	6:16:18AM			
B0712127-05B	Spoil Leachate 1 Dup	071	219_060.DXD	12/20/2007	6:34:42AM			
B0712127-01B	MB Leachate 1	071	220_003.DXD	12/20/2007	5:51:04PM			
B0712127-02B	Ash Leachate 1	071	220_005.DXD	12/20/2007	6:27:50PM			
B0712127-03B	Ash Leachate 1 Dup	071	220_007.DXD	12/20/2007	7:04:36PM			
B0712127-04B	Spoil Leachate 1	071	220_008.DXD	12/20/2007	7:23:00PM			
B0712127-05B	Spoil Leachate 1 Dup	071	220_009.DXD	12/20/2007	7:41:22PM			

Detailed Analyti	ical Report	Analytica Enviro	onmental Laborato	ories, Inc.	
Workorder (SDG): B	0712127				
Project:	Navajo Mine Exte	nsion Leaching Study			
Client:	Applied Hydrolog	y Associates, Inc.			
Client Project Number:	none				
	QCI	BATCH ASSOCIATIONS - BY N	/IETHOD BLANK		
Lab Project ID:	82,236	Lab Project Number:	B0712127		
				Prep Date:	12/18/2007
Lab Method Blank Id:	T071218023-MB				
Prep Batch ID:	T071218023	win Liquid Wests by CVAA	Total Ug		
Method:	5 w /4/0A - Mercur	y III Liquid waste by CVAA -		1 1 4	
This Method blank and	sample preparation batch a	re associated with the following sat	mples, spikes, and d	iuplicates:	
SampleiNum	ClientSampleName	Datarne	A N W G		10.50.57DM
J0712041-01B-MS	MS	B121807	2.WKS	12/19/2007	12:58:57PM
B0712127-01A	MB Leachate I	B121807	W.WKS	12/18/2007	5:51:20PM
B0712127-02A	Ash Leachate I	B121807	W.WKS	12/18/2007	5:58:45PM
B0712127-03A	Ash Leachate I Dup	B121807	W.WKS	12/18/2007	6:00:49PM
B0712127-04A	Spoil Leachate 1	B121807	W.WKS	12/18/2007	6:03:02PM
B0712127-05A	Spoil Leachate I Dup	B121807	W.WKS	12/18/2007	6:05:14PM
J0712041-01B	Batch QC	B121807	W.WKS	12/18/2007	6:13:47PM
T071218023-LCS	LCS	B121807	W.WKS	12/18/2007	5:31:45PM
T071218023-LCSD	LCSD	B121807	W.WKS	12/18/2007	5:33:52PM
J0712041-01B-DUP	DUP	B121807	W.WKS	12/18/2007	6:15:51PM
J0712041-01B-MSD	MSD	B121807	W.WKS	12/18/2007	6:25:46PM
J0712041-01B-PDS	PDS	B121807	W.WKS	12/18/2007	6:27:55PM
				Prep Date:	12/19/2007
Lab Method Blank Id:	T071219013-MB				
Prep Batch ID:	T071219013	Fitzimatria (nU 45) Allealinite			
Method:	510.1 - Aikainiity, I	i unineuric (pH 4.5) - Alkannity			
This Method blank and	sample preparation batch a	re associated with the following sat	mples, spikes, and d	iuplicates:	
SampleiNum	<u>ClientSampleName</u>	Datarne			2.20.1 (DM
B0/1212/-01B	MB Leachate 1			12/19/2007	2:30:16PM
B0712127-02B	Ash Leachate 1			12/19/2007	2:30:16PM
B0/1212/-03B	Asn Leachate I Dup			12/19/2007	2:30:10PM
B0/1212/-04B	Spoil Leachate 1			12/19/2007	2:30:16PM
B0712127-05B	Spoil Leachate I Dup			12/19/2007	2:30:16PM
T0/1219013-LCS	LCS			12/19/2007	2:30:16PM
T071219013-LCSD	LCSD			12/19/2007	2:30:16PM
B0712127-01B-DUP	DUP			12/19/2007	2:30:16PM

Detailed Analyt	ical Report	Analytica E	nvironmental Labora	tories, Inc.						
workorder (SDG): E	30/12127 Navaio Mine Fy	ztension Leaching Study								
Client:	Applied Hydrol	(vdrology Associates Inc								
Client Project Number	none	ogy Associates, me.								
chent i roject Number.	none			-						
	Q	C BATCH ASSOCIATIONS - 1	BY METHOD BLAN	8						
Lab Project ID:	82,236	Lab Project Number:	B0712127							
				Prep Date: 12/21/2007						
Lab Method Blank Id:	T071221010-MB									
Prep Batch ID:	T071221010									
Method:	160.1 - Total Diss	solved Solids dried at 180°C -	TDS							
This Method blank and	sample preparation batch	h are associated with the followir	ng samples, spikes, and	duplicates:						
SampleNum	ClientSampleName	DataF	ile	AnalysisDate						
B0712127-01B	MB Leachate 1			12/31/2007 10:51:30AM						
B0712127-02B	Ash Leachate 1			12/31/2007 10:51:30AM						
B0712127-03B	Ash Leachate 1 Dup			12/31/2007 10:51:30AM						
B0712127-04B	Spoil Leachate 1			12/31/2007 10:51:30AM						
B0712127-05B	Spoil Leachate 1 Du	р		12/31/2007 10:51:30AM						
T071221010-LCS	LCS	-		12/31/2007 10:51:30AM						
T071221010-LCSD	LCSD			12/31/2007 10:51:30AM						
B0712127-01B-DUP	DUP			12/31/2007 10:51:30AM						
B0712127-01B-MS	MS			12/31/2007 10:51:30AM						

Detailed Analytical Report

Workorder (SDG): B0712127

Project: Navajo Mine Extension Leaching Study

Client: Applied Hydrology Associates, Inc.

none

Client Project Number:

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.

Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

ND = Not Detected at or above the Reporting Limit

NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit

HIGH = Recovery, RPD, or other parameter is above Upper Control Limit

E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank

J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)

W = Post digestion spike did not meet criteria

S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)

PQL = "practical quantitation limit", from SW-846

EQL = "estimated quantitation limit", from SW-846

LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.

The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG):	B0712127
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Numbers	none

REPORTING CONVENTIONS FOR THIS REPORT B0712127										
<u>TestPkgName</u>	Basis	<u># Sig Figs</u>	<u>Reporting Limit</u>							
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL							
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL							
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL							
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL							
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL							
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL							

	Relinquished by: Date		Relinquished by: Date	R. Seeman 12/17/07 14	Relinquished by: Date		Spoil lecture 1 Dup	Spoil reachase 1	Ash Leachate 1. Dup	Ash Leachate 1	MB Leachate 1	Client Sample Identification / Location	Kit Prep/Shipping Charge: \$	Duplicate 18 neur tumble st	Tumbled in house by A	E-mail:	Fax No:	Phone No:	Report to:		Applied Hydrology Associates, 7	Client Name & Address:	ANALYTICA GROUP®	
	Time Received		Time Received		Time Received		4	-			12/17/	Date Sample		tep 1	S	Requeste				-	LNC. Project N Navaju	Public W	12189 Pennsylva Thornton, CO 8 (303) 469-88 (303) 469-525	
	i by:		l by:	Jul-	भूष		4			-	07 0940	Time Sampled				d Due Date for Resu		Standard	Turnaround		vame: o Mine Ext	/ater System (PW:	ania St. 4307 An 30241 Anchora 968 (907 4 fax (907) 7	Analytica
	Date		Date	12/1/ST	Date		4				other	Matrix (S-DW-WW-Ot	ther)			ults:		Expedi	Time for		fension	S) ID#:	ctic Boulevard ge, AK 99503) 258-2155 258-6634 fax	Chain
	Time		Time	12.10	Time		+ +				x (6010 B / 3010	5 A -	·πι			(please specify c'ue add'il charge: m	led (< 10 days, prior au	Results (T/		Leaching		475 Hall S Fairbanks, AK : (907) 456 - 3 (907) 456-312	of Custo
Shipp	Thern	Initiale	Custo	Condi			4			-	×	7470A/747 Lol# Pres:	6 A -	-H <u>s</u>			date below; ay apply)	uthorization required	AT)	L	study		t. 54 99701 Ju 116 (5 Fax (90	dy Forr
ed Via:	/Loc: no ID#:	∍d By:	dy Seal?:	tion of			4				×	150.1 PH Lot#: Prosi			P.O. o				Invoi	Accou	Quote		38 Shaune Driv neau, AK 9980 907) 780-6668)7) 780-6670 fa	з
en altalet statut alta biate occ co	arran ar ann an ann ann an an an an			THO	Section 1		f				×	Ko. (TDS Lot# Pres:			r Contract No Requested				ce to Name	nt#: o 3.o	; D	Sec.	× → œ	
				ANC	o Be Com		4				×	300.0 Anio Lot#: Pres:	¹¹ 5 /	/IC	o: Analysis/Met				& Address:	185		tion To be	Chain	
	111 III 111 111 111 111		an o cada	16-	pleted by Ar						×	310.1 AIK Lot#; Pres:			thod					Cash	-og	Completed	of Custody	
	Anna a succession and a succession			NU	nalytica							Lot#. Pres:								Credit C	el en	by Analytica	_{No:} 628	Page
	anna an			FBH		 ┼╌┼					ļ	Field Field	tered			Ē				ard	7		354	of
	and a second	****		ŝ								MS/MS	D?											



Cooler Receipt Form

Client: Applied Hydrolo Project: Navajo Mine Ex	gy Associates Cli tension Leaching S	ent Code: 030188 Study		Order #: B0712127
Cooler ID; 1				
A. Preliminary Examination	Phase:	Date cooler opened: Cooler opened by:	12/17/2007 gp	Signature: <u>6</u> P
1. Was airbill Attached?	N/A	Airbill #:		Carrier Name: Other
2. Custody Seals?	N/A	How many? 0	Location:	Seal Name:
3. Seals intact?	N/A			
4. COC Attached?	Yes	Properly Completed?	Yes	Signed by AEL employee? Yes
5. Project Identification fro	om custody paper:	Navajo Mine Ex	tension Leachin	ng Study
6. Preservative:	None	Tempera	ature: 20.0 de	g. C
Designated person initial he	ere to acknowledge	receipt:	ćP	Date: 12/17/07

COMMENTS:

В.	Log-In Phase:	Samples Log-in	Date: 12/17/2007	Log-in By: gp		
1	Packing Type:		Other			
2	. Were samples in sep	parate bags?	N/A			
3	. Were containers inta	act?	Yes	Labels agree with COC?	Yes	
4	Number of bottles re	ceived:	10	Number of samples received:	5	
5	Correct containers u	ised?	Yes	Correct preservatives added?	Yes	
6	Sufficient sample vol	ume?	Yes			
7	Bubbles in VOA sam	iples?	N/A			
8	Was Project manage	r called and stat	us discussed?	No		
9.	Was anyone called?	No	Who was called?	By whom?		Date:
CC	MMENTS:					

Remit to:	Accounting Dpt	Invoice #:	81993
	Analytica Environmental Laboratories, Inc.	Work Order#:	B0801027
	P.O. Box 973426	Account#:	030188
	Dallas,TX 75397-3426	Quote ID#:	11340
		Invoice Date:	1/21/2008
		Work ID:	Navajo Mine Extension
Phone:	(303) 469-8868	PO #:	Leaching Study
Attention:	Mr.Art O'Hayre	Received:	1/7/2008
Invoice to:	Applied Hydrology Associates, Inc.	Reported:	1/21/2008
	950 South Cherry Street Suite 810 Denver, CO 80246	Client Project#:	Navajo Mine Extension Leach

Comments:

Item charges		<u>Oty</u>	Price	Total	
SW7470A - Mercury in Liquid Waste by CVAA - Total Hg In Aqueous	М	2	35.00	70.00	
160.1 - Total Dissolved Solids dried at 180°C - TDS In Liquid	Matrix	2	22.00	44.00	
150.1 - pH, Elecrometric - pH In Liquid Matrix		2	10.00	20.00	
SW6010B - ICP - Total In Aqueous Matrix		2	312.00	624.00	
Inorganic Anions by Ion Chromatography - Anions by IC In Liquid	Matrix	2	54.00	108.00	
310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity In Liquid	Matrix	2	36.00	72.00	
	Total of Ite	al of Items Above: \$938.0			
Adjustments or Special Services		<u>Qty</u>	Price	<u>Total</u>	
One Gallon of DI water		4	24.00	96.00	
Tumbling Charge		1	95.00	95.00	
	Total of Ite	ms Abovo	e:	\$191.00	
	Grand Tota	ıl:		\$1,129.00	

All invoices are due and payable upon receipt. Outstanding balances over 30 days are subject to a finance charge of 1.5% per month, plus a late fee of \$25.00. If Analytica engages legal counsel to enforce its rights or any other rights under an application for payment, the customer will be liable to Analytica for all costs of collection and other legal expenses, including reasonable attorney fees.

REMITTANCE ADVICE PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Mr.Art O'Hayre		Account#:	030188
Applied Hydrology Associates, Inc.		Invoice #:	81993
950 South Cherry Street		Invoice Date:	1/21/2008
Suite 810 Denver, CO 80246			
TOTAL INVOICE AMOUNT:	\$1,129.00		

PAYMENT AMOUNT ENCLOSED:



1/21/2008 Applied Hydrology Associates, Inc. 950 South Cherry Street Suite 810 Denver, CO 80246 Attn: Art O'Hayre Analytica Environmental Laboratories, Inc. 12189 Pennsylvania Street Thornton, CO 80241 Phone: 303-469-8868 Fax: 303-469-5254

Work Order #: B0801027 Date: 1/21/2008 Work ID: Navajo Mine Extension Leaching Study Date Received: 1/7/2008 Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801027-01	MB	B0801027-02	4 Corners PP Bottom Ash Leac

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

_

Kristen Stone Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0801027

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT:

Two (2) samples were received on 1/7/2008 1:55:00 PM., at a temperature of 3.1 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody. The samples were tumbled upon arrival to the laboratory.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality control parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous Test Method: 150.1 - pH, Elecrometric - pH - Aqueous Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous

Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous

MS/MSD and DUP OUTLIERS:

As shown below, the MS was outside of limits for Bicarbonate and Carbonate. Bicarbonate had a sample concentration that was greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate. The MS recovery of Carbonate was slightly low. No corrective action was taken, as the recoveries of this compounds in the LCS/LCSD were acceptable.

Туре	. (Client Sa	amp ⁻	le l	LabSample	A	nalyte	Recovery	LCL	UCL	Parent	Spike
MS	4	Corners	PP	Bot	B0801027-02B		Bicarbonate	56.0	70	130	1250	50.0
MS	4	Corners	PP	Bot	B0801027-02B		Carbonate	68.0	70	130	228	100

Test Method: SW6010B - ICP - Total - Aqueous

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0801027 (continued)

MS/MSD and DUP OUTLIERS:

As shown below, the MS/MSD were outside of the limits for Sodium. Sodium had a sample concentration that was greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate. The MSD recovery of Potassium is slightly low. No corrective action was taken, as the recovery of Pottasium in the LCS/LCSD/MS were acceptable.

Type Client Sample LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS 4 Corners PP Bot B0801027-02A	Sodium	-149	75	125	1130	10.0
MSD 4 Corners PP Bot B0801027-02A	Potassium	71.2	75	125	10.9	10.0
MSD 4 Corners PP Bot B0801027-02A	Sodium	-607	75	125	1130	10.0

Detailed Analytical Report						Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B080102	.7										
Project:	Na	wajo Mine	Extensior	ı Leachiı	ng Stu	ıdy						
Client:	Ar	plied Hydi	rology Ass	sociates,	Inc.							
Client Project Number	r: no	ne v		,								
Report Section	:	Client	t Samn	le Ren	ort							
Client Sample Name			- ~p	P	010							
enent Sumple Rune.		MB										
Matrix:	Aqueo	us					C	ollection Date:	1/4/2008	1:20:00PM		
The following test was	conducted by	: Analytica -	Thornton									
Lab Sample Number:	B0801027-	-01A						Analysis Date:	1/8/200	8 5:17:11PM		
Prep Date:	1/8/2008							Instrument:	CVAA_	1		
Analytical Method ID:	SW7470A -	Mercury in 1	Liquid Was	te by CVA	AA - 7	Fotal Hg		File Name:	B01080	7W.W		
Prep Method ID:	7470A							Dilution Factor:	1			
Prep Batch Number:	T0801080	12										
Report Basis:	As Received	1						Analyst Initials:	DL			
Sample prep wt./vol:	30.00	ml						Prep Extract Vol:	30.00	ml		
Analyta		SNo	Docult	Flage	Inita	вот	MDI	•		m #.		
<u>Analyte</u> Mercurv	<u>C</u> 743	<u>15110</u> 9-97-6	<u>Result</u> ND	<u>Flags</u>	ng/L	0.00020	0.00005	50		<u>run #:</u> 1		
	1 (11	A 1 (*	T1 (U					_		
The following test was	conducted by	Analytica -	Thornton						1/0/000	9 7 52 00 DM		
Lab Sample Number:	BU801027	-01A						Analysis Date:	1/8/200 ICD 2	8 7:53:00PM		
Analytical Mathad ID:	1/8/2008 SW6010B -	ICP - Total						Eile Normer	E01099	•		
Anarytical Method ID:	2010 ICD	ici - iotai						Dilution Ersten	1	A		
Prep Method ID:	3010_ICP							Dilution Factor:	1			
Prep Batch Number:	10801080	15										
Report Basis:	As Received	1						Analyst Initials:	rm			
Sample prep wt./vol:	50.00	mi						Prep Extract vol:	50.00	mi		
Analyte	<u>CA</u> 742	<u>ASNo</u> 0.00.5	<u>Result</u>	<u>Flags</u>	Units	POL 0.050	<u>MDL</u>			<u>run #:</u>		
Antinan	742	9-90-5	0.058 ND	1	ng/L	0.050	0.014	7		1		
Antimony	744	0-36-0	ND	1	ng/L	0.050	0.0067	/				
Arsenic	/44	0-38-2	ND	I	ng/L	0.10	0.015					
Barium	744	0-39-3	0.088	1	ng/L	0.010	0.0001	0				
	744	0-43-9	ND	1	ng/L	0.0060	0.0005	1				
Calcium	744	0-70-2	2.4	1	ng/L	0.10	0.013	,				
Chromium	744	0-47-3	ND	1	ng/L	0.010	0.0018	3				
Cobalt	744	0-48-4	ND	1	ng/L	0.0050	0.0016)				
Copper	744	0-50-8	0.0073	1	ng/L	0.0050	0.0019)				
Iron	743	9-89-6	ND	1	ng/L	0.050	0.0027	1				
Lead	743	9-92-1	ND	1	ng/L	0.050	0.011					
Lithium	743	9-93-2	ND	1	ng/L	0.10	0.0007	2				
Magnesium	743	9-96-4	1.2	1	ng/L	0.10	0.012					
Manganese	743	9-96-5	ND	1	ng/L	0.010	0.0006	6				
Molybdenum	743	9-98-7	ND	1	ng/L	0.010	0.0018	3				
Nickel	744	0-02-0	ND	1	ng/L	0.040	0.0027	7				
					ng/L	1.0	0.31					
Potassium	744	0-09-7	11	1								
Potassium Selenium	744 778	0-09-7 4-49-2	11 ND	1	ng/L	0.10	0.026					
Potassium Selenium Silver	744 778 744	0-09-7 4-49-2 0-22-4	11 ND ND	1	ng/L ng/L	0.10 0.015	0.026 0.0006	6				
Potassium Selenium Silver Sodium	744 778 744 744	0-09-7 4-49-2 0-22-4 0-23-5	11 ND ND 1,200	1	ng/L ng/L ng/L	0.10 0.015 3.0	0.026 0.0006 0.028	6				

Detailed Ana	lytical Report			Anal	ytica En	vironr	nental Laboratories,	Inc.	
Workorder (SDG):	B0801027								
Project:	Navajo Mine I	Extension	Leachi	ing Stu	ıdy				
Client:	Applied Hydro	ology Ass	ociates,	Inc.					
Client Project Number	none								
Report Section	Client	Sampl	le Rej	port					
Client Sample Name:	MB								
Matrix:	Aqueous					C	Collection Date:	1/4/2008 1	:20:00PM
Lab Sample Number:	B0801027-01A						Analysis Date:	1/8/2008	7:53:00PM
Prep Date:	1/8/2008						Instrument:	ICP_2	
Analytical Method ID:	SW6010B - ICP - Total						File Name:	E01088A	Δ
Prep Method ID:	3010_ICP						Dilution Factor:	1	
Prep Batch Number:	T080108015								
Report Basis:	As Received						Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml						Prep Extract Vol:	50.00	ml
<u>Analyte</u> Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.0050	<u>MDL</u> 0.001	0		<u>run #:</u> 1
Lab Sample Number:	B0801027-01A						Analysis Date:	1/9/2008	1:35:00PM
Prep Date:	1/8/2008						Instrument:	ICP 2	1.001001101
Analytical Method ID:	SW6010B - ICP - Total						File Name:	E01098A	Δ
Prep Method ID:	3010_ICP						Dilution Factor:	1	
Prep Batch Number:	T080108015								
Report Basis:	As Received						Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml						Prep Extract Vol:	50.00	ml
<u>Analyte</u> Beryllium	<u>CASNo</u> 7440-41-7	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.0010	<u>MDL</u> 0.0000	60		<u>run #:</u> 2
Boron	7440-42-8	0.35		mg/L	0.050	0.001	8		
Thallium	7440-28-0	ND		mg/L	0.40	0.011	l		
The following test was	conducted by: Analytica -	Thornton							
Lab Sample Number:	B0801027-01B						Analysis Date:	1/17/200	8 2:31:55PM
Prep Date:	1/17/2008						Instrument:	Titrametr	ric
Analytical Method ID:	310.1 - Alkalinity, Titrime	etric (pH 4.	.5) - Alka	alinity			File Name:		
Prep Method ID:	Alkalinity_W						Dilution Factor:	1	
Prep Batch Number:	T080117013								
Report Basis:	As Received						Analyst Initials:	kl	
Sample prep wt./vol:	50.00 ml						Prep Extract Vol:	50.00	ml
<u>Analyte</u> Bicarbonate	<u>CASNo</u>	<u>Result</u> 1.300	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 5.0	<u>MDL</u> 1.5			<u>run #:</u> 1
Carbonate		220		mg/L	7.0	1.2			
The following test was	conducted by: Analytica - '	Chornton							
Lab Sample Number:	B0801027-01B						Analysis Date:	1/5/2008	9:29:27AM
Prep Date:	1/5/2008						Instrument:	Probe	,,_,,_,,
Analytical Method ID:	150.1 - pH, Elecrometric	- pH					File Name:		
Prep Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T080117001								
Report Basis:	As Received						Analyst Initials:	rs	
Sample prep wt./vol:	10.00 ml						Prep Extract Vol:	10.00	ml
<u>Analyte</u>	<u>CASNo</u>	<u>Result</u>	<u>Flags</u>	<u>Units</u>	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>

Page 5 of 28

Detailed Ana	lytical Report		Analy	tica En	vironn	nental Laboratories,	, Inc.	
Workorder (SDG):	B0801027							
Project:	Navajo Mi	ine Extension	Leaching Stud	ly				
Client:	Applied H	ydrology Ass	ociates, Inc.					
Client Project Number	r: none							
Report Section	: Clie	ent Sampl	e Report					
Client Sample Name:	MB		-					
Matrix:	Aqueous				C	Collection Date:	1/4/2008 1	:20:00PM
Lab Sample Number:	B0801027-01B					Analysis Date:	1/5/2008	9:29:27AM
Prep Date:	1/5/2008					Instrument:	Probe	
Analytical Method ID:	150.1 - pH, Elecrome	etric - pH				File Name:		
Prep Method ID:	150.1					Dilution Factor:	1	
Prep Batch Number:	T080117001							
Report Basis:	As Received					Analyst Initials:	rs	
Sample prep wt./vol:	10.00 ml					Prep Extract Vol:	10.00	ml
<u>Analyte</u> pH	<u>CASNo</u>	<u>Result</u> 9.0	<u>Flags</u> <u>Units</u> pH	PQL 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1
The following test was	conducted by: Analyti	ca - Thornton	*					
Lab Sample Number:	B0801027-01B	ea - mormon				Analysis Date:	1/16/200	8 1·50·18PM
Pren Date:	1/11/2008					Instrument	SCALE	1.50.101 W
Analytical Method ID:	160.1 - Total Dissolv	ed Solids dried	at 180°C - TDS			File Name:	5 01 122	
Prep Method ID:	160.1					Dilution Factor:	1	
Pren Batch Number	T080111013						-	
Report Basis:	As Received					Analyst Initials:	KLibhart	
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00	ml
Analyte Total Dissolved Solids	<u>CASNo</u>	<u>Result</u> 3,100	<u>Flags</u> <u>Units</u> mg/L	<u>POL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted by: Analyti	ca - Thornton						
Lab Sample Number:	B0801027-01B					Analysis Date:	1/8/2008	2:44:31AM
Prep Date:	1/7/2008					Instrument:	IC	
Analytical Method ID:	Inorganic Anions by	Ion Chromatogr	aphy - Anions by	' IC		File Name:	080107_	047.D
Prep Method ID:	300.0					Dilution Factor:	25	
Prep Batch Number:	T080107001							
Report Basis:	As Received					Analyst Initials:	CS	
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml
<u>Analyte</u> Chloride	<u>CASNo</u>	<u>Result</u> 630	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1
Lab Sample Number: Prep Date:	B0801027-01B 1/7/2008					Analysis Date: Instrument:	1/8/2008 IC	3:21:16AM
Analytical Method ID:	Inorganic Anions by	Ion Chromatogi	aphy - Anions by	' IC		File Name:	080107_	049.D
Prep Method ID:	300.0					Dilution Factor:	1	
Prep Batch Number:	T080107001							
Report Basis:	As Received					Analyst Initials:	CS	
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml
Analyte	<u>CASNo</u>	Result	<u>Flags</u> <u>Units</u>	<u>POL</u>	<u>MDL</u>			<u>run #:</u>
Fluoride		2.2	mg/L	0.40	0.031			3
Sulfate		280	mg/L	1.5	0.11			

Detailed Ana		Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B0801	027								
Project:]	Navajo Mine	Extensior	n Leach	ing Stu	ıdy				
Client:		Applied Hydr	ology Ass	ociates	, Inc.					
Client Project Number	r: 1	none	00		,					
Report Section	•	Client	Samp	le Re	port					
Client Sample Name:		4 Corner	s PP Bo	ttom A	Ash L	eachate	e .			
Matrix:	Aqu	eous					С	ollection Date:	1/4/2008	:20:00PM
The following test was	conducted	by: Analytica -	Thornton							
Lab Sample Number:	B080102	27-02A						Analysis Date:	1/8/2008	5:19:17PM
Prep Date:	1/8/2008	3						Instrument:	CVAA_	1
Analytical Method ID:	SW74704	A - Mercury in I	Liquid Was	te by C√	AA - T	Fotal Hg		File Name:	B010807	7W.W
Prep Method ID:	7470A							Dilution Factor:	1	
Prep Batch Number:	T080108	8012								
Report Basis:	As Receiv	ved						Analyst Initials:	DL	
Sample prep wt./vol:	30.00	ml						Prep Extract Vol:	30.00	ml
		CAEN	D 14	F 1	TT	DOI	MDI	1		# .
<u>Analyte</u> Mercury	7	<u>CASNo</u> 7439-97-6	<u>Result</u> ND	Flags	<u>Units</u> mg/L	0.00020	0.00005	50		<u>run #:</u> 1
The following test was	conducted	by: Analytica -	Thornton							
Lab Sample Number:	B080102	27-02A						Analysis Date:	1/8/2008	7:58:00PM
Prep Date:	1/8/2008	3						Instrument:	ICP 2	
Analytical Method ID:	SW60101	B - ICP - Total						File Name:	E01088A	A
Prep Method ID:	3010 IC	Р						Dilution Factor:	1	
Pren Batch Number	T080108	8015								
Report Basis	As Receiv	ved						Analyst Initials	rm	
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml
Analyte		CASNo	Result	Flags	Units	POL	MDL			run #:
Aluminum	7	7429-90-5	0.20		mg/L	0.050	0.014			1
Antimony	7	7440-36-0	ND		mg/L	0.050	0.0067	7		
Arsenic	7	7440-38-2	ND		mg/L	0.10	0.015			
Barium	7	7440-39-3	0.13		mg/L	0.010	0.0001	6		
Cadmium	7	7440-43-9	ND		mg/L	0.0060	0.0005	1		
Calcium	7	7440-70-2	3.1		mg/L	0.10	0.013			
Chromium	7	7440-47-3	ND		mg/L	0.010	0.0018	3		
Cobalt	7	7440-48-4	ND		mg/L	0.0050	0.0016	5		
Copper	7	7440-50-8	ND		mg/L	0.0050	0.0019)		
Iron	7	7439-89-6	0.054		mg/L	0.050	0.0027	7		
Lead	7	7439-92-1	ND		mg/L	0.050	0.011			
Lithium	7	7439-93-2	ND		mg/L	0.10	0.0007	2		
Magnesium	7	7439-96-4	1.3		mg/L	0.10	0.012			
Manganese	,	7439-96-5	ND		mg/L	0.010	0.0006	6		
Molybdenum	, 7	7439-98-7	ND		mg/L	0.010	0.0018	3		
Nickel	, 	7440-02-0	ND		mg/L	0.040	0.0027	7		
Potassium	, 	7440-09-7	11		mg/L	1.0	0.31			
Selenium	, -	7784_49_2	ND		mø/I	0.10	0.026			
Silver		7440-22 4	ND		mg/L	0.10	0.0006	6		
Sodium		7440 22 5	1 100		mg/L	2.0	0.000	v		
Vanadium		7440-25-5	1,100 ND		mg/L	5.0	0.028	2		
vanaululli		/440-62-2	ND		mg/L	0.010	0.0007	2		

Detailed Ana		Anal	ytica En	vironn	nental Laboratories,	Inc.			
Workorder (SDG):	B0801027								
Project:	Navajo Mine l	Extension	Leach	ing Stu	dy				
Client:	Applied Hydro	ology Asso	ociates	, Inc.					
Client Project Number	none	a 1	D						
Report Section	Client	Sampl	e Rej	port					
Client Sample Name:	4 Corners	s PP Bot	tom A	sh Le	eachate	e			
Matrix:	Aqueous					C	Collection Date:	1/4/2008 1	:20:00PM
Lab Sample Number:	B0801027-02A						Analysis Date:	1/8/2008	7:58:00PM
Prep Date:	1/8/2008						Instrument:	ICP_2	
Analytical Method ID:	SW6010B - ICP - Total						File Name:	E01088A	Δ
Prep Method ID:	3010_ICP						Dilution Factor:	1	
Prep Batch Number:	T080108015								
Report Basis:	As Received						Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml						Prep Extract Vol:	50.00	ml
<u>Analyte</u> Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.0050	<u>MDL</u> 0.001	0		<u>run #:</u> 1
I ah Sample Number:	B0801027-02A						Analysis Date:	1/9/2008	1.40.00PM
Pren Date:	1/8/2008						Instrument:	ICP 2	1.10.001.01
Analytical Method ID:	SW6010B - ICP - Total						File Name:	E01098A	1
Prep Method ID:	3010 ICP						Dilution Factor:	1	
Prep Batch Number:	 T080108015								
Report Basis:	As Received						Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml						Prep Extract Vol:	50.00	ml
Analyte	CASNo	Result	Flags	Units	POL	MDL			run #:
Beryllium	7440-41-7	ND		mg/L	0.0010	0.0000	60		3
Boron	7440-42-8	0.39		mg/L	0.050	0.001	8		
Thallium	7440-28-0	ND		mg/L	0.40	0.011			
The following test was	conducted by: Analytica - '	Thornton							
Lab Sample Number:	B0801027-02B						Analysis Date:	1/17/200	8 2:31:55PM
Prep Date:	1/1//2008		5) A 11	1/			Instrument:	Titramet	ric
Analytical Method ID:	310.1 - Alkalinity, Hurimo	etric (pH 4.	5) - AIK	annity			File Name:	1	
Prep Method ID:	Alkalinity_W						Dilution Factor:	1	
Prep Batch Number:	1080117013								
Report Basis:	As Received						Analyst Initials:	KI 50.00	1
Sample prep wt./vol:	50.00 mi						Prep Extract Vol:	50.00	ml
Analyte	<u>CASNo</u>	<u>Result</u>	<u>Flags</u>	<u>Units</u>	POL	MDL			<u>run #:</u>
Bicarbonate		1,300		mg/L	5.0	1.5			1
Carbonate		230		mg/L	7.0	1.2			
The following test was	conducted by: Analytica - '	Thornton							
Lab Sample Number:	B0801027-02B						Analysis Date:	1/5/2008	9:29:27AM
Prep Date:	1/5/2008						Instrument:	Probe	
Analytical Method ID:	150.1 - pH, Elecrometric	- рН					File Name:		
Prep Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T080117001								
Report Basis:	As Received						Analyst Initials:	rs	
Sample prep wt./vol:	10.00 ml						Prep Extract Vol:	10.00	ml
Analyte	<u>CASNo</u>	<u>Result</u>	<u>Flags</u>	<u>Units</u>	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>

Page 8 of 28

Narkower (SING: BORNING? Project: Navajo Mine Etension Leaching Study Project Number: Applied Hydrology Associates, Inc. Report Section: Inon Report Section: Client Sample Report Iteration of the section Date: 1/4/2008 1/2000 Stand Sample Name: B0801027-028 Collection Date: 1/4/2008 1/2000 9/29/27AM Matrix: Aqueous Collection Date: 1/4/2008 1/2000 9/29/27AM Matrix: Aqueous Collection Date: 1/4/2008 1/2000PM Matrix: Aqueous Analysis Date: 1/5/2008 9/29/27AM Topp Intermeteries Instance Prope Perp Mach Mumber: 108011070 Heas Prop Prope Narmeteries Report Basis: As Received South Particle Analysis Date: 1/16/2008 1/50/1 PM Bos South Stunder Bos Of Mine Particle Mine Particle Analysis Date: 1/16/2008 1/50/208 Bos South Stunder Bos Of Mine Particle Mine Particle Mine	Detailed Ana	lytical l	Report			Analyti	ca En	vironn	nental Laboratories,	Inc.	
brajeci Sitem: Sitem: Liend Pojeck Number: Report Section: Time: Client Sample ReportClient Sample ReportSitem Section: Applied Pythology Associates, Inc.Marrix: absample Number: Prope Liend Sample Number: Prope DataClient Sample ReportCollection Date: I/4/20081/4/20081:20:00PMMarrix: absample Number: Prope DataB001027-02B 1/5/2008Analysis Date: File Name: Prope Date:Analysis Date: Prope Prope Date:1/4/20081:20:00PMMarrix: absample Number: Prop Method DI Prop Method DI Prop Method DI 100.0File Name: Prope Prope Prope Prope Prop Method DI 100.0NomeNome Prope Prope Prope Prope Prope Prope Prope Prope PropeNome Prop	Workorder (SDG):	B0801	027								
Applied Hydrology Associates, Inc. Applied Hydrology Associates, Inc. Eter Project Number: Nore Report Section Client Sample Report Autorian Sample Number: Aquecos Sample Number: B0801027-02B Autorian Sample Number: B0801027-02B Maria: Aquecos Autorian Sample Number: B0801027-02B Maria: Aquecos Autorian Sample Number: B0801027-02B Maria: Aquecos Autorian Sample Number: B0801027-02B Total Sample Number: B08010700 Total Sample Number: B080110700 Total Sample Number: Total Sample Number: Total Sample Number: Astecived Astecived Sample Number: B0801027-02B International Sample Number: B0801027-02B Internationa	Project:	I	Navajo Mine F	Extension I	Leach	ing Study					
There Tork Content Sample Report Sittent Sample Number: Isoners: Isoners: PP Bottom Ash Leachate Matrix: Aqueous Collection Date: 1/4/2008 1/20:00PM Assample Number: B0801027-02B Analysis Date: 1/5/2008 9:29:27 AM Twp Date: 1/5/2008 1/5/2008 9:29:27 AM Instrument: Probe Matrix: Aqueous Analysis Date: 1/5/2008 9:29:27 AM Twp Date: 1/5/2008 9:29:27 AM Instrument: Probe Matrix: Asseevel Analysis Date: 1/5/2008 9:29:27 AM Twp Batch Number: 1080117001 Hease Probe Analysis Date: 1/16/2008 1/16/2008 Matrix: Asseevel Analysis Date: 1/16/2008 1:50:18PM Instrument: NULL Dilution Factor: 1 1 Prop Date: 1/10/2008 1:50:18PM Instrument: SCALE Matrix: Asseevel Analysis Date: 1/16/2008 1:50:18PM Matrix: Asseevel Analysis Date: 1/8/2008 3:	Client:	A	Applied Hydro	logy Asso	ciates	, Inc.					
Report Section: Client Sample Report Jient Sample Name: 4 Corners PP Bottom Ash Leachate Marix: Aqueous ab Sample Nume: 105/2008 1:20:00PM ab Sample Nume: 105/2008 9:29:27AM prop Date: 1000 ml ml Prop Bath Numbe: 7080117001 start rs sample prop wt/vol: 10.00 ml ml rs prop Bath Numbe: 0.00 ml ml rs ab Sample Numbe: 68001027-02B Analysis Date: 1/16/2008 1:50:18PM shample Numbe: 1080111013 startument: SCALE rm# rep Mathol D: 10.1 - Total Dissolved Solids dried at 180°C - TDS File Name: 1/16/2008 1:50:18PM rep Mathol ND: 100.1 - Total Dissolved Solids dried at 180°C - TDS File Name: 1/16/2008 1:50:18PM rep Mathol ND: 100.0	Client Project Number	: 1	none								
Line Sample Name Lociners PP Bottom Ash Leachate Values Collection Date: 1/4/2008 1:20:00PM ab Sample Nume 08001027-02B Analysis Date:: 1/5/2008 9:29:27AM rep Date: 1/5/2008 File Name: Probe 9:29:27AM handysis Date:: 1/5/2008 9:29:27AM Probe handysis Date:: 1/5/2008 9:29:27AM Probe handysis Date:: 1/5/2008 9:29:27AM Probe handysis Date:: 1/5/2008 1	Report Section		Client	Sample	Re	port					
Matrix: Aqueous Collection Date: 1/4/2008 1:20:00PM ab Sample Number: 10801027-02B Analysis Date: 1/672008 Prop Date: 1 Prop Prop Date: 1 Prop Prop Date: 1 Prop Prop Prop Date: 1 Prop Prop Prop Prop Prop Prop Prop Prop	Client Sample Name:		4 Corners	PP Bott	om A	Ash Lead	chate	è			
ah Sample Numher: B0801027-02B Analysis Date: 1/5/2008 9:29:27AM Instrument: Probe Instrument: Instrument: Probe Instrument: Instrument: Probe Instrument: Instru	Matrix:	Aque	eous					C	ollection Date:	1/4/2008 1	:20:00PM
rep Date: 1/5/2008 Instrument: Probe hadyited Method ID: 150.1 - pH. Elecrometric - pH File Name: Probe tep Method ID: 150.1 - 00 ml Dilution Factor: 1 tep Method ID: 150.1 - 00 ml Prep Extract Vol: 10.00 ml tep Method ID: 10.00 ml Prep Extract Vol: 10.00 ml maple prep wt/vol: 10.00 ml Prep Extract Vol: 10.00 ml analytic at the statistic at the	Lab Sample Number:	B080102	27-02B						Analysis Date:	1/5/2008	9:29:27AM
Variational Method ID: 15.0.1 - pH, Electrometric - pH File Name: Dilution Factor: 1 trep Match Number: T080117001 H Nalaysi Initials: rs trep Match Number: T080117001 T Prep Extract Vol: 10.00 ml trep Match Number: 10.00 ml Prep Extract Vol: 10.00 ml mm/rep trep Match Number: B0801027-02B Scale Nalaysis Date: 1/16/2008 1:50:18PM trep Match Number: 1000 ml 1001 ml 1/16/2008 1:50:18PM Instrument: SCALE trep Batch Number: 1080111013 File Name: Nalaysis Date: 1/16/2008 1:50:18PM trep Batch Number: 1080111013 File Name: Nalaysis Initials: KLibhart trep Batch Number: 10800 ml Tos T T trep Batch Number: 10800 ml Tos T T trep Batch Number: 10800 ml Tos T T T trep Batch Number: 10800 ml Tos T T T T trep Batch Number: 1000 ml T T T T T	Prep Date:	1/5/2008							Instrument:	Probe	,
PrepMethod ID: tep Ratch Number: tep Ratch Number: TO80117001Solution Factor: solution Factor:1teport Basis: tample prep wt.vdviAs Received analyte and prep extract Vol: 9.0MDL prep Extract Vol:No.00mltambter tep Ratch Number: HCASNo 9.0Result 9.0Page Vinto pHNDL 0.10Prep Extract Vol: 0.10ND.00ml \pm 1tambter tep Ratch Number: HCASNo 10017-02BResult 9.0Prep Extract Vol: 1010ND.00ml \pm 11/1/2008tanalytical Method ID: tep Method ID: top Batch Number:160.1 - Total Dissolved Solids dried at 180°C - TDSFile Name: Prep Extract Vol:1/16/2008 1.50:18PM Instrument: Nanalysis Date: Nanalysis Initials: Nanalysis Initials: Nanalys	Analytical Method ID:	150.1 - pH	I, Elecrometric -	pН					File Name:		
Prep Bach Number: T080117001 As Received Analyst Initials: n ample prep wt./vol: 10.00 ml Prep Extract Vol: 10.00 ml manubre: GASNO Result Flags Units Prep Extract Vol: 10.00 ml manubre: B0801027-02B Analysis Date: 1/16/2008 1:50:18PM the pole 1/11/2008 Instrument: SCALE SCALE verp Batch Number: B0801027-02B Instrument: SCALE SCALE verp Batch Number: 160.1 Total Dissolved Solids dried at 180°C - TDS File Name: SCALE verp Batch Number: T080111013 Scale Instrument: SCALE there potent Saisis: As Received Malyst Initials: KLibhart ataribe prep wt./vol: 100.0 ml Prep Extract Vol: 1.00 ml the following test was conducted by: Analytica - Thornton Scale Instrument: I/8/2008 3:58:04AM taid Dissolved Solids Signo mg/L Prep Extract Vol: 1.00 ml #: taid Dissolved Solids Instrument:	Prep Method ID:	150.1							Dilution Factor:	1	
Report Basis:As ReceivedAnalyst Initials:rsample prep wt./vol:10.00mlPrep Extract Vol:10.00mlanalyst Initials:CASNoRoutFasUnitMDLPolMDL9.09.00.100.100.10Image: Second Seco	Prep Batch Number:	T080117	001								
ample prep wt./vol: 10.00 ml Prep Extract Vol: 10.00 ml maker CASNo Result Flags Units PH Oli Oli MDL the following test was conducted by: Analytica - Thornton ab Sample Number: B0801027-02B Analysis Date: 1/16/2008 1:50:18PM ab Sample Number: 160.1 160.1 Dilution Factor: 1 rep Date: 1/11/2008 Instrument: SCALE wrap batch Number: T080111013 State Analysis Date: 1/16/2008 1:50:18PM there pote: 100.0 ml Dilution Factor: 1 Ten #1: SCALE there pote: 100.00 ml Prep Extract Vol: 10.00 ml Ten #1: total Dissolved Solids CASNo Result Flags Units MDL MDL Ten #1: total Dissolved Solids CASNo Result Flags Units Molt Ten #1: Ten #1: total Dissolved Solids Sol0007-02B Analysis Date: 1/8/2008 3:58:04AM there Date: 1/7/2008	Report Basis:	As Receiv	ved						Analyst Initials:	rs	
InstrumentCASNoResult 9.0Flags pHUnit pHPOL 0.10MDL 0.10MDL 1Index definition500Flags 1Unit pH0.10MDL 0.10Image: Constant of the c	Sample prep wt./vol:	10.00	ml						Prep Extract Vol:	10.00	ml
Manual H Case of pH Page of pH 0.10 0.10 1 H 9.0 pH 0.10 0.10 1 H 1/11/2008 Thornton Analysis Date: 1/16/2008 1:50:18PM Stanple Number: 108011027-02B Instrument: SCALE Instrument: SCALE Analysis Initials: As Received Analysis Initials: KLibhart Prep Extract Vol: 1.00 ml Instrument: 100.0 ml mg/L 0^2 0^2 1 Instrument: IO 8.2 Initials: KLibhart 1.00 ml Instrument: B0801027-02B Instrument: IC ICASNo Result Flags Inits Malysis Date: 1/8/2008 3:58:04AM Inalyticia Hethod ID: <	1 1 1 A nalata		CA EN-	Descalt	Flags	TI:4a	DOI	MDI	1		
The following test was conducted by: Analytica - Thornton Analysis Date: 1/16/2008 1:50:18PM ab Sample Number: B0801027-02B Instrument: SCALE rep Date: 1/11/2008 Instrument: SCALE hanlytical Method ID: 160.1 Total Dissolved Solids dried at 180°C - TDS File Name: rep Method ID: 160.1 160.1 Dilution Factor: 1 rep Method ID: 160.1 As Received Analyst Initials: KLibhart ample prep wt./vol: 100.0 ml Prep Extract Vol: 1.00 ml rep Date: 1/7/2008 Result Flags Units mg/L MDL 10 8.2 run #: rep Method ID: 100 ml with mg/L 10 8.2 run #: foot Dissolved Solids CASNo Result Flags Units mg/L MDL 	Analyte pH		<u>LASNO</u>	<u>Result</u> 9.0	<u>Flags</u>	pH	0.10	0.10			<u>run #:</u> 1
ah S ample Number: B0801027-02B Analysis Date: 1/16/2008 1:50:18PM Prep Date: 1/11/2008 Instrument: SCALE Nunlytical Method ID: 160.1 T080111013 T080111013 Instrument: SCALE Prep Batich Number: T080111013 As Received Analyst Initials: KLibhart ample prep wt./vol: 100.00 ml Prep Extract Vol: 1.00 ml ial Dissolved Solids As Received Analyst Initials: KLibhart Instrument: Ins	The following test was	conducted	by: Analytica - Т	hornton							
Trep Date:1/11/2008Instrument:SCALEAnalytical Method ID:160.1 - Total Dissolved Solids dried at 180°C - TDSFile Name:The Name:Trep Method ID:160.1- Total Dissolved Solids dried at 180°C - TDSFile Name:The Name:Trep Method ID:160.1- Total Dissolved Solids dried at 180°C - TDSDilution Factor:1Trep Batch Number:T080111013- Manlyst Initials:KLibhartAraple prep wt./vol:100.00mlPOLMDLTum#:MalviteAs ReceivedAnalyst Initials:KLibhartAnalyteCASNoResultFlagsUnitsNDLAnalyteB0801027-02BInstrument:ICAraple Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_051.DPrep Batch Number:T080107001Estart Vol:20.00mlAnalytical Method ID:20.00mlrum#:1Analytical Method ID:100/201Instrument:ICAnalyteCASNoResultFlagsUnitsPOLAs Sample Number:B0801027-02BAnalyst Initials:CSAs Sample Number:B0801027-02BAnalyst Initials:CSAs Sample Number:B0801027-02BInstrument:ICAnalytical Method ID:Iorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DAs Sample Number:B08010701Estart Vol:20.00Instrument:ICAnalytical Method ID:Iorganic Ani	Lab Sample Number:	B080102	27-02B						Analysis Date:	1/16/200	8 1:50:18PM
Nnalytical Method ID: 160.1 - Total Dissolved Solids dried at 180°C - TDS File Name: Prep Method ID: 160.1 Dilution Factor: 1 Prep Method ID: 100.11013 KLibhart KLibhart Verp Method ID: 100.00 ml Prep Extract Vol: 1.00 ml Analytic CASNo Result Flags Units POL MDL Tum#: Other Dissolved Solids CASNo Result Flags Units POL MDL 10 8.2 Charle Dissolved Solids CASNo Result Flags Units POL MDL 10 8.2 100 100 10 100<	Prep Date:	1/11/200	8			~ ~			Instrument:	SCALE	
Prep Method ID: 160.1 Dilution Factor: 1 Prep Batch Number: T080111013	Analytical Method ID:	160.1 - To	otal Dissolved So	olids dried a	t 180° (C - TDS			File Name:		
Prep Batch Number: T080111013 Leport Basis: As Received Analyst Initials: KLibhart ample prep wt./vol: 100.0 ml Prep Extract Vol: 1.00 ml nahvte CASNo Result Flags Units NDL Prep Extract Vol: 1.00 ml nahvte CASNo Result Flags Units POL MDL Prep Extract Vol: 1.00 ml nahvte Bostonie BOS01027-02B Analysis Date: 1/8/2008 3:58:04AM Prep Date: 1/7/2008 Analysis Date: 1/8/2008 3:58:04AM Prep Date: 1/7/2008 Analysis Date: 1/8/2008 3:58:04AM Prep Date: 1/7/2008 Analysis Date: 1/8/2008 3:58:04AM Prep Method ID: Borganic Anions by Ion Chromatography - Anions by IC File Name: 080107_051.D Report Basis: As Received Analyst Initials: CS ample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Mabyte Bostone Gastone Prep Extract Vol: 20.00 <td>Prep Method ID:</td> <td>160.1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Dilution Factor:</td> <td>1</td> <td></td>	Prep Method ID:	160.1							Dilution Factor:	1	
keport Basis:As ReceivedAnalyst Initials:KLibharttample prep wt/vol:100.0 mlPrep Extract Vol:1.00 mlmatvite total Dissolved SolidsCASNo Result 3,100Result sultFlags mg/LUnits mg/LPOL 10MDL 8.2I.00 mltotal Dissolved SolidsCASNo Result 	Prep Batch Number:	T080111	013								
tample prep wt./vol: 100.00 ml Prep Extract Vol: 1.00 ml tample prep wt./vol: CASNo Result 3,100 Flags Units mg/L POL 10 MDL 8.2 Tum#: Vial Dissolved Solids CASNo Result 3,100 Flags Units mg/L POL 10 MDL 8.2 1 The following test was conducted by: Analytica - Thornton Analysis Date: 1/8/2008 3:58:04AM 1 Ab Sample Number: B0801027-02B Instrument: IC Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_051.D Prep Batch Number: T080107001 25 25 Analyte prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Analyte frags Units Gato Prep Extract Vol: 20.00 ml 1 Analyte frags Units Gato Prep Extract Vol: 20.00 ml 1 Analyte frags Units Gato Prep Extract Vol: 20.00 ml 1 Analyte Intitials: CS 20.00 ml 1 1 Analyte Independent Units in Transition of the optical prep Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_053.D	Report Basis:	As Receiv	ved						Analyst Initials:	KLibhart	
Analytic CASNo Result Flags Units POL MDL ID MDL	Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	1.00	ml
The following test was conducted by: Analytica - Thornton .ab Sample Number: B0801027-02B Analysis Date: 1/8/2008 3:58:04AM Prep Date: 1/7/2008 Instrument: IC Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_051.D Prep Method ID: 300.0 Dilution Factor: 25 Prep Batch Number: T080107001 Analyst Initials: CS Report Basis: As Received Analyst Initials: CS Amalytical Method ID: 20.00 ml Prep Extract Vol: 20.00 ml Analytical Method ID: 630 mg/L 20 1.1 1 1 Analytical Method ID: B0801027-02B Analysis Date: 1/8/2008 4:34:49AM Choride 1/7/2008 Instrument: IC 1 Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_053.D Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_053.D Arep Bach Number: T080107001 X X X X	<u>Analyte</u> Total Dissolved Solids	<u>-</u>	<u>CASNo</u>	<u>Result</u> 3,100	<u>Flags</u>	<u>Units</u> mg/L	POL 10	<u>MDL</u> 8.2			<u>run #:</u> 1
Ab Sample Number:B0801027-02BAnalysis Date:1/8/20083:58:04AMPrep Date:1/7/2008Instrument:ICAnalytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_051.DPrep Method ID:300.0Dilution Factor:25Prep Batch Number:T080107001Keport Basis:As ReceivedAnalyst Initials:CSAmalytical Method ID:20.00mlPrep Extract Vol:20.00mlAmalyteCASNoResultFlagsUnitsPOLMDLrun #:Analytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICNalysis Date:1/8/20084:34:49AMAnalytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DInstrument:ICAnalytical Method ID:100.0Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DDilution Factor:1Prep Method ID:300.0Dilution Factor:1Instrument:ICAnalytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DPrep Method ID:300.0Dilution Factor:1Prep Batch Number:T080107001Keport Basis:As ReceivedAnalyst Initials:CSAnalyst Initials:CSPrep Extract Vol:20.00mlPrep Batch Number:T080107001Prep Extract Vol:20.00mlKeport Basis:As ReceivedAnalyst Ini	The following test was	conducted	by: Analytica - T	hornton							
Prep Date:1/7/2008Instrument::ICAnalytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_051.DPrep Method ID:300.0Dilution Factor:25Prep Batch Number:T080107001Analyst Initials:CSReport Basis:As ReceivedAnalyst Initials:CSample prep wt./vol:20.00mlPrep Extract Vol:20.00AnalyteCASNoResultFlagsUnitsPOLG30mg/L201.11Analysis Date:1/8/20084:34:49AMInstrument:ICAnalytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DPrep Date:1/7/2008Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DPrep Method ID:300.0Dilution Factor:1Prep Batch Number:T080107001Dilution Factor:1Prep Batch Number:T080107001TosInstrument:CSPrep Batch Number:T080107001Analyst Initials:CSAnalyst Initials:CSPrep Extract Vol:20.00mlPrep Batch Number:T080107001TosInstrument:ICAnalyst Initials:CSPrep Extract Vol:20.00mlPrep Extract Vol:20.00mlPrep Extract Vol:20.00Prep Extract Vol:20.00mlPrep Extract Vol:20.00Analyst Initials:CS	Lab Sample Number:	B080102	27-02B						Analysis Date:	1/8/2008	3:58:04AM
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_051.D Prep Method ID: 300.0 Dilution Factor: 25 Prep Batch Number: T080107001 Analyst Initials: CS Report Basis: As Received Analyst Initials: CS Analyte CASNo Result Flags Units 630 POL MDL MDL run #: Chloride 1/7/2008 Result 630 mg/L 20 1.1 1 Analytical Method ID: 107201-02B Analysis Date: 1/8/2008 4:34:49AM 1 Analytical Method ID: 1072007-02B Instrument: IC Analytical Method ID: 1072008 Instrument: IC Analytical Method ID: 300.0 Dilution Factor: 1 Prep Batch Number: T080107001 Dilution Factor: 1 Prep Batch Number: 7080107001 Dilution Factor: 1 Prep Batch Number: 7080107001 CS Dilution Factor: 1 Prep Batch Number: 7080107001 Prep Extract Vol: 20.00 ml Dilution Factor: 1 <td< td=""><td>Prep Date:</td><td>1/7/2008</td><td></td><td></td><td></td><td></td><td></td><td></td><td>Instrument:</td><td>IC</td><td></td></td<>	Prep Date:	1/7/2008							Instrument:	IC	
Prep Method ID: 300.0 Dilution Factor: 25 Prep Batch Number: T080107001 Analyst Initials: CS Report Basis: As Received Prep Extract Vol: 20.00 ml Analyte CASNo Result Flags Units POL MDL 1 Analyte CASNo Result Flags Units POL MDL 1 Analyte B0801027-02B Flags Units POL MDL 18/2008 4:34:49AM Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_053.D Prep Batch Number: T080107001 File Name: 080107_053.D Dilution Factor: 1 Prep Batch Number: T080107001 File Name: 080107_053.D Dilution Factor: 1 Prep Batch Number: T080107001 File Name: CS S S Report Basis: As Received Analyst Initials: CS Gample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml	Analytical Method ID:	Inorganic	Anions by Ion C	hromatogra	phy - A	Anions by I	С		File Name:	080107_	051.D
Prep Batch Number: T080107001 Report Basis: As Received Analyst Initials: CS Prep Extract Vol: 20.00 ml memory 20.00 ml Malyte CASNo Result Flags Units POL MDL MDL 20.00 ml Malyte CASNo Result Flags Units POL MDL MDL Instrument: I/8/2008 4:34:49AM Cab Sample Number: B0801027-02B Malytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC Flags Malytical Method ID: 080107_001 Instrument: IC Prep Batch Number: T080107001 Store Analyst Initials: CS Gample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Prep Batch Number: T080107001 Extract Vol: 20.00 ml Report Basis: As Received Analyst Initials: CS Gample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Maty CASNo Result Flags Units POL MDL	Prep Method ID:	300.0							Dilution Factor:	25	
Report Basis:As ReceivedAnalyst Initials:CScample prep wt./vol:20.00 mlPrep Extract Vol:20.00 mlAnalyteCASNoResultFlagsUnitsPQLMDL20.00 mlchlorideCASNoResultFlagsUnitsPQLMDL1.1chlorideS0801027-02Bmg/L201.1Analysis Date:1/8/20084:34:49AMchoride1/7/2008Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DInstrument:ICcher p Method ID:300.0300.0Dilution Factor:1Dilution Factor:1cher p Batch Number:T080107001As ReceivedAnalyst Initials:CScharple prep wt./vol:20.00 mlCSPrep Extract Vol:20.00 mlcharple prep wt./vol:20.00 mlTo method ID:20.00 mlTo method ID:charple prep wt./vol:CASNoResultFlags UnitsPQL MDLCScharple prep wt./vol:20.00 mlTo method ID:20.00 ml	Prep Batch Number:	T080107	001								
Sample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Analyte Chloride CASNo Result 630 Flags mg/L Units 20 POL 20 MDL 20 MDL 1.1 20.00 ml #: 1 Analyte Chloride B0801027-02B 1/7/2008 Result 630 Flags mg/L PoL 20 MDL 20 Analysis Date: 1/8/2008 4:34:49AM Orep Date: 1/7/2008 Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_053.D Dilution Factor: 1 Orep Method ID: 300.0 TO80107001 Analysis Initials: CS Prep Extract Vol: 20.00 ml Analyte CASNo Result Flags Units POL MDL POL MDL POL MDL	Report Basis:	As Receiv	ved						Analyst Initials:	CS	
Malyte ChlorideCASNoResult GaoFlags Units ng/LPOL 20MDL 1MDL 1Fun #: 1Lab Sample Number: Prep Date:B0801027-02B 1/7/2008Analysis Date: 1/7/20081/8/20084:34:49AM Instrument:1/8/20084:34:49AM Instrument:Analytical Method ID: Prep Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DPrep Method ID: Prep Batch Number:300.0Image: Comment of the second o	Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml
Lab Sample Number:B0801027-02BAnalysis Date:1/8/20084:34:49AMPrep Date:1/7/2008Instrument:ICAnalytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DPrep Method ID:300.0Dilution Factor:1Prep Batch Number:T080107001T080107001SReport Basis:As ReceivedAnalyst Initials:CSBample prep wt./vol:20.00mlPrep Extract Vol:20.00AnalyteCASNoResultFlags UnitsPOL MDLrun #:	<u>Analyte</u> Chloride	<u>.</u>	<u>CASNo</u>	<u>Result</u> 630	<u>Flags</u>	<u>Units</u> mg/L	<u>POL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1
Prep Date:1/7/2008Instrument:ICAnalytical Method ID:Inorganic Anions by Ion Chromatography - Anions by ICFile Name:080107_053.DPrep Method ID:300.0Dilution Factor:1Prep Batch Number:T080107001T080107001CSReport Basis:As ReceivedAnalyst Initials:CSGample prep wt./vol:20.00mlPrep Extract Vol:20.00AnalyteCASNoResultFlags UnitsPOL MDLrun #:	Lab Sample Number:	B080102	27-02B						Analysis Date:	1/8/2008	4:34:49AM
Analytical Method ID: Inorganic Anions by Ion Chromatography - Anions by IC File Name: 080107_053.D Prep Method ID: 300.0 Dilution Factor: 1 Prep Batch Number: T080107001 Analyst Initials: CS Report Basis: As Received Analyst Initials: CS Gample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml	Prep Date:	1/7/2008							Instrument:	IC	
Orep Method ID: 300.0 Dilution Factor: 1 Orep Batch Number: T080107001 As Received Analyst Initials: CS Report Basis: As Received Prep Extract Vol: 20.00 ml run #: Analyte CASNo Result Flags Units POL MDL run #:	Analytical Method ID:	Inorganic	Anions by Ion C	hromatogra	phy - A	Anions by I	С		File Name:	080107_	053.D
Prep Batch Number: T080107001 Report Basis: As Received Analyst Initials: CS Gample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Analyte CASNo Result Flags Units POL MDL run #:	Prep Method ID:	300.0							Dilution Factor:	1	
Report Basis: As Received Analyst Initials: CS Cample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Analyte CASNo Result Flags Units POL MDL run #:	Prep Batch Number:	T080107	001								
Cample prep wt./vol: 20.00 ml Prep Extract Vol: 20.00 ml Analyte CASNo Result Flags Units POL MDL run #:	Report Basis:	As Receiv	ved						Analyst Initials:	CS	
Analyte CASNo Result Flags Units POL MDL run #:	Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml
$\frac{1}{101}\pi_{0}$	Analyte		CASNo	Result	Flage	Unite	ΡΟΙ	мы			run #•
luoride 2.2 mg/L 0.40 0.031 3	Fluoride	-	<u></u>	2.2	1 1450	mg/L	0.40	0.031			3
ulfate 280 mg/L 1.5 0.11	Sulfate			280		mg/L	1.5	0.11			

Detailed Ana	Analytica Environmental Laboratories, Inc.									
Workorder (SDG):	B0801	027								
Project:	-	Navajo Mine	Extensior	1 Leach	ing Stu	udy				
Client:		Applied Hydr	ology Ass	sociates	. Inc.					
Client Project Number	r:	none			/					
Report Section	:	Metho	od Blar	ık Re	port					
Client Sample Name:		MB			-					
Matrix:	Aqu	leous					C	collection Date:	1/8/2008 12	2:00:00AM
The following test was	conducted	by: Analytica -	Thornton							
I ab Sample Number:	T08010	8012-MB	moniton					Analysis Date:	1/8/2008	5·04·24PM
Pren Date:	1/8/2008	8						Instrument:	CVAA 1	5.01.21110
Analytical Method ID:	SW7470.	A - Mercury in I	Liquid Was	te by CV	AA - T	Fotal Hg		File Name:	B010807	W.W
Pren Method ID [.]	7470A		1			0		Dilution Factor	1	
Prep Batch Number	T08010	8012						Difution Fuctor.		
Report Basis	As Recei	ved						Analyst Initials	DL.	
Sample prep wt /vol	30.00	ml						Pren Extract Vol	30.00	ml
sample prep wi./voi.	50.00	IIII						Thep Extract vol.	50.00	
<u>Analyte</u> Mercury		<u>CASNo</u> 1420.07.6	<u>Result</u>	<u>Flags</u>	<u>Units</u>	POL 0.00020	<u>MDL</u>	50		<u>run #:</u>
Wiereury		1439-97-0			ing/L	0.00020	0.0000.			I
The following test was	conducted	by: Analytica -	Thornton							
Lab Sample Number:	T080108	8015-MB						Analysis Date:	1/8/2008	7:38:00PM
Prep Date:	1/8/2008	5 D ICD T-4-1						Instrument:	ICP_2	
Analytical Method ID:	SW00101	B - ICP - Total						File Name:	E01088A	L .
Prep Method ID:	3010_IC	СР 						Dilution Factor:	1	
Prep Batch Number:	T080108	8015								
Report Basis:	As Recei	ved						Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml						Prep Extract Vol:	50.00	ml
<u>Analyte</u> Aluminum	-	<u>CASNo</u> 7429-90-5	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	PQL 0.050	<u>MDL</u> 0.014			<u>run #:</u>
Antimony		7440-36-0	ND		mg/L	0.050	0.0067	7		1
Arsenic		7440-38-2	ND		mg/L	0.10	0.015			
Barium		7440-39-3	ND		mg/L	0.010	0.0001	6		
Cadmium		7440-43-9	ND		mg/L	0.0060	0.0005	1		
Calcium		7440-70-2	ND		mg/L	0.10	0.013	-		
Chromium		7440-47-3	ND		mg/L	0.010	0.0018	3		
Cobalt		7440-48-4	ND		mg/L	0.0050	0.0016	- 5		
Copper	-	7440-50-8	ND		mg/L	0.0050	0.0019)		
Iron	-	7439-89-6	ND		mg/L	0.050	0.0027	7		
Lead		7439-92-1	ND		mg/L	0.050	0.011			
Lithium		7439-93-2	ND		mg/L	0.10	0.0007	2		
Magnesium		7439-96-4	ND		mg/L	0.10	0.012			
Manganese		7439-96-5	ND		mg/L	0.010	0.0006	6		
Molybdenum	-	7439-98-7	ND		mg/L	0.010	0.0018	3		
Nickel	-	7440-02-0	ND		mg/L	0.040	0.0027	7		
Potassium	· ~	7440-09-7	ND		mg/L	1.0	0.31			
Selenium	-	7784_40_2	ND		mo/I	0.10	0.026			
Silver	-	7440-22-4	ND		mø/L	0.015	0.0006	6		
Sodium	-	7440-22-4	ND		mg/I	3.0	0.028	Ť		
Vanadium		7440-62 2	ND		mg/I	0.010	0.0028	2		
v anaululli		/440-02-2	ND		mg/L	0.010	0.0007	2		

Detailed Ana	lytical Report		Analy	tica En	vironn	nental Laboratories,	Inc.
Workorder (SDG):	B0801027						
Project:	Navajo Mine	Extension	h Leaching Stud	dy			
Client:	Applied Hydr	ology Ass	sociates, Inc.				
Client Project Number	none :		,				
Report Section	Metho	od Blar	nk Report				
Client Sample Name:	MB						
Matrix:	Aqueous				C	Collection Date:	1/8/2008 12:00:00AM
Lab Sample Number:	T080108015-MB					Analysis Date:	1/8/2008 7:38:00PM
Prep Date:	1/8/2008					Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total					File Name:	E01088A
Prep Method ID:	3010_ICP					Dilution Factor:	1
Prep Batch Number:	T080108015						
Report Basis:	As Received					Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml					Prep Extract Vol:	50.00 ml
<u>Analyte</u> Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.0050	<u>MDL</u> 0.001	0	<u>run #:</u> 1
Lab Sample Number:	T080108015-MB					Analysis Date:	1/9/2008 1:05:00PM
Prep Date:	1/8/2008					Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total					File Name:	E01098A
Prep Method ID:	3010_ICP					Dilution Factor:	1
Prep Batch Number:	T080108015						
Report Basis:	As Received					Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml					Prep Extract Vol:	50.00 ml
<u>Analyte</u> Beryllium	<u>CASNo</u> 7440-41-7	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.0010	<u>MDL</u> 0.0000	60	<u>run #:</u> 2
Boron	7440-42-8	ND	mg/L	0.050	0.001	8	
Thallium	7440-28-0	ND	mg/L	0.40	0.011		
The following test was	conducted by: Analytica -	Thornton					
Lab Sample Number:	T080117013-MB					Analysis Date:	1/17/2008 2:31:55PM
Prep Date:	1/17/2008					Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, Titrim	etric (pH 4	.5) - Alkalinity			File Name:	
Prep Method ID:	Alkalinity_W					Dilution Factor:	1
Prep Batch Number:	T080117013						
Report Basis:	As Received					Analyst Initials:	kl
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	100.00 ml
<u>Analyte</u> Bicarbonate	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 5.0	<u>MDL</u> 1.5		<u>run #:</u> 1
Carbonate		ND	mg/L	7.0	1.2		
The following test was	conducted by: Analytica -	Thornton					
Lab Sample Number:	T080111013-MB					Analysis Date:	1/16/2008 1:50:18PM
Prep Date:	1/11/2008					Instrument:	SCALE
Analytical Method ID:	160.1 - Total Dissolved S	olids dried	at 180°C - TDS			File Name:	
Prep Method ID:	160.1					Dilution Factor:	1
Prep Batch Number:	T080111013						
Report Basis:	As Received					Analyst Initials:	KLibhart
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00 ml
Analyte	<u>CASNo</u>	<u>Result</u>	Flags Units	<u>PQL</u>	<u>MDL</u>		<u>run #:</u>

Page 11 of 28

Detailed Ana	lytical I	Report		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B08010)27									
Project:	Ν	Navajo Mine	e Extension	Leachi	ng Study	7					
Client:	A	Applied Hyd	rology Ass	ociates,	Inc.						
Client Project Number	:: n	ione									
Report Section	:	Meth	od Blan	k Re	port						
Client Sample Name:		MB		-]							
Matrix:	Aque	eous					C	Collection Date:	1/11/2008 1	12:00:00AM	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	T080111 1/11/2000 160.1 - To 160.1	013-MB 8 otal Dissolved	Solids dried	at 180°C	C - TDS			Analysis Date: Instrument: File Name: Dilution Factor:	1/16/200 SCALE 1	8 1:50:18PM	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T080111 As Receiv 100.00	013 ed ml						Analyst Initials: Prep Extract Vol:	KLibhart 1.00	ml	
<u>Analyte</u> Total Dissolved Solids	<u>(</u>	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			run #: 1	
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	conducted 1 T080107 1/7/2008 Inorganic 300.0 T080107	by: Analytica 001-MB Anions by Ior 001	- Thornton n Chromatogr	aphy - A	nions by	IC		Analysis Date: Instrument: File Name: Dilution Factor:	1/8/2008 IC 080108_0 1	12:12:51PM 009.D	
Report Basis: Sample prep wt./vol:	As Receiv 20.00	ed ml						Analyst Initials: Prep Extract Vol:	КВ 20.00	ml	
<u>Analyte</u> Sulfate	<u>(</u>	CASNo	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 1.5	<u>MDL</u> 0.11			<u>run #:</u> 2	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	T080107 1/7/2008 Inorganic 300.0 T080107	001-MB Anions by Ior 001	n Chromatogr	aphy - A	anions by i	IC		Analysis Date: Instrument: File Name: Dilution Factor:	1/9/2008 IC 080108_0 1	3:32:33AM 059.D	
Report Basis: Sample prep wt./vol:	As Receiv 20.00	ed ml						Analyst Initials: Prep Extract Vol:	KB 20.00	ml	
<u>Analyte</u> Fluoride	<u>(</u>	CASNo	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031			<u>run #:</u> 3	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis: Sample prep wt /vol:	T080107 1/7/2008 Inorganic 300.0 T080107 As Receiv 20.00	001-MB Anions by Ior 001 ed ml	n Chromatogr	aphy - A	anions by a	IC		Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials: Prep Extract Vol:	1/10/200 IC 080110_0 1 KB 20.00	8 9:49:26PM 032.D	
Analyte Chloride	20.00	CASNo	<u>Result</u> ND	<u>Flags</u>	<u>Units</u> mg/L	<u>POL</u> 0.80	<u>MDL</u> 0.042		20.00	run #: 4	

Detailed An	alytical	Report		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B080	1027									
Project:		Navajo Min	e Extension	Leaching	g Study						
Client:		Applied Hy	drology Ass	ociates, Ir	nc.						
Client Project Numb	per:	none									
Tests Run at:	Analytica	Environment	al Laborator	ies - Thor	nton, Colorad	0					
Workorder (SDG):	B080102	7									
Project: Project Number:	Navajo M	fine Extension	n Leaching S QI	udy UALIT	Y CONTR	OL RE	PORT				
Prep Batch:	T080108	015									
			S	AMPLE I	DUPLICATE	E REPOI	RT				
Analysis:	SW6010E	3 - ICP - Tota	1				Base Samp Prep Date:	le:B0801027-02A 1/8/2008			
Samp. Anal. Date: DUP Anal. Date:	1/8/2008 1/8/2008	7:58:00PM 8:03:00PM					Units: Matrix:	mg/L Aqueous			
Analyte Name	S	ampResult	DUPRes.	<u>RPD</u>	<u>RPDLim</u>	<u>Flag</u>					
Aluminum		0.198	0.205	3.5	20						
Antimony		ND	ND	0.0	20						
Arsenic		ND	ND	0.0	20						
Barium		0.127	0.128	0.8	20						
Beryllium		ND	ND	0.0	20						
Boron		0.390	0.386	1.0	20						
Cadmium		ND	ND	0.0	20						
Calcium		3.11	3.12	0.3	20						
Chromium		ND	ND	0.0	20						
Cobalt		ND	ND	0.0	20						
Copper		ND	ND	0.0	20						
Iron		0.0542	0.0637	16.1	20						
Lead		ND	ND	0.0	20						
Magnesium		1.32	1.33	0.8	20						
Manganese		ND	ND	0.0	20						
Molybdenum		ND	ND	0.0	20						
Nickel		ND	ND	0.0	20						
Potassium		10.9	11.2	2.7	20						
Selenium		ND	ND	0.0	20						
Silver		ND	ND	0.0	20						
Sodium		1,130	1,140	0.9	20						
Thallium		ND	ND	0.0	20						
Vanadium		ND	ND	0.0	20						
Zinc		ND	ND	0.0	20						
Lithium		ND	ND	0.0	20						
				LCS	/LCSD REP	ORT					

Detailed An	alytical Repo	rt			Analytica	Environ	mental Lab	oratorie	es, Inc.		
Workorder (SDG):	B0801027										
Project:	Navajo	Mine Ex	tension	Leachir	ng Study						
Client:	Applie	d Hydrol	ogy Asso	ociates, 1	Inc.						
Client Project Numb	oer: none										
Tests Run at:	Analytica Enviror	mental L	aborator	ies - Tho	ornton, Col	orado					
Workorder (SDG):	B0801027										
Project: Project Number:	Navajo Mine Exte	ension Le	aching S QU	udy UALIT	Y CON	TROL	REPOR	Г			
Prep Batch:	T080108015										
				LC	S/LCSD R	FPORT					
Analysis:	SW6010B - ICP -	Total		LU	S/LCOD I		MB:		T08010801	15-MB	
,							Prep	Date:	1/8/2008		
MB Anal. Date:	1/8/2008 7:38:00)PM					Units		mg/L		
LCS Anal. Date:	1/8/2008 7:43:00	OPM LC	SD Anal	l. Date:	1/8/2008	7:48:00	PM Matri	x:	Aqueous		
Analyte Name	SampResult	LCSRes	SDRes	SPI ev	SPDI ev	Recov	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	1.83	1.85	2.00	2.00	91.5	92.5	1.1	89 - 117	20	
Antimony	ND	0.433	0.446	0.500	0.500	86.6	89.2	3.0	82 - 117	20	
Arsenic	ND	1.77	1.78	2.00	2.00	88.5	89.0	0.6	86 - 116	20	
Barium	ND	1.84	1.86	2.00	2.00	92.0	93.0	1.1	86 - 116	20	
Beryllium	ND	0.0507	0.0505	0.0500	0.0500	101.4	101.0	0.4	87 - 111	20	
Boron	ND	0.509	0.507	0.500	0.500	101.8	101.4	0.4	76 - 130	20	
Cadmium	ND	0.0475	0.0471	0.0500	0.0500	95.0	94.2	0.8	79 - 113	20	
Calcium	ND	8.53	8.99	10.0	10.0	85.3	89.9	5.3	79 - 119	20	
Chromium	ND	0.178	0.184	0.200	0.200	89.0	92.0	3.3	86 - 117	20	
Cobalt	ND	0.436	0.443	0.500	0.500	87.2	88.6	1.6	82 - 118	20	
Copper	ND	0.234	0.237	0.250	0.250	93.6	94.8	1.3	86 - 117	20	
Iron	ND	0.913	0.952	1.00	1.00	91.3	95.2	4.2	83 - 121	20	
Lead	ND	0.442	0.454	0.500	0.500	88.4	90.8	2.7	83 - 121	20	
Magnesium	ND	9.31	9.42	10.0	10.0	93.1	94.2	1.2	83 - 118	20	
Manganese	ND	0.444	0.451	0.500	0.500	88.8	90.2	1.6	82 - 121	20	
Molybdenum	ND	0.431	0.435	0.500	0.500	86.2	87.0	0.9	82 - 120	20	
Nickel	ND	0.434	0.440	0.500	0.500	86.8	88.0	1.4	84 - 117	20	
Potassium	ND	9.01	8.87	10.0	10.0	90.1	88.7	1.6	74 - 110	20	
Selenium	ND	1.78	1.84	2.00	2.00	89.0	92.0	3.3	87 - 117	20	
Silver	ND	0.244	0.246	0.250	0.250	97.6	98.4	0.8	80 - 127	20	
Sodium	ND	9.55	10.6	10.0	10.0	95.5	106.0	10.4	87 - 113	20	
Thallium	ND	0.198	0.218	0.200	0.200	99.0	109.0	9.6	89 - 113	20	
Vanadium	ND	0.450	0.456	0.500	0.500	90.0	91.2	1.3	87 - 119	20	
Zinc	ND	0.436	0.473	0.500	0.500	87.2	94.6	8.1	81 - 120	20	
Lithium	ND	0.490	0.497	0.500	0.500	98.0	99.4	1.4	80 - 120	20	
				Μ	S/MSD R	EPORT					

Detailed Analytical Report			Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0801027									
Project:	Navajo Mine Extension Leaching Study									
Client:	Applied Hydrology Associates, Inc.									
Client Project Number: none										
Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): P0801027										
Project: Navajo Mine Extension Leaching Study										
Project Number:	QUALITY CONTROL REPORT									
Prep Batch:	T080108015									
MS/MSD REPORT										
Analysis:	SW6010B - ICP -	Total					Parent: Prep Date:		B0801027-02A 1/8/2008	
Samp. Anal. Date:	1/8/2008 7:58:00	PM					Units	:	mg/L	
MS Anal. Date:	1/8/2008 8:23:00	PM MS	D Anal. D	ate: 1/	8/2008	8:28:00P	M Matri	x:	Aqueous	
Analyte Name	SampResult	MSRes.	<u>MSDRes</u>	SPLev	SPDLev	Recov.	MSD Rec.	<u>RPD</u>	Recov Lim	<u>RPDLim</u> <u>Flag</u>
Aluminum	0.198	1.73	1.94	2.00	2.00	76.6	87.1	11.4	75 - 125	20
Antimony	ND	0.378	0.430	0.500	0.500	75.6	86.0	12.9	75 - 125	20
Arsenic	ND	1.54	1.73	2.00	2.00	77.0	86.5	11.6	75 - 125	20
Barium	0.127	2.08	1.83	2.00	2.00	97.7	85.2	12.8	75 - 125	20
Beryllium	ND	0.0499	0.0498	0.0500	0.0500	99.8	99.6	0.2	75 - 125	20
Boron	0.390	0.870	0.869	0.500	0.500	96.0	95.8	0.1	75 - 125	20
Cadmium	ND	0.0410	0.0413	0.0500	0.0500	82.0	82.6	0.7	75 - 125	20
Calcium	3.11	13.1	11.0	10.0	10.0	99.9	78.9	17.4	75 - 125	20
Chromium	ND	0.192	0.166	0.200	0.200	96.0	83.0	14.5	75 - 125	20
Cobalt	ND	0.475	0.410	0.500	0.500	95.0	82.0	14.7	75 - 125	20
Copper	ND	0.196	0.221	0.250	0.250	78.4	88.4	12.0	75 - 125	20
Iron	0.0542	0.819	0.905	1.00	1.00	76.5	85.1	10.0	75 - 125	20
Lead	ND	0.376	0.414	0.500	0.500	75.2	82.8	9.6	75 - 125	20
Magnesium	1.32	8.91	9.93	10.0	10.0	75.9	86.1	10.8	75 - 125	20
Manganese	ND	0.379	0.422	0.500	0.500	75.8	84.4	10.7	75 - 125	20
Molybdenum	ND	0.377	0.423	0.500	0.500	75.4	84.6	11.5	75 - 125	20
Nickel	ND	0.481	0.409	0.500	0.500	96.2	81.8	16.2	75 - 125	20
Potassium	10.9	19.0	18.0	10.0	10.0	81.0	71.0	5.4	75 - 125	20 lowMSD
Selenium	ND	1.56	1.75	2.00	2.00	78.0	87.5	11.5	75 - 125	20
Silver	ND	0.207	0.229	0.250	0.250	82.8	91.6	10.1	75 - 125	20
Sodium	1,130	984	1,070	10.0	10.0	-1,460.0	-600.0	8.4	75 - 125	20 NOTE 2 NOTE 2
Thallium	ND	0.187	0.174	0.200	0.200	93.5	87.0	7.2	75 - 125	20
Vanadium	ND	0.381	0.429	0.500	0.500	76.2	85.8	11.9	75 - 125	20
Zinc	ND	0.383	0.424	0.500	0.500	76.6	84.8	10.2	75 - 125	20
Lithium	ND	0.465	0.524	0.500	0.500	93.0	104.8	11.9	75 - 125	20
Detailed An	alytical Report		Analytica Environmental Laboratories, Inc.							
-----------------------------	--	--------------	--	---------------	------------	---------------	----------	--	--	--
Workorder (SDG):	B0801027									
Project:	Navajo Mine Extension Leaching Study									
Client:	Applied Hydrology Associates, Inc.									
Client Project Numl	ber: none									
Tests Run at:	Analytica Environmer	tal Laborato	ories - Th	ornton, Color	ado					
Workorder (SDG):	B0801027									
Project: Project Number:	Navajo Mine Extension Leaching Study QUALITY CONTROL REPORT									
Prep Batch:	T080108015									
		D		FECTION CD	IVE DEDADT					
Apolycic	SW6010D ICD Tot		JSI DIG	ESTION SP	IKE KEPUKI	N D0801027 02	N			
Allarysis.	5 W 0010B - ICF - 100	ai			Pren Date	1/8/2008	1			
Samn Anal Date:	1/8/2008 7·58·00PM				Units:	mg/I				
PDS Anal Date:	1/8/2008 8:33:00PM				Matrix:					
i D5 Anai. Date.	1/0/2000 0.55.001 W				Width.	Aqueous				
Analyte Name	SampResult	PDSRes.	<u>SPLev</u>	Recov.	Recov Lim	Flag				
Aluminum	0.198	1.98	2.00	88.9	75 - 117					
Antimony	ND	0.438	0.500	87.0	75 - 117					
Arsenic	ND	1.78	2.00	88.8	75 - 116					
Barium	0.127	1.88	2.00	87.5	75 - 116					
Beryllium	ND	0.0478	0.0500	95.4	75 - 111					
Boron	0.390	0.846	0.500	91.1	75 - 130					
Cadmium	ND	0.0408	0.0500	86.7	75 - 113					
Calcium	3.11	11.2	10.0	80.8	75 - 119					
Chromium	ND	0.172	0.200	85.4	75 - 117					
Cobalt	ND	0.418	0.500	83.5	75 - 118					
Copper	ND	0.228	0.250	91.1	75 - 117					
Iron	0.0542	0.925	1.00	87.1	75 - 121					
Lead	ND	0.430	0.500	86.0	75 - 121					
Magnesium	1.32	10.1	10.0	88.3	75 - 118					
Manganese	ND	0.431	0.500	84.9	75 - 121					
Molybdenum	ND	0.429	0.500	84.0	75 - 120					
Nickel	ND	0.417	0.500	83.0	75 - 117					
Potassium	10.9	17.8	10.0	69.0	75 - 110	lowPDS				
Selenium	ND	1.79	2.00	89.2	75 - 117					
Silver	ND	0.234	0.250	93.2	75 - 127					
Sodium	1,130	1,100	10.0	-349.9	75 - 113	lowPDS	Note 2			
Thallium	ND	0.174	0.200	85.7	75 - 113					
Vanadium	ND	0.440	0.500	87.4	75 - 119					
Zinc	ND	0.432	0.500	86.5	75 - 120					
Lithium	ND	0.539	0.500	92.0	75 - 120					
			SERIA	L DILUTIO	N REPORT					

Detailed An	Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B080	801027							
Project:	Navajo Mine Extension Leaching Study								
Client:		Applied Hy	drology As	sociates. In	ic.				
Client Project Num)er•	none		,					
Tests Run at:	Analytica	Environment	al Laborate	ories - Thor	nton Colorad	0			
Workorder (SDG):	R080102	7		51105 - 111011		10			
Project	Navajo M	/ line Extensio	n Leaching	Study					
Project Number:	j.		Ç	QUALITY	Y CONTR	OL RE	PORT		
Prep Batch:	T080108	015							
				SERIAL I	DILUTION	REPORT	ſ		
Analysis:	SW6010E	8 - ICP - Tota	1				Base Sample	e:B0801027-02A	
							Prep Date:	1/8/2008	
Samp. Anal. Date:	1/8/2008	3 7:58:00PM	[Units:	mg/L	
SER DIL. Date:	1/8/2008	8:38:00PM					Matrix:	Aqueous	
Analyte Name	Samp	Result	<u>PQL.</u>	MDL.	SerialRes.	<u>SerPQL</u>	<u> RPD</u>	<u>Flag</u>	
Aluminum		0.198	0.050	0.014	ND	0.25			
Antimony		ND	0.050	0.0067	ND	0.25			
Arsenic		ND	0.10	0.015	ND	0.50			
Barium		0.127	0.0100	0.00016	0.111	0.050	13.4	OUT	
Cadmium		ND	0.0060	0.00051	ND	0.030		0.1.m	
Calcium		3.11	0.10	0.013	5.53	0.50	56.0	OUT	
Chromium		ND	0.0100	0.0018	ND	0.050			
Cobalt		ND	0.0050	0.0016	ND	0.025			
Copper		ND	0.0050	0.0019	ND	0.025			
Iron		0.0542	0.050	0.0027	ND	0.25			
Lead		ND	0.050	0.011	ND	0.25	17.0	OUT	
Magnesium		1.32	0.10	0.012	1.11	0.50	17.2	001	
Manganese		ND	0.0100	0.00000	ND	0.050			
Molybdenum		ND	0.0100	0.0018	ND	0.030			
Nickel		<u>ND</u>	1.0	0.0027	ND 10.2	5.0	5.6		
Potassium		10.9 ND	0.10	0.026	10.3	0.50	3.0		
Silver		ND	0.10	0.020	ND ND	0.075			
Solium		1 130	3.0	0.00000	1.020	15	0.2		
Vanadium		ND	0.0100	0.020	1,030 ND	0.050	9.2		
Zinc		ND	0.0050	0.0010	0.204	0.025			
Lithium		ND	0.10	0.00072	ND	0.50			
Liunum		TLD .			ND				
Dram Datah	T0801080	112							
Рер Басп:	1000100)14							
			;	SAMPLE I	DUPLICATE	E REPOR	RT		
Analysis:	SW7470A	A - Mercury in	n Liquid W	aste by CVA	AA - Total H	[g	Base Sample	e:B0801027-02A	
				2		-	Prep Date:	1/8/2008	
Samp Anal Date	1/8/2008	5:19·17PM					Units	mg/L	
DUP Anal. Date	1/8/2008	5:21:31PM					Matrix.	Aqueous	
	_, c, _ 000								
Analyte Name	<u>S</u>	ampResult	DUPRes.	<u>RPD</u>	<u>RPDLim</u>	<u>Flag</u>			

Page 17 of 28

Detailed An	alytical Report Analytic	a Environmental Laboratories, Inc.	
Workorder (SDG):	B0801027		
Project:	Navajo Mine Extension Leaching Study		
Client:	Applied Hydrology Associates, Inc.		
Client Project Numb	ber: none		
Tests Run at:	Analytica Environmental Laboratories - Thornton, Co	lorado	
Workorder (SDG):	B0801027		
Project:	Navajo Mine Extension Leaching Study OUALITY CON	JTROL REPORT	
Project Number.	TAQA1AQA17		
Prep Batch.	1080108012		
	SAMPLE DUPLIC	CATE REPORT	
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - To	btal Hg Base Sample:B0801027-02A Prep Date: 1/8/2008	
Samp. Anal. Date:	1/8/2008 5:19:17PM	Units: mg/L	
DUP Anal. Date:	1/8/2008 5:21:31PM	Matrix: Aqueous	
Analyte Name	SampResult DUPRes. RPD RPDL	im Flao	
Mercury	ND ND 0.0 20		
	LCS/LCSD	REPORT	
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Te	otal Hg MB: T080108012-MB	
-		Prep Date: 1/8/2008	
MB Anal. Date:	1/8/2008 5:04:24PM	Units: mg/L	
LCS Anal. Date:	1/8/2008 5:10:50PM LCSD Anal. Date: 1/8/2008	5:12:54PM Matrix: Aqueous	
Analyte Name	SampResult LCSRes. SD <u>Res.</u> SPLev SPDLev	Recov. SD Recov <u>RPD</u> <u>Recov Lim</u> <u>RPDLim</u> <u>Fla</u>	ıg
Mercury	ND 0.00203 0.00208 0.00200 0.0020) 101.5 104.0 2.4 80 - 120 20	5
	MS/MSD F	EPORT	
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - To	otal Hg Parent: B0801027-02A	
		Prep Date: 1/8/2008	
Samp. Anal. Date:	1/8/2008 5:19:17PM	Units: mg/L	
MS Anal. Date:	1/8/2008 5:23:34PM MSD Anal. Date: 1/8/2008	5:25:40PM Matrix: Aqueous	
Analyte Nam <u>e</u>	SamnResult MSRes. MSDRes SPLev SPDL	ev Recov. MSD Rec. RPD <u>Recov Lim</u> <u>RPDLim</u> <u>Fla</u>	ag
Mercury	ND 0.00213 0.00210 0.00200 0.0020	00 106.5 105.0 1.4 70 - 130 20	-
-		<u> </u>	
	POST DIGESTION	SPIKE REPORT	
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Te	btal Hg Base Sample: B0801027-02A	
		Prep Date: 1/8/2008	
Samp. Anal. Date:	1/8/2008 5:19:17PM	Units: mg/L	
PDS Anal. Date:	1/8/2008 5:27:45PM	Matrix: Aqueous	
		-	
Analyte Name	SampResult PDSRes. SPLev Recov.	Recov Lim Flag	

. •1

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027 Navajo Mine Extension Leaching Study **Project: Client:** Applied Hydrology Associates, Inc. none

Client Project Number:

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report Analytica Environmental Laboratori					es, Inc.							
Workorder (SDG):	B08010	027										
Project:	ľ	Navajo Mi	ne Ex	tension	Leachiı	ng Study						
Client:	I	Applied Hy	ydrol	ogy Asso	ociates,	Inc.						
Client Project Numb	er: r	none										
Tests Run at:	Analytica H	Environme	ntal La	aboratori	ies - Tho	ornton, Col	orado					
Workorder (SDG):	B0801027	n a Eastan ai	T .	a a h i a a C	4 J							
Project: Project Number:	Navajo Mi	ne Extensi	on Le	QU	JALI	FY CON	TROL	REPORT	[
Prep Batch:	T08010700	01										
					LC	S/LCSD F	REPORT					
Analysis:	Inorganic A	Anions by I	on Ch	nromatog	raphy -	Anions by	IC	MB:		T08010700)1-MB	
								Prep I	Date:	1/7/2008		
MB Anal. Date:	1/9/2008	3:32:33AN	1					Units:		mg/L		
LCS Anal. Date:	1/7/2008	6:27:53PM	LC	SD Anal	. Date:	1/7/2008	6:46:17	PM Matrix	c :	Aqueous		
Analyte Name	SampRe	esult LC	SRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	Flag
Fluoride	N	ND 2.	31	2.25	2.50	2.50	92.4	90.0	2.6	90 - 110	20	
Chloride	N	JD 4.	71	4.71	5.00	5.00	94.2	94.2	0.0	90 - 110	20	
Sulfate	N	ND 34	.1	34.0	37.5	37.5	90.9	90.7	0.3	90 - 110	20	
Analysis:	MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801027-02B											
								Prep I	Date:	1/7/2008		
Samp. Anal. Date:	1/8/2008	4:34:49AN	1					Units:		mg/L		
MS Anal. Date:	1/9/2008	2:37:21AN	1					Matrix	: :	Aqueous		
Analyte Name	SampRe	sult MS	Res		SPL	ev	Recov			Recov Lim		Flag
Fluoride	2	$\frac{1}{2.16}$ $\frac{113}{4.3}$	39		2.50		89.2			70 - 130		<u></u> 6
Chloride	6	532 75	5		125		98.4			70 - 130	NOTE 2	
Sulfate		$\frac{32}{985}$ $\frac{13}{32}$	3		37.5		101.3			70 - 130	NOTE 2	
Sunate	2	285 52	5		51.5		101.5			70 - 150	NOIL 2	
	TA0A111A1	12										
Prep Batch:	10801110	13										
				SA	AMPLE	DUPLIC	ATE RE	PORT				
Analysis:	160.1 - Tot	tal Dissolve	ed Sol	lids dried	l at 180°	°C - TDS		Base S Prep I	ampl Date:	e:B0801027- 1/11/2008	-02B	
Samp. Anal. Date: DUP Anal. Date:	1/16/2008 1/16/2008	1:50:18PI 1:50:18PI	M M					Units: Matrix	: :	mg/L Aqueous		
Analyte Name	Sa	mpResult	DU	PRes.	<u>RPD</u>	<u>RPDLi</u>	<u>n I</u>	Flag				
Total Dissolved So	olids	3,070	3,0	60	0.3	20						
					LC	S/LCSD F	REPORT					

Detailed An	alytical Report A	Analytica Environmental Laboratories, Inc.							
Workorder (SDG):): B0801027								
Project:	Navajo Mine Extension Leaching	Study							
Client:	Applied Hydrology Associates, Inc	с.							
Client Project Numb	er: none								
Tests Run at:	Analytica Environmental Laboratories - Thorn	ton, Colorado							
Workorder (SDG):	B0801027								
Project:	Navajo Mine Extension Leaching Study OLIALITY	CONTROL REPORT							
Project Number:	T090111012								
Prep Batch:	1080111013								
	LCS/I	LCSD REPORT							
Analysis:	160.1 - Total Dissolved Solids dried at $180^\circ\mathrm{C}$	- TDS MB: T080111013-MB							
		Prep Date: 1/11/2008							
MB Anal. Date:	1/16/2008 1:50:18PM	Units: mg/L							
LCS Anal. Date:	1/16/2008 1:50:18PM LCSD Anal. Date: 1/	(16/2008 1:50:18PM Matrix: Aqueous							
Analyte Name	SampResult LCSRes. SDRes. SPLev SF	PDLev <u>Recov.</u> <u>SD Recov</u> <u>RPD</u> <u>Recov Lim</u> <u>RPDLim</u> <u>Flag</u>							
Total Dissolved Soli	ds ND 815 826 825	825 98.8 100.1 1.3 80 - 120 20							
	Μ	IS REPORT							
Analysis:	160.1 - Total Dissolved Solids dried at 180°C	- TDS Parent: B0801027-02B							
		Prep Date: 1/11/2008							
Samp. Anal. Date:	1/16/2008 1:50:18PM	Units: mg/L							
MS Anal. Date:	1/16/2008 1:50:18PM	Matrix: Aqueous							
Analyte Name	SampResult MSRes. SPLev	Recov. Recov Lim Flag							
Total Dissolved Soli	ds 3,070 3,850 825	94.5 70 - 130							
Prep Batch:	T080117001								
	SAMPI F D	UDI ICATE REDORT							
Analysis	150.1 - pH Elecrometric - pH	Base Sample: B0801027-02B							
Anarysis.	150.1 pH, Electometric pH	Prep Date: 1/5/2008							
Samn Anal Date:	1/5/2008 9·29·27AM	Units: nH							
DUP Anal. Date:	1/5/2008 9:29:27AM	Matrix: Aqueous							
Analyte Name	SampResult DUPRes. <u>RPD</u>	<u>RPDLim</u> <u>Flag</u>							
pn	6.97 0.27 0.0	20							
Dran Ratah	T080117013								
гтер Басп:	100011/015								
	SAMPLE D	UPLICATE REPORT							

Detailed Analytical Report					Analytica Environmental Laboratories, Inc.							
Workorder (SDG): B0801027												
Project:	Navajo Mine Extension Leaching Study											
Client:	Appl	ied Hydro	logy Asso	ociates,	Inc.							
Client Project Numb	ber: none											
Tests Run at: Workorder (SDG): Project: Project Number:	Analytica Envir B0801027 Navajo Mine E	onmental L xtension Le	aborator eaching S QU	ies - The tudy UALI	ornton, Col	orado TROL	, REPC	ORT				
Prep Batch:	T080117013											
Analysis:	310.1 - Alkalini	ty, Titrime	SA tric (pH 4	AMPLE 4.5) - Al	E DUPLIC kalinity	ATE RE	E PORT Ba Pr	se Samp ep Date:	le:B0801027 1/17/2008	-02B		
Samp. Anal. Date: DUP Anal. Date:	1/17/2008 2:3 1/17/2008 2:3	1:55PM 1:55PM					Uı M	nits: atrix:	mg/L Aqueous			
<u>Analyte Name</u> Bicarbonate	<u>SampRa</u> 1,2	<u>esult</u> <u>DU</u> 501,2	U <u>PRes.</u> 240	<u>RPD</u> 0.8	<u>RPDLir</u> 20	<u>n 1</u>	<u>Flag</u>					
Carbonate	228	3 24	8	8.4	20							
Analysis:	310.1 - Alkalini	ty, Titrime	tric (pH 4	LC 4.5) - Al	C S/LCSD R kalinity	EPORT	Г МІ Pr	B: ep Date:	T0801170 1/17/2008	13-MB		
MB Anal. Date:	1/17/2008 2:3	1:55PM					U	nits:	mg/L			
LCS Anal. Date:	1/17/2008 2:3	1:55PM LC	CSD Anal	l. Date:	1/17/2008	2:31:5	5PM M	atrix:	Aqueous			
Analyte Name Bicarbonate	<u>SampResult</u> ND	<u>LCSRes.</u> 28.0	<u>SDRes.</u> 26.0	<u>SPLev</u> 25.0	<u>SPDLev</u> 25.0	<u>Recov.</u> 112.0	<u>SD Reco</u> 104.0	<u>ov</u> <u>RPI</u>) 7.4	<u>Recov Lim</u> 80 - 120	<u>RPDLim</u> 20	<u>Flag</u>	
Carbonate	ND	51.0	49.0	50.0	50.0	102.0	98.0	4.0	80 - 120	20		
					MS REPO	ORT						
Analysis:	310.1 - Alkalini	ty, Titrime	tric (pH 4	4.5) - Al	kalinity		Pa Pr	rent: ep Date:	B0801027 1/17/2008	-02B		
Samp. Anal. Date:	1/17/2008 2:3	1:55PM					U	nits:	mg/L			
MS Anal. Date:	1/17/2008 2:3	1:55PM					М	atrix:	Aqueous			
<u>Analyte Name</u> Bicarbonate	<u>SampResult</u> 1,250	<u>MSRes.</u> 1,280		<u>SPL</u> 50.0	<u>ev</u>	<u>Recov.</u> 60.0			<u>Recov Lim</u> 70 - 130	NOTE 2	<u>Flag</u>	
Carbonate	228	296		100		68.0			70 - 130	lowMS		

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801027 Navajo Mine Extension Leaching Study **Project: Client:** Applied Hydrology Associates, Inc. none

Client Project Number:

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical ReportAnalytica Environmental Laboratories, Inc.					
Workorder (SDG): B	0801027				
Project:	Navajo Mine Ex	tension Leaching Stud	y		
Client:	Applied Hydrolo	ogy Associates, Inc.			
Client Project Number:	none				
	Q	C BATCH ASSOCIATIO	NS - BY METHOD BLAN	K	
Lab Project ID:	82,878	Lab Project Number:	B0801027		
				Prep Date: 1/7/2008	
Lab Method Blank Id:	T080107001-MB				
Prep Batch ID:	T080107001				
Method:	Inorganic Anions	by Ion Chromatography	- Anions by IC		
This Method blank and	sample preparation batch	are associated with the fo	llowing samples, spikes, and	duplicates:	
<u>SampleNum</u>	<u>ClientSampleName</u>]	DataFile	<u>AnalysisDate</u>	
T080107001-LCS	LCS		080107_020.DXD	1/7/2008 6:27:53PM	
T080107001-LCSD	LCSD		080107_021.DXD	1/7/2008 6:46:17PM	
B0801018-08B	Batch QC		080107_036.DXD	1/7/2008 11:22:10PM	
B0801027-01B	MB		080107_047.DXD	1/8/2008 2:44:31AM	
B0801027-01B	MB		080107_049.DXD	1/8/2008 3:21:16AM	
B0801027-02B	4 Corners PP Bottom	Ash Leachate	080107_051.DXD	1/8/2008 3:58:04AM	
B0801027-02B	4 Corners PP Bottom	Ash Leachate	080107_053.DXD	1/8/2008 4:34:49AM	
T080107001-LCS	LCS		080108_010.DXD	1/8/2008 12:31:14PM	
T080107001-LCSD	LCSD		080108_011.DXD	1/8/2008 12:49:38PM	
B0801018-08B-DUP	DUP		080108_026.DXD	1/8/2008 5:25:29PM	
B0801018-08B-MS	MS		080108_027.DXD	1/8/2008 5:43:52PM	
B0801027-02B-MS	MS		080108_052.DXD	1/9/2008 1:23:44AM	
B0801027-02B-MS	MS		080108_056.DXD	1/9/2008 2:37:21AM	
B0801018-08B	Batch QC		080111_042.DXD	1/12/2008 12:33:51AM	
B0801018-08B-DUP	DUP		080111_043.DXD	1/12/2008 12:52:16AM	
				Prep Date: 1/8/2008	
Lab Method Blank Id:	T080108012-MB				
Prep Batch ID:	T080108012				
Method:	Sw/4/0A - Merc	ury in Liquid waste by	CVAA - Total Hg		
I his Method blank and	sample preparation batch	are associated with the fo	llowing samples, spikes, and	a duplicates:	
SampleINUM	<u>ClientSampleName</u>	<u> </u>		$\frac{\text{AllarysisDate}}{1/8/2008} = 5.17.11\text{DM}$	
B0801027-01A	MD	Ash I sashata	B010807W.WKS	1/8/2008 5:17:11PM	
BU801027-02A	4 Corners PP Bottom	Asn Leachate	BUIU8U/W.WKS	1/8/2008 5:19:1/PM	
1080108012-LCS	LCS		BU1080/W.WKS	1/8/2008 5:10:50PM	
1080108012-LCSD	LC2D		BUIU8U/W.WKS	1/8/2008 5:12:54PM	
B0801027-02A-DUP	DUP		B010807W.WKS	1/8/2008 5:21:31PM	
B0801027-02A-MS	MS MSD		B010807W.WKS	1/8/2008 5:23:34PM	
B0801027-02A-MSD	MSD		B010807W.WKS	1/8/2008 5:25:40PM	
B0801027-02A-PDS	PDS		B010807W.WKS	1/8/2008 5:27:45PM	

Detailed Analyti	ical Report	Analytica Environmental Laboratories, Inc.						
Workorder (SDG): B	0801027							
Project:	Navajo Mine Exte	nsion Leaching Stud	y					
Client:	Applied Hydrolog	y Associates, Inc.						
Client Project Number:	none							
	QC	BATCH ASSOCIATIO	ONS - BY METHOD BLA	NK				
Lab Project ID:	82,878	Lab Project Number	: B0801027					
				Prep Date: 1/8/2008				
Lab Method Blank Id:	T080108015-MB							
Prep Batch ID:	T080108015							
Method:	SW6010B - ICP - 1	otal						
This Method blank and	sample preparation batch a	re associated with the fo	ollowing samples, spikes, a	nd duplicates:				
SampleNum	<u>ClientSampleName</u>		DataFile	AnalysisDate				
B0801027-01A	MB		E01088A	1/8/2008 7:53:00PM				
B0801027-02A	4 Corners PP Bottom A	Ash Leachate	E01088A	1/8/2008 7:58:00PM				
T080108015-LCS	LCS		E01088A	1/8/2008 7:43:00PM				
T080108015-LCSD	LCSD		E01088A	1/8/2008 7:48:00PM				
B0801027-02A-DUP	DUP		E01088A	1/8/2008 8:03:00PM				
B0801027-02A-MS	MS		E01088A	1/8/2008 8:23:00PM				
B0801027-02A-MSD	MSD		E01088A	1/8/2008 8:28:00PM				
B0801027-02A-PDS	PDS		E01088A	1/8/2008 8:33:00PM				
B0801027-01A	MB		E01098A	1/9/2008 1:35:00PM				
B0801027-02A	4 Corners PP Bottom A	Ash Leachate	E01098A	1/9/2008 1:40:00PM				
T080108015-LCS	LCS		E01098A	1/9/2008 1:10:00PM				
T080108015-LCSD	LCSD		E01098A	1/9/2008 1:15:00PM				
B0801027-02A-DUP	DUP		E01098A	1/9/2008 1:45:00PM				
B0801027-02A-MS	MS		E01098A	1/9/2008 1:50:00PM				
B0801027-02A-MSD	MSD		E01098A	1/9/2008 1:56:00PM				
B0801027-02A-PDS	PDS		E01098A	1/9/2008 2:01:00PM				
				Prep Date: 1/11/2008				
Lab Method Blank Id:	T080111013-MB							
Prep Batch ID:	T080111013							
Method:	160.1 - Total Dissol	lved Solids dried at 18	30°C - TDS					
This Method blank and	sample preparation batch a	re associated with the fo	ollowing samples, spikes, a	nd duplicates:				
SampleNum	<u>ClientSampleName</u>		DataFile	AnalysisDate				
B0801027-01B	MB			1/16/2008 1:50:18PM				
B0801027-02B	4 Corners PP Bottom A	Ash Leachate		1/16/2008 1:50:18PM				
T080111013-LCS	LCS			1/16/2008 1:50:18PM				
T080111013-LCSD	LCSD			1/16/2008 1:50:18PM				
B0801027-02B-DUP	DUP			1/16/2008 1:50:18PM				
B0801027-02B-MS	MS			1/16/2008 1:50:18PM				

Detailed Analy	tical Report	Analytica E	Invironmental Laborat	tories, Inc.
Workorder (SDG):]	B0801027			
Project:	Navajo Mine I	Extension Leaching Study		
Client:	Applied Hydro	ology Associates, Inc.		
Client Project Number:	none			
		QC BATCH ASSOCIATIONS -	BY METHOD BLANI	K
Lab Project ID:	82,878	Lab Project Number:	B0801027	
				Prep Date: 1/17/2008
Lab Method Blank Id:	T080117013-M	IB		
Prep Batch ID:	T080117013			
Method:	310.1 - Alkalini	ity, Titrimetric (pH 4.5) - Alkal	inity	
This Method blank and	sample preparation ba	tch are associated with the followi	ng samples, spikes, and	duplicates:
SampleNum	ClientSampleName	DataF	lile	<u>AnalysisDate</u>
B0801027-01B	MB			1/17/2008 2:31:55PM
B0801027-02B	4 Corners PP Botto	om Ash Leachate		1/17/2008 2:31:55PM
T080117013-LCS	LCS			1/17/2008 2:31:55PM
T080117013-LCSD	LCSD			1/17/2008 2:31:55PM
B0801027-02B-DUP	P DUP			1/17/2008 2:31:55PM
B0801027-02B-MS	MS			1/17/2008 2:31:55PM

Workorder (SDG): B0801027

Project: Navajo Mine Extension Leaching Study

Client: Applied Hydrology Associates, Inc.

none

Client Project Number:

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.

Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

ND = Not Detected at or above the Reporting Limit

NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit

HIGH = Recovery, RPD, or other parameter is above Upper Control Limit

E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank

J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)

W = Post digestion spike did not meet criteria

S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)

PQL = "practical quantitation limit", from SW-846

EQL = "estimated quantitation limit", from SW-846

LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.

The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Analytica Environmental Laboratories, Inc.

Workorder (SDG):	B0801027
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Number:	none

REPORTING CONVENTIONS FOR THIS REPORT B0801027 **TestPkgName** <u># Sig Figs</u> **Reporting Limit Basis** 150.1/150.1 (Aqueous) - pH As Received 2 Report to PQL 160.1/160.1 (Aqueous) - TDS 2 Report to PQL As Received 2 300.0/300.0 (Aqueous) - Anions by IC Report to PQL As Received 2 2 310.1/310.1 (Aqueous) - Alkalinity As Received Report to PQL 6010B/3010A (Aqueous) - Total As Received Report to PQL 2 7470A/7470A (Aqueous) - Total Hg Report to PQL As Received

•

1



Cooler Receipt Form

Client: Project	Applied Hydrolog Navajo Mine Exte	y Associates Cli ension Leaching \$	ent Code: 03 Study	0188		Order #:	B0801027
Cooler	ID: 1						
A. <u>Prel</u>	iminary Examination	<u>Phase</u> :	Date cooler o Cooler opene	pened: d by:	1/7/2008 gp	Signature:	GP
1. Wa	s airbill Attached?	N/A	Airbill #:			Carrier Name: Ot	her
2. Cu	stody Seals?	N/A	How many?	0	Location:	Seal I	Name:
3. Sea	als intact?	N/A					
4. CO	C Attached?	Yes	Properly Com	pleted?	Yes	Signed by AEL emp	loyee? Yes
5. Pro	ject Identification fro	m custody paper:	Navajo	Mine Ext	tension Leachir	ng Study	
6. Pre	servative:	None		Tempera	ture: 3.1 de	eg. C	
Designa	ated person initial her	e to acknowledge	receipt:		6F		Pate: 1/7/08

COMMENTS:

В.	Log-in Phase: Samples Log-in	Date: 1/7/2008	Log-in By: gp		
1	Packing Type:	Other			
2	Were samples in separate bags?	N/A			
3	Were containers intact?	Yes	Labels agree with COC?	Yes	
4	Number of bottles received:	4	Number of samples received:	2	
5.	Correct containers used?	Yes	Correct preservatives added?	Yes	
6.	Sufficient sample volume?	Yes			
7.	Bubbles in VOA samples?	N/A			
8.	Was Project manager called and state	us discussed?	No		
9.	Was anyone called? No	Who was called?	By whom?	I	Date:
СС	MMENTS:				

Remit to:	Accounting Dpt	Invoice #:	82649
	Analytica Environmental Laboratories, Inc.	Work Order#:	B0801191
	P.O. Box 973426	Account#:	030188
	Dallas,TX 75397-3426	Quote ID#:	11340
		Invoice Date:	2/11/2008
		Work ID:	Navajo Mine Extension
Phone:	(303) 469-8868	PO #:	Leaching Study
Attention:	Mr.Art O'Hayre	Received:	1/28/2008
Invoice to:	Applied Hydrology Associates, Inc.	Reported:	2/11/2008
	950 South Cherry Street	Client Project#:	Navajo Mine Extension Leach
	Suite 810	-	
	Denver, CO 80246		

Comments:

Item charges		<u>Oty</u>	Price	<u>Total</u>	
SW7470A - Mercury in Liquid Waste by CVAA - Total Hg In Aqueous	М	6	35.00	210.00	
160.1 - Total Dissolved Solids dried at 180°C - TDS In Liquid	Matrix	6	22.00	132.00	
150.1 - pH, Elecrometric - pH In Liquid Matrix		6	10.00	60.00	
SW6010B - ICP - Total In Aqueous Matrix		6	312.00	1,872.00	
Inorganic Anions by Ion Chromatography - Anions by IC In Liquid	Matrix	6	54.00	324.00	
310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity In Liquid	Matrix	6	36.00	216.00	
	Total of It	ems Above	\$2,814.00		
Adjustments or Special Services		<u>Oty</u>	Price	<u>Total</u>	
Tumbling Charge		5	95.00	475.00	
	Total of It	ems Above	:	\$475.00	
	Grand Tot	tal:		\$3,289.00	

All invoices are due and payable upon receipt. Outstanding balances over 30 days are subject to a finance charge of 1.5% per month, plus a late fee of \$25.00. If Analytica engages legal counsel to enforce its rights or any other rights under an application for payment, the customer will be liable to Analytica for all costs of collection and other legal expenses, including reasonable attorney fees.

REMITTANCE ADVICE PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Mr.Art O'Hayre		Account#:	030188
Applied Hydrology Associates, Inc.		Invoice #:	82649
950 South Cherry Street		Invoice Date:	2/11/2008
Suite 810 Denver, CO 80246			
TOTAL INVOICE AMOUNT:	\$3,289.00		

PAYMENT AMOUNT ENCLOSED:



2/11/2008 Applied Hydrology Associates, Inc. 950 South Cherry Street Suite 810 Denver, CO 80246 Attn: Art O'Hayre Analytica Environmental Laboratories, Inc. 12189 Pennsylvania Street Thornton, CO 80241 Phone: 303-469-8868 Fax: 303-469-5254

Work Order #: B0801191 Date: 2/11/2008 Work ID: Navajo Mine Extension Leaching Study Date Received: 1/28/2008 Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801191-01	MB 45 day	B0801191-02	Ash Composite 45 day
B0801191-03	Spoil Composite 45 day	B0801191-04	MB SPLP
B0801191-05	Ash Composite SPLP	B0801191-06	Spoil Composite SPLP

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Kristen Stone Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0801191

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT: Six (6) samples were received on 1/28/2008 12:35:00 PM., at a temperature of 6 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody. The samples were tumbled at the laboratory.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality contro parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: 150.1 - pH, Elecrometric - pH - Aqueous Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous MS/MSD and DUP OUTLIERS:

As shown below, the MSD was outside of limits for Calcium. The sample had Calcium concentrations greater than four times the spike amount. In these cases it is not appropriate to calculate a recovery. The result should be used as a replicate.

Туре	Client	Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MSD A	Ash Com	posite SP	B0801191-05A	Calcium	-11.	75	125	562	10.0

Detailed Ana	lytical Report		Ana	Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0801191									
Project:	Navajo Mine	Extension	Leaching Stu	ldy						
Client:	Applied Hyd	ology Ass	ociates, Inc.							
Client Project Numbe	er: none									
Report Section	: Client	t Samp	le Report							
Client Sample Name:	MD 45 d		1							
		ay			Collection Data	1/25/2008	2.00.00PM			
Matrix:	Aqueous				Collection Date:	1/23/2008	2.00.001 101			
The following test was	conducted by: Analytica -	Thornton								
Lab Sample Number:	B0801191-01A				Analysis Date:	1/31/200	8 1:50:33PM			
Prep Date:	1/29/2008				Instrument:	CVAA_1				
Analytical Method ID:	SW7470A - Mercury in I	Liquid Wast	e by CVAA - T	otal Hg	File Name:	B013108	W.W			
Prep Method ID:	7470A				Dilution Factor:	1				
Prep Batch Number:	T080131004									
Report Basis:	As Received				Analyst Initials:	DL				
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00	ml			
Analyte	CASNo	Result	Flags Units	POL M	IDL		run #:			
Mercury	7439-97-6	ND	mg/L	0.000200.0	000050		1			
The following test was	conducted by: Analytica -	Thornton								
Lab Sample Number:	B0801191-01A				Analysis Date:	1/30/200	8 12:59:00PM			
Prep Date:	1/29/2008				Instrument:	ICP 2				
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E01308A	1			
Prep Method ID:	3010_ICP				Dilution Factor:	1				
Prep Batch Number:	T080129008									
Report Basis:	As Received				Analyst Initials:	rm				
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00	ml			
Analyte	CASNo	Result	Flags Units	PQL M	IDL		run #:			
Aluminum	7429-90-5	0.85	mg/L	0.050 (0.014		1			
Antimony	7440-36-0	ND	mg/L	0.050 0	.0067					
Arsenic	7440-38-2	ND	mg/L	0.10 (0.015					
Barium	7440-39-3	0.081	mg/L	0.010 0.	00016					
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0	000060					
Boron	7440-42-8	0.32	mg/L	0.050 0	.0018					
Cadmium	7440-43-9	ND	mg/L	0.0060 0.	00051					
Calcium	7440-70-2	3.0	mg/L	0.10 (0.013					
Chromium	7440-47-3	ND	mg/L	0.010 0	.0018					
Cobalt	7440-48-4	ND	mg/L	0.0050 0	.0016					
Copper	7440-50-8	0.14	mg/L	0.0050 0	.0019					
Iron	7439-89-6	ND	mg/L	0.050 0	.0027					
Lead	7439-92-1	ND	mg/L	0.050 (0.011					
Lithium	7439-93-2	ND	mg/L	0.10 0.	00072					
Magnesium	7439-96-4	1.2	mg/L	0.10 (0.012					
Manganese	7439-96-5	ND	mg/L	0.010 0.	00066					
Molybdenum	7439-98-7	0.013	mg/L	0.010 0	.0018					
Nickel	7440-02-0	ND	mg/L	0.040 0	.0027					
Potassium	7440-09-7	12	mg/L	1.0	0.31					
Selenium	7784-49-2	ND	mg/L	0.10 (0.026					
Silver	7440-22-4	ND	mg/L	0.015 0.	00066					
			č							

Detailed Analytical Report Analytica Environmental Laboratories, Inc.									
Workorder (SDG):	B0801	191							
Project:		Navajo Mir	ne Extension	Leaching Stu	dy				
Client:		Applied Hy	drology Asso	ciates, Inc.					
Client Project Numbe	r:	none							
Report Section	:	Clie	nt Sample	e Report					
Client Sample Name:		MB 45	day	_					
Matrix:	Aqu	ieous				C	ollection Date:	1/25/2008	2:00:00PM
Lab Sample Number:	B08011	91-01A					Analysis Date:	1/30/200	8 12:59:00PM
Prep Date:	1/29/20	08					Instrument:	ICP_2	
Analytical Method ID:	SW6010	B - ICP - Tota	al				File Name:	E01308A	Α
Prep Method ID:	3010_IC	CP					Dilution Factor:	1	
Prep Batch Number:	T08012	9008							
Report Basis:	As Recei	ved					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml
<u>Analyte</u> Sodium		<u>CASNo</u> 7440-23-5	<u>Result</u> 1,200	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1
Thallium		7440-28-0	ND	mg/L	0.40	0.011			
Vanadium		7440-62-2	ND	mg/L	0.010	0.0007	2		
Zinc		7440-66-6	0.0053	mg/L	0.0050	0.0010	0		
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	conducted B08011 2/4/200 310.1 - A Alkalini T08020	by: Analytica 91-01B 8 Ikalinity, Titri ty_W 5001	a - Thornton metric (pH 4.5)	- Alkalinity			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 Titrametr 1	9:52:02AM ic
Report Basis:	As Recei	ved					Analyst Initials:	cs	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml
<u>Analyte</u> Bicarbonate Carbonate		<u>CASNo</u>	<u>Result</u> 1,200 260	<u>Flags</u> <u>Units</u> mg/L mg/L	<u>POL</u> 5.0 7.0	<u>MDL</u> 1.5 1.2			<u>run #:</u> 1
The following test was	conducted	by: Analytica	a - Thornton						
Lab Sample Number: Prep Date: Analytical Method ID:	B08011 1/25/20 150.1 - p	91-01B 08 H, Elecrometr	ric - pH				Analysis Date: Instrument: File Name:	1/25/200 Probe	8 2:10:00PM
Prep Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T08020	1005							
Report Basis:	As Recei	ved					Analyst Initials:	R. Seemar	1
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00	ml
<u>Analyte</u> pH		<u>CASNo</u>	<u>Result</u> 8.7	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Ana	lytical Rep	port			Analyt	ica En	vironn	nmental Laboratories, Inc.			
Workorder (SDG):	B0801191										
Project:	Nav	ajo Mine H	Extension 1	Leachi	ing Study						
Client:	Арр	lied Hydro	ology Asso	ciates,	Inc.						
Client Project Number	r: none	e									
Report Section	:	Client	Sample	e Rep	oort						
Client Sample Name:	N	/IB 45 da	y y	-							
Matrix:	Aqueous		-				С	Collection Date:	1/25/2008	2:00:00PM	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801191-0 1/31/2008 160.1 - Total 1 160.1)1B Dissolved So	olids dried a	t 180°C	C - TDS			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 SCALE 1	8 12:47:24PM	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T080131008 As Received 100.00 r	3 nl						Analyst Initials: Prep Extract Vol:	kl 1.00	ml	
Analyte Total Dissolved Solids	CAS	<u>No</u>	<u>Result</u> 3,000	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1	
The following test was	conducted by: A	Analytica - T	hornton								
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801191-0 1/30/2008 Inorganic Ani 300.0)1B ons by Ion C	Chromatogra	iphy - A	Anions by I	С		Analysis Date: Instrument: File Name: Dilution Factor:	1/30/200 IC 080130_ 25	08 4:18:17PM _011.D	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T080130013 As Received 20.00 r	3 nl						Analyst Initials: Prep Extract Vol:	KB 20.00	ml	
Analyte Chloride	CAS	<u>No</u>	<u>Result</u> 600	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801191-0 1/30/2008 Inorganic Ani 300.0	01B ons by Ion C	Thromatogra	iphy - A	Anions by I	С		Analysis Date: Instrument: File Name: Dilution Factor:	1/30/200 IC 080130_ 1	08 9:12:31PM _027.D	
Prep Batch Number:	108013001: As Received)						A poly of Initiala	KB		
Sample pren wt./vol·	20.00 r	nl						Prep Extract Vol	20.00	ml	
Analyte Fluoride Sulfate	<u>CAS</u>	<u>No</u>	<u>Result</u> 2.2 280	<u>Flags</u>	<u>Units</u> mg/L mg/L	POL 0.40 1.5	<u>MDL</u> 0.031 0.11		20.00	<u>run #:</u> 2	

Detailed Ana	lytical Report		Ana	Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0801191									
Project:	Navajo Min	e Extension	Leaching Stu	ıdy						
Client:	Applied Hyd	Irology Ass	ociates, Inc.							
Client Project Numbe	r: none		,							
Report Section	: Clien	ıt Sampl	e Report							
Client Sample Name:	Ash Co	mposite 4	5 day							
Matrix:	Aqueous				Collection Date:	1/25/2008 2	:00:00PM			
The following test was	conducted by: Analytica	- Thornton								
Lab Sample Number:	B0801191-02A				Analysis Date:	1/31/2008	2:39:43PM			
Prep Date:	1/29/2008				Instrument:	CVAA_1				
Analytical Method ID:	SW7470A - Mercury in	Liquid Wast	e by CVAA - T	otal Hg	File Name:	B013108V	V.W			
Prep Method ID:	7470A				Dilution Factor:	1				
Prep Batch Number:	T080131004									
Report Basis:	As Received				Analyst Initials:	DL				
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 1	nl			
	CLEN			DOL N			<i>4</i> 1.			
Analyte Mercury	<u>CASNo</u> 7439-97-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> <u>M</u> 0.000200.0	<u>DL</u> 000050		<u>run #:</u> 1			
The following test was	conducted by: Analytica	- Thornton								
Lab Sample Number:	B0801191-02A				Analysis Date:	1/30/2008	1:04:00PM			
Prep Date:	1/29/2008				Instrument:	ICP_2				
Analytical Method ID:	SW6010B - ICP - Tota	l			File Name:	E01308A				
Prep Method ID:	3010_ICP				Dilution Factor:	1				
Prep Batch Number:	T080129008									
Report Basis:	As Received				Analyst Initials:	rm				
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00	nl			
Analyte	CASNo	Result	<u>Flags</u> <u>Units</u>	PQL M	<u>IDL</u>		<u>run #:</u>			
Aluminum	7429-90-5	4.6	mg/L	0.050 ().014		1			
Antimony	7440-36-0	ND	mg/L	0.050 0	.0067					
Arsenic	7440-38-2	ND	mg/L	0.10 (0.015					
Barium	7440-39-3	0.033	mg/L	0.010 0.	00016					
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0)00060					
Boron	7440-42-8	2.6	mg/L	0.050 0	.0018					
Cadmium	7440-43-9	ND	mg/L	0.0060 0.	00051					
Calcium	7440-70-2	530	mg/L	0.10 ().013					
Chromium	7440-47-3	0.031	mg/L	0.010 0	.0018					
Cobalt	7440-48-4	ND	mg/L	0.0050 0	.0016					
Copper	7440-50-8	0.72	mg/L	0.0050 0	.0019					
Iron	7439-89-6	0.071	mg/L	0.050 0	.0027					
Lead	7439-92-1	ND	mg/L	0.050 ().011					
Lithium	7439-93-2	0.14	mg/L	0.10 0.	00072					
Magnesium	7439-96-4	12	mg/L	0.10 (0.012					
Manganese	7439-96-5	0.12	mg/L	0.010 0.	00066					
Molybdenum	7439-98-7	0.15	mg/L	0.010 0	.0018					
Nickel	7440-02-0	ND	mg/L	0.040 0	.0027					
Potassium	7440-09-7	12	mg/L	1.0	0.31					
Selenium	7784-49-2	0.15	mg/L	0.10 (0.026					
Silver	7440-22-4	ND	mg/L	0.015 0.	00066					

Detailed Ana	lytical l	Report		Anal	Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0801	191										
Project:	ľ	Navajo Mine	Extension	Leaching Stu	dy							
Client:	A	Applied Hydr	ology Asso	ociates, Inc.								
Client Project Numbe	r: r	one										
Report Section	:	Client	Sampl	e Report								
Client Sample Name:		Ash Com	posite 4	5 day								
Matrix:	Aque	eous				C	ollection Date:	1/25/2008	2:00:00PM			
Lab Sample Number:	B080119	91-02A					Analysis Date:	1/30/200	8 1:04:00PM			
Prep Date:	1/29/200	8					Instrument:	ICP_2				
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E01308A	L			
Prep Method ID:	3010_IC	Р					Dilution Factor:	1				
Prep Batch Number:	T080129	0008										
Report Basis:	As Receiv	ed					Analyst Initials:	rm				
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml			
<u>Analyte</u> Sodium	7	<u>CASNo</u> 440-23-5	<u>Result</u> 1,200	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1			
Thallium	7	440-28-0	ND	mg/L	0.40	0.011						
Vanadium	7	440-62-2	0.10	mg/L	0.010	0.0007	2					
Zinc	7	440-66-6	0.098	mg/L	0.0050	0.0010)					
The following test was	conducted l	oy: Analytica -	Thornton									
Lab Sample Number:	B080119	91-02B					Analysis Date:	2/4/2008	9:52:02AM			
Prep Date:	2/4/2008	5					Instrument:	Titrametr	ic			
Analytical Method ID:	310.1 - Al	kalinity, Titrime	etric (pH 4.5)) - Alkalinity			File Name:					
Prep Method ID:	Alkalinit	y_W					Dilution Factor:	1				
Prep Batch Number:	T080205	5001										
Report Basis:	As Receiv	red					Analyst Initials:	cs				
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml			
<u>Analyte</u>	<u>(</u>	CASNo	Result	<u>Flags</u> <u>Units</u>	<u>PQL</u>	MDL			<u>run #:</u>			
Bicarbonate			1,100	mg/L	5.0	1.5			1			
Carbonate			ND	mg/L	7.0	1.2						
The following test was	conducted l	oy: Analytica -	Thornton									
Lab Sample Number:	B080119	91-02B					Analysis Date:	1/25/200	8 2:10:00PM			
Prep Date:	1/25/200	18					Instrument:	Probe				
Analytical Method ID:	150.1 - pF	I, Elecrometric	- pH				File Name:					
Prep Method ID:	150.1						Dilution Factor:	1				
Prep Batch Number:	T080201	.005										
Report Basis:	As Receiv	ed					Analyst Initials:	R. Seemar				
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00	ml			
<u>Analyte</u> pH	<u>9</u>	<u>CASNo</u>	<u>Result</u> 7.8	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1			

Detailed Analytical Report Analytica Env						vironr	ironmental Laboratories, Inc.				
Workorder (SDG):	B0801	191									
Project:]	Navajo Mi	ne Extension	Leaching Stud	l y						
Client:		Applied Hy	drology Asso	ciates, Inc.							
Client Project Number	r:	none									
Report Section	:	Clie	nt Sample	e Report							
Client Sample Name:		Ash Co	omposite 45	day							
Matrix:	Aqu	eous				C	Collection Date:	1/25/2008	2:00:00PM		
Lab Sample Number: Prep Date: Analytical Method ID:	B08011 1/31/200 160.1 - T	91-02B 08 otal Dissolve	ed Solids dried a	t 180°C - TDS			Analysis Date: Instrument: File Name:	2/4/2008 SCALE	3 12:47:24PM		
Prep Method ID:	160.1						Dilution Factor:	1			
Prep Batch Number: Report Basis: Sample prep wt./vol:	T08013 As Receiv 100.00	1008 ved ml					Analyst Initials: Prep Extract Vol:	kl 1.00	ml		
Analyte Total Dissolved Solids		<u>CASNo</u>	<u>Result</u> 5,300	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1		
The following test was	conducted	by: Analytic	a - Thornton								
Lab Sample Number: Prep Date: Analytical Method ID:	B08011 1/30/200 Inorganic	91-02B 08 Anions by I	on Chromatogra	phy - Anions by	IC		Analysis Date: Instrument: File Name:	1/30/200 IC 080130_	08 4:36:41PM 012.D		
Prep Method ID:	300.0						Dilution Factor:	25			
Prep Batch Number: Report Basis: Sample prep wt./vol:	T08013 As Receiv 20.00	0013 ved ml					Analyst Initials: Prep Extract Vol:	КВ 20.00	ml		
Analyte Chloride		<u>CASNo</u>	<u>Result</u> 610	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1		
Sulfate			2,500	mg/L	38	2.8					
Lab Sample Number: Prep Date: Analytical Method ID:	B08011 1/30/200 Inorganic	91-02B 08 Anions by I	on Chromatogra	phy - Anions by	IC		Analysis Date: Instrument: File Name:	1/30/200 IC 080130	08 9:49:17PM 029.D		
Prep Method ID:	300.0						Dilution Factor:	1	-		
Prep Batch Number: Report Basis: Sample prep wt./vol:	T08013 As Receiv 20.00	0013 ved ml					Analyst Initials: Prep Extract Vol:	КВ 20.00	ml		
<u>Analyte</u> Fluoride		<u>CASNo</u>	<u>Result</u> 8.2	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.03	1		<u>run #:</u> 2		

Detailed Ana	lytical Report		Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0801191								
Project:	Navajo Mir	ne Extension	Leaching Stu	ıdy					
Client:	Applied Hy	drology Ass	ociates, Inc.						
Client Project Numbe	r: none		,						
Report Section	: Clie	nt Sampl	e Report						
Client Sample Name:	Spoil C	composite	45 day						
Matrix:	Aqueous				Collection Date:	1/25/2008 2:	00:00PM		
The following test was	conducted by: Analytic	a - Thornton							
Lab Sample Number:	B0801191-03A				Analysis Date:	1/31/2008	2:41:52PM		
Prep Date:	1/29/2008				Instrument:	CVAA_1			
Analytical Method ID:	SW7470A - Mercury i	n Liquid Wast	e by CVAA - T	otal Hg	File Name:	B013108W	′.W		
Prep Method ID:	7470A				Dilution Factor:	1			
Prep Batch Number:	T080131004								
Report Basis:	As Received				Analyst Initials:	DL			
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 n	nl		
Analyte	CASNo	Recult	Flage Unite	ροι λ			run #•		
Mercury	7439-97-6	ND	mg/L	0.000200.	000050		1		
The following test was	conducted by: Analytica	a - Thornton							
Lab Sample Number:	B0801191-03A				Analysis Date:	1/30/2008	1:09:00PM		
Prep Date:	1/29/2008				Instrument:	ICP_2			
Analytical Method ID:	SW6010B - ICP - Tot	al			File Name:	E01308A			
Prep Method ID:	3010_ICP				Dilution Factor:	1			
Prep Batch Number:	T080129008								
Report Basis:	As Received				Analyst Initials:	rm			
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 n	ıl		
Analyte	CASNo	Result	Flags Units	PQL N	IDL		<u>run #:</u>		
Aluminum	7429-90-5	0.38	mg/L	0.050	0.014		1		
Antimony	7440-36-0	ND	mg/L	0.050 0	0.0067				
Arsenic	7440-38-2	ND	mg/L	0.10	0.015				
Barium	7440-39-3	0.079	mg/L	0.010 0.	.00016				
Beryllium	7440-41-7	ND	mg/L	0.0010 0.	000060				
Boron	7440-42-8	0.36	mg/L	0.050 0	0.0018				
Cadmium	7440-43-9	ND	mg/L	0.0060 0.	00051				
	7440-70-2	56	mg/L	0.10	0.013				
Chromium	7440-47-3	ND	mg/L	0.010 0	0.0018				
Connan	7440-48-4		mg/L	0.0050 0	0.0010				
Leon	7440-50-8	0.053 ND	mg/L	0.0050 0	0.0019				
Load	7439-89-0	ND	mg/L	0.050	0.011				
Leau	7439-92-1	ND 0.11	mg/L	0.030	0.011				
Magnesium	7439-93-2	0.11	mg/L	0.10 0.	00072				
Manganese	7439-96-4	12	mg/L	0.10	00066				
Molybdonum	/439-96-5	0.098	ing/L	0.010 0.	00000				
Nickel	/439-98-7	0.015 ND	ing/L	0.010 0	0.0010				
Detection	/440-02-0		mg/L	1.040 (0.21				
Potassium	/440-09-7	14 ND	mg/L	1.0	0.024				
Silver	7740.22.4		mg/L	0.10	0.020				
Silver	7440-22-4	IND	mg/L	0.015 0.	.00000				

Detailed Ana	lytical I	Report		Ana	Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0801	191									
Project:	Ν	Navajo Mine I	Extension	Leaching St	udy						
Client:	A	Applied Hydr	ology Asso	ciates, Inc.							
Client Project Number	r: n	one									
Report Section	:	Client	Sample	e Report							
Client Sample Name:		Spoil Cor	nposite 4	l5 day							
Matrix:	Aque	eous				C	ollection Date:	1/25/2008	2:00:00PM		
Lab Sample Number:	B080119	01-03A					Analysis Date:	1/30/200	8 1:09:00PM		
Prep Date:	1/29/200	8					Instrument:	ICP_2			
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E01308A	Δ		
Prep Method ID:	3010_IC	Р					Dilution Factor:	1			
Prep Batch Number:	T080129	008									
Report Basis:	As Receiv	ed					Analyst Initials:	rm			
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml		
<u>Analyte</u> Sodium	<u>(</u> 74	<u>CASNo</u> 440-23-5	<u>Result</u> 1,200	Flags Units mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028	i		<u>run #:</u> 1		
Thallium	74	440-28-0	ND	mg/L	0.40	0.011					
Vanadium	74	440-62-2	ND	mg/L	0.010	0.0007	2				
Zinc	74	440-66-6	ND	mg/L	0.0050	0.0010)				
The following test was	conducted b	oy: Analytica - '	Thornton								
Lab Sample Number:	B080119	01-03B					Analysis Date:	2/4/2008	9:52:02AM		
Prep Date:	2/4/2008						Instrument:	Titrametr	ic		
Analytical Method ID:	310.1 - All	kalinity, Titrime	tric (pH 4.5)	- Alkalinity			File Name:				
Prep Method ID:	Alkalinit	y_W					Dilution Factor:	1			
Prep Batch Number:	T080205	001									
Report Basis:	As Receiv	ed					Analyst Initials:	CS			
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml		
Analyte	<u>(</u>	CASNo	<u>Result</u>	<u>Flags</u> <u>Units</u>	<u>PQL</u>	MDL			<u>run #:</u>		
Bicarbonate			960	mg/L	5.0	1.5			1		
Carbonate			ND	mg/L	7.0	1.2					
The following test was	conducted b	oy: Analytica - '	Thornton								
Lab Sample Number:	B080119	01-03B					Analysis Date:	1/25/200	8 2:10:00PM		
Prep Date:	1/25/200	8					Instrument:	Probe			
Analytical Method ID:	150.1 - pH	I, Elecrometric	- pH				File Name:				
Prep Method ID:	150.1						Dilution Factor:	1			
Prep Batch Number:	T080201	005									
Report Basis:	As Receiv	ed					Analyst Initials:	R. Seemar	1		
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00	ml		
<u>Analyte</u> pH	<u>(</u>	<u>CASNo</u>	<u>Result</u> 8.0	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1		

Detailed Ana	tailed Analytical Report					Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0801	191										
Project:]	Navajo Mi	ne Extension	Leachin	g Study							
Client:		Applied Hy	ydrology Asso	ciates, I	nc.							
Client Project Number	r:	none										
Report Section	:	Clie	nt Sample	e Repo	ort							
Client Sample Name:		Spoil (Composite 4	5 day								
Matrix:	Aqu	eous					C	Collection Date:	1/25/2008	2:00:00PM		
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B080119 1/31/200 160.1 - To 160.1	91-03B)8 otal Dissolve	ed Solids dried a	t 180°C -	TDS			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 SCALE 1	3 12:47:24PM		
Prep Batch Number: Report Basis: Sample prep wt./vol:	T08013 As Receiv 100.00	1008 ved ml						Analyst Initials: Prep Extract Vol:	kl 1.00	ml		
Analyte Total Dissolved Solids		<u>CASNo</u>	<u>Result</u> 3,500	<u>Flags</u> <u>U</u> m	nits ng/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1		
The following test was	conducted	by: Analytic	a - Thornton									
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B08011 1/30/200 Inorganic 300.0	91-03B)8 Anions by I	on Chromatogra	phy - An	ions by IC	C		Analysis Date: Instrument: File Name: Dilution Factor:	1/30/200 IC 080130_ 25	08 5:50:15PM 016.D		
Report Basis: Sample prep wt./vol:	As Receiv 20.00	ved ml						Analyst Initials: Prep Extract Vol:	КВ 20.00	ml		
<u>Analyte</u> Chloride Sulfate		<u>CASNo</u>	<u>Result</u> 600 930	<u>Flags</u> <u>U</u> m	nits ng/L	PQL 20 38	<u>MDL</u> 1.1 2.8			<u>run #:</u> 1		
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number: Report Basis:	B080111 1/30/200 Inorganic 300.0 T080130 As Receiv	91-03B 08 Anions by I 0013 ved	on Chromatogra	phy - An	ions by IC	C		Analysis Date: Instrument: File Name: Dilution Factor: Analyst Initials:	1/30/200 IC 080130_ 1 KB	08 11:02:52PM 033.D		
Sample prep wt./vol: Analyte Fluoride	20.00	ml <u>CASNo</u>	<u>Result</u> 1.5	<u>Flags</u> <u>U</u> m	nits ng/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031	Prep Extract Vol:	20.00	ml <u>run #:</u> 2		

Detailed Ana	lytical Report		Ana	lytica Envi	ronmental Laboratories	, Inc.	
Workorder (SDG):	B0801191						
Project:	Navajo Mine	e Extension	Leaching Stu	ıdy			
Client:	Applied Hyd	lrology Ass	ociates, Inc.				
Client Project Numbe	er: none		,				
Report Section	: Clien	t Sampl	e Report				
Client Sample Name:	MR SPI		•		- 1		
Matrix	Aqueous				Collection Date:	1/25/2008 2:	00:00PM
The following test was	conducted by: Analytica	- Thornton				1/21/2000	
Lab Sample Number:	B0801191-04A				Analysis Date:	1/31/2008	2:44:26PM
Prep Date:	1/29/2008 SW7470A Mercury in	Liquid West		otal Ug	Instrument:	CVAA_I D012109W	7 117
Analytical Method ID:	7470A - Melcury III	Liquid Wasi	e by CVAA - I	otai 11g	File Name:	1	
Prep Method ID:	/4/0A				Dilution Factor:	1	
Prep Batch Number:	1080131004					DI	
Report Basis:	As Received				Analyst Initials:	DL 20.00	,
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 n	nl
Analyte	CASNo	Result	<u>Flags</u> <u>Units</u>	<u>PQL</u> <u>M</u>			<u>run #:</u>
Mercury	7439-97-6	ND	mg/L	0.000200.0	000050		1
The following test was	conducted by: Analytica	- Thornton					
Lab Sample Number:	B0801191-04A				Analysis Date:	1/30/2008	1:14:00PM
Prep Date:	1/29/2008				Instrument:	ICP_2	
Analytical Method ID:	SW6010B - ICP - Tota				File Name:	E01308A	
Prep Method ID:	3010_ICP				Dilution Factor:	1	
Prep Batch Number:	T080129008						
Report Basis:	As Received				Analyst Initials:	rm	_
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 n	nl
Analyte	CASNo	Result	Flags Units	\underline{PQL} \underline{M}			<u>run #:</u>
Antimony	7429-90-5	0.056 ND	mg/L	0.050 0	0067		1
Amuniony	7440-36-0		mg/L	0.050 0	.0007		
Arsenic	7440-38-2	ND	mg/L	0.10	00016		
Barium	7440-39-3	ND	mg/L	0.010 0.	00010		
Berymum	7440-41-7	ND	mg/L	0.0010 0.0	0018		
Codmium	7440-42-8	ND	mg/L	0.050 0	00051		
Calaium	7440-43-9	ND	mg/L	0.0000 0.	00051		
Chromium	7440-70-2	0.27 ND	mg/L	0.10 0	0018		
Cobalt	7440-47-5	ND	mg/L	0.010 0	0016		
Copper	7440-48-4	110	mg/L	0.0050 0	0010		
Iron	7440-30-8	0.0067 ND	mg/L	0.0050 0	0027		
Lead	7439-89-0	ND	mg/L	0.050 0	0027		
Lithium	7439-92-1	ND	mg/L	0.050	00072		
Magnesium	7420 06 1	ND	mg/L	0.10 0.	00072		
Manganese	7437-70-4	ND	mg/L	0.010 0	00066		
Molybdenum	7420 00 7	ND	mg/L	0.010 0.	0018		
Nickel	1437-78-1 7110 02 0	ND	mg/L	0.040 0	0027		
Potassium	7440-02-0	ND	mg/L	1.0	0.31		
Selenium	7784 40 2	ND	mg/L	0.10	0.51		
Silver	7740 22 4	ND	mg/L	0.10	00066		
511701	/440-22-4	1ND	ing/L	0.015 0.	00000		

Detailed Ana	lytical H	Report		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0801	191									
Project:	Ν	Navajo Mine	Extension	Leaching Stu	dy						
Client:	A	Applied Hyd	rology Asso	ciates, Inc.							
Client Project Numbe	r: n	one									
Report Section	:	Clien	t Sample	e Report							
Client Sample Name:		MB SPI	LP -	-							
Matrix:	Aque	eous				C	ollection Date:	1/25/2008	2:00:00PM		
Lab Sample Number:	B080119	01-04A					Analysis Date:	1/30/2008	8 1:14:00PM		
Prep Date:	1/29/200	8					Instrument:	ICP_2			
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E01308A			
Prep Method ID:	3010_IC	Р					Dilution Factor:	1			
Prep Batch Number:	T080129	008									
Report Basis:	As Receiv	ed					Analyst Initials:	rm			
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml		
<u>Analyte</u> Sodium	<u>(</u> 74	<u>CASNo</u> 440-23-5	<u>Result</u> 5.7	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1		
Thallium	74	440-28-0	ND	mg/L	0.40	0.011					
Vanadium	74	440-62-2	ND	mg/L	0.010	0.0007	2				
Zinc	74	440-66-6	ND	mg/L	0.0050	0.0010	0				
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	conducted b B080119 2/4/2008 310.1 - All Alkalinity T080205	py: Analytica 01-04B kalinity, Titrin y_W 001	- Thornton netric (pH 4.5)	- Alkalinity			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 Titrametri 1	9:52:02AM		
Report Basis:	As Receiv	ed1					Analyst Initials:	cs	1		
Sample prep wt./vol:	100.00	mi					Prep Extract Vol:	100.00	mi		
Analyte	<u>(</u>	CASNo	<u>Result</u>	<u>Flags</u> <u>Units</u>	<u>PQL</u>	MDL			<u>run #:</u>		
Bicarbonate			ND	mg/L	5.0	1.5			1		
Carbonate			10	mg/L	7.0	1.2					
The following test was	conducted b	by: Analytica	- Thornton								
Lab Sample Number: Prep Date: Analytical Method ID:	B080119 1/25/200 150.1 - pH	91-04B 8 I, Elecrometri	c - pH				Analysis Date: Instrument: File Name:	1/25/2003 Probe	8 2:10:00PM		
Prep Method ID:	150.1						Dilution Factor:	1			
Prep Batch Number:	T080201	005									
Report Basis:	As Receiv	ed					Analyst Initials:	R. Seeman			
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00	ml		
<u>Analyte</u> pH	<u>(</u>	CASNo	<u>Result</u> 5.0	<u>Flags</u> <u>Units</u> pH	<u>POL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1		

Detailed Ana	lytical Report		Analy	tica En	vironn	nental Laboratories	, Inc.	
Workorder (SDG):	B0801191							
Project:	Navajo Mir	ne Extension	n Leaching Stud	ly				
Client:	Applied Hy	drology Ass	ociates, Inc.					
Client Project Numbe Report Section	r: none : Clie	nt Sampl	le Report					
Client Sample Name:	MB SF	PLP	_					
Matrix:	Aqueous				C	Collection Date:	1/25/2008	2:00:00PM
Lab Sample Number:	B0801191-04B					Analysis Date:	2/4/2008	3 12:47:24PM
Analytical Method ID:	1/31/2008 160.1 - Total Dissolve	d Solids dried	at 180°C - TDS			File Name:	SCALE	
Prep Method ID:	160.1					Dilution Factor:	1	
Prep Batch Number:	T080131008							
Report Basis:	As Received					Analyst Initials:	kl	
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00	ml
<u>Analyte</u> Total Dissolved Solids	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 10	MDL 8.2			<u>run #:</u> 1
The following test was	conducted by: Analytic	a - Thornton						
Lab Sample Number:	B0801191-04B					Analysis Date:	1/31/200	8 12:16:31AM
Prep Date:	1/30/2008					Instrument:	IC	
Analytical Method ID:	Inorganic Anions by I	on Chromatog	raphy - Anions by	IC		File Name:	080130_	037.D
Prep Method ID:	300.0					Dilution Factor:	1	
Prep Batch Number:	T080130013							
Report Basis:	As Received					Analyst Initials:	KB	
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml
Analyte Chloride	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.80	<u>MDL</u> 0.042	2		<u>run #:</u> 2
Fluoride		ND	mg/L	0.40	0.031			
Sulfate		3.4	mg/L	1.5	0.11			

Detailed Ana	lytical Report		Anal	lytica Envir	onmental Laboratories,	, Inc.
Workorder (SDG):	B0801191					
Project:	Navajo Mine	Extension	Leaching Stu	dy		
Client:	Applied Hyd	rology Ass	ociates, Inc.			
Client Project Number	r: none					
Report Section	: Client	t Sampl	e Report			
Client Sample Name:	Ash Con	nposite S	PLP			
Matrix:	Aqueous				Collection Date:	1/25/2008 2:00:00PM
The following test was	conducted by: Analytica -	Thornton				
Lab Sample Number:	B0801191-05A				Analysis Date:	1/31/2008 2:46:54PM
Prep Date:	1/29/2008				Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in I	Liquid Wast	e by CVAA - To	otal Hg	File Name:	B013108W.W
Prep Method ID:	7470A				Dilution Factor:	1
Prep Batch Number:	T080131004					
Report Basis:	As Received				Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 ml
Analyte	CASNo	Result	Flags Units	PQL M	DL	run #:
Mercury	7439-97-6	ND	mg/L	0.000200.0	00050	1
The following test was	conducted by: Analytica -	Thornton				
Lab Sample Number:	B0801191-05A				Analysis Date:	1/30/2008 1:19:00PM
Prep Date:	1/29/2008				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E01308A
Prep Method ID:	3010_ICP				Dilution Factor:	1
Prep Batch Number:	T080129008					
Report Basis:	As Received				Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml
Analyte	<u>CASNo</u> 7420.00.5	Result	Flags Units	$\frac{PQL}{0.050} \frac{M}{0}$	<u>DL</u>	<u>run #:</u>
Antimony	7429-90-3	0.50 ND	mg/L	0.050 0	0067	1
Arsenic	7440-38-2	ND	mg/L	0.10 0	015	
Barium	7440-39-3	0.11	mg/L	0.010 0.0	0016	
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0	00060	
Boron	7440-42-8	0.28	mg/L	0.050 0.	0018	
Cadmium	7440-43-9	ND	mg/L	0.0060 0.0	00051	
Calcium	7440-70-2	560	mg/L	0.10 0	.013	
Chromium	7440-47-3	ND	mg/L	0.010 0.	0018	
Cobalt	7440-48-4	ND	mg/L	0.0050 0.	0016	
Copper	7440-50-8	ND	mg/L	0.0050 0.	0019	
Iron	7439-89-6	ND	mg/L	0.050 0.	0027	
Lead	7439-92-1	ND	mg/L	0.050 0	.011	
Lithium	7439-93-2	ND	mg/L	0.10 0.0	00072	
Magnesium	7439-96-4	0.88	mg/L	0.10 0	.012	
Manganese	7439-96-5	ND	mg/L	0.010 0.0	00066	
Molybdenum	7439-98-7	0.089	mg/L	0.010 0.	0018	
Nickel	7440-02-0	ND	mg/L	0.040 0.	0027	
Potassium	7440-09-7	ND	mg/L	1.0 ().31	
Selenium	7784-49-2	ND	mg/L	0.10 0	.026	
Silver	7440-22-4	ND	mg/L	0.015 0.0	00066	

Detailed Ana		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B08011	191							
Project:	N	lavajo Mine	Extension	Leaching Stu	dy				
Client:	A	Applied Hydi	rology Asso	ciates, Inc.					
Client Project Numbe	r: n	one							
Report Section	:	Client	t Sample	e Report					
Client Sample Name:		Ash Con	nposite S	PLP					
Matrix:	Aque	ous				C	ollection Date:	1/25/2008 2	:00:00PM
Lab Sample Number:	B080119	1-05A					Analysis Date:	1/30/2008	1:19:00PM
Prep Date:	1/29/200	8					Instrument:	ICP_2	
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E01308A	
Prep Method ID:	3010_IC	Р					Dilution Factor:	1	
Prep Batch Number:	T080129	008							
Report Basis:	As Receiv	ed					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 1	nl
Analyte Sodium	<u>(</u>	CASNo 140-23-5	<u>Result</u>	Flags Units	<u>PQL</u> 3.0	<u>MDL</u> 0.028	1		<u>run #:</u> 1
Thallium	7/	140-28-0	o.o ND	mg/L	0.40	0.011			1
Vanadium	74	140-62-2	0.088	mg/L	0.010	0.0007	2		
Zinc	, 74	440-66-6	ND	mg/L	0.0050	0.0010)		
The following test was	aanduatad k	wy Analystica	Thomaton	0					
Lab Sampla Number		9. Analytica -	ΠΟΓΠΙΟΠ				Analysis Data	2/4/2008	0.52.02 AM
Pren Date:	2/4/2008	1-03D					Instrument.	Titrametric	2.02/101
Analytical Method ID:	310.1 - All	calinity, Titrime	etric (pH 4.5)	- Alkalinity			File Name:		-
Prep Method ID:	Alkalinity	v W	Υ.	2			Dilution Factor:	1	
Prep Batch Number	T080205	001							
Report Basis:	As Receiv	ed					Analyst Initials:	CS	
Sample prep wt./vol:	100.00	ml					Prep Extract Vol:	100.00 1	nl
<u>Analyte</u> Bicarbonate	<u>(</u>	CASNo	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 5.0	<u>MDL</u> 1.5			<u>run #:</u> 1
Carbonate			18	mg/L	7.0	1.2			
The following test was	conducted b	y: Analytica -	Thornton						
Lab Sample Number:	B080119	1-05B					Analysis Date:	1/25/2008	2:10:00PM
Prep Date:	1/25/200	8					Instrument:	Probe	
Analytical Method ID:	150.1 - pH	I, Elecrometric	- pH				File Name:		
Prep Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T080201	005							
Report Basis:	As Receiv	ed					Analyst Initials:	R. Seeman	
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00 1	nl
<u>Analyte</u> pH	<u>(</u>	CASNo	<u>Result</u> 7.4	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Analytical Report				Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B08011	91								
Project:	Na	avajo Mine I	Extension 1	Leachi	ng Study					
Client:	Aj	pplied Hydro	ology Asso	ciates,	Inc.					
Client Project Numbe	r: no	one								
Report Section	:	Client	Sample	Rep	ort					
Client Sample Name:		Ash Com	posite SI	PLP						
Matrix:	Aqueo	ous					C	Collection Date:	1/25/2008	2:00:00PM
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801191 1/31/2008 160.1 - Tota	l-05B al Dissolved So	olids dried a	t 180°C	- TDS			Analysis Date: Instrument: File Name: Dilution Eactor:	2/4/200 SCALE	8 12:47:24PM
Pren Batch Number	T0801310	008						Dilution ractor.	1	
Report Basis:	As Receive	d						Analyst Initials:	kl	
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	1.00	ml
Analyte Total Dissolved Solids	<u>C</u>	ASNo	<u>Result</u> 2,200	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2	-		<u>run #:</u> 1
The following test was	conducted by	7: Analytica - 7	Thornton							
Lab Sample Number: Prep Date: Analytical Method ID:	B0801191 1/30/2008 Inorganic A	l-05B S Inions by Ion C	Chromatogra	phy - A	nions by I	С		Analysis Date: Instrument: File Name:	1/30/20 IC 080130	08 6:27:01PM _018.D
Prep Method ID:	300.0							Dilution Factor:	25	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T0801300 As Receive 20.00	d ml						Analyst Initials: Prep Extract Vol:	КВ 20.00	ml
<u>Analyte</u> Sulfate	<u>C</u>	ASNo	<u>Result</u> 1,300	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 38	<u>MDL</u> 2.8			<u>run #:</u> 1
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801191 1/30/2008 Inorganic A 300.0	l-05B nions by Ion C	Chromatogra	phy - A	nions by I	С		Analysis Date: Instrument: File Name: Dilution Factor:	1/31/20 IC 080130 1	08 12:34:55AM _038.D
Prep Batch Number:	10801300)13 a						A 1 / T 1/ 1	VD	
Sample prep wt /vol:	20.00	u ml						Analyst Initials: Pren Extract Vol:	20.00	ml
Analyte Chloride	<u><u>C</u></u>	ASNo	<u>Result</u> 5.6	<u>Flags</u>	<u>Units</u> mg/L mg/L	POL 0.80 0.40	<u>MDL</u> 0.042		20.00	<u>run #:</u> 2
i iuonue			3.4		111 <u>8</u> / L	0.40	0.051			

Detailed Ana	lytical Report		Ana	lytica Envir	onmental Laboratories,	, Inc.	
Workorder (SDG):	B0801191						
Project:	Navajo Mine	Extension	Leaching Stu	dy			
Client:	Applied Hydi	ology Ass	ociates, Inc.				
Client Project Number	r: none						
Report Section	: Client	t Sampl	e Report				
Client Sample Name:	Spoil Co	mposite	SPLP				
Matrix:	Aqueous				Collection Date:	1/25/2008 2:00:	00PM
The following test was	conducted by: Analytica -	Thornton					
Lab Sample Number:	B0801191-06A				Analysis Date:	1/31/2008 2:	48:59PM
Prep Date:	1/29/2008				Instrument:	CVAA_1	
Analytical Method ID:	SW7470A - Mercury in I	Liquid Wast	e by CVAA - Te	otal Hg	File Name:	B013108W.W	,
Prep Method ID:	7470A				Dilution Factor:	1	
Prep Batch Number:	T080131004						
Report Basis:	As Received				Analyst Initials:	DL	
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 ml	
Analyta	CASNo	Docult	Flogs Units	DOL M	DI .		
Mercury	7439-97-6	ND	mg/L	0.000200.0	<u>DL</u> 00050	<u>1</u>	1
The following test was a	conducted by: Analytica -	Thornton					
Lab Sample Number:	B0801191-06A	mormon			Analysis Date	1/30/2008 2:	29·00PM
Prep Date:	1/29/2008				Instrument:	ICP 2	
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E01308A	
Prep Method ID:	3010_ICP				Dilution Factor:	1	
Prep Batch Number:	T080129008						
Report Basis:	As Received				Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml	
Analyte	CASNo	Result	Flags Units	PQL M	DL	<u>1</u>	<u>un #:</u>
Aluminum	7429-90-5	ND	mg/L	0.050 0	0.014		1
Antimony	7440-36-0	ND	mg/L	0.050 0.	0067		
Arsenic	7440-38-2	ND	mg/L	0.10 0	0.015		
Barium	7440-39-3	0.070	mg/L	0.010 0.0	00016		
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0	00060		
Boron	7440-42-8	0.084	mg/L	0.050 0.	0018		
Cadmium	7440-43-9	ND	mg/L	0.0060 0.0	00051		
Calcium	7440-70-2	150	mg/L	0.10 0	0.013		
Chromium	7440-47-3	ND	mg/L	0.010 0.	0018		
Cobalt	7440-48-4	ND	mg/L	0.0050 0.	0016		
Copper	7440-50-8	ND	mg/L	0.0050 0.	0019		
Iron	7439-89-6	ND	mg/L	0.050 0.	0027		
Lead	7439-92-1	ND	mg/L	0.050 0	.011		
Lithium	7439-93-2	ND	mg/L	0.10 0.0	00072		
Magnesium	7439-96-4	15	mg/L	0.10 0	0.012		
Manganese	7439-96-5	0.19	mg/L	0.010 0.0	00066		
Molybdenum	7439-98-7	ND	mg/L	0.010 0.	0018		
Nickel	7440-02-0	ND	mg/L	0.040 0.	0027		
Potassium	7440-09-7	7.0	mg/L	1.0 0	0.31		
Selenium	7784-49-2	ND	mg/L	0.10 0	.026		
Silver	7440-22-4	ND	mg/L	0.015 0.0	00066		

Detailed Ana	lytical F	Report		Anal	Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0801	191									
Project:	Ν	lavajo Mine	Extension	Leaching Stu	dy						
Client:	A	Applied Hydr	ology Ass	ociates, Inc.							
Client Project Numbe	r: n	one									
Report Section	:	Client	: Sampl	e Report							
Client Sample Name:		Spoil Co	mposite	SPLP							
Matrix:	Aque	ous				C	ollection Date:	1/25/2008	2:00:00PM		
Lab Sample Number:	B080119	1-06A					Analysis Date:	1/30/200	8 2:29:00PM		
Prep Date:	1/29/200	8					Instrument:	ICP_2			
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E01308A	1		
Prep Method ID:	3010_IC	Р					Dilution Factor:	1			
Prep Batch Number:	T080129	008									
Report Basis:	As Receiv	ed					Analyst Initials:	rm			
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml		
<u>Analyte</u> Sodium	<u>(</u> 74	C <mark>ASNo</mark> 440-23-5	<u>Result</u> 150	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028	i		<u>run #:</u> 1		
Thallium	74	440-28-0	ND	mg/L	0.40	0.011					
Vanadium	74	440-62-2	ND	mg/L	0.010	0.0007	2				
Zinc	74	440-66-6	ND	mg/L	0.0050	0.0010)				
The following test was	conducted b	y: Analytica -	Thornton								
Lab Sample Number:	B080119	1-06B					Analysis Date:	2/4/2008	9:52:02AM		
Prep Date:	2/4/2008						Instrument:	Titrametr	ic		
Analytical Method ID:	310.1 - All	calinity, Titrime	etric (pH 4.5)) - Alkalinity			File Name:				
Prep Method ID:	Alkalinity	y_W					Dilution Factor:	1			
Prep Batch Number:	T080205	001									
Report Basis:	As Receiv	ed					Analyst Initials:	cs			
Sample prep wt./vol:	100.00	ml					Prep Extract Vol:	100.00	ml		
Analyte	<u>(</u>	CASNo	<u>Result</u>	Flags Units	POL	MDL			<u>run #:</u>		
Bicarbonate			33	mg/L	5.0	1.5			1		
Carbonate			14	mg/L	7.0	1.2					
The following test was	conducted b	y: Analytica -	Thornton								
Lab Sample Number:	B080119	1-06B					Analysis Date:	1/25/200	8 2:10:00PM		
Prep Date:	1/25/200	8					Instrument:	Probe			
Analytical Method ID:	150.1 - pH	l, Elecrometric	- pH				File Name:				
Prep Method ID:	150.1						Dilution Factor:	1			
Prep Batch Number:	T080201	005						_			
Report Basis:	As Receiv	ed					Analyst Initials:	R. Seeman	l _		
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00	ml		
<u>Analyte</u> pH	<u>(</u>	<u>CASNo</u>	<u>Result</u> 7.5	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1		
Detailed Ana	lytical R	eport			Analyt	ica En	vironn	nental Laboratories,	Inc.		
--	---	--------------------------------	------------------------	--------------	----------------------	--------------------	---------------------	---	--------------------------------	-------------------------	
Workorder (SDG):	B08011	91									
Project:	N	avajo Mine I	Extension 1	Leach	ing Study	7					
Client:	A	pplied Hydro	ology Asso	ciates.	Inc.						
Client Project Numbe	r: no	one									
Report Section	:	Client	Sample	Rei	oort						
Client Sample Name:		Spoil Con	nposite S	PLP							
Matrix:	Aqueo	ous					C	Collection Date:	1/25/2008	2:00:00PM	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801192 1/31/2008 160.1 - Tot 160.1	1-06B 3 al Dissolved So	olids dried a	t 180°C	C - TDS			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2003 SCALE 1	8 12:47:24PM	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T0801310 As Receive 100.00	008 d ml						Analyst Initials: Prep Extract Vol:	kl 1.00	ml	
<u>Analyte</u> Total Dissolved Solids	<u>C</u>	<u>ASNo</u>	<u>Result</u> 1,200	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	MDL 8.2			<u>run #:</u> 1	
The following test was	conducted by	y: Analytica - T	Thornton								
Lab Sample Number: Prep Date: Analytical Method ID:	B0801192 1/30/2008 Inorganic A	l -06B 3 anions by Ion C	Chromatogra	phy - A	Anions by I	C		Analysis Date: Instrument: File Name:	1/30/200 IC 080130_	08 7:40:34PM _022.D	
Prep Method ID:	300.0							Dilution Factor:	25		
Prep Batch Number: Report Basis: Sample prep wt./vol:	T0801300 As Receive 20.00	d ml						Analyst Initials: Prep Extract Vol:	КВ 20.00	ml	
Analyte Sulfate	<u>C</u>	<u>ASNo</u>	<u>Result</u> 670	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 38	<u>MDL</u> 2.8			<u>run #:</u> 1	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801192 1/30/2008 Inorganic A 300.0	L-06B S Anions by Ion C	Chromatogra	phy - A	Anions by I	C		Analysis Date: Instrument: File Name: Dilution Factor:	1/31/200 IC 080130_ 1	08 12:53:17AM _039.D	
Prep Batch Number:	10801300	13							VD		
Report Basis:		u ml						Analyst Initials: Prop Extract Volu	20 00	ml	
Sample prep wt./vol:	20.00	1111						FIEP Exifact vol:	20.00	1111	
<u>Analyte</u> Chloride	<u>C</u>	<u>ASNo</u>	<u>Result</u> 1.5	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.80	<u>MDL</u> 0.042	2		<u>run #:</u> 2	
Fluoride			0.54		mg/L	0.40	0.031	[

Detailed Ana	lytical	Report		Anal	lytica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B0801	191							
Project:		Navajo Mine	Extension	Leaching Stu	dy				
Client:		Applied Hydr	ology Ass	ociates, Inc.					
Client Project Numbe	er:	none							
Report Section	:	Metho	od Blan	k Report					
Client Sample Name:		MB							
Matrix:	Aqu	ieous				С	ollection Date:	1/29/2008	12:00:00AM
The following test was	conducted	by: Analytica -	Thornton						
Lab Sample Number:	T08013	1004-MB					Analysis Date:	1/31/200	08 1:01:23PM
Prep Date:	1/29/20	08					Instrument:	CVAA_	1
Analytical Method ID:	SW7470.	A - Mercury in I	Liquid Wast	e by CVAA - Te	otal Hg		File Name:	B013108	3W.W
Prep Method ID:	7470A						Dilution Factor:	1	
Prep Batch Number:	T08013	1004							
Report Basis:	As Recei	ved					Analyst Initials:	DL	
Sample prep wt./vol:	30.00	ml					Prep Extract Vol:	30.00	ml
Analyte		CASNo	Result	Flags Units	PQL	MDL			run #:
Mercury	,	7439-97-6	ND	mg/L	0.00020	0.00005	50		1
The following test was	conducted	by: Analytica -	Thornton						
Lab Sample Number:	T08012	9008-MB					Analysis Date:	1/30/200)8 12:34:00PM
Prep Date:	1/29/20	08					Instrument:	ICP_2	
Analytical Method ID:	SW6010	B - ICP - Total					File Name:	E01308.	A
Prep Method ID:	3010_IC	CP					Dilution Factor:	1	
Prep Batch Number:	T08012	9008							
Report Basis:	As Recei	ved					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml
<u>Analyte</u> Aluminum	,	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u> <u>Units</u>	PQL 0.050	$\frac{\mathbf{MDL}}{0.014}$			<u>run #:</u>
Antimony		7429-90-5	ND	mg/L	0.050	0.0067	7		1
Arsenic		7440-38-2	ND	mg/L	0.10	0.015			
Barium		7440-39-3	ND	mg/L	0.010	0.0001	6		
Bervllium		7440-41-7	ND	mg/L	0.0010	0.00006	50		
Boron	,	7440-42-8	ND	mg/L	0.050	0.0018	3		
Cadmium		7440-43-9	ND	mg/L	0.0060	0.0005	1		
Calcium		7440-70-2	ND	mg/L	0.10	0.013			
Chromium		7440-47-3	ND	mg/L	0.010	0.0018	3		
Cobalt		7440-48-4	ND	mg/L	0.0050	0.0016	5		
Copper		7440-50-8	ND	mg/L	0.0050	0.0019)		
Iron	-	7439-89-6	ND	mg/L	0.050	0.0027	7		
Lead	-	7439-92-1	ND	mg/L	0.050	0.011			
Lithium	-	7439-93-2	ND	mg/L	0.10	0.0007	2		
Magnesium	-	7439-96-4	ND	mg/L	0.10	0.012			
Manganese	-	7439-96-5	ND	mg/L	0.010	0.0006	6		
Molybdenum		7439-98-7	ND	mg/L	0.010	0.0018	3		
Nickel		7440-02-0	ND	mg/L	0.040	0.0027	7		
Potassium		7440-09-7	ND	mg/L	1.0	0.31			
Selenium		7784-49-2	ND	mg/L	0.10	0.026			
Silver		7440-22-4	ND	mg/L	0.015	0.0006	6		

Detailed Ana	lytical Report		Analy	tica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B0801191							
Project:	Navajo Mine	Extension 1	Leaching Stud	ly				
Client:	Applied Hyd	rology Asso	ciates, Inc.					
Client Project Numbe	r: none							
Report Section	: Meth	od Blanl	x Report					
Client Sample Name:	MB		•					
Matrix:	Aqueous				C	Collection Date:	1/29/2008 1	2:00:00AM
Lab Sample Number:	T080129008-MB					Analysis Date:	1/30/2008	3 12:34:00PM
Prep Date:	1/29/2008					Instrument:	ICP_2	
Analytical Method ID:	SW6010B - ICP - Total					File Name:	E01308A	
Prep Method ID:	3010_ICP					Dilution Factor:	1	
Prep Batch Number:	T080129008							
Report Basis:	As Received					Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml					Prep Extract Vol:	50.00	ml
Analyta	CASNo	Docult	Flags Units	POI	MDI	-		run #•
Sodium	7440-23-5	ND ND	mg/L	3.0	0.028	3		<u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>
Thallium	7440-28-0	ND	mg/L	0.40	0.011			
Vanadium	7440-62-2	ND	mg/L	0.010	0.0007	2		
Lah Sampla Number	T080129008-MB		U			Analysis Data:	1/31/2008	8 11.13.00 AM
Pren Date:	1/29/2008					Instrument:	ICP 2	, 11.13.007 IVI
Analytical Method ID [.]	SW6010B - ICP - Total					File Name:	E01318A	
Pren Method ID [.]	3010 ICP					Dilution Factor:	1	
Pren Batch Number	T080129008						-	
Report Basis	As Received					Analyst Initials	rm	
Sample prep wt./vol:	50.00 ml					Prep Extract Vol:	50.00	ml
<u>Analyte</u> Zinc	<u>CASNo</u> 7440-66-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.0050	<u>MDL</u> 0.001	0		<u>run #:</u> 2
The following test was	conducted by: Analytica -	Thornton						
Lab Sample Number:	T080205001-MB					Analysis Date:	2/4/2008	9:52:02AM
Prep Date:	2/4/2008					Instrument:	Titrametri	c
Analytical Method ID:	310.1 - Alkalinity, Titrim	etric (pH 4.5)	- Alkalinity			File Name:		
Prep Method ID:	Alkalinity_W					Dilution Factor:	1	
Prep Batch Number:	T080205001							
Report Basis:	As Received					Analyst Initials:	cs	
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	100.00	ml
Analyte	CASNo	<u>Result</u>	Flags Units	PQL	<u>MDL</u>			<u>run #:</u>
Bicarbonate		ND	mg/L	5.0	1.5			1
Carbonate		ND	mg/L	7.0	1.2			
The following test was	conducted by: Analytica -	Thornton						
Lab Sample Number:	T080131008-MB					Analysis Date:	2/4/2008	12:47:24PM
Prep Date:	1/31/2008					Instrument:	SCALE	
Analytical Method ID:	160.1 - Total Dissolved	Solids dried a	t 180°C - TDS			File Name:		
Prep Method ID:	160.1					Dilution Factor:	1	
Prep Batch Number:	T080131008							
Report Basis:	As Received					Analyst Initials:	kl	
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00	ml
Analyte	CASNo	<u>Result</u>	<u>Flags</u> <u>Units</u>	<u>PQL</u>	<u>MDL</u>			<u>run #:</u>

Page 22 of 38

Detailed Ana	lytical Report		Analy	tica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B0801191							
Project:	Navajo Mine	Extension	Leaching Stud	у				
Client:	Applied Hyd	rology Ass	ociates, Inc.					
Client Project Numbe	r: none							
Report Section	: Meth	od Blan	k Report					
Client Sample Name:	MB							
Matrix:	Aqueous				C	Collection Date:	1/31/2008	12:00:00AM
Lab Sample Number:	T080131008-MB					Analysis Date:	2/4/2008	12:47:24PM
Prep Date:	1/31/2008					Instrument:	SCALE	
Analytical Method ID:	160.1 - Total Dissolved	Solids dried	at 180°C - TDS			File Name:		
Prep Method ID:	160.1					Dilution Factor:	1	
Prep Batch Number:	T080131008							
Report Basis:	As Received					Analyst Initials:	kl	
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00	ml
<u>Analyte</u> Total Dissolved Solids	CASNo	<u>Result</u> ND	Flags Units mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number:	T080130013-MB					Analysis Date:	1/30/200	8 3:04:45PM
Prep Date:	1/30/2008					Instrument:	IC	
Analytical Method ID:	Inorganic Anions by Ior	Chromatogr	aphy - Anions by	IC		File Name:	080130_	007.D
Prep Method ID:	300.0					Dilution Factor:	1	
Prep Batch Number:	T080130013							
Report Basis:	As Received					Analyst Initials:	KB	
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml
Analyte Chloride	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.80	<u>MDL</u> 0.042	2		<u>run #:</u> 1
Fluoride		ND	mg/L	0.40	0.031			
Sulfate		ND	mg/L	1.5	0.11			

Detailed An	alytical H	Report	Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0801	191								
Project:	Ν	Navajo Min	e Extension	Leaching	s Study					
Client:	A	Applied Hy	drology Asso	ciates, In	ic.					
Client Project Num	ber: n	one								
Tests Run at: Workorder (SDG): Project: Project Number: Prep Batch:	Analytica E B0801191 Navajo Min T08012900	Environmen ne Extensio 0 8	tal Laboratori n Leaching Si Ql	ies - Thori tudy UALIT	nton, Colorado Y CONTR	° OL RE	PORT			
			SA	AMPLE I	DUPLICATE	E REPOI	RT			
Analysis:	SW6010B	- ICP - Tota	al				Base Samp Prep Date:	le: B0801191-05A 1/29/2008		
Samp. Anal. Date: DUP Anal. Date:	1/30/2008 1/30/2008	1:19:00P1 1:40:00P1	M M				Units: Matrix:	mg/L Aqueous		
<u>Analyte Name</u> Aluminum	<u>Sar</u>	<u>mpResult</u> 0.359	<u>DUPRes.</u> 0.346	<u>RPD</u> 3.7	<u>RPDLim</u> 20	<u>Flag</u>				
Antimony		ND	ND	0.0	20					
Arsenic		ND	ND	0.0	20					
Barium		0.113	0.110	2.7	20					
Beryllium		ND	ND	0.0	20					
Boron		0.282	0.278	1.4	20					
Cadmium		ND	ND	0.0	20					
Calcium		562	549	2.3	20					
Chromium		ND	ND	0.0	20					
Cobalt		ND	ND	0.0	20					
Copper		ND	ND	0.0	20					
Iron		ND	ND	0.0	20					
Lead		ND	ND	0.0	20					
Magnesium		0.883	0.856	3.1	20					
Manganese		ND	ND	0.0	20					
Molybdenum		0.0886	0.0859	3.1	20					
Nickel		ND	ND	0.0	20					
Potassium		ND	1.10	0.0	20					
Selenium		ND	ND	0.0	20					
Silver		ND	ND	0.0	20					
Sodium		8.85	8.45	4.6	20					
Thallium		ND	ND	0.0	20					
Vanadium		0.0883	0.0868	1.7	20					
Zinc		ND	ND	0.0	20					
Lithium		ND	ND	0.0	20					
				LCS	/LCSD REP	ORT				

Detailed An	alytical Repo	rt	Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B0801191										
Project:	Navajo	Mine Ex	tension	Leachin	ng Study						
Client:	Applie	d Hydrol	ogy Asso	ciates, I	nc.						
Client Project Num	ber: none										
Tests Run at:	Analytica Enviror	nmental L	aboratori	es - Tho	rnton, Col	orado					
Workorder (SDG):	B0801191	· •	1. 0								
Project:	Navajo Mine Exte	ension Lea	aching St	Udy	Y CON	TROL	REPORT	Г			
Project Number:	T080120008		×		1 001	11102					
Prep Batch:	1000129000										
				LC	S/LCSD H	REPORT	Γ				
Analysis:	SW6010B - ICP -	Total					MB:		T0801290	08-MB	
							Prep l	Date:	1/29/2008		
MB Anal. Date:	1/30/2008 12:34	:00PM					Units	:	mg/L		
LCS Anal. Date:	1/30/2008 12:39	:00PMLC	SD Anal	. Date:	1/30/2008	8 12:44:	00PMMatri	x:	Aqueous		
Analyte Name	SampResult	LCSRes.	SDRes.	<u>SPLev</u>	<u>SPDLev</u>	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Aluminum	ND	1.91	1.88	2.00	2.00	95.5	94.0	1.6	89 - 117	20	
Antimony	ND	0.474	0.458	0.500	0.500	94.8	91.6	3.4	82 - 117	20	
Arsenic	ND	1.81	1.82	2.00	2.00	90.5	91.0	0.6	86 - 116	20	
Barium	ND	1.87	1.85	2.00	2.00	93.5	92.5	1.1	86 - 116	20	
Beryllium	ND	0.0481	0.0477	0.0500	0.0500	96.2	95.4	0.8	87 - 111	20	
Boron	ND	0.463	0.459	0.500	0.500	92.6	91.8	0.9	76 - 130	20	
Cadmium	ND	0.0448	0.0430	0.0500	0.0500	89.6	86.0	4.1	79 - 113	20	
Calcium	ND	9.59	9.28	10.0	10.0	95.9	92.8	3.3	79 - 119	20	
Chromium	ND	0.189	0.185	0.200	0.200	94.5	92.5	2.1	86 - 117	20	
Cobalt	ND	0.468	0.464	0.500	0.500	93.6	92.8	0.9	82 - 118	20	
Copper	ND	0.231	0.231	0.250	0.250	92.4	92.4	0.0	86 - 117	20	
Iron Land	ND	0.981	0.972	1.00	1.00	98.1	97.2	0.9	83 - 121	20	
Lead	ND	0.472	0.455	10.0	10.0	94.4	90.0	4.1	83 - 121	20	
Magnesium	ND	9.01	9.54	0.500	0.500	96.1	95.4	0.7	83 - 118	20	
Maluhdanum	ND	0.473	0.4/1	0.500	0.300	93.0	94.2	0.8	82 - 121	20	
Nickel		0.400	0.403	0.500	0.500	93.0	92.0	1.1	62 - 120 84 - 117	20	
Potassium	ND	7.84	7 75	10.0	10.0	78.4	77.5	1.2	74 - 110	20	
Selenium	ND	1.86	1.15	2.00	2.00	93.0	93.0	0.0	87 - 117	20	
Silver	ND	0.248	0.247	0.250	0.250	99.2	98.8	0.0	80 - 127	20	
Sodium	ND	9.34	10.1	10.0	10.0	93.4	101.0	7.8	87 - 113	20	
Thallium	ND	0.190	0.198	0.200	0.200	95.4	99.0	4.1	89 - 113	20	
Vanadium	ND	0.481	0.476	0.500	0.500	96.2	95.2	1.0	87 - 119	20	
Zinc	ND	0.476	0.543	0.500	0.500	95.2	108.6	13.2	81 - 120	20	
Lithium	ND	0.463	0.459	0.500	0.500	92.6	91.8	0.9	80 - 120	20	
		005	5	0.000	0.000	,2.0	21.0	0.7	50 120		
				М	S/MSD P	EPORT					
				IVI							

Detailed An	rt	Analytica Environmental Laboratories, Inc.									
Workorder (SDG):	B0801191										
Project:	Navajo	Mine Ex	tension Le	eaching	Study						
Client:	Applied	l Hydrolo	ogy Associ	ates, Inc	•						
Client Project Num	ber: none										
Tests Run at:	Analytica Environ	mental La	aboratories	- Thorn	ton, Color	rado					
Workorder (SDG): Project:	B0801191 Navaio Mine Exte	nsion Lea	aching Stud	lv							
Project Number:	The up of the second		QUA	ÄLITY	CON1	ROL	REPORT	Γ			
Prep Batch:	T080129008										
				MS/I	MSD RE	PORT					
Analysis:	SW6010B - ICP -	Total					Paren	t:	B08011	91-05A	
							Prep 1	Date:	1/29/200	08	
Samp. Anal. Date:	1/30/2008 1:19:0	DOPM					Units	:	mg/L		
MS Anal. Date:	1/30/2008 1:45:0	00PMMS	D Anal. D	ate: 1/	/30/2008	1:50:0	0PM Matri	x:	Aqueous	8	
Analyte Name	SampResult	MSRes.	<u>MSDRes</u>	<u>SPLev</u>	<u>SPDLev</u>	Recov.	MSD Rec.	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Aluminum	0.359	2.23	2.20	2.00	2.00	93.6	92.1	1.4	75 - 125	20	
Antimony	ND	0.449	0.440	0.500	0.500	89.8	88.0	2.0	75 - 125	20	
Arsenic	ND	1.80	1.73	2.00	2.00	90.0	86.5	4.0	75 - 125	20	
Barium	0.113	1.89	1.82	2.00	2.00	88.9	85.4	3.8	75 - 125	20	
Beryllium	ND	0.0466	0.0452	0.0500	0.0500	93.2	90.4	3.1	75 - 125	20	
Boron	0.282	0.733	0.715	0.500	0.500	90.2	86.6	2.5	75 - 125	20	
Cadmium	ND	0.0408	0.0411	0.0500	0.0500	81.6	82.2	0.7	75 - 125	20	
Calcium	562	572	560	10.0	10.0	100.0	-20.0	2.1	75 - 125	20 NOTE 2	NOTE 2
Chromium	ND	0.184	0.180	0.200	0.200	92.0	90.0	2.2	75 - 125	20	
Cobalt	ND	0.437	0.427	0.500	0.500	87.4	85.4	2.3	75 - 125	20	
Copper	ND	0.229	0.221	0.250	0.250	91.6	88.4	3.6	75 - 125	20	
Iron	ND	0.935	0.925	1.00	1.00	93.5	92.5	1.1	75 - 125	20	
Lead	ND	0.434	0.429	0.500	0.500	86.8	85.8	1.2	75 - 125	20	
Magnesium	0.883	10.5	10.2	10.0	10.0	96.2	93.2	2.9	75 - 125	20	
Manganese	ND	0.445	0.431	0.500	0.500	89.0	86.2	3.2	75 - 125	20	
Molybdenum	0.0886	0.525	0.513	0.500	0.500	87.3	84.9	2.3	75 - 125	20	
Nickel	ND	0.445	0.433	0.500	0.500	89.0	86.6	2.7	75 - 125	20	
Potassium	ND	9.32	9.45	10.0	10.0	93.2	94.5	1.4	75 - 125	20	
Selenium	ND	1.94	1.87	2.00	2.00	97.0	93.5	3.7	75 - 125	20	
Silver	ND	0.241	0.234	0.250	0.250	96.4	93.6	2.9	75 - 125	20	
Sodium	8.85	18.0	17.5	10.0	10.0	91.5	86.5	2.8	75 - 125	20	
Thallium	ND	0.179	0.176	0.200	0.200	89.5	88.0	1.7	75 - 125	20	
Vanadium	0.0883	0.546	0.532	0.500	0.500	91.5	88.7	2.6	75 - 125	20	
Zinc	ND	0.428	0.419	0.500	0.500	85.6	83.8	2.1	75 - 125	20	
Lithium	ND	0.523	0.505	0.500	0.500	104.6	101.0	3.5	75 - 125	20	

. •1 1

Detailed An	alytical R	eport		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B080119	91									
Project:	Na	avajo Min	e Extensio	n Leachi	ng Study						
Client:	Ar	oplied Hyd	lrology As	sociates,	Inc.						
Client Project Num	ber: no	one									
Tests Run at:	Analytica En	vironment	al Laborato	ories - The	ornton, Color	ado					
Workorder (SDG):	B0801191										
Project: Project Number:	Navajo Mine	e Extensior	Leaching	Study QUALI	TY CONT	ROL REPORT					
Prep Batch:	T080129008	8									
			PO	OST DIG	ESTION SE	PIKE REPORT					
Analysis:	SW6010B -]	ICP - Tota				Base Sample	e: B0801191-054	A			
						Prep Date:	1/29/2008				
Samp. Anal. Date:	1/30/2008	1:19:00PN	1			Units:	mg/L				
PDS Anal. Date:	1/30/2008	1:55:00PN	1			Matrix:	Aqueous				
							1				
Analyte Name	<u>SampRe</u>	<u>esult</u>	PDSRes.	SPLev	Recov.	Recov Lim	<u>Flag</u>				
Aluminum		0.359	2.27	2.00	95.7	75 - 117					
Antimony		ND	0.444	0.500	87.5	75 - 117					
Arsenic		ND	1.76	2.00	88.3	75 - 116					
Barium		0.113	1.89	2.00	89.0	75 - 116					
Beryllium		ND	0.0467	0.0500	92.5	75 - 111					
Boron		0.282	0.736	0.500	90.7	75 - 130					
Cadmium	•	ND	0.0404	0.0500	79.3	75 - 113					
Calcium		562	580	10.0	186.5	75 - 119	highPDS	Note 2			
Chromium		ND	0.185	0.200	88.3	75 - 117					
Cobalt		ND	0.438	0.500	87.3	75 - 118					
Copper		ND	0.227	0.250	89.9	75 - 117					
Iron		ND	0.957	1.00	95.5	75 - 121					
Lead		ND	0.438	0.500	88.0	75 - 121					
Magnesium		0.883	10.6	10.0	96.7	75 - 118					
Manganese		ND	0.443	0.500	88.4	75 - 121					
Molybdenum		0.0886	0.525	0.500	87.3	75 - 120					
Nickel		ND	0.443	0.500	88.9	75 - 117					
Potassium		ND	9.68	10.0	87.5	75 - 110					
Selenium		ND	1.94	2.00	95.6	75 - 117					
Silver		ND	0.240	0.250	96.5	75 - 127					
Sodium		8.85	18.4	10.0	95.2	75 - 113					
Thallium	-	ND	0.169	0.200	80.3	75 - 113					
Vanadium		0.0883	0.547	0.500	91.7	75 - 119					
Zinc	,	ND	0.428	0.500	88.6	75 - 120					
Lithium		ND	0.531	0.500	96.7	75 - 120					
				SERIA	L DILUTIO	N REPORT					

Detailed An	alytical Report		A	Analytica Env	vironmenta	al Laboratorio	es, Inc.	
Workorder (SDG):	B0801191							
Project:	Navajo Min	e Extensio	n Leaching	Study				
Client:	Applied Hy	drology As	sociates, Ind	2.				
Client Project Num	ber: none	87						
Tests Run at:	Analytica Environmen	tal Laborat	ories - Thorn	ton. Colorad	0			
Workorder (SDG):	B0801191			,				
Project:	Navajo Mine Extensio	n Leaching	Study					
Project Number:		(QUALITY	CONTR	OL REI	PORT		
Prep Batch:	T080129008							
					DEDODT			
			SERIAL I	DILUTION	REPORT		D0001101.054	
Analysis:	SW6010B - ICP - Tota	l				Base Sample	: B0801191-05A	
						Prep Date:	1/29/2008	
Samp. Anal. Date:	1/30/2008 1:19:00	PM				Units:	mg/L	
SER DIL. Date:	1/30/2008 2:24:00Pt	M				Matrix:	Aqueous	
		DOI		0 10	a boy	DDD		
Analyte Name	SampResult	<u>PQL.</u>	<u>MDL.</u>	<u>SerialRes.</u>	<u>SerPQL</u>	<u></u>	<u>Flag</u> Note 4	
Aluminum	0.359	0.050	0.014	0.526	0.25	31.1	Note 4	
Antimony	ND	0.030	0.0007	ND	0.23			
Arsenic	ND 0.112	0.10	0.013	ND 0.122	0.30	76		
Barium	0.115 ND	0.0100	0.00010	0.122 ND	0.030	7.0		
Berginum	0.282	0.0010	0.000000	ND 0.301	0.0050	6.5		
Cadmium	0.202 ND	0.0060	0.00051	ND	0.030	0.5		
Calcium	562	0.10	0.013	585	0.50	4.0		
Chromium	ND	0.0100	0.0018	ND	0.050	1.0		
Cobalt	ND	0.0050	0.0016	ND	0.025			
Copper	ND	0.0050	0.0019	ND	0.025			
Iron	ND	0.050	0.0027	ND	0.25			
Lead	ND	0.050	0.011	ND	0.25			
Magnesium	0.883	0.10	0.012	0.965	0.50	8.8		
Manganese	ND	0.0100	0.00066	ND	0.050			
Molybdenum	0.0886	0.0100	0.0018	0.0920	0.050	3.7		
Nickel	ND	0.040	0.0027	ND	0.20			
Potassium	ND	1.0	0.31	ND	5.0			
Selenium	ND	0.10	0.026	ND	0.50			
Silver	ND	0.015	0.00066	ND	0.075			
Sodium	8.85	3.0	0.028	ND	15			
Thallium	ND	0.40	0.011	ND	2.0			
Vanadium	0.0883	0.0100	0.00072	0.0903	0.050	2.2		
Zinc	ND	0.0050	0.0010	ND	0.025			
Lithium	ND	0.10	0.00072	ND	0.50			
Prep Batch:	T080131004							
			TOP	і сер рер	ОРТ			
			LCS/	LUSD KEP	UKI			

Detailed An	halytical Report Analytica Environmental Laboratories, Inc.
Workorder (SDG):	B0801191
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Num	ber: none
Tests Run at:	Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG):	: B0801191
Project: Project Number:	Navajo Mine Extension Leaching Study QUALITY CONTROL REPORT
Prep Batch:	T080131004
	LCS/LCSD REPORT
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080131004-MB
	Prep Date: 1/29/2008
MB Anal. Date:	1/31/2008 1:01:23PM Units: mg/L
LCS Anal. Date:	1/31/2008 1:03:28PMLCSD Anal. Date: 1/31/2008 1:06:14PM Matrix: Aqueous
Analyte Name	SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag
Mercury	ND 0.00204 0.00209 0.00200 0.0020 102.0 104.5 2.4 80 - 120 20
-	
	FOOTNOTES TO OC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Samp Anal. Date: 1/30/2008 9:00 Bits Status Status 2.	Detailed An	alytical Repo	rt	Analytica Environmental Laboratories, Inc.									
Projec: Applied Hyperology Associates, Inc. Client Project Number: Applied Hyperology Associates, Inc. Client Project Number: Applied Hyperology Associates, Inc. Client Project Number: Navajo Mine Extension Leaching Study Project: Navajo Mine Extension Project: Navajo Minie Extension Project: Navajo Minie Extension Project: Navajo Mine Exte	Workorder (SDG):	B0801191											
Client model Hydrology Associates, Inc. Client Project Name: none Tests Nun 4: Malytice Environmental Laboratories - Thornton, Colorado Workordr (SDG): B0001191 Project: Navajo Mine Extension Laboratories - Thornton, Colorado Navajo Mine Extension Laboratories - Thornton, Colorado Workordr (SDG): B0001191 Project: Navajo Mine Extension Laboratories - Thornton, Colorado Navajo Mine Extension Laboratories - Thornton, Colorado Workordr (SDG): B0001191 Project: Navajo Mine Extension Laboratories - Thornton, Colorado Navajo Mine Extension Laboratories - Thornton, Mine Mine Mine Mine Mine Mine Mine Mine	Project:	Navajo	o Mine Ex	tension	Leaching	g Study							
CHent Project Number: none Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801191 Project: Nuvajo Mine Extension Leaching Study Protect Number: UALITY CONTROL REPORT Project Number: Cuality Control (SDG): B0801191 Sample EDUPLICATE REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Base Sample: B0801191-02B Samp, Anal. Date: 1/30/2008 9:49:17PM Units: mg/L DUP Anal. Date: 1/30/2008 9:49:17PM Units: mg/L LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB Pituoride 8.19 8.30 1.3 30 S0 Chloride 6.11 599 2.0 30 S0 S0 Salfate 2.480 2.440 1.6 30 S0 MB: T080130013-MB MB Anal. Date: 1/30/2008 S0 Chromatography - Anions by IC MB: T080130013-MB Prep Date: 70/2008 Salfate 1/30/2008 2.430 2.245 250 2.0 90 0.0	Client:	Applie	d Hydrol	ogy Asso	ociates, I	nc.							
Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801191 Vavajo Mine Extension Leaching Study QUALITY CONTROL REPORT Project: Workorder (SDG): Base Sample: B0801191-02B Prep Batch: T080130013 SAMPLE DUPLICATE REPORT Base Sample: B0801191-02B Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Base Sample: I/30/2008 9/49:17PM Samp, Anal. Date: 1/30/2008 10:07:41PM Units: mg/L Analysis: SampResult DUPRes. RPD RPD in Matrix: Aqueous Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Matrix: Aqueous Matrix: Aqueous Analyse Name SampResult DUPRes. RPD RPD in Bag Frep Date: 1/30/2008 Sulfate 2,480 2,440 1.6 30 Toss Res Sulfate 1/30/2008 MB Anal. Date: 1/30/2008 30:455PM Units: mg/L KES/LCSD Res No Res Res Res Res Res Res Res Sulfate Sulfate	Client Project Num	ber: none											
Workorder (SD 02): Bio801191 Project: Navajo Mine Extension Leaching Study Project Number: Prep Batch: QUALITY CONTROL REPORT Project Number: Prep Batch: SAMPLE DUPLICATE REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Bace Sample: B0801191-02B Prep Date: 1/30/2008 Marin: Prep Date: 1/30/2008 Samp Anal. Date: 1/30/2008 1/3 RPD RPD Im Prep Date: Marin: 1/30/2008 Analyte Name SampResult DUPRes. Pluoride RPD RPD Im Sulfate MB: T080130013-MB INORGAN Sub-Sub In Chromatography - Anions by IC MB: T080130013-MB Marking SumpResult ILES/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB MB Anal. Date: 1/31/2008 2:31:20PM Marrix: Aqueous Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: Rep Curl LIS/LCSD REPORT Analysis: Inor	Tests Run at:	Analytica Enviror	nmental L	aboratori	ies - Thoi	rnton, Colo	orado						
Project: Links and Particle Stephen St	Workorder (SDG):	B0801191	· •	1. 0	. 1								
Control of the formator that the properties of the formator the formator the properties of the formator the formator the properties of the formator the formator the properties of the formator the formator the properties of the formator the formator the formator the properties of the formator the proprecent the formator the properties of the formator the	Project:	Navajo Mine Ext	ension Lea	aching S	uay UALIT	Y CON	TROL	REPOR	Г				
SAMPLE DUPLICATE REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Base Sample: B0801191-02B Prep Date: 1/30/2008 Samp, Anal. Date: 1/30/2008 9:49:17PM Units: mg/L DUP Anal. Date: 1/30/2008 9:49:17PM Units: mg/L DUP Anal. Date: 1/30/2008 10:07:41PM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPDLim Flag Fluoride 6.11 599 2.0 30 Salfate 2,480 2,440 1.6 30 LCSLCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB Prep Date: 1/30/2008 :00:212:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SPLev SPLev Recov. MED RPD Recov Ian RPDI in Flag Fluoride ND 2.37 2.36 2.50 9.03 9.0 90.10 20 Salfate ND 34.1 37.5 5.00 9.0	Project Number:	TAQA13AA13		×	011211	1 0011	11102		•				
SAMPLE DUPLICATE REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Base Sample: B0801191-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L DUP Anal. Date: 1/30/2008 1:3 30 Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD Flag Fluoride 6.11 599 2.0 30	Prep Batch:	1080130013											
SAMPLE DUPLICATE REPORTAnalysis:Inorganic Anions by Ion Chromatography - Anions by ICBase Sample: B0801191-02B Prep Date: 1/30/2008Samp, Anal. Date:1/30/200810:07:41PMUnits:mg/LAnalyte NameSampResultDUPRes. 8.30RPDImage PlaneFlagFluoride6.115992.030Image PlaneChloride6.115992.030Image PlaneImage PlaneSulfate2.4802.4401.630Image PlaneCSCLCSD REPORTAnalysis:Inorganic Anions by Ion Chromatography - Anions by ICMB: Prep Date:T080130013-MB Prep Date:Mal. Date:1/30/20083:04:45PMImage PlaneUnits: Prep Date:mg/LLCS Anal. Date:1/31/20082:12:57PMLCSD Anal. Date:1/31/20082:31:20PM Matrix: Prep Date:AqueousAnalyte NameSampResultImage SampResultImage SampResultSPREsSPLEsMBFluorideND4.754.755.005.0095.00.090-11020ChlorideND34.137.537.590.990.90.090-11020Samp. Anal. Date:1/30/20089:49:17PMFree Date:1/30/20081/30/2008MB Anal. Date:1/30/20089:49:17PMSPLEPree Date:1/30/2008SampResultND34.137.55.0090.990.990.990.910Samp. Anal. Date:<													
Inorganic Anions by Ion Chromatography - Anions by IC Base Sample: B0801191-02B Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L DUP Anal. Date: 1/30/2008 9:49:17PM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD Hag Pluoride 8.19 8.30 1.3 30				SA	AMPLE	DUPLIC	ATE RE	PORT					
Samp. Anal. Date: 1/30/2008 9:9:9:17PM Units: mg/L Analyte Name SampResult DUP Res. RPD RPD im Flag Fluoride 8,19 8.30 1.3 30 - - Chloride 611 599 2.0 30 - - - Sulfate 2.480 2.440 1.6 30 - - - - - Analysis: Inorganic Anions by Ion Chromatograph - Anions by IC MB MB T080130013-MB Prep Date: 1/30/2008 MB Anal. Date: 1/30/2008 3:04:45PM Units: mg/L CSRes SPrep Date: 1/30/2008 RPD im RPI im	Analysis:	Inorganic Anions	by Ion Ch	romatogi	raphy - A	nions by I	С	Base Prep	Sample Date:	e: B0801191 1/30/2008	1-02B		
DUP Anal. Date: 1/30/2008 10:07:41PM Matrix: Aqueous Analyte Name SampResult DUPRes, 8:19 RPD im 30 Flag Fluoride 8:19 8:30 1.3 30	Samp. Anal. Date:	1/30/2008 9:49	:17PM					Units	:	mg/L			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	DUP Anal. Date:	1/30/2008 10:07	7:41PM					Matri	x:	Aqueous			
Fluoride 8,19 8.30 1.3 30 Chloride 611 599 2.0 30 Sulfate 2,480 2,440 1.6 30 LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB MB Anal. Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SPLev Recov. SD Recov RPD Recov Lim RPDLim Flag Fluoride ND 4.75 4.75 5.00 5.00 95.0 90.9<	Analyte Name	SampRes	sult DU	JPRes.	RPD	RPDLin	n l	Flag					
Chloride 611 599 2.0 30 Sulfate 2,480 2,440 1.6 30 LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB Prep Date: 1/30/2008 3:04:45PM Units: mg/L LCSAnal. Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev Spontery Spontery 94.4 0.4 90 - 110 20 Chloride ND 4.75 4.75 500 5.00 95.0 9.0 90.9 90.	Fluoride	8.19	8.3	0	1.3	30		-					
Sulfate 2,480 2,440 1.6 30 LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB MB Anal. Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov SD Recov RPD in Rageous Fluoride ND 4.75 4.75 5.00 5.00 95.0 90.9 90.9 90.10 20 Sulfate ND 34.1 37.5 37.5 90.9 90.9 0.0 90-110 20 Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 9:49:17PM Matrix: Aqueous Analyte Name SanpResult MSRes. <td>Chloride</td> <td>611</td> <td>599</td> <td>9</td> <td>2.0</td> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Chloride	611	599	9	2.0	30							
LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB. BAnal. Date: 1/30/2008 3:04:45PM Image: 1/30/2008 1/30/2008 MB Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRs. SDR.s. SPLev SPDLev Recov. SD Recov Image: ND RepDIm Flag Fluoride ND 4.75 4.75 5.00 5.00 95.0 90.0 90.9 10.0 20 Suffate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90.110 20 Samp. Anal. Date: 1/30/2008 9:49:17PM Prep Date: 1/30/2008 9:49:10.0 90.9	Sulfate	2,48	0 2,4	-40	1.6	30							
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Analysis:	Inorganic Anions	by Ion Ch	romatog	LCS raphy - A	S/LCSD R nions by I	EPORI C	ſ MB:		T0801300	013-MB		
MB Anal. Date: 1/30/2008 $3:04:45PM$ Units: mg/L LCS Anal. Date: 1/31/2008 $2:12:57PMLCSD$ Anal. Date: $1/31/2008$ $2:31:20PM$ Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev Recov. SD Recov. SD Recov. RPD Recov Lin RPLin Flag Fluoride ND 2.37 2.36 2.50 2.50 94.8 94.4 0.4 $90 \cdot 110$ 20 Chloride ND 4.75 4.75 5.00 5.00 95.0 90.9 0.0 $90 \cdot 110$ 20 Sulfate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 $90 \cdot 110$ 20 Matrix: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801191-02B Prep Date: $1/30/2008$ Samp. Anal. Date: $1/30/2008$ $9:49:17PM$ Units: mg/L MS Anal. Date: $1/30/2008$ $9:49:17PM$ Matrix: Aqueous Analyte Name SampResult MSRes. SPL		8	5	0	1 5	5		Prep	Date:	1/30/2008	5		
LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Fluoride ND 2.37 2.36 2.50 94.8 94.4 0.4 90-110 20 Chloride ND 4.75 4.75 5.00 5.00 95.0 90.9 90.0 90-110 20 Sulfate ND 34.1 34.1 37.5 90.9 90.9 0.0 90-110 20 MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801191-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 9:60 9:64 70 - 130 Flag Fluoride 8.19 10.6 2:50 96.4 70 - 130 NOTE 2 Sulfate 2;480 3;420 938	MB Anal. Date:	1/30/2008 3:04	:45PM					Units	:	mg/L			
Analyte Name SampResult LCSRes. SDLes. SPDLev Recov. SD Recov. SD Recov. SD Recov. RPD Recov. Rec	LCS Anal. Date:	1/31/2008 2:12	:57PMLC	SD Anal	l. Date:	1/31/2008	3 2:31:2	20PM Matri	x:	Aqueous			
Fluoride ND 2.37 2.36 2.50 94.8 94.4 0.4 90 - 110 20 Chloride ND 4.75 4.75 5.00 5.00 95.0 0.0 90 - 110 20 Sulfate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90 - 110 20 MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801191-02B Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 10:26:05PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 Prep 2 Prep Batch: T080131008 92.8 70 - 130 938 100.3	Analyte Name	SampResult	LCSRes	SDRes	SPL ev	SPDL ev	Recov	SD Recov	RPD	Recov Lim	RPDLim	Flag	
Chloride ND 4.75 4.75 5.00 5.00 95.0 95.0 0.0 90 - 110 20 Sulfate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90 - 110 20 MS REPORT MS REPORT Parent: B0801191-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L Matrix: Aqueous Analyte Name SampResult MSRes. SPLey Recov. Recov Lim Flag Fluoride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2	Fluoride	ND	2.37	2.36	2.50	2.50	94.8	94.4	0.4	90 - 110	20		
Sulfate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90 - 110 20 MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801191-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 8.19 10.6 2.50 96.4 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2 Prep Batch: T080131008 Flag 100.3 70 - 130 NOTE 2	Chloride	ND	4.75	4.75	5.00	5.00	95.0	95.0	0.0	90 - 110	20		
MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801191-02B Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 10:26:05PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2 Prep Batch: T080131008 Flooride 100.3 70 - 130 NOTE 2 100.3 10	Sulfate	ND	34.1	34.1	37.5	37.5	90.9	90.9	0.0	90 - 110	20		
MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801191-02B Prep Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 10:26:05PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 8.19 10.6 2.50 96.4 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2 Prep Batch: T080131008 E E E E E E													
Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801191-02B Prep Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 10:26:05PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2 Prep Batch: T080131008 Fluoride Fluoride <td></td> <td></td> <td></td> <td></td> <td></td> <td>MS REP</td> <td>ORT</td> <td></td> <td></td> <td></td> <td></td> <td></td>						MS REP	ORT						
Samp. Anal. Date: 1/30/2008 9:49:17PM Units: mg/L MS Anal. Date: 1/30/2008 10:26:05PM Matrix: Aqueous <u>Analyte Name</u> <u>SampResult</u> <u>MSRes.</u> <u>SPLev</u> <u>Recov.</u> <u>Recov Lim</u> <u>Flag</u> Fluoride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2 Prep Batch: T080131008 E E E E E E	Analysis:	Inorganic Anions	by Ion Ch	romatog	raphy - A	nions by I	С	Paren	t: Date:	B0801191	1-02B		
Samp. Anal. Date: 1/30/2008 9:49:17PM Onits: Ing/L MS Anal. Date: 1/30/2008 10:26:05PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2 Prep Batch: T080131008 Flag 100.3 70 - 130 NOTE 2	Some Anal Data	1/20/2008 0.40	.17DM					Unito	Date.	ma/I	,		
Mis Anal. Date: 1/30/2008 10:28:05PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 8.19 10.6 2.50 96.4 70 - 130 100 Chloride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 NOTE 2 Prep Batch: T080131008 Total Sulfate Total Sulfate Total Sulfate Sulfate Total Sulfate	Samp. Anal. Date:	1/30/2008 9:49	:1/PM					Units		mg/L			
Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 8.19 10.6 2.50 96.4 70 - 130 70 - 130 Chloride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 100 Prep Batch: T080131008	MS Anal. Date:	1/30/2008 10:26):05PM					Matri	X:	Aqueous			
Fluoride 8.19 10.6 2.50 96.4 70 - 130 Chloride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 Prep Batch: T080131008 V V V V	Analyte Name	SampResult	MSRes.		SPLe	<u>ev</u>	Recov.]	Recov Lim		Flag	
Chloride 611 727 125 92.8 70 - 130 NOTE 2 Sulfate 2,480 3,420 938 100.3 70 - 130 Prep Batch: T080131008 Image: Chloride Image: Chloride Total Image: Chloride Image: Chloride <td>Fluoride</td> <td>8.19</td> <td>10.6</td> <td></td> <td>2.50</td> <td></td> <td>96.4</td> <td></td> <td></td> <td>70 - 130</td> <td></td> <td></td>	Fluoride	8.19	10.6		2.50		96.4			70 - 130			
Sulfate 2,480 3,420 938 100.3 70 - 130 Prep Batch: T080131008	Chloride	611	727		125		92.8			70 - 130	NOTE 2		
Prep Batch: T080131008	Sulfate	2,480	3,420		938		100.3			70 - 130			
	Prep Batch.	T080131008											
	Ttop Buton.												
SAMPLE DUPLICATE REPORT				SA	AMPLE	DUPLIC	ATE RE	PORT					

Detailed An	alytical Report			Analytica E	Invironment	al Laboratori	es, Inc.		
Workorder (SDG):	B0801191								
Project:	Navajo N	/line Extension	Leaching	g Study					
Client:	Applied	Hydrology Asso	ociates, Iı	nc.					
Client Project Num	ber: none								
Tests Run at: Workorder (SDG): Project: Project Number:	Analytica Environn B0801191 Navajo Mine Exten	ental Laborator sion Leaching S Q	ies - Thor tudy UALIT	rnton, Color Y CONT	ado ROL RE	PORT			
Prep Batch:	T080131008								
Analysis:	160.1 - Total Disso	SA lved Solids dried	AMPLE 1 at 180° (DUPLICA C - TDS	FE REPOI	RT Base Sample Pren Date:	e: B0801191 1/31/2008	-02B	
Samp. Anal. Date: DUP Anal. Date:	2/4/2008 12:47:24 2/4/2008 12:47:24	PM PM				Units: Matrix:	mg/L Aqueous		
<u>Analyte Name</u> Total Dissolved So	SampResulolids5,320	<u>t</u> <u>DUPRes.</u> 5,430	<u>RPD</u> 2.0	RPDLim 20	<u>Flag</u>				
					DODT				
Analysis:	160.1 - Total Disso	lved Solids dried	LCS 1 at 180°C	S/LCSD RE C - TDS	PORT	MB: Prep Date:	T08013100 1/31/2008)8-MB	
MB Anal. Date: LCS Anal. Date:	2/4/2008 12:47:24 2/4/2008 12:47:24	PM PM LCSD Anal	. Date:	2/4/2008 1	2:47:24PM	Units: Matrix:	mg/L Aqueous		
<u>Analyte Name</u> Total Dissolved Soli	<u>SampResult I</u> ds ND	<u>CSRes.</u> <u>SDRes.</u> 802 765	SPLev 821	<u>SPDLev</u> <u>R</u> 821	<u>ecov.</u> <u>SD</u> 97.6 <u>9</u>	<u>Recov</u> <u>RPD</u> 93.1 4.7	<u>Recov Lim</u> 80 - 120	<u>RPDLim</u> 20	<u>Flag</u>
Analysis:	160.1 - Total Disso	lved Solids dried	l at 180° (MS REPO C - TDS	RT	Parent: Prep Date:	B0801191- 1/31/2008	-02B	
Samp. Anal. Date:	2/4/2008 12:47:24	PM				Units:	mg/L		
MS Anal. Date:	2/4/2008 12:47:24	PM				Matrix:	Aqueous		
Analyte Name	SampResult M	<u>ASRes.</u>	SPLe	V	Recov.		Recov Lim	NOTE 2	<u>Flag</u>
Total Dissolved Soli	us 5,520	0,190	0/1		103.9		70 - 150	NOTE 2	
Prep Batch:	T080205001								
Analysis:	310.1 - Alkalinity,	SA Fitrimetric (pH 4	AMPLE 4.5) - Alk	DUPLICA alinity	TE REPOI	RT Base Sample Prep Date:	e: B0801191 2/4/2008	-04B	
Samp. Anal. Date: DUP Anal. Date:	2/4/2008 9:52:02/ 2/4/2008 9:52:02/	AM AM				Units: Matrix:	mg/L Aqueous		
Analyte Name Bicarbonate	<u>SampResul</u> ND	t <u>DUPRes.</u> ND	<u>RPD</u> 0.0	<u>RPDLim</u> 20	Flag				
Carbonate	10.0	8.00	22.2	20	OUT				

Detailed An	alytical Repo	ort			Analytica	a Environ	mental Lab	oratorie	es, Inc.		
Workorder (SDG):	B0801191										
Project:	Navaj	jo Mine Ez	ctension	Leachi	ng Study						
Client:	Appli	ed Hydrol	ogy Asso	ociates, 1	Inc.						
Client Project Numb	ber: none			,							
Tests Run at:	Analytica Enviro	onmental L	aboratori	les - Tho	ornton, Col	orado					
Workorder (SDG):	B0801191 Neveio Mine Ex	tension La	aching S	toda							
Project: Project Number:	Inavajo milie Ex		QI	UALI	ГY CON	TROL	REPORT	Г			
Prep Batch:	T080205001										
Analysis:	310.1 - Alkalinit	y, Titrimet	tric (pH 4	LC 4.5) - Al	S/LCSD F	EPOR	[MB: Prep]	Date:	T08020500 2/4/2008	01-MB	
MB Anal. Date:	2/4/2008 9:52:	02AM					Units	:	mg/L		
LCS Anal. Date:	2/4/2008 9:52:	02AM LC	SD Anal	. Date:	2/4/2008	9:52:02	AM Matri	x:	Aqueous		
<u>Analyte Name</u> Bicarbonate	<u>SampResult</u> ND	<u>LCSRes.</u> 24.0	<u>SDRes.</u> 27.0	<u>SPLev</u> 25.0	SPDLev 25.0	<u>Recov.</u> 96.0	<u>SD Recov</u> 108.0	<u>RPD</u> 11.8	<u>Recov Lim</u> 80 - 120	<u>RPDLim</u> 20	<u>Flag</u>
Carbonate	ND	50.0	51.0	50.0	50.0	100.0	102.0	2.0	80 - 120	20	
				FO	OTNOTES	TOQC	REPORT				

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

	Detailed Analytic	cal Report	Analytica En	vironmental Laboratories,	Inc.	
W	orkorder (SDG): B	0801191				
Pr	oject:	Navajo Mine Exter	nsion Leaching Study			
Cl	ient:	Applied Hydrology	y Associates, Inc.			
Cl	ient Project Number:	none				
		OC H	BATCH ASSOCIATIONS - B	Y METHOD BLANK		
	Lab Project ID:	83,542	Lab Project Number:	B0801191		
					Prep Date: 1/29/2008	
	Lab Method Blank Id:	T080129008-MB				
	Prep Batch ID:	T080129008	otol			
	Method:	SW0010B - ICP - 1				
	This Method blank and s	sample preparation batch a	re associated with the following	samples, spikes, and duplica	ates:	
	<u>SampleNum</u>	ClientSampleName	DataFile	<u>/</u>	AnalysisDate	
	B0801191-01A	MB 45 day	E0130	8A	1/30/2008 12:59:00PM	
	B0801191-02A	Ash Composite 45 day	E0130	8A 1	1/30/2008 1:04:00PM	
	B0801191-03A	Spoil Composite 45 day	E0130	8A 1	1/30/2008 1:09:00PM	
	B0801191-04A	MB SPLP	E0130	8A 1	1/30/2008 1:14:00PM	
	B0801191-05A	Ash Composite SPLP	E0130	8A 1	1/30/2008 1:19:00PM	
	B0801191-06A	Spoil Composite SPLP	E0130	8A 1	1/30/2008 2:29:00PM	
	T080129008-LCS	LCS	E0130	8A 1	1/30/2008 12:39:00PM	
	T080129008-LCSD	LCSD	E0130	8A 1	1/30/2008 12:44:00PM	
	B0801191-05A-DUP	DUP	E0130	8A 1	1/30/2008 1:40:00PM	
	B0801191-05A-MS	MS	E0130	8A 1	1/30/2008 1:45:00PM	
	B0801191-05A-MSD	MSD	E0130	8A 1	1/30/2008 1:50:00PM	
	B0801191-05A-PDS	PDS	E0130	8A 1	1/30/2008 1:55:00PM	
	T080129008-LCS	LCS	E0131	8A 1	1/31/2008 11:18:00AM	
	T080129008-LCSD	LCSD	E0131	8A 1	1/31/2008 11:23:00AM	
	B0801191-05A-MS	MS	E0131	8A 1	1/31/2008 11:28:00AM	
	B0801191-05A-MSD	MSD	E0131	8A 1	1/31/2008 11:33:00AM	
	B0801191-05A-PDS	PDS	E0131	8A 1	1/31/2008 11:38:00AM	

 . ..

Detailed Analyti	ical Report	Analytica	Environmental Labora	atories, Inc.	
Workorder (SDG): B	0801191				
Project:	Navajo Mine Exte	nsion Leaching Study			
Client:	Applied Hydrolog	y Associates, Inc.			
Client Project Number:	none				
	QCI	BATCH ASSOCIATIONS	- BY METHOD BLAN	NK	
Lab Project ID:	83,542	Lab Project Number:	B0801191		
Lab Method Blank Id: Prep Batch ID:	T080130013-MB T080130013			Prep Date: 1/30/2008	
Method:	Inorganic Anions by	Ion Chromatography - An	ions by IC		
This Method blank and	sample preparation batch a	re associated with the followi	ing samples, spikes, and	duplicates:	
<u>SampleNum</u>	ClientSampleName	Data	File	AnalysisDate	
T080130013-LCS	LCS	080)130_008.DXD	1/30/2008 3:23:07PM	ĺ
T080130013-LCSD	LCSD	080)130_009.DXD	1/30/2008 3:41:32PM	ĺ
B0801191-01B	MB 45 day	080	0130_011.DXD	1/30/2008 4:18:17PM	ĺ
B0801191-02B	Ash Composite 45 day	080)130_012.DXD	1/30/2008 4:36:41PM	ĺ
B0801191-02B-DUP	DUP	080)130_013.DXD	1/30/2008 4:55:04PM	ĺ
B0801191-02B-MS	MS	080)130_014.DXD	1/30/2008 5:13:28PM	ĺ
B0801191-03B	Spoil Composite 45 da	y 080)130_016.DXD	1/30/2008 5:50:15PM	[
B0801191-05B	Ash Composite SPLP	080	0130_018.DXD	1/30/2008 6:27:01PM	[
B0801191-06B	Spoil Composite SPLP	080)130_022.DXD	1/30/2008 7:40:34PM	[
B0801197-02B	Batch QC	080	0130_024.DXD	1/30/2008 8:17:21PM	[
B0801197-02B-MS	MS	080	0130_025.DXD	1/30/2008 8:35:45PM]
B0801191-01B	MB 45 day	080	0130_027.DXD	1/30/2008 9:12:31PM]
B0801191-02B	Ash Composite 45 day	080	0130_029.DXD	1/30/2008 9:49:17PM	[
B0801191-02B-DUP	DUP	080	0130_030.DXD	1/30/2008 10:07:41PM	1
B0801191-02B-MS	MS	080	0130_031.DXD	1/30/2008 10:26:05PM	1
B0801191-03B	Spoil Composite 45 da	y 080)130_033.DXD	1/30/2008 11:02:52PM	1
B0801191-04B	MB SPLP	080)130_037.DXD	1/31/2008 12:16:31AN	Л
B0801191-05B	Ash Composite SPLP	080)130_038.DXD	1/31/2008 12:34:55AN	Л
B0801191-06B	Spoil Composite SPLP	080)130_039.DXD	1/31/2008 12:53:17AN	Л
B0801197-02B	Batch QC	080)130_043.DXD	1/31/2008 2:06:51AM	1
B0801197-02B-MS	MS	080)130_044.DXD	1/31/2008 2:25:15AM	1
T080130013-LCS	LCS	080	0131_010.DXD	1/31/2008 2:12:57PM	[
T080130013-LCSD	LCSD	080)131_011.DXD	1/31/2008 2:31:20PM]

.

Detailed Analyt	ical Report	Analytica Environmental Labora	atories, Inc.
Workorder (SDG):	30801191		
Project:	Navajo Mine Exter	nsion Leaching Study	
Client:	Applied Hydrology	Associates, Inc.	
Client Project Number:	none		
	QC B	BATCH ASSOCIATIONS - BY METHOD BLAN	NK
Lab Project ID:	83,542	Lab Project Number: B0801191	
Lab Method Blank Id:	T080131004-MB		Prep Date: 1/29/2008
Prep Batch ID:	T080131004		
Method:	SW7470A - Mercury	in Liquid Waste by CVAA - Total Hg	
This Method blank and	sample preparation batch ar	e associated with the following samples, spikes, and	duplicates:
SampleNum	ClientSampleName	DataFile	AnalysisDate
A0801184-01D	Batch QC	B013108W.WKS	1/31/2008 1:13:50PM
B0801191-01A	MB 45 day	B013108W.WKS	1/31/2008 1:50:33PM
B0801191-02A	Ash Composite 45 day	B013108W.WKS	1/31/2008 2:39:43PM
B0801191-03A	Spoil Composite 45 day	B013108W.WKS	1/31/2008 2:41:52PM
B0801191-04A	MB SPLP	B013108W.WKS	1/31/2008 2:44:26PM
B0801191-05A	Ash Composite SPLP	B013108W.WKS	1/31/2008 2:46:54PM
B0801191-06A	Spoil Composite SPLP	B013108W.WKS	1/31/2008 2:48:59PM
T080131004-LCS	LCS	B013108W.WKS	1/31/2008 1:03:28PM
T080131004-LCSD	LCSD	B013108W.WKS	1/31/2008 1:06:14PM
A0801184-01D-DUI	P DUP	B013108W.WKS	1/31/2008 1:16:26PM
A0801184-01D-MS	MS	B013108W.WKS	1/31/2008 1:18:43PM
A0801184-01D-MSI) MSD	B013108W.WKS	1/31/2008 1:20:47PM
A0801184-01D-PDS	S PDS	B013108W.WKS	1/31/2008 1:23:11PM
	T000121000 ND		Prep Date: 1/31/2008
Lab Method Blank Id: Pren Batch ID:	T080131008-MB		
Method:	160.1 - Total Dissol	ved Solids dried at 180°C - TDS	
This Method blank and	sample preparation batch ar	re associated with the following samples spikes and	duplicates:
SampleNum	ClientSampleName	DataFile	AnalysisDate
B0801191-01B	MB 45 day	<u> </u>	2/4/2008 12·47·24PM
B0801191-02B	Ash Composite 45 day		2/4/2008 12:47:24PM
B0801191-03B	Spoil Composite 45 day	J	2/4/2008 12:47:24PM
B0801191-04B	MB SPLP	,	2/4/2008 12:47:24PM
B0801191-05B	Ash Composite SPLP		2/4/2008 12:47:24PM
B0801191-05B	Spoil Composite SPLP		2/4/2008 12:47:24PM
B0801191-00B	Batch OC		2/4/2008 12:47·24PM
T080131008-I CS	LCS		2/4/2008 12:47:24PM
T080131008-LCS	LCSD		2/4/2008 12:47·24PM
R0801101_02R_DUI	> DUP		2/4/2008 12:47:24PM
B0801191-02B-D01	MS		2/4/2008 12·47·24PM
B0801197-02B-MS	MS		2/4/2008 12:47:24PM
20001177 021 MD			<i>_, ,, _</i> 0000 (<i>B</i> , 1 <i>,</i> 1 <i>E</i> 11 11

Detailed Analyti	ical Report	Analytica E	nvironmental Laborat	ories, Inc.
Workorder (SDG): E	80801191			
Project:	Navajo Mine I	Extension Leaching Study		
Client:	Applied Hydro	ology Associates, Inc.		
Client Project Number:	none			
	(QC BATCH ASSOCIATIONS -	BY METHOD BLAN	K
Lab Project ID:	83,542	Lab Project Number:	B0801191	
				Prep Date: 2/4/2008
Lab Method Blank Id:	T080205001-M	B		
Prep Batch ID:	T080205001			
Method:	310.1 - Alkalini	ty, Titrimetric (pH 4.5) - Alkali	nity	
This Method blank and	sample preparation bat	ch are associated with the following	g samples, spikes, and	duplicates:
<u>SampleNum</u>	<u>ClientSampleName</u>	DataFi	<u>le</u>	AnalysisDate
B0801191-01B	MB 45 day			2/4/2008 9:52:02AM
B0801191-02B	Ash Composite 45	day		2/4/2008 9:52:02AM
B0801191-03B	Spoil Composite 43	5 day		2/4/2008 9:52:02AM
B0801191-04B	MB SPLP			2/4/2008 9:52:02AM
B0801191-05B	Ash Composite SP	LP		2/4/2008 9:52:02AM
B0801191-06B	Spoil Composite S	PLP		2/4/2008 9:52:02AM
T080205001-LCS	LCS			2/4/2008 9:52:02AM
T080205001-LCSD	LCSD			2/4/2008 9:52:02AM
B0801191-04B-DUP	DUP			2/4/2008 9:52:02AM

Detailed Analytical Report

Workorder (SDG): B0801191

Navajo Mine Extension Leaching Study **Project:**

Client: Applied Hydrology Associates, Inc. none

Client Project Number:

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.

Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

ND = Not Detected at or above the Reporting Limit

NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit

HIGH = Recovery, RPD, or other parameter is above Upper Control Limit

E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank

J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)

W = Post digestion spike did not meet criteria

S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)

PQL = "practical quantitation limit", from SW-846

EQL = "estimated quantitation limit", from SW-846

LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.

The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG):	B0801191
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Number:	none

REPOI	RTING CONVENTIONS B0801191	S FOR THIS REI	PORT
TestPkgName	Basis	<u># Sig Figs</u>	<u>Reporting Limit</u>
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

•															
		12 T	189 Pennsylvania St. hornton, CO 80241	4307 A Anchon	rctic Boulevard age, AK 99503	475 Hall St. Fairbanks, AK 9	9701 Ju	38 Shaune Driv	- 0			Page			
CROUP®			303) 469-5254 Tax	(106)	258-6634 fax	(907) 456-3125	Fax (90	17) 780-6670 fa	×						
Client Name & Address:	•		Public Water :	System (PW	S) ID#:				Se Se	ction To be	Complete	d by Analyt	ica:		
Hop lived Hugo rology Hsso	iciates,J	20	Project Name					Quote	Ď		LGN: ア	カフー	Ω -		
			Navajo	Mine Ex	fension	Leaching S	itude	Accour	**		Cash	Cred	it Card		
Report to:			_	urnaround	d Time for	Results (TA	T)	Invoid	e to Name	& Address				-	
Phone No:			X Stand	ard	Expedi	ted (< 10 days, prior ault	vorization required)								
Fax No:					1	(please specify due d add"ti cherges may	r apply)								
E-mail:			Requested Due	Date for Res	ults:										
Special Instructions/Comments:	e by R.	Seemen	/					P.O. o	r Contract N	8					
	c								Requested	Analysis/Me	thod				
45 day coal water a	and SPL	P leac	۶			۲ ۲	5						-		
Kit Prep/Shipping Charge: \$					ther)	я ·Т 76	6 6			\$/I(ervec	ered	7
Client Sample Identificati	on / Location		Date Sampled	Time Sampled	Matrix (S-DW-WW-O	(010 8/3010 Lot # 107 0 Pres: #4 * 3	14 (04) (47 Loi # 1670 C Pres: 440	ISO.I PH	ola Pres	soc Anjo .ot# ?res:	310.1 AIK ot#: ?res	.ot # ?res:	Field Pres	Field Fil	MS/MS
MB 45 de-4			1/25/08	14;00	A.e. S	×	×	×	×	×	×		5	×	
Ash Composite 452	er/				45	• ×	*	×	×	7	×		<u>۲</u>		×
Spoil Composite 45	del				• •	×	*	×	×	×	×		র্ন		
MB SPLP	ι					× (×	×	×	×	×			+	
ASK composite SPLP		-		 	• 1	×	×	×	×	×	×				
Spoil Composite SPLF			ł	4	+	×	×	*	×	×	×		<u>ب</u>	-P -	
Relinquished by:	Date	Time	Received by:		Date	Time			Section	o Be Comi	beted by A	nalvfica			
R. Seeman	1/28/08	12:35	APM		39/35/1	· 12:35	Conditi	on of	ТНО	ANC	1000-000-000-000-000-000-000-000-000-00	UNL	1	BKS	10000
Relinquished by:	Date	Time	Received by:		Date	Time	Custod	ly Seal?:)		NAME AND ADDRESS				:
	1						Initiale	d By:)						1
Relinquished by:	Date	Time	Received by:		Date	Time	Temp/L Thermo	0 ID#:	<u>6.</u> 0	and the second results of the second		a talanta kalendara talan t			
Name of Sampler: (printed)							Shippe	d Via: 🕺	Jan Samon						:
Version 2.0															Ľ



Cooler Receipt Form

Client: Applied Hydrology Associates Clie Project: Navajo Mine Extension Leaching S	ent Code: 030188 Study		Order #: B0801191
Cooler ID: 1			·
A. Preliminary Examination Phase:	Date cooler opened: Cooler opened by:	1/28/2008 gp	Signature:
1. Was airbill Attached? N/A	Airbill #:	Ca	arrier Name: Other
2. Custody Seals? N/A	How many? 0	Location:	Seal Name:
3. Seals intact? N/A			
4. COC Attached? Yes	Properly Completed?	Yes S i	gned by AEL employee? Yes
5. Project Identification from custody paper:	Navajo Mine Exte	ension Leaching Stu	ıdy
6. Preservative: None	Temperat	ure: 6.0 deg.C	
Designated person initial here to acknowledge	receipt:	69	Date: 1/28/08
COMMENTS: Tumbled in house by R. Seeman	. 45 day coal water and SF	PLP Leach.	Der

В,	Log-In Phase: Samples Log-in	Date: 1/28/2008	Log-in By: gp		
1	. Packing Type:	Other			
2	. Were samples in separate bags?	N/A			
3	. Were containers intact?	Yes	Labels agree with COC?	Yes	
4	Number of bottles received:	13	Number of samples received:	6	
5,	Correct containers used?	Yes	Correct preservatives added?	Yes	4 1 21
6.	Sufficient sample volume?	Yes			
7.	Bubbles in VOA samples?	N/A			
8.	Was Project manager called and stat	us discussed?	No		
9.	Was anyone called? No	Who was called?	By whom?		Date:

COMMENTS:

Remit to:	Accounting Dpt	Invoice #:	82691
	Analytica Environmental Laboratories, Inc.	Work Order#:	B0801197
	P.O. Box 973426	Account#:	030188
	Dallas,TX 75397-3426	Quote ID#:	11340
		Invoice Date:	2/11/2008
		Work ID:	Navajo Mine Extension
Phone:	(303) 469-8868	PO #:	Leaching Study
Attention:	Mr.Art O'Hayre	Received:	1/29/2008
Invoice to:	Applied Hydrology Associates, Inc.	Reported:	2/11/2008
	950 South Cherry Street	Client Project#:	Navajo Mine Extension Leach
	Suite 810	-	
	Denver, CO 80246		

Comments:

Item charges		<u>Oty</u>	Price	<u>Total</u>	
SW7470A - Mercury in Liquid Waste by CVAA - Total Hg In Aqueous	М	2	35.00	70.00	
160.1 - Total Dissolved Solids dried at 180°C - TDS In Liquid	Matrix	2	22.00	44.00	
150.1 - pH, Elecrometric - pH In Liquid Matrix		2	10.00	20.00	
SW6010B - ICP - Total In Aqueous Matrix		2	312.00	624.00	
Inorganic Anions by Ion Chromatography - Anions by IC In Liquid	Matrix	2	54.00	108.00	
310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity In Liquid	Matrix	2	36.00	72.00	
	Total of It	ems Abovo	e:	\$938.00	
Adjustments or Special Services		<u>Oty</u>	Price	<u>Total</u>	
Tumbling Charge		1	95.00	95.00	
	Total of It	ems Abovo	e:	\$95.00	
	Grand Tot	al:		\$1,033.00	

All invoices are due and payable upon receipt. Outstanding balances over 30 days are subject to a finance charge of 1.5% per month, plus a late fee of \$25.00. If Analytica engages legal counsel to enforce its rights or any other rights under an application for payment, the customer will be liable to Analytica for all costs of collection and other legal expenses, including reasonable attorney fees.

REMITTANCE ADVICE PLEASE RETURN THIS PORTION WITH YOUR PAYMENT

Mr.Art O'Hayre		Account#:	030188
Applied Hydrology Associates, Inc.		Invoice #:	82691
950 South Cherry Street		Invoice Date:	2/11/2008
Suite 810 Denver, CO 80246			
TOTAL INVOICE AMOUNT:	\$1,033.00		
PAYMENT AMOUNT ENCLOSED:			

Page 2 of 2



2/11/2008 Applied Hydrology Associates, Inc. 950 South Cherry Street Suite 810 Denver, CO 80246 Attn: Art O'Hayre Analytica Environmental Laboratories, Inc. 12189 Pennsylvania Street Thornton, CO 80241 Phone: 303-469-8868 Fax: 303-469-5254

Work Order #: B0801197 Date: 2/11/2008 Work ID: Navajo Mine Extension Leaching Study Date Received: 1/29/2008 Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801197-01	MB Successive #1	B0801197-02	Ash Successive #1

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Kristen Stone Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0801197

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Methods for the Determination of Metals in Environmental Samples, EPA/600/R-94/111, May 1994.

SAMPLE RECEIPT: Two (2) samples were received on 1/29/2008 1:40:00 PM., at a temperature of 20 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody. The samples were tumbled at the laboratory.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality contro parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: 150.1 - pH, Elecrometric - pH - Aqueous Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous

MS/MSD and DUP OUTLIERS: As shown below, the MS/MSD was outside of limits for Sodium and Calcium. The sample had Sodium and Calcium concentrations greater than four times the spike amount. In these case it is not appropriate to calculate a recovery. The result should be used as a replicate.

Туре	e Cli	lent Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	Ash	Successive	# B0801197-02A	Sodium	52.8	75	125	1130	10.0
MSD	Ash	Successive	# B0801197-02A	Calcium	217	75	125	472	10.0
MSD	Ash	Successive	# B0801197-02A	Sodium	352	75	125	1130	10.0

Detailed Ana	lytical Report		Ana	lytica Envi	ronmental Laboratories	, Inc.	
Workorder (SDG):	B0801197						
Project:	Navajo Mine	Extension	Leaching Stu	ıdy			
Client:	Applied Hyd	rology Ass	ociates, Inc.				
Client Project Numbe	er: none		,				
Report Section	: Client	t Sampl	le Report				
- Client Sample Name:	MB Suc	ressive #	1		-		
Matrix	Aqueous		1		Collection Date:	1/29/2008 11	1:10:00AM
		T 1					
The following test was	conducted by: Analytica -	Inornton				2/5/2008	4.2C.21DM
Lab Sample Number: Prop Date:	B0801197-01A 2/5/2008				Analysis Date:	$\frac{2}{5}\frac{2008}{2008}$	4:30:31PM
Analytical Method ID:	SW7470A - Mercury in 1	Liquid Wast	e by CVAA - T	otal Ho	File Name:	B020508V	vw
Bran Method ID:	7470A	Elquid Wust		ourng	Dilution Eactor:	1	• . • •
Drep Method ID.	TOPO205004				Dilution Pactor.	1	
Prep Batch Number:	As Received				Analyset Initials	DI	
Sampla prop wt /vol:	30.00 ml				Analyst Initials: Drop Extract Vol:	30.00	ml
Sample prep wi./voi.	50.00 III				riep Extract voi.	50.00 1	111
<u>Analyte</u> Mercury	<u>CASNo</u> 7439 97 6	<u>Result</u> ND	Flags Units	<u>PQL</u> <u>N</u> 0.000200.0	<u>IDL</u> 000050		<u>run #:</u> 2
	1-11-1-1-1	- 1.2 	<u>g</u> , 2	0.000200.			2
The following test was	conducted by: Analytica -	Thornton				1/21/2000	1.25.000
Lab Sample Number:	B0801197-01A				Analysis Date:	1/31/2008	1:35:00PM
Prep Date:	1/30/2008 SW6010B - ICP - Total				Eile Nome:	ICP_2 E01318A	
Prop Mathad ID.	3010 ICP				Dilution Easter	1	
	J010_ICI T080120010				Dilution Factor:	1	
Prep Batch Number:	As Paceived				Analyset Initials	****	
Sample prep wt /vol	50.00 ml				Pren Extract Vol	50.00 1	ml
	CASN	Derek		DOL N			#-
<u>Analyte</u> Aluminum	<u>CASNo</u> 7429-90-5	Result 0.063	<u>Flags</u> Units mg/L	0.050 0	<u>IDL</u> 0.014		<u>run #:</u> 1
Antimony	7440-36-0	ND	mg/L	0.050 0	.0067		1
Arsenic	7440-38-2	ND	mg/L	0.10	0.015		
Barium	7440-39-3	0.085	mg/L	0.010 0	00016		
Bervllium	7440-41-7	ND	mg/L	0.0010.0.0	000060		
Boron	7440-42-8	0.31	mg/L	0.050 0	0018		
Cadmium	7440-43-9	ND	mg/L	0.0060 0.	00051		
Calcium	7440-70-2	3.2	mg/L	0.10	0.013		
Chromium	7440-47-3	ND	mg/L	0.010 0	0.0018		
Cobalt	7440-48-4	ND	mg/L	0.0050 0	0.0016		
Copper	7440-50-8	ND	mg/L	0.0050 0	0.0019		
Iron	7439-89-6	ND	mg/L	0.050 0	0.0027		
Lead	7439-92-1	ND	mg/L	0.050	0.011		
Lithium	7439-93-2	ND	mg/L	0.10 0.	00072		
Magnesium	7439-96-4	1.3	mg/L	0.10	0.012		
Manganese	7439-96-5	ND	mg/L	0.010 0.	00066		
Molybdenum	7439-98-7	0.016	mg/L	0.010 0	0.0018		
Nickel	7440-02-0	ND	mg/L	0.040 0	0.0027		
Potassium	7440-09-7	12	mg/L	1.0	0.31		
Selenium	7784-49-2	ND	mg/L	0.10	0.026		
Silver	7440-22-4	ND	mg/L	0.015 0	00066		
511701	1440-22-4		iiig/L	0.015 0.			

Detailed Ana	lytical Re	eport		Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B080119	7								
Project:	Na	vajo Mine l	Extension l	Leaching Stu	dy					
Client:	Ар	plied Hydro	ology Asso	ciates, Inc.						
Client Project Numbe	r: noi	ne								
Report Section	:	Client	Sample	Report						
Client Sample Name:	•	MB Succ	essive #1	-						
Matrix:	Aqueou	S				C	ollection Date:	1/29/2008 1	1:10:00AM	
Lab Sample Number:	B0801197-	·01A					Analysis Date:	1/31/2008	3 1:35:00PM	
Prep Date:	1/30/2008						Instrument:	ICP_2		
Analytical Method ID:	SW6010B -	ICP - Total					File Name:	E01318A		
Prep Method ID:	3010_ICP						Dilution Factor:	1		
Prep Batch Number:	T08013001	0								
Report Basis:	As Received						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Sodium	<u>CA</u> 7440	<u>SNo</u>)-23-5	<u>Result</u> 1,200	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028	i		<u>run #:</u> 1	
Thallium	7440	0-28-0	ND	mg/L	0.40	0.011				
Vanadium	7440)-62-2	ND	mg/L	0.010	0.0007	2			
Zinc	7440)-66-6	ND	mg/L	0.0050	0.0010)			
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	conducted by: B0801197- 2/4/2008 310.1 - Alkal Alkalinity_ T08020500	Analytica - 7 -01B inity, Titrimer W)1	Thornton tric (pH 4.5)	- Alkalinity			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 Titrametri 1	9:52:02AM c	
Report Basis:	As Received						Analyst Initials:	cs	_	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Bicarbonate Carbonate	<u>CA</u>	<u>SNo</u>	<u>Result</u> 1,100 280	Flags Units mg/L mg/L	<u>POL</u> 5.0 7.0	MDL 1.5 1.2			<u>run #:</u> 1	
The following test was	conducted by:	Analytica - 7	Thornton							
Lab Sample Number: Prep Date: Analytical Method ID:	B0801197- 1/29/2008 150.1 - pH, H	•01 B Elecrometric •	- pH				Analysis Date: Instrument: File Name:	1/29/2008 Probe	3 11:20:00AM	
Prep Method ID:	150.1						Dilution Factor:	1		
Prep Batch Number:	T08020100)6								
Report Basis:	As Received						Analyst Initials:	R. Seeman		
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00	ml	
<u>Analyte</u> pH	<u>CA</u>	<u>SNo</u>	<u>Result</u> 9.1	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1	

The following test was conducted by: Analytica - Thornton

Detailed Anal	Analytical Report Analytica Env					ivironmental Laboratories, Inc.			
Workorder (SDG):	B0801197								
Project:	Navajo Mine	Extension	Leaching Study	y					
Client:	Applied Hydr	rology Asso	ciates, Inc.						
Client Project Number	r: none								
Report Section:	client	t Sample	e Report						
Client Sample Name:	MB Suce	cessive #1							
Matrix:	Aqueous				C	Collection Date:	1/29/2008 1	1:10:00AM	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801197-01B 1/31/2008 160.1 - Total Dissolved S 160.1	Solids dried a	tt 180°C - TDS			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 SCALE 1	12:47:24PM	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T080131008 As Received 100.00 ml					Analyst Initials: Prep Extract Vol:	kl 1.00	ml	
Analyte Total Dissolved Solids	CASNo	<u>Result</u> 3,000	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 10	MDL 8.2			<u>run #:</u> 1	
The following test was c	conducted by: Analytica -	Thornton							
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801197-01B 1/30/2008 Inorganic Anions by Ion 300.0	Chromatogra	aphy - Anions by I	IC		Analysis Date: Instrument: File Name: Dilution Factor:	1/30/2008 IC 080130_0 25	3 7:58:57PM)23.D	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T080130013 As Received 20.00 ml					Analyst Initials: Prep Extract Vol:	КВ 20.00	ml	
<u>Analyte</u> Chloride	CASNo	<u>Result</u> 600	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1	
Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID:	B0801197-01B 1/30/2008 Inorganic Anions by Ion 300.0	Chromatogra	aphy - Anions by I	IC		Analysis Date: Instrument: File Name: Dilution Factor:	1/31/2008 IC 080130_0 1	3 1:30:04AM 041.D	
Prep Batch Number:	1080130013					Ampletet Tutte 1	KB		
Sample prep wt /vol·	20.00 ml					Pren Extract Vol	20.00	ml	
Analyte Fluoride Sulfate	<u>CASNo</u>	<u>Result</u> 2.2 280	<u>Flags</u> <u>Units</u> mg/L mg/L	POL 0.40 1.5	<u>MDL</u> 0.031 0.11		20.00	<u>run #:</u> 2	

Workorder (SDG):B0801197Project:Navajo Mine Extension Leaching StudyClient:Applied Hydrology Associates, Inc.	
Project:Navajo Mine Extension Leaching StudyClient:Applied Hydrology Associates, Inc.	
Client: Applied Hydrology Associates, Inc.	
Client Project Number: none	
Report Section: Client Sample Report	
Client Sample Name:	
Ash Successive #1	
Matrix: Aqueous Co	ollection Date: 1/29/2008 11:10:00AM
The following test was conducted by: Analytica - Thornton	
Lab Sample Number: B0801197-02A	Analysis Date: 2/5/2008 4:38:47PM
Prep Date: 2/5/2008	Instrument: CVAA_1
Analytical Method ID: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg	File Name: B020508W.W
Prep Method ID: 7470A	Dilution Factor: 1
Prep Batch Number: T080205004	
Report Basis: As Received	Analyst Initials: DL
Sample prep wt./vol: 30.00 ml	Prep Extract Vol: 30.00 ml
Analyte CASNO Result Flags Units POI MDI	run #•
Marcury 7439-97-6 ND mg/L 0.000200.00005	50 2
The following test was conducted by: Analytica - Thornton	
Lab Sample Number: B0801197-02A	Analysis Date: 1/31/2008 1:40:00PM
Prep Date: 1/30/2008	Instrument: ICP 2
Analytical Method ID: SW6010B - ICP - Total	File Name: E01318A
Prep Method ID: 3010 ICP	Dilution Factor: 1
Pren Batch Number: T080130010	
Report Basis: As Received	Analyst Initials: rm
Sample prep wt./vol: 50.00 ml	Prep Extract Vol: 50.00 ml
Analyte CASNo Result Flags Units POL MDL	run #:
Aluminum 7429-90-5 0.065 mg/L 0.050 0.014	1
Antimony 7440-36-0 ND mg/L 0.050 0.0067	7
Arsenic 7440-38-2 ND mg/L 0.10 0.015	
Barium 7440-39-3 0.033 mg/L 0.010 0.00016	6
Beryllium 7440-41-7 ND mg/L 0.0010 0.00006	50
Boron 7440-42-8 0.37 mg/L 0.050 0.0018	3
Cadmium 7440-43-9 ND mg/L 0.0060 0.0005	1
Calcium 7440-70-2 470 mg/L 0.10 0.013	
Chromium 7440-47-3 ND mg/L 0.010 0.0018	3
Cobalt 7440-48-4 ND mg/L 0.0050 0.0016	5
Copper 7440-50-8 ND mg/L 0.0050 0.0019)
Iron 7439-89-6 ND mg/L 0.050 0.0027	7
Lead 7439-92-1 ND mg/L 0.050 0.011	
Lithium 7439-93-2 ND mg/L 0.10 0.00072	2
Magnesium 7439-96-4 2.0 mg/L 0.10 0.012	6
Magnesium 7439-96-4 2.0 mg/L 0.10 0.012 Manganese 7439-96-5 0.021 mg/L 0.010 0.00066	0
Magnesium 7439-96-4 2.0 mg/L 0.10 0.012 Manganese 7439-96-5 0.021 mg/L 0.010 0.0006 Molybdenum 7439-98-7 0.019 mg/L 0.010 0.0018	3
Magnesium 7439-96-4 2.0 mg/L 0.10 0.012 Manganese 7439-96-5 0.021 mg/L 0.010 0.0006 Molybdenum 7439-98-7 0.019 mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027	3
Magnesium 7439-96-4 2.0 mg/L 0.10 0.012 Manganese 7439-96-5 0.021 mg/L 0.010 0.0006 Molybdenum 7439-98-7 0.019 mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-09-7 12 mg/L 1.0 0.31	3
Magnesium 7439-96-4 2.0 mg/L 0.10 0.012 Manganese 7439-96-5 0.021 mg/L 0.010 0.0006 Molybdenum 7439-98-7 0.019 mg/L 0.010 0.0018 Nickel 7440-02-0 ND mg/L 0.040 0.0027 Potassium 7440-09-7 12 mg/L 1.0 0.31 Selenium 7784-49-2 ND mg/L 0.10 0.026	3 7

Detailed Ana	lytical Re	port		Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B080119'	7								
Project:	Nav	vajo Mine I	Extension	Leaching Stu	dy					
Client:	Ap	plied Hydr	ology Asso	ciates, Inc.						
Client Project Numbe	r: non	e								
Report Section	:	Client	Sample	e Report						
Client Sample Name:	1	Ash Succ	essive #1	1						
Matrix:	Aqueou	s				C	ollection Date:	1/29/2008 1	1:10:00AM	
Lab Sample Number:	B0801197-	02A					Analysis Date:	1/31/200	8 1:40:00PM	
Prep Date:	1/30/2008						Instrument:	ICP_2		
Analytical Method ID:	SW6010B - I	CP - Total					File Name:	E01318A	L	
Prep Method ID:	3010_ICP						Dilution Factor:	1		
Prep Batch Number:	T08013001	0								
Report Basis:	As Received						Analyst Initials:	rm		
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Sodium	<u>CA</u> 7440	<u>SNo</u>)-23-5	<u>Result</u> 1,100	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1	
Thallium	7440	-28-0	ND	mg/L	0.40	0.011				
Vanadium	7440	-62-2	0.034	mg/L	0.010	0.0007	2			
Zinc	7440	-66-6	ND	mg/L	0.0050	0.0010)			
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Prep Method ID: Prep Batch Number:	conducted by: B0801197- 2/4/2008 310.1 - Alkali Alkalinity_Y T08020500	Analytica - 02B inity, Titrime W 1	Thornton tric (pH 4.5)	- Alkalinity			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 Titrametr 1	9:52:02AM ic	
Report Basis:	As Received						Analyst Initials:	CS		
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml	
<u>Analyte</u> Bicarbonate Carbonate	<u>CA</u>	<u>SNo</u>	<u>Result</u> 790 ND	Flags <u>Units</u> mg/L mg/L	<u>POL</u> 5.0 7.0	MDL 1.5 1.2			<u>run #:</u> 1	
The following test was	conducted by:	Analytica - 7	Thornton							
Lab Sample Number: Prep Date: Analytical Method ID:	B0801197- 1/29/2008 150.1 - pH, E	02B	- pH				Analysis Date: Instrument: File Name:	1/29/2008 Probe	8 11:20:00AM	
Prep Method ID:	150.1						Dilution Factor:	1		
Prep Batch Number:	T08020100	6								
Report Basis:	As Received						Analyst Initials:	R. Seeman		
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00	ml	
<u>Analyte</u> pH	CAS	<u>SNo</u>	<u>Result</u> 7.4	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1	

The following test was conducted by: Analytica - Thornton

Detailed Analytical Report Analytic					nalytica Environmental Laboratories, Inc.					
Workorder (SDG):	B0801	197								
Project:]	Navajo Mi	ne Extension	Leach	ing Study	y				
Client:		Applied H	ydrology Asso	ciates,	Inc.					
Client Project Numbe	r:	none								
Report Section	:	Clie	ent Sample	e Rej	oort					
Client Sample Name:		Ash Su	- iccessive #1	-	·		i			
Matrix:	Aqu	eous					C	Collection Date:	1/29/2008	11:10:00AM
Lab Sample Number:	B08011	97-02B						Analysis Date:	2/4/2008	3 12:47:24PM
Prep Date:	1/31/200	08						Instrument:	SCALE	
Analytical Method ID:	160.1 - T	otal Dissolve	ed Solids dried a	t 180°C	C - TDS			File Name:		
Prep Method ID:	160.1							Dilution Factor:	1	
Prep Batch Number:	T08013	1008								
Report Basis:	As Receiv	ved						Analyst Initials:	kl	
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	1.00	ml
<u>Analyte</u> Total Dissolved Solids		<u>CASNo</u>	<u>Result</u> 4,900	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted	by: Analytic	a - Thornton							
Lab Sample Number:	B08011	97-02B						Analysis Date:	1/30/200	08 8:17:21PM
Prep Date:	1/30/200	08						Instrument:	IC	
Analytical Method ID:	Inorganic	Anions by l	on Chromatogra	phy - A	Anions by	IC		File Name:	080130_	_024.D
Prep Method ID:	300.0							Dilution Factor:	25	
Prep Batch Number:	T08013	0013								
Report Basis:	As Receiv	ved						Analyst Initials:	KB	
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml
Analyte Chloride		<u>CASNo</u>	<u>Result</u> 610	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1
Sulfate			2,100		mg/L	38	2.8			
Lab Sample Number:	B08011	97-02B						Analysis Date:	1/31/200	08 2:06:51AM
Prep Date:	1/30/200	08						Instrument:	IC	
Analytical Method ID:	Inorganic	Anions by I	on Chromatogra	phy - A	Anions by	IC		File Name:	080130_	_043.D
Prep Method ID:	300.0							Dilution Factor:	1	
Prep Batch Number:	T08013	0013								
Report Basis:	As Receiv	ved						Analyst Initials:	KB	
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml
<u>Analyte</u> Fluoride		<u>CASNo</u>	<u>Result</u> 2.6	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031	l		<u>run #:</u> 2

Detailed Ana	lytical Report		Ana	Analytica Environmental Laboratories, Inc.					
Workorder (SDG):	B0801197								
Project:	Navajo Mine	Extension	Leaching Stu	ıdy					
Client:	Applied Hyd	rology Ass	ociates, Inc.						
Client Project Numbe	er: none		,						
Report Section	: Methe	o <mark>d Bla</mark> n	k Report						
Client Sample Name:	MB		_		7				
Matrix:	Aqueous				Collection Date:	2/5/2008 12:00:00	0AM		
The following test was	conducted by Analytica -	Thornton							
Lab Sample Number:	T080205004-MB				Analysis Date:	2/5/2008 4:23	:51PM		
Prep Date:	2/5/2008				Instrument:	CVAA_1			
Analytical Method ID:	SW7470A - Mercury in I	Liquid Wast	e by CVAA - T	otal Hg	File Name:	B020508W.W			
Prep Method ID:	7470A				Dilution Factor:	1			
Prep Batch Number:	T080205004								
Report Basis:	As Received				Analyst Initials:	DL			
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 ml			
Analyta	CASNo	Dogult	Eleca Unita	DOL M	T I				
Mercury	<u>CASN0</u> 7439-97-6	ND ND	mg/L	0.000200.0	000050	<u>11</u>	<u>111 #:</u> 2		
The following test was	conducted by: Analytica -	Thornton							
Lab Sample Number:	T080130010-MB	moniton			Analysis Date:	1/31/2008 1.0	4·00PM		
Pren Date:	1/30/2008				Instrument:	ICP 2	1.001 101		
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E01318A			
Prep Method ID:	3010 ICP				Dilution Factor:	1			
Prep Batch Number	 T080130010								
Report Basis:	As Received				Analyst Initials:	rm			
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml			
Analyte	CASNo	Result	Flags Units	PQL M	DL	rı	un #:		
Aluminum	7429-90-5	ND	mg/L	0.050 0	0.014		1		
Antimony	7440-36-0	ND	mg/L	0.050 0	.0067				
Arsenic	7440-38-2	ND	mg/L	0.10 0	0.015				
Barium	7440-39-3	ND	mg/L	0.010 0.0	00016				
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0	000060				
Boron	7440-42-8	ND	mg/L	0.050 0	.0018				
Cadmium	7440-43-9	ND	mg/L	0.0060 0.0	00051				
Calcium	7440-70-2	ND	mg/L	0.10 0	0.013				
Chromium	7440-47-3	ND	mg/L	0.010 0	.0018				
Cobalt	7440-48-4	ND	mg/L	0.0050 0	.0016				
Copper	7440-50-8	ND	mg/L	0.0050 0.	.0019				
Iron	7439-89-6	ND	mg/L	0.050 0	.0027				
Lithium	7439-93-2	ND	mg/L	0.10 0.0	00072				
Magnesium	7439-96-4	ND	mg/L	0.10 0	0.012				
Manganese	7439-96-5	ND	mg/L	0.010 0.0	00066				
Molybdenum	7439-98-7	ND	mg/L	0.010 0.	.0018				
Nickel	7440-02-0	ND	mg/L	0.040 0.	.0027				
Potassium	7440-09-7	ND	mg/L	1.0	0.31				
Selenium	7784-49-2	ND	mg/L	0.10 0	0.026				
Silver	7440-22-4	ND	mg/L	0.015 0.0	00066				
Sodium	7440-23-5	ND	mg/L	3.0 0	0.028				
			-						

Detailed Ana	lytical Report		Anal	lytica En	vironr	nental Laboratories,	Inc.
Workorder (SDG):	B0801197						
Project:	Navajo Mine	Extension 1	Leaching Stu	dy			
Client:	Applied Hydr	ology Asso	ciates, Inc.				
Client Project Numbe	r: none						
Report Section	: Metho	d Blank	Report				
Client Sample Name:	MB		1		i		
Matrix:	L Aqueous				C	Collection Date:	1/30/2008 12:00:00AM
Lab Sample Number:	T080130010-MB					Analysis Date:	1/31/2008 1:04:00PM
Prep Date:	1/30/2008					Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total					File Name:	E01318A
Prep Method ID:	3010_ICP					Dilution Factor:	1
Prep Batch Number:	T080130010						
Report Basis:	As Received					Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml					Prep Extract Vol:	50.00 ml
<u>Analyte</u> Thallium	<u>CASNo</u> 7440-28-0	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.011	1	<u>run #:</u> 1
Vanadium	7440-62-2	ND	mg/L	0.010	0.0007	72	
I ah Sample Number:	T080130010-MB		-			Analysis Date:	2/1/2008 12·48·00PM
Pren Date:	1/30/2008					Instrument:	ICP 2
Analytical Method ID:	SW6010B - ICP - Total					File Name:	E02018A
Prep Method ID:	3010 ICP					Dilution Factor:	1
Prep Batch Number:	 T080130010						
Report Basis:	As Received					Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml					Prep Extract Vol:	50.00 ml
Analyte	CASNo	Result	<u>Flags</u> <u>Units</u>	POL	<u>MDL</u>	-	<u>run #:</u>
Lead	7439-92-1	ND	mg/L	0.050	0.01		2
Zinc	/440-66-6	ND	mg/L	0.0050	0.001	0	
The following test was	conducted by: Analytica - '	Thornton					
Lab Sample Number:	T080205001-MB					Analysis Date:	2/4/2008 9:52:02AM
Prep Date:	2/4/2008	(A 11 - 11 - 14			Instrument:	Titrametric
Analytical Method ID:	310.1 - Alkalinity, litrime	tric (pH 4.5)	- Alkalinity			File Name:	
Prep Method ID:	Alkalinity_W					Dilution Factor:	1
Prep Batch Number:	1080205001						
Report Basis:	As Received					Analyst Initials:	
Sample prep wt./vol:	100.00 mi					Prep Extract Vol:	100.00 mi
Analyte	CASNo	<u>Result</u>	<u>Flags</u> <u>Units</u>	POL	MDL		<u>run #:</u>
Bicarbonate		ND	mg/L	5.0	1.5		1
Carbonate		ND	mg/L	7.0	1.2		
The following test was	conducted by: Analytica - '	Thornton					
Lab Sample Number:	T080131008-MB					Analysis Date:	2/4/2008 12:47:24PM
Prep Date:	1/31/2008		10000 TD0			Instrument:	SCALE
Analytical Method ID:	100.1 - Total Dissolved S	onus dried a	1 180°C - IDS			File Name:	1
Prep Method ID:	160.1					Dilution Factor:	1
Prep Batch Number:	1080131008						11
Report Basis:	As Received					Analyst Initials:	KI 1.00 1
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00 ml
<u>Analyte</u>	CASNo	<u>Result</u>	<u>Flags</u> <u>Units</u>	<u>PQL</u>	<u>MDL</u>		<u>run #:</u>

Page 10 of 26

Detailed Ana	Analy	Analytica Environmental Laboratories, Inc.						
Workorder (SDG):	B0801197							
Project:	Navajo Mine	e Extension	Leaching Stud	у				
Client:	Applied Hyd	rology Ass	ociates, Inc.					
Client Project Number	r: none							
Report Section	: Meth	od Blan	k Report					
Client Sample Name:	MB							
Matrix:	Aqueous				C	Collection Date:	1/31/2008	12:00:00AM
Lab Sample Number:	T080131008-MB					Analysis Date:	2/4/2008	3 12:47:24PM
Prep Date:	1/31/2008					Instrument:	SCALE	
Analytical Method ID:	160.1 - Total Dissolved	Solids dried	at 180°C - TDS			File Name:		
Prep Method ID:	160.1					Dilution Factor:	1	
Prep Batch Number:	T080131008							
Report Basis:	As Received					Analyst Initials:	kl	
Sample prep wt./vol:	100.00 ml					Prep Extract Vol:	1.00	ml
<u>Analyte</u> Total Dissolved Solids	CASNo	<u>Result</u> ND	Flags Units mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted by: Analytica	- Thornton						
Lab Sample Number:	T080130013-MB					Analysis Date:	1/30/200	08 3:04:45PM
Prep Date:	1/30/2008					Instrument:	IC	
Analytical Method ID:	Inorganic Anions by Ior	h Chromatogr	aphy - Anions by	IC		File Name:	080130_	007.D
Prep Method ID:	300.0					Dilution Factor:	1	
Prep Batch Number:	T080130013							
Report Basis:	As Received					Analyst Initials:	KB	
Sample prep wt./vol:	20.00 ml					Prep Extract Vol:	20.00	ml
Analyte Chloride	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 0.80	<u>MDL</u> 0.042	2		<u>run #:</u> 1
Fluoride		ND	mg/L	0.40	0.031			
Sulfate		ND	mg/L	1.5	0.11			

Detailed An	Analytica Environmental Laboratories, Inc.									
Workorder (SDG): B0801197										
Project:	Navajo Mine Extension Leaching Study									
Client:	Applied Hydrology Associates, Inc.									
Client Project Num	ber: n	one								
Tests Run at:	Analytica E	Invironmen	tal Laboratori	es - Thori	nton, Colorad	C				
Workorder (SDG):	B0801197									
Project:	Navajo Mine Extension Leaching Study									
Project Number:	QUALITY CONTROL REPORT									
Prep Batch:	T080130010									
SAMPLE DUPLICATE REPORT										
Analysis:	SW6010B	- ICP - Tota	al			Base Sample: B0801197-02A Prep Date: 1/30/2008				
Samp. Anal. Date:	1/31/2008	1:40:00P	М				Units:	mg/L		
DUP Anal. Date:	1/31/2008	1:45:00P	М				Matrix:	Aqueous		
Analyte Name	Sar	<u>npResult</u>	DUPRes.	<u>RPD</u>	RPDLim	Flag				
Aluminum		0.0655	ND	0.0	20					
Antimony		ND	ND	0.0	20					
Arsenic		ND	ND	0.0	20					
Barium		0.0334	0.0320	4.3	20					
Beryllium		ND	ND	0.0	20					
Boron		0.369	0.359	2.7	20					
Cadmium		ND	ND	0.0	20					
Calcium		472	452	4.3	20					
Chromium		ND	ND	0.0	20					
Cobalt		ND	ND	0.0	20					
Copper		ND	ND	0.0	20					
Iron		ND	ND	0.0	20					
Lead		ND	ND	0.0	20					
Magnesium		1.99	1.89	5.2	20					
Manganese		0.0213	0.0202	5.3	20					
Molybdenum		0.0188	0.0181	3.8	20					
Nickel		ND	ND	0.0	20					
Potassium		11.8	11.9	0.8	20					
Selenium		ND	ND	0.0	20					
Silver		ND	ND	0.0	20					
Sodium		1,130	1,080	4.5	20					
Thallium		ND	ND	0.0	20					
Vanadium		0.0339	0.0313	8.0	20					
Zinc		ND	ND	0.0	20					
Lithium		ND	ND	0.0	20					
LCS/LCSD REPORT										

Detailed An	rt	Analytica Environmental Laboratories, Inc.									
Workorder (SDG):	B0801197										
Project:	Navajo Mine Extension Leaching Study										
Client:	Applied Hydrology Associates, Inc.										
Client Project Number: none											
Tests Run at:	Analytica Enviror	nmental L	aboratori	es - Tho	rnton, Col	orado					
Workorder (SDG):	B0801197										
Project: Project Number:	Navajo Mine Extension Leaching Study QUALITY CONTROL REPORT										
Prep Batch:	T080130010										
LCS/LCSD REPORT											
Analysis:	SW6010B - ICP -	Total		20	0,20021		MB:		T080130010-MB		
2							Prep Date:		1/30/2008		
MB Anal. Date:	1/31/2008 1:04:00PM						Units:		mg/L		
LCS Anal. Date:	1/31/2008 1:25:	00PMLC	SD Anal	. Date:	1/31/200	8 1:30:0	00PM Matrix	x:	Aqueous		
Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	RPD	Recov Lim	RPDLim	Flag
Aluminum	ND	1.89	1.94	2.00	2.00	94.5	97.0	2.6	89 - 117	20	_
Antimony	ND	0.451	0.464	0.500	0.500	90.2	92.8	2.8	82 - 117	20	
Arsenic	ND	1.84	1.88	2.00	2.00	92.0	94.0	2.2	86 - 116	20	
Barium	ND	1.84	1.89	2.00	2.00	92.0	94.5	2.7	86 - 116	20	
Beryllium	ND	0.0499	0.0512	0.0500	0.0500	99.8	102.4	2.6	87 - 111	20	
Boron	ND	0.440	0.452	0.500	0.500	88.0	90.4	2.7	76 - 130	20	
Cadmium	ND	0.0438	0.0439	0.0500	0.0500	87.6	87.8	0.2	79 - 113	20	
Calcium	ND	9.54	9.93	10.0	10.0	95.4	99.3	4.0	79 - 119	20	
Chromium	ND	0.192	0.197	0.200	0.200	96.0	98.5	2.6	86 - 117	20	
Cobalt	ND	0.474	0.488	0.500	0.500	94.8	97.6	2.9	82 - 118	20	
Copper	ND	0.229	0.234	0.250	0.250	91.6	93.6	2.2	86 - 117	20	
Iron	ND	0.998	1.04	1.00	1.00	99.8	104.0	4.1	83 - 121	20	
Lead	ND	0.465	0.479	0.500	0.500	93.0	95.8	3.0	83 - 121	20	
Magnesium	ND	9.89	10.2	10.0	10.0	98.9	102.0	3.1	83 - 118	20	
Manganese	ND	0.480	0.493	0.500	0.500	96.0	98.6	2.7	82 - 121	20	
Molybdenum	ND	0.468	0.483	0.500	0.500	93.6	96.6	3.2	82 - 120	20	
Nickel	ND	0.478	0.490	0.500	0.500	95.6	98.0	2.5	84 - 117	20	
Potassium	ND	8.36	8.35	10.0	10.0	83.6	83.5	0.1	74 - 110	20	
Selenium	ND	1.89	1.93	2.00	2.00	94.5	96.5	2.1	87 - 117	20	
Silver	ND	0.248	0.253	0.250	0.250	99.2	101.2	2.0	80 - 127	20	
Sodium	ND	9.23	9.80	10.0	10.0	92.3	98.0	6.0	87 - 113	20	
Thallium	ND	0.199	0.178	0.200	0.200	99.5	89.0	11.1	89 - 113	20 lowdug)
Vanadium	ND	0.484	0.497	0.500	0.500	96.8	99.4	2.7	87 - 119	20	
Zinc	ND	0.450	0.459	0.500	0.500	90.0	91.8	2.0	81 - 120	20	
Lithium	ND	0.457	0.471	0.500	0.500	91.4	94.2	3.0	80 - 120	20	
MS/MSD REPORT											

• •
Detailed An	alytical Rep	ort		A	Analytica	Environr	nental Lab	orator	ies, Inc.		
Workorder (SDG):	B0801197										
Project:	Nava	jo Mine Ex	tension L	eaching	Study						
Client:	Appli	ied Hydrol	ogy Assoc	iates, Inc	2.						
Client Project Num	ber: none										
Tests Run at:	Analytica Envir	onmental L	aboratorie	s - Thorn	ton, Colo	rado					
Workorder (SDG): Project:	B0801197 Navaio Mine Ex	xtension Le	aching Stu	dv							
Project Number:			QŬ	ÄLITY	CONT	ROL]	REPORT	Γ			
Prep Batch:	T080130010										
-											
				MS/	MSD RE	PORT					
Analysis:	SW6010B - ICH	P - Total					Paren	t:	B08011	97-02A	
							Prep 1	Date:	1/30/200	08	
Samp. Anal. Date:	1/31/2008 1:4	0:00PM					Units	:	mg/L		
MS Anal. Date:	1/31/2008 1:5	0:00PMMS	SD Anal. D	ate: 1	/31/2008	1:55:0	0PM Matri	x:	Aqueous	S	
Analyte Name	SampResult	MSRes.	MSDRes	<u>s</u> SPLev	<u>SPDLev</u>	Recov.	MSD Rec.	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	Flag
Aluminum	0.0655	5 1.96	1.96	2.00	2.00	94.7	94.7	0.0	75 - 125	20	
Antimony	ND	0.449	0.459	0.500	0.500	89.8	91.8	2.2	75 - 125	20	
Arsenic	ND	1.85	1.92	2.00	2.00	92.5	96.0	3.7	75 - 125	20	
Barium	0.0334	1 1.77	1.82	2.00	2.00	86.8	89.3	2.8	75 - 125	20	
Beryllium	ND	0.0469	0.0492	0.0500	0.0500	93.8	98.4	4.8	75 - 125	20	
Boron	0.369	0.789	0.815	0.500	0.500	84.0	89.2	3.2	75 - 125	20	
Cadmium	ND	0.0392	0.0387	0.0500	0.0500	78.4	77.4	1.3	75 - 125	20	
Calcium	472	480	493	10.0	10.0	80.0	210.0	2.7	75 - 125	20 NOTE 2 N	VOTE 2
Chromium	ND	0.177	0.184	0.200	0.200	88.5	92.0	3.9	75 - 125	20	
Cobalt	ND	0.430	0.450	0.500	0.500	86.0	90.0	4.5	75 - 125	20	
Copper	ND	0.223	0.232	0.250	0.250	89.2	92.8	4.0	75 - 125	20	
Iron	ND	0.925	0.956	1.00	1.00	92.5	95.6	3.3	75 - 125	20	
Lead	ND	0.432	0.448	0.500	0.500	86.4	89.6	3.6	75 - 125	20	
Magnesium	1.99	11.6	12.0	10.0	10.0	96.1	100.1	3.4	75 - 125	20	
Manganese	0.0213	3 0.463	0.479	0.500	0.500	88.3	91.5	3.4	75 - 125	20	
Molybdenum	0.0188	3 0.455	0.469	0.500	0.500	87.2	90.0	3.0	75 - 125	20	
Nickel	ND	0.439	0.455	0.500	0.500	87.8	91.0	3.6	75 - 125	20	
Potassium	11.8	20.4	21.4	10.0	10.0	86.0	96.0	4.8	75 - 125	20	
Selenium	ND	2.00	2.07	2.00	2.00	100.0	103.5	3.4	75 - 125	20	
Silver	ND	0.237	0.244	0.250	0.250	94.8	97.6	2.9	75 - 125	20	
Sodium	1,130	1,130	1,160	10.0	10.0	0.0	300.0	2.6	75 - 125	20 NOTE 2 N	VOTE 2
Thallium	ND	0.166	0.165	0.200	0.200	83.0	82.5	0.6	75 - 125	20	
Vanadium	0.0339	0.494	0.509	0.500	0.500	92.0	95.0	3.0	75 - 125	20	
Zinc	ND	0.434	0.445	0.500	0.500	86.8	89.0	2.5	75 - 125	20	
Lithium	ND	0.562	0.579	0.500	0.500	112.4	115.8	3.0	75 - 125	20	

Detailed An	alytical R	Report			Analytica E	Environmental Laboratori	es, Inc.	
Workorder (SDG):	B08011	.97						
Project:	Ν	avajo Mir	ne Extensio	n Leachi	ng Study			
Client:	Α	pplied Hy	drology As	sociates,	Inc.			
Client Project Num	ber: no	one						
Tests Run at:	Analytica E	nvironmen	tal Laborato	ories - Th	ornton, Colora	ado		
Workorder (SDG):	B0801197							
Project: Project Number:	Navajo Min	e Extensio	n Leaching	Study QUALI	ΓΥ CONT	ROL REPORT		
Prep Batch:	T08013001	.0						
			Р	OST DIG	ESTION SP	IKE REPORT		
Analysis:	SW6010B -	ICP - Tota	al			Base Sample	e: B0801197-02	A
1 mary 515.	SWOOTOD	101 100				Prep Date:	1/30/2008	
Samp. Anal. Date:	1/31/2008	1:40:00PI	М			Units:	mg/L	
PDS Anal. Date:	1/31/2008	2:00:00PI	М			Matrix:	Aqueous	
							1	
Analyte Name	<u>SampR</u>	esult	PDSRes.	<u>SPLev</u>	Recov.	Recov Lim	<u>Flag</u>	
Aluminum		0.0655	1.91	2.00	92.0	75 - 117		
Antimony		ND	0.447	0.500	87.2	75 - 117		
Arsenic		ND	1.85	2.00	91.2	75 - 116		
Barium		0.0334	1.76	2.00	86.3	75 - 116		
Beryllium		ND	0.0477	0.0500	94.4	75 - 111		
Boron		0.369	0.791	0.500	84.4	75 - 130		
Cadmium		ND	0.0391	0.0500	77.3	75 - 113		
Calcium		472	480	10.0	78.6	75 - 119		Note 2
Chromium		ND	0.178	0.200	88.8	75 - 117		
Cobalt		ND	0.435	0.500	86.7	75 - 118		
Copper		ND	0.225	0.250	89.0	75 - 117		
Iron		ND	0.931	1.00	93.2	75 - 121		
Lead		ND	0.442	0.500	87.1	75 - 121		
Magnesium		1.99	11.7	10.0	97.3	75 - 118		
Manganese		0.0213	0.466	0.500	89.0	75 - 121		
Molybdenum		0.0188	0.457	0.500	87.6	75 - 120		
Nickel		ND	0.444	0.500	88.3	75 - 117		
Potassium		11.8	21.1	10.0	93.1	75 - 110		
Selenium		ND	1.98	2.00	97.3	75 - 117		
Silver		ND	0.239	0.250	93.8	75 - 127		
Sodium		1,130	1,130	10.0	22.3	75 - 113	lowPDS	Note 2
Thallium		ND	0.165	0.200	79.3	75 - 113		
Vanadium		0.0339	0.496	0.500	92.4	75 - 119		
Zinc		ND	0.439	0.500	90.6	75 - 120		
Lithium		ND	0.559	0.500	94.3	75 - 120		
				SERIA	L DILUTIO	N REPORT		

Detailed An	alytical Report		A	Analytica Env	vironmenta	l Laboratorie	es, Inc.	
Workorder (SDG):	B0801197							
Project:	Navajo Mir	e Extensio	on Leaching	Study				
Client:	Applied Hy	drology As	ssociates, Ind	2.				
Client Project Num	ber: none		,					
Tests Run at:	Analytica Environmen	tal Laborat	ories - Thorn	ton, Colorad	0			
Workorder (SDG):	B0801197							
Project:	Navajo Mine Extensio	n Leaching	Study					
Project Number:			QUALITY	CONTR	OL REP	ORI		
Prep Batch:	T080130010							
			CEDIAL I		DEDODT			
A malanaia.	SW6010D ICD Tot	.1	SERIAL I	JILUTION .	KEPUKI	Deee Commis	. D0901107 02 A	
Analysis:	5W0010B - ICP - 100	11			-	Base Sample	1/20/2000	
						Prep Date:	1/30/2008	
Samp. Anal. Date:	1/31/2008 1:40:001	ΡM				Units:	mg/L	
SER DIL. Date:	1/31/2008 2:05:00PI	M				Matrix:	Aqueous	
Analyta Marra	Some Descrit	DOI	MDI	Comio 1D -	GamDOI	סחם	Floo	
Anaryte Marine	<u>Sampkesuit</u> 0.0655	<u>FQL.</u> 0.050	0.014	<u>Senaikes.</u>	0.25	<u>KPD</u>	<u>riag</u>	
Antimony	0.0035 ND	0.050	0.014		0.25			
Arsenic	ND	0.000	0.0007	ND	0.50			
Barium	0.0334	0.0100	0.00016	ND	0.050			
Beryllium	ND	0.0010	0.000060	ND	0.0050			
Boron	0.369	0.050	0.0018	0.353	0.25	4.4		
Cadmium	ND	0.0060	0.00051	ND	0.030			
Calcium	472	0.10	0.013	435	0.50	8.1		
Chromium	ND	0.0100	0.0018	ND	0.050			
Cobalt	ND	0.0050	0.0016	ND	0.025			
Copper	ND	0.0050	0.0019	ND	0.025			
Iron	ND	0.050	0.0027	ND	0.25			
Lead	ND	0.050	0.011	ND	0.25			
Magnesium	1.99	0.10	0.012	1.72	0.50	14.5	OUT	
Manganese	0.0213	0.0100	0.00066	ND	0.050			
Molybdenum	0.0188	0.0100	0.0018	ND	0.050			
Nickel	ND	0.040	0.0027	ND	0.20			
Potassium	11.8	1.0	0.31	11.7	5.0	0.8		
Selenium	ND	0.10	0.026	ND	0.50			
Silver	ND	0.015	0.00066	ND	0.075			
Sodium	1,130	3.0	0.028	1,030	15	9.2		
Thallium	ND	0.40	0.011	ND	2.0			
Vanadium	0.0339	0.0100	0.00072	ND	0.050			
Zinc	ND	0.0050	0.0010	ND	0.025			
Lithium	ND	0.10	0.00072	ND	0.50			
Prep Batch:	T080205004							
			SAMPLED	ПЫЛСАТІ	E REPOR'	Т		
				ULICATI		•		

Detailed An	alytical Report Analyti	ica Environmental Laboratories, Inc.
Workorder (SDG):	B0801197	
Project:	Navajo Mine Extension Leaching Study	,
Client:	Applied Hydrology Associates, Inc.	
Client Project Num	ber: none	
Tests Run at:	Analytica Environmental Laboratories - Thornton, Co	olorado
Workorder (SDG):	B0801197	
Project: Project Number:	QUALITY CO	NTROL REPORT
Dran Ratch	T080205004	
rtep Baten.		
	SAMPLE DUPLI	CATE REPORT
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - To	otal Hg Base Sample: B0801197-02A Prep Date: 2/5/2008
Samp. Anal. Date:	2/5/2008 4:38:47PM	Units: mg/L
DUP Anal. Date:	2/5/2008 4:41:14PM	Matrix: Aqueous
Analvte Na <u>me</u>	SampResult DUPRes <u>. RPD RPDI</u>	Lim Flag
Mercury	ND ND 0.0 2	
	LCS/LCSD	REPORT
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Te	otal Hg MB: T080205004-MB
		Prep Date: 2/5/2008
MB Anal. Date:	2/5/2008 4:23:51PM	Units: mg/L
LCS Anal. Date:	2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/200	08 4:29:07PM Matrix: Aqueous
Analyte Name	SampResult LCSRes. SDRes. SPLev SPDLev	Recov. SD Recov RPD Recov Lim RPDLim Flag
Mercury	ND 0.00223 0.00227 0.00200 0.0020	0 111.5 113.5 1.8 80 - 120 20
	MS/MSD J	REPORT DOSO1107.024
Analysis:	SW/4/0A - Mercury in Liquid waste by UVAA - 10	otal Hg Parent: BU801197-02A Drop Date: 2/5/2008
C And Deter	2/5/2000 A 20 ADDA	Prep Date: 2/5/2006
Samp. Anal. Date:	2/5/2008 4:38:47PM	Units: mg/L
MS Anal. Date:	2/5/2008 4:43:28PM MSD Anal. Date: 2/5/200	18 4:46:03PM Matrix: Aqueous
Analyte Name	<u>SampResult MSRes. MSDRes SPLev SPDL</u>	Lev Recov. MSD Rec. RPD Recov Lim RPDLim Flag
Mercury	ND 0.00209 0.00203 0.00200 0.0024	00 104.5 101.5 2.9 70 - 130 20
	POST DIGESTION	N SPIKE REPORT
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - To	otal Hg Base Sample: B0801197-02A
		Prep Date: 2/5/2008
Samp. Anal. Date:	2/5/2008 4:38:47PM	Units: mg/L
PDS Anal. Date:	2/5/2008 4:52:53PM	Matrix: Aqueous
A		
Analyte Name	SampKesult PDSKes. SPLev Kecov.	$\frac{\text{Recov Lim}}{2} = \frac{\text{Fiag}}{80 - 120}$
Withouty	ND 0.00211 0.00200 110.2	2 00 120

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801197

Navajo Mine Extension Leaching Study **Project:**

Client: Applied Hydrology Associates, Inc. none

Client Project Number:

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Markoner (SDG): B0801197 Project: Navgio Mine Extension Leaching Study Steff Project Number: none Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801197 Project Number: QUALITY CONTROL REPORT Project Number: QUALITY CONTROL REPORT Project Number: QUALITY CONTROL REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T08013/0013 MB Anal. Date: 1/30/2008 3:04:45PM Yes Yes CS Anal. Date: 1/30/2008 3:04:257PMLCSD Anal. Date: 1/31/2008 Yes Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: Control Web/im CS Anal. Date: 1/30/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 Yes Aqueous Analytic Name Sampleault LCSRes, SPRes SPDer Recov. SBRev MBP Recov ND 20 Yes Saffate ND 3:4.1 37.5 37.5 90.9 90.	Detailed An	alytical Rep	ort			Analytica	a Environ	mental Labo	oratori	es, Inc.		
Project: Navajo Mine Extension Leaching Study Stient Project Number: Applied Hydrology Associates, Inc. Client Number: Novajo Mine Extension Leaching Study Totss Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801197 Project: Navajo Mine Extension Leaching Study Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T08013/013-MB Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Units: mg/L LCS Anal. Date: 1/30/2008 2:32:20PM Mutrix: Aquety Analysis: Inorganic Anions by Ion Chromatography - Anions by IC SD Record REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC SD Record REPUL REPUL Analysis: Inorganic Anions by Ion Chromatography - Anions by IC SD Record REPUL Record Im <tr< th=""><th>Workorder (SDG):</th><th>B0801197</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></tr<>	Workorder (SDG):	B0801197										
Applied Hydrology Associates, Inc. Chain Project Number: volume to the balance of the sector	Project:	Nava	jo Mine Ex	xtension	Leachi	ng Study						
Client Project Number: none Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801197 Project X Navajo Mine Extension Leaching Study Project X Propert X Project X T080130013 Hardy State T080130013 Hardy State Prep Batch: T080130013-MB CS Anal. Date: 1/30/2008 3:04:45 PM LCS Anal. Date: 1/30/2008 3:04:45 PM LCS Anal. Date: 1/31/2008 2:31:25 PMI LCSD Anal. Date: 1/30/2008 Analyte Name SampResult LCSRes, SDRes, SPLex SPLex Recore, SD Recore Ling RPD Ling Sufface ND 2.37 2.36 2.50 96.4 94.4 0.4 90-110 20 Sufface ND 3.4.1 3.4.1 3.7.5 3.7.5 90.9 90.9 0.0 90-110 20 Sufface ND 3.4.1 3.4.1 3.7.5 3.7.5 90.9 90.9 0.0 90-110 20 Sufface <	Client:	Appl	ied Hydrol	ogy Asso	ociates,	Inc.						
Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801197 Project: Navajo Mine Extension Leaching Study. OUALITY CONTROL REPORT Project: T080130013 USE D080130013-MB LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB Units: mg/L Units: mg/L CS/LCSD REPORT MB Anal. Date: 1/30/2008 3:04:45PM Units: mg/L LCSRes, SPRes, SPLex Prep Date: 1/30/2008 MB Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:20 SampResult LCSRes, SPRes, SPLex Rep Date: 1/30/2008 SampResult ND 34.1 37.5 5.00 5.00 9.09 9.01 9.100	Client Project Num	ber: none										
Navajo Mine Extension Leaching Study Project: Navajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Prep Batch: T080130013 LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB Prep Batch: 1/30/2008 3:04:45PM Fuer Date: 1/30/2008 LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: mg/L CSRes, SPLex SUPLex Recov. RECOVERT Analytis Name SampResult LCSRes, SPLex SUPLex Recov. REP Lim Flag Analyte Name SampResult LCSRes, SPLex SUPLex Recov. REP Date: 1/30/2008 Analyte Name SampResult Analysis: Inorganic Anions by Ion Chromatography - Anions by IC PareIn: B0801197-02B SampResult INS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC PareIn: B0801197-02B	Tests Run at:	Analytica Envir	onmental L	aboratori	ies - Tho	ornton, Col	orado					
Project Number: Project Number: Project Number: Project Number: Project Number: Project Number: Project Number: Prep Batch: T080130013 LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB Anal. Date: 1/30/2008 3:04:45PM LCS Anal. Date: 1/31/2008 3:04:45PM LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: NS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC NS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC NS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC NS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC NS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Prep Date: 1/31/2008 2:06:51AM Vinits: MS Anal. Date: 1/31/2008 2:06:51AM Matrix: Aqueous Analyte Name SampResult Analysis: Io0.1 - Total Dissolved Solids dried at 180°C - TDS MB Anal. Date: 2/4/2008 12:47:24PM Units: RECS/LCSD REPORT Analysis: Io0.1 - Total Dissolved Solids dried at 180°C - TDS MB Anal. Date: 2/4/2008 12:47:24PM Units: MS REPORT Analysis: MS REPORT Analysis: MB Anal. Date: 2/4/2008 12:47:24PM Units: MB Anal. Date: 2/4/2008 12:47:24PM Units: MS REPORT Analysis: MS REPORT MS REPORT	Workorder (SDG):	B0801197	stancion I a	aching S	hidu							
Prep Batch: T080130013 LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB Prep Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal, Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal, Date: 1/30/2008 2:12:57PMLCSD Anal, Date: Y/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes, SPLes,	Project: Project Number:	Navajo Mine E.	Atension Le	Q	UALI'	ΓY CON	TROL	REPORT	-			
Internet LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB MB Anal. Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPLev SD 0.0 90.10 20 Chorde ND 2.37 2.36 2.50 2.50 94.8 94.4 0.4 90.110 20 Sufface ND 4.75 4.75 5.00 50.0 95.0 90.9 0.0 90.110 20 Sufface ND 34.1 34.5 37.5 90.9 90.9 0.0 90.110 20 SampA anal. Date: 1/31/2008 2:06:51AM Units: mg/L MS Anal. Date: 1/31/2008 2:06:51AM Units: mg/L Stange Colida MSREPORT Matrix: Aqueous <	Pren Batch	T080130013										
LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: TO80130/13-MB MB Anal, Date: 1/30/2008 3;04:45PM Units: mg/L CCS Anal, Date: 1/30/2008 3;04:45PM SPEev Prop Date: Vinits: mg/L CCS Anal, Date: 1/31/2008 2;12:57PMLCSD Anal, Date: 1/31/2008 2;31:20PM Matrix: Aqueous Analyte Name ND 2.37 2.36 2.50 2.50 90.8 94.4 0.4 0.9 100 20 Choride ND 4.75 4.75 5.00 5.00 95.0 95.0 0.0 90-110 20 Salifate ND 34.1 31.3 37.5 37.5 90.9 90.9 0.0 90-110 20 Matrix: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Parent: B0801197-02B Samp Anal, Date: 1/31/2008 2:25:15AM Matrix: Aqueous Analyte Name SampResult MSRes. SPL× Recov. Recov. Lin Elag	Thep Daten.											
LCS/LCSD REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: T080130013-MB Prep Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPLev SD Recov SD Recov Im RPDLim Elag Fluoride ND 2.37 2.36 2.50 2.50 95.0 95.0 90.9 90.9 90.10 20 Satifate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90.110 20 MS REPORT Analytes: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/31/2008 2:25:15AM Units: mg/L MS Anal. Date: 1/31/2008 2:25:15AM Matrix: Aqueous Amalyte Name												
Analysis: Inorganic Anions by Ion Chromatography - Anions by IC MB: 10801/3001/3-MB Prep Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPIC Recov. SD Recov. RPD Recov. Im RPDLim Flag Fluoride ND 4.75 4.75 5.00 5.00 95.0 0.0 90-110 20 Suffate ND 4.75 4.75 5.00 5.00 90.9 0.0 90-110 20 Suffate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90-110 20 MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/31/2008 2:25:15AM Units: mg/L ND 4.75 MS Anal. Date: 1/31/2008 SPLey Recov. Recov Lim Flag		- · · ·			LC	S/LCSD I	REPORT			T 0001000		
Prep Date: 1/30/2008 3:04:45PM Units: mg/L LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLey SPDLey Recov, SD R	Analysis:	Inorganic Anion	s by Ion Ch	iromatogi	raphy - A	Anions by I	C	MB:		T0801300	13-MB	
MB Anal. Date: 1/31/2008 3:04:35 PM LCS Anal. Date: 1/31/2008 2:12:57PMLCSD Anal. Date: 1/31/2008 2:31:20PM Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLey SPDLey Recov, SD Recov RPD Recov Lin RPDLim Flag Fluoride ND 2.37 2.36 2.50 2.50 94.8 94.4 04 90-110 20 Sulfate ND 4.75 4.75 5.00 5.00 95.0 90.0 09 0110 20 MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Prep Date: 1/31/2008 2:06:51AM Units: mg/L SampAnal. Date: 1/31/2008 2:25:15AM Matrix: Aqueous Analyte Name SampResult MSRes, SPLey Recov, Recov Lin Recov Lin Flag Fluoride 2.55 4.83 2.50 91.2 70 - 130 Choride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2.100 3.120 938 108.8 70 - 130 Prep Batch: T080131008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L Analysis: 160.1 - Cotal Dissolved Solids dried at 180°C - TDS MB: Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L Analysis: 160.1 - Cotal Dissolved Solids dried at 180°C - TDS MB: Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L Analysis: 160.1 - Cotal Dissolved Solids dried at 180°C - TDS MB: Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L Analysis: 160.1 - Cotal Dissolved Solids dried at 180°C - TDS MB: Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLey SPDLey Recov, SD Recov KPD Recov Lin RPDLim Flag Total Dissolved Solids ND 802 765 821 821 97.6 93.1 4.7 80-120 20 MB REPORT		1 /20 /2000 2 0						Prep I	Jate:	1/30/2008		
LCS Anal. Date: 17/31/2008 2:31:25 (PMLCSD Anal. Date: 17/31/2008 2:31:2009 Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLev SPDLev Recov SD RPD Recov Lin RPDLin Flag Fluoride ND 2.37 2.36 2.50 94.8 94.4 0.4 90-110 20 Chloride ND 4.75 4.75 5.00 50.0 95.0 0.0 90-110 20 Sulfate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90-110 20 MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/31/2008 2:25:15AM Matrix: Aqueous Aqueous Analyte Name SampResult MSRes, SPLev Recov, Recov Lin Flag Fluoride 2.55 4.83 2.50 91.2 70 - 130 NOTE 2 Sulfate 2.100 3.120 938 </td <td>MB Anal. Date:</td> <td>1/30/2008 3:0</td> <td>4:45PM</td> <td></td> <td></td> <td>1/21/200</td> <td></td> <td>Units:</td> <td></td> <td>mg/L</td> <td></td> <td></td>	MB Anal. Date:	1/30/2008 3:0	4:45PM			1/21/200		Units:		mg/L		
Analyte Name SampResult LCSRes, SDRes, SDRev SPDLev SPDLev Recov, SD Recov RDD Recov RDD Recov RDD Recov RDD Recov RDD Recov RDD 2.37 2.36 2.50 94.8 94.4 0.4 90-110 20 Sulfate ND 34.1 34.1 37.5 50.0 95.0 90.0 0.0 90-110 20 Sulfate ND 34.1 34.1 37.5 37.5 90.9 90.9 0.0 90-110 20 Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/31/2008 2:25:15AM Units: mg/L Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov Recov Lim Flag Fluoride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2,100 3,120 938	LCS Anal. Date:	1/31/2008 2:1	2:5/PMLC	SD Anal	. Date:	1/31/200	8 2:31:2	20PM Matrix	x:	Aqueous		
Hubite ND 2.37 2.30 2.30 2.30 94.8 94.4 0.4 90-110 20 Chloride ND 4.75 4.75 5.00 500 95.0 90.9 90.9 90.10 90-110 20 MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/31/2008 2:26:51AM Units: mg/L Matrix: Aqueous Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Prep Date: 1/30/2008 Samp. Anal. Date: 1/31/2008 2:25:15AM Matrix: Aqueous Analyce Name SampResult MSRes. SPLev Recov. Recov. Im Flag Fluoride 2.55 4.83 2.50 91.2 70 - 130 NOTE 2 Sulfate 2.100 3.120 938 108.8 70 - 130 NOTE 2 Sulfate 2.100 3.120 938 108.8 70 - 130 NOTE 2	<u>Analyte Name</u>	SampResult	LCSRes.	SDRes.	<u>SPLev</u>	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Chinade ND 47.5 47.5 33.0 <t< td=""><td>Chlorida</td><td></td><td>4.75</td><td>2.30</td><td>5.00</td><td>2.30</td><td>94.0</td><td>94.4</td><td>0.4</td><td>90 - 110</td><td>20</td><td></td></t<>	Chlorida		4.75	2.30	5.00	2.30	94.0	94.4	0.4	90 - 110	20	
MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Samp. Anal. Date: 1/31/2008 2:05 9.05 <	Sulfate		34.73	4.73	37.5	37.5	93.0	93.0	0.0	90 - 110	20	
MS REPORT Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Samp, Anal. Date: 1/31/2008 2:06:51AM Units: mg/L MS Anal. Date: 1/31/2008 2:25:15AM Units: mg/L MS Anal. Date: 1/31/2008 2:25:15AM Recov. Recov Lim Flag Fluoride 2.55 4.83 2.50 91.2 70 - 130 NOTE 2 Chloride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2.100 3.120 938 108.8 70 - 130 NOTE 2 Prep Batch: T080131008 ECS/LCSD REPORT MB: T080131008-MB Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L ICSA MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L CtSA anal. Date: 2/4/2008 12:47:24PM Units: mg/L CtSA anal. Date: 2/4/2008 12:47:24PM Units: mg/L MB Anal. Date: 2/4/2008		n.D	54.1	54.1	57.5	57.5	70.7	<i>J</i> 0. <i>J</i>	0.0	<i>y</i> 0 110	20	
Analysis: Inorganic Anions by Ion Chromatography - Anions by IC Parent: B0801197-02B Samp. Anal. Date: 1/31/2008 2:06:51AM Units: mg/L MS Anal. Date: 1/31/2008 2:25:15AM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov. Lim Flag Fluoride 2.55 4.83 2.50 91.2 70 - 130 NOTE 2 Chloride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2.100 3.120 938 108.8 70 - 130 NOTE 2 Prep Batch: T080131008 E E 1/31/2008 MB: T080131008-MB MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L 1/31/2008 MB Anal. Date: <td< td=""><td></td><td></td><td></td><td></td><td></td><td>MS REP</td><td>ORT</td><td></td><td></td><td></td><td></td><td></td></td<>						MS REP	ORT					
Analysis: Integrate binding of the binding of period of the binding of	Analysis:	Inorganic Anion	s by Ion Ch	romatog	aphy - /	Anions by I	C	Parent	•	B0801197	-02B	
Samp. Anal. Date: $1/31/2008$ $2:06:51AM$ Units:mg/LMS Anal. Date: $1/31/2008$ $2:25:15AM$ Matrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov.Recov LimFlagFluoride 2.55 4.83 2.50 91.2 $70 - 130$ NOTE 2Chloride 605 743 125 110.4 $70 - 130$ NOTE 2Sulfate $2,100$ $3,120$ 938 108.8 $70 - 130$ LCS/LCSD REPORTAnalysis: 160.1 - Total Dissolved Solids dried at 180° C - TDSMB: Prep Date: $1/31/2008$ MB: $1/31/2008$ MB Anal. Date: $2/4/2008$ $12:47:24PM$ Units: Units:mg/LLCSA Anal. Date: $2/4/2008$ $12:47:24PM$ Units: Units: ng/L LCS Anal. Date: $2/4/2008$ $12:47:24PM$ Units: Units: ng/L LCSAnal. Date: $2/4/2008$ $12:47:24PM$ Units: Units: ng/L LCSAnal. Date: $2/4/2008$ $12:47:24PM$ Units: Units: ng/L LCSRes. SDRes. $SPLev$ $SPDLev$ $Recov.$ SD $Recov.$ $RPDLim$ $Flag$ Total Dissolved SolidsND 802 765 821 97.6 93.1 4.7 $80 - 120$ 20	1 1100 9 0101	8		8			-	Prep I	Date:	1/30/2008		
MS Anal. Date: 1/31/2008 2:25:15AM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 2.55 4.83 2.50 91.2 70 - 130 NOTE 2 Chloride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2,100 3,120 938 108.8 70 - 130 Prep Batch: T080131008 LCS/LCSD REPORT MB: T080131008-MB Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM Units: mg/L 20 20 MB Anal. Date: SampResult LCSRes. SDRes. SPLev Recov. SD Recov. Rep DRim Flag Total Dissolved Solids ND 802 765 821 821 97.6 93.1 4.7 80 - 120 20	Samp. Anal. Date:	1/31/2008 2:0	6:51AM					Units:		mg/L		
Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Fluoride 2.55 4.83 2.50 91.2 70 - 130 NOTE 2 Chloride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2,100 3,120 938 108.8 70 - 130 NOTE 2 Prep Batch: T080131008 LCS/LCSD REPORT MB: T080131008-MB Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPLev SD Recov SD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 97.6 93.1 4.7 80 - 120 20	MS Anal. Date:	1/31/2008 2:2	5:15AM					Matrix	x:	Aqueous		
Analyte Name SampResult MSRes. SPLev Recov. Recov. Recov Lim Hag Fluoride 2.55 4.83 2.50 91.2 70 - 130 NOTE 2 Chloride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2,100 3,120 938 108.8 70 - 130 NOTE 2 Prep Batch: T080131008 LCS/LCSD REPORT MB: T080131008-MB Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCSAnal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM Erecov. SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 97.6 93.1 4.7 80 - 120 20												
Fluoride 2.55 4.83 2.50 91.2 70 - 130 Chloride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2,100 3,120 938 108.8 70 - 130 Prep Batch: T080131008 LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB Prep Date: 1/31/2008 Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM SPLev SPDLev Recov. SD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 97.6 93.1 4.7 80 - 120 20	Analyte Name	SampResult	MSRes.		<u>SPL</u>	ev	Recov.		<u>-</u>	Recov Lim		<u>Flag</u>
Chloride 605 743 125 110.4 70 - 130 NOTE 2 Sulfate 2,100 3,120 938 108.8 70 - 130 NOTE 2 Prep Batch: T080131008 LCS/LCSD REPORT MB: T080131008-MB Prep Date: 1/31/2008 MB Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov Lim RPDLim Flag MS REPORT MS REPORT MS REPORT MS REPORT MS REPORT MS REPORT	Fluoride	2.55	4.83		2.50		91.2			70 - 130		
Sulfate 2,100 3,120 938 108.8 70 - 130 Prep Batch: T080131008 LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB Prep Date: 1/31/2008 Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 821 97.6 93.1 4.7 80 - 120 20	Chloride	605	743		125		110.4			70 - 130	NOTE 2	
Prep Batch: T080131008 LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag MS REPORT MS REPORT MS REPORT MS REPORT MS REPORT MS REPORT	Sulfate	2,100	3,120		938		108.8			70 - 130		
Prep Batch: T080131008 LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB Prep Date: 1/31/2008 Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag MS REPORT MS REPORT												
LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev 821 Preov. SD Recov. RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 821 97.6 93.1 4.7 80 - 120 20	Prep Batch:	T080131008										
LCS/LCSD REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB MB Anal. Date: 2/4/2008 12:47:24PM Vints: ng/L LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM ICSD Anal. Date: 2/4/2008 12:47:24PM ICSD Anal. Date: 2/4/2008 12:47:24PM ICSD Anal. Date: Spleev Spleev Spleev Recov. Spleev Recov. Spleev Recov. Spleev Recov. Spleev 80-120 20 MS REPORT MS REPORT MS REPORT MS REPORT MS REPORT MS REPORT												
Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS MB: T080131008-MB Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev 821 97.6 93.1 4.7 80 - 120 20					LC	S/LCSD I	REPORT	-				
Prep Date: 1/31/2008 MB Anal. Date: 2/4/2008 12:47:24PM LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 821 97.6 93.1 4.7 80 - 120 20	Analysis:	160.1 - Total Di	issolved So	lids driec	l at 180	°C - TDS		MB:		T0801310	08-MB	
MB Anal. Date: 2/4/2008 12:47:24PM Units: mg/L LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 97.6 93.1 4.7 80 - 120 20 MS REPORT	-							Prep I	Date:	1/31/2008		
LCS Anal. Date: 2/4/2008 12:47:24PM LCSD Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 821 97.6 93.1 4.7 80 - 120 20	MB Anal. Date:	2/4/2008 12:47	7:24PM					Units:		mg/L		
Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Total Dissolved Solids ND 802 765 821 821 97.6 93.1 4.7 80 - 120 20 MS REPORT	LCS Anal. Date:	2/4/2008 12:47	7:24PM LC	CSD Anal	. Date:	2/4/2008	12:47:2	4PM Matrix	x:	Aqueous		
Total Dissolved Solids ND 802 765 821 97.6 93.1 4.7 80 - 120 20 MS REPORT	Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
MS REPORT	Total Dissolved Soli	ds ND	802	765	821	821	97.6	93.1	4.7	80 - 120	20	
MS REPORT												
						MS REP	ORT					

B0801197 'roject: Navajo Mine Extension Leaching Study 'roject: Applied Hydrology Associates, Inc. Zient Project Number: non Tests Run at: Analytic Environmental Laboratories - Thomton, Colorado Workorder (SDG): B0801197 Project Number: QUALITY CONTROL REPORT Project Number: Parent: B0801197-02B Project Number: Vavajo Mine Extension Leaching Study Parent: B0801197-02B Project Number: Vavajo Mine Extension Leaching Study Parent: B0801197-02B Project Number: Vavajo Mine Extension Leaching Study Parent: B0801197-02B Standysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0801197-02B Samp, Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Anal. Date: 2/4/2008 SPLey Recov Recov Lim Flag Total Dissolved Solids MSRes. SPLey Recov Recov Lim Flag MS Anal. Date: 2/4/2008 5:940 821 129.0 70 - 130 NOTE 2 Prep Batch: To80205001- <th>Detailed An</th> <th>alytical Repo</th> <th>ort</th> <th></th> <th></th> <th>Analytica</th> <th>a Environ</th> <th>mental Lab</th> <th>oratori</th> <th>es, Inc.</th> <th></th> <th></th>	Detailed An	alytical Repo	ort			Analytica	a Environ	mental Lab	oratori	es, Inc.			
Project: Navajo Mine Extension Leaching Study Zient Project Nume: Applied Hydrology Associates, Inc. Project: Navajo Mine Extension Leaching Study Project: Navajo Mine Extension Leaching Study Navajo Mine Extension Leaching Study Project: Navajo Mine Extension Leaching Study Navajo Mine Extension Leaching Study Navajo Mine Extension Leaching Study Project: Navajo Mine Extension Leaching Study Navajo Mine Extension Leaching Study Parent: B0801197-02B Samp Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Econ Line Analytic Name Samp Result MSRs. SPLey Recov. Nove To - 130 NOTE 2 Total Dissolved Solids Spl v	Workorder (SDG):	B0801197											
Applied Hydrology Associates, Inc. Ziend Project Number: none Tests Run at: Analytica: Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801197 Project: Navio Mine Extension Leaching Study Project: Parent: B0801197-02B Response Parent: B0801197-02B Samp, Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Anal. Date: Sampleault MSRes. SPLey Recov. Recov. Recov Lin Flag Analytic Name Sampleault MSRes. SPLey Recov. Recov. Recov. Recov. Recov. Lin NOTE 2 MB Anal. Date: Sumpleault MSRes. SPLey Recov. Recov. Lin NOTE 2 Flag MB	Project:	Navaj	o Mine Ex	xtension l	Leachir	ng Study							
Chient Project Number: none Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801197 Project: Navijo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Project Number: QUALITY CONTROL REPORT Project Number: No 80131008 Project Number: Parent: B0801197-02B Project Number: Propodet at 180°C - TDS Parent: B0801197-02B Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0801197-02B Samp, Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Dissolved Solids 4,880 5,940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 T Etsztecker Units: mg/L Hag MB Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM <	Client:	Applie	d Hydrol	ogy Asso	ciates, I	Inc.							
Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801197 Navajo Mine Extension Leaching Study Navajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Prep Batch: T080131008 Malysis: 160.1 - Total Dissolved Solids dried at 180° C - TDS Parent: B0801197-02B Samp. Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Anal. Date: 2/4/2008 12:47:24PM CES/LCSD REPORT Analyte Name SampResult MSRes SPLev Recov. Recov Lim Flag Total Dissolved Solids 5,940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 MB MIB: T080205001-MB Prep Date: 2/4/2008 9:52:02AM Units: mg/L LCSA Anal Nate: 2/4/2008 9:52:02AM Units: <th colspa<="" th=""><th>Client Project Num</th><th>ber: none</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th>	<th>Client Project Num</th> <th>ber: none</th> <th></th>	Client Project Num	ber: none										
Morkorder (SDG): B0801197 Project: Navajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT MS REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180° C - TDS Parent: B0801197-02B Prep Date: 1/31/2008 Samp. Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Report Matrix: Aqueous Analyte Name SampResult MSRes. SPLey Recov. Recov Lim Flag MS Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLey Recov. Recov Lim Flag T080205001 USS/LCSD REPORT Analyte Name 2/4/2008 9:52:02AM Units: mg/L LCSR/LCSD Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS/LCSD REPORT Analyte Name 2/4/2008 9:52:02AM Units: mg/L	Tests Run at:	Analytica Enviro	nmental L	aboratorio	es - Tho	ornton, Col	orado						
Navajo Mune Extension Leaching Study Project Number: Navajo Mune Extension Leaching Study QUALITY CONTROL REPORT Prep Batch: T080131008 Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0801197-02B Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0801197-02B Samp. Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Anal. Date: 2/4/2008 12:47:24PM SPLev Recov. Recov Lim Flag Total Dissolved Solids 4.880 5.940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 LCS/LCSD REPORT HB: T080205001-MB Flag MB Anal. Date: 2/4/2008 9:52:02AM LCSP Anal. Date: 2/4/2008 9:52:02AM Units: mg/L CCS Anal. Date: 2/4/2008 9:52:02AM Units: mg/L Analyte Name SampResult LCSRs. SDRes SPLev SDRecov SD Recov Lim RPDLim Flag CCS Anal. Date: 2/4/2008 9:52:02AM LCSR REPORT Units: <th< td=""><td>Workorder (SDG):</td><td>B0801197</td><td></td><td>1. 0.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	Workorder (SDG):	B0801197		1. 0.									
MS REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0801197-02B Barent: B0801197-02B Prep Date: 1/31/2008 Samp. Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Dissolved Solids 4.880 5.940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 LCS/LCSD REPORT MB: T080205001-MB Prep Date: 2/4/2008 MB Anal. Date: 2/4/2008 9:52:02AM Units: mg/L CS Anal. Date: 2/4/2008 9:52:02AM Units: mg/L J.CS Anal. Date: 2/4/2008 9:52:02AM Units: mg/L J.CSRes, SDRes, SDRes, SPLev SPLev SP Recov Recov Lim RPDLim Analyte Name SampResult LCSRes, SDRes, SPLev SP Recov SP Recov Lim RPDLim Analyte Name SampResult LCSRes, SDRes, S	Project:	Navajo Mine Ext	tension Le	aching St OI	udy JALI	ΓΥ CON	TROL	REPOR	Г				
MS REPORT Analysis: 160.1 - Total Dissolved Solids dried at 180° C - TDS Parent: B0801197-02B Prep Date: 1/31/2008 Prep Date: 1/31/2008 Samp. Anal. Date: 2/4/2008 12:47:24PM Units: mg/L MS Anal. Date: 2/4/2008 12:47:24PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Dissolved Solids 4.880 5.940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 LCS/LCSD REPORT MB: T080205001-MB Prep Date: 2/4/2008 MB Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM Units: Aqueous Analytic Name SampResult LCSRes, SDRes, SPLev SPLev SP Cov, SD Recov RPD Lim RPDLim Flag Bicarbonate ND 24.0 27.0 25.0 26.0 108.0 11.8	Project Nulliber.	T080131008		× ·					-				
MS REPORTAnalysis:160.1 - Total Dissolved Solids dried at 180° C - TDSParent:B0801197-02BPrep Date:1/31/2008Samp. Anal. Date:2/4/200812:47:24PMUnits:mg/LMS Anal. Date:2/4/200812:47:24PMMatrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov. LimFlagTotal Dissolved Solids4,8805,940821129.070 - 130NOTE 2Prep Batch:T080205001MS RESCIES REPORTLCS/LCSD REPORTAnalysis:310.1 - Alkalinity, Titrimetric (pH 4.5) - AlkalinityMB:T080205001-MBPrep Date:2/4/20089rep Date:2/4/2008US2/2025001MB Anal. Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/20089:52:02AMCS Anal. Date:2/4/20089:52:02AMUnits:mg/L.CS Anal. Date:2/4/20089:52:02AMUnits:mg/L.CS Anal. Date:2/4/20089:52:02AMLCSRes, SDRes, SPLevSPLevRecov, SD Recov, SD Reco	Prep Batch:	1000131000											
MS REPORTAnalysis: $16.1 - Total Dissolved Solids dried at 180^{\circ}C - TDSParent:B0801197 - 02BPrep Date:1/31/2008Samp. Anal. Date:2/4/200812:47:24PMUnits:mg/LMS Anal. Date:2/4/200812:47:24PMMatrix:AqueousAnalyte NameSampResultMSRes.SPLevRecov.Recov.FlagTotal Dissolved Solids4,8805,940821129.070 - 130NOTE 2Prep Batch:T080205001LCS/LCSD REPORTAnalysis:310.1 - Alkalinity, Titrimetric (pH 4.5) - AlkalinityMB:T080205001-MBPrep Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/20089:52:02AMMB Anal. Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/2008MB Anal. Date:2/4/20089:52:02AMLCSRes. SPLevSPLevSD RecovSD RecovRecov LimRPD inLCS Anal. Date:2/4/20089:52:02AMLCSRes. SPLevSD RecovSD Recov LimRPDLimFlagBicarbonateND24.027.025.025.096.0108.011.880 - 12020$													
Analysis: 160.1 - Total Dissolved Solids dried at 180°C - TDS Parent: B0801197-02B Prep Date: $1/31/2008$ Samp. Anal. Date: $2/4/2008$ 12:47:24PM Units: mg/L MS Anal. Date: $2/4/2008$ 12:47:24PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Dissolved Solids 4.880 5,940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 Image: Sign Prep Date: $2/4/2008$ 9:52:02AM NOTE 2 Prep Date: $2/4/2008$ MB Anal. Date: $2/4/2008$ 9:52:02AM Units: mg/L Image: Sign Prep Date: $2/4/2008$ MB Anal. Date: $2/4/2008$ 9:52:02AM Units: mg/L Image: Sign Prep Date: $2/4/2008$ MB Anal. Date: $2/4/2008$ 9:52:02AM LCSD Anal. Date: $2/4/2008$ 9:52:02AM Matrix: Aqueous MB Anal. Date: $2/4/2008$ 9:52:02AM LCSD Anal. Date: $2/4/2008$ 9:52:02AM Matrix: Aqueous Analyte Name </td <td></td> <td></td> <td></td> <td></td> <td></td> <td>MS REP</td> <td>ORT</td> <td></td> <td></td> <td></td> <td></td> <td></td>						MS REP	ORT						
Prep Date: $1/31/2008$ Samp. Anal. Date: $2/4/2008$ 12:47:24PM Units: mg/L MS Anal. Date: $2/4/2008$ 12:47:24PM Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov Lim Flag Total Dissolved Solids 4,880 5,940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 LCS/LCSD REPORT MB: T080205001-MB Prep Date: $2/4/2008$ 9:52:02AM Units: mg/L MB Anal. Date: $2/4/2008$ 9:52:02AM Units: mg/L CSA Aqueous MB Anal. Date: $2/4/2008$ 9:52:02AM LCSD Anal. Date: $2/4/2008$ 9:52:02AM Units: mg/L LCS Anal. Date: $2/4/2008$ 9:52:02AM LCSD Anal. Date: $2/4/2008$ 9:52:02AM Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLev SPLev SD Recov RPD Recov Lim RPDLim Flag Garbonate ND 24.0 27.0 25.0 25.0 26.0 21.0 20.0 20.0	Analysis:	160.1 - Total Dis	solved So	lids dried	at 180°	°C - TDS		Paren	t:	B0801197	-02B		
Samp. Anal. Date: $2/4/2008$ $12:47:24PM$ Units: mg/L MS Anal. Date: $2/4/2008$ $12:47:24PM$ Matrix: Aqueous Analyte Name SampResult MSRes. SPLev Recov. Recov. Recov Lim Flag Total Dissolved Solids 4.880 $5,940$ 821 129.0 $70 - 130$ $NOTE 2$ Prep Batch: T080205001 LCS/LCSD REPORT MB: T080205001-MB Analysis: $310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity MB: T080205001-MB MB Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous Analyte Name SampResult LCSRes, SDRes, SPLev SPLev SD Recov, SD Recov RPD Recov Lim RPDLim Flag Bicarbonate ND 24.0 27.0 25.0 $								Prep	Date:	1/31/2008			
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Samp. Anal. Date:	2/4/2008 12:47:	24PM					Units	:	mg/L			
Analyte Name Total Dissolved SolidsSampResult $4,880$ MSRes. $5,940$ SPLev 821 Recov. 129.0 Recov Lim $70 - 130$ FlagPrep Batch: T080205001 LCS/LCSD REPORTAnalysis: $310.1 - Alkalinity, Titrimetric (pH 4.5) - AlkalinityMB Anal. Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/20089:52:02AMLCS Anal. Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/20089:52:02AMLCSRes.SDRes.SplevSPLev96.0108.011.880 - 12020CarbonateND50.051.050.050.0100.0102.02.080 - 120$	MS Anal. Date:	2/4/2008 12:47:	24PM					Matri	x:	Aqueous			
Total Dissolved Solids 4,880 5,940 821 129.0 70 - 130 NOTE 2 Prep Batch: T080205001 Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity MB: T080205001-MB MB Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. ND SPLev SPDLev SD Recov. 96.0 SD Recov Lim RPDLim Flag Bicarbonate ND 50.0 51.0 50.0 50.0 100.0 102.0 2.0 80 - 120 20	Analyte Name	SampResult	MSRes.		SPL	ev	Recov.]	Recov Lim		Flag	
Prep Batch: T080205001 LCS/LCSD REPORT Analysis: $310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity MB: T080205001-MB Prep Date: 2/4/2008 9:52:02AM Units: mg/L MB Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Bicarbonate ND 24.0 27.0 25.0 25.0 96.0 100.0 11.8 80 - 120 20 $	Total Dissolved Soli	ds 4,880	5,940		821		129.0			70 - 130	NOTE 2		
Prep Batch:T080205001LCS/LCSD REPORTAnalysis: $310.1 - Alkalinity, Titrimetric (pH 4.5) - AlkalinityMB:T080205001-MBPrep Date:MB Anal. Date:2/4/20089:52:02AMUnits:mg/LLCS Anal. Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/20089:52:02AMAnalyte NameSampResultLCSRes.SDRes.SPLevSD Recov.SD RecovRPDBicarbonateND24.027.025.096.0108.011.880 - 12020$													
LCS/LCSD REPORT Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity MB: T080205001-MB Prep Date: 2/4/2008 9:52:02AM Prep Date: 2/4/2008 MB Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Bicarbonate ND 24.0 27.0 25.0 25.0 96.0 108.0 11.8 80 - 120 20 Carbonate ND 50.0 51.0 50.0 50.0 100.0 102.0 2.0 80 - 120 20	Prep Batch:	T080205001											
LCS/LCSD REPORTAnalysis: $310.1 - Alkalinity, Titrimetric (pH 4.5) - AlkalinityMB:T080205001-MBPrep Date:MB Anal. Date:2/4/20089:52:02AMUnits:mg/LLCS Anal. Date:2/4/20089:52:02AMLCSD Anal. Date:2/4/20089:52:02AMMatrix:AqueousAnalyte NameSampResultLCSRes.SDRes.SPLevSPDLevRecov.SD RecovRPDRecov LimRPDLimFlagBicarbonateND50.051.050.050.0100.0102.02.080 - 12020$	<u>.</u>												
Analysis: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity MB: T080205001-MB Prep Date: 2/4/2008 9:52:02AM Units: mg/L Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Bicarbonate ND 50.0 51.0 50.0 50.0 100.0 102.0 2.0 80 - 120 20					IC	S/I CSD I		•					
Prep Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Bicarbonate ND 24.0 27.0 25.0 25.0 96.0 108.0 11.8 80 - 120 20 Carbonate ND 50.0 51.0 50.0 50.0 100.0 102.0 2.0 80 - 120 20	Analysis:	310.1 - Alkalinit	v. Titrimet	ric (pH 4	.5) - All	kalinity		MB:		T0802050	01-MB		
MB Anal. Date: 2/4/2008 9:52:02AM Units: mg/L LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous Analyte Name Bicarbonate SampResult ND LCSRes. SDRes. 24.0 SPLev 25.0 SPLev 25.0 Recov. 96.0 SD Recov 108.0 RPD 11.8 RPDLim 80 - 120 Flag 20 Carbonate ND 50.0 51.0 50.0 50.0 100.0 102.0 2.0 80 - 120 20			,,	(F				Prep	Date:	2/4/2008	01 112		
LCS Anal. Date: 2/4/2008 9:52:02AM LCSD Anal. Date: 2/4/2008 9:52:02AM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Bicarbonate ND 50.0 51.0 50.0 50.0 100.0 102.0 2.0 80 - 120 20	MB Anal. Date:	2/4/2008 9:52:0)2AM					Units	:	mg/L			
Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Bicarbonate ND 24.0 27.0 25.0 25.0 96.0 108.0 11.8 80 - 120 20 Carbonate ND 50.0 51.0 50.0 100.0 102.0 2.0 80 - 120 20	LCS Anal. Date:	2/4/2008 9:52:0)2AM LC	CSD Anal.	Date:	2/4/2008	9:52:02	AM Matri	x:	Aqueous			
Bicarbonate ND 24.0 27.0 25.0 25.0 96.0 108.0 11.8 80 - 120 20 Carbonate ND 50.0 51.0 50.0 100.0 102.0 2.0 80 - 120 20	Analyte Name	SampResult	LCSRes	SDRes	SPLev	SPDLev	Recov	SD Recov	RPD	Recov Lim	RPDLim	Flag	
Carbonate ND 50.0 51.0 50.0 50.0 100.0 102.0 2.0 80 - 120 20	Bicarbonate	ND	24.0	27.0	25.0	25.0	96.0	108.0	11.8	80 - 120	20	_ _	
	Carbonate	ND	50.0	51.0	50.0	50.0	100.0	102.0	2.0	80 - 120	20		
					FO	OTNOTES	TOOC	REPORT					

REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Analytica Environmental Laboratories, Inc.

Workorder (SDG):B0801197Project:Navajo Mine Extension Leaching StudyClient:Applied Hydrology Associates, Inc.Client Project Number:none

Detailed Analyti	cal Report	Analytica Env	vironmental Laborato	ries, Inc.
Workorder (SDG): B	0801197			
Project:	Navajo Mine Exte	nsion Leaching Study		
Client:	Applied Hydrolog	y Associates, Inc.		
Client Project Number:	none			
	QC I	BATCH ASSOCIATIONS - BY	Y METHOD BLANK	
Lab Project ID:	83,582	Lab Project Number:	B0801197	
Lab Method Blank Id: Prep Batch ID: Method:	T080130010-MB T080130010 SW6010B - ICP - T	otal		Prep Date: 1/30/2008
This Method blank and	sample preparation batch a	re associated with the following s	samples, spikes, and d	uplicates:
SampleNum	ClientSampleName	DataFile		AnalysisDate
B0801197-02A-PDS	PDS	E0201	8A	2/1/2008 1:13:00PM
T080130010-LCSD	LCSD	E0201	8A	2/1/2008 12:58:00PM
B0801197-02A-MS	MS	E0201	8A	2/1/2008 1:03:00PM
B0801197-02A-MSD	MSD	E0201	8A	2/1/2008 1:08:00PM
B0801197-02A-MSD	MSD	E0131	8A	1/31/2008 1:55:00PM
B0801197-02A-PDS	PDS	E0131	8A	1/31/2008 2:00:00PM
T080130010-LCS	LCS	E0201	8A	2/1/2008 12:53:00PM
T080130010-LCSD	LCSD	E0131	8A	1/31/2008 1:30:00PM
B0801197-02A-DUP	DUP	E0131	8A	1/31/2008 1:45:00PM
B0801197-02A-MS	MS	E0131	8A	1/31/2008 1:50:00PM
B0801197-01A	MB Successive #1	E0131	8A	1/31/2008 1:35:00PM
B0801197-02A	Ash Successive #1	E0131	8A	1/31/2008 1:40:00PM
T080130010-LCS	LCS	E0131	8A	1/31/2008 1:25:00PM

Detailed Analytic	cal Report	Analytica Er	vironmental Labora	tories, Inc.
orkorder (SDG): B	0801197			
oject:	Navajo Mine Ext	tension Leaching Study		
ient:	Applied Hydrolo	gy Associates, Inc.		
ient Project Number:	none			
	QC	BATCH ASSOCIATIONS - H	BY METHOD BLAN	K
Lab Project ID:	83,582	Lab Project Number:	B0801197	
Lab Method Blank Id:	T080130013-MB			Prep Date: 1/30/2008
Prep Batch ID:	T080130013			
Method:	Inorganic Anions b	by Ion Chromatography - Anio	ns by IC	
This Method blank and	sample preparation batch	are associated with the following	samples, spikes, and	duplicates:
SampleNum	ClientSampleName	<u>DataFil</u>	<u>e</u>	AnalysisDate
T080130013-LCSD	LCSD	08013	31_011.DXD	1/31/2008 2:31:20PM
B0801197-02B	Ash Successive #1	08013	30_043.DXD	1/31/2008 2:06:51AM
B0801197-02B-MS	MS	08013	30_044.DXD	1/31/2008 2:25:15AM
T080130013-LCS	LCS	08013	31_010.DXD	1/31/2008 2:12:57PM
B0801191-02B-DUP	DUP	08013	30_030.DXD	1/30/2008 10:07:41PM
B0801191-02B-MS	MS	08013	30_031.DXD	1/30/2008 10:26:05PM
B0801197-01B	MB Successive #1	08013	30_041.DXD	1/31/2008 1:30:04AM
B0801197-02B	Ash Successive #1	08013	30_024.DXD	1/30/2008 8:17:21PM
B0801197-02B-MS	MS	08013	30_025.DXD	1/30/2008 8:35:45PM
B0801191-02B	Batch QC	08013	30_029.DXD	1/30/2008 9:49:17PM
B0801191-02B-DUP	DUP	08013	30_013.DXD	1/30/2008 4:55:04PM
B0801191-02B-MS	MS	08013	30 014.DXD	1/30/2008 5:13:28PM
B0801197-01B	MB Successive #1	08013	- 30 023.DXD	1/30/2008 7:58:57PM
T080130013-LCS	LCS	08013	- 30_008.DXD	1/30/2008 3:23:07PM
T080130013-LCSD	LCSD	08013	30_009 DXD	1/30/2008 3:41:32PM
B0801191-02B	Batch QC	08013	30_012.DXD	1/30/2008 4:36:41PM
				Prep Date: 1/31/2008
Lab Method Blank Id: Prep Batch ID:	T080131008-MB			
Method:	160.1 - Total Disso	olved Solids dried at 180°C -	TDS	
This Method blank and	sample preparation batch	are associated with the following	samples spikes and	duplicates:
SampleNum	ClientSampleName	DataFil	e	AnalysisDate
B0801191_028_MS	MS	<u>Dutti II</u>	_	2/4/2008 12·47·24PM
B0801191-02D-1415	MS			2/4/2008 12:47:24PM
TOSO117/-02D-1015	ICS			2/4/2008 12.47.241 M 2/4/2008 12.47.241 M
T000121000-LCS	LCSD			2/7/2000 12.47.241 M 2/A/2008 12.47.241 M
R001101 000-LCSD	DUP			2/4/2000 12.47.24F M 2/4/2008 12.47.24F M
D0001191-02B-DUP	Batch OC			2/7/2000 12.47.24FW
DUOUII91-U2B	MR Successive #1			2/4/2000 12:4/:24PM
BU801197-01B	A ah Successive #1			2/4/2000 12:4/:24PM
DU0U119/-U2B	ASII SUCCESSIVE #1			2/4/2008 12:4/:24PM

	Detailed Analytic	cal Report	Analytica Er	vironmental Labor	atories, Inc.
W	orkorder (SDG): B	0801197			
Pr	oject:	Navajo Mine Exte	ension Leaching Study		
Cl	ient:	Applied Hydrolog	y Associates, Inc.		
Cl	lient Project Number:	none			
		QC	BATCH ASSOCIATIONS - E	BY METHOD BLAN	NK
	Lab Project ID:	83,582	Lab Project Number:	B0801197	
					Prep Date: 2/4/2008
	Lab Method Blank Id:	T080205001-MB			
	Prep Batch ID:	T080205001		•	
	Method:	310.1 - Alkalinity,	I itrimetric (pH 4.5) - Alkalin	nty	
	This Method blank and s	sample preparation batch a	re associated with the following	samples, spikes, and	duplicates:
	SampleNum	<u>ClientSampleName</u>	DataFil	<u>e</u>	AnalysisDate
	T080205001-LCS	LCS			2/4/2008 9:52:02AM
	T080205001-LCSD	LCSD			2/4/2008 9:52:02AM
	B0801191-04B-DUP	DUP			2/4/2008 9:52:02AM
	B0801191-04B	Batch QC			2/4/2008 9:52:02AM
	B0801197-01B	MB Successive #1			2/4/2008 9:52:02AM
	B0801197-02B	Ash Successive #1			2/4/2008 9:52:02AM
					Prep Date: 2/5/2008
	Lab Method Blank Id: Prop Batab ID:	T080205004-MB			
		1080205004 SW7470A Moreur	win Liquid Weste by CVAA	Total Ha	
	Method:	Sw 7470A - Melcul	y in Elquid waste by CVAA	- Total Hg	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	This Method blank and s	sample preparation batch a	re associated with the following	samples, spikes, and	duplicates:
	Sampleinum	DDS			<u>AnalysisDate</u>
	B0801197-02A-PDS	PDS	B020	508W.WK5	2/5/2008 4:32:55PM
	B0801210-02A-PDS	PDS	B020	508W.WKS	2/5/2008 5:08:58PW
	B0801210-04A-PDS	PDS MSD	B020	508W.WKS	2/5/2008 4:46:02DM
	B0801197-02A-MSD	MSD	B020	508W.WKS	2/5/2008 4:40:03PM
	B0801210-02A-MSD	MSD	B020	508W.WKS	2/5/2008 5:00:25PM
	B0801210-04A-MSD	MSD	B020	508W.WKS	2/5/2008 5:25:08PM
	B0801197-02A-MS	MS	B020	508W.WKS	2/5/2008 4:43:28PM
	B0801210-02A-MS	MS	B020	508W.WKS	2/5/2008 5:04:18PM
	B0801210-04A-MS	MS	B020	508W.WKS	2/5/2008 5:22:59PM
	B0801197-02A-DUP	DUP	B020	508W.WKS	2/5/2008 4:41:14PM
	B0801210-02A-DUP	DUP	B020	508W.WKS	2/5/2008 5:02:05PM
	B0801210-04A-DUP	DUP	B020	508W.WKS	2/5/2008 5:20:14PM
	B0801210-04A	Batch QC	B020	508W.WKS	2/5/2008 5:13:23PM
	T080205004-LCS	LCS	B020	508W.WKS	2/5/2008 4:26:44PM
	T080205004-LCSD	LCSD	B020	508W.WKS	2/5/2008 4:29:07PM
	B0801197-01A	MB Successive #1	B020	508W.WKS	2/5/2008 4:36:31PM
	B0801197-02A	Ash Successive #1	B020	508W.WKS	2/5/2008 4:38:47PM
	B0801210-02A	Batch QC	B020	508W.WKS	2/5/2008 4:59:48PM

Workorder (SDG): B0801197

Navajo Mine Extension Leaching Study **Project:**

Client: Applied Hydrology Associates, Inc. none

Client Project Number:

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.

Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

ND = Not Detected at or above the Reporting Limit

NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit

HIGH = Recovery, RPD, or other parameter is above Upper Control Limit

E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank

J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)

W = Post digestion spike did not meet criteria

S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)

PQL = "practical quantitation limit", from SW-846

EQL = "estimated quantitation limit", from SW-846

LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.

The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Analytica Environmental Laboratories, Inc.

Workorder (SDG):	B0801197
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Number:	none

REPOI	RTING CONVENTIONS B0801197	S FOR THIS REI	PORT
<u>TestPkgName</u>	Basis	<u> # Sig Figs</u>	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

			Þ	nalytic	a Chain	ō	Custoc	iy Forr	J				Pade	_	Ĵ.	
ANALYTICA GROUP ®		с т ¹ 21	89 Pennsylvania St. hernton, CO 80241 (303) 469-8868 303) 469-5254 fax	4307 Anct ()	Arctic Boulevard orage, AK 9950 007) 258-2155 7) 258-6634 fax		475 Hall St. airbanks, AK 9 (907) 456 - 31 (907) 456-3125	9701 54	38 Shaune Dri neau, AK 998(907) 780-666	8 ~ <u>7</u> 8	Chain	of Custod	y No: 6	;32	43	
Client Name & Address:			Public Water	System (P	WS) ID#:					Se	ction To be	Complete	Tov Analvo	3		
Hpplied Hydrology A	Specic fes ,2	ENC,	Project Name				-		Quot	e ID:		LGN:	9 2	2	ן ן	
			Navajo	Mine	extens	Ň	leachi	na Stud	Acco	Int 表			Cradi] -	
Report to:				urnarou	nd Time fo	or Re	sults (TA	Ξ(Invo	ice to Name	& Address					100 C 100 C 100 C
Phone No:			X Stand	lard	Expe	dited	< 10 days, prior auth	horization required								
Fax No:						(p	ease specify due d add'll charpes may	ate below;								
E-mail:			Requested Due	Date for R	sults:											
Special instructions/comments:	se by R	.Seer	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			I			P.O.	or Contract N						
	- - -	-				1				Requested	Analysis/Me	thod				
Kit Prep/Shipping Charge: \$					r)	5	TT S			S	s			ved	ed	?
Client Sample Identificat	ion / Location		Date Sampled	Time Sampled	Matrix (S-DW-WW-Oth	No. of Containe	6010 8/3010 / Lot # 110709 Prest 1103	107/107/197 Lot#410709 Pres: Haos	150.1 pt	140.1 TD Lot#: Pres:	300.0 Anio Lol #s Pros	310-1 R14 Lot#: Pres:	Loi# Presi	Field Prese	Field Filte	MS/MSD
MB Succes	ssive #1		B0) 66/1	11:10	A ₉	ບ	γ	Ķ	X	×	×	×	1.1. N	54	$\overline{\langle}$	`
Ash Success	ive # 1		80/66/1	11:10	P.		×	×	×	×	×	×		\$	7	X
						_										
Relinquished by:	Date	Time	Received by:		Date	╞	Time			Section	o Be Comi	leted by A	nalvfica			
R. Seemen	1/24/08 13:	40	Ar Pul		1/29/6	ğ İ	(<u>3</u> , 4)	Condit	ion af	Тно	ANC		JNU	0201018965294 ₆ .	FBKS	
Relinquished by:	Date	Time	Received by:		Date		Time	Custo	ty Seal?:)			HA Barren alternation		:	
Relinquished by:	Date	Time	Received by:		Date		Time	Initiale Temp/	d By:	20)	With International Law and the		and the second second second			
								Therm	o ID#:	2			VIII III	1		-
Version 2.0					ł			Shippe	d Via: A	Jer Xcare						
															ļ	



Cooler Receipt Form

Clie Pro	ent: Applied Hydrology ject: Navajo Mine Exter	Associates Cliension Leaching S	ent Code: 03 Study	0188		Order #:	B0801197
Cod	oler ID: 1						
A.	Preliminary Examination P	hase:	Date cooler of Cooler opened	pened: d by:	1/29/2008 gp	Signature:	67
1.	Was airbill Attached?	N/A	Airbill #:			Carrier Name: Ot	her
2.	Custody Seals?	N/A	How many?	0	Location:	Seal I	Name:
3.	Seals intact?	N/A					
4.	COC Attached?	Yes	Properly Com	pleted?	Yes	Signed by AEL emp	loyee? Yes
5.	Project Identification from	custody paper:	Navajo	Mine Exte	ension Leaching	Study	
6.	Preservative:	None		Temperat	cure: 20.0 deg.	C	
Des	ignated person initial here	to acknowledge	receipt:		66) D	ate: 1/29/08

COMMENTS: Tumbled in house by R. Seeman. Successive Ash leaching study.

8.	Log-In Phase: Samples Log-in	Date: 1/29/2008	Log-in By: gp		
1	Packing Type:	Other			
2	Were samples in separate bags?	N/A			
3	Were containers intact?	Yes	Labels agree with COC?	Yes	
4	Number of bottles received:	4	Number of samples received:	2	
5	Correct containers used?	Yes	Correct preservatives added?	Yes	
6	Sufficient sample volume?	Yes			
7	Bubbles in VOA samples?	N/A			
8	Was Project manager called and state	us discussed?	No		
9	Was anyone called? No	Who was called?	By whom?	Date:	
СС	DMMENTS:				



2/21/2008 Applied Hydrology Associates, Inc. 950 South Cherry Street Suite 810 Denver, CO 80246 Attn: Art O'Hayre Analytica Environmental Laboratories, Inc. 12189 Pennsylvania Street Thornton, CO 80241 Phone: 303-469-8868 Fax: 303-469-5254

Work Order #: B0801210 Date: 2/21/2008 Work ID: Navajo Mine Extension Leaching Study Date Received: 1/31/2008 Proj #: none

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
B0801210-01	MB Successive #2	B0801210-02	Ash Successive #2
B0801210-03	MB Successive #3	B0801210-04	Ash Successive #3

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Kristen Stone Project Manager

"The Science of Analysis, The Art of Service"

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0801210

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, March 1983.

Pfaff, J. D., C. A. Brockhoff and J. W. O'Dell. 1994. The Determination of Inorganic Anions in Water by Ion Chromatography. Method 300.0 A. U. S. Environmental Protection Agency. Environmental Monitoring Systems Lab.

Test Methods for Evaluating Solid Waste, USEPA SW-846, Third Edition, Revision 4, Decembe 1996.

PLEASE NOTE: THIS (2/21/08) IS A RE-ISSUE OF THE REPORT. ALL RESULTS ARE UNCHANGED EXCEPT FOR THE ICP METALS RESULTS. THE DATA VALIDATOR CONTACTED THE LABORATORY NOTING THAT THE ION BALANCE WAS OUT OF CONTROL FOR ALL SAMPLES ON THIS SDG, AND REQUESTED REANALYSIS FOR METALS. THE METALS WERE REANALYZED WITH THE EXCEPTION OF THE MATRIX SPIKES, FOR WHICH THERE WAS NOT SUFFICIENT SAMPLE. RESULTS WERE HIGHER, AND THE DATA VALIDATOR INDICATED THAT THE ION BALANCE WAS NOW IN CONTROL. THEREFORE THESE RESULTS ARE PREFERRED AND ARE SUBMITTED WITH THIS REPORT.

SAMPLE RECEIPT: Four (4) samples were received on 1/31/2008 3:05:00 PM., at a temperature of 3 deg C., at Analytica-Thornton. The samples were received in good condition and in order per chain of custody.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN A summary of our review is shown below.

All analytical results contained in this report have been reviewed under Analytica's internal quality assurance and quality control program. Any deviations in quality contro parameters for specific analyses are noted in the following text. A complete quality assurance report, including laboratory control, matrix spike, and sample duplicate recoveries is kept on file in our office and is available upon request.

All method specifications were met for the following tests:

Test Method: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg - Aqueous Test Method: 150.1 - pH, Elecrometric - pH - Aqueous Test Method: 160.1 - Total Dissolved Solids dried at 180°C - TDS - Aqueous Test Method: 310.1 - Alkalinity, Titrimetric (pH 4.5) - Alkalinity - Aqueous Test Method: Inorganic Anions by Ion Chromatography - Anions by IC - Aqueous

Test Method: SW6010B - ICP - Total - Aqueous

CLOSING CONTINUING CALIBRATIONS:

The closing CCV immediately following these samples was slightly elevated for Sodium. Th samples are high in Sodium and this is due to small amounts of carryover. A subsequent CCV was analyzed and is in control. The results are not expected to be significantly impacted and are submitted as they are. There is not sufficient sample remaining for reanalysis.

Case Narrative

Analytica Environmental Laboratories, Inc. Work Order: B0801210 (continued)

RunDate	Data File	Analyte	Recovery	LCL	UCL
2/19/2008 3:01:00 PM	E02198A	Sodium	111.	90	110

MS/MSD and DUP OUTLIERS:

As shown below, the MS/MSD were outside of limits for a number of targets. With the exception of Cadmium, Aluminum, Potassium, and Boron, these samples had target concentrations greater than four times the spike amount. In these cases it is not appropriate to calculate recoveries. The results should be used as replicates. Although reanalyses were conducted, there was not sufficient sample remaining to re-spike for the targets that are out of limits. These should be reviewed for potential low bias.

M	S/MSI) and DUP OU	JTL	IERS:							
Туре	e Cli	ent Sample	La	abSample	Ana	alyte	Recovery	LCL	UCL	Parent	Spike
MS	Ash	Successive	#2	B0801210-02A		Aluminum	71.9	75	125	0.984	2.00
MS	Ash	Successive	#3	B0801210-04A		Boron	72.9	75	125	0.341	0.500
MS	Ash	Successive	#3	B0801210-04A		Cadmium	71.9	75	125	-0.001	24
0.0	500										
MS	Ash	Successive	#3	B0801210-04A		Potassium	59.6	75	125	12.4	10.0
MS	Ash	Successive	#3	B0801210-04A		Sodium	-291	75	125	1270	10.0
MS	Ash	Successive	#2	B0801210-02A		Cadmium	67.8	75	125	-0.001	48
0.0	500										
MS	Ash	Successive	#2	B0801210-02A		Sodium	-272	75	125	1220	10.0
MSD	Ash	Successive	#2	B0801210-02A		Potassium	70.4	75	125	11.5	10.0
MSD	Ash	Successive	#2	B0801210-02A		Sodium	-247	75	125	1220	10.0
MSD	Ash	Successive	#3	B0801210-04A		Boron	72.4	75	125	0.341	0.500
MSD	Ash	Successive	#3	B0801210-04A		Cadmium	72.1	75	125	-0.001	.24
0.0	500										
MSD	Ash	Successive	#3	B0801210-04A		Potassium	60.6	75	125	12.4	10.0
MSD	Ash	Successive	#3	B0801210-04A		Sodium	-290	75	125	1270	10.0
MSD	Ash	Successive	#2	B0801210-02A		Aluminum	73.8	75	125	0.984	2.00
MSD	Ash	Successive	#2	B0801210-02A		Boron	69.9	75	125	0.345	0.500
MSD	Ash	Successive	#2	B0801210-02A		Cadmium	69.0	75	125	-0.001	48
0.0	500										

Detailed Ana	lytical Report		Ana	lytica Envi	ronmental Laboratories	, Inc.	
Workorder (SDG):	B0801210						
Project:	Navajo Mine	Extension	Leaching Stu	ıdy			
Client:	Applied Hyd	rology Ass	ociates, Inc.				
Client Project Numbe	r: none	00	,				
Report Section	: Clien	t Samnl	e Report				
Client Seconds Nerror		t Bump	e Report				
Client Sample Name:	MB Suc	cessive #	2				
Matrix:	Aqueous				Collection Date:	1/30/2008 11	:20:00AM
The following test was	conducted by: Analytica -	Thornton					
Lab Sample Number:	B0801210-01A				Analysis Date:	2/5/2008	4:57:34PM
Prep Date:	2/5/2008				Instrument:	CVAA_1	
Analytical Method ID:	SW7470A - Mercury in	Liquid Wast	e by CVAA - T	otal Hg	File Name:	B020508W	/.W
Reg. Method ID:	7470A				Dilution Factor:	1	
Prep Batch Number:	T080205004						
Report Basis:	As Received				Analyst Initials:	DL	
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 r	nl
A malata	CASN	D a seel4	Elece Unite		т ПЛ		
<u>Analyte</u> Mercury	<u>CASNo</u> 7439-97-6	<u>Result</u> ND	<u>Flags</u> Units mg/L	0.000200.0	<u>IDL</u>)00050		<u>run #:</u> 2
							2
The following test was	conducted by: Analytica -	Thornton				0/10/0000	2 26 00 D M
Lab Sample Number:	B0801210-01A				Analysis Date:	2/19/2008 ICD 2	2:36:00PM
Analytical Mathed ID:	2/ 3/ 2008 SW6010B - ICP - Total				File Neme:	E02108A	
	6010D - ICI - I0Ial				File Name:	1	
Reg. Method ID:	0010B				Dilution Factor:	1	
Prep Batch Number:	1080205002				A 1		
Report Basis:	50.00 ml				Analyst Initials:	50.00 ×	-1
Sample prep wt./vol.	50.00 III				Flep Extract Vol.	J0.00 II	111
<u>Analyte</u> Aluminum	<u>CASNo</u> 7429-90-5	<u>Result</u> 0.051	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> <u>M</u> 0.050 (<u>IDL</u> 0.014		<u>run #:</u> 2
Antimony	7440-36-0	ND	mg/L	0.050 0	.0067		
Arsenic	7440-38-2	ND	mg/L	0.10	0.015		
Barium	7440-39-3	0.089	mg/L	0.010 0.	00016		
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0	000060		
Boron	7440-42-8	0.31	mg/L	0.050 0	.0018		
Cadmium	7440-43-9	ND	mg/L	0.0060 0.	00051		
Calcium	7440-70-2	3.0	mg/L	0.10	0.013		
Chromium	7440-47-3	ND	mg/L	0.010 0	.0018		
Cobalt	7440-48-4	ND	mg/L	0.0050 0	.0016		
Copper	7440-50-8	ND	mg/L	0.0050 0	.0019		
Iron	7439-89-6	ND	mg/L	0.050 0	.0027		
Lead	7439-92-1	ND	mg/L	0.050	0.011		
Lithium	7439-93-2	ND	mg/L	0.10 0.	00072		
Magnesium	7439-96-4	1.3	mg/L	0.10	0.012		
Manganese	7439-96-5	ND	mg/L	0.010 0.	00066		
Molybdenum	7439-98-7	0.010	mg/L	0.010 0	.0018		
Nickel	7440-02-0	ND	mg/L	0.040 0	.0027		
Potassium	7440-09-7	12	mg/L	1.0	0.31		
Selenium	7784-49-2	ND	mg/L	0.10 (0.026		
Silver	7440-22-4	ND	mg/L	0.015 0	00066		
	/ ++0-22-4	1.10	111 <u>5</u> / L	0.015 0.			

Page 4 of 40

Detailed Ana	lytical l	Report		Anal	ytica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B0801	210							
Project:	ľ	Navajo Mine	Extension	Leaching Stu	dy				
Client:	A	Applied Hydr	ology Asso	ociates, Inc.					
Client Project Numbe	r: I	none							
Report Section	:	Client	Sample	e Report					
Client Sample Name:		MB Succ	essive #2	2					
Matrix:	Aque	eous				C	ollection Date:	1/30/2008 11	:20:00AM
Lab Sample Number:	B080121	10-01A					Analysis Date:	2/19/2008	2:36:00PM
Prep Date:	2/5/2008						Instrument:	ICP_2	
Analytical Method ID:	SW6010E	B - ICP - Total					File Name:	E02198A	
Reg. Method ID:	6010B						Dilution Factor:	1	
Prep Batch Number:	T080205	5002							
Report Basis:	As Receiv	red					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 n	าไ
<u>Analyte</u> Sodium	7	<u>CASNo</u> 440-23-5	<u>Result</u> 1,200	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028	i		<u>run #:</u> 2
Thallium	7	440-28-0	ND	mg/L	0.40	0.011			
Vanadium	7	440-62-2	ND	mg/L	0.010	0.0007	2		
Zinc	7	440-66-6	ND	mg/L	0.0050	0.0010)		
The following test was	conducted	by: Analytica -	Thornton						
Lab Sample Number:	B080121	10-01B					Analysis Date:	2/4/2008	9:52:02AM
Prep Date:	2/4/2008	3					Instrument:	Titrametric	
Analytical Method ID:	310.1 - Al	kalinity, Titrime	etric (pH 4.5)	- Alkalinity			File Name:		
Reg. Method ID:	310.1						Dilution Factor:	1	
Prep Batch Number:	T080205	5001							
Report Basis:	As Receiv	red					Analyst Initials:	cs	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 n	าไ
Analyte	9	CASNo	<u>Result</u>	Flags Units	PQL	MDL			<u>run #:</u>
Bicarbonate			1,100	mg/L	5.0	1.5			1
Carbonate			320	mg/L	7.0	1.2			
The following test was	conducted	by: Analytica -	Thornton						
Lab Sample Number:	B080121	10-01B					Analysis Date:	1/31/2008	11:25:00AM
Prep Date:	1/31/200)8					Instrument:	Probe	
Analytical Method ID:	150.1 - pł	I, Elecrometric	- pH				File Name:		
Reg. Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T080201	.007							
Report Basis:	As Receiv	red					Analyst Initials:	R. Seeman	
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00 n	าไ
<u>Analyte</u> pH	<u> </u>	<u>CASNo</u>	<u>Result</u> 9.1	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Ana	lytical Rep	ort		Analy	rtica En	vironr	nental Laboratories,	Inc.	
Workorder (SDG):	B0801210								
Project:	Navaj	jo Mine E	xtension l	Leaching Stud	y				
Client:	Appli	ed Hydrol	logy Asso	ciates, Inc.					
Client Project Numbe	r: none								
Report Section	:	Client S	Sample	Report					
Client Sample Name:	Μ	B Succe	ssive #2	1					
Matrix:	Aqueous					C	Collection Date:	1/30/2008	11:20:00AM
Lab Sample Number: Prep Date: Analytical Method ID:	B0801210-01 2/6/2008 160.1 - Total D	B	lids dried at	t 180°C - TDS			Analysis Date: Instrument: File Name:	2/12/200 SCALE	98 10:07:15AM
Reg. Method ID:	160.1						Dilution Factor:	1	
Prep Batch Number: Report Basis: Sample prep wt./vol:	1080207003 As Received 100.00	1					Analyst Initials: Prep Extract Vol:	kl 1.00	ml
Analyte Total Dissolved Solids	CASN	<u>o</u>	<u>Result</u> 3,000	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted by: A	nalytica - Tł	nornton						
Lab Sample Number: Prep Date: Analytical Method ID:	B0801210-01 2/4/2008 Inorganic Anion	B ns by Ion Ch	nromatogra	phy - Anions by	IC		Analysis Date: Instrument: File Name:	2/4/2008 IC 080204_	017.D
Reg. Method ID:	300.0						Dilution Factor:	25	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T080204004 As Received 20.00 ml	1					Analyst Initials: Prep Extract Vol:	CS 20.00	ml
Analyte Chloride	<u>CASN</u>	<u>o</u>	<u>Result</u> 600	Flags <u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1
Lab Sample Number: Prep Date:	B0801210-01 2/4/2008	B			10		Analysis Date: Instrument:	2/4/2008 IC	3 7:30:06PM
Analytical Method ID: Reg. Method ID:	300.0	ns by Ion Cl	nromatogra	phy - Anions by	IC		File Name: Dilution Factor:	080204_ 1	<u>0</u> 28.D
Prep Batch Number:	T080204004								
Report Basis:	As Received						Analyst Initials:	CS	
Sample prep wt./vol:	20.00 m	1					Prep Extract Vol:	20.00	ml
Analyte Fluoride	<u>CASN</u>	<u>0</u>	<u>Result</u> 2.2	Flags Units mg/L	POL 0.40	<u>MDL</u> 0.031	I		<u>run #:</u> 2
Suitate			280	mg/L	1.5	0.11			

Detailed Ana	lytical Report		Ana	lytica Envii	conmental Laboratories	, Inc.
Workorder (SDG):	B0801210					
Project:	Navajo Mine	e Extension	Leaching Stu	ıdy		
Client:	Applied Hyd	Irology Ass	ociates, Inc.			
Client Project Numbe	r: none					
Report Section	: Clien	t Sampl	e Report			
Client Sample Name:	Ash Suc	ccessive #	2			
Matrix:	Aqueous				Collection Date:	1/30/2008 11:20:00AM
The following test was	conducted by: Analytica	- Thornton				
Lab Sample Number:	B0801210-02A				Analysis Date:	2/5/2008 4:59:48PM
Prep Date:	2/5/2008				Instrument:	CVAA_1
Analytical Method ID:	SW7470A - Mercury in	Liquid Wast	e by CVAA - T	otal Hg	File Name:	B020508W.W
Reg. Method ID:	7470A				Dilution Factor:	1
Prep Batch Number:	T080205004					
Report Basis:	As Received				Analyst Initials:	DL
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 ml
A nalvto	CASNo	Recult	Flags Units	POL M	DI	run #•
Mercury	7439-97-6	ND	mg/L	0.000200.0	000050	2
The following test was	conducted by: Analytica	- Thornton				
Lab Sample Number:	B0801210-02A				Analysis Date:	2/19/2008 2:41:00PM
Prep Date:	2/5/2008				Instrument:	ICP_2
Analytical Method ID:	SW6010B - ICP - Total	l			File Name:	E02198A
Reg. Method ID:	6010B				Dilution Factor:	1
Prep Batch Number:	T080205002					
Report Basis:	As Received				Analyst Initials:	rm
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 ml
<u>Analyte</u> Aluminum	<u>CASNo</u>	<u>Result</u>	Flags Units	$\frac{PQL}{0.050} \frac{M}{0}$	DL 0.014	<u>run #:</u>
Antimony	7429-90-5	0.98 ND	mg/L	0.050 0	0067	C.
Arsenic	7440-38-2	0.11	mg/L	0.10 (0.015	
Barium	7440-39-3	0.11	mg/L	0.010 0.0	00016	
Bervllium	7440-41-7	0.035 ND	mg/L	0.0010.0.0	000060	
Boron	7440-42-8	0.34	mg/L	0.050 0	0018	
Cadmium	7440-43-9	ND	mg/L	0.0060 0.0	00051	
Calcium	7440-70-2	36	mg/L	0.10 (0.013	
Chromium	7440-47-3	ND	mg/L	0.010 0	.0018	
Cobalt	7440-48-4	ND	mg/L	0.0050 0	.0016	
Copper	7440-50-8	ND	mg/L	0.0050 0	.0019	
Iron	7439-89-6	ND	mg/L	0.050 0.	.0027	
Lead	7439-92-1	ND	mg/L	0.050 0	0.011	
Lithium	7439-93-2	ND	mg/L	0.10 0.0	00072	
Magnesium	7439-96-4	1.5	mg/L	0.10 0	0.012	
Manganese	7439-96-5	ND	mg/L	0.010 0.0	00066	
Molybdenum	7439-98-7	0.016	mg/L	0.010 0	.0018	
Nickel	7440-02-0	ND	mg/L	0.040 0	.0027	
Potassium	7440-09-7	11	mg/L	1.0	0.31	
Selenium	7784-49-2	ND	mg/L	0.10 0	0.026	
Silver	7440-22-4	ND	mg/L	0.015 0.0	00066	

Detailed Ana	lytical 1	Report		Anal	ytica En	vironn	nental Laboratories,	, Inc.	
Workorder (SDG):	B0801	210							
Project:	I	Navajo Mine	Extension	Leaching Stu	dy				
Client:	1	Applied Hyd	rology Asso	ciates, Inc.					
Client Project Numbe	r: 1	none							
Report Section	:	Client	t Sample	e Report					
Client Sample Name:		Ash Suc	cessive #2	2					
Matrix:	Aque	eous				C	collection Date:	1/30/2008 11	:20:00AM
Lab Sample Number:	B08012	10-02A					Analysis Date:	2/19/2008	2:41:00PM
Prep Date:	2/5/2008	3					Instrument:	ICP_2	
Analytical Method ID:	SW6010E	3 - ICP - Total					File Name:	E02198A	
Reg. Method ID:	6010B						Dilution Factor:	1	
Prep Batch Number:	T080205	5002							
Report Basis:	As Receiv	ved					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 m	ıl
<u>Analyte</u> Sodium	7	<u>CASNo</u> 440-23-5	<u>Result</u> 1,200	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028	3		<u>run #:</u> 3
Thallium	7	440-28-0	ND	mg/L	0.40	0.011			
Vanadium	7	440-62-2	0.063	mg/L	0.010	0.0007	2		
Zinc	7	440-66-6	0.0081	mg/L	0.0050	0.001	0		
The following test was	conducted	by: Analytica -	Thornton						
Lab Sample Number:	B08012	10-02B					Analysis Date:	2/4/2008	9:52:02AM
Prep Date:	2/4/2008	3					Instrument:	Titrametric	
Analytical Method ID:	310.1 - Al	kalinity, Titrim	etric (pH 4.5)	- Alkalinity			File Name:		
Reg. Method ID:	310.1						Dilution Factor:	1	
Prep Batch Number:	T080205	5001							
Report Basis:	As Receiv	ved					Analyst Initials:	cs	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 m	ıl
Analyte Bicarbonate		<u>CASNo</u>	<u>Result</u> 1,200	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 5.0	<u>MDL</u> 1.5			<u>run #:</u> 1
Carbonate			160	mg/L	7.0	1.2			
The following test was	conducted	by: Analytica -	Thornton						
Lab Sample Number:	B08012	10-02B					Analysis Date:	1/31/2008	11:25:00AM
Prep Date:	1/31/200)8					Instrument:	Probe	
Analytical Method ID:	150.1 - pł	H, Elecrometric	- pH				File Name:		
Reg. Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T080201	1007							
Report Basis:	As Receiv	ved					Analyst Initials:	R. Seeman	
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00 m	ıl
<u>Analyte</u> pH		<u>CASNo</u>	<u>Result</u> 8.8	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Ana	lytical I	Report			Analy	tica En	vironr	nental Laboratories,	, Inc.	
Workorder (SDG):	B0801	210								
Project:]	Navajo Mi	ne Extension	Leachi	ing Stud	y				
Client:		Applied H	ydrology Asso	ciates,	Inc.					
Client Project Numbe	r: 1	none								
Report Section	:	Clie	ent Sample	e Rep	ort					
Client Sample Name:		Ash Su	uccessive #2	2						
Matrix:	Aqu	eous					C	Collection Date:	1/30/2008	11:20:00AM
Lab Sample Number: Prep Date:	B08012 2/6/2008	10-02B 3		+ 190°C				Analysis Date: Instrument:	2/12/200 SCALE	08 10:07:15AM
Analytical Method ID: Reg. Method ID:	160.1 - 16	Juli Dissolv	ed Solids difed a	1 180 C	- 105			File Name: Dilution Factor:	1	
Prep Batch Number: Report Basis:	T08020' As Receiv	7003 ved						Analyst Initials:	kl	
Sample prep wt./vol:	100.00	ml						Prep Extract Vol:	1.00	ml
Analyte Total Dissolved Solids		<u>CASNo</u>	<u>Result</u> 3,100	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted	by: Analytic	ca - Thornton							
Lab Sample Number: Prep Date: Analytical Method ID:	B08012 2/4/2008 Inorganic	10-02B 3 Anions by 1	Ion Chromatogra	iphy - A	nions by	IC		Analysis Date: Instrument: File Name:	2/4/2008 IC 080204	4:26:11PM
Reg Method ID:	300 0	i inons og i	ton emonutogi	.pny n				Dilution Factor:	25	_010.D
Pren Batch Number	T080204	1004						Dilution ractor.	25	
Report Basis:	As Receiv	ved						Analyst Initials:	KB	
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml
Analyte Chloride		<u>CASNo</u>	<u>Result</u> 610	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1
Sulfate			350		mg/L	38	2.8			
Lab Sample Number: Prep Date:	B08012 2/4/2008	10-02B 3						Analysis Date: Instrument:	2/4/2008 IC	3 7:48:30PM
Analytical Method ID:	Inorganic	Anions by 1	Ion Chromatogra	iphy - A	nions by	IC		File Name:	080204_	_029.D
Reg. Method ID:	300.0							Dilution Factor:	1	
Prep Batch Number:	T080204	4004								
Report Basis:	As Receiv	ved						Analyst Initials:	CS	
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml
<u>Analyte</u> Fluoride		<u>CASNo</u>	<u>Result</u> 10	<u>Flags</u>	<u>Units</u> mg/L	<u>PQL</u> 0.40	<u>MDL</u> 0.031	l		<u>run #:</u> 2

Detailed Ana	lytical Report		Ana	lytica Envi	ronmental Laboratories	, Inc.	
Workorder (SDG):	B0801210						
Project:	Navajo Mine	Extension	Leaching Stu	ıdy			
Client:	Applied Hyd	rology Ass	ociates, Inc.				
Client Project Numbe	r: none	00	,				
Report Section	: Clien	t Samnl	le Report				
Client Secole Nemes		, bump	e Report		1		
Client Sample Name:	MB Suc	cessive #	3				
Matrix:	Aqueous				Collection Date:	1/31/2008 11	1:00:00AM
The following test was	conducted by: Analytica -	Thornton					
Lab Sample Number:	B0801210-03A				Analysis Date:	2/5/2008	5:11:03PM
Prep Date:	2/5/2008				Instrument:	CVAA_1	
Analytical Method ID:	SW7470A - Mercury in	Liquid Wast	e by CVAA - T	otal Hg	File Name:	B020508V	V.W
Reg. Method ID:	7470A				Dilution Factor:	1	
Prep Batch Number:	T080205004						
Report Basis:	As Received				Analyst Initials:	DL	
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00	nl
	CA SN.	D			т П		#-
<u>Analyte</u> Mercury	<u>CASINO</u> 7/39-97-6	<u>Result</u> ND	<u>Flags</u> Units mg/L	0.000200.0	<u>1DL</u> 000050		<u>run #:</u> 2
	1	- ·	8				2
The following test was	conducted by: Analytica -	Thornton				2/10/2000	0 46 00DM
Lab Sample Number:	B0801210-03A				Analysis Date:	2/19/2008	2:46:00PM
Prep Date:	2/3/2008 SW6010B_ICD_Total				Instrument:	ICP_2 E02108A	
Analytical Method ID:	5 W 00 10 D - 10 F - 10 tai				File Name:	EU2198A	
Reg. Method ID:	0010B				Dilution Factor:	1	
Prep Batch Number:	1080205002						
Report Basis:	50.00 ml				Analyst Initials:	50.00	1
Sample prep wi./vol:	50.00 III				Prep Extract vor.	50.00 1	111
<u>Analyte</u> Aluminum	<u>CASNo</u> 7429-90-5	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> <u>N</u> 0.050	<u>1DL</u> 0.014		<u>run #:</u> 2
Antimony	7440-36-0	ND	mg/L	0.050 0	0.0067		-
Arsenic	7440-38-2	ND	mg/L	0.10	0.015		
Barium	7440-39-3	0.089	mg/L	0.010 0.	.00016		
Bervllium	7440-41-7	ND	mg/L	0.0010 0.0	000060		
Boron	7440-42-8	0.32	mg/L	0.050 0	0.0018		
Cadmium	7440-43-9	ND	mg/L	0.0060 0.	.00051		
Calcium	7440-70-2	3.0	mg/L	0.10	0.013		
Chromium	7440-47-3	ND	mg/L	0.010 0	0.0018		
Cobalt	7440-48-4	ND	mg/L	0.0050 0	0.0016		
Copper	7440-50-8	ND	mg/L	0.0050 0	0.0019		
Iron	7439-89-6	0.051	mg/L	0.050 0	0.0027		
Lead	7439-92-1	ND	mg/L	0.050	0.011		
Lithium	7439-93-2	ND	mg/L	0.10 0.	.00072		
Magnesium	7439-96-4	1.3	mg/L	0.10	0.012		
Manganese	7439-96-5	ND	mg/L	0.010 0.	.00066		
Molybdenum	7439-98-7	0.011	mg/L	0.010 0	0.0018		
Nickel	7440-02-0	ND	mg/L	0.040 0	0.0027		
Potassium	7440-09-7	12	mg/L	1.0	0.31		
Selenium	7784-49-2	ND	mg/L	0.10	0.026		
Silver	7440-22-4	ND	mg/I	0.015 0	00066		
511701	/++0-22-4		iiig/L	0.015 0.			

Detailed Ana	lytical l	Report		Ana	lytica En	vironn	nental Laboratories,	, Inc.	
Workorder (SDG):	B0801	210							
Project:	I	Navajo Mine I	Extension	Leaching Stu	dy				
Client:	A	Applied Hydr	ology Asso	ciates, Inc.					
Client Project Number	r: r	none							
Report Section	:	Client	Sample	e Report					
Client Sample Name:		MB Succ	essive #3	;					
Matrix:	Aque	eous				C	ollection Date:	1/31/2008 11	:00:00AM
Lab Sample Number:	B080121	10-03A					Analysis Date:	2/19/2008	2:46:00PM
Prep Date:	2/5/2008	3					Instrument:	ICP_2	
Analytical Method ID:	SW6010E	3 - ICP - Total					File Name:	E02198A	
Reg. Method ID:	6010B						Dilution Factor:	1	
Prep Batch Number:	T080205	5002							
Report Basis:	As Receiv	ved					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 n	nl
<u>Analyte</u> Sodium	7	<u>CASNo</u> 440-23-5	<u>Result</u> 1,300	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 2
Thallium	7	440-28-0	ND	mg/L	0.40	0.011			
Vanadium	7	440-62-2	ND	mg/L	0.010	0.0007	2		
Zinc	7	440-66-6	ND	mg/L	0.0050	0.0010)		
The following test was	conducted	by: Analytica - '	Thornton						
Lab Sample Number:	B080121	10-03B					Analysis Date:	2/4/2008	9:52:02AM
Prep Date:	2/4/2008	3					Instrument:	Titrametric	
Analytical Method ID:	310.1 - Al	kalinity, Titrime	tric (pH 4.5)	- Alkalinity			File Name:		
Reg. Method ID:	310.1						Dilution Factor:	1	
Prep Batch Number:	T080205	5001							
Report Basis:	As Receiv	ved					Analyst Initials:	cs	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 n	nl
Analyte Bicarbonate	<u>9</u>	<u>CASNo</u>	<u>Result</u> 1,200	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 5.0	<u>MDL</u> 1.5			<u>run #:</u> 1
Carbonate			320	mg/L	7.0	1.2			
The following test was	conducted	by: Analytica - '	Thornton						
Lab Sample Number:	B080121	10-03B					Analysis Date:	1/31/2008	11:25:00AM
Prep Date:	1/31/200)8					Instrument:	Probe	
Analytical Method ID:	150.1 - pH	I, Elecrometric	- pH				File Name:		
Reg. Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T080201	007							
Report Basis:	As Receiv	ved					Analyst Initials:	R. Seeman	
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00 n	nl
<u>Analyte</u> pH	<u> </u>	<u>CASNo</u>	<u>Result</u> 9.1	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	<u>MDL</u> 0.10			<u>run #:</u> 1

Detailed Ana	lytical R	eport		Anal	ytica En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B08012	10							
Project:	Ν	avajo Mine	e Extension	Leaching Stu	dy				
Client:	Α	pplied Hyd	rology Asso	ciates, Inc.					
Client Project Numbe	r: no	one							
Report Section	:	Clien	t Sample	e Report					
Client Sample Name:		MB Suc	cessive #3	3					
Matrix:	Aqueo	ous				C	Collection Date:	1/31/2008	11:00:00AM
Lab Sample Number: Prep Date: Analytical Method ID:	B0801210 2/6/2008 160.1 - Tot	D-03B al Dissolved	Solids dried a	nt 180°C - TDS			Analysis Date: Instrument: File Name:	2/12/200 SCALE	08 10:07:15AM
Reg. Method ID:	160.1						Dilution Factor:	1	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T0802070 As Receive 100.00)03 d ml					Analyst Initials: Prep Extract Vol:	kl 1.00	ml
Analyte Total Dissolved Solids	<u>C</u>	<u>ASNo</u>	<u>Result</u> 3,100	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted by	y: Analytica	- Thornton						
Lab Sample Number: Prep Date: Analytical Method ID:	B0801210 2/4/2008 Inorganic A)-03B Anions by Ior	1 Chromatogra	aphy - Anions by	y IC		Analysis Date: Instrument: File Name:	2/4/2008 IC 080204	3 5:39:45PM 022.D
Reg. Method ID:	300.0	-	-				Dilution Factor:	25	-
Prep Batch Number: Report Basis: Sample prep wt./vol:	T0802040 As Receive 20.00	004 d ml					Analyst Initials: Prep Extract Vol:	KB 20.00	ml
Analyte Chloride	<u>C</u>	<u>ASNo</u>	<u>Result</u> 620	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 20	<u>MDL</u> 1.1			<u>run #:</u> 1
Lab Sample Number: Prep Date:	B0801210 2/4/2008)-03B	Characterist	when Ariana ha			Analysis Date: Instrument:	2/4/2008 IC	9:02:06PM
Analytical Method ID: Reg. Method ID:	300.0	MIONS BY IOL	r Chromatogra	apny - Amons b <u>y</u>	y IC		File Name: Dilution Factor:	080204_ 1	<u>0</u> 33.D
Prep Batch Number:	T0802040	004							
Report Basis:	As Receive	d					Analyst Initials:	KB	
Sample prep wt./vol:	20.00	ml					Prep Extract Vol:	20.00	ml
Analyte Fluoride	<u>C</u>	<u>ASNo</u>	<u>Result</u> 2.2	Flags Units mg/L	POL 0.40	<u>MDL</u> 0.031	l		<u>run #:</u> 2
Suitate			280	IIIg/L	1.5	0.11			

Detailed Ana	lytical Report		Ana	lytica Envii	ronmental Laboratories	, Inc.	
Workorder (SDG):	B0801210						
Project:	Navajo Min	e Extension	Leaching Stu	ıdy			
Client:	Applied Hy	drology Ass	ociates, Inc.				
Client Project Numb	er: none						
Report Section	: Clier	nt Sampl	e Report				
Client Sample Name:	Ash Su	ccessive #	3				
Matrix:	Aqueous				Collection Date:	1/31/2008 1	1:00:00AM
The following test was	conducted by: Analytica	- Thornton					
I ab Sample Number:	B0801210-04A	inomiton			Analysis Date:	2/5/2008	5·13·23PM
Prep Date:	2/5/2008				Instrument:	CVAA 1	5.15.251 101
Analytical Method ID:	SW7470A - Mercury in	n Liquid Wast	e by CVAA - T	otal Hg	File Name:	B020508V	V.W
Reg. Method ID:	7470A	-	-	-	Dilution Factor:	1	
Pren Batch Number	T080205004						
Report Basis:	As Received				Analyst Initials:	DL	
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00	ml
<u>Analyte</u> Mercury	<u>CASNo</u> 7439-97-6	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	PQL M 0.000200.0	<u>IDL</u>)00050		<u>run #:</u> 2
The following test was	conducted by: Analytica	- Thornton					
I ab Sample Number	B0801210-04A				Analysis Date:	2/19/2008	2.51.00PM
Prep Date:	2/5/2008				Instrument:	ICP 2	2.51.001 101
Analytical Method ID:	SW6010B - ICP - Tota	ıl			File Name:	E02198A	
Reg. Method ID:	6010B				Dilution Factor:	1	
Pren Batch Number:	T080205002						
Report Basis:	As Received				Analyst Initials:	rm	
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00	nl
Analyte	CASNo	Result	Flags Units	<u>PQL</u> M	IDL		<u>run #:</u>
Aluminum	7429-90-5	0.67	mg/L	0.050 0	0.014		3
Antimony	7440-36-0	ND	mg/L	0.050 0.	.0067		
Arsenic	7440-38-2	ND	mg/L	0.10 0	0.015		
Barium	7440-39-3	0.070	mg/L	0.010 0.0	00016		
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0	000060		
Boron	7440-42-8	0.34	mg/L	0.050 0	.0018		
Cadmium	7440-43-9	ND	mg/L	0.0060 0.0	00051		
Calcium	7440-70-2	3.3	mg/L	0.10 0	0.013		
Chromium					0010		
Cobalt	7440-47-3	ND	mg/L	0.010 0.	.0018		
coour	7440-47-3 7440-48-4	ND ND	mg/L mg/L	0.010 0. 0.0050 0.	.0018		
Copper	7440-47-3 7440-48-4 7440-50-8	ND ND ND	mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0.	.0018 .0016 .0019		
Copper Iron	7440-47-3 7440-48-4 7440-50-8 7439-89-6	ND ND ND ND	mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0.	.0018 .0016 .0019 .0027		
Copper Iron Lead	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1	ND ND ND ND ND	mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0.	.0018 .0016 .0019 .0027 0.011		
Copper Iron Lead Lithium	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1 7439-93-2	ND ND ND ND ND ND	mg/L mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0. 0.050 0. 0.10 0.4	.0018 .0016 .0019 .0027 0.011 00072		
Copper Iron Lead Lithium Magnesium	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1 7439-93-2 7439-96-4	ND ND ND ND ND 1.9	mg/L mg/L mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0. 0.10 0.	.0018 .0016 .0019 .0027 0.011 00072 0.012		
Copper Iron Lead Lithium Magnesium Manganese	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1 7439-93-2 7439-96-4 7439-96-5	ND ND ND ND ND 1.9 ND	mg/L mg/L mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0. 0.050 0. 0.10 0. 0.10 0. 0.010 0.	.0018 .0016 .0019 .0027 0.011 00072 0.012 00066		
Copper Iron Lead Lithium Magnesium Manganese Molybdenum	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1 7439-93-2 7439-96-4 7439-96-5 7439-98-7	ND ND ND ND ND 1.9 ND 0.013	mg/L mg/L mg/L mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0. 0.050 0. 0.050 0. 0.050 0. 0.10 0. 0.010 0. 0.010 0.	.0018 .0016 .0019 .0027 0.011 00072 0.012 00066 .0018		
Copper Iron Lead Lithium Magnesium Manganese Molybdenum Nickel	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1 7439-93-2 7439-93-2 7439-96-5 7439-96-5 7439-98-7 7440-02-0	ND ND ND ND ND 1.9 ND 0.013 ND	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0. 0.050 0. 0.050 0. 0.050 0. 0.10 0. 0.10 0. 0.010 0. 0.010 0. 0.010 0. 0.040 0.	.0018 .0016 .0019 .0027 0.011 00072 0.012 00066 .0018 .0027		
Copper Iron Lead Lithium Magnesium Manganese Molybdenum Nickel Potassium	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1 7439-93-2 7439-96-4 7439-96-5 7439-96-5 7439-98-7 7440-02-0 7440-02-7	ND ND ND ND ND 1.9 ND 0.013 ND 12	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0. 0.050 0. 0.10 0. 0.10 0. 0.010 0. 0.010 0. 0.040 0. 1.0 0.	.0018 .0016 .0019 .0027 0.011 00072 0.012 00066 .0018 .0027 0.31		
Copper Iron Lead Lithium Magnesium Manganese Molybdenum Nickel Potassium Selenium	7440-47-3 7440-48-4 7440-50-8 7439-89-6 7439-92-1 7439-93-2 7439-96-4 7439-96-5 7439-96-5 7439-98-7 7440-02-0 7440-09-7 7784-49-2	ND ND ND ND 1.9 ND 0.013 ND 12 ND	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	0.010 0. 0.0050 0. 0.0050 0. 0.050 0. 0.050 0. 0.050 0. 0.010 0. 0.010 0. 0.010 0. 0.010 0. 0.040 0. 1.0 0.	.0018 .0016 .0019 .0027 0.011 00072 0.012 00066 .0018 .0027 0.31 0.026		

Detailed Ana	lytical l	Report		Ana	lytica Er	vironn	nental Laboratories	, Inc.	
Workorder (SDG):	B0801	210							
Project:	ľ	Navajo Mine	Extension	Leaching Stu	ıdy				
Client:	A	Applied Hydr	ology Asso	ociates, Inc.					
Client Project Numbe	r: r	none							
Report Section	:	Client	Sample	e Report					
Client Sample Name:		Ash Succ	essive #.	3					
Matrix:	Aque	eous				C	collection Date:	1/31/2008 11	:00:00AM
Lab Sample Number:	B080121	10-04A					Analysis Date:	2/19/2008	2:51:00PM
Prep Date:	2/5/2008	3					Instrument:	ICP_2	
Analytical Method ID:	SW6010B	B - ICP - Total					File Name:	E02198A	
Reg. Method ID:	6010B						Dilution Factor:	1	
Prep Batch Number:	T080205	5002							
Report Basis:	As Receiv	red					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 n	nl
<u>Analyte</u> Sodium	7	<u>CASNo</u> 440-23-5	<u>Result</u> 1,300	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028	3		<u>run #:</u> 3
Thallium	7	440-28-0	ND	mg/L	0.40	0.011			
Vanadium	7	440-62-2	0.031	mg/L	0.010	0.0007	2		
Zinc	7	440-66-6	ND	mg/L	0.0050	0.001	0		
The following test was	conducted l	by: Analytica -	Thornton						
Lab Sample Number:	B080121	10-04B					Analysis Date:	2/4/2008	9:52:02AM
Prep Date:	2/4/2008	3					Instrument:	Titrametric	
Analytical Method ID:	310.1 - Al	kalinity, Titrime	tric (pH 4.5)	- Alkalinity			File Name:		
Reg. Method ID:	310.1						Dilution Factor:	1	
Prep Batch Number:	T080205	5001							
Report Basis:	As Receiv	ved					Analyst Initials:	cs	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00 n	nl
Analyte Bicarbonate	<u>.</u>	<u>CASNo</u>	<u>Result</u> 1,100	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 5.0	<u>MDL</u> 1.5			<u>run #:</u> 1
Carbonate			340	mg/L	7.0	1.2			
The following test was	conducted l	by: Analytica -	Thornton						
Lab Sample Number:	B080121	10-04B					Analysis Date:	1/31/2008	11:25:00AM
Prep Date:	1/31/200)8					Instrument:	Probe	
Analytical Method ID:	150.1 - pH	I, Elecrometric	- pH				File Name:		
Reg. Method ID:	150.1						Dilution Factor:	1	
Prep Batch Number:	T080201	007							
Report Basis:	As Receiv	ved					Analyst Initials:	R. Seeman	
Sample prep wt./vol:	10.00	ml					Prep Extract Vol:	10.00 n	nl
<u>Analyte</u> pH	<u>9</u>	<u>CASNo</u>	<u>Result</u> 9.0	<u>Flags</u> <u>Units</u> pH	<u>PQL</u> 0.10	MDL 0.10			<u>run #:</u> 1

Detailed Ana	lytical Re	port		А	nalytica	ı En	vironn	nental Laboratories,	Inc.	
Workorder (SDG):	B0801210	0								
Project:	Nav	vajo Mine I	Extension 1	Leaching S	Study					
Client:	Арј	plied Hydro	ology Asso	ciates, Inc	•					
Client Project Numbe	r: non	ie								
Report Section	:	Client	Sample	e Repor	t					
Client Sample Name:	1	Ash Succ	essive #3	;						
Matrix:	Aqueou	S					С	ollection Date:	1/31/2008	11:00:00AM
Lab Sample Number: Prep Date: Analytical Method ID:	B0801210- 2/6/2008 160.1 - Total	04B Dissolved So	olids dried a	t 180°C - T	DS			Analysis Date: Instrument: File Name:	2/12/200 SCALE	8 10:07:15AM
Reg. Method ID:	160.1							Dilution Factor:	1	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T08020700 As Received 100.00	3 ml						Analyst Initials: Prep Extract Vol:	kl 1.00	ml
<u>Analyte</u> Total Dissolved Solids	CAS	<u>SNo</u>	<u>Result</u> 3,100	<u>Flags</u> <u>Unit</u> mg/l	t <u>s F</u> L 1	0 0	<u>MDL</u> 8.2			<u>run #:</u> 1
The following test was	conducted by:	Analytica - 7	Thornton							
Lab Sample Number: Prep Date: Analytical Method ID:	B0801210- 2/4/2008 Inorganic An	04B ions by Ion (Chromatogra	phy - Anior	is by IC			Analysis Date: Instrument: File Name:	2/4/2008 IC 080204	5:58:09PM 023.D
Reg. Method ID:	300.0							Dilution Factor:	25	
Prep Batch Number: Report Basis: Sample prep wt./vol:	T08020400 As Received 20.00	4 ml						Analyst Initials: Prep Extract Vol:	КВ 20.00	ml
Analyte Chloride	CAS	<u>SNo</u>	<u>Result</u> 620	<u>Flags</u> <u>Unit</u> mg/l	t <u>s <u>F</u> L 2</u>	QL 0	<u>MDL</u> 1.1			<u>run #:</u> 1
Lab Sample Number: Prep Date:	B0801210- 2/4/2008	04B	71		a ha IC			Analysis Date: Instrument:	2/4/2008 IC	9:20:30PM
Analytical Method ID: Reg. Method ID:	300.0	Ions by Ion C	Informatogra	pny - Amor	is by IC			File Name: Dilution Factor:	1 1	034.D
Prep Batch Number:	T08020400	4								
Report Basis:	As Received							Analyst Initials:	CS	
Sample prep wt./vol:	20.00	ml						Prep Extract Vol:	20.00	ml
<u>Analyte</u> Fluoride Sulfate	CAS	<u>SNo</u>	<u>Result</u> 4.7	Flags Unit	t <u>s F</u> L 0.	<u>OL</u> 40 5	MDL 0.031			<u>run #:</u> 2
Sunate			290	ing/l			0.11			

Detailed Ana	lytical Report		Analytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0801210									
Project:	Navajo Mine	Extension	Leaching Stu	ıdy						
Client:	Applied Hyd	rology Ass	ociates, Inc.							
Client Project Numbe	er: none									
Report Section	: Meth	od Blan	k Report							
Client Sample Name:	MB		_							
Matrix:	Aqueous				Collection Date:	2/5/2008 12:0	00:00AM			
The following test was	conducted by: Analytica	Thornton								
I ab Sample Number:	T080205004-MB	moniton			Analysis Date:	2/5/2008	4.23.51PM			
Prep Date:	2/5/2008				Instrument:	CVAA 1	1.23.31114			
Analytical Method ID:	SW7470A - Mercury in	Liquid Wast	e by CVAA - T	otal Hg	File Name:	B020508W	/.W			
Reg. Method ID:	7470A	-			Dilution Factor:	1				
Prep Batch Number:	T080205004									
Report Basis:	As Received				Analyst Initials:	DL				
Sample prep wt./vol:	30.00 ml				Prep Extract Vol:	30.00 r	nl			
	CA SN.	Densk					#-			
Analyte Mercury	<u>CASNo</u> 7439-97-6	<u>Result</u> ND	<u>Flags</u> Units mg/L	0.000200.0	<u>IDL</u>)00050		<u>run #:</u> 2			
The following test was	conducted by: Analytica	Thornton	-							
Lab Sample Number:	TO80205002-MB	THOIMON			Analysis Date:	2/5/2008	4.27.00PM			
Pren Date:	2/5/2008				Instrument [.]	ICP 2	4.27.001 WI			
Analytical Method ID:	SW6010B - ICP - Total				File Name:	E02058A				
Reg. Method ID:	6010B				Dilution Factor:	1				
Pren Batch Number	T080205002									
Report Basis:	As Received				Analyst Initials:	rm				
Sample prep wt./vol:	50.00 ml				Prep Extract Vol:	50.00 n	nl			
Analyte	CASNo	Result	Flags Units	PQL M	IDL		run #:			
Aluminum	7429-90-5	ND	mg/L	0.050 (0.014		1			
Antimony	7440-36-0	ND	mg/L	0.050 0	.0067					
Arsenic	7440-38-2	ND	mg/L	0.10 0	0.015					
Barium	7440-39-3	ND	mg/L	0.010 0.	00016					
Beryllium	7440-41-7	ND	mg/L	0.0010 0.0	000060					
Boron	7440-42-8	ND	mg/L	0.050 0	.0018					
Cadmium	7440-43-9	ND	mg/L	0.0060 0.	00051					
Calcium	7440-70-2	ND	mg/L	0.10 (0.013					
Chromium	7440-47-3	ND	mg/L	0.010 0	.0018					
Cobalt	7440-48-4	ND	mg/L	0.0050 0	.0016					
Copper	7440-50-8	ND	mg/L	0.0050 0	.0019					
Iron	7439-89-6	ND	mg/L	0.050 0	.0027					
Lead	7439-92-1	ND	mg/L	0.050 (0.011					
Lithium	7439-93-2	ND	mg/L	0.10 0.	00072					
Magnesium	7439-96-4	ND	mg/L	0.10 (0.012					
Manganese	7439-96-5	ND	mg/L	0.010 0.	00066					
Molybdenum	7439-98-7	ND	mg/L	0.010 0	.0018					
Nickel	7440-02-0	ND	mg/L	0.040 0	.0027					
Potassium	7440-09-7	ND	mg/L	1.0	0.31					
Selenium	7784-49-2	ND	mg/L	0.10 (0.026					
Silver	7440-22-4	ND	mg/L	0.015 0.	00066					

Detailed Ana	lytical I	Report		Analy	ytica En	vironn	nental Laboratories	, Inc.	
Workorder (SDG):	B08012	210							
Project:	Ν	Navajo Mine	Extension 1	Leaching Stud	ły				
Client:	A	Applied Hydr	ology Asso	ciates, Inc.					
Client Project Numbe	r: n	one							
Report Section	:	Metho	od Blank	k Report					
Client Sample Name:		MB		-					
Matrix:	Aque	eous				С	ollection Date:	2/5/2008 12	2:00:00AM
Lab Sample Number:	T080205	002-MB					Analysis Date:	2/5/2008	4:27:00PM
Prep Date:	2/5/2008						Instrument:	ICP_2	
Analytical Method ID:	SW6010B	- ICP - Total					File Name:	E02058A	L
Reg. Method ID:	6010B						Dilution Factor:	1	
Prep Batch Number:	T080205	002							
Report Basis:	As Receiv	ed					Analyst Initials:	rm	
Sample prep wt./vol:	50.00	ml					Prep Extract Vol:	50.00	ml
<u>Analyte</u> Sodium	7	<u>CASNo</u> 440-23-5	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>PQL</u> 3.0	<u>MDL</u> 0.028			<u>run #:</u> 1
Thallium	7.	440-28-0	ND	mg/L	0.40	0.011			
Vanadium	7.	440-62-2	ND	mg/L	0.010	0.0007	2		
Zinc	7-	440-66-6	ND	mg/L	0.0050	0.0010	0		
The following test was Lab Sample Number: Prep Date: Analytical Method ID: Reg. Method ID: Prep Batch Number:	conducted t T080205 2/4/2008 310.1 - All 310.1 T080205	oy: Analytica - 001-MB kalinity, Titrime 001	Thornton tric (pH 4.5)	- Alkalinity			Analysis Date: Instrument: File Name: Dilution Factor:	2/4/2008 Titrametr 1	9:52:02AM ic
Report Basis:	As Receiv	ed					Analyst Initials:	CS	
Sample prep wt./vol:	100.00	ml					Prep Extract Vol:	100.00	ml
Analyte Bicarbonate Carbonate	<u>9</u>	<u>CASNo</u>	<u>Result</u> ND ND	<u>Flags</u> <u>Units</u> mg/L mg/L	<u>PQL</u> 5.0 7.0	MDL 1.5 1.2			run #: 1
The following test was	conducted b	y: Analytica -	Thornton						
Lab Sample Number: Prep Date: Analytical Method ID:	T080207 2/6/2008 160.1 - To	003-MB atal Dissolved S	olids dried a	t 180°C - TDS			Analysis Date: Instrument: File Name:	2/12/2003 SCALE	8 10:07:15AM
Reg. Method ID:	160.1						Dilution Factor:	1	
Prep Batch Number:	T080207	003							
Report Basis:	As Receiv	ed					Analyst Initials:	kl	
Sample prep wt./vol:	100.00	ml					Prep Extract Vol:	1.00	ml
<u>Analyte</u> Total Dissolved Solids	<u>9</u>	<u>CASNo</u>	<u>Result</u> ND	<u>Flags</u> <u>Units</u> mg/L	<u>POL</u> 10	<u>MDL</u> 8.2			<u>run #:</u> 1

Detailed Ana	lytical Rep	ort	Ana	lytica En	vironmental Laborato	ries, Inc.	
Workorder (SDG):	B0801210						
Project:	Nava	jo Mine Extensi	on Leaching Stu	dy			
Client:	Appl	ied Hydrology A	ssociates, Inc.				
Client Project Numbe	r: none						
Report Section	:	Method Bla	nk Report				
Client Sample Name:	Μ	B					
Matrix:	Aqueous				Collection Date:	2/4/2008 1	2:00:00AM
Lab Sample Number:	T080204004	MB			Analysis Date:	2/4/200	8 2:54:13PM
Prep Date:	2/4/2008				Instrument:	IC	
Analytical Method ID:	Inorganic Anio	ns by Ion Chromat	ography - Anions b	y IC	File Name:	080204	_013.D
Reg. Method ID:	300.0				Dilution Factor:	1	
Prep Batch Number:	T080204004						
Report Basis:	As Received				Analyst Initials:	CS	
Sample prep wt./vol:	20.00 m	1			Prep Extract V	'ol: 20.00	ml
<u>Analyte</u> Chloride	CASN	lo <u>Result</u> ND	Flags Units	PQL 0.80	<u>MDL</u> 0.042		<u>run #:</u> 1
Fluoride		ND	mg/L	0.40	0.031		-
Sulfate		ND	mg/L	1.5	0.11		

Detailed An	Analytical Report Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B08	01210							
Project:		Navajo Min	e Extension	Leaching	Study				
Client:		Applied Hy	drology Asso	ociates, In	с.				
Client Project Num	ber:	none		,					
Tosts Dup et:	Analystia	o Environmon	tal Laborator	ing Thom	aton Coloros	0			
Workorder (SDG): Project:	B08012 Navajo l	10 Mine Extension	n Leaching S	tudy			DODT		
Project Number:			Q	UALII		UL KE	FUKI		
Prep Batch:	T08020	5002							
Analysis:	SW6010)B - ICP - Tota	S2	AMPLE I	DUPLICAT	E REPOI	RT Base Samj Prep Date	ble: B0801210-02A	
							r tep Date	. 2/3/2008	
Samp. Anal. Date: DUP Anal. Date:	2/19/200 2/5/2008	08 2:41:00PM 8 4:52:00PM	M				Units: Matrix:	mg/L Aqueous	
Analyte Name		SampResult	DUPRes.	RPD	<u>RPDLim</u>	<u>Flag</u>			
Aluminum	-	0.984	0.855	14.0	20				
Antimony		ND	ND	0.0	20				
Arsenic		0.108	ND	0.0	20				
Barium		0.0533	0.0470	12.6	20				
Beryllium		ND	ND	0.0	20				
Boron		0.345	0.309	11.0	20				
Cadmium		ND	ND	0.0	20				
Calcium		3.61	3.34	7.8	20				
Chromium		ND	ND	0.0	20				
Cobalt		ND	ND	0.0	20				
Copper		ND	ND	0.0	20				
Iron		ND	ND	0.0	20				
Lead		ND	ND	0.0	20				
Magnesium		1.50	1.36	9.8	20				
Manganese		ND	ND	0.0	20				
Molybdenum		0.0160	0.0193	18.7	20				
Nickel		ND	ND	0.0	20				
Potassium		11.5	10.2	12.0	20				
Selenium		ND	ND	0.0	20				
Silver		ND	ND	0.0	20				
Sodium		1,220	994	20.4	20	OUT			
Thallium		ND	ND	0.0	20				
Vanadium		0.0630	0.0540	15.4	20				
Zinc		0.00809	0.00785	3.0	20				
Lithium		ND	ND	0.0	20				

Detailed Ar	nalytical Report			Analytica Env	a Environmental Laboratories, Inc.					
Workorder (SDG):	B0801210									
Project:	Navajo Mir	ne Extension	Leaching	; Study						
Client:	Applied Hy	drology Asso	ociates, In	IC.						
Client Project Num	iber: none									
Tests Run at:	Analytica Environmen	ital Laborator	ies - Thorr	nton, Colorado	5					
Workorder (SDG)	: B0801210									
Project:	Navajo Mine Extensio	n Leaching S		VCONTD		DODT				
Project Number:		Q.	UALII	I CONTRO	JL KE	PUKI				
Prep Batch:	T080205002									
		SA	AMPLE I	JUPLICATE	REPO	RT				
Analysis:			Base Samp Prep Date	le: B0801210-04A : 2/5/2008						
Samp. Anal. Date:	: 2/19/2008 2:51:00P	М				Units:	mg/L			
DUP Anal. Date:	2/5/2008 6:06:00PM	1				Matrix:	Aqueous			
Analyte Name	<u>SampResult</u>	DUPRes.	<u>RPD</u>	<u>RPDLim</u>	<u>Flag</u>					
Aluminum	0.674	0.601	11.5	20						
Antimony	ND	ND	0.0	20						
Arsenic	ND	ND	0.0	20						
Barium	0.0701	0.0615	13.1	20						
Beryllium	ND	ND	0.0	20						
Boron	0.341	0.311	9.2	20						
Cadmium	ND	ND	0.0	20						
Calcium	3.27	2.96	10.0	20						
Chromium	ND	ND	0.0	20						
Cobalt	ND	ND	0.0	20						
Copper	ND	ND	0.0	20						
Iron	ND	ND	0.0	20						
Lead	ND	ND	0.0	20						
Magnesium	1.88	1.65	13.0	20						
Manganese	ND	ND	0.0	20						
Molybdenum	0.0127	0.0147	14.6	20						
Nickel	ND	ND	0.0	20						
Potassium	12.4	10.4	17.5	20						
Selenium	ND	ND	0.0	20						
Silver	ND	ND	0.0	20						
Sodium	1,270	1,040	19.9	20						
Thallium	ND	ND	0.0	20						
Vanadium	0.0313	0.0268	15.5	20						
Zinc	ND	ND	0.0	20						
1		ND	0.0	20						

Detailed Analytical ReportAnalytica Environmental Laboratories, Inc.											
Workorder (SDG):	B0801210										
Project:	Navajo	Mine Ex	tension	Leachin	ng Study						
Client:	Applied	l Hydrol	ogy Asso	ciates, I	nc.						
Client Project Num	ber: none										
Tests Run at:	Analytica Environ	mental L	aboratori	es - Tho	rnton, Col	orado					
Workorder (SDG):	B0801210		1. 0.								
Project: Project Number:	Navajo Mine Exte	ension Lea	aching St QU	Udy JALIT	TY CON	TROL	REPORT	Γ			
Prep Batch:	T080205002										
				LC	S/LCSD F	REPORT	[
Analysis:	SW6010B - ICP -	Total					MB:		T0802050	02-MB	
-							Prep I	Date:	2/5/2008		
MB Anal. Date:	2/5/2008 4:27:00	0PM					Units	:	mg/L		
LCS Anal. Date:	2/5/2008 4:32:00	OPM LC	SD Anal	. Date:	2/5/2008	4:37:00	OPM Matrix	x:	Aqueous		
Analyte Name	SampResult	LCSRes.	SDRes.	SPLev	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Aluminum	ND	1.91	1.92	2.00	2.00	95.5	96.0	0.5	89 - 117	20	
Antimony	ND	0.445	0.442	0.500	0.500	89.0	88.4	0.7	82 - 117	20	
Arsenic	ND	1.81	1.82	2.00	2.00	90.5	91.0	0.6	86 - 116	20	
Barium	ND	1.89	1.91	2.00	2.00	94.5	95.5	1.1	86 - 116	20	
Beryllium	ND	0.0497	0.0500	0.0500	0.0500	99.4	100.0	0.6	87 - 111	20	
Boron	ND	0.458	0.461	0.500	0.500	91.6	92.2	0.7	76 - 130	20	
Cadmium	ND	0.0425	0.0428	0.0500	0.0500	85.0	85.6	0.7	79 - 113	20	
Calcium	ND	9.41	9.45	10.0	10.0	94.1	94.5	0.4	79 - 119	20	
Chromium	ND	0.191	0.191	0.200	0.200	95.5	95.5	0.0	86 - 117	20	
Cobalt	ND	0.468	0.471	0.500	0.500	93.6	94.2	0.6	82 - 118	20	
Copper	ND	0.233	0.235	0.250	0.250	93.2	94.0	0.9	86 - 117	20	
Iron	ND	1.01	1.02	1.00	1.00	101.0	102.0	1.0	83 - 121	20	
Lead	ND	0.456	0.465	0.500	0.500	91.2	93.0	2.0	83 - 121	20	
Magnesium	ND	9.99	10.0	10.0	10.0	99.9	100.0	0.1	83 - 118	20	
Manganese	ND	0.472	0.474	0.500	0.500	94.4	94.8	0.4	82 - 121	20	
Molybdenum	ND	0.464	0.467	0.500	0.500	92.8	93.4	0.6	82 - 120	20	
Nickel	ND	0.483	0.484	0.500	0.500	96.6	96.8	0.2	84 - 117	20	
Potassium	ND	8.29	8.02	10.0	10.0	82.9	80.2	3.3	74 - 110	20	
Selenium	ND	1.87	1.8/	2.00	2.00	93.5	93.5	0.0	87 - 117	20	
Silver	ND	0.248	0.250	0.250	0.250	99.2	100.0	0.8	80 - 127	20	
Thallium	ND	9.48	9.59	10.0	10.0	94.8	95.9	1.2	8/ - 113	20	
Vonadium	ND	0.212	0.206	0.200	0.200	106.0	103.0	2.9	89 - 113	20	
		0.483	0.483	0.500	0.500	90.0	97.0	0.4	81 100	20	
		0.455	0.457	0.500	0.500	91.0	91.4	1.0	01 - 120 80 120	20	
	IND	0.4//	0.462	0.300	0.500	95.4	90.4	1.0	ou - 120	20	
				М	S/MGD DI	грлрт					
				IVI	SIMOD K	LIOKI					

.

..
Detailed An	alytical Repor	:t		A	Analytica	Environm	nental Labo	orator	ies, Inc.	
Workorder (SDG):	B0801210									
Project:	Navajo	Mine Ex	tension Le	eaching	Study					
Client:	Applied	l Hydrolo	ogy Associ	ates, Inc						
Client Project Num	ber: none									
Tests Run at:	Analytica Environ	mental La	aboratories	- Thorn	ton, Colo	rado				
Workorder (SDG):	B0801210 Navaio Mine Exte	ension Lea	aching Stuc	lv						
Project Number:	1 (4) 4]0 11110 2110		QU	ÄLITY	CON	FROL F	REPORT	Γ		
Prep Batch:	T080205002									
				MS/	MSD RE	PORT				
Analysis:	SW6010B - ICP -	Total					Parent Prep I	:: Date:	B08012 2/5/2008	10-02A 3
Samp. Anal. Date:	2/19/2008 2:41:0	00PM					Units	:	mg/L	
MS Anal. Date:	2/5/2008 4:57:00	OPM MS	D Anal. D	ate: 2/	/5/2008	5:02:00F	PM Matri	x:	Aqueous	
Analyte Name	SampResult	MSRes.	MSDRes	SPLev	SPDLev	Recov.	MSD Rec.	<u>RPD</u>	Recov Lim	<u>RPDLim</u> <u>Flag</u>
Aluminum	0.984	2.42	2.46	2.00	2.00	71.8	73.8	1.6	75 - 125	20 lowMS lowMSD
Antimony	ND	0.395	0.403	0.500	0.500	79.0	80.6	2.0	75 - 125	20
Arsenic	0.108	1.69	1.74	2.00	2.00	79.1	81.6	2.9	75 - 125	20
Barium	0.0533	1.57	1.61	2.00	2.00	75.8	77.8	2.5	75 - 125	20
Beryllium	ND	0.0421	0.0432	0.0500	0.0500	84.2	86.4	2.6	75 - 125	20
Boron	0.345	0.737	0.694	0.500	0.500	78.4	69.8	6.0	75 - 125	20 lowMSD
Cadmium	ND	0.0339	0.0345	0.0500	0.0500	67.8	69.0	1.8	75 - 125	20 lowMS lowMSD
Calcium	3.61	11.4	11.6	10.0	10.0	77.9	79.9	1.7	75 - 125	20
Chromium	ND	0.165	0.169	0.200	0.200	82.5	84.5	2.4	75 - 125	20
Cobalt	ND	0.403	0.412	0.500	0.500	80.6	82.4	2.2	75 - 125	20
Copper	ND	0.198	0.202	0.250	0.250	79.2	80.8	2.0	75 - 125	20
Iron	ND	0.891	0.907	1.00	1.00	89.1	90.7	1.8	75 - 125	20
Lead	ND	0.405	0.414	0.500	0.500	81.0	82.8	2.2	75 - 125	20
Magnesium	1.50	9.70	9.90	10.0	10.0	82.0	84.0	2.0	75 - 125	20
Manganese	ND	0.400	0.409	0.500	0.500	80.0	81.8	2.2	75 - 125	20
Molybdenum	0.0160	0.414	0.424	0.500	0.500	79.6	81.6	2.4	75 - 125	20
Nickel	ND	0.415	0.423	0.500	0.500	83.0	84.6	1.9	75 - 125	20
Potassium	11.5	19.7	18.5	10.0	10.0	82.0	70.0	6.3	75 - 125	20 lowMSD
Selenium	ND	1.69	1.75	2.00	2.00	84.5	87.5	3.5	75 - 125	20
Silver	ND	0.215	0.214	0.250	0.250	86.0	85.6	0.5	75 - 125	20
Sodium	1,220	945	970	10.0	10.0	-2,750.0	-2,500.0	2.6	75 - 125	20 NOTE 2 NOTE 2
Thallium	ND	0.181	0.153	0.200	0.200	90.5	76.5	16.8	75 - 125	20
Vanadium	0.0630	0.460	0.473	0.500	0.500	79.4	82.0	2.8	75 - 125	20
Zinc	0.00809	0.417	0.424	0.500	0.500	81.8	83.2	1.7	75 - 125	20
Lithium	ND	0.482	0.495	0.500	0.500	96.4	99.0	2.7	75 - 125	20

Detailed An	alytical Repo	rt		A	Analytica	Environn	nental Labo	orator	ies, Inc.	
Workorder (SDG):	B0801210									
Project:	Navajo	Mine Ex	tension Lo	eaching	Study					
Client:	Applie	d Hydrolo	ogy Associ	ates, Inc	2.					
Client Project Num	ber: none									
Tests Run at:	Analytica Enviror	imental La	aboratories	- Thorn	ton, Colo	rado				
Workorder (SDG): Project:	B0801210 Navaio Mine Exte	ension Lea	aching Stud	lv						
Project Number:	1 (4) (4) 0 1/1/10 2/10		QU	ÄLITY	CON	FROL I	REPORT	Γ		
Prep Batch:	T080205002									
				MS/	MSD RF	PORT				
Analysis:	SW6010B - ICP -	Total					Parent Prep 1	t: Date:	B08012 2/5/2008	10-04A 3
Samp. Anal. Date:	2/19/2008 2:51:	00PM					Units	:	mg/L	
MS Anal. Date:	2/5/2008 6:11:0	OPM MS	D Anal. D	ate: 2	/5/2008	6:16:00I	PM Matri	x:	Aqueous	3
Analyte Name	SampResult	MSRes.	<u>MSDRes</u>	SPLev	<u>SPDLev</u>	Recov.	MSD Rec.	<u>RPD</u>	Recov Lim	<u>RPDLim</u> <u>Flag</u>
Aluminum	0.674	2.32	2.29	2.00	2.00	82.3	80.8	1.3	75 - 125	20
Antimony	ND	0.434	0.444	0.500	0.500	86.8	88.8	2.3	75 - 125	20
Arsenic	ND	1.76	1.77	2.00	2.00	88.0	88.5	0.6	75 - 125	20
Barium	0.0701	1.71	1.71	2.00	2.00	82.0	82.0	0.0	75 - 125	20
Beryllium	ND	0.0424	0.0420	0.0500	0.0500	84.8	84.0	0.9	75 - 125	20
Boron	0.341	0.705	0.703	0.500	0.500	72.8	72.4	0.3	75 - 125	20 lowMS lowMSD
Cadmium	ND	0.0359	0.0361	0.0500	0.0500	71.8	72.2	0.6	75 - 125	20 lowMS lowMSD
Calcium	3.27	12.6	12.5	10.0	10.0	93.3	92.3	0.8	75 - 125	20
Chromium	ND	0.170	0.169	0.200	0.200	85.0	84.5	0.6	75 - 125	20
Cobalt	ND	0.417	0.416	0.500	0.500	83.4	83.2	0.2	75 - 125	20
Copper	ND	0.217	0.215	0.250	0.250	86.8	86.0	0.9	75 - 125	20
Iron	ND	1.02	1.02	1.00	1.00	102.0	102.0	0.0	75 - 125	20
Lead	ND	0.428	0.418	0.500	0.500	85.6	83.6	2.4	75 - 125	20
Magnesium	1.88	10.3	10.3	10.0	10.0	84.2	84.2	0.0	75 - 125	20
Manganese	ND	0.427	0.425	0.500	0.500	85.4	85.0	0.5	75 - 125	20
Molybdenum	0.0127	0.446	0.443	0.500	0.500	86.7	86.1	0.7	75 - 125	20
Nickel	ND	0.425	0.419	0.500	0.500	85.0	83.8	1.4	75 - 125	20
Potassium	12.4	18.3	18.4	10.0	10.0	59.0	60.0	0.5	75 - 125	20 lowMS lowMSD
Selenium	ND	1.76	1.75	2.00	2.00	88.0	87.5	0.6	75 - 125	20
Silver	ND	0.222	0.219	0.250	0.250	88.8	87.6	1.4	75 - 125	20
Sodium	1,270	982	983	10.0	10.0	-2,880.0	-2,870.0	0.1	75 - 125	20 NOTE 2 NOTE 2
Thallium	ND	0.170	0.160	0.200	0.200	85.0	80.0	6.1	75 - 125	20
Vanadium	0.0313	0.469	0.467	0.500	0.500	87.5	87.1	0.4	75 - 125	20
Zinc	ND	0.448	0.444	0.500	0.500	89.6	88.8	0.9	75 - 125	20
Lithium	ND	0.512	0.512	0.500	0.500	102.4	102.4	0.0	75 - 125	20

Detailed A	nalytical Report	cal ReportAnalytica Environmental Laboratories, Inc.							
Workorder (SDG):	B0801210 Navaio Mine Extension Leaching Study								
Project:	Navajo Min	e Extensio	n Leachi	ng Study					
Client:	Applied Hy	drology As	sociates,	Inc.					
Client Project Nun	iber: none								
Tests Run at:	Analytica Environmen	tal Laborato	ories - Th	ornton, Colora	do				
Workorder (SDG)	: B0801210	. T 1. ¹	Circular						
Project:	Navajo Mine Extensio	n Leaching	Study DUALI	TY CONTI	ROL REPORT				
Project Nulliber:	T080205002								
Prep Batch:	1000203002								
		P	OST DIC	GESTION SPI	IKE REPORT				
Analysis:	SW6010B - ICP - Tota	ıl			Base Samp	ole: B0801210-02	А		
					Prep Date:	2/5/2008			
Samp. Anal. Date	: 2/19/2008 2:41:00PI	M			Units:	mg/L			
PDS Anal. Date:	2/5/2008 5:46:00PM	[Matrix:	Aqueous			
Analyta Nama	SompDocult	DDCDag	SDI ov	Docov	Doooy Lim	Flog			
Aluminum	<u>Sampkesun</u> 0 984	<u>r DSRes.</u> 2.79	$\frac{SFLev}{2.00}$	<u>80.2</u>	<u>Recovilini</u> 75 - 117	riag			
Antimony	0.964 ND	0.473	0.500	93.2	75 - 117				
Arsenic	0.108	1.97	2.00	93.1	75 - 116				
Barium	0.0533	1.85	2.00	89.7	75 - 116				
Beryllium	ND	0.0459	0.0500	92.3	75 - 111				
Boron	0.345	0.780	0.500	87.0	75 - 130				
Cadmium	ND	0.0350	0.0500	73.0	75 - 113	lowPDS			
Calcium	3.61	12.5	10.0	88.6	75 - 119				
Chromium	ND	0.185	0.200	90.6	75 - 117				
Cobalt	ND	0.452	0.500	90.2	75 - 118				
Copper	ND	0.229	0.250	89.9	75 - 117				
Iron	ND	0.971	1.00	92.9	75 - 121				
Lead	ND	0.455	0.500	90.5	75 - 121				
Magnesium	1.50	10.6	10.0	91.4	75 - 118				
Manganese	ND	0.457	0.500	91.0	75 - 121				
Molybdenum	0.0160	0.481	0.500	93.0	75 - 120				
Nickel	ND	0.455	0.500	90.8	75 - 117				
Potassium	11.5	18.8	10.0	73.6	75 - 110	lowPDS			
Selenium	ND	1.96	2.00	93.6	75 - 117				
Silver	ND	0.237	0.250	95.2	75 - 127				
Sodium	1,220	1,070	10.0	-1,516.8	75 - 113	lowPDS	Note 2		
Thallium	ND	0.185	0.200	85.5	75 - 113				
Vanadium	0.0630	0.540	0.500	95.4	75 - 119				
Zinc	0.00809	0.477	0.500	93.8	75 - 120				
Lithium	ND	0.558	0.500	94.8	75 - 120				

Detailed An	Analytical Report Analytica Environmental Laboratories, Inc.									
Workorder (SDG):	B0801210									
Project:	Navajo Mir	e Extensio	n Leachi	ng Study						
Client:	Applied Hy	drology As	sociates,	Inc.						
Client Project Num	ber: none									
Tests Run at:	Analytica Environmen	tal Laborato	ories - Th	ornton, Colora	do					
Workorder (SDG):	B0801210									
Project: Project Number:	Navajo Mine Extensio	n Leaching	Study QUALI	TY CONTI	ROL REPORT					
Prep Batch:	T080205002									
		Р	OST DIG	ESTION SPI	IKE REPORT					
Analysis	SW6010B - ICP - Tot	1			Base Sample	e [.] B0801210-04	А			
T mary 515.	Swoorod lei iou	u			Prep Date:	2/5/2008				
Samp Anal Date:	2/19/2008 2:51:00PI	M			Units.	mg/L				
PDS Anal Date:	2/5/2008 6:21:00PM				Matrix.	Aqueous				
		-								
Analyte Name	<u>SampResult</u>	PDSRes.	SPLev	Recov.	Recov Lim	Flag				
Aluminum	0.674	2.33	2.00	82.8	75 - 117					
Antimony	ND	0.433	0.500	85.3	75 - 117					
Arsenic	ND	1.77	2.00	86.4	75 - 116					
Barium	0.0701	1.74	2.00	83.7	75 - 116					
Beryllium	ND	0.0425	0.0500	85.5	75 - 111					
Boron	0.341	0.712	0.500	74.2	75 - 130	lowPDS				
Cadmium	ND	0.0330	0.0500	68.5	75 - 113	lowPDS				
Calcium	3.27	12.6	10.0	93.5	75 - 119					
Chromium	ND	0.172	0.200	84.0	75 - 117					
Cobalt	ND	0.418	0.500	82.7	75 - 118					
Copper	ND	0.219	0.250	87.1	75 - 117					
Iron	ND	1.04	1.00	100.4	75 - 121					
Lead	ND	0.422	0.500	84.6	75 - 121					
Magnesium	1.88	10.4	10.0	85.3	75 - 118					
Manganese	ND	0.429	0.500	85.4	75 - 121					
Molybdenum	0.0127	0.449	0.500	87.2	75 - 120					
Nickel	ND	0.424	0.500	84.9	75 - 117					
Potassium	12.4	18.1	10.0	57.7	75 - 110	lowPDS				
Selenium	ND	1.74	2.00	87.0	75 - 117					
Silver	ND	0.222	0.250	89.9	75 - 127					
Sodium	1,270	996	10.0	-2,766.0	75 - 113	lowPDS	Note 2			
Thallium	ND	0.165	0.200	78.9	75 - 113					
Vanadium	0.0313	0.473	0.500	88.3	75 - 119					
Zinc	ND	0.449	0.500	89.5	75 - 120					
Lithium	ND	0.523	0.500	86.7	75 - 120					
			SERIA	L DILUTION	REPORT					

Detailed An	Analytical Report Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B0801210								
Project:	Navajo Min	e Extensio	n Leaching	Study					
Client:	Applied Hy	drology As	sociates. In	r.					
Client Project Num	her none	ur orogy ric	,500 -111 0						
Tests Run at	Analytica Environmen	tal Laborat	ories - Thorn	ton Colorad	0				
Workorder (SDG):	R0801210			itoli, Colorad	0				
Project	Navajo Mine Extensio	n Leaching	Study						
Project Number:	j	(QUÁLITY	CONTR	OL RE	PORT			
Pren Batch	T080205002								
Tiep Baten.									
			SERIAL I	DILUTION	REPORT				
Analysis:	SW6010B - ICP - Tota	al				Base Sample	::B0801210-02A		
						Prep Date:	2/5/2008		
Samp. Anal. Date:	2/19/2008 2:41:00	PM				Units:	mg/L		
SER DIL. Date:	2/5/2008 5:51:00PM	[Matrix:	Aqueous		
Analyte Name	SampResult	<u>PQL.</u>	MDL.	SerialRes.	<u>SerPQL</u>	<u>. RPD</u>	<u>Flag</u>		
Aluminum	0.984	0.050	0.014	1.04	0.25	5.5			
Antimony	ND	0.050	0.0067	ND	0.25				
Arsenic	0.108	0.10	0.015	ND	0.50				
Barium	0.0533	0.0100	0.00016	0.0576	0.050	7.7			
Beryllium	ND	0.0010	0.000060	ND	0.0050				
Boron	0.345	0.050	0.0018	0.348	0.25	0.8			
Cadmium	ND	0.0060	0.00051	ND	0.030				
Calcium	3.61	0.10	0.013	3.63	0.50	0.5			
Chromium	ND	0.0100	0.0018	ND	0.050				
Cobalt	ND	0.0050	0.0016	ND	0.025				
Copper	ND	0.0050	0.0019	ND	0.025				
Iron	ND	0.050	0.0027	ND	0.25				
Lead	ND	0.050	0.011	ND	0.25	0.0			
Magnesium	1.50	0.10	0.012	1.50	0.50	0.0			
Manganese	ND	0.0100	0.00066	ND	0.050				
Molybdenum	0.0100	0.0100	0.0018	ND	0.030				
Nickel	11.5	1.0	0.0027	ND 11.7	5.0	1 7			
Potassium	ND	0.10	0.026	11./ ND	0.50	1.7			
Silver	ND	0.10	0.020		0.075				
Sodium	1 220	3.0	0.00000	1 100	15	10.3	OUT		
Thallium	ND	0.40	0.011	ND	2.0	10.5	001		
Vanadium	0.0630	0.0100	0.00072	0.0681	0.050	77			
Zinc	0.00809	0.0050	0.0010	ND	0.025	7.1			
Lithium	ND	0.10	0.00072	ND	0.50				
Liunum	1.2			ΠD					
Analysis	SW6010R - ICP - Tot	al				Base Sample	·· B0801210_04 4		
Analysis.	5 W 0010D - ICI - 100	11				Dase Sample	2/5/2009		
Come A 1 D 1	0/10/0000 0 51 000						2/ J/ 2000		
Samp. Anal. Date:	2/19/2008 2:51:001	-1 VI				Units:	mg/L		
SER DIL. Date:	2/5/2008 6:26:00PM	l				Matrix:	Aqueous		
Analyte Name	SamnResult	POL	MDL	SerialRes	SerPOI	RÞD	Flag		
2 mary to 1 varie	Dampresuit	$\underline{1} \underline{\nabla D}$		<u>benances.</u>	<u>JUI VL</u>	<u>. <u>NID</u></u>	<u>1 105</u>		

Page 26 of 40

Detailed Analytical Report Analytica Environmental Laboratories, Inc.								
Workorder (SDG):	B0801210							
Project:	Navajo Mir	e Extensio	on Leaching	Study				
Client:	Applied Hy	drology As	ssociates. In	C.				
Client Project Num	ber: none		,					
Tests Run at:	Analytica Environmen	tal Laborat	ories - Thorn	ton, Colorad	0			
Workorder (SDG):	B0801210			,				
Project:	Navajo Mine Extensio	n Leaching	Study					
Project Number:			QUALITY	CONTR	OL REI	PORT		
Prep Batch:	T080205002							
			CEDIAL I		DEDODT			
A malanaia.	SW6010D ICD Tot	.1	SERIAL I	JILUTION	KEPUKI	Deee Commis		
Analysis:	SW0010B - ICP - 100	11				Base Sample	2/5/2000	
						Prep Date:	2/5/2008	
Samp. Anal. Date:	2/19/2008 2:51:001	PM				Units:	mg/L	
SER DIL. Date:	2/5/2008 6:26:00PM	[Matrix:	Aqueous	
Analyta Nama	SampPagult	DOI	MDI	SorialDoc	SorDOI	רותם	Flag	
Allaryte Name	<u>Sampkesun</u> 0.674	<u>FQL.</u> 0.050	0.014	<u>5eriaires.</u> 0.740	0.25	<u> </u>	<u>riag</u> Note /	
Antimony	0.074 ND	0.050	0.014	0.749 ND	0.25	10.5	11010 4	
Anumony		0.030	0.0007		0.23			
Barium	0.0701	0.10	0.0015	0.0688	0.050	1.8		
Barullium	ND	0.0010	0.000060	0.0088 ND	0.0050	1.0		
Boron	0.341	0.050	0.0018	0.331	0.25	29		
Cadmium	ND	0.0060	0.00051	ND	0.030	2.7		
Calcium	3.27	0.10	0.013	3.24	0.50	0.9		
Chromium	ND	0.0100	0.0018	ND	0.050	017		
Cobalt	ND	0.0050	0.0016	ND	0.025			
Copper	ND	0.0050	0.0019	ND	0.025			
Iron	ND	0.050	0.0027	ND	0.25			
Lead	ND	0.050	0.011	ND	0.25			
Magnesium	1.88	0.10	0.012	1.81	0.50	3.7		
Manganese	ND	0.0100	0.00066	ND	0.050			
Molybdenum	0.0127	0.0100	0.0018	ND	0.050			
Nickel	ND	0.040	0.0027	ND	0.20			
Potassium	12.4	1.0	0.31	11.7	5.0	5.8		
Selenium	ND	0.10	0.026	ND	0.50			
Silver	ND	0.015	0.00066	ND	0.075			
Sodium	1,270	3.0	0.028	1,080	15	16.1	OUT	
Thallium	ND	0.40	0.011	ND	2.0			
Vanadium	0.0313	0.0100	0.00072	ND	0.050		Note 4	
Zinc	ND	0.0050	0.0010	ND	0.025			
Lithium	ND	0.10	0.00072	ND	0.50			
Prep Batch:	T080205004							
			CAMPT P			т		
			SAMPLE D	UPLICATI	LKEPUR	.1		

Workerder (SDG): B0801210 Project : Navajo Mine Extension Leaching Study Client : Applied Hydrology Associates, Inc. Client : Analytica Environmental Laboratories - Thomton, Colorado Workorder (SDG): B0801210 Project Number: QUALITY CONTROL REPORT Project Number: QUALITY CONTROL REPORT Project Number: QUALITY CONTROL REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Samp, Anal. Date: 2/5/2008 4:59:48PM Units: mg/L DIP Anal. Date: 2/5/2008 4:59:48PM Units: mg/L DIP Anal. Date: 2/5/2008 5:02:05PM Matrix: Aqueous Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prop Date: 2/5/2008 Samp, Anal. Date: 2/5/2008 5:13:23PM Units: mg/L DIP Anal. Date: 2/5/2008 5:13:23PM Units: mg/L CSALCSD REPORT MB: T080205004-MB Prop Date: 2/5/2008	Detailed An	nalytical Report Analytica Environmental Laboratories, Inc.							
Projec: Navajo Mine Extension Leaching Study Client: Applied Hydrology Associates, Inc. Client Project Namker Tests Run at: Analytica Environmental Laboratories - Thomton, Colorado Workorde (SDR): B0801210 Project: Navajo Mine Extension Leaching Study Project Namker Project Namker ND DUPLE DUPLICATE REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg ND ND 0.0 20 Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg ND ND 0.0 20 Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Matrix: Aqueous Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Mercury ND ND 0.0 20 ND ND N	Workorder (SDG):	B0801210							
CHent: Applied Hydrology Associates, Inc. CHent Project Nume: none Tests Num 3t: Nanalytics: Nanajor Since Extension Leaching Study Project Numbe: OUALITY CONTROL REPORT Extension Leaching Study Project Numbe: OUALITY CONTROL REPORT Extension Leaching Study Project Numbe: OUALITY CONTROL REPORT Base Sample: B0801210-02A Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Samp Anal. Date: 2/5/2008 4:59:48PM Units: mg/L OUP Anal. Date: 2/5/2008 Sto2:32PM Units: mg/L Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/200S Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/200S Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/200S Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Matrix: Aquecous Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Matrix: Aquecous	Project:	Navajo Mine Extension Leaching Study							
Client Project Number: none Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801210 Project: Navajo Mine Extension Leaching Study Project Number: QUALITY CONTROL REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Page Batch: T080205004 Samp. Anal. Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 Supp. ND ND 0.0 Rec	Client:	Applied Hydrology Associates, Inc.							
Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado Workorder (SDG): B0801210 Project: Navajo Mine Extension Leaching Study Prep Extension Leaching Study Prep Extension Leaching Study Prep Batch: T080205004 SAMPLE DUPLICATE REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Prep Date: 2/5/2008 4:59:48PM Units: mg/L DUP Anal. Date: 2/5/2008 5:02:05PM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPDLim Flag Mercury ND ND 0.0 20 Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 5:13:23PM Units: mg/L DUP Anal. Date: 2/5/2008 5:13:23PM LCS/LCSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080205004-MB Prep Date: 2/5/2008 MB Anal. Date: 2/5/2008 4:23:51PM LCS/LCSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080205004-MB Prep Date: 2/5/2008 MB Anal. Date: 2/5/2008 4:23:51PM LCS Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous Analyte Name SampResult LCSR APPLE NET Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Prep Date: 2/5/2008 MB Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous Analyte Name SampResult LCSR APPLE NET Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Prep Date: 2/5/2008 MB Anal. Date: 2/5/2008 4:59:48PM Units: mg/L Analysis: SW7470A - Mercur	Client Project Numl	ber: none							
Workorder (SDG): B0801210 Project: Navajo Mine Extension Leaching Study Project Number: Prep Batch: T080205004 SAMPLE DUPLICATE REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Prep Date: 2/5/2008 4:59:48PM Units: mg/L DUP Anal, Date: 2/5/2008 5:02:05PM Matrix: Aqueous Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Prep Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 5:13:23PM DUP Anal. Date: 2/5/2008 5:13:23PM LCS/LCSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Matrix: Aqueous Analyte Name SampResult DUPRes, RPD RPDLim Flag Mercury ND ND 0.0 20 CCS/LCSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Units: mg/L LCS Anal. Date: 2/5/2008 4:23:51PM Units: mg/L LCS Anal. Date: 2/5/2008 4:23:644PM LCSD Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous Analyte Name ND 0.00223 0.00227 0.00200 111.5 113.5 1.8 0-120 20 MS/MSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Prep Date: 2/5/2008 SampAnal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous Analyte Name ND 0.00223 0.00227 0.00200 111.5 113.5 1.8 0-120 20 MS/MSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Parent: B0801210-02A Prep Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 4:59:48PM Units: mg/L MS Anal. Date: 2/5/2008 4:59:48PM Units: mg/L MS Anal. Date: 2/5/2008 4:59:48PM Matrix: Aqueous	Tests Run at:	Analytica Environmental Laboratories - Thornton, Colorad	do						
Toking hime Extended Extended Control of Apple 1000000000000000000000000000000000000	Workorder (SDG):	B0801210 Navaio Mine Extension Leaching Study							
Prep Batch: T080205004 SAMPLE DUPLICATE REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Prep Date: Z0/2/008 Samp, Anal. Date: 2/5/2008 4:59:48PM Units: mg/L DUP Anal. Date: 2/5/2008 5:02:05PM Matrix: Aqueous Analyte Name SampResult DUPRes, RPD RPD Flag Mercury ND ND 0.0 20 V Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/2008 Samp, Anal. Date: 2/5/2008 5:13:23PM Units: mg/L DUP Anal. Date: 2/5/2008 5:13:23PM Units: mg/L Mercury ND ND 0.0 20 V Mercury ND ND 0.0 20 V Matrix: Aqueous Matrix: Aqueous Matrix: Aqueous Analyte Name SampResult DUPRes, RPD RPD Eng MB: T080205004-MB Mercury ND 0.0 <td>Project Number:</td> <td>QUALITY CONTR</td> <td>ROL REPORT</td> <td></td>	Project Number:	QUALITY CONTR	ROL REPORT						
SAMPLE DUPLICATE REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Prep Date: 2/5/2008 Samp, Anal. Date: 2/5/2008 5:02:05PM Matrix: Analyte Name SampResult DUPRes. RPD Flag Mercury ND 0.0 20 20 Analytes: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/2008 Samp, Anal. Date: 2/5/2008 5:13:23PM Units: mg/L DUP Anal, Date: 2/5/2008 5:20:14PM Matrix: Aqueous Analyte Name SampResult DUPRes, RPD RPD Flag Mercury ND ND 0.0 20 20 LCS/LCSD REPORT Matrix: Aqueous Aqueous Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080205004-MB Prep Date: 2/5/2008 4:23:51PM Units: mg/L LCSA nal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM Matrix Aqueous Analysis:<	Prep Batch:	T080205004							
SAMPLE DUPLICATE REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total HgBase Sample: B0801210-02A Prep Date: $2'5'2008$ Samp, Anal. Date: $2'5/2008$ $5:02:05$ Matrix: mgL DUP Anal. Date: $2'5/2008$ $5:02:05$ Matrix: $Aqueous$ Analyte Name MercurySumpResult NDDUPRes. NDRPD 0.0RPDLim 20ElagAnalyte Name MercurySumpResult $5:02:058$ DUPRes. NDRPD 0.0RPDLim 20ElagAnalyte Name MercurySumpResult $5:20:14PM$ DUPRes. NDRPD 0.0RPDLim 20ElagAnalyte Name MercurySampResult NDDUPRes. NDRPD 0.0RPDLim 20ElagAnalyte Name MercurySampResult NDDUPRes. NDRPD 0.0RPDLim 20ElagAnalyte Name MercurySampResult NDDUPRes. NDRPD 0.0RPDLim 20ElagAnalyte Name MercurySampResult $1000223 00027$ RPD kercuryRep 20RepLim 20RepLim 20Analyte Name MercurySampResult $10000223 00027$ SPLev 1115 MBNBNBAnalyte Name MercurySampResult $10000223 00027$ SPLev $1000202 00002$ RepLim 1115 SPRecov 1115 RPD kercur 1135 <td></td> <td></td> <td></td> <td></td>									
Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A Prep Date: 2/5/2008 Samp, Anal. Date: 2/5/2008 4:59:48PM Units: mg/L DUP Anal. Date: 2/5/2008 5:02:05PM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD im Flag Mercury ND ND 0.0 20 Sump. Sumple: B0801210-04A Prep Date: 2/5/2008 Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/2008 Samp, Anal. Date: 2/5/2008 5:13:23PM Units: mg/L DUP Anal. Date: 2/5/2008 5:20:14PM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD im Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD im Flag Mercury Suppresult Supresult Supresult		SAMPLE DUPLICAT	E REPORT						
Samp, Anal. Date: 2/5/2008 4:59:48PM Units: mg/L DUP Anal. Date: 2/5/2008 5:02:05PM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD Flag Mercury ND ND 0.0 20 Flag Analyte Name ND ND 0.0 20 Flag Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Prep Date: 2/5/2008 Samp, Anal. Date: 2/5/2008 5:13:23PM Units: mg/L Matrix: DUP Anal. Date: 2/5/2008 5:20:14PM Matrix: Aqueous Analyte Name SampResult DUPRes. RPD RPD Flag Mercury ND ND 0.0 20 Flag State Analyte Name SampResult DUPRes. RPD RPD Lim Flag Flag Mercury ND ND 0.0 20 Flag State State Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080205004-MB	Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Total H	Ig Base Sample: Prep Date:	B0801210-02A 2/5/2008					
DUP Anal. Date: $2/5/2008$ $5:02:05PM$ Matrix:AqueousAnalyte Name Mercury $SampResultNDDUPRes_NDORPD im0.0ElagAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total HgPrep Date:Base Sample: B0801210-04APrep Date:2/5/2008Samp. Anal. Date:2/5/20085:13:23PMUnits:Matrix:mg/LMatrix:QUP Anal. Date:2/5/20085:20:14PMMatrix:Matrix:AqueousAnalyte NameMercurySampResultNDDUPRes.NDRPD0.0RPDLim20FlagMercuryNDND0.020LCS/LCSD REPORTAnalyte NameMercurySW7470A - Mercury in Liquid Waste by CVAA - Total HgNDMB:Prep Date:T080205004-MBPrep Date:Analytes:SW7470A - Mercury in Liquid Waste by CVAA - Total HgNDMB:NDT080205004-MBPrep Date:2/5/2008MB Anal. Date:2/5/20084:23:51PMNDUnits:O0220mg/LLCS Anal. Date:2/5/20084:26:44PMLCSD Anal. Date:2/5/2008Analyte NameMercurySampResultNDCSRes, SDRes,O02223SDLevSPLevSD RecovSD RecovSD RecovSD Recov LimPrep Date:2/5/2008Analyte NameMercurySampResultNDCSRes, SDRes,SPLevNDSD RecovSD RecovSD RecovSD Recov LimPrep Date:2/5/2008Analyte NameMercurySampResultNDCSRes, SDRes, SPLevSD RecovNDSD RecovSD RecovS$	Samp. Anal. Date:	2/5/2008 4:59:48PM	Units:	mg/L					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	DUP Anal. Date:	2/5/2008 5:02:05PM	Matrix:	Aqueous					
Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A Samp. Anal. Date: 2/5/2008 S:13:23PM Units: mg/L DUP Anal. Date: 2/5/2008 S:20:14PM Matrix: Aqueous Analyte Name SampResult DUPRes, RPD RPDLim Flag Mercury ND ND 0.0 20 LCS/LCSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080205004-MB Prep Date: 2/5/2008 Hight Waste Prep Date: 2/5/2008 MB Anal. Date: 2/5/2008 4:23:51PM Units: mg/L LCS Anal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous SampResult LCSRes, SDRes, SPLev SD Recov, SD Recov RPD Recov Lim RPDLim Flag Mercury ND 0.00223 0.00227 0.00200 111.5 113.5 1.8 80 - 120 20	<u>Analyte Name</u> Mercury	SampResult DUPRes. <u>RPD</u> <u>RPDLim</u>	Flag						
Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total HgBase Sample: B0801210-04A Prep Date: $2/5/2008$ Samp, Anal. Date: $2/5/2008$ $5:13:23PM$ Units:mg/L Matrix:DUP Anal. Date: $2/5/2008$ $5:20:14PM$ Matrix:AqueousAnalyte Name MercurySampResult NDDUPRes. NDRPD im 0.0FlagMercurySW7470A - Mercury in Liquid Waste by CVAA - Total Hg Prep Date:MB: $2/5/2008$ T080205004-MB Prep Date:Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total HgMB: Prep Date:T080205004-MB Prep Date:MB Anal. Date: $2/5/2008$ $4:23:51PM$ Units: Units: Units:mg/LLCS Anal. Date: $2/5/2008$ $4:26:44PM$ LCSD Anal. Date: $2/5/2008$ Analyte Name MercurySampResult NDLCSRes, SDRes, O00223SPLev O00200SD Recov PRED PRECOVRPD Lim Recov Lim RPDLim Prep Date:Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NDParent: Prep Date:B0801210-02A Prep Date:Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NDParent: Prep Date:B0801210-02A Prep Date:Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NDParent: Prep Date:B0801210-02A Prep Date:Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NDParent: Prep Date:B0801210-02A Prep Date:Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NDParent: Prep Date:<	Wiciculy								
Samp. Anal. Date: $2/5/2008$ $5:13:23PM$ Units: Matrix: mg/L Matrix:Analyte Name Mercury $SampResult$ ND $DUPRes.$ ND RPD 0.0 $PDLim$ 20 $Flag$ 20LCS/LCSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg 2/5/2008MB: 4:29:07PMT080205004-MB Prep Date:MB Anal. Date: $2/5/2008$ $4:26:44PM$ LCSD Anal. Date: $2/5/2008$ $4:29:07PM$ 111.5Matrix: AqueousAnalysis:SampResult 0.00223 $CSRes.$ 0.00227 $SPLev$ 0.00200 $SD Recov.$ 111.5 $SD Recov.$ 113.5 $RPD Im RPDLim Flag80 - 120Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg0.00223Parent:0.00200B0801210-02APrep Date:2/5/2008Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg0.00223Parent:0.00223B0801210-02APrep Date:2/5/2008Samp. Anal. Date:2/5/20084:59:48PMMSD Anal. Date:2/5/20085:06:23PMMatrix:Matrix:Aqueous$	Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Total H	Ig Base Sample: Prep Date:	B0801210-04A 2/5/2008					
Analyte Name MercurySampResult NDDUPRes. NDRPD 0.0RPDLim 20FlagLCS/LCSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Prep Date:MB: 2/5/2008T080205004-MB Prep Date:MB Anal. Date:2/5/20084:23:51PM 2/5/2008Units: 2/5/2008mg/LLCS Anal. Date:2/5/20084:26:44PMLCSD Anal. Date:2/5/2008Analyte Name MercurySampResult NDLCSRes. SDRes. 0.00223SPLev 0.00200Recov. 111.5SD Recov 113.5RPD im RPD Recov Lim 80-120FlagMS/MSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NDParent: 0.00223B0801210-02A Prep Date: 2/5/2008MS/MSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg NDParent: NDB0801210-02A Prep Date: 2/5/2008Units: mg/LMatrix:2/5/20084:59:48PM 	Samp. Anal. Date: DUP Anal. Date:	2/5/2008 5:13:23PM 2/5/2008 5:20:14PM	Units: Matrix:	mg/L Aqueous					
LCS/LCSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080205004-MB Prep Date: 2/5/2008 4:23:51PM Units: mg/L LCS Anal. Date: 2/5/2008 4:23:51PM Units: mg/L LCS Anal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous Analyte Name Mercury SampResult ND LCSRes. SDRes. 0.00223 SPLev SPDLev 0.00200 Recov. SD Recov RPD 113.5 Recov Lim 188 RPDLim 800-120 Flag Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Parent: B0801210-02A Prep Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 4:59:48PM Units: mg/L MS Anal. Date: 2/5/2008 5:04:18PM MSD Anal. Date: 2/5/2008 5:06:23PM Matrix: Aqueous	Analyte Name Mercury	SampResultDUPRes.RPDRPDLimNDND0.020	<u>Flag</u>						
Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg MB: T080205004-MB Prep Date: 2/5/2008 4:23:51PM Units: mg/L LCS Anal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPLev SPD Recov RPD Recov Lim RPDLim Flag Mercury ND 0.00223 0.00227 0.00200 0.0020 111.5 113.5 1.8 80 - 120 20 Ms/MSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Parent: B0801210-02A Prep Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 4:59:48PM Units: mg/L Matrix: Aqueous MS Anal. Date: 2/5/2008 5:04:18PM MSD Anal. Date: 2/5/2008 5:06:23PM Matrix: Aqueous		L CS/L CSD PEI	рарт						
Millight State Difference Difference Prep Date: 2/5/2008 MB Anal. Date: 2/5/2008 4:23:51PM Units: mg/L LCS Anal. Date: 2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:29:07PM Matrix: Aqueous Analyte Name SampResult LCSRes. SDRes. SPLev SPDLev Recov. SD Recov RPD Recov Lim RPDLim Flag Mercury ND 0.00223 0.00227 0.00200 0.0020 111.5 113.5 1.8 80 - 120 20 MS/MSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Parent: B0801210-02A Prep Date: 2/5/2008 4:59:48PM Units: mg/L MS Anal. Date: 2/5/2008 5:04:18PM MSD Anal. Date: 2/5/2008 5:06:23PM Matrix: Aqueous	Analysis	SW7470A - Mercury in Liquid Waste by CVAA - Total H	for MB:	T080205004-MB					
MB Anal. Date: $2/5/2008$ $4:23:51PM$ Units: mg/L LCS Anal. Date: $2/5/2008$ $4:26:44PM$ LCSD Anal. Date: $2/5/2008$ $4:29:07PM$ Matrix:AqueousAnalyte NameSampResultLCSRes. SDRes.SPLevSPDLevRecov.SD RecovRPDRecov LimRPDLimFlagMercuryND 0.00223 0.00227 0.00200 0.0020 111.5 113.5 1.8 $80 - 120$ 20 MS/MSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total HgParent:B0801210-02APrep Date: $2/5/2008$ $4:59:48PM$ Units: mg/L MS Anal. Date: $2/5/2008$ $5:04:18PM$ MSD Anal. Date: $2/5/2008$ $5:06:23PM$ Matrix:Aqueous	T filmi y bio.	5 · · · · · · · · · · · · · · · · · · ·	Prep Date:	2/5/2008					
LCS Anal. Date:2/5/20084:26:44PMLCSD Anal. Date:2/5/20084:29:07PMMatrix:AqueousAnalyte Name MercurySampResult NDLCSRes. SDRes. 0.00223SPLev 0.00227SPDLev 0.00200Recov. 111.5SD Recov 113.5RPD 1.8Recov Lim 80 - 120RPDLim 20Flag 80 - 120Analysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Prep Date:Parent: 2/5/2008B0801210-02A Prep Date:2/5/2008Samp. Anal. Date:2/5/20084:59:48PM SO Anal. Date:Units: 2/5/2008mg/LMS Anal. Date:2/5/20085:04:18PMMSD Anal. Date:2/5/20085:06:23PMMatrix:	MB Anal. Date:	2/5/2008 4:23:51PM	Units:	mg/L					
Analyte Name MercurySampResult NDLCSRes. SDRes. 0.00223SPLev 0.00227SPDLev 0.00200Recov. 111.5SD Recov 113.5RPD 1.8Recov Lim 80 - 120RPDLim 20FlagMS/MSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Recov Lim Samp. Anal. Date:Parent: 2/5/2008B0801210-02A Prep Date:B0801210-02A 2/5/2008Samp. Anal. Date:2/5/20084:59:48PM Sight MSD Anal. Date:Units: 2/5/2008mg/L	LCS Anal. Date:	2/5/2008 4:26:44PM LCSD Anal. Date: 2/5/2008 4:	:29:07PM Matrix:	Aqueous					
Mercury ND 0.00223 0.00227 0.00200 0.0020 111.5 113.5 1.8 80 - 120 20 MS/MSD REPORT Analysis: SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Parent: B0801210-02A Prep Date: 2/5/2008 Samp. Anal. Date: 2/5/2008 4:59:48PM Units: mg/L MS Anal. Date: 2/5/2008 5:04:18PM MSD Anal. Date: 2/5/2008 5:06:23PM Matrix: Aqueous	Analyte Name	SampResult LCSRes. SDRes. SPLev SPDLev Re	<u>xcov.</u> <u>SD Recov</u> <u>RPD</u>	Recov Lim RPDLim Flag					
MS/MSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total HgParent:B0801210-02APrep Date:2/5/20084:59:48PMUnits:mg/LMS Anal. Date:2/5/20085:04:18PM MSD Anal. Date:2/5/20085:06:23PMMatrix:Aqueous	Mercury	ND 0.00223 0.00227 0.00200 0.0020	111.5 113.5 1.8	80 - 120 20					
MS/MSD REPORTAnalysis:SW7470A - Mercury in Liquid Waste by CVAA - Total HgParent:B0801210-02APrep Date:2/5/2008Samp. Anal. Date:2/5/20084:59:48PMUnits:mg/LMS Anal. Date:2/5/20085:04:18PM MSD Anal. Date:2/5/20085:06:23PMMatrix:Aqueous			~~~						
Analysis:Sw/4/0A - Mercury in Equild waste by CVAA - Total HgPatent.B0801210-02APrep Date:2/5/20082/5/2008Units:mg/LMS Anal. Date:2/5/20085:04:18PM MSD Anal. Date:2/5/20085:06:23PMMatrix:Aqueous	A	MS/MSD KEP	ORT La Doront:	D0001010 00 A					
Samp. Anal. Date:2/5/20084:59:48PMUnits:mg/LMS Anal. Date:2/5/20085:04:18PMMSD Anal. Date:2/5/20085:06:23PMMatrix:Aqueous	Allarysis:	SW 14/0A - Melculy III Equility waste by CVAA - Total II	Pren Date:	2/5/2008					
MS Anal. Date: 2/5/2008 5:04:18PM MSD Anal. Date: 2/5/2008 5:06:23PM Matrix: Aqueous	Samp Anal Date	2/5/2008 4·59·48PM	Units [.]	то/Ι.					
	MS Anal. Date:	2/5/2008 5:04:18PM MSD Anal. Date: 2/5/2008 5:	:06:23PM Matrix:	Aqueous					
	A .1 () NT								
Analyte Name SampResult MSRes. MSDRes SPLev SPDLev Kecov. MSD Rec. KPD Kecov Lini Frag Mercury ND 0.00217 0.00209 0.00200 0.00200 108.5 104.5 3.8 70 - 130 20	Analyte Name Mercury	$\frac{\text{SampKesult}}{\text{ND}} = 0.00217 + 0.00209 + 0.00200 $	<u>lecov.</u> <u>MSD кес.</u> <u>кръ к</u> 1085 1045 38 ′	<u>ecov Lim KPDLim</u> <u>Fiag</u> 70 - 130 20					

Detailed An	halytical Report Analytica Environmental Laboratories, Inc.	
Workorder (SDG):	B0801210	
Project:	Navajo Mine Extension Leaching Study	
Client:	Applied Hydrology Associates, Inc.	
Client Project Num	ber: none	
Tests Run at:	Analytica Environmental Laboratories - Thornton, Colorado	
Workorder (SDG):	B0801210	
Project:	Navajo Mine Extension Leaching Study OIJALITY CONTROL REPORT	
Project Number:		
Prep Batch:	1080205004	
	MS/MSD REPORT	
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Parent: B0801210-04A	
	Prep Date: 2/5/2008	
Samp. Anal. Date:	2/5/2008 5:13:23PM Units: mg/L	
MS Anal. Date:	2/5/2008 5:22:59PM MSD Anal. Date: 2/5/2008 5:25:08PM Matrix: Aqueous	
Analyte Name	SampResult MSRes. MSDRes SPLev SPDLev Recov. MSD Rec. RPD Recov Lim RPDLim Flag	
Mercury	ND 0.00215 0.00209 0.00200 0.00200 107.5 104.5 2.8 70 - 130 20	
	POST DIGESTION SPIKE REPORT	
Analysis:	SW7470A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-02A	
-	Prep Date: 2/5/2008	
Samp. Anal. Date:	2/5/2008 4:59:48PM Units: mg/L	
PDS Anal. Date:	2/5/2008 5:08:38PM Matrix: Aqueous	
Analyte Name	SampResult PDSRes. SPLev Recov. Recov Lim Flag	
Mercury	ND 0.00211 0.00200 109.4 80 - 120	
Analysis:	SW /4/0A - Mercury in Liquid Waste by CVAA - Total Hg Base Sample: B0801210-04A	
	Prep Date: 2/5/2008	
Samp. Anal. Date:	2/5/2008 5:13:23PM Units: mg/L	
PDS Anal. Date:	2/5/2008 5:27:21PM Matrix: Aqueous	
Analyte Name	SampResult PDSRes. SPLev Recov. Recov Lim Flag	
Mercury	ND 0.00208 0.00200 109.4 80 - 120	

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Navajo Mine Extension Leaching Study **Project:**

Client: Applied Hydrology Associates, Inc. none

Client Project Number:

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed An	alytical Report	t		Analytica	1 Environ	mental Lab	oratori	es, Inc.		
Workorder (SDG):	B0801210									
Project:	Navajo N	Mine Extension	Leachin	ng Study						
Client:	Applied	Hydrology Ass	ociates, I	nc.						
Client Project Num	ber: none									
Tests Run at:	Analytica Environn	nental Laborator	ries - Tho	ornton, Colo	orado					
Workorder (SDG):	B0801210	• • • • •	7. 1							
Project:	Navajo Mine Exten	Ision Leaching S	Study NJALIT	Y CON	TROL	REPORT	Г			
Prop Datah	T080204004	×					-			
Flep Balch.	1000204004									
		S	AMPLE	DUPLIC	ATE RE	PORT				
Analysis:	Inorganic Anions by	V Ion Chromatog	graphy - A	Anions by I	С	Base S Pren l	Sample Date [:]	e: B0801210 2/4/2008	-02B	
	2/1/2000 5 40 20						Butto.			
Samp. Anal. Date:	2/4/2008 7:48:30	PM DM				Units	:	mg/L		
DUP Anal. Date:	2/4/2008 8.00.34	r IVI				Iviatri	х.	Aqueous		
Analyte Name	SampResul	t <u>DUPRes.</u>	<u>RPD</u>	<u>RPDLin</u>	<u>n I</u>	Flag				
Fluoride	10.2	609	0.0	30						
Sulfate	340	352	0.3	30						
Sunde	547	552	0.7	50						
			LC	S/LCSD F	REPORT					
Analysis:	Inorganic Anions by	/ Ion Chromatog	graphy - A	Anions by I	С	MB:		T0802040	04-MB	
5				•		Prep 1	Date:	2/4/2008		
MB Anal. Date:	2/4/2008 2:54:13	PM				Units	:	mg/L		
LCS Anal. Date:	2/4/2008 3:12:36	PM LCSD Ana	al. Date:	2/4/2008	3:31:00	PM Matri	x:	Aqueous		
Analyte Name	SampResult I	CSRes. SDRes.	SPLev	SPDLev	Recov.	SD Recov	<u>RPD</u>	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Fluoride	ND	2.46 2.43		2.50		97.2	1.2	90 - 110	20	
Chloride	ND	5.15 5.14		5.00		102.8	0.2	90 - 110	20	
Sulfate	ND	37.1 37.1		37.5		98.9	0.0	90 - 110	20	
	T · A · 1	I CI I	1	MS REP	ORT	D		D0001010	020	
Analysis:	Inorganic Anions by	/ Ion Chromatog	graphy - A	Anions by I	C	Paren	l: Doto:	B0801210	-02B	
	2/4/2000 7 40 20						Date.	2/4/2000 /T		
Samp. Anal. Date:	2/4/2008 /:48:30	PM				Units	:	mg/L		
MS Anal. Date:	2/4/2008 8:25:18	PM				Matri	X:	Aqueous		
Analyte Name	SampResult N	MSRes.	SPL	ev	Recov.]	Recov Lim		<u>Flag</u>
Fluoride	10.2	12.8	2.50		104.0			70 - 130	NOTE 2	
Chloride	607	743	125		108.8			70 - 130	NOTE 2	
Sulfate	349	1,270	938		98.2			70 - 130		
Analysis:	Inorganic Anions by	/ Ion Chromatog	graphy - A	Anions by I	С	Parent	t:	B0801210	-04B	
						Prep	Date:	2/4/2008		
Samp. Anal. Date:	2/4/2008 9:20:30	PM				Units	:	mg/L		
MS Anal. Date:	2/4/2008 9:38:55	PM				Matri	x:	Aqueous		
Analyte Name	SampResult <u>N</u>	MSRes.	SPL	ev	Recov.		<u>]</u>	Recov Lim		<u>Flag</u>
MB Anal. Date: LCS Anal. Date: <u>Analyte Name</u> Fluoride Chloride Sulfate Analysis: Samp. Anal. Date: <u>Analyte Name</u> Fluoride Chloride Sulfate Analysis: Samp. Anal. Date: <u>Analysis</u> : Samp. Anal. Date: <u>Analysis</u> : Samp. Anal. Date: <u>Analyte Name</u>	2/4/2008 2:54:13 2/4/2008 3:12:36 <u>SampResult</u> I ND ND ND 2/4/2008 7:48:30 2/4/2008 7:48:30 2/4/2008 8:25:18 <u>SampResult</u> M 10.2 607 349 Inorganic Anions by 2/4/2008 9:20:30 2/4/2008 9:38:55	PM PM LCSD Ana <u>2.46</u> 2.43 5.15 5.14 37.1 37.1 7 Ion Chromatog PM PM <u>MSRes.</u> 12.8 743 1,270 7 Ion Chromatog PM PM MSRes.	al. Date: <u>SPLev</u> graphy - A <u>SPLa</u> 2.50 125 938 graphy - A <u>SPLa</u>	2/4/2008 <u>SPDLev</u> 2.50 5.00 37.5 MS REP Anions by I	3:31:00 <u>Recov.</u> ORT C <u>Recov.</u> 104.0 108.8 98.2 C <u>Recov.</u>	Prep J Units DPM Matrii SD Recov 97.2 102.8 98.9 Parent Prep J Units Matrii	Date: : x: <u>RPD</u> 1.2 0.2 0.0 t: Date: : x: <u>]</u> t: Date: : x: <u>]</u>	2/4/2008 mg/L Aqueous <u>Recov Lim</u> 90 - 110 90 - 110 90 - 110 90 - 110 2/4/2008 mg/L Aqueous <u>Recov Lim</u> 70 - 130 70 - 130 70 - 130 70 - 130 80801210 2/4/2008 mg/L Aqueous Recov Lim	RPDLim 20 20 20 -02B NOTE 2 NOTE 2 -04B	Flag Flag

Detailed An	alytical Repo	ort		Analytica E	Environm	ental Laboratori	es, Inc.		
Workorder (SDG):	B0801210								
Project:	Navaj	o Mine Ext	tension Leachin	ng Study					
Client:	Applie	ed Hydrolo	gy Associates, I	nc.					
Client Project Num	ber: none								
Tests Run at:	Analytica Enviro	nmental La	boratories - Tho	rnton, Colora	ado				
Workorder (SDG):	B0801210								
Project:	Navajo Mine Ext	tension Lea	ching Study OLIAL IT	Y CONT	ROLE	PEPORT			
Project Number:	TANA 30 400 4		QUILLI		NOL I				
Prep Batch:	1080204004								
				MS REPOR	RT				
Analysis:	Inorganic Anions	by Ion Chr	omatography - A	nions by IC		Parent:	B0801210	-04B	
						Prep Date:	2/4/2008		
Samp. Anal. Date:	2/4/2008 9:20:3	30PM				Units:	mg/L		
MS Anal. Date:	2/4/2008 9:38:	55PM				Matrix:	Aqueous		
Analyte Name	SampResult	MSRes.	SPL	ev	Recov.]	Recov Lim		Flag
Fluoride	4.72	7.14	2.50		96.8		70 - 130		
Chloride	624	757	125		106.4		70 - 130	NOTE 2	
Sulfate	285	321	37.5		96.0		70 - 130	NOTE 2	
Prep Batch:	T080207003								
Analysis:	160.1 - Total Dis	solved Soli	SAMPLE ds dried at 180°	DUPLICA ' C - TDS	TE REP	ORT Base Sample Prep Date:	e: B0801210 2/6/2008	-02B	
Samp. Anal. Date: DUP Anal. Date:	2/12/2008 10:07 2/12/2008 10:07	7:15AM 7:15AM				Units: Matrix:	mg/L Aqueous		
Analyte Name	SampRe	sult DU	PRes. RPD	RPDLim	Fla	ag			
Total Dissolved So	olids 3,07	0 3,05	50 0.7	20					
			LC	S/LCSD RE	PORT				
Analysis:	160.1 - Total Dis	solved Soli	ids dried at 180°	C - TDS		MB:	T08020700	03-MB	
						Prep Date:	2/6/2008		
MB Anal. Date:	2/12/2008 10:07	7:15AM				Units:	mg/L		
LCS Anal. Date:	2/12/2008 10:07	:15AMLCS	SD Anal. Date:	2/12/2008	10:07:15	5AMMatrix:	Aqueous		
Analyte Name	SampResult	LCSRes.	SDRes. SPLev	<u>SPDLev</u> <u>R</u>	$\frac{1}{1000}$	$\frac{\text{SD Recov}}{102.0}$ $\frac{\text{RPD}}{5.8}$	Recov Lim	<u>RPDLim</u>	<u>Flag</u>
		191	043 021	021	97.0	102.9 5.8	80 - 120	20	
				MS REPOI	рт				
Analysis:	160.1 - Total Dis	solved Soli	ds dried at 180°	C - TDS	NI	Parent: Prep Date:	B0801210 2/6/2008	-02B	
Samp. Anal. Date:	2/12/2008 10:07	7:15AM				Units:	mg/L		
MS Anal. Date:	2/12/2008 10:07	7:15AM				Matrix:	Aqueous		
Analyte Name	<u>SampResult</u>	MSRes.	SPL	ev	Recov.]	Recov Lim		Flag
8									

Detailed An	Detailed Analytical Report Analytica Environmental Laboratories, Inc.									
Workorder (SDG):	B0801210									
Project:	Navaj	o Mine Ex	tension L	<i>leachir</i>	ng Study					
Client:	Applie	ed Hydrol	ogy Assoc	iates, l	lnc.					
Client Project Num	ber: none									
Tests Run at:	Analytica Enviro	onmental L	aboratorie	s - Tho	ornton, Col	orado				
Workorder (SDG):	B0801210 Navaio Mine Ex	tension Le	aching Str	ıdv						
Project Number:			QU	ĬĂLIJ	ΓY CON	TROL	REPORT			
Prep Batch:	T080207003									
					MCDED	ODT				
Analysis	160 1 - Total Dis	solved So	lids dried	at 180°	MS KEP	OKI	Parent	B0801210	0-02B	
Anarysis.	100.1 - 10tai Dis	5501700 50	ilus uricu	at 100	C - IDS		Prep Date	2/6/2008	-02D	
Samp Anal Date:	2/12/2008 10.0	7·15AM					Units [.]	mg/L		
MS Anal. Date:	2/12/2008 10:0	7:15AM					Matrix:	Aqueous		
								1		
Analyte Name	SampResult	<u>MSRes.</u>		SPL	ev	Recov.		$\frac{\text{Recov Lim}}{70 - 120}$		Flag
Total Dissolved Soli	ds 3,070	3,890		821		99.8		70 - 130		
Amalyzia	160.1 Total Die	solved Se	lide dried	ot 1900			Dononti	D0001210	040	
Analysis:	100.1 - 10tal Dis	solved So	lius urieu	at 180	C - IDS		Parent: Pren Dat	DU801210	J-04D	
Some Anal Data	2/12/2008 10.0	7.15 A M					I Top Dat	mg/I		
Samp. Anal. Date:	2/12/2008 10:0	7.15AM					Units: Matrix:			
MS Anai. Date.	2/12/2008 10:0	/.13/401					Iviaulia.	Aqueous		
Analyte Name	SampResult	MSRes.		<u>SPL</u>	<u>ev</u>	Recov.		Recov Lim		<u>Flag</u>
Total Dissolved Soli	ds 3,060	3,930		821		105.9		70 - 130		
Prep Batch:	T080205001									
				LC	S/LCSD F	REPORT				
Analysis:	310.1 - Alkalinit	y, Titrimet	ric (pH 4.	5) - All	kalinity		MB:	T0802050	01-MB	
							Prep Dat	e: 2/4/2008		
MB Anal. Date:	2/4/2008 9:52:0	02AM					Units:	mg/L		
LCS Anal. Date:	2/4/2008 9:52:0	02AM LC	SD Anal.	Date:	2/4/2008	9:52:02	AM Matrix:	Aqueous		
Analyte Name	SampResult	LCSRes.	SDRes.	<u>SPLev</u>	SPDLev	Recov.	SD Recov R	PD Recov Lim	<u>RPDLim</u>	<u>Flag</u>
Bicarbonate	ND	24.0	27.0	25.0	25.0	96.0	108.0 11	.8 80 - 120	20	
Carbonate	ND	50.0	51.0	50.0	50.0	100.0	102.0 2.	0 80 - 120	20	

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210

Navajo Mine Extension Leaching Study **Project:**

Client: Applied Hydrology Associates, Inc. none

Client Project Number:

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little significance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical ReportAnalytica Environmental Laboratories, Inc.							
Workorder (SDG): B	0801210						
Project:	Navajo Mine Ext	tension Leaching Study					
Client:	Applied Hydrolo	gy Associates, Inc.					
Client Project Number:	none						
	QC	BATCH ASSOCIATIONS -	BY METHOD BLAN	К			
Lab Project ID:	83,686	Lab Project Number:	B0801210				
				Prep Date:	2/4/2008		
Lab Method Blank Id:	T080204004-MB			_			
Prep Batch ID:	T080204004		1 10				
Method:	Inorganic Anions b	by Ion Chromatography - Anio	ons by IC				
This Method blank and	sample preparation batch	are associated with the followin	ig samples, spikes, and	duplicates:			
SampleNum	ClientSampleName	DataF	ile	AnalysisDate			
T080204004-LCS	LCS	0802	204_014.DXD	2/4/2008 3	3:12:36PM		
T080204004-LCSD	LCSD	0802	204_015.DXD	2/4/2008 3	3:31:00PM		
B0801210-01B	MB Successive #2	0802	204_017.DXD	2/4/2008 4	4:07:47PM		
B0801210-02B	Ash Successive #2	0802	204_018.DXD	2/4/2008 4	4:26:11PM		
B0801210-02B-DUP	DUP	0802	204_019.DXD	2/4/2008 4	1:44:34PM		
B0801210-02B-MS	MS	0802	204_020.DXD	2/4/2008 5	5:02:58PM		
B0801210-03B	MB Successive #3	0802	204_022.DXD	2/4/2008 5	5:39:45PM		
B0801210-04B	Ash Successive #3	0802	204_023.DXD	2/4/2008 5	5:58:09PM		
B0801210-04B-MS	MS	0802	204_024.DXD	2/4/2008 6	5:16:33PM		
B0801210-01B	MB Successive #2	0802	204_028.DXD	2/4/2008 7	7:30:06PM		
B0801210-02B	Ash Successive #2	0802	204_029.DXD	2/4/2008 7	7:48:30PM		
B0801210-02B-DUP	DUP	0802	204_030.DXD	2/4/2008 8	3:06:54PM		
B0801210-02B-MS	MS	0802	204_031.DXD	2/4/2008 8	3:25:18PM		
B0801210-03B	MB Successive #3	0802	204_033.DXD	2/4/2008 9	9:02:06PM		
B0801210-04B	Ash Successive #3	0802	204_034.DXD	2/4/2008 9	9:20:30PM		
B0801210-04B-MS	MS	0802	204_035.DXD	2/4/2008 9	9:38:55PM		
				Prep Date:	2/4/2008		
Lab Method Blank Id: Pren Batch ID:	T080205001-MB						
Method.	1080205001 310 1 - Alkalinity	Titrimetric (nH 4 5) - Alkali	inity				
This Method blank and	sample preparation batch	are associated with the followin	a samples spikes and	duplicates			
SampleNum	ClientSampleName	DataF	ile	AnalysisDate			
B0801101 0/B	Batch OC	Duur		2/4/2008	0.25.02 AM		
B0801210 01B	MB Successive #2			2/4/2008	0.52.027MM		
B0801210-01B	Ash Successive #2			2/4/2008 5	0.52.02. M		
B0801210-02B	MB Successive #2			2/4/2008	0.52.02AM		
B0801210-03B	Δ sh Successive #2			2/4/2008 2	0.52.02AM		
DU0U121U-U4D				2/4/2000 5	0.52.02AW		
T000203001-LCS				2/4/2000 5	0.52.02AM		
1000203001-LCSD				2/4/2000 5).52.02ANI		
BU901131-04B-DUP	DUF			2/4/2008 9	JZ.UZANI		

Detailed Analytic	cal Report	Analytica Env	vironmental Laboratories, Inc.	
Workorder (SDG): B	0801210			
Project:	Navajo Mine Exte	nsion Leaching Study		
Client:	Applied Hydrolog	y Associates, Inc.		
Client Project Number:	none			
	QCI	BATCH ASSOCIATIONS - BY	Y METHOD BLANK	
Lab Project ID:	83,686	Lab Project Number:	B0801210	
	T0000000000 MD		Prep Dat	e: 2/5/2008
Lab Method Blank Id: Pren Batch ID:	1080205002-MB			
Method:	SW6010B - ICP - T	otal		
This Method blank and	sample preparation batch a	re associated with the following	samples spikes and duplicates.	
SampleNum	ClientSampleName	DataFile	AnalysisDa	ite
T080205002-LCS	LCS	E0205	2/5/2008	4:32:00PM
T080205002-LCSD	LCSD	E0205	58A 2/5/2008	4:37:00PM
B0801210-02A-DUP	DUP	E0205	8A 2/5/2008	4:52:00PM
B0801210-04A-DUP	DUP	E0205	2/5/2008	6:06:00PM
B0801210-02A-MS	MS	E0205	8A 2/5/2008	4:57:00PM
B0801210-04A-MS	MS	E0205	8A 2/5/2008	6:11:00PM
B0801210-02A-MSD	MSD	E0205	8A 2/5/2008	5:02:00PM
B0801210-04A-MSD	MSD	E0205	8A 2/5/2008	6:16:00PM
B0801210-02A-PDS	PDS	E0205	8A 2/5/2008	5:46:00PM
B0801210-04A-PDS	PDS	E0205	8A 2/5/2008	6:21:00PM
T080205002-LCS	LCS	E0206	i8A 2/6/2008	1:59:00PM
T080205002-LCSD	LCSD	E0206	i8A 2/6/2008	2:04:00PM
B0801210-02A-MS	MS	E0206	i8A 2/6/2008	2:09:00PM
B0801210-04A-MS	MS	E0206	i8A 2/6/2008	2:19:00PM
B0801210-02A-MSD	MSD	E0206	i8A 2/6/2008	2:14:00PM
B0801210-04A-MSD	MSD	E0206	i8A 2/6/2008	2:24:00PM
B0801210-01A	MB Successive #2	E0219	2/19/2008	8 2:36:00PM
B0801210-02A	Ash Successive #2	E0219	2/19/2008	8 2:41:00PM
B0801210-03A	MB Successive #3	E0219	2/19/2008	8 2:46:00PM
B0801210-04A	Ash Successive #3	E0219	8A 2/19/2008	8 2:51:00PM

Detailed Analyti	cal Report	Analytica En	vironmental Labor	ratories, Inc.	
workorder (SDG): B	Vouia Mina Euto	ncion I coching Study			
Project:	Navajo Mine Exte	nsion Leaching Study			
	Applied Hydrolog	y Associates, Inc.			
Client Project Number:	none				
	QC I	BATCH ASSOCIATIONS - B	Y METHOD BLA	NK	
Lab Project ID:	83,686	Lab Project Number:	B0801210		
Lab Method Blank Id: Prep Batch ID: Method:	T080205004-MB T080205004 SW7470A - Mercury	y in Liquid Waste by CVAA	- Total Hg	Prep Date	:: 2/5/2008
This Method blank and	sample preparation batch a	re associated with the following	samples, spikes, and	d duplicates:	
SampleNum	ClientSampleName	<u>DataFile</u>	<u>}</u>	<u>AnalysisDat</u>	e
B0801197-02A	Batch QC	B0205	08W.WKS	2/5/2008	4:38:47PM
B0801210-01A	MB Successive #2	B0205	08W.WKS	2/5/2008	4:57:34PM
B0801210-02A	Ash Successive #2	B0205	08W.WKS	2/5/2008	4:59:48PM
B0801210-03A	MB Successive #3	B0205	08W.WKS	2/5/2008	5:11:03PM
B0801210-04A	Ash Successive #3	B0205	08W.WKS	2/5/2008	5:13:23PM
T080205004-LCS	LCS	B0205	08W.WKS	2/5/2008	4:26:44PM
T080205004-LCSD	LCSD	B0205	08W.WKS	2/5/2008	4:29:07PM
B0801197-02A-DUP	DUP	B0205	08W.WKS	2/5/2008	4:41:14PM
B0801210-02A-DUP	DUP	B0205	08W.WKS	2/5/2008	5:02:05PM
B0801210-04A-DUP	DUP	B0205	08W.WKS	2/5/2008	5:20:14PM
B0801197-02A-MS	MS	B0205	08W.WKS	2/5/2008	4:43:28PM
B0801210-02A-MS	MS	B0205	08W.WKS	2/5/2008	5:04:18PM
B0801210-04A-MS	MS	B0205	08W.WKS	2/5/2008	5:22:59PM
B0801197-02A-MSD	MSD	B0205	08W.WKS	2/5/2008	4:46:03PM
B0801210-02A-MSD	MSD	B0205	08W.WKS	2/5/2008	5:06:23PM
B0801210-04A-MSD	MSD	B0205	08W.WKS	2/5/2008	5:25:08PM
B0801197-02A-PDS	PDS	B0205	08W.WKS	2/5/2008	4:52:53PM
B0801210-02A-PDS	PDS	B0205	08W.WKS	2/5/2008	5:08:38PM
B0801210-04A-PDS	PDS	B0205	08W.WKS	2/5/2008	5:27:21PM

Detailed Analy	ytical Report	Analytica E	nvironmental Laborat	ories, Inc.
Workorder (SDG):	B0801210			
Project:	Navajo Mine E	Extension Leaching Study		
Client:	Applied Hydro	logy Associates, Inc.		
Client Project Number:	: none			
	C	C BATCH ASSOCIATIONS -	BY METHOD BLAN	K
Lab Project ID:	83,686	Lab Project Number:	B0801210	
				Prep Date: 2/6/2008
Lab Method Blank Id	l: T080207003-M	В		
Prep Batch ID:	T080207003			
Method:	160.1 - Total Di	ssolved Solids dried at 180°C -	TDS	
This Method blank a	nd sample preparation bat	ch are associated with the followin	g samples, spikes, and	duplicates:
SampleNum	ClientSampleName	DataFi	ile_	AnalysisDate
B0801210-01B	MB Successive #2			2/12/2008 10:07:15AM
B0801210-02B	Ash Successive #2			2/12/2008 10:07:15AM
B0801210-03B	MB Successive #3			2/12/2008 10:07:15AM
B0801210-04B	Ash Successive #3			2/12/2008 10:07:15AM
T080207003-LCS	LCS			2/12/2008 10:07:15AM
T080207003-LCSI	D LCSD			2/12/2008 10:07:15AM
B0801210-02B-D	UP DUP			2/12/2008 10:07:15AM
B0801210-02B-M	S MS			2/12/2008 10:07:15AM
B0801210-04B-M	S MS			2/12/2008 10:07:15AM

Analytica Environmental Laboratories, Inc.

Workorder (SDG): B0801210
Project: Navajo Mine Extension Leaching Study

Applied Hydrology Associates, Inc.

Client Project Number:

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.

none

Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

Client:

ND = Not Detected at or above the Reporting Limit

NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit

HIGH = Recovery , RPD, or other parameter is above Upper Control Limit

E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank

J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)

W = Post digestion spike did not meet criteria

S = Reported value determined by the Method of Standard Additions (MSA)

Several ways of defining the limit of detection and quantitation are prevalent in the laboratory industry and may appear in Analytica reports. These include the following:

MRL = "minimum reporting level", from the EPA Safe Drinking Water program (SDW)

PQL = "practical quantitation limit", from SW-846

EQL = "estimated quantitation limit", from SW-846

LOQ = "limit of quantitation", from a number of authoritative sources

In Analytica's work, all of these terms have the same meaning, equivalent to the EPA definition of the MRL. This reporting level is supported by a satisfactory calibration data point which is at that level or lower, and also is supported by a method detection limit (MDL) determined by the procedure in 40CFR. The MDL is lower than the MRL and represents an estimate of the level where positive detections have a 99% probability of being real, but where quantitation accuracy is unknown.

The MRL as defined by Analytica is the lowest demonstrated point of known quantitation accuracy.

The MRL should not be confused with the MCL, which is the EPA-defined "maximum contaminant level" allowed for certain regulated targets under specific regulations, such as the National Primary Drinking Water Regulations. Normally, the MRL is set at a level which is much lower than the MCL in order to ensure that levels are well below those limits. Not all target analytes have MCL levels established.

Other Flags may be applied. See Case Narrative for Description

Analytica Environmental Laboratories, Inc.

Workorder (SDG):	B0801210
Project:	Navajo Mine Extension Leaching Study
Client:	Applied Hydrology Associates, Inc.
Client Project Number:	none

REPOR	TING CONVENTIONS B0801210	S FOR THIS REI	PORT
TestPkgName	Basis	<u> # Sig Figs</u>	Reporting Limit
150.1/150.1 (Aqueous) - pH	As Received	2	Report to PQL
160.1/160.1 (Aqueous) - TDS	As Received	2	Report to PQL
300.0/300.0 (Aqueous) - Anions by IC	As Received	2	Report to PQL
310.1/310.1 (Aqueous) - Alkalinity	As Received	2	Report to PQL
6010B/3010A (Aqueous) - Total	As Received	2	Report to PQL
7470A/7470A (Aqueous) - Total Hg	As Received	2	Report to PQL

Conversion Time bases and management by the second by th				A	nalytica	Chain	<u>o</u> f	Custoc	ly Forr	J				Page		<u>5</u>	
Additional Point Name: Point Name: Control Nam	ANALYTICA GROUP &		121 T	89 Pennsylvania St. omton, CO 80241 (303) 469-8868 (03) 469-5254 fax	4307 A Anchora (907)	rctic Boulevard ige, AK 99503) 258-2155 258-6634 fax		475 Hall St. Fairbanks, AK 99 (907) 456 - 31 (907) 456-3125	9701 54; 16 Ju Fax (90	38 Shaune Driv neau, AK 9980 907) 780-6668 97) 780-6670 ft	¥ ->0	Chain	of Custod	y Na:	63	254	1
Hype and Hype bology Hype Sociality, FLUC Project Name: Control Contro Control Control Con	Client Name & Address:	-		Public Water	System (PW	S) ID#:					Se la se	ction To be	Completed	1 by Analyt	<u>8</u>	And	
Report In: Hounging Marker Standard Interference	HP Holoidon Hydri Pan gdH	Sociates, J	FUC	Project Name	÷					Quot	a ID;		LGN: D D	S 1 5 8	\overline{c}	´	
Truncation Trunce of the second sec				Navajo	Trine	Exten	ADIS Sight	(leachi	na X	Accou			Cash	Credi	t Card		
Parkon hit: Standard Endige (Sinverse results) Parkon (Sinverse results) Email: Turnellic (Sinverse results) Pol or Connect Net Pol or Connect Net Beall Instructions/Comments: Turnellic (Sinverse results) Pol or Connect Net Pol or Connect Net Beall Instructions/Comments: Turnellic (Sinverse results) Pol or Connect Net Pol or Connect Net Beall Instructions/Comments: Data Time Sinverse results) Pol or Connect Net Character Struct Base Sinverse results Data Time Sinverse results) Pol or Connect Net Character Struct Base Sinverse results Data Time Sinverse results) Pol or Connect Net Character Struct Base Sinverse results Data Time Sinverse results) Pol or Connect Net Character Struct Time Sinverse results) Data Time Sinverse results) Pol or Connect Net AS: A: Successive #2 Ligo(RS Ligo(RS Ligo(RS Ligo(RS Pol or Sinverse results) Pol or Sinverse results)<	Report to:			Ĺ	urnaround	d Time fo	r Re	sults (TA	T)	Invoi	ce to Name	& Address					
Endity Requested Due bits for Name Endity Requested Due bits for Results Standing Hard Sh. Scocessive ASh. Successive Standing Older Sample duantification / Location Date The Sample duantification / Location Date Older Sample duantification / Location Time Older Sample duantification / Location Time Older Sample duantification / Location Date Time Older Sample duantification / Location Date Time Ash. Successive Time Received by Ash. Successive Time Received by Date Time Received by Date Time Received by Date Time Received by Date <tr< td=""><td>Phone No:</td><td></td><td></td><td>Stand</td><td>lard</td><td>Expec</td><td>dited</td><td>< 10 days, prior auth</td><td>orization required)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr<>	Phone No:			Stand	lard	Expec	dited	< 10 days, prior auth	orization required)								
Represented Due Date for Reader: Projection Discontrast:	Fax No:						6	leese specify due d edd'll charges may	ate below; apply}								
Special instructions/comments: Instructions/comments: Instructions/comments: Representation / Location Special instructions/comments: Representation / Location Representation / Location Instructions/comments: Representation / Location Representation / Location Sumpled Representation / Location A Successive # 2 Iligi(02 Iligi(02 Iligi(02 Sumpled Representation / Location MB Successive # 2 Iligi(02 Iligi(02 Iligi(02 Iligi(02 Iligi(02 Sumpled Representation / Location MB Successive # 2 Iligi(02 Iligi(02 Iligi(02 Iligi(02 Iligi(02 Sumpled Representation / Location MB Successive # 2 Iligi(02 Iligi(02 Iligi(02 Iligi Presenved A Clo Centered by: Iligi Presenved Iligi Preserved Iligi Preserved <td>E-mail:</td> <td></td> <td></td> <td>Requested Due</td> <td>Date for Resi</td> <td>ults:</td> <td></td>	E-mail:			Requested Due	Date for Resi	ults:											
Representation (Location Glant Sample dentification (Location Claim Sample dentification Claim Sample dentification C	Special Instructions/Comments:	by R.Se					l			P.O. o	r Contract N	<u>.</u>					
Kit Presidioning Charge: S Date Time Client Sample Identification Location Sampled Sampled Ass. Soccessive #2 IlSo(08 11:00 Ass. Soccessive #2 IlSo(08 11:00 Aq Ass. Soccessive #2 IlSo(08 11:00 Aq 2 X Ass. Soccessive #2 IlSo(08 11:00 Aq 2 X X Ass. Soccessive #2 IlSo(08 11:00 Aq 2 X X X Ass. Soccessive #2 IlSo(08 11:00 Aq 2 X X X X Ass. Soccessive #2 IlSo(08 11:00 Aq 2 X </td <td>Actor Company</td> <td></td> <td>0</td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td>Requested</td> <td>Analysis/Me</td> <td>thod</td> <td></td> <td></td> <td></td> <td></td>	Actor Company		0				-				Requested	Analysis/Me	thod				
Client Sample Identification / Location Sampled Sampled Sampled MB Successive #2 IISO(08 11:30 Aq. 2 X MS Successive #2 IISO(08 IISO(08 IISO(08 Reinquished by: Date Time IISO(08 IISO(08 Reinquished by: Date Time IISO(08 IISO(08) Reinquished by: Date Time IISO(08) IISO(08) <t< td=""><td>Kit Pren/Shinning Charge: \$</td><td></td><td>ŀ</td><td></td><td></td><td>r)</td><td>•</td><td>τ •</td><td>H I</td><td></td><td>to to</td><td></td><td>•</td><td></td><td>ved</td><td>d</td><td>, ,</td></t<>	Kit Pren/Shinning Charge: \$		ŀ			r)	•	τ •	H I		to to		•		ved	d	, ,
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$				Date	Time Sampled	latrix WW-Oth	Containe	B/30101 INCTOR HEND	67096 67096	PH	i to	Anion	1 Alı		d Prese	ld Filte	IS/MSD
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						(S-DW	No. of	Loi #: Pres;	7474 Lot# Pres	150 Lot# Pres:) 6 0. Lot#; Pres:	300.4 Lot# Pres	310 Lol #:* Pres	Lol #: Pres:	Fie	Fi	1
Ask successive 1 1 1 2 x <	MB successive #	C_		1/30/08	06:11	Aq	υ	×	×	x	×	*	×		5	γ _Z γ	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Ash Successive	H.		+	+	_	9	×	×	×	×	×	×			7	*
ACL Successive $\frac{4}{3}$ 4 4 3 ×<	MR Successive	2#3		1/31/08	11:00		0	×	Y	×	×	×	Y		-		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	ASK SUCEESSIU	e#3		+	+	H	Q	×	¥	×	¥	×′	×			H	X
Relinquished by: Date Time Received by: Date Time Rule of sampler: (printed) Date Time Received by: Date Time Rule of sampler: (printed) Section for sampler: (printed) Time Received by: Date Time Rule of sampler: (printed) Section for sampler: (printed) Time Received by: Date Time Rule of sampler: (printed) Section for sampler: (printed)																	
Relinquished by: Date Time Received by: Date Time Relinquished by: Date Time Relinquished by: Date Time Relinquished by: Date Time Time Relinquished by: Date Time Time Relinquished by: Date Time Time Time Time Relinquished by: Date Time																	
Relinquished by: Date Time Received by: Date Time Condition of THO ANC JNU FBKS Relinquished by: Date Time Received by: Date Time Custody Seal? Idialed By: Idialed By: <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>									1								
Relinquished by: Date Time Received by: Date Time Section To Be Completed by Analytica R.Section U131 log 15:05 Last 1/31/o8 15:05 Condition of THO ANC JNU FBKS Relinquished by: Date Time Received by: Date Time Condition of THO ANC JNU FBKS Relinquished by: Date Time Received by: Date Time Condition of THO ANC JNU FBKS Relinquished by: Date Time Received by: Date Time Time Custody Seal?: Time MU FBKS Relinquished by: Date Time Received by: Date Time Temp/Loc: 3.0 3.0 Name of Sampler: (printed) U U U U Date Time Thermo ID#: Shipped Via: Man. Man. Man.							_										
R.Secure M 1131 log 15:05 4 / 31 / 68 1 / 5:05 Condition of Log THO ANC JNU FBKS Relinquished by: Date Time Received by: Date Time Custody Seal?: Initialed By:	Relinquished by:	Date	Time	Received by:		Date		Time		的数据设备	Section	lo Be Com	Heted by A	nalytica			
Relinquished by: Date Time Received by: Date Time Custody Seal? Relinquished by: Date Time Received by: Initialed By: Initialed By: Relinquished by: Date Time Received by: Date Time Relinquished by: Date Time Received by: Date Time Name of Sampler: (printed) Image: State Shipped Via: Name	Riseman	1/31/08/19	š,	ACC.)	1/31/0	હેલ	15:05	Condit	ion of	THO	ANC		UND		FBKS	
Relinquished by: Date Time Received by: Date Time Temp/Loc: 3_0 Name of Sampler: (printed) Image: Compare the second s	Relinquished by:	Date	Time	Received by:		Date		Time	Custoc	ty Seal?: . d By:		WITT FROM IN AM ANTI-	Anno 11	NAME AND ADDRESS OF A DESCRIPTION			
Name of Sampler: (printed) Thermo ID#: Shipped Via: Name of Sampler: (printed)	Relinquished by:	Date	Time	Received by:		Date		Time	Temp/		3.0		No. of the second				
Name of Sampler: (printed)									Therm	o ID#:	>		NUMBER OF THE OWNER	And solar and solar and solar			
	Name of Sampler: (printed)							•	Shippe	id Via:	San Same						



Cooler Receipt Form

Client: Applied Hydrology Asso Project: Navajo Mine Extension	ciates Client Code: 0 Leaching Study	30188	<u> </u>	Order #:	B0801210
Cooler ID: 1					
A. Preliminary Examination Phase:	Date cooler (Cooler open	opened: ed by:	1/31/2008 gp	Signature:	GP
1. Was airbill Attached? N/A	Airbill #:		Ca	urrier Name: O	ther
2. Custody Seals? N/A	How many?	0	Location:	Seal	Name:
3. Seals intact? N/A					
4. COC Attached? Yes	Properly Cor	npleted?	Yes Sig	gned by AEL em	ployee? Yes
5. Project Identification from cust	ody paper: Navaj	jo Mine Ex	ktension Leaching Stu	ıdy	
6. Preservative: None	•	Temper	ature: 3.0 deg.C		
B. Log-In Phase: Samples Lo	og-in Date: 1/31/2008	Log-in E	ig study. 3y: gp		
1 Packing Type	Other				
2. Were samples in separate hans	2 N/A				
3. Were containers intact?	Yes	Labels a	agree with COC2	Yes	
4. Number of bottles received:	8	Number	of samples received:	4	
5. Correct containers used?	Yes	Correct	preservatives added?	Yes	
6. Sufficient sample volume?	Yes		•		
7. Bubbles in VOA samples?	N/A				
8. Was Project manager called and	status discussed?	No			
9. Was anyone called? No	Who was called?		By whom	?	_ Date:
COMMENTS:					







MAP LEGEND Monitoring Well
 CCB Disposal Locations
 B Hydrogeologic Section Transect





CROSS SECTION B-B'

Shale



Screen Interval

Approximate Mining Extent

/ _	K 83	-1 5225 (famsl)	(Saturated)
	NN. 0	Alluvium	
			Siltstone
		Shale Coal	Coal
		Shale	- Coal
7		Shale	Coal
5/96)	-2-1	Shale	
,		Siltstone	-
		Sandstone	
		Coal	
	Ź	Shale	
		Coal	-
145'		Shale	-

REV. No.	DATE	DRAFT. BY	REVISION DESCRIPTION	PRE'D BY	E.Q.	P.E.	DATE CERTIFIED
		ı <u>ı</u>	Exhibit 11-10	67			
	<u>Р.(</u>	HP N D. BOX 171	Z FRUITLAND, NEW MEXICO		tor:) 1 15-598-4	N Y 229
	Navajo Mine Permit						
L	ا 00۔	NAVA. ATION	IO MINES MONI NS AND HYDRO	torin Logi(NG V C SE	VEL ECTI	L ONS
PREF	PARED	BY: JLS	DRAWN BY: JLS	S	CALE: AS	S SHOW	4
APPR	OVED	BY: APO	DATE: 2/25/2011				