APPENDIX 11-MM

SUPPLEMENTAL GROUNDWATER MONITORING STUDY

- NOVEMBER 1996
- THROUGH MARCH 1998

SUPPLEMENTAL GROUNDWATER STUDY

November 1996

BHP Minerals
Navajo Mine
Fruitland, New Mexico

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

1.0 Introduction 3

2.0 Groundwater Monitoring Study 4
- 2.1 Objective 4
- 2.2 Background 6

3.0 Groundwater Monitoring 8
- 3.1 Monitoring Well Locations 8
- 3.2 Well Construction 9
- 3.3 Sampling and Analysis 10
- 3.4 Parameter Selection 11
- 3.5 Sampling Frequency 12
- 3.6 Data Analysis 12

4.0 Results and Conclusions 13
- 4.1 Results 13
- 4.2 Conclusions 17

LIST OF FIGURES

FIGURE 1 SUPPLEMENTAL GROUNDWATER STUDY 5

LIST OF TABLES

TABLE 1 GROUNDWATER QUALITY PARAMETERS 11

TABLE 2 POTENTIOMETRIC SURFACE DATA 14

LIST OF APPENDICES

APPENDIX A WELL LOGS AND CONSTRUCTION DIAGRAMS

APPENDIX B LEACH STUDY TABLE 27.B2 AND TABLE 27.B20

APPENDIX C GROUNDWATER POTENTIOMETRIC MAPS

APPENDIX D ANALYTICAL DATA AND RESULTS

- D-1 Summary of Groundwater Data
- D-2 Piper Trilinear Plots
- D-3 Statistical Summary Reports
- D-4 Original Laboratory Data
- D-5 Electronic Data
- D-6 Water Quality Parameter Graphs

EXECUTIVE SUMMARY

The results of the Supplemental Groundwater Study concluded that the burial of ash in saturated post mined pits has an negligible impact on human health and the environment. The study determined that the probable hydrological consequence of ash disposal and ash generated leachate upon the groundwater quality is insignificant. Ash burial and potential ash affected groundwater does not impact the water quality or quantity significantly as to change the designated use or classification of the groundwater or surface water. The conclusions of the Supplemental Groundwater Study support and strengthen the previous results of Chapter 11, Section 6.0, Probable Hydraulic Consequences and APPENDIX 11-K, Leach Study of the Navajo Mine's NM-0003D Permit Application Package.

BHP Navajo Mine implemented a Supplemental Groundwater Study to evaluate the hydraulic consequences of ash disposal in mined out pits. This Supplemental Groundwater Study was executed in two phases; Phase One, a detection investigation, and Phase Two, an assessment investigation. Three new monitoring wells were installed for each phase. The goal for the Supplementary Groundwater Study was to determine the impacts of ash disposal on human health and the environment.

The Supplemental Groundwater Study was designed using the hydrogeologic characteristics provided in Chapter 11, Section 6.0, Probable Hydraulic Consequences and APPENDIX 11-K, Leach Study of the Navajo Mine's NM-0003D Permit Application Package.

The Supplemental Groundwater Study determined that Boron was an indicator parameter of ash affected groundwater. Boron was found to be present only in the groundwater directly saturating the ash. Migration of this constituent or other typical ash leachate constituents away from the pit boundary was not detected in the

groundwater downgradient of the ash. The attenuation of Boron and other leachate constituents of ash appears to be caused by the absorption and/or precipitation of the constituents in solution. Boron as well as other ash constituents were determined to attenuate in solution in bench leachate tests performed as part of the Leach Study.

The results from this study support BHP's conclusions that ash disposal has a negligible impact on regional groundwater quality and human health and the environment.

The findings of the Supplemental Groundwater Study are consistent with United States Environmental Protection Agency's (EPA) 1988 Report to Congress, Wastes from the Combustion of Coal by Electric Utility Power Plants, demonstrating that these wastes do not exhibit hazardous characteristics under current the Resource Conservation Recovery Act regulations. EPA does not intend to regulate fly ash, bottom ash, or flew gas desulfurization wastes under Subtitle C. EPA's tentative conclusion is that current waste management practices appear to be adequate for protecting human health and the environment.

1.0 INTRODUCTION

The purpose of the Supplemental Groundwater Study (SGS) was to address OSM's concerns related to the impact of ash disposal on groundwater quality. This report summarizes the results of the SGS and supports BHP's conclusion that ash disposal has a negligible impact on the regional groundwater quality. In order to address Deficiency 1a of OSM's September 2, 1992, deficiency letter, requiring additional hydrogeologic information, BHP proposed a Supplemental Groundwater Monitoring Plan to OSM. In their letter of August 18, 1993, OSM stated that the proposed Supplemental Groundwater Monitoring Plan was in line with OSM's recommendations and BHP must implement the proposed plan. The Supplemental Groundwater Monitoring Plan was implemented as the SGS.

The results of the SGS were determined from two groundwater characterization phases. The objective of the first phase was to detect potential ash constituents in the groundwater. The objectives of the second phase were the following: 1) to delineate the extent of constiuent migration closer to the buried ash based on hydrogeologic information gained from Phase One; 2) further support the conclusions presented in Chapter 11, Section 11.6, Probable Hydraulic Consequences (PHC) and APPENDIX 11-K, Leach Study of the Navajo Mine's NM-0003D Permit Application Package (PAP); and 3) further define the hydrogeologic conditions in the Bitsui A area of the mine.

2.0 GROUNDWATER MONITORING STUDY

2.1 Objective

The objective of the SGS was to demonstrate that the disposal of ash in post mine pits is an acceptable management practice and that the impact to human health and the environment is negligible. To meet this objective the SGS was designed to optimize the potential for detecting ash leachate at the Navajo Mine and any off-lease migration of the leachate. In addition, the monitoring system was designed to further characterize the hydrologic regime, support previous hydrogeologic studies performed, and assess any potential risks to human health and the environment.

The objective of Phase One included the installation of three monitoring wells to: 1) to determine if groundwater is present in the Bitsui A area and if the ash is saturated. If groundwater is present, determine its characteristics (i.e., direction and gradient). 2) confirm whether or not leachate is generated and migrating off-lease; 3) determine the effect, if any, the leachate has on groundwater quality and any impacts which may result from these changes.

The Phase One study was designed using hydrogeologic information from the Navajo Mine's PAP, Chapter 6, Groundwater Hydrology . The program included the installation of three monitoring wells (i.e., Wells Bitsui 1, 2, and 3) and focused directly in the Bitsui A area, in the northern part of the mine lease (FIGURE 1). The study focused on establishing a groundwater detection monitoring program that would be able to detect potential ash leachate constituents migrating away from the Bitsui A area towards the San Juan River Valley aquifer to the North.

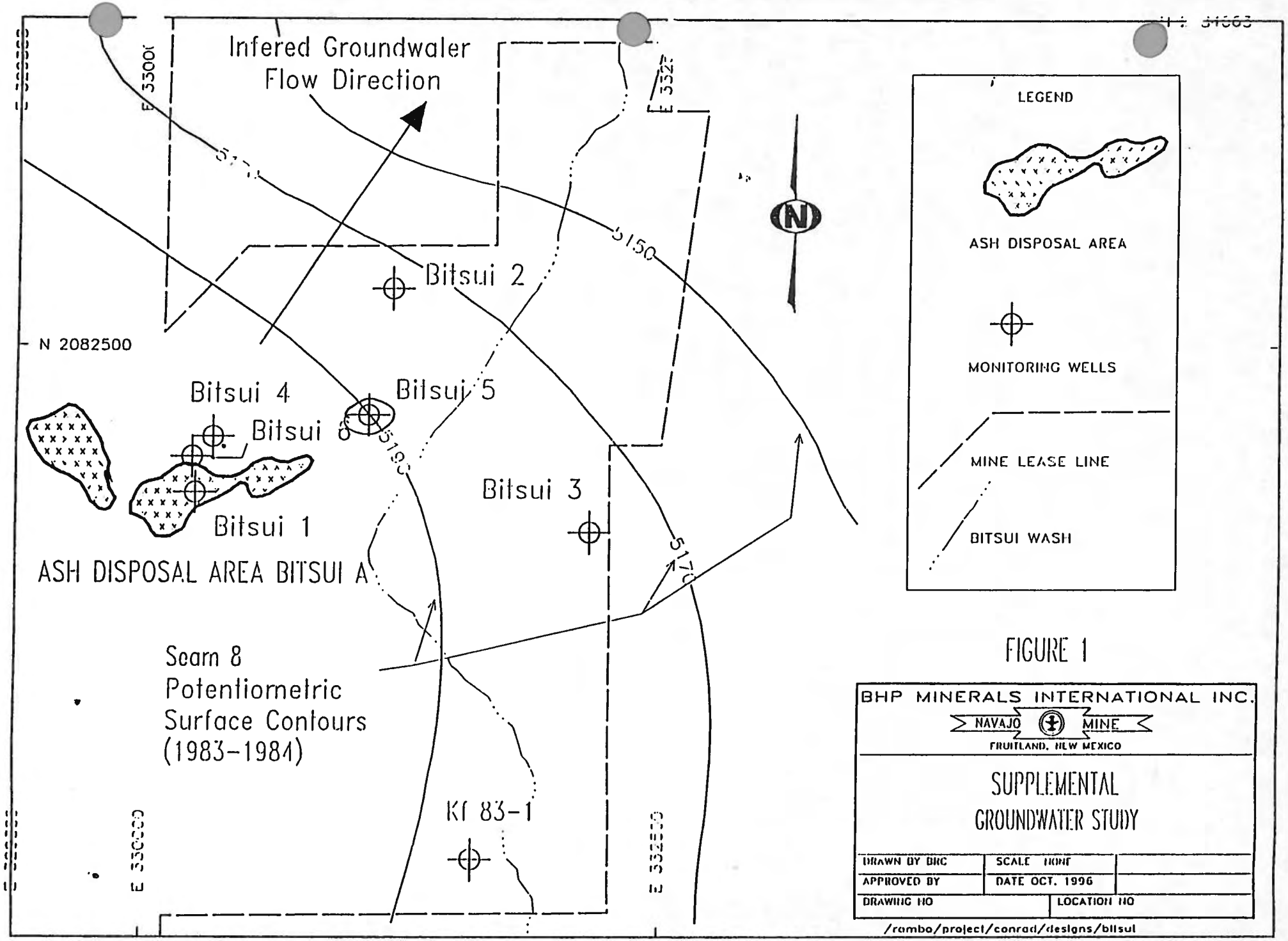

Infered Groundwater
Flow Direction
E 3300
E 332
N 2082500
Bitsui 2
Bitsui 4
Bitsui 5
Bitsui 6
Bitsui 1
Bitsui 3
ASH DISPOSAL AREA BITSUI A
5150
5170
Seam 8
Potentiometric
Surface Contours
(1983-1984)
KI 83-1
E 330000
E 332000
LEGEND
ASH DISPOSAL AREA
MONITORING WELLS
MINE LEASE LINE
BITSUI WASH
N
BHP MINERALS INTERNATIONAL INC.
NAVAJO MINE
FRUITLAND, NEW MEXICO
SUPPLEMENTAL
GROUNDWATER STUDY
DRAWN BY BRC
SCALE NONE
APPROVED BY
DATE OCT. 1996
DRAWING NO
LOCATION NO
/rambo/project/conrad/designs/bitsui

FIGURE 1

Phase Two of the SGS was implemented to meet the following objectives: 1) optimize the potential for early detection of ash leachate constituents; 2) further enhanced BHP's understanding of the fate and transport of ash leachate indicator parameters identified in Phase One; 3) define the extent of ash leachate constituent migration; and 4) test the findings and assumptions made in the Leach Study and the PHC of the Navajo Mine's PAP.

The second phase was designed using the hydrogeologic information gained from Phase One and the hydrogeologic information presented in the PHC and the Leach Study of the Navajo Mine PAP. This phase focused on determining the extent to which ash related constituents if any, may have migrated away from the ash disposal area. The Phase Two study also established an enhanced groundwater detection monitoring program, located closer to the ash disposal area, to facilitate the early detection of potential ash leachate constituents. Phase Two included the installation of three wells, Bitsui 4, 5, and 6.

2.2 Background

As mentioned, the SGS focused on the Bitsui A area of the mine located in the prelaw jurisdictional area of the northeastern section of the mine (FIGURE 1). The geologic formations disturbed by mining activities in the Bitsui A area include the Cretaceous Fruitland Formation and associated No. 8 Coal Seam and the overlying Quaternary eolian and alluvial formations. The baseline geology and groundwater quality and quantity information used when designing the SGS was found in the Navajo Mine's PAP, Chapters 5, Geology and Chapter 6, Groundwater Hydrology.

The area designated as Bitsui A was believed to be a location having a high probability of containing power plant ash placed below the potentiometric surface of the No. 8 Coal Seam. This area was chosen for the groundwater characterization because of the

probable saturated conditions, and it is the closest (i.e., worst case scenario) ash management area to the San Juan River Valley. The San Juan River alluvial aquifer has the potential to receive water from the Bitsui A area.

In general, the hydrogeologic regime of the Bitsui A area is characterized by one water bearing formation, the No. 8 Coal Seam, with varying degrees of saturation separated by hydrologically tight mudstones, sandstones, clays, and shales within the Fruitland Formation.

The hydrogeologic properties of the No. 8 Coal Seam were obtained from groundwater aquifer test information presented in Chapter 11, Section 11.6, Probable Hydrological Consequences (PHC) and Chapter 6, Groundwater Hydrology Groundwater Hydrology of the PAP. The No. 8 Coal Seam is characterized as the zone of the greatest hydrogeologic conductivity. Generally, the groundwater velocity of the No. 8 Coal Seam was found to be no greater than 0.076 feet per day. The groundwater production from the Fruitland Formation and the associated coal seams very minor and it is not considered an aquifer. The groundwater quality in the coal seams of the Fruitland Formation is naturally poor and water production is very minor. Consequently, regional use is virtually nonexistent because of the poor water quality and quantity.

The Fruitland Formation is overlain in selected areas by an unconfined Quaternary eolian and alluvial sand, silt, and gravel formation. The Quaternary deposits vary in thickness and are unsaturated to the west of the Bitsui Wash and saturated by agricultural return flows to the east of the wash. Underlying the Fruitland Formation is the Pictured Cliffs Sandstone, a very low water yielding fine grained clean marine sandstone. There is approximately 60 feet of the Fruitland Formation separating the upper Quaternary deposits and the No. 8 Coal Seam, therefore no hydrologic connection between the water within coal seam and the overlying Quaternary formation

exists. Similarly, downward migration of water from the coal seam to the Pictured Cliffs Sandstone is blocked by the lower section of the Fruitland Formation.

Background studies evaluating ash leaching potential and constituent migration were conducted prior to the SGS. The Leach Study, was used as a source of information relating to the geochemical interactions that potentially take place between spoils, fly ash, bottom ash, sludge/fly ash, coal and the groundwater. The fate and transport assessment of ash constituents and the potential impacts to the groundwater quality on downgradient receptors (i.e., San Juan Valley aquifer) due to ash disposal were evaluated using the Leachate Study.

3.0 GROUNDWATER MONITORING

3.1 Monitoring Well Locations

Phase One of the SGS consisted of the installation of three monitoring wells, Bitsui 1, 2, and 3 in the Bitsui A area (FIGURE 1). Well Bitsui-1 was located directly within the boundary of the ash disposal area. This well was completed down to the old pit floor and monitors the saturated thickness of the ash. Wells Bitsui-2 and Bitsui-3 are located downgradient from Bitsui-1 and are completed at a similar depth to Bitsui-1, at the bottom of the No. 8 Coal Seam in the Fruitland Formation. Wells Bitsui-2 and Bitsui-3 are located in an undisturbed area between the ash and the northeastern and east lease boundaries. The three wells were located so that they form an approximate equilateral triangle in order to assess the groundwater flow direction and gradient. The well locations and depths were based on hydrogeologic information provided in the PAP Chapter 6, Groundwater Hydrology.

After reviewing the sampling and analysis results from the Phase One wells and the hydrogeologic and geochemical information provided in the Leach Study, and the PHC three wells, Bitsui 4, 5, and 6 were installed as part of Phase Two. These wells were used to determine if leachate is migrating away from the Bitsui area and to what extent. The wells also provide for the early detection of potential migration of leachate constituents. Wells Bitsui-4 and Bitsui-6 were located sufficiently within the distance a constituent would travel freely in solution in 20 years (i.e., estimated time since ash burial) based on the groundwater velocity of 0.076 ft/day. Well Bitsui-5 was located to assess groundwater movement towards the Bitsui Wash. The location of these wells and the Bitsui 1, 2 and 3 wells are indicated on FIGURE 1.

Background groundwater quality data was obtained from Well Kf83-1. This well is part of the Navajo Mine's annual groundwater monitoring program Chapter 6, Groundwater Hydrology. Well Kf83-1 is located upgradient so that its water quality was not affected by ash disposal in the Bitsui A area. A Piper trilinear plot of the three detection wells Bitsui 1, 2, 3 and the background well KF83-1 is provided in APPENDIX D-2. The plot shows that the water quality between the background well and the downgradient detection wells is similar and therefore the wells are monitoring the same water bearing formation (i.e., No. 8 Coal Seam).

The location of the down gradient monitoring wells (i.e., Wells Bitsui-2, 3, 4, 5, and 6) in the Bitsui A area of the mine are in compliance with the requirements of 40 CFR 264.79. The wells are located so that they intercept the potential leachate migration pathway from the ash disposal area in the Bitsui A area.

3.2 Well Construction

The wells installed in Phase One were two inch diameter wells. The wells installed in Phase Two were four inch diameter wells. Both the Phase One and Phase Two wells

were constructed of PVC well casing with sand packed screened intervals and bentonite grout annular spaces. The screened interval for all the wells is at the depth of the No. 8 Coal Seam. This is considered the potential groundwater pathway within the Fruitland Formation for ash leachate affected groundwater. The wells were completed as above ground wells with locking steel protective outer casings.

Boring logs and well construction diagrams are presented in APPENDIX A. The monitoring wells were completed in July 1994 for Phase One and in October 1995 for Phase Two.

3.3 Sampling and Analysis

Static water level measurements to the nearest 0.01 foot were documented prior to each water sampling event. EPA groundwater sample collection guidance and management procedures were followed for the collection, transport, and preservation of collected samples.

The laboratory analysis performed on the samples followed EPA approved procedures found in Standard Methods for the Examination of Water and Waste Water by the Joint Editorial Board, American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 18th edition. The Quality Assurance Quality Control Program in Appendix 27-E of Navajo Mine's NM-0003C PAP was followed.

3.4 Parameter Selection

The parameters listed in TABLE 1 were used for sample analysis. The parameter list was developed based on the identification of potential sources of contaminants to the groundwater specifically as a result of ash disposal. The results of the Leach Study were considered in selection of the parameters. Major ions were included in the list for an ion balance as a quality control measure.

TABLE 1

GROUNDWATER QUALITY PARAMETERS

Water Level	Iron, dissolved
pH	Manganese, total
Total Dissolved Solids	Manganese, dissolved
Conductivity	Aluminum
Calcium	Arsenic
Magnesium	Barium
Sodium	Beryllium
Potassium	Boron
Carbonate	Cadmium
Bicarbonate	Copper
Sulfate	Lead
Chloride	Mercury
Fluoride	Selenium
Nitrate	Silver
Nitrite	Silica
Phosphate	Sulfide
Iron, total	Zinc

3.5 Sampling Frequency

The three Phase One detection monitoring wells were sampled five times. The background well (i.e., Kf83-1) is part of the PAP annual monitoring program and data was provided from five sampling events. The Phase Two assessment wells were sampled two times.

3.6 Data Analysis

The groundwater laboratory data generated was entered into the Navajo Mine's database for analytical review (APPENDIX D). The data from well Bitsui -1 installed in ash was used to identify ash leachate indicator parameters. The data collected from the five remaining wells were analyzed to detect potential ash leachate parameters and determine the extent of leachate migration. Statistical analyses of mean, standard deviation, coefficient of variation, and time verse concentration graphs were reviewed to characterize the water quality, identify trends, detect leachate constituents, and identify problems with the laboratory data.

The groundwater analysis results are summarized in APPENDIX D-1 and the complete lab data reports are provided in APPENDIX D-4. The mean, standard deviation, coefficient of variance, and range were calculated for each parameter and are provided in APPENDIX D-3. The data from these sampling events is provided electronically in the format specified for the Office of Surface Mining's Coal Permit and Reclamation Database (APPENDIX D-5).

4.0 RESULTS AND CONCLUSIONS

4.1 Results

The hydrogeologic data collected during the SGS provided potentiometric surface maps, hydrologic gradients, direction of groundwater flow, and groundwater quality information. This information supported previous work completed by Navajo Mine including, baseline hydrogeology, the PHC section, and the Leach Study. The Phase One wells were used to determine the groundwater flow direction, groundwater quantity and quality, hydrologic gradient, and the potentiometric surface. The field potentiometric surface measurements from the Phase One wells are presented in TABLE 2. The potentiometric maps constructed from these measurements are presented in FIGURES 2 through 6 of APPENDIX C. The potentiometric surface maps constructed using the Phase One well information show the groundwater flow direction in the area to be generally in a northeast direction. This is consistent with the flow directions shown in FIGURE 1, for the No. 8 Coal Seam and the direction used in the PHC and Leach Study.

The hydraulic gradients determined using the Phase One wells ranged from 0.0007 ft/ft to 0.0009 ft/ft. This is consistent with the baseline groundwater information provided in the PAP Chapter 6, Groundwater Hydrology. This gradient range is also consistent with the groundwater velocity of 0.076 feet per day stated in Chapter 11, PHC, Section 11.6. These hydrologic characteristics were also used in the Leach Study. The potentiometeric map constructed from measurements collected on March 1, 1995, shows the groundwater flow direction towards the east. This is a result of an error in field measurements.

TABLE 2

NAVAJO MINE
POTENTIOMETRIC SURFACE DATA

WELL	MEASURING POINT ELEVATION (ft)	DATE	DEPTH TO WATER (ft)	WATER LEVEL ELEVATION (ft)
Bitsui 1	5194.76	2/17/95	32.17	5162.59
		3/1/95	32.10	5162.66
		4/27/95	31.90	5162.86
		5/19/95	31.85	5162.91
		10/18/95	30.19	5164.57
Bitsui 2	5217.32	2/17/95	55.92	5161.40
		3/2/95	55.07	5162.25
		4/27/95	55.47	5161.85
		5/19/95	55.48	5161.84
		10/18/95	53.96	5163.36
Bitsui 3	5235.97	2/17/95	74.06	5161.91
		3/1/95	74.18	5161.79
		4/27/95	73.94	5162.03
		5/18/95	73.32	5162.65
		10/18/95	72.50	5163.47

A total of five groundwater samples were collected for laboratory analysis from the Phase One wells. The Phase Two wells were sampled two times. The results are presented in APPENDIX D-1 and complete lab data reports are provided in APPENDIX D-4. The statistical analysis performed for each parameter is provided in APPENDIX D-3. The data from these sampling events is provided electronically in the format specified for the Office of Surface Mining's Coal Permit and Reclamation Database (APPENDIX D-5).

The water quality analyses for well Bitsui-1, completed in the ash, exhibit elevated levels of Boron (i.e., mean concentration 8.10 mg/l). These levels were greater than the Boron concentrations found in composite groundwater samples collected as part of the Leach Study (i.e., mean concentration 0.43 mg/l) shown in TABLE 27.B2 (reproduced in APPENDIX B), the downgradient detection wells, and the background well Kf83-1 (i.e., 0.95 mg/l mean concentration). Two graphs are provided in APPENDIX D-6 comparing Boron levels between background, ash, and downgradient wells. The background well Kf83-1 is located upgradient so that its water quality was not affected by ash disposal in the Bitsui A area.

A Piper trilinear plot of the three detection wells Bitsui 1, 2, 3 and the background well KF83-1 is provided in APPENDIX D-2. The plot shows similar water quality between the background well and the downgradient detection wells. Therefore the wells are monitoring the same water bearing formation (i.e., No. 8 Coal Seam).

It was also noted that selenium and arsenic were elevated slightly above detection limits in Bitsui-1 when compared to Bitsui-2 and Bitsui-3 and the background water quality. These two parameters, along with Boron, were used as indicator parameters of leachate formation and transport.

The Boron concentrations detected in Bitsui-1 (i.e., mean concentration 8.10 mg/l), are less than the Boron concentrations detected in the fly ash leached with composite groundwater (i.e., mean concentration 11.1 mg/l) as shown in TABLE 27.B20 from the Leach Study (reproduced in APPENDIX B). This data indicates that the groundwater at well Bitsui-1 has elevated Boron due to contact with the buried ash. However, the Boron levels are less than those predicted by the Leach Study. The downgradient wells Bitsui-2, 3, 4, 5, and 6 completed within the potential extent of the groundwater migration pathway downgradient from the Bitsui A area did not show elevated Boron levels. These monitoring results indicate that Boron as well as other constituents are being attenuated and therefore have not migrated downgradient away from the ash burial location at the same rate as the groundwater. The fact that the Boron levels in well Bitsui-1 are less than those predicted in the Leach Study and are not detected in downgradient detection wells supports the attenuation conclusions of the Leach Study.

While dissolved sodium and sulfate in groundwater are not of particular concern from a water quality perspective, it can be noted from the groundwater quality data collected that those two parameters are elevated in the samples from well Bitsui-1. It can also be noted that sodium and sulfate in well Bitsui-1 are elevated above levels predicted in the Leach Study for fly ash leached with composite groundwater as shown in TABLE 27.B2 in APPENDIX B.

The source of the elevated sodium and sulfate appears to be the spoil material that surrounds the ash at the Bitsui-1 well location. TABLES 27.B15 through 27.B19 (combined in the Leach Study NM-0003D PAP APPENDIX 11-K) show elevated sodium and sulfate levels for spoil materials leached with composite groundwater.

5.0 Conclusions

The conclusion of the SGS is that burial of ash in saturated post mined pits has an negligible impact on human health and the environment. The SGS determined that the probable hydrological consequence of ash disposal and ash generated leachate upon the groundwater quality is insignificant. Ash burial and potential ash affected groundwater does not impact the water quality or quantity significantly as to change the designated use or classification of the groundwater or surface water. These conclusions are consistent with the conclusions of the Leach Study, and the predictions stated in the PHC in the PAP.

The information provided in the Leach Study and the PHC were used to design the SGS, including hydrogeologic and geochemical characteristics, the placement of the wells, and the selection of the water quality parameters. In turn, the results of the SGS supported and strengthened the conclusions made in the Leach Study and PHC. The PHC assumed the rate of movement of the groundwater to be 0.076 ft/day. Based on this flow velocity, the shortest time of travel for leach affected groundwater from the northern most portion of the mine to the San Juan River was estimated to be approximately 200 years. Using a groundwater velocity of approximately 2.6 times the 0.076 ft/day rate and the downgradient historical boundary of ash disposal in the Bitsui A area, a worst case well was installed (i.e., Well Bitsui-6), 40 feet downgradient at the same elevation as the No. 8 Coal Seam . The groundwater sample results from the Bitsui - 6 detection well, as well as the other five detection wells showed no evidence of ash leachate constituent migration. The very slow rate of migration (i.e., less than 40 feet) of potential ash leachate constituents (i.e., Boron, Arsenic, and Selenium) within the time period of approximately the 20 years since the start of ash disposal supports the Leach Study attenuation conclusions.

The results of the Leach Study concluded that the migration of ash leachate constituents may not occur or, if so, at a slower rate than the groundwater velocity. The Leach Study's bench leach tests concluded that the rate of selected constituent migration would be attenuated and would be significantly less than the groundwater velocity of 0.076 ft/day. The failure to detect ash leachate constituents in the downgradient wells above background concentrations supports the attenuation conclusions. The Leach Study determined that the reason for the attenuation of the ash constituents included the absorption and/or precipitation of the constituents from the leachate. The study also predicted that the quality of the groundwater would be expected to generally increase (i.e., metal concentrations usually decrease while sulfate levels increase) when the groundwater is exposed to spoil. Moreover, as the groundwater travels through the water bearing formations (i.e., coal seams) additional attenuation would occur, further reducing migration of constituents and the impact on groundwater quality.

The PHC section of the PAP predicted that the impacts from ash disposal to the hydrologic regime and specifically the San Juan River water, would be so small as to be undetectable. This prediction was based on the baseline hydrogeologic characteristics of the water bearing formation (i.e., No. 8 Coal Seam) and the San Juan River alluvial aquifer and the attenuation determinations made in the Leach Study. Based on the hydrogeologic aquifer tests performed on the Fruitland Formation and the associated No. 8 Coal Seam the PHC concluded that the contribution of leachate affected groundwater to the large storage capacities of the San Juan Valley alluvial aquifer would be undetectable. Moreover, impacts to surface from water contributions of leachate affected groundwater from the Fruitland Formation to the San Juan River using the mean annual flow in San Juan River would be a ratio of 0.000074 to 1.0. The impact of ash affected groundwater on the San Juan River water quality using these results is so small as to be unmeasurable.

The information and conclusions provided in the SGS, PHC, and the Leach Study provide the technical documentation necessary to show that no significant impacts are observed from ash disposal on the quality and quantity of groundwater at the Navajo Mine. Moreover, The findings of the Supplemental Groundwater Study are consistent with United States Environmental Protection Agency's (EPA) 1988 Report to Congress, Wastes from the Combustion of Coal by Electric Utility Power Plants, demonstrating that these wastes do not exhibit hazardous characteristics under current the Resource Conservation Recovery Act regulations. Including, EPA's tentative conclusion that current waste management practices appear to be adequate for protecting human health and the environment.

APPENDIX A
WELL LOGS AND WELL CONSTRUCTION DIAGRAMS

November 1996

BHP Minerals

Navajo Mine

Fruitland

NAVAJO MINE

PROJECT: SGS Phase One , BHP Minerals
Navajo Mine
AREA: BITSUI A
SECTION: 15
TOWNSHIP: T29N
RANGE: R15W
CONTRACTOR: Metric Corp.
DRILLER: Rogers & Company Inc.

BORING NUMBER: Bitsui-1
TOTAL DEPTH: 78.7'
LOGGER: Phil Berry, Metric Corp.
NORTHING: 2,081,799.4
EASTING: 330,254.5
COLLAR ELEVATION: 5191.92
DATE COLLARED: June 15,1994
DATE BOTTOMED: June 15,1994

FORMATION RECORD

Interval	Thickness	Description
0.0-8.7	8.7	Brownish gray (5YR 4/1) sandy clay with some granule and pabble gravel.
8.7-28.7	20	Brownish gray (5YR 4/1) sandy clay with some granule gravel.
28.7-38.7	10	Light olive gray (5Y6/1) sandy clay with siliceous bottom ash.
38.7-55.0	16.3	Light olive gray (5Y6/1) siliceous bottom ash and sandy fly ash.
55.0-63.7	8.7	Light gray (N7) fly ash.
63.7-73.7	10	Light olive gray (5Y 6/1) siliceous bottom ash and sandy fly ash.
73.7-78.7	5.0	Olive gray (5Y 4/1) shale .

REMARKS:

NAVAJO MINE

PROJECT: SGS Phase One, BHP Minerals Navajo Mine
AREA: BITSUI A
SECTION: 15
TOWNSHIP: T29N
RANGE: R15W
CONTRACTOR: Metric Corp.
DRILLER: Rogers & Company Inc.

BORING NUMBER: Bitsui-2
TOTAL DEPTH: 125.0'
LOGGER: Phil Berry, Metric Corp.
NORTHING: 2,082,771.6
EASTING: 331,198.7
COLLAR ELEVATION: 5,214.5
DATE COLLARED: July 13,1994
DATE BOTTOMED: July 13,1994

FORMATION RECORD

Interval	Thickness	Description
0.0-5.0	5.0	Pale yellowish brown (10YR 6/2) weathered shale.
5.0-10.0	5.0	Dark yellowish brown (10YR 4/2) weathered shale.
10.0-30.0	20.0	Pale yellowish brown (10YR 6/2) weathered shale.
30.0-40.0	10.0	Dark yellowish brown (10YR 4/2) weathered shale.
40.0-49.0	9.0	Light olive gray (5Y 6/1) weathered shale.
49.0-52.0	3.0	Black (N1) coal.
52.0-56.0	4.0	Light olive gray (5Y 6/1) weathered shale.
56.0-95.0	39.0	Light olive gray (5Y 6/1) friable shale.
95.0-99.0	4.0	Pale yellowish brown (10YR 6/2) friable shale.
99.0-120.0	21.0	Grayish black (N2) coal.
120.0-125.0	5.0	Olive gray (5Y 4/1) friable shale.

REMARKS:

NAVAJO MINE

PROJECT: SGS Phase One. BHP Minerals Navajo mine
AREA: BITSUI A
SECTION: 15
TOWNSHIP: T29N
RANGE: R15W
CONTRACTOR: Metric Corp.
DRILLER: Rogers & Company Inc.

BORING NUMBER: Bitsui-3
TOTAL DEPTH: 175.0'
LOGGER: Phil Berry, Metric Corp.
NORTHING: 2,081,610.5
EASTING: 332,157.1
COLLAR ELEVATION: 5,233.8.5
DATE COLLARED: July 14,1994
DATE BOTTOMED: July 14,1994

FORMATION RECORD

Interval	Thickness	Description
0.0-13	13.0	Pale yellowish brown (10YR 6/2) poorly sorted. subangular to subrounded, very fine sand to vary course sand
13.0-25.0	12.0	Grayish orange (10YR 7/4) medium sorted subrounded, fine to medium sand.
25.0-35.0	10.0	Grayish orange (10YR 7/4) poorly sorted, subrounded very fine sand to granule gravel.
35.0-62.0	27.0	Light olive gray (5Y 6/1) weathered shale.
62.0-63.0	1.0	Olive gray (5 Y 4/1) carbonaceous shale.
63.0-68.0	5.0	Light olive gray (5Y i6/1) weathered shale.
68.0-69.0	1.0	Olive gray (5Y 4/1) carbonaceous shale.
69.0-78.0	9.0	Light olive gray (5Y 6/1) weathered shale.
78.0-80.0	2.0	Black (N1) coal.
80.0-100.0	20.0	Light olive gray (5Y 6/1) friable shale.
100.0-133.0	33.0	Olive gray (5Y 4/1) friable shale.
133.0-140.0	7.0	Grayish black (N2) coal.
140.0-148.0	8.0	Olive gray (5Y 4/1) friable shale.
148.0-152.0	4.0	Black (N1) coal.
152.0-157.0	5.0	Olive black (5Y 2/1) shale.
157.0-170.0	13.0	Black (N1) coal.
170.0-175.0	5.0	Olive gray (5Y 4/1) shale.

REMARKS:

NAVAJO MINE

PROJECT: SGS Phase Two. BHP Minerals
Navajo Mine
AREA: BITSUI A
SECTION: 15
TOWNSHIP: T29N
RANGE: R15W
CONTRACTOR: Philip Environment
DRILLER: Mike Donohue

HOLE NUMBER: Bitsui-4
TOTAL DEPTH: 63.0'
LOGGER:
NORTHING: 2,082,065.3
EASTING: 330,339.5
COLLAR ELEVATION: 5,192.6
DATE COLLARED: 26-Jan-1996
DATE BOTTOMED: 25-Jan-1996

FORMATION RECORD

Interval	Thickness	Description
0.0-2.0	2.0	Tan topsoil material mostly silly sand, very loose.
2.0-24.0	22.0	Gray spoil, shale and sandstone.
24.0-63	39.0	Gray spoil shale and sandstone material.
63.0		Bottom of hole.

REMARKS:

DATE PREPARED: Feb. 03-96

PREPARED BY: K. valdez

NAVAJO MINE

PROJECT: GSG Phase Two, BHP Minerals Navajo Mine
AREA: BITSUI A
SECTION: 15
TOWNSHIP: T29N
RANGE: R15W
CONTRACTOR: Philip Environment
DRILLER: Mike Donohue

HOLE NUMBER: Bitsui-5
TOTAL DEPTH: 63.0'
LOGGER: KEROY VALDEZ
NORTHING: 2,082,169.5
EASTING: 331,089.2
COLLAR ELEVATION: 5,181.1
DATE COLLARED: 26-Jan-1996
DATE BOTTOMED: 26-Jan-1996

FORMATION RECORD

Interval	Thickness	Description
0.0-2.0	2.0	Tan topsoil material mostly sand and very loose.
2.0-18.0	16.0	Gray spoil material, mostly fine grained sand with shale.
18.0-24.0	6.0	Dark brown spoil, shale and sandstone.
24.0-76.0	52.0	Dark brown clay material well compacted, fine grained.
76.0		Bottom of hole.

REMARKS:

DATE PREPARED: Feb. 03-96

PREPARED BY: K. valdez

NAVAJO MINE

PROJECT: SGS Phase Two, BHP Minerals
Navajo Mine
AREA: Bitsui A
SECTION: 15
TOWNSHIP: T29N
RANGE: R15W
CONTRACTOR: Philip Environment
DRILLER: Freddie Rivera

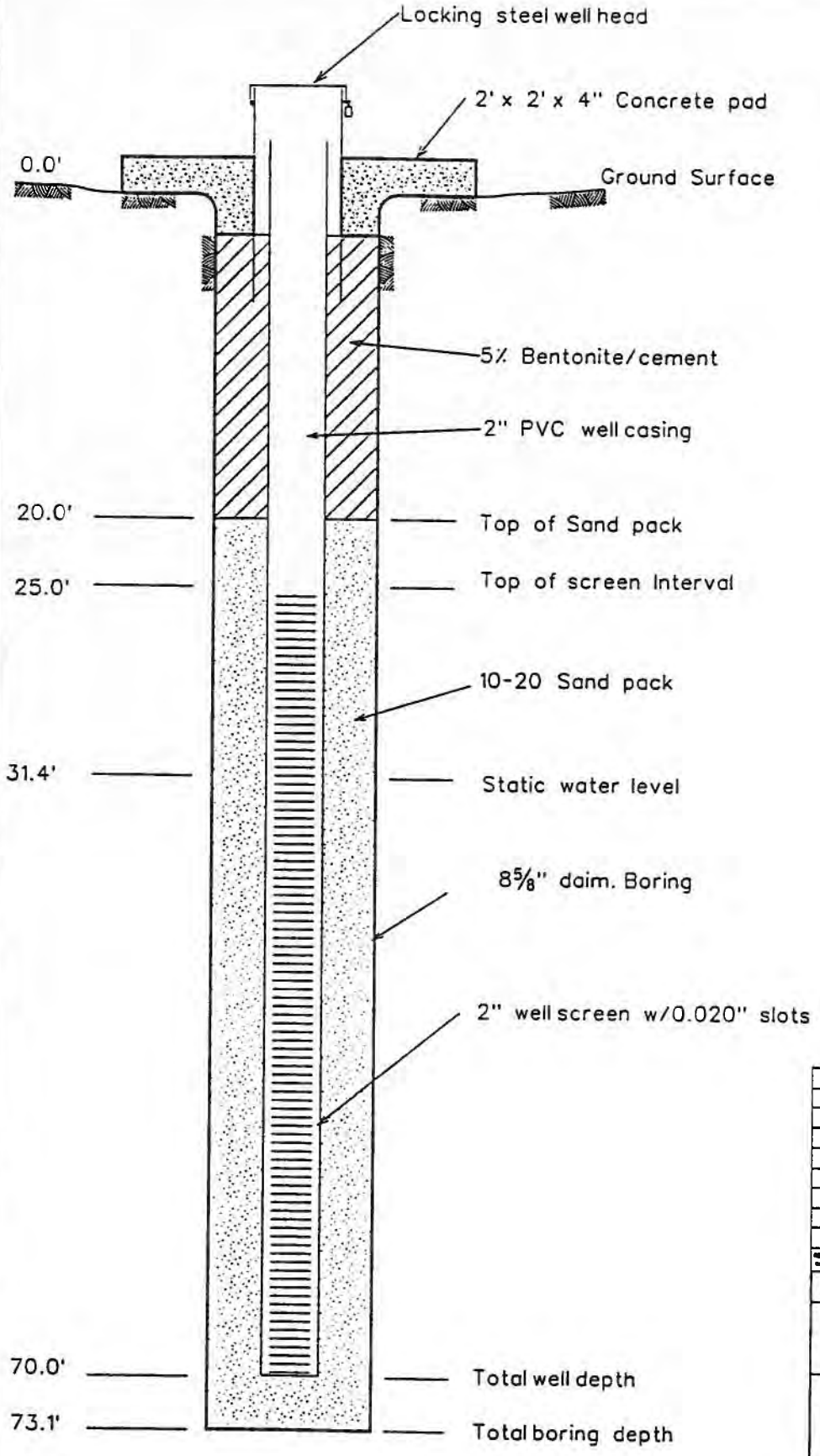
BORING NUMBER: Bitsui-6
TOTAL DEPTH: 76.0'
LOGGER: KEROY VALDEZ
NORTHING: 2,081,971.3
EASTING: 330,239.4
COLLAR ELEVATION: 5,195.6
DATE COLLARED: 31-Jan-1996
DATE BOTTOMED: 30-Jan-1996

FORMATION RECORD

Interval	Thickness	Description
0.0-2.0	2.0	Tan, sandy topsoil material, fine to coarse grained, soft.
2.0-7.0	5.0	Tan/gray, sandy spoil material, with shale and rounded sandstone, fine to coarse grained.
7.0-8.0	1.0	Tan/gray sandy spoil material with shale and rounded sandstone, fine to coarse grained.
8.0-23.0	15.0	Gray sandy spoil materiel with shale and rounded sandstone, fine to coarse grained.
23.0-38.0	15.0	Gray sandy spoil with shale and rounded sandstone, fine grained.
38.0-60.0	22.0	No material came up.
60.0-63.0	3.0	Hard rock and slow drilling.
63.0-76.0	13.0	No material came up, stopped activity at this point to have the water stabilize overnight.
76.0' T.D.		

DATE PREPARED: Feb. 03-96

PREPARED BY: K. valdez



REV. NO.	DATE	DRAWN BY	REVISION DESCRIPTION	ENG.	G.A.	P.E.

BHP NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 155 FRUITLAND, NEW MEXICO 87416

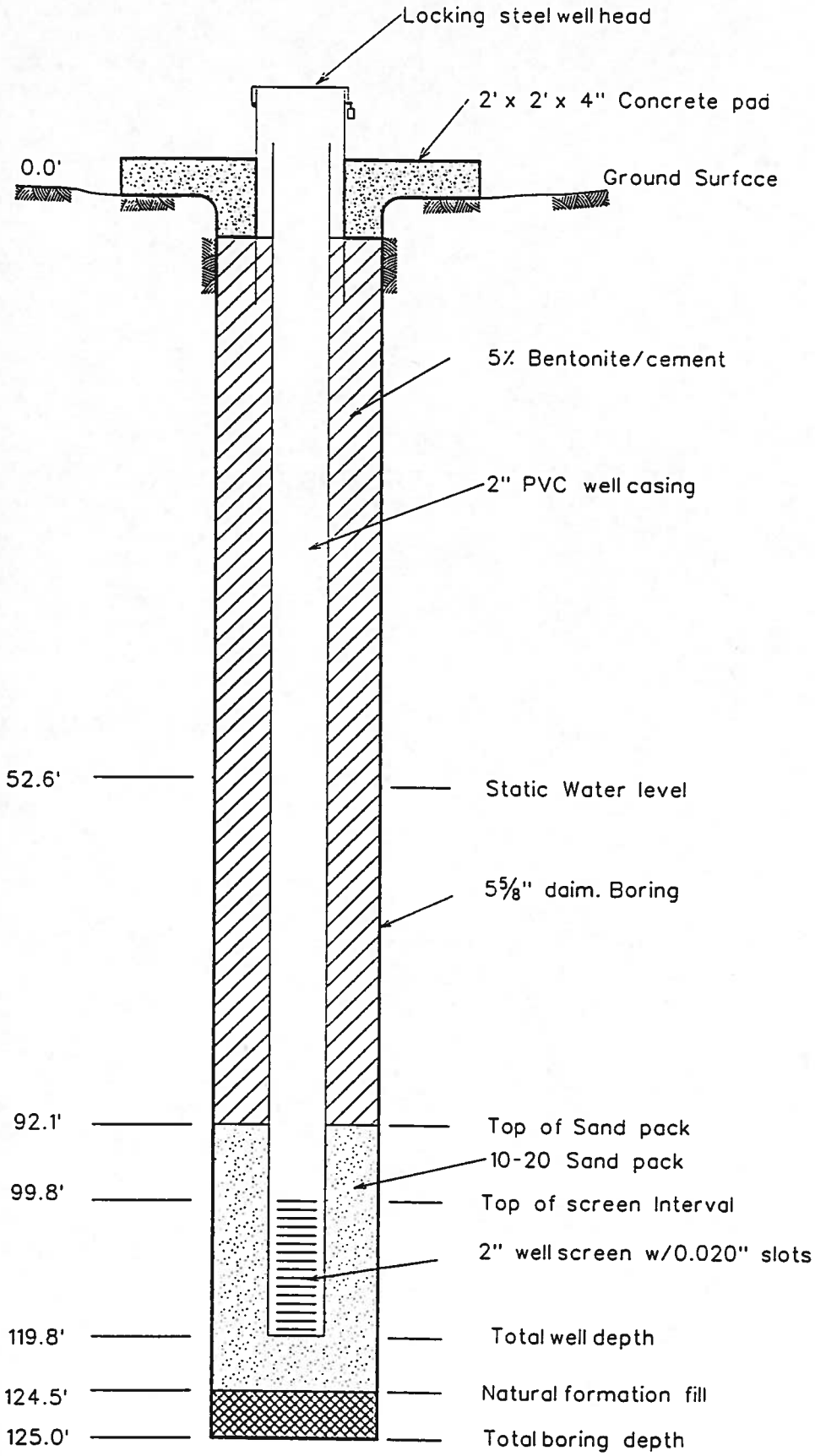
BITSUI-1

WELL CONSTRUCTION DIAGRAM

SUPPLEMENTAL

GROUNDWATER STUDY

PREPARED BY PJS	DRAWN BY PJS	SCALE N.T.S.
APPROVED BY	DATE OCT 13, 1996	DWG. LOC.
DWG. No.	REF. DWG.	



BHP NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 155 FRUITLAND, NEW MEXICO 87416

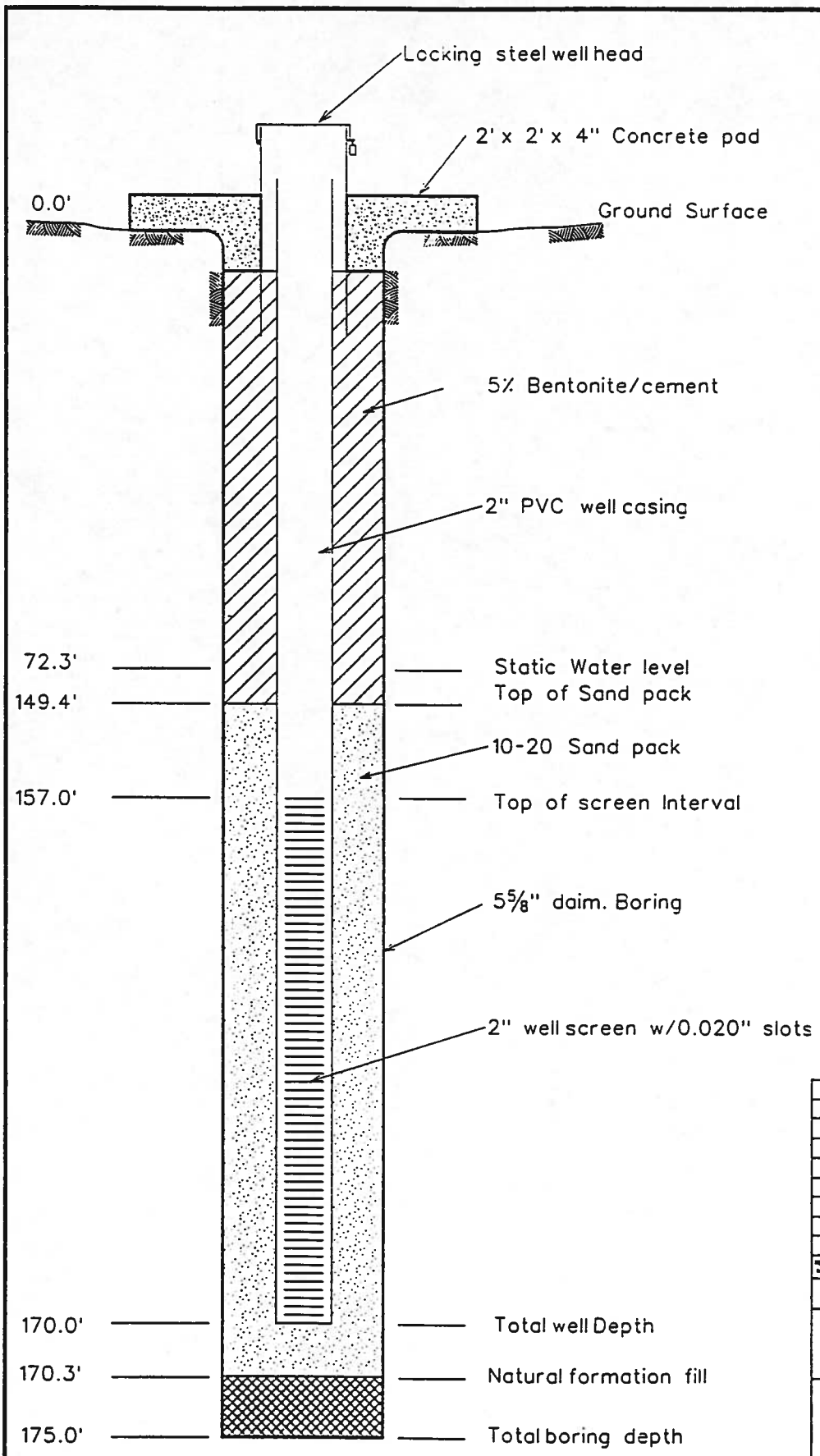
BITSUI-2

WELL CONSTRUCTION DIAGRAM

SUPPLEMENTAL

GROUNDWATER STUDY

PREPARED BY PJF	DRAWN BY PJF	SCALE N.T.S.
APPROVED BY	DATE OCT 12, 1996	DWG. LOC.
DWG. No.	REF. DWG.	



REV. No.	DATE	DRAWN BY	REVISED DESCRIPTION	CHK.	E.O.	P.E.	P.O.

BHP NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 35 FRUITLAND, NEW MEXICO 87416

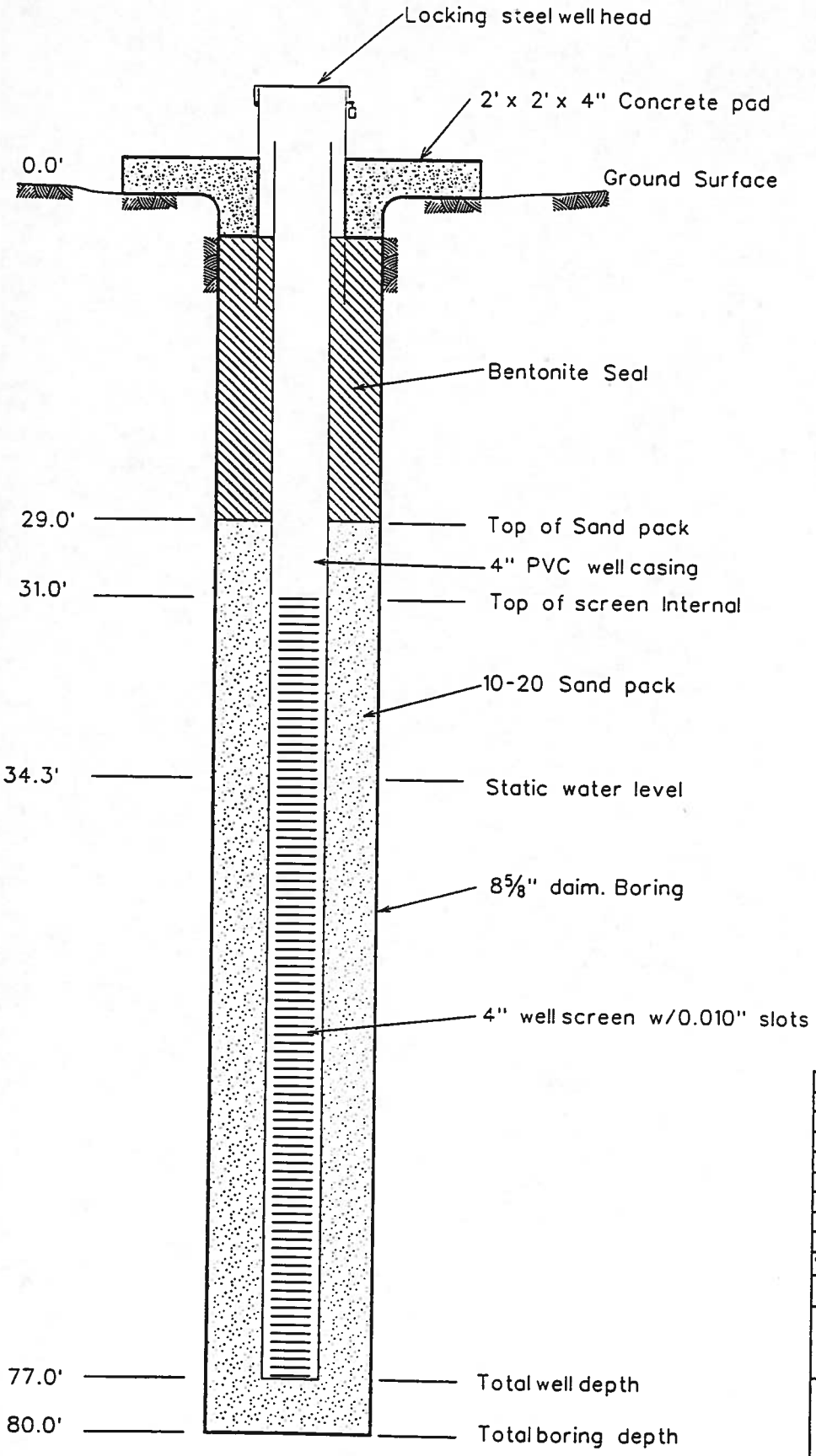
BITSUI-3

WELL CONSTRUCTION DIAGRAM

SUPPLEMENTAL

GROUNDWATER STUDY

PREPARED BY P.J.	DRAWN BY P.J.	SCALE N.T.S.
APPROVED BY	DATE OCT 13, 1996	DWG. LOC.
DWG. No.	REF. DWG.	



REV. NO.	DATE	DRAWN BY	REVISION DESCRIPTION	CHK.	E.C.	P.E.	P.S.

BHP NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 155 FRUITLAND, NEW MEXICO 87416

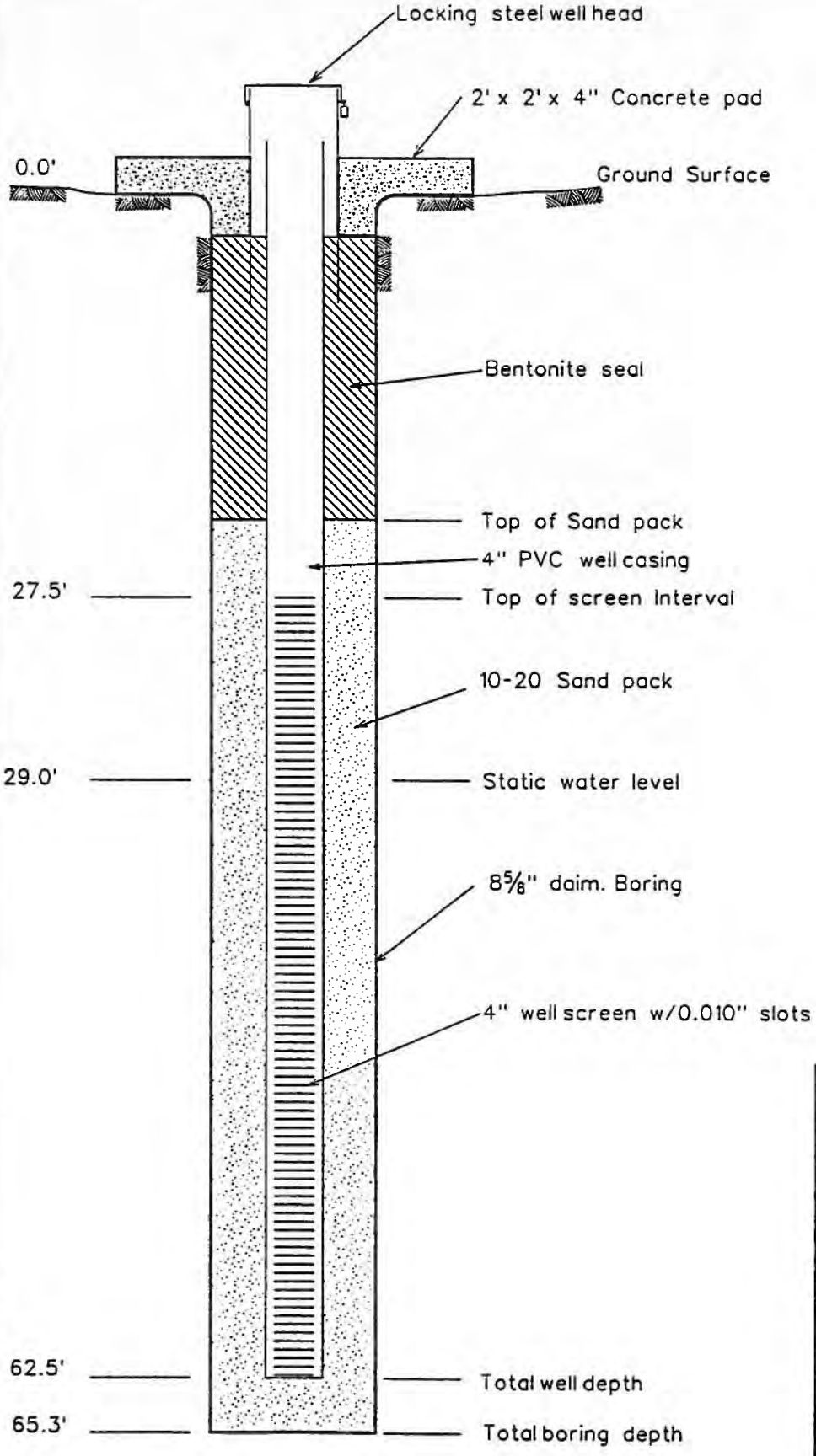
BITSUI-4

WELL CONSTRUCTION DIAGRAM

SUPPLEMENTAL

GROUNDWATER STUDY

PREPARED BY PJF	DRAWN BY PJF	SCALE N.T.S.
APPROVED BY	DATE OCT 13, 1996	DWG. LOC.
DWG. No.	REF. DWG.	



BHP NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 125 FRUITLAND, NEW MEXICO 87416

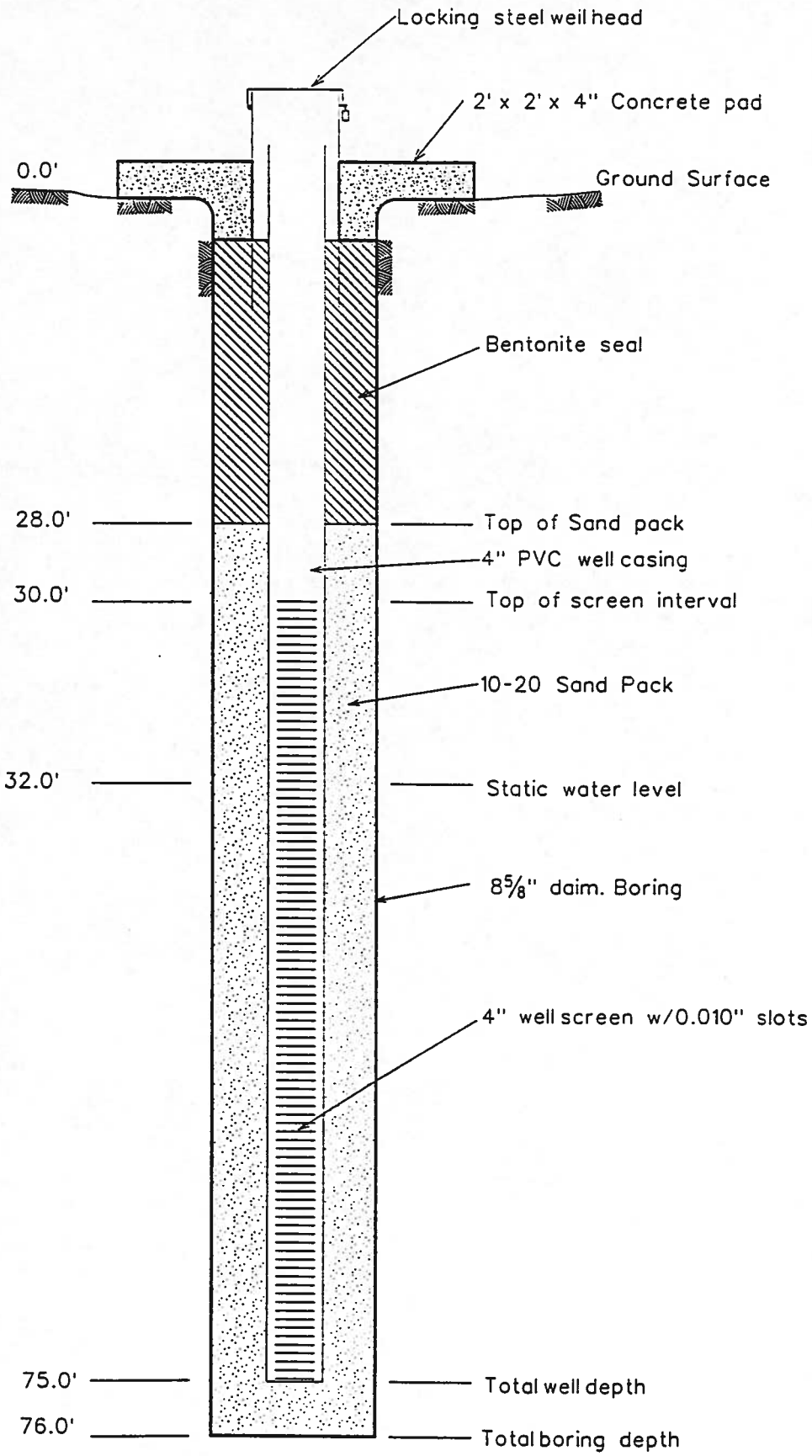
BITSUI-5

WELL CONSTRUCTION DIAGRAM

SUPPLEMENTAL

GROUNDWATER STUDY

PREPARED BY P.F	DRAWN BY P.F	SCALE N.T.S.
APPROVED BY	DATE OCT 13, 1996	DWG. LOC.
DWG. No.	REF. DWG.	



REV. No.	DATE	DRAWN BY	REVISION DESCRIPTION	ENGL	E.M.	P.E.	P.L.

BHP NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 185 FRUITLAND, NEW MEXICO 87416

BITSUI-6

WELL CONSTRUCTION DIAGRAM

SUPPLEMENTAL

GROUNDWATER STUDY

PREPARED BY P.J.F.	DRAWN BY P.J.F.	SCALE N.T.S.
APPROVED BY	DATE OCT 13, 1996	DWG. LOC.
DWG. No.	REF. DWG.	

APPENDIX B
LEACH STUDY
TABLE 27.B2 AND TABLE 27.B20

November 1996

BHP Minerals

Navajo Mine

Fruitland

TABLE 27.B2

WATER ANALYSIS SUMMARY

PARAMETER	UNITS	SAMPLE IDENTIFICATION SURFACE WATER	COMPOSITE 1	COMPOSITE 2	COMPOSITE 3
General Chemistry:					
Acidity	mg/ℓ[1] $CaCO_3$	<1	<1	NA[3]	<1
Alkalinity	mg/ℓ $CaCO_3$	88	3,100	NA	940
Chloride	mg/ℓ	15	380	7.5	310
Cyanide	mg/ℓ	<0.02	<0.02	<0.01	<0.02
Fluoride	mg/ℓ	1.0	2.2	0.62	2.6
Nitrate	mg/ℓ NO_3-N	9.7	4.5	0.03	1.3
pH	--	7.80	8.80	11.98	8.70
Phenolics	mg/ℓ	<0.01	<0.01	0.07	0.01
Residue:					
Filterable @ 180°C	mg/ℓ	1,900	4,400	7,260	4,100
Specific Conductance	umhos/cm @ 25°C	2,310	5,900	NA	6,000
Sulfate	mg/ℓ SO_4^{-2}	1,200	22	<1.0	1,500
Metals:					
Aluminum	mg/ℓ	0.69/0.75[2]	0.68	5.0	1.3
Arsenic	mg/ℓ	<0.001	0.004	<0.001	0.008
Barium	mg/ℓ	0.03/0.02	1.5	3.9	0.06
Boron	mg/ℓ	0.31	0.97	<0.01	0.20
Cadmium	mg/ℓ	<0.001/<0.002	<0.001/0.002	<0.004/0.004	0.002/0.002
Calcium	mg/ℓ	230	11	620	36
Chromium	mg/ℓ	0.002	0.001	0.14	0.006
Cobalt	mg/ℓ	<0.001/0.001	0.008/0.002	<0.01/<0.004	0.014/0.012
Copper	mg/ℓ	0.04/0.031	0.02/0.051	<0.02/0.029	<0.01/0.017
Iron	mg/ℓ	0.45	2.8	0.07	3.7/3.8
Lead	mg/ℓ	<0.01/<0.01	0.03/0.03	0.1	0.02/<0.01
Magnesium	mg/ℓ	28	3.6	0.8	4.5
Manganese	mg/ℓ	0.08	0.47	0.06	0.38
Mercury (Total)	mg/ℓ	<0.0002	<0.0002	<0.001	<0.0002
Molybdenum	mg/ℓ	<0.001	0.005	<0.05	0.003
Nickel	mg/ℓ	0.04	0.11	<0.01	0.07
Potassium	mg/ℓ	11	7.2	66	8.4
Selenium	mg/ℓ	<0.001	0.006	<0.018	0.014
Silver	mg/ℓ	<0.001/<0.002	<0.001/<0.002	<0.002	0.001/<0.002
Sodium	mg/ℓ	280	1,600	2,300	1,400
Zinc	mg/ℓ	0.06	0.07	0.04	0.08
Total Alpha	pCi/ℓ[4]	0.5±0.5	1.7±0.6	1.0±0.5	0.8±0.7
Total Beta	pCi/ℓ	4.7±4.7	4.2±4.1	5.2±4.5	4.0±4.3
Total Radium (226 and 228)	pCi/ℓ	0.3±0.6	0.3±0.6	0.5±0.7	0.2±0.5

TABLE 27.B2
(Continued)

PARAMETER	UNITS	SAMPLE IDENTIFICATION COMPOSITE 4	COMPOSITE 5
General Chemistry:			
Acidity	mg/ℓ[1] $CaCO_3$	<1	<1
Alkalinity	mg/ℓ $CaCO_3$	510	940
Chloride	mg/ℓ	5,200	2,000
Cyanide	mg/ℓ	<0.02	<0.02
Fluoride	mg/ℓ	0.3	1.3
Nitrate	mg/ℓ NO_3-N	18	11
pH	—	8.20	9.50
Phenolics	mg/ℓ	0.04	0.02
Residue:			
Filterable @ 180°C	mg/ℓ	9,800	4,600
Specific Conductance	umhos/cm @ 25°C	15,600	8,100
Sulfate	mg/ℓ SO_4^{-2}	120	55
Metals:			
Aluminum	mg/ℓ	<0.01	1.7
Arsenic	mg/ℓ	0.015	0.017
Barium	mg/ℓ	0.92	2.5
Boron	mg/ℓ	0.53	0.42
Cadmium	mg/ℓ	0.001	0.002/<0.001
Calcium	mg/ℓ	140	140
Chromium	mg/ℓ	0.008	0.034
Cobalt	mg/ℓ	0.035/0.034	0.017
Copper	mg/ℓ	<0.01	0.04
Iron	mg/ℓ	0.15	5.6
Lead	mg/ℓ	0.12	0.08
Magnesium	mg/ℓ	32	11
Manganese	mg/ℓ	0.03	0.70/0.70
Mercury (Total)	mg/ℓ	<0.0002	<0.0002
Molybdenum	mg/ℓ	0.025	0.008/0.006
Nickel	mg/ℓ	0.11	0.04/0.04
Potassium	mg/ℓ	19	12
Selenium	mg/ℓ	0.011	0.020
Silver	mg/ℓ	<0.001/<0.002	0.015/<0.002
Sodium	mg/ℓ	3,500	1,600
Zinc	mg/ℓ	0.21/0.22	0.09
Total Alpha	pCi/ℓ[4]	1.9±0.5	<0.1
Total Beta	pCi/ℓ	4.0±3.7	3.9±3.9
Total Radium (226 and 228)	pCi/ℓ	0.4±0.6	0.4±0.6

(1) mg/ℓ = milligrams per liter or parts per million.
(2) The indicated sample was analyzed in duplicate.
(3) Not analyzed.
(4) pCi/ℓ = pico curies per liter.

1:4 ASTM LEACHATE ANALYSIS SUMMARY
FOR FLY ASH

Amended 02/88, 01/89
27-B-52

PARAMETER	UNITS	FLY ASH LEACHED WITH: SURFACE WATER	COMPOSITE 1	COMPOSITE 3
General Chemistry:				
Acidity	mg/ℓ(1) $CaCO_3$	<1	<1	<1
Alkalinity	mg/ℓ $CaCO_3$	820	2,600	840
Chloride	mg/ℓ	16	360	290
Cyanide	mg/ℓ	<0.02	<0.02	<0.02
Fluoride	mg/ℓ	1.9	1.6	0.4
Nitrate	mg/ℓ NO_3-N	3.3	2.0	2.0
pH	—	12.20	10.30	11.80
Phenolics	mg/ℓ	0.03	0.03	0.03
Residue:				
Filterable @ 180°C	mg/ℓ	2,000	4,300	4,500
Specific Conductance	µmhos/cm @ 25°C	5,490	7,470	7,350
Sulfate	mg/ℓ SO_4^{-2}	590	510	1,200
Metals:				
Aluminum	mg/ℓ	0.8	15	16
Arsenic	mg/ℓ	0.009	1.00	0.140
Barium	mg/ℓ	0.49	0.30	0.33
Boron	mg/ℓ	1.0	20	12
Cadmium	mg/ℓ	<0.001	<0.001	<0.001
Calcium	mg/ℓ	290	7	80
Chromium	mg/ℓ	0.14	0.24	0.22
Cobalt	mg/ℓ	<0.001	0.005	0.004
Copper	mg/ℓ	<0.01	<0.01	<0.01
Iron	mg/ℓ	0.02	0.07	0.04
Lead	mg/ℓ	<0.01	0.01	0.01
Magnesium	mg/ℓ	0.2	0.8	0.2
Manganese	mg/ℓ	0.02	0.02	<0.01
Mercury	mg/ℓ	<0.0002	<0.0002	<0.0002
Molybdenum	mg/ℓ	1.4	0.75	0.64
Nickel	mg/ℓ	<0.01	<0.01	<0.01
Potassium	mg/ℓ	17	7.0	9.2
Selenium	mg/ℓ	0.09	0.83	0.32
Silver	mg/ℓ	<0.001/<0.001	<0.001/0.002	0.001
Sodium	mg/ℓ	380	1,300	1,100
Zinc	mg/ℓ	0.01	0.01	0.01

PARAMETER	UNITS	COMPOSITE 4	COMPOSITE 5	DEIONIZED WATER
General Chemistry:				
Acidity	mg/ℓ[1] $CaCO_3$	<1	<1	<1
Alkalinity	mg/ℓ $CaCO_3$	960	1,000	1,400
Chloride	mg/ℓ	5,600	2,100	3.9
Cyanide	mg/ℓ	<0.02	0.04	<0.02
Fluoride	mg/ℓ	3.1	1.9	3.3
Nitrate	mg/ℓ NO_3-N	19	3.3	2.5
pH	—	12.00	12.15	12.10
Phenolics	mg/ℓ	0.03	0.05	0.05
Residue:				
Filterable @ 180°C	mg/ℓ	10,000	4,800	1,600
Specific Conductance	µmhos/cm @ 25°C	1,970	12,500	5,710
Sulfate	mg/ℓ SO_4^{-2}	320	370	130
Metals:				
Aluminum	mg/ℓ	0.3	2.0	<0.1
Arsenic	mg/ℓ	0.017	0.030	0.010
Barium	mg/ℓ	1.3	1.7	4.9
Boron	mg/ℓ	6.2	6.2	5.1
Cadmium	mg/ℓ	<0.001	<0.001	<0.001/<0.001
Calcium	mg/ℓ	520	160	590
Chromium	mg/ℓ	0.070	0.118	0.036
Cobalt	mg/ℓ	0.070	0.006	<0.001
Copper	mg/ℓ	<0.01	<0.01	<0.01/0.05
Iron	mg/ℓ	0.04	0.03	0.02
Lead	mg/ℓ	0.19	0.04	<0.01/<0.01
Magnesium	mg/ℓ	0.2	<0.1	0.2
Manganese	mg/ℓ	0.02	<0.01	0.02/0.02
Mercury	mg/ℓ	0.0006	<0.0002	<0.0002
Molybdenum	mg/ℓ	1.5	1.2	1.5
Nickel	mg/ℓ	0.05	<0.01	0.07
Potassium	mg/ℓ	22	14	2.0/2.0
Selenium	mg/ℓ	0.22	0.38	0.24
Silver	mg/ℓ	0.001/0.002	<0.001/0.001	0.016/0.014
Sodium	mg/ℓ	3,000	1,900	41
Zinc	mg/ℓ	0.01	0.01	0.04/0.04

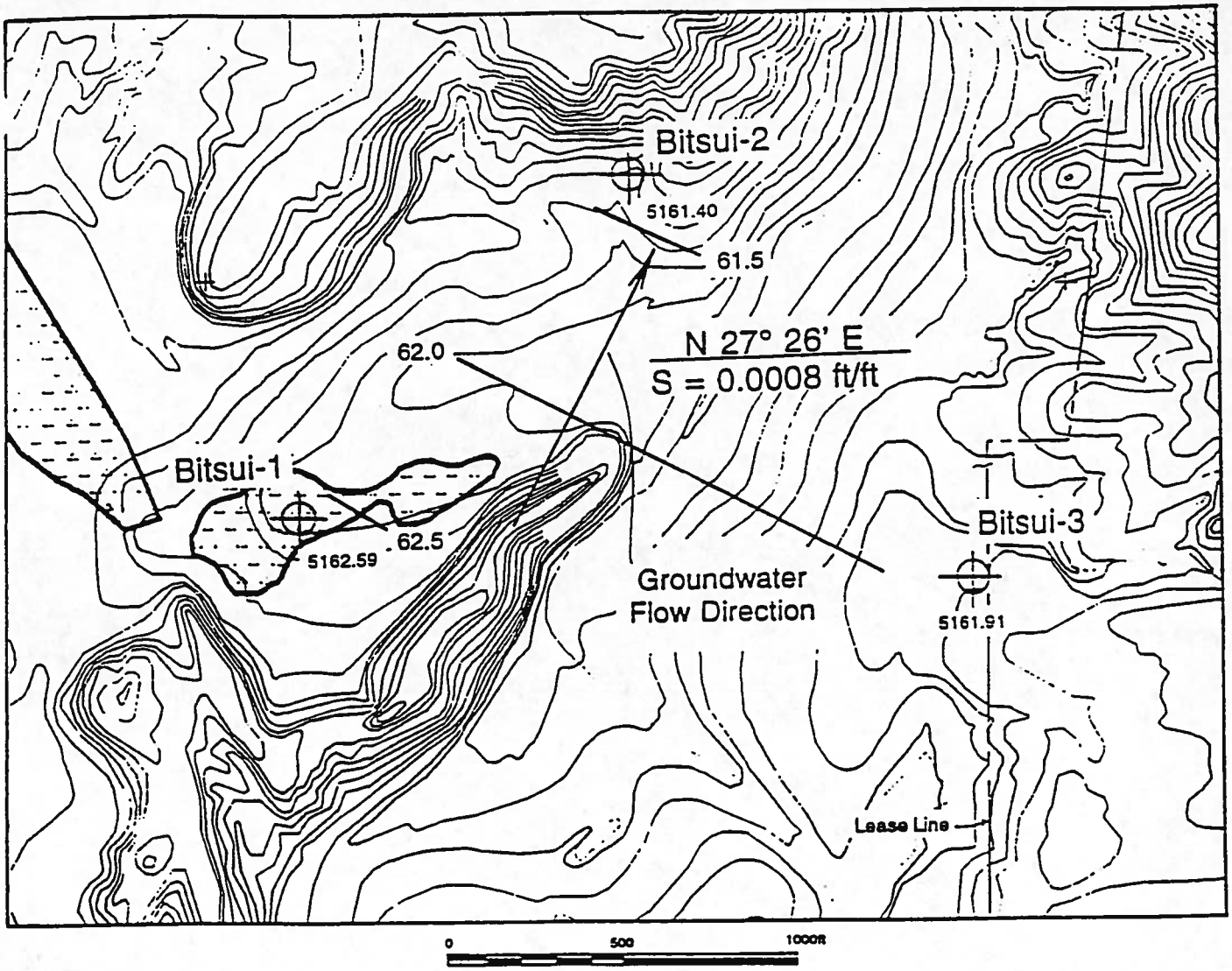
APPENDIX C
GROUNDWATER POTENTIOMETRIC MAPS

November 1996

BHP Minerals

Navajo Mine

Fruitland



LEGEND

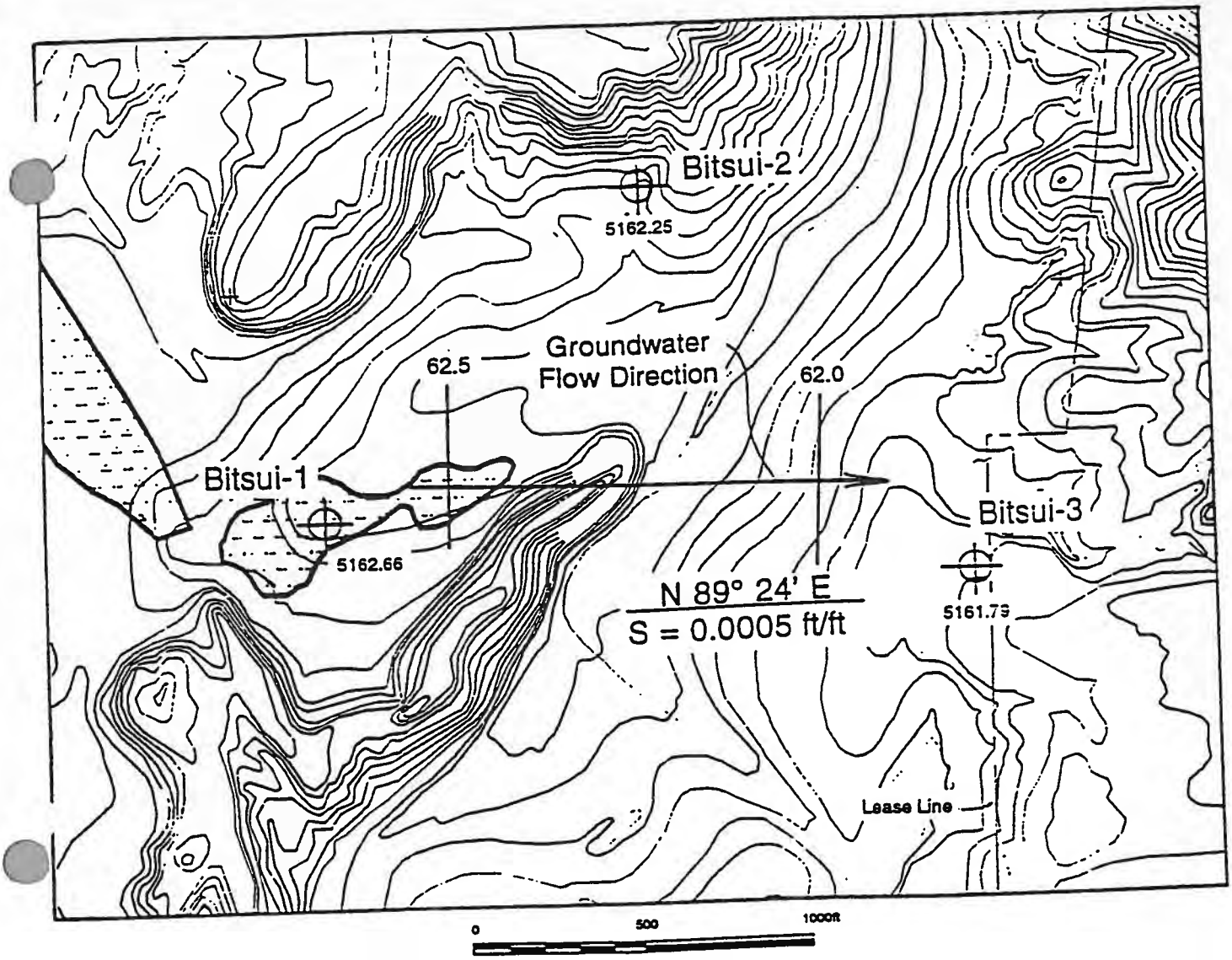
Monitoring Well

Ash Management Area

N

FIGURE 2

WATER TABLE CONTOUR MAP
February 17, 1995



LEGEND

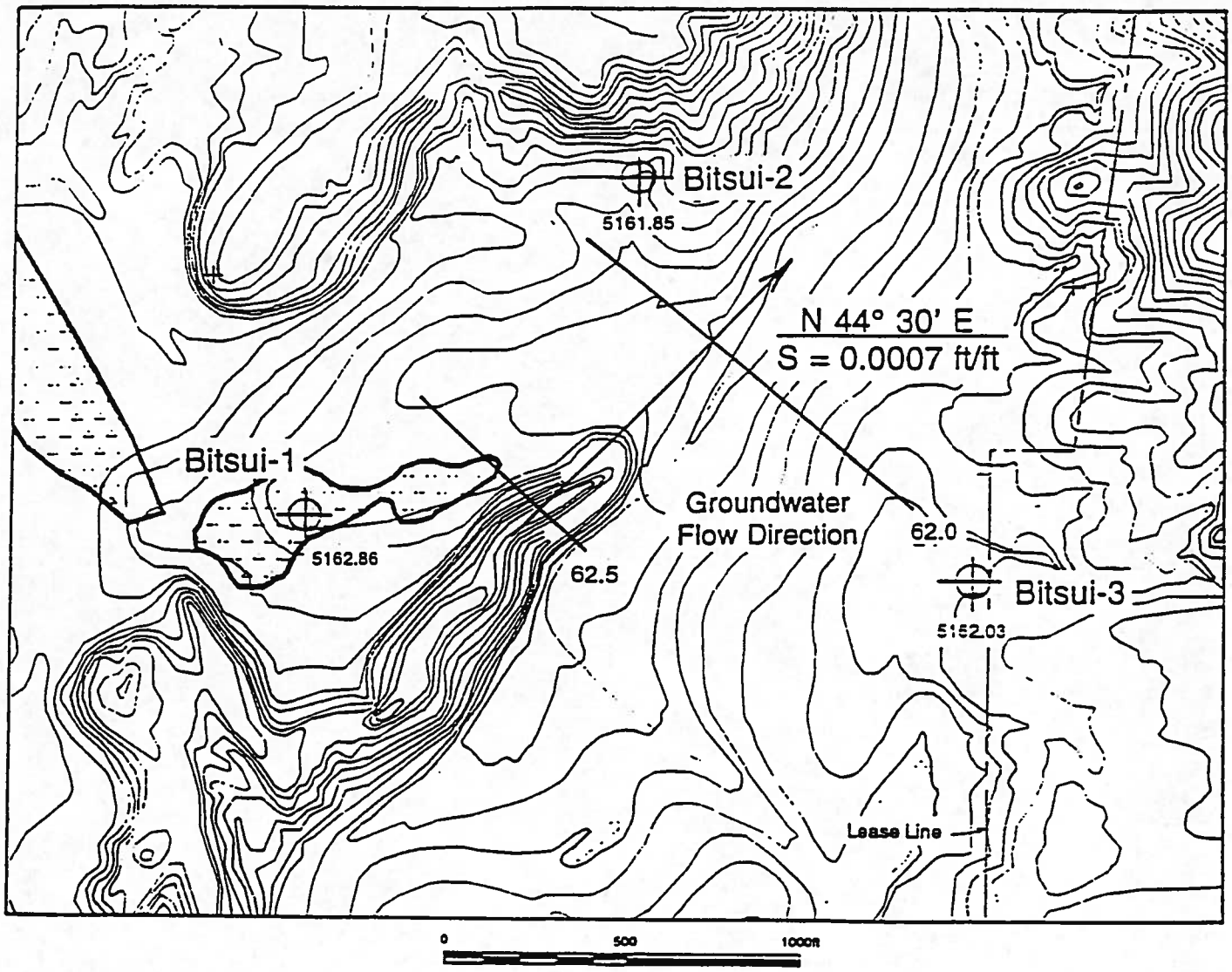
Monitoring Well

Ash Management Area

N

FIGURE 3

WATER TABLE CONTOUR MAP
March 1, 1995



LEGEND

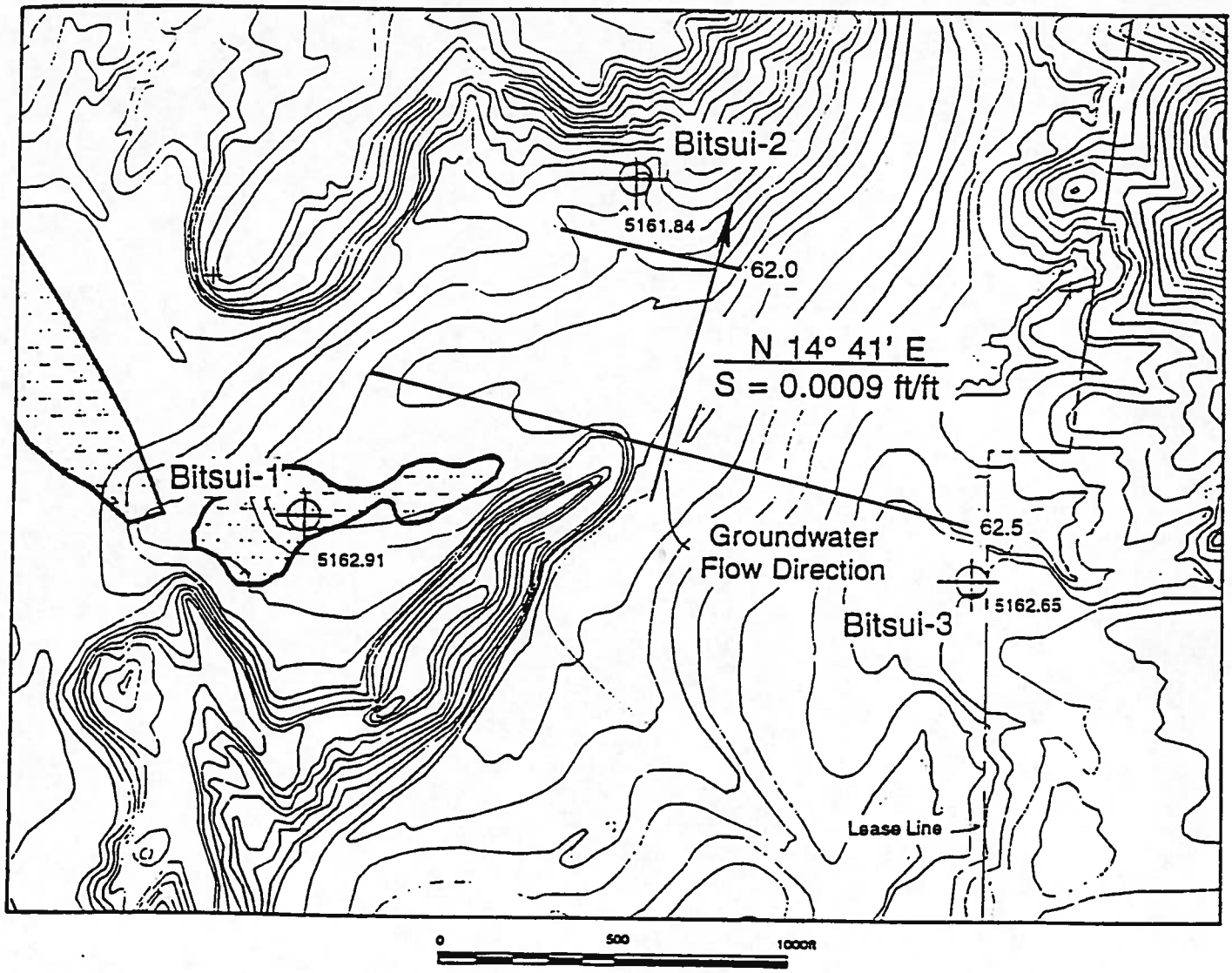
Monitoring Well

Ash Management Area

N

FIGURE 4

WATER TABLE CONTOUR MAP
April 27, 1995



LEGEND

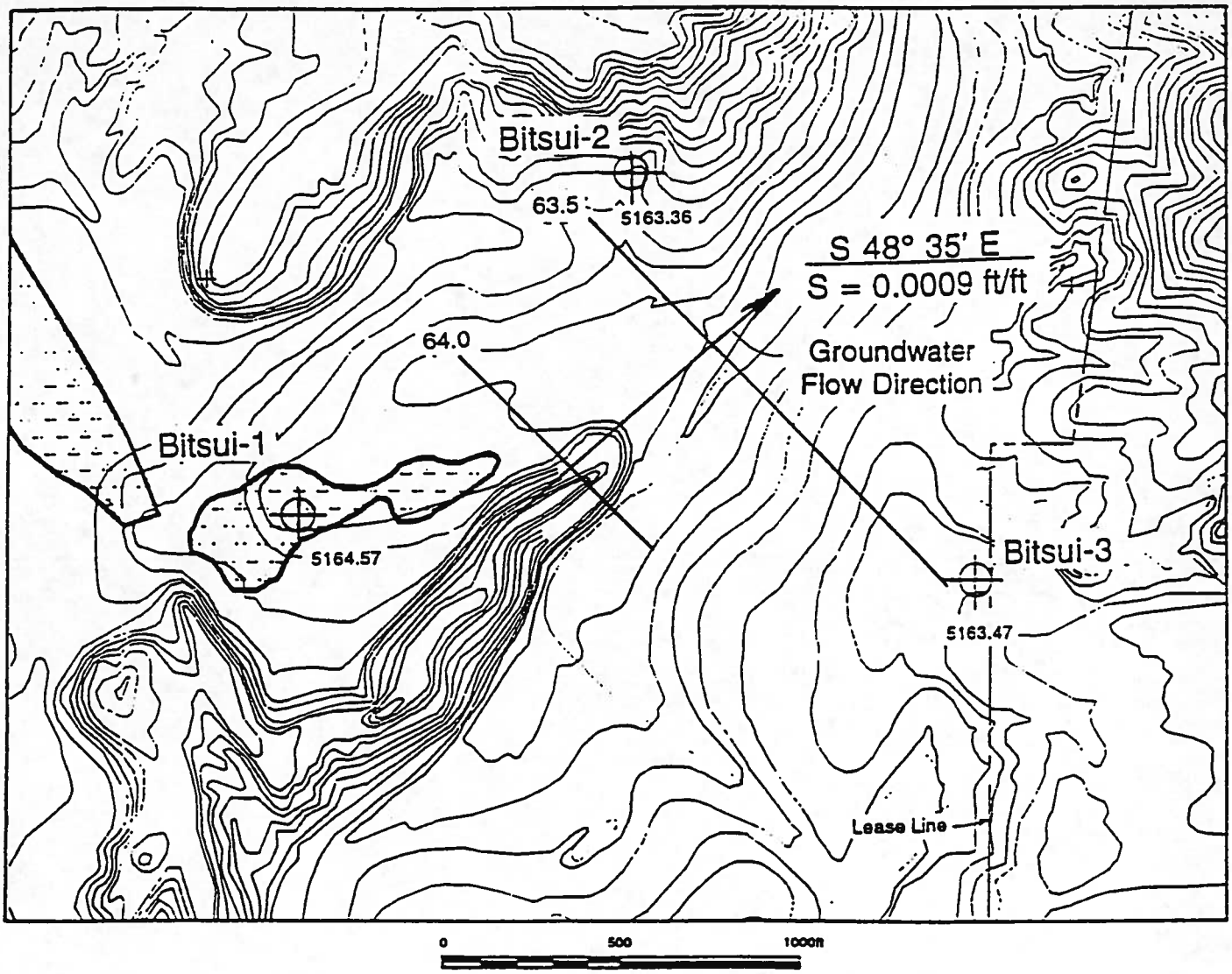
Monitoring Well

Ash Management Area

N

FIGURE 5

WATER TABLE CONTOUR MAP
May 18, 1995



LEGEND

Monitoring Well

Ash Management Area

N

FIGURE 6

WATER TABLE CONTOUR MAP
October 18, 1995

APPENDIX D

ANALYTICAL DATA AND RESULTS

D-1	**Groundwater Data Summary Tables**
D-2	**Piper Trilinear Plots**
D-3	**Statistical Summary Reports**
D-4	**Original Laboratory Data**
D-5	**Electronic Data (Originally submitted in June 1996 submission).**
D-6	**Water Quality Graphs**

APPENDIX D

ANALYTICAL DATA AND RESULTS

D-1 Groundwater Data Summary Tables

November 1996

BHP Minerals

Navajo Mine

Fruitland

BHP MINERALS, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER QUALITY DATA

Sample Range: From 03/01/95 Through 04/30/96

Station Name:		BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1
Sample Date:		03/01/95	04/27/95	05/19/95	10/18/95	01/02/96
LABORATORY MEASUREMENTS						
pH	(S.U.)	8.70	8.80	8.80	8.90	8.80
Conductivity	(umho/cm)	17800	18100	25900	17800	17300
TDS (180 deg C)	(mg/l)	14200	14200	14200	14200	14700
Boron	(mg/l)	9.20	7.60	8.44	6.98	8.30
Fluoride	(mg/l)	2.60	2.64	2.71	2.51	4.39
Nutrients						
Nitrate as N	(mg/l)	1.40	2.40	1.50	-0.01	0.73
Nitrite as N	(mg/l)	-0.01	-0.01	-0.01	-0.01	-0.05
Major Ions						
Bicarbonate as HCO3	(mg/l)	1020.00	1160.00	1180.00	1010.00	837.00
Carbonate as CO3	(mg/l)	82.00	60.00	84.00	108.00	96.00
Sulfate	(mg/l)	6780.00	6680.00	7100.00	6850.00	6990.00
Sulfide	(mg/l)	0.570	N	-0.010	N	-0.010
Calcium	(mg/l)	46.00	56.00	45.00	56.00	63.00
Magnesium	(mg/l)	28.00	34.00	29.00	27.00	32.00
Sodium	(mg/l)	4980.00	4970.00	4830.00	4860.00	5040.00
Potassium	(mg/l)	27.00	54.00	23.00	20.00	20.00
Chloride	(mg/l)	1880.00	2050.00	2070.00	1950.00	1980.00
Total Phosphorus	(mg/l)	1.89	1.88	N	N	N
Major Cations	(meq/l)	221.91	223.15	215.32	216.92	225.51
Major Anions	(meq/l)	213.75	218.08	228.47	217.77	218.36
Charge Balance	(percent)	1.87	1.15	2.96	0.20	1.61
Lab Determined Cations	(meq/l)	221.80	223.26	215.22	216.89	225.36
Lab Determined Anions	(meq/l)	213.93	218.10	228.70	218.06	218.69
Lab Determined Ion Balance	(percent)	1.81	1.17	3.04	0.27	1.50
Trace Metals (Dissolved)						
Aluminum	(mg/l)	-0.100	N	-0.100	N	0.150
Arsenic	(mg/l)	0.040	0.030	0.040	N	0.036
Barium	(mg/l)	-0.050	-0.500	-0.500	-0.500	0.030
Beryllium	(mg/l)	-0.0010	N	-0.0010	N	-0.0050
Cadmium	(mg/l)	0.0030	-0.0020	-0.0050	-0.0020	-0.0020
Copper	(mg/l)	-0.010	N	-0.010	N	-0.010
Iron	(mg/l)	-0.050	-0.050	-0.050	-0.050	-0.050
Lead	(mg/l)	0.006	0.011	-0.050	-0.005	-0.005
Manganese	(mg/l)	0.110	0.094	0.100	0.080	0.100
Mercury	(mg/l)	-0.00100	N	-0.00100	N	-0.00100
Selenium	(mg/l)	0.009	0.007	0.007	0.016	0.010
Silica as Si	(mg/l)	6.950	N	6.660	N	6.970
Silver	(mg/l)	-0.010	-0.010	-0.010	N	-0.010
Zinc	(mg/l)	0.050	-0.010	-0.010	N	-0.010
Trace Metals (Total)						
Total Iron	(mg/l)	1.50	0.90	1.06	0.62	0.65
Total Manganese	(mg/l)	0.14	0.11	0.11	0.07	0.10

Note: N => No measurement

BHP MINERALS, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER QUALITY DATA

Sample Range: From 03/01/95 Through 04/30/96

Station Name:		BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2
Sample Date:		03/02/95	04/27/95	05/19/95	10/18/95	01/02/96
LABORATORY MEASUREMENTS						
pH	(S.U.)	8.00	8.00	8.00	8.00	7.90
Conductivity	(umho/cm)	8080	8110	12100	7730	7590
TDS (180 deg C)	(mg/l)	5050	5020	5010	4910	5020
Boron	(mg/l)	0.93	0.91	1.03	0.83	1.01
Fluoride	(mg/l)	0.79	1.78	1.75	1.69	2.66
Nutrients						
Nitrate as N	(mg/l)	-0.01	0.15	-0.01	0.50	0.83
Nitrite as N	(mg/l)	-0.01	-0.01	0.05	-0.02	-0.05
Major Ions						
Bicarbonate as HCO3	(mg/l)	3480.00	3460.00	3520.00	3420.00	3610.00
Carbonate as CO3	(mg/l)	0.00	0.00	0.00	0.00	0.00
Sulfate	(mg/l)	7.00	48.00	28.00	17.00	4.50
Sulfide	(mg/l)	28.200	N	65.500	N	34.000
Calcium	(mg/l)	3.60	6.60	8.60	8.60	6.40
Magnesium	(mg/l)	1.50	2.70	3.00	1.90	2.60
Sodium	(mg/l)	1940.00	2110.00	2090.00	1990.00	2080.00
Potassium	(mg/l)	7.00	13.00	1.60	7.00	5.10
Chloride	(mg/l)	1160.00	1220.00	1220.00	1170.00	1180.00
Total Phosphorus	(mg/l)	-0.20	-0.50	N	N	N
Major Cations	(meq/l)	84.87	92.66	91.63	87.33	88.83
Major Anions	(meq/l)	89.90	92.13	92.68	89.44	91.73
Charge Balance	(percent)	2.88	0.29	0.57	1.19	1.05
Lab Determined Cations	(meq/l)	85.07	92.51	91.60	87.52	90.01
Lab Determined Anions	(meq/l)	89.97	92.07	92.85	89.45	91.82
Lab Determined Ion Balance	(percent)	2.80	0.24	0.68	1.09	0.99
Trace Metals (Dissolved)						
Aluminum	(mg/l)	-0.010	N	-0.100	N	-0.100
Arsenic	(mg/l)	-0.005	-0.005	-0.005	N	-0.005
Barium	(mg/l)	2.690	2.700	2.890	2.420	2.960
Beryllium	(mg/l)	-0.0010	N	-0.0010	N	-0.0050
Cadmium	(mg/l)	-0.0020	-0.0020	-0.0020	-0.0020	-0.0020
Copper	(mg/l)	-0.010	N	-0.010	N	-0.010
Iron	(mg/l)	-0.050	-0.050	-0.050	-0.050	-0.050
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	-0.020	-0.020	-0.020	-0.020	-0.020
Mercury	(mg/l)	-0.00100	N	-0.00100	N	-0.00100
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005
Silica as Si	(mg/l)	4.360	N	4.340	N	4.330
Silver	(mg/l)	-0.010	-0.010	-0.010	N	-0.010
Zinc	(mg/l)	-0.010	0.010	0.030	N	-0.010
Trace Metals (Total)						
Total Iron	(mg/l)	0.07	0.11	0.07	-0.05	-0.05
Total Manganese	(mg/l)	-0.02	-0.02	-0.02	-0.02	-0.02

Note: N => No measurement

BHP MINERALS, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER QUALITY DATA

Sample Range: From 03/01/95 Through 04/30/96

Station Name:		BITSUI-3	BITSUI-3	BITSUI-3	BITSUI-3	BITSUI-3
Sample Date:		03/02/95	04/27/95	05/18/95	10/18/95	12/29/95
LABORATORY MEASUREMENTS						
pH	(S.U.)	7.60	7.50	7.30	7.60	7.60
Conductivity	(umho/cm)	13000	13100	14600	12400	12600
TDS (180 deg C)	(mg/l)	7980	7740	7730	7790	8140
Boron	(mg/l)	1.07	1.00	1.05	0.92	1.08
Fluoride	(mg/l)	-0.01	0.99	0.99	1.02	1.27
Nutrients						
Nitrate as N	(mg/l)	1.00	4.10	-0.01	1.20	-0.05
Nitrite as N	(mg/l)	-0.01	-0.01	-0.01	-0.01	-0.05
Major Ions						
Bicarbonate as HCO3	(mg/l)	3.12	3050.00	3070.00	3220.00	2920.00
Carbonate as CO3	(mg/l)	0.00	0.00	0.00	0.00	0.00
Sulfate	(mg/l)	442.00	255.00	192.00	471.00	509.00
Sulfide	(mg/l)	6.100	N	2.800	N	-0.010
Calcium	(mg/l)	11.00	27.00	19.00	23.00	25.00
Magnesium	(mg/l)	5.20	12.00	6.10	12.00	10.00
Sodium	(mg/l)	3200.00	3150.00	3130.00	3390.00	3230.00
Potassium	(mg/l)	14.00	44.00	10.00	23.00	9.80
Chloride	(mg/l)	2820.00	3160.00	3080.00	2760.00	2810.00
Total Phosphorus	(mg/l)	-0.02	-0.50	N	N	N
Major Cations	(meq/l)	140.53	140.49	137.86	150.19	142.82
Major Anions	(meq/l)	88.86	144.72	141.19	140.52	137.72
Charge Balance	(percent)	22.52	1.48	1.19	3.33	1.82
Lab Determined Cations	(meq/l)	140.53	140.52	137.71	150.16	142.94
Lab Determined Anions	(meq/l)	139.99	144.57	141.36	140.75	137.78
Lab Determined Ion Balance	(percent)	0.19	1.42	1.31	3.23	1.84
Trace Metals (Dissolved)						
Aluminum	(mg/l)	-0.100	N	-0.100	N	-0.100
Arsenic	(mg/l)	-0.005	-0.005	-0.005	N	-0.005
Barium	(mg/l)	-0.500	1.300	0.510	-0.500	0.360
Beryllium	(mg/l)	-0.0010	N	-0.0010	N	-0.0050
Cadmium	(mg/l)	0.0040	-0.0020	-0.0050	-0.0020	-0.0020
Copper	(mg/l)	-0.010	N	-0.010	N	-0.010
Iron	(mg/l)	-0.050	-0.050	0.050	-0.050	-0.050
Lead	(mg/l)	0.012	0.033	-0.050	-0.005	-0.005
Manganese	(mg/l)	-0.020	-0.020	-0.020	-0.020	-0.020
Mercury	(mg/l)	-0.00100	N	-0.00100	N	-0.00100
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005
Silica as Si	(mg/l)	N	N	4.690	N	4.960
Silver	(mg/l)	-0.010	-0.010	-0.010	N	-0.010
Zinc	(mg/l)	-0.010	0.010	0.100	N	-0.010
Trace Metals (Total)						
Total Iron	(mg/l)	0.24	0.75	0.28	0.12	0.18
Total Manganese	(mg/l)	-0.02	-0.02	-0.02	-0.02	-0.02

Note: N => No measurement

BHP MINERALS, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER QUALITY DATA

Sample Range: From 03/01/95 Through 04/30/96

Station Name:		BITSUI-4	BITSUI-4	BITSUI-4
Sample Date:		01/26/96	02/12/96	04/10/96
LABORATORY MEASUREMENTS				
pH	(S.U.)	6.90	7.10	7.10
Conductivity	(umho/cm)	15700	14400	16500
TDS (180 deg C)	(mg/l)	15000	13100	13800
Boron	(mg/l)	1.71	1.49	1.54
Fluoride	(mg/l)	0.29	0.33	0.33
Nutrients				
Nitrate as N	(mg/l)	0.09	1.20	1.17
Nitrite as N	(mg/l)	-0.01	-0.01	0.05
Major Ions				
Bicarbonate as HCO3	(mg/l)	1760.00	1510.00	1650.00
Carbonate as CO3	(mg/l)	0.00	0.00	-1.00
Sulfate	(mg/l)	8640.00	6680.00	7860.00
Sulfide	(mg/l)	-0.010	-0.010	-0.010
Calcium	(mg/l)	15.00	287.00	231.00
Magnesium	(mg/l)	131.00	125.00	123.00
Sodium	(mg/l)	4650.00	3850.00	4280.00
Potassium	(mg/l)	538.00	22.00	19.20
Chloride	(mg/l)	634.00	451.00	651.00
Total Phosphorus	(mg/l)	N	N	-0.01
Major Cations	(meq/l)	227.55	192.64	208.31
Major Anions	(meq/l)	226.62	176.64	209.14
Charge Balance	(percent)	0.20	4.33	0.20
Lab Determined Cations	(meq/l)	228.00	192.63	208.00
Lab Determined Anions	(meq/l)	227.00	176.83	209.00
Lab Determined Ion Balance	(percent)	0.19	4.28	0.23
Trace Metals (Dissolved)				
Aluminum	(mg/l)	-0.100	-0.100	0.590
Arsenic	(mg/l)	-0.005	-0.005	-0.005
Barium	(mg/l)	0.030	-0.500	0.020
Beryllium	(mg/l)	-0.0050	-0.0010	-0.0010
Cadmium	(mg/l)	-0.0020	-0.0020	-0.0020
Copper	(mg/l)	-0.010	-0.010	-0.010
Iron	(mg/l)	-0.050	0.060	0.260
Lead	(mg/l)	-0.005	-0.005	-0.005
Manganese	(mg/l)	2.400	3.180	2.660
Mercury	(mg/l)	-0.00100	-0.00100	-0.00100
Selenium	(mg/l)	-0.005	-0.005	-0.005
Silica as Si	(mg/l)	-0.010	4.270	6.470
Silver	(mg/l)	-0.010	-0.010	-0.010
Zinc	(mg/l)	0.030	0.140	0.020
Trace Metals (Total)				
Total Iron	(mg/l)	4.67	16.60	4.21
Total Manganese	(mg/l)	2.41	3.35	2.52

Note: N => No measurement

BHP MINERALS, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER QUALITY DATA

Sample Range: From 03/01/95 Through 04/30/96

Station Name:		BITSUI-5	BITSUI-5
Sample Date:		02/13/96	04/11/96
LABORATORY MEASUREMENTS			
pH	(S.U.)	7.40	7.50
Conductivity	(umho/cm)	13000	14200
TDS (180 deg C)	(mg/l)	10300	10600
Boron	(mg/l)	1.10	1.13
Fluoride	(mg/l)	1.00	1.04
Nutrients			
Nitrate as N	(mg/l)	0.01	-0.05
Nitrite as N	(mg/l)	-0.05	-0.05
Major Ions			
Bicarbonate as HCO3	(mg/l)	3170.00	3090.00
Carbonate as CO3	(mg/l)	0.00	-1.00
Sulfate	(mg/l)	3550.00	4060.00
Sulfide	(mg/l)	-0.010	2.800
Calcium	(mg/l)	72.00	59.50
Magnesium	(mg/l)	30.00	27.50
Sodium	(mg/l)	3630.00	3830.00
Potassium	(mg/l)	16.00	14.10
Chloride	(mg/l)	1330.00	1210.00
Total Phosphorus	(mg/l)	N	-0.01
Major Cations	(meq/l)	164.37	172.19
Major Anions	(meq/l)	163.37	169.30
Charge Balance	(percent)	0.31	0.85
Lab Determined Cations	(meq/l)	164.49	172.00
Lab Determined Anions	(meq/l)	163.92	169.00
Lab Determined Ion Balance	(percent)	0.17	0.84
Trace Metals (Dissolved)			
Aluminum	(mg/l)	-0.100	0.110
Arsenic	(mg/l)	-0.005	-0.005
Barium	(mg/l)	-0.500	-0.500
Beryllium	(mg/l)	-0.0010	-0.0050
Cadmium	(mg/l)	-0.0020	-0.0020
Copper	(mg/l)	-0.010	-0.010
Iron	(mg/l)	0.480	0.310
Lead	(mg/l)	-0.005	-0.005
Manganese	(mg/l)	0.410	0.170
Mercury	(mg/l)	-0.00100	-0.00100
Selenium	(mg/l)	-0.005	-0.005
Silica as Si	(mg/l)	4.450	5.170
Silver	(mg/l)	-0.010	-0.010
Zinc	(mg/l)	0.010	0.030
Trace Metals (Total)			
Total Iron	(mg/l)	2.05	1.83
Total Manganese	(mg/l)	0.41	0.17

Note: N => No measurement

BHP MINERALS, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER QUALITY DATA

Sample Range: From 03/01/95 Through 04/30/96

Station Name:		BITSUI-6	BITSUI-6
Sample Date:		02/12/96	04/11/96
LABORATORY MEASUREMENTS			
pH	(S.U.)	7.10	7.20
Conductivity	(umho/cm)	14300	15100
TDS (180 deg C)	(mg/l)	13200	13300
Boron	(mg/l)	1.57	1.47
Fluoride	(mg/l)	0.30	0.31
Nutrients			
Nitrate as N	(mg/l)	6.20	0.08
Nitrite as N	(mg/l)	-0.05	-0.05
Major Ions			
Bicarbonate as HCO3	(mg/l)	1440.00	1500.00
Carbonate as CO3	(mg/l)	0.00	-1.00
Sulfate	(mg/l)	7690.00	7920.00
Sulfide	(mg/l)	-0.010	-0.010
Calcium	(mg/l)	327.00	296.00
Magnesium	(mg/l)	158.00	161.00
Sodium	(mg/l)	3780.00	3940.00
Potassium	(mg/l)	24.00	21.90
Chloride	(mg/l)	392.00	356.00
Total Phosphorus	(mg/l)	N	-0.01
Major Cations	(meq/l)	194.35	199.96
Major Anions	(meq/l)	195.21	199.53
Charge Balance	(percent)	0.22	0.11
Lab Determined Cations	(meq/l)	194.24	200.00
Lab Determined Anions	(meq/l)	195.32	200.00
Lab Determined Ion Balance	(percent)	0.28	0.09
Trace Metals (Dissolved)			
Aluminum	(mg/l)	-0.100	0.460
Arsenic	(mg/l)	-0.005	-0.005
Barium	(mg/l)	-0.500	-0.500
Beryllium	(mg/l)	-0.0010	-0.0050
Cadmium	(mg/l)	-0.0020	0.0110
Copper	(mg/l)	-0.010	-0.010
Iron	(mg/l)	-0.050	0.190
Lead	(mg/l)	-0.005	-0.005
Manganese	(mg/l)	3.260	2.730
Mercury	(mg/l)	-0.00100	-0.00100
Selenium	(mg/l)	-0.005	-0.005
Silica as Si	(mg/l)	4.280	5.790
Silver	(mg/l)	-0.010	-0.010
Zinc	(mg/l)	0.050	0.020
Trace Metals (Total)			
Total Iron	(mg/l)	20.00	1.25
Total Manganese	(mg/l)	3.55	2.54

Note: N => No measurement

BHP MINERALS, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER QUALITY DATA

Sample Range: From 03/01/95 Through 04/30/96

Station Name:		KF83-1	KF83-1	KF83-1	KF83-1	KF83-1
Sample Date:		05/03/95	06/14/95	06/21/95	07/14/95	08/26/95
LABORATORY MEASUREMENTS						
pH	(S.U.)	7.60	7.90	7.90	7.80	7.80
Conductivity	(umho/cm)	11500	9690	10300	9850	9300
TDS (180 deg C)	(mg/l)	6820	5750	5670	5850	5830
Boron	(mg/l)	0.87	1.00	0.97	0.92	1.00
Fluoride	(mg/l)	0.83	1.44	1.54	1.57	1.29
Nutrients						
Nitrate as N	(mg/l)	6.24	-0.01	18.20	-0.01	-0.01
Nitrite as N	(mg/l)	-0.01	-0.01	-0.01	-0.01	-0.01
Major Ions						
Bicarbonate as HCO3	(mg/l)	2970.00	3690.00	3740.00	3630.00	3530.00
Carbonate as CO3	(mg/l)	0.00	0.00	0.00	0.00	0.00
Sulfate	(mg/l)	7.00	353.00	411.00	375.00	351.00
Sulfide	(mg/l)	N	N	N	N	N
Calcium	(mg/l)	28.00	11.00	11.00	11.00	14.60
Magnesium	(mg/l)	13.00	4.60	4.90	4.40	7.05
Sodium	(mg/l)	2760.00	2380.00	2370.00	2260.00	2480.00
Potassium	(mg/l)	31.00	7.00	13.00	8.20	9.80
Chloride	(mg/l)	2700.00	1210.00	1170.00	1230.00	1500.00
Total Phosphorus	(mg/l)	N	N	N	N	N
Major Cations	(meq/l)	123.31	104.63	104.37	99.42	109.43
Major Anions	(meq/l)	125.43	101.95	104.15	101.99	107.47
Charge Balance	(percent)	0.85	1.30	0.11	1.28	0.90
Lab Determined Cations	(meq/l)	123.27	104.52	104.48	99.53	109.36
Lab Determined Anions	(meq/l)	125.25	102.03	104.03	102.16	107.53
Lab Determined Ion Balance	(percent)	0.80	1.20	0.22	1.30	0.84
Trace Metals (Dissolved)						
Aluminum	(mg/l)	N	N	N	N	N
Arsenic	(mg/l)	N	N	N	N	N
Barium	(mg/l)	5.000	-0.500	1.700	0.580	-0.500
Beryllium	(mg/l)	N	N	N	N	N
Cadmium	(mg/l)	-0.0040	-0.0020	-0.0020	-0.0020	-0.0020
Copper	(mg/l)	N	N	N	N	N
Iron	(mg/l)	-0.050	-0.050	-0.050	-0.050	-0.050
Lead	(mg/l)	-0.010	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	-0.020	-0.020	-0.020	-0.020	-0.020
Mercury	(mg/l)	N	N	N	N	N
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005
Silica as Si	(mg/l)	N	N	N	N	N
Silver	(mg/l)	N	N	N	N	N
Zinc	(mg/l)	N	N	N	N	N
Trace Metals (Total)						
Total Iron	(mg/l)	1.06	0.07	-0.05	-0.05	-0.05
Total Manganese	(mg/l)	0.03	-0.02	-0.02	-0.02	-0.02

Note: N => No measurement

APPENDIX D

ANALYTICAL DATA AND RESULTS

D-2 Piper Trilinear Plots

November 1996

BHP Minerals

Navajo Mine

Fruitland

Piper Trilinear Diagram

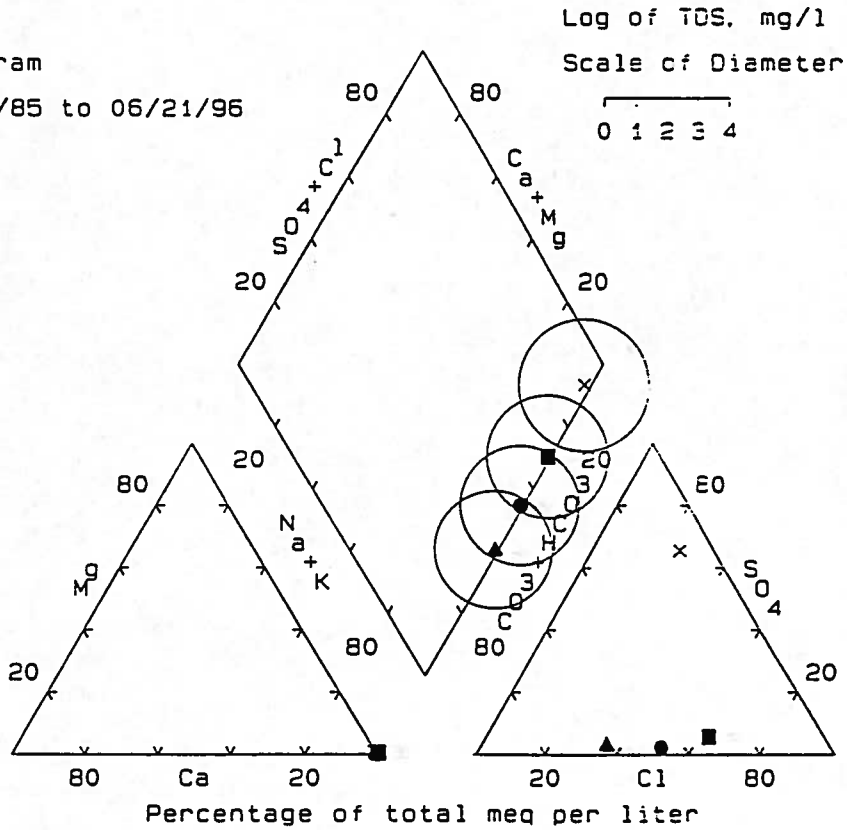
Average Values 09/16/85 to 06/21/96

× BITSUI-1 6 SAMPLES

▲ BITSUI-2 6 SAMPLES

■ BITSUI-3 5 SAMPLES

● KF83-1 16 SAMPLES



APPENDIX D

ANALYTICAL DATA AND RESULTS

D-3 Statistical Summary Reports

November 1996

BHP Minerals

Navajo Mine

Fruitland

BHP MINERAL, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
QUALITY STATISTICS FOR MONITORING WELLS

Station: BITSUI-1
Sample Range: From 03/01/95 Through 04/30/96

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH	(S.U.)	8.80	0.07	1	0.20	8.90	8.70	10/18/95	03/01/95	5
Conductivity	(umho/cm)	19480	3591	18	8100	25900	17800	05/19/95	03/01/95	5
TDS (180 deg C)	(mg/l)	14300	224	2	500	14700	14200	01/02/96	03/01/95	5
Boron	(mg/l)	8.10	0.85	10	2.22	9.20	6.98	03/01/95	10/18/95	5
Fluoride	(mg/l)	2.97	0.80	27	1.88	4.39	2.51	01/02/96	10/18/95	5
Nutrients										
Nitrate as N	(mg/l)	1.21	0.90	74	2.40	2.40	0.01	04/27/95	10/18/95	5
Nitrite as N	(mg/l)	0.01	0.01	99	0.02	0.03	0.01	01/02/96	03/01/95	5
Total Phosphorus	(mg/l)	1.89	0.01	0	0.01	1.89	1.88	03/01/95	04/27/95	2
Major Ions										
Bicarbonate as HCO3	(mg/l)	1041.40	138.29	13	343.00	1180.00	837.00	05/19/95	01/02/96	5
Carbonate as CO3	(mg/l)	86.00	17.89	21	48.00	108.00	60.00	10/18/95	04/27/95	5
Chloride	(mg/l)	1986.00	77.01	4	190.00	2070.00	1880.00	05/19/95	03/01/95	5
Sulfate	(mg/l)	6880.00	166.88	2	420.00	7100.00	6680.00	05/19/95	04/27/95	5
Sulfide	(mg/l)	0.193	0.326	169	0.565	0.570	0.005	03/01/95	05/19/95	3
Calcium	(mg/l)	53.20	7.60	14	18.00	63.00	45.00	01/02/96	05/19/95	5
Potassium	(mg/l)	28.80	14.38	50	34.00	54.00	20.00	04/27/95	10/18/95	5
Magnesium	(mg/l)	30.00	2.92	10	7.00	34.00	27.00	04/27/95	10/18/95	5
Sodium	(mg/l)	4936.00	87.92	2	210.00	5040.00	4830.00	01/02/96	05/19/95	5
Major Cations	(meq/l)	220.56	4.29	2	10.19	225.51	215.32	01/02/96	05/19/95	5
Major Anions	(meq/l)	219.29	5.47	2	14.72	228.47	213.75	05/19/95	03/01/95	5
Charge Balance	(percent)	1.56	1.01	65	2.76	2.96	0.20	05/19/95	10/18/95	5
Lab Determined Cations	(meq/l)	220.51	4.30	2	10.14	225.36	215.22	01/02/96	05/19/95	5
Lab Determined Anions	(meq/l)	219.50	5.49	2	14.77	228.70	213.93	05/19/95	03/01/95	5
Lab Determined Ion Balance	(percent)	1.56	1.01	65	2.77	3.04	0.27	05/19/95	10/18/95	5
Trace Metals (Dissolved)										
Aluminum	(mg/l)	0.083	0.058	69	0.100	0.150	0.050	01/02/96	03/01/95	3
Arsenic	(mg/l)	0.037	0.005	13	0.010	0.040	0.030	03/01/95	04/27/95	4
Barium	(mg/l)	0.161	0.122	76	0.225	0.250	0.025	04/27/95	03/01/95	5
Beryllium	(mg/l)	0.0012	0.0012	99	0.0020	0.0025	0.0005	01/02/96	03/01/95	3
Cadmium	(mg/l)	0.0017	0.0010	57	0.0020	0.0030	0.0010	03/01/95	04/27/95	5
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/01/95	03/01/95	3
Iron	(mg/l)	0.025	0.000	0	0.000	0.025	0.025	03/01/95	03/01/95	5
Lead	(mg/l)	0.009	0.009	100	0.023	0.025	0.003	05/19/95	10/18/95	5
Manganese	(mg/l)	0.097	0.011	11	0.030	0.110	0.080	03/01/95	10/18/95	5
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	03/01/95	03/01/95	3
Silica as Si	(mg/l)	6.860	0.173	3	0.310	6.970	6.660	01/02/96	05/19/95	3
Selenium	(mg/l)	0.010	0.004	38	0.009	0.016	0.007	10/18/95	04/27/95	5
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/01/95	03/01/95	4
Zinc	(mg/l)	0.016	0.023	138	0.045	0.050	0.005	03/01/95	04/27/95	4
Trace Metals (Total)										
Total Iron	(mg/l)	0.95	0.36	38	0.88	1.50	0.62	03/01/95	10/18/95	5
Total Manganese	(mg/l)	0.11	0.03	24	0.07	0.14	0.07	03/01/95	10/18/95	5

Below detection limit values included at 0.5 times detection limit.

BHP MINERAL, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
QUALITY STATISTICS FOR MONITORING WELLS

Station: BITSUI-2
Sample Range: From 03/01/95 Through 04/30/96

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH	(S.U.)	7.98	0.04	1	0.10	8.00	7.90	03/02/95	01/02/96	5
Conductivity	(umho/cm)	8722	1902	22	4510	12100	7590	05/19/95	01/02/96	5
TDS (180 deg C)	(mg/l)	5002	54	1	140	5050	4910	03/02/95	10/18/95	5
Boron	(mg/l)	0.94	0.08	9	0.20	1.03	0.83	05/19/95	10/18/95	5
Fluoride	(mg/l)	1.73	0.66	38	1.87	2.66	0.79	01/02/96	03/02/95	5
Nutrients										
Nitrate as N	(mg/l)	0.24	0.26	109	0.53	0.53	0.01	01/02/96	03/02/95	5
Nitrite as N	(mg/l)	0.02	0.02	110	0.05	0.05	0.01	05/19/95	03/02/95	5
Total Phosphorus	(mg/l)	0.18	0.11	61	0.15	0.25	0.10	04/27/95	03/02/95	2
Major Ions										
Bicarbonate as HCO3	(mg/l)	3498.00	72.25	2	190.00	3610.00	3420.00	01/02/96	10/18/95	5
Carbonate as CO3	(mg/l)	0.00	0.00		0.00	0.00	0.00	03/02/95	03/02/95	5
Chloride	(mg/l)	1184.00	33.62	3	70.00	1220.00	1150.00	04/27/95	01/02/96	5
Sulfate	(mg/l)	20.90	17.76	85	43.50	48.00	4.50	04/27/95	01/02/96	5
Sulfide	(mg/l)	42.567	20.071	47	37.300	65.500	28.200	05/19/95	03/02/95	3
Calcium	(mg/l)	6.76	2.06	30	5.00	8.60	3.60	05/19/95	03/02/95	5
Potassium	(mg/l)	6.74	4.14	61	11.40	13.00	1.60	04/27/95	05/19/95	5
Magnesium	(mg/l)	2.34	0.62	26	1.50	3.00	1.50	05/19/95	03/02/95	5
Sodium	(mg/l)	2036.00	70.57	3	170.00	2110.00	1940.00	04/27/95	03/02/95	5
Major Cations	(meq/l)	89.26	3.18	4	7.79	92.66	84.87	04/27/95	03/02/95	5
Major Anions	(meq/l)	91.18	1.42	2	3.24	92.68	89.44	05/19/95	10/18/95	5
Charge Balance	(percent)	1.20	1.01	84	2.59	2.88	0.29	03/02/95	04/27/95	5
Lab Determined Cations	(meq/l)	89.34	3.05	3	7.44	92.51	85.07	04/27/95	03/02/95	5
Lab Determined Anions	(meq/l)	91.23	1.45	2	3.40	92.85	89.45	05/19/95	10/18/95	5
Lab Determined Ion Balance	(percent)	1.16	0.97	84	2.56	2.80	0.24	03/02/95	04/27/95	5
Trace Metals (Dissolved)										
Aluminum	(mg/l)	0.035	0.026	74	0.045	0.050	0.005	05/19/95	03/02/95	3
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	4
Barium	(mg/l)	2.732	0.210	8	0.540	2.960	2.420	01/02/96	10/18/95	5
Beryllium	(mg/l)	0.0012	0.0012	99	0.0020	0.0025	0.0005	01/02/96	03/02/95	3
Cadmium	(mg/l)	0.0010	0.0000	0	0.0000	0.0010	0.0010	03/02/95	03/02/95	5
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/02/95	03/02/95	3
Iron	(mg/l)	0.025	0.000	0	0.000	0.025	0.025	03/02/95	03/02/95	5
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	5
Manganese	(mg/l)	0.010	0.000	0	0.000	0.010	0.010	03/02/95	03/02/95	5
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	03/02/95	03/02/95	3
Silica as Si	(mg/l)	4.360	0.020	0	0.040	4.380	4.340	01/02/96	05/19/95	3
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	5
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/02/95	03/02/95	4
Zinc	(mg/l)	0.013	0.012	95	0.025	0.030	0.005	05/19/95	03/02/95	4
Trace Metals (Total)										
Total Iron	(mg/l)	0.06	0.04	60	0.08	0.11	0.03	04/27/95	10/18/95	5
Total Manganese	(mg/l)	0.01	0.00	0	0.00	0.01	0.01	03/02/95	03/02/95	5

Below detection limit values included at 0.5 times detection limit.

BHP MINERAL, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
QUALITY STATISTICS FOR MONITORING WELLS

Station: BITSUI-3
Sample Range: From 03/01/95 Through 04/30/96

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH	(S.U.)	7.52	0.13	2	0.30	7.60	7.30	03/02/95	05/18/95	5
Conductivity	(umho/cm)	13140	865	7	2200	14600	12400	05/18/95	10/18/95	5
TDS (180 deg C)	(mg/l)	7876	179	2	410	8140	7730	12/29/95	05/18/95	5
Boron	(mg/l)	1.02	0.07	6	0.16	1.08	0.92	12/29/95	10/18/95	5
Fluoride	(mg/l)	0.86	0.49	57	1.27	1.27	0.01	12/29/95	03/02/95	5
Nutrients										
Nitrate as N	(mg/l)	1.27	1.68	132	4.10	4.10	0.01	04/27/95	05/18/95	5
Nitrite as N	(mg/l)	0.01	0.01	99	0.02	0.03	0.01	12/29/95	03/02/95	5
Total Phosphorus	(mg/l)	0.13	0.17	131	0.24	0.25	0.01	04/27/95	03/02/95	2
Major Ions										
Bicarbonate as HCO3	(mg/l)	2452.62	1373.44	56	3216.88	3220.00	3.12	10/18/95	03/02/95	5
Carbonate as CO3	(mg/l)	0.00	0.00		0.00	0.00	0.00	03/02/95	03/02/95	5
Chloride	(mg/l)	2926.00	180.78	6	400.00	3160.00	2760.00	04/27/95	10/18/95	5
Sulfate	(mg/l)	373.80	141.02	38	317.00	509.00	192.00	12/29/95	05/18/95	5
Sulfide	(mg/l)	2.968	3.051	103	6.095	6.100	0.005	03/02/95	12/29/95	3
Calcium	(mg/l)	21.00	6.32	30	16.00	27.00	11.00	04/27/95	03/02/95	5
Potassium	(mg/l)	20.16	14.36	71	34.20	44.00	9.80	04/27/95	12/29/95	5
Magnesium	(mg/l)	9.06	3.23	36	6.80	12.00	5.20	04/27/95	03/02/95	5
Sodium	(mg/l)	3220.00	102.96	3	260.00	3390.00	3130.00	10/18/95	05/18/95	5
Major Cations	(meq/l)	142.38	4.71	3	12.33	150.19	137.86	10/18/95	05/18/95	5
Major Anions	(meq/l)	130.60	23.47	18	55.86	144.72	88.86	04/27/95	03/02/95	5
Charge Balance	(percent)	6.07	9.23	152	21.33	22.52	1.19	03/02/95	05/18/95	5
Lab Determined Cations	(meq/l)	142.37	4.73	3	12.45	150.16	137.71	10/18/95	05/18/95	5
Lab Determined Anions	(meq/l)	140.89	2.46	2	6.79	144.57	137.78	04/27/95	12/29/95	5
Lab Determined Ion Balance	(percent)	1.60	1.10	69	3.04	3.23	0.19	10/18/95	03/02/95	5
Trace Metals (Dissolved)										
Aluminum	(mg/l)	0.050	0.000	0	0.000	0.050	0.050	03/02/95	03/02/95	3
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	4
Barium	(mg/l)	0.534	0.441	83	1.050	1.300	0.250	04/27/95	03/02/95	5
Beryllium	(mg/l)	0.0012	0.0012	99	0.0020	0.0025	0.0005	12/29/95	03/02/95	3
Cadmium	(mg/l)	0.0019	0.0013	71	0.0030	0.0040	0.0010	03/02/95	04/27/95	5
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/02/95	03/02/95	3
Iron	(mg/l)	0.030	0.011	37	0.025	0.050	0.025	05/18/95	03/02/95	5
Lead	(mg/l)	0.015	0.014	91	0.031	0.033	0.003	04/27/95	10/18/95	5
Manganese	(mg/l)	0.010	0.000	0	0.000	0.010	0.010	03/02/95	03/02/95	5
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	03/02/95	03/02/95	3
Silica as Si	(mg/l)	4.825	0.191	4	0.270	4.960	4.690	12/29/95	05/18/95	2
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	5
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/02/95	03/02/95	4
Zinc	(mg/l)	0.030	0.047	156	0.095	0.100	0.005	05/18/95	03/02/95	4
Trace Metals (Total)										
Total Iron	(mg/l)	0.31	0.25	80	0.63	0.75	0.12	04/27/95	10/18/95	5
Total Manganese	(mg/l)	0.01	0.00	0	0.00	0.01	0.01	03/02/95	03/02/95	5

Below detection limit values included at 0.5 times detection limit.

BHP MINERAL, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
QUALITY STATISTICS FOR MONITORING WELLS

Station: BITSUI-4
Sample Range: From 03/01/95 Through 04/30/96

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH	(S.U.)	7.03	0.12	2	0.20	7.10	6.90	02/12/96	01/26/96	3
Conductivity	(umho/cm)	15867	1274	8	2300	16700	14400	01/26/96	02/12/96	3
TDS (180 deg C)	(mg/l)	13967	961	7	1900	15000	13100	01/26/96	02/12/96	3
Boron	(mg/l)	1.58	0.12	7	0.22	1.71	1.49	01/26/96	02/12/96	3
Fluoride	(mg/l)	0.32	0.02	7	0.04	0.33	0.29	02/12/96	01/26/96	3
Nutrients										
Nitrate as N	(mg/l)	0.82	0.63	77	1.11	1.20	0.09	02/12/96	01/26/96	3
Nitrite as N	(mg/l)	0.02	0.03	130	0.05	0.05	0.01	04/10/96	01/26/96	3
Total Phosphorus	(mg/l)	0.01			0.00	0.01	0.01	04/10/96	04/10/96	1
Major Ions										
Bicarbonate as HCO3	(mg/l)	1640.00	125.30	8	250.00	1760.00	1510.00	01/26/96	02/12/96	3
Carbonate as CO3	(mg/l)	0.17	0.29	173	0.50	0.50	0.00	04/10/96	01/26/96	3
Chloride	(mg/l)	578.67	110.89	19	200.00	651.00	451.00	04/10/96	02/12/96	3
Sulfate	(mg/l)	7726.67	986.78	13	1960.00	8640.00	6680.00	01/26/96	02/12/96	3
Sulfide	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	01/26/96	01/26/96	3
Calcium	(mg/l)	177.67	143.63	81	272.00	287.00	15.00	02/12/96	01/26/96	3
Potassium	(mg/l)	193.07	298.72	155	518.80	538.00	19.20	01/26/96	04/10/96	3
Magnesium	(mg/l)	126.33	4.16	3	8.00	131.00	123.00	01/26/96	04/10/96	3
Sodium	(mg/l)	4260.00	400.37	9	800.00	4650.00	3850.00	01/26/96	02/12/96	3
Major Cations	(meq/l)	209.50	17.49	8	34.91	227.55	192.64	01/26/96	02/12/96	3
Major Anions	(meq/l)	204.13	25.36	12	49.98	226.62	176.64	01/26/96	02/12/96	3
Charge Balance	(percent)	1.58	2.38	151	4.13	4.33	0.20	02/12/96	01/26/96	3
Lab Determined Cations	(meq/l)	209.54	17.74	8	35.37	228.00	192.63	01/26/96	02/12/96	3
Lab Determined Anions	(meq/l)	204.28	25.42	12	50.17	227.00	176.83	01/26/96	02/12/96	3
Lab Determined Ion Balance	(percent)	1.57	2.35	150	4.09	4.28	0.19	02/12/96	01/26/96	3
Trace Metals (Dissolved)										
Aluminum	(mg/l)	0.230	0.312	136	0.540	0.590	0.050	04/10/96	01/26/96	3
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	01/26/96	01/26/96	3
Barium	(mg/l)	0.100	0.130	130	0.230	0.250	0.020	02/12/96	04/10/96	3
Beryllium	(mg/l)	0.0012	0.0012	99	0.0020	0.0025	0.0005	01/26/96	02/12/96	3
Cadmium	(mg/l)	0.0010	0.0000	0	0.0000	0.0010	0.0010	01/26/96	01/26/96	3
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	01/26/96	01/26/96	3
Iron	(mg/l)	0.115	0.127	110	0.235	0.260	0.025	04/10/96	01/26/96	3
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	01/26/96	01/26/96	3
Manganese	(mg/l)	2.747	0.397	14	0.780	3.180	2.400	02/12/96	01/26/96	3
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	01/26/96	01/26/96	3
Silica as Si	(mg/l)	3.582	3.287	92	6.465	6.470	0.005	04/10/96	01/26/96	3
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	01/26/96	01/26/96	3
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	01/26/96	01/26/96	3
Zinc	(mg/l)	0.063	0.067	105	0.120	0.140	0.020	02/12/96	04/10/96	3
Trace Metals (Total)										
Total Iron	(mg/l)	8.49	7.02	83	12.39	16.60	4.21	02/12/96	04/10/96	3
Total Manganese	(mg/l)	2.76	0.51	19	0.94	3.35	2.41	02/12/96	01/26/96	3

Below detection limit values included at 0.5 times detection limit.

BHP MINERAL, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
QUALITY STATISTICS FOR MONITORING WELLS

Station: BITSUI-5
Sample Range: From 03/01/95 Through 04/30/96

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH	(S.U.)	7.45	0.07	1	0.10	7.50	7.40	04/11/96	02/13/96	2
Conductivity	(umho/cm)	13600	849	6	1200	14200	13000	04/11/96	02/13/96	2
TDS (180 deg C)	(mg/l)	10450	212	2	300	10600	10300	04/11/96	02/13/96	2
Boron	(mg/l)	1.12	0.02	2	0.03	1.13	1.10	04/11/96	02/13/96	2
Fluoride	(mg/l)	1.02	0.03	3	0.04	1.04	1.00	04/11/96	02/13/96	2
Nutrients										
Nitrate as N	(mg/l)	0.02	0.01	61	0.02	0.03	0.01	04/11/96	02/13/96	2
Nitrite as N	(mg/l)	0.03	0.00	0	0.00	0.03	0.03	02/13/96	02/13/96	2
Total Phosphorus	(mg/l)	0.01			0.00	0.01	0.01	04/11/96	04/11/96	1
Major Ions										
Bicarbonate as HCO3	(mg/l)	3130.00	56.57	2	80.00	3170.00	3090.00	02/13/96	04/11/96	2
Carbonate as CO3	(mg/l)	0.25	0.35	141	0.50	0.50	0.00	04/11/96	02/13/96	2
Chloride	(mg/l)	1270.00	84.85	7	120.00	1330.00	1210.00	02/13/96	04/11/96	2
Sulfate	(mg/l)	3805.00	360.62	9	510.00	4060.00	3550.00	04/11/96	02/13/96	2
Sulfide	(mg/l)	1.403	1.976	141	2.795	2.800	0.005	04/11/96	02/13/96	2
Calcium	(mg/l)	65.75	8.84	13	12.50	72.00	59.50	02/13/96	04/11/96	2
Potassium	(mg/l)	15.05	1.34	9	1.90	16.00	14.10	02/13/96	04/11/96	2
Magnesium	(mg/l)	28.75	1.77	6	2.50	30.00	27.50	02/13/96	04/11/96	2
Sodium	(mg/l)	3730.00	141.42	4	200.00	3830.00	3630.00	04/11/96	02/13/96	2
Major Cations	(meq/l)	168.28	5.53	3	7.82	172.19	164.37	04/11/96	02/13/96	2
Major Anions	(meq/l)	166.34	4.19	3	5.93	169.30	163.37	04/11/96	02/13/96	2
Charge Balance	(percent)	0.58	0.38	66	0.54	0.85	0.31	04/11/96	02/13/96	2
Lab Determined Cations	(meq/l)	168.25	5.31	3	7.51	172.00	164.49	04/11/96	02/13/96	2
Lab Determined Anions	(meq/l)	166.46	3.59	2	5.08	169.00	163.92	04/11/96	02/13/96	2
Lab Determined Ion Balance	(percent)	0.51	0.47	94	0.67	0.84	0.17	04/11/96	02/13/96	2
Trace Metals (Dissolved)										
Aluminum	(mg/l)	0.080	0.042	53	0.060	0.110	0.050	04/11/96	02/13/96	2
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/13/96	02/13/96	2
Barium	(mg/l)	0.250	0.000	0	0.000	0.250	0.250	02/13/96	02/13/96	2
Beryllium	(mg/l)	0.0015	0.0014	94	0.0020	0.0025	0.0005	04/11/96	02/13/96	2
Cadmium	(mg/l)	0.0010	0.0000	0	0.0000	0.0010	0.0010	02/13/96	02/13/96	2
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	02/13/96	02/13/96	2
Iron	(mg/l)	0.395	0.120	30	0.170	0.480	0.310	02/13/96	04/11/96	2
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/13/96	02/13/96	2
Manganese	(mg/l)	0.290	0.170	59	0.240	0.410	0.170	02/13/96	04/11/96	2
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	02/13/96	02/13/96	2
Silica as Si	(mg/l)	4.810	0.509	11	0.720	5.170	4.450	04/11/96	02/13/96	2
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/13/96	02/13/96	2
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	02/13/96	02/13/96	2
Zinc	(mg/l)	0.020	0.014	71	0.020	0.030	0.010	04/11/96	02/13/96	2
Trace Metals (Total)										
Total Iron	(mg/l)	1.94	0.16	8	0.22	2.05	1.83	02/13/96	04/11/96	2
Total Manganese	(mg/l)	0.29	0.17	59	0.24	0.41	0.17	02/13/96	04/11/96	2

Below detection limit values included at 0.5 times detection limit.

BHP MINERAL, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
QUALITY STATISTICS FOR MONITORING WELLS

Station: BITSUI-6
Sample Range: From 03/01/95 Through 04/30/96

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH	(S.U.)	7.15	0.07	1	0.10	7.20	7.10	04/11/96	02/12/96	2
Conductivity	(umho/cm)	14700	566	4	800	15100	14300	04/11/96	02/12/96	2
TDS (180 deg C)	(mg/l)	13250	71	1	100	13300	13200	04/11/96	02/12/96	2
Boron	(mg/l)	1.52	0.07	5	0.10	1.57	1.47	02/12/96	04/11/96	2
Fluoride	(mg/l)	0.31	0.01	2	0.01	0.31	0.30	04/11/96	02/12/96	2
Nutrients										
Nitrate as N	(mg/l)	3.14	4.33	138	6.12	6.20	0.08	02/12/96	04/11/96	2
Nitrite as N	(mg/l)	0.03	0.00	0	0.00	0.03	0.03	02/12/96	02/12/96	2
Total Phosphorus	(mg/l)	0.01			0.00	0.01	0.01	04/11/96	04/11/96	1
Major Ions										
Bicarbonate as HCO3	(mg/l)	1470.00	42.43	3	60.00	1500.00	1440.00	04/11/96	02/12/96	2
Carbonate as CO3	(mg/l)	0.25	0.35	141	0.50	0.50	0.00	04/11/96	02/12/96	2
Chloride	(mg/l)	374.00	25.46	7	36.00	392.00	356.00	02/12/96	04/11/96	2
Sulfate	(mg/l)	7805.00	162.63	2	230.00	7920.00	7690.00	04/11/96	02/12/96	2
Sulfide	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	02/12/96	02/12/96	2
Calcium	(mg/l)	311.50	21.92	7	31.00	327.00	296.00	02/12/96	04/11/96	2
Potassium	(mg/l)	22.95	1.48	6	2.10	24.00	21.90	02/12/96	04/11/96	2
Magnesium	(mg/l)	159.50	2.12	1	3.00	161.00	158.00	04/11/96	02/12/96	2
Sodium	(mg/l)	3860.00	113.14	3	160.00	3940.00	3780.00	04/11/96	02/12/96	2
Major Cations	(meq/l)	197.16	3.97	2	5.61	199.96	194.35	04/11/96	02/12/96	2
Major Anions	(meq/l)	197.37	3.05	2	4.32	199.53	195.21	04/11/96	02/12/96	2
Charge Balance	(percent)	0.17	0.08	47	0.11	0.22	0.11	02/12/96	04/11/96	2
Lab Determined Cations	(meq/l)	197.12	4.07	2	5.76	200.00	194.24	04/11/96	02/12/96	2
Lab Determined Anions	(meq/l)	197.66	3.31	2	4.68	200.00	195.32	04/11/96	02/12/96	2
Lab Determined Ion Balance	(percent)	0.19	0.13	73	0.19	0.28	0.09	02/12/96	04/11/96	2
Trace Metals (Dissolved)										
Aluminum	(mg/l)	0.255	0.290	114	0.410	0.460	0.050	04/11/96	02/12/96	2
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/12/96	02/12/96	2
Barium	(mg/l)	0.250	0.000	0	0.000	0.250	0.250	02/12/96	02/12/96	2
Beryllium	(mg/l)	0.0015	0.0014	94	0.0020	0.0025	0.0005	04/11/96	02/12/96	2
Cadmium	(mg/l)	0.0060	0.0071	118	0.0100	0.0110	0.0010	04/11/96	02/12/96	2
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	02/12/96	02/12/96	2
Iron	(mg/l)	0.108	0.117	109	0.165	0.190	0.025	04/11/96	02/12/96	2
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/12/96	02/12/96	2
Manganese	(mg/l)	2.995	0.375	13	0.530	3.260	2.730	02/12/96	04/11/96	2
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	02/12/96	02/12/96	2
Silica as Si	(mg/l)	5.035	1.068	21	1.510	5.790	4.280	04/11/96	02/12/96	2
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/12/96	02/12/96	2
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	02/12/96	02/12/96	2
Zinc	(mg/l)	0.035	0.021	61	0.030	0.050	0.020	02/12/96	04/11/96	2
Trace Metals (Total)										
Total Iron	(mg/l)	10.63	13.26	125	18.75	20.00	1.25	02/12/96	04/11/96	2
Total Manganese	(mg/l)	3.05	0.71	23	1.01	3.55	2.54	02/12/96	04/11/96	2

Below detection limit values included at 0.5 times detection limit.

BHP MINERAL, NAVAJO MINE
SUPPLEMENTAL GROUNDWATER STUDY
QUALITY STATISTICS FOR MONITORING WELLS

Station: KF83-1
Sample Range: From 03/01/95 Through 04/30/96

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH	(S.U.)	7.80	0.12	2	0.30	7.90	7.60	05/24/95	05/03/95	5
Conductivity	(umho/cm)	10128	847	8	2200	11500	9300	05/03/95	09/26/95	5
TDS (180 deg C)	(mg/l)	5984	473	8	1150	6820	5670	05/03/95	06/21/95	5
Boron	(mg/l)	0.95	0.06	6	0.13	1.00	0.87	05/24/95	05/03/95	5
Fluoride	(mg/l)	1.33	0.30	23	0.74	1.57	0.83	07/24/95	05/03/95	5
Nutrients										
Nitrate as N	(mg/l)	4.89	7.91	162	18.20	18.20	0.01	05/21/95	06/14/95	5
Nitrite as N	(mg/l)	0.01	0.00	0	0.00	0.01	0.01	05/03/95	05/03/95	5
Total Phosphorus	(mg/l)									0
Major Ions										
Bicarbonate as HCO3	(mg/l)	3512.00	312.92	9	770.00	3740.00	2970.00	05/21/95	05/03/95	5
Carbonate as CO3	(mg/l)	0.00	0.00		0.00	0.00	0.00	05/03/95	05/03/95	5
Chloride	(mg/l)	1562.00	649.36	42	1530.00	2700.00	1170.00	05/03/95	06/21/95	5
Sulfate	(mg/l)	299.40	165.23	55	404.00	411.00	7.00	05/21/95	05/03/95	5
Sulfide	(mg/l)									0
Calcium	(mg/l)	15.12	7.37	49	17.00	28.00	11.00	05/03/95	06/14/95	5
Potassium	(mg/l)	13.80	9.88	72	24.00	31.00	7.00	05/03/95	06/14/95	5
Magnesium	(mg/l)	6.79	3.63	53	8.60	13.00	4.40	05/03/95	07/14/95	5
Sodium	(mg/l)	2450.00	190.00	8	500.00	2760.00	2260.00	05/03/95	07/14/95	5
Major Cations	(meq/l)	108.23	9.14	8	23.89	123.31	99.42	05/03/95	07/14/95	5
Major Anions	(meq/l)	108.20	9.89	9	23.48	125.43	101.95	05/03/95	06/14/95	5
Charge Balance	(percent)	0.89	0.48	54	1.19	1.30	0.11	05/14/95	06/21/95	5
Lab Determined Cations	(meq/l)	108.23	9.10	8	23.74	123.27	99.53	05/03/95	07/14/95	5
Lab Determined Anions	(meq/l)	108.20	9.79	9	23.22	125.25	102.03	05/03/95	06/14/95	5
Lab Determined Ion Balance	(percent)	0.87	0.42	49	1.08	1.30	0.22	07/24/95	06/21/95	5
Trace Metals (Dissolved)										
Aluminum	(mg/l)									0
Arsenic	(mg/l)									0
Barium	(mg/l)	1.556	2.015	130	4.750	5.000	0.250	05/03/95	06/14/95	5
Beryllium	(mg/l)									0
Cadmium	(mg/l)	0.0012	0.0004	37	0.0010	0.0020	0.0010	05/03/95	06/14/95	5
Copper	(mg/l)									0
Iron	(mg/l)	0.025	0.000	0	0.000	0.025	0.025	05/03/95	05/03/95	5
Lead	(mg/l)	0.003	0.001	37	0.003	0.005	0.003	05/03/95	06/14/95	5
Manganese	(mg/l)	0.010	0.000	0	0.000	0.010	0.010	05/03/95	05/03/95	5
Mercury	(mg/l)									0
Silica as Si	(mg/l)									0
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	05/03/95	05/03/95	5
Silver	(mg/l)									0
Zinc	(mg/l)									0
Trace Metals (Total)										
Total Iron	(mg/l)	0.24	0.46	190	1.04	1.06	0.03	05/03/95	06/21/95	5
Total Manganese	(mg/l)	0.01	0.01	64	0.02	0.03	0.01	05/03/95	06/14/95	5

Below detection limit values included at 0.5 times detection limit.

APPENDIX D

ANALYTICAL DATA AND RESULTS

D-4 Original Laboratory Data

November 1996

BHP Minerals

Navajo Mine

Fruitland

ıter-Mountain Laboratories, Inc.
2508 W. Main Street
Farmington, New Mexico 87401

Cli	BHP Minerals		
Pr t:	Navajo Mine	Date Reported:	03/17/95
Sample ID:	Bitsui-1	Date Sampled:	03/01/95
Laboratory ID:	W02720	Time Sampled:	1000
Sample Matrix:	Water	Date Received:	03/01/95
Condition:	Cool/Intact		

Parameter	Analytical Result	Units		Units
Lab pH	8.7	s.u.		
Lab Conductivity @ 25° C	17,800	umhos/cm		
Total Dissolved Solids @ 180°C	14,200	mg/L		
Total Dissolved Solids (Calc)	14,300	mg/L		
Total Alkalinity as CaCO3	972	mg/L		
Total Hardness as CaCO3	230	mg/L		
Ortho Phosphate	12.3	mg/L		
Sulfide	0.57	mg/L		
Hydrogen Sulfide	0.01	mg/L		
Bicarbonate as HCO3	1,020	mg/L	16.72	meq/L
Carbonate as CO3	82	mg/L	2.72	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	2.60	mg/L	0.14	meq/L
Chloride	1,880	mg/L	53.10	meq/L
Sulfate	6,780	mg/L	141.29	meq/L
Nitrate as Nitrogen	1.4	mg/L	0.10	meq/L
Nitrite as Nitrogen	<0.01	mg/L	<0.01	meq/L
Calcium	46	mg/L	2.28	meq/L
Magnesium	28	mg/L	2.32	meq/L
Potassium	27	mg/L	0.70	meq/L
Sodium	4,980	mg/L	216.50	meq/L
Cations			221.80	meq/L
Anions			213.93	meq/L
Cation/Anion Difference			1.81	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Comments:

Reviewed by df

Reported by M. Klute

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	03/17/95
Sample ID:	Bitsui-1	Date Sampled:	03/01/95
Laboratory ID:	W02720	Time Sampled:	1000
Sample Matrix:	Water	Date Received:	03/01/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	0.04	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.001	mg/L		
Boron	9.20	mg/L		
Cadmium	0.003	mg/L		
Chromium	NA	mg/L	<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	1.15	mg/L
Lead	0.006	mg/L		
Manganese	0.11	mg/L	0.14	mg/L
Mercury	<0.001	mg/L		
Phosphorus	NA	mg/L	1.89	mg/L
Selenium	0.009	mg/L		
Silica	6.95	mg/L		
Silver	<0.01	mg/L		
Zinc	0.05	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Comments:

Reported by M. Kleute

Reviewed by dt

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine		
Sample ID:	Bitsui - 2	Date Reported:	03/22/95
Laboratory ID:	W02730	Date Sampled:	03/02/95
Sample Matrix:	Water	Time Sampled:	1040
Condition:	Cool/Intact	Date Received:	03/02/95

Parameter	Analytical Result	Units		Units
Lab pH	8.0	s.u.		
Lab Conductivity @ 25° C	8,080	umhos/cm		
Total Dissolved Solids @ 180°C	5,050	mg/L		
Total Dissolved Solids (Calc)	4,840	mg/L		
Total Alkalinity as CaCO3	2,860	mg/L		
Total Hardness as CaCO3	15	mg/L		
Ortho Phosphate	<0.01	mg/L		
Sulfide	28.2	mg/L		
Hydrogen Sulfide	2.26	mg/L		
Bicarbonate as HCO3	3,480	mg/L	57.12	meq/L
Carbonate as CO3	0	mg/L	0.00	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	0.79	mg/L	0.04	meq/L
Chloride	1,160	mg/L	32.71	meq/L
Sulfate	7	mg/L	0.14	meq/L
Nitrate as Nitrogen	<0.01	mg/L	<0.01	meq/L
Nitrite as Nitrogen	<0.01	mg/L	<0.01	meq/L
Calcium	3.6	mg/L	0.18	meq/L
Magnesium	1.5	mg/L	0.12	meq/L
Potassium	7.0	mg/L	0.18	meq/L
Sodium	1,940	mg/L	84.59	meq/L
Cations			85.07	meq/L
Anions			89.97	meq/L
Cation/Anion Difference			2.80	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Comments:

Reported by M. Klute

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	03/22/95
Sample ID:	Bitsui - 2	Date Sampled:	03/02/95
Laboratory ID:	W02730	Time Sampled:	1040
Sample Matrix:	Water	Date Received:	03/02/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Result	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	2.69	mg/L		
Beryllium	<0.001	mg/L		
Boron	0.93	mg/L		
Cadmium	<0.002	mg/L		
Chromium	<0.02	mg/L	<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	0.07	mg/L
Lead	<0.005	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Mercury	<0.001	mg/L		
Phosphorus	NA	mg/L	<0.2	mg/L
Selenium	<0.005	mg/L		
Silica	4.36	mg/L		
Silver	<0.01	mg/L		
Zinc	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Comments:

Reported by M. Flute

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine		
Sample ID:	Bitsui - 3	Date Reported:	03/22/95
Laboratory ID:	W02729	Date Sampled:	03/02/95
Sample Matrix:	Water	Time Sampled:	1000
Condition:	Cool/Intact	Date Received:	03/02/95

Parameter	Analytical Result	Units		Units
Lab pH	7.6	s.u.		
Lab Conductivity @ 25° C	13,000	umhos/cm		
Total Dissolved Solids @ 180°C	7,980	mg/L		
Total Dissolved Solids (Calc)	8,030	mg/L		
Total Alkalinity as CaCO3	2,560	mg/L		
Total Hardness as CaCO3	49	mg/L		
Ortho Phosphate	3.5	mg/L		
Sulfide	6.1	mg/L		
Hydrogen Sulfide	1.04	mg/L		
Bicarbonate as HCO3	3,120	mg/L	51.20	meq/L
Carbonate as CO3	0	mg/L	0.00	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	<0.01	mg/L	<0.01	meq/L
Chloride	2,820	mg/L	79.57	meq/L
Sulfate	442	mg/L	9.22	meq/L
Nitrate as Nitrogen	1	mg/L	0.10	meq/L
Nitrite as Nitrogen	<0.01	mg/L	<0.01	meq/L
Calcium	11	mg/L	0.55	meq/L
Magnesium	5.2	mg/L	0.43	meq/L
Potassium	14	mg/L	0.35	meq/L
Sodium	3,200	mg/L	139.20	meq/L
Cations			140.53	meq/L
Anions			139.99	meq/L
Cation/Anion Difference			0.19	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Comments:

Reported by M. Klute

Reviewed by dk

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	03/24/95
Sample ID:	Bitsui - 3	Date Sampled:	03/02/95
Laboratory ID:	W02729	Time Sampled:	1000
Sample Matrix:	Water	Date Received:	03/02/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.001	mg/L		
Boron	1.07	mg/L		
Cadmium	0.004	mg/L		
Chromium	<0.02	mg/L	<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	0.24	mg/L
Lead	0.012	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Mercury	<0.001	mg/L		
Phosphorus	NA	mg/L	<0.2	mg/L
Selenium	<0.005	mg/L		
Silica	4.82	mg/L		
Silver	<0.01	mg/L		
Zinc	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Comments:

Reported by M. Kluto

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	05/17/95
Sample ID:	Bitsui-1	Date Sampled:	04/27/95
Laboratory ID:	W00337	Time Sampled:	1345
Sample Matrix:	Water	Date Received:	04/27/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Result	Units	Total Analytical Result	Units
Trace Metals				
Arsenic	0.03	mg/L		
Barium	<0.5	mg/L		
Boron	7.6	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	<0.02	
Iron	<0.05	mg/L	0.90	mg/L
Lead	0.011	mg/L		
Manganese	0.094	mg/L	0.11	mg/L
Phosphorus	NA	mg/L	1.88	mg/L
Selenium	0.007	mg/L		
Silver	<0.01	mg/L		
Zinc	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by: [illegible]

[illegible]

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine		
Sample ID:	Bitsui-1	Date Reported:	05/18/95
Laboratory ID:	W00337	Date Sampled:	04/27/95
Sample Matrix:	Water	Time Sampled:	1345
Condition:	Cool/Intact	Date Received:	04/27/95

Parameter	Analytical Result	Units		Units
Lab pH	8.8	s.u.		
Lab Conductivity @ 25° C	18,100	umhos/cm		
Total Dissolved Solids @ 180°C	14,200	mg/L		
Total Dissolved Solids (Calc)	14,500	mg/L		
Total Suspended Solids	74	mg/L		
Total Alkalinity as CaCO3	1,050	mg/L		
Total Hardness as CaCO3	280	mg/L		
Total Organic Carbon	33	mg/L		
SAR	129.380	ratio		
Grain Size Finer Than 0.062 mm	*NA	%		
Bicarbonate as HCO3	1,160	mg/L	19.00	meq/L
Carbonate as CO3	60	mg/L	2.00	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	2.64	mg/L	0.14	meq/L
Nitrate	2.4	mg/L	0.17	meq/L
Nitrite	<0.01	mg/L	<0.01	meq/L
Chloride	2,050	mg/L	57.8	meq/L
Sulfate	6,680	mg/L	139.10	meq/L
Calcium	56	mg/L	2.80	meq/L
Magnesium	34	mg/L	2.79	meq/L
Potassium	54	mg/L	1.37	meq/L
Sodium	4,970	mg/L	216.30	meq/L
Cations			223.26	meq/L
Anions			218.10	meq/L
Cation/Anion Difference			1.17	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments: *NA - Insufficient amount of suspended particulates to perform analysis.

Reported by M. Klute

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine		
Sample ID:	Bitsui-2	Date Reported:	05/18/95
Laboratory ID:	W00336	Date Sampled:	04/27/95
Sample Matrix:	Water	Time Sampled:	1311
Condition:	Cool/Intact	Date Received:	04/27/95

Parameter	Analytical Result	Units		Units
Lab pH	8.0	s.u.		
Lab Conductivity @ 25° C	8,110	umhos/cm		
Total Dissolved Solids @ 180°C	5,020	mg/L		
Total Dissolved Solids (Calc)	5,100	mg/L		
Total Suspended Solids	<10	mg/L		
Total Alkalinity as CaCO3	2,840	mg/L		
Total Hardness as CaCO3	28	mg/L		
Total Organic Carbon	11	mg/L		
SAR	174.732	ratio		
Grain Size Finer Than 0.062 mm	*NA	%		
Bicarbonate as HCO3	3,460	mg/L	56.72	meq/L
Carbonate as CO3	0	mg/L	0.00	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	1.78	mg/L	0.09	meq/L
Nitrate	0.15	mg/L	0.01	meq/L
Nitrite	<0.01	mg/L	<0.01	meq/L
Chloride	1,220	mg/L	34.3	meq/L
Sulfate	48	mg/L	1.00	meq/L
Calcium	6.6	mg/L	0.33	meq/L
Magnesium	2.7	mg/L	0.22	meq/L
Potassium	13	mg/L	0.33	meq/L
Sodium	2,110	mg/L	91.63	meq/L
Cations			92.51	meq/L
Anions			92.07	meq/L
Cation/Anion Difference			0.24	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments: *NA - Insufficient amount of suspended particulates to perform analysis.

Reported by M. Klute

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main St
Farmington, New Mexico 874

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	05/17/95
Sample ID:	Bitsui-2	Date Sampled:	04/27/95
Laboratory ID:	W00336	Time Sampled:	1311
Sample Matrix:	Water	Date Received:	04/27/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Result	Units	Total Analytical Result	Units
Trace Metals				
Arsenic.....	<0.005	mg/L		
Barium.....	2.7	mg/L		
Boron.....	0.91	mg/L		
Cadmium.....	<0.002	mg/L		
Chromium.....	NA	mg/L	<0.02	
Iron.....	<0.05	mg/L	0.11	mg/L
Lead.....	<0.005	mg/L		
Manganese.....	<0.02	mg/L	<0.02	mg/L
Phosphorus.....	NA	mg/L	<0.5	mg/L
Selenium.....	<0.005	mg/L		
Silver.....	<0.01	mg/L		
Zinc.....	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by M Klute

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine		
Sample ID:	Bitsui-3	Date Reported:	05/18/95
Laboratory ID:	W00335	Date Sampled:	04/27/95
Sample Matrix:	Water	Time Sampled:	1220
Condition:	Cool/Intact	Date Received:	04/27/95

Parameter	Analytical Result	Units		Units
Lab pH	7.5	s.u.		
Lab Conductivity @ 25° C	13,100	umhos/cm		
Total Dissolved Solids @ 180°C	7,740	mg/L		
Total Dissolved Solids (Calc)	8,150	mg/L		
Total Suspended Solids	20	mg/L		
Total Alkalinity as CaCO3	2,500	mg/L		
Total Hardness as CaCO3	115	mg/L		
Total Organic Carbon	7	mg/L		
SAR	128.125	ratio		
Grain Size Finer Than 0.062 mm	*NA	%		
Bicarbonate as HCO3	3,050	mg/L	49.92	meq/L
Carbonate as CO3	0	mg/L	0.00	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	0.99	mg/L	0.05	meq/L
Nitrate	4.1	mg/L	0.30	meq/L
Nitrite	<0.01	mg/L	<0.01	meq/L
Chloride	3,160	mg/L	89.0	meq/L
Sulfate	255	mg/L	5.32	meq/L
Calcium	27	mg/L	1.34	meq/L
Magnesium	12	mg/L	0.95	meq/L
Potassium	44	mg/L	1.13	meq/L
Sodium	3,150	mg/L	137.10	meq/L
Cations			140.52	meq/L
Anions			144.57	meq/L
Cation/Anion Difference			1.42	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments: *NA - Insufficient amount of suspended particulates to perform analysis.

Reported by M. Klute

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	05/17/95
Sample ID:	Bitsui-3	Date Sampled:	04/27/95
Laboratory ID:	W00335	Time Sampled:	1220
Sample Matrix:	Water	Date Received:	04/27/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Result	Units	Total Analytical Result	Units
Trace Metals				
Arsenic	<0.005	mg/L		
Barium	1.3	mg/L		
Boron	1.0	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	<0.02	
Iron	<0.05	mg/L	0.75	mg/L
Lead	0.033	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Phosphorus	NA	mg/L	<0.5	mg/L
Selenium	<0.005	mg/L		
Silver	<0.01	mg/L		
Zinc	0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by M. Klute

Reviewed by

Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

t:	BHP Minerals		
ct:	Navajo Mine	Date Reported:	06/03/95
ple ID:	Bitsui - 1	Date Sampled:	05/19/95
ratory ID:	W00532	Time Sampled:	0712
ple Matrix:	Water	Date Received:	05/19/95
dition:	Cool/Intact		

ameter	Analytical Result	Units		Units
pH	8.8	s.u.		
Conductivity @ 25° C	25,900	umhos/cm		
al Dissolved Solids @ 180°C	14,200	mg/L		
tal Dissolved Solids (Calc)	14,800	mg/L		
tal Alkalinity as CaCO3	1,110	mg/L		
tal Hardness as CaCO3	232	mg/L		
tho Phosphate	<0.01	mg/L		
lfide	<0.01	mg/L		
b. onate as HCO3	1,180	mg/L	19.32	meq/L
Carbonate as CO3	84	mg/L	2.80	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	2.71	mg/L	0.14	meq/L
Chloride	2,070	mg/L	58.40	meq/L
Sulfate	7,100	mg/L	147.93	meq/L
Nitrate as Nitrogen	1.5	mg/L	0.11	meq/L
Nitrite as Nitrogen	<0.01	mg/L	<0.01	meq/L
Calcium	45	mg/L	2.25	meq/L
Magnesium	29	mg/L	2.38	meq/L
Potassium	23	mg/L	0.59	meq/L
Sodium	4,830	mg/L	210.00	meq/L
Cations			215.22	meq/L
Anions			228.70	meq/L
Cation/Anion Difference			3.04	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reviewed by dt

Reported by M. Klute

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	06/05/95
Sample ID:	Bitsui - 1	Date Sampled:	05/19/95
Laboratory ID:	W00532	Time Sampled:	0712
Sample Matrix:	Water	Date Received:	05/19/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	0.04	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.001	mg/L		
Boron	8.44	mg/L		
Cadmium	<0.005	mg/L		
Chromium	NA		<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	1.06	mg/L
Lead	<0.050	mg/L		
Manganese	0.10	mg/L	0.11	mg/L
Mercury	<0.001	mg/L		
Selenium	0.007	mg/L		
Silica	6.66	mg/L		
Silver	<0.01	mg/L		
Zinc	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by M. Kluto

Reviewed by

:er-Mountain Laboratories, Inc.
2506 W. Main Street
Farmington, New Mexico 87401

ien'	BHP Minerals		
oje	Navajo Mine	Date Reported:	06/05/95
ample ID:	Bitsui - 2	Date Sampled:	05/19/95
aboratory ID:	W00533	Time Sampled:	0745
ample Matrix:	Water	Date Received:	05/19/95
ondition:	Cool/Intact		

arameter	Analytical Result	Units		Units
ab pH	8.0	s.u.		
ab Conductivity @ 25° C	12,100	umhos/cm		
'otal Dissolved Solids @ 180°C	5,010	mg/L		
'otal Dissolved Solids (Calc)	5,080	mg/L		
'otal Alkalinity as CaCO3	2,890	mg/L		
'otal Hardness as CaCO3	34	mg/L		
Ortho Phosphate	<0.01	mg/L		
Sulfide	65.5	mg/L		
r bonate as HCO3	3,520	mg/L	57.76	meq/L
Ca bonate as CO3	0	mg/L	0.00	meq/L
roxide as OH	0	mg/L	0.00	meq/L
Fluoride	1.75	mg/L	0.09	meq/L
Chloride	1,220	mg/L	34.41	meq/L
Sulfate	28	mg/L	0.58	meq/L
Nitrate as Nitrogen	<0.01	mg/L	<0.01	meq/L
Nitrite as Nitrogen	0.05	mg/L	<0.01	meq/L
Calcium	8.6	mg/L	0.43	meq/L
Magnesium	3.0	mg/L	0.25	meq/L
Potassium	1.6	mg/L	0.04	meq/L
Sodium	2,090	mg/L	90.88	meq/L
Cations			91.60	meq/L
Anions			92.85	meq/L
Cation/Anion Difference			0.68	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by M. Klute

Reviewed by

Inter Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	06/05/95
Sample ID:	Bitsui - 2	Date Sampled:	05/19/95
Laboratory ID:	W00533	Time Sampled:	0745
Sample Matrix:	Water	Date Received:	05/19/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	2.89	mg/L		
Beryllium	<0.001	mg/L		
Boron	1.03	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA		<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	0.07	mg/L
Lead	<0.005	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	4.34	mg/L		
Silver	<0.01	mg/L		
Zinc	0.03	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes". 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed. 1992.

Comments:

Reported by M. Klute

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine		
Sample ID:	Bitsui - 3	Date Reported:	06/01/95
Laboratory ID:	W00530	Date Sampled:	05/18/95
Sample Matrix:	Water	Time Sampled:	1140
Condition:	Cool/Intact	Date Received:	05/18/95

Parameter	Analytical Result	Units		Units
Lab pH	7.3	s.u.		
Lab Conductivity @ 25° C	14,600	umhos/cm		
Total Dissolved Solids @ 180°C	7,730	mg/L		
Total Dissolved Solids (Calc)	7,950	mg/L		
Total Alkalinity as CaCO3	2,520	mg/L		
Total Hardness as CaCO3	73	mg/L		
Ortho Phosphate	<0.01	mg/L		
Sulfide	2.8	mg/L		
Bicarbonate as HCO3	3,070	mg/L	50.40	meq/L
Carbonate as CO3	0	mg/L	0.00	meq/L
Hydroxide as OH	0	mg/L	0.00	meq/L
Fluoride	0.99	mg/L	0.05	meq/L
Chloride	3,080	mg/L	86.91	meq/L
Sulfate	192	mg/L	4.00	meq/L
Nitrate as Nitrogen	<0.01	mg/L	<0.01	meq/L
Nitrite as Nitrogen	<0.01	mg/L	<0.01	meq/L
Calcium	19	mg/L	0.95	meq/L
Magnesium	6.1	mg/L	0.50	meq/L
Potassium	10	mg/L	0.26	meq/L
Sodium	3,130	mg/L	136.00	meq/L
Cations			137.71	meq/L
Anions			141.36	meq/L
Cation/Anion Difference			1.31	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by M. Kluite

Reviewed by dt

Inter-Mountain Laboratories, Inc.

2508 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine	Date Reported:	06/01/95
Sample ID:	Bitsui - 3	Date Sampled:	05/18/95
Laboratory ID:	W00530	Time Sampled:	1140
Sample Matrix:	Water	Date Received:	05/18/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	0.51	mg/L		
Beryllium	<0.001	mg/L		
Boron	1.05	mg/L		
Cadmium	<0.005	mg/L		
Chromium	NA		<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	0.05	mg/L	0.28	mg/L
Lead	<0.05	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	4.69	mg/L		
Silver	<0.01	mg/L		
Zinc	0.10	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by M Kluite

Reviewed by dt

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine - Table 2		
Sample ID:	Bitsui-1	Date Reported:	11/19/95
Laboratory ID:	0395W01941	Date Sampled:	10/18/95
Sample Matrix:	Water	Time Sampled:	1337
Condition:	Cool/Intact	Date Received:	10/19/95

Parameter	Analytical Result	Units		Units
Lab pH	8.9	s.u.		
Lab Conductivity @ 25° C	17,800	umhos/cm		
Total Dissolved Solids @ 180°C	*14200	mg/L		
Total Dissolved Solids (Calc)	*14400	mg/L		
Total Alkalinity as CaCO3	1,010	mg/L		
Total Hardness as CaCO3	249	mg/L		
Bicarbonate as HCO3	1,010	mg/L	16.6	meq/L
Carbonate as CO3	108	mg/L	3.60	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	2.51	mg/L	0.13	meq/L
Chloride	1,950	mg/L	54.98	meq/L
Sulfate	6,850	mg/L	142.75	meq/L
Nitrate	<0.01	mg/L	<0.01	meq/L
Nitrite	<0.01	mg/L	<0.01	meq/L
Calcium	56	mg/L	2.77	meq/L
Magnesium	27	mg/L	2.21	meq/L
Potassium	20	mg/L	0.51	meq/L
Sodium	4,860	mg/L	211.40	meq/L
Cations			216.89	meq/L
Anions			218.06	meq/L
Cation/Anion Difference			0.27	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments: *Due to insuffient sample size and matrix effects, the ratio between the calculated TDS and the measured TDS does not meet criteria for balancing.

Reported by DB

Reviewed by dh

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine - Table 2	Date Reported:	11/19/95
Sample ID:	Bitsui-1	Date Sampled:	10/18/95
Laboratory ID:	0395W01941	Time Sampled:	1337
Sample Matrix:	Water	Date Received:	10/19/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Result	Units	Total Analytical Result	Units
Trace Metals				
Barium	<0.5	mg/L		
Boron	6.98	mg/L		
Cadmium	<0.002	mg/L		
Iron	<0.05	mg/L	0.62	mg/L
Lead	<0.005	mg/L		
Manganese	0.080	mg/L	0.07	mg/L
Selenium	0.016	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by SB

Reviewed by AK

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine - Table 2		
Sample ID:	Bitsui 2	Date Reported:	11/19/95
Laboratory ID:	0395W01943	Date Sampled:	10/18/95
Sample Matrix:	Water	Time Sampled:	1230
Condition:	Cool/Intact	Date Received:	10/19/95

Parameter	Analytical Result	Units		Units
Lab pH	8.0	s.u.		
Lab Conductivity @ 25° C	7,730	umhos/cm		
Total Dissolved Solids @ 180°C	4,910	mg/L		
Total Dissolved Solids (Calc)	4,880	mg/L		
Total Alkalinity as CaCO3	2,800	mg/L		
Total Hardness as CaCO3	30	mg/L		
Bicarbonate as HCO3	3,420	mg/L	56.0	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	1.69	mg/L	0.09	meq/L
Chloride	1,170	mg/L	32.95	meq/L
Sulfate	17	mg/L	0.35	meq/L
Nitrate	0.5	mg/L	0.04	meq/L
Nitrite	<0.01	mg/L	<0.01	meq/L
Calcium	8.6	mg/L	0.43	meq/L
Magnesium	1.9	mg/L	0.16	meq/L
Potassium	7.0	mg/L	0.18	meq/L
Sodium	1,990	mg/L	86.75	meq/L
Cations			87.52	meq/L
Anions			89.45	meq/L
Cation/Anion Difference			1.09	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by DB

Reviewed by DB

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine - Table 2	Date Reported:	11/19/95
Sample ID:	Bitsui 2	Date Sampled:	10/18/95
Laboratory ID:	0395W01943	Time Sampled:	1230
Sample Matrix:	Water	Date Received:	10/19/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Result	Units	Total Analytical Result	Units
Trace Metals				
Barium	2.42	mg/L		
Boron	0.83	mg/L		
Cadmium	<0.002	mg/L		
Iron	<0.05	mg/L	<0.05	mg/L
Lead	<0.005	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Selenium	<0.005	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by SB

Reviewed by AS

Inter-Mountain Laboratories, Inc.

2506 W Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine - Table 2		
Sample ID:	Bitsui 3A	Date Reported:	11/19/95
Laboratory ID:	0395W01945	Date Sampled:	10/18/95
Sample Matrix:	Water	Time Sampled:	1005
Condition:	Cool/Intact	Date Received:	10/19/95

Parameter	Analytical Result	Units		Units
Lab pH	7.6	s.u.		
Lab Conductivity @ 25° C	12,400	umhos/cm		
Total Dissolved Solids @ 180°C	*7790	mg/L		
Total Dissolved Solids (Calc)	*8270	mg/L		
Total Alkalinity as CaCO3	2,640	mg/L		
Total Hardness as CaCO3	109	mg/L		
Bicarbonate as HCO3	3,220	mg/L	52.9	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	1.02	mg/L	0.05	meq/L
Chloride	2,760	mg/L	77.94	meq/L
Sulfate	471	mg/L	9.81	meq/L
Nitrate	1.20	mg/L	0.09	meq/L
Nitrite	<0.01	mg/L	<0.01	meq/L
Calcium	23	mg/L	1.16	meq/L
Magnesium	12	mg/L	1.02	meq/L
Potassium	23	mg/L	0.58	meq/L
Sodium	3,390	mg/L	147.40	meq/L
Cations			150.16	meq/L
Anions			140.75	meq/L
Cation/Anion Difference			3.23	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments: *Due to insuffient sample size and matrix effects, the ratio between the calculated TDS and the measured TDS does not meet criteria for balancing.

Reported by GB

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine - Table 2	Date Reported:	11/19/95
Sample ID:	Bitsui 3A	Date Sampled:	10/18/95
Laboratory ID:	0395W01945	Time Sampled:	1005
Sample Matrix:	Water	Date Received:	10/19/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Result	Units	Total Analytical Result	Units
Trace Metals				
Barium.....	<0.5	mg/L		
Boron.....	0.92	mg/L		
Cadmium.....	<0.002	mg/L		
Iron.....	<0.05	mg/L	0.12	mg/L
Lead.....	<0.005	mg/L		
Manganese.....	<0.02	mg/L	<0.02	mg/L
Selenium.....	<0.005	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 18th ed., 1992.

Comments:

Reported by SB

Reviewed by dk

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	01/11/96
Sample ID:	Bitsui 1-4	Date Sampled:	01/02/96
Laboratory ID:	0396W00003	Time Sampled:	13:30
Sample Matrix:	Water	Date Received:	01/02/96
Condition:	Cool/Intact		

Parameter	Analytical Result	Units		Units
Lab pH	8.8	s.u.		
Lab Conductivity @ 25° C	17,800	umhos/cm		
Total Dissolved Solids @ 180°C	14,700	mg/L		
Total Dissolved Solids (Calc)	14,600	mg/L		
Total Alkalinity as CaCO3	846	mg/L		
Total Hardness as CaCO3	289	mg/L		
Ortho Phosphate	3.6	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	837	mg/L	<0.01	meq/L
Carbonate as CO3	96	mg/L	3.20	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	4.39	mg/L	0.23	meq/L
Chloride	1,980	mg/L	56.0	meq/L
Sulfate	6,990	mg/L	145.5	meq/L
Nitrate as Nitrogen	0.73	mg/L	0.05	meq/L
Nitrite as Nitrogen	<0.05	mg/L	<0.01	meq/L
Calcium	63	mg/L	3.13	meq/L
Magnesium	32	mg/L	2.65	meq/L
Potassium	20	mg/L	0.51	meq/L
Sodium	5,040	mg/L	219.1	meq/L
Cations			225.36	meq/L
Anions			218.69	meq/L
Cation/Anion Difference			1.50	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by JB

Reviewed by JH

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	01/11/96
Sample ID:	Bitsui 1-4	Date Sampled:	01/02/96
Laboratory ID:	0396W00003	Time Sampled:	13:30
Sample Matrix:	Water	Date Received:	01/02/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	0.15	mg/L		
Arsenic	0.036	mg/L		
Barium	0.03	mg/L		
Beryllium	<0.005	mg/L		
Boron	8.30	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	<0.02	mg/L
Cobalt	<0.02	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	0.65	mg/L
Lead	<0.005	mg/L		
Manganese	0.10	mg/L	0.10	mg/L
Mercury	<0.001	mg/L		
Selenium	0.010	mg/L		
Silica	6.97	mg/L		
Silver	<0.01	mg/L		
Zinc	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by SB

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	01/11/96
Sample ID:	Bitsui 2-4	Date Sampled:	01/02/96
Laboratory ID:	0396W00004	Time Sampled:	14:45
Sample Matrix:	Water	Date Received:	01/02/96
Condition:	Cool/Intact		

Parameter	Analytical Result	Units		Units
Lab pH	7.9	s.u.		
Lab Conductivity @ 25° C	7,590	umhos/cm		
Total Dissolved Solids @ 180°C	5,020	mg/L		
Total Dissolved Solids (Calc)	5,000	mg/L		
Total Alkalinity as CaCO3	2,960	mg/L		
Total Hardness as CaCO3	27	mg/L		
Ortho Phosphate	0.13	mg/L		
Sulfide	34	mg/L		
Bicarbonate as HCO3	3,610	mg/L	<0.01	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	2.66	mg/L	0.14	meq/L
Chloride	1,150	mg/L	32.5	meq/L
Sulfate	4.5	mg/L	0.09	meq/L
Nitrate as Nitrogen	0.53	mg/L	0.04	meq/L
Nitrite as Nitrogen	<0.05	mg/L	<0.01	meq/L
Calcium	6.4	mg/L	0.32	meq/L
Magnesium	2.6	mg/L	0.21	meq/L
Potassium	5.1	mg/L	0.13	meq/L
Sodium	2,050	mg/L	89.4	meq/L
Cations			90.01	meq/L
Anions			91.82	meq/L
Cation/Anion Difference			0.99	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by SB

Reviewed by dt

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	01/11/96
Sample ID:	Bitsui 2-4	Date Sampled:	01/02/96
Laboratory ID:	0396W00004	Time Sampled:	14:45
Sample Matrix:	Water	Date Received:	01/02/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	2.96	mg/L		
Beryllium	<0.005	mg/L		
Boron	1.01	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	<0.02	mg/L
Cobalt	<0.02	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	<0.05	mg/L
Lead	<0.005	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	4.38	mg/L		
Silver	<0.01	mg/L		
Zinc	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by JB

Reviewed by dt

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	01/11/96
Sample ID:	Bitsui 3-4	Date Sampled:	12/29/95
Laboratory ID:	0396W00001	Time Sampled:	10:25
Sample Matrix:	Water	Date Received:	12/29/95
Condition:	Cool/Intact		

Parameter	Analytical Result	Units		Units
Lab pH	7.6	s.u.		
Lab Conductivity @ 25° C	12,600	umhos/cm		
Total Dissolved Solids @ 180°C	8,140	mg/L		
Total Dissolved Solids (Calc)	8,030	mg/L		
Total Alkalinity as CaCO3	2,400	mg/L		
Total Hardness as CaCO3	104	mg/L		
Ortho Phosphate	0.11	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	2,920	mg/L	<0.01	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	1.27	mg/L	0.07	meq/L
Chloride	2,810	mg/L	79.2	meq/L
Sulfate	509	mg/L	10.6	meq/L
Nitrate as Nitrogen	<0.05	mg/L	<0.01	meq/L
Nitrite as Nitrogen	<0.05	mg/L	<0.01	meq/L
Calcium	25	mg/L	1.23	meq/L
Magnesium	10	mg/L	0.85	meq/L
Potassium	9.8	mg/L	0.25	meq/L
Sodium	3,230	mg/L	140.6	meq/L
Cations			142.94	meq/L
Anions			137.78	meq/L
Cation/Anion Difference			1.84	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by _____ Reviewed by _____

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	01/11/96
Sample ID:	Bitsui 3-4	Date Sampled:	12/29/95
Laboratory ID:	0396W00001	Time Sampled:	10:25
Sample Matrix:	Water	Date Received:	12/29/95
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	0.36	mg/L		
Beryllium	<0.005	mg/L		
Boron	1.08	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	<0.02	mg/L
Cobalt	<0.02	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	0.18	mg/L
Lead	<0.005	mg/L		
Manganese	<0.02	mg/L	<0.02	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	4.96	mg/L		
Silver	<0.01	mg/L		
Zinc	<0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by SB

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4		
Sample ID:	Bitsui #4	Date Reported:	02/15/96
Laboratory ID:	0396W00117	Date Sampled:	01/26/96
Sample Matrix:	Water	Time Sampled:	15:30
Condition:	Cool/Intact	Date Received:	01/26/96

Parameter	Analytical Result	Units		Units
Lab pH	6.9	s.u.		
Lab Conductivity @ 25° C	16,700	umhos/cm		
Total Dissolved Solids @ 180°C	*15,000	mg/L		
Total Dissolved Solids (Calc)	*15,500	mg/L		
Total Hardness as CaCO3	576	mg/L		
Total Alkalinity as CaCO3	1,440	mg/L		
Ortho-Phosphate	0.02	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	1,760	mg/L	<0.01	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	0.29	mg/L	0.02	meq/L
Chloride	634	mg/L	17.9	meq/L
Sulfate	8,640	mg/L	180	meq/L
Nitrate as Nitrogen	0.09	mg/L	0.01	meq/L
Nitrite as Nitrogen	<0.01	mg/L	<0.01	meq/L
Calcium	15	mg/L	0.73	meq/L
Magnesium	131	mg/L	10.8	meq/L
Potassium	538	mg/L	13.8	meq/L
Sodium	4,650	mg/L	202	meq/L
Cations			228	meq/L
Anions			227	meq/L
Cation/Anion Difference			0.19	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments: *TDS ratio does not meet normal criteria for balancing. Sample was reran several times with no significant change in result. Matrix interferences are suspect.

Reported by JB

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

lient:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	02/15/96
Sample ID:	Bitsui #4	Date Sampled:	01/26/96
Laboratory ID:	0396W00117	Time Sampled:	15:30
Sample Matrix:	Water	Date Received:	01/26/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L	NA	mg/L
Arsenic	<0.005	mg/L	NA	mg/L
Barium	0.03	mg/L	NA	mg/L
Beryllium	<0.005	mg/L	NA	mg/L
Boron	1.71	mg/L	NA	mg/L
Cadmium	<0.002	mg/L	NA	mg/L
Chromium	NA	mg/L	<0.02	mg/L
Cobalt	<0.02	mg/L	NA	mg/L
Copper	<0.01	mg/L	NA	mg/L
Iron	<0.05	mg/L	4.67	mg/L
Lead	<0.005	mg/L	NA	mg/L
Manganese	2.40	mg/L	2.41	mg/L
Mercury	<0.001	mg/L	NA	mg/L
Selenium	<0.005	mg/L	NA	mg/L
Silica	<0.01	mg/L	NA	mg/L
Silver	<0.01	mg/L	NA	mg/L
Zinc	0.03	mg/L	NA	mg/L

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by SB

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4		
Sample ID:	Bitsui 4	Date Reported:	02/28/96
Laboratory ID:	0396W00177	Date Sampled:	02/12/96
Sample Matrix:	Water	Time Sampled:	1125
Condition:	Cool/Intact	Date Received:	02/12/96

Parameter	Analytical Result	Units		Units
Lab pH	7.1	s.u.		
Lab Conductivity @ 25° C	14,400	umhos/cm		
Total Dissolved Solids @ 180°C	13,100	mg/L		
Total Dissolved Solids (Calc)	12,200	mg/L		
Total Alkalinity as CaCO3	1,240	mg/L		
Total Hardness as CaCO3	1,230	mg/L		
Ortho Phosphate	0.39	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	1,510	mg/L	<0.01	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	0.33	mg/L	0.02	meq/L
Chloride	451	mg/L	12.72	meq/L
Sulfate	6,680	mg/L	139.19	meq/L
Nitrate as Nitrogen	1.2	mg/L	0.09	meq/L
Nitrite as Nitrogen	<0.01	mg/L	<0.01	meq/L
Calcium	287	mg/L	14.30	meq/L
Magnesium	125	mg/L	10.28	meq/L
Potassium	22	mg/L	0.55	meq/L
Sodium	3,850	mg/L	167.50	meq/L
Cations			192.63	meq/L
Anions			176.83	meq/L
Cation/Anion Difference			4.28	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by dk

Reviewed by SB

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	02/28/96
Sample ID:	Bitsui 4	Date Sampled:	02/12/96
Laboratory ID:	0396W00177	Time Sampled:	1125
Sample Matrix:	Water	Date Received:	02/12/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.001	mg/L		
Boron	1.49	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	0.04	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	0.06	mg/L	16.6	mg/L
Lead	<0.005	mg/L		
Manganese	3.18	mg/L	3.35	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	4.27	mg/L		
Silver	<0.01	mg/L		
Zinc	0.14	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by _____ Reviewed by _____

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4		
Sample ID:	Bitsui 5	Date Reported:	02/28/96
Laboratory ID:	0396W00185	Date Sampled:	02/13/96
Sample Matrix:	Water	Time Sampled:	1420
Condition:	Cool/Intact	Date Received:	02/13/96

Parameter	Analytical Result	Units		Units
Lab pH	7.4	s.u.		
Lab Conductivity @ 25° C	13,000	umhos/cm		
Total Dissolved Solids @ 180°C	10,300	mg/L		
Total Dissolved Solids (Calc)	10,200	mg/L		
Total Alkalinity as CaCO3	2,600	mg/L		
Total Hardness as CaCO3	304	mg/L		
Ortho Phosphate	0.01	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	3,170	mg/L	<0.01	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	1.0	mg/L	0.45	meq/L
Chloride	1,330	mg/L	37.54	meq/L
Sulfate	3,550	mg/L	73.96	meq/L
Nitrate as Nitrogen	0.01	mg/L	<0.05	meq/L
Nitrite as Nitrogen	<0.05	mg/L	<0.05	meq/L
Calcium	72	mg/L	3.58	meq/L
Magnesium	30	mg/L	2.49	meq/L
Potassium	16	mg/L	0.42	meq/L
Sodium	3,630	mg/L	158.00	meq/L
Cations			164.49	meq/L
Anions			163.92	meq/L
Cation/Anion Difference			0.17	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by dk

Reviewed by JB

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	02/28/96
Sample ID:	Bitsui 5	Date Sampled:	02/13/96
Laboratory ID:	0396W00185	Time Sampled:	1420
Sample Matrix:	Water	Date Received:	02/13/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.001	mg/L		
Boron	1.10	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	0.48	mg/L	2.05	mg/L
Lead	<0.005	mg/L		
Manganese	0.41	mg/L	0.41	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	4.45	mg/L		
Silver	<0.01	mg/L		
Zinc	0.01	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by dk

Reviewed by JB

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4		
Sample ID:	Bitsui 6	Date Reported:	02/28/96
Laboratory ID:	0396W00178	Date Sampled:	02/12/96
Sample Matrix:	Water	Time Sampled:	1418
Condition:	Cool/Intact	Date Received:	02/12/96

Parameter	Analytical Result	Units		Units
Lab pH	7.1	s.u.		
Lab Conductivity @ 25° C	14,300	umhos/cm		
Total Dissolved Solids @ 180°C	13,200	mg/L		
Total Dissolved Solids (Calc)	13,100	mg/L		
Total Alkalinity as CaCO3	1,180	mg/L		
Total Hardness as CaCO3	1,470	mg/L		
Ortho Phosphate	0.33	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	1,440	mg/L	<0.01	meq/L
Carbonate as CO3	0	mg/L	<0.01	meq/L
Hydroxide as OH	0	mg/L	<0.01	meq/L
Fluoride	0.30	mg/L	0.02	meq/L
Chloride	392	mg/L	11.05	meq/L
Sulfate	7,690	mg/L	160.22	meq/L
Nitrate as Nitrogen	6.2	mg/L	0.44	meq/L
Nitrite as Nitrogen	<0.05	mg/L	<0.05	meq/L
Calcium	327	mg/L	16.34	meq/L
Magnesium	158	mg/L	12.98	meq/L
Potassium	24	mg/L	0.62	meq/L
Sodium	3,780	mg/L	164.30	meq/L
Cations			194.24	meq/L
Anions			195.32	meq/L
Cation/Anion Difference			0.28	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by _____ Reviewed by _____

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

.ient:	BHP Minerals		
roject:	Navajo Mine-Table 4	Date Reported:	02/28/96
Sample ID:	Bitsui 6	Date Sampled:	02/12/96
Laboratory ID:	0396W00178	Time Sampled:	1418
Sample Matrix:	Water	Date Received:	02/12/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	<0.1	mg/L		
Arsenic	<0.005	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.001	mg/L		
Boron	1.57	mg/L		
Cadmium	<0.002	mg/L		
'hromium	NA	mg/L	0.04	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	<0.05	mg/L	20.0	mg/L
Lead	<0.005	mg/L		
Manganese	3.26	mg/L	3.55	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	4.28	mg/L		
Silver	<0.01	mg/L		
Zinc	0.05	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by _____

Reviewed by SB

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4		
Sample ID:	Bitsui 4-1	Date Reported:	05/03/96
Laboratory ID:	0396W00600	Date Sampled:	04/10/96
Sample Matrix:	Water	Time Sampled:	13:45
Condition:	Cool/Intact	Date Received:	04/10/96

Parameter	Analytical Result	Units		Units
Lab pH	7.1	s.u.		
Lab Conductivity @ 25° C	16,500	umhos/cm		
Total Dissolved Solids @ 180°C	13,800	mg/L		
Total Dissolved Solids (Calc)	14,000	mg/L		
Total Alkalinity as CaCO3	1,350	mg/L		
Total Hardness as CaCO3	1,080	mg/L		
Total Phosphate	<0.01	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	1,650	mg/L	27.0	meq/L
Carbonate as CO3	<1.0	mg/L	<1.0	meq/L
Hydroxide as OH	<1.0	mg/L	<1.0	meq/L
Fluoride	0.33	mg/L	0.02	meq/L
Chloride	651	mg/L	18.4	meq/L
Sulfate	7,860	mg/L	164	meq/L
Nitrate as Nitrogen	1.17	mg/L	0.08	meq/L
Nitrite as Nitrogen	0.05	mg/L	<0.05	meq/L
Calcium	231	mg/L	11.6	meq/L
Magnesium	123	mg/L	10.1	meq/L
Potassium	19.2	mg/L	0.49	meq/L
Sodium	4,280	mg/L	186	meq/L
Cations			208	meq/L
Anions			209	meq/L
Cation/Anion Difference			0.23	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments: Electrical conductivity and TDS reanalyzed with no significant difference.

Reported by WM

Reviewed by [illegible]

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	05/03/96
Sample ID:	Bitsui 4-1	Date Sampled:	04/10/96
Laboratory ID:	0396W00600	Time Sampled:	13:45
Sample Matrix:	Water	Date Received:	04/10/96
Condition:	Cool/Intact		

Parameter:	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	0.59	mg/L		
Arsenic	<0.005	mg/L		
Barium	0.02	mg/L		
Beryllium	<0.001	mg/L		
Boron	1.54	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	0.03	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	0.26	mg/L	4.21	mg/L
Lead	<0.005	mg/L		
Manganese	2.66	mg/L	2.52	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	6.47	mg/L		
Silver	<0.01	mg/L		
Zinc	0.02	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Reported by WM

Reviewed by CSHallmark

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4		
Sample ID:	Bitsui 5-1	Date Reported:	05/10/96
Laboratory ID:	0396W00609	Date Sampled:	04/11/96
Sample Matrix:	Water	Time Sampled:	15:15
Condition:	Cool/Intact	Date Received:	04/12/96

Parameter	Analytical Result	Units		Units
Lab pH	7.5	s.u.		
Lab Conductivity @ 25° C	14,200	umhos/cm		
Total Dissolved Solids @ 180°C	10,600	mg/L		
Total Alkalinity as CaCO3	2,530	mg/L		
Total Hardness as CaCO3	262	mg/L		
Total Phosphorous	<0.01	mg/L		
Sulfide	2.8	mg/L		
Bicarbonate as HCO3	3,090	mg/L	50.6	meq/L
Carbonate as CO3	<1.00	mg/L	<1.00	meq/L
Hydroxide as OH	<1.00	mg/L	<1.00	meq/L
Fluoride	1.04	mg/L	0.05	meq/L
Chloride	1,210	mg/L	34.1	meq/L
Sulfate	4,060	mg/L	84.6	meq/L
Nitrate as Nitrogen	<0.05	mg/L	<0.05	meq/L
Nitrite as Nitrogen	<0.05	mg/L	<0.05	meq/L
Calcium	59.5	mg/L	2.97	meq/L
Magnesium	27.5	mg/L	2.26	meq/L
Potassium	14.1	mg/L	0.36	meq/L
Sodium	3,830	mg/L	167	meq/L
Cations			172	meq/L
Anions			169	meq/L
Cation/Anion Difference			0.84	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by LJM

Reviewed by C.S. Hollins

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	05/10/96
Sample ID:	Bitsui 5-1	Date Sampled:	04/11/96
Laboratory ID:	0396W00609	Time Sampled:	15:15
Sample Matrix:	Water	Date Received:	04/12/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	0.11	mg/L		
Arsenic	<0.005	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.005	mg/L		
Boron	1.13	mg/L		
Cadmium	<0.002	mg/L		
Chromium	NA	mg/L	<0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	0.31	mg/L	1.83	mg/L
Lead	<0.005	mg/L		
Manganese	0.17	mg/L	0.17	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	5.17	mg/L		
Silver	<0.01	mg/L		
Zinc	0.03	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments: NA = Not Applicable

Reported by WM

Reviewed by [illegible]

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

Client:	BHP Minerals		
Project:	Navajo Mine-Table 4		
Sample ID:	Bitsui 6-1	Date Reported:	05/10/96
Laboratory ID:	0396W00610	Date Sampled:	04/11/96
Sample Matrix:	Water	Time Sampled:	12:32
Condition:	Cool/Intact	Date Received:	04/12/96

Parameter	Analytical Result	Units		Units
Lab pH	7.2	s.u.		
Lab Conductivity @ 25° C	15,100	umhos/cm		
Total Dissolved Solids @ 180°C	13,300	mg/L		
Total Dissolved Solids (Calc)	13,400	mg/L		
Total Alkalinity as CaCO3	1,230	mg/L		
Total Hardness as CaCO3	1,400	mg/L		
Total Phosphorous	<0.01	mg/L		
Sulfide	<0.01	mg/L		
Bicarbonate as HCO3	1,500	mg/L	24.6	meq/L
Carbonate as CO3	<1.00	mg/L	<1.00	meq/L
Hydroxide as OH	<1.00	mg/L	<1.00	meq/L
Fluoride	0.31	mg/L	0.02	meq/L
Chloride	356	mg/L	10.0	meq/L
Sulfate	7,920	mg/L	165	meq/L
Nitrate as Nitrogen	0.08	mg/L	<0.05	meq/L
Nitrite as Nitrogen	<0.05	mg/L	<0.05	meq/L
Calcium	296	mg/L	14.8	meq/L
Magnesium	161	mg/L	13.2	meq/L
Potassium	21.900	mg/L	0.56	meq/L
Sodium	3,940	mg/L	171	meq/L
Cations			200	meq/L
Anions			200	meq/L
Cation/Anion Difference			0.09	%

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments:

Reported by WM

Reviewed by

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

lient:	BHP Minerals		
Project:	Navajo Mine-Table 4	Date Reported:	05/10/96
Sample ID:	Bitsui 6-1	Date Sampled:	04/11/96
Laboratory ID:	0396W00610	Time Sampled:	12:32
Sample Matrix:	Water	Date Received:	04/12/96
Condition:	Cool/Intact		

Parameter	Dissolved Analytical Results	Units	Total Analytical Results	Units
Trace Metals				
Aluminum	0.46	mg/L		
Arsenic	<0.005	mg/L		
Barium	<0.5	mg/L		
Beryllium	<0.005	mg/L		
Boron	1.47	mg/L		
Cadmium	0.011	mg/L		
Chromium	NA	mg/L	0.02	mg/L
Cobalt	<0.05	mg/L		
Copper	<0.01	mg/L		
Iron	0.19	mg/L	1.25	mg/L
Lead	<0.005	mg/L		
*Manganese	2.73	mg/L	2.54	mg/L
Mercury	<0.001	mg/L		
Selenium	<0.005	mg/L		
Silica	5.79	mg/L		
Silver	<0.01	mg/L		
Zinc	0.02	mg/L		

Reference: U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983
"Standard Methods For The Examination Of Water And Waste Water", 19th ed., 1995.

Comments: Dissolved Mn > Total Mn, within range of laboratory error.

Reported by WM

Reviewed by

APPENDIX D

D-5 ELECTRONIC DATA

BLANK APPENDIX

(Data originally submitted in June 1996 submission)

November 1996

BHP Minerals

Navajo Mine

Fruitland

APPENDIX D

ANALYTICAL DATA AND RESULTS

D-6 Water Quality Graphs

November 1996

BHP Minerals

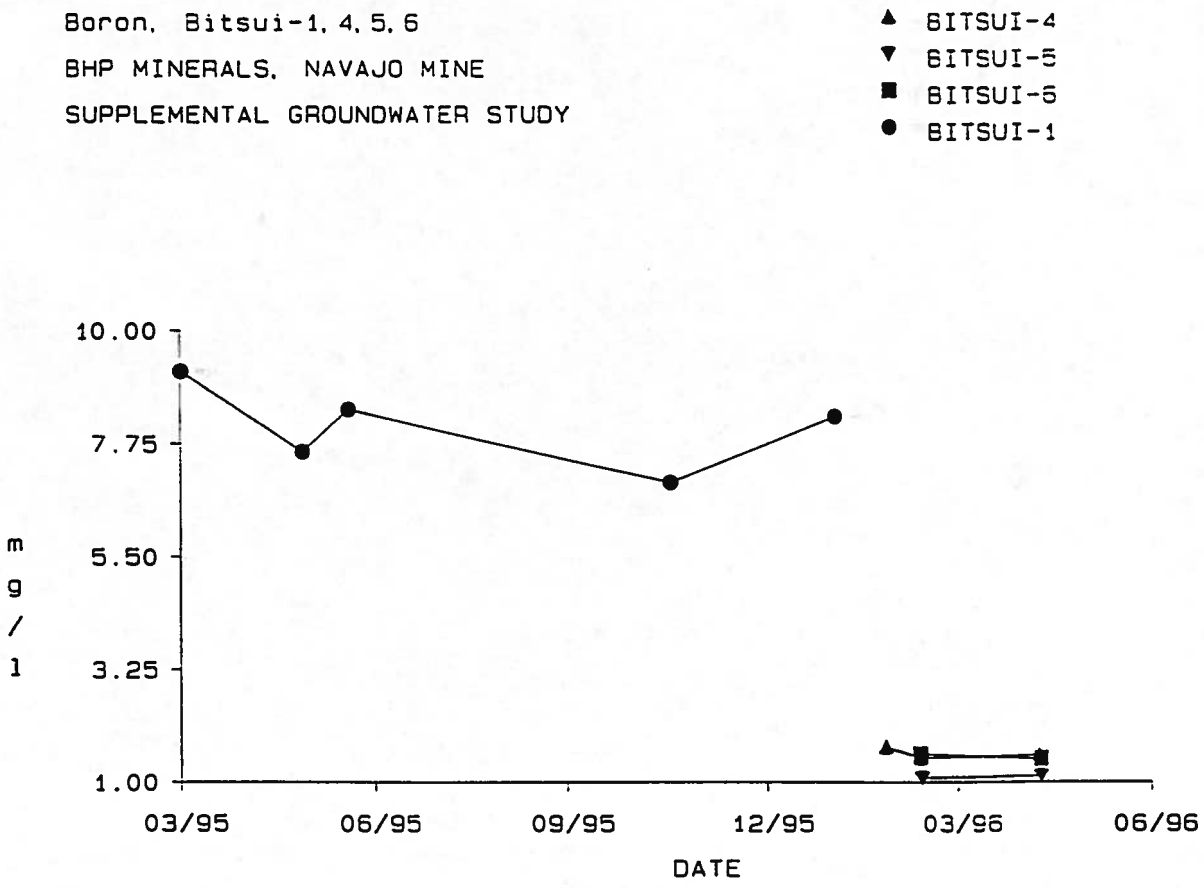
Navajo Mine

Fruitland

Boron, Bitsui-1, 4, 5, 6

BHP MINERALS, NAVAJO MINE

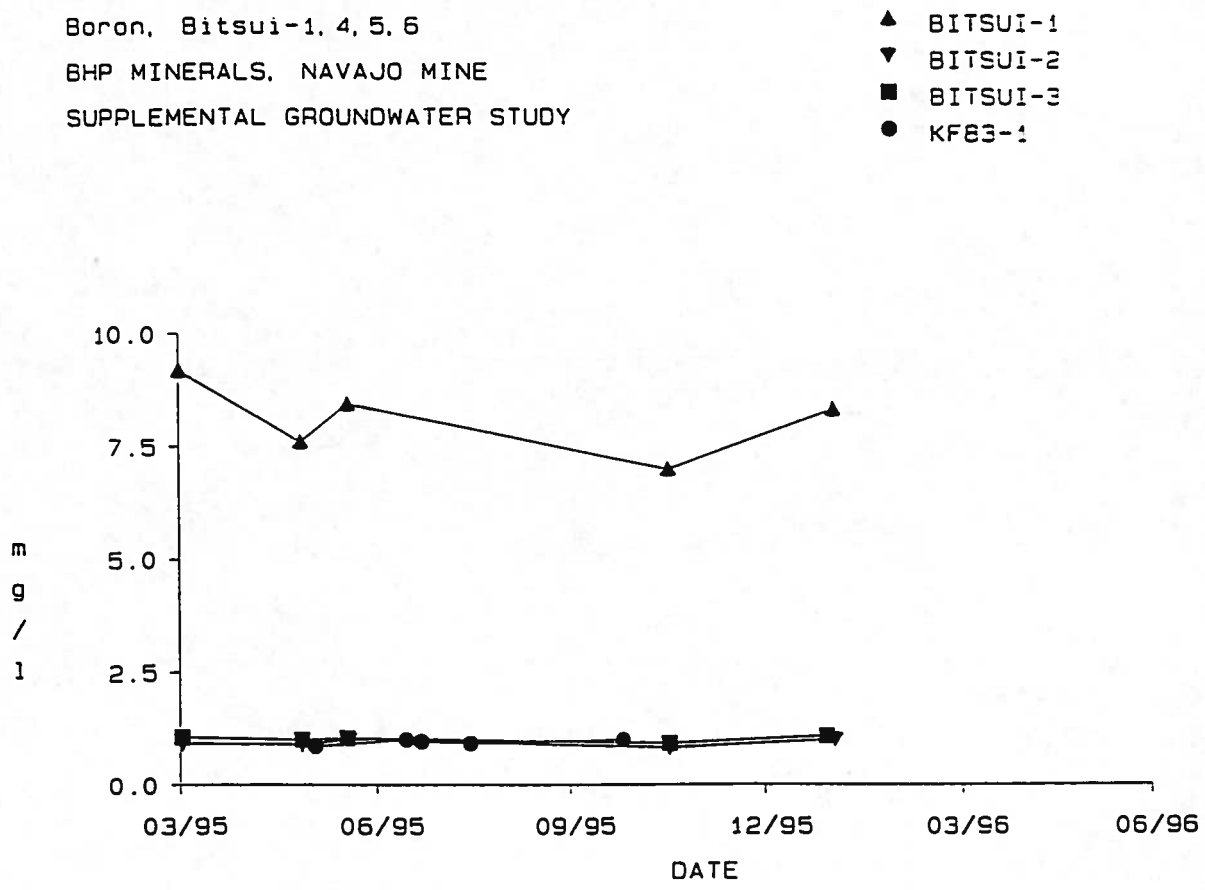
SUPPLEMENTAL GROUNDWATER STUDY



Boron, Bitsui-1, 4, 5, 6

BHP MINERALS, NAVAJO MINE

SUPPLEMENTAL GROUNDWATER STUDY



SUPPLEMENTAL GROUNDWATER STUDY
GROUNDWATER DATA

- **THROUGH MARCH 1998**

(6/99)

SUPPLEMENTAL GROUNDWATER STUDY

TABLE OF CONTENTS

1.0 Quality Report 2

2.0 Summary Statistics 21

3.0 Concentration versus Time Plots 29

4.0 Trilinear Diagrams 38

QUALITY REPORT

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: ASH

Station Name:		BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1
Sample Date:		03/01/95	04/27/95	05/19/95	10/18/95	01/02/96	04/09/96
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	8.70	8.80	8.80	8.90	8.80	8.90
Conductivity (Lab)	(umho/cm)	17800	18100	25900	17800	17800	16600
TDS (180 deg C)	(mg/l)	14200	14200	14200	14200	14700	13200
Boron	(mg/l)	9.20	7.60	8.44	6.98	8.30	10.20
Fluoride	(mg/l)	2.60	2.64	2.71	2.51	4.39	2.18
NUTRIENTS							
Nitrate as N	(mg/l)	1.40	2.40	1.50	-0.01	0.73	-0.05
Nitrite as N	(mg/l)	-0.01	-0.01	-0.01	-0.01	-0.05	0.20
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	1020.00	1160.00	1180.00	1010.00	837.00	866.00
Carbonate as CO3	(mg/l)	82.00	60.00	84.00	108.00	96.00	84.00
Chloride	(mg/l)	1880.00	2050.00	2070.00	1950.00	1980.00	1800.00
Sulfate	(mg/l)	6780.00	6680.00	7100.00	6850.00	6990.00	6570.00
MAJOR CATIONS							
Calcium	(mg/l)	46.00	56.00	45.00	56.00	63.00	270.00
Magnesium	(mg/l)	28.00	34.00	29.00	27.00	32.00	119.00
Potassium	(mg/l)	27.00	54.00	23.00	20.00	20.00	21.10
Sodium	(mg/l)	4980.00	4970.00	4830.00	4860.00	5040.00	3980.00
Major Anions	(meq/l)	213.75	218.08	228.47	217.77	218.36	204.56
Major Cations	(meq/l)	221.91	223.15	215.32	216.92	225.51	196.92
Charge Balance	(percent)	1.87	1.15	2.96	0.20	1.61	1.90
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	0.040	0.030	0.040	N	0.036	0.030
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	-0.010	N	-0.010	N	-0.010	-0.010
Mercury	(mg/l)	-0.00100	N	-0.00100	N	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010	-0.010	N	-0.010	-0.010
Zinc	(mg/l)	0.050	-0.010	-0.010	N	-0.010	-0.010
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	-0.050	-0.500	-0.500	-0.500	0.030	-0.500
Cadmium	(mg/l)	0.0030	-0.0020	-0.0050	-0.0020	-0.0020	-0.0020
Iron	(mg/l)	-0.050	-0.050	-0.050	-0.050	-0.050	0.450
Total Iron	(mg/l)	1.50	0.90	1.06	0.62	0.65	21.40
Lead	(mg/l)	0.006	0.011	-0.050	-0.005	-0.005	-0.005
Manganese	(mg/l)	0.110	0.094	0.100	0.080	0.100	0.280
Total Manganese	(mg/l)	0.14	0.11	0.11	0.07	0.10	0.57
Selenium	(mg/l)	0.009	0.007	0.007	0.016	0.010	0.006

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: ASH

Station Name:		BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1	BITSUI-1
Sample Date:		06/21/96	09/27/96	12/12/96	03/12/97	06/17/97	10/01/97
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	8.50	8.90	N	8.90	N	8.80
Conductivity (Lab)	(umho/cm)	368	19300	N	19200	N	18500
TDS (180 deg C)	(mg/l)	N	15300	N	15400	N	15000
Boron	(mg/l)	N	8.75	N	8.01	N	8.97
Fluoride	(mg/l)	0.58	2.62	N	2.81	N	2.00
NUTRIENTS							
Nitrate as N	(mg/l)	N	0.24	N	-0.05	N	N
Nitrite as N	(mg/l)	N	-0.05	N	N	N	N
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	N	0.27
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	123.00	1100.00	N	1190.00	N	938.00
Carbonate as CO3	(mg/l)	2.88	120.00	N	91.90	N	92.00
Chloride	(mg/l)	58.80	2310.00	N	2023.00	N	1980.00
Sulfate	(mg/l)	261.00	7460.00	N	7588.00	N	7040.00
MAJOR CATIONS							
Calcium	(mg/l)	56.50	51.10	N	51.60	N	64.40
Magnesium	(mg/l)	11.70	31.50	N	33.60	N	30.70
Potassium	(mg/l)	2.35	18.40	N	22.30	N	3.00
Sodium	(mg/l)	120.00	5180.00	N	5077.00	N	5050.00
Major Anions	(meq/l)	9.21	242.53	N	237.61	N	220.89
Major Cations	(meq/l)	9.06	230.93	N	226.74	N	225.48
Charge Balance	(percent)	0.82	2.45	N	2.34	N	1.03
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	-0.005	-0.005	N	0.310	N	0.032
Chromium	(mg/l)	-0.0100	N	N	N	N	N
Copper	(mg/l)	N	-0.010	N	-0.010	N	-0.010
Mercury	(mg/l)	N	-0.00100	N	-0.00100	N	-0.00100
Silver	(mg/l)	-0.010	-0.010	N	-0.010	N	-0.010
Zinc	(mg/l)	-0.050	-0.050	N	-0.050	N	-0.020
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	0.050	0.030	N	0.040	N	0.030
Cadmium	(mg/l)	-0.0010	-0.0010	N	-0.0010	N	-0.0010
Iron	(mg/l)	0.030	0.250	N	0.400	N	0.210
Total Iron	(mg/l)	0.12	0.67	N	1.21	N	1.64
Lead	(mg/l)	-0.005	-0.005	N	-0.005	N	-0.005
Manganese	(mg/l)	0.020	0.120	N	0.140	N	0.190
Total Manganese	(mg/l)	0.02	0.11	N	0.14	N	0.03
Selenium	(mg/l)	0.006	0.006	N	-0.005	N	0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: ASH

Station Name:		BITSUI-1	BITSUI-1
Sample Date:		01/20/98	03/26/98
LABORATORY MEASUREMENTS			
pH (Lab)	(S.U.)	8.90	8.80
Conductivity (Lab)	(umho/cm)	24900	19600
TDS (180 deg C)	(mg/l)	15200	14600
Boron	(mg/l)	9.52	12.10
Fluoride	(mg/l)	2.49	2.74
NUTRIENTS			
Nitrate as N	(mg/l)	N	N
Nitrite as N	(mg/l)	N	N
Nitrate + Nitrite as N	(mg/l)	-0.05	-0.05
MAJOR ANIONS			
Bicarbonate as CaCO3	(mg/l)	N	N
Carbonate as CaCO3	(mg/l)	N	N
Bicarbonate as HCO3	(mg/l)	765.00	950.00
Carbonate as CO3	(mg/l)	170.00	86.00
Chloride	(mg/l)	1830.00	1750.00
Sulfate	(mg/l)	6450.00	6200.00
MAJOR CATIONS			
Calcium	(mg/l)	65.60	52.00
Magnesium	(mg/l)	32.50	28.00
Potassium	(mg/l)	16.30	21.00
Sodium	(mg/l)	3750.00	4360.00
Major Anions	(meq/l)	204.12	196.89
Major Cations	(meq/l)	169.48	195.09
Charge Balance	(percent)	9.27	0.46
TRACE METALS (Dissolved)			
Arsenic	(mg/l)	0.029	-0.005
Chromium	(mg/l)	N	N
Copper	(mg/l)	-0.010	-0.010
Mercury	(mg/l)	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010
Zinc	(mg/l)	-0.020	-0.025
Radium 226	(pCi/l)	N	N
Radium 228	(pCi/l)	N	N
Barium	(mg/l)	0.030	0.040
Cadmium	(mg/l)	-0.0010	-0.0010
Iron	(mg/l)	0.200	0.350
Total Iron	(mg/l)	0.22	0.56
Lead	(mg/l)	-0.005	-0.005
Manganese	(mg/l)	0.249	0.391
Total Manganese	(mg/l)	0.26	0.41
Selenium	(mg/l)	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2
Sample Date:		03/02/95	04/27/95	05/19/95	10/18/95	01/02/96	04/09/96
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	8.00	8.00	8.00	8.00	7.90	8.20
Conductivity (Lab)	(umho/cm)	8080	8110	12100	7730	7590	7950
TDS (180 deg C)	(mg/l)	5050	5020	5010	4910	5020	5010
Boron	(mg/l)	0.93	0.91	1.03	0.83	1.01	0.97
Fluoride	(mg/l)	0.79	1.78	1.75	1.69	2.66	1.61
NUTRIENTS							
Nitrate as N	(mg/l)	-0.01	0.15	-0.01	0.50	0.53	-0.05
Nitrite as N	(mg/l)	-0.01	-0.01	0.05	-0.01	-0.05	-0.05
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	3480.00	3460.00	3520.00	3420.00	3610.00	3460.00
Carbonate as CO3	(mg/l)	0.00	0.00	0.00	0.00	0.00	-1.00
Chloride	(mg/l)	1160.00	1220.00	1220.00	1170.00	1150.00	1250.00
Sulfate	(mg/l)	7.00	48.00	28.00	17.00	4.50	24.70
MAJOR CATIONS							
Calcium	(mg/l)	3.60	6.60	8.60	8.60	6.40	6.01
Magnesium	(mg/l)	1.50	2.70	3.00	1.90	2.60	2.07
Potassium	(mg/l)	7.00	13.00	1.60	7.00	5.10	5.87
Sodium	(mg/l)	1940.00	2110.00	2090.00	1990.00	2050.00	1930.00
Major Anions	(meq/l)	89.90	92.13	92.68	89.44	91.73	92.48
Major Cations	(meq/l)	84.87	92.66	91.63	87.33	89.83	84.57
Charge Balance	(percent)	2.88	0.29	0.57	1.19	1.05	4.47
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	-0.005	-0.005	-0.005	N	-0.005	-0.005
Chromium	(mg/l)	-0.0200	N	N	N	N	N
Copper	(mg/l)	-0.010	N	-0.010	N	-0.010	-0.010
Mercury	(mg/l)	-0.00100	N	-0.00100	N	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010	-0.010	N	-0.010	-0.010
Zinc	(mg/l)	-0.010	0.010	0.030	N	-0.010	0.020
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	2.690	2.700	2.890	2.420	2.960	2.800
Cadmium	(mg/l)	-0.0020	-0.0020	-0.0020	-0.0020	-0.0020	-0.0020
Iron	(mg/l)	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
Total Iron	(mg/l)	0.07	0.11	0.07	-0.05	-0.05	0.12
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	-0.020	-0.020	-0.020	-0.020	-0.020	-0.020
Total Manganese	(mg/l)	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-2
Sample Date:		06/21/96	09/27/96	01/10/97	03/11/97	06/18/97	10/01/97
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	8.50	8.00	7.90	8.00	8.00	7.90
Conductivity (Lab)	(umho/cm)	2030	7990	8010	8000	7900	8000
TDS (180 deg C)	(mg/l)	1450	5160	5130	5080	5100	5090
Boron	(mg/l)	0.27	1.05	0.95	0.97	1.02	0.93
Fluoride	(mg/l)	1.36	1.74	1.68	1.75	1.71	2.00
NUTRIENTS							
Nitrate as N	(mg/l)	N	1.01	0.11	-0.05	N	N
Nitrite as N	(mg/l)	N	-0.05	N	N	N	N
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	-0.05	-0.05
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	182.00	3510.00	3370.00	3340.00	3320.00	3160.00
Carbonate as CO3	(mg/l)	30.00	-1.00	-1.00	-1.00	-1.00	-1.00
Chloride	(mg/l)	130.00	1260.00	1270.00	1154.00	1150.00	1200.00
Sulfate	(mg/l)	744.00	82.30	70.00	37.00	95.00	264.00
MAJOR CATIONS							
Calcium	(mg/l)	70.30	4.61	5.21	4.87	5.50	5.10
Magnesium	(mg/l)	23.20	1.94	2.07	2.10	2.00	1.50
Potassium	(mg/l)	4.30	5.47	7.43	6.13	8.00	3.30
Sodium	(mg/l)	390.00	1980.00	2220.00	2002.00	2150.00	2060.00
Major Anions	(meq/l)	23.14	94.84	92.52	88.06	88.83	91.13
Major Cations	(meq/l)	22.49	86.66	97.18	87.65	94.16	90.07
Charge Balance	(percent)	1.42	4.51	2.46	0.23	2.92	0.59
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	-0.0100	N	N	N	N	N
Copper	(mg/l)	N	-0.010	-0.010	-0.010	-0.010	-0.010
Mercury	(mg/l)	N	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010	-0.010	-0.010	0.050	-0.010
Zinc	(mg/l)	-0.050	-0.050	-0.050	-0.050	-0.020	-0.020
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	0.030	2.990	2.930	3.120	2.830	2.720
Cadmium	(mg/l)	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010
Iron	(mg/l)	0.140	0.030	-0.030	-0.030	-0.020	-0.020
Total Iron	(mg/l)	0.24	0.19	0.07	0.10	0.06	0.48
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	0.020	-0.010	-0.010	-0.010	-0.005	-0.010
Total Manganese	(mg/l)	0.06	-0.01	-0.01	-0.01	-0.01	0.18
Selenium	(mg/l)	0.006	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		BITSUI-2	BITSUI-2	BITSUI-2	BITSUI-3	BITSUI-3	BITSUI-3
Sample Date:		10/05/97	01/22/98	03/26/98	03/02/95	04/27/95	05/18/95
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	N	7.90	8.00	7.60	7.50	7.30
Conductivity (Lab)	(umho/cm)	N	7510	8700	13000	13100	14600
TDS (180 deg C)	(mg/l)	N	5190	5050	7980	7740	7730
Boron	(mg/l)	N	0.87	1.06	1.07	1.00	1.05
Fluoride	(mg/l)	N	1.87	1.86	-0.01	0.99	0.99
NUTRIENTS							
Nitrate as N	(mg/l)	N	N	N	1.00	4.10	-0.01
Nitrite as N	(mg/l)	N	N	N	-0.01	-0.01	-0.01
Nitrate + Nitrite as N	(mg/l)	N	0.12	-0.05	N	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	N	2590.00	3390.00	3.12	3050.00	3070.00
Carbonate as CO3	(mg/l)	N	-1.00	-1.00	0.00	0.00	0.00
Chloride	(mg/l)	N	1150.00	1040.00	2820.00	3160.00	3080.00
Sulfate	(mg/l)	N	51.00	34.00	442.00	255.00	192.00
MAJOR CATIONS							
Calcium	(mg/l)	N	4.70	4.00	11.00	27.00	19.00
Magnesium	(mg/l)	N	1.10	2.00	5.20	12.00	6.10
Potassium	(mg/l)	N	3.80	8.00	14.00	44.00	10.00
Sodium	(mg/l)	N	1740.00	1750.00	3200.00	3150.00	3130.00
Major Anions	(meq/l)	N	75.95	85.60	88.86	144.72	141.19
Major Cations	(meq/l)	N	76.11	76.69	140.53	140.49	137.86
Charge Balance	(percent)	N	0.10	5.49	22.52	1.48	1.19
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	N	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	-0.0200	N	N
Copper	(mg/l)	N	0.040	-0.010	-0.010	N	-0.010
Mercury	(mg/l)	N	-0.00100	-0.00100	-0.00100	N	-0.00100
Silver	(mg/l)	N	-0.010	-0.010	-0.010	-0.010	-0.010
Zinc	(mg/l)	N	-0.025	-0.025	-0.010	0.010	0.100
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	N	2.860	3.130	-0.500	1.300	0.510
Cadmium	(mg/l)	N	-0.0010	-0.0010	0.0040	-0.0020	-0.0050
Iron	(mg/l)	N	0.040	-0.020	-0.050	-0.050	0.050
Total Iron	(mg/l)	N	0.08	0.09	0.24	0.75	0.28
Lead	(mg/l)	N	-0.005	-0.005	0.012	0.033	-0.050
Manganese	(mg/l)	N	-0.005	-0.005	-0.020	-0.020	-0.020
Total Manganese	(mg/l)	N	-0.01	0.03	-0.02	-0.02	-0.02
Selenium	(mg/l)	N	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		BITSUI-3	BITSUI-3	BITSUI-3	BITSUI-3	BITSUI-3	BITSUI-3
Sample Date:		10/18/95	12/29/95	03/25/96	09/26/96	01/10/97	03/12/97
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	7.60	7.60	7.70	7.60	7.40	7.60
Conductivity (Lab)	(umho/cm)	12400	12600	12900	12900	12800	12700
TDS (180 deg C)	(mg/l)	7790	8140	8010	8120	8220	8100
Boron	(mg/l)	0.92	1.08	1.15	1.07	1.09	1.02
Fluoride	(mg/l)	1.02	1.27	1.04	1.01	0.94	1.11
NUTRIENTS							
Nitrate as N	(mg/l)	1.20	-0.05	-0.05	0.25	-0.05	-0.05
Nitrite as N	(mg/l)	-0.01	-0.05	-0.05	-0.05	N	N
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	3220.00	2920.00	3290.00	3200.00	3000.00	3090.00
Carbonate as CO3	(mg/l)	0.00	0.00	-1.00	-1.00	-1.00	-1.00
Chloride	(mg/l)	2760.00	2810.00	2610.00	3070.00	2970.00	2890.00
Sulfate	(mg/l)	471.00	509.00	604.00	530.00	400.00	321.00
MAJOR CATIONS							
Calcium	(mg/l)	23.00	25.00	23.00	18.20	22.40	21.50
Magnesium	(mg/l)	12.00	10.00	9.70	7.53	10.20	9.30
Potassium	(mg/l)	23.00	9.80	11.00	8.60	11.70	12.30
Sodium	(mg/l)	3390.00	3230.00	3210.00	3420.00	3380.00	3093.00
Major Anions	(meq/l)	140.52	137.72	140.12	150.09	141.27	138.84
Major Cations	(meq/l)	150.19	142.82	141.86	150.51	149.28	136.69
Charge Balance	(percent)	3.33	1.82	0.62	0.14	2.76	0.78
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	N	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	N	-0.010	-0.010	-0.010	-0.010	-0.010
Mercury	(mg/l)	N	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	N	-0.010	-0.010	-0.010	-0.010	-0.010
Zinc	(mg/l)	N	-0.010	-0.010	-0.050	-0.050	-0.050
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	-0.500	0.360	-0.500	0.240	0.090	5.850
Cadmium	(mg/l)	-0.0020	-0.0020	-0.0020	-0.0010	-0.0010	-0.0010
Iron	(mg/l)	-0.050	-0.050	0.400	0.060	0.220	0.140
Total Iron	(mg/l)	0.12	0.18	0.85	0.16	0.35	0.21
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	-0.020	-0.020	-0.020	-0.010	-0.010	-0.010
Total Manganese	(mg/l)	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		BITSUI-3	BITSUI-3	BITSUI-3	BITSUI-3	KF83-1	KF83-1
Sample Date:		06/17/97	10/01/97	01/22/98	03/26/98	09/16/85	09/16/86
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	N	7.50	7.50	7.50	8.28	8.25
Conductivity (Lab)	(umho/cm)	N	12500	11900	14100	9400	9600
TDS (180 deg C)	(mg/l)	N	N	N	N	7080	7050
Boron	(mg/l)	N	1.02	1.03	1.10	1.16	1.10
Fluoride	(mg/l)	N	1.00	1.14	1.05	1.32	1.13
NUTRIENTS							
Nitrate as N	(mg/l)	N	N	N	N	N	N
Nitrite as N	(mg/l)	N	N	N	N	N	N
Nitrate + Nitrite as N	(mg/l)	N	0.29	0.12	-0.05	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	2630.00	2790.00
Carbonate as CaCO3	(mg/l)	N	N	N	N	300.00	320.00
Bicarbonate as HCO3	(mg/l)	N	3140.00	3240.00	3200.00	N	N
Carbonate as CO3	(mg/l)	N	-1.00	-1.00	-1.00	N	N
Chloride	(mg/l)	N	2780.00	2650.00	2430.00	2255.00	2460.00
Sulfate	(mg/l)	N	560.00	529.00	317.00	83.00	72.00
MAJOR CATIONS							
Calcium	(mg/l)	N	100.00	17.50	17.00	20.00	16.20
Magnesium	(mg/l)	N	12.00	7.10	8.00	6.40	6.00
Potassium	(mg/l)	N	1.90	5.70	11.00	18.00	26.90
Sodium	(mg/l)	N	3320.00	3100.00	2590.00	2630.00	2750.00
Major Anions	(meq/l)	N	141.55	138.87	127.58	123.88	133.03
Major Cations	(meq/l)	N	150.44	136.44	114.45	116.39	121.61
Charge Balance	(percent)	N	3.04	0.88	5.42	3.12	4.48
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	N	-0.005	-0.005	-0.005	0.002	0.002
Chromium	(mg/l)	N	N	N	N	0.0050	-0.0020
Copper	(mg/l)	N	-0.010	0.030	-0.010	N	N
Mercury	(mg/l)	N	-0.00100	-0.00100	-0.00100	N	N
Silver	(mg/l)	N	-0.010	-0.010	-0.010	N	N
Zinc	(mg/l)	N	-0.020	-0.025	-0.025	0.050	-0.050
Radium 226	(pCi/l)	N	N	N	N	3.4	1.0
Radium 228	(pCi/l)	N	N	N	N	1.1	1.9
Barium	(mg/l)	N	0.070	0.050	0.120	6.000	6.100
Cadmium	(mg/l)	N	-0.0010	-0.0010	-0.0010	0.0010	-0.0010
Iron	(mg/l)	N	-0.020	0.200	0.140	3.000	0.230
Total Iron	(mg/l)	N	0.57	0.22	0.29	N	N
Lead	(mg/l)	N	-0.005	-0.005	-0.005	0.007	0.010
Manganese	(mg/l)	N	-0.010	-0.005	-0.005	0.210	0.038
Total Manganese	(mg/l)	N	0.03	-0.01	0.03	N	N
Selenium	(mg/l)	N	-0.005	-0.005	-0.005	-0.001	-0.001

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		KF83-1	KF83-1	KF83-1	KF83-1	KF83-1	KF83-1
Sample Date:		09/16/87	09/23/88	09/21/89	09/21/90	09/23/91	09/22/92
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	8.06	7.99	8.05	8.53	8.02	8.68
Conductivity (Lab)	(umho/cm)	10000	9900	10000	9400	9800	11000
TDS (180 deg C)	(mg/l)	7300	7040	7440	7100	7250	7270
Boron	(mg/l)	1.70	1.04	1.09	1.08	0.99	1.00
Fluoride	(mg/l)	0.93	0.93	0.98	1.06	0.90	1.08
NUTRIENTS							
Nitrate as N	(mg/l)	N	N	N	-0.05	-0.05	-0.05
Nitrite as N	(mg/l)	N	N	N	-0.05	-0.05	-0.05
Nitrate + Nitrite as N	(mg/l)	N	N	N	-0.05	-0.04	-0.04
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	1880.00	2530.00	2340.00	2660.00	2600.00	2260.00
Carbonate as CaCO3	(mg/l)	600.00	0.00	220.00	160.00	0.00	240.00
Bicarbonate as HCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CO3	(mg/l)	N	N	N	N	N	N
Chloride	(mg/l)	2485.00	2760.00	2530.00	2260.00	2400.00	2680.00
Sulfate	(mg/l)	50.00	-10.00	34.00	80.00	50.00	-10.00
MAJOR CATIONS							
Calcium	(mg/l)	22.10	20.00	18.80	23.90	19.60	19.60
Magnesium	(mg/l)	7.20	8.20	6.60	7.00	6.90	7.00
Potassium	(mg/l)	11.50	12.10	13.00	11.80	9.40	9.80
Sodium	(mg/l)	2650.00	2650.00	2350.00	2690.00	2670.00	2890.00
Major Anions	(meq/l)	120.69	128.40	123.23	121.77	120.69	125.55
Major Cations	(meq/l)	117.25	117.25	104.03	119.08	117.93	127.52
Charge Balance	(percent)	1.45	4.54	8.45	1.12	1.16	0.78
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	0.002	0.002	0.004	0.003	0.001	0.002
Chromium	(mg/l)	0.0150	-0.0200	-0.0100	-0.0100	-0.0200	-0.0200
Copper	(mg/l)	N	N	N	N	N	N
Mercury	(mg/l)	N	N	N	N	N	N
Silver	(mg/l)	N	N	N	N	N	N
Zinc	(mg/l)	-0.050	-0.050	-0.100	-0.050	-0.250	-0.250
Radium 226	(pCi/l)	3.1	2.5	2.3	2.2	1.6	2.6
Radium 228	(pCi/l)	1.6	0.8	0.1	4.1	9.5	-4.2
Barium	(mg/l)	-1.000	6.600	4.400	2.100	3.800	5.100
Cadmium	(mg/l)	0.0900	-0.0100	-0.0050	-0.0050	-0.0050	-0.0050
Iron	(mg/l)	-0.500	0.500	-0.500	1.300	-0.500	-0.200
Total Iron	(mg/l)	N	N	N	N	N	N
Lead	(mg/l)	0.095	0.040	0.030	0.050	0.020	-0.020
Manganese	(mg/l)	-0.200	-0.200	-0.200	-0.200	-0.200	-0.200
Total Manganese	(mg/l)	N	N	N	N	N	N
Selenium	(mg/l)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		KF83-1	KF83-1	KF83-1	KF83-1	KF83-1	KF83-1
Sample Date:		03/08/93	09/07/94	05/03/95	06/14/95	06/21/95	07/14/95
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	8.57	7.65	7.60	7.90	7.90	7.80
Conductivity (Lab)	(umho/cm)	9300	9600	11500	9690	10300	9850
TDS (180 deg C)	(mg/l)	6710	7330	6820	5750	5670	5850
Boron	(mg/l)	0.93	0.90	0.87	1.00	0.97	0.92
Fluoride	(mg/l)	1.13	1.07	0.83	1.44	1.54	1.57
NUTRIENTS							
Nitrate as N	(mg/l)	-0.05	-0.05	6.24	-0.01	18.20	-0.01
Nitrite as N	(mg/l)	-0.05	-0.05	-0.01	-0.01	-0.01	-0.01
Nitrate + Nitrite as N	(mg/l)	-0.04	-0.04	N	N	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	2260.00	2740.00	N	N	N	N
Carbonate as CaCO3	(mg/l)	480.00	0.00	N	N	N	N
Bicarbonate as HCO3	(mg/l)	N	N	2970.00	3690.00	3740.00	3630.00
Carbonate as CO3	(mg/l)	N	N	0.00	0.00	0.00	0.00
Chloride	(mg/l)	2180.00	2080.00	2700.00	1210.00	1170.00	1230.00
Sulfate	(mg/l)	74.00	142.00	7.00	353.00	411.00	375.00
MAJOR CATIONS							
Calcium	(mg/l)	19.00	14.00	28.00	11.00	11.00	11.00
Magnesium	(mg/l)	5.60	4.90	13.00	4.60	4.90	4.40
Potassium	(mg/l)	9.30	8.20	31.00	7.00	13.00	8.20
Sodium	(mg/l)	2690.00	2670.00	2760.00	2380.00	2370.00	2260.00
Major Anions	(meq/l)	117.78	116.38	125.43	101.95	104.15	101.99
Major Cations	(meq/l)	118.66	117.45	123.31	104.63	104.37	99.42
Charge Balance	(percent)	0.37	0.46	0.85	1.30	0.11	1.28
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	N	N	N	N	N	N
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	N	N	N	N	N	N
Mercury	(mg/l)	N	N	N	N	N	N
Silver	(mg/l)	N	N	N	N	N	N
Zinc	(mg/l)	N	N	N	N	N	N
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	1.400	-1.000	5.000	-0.500	1.700	0.580
Cadmium	(mg/l)	-0.0050	-0.0050	-0.0040	-0.0020	-0.0020	-0.0020
Iron	(mg/l)	-0.300	-0.200	-0.050	-0.050	-0.050	-0.050
Total Iron	(mg/l)	-0.30	-0.20	1.06	0.07	-0.05	-0.05
Lead	(mg/l)	-0.020	-0.020	-0.010	-0.005	-0.005	-0.005
Manganese	(mg/l)	-0.200	-0.200	-0.020	-0.020	-0.020	-0.020
Total Manganese	(mg/l)	-0.20	-0.20	0.03	-0.02	-0.02	-0.02
Selenium	(mg/l)	-0.001	-0.001	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		KF83-1	KF83-1	KF83-1	KF83-1	KF83-1	KF83-1
Sample Date:		09/26/95	03/25/96	10/03/96	12/03/96	03/26/97	07/01/97
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	7.80	7.70	7.80	7.60	7.70	7.70
Conductivity (Lab)	(umho/cm)	9300	11100	9650	10500	11650	11300
TDS (180 deg C)	(mg/l)	5830	6860	6270	6860	7168	7100
Boron	(mg/l)	1.00	0.90	0.94	1.04	0.95	1.03
Fluoride	(mg/l)	1.29	0.90	1.38	1.07	1.05	0.95
NUTRIENTS							
Nitrate as N	(mg/l)	-0.01	0.14	-0.05	-0.05	-0.05	N
Nitrite as N	(mg/l)	-0.01	-0.05	-0.05	N	N	N
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	N	-0.05
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	3530.00	3130.00	3360.00	3180.00	2764.00	3010.00
Carbonate as CO3	(mg/l)	0.00	-1.00	-1.00	-1.00	-1.00	-1.00
Chloride	(mg/l)	1500.00	2610.00	123.00	2089.00	2610.00	2620.00
Sulfate	(mg/l)	351.00	123.50	980.00	360.00	239.00	379.00
MAJOR CATIONS							
Calcium	(mg/l)	14.60	19.40	11.60	16.20	21.20	20.50
Magnesium	(mg/l)	7.05	7.41	4.50	5.83	8.10	7.00
Potassium	(mg/l)	9.80	8.60	7.82	8.21	15.00	8.50
Sodium	(mg/l)	2480.00	2720.00	2400.00	2601.00	2620.00	2290.00
Major Anions	(meq/l)	107.47	127.50	78.94	118.54	123.90	131.12
Major Cations	(meq/l)	109.43	120.11	105.54	114.64	116.07	101.43
Charge Balance	(percent)	0.90	2.98	14.42	1.67	3.26	12.77
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	N	N	N	N	N	N
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	N	N	N	N	N	N
Mercury	(mg/l)	N	N	N	N	N	N
Silver	(mg/l)	N	N	N	N	N	N
Zinc	(mg/l)	N	N	N	N	N	N
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	-0.500	3.770	0.050	0.170	0.250	-0.010
Cadmium	(mg/l)	-0.0020	-0.0020	-0.0010	-0.0010	-0.0010	-0.0010
Iron	(mg/l)	-0.050	0.140	0.040	0.170	0.150	0.100
Total Iron	(mg/l)	-0.05	0.22	0.10	0.83	0.19	0.11
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	-0.020	-0.020	-0.010	0.030	0.030	0.023
Total Manganese	(mg/l)	-0.02	-0.02	-0.01	0.02	0.03	0.02
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		KF83-1	KF83-1	KF83-1	KF83-1	KF83-1	KF83-1
Sample Date:		09/26/97	12/22/97	12/22/97	03/19/98	06/18/98	09/21/98
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	7.60	7.70	7.70	7.60	7.60	7.60
Conductivity (Lab)	(umho/cm)	11400	11700	11600	11700	12900	11800
TDS (180 deg C)	(mg/l)	7140	7140	7290	7350	7280	7500
Boron	(mg/l)	0.92	1.04	1.04	1.15	1.02	1.04
Fluoride	(mg/l)	1.11	1.19	1.20	1.05	0.91	0.93
NUTRIENTS							
Nitrate as N	(mg/l)	N	N	N	N	N	N
Nitrite as N	(mg/l)	N	N	N	N	N	N
Nitrate + Nitrite as N	(mg/l)	0.29	0.14	0.14	0.07	0.32	-0.05
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	2500.00	2910.00	2970.00	2700.00	2740.00	2580.00
Carbonate as CO3	(mg/l)	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
Chloride	(mg/l)	2270.00	2660.00	2670.00	2260.00	2380.00	2000.00
Sulfate	(mg/l)	435.00	619.00	825.00	276.00	371.00	503.00
MAJOR CATIONS							
Calcium	(mg/l)	-0.20	23.40	23.70	15.80	25.00	24.90
Magnesium	(mg/l)	3.20	7.30	7.90	5.80	10.00	7.40
Potassium	(mg/l)	5.80	11.00	10.90	7.70	15.00	7.60
Sodium	(mg/l)	2370.00	2960.00	3100.00	2530.00	2400.00	2440.00
Major Anions	(meq/l)	114.08	135.62	141.17	113.75	119.78	109.17
Major Cations	(meq/l)	103.50	130.80	136.95	111.51	106.85	108.18
Charge Balance	(percent)	4.86	1.31	1.52	0.99	5.71	0.45
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	N	N	-0.0100
Copper	(mg/l)	-0.010	0.130	0.170	-0.010	-0.010	-0.010
Mercury	(mg/l)	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
Zinc	(mg/l)	-0.025	-0.020	-0.020	-0.025	-0.025	-0.025
Radium 226	(pCi/l)	N	N	N	N	N	1.9
Radium 228	(pCi/l)	N	N	N	N	N	-1.5
Barium	(mg/l)	0.220	0.160	0.110	0.280	-0.010	0.400
Cadmium	(mg/l)	0.0040	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010
Iron	(mg/l)	0.050	0.140	0.140	0.230	0.240	0.100
Total Iron	(mg/l)	0.95	0.12	0.14	0.27	0.29	0.27
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	0.023	0.018	0.019	0.027	-0.005	0.018
Total Manganese	(mg/l)	0.87	0.02	0.02	0.02	-0.01	0.02
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: FRUITLAND FM; CS#8

Station Name:		KF83-1
Sample Date:		12/30/98
LABORATORY MEASUREMENTS		
pH (Lab)	(S.U.)	7.70
Conductivity (Lab)	(umho/cm)	11900
TDS (180 deg C)	(mg/l)	7370
Boron	(mg/l)	1.12
Fluoride	(mg/l)	0.92
NUTRIENTS		
Nitrate as N	(mg/l)	N
Nitrite as N	(mg/l)	N
Nitrate + Nitrite as N	(mg/l)	-0.05
MAJOR ANIONS		
Bicarbonate as CaCO3	(mg/l)	N
Carbonate as CaCO3	(mg/l)	N
Bicarbonate as HCO3	(mg/l)	2690.00
Carbonate as CO3	(mg/l)	-1.00
Chloride	(mg/l)	2450.00
Sulfate	(mg/l)	549.00
MAJOR CATIONS		
Calcium	(mg/l)	28.00
Magnesium	(mg/l)	9.00
Potassium	(mg/l)	8.00
Sodium	(mg/l)	2840.00
Major Anions	(meq/l)	124.62
Major Cations	(meq/l)	125.88
Charge Balance	(percent)	0.50
TRACE METALS (Dissolved)		
Arsenic	(mg/l)	-0.005
Chromium	(mg/l)	-0.0100
Copper	(mg/l)	-0.010
Mercury	(mg/l)	-0.00100
Silver	(mg/l)	-0.010
Zinc	(mg/l)	-0.025
Radium 226	(pCi/l)	1.8
Radium 228	(pCi/l)	-1.5
Barium	(mg/l)	0.500
Cadmium	(mg/l)	-0.0010
Iron	(mg/l)	N
Total Iron	(mg/l)	0.36
Lead	(mg/l)	-0.005
Manganese	(mg/l)	0.020
Total Manganese	(mg/l)	0.08
Selenium	(mg/l)	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: SPOIL

Station Name:		BITSUI-4	BITSUI-4	BITSUI-4	BITSUI-4	BITSUI-4	BITSUI-4
Sample Date:		01/26/96	02/12/96	04/10/96	10/02/96	01/13/97	03/12/97
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	6.90	7.10	7.10	6.80	6.80	6.90
Conductivity (Lab)	(umho/cm)	16700	14400	16500	17500	17500	18200
TDS (180 deg C)	(mg/l)	15000	13100	13800	15100	15500	16100
Boron	(mg/l)	1.71	1.49	1.54	1.49	1.67	1.61
Fluoride	(mg/l)	0.29	0.33	0.33	0.32	0.30	0.32
NUTRIENTS							
Nitrate as N	(mg/l)	0.09	1.20	1.17	0.33	0.09	-0.05
Nitrite as N	(mg/l)	-0.01	-0.01	0.05	-0.05	N	N
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	1760.00	1510.00	1650.00	1650.00	1800.00	1840.00
Carbonate as CO3	(mg/l)	0.00	0.00	-1.00	-1.00	-1.00	-1.00
Chloride	(mg/l)	634.00	451.00	651.00	45.70	630.00	659.00
Sulfate	(mg/l)	8640.00	6680.00	7860.00	8710.00	9460.00	9205.00
MAJOR CATIONS							
Calcium	(mg/l)	15.00	287.00	231.00	270.00	270.00	251.00
Magnesium	(mg/l)	131.00	125.00	123.00	130.00	130.00	129.00
Potassium	(mg/l)	538.00	22.00	19.20	20.70	22.30	24.80
Sodium	(mg/l)	4650.00	3850.00	4280.00	4610.00	4710.00	4824.00
Major Anions	(meq/l)	226.62	176.64	209.14	209.70	244.25	240.41
Major Cations	(meq/l)	227.55	192.64	208.31	225.22	229.61	233.60
Charge Balance	(percent)	0.20	4.33	0.20	3.57	3.09	1.44
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
Mercury	(mg/l)	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
Zinc	(mg/l)	0.030	0.140	0.020	0.060	-0.050	-0.050
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	0.030	-0.500	0.020	0.010	0.010	0.010
Cadmium	(mg/l)	-0.0020	-0.0020	-0.0020	-0.0010	-0.0010	-0.0010
Iron	(mg/l)	-0.050	0.060	0.260	0.370	0.400	0.550
Total Iron	(mg/l)	4.67	16.60	4.21	0.74	0.67	1.02
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	2.400	3.180	2.660	2.420	2.790	2.080
Total Manganese	(mg/l)	2.41	3.35	2.52	2.73	2.63	1.95
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: SPOIL

Station Name:		BITSUI-4	BITSUI-4	BITSUI-4	BITSUI-4	BITSUI-5	BITSUI-5
Sample Date:		06/17/97	10/02/97	01/20/98	03/26/98	02/13/96	04/11/96
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	N	6.80	6.80	6.80	7.40	7.50
Conductivity (Lab)	(umho/cm)	N	15900	24600	18600	13000	14200
TDS (180 deg C)	(mg/l)	N	15000	15200	15100	10300	10600
Boron	(mg/l)	N	1.52	2.24	1.71	1.10	1.13
Fluoride	(mg/l)	N	0.26	0.29	0.34	1.00	1.04
NUTRIENTS							
Nitrate as N	(mg/l)	N	N	N	N	0.01	-0.05
Nitrite as N	(mg/l)	N	N	N	N	-0.05	-0.05
Nitrate + Nitrite as N	(mg/l)	N	0.27	0.21	-0.05	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	N	1810.00	1080.00	1760.00	3170.00	3090.00
Carbonate as CO3	(mg/l)	N	-1.00	-1.00	-1.00	0.00	-1.00
Chloride	(mg/l)	N	696.00	540.00	508.00	1330.00	1210.00
Sulfate	(mg/l)	N	8670.00	7880.00	8130.00	3550.00	4060.00
MAJOR CATIONS							
Calcium	(mg/l)	N	284.00	256.00	194.00	72.00	59.50
Magnesium	(mg/l)	N	135.00	131.00	112.00	30.00	27.50
Potassium	(mg/l)	N	10.20	18.90	23.00	16.00	14.10
Sodium	(mg/l)	N	4920.00	3660.00	4090.00	3630.00	3830.00
Major Anions	(meq/l)	N	229.83	197.01	212.45	163.37	169.30
Major Cations	(meq/l)	N	239.55	183.24	197.39	164.37	172.19
Charge Balance	(percent)	N	2.07	3.62	3.67	0.31	0.85
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	N	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	N	-0.010	-0.010	-0.010	-0.010	-0.010
Mercury	(mg/l)	N	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	N	-0.010	-0.010	-0.010	-0.010	-0.010
Zinc	(mg/l)	N	-0.025	-0.020	-0.025	0.010	0.030
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	N	0.010	-0.010	0.010	-0.500	-0.500
Cadmium	(mg/l)	N	-0.0010	-0.0010	-0.0010	-0.0020	-0.0020
Iron	(mg/l)	N	0.520	0.690	0.890	0.480	0.310
Total Iron	(mg/l)	N	0.83	0.72	1.33	2.05	1.83
Lead	(mg/l)	N	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	N	2.240	2.990	4.270	0.410	0.170
Total Manganese	(mg/l)	N	2.49	3.02	5.09	0.41	0.17
Selenium	(mg/l)	N	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: SPOIL

Station Name:		BITSUI-5	BITSUI-5	BITSUI-5	BITSUI-5	BITSUI-5	BITSUI-5
Sample Date:		10/03/96	01/10/97	01/22/97	03/12/97	06/18/97	10/03/97
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	7.40	7.40	N	7.40	7.40	7.40
Conductivity (Lab)	(umho/cm)	15000	14900	N	15100	14900	15100
TDS (180 deg C)	(mg/l)	11400	11500	N	11600	11700	11600
Boron	(mg/l)	1.11	1.06	N	0.96	1.33	0.11
Fluoride	(mg/l)	1.02	1.00	N	1.04	1.00	0.85
NUTRIENTS							
Nitrate as N	(mg/l)	-0.05	0.09	N	-0.05	N	N
Nitrite as N	(mg/l)	-0.05	N	N	N	N	N
Nitrate + Nitrite as N	(mg/l)	N	N	N	N	-0.05	0.28
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	3050.00	2960.00	N	2940.00	-1.00	3010.00
Carbonate as CO3	(mg/l)	-1.00	-1.00	N	-1.00	-1.00	-1.00
Chloride	(mg/l)	1320.00	1260.00	N	1222.00	1200.00	1210.00
Sulfate	(mg/l)	4770.00	4770.00	N	4876.00	5030.00	5030.00
MAJOR CATIONS							
Calcium	(mg/l)	56.70	59.70	N	61.70	68.60	77.20
Magnesium	(mg/l)	27.60	29.60	N	30.70	33.30	34.90
Potassium	(mg/l)	13.30	10.40	N	15.60	16.60	11.60
Sodium	(mg/l)	4030.00	4000.00	N	4019.00	4300.00	3850.00
Major Anions	(meq/l)	186.54	183.38	N	184.17	186.26	188.21
Major Cations	(meq/l)	180.74	179.68	N	180.83	193.63	174.49
Charge Balance	(percent)	1.58	1.02	N	0.92	1.94	3.78
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	-0.005	-0.005	N	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	-0.010	-0.010	N	-0.010	-0.010	-0.010
Mercury	(mg/l)	-0.00100	-0.00100	N	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010	N	-0.010	0.050	-0.010
Zinc	(mg/l)	13.500	-0.050	N	-0.050	-0.020	-0.025
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	0.010	0.010	N	0.010	-0.010	-0.010
Cadmium	(mg/l)	-0.0010	-0.0010	N	-0.0010	-0.0010	-0.0010
Iron	(mg/l)	0.280	0.230	N	0.190	0.210	-0.020
Total Iron	(mg/l)	0.46	0.34	N	0.31	0.49	0.43
Lead	(mg/l)	-0.005	-0.005	N	-0.005	-0.005	-0.005
Manganese	(mg/l)	0.090	0.100	N	0.080	0.104	-0.005
Total Manganese	(mg/l)	0.08	0.09	N	0.09	0.09	0.11
Selenium	(mg/l)	-0.005	-0.005	N	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: SPOIL

Station Name:		BITSUI-5	BITSUI-5	BITSUI-6	BITSUI-6	BITSUI-6	BITSUI-6
Sample Date:		01/22/98	03/26/98	02/12/96	04/11/96	10/02/96	01/13/97
LABORATORY MEASUREMENTS							
pH (Lab)	(S.U.)	7.40	7.40	7.10	7.20	6.60	6.80
Conductivity (Lab)	(umho/cm)	19300	16900	14300	15100	18200	17600
TDS (180 deg C)	(mg/l)	12300	11800	13200	13300	16200	16500
Boron	(mg/l)	1.05	1.10	1.57	1.47	2.34	2.59
Fluoride	(mg/l)	1.12	1.12	0.30	0.31	1.34	0.28
NUTRIENTS							
Nitrate as N	(mg/l)	N	N	6.20	0.08	-0.05	0.10
Nitrite as N	(mg/l)	N	N	-0.05	-0.05	-0.05	N
Nitrate + Nitrite as N	(mg/l)	0.13	0.15	N	N	N	N
MAJOR ANIONS							
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	3010.00	3010.00	1440.00	1500.00	1620.00	1530.00
Carbonate as CO3	(mg/l)	-1.00	-1.00	0.00	-1.00	-1.00	-1.00
Chloride	(mg/l)	1080.00	1030.00	392.00	356.00	56.90	490.00
Sulfate	(mg/l)	4770.00	4780.00	7690.00	7920.00	9890.00	10280.00
MAJOR CATIONS							
Calcium	(mg/l)	57.20	42.00	327.00	296.00	390.00	380.00
Magnesium	(mg/l)	27.00	27.00	158.00	161.00	170.00	170.00
Potassium	(mg/l)	11.60	15.00	24.00	21.90	23.50	23.90
Sodium	(mg/l)	3490.00	3690.00	3780.00	3940.00	4730.00	4860.00
Major Anions	(meq/l)	179.12	177.92	195.21	199.53	234.07	252.94
Major Cations	(meq/l)	157.18	165.21	194.35	199.96	239.79	244.96
Charge Balance	(percent)	6.52	3.70	0.22	0.11	1.21	1.60
TRACE METALS (Dissolved)							
Arsenic	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	N	N	N
Copper	(mg/l)	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
Mercury	(mg/l)	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
Zinc	(mg/l)	-0.025	-0.025	0.050	0.020	0.280	-0.050
Radium 226	(pCi/l)	N	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N	N
Barium	(mg/l)	0.010	0.010	-0.500	-0.500	0.010	0.010
Cadmium	(mg/l)	-0.0010	-0.0010	-0.0020	0.0110	-0.0010	-0.0010
Iron	(mg/l)	0.180	0.100	-0.050	0.190	1.350	1.880
Total Iron	(mg/l)	0.17	0.21	20.00	1.25	2.08	1.79
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	0.108	0.144	3.260	2.730	3.730	0.130
Total Manganese	(mg/l)	0.13	0.16	3.55	2.54	4.05	3.60
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER QUALITY REPORT

Aquifer: SPOIL

Station Name:		BITSUI-6	BITSUI-6	BITSUI-6	BITSUI-6	BITSUI-6
Sample Date:		03/12/97	06/18/97	10/02/97	01/20/98	03/26/98
LABORATORY MEASUREMENTS						
pH (Lab)	(S.U.)	6.80	6.60	6.70	6.80	6.70
Conductivity (Lab)	(umho/cm)	17700	1780	15900	23200	17400
TDS (180 deg C)	(mg/l)	16100	16200	14500	14700	14300
Boron	(mg/l)	2.41	2.61	2.04	2.26	2.34
Fluoride	(mg/l)	0.29	0.28	0.26	0.27	0.33
NUTRIENTS						
Nitrate as N	(mg/l)	0.07	N	N	N	N
Nitrite as N	(mg/l)	N	N	N	N	N
Nitrate + Nitrite as N	(mg/l)	N	-0.05	0.30	0.21	0.21
MAJOR ANIONS						
Bicarbonate as CaCO3	(mg/l)	N	N	N	N	N
Carbonate as CaCO3	(mg/l)	N	N	N	N	N
Bicarbonate as HCO3	(mg/l)	1530.00	1540.00	1420.00	744.00	1490.00
Carbonate as CO3	(mg/l)	-1.00	-1.00	-1.00	-1.00	-1.00
Chloride	(mg/l)	460.00	450.00	470.00	364.00	354.00
Sulfate	(mg/l)	9818.00	9920.00	8710.00	7810.00	7610.00
MAJOR CATIONS						
Calcium	(mg/l)	377.00	360.00	389.00	332.00	238.00
Magnesium	(mg/l)	164.00	145.00	183.00	165.00	139.00
Potassium	(mg/l)	25.00	26.90	11.40	18.50	21.00
Sodium	(mg/l)	4629.00	3880.00	4560.00	3180.00	3570.00
Major Anions	(meq/l)	242.46	244.47	217.90	185.08	192.87
Major Cations	(meq/l)	234.30	199.35	233.11	168.94	179.15
Charge Balance	(percent)	1.71	10.17	3.37	4.56	3.69
TRACE METALS (Dissolved)						
Arsenic	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium	(mg/l)	N	N	N	N	N
Copper	(mg/l)	-0.010	-0.010	-0.010	-0.010	-0.010
Mercury	(mg/l)	-0.00100	-0.00100	-0.00100	-0.00100	-0.00100
Silver	(mg/l)	-0.010	0.040	-0.010	-0.010	-0.010
Zinc	(mg/l)	-0.050	0.030	-0.025	-0.020	-0.025
Radium 226	(pCi/l)	N	N	N	N	N
Radium 228	(pCi/l)	N	N	N	N	N
Barium	(mg/l)	0.010	-0.010	0.010	0.010	0.020
Cadmium	(mg/l)	0.0010	-0.0010	-0.0010	-0.0010	-0.0010
Iron	(mg/l)	0.800	1.320	0.490	0.740	0.780
Total Iron	(mg/l)	1.28	1.36	0.41	0.96	1.18
Lead	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005
Manganese	(mg/l)	3.620	3.600	3.510	4.350	6.600
Total Manganese	(mg/l)	3.58	3.39	1.24	4.48	6.48
Selenium	(mg/l)	-0.005	-0.005	-0.005	-0.005	-0.005

Note: N => No measurement

SUMMARY STATISTICS

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER STATISTICAL REPORT

Station: BITSUI-1

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH (Lab)	(S.U.)	8.79				8.90	8.50	10/18/95	06/21/96	12
Conductivity (Lab)	(umho/cm)	18031	6117	34	25032	25900	868	05/19/95	06/21/96	12
TDS (180 deg C)	(mg/l)	14564	652	4	2200	15400	13200	03/12/97	04/09/96	11
Boron	(mg/l)	8.92	1.38	16	5.12	12.10	6.98	03/26/98	10/18/95	11
Fluoride	(mg/l)	2.52	0.84	33	3.81	4.39	0.58	01/02/96	06/21/96	12
NUTRIENTS										
Nitrate as N	(mg/l)	0.79	0.89	113	2.40	2.40	0.01	04/27/95	10/18/95	8
Nitrite as N	(mg/l)	0.04	0.07	186	0.20	0.20	0.01	04/09/96	03/01/95	7
Nitrate + Nitrite as N	(mg/l)	0.11	0.14	133	0.25	0.27	0.03	10/01/97	01/20/98	3
MAJOR ANIONS										
Bicarbonate as HCO3	(mg/l)	928.25	288.89	31	1067.00	1190.00	123.00	03/12/97	06/21/96	12
Bicarbonate as CaCO3	(mg/l)									0
Carbonate as CaCO3	(mg/l)									0
Carbonate as CO3	(mg/l)	89.73	38.50	43	167.12	170.00	2.88	01/20/98	06/21/96	12
Chloride	(mg/l)	1806.82	569.97	32	2251.20	2310.00	58.80	09/27/96	06/21/96	12
Sulfate	(mg/l)	6330.75	1951.90	31	7327.00	7588.00	261.00	03/12/97	06/21/96	12
MAJOR CATIONS										
Calcium	(mg/l)	73.10	62.36	85	225.00	270.00	45.00	04/09/96	05/19/95	12
Magnesium	(mg/l)	36.42	26.67	73	107.30	119.00	11.70	04/09/96	06/21/96	12
Potassium	(mg/l)	20.70	12.91	62	51.65	54.00	2.35	04/27/95	06/21/96	12
Sodium	(mg/l)	4349.75	1409.23	32	5060.00	5180.00	120.00	09/27/96	06/21/96	12
Major Anions	(meq/l)	201.02	61.85	31	233.32	242.53	9.21	09/27/96	06/21/96	12
Major Cations	(meq/l)	196.38	61.53	31	221.87	230.93	9.06	09/27/96	06/21/96	12
Charge Balance	(percent)	2.17	2.39	110	9.07	9.27	0.20	01/20/98	10/18/95	12
TRACE METALS (Dissolved)										
Arsenic	(mg/l)	0.050	0.087	173	0.308	0.310	0.003	03/12/97	06/21/96	11
Chromium	(mg/l)	0.0050			0.0000	0.0050	0.0050	06/21/96	06/21/96	1
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/01/95	03/01/95	9
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	03/01/95	03/01/95	9
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/01/95	03/01/95	11
Zinc	(mg/l)	0.016	0.014	87	0.045	0.050	0.005	03/01/95	04/27/95	11
Radium 226	(pCi/l)									0
Radium 228	(pCi/l)									0
Barium	(mg/l)	0.106	0.106	100	0.225	0.250	0.025	04/27/95	03/01/95	12
Cadmium	(mg/l)	0.0010	0.0008	80	0.0025	0.0030	0.0005	03/01/95	06/21/96	12
Iron	(mg/l)	0.168	0.164	98	0.425	0.450	0.025	04/09/96	03/01/95	12
Total Iron	(mg/l)	2.55	5.96	234	21.28	21.40	0.12	04/09/96	06/21/96	12
Lead	(mg/l)	0.005	0.007	124	0.023	0.025	0.003	05/19/95	10/18/95	12
Manganese	(mg/l)	0.156	0.104	66	0.371	0.391	0.020	03/26/98	06/21/96	12
Total Manganese	(mg/l)	0.17	0.16	95	0.55	0.57	0.02	04/09/96	06/21/96	12
Selenium	(mg/l)	0.007	0.004	58	0.014	0.016	0.003	10/18/95	03/12/97	12

Below detection limit values included at 0.5 times detection limit.

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER STATISTICAL REPORT

Station: BITSUI-2

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH (Lab)	(S.U.)	8.00				8.50	7.90	06/21/96	01/02/96	14
Conductivity (Lab)	umho/cm)	7836	2021	26	10070	12100	2030	05/19/95	06/21/96	14
TDS (180 deg C)	(mg/l)	4805	968	20	3740	5190	1450	01/22/98	06/21/96	14
Boron	(mg/l)	0.91	0.20	22	0.79	1.06	0.27	03/26/98	06/21/96	14
Fluoride	(mg/l)	1.73	0.39	23	1.87	2.66	0.79	01/02/96	03/02/95	14
NUTRIENTS										
Nitrate as N	(mg/l)	0.26	0.35	133	1.01	1.01	0.01	09/27/96	03/02/95	9
Nitrite as N	(mg/l)	0.02	0.02	83	0.05	0.05	0.01	05/19/95	03/02/95	7
Nitrate + Nitrite as N	(mg/l)	0.05	0.05	97	0.10	0.12	0.03	01/22/98	06/18/97	4
MAJOR ANIONS										
Bicarbonate as HCO3	(mg/l)	3129.43	883.17	28	3428.00	3610.00	182.00	01/02/96	06/21/96	14
Bicarbonate as CaCO3	(mg/l)									0
Carbonate as CaCO3	(mg/l)									0
Carbonate as CO3	(mg/l)	2.43	7.94	327	30.00	30.00	0.00	06/21/96	03/02/95	14
Chloride	(mg/l)	1108.86	287.98	26	1140.00	1270.00	130.00	01/10/97	06/21/96	14
Sulfate	(mg/l)	107.61	194.34	181	739.50	744.00	4.50	06/21/96	01/02/96	14
MAJOR CATIONS										
Calcium	(mg/l)	10.29	17.34	168	66.70	70.30	3.60	06/21/96	03/02/95	14
Magnesium	(mg/l)	3.55	5.68	160	22.10	23.20	1.10	06/21/96	01/22/98	14
Potassium	(mg/l)	6.14	2.72	44	11.40	13.00	1.60	04/27/95	05/19/95	14
Sodium	(mg/l)	1885.86	451.15	24	1830.00	2220.00	390.00	01/10/97	06/21/96	14
Major Anions	(meq/l)	84.89	18.35	22	71.70	94.84	23.14	09/27/96	06/21/96	14
Major Cations	(meq/l)	82.99	18.39	22	74.69	97.18	22.49	01/10/97	06/21/96	14
Charge Balance	percent)	2.01	1.80	89	5.39	5.49	0.10	03/26/98	01/22/98	14
TRACE METALS (Dissolved)										
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	13
Chromium	(mg/l)	0.0075	0.0035	47	0.0050	0.0100	0.0050	03/02/95	06/21/96	2
Copper	(mg/l)	0.008	0.011	129	0.035	0.040	0.005	01/22/98	03/02/95	11
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	03/02/95	03/02/95	11
Silver	(mg/l)	0.008	0.012	147	0.045	0.050	0.005	06/18/97	03/02/95	13
Zinc	(mg/l)	0.017	0.009	53	0.025	0.030	0.005	05/19/95	03/02/95	13
Radium 226	(pCi/l)									0
Radium 228	(pCi/l)									0
Barium	(mg/l)	2.648	0.776	29	3.100	3.130	0.030	03/26/98	06/21/96	14
Cadmium	(mg/l)	0.0007	0.0003	36	0.0005	0.0010	0.0005	03/02/95	06/21/96	14
Iron	(mg/l)	0.030	0.033	109	0.130	0.140	0.010	06/21/96	06/18/97	14
Total Iron	(mg/l)	0.12	0.12	95	0.46	0.48	0.03	10/01/97	10/18/95	14
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	14
Manganese	(mg/l)	0.008	0.005	62	0.018	0.020	0.003	06/21/96	06/18/97	14
Total Manganese	(mg/l)	0.03	0.05	185	0.18	0.18	0.01	10/01/97	09/27/96	14
Selenium	(mg/l)	0.003	0.001	34	0.004	0.006	0.003	06/21/96	03/02/95	14

Below detection limit values included at 0.5 times detection limit.

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER STATISTICAL REPORT

Station: BITSUI-3

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH (Lab)	(S.U.)	7.52				7.70	7.30	03/25/96	05/18/95	12
Conductivity (Lab)	(umho/cm)	12958	732	6	2700	14600	11900	05/18/95	01/22/98	12
TDS (180 deg C)	(mg/l)	7981	185	2	490	8220	7730	01/10/97	05/18/95	9
Boron	(mg/l)	1.05	0.06	6	0.23	1.15	0.92	03/25/96	10/18/95	12
Fluoride	(mg/l)	0.96	0.31	33	1.27	1.27	0.01	12/29/95	03/02/95	12
NUTRIENTS										
Nitrate as N	(mg/l)	0.74	1.34	181	4.10	4.10	0.01	04/27/95	05/18/95	9
Nitrite as N	(mg/l)	0.01	0.01	79	0.02	0.03	0.01	12/29/95	03/02/95	7
Nitrate + Nitrite as N	(mg/l)	0.15	0.13	93	0.27	0.29	0.03	10/01/97	03/26/98	3
MAJOR ANIONS										
Bicarbonate as HCO3	(mg/l)	2868.59	908.83	32	3286.88	3290.00	3.12	03/25/96	03/02/95	12
Bicarbonate as CaCO3	(mg/l)									0
Carbonate as CaCO3	(mg/l)									0
Carbonate as CO3	(mg/l)	0.29	0.26	88	0.50	0.50	0.00	03/25/96	03/02/95	12
Chloride	(mg/l)	2835.83	213.31	8	730.00	3160.00	2430.00	04/27/95	03/26/98	12
Sulfate	(mg/l)	427.50	130.66	31	412.00	604.00	192.00	03/25/96	05/18/95	12
MAJOR CATIONS										
Calcium	(mg/l)	27.05	23.36	86	89.00	100.00	11.00	10/01/97	03/02/95	12
Magnesium	(mg/l)	9.09	2.33	26	6.80	12.00	5.20	04/27/95	03/02/95	12
Potassium	(mg/l)	13.58	10.80	80	42.10	44.00	1.90	04/27/95	10/01/97	12
Sodium	(mg/l)	3184.42	219.57	7	830.00	3420.00	2590.00	09/26/96	03/26/98	12
Major Anions	(meq/l)	135.94	15.70	12	61.23	150.09	88.86	09/26/96	03/02/95	12
Major Cations	(meq/l)	140.96	9.96	7	36.06	150.51	114.45	09/26/96	03/26/98	12
Charge Balance	(percent)	3.67	6.12	167	22.38	22.52	0.14	03/02/95	09/26/96	12
TRACE METALS (Dissolved)										
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	11
Chromium	(mg/l)	0.0100			0.0000	0.0100	0.0100	03/02/95	03/02/95	1
Copper	(mg/l)	0.008	0.008	105	0.025	0.030	0.005	01/22/98	03/02/95	10
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	03/02/95	03/02/95	10
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	03/02/95	03/02/95	11
Zinc	(mg/l)	0.021	0.027	128	0.095	0.100	0.005	05/18/95	03/02/95	11
Radium 226	(pCi/l)									0
Radium 228	(pCi/l)									0
Barium	(mg/l)	0.778	1.632	210	5.800	5.850	0.050	03/12/97	01/22/98	12
Cadmium	(mg/l)	0.0011	0.0011	95	0.0035	0.0040	0.0005	03/02/95	09/26/96	12
Iron	(mg/l)	0.110	0.117	107	0.390	0.400	0.010	03/25/96	10/01/97	12
Total Iron	(mg/l)	0.35	0.24	68	0.73	0.85	0.12	03/25/96	10/18/95	12
Lead	(mg/l)	0.008	0.010	136	0.031	0.033	0.003	04/27/95	10/18/95	12
Manganese	(mg/l)	0.007	0.003	45	0.008	0.010	0.003	03/02/95	01/22/98	12
Total Manganese	(mg/l)	0.01	0.01	76	0.03	0.03	0.01	10/01/97	09/26/96	12
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	03/02/95	03/02/95	12

Below detection limit values included at 0.5 times detection limit.

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER STATISTICAL REPORT

Station: BITSUI-4

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH (Lab)	(S.U.)	6.87				7.10	6.80	02/12/96	10/02/96	9
Conductivity (Lab)	(umho/cm)	17878	2794	16	10200	24600	14400	01/20/98	02/12/96	9
TDS (180 deg C)	(mg/l)	14878	897	6	3000	16100	13100	03/12/97	02/12/96	9
Boron	(mg/l)	1.66	0.23	14	0.75	2.24	1.49	01/20/98	02/12/96	9
Fluoride	(mg/l)	0.31	0.03	8	0.08	0.34	0.26	03/26/98	10/02/97	9
NUTRIENTS										
Nitrate as N	(mg/l)	0.48	0.55	114	1.18	1.20	0.03	02/12/96	03/12/97	6
Nitrite as N	(mg/l)	0.02	0.02	101	0.05	0.05	0.01	04/10/96	01/26/96	4
Nitrate + Nitrite as N	(mg/l)	0.17	0.13	76	0.25	0.27	0.03	10/02/97	03/26/98	3
MAJOR ANIONS										
Bicarbonate as HCO3	(mg/l)	1651.11	237.93	14	760.00	1840.00	1080.00	03/12/97	01/20/98	9
Bicarbonate as CaCO3	(mg/l)									0
Carbonate as CaCO3	(mg/l)									0
Carbonate as CO3	(mg/l)	0.39	0.22	57	0.50	0.50	0.00	04/10/96	01/26/96	9
Chloride	(mg/l)	534.97	200.25	37	650.30	696.00	45.70	10/02/97	10/02/96	9
Sulfate	(mg/l)	8359.44	834.92	10	2780.00	9460.00	6680.00	01/13/97	02/12/96	9
MAJOR CATIONS										
Calcium	(mg/l)	228.67	85.14	37	272.00	287.00	15.00	02/12/96	01/26/96	9
Magnesium	(mg/l)	127.33	6.73	5	23.00	135.00	112.00	10/02/97	03/26/98	9
Potassium	(mg/l)	77.68	172.67	222	527.80	538.00	10.20	01/26/96	10/02/97	9
Sodium	(mg/l)	4399.33	449.09	10	1260.00	4920.00	3660.00	10/02/97	01/20/98	9
Major Anions	(meq/l)	216.23	21.53	10	67.61	244.25	176.64	01/13/97	02/12/96	9
Major Cations	(meq/l)	215.23	20.27	9	56.31	239.55	183.24	10/02/97	01/20/98	9
Charge Balance	(percent)	2.47	1.55	63	4.13	4.33	0.20	02/12/96	01/26/96	9
TRACE METALS (Dissolved)										
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	01/26/96	01/26/96	9
Chromium	(mg/l)									0
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	01/26/96	01/26/96	9
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	01/26/96	01/26/96	9
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	01/26/96	01/26/96	9
Zinc	(mg/l)	0.037	0.041	111	0.130	0.140	0.010	02/12/96	01/20/98	9
Radium 226	(pCi/l)									0
Radium 228	(pCi/l)									0
Barium	(mg/l)	0.039	0.079	201	0.245	0.250	0.005	02/12/96	01/20/98	9
Cadmium	(mg/l)	0.0007	0.0002	37	0.0005	0.0010	0.0005	01/26/96	10/02/96	9
Iron	(mg/l)	0.418	0.282	67	0.865	0.890	0.025	03/26/98	01/26/96	9
Total Iron	(mg/l)	3.42	5.18	151	15.93	16.60	0.67	02/12/96	01/13/97	9
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	01/26/96	01/26/96	9
Manganese	(mg/l)	2.781	0.661	24	2.190	4.270	2.080	03/26/98	03/12/97	9
Total Manganese	(mg/l)	2.91	0.91	31	3.14	5.09	1.95	03/26/98	03/12/97	9
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	01/26/96	01/26/96	9

Below detection limit values included at 0.5 times detection limit.

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER STATISTICAL REPORT

Station: BITSUI-5

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH (Lab)	(S.U.)	7.41				7.50	7.40	04/11/96	02/13/96	9
Conductivity (Lab)	(umho/cm)	15378	1785	12	6300	19300	13000	01/22/98	02/13/96	9
TDS (180 deg C)	(mg/l)	11422	612	5	2000	12300	10300	01/22/98	02/13/96	9
Boron	(mg/l)	0.99	0.35	35	1.22	1.33	0.11	06/18/97	10/03/97	9
Fluoride	(mg/l)	1.02	0.08	8	0.27	1.12	0.85	01/22/98	10/03/97	9
NUTRIENTS										
Nitrate as N	(mg/l)	0.04	0.03	90	0.08	0.09	0.01	01/10/97	02/13/96	5
Nitrite as N	(mg/l)	0.03	0.00	0	0.00	0.03	0.03	02/13/96	02/13/96	3
Nitrate + Nitrite as N	(mg/l)	0.15	0.10	72	0.26	0.28	0.03	10/03/97	06/18/97	4
MAJOR ANIONS										
Bicarbonate as HCO3	(mg/l)	2693.39	1012.17	38	3169.50	3170.00	0.50	02/13/96	06/18/97	9
Bicarbonate as CaCO3	(mg/l)									0
Carbonate as CaCO3	(mg/l)									0
Carbonate as CO3	(mg/l)	0.44	0.17	38	0.50	0.50	0.00	04/11/96	02/13/96	9
Chloride	(mg/l)	1206.89	99.03	8	300.00	1330.00	1030.00	02/13/96	03/26/98	9
Sulfate	(mg/l)	4626.22	494.09	11	1480.00	5030.00	3550.00	06/18/97	02/13/96	9
MAJOR CATIONS										
Calcium	(mg/l)	61.62	10.22	17	35.20	77.20	42.00	10/03/97	03/26/98	9
Magnesium	(mg/l)	29.73	2.85	10	7.90	34.90	27.00	10/03/97	01/22/98	9
Potassium	(mg/l)	13.80	2.21	16	6.20	16.60	10.40	06/18/97	01/10/97	9
Sodium	(mg/l)	3871.00	246.47	6	810.00	4300.00	3490.00	06/18/97	01/22/98	9
Major Anions	(meq/l)	179.81	8.47	5	24.84	188.21	163.37	10/03/97	02/13/96	9
Major Cations	(meq/l)	174.26	10.99	6	36.45	193.63	157.18	06/18/97	01/22/98	9
Charge Balance	(percent)	2.29	2.01	88	6.21	6.52	0.31	01/22/98	02/13/96	9
TRACE METALS (Dissolved)										
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/13/96	02/13/96	9
Chromium	(mg/l)									0
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	02/13/96	02/13/96	9
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	02/13/96	02/13/96	9
Silver	(mg/l)	0.010	0.015	150	0.045	0.050	0.005	06/18/97	02/13/96	9
Zinc	(mg/l)	1.515	4.494	297	13.490	13.500	0.010	10/03/96	02/13/96	9
Radium 226	(pCi/l)									0
Radium 228	(pCi/l)									0
Barium	(mg/l)	0.062	0.106	171	0.245	0.250	0.005	02/13/96	06/18/97	9
Cadmium	(mg/l)	0.0006	0.0002	36	0.0005	0.0010	0.0005	02/13/96	10/03/96	9
Iron	(mg/l)	0.221	0.133	60	0.470	0.480	0.010	02/13/96	10/03/97	9
Total Iron	(mg/l)	0.70	0.71	102	1.88	2.05	0.17	02/13/96	01/22/98	9
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/13/96	02/13/96	9
Manganese	(mg/l)	0.134	0.113	84	0.408	0.410	0.003	02/13/96	10/03/97	9
Total Manganese	(mg/l)	0.15	0.10	70	0.33	0.41	0.08	02/13/96	10/03/96	9
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/13/96	02/13/96	9

Below detection limit values included at 0.5 times detection limit.

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER STATISTICAL REPORT

Station: BITSUI-6

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH (Lab)	(S.U.)	6.77				7.20	6.60	04/11/96	10/02/96	9
Conductivity (Lab)	(umho/cm)	15687	5800	37	21420	23200	1780	01/20/98	06/18/97	9
TDS (180 deg C)	(mg/l)	15000	1289	9	3300	16500	13200	01/13/97	02/12/96	9
Boron	(mg/l)	2.18	0.41	19	1.14	2.61	1.47	06/18/97	04/11/96	9
Fluoride	(mg/l)	0.41	0.35	86	1.08	1.34	0.26	10/02/96	10/02/97	9
NUTRIENTS										
Nitrate as N	(mg/l)	1.30	2.74	212	6.18	6.20	0.03	02/12/96	10/02/96	5
Nitrite as N	(mg/l)	0.03	0.00	0	0.00	0.03	0.03	02/12/96	02/12/96	3
Nitrate + Nitrite as N	(mg/l)	0.19	0.12	62	0.28	0.30	0.03	10/02/97	06/18/97	4
MAJOR ANIONS										
Bicarbonate as HCO3	(mg/l)	1423.78	261.52	18	876.00	1620.00	744.00	10/02/96	01/20/98	9
Bicarbonate as CaCO3	(mg/l)									0
Carbonate as CaCO3	(mg/l)									0
Carbonate as CO3	(mg/l)	0.44	0.17	38	0.50	0.50	0.00	04/11/96	02/12/96	9
Chloride	(mg/l)	376.99	131.08	35	433.10	490.00	56.90	01/13/97	10/02/96	9
Sulfate	(mg/l)	8849.78	1121.26	13	2670.00	10280.00	7610.00	01/13/97	03/26/98	9
MAJOR CATIONS										
Calcium	(mg/l)	343.22	50.93	15	152.00	390.00	238.00	10/02/96	03/26/98	9
Magnesium	(mg/l)	161.67	13.30	8	44.00	183.00	139.00	10/02/97	03/26/98	9
Potassium	(mg/l)	21.79	4.58	21	15.50	26.90	11.40	06/18/97	10/02/97	9
Sodium	(mg/l)	4125.44	587.77	14	1680.00	4860.00	3180.00	01/13/97	01/20/98	9
Major Anions	(meq/l)	218.28	25.87	12	67.86	252.94	185.08	01/13/97	01/20/98	9
Major Cations	(meq/l)	210.43	28.13	13	76.02	244.96	168.94	01/13/97	01/20/98	9
Charge Balance	(percent)	2.96	3.11	105	10.06	10.17	0.11	06/18/97	04/11/96	9
TRACE METALS (Dissolved)										
Arsenic	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/12/96	02/12/96	9
Chromium	(mg/l)									0
Copper	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	02/12/96	02/12/96	9
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	02/12/96	02/12/96	9
Silver	(mg/l)	0.009	0.012	131	0.035	0.040	0.005	06/18/97	02/12/96	9
Zinc	(mg/l)	0.052	0.086	167	0.270	0.280	0.010	10/02/96	01/20/98	9
Radium 226	(pCi/l)									0
Radium 228	(pCi/l)									0
Barium	(mg/l)	0.064	0.106	165	0.245	0.250	0.005	02/12/96	06/18/97	9
Cadmium	(mg/l)	0.0018	0.0035	195	0.0105	0.0110	0.0005	04/11/96	10/02/96	9
Iron	(mg/l)	0.842	0.591	70	1.855	1.880	0.025	01/13/97	02/12/96	9
Total Iron	(mg/l)	3.37	6.25	186	19.59	20.00	0.41	02/12/96	10/02/97	9
Lead	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/12/96	02/12/96	9
Manganese	(mg/l)	3.503	1.674	48	6.470	6.600	0.130	03/26/98	01/13/97	9
Total Manganese	(mg/l)	3.66	1.41	39	5.24	6.48	1.24	03/26/98	10/02/97	9
Selenium	(mg/l)	0.003	0.000	0	0.000	0.003	0.003	02/12/96	02/12/96	9

Below detection limit values included at 0.5 times detection limit.

BHP NAVAJO MINE
1998 ANNUAL HYDROLOGY REPORT
GROUNDWATER STATISTICAL REPORT

Station: KF83-1

		Mean	Std Dev	Coef Var	Range	Maximum Value	Minimum Value	Max Value Found	Min Value Found	# of Samp
LABORATORY MEASUREMENTS										
pH (Lab)	(S.U.)	7.81				8.68	7.60	09/22/92	05/03/95	27
Conductivity (Lab)	(umho/cm)	10576	1050	10	3900	12900	9000	06/18/98	09/08/93	27
TDS (180 deg C)	(mg/l)	6919	549	8	1830	7500	5670	09/21/98	06/21/95	27
Boron	(mg/l)	1.03	0.15	15	0.83	1.70	0.87	09/16/87	05/03/95	27
Fluoride	(mg/l)	1.11	0.20	18	0.74	1.57	0.83	07/14/95	05/03/95	27
NUTRIENTS										
Nitrate as N	(mg/l)	1.77	5.01	283	18.20	18.20	0.01	06/21/95	06/14/95	14
Nitrite as N	(mg/l)	0.02	0.01	62	0.02	0.03	0.01	09/21/90	05/03/95	12
Nitrate + Nitrite as N	(mg/l)	0.09	0.11	121	0.30	0.32	0.02	06/18/98	09/23/91	13
MAJOR ANIONS										
Bicarbonate as HCO3	(mg/l)	3064.35	399.67	13	1240.00	3740.00	2500.00	06/21/95	09/26/97	17
Bicarbonate as CaCO3	(mg/l)	2469.00	281.01	11	910.00	2790.00	1880.00	09/16/86	09/16/87	10
Carbonate as CaCO3	(mg/l)	232.00	204.44	88	600.00	600.00	0.00	09/16/87	09/23/88	10
Carbonate as CO3	(mg/l)	0.35	0.23	67	0.50	0.50	0.00	03/25/96	05/03/95	17
Chloride	(mg/l)	2171.93	619.51	29	2637.00	2760.00	123.00	09/23/88	10/03/96	27
Sulfate	(mg/l)	287.09	256.42	89	975.00	980.00	5.00	10/03/96	09/23/88	27
MAJOR CATIONS										
Calcium	(mg/l)	18.47	6.15	33	27.90	28.00	0.10	05/03/95	09/26/97	27
Magnesium	(mg/l)	6.78	1.96	29	9.80	13.00	3.20	05/03/95	09/26/97	27
Potassium	(mg/l)	11.60	5.76	50	25.20	31.00	5.80	05/03/95	09/26/97	27
Sodium	(mg/l)	2598.56	212.07	8	840.00	3100.00	2260.00	12/22/97	07/14/95	27
Major Anions	(meq/l)	118.91	12.65	11	62.23	141.17	78.94	12/22/97	10/03/96	27
Major Cations	(meq/l)	114.81	9.50	8	37.53	136.95	99.42	12/22/97	07/14/95	27
Charge Balance	(percent)	3.01	3.64	121	14.31	14.42	0.11	10/03/96	06/21/95	27
TRACE METALS (Dissolved)										
Arsenic	(mg/l)	0.002	0.001	27	0.003	0.004	0.001	09/21/89	09/23/91	15
Chromium	(mg/l)	0.0071	0.0040	57	0.0140	0.0150	0.0010	09/16/87	09/16/86	10
Copper	(mg/l)	0.046	0.072	154	0.165	0.170	0.005	12/22/97	09/26/97	7
Mercury	(mg/l)	0.00050	0.00000	0	0.00000	0.00050	0.00050	09/26/97	09/26/97	7
Silver	(mg/l)	0.005	0.000	0	0.000	0.005	0.005	09/26/97	09/26/97	7
Zinc	(mg/l)	0.035	0.039	109	0.115	0.125	0.010	09/23/91	12/22/97	15
Radium 226	(pCi/l)	2.2	0.7	32	2.4	3.4	1.0	09/16/85	09/16/86	10
Radium 228	(pCi/l)	2.3	2.8	122	9.4	9.5	0.1	09/23/91	09/21/89	10
Barium	(mg/l)	1.859	2.265	122	6.595	6.600	0.005	09/23/88	07/01/97	27
Cadmium	(mg/l)	0.0047	0.0171	362	0.0895	0.0900	0.0005	09/16/87	09/16/86	27
Iron	(mg/l)	0.298	0.605	203	2.975	3.000	0.025	09/16/85	05/03/95	26
Total Iron	(mg/l)	0.28	0.31	112	1.04	1.06	0.03	05/03/95	06/21/95	19
Lead	(mg/l)	0.012	0.021	170	0.093	0.095	0.003	09/16/87	06/14/95	27
Manganese	(mg/l)	0.049	0.050	103	0.208	0.210	0.003	09/16/85	06/18/98	27
Total Manganese	(mg/l)	0.07	0.20	267	0.87	0.87	0.01	09/26/97	10/03/96	19
Selenium	(mg/l)	0.002	0.001	56	0.002	0.003	0.001	05/03/95	09/16/85	27

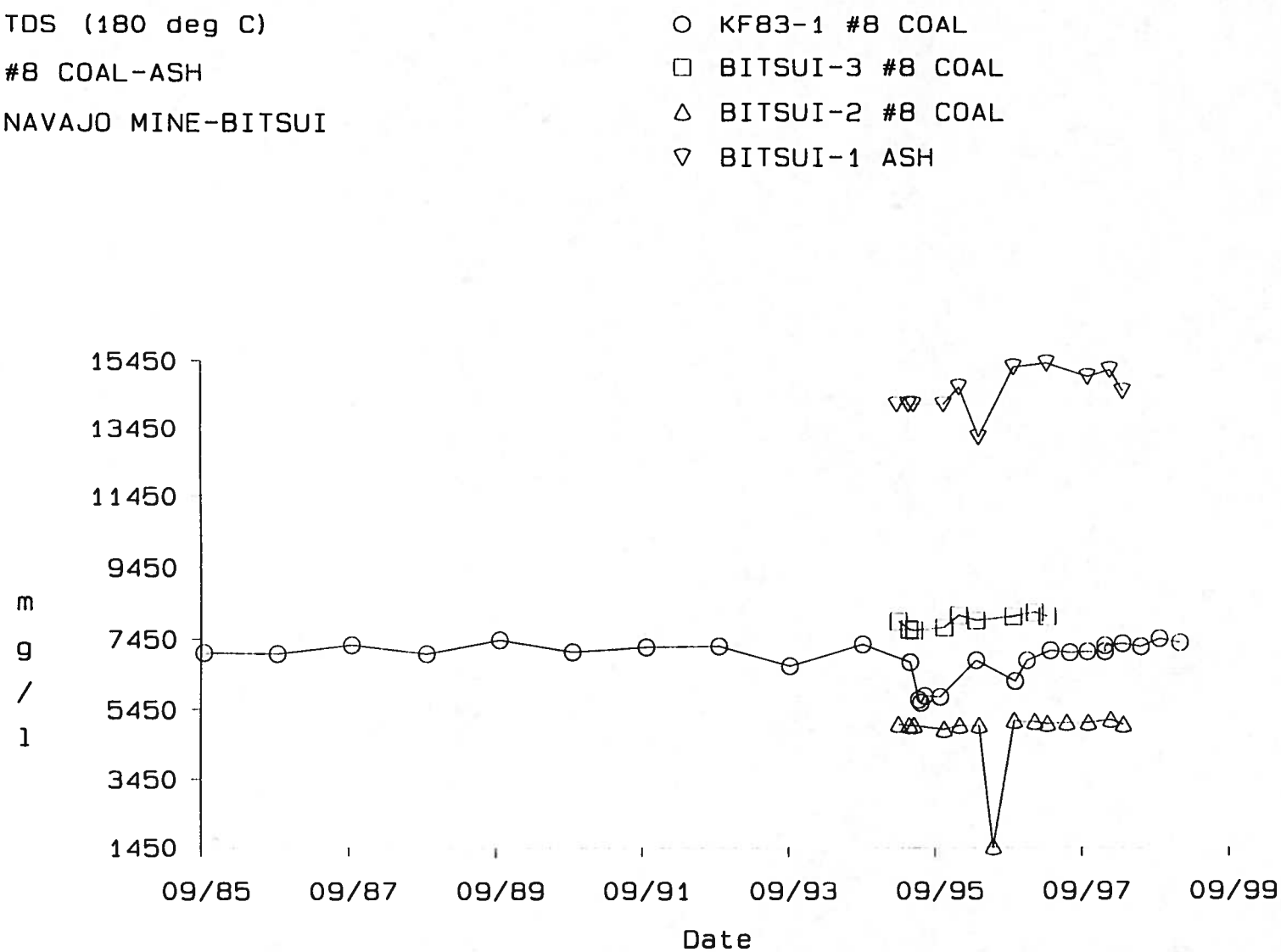
Below detection limit values included at 0.5 times detection limit.

CONCENTRATION VERSUS TIME PLOTS

TDS (180 deg C)

#8 COAL-ASH

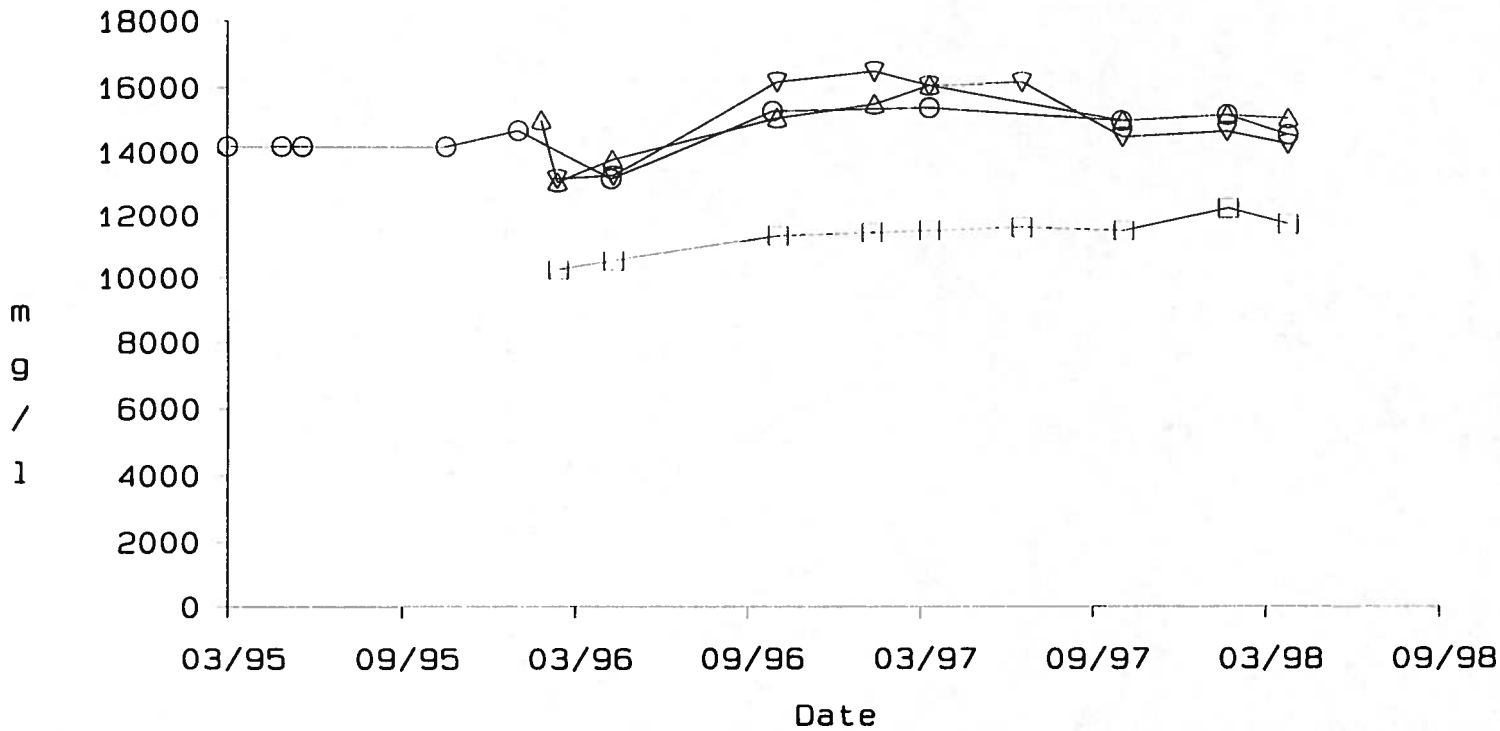
NAVAJO MINE-BITSUI



TDS (180 deg C)

SPOIL-ASH

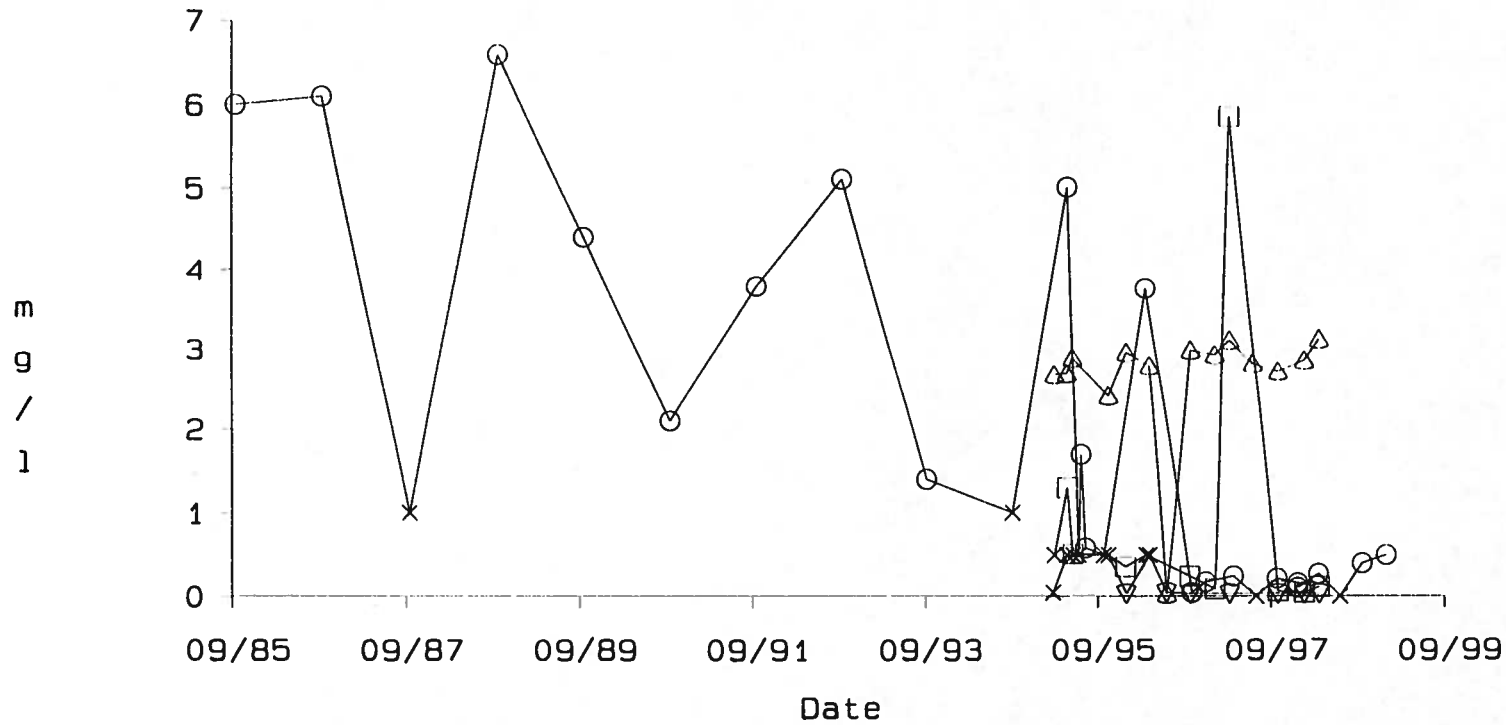
NAVAJO MINE-BITSUI



Barium

#8 COAL-ASH

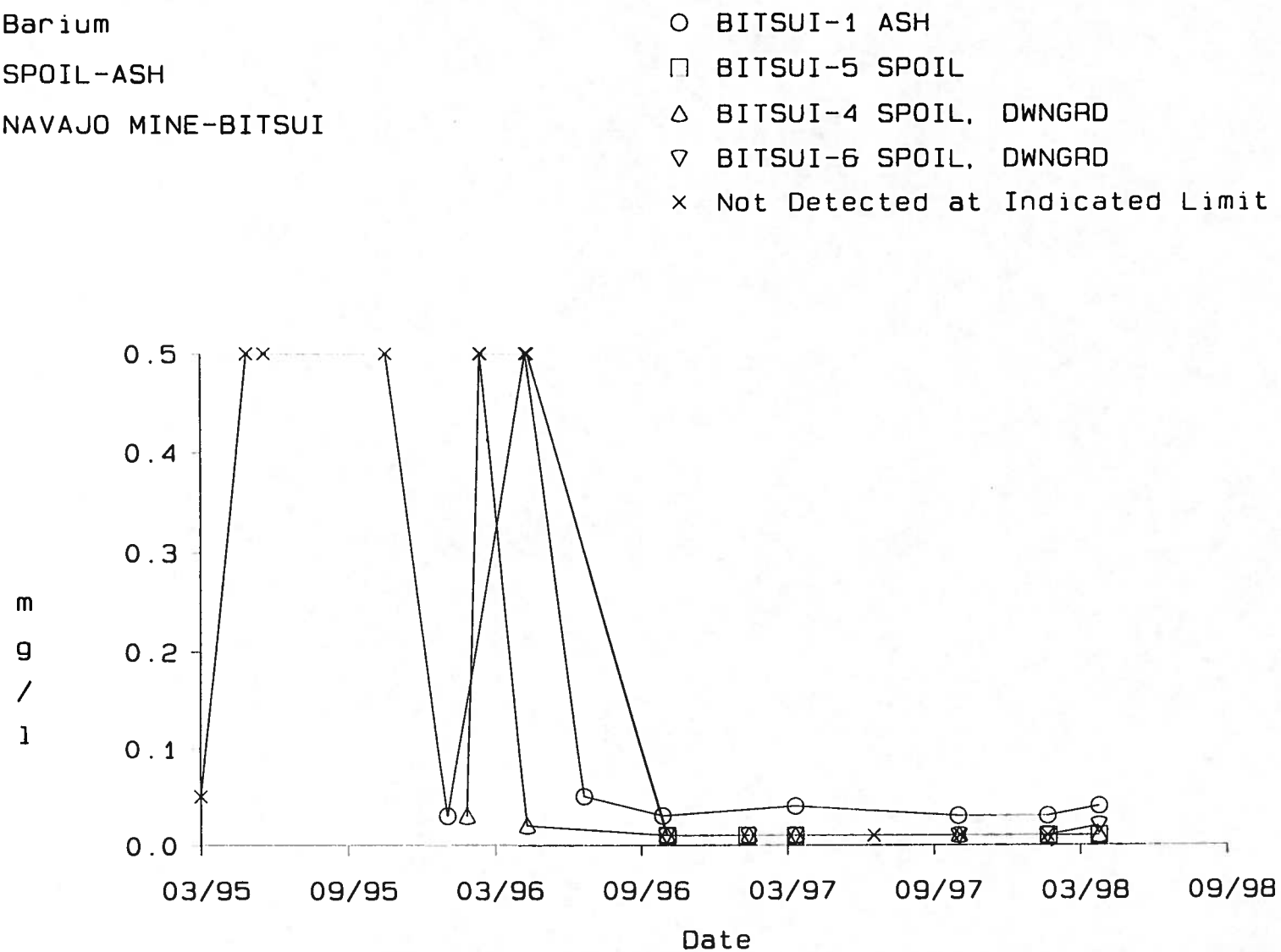
NAVAJO MINE-BITSUI



Barium

SPOIL-ASH

NAVAJO MINE-BITSUI



Selenium

#8 COAL-ASH

NAVAJO MINE-BITSUI

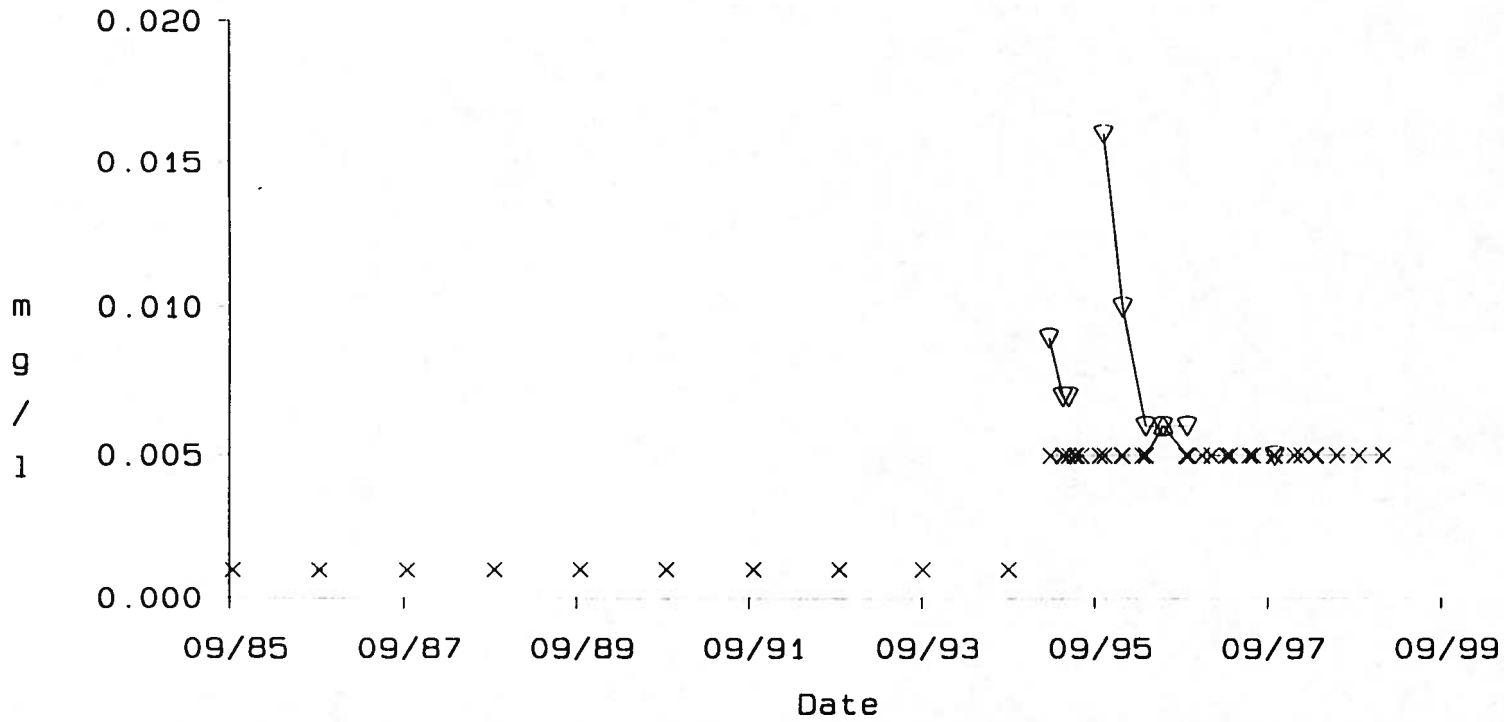
○ KF83-1 #8 COAL

□ BITSUI-3 #8 COAL

△ BITSUI-2 #8 COAL

▽ BITSUI-1 ASH

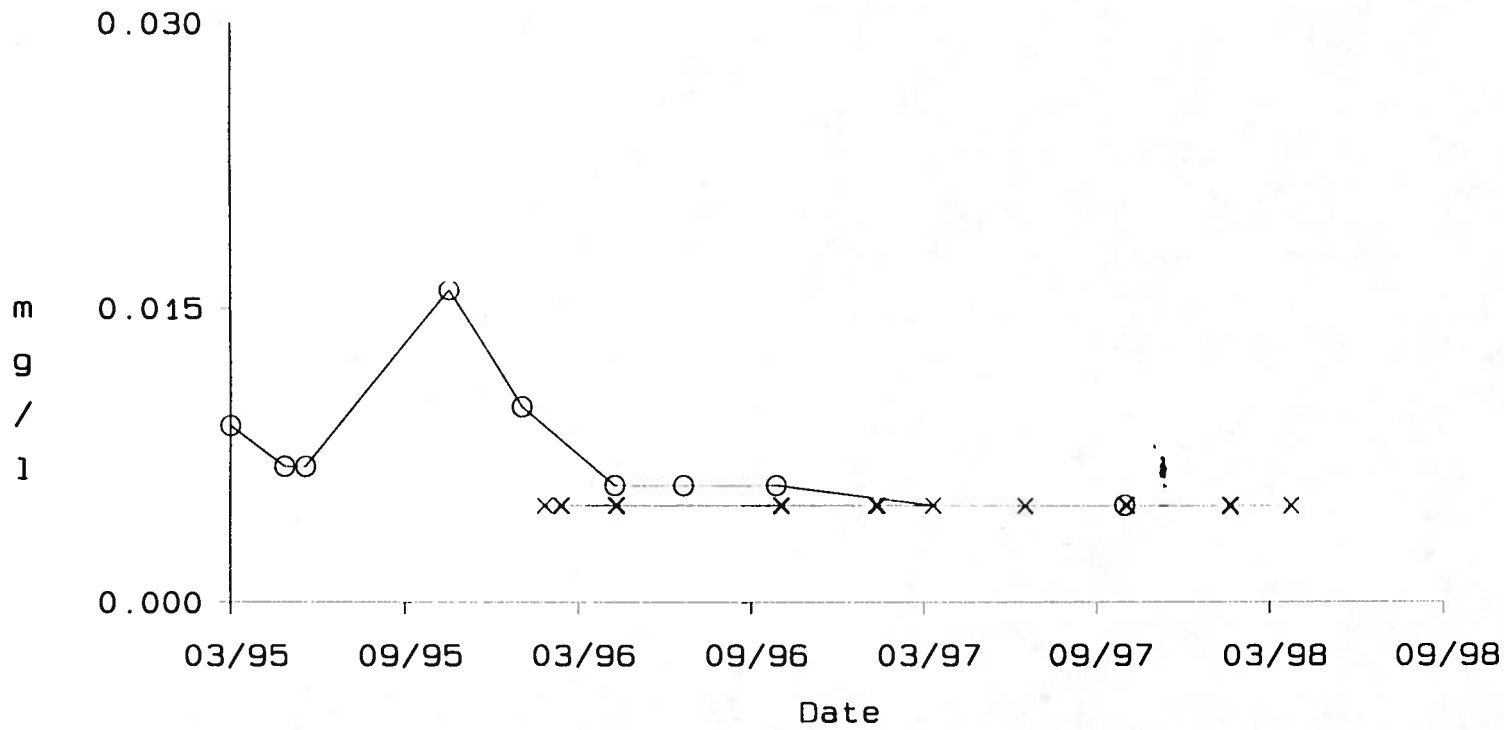
× Not Detected at Indicated Limit



Selenium

SPOIL-ASH

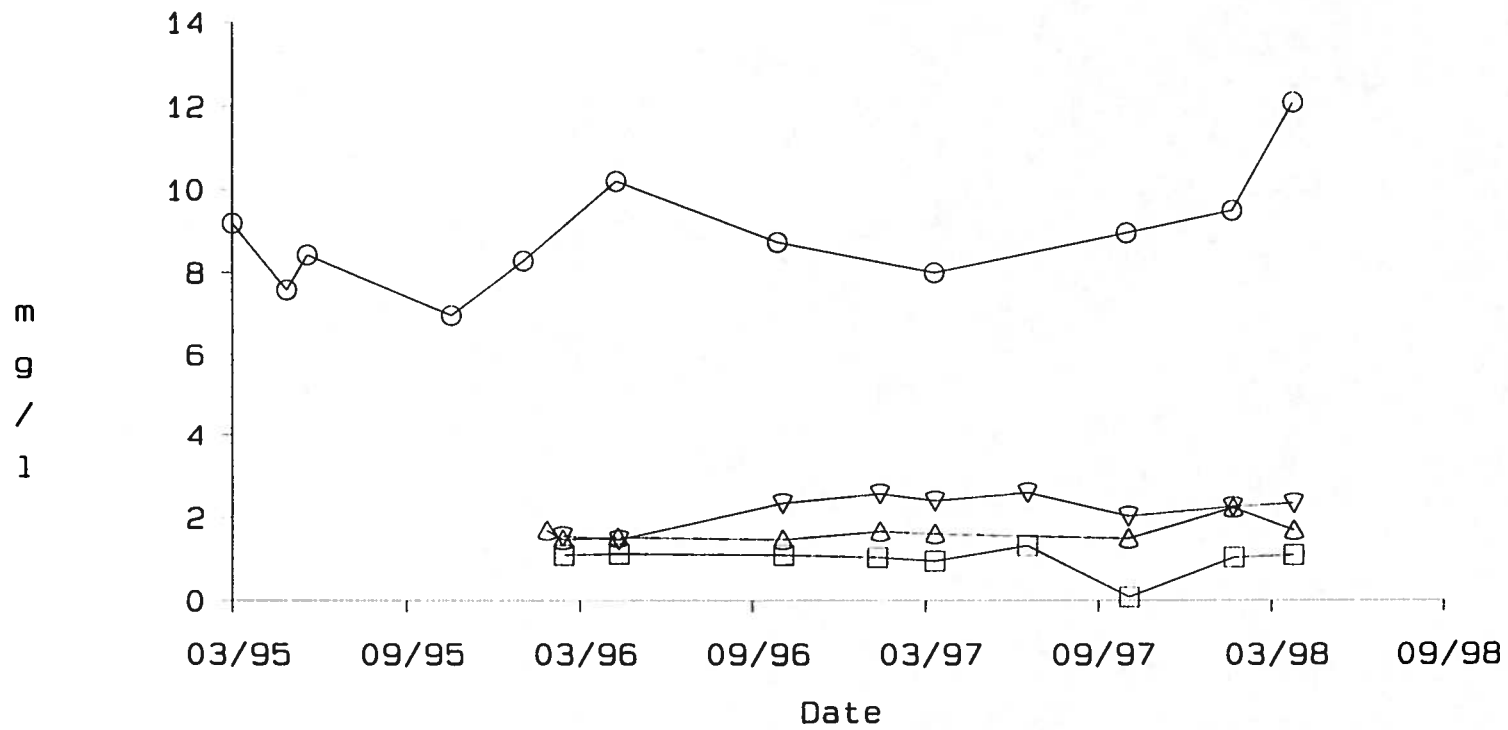
NAVAJO MINE-BITSUI



Boron

SPOIL-ASH

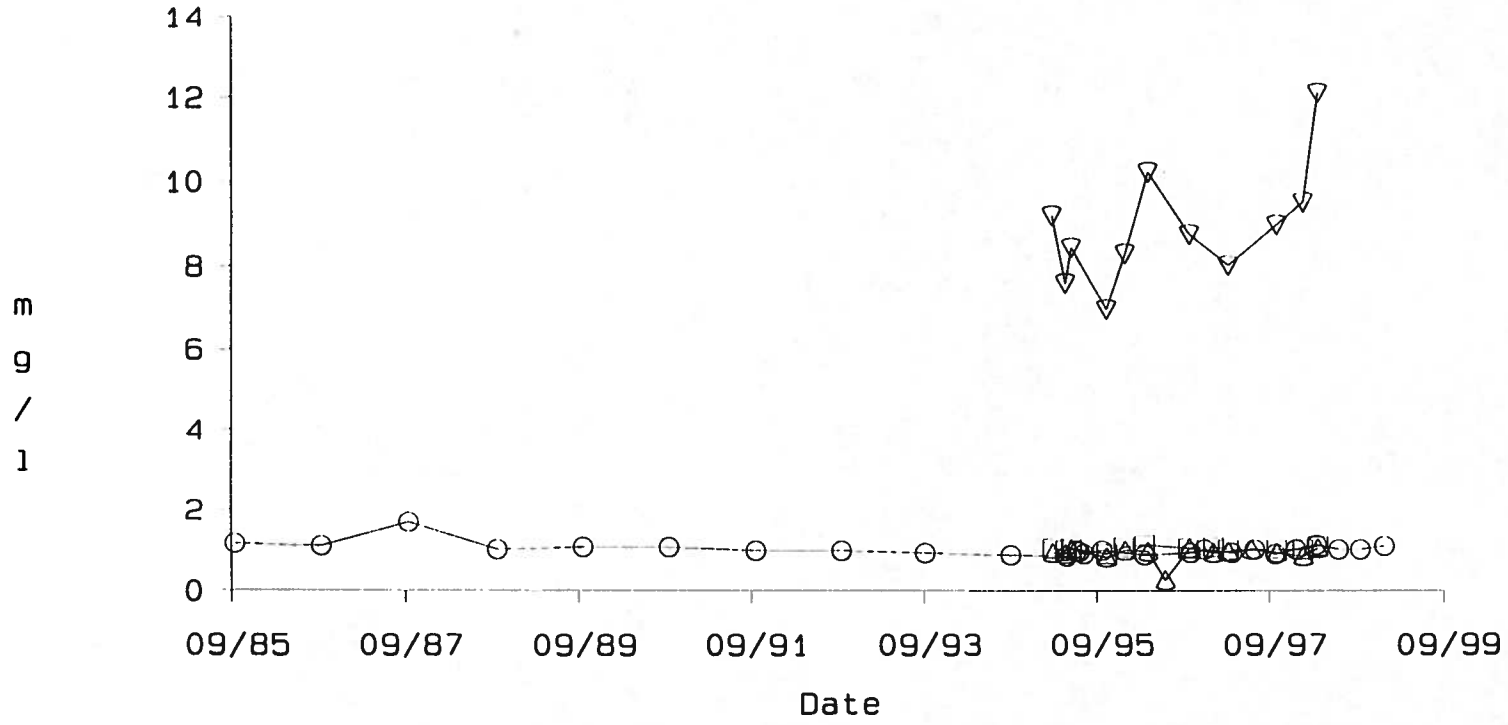
NAVAJO MINE-BITSUI



Boron

#8 COAL-ASH

NAVAJO MINE-BITSUI



TRILINEAR DIAGRAMS

Piper Trilinear Diagram

BITSUI-SPOIL, ASH, COAL

NAVAJO MINE

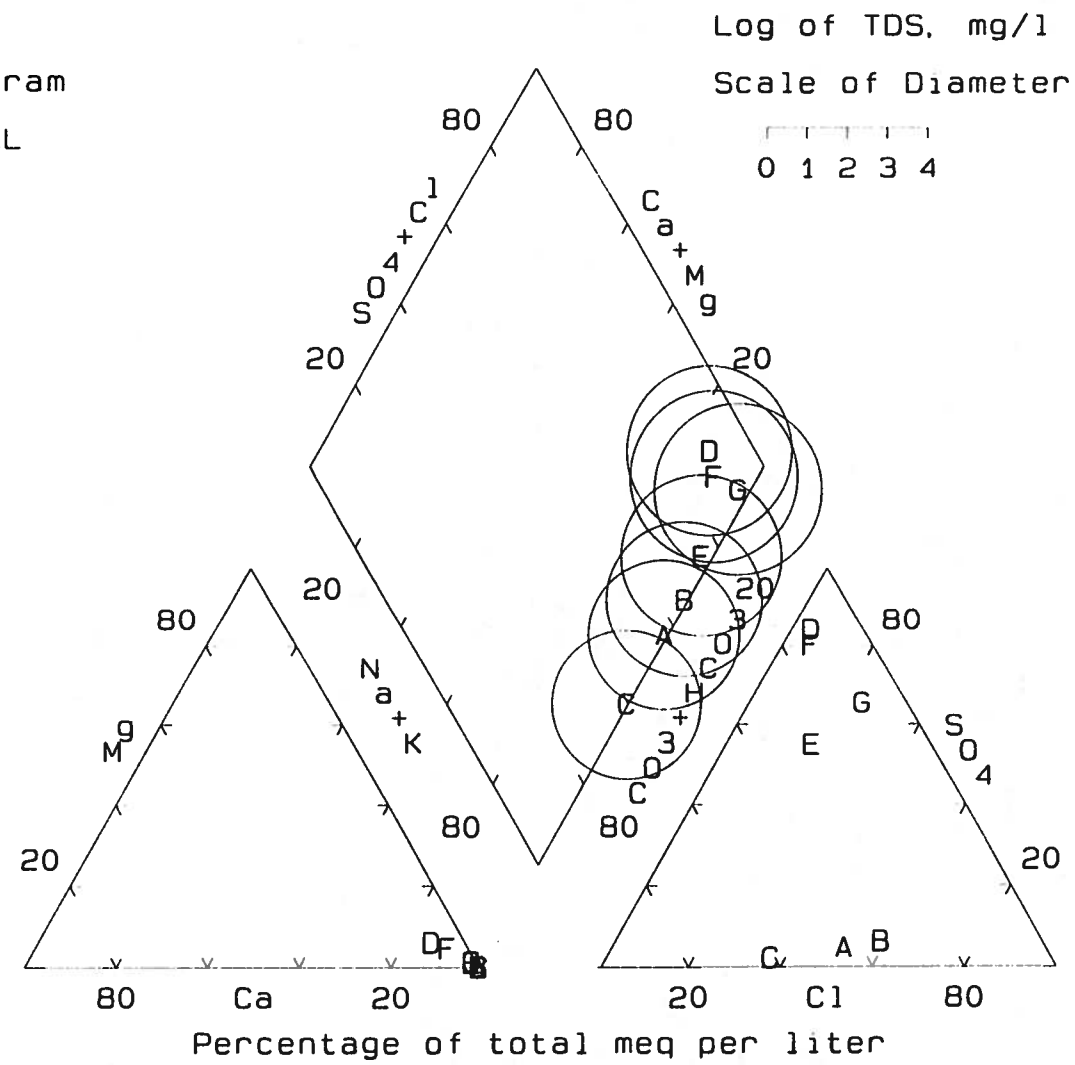
A KF83-1 8 COAL

B BITSUI-3 8 COAL

C BITSUI-2 8 COAL

D BITSUI-6 SPOIL

E BITSUI-5 SPOIL

F BITSUI-4 SPOIL

G BITSUI-1 ASH