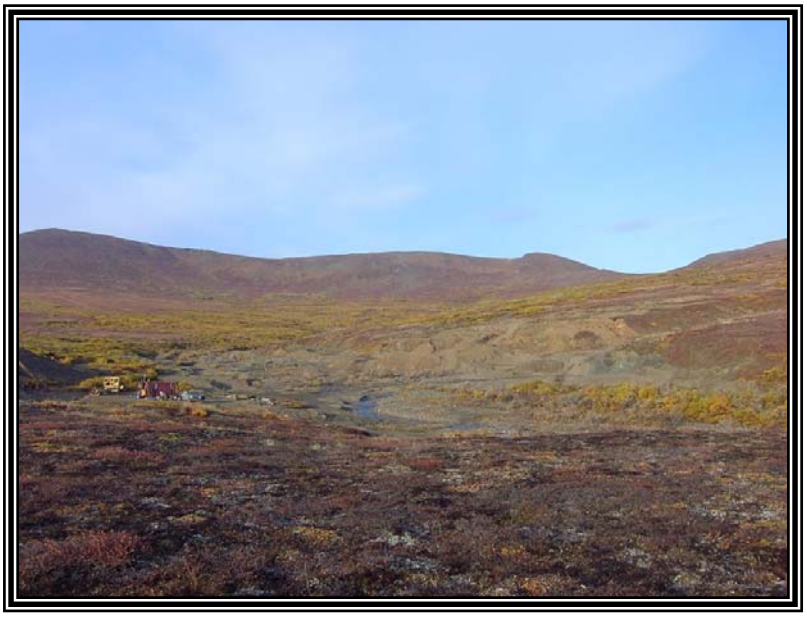
Alaska Gold Company

A NovaGold Subsidiary

ROCK CREEK MINE
PLAN OF OPERATIONS
VOLUME 8
Geochemistry & Groundwater Reports for Rock Creek & Big Hurrah
May, 2006

Alaska State Library, Gold Rush Centennial Collection

Placer mining on the Rock Creek deposit, 1902



NovaGold

ROCK CREEK PROJECT
PLAN OF OPERATIONS

VOLUME 8
GEOCHEMISTRY AND GROUNDWATER
ROCK CREEK & BIG HURRAH

TABLE OF CONTENTS

- Rock Creek Baseline Groundwater (March 27,2006) page 3 of 435
- Rock Creek Project – Preliminary Materials Geochemical Testing Update (May 8, 2006) page 86 of 435
- Tailings and Development Rock Storage Facilities Geochemical Modeling (March 27, 2006) page 223 of 435
- Rock Creek Preliminary Pit Lake Geochemical Assessment (March 27, 2006) page 237 of 435
- Big Hurrah Baseline Groundwater (March 23, 2006) page 255 of 435
- Big Hurrah Project – Preliminary Materials Geochemical Testing Results (May 8, 2006) page 289 of 435
- Big Hurrah Project Development Rock Storage Facility Geochemical Assessment (March 23, 2006) page 413 of 435
- Big Hurrah Pit Lake Geochemical Assessment (May 8, 2006) page 422 of 435

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007

To: Doug Nicholson (doug.nicholson@novagold.net)

Company: NovaGold Resources, Inc.

Project No.: 2509

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date: March 27, 2006

Subject: Rock Creek Baseline Groundwater

---

1 INTRODUCTION

The Rock Creek project area is located approximately 12 km north of Nome, Alaska, on private lands owned by the Bering Straight Native Corporation and NovaGold Resources Inc. (NovaGold). The proposed mine is currently in the feasibility development stage. Figure 1.1 is a generalized site location map, which shows the site layout and groundwater monitoring locations.

The regional drainage is controlled by the Snake River, which empties into Norton Sound near Nome. The project area is located near the middle of the Snake River drainage basin, and local surface water is drained by Rock Creek and its tributary Albion Creek. Topography is moderately steep (up to 15% grade) along Rock Creek and steeper rock slopes near the top of the catchment (up to 38% grade). Thin overburden covers most of the slopes. Vegetation includes grasses, with brush in wet areas lower on the slopes.

The primary bedrock geologic units at the site are metamorphic schists and a marble from the Nome Group. The protoliths of the units are likely Cambrian to Devonian sediments consisting of shales, siltstones, marls, and limestones deposited in a shallow-water continental platform. The mafic volcanics are probably younger mafic sills (NovaGold Resources, 2000). Bedrock outcrops along Rock Creek are fractured and faulted in multiple directions. Core from exploration drilling indicates that rock quality improves quickly with depth. Alluvium and colluvium are present along the base of Rock Creek valley and alluvium is present in the Snake River valley.

Figure 1.2 shows the average monthly temperature and rainfall for the project area. The temperature reaches a maximum of around 10°C during July and a minimum of approximately -13°C in January. The majority of the precipitation occurs between July and October, and the mean annual precipitation is approximately 41 inches.

Groundwater flows through the project area from recharge areas located higher in the watershed north and west of the site, to discharge areas lower in the Rock Creek and Snake River. In general, the potentiometric surface tends to mimic the surface topography, suggesting that the fractures that control groundwater flow are connected and act as an aquifer. Discharge of interflow or shallow groundwater occurs in few areas on the slopes and extensively along the banks of the creek. The discharge of groundwater constitutes much of the creek flow. Both the creek and the alluvium are fed primarily by the shallow groundwater but with some contribution from deeper groundwater that has passed through the mineralized rock. Surface water and groundwater in the Rock Creek drainage discharges to the Snake River and associated alluvium located southwest of the site.

NovaGold is investigating the feasibility of an open-pit gold mine within the catchment of Rock Creek. The facility will include an open pit, a mill, tailings facility, and development rock areas. During mining, surface water will be diverted around the facility to minimize the quantity of water impacted by mining. The facility will be operated as a closed system to the extent possible so that water brought onsite will remain onsite or evaporate. Excess water will be treated and re-injected.

The baseline monitoring program described in this report was developed to provide baseline water-quality data prior to mining activity at the site.

2 BASELINE MONITORING

NovaGold began a groundwater monitoring program in preparation of permitting the Rock Creek Mine. Baseline groundwater monitoring began in October 2003, and has continued on a quarterly basis. Currently, there are nine baseline sampling events between October 2003 and November 2005, completed with water-chemistry data available from the laboratory.

There are seven monitoring wells, designed and located to collect baseline groundwater chemistry and water-level data upgradient, within, and downgradient of the proposed mining facilities. Monitoring well details are provided in Table 2.1 and their locations are shown in Figure 1.1. Appendix A contains a report summarizing the monitoring well drilling and installation. These well locations were selected to represent groundwater quality in alluvium, shallow bedrock and deep bedrock. In addition, wells were sited to represent conditions upstream and downstream of anticipated locations for the open pit, waste-rock dumps, and tailings facility. Samples of springs are included in the surface water program.

Groundwater samples are collected from each of the seven monitoring wells using methods outlined in the State DEC approved project Quality Assurance Project Plan (WMCI, 2004). Submersible sampling pumps were installed in each of the wells. For each monitoring well, during each quarter, sampling includes:

- observations that are recorded using a field notebook, sample form, and chain of custody form;
- measurement of static water level and total depth used to calculate purge volume;
- decontamination of sampling equipment with detergent and rinsing with distilled water;
- well purging so that sampled water is representative of groundwater conditions;
- measurement of field parameters during well purging to verify that water quality has stabilized;
- field measurement of groundwater pH, electrical conductivity, temperature, redox potential, and depth to water;
- collection of groundwater samples for total metals, pH, alkalinity, ammonia, chloride, total and Wad cyanide, fluoride, nitrite and nitrate, total phosphorus, sulfate, sulfide, silicon, and TDS;
- samples are also collected for dissolved metals by passing the pump stream through an in-line disposable filter (one 0.45 micrometer filter should be used for each well each quarter);

- quality-assurance and quality-control (QA/QC) samples (one duplicate and one equipment blank) are collected each sample round; and

- preservation of samples according to standard protocols, labeling with well name and date, storage at 4°C, and shipment to the laboratory.

Low-flow sampling techniques were initiated in 2005 to improve the sample quality by reducing the amount of suspended solids. The samples were analyzed at SGS Environmental Services in Anchorage using standard methods.

2.1 Water-level data

Water levels in the monitoring wells are measured to evaluate relative changes in groundwater elevation as part of the baseline data collection for the project area. Water levels have been collected on a quarterly basis beginning in January of 2004. Table 2.2 presents the measuring point elevations, groundwater elevations, average values, and ranges of water levels measured to date. The depth to groundwater and other field data are also contained in Table 2.3.

Figure 2.1 is a hydrograph of groundwater elevation for each of the monitoring wells. This figure indicates that water levels appear to undergo seasonal fluctuations that relate to precipitation (Figure 1.2). All of the wells, except MW03-05, have water levels that are constant or decrease in the winter and increase in the summer, which coincides with the peak rainfall.

In general, the water levels mimic topography and Rock Creek from MW03-03 and MW03-04 toward MW03-05 and MW03-06. It is likely that groundwater flow primarily occurs through interconnected bedrock fractures. The hydraulic gradient was calculated for each quarter using all seven wells. The average gradient was 0.06 (ranged from 0.057 to 0.059) to the southwest. The gradient showed a minor increase from 0.057 to 0.059 from winter to summer.

2.2 Field parameter data

In addition to water levels, other field data are collected as part of the baseline data collection for the project area. Field data including well depths, well purging volumes, groundwater temperature, pH, electrical conductivity (EC), oxidation reduction potential (ORP), and ferrous iron concentrations have been collected on a quarterly basis beginning in January of 2004. The field data, including minimum, maximum, and averages, are provided in Table 2.3.

Well purging and field water-quality parameters have been collected to confirm that each well was properly purged prior to groundwater sample collection. Water-quality parameters were measured three times during purging, and the values did not vary significantly for any of the wells. Field notes also indicate that the purging was conducted as three separate events (pump was turned off in between). The minimum of three wetted casing volumes was purged for each of the wells prior to sample collection. However, purging the wells may have required multiple pumping events to allow the water level to recover. Beginning in 2005, micropurging replaced pumping to eliminate surging of the well and to reduce excessive suspended solids in samples.

Observations (Table 2.3) indicate that field water-quality values are fairly consistent across the site, with a few notable exceptions. The highest temperature value of 11.5°C was observed in the July 2005 sample of MW03-06. The lowest temperature value of 1.1°C was observed in the September 2005 sample of MW03-01. Generally the groundwater at the site had temperatures between 4.5°C and 8°C. The pH values ranged from 6.2 to 7.9 standard units. Well MW03-02 had the lowest observed pH value of 6.2 and also had a significantly higher EC value than the other wells. The other wells had an average EC value of approximately 300 micro siemens per centimeter whereas well MW03-02 had an average EC of 508 micro siemens per centimeter. Well MW03-02 also had the highest value of ferrous iron at 2.4 milligrams per liter.

2.3 Water-quality data

Collection of groundwater samples and laboratory analysis began in October of 2003, and quarterly since then. Water-chemistry data are presented in Appendix B in their entirety and summarized in Table 2.4. The analytical suite is shown in Table 2.4 and includes both total and dissolved constituents. Table 2.4 also provides the minimum, average, and maximum concentration observed at each monitoring well over the last seven sampling rounds.

Figure 2.2 shows the dissolved arsenic concentrations over time in each of the wells. The results suggest that the concentrations have not changed significantly over time in wells MW03-01, MW03-03, MW03-04, MW03-05, MW03-06, and MW03-07. Arsenic concentrations in well MW03-02 appear to have decreased significantly after an initial increase over the months of October 2004 to January 2005. The initial dissolved arsenic concentration in well MW03-02 of 161 ug/l is a result of sorbtion of arsenic onto iron particles that coincide with high total suspended solids, which is common in newly constructed wells. Another marked decrease in the MW03-02 arsenic concentration occurs in the January 2005 sample. The water chemistry of the January 2005 sample is slightly different in composition, with increased iron concentration as a possible reason for the observed decrease in arsenic concentration. However, the January 2005 sample is within a normal range of chemical compositions observed at MW03-02.

Figures 2.3 through 2.11 contain Piper diagrams showing the relative proportions of major cations and anions for each of the seven wells during each quarter. Piper diagrams are used to provide a visual representation of waters' major chemistry. As illustrated in Figures 2.3 through 2.11, the Piper plots contain two base triangles and a larger central grid that combines the constituents of the base triangles. The base triangles are used to plot major cations (positively charged ions) and anions (negatively charged ions) as percentages. Cations (calcium, magnesium, and potassium + sodium) are plotted on the left base triangle, while anions (sulfate, chloride, and alkalinity) are plotted on the right base triangle. The larger grid shows the contents of the base triangles combined to display the overall water type for a particular sample. Water samples of similar major chemistry tend to plot in the same regions of the chart. This plotting system allows the user to plot multiple samples and to show dominant water types and trends either spatially or through time.

At Rock Creek, Groundwater types are generally consistent across the site and are calcium-bicarbonate type in all wells except for MW03-02 and MW03-05, which are calcium-magnesium-bicarbonate-sulfate type. These two wells represent groundwater in the pit area and immediately downgradient of the proposed pit and reflect the natural influence of mineralization on groundwater chemistry. Groundwater from these two wells also shows elevated total dissolved solids (TDS). TDS from all wells ranges from 139 to 728 mg/l. Groundwater pH is circumneutral across the site, ranging from 6.9 to 8.1; although pH values obtained at MW03-02 were slightly lower than the other wells.

Metals concentrations are variable across the site with elevated arsenic, iron, and manganese (compared to drinking water standards), in most wells except for MW03-04. Arsenic concentrations tend to increase near the proposed open pit, reflecting the increased natural mineralization in that area. Dissolved arsenic concentrations range from 1.5 ug/l in well MW03-04 to a maximum of 1,360 µg/l in well MW03-02, adjacent to the proposed pit area. Figure 2.12 shows the dissolved arsenic, manganese, and antimony concentrations versus distance from MW03-03 (upgradient of site) to MW03-06 (downgradient of site). The increase in concentrations shown in Figure 2.12 occurs at MW03-02 due to the natural mineralization near the proposed pit.

In summary, groundwater chemistry can be generally categorized into three types reflecting the waters' origins, level of influence from natural mineralization, and subsequent chemical attenuation and/or dilution. The first category is upgradient groundwater dominated by snowmelt. This groundwater is represented by MW03-04 and has had no exceedences of primary or secondary drinking water standards during baseline sampling.

The second groundwater category is characterized by water adjacent to, and influenced by, the ore body. MW03-02 is closest to the ore body and is therefore most influenced by the mineralization, resulting in higher TDS, major ions, and metals concentrations (Sb, As, Fe, and Mn). These influences decrease with increasing distance from the ore body in wells MW03-01 and MW03-07.

The third groundwater type represents groundwater that has been influenced by the mineralization but has subsequently flowed downgradient of the proposed mine area and whose chemistry reflects chemical attenuation and/or dilution. This has resulted in naturally lower major ion and metals concentrations as observed in MW03-05 and MW03-06.

QA/QC methods in the laboratory include blanks, duplicates and spikes to verify that laboratory measurements meet the criteria of the selected methods. However, it is also necessary to collect and submit quality assurance samples from the field. For this site, this includes a duplicate sample from one of the wells and one equipment blank for each sampling round.

Table 2.5 contains the laboratory analysis results for the original samples and field-duplicate samples. Relative percent differences between the original and the duplicate for each result are calculated for comparison. Significant differences (greater than PQL values) between duplicates were measured for many of the compounds. Relative difference values ranged from 0 to 200% but were generally low (i.e., less than 20%) for major ions. Higher relative differences were calculated for those constituents with low concentrations (e.g., metals), which is expected, because at lower concentrations, small differences in duplicate concentration can result in higher relative percent differences. The relative percent difference for total suspended solids in the April 2005 samples is high. However, both the sample and duplicate are at or below the detection limit, and the values are estimated. In a few cases, major ion duplicate samples resulted in significantly different values (e.g., sulfate for April 2004).

Table 2.6 contains the laboratory analysis results from each of the equipment blanks. The equipment blanks had several detected compounds indicated in bold. There were detections in the equipment blanks collected for each of the quarters. However, the detections found in the fourth quarter of 2004 (conductivity and chloride) are insignificant, and dust contamination may have contributed to some of the other detections. The April 2005 equipment blank results showed low detections of lead and zinc. Detection of metals that have been found in groundwater samples indicates inadequate decontamination between wells and decreases confidence in sample results.

The analysis of the samples collected was affected by the elevated total suspended solids (TSS) found in several of the wells (Table 2.4 and Appendix B). Wells MW03-02, MW03-05, and MW03-06 had TSS concentrations that were significantly higher than the other wells. The TSS values generally decreased

after the first two sampling events, from natural development of the well. The TSS was generally associated with significant increases in total compared to dissolved metal concentrations. Many of the metals and the major ions had total concentrations that were similar to their corresponding dissolved concentrations. Calcium is shown as an example in Figure 2.13, indicating that the dissolved major ion chemistry accounts for nearly all of the total concentration measured. However, some metals had higher total concentrations compared to dissolved concentrations (Figure 2.14) that corresponded to elevated TSS concentrations. The elevated TSS concentrations were measured during the first few sampling rounds and have gradually decreased over time. This issue appears to be resulting from the natural development of the wells along with changing purge method protocols to further reduce the sediment entering the well. TSS values measured in the November 2005 samples are significantly lower than the initial values measured in October 2003.

While total concentrations of constituents are measured in water collected from these wells, total concentrations do not represent background groundwater quality. Water flowing through aquifers is naturally filtered and particulates do not migrate through aquifer material. Only dissolved mass migrates with groundwater through aquifer matrix material or fractures. Because of this and the fact that well have been slow to develop at this site, the focus of the baseline sampling and analysis has been on the dissolved fraction of the water chemistry. These data provide a more reliable representation of baseline aquifer water quality.

3 CONCLUSIONS

The baseline monitoring program for Rock Creek utilized data from nine sampling rounds conducted from 2003 to 2005 for the evaluation of the hydrogeology and water quality of the site prior to mining activities. This report focused on the physical properties of groundwater flow in the Rock Creek area, as well as the evolution of groundwater chemistry as it flows through the subsurface.

Groundwater elevation measurements collected quarterly since October 2003 suggests a hydraulic gradient of 0.6 toward the southwest, discharging into Rock Creek and the Snake River. Recharge of groundwater occurs to the north and west of the site Water levels in the seven monitoring wells have remained relatively constant, with seasonal fluctuations in response to local precipitation. Groundwater flow occurs primarily through interconnected bedrock fractures and water levels mimic surface topography at Rock Creek.

The groundwater at Rock Creek is predominantly of calcium-bicarbonate type. Where groundwater is in contact with the mineralized zones, the water type is calcium-magnesium-bicarbonate-sulfate. The effect of mineralization in the area of the proposed pit is indicated by the water chemistry at MW03-02. The pH at MW03-05 was generally lower than the other wells, and had elevated concentrations of arsenic, manganese, antimony, and total dissolved solids. The dissolved metal concentrations decrease with distance from MW03-02 as observed in MW03-06. In the early stages of sampling, total suspended solids concentrations were elevated and generally decreased over time. This trend can be attributed to the natural development of the wells over time, as well as modified purge methods to limit the amount of sediment entering the well.

The baseline monitoring program will continue until proposed operations begin in 2006.

4 REFERENCES

WMC, 2004. Rock Creek Property, Groundwater Sampling and Analysis Quality Assurance Project Plan. Water Management Consultants, Inc. April 2004.

NovaGold Resources, 2000. Internal memo titled “Evaluation of Geology at Rock Creek.”

TABLES

Table 2.1 Monitoring Well Descriptions

Well ID	UTM* Easting (m)	UTM* Northing (m)	Collar Elevation (m amsl)	Purpose	Total depth drilled (m)	Top of screen (m)	Bottom of screen (m)	Top of filter pack (m)	Bottom of filter pack (m)	Depth of pump (m)
MW-03-01	480011	7164903	86.49	Monitors areas upgradient from the proposed tailings facility.	24.39	13.72	19.82	10.67	24.09	18.29
MW-03-02	479855	7165284	75.2	Monitors downgradient from the mineralized zone. Will be used to quantify the quantity of groundwater that flows from the mineralized zone to the Snake River alluvium.	45.73	30.09	42.29	27.13	42.29	42.68
MW-03-03	480751	7166260	162.3	Monitors upgradient from the mineralized zone	36.59	29.88	35.98	27.44	37.2	30.49
MW-03-04	479994	7166135	133.08	Monitors areas upgradient from the proposed waste rock facilities.	21.34	14.02	20.12	12.5	21.34	18.29
MW-03-05P	479159	7164301	29.97	Monitors areas downgradient from the proposed tailings facility.	89.94	50	53.05	49.7	53.35	None
MW-03-05	479178	7164306	30.9	Monitors areas downgradient from the proposed tailings facility.	27.04	20.73	26.83	19.21	26.83	24.39
MW-03-06	478802	7164190	22.39	Monitors alluvium downgradient from the mine area.	7.62	4.88	7.93	3.35	9.15	6.1
MW-03-07	479620	7165330	70	Monitors areas downgradient from the proposed waste rock facilities.	33.54	26.83	32.93	25.3	33.54	30.49

*UTM coordinates using NAD 27 Zone 3

m - meters

m amsl - meters above mean sea level

Table 2.2 Groundwater elevation data summary

Well I.D.	Measuring point elevation (m amsl)	Potentiometric elevation January 2004 (m amsl)	Potentiometric elevation April 2004 (m amsl)	Potentiometric elevation August 2004 (m amsl)	Potentiometric elevation November 2004 (m amsl)	Potentiometric elevation April 2005 (m amsl)	Potentiometric elevation July 2005 (m amsl)	Potentiometric elevation February 2006 (m amsl)	Minimum (m amsl)	Average (m amsl)	Maximum (m amsl)
MW03-01	86.49	76.28	75.49	76.67	78.56	74.91	77.33	75.43	74.91	76.38	78.56
MW03-02	75.2	65.31	65.26	66.6	65.75	65.10	66.30	65.38	65.10	65.67	66.60
MW03-03	162.3	158.69	158.06	158.88	159.72	157.27	160.46	158.05	157.27	158.73	160.46
MW03-04	133.08	129.16	128.21	131.11	131.68	127.69	130.99	128.15	127.69	129.57	131.68
MW03-05	30.9	28.03	28.89	28.04	28.00	27.91	28.27	28.56	27.91	28.24	28.89
MW03-06	22.39	19.71	18.29	19.57	19.39	17.43	20.46	17.7	17.43	18.94	20.46
MW03-07	70	67.87	67.06	67.29	67.56	68.07	68.90		67.06	67.79	68.90

m amsl - meters above mean sea level

Table 2.3 Field parameter data summary

Parameter	Unit	Result	Result	Result	Result	Minimum	Average	Maximum
Well ID: MW03-01								
Collection date:		19-Apr-05	20-Jul-05	11-Sep-05	21-Feb-06			
Collection time:		13:05	15:45					
Well diameter:	cm	10.163	10.163	10.163	10.163			
Depth to water:	m btoc	11.58	9.16	9.08	11.06	9.08	10.22	11.58
Total depth:	m btoc	24.39	24.39	24.39	24.39	24.39	24.39	24.39
Total volume purged:	liters	314.57	125.07	215.77	132.49	125.07	196.98	314.57
Temperature	^{o}C	2.9	8.2	1.1	4.5	1.10	4.19	8.20
pH	s.u.	6.72	7.26	7.76	7.91	6.72	7.41	7.91
EC	uS/cm	376	356	197	65	65.00	248.50	376.00
ORP	mV							
Ferrous Iron	mg/L	0.2	0	0	0.2	0.00	0.10	0.20
Well ID: MW03-02								
Collection date:		2/11/2005	19-Apr-05	19-Jul-05	21-Feb-06			
Collection time:			17:50	17:00				
Well diameter:	cm	10.163	10.163	10.163	10.163			
Depth to water:	m btoc	7.96	10.10	8.90	9.82	7.96	9.20	10.10
Total depth:	m btoc	45.73	45.73	45.73	45.73	45.73	45.73	45.73
Total volume purged:	liters	333	758	95	322	94.75	376.94	758.00
Temperature	^{o}C	2.2	4.4	6.1	4.4	2.20	4.27	6.10
pH	s.u.	7.1	6.87	6.21	7.09	6.21	6.82	7.10
EC	uS/cm	502	880	500	151	151.00	508.25	880.00
ORP	mV		NA	NA				
Ferrous Iron	mg/L	1.2	1.4	2.4	1.8	1.20	1.70	2.40
Well ID: MW03-03								
Collection date:		2/11/2005	18-Apr-05	21-Jul-05	20-Feb-06			
Collection time:			14:00	17:15				
Well diameter:	cm	10.163	10.163	10.163	10.163			
Depth to water:	m btoc	2.77	5.03	1.84	4.25	1.84	3.47	5.03
Total depth:	m btoc	37.2	37.20	37.20	37.20	37.20	37.20	37.20
Total volume purged:	liters	624	746	288	435	288.00	523.30	746.20
Temperature	^{o}C	3.8	5.4	5.5	4.3	3.80	4.75	5.50
pH	s.u.	7.72	7.28	7.56	7.8	7.28	7.59	7.80
EC	uS/cm	214	365	364	64	64.00	251.75	365.00
ORP	mV		29	NA		29.00	29.00	29.00
Ferrous Iron	mg/L	0.2	0.6	0.6	0.6	0.20	0.50	0.60
Well ID: MW03-04								
Collection date:		18-Apr-05	7/11/2005	19-Jul-05	20-Feb-06			
Collection time:		16:00		14:00				
Well diameter:	cm	10.163	10.163	10.163	10.163			
Depth to water:	m btoc	5.39	2.18	2.09	4.93	2.09	3.65	5.39
Total depth:	m btoc	21.34	21.34	21.34	21.34	21.34	21.34	21.34
Total volume purged:	liters	359	356	87	246	87.20	262.05	359.00
Temperature	^{o}C	6.7	1.2	7.7	2.8	1.20	4.59	7.70
pH	s.u.	6.33	7.78	6.74	7.69	6.33	7.14	7.78
EC	uS/cm	441	222	378	71	71.00	278.00	441.00
ORP	mV	164		NA		164.00	164.00	164.00
Ferrous Iron	mg/L	0	0	0	0	0.00	0.00	0.00

Table 2.3 Field parameter data summary

Well ID: MW03-05								
Collection date:		20-Apr-05	7/11/2005	21-Jul-05	22-Feb-06			
Collection time:		12:45		15:15				
Well diameter:	cm	10.163	10.163	10.163	10.163			
Depth to water:	m btoc	2.99	2.46	2.63	2.34	2.34	2.61	2.99
Total depth:	m btoc	27.07	27.07	27.07	27.07	27.07	27.07	27.07
Total volume purged:	liters	584	416	68	284	68.20	337.97	583.66
Temperature	^{o}C	2.9	1.2	7.0	3.4	1.20	3.64	7.00
pH	s.u.	6.31	7.84	7.44	7.82	6.31	7.35	7.84
EC	uS/cm	484	286	465	81	81.00	329.00	484.00
ORP	mV	NA		NA				
Ferrous Iron	mg/L	0.8	0.8	0.8	0.6	0.60	0.75	0.80
Well ID: MW03-06								
Collection date:		20-Apr-05	21-Jul-05	11-Oct-05	22-Feb-06			
Collection time:		14:20	13:45					
Well diameter:	cm	10.163	10.163	10.163	10.163			
Depth to water:	m btoc	4.96	1.93	1.93	4.69	1.93	3.38	4.96
Total depth:	m btoc	7.62	7.62	7.62	7.62	7.62	7.62	7.62
Total volume purged:	liters	87	30	303	68	30.32	122.11	303.00
Temperature	^{o}C	4.7	11.5	4.7	6.9	4.70	6.96	11.50
pH	s.u.	6.57	6.58	7.44	7.54	6.57	7.03	7.54
EC	uS/cm	358	273	164	59	59.00	213.50	358.00
ORP	mV	NA	NA					
Ferrous Iron	mg/L	0	0	0	0	0.00	0.00	0.00
Well ID: MW03-07								
Collection date:		18-Apr-05	21-Jul-05					
Collection time:		17:40	12:15					
Well diameter:	cm	10.163	10.163					
Depth to water:	m btoc	1.93	1.10			1.10	1.52	1.93
Total depth:	m btoc	33.54	33.54			33.54	33.54	33.54
Total volume purged:	liters	785	49			49.30	416.90	784.50
Temperature	^{o}C	3.6	7.0			3.61	5.31	7.00
pH	s.u.	6.63	6.9			6.63	6.77	6.90
EC	uS/cm	469	435			435.00	452.00	469.00
ORP	mV	41	-79			-79.00	-19.00	41.00
Ferrous Iron	mg/L	0.8	0.8			0.80	0.80	0.80

m btoc - meters below top of casing

Table 2.4 Groundwater quality data summary

Statistics		MW03-01			MW03-02			MW03-03			MW03-04			MW03-05			MW03-06			MW03-07		
Analyte	Units	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Alkalinity	mg/L	138	142	146	258	302	468	165	172	178	178	192	204	156	214	516	105	117	126	210	217	222
Aluminum	ug/L	6	543	2560	6.2	3145	24300	6	39	317	6.2	358	1710	6.2	1709	13100	6.2	5669	23900	6.2	104	355
Ammonia-N	mg/L	0.031	0.031	0.063	0.031	0.218	1.66	0.031	0.039	0.202	0.031	0.031	0.065	0.031	0.042	0.108	0.03	0.17	0.66	0.03	0.12	0.18
Antimony	ug/L	3.10	4.71	8.25	10.3	19.38	36	<0.31	<0.31	<0.31	0.54	0.88	1.24	0.31	2.5	14	0.90	2.56	4.19	2.0	3.6	5.2
Arsenic	ug/L	135	179	230	1050	1822	3980	36	44	52	1.5	6.2	42.9	70.6	83.9	94	13	238	494	452	499	541
Barium	ug/L	16	31	82	13	56	333	3.03	3.51	6.01	5.2	11.7	38.1	29	62	273	6.2	75	290	25	28	34
Beryllium	ug/L	0.130	0.130	0.336	0.13	0.530	3.91	<0.13	<0.13	<0.13	0.13	0.13	0.26	0.13	0.317	2.08	0.13	0.49	1.57	<0.13	<0.13	<0.13
Cadmium	ug/L	0.050	0.053	0.250	0.05	0.209	1.16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.07	0.37	0.05	0.39	1.20	0.05	0.06	0.25
Calcium	mg/L	53	58	60	101	122	215	57	58	63	66	71	75	56	70	139	40	45	53	61	65	67
Chloride	mg/L	2.4	2.6	2.9	2.61	2.88	3.13	2.09	2.23	2.5	2.5	2.7	2.9	3.9	5.5	6.7	2.28	2.65	2.95	3.2	6.2	21
Chromium	ug/L	0.3	1.1	4.0	0.31	8.59	64.6	0.31	0.98	4.64	0.3	1.9	10.7	0.31	2.30	14.3	0.31	9.97	37.2	0.3	1.0	2.7
Cobalt	ug/L	1.2	1.2	2.0	1.98	12.19	72.9	<1.2	<1.2	<1.2	1.2	1.2	2.1	1.2	2.3	14.5	1.2	9.9	28.8	<1.2	<1.2	<1.2
Conductivity	umhos/cm	8	309	370	800	886	1000	320	346	380	380	406	420	420	465	550	260	280	310	390	421	490
Copper	ug/L	0.31	1.22	4.20	0.31	13	103	0.31	0.32	1.26	0.31	1.24	5.71	0.31	4.3	31	0.4	22	77	0.31	0.48	1.26
Cyanide	mg/L	<0.0025	<0.0025	<0.0025	0.0025	0.0025	0.0036	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0025	0.0025	0.0013	0.0025	0.0025	0.0030	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.031	0.062	0.102	0.042	0.101	0.162	0.031	0.041	0.072	0.031	0.059	0.094	0.050	0.089	0.133	0.032	0.047	0.067	0.05	0.09	0.11
Iron	mg/L	0.20	1.25	4.84	1.7	17	123	0.435	0.60	1.41	0.019	0.77	4.94	0.57	4.4	30	0.041	15	47	0.72	0.91	1.40
Lead	ug/L	0.06	1.18	5.27	0.062	14	102	0.062	0.184	0.896	0.1	1.9	11.8	0.06	7.4	56	0.062	14	47	0.06	0.45	1.24
Magnesium	mg/L	11	12	12	50.5	62	110	13	13	14	11	12	14	24	27	37	9	12	16	16	18	19
Manganese	ug/L	75	118	230	751	2090	6570	17	20	27	4.7	38	101	23	100	593	0.84	168	495	51	61	76
Molybdenum	ug/L	3.10	3.10	6.16	3.1	4.01	7.62	3.1	3.10	5	3.1	3.1	5.0	3.1	3.1	3.8	3.1	3.1	6.1	3.1	3.1	6.5
Nickel	ug/L	1.59	3.12	7.81	12	45	229	0.62	1.30	2.37	1.8	4.3	9.9	0.62	18	130	1.6	23	69	1.1	2.1	2.9
pH	pH units	7.54	7.68	8.10	6.89	6.97	7.1	7.4	7.6	7.7	7.5	7.7	7.7	7.5	7.7	7.8	7.0	7.3	7.5	7.2	7.4	7.5
Phosphorus	ug/L	9	44	100	9.4	182	1220	9.4	33	100	9.4	44	101	9.4	126	845	9.4	252	675	9.4	34	100
Potassium	ug/L	214	398	967	331	1273	6250	204	250	405	205	416	1090	532	1267	5710	325	676	1150	728	845	980
Selenium	ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	1.5	2.5	4.1	1.5	1.5	1.6	1.5	1.5	3.1	1.5	1.5	2.5
Silicon	ug/L	2950	3814	5670	4260	8695	30700	2530	3777	4750	2010	3154	5400	2910	5764	22300	3130	7981	26700	3440	4130	5100
Silver	ug/L	<0.31	<0.31	<0.31	0.31	0.31	0.5	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	0.31	0.31	0.16	0.31	0.31	0.39	<0.31	<0.31	<0.31
Sodium	ug/L	2010	2193	2360	2710	6084	28500	1800	2071	2360	2030	2486	4380	4310	7181	20700	1900	2404	3240	2230	5181	20800
Strontium	mg/L	0.168	0.182	0.198	0.296	0.360	0.643	0.206	0.214	0.226	0.202	0.217	0.232	0.244	0.296	0.559	0.109	0.125	0.146	0.25	0.27	0.30
Sulfate	mg/L	49	52	55	181	252	323	25	27	28	28	34	37	79	84	92	25	35	47	18	20	22
Sulfide	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	0.12	0.60	0.10	0.10	0.05	<0.1	<0.1	<0.1
Thallium	ug/L	0.31	0.52	2.64	0.31	0.315	1.25	<0.31	<0.31	<0.31	0.31	0.510	2.09	0.31	0.31	0.16	0.31	0.31	0.96	0.31	0.31	0.51
Tin	ug/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0.31	0.47	1.00	0.31	0.62	1.4	0.31	0.58	1.49
Titanium	ug/L	28	70	118	17.8	146.9	348	38	58	86	14	74	118	50	95	221	49	100	173	14	58	92
Total Dissolved Solids	mg/L	211	228	240	565	626	728	185	213	223	221	247	286	266	302	334	139	180	216	208	245	265
Total Nitrate/Nitrite	mg/L	0.31	0.31	0.50	0.31	0.31	0.5	0.31	0.32	1.36	0.31	0.34	1.56	0.31	0.32	1.41	0.31	0.38	1.71	<0.31	<0.31	<0.31
Total Suspended Solids	mg/L	1	30	174	1.3	1081	9300	0.4	3.9	19	0.15	32	188	1.3	73	552	1.0	665	2260	1.6	8	25
Vanadium	ug/L	<6.2	<6.2	<6.2	6.2	11.49	67	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	6.2	6.2	16.1	6.2	20	65	<6.2	<6.2	<6.2
WAD CN	mg/L	0.0025	0.0025	0.0028	0.0025	0.0025	0.004	0.0025	0.0025	0.003	0.0025	0.0025	0.00391	0.0025	0.0025	0.00125	0.0025	0.0025	0.003	0.0025	0.0025	0.0031
Zinc	ug/L	2.7	7.5	19.5	5	48	302	1.0	1.1	2.5	1.0	4.0	21.6	1.0	14	97	1.0	34	105	1.0	3.6	15
Aluminum, dissolved	ug/L	6	13	84	<6.2	<6.2	<6.2	6.2	8.6	27	6.2	21	151	6.2	13	84	6.2	6.7	14	6.2	9.4	46
Antimony, dissolved	ug/L	3.0	4.2	5.6	11.1	23	105	<0.31	<0.31	<0.31	0.53	0.92	1.41	0.31	6.5	45	0.51	1.40	4.90	1.6	2.9	4.2
Arsenic, dissolved	ug/L	123	150	187	161	1042	1360	38	42	49	1.5	1.8	5.7	33	73	95	5	10	20	482	502	530
Barium, dissolved	ug/L	16	18	26	11	17	29.9	2.9	3.3	4.3	5	9	22	27	32	38	3.4	9	25	25.3	27	29.5
Beryllium, dissolved	ug/L	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	0.13	0.13	0.20	<0.13	<0.13	<0.13	0.13	0.29	1.86	0.130	0.130	0.065	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.050	0.058	0.250	0.05	0.076	0.261	0.05	0.061	0.25	<0.05	<0.05	<0.05	0.05	0.24	1.63	0.05	0.050	0.12	<0.05	<0.05	<0.05
Calcium, dissolved	mg/L	57	59	61	105	113	125	55	58	60	67	71	77	55	60	65	41	44	50	62	65	67
Chromium, dissolved	ug/L	0.31	0.95	2.72	0.31	1.87	7.06	0.31	0.53	3.21	0.3	1.3	4.9	0.31	0.46	2.60	0.31	0.76	2.5	0.31	0.92	4.72
Cobalt, dissolved	ug/L	<1.2	<1.2	<1.2	2.01	3.93	6.26	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	1.20	1.20	1.91	1.2	1.2	0.6	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	0.31	0.48	1.09	0.31	1.50	2.9	0.31	0.80	4.71	0.31	0.43	1.77	0.31	0.70	1.58	0.3	0.5	1.2	0.31	0.46	0.81
Iron, dissolved	mg/L	0.01	0.21	0.49	0.0124	1.71	2.51	0.0124	0.45	0.738	0.0124	0.09	0.639	0.012	0.554	0.749	0.012	0.014	0.037	0.68	0.73	0.92
Lead, dissolved	ug/L	0.062	0.174	1.090	0.062	0.062	0.188	0.062	0.457	2.38	0.062	0.853	6.88	0.06	0.29	1.93	0.062	0.062	0.092	0.062	0.268	1.13
Magnesium, dissolved	mg/L	11	12	12	53	56	62	11	13	14	11	12	15	25	26	29	9	10	12	16	18	19
Manganese, dissolved	ug/L	76	86	99	721	1345	1870	17	19	24	2.7	24	71	23	31	54	0.31	27	115	54	59	66
Molybdenum, dissolved	ug/L	3.1	3.1	5.0	3.1	3.10	5	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	3.1	3.1	4.1	3.1	3.1	1.6	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	1.62	2.07	2.68	12	26	80	0.645	1.31	1.81	0.62	2.70	5.08	0.62	4.8	26	0.62	1.62	2.39	1.18	1.88	2.73
Phosphorus, dissolved	ug/L	9	35	100	9	35	100	9	36	100	9.4	45	100	9.4	28	38	9	32	40	9.4	35	100
Potassium, dissolved	ug/L	190	242	364	327	763	3010	200	227	283	219	312	595	540	702	1290	150	245	369	763	892	1370
Selenium, dissolved	ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	1.5	2.16	3.84	1.50	1.50	4.21	1.5	1.50	0.75	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	2860	3131	3460	4380	4865	5340	2320	3564	4030	2090	2430	2680	2920	3168	3550	963	2132	2780	3870	4117	4530
Silver, dissolved	ug/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	0.31	0.31	0.44	0.31	0.31	0.16	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	1900	2096	2240	2720	5587	24400	1870	2063	2210	1880	2373	4040	4400	6123	11200	1370	2143	2680	2500	4793	16400
Strontium, dissolved	mg/L	0.179	0.185	0.196	0.304	0.337	0.398	0.152	0.208	0.226	0.20	0.22	0.25	0.24	0.26	0.28	0.105	0.116	0.127	0.26	0.276	0.302
Thallium, dissolved	ug/L	0.310	0.348	1.180	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	0.31	0.310	0.5	0.31	0.49	2.82	0.31	0.31	0.16	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	<2	<2	<2	<2	<2	<2	0.31	1.07	6.32	<2	<2	<2	0.31	0.47	1.00	0.31	0.37	1.00	<2	<2	<2
Titanium, dissolved	ug/L	13.9	55.3	78.2	25	111	183	35	56	70	14	59	94	27	58	87	25.1	38.64	52.4	14	47	71
Vanadium, dissolved	ug/L	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	6.2	6.2	3.1	6.2	6.2	3.1	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	2.5	5.6	10.4	6	13	19	1.0	1.8	4.9	1.0	2.5	10.5	1.00	5.0	26	1.00	1.61	3.67	1.0	2.7	7.0
Mercury, total	ug/L	0.0010	0.0016	0.0024	0.001	0.003	0.005	0.0010	0.0010	0.0005	0.0017	0.0045	0.0073	0.0010	0.0010	0.0012	0.0053	0.0306	0.0768	0.0010	0.0010	0.0005

For constituents with some detects, these were included in statistics calculations at half the detection limit.

For constituents with no detects the result is set to the maximum detection limit for that constituent

Table 2.5 Field duplicate sample analysis data summary

		October 2003			October 2003			
Duplicates		**MW-03-03**			**Duplicate**			**Percent**
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	mg/L	176		6.2	174		6.2	1.1
Aluminum	ug/L	317		6.2	20.5		6.2	175.7
Ammonia-N	mg/L	0.042	J	0.031	0.042	J	0.031	
Antimony	ug/L	0.31	ND	0.31	0.57	J	0.31	-59.1
Arsenic	ug/L	48.2		1.5	51.6		1.5	-6.8
Barium	ug/L	6.01		0.94	2.5	J	0.94	82.5
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13	
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05	
Calcium	mg/L	56.6		0.031	61.6		0.62	-8.5
Chloride	mg/L	2.14		0.031	2.28		0.031	-6.3
Chromium	ug/L	0.784	J	0.31	0.31	ND	0.31	86.7
Cobalt	ug/L	1.2	ND	1.2	1.2	ND	1.2	
Conductivity	umhos/cm	350		0.477	370		0.477	-5.6
Copper	ug/L	1.26		0.31	0.31	ND	0.31	121.0
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	
Fluoride	mg/L	0.036	J	0.031	0.032	J	0.031	11.8
Iron	mg/L	1.41		0.0062	0.0625		0.0124	183.0
Lead	ug/L	0.896		0.07	0.07	ND	0.07	171.0
Magnesium	mg/L	12.6		0.031	13.1		0.062	-3.9
Manganese	ug/L	27.3		0.31	2.06		0.31	171.9
Molybdenum	ug/L	3.57	J	3.1	3.1	ND	3.1	14.1
Nickel	ug/L	2.37		0.62	1.88	J	0.62	23.1
pH	pH units	7.6		0.1	7.6		0.1	
Phosphorus	ug/L	9.81	J	9.4	9.4	ND	9.4	4.3
Potassium	ug/L	405	J	150	246	J	150	48.8
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	
Silicon	ug/L	4750		62	3140		62	40.8
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Sodium	ug/L	2360		150	2050		150	14.1
Strontium	mg/L	0.211		0.0015	0.237		0.003	-11.6
Sulfate	mg/L	28.4		0.031	29.4		0.031	-3.5
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Tin	ug/L	2	ND	2	2	ND	2	
Titanium	ug/L	66.6		1.5	72		1.5	-7.8
Total Dissolved Solids	mg/L	220		16	238		16	-7.9
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	0.31	ND	0.31	
Total Suspended Solids	mg/L	19.2		0.8	4.06		0.406	130.2
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	
WAD CN	mg/L	0.0025	ND	0.0025	0.00362	J	0.0025	-36.6
Zinc	ug/L	1.51	J	1	1	ND	1	40.6
Aluminum, dissolved	ug/L	26.8		6.2	14.7	J	6.2	58.3
Antimony, dissolved	ug/L	0.31	ND	0.31	0.615	J	0.31	-65.9
Arsenic, dissolved	ug/L	41		1.5	50.1		1.5	-20.0
Barium, dissolved	ug/L	3.59		0.94	2.47	J	0.94	37.0
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	mg/L	58.5		0.62	65.8		0.062	-11.7
Chromium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	
Copper, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Iron, dissolved	mg/L	0.738		0.0124	0.0528		0.0124	173.3
Lead, dissolved	ug/L	0.693		0.07	0.07	ND	0.07	163.3
Magnesium, dissolved	mg/L	13.9		0.062	13.3		0.062	4.4
Manganese, dissolved	ug/L	23.7		0.31	2.04		0.31	168.3
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	ug/L	1.58	J	0.62	2.12		0.62	-29.2
Phosphorus, dissolved	ug/L	31.9		9.4	9.4	ND	9.4	109.0
Potassium, dissolved	ug/L	283	J	150	261	J	150	8.1
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	ug/L	3810		62	3260		62	15.6
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	ug/L	2210		150	2110		150	4.6
Strontium, dissolved	mg/L	0.226		0.003	0.246		0.003	-8.5
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Tin, dissolved	ug/L	2	ND	2	2	ND	2	
Titanium, dissolved	ug/L	69.5		1.5	71.2		1.5	-2.4
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	ug/L	1	ND	1	1	ND	1	

	January 2004			January 2004			
	MW03-06			**Duplicate**			**Percent**
Analyte	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	116		12.4	112		12.4	3.5
Aluminum	5020		31	4060		3.1	21.1
Ammonia-N	0.516		0.031	0.408		0.031	23.4
Antimony	3.46		0.31	2.37		0.155	37.4
Arsenic	355		1.5	245		0.75	36.7
Barium	115		0.94	78.9		0.47	37.2
Beryllium	0.926		0.13	0.637		0.065	37.0
Cadmium	0.809		0.05	0.499		0.025	47.4
Calcium	49.2		0.31	51.4		0.031	-4.4
Chloride	2.58		0.031	2.57		0.031	0.4
Chromium	7.26		0.31	6.52		0.155	10.7
Cobalt	23.4		1.2	14.4		0.6	47.6
Conductivity	280		0.477	280		0.477	
Copper	35.7		0.31	23.1		0.155	42.9
Cyanide	0.0025	ND	0.0025	0.0025	ND	0.0025	
Fluoride	0.067	J	0.031	0.061	J	0.031	9.4
Iron	17.5		0.062	29.1		0.0062	-49.8
Lead	24.1		0.07	16.1		0.035	39.8
Magnesium	11.8		0.031	12.7		0.031	-7.3
Manganese	495		0.31	271		0.155	58.5
Molybdenum	3.1	ND	3.1	1.86	J	1.55	50.0
Nickel	36.9		0.62	26		0.31	34.7
pH	7.2		0.1	7.2		0.1	
Phosphorus	420		9.4	371		4.7	12.4
Potassium	675		150	388		75	54.0
Selenium	1.5	ND	1.5	0.75	ND	0.75	
Silicon	7230		310	5260		31	31.5
Silver	0.31	ND	0.31	0.155	ND	0.155	
Sodium	2510		150	1340		75	60.8
Strontium	0.14		0.0015	0.147		0.0015	-4.9
Sulfate	42		0.031	41		0.031	2.4
Sulfide	0.1	ND	0.1	0.1	ND	0.1	
Thallium	0.31	ND	0.31	1.21		0.155	-118.4
Tin	2	ND	2	1	ND	1	
Titanium	114		1.5	73.9		0.75	42.7
Total Dissolved Solids	213		16	216		16	-1.4
Total Nitrate/Nitrite	1.71		0.31	0.82	J	0.31	70.4
Total Suspended Solids	2260		20	2400		20	-6.0
Vanadium	17.9	J	6.2	16.9		3.1	5.7
WAD CN	0.0025	ND	0.0025	0.0025	ND	0.0025	
Zinc	46.8		1	34.3		0.5	30.8
Aluminum, dissolved	8.44	J	6.2	10.3	J	6.2	-19.9
Antimony, dissolved	1.35		0.31	1.33		0.31	1.5
Arsenic, dissolved	19.8		1.5	18.8		1.5	5.2
Barium, dissolved	8.5		0.94	10.1		0.94	-17.2
Beryllium, dissolved	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	41.8		0.62	44		0.062	-5.1
Chromium, dissolved	1.43		0.31	1.92		0.31	-29.3
Cobalt, dissolved	1.2	ND	1.2	1.2	ND	1.2	
Copper, dissolved	1.2		0.31	0.31	ND	0.31	117.9
Iron, dissolved	0.0124	ND	0.0124	0.0124	ND	0.0124	
Lead, dissolved	0.07	ND	0.07	0.07	ND	0.07	
Magnesium, dissolved	10		0.062	10.2		0.062	-2.0
Manganese, dissolved	115		0.31	123		0.31	-6.7
Molybdenum, dissolved	3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	1.71	J	0.62	1.62	J	0.62	5.4
Phosphorus, dissolved	40.3		9.4	35.4		9.4	12.9
Potassium, dissolved	214	J	150	202	J	150	5.8
Selenium, dissolved	1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	1900		62	1830		62	3.8
Silver, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	2190		150	2080		150	5.2
Strontium, dissolved	0.113		0.003	0.115		0.003	-1.8
Thallium, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Tin, dissolved	2	ND	2	2	ND	2	
Titanium, dissolved	45.4		1.5	46.6		1.5	-2.6
Vanadium, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	1	ND	1	1	ND	1	

	April 2004			April 2004			
	MW-03-01			**Duplicate**			**Percent**
Analyte	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	144		6.2	142		6.2	1.4
Aluminum	6.2	ND	6.2	6.2	ND	6.2	
Ammonia-N	0.031	ND	0.031	0.031	ND	0.031	
Antimony	3.52		0.31	3.72		0.31	-5.5
Arsenic	162		1.5	159		1.5	1.9
Barium	18.2		0.94	17.9		0.94	1.7
Beryllium	0.13	ND	0.13	0.13	ND	0.13	
Cadmium	0.05	ND	0.05	0.05	ND	0.05	
Calcium	59.8		0.062	58.3		0.062	2.5
Chloride	2.48		0.031	2.5		0.031	-0.8
Chromium	0.31	ND	0.31	0.31	ND	0.31	
Cobalt	1.2	ND	1.2	1.2	ND	1.2	
Conductivity	360		0.477	360		0.477	
Copper	0.806	J	0.31	0.624	ND	0.31	25.5
Cyanide	0.0025	ND	0.0025	0.0025	ND	0.0025	
Fluoride	0.077	J	0.031	0.092	ND	0.031	-17.8
Iron	0.203		0.0124	0.166		0.0124	20.1
Lead	0.065	J	0.062	0.081	ND	0.062	-21.9
Magnesium	11.6		0.062	11.4		0.062	1.7
Manganese	87.4		0.31	89		0.31	-1.8
Molybdenum	6.16	J	3.1	3.1	ND	3.1	66.1
Nickel	2.08		0.62	2.14		0.62	-2.8
pH	7.7		0.1	7.7		0.1	
Phosphorus	62	ND	62	62	ND	62	
Potassium	244	J	150	251	ND	150	-2.8
Selenium	1.5	ND	1.5	1.5	ND	1.5	
Silicon	3200		62	3250		62	-1.6
Silver	0.31	ND	0.31	0.31	ND	0.31	
Sodium	2290		150	2230		150	2.7
Strontium	0.181		0.003	0.174		0.003	3.9
Sulfate	49.8		0.062	49.6		0.062	0.4
Sulfide	0.1	ND	0.1	0.1	ND	0.1	
Thallium	2.64		0.31	0.503	ND	0.31	136.0
Tin	0.31	ND	0.31	0.31	ND	0.31	
Titanium	60.2		1.5	59.1		1.5	1.8
Total Dissolved Solids	229		3.1	229		3.1	
Total Nitrate/Nitrite	0.31	ND	0.31	0.31	ND	0.31	
Total Suspended Solids	19.1		0.15	56.6		0.214	-99.1
Vanadium	6.2	ND	6.2	6.2	ND	6.2	
WAD CN	0.0025	ND	0.0025	0.0025	ND	0.0025	
Zinc	7		1.5	6.21		1.5	12.0
Aluminum, dissolved	84.1		6.2	202		6.2	-82.4
Antimony, dissolved	4.26		0.31	5.51		0.31	-25.6
Arsenic, dissolved	187		1.5	208		1.5	-10.6
Barium, dissolved	20		0.94	21.1		0.94	-5.4
Beryllium, dissolved	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	59.3		0.062	58.8		0.062	0.8
Chromium, dissolved	0.31	ND	0.31	0.476	ND	0.31	-42.2
Cobalt, dissolved	1.2	ND	1.2	1.2	ND	1.2	
Copper, dissolved	0.705	J	0.31	1.08		0.31	-42.0
Iron, dissolved	0.486		0.0124	1.05		0.0124	-73.4
Lead, dissolved	1.09		0.062	2.45		0.062	-76.8
Magnesium, dissolved	11.5		0.062	11.5		0.062	
Manganese, dissolved	98.3		0.31	130		0.31	-27.8
Molybdenum, dissolved	3.4	J	3.1	3.1	ND	3.1	9.2
Nickel, dissolved	1.9	J	0.62	2.31		0.62	-19.5
Phosphorus, dissolved	62	ND	62	62	ND	62	
Potassium, dissolved	245	J	150	284	ND	150	-14.7
Selenium, dissolved	1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	3460		62	3520		62	-1.7
Silver, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	2240		150	2270		150	-1.3
Strontium, dissolved	0.186		0.003	0.185		0.003	0.5
Thallium, dissolved	1.18		0.31	0.31	ND	0.31	116.8
Tin, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Titanium, dissolved	67.4		1.5	72.8		1.5	-7.7
Vanadium, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	10.4		1.5	8.64		1.5	18.5

	July 2004			July 2004			
	MW03-01			**Duplicate**			**Percent**
Analyte	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	NA	NA	NA	139		3.1	
Aluminum	25.3		6.2	25		6.2	1.2
Ammonia-N	0.031	ND	0.031	0.058	J	0.031	-60.7
Antimony	3.1		0.31	3.4		0.31	-9.2
Arsenic	145		1.5	148		1.5	-2.0
Barium	16.9		0.94	16.8		0.94	0.6
Beryllium	0.13	ND	0.13	0.13	ND	0.13	
Cadmium	0.05	ND	0.05	0.054	ND	0.05	-7.7
Calcium	58		0.062	58.2		0.062	-0.3
Chloride	2.88		0.031	2.75		0.031	4.6
Chromium	0.326		0.31	0.31	ND	0.31	5.0
Cobalt	1.2	ND	1.2	1.2	ND	1.2	
Conductivity	360		0.477	360		0.477	
Copper	0.31	J	0.31	0.31	ND	0.31	
Cyanide	0.0025	ND	0.0025	0.0025	ND	0.0025	
Fluoride	0.07	ND	0.031	0.069	ND	0.031	1.4
Iron	0.309		0.0124	0.293		0.0124	5.3
Lead	0.207		0.062	0.182	ND	0.062	12.9
Magnesium	11.4		0.062	11.4		0.062	
Manganese	80.1		0.31	81.2		0.31	-1.4
Molybdenum	3.1	ND	3.1	3.1	ND	3.1	
Nickel	1.62		0.62	1.77	ND	0.62	7.6
pH	7.54		0.1	7.61		0.1	-0.9
Phosphorus	62	ND	62	62	ND	62	
Potassium	218	J	150	229	ND	150	-4.9
Selenium	1.5	ND	1.5	1.5	ND	1.5	
Silicon	2950		62	2960		62	-0.3
Silver	0.31	ND	0.31	0.31	ND	0.31	
Sodium	2040		150	1950		150	4.5
Strontium	0.182		0.003	0.182		0.003	
Sulfate	49.2		0.062	25.8		0.031	62.4
Sulfide	0.1	ND	0.1	0.1	ND	0.1	
Thallium	0.31	J	0.31	0.31	ND	0.31	
Tin	0.31	ND	0.31	0.31	ND	0.31	
Titanium	49.4		1.5	51.6		1.5	-4.4
Total Dissolved Solids	240		3.1	228		3.1	5.1
Total Nitrate/Nitrite	0.31	ND	0.31	0.31	ND	0.31	
Total Suspended Solids	5.3		0.15	4.6		0.15	14.1
Vanadium	6.2	ND	6.2	6.2	ND	6.2	
WAD CN	0.0025	ND	0.0025	0.0025	ND	0.0025	
Zinc	5.69	J	1.5	16.6		1.5	-97.9
Aluminum, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Antimony, dissolved	3.55		0.31	3.54		0.31	0.3
Arsenic, dissolved	147		1.5	150		1.5	-2.0
Barium, dissolved	17.1		0.94	17.3		0.94	-1.2
Beryllium, dissolved	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	58.9		0.062	59.7		0.062	-1.3
Chromium, dissolved	0.31		0.31	0.31	ND	0.31	
Cobalt, dissolved	1.2	ND	1.2	1.2	ND	1.2	
Copper, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Iron, dissolved	0.226		0.0124	0.211		0.0124	6.9
Lead, dissolved	0.062	ND	0.062	0.062	ND	0.062	
Magnesium, dissolved	11.5		0.062	11.6		0.062	-0.9
Manganese, dissolved	81.7		0.31	80.8		0.31	1.1
Molybdenum, dissolved	3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	1.62		0.62	1.54	ND	0.62	5.1
Phosphorus, dissolved	62	ND	62	62	ND	62	
Potassium, dissolved	190	J	150	191	ND	150	-0.5
Selenium, dissolved	1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	3170		62	3120		62	1.6
Silver, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	2030		150	2020		150	0.5
Strontium, dissolved	0.184		0.003	0.184		0.003	
Thallium, dissolved	0.31	J	0.31	0.31	ND	0.31	
Tin, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Titanium, dissolved	66.9		1.5	64.4		1.5	3.8
Vanadium, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	6.53	J	1.5	19		1.5	-97.7

Result flags:"ND" means not detected; "J" means result is estimated concentration that is less than the practical quantitation limit but greater than method detection limit.

Table 2.5 Field duplicate sample analysis data summary

Duplicates		July 2004			July 2004			Percent
		MW-03-02			Duplicate			
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	mg/L	262		3.1	266		3.1	-1.5
Aluminum	ug/L	579		6.2	460		6.2	22.9
Ammonia-N	mg/L	0.031	J	0.031	0.031	ND	0.031	
Antimony	ug/L	19.1		0.31	19.4		0.31	-1.6
Arsenic	ug/L	1600		1.5	1560		1.5	2.5
Barium	ug/L	24.5		0.94	23.3		0.94	5.0
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13	
Cadmium	ug/L	0.05	J	0.05	0.05	ND	0.05	
Calcium	mg/L	103		0.31	108		0.31	-4.7
Chloride	mg/L	2.83		0.031	2.85		0.031	-0.7
Chromium	ug/L	1.6	J	0.31	1.15		0.31	32.7
Cobalt	ug/L	5.16	J	1.2	4.32		1.2	17.7
Conductivity	umhos/cm	800		0.477	800		0.477	
Copper	ug/L	1.04		0.31	1.11		0.31	-6.5
Cyanide	mg/L	0.0025	J	0.0025	0.0025	ND	0.0025	
Fluoride	mg/L	0.162	J	0.031	0.139		0.031	15.3
Iron	mg/L	3.83		0.0062	3.38		0.0062	12.5
Lead	ug/L	1.07		0.062	0.808		0.062	27.9
Magnesium	mg/L	55.5		0.31	55.5		0.31	
Manganese	ug/L	1920		0.31	1740		0.31	9.8
Molybdenum	ug/L	4.47	J	3.1	3.54	ND	3.1	23.2
Nickel	ug/L	26.8		0.62	22.7		0.62	16.6
pH	pH units	6.9		0.1	6.9		0.1	
Phosphorus	ug/L	62	ND	62	62	ND	62	
Potassium	ug/L	723		150	724		150	-0.1
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	
Silicon	ug/L	6740		62	5640		62	17.8
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Sodium	ug/L	3040		150	3500		150	-14.1
Strontium	mg/L	0.297		0.0015	0.321		0.0015	-7.8
Sulfate	mg/L	247		0.31	247		0.31	
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Tin	ug/L	0.379	ND	0.31	0.31	ND	0.31	20.0
Titanium	ug/L	92.2		1.5	119		1.5	-25.4
Total Dissolved Solids	mg/L	665		3.1	650		3.1	2.3
Total Nitrate/Nitrite	mg/L	0.62	ND	0.62	3.62		0.62	-141.5
Total Suspended Solids	mg/L	64.3		0.429	82.7		0.5	-25.0
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	
WAD CN	mg/L	0.0025	J	0.0025	0.0025	ND	0.0025	
Zinc	ug/L	23.7		1.5	19.5		1.5	19.4
Aluminum, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	
Antimony, dissolved	ug/L	14.3		0.31	13.7		0.31	4.3
Arsenic, dissolved	ug/L	1360		1.5	1300		1.5	4.5
Barium, dissolved	ug/L	15.5		0.94	15.6		0.94	-0.6
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	mg/L	109		0.062	111		0.062	-1.8
Chromium, dissolved	ug/L	0.31		0.31	0.31	ND	0.31	
Cobalt, dissolved	ug/L	4.03	J	1.2	4.67		1.2	-14.7
Copper, dissolved	ug/L	0.31		0.31	0.31	ND	0.31	
Iron, dissolved	mg/L	2.51		0.0124	2.26		0.0124	10.5
Lead, dissolved	ug/L	0.062	ND	0.062	0.062	ND	0.062	
Magnesium, dissolved	mg/L	55.8		0.062	54.9		0.062	1.6
Manganese, dissolved	ug/L	1730		0.31	1740		0.31	-0.6
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	ug/L	22.6		0.62	23.3		0.62	-3.1
Phosphorus, dissolved	ug/L	62.3	ND	62	62	ND	62	0.5
Potassium, dissolved	ug/L	353		150	364	ND	150	-3.1
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	ug/L	4850		62	4890		62	-0.8
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	ug/L	3000		150	3120		150	-3.9
Strontium, dissolved	mg/L	0.307		0.003	0.308		0.003	-0.3
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	
Titanium, dissolved	ug/L	83.8		1.5	79.3		1.5	5.5
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	ug/L	18.8		1.5	17.7		1.5	6.0

	October 2004			October 2004			Percent
	MW03-02			Duplicate			
Analyte	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	292		3.1	290		3.1	0.7
Aluminum	40.2		6.2	46.6		6.2	-14.7
Ammonia-N	0.041	J	0.031	0.086	ND	0.031	-70.9
Antimony	16.3		0.31	14.6		0.31	11.0
Arsenic	1170		1.5	1290		1.5	-9.8
Barium	17.2		0.94	18.2		0.94	-5.6
Beryllium	0.13	ND	0.13	0.13	ND	0.13	
Cadmium	0.0715	J	0.05	0.05	ND	0.05	35.4
Calcium	126		3.1	114		0.062	10.0
Chloride	3.13		0.031	3.13		0.031	
Chromium	0.719	J	0.31	4.03		0.31	-139.4
Cobalt	1.98	J	1.2	2.06	ND	1.2	-4.0
Conductivity	900		0.477	900		0.477	
Copper	1.09		0.31	2.2		0.31	-67.5
Cyanide	0.0036	J	0.0025	0.0036	ND	0.0025	
Fluoride	0.067	J	0.031	0.051	ND	0.031	27.1
Iron	1.7		0.0062	1.56		0.0124	8.6
Lead	0.386		0.062	0.261		0.062	38.6
Magnesium	51.5		0.031	48.4		0.062	6.2
Manganese	751		0.31	738		0.31	1.7
Molybdenum	3.33	J	3.1	3.1	ND	3.1	7.2
Nickel	11.5		0.62	11.9		0.62	-3.4
pH	6.98		0.1	7.05		0.1	-1.0
Phosphorus	62	ND	62	62	ND	62	
Potassium	587		150	554		150	5.8
Selenium	1.5	ND	1.5	1.5	ND	1.5	
Silicon	4730		62	5040		62	-6.3
Silver	0.31	ND	0.31	0.31	ND	0.31	
Sodium	3130		150	3120		150	0.3
Strontium	0.364		0.0015	0.344		0.003	5.6
Sulfate	209		0.62	205		0.62	1.9
Sulfide	0.1	ND	0.1	0.1	ND	0.1	
Thallium	0.31	ND	0.31	0.31	ND	0.31	
Tin	0.31	ND	0.31	0.31	ND	0.31	
Titanium	107		1.5	68.1		1.5	44.4
Total Dissolved Solids	655		3.1	650		3.1	0.8
Total Nitrate/Nitrite	0.31	ND	0.31	0.31	ND	0.31	
Total Suspended Solids	10.4		0.2	9.6		0.2	8.0
Vanadium	6.2	ND	6.2	6.2	ND	6.2	
WAD CN	0.004	J	0.0025	0.0026	ND	0.0025	42.4
Zinc	6		1.5	5.76		1.5	4.1
Aluminum, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Antimony, dissolved	14.9		0.31	15.3		0.31	-2.6
Arsenic, dissolved	1240		1.5	1250		1.5	-0.8
Barium, dissolved	17.3		0.94	18.1		0.94	-4.5
Beryllium, dissolved	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	125		0.062	125		0.062	
Chromium, dissolved	3.16		0.31	2.99		0.31	5.5
Cobalt, dissolved	2.01	J	1.2	2.04	ND	1.2	-1.5
Copper, dissolved	2.22		0.31	2.15		0.31	3.2
Iron, dissolved	1.52		0.0124	1.52		0.0124	
Lead, dissolved	0.062	ND	0.062	0.062	ND	0.062	
Magnesium, dissolved	53.4		0.062	53.5		0.062	-0.2
Manganese, dissolved	721		0.31	739		0.31	-2.5
Molybdenum, dissolved	3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	12		0.62	12.1		0.62	-0.8
Phosphorus, dissolved	62	ND	62	62	ND	62	
Potassium, dissolved	517		150	539		150	-4.2
Selenium, dissolved	1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	5130		62	5270		62	-2.7
Silver, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	3130		150	3150		150	-0.6
Strontium, dissolved	0.377		0.003	0.377		0.003	
Thallium, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Tin, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Titanium, dissolved	69.3		1.5	69.6		1.5	-0.4
Vanadium, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	5.51		1.5	6.66		1.5	-18.9

	April 2005			April 2005			Percent
	MW03-04			Duplicate			
Analyte	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	195		3.1	196		3.1	-0.5
Aluminum	6.2	ND	6.2	6.2	ND	6.2	
Ammonia-N	0.065	J	0.031	0.09	ND	0.031	-32.3
Antimony	0.817	J	0.31	0.98	ND	0.31	-18.1
Arsenic	1.5	ND	1.5	1.5	ND	1.5	
Barium	6.74		0.94	6.31		0.94	6.6
Beryllium	0.13	ND	0.13	0.13	ND	0.13	
Cadmium	0.05	ND	0.05	0.05	ND	0.05	
Calcium	71.9		0.062	71.6		0.062	0.4
Chloride	2.64		0.031	2.64		0.031	
Chromium	0.49	J	0.31	0.761	ND	0.31	-43.3
Cobalt	1.2	ND	1.2	1.2	ND	1.2	
Conductivity	380		0.477	380		0.477	
Copper	0.745	J	0.31	0.31	ND	0.31	82.5
Cyanide	0.0025	ND	0.0025	0.0025	ND	0.0025	
Fluoride	0.05	J	0.031	0.05	ND	0.031	
Iron	0.0216	J	0.0124	0.0204	ND	0.0124	5.7
Lead	0.35		0.062	0.341		0.062	2.6
Magnesium	12.4		0.062	12.4		0.062	
Manganese	8.26		0.31	7.66		0.31	7.5
Molybdenum	3.1	ND	3.1	3.1	ND	3.1	
Nickel	2.46		0.62	2.63		0.62	-6.7
pH	7.5		0.1	7.6		0.1	-1.3
Phosphorus	62	ND	62	62	ND	62	
Potassium	228	J	150	215	ND	150	5.9
Selenium	1.5	ND	1.5	1.89	ND	1.5	-23.0
Silicon	2200		62	2080		62	5.6
Silver	0.31	ND	0.31	0.31	ND	0.31	
Sodium	2100		150	1970		150	6.4
Strontium	0.214		0.003	0.213		0.003	0.5
Sulfate	36.1		0.031	35.9		0.031	0.6
Sulfide	0.1	ND	0.1	0.1	ND	0.1	
Thallium	0.31	ND	0.31	0.31	ND	0.31	
Tin	0.31	ND	0.31	0.31	ND	0.31	
Titanium	50.4		1.5	47.2		1.5	6.6
Total Dissolved Solids	241		3.1	241		3.1	
Total Nitrate/Nitrite	0.31	ND	0.31	0.31	ND	0.31	
Total Suspended Solids	0.15	ND	0.15	0.2	ND	0.15	-28.6
Vanadium	6.2	ND	6.2	6.2	ND	6.2	
WAD CN	0.0025	ND	0.0025	0.0025	ND	0.0025	
Zinc	1.5	ND	1.5	1.5	ND	1.5	
Aluminum, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Antimony, dissolved	0.855	J	0.31	0.954	ND	0.31	-10.9
Arsenic, dissolved	1.5	ND	1.5	1.5	ND	1.5	
Barium, dissolved	6.65		0.94	6.94		0.94	-4.3
Beryllium, dissolved	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	70.1		0.062	70.3		0.062	-0.3
Chromium, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Cobalt, dissolved	1.2	ND	1.2	1.2	ND	1.2	
Copper, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Iron, dissolved	0.0144	J	0.0124	0.0136	ND	0.0124	5.7
Lead, dissolved	0.377		0.062	0.365		0.062	3.2
Magnesium, dissolved	12.2		0.062	12.3		0.062	-0.8
Manganese, dissolved	8.65		0.31	8.57		0.31	0.9
Molybdenum, dissolved	3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	2.73		0.62	2.71		0.62	0.7
Phosphorus, dissolved	62	ND	62	62	ND	62	
Potassium, dissolved	240	J	150	247	ND	150	-2.9
Selenium, dissolved	2.09	J	1.5	2.31	ND	1.5	-10.0
Silicon, dissolved	NA	NA	NA	NA	NA	NA	
Silver, dissolved	0.31	ND	0.31	0.31	ND	0.3	
Sodium, dissolved	2210		150	2230		150	-0.9
Strontium, dissolved	0.22		0.003	0.222		0.003	-0.9
Thallium, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Tin, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Titanium, dissolved	44.2		1.5	44.9		1.5	-1.6
Vanadium, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	1.5	ND	1.5	1.5	ND	1.5	

	July 2005			July 2005			Percent
	MW03-02			Duplicate			
Analyte	Result	Result Flag	MDL	Result	Result Flag	MDL	Difference
Alkalinity	275		3.1	276		3.1	-0.4
Aluminum	6.2	ND	6.2	6.2	ND	6.2	
Ammonia-N	0.031	ND	0.031	0.031	ND	0.031	
Antimony	14.3		0.31	14.1		0.31	1.4
Arsenic	1510		1.5	1510		1.5	
Barium	13.6		0.94	13		0.94	4.5
Beryllium	0.13	ND	0.13	0.13	ND	0.13	
Cadmium	0.222	J	0.05	0.19	ND	0.05	15.5
Calcium	107		0.031	106		0.62	0.9
Chloride	2.61		0.031	2.63		0.031	-0.8
Chromium	0.379	J	0.31	0.31	ND	0.31	20.0
Cobalt	4.47		1.2	4.29		1.2	4.1
Conductivity	NA	NA	NA	NA	NA	NA	
Copper	1.01		0.31	1.11		0.31	-9.4
Cyanide	0.0025	ND	0.0025	0.0025	ND	0.0025	
Fluoride	0.1		0.031	0.079	ND	0.031	23.5
Iron	2.66		0.0062	2.68		0.0124	-0.7
Lead	0.062	ND	0.062	0.067	ND	0.062	-7.8
Magnesium	54.4		0.031	53.6		0.62	1.5
Manganese	1640		0.31	1580		0.31	3.7
Molybdenum	3.1	ND	3.1	3.36	ND	3.1	-8.0
Nickel	22.2		0.62	20.9		0.62	6.0
pH	NA	NA	NA	NA	NA	NA	
Phosphorus	62	ND	62	62	ND	62	
Potassium	514		150	505		150	1.8
Selenium	1.5	ND	1.5	1.5	ND	1.5	
Silicon	4840		NA	4880		62	-0.8
Silver	0.31	ND	0.31	0.31	ND	0.31	
Sodium	3260		150	3320		150	-1.8
Strontium	0.304		0.0015	0.301		0.003	1.0
Sulfate	181		0.31	183		0.31	-1.1
Sulfide	0.1	ND	0.1	0.1	ND	0.1	
Thallium	0.31	ND	0.31	0.31	ND	0.31	
Tin	0.31	ND	0.31	0.31	ND	0.31	
Titanium	172		1.5	171		1.5	0.6
Total Dissolved Solids	565		3.1	570		3.1	-0.9
Total Nitrate/Nitrite	0.31	ND	0.31	0.031	ND	0.031	163.6
Total Suspended Solids	5.2		0.15	5.4		0.15	-3.8
Vanadium	6.2	ND	6.2	6.2	ND	6.2	
WAD CN	0.0025	ND	0.0025	0.0025	ND	0.0025	
Zinc	15.2		1.5	15		1.5	1.3
Aluminum, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Antimony, dissolved	12.9		0.31	12.4		0.31	4.0
Arsenic, dissolved	1360		1.5	1310		1.5	3.7
Barium, dissolved	12.4		0.94	12.3		0.94	0.8
Beryllium, dissolved	0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	0.05	ND	0.05	0.05	ND	0.05	
Calcium, dissolved	107		0.062	108		0.062	-0.9
Chromium, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Cobalt, dissolved	4.08		1.2	3.86	ND	1.2	5.5
Copper, dissolved	1.14		0.31	0.825	ND	0.31	32.1
Iron, dissolved	2.48		0.0124	2.43		0.0124	2.0
Lead, dissolved	0.062	ND	0.062	0.062	ND	0.062	
Magnesium, dissolved	54.2		0.062	53.9		0.062	0.6
Manganese, dissolved	1550		0.31	1490		0.31	3.9
Molybdenum, dissolved	3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	22.2		0.62	20.8		0.62	6.5
Phosphorus, dissolved	62	ND	62	62	ND	62	
Potassium, dissolved	456	J	150	456	ND	150	
Selenium, dissolved	1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	4760		NA	4650		62	2.3
Silver, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	3100		150	3030		150.0	2.3
Strontium, dissolved	0.304		0.003	0.305		0.003	-0.3
Thallium, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Tin, dissolved	0.31	ND	0.31	0.31	ND	0.31	
Titanium, dissolved	98.4		1.5	91.8		1.5	6.9
Vanadium, dissolved	6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	16.9		1.5	15.1		1.5	11.3

Result flags:"ND" means not detected; "J" means result is eResult flags from database:"ND" means not detected; "J" means result is estimated conc. that is less than the practical quantitation limit but greater than MDL.

Table 2.6 Equipment blank sample analysis data summary

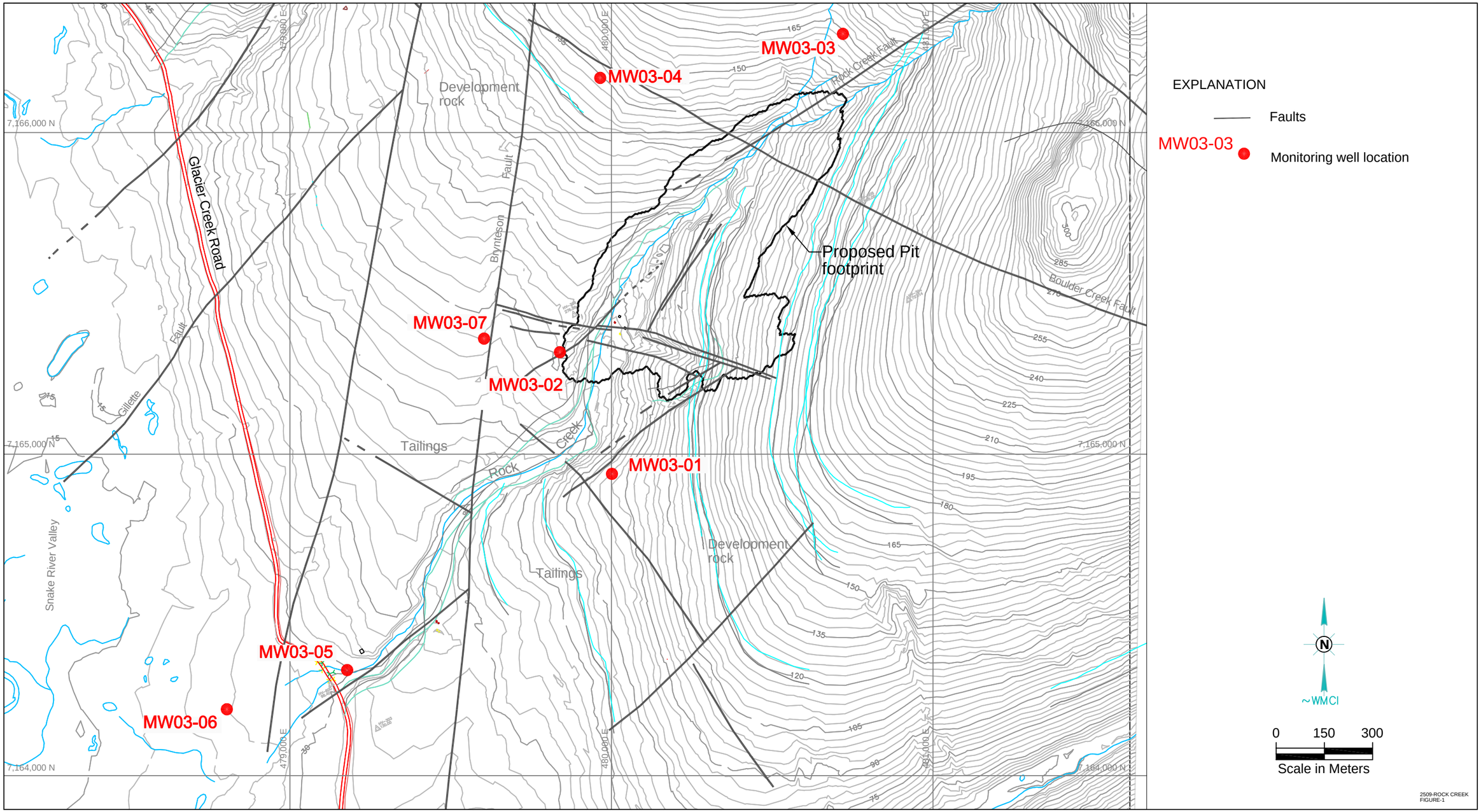
Equipment Blanks		January 2004			April 2004			August 2004			November 2004			April 2005			July 2005		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL
Alkalinity	mg/L	3.1	ND	3.1	2.7	J	2.07	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1
Aluminum	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2
Ammonia-N	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031
Antimony	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Arsenic	ug/L	1.5	ND	1.5	2.12	J	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5
Barium	ug/L	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05
Calcium	mg/L	0.062	ND	0.062	0.0862	J	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062
Chloride	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.038	J	0.031	0.031	ND	0.031	0.031	ND	0.031
Chromium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Cobalt	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2
Conductivity	umhos/cm	2		0.477	2.6		0.477	1.2		0.477	1.3		0.477	1.4		0.477	0.31	ND	0.31
Copper	ug/L	0.31	ND	0.31	0.406	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.0025	ND	0.0025
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.031	ND	0.031
Fluoride	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.032	J	0.031	0.031	ND	0.031	0.031	ND	0.031	0.0145	J	0.0124
Iron	mg/L	0.0124	ND	0.0124	0.0163	J	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.062	ND	0.062
Lead	ug/L	0.07	ND	0.07	0.088	J	0.062	0.104	J	0.062	0.062	ND	0.062	0.511		0.062	0.062	ND	0.062
Magnesium	mg/L	0.062	ND	0.062	0.0666	J	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.31	ND	0.31
Manganese	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	3.1	ND	3.1
Molybdenum	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	0.62	ND	0.62
Nickel	ug/L	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	62	ND	62
pH	pH units	6		0.1	7.6		0.1	6.06		0.1	6.02		0.1	6.1		0.1	150	ND	150
Phosphorus	ug/L	9.4	ND	9.4	62	ND	62	62	ND	62	62	ND	62	62	ND	62	1.5	ND	1.5
Potassium	ug/L	150	ND	150	150	ND	150	150	ND	150	150	ND	150	150	ND	150	62	ND	62
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	0.31	ND	0.31
Silicon	ug/L	62	ND	62	62	ND	62	62	ND	62	62	ND	62	NA	NA	NA	150	ND	150
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.003	ND	0.003
Sodium	ug/L	150	ND	150	150	ND	150	150	ND	150	150	ND	150	150	ND	150	0.041	J	0.031
Strontium	mg/L	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.1	ND	0.1
Sulfate	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.077	J	0.031	0.031	ND	0.031	0.045	J	0.031	0.31	ND	0.31
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.31	ND	0.31
Thallium	ug/L	0.31	ND	0.31	0.863	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1.5	ND	1.5
Tin	ug/L	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	3.8	J	3.1
Titanium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	0.031	ND	0.031
Total Dissolved Solids	mg/L	16	ND	16	6.25	J	3.1	8.75	J	3.1	3.1	ND	3.1	3.1	ND	3.1	0.3	ND	0.3
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	6.2	ND	6.2
Total Suspended Solids	mg/L	0.4	ND	0.4	0.2	J	0.15	0.2	J	0.15	0.15	ND	0.15	0.3	ND	0.3	0.0025	ND	0.0025
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	1.5	ND	1.5
WAD CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	6.2	ND	6.2
Zinc	ug/L	1	ND	1	1.75	J	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	0.31	ND	0.31
Aluminum, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	1.75	J	1.5
Antimony, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.94	ND	0.94
Arsenic, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	0.13	ND	0.13
Barium, dissolved	ug/L	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.05	ND	0.05
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.062	ND	0.062
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.31	ND	0.31
Calcium, dissolved	mg/L	0.102	J	0.062	0.0943	J	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	1.2	ND	1.2
Chromium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	0.0124	ND	0.0124
Copper, dissolved	ug/L	0.31	ND	0.31	0.545	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.062	ND	0.062
Iron, dissolved	mg/L	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.062	ND	0.062
Lead, dissolved	ug/L	0.07	ND	0.07	0.062	ND	0.062	0.102	J	0.062	0.062	ND	0.062	0.223		0.062	1.06		0.31
Magnesium, dissolved	mg/L	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	3.1	ND	3.1
Manganese, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.62	ND	0.62
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	62	ND	62
Nickel, dissolved	ug/L	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	150	ND	150
Phosphorus, dissolved	ug/L	11.4	J	9.4	62	ND	62	62	ND	62	62	ND	62	62	ND	62	1.5	ND	1.5
Potassium, dissolved	ug/L	150	ND	150	150	ND	150	150	ND	150	150	ND	150	150	ND	150	62	ND	62
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	0.31	ND	0.31
Silicon, dissolved	ug/L	62	ND	62	62	ND	62	62	ND	62	62	ND	62	NA	NA	NA	150	ND	150
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.003	ND	0.003
Sodium, dissolved	ug/L	150	ND	150	150	ND	150	150	ND	150	150	ND	150	150	ND	150	0.31	ND	0.31
Strontium, dissolved	mg/L	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.31	ND	0.31
Thallium, dissolved	ug/L	0.31	ND	0.31	0.812	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1.5	ND	1.5
Tin, dissolved	ug/L	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	6.2	ND	6.2
Titanium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	J	1.5
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	NA	NA	NA
Zinc, dissolved	ug/L	3.86		1	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	2.67	J	1.5	NA	NA	NA

Result flags from database:"ND" means not detected; "J" means result is estimated conc. that is less than the practical quantitation limit but greater than MDL.

FIGURES

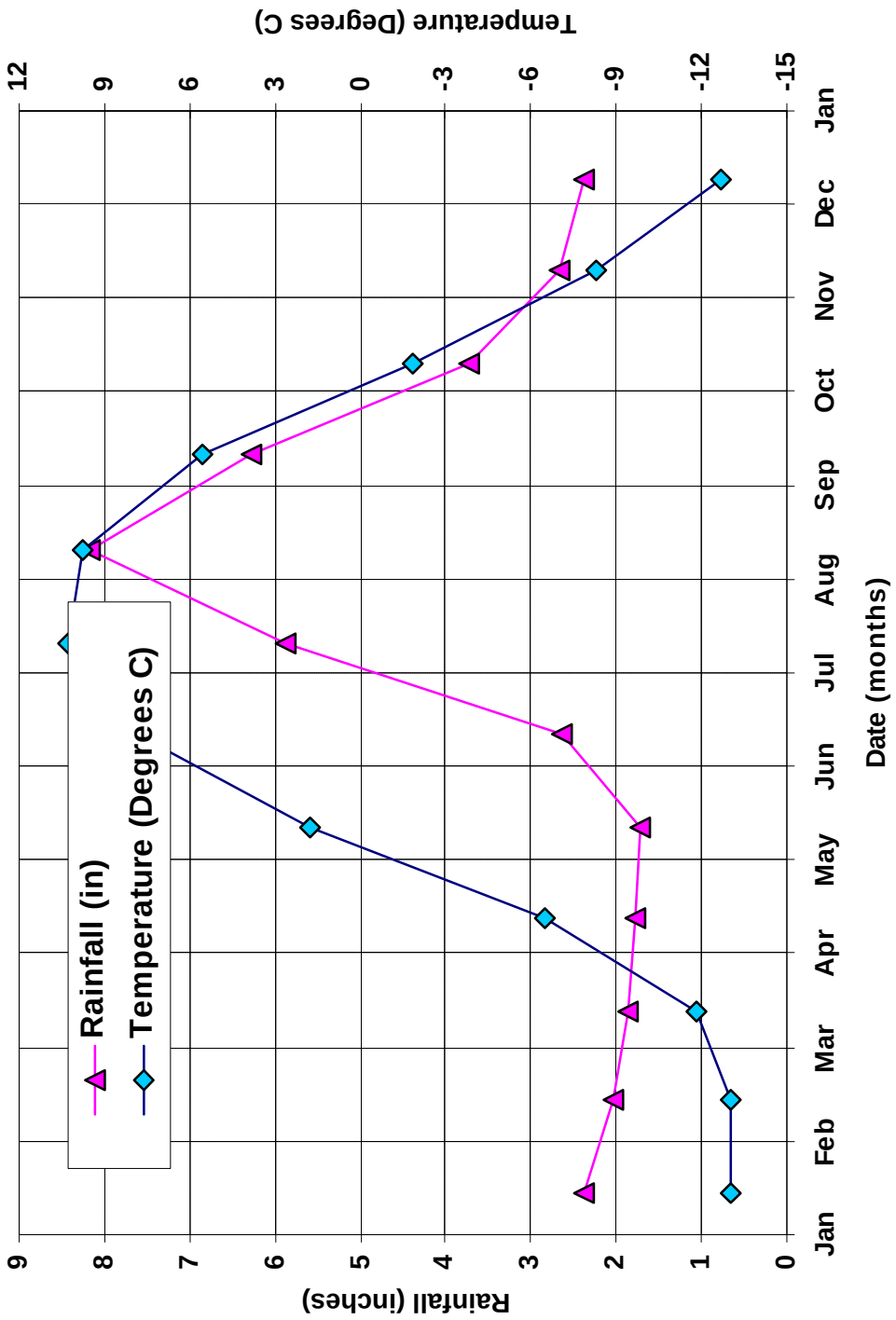
WATER MANAGEMENT CONSULTANTS

Figure 1.1 Site map and monitoring well locations



WATER MANAGEMENT CONSULTANTS

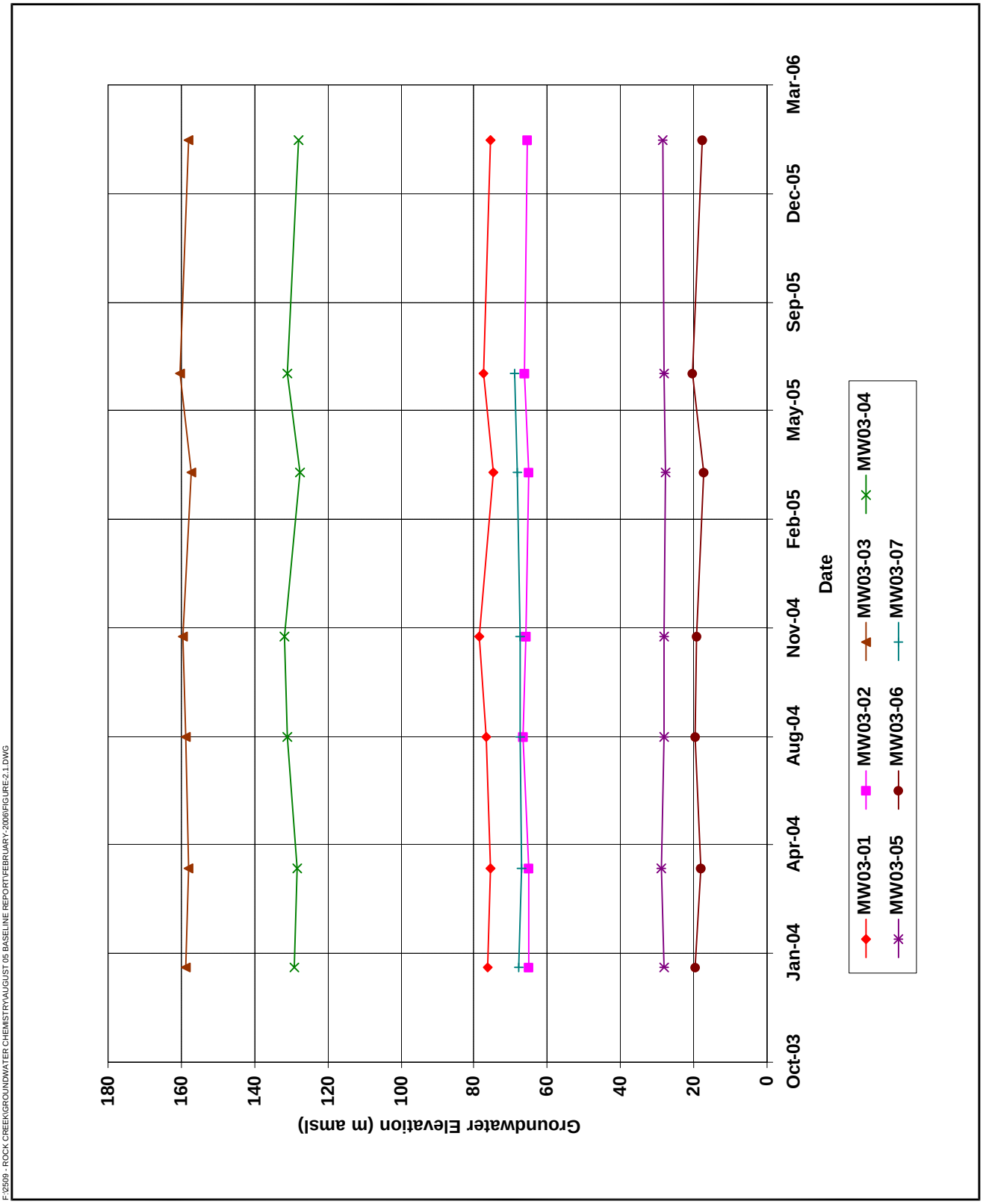
Figure 1.2 Monthly average climate data



F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-1.2.DWG

WATER MANAGEMENT CONSULTANTS

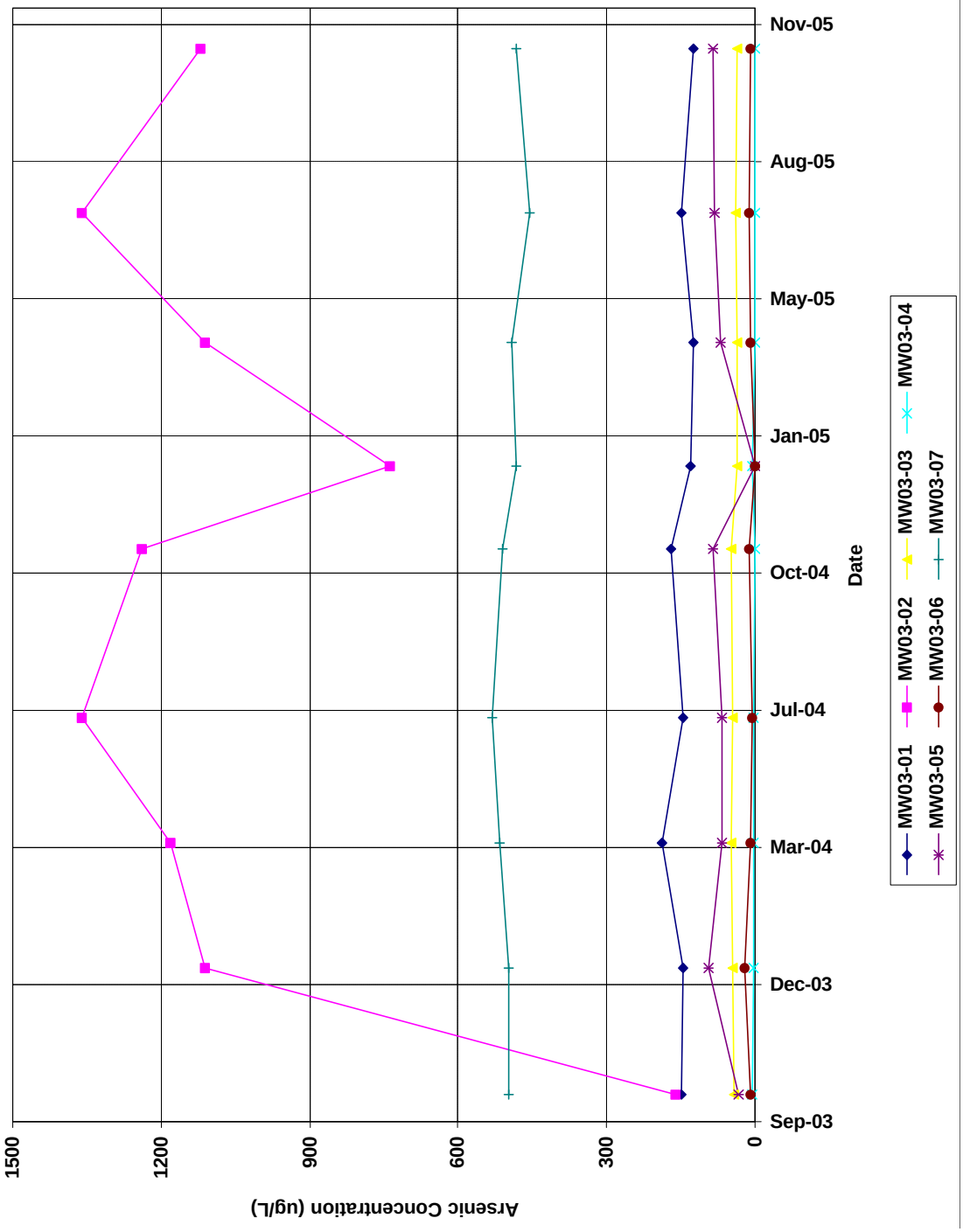
Figure 2.1 Groundwater elevation hydrograph for Rock Creek monitoring wells



F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.1.DWG

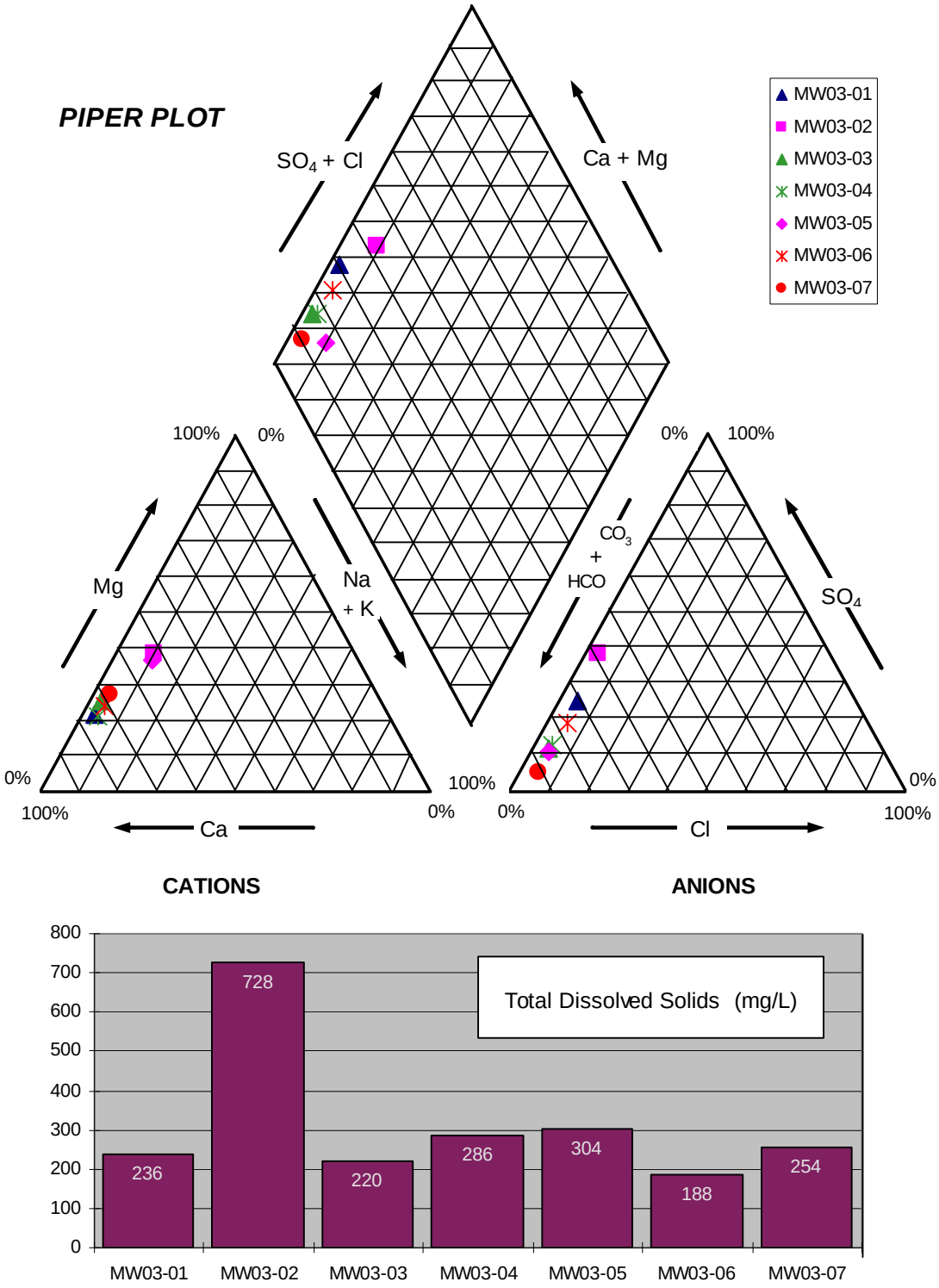
WATER MANAGEMENT CONSULTANTS

Figure 2.2 Dissolved arsenic concentration through time



WATER MANAGEMENT CONSULTANTS

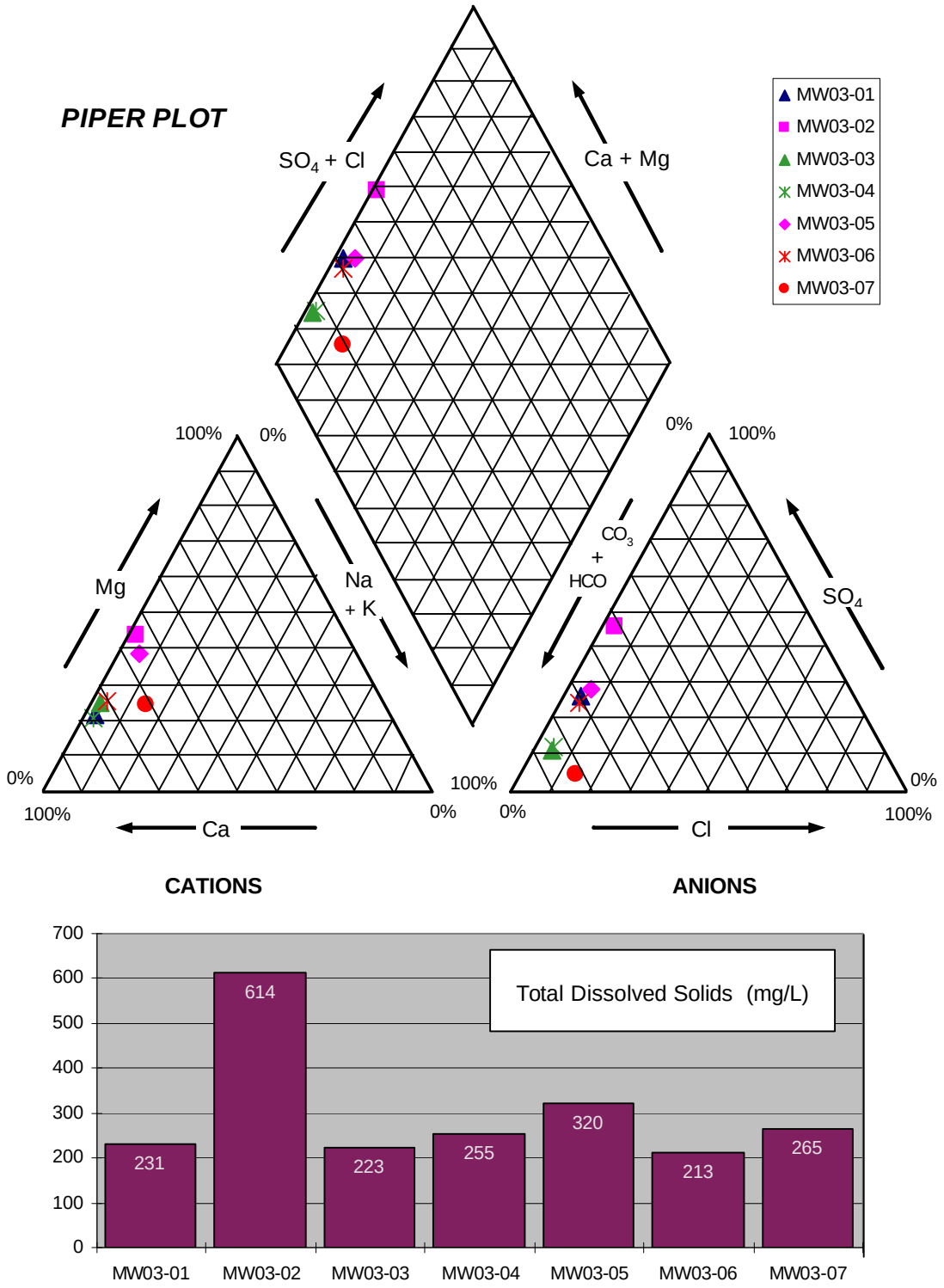
Figure 2.3 Hydrochemical typing of groundwaters at Rock Creek, Alaska (November 2003)



F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY 2006\FIGURE 2.3.DWG

WATER MANAGEMENT CONSULTANTS

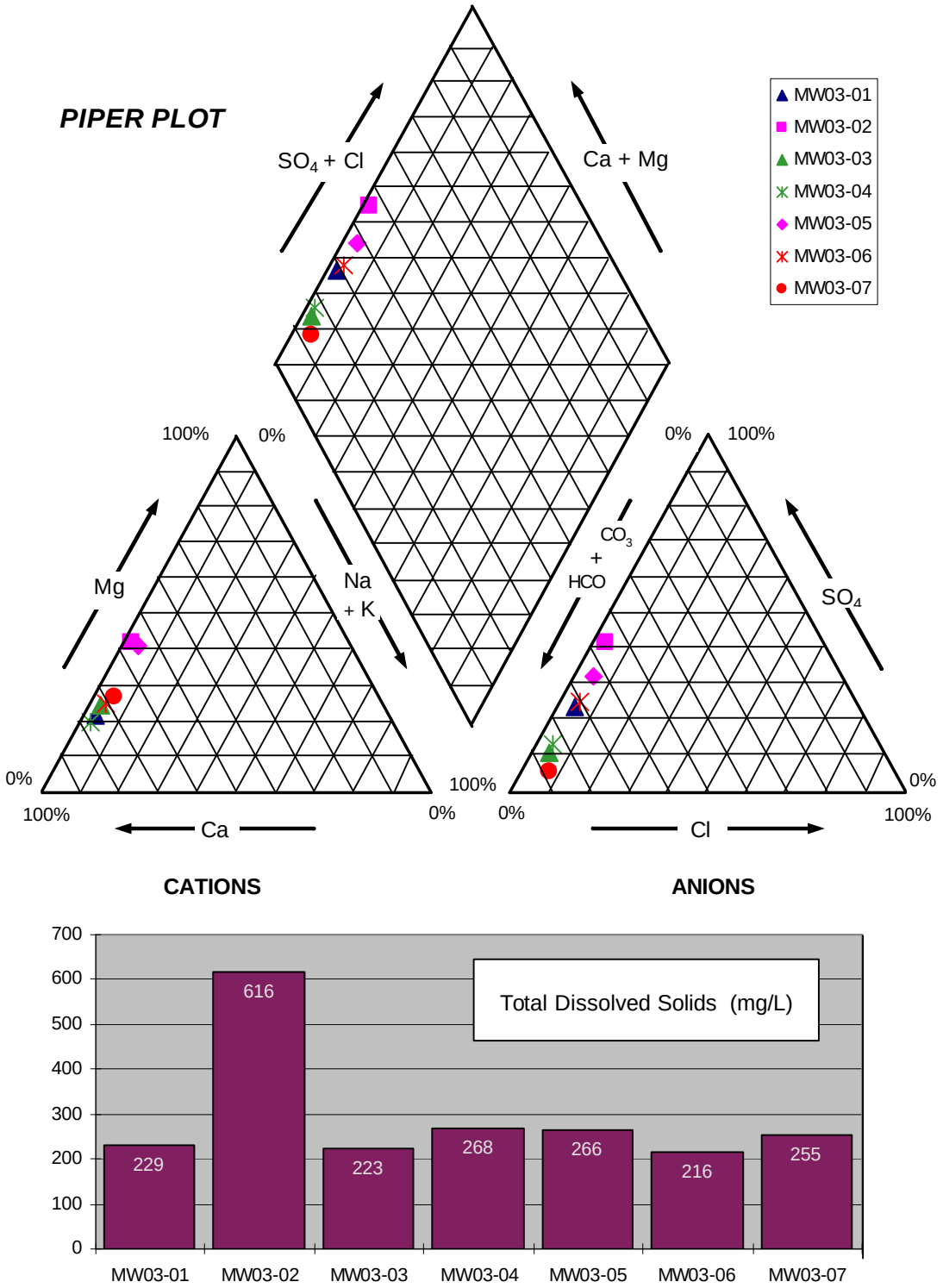
Figure 2.4 Hydrochemical typing of groundwater at Rock Creek, Alaska (January 2004)



F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.4.DWG

WATER MANAGEMENT CONSULTANTS

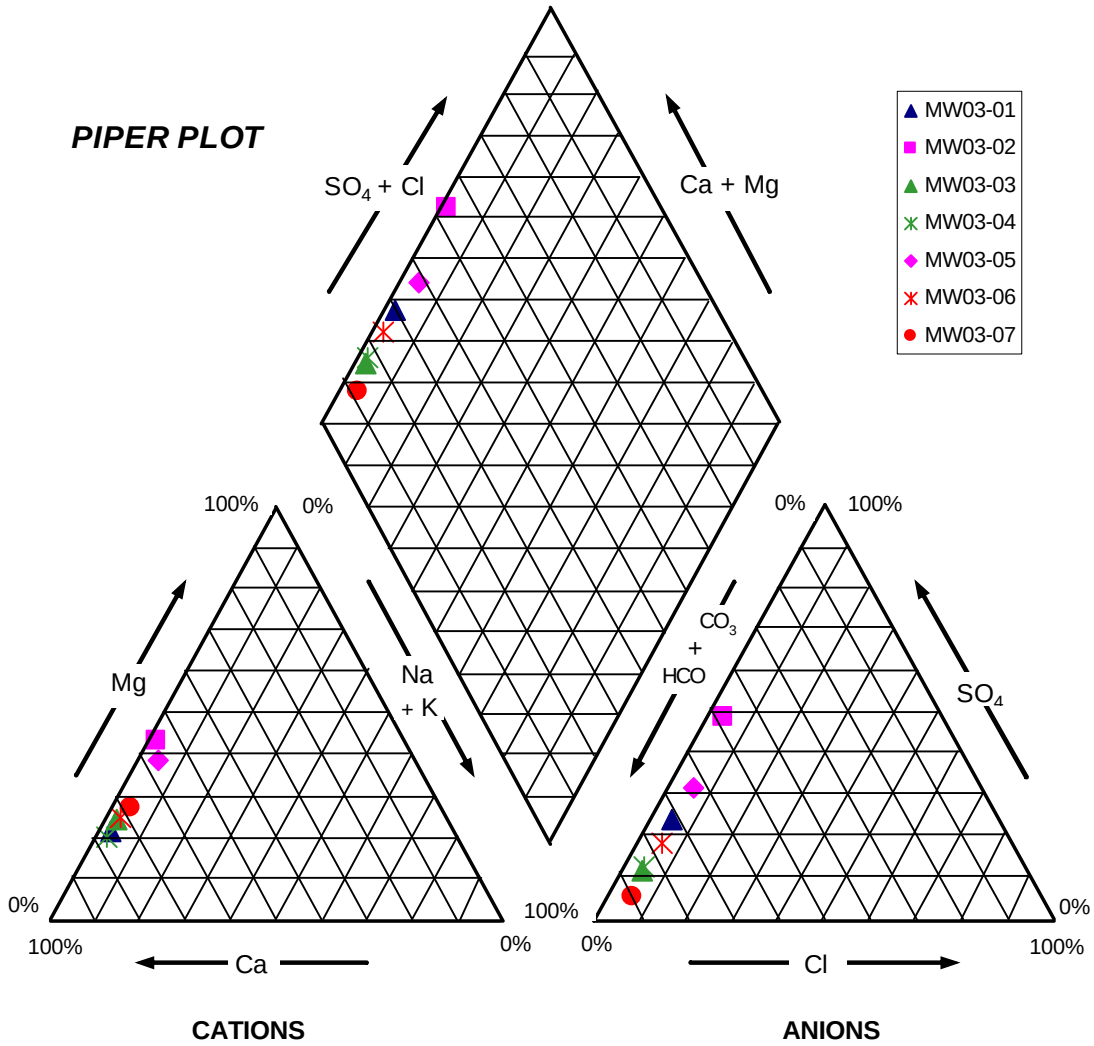
Figure 2.5 Hydrochemical typing of groundwaters at Rock Creek, Alaska (April 2004)

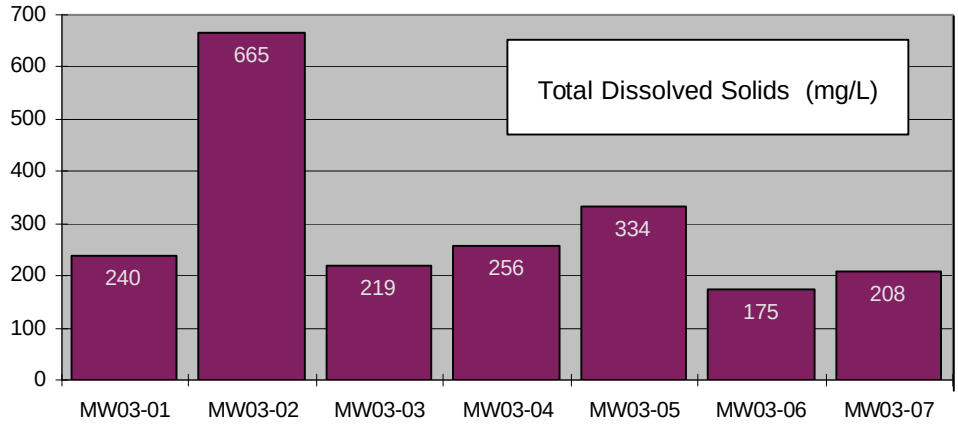


F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY 2006\FIGURE 2.5.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.6 Hydrochemical typing of groundwaters at Rock Creek, Alaska (July 2004)

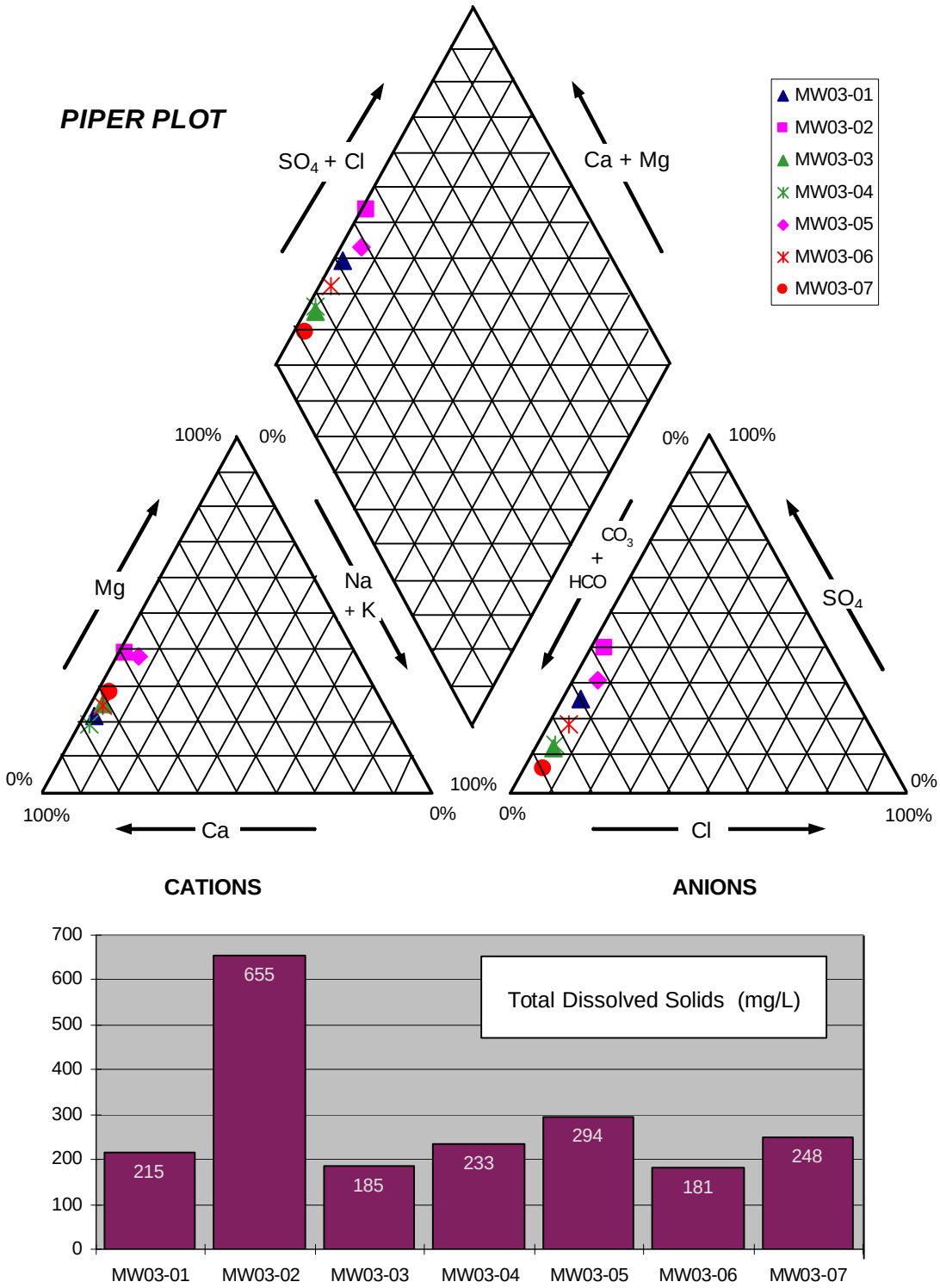




F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.6.DWG

WATER MANAGEMENT CONSULTANTS

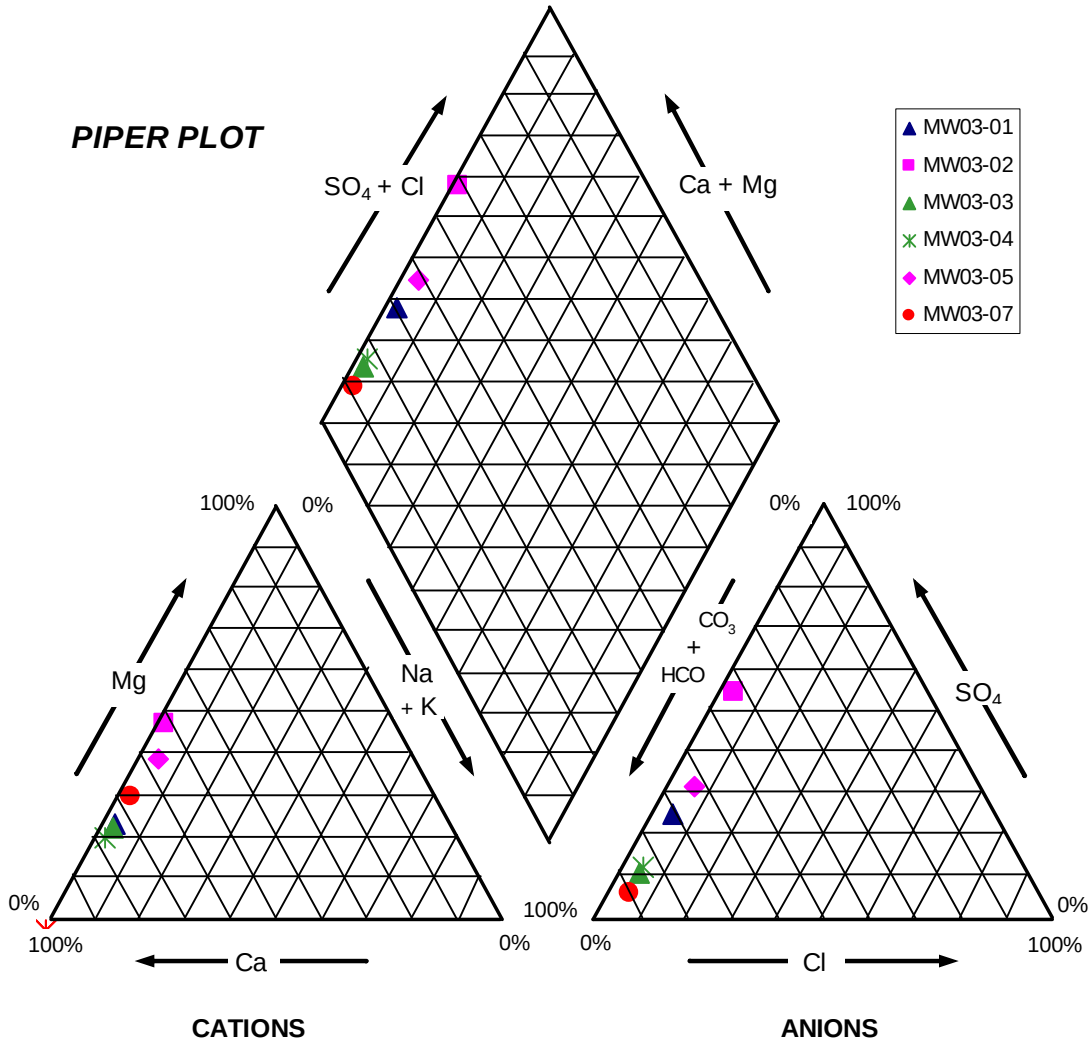
Figure 2.7 Hydrochemical typing of groundwaters at Rock Creek, Alaska (November 2004)

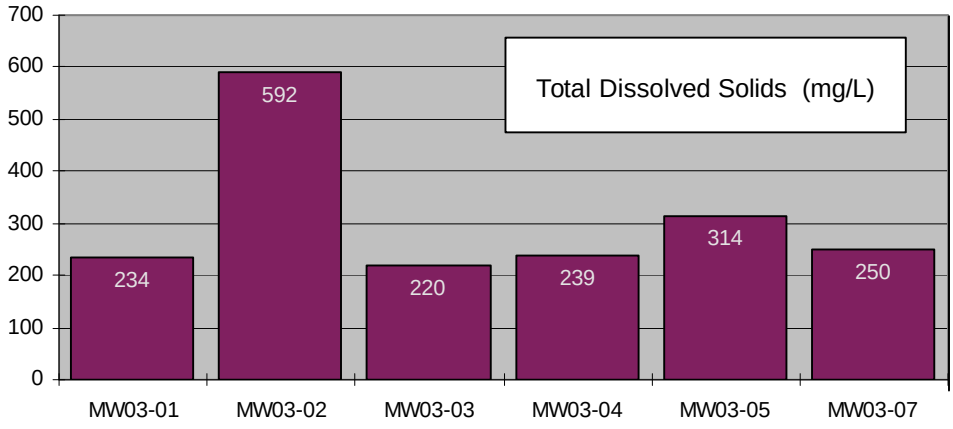


F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY 2006\FIGURE 2.7.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.8 Hydrochemical typing of groundwaters at Rock Creek, Alaska (January 2005)

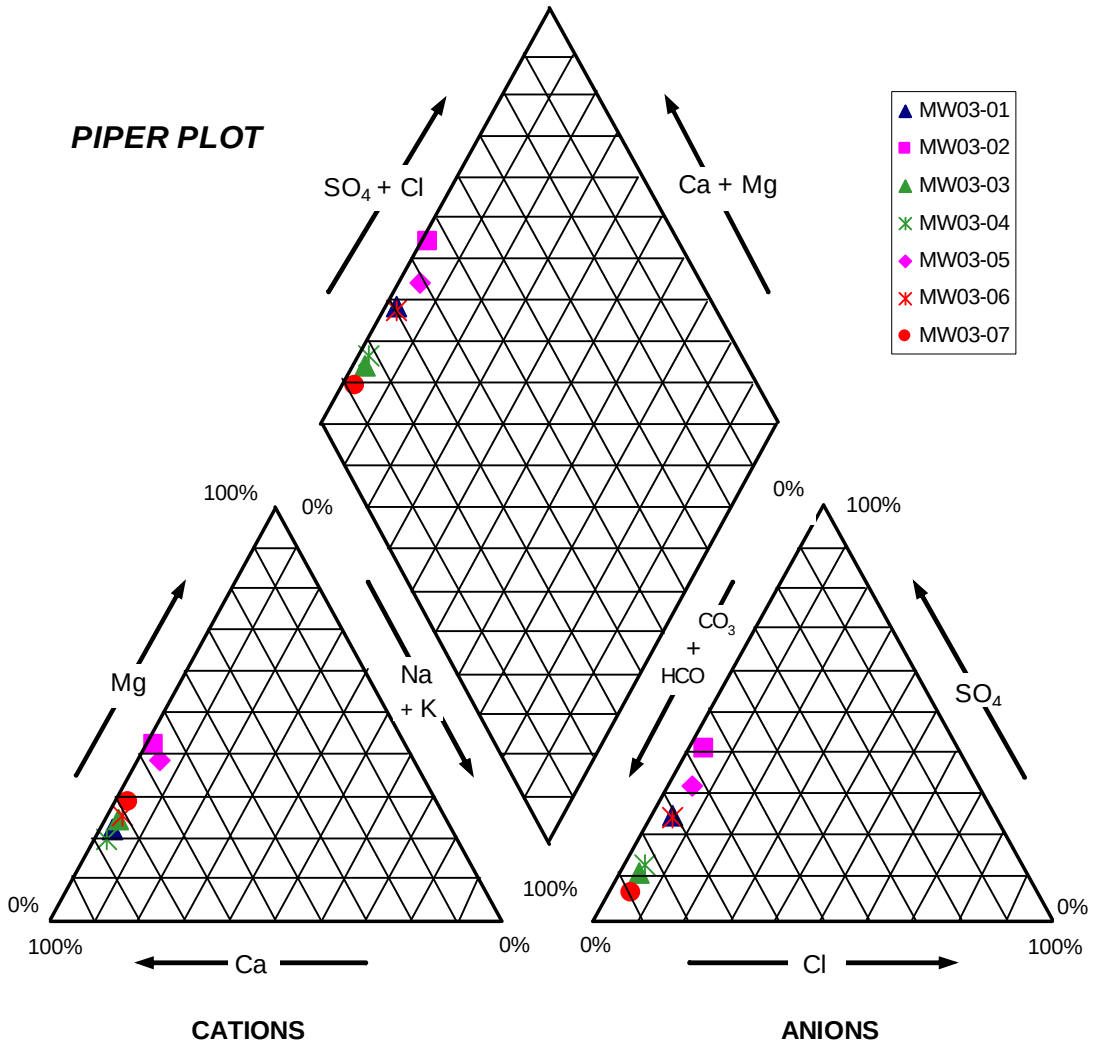


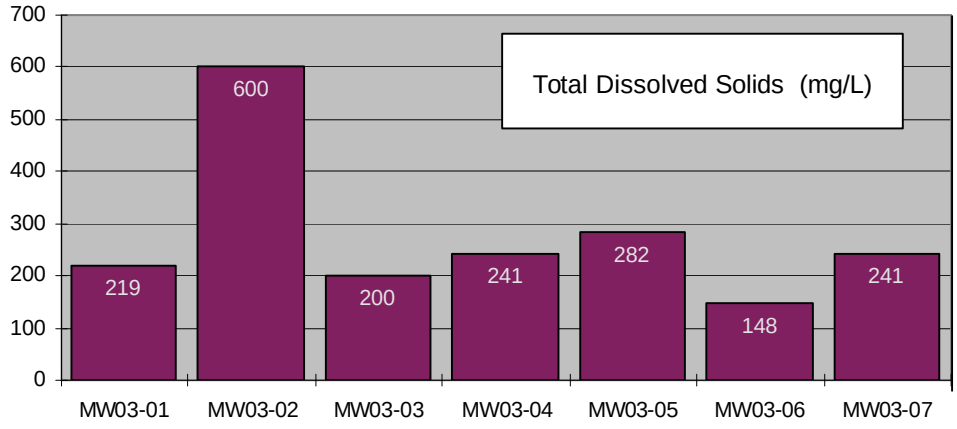


F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.8.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.9 Hydrochemical typing of groundwaters at Rock Creek, Alaska (April/May 2005)

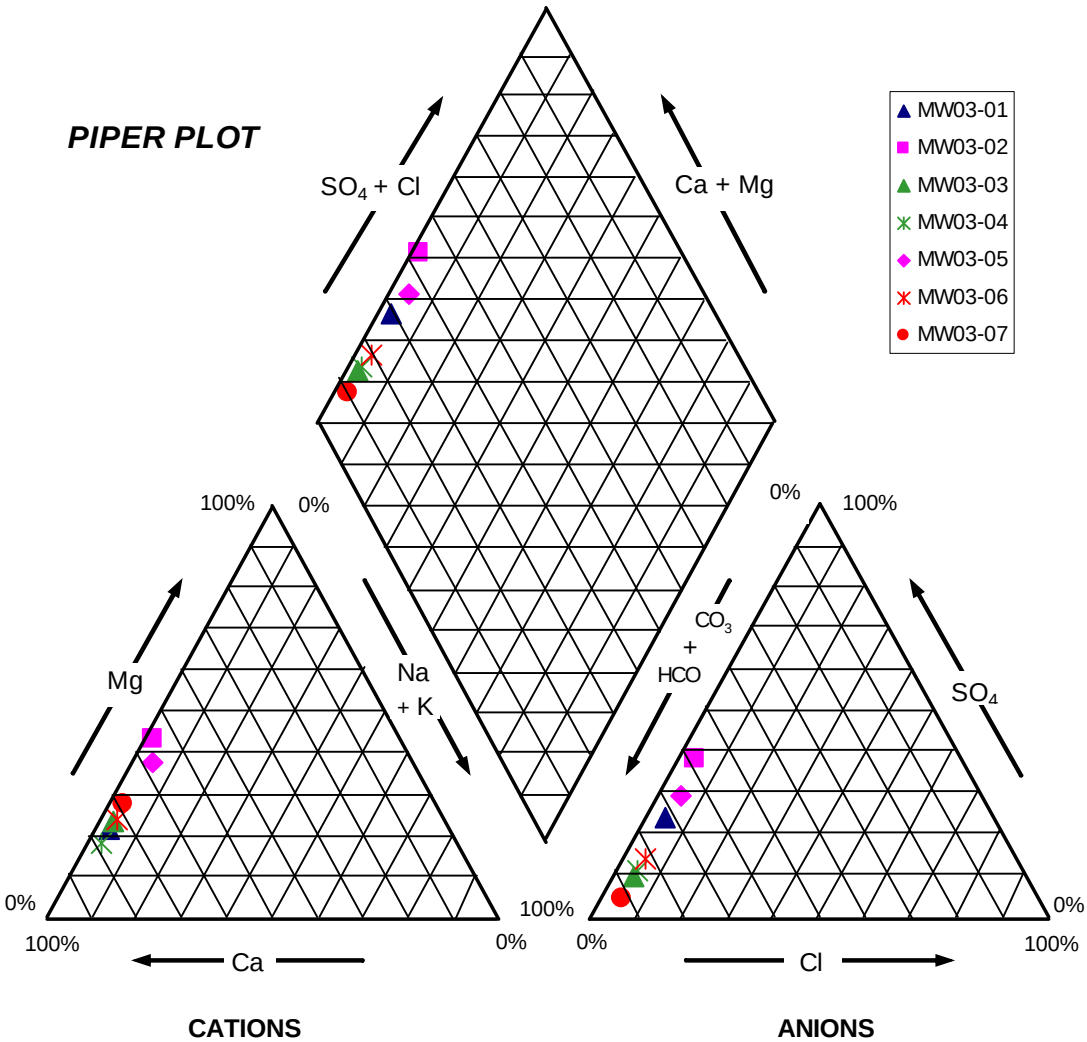


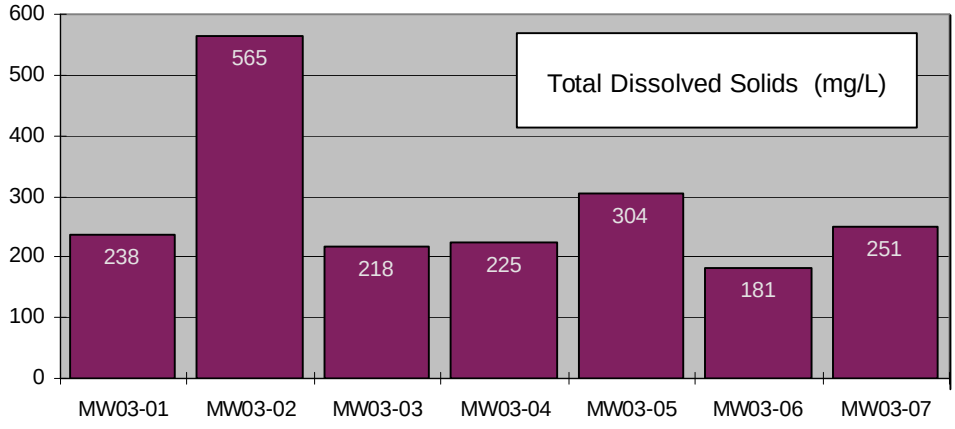


F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY 2006\FIGURE 2.9.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.10 Hydrochemical typing of groundwaters at Rock Creek, Alaska (July 2005)

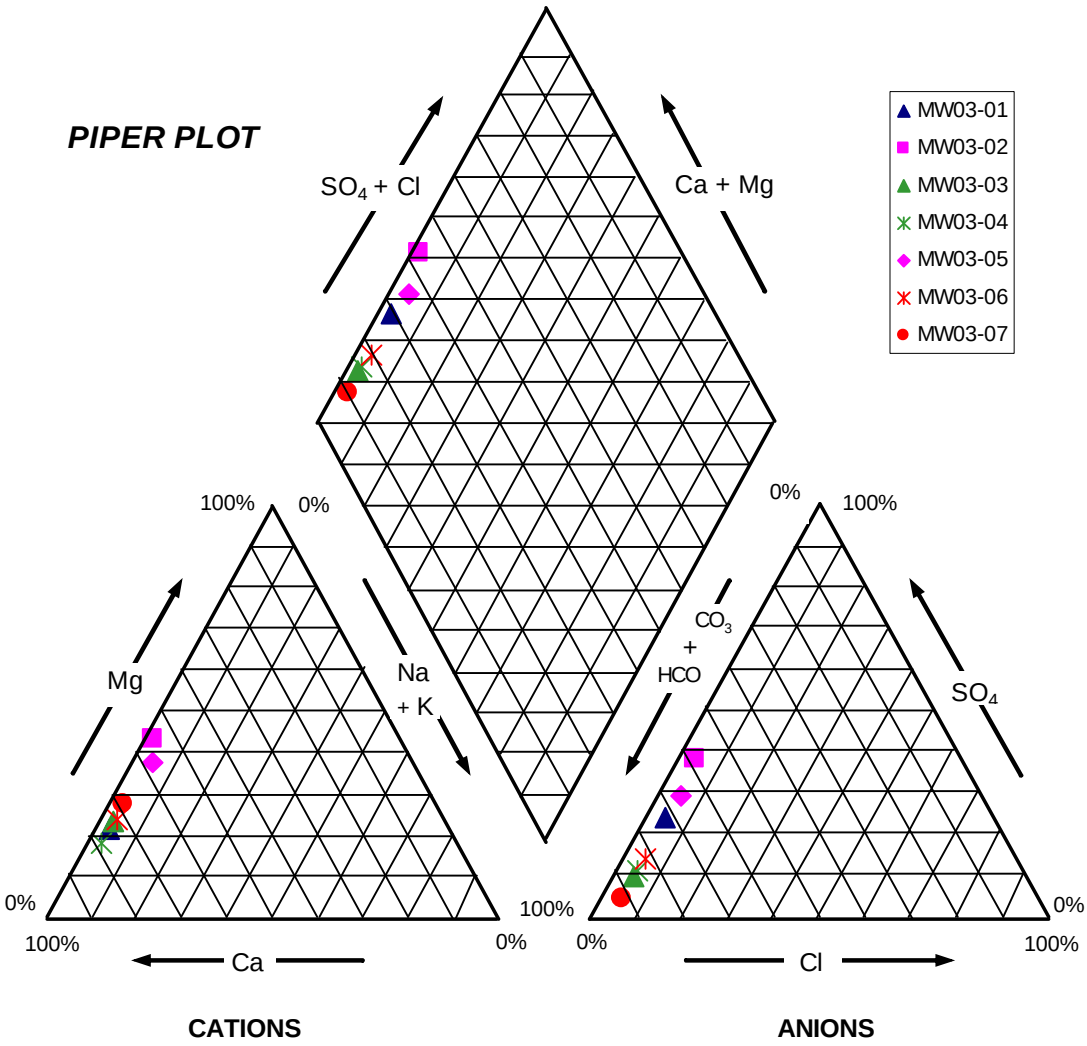


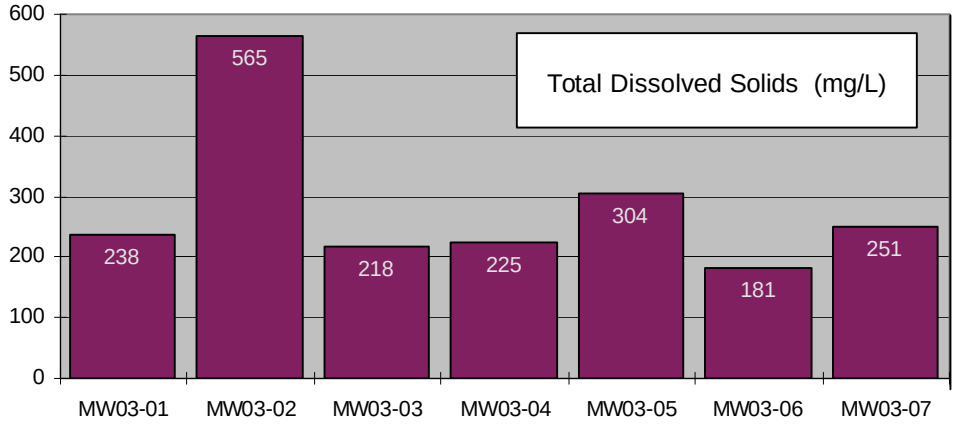


F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.10.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.11 Hydrochemical typing of groundwaters at Rock Creek, Alaska (November 2005)

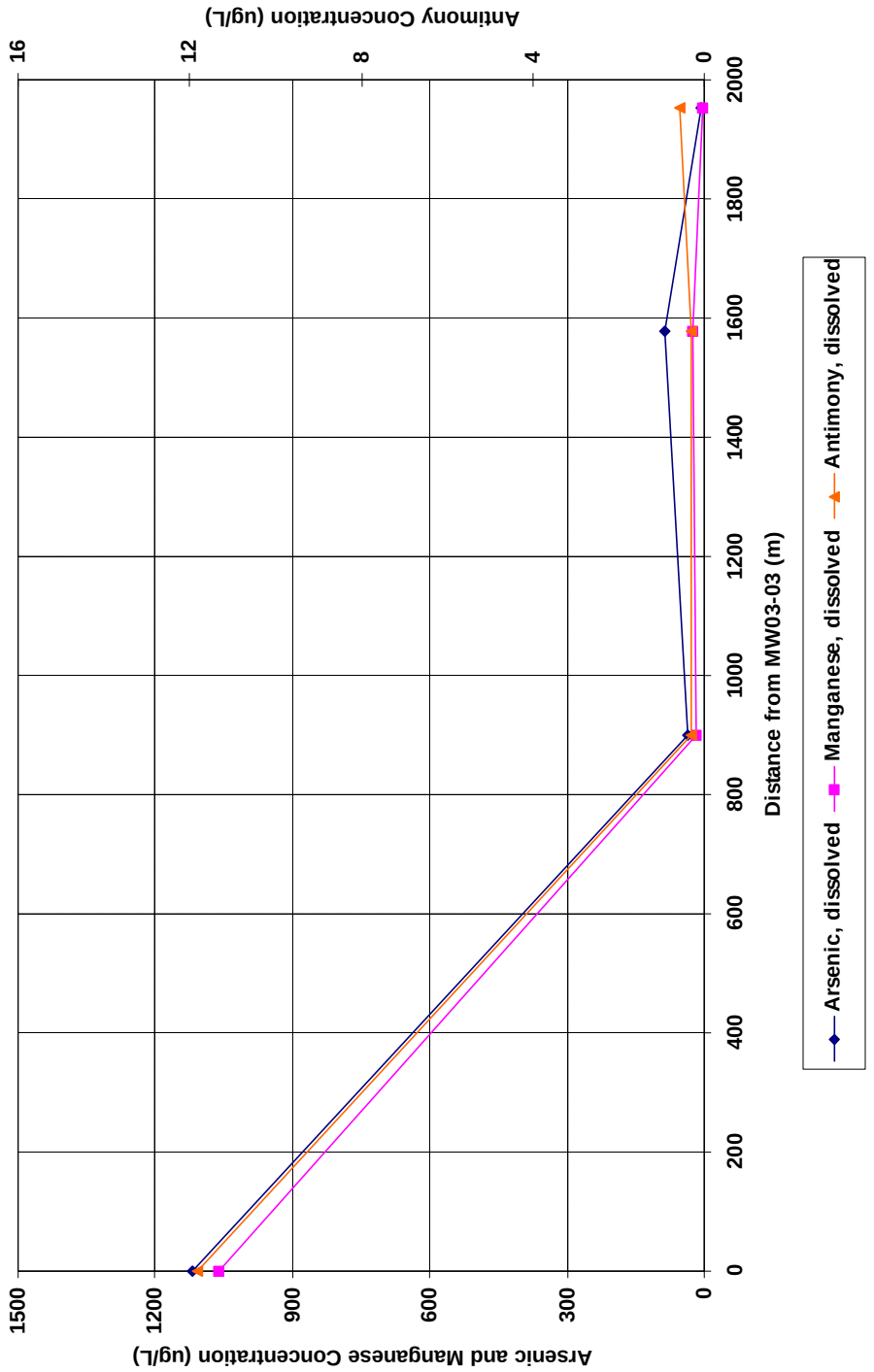




F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY 2006\FIGURE 2.11.DWG

WATER MANAGEMENT CONSULTANTS

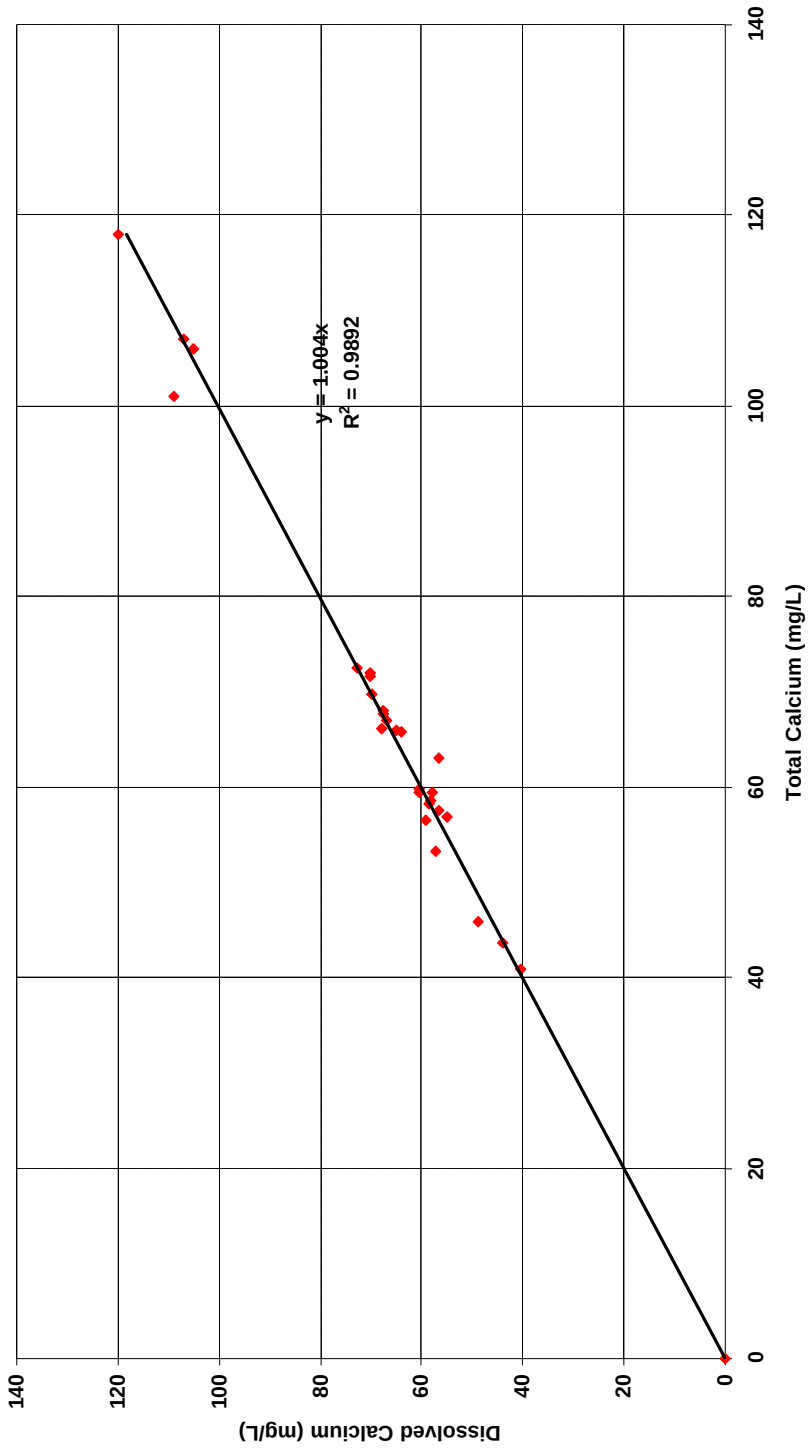
Figure 2.12 Dissolved concentrations with distance from upgradient to downgradient



F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.12.DWG

WATER MANAGEMENT CONSULTANTS

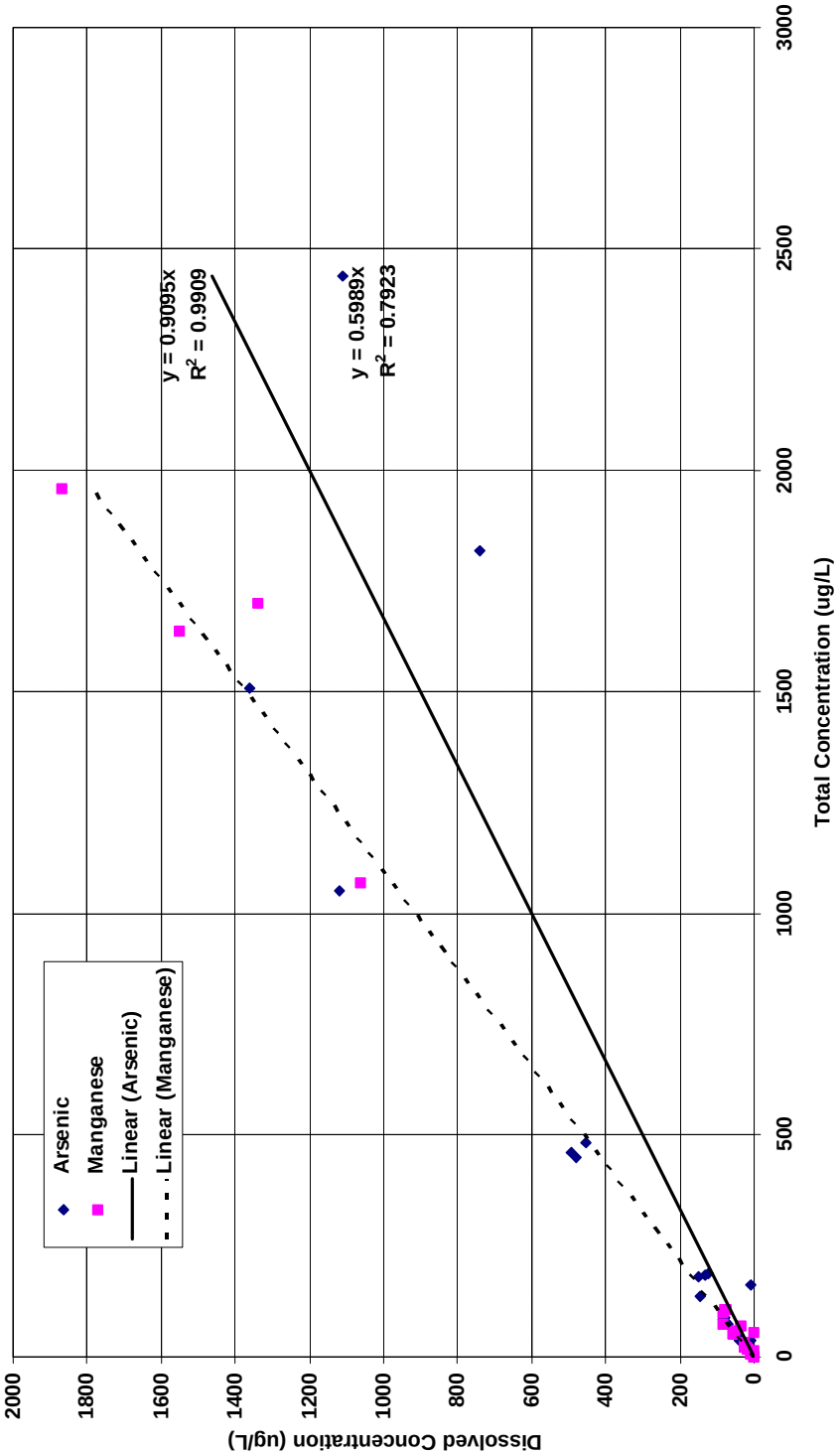
Figure 2.13 Total versus dissolved concentrations for calcium



F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.13.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.14 Total versus dissolved concentrations for arsenic and manganese



F:\2509 - ROCK CREEK\GROUNDWATER CHEMISTRY\AUGUST 05 BASELINE REPORT\FEBRUARY-2006\FIGURE-2.14.DWG

APPENDIX A

Monitoring well drilling and installation summary

WATER MANAGEMENT CONSULTANTS, INC.

MEMORANDUM

To: Ken Kuchling

Copy to: Doug Nicholson, Brent Johnson

From: Alex Rosenberg

Date: July 19, 2004

Subject: Observational Well Summary

The attached Observational Well Summary Table provides well locations, elevations, potentiometric surface elevations with dates of record, and conductivity estimates for the monitoring wells at the Rock Creek site. Drill hole logs and installation diagrams are also attached.

Two recovery tests were run on monitoring well MW03-04. The different conductivity estimates made from these tests could have been the result of hole development during testing.

Pilot hole MW03-05P was completed but was not tested. Pilot hole MW03-03P was strongly artesian and was therefore plugged and abandoned.

Monitoring well MW03-06, within the alluvium of the Snake River valley, recovered to quickly to run a recovery test. We assume the conductivity would be on the order of 10-4 m/s due to the nature of the alluvial material.

DRAFT

Observation Well Summary Table

Well ID	Location	Location	Total Drilled Depth	Elevation	Depth to Water	Date	Potentiometric Elevation	Conductivity Estimates
Monitoring Wells	UTM* Easting	UTM* Northing	(m)	Measuring Porch (m amsl)	(m)	(d-m-y)	(m amsl)	(m/s)
MW-03-01	480011	7164903	24.39	86.49	10.21	22-1-04	76.28	1.30E-06
MW-03-02	479855	7165284	45.73	75.2	9.89	29-1-04	65.31	2.50E-07
MW-03-03	480751	7166260	36.59	162.3	3.61	30-1-04	158.69	5.00E-07
MW-03-04	479994	7166135	21.34	133.08	3.92	21-1-04	129.16	(a) 6.00E-70
								(b) 2E-05
MW-03-05	479178	7164306	27.04	30.9	2.87	15-1-04	28.03	2.50E-06
MW-03-06	478802	7164190	7.62	22.39	2.65/2.68	22-1-04	19.74	1E-05*[1]
						26-1-04	19.71	
MW-03-07	479620	7165330	33.54	70	3.12/2.13	21-1-04	66.88	4.00E-07
						28-1-04	67.87	
MW-03-05P	479159	7164301	89.94	29.97				
								Average: 3.65E-6

*UTM coordinates using NAD 27 Zone 3

*[1] could not run recovery test on hole, value is an approximation

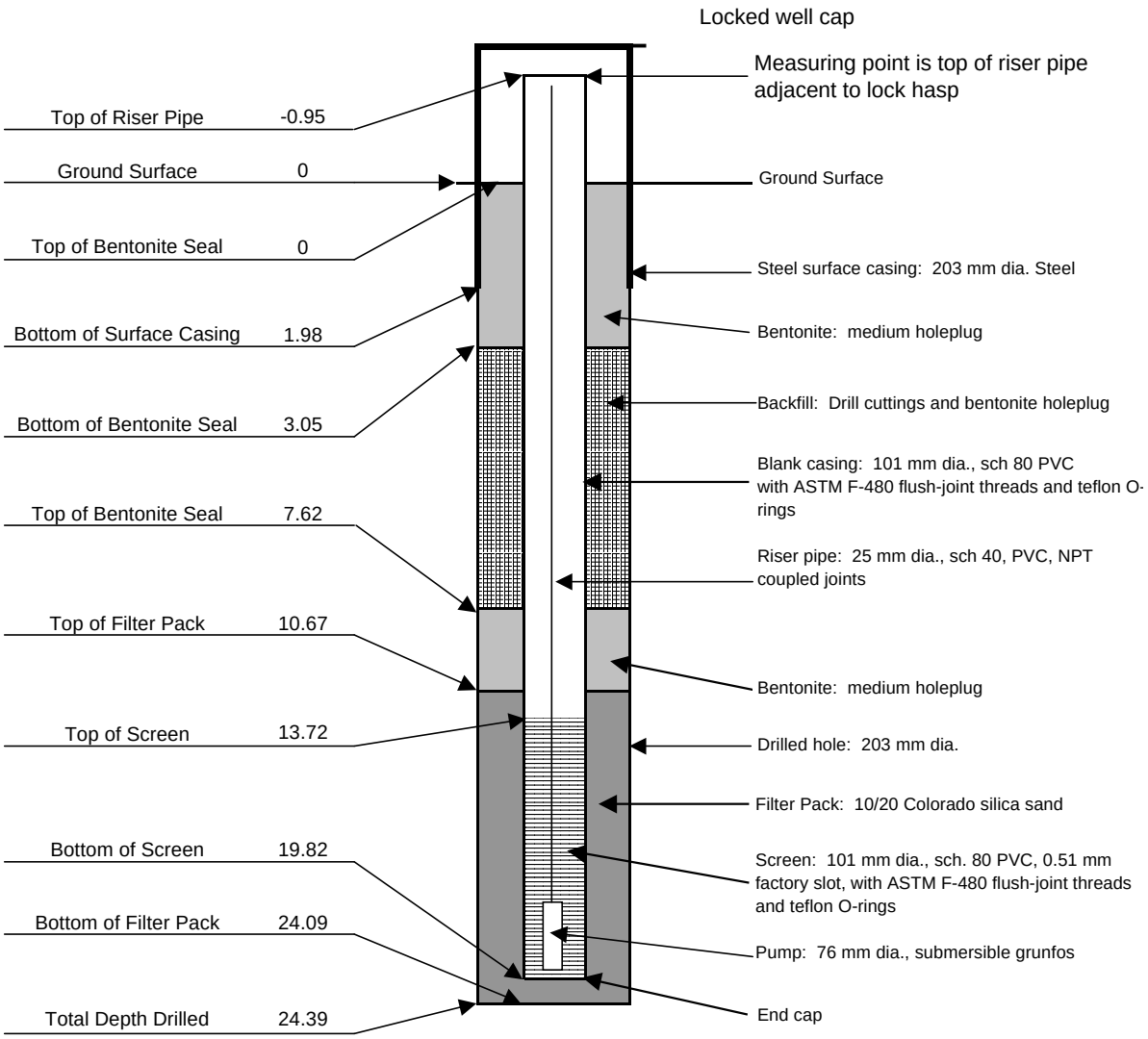
DRAFT

DRAFT

Monitoring Well Completion Schematic

Project Name:	Rock Creek	**Well I.D.:**	MW03-01
UTM Northing (m):	7164903	**UTM Easting (m):**	480011
Drilling Co.:	T&J Enterprises	**Elevation (m):**	86.49
Pump model number:	5SQE03A-140	**Depth of pump (m):**	18.29
Driller:	R. Brown	**Datum:**	NAD 27, ZONE 3

Completion detail	Depth (m) (bgs)	Completion Details *(not drawn to scale)*	Completion Materials and Installation Specifications

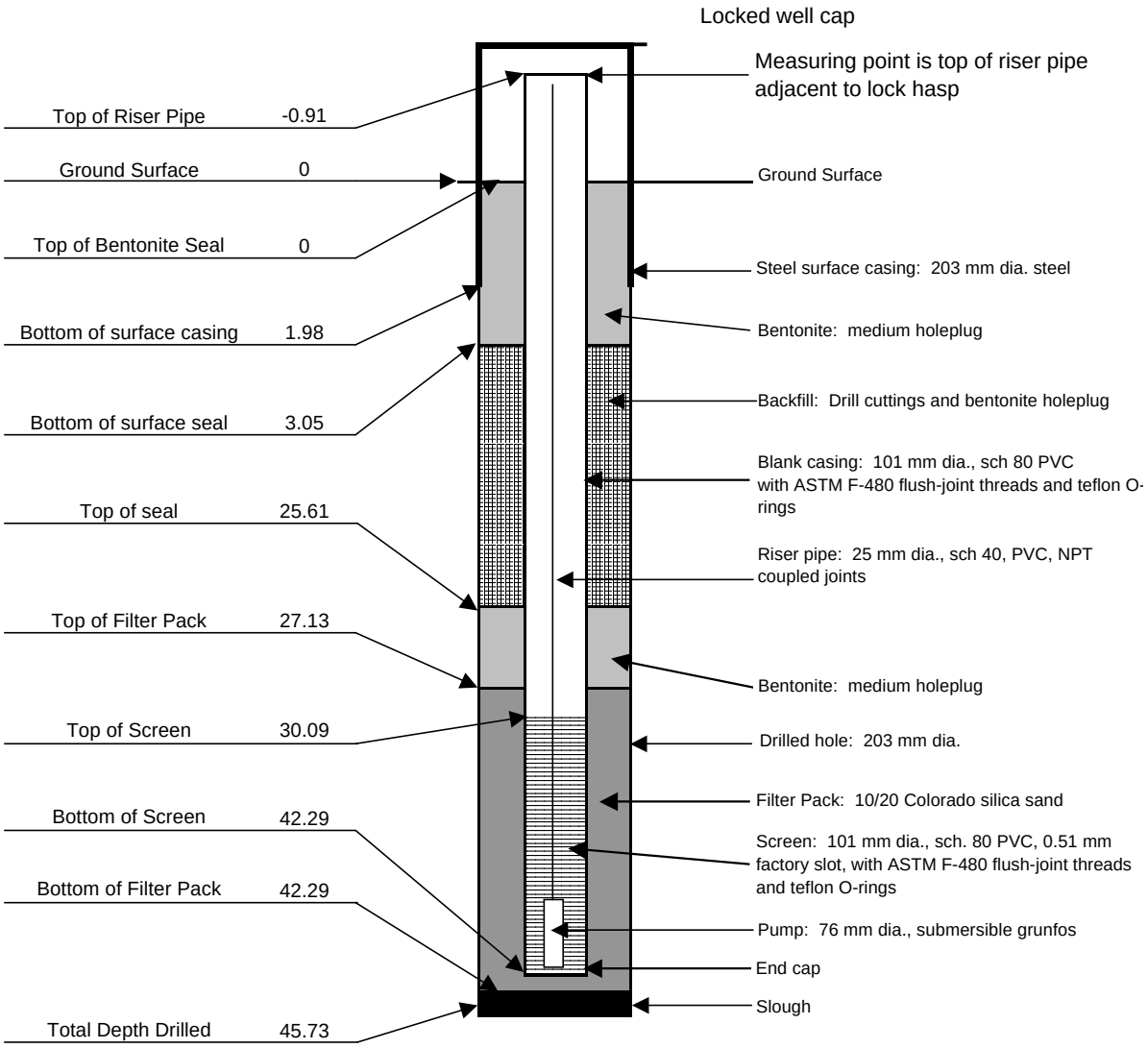


DRAFT

Monitoring Well Completion Schematic

Project Name:	Rock Creek	**Well I.D.:**	MW03-02
UTM Northing (m):	7165284	**UTM Easting (m):**	479855
Drilling Co.:	T&J Enterprises	**Elevation (m):**	75.20
Pump model number:	5SQE03A-140	**Depth of pump (m):**	42.68
Driller:	R. Brown	**Datum:**	NAD 27, ZONE 3

Completion detail	Depth (m) (bgs)	Completion Details *(not drawn to scale)*	Completion Materials and Installation Specifications

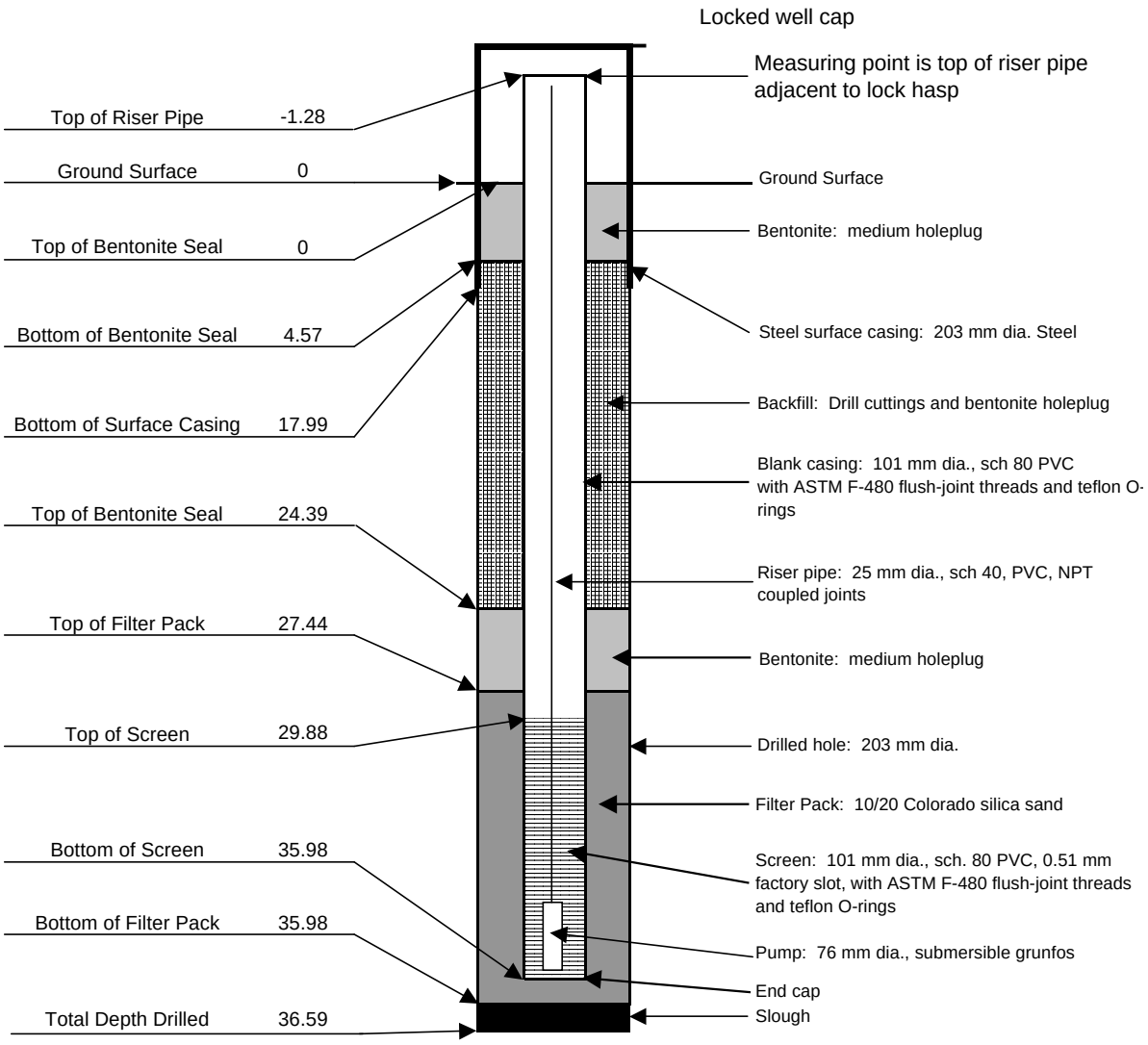


DRAFT

Monitoring Well Completion Schematic

Project Name:	Rock Creek	**Well I.D.:**	MW03-03
UTM Northing (m):	7166260	**UTM Easting (m):**	480751
Drilling Co.:	T&J Enterprises	**Elevation (m):**	162.30
Pump model number:	5SQE03A-140	**Depth of pump (m):**	30.49
Driller:	R. Brown	**Datum:**	NAD 27, ZONE 3

Completion detail	Depth (m) (bgs)	Completion Details *(not drawn to scale)*	Completion Materials and Installation Specifications

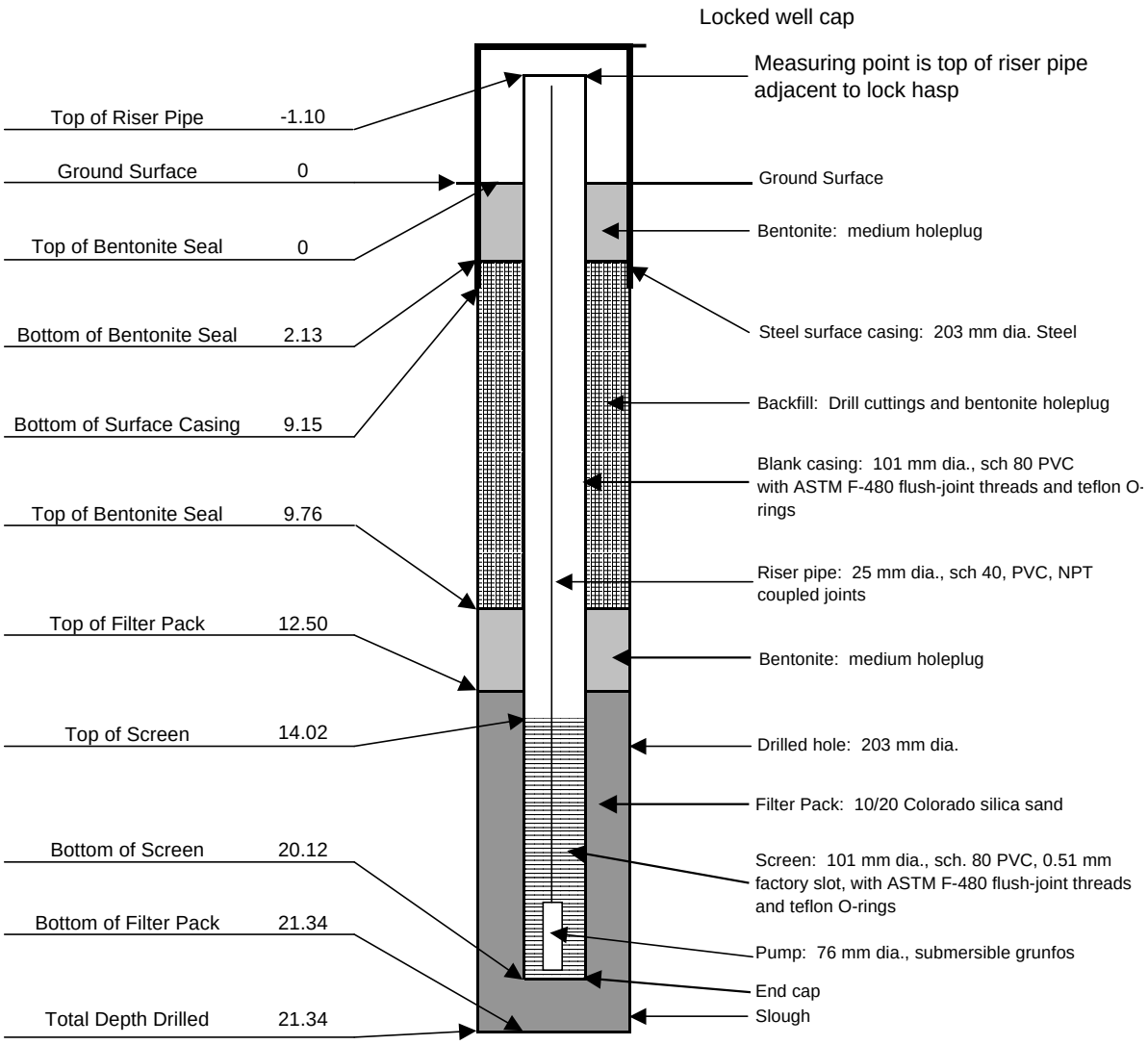


DRAFT

Monitoring Well Completion Schematic

Project Name:	Rock Creek	**Well I.D.:**	MW03-04
UTM Northing (m):	7166135	**UTM Easting (m):**	479994
Drilling Co.:	T&J Enterprises	**Elevation (m):**	133.08
Pump model number:	5SQE03A-140	**Depth of pump (m):**	18.29
Driller:	R. Brown	**Datum:**	NAD 27, ZONE 3

Completion detail	Depth (m) (bgs)	Completion Details *(not drawn to scale)*	Completion Materials and Installation Specifications

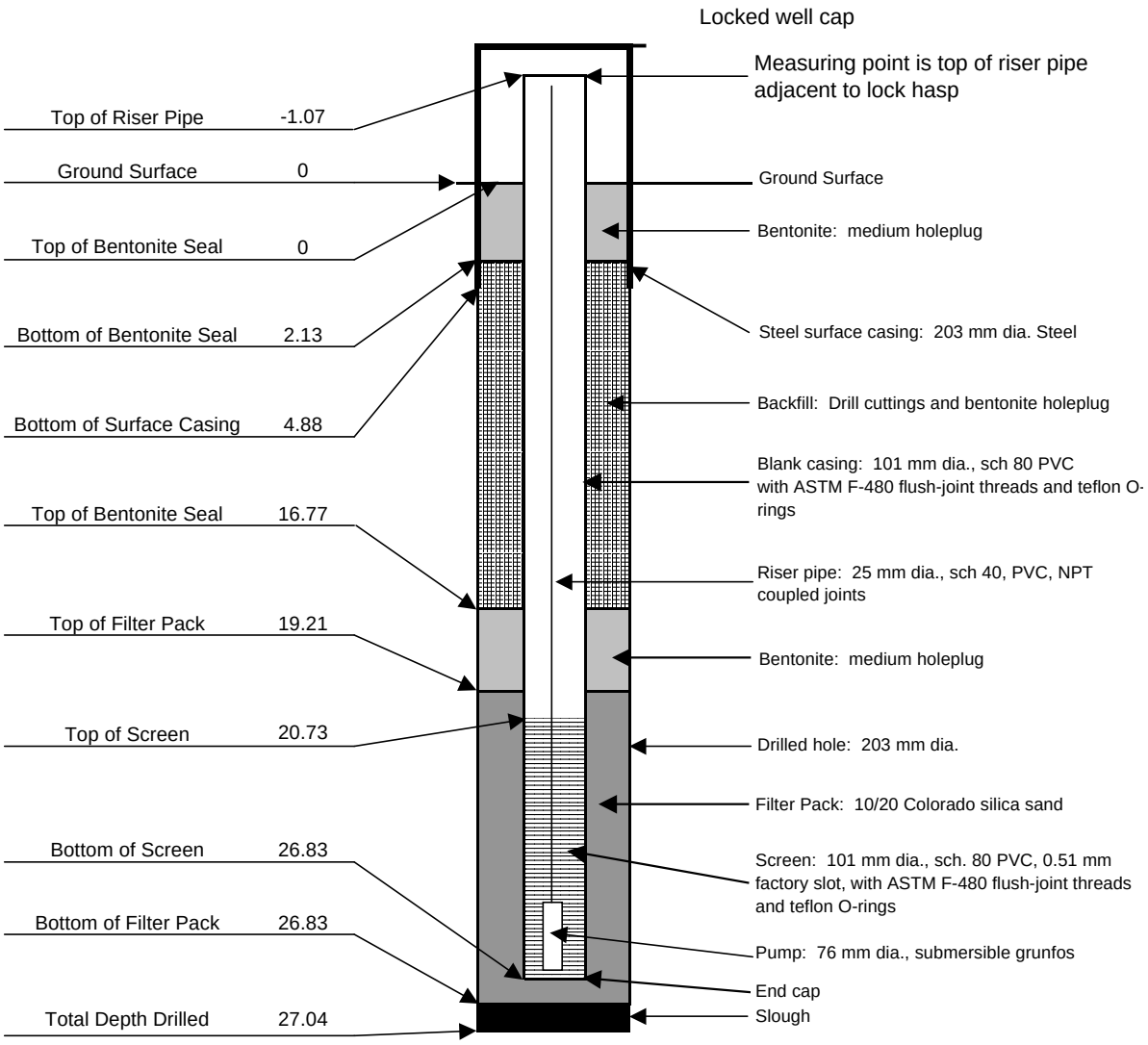


DRAFT

Monitoring Well Completion Schematic

Project Name:	Rock Creek	**Well I.D.:**	MW03-05
UTM Northing (m):	7164306	**UTM Easting (m):**	479178
Drilling Co.:	T&J Enterprises	**Elevation (m):**	30.90
Pump model number:	5SQE03A-140	**Depth of pump (m):**	24.39
Driller:	R. Brown	**Datum:**	NAD 29, ZONE 3

Completion detail	Depth (m) (bgs)	Completion Details *(not drawn to scale)*	Completion Materials and Installation Specifications

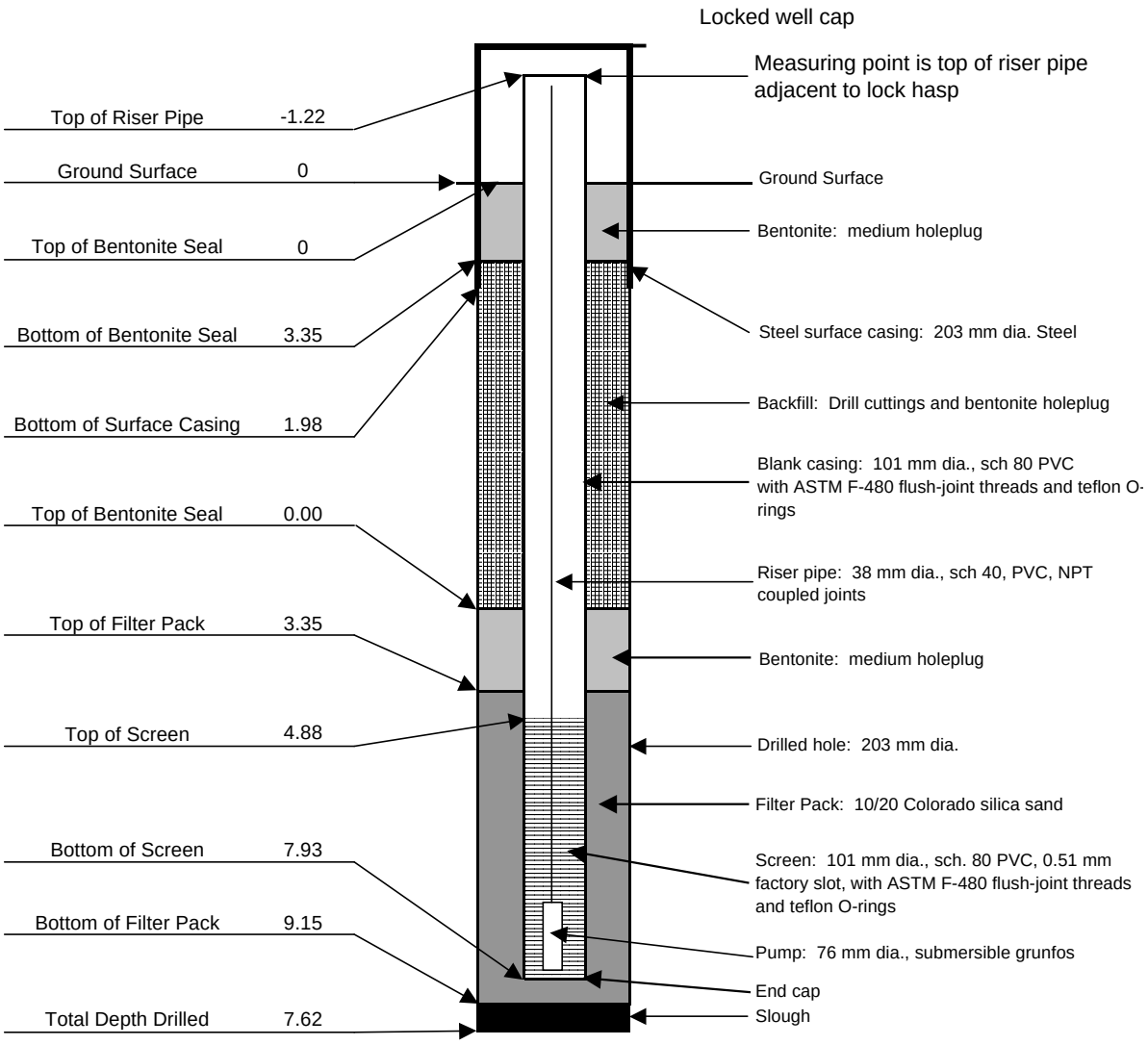


DRAFT

Monitoring Well Completion Schematic

Project Name:	Rock Creek	**Well I.D.:**	MW03-06
UTM Northing (m):	7164190	**UTM Easting (m):**	478802
Drilling Co.:	T&J Enterprises	**Elevation (m):**	22.39
Pump model number:	30SQE10C-130	**Depth of pump (m):**	6.10
Driller:	R. Brown	**Datum:**	NAD 210, ZONE 3

Completion detail	Depth (m) (bgs)	Completion Details *(not drawn to scale)*	Completion Materials and Installation Specifications

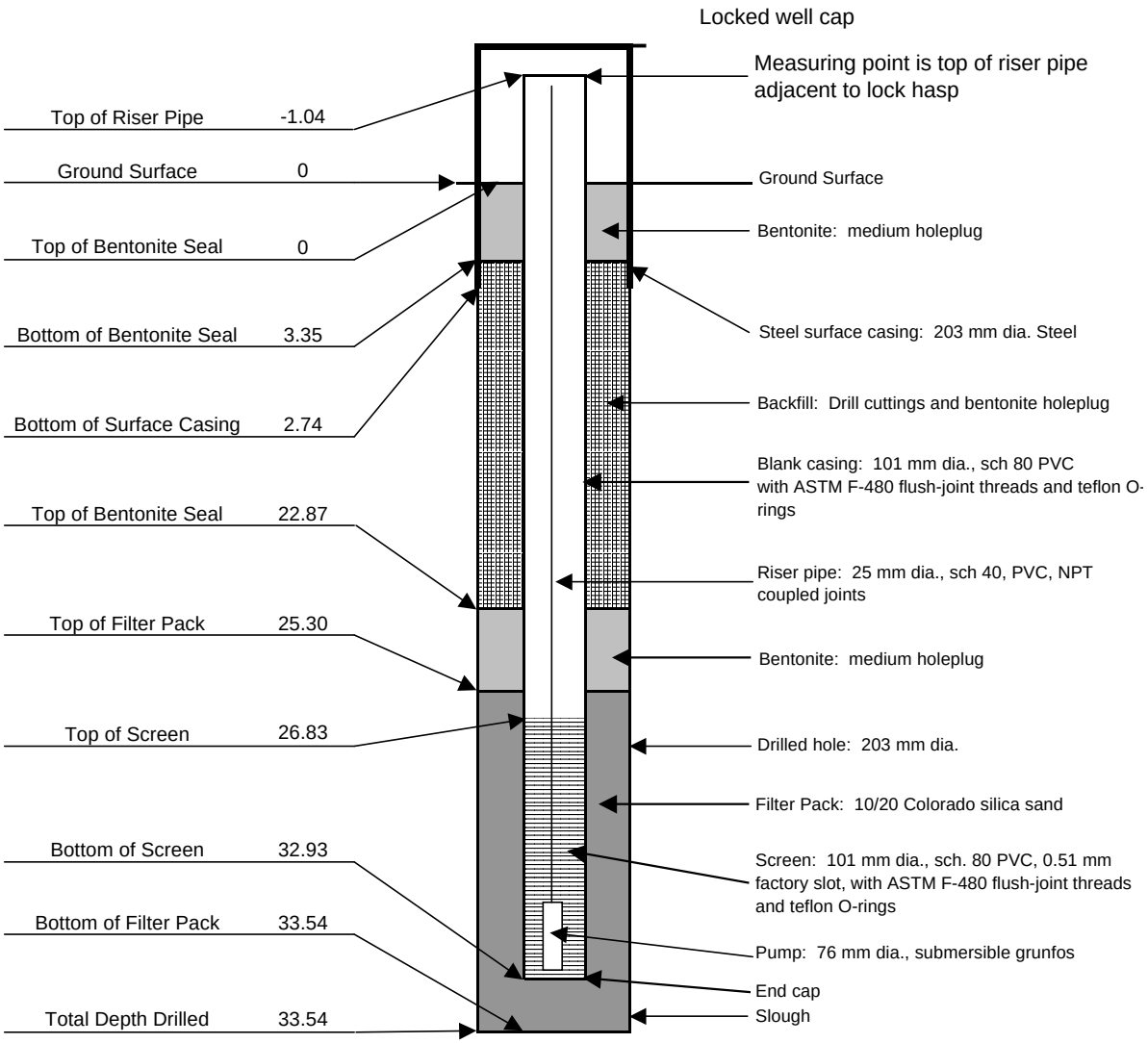


DRAFT

Monitoring Well Completion Schematic

Project Name:	Rock Creek	**Well I.D.:**	MW03-07
UTM Northing (m):	7165330	**UTM Easting (m):**	479620
Drilling Co.:	T&J Enterprises	**Elevation (m):**	70.00
Pump model number:	5SQE05A-270	**Depth of pump (m):**	30.49
Driller:	R. Brown	**Datum:**	NAD 211, ZONE 3

Completion detail	Depth (m) (bgs)	Completion Details *(not drawn to scale)*	Completion Materials and Installation Specifications



DRAFT

SYMBOLS AND TERMS
FOR SOIL DESCRIPTION AND TEST HOLE LOGS

LITHOLOGIC SYMBOLS

gravely organic clay

schist

gravel

quartz

sand and gravel

clay

fractures

gangue

WELL CONSTRUCTION SYMBOLS

BENTONITE

SANDPACK

BACKFILL

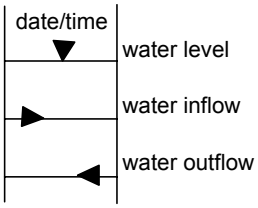
PVC PIPE

SCREEN

PENETRATION

HIGH RESISTANCE---NONE

WATER



Client: AKGold
Project: Rock Creek
Project No: 2509

WATER MANAGEMENT CONSULTANTS

BORING LOG

Hole No: MW03-01	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 480011E, 7164903N	**Descriptive Loc:** Upgrad from tailings	**Loc. Elev:** 283'	
Drilling Co: T&J Enterprises	**Logged By:** Bill Coolash, U. Williams	**Checked By:** Coord not final	
Driller: Roy Brown	**Rig Type:** Explor. Rotary w 3" rods	**Drill Bit:** hammer	**Bit Size:** 8"
Start Date/Time: Sept 25, 2003	**Screen Type:** 0.02" factory slot PVC	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: Sept 25, 2003	**Gravel Pack Type:** 10-20 sand		
Final Depth: 79'/24.08 m	**Seal Type:** Medium holeplug		

Depth (ft / m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
						Ground Surface			
0 / 0	DIRECT CIRCULATION ROTARY - 8" HAMMER					**BEDROCK** moderately weathered graphitic schist	1" RISER PIPE		
10								10:45 end	
10								10:47 begin	
30									inflow < 1gpm; wet at 37'
40									
50							PUMP		
60								11:43 end	
20								11:55 begin	
70								12:15 end	let hole sit (shutdown) for 15 minutes, blew water from 10' off bottom
80									

DRAFT

BORING LOG			
Hole No: MW03-02	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 479855E, 7165284N	**Descriptive Loc:** Downgrade from pit	**Loc. Elev:** 247'	
Drilling Co: T&J Enterprises	**Logged By:** Bill Coolash, U. Williams	**Checked By:** Coord not final	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 8"
Start Date/Time: 9/25/03	**Screen Type:** 0.02 factory slot	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 9/26/03	**Gravel Pack Type:** 10-20 silica sand		
Final Depth: 150'/45.73m	**Seal Type:** Medium Holeplug		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
							Ground Surface			
0	0	DIRECT ROTARY AIR - 8" HAMMER					**BEDROCK** weathered graphitic schist			NOTE: Could not accurately estimate flow due to drilling method
										little overburden
10										schist a little harder
									5:00	
20									5:01	
									5:09	
30										first water
	10								5:12	
40										
50										
60									5:36	
	20									
70										slightly more water
										water surge (small)
80									5:56	

DRAFT

BORING LOG

Hole No: MW03-02	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
90	DIRECT ROTATY AIR - 8" HAMMER							6:08	
100						1" Riser Pump	1" Riser Pump	6:30	
110	34								
120						PUMP	PUMP		slightly more water soft
130									small slug of water
									making more water
140								7:35am 9/26/03	
	44								2 - 3 gpm; let hole recover for 15 minutes and unloaded 30-45 gal
150									
160									

DRAFT

BORING LOG

Hole No: MW03-03	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 480751E, 7166260N	**Descriptive Loc:** Up pit	**Loc. Elev:** 532'	
Drilling Co: T&J Enterprises	**Logged By:** D. Dander	**Checked By:** Coord not final	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 8"
Start Date/Time: 10/03/03 9:00 am	**Screen Type:** 0.02 factory slot PVC	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10/04/03 8:00 pm	**Gravel Pack Type:** 10 - 20 sand		
Final Depth: 122'/37.19m	**Seal Type:** Bentonite Chips		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
							Ground Surface			
0	0	DIRECT ROTARY - 8" UNDER-REAMER					**COLLUVIUM** silt; gravely; subangular to subrounded	1" RISER PIPE		
10										becoming clayey
										gravels < 20mm
20										gravels < 10mm
30							**BEDROCK** weathered graphitic schist			first water
	10									
40										sharp angular chips <10mm
		DIRECT ROTARY -8" HAMMER					UNWEATHERED BEDROCK			
50							graphitic schist solid; sharp angular chips 40mm			
60							as above; flat platty chips			grouted surface casing flat platy chips
	20									
70										
80										some moderate oxidation

DRAFT

BORING LOG

Hole No: MW03-03	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Construction Details	Time	Remarks
						as above; mod. oxidation				
90										7-8 gpm
										slightly oxidized
						as above; tr. oxidation	PUMP			
100						as above; abundant oxidation; tr. qtz				
										some quartz good oxidation
										large chips/quartz35 gpm recovery to 15'
110	34					fractures; large chips, abundant qtz				
										some fracturing; Recovery Test
										fracturing stops
120										
130										
140										
	44									
150										
160										

DRAFT

BORING LOG

Hole No: MW03-04	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 479994E, 7166135N	**Descriptive Loc:** Up Dump	**Loc. Elev:** 436.5'	
Drilling Co: T&J Enterprises	**Logged By:** D. Dander	**Checked By:** Coords not final	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 8"
Start Date/Time: 10-10-03/5:20 pm	**Screen Type:** 0.02" factory slot PVC	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10-12-03/11:45 am	**Gravel Pack Type:** 10-20 sand		
Final Depth: 64.9'/19.78m	**Seal Type:** Bentonite Chips		

Depth (ft / m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
						Ground Surface			
0 / 0	DIRECT CIRC. ROTARY 8"			DRY		**COLLUVIUM**		5:20	
						BEDROCK weathered graphitic schist		6:12	
10									
20						UNWEATHERED BEDROCK		6:52	
								11/10/03	
30						some oxidation; variable chip size	1" RISER PIPE	7:15	
10									
40								7:28	first water @ 40'
50							PUMP		good fractures good water recovery
60						strong fracturing stops		8:00	good fractures
20									
70						DRAFT			Airlift at 85' in pilot approx. 15 gpm
80									

BORING LOG

Hole No: MW03-05	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 479178E, 7164306N	**Descriptive Loc:** Downtailings Faciity	**Loc. Elev:** 101'	
Drilling Co: T&J Enterprises	**Logged By:** D. Dander	**Checked By:** Coord not final	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 8"
Start Date/Time: 10-14-03/11:30 am	**Screen Type:** 0.02" factory slot PVC	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10-14-03/5:00 pm	**Gravel Pack Type:** 10-20 sand		
Final Depth: 88.7'/27m	**Seal Type:** Bentonite Chips		

Depth (ft / m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
						Ground Surface			
0	Dir. Rotary Underreamer					**ALLUVIUM** muskeg; large gravel to sand	1" RISER PIPE	11:30	
10						**BEDROCK** graphitic schist weathered		12:30	
20						UNWEATHERED BEDROCK oxidized, traces of qtz.		14:20	cut off surface casing and cont. drilling
30								14:20	
40								14:40	
50	Direct Rotary Hammer							15:00	
60								15:15	
70						fracturing, larger chips solid rock, some qtz chips	PUMP	15:35	Airlift approx. 6 gpm; fracture produced water
80									

DRAFT

BORING LOG

Hole No: MW03-05	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	SSQE03A-140	Construction Details	Time	Remarks
	Dir. Rot. Hammer					SSQE03A-140				good fracturing 7 gpm
90										
100										
110	34									
120										
130										
140	44									
150										
160										

DRAFT

BORING LOG

Hole No: MW03-06	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 478802E, 7164190N	**Descriptive Loc:** Alluvial Well	**Loc. Elev:** 73.4'	
Drilling Co: T&J Enterprises	**Logged By:** D. Dander	**Checked By:** Coord not final	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 8"
Start Date/Time: 10-15-03/2:30 pm	**Screen Type:** 0.02" factory slot PVC	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10-15-03/10:30 pm	**Gravel Pack Type:** 10-20 sand		
Final Depth: 30'/9.15m	**Seal Type:** Bentonite Chips		

Depth (ft / m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
0 / 0						Ground Surface			
0–30	DIRECT CIRC. ROTARY					**ALLUVIUM** gravel increase in larger pebbles very well rounded <1"	1" RISER PIPE PUMP		10 gpm
30–80 (10, 20)									NOTE: Difficulty getting under reamer into casing. Hole very unstable. Significatnt sloughing and caving. Significant wash out in upper 10 ft. Required more bentonite than estimated.

DRAFT

BORING LOG

Hole No: MW-03-07	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 479620E, 7165330N	**Descriptive Loc:** Down Dump	**Loc. Elev:** 229.6'	
Drilling Co: T&J Enterprises	**Logged By:** D. Dander	**Checked By:** Coords not final	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 8"
Start Date/Time: 10-18-03/8:30 am	**Screen Type:** 0.02" factory slot PVC	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10-18-03/5:00pm	**Gravel Pack Type:** 10-20 sand		
Final Depth: 110'/33.53m	**Seal Type:** Bentonite Chips		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Construction Details	Time	Remarks
							Ground Surface				
0–20	0–6.1	Direct Rotary Underreamer					HOLE NOT LOGGED: FOR GEOLOGIC DESCRIPTIONS AND COMMENTS SEE PILOT HOLE LOGS MW03-07P and MW03-07P2	1" RISER PIPE			
20–80	6.1–24.4	Direct Rotary Hammer									

DRAFT

BORING LOG

Hole No: MW-03-07	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
90									
100				▶		PUMP	PUMP; 55QE05B-270		Airlift approx. 5 gpm, good water in hole
110	34			▶		55QE05B-270			Airlift approx. 10 gpm, good water
120									
130									
140	44								
150									
160									

DRAFT

BORING LOG

Hole No: MW03-03P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold
Loc. Coords:	**Descriptive Loc:** 100 Ft SW of MW-03	**Loc. Elev:** -	
Drilling Co: T + J Enterprises	**Logged By:** U. Williams	**Checked By:**	
Driller: Roy Brown	**Rig Type:** Exp. Rotary w/ 3 in. rods	**Drill Bit:** Hammer	**Bit Size:** 5 3/4
Start Date/Time: 29-9-3	**Screen Type:** None	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 2-10-3	**Gravel Pack Type:** none		
Final Depth: 270'/82.3m	**Seal Type:** bentonite hole plug		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
							Ground Surface			
0–25	0–7.6	Direct Rotary Underreamer 6" casing					**OVERBURDEN** muskeg; organic clays; colluvial overburden	28-9-3		
25–93	7.6–28.4	Reverse Circ. 5.75" Hammer					**BEDROCK** weathered schist med. to lt. gray; 0.5-2 inch chips	29-9-3		
93–100	28.4–30.5						GANGUE; light grey, abundant clay			

Depth scale: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 ft; 0, 10, 20, 30 m

Remarks

- hole not artesian over night
- hole strongly artesian at 40 ft; Recovery Test
- Grouted surface casing;3 bags porlland, 95 gal water, 0.5 gal. rockite powder
- SWL on top of plug approx. 7 ft bgs + steady after removing drill rods-no recovery-good seal
- First water below surface casing
- shear fractures

UNWEATHERED BEDROCK

pyrite and quartz present

DRAFT

BORING LOG

Hole No: MW03-03P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Time	Remarks
110						GANGUE		shear fractures
120							1-10-4 13:29	Attempted recovery test, but probe shorting out on wet steel casing
130	40						14:34	much "blowby" up anulus, flow measure is estimate only
140						Schist as before; more qtz and pyrite; some altered and harder schist	14:55	
150							15:19	
160	50						15:31	
170						little shear 2 ft wide; abundant chlorite and qtz		
180							15:47	
190	60						16:02	Attempted injection test-too little flow to measure; over-topped casing immediately, hammer beginning to be watered out
200							16:24	

DRAFT

BORING LOG			
Hole No: MW03-03P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Time	Remarks
						as above; drilling slow but getting big chips-watering out?		
210							17:41	
220								
230	70							
240								
250						oxide zone	10/2/5 09:45	
						oxide zone	10:46	
260	80						11:38	NOTES: Out of sequence! Hole was strongly artesian. Constant=head pumping test indicated flow rate of 170 gpm. 3 days later flow rate was 100 gpm during constant head pumping test
						oxide zone		
270							12:29	
						oxide zone		
280						TDD watered out		Air lift estimate of flow 100-150 gpm
290								Hole was abandoned by inserting a rubber plug at 50 ft back filling with 3/8 inch bent. hole plug
	90							
300								

DRAFT

BORING LOG			
Hole No: MW03-04P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold
Loc. Coords:	**Descriptive Loc:** up gradient from pit	**Loc. Elev:** -	
Drilling Co: T + J Enterprises	**Logged By:** D Dander	**Checked By:** U Williams	
Driller: R Brown	**Rig Type:** Exp Rotary 3" Rods	**Drill Bit:** Hammer	**Bit Size:** 5 3/4"
Start Date/Time: 10-10-3 12:00	**Screen Type:**	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 11-10-3 18:00	**Gravel Pack Type:**		
Final Depth: 195'/59.45m	**Seal Type:** packer @ 35'; 3/8" bent.		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Time	Remarks
							Ground Surface		
0	0	Direct Rotary; 6 in underreamer bit					**COLLUVIUM** rounded clasts		
10							**BEDROCK** weathered schist various sizes and colors, subangular		0-10'; 10 min.
20							UNWEATHERED BEDROCK		trace of water at 18'; 10-20' : 13 min.
30								11:00	20-30' : 15 min. grouted suface casing @ 30 ft bgs
	10	Reverse Circulation Rotary 15.75 in hammer					not logged		
							uniform color; chips < 1-2 cm; no oxidation; 70% fines	11:05	problems with splitter clogging
40								11:15	
50							tr. clear, qtz. chips<20mm; some black chips	11:30	beginning to see some moisture hole wet to moist
60							fractures	11:40	hole is now wet
	20								
70								11:46	recovery test at 75' recovers 1 ft/min
80									

DRAFT

BORING LOG

Hole No: MW03-04P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold

DRAFT

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Time	Remarks
							11:56	15 gpm
90								
							12:09	
100								
							12:26	15 gpm
110								
34	Reverse Circulation Rotary 6 in hammer							
							12:38	
120							12:50	
								drilling getting harder
						fractured qtz chips		25 gpm
130								
							13:00	
140								
44						broken fragments 0.5-1 in.	13:25	35 gpm
150								
						trace qtz; large chips	13:47	150 gpm
160								

BORING LOG

Hole No: MW03-04P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
								14:03	water cleared up significantly; drilling slower but not sure why
170									
								14:40	
180									noticed changes in rig.
190	58								
						TDD = 195'			65 gpm; abondoned hole; mechanical plug @ 35', 3/8 bent. hole plug 35-25' cuttings 25-0'
200									
210									
220	68								
230									
240									

DRAFT

BORING LOG			
Hole No: MW03-05P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold
Loc. Coords:	**Descriptive Loc:** downgrad of tailings	**Loc. Elev:** -	
Drilling Co: T+J Enterprises	**Logged By:** D. Dander	**Checked By:** U. Williams	
Driller: R. Brown	**Rig Type:** Exp. Rotary 3" rods	**Drill Bit:** Hammer	**Bit Size:** 6 in
Start Date/Time: 12-10-3	**Screen Type:** hand slotted 1" PVC	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 13-10-3	**Gravel Pack Type:** 10-20 sand		
Final Depth: 295'/89.94m	**Seal Type:** medium bentonite hold plug		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Time	Remarks
							Ground Surface		
0	0	Direct Rotary 6" Underreamer					**ALLUVIUM** muskeg; large gravel to sand	3:40	
10							**BEDROCK** weathered schist	3:45 4:30	
20							UNWEATHERED BEDROCK tr. qtz; oxidized	4:42 5:15	fractures
								13-10-3 5:30	10 GPM; grouted surface easing at 30': TR water when resume drilling , maybe damming down casing
30	10							10:00	
40							uniform color	10:27	small uniformly sized chips < 10mm
50								10:41	
60							**QUARTZ VIEN**		dusty dry
	20	Reverse Circulation - 6" hammer					**BEDROCK** schist as before	10:51	
70							DRAFT	11:22	recovery test: WL ~ 7 ft; 0.2 ft/min rise zones of softer material but not fractures,TR
80									

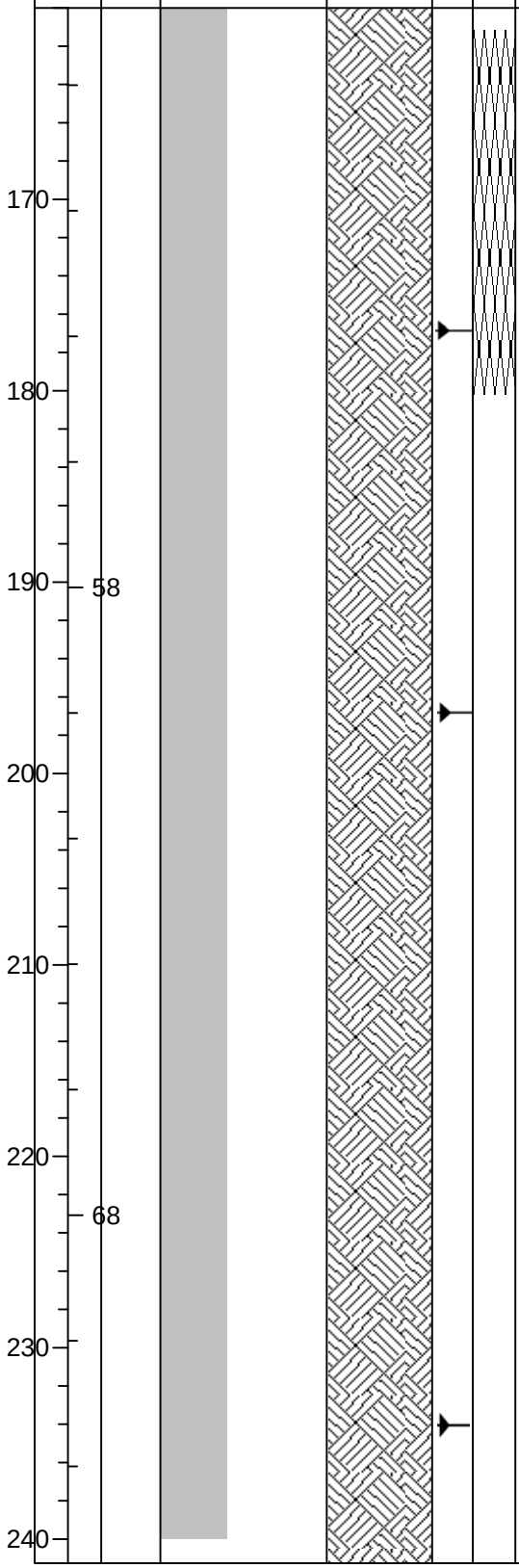
BORING LOG			
Hole No: MW03-05P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Time	Remarks
								smaller uniformly sized chips; uniform color
							11:40	variable sized chips, 15 gpm
90								
							11:57	
100								
							12:15	water level recoverd to 8', 15 gpm
110	34							
							12:30	
120								
							12:45	
130								15gpm
							13:05	
140								
	44						13:17	
150						increase in qtz. fragments of various sizes		
							13:30	larger chips; fractured; water level ~ 10 ft bgs, 20 gpm
160						trace of pyrite		

DRAFT

BORING LOG

Hole No: MW03-05P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold



Description	Time	Remarks
	13:40	
	14:00	water level ~10 Ft. bgs, 25 gpm
	14:15	
		chips < 10mm
		water level is ~15' bgs
	14:35	40 gpm
		chips are smaller and more uniform
	14:52	50 gpm
	15:12	variable size chips
	15:32	
	15:48	some zones of qtz, 65 gpm

DRAFT

BORING LOG

Hole No: MW03-05P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
								16:05	
250									
								16:20	
260									
								16:40	70 gpm
270									
	83								
								17:05	
									no qtz.; chips are uniform size and color
280									
									75 gpm
290									
									TDD = 295ft, 80 gpm
300									
	93								
310									
320									

DRAFT

BORING LOG

Hole No: MW03-06P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AK Gold
Loc. Coords:	**Descriptive Loc:** alluvium near Snake R	**Loc. Elev:** -	
Drilling Co: T+J Enterprises	**Logged By:** D Dander	**Checked By:** U Williams	
Driller: R Brown	**Rig Type:** Exp. Rotary 3 " Rods	**Drill Bit:** See Log	**Bit Size:** 8"
Start Date/Time: 15-10-3	**Screen Type:**	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 15-10-3	**Gravel Pack Type:**		
Final Depth: 67'/20.46m	**Seal Type:**		

Depth (ft / m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Time	Remarks
						Ground Surface		
0 / 0	Direct Circulation Underreamer (Hammer Drill Bit)					**ALLUVIUM** subrounded coarse gravel; oxidized qtz.	10:05	10-25 gpm
10								large clasts clogging interchanger
								larger clasts well rounded <1"
20							10:25	
30 / 10							11:30	larger clasts clogging interchanger
	Reverse Circulation Tricone (Tricone Drill Bit)					**CLAY** very plastic and sticky		clays clogging splitter and interchanger, gravelly fat clay
40								
50								
60 / 20						**BEDROCK** schist; weathered; subrounded; oxidized		TDD = 67'
70								
80								

DRAFT

BORING LOG

Hole No: MW-03-07P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords:	**Descriptive Loc:** Down Dump of Pilot#1	**Loc. Elev:** -	
Drilling Co: T&J Enterprises	**Logged By:** D. Dander	**Checked By:**	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 5.75"
Start Date/Time: 10-16-03 10am	**Screen Type:**	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10-16-03 8pm	**Gravel Pack Type:**		
Final Depth: 255'/77.72m	**Seal Type:** bentonite hole plug		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
							Ground Surface			
0	0	Direct Rotary Underreamer					**COLLUVIUM** clays with subrounded gravels marshy and very wet			
10							**BEDROCK** weathered graphitic schist subrounded, oxidized, various sizes			permafrost?
20		reverse circulation 5.75" hammer					UNWEATHERED BEDROCK			sub angular, trace qtz.
30	10									mixed with qtz fragments
40										
50										less trace qtz.
60	20									
70										
80										

DRAFT

BORING LOG			
Hole No: MW-03-07P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
90									
									periodically stopped drilling allowing any moisture into hole. Never produced any water, very dry.
100									
110	34								
120									
130						DRAFT			
									trace qtz less dust from hole below this point
140	44								
150									water truck broken at another site. no water to wash chips very dry hole.
160									

BORING LOG			
Hole No: MW-03-07P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
170									
180									schist unweathered small chips <10mm silvery grey
190	58								
200									
210									
220	68					DRAFT			
230									chips smaller and more uniform, darker in color
240									water at 240'

BORING LOG			
Hole No: MW-03-07P	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
250									chips variable sizes some oxidation
260									
270	83								
280									
290									
300	93								
310									
320									

DRAFT

BORING LOG

Hole No: MW-03-07P2	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords:	**Descriptive Loc:** Down Dump of Pilot#2	**Loc. Elev:** -	
Drilling Co: T&J Enterprises	**Logged By:** D. Dander	**Checked By:** U. Williams	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 5.75"
Start Date/Time: 10-17-03 11am	**Screen Type:**	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10-17-03 7pm	**Gravel Pack Type:**		
Final Depth: 85'/25.91m	**Seal Type:** bentonite hole plug		

Depth (ft)	Depth (m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
							Ground Surface			
0	0	Direct Rotary Underreamer					**COLLUVIUM** rounded clayey gravels, frozen ground to 6-7ft			
10							**BEDROCK** weathered schist; silvery grey subrounded			
20							UNWEATHERED BEDROCK silvery grey, sub angular, some quartz			Location along fault zone easy drilling, rock not hard
30	10	reverse circulation 5.75" hammer								
40										
50										probably first water
60										
70	20									driller felt fracture some large dark chips
80										

DRAFT

BORING LOG			
Hole No: MW-03-07P2	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Time	Remarks
						quartz, <20mm, white chips			12 gpm
90									
100									
110	34								
120									
130									
140	44								
150									
160									

DRAFT

BORING LOG

Hole No: Pit-03-01	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold
Loc. Coords: 480454E, 7165970N	**Descriptive Loc:** North Pit	**Loc. Elev:** next to RKDC-03-181	
Drilling Co: T&J Enterprises	**Logged By:** David Dander	**Checked By:** no survey	
Driller: Roy Brown	**Rig Type:** Exploration Rotary 3" rods	**Drill Bit:** hammer	**Bit Size:** 4.75"
Start Date/Time: 10-06-03/3:00	**Screen Type:** n/a	WATER MANAGEMENT CONSULTANTS	
Comp. Date/Time: 10-07-03/8:00	**Gravel Pack Type:** n/a		
Final Depth: 295'	**Seal Type:** bentonite chips/backfilled		

Depth (ft / m)	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description	Construction Details	Time	Remarks
						Ground Surface			
0 / 0	Direct Rotary 6" Underreamer			▼		**COLLUVIUM**			
10						**BEDROCK** weathered graphitic schist			
						UNWEATHERED BEDROCK sub angular with some qtz and pyrite			creek level 80' to NW
20									fracture zone DTW approx. 7'
30 / 10									large fracture zone
40									DTW approx 72'
	5 3/4" Tricone					qtz and oxidation present			
50									
60 / 20									
70									
80									

DRAFT

BORING LOG			
Hole No: Pit-03-01	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Construction Details	Time	Remarks
										approx. 15 gpm flow test
90						SAME AS ABOVE (UNWEATHERED BEDROCK)				
100										fracturing; approx. 20 gpm flow test
110	34									
										indication of fracturing, not fracturing, larger chips < 0.5"
120										rig changes
										25 gpm
					?					
130										
										increase in fracturing
140										
	44									flow test approx. 30 gpm
150										
										fracturing
160										rig changes

DRAFT

BORING LOG			
Hole No: Pit-03-01	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Construction Details	Time	Remarks
										flow test approx. 30 gpm down to 14 gpm after 20 min.
170										
										use foam
180										
190	58									
										flow test approx 35 gpm
200										
210										
220										
	68									rig changes
										flow test approx 35 gpm, fracturing
230										
										flow test approx. 35 gpm
240										

DRAFT

BORING LOG			
Hole No: Pit-03-01	**Project Name:** Rock Creek	**Job No:** 2509	**Client:** AKGold

Depth	Drill Method	Penetration (1 2 3 4)	Lithologic Log	Water	Fractures	Description		Construction Details	Time	Remarks
250										fracturing layer
260										flow test approx. 40 gpm
						larger fragments of quartz				
270	83									
										flow test approx. 40 gpm
280										
										flow test approx. 40 gpm
290										
300	93									
310										
320										

DRAFT

APPENDIX B

Analytical results summary

Rock Creek water quality data summary

MW03-01		October 2003			January 2004			April 2004			July 2004			November 2004			January 2005			April 2005			July 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	144		6.2	140		6.2	144		6.2	NA	NA	NA	138		3.1	146		3.1	143		3.1	139		3.1	140		3.1	138	142	146
Aluminum	ug/L	2560		6.2	944		31	6.2	ND	6.2	25.3		6.2	62.4		6.2	713		6.2	576		6.2	6.2	ND	6.2	6.2	ND	6.2	6	543	2560
Ammonia-N	mg/L	0.063	J	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.1	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	0.031	0.063
Antimony	ug/L	4.5		0.31	5.27		0.31	3.52		0.31	3.1		0.31	4.39		0.31	5.16		0.31	8.25		0.31	3.48		0.31	4.76		0.31	3.10	4.71	8.25
Arsenic	ug/L	230		1.5	211		1.5	162		1.5	145		1.5	175		1.5	185		1.5	190		1.5	179		1.5	135		1.5	135	179	230
Barium	ug/L	82		0.94	39		0.94	18.2		0.94	17		0.94	20		0.94	36		0.94	33		0.94	18		0.94	16.4		0.94	16	31	82
Beryllium	ug/L	0.336	J	0.13	0.216	J	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.132	J	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.130	0.130	0.336
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.054	J	0.05	0.05	ND	0.05	0.050	0.053	0.250
Calcium	mg/L	58.1		0.031	58.8		0.31	59.8		0.062	58		0.062	55.9		0.062	58.3		0.062	53.2		0.031	56.6		0.031	59.8		0.031	53	58	60
Chloride	mg/L	2.62		0.031	2.48		0.031	2.48		0.031	2.88		0.031	2.69		0.031	2.7		0.031	2.6		0.031	2.43		0.031	2.45		0.031	2.4	2.6	2.9
Chromium	ug/L	0.78	J	0.31	3.95		0.31	0.31	ND	0.31	0.326		0.31	3.01		0.31	0.325	J	0.31	0.762	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.3	1.1	4.0
Cobalt	ug/L	1.7	J	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	1.2	2.0
Conductivity	umhos/cm	355		0.477	320		0.477	360		0.477	360		0.477	370		0.477	360		0.477	340		0.477	8.1		0.477	NA	NA	NA	8	309	370
Copper	ug/L	4.2		0.31	2.46		0.31	0.806	J	0.31	0.31	J	0.31	0.473	J	0.31	1.19		0.31	0.916	J	0.31	0.475	J	0.31	0.31	ND	0.31	0.31	1.22	4.20
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.073	J	0.031	0.102		0.031	0.077	J	0.031	0.07	ND	0.031	0.031	ND	0.031	0.1	ND	0.031	0.063	J	0.031	0.058	J	0.031	0.08	J	0.031	0.031	0.062	0.102
Iron	mg/L	4.84		0.0062	2.31		0.0062	0.203		0.0124	0.309		0.0124	0.395		0.0124	1.64		0.0124	0.982		0.0062	0.327		0.0062	0.254		0.0062	0.20	1.25	4.84
Lead	ug/L	5.27		0.07	2.49		0.07	0.065	J	0.062	0.207		0.062	0.366		0.062	1.21		0.062	0.865		0.062	0.147	J	0.062	0.062	ND	0.062	0.06	1.18	5.27
Magnesium	mg/L	12		0.031	11.9		0.031	12		0.062	11		0.062	12		0.062	12.2		0.062	11		0.031	11		0.031	11.9		0.031	11	12	12
Manganese	ug/L	230		0.31	180		0.31	87.4		0.31	80.1		0.31	98.1		0.31	107		0.31	106		0.31	98.6		0.31	74.9		0.31	75	118	230
Molybdenum	ug/L	3.1	ND	3.1	3.1	ND	3.1	6.16	J	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.52	J	3.1	3.1	ND	3.1	3.1	ND	3.1	3.10	3.10	6.16
Nickel	ug/L	7.81		0.62	4.65		0.62	2.08		0.62	1.91		0.62	2.25		0.62	2.68		0.62	2.84		0.62	1.59	J	0.62	2.26		0.62	1.59	3.12	7.81
pH	pH units	7.6		0.1	7.55		0.1	7.7		0.1	7.54		0.1	7.65		0.1	7.66		0.1	7.6		0.1	8.1		0.1	NA	NA	NA	7.54	7.68	8.10
Phosphorus	ug/L	62		9.4	48		9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9	44	100
Potassium	ug/L	967		150	485	J	150	244	J	150	218	J	150	239	J	150	455	J	150	466	J	150	297	J	150	214	J	150	214	398	967
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Silicon	ug/L	5670		62	4800		62	3200		62	2950		62	3310		62	3750		62	NA	NA	NA	3600		NA	3230		NA	2950	3814	5670
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	2260		150	2280		150	2290		150	2040		150	2040		150	2180		150	2360		150	2280		150	2010		150	2010	2193	2360
Strontium	mg/L	0.184		0.0015	0.189		0.0015	0.181		0.003	0.182		0.003	0.177		0.003	0.198		0.003	0.168		0.0015	0.172		0.0015	0.189		0.0015	0.168	0.182	0.198
Sulfate	mg/L	53		0.062	55		0.062	50		0.062	49		0.062	54		0.062	54		0.062	53		0.031	49		0.031	51		0.031	49	52	55
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	<0.1	<0.1	<0.1
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	2.64		0.31	0.31	J	0.31	0.497	J	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.52	2.64
Tin	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium	ug/L	118		1.5	80		1.5	60		1.5	49		1.5	52		1.5	28		1.5	62		1.5	96		1.5	82		1.5	28	70	118
Total Dissolved Solids	mg/L	236		16	231		16	229		3.1	240		3.1	215		3.1	234		3.1	219		3.1	238		3.1	211		3.1	211	228	240
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.0495	J	0.31	0.31	0.31	0.50
Total Suspended Solids	mg/L	174		1	28.1		0.4	19		0.15	5.3		0.15	13.2		0.15	14		0.15	3.7		0.15	0.7		0.15	10.8		0.15	1	30	174
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
WAD CN	mg/L	0.00276	J	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.0028
Zinc	ug/L	19.5		1	10.3		1	7		1.5	5.69	J	1.5	3.1	J	1.5	7.31		1.5	8.18		1.5	3.94	J	1.5	2.69	J	1.5	2.7	7.5	19.5
Aluminum, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	84.1		6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6	13	84
Antimony, dissolved	ug/L	4.8		0.31	3.9		0.31	4.3		0.31	3.6		0.31	3.5		0.31	4.9		0.31	5.6		0.31	3.0		0.31	4.5		0.31	3.0	4.2	5.6
Arsenic, dissolved	ug/L	148		1.5	146		1.5	187		1.5	147		1.5	169		1.5	132		1.5	123		1.5	149		1.5	147		1.5	123	150	187
Barium, dissolved	ug/L	26		0.94	16		0.94	20		0.94	17		0.94	18		0.94	16		0.94	17		0.94	16		0.94	18.8		0.94	16	18	26
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.097	J	0.05	0.050	0.058	0.250
Calcium, dissolved	mg/L	60		0.062	61		0.062	59.3		0.062	59		0.062	60		0.062	58		0.062	57		0.62	59		0.62	60		0.62	57	59	61
Chromium, dissolved	ug/L	5	ND	5	2.05		0.31	0.31	ND	0.31	0.31		0.31	2.72		0.31	0.384	J	0.31	0	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.95	2.72
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	0.896	J	0.31	0.31	ND	0.31	0.705	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.334	J	0.31	0.328	J	0.31	1.09		0.31	0.489	J	0.31	0.31	0.48	1.09
Iron, dissolved	mg/L	0.0124	ND	0.0124	0.173		0.0124	0.486		0.0124	0.226		0.0124	0.207		0.0124	0.228		0.0124	0.12		0.0124	0.253		0.0124	0.185		0.0124	0.01	0.21	0.49
Lead, dissolved	ug/L	0.07	ND	0.07	0.07	ND	0.07	1.09		0.062	0.062	ND	0.062	0.062	ND	0.062	0.2	ND	0.062	0.152	J	0.062	0.062	ND	0.062	0.065	J	0.062	0.062	0.174	1.090
Magnesium, dissolved	mg/L	11.5		0.062	11.9		0.062	11.5		0.062	11.5		0.062	11.6		0.062	12.1		0.062	11.5		0.062	11.4		0.062	11.6		0.062	11	12	12
Manganese, dissolved	ug/L	99		0.31	84		0.31	98		0.31	82		0.31	90		0.31	76		0.31	78		0.31	83		0.31	84		0.31	76	86	99
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.4	J	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.1	5.0
Nickel, dissolved	ug/L	2.68		0.62	1.65	J	0.62	1.9	J	0.62	1.62		0.62	2.07		0.62	1.82	J	0.62	2.36		0.62	2.09		0.62	2.47		0.62	1.62	2.07	2.68
Phosphorus, dissolved	ug/L	15	J	9	10	J	9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9	35	100
Potassium, dissolved	ug/L	364	J	150	204	J	150	245	J	150	190	J	150	222	J	150	199	J	150	240	J	150	254	J	150	261	J	150	190	242	364
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	3190		62	2860		62	3460		62	3170		62	3160		62	2890		62	NA	NA	NA	3140		NA	3180		NA	2860	3131	3460
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	2170		150	1900		150	2240		150	2030		150	2080		150	2150		150	2030		150	2110		150	2150		150	1900	2096	2240
Strontium, dissolved	mg/L	0.181		0.003	0.19		0.003	0.186		0.003	0.184		0.003	0.182		0.003	0.196		0.003	0.179		0.003	0.182		0.003	0.183		0.003	0.179	0.185	0.196
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	1.18		0.31	0.31	J	0.31	0.367	J	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.310	0.348	1.180
Tin, dissolved	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium, dissolved	ug/L	78		1.5	63		1.5	67.4		1.5	67		1.5	53		1.5	14		1.5	53		1.5	47		1.5	55		1.5	13.9	55.3	78.2
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	7.25		1	2.83		1	10.4		1.5	6.53	J	1.5	4.25	J	1.5	2.45	J	1.5	3.64	J	1.5	5.19		1.5	7.93		1.5	2.5	5.6	10.4
Mercury, total	ug/L	NA	NA	NA	0.0024		0.001	0.001	ND	0.001	0.0018		0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0010	0.0016	0.0024

Notes:
MDL: method detection limit
Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.
Statistics: For constituents with no detects the result is set to the maximum detection limit for that constituent
For constituents with some detects, these were included in the calculation of average at half the detection limit.

Rock Creek water quality data summary

MW03-02		October 2003			January 2004			April 2004			July 2004			November 2004			January 2005			April 2005			July 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	468		6.2	274		6.2	292		6.2	262		3.1	292		3.1	258		3.1	296		3.1	275		3.1	302		3.1	258	302	468
Aluminum	ug/L	24300		6.2	2550		6.2	165		6.2	579		6.2	40.2		6.2	19.3	J	6.2	640		6.2	6.2	ND	6.2	6.6		6.2	6.2	3145	24300
Ammonia-N	mg/L	1.66		0.155	0.031	ND	0.031	0.031	ND	0.031	0.031	J	0.031	0.041	J	0.031	0.1	ND	0.031	0.122		0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	0.218	1.66
Antimony	ug/L	35.6		0.31	12		0.31	10.3		0.31	19.1		0.31	16.3		0.31	20.2		0.31	36		0.31	14.3		0.31	10.6		0.31	10.3	19.38	36
Arsenic	ug/L	3980		1.5	1450		1.5	1380		1.5	1600		1.5	1170		1.5	1820		1.5	2440		1.5	1510		1.5	1050		1.5	1050	1822	3980
Barium	ug/L	333		0.94	42.9		0.94	18.1		0.94	24.5		0.94	17.2		0.94	13.2		0.94	28		0.94	13.6		0.94	14.1		0.94	13	56	333
Beryllium	ug/L	3.91		0.13	0.267	J	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	0.530	3.91
Cadmium	ug/L	1.16		0.05	0.05	ND	0.05	0.052	J	0.05	0.05	J	0.05	0.0715	J	0.05	0.5	ND	0.05	0.05	ND	0.05	0.222	J	0.05	0.05	ND	0.05	0.05	0.209	1.16
Calcium	mg/L	215		0.31	110		3.1	115		0.062	103		0.31	126		3.1	106		0.062	101		0.031	107		0.031	118		0.031	101	122	215
Chloride	mg/L	3.06		0.031	2.8		0.031	2.89		0.031	2.83		0.031	3.13		0.031	2.94		0.031	2.85		0.031	2.61		0.031	2.82		0.031	2.61	2.88	3.13
Chromium	ug/L	64.6		0.31	4.72		0.31	1.31		0.31	1.6	J	0.31	0.719	J	0.31	2.84		0.31	0.949	J	0.31	0.379	J	0.31	0.31	ND	0.31	0.31	8.59	64.6
Cobalt	ug/L	72.9		1.2	7.32		1.2	3.73	J	1.2	5.16	J	1.2	1.98	J	1.2	5.22		1.2	5.83		1.2	4.47		1.2	3.07	J	1.2	1.98	12.19	72.9
Conductivity	umhos/cm	1000		0.477	900		0.477	900		0.477	800		0.477	900		0.477	900		0.477	800		0.477	NA	NA	NA	NA	NA	NA	800	886	1000
Copper	ug/L	103		0.31	4.75		0.31	4.47		0.31	1.04		0.31	1.09		0.31	1.39		0.31	3.42		0.31	1.01		0.31	0.31	ND	0.31	0.31	13	103
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	J	0.0025	0.0036	J	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.0036
Fluoride	mg/L	0.102		0.031	0.132		0.031	0.098	J	0.031	0.162	J	0.031	0.067	J	0.031	0.042	J	0.031	0.08	J	0.031	0.1		0.031	0.127		0.031	0.042	0.101	0.162
Iron	mg/L	123		0.062	7.61		0.0062	2.88		0.0124	3.83		0.0062	1.7		0.0062	5.08		0.0124	4.29		0.0062	2.66		0.0062	1.77		0.0062	1.7	17	123
Lead	ug/L	102		0.07	8.18		0.07	8.27		0.062	1.07		0.062	0.386		0.062	0.839		0.062	3.25		0.062	0.062	ND	0.062	0.112	J	0.062	0.062	14	102
Magnesium	mg/L	110		0.31	59		0.31	56.6		0.062	55.5		0.31	51.5		0.031	61.8		0.062	50.5		0.031	54.4		0.031	55.3		0.031	50.5	62	110
Manganese	ug/L	6570		0.31	1840		0.31	1360		0.31	1920		0.31	751		0.31	1960		0.31	1700		0.31	1640		0.31	1070		0.31	751	2090	6570
Molybdenum	ug/L	7.62	J	3.1	3.74	J	3.1	4.46	J	3.1	4.47	J	3.1	3.33	J	3.1	10	ND	3.1	4.35	J	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	4.01	7.62
Nickel	ug/L	229		0.62	28.6		0.62	20.1		0.62	26.8		0.62	11.5		0.62	25.6		0.62	26		0.62	22.2		0.62	14.9		0.62	12	45	229
pH	pH units	7.1		0.1	6.9		0.1	7.1		0.1	6.9		0.1	6.98		0.1	6.89		0.1	6.9		0.1	NA	NA	NA	NA	NA	NA	6.89	6.97	7.1
Phosphorus	ug/L	1220		9.4	129		9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9.4	182	1220
Potassium	ug/L	6250		150	1090		150	623		150	723		150	587		150	331	J	150	828		150	514		150	512		150	331	1273	6250
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Silicon	ug/L	30700		62	8230		62	5120		62	6740		62	4730		62	4260		62	NA	NA	NA	4840		NA	4940		NA	4260	8695	30700
Silver	ug/L	0.347	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.5
Sodium	ug/L	28500		150	3270		150	3750		150	3040		150	3130		150	2710		150	3840		150	3260		150	3260		150	2710	6084	28500
Strontium	mg/L	0.643		0.0015	0.33		0.0015	0.325		0.003	0.297		0.0015	0.364		0.0015	0.32		0.003	0.296		0.0015	0.304		0.0015	0.36		0.0015	0.296	0.360	0.643
Sulfate	mg/L	309		1.55	244		0.31	219		0.31	247		0.31	209		0.62	319		0.062	218		0.31	181		0.31	323		0.31	181	252	323
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	<0.1	<0.1	<0.1
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	1.25		0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.315	1.25
Tin	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.379	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium	ug/L	348		1.5	155		1.5	122		1.5	92.2		1.5	107		1.5	17.8		1.5	118		1.5	172		1.5	190		1.5	17.8	146.9	348
Total Dissolved Solids	mg/L	728		32	614		16	616		3.1	665		3.1	655		3.1	592		3.1	600		3.1	565		3.1	597		3.1	565	626	728
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.62	ND	0.62	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.0585	J	0.31	0.31	0.31	0.5
Total Suspended Solids	mg/L	9300		80	235		1.6	57		0.3	64.3		0.429	10.4		0.2	27.7		0.15	24.5		0.15	5.2		0.15	1.3		0.15	1.3	1081	9300
Vanadium	ug/L	67		6.2	7.83	J	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	11.49	67
WAD CN	mg/L	0.00305	J	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	J	0.0025	0.004	J	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.004
Zinc	ug/L	302		1	22.7		1	22.4		1.5	23.7		1.5	6		1.5	16.7		1.5	18		1.5	15.2		1.5	5.45		1.5	5	48	302
Aluminum, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
Antimony, dissolved	ug/L	105		0.31	11.1		0.31	12.1		0.31	14.3		0.31	14.9		0.31	11.8		0.31	16.1		0.31	12.9		0.31	11.8		0.31	11.1	23	105
Arsenic, dissolved	ug/L	161		1.5	1110.00		1.5	1180.00		1.5	1360.00		1.5	1240.00		1.5	738.00		1.5	1110		1.5	1360		1.5	1120		1.5	161	1042	1360
Barium, dissolved	ug/L	29.9		0.94	16.3		0.94	17		0.94	15.5		0.94	17.3		0.94	11		0.94	15.50		0.94	12.4		0.94	16.7		0.94	11	17	29.9
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.261	J	0.05	0.05	0.076	0.261
Calcium, dissolved	mg/L	121		0.062	108		0.62	114		0.062	109		0.062	125		0.062	105		0.062	109		0.062	107		0.062	120		0.062	105	113	125
Chromium, dissolved	ug/L	5	ND	5	7.06		0.31	0.47	J	0.31	0.31		0.31	3.16		0.31	2.84		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	1.87	7.06
Cobalt, dissolved	ug/L	6.26		1.2	3.79	J	1.2	3.14	J	1.2	4.03	J	1.2	2.01	J	1.2	4.73		1.2	4.45		1.2	4.08		1.2	2.87	J	1.2	2.01	3.93	6.26
Copper, dissolved	ug/L	2.9		0.31	0.81	J	0.31	2.17		0.31	0.31		0.31	2.22		0.31	1.44		0.31	1.61		0.31	1.14		0.31	0.936	J	0.31	0.31	1.50	2.9
Iron, dissolved	mg/L	0.0124	ND	0.0124	1.7		0.0124	1.68		0.0124	2.51		0.0124	1.52		0.0124	2.29		0.0124	1.58		0.0124	2.48		0.0124	1.62		0.0124	0.0124	1.71	2.51
Lead, dissolved	ug/L	0.071	J	0.07	0.07	ND	0.07	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.2	ND	0.062	0.188	J	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	0.062	0.188
Magnesium, dissolved	mg/L	58.6		0.062	56.2		0.062	54.9		0.062	55.8		0.062	53.4		0.062	61.5		0.062	53.6		0.062	54.2		0.062	53.3		0.062	53	56	62
Manganese, dissolved	ug/L	1270		0.31	1370		0.31	1190		0.31	1730		0.31	721		0.31	1870		0.31	1340		0.31	1550		0.31	1060		0.31	721	1345	1870
Molybdenum, dissolved	ug/L	3.76	J	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.29	J	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.10	5
Nickel, dissolved	ug/L	79.8		0.62	20.3		0.62	17.2		0.62	22.6		0.62	12		0.62	25.6		0.62	21.9		0.62	22.2		0.62	13.3		0.62	12	26	80
Phosphorus, dissolved	ug/L	17.2	J	9.4	13.9	J	9.4	62	ND	62	62.3	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9	35	100
Potassium, dissolved	ug/L	3010		150	605		150	608		150	353		150	517		150	327	J	150	529		150	456	J	150	465	J	150	327	763	3010
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	4750		62	4710		62	5340		62	4850		62	5130		62	4380		62	NA	NA	NA	4760		NA	5000		NA	4380	4865	5340
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	24400		150	3460		150	3860		150	3000		150	3130		150	2720		150	3270		150	3100		150	3340		150	2720	5587	24400
Strontium, dissolved	mg/L	0.398		0.003	0.333		0.003	0.336		0.003	0.307		0.003	0.377		0.003	0.32		0.003	0.313		0.003	0.304		0.003	0.343		0.003	0.304	0.337	0.398
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium, dissolved	ug/L	183		1.5	130		1.5	140		1.5	83.8		1.5	69.3		1.5	24.5		1.5	111		1.5	98.4		1.5	156		1.5	25	111	183
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	17.5		1	10.2		1	11.7		1.5	18.8		1.5	5.51		1.5	14.3		1.5	10.8		1.5	16.9		1.5	8.89		1.5	6	13	19
Mercury	ug/L	NA	NA	NA	0.005		0.005	0.001	ND	0.001	0.0036		1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.001	0.003	0.005

Notes:

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects the result is set to the maximum detection limit for that constituent

For constituents with some detects, these were included in the calculation of average at half the detection limit.

Rock Creek water quality data summary

MW03-03		October 2003			January 2004			April 2004			July 2004			November 2004			January 2005			April 2005			July 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	176		6.2	174		6.2	178		6.2	165		3.1	166		3.1	170		3.1	168		3.1	175		3.1	174		3.1	165	172	178
Aluminum	ug/L	317		6.2	6.2	ND	6.2	6.2	ND	6.2	14.5	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6	39	317
Ammonia-N	mg/L	0.042	J	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.202		0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	0.039	0.202
Antimony	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Arsenic	ug/L	48.2		1.5	46.4		1.5	51.6		1.5	43.4		1.5	46.3		1.5	39		1.5	40.1		1.5	42.1		1.5	35.8		1.5	36	44	52
Barium	ug/L	6.01		0.94	3.03		0.94	3.37		0.94	3.09		0.94	3.46		0.94	3.07		0.94	3.09		0.94	3.4		0.94	3.04		0.94	3.03	3.51	6.01
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	<0.13	<0.13	<0.13
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.18	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	<0.05	<0.05	<0.05
Calcium	mg/L	56.6		0.031	57.6		0.62	58.1		0.062	56.8		0.062	56.9		0.062	63		0.062	56.9		0.062	58.5		0.062	59.5		0.062	57	58	63
Chloride	mg/L	2.14		0.031	2.21		0.031	2.21		0.031	2.32		0.031	2.5		0.031	2.27		0.031	2.25		0.031	2.11		0.031	2.09		0.031	2.09	2.23	2.5
Chromium	ug/L	0.784	J	0.31	4.64		0.31	1.99		0.31	0.483	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.98	4.64
Cobalt	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	<1.2	<1.2	<1.2
Conductivity	umhos/cm	350		0.477	320		0.477	380		0.477	340		0.477	340		0.477	370		0.477	320		0.477	NA	NA	NA	NA	NA	NA	320	346	380
Copper	ug/L	1.26		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.32	1.26
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.036	J	0.031	0.059	J	0.031	0.038	J	0.031	0.065	ND	0.031	0.031	ND	0.031	0.1	ND	0.031	0.033	J	0.031	0.031	J	0.031	0.072	J	0.031	0.031	0.041	0.072
Iron	mg/L	1.41		0.0062	0.557		0.0124	0.522		0.0124	0.543		0.0124	0.515		0.0124	0.506		0.0124	0.45		0.0124	0.435		0.0124	0.457		0.0124	0.435	0.60	1.41
Lead	ug/L	0.896		0.07	0.07	ND	0.07	0.082	J	0.062	0.166	ND	0.062	0.062	ND	0.062	0.065	J	0.062	0.4		0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	0.184	0.896
Magnesium	mg/L	12.6		0.031	13.7		0.062	13.2		0.062	12.9		0.062	12.9		0.062	14		0.062	12.7		0.062	12.7		0.062	13		0.062	13	13	14
Manganese	ug/L	27.3		0.31	20.5		0.31	21.4		0.31	18.2		0.31	20		0.31	18.2		0.31	18		0.31	20		0.31	16.7		0.31	17	20	27
Molybdenum	ug/L	3.57	J	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.10	5
Nickel	ug/L	2.37		0.62	1.01	J	0.62	1.22	J	0.62	1.12	J	0.62	1.14	J	0.62	2	ND	0.62	1.26	J	0.62	1.11	J	0.62	1.43	J	0.62	0.62	1.30	2.37
pH	pH units	7.6		0.1	7.66		0.1	7.7		0.1	7.43		0.1	7.54		0.1	7.53		0.1	7.6		0.1	NA	NA	NA	NA	NA	NA	7.4	7.6	7.7
Phosphorus	ug/L	9.81	J	9.4	9.4	ND	9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9.4	33	100
Potassium	ug/L	405	J	150	204	J	150	236	J	150	222	J	150	230	J	150	225	J	150	238	J	150	269	J	150	220	J	150	204	250	405
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Silicon	ug/L	4750.0		62	3610		62	4170		62	3550		62	3890		62	2530		62	3310		62	4220		62	3960		62	2530	3777	4750
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	2360		150	1800		150	2200		150	1890		150	2160		150	2050		150	2050		150	2180		150	1950		150	1800	2071	2360
Strontium	mg/L	0.211		0.0015	0.221		0.003	0.212		0.003	0.212		0.003	0.209		0.003	0.226		0.003	0.206		0.003	0.21		0.003	0.219		0.003	0.206	0.214	0.226
Sulfate	mg/L	28.4		0.031	27.9		0.031	26.7		0.031	27.1		0.031	28.2		0.031	26		0.062	26.3		0.031	24.8		0.031	26.2		0.031	25	27	28
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	<0.1	<0.1	<0.1
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Tin	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium	ug/L	66.6		1.5	59.1		1.5	58		1.5	46.9		1.5	51		1.5	47.2		1.5	37.8		1.5	85.8		1.5	68.6		1.5	38	58	86
Total Dissolved Solids	mg/L	220		16	223		16	223		3.1	219		3.1	185		3.1	220		3.1	200		3.1	218		3.1	205		3.1	185	213	223
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31		0.31	1.36		0.31	1	ND	0.31	0.31	ND	0.31	0.033	J	0.31	0.034	J	0.31	0.31	0.32	1.36
Total Suspended Solids	mg/L	19.2		0.8	1.7		0.4	2.8		0.15	3		0.15	1.2		0.3	5		0.15	1		0.3	0.5		0.3	0.4	J	0.3	0.4	3.9	19
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
WAD CN	mg/L	0.0025	ND	0.0025	0.0028	J	0.0025	0.0025	ND	0.0025	0.0025	J	0.0025	0.003	J	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.003
Zinc	ug/L	1.51	J	1	1	ND	1	1.5	ND	1.5	3.1	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.0	1.1	2.5
Aluminum, dissolved	ug/L	26.8		6.2	6.2	ND	6.2	21.8		6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	8.6	27
Antimony, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Arsenic, dissolved	ug/L	41		1.5	46.8		1.5	48.8		1.5	45		1.5	47.2		1.5	37.8		1.5	37.8		1.5	38.4		1.5	37.7		1.5	38	42	49
Barium, dissolved	ug/L	3.59		0.94	3.04		0.94	4.3		0.94	3.13		0.94	3.67		0.94	2.96	J	0.94	3.19		0.94	2.9	J	0.94	3.07		0.94	2.9	3.3	4.3
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.19	J	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	0.13	0.20
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.114	J	0.05	0.065	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	0.061	0.25
Calcium, dissolved	mg/L	58.5		0.62	59.4		0.062	60.3		0.062	57.7		0.062	56.5		0.62	56.7		0.062	55.1		0.062	58.1		0.062	57.9		0.062	55	58	60
Chromium, dissolved	ug/L	0.31	ND	0.31	3.21		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.53	3.21
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	0.31	ND	0.31	0.469	J	0.31	4.71		0.31	0.31	J	0.31	0.383	J	0.31	1	ND	0.31	0.31	ND	0.31	0.348	J	0.31	0.31	ND	0.31	0.31	0.80	4.71
Iron, dissolved	mg/L	0.738		0.0124	0.521		0.0124	0.485		0.0124	0.48		0.0124	0.493		0.0124	0.04	ND	0.0124	0.444		0.0124	0.457		0.0124	0.431		0.0124	0.0124	0.45	0.738
Lead, dissolved	ug/L	0.693		0.07	0.07	ND	0.07	2.38		0.062	0.062		0.062	0.432		0.062	0.2	ND	0.062	0.352		0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	0.457	2.38
Magnesium, dissolved	mg/L	13.9		0.062	13.7		0.062	13.7		0.062	13		0.062	13.3		0.062	11.3		0.062	12.5		0.062	12.8		0.062	12.7		0.062	11	13	14
Manganese, dissolved	ug/L	23.7		0.31	20.2		0.31	21.7		0.31	19		0.31	20.1		0.31	18		0.31	17.9		0.31	17.3		0.31	17.3		0.31	17	19	24
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	1.58	J	0.62	1.14	J	0.62	1.65	J	0.62	1.1	J	0.62	1.81	J	0.62	0.645	J	0.62	1.25	J	0.62	1.58	J	0.62	1.03	J	0.62	0.645	1.31	1.81
Phosphorus, dissolved	ug/L	31.9		9.4	9.4	ND	9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9	36	100
Potassium, dissolved	ug/L	283	J	150	200	J	150	208	J	150	212	J	150	246	J	150	212	J	150	217	J	150	253	J	150	209	J	150	200	227	283
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	3810		62	3600		62	3460		62	3500		62	3930		62	2320		62	NA	NA	NA	3860		62	4030		62	2320	3564	4030
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	2210		150	1870		150	2120		150	2040		150	2180		150	2080		150	1990		150	2010		150	2070		150	1870	2063	2210
Strontium, dissolved	mg/L	0.226		0.003	0.222		0.003	0.21		0.003	0.214		0.003	0.215		0.003	0.152		0.003	0.209		0.003	0.213		0.003	0.208		0.003	0.152	0.208	0.226
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	2	ND	2	2	ND	2	6.32		0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	1.07	6.32
Titanium, dissolved	ug/L	69.5		1.5	65.2		1.5	65.9		1.5	65.4		1.5	53.4		1.5	44		1.5	35.1		1.5	44.2		1.5	64.6		1.5	35	56	70
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	1	ND	1	1	ND	1	4.86	J	1.5	5.95	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.81	J	1.5	1.82	J	1.5	1.0	1.8	4.9
Mercury	ug/L	NA	NA	NA	0.001	ND	0.001	0.001	ND	0.001	0.001	ND	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0010	0.0010	0.0005

Notes:

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were set to zero

For constituents with some detects, these were included in the calculation of average at half the detection limit.

Rock Creek water quality data summary

MW03-04		October 2003			January 2004			April 2004			July 2004			November 2004			January 2005			April 2005			July 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	204		12.4	196		3.1	204		6.2	196		6.2	181		3.1	186		3.1	195		3.1	178		3.1	186		3.1	178	192	204
Aluminum	ug/L	1710		6.2	6.44	J	6.2	1470		6.2	25.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	358	1710
Ammonia-N	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.1	ND	0.031	0.065	J	0.031	0.031	ND	0.031	0.054	J	0.031	0.031	0.031	0.065
Antimony	ug/L	1.24		0.31	1.08		0.31	0.80	J	0.31	1.07	J	0.31	0.99	J	0.31	0.75	J	0.31	0.82	J	0.31	0.67	J	0.31	0.54	J	0.31	0.54	0.88	1.24
Arsenic	ug/L	42.9		1.5	1.5	J	1.5	4.05	J	1.5	3.06	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	6.2	42.9
Barium	ug/L	38.1		0.94	9.35		0.94	20.6		0.94	7.37		0.94	6.5		0.94	5.51		0.94	6.74		0.94	5.81		0.94	5.21		0.94	5.2	11.7	38.1
Beryllium	ug/L	0.262	J	0.13	0.13	ND	0.13	0.2	J	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	0.13	0.26
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	<0.05	<0.05	<0.05
Calcium	mg/L	70.1		0.031	71.1		0.062	75.2		0.31	70.3		0.062	66.3		0.062	69.7		0.062	71.9		0.062	68.1		0.062	72.5		0.062	66	71	75
Chloride	mg/L	2.6		0.031	2.59		0.031	2.63		0.031	2.86		0.031	2.74		0.031	2.68		0.031	2.64		0.031	2.52		0.031	2.81		0.031	2.5	2.7	2.9
Chromium	ug/L	0.31	ND	0.31	10.7		0.31	0.34	J	0.31	0.672		0.31	3.86		0.31	0.49	J	0.31	0.49	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.3	1.9	10.7
Cobalt	ug/L	1.67	J	1.2	1.2	ND	1.2	2.09	J	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	1.2	2.1
Conductivity	umhos/cm	420		0.477	400		0.477	420		0.477	410		0.477	410		0.477	400		0.477	380		0.477	NA	NA	NA	NA	NA	NA	380	406	420
Copper	ug/L	5.71		0.31	0.382	J	0.31	2.23		0.31	0.502	J	0.31	0.401	J	0.31	1	ND	0.31	0.745	J	0.31	0.493	J	0.31	0.31	ND	0.31	0.31	1.24	5.71
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.068	J	0.031	0.09	J	0.031	0.069	J	0.031	0.051	ND	0.031	0.031	ND	0.031	0.062	J	0.031	0.05	J	0.031	0.059	J	0.031	0.094	J	0.031	0.031	0.059	0.094
Iron	mg/L	4.94		0.0062	0.0288	J	0.0124	1.67		0.062	0.031	J	0.0124	0.0241	J	0.0124	0.157		0.0124	0.0216	J	0.0124	0.0595		0.0124	0.019	J	0.0124	0.019	0.77	4.94
Lead	ug/L	11.8		0.07	0.071	J	0.07	4.33		0.062	0.288	ND	0.062	0.062	ND	0.062	0.2	ND	0.062	0.35		0.062	0.067	J	0.062	0.062	ND	0.062	0.1	1.9	11.8
Magnesium	mg/L	14		0.031	13		0.062	12.8		0.031	12		0.062	11.8		0.062	11.8		0.062	12.4		0.062	10.8		0.062	11.8		0.062	11	12	14
Manganese	ug/L	101		0.31	19.2		0.31	53.9		0.31	4.65		0.31	8.76		0.31	71.6		0.31	8.26		0.31	67.4		0.31	7.13		0.31	4.7	38	101
Molybdenum	ug/L	3.1	ND	3.1	3.1	ND	3.1	4.66	J	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.1	5.0
Nickel	ug/L	8.38		0.62	9.92		0.62	5.8		0.62	2.28		0.62	2.76		0.62	1.76	J	0.62	2.46		0.62	2.42		0.62	2.74		0.62	1.8	4.3	9.9
pH	pH units	7.7		0.1	7.7		0.1	7.7		0.1	7.72		0.1	7.66		0.1	7.64		0.1	7.5		0.1	NA	NA	NA	NA	NA	NA	7.5	7.7	7.7
Phosphorus	ug/L	101		9.4	9.4	ND	9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9.4	44	101
Potassium	ug/L	1090		150	447	J	150	701		150	239	J	150	227	J	150	246	J	150	228	J	150	358	J	150	205	J	150	205	416	1090
Selenium	ug/L	1.8	J	1.5	2.84	J	1.5	4.11	J	1.5	3.28	J	1.5	3.2	J	1.5	2.47	J	1.5	1.5	ND	1.5	1.87	J	1.5	2.3	J	1.5	1.5	2.5	4.1
Silicon	ug/L	5330		62	2850		62	5400		62	2520		62	2720		62	2010		62	2200		62	2730		62	2630		62	2010	3154	5400
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	4380		150	2430		150	2690		150	2130		150	2060		150	2100		150	2100		150	2450		150	2030		150	2030	2486	4380
Strontium	mg/L	0.232		0.0015	0.225		0.003	0.221		0.0015	0.219		0.003	0.205		0.003	0.226		0.003	0.214		0.003	0.202		0.003	0.213		0.003	0.202	0.217	0.232
Sulfate	mg/L	36.5		0.031	33.9		0.031	36.7		0.031	34.7		0.031	32.8		0.031	32.3		0.062	36.1		0.031	27.8		0.031	31.1		0.031	28	34	37
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	<0.1	<0.1	<0.1
Thallium	ug/L	0.31	ND	0.31	1.07		0.31	2.09		0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.510	2.09
Tin	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium	ug/L	118		1.5	71		1.5	96.5		1.5	46.2		1.5	63		1.5	14.1		1.5	50.4		1.5	104		1.5	103		1.5	14	74	118
Total Dissolved Solids	mg/L	286		16	255		16	268		3.1	256		3.1	233		3.1	239		3.1	241		3.1	225		3.1	221		3.1	221	247	286
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	1.56		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.0695	J	0.31	0.31	0.34	1.56
Total Suspended Solids	mg/L	188		2	1.4		0.4	88.9		0.429	3.5		0.15	0.5		0.15	2		0.15	0.15	ND	0.15	0.15	ND	0.15	0.15	ND	0.15	0.15	32	188
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
WAD CN	mg/L	0.00391	J	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.00391
Zinc	ug/L	21.6		1	1	ND	1	7.75		1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.0	4.0	21.6
Aluminum, dissolved	ug/L	151		6.2	6.2	ND	6.2	6.29	J	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	21	151
Antimony, dissolved	ug/L	1.15		0.31	1.06		0.31	0.778	J	0.31	1.41		0.31	1.03		0.31	0.837	J	0.31	0.855	J	0.31	0.526	J	0.31	0.599	J	0.31	0.53	0.92	1.41
Arsenic, dissolved	ug/L	5.68		1.5	2.19	J	1.5	1.83	J	1.5	1.88	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	1.8	5.7
Barium, dissolved	ug/L	22		0.94	8.85		0.94	8.87		0.94	7.5		0.94	7.14		0.94	5.64		0.94	6.65		0.94	5.29		0.94	6.04		0.94	5	9	22
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.152	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	<0.05	<0.05	<0.05
Calcium, dissolved	mg/L	76.3		0.062	70.8		0.062	76.9		0.062	66.9		0.62	69.9		0.062	69.9		0.062	70.1		0.062	67.6		0.062	72.7		0.062	67	71	77
Chromium, dissolved	ug/L	0.31	ND	0.31	4.48		0.31	0.31	ND	0.31	0.31		0.31	4.85		0.31	1.01		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.3	1.3	4.9
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	1.77		0.31	0.31	ND	0.31	0.446	J	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.372	J	0.31	0.31	ND	0.31	0.31	0.43	1.77
Iron, dissolved	mg/L	0.639		0.0124	0.0131	J	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0364	J	0.0124	0.0144	J	0.0124	0.0342	J	0.0124	0.0282	J	0.0124	0.0124	0.09	0.639
Lead, dissolved	ug/L	6.88		0.07	0.07	ND	0.07	0.062	ND	0.062	0.325	ND	0.062	0.062	ND	0.062	0.2	ND	0.062	0.377		0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	0.853	6.88
Magnesium, dissolved	mg/L	14.5		0.062	13		0.062	13.5		0.062	11.8		0.062	11.9		0.062	12.2		0.062	12.2		0.062	10.6		0.062	11.6		0.062	11	12	15
Manganese, dissolved	ug/L	70.8		0.31	16.7		0.31	17.8		0.31	2.72		0.31	4.65		0.31	36.1		0.31	8.65		0.31	53.1		0.31	7.84		0.31	2.7	24	71
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	4.55	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	5.08		0.62	2.19		0.62	3.53		0.62	0.62		0.62	2.64		0.62	1.87	J	0.62	2.73		0.62	2.68		0.62	2.99		0.62	0.62	2.70	5.08
Phosphorus, dissolved	ug/L	94.8		9.4	21.1	J	9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	62	ND	62	9.4	45	100
Potassium, dissolved	ug/L	595		150	423	J	150	292	J	150	264	J	150	225	J	150	219	J	150	240	J	150	301	J	150	248	J	150	219	312	595
Selenium, dissolved	ug/L	1.8	J	1.5	2.61	J	1.5	1.76	J	1.5	3.84	J	1.5	2.84	J	1.5	3.03	J	1.5	2.09	J	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	2.16	3.84
Silicon, dissolved	ug/L	2630		62	2630		62	2220		62	2090		62	2680		62	2330		62	NA	NA	NA	2350		NA	2510		NA	2090	2430	2680
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	4040		150	2360		150	2460		150	1880		150	2010		150	2060		150	2210		150	2230		150	2110		150	1880	2373	4040
Strontium, dissolved	mg/L	0.249		0.003	0.222		0.003	0.221		0.003	0.214		0.003	0.209		0.003	0.228		0.003	0.22		0.003	0.2		0.003	0.208		0.003	0.20	0.22	0.25
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.318	J	0.31	0.829	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.310	0.5
Tin, dissolved	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium, dissolved	ug/L	93.8		1.5	71.1		1.5	90.7		1.5	64.5		1.5	58.7		1.5	13.8		1.5	44.2		1.5	45.1		1.5	52.5		1.5	14	59	94
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	10.5		1	1	ND	1	2.15	J	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	2.05	J	1.5	2.99	J	1.5	1.0	2.5	10.5
Mercury	ug/L	NA	NA	NA	NA	NA	NA	0.0073		0.001	0.0017		0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0017	0.0045	0.0073

Notes:
MDL: method detection limit
Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.
Statistics: For constituents with no detects, mean, max and min were set to zero
For constituents with some detects, these were included in the calculation of average at half the detection limit.

Rock Creek water quality data summary

MW03-05		October 2003			January 2004			April 2004			July 2004			November 2004			January 2005 Sampling not possible			April 2005			July 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	516		12.4	178		6.2	156		6.2	168		6.2	178		3.1	NA	NA	NA	163		3.1	174		3.1	182		3.1	156	214	516
Aluminum	ug/L	13100		6.2	14	J	6.2	46.4		6.2	434		6.2	62.8		6.2	NA	NA	NA	8.21	J	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	1709	13100
Ammonia-N	mg/L	0.059	J	0.031	0.039	J	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	NA	NA	NA	0.108		0.031	0.031	ND	0.031	0.068	J	0.031	0.031	0.042	0.108
Antimony	ug/L	14		0.31	0.664	J	0.31	1.99		0.31	1.5		0.31	0.607	J	0.31	NA	NA	NA	0.421	J	0.31	0.448	J	0.31	0.31	ND	0.31	0.31	2.5	14
Arsenic	ug/L	94		1.5	93.6		1.5	70.6		1.5	80		1.5	86.7		1.5	NA	NA	NA	73.1		1.5	88.5		1.5	84.7		1.5	70.6	83.9	94
Barium	ug/L	273		0.94	34		0.94	29.5		0.94	34.6		0.94	34		0.94	NA	NA	NA	28.8		0.94	30.4		0.94	31.4		0.94	29	62	273
Beryllium	ug/L	2.08		0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	NA	NA	NA	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	0.317	2.08
Cadmium	ug/L	0.365		0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	NA	NA	NA	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	0.07	0.37
Calcium	mg/L	139		0.31	59.9		0.062	56.4		0.062	57.9		0.031	60.7		0.062	NA	NA	NA	57.5		0.062	59.5		0.062	65.9		0.062	56	70	139
Chloride	mg/L	5.86		0.031	6.21		0.031	3.94		0.031	5.47		0.031	6.7		0.031	NA	NA	NA	5.1		0.031	4.95		0.031	6.03		0.031	3.9	5.5	6.7
Chromium	ug/L	14.3		0.31	1.65		0.31	0.31	ND	0.31	0.31	ND	0.31	1.7		0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	2.30	14.3
Cobalt	ug/L	14.5		1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	NA	NA	NA	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	2.3	14.5
Conductivity	umhos/cm	470		0.477	460		0.477	420		0.477	450		0.477	550		0.477	NA	NA	NA	440		0.477	NA	NA	NA	NA	NA	NA	420	465	550
Copper	ug/L	31.2		0.31	0.31	ND	0.31	0.477	J	0.31	0.557	J	0.31	1.19		0.31	NA	NA	NA	0.536	J	0.31	0.478	J	0.31	0.31	ND	0.31	0.31	4.3	31
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	NA	NA	NA	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.0013
Fluoride	mg/L	0.103		0.031	0.133		0.031	0.105		0.031	0.104		0.031	0.05	J	0.031	NA	NA	NA	0.08	J	0.031	0.077	J	0.031	0.06	J	0.031	0.050	0.089	0.133
Iron	mg/L	30.1		0.0062	0.666		0.0124	0.655		0.0124	1.19		0.0062	0.721		0.0124	NA	NA	NA	0.574		0.0124	0.774		0.0124	0.8		0.0124	0.57	4.4	30
Lead	ug/L	56.4		0.07	0.07	ND	0.07	0.543		0.07	1.08		0.062	0.431		0.062	NA	NA	NA	0.226		0.062	0.062	ND	0.062	0.099	J	0.062	0.06	7.4	56
Magnesium	mg/L	37.2		0.031	26.7		0.062	23.6		0.062	25.5		0.031	26.9		0.062	NA	NA	NA	25.5		0.062	25.3		0.062	29.1		0.062	24	27	37
Manganese	ug/L	593		0.31	27.1		0.31	29.2		0.31	42.6		0.31	28		0.31	NA	NA	NA	23		0.31	33.1		0.31	23		0.31	23	100	593
Molybdenum	ug/L	3.83	J	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	NA	NA	NA	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.1	3.8
Nickel	ug/L	130		0.62	0.62	ND	0.62	2.87		0.62	3.23		0.62	2.41		0.62	NA	NA	NA	1.73	J	0.62	1.56	J	0.62	1.84	J	0.62	0.62	18	130
pH	pH units	7.8		0.1	7.6		0.1	7.8		0.1	7.48		0.1	7.54		0.1	NA	NA	NA	7.8		0.1	NA	NA	NA	NA	NA	NA	7.5	7.7	7.8
Phosphorus	ug/L	845		9.4	9.4	ND	9.4	9.4	ND	9.4	62	ND	62	62	ND	62	NA	NA	NA	62	ND	62	62	ND	62	62	ND	62	9.4	126	845
Potassium	ug/L	5710		150	599		150	711		150	693		150	596		150	NA	NA	NA	623		150	670		150	532		150	532	1267	5710
Selenium	ug/L	1.5	ND	1.5	1.64	J	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	NA	NA	NA	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	1.5	1.6
Silicon	ug/L	22300		62	3090		62	2990		62	4010		62	3810		62	NA	NA	NA	2910		62	3450		62	3550		62	2910	5764	22300
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.16
Sodium	ug/L	20700		150	5460		150	4310		150	5090		150	6220		150	NA	NA	NA	5090		150	4770		150	5810		150	4310	7181	20700
Strontium	mg/L	0.559		0.0015	0.262		0.003	0.244		0.003	0.262		0.0015	0.262		0.003	NA	NA	NA	0.244		0.003	0.25		0.003	0.288		0.003	0.244	0.296	0.559
Sulfate	mg/L	79.6		0.062	78.5		0.062	80.4		0.062	87		0.062	90.7		0.31	NA	NA	NA	85.7		0.31	79.2		0.31	92.2		0.31	79	84	92
Sulfide	mg/L	0.6		0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	NA	NA	NA	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.10	0.12	0.60
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.16
Tin	ug/L	2	ND	2	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.47	1.00
Titanium	ug/L	221		1.5	77.9		1.5	50.2		1.5	89.7		1.5	69.5		1.5	NA	NA	NA	55.8		1.5	98.9		1.5	94.9		1.5	50	95	221
Total Dissolved Solids	mg/L	304		16	320		16	266		3.1	334		3.1	294		3.1	NA	NA	NA	282		3.1	304		3.1	314		3.1	266	302	334
Total Nitrate/Nitrite	mg/L	0.31	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1.41		0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.0535	J	0.31	0.31	0.32	1.41
Total Suspended Solids	mg/L	552		8	3.3		0.4	2.7		0.15	14.7		0.214	4.1		0.15	NA	NA	NA	1.3		0.15	1.3		0.15	1.9		0.15	1.3	73	552
Vanadium	ug/L	16.1	J	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	NA	NA	NA	6.2	ND	6.2		ND	6.2		ND	6.2	6.2	6.2	16.1
Weak Acid Dissociable CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	NA	NA	NA	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.00125
Zinc	ug/L	96.7		1	1	ND	1	1	ND	1	9.11		1.5	1.5	ND	1.5	NA	NA	NA	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.0	14	97
Aluminum, dissolved	ug/L	6.2	ND	6.2	84.3		6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	NA	NA	NA	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	13	84
Antimony, dissolved	ug/L	45.4		0.31	2.9		0.31	1.94		0.31	0.79	J	0.31	0.476	J	0.31	NA	NA	NA	0.395	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	6.5	45
Arsenic, dissolved	ug/L	33		1.5	95.2		1.5	67		1.5	67		1.5	83.7		1.5	NA	NA	NA	71		1.5	81.1		1.5	85.8		1.5	33	73	95
Barium, dissolved	ug/L	38		0.94	36.7		0.94	28.3		0.94	29.1		0.94	31.1		0.94	NA	NA	NA	29		0.94	27		0.94	34.7		0.94	27	32	38
Beryllium, dissolved	ug/L	0.13	ND	0.13	1.86		0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	NA	NA	NA	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	0.29	1.86
Cadmium, dissolved	ug/L	0.05	ND	0.05	1.63		0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	NA	NA	NA	0.05	ND	0.05	0.05	ND	0.05	0.12	J	0.05	0.05	0.24	1.63
Calcium, dissolved	mg/L	55.2		0.062	60.6		0.062	62		0.62	59.4		0.062	60		0.062	NA	NA	NA	56.5		0.062	60.4		0.062	65.1		0.062	55	60	65
Chromium, dissolved	ug/L	0.31	ND	0.31	2.6		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.46	2.60
Cobalt, dissolved	ug/L	1.34	J	1.2	1.91	J	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	NA	NA	NA	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.20	1.20	1.91
Copper, dissolved	ug/L	1.07		0.31	1.58		0.31	0.592	J	0.31	0.31	ND	0.31	0.651	J	0.31	NA	NA	NA	0.712	J	0.31	0.361	J	0.31	0.446	J	0.31	0.31	0.70	1.58
Iron, dissolved	mg/L	0.0124	ND	0.0124	0.653		0.0124	0.619		0.0124	0.518		0.0124	0.637		0.0124	NA	NA	NA	0.537		0.0124	0.749		0.0124	0.714		0.0124	0.012	0.554	0.749
Lead, dissolved	ug/L	0.07	ND	0.07	1.93		0.07	0.163	J	0.07	0.062	ND	0.062	0.062	ND	0.062	NA	NA	NA	0.064	J	0.062	0.062	ND	0.062	0.062	ND	0.062	0.06	0.29	1.93
Magnesium, dissolved	mg/L	24.8		0.062	27.1		0.062	27.2		0.62	26.1		0.062	26.6		0.062	NA	NA	NA	25.2		0.062	25.7		0.062	28.8		0.062	25	26	29
Manganese, dissolved	ug/L	54.2		0.31	35.8		0.31	27.2		0.31	28.6		0.31	23.9		0.31	NA	NA	NA	22.9		0.31	28.6		0.31	24.3		0.31	23	31	54
Molybdenum, dissolved	ug/L	3.1	ND	3.1	4.11	J	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	NA	NA	NA	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.1	4.1
Nickel, dissolved	ug/L	25.7		0.62	0.62	ND	0.62	2.84		0.62	2.17		0.62	1.84	J	0.62	NA	NA	NA	1.77	J	0.62	1.83	J	0.62	1.88		0.62	0.62	4.8	26
Phosphorus, dissolved	ug/L	15.6	J	9.4	37.9		9.4	16.9	J	9.4	62	ND	62	62	ND	62	NA	NA	NA	62	ND	62	62	ND	62	62	ND	62	9.4	28	38
Potassium, dissolved	ug/L	1290		150	713		150	722		150	585		150	540		150	NA	NA	NA	620		150	586		150	561		150	540	702	1290
Selenium, dissolved	ug/L	1.5	ND	1.5	4.21	J	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	NA	NA	NA	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.50	1.50	4.21
Silicon, dissolved	ug/L	3180		62	3120		62	2950		62	3050		62	3550		62	NA	NA	NA	2920		62	3110		62	3460		62	2920	3168	3550
Silver, dissolved	ug/L	0.31	ND	0.31	0.444	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.44
Sodium, dissolved	ug/L	11200		150	6130		150	4400		150	5170		150	6360		150	NA	NA	NA	5130		150	4590		150	6000		150	4400	6123	11200
Strontium, dissolved	mg/L	0.255		0.003	0.266		0.003	0.254		0.003	0.262		0.003	0.259		0.003	NA	NA	NA	0.239		0.003	0.255		0.003	0.276		0.003	0.24	0.26	0.28
Thallium, dissolved	ug/L	0.31	ND	0.31	2.82		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.49	2.82
Tin, dissolved	ug/L	2	ND	2	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.47	1.00
Titanium, dissolved	ug/L	74.9		1.5	79.1		1.5	50.9		1.5	86.5		1.5	27		1.5	NA	NA	NA	51.2		1.5	46.3		1.5	52		1.5	27	58	87
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	NA	NA	NA	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	6.2	3.1
Zinc, dissolved	ug/L	2.35		1	26.1		1	4.14		1	1.71	J	1.5	1.5	ND	1.5	NA	NA	NA	1.5	ND	1.5	2.14	J	1.5	1.88	J	1.5	1.00	5.0	26
Mercury	ug/L	NA	NA	NA	NA	NA	NA	0.001	ND	0.001	0.0012		0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0010	0.0010	0.0012

Notes:
MDL: method detection limit
Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.
Statistics: For constituents with some detects, these were included in the calculation of average at half the detection limit.
For constituents with some no detects, these were included in the calculation of average at half the detection limit.

Rock Creek water quality data summary

MW03-06		October 2003			January 2004			April 2004			July 2004			November 2004			January 2005 Sampling not possible			April 2005			July 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	120		6.2	116		12.4	124		6.2	106		3.1	116		3.1	NA	NA	NA	126		3.1	126		3.1	105		3.1	105	117	126
Aluminum	ug/L	23900		6.2	5020		31	6300		62	4910		6.2	2030		6.2	NA	NA	NA	2580		6.2	6.2	ND	6.2	608		6.2	6.2	5669	23900
Ammonia-N	mg/L	0.655		0.155	0.516		0.031	0.031	ND	0.031	0.031	ND	0.031	0.037	J	0.031	NA	NA	NA	0.074	J	0.031	0.031	ND	0.031	0.031	ND	0.031	0.03	0.17	0.66
Antimony	ug/L	3.71		0.31	3.46		0.31	4.19		0.31	2.88		0.31	2.32		0.31	NA	NA	NA	1.89		0.31	0.904	J	0.31	1.1		0.31	0.90	2.56	4.19
Arsenic	ug/L	494		1.5	355		1.5	402		1.5	308		1.5	134		1.5	NA	NA	NA	163		1.5	12.9		1.5	37.8		1.5	13	238	494
Barium	ug/L	290		0.94	115		0.94	80.9		0.94	43.9		0.94	23.8		0.94	NA	NA	NA	28.6		0.94	6.22		0.94	11.6		0.94	6.2	75	290
Beryllium	ug/L	1.57		0.13	0.926		0.13	0.47		0.13	0.31	J	0.13	0.364	J	0.13	NA	NA	NA	0.13	ND	0.13	0.13	ND	0.13	0.176	J	0.13	0.13	0.49	1.57
Cadmium	ug/L	1.2		0.05	0.809		0.05	0.418	J	0.05	0.21	J	0.05	0.246	J	0.05	NA	NA	NA	0.05	ND	0.05	0.05	ND	0.05	0.173	J	0.05	0.05	0.39	1.20
Calcium	mg/L	46.1		0.031	49.2		0.31	52.8		0.31	40.1		0.031	44.7		0.031	NA	NA	NA	45.8		0.031	43.6		0.031	40.9		0.031	40	45	53
Chloride	mg/L	2.53		0.031	2.58		0.031	2.9		0.031	2.59		0.031	2.66		0.031	NA	NA	NA	2.71		0.031	2.28		0.031	2.95		0.031	2.28	2.65	2.95
Chromium	ug/L	37.2		0.31	7.26		0.31	18.1		0.31	8.96		0.31	3.57		0.31	NA	NA	NA	3.46		0.31	0.31	ND	0.31	1.04		0.31	0.31	9.97	37.2
Cobalt	ug/L	28.8		1.2	23.4		1.2	13.2		1.2	7.06		1.2	2.82	J	1.2	NA	NA	NA	2.99	J	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	9.9	28.8
Conductivity	umhos/cm	260		0.477	280		0.477	300		0.477	270		0.477	260		0.477	NA	NA	NA	310		0.477	NA	NA	NA	NA	NA	NA	260	280	310
Copper	ug/L	77.1		0.31	35.7		0.31	33.5		0.31	15.5		0.31	6.79		0.31	NA	NA	NA	6.23		0.31	0.417	J	0.31	1.52		0.31	0.4	22	77
Cyanide	mg/L	NA	NA	NA	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.003	J	0.0025	NA	NA	NA	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.0030
Fluoride	mg/L	0.046	J	0.031	0.067	J	0.031	0.048	J	0.031	0.046	J	0.031	0.05	J	0.031	NA	NA	NA	0.032	J	0.031	0.033	J	0.031	0.051	J	0.031	0.032	0.047	0.067
Iron	mg/L	47.4		0.0062	17.5		0.062	23.6		0.062	17.4		0.0062	6.09		0.0062	NA	NA	NA	6.51		0.0062	0.041		0.0062	1.63		0.0062	0.041	15	47
Lead	ug/L	46.8		0.07	24.1		0.07	18.3		0.062	10.2		0.062	4.02		0.062	NA	NA	NA	4.06		0.062	0.062	ND	0.062	1.16		0.062	0.062	14	47
Magnesium	mg/L	16.1		0.031	11.8		0.031	14.6		0.31	10.8		0.031	10.8		0.031	NA	NA	NA	11.6		0.031	9.69		0.031	9.12		0.031	9	12	16
Manganese	ug/L	349		0.31	495		0.31	202		0.31	160		0.31	64.7		0.31	NA	NA	NA	55.7		0.31	0.84	J	0.31	16.1		0.31	0.84	168	495
Molybdenum	ug/L	3.1	ND	3.1	3.1	ND	3.1	6.14	J	3.1	3.1	ND	3.1	3.1	ND	3.1	NA	NA	NA	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.1	6.1
Nickel	ug/L	69.2		0.62	36.9		0.62	35.3		0.62	18.9		0.62	8.17		0.62	NA	NA	NA	8.83		0.62	1.6	J	0.62	3.17		0.62	1.6	23	69
pH	pH units	7.3		0.1	7.2		0.1	7.2		0.1	6.96		0.1	7.5		0.1	NA	NA	NA	7.4		0.1	NA	NA	NA	NA	NA	NA	7.0	7.3	7.5
Phosphorus	ug/L	675		9.4	420		9.4	348		62	266		62	88.3	J	62	NA	NA	NA	157	J	62	62	ND	62	62	ND	62	9.4	252	675
Potassium	ug/L	1150		150	675		150	917		150	740		150	597		150	NA	NA	NA	669		150	332	J	150	325	J	150	325	676	1150
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	3.06	J	1.5	1.5	ND	1.5	1.5	ND	1.5	NA	NA	NA	2.09	J	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	1.5	3.1
Silicon	ug/L	26700		62	7230		310	6240		620	7090		62	4700		62	NA	NA	NA	5170		62	3130		62	3590		62	3130	7981	26700
Silver	ug/L	0.389	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.39
Sodium	ug/L	3240		150	2510		150	2660		150	2310		150	2150		150	NA	NA	NA	2230		150	2230		150	1900		150	1900	2404	3240
Strontium	mg/L	0.136		0.0015	0.14		0.0015	0.146		0.015	0.109		0.0015	0.121		0.0015	NA	NA	NA	0.124		0.0015	0.117		0.0015	0.11		0.0015	0.109	0.125	0.146
Sulfate	mg/L	32.6		0.031	42		0.031	46.8		0.031	27.9		0.031	31.3		0.031	NA	NA	NA	45.7		0.031	24.8		0.031	27.2		0.031	25	35	47
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	NA	NA	NA	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.10	0.10	0.05
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.958	J	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.96
Tin	ug/L	2	ND	2	2	ND	2	1.43		0.31	0.31	ND	0.31	0.388	J	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.694	J	0.31	0.31	0.62	1.4
Titanium	ug/L	173		1.5	114		1.5	141		1.5	86.6		1.5	73.5		1.5	NA	NA	NA	99.9		1.5	64.7		1.5	48.7		1.5	49	100	173
Total Dissolved Solids	mg/L	188		16	213		16	216		3.1	175		3.1	181		3.1	NA	NA	NA	148		3.1	181		3.1	139		3.1	139	180	216
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	1.71		0.31	0.31	ND	0.31	0.62	ND	0.62	0.41	J	0.31	NA	NA	NA	0.31	ND	0.31	0.052	J	0.31	0.1		0.31	0.31	0.38	1.71
Total Suspended Solids	mg/L	1780		16	2260		20	660		3	315		1.5	81		0.75	NA	NA	NA	198		0.6	1		0.6	27.1		0.6	1.0	665	2260
WAD CN	ug/L	65.2		6.2	17.9	J	6.2	20.8		6.2	9.83	J	6.2	6.2	ND	6.2	NA	NA	NA	6.2	ND	6.2	NA	NA	NA	NA	NA	NA	6.2	20	65
Weak Acid Dissociable CN	mg/L	NA	NA	NA	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.003	J	0.0025	NA	NA	NA	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.003
Zinc	ug/L	105		1	46.8		1	55.9		1.5	31.4		1.5	15.9		1.5	NA	NA	NA	13.3		1.5	1.5	ND	1.5	2.85	J	1.5	1.0	34	105
Aluminum, dissolved	ug/L	8.54	J	6.2	8.44	J	6.2	13.5	J	6.2	6.2	ND	6.2	7.53	J	6.2	NA	NA	NA	6.38	J	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	6.7	14
Antimony, dissolved	ug/L	4.9		0.31	1.35		0.31	1.07		0.31	0.506	J	0.31	1.33		0.31	NA	NA	NA	0.727	J	0.31	0.734	J	0.31	0.575	J	0.31	0.51	1.40	4.90
Arsenic, dissolved	ug/L	9.61		1.5	19.8		1.5	9.91		1.5	4.9	J	1.5	11.1		1.5	NA	NA	NA	8.9		1.5	11.3		1.5	7.8		1.5	5	10	20
Barium, dissolved	ug/L	25.1		0.94	8.5		0.94	9.4		0.94	3.42		0.94	7.33		0.94	NA	NA	NA	6.9		0.94	5.52		0.94	6.03		0.94	3.4	9	25
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	NA	NA	NA	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.130	0.130	0.065
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.117	J	0.05	0.05	ND	0.05	0.05	ND	0.05	NA	NA	NA	0.05	ND	0.05	0.05	ND	0.05	0.06	J	0.05	0.05	0.050	0.12
Calcium, dissolved	mg/L	41.1		0.062	41.8		0.62	50		0.62	40.9		0.062	45.5		0.062	NA	NA	NA	48.7		0.062	44		0.062	40.5		0.062	41	44	50
Chromium, dissolved	ug/L	5	ND	5	1.43		0.31	0.31	ND	0.31	0.31	ND	0.31	1.37		0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.76	2.5
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	NA	NA	NA	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	1.2	0.6
Copper, dissolved	ug/L	0.89	J	0.31	1.2		0.31	0.624	J	0.31	0.31	ND	0.31	0.605	J	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.3	0.5	1.2
Iron, dissolved	mg/L	0.0124	ND	0.0124	0.0124	ND	0.0124	0.014	J	0.0124	0.0124	ND	0.0124	0.0374	J	0.0124	NA	NA	NA	0.0161	J	0.0124	0.0124	ND	0.0124	0.0198		0.0124	0.012	0.014	0.037
Lead, dissolved	ug/L	0.07	ND	0.07	0.07	ND	0.07	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	NA	NA	NA	0.092	J	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	0.062	0.092
Magnesium, dissolved	mg/L	9.27		0.062	10		0.062	11.8		0.062	9.55		0.062	10.4		0.062	NA	NA	NA	11.5		0.062	9.77		0.062	8.96		0.062	9	10	12
Manganese, dissolved	ug/L	56.2		0.31	115		0.31	21.7		0.31	2.29		0.31	15.9		0.31	NA	NA	NA	1.52		0.31	0.31	ND	0.31	1.93		0.31	0.31	27	115
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	NA	NA	NA	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.1	1.6
Nickel, dissolved	ug/L	1.22	J	0.62	1.71	J	0.62	2.39		0.62	0.62	ND	0.62	2		0.62	NA	NA	NA	1.77	J	0.62	1.71	J	0.62	1.83	J	0.62	0.62	1.62	2.39
Phosphorus, dissolved	ug/L	30.1		9.4	40.3		9.4	62	ND	62	62	ND	62	62	ND	62	NA	NA	NA	62	ND	62	62	ND	62	62	ND	62	9	32	40
Potassium, dissolved	ug/L	369	J	150	214	J	150	253	J	150	150	ND	150	255	J	150	NA	NA	NA	238	J	150	294	J	150	263	J	150	150	245	369
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	NA	NA	NA	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	1.50	0.75
Silicon, dissolved	ug/L	2100		62	1900		62	2320		62	963		62	2280		62	NA	NA	NA	2070		62	2780		62	2640		62	963	2132	2780
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.16
Sodium, dissolved	ug/L	2680		150	2190		150	2660		150	1370		150	2030		150	NA	NA	NA	2140		150	2170		150	1900		150	1370	2143	2680
Strontium, dissolved	mg/L	0.107		0.003	0.113		0.003	0.127		0.003	0.105		0.003	0.12		0.003	NA	NA	NA	0.126		0.003	0.119		0.003	0.108		0.003	0.105	0.116	0.127
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.16
Tin, dissolved	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	NA	NA	NA	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.37	1.00
Titanium, dissolved	ug/L	39.1		1.5	45.4		1.5	52.4		1.5	25.6		1.5	25.1		1.5	NA	NA	NA	41		1.5	47.3		1.5	33.2		1.5	25.1	38.64	52.4
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	NA	NA	NA	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	6.2	3.1
Zinc, dissolved	ug/L	3.67		1	1	ND	1	2.57	J	1.5	1.5	ND	1.5	1.5	ND	1.5	NA	NA	NA	1.5	ND	1.5	2.23	J	1.5	1.68	J	1.5	1.00	1.61	3.67
Mercury	ug/L	NA	NA	NA	0.0768		0.001	0.0053		1	0.0097		0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0053	0.0306	0.0768

Notes:

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with some detects, these were included in the calculation of average at half the detection limit.

For constituents with some no detects, these were included in the calculation of average at half the detection limit.

Rock Creek water quality data summary

MW03-07		October 2003			January 2004			April 2004			July 2004			November 2004			January 2005			April 2005			July 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	216		5.17	212		6.2	210		6.2	219		6.2	220		3.1	222		3.1	218		3.1	229		3.1	210	217	222
Aluminum	ug/L	282		6.2	355		6.2	110		6.2	15.4	J	6.2	17.8	J	6.2	45.5		6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	104	355
Ammonia-N	mg/L	0.167		0.031	0.18		0.031	0.157		0.031	0.133		0.031	0.135		0.031	0.1	ND	0.031	0.083	J	0.031	0.147		0.031	0.03	0.12	0.18
Antimony	ug/L	4.67		0.31	5.22		0.31	4.87		0.31	2.82		0.31	3.97		0.31	3.18		0.31	1.99		0.31	2.61		0.31	2.0	3.6	5.2
Arsenic	ug/L	495		1.5	527		1.5	541		1.5	534		1.5	521		1.5	452		1.5	461		1.5	485		1.5	452	499	541
Barium	ug/L	30		0.94	34.3		0.94	32.1		0.94	27		0.94	28.2		0.94	24.5		0.94	25		0.94	25.5		0.94	25	28	34
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	<0.13	<0.13	<0.13
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.117	J	0.05	0.05	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	0.06	0.25
Calcium	mg/L	61.2		0.031	66		0.31	62.4		0.031	63.4		0.062	66.1		0.062	67		0.062	65.8		0.062	67.6		0.062	61	65	67
Chloride	mg/L	3.19		0.031	20.6		0.031	7.18		0.031	4.71		0.031	3.59		0.031	3.52		0.031	3.43		0.031	3.13		0.031	3.2	6.2	21
Chromium	ug/L	0.31	ND	0.31	0.793	J	0.31	0.921	J	0.31	0.31		0.31	2.72		0.31	1.64		0.31	0.913	J	0.31	0.31	ND	0.31	0.3	1.0	2.7
Cobalt	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	<1.2	<1.2	<1.2
Conductivity	umhos/cm	410		0.477	490		0.477	420		0.477	400		0.477	440		0.477	430		0.477	390		0.477	NA	NA	NA	390	421	490
Copper	ug/L	0.31	ND	0.31	0.872	J	0.31	1.26		0.31	0.409	J	0.31	0.506	J	0.31	0.314	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.48	1.26
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.097	J	0.031	0.11		0.031	0.102		0.031	0.096	J	0.031	0.048	J	0.031	0.083	J	0.031	0.081	J	0.031	0.105		0.031	0.05	0.09	0.11
Iron	mg/L	1.4		0.0062	0.922		0.0062	1.03		0.0062	0.742		0.0124	0.749		0.0124	0.979		0.0124	0.721		0.0124	0.68		0.0124	0.72	0.91	1.40
Lead	ug/L	1.24		0.07	0.43		0.07	0.446		0.062	0.324		0.062	0.229		0.062	0.302		0.062	0.321		0.062	0.062	ND	0.062	0.06	0.45	1.24
Magnesium	mg/L	16.4		0.031	18.3		0.031	16.5		0.031	16.7		0.062	17.9		0.062	19.3		0.062	17.9		0.062	18.1		0.062	16	18	19
Manganese	ug/L	67.4		0.31	76.3		0.31	66.1		0.31	65.5		0.31	59.1		0.31	52.4		0.31	51.1		0.31	60.8		0.31	51	61	76
Molybdenum	ug/L	3.1	ND	3.1	3.1	ND	3.1	6.49	J	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	3.1	6.5
Nickel	ug/L	2.75		0.62	2.92		0.62	2.9		0.62	1.06		0.62	2.42		0.62	1.27	J	0.62	1.7	J	0.62	1.4	J	0.62	1.1	2.1	2.9
pH	pH units	7.5		0.1	7.5		0.1	NA	NA	NA	7.22		0.1	7.19		0.1	7.53		0.1	7.5		0.1	NA	NA	NA	7.2	7.4	7.5
Phosphorus	ug/L	12.5	J	9.4	9.4	ND	9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	9.4	34	100
Potassium	ug/L	920		150	980		150	932		150	877		150	834		150	763		150	728		150	928		150	728	845	980
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.9	J	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	1.5	2.5
Silicon	ug/L	4460		62	5100		62	4790		62	3810		62	4540		62	3460		62	3440		62	4270		62	3440	4130	5100
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	3720		150	20800		150	3910		150	3460		150	2710		150	2390		150	2230		150	2560		150	2230	5181	20800
Strontium	mg/L	0.248		0.0015	0.295		0.0015	0.291		0.0015	0.259		0.003	0.268		0.003	0.299		0.003	0.266		0.003	0.278		0.003	0.25	0.27	0.30
Sulfate	mg/L	18		0.031	18.8		0.031	18.8		0.031	19.5		0.031	21.6		0.031	20.7		0.062	21.4		0.031	18.4		0.031	18	20	22
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	<0.1	<0.1	<0.1
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.511	J	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.51
Tin	ug/L	2	ND	2	2	ND	2	1.49		0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.58	1.49
Titanium	ug/L	91.9		1.5	86.4		1.5	81.4		1.5	44.2		1.5	69.7		1.5	14		1.5	38.4		1.5	108		1.5	14	58	92
Total Dissolved Solids	mg/L	254		16	265		16	255		3.1	208		3.1	248		3.1	250		3.1	241		3.1	251		3.1	208	245	265
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Total Suspended Solids	mg/L	24.8		0.8	9.1		0.4	5.7		0.15	4.53		0.158	7		0.15	7		0.15	1.6		0.15	1.4		0.15	1.6	8	25
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
WAD CN	mg/L	0.00305	J	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.005	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.0031
Zinc	ug/L	30	ND	30	3.04		1	3.47	J	1.5	1.5	J	1.5	1.86	J	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.0	3.6	15
Aluminum, dissolved	ug/L	46.4		6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	9.4	46
Antimony, dissolved	ug/L	1.63		0.31	2.02		0.31	2.79		0.31	3.29		0.31	4.13		0.31	4.23		0.31	2.5		0.31	2.35		0.31	1.6	2.9	4.2
Arsenic, dissolved	ug/L	497		1.5	497		1.5	515		1.5	530		1.5	511		1.5	482		1.5	493		1.5	454		1.5	482	502	530
Barium, dissolved	ug/L	29.5		0.94	26.1		0.94	28.7		0.94	26.8		0.94	26.4		0.94	25.3		0.94	27.4		0.94	22.7		0.94	25.3	27	29.5
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.4	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.5	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	<0.05	<0.05	<0.05
Calcium, dissolved	mg/L	66.3		0.062	63.3		0.062	65.4		0.062	62.3		0.62	65.4		0.062	66.8		0.062	64		0.062	67.6		0.062	62	65	67
Chromium, dissolved	ug/L	0.31	ND	0.31	4.72		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1.68		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.92	4.72
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	4	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	0.323	J	0.31	0.806	J	0.31	0.35	J	0.31	0.639	J	0.31	0.735	J	0.31	1	ND	0.31	0.31	ND	0.31	6.26		0.31	0.31	0.46	0.81
Iron, dissolved	mg/L	0.921		0.0124	0.679		0.0124	0.697		0.0124	0.683		0.0124	0.694		0.0124	0.755		0.0124	0.723		0.0124	0.657		0.0124	0.68	0.73	0.92
Lead, dissolved	ug/L	1.13		0.07	0.07	ND	0.07	0.062	ND	0.062	0.129	J	0.062	0.069	J	0.062	0.2	ND	0.062	0.323		0.062	0.062	ND	0.062	0.062	0.268	1.13
Magnesium, dissolved	mg/L	17.5		0.062	16.9		0.062	17.3		0.062	16.3		0.62	17.7		0.062	19.2		0.062	17.7		0.062	18.2		0.062	16	18	19
Manganese, dissolved	ug/L	65.8		0.31	56.8		0.31	59.6		0.31	65.2		0.31	57.6		0.31	54		0.31	56.8		0.31	52		0.31	54	59	66
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	10	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	2.73		0.62	1.88	J	0.62	2.3		0.62	1.18	J	0.62	1.99	J	0.62	1.28	J	0.62	1.85	J	0.62	2.21		0.62	1.18	1.88	2.73
Phosphorus, dissolved	ug/L	10.7	J	9.4	14.6	J	9.4	62	ND	62	62	ND	62	62	ND	62	200	ND	62	62	ND	62	62	ND	62	9.4	35	100
Potassium, dissolved	ug/L	885		150	763		150	1370		150	898		150	835		150	794		150	797		150	832		150	763	892	1370
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	3970		62	3950		62	4530		62	3870		62	4360		62	4020		62	NA	NA	NA	4230		NA	3870	4117	4530
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	3540		150	16400		150	4670		150	3450		150	2760		150	2520		150	2500		150	2390		150	2500	4793	16400
Strontium, dissolved	mg/L	0.269		0.003	0.26		0.003	0.302		0.003	0.263		0.003	0.266		0.003	0.3		0.003	0.274		0.003	0.279		0.003	0.26	0.276	0.302
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	2	ND	2	2	ND	2	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<2	<2	<2
Titanium, dissolved	ug/L	71.1		1.5	68.6		1.5	67.3		1.5	47.5		1.5	22.3		1.5	13.6		1.5	43.5		1.5	49.7		1.5	14	47	71
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	20	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	4.66		1	1	ND	1	7.02		1.5	1.8	J	1.5	3.56	J	1.5	2.71	J	1.5	1.5	ND	1.5	6.72		1.5	1.0	2.7	7.0
Mercury	ug/L	NA	NA	NA	0.001	ND	0.001	0.001	ND	0.001	0.001	ND	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0010	0.0010	0.0005

Notes:
MDL: method detection limit
Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.
Statistics: For constituents with no detects, mean, max and min were set to zero
For constituents with some detects, these were included in the calculation of average at half the detection limit.

Note: updated 8-15-06 with Tables 6a and 6b

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007
www.watermc.com

To: Doug Nicholson (doug.nicholson@novagold.net)

Company: NovaGold Resources Inc.

Project No.: 2509

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date: May 26, 2006

Subject: Rock Creek Project – Preliminary Materials Geochemical Testing Update

1 BACKGROUND

Geochemical testing for the Rock Creek project was conducted in two phases. Results from Phase I geochemical testing, completed in April 2004, provided the basis for an initial characterization of development and ore rock. The results also helped define the needs for Phase II geochemical testing. Confirmatory acid-base accounting sampling and analysis was completed in the first quarter of 2006 at the request of Alaska Division of Natural Resources (DNR). The compiled results of the three testing phases were interpreted as necessary for mine permitting support, mine-feasibility studies, operational decision making (e.g., selective handling), construction material selection, and preliminary closure-study support.

The specific objective of the Phase I program was to conduct static testing on representative development rock and ore samples. The number of test samples were based on the relative tonnage of each material type that was predicted to be excavated from the mine, in accordance with the most recent block model results. Development rock and ore were classified and tested according to rock type.

The specific objectives of Phase II testing were to conduct kinetic testing and systematic static testing and to fill in data gaps based on the Phase I results. Phase II sampling was completed in the third quarter of 2005.

The specific objective of the confirmatory sampling was to define the different sources of neutralizing potential present in the Rock Creek and Big Hurrah development rock and ore. This was completed in March 2006.

2 GEOCHEMICAL SAMPLING AND ANALYSIS

The State DEC approved, geochemical sampling and analysis plan (SAP, WMC 2003) proposed sampling based on tonnages and rock types summarized in Table 1, with a total of 59 million tons (Mt) of excavated rock mass. Based on the percentages, which were provided by NovaGold, the focus of the sampling and analysis was on quartz-muscovite schist (QMS), calcareous quartz-muscovite schist (CQMS), and graphitic quartz-muscovite schist (GQMS). The number of samples for the Phase I work was based on a minimum of one sample per 5 Mt of materials (MEND, 1994), and in most cases exceeded this guideline.

Table 1 Rock Creek Project rock types, tonnages, and number of Phase I samples

	Abbreviation	Percent	Rock mass (Mt)	Number of samples	Samples/ 5 Mt of material
Development rock					
Overburden/Soils	OVB	na	Na	2	na
Quartz-muscovite schist	QMS	28%	13.4	5	3
Graphitic quartz-muscovite schist	GQMS	25%	12.0	5	2
Calcareous quartz-muscovite schist	CQMS	27%	13.0	5	3
Calcareous schist	CS	12%	5.8	2	3
Quartzitic graphite schist	QGS	7%	3.4	2	2
Total development rock		**99%**	**48**	**21**	**2**
Ore					
Overburden/Soils	OVB	na	Na	1	na
Quartz-muscovite schist	QMS	28%	3.1	1	3
Graphitic quartz -muscovite schist	GQMS	25%	2.8	1	3
Calcareous quartz-muscovite schist	CQMS	27%	3.0	1	3
Calcareous schist	CS	11%	1.2	1	1
Quartzitic graphite schist	QGS	7%	0.8	1	1
Total ore		**98%**	**11**	**6**	**2**
Total for ore and development rock			**59**	**27**	**2**

Phase I testing was conducted in two parts. Archived pulp samples from previous drilling and testing programs were available. Bulk chemistry (ICP/MS – ion-coupled plasma/mass spectrometry) of the pulps had already been completed, samples were of an appropriate grain size, and they provided statistically representative coverage of the development and ore material. Borehole locations and intervals were selected to provide a spatially representative set of samples. Therefore, pulps were used for ABA and x-ray diffraction (XRD) analysis. The second part included meteoric water mobility procedures (MWMP) testing and required whole core. These core samples were available only from the ongoing drilling program. MWMP tests were accompanied by ABA, XRD, and ICP/MS testing to allow correlating results to the tests conducted on the pulp materials. Each rock type was represented in MWMP testing. The extent to which these samples are representative of the rock body is described in the results section of this document.

Phase II testing included HCTs on selected, representative samples of ore, development rock, and tailings. HCT samples were split and analyzed for detailed mineralogy, chemistry, and ABA. In addition, NovaGold instigated systematic testing of all reverse-circulation, exploration drill cuttings at 15-ft intervals. ABA analyses allowed complete and systematic coverage of the entire ore body and related development rock. These data were submitted for permitting as well as for operational management of the development rock.

Confirmatory sampling and analysis was conducted to define and quantify the various types of neutralizing potential and to provide additional information on the north portion of the Rock Creek deposit. Samples were collected from each lithology type in approximate proportion to their relative volumes of development rock and ore from each project site. Samples were also collected from diverse areas (spatially) from the deposit. A total of 104 representative samples were selected from five different rock types including CQMS, CS, GQMS, QGS, and QMS. The standard Sobek, siderite-corrected, and total inorganic carbon analytical methods were used for the determination and comparison of (NP) values.

Specific test types and numbers for Phase I were defined as summarized in Tables 2 and 3. Table 2 shows the pulp samples selected for ABA and XRD analysis. Table 3 shows the core samples selected for MWMP testing. These test protocols are described below. These methods provide results that represent field-scale conditions.

Paste pH

Paste-pH values were determined for all samples. Paste-pH data provide a quantitative estimate of the pH of a lixiviant such as rainwater on initial contact with the test sample. Because of the short solid-solution reaction time accommodated by the test, paste-pH data reflect the net acid-generation/consumption potential of readily hydrolyzed mineral phases only. Typically, these include carbonates and sulfosalt weathering products.

Acid-base accounting

Acid-base accounting is an industry-standard procedure for appraising the acid-generation (or acid-consumption) potential of rock and soils. The procedure involves the assessment of two parameters:

- neutralization potential (NP), and
- acid-generation potential (AP).

These parameters are subsequently used to calculate interpretive indices, including net neutralization potential (NNP) and NP:AP ratios.

Neutralizing potential (NP)

Values of NP indicate the capacity of rock materials to buffer acidity produced by sulfide oxidation or other proton-generating reactions. Three analytical methods were used for the determination of NP values for comparison.

The standard Sobek method (Sobek, et al., 1978) is applied to a mixture containing 1-2 grams of crushed rock sample, and a volume of hydrochloric acid (HCl). The solution is heated for 2 hours in order to expel any dissolved carbon dioxide (CO_2) and bring the reaction to completion. A neutralizing potential (NP) is calculated based upon the normality of the acid and base applied, and the mass of the sample.

An alternative method used to determine NP values for confirmatory testing is the peroxide siderite correction for the Sobek method (Skousen, et al., 1997). This method addresses potential erroneously high NP calculations from the above described standard Sobek method due to the presence of siderite or other iron carbonates in the material. For this method, a 2 gram sample is boiled in HCl for 5 minutes, and then filtered. The filtrate is then added to a 30 percent peroxide solution and boiled for 5 minutes to drive the oxidation of ferrous to ferric iron. The solution is then titrated to determine the calcium carbonate equivalent for the acid consumed during the test.

For these methods described above, the results are normalized to a conventional unit of tons $CaCO_3$ (equivalent) per 1,000 tons of rock. The reported results do not necessarily imply that calcite ($CaCO_3$) is present.

Table 2 Rock Creek Phase I geochemical sampling and analysis summary

Sample Number	Dup.*	Origin					Rock type	Au	Quantity	Testing		
		Drill hole	Sample #	Certificate	From	To			(g)	pH	ABA	XRD
1		RKDC03-137	202205	FA03029950	20	22	QMS	<1.0	50	x	x	x
2		RKDC03-127	127040	FA03014787	38	40	QMS	<1.0	50	x	x	x
3		RKDC03-124	124055	FA03014657	53	55	QMS	<1.0	50	x	x	x
4		RKDC03-123	123004	FA03013490	2	4	QMS	<1.0	50	x	x	x
5		RKDC03-119	119047	FA03012243	45	47	QMS	<1.0	50	x	x	x
6	X	RKDC03-119	119047	FA03012243	45	47	QMS	<1.0	50	x	x	x
7		RKDC03-118	118042	FA03012243	40	42	CQMS	<1.0	50	x	x	x
8		RKDC03-129	129087	FA03014651	85	87	CQMS	<1.0	50	x	x	x
9		RKDC03-131	202032	FA03029617	52	54	CQMS	<1.0	50	x	x	x
10		RKDC03-135	202125	FA03029953	13	15	CQMS	<1.0	50	x	x	x
11		RKDC03-137	202235	FA03029951	72	74	CQMS	<1.0	50	x	x	x
12	X	RKDC03-137	202235	FA03029951	72	74	CQMS	<1.0	50	x	x	x
13		RKDC03-117	117015	FA03011671	13	15	GQMS	<1.0	50	x	x	x
14		RKDC03-118	118090	FA03012243	88	90	GQMS	<1.0	50	x	x	x
15		RKDC03-119	119117	FA03012243	115	117	GQMS	<1.0	50	x	x	x
16		RKDC03-120	120036	FA03013491	34	36	GQMS	<1.0	50	x	x	x
17		RKDC03-133	202075	FA03029619	28	30	GQMS	<1.0	50	x	x	x
18		RKDC03-126	126043	FA03014781	41	43	CS	<1.0	50	x	x	x
19		RKDC03-122	122014	FA03013494	12	14	CS	<1.0	50	x	x	x
20		RKDC03-121	121033	FA03013496	31	33	QGS	<1.0	50	x	x	x
21		RKDC03-122	122066	FA03013679	64	66	QGS	<1.0	50	x	x	x
22		RKDC03-117	117001	FA03011671	0	1.46	OVB	<1.0	50	x	x	
23		RKDC03-131	202001	FA03029616	0	2.59	OVB	<1.0	50	x	x	
24		RKDC03-119	119029	FA03012243	27	29	QMS	>1.0	50	x	x	x
25		RKDC03-135	202143	FA03031786	41	43	CQMS	>1.0	50	x	x	x
26		RKDC03-124	124145	FA03013678	143	145	GQMS	>1.0	50	x	x	x
27		RKDC03-126	126035	FA03014781	33	35	CS	>1.0	50	x	x	x
28	X	RKDC03-126	126035	FA03014781	33	35	CS	>1.0	50	x	x	x
29		RKDC03-120	120092	FA03013491	90	92	GS	>1.0	50	x	x	x
30		RKDC03-135	202119	FA03029952	0	2.75	OVB	>1.0	50	x	x	
Total										**30**	**30**	**27**

* Duplicates will be collected from the sample immediately above marked samples.

The NP of the material may also be calculated based on the total inorganic carbon (TIC) content of the sample. TIC content is determined in the laboratory as the difference between the total carbon content and the total organic carbon (TOC) content. Total carbon is measured using the standard LECO furnace method. For TOC determination, inorganic carbon must be removed from the samples by bathing the samples in 2N HCl for 24 hours, followed by rinsing and centrifuging. The sample is then analyzed for TOC using the LECO furnace method. The difference between total carbon and TOC is the TIC content of the material. The NP is calculated based on the TIC, and converted to standard units (i.e., TIC, as percent carbon, is multiplied by a factor of 83.3 to convert to NP, as tons $CaCO_3$ per 1,000 tons of rock).

Table 3 Rock Creek Phase I draft MWMP testing summary

Sample number	Origin			Rock type	Au	Quantity	MWMP
	Drill hole	From	To		(g/T)	(Kg)	
MWMP-1	RKGT03-215	22 m	26 m	QGS	<1.0	7	x
MWMP-2	RKGT03-215	77 m	79 m	QMS	<1.0	7	x
MWMP-3	RKGT03-214	58 m	59.5 m	CS	<1.0	7	x
MWMP-4	RKGT03-214	39.5 m	41.15 m	CQMS	<1.0	7	x
MWMP-5	RKGT03-214	73.15 m	74.7 m	GQMS	<1.0	7	x
MWMP-6	RKAB03-230	15.5 m	16.6 m	CQMS	>1.0	7	x
MWMP-7	RKAB03-230	29.2 m	30.3 m	QGS	>1.0	7	x
MWMP-8	RKAB03-230	37.8 m	38.8 m	QMS	>1.0	7	x
MWMP-9	RKAB03-230	56 m	57 m	GQMS	>1.0	7	x
Total							**9**

Acid-generation potential (AP)

Numerous procedures exist for the determination of AP. All include the analytical derivation of the various forms of sulfur, including total and sulfide-sulfur. For all Rock Creek samples, total sulfur was determined using a LECO induction furnace (EPA method 600). Sulfur speciation was then undertaken following the US-EPA method 600 sequential leach procedure, in which sulfate and sulfide sulfur are differentiated on the basis of their respective solubilities in HCl and HNO_3.

The potential proton yield is calculated in accordance with the stoichiometry of pyrite oxidation. Options for the derivation of AP using an appropriate sulfur value include:

- the assignment of total sulfur within a sample to stoichiometric pyrite;
- the analytical differentiation of sulfide-sulfur from other sulfur species, and assignment of the former to stoichiometric pyrite; and
- the mineralogical determination of pyrite sulfur.

The Sobek (1978) method, involving the use of sulfide-sulfur for AP calculation, is most commonly deployed worldwide and is most appropriate for determination of AP for unweathered rock samples. This procedure can, however, be considered conservative for samples containing a significant component of sulfide-sulfur in non-pyrite phases. For this evaluation, values of AP were calculated using both (a) total sulfur and (b) sulfide-sulfur data. All results were converted to ton equivalents of $CaCO_3$ per 1,000 tons (T $CaCO_3$), using a conventional multiplier of 31.25 (moles of calcite required to neutralize protons liberated by 1 mole of oxidized pyrite).

Meteoric water mobility procedure (MWMP)

MWMP testing was conducted according to Standard Methods (1992). This method is a standard leach procedure involving a 24-hour, single-pass column leach using a 1:1 water to rock ratio. The extraction solution is distilled, de-ionized water. This method provides an indication of the propensity of minerals in the samples to leach under environmental conditions. Leachates from this test are not necessarily representative of long-term environmental exposure, rather they are more indicative of a "first flush" chemistry that results from dissolving the relatively mobile mineral salts. Results from these tests will be used in preliminary characterization of environmental behavior of materials and to define the next phase of geochemical testing of Rock Creek site materials.

X-ray diffraction (XRD)

XRD is used to identify and estimate the quantity of major rock-forming minerals of each sample. This mineralogical data helps verify the mineralogical sources of the key ABA species. For example, carbonate rocks which are in the form of siderite (iron carbonate), will release iron in addition to the buffering carbonate. The type and quantity of mineral phases also influences how the rock will weather in the environment.

ICP/MS

Ion-coupled plasma/mass spectrometry (ICP/MS) testing is a pseudo whole-rock analysis whereby the material to be tested is digested (leached/dissolved) and the liquid is analyzed for elemental content. The degree of digestion depends on the particular method, but it is assumed that the digestion is complete enough to be representative of the bulk rock chemistry.

These analyses have been conducted routinely as part of the metallurgical analytical work, so existing data were available from the pulp samples. ICP/MS was also performed on samples collected for MWMP for the Phase I work.

Humidity cell testing (HCT)

Samples were collected from each of the major development rock lithologies, tailings from metallurgical testing, and an ore composite and submitted for HCTs. HCTs are kinetic tests. That is, they are intended to provide data as a function of time instead of a "snapshot" in time that results from static testing. This information is critical to understanding how materials respond to weathering through time as they are exposed to multiple wetting and drying cycles in the environment. Humidity cells, in particular, are designed to simulate multiple wetting and drying cycles to establish optimal conditions for weathering of the sample. Typically, 1.0 to 1.5 kg of material is placed in a column and undergoes weekly flushing using distilled water at a 1:1 water to rock ratio. The leachate from each week is analyzed for key parameters (volume of leachate recovered, pH, TDS, temperature, sulfate, iron, acidity, alkalinity, and redox potential). Samples are stored and combined into a composite representing four weeks and sent for detailed chemistry. Tests are run a minimum of 20 weeks and are then stopped when parameter concentrations stabilize or indicate negligible weathering is occurring. Data are processed to estimate weathering rates and chemical mass release rates.

Carbonate neutralization depletion time calculations were conducted following the protocol for the interpretation of kinetic tests established by Price (1997). The carbonate molar ratio for each cell was calculated based on average values of calcium, magnesium and sulfate from stabilized kinetic test data. The sulfate production rate was also determined from stabilized kinetic data and used to calculate the rate of acid depletion in the sample. The original sulfide-sulfur content of the material (from ABA testing) was used to represent the initial, total AP of the sample. The rate of acid depletion was used to calculate the remaining AP in the sample, and corresponding time remaining until that AP is theoretically depleted. The rates of neutralization depletion was similarly calculated and compared to the total NP in the sample (based on initial ABA data). These data were used to estimate the remaining NP in the sample, and the corresponding time remaining until that NP is depleted. The NP depletion time was then compared to the AP depletion time to predict whether the sample will generate acid or be neutralizing over the long term.

Detailed mineralogy

Splits from the HCT samples were submitted for detailed mineralogy and ABA to allow more thorough interpretation of the kinetic test results in context with a clear understanding of the samples' acid generation or neutralizing potential and their mineralogy. Detailed mineralogy includes doing optical characterization in hand sample and by optical microscope. This provided valuable information on rock type, mineralogy, the nature of the acid-generating and acid-neutralizing mineral phases, alteration/reaction phases, grain size, and porosity. The optical inspection was used to define further testing using scanning electron microscopy (SEM) and/or microprobe analysis.

3 PHASE I TEST RESULTS AND INTERPRETATION

ABA

The purpose of ABA testing was to predict the tendency of a material to generate and/or neutralize acid. ABA provides a snapshot in time, based on the bulk chemistry of sulfur and neutralizing species only and does not account for the kinetics of the reactions. ABA does indicate if the neutralizing minerals and sulfur are present in quantities necessary to buffer pH in the neutral to slightly alkaline range or generate net acidity, assuming that the samples were taken to be representative of large-scale materials in which all the sulfide is oxidized and all the neutralization potential is available.

There are numerous ABA analytical and interpretive methods. In general, sulfide-sulfur (e.g., pyrite sulfur) generates acid, and neutralizing material neutralizes acid. The balance of these provides an indication of the potential net neutralizing potential (NNP) of the rock. NNP is calculated by subtracting the acid potential (AP) from neutralization potential (NP). The NP:AP ratio (calculated as the NP divided by the AP) is another calculation that is helpful in interpreting ABA data.

Some interpretation methods advocate using total sulfur to estimate the AP of the rock. This tends to result in more conservative (higher) estimates of AP because it includes the non-pyritic (sulfide-sulfur) species (e.g., sulfate and organic-sulfur minerals), which do not contribute appreciably to the acid generation potential of the material. For purposes of comparison, both total and sulfide-sulfur are presented and used to estimate the AP of the samples, as well as the NNP and NP:AP ratios (Tables 4a and 4b). However, for the purpose of evaluating and interpreting the ABA data, this discussion focuses on the calculation of AP based on sulfide-sulfur analyses, which more accurately represent the acid generating component of the materials.

Various guidance criteria are published and used as general guidance and decision-making. In general, these criteria are divided into "potentially acid generating", "potentially acid neutralizing", and "uncertain behavior". EPA Region 10 (1999) summarizes some of the interpretative methods as follows:

- NNP values of greater than 20 tons $CaCO_3$/1,000 tons (T $CaCO_3$) suggests a potentially acid-neutralizing material,
- NNP values between -20 and 20 T $CaCO_3$ suggest an uncertain potential,
- NNP values less than -20 T $CaCO_3$ suggest that the material is potentially acid generating,
- NP:AP values greater than 3:1 suggest a potentially acid-neutralizing material,
- NP:AP values less than 3:1 but greater than 1:1 suggest and uncertain potential, and
- NP:AP values less than 1:1 suggest materials are potentially acid generating.

The NP:AP ratio, however, becomes uncertain at low NP or AP values and the NNP should be weighted more strongly in those cases.

Tables 4a and 4b summarize the results of the Phase I ABA testing for the pulp and core samples, respectively. These include the concentrations of sulfur by species, the NP, and calculated AP, NNP and NP:AP values using both total and sulfide-sulfur for comparison. The NNP and NP:AP values are interpreted based on the sulfide-sulfur determination of AP. All of the samples have relatively high NP values, ranging from 11 to 186 T $CaCO_3$ with an average of 101 T $CaCO_3$. None of the development rock or ore samples are interpreted to be "acid generating" as indicated by the sulfide-sulfur NNP and NP:AP values. Based on the NNP using sulfide-sulfur, all 23 development rock samples are non-acid generating, and only two of the seven ore samples are in the uncertain range with the remaining samples in the non-acid generating range. Based on the NP:AP ratio using sulfide-sulfur, only two of the 23 development rock samples, representing 7 percent of the development rock material are in the uncertain range and the remaining are non-acid generating. Four of the seven ore samples are in the uncertain range, and three are in the non-acid generating range.

Figures 1 and 2 show the Phase I results graphically using both total and sulfide-sulfur to calculate AP. Figure 1 presents the ABA data by ore versus development rock, and Figure 2 presents the data by lithology. Theses figures demonstrate that the majority of the samples fall within the non-acid generating zone, with a few samples with values near the non-acid generating threshold. Figure 3 is a histogram of the NNP results for the Phase I development rock and ore samples. The x-axis is scaled to show equal portions of acid-generating to non-acid generating scale. This figure presents a similar trend indicating that based on the NNP data, the majority of the samples are interpreted to be non-acid generating.

According to the XRD results (described in the next section), the NP consists of a mixture of calcite and dolomite, and the semi-quantitative XRD results (percent dolomite (x2) plus calcite) corroborate the (more rigorous) NP estimates with an average error of +16%. This combination of neutralizing mineral phases has the potential to provide both longer-term and shorter-term acid neutralization because in general, dolomite dissolves slower providing a more resistant and durable source of NP while calcite tends to dissolve faster resulting in a short-term NP.

Assuming all of the NP of the rock samples is available for reaction (i.e., not encapsulated or otherwise isolated from weathering conditions), the ABA results suggest that the development rock material will not pose a risk of acid generation in the short or long term.

Table 4a Pulp ABA results summary

Sample #	Rock Type	Total Sulfur %	Sulfide Sulfur %	Sulfate Sulfur %	Non-extractable Sulfur %	Paste pH (su)	NP Tons CaCO3 /1000 tons	AP Tons CaCO3 /1000 tons		NP:AP Tons CaCO3 /1000 tons		NNP Tons CaCO3 /1000 tons		Interpretation (Based on NP:AP Sulfide-Sulfur)	Interpretation (Based on NNP Sulfide-Sulfur)
								Total Sulfur	Sulfide Sulfur	Total Sulfur	Sulfide Sulfur	Total Sulfur	Sulfide Sulfur		
DEVELOPMENT ROCK SAMPLES															
1	QMS	1.23	0.33	0.27	0.63	8.3	97	38	10	2.6	9.4	59	87	**Non acid generating**	**Non acid generating**
2	QMS	0.84	0.68	0.02	0.14	7.6	96	26	21	3.7	4.5	70	75	**Non acid generating**	**Non acid generating**
3	QMS	0.62	0.41	0.08	0.13	8.0	119	19	13	6.3	9.3	100	106	**Non acid generating**	**Non acid generating**
4	QMS	0.55	0.09	0.03	0.43	7.6	42	17	3	2.5	14.9	25	39	**Non acid generating**	**Non acid generating**
5	QMS	1.65	1.1	0.07	0.48	7.6	97	52	34	1.9	2.8	45	63	*Zone of Uncertainty*	**Non acid generating**
6	QMS	1.72	0.96	0.26	0.5	7.6	99	54	30	1.8	3.3	45	69	**Non acid generating**	**Non acid generating**
7	CQMS	0.43	0.15	0.08	0.2	8.4	109	13	5	8.4	23.3	96	104	**Non acid generating**	**Non acid generating**
8	CQMS	1.26	0.76	0.11	0.39	7.8	78	39	24	2	3.3	39	54	**Non acid generating**	**Non acid generating**
9	CQMS	1.01	0.39	0.18	0.44	8.1	100	32	12	3.1	8.2	68	88	**Non acid generating**	**Non acid generating**
10	CQMS	1.33	0.79	0.24	0.3	7.8	106	42	25	2.5	4.3	64	81	**Non acid generating**	**Non acid generating**
11	CQMS	1.15	0.75	0.22	0.18	8.2	183	36	23	5.1	7.8	147	160	**Non acid generating**	**Non acid generating**
12	CQMS	1.14	0.75	0.22	0.17	8.2	181	36	23	5	7.7	145	158	**Non acid generating**	**Non acid generating**
13	GQMS	0.89	0.64	0.11	0.14	7.9	186	28	20	6.6	9.3	158	166	**Non acid generating**	**Non acid generating**
14	GQMS	1.03	0.72	0.09	0.22	7.7	75	32	23	2.3	3.3	43	53	**Non acid generating**	**Non acid generating**
15	GQMS	0.89	0.67	0.08	0.14	7.8	108	28	21	3.9	5.2	80	87	**Non acid generating**	**Non acid generating**
16	GQMS	1.45	0.78	0.3	0.37	7.8	103	45	24	2.3	4.2	58	79	**Non acid generating**	**Non acid generating**
17	GQMS	1.2	0.84	0.1	0.26	8.0	123	38	26	3.2	4.7	85	97	**Non acid generating**	**Non acid generating**
18	CS	1.44	0.66	0.22	0.56	7.7	117	45	21	2.6	5.7	72	96	**Non acid generating**	**Non acid generating**
19	CS	1.14	0.34	0.14	0.66	7.8	181	36	11	5	17	145	170	**Non acid generating**	**Non acid generating**
20	QGS	0.7	0.63	0.02	0.05	8.4	118	22	20	5.4	6.0	96	98	**Non acid generating**	**Non acid generating**
21	QGS	1.5	1.26	0.12	0.12	7.8	102	47	39	2.2	2.6	55	63	*Zone of Uncertainty*	**Non acid generating**
22	OVB	0.1	0.02	2.4	0.08	7.0	24	3	1	8	38	21	23	**Non acid generating**	**Non acid generating**
23	OVB	0.01	0.01	0.01	0.01	8.0	54	1	1	54	173	54	54	**Non acid generating**	**Non acid generating**
ORE SAMPLES															
24	QMS	1.89	1.37	0.04	0.48	7.4	84	59	43	1.4	2.0	25	41	*Zone of Uncertainty*	**Non acid generating**
25	CQMS	1.76	0.56	0.76	0.44	8.0	91	55	18	1.7	5.2	36	74	**Non acid generating**	**Non acid generating**
26	GQMS	0.88	0.58	0.14	0.16	7.3	38	28	18	1.4	2.1	10	20	*Zone of Uncertainty*	*Zone of Uncertainty*
27	CS	1.82	1.3	0.22	0.3	7.5	81	57	41	1.4	2.0	24	40	*Zone of Uncertainty*	**Non acid generating**
28	CS	1.68	1.24	0.16	0.28	7.6	80	53	39	1.5	2.1	27	41	*Zone of Uncertainty*	**Non acid generating**
29	GS	1.68	1.43	0.09	0.16	8.0	137	53	45	2.6	3.1	84	92	**Non acid generating**	**Non acid generating**
30	OVB	0.02	0.01	0.01	0.01	7.7	11	1	1	11	35	10	11	**Non acid generating**	*Zone of Uncertainty*

Table 4b Core sample ABA results summary

Sample #	Rock Type	Total Sulfur %	Sulfide Sulfur %	Sulfate Sulfur %	Non-extractable Sulfur %	Paste pH (su)	NP Tons CaCO3 /1000 tons	AP Tons CaCO3 /1000 tons		NP:AP Tons CaCO3 /1000 tons		NNP Tons CaCO3 /1000 tons		Interpretation (Based on NP:AP Sulfide-Sulfur)	Interpretation (Based on NNP Sulfide-Sulfur)
								Total Sulfur	Sulfide Sulfur	Total Sulfur	Sulfide Sulfur	Total Sulfur	Sulfide Sulfur		
MWMP-1	QGS	1.9	1.73	0.01	0.17	7.5	151	59	54	2.6	2.8	92	97	*Zone of Uncertainty*	**Non acid generating**
MWMP-2	QMS	0.09	0.06	0.01	0.04	8.2	58	3	2	19.3	31	55	56	**Non acid generating**	**Non acid generating**
MWMP-3	CS	0.61	0.02	0.5	0.09	8.3	146	19	1	7.7	234	127	145	**Non acid generating**	**Non acid generating**
MWMP-4	CQMS	0.77	0.71	0.02	0.04	7.9	77	24	22	3.2	3.5	53	55	**Non acid generating**	**Non acid generating**
MWMP-5	GQMS	1.11	1.02	0.02	0.07	7.9	119	35	32	3.4	3.7	84	87	**Non acid generating**	**Non acid generating**
MWMP-6	CQMS	0.57	0.38	0.09	0.1	8.2	143	18	12	7.9	12	125	131	**Non acid generating**	**Non acid generating**
MWMP-7	QGS	1.01	0.79	0.14	0.08	8.1	33	32	25	1	1.3	1	8	*Zone of Uncertainty*	*Zone of Uncertainty*
MWMP-8	QMS	1.69	1.09	0.41	0.19	7.8	173	53	34	3.3	5.1	120	139	**Non acid generating**	**Non acid generating**
MWMP-9	GQMS	0.61	0.3	0.09	0.22	7.6	38	19	9	2	4.1	19	29	**Non acid generating**	**Non acid generating**

These results of analysis demonstrate that some of the ore materials contain some data within the uncertain category. This uncertainty stems from the inability of static ABA tests to predict the behavior of materials with roughly equal NP and AP values, or materials that do not contain an overabundance of NP. In these cases, the long-term behavior depends on the reaction kinetics (i.e., how quickly the reactions progress) and availability of NP to weathering conditions.

XRD

Tables 5a and 5b summarize the XRD results by sample and estimated percentage of mineral phases. Dominant minerals include quartz, muscovite, sericite, and chlorite. Minor mineral phases include dolomite, pyrite, arsenopyrite, calcite, kaolinite, and feldspars. Other minor minerals include rutile, magnetite, scawtite, and "unidentified" which likely include amorphous (non-crystalline) phases such as some clays, metalliferous sulfosalts, and oxy-hydroxide minerals.

Of particular interest for this study are mineral phases that are acid generating or acid neutralizing. Acid-generating minerals include pyrite and arsenopyrite. Acid-neutralizing minerals include calcite, dolomite, and siderite. Scawtite is present in MWMP sample 3 and is a carbonate-containing, altered silicate.

Acid-generating phases comprise from less than detection to 6% of total rock composition, and acid-neutralizing phases range from less than detection to 20 percent of total rock composition.

ICP/MS

ICP/MS results for the mine database are presented in Tables 6a and 6b for pulp and core samples, respectively. These include minimum, maximum, and average composition by rock type. The compilation includes marble (MBL), which was grouped in the calcareous schist (CS) rock type for this phase of testing. For purposes of comparison, the table includes a comparison with average crustal igneous rock composition. Bold values indicate a value that is higher than the average crustal concentration. Statistics were developed by assuming that non-detects were equal to the detection limit, thereby resulting in a conservative estimate of the average, minimum, and sometimes the maximum values.

Elements that consistently exceeded the average crustal concentration in igneous rocks included gold, arsenic, molybdenum, lead, sulfur, antimony, and zinc. These are consistent in both development rock and ore. Elevated arsenic, sulfur, and antimony are consistent with MWMP results described above. Some metals concentrations are generally higher in the ore than in the development rock because of the increased level of mineralization although this does not apply to all metals. For example, arsenic and antimony concentrations are elevated in ore relative to development rock; however, cobalt, cadmium, copper, and zinc are very similar in both populations.

MWMP

MWMP is a leach procedure that involves rinsing samples with water. Generally, the procedure rinses readily mobile phases, especially efflorescent salts and fine-grained, reactive minerals from the rock surface and does not weather the sample. The results provide an indication of what constituents are mobilized by an initial contact with water, and it is assumed that there is a potential correlation between the results of the MWMP and what constituents could pose a longer-term risk. However, this would have to be verified by kinetic testing, if necessary.

Results are typically compared to water-quality standards, but because this procedure mobilizes the weathered and reactive salts on the rock surface, and because of the water to rock ratio (1:1), concentrations are, by design, higher than what would likely be observed in the field as runoff and lower than what would be expected to infiltrate. Any exceedence of water quality standards are not conclusive, but only serve to indicate potential constituents of concern.

MWMP results are summarized in Table 7 and compared to primary and secondary EPA drinking water standards. Of the development rock samples, test 1 (QGS) resulted in exceedences for arsenic, antimony, beryllium, cadmium, and manganese, and test 2 (QMS) resulted in exceedences of manganese. Of the ore samples, all tests resulted in exceedences of antimony, tests 6, 7, and 9 exceeded the arsenic standard, and test 9 also exceeded the standard for manganese. These results indicate that some of the rock types have readily soluble metalliferous phases, that, when rinsed with water are readily dissolved. This could be because of weathering of the sample during storage and transport or that samples have genetic metalliferous mineral phases that are readily soluble. It is not possible to determine this from the Phase I test results.

Table 5a Pulp XRD results summary

Sample #	Rock Unit		Quartz	Kaolinite	Dolomite	Chlorite	Calcite	Muscovite/Sericite	Rutile	Arsenopyrite	Magnetite	Pyrite	Unaccounted
01	QMS	Waste Rock	20	6	6	18	-	44	2	<2**	<2 *	<2**	<5**
02	QMS		10	18	2	22	2	40	1	<2**	<2 *	2	<5**
03	QMS		11	17	4	<2 *	-	64	2	<2 *	<2 *	<2 *	<5**
04	QMS		24	-	<2**	20	2	49	1	<2 *	<2 *	<2 *	<5**
05	QMS		16	6	5	9	<2**	56	1	2	<2 *	2	<5**
06	QMS		13	8	4	9	<2**	60	1	<2**	<2 *	<2 *	<5**
07	CQMS		14	-	6	44	2	31	1	<2**	<2 *	<2**	<5**
08	CQMS		15	-	4	20	2	55	1	<2**	<2 *	<2**	<5**
09	CQMS		25	<2 *	4	22	-	45	<1 *	<2**	<2 *	<2**	<5**
10	CQMS		20	5	4	28	-	35	1	2	<2 *	<2**	<5**
11	CQMS		23	14	12	<2**	2	40	1	2	<2 *	2	<5**
12	CQMS		20	15	13	<2**	-	42	1	2	<2 *	2	<5**
13	GQMS		18	12	6	4	-	56	1	<2**	<2 *	<2 *	<5**
14	GQMS		17	-	5	30	<2**	42	1	<2**	<2 *	<2**	<5**
15	GQMS		13	12	3	2	-	64	1	2	<2 *	<2 *	<5**
16	GQMS		13	6	4	8	<2**	64	1	<2**	<2 *	<2**	<5**
17	GQMS		24	<2 *	10	25	2	32	1	2	<2 *	<2**	<5**
18	CS		16	-	5	18	5	50	1	2	<2 *	<2**	<5**
19	CS		10	-	6	15	14	50	1	<2 *	<2 *	<2 *	<5**
20	QGS		54	10	6	<2 *	4	16	-	4	<2 *	2	<5**
21	QGS		17	9	4	7	-	55	1	2	<2 *	<2**	<5**
24	QMS	Ore	14	14	5	18	2	40	1	2	<2 *	<2**	<5**
25	CQMS		28	-	7	11	2	43	1	2	<2 *	<2**	<5**
26	GQMS		16	-	3	51	-	23	1	2	<2 *	<2**	<5**
27	CS		10	-	3	14	3	62	1	2	<2 *	2	<5**
28	CS		14	-	4	15	3	58	1	2	<2 *	<2**	<5**
29	GS		10	10	9	10	-	57	<1**	<2 *	<2 *	<2 *	<5**

- Not Detected
* Uncertain Detection
**Present, but not quantifiable

ICP/MS analyses are valuable in estimating the elemental concentrations in the rocks and highlighting elements which are elevated relative to a standard. The data can be used also to hypothesize elements that may be of environmental concern under variable weathering conditions. At Rock Creek, ABA results suggest that mine-affected waters will remain alkaline. Under these conditions, constituents that are mobile at circumneutral pH values (e.g., metal oxyanions), which are also elevated in elemental concentration, are of potential concern. Constituents that follow these criteria include antimony, arsenic, chromium, sulfate, and molybdenum. However, antimony, arsenic, and molybdenum also tend to adsorb strongly to organic and iron-hydroxide substrates, and so may be less mobile in the environment at circumneutral pH values.

Table 5b Core samples XRD results summary

Sample #	Rock Unit		Quartz	Plagioclase feldspar	K-feldspar	Kaolinite	Dolomite	Chlorite	Calcite	Mica /illite	Siderite	Arseno-pyrite	Pyrite	Silli-manite	Galena	Scawtite	Unaccounted
MWMP 1	QGS	Waste Rock	50		-	<5	13	13		16			<3			-	<5
MWMP 2	QMS		18		<3	-	-	36		23			-			-	<5
MWMP 3	CS		29		<3	-	<5	24		27			-			10	<5
MWMP 4	CQMS		24		<5	-	<3	35		31			<2			-	<5
MWMP 5	GQMS		29		<5	-	<3	22		28			<2			-	<5
MWMP 6	CQMS	Ore	75	-	-	-	7	-	8	7	-	<1	-	-	<1		<5
MWMP 7	QGS		80	<2	-	-	4	-	-	10	-	-	<1	<1	-		<5
MWMP 8	QMS		25	-	-	26	9	9	-	22	<5	-	-	-	-		<5
MWMP 9	GQMS		27	<3	<3	-	-	-	-	28	8	-	<1	-	-		<5

Table 6a ICP/MS (whole rock) elemental data summary – development rock

Gold <1 g/t - WASTE ROCK

Lithology		Au g/t	Ag_ppm	Al_ppm	As_ppm	Ba_ppm	Be_ppm	Bi_ppm	Ca_ppm	Cd_ppm	Co_ppm	Cr_ppm	Cu_ppm	Fe_ppm	Ga_ppm	Hg_ppm	K_ppm	Li_ppm	Mg_ppm	Mn_ppm	Mo_ppm	Na_ppm	Ni_ppm	P_ppm	Pb_ppm	S_ppm	Sb_ppm	Sc_ppm	Sr_ppm	Ti_ppm	Tl_ppm	U_ppm	V_ppm	W_ppm	Zn_ppm
Average crustal igneous rocks		0.004	0.15*	79500	1.8	595	3.6	no data	36200	0.19*	23	198	97	42200	18	0.33*	25700	32	17600	937	1.2	28100	94	1100	16	410	0.51	15	410	4830	1.1*	2.8*	149	1.4*	80
CQMS	AVG	0.3	1.5	17106.7	3522.2	45.6	0.6	3.6	25400.0	1.0	16.4	83.6	30.6	41898.3	10.1	1.0	2005.8	20.2	17329.2	543.1	1.4	140.8	43.8	523.8	127.5	10713.3	27.4	3.3	77.5	100.0	10.0	10.0	20.7	23.0	114.7
	Max	0.99	67.8	51600	9370	160	1.1	100	70900	26.3	31	210	75	65700	20	1	3800	30	54600	3620	5	300	158	1020	5170	27000	394	8	273	100	10	10	53	440	2200
	Min	0.002	0.2	2400	19	10	0.5	2	5200	0.5	8	7	6	21300	10	1	700	10	7900	294	1	100	28	340	6	600	2	1	19	100	10	10	6	10	49
	Count	120	120	120	113	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	ND	0	34	0	0	0	14	89	0	76	0	0	0	0	57	104	0	7	0	0	24	5	0	0	0	0	9	0	0	117	120	110	0	100	0
CS	AVG	0.1	0.3	17384.5	1608.9	40.6	0.6	3.1	33819.0	0.6	16.5	28.5	32.8	41505.6	10.0	1.0	1823.5	17.3	19067.6	514.6	1.9	121.1	44.7	533.4	19.0	9552.1	9.1	3.1	105.3	100.0	10.0	10.0	22.4	13.4	79.2
	Max	0.94	3.2	50200	9940	130	1.5	38	140500	2	33	134	76	78300	10	2	4200	40	87300	3490	9	300	131	1080	450	21000	148	12	522	100	10	10	71	260	154
	Min	0.005	0.2	1600	10	10	0.5	2	1400	0.5	3	9	2	19400	10	1	200	10	10000	180	1	100	10	220	2	500	2	1	11	100	10	10	8	10	14
	Count	213	213	213	213	213	213	213	211	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213
	ND	0	153	0	0	0	36	154	0	118	0	0	0	0	117	197	0	13	0	0	37	38	0	0	2	1	30	0	0	194	213	202	0	197	0
GQMS	AVG	0.2	0.8	15606.1	2900.4	46.9	0.6	3.6	23478.4	0.8	17.7	42.0	33.0	44396.6	10.2	1.0	1791.5	17.1	18778.2	563.0	2.1	118.2	47.4	524.6	55.0	10582.1	18.3	3.6	82.2	100.0	10.0	10.0	23.0	10.5	99.7
	Max	0.97	35.2	71200	9960	150	1.3	47	147000	13	40	261	133	105500	30	3	3700	40	90800	5520	29	300	120	3160	2820	33400	470	14	814	100	10	10	80	60	1195
	Min	0.002	0.2	1200	10	10	0.5	2	1000	0.5	5	6	1	13300	10	1	200	10	300	10	1	100	11	160	2	100	2	1	6	100	10	10	6	10	16
	Count	413	413	413	402	413	413	413	408	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413	413
	ND	0	179	0	0	0	71	320	0	273	0	0	1	0	222	368	0	28	0	0	46	40	0	0	1	0	30	2	0	396	411	379	0	381	0
GS	AVG	0.2	1.2	9774.7	3339.9	70.5	0.5	2.4	27882.2	1.1	15.3	26.8	43.0	38732.9	10.2	1.0	1647.9	10.8	15389.7	503.3	5.6	101.4	57.3	520.7	52.1	14330.1	23.7	3.0	96.4	100.0	10.0	10.0	23.3	13.8	130.8
	Max	0.98	41.5	34600	9590	280	1	19	118500	5.5	31	157	289	58400	20	3	2900	20	50600	4210	36	200	175	4870	571	31400	234	7	270	100	10	10	75	360	576
	Min	0.005	0.2	1400	14	10	0.5	2	500	0.5	4	6	11	13100	10	1	400	10	100	25	1	100	27	160	4	100	2	1	3	100	10	10	5	10	44
	Count	146	146	146	132	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146	146
	ND	0	41	0	0	0	51	118	0	45	0	0	0	0	106	138	0	68	0	0	23	47	0	0	0	2	2	8	0	146	146	129	0	133	0
MBL	AVG	0.1	0.4	5935.3	1425.6	37.1	0.5	4.4	90140.0	0.5	7.6	11.5	18.4	19747.1	10.0	1.0	935.3	12.4	18111.8	334.8	1.9	100.0	22.7	285.9	10.4	6917.6	7.3	2.2	783.0	100.0	10.0	11.8	10.4	10.0	34.9
	Max	0.77	1.5	21000	6290	110	0.5	22	117500	0.6	17	41	46	36900	10	1	2100	20	28500	834	4	100	42	530	24	13400	18	6	1480	100	10	20	30	10	90
	Min	0.005	0.2	300	10	10	0.5	2	64500	0.5	1	1	3	2300	10	1	100	10	12600	46	1	100	3	80	2	1600	2	1	112	100	10	10	1	10	2
	Count	17	17	17	17	17	17	17	5	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
	ND	0	7	0	0	0	15	14	0	11	0	0	0	0	12	16	0	8	0	0	1	10	0	0	1	1	2	3	0	17	10	14	0	16	2
OVB	AVG	0.2	2.6	15723.1	1884.8	73.8	0.5	2.1	4850.0	0.7	13.9	45.9	31.3	38342.3	10.0	1.0	1280.8	17.7	11492.3	498.7	2.6	103.8	44.4	555.8	49.2	1292.3	13.2	2.7	20.5	100.0	10.0	10.0	24.5	30.8	96.8
	Max	0.72	15.2	34000	7190	210	1	4	27900	3.5	19	222	79	47300	10	1	2100	30	27100	750	21	200	72	910	222	16500	54	5	103	100	10	10	53	240	256
	Min	0.01	0.2	3100	395	30	0.5	2	1200	0.5	6	15	13	18800	10	1	400	10	3000	142	1	100	19	250	6	100	2	1	6	100	10	10	12	10	47
	Count	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
	ND	0	1	0	0	0	11	24	0	20	0	0	0	0	13	23	0	2	0	0	5	4	0	0	0	2	0	0	0	20	26	26	0	4	0
QGS	AVG	0.1	1.3	3301.5	4518.3	179.9	0.5	4.8	16714.7	2.9	8.6	44.1	46.3	22555.9	10.0	1.0	916.2	10.3	6980.9	271.8	18.6	102.9	79.5	372.9	95.4	11760.3	19.1	1.3	63.9	100.0	10.0	10.4	31.0	10.6	228.7
	Max	0.68	10.8	13700	9860	400	0.8	26	88500	8	30	195	80	53600	10	1	2000	20	19100	2230	37	200	138	1770	1000	27300	118	3	244	100	10	20	58	40	630
	Min	0.005	0.2	900	8	40	0.5	2	600	0.5	4	6	15	9500	10	1	300	10	400	13	1	100	27	110	6	800	5	1	6	100	10	10	11	10	53
	Count	68	68	68	60	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
	ND	0	7	0	0	0	66	41	0	5	0	0	0	0	57	64	0	60	0	0	0	40	0	0	0	0	0	19	0	68	68	49	0	66	0
QMS	AVG	0.2	0.7	15515.5	3127.5	51.8	0.6	3.9	22190.2	0.8	18.6	29.7	36.7	43659.6	10.8	1.0	1755.5	15.5	16840.4	653.1	1.9	120.2	48.4	525.1	58.6	9822.4	17.3	3.3	82.0	100.0	10.0	10.0	22.8	19.7	103.3
	Max	0.99	38.4	63100	9830	190	1.7	53	107500	16.8	41	161	138	81800	30	2	3600	40	56400	3590	14	400	94	1380	2910	26800	252	11	2680	100	10	10	81	1040	1500
	Min	0.005	0.2	800	9	10	0.5	2	1100	0.5	1	1	1	1100	10	1	100	10	500	30	1	100	1	110	2	100	2	1	7	100	10	10	1	10	4
	Count	317	317	317	304	317	317	317	316	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317
	ND	0	158	0	0	1	100	227	0	194	0	0	0	0	182	293	0	26	0	0	67	50	1	0	2	0	18	1	0	294	317	297	1	294	0

* Detection limit is higher than the average crustal concentration so comparison was not valid

Table 6b ICP/MS(whole rock) elemental data summary – ore

Gold >1 g/t - ORE

Lithology		Au g/t	Ag_ppm	Al_ppm	Al_%	As_ppm	B_ppm	Ba_ppm	Be_ppm	Bi_ppm	Ca_ppm	Ca_%	Cd_ppm	Co_ppm	Cr_ppm	Cu_ppm	Fe_ppm	Fe_%	Ga_ppm	Hg_ppm	K_ppm	K_%	Li_ppm	Mg_ppm	Mg_%	Mn_ppm	Mo_ppm	Na_ppm	Na_%	Ni_ppm	P_ppm	Pb_ppm	S_ppm	S_%	Sb_ppm	Sc_ppm	Sr_ppm	Ti_ppm	Tl_%	Tl_ppm	U_ppm	V_ppm	W_ppm	Zn_ppm
Average crustal igneous rocks		0.004	0.15*	79500		1.8	7.5	595	3.6	no data	36200		0.19*	23	198	97	42200		18	0.33*	25700		32	17600		937	1.2	28100		94	1100	16	410		0.51	15	410	4830		1.1*	2.8*	149	1.4*	80
CQMS	AVG	**3.0**	1.4	13077.8	**1.3**	**4452.2**	**10.0**	41.1	0.6	4.1	26475.0	**2.6**	0.7	15.4	71.8	29.3	39875.0	**4.0**	10.3	1.0	1838.9	**0.2**	15.3	15538.9	**1.6**	529.5	**1.4**	116.7	**0.0**	39.6	471.9	**186.6**	**13458.3**	**1.3**	**86.3**	2.9	101.2	100.0	**0.0**	10.0	10.0	15.9	10.8	**94.2**
	Max	13.75	10.2	43300	4.33	9960	10	70	1.5	29	78100	7.81	2.1	26	181	64	58800	5.88	20	1	2900	0.29	30	34500	3.45	1200	3	200	0.02	85	870	1395	31100	3.11	748	5	304	100	0.01	10	10	41	30	182
	Min	1.02	0.2	2000	0.2	385	10	10	0.5	2	11100	1.11	0.5	7	4	7	22000	2.2	10	1	800	0.08	10	6000	0.6	220	1	100	0.01	17	190	9	7900	0.79	3	1	33	100	0.01	10	10	3	10	56
	Count	36	36	36	36	26	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	ND	0	6	0	0	0	36	0	5	24	0	0	19	0	0	0	0	0	22	32	0	0	12	0	0	0	13	9	9	0	0	0	0	0	0	0	0	36	36	36	31	0	32	0
CS	AVG	**4.0**	0.6	15320.0	**1.5**	**4294.0**	**10.0**	43.0	0.6	13.1	35010.0	**3.5**	0.6	16.0	19.9	30.6	38350.0	**3.8**	10.0	1.0	1870.0	**0.2**	19.0	16340.0	**1.6**	489.8	**1.8**	100.0	**0.0**	44.1	551.0	**28.3**	**10290.0**	**1.0**	**12.9**	2.7	91.6	100.0	**0.0**	10.0	10.0	16.0	14.0	72.9
	Max	18.01	1.4	19600	1.96	9110	10	80	0.8	51	62400	6.24	0.9	21	30	49	46400	4.64	10	1	2500	0.25	30	21700	2.17	650	5	100	0.01	68	670	98	16200	1.62	35	4	197	100	0.01	10	10	25	40	116
	Min	1.11	0.2	8800	0.88	1400	10	20	0.5	2	19800	1.98	0.5	12	10	12	33000	3.3	10	1	1100	0.11	10	13200	1.32	400	1	100	0.01	36	410	8	4000	0.4	2	2	53	100	0.01	10	10	10	10	51
	Count	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	ND	0	4	0	0	0	10	0	3	5	0	0	5	0	0	0	0	0	10	9	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	10	10	10	10	0	7	0
GQMS	AVG	**3.6**	2.7	12032.1	**1.2**	**5085.9**	**10.0**	46.6	0.7	5.0	27218.9	**2.7**	1.6	18.0	45.3	34.9	**42409.4**	**4.2**	10.0	1.0	1786.8	**0.2**	14.7	16084.9	**1.6**	588.2	**2.1**	130.2	**0.0**	45.5	456.8	**227.0**	**14211.3**	**1.4**	**73.5**	3.0	86.0	100.0	**0.0**	10.0	10.0	16.4	32.6	**165.9**
	Max	46.6	20.2	28100	2.81	9690	10	130	1.3	34	109500	10.95	30.5	37	195	149	61000	6.1	10	1	4100	0.41	30	50100	5.01	2790	6	300	0.03	102	750	1730	21900	2.19	897	5	182	100	0.01	10	10	42	510	2670
	Min	1	0.2	3200	0.32	512	10	10	0.5	2	1700	0.17	0.5	10	9	5	24800	2.48	10	1	500	0.05	10	1500	0.15	290	1	100	0.01	28	230	3	7500	0.75	2	1	9	100	0.01	10	10	4	10	31
	Count	53	52	53	53	37	52	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
	ND	0	9	0	0	0	49	0	11	37	0	0	25	0	0	0	0	0	27	48	0	0	11	0	0	0	6	1	1	0	0	0	0	0	1	0	0	52	52	52	41	0	45	0
GS	AVG	**4.1**	1.8	8608.3	**0.9**	**6118.4**	**10.0**	53.6	0.5	3.2	25580.6	**2.6**	1.2	14.2	18.2	31.3	37744.4	**3.8**	10.3	1.0	1511.1	**0.2**	10.0	14375.0	**1.4**	419.7	**3.6**	100.0	**0.0**	46.8	484.7	**144.9**	**16694.4**	**1.7**	**52.4**	2.7	102.8	100.0	**0.0**	10.0	10.0	16.3	10.0	**136.0**
	Max	23.31	7.8	36700	3.67	9540	10	150	1	12	52200	5.22	9.2	20	84	94	58500	5.85	20	1	2500	0.25	10	37900	3.79	638	27	100	0.01	114	2920	771	28500	2.85	266	7	238	100	0.01	10	10	54	10	851
	Min	1.06	0.2	2900	0.29	1335	10	10	0.5	2	3900	0.39	0.5	5	5	4	20500	2.05	10	1	600	0.06	10	1600	0.16	80	1	100	0.01	20	250	7	800	0.08	6	1	16	100	0.01	10	10	5	10	46
	Count	36	36	36	36	16	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
	ND	0	1	0	0	0	36	0	13	19	0	0	12	0	0	0	0	0	32	35	0	0	27	0	0	0	12	18	18	0	0	0	0	0	0	1	0	36	36	36	35	0	36	0
OVB	AVG	**1.6**	6.2	16700.0	**1.7**	**2129.0**	**10.0**	62.0	0.6	2.0	2320.0	**0.2**	0.5	14.8	63.0	46.6	41140.0	**4.1**	10.0	1.0	1540.0	**0.2**	18.0	10960.0	**1.1**	535.0	**1.8**	100.0	**0.0**	44.8	536.0	**73.2**	**480.0**	**0.0**	**30.4**	2.6	12.4	100.0	**0.0**	10.0	10.0	22.0	46.0	**103.2**
	Max	2.34	14.4	21200	2.12	4950	10	70	0.9	2	3600	0.36	0.6	17	227	80	44500	4.45	10	1	2300	0.23	20	15400	1.54	661	3	100	0.01	60	610	181	1600	0.16	89	3	19	100	0.01	10	10	28	100	152
	Min	1	0.2	9500	0.95	1010	10	50	0.5	2	1500	0.15	0.5	11	13	26	35700	3.57	10	1	1000	0.1	10	5000	0.5	408	1	100	0.01	35	470	20	100	0.01	8	2	9	100	0.01	10	10	14	10	78
	Count	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	ND	0	1	0	0	0	5	0	1	4	0	0	3	0	0	0	0	0	3	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4	4	5	5	0	1	0
QGS	AVG	**6.0**	2.2	4085.7	**0.4**	**8665.0**	**10.0**	142.9	0.5	3.6	21142.9	**2.1**	2.4	12.1	38.1	38.1	30685.7	**3.1**	10.0	1.0	1014.3	**0.1**	10.0	10900.0	**1.1**	595.9	**18.1**	100.0	**0.0**	**98.6**	324.3	**91.6**	**13714.3**	**1.4**	**30.3**	1.6	84.0	100.0	**0.0**	10.0	10.0	34.4	10.0	**221.1**
	Max	18.89	4.2	11200	1.12	9360	10	220	0.5	8	32400	3.24	4.7	26	153	66	49400	4.94	10	1	1800	0.18	10	18800	1.88	1950	34	100	0.01	174	680	202	18800	1.88	46	4	250	100	0.01	10	10	43	10	421
	Min	1.11	0.4	1700	0.17	7970	10	80	0.5	2	5700	0.57	1.1	5	7	8	18000	1.8	10	1	600	0.06	10	2700	0.27	115	8	100	0.01	47	180	26	8000	0.8	22	1	20	100	0.01	10	10	17	10	127
	Count	7	7	7	7	2	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	ND	0	0	0	0	0	7	0	7	4	0	0	0	0	0	0	0	0	6	6	0	0	7	0	0	0	0	2	2	0	0	0	0	0	0	1	0	7	7	7	7	0	7	0
QMS	AVG	**3.0**	1.4	13226.7	**1.3**	**4947.0**	**10.0**	47.7	0.6	3.8	23720.0	**2.4**	0.7	16.2	39.2	34.1	40523.3	**4.1**	10.2	1.0	1801.7	**0.2**	14.5	15036.7	**1.5**	504.2	**1.8**	121.7	**0.0**	42.8	511.2	**112.0**	**13460.0**	**1.3**	**53.3**	2.8	89.8	100.0	**0.0**	10.0	10.0	17.0	11.0	**103.8**
	Max	21.3	14.4	41200	4.12	9970	10	130	1.3	44	118000	11.8	3.5	24	178	62	64800	6.48	20	2	3100	0.31	30	41200	4.12	897	8	300	0.03	77	860	1435	28000	2.8	482	6	433	100	0.01	10	10	55	40	370
	Min	1	0.2	2300	0.23	784	10	20	0.5	2	1700	0.17	0.5	8	6	10	21000	2.1	10	1	900	0.09	10	7100	0.71	285	1	100	0.01	22	300	4	100	0.01	2	1	11	100	0.01	10	10	6	10	46
	Count	60	60	60	60	41	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	ND	0	12	0	0	0	59	0	21	43	0	0	30	0	0	0	0	0	45	53	0	0	15	0	0	0	15	6	6	0	0	0	0	0	0	0	0	60	60	60	59	0	53	0

* Detection limit is higher than the average crustal concentration so comparison was not valid

Table 7 MWMP results summary

Sample #		Rock Type	Ag	Al	As	Ba	Be	Bi	Bicarbonate	Ca	Cd	Chloride	Cyanide	Cyanide WAD	Co	Cr	Cu	Fluoride	Fe	Ga	Hg	Hydroxide	K	Li	Mg	Mn	Mo	Na	Ni	Nitrate as N	Nitrate/Nitrite	Nitrogen, ammonia	P	Pb	Sulfate	Sb	Se	Sn	Sr	Ti	Tl	V	Zn
Standards	Value		NS	0.087	0.01	2	0.004	NS	NS	NS	0.00033	230	NS	NS	NS	0.1	0.013	2	0.3	NS	0.00077	NS	NS	NS	NS	0.05	NS	250	0.1	NS	10	NS	NS	0.004	250	0.006	0.005	NS	NS	NS	0.002	NS	0.169
	Source			3	1	1	1				3	3				1	3	2	2		3					2		2			1			3	2	1	3				1		3
MWMP-1		QGS	0.0030	0.05	**0.027**	0	**0.0050**	0.1	28	32	**0.00500**	9	0.01	0.01	0.003	0.000	0.001	0	0.01	0.1	0.0002	2	0.9	0.02	6.7	**0.102**	0.016	3.	0.0288	0.0	0	0.05	0.01	0.0050	70	**0.6100**	0.0195	0.1	0.1	0.005	0.00	0.005	0.01
MWMP-2		QMS	0.0001	0.038	0.002	0	0.0002	0.1	32	22	0.00020	2	0.01	0.01	0.002	0.000	0.001	0	0.01	0.1	0.0002	2	1.6	0.02	4.5	**0.111**	0.001	3	0.0120	0.0	0	0.07	0.01	0.0002	40	0.0026	0.0029	0.1	0.07	0.005	0.00	0.005	0.01
MWMP-3		CS	0.0001	0.039	0.010	0	0.0001	0.1	2	9	0.00010	12	0.01	0.01	0.000	0.000	0.001	0	0.01	0.1	0.0002	2	0.6	0.02	1.3	0.005	0.001	2	0.0010	0.0	0	0.05	0.01	0.0001	10	0.0011	0.0002	0.1	0.03	0.005	0.00	0.005	0.02
MWMP-4		CQMS	0.0001	0.005	0.001	0	0.0001	0.1	7	11	0.00010	12	0.01	0.01	0.002	0.000	0.001	0	0.01	0.1	0.0002	2	0.3	0.02	1.8	0.046	0.000	2	0.0073	0.0	0	0.05	0.01	0.0001	10	0.0006	0.0010	0.1	0.05	0.005	0.00	0.005	0.02
MWMP-5		GQMS	0.0001	0.024	0.002	0	0.0001	0.1	18	15	0.00010	17	0.01	0.01	0.004	0.000	0.001	0	0.01	0.1	0.0002	2	0.5	0.02	4.7	0.017	0.002	3	0.010	0.0	0	0.05	0.01	0.0001	30	0.0013	0.0029	0.1	0.05	0.005	0.00	0.005	0.02
MWMP 6		CQMS	0.0001	0.015	**0.012**	0	0.0001	0.1	11	3	0.00010	2	0.01	0.01	0.000	0.000	0.001	0	0.01	0.1	0.0002	2	0.3	0.02	0.6	0.007	0.001	2	0.0021	0.0	0	0.05	0.01	0.0001	10	**0.0168**	0.0029	0.1	0.01	0.005	0.00	0.005	0.01
MWMP 7		QGS	0.0001	0.002	**0.013**	0	0.0001	0.1	4	0.5	0.00010	1	0.01	0.01	0.000	0.000	0.001	0	0.01	0.1	0.0002	2	0.3	0.02	0.2	0.005	0.000	1	0.0009	0.0	0	0.05	0.01	0.0001	10	**0.0113**	0.0001	0.1	0.01	0.005	0.00	0.005	0.01
MWMP 8		QMS	0.0001	0.003	0.007	0	0.0001	0.1	5	0.6	0.00010	1	0.01	0.01	0.000	0.000	0.001	0	0.01	0.1	0.0002	2	0.3	0.02	0.2	0.008	0.000	1	0.0006	0.0	0	0.05	0.01	0.0001	10	**0.0077**	0.0001	0.1	0.01	0.005	0.00	0.005	0.01
MWMP 9		GQMS	0.0001	0.100	**0.119**	0	0.0001	0.1	17	10	0.00010	1	0.01	0.01	0.005	0.000	0.001	0	0.01	0.1	0.0002	2	0.9	0.02	4.6	**0.343**	0.001	5	0.0470	0.0	0	0.05	0.01	0.0001	40	**0.9500**	0.0024	0.1	0.06	0.005	0.00	0.005	0.01

Notes:
1 = EPA Drinking Water Standards (Primary)
2 = EPA Drinking Water Standards (Secondary)
3 = Chronic Aquatic Life Fresh Water criterion
Concentrations in bold exceed current water quality standard values

4 PHASE II TEST RESULTS AND INTERPRETATION

ABA

Phase II ABA testing included systematic testing of all 2004 reverse circulation exploration drilling, on 15-ft composite intervals, for a total of 407 tests from 26 boreholes, ranging from 0- to 330-ft deep. Figure 4 illustrates the spatial distribution and depth of the phase II ABA sampling locations. Samples are well distributed across the ore body. Attachment 1 summarizes the ABA results in tabular format.

Figures 5 through 7 present the results of Phase I and Phase II ABA data as scatter plots (Figures 5 and 6) and a NNP histogram (Figure 7), respectively. For each figure, the ABA data is presented based on both sulfide-sulfur (indication of acid-generating material) and total sulfur (most conservative estimate). The ratio of NP to AP (based on sulfide-sulfur) for all data ranges from 0.1 to 1493, with an arithmetic mean of 13 and a geometric mean of 3.7, indicating overall non acid-generating material. The geometric mean gives a more realistic average, as there are a few extremely high NP:AP ratios in the data which act to skew the arithmetic mean. Of all of the 407 samples, there are only 28, representing both ore and development rock, which have a NP:AP ratio less than 1.0, indicating potentially acid-generating material for approximately 7 percent of the samples.

If ore and development rock are considered separately (Figure 5), a clear distinction can be seen between the two material types. Average ore ABA data is characterized within the uncertain zone with a geometric mean NP:AP of 2.5; however, the average NNP of ore samples is 62 T CaCO3, indicating non acid-generating material. Development rock is interpreted as more acid neutralizing than the ore with a geometric mean NP:AP ratio of 4.1 and average NNP of 78 T CaCO3 (non acid-generating). Figure 6 presents the data by lithology.

Figure 7 presents the histogram of the NNP results for both the Phase I and Phase II development rock and ore samples. Based on these data, the majority of the samples are considered non-acid generating with some samples in the zone of uncertainty.

The ABA results suggest that the development rock and ore material will not pose a risk of acid generation in the short- or long-term.

Humidity cell tests

Humidity cell tests were conducted on eight samples; five representing development rock lithologies, one representing a bulk composite of ore, and two representing both types of tailings which were developed by the mine process. A summary of these tests is provided below.

Results are provided in Attachment 2. A graph for each humidity cell is shown containing alkalinity, acidity, pH, and sulfate concentrations through time. In addition, the full suite of analytes (including metals) is provided in tabular format.

Cell 1 (ore composite) is ongoing in its 69th week. The pH has been relatively stable between 7.5 and 8.1 since week 5. Sulfate has gradually increased until week 34 when sulfate production stabilized. There has been no measurable acidity, and alkalinity has remained steady between about 60 and 90 mg/l. Antimony and arsenic concentrations peaked early in the test and have generally remained steady or decreased through time.

Cell 2 (QMS) is ongoing in its 69th week. The pH has been stable between 7.5 and 8.0 since Week 5. Sulfate has gradually increased until Week 34 when sulfate production stabilized. There has been no measurable acidity, and alkalinity has remained steady at around 70 mg/l. Antimony and arsenic concentrations peaked at the initial flush of the cell and have been below detection since Week 8.

Cell 3 (CQMS) is complete and ran for 36 weeks. pH stabilized at around 8.0, and sulfate generally varied between about 20 to 50 mg/l for the duration of the test. There was no measurable acidity and alkalinity remained steady between around 25 and 40 mg/l. Antimony and arsenic concentrations peaked at Week 9 to 12 and declined to below detection by Week 29 to 32.

Cell 4 (GQMS) is ongoing in its 69th week. pH has been stable between 7.5 and 8.0 since Week 2. Sulfate has been steady between 20 to 40 mg/l since Week 5 of the test. There has been no measurable acidity, and alkalinity has remained steady between around 30 and 90 mg/l. Antimony concentrations increased through Week 16 and have been relatively stable since that point, and arsenic concentrations have gradually increased throughout the length of the test.

Cell 5 (GS) is complete and ran for 36 weeks. pH stabilized between 8.0 and 8.5 and sulfate peaked at Week 6 and decreased to stabilize between about 10 to 30 mg/l for the duration of the test. There was no measurable acidity, and alkalinity remained steady at around 35 mg/l. Antimony concentrations peaked at Week 1 to 4 and declined to stabilize during the middle weeks of the test. Concentrations rose slightly between Weeks 25 and 32. Arsenic was stable during the first 24 weeks of the test and increased by a factor of about 3 during Weeks 25 to 32.

Cell 6 (CS) is complete and ran for 36 weeks. pH stabilized between 7.5 and 8.0 and sulfate peaked at Week 4 and decreased to stabilize at about 20 mg/l until the final weeks when it increased slightly during the final three weeks of the test. There was no measurable acidity, and alkalinity remained steady between about 50 and 70 mg/l. Antimony concentrations peaked at week 0 and declined to stabilize during the middle weeks of the test. Arsenic concentrations remained stable or decreased slightly during the test.

Cell Tailings #1 (Albion 21%, Paste Tails 79%) has run for 41 weeks and is ongoing. Over this period pH has fluctuated around pH 7. Sulfate peaked at Week 3 and has since decreased to stabilize between 30 to 60 mg/l for the last 20 weeks of the test. There has been no measurable acidity, and alkalinity has been steady between about 20 and 45 mg/l over the last 20 weeks. Antimony concentrations peaked between Weeks 13 to 24 and then declined dramatically in the most recent test (Week 33-36). The arsenic concentration peaked during the initial flush (Weeks 1-4 and 5-8), and have decreased slightly during the test.

Cell Tailings #2 (Tension vein 14%, Paste Tails 86%) has run for 41 weeks and is ongoing. Over this period pH has fluctuated around pH 7.5. Sulfate peaked at Week 2 and has since decreased to stabilize between 2 to 20 mg/l for the last 20 weeks of the test. There has been no measurable acidity, and alkalinity has been steady between about 30 and 60 mg/l over the last 15 weeks. Antimony concentrations were generally stable from Weeks 1 to 24 and then declined slightly during the later test weeks (Weeks 25-36). The arsenic concentrations have remained generally stable throughout the testing period.

Results from the depletion time calculations for development rock lithologies and tailings samples are presented in Table 8. Depletion time estimates were calculated based on sulfate mass generated (for acid depletion) and calcium and magnesium mass generated (for neutralization depletion). Depletion rates were compared to total sulfide sulfur AP and carbonate NP to estimate whether NP or AP would be depleted first. For all development rock lithologies and tailings samples, NP was predicted to far outlast AP (Table 8).

Table 8 NP and AP depletion calculation results summary

Rock Type	HCT #	Ca (mg/L)	Mg (mg/L)	SO4 (mg/L)	Carbonate molar ratio	Initial AP (Sulfide S) (%)	AP depletion rate (mg SO4/kg/wk)	AP depletion rate (mg CaCO3/kg/wk)	Remaining AP (weeks)	Initial NP(g CaCO3/kg)	NP depletion rate (mg CaCO3/kg/wk)	Remaining NP (weeks)	Prediction of outcome
Development Rock Samples													
QMS	2	43	11	89	1.65	0.14	24	25	**175**	85	41.1	**2066**	Non Acid
CQMS	3	35	10	65	1.90	0.56	21	22	**799**	79	41.5	**1903**	Non Acid
GQMS	4	34	11	56	2.23	1.37	21	22	**1955**	169	48.8	**3465**	Non Acid
GS	5	15	4	20	2.59	0.57	6	6	**2846**	151	16.2	**9342**	Non Acid
CS	6	31	7	50	2.04	0.35	17	18	**617**	73	36.1	**2023**	Non Acid
Tailings Samples													
Tailings #1	1	19	8	41	1.88	1.12	54	57	**615**	88.08	107	**824**	Non acid
Tailings #2	2	20	4.5	31	2.12	1.12	7.3	8	4582	88.05	16	5448	Non acid

The AP depletion rate is based on the sulfate production rate over the period of stable kinetic data.
The initial AP and NP in tailings materials has been estimated based on Rock Creek ore sample data and tailings process information.

Humidity cell test results for development rock samples indicate strongly acid neutralizing conditions both during the test and from long-term depletion calculations. There is no evidence either from test data or long-term estimates that suggests acidic conditions will develop from the Rock Creek development rock.

Detailed mineralogy

Detailed mineralogy includes characterizing the rock under optical microscope and SEM to determine the nature of acid-generating and acid-neutralizing phases, efflorescent salts, alteration products, and the source of metals of concern in the various mineral phases.

The mineralogy study indicates that pyrite content is generally below 2% of the total rock mass, and is generally associated with calcite. Both pyrite and calcite are secondary minerals that are present as replacement or secondary hydrothermal alteration products.

Neither the pyrite nor calcite are generally isolated or coated by other products that might limit their reactivity or availability, nor are these minerals distinctly euhedral in form indicating that mineral surfaces are irregular and therefore assumed to have accessible surface area for reactions to proceed.

Metals, especially arsenic, are predominantly found as secondary and tertiary efflorescent salt coatings on primary grains. This suggests there may be limited long-term generation of metals during weathering.

5 CONFIRMATORY ABA TESTING RESULTS USING ALTERNATE NP DETERMINATIONS

Additional samples were analyzed using the standard and alternate methods for determining NP, as a confirmation of earlier findings and to reevaluate the acid generation/neutralization potential of the different rock types. A total of 104 additional samples were selected from five different rock types and analyzed using the standard ABA testing procedures. In addition, the siderite-corrected Sobek and the total inorganic carbon analytical methods were used for the determination and comparison of NP values. The results of this testing are presented in Attachment 3. Table 9 presents the ranges and geometric mean values of NP based on lithology, using the three alternate NP determinations. Correlation data between the alternate NP determinations are presented graphically in Attachment 3; in both cases, the standard Sobek and alternate methods show a near 1:1 relationship.

Table 9 NP value summary statistics

Lithology	Standard Sobek			Siderite-corrected Sobek			TIC		
	Min	Max	Geomean	Min	Max	Geomean	Min	Max	Geomean
CQMS	57	286	135	53	288	124	42	242	108
CS	95	272	147	84	284	146	58	242	120
GQMS	44	336	162	21	310	137	25	317	137
QGS	5	160	47	25	159	68	8	158	47
QMS	14	447	120	13	444	107	8	408	100

A summary table and series of figures are included in Attachment 3 that present the confirmation ABA data based on determinations of NP using (1) the standard Sobek method; (2) siderite-corrected Sobek method; and (3) total inorganic carbon carbonate determination. The NP:AP ratios and NNP values are calculated using each of the three NP determinations, and using both total sulfur and sulfide sulfur for calculating AP.

The first series of figures present the results of the confirmatory ABA data using the NP values determined by the standard Sobek method. These data are presented as scatter plots, and are grouped first by lithology and then by ore versus development rock samples. For each scatter plot, the ABA data are presented as both total sulfur (most conservative estimate) and sulfide sulfur (indication of acid generating material). As presented in the summary table, the NP:AP ratios (based on sulfide-sulfur) using the standard ABA methods range from 0.48 to 47, with an arithmetic mean of 8.7 and a geometric mean of 6.0 indicating overall non acid-generating material. Of the 104 samples, there are only 3 which represent the development rock composition and have a NP:AP ratio of less than 1.0, indicating potentially acid-generating material for approximately 3 percent of the samples.

The second series of figures present the results of the confirmatory ABA data using the NP values determined by the siderite-corrected Sobek method. These data are presented as scatter plots, and are grouped first by lithology and then by ore versus development rock samples. The NP:AP (based on sulfide-sulfur) ratio for the confirmatory ABA data ranges from 0.63 to 47 with an arithmetic mean of 8.2 and a geometric mean of 5.6, indicating overall non acid-generating material. Of the 104 samples, there is only one which represents the ore rock composition and has a NP:AP ratio of less than 1.0, indicating potentially acid-generating material for less than 1 percent of the samples.

The third series of figures present the results of the confirmatory ABA data using the NP values determined based on the total inorganic carbon content. The NP:AP (based on sulfide-sulfur) ratio for the confirmatory ABA data ranges from 0.55 to 37 with an arithmetic mean of 7.0 and a geometric mean of 5.0 indicating overall non acid-generating material. Of the 104 samples, there are only 2 which represent the development rock composition and have a NP:AP ratio of less than 1.0, indicating potentially acid-generating material for approximately 2 percent of the samples.

The NNP values for the confirmation samples, calculated using the three alternate NP values, are presented in histograms in Attachment 3. For each data set, the majority of the samples are considered non-acid generating with some samples in the zone of uncertainty.

The variations in ABA results using the three alternate methods for determining NP are relatively insignificant and within the range of analytical error. The overall interpretation of acid generation/neutralization capacity of the samples data does not differ based on the different methodologies. These results confirm the original ABA test data and interpretations from Phases I and II.

Attachment 4 presents borehole locations of ABA samples and illustrative cross-sections indicating the location of potentially acid generating rock within the proposed pit outline. Potentially acid generating material was defined, for this evaluation, based on a NP:AP ratio of 2.0.

6 SUMMARY

Bulk rock elemental chemistry indicates few elements that are elevated relative to average igneous rocks. These include gold, arsenic, molybdenum, lead, sulfur, antimony, and zinc. Of these, arsenic, antimony, and molybdenum are indicated at elemental concentrations which could, if mobilized in the environment, pose an environmental risk. This is corroborated by the MWMP results, which indicate elevated arsenic and antimony in the ore samples and one development rock sample (QGS). Based on current estimates of the distribution of lithologies among mined rocks, leachable arsenic and antimony occurrence is limited to only 7 percent of the potential development rock material, while arsenic and antimony are more widely distributed and mobile (at least in the short-term conditions tested by MWMP) in the ore. Given the apparently small percentage (approximately 8 percent) of the QGS material compared to the total development rock mass, it is likely possible manage the development rock handling to limit the long-term risk of impacts from the QGS material.

Other than an isolated band of QGS in the southern portion of the ore body, the development rock and ore consists of highly altered, folded, and foliated, metamorphic rocks. Discrete occurrences of individual lithologies are not observed in the core and not traceable with the geologic model, nor are they well-defined enough to represent in the block model. This configuration renders the ore body and development rock well blended by natural processes.

Average ABA data for both ore and development rock samples indicate overall non acid-generating material, with a geometric mean NP:AP ratio of 3.7. Of the 407 samples tested, 28 samples (7 percent) were potentially acid-generating. Considered separately, ore samples are classified within the uncertain zone, bordering on non acid-generating, and development rock samples are interpreted as more non acid-generating (acid neutralizing) than the ore with a geometric mean NP:AP ratio of 4.1. XRD analysis confirms the presence of neutralizing minerals, predominantly in the form of dolomite and calcite. Confirmatory ABA data for 104 additional samples of both ore and development rock also indicate an overall non acid-generating material with a geometric mean NP:AP ratio of 6.0. The confirmatory samples were also analyzed using alternate methods for determining NP, as a confirmation of earlier findings and to reevaluate the acid generation/neutralization potential of the different rock types. The two alternate methods for determining NP are the siderite-corrected Sobek method and the total inorganic carbon method. Of the 104 samples tested using the alternate NP methods, only 3 samples (less than 3%) were potentially acid-generating, which is consistent with earlier findings. Both ore and development rock samples are interpreted as non acid-generating. The ABA results suggest that the development rock and ore material will not pose a risk of acid generation in the short or long term. The few samples categorized in the uncertain range, could potentially generate acid in the long term, however the effects may be localized and may be mitigated by the other, non acid-generating/net neutralizing tonnage of rock material.

These interpretations are supported by the kinetic test results. All samples, including the ore composite, are generating alkaline leachate with circumneutral pH and no measurable acidity. Humidity cell test results for development rock samples indicate strongly neutralizing conditions both during the test and from long-term depletion calculations. There is no evidence either from test data or long-term estimates that suggest acidic conditions will develop from the Rock Creek development rock. This indicates that acid rock drainage from development rock and pit walls is not a short- or long-term issue at Rock Creek. Metals concentrations vary depending on the material including rock types that generate moderate to very low and non-detectable concentrations of key metals including arsenic. This is expected since natural arsenic concentrations in groundwater and surface water in the area are generally elevated.

Development rock at the Rock Creek project will be placed using run-of-mine blending, such that material excavated from the deposit that does not go to the mill will be deposited in designated development rock facilities. The Rock Creek development rock, from a geochemical standpoint, is ideal for this stockpiling technique because of the following aspects:

- The deposit is strongly foliated, fractured, and folded. All lithological differences are subtle and defined by minor mineralogic changes. This has resulted in a relatively homogenous deposit in terms of ABA and metals content. There are few, if any, well-defined blocks of unique, acid-generating material such that they could be feasibly segregated or handled differently.

- The ABA data indicate a preponderance of NP compared to AP in all lithologies in all areas of the deposit. The majority of the samples were non-acid generating, with secondary quantity of materials in the uncertain range with a low (between 5 and 6) percentage of samples in the acid-generating zone.

- These acid-generating samples are of mixed lithology and location in the deposit such that no single lithology or area of the deposit will be acid generating, thereby eliminating the possibility of “hot spots” in the development rock facilities.

- All confirmatory sampling and analysis, including two additional methods of quantifying the neutralizing potential, give the results consistent with the standard neutralizing potential methods.

- All kinetic humidity cell test results indicate strongly buffered (neutralizing) conditions from all lithologies.

- All depletion calculations, intended to predict the long-term behavior of development rock lithologies using the humidity cell tests, indicate long-term neutralizing conditions.

- There is no indication, from any of the test work to-date, of any short- or long-term acid generation developing from the Rock Creek development rock.

7 REFERENCES

APHA, AWWA, and WPCF, 1992. Standard Methods for the Examination of Water and Wastewater, 18th ed. American Public Health Association, Washington, D.C. USA.

ASTM, 1996. ASTM D5744-96 – Standard Test Method for Accelerated Weathering of Solid materials Using a Modified Humidity Cell.

British Columbia Acid Mine Drainage Task Force (1989), Draft Acid Rock Drainage Guide, BiTech Publishers Ltd., Vancouver, British Columbia.

EPA, 1999. EPA and Hardrock Mining: A Sourcebook for Industry in the Northwest and Alaska. Draft Guidance Document from EPA Region 10; EPA-10-R-99-016.

Lawrence, R.W. and Y. Wang, 1997. Determination of Neutralization Potential in the Prediction of Acid Rock Drainage. Proc. 4th International Conference on Acid Rock Drainage, Vancouver, B.C., p449-464.

Mend, 1994. Handbook for Wasterock Sampling Techniques. MEND Report 4.5.1-2. June.

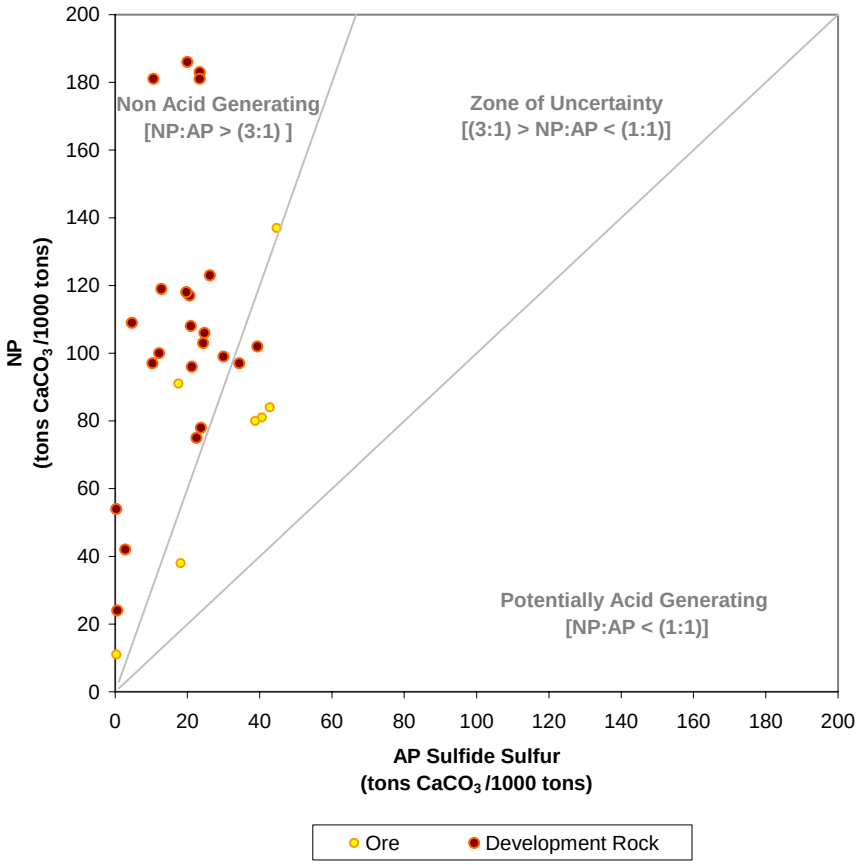
Price, W.A., 1997. Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia. B.C. Ministry of Employment and Investment, p141 plus appendices.

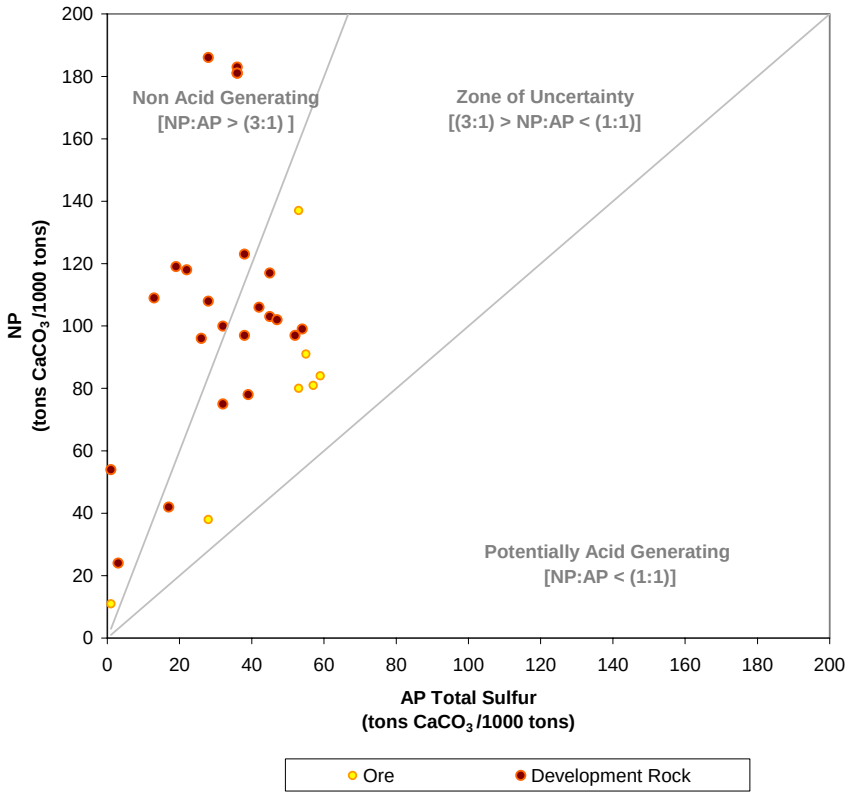
Skousen, J., Renton, J., Brown, H., Evans, P., Leavitt, B., Brady, K., Cohen, L. and P. Ziemkiewicz, 1997. Neutralization Potential of Overburden Samples containing Siderite. Journal of Environmental Quality, v26, n3, p673-681.

Sobek, A.A., W.A. Schuller, J.R. Freeman, and R.M. Smith, 1978. Field and laboratory methods applicable to overburden and minesoils. U.S. E.P.A. Report EPA-600/2-78-054.

WMC, 2003. "Rock Creek Phase I Geochemistry Program," draft memorandum to Nova Gold Resources from Water Management Consultants Inc., December, 2003.

FIGURES

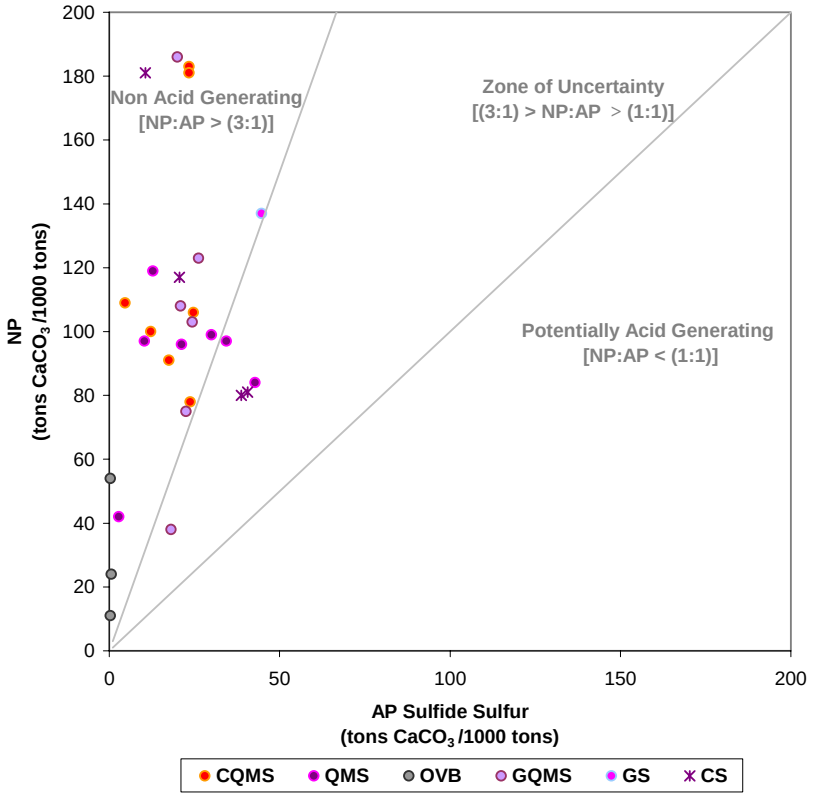


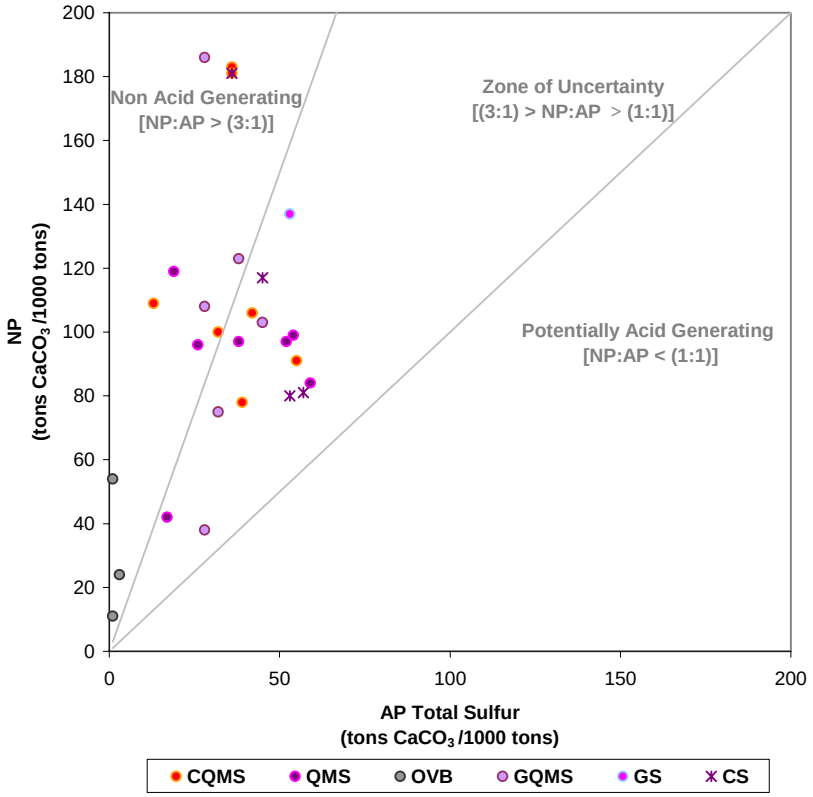


WATER MANAGEMENT CONSULTANTS
Denver, CO

ABA SCATTER PLOTS BY ORE AND DEVELOPMENT ROCK PHASE I DATA			
CLIENT: NovaGold RESORCES, INC.		PROJECT: ROCK CREEK	
JOB: 2509	FILE: FIGURE-1.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 1	

F:\2509 - ROCK CREEK\2509 - FINAL MEMOS APR 2006\GEOCHEM MEMO APR 2006\2509-MEMO-MAY-2006\FIGURE-1.DWG



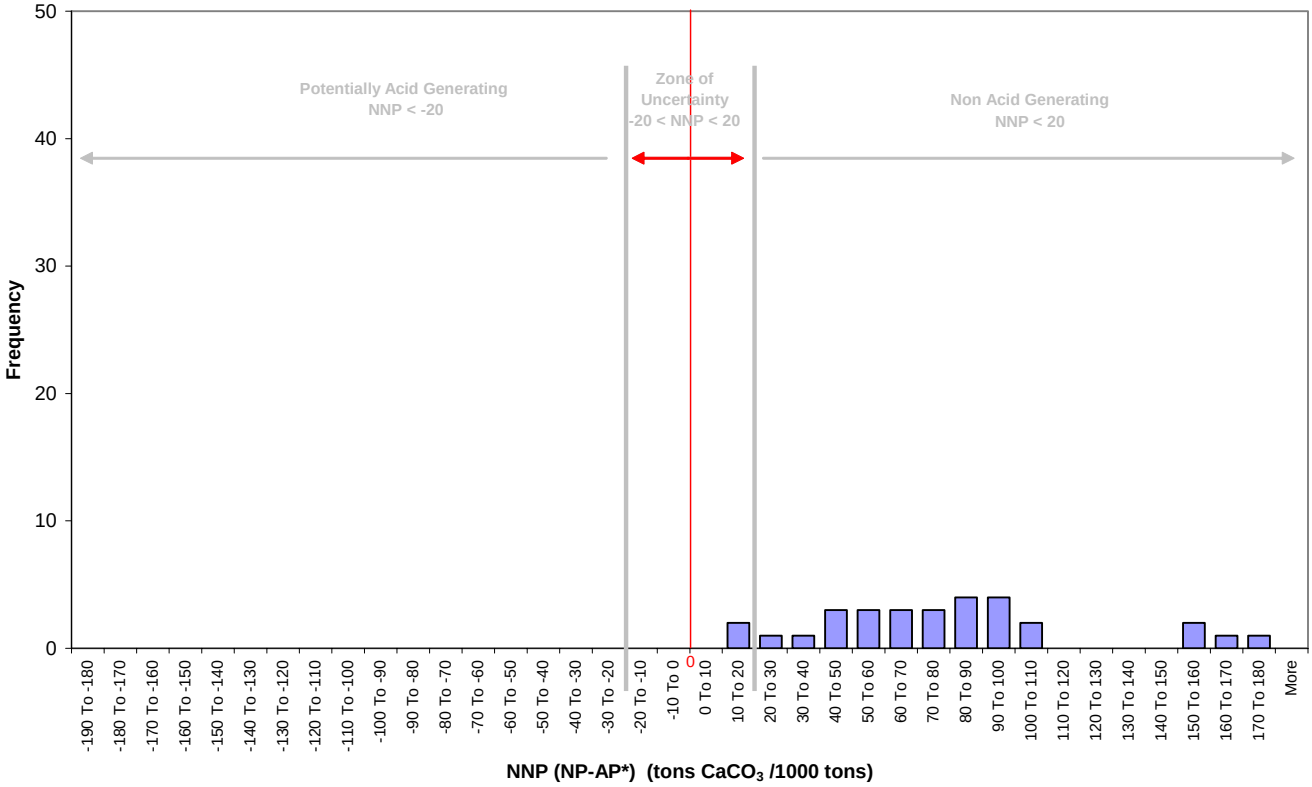


WATER MANAGEMENT CONSULTANTS
Denver, CO

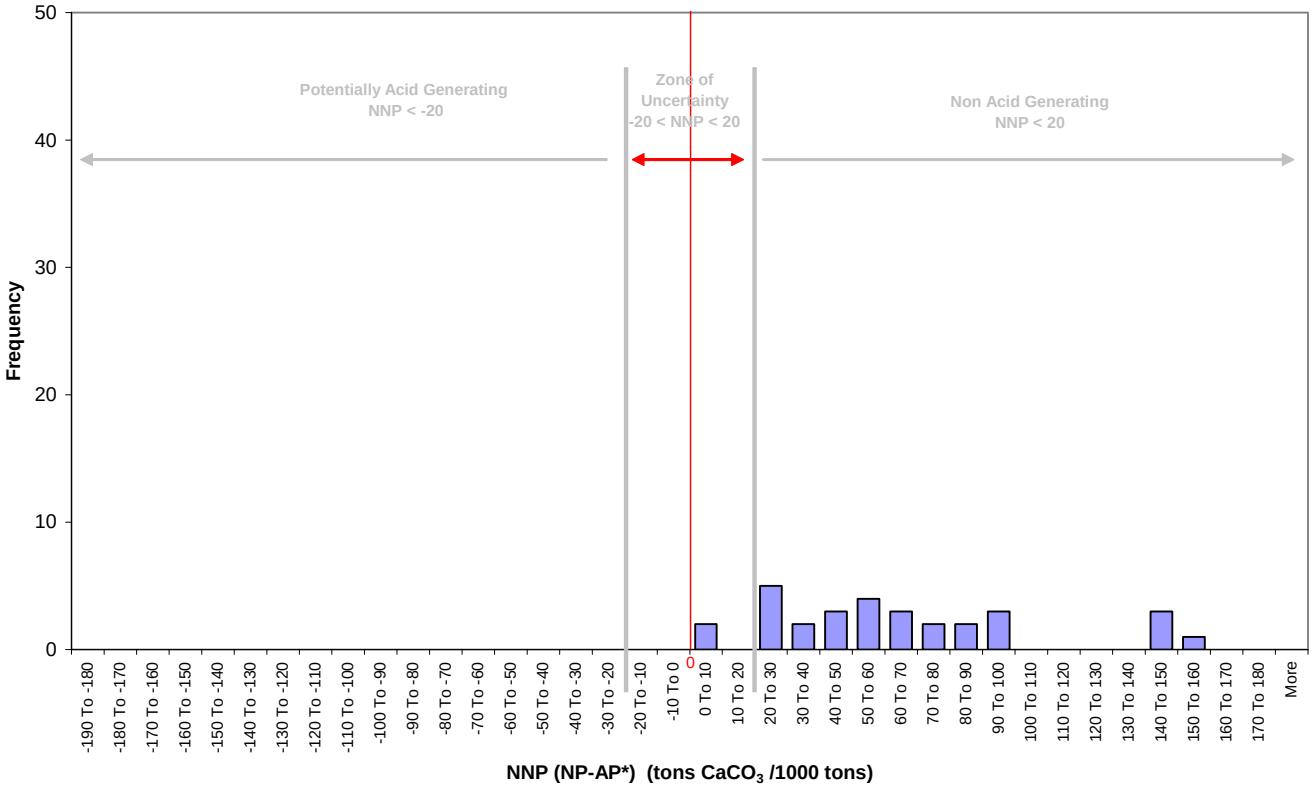
ABA SCATTER PLOTS BY LITHOLOGY
PHASE I DATA

CLIENT: NovaGold RESORCES, INC.		PROJECT: ROCK CREEK	
JOB: 2509	FILE: FIGURE-2.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 2	

F:\2509 - ROCK CREEK\2509 - FINAL MEMOS APR 2006\GEOCHEM MEMO APR 2006\2509-MEMO-MAY-2006\FIGURE-2.DWG



* AP calculated using sulfide sulfur



* AP calculated using total sulfur

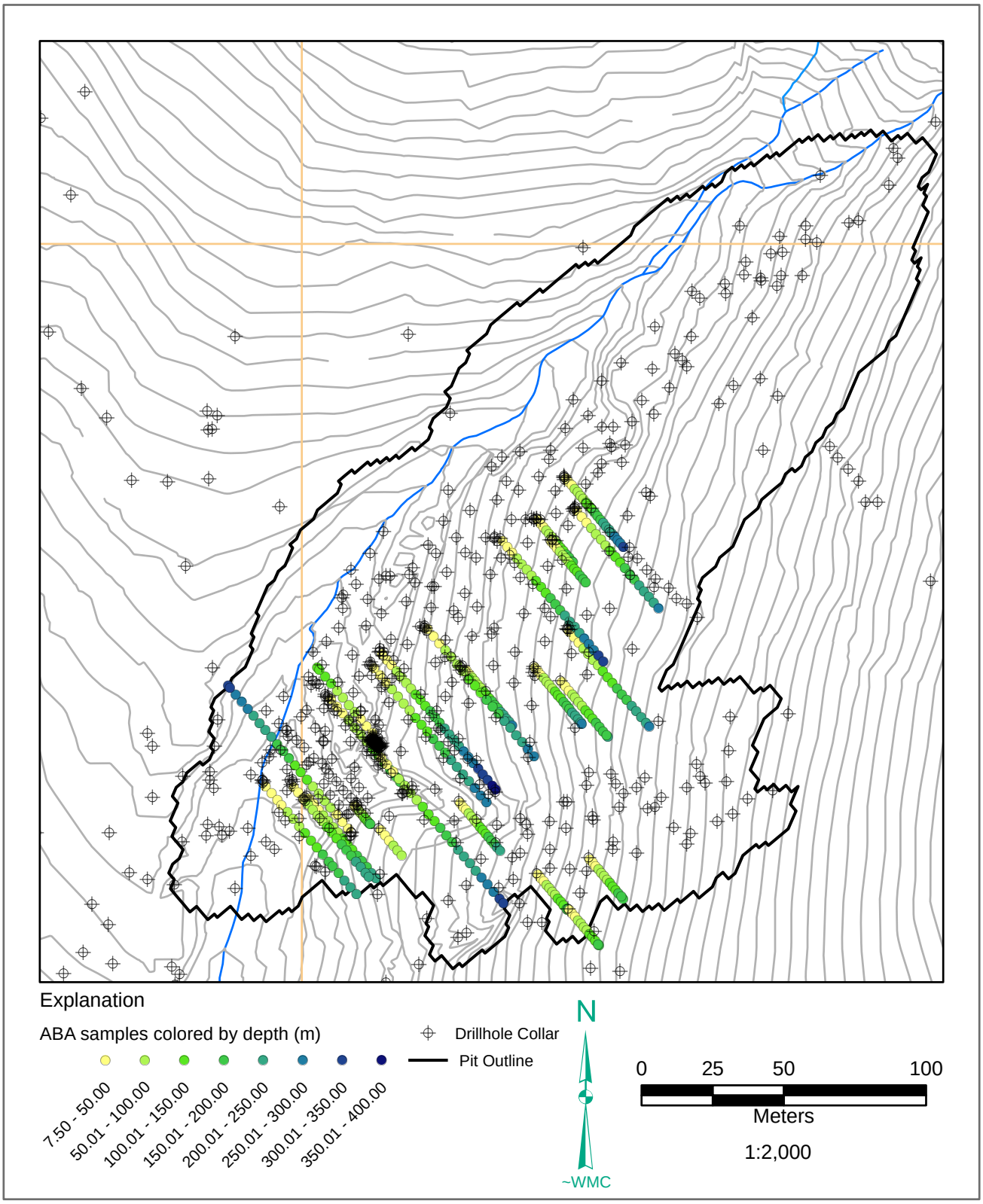
WATER MANAGEMENT CONSULTANTS
Denver, CO

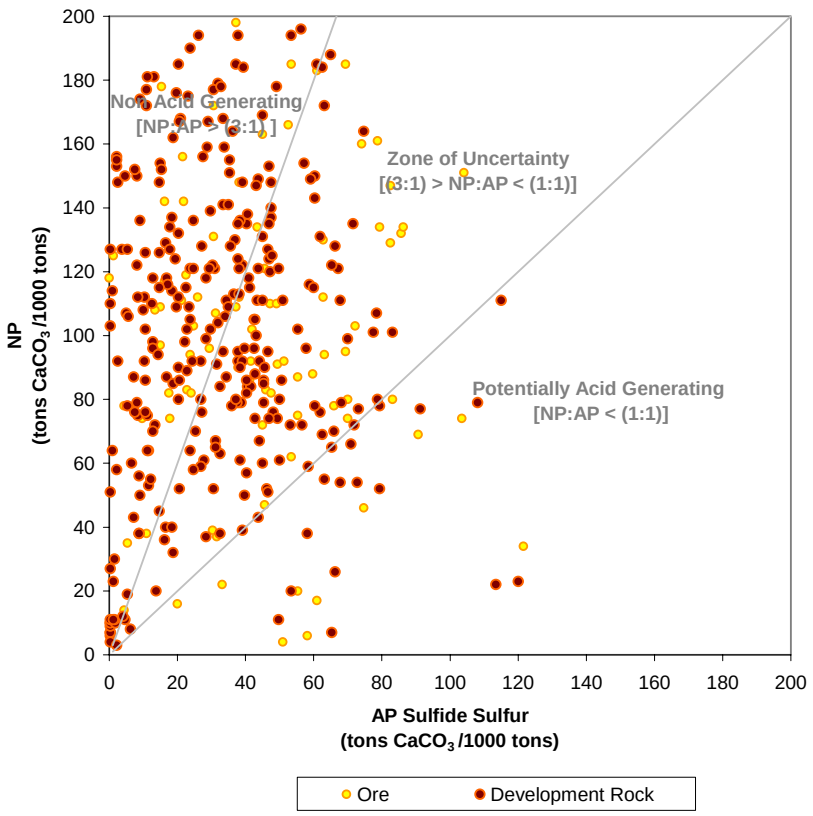
NET NEUTRALIZATION POTENTIAL HISTOGRAM PHASE I DATA			
CLIENT: NovaGold RESORCES, INC.		PROJECT: ROCK CREEK	
JOB: 2509	FILE: FIGURE-3.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 3	

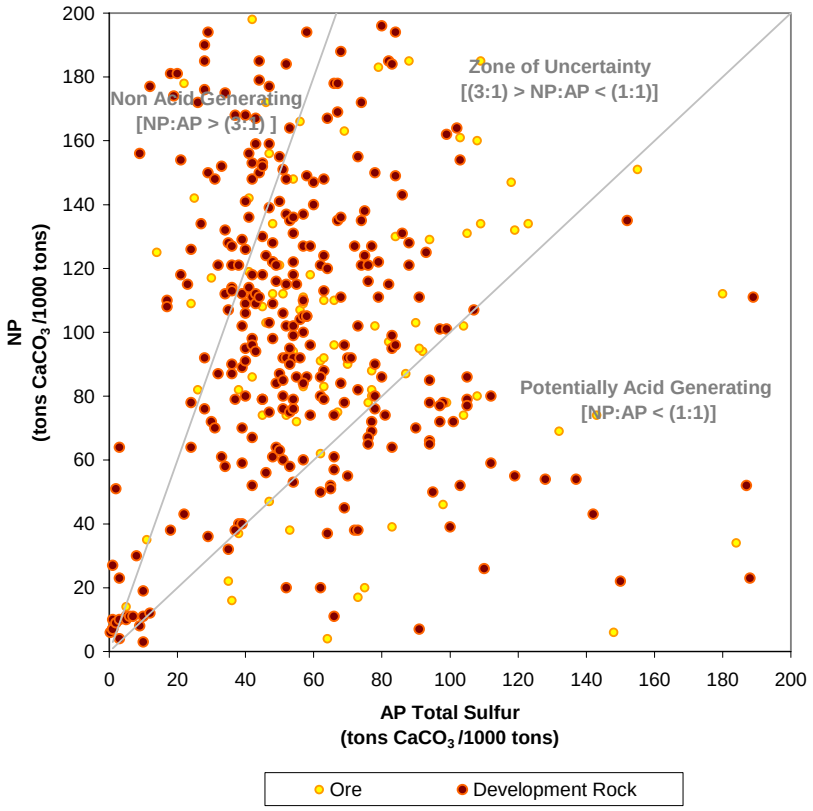
F:\2509 - ROCK CREEK\2509 - FINAL MEMOS APR 2006\GEOCHEM MEMO APR 2006\2509-MEMO-MAY-2006\FIGURE-3.DWG

WATER MANAGEMENT CONSULTANTS

Figure 4 Spatial distribution and depth of ABA samples





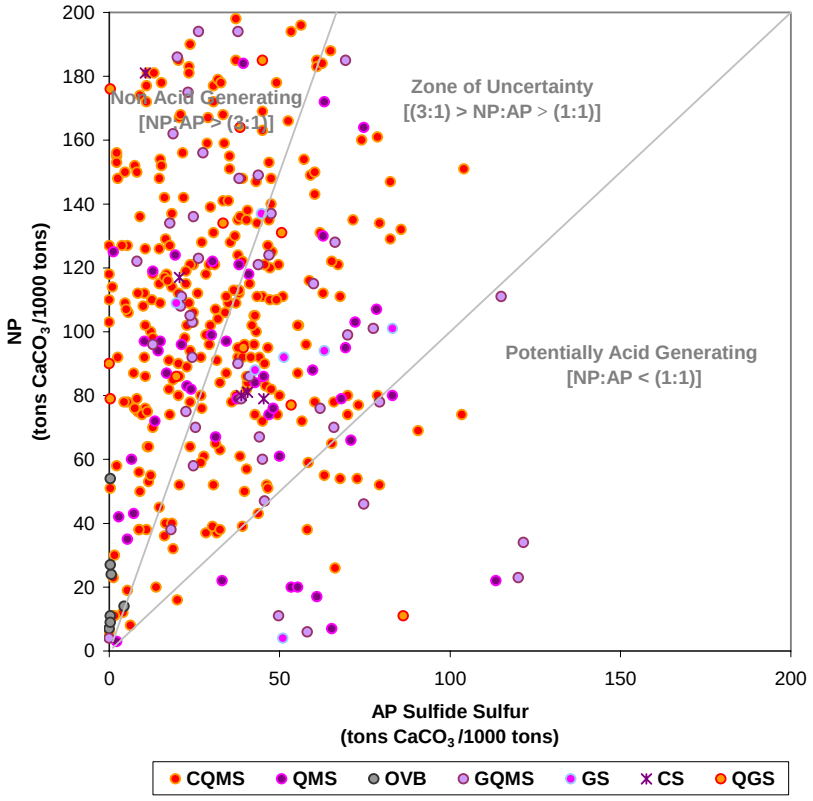


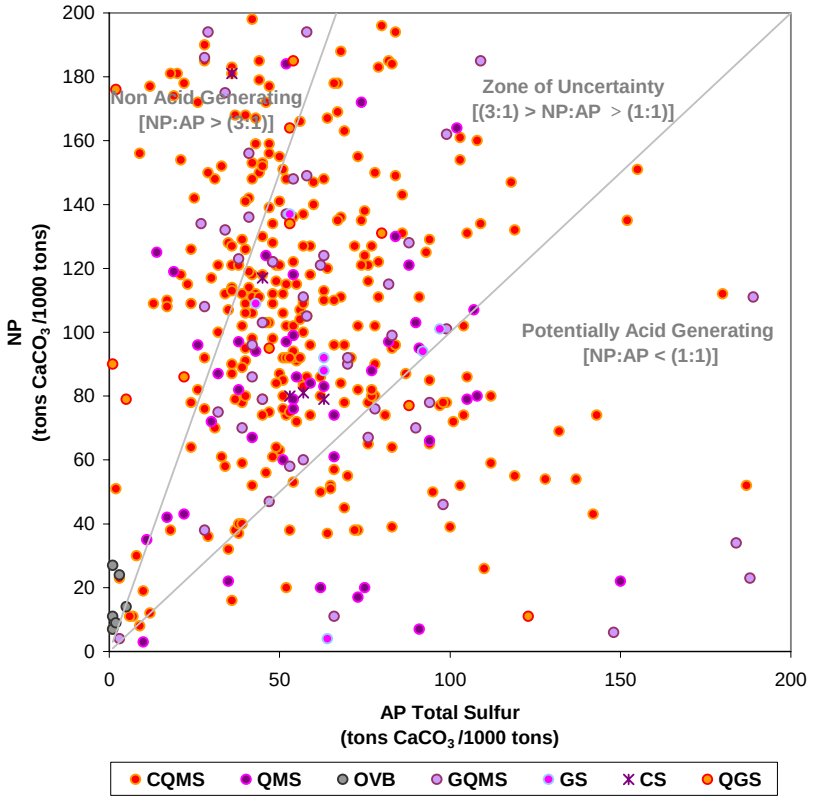
WATER MANAGEMENT CONSULTANTS
Denver, CO

ABA SCATTER PLOTS BY ORE AND DEVELOPMENT ROCK
PHASE I AND II DATA

CLIENT: NovaGold RESORCES, INC.		PROJECT: ROCK CREEK	
JOB: 2509	FILE: FIGURE-5.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 5	

F:\2509 - ROCK CREEK\2509 - FINAL MEMOS APR 2006\GEOCHEM MEMO APR 2006\2509-MEMO-MAY-2006\FIGURE-5.DWG



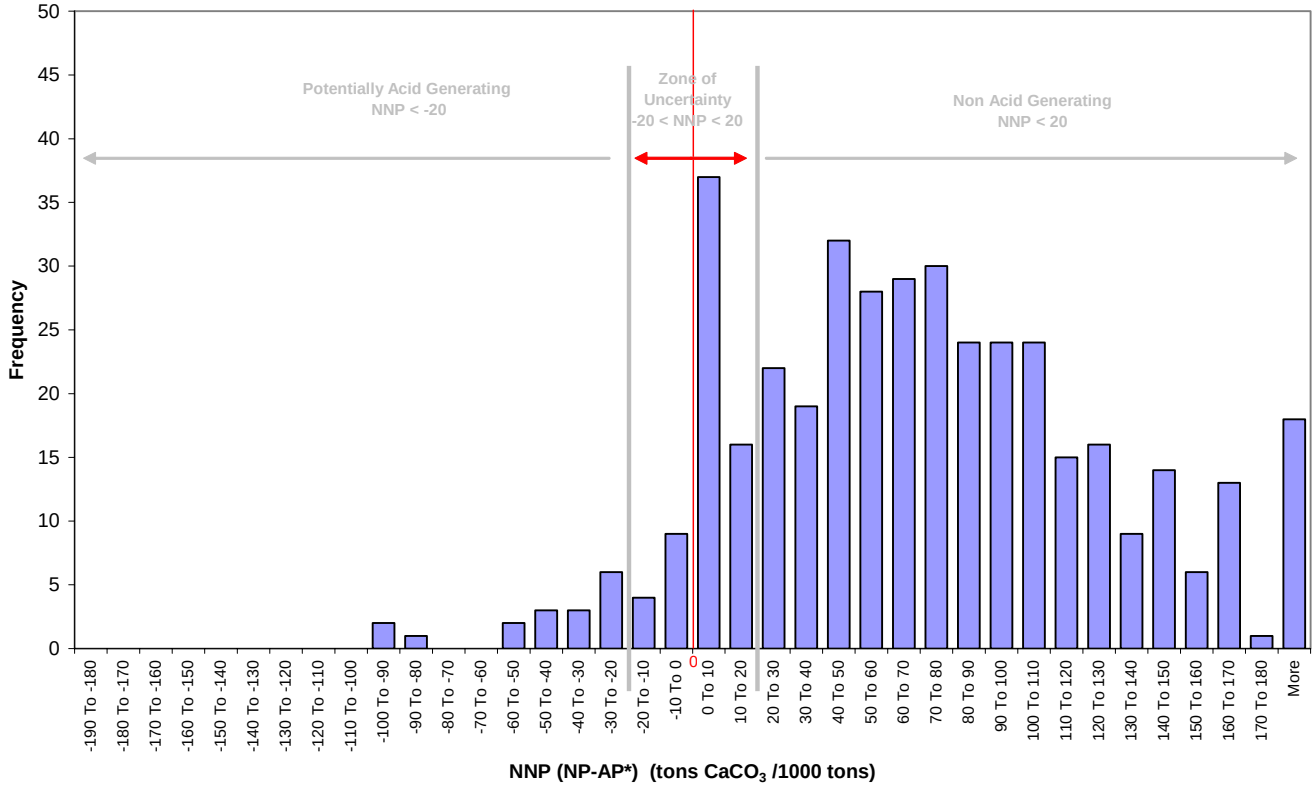


WATER MANAGEMENT CONSULTANTS
Denver, CO

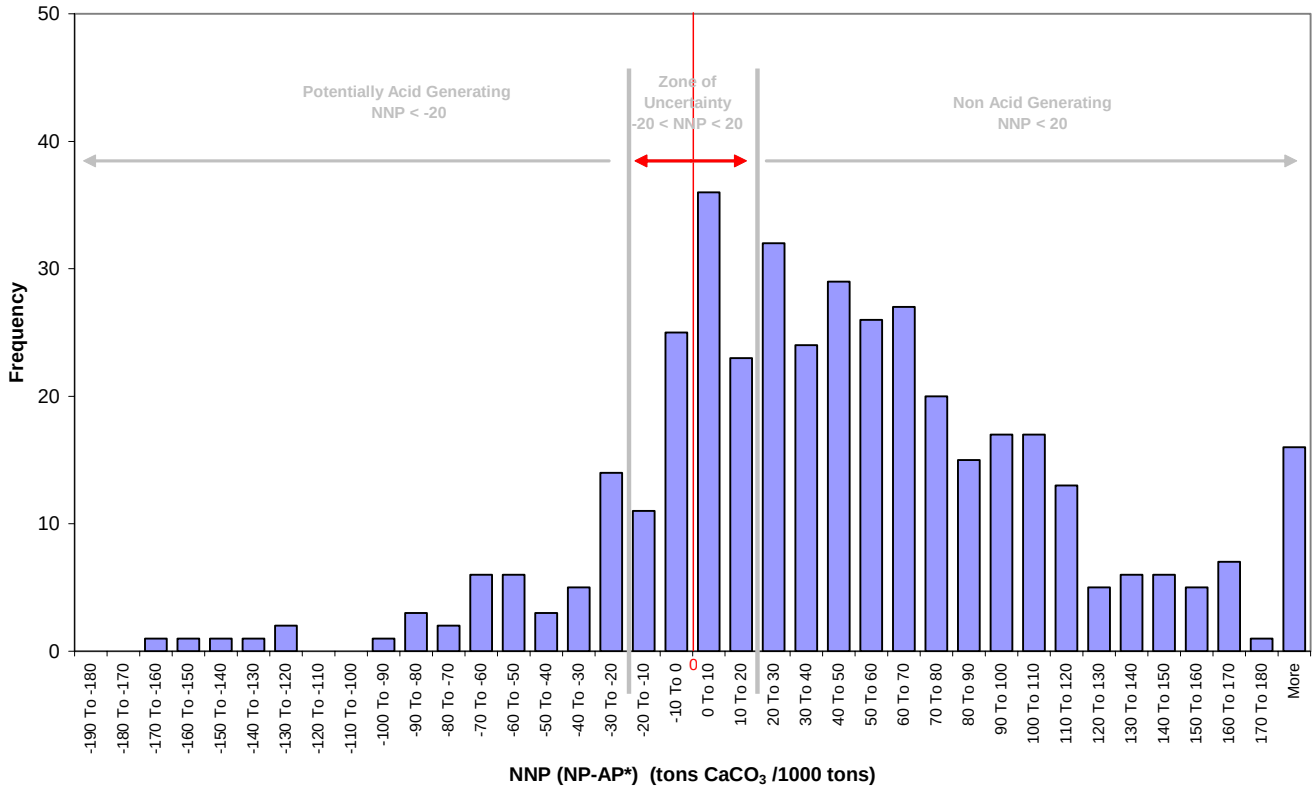
ABA SCATTER PLOTS BY LITHOLOGY
PHASE I AND II DATA

CLIENT: NovaGold RESORCES, INC.		PROJECT: ROCK CREEK	
JOB: 2509	FILE: FIGURE-6.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 6	

F:\2509 - ROCK CREEK\2509 - FINAL MEMOS APR 2006\GEOCHEM MEMO APR 2006\2509-MEMO-MAY-2006\FIGURE-6.DWG



* AP calculated using sulfide sulfur



* AP calculated using total sulfur

WATER MANAGEMENT CONSULTANTS
Denver, CO

NET NEUTRALIZATION POTENTIAL HISTOGRAM PHASE I AND II DATA			
CLIENT: NovaGold RESORCES, INC.		PROJECT: ROCK CREEK	
JOB: 2509	FILE: FIGURE-7.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 7	

F:\2509 - ROCK CREEK\2509 - FINAL MEMOS APR 2006\GEOCHEM MEMO APR 2006\2509-MEMO-MAY-2006\FIGURE-7.DWG

ATTACHMENT 1

ABA Results

Attachment 1
ABA Results - Ore Rock
Rock Creek Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
04-22-030	6.8	4	64	51	-60	-47	0.1	0.1
04-22-075	8.0	163	69	45	94	118	2.4	3.6
04-22-090	7.9	131	105	31	26	100	1.2	4.3
04-22-105	8.1	112	48	38	65	74	2.3	2.9
04-23-030	7.9	37	38	32	-1	5	1.0	1.2
04-23-135	8.0	107	56	31	51	76	1.9	3.4
04-23-165	8.1	90	70	38	20	52	1.3	2.4
04-23-195	8.2	111	57	21	54	90	1.9	5.2
04-23-210	8.0	96	66	29	30	67	1.5	3.3
04-24-015	7.3	14	5	4	9	10	2.8	3.2
04-24-030	7.7	94	92	63	2	31	1.0	1.5
04-24-045	8.0	78	99	66	-21	12	0.8	1.2
04-24-060	8.0	87	87	55	----	32	1.0	1.6
04-24-090	6.9	17	73	61	-56	-44	0.2	0.3
04-24-105	7.6	20	75	55	-55	-35	0.3	0.4
04-24-120	7.7	22	35	33	-13	-11	0.6	0.7
04-24-165	8.3	82	26	18	56	65	3.2	4.7
04-24-195	8.2	109	24	15	85	94	4.5	7.3
04-25-120	8.1	129	94	83	35	47	1.4	1.6
04-25-150	8.0	160	108	74	52	86	1.5	2.2
04-25-165	8.1	134	109	79	25	55	1.2	1.7
04-25-190	8.0	132	119	86	13	46	1.1	1.5
04-26-120	8.3	94	54	24	40	70	1.7	4.0
04-27-045	7.4	38	53	11	-15	27	0.7	3.5
04-27-135	8.0	97	82	15	15	82	1.2	6.5
04-27-240	8.1	83	63	23	20	60	1.3	3.6
04-28-075	7.9	39	83	30	-44	9	0.5	1.3
04-28-135	8.1	78	76	4	2	74	1.0	17.8
04-28-150	8.2	102	104	56	-2	46	1.0	1.8
04-28-165	8.3	74	52	10	22	64	1.4	7.6
04-29-210	8.2	74	143	103	-69	-29	0.5	0.7
04-29-255	8.1	217	59	43	158	175	3.7	5.1
04-29-270	8.1	69	132	91	-63	-22	0.5	0.8
431035-045	8.0	91	62	49	29	42	1.5	1.8
431065-075	7.9	62	62	53	0	9	1.0	1.2
431080-090	8.1	75	67	55	8	20	1.1	1.4
432035-045	8.1	118	59	1	59	118	2.0	118.0
432110-120	8.2	130	84	63	46	67	1.5	2.1
432125-135	8.1	88	77	60	11	28	1.1	1.5
433005-015	7.3	35	11	5	24	30	3.2	6.6
433035-045	8.0	80	108	83	-28	-3	0.7	1.0
434035-045	8.1	161	103	79	58	82	1.6	2.0
435080-090	7.9	74	104	70	-30	4	0.7	1.1
435155-165	8.2	47	47	46	0	1	1.0	1.0
435200-210	8.0	46	98	75	-52	-29	0.5	0.6
435215-225	8.2	134	123	86	11	48	1.1	1.6
435230-240	8.2	185	109	69	76	116	1.7	2.7
435245-255	8.0	185	88	53	97	132	2.1	3.5
436050-060	7.9	83	57	46	26	37	1.5	1.8
436110-120	7.9	80	77	70	3	10	1.0	1.1
436125-135	8.1	147	118	83	29	65	1.2	1.8
436140-150	8.3	246	72	53	174	193	3.4	4.6
436155-165	8.5	183	79	61	104	122	2.3	3.0
436200-210	8.2	117	30	16	87	101	3.9	7.2
437065-075	8.3	86	42	41	44	45	2.0	2.1
437125-135	8.3	151	155	104	-4	47	1.0	1.5
437245-255	8.3	112	180	63	-68	49	0.6	1.8
438035-045	8.1	125	14	1	111	124	8.9	100.0
438050-060	7.8	74	45	18	29	56	1.6	4.2
438095-105	7.9	82	77	48	5	35	1.1	1.7
439065-075	8.1	172	46	31	126	141	3.7	5.6
439080-090	8.0	109	57	37	52	72	1.9	2.9
439110-120	7.8	134	48	43	86	91	2.8	3.1

Attachment 1
ABA Results - Ore Rock
Rock Creek Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
439185-195	8.4	112	51	26	61	86	2.2	4.3
444060-070	7.1	34	184	122	-150	-88	0.2	0.3
444125-130	6.5	6	148	58	-142	-52	0.0	0.1
444135-145	7.2	16	36	20	-20	-4	0.4	0.8
444190-200	8.0	178	22	15	156	163	8.1	11.6
444205-215	8.0	142	41	22	101	120	3.5	6.5
444220-230	8.1	142	25	16	117	126	5.7	8.7
444235-245	8.0	121	50	46	71	75	2.4	2.7
443035-045	7.8	92	53	42	39	50	1.7	2.2
444050-060	8.1	110	63	47	47	63	1.7	2.3
444110-120	8.0	82	38	24	44	58	2.2	3.4
444125-135	8.0	95	91	69	4	26	1.0	1.4
444185-195	7.8	72	55	45	17	27	1.3	1.6
444200-210	8.0	110	66	49	44	61	1.7	2.2
444215-225	8.1	102	78	42	24	60	1.3	2.4
447020-030	7.8	119	41	23	78	97	2.9	5.3
447035-045	7.9	103	46	25	57	78	2.2	4.2
447050-060	8.0	156	47	22	109	134	3.3	7.2
447065-075	8.1	166	56	53	110	114	3.0	3.2
447080-090	8.1	198	42	37	156	161	4.7	5.3
447110-120	8.1	223	40	40	183	183	5.6	5.6
447125-135	8.4	442	33	28	409	415	13.4	16.1
447170-180	8.2	103	90	72	13	31	1.1	1.4
447305-315	7.6	148	54	38	94	110	2.7	3.9
447320 325	7.9	108	45	13	63	95	2.4	8.0
448065-075	7.7	92	63	51	29	41	1.5	1.8
STATISTICS								
Count	89	89	89	89	88	**89**	89	**89**
Minimum	6.5	4.0	5.0	1.0	-150	**-88**	0.0	**0.1**
Maximum	8.5	442	184	122	409	**415**	13	**118**
Geometric Mean	8.0	88	61	35	na	**na**	1.4	**2.5**
Arithmetic Mean	8.0	108	71	45	38	**62**	2.0	**5.7**

NP = Neutralizing Potential (EPA Sobek, et.al., 1978 protocol)
AP = Acid-generating potential (EPA Sobek, et al., 1978 protocol). Calculated based on total sulfur or sulfide-sulfur, as [sulfur] * 31.25 multiplier.
NNP = Net neutralization potential. Calculated as NP - AP.
NP:AP = Ratio of NP divided by AP.
Total Sulfur = Total Sulfur (EPA M600),
Sulfide-S = Sulfide sulfur (EPA M600).
T CaCO3 = Ton CaCO3 per ton of material.
* Non-detected values of AP and NP are substituted with the method detection limit (1.0 T CaCO3/ton material) for calculations.

Attachment 1
ABA Results - Development Rock
Rock Creek Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
04-22-015	7.3	27	1	0.3	26	27	27.0	86.4
04-22-045	7.8	38	73	58.1	-35	-20	0.5	0.7
04-22-060	8.8	80	40	26.9	40	53	2.0	3.0
04-22-120	7.9	102	52	22.8	50	79	2.0	4.5
04-22-135	7.9	106	51	34.1	55	72	2.1	3.1
04-22-150	8.1	58	34	2.2	24	56	1.7	26.5
04-22-165	8.2	78	24	5.3	54	73	3.3	14.7
04-22-175	8.2	148	31	2.5	117	146	4.8	59.2
04-23-015	7.4	7	1	1.0	6	6	7.0	7.0
04-23-045	8.0	77	97	73.1	-20	4	0.8	1.1
04-23-060	8.0	138	75	40.6	63	97	1.8	3.4
04-23-075	8.1	92	54	26.9	38	65	1.7	3.4
04-23-090	7.9	72	101	56.6	-29	15	0.7	1.3
04-23-105	8.1	50	62	39.7	-12	10	0.8	1.3
04-23-120	8.1	79	45	38.1	34	41	1.8	2.1
04-23-150	8.3	122	48	8.1	74	114	2.5	15.0
04-23-180	8.1	92	70	24.4	22	68	1.3	3.8
04-23-225	8.1	110	57	1.0	53	109	1.9	110.0
04-24-075	6.7	20	62	53.4	-42	-33	0.3	0.4
04-24-135	8.1	115	23	22.5	92	93	5.0	5.1
04-24-150	8.3	110	17	12.5	93	98	6.5	8.8
04-24-180	8.1	126	24	14.7	102	111	5.3	8.6
04-24-210	8.3	408	22	13.1	386	395	18.5	31.1
04-24-225	8.5	933	4	0.6	929	932	233.3	1493
04-24-240	8.3	256	44	10.6	212	245	5.8	24.1
04-24-250	8.2	111	79	50.9	32	60	1.4	2.2
04-25-015	7.9	9	2	0.3	7	9	4.5	28.8
04-25-030	8.2	246	19	14.4	227	232	12.9	17.1
04-25-045	8.7	262	72	56.6	190	205	3.6	4.6
04-25-060	8.4	140	60	47.5	80	93	2.3	2.9
04-25-075	8.5	143	86	60.3	57	83	1.7	2.4
04-25-090	7.8	185	44	37.2	141	148	4.2	5.0
04-25-105	8.0	168	37	33.4	131	135	4.5	5.0
04-25-135	8.0	153	45	46.9	108	106	3.4	3.3
04-25-180	8.1	148	63	47.5	85	101	2.3	3.1
04-26-030	7.9	181	20	11.3	161	170	9.1	16.1
04-26-045	7.8	100	57	43.1	43	57	1.8	2.3
04-26-060	7.9	92	51	37.8	41	54	1.8	2.4
04-26-075	7.9	87	50	34.4	37	53	1.7	2.5
04-26-090	8.1	124	75	37.8	49	86	1.7	3.3
04-26-105	8.1	113	63	38.1	50	75	1.8	3.0
04-26-135	8.1	125	93	47.8	32	77	1.3	2.6
04-26-150	8.2	63	50	32.5	13	31	1.3	1.9
04-26-165	8.2	53	54	11.6	-1	41	1.0	4.6
04-26-180	7.8	37	64	28.4	-27	9	0.6	1.3
04-26-195	8.2	85	51	18.8	34	66	1.7	4.5
04-26-210	8.0	38	37	8.8	1	29	1.0	4.3
04-26-225	8.0	64	49	23.8	15	40	1.3	2.7
04-26-240	8.0	154	103	57.2	51	97	1.5	2.7
04-26-255	8.3	136	54	9.1	82	127	2.5	15.0
04-26-270	8.2	76	54	10.6	22	65	1.4	7.2
04-27-015	7.6	7	1	1.0	6	6	7.0	7.0
04-27-030	7.2	12	12	4.1	0	8	1.0	3.0
04-27-060	7.9	60	51	6.6	9	53	1.2	9.1
04-27-075	8.1	79	105	68.1	-26	11	0.8	1.2
04-27-090	8.1	155	73	35.3	82	120	2.1	4.4
04-27-105	8.0	127	72	1.0	55	126	1.8	127.0
04-27-120	8.0	162	99	18.8	63	143	1.6	8.6
04-27-150	8.3	150	44	4.7	106	145	3.4	32.0
04-27-165	8.1	167	64	20.6	103	146	2.6	8.1
04-27-180	8.2	86	62	10.6	24	75	1.4	8.1
04-27-195	8.0	121	88	38.1	33	83	1.4	3.2
04-27-210	8.0	135	152	71.6	-17	63	0.9	1.9
04-27-225	8.1	94	43	14.4	51	80	2.2	6.5
04-27-255	8.1	92	71	2.5	21	90	1.3	36.8
04-27-260	8.0	75	47	8.4	28	67	1.6	8.9
04-28-015	6.6	1	1	1.0	0	0	1.0	1.0
04-28-030	7.2	11	7	1.3	4	10	1.6	8.8
04-28-045	7.8	127	77	5.3	50	122	1.6	23.9
04-28-060	7.9	82	73	40.3	9	42	1.1	2.0

Attachment 1
ABA Results - Development Rock
Rock Creek Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
04-28-090	8.1	137	57	18.4	80	119	2.4	7.4
04-28-105	8.0	45	69	14.7	-24	30	0.7	3.1
04-28-120	8.1	55	70	12.2	-15	43	0.8	4.5
04-28-180	8.3	20	52	13.8	-32	6	0.4	1.5
04-28-195	8.6	102	54	10.6	48	91	1.9	9.6
04-28-210	8.3	135	74	37.8	61	97	1.8	3.6
04-28-225	8.5	56	46	8.8	10	47	1.2	6.4
04-28-240	8.4	80	78	37.2	2	43	1.0	2.2
04-28-255	8.3	74	81	42.8	-7	31	0.9	1.7
04-28-265	8.5	294	29	7.5	265	287	10.1	39.2
04-29-015	7.5	23	3	1.3	20	22	7.7	18.4
04-29-030	8.0	108	17	10.0	91	98	6.4	10.8
04-29-045	8.1	121	49	29.4	72	92	2.5	4.1
04-29-060	8.2	317	57	10.3	260	307	5.6	30.7
04-29-075	8.2	210	49	0.3	161	210	4.3	672.0
04-29-090	8.1	86	80	50.6	6	35	1.1	1.7
04-29-105	8.1	76	51	7.5	25	69	1.5	10.1
04-29-120	8.1	105	58	23.8	47	81	1.8	4.4
04-29-135	8.1	79	37	8.1	42	71	2.1	9.7
04-29-150	8.1	84	68	41.6	16	42	1.2	2.0
04-29-165	8.1	121	36	24.7	85	96	3.4	4.9
04-29-180	8.2	92	52	39.1	40	53	1.8	2.4
04-29-195	8.1	102	39	29.7	63	72	2.6	3.4
04-29-225	8.3	95	53	33.4	42	62	1.8	2.8
04-29-240	8.1	131	86	61.9	45	69	1.5	2.1
04-29-285	8.1	52	65	46.3	-13	6	0.8	1.1
04-29-300	8.0	177	47	30.6	130	146	3.8	5.8
04-29-315	8.1	57	66	40.3	-9	17	0.9	1.4
431005-015	6.8	11	10	4.7	1	6	1.1	2.3
431020-030	7.7	72	97	71.9	-25	0	0.7	1.0
431050-060	7.9	69	77	62.5	-8	7	0.9	1.1
431095-105	8.1	78	94	79.4	-16	-1	0.8	1.0
431110-120	8.0	76	78	61.9	-2	14	1.0	1.2
431125-135	8.0	67	76	44.1	-9	23	0.9	1.5
43114-150	7.9	72	77	53.1	-5	19	0.9	1.4
431155-165	8.1	58	53	24.7	5	33	1.1	2.3
431170-180	8.2	90	36	20.3	54	70	2.5	4.4
431185-195	8.2	84	57	40.6	27	43	1.5	2.1
431200-210	8.1	80	51	20.3	29	60	1.6	3.9
431215-225	8.3	86	58	20.6	28	65	1.5	4.2
431230-240	8.1	40	38	16.6	2	23	1.1	2.4
431245-255	8.0	51	65	46.6	-14	4	0.8	1.1
431260-270	8.1	111	68	45.0	43	66	1.6	2.5
432005-015	7.8	51	2	0.3	49	51	25.5	163.2
432020-030	8.1	103	47	1.0	56	102	2.2	103.0
432050-060	8.1	96	59	42.5	37	54	1.6	2.3
432065-075	8.1	61	48	38.4	13	23	1.3	1.6
432080-090	8.1	92	56	44.1	36	48	1.6	2.1
432095-105	8.1	87	32	16.9	55	70	2.7	5.2
432140-150	8.1	159	43	33.8	116	125	3.7	4.7
432155-165	8.2	121	38	30.9	83	90	3.2	3.9
432170-180	8.2	72	30	13.4	42	59	2.4	5.4
432185-195	8.2	118	54	40.9	64	77	2.2	2.9
432190-200	8.3	107	107	78.4	0	29	1.0	1.4
433020-030	8.0	164	102	74.7	62	89	1.6	2.2
433050-060	8.3	277	62	47.5	215	230	4.5	5.8
433065-075	8.2	210	77	43.1	133	167	2.7	4.9
433080-090	8.2	185	82	60.9	103	124	2.3	3.0
433095-105	8.2	118	42	16.9	76	101	2.8	7.0
433110-120	8.2	136	68	38.4	68	98	2.0	3.5
433125-135	8.2	98	48	22.2	50	76	2.0	4.4
433140-150	8.1	152	45	7.5	107	145	3.4	20.3
433155-165	8.3	155	50	2.2	105	153	3.1	70.9
433170-180	8.2	115	55	14.7	60	100	2.1	7.8
433185-195	8.2	75	53	11.3	22	64	1.4	6.7
434005-015	7.1	19	10	5.3	9	14	1.9	3.6
434020-030	8.0	38	72	32.5	-34	6	0.5	1.2
434050-060	8.0	84	49	32.5	35	52	1.7	2.6
434065-075	8.3	529	27	11.6	502	517	19.6	45.8
434080-090	8.2	262	42	34.7	220	227	6.2	7.6

Attachment 1
ABA Results - Development Rock
Rock Creek Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
434095-105	8.2	131	54	45.0	77	86	2.4	2.9
434110-120	8.2	124	63	46.9	61	77	2.0	2.6
434125-135	8.1	91	40	31.6	51	59	2.3	2.9
434140-150	8.3	61	33	27.8	28	33	1.8	2.2
434155-165	8.3	89	39	22.8	50	66	2.3	3.9
434170-180	8.1	52	42	30.6	10	21	1.2	1.7
434185-195	8.1	59	39	26.9	20	32	1.5	2.2
434200-210	8.3	54	128	67.8	-74	-14	0.4	0.8
434215-225	8.3	149	84	59.1	65	90	1.8	2.5
434230-240	8.2	121	62	43.8	59	77	2.0	2.8
434245-255	8.3	70	90	65.9	-20	4	0.8	1.1
434260-270	8.2	65	94	65.3	-29	0	0.7	1.0
434275-285	8.2	101	99	77.5	2	24	1.0	1.3
434290-300	8.2	99	83	70.0	16	29	1.2	1.4
434305-315	8.1	80	112	78.8	-32	1	0.7	1.0
434320-330	8.2	78	98	60.3	-20	18	0.8	1.3
435005-015	7.4	11	6	1.6	5	9	1.8	7.0
435020-030	7.8	135	53	40.3	82	95	2.5	3.3
435035-045	7.8	85	94	45.3	-9	40	0.9	1.9
435050-060	7.8	65	76	31.3	-11	34	0.9	2.1
435065-075	7.9	109	40	23.4	69	86	2.7	4.7
435095-105	8.2	238	40	29.4	198	209	6.0	8.1
435110-120	8.2	79	63	45.3	16	34	1.3	1.7
435125-135	8.4	134	27	17.8	107	116	5.0	7.5
435140-150	8.3	70	39	25.3	31	45	1.8	2.8
435170-180	8.1	60	57	45.0	3	15	1.1	1.3
435185-195	8.0	115	82	60.0	33	55	1.4	1.9
435260-270	8.0	169	67	45.0	102	124	2.5	3.8
435275-285	8.1	194	84	53.4	110	141	2.3	3.6
435290-300	8.2	216	70	52.5	146	164	3.1	4.1
435305-315	8.1	74	66	46.9	8	27	1.1	1.6
435320-330	8.1	66	94	70.9	-28	-5	0.7	0.9
435335-345	8.3	79	54	37.5	25	42	1.5	2.1
435350-360	8.1	76	54	48.1	22	28	1.4	1.6
435365-370	8.0	61	66	50.0	-5	11	0.9	1.2
436005-015	7.0	6	1	1.0	5	5	6.0	6.0
436020-030	7.6	38	18	8.8	20	29	2.1	4.3
436035-045	7.8	105	57	42.5	48	63	1.8	2.5
436065-075	7.7	95	83	46.6	12	48	1.1	2.0
436080-090	8.0	90	78	45.6	12	44	1.2	2.0
436095-105	7.9	147	60	43.1	87	104	2.5	3.4
436170-180	8.0	96	84	57.8	12	38	1.1	1.7
436185-195	8.2	118	21	12.8	97	105	5.6	9.2
436215-225	8.1	92	28	10.3	64	82	3.3	8.9
436230-240	8.0	127	59	46.6	68	80	2.2	2.7
436245-255	8.2	116	76	58.8	40	57	1.5	2.0
436260-270	8.0	105	58	42.8	47	62	1.8	2.5
436275-285	8.1	95	40	37.8	55	57	2.4	2.5
436290-300	8.0	121	76	67.2	45	54	1.6	1.8
437005-015	7.5	11	5	0.3	6	11	2.2	35.2
437020-030	8.1	177	12	10.9	165	166	14.8	16.2
437035-045	8.2	128	35	27.2	93	101	3.7	4.7
437050-060	8.0	76	28	27.2	48	49	2.7	2.8
437080-090	8.3	137	52	47.5	85	90	2.6	2.9
437095-105	8.4	74	59	49.4	15	25	1.3	1.5
437110-120	8.4	121	74	49.7	47	71	1.6	2.4
437140-150	8.2	55	119	63.1	-64	-8	0.5	0.9
437155-165	8.3	26	110	66.3	-84	-40	0.2	0.4
437170-180	8.2	50	95	9.1	-45	41	0.5	5.5
437185-195	8.2	64	83	11.3	-19	53	0.8	5.7
437200-210	8.1	52	187	79.4	-135	-27	0.3	0.7
437215-225	8.2	43	142	43.8	-99	-1	0.3	1.0
437230-240	8.2	52	103	20.6	-51	31	0.5	2.5
437260-270	8.1	54	137	72.8	-83	-19	0.4	0.7
437275-285	8.1	86	105	40.3	-19	46	0.8	2.1
438155	8.1	111	189	115.0	-78	-4	0.6	1.0
438005-015	7.2	10	3	1.0	7	9	3.3	10.0
438020-030	7.6	43	22	7.2	21	36	2.0	6.0
438065-075	7.7	59	112	58.4	-53	1	0.5	1.0
438080-090	8.0	102	73	55.3	29	47	1.4	1.8

Attachment 1
ABA Results - Development Rock
Rock Creek Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
438110-120	8.1	120	64	47.2	56	73	1.9	2.5
438125-135	7.9	77	105	91.3	-28	-14	0.7	0.8
438140-150	8.1	79	203	108.1	-124	-29	0.4	0.7
439320	8.2	167	43	29.1	124	138	3.9	5.7
439005-015	6.8	1	1	1.0	0	0	1.0	1.0
439020-030	7.0	1	1	1.0	0	0	1.0	1.0
439035-045	6.7	1	2	0.3	-1	1	0.5	3.2
439050-060	7.7	67	42	31.3	25	36	1.6	2.1
439095-105	7.9	114	41	18.4	73	96	2.8	6.2
439125-135	8.0	122	79	65.3	43	57	1.5	1.9
439140-150	8.0	139	47	29.7	92	109	3.0	4.7
439155-165	8.1	99	54	28.4	45	71	1.8	3.5
439170-180	8.0	78	69	35.9	9	42	1.1	2.2
439200-210	8.6	127	36	3.8	91	123	3.5	33.9
439215-225	8.4	98	42	12.8	56	85	2.3	7.6
439230-240	8.3	114	36	0.9	78	113	3.2	121.6
439245-255	8.3	126	40	10.6	86	115	3.2	11.9
439260-270	8.3	153	42	2.2	111	151	3.6	69.9
439275-285	8.2	168	40	20.9	128	147	4.2	8.0
439290-300	8.2	179	44	31.9	135	147	4.1	5.6
439305-315	8.3	185	28	20.3	157	165	6.6	9.1
440005-015	7.4	3	10	2.2	-7	1	0.3	1.4
444020-030	6.4	7	91	65.3	-84	-58	0.1	0.1
444035-045	6.3	22	150	113.4	-128	-91	0.1	0.2
444050-055	6.6	23	188	120.0	-165	-97	0.1	0.2
444075-085	7.7	128	88	66.3	40	62	1.5	1.9
444090-100	7.9	39	100	39.1	-61	0	0.4	1.0
444105-115	7.9	11	66	49.7	-55	-39	0.2	0.2
444150-160	7.9	32	35	18.8	-3	13	0.9	1.7
444165-175	8.1	135	67	46.9	68	88	2.0	2.9
444175-185	8.1	174	19	9.1	155	165	9.2	19.2
442210	8.2	150	29	8.1	121	142	5.2	18.5
442005-015	7.4	10	1	1.0	9	9	10.0	10.0
442020-030	6.9	8	9	6.3	-1	2	0.9	1.3
442035-045	7.7	70	31	12.8	39	57	2.3	5.5
442050-060	7.9	64	24	11.6	40	52	2.7	5.5
442060-070	8.1	87	36	7.2	51	80	2.4	12.1
442075-085	8.1	154	21	15.0	133	139	7.3	10.3
442090-100	8.0	181	18	13.1	163	168	10.1	13.8
442105-115	8.2	172	26	10.9	146	161	6.6	15.7
442120-130	8.0	112	34	10.3	78	102	3.3	10.9
442135-145	8.1	106	40	5.6	66	100	2.7	18.8
442150-160	8.0	152	33	15.3	119	137	4.6	9.9
442165-175	8.1	112	39	8.4	73	104	2.9	13.3
442180-190	8.0	122	54	39.1	68	83	2.3	3.1
442195-205	8.1	148	42	14.7	106	133	3.5	10.1
443005-015	7.7	156	9	2.2	147	154	17.3	71.3
443020-030	7.7	112	43	20.3	69	92	2.6	5.5
443050-060	8.2	141	40	33.4	101	108	3.5	4.2
443065-075	8.1	196	80	56.3	116	140	2.5	3.5
443080-090	8.1	221	60	55.6	161	165	3.7	4.0
444005-015	7.6	30	8	1.6	22	28	3.8	19.2
444020-030	7.9	122	48	30.3	74	92	2.5	4.0
444035-045	7.9	124	46	19.4	78	105	2.7	6.4
444065-075	7.9	128	48	35.6	80	92	2.7	3.6
444080-090	7.9	111	91	67.8	20	43	1.2	1.6
444095-105	7.8	178	67	49.1	111	129	2.7	3.6
444140-150	7.9	101	97	83.1	4	18	1.0	1.2
444155-165	8.0	80	62	50.0	18	30	1.3	1.6
444170-180	7.9	184	83	62.5	101	122	2.2	2.9
445170	8.0	121	32	23.8	89	97	3.8	5.1
445005-015	7.3	64	3	0.9	61	63	21.3	68.3
445020-030	7.5	159	47	28.8	112	130	3.4	5.5
445035-045	7.5	96	69	39.7	27	56	1.4	2.4
445050-060	7.7	148	52	39.1	96	109	2.8	3.8
445065-075	7.9	178	66	32.8	112	145	2.7	5.4
445080-090	7.8	109	48	35.0	61	74	2.3	3.1
445095-105	7.8	90	53	38.4	37	52	1.7	2.3
445110-120	8.0	113	36	36.6	77	76	3.1	3.1
445125-135	7.9	111	42	34.4	69	77	2.6	3.2

Attachment 1
ABA Results - Development Rock
Rock Creek Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
445140-150	8.0	115	52	41.3	63	74	2.2	2.8
445155-165	8.1	176	28	19.7	148	156	6.3	8.9
446170	7.8	150	78	60.3	72	90	1.9	2.5
446005-015	6.5	10	5	1.9	5	8	2.0	5.3
446020-030	7.4	40	39	18.4	1	22	1.0	2.2
446035-045	7.8	151	51	35.3	100	116	3.0	4.3
446050-060	7.8	130	45	36.9	85	93	2.9	3.5
446065-075	7.9	104	56	31.9	48	72	1.9	3.3
446080-090	7.9	118	45	28.4	73	90	2.6	4.1
446095-105	7.9	188	68	65.0	120	123	2.8	2.9
446110-120	8.0	129	39	16.6	90	112	3.3	7.8
446125-135	7.9	141	50	35.0	91	106	2.8	4.0
446140-150	8.0	111	44	43.4	67	68	2.5	2.6
446155-165	8.0	190	28	23.8	162	166	6.8	8.0
447005-015	7.5	36	29	16.3	7	20	1.2	2.2
447095-105	8.2	251	55	53.4	196	198	4.6	4.7
447140-150	8.1	282	51	49.7	231	232	5.5	5.7
447155-165	8.3	341	35	29.4	306	312	9.7	11.6
447185-195	8.1	172	74	63.1	98	109	2.3	2.7
447200-210	8.0	184	52	39.4	132	145	3.5	4.7
447215-225	8.0	86	55	45.3	31	41	1.6	1.9
447230-240	8.0	194	58	37.8	136	156	3.3	5.1
447245-255	8.0	164	53	36.3	111	128	3.1	4.5
447260-270	8.2	175	34	23.1	141	152	5.1	7.6
447275-285	8.1	156	41	27.5	115	129	3.8	5.7
447290-300	8.0	109	43	19.7	66	89	2.5	5.5
432185-190	8.0	79	45	38.8	34	40	1.8	2.0
448005-015	7.0	4	3	1.0	1	3	1.3	4.0
448020-030	7.0	1	3	0.6	-2	0	0.3	1.6
448035-045	7.6	136	41	24.7	95	111	3.3	5.5
448050-060	7.6	88	63	42.8	25	45	1.4	2.1
448080-090	7.9	96	42	12.8	54	83	2.3	7.5
448095-105	8.2	107	35	5.0	72	102	3.1	21
448110-120	7.9	116	49	17.2	67	99	2.4	6.7
448125-135	8.0	127	57	17.8	70	109	2.2	7.1
448140-150	7.8	149	58	43.8	91	105	2.6	3.4
448155-165	7.9	194	29	26.3	165	168	6.7	7.4
448170-180	7.9	132	34	20.3	98	112	3.9	6.5
STATISTICS								
Count	318	318	318	318.0	318	**318**	318	**318**
Minimum	6.3	1.0	1.0	0.3	-165	**-97**	0.1	**0.1**
Maximum	8.8	933	203	120.0	929	**932**	233	**1493**
Geometric Mean	8.0	na	na	na	na	**na**	2.0	**4.1**
Arithmetic Mean	8.0	110	55	32.0	55	**78**	3.5	**16**

NP = Neutralizing Potential (EPA Sobek, et.al., 1978 protocol)
AP = Acid-generating potential (EPA Sobek, et al., 1978 protocol). Calculated based on total sulfur or sulfide-sulfur, as [sulfur] * 31.25 multiplier.
NNP = Net neutralization potential. Calculated as NP - AP.
NP:AP = Ratio of NP divided by AP.
Total Sulfur = Total Sulfur (EPA M600),
Sulfide-S = Sulfide sulfur (EPA M600).
T CaCO3 = Ton CaCO3 per ton of material.
* Non-detected values of AP and NP are substituted with the method detection limit (1.0 T CaCO3/ton material) for calculations.

ATTACHMENT 2

HCT Results

Profile II Analytical Results, Humidity Cell Extracts,
Rock Creek Ore Composite

	Extract Composite														
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36	Wks 37-40	Wks 41-44	Wks 45-48	Wks 49-52	Wks 53-56
Alkalinity, CaCO3	46	38	92	80	66	72	78	78	60	74	54	44	74	94	86
CO3, CaCO3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO3	56	46	110	98	80	88	95	95	73	90	66	54	90	110	100
Aluminum	<0.045	<0.045	0.061	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
Antimony	0.22	0.088	0.22	0.16	0.095	0.099	0.079	0.073	0.059	0.075	0.031	0.029	0.042	0.046	0.036
Arsenic	0.26	0.19	0.51	0.42	0.21	0.21	0.23	0.17	0.18	0.11	0.097	0.11	0.098	0.072	0.095
Barium	0.28	0.14	0.032	0.039	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.013
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	30	22	27	25	25	34	32	32	32	72	54	58	71	65	50
Chloride	1.6	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.4	1.4 M	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.059
Fluoride	0.57	0.12	0.40	0.21	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.18	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	<0.10 M	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	13	9.4	12	9.2	7.9	10	9.7	9.6	8.1	19	12	14	19	16	13
Manganese	0.028	0.024	0.030	0.056	0.039	0.063	0.064	0.052	0.027	0.064	0.067	0.073	0.11	0.13	0.10
Mercury	<0.00010	0.00017	<0.00010	0.00099	<0.00010	<0.00010	<0.00010	0.0022	0.00023	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010
Molybdenum	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	0.029	0.024	0.058	0.041	0.035	0.03	0.017	<0.010	<0.010	0.066	0.022	0.033	<0.010	<0.010	0.074
pH, stu	7.55	7.51	7.72	7.66	7.67	7.77	7.60	7.65	7.69	7.92	7.66	7.42	7.75	8.05	7.80
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	16	7.6	13	7.2	3.8	3.2	2.4	1.8	1.3	2.0	2.1	0.86	1.4	1.2	1.4
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	12	5.0	2.4	0.88	0.80	1.2	0.88	0.58	0.72	1.2	2.3	0.68	0.61	0.82	10
Strontium	0.26	0.16	0.19	0.15	0.12	0.17	0.16	0.14	0.13	0.26	0.20	0.20	0.24	0.22	0.17
Sulfate	130	77	47	37	41	60	49	52	52	200	110	160	200	140	120
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	210	160	160	120	110	190	150	150	140	310	250	280	350	300	250
Vanadium	0.022	0.011	0.018	<0.010	0.011	<0.010	0.015	0.013	0.011	0.022	0.015	0.023	<0.010	<0.010	<0.010
Zinc	0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cations, meq/L	3.5	2.28	2.77	2.23	2.03	2.66	2.50	2.46	2.33	5.26	3.84	4.10	5.17	4.63	4.04
Anions, meq/L	3.7	2.39	2.80	2.39	2.16	2.69	2.58	2.64	2.28	5.71	3.42	4.22	5.64	4.72	4.14
Balance, %	2.8	2.3	<1.0	3.4	3.2	<1.0	1.6	3.5	1.1	4.1	5.7	1.4	4.3	<1.0	1.2

M= Reported value for this analyte demonstrated a matrix effect.

Profile II Analytical Results, Humidity Cell Extracts,
Rock Creek Development Rock (QMS)

	Extract Composite														
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36	Wks 37-40	Wks 41-44	Wks 45-48	Wks 49-52	Wks 53-56
Alkalinity, CaCO3	50	34	84	76	72	70	72	68	66	72	64	70	84	80	70
CO3, CaCO3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO3	61	41	100	93	88	85	88	83	80	88	78	85	100	98	90
Aluminum	<0.045	<0.045	0.062	0.062	0.061	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
Antimony	0.0066 SA	<0.0025	0.0028	0.0030	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.0029	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic	0.0086	0.0056	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0084	<0.0050	0.0083	0.0051	<0.0050	0.0078
Barium	0.25	0.12	0.021	0.023	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	36	27	36	28	29	33	29	30	32	40	50	52	50	51	28
Chloride	2.7	1.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoride	0.56 M	<0.10	0.30	0.21	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.17	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	12	8.6	11	7.1	6.4	7.3	6.2	6.6	6.8	8.6	12	14	16	13	5.9
Manganese	0.04	0.038	0.043	0.043	0.064	0.089	0.14	0.061	0.061	0.090	0.10	0.13	0.095	0.088	0.070
Mercury	0.00018	0.00024	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00025	0.00027	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	0.081 M	0.021	0.058	0.038	0.030	0.027	0.026	<0.010	<0.010	0.039	0.084	0.092	0.11	<0.010	0.021
pH, stu	7.8	7.48	7.81	7.74	7.83	7.84	7.63	7.72	7.80	7.98	7.86	7.84	7.97	7.98	7.80
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	26	9.8	15	6.9	4.4	3.2	2.4	1.9	1.6	1.8	1.4	1.4	1.4	1.1	0.74
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	0.0051	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	18	5.4	3.0	1.0	0.96	1.2	1.0	0.71	0.85	0.98	1.1	0.84	0.70	4.5	0.84
Strontium	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.11	0.11	0.14	<0.10
Sulfate	150	92	77	39	37	39	36	41	42	100	90	120	130	110	31
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	280	170	180	130	120	150	140	170	130	180	220	230	250	240	120
Vanadium	0.02	<0.010	<0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	0.014	0.024	<0.010	<0.010	<0.010
Zinc	0.02	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cations, meq/L	4.23	2.54	3.22	2.20	2.13	2.38	2.07	2.12	2.24	2.80	3.57	3.82	3.88	3.84	1.94
Anions, meq/L	4.23	2.62	3.26	2.35	2.21	2.21	2.19	2.21	2.19	3.52	3.16	3.89	4.35	3.90	2.12
Balance, %	<1.0	1.5	<1.0	3.2	1.9	3.9	2.9	2.1	1.2	12	6.1	<1.0	5.6	<1.0	4.4

SA= Reported value for this analyte was calculated using the method of standard additions.

M= Reported value for this analyte demonstrated a matrix effect.

Profile II Analytical Results, Humidity Cell Extracts,
Rock Creek Development Rock (CQMS)

	Extract Composite									
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36
Alkalinity, CaCO3	40	38	110	84	72	72	82	84	68	54
CO3, CaCO3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO3	49	46	140	100	88	88	100	100	83	66
Aluminum	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
Antimony	<0.0025 SA	<0.0025	0.0029	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic	<0.0050	0.0053	0.0066	0.0082	0.0053	0.0062	0.0056	0.0054	<0.0050	0.0070
Barium	0.21	0.11	0.014	0.017	0.030	<0.010	<0.010	<0.010	<0.010	<0.010
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	54	37	36	28	25	30	34	34	32	47
Chloride	1.4	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoride	0.49	0.1	0.43	0.19	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	17	12	12	8.0	6.8	8.3	9.3	9.7	8.5	14
Manganese	0.056	0.04	0.042	0.043	0.042	0.049	0.056	0.059	0.048	0.072
Mercury	<0.00010	0.00035	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00060	<0.00010	<0.00010
Molybdenum	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	0.039	0.053	0.062	0.048	0.036	0.029	0.046	<0.010	<0.010	0.072
pH, stu	7.59	7.59	7.98	7.82	7.85	7.84	7.80	7.83	7.85	7.87
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	17	9.2	15	7.1	3.7	2.9	2.1	1.6	1.2	1.4
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	0.011	0.0084	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	14	5.4	2.4	0.92	0.96	1.1	0.94	0.61	0.70	0.89
Strontium	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.11
Sulfate	210	130	52	30	28	35	51	50	49	140
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	330	220	180	130	140	150	170	150	130	210
Vanadium	0.026	0.013	0.016	<0.010	<0.010	<0.010	0.014	0.013	0.012	0.020
Zinc	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cations, meq/L	5.14	3.31	3.27	2.28	1.95	2.30	2.56	2.56	2.36	3.57
Anions, meq/L	5.24	3.51	3.40	2.27	2.03	2.17	2.70	2.68	2.38	4.00
Balance, %	<1.0	3.0	1.9	<1.0	2.0	3.0	2.7	2.2	<1.0	5.6

SA= Reported value for this analyte was calculated using the method of standard additions.

Profile II Analytical Results, Humidity Cell Extracts,
Rock Creek Development Rock (GQMS)

	Extract Composite														
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36	Wks 37-40	Wks 41-44	Wks 45-48	Wks 49-52	Wks 53-56
Alkalinity, CaCO3	40	40	40	46	62	46	54	66	66	62	68	70	82	80	82
CO3, CaCO3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO3	49	49	49	56	76	56	66	80	80	76	83	85	100	98	100
Aluminum	<0.045	<0.045	<0.045	<0.045	0.060	0.049	0.077	0.065	0.094	0.091	0.11	0.083	0.13	0.15	0.16
Antimony	0.23	0.20	0.46	0.77	0.83	0.61	0.79	0.91	0.84	0.92	0.82	0.61	0.52	0.43	0.36
Arsenic	0.11	0.074	0.071	0.11	0.26	0.27	0.60	0.98	1.4	2.0	2.5	2.6	4.1	5.2	5.6
Barium	0.29	0.090	0.024	0.094	0.027	0.017	0.021	0.023	0.026	0.027	0.098	0.026	0.027	0.032	0.023
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	26	28	22	21	22	19	21	24	28	32	33	34	39	38	37
Chloride	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0 M	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoride	0.41	0.19	0.17	0.19	0.16	<0.10	<0.10	0.18	0.17	0.14	0.20	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	14	15	9.5	8.6	8.7	6.2	7.6	8.6	9.0	11	10	10	12	11	11
Manganese	0.11	0.027	0.027	0.018	0.016	0.020	0.031	0.050	0.038	0.016	0.0094	0.0088	0.016	0.011	0.019
Mercury	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00061	0.00030	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum	0.020	0.020	0.022	0.035	0.060	0.063	0.13	0.14	0.18	0.24	0.30	0.32	0.32	0.23	0.18
Nickel	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	0.032	0.025	0.022	0.029	0.023	<0.010	0.033 M	<0.010	0.022	0.045	0.018	0.016	<0.010	<0.010	<0.010
pH, stu	7.75	7.58	7.63	7.65	7.87	7.74	7.69	7.76	7.85	7.92	7.90	7.81	8.00	7.99	7.91
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	14	9.3	4.5	3.4	3.5	1.8	1.8	1.8	1.5	1.5	1.3	0.94	0.76	0.65	<0.50
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	0.014	0.019	0.011	0.0090	0.010	0.0057	0.0066	0.0066	0.0058	0.0052	0.0051	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	13	4.3	1.2	1.0	0.87	1.4	1.0	0.63	0.86	0.84	1.1	1.1	0.69	0.86	0.73
Strontium	0.14	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.11	0.11	0.12	0.12	0.11
Sulfate	110	120	59	46	33	24	37	34	40	46	43	56	91	64	57
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	230	190	120	110	120	98	120	130	110	140	140	150	200	190	150
Vanadium	0.025	0.017	0.014	<0.010	0.015	<0.010	0.014	0.014	0.016	0.018	0.017	0.021	<0.010	<0.010	<0.010
Zinc	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cations, meq/L	3.38	3.06	2.05	1.89	1.94	1.57	1.76	1.98	2.21	2.58	2.55	2.59	2.98	2.86	2.78
Anions, meq/L	3.11	3.31	2.04	1.89	1.94	1.42	1.85	2.03	2.15	2.21	2.27	2.56	3.53	2.94	2.83
Balance, %	4.1	4.0	<1.0	<1.0	<1.0	5.0	2.4	1.2	1.4	7.7	5.9	<1.0	8.4	1.4	<1.0

M= Reported value for this analyte demonstrated a matrix effect.

Profile II Analytical Results, Humidity Cell Extracts,
Rock Creek Development Rock (GS)

	Extract Composite									
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36
Alkalinity, CaCO3	46	30	30	34	34	34	32	34	34	36
CO3, CaCO3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO3	56	37	37	41	41	41	39	41	41	44
Aluminum	<0.045	<0.045	<0.045	<0.045	<0.045	0.051	0.055	<0.045	0.059	0.054
Antimony	1.8	0.86	0.68	0.72	0.70	0.77	0.76	0.91	1.3	2.0
Arsenic	0.03	0.026	0.020	0.027	0.030	0.035	0.033	0.045	0.11	0.27
Barium	0.088	0.11	0.028	0.15	0.23	0.03	0.046	0.034	0.045	0.050
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	11	14	15	14	13	13	12	13	16	21
Chloride	<1.0	<1.0	<1.0	<1.0	1.2	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoride	0.5	0.18	0.15	0.20	0.19	0.11	<0.10	0.17	0.24	0.28
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	<0.10 M	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	6.2	7.3	6.4	4.8	4.1	3.9	3.4	3.0	3.6	4.4
Manganese	<0.0050	0.018	0.013	0.011	0.0073	0.0078	0.0087	0.010	0.018	0.011
Mercury	<0.00010	0.00026	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00066	0.00030	<0.00010
Molybdenum	0.045	0.026	0.025	0.018	0.020	0.023	0.026	0.026	0.045	0.063
Nickel	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	0.02	<0.010	0.035	0.040	0.038	0.026	<0.010	<0.010	<0.010	<0.010
pH, stu	7.88	7.45	7.62	7.59	7.69	7.62	7.56	7.56	7.68	7.75
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	14	7.7	4.4	2.6	1.8	1.7	1.2	0.98	0.97	1.2
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	0.0071	0.0083	0.0072	0.0059	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	19	7.3	2.6	1.7	2.0	1.6	1.0	0.62	0.80	0.68
Strontium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate	57	61	43	28	20	16	15	16	23	30
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	150	130	89	71	68	75	66	87	68	98
Vanadium	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Zinc	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cations, meq/L	2.24	1.81	1.50	1.23	1.12	1.08	0.95	0.95	1.15	1.47
Anions, meq/L	2.13	1.89	1.51	1.27	1.13	1.01	0.95	1.01	1.16	1.36
Balance, %	2.6	1.9	<1.0	1.2	<1.0	3.4	<1.0	3.4	<1.0	3.9

M= Reported value for this analyte demonstrated a matrix effect.

Profile II Analytical Results, Humidity Cell Extracts,
Rock Creek Development Rock (CS)

	Extract Composite									
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36
Alkalinity, CaCO3	54	46	78	68	68	72	66	58	56	66
CO3, CaCO3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO3	66	56	95	83	83	88	80	71	68	80
Aluminum	<0.045	<0.045	0.055	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
Antimony	0.24	0.085	0.15	0.16	0.098	0.092	0.068	0.064	0.064	0.077
Arsenic	0.064	0.07	0.069	0.064	0.087	0.070	0.071	0.046	0.057	0.051
Barium	0.27	0.11	<0.010	0.030	0.015	<0.010	<0.010	<0.010	<0.010	<0.010
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	43	30	27	24	25	28	24	23	25	55
Chloride	16	2.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoride	0.44	0.13	0.25	0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	0.035	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	12	7.9	7.5	6.2	6.0	6.3	5.6	5.3	5.2	12
Manganese	0.041	0.024	0.029	0.024	0.028	0.039	0.057	0.032	0.024	0.060
Mercury	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0016	0.00028	<0.00010
Molybdenum	0.026	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	0.066	0.044	0.056	0.055	0.037	0.033	0.039	<0.010	<0.010	0.10
pH, stu	7.84	7.64	7.91	7.78	7.85	7.90	7.84	7.83	7.80	7.97
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	16	7.6	8.2	5.8	4.2	2.8	1.9	1.4	1.1	1.7
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	26	6.0	2.4	1.0	0.98	1.4	1.1	0.80	0.84	1.1
Strontium	0.18	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.14
Sulfate	150	83	31	28	30	29	25	26	29	140
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	310	160	110	110	140	120	100	93	90	230
Vanadium	0.019	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015
Zinc	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cations, meq/L	4.68	2.60	2.28	1.90	1.89	2.05	1.76	1.66	1.74	3.83
Anions, meq/L	4.68	2.71	2.22	1.95	1.98	2.05	1.83	1.71	1.72	4.23
Balance, %	<1.0	2.1	1.4	1.4	2.4	<1.0	2.1	1.5	<1.0	5.0

Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3063 -

HCT: Tailings #1
Table . - Profile II Analytical Results, Humidity Cell Extracts, Rock Creek
Albion/Paste Tail Flotation Product Blend (21% Albion; 79% Paste Tail)

		Extract Composite								
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36
Alkalinity, $CaCO_3$	16	12	24	28	84	30	40	42	40	40
CO_3, $CaCO_3$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO_3	9.6	15	29	34	100	37	49	51	49	49
Aluminum	0.11	<0.45*	0.22	<0.22	0.14	<0.45*	<0.45*	0.081	0.067	<0.045
Antimony	0.11	0.27	0.54	0.78	1.1	1.1	1.2	0.95	0.76	0.0031
Arsenic	3.9	9.8	8.8	6.4	5.3	4.0	3.5	3.0	2.3	3.2
Barium	<0.010	0.019	0.012	0.011	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050*
Calcium	16	75	69	50	38	28	22	23	20	19
Chloride	<1.0	1.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0 M
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.025*
Cobalt	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cyanide, WAD	0.69	0.63	0.50	0.46	0.11	0.30	0.19	NA	0.070	NA
Fluoride	<0.10	<0.10	0.16	<0.10	<0.10	<0.10	0.18	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	0.75	2.3	9.3	6.6	4.0	2.9	1.9	1.2	0.79	0.91
Lead	<0.010	<0.010	<0.010	<0.050*	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	4.9	24	23	19	17	12	9.2	9.4	7.8	8.0
Manganese	0.0086	0.023	0.040	0.026	0.031	0.096	0.025	0.028	0.048	0.066
Mercury	<0.0010*	0.0017	<0.0010*	<0.0010*	<0.00010	<0.00020*	<0.00010	<0.00010	0.00035	<0.00010
Molybdenum	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.050	<0.020*
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	<0.010	<0.010	0.022	<0.10	0.11	<0.010	<0.010	<0.010	<0.010	<0.010
pH, stu	7.52	7.18	7.38	7.18	7.80	7.54	7.63	7.66	7.88	7.75
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	<0.50	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	23	4.8
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	<0.0050	<0.0050	<0.0050	0.0054	0.0052	0.0061	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	8.0	10	6.0	2.9	2.0	1.4	1.0	0.81	0.67	<0.50
Strontium	<0.10	0.12	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate	26	250	230	150	160	80	49	53	51	41
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	97	420	380	300	290	180	96	130	110	170
Vanadium	<0.010	0.026	0.024	0.026	<0.010	<0.010	<0.010	<0.010	<0.010	0.028
Zinc	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020*
Cations, meq/L	1.59	6.29	6.10	4.54	3.60	3.16	2.00	2.02	2.30	1.78
Anions, meq/L	0.807	5.50	5.27	3.68	4.97	3.47	1..83	1.94	1.86	1.66
Balance, %	33[1)]	6.7	7.3	10	16.0	4.6	4.4	2.1	10	3.6

* Elevated detection limit due to matrix interference.

1) Balance outside accepted criteria, however, reanalysis confirmed original results.

M= Reported Value for this analyte demonstrated a matrix effect.

Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3063 -

HCT: Tailings #2
Table . - Profile II Analytical Results, Humidity Cell Extracts, Rock Creek
Tension Vein/Paste Tail Flotation Product Blend (13% Tension Vein; 86.4% Paste Tail)

		Extract Composite								
Analysis, mg/L	Week 0	Wks 1-4	Wks 5-8	Wks 9-12	Wks 13-16	Wks 17-20	Wks 21-24	Wks 25-28	Wks 29-32	Wks 33-36
Alkalinity, $CaCO_3$	36	44	42	40	30	50	68	58	52	42
CO_3, $CaCO_3$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HCO_3	44	54	51	49	37	61	83	71	63	51
Aluminum	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
Antimony	0.19	0.28	0.22	0.20	0.20	0.23	0.22	0.15	0.12	0.099
Arsenic	1.4	1.5	1.4	1.3	1.2	1.4	1.8	1.3	1.0	1.2
Barium	0.021	0.020	0.017	0.017	0.019	0.018	0.013	<0.010	<0.010	<0.010
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium	140	150	80	62	51	43	39	27	23	20
Chloride	6.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cobalt	0.043	0.015	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cyanide, WAD	0.21	0.63	0.35	0.24	0.23	0.31	0.083	NA	0.084	NA
Fluoride	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Gallium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Iron	8.4	5.4	4.6	2.8	1.8	1.3	2.6	1.5	0.89	0.55
Lead	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lithium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium	39	26	14	15	15	12	9.9	6.4	5.3	4.5
Manganese	0.20	0.062	0.086	0.074	0.062	0.066	0.090	0.059	0.048	0.040
Mercury	<0.0010*	0.0014	<0.0010*	<0.0010*	<0.00010	<0.00020*	<0.00010	<0.00010	0.00034	<0.00010
Molybdenum	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	0.018	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nitrite as N	<0.010	<0.010	0.028	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
pH, stu	7.72	7.53	7.75	7.52	7.55	7.82	7.92	7.85	7.90	7.91
Phosphorus	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Potassium	0.86	0.86	0.70	0.81	0.69	0.81	0.68	0.53	20	4.0
Scandium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Selenium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Silver	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sodium	34	12	2.5	2.2	1.8	1.4	1.4	0.87	0.79	0.64
Strontium	0.36	0.32	0.17	0.13	0.12	0.10	<0.10	<0.10	<0.10	<0.10
Sulfate	470	430	220	170	140	110	42	35	37	31
Thallium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Dissolved Solids	800	710	360	280	240	200	130	84	91	130
Vanadium	0.039	0.026	0.015	0.021	<0.010	<0.010	0.015	<0.010	<0.010	<0.010
Zinc	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cations, meq/L	12.2	10.5	5.52	4.60	3.97	3.29	2.98	1.93	2.18	1.53
Anions, meq/L	10.7	9.84	5.42	4.34	3.52	3.29	2.23	1.89	1.80	1.48
Balance, %	6.4	3.1	<1.0	2.9	6.0	<1.0	14	<1.0	9.5	1.6

* Elevated detection limit due to matrix interference.

Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3020 -

Table 1 Humidity Cell Analytical Results, Ore Composite (1.4603 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.475	8.35	180	0.22	0.01	0.003	0.003	0.01	0.00	141.0	45.86	45.86	0.0	0.00	0.00	41.00	13.34	13.34
1	0.786	8.75	160	0.10	0.03	0.016	0.019	0.01	0.02	93.5	50.33	96.19	0.0	0.00	0.00	25.00	13.46	26.80
2	0.880	8.15	135	0.17	0.00	0.000	0.019	0.00	0.00	126.0	75.93	172.12	0.0	0.00	0.00	37.00	22.30	49.10
3	0.755	8.84	148	0.10	0.01	0.005	0.024	0.00	0.01	8.5	4.39	176.51	0.0	0.00	0.00	37.00	19.13	68.23
4	0.828	8.18	222	0.26	0.02	0.011	0.035	0.00	0.02	177.0	100.36	276.87	0.0	0.00	0.00	67.00	37.99	106.22
5	0.640	8.11	179	0.22	0.03	0.013	0.048	0.03	0.00	90.5	39.66	316.53	0.0	0.00	0.00	105.00	46.02	152.24
6	0.690	7.96	208	0.16	0.03	0.014	0.062	0.03	0.00	102.0	48.20	364.73	0.0	0.00	0.00	87.00	41.11	193.35
7	0.686	7.98	203	0.20	0.01	0.005	0.067	0.00	0.01	8.5	3.99	368.72	0.0	0.00	0.00	85.00	39.93	233.28
8	0.650	8.11	171	0.15	0.04	0.018	0.085	0.01	0.03	28.0	12.46	381.18	0.0	0.00	0.00	94.00	41.84	275.12
9	0.694	7.84	187	0.14	0.04	0.019	0.104	0.00	0.04	26.7	12.69	393.87	0.0	0.00	0.00	81.00	38.49	313.61
10	0.679	7.87	186	0.14	0.00	0.000	0.104	0.00	0.00	7.4	3.44	397.31	0.0	0.00	0.00	76.00	35.34	348.95
11	0.668	7.95	227	0.15	0.00	0.000	0.104	0.00	0.00	34.9	15.96	413.27	0.0	0.00	0.00	81.00	37.05	386.00
12	0.683	8.00	184	0.15	0.00	0.000	0.104	0.00	0.00	31.5	14.73	428.00	0.0	0.00	0.00	82.00	38.35	424.35
13	0.668	8.01	182	0.15	0.01	0.005	0.109	0.01	0.00	42.2	19.30	447.30	0.0	0.00	0.00	83.00	37.97	462.32
14	0.661	7.92	190	0.15	0.01	0.005	0.114	0.00	0.01	56.0	25.35	472.65	0.0	0.00	0.00	67.00	30.33	492.65
15	0.675	7.88	216	0.13	0.01	0.005	0.119	0.01	0.00	33.6	15.53	488.18	0.0	0.00	0.00	65.00	30.05	522.70
16	0.716	7.75	180	0.12	0.02	0.010	0.129	0.02	0.00	19.7	9.66	497.84	0.0	0.00	0.00	44.00	21.57	544.27
17	0.676	7.85	200	0.14	0.03	0.014	0.143	0.00	0.03	35.9	16.62	514.46	0.0	0.00	0.00	54.00	25.00	569.27
18	0.566	7.50	170	0.16	0.01	0.004	0.147	0.00	0.01	56.6	21.94	536.40	0.0	0.00	0.00	55.00	21.32	590.59
19	0.684	8.01	176	0.20	0.01	0.005	0.152	0.00	0.01	85.0	39.81	576.21	0.0	0.00	0.00	93.00	43.56	634.15
20	0.683	7.95	188	0.21	0.00	0.000	0.152	0.00	0.00	51.0	23.85	600.06	0.0	0.00	0.00	87.00	40.69	674.84
21	0.689	7.97	166	0.21	0.00	0.000	0.152	0.00	0.00	53.8	25.38	625.44	0.0	0.00	0.00	86.00	40.58	715.42
22	0.724	7.87	194	0.21	0.00	0.000	0.152	0.00	0.00	59.6	29.55	654.99	0.0	0.00	0.00	80.00	39.66	755.08
23	0.722	8.06	160	0.21	0.00	0.000	0.152	0.00	0.00	53.6	26.50	681.49	0.0	0.00	0.00	80.00	39.55	794.63
24	0.723	7.68	148	0.17	0.01	0.005	0.157	0.00	0.01	41.0	20.30	701.79	0.0	0.00	0.00	58.00	28.72	823.35
25	0.694	7.87	130	0.18	0.01	0.005	0.162	0.00	0.01	38.7	18.39	720.18	0.0	0.00	0.00	66.00	31.37	854.72
26	0.691	8.00	170	0.24	0.02	0.009	0.171	0.00	0.02	59.0	27.92	748.10	0.0	0.00	0.00	83.00	39.27	893.99
27	0.758	7.83	136	0.20	0.00	0.000	0.171	0.00	0.00	58.4	30.31	778.41	0.0	0.00	0.00	75.00	38.93	932.92
28	0.697	7.86	174	0.20	0.02	0.010	0.181	0.00	0.02	55.6	26.54	804.95	0.0	0.00	0.00	66.00	31.50	964.42
29	0.760	7.93	165	0.21	0.00	0.000	0.181	0.00	0.00	59.4	30.91	835.86	0.0	0.00	0.00	74.00	38.51	1002.93
30	0.689	7.96	172	0.21	0.00	0.000	0.181	0.00	0.00	56.0	26.42	862.28	0.0	0.00	0.00	59.00	27.84	1030.77
31	0.750	8.03	176	0.19	0.04	0.021	0.202	0.00	0.04	51.0	26.19	888.47	0.0	0.00	0.00	64.00	32.87	1063.64
32	0.720	7.55	179	0.16	0.00	0.000	0.202	0.00	0.00	42.6	21.00	909.47	0.0	0.00	0.00	39.00	19.23	1082.87
33	0.684	7.57	191	0.23	0.01	0.005	0.207	0.00	0.01	72.2	33.82	943.29	0.0	0.00	0.00	47.00	22.01	1104.88
34	0.610	8.04	129	0.59	0.01	0.004	0.211	0.00	0.01	60.4	25.23	968.52	0.0	0.00	0.00	110.00	45.95	1150.83
35	0.726	7.69	174	0.35	0.01	0.005	0.216	0.00	0.01	131.0	65.13	1033.65	0.0	0.00	0.00	68.00	33.81	1184.64
36	0.638	7.78	191	0.35	0.01	0.004	0.220	0.01	0.00	159.0	69.47	1103.12	0.0	0.00	0.00	64.00	27.96	1212.60
37	0.660	7.69	199	0.26	0.02	0.009	0.229	0.00	0.02	108.0	48.81	1151.93	0.0	0.00	0.00	45.00	20.34	1232.94
38	0.716	7.74	181	0.42	0.00	0.000	0.229	0.00	0.00	196.0	96.10	1248.03	0.0	0.00	0.00	67.00	32.85	1265.79
39	0.699	7.77	200	0.20	0.01	0.005	0.234	0.00	0.01	67.0	32.08	1280.11	0.0	0.00	0.00	43.00	20.59	1286.38
40	0.697	7.34	211	0.32	0.03	0.014	0.248	0.00	0.03	64.5	30.79	1310.90	0.0	0.00	0.00	44.00	21.00	1307.38
41	0.698	7.63	217	0.33	0.00	0.000	0.248	0.00	0.00	169.0	80.83	1391.73	0.0	0.00	0.00	44.00	21.04	1328.42
42	0.714	7.71	221	0.29	0.04	0.020	0.268	0.02	0.02	125.0	61.12	1452.85	0.0	0.00	0.00	40.00	19.56	1347.98
43	0.608	7.51	235	0.26	0.00	0.000	0.268	0.00	0.00	185.0	77.03	1529.88	0.0	0.00	0.00	41.00	17.07	1365.05
44	0.554	7.11	216	0.32	0.03	0.011	0.279	0.00	0.03	195.0	73.92	1603.80	0.0	0.00	0.00	48.00	18.20	1383.25
45	0.606	6.96	229	0.48	0.02	0.008	0.287	0.00	0.02	302.0	125.32	1729.12	0.0	0.00	0.00	44.00	18.26	1401.51
46	0.648	6.92	207	0.37	0.09	0.040	0.327	0.00	0.09	173.0	76.77	1805.89	0.0	0.00	0.00	42.00	18.64	1420.15
47	0.687	6.98	172	0.37	0.07	0.033	0.360	0.01	0.06	152.0	71.51	1877.40	0.0	0.00	0.00	48.00	22.58	1442.73
48	0.673	7.22	220	0.38	0.04	0.018	0.378	0.01	0.03	200.0	92.17	1969.57	0.0	0.00	0.00	71.00	32.72	1475.45
49	0.565	7.32	235	0.51	0.05	0.019	0.397	0.01	0.04	200.0	77.38	2046.95	0.0	0.00	0.00	61.00	23.60	1499.05
50	0.705	7.33	203	0.31	0.08	0.039	0.436	0.02	0.06	146.0	70.49	2117.44	0.0	0.00	0.00	94.00	45.38	1544.43
51	0.692	7.50	200	0.32	0.11	0.052	0.488	0.00	0.11	147.0	69.66	2187.10	0.0	0.00	0.00	106.00	50.23	1594.66
52	0.706	7.61	187	0.25	0.02	0.010	0.498	0.01	0.01	172.0	83.10	2270.20	0.0	0.00	0.00	108.00	52.18	1646.84
53	0.724	7.70	162	0.20	0.01	0.005	0.503	0.00	0.01	153.0	75.85	2346.05	0.0	0.00	0.00	79.00	39.16	1686.00
54	0.716	7.71	169	0.30	0.00	0.000	0.503	0.00	0.00	138.0	67.65	2413.70	0.0	0.00	0.00	95.00	46.57	1732.57
55	0.668	8.06	218	0.35	0.00	0.000	0.503	0.00	0.00	152.0	69.52	2483.22	0.0	0.00	0.00	92.00	42.08	1774.65
56	0.523	7.78	181	0.37	0.06	0.022	0.525	0.00	0.06	179.0	64.16	2547.38	0.0	0.00	0.00	76.00	27.24	1801.89
57	0.708	7.48	196	0.29	0.02	0.010	0.535	0.02	0.00	81.0	39.28	2586.66	0.0	0.00	0.00	104.00	50.43	1852.32
58	0.720	7.51	180	0.19	0.00	0.000	0.535	0.00	0.00	50.0	24.65	2611.31	0.0	0.00	0.00	89.00	43.87	1896.19
59	0.716	7.09	207	0.19	0.02	0.010	0.545	0.02	0.00	40.0	19.61	2630.92	0.0	0.00	0.00	83.00	40.70	1936.89
60	0.708	7.44	203	0.19	0.01	0.005	0.550	0.00	0.01	55.0	26.65	2657.57	0.0	0.00	0.00	82.00	39.74	1976.63

Figure 1a.- Weekly Humidity Cell Analytical Results

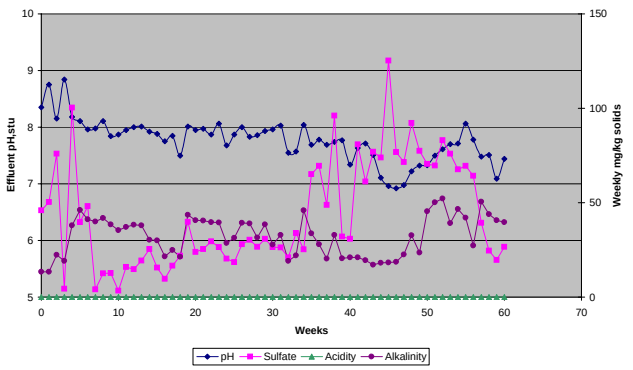
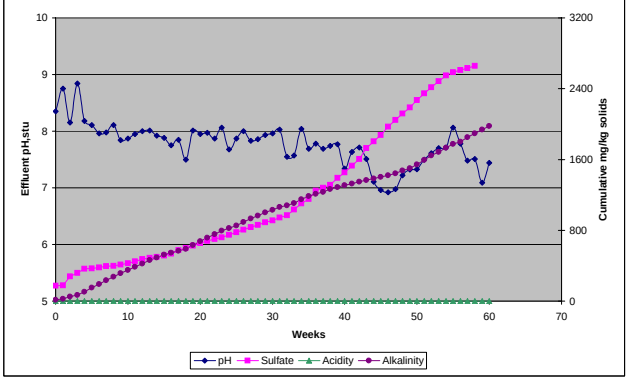


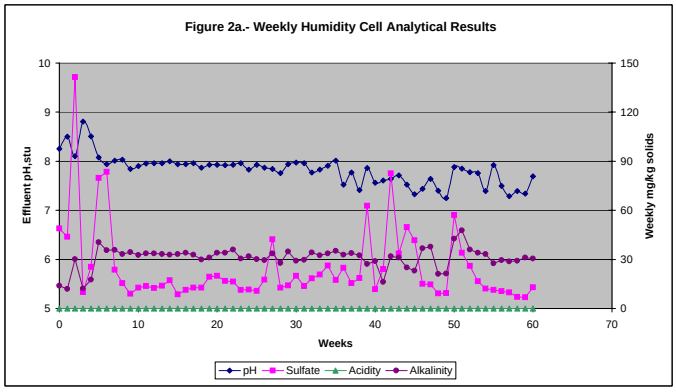
Figure 1b.- Cumulative Humidity Cell Analytical Results

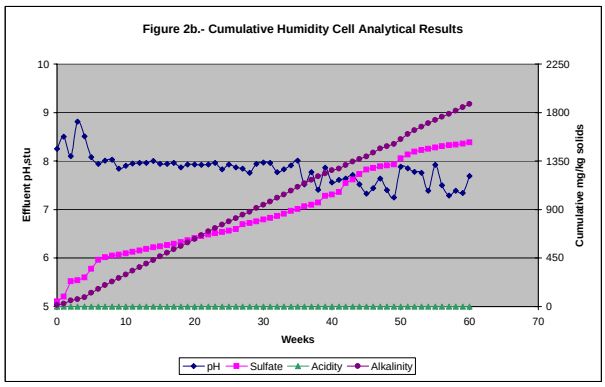


Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3020 -

Table 2 Humidity Cell Analytical Results, 205880 (QMS) (1.5362 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.487	8.25	170	0.26	0.02	0.006	0.006	0.00	0.02	154.0	48.82	48.82	0.0	0.00	0.00	44.00	13.95	13.95
1	0.769	8.50	165	0.14	0.01	0.005	0.011	0.00	0.01	87.5	43.80	92.62	0.0	0.00	0.00	24.00	12.01	25.96
2	0.887	8.10	140	0.29	0.01	0.006	0.017	0.00	0.01	245.0	141.46	234.08	0.0	0.00	0.00	52.00	30.02	55.98
3	0.751	8.81	154	0.11	0.03	0.015	0.032	0.01	0.02	20.5	10.02	244.10	0.0	0.00	0.00	25.00	12.22	68.20
4	0.795	8.51	206	0.12	0.02	0.010	0.042	0.01	0.01	49.0	25.36	269.46	0.0	0.00	0.00	34.00	17.60	85.80
5	0.655	8.08	185	0.30	0.00	0.000	0.042	0.00	0.00	187.0	79.73	349.19	0.0	0.00	0.00	95.00	40.51	126.31
6	0.675	7.94	209	0.18	0.01	0.004	0.046	0.01	0.00	190.0	83.49	432.68	0.0	0.00	0.00	81.00	35.59	161.90
7	0.686	8.01	180	0.28	0.00	0.000	0.046	0.00	0.00	53.0	23.67	456.35	0.0	0.00	0.00	80.00	35.72	197.62
8	0.671	8.03	172	0.14	0.01	0.004	0.050	0.01	0.00	35.2	15.38	471.73	0.0	0.00	0.00	76.00	33.20	230.82
9	0.685	7.84	188	0.15	0.02	0.009	0.059	0.01	0.01	20.1	8.96	480.69	0.0	0.00	0.00	77.00	34.33	265.15
10	0.679	7.90	188	0.15	0.03	0.013	0.072	0.00	0.03	28.6	12.64	493.33	0.0	0.00	0.00	74.00	32.71	297.86
11	0.671	7.95	226	0.15	0.00	0.000	0.072	0.00	0.00	31.3	13.67	507.00	0.0	0.00	0.00	77.00	33.63	331.49
12	0.681	7.96	199	0.14	0.00	0.000	0.072	0.00	0.00	28.2	12.50	519.50	0.0	0.00	0.00	76.00	33.69	365.18
13	0.664	7.96	193	0.14	0.00	0.000	0.072	0.00	0.00	32.3	13.96	533.46	0.0	0.00	0.00	77.00	33.28	398.46
14	0.701	8.00	189	0.14	0.00	0.000	0.072	0.00	0.00	37.6	17.16	550.62	0.0	0.00	0.00	72.00	32.86	431.32
15	0.692	7.94	215	0.14	0.00	0.000	0.072	0.00	0.00	19.2	8.65	559.27	0.0	0.00	0.00	74.00	33.33	464.65
16	0.717	7.94	184	0.14	0.00	0.000	0.072	0.00	0.00	24.2	11.30	570.57	0.0	0.00	0.00	73.00	34.07	498.72
17	0.674	7.96	203	0.14	0.01	0.004	0.076	0.00	0.01	28.9	12.68	583.25	0.0	0.00	0.00	75.00	32.91	531.63
18	0.685	7.87	168	0.14	0.08	0.036	0.112	0.07	0.01	28.4	12.66	595.91	0.0	0.00	0.00	67.00	29.88	561.51
19	0.674	7.93	202	0.16	0.00	0.000	0.112	0.00	0.00	44.3	19.44	615.35	0.0	0.00	0.00	71.00	31.15	592.66
20	0.678	7.93	192	0.20	0.01	0.004	0.116	0.00	0.01	45.0	19.86	635.21	0.0	0.00	0.00	77.00	33.98	626.64
21	0.707	7.92	169	0.18	0.00	0.000	0.116	0.00	0.00	36.4	16.75	651.96	0.0	0.00	0.00	74.00	34.06	660.70
22	0.719	7.93	193	0.18	0.00	0.000	0.116	0.00	0.00	35.3	16.52	668.48	0.0	0.00	0.00	77.00	36.04	696.74
23	0.711	7.96	162	0.16	0.00	0.000	0.116	0.00	0.00	24.4	11.29	679.77	0.0	0.00	0.00	66.00	30.55	727.29
24	0.720	7.83	153	0.16	0.00	0.000	0.116	0.00	0.00	24.7	11.58	691.35	0.0	0.00	0.00	68.00	31.87	759.16
25	0.689	7.93	140	0.17	0.02	0.009	0.125	0.00	0.02	23.8	10.67	702.02	0.0	0.00	0.00	67.00	30.05	789.21
26	0.687	7.87	167	0.18	0.00	0.000	0.125	0.00	0.00	39.3	17.58	719.60	0.0	0.00	0.00	66.00	29.52	818.73
27	0.747	7.84	140	0.19	0.00	0.000	0.125	0.00	0.00	86.8	42.21	761.81	0.0	0.00	0.00	69.00	33.55	852.28
28	0.699	7.76	180	0.17	0.00	0.000	0.125	0.00	0.00	28.0	12.74	774.55	0.0	0.00	0.00	61.00	27.76	880.04
29	0.753	7.94	170	0.18	0.00	0.000	0.125	0.00	0.00	28.6	14.02	788.57	0.0	0.00	0.00	71.00	34.80	914.84
30	0.687	7.97	176	0.20	0.00	0.000	0.125	0.00	0.00	44.6	19.95	808.52	0.0	0.00	0.00	65.00	29.07	943.91
31	0.738	7.96	203	0.16	0.01	0.005	0.130	0.00	0.01	28.5	13.69	822.21	0.0	0.00	0.00	62.00	29.79	973.70
32	0.760	7.77	182	0.19	0.01	0.005	0.135	0.00	0.01	37.1	18.35	840.56	0.0	0.00	0.00	69.00	34.14	1007.84
33	0.733	7.83	193	0.19	0.00	0.000	0.135	0.00	0.00	43.3	20.66	861.22	0.0	0.00	0.00	68.00	32.45	1040.29
34	0.697	7.91	181	0.24	0.00	0.000	0.135	0.00	0.00	57.8	26.22	887.44	0.0	0.00	0.00	74.00	33.58	1073.87
35	0.751	8.01	127	0.20	0.00	0.000	0.135	0.00	0.00	35.7	17.45	904.89	0.0	0.00	0.00	72.00	35.20	1109.07
36	0.722	7.52	190	0.22	0.04	0.019	0.154	0.00	0.04	52.8	24.82	929.71	0.0	0.00	0.00	70.00	32.90	1141.97
37	0.722	7.77	203	0.21	0.01	0.005	0.159	0.00	0.01	33.0	15.51	945.22	0.0	0.00	0.00	72.00	33.84	1175.81
38	0.666	7.41	194	0.25	0.00	0.000	0.159	0.00	0.00	43.0	18.64	963.86	0.0	0.00	0.00	74.80	32.43	1208.24
39	0.578	7.86	176	0.42	0.02	0.008	0.167	0.00	0.02	167.0	62.87	1026.73	0.0	0.00	0.00	72.00	27.10	1235.34
40	0.685	7.56	208	0.26	0.00	0.000	0.167	0.00	0.00	26.5	11.82	1038.55	0.0	0.00	0.00	65.00	28.98	1264.32
41	0.693	7.61	222	0.17	0.00	0.000	0.167	0.00	0.00	53.5	24.14	1062.69	0.0	0.00	0.00	36.00	16.24	1280.56
42	0.708	7.64	204	0.35	0.00	0.000	0.167	0.00	0.00	179.0	82.50	1145.19	0.0	0.00	0.00	69.00	31.80	1312.36
43	0.570	7.71	207	0.29	0.01	0.004	0.171	0.00	0.01	90.8	33.69	1178.88	0.0	0.00	0.00	84.00	31.17	1343.53
44	0.511	7.52	193	0.33	0.02	0.007	0.178	0.00	0.02	149.5	49.71	1228.59	0.0	0.00	0.00	75.00	24.94	1368.47
45	0.593	7.33	209	0.28	0.04	0.015	0.193	0.00	0.04	108.0	41.66	1270.25	0.0	0.00	0.00	60.00	23.15	1391.62
46	0.635	7.44	196	0.28	0.07	0.029	0.222	0.02	0.05	36.5	15.09	1285.34	0.0	0.00	0.00	89.00	36.79	1428.41
47	0.644	7.64	221	0.28	0.10	0.042	0.264	0.01	0.09	35.0	14.67	1300.01	0.0	0.00	0.00	90.00	37.73	1466.14
48	0.456	7.40	209	0.34	0.05	0.015	0.279	0.01	0.04	30.8	9.14	1309.15	0.0	0.00	0.00	71.00	21.08	1487.22
49	0.438	7.25	241	0.51	0.05	0.014	0.293	0.00	0.05	32.9	9.38	1318.53	0.0	0.00	0.00	75.00	21.38	1508.60
50	0.697	7.88	210	0.29	0.08	0.036	0.329	0.02	0.06	126.0	57.17	1375.70	0.0	0.00	0.00	94.00	42.65	1551.25
51	0.705	7.85	202	0.21	0.13	0.060	0.389	0.00	0.13	74.0	33.96	1409.66	0.0	0.00	0.00	104.00	47.73	1598.98
52	0.676	7.78	151	0.18	0.00	0.000	0.389	0.00	0.00	59.0	25.95	1435.61	0.0	0.00	0.00	82.00	36.06	1635.04
53	0.706	7.76	172	0.17	0.05	0.023	0.412	0.00	0.05	36.0	16.54	1452.15	0.0	0.00	0.00	74.00	34.00	1669.04
54	0.682	7.39	169	0.30	0.00	0.000	0.412	0.00	0.00	27.2	12.08	1464.23	0.0	0.00	0.00	75.00	33.30	1702.34
55	0.697	7.92	238	0.16	0.01	0.005	0.417	0.00	0.01	24.9	11.29	1475.52	0.0	0.00	0.00	61.00	27.66	1730.00
56	0.696	7.50	187	0.16	0.00	0.000	0.417	0.00	0.00	23.5	10.65	1486.17	0.0	0.00	0.00	65.00	29.46	1759.46
57	0.713	7.29	208	0.15	0.01	0.005	0.422	0.00	0.01	21.1	9.79	1495.96	0.0	0.00	0.00	62.00	28.76	1788.22
58	0.720	7.39	186	0.14	0.02	0.009	0.431	0.01	0.01	14.9	6.98	1502.94	0.0	0.00	0.00	62.00	29.05	1817.27
59	0.726	7.34	208	0.15	0.02	0.009	0.440	0.02	0.00	14.5	6.85	1509.79	0.0	0.00	0.00	66.00	31.17	1848.44
60	0.690	7.69	205	0.15	0.02	0.009	0.449	0.00	0.02	28.5	12.81	1522.60	0.0	0.00	0.00	68.00	30.56	1879.00

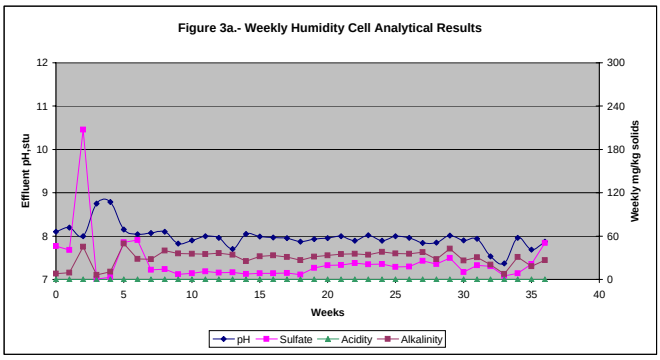




Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3020 -

Table 3 Humidity Cell Analytical Results, 205881 (CQMS) (1.6148 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.366	8.10	150	0.30	0.02	0.005	0.005	0.00	0.02	203.0	46.01	46.01	0.0	0.00	0.00	36.00	8.16	8.16
1	0.762	8.20	180	0.15	0.00	0.000	0.005	0.00	0.00	86.5	40.82	86.83	0.0	0.00	0.00	20.00	9.44	17.60
2	0.813	8.00	150	0.53	0.01	0.005	0.010	0.01	0.00	412.0	207.43	294.26	0.0	0.00	0.00	90.00	45.31	62.91
3	0.748	8.75	154	0.08	0.02	0.009	0.019	0.00	0.02	0.6	0.28	294.54	0.0	0.00	0.00	13.00	6.02	68.93
4	0.755	8.79	200	0.08	0.04	0.019	0.038	0.02	0.02	6.8	3.18	297.72	0.0	0.00	0.00	23.00	10.75	79.68
5	0.656	8.15	183	0.27	0.02	0.008	0.046	0.01	0.01	126.0	51.19	348.91	0.0	0.00	0.00	122.00	49.56	129.24
6	0.677	8.04	185	0.20	0.01	0.004	0.050	0.01	0.00	130.0	54.50	403.41	0.0	0.00	0.00	68.00	28.51	157.75
7	0.649	8.07	186	0.28	0.03	0.012	0.062	0.00	0.03	33.5	13.46	416.87	0.0	0.00	0.00	70.00	28.13	185.88
8	0.664	8.10	173	0.16	0.00	0.000	0.062	0.00	0.00	34.2	14.06	430.93	0.0	0.00	0.00	97.00	39.89	225.77
9	0.676	7.83	189	0.14	0.02	0.008	0.070	0.00	0.02	17.0	7.12	438.05	0.0	0.00	0.00	86.00	36.00	261.77
10	0.680	7.90	188	0.15	0.00	0.000	0.070	0.00	0.00	19.7	8.30	446.35	0.0	0.00	0.00	84.00	35.37	297.14
11	0.655	8.00	215	0.15	0.00	0.000	0.070	0.00	0.00	27.1	10.99	457.34	0.0	0.00	0.00	86.00	34.88	332.02
12	0.681	7.96	198	0.14	0.02	0.008	0.078	0.00	0.02	22.1	9.32	466.66	0.0	0.00	0.00	86.00	36.27	368.29
13	0.643	7.70	181	0.14	0.01	0.004	0.082	0.00	0.01	24.8	9.88	476.54	0.0	0.00	0.00	86.00	34.24	402.53
14	0.715	8.05	185	0.12	0.01	0.004	0.086	0.01	0.00	17.2	7.62	484.16	0.0	0.00	0.00	57.00	25.24	427.77
15	0.690	7.99	210	0.13	0.01	0.004	0.090	0.00	0.01	20.1	8.59	492.75	0.0	0.00	0.00	75.00	32.05	459.82
16	0.725	7.97	185	0.13	0.01	0.004	0.094	0.00	0.01	19.2	8.62	501.37	0.0	0.00	0.00	74.00	33.22	493.04
17	0.701	7.95	204	0.13	0.00	0.000	0.094	0.00	0.00	20.8	9.03	510.40	0.0	0.00	0.00	71.00	30.82	523.86
18	0.679	7.87	170	0.12	0.02	0.008	0.102	0.00	0.02	16.0	6.73	517.13	0.0	0.00	0.00	63.00	26.49	550.35
19	0.675	7.93	202	0.15	0.00	0.000	0.102	0.00	0.00	38.3	16.01	533.14	0.0	0.00	0.00	75.00	31.35	581.70
20	0.662	7.95	193	0.21	0.08	0.033	0.135	0.00	0.08	47.4	19.43	552.57	0.0	0.00	0.00	81.00	33.21	614.91
21	0.698	8.00	121	0.20	0.00	0.000	0.135	0.00	0.00	45.7	19.75	572.32	0.0	0.00	0.00	81.00	35.01	649.92
22	0.725	7.89	195	0.20	0.00	0.000	0.135	0.00	0.00	50.6	22.72	595.04	0.0	0.00	0.00	79.00	35.47	685.39
23	0.729	8.02	168	0.20	0.00	0.000	0.135	0.00	0.00	46.1	20.81	615.85	0.0	0.00	0.00	76.00	34.31	719.70
24	0.733	7.89	153	0.20	0.01	0.005	0.140	0.00	0.01	46.4	21.06	636.91	0.0	0.00	0.00	84.00	38.13	757.83
25	0.705	8.00	143	0.20	0.00	0.000	0.140	0.00	0.00	39.4	17.20	654.11	0.0	0.00	0.00	82.00	35.80	793.63
26	0.703	7.96	169	0.21	0.01	0.004	0.144	0.00	0.01	41.0	17.85	671.96	0.0	0.00	0.00	81.00	35.26	828.89
27	0.746	7.84	141	0.21	0.02	0.009	0.153	0.00	0.02	55.5	25.64	697.60	0.0	0.00	0.00	82.00	37.88	866.77
28	0.604	7.85	182	0.20	0.01	0.004	0.157	0.00	0.01	56.4	21.10	718.70	0.0	0.00	0.00	75.00	28.05	894.82
29	0.741	8.01	119	0.23	0.00	0.000	0.157	0.00	0.00	64.4	29.55	748.25	0.0	0.00	0.00	93.00	42.68	937.50
30	0.688	7.90	179	0.18	0.00	0.000	0.157	0.00	0.00	24.0	10.23	758.48	0.0	0.00	0.00	61.00	25.99	963.49
31	0.742	7.94	206	0.18	0.00	0.000	0.157	0.00	0.00	42.2	19.39	777.87	0.0	0.00	0.00	67.00	30.79	994.28
32	0.731	7.53	185	0.16	0.00	0.000	0.157	0.00	0.00	39.8	18.02	795.89	0.0	0.00	0.00	45.00	20.37	1014.65
33	0.716	7.37	219	0.10	0.00	0.000	0.157	0.00	0.00	11.3	5.01	800.90	0.0	0.00	0.00	17.00	7.54	1022.19
34	0.653	7.96	189	0.41	0.00	0.000	0.157	0.00	0.00	20.5	8.29	809.19	0.0	0.00	0.00	77.00	31.14	1053.33
35	0.701	7.69	174	0.19	0.00	0.000	0.157	0.00	0.00	48.6	21.10	830.29	0.0	0.00	0.00	42.00	18.23	1071.56
36	0.588	7.87	192	0.34	0.01	0.004	0.161	0.00	0.01	139.0	50.61	880.90	0.0	0.00	0.00	73.00	26.58	1098.14
	Test Terminated																	



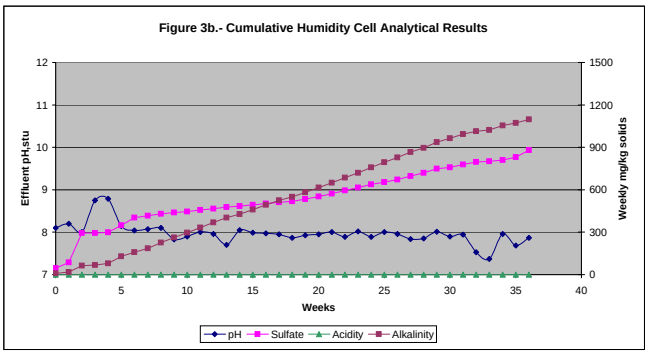
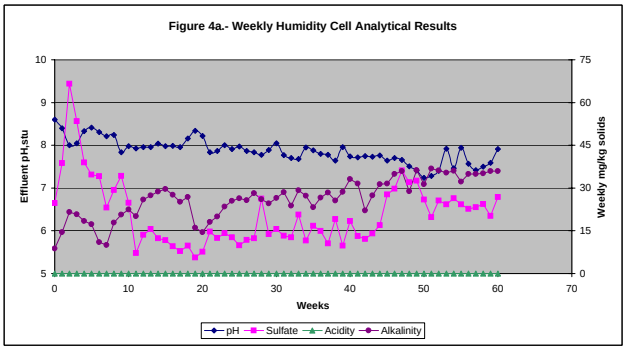
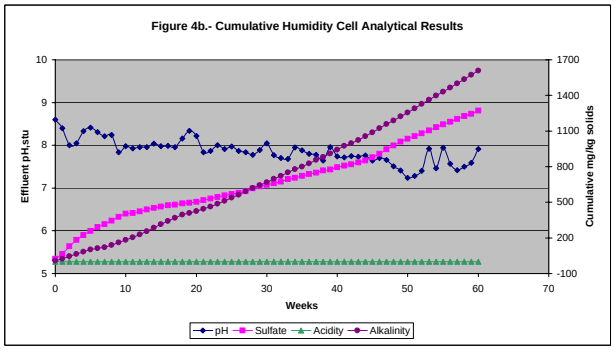


Table 4 Humidity Cell Analytical Results, 205962 (GQMS) (1.6369 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2+} mg/l	Fe^{3+} mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.375	8.60	115	0.22	0.01	0.002	0.002	0.00	0.01	108.0	24.74	24.74	0.0	0.00	0.00	38.00	8.71	8.71
1	0.738	8.40	175	0.20	0.03	0.014	0.016	0.00	0.03	86.0	38.77	63.51	0.0	0.00	0.00	32.00	14.43	23.14
2	0.839	8.00	140	0.21	0.00	0.000	0.016	0.00	0.00	130.0	66.63	130.14	0.0	0.00	0.00	42.00	21.53	44.67
3	0.754	8.05	192	0.21	0.01	0.005	0.021	0.00	0.01	116.0	53.43	183.57	0.0	0.00	0.00	45.00	20.73	65.40
4	0.753	8.33	219	0.15	0.02	0.009	0.030	0.01	0.01	84.8	39.01	222.58	0.0	0.00	0.00	40.00	18.40	83.80
5	0.745	8.41	175	0.15	0.00	0.000	0.030	0.00	0.00	76.2	34.68	257.26	0.0	0.00	0.00	38.00	17.29	101.09
6	0.752	8.31	177	0.14	0.00	0.000	0.030	0.00	0.00	74.2	34.09	291.35	0.0	0.00	0.00	24.00	11.03	112.12
7	0.741	8.21	179	0.15	0.03	0.014	0.044	0.00	0.03	51.2	23.18	314.53	0.0	0.00	0.00	22.00	9.96	122.08
8	0.768	8.24	171	0.13	0.05	0.023	0.067	0.02	0.03	62.4	29.28	343.81	0.0	0.00	0.00	38.00	17.83	139.91
9	0.752	7.84	192	0.14	0.02	0.009	0.076	0.00	0.02	74.6	34.27	378.08	0.0	0.00	0.00	45.00	20.67	160.58
10	0.735	7.98	188	0.13	0.00	0.000	0.076	0.00	0.00	55.2	24.79	402.87	0.0	0.00	0.00	50.00	22.45	183.03
11	0.733	7.93	227	0.12	0.01	0.004	0.080	0.00	0.01	16.1	7.21	410.08	0.0	0.00	0.00	45.00	20.15	203.18
12	0.733	7.96	197	0.13	0.00	0.000	0.080	0.00	0.00	30.4	13.61	423.69	0.0	0.00	0.00	58.00	25.97	229.15
13	0.724	7.96	191	0.13	0.00	0.000	0.080	0.00	0.00	35.3	15.61	439.30	0.0	0.00	0.00	62.00	27.42	256.57
14	0.724	8.04	188	0.13	0.01	0.004	0.084	0.00	0.01	27.8	12.30	451.60	0.0	0.00	0.00	65.00	28.75	285.32
15	0.725	7.98	210	0.14	0.00	0.000	0.084	0.00	0.00	26.4	11.69	463.29	0.0	0.00	0.00	67.00	29.67	314.99
16	0.729	7.99	188	0.12	0.02	0.009	0.093	0.00	0.02	21.4	9.53	472.82	0.0	0.00	0.00	62.00	27.61	342.60
17	0.633	7.96	204	0.13	0.00	0.000	0.093	0.00	0.00	20.3	7.85	480.67	0.0	0.00	0.00	65.00	25.14	367.74
18	0.743	8.16	148	0.13	0.01	0.005	0.098	0.00	0.01	21.5	9.76	490.43	0.0	0.00	0.00	59.00	26.78	394.52
19	0.711	8.34	164	0.10	0.29	0.126	0.224	0.22	0.07	12.9	5.60	496.03	0.0	0.00	0.00	37.00	16.07	410.59
20	0.720	8.22	160	0.12	0.10	0.044	0.268	0.08	0.02	17.4	7.65	503.68	0.0	0.00	0.00	33.00	14.52	425.11
21	0.615	7.84	171	0.16	0.00	0.000	0.268	0.00	0.00	39.1	14.69	518.37	0.0	0.00	0.00	48.00	18.03	443.14
22	0.742	7.87	194	0.14	0.03	0.014	0.282	0.00	0.03	27.5	12.47	530.84	0.0	0.00	0.00	44.00	19.95	463.09
23	0.723	8.00	170	0.16	0.01	0.004	0.286	0.00	0.01	32.0	14.13	544.97	0.0	0.00	0.00	53.00	23.41	486.50
24	0.706	7.91	152	0.15	0.01	0.004	0.290	0.01	0.00	29.4	12.68	557.65	0.0	0.00	0.00	59.00	25.45	511.95
25	0.709	7.97	149	0.16	0.06	0.026	0.316	0.00	0.06	22.7	9.83	567.48	0.0	0.00	0.00	61.00	26.42	538.37
26	0.667	7.87	168	0.17	0.00	0.000	0.316	0.00	0.00	28.9	11.78	579.26	0.0	0.00	0.00	63.00	25.67	564.04
27	0.720	7.84	141	0.16	0.02	0.009	0.325	0.00	0.02	28.1	12.36	591.62	0.0	0.00	0.00	64.00	28.15	592.19
28	0.645	7.78	186	0.17	0.02	0.008	0.333	0.02	0.00	66.8	26.32	617.94	0.0	0.00	0.00	66.00	26.01	618.20
29	0.639	7.89	172	0.17	0.01	0.004	0.337	0.01	0.00	35.4	13.82	631.76	0.0	0.00	0.00	63.00	24.59	642.79
30	0.594	8.05	144	0.20	0.00	0.000	0.337	0.00	0.00	43.0	15.60	647.36	0.0	0.00	0.00	73.00	26.49	669.28
31	0.753	7.77	208	0.16	0.02	0.009	0.346	0.00	0.02	28.8	13.25	660.61	0.0	0.00	0.00	62.00	28.52	697.80
32	0.617	7.70	185	0.17	0.01	0.004	0.350	0.00	0.01	33.6	12.66	673.27	0.0	0.00	0.00	63.00	23.75	721.55
33	0.759	7.68	212	0.18	0.01	0.005	0.355	0.00	0.01	44.6	20.68	693.95	0.0	0.00	0.00	63.00	29.21	750.76
34	0.698	7.95	186	0.19	0.00	0.000	0.355	0.00	0.00	27.0	11.51	705.46	0.0	0.00	0.00	64.00	27.29	778.05
35	0.667	7.88	175	0.19	0.02	0.008	0.363	0.00	0.02	41.1	16.75	722.21	0.0	0.00	0.00	57.00	23.23	801.28
36	0.680	7.80	190	0.19	0.03	0.012	0.375	0.01	0.02	35.9	14.91	737.12	0.0	0.00	0.00	64.00	26.59	827.87
37	0.705	7.78	205	0.20	0.02	0.009	0.384	0.00	0.02	24.5	10.55	747.67	0.0	0.00	0.00	66.00	28.43	856.30
38	0.664	7.64	187	0.21	0.02	0.008	0.392	0.00	0.02	47.0	19.07	766.74	0.0	0.00	0.00	63.00	25.56	881.86
39	0.680	7.96	211	0.20	0.04	0.017	0.409	0.00	0.04	23.6	9.80	776.54	0.0	0.00	0.00	69.00	28.64	910.50
40	0.742	7.74	202	0.21	0.03	0.014	0.423	0.01	0.02	40.6	18.40	794.94	0.0	0.00	0.00	73.00	33.09	943.59
41	0.875	7.72	213	0.17	0.02	0.011	0.434	0.00	0.02	24.5	13.10	808.04	0.0	0.00	0.00	59.00	31.55	975.14
42	0.723	7.75	197	0.19	0.05	0.022	0.456	0.01	0.04	27.4	12.10	820.14	0.0	0.00	0.00	50.00	22.08	997.22
43	0.678	7.73	205	0.23	0.06	0.025	0.481	0.00	0.06	34.0	14.08	834.22	0.0	0.00	0.00	66.00	27.34	1024.56
44	0.692	7.76	191	0.25	0.03	0.013	0.494	0.00	0.03	40.0	16.90	851.12	0.0	0.00	0.00	74.00	31.27	1055.83
45	0.699	7.64	209	0.28	0.07	0.030	0.524	0.00	0.07	65.0	27.76	878.88	0.0	0.00	0.00	74.00	31.60	1087.43
46	0.698	7.70	190	0.24	0.12	0.051	0.575	0.00	0.12	69.8	29.76	908.64	0.0	0.00	0.00	82.00	34.97	1122.40
47	0.691	7.66	216	0.24	0.08	0.034	0.609	0.01	0.07	85.6	36.14	944.78	0.0	0.00	0.00	85.00	35.88	1158.28
48	0.696	7.51	206	0.34	0.15	0.064	0.673	0.01	0.14	75.2	31.97	976.75	0.0	0.00	0.00	68.00	28.91	1187.19
49	0.707	7.41	240	0.25	0.09	0.039	0.712	0.01	0.08	75.4	32.57	1009.32	0.0	0.00	0.00	84.00	36.28	1223.47
50	0.703	7.24	211	0.21	0.05	0.021	0.733	0.01	0.04	60.4	25.94	1035.26	0.0	0.00	0.00	73.00	31.35	1254.82
51	0.718	7.28	206	0.23	0.19	0.083	0.816	0.01	0.18	45.0	19.74	1055.00	0.0	0.00	0.00	84.00	36.85	1291.67
52	0.714	7.40	155	0.22	0.00	0.000	0.816	0.00	0.00	58.6	25.56	1080.56	0.0	0.00	0.00	83.00	36.20	1327.87
53	0.715	7.92	174	0.21	0.00	0.000	0.816	0.00	0.00	55.6	24.29	1104.85	0.0	0.00	0.00	81.00	35.39	1363.26
54	0.712	7.46	179	0.22	0.00	0.000	0.816	0.00	0.00	60.6	26.35	1131.20	0.0	0.00	0.00	83.00	36.09	1399.35
55	0.713	7.94	240	0.22	0.02	0.009	0.825	0.02	0.00	55.6	24.21	1155.41	0.0	0.00	0.00	74.00	32.22	1431.57
56	0.715	7.57	192	0.22	0.01	0.004	0.829	0.00	0.01	52.0	22.72	1178.13	0.0	0.00	0.00	80.00	34.96	1466.53
57	0.714	7.42	209	0.20	0.05	0.022	0.851	0.01	0.04	53.2	23.19	1201.32	0.0	0.00	0.00	80.00	34.88	1501.41
58	0.718	7.50	180	0.20	0.02	0.009	0.860	0.01	0.01	55.4	24.31	1225.63	0.0	0.00	0.00	80.00	35.10	1536.51
59	0.716	7.59	201	0.21	0.01	0.004	0.864	0.00	0.01	46.2	20.21	1245.84	0.0	0.00	0.00	82.00	35.88	1572.39
60	0.708	7.91	201	0.20	0.01	0.004	0.868	0.00	0.01	62.0	26.82	1272.66	0.0	0.00	0.00	83.00	35.91	1608.30

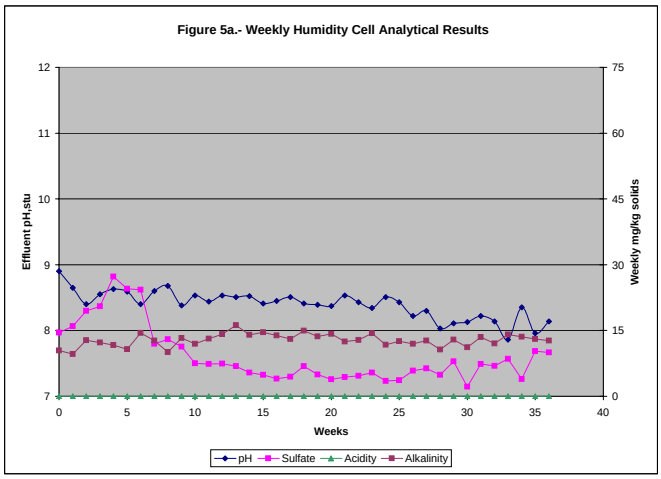


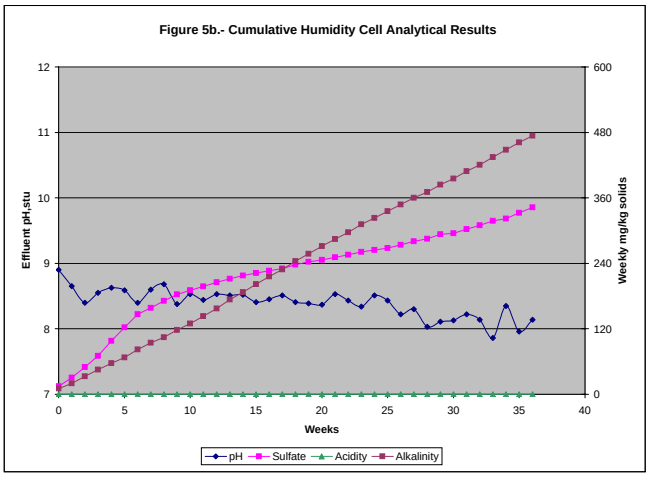


Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3020 -

Table 5 Humidity Cell Analytical Results, 205967 (GS) (1.8536 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.410	8.90	100	0.16	0.03	0.007	0.007	0.01	0.02	65.5	14.49	14.49	0.0	0.00	0.00	47.00	10.40	10.40
1	0.715	8.65	165	0.12	0.01	0.004	0.011	0.00	0.01	41.5	16.01	30.50	0.0	0.00	0.00	25.00	9.64	20.04
2	0.740	8.40	130	0.16	0.01	0.004	0.015	0.00	0.01	48.8	19.48	49.98	0.0	0.00	0.00	32.00	12.78	32.82
3	0.758	8.55	181	0.14	0.00	0.000	0.015	0.00	0.00	50.2	20.53	70.51	0.0	0.00	0.00	30.00	12.27	45.09
4	0.744	8.63	208	0.12	0.00	0.000	0.015	0.00	0.00	68.0	27.29	97.80	0.0	0.00	0.00	29.00	11.64	56.73
5	0.738	8.59	174	0.12	0.00	0.000	0.015	0.00	0.00	61.6	24.53	122.33	0.0	0.00	0.00	27.00	10.75	67.48
6	0.743	8.40	181	0.13	0.00	0.000	0.015	0.00	0.00	60.6	24.29	146.62	0.0	0.00	0.00	36.00	14.43	81.91
7	0.693	8.60	174	0.12	0.03	0.011	0.026	0.00	0.03	32.0	11.96	158.58	0.0	0.00	0.00	34.00	12.71	94.62
8	0.691	8.68	159	0.10	0.01	0.004	0.030	0.01	0.00	34.8	12.97	171.55	0.0	0.00	0.00	27.00	10.07	104.69
9	0.745	8.38	182	0.11	0.04	0.016	0.046	0.00	0.04	28.2	11.33	182.88	0.0	0.00	0.00	33.00	13.26	117.95
10	0.738	8.53	159	0.10	0.03	0.012	0.058	0.02	0.01	18.8	7.49	190.37	0.0	0.00	0.00	30.00	11.94	129.89
11	0.717	8.44	202	0.10	0.01	0.004	0.062	0.00	0.01	19.0	7.35	197.72	0.0	0.00	0.00	34.00	13.15	143.04
12	0.727	8.53	172	0.11	0.00	0.000	0.062	0.00	0.00	19.0	7.45	205.17	0.0	0.00	0.00	36.00	14.12	157.16
13	0.732	8.51	169	0.10	0.02	0.008	0.070	0.02	0.00	17.3	6.83	212.00	0.0	0.00	0.00	41.00	16.19	173.35
14	0.723	8.52	177	0.10	0.02	0.008	0.078	0.01	0.01	13.9	5.42	217.42	0.0	0.00	0.00	36.00	14.04	187.39
15	0.750	8.41	198	0.10	0.01	0.004	0.082	0.00	0.01	12.1	4.90	222.32	0.0	0.00	0.00	36.00	14.57	201.96
16	0.754	8.45	170	0.10	0.02	0.008	0.090	0.00	0.02	9.8	3.99	226.31	0.0	0.00	0.00	34.00	13.83	215.79
17	0.713	8.51	162	0.10	0.02	0.008	0.098	0.01	0.01	11.6	4.46	230.77	0.0	0.00	0.00	34.00	13.08	228.87
18	0.749	8.41	135	0.10	0.02	0.008	0.106	0.00	0.02	16.9	6.83	237.60	0.0	0.00	0.00	37.00	14.95	243.82
19	0.724	8.39	170	0.10	0.04	0.016	0.122	0.03	0.01	12.7	4.96	242.56	0.0	0.00	0.00	35.00	13.67	257.49
20	0.733	8.37	168	0.11	0.00	0.000	0.122	0.00	0.00	9.8	3.88	246.44	0.0	0.00	0.00	36.00	14.24	271.73
21	0.724	8.53	134	0.10	0.00	0.000	0.122	0.00	0.00	11.2	4.37	250.81	0.0	0.00	0.00	32.00	12.50	284.23
22	0.743	8.43	170	0.11	0.08	0.032	0.154	0.00	0.08	11.6	4.65	255.46	0.0	0.00	0.00	32.00	12.83	297.06
23	0.782	8.34	167	0.11	0.01	0.004	0.158	0.00	0.01	12.8	5.40	260.86	0.0	0.00	0.00	34.00	14.34	311.40
24	0.700	8.51	102	0.10	0.01	0.004	0.162	0.00	0.01	9.3	3.51	264.37	0.0	0.00	0.00	31.00	11.71	323.11
25	0.749	8.43	97	0.11	0.01	0.004	0.166	0.00	0.01	9.1	3.68	268.05	0.0	0.00	0.00	31.00	12.53	335.64
26	0.715	8.22	153	0.11	0.01	0.004	0.170	0.00	0.01	15.2	5.86	273.91	0.0	0.00	0.00	31.00	11.96	347.60
27	0.737	8.30	109	0.11	0.01	0.004	0.174	0.01	0.00	15.9	6.32	280.23	0.0	0.00	0.00	32.00	12.72	360.32
28	0.730	8.03	166	0.11	0.01	0.004	0.178	0.00	0.01	12.4	4.88	285.11	0.0	0.00	0.00	27.00	10.63	370.95
29	0.727	8.11	140	0.12	0.01	0.004	0.182	0.00	0.01	20.3	7.96	293.07	0.0	0.00	0.00	33.00	12.94	383.89
30	0.714	8.13	157	0.12	0.00	0.000	0.182	0.00	0.00	5.7	2.20	295.27	0.0	0.00	0.00	29.00	11.17	395.06
31	0.759	8.22	170	0.11	0.00	0.000	0.182	0.00	0.00	18.0	7.37	302.64	0.0	0.00	0.00	33.00	13.51	408.57
32	0.676	8.14	163	0.12	0.00	0.000	0.182	0.00	0.00	19.0	6.93	309.57	0.0	0.00	0.00	33.00	12.03	420.60
33	0.687	7.86	206	0.13	0.00	0.000	0.182	0.00	0.00	23.0	8.52	318.09	0.0	0.00	0.00	38.00	14.08	434.68
34	0.740	8.35	151	0.12	0.03	0.012	0.194	0.00	0.03	9.9	3.95	322.04	0.0	0.00	0.00	34.00	13.57	448.25
35	0.758	7.96	171	0.13	0.00	0.000	0.194	0.00	0.00	25.1	10.26	332.30	0.0	0.00	0.00	32.00	13.09	461.34
36	0.712	8.14	192	0.13	0.02	0.008	0.202	0.01	0.01	26.0	9.99	342.29	0.0	0.00	0.00	33.00	12.68	474.02
37	: Terminated																	



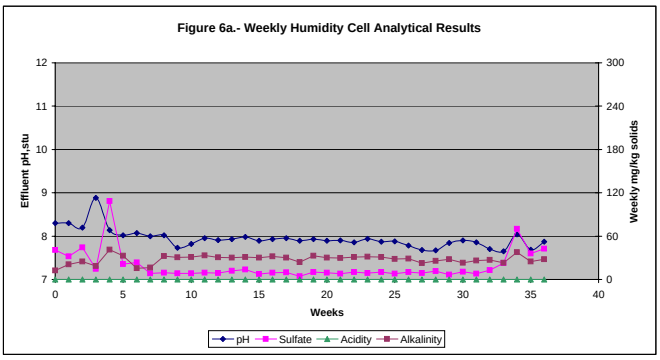


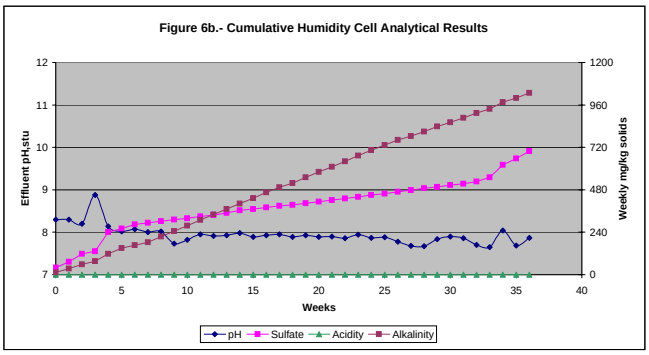
Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3020 -

Table 6 Humidity Cell Analytical Results, 206338 (CS) (1.5452 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.405	8.30	130	0.28	0.01	0.003	0.003	0.01	0.00	155.0	40.63	40.63	0.0	0.00	0.00	48.00	12.58	12.58
1	0.878	8.30	165	0.14	0.01	0.006	0.009	0.01	0.00	56.0	31.82	72.45	0.0	0.00	0.00	37.00	21.02	33.60
2	0.930	8.20	130	0.16	0.04	0.024	0.033	0.00	0.04	73.6	44.30	116.75	0.0	0.00	0.00	41.00	24.68	58.28
3	0.797	8.88	152	0.11	0.01	0.005	0.038	0.01	0.00	28.4	14.65	131.40	0.0	0.00	0.00	36.00	18.57	76.85
4	0.869	8.14	217	0.28	0.05	0.028	0.066	0.01	0.04	193.0	108.54	239.94	0.0	0.00	0.00	73.00	41.05	117.90
5	0.651	8.02	182	0.16	0.01	0.004	0.070	0.01	0.00	50.5	21.28	261.22	0.0	0.00	0.00	78.00	32.86	150.76
6	0.714	8.07	181	0.13	0.01	0.005	0.075	0.01	0.00	50.5	23.33	284.55	0.0	0.00	0.00	34.00	15.71	166.47
7	0.746	8.00	200	0.16	0.03	0.014	0.089	0.00	0.03	17.8	8.59	293.14	0.0	0.00	0.00	34.00	16.41	182.88
8	0.676	8.02	175	0.13	0.02	0.009	0.098	0.00	0.02	21.4	9.36	302.50	0.0	0.00	0.00	74.00	32.37	215.25
9	0.697	7.73	194	0.12	0.01	0.005	0.103	0.00	0.01	18.5	8.34	310.84	0.0	0.00	0.00	68.00	30.67	245.92
10	0.686	7.82	189	0.13	0.00	0.000	0.103	0.00	0.00	19.2	8.52	319.36	0.0	0.00	0.00	70.00	31.08	277.00
11	0.679	7.95	226	0.13	0.00	0.000	0.103	0.00	0.00	21.0	9.23	328.59	0.0	0.00	0.00	76.00	33.40	310.40
12	0.685	7.91	198	0.13	0.02	0.009	0.112	0.00	0.02	19.7	8.73	337.32	0.0	0.00	0.00	69.00	30.59	340.99
13	0.659	7.93	193	0.13	0.01	0.004	0.116	0.00	0.01	27.8	11.86	349.18	0.0	0.00	0.00	71.00	30.28	371.27
14	0.716	7.98	190	0.13	0.00	0.000	0.116	0.00	0.00	29.9	13.85	363.03	0.0	0.00	0.00	67.00	31.05	402.32
15	0.695	7.89	212	0.13	0.00	0.000	0.116	0.00	0.00	16.6	7.47	370.50	0.0	0.00	0.00	67.00	30.14	432.46
16	0.745	7.93	194	0.13	0.00	0.000	0.116	0.00	0.00	19.5	9.40	379.90	0.0	0.00	0.00	66.00	31.82	464.28
17	0.683	7.95	208	0.13	0.00	0.000	0.116	0.00	0.00	22.5	9.95	389.85	0.0	0.00	0.00	68.00	30.06	494.34
18	0.499	7.89	172	0.14	0.00	0.000	0.116	0.00	0.00	13.2	4.26	394.11	0.0	0.00	0.00	74.00	23.90	518.24
19	0.701	7.93	202	0.13	0.01	0.005	0.121	0.01	0.00	22.0	9.98	404.09	0.0	0.00	0.00	72.00	32.66	550.90
20	0.667	7.89	193	0.15	0.00	0.000	0.121	0.00	0.00	21.4	9.24	413.33	0.0	0.00	0.00	70.00	30.22	581.12
21	0.738	7.90	174	0.14	0.00	0.000	0.121	0.00	0.00	16.8	8.02	421.35	0.0	0.00	0.00	62.00	29.61	610.73
22	0.712	7.86	198	0.15	0.00	0.000	0.121	0.00	0.00	22.0	10.14	431.49	0.0	0.00	0.00	67.00	30.87	641.60
23	0.729	7.94	168	0.15	0.01	0.005	0.126	0.00	0.01	18.9	8.92	440.41	0.0	0.00	0.00	67.00	31.61	673.21
24	0.729	7.87	157	0.15	0.01	0.005	0.131	0.00	0.01	21.7	10.24	450.65	0.0	0.00	0.00	66.00	31.14	704.35
25	0.682	7.88	154	0.15	0.01	0.004	0.135	0.00	0.01	17.7	7.81	458.46	0.0	0.00	0.00	64.00	28.25	732.60
26	0.695	7.78	173	0.16	0.01	0.004	0.139	0.00	0.01	22.6	10.17	468.63	0.0	0.00	0.00	64.00	28.79	761.39
27	0.739	7.68	145	0.13	0.00	0.000	0.139	0.00	0.00	18.4	8.80	477.43	0.0	0.00	0.00	47.00	22.48	783.87
28	0.702	7.67	188	0.15	0.00	0.000	0.139	0.00	0.00	25.7	11.68	489.11	0.0	0.00	0.00	57.00	25.90	809.77
29	0.754	7.84	176	0.14	0.00	0.000	0.139	0.00	0.00	13.7	6.69	495.80	0.0	0.00	0.00	57.00	27.81	837.58
30	0.691	7.90	179	0.15	0.00	0.000	0.139	0.00	0.00	23.8	10.64	506.44	0.0	0.00	0.00	52.00	23.25	860.83
31	0.738	7.86	211	0.14	0.01	0.005	0.144	0.00	0.01	16.8	8.02	514.46	0.0	0.00	0.00	55.00	26.27	887.10
32	0.741	7.70	187	0.16	0.00	0.000	0.144	0.00	0.00	27.0	12.95	527.41	0.0	0.00	0.00	56.00	26.85	913.95
33	0.691	7.65	212	0.18	0.00	0.000	0.144	0.00	0.00	50.2	22.45	549.86	0.0	0.00	0.00	52.00	23.25	937.20
34	0.616	8.04	168	0.38	0.00	0.000	0.144	0.00	0.00	176.0	70.16	620.02	0.0	0.00	0.00	94.00	37.47	974.67
35	0.667	7.69	183	0.25	0.00	0.000	0.144	0.00	0.00	83.6	36.09	656.11	0.0	0.00	0.00	57.00	24.60	999.27
36	0.678	7.87	194	0.27	0.02	0.009	0.153	0.02	0.00	97.4	42.74	698.85	0.0	0.00	0.00	64.00	28.08	1027.35

Test Terminated





Mr. Doug Nicholson - **Nova Gold Resources**
MLI Job No. 3063 -

HCT Tailings # 1 . - Humidity Cell Analytical Results, Albion, 21%; Paste Tail, 79% (0.715 Kg ~ 25% Moisture)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCI)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	1.405	8.48	122	0.13	0.00	0.000	0.000	0.00	0.00	19.6	38.51	38.51	0.0	0.00	0.00	14.00	27.51	27.51
1	0.729	7.57	131	0.31	0.07	0.071	0.071	0.00	0.07	120.0	122.35	160.86	1.0	1.02	1.02	17.00	17.33	44.84
2	0.637	7.53	117	0.31	0.12	0.107	0.178	0.00	0.12	178.0	158.58	319.44	3.0	2.67	3.69	11.00	9.80	54.64
3	0.762	7.30	104	0.76	0.14	0.149	0.327	0.00	0.14	434.0	462.53	781.97	0.0	0.00	3.69	27.00	28.77	83.41
4	0.732	7.30	121	0.27	0.17	0.174	0.501	0.00	0.17	170.0	174.04	956.01	0.0	0.00	3.69	15.00	15.36	98.77
5	0.752	7.35	123	0.32	0.16	0.168	0.669	0.00	0.16	180.0	189.31	1145.32	0.0	0.00	3.69	19.00	19.98	118.75
6	0.724	7.27	120	0.44	0.23	0.233	0.902	0.00	0.23	244.0	247.07	1392.39	0.0	0.00	3.69	27.00	27.34	146.09
7	0.645	7.51	128	0.44	0.58	0.523	1.425	0.00	0.58	221.0	199.27	1591.66	0.0	0.00	3.69	21.00	18.94	165.03
8	0.734	7.47	125	0.36	0.39	0.400	1.825	0.01	0.38	194.0	199.02	1790.68	0.0	0.00	3.69	28.00	28.72	193.75
9	0.719	7.38	124	0.27	0.27	0.271	2.096	0.04	0.23	149.0	149.79	1940.47	0.0	0.00	3.69	31.00	31.16	224.91
10	0.665	7.59	143	0.30	0.35	0.326	2.422	0.01	0.34	197.0	183.22	2123.69	0.0	0.00	3.69	21.00	19.53	244.44
11	0.642	7.37	134	0.30	0.40	0.359	2.781	0.00	0.40	187.0	167.91	2291.60	0.0	0.00	3.69	40.00	35.92	280.36
12	0.619	7.81	135	0.30	0.37	0.320	3.101	0.05	0.32	185.5	160.49	2452.09	0.0	0.00	3.69	22.00	19.03	299.39
13	0.656	7.52	145	0.29	0.30	0.275	3.376	0.04	0.26	183.0	167.87	2619.96	0.0	0.00	3.69	23.00	21.10	320.49
14	0.669	6.58	150	0.25	0.23	0.215	3.591	0.01	0.22	142.5	133.33	2753.29	0.0	0.00	3.69	29.00	27.13	347.62
15	0.788	6.08	166	0.20	0.11	0.121	3.712	0.00	0.11	81.0	89.27	2842.56	0.0	0.00	3.69	24.00	26.45	374.07
16	0.510	7.30	160	0.25	0.36	0.257	3.969	0.03	0.33	115.0	82.03	2924.59	0.0	0.00	3.69	23.00	16.41	390.48
17	0.653	7.16	143	0.25	0.34	0.311	4.280	0.01	0.33	147.0	134.25	3058.84	0.0	0.00	3.69	32.00	29.23	419.71
18	0.679	7.58	141	0.20	0.20	0.190	4.470	0.03	0.17	93.5	88.79	3147.63	0.0	0.00	3.69	36.00	34.19	453.90
19	0.657	7.80	146	0.19	0.37	0.340	4.810	0.01	0.36	84.5	77.65	3225.28	0.0	0.00	3.69	36.00	33.08	486.98
20	0.721	7.20	128	0.17	0.12	0.121	4.931	0.02	0.10	49.5	49.92	3275.20	0.0	0.00	3.69	37.00	37.31	524.29
21	0.732	7.08	136	0.16	0.11	0.113	5.044	0.01	0.10	55.0	56.34	3331.54	0.0	0.00	3.69	42.00	43.02	567.31
22	0.733	7.43	141	0.16	0.09	0.092	5.136	0.01	0.08	47.5	48.66	3380.20	0.0	0.00	3.69	43.00	44.05	611.36
23	0.743	7.77	172	0.15	0.10	0.104	5.240	0.02	0.08	43.5	45.20	3425.40	0.0	0.00	3.69	35.00	36.37	647.73
24	0.734	7.32	158	0.15	0.10	0.103	5.343	0.01	0.09	42.5	43.64	3469.04	0.0	0.00	3.69	23.00	23.61	671.34
25	0.734	7.13	184	0.17	0.35	0.359	5.702	0.02	0.33	55.5	57.01	3526.05	0.0	0.00	3.69	43.00	44.17	715.51
26	0.747	7.08	188	0.16	0.17	0.178	5.880	0.02	0.15	58.5	61.13	3587.18	0.0	0.00	3.69	39.00	40.76	756.27
27	0.750	7.19	162	0.15	0.12	0.126	6.006	0.03	0.09	37.5	39.35	3626.53	0.0	0.00	3.69	44.00	46.17	802.44
28	0.734	7.49	169	0.17	0.11	0.113	6.119	0.01	0.10	60.0	61.56	3688.09	0.0	0.00	3.69	42.00	43.09	845.53
29	0.727	7.37	134	0.15	0.11	0.112	6.231	0.01	0.10	40.5	41.18	3729.27	0.0	0.00	3.69	44.00	44.74	890.27
30	0.751	7.27	171	0.16	0.12	0.126	6.357	0.01	0.11	44.5	46.73	3776.00	0.0	0.00	3.69	44.00	46.21	936.48
31	0.740	7.21	177	0.15	0.12	0.124	6.481	0.05	0.07	38.0	39.31	3815.31	0.0	0.00	3.69	42.00	43.45	979.93
32	0.734	7.25	199	0.16	0.08	0.082	6.563	0.00	0.08	45.5	46.68	3861.99	0.0	0.00	3.69	48.00	49.25	1029.18
33	0.739	7.01	181	0.15	0.18	0.186	6.749	0.02	0.16	50.0	51.65	3913.64	0.0	0.00	3.69	43.00	44.42	1073.60
34	0.728	7.22	139	0.15	0.15	0.153	6.902	0.01	0.14	40.0	40.73	3954.37	0.0	0.00	3.69	44.00	44.80	1118.40
35	0.751	7.29	171	0.14	0.22	0.231	7.133	0.02	0.20	30.5	32.03	3986.40	0.0	0.00	3.69	28.00	29.40	1147.80
36	0.717	7.44	162	0.15	0.22	0.221	7.354	0.03	0.19	51.0	51.14	4037.54	0.0	0.00	3.69	31.00	31.08	1178.88
37	0.740	6.85	153	0.14	0.13	0.135	7.489	0.01	0.12	34.0	35.21	4072.75	0.0	0.00	3.69	34.00	35.21	1214.09
38	0.671	7.02	164	0.16	0.09	0.084	7.573	0.00	0.09	64.0	60.02	4132.77	0.0	0.00	3.69	32.00	30.01	1244.10
39	0.693	7.12	183	0.16	0.15	0.145	7.718	0.01	0.14	60.0	58.13	4190.90	0.0	0.00	3.69	28.00	27.13	1271.23
40	0.687	7.08	152	0.15	0.06	0.058	7.776	0.02	0.04	60.5	58.10	4249.00	0.0	0.00	3.69	14.00	13.44	1284.67
41	0.698	6.74	173	0.17	0.20	0.195	7.971	0.02	0.18	63.0	61.50	4310.50	0.0	0.00	3.69	38.00	37.10	1321.77

Figure 1a.- Weekly Humidity Cell Analytical Results

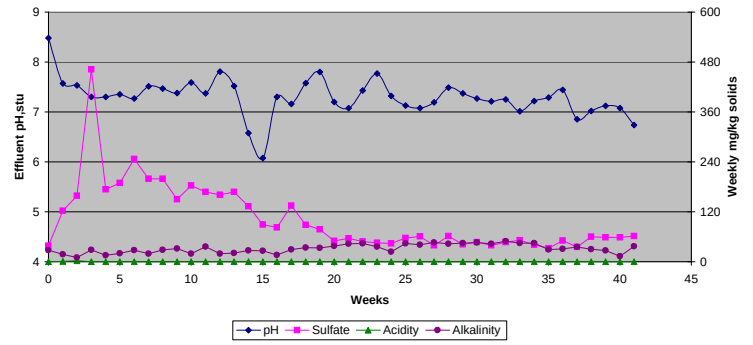
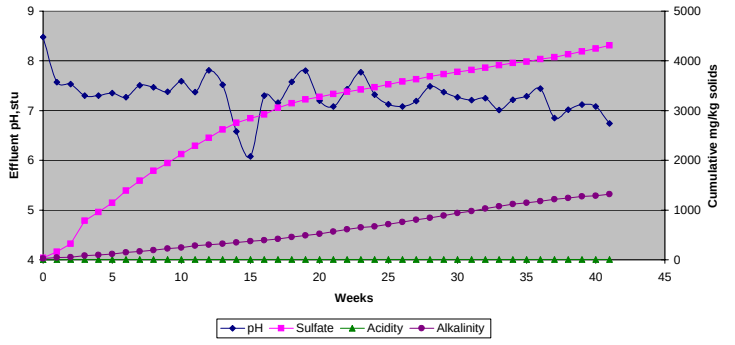


Figure 1b.- Cumulative Humidity Cell Analytical Results



Mr. Doug Nicholson - **Nova Gold Resources**
MLI Job No. 3063 -

HCT Tailings #2 - Humidity Cell Analytical Results, Tension Vein, 13.6%; Paste Tail, 86.4% (1.2 Kg ~ 25% Moisture)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	1.482	7.51	101	0.81	0.02	0.025	0.025	0.00	0.02	488.0	602.68	602.68	0.0	0.00	0.00	35.00	43.23	43.23
1	0.713	7.72	117	0.87	0.05	0.030	0.055	0.00	0.05	624.0	370.76	973.44	0.0	0.00	0.00	46.00	27.33	70.56
2	0.636	7.87	126	0.94	0.15	0.080	0.135	0.00	0.15	684.0	362.52	1335.96	0.0	0.00	0.00	34.00	18.02	88.58
3	0.775	7.77	131	0.62	0.06	0.039	0.174	0.00	0.06	355.0	229.27	1565.23	0.0	0.00	0.00	56.00	36.17	124.75
4	0.726	7.70	135	0.42	0.05	0.030	0.204	0.01	0.04	240.0	145.20	1710.43	0.0	0.00	0.00	36.00	21.78	146.53
5	0.703	7.92	147	0.44	0.04	0.023	0.227	0.00	0.04	252.0	147.63	1858.06	0.0	0.00	0.00	40.00	23.43	169.96
6	0.695	7.74	146	0.38	0.03	0.017	0.244	0.00	0.03	155.0	89.77	1947.83	0.0	0.00	0.00	42.00	24.33	194.29
7	0.664	7.95	150	0.41	0.10	0.055	0.299	0.01	0.09	212.0	117.36	2065.19	0.0	0.00	0.00	39.00	21.59	215.88
8	0.690	7.71	150	0.33	0.04	0.023	0.322	0.01	0.03	168.0	96.64	2161.83	0.0	0.00	0.00	41.00	23.59	239.47
9	0.696	7.56	149	0.26	0.05	0.029	0.351	0.04	0.01	137.0	79.51	2241.34	0.0	0.00	0.00	44.00	25.53	265.00
10	0.665	7.71	157	0.30	0.05	0.028	0.379	0.00	0.05	181.0	100.30	2341.64	0.0	0.00	0.00	36.00	19.95	284.95
11	0.669	7.36	149	0.30	0.02	0.011	0.390	0.00	0.02	191.0	106.48	2448.12	0.0	0.00	0.00	40.00	22.30	307.25
12	0.350	7.81	260	0.10	0.08	0.023	0.413	0.04	0.04	324.0	94.50	2542.62	0.0	0.00	0.00	37.00	10.79	318.04
13	0.697	7.59	157	0.22	0.07	0.041	0.454	0.01	0.06	135.0	78.37	2620.99	0.0	0.00	0.00	32.00	18.58	336.62
14	0.687	7.63	162	0.33	0.05	0.029	0.483	0.00	0.05	186.0	106.49	2727.48	0.0	0.00	0.00	54.00	30.92	367.54
15	0.704	7.62	173	0.26	0.07	0.041	0.524	0.01	0.06	103.0	60.43	2787.91	0.0	0.00	0.00	24.00	14.08	381.62
16	0.505	7.78	147	0.33	0.12	0.051	0.575	0.04	0.08	184.0	77.43	2865.34	0.0	0.00	0.00	36.00	15.15	396.77
17	0.648	7.62	151	0.27	0.19	0.103	0.678	0.06	0.13	158.0	85.32	2950.66	0.0	0.00	0.00	46.00	24.84	421.61
18	0.678	7.64	149	0.24	0.11	0.062	0.740	0.02	0.09	127.0	71.76	3022.42	0.0	0.00	0.00	49.00	27.69	449.30
19	0.667	7.71	161	0.27	0.17	0.094	0.834	0.01	0.16	133.0	73.87	3096.29	0.0	0.00	0.00	45.00	24.99	474.29
20	0.707	7.16	156	0.24	0.01	0.006	0.840	0.00	0.01	72.0	42.41	3138.70	0.0	0.00	0.00	75.00	44.18	518.47
21	0.724	7.05	136	0.16	0.03	0.018	0.858	0.01	0.02	37.0	22.31	3161.01	0.0	0.00	0.00	74.00	44.62	563.09
22	0.731	7.41	151	0.19	0.01	0.006	0.864	0.00	0.01	9.0	5.48	3166.49	0.0	0.00	0.00	70.00	42.64	605.73
23	0.749	7.89	183	0.17	0.01	0.006	0.870	0.00	0.01	11.0	6.87	3173.36	0.0	0.00	0.00	58.00	36.20	641.93
24	0.737	7.48	171	0.17	0.01	0.006	0.876	0.00	0.01	11.0	6.75	3180.11	0.0	0.00	0.00	90.00	55.26	697.19
25	0.757	7.36	190	0.16	0.09	0.057	0.933	0.06	0.03	3.0	1.89	3182.00	0.0	0.00	0.00	52.00	32.78	729.97
26	0.760	7.39	195	0.14	0.01	0.006	0.939	0.00	0.01	2.0	1.27	3183.27	0.0	0.00	0.00	53.00	33.57	763.54
27	0.734	7.26	170	0.16	0.23	0.141	1.080	0.01	0.22	11.0	6.73	3190.00	0.0	0.00	0.00	58.00	35.49	799.03
28	0.736	7.76	172	0.15	0.05	0.031	1.111	0.01	0.04	10.0	6.13	3196.13	0.0	0.00	0.00	61.00	37.40	836.43
29	0.754	7.56	162	0.13	0.05	0.031	1.142	0.01	0.04	7.0	4.40	3200.53	0.0	0.00	0.00	52.00	32.69	869.12
30	0.754	7.44	185	0.16	0.16	0.101	1.243	0.00	0.16	16.0	10.05	3210.58	0.0	0.00	0.00	59.00	37.08	906.20
31	0.717	7.24	191	0.15	0.10	0.060	1.303	0.05	0.05	13.0	7.77	3218.35	0.0	0.00	0.00	52.00	31.07	937.27
32	0.767	7.43	207	0.15	0.04	0.026	1.329	0.00	0.04	6.0	3.83	3222.18	0.0	0.00	0.00	55.00	35.15	972.42
33	0.734	7.15	193	0.14	0.07	0.043	1.372	0.00	0.07	6.0	3.67	3225.85	0.0	0.00	0.00	59.00	36.08	1008.50
34	0.716	7.44	182	0.15	0.07	0.042	1.414	0.00	0.07	7.0	4.17	3230.02	0.0	0.00	0.00	59.00	35.19	1043.69
35	0.751	7.47	186	0.14	0.07	0.044	1.458	0.00	0.07	5.0	3.13	3233.15	0.0	0.00	0.00	34.00	21.29	1064.98
36	0.751	7.25	171	0.13	0.07	0.044	1.502	0.02	0.05	4.0	2.50	3235.65	0.0	0.00	0.00	29.00	18.15	1083.13
37	0.740	7.39	177	0.14	0.01	0.006	1.508	0.00	0.01	4.0	2.47	3238.12	0.0	0.00	0.00	34.00	20.96	1104.09
38	0.726	7.26	180	0.14	0.04	0.024	1.532	0.00	0.04	4.0	2.42	3240.54	0.0	0.00	0.00	24.00	14.52	1118.61
39	0.746	7.25	192	0.13	0.05	0.031	1.563	0.00	0.05	13.0	8.08	3248.62	0.0	0.00	0.00	44.00	27.34	1145.95
40	0.744	7.28	201	0.15	0.06	0.037	1.600	0.02	0.04	20.0	12.40	3261.02	0.0	0.00	0.00	30.00	18.59	1164.54
41	0.750	6.41	206	0.15	0.08	0.050	1.650	0.02	0.06	18.0	11.25	3272.27	0.0	0.00	0.00	52.00	32.50	1197.04

Figure 2a.- Weekly Humidity Cell Analytical Results

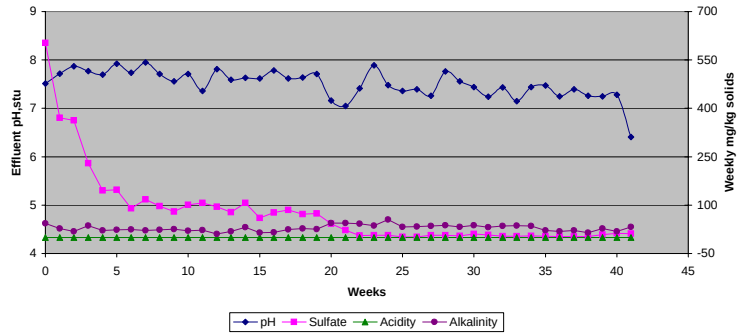
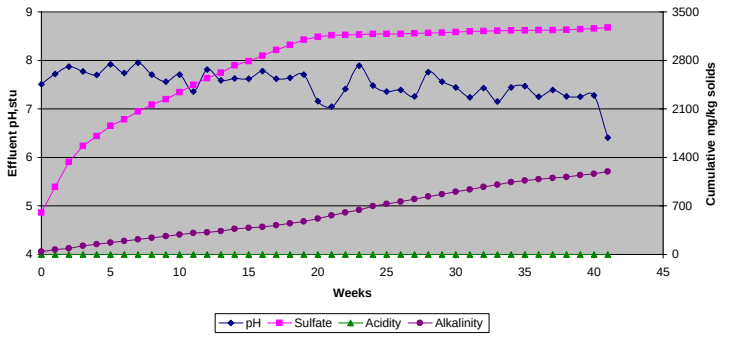


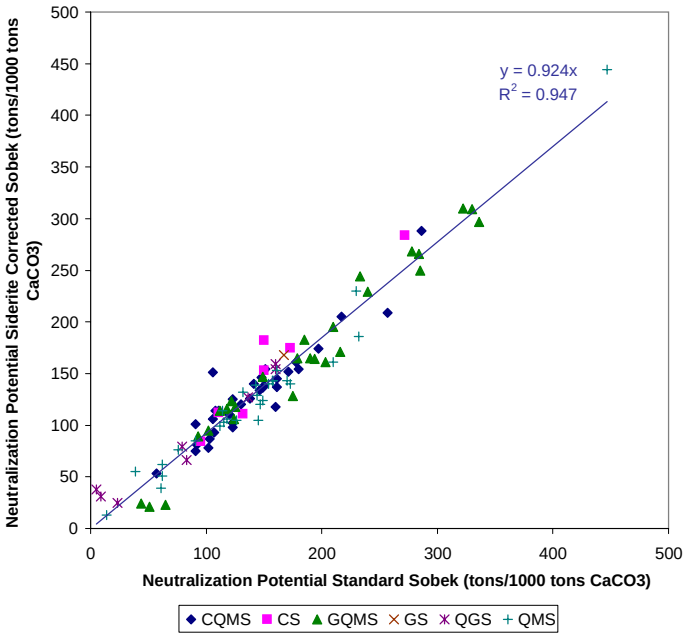
Figure 2b.- Cumulative Humidity Cell Analytical Results

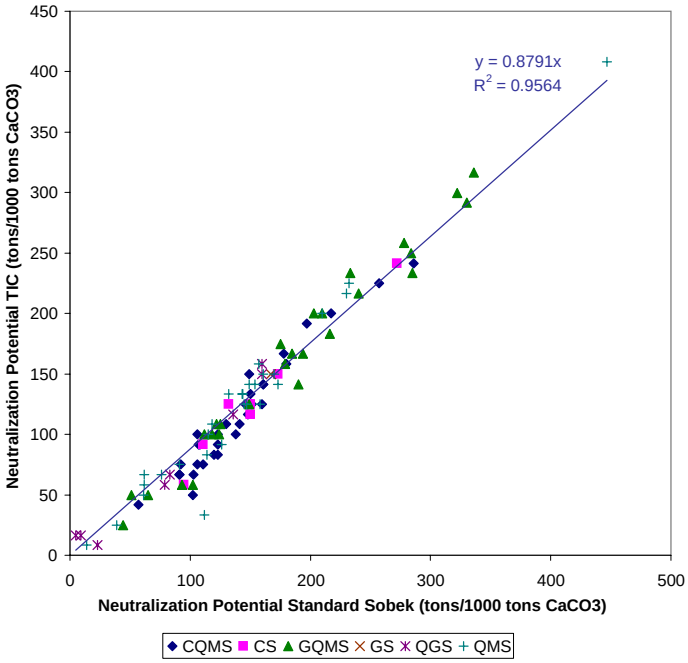


ATTACHMENT 3

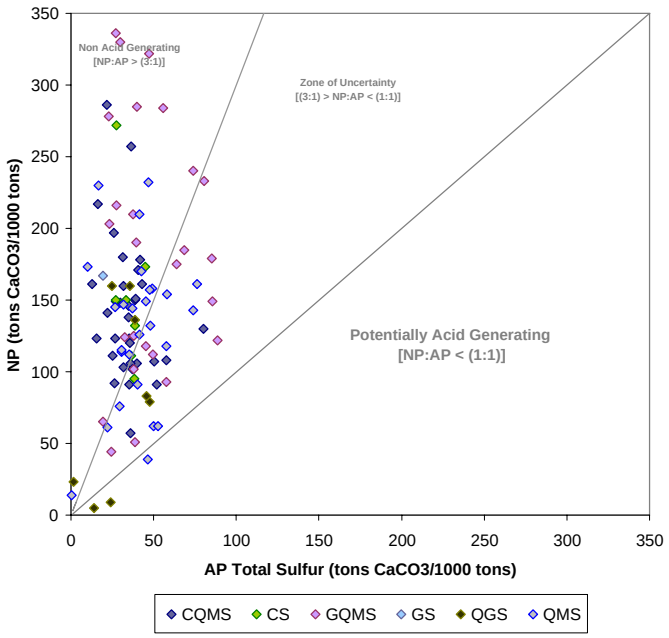
Confirmatory ABA Results

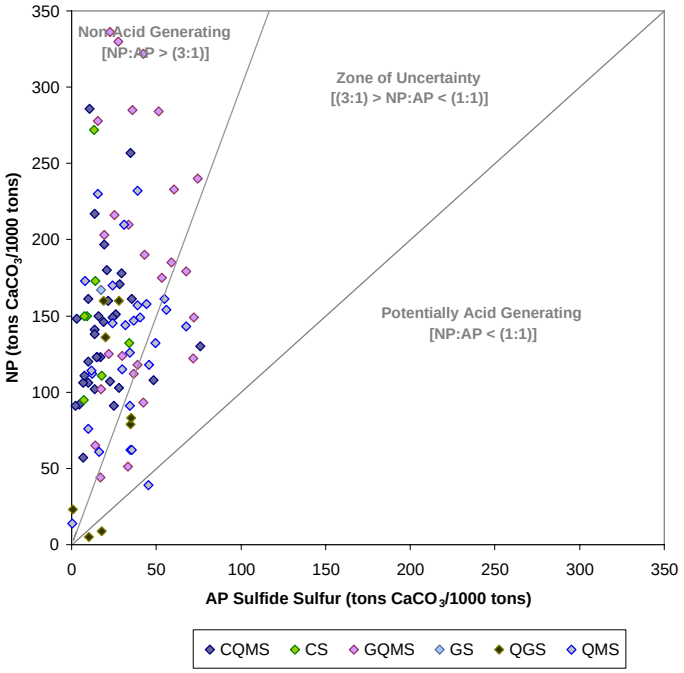
Confirmatory ABA - Corellation of Analytical Methods



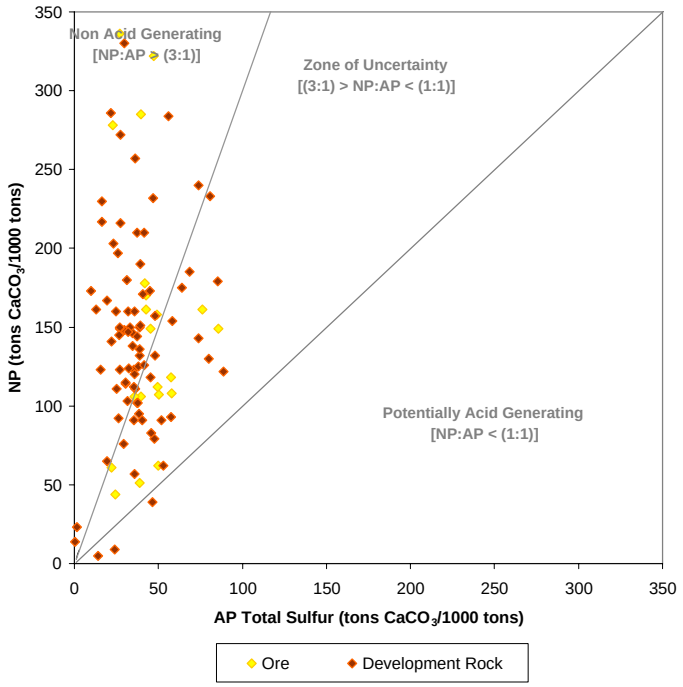


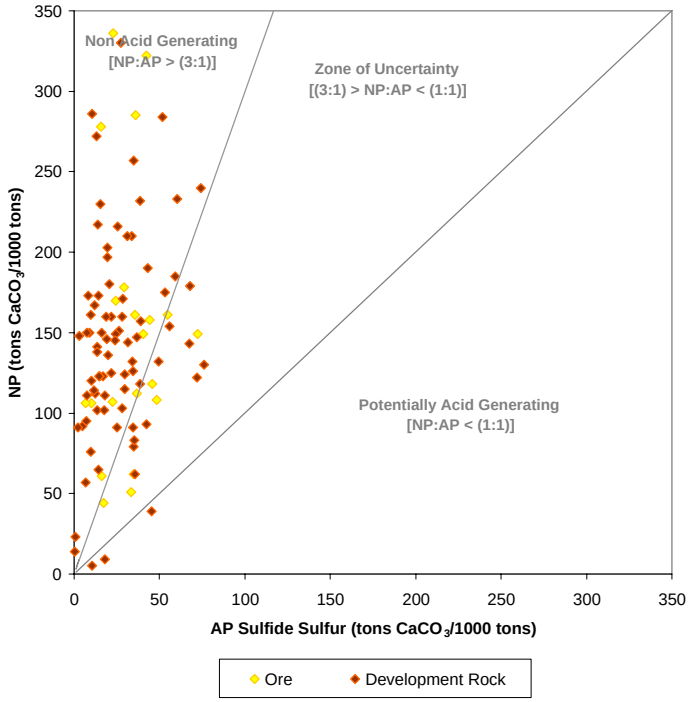
Confirmatory ABA - Scatter Plots by Lithology (Standard Sobek Method)



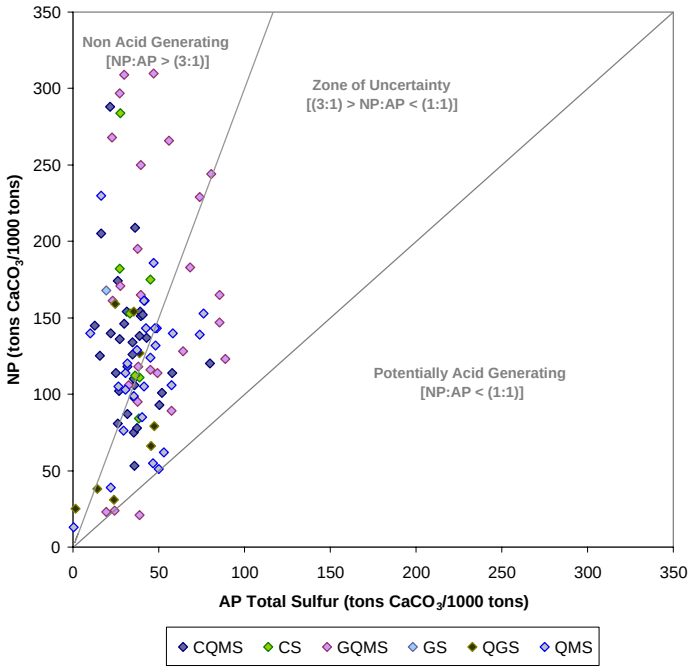


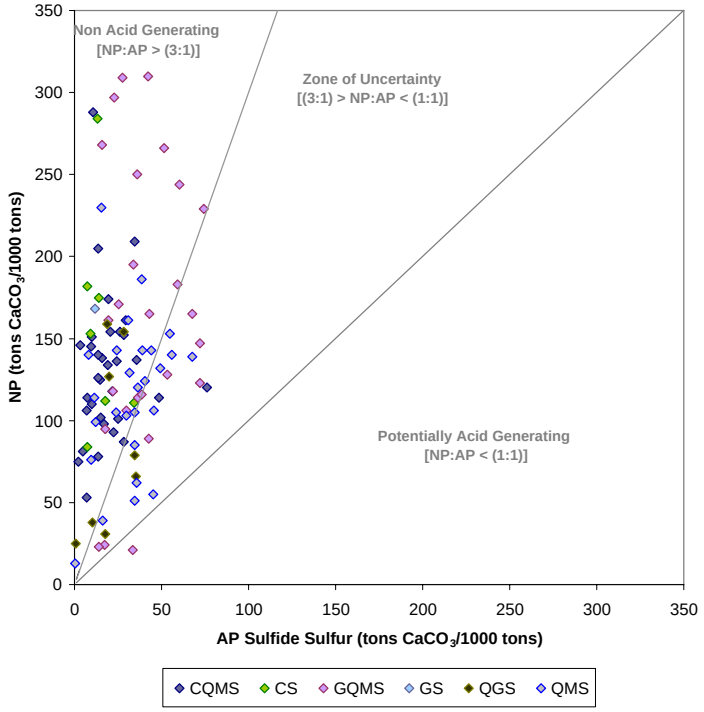
Confirmatory ABA - Scatter Plots by Ore and Development Rock (Standard Sobeck Method)



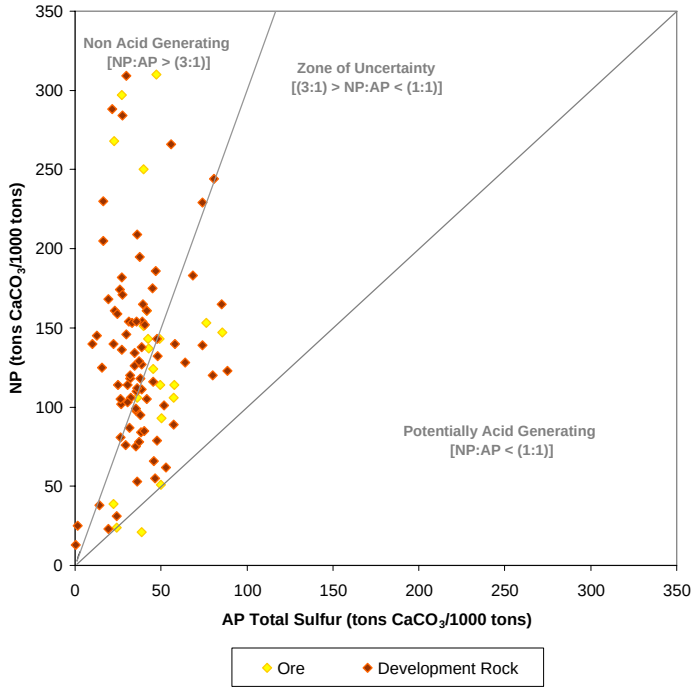


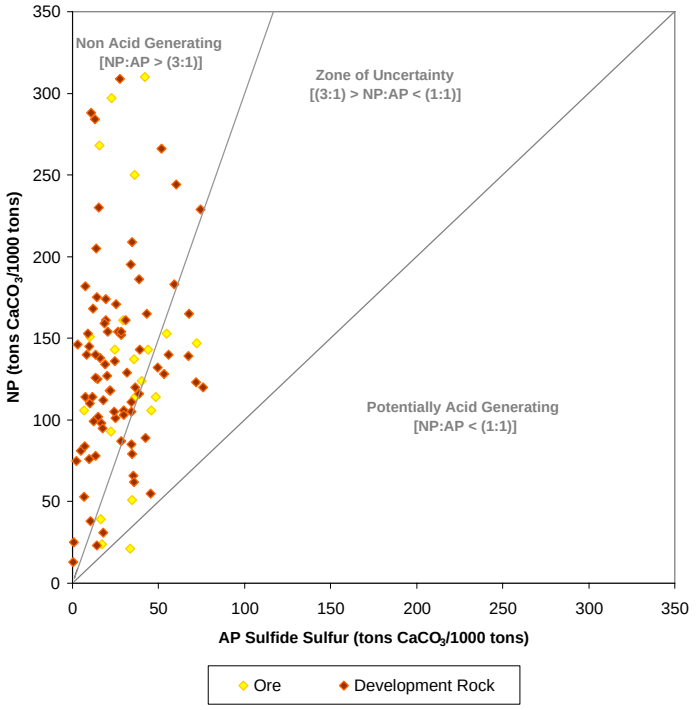
Confirmatory ABA - Scatter Plots by Lithology (Siderite-corrected Sobek)



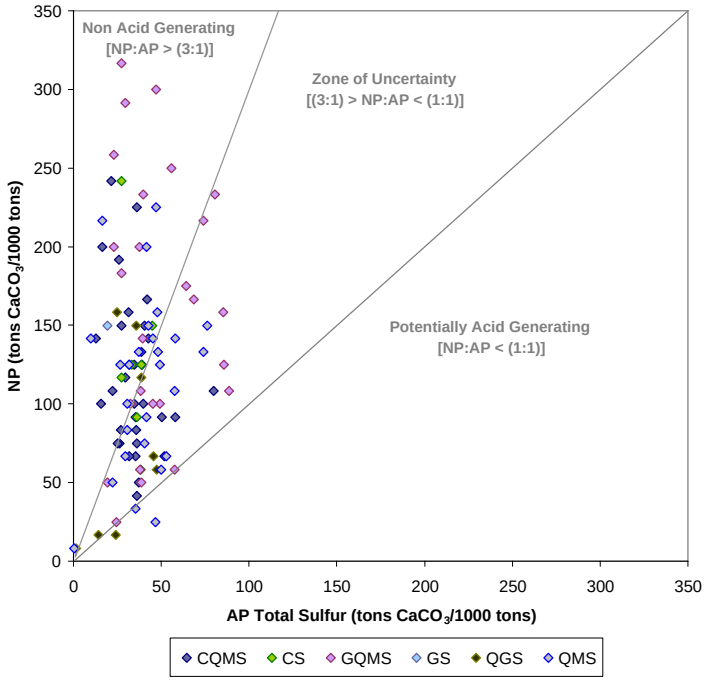


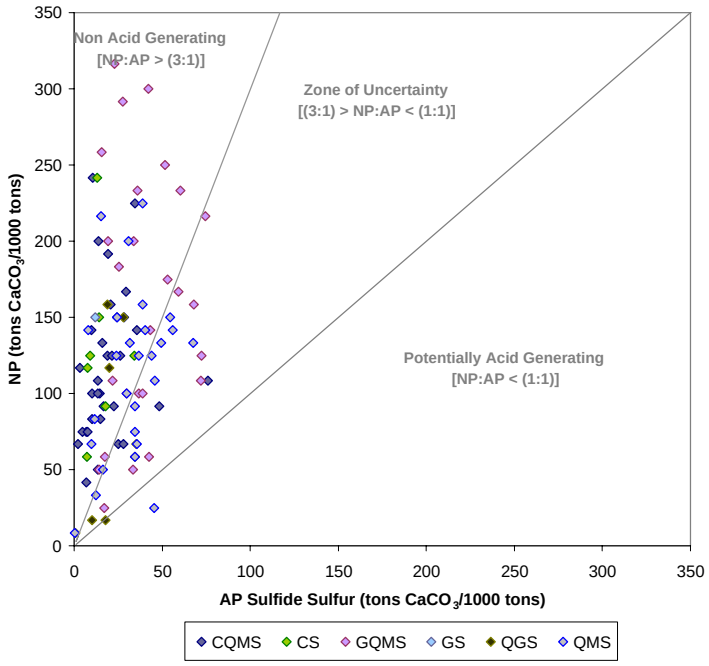
Confirmatory ABA - Scatter Plots by Ore and Development Rock (Siderite-corrected Sobek)



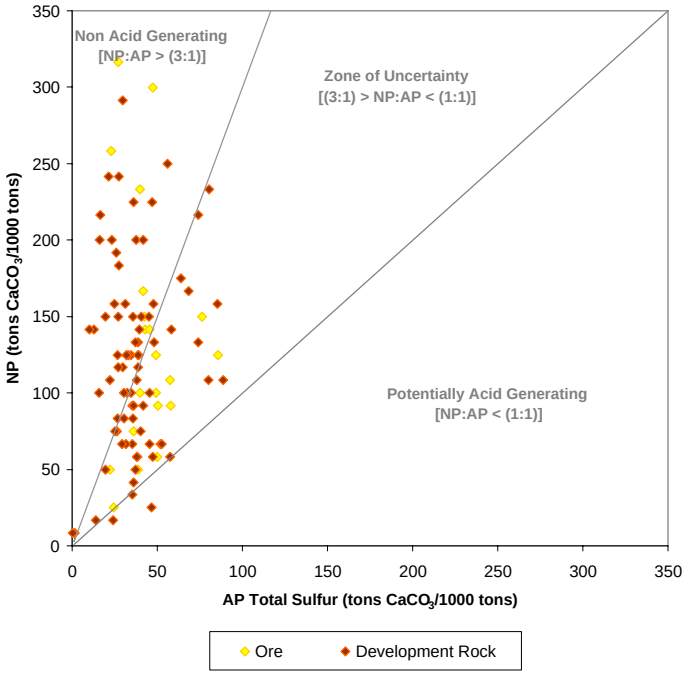


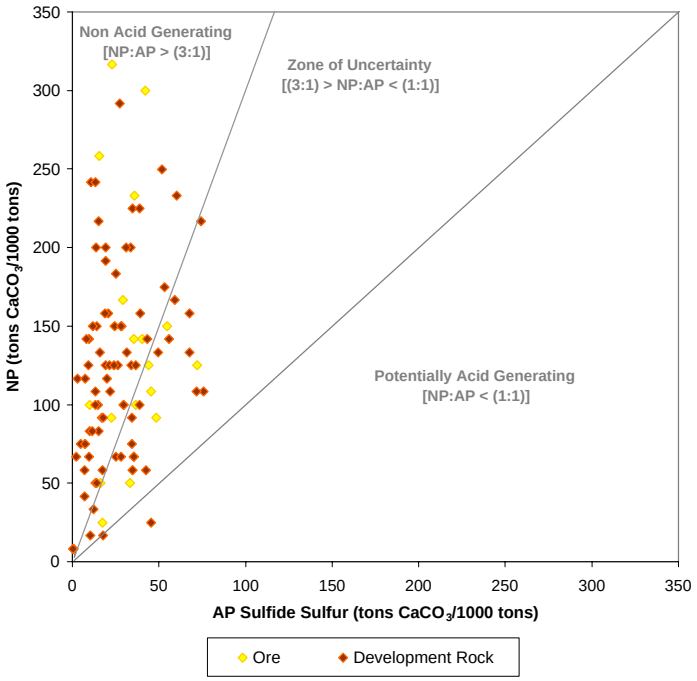
Confirmatory ABA - Scatter Plots by Lithology (Inoganic Carbon - Carbonate)



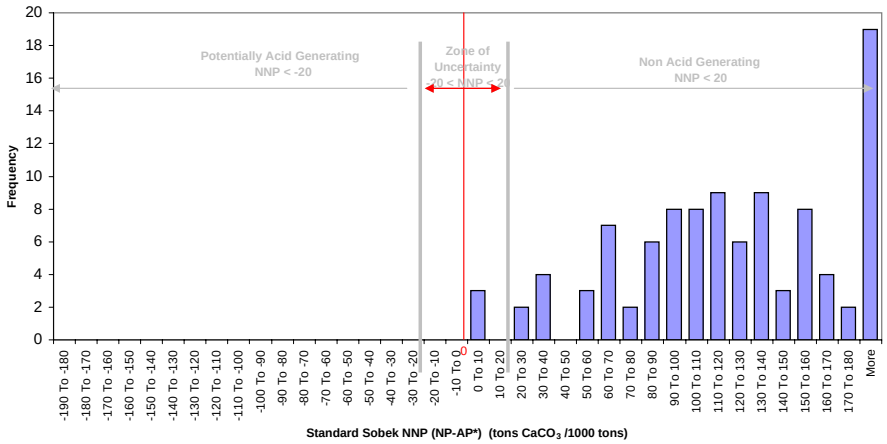


Confirmatory ABA - Scatter Plots by Ore and Development Rock (Inorganic Carbon - Carbonate)

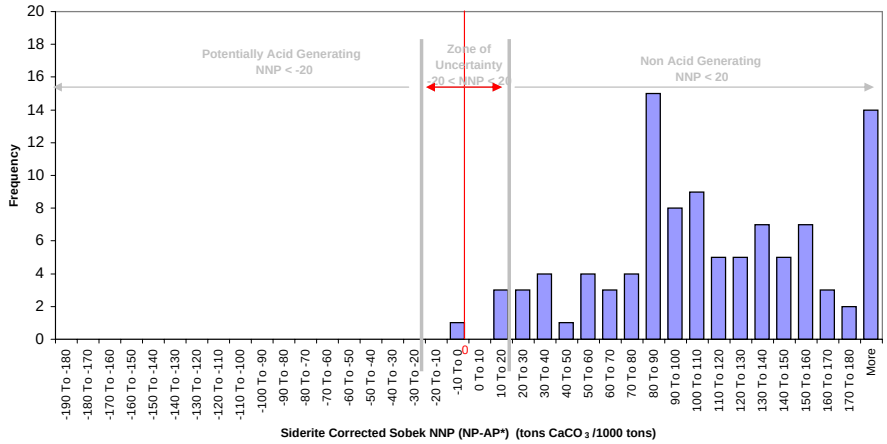




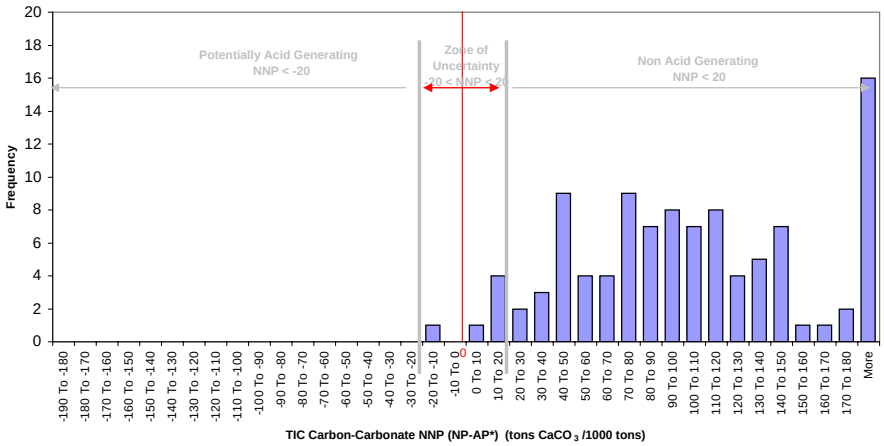
Confirmatory ABA - Net Neutralization Potential Histograms



* AP calculated using sulfide sulfur



* AP calculated using sulfide sulfur

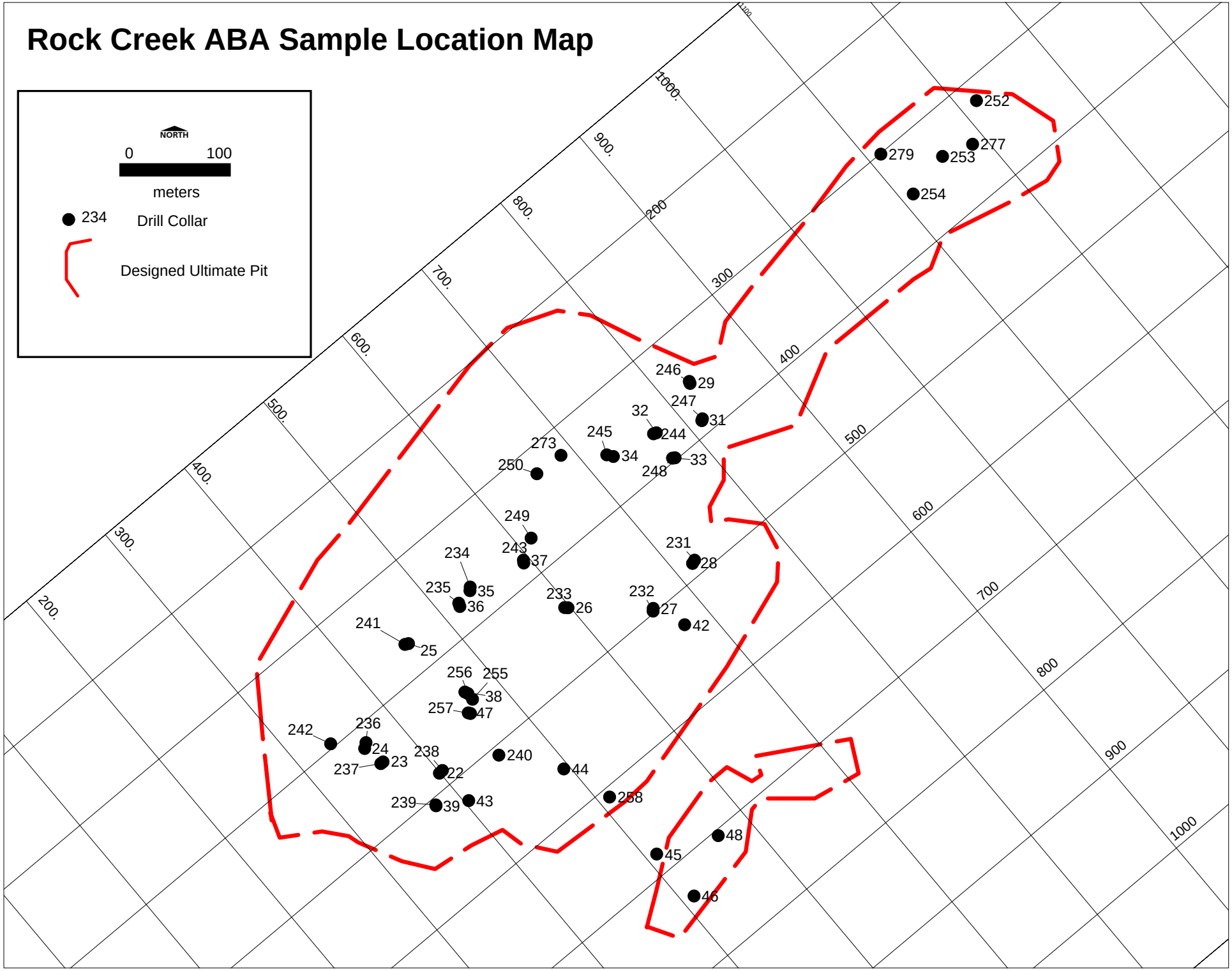


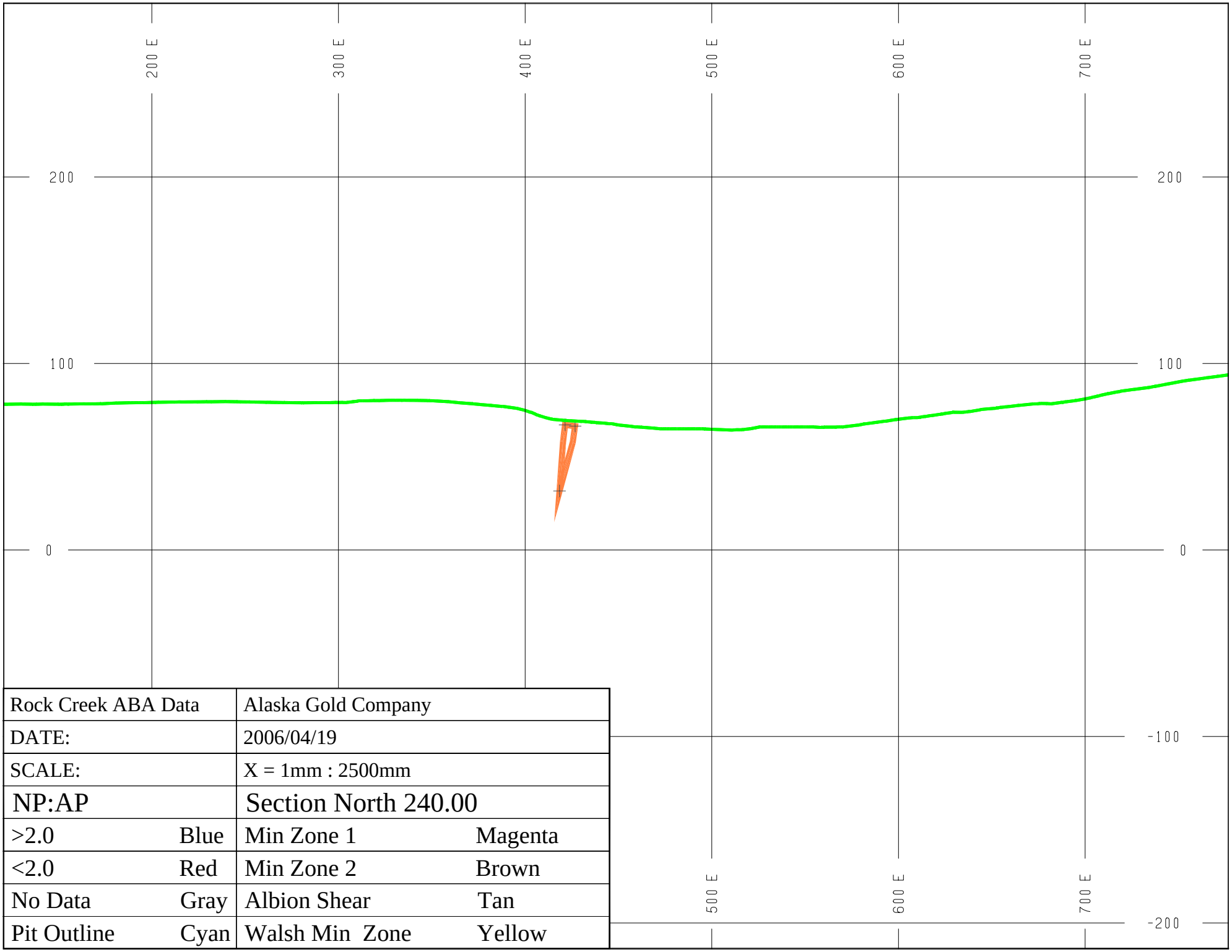
* AP calculated using sulfide sulfur

ATTACHMENT 4

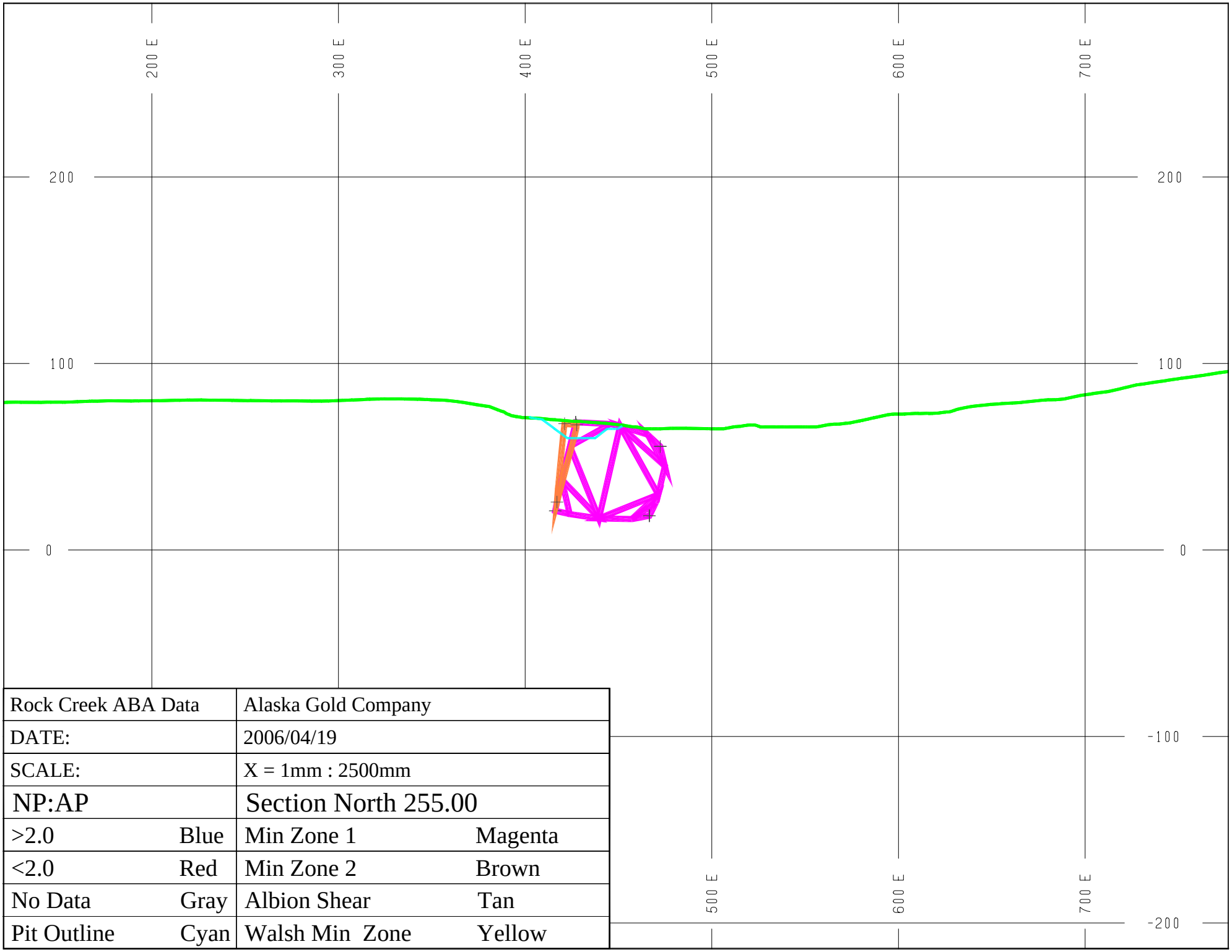
Rock Creek ABA Cross-sections

Rock Creek ABA Sample Location Map

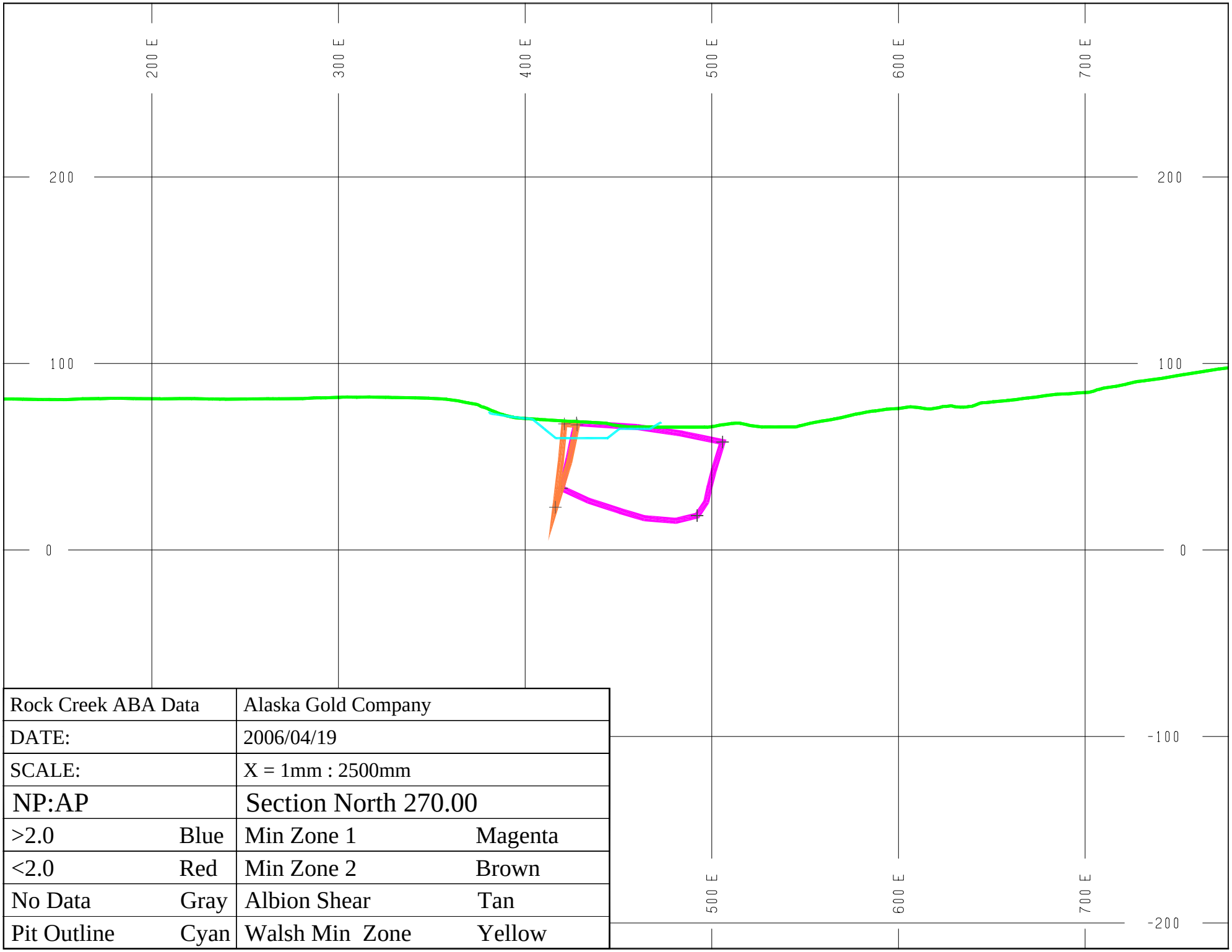




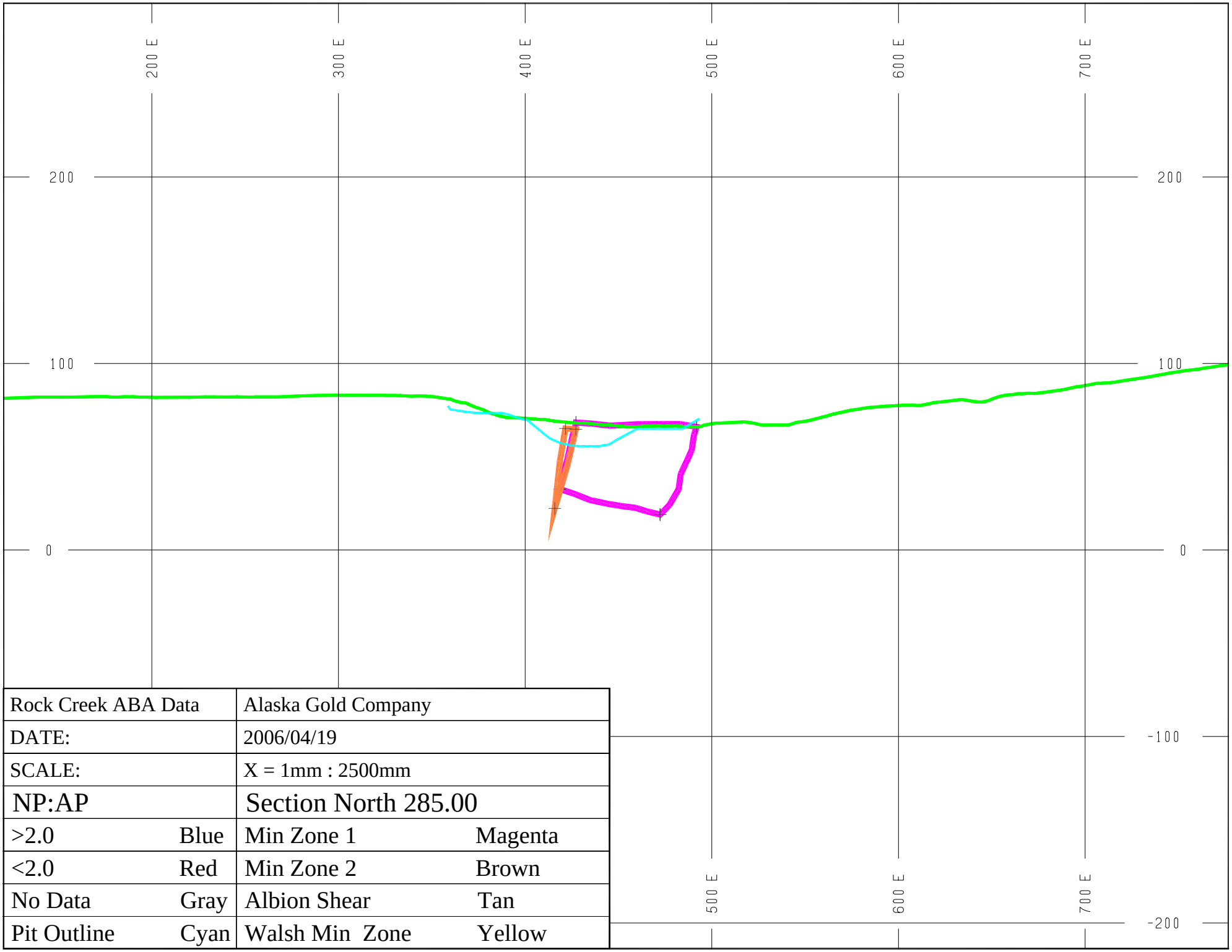
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 240.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



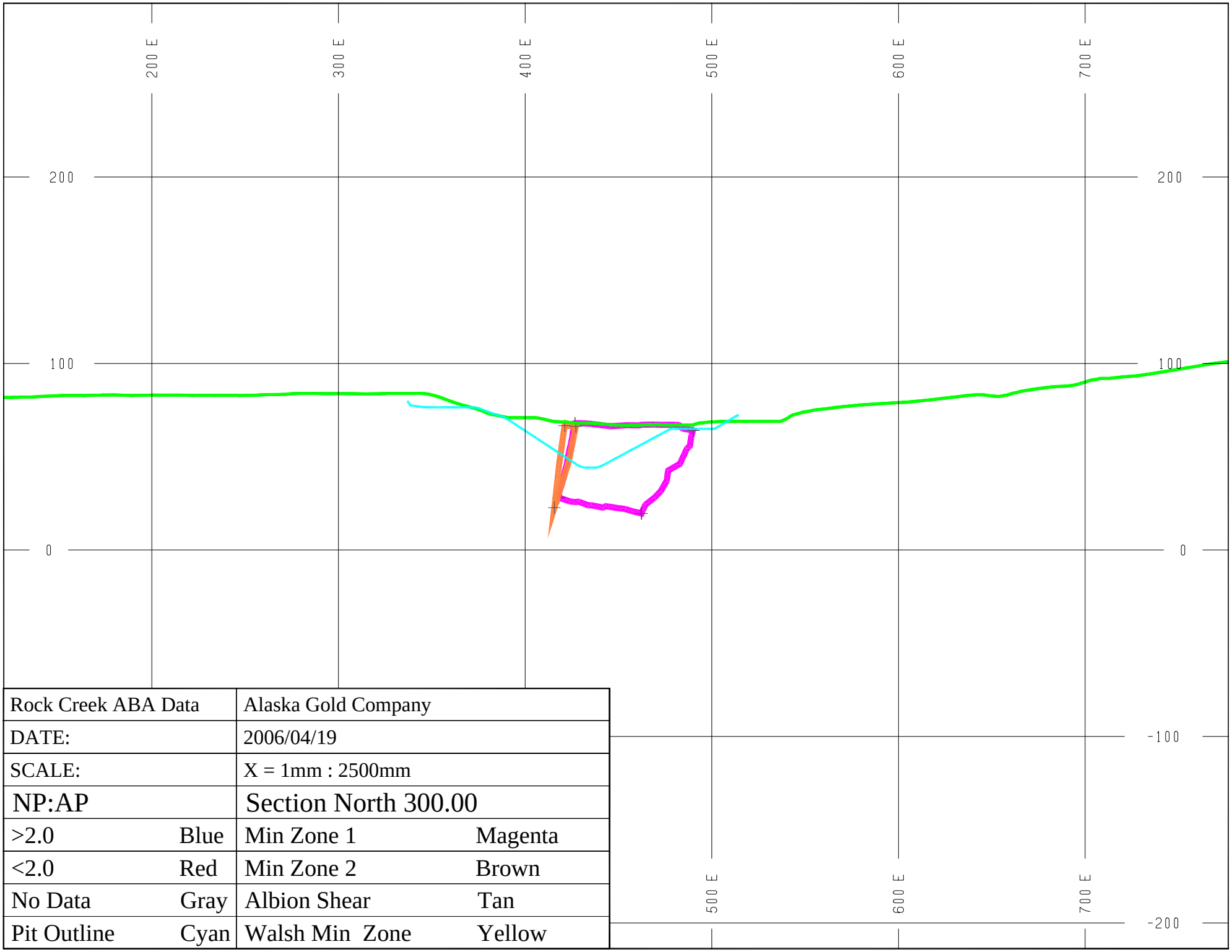
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 255.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



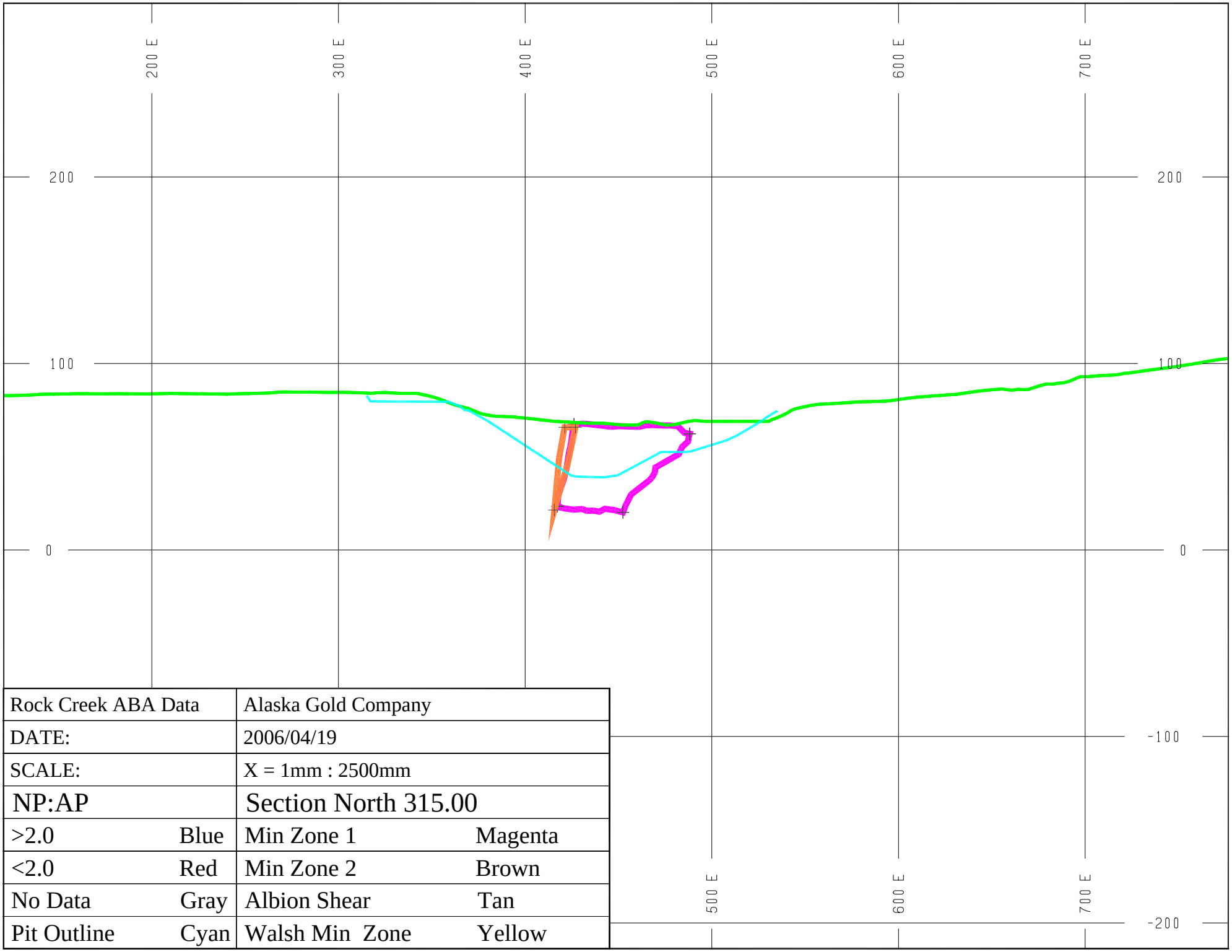
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 270.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



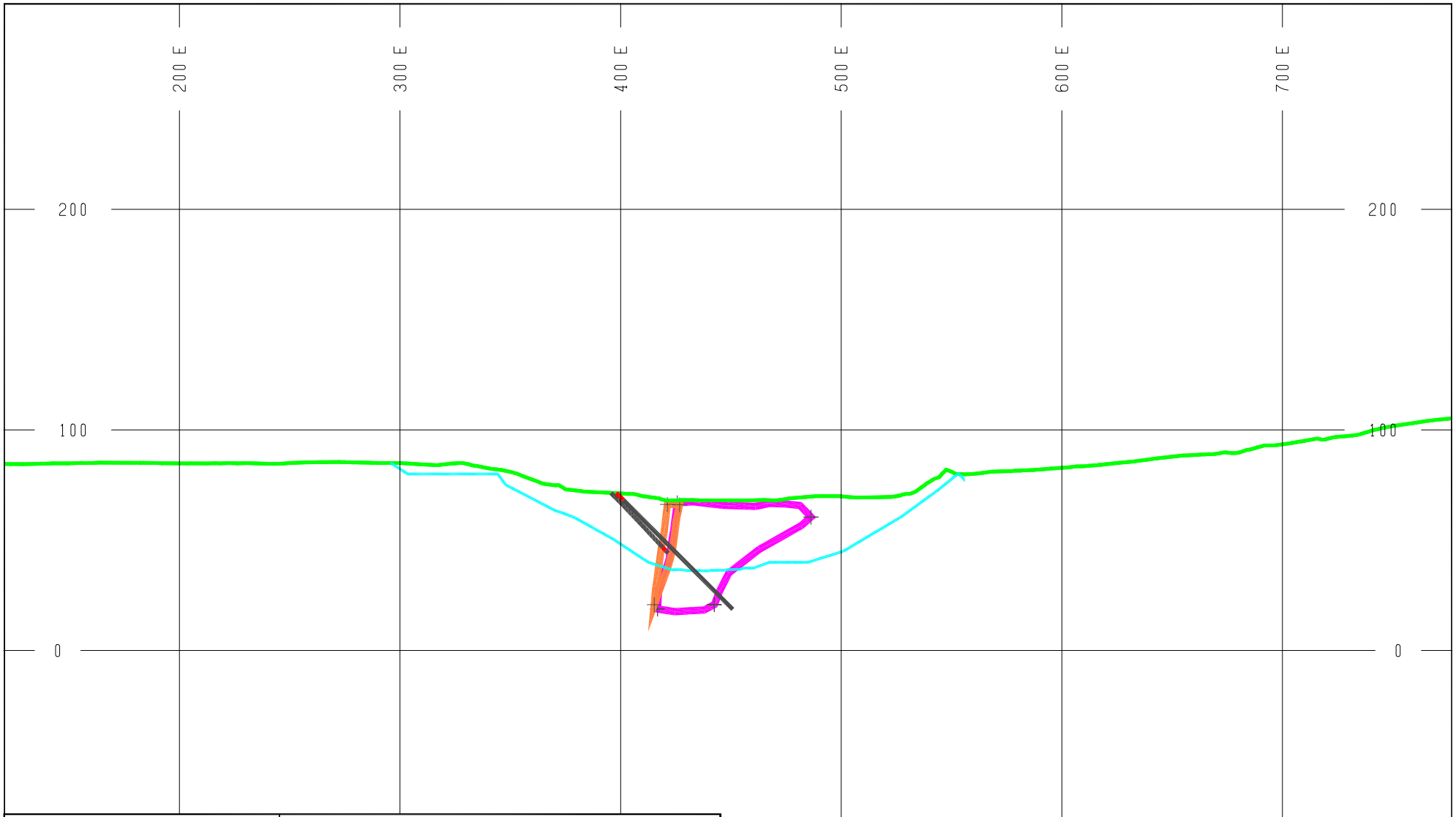
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 285.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



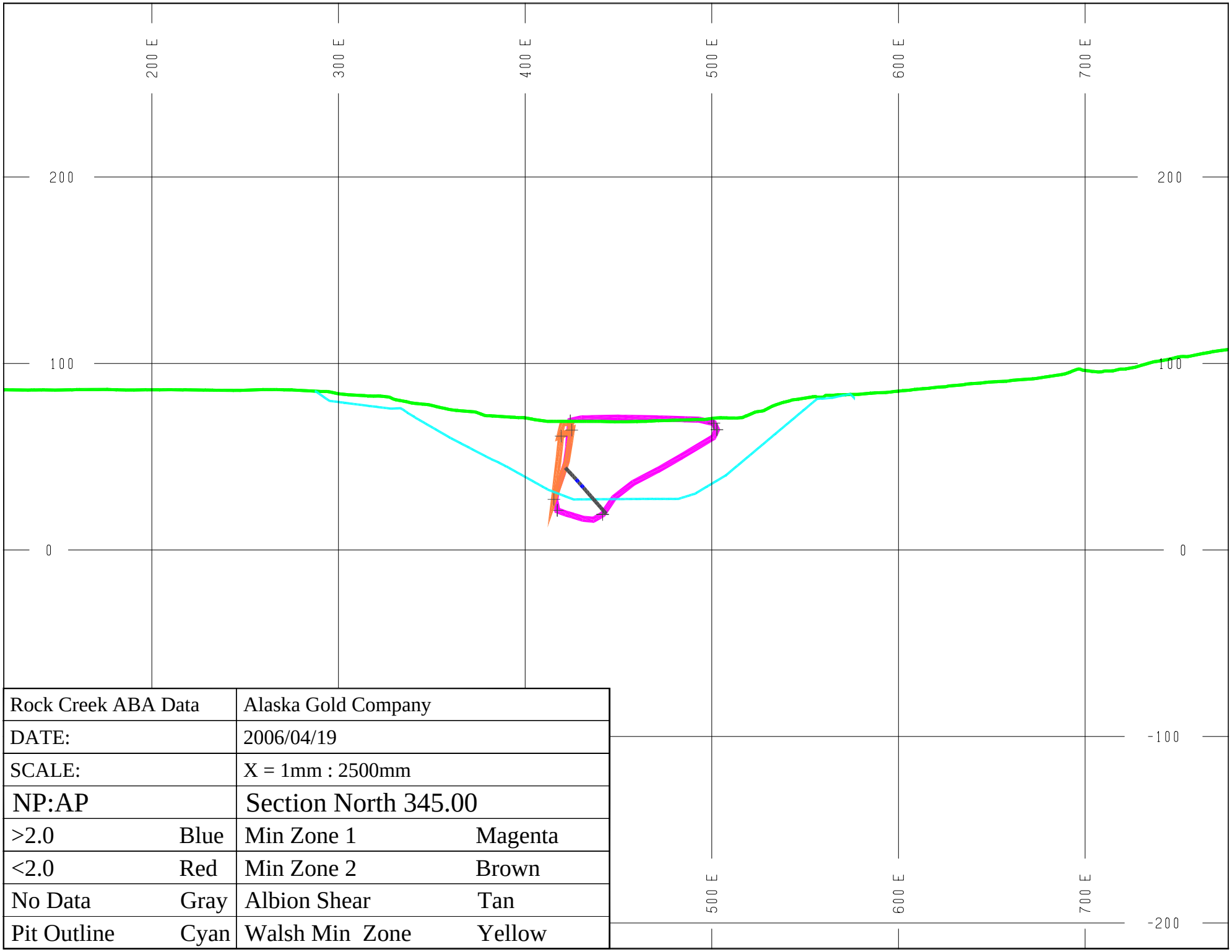
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 300.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



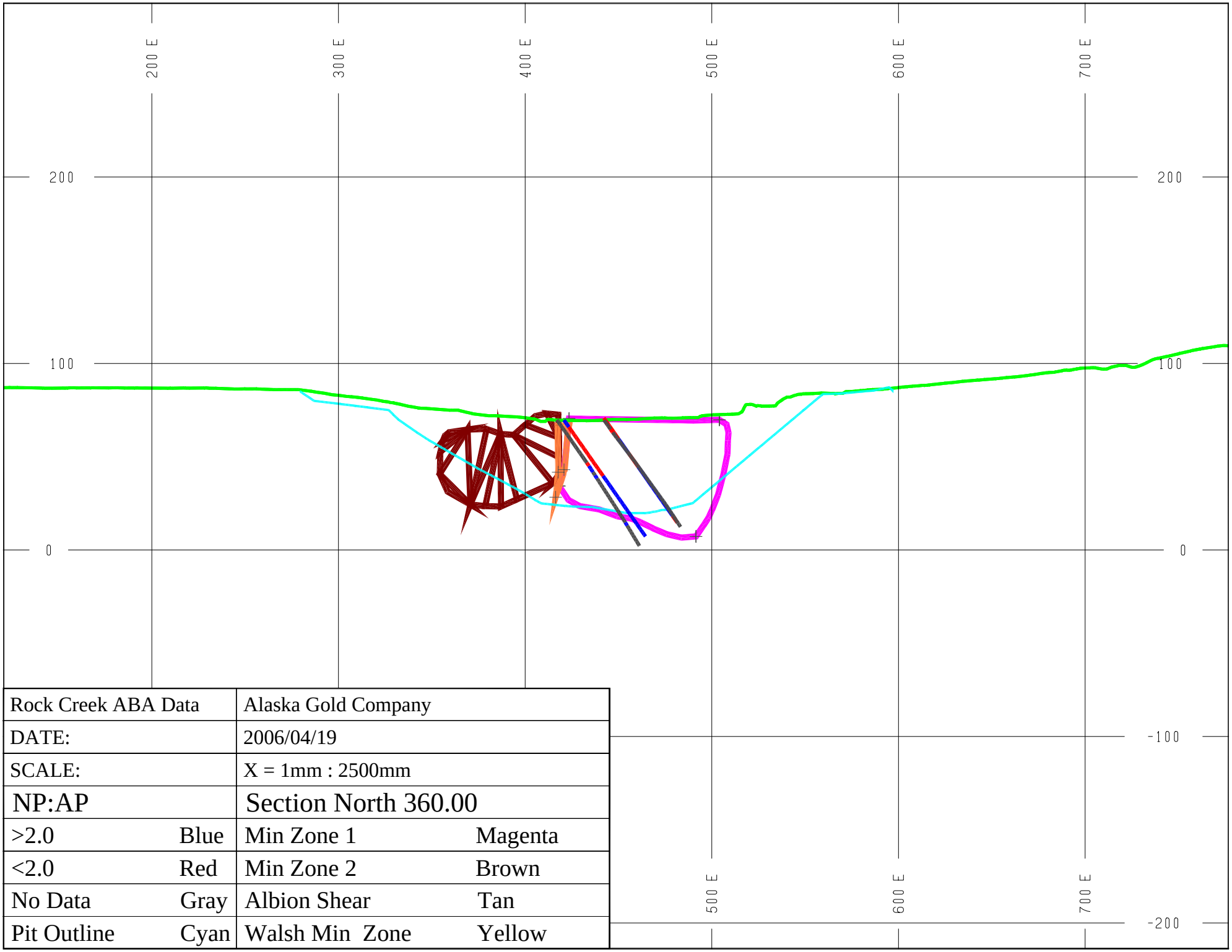
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 315.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



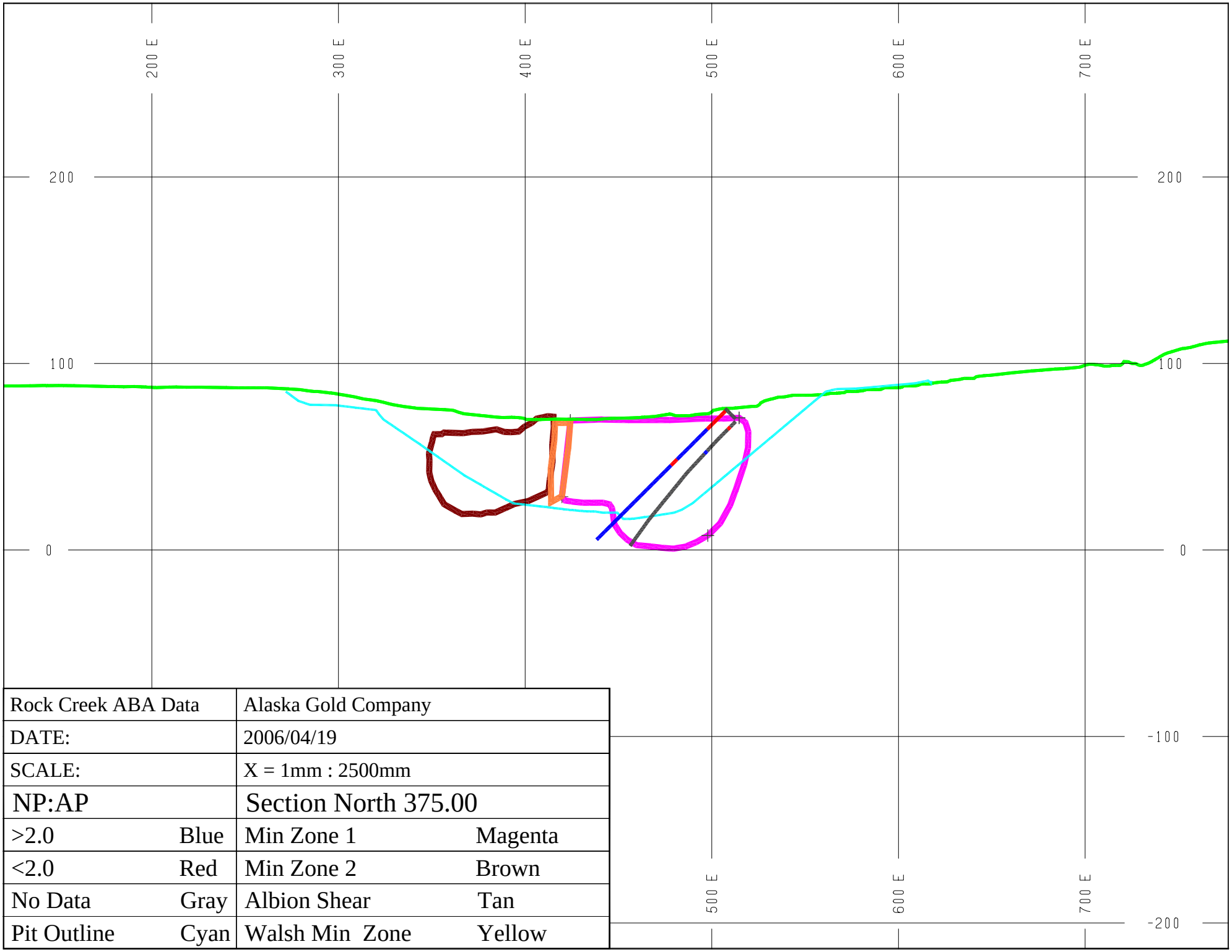
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 330.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



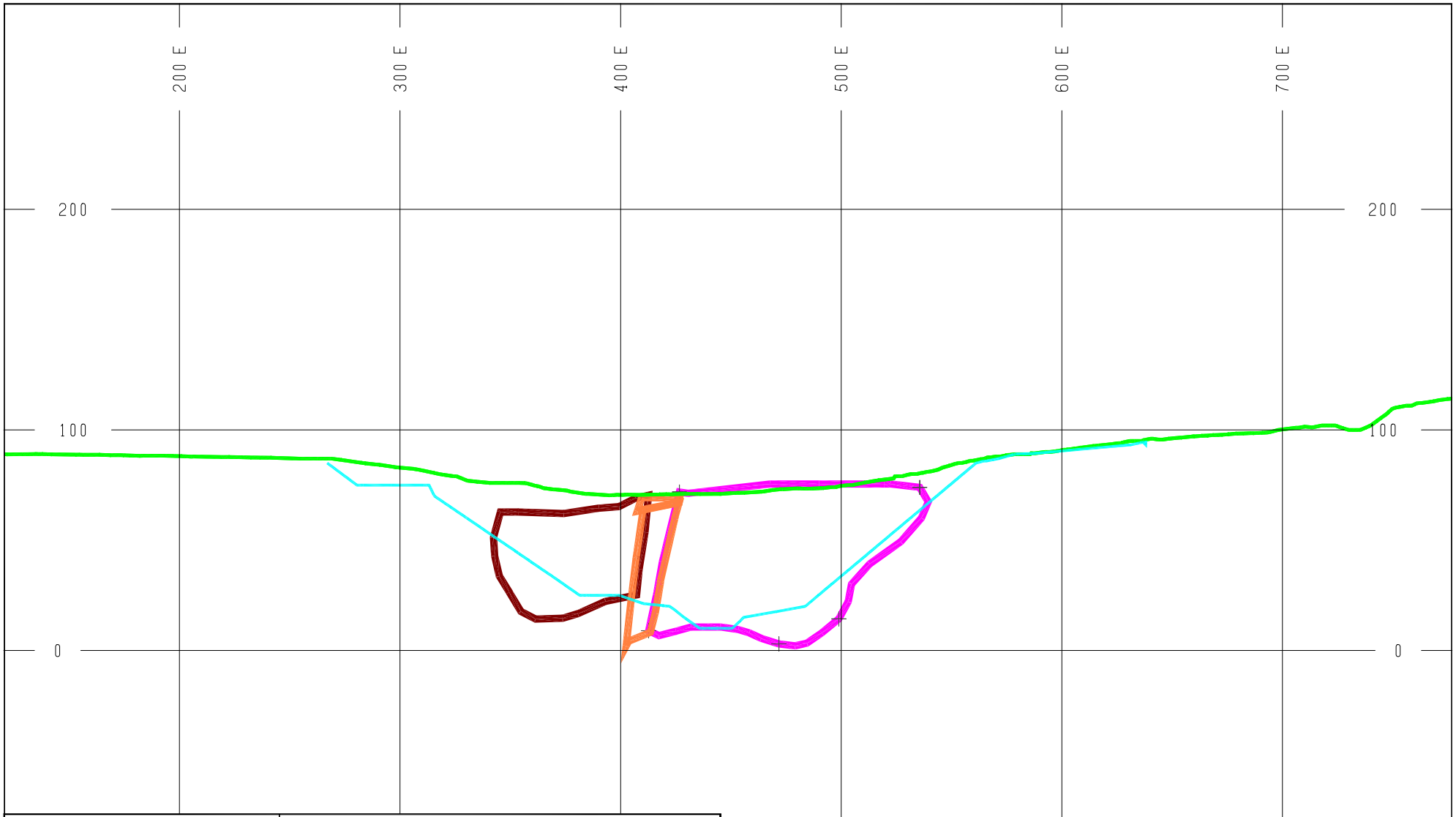
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 345.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



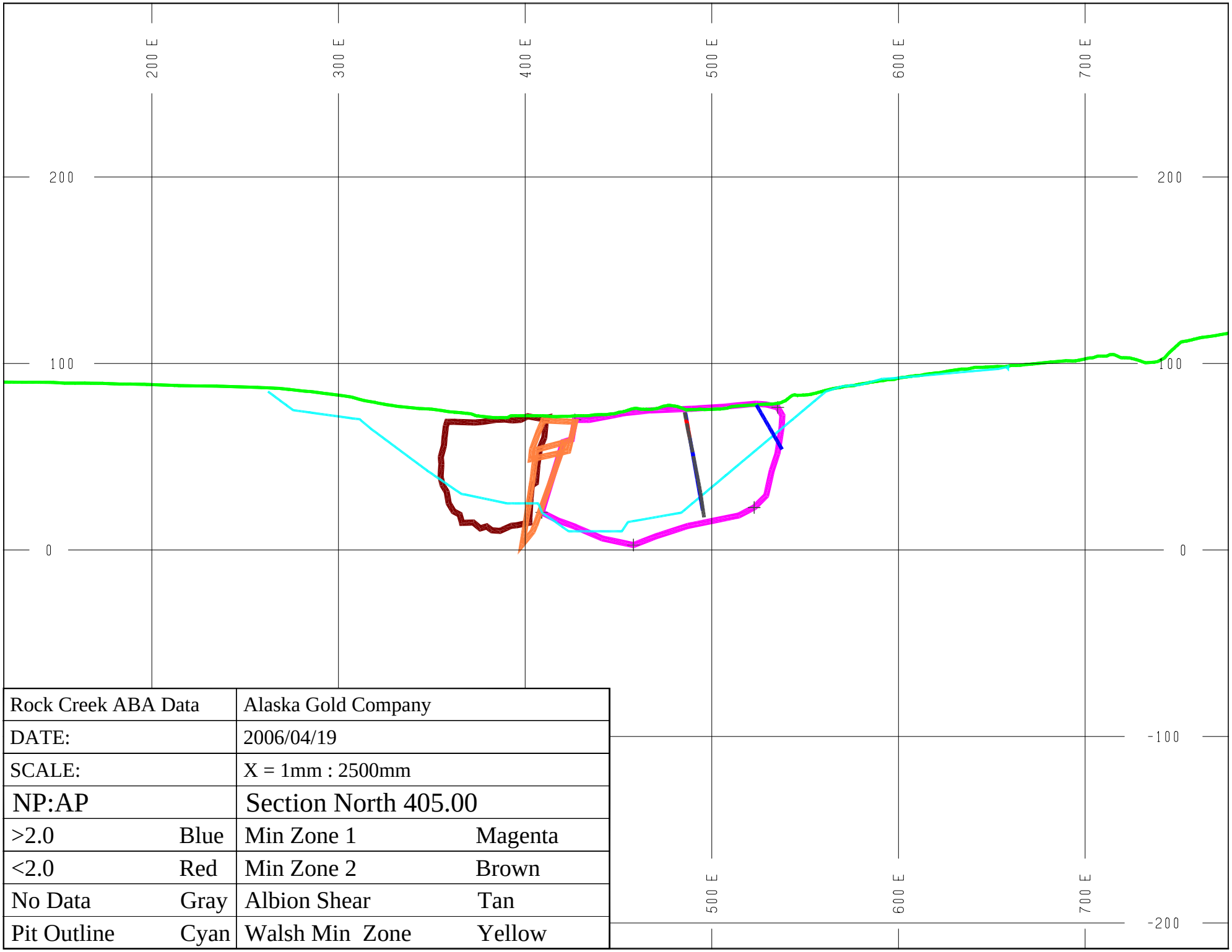
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 360.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



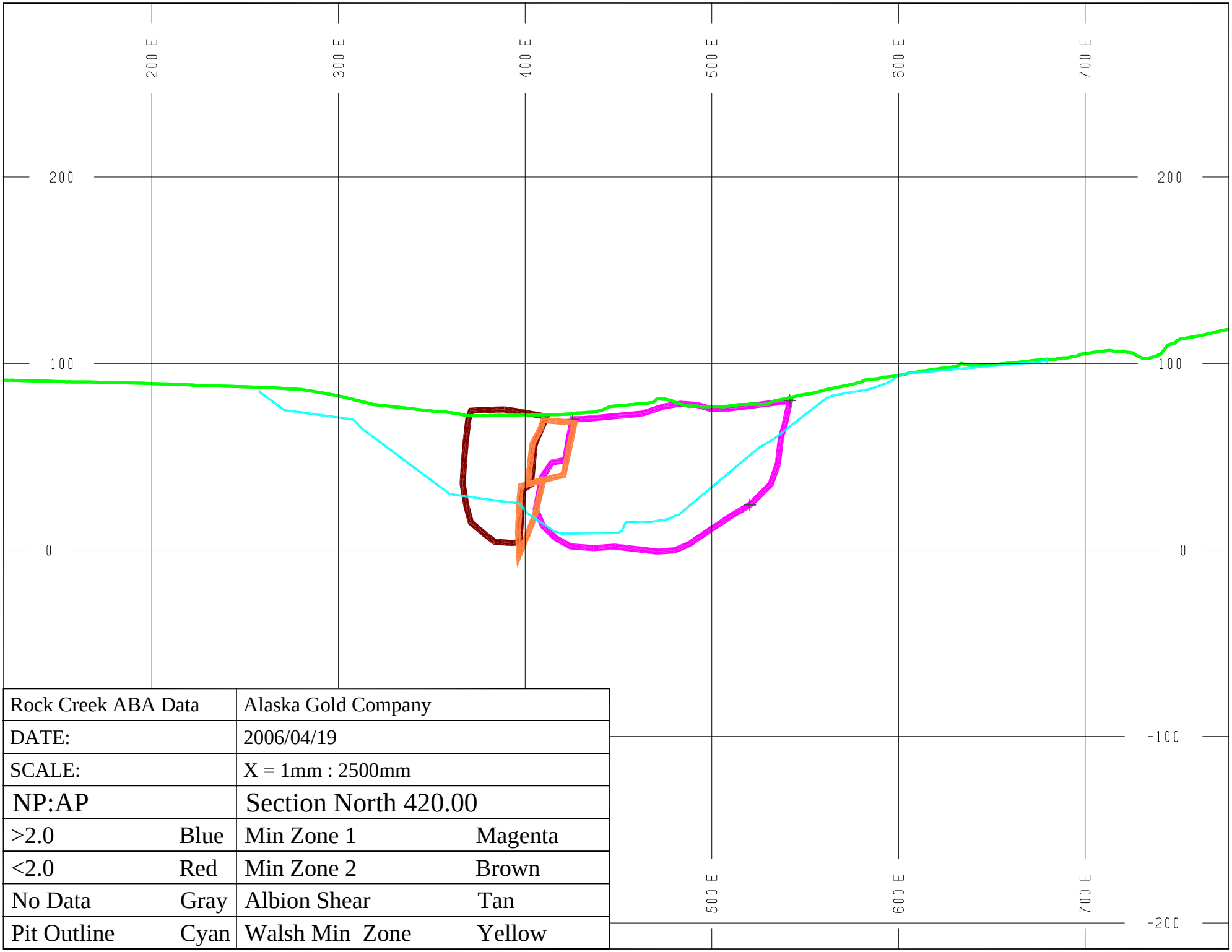
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 375.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



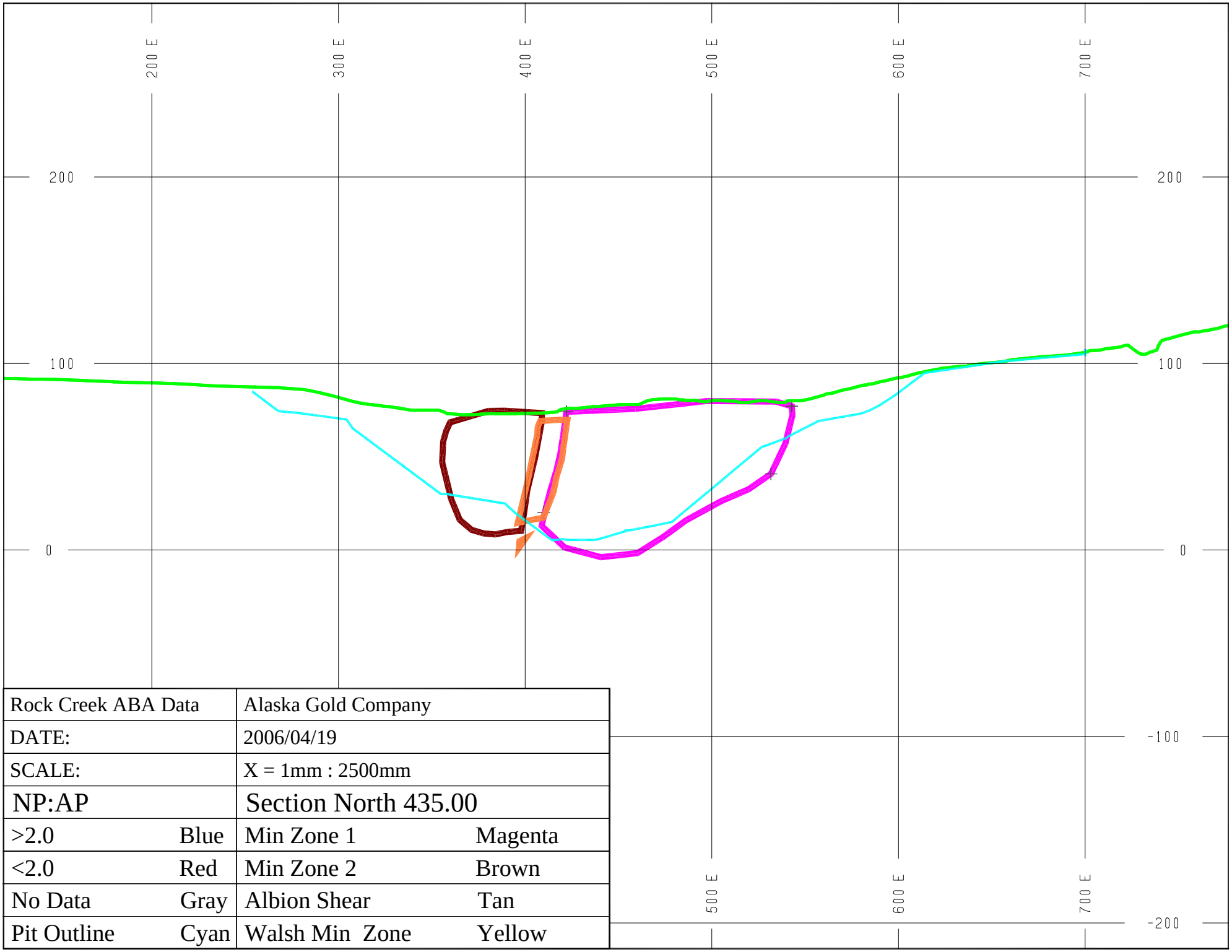
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 390.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



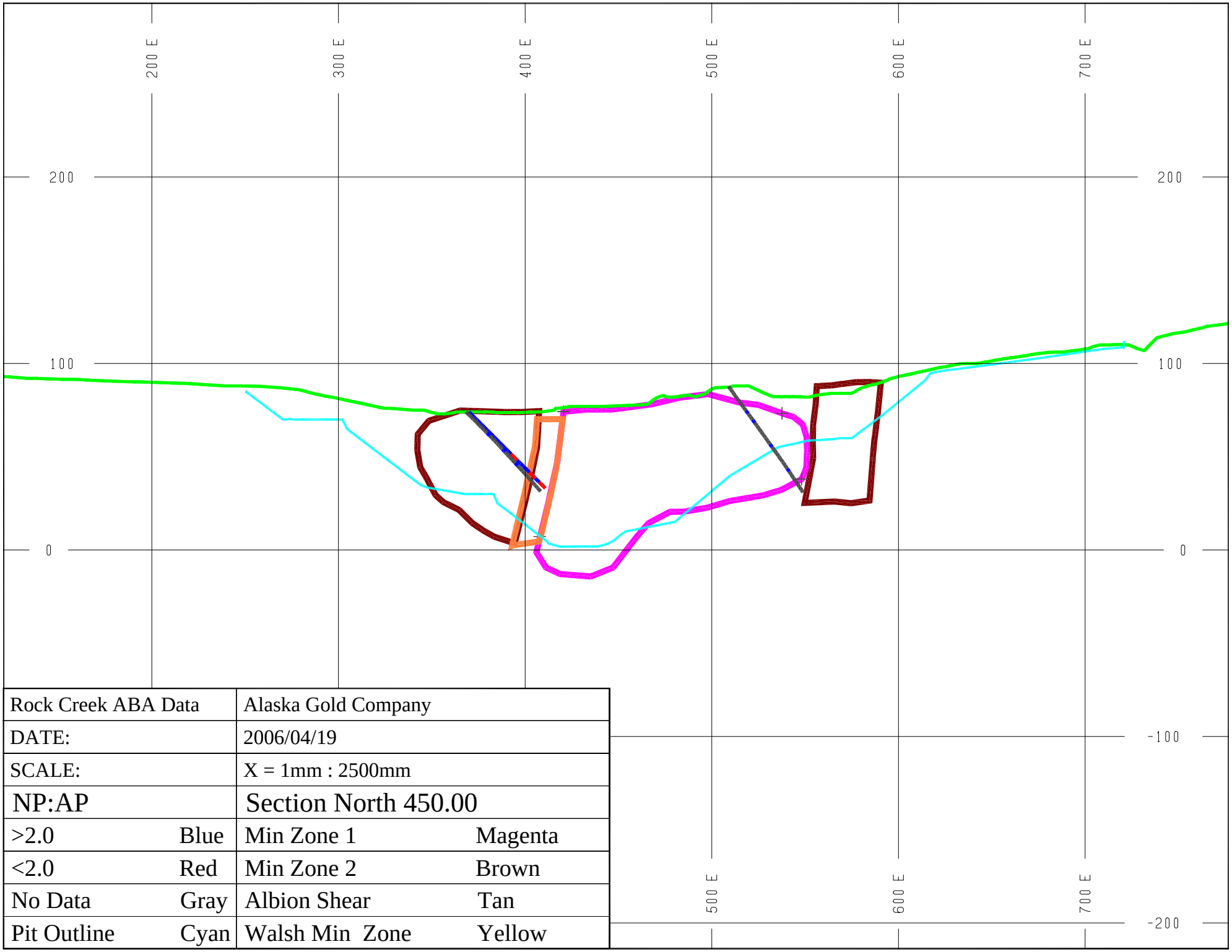
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 405.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



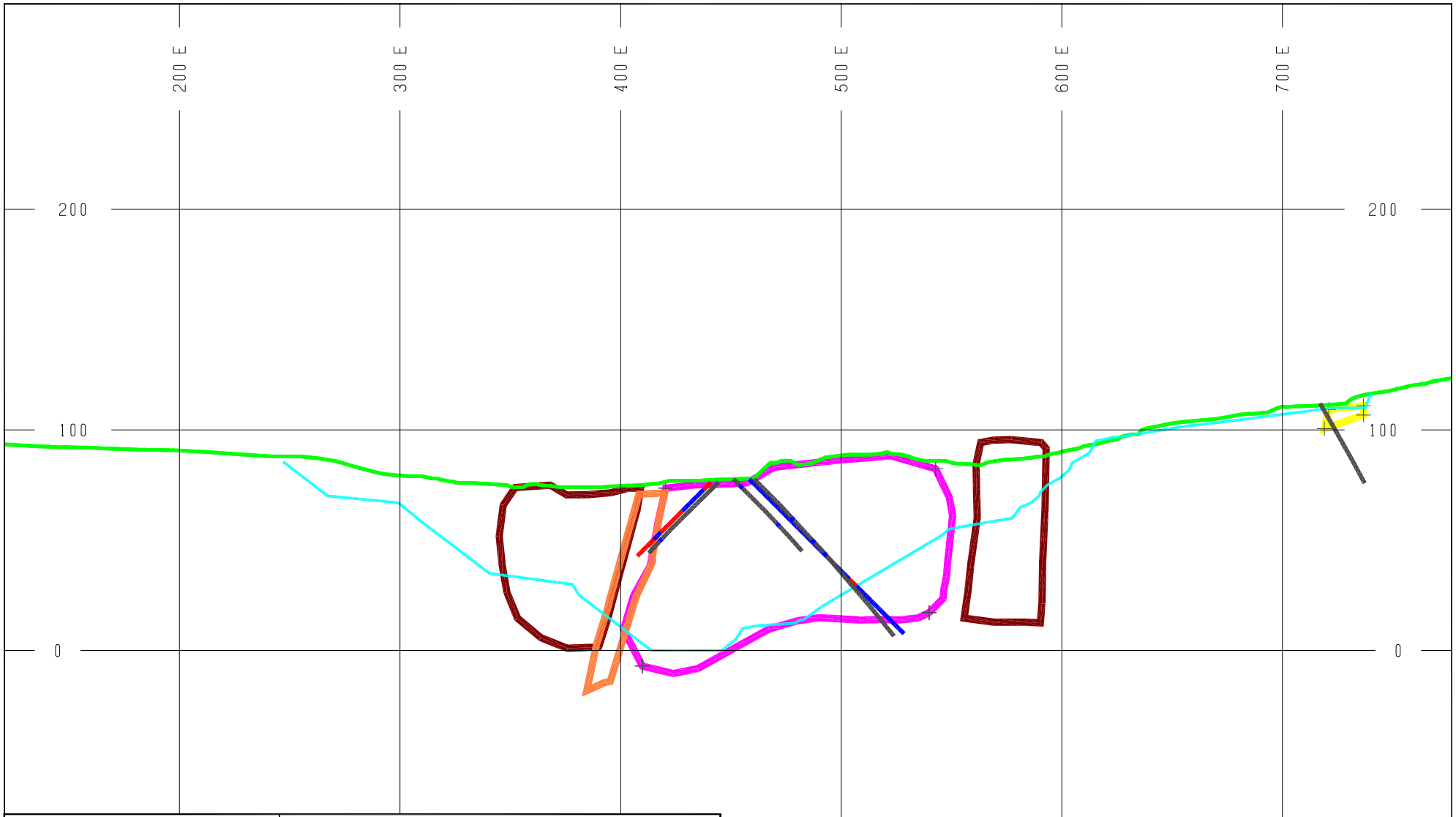
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 420.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



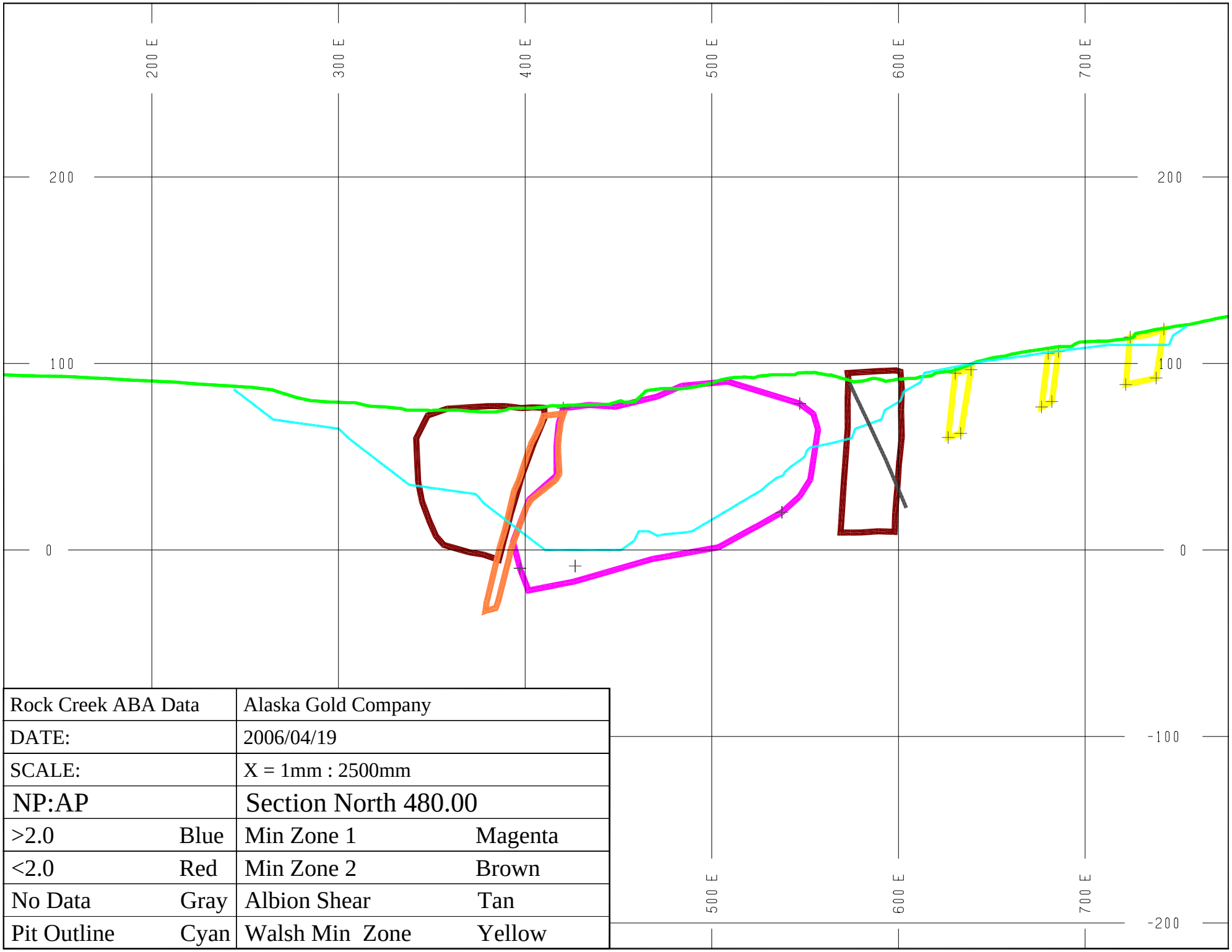
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 435.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



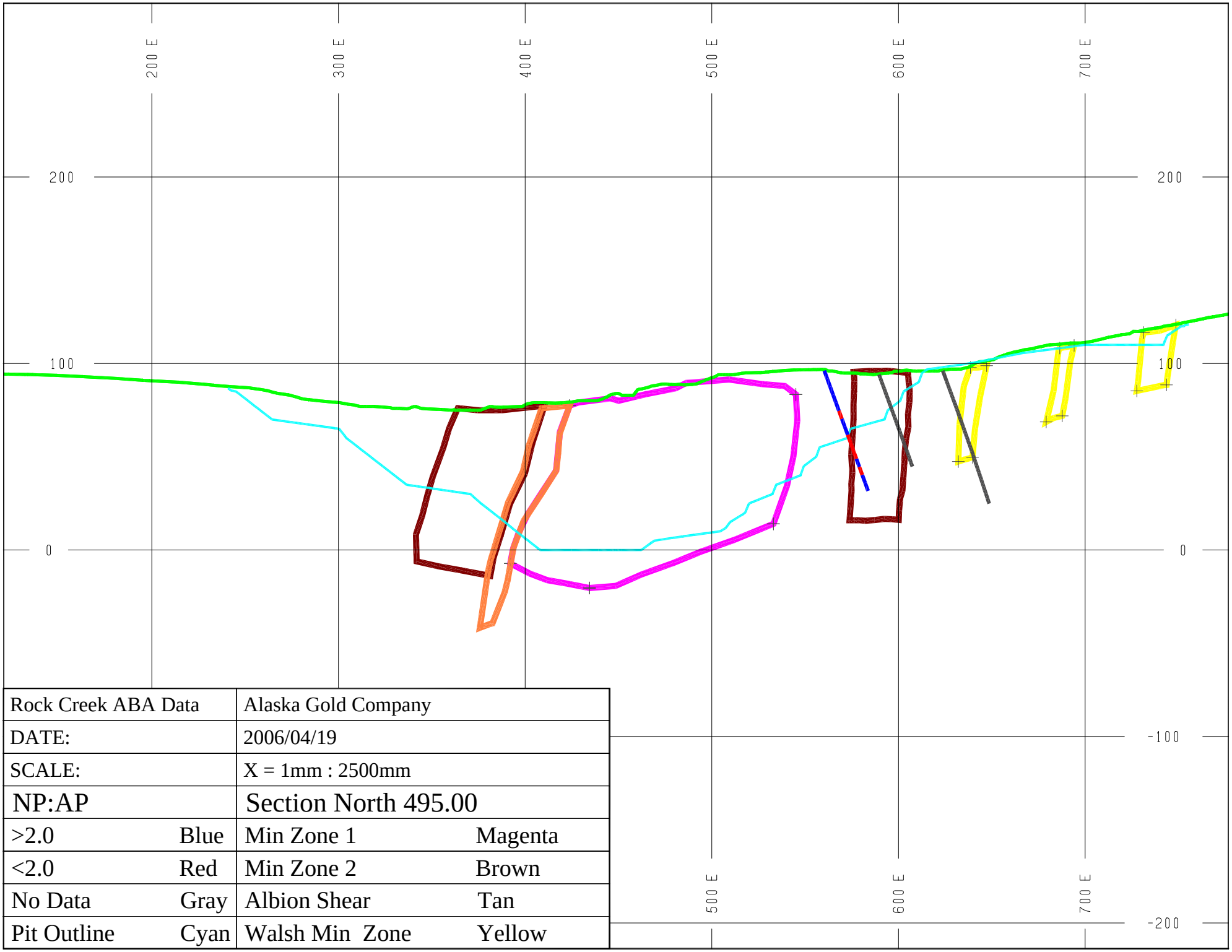
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 450.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



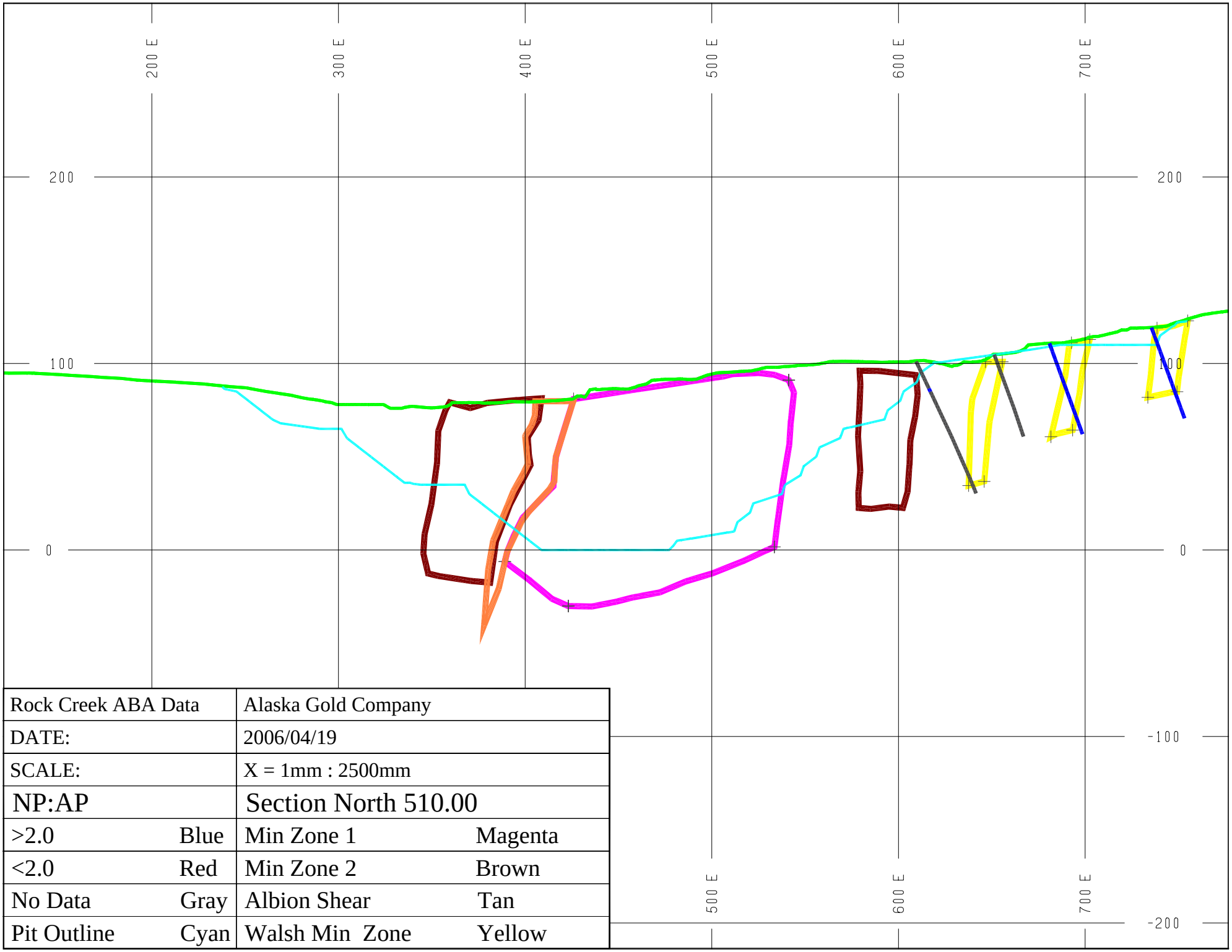
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 465.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



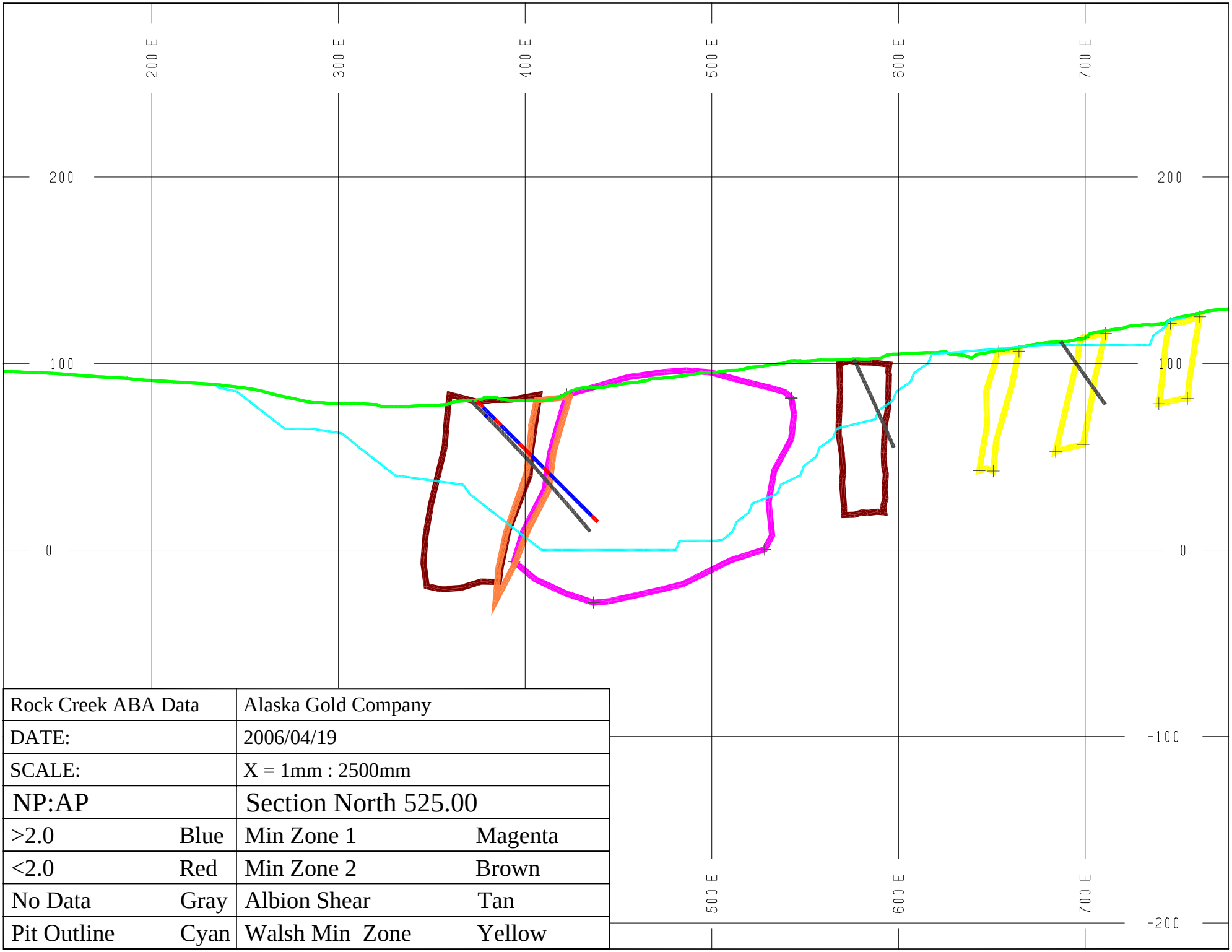
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 480.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



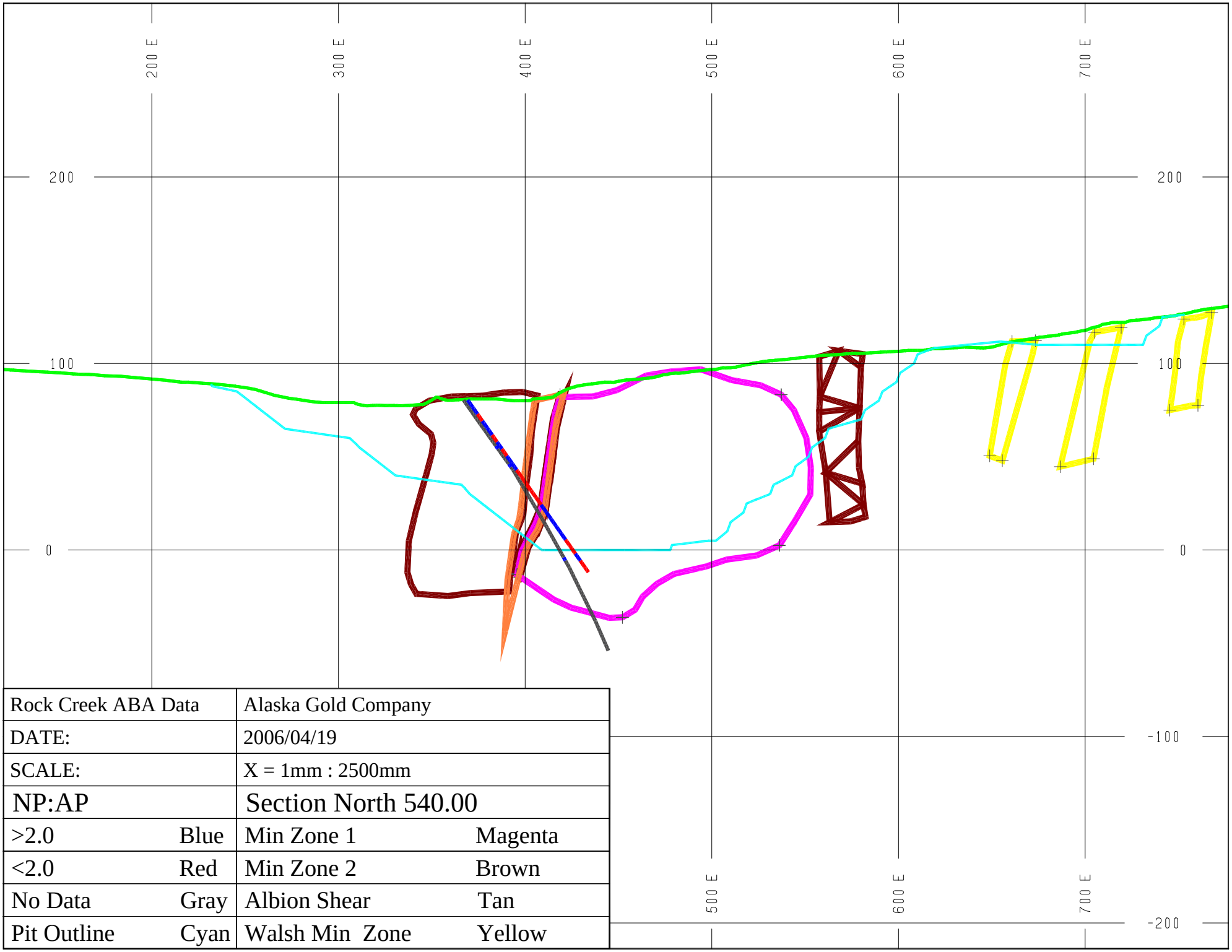
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 495.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



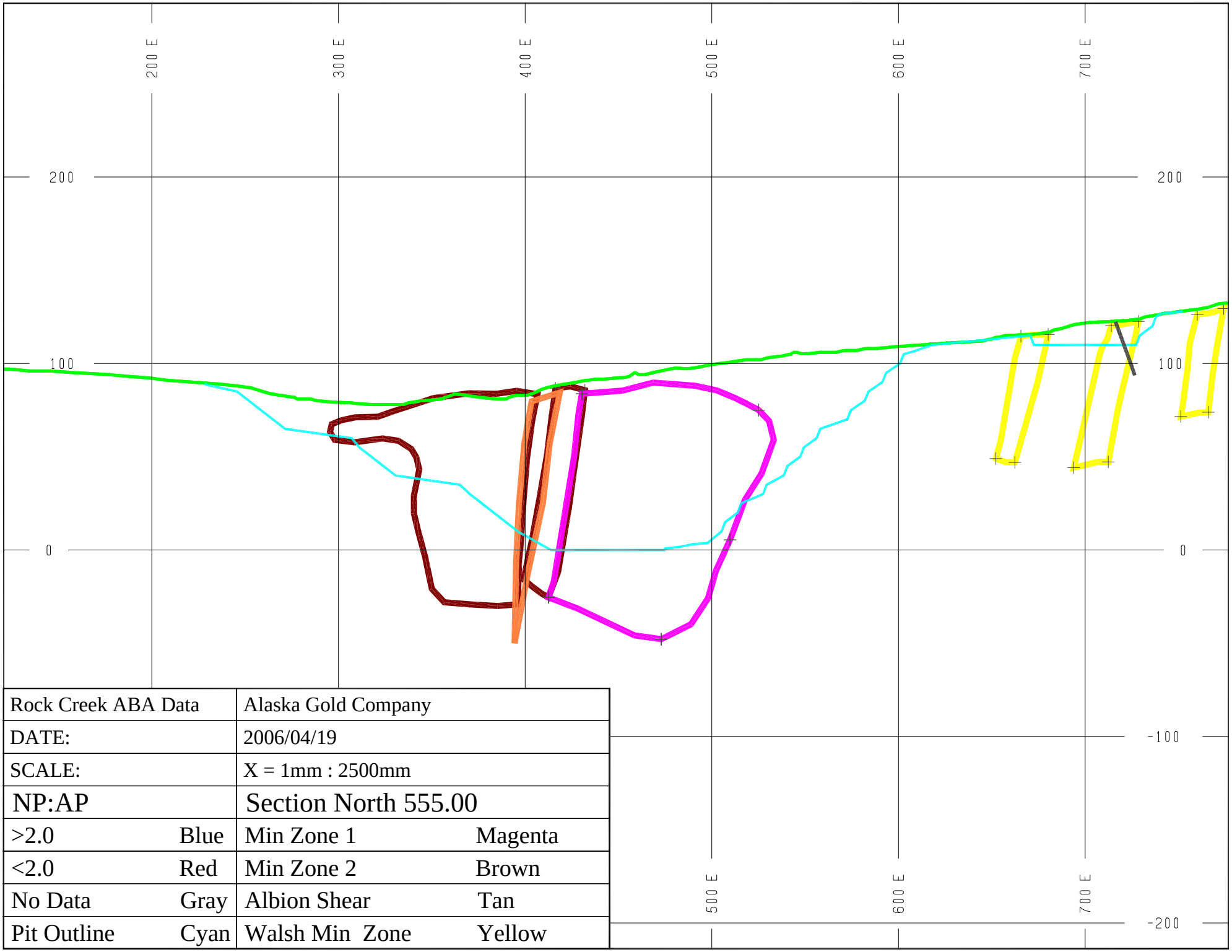
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 510.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



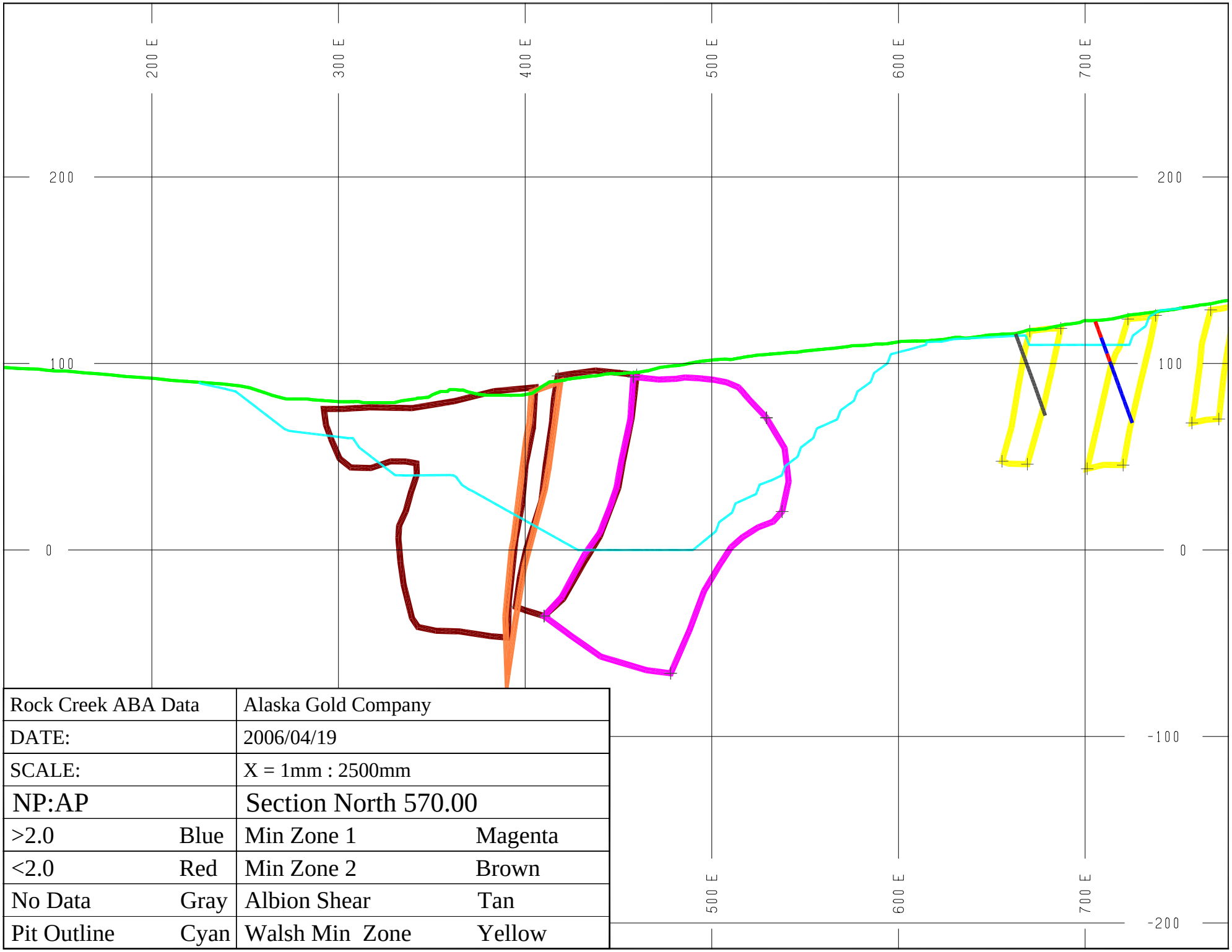
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 525.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



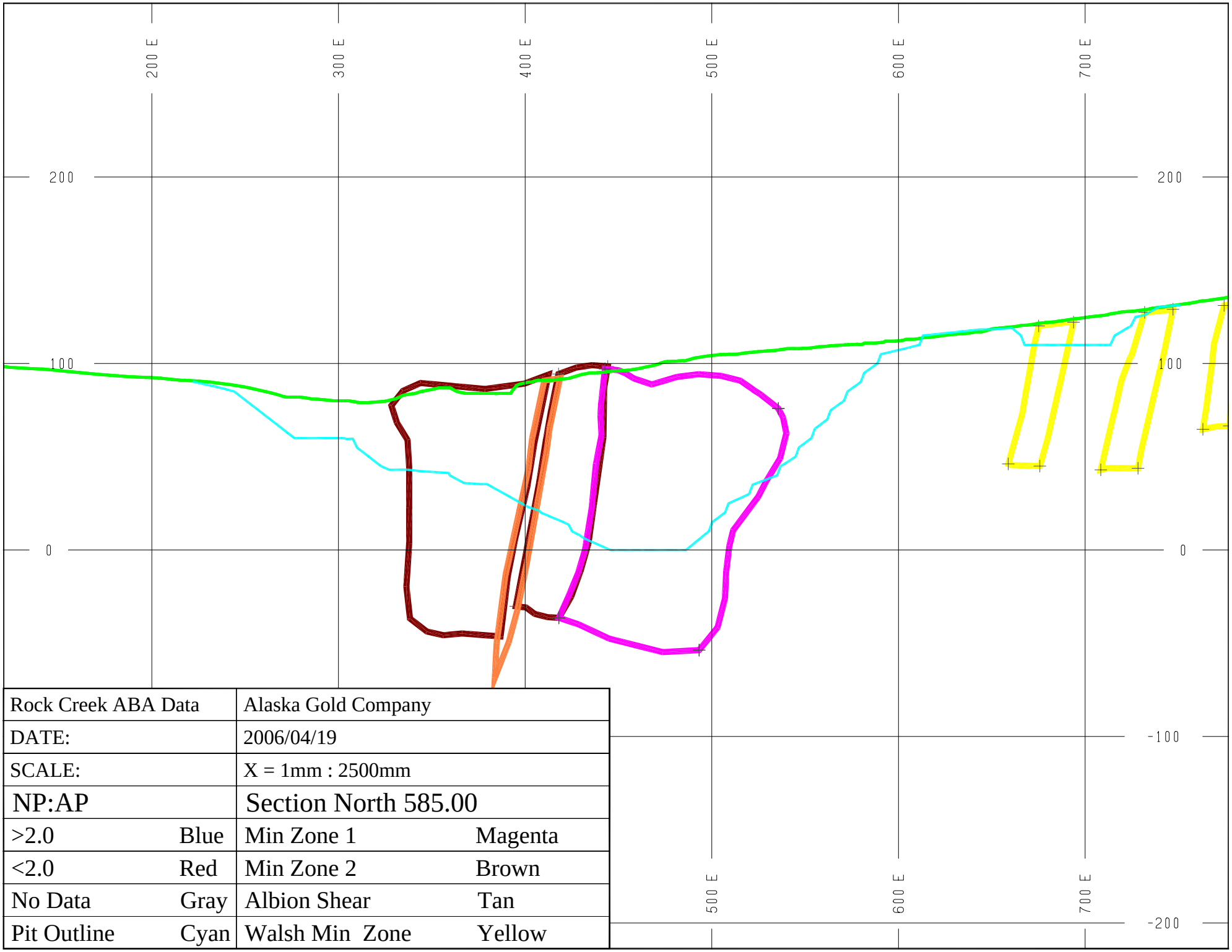
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 540.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



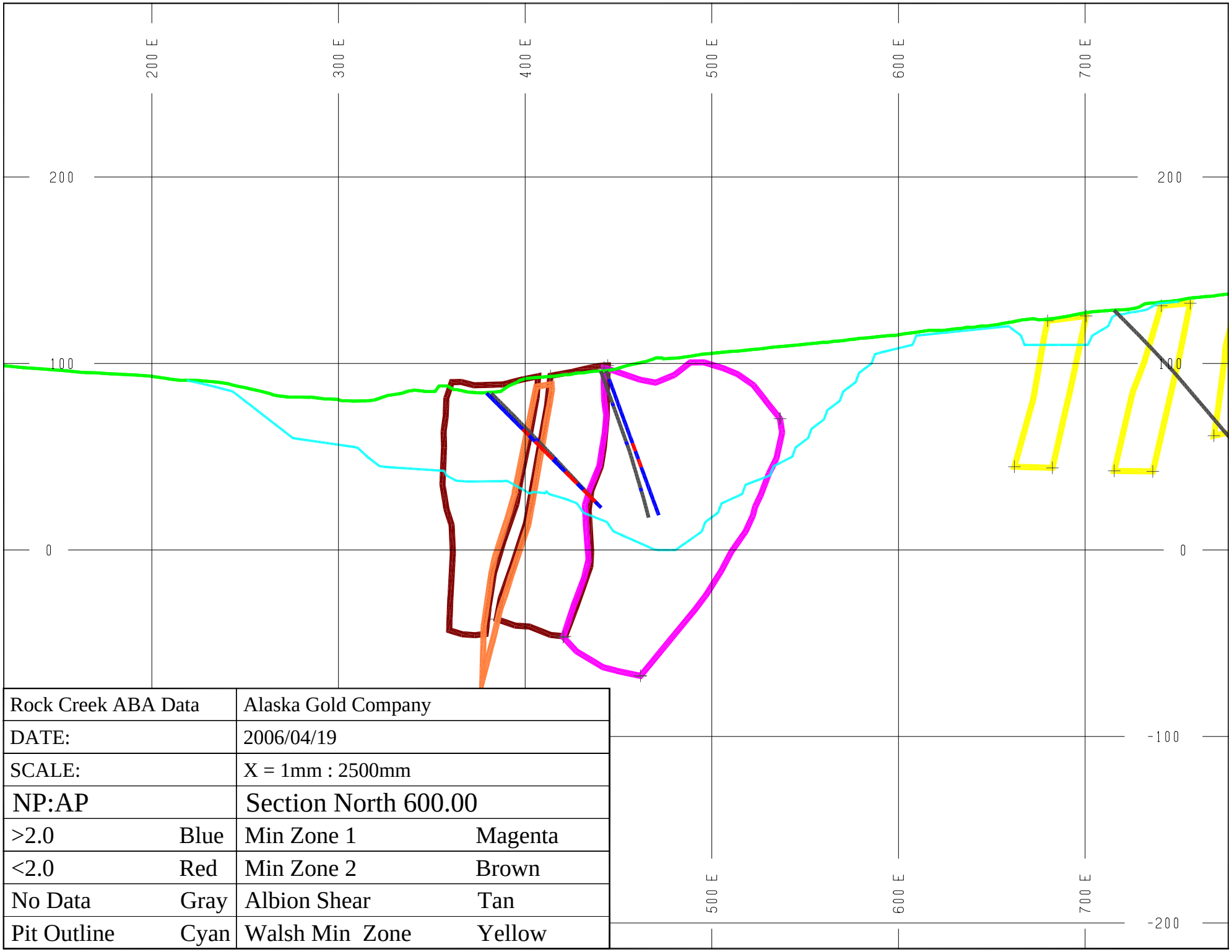
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 555.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



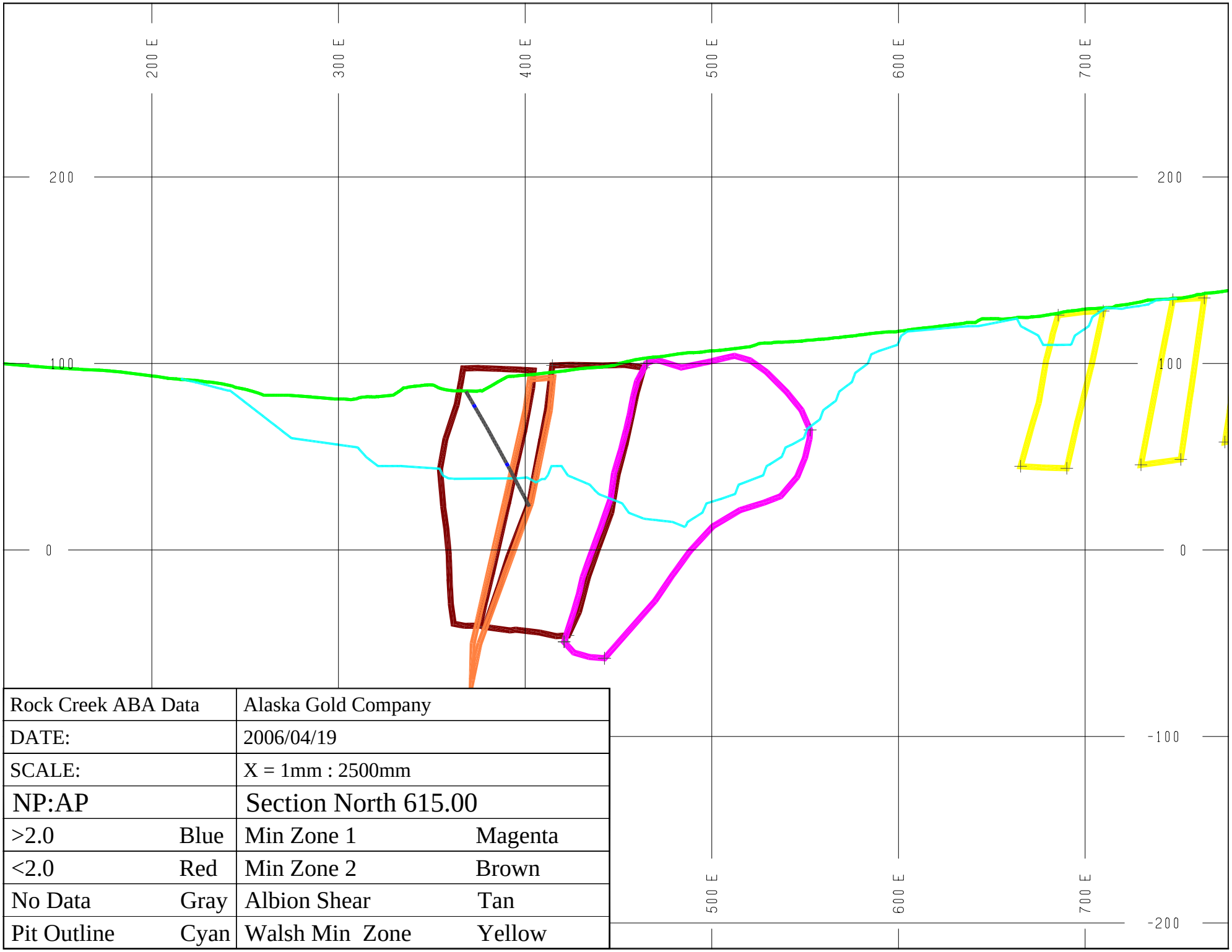
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 570.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



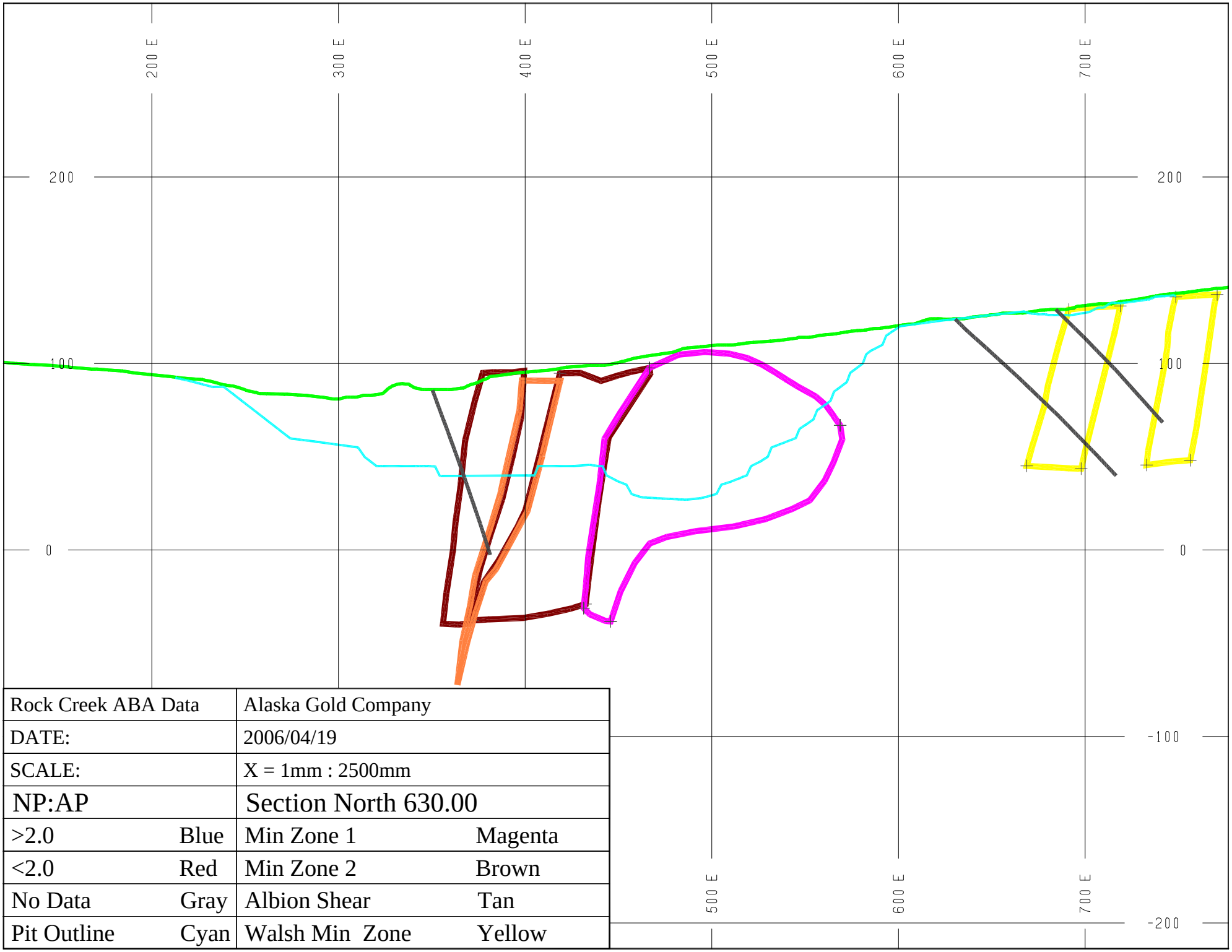
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 585.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



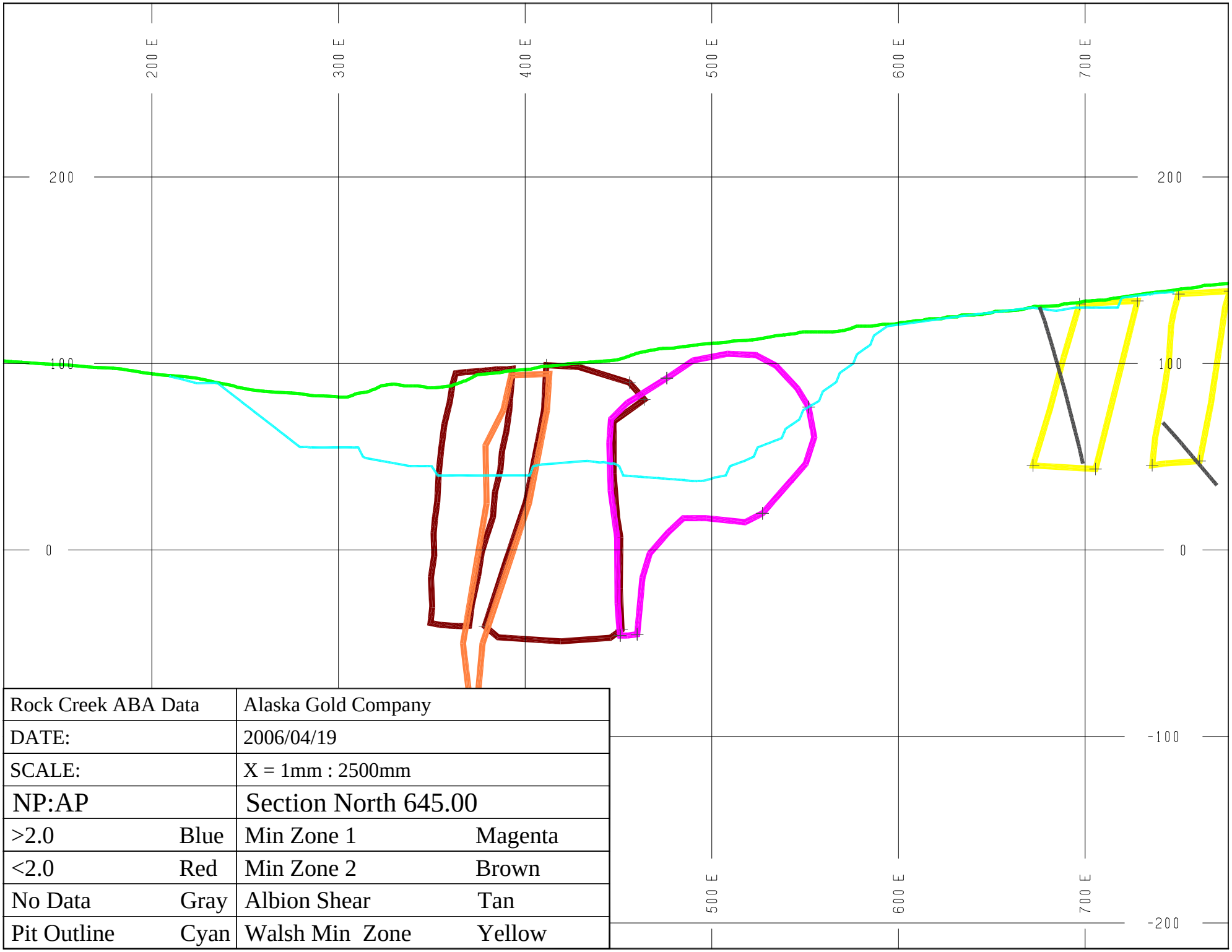
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 600.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



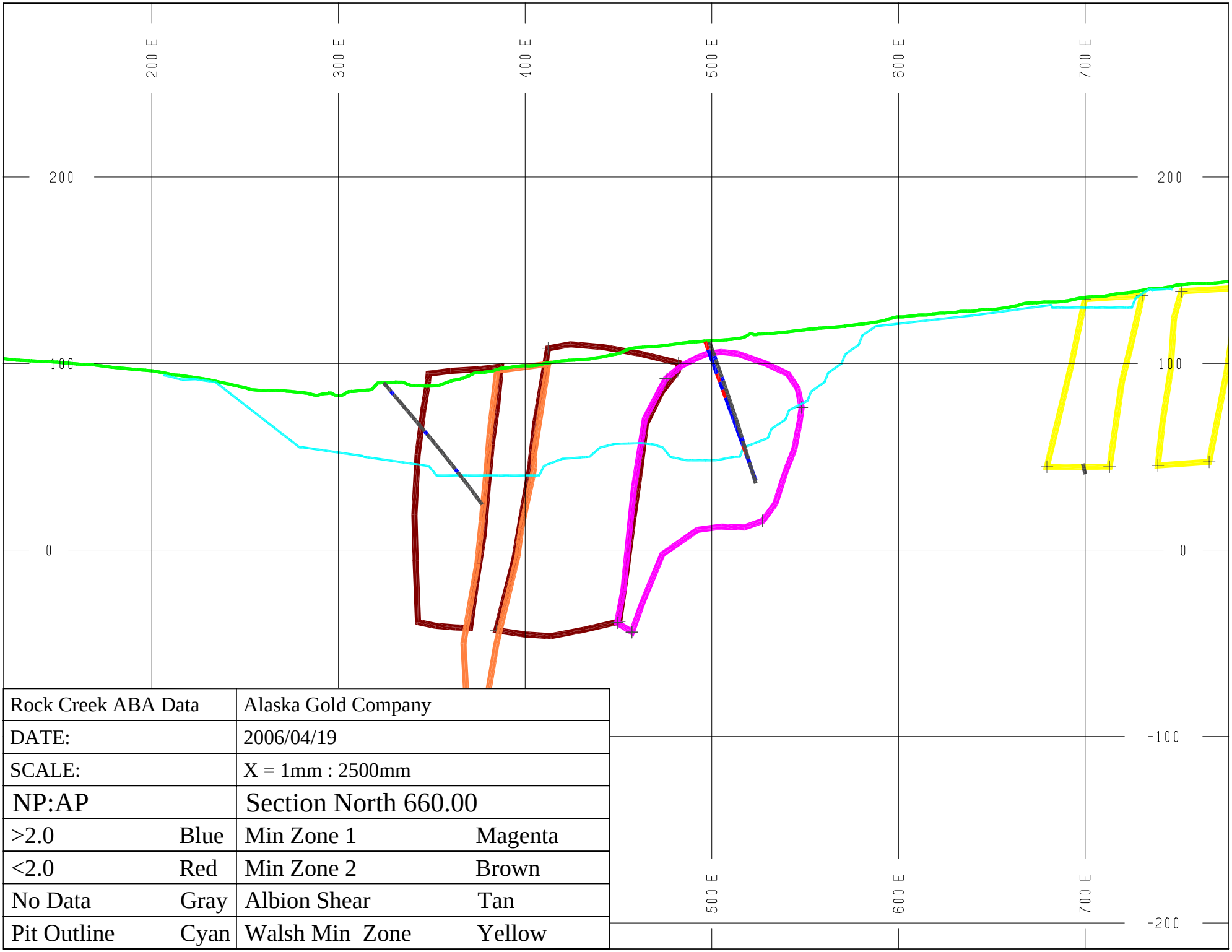
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 615.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



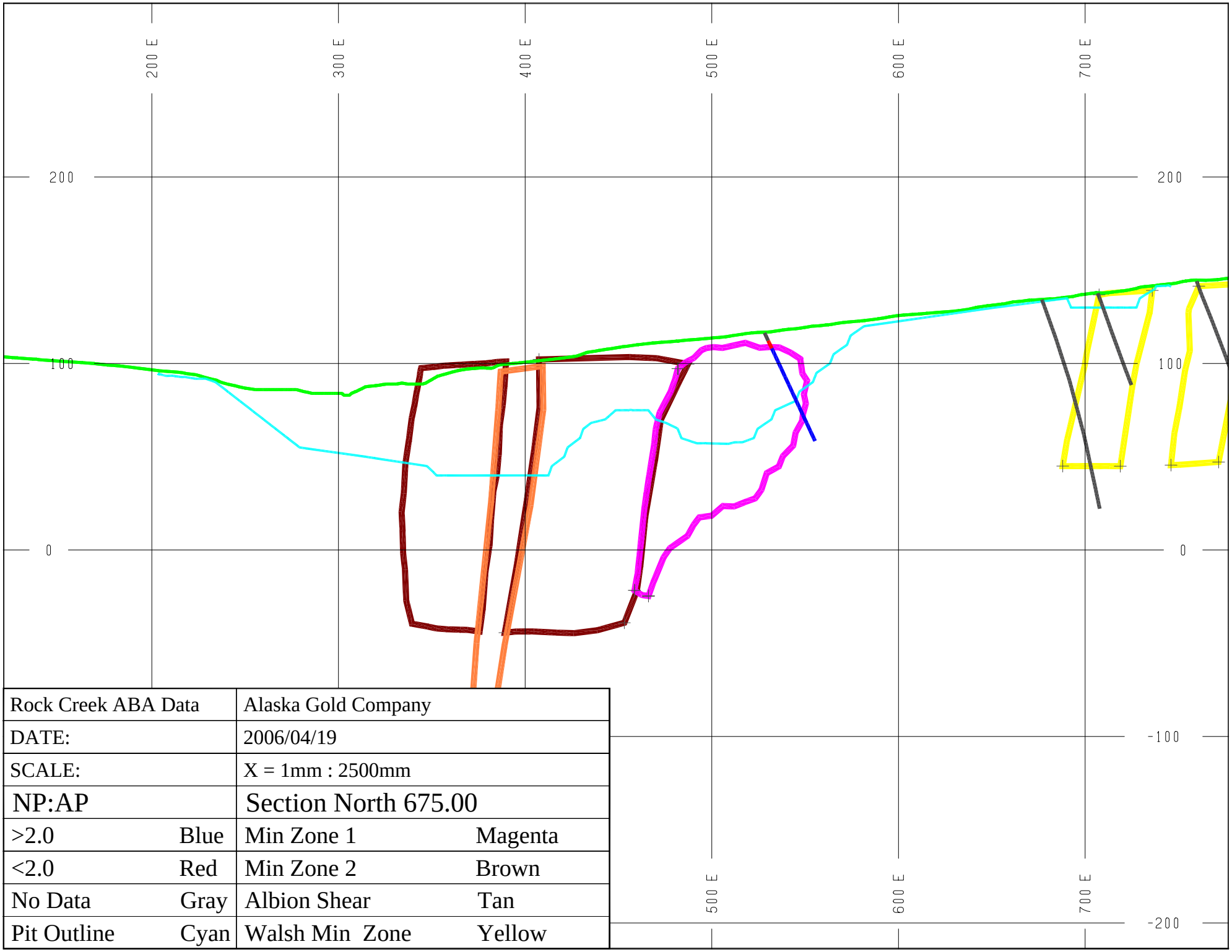
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 630.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



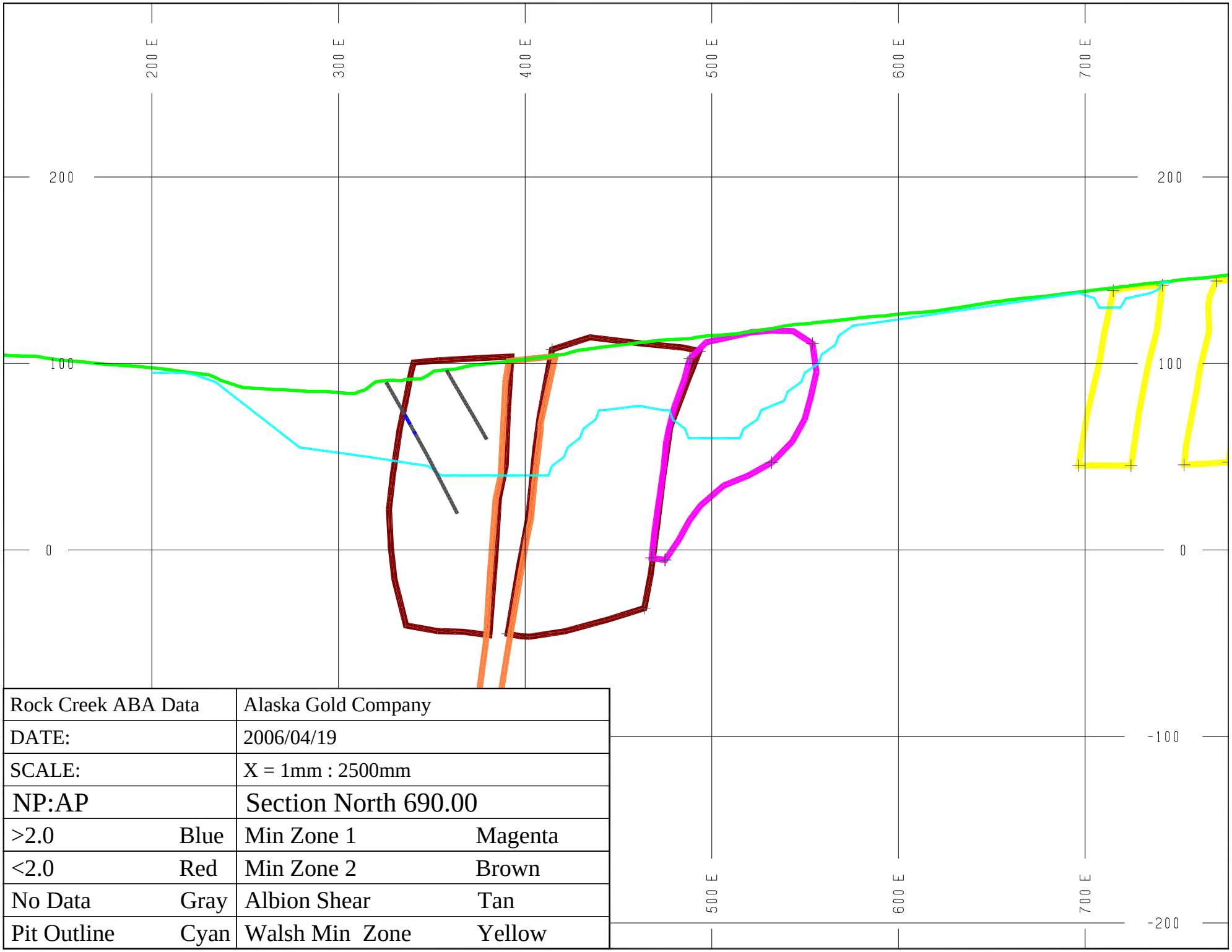
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 645.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



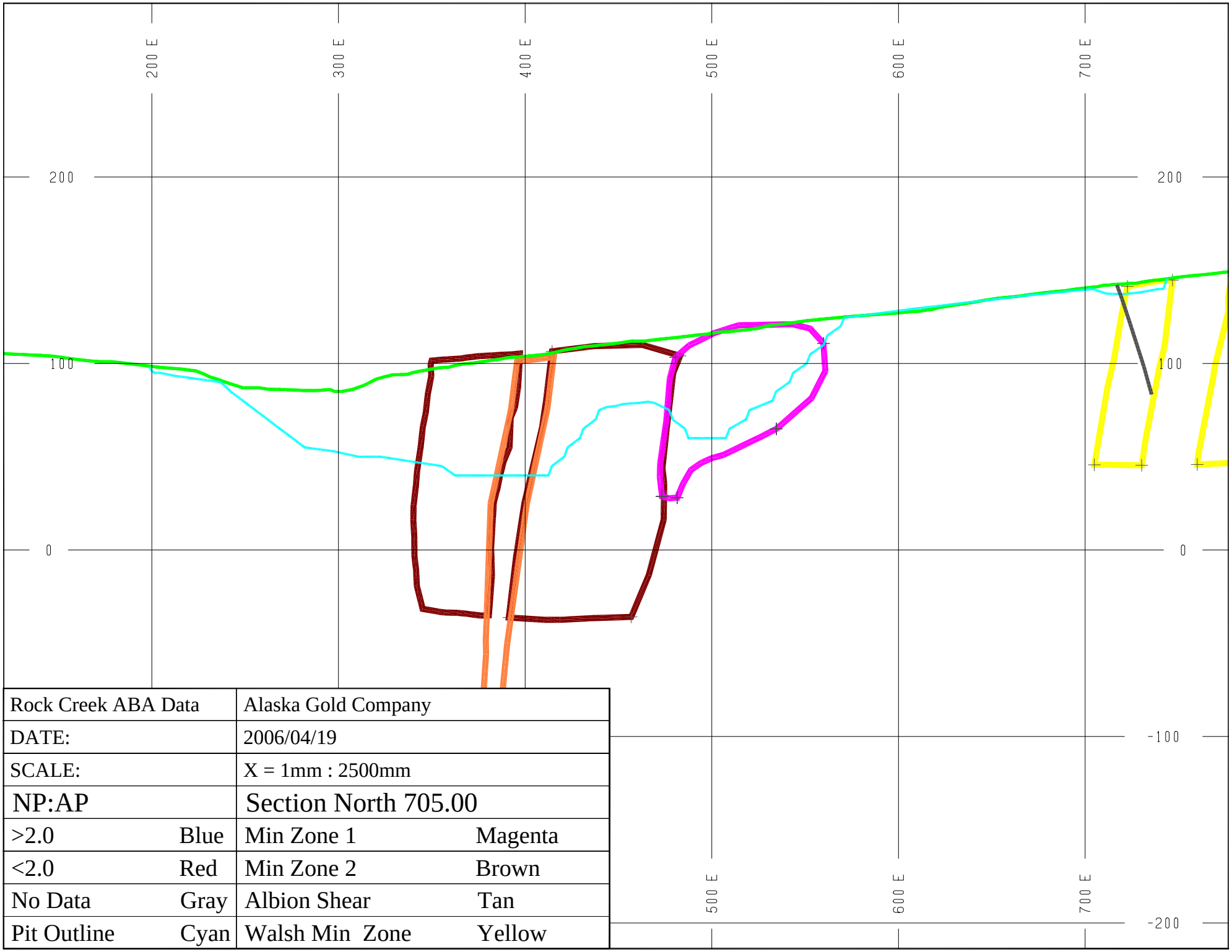
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 660.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



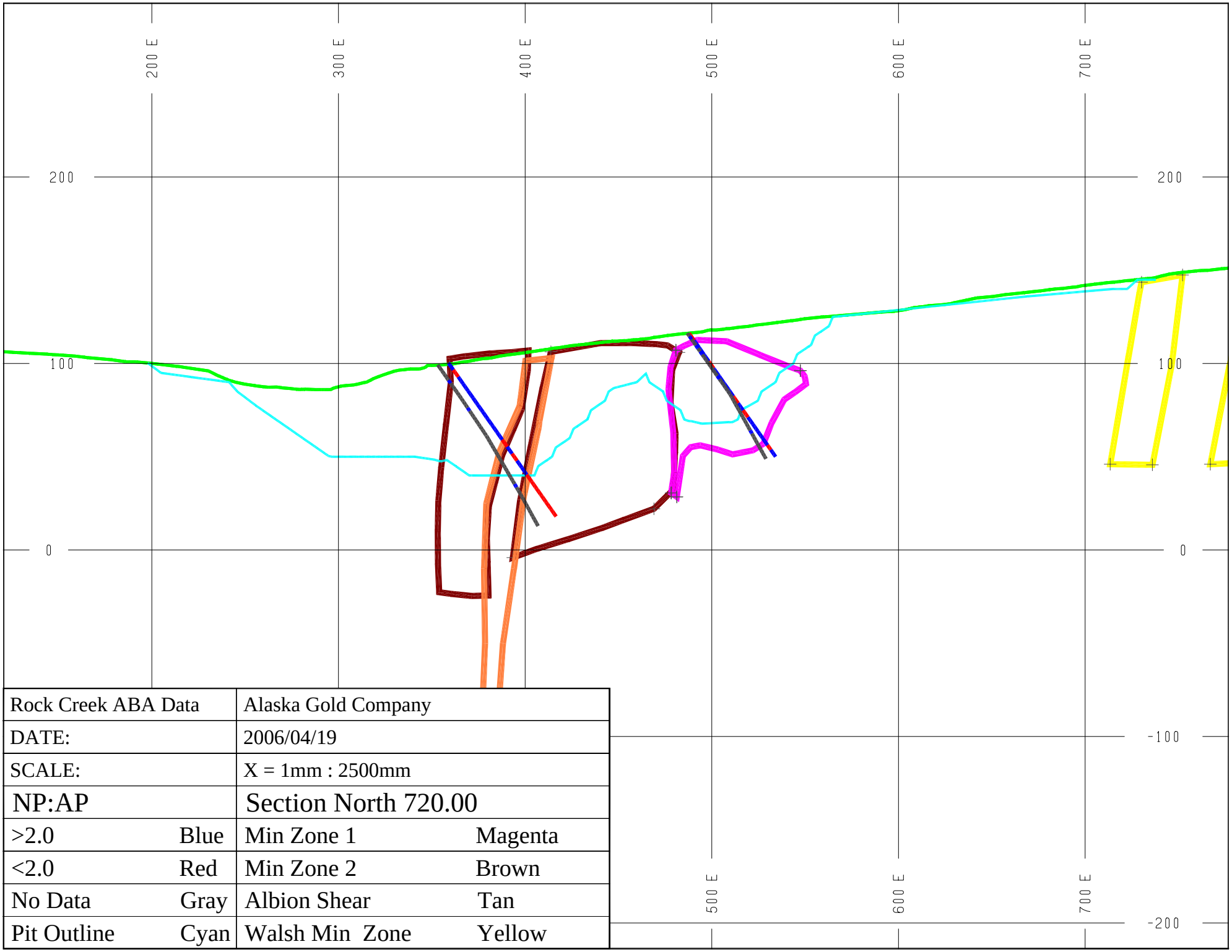
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 675.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



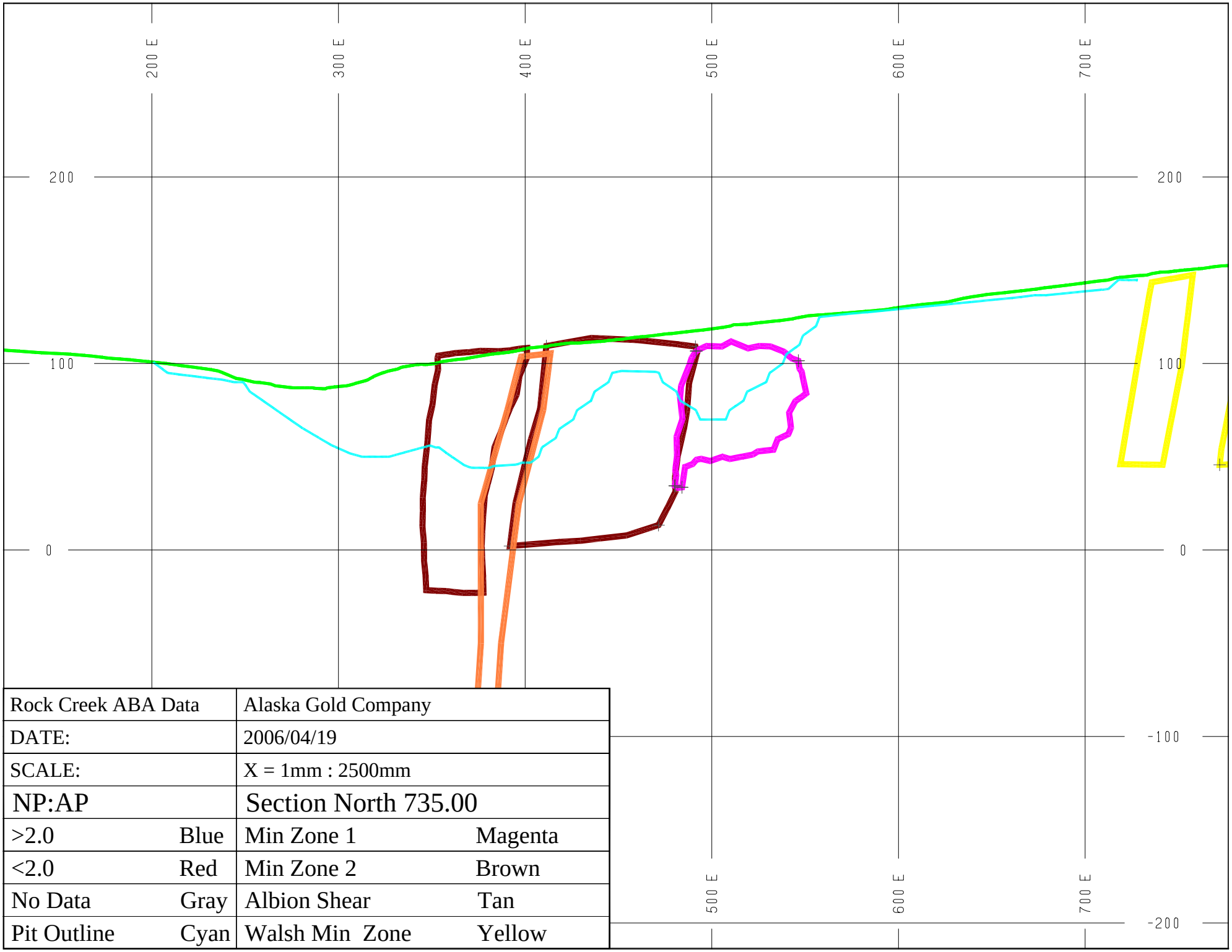
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 690.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



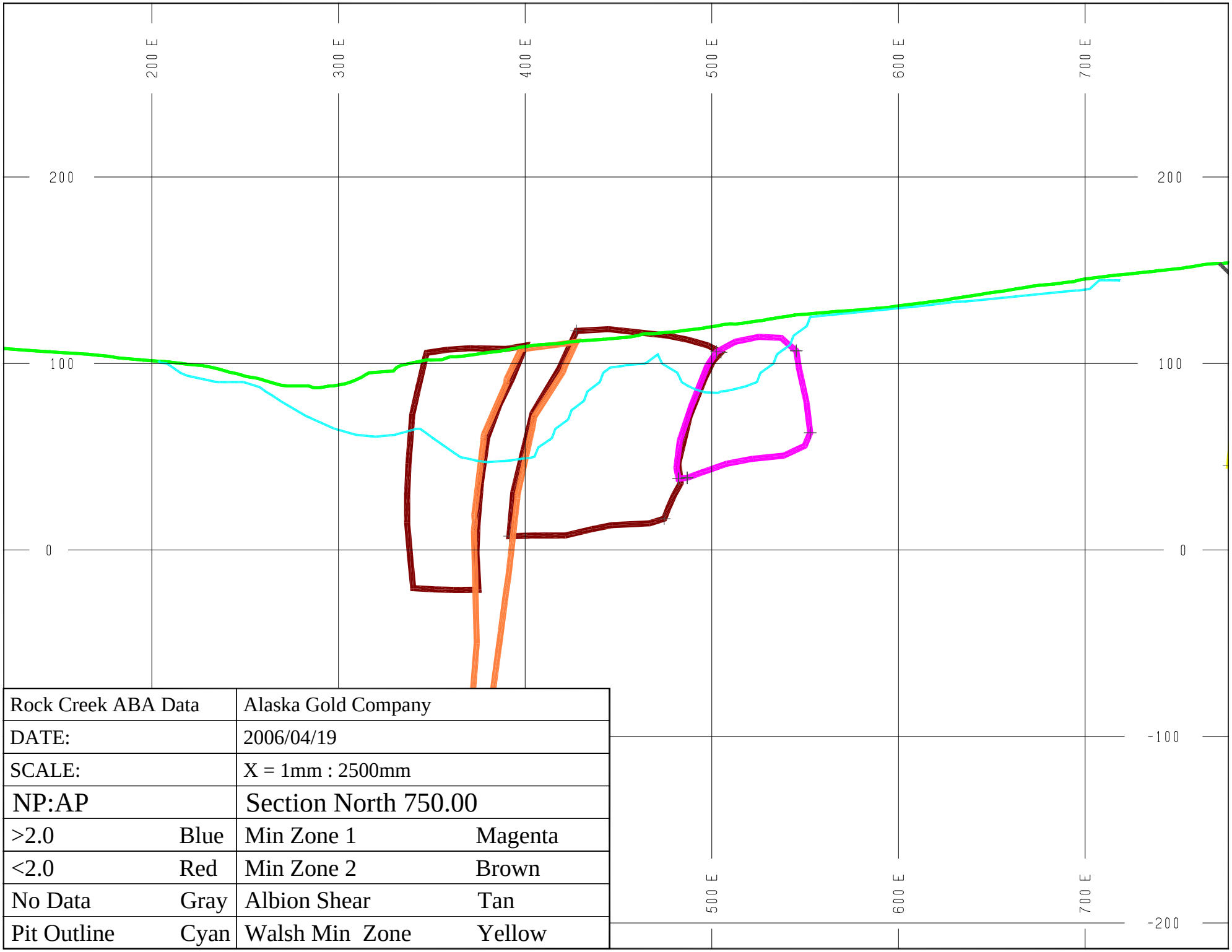
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 705.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



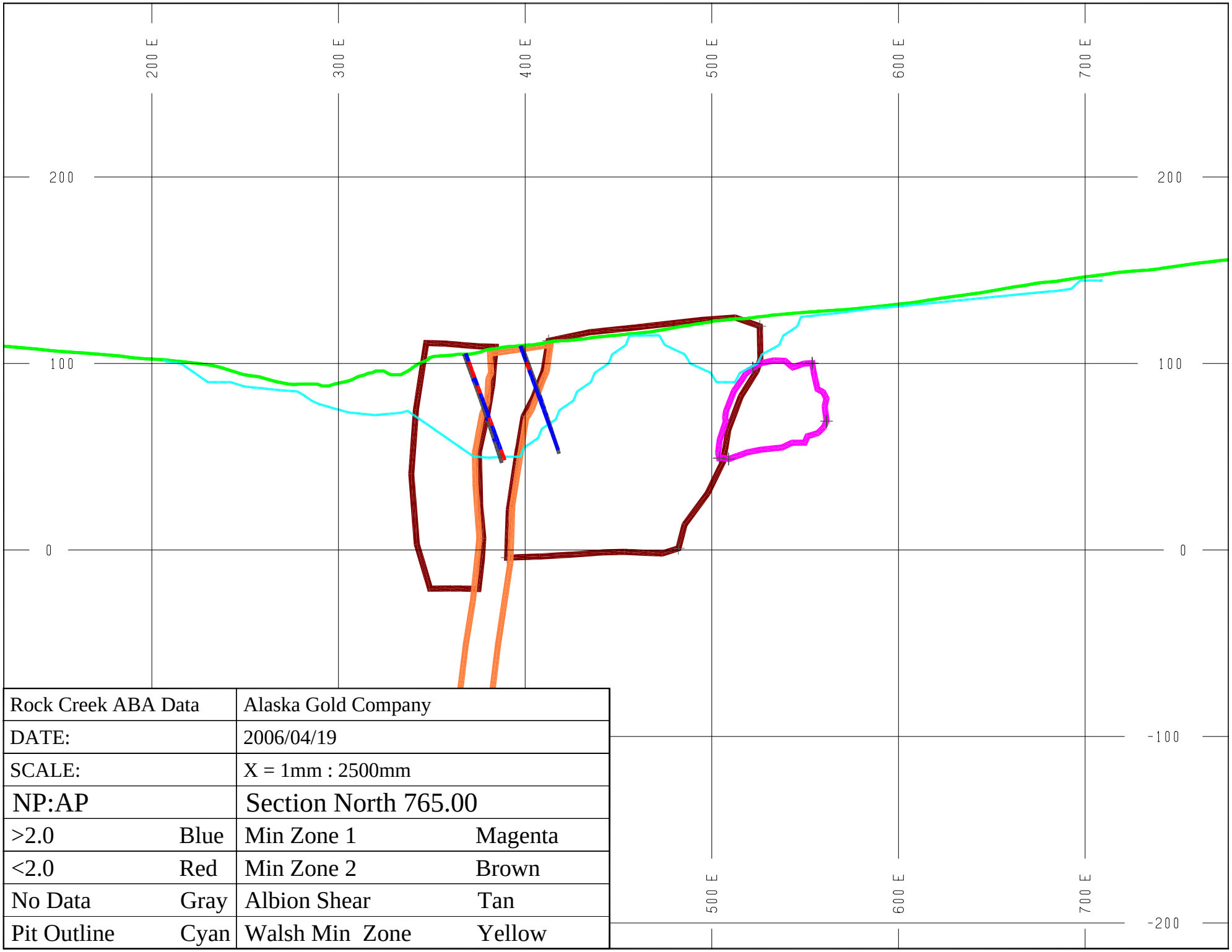
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 720.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



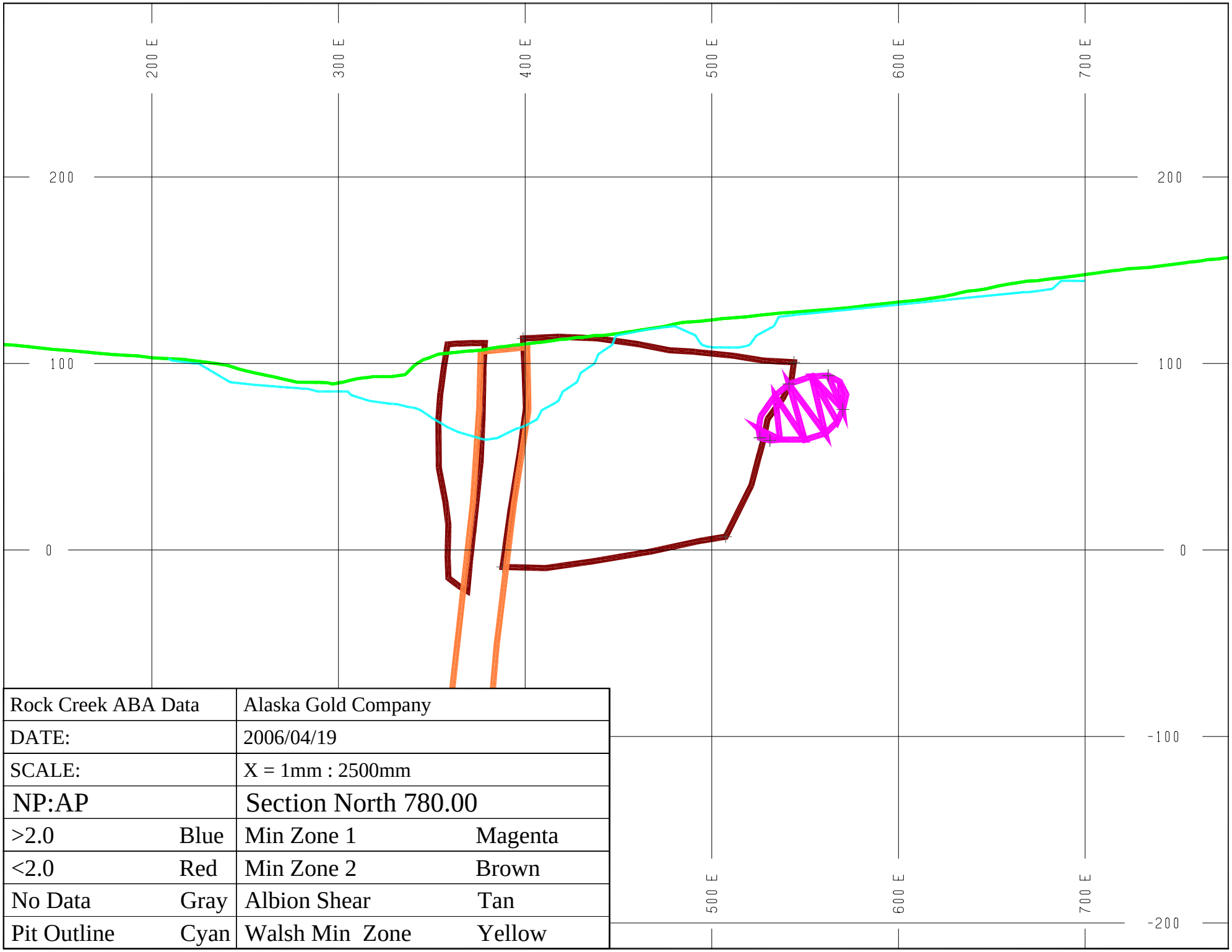
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 735.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



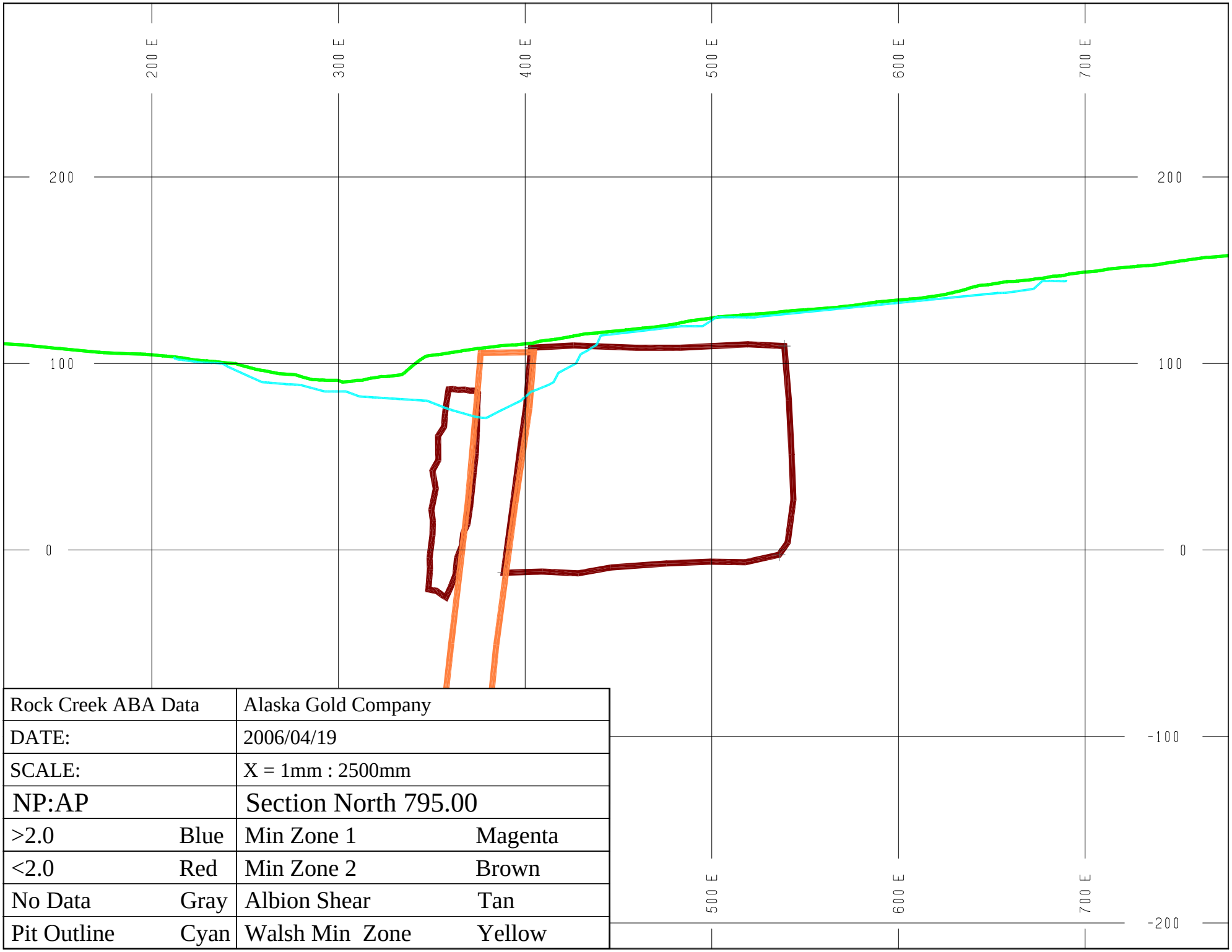
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 750.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



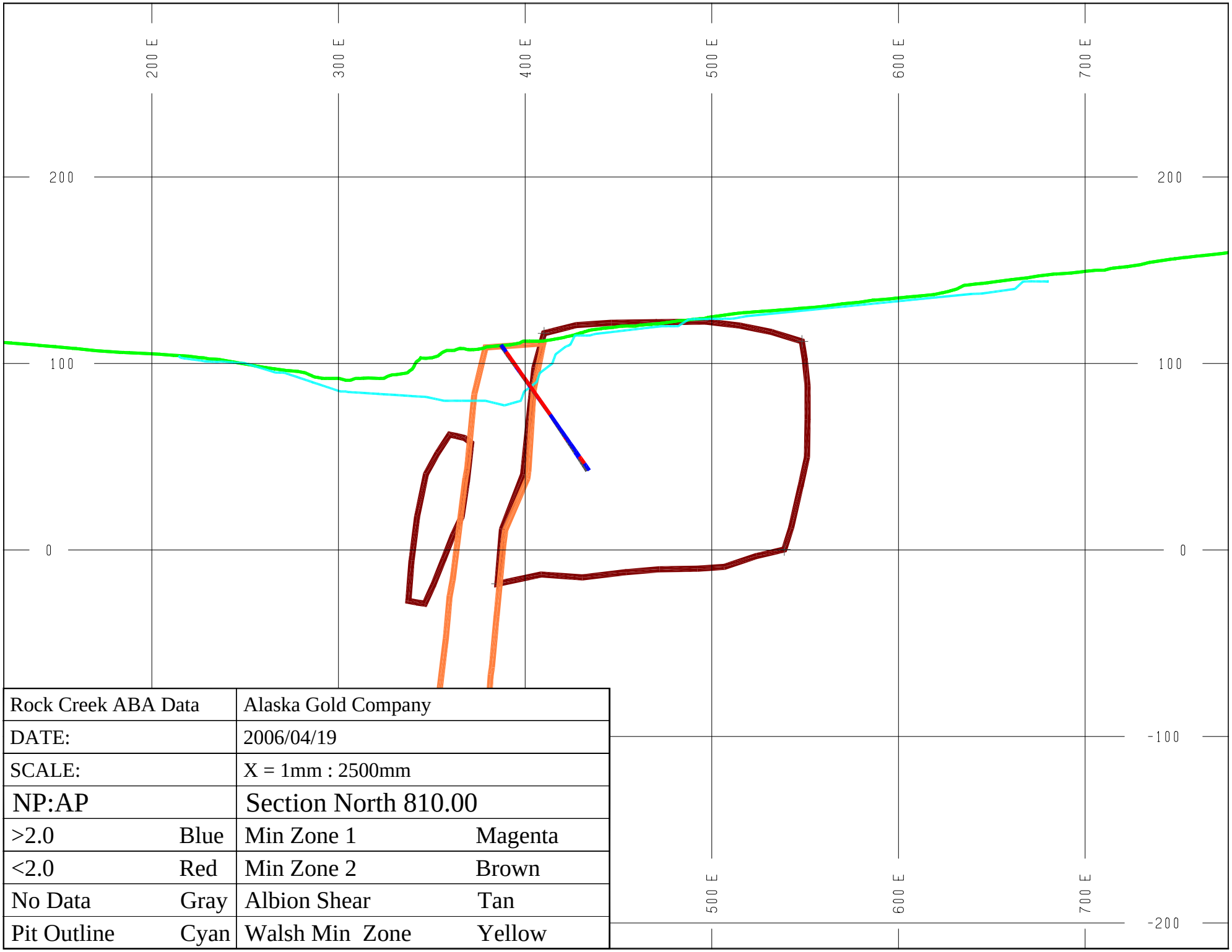
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 765.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 780.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow

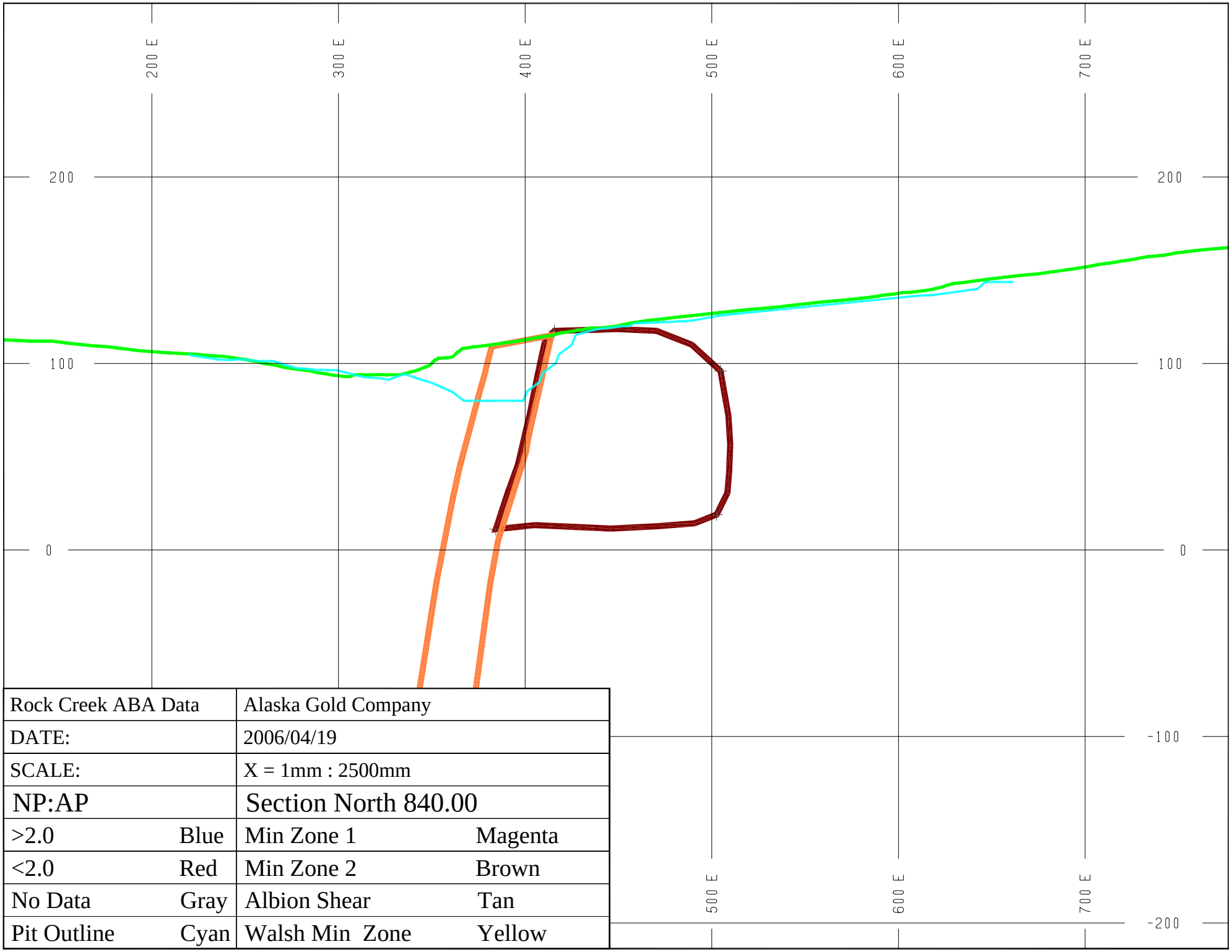


Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 795.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow

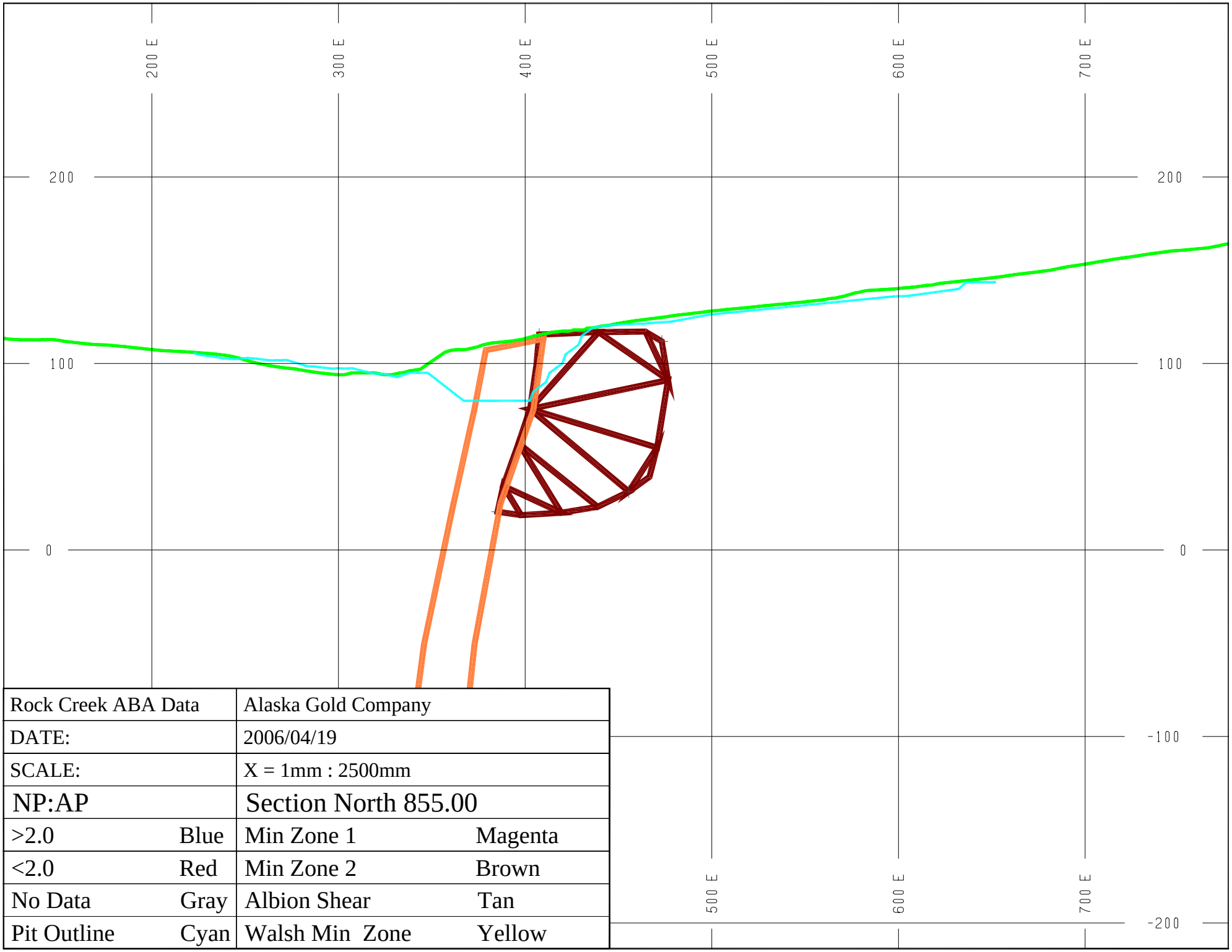


Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 810.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow

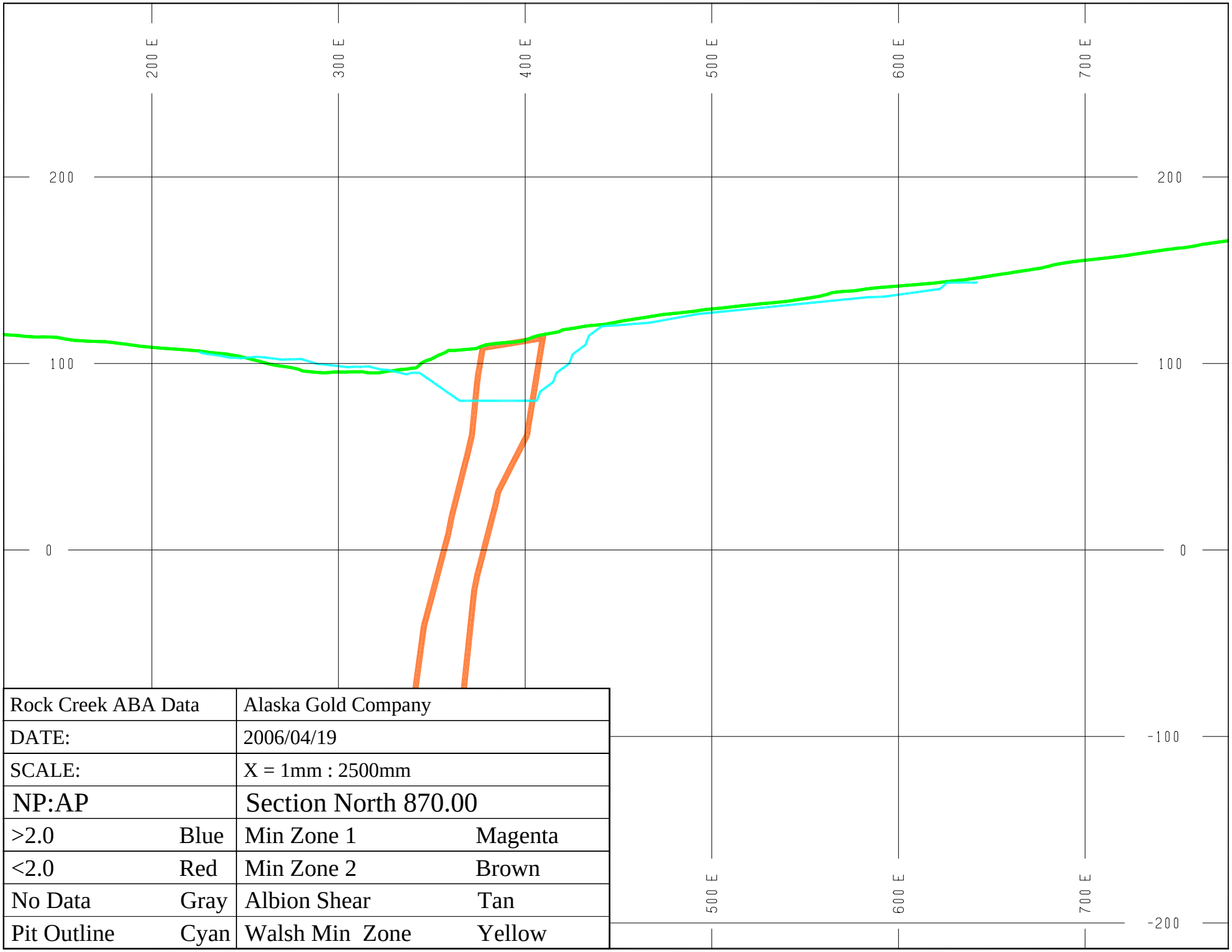
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 825.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



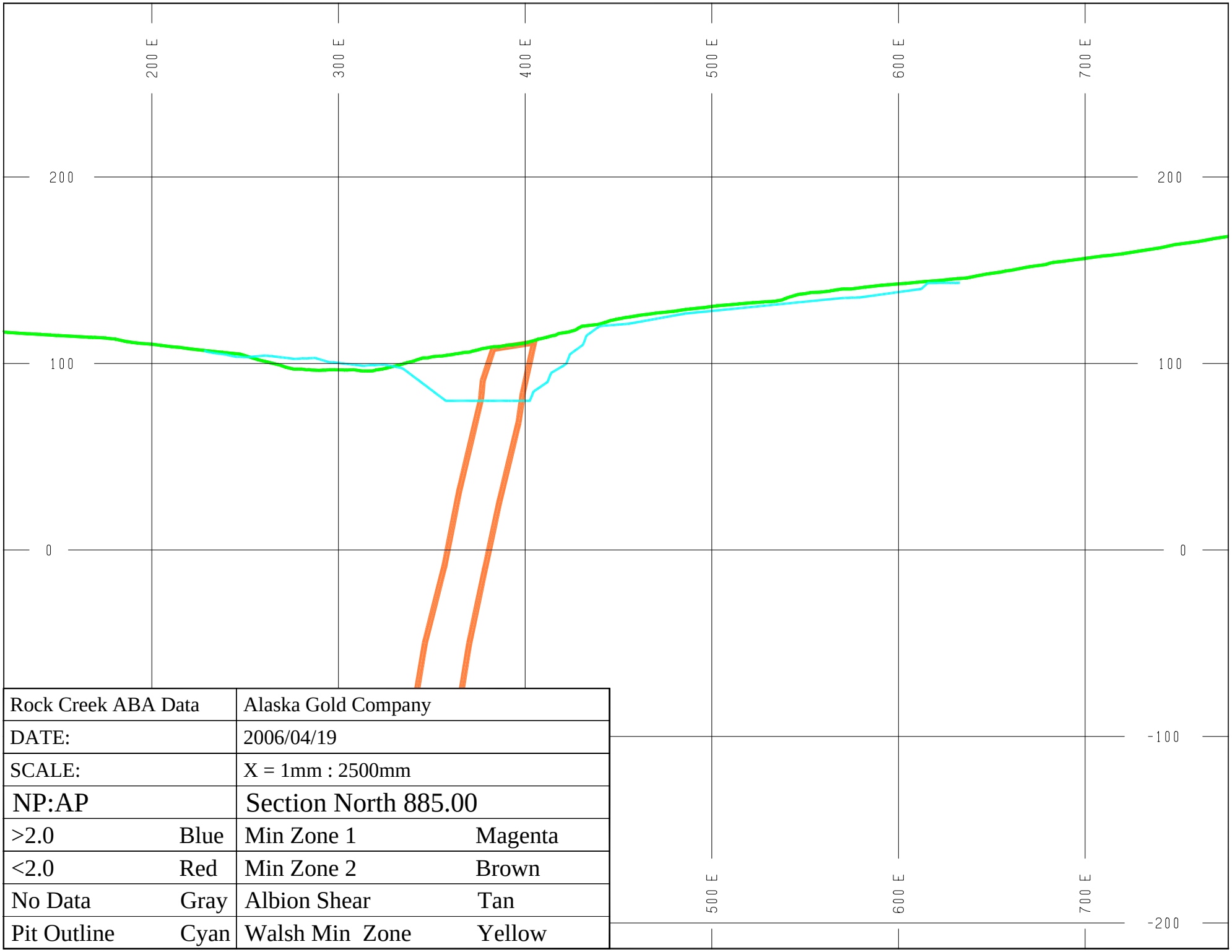
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 840.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



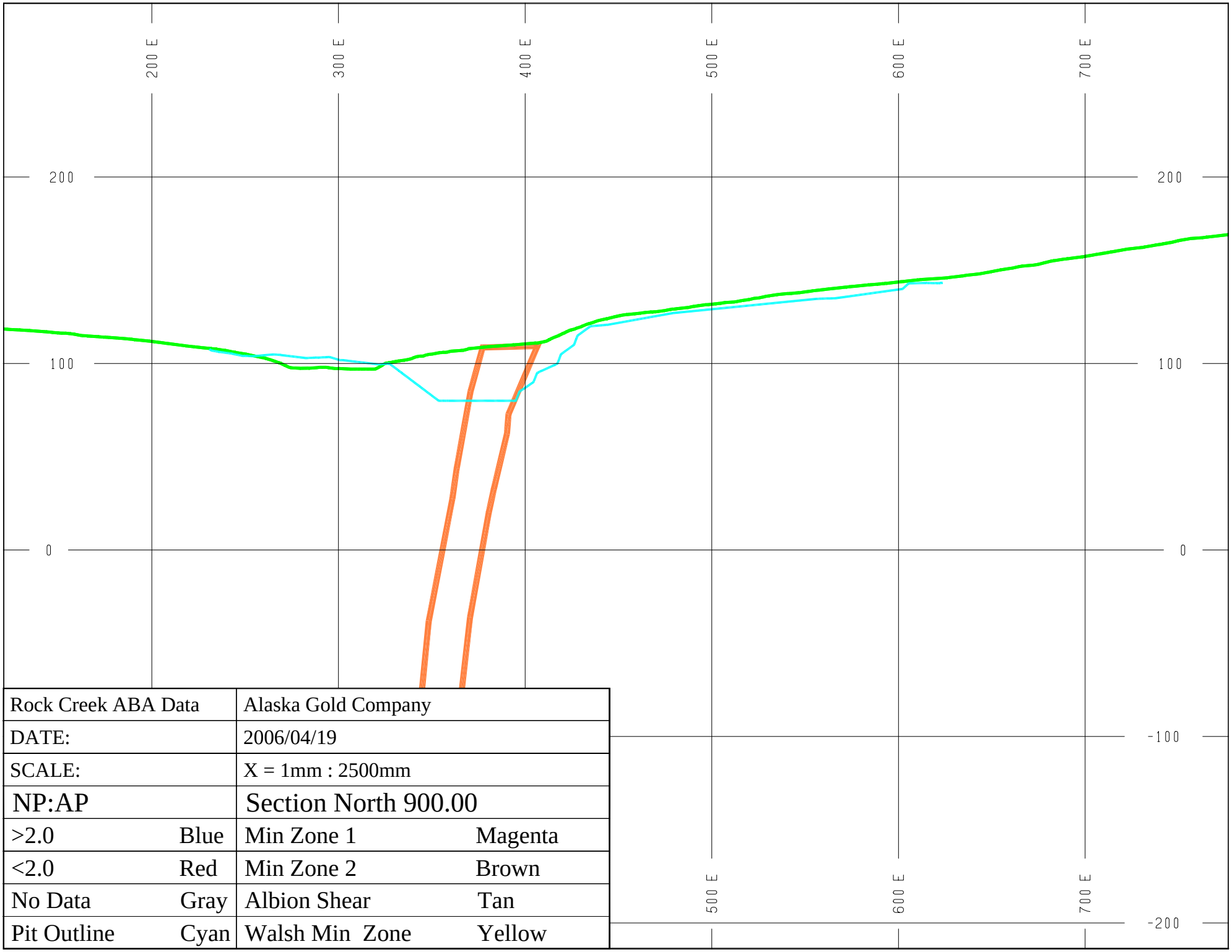
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 855.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



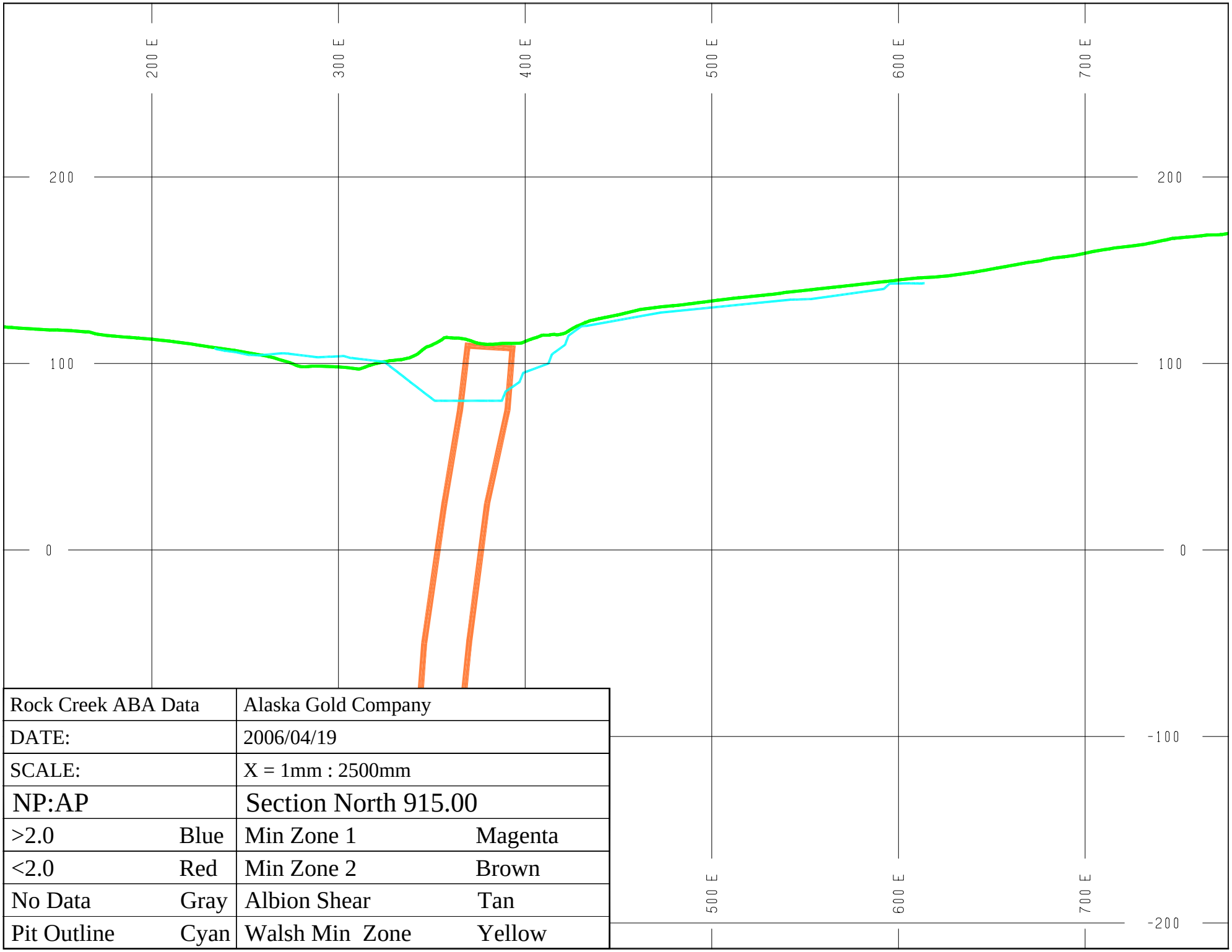
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 870.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



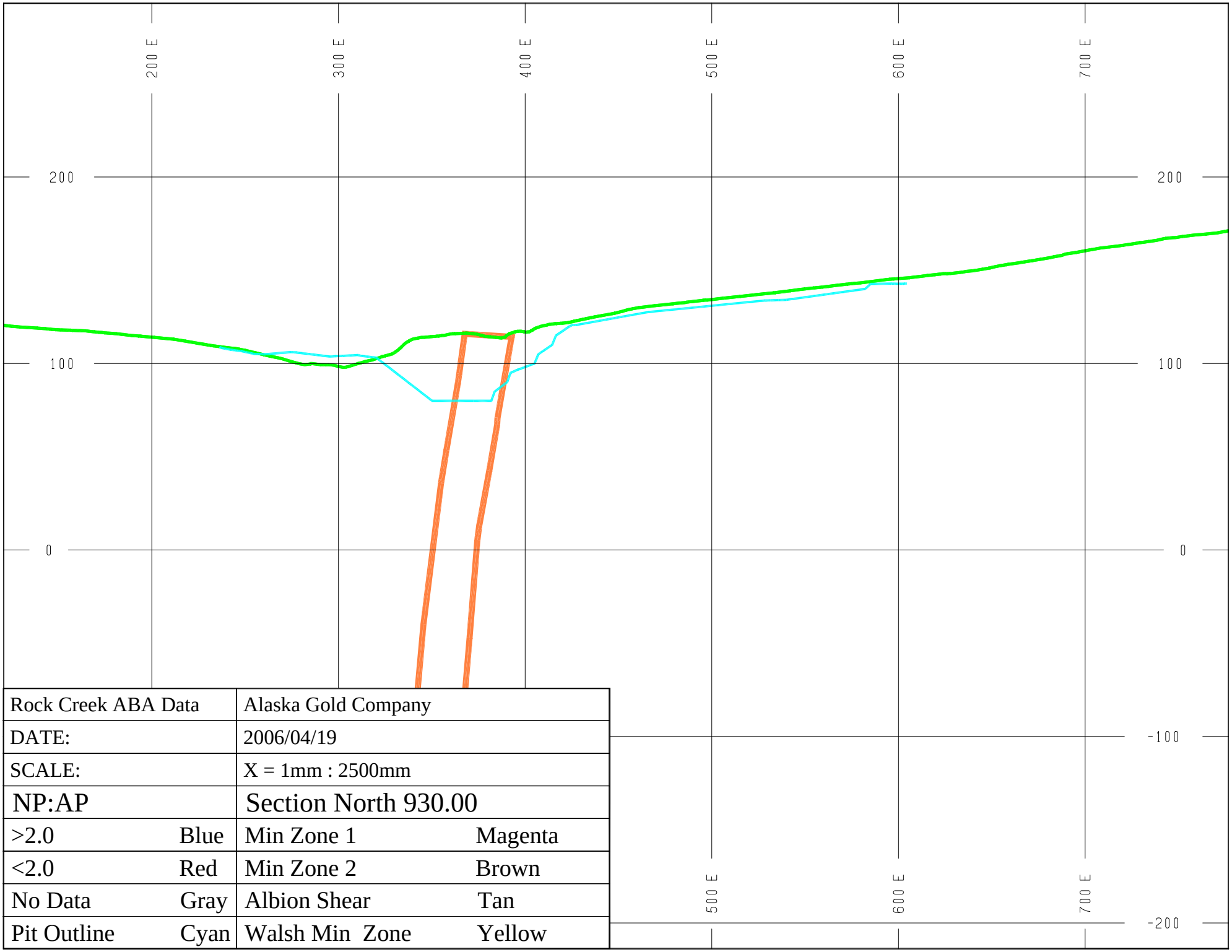
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 885.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



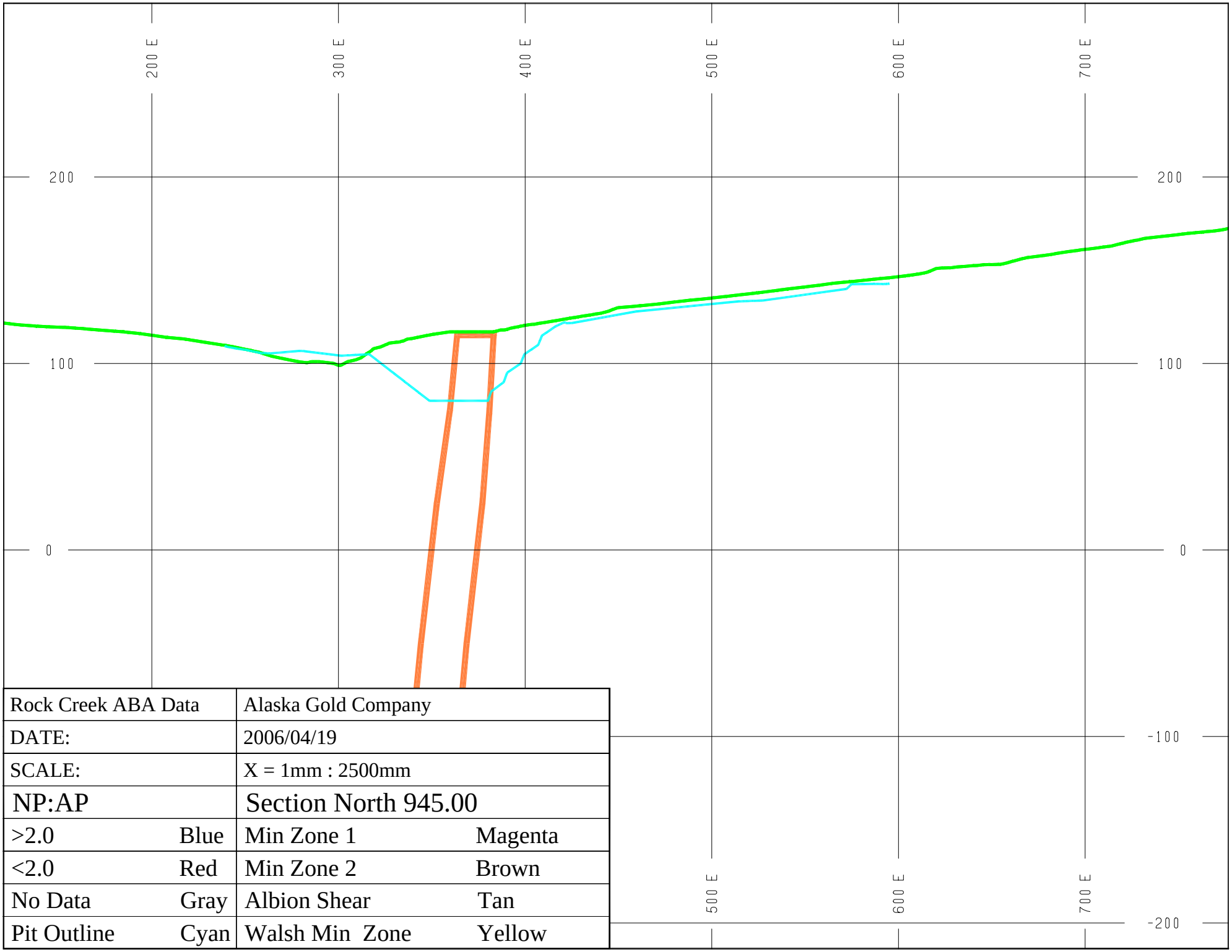
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 900.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



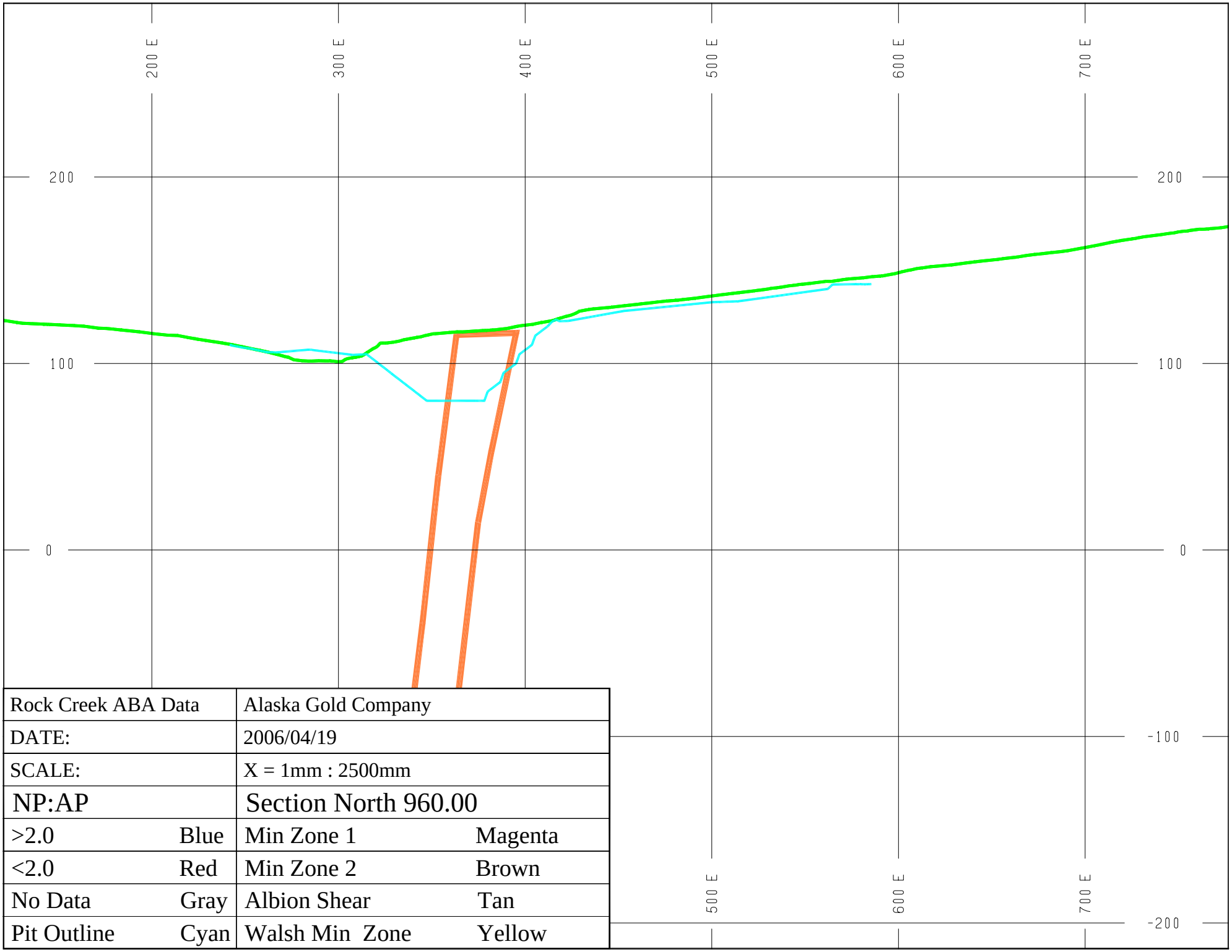
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 915.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



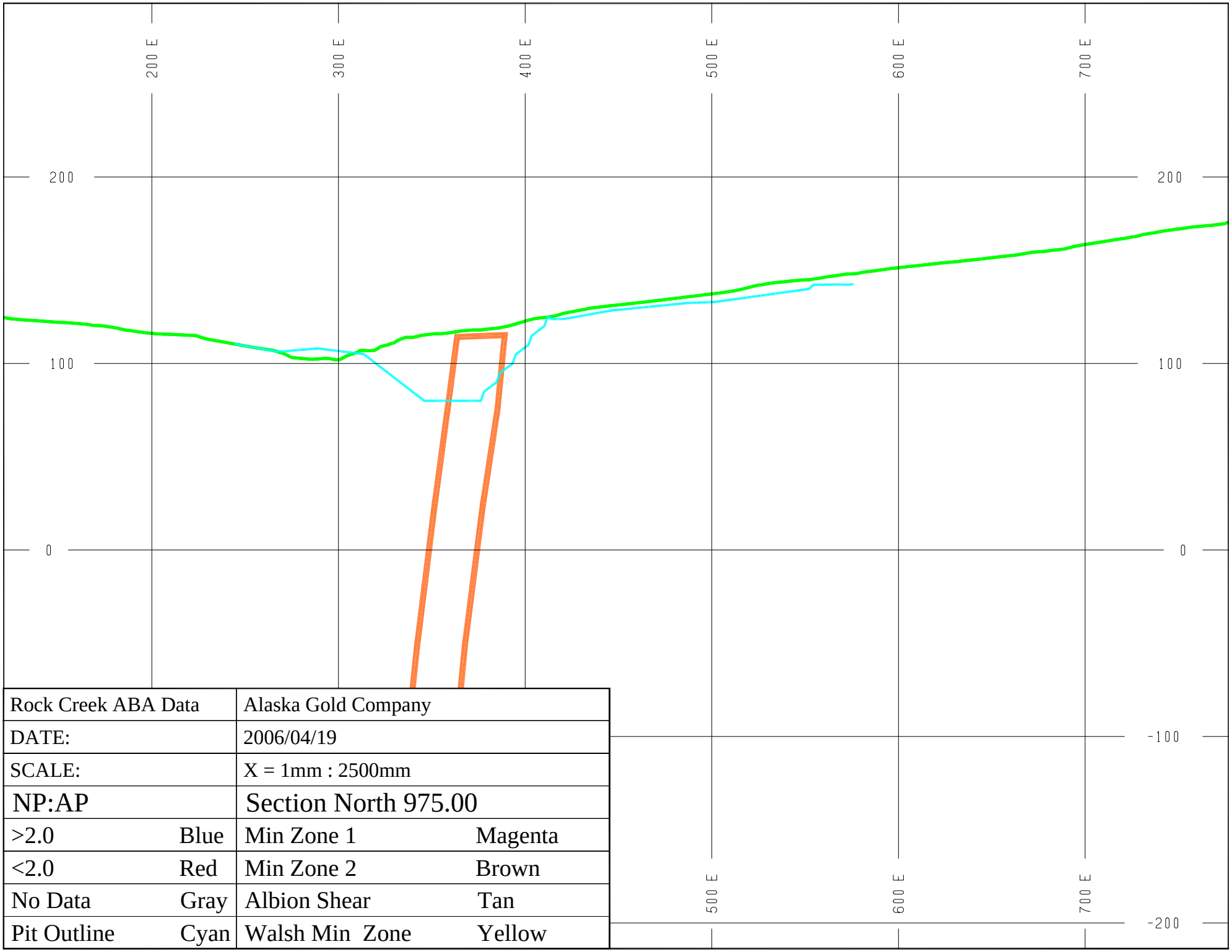
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 930.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



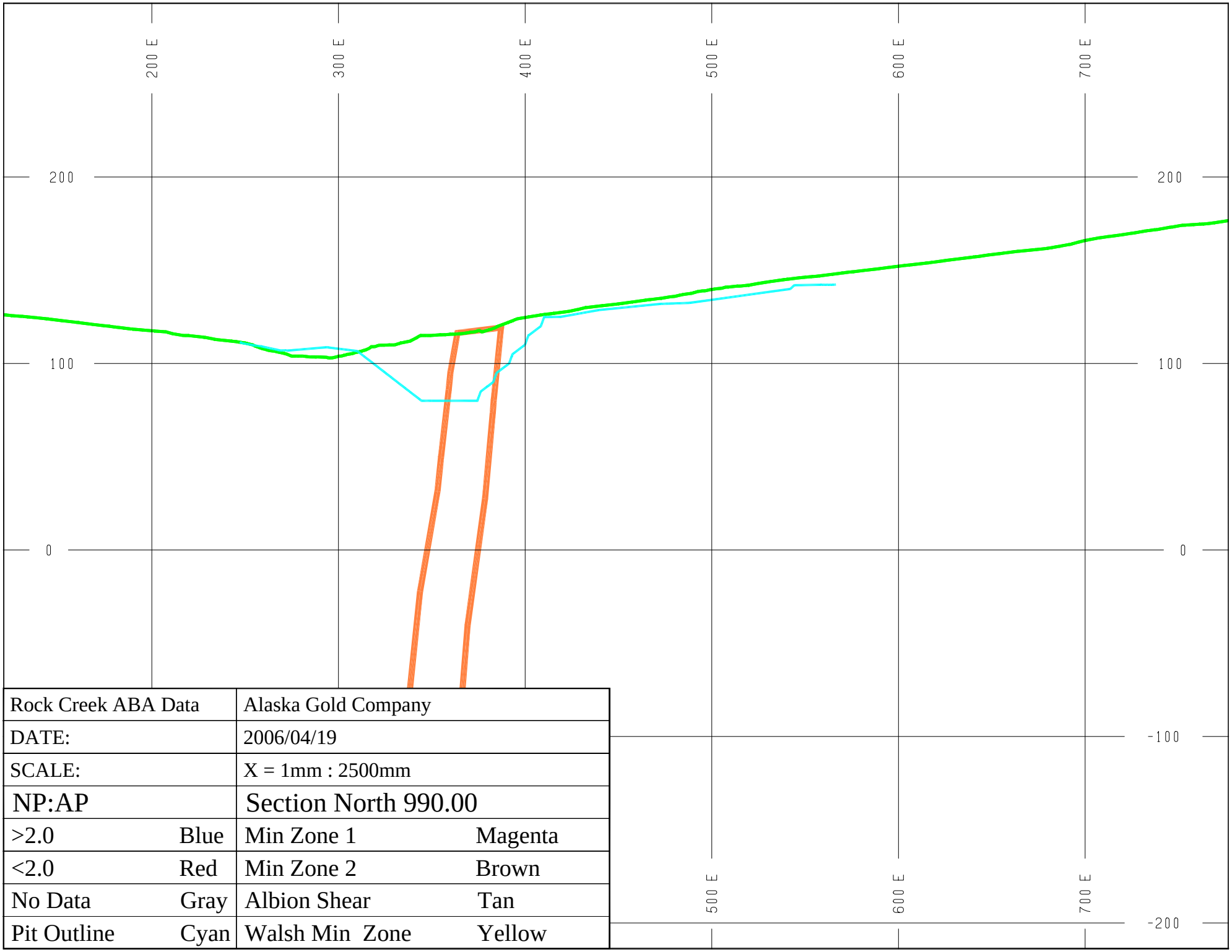
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 945.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



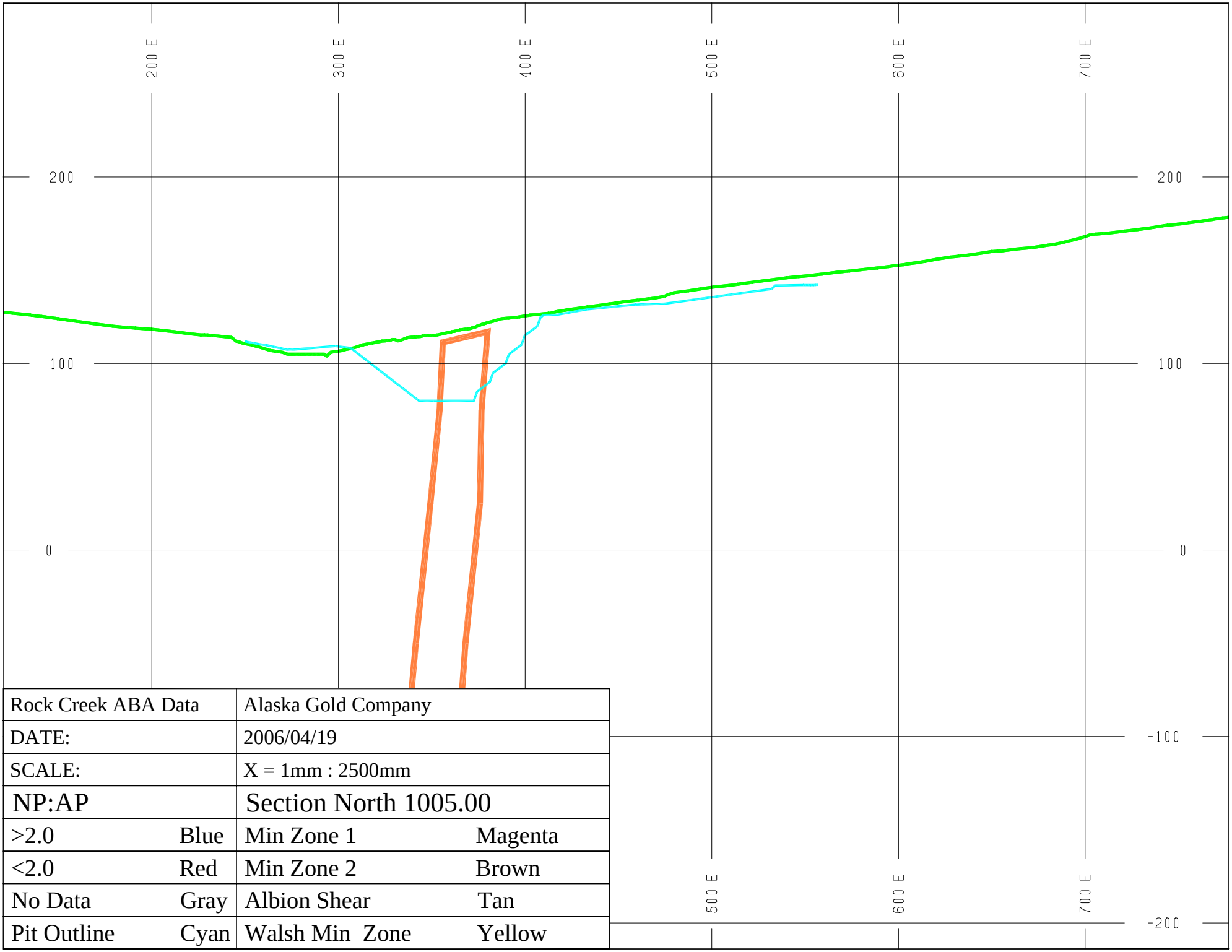
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 960.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



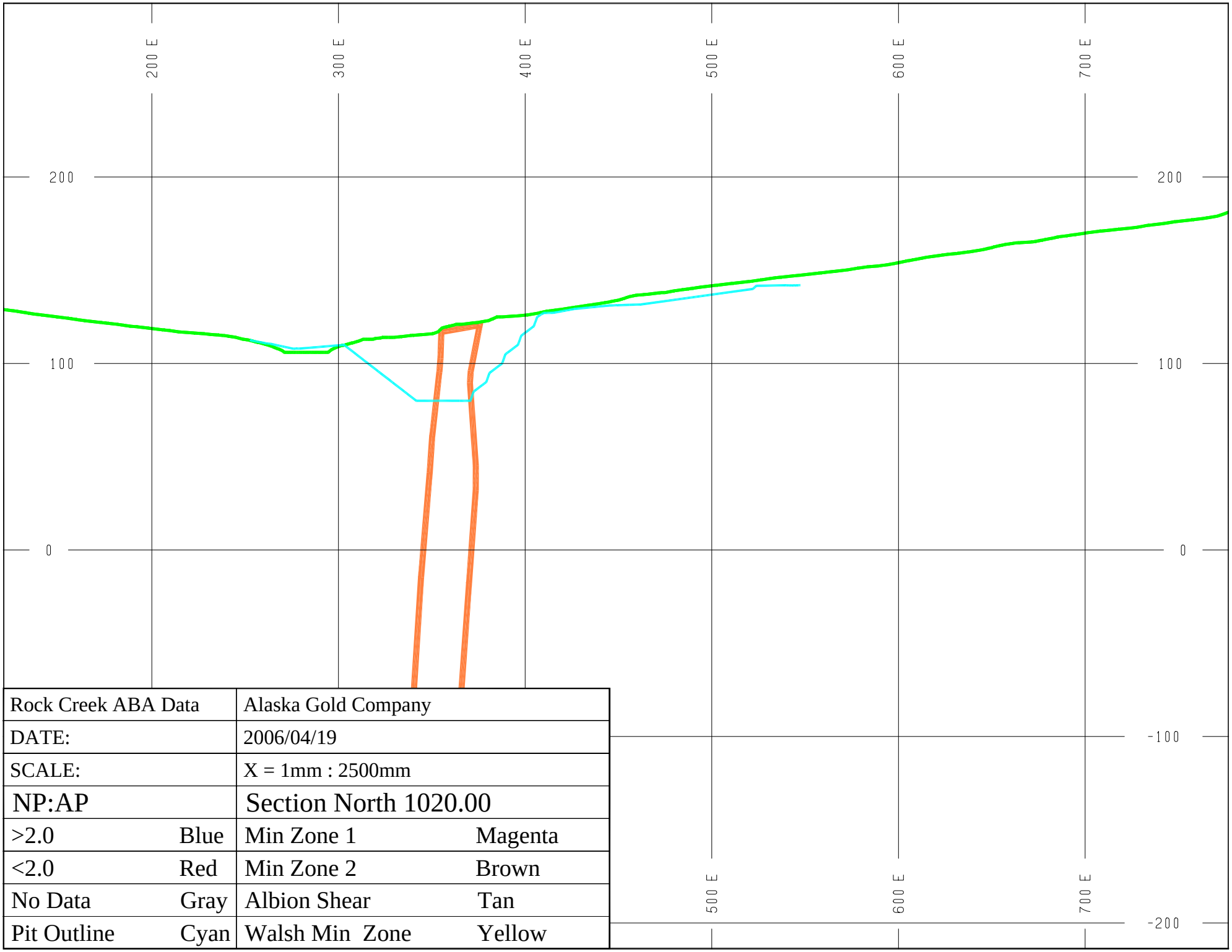
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 975.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



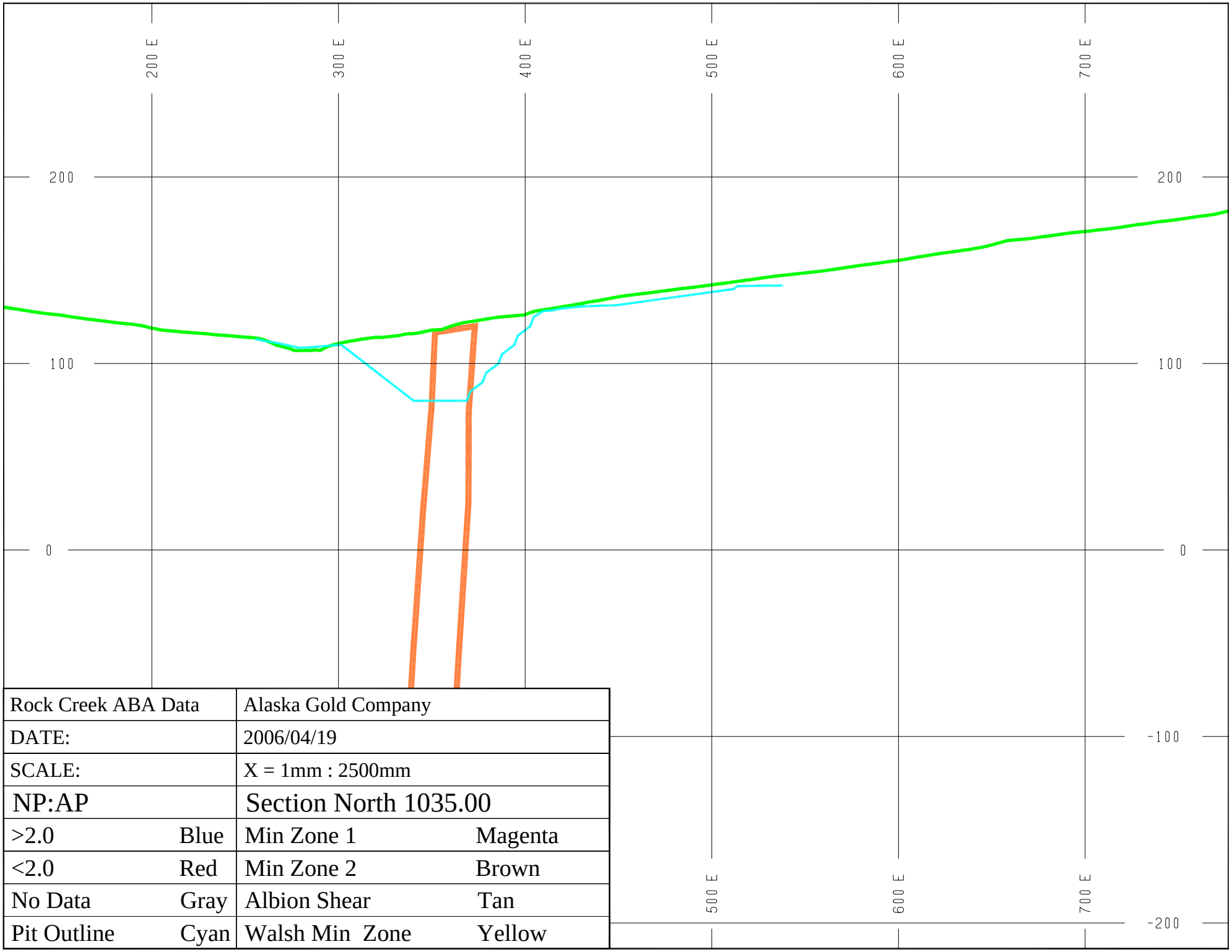
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 990.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



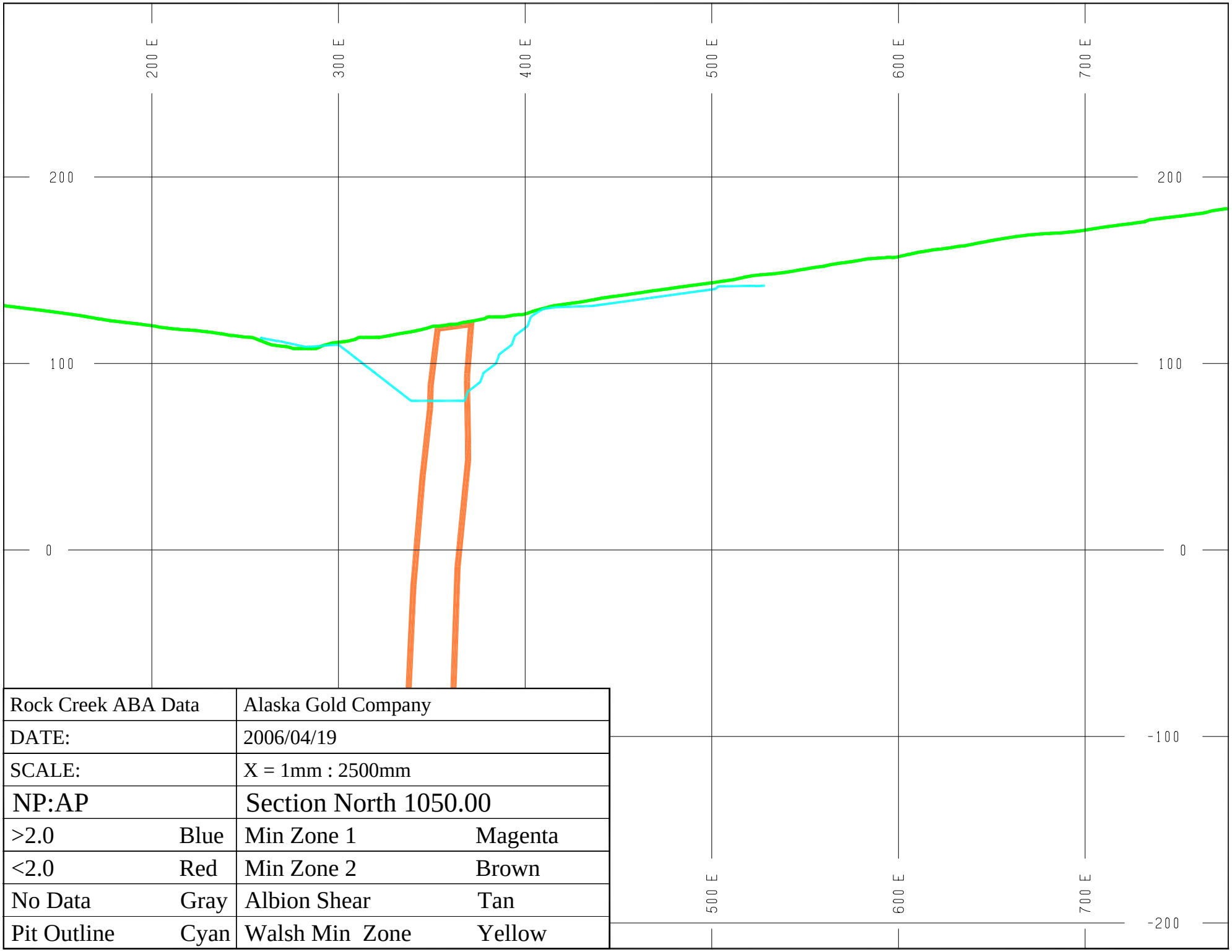
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1005.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



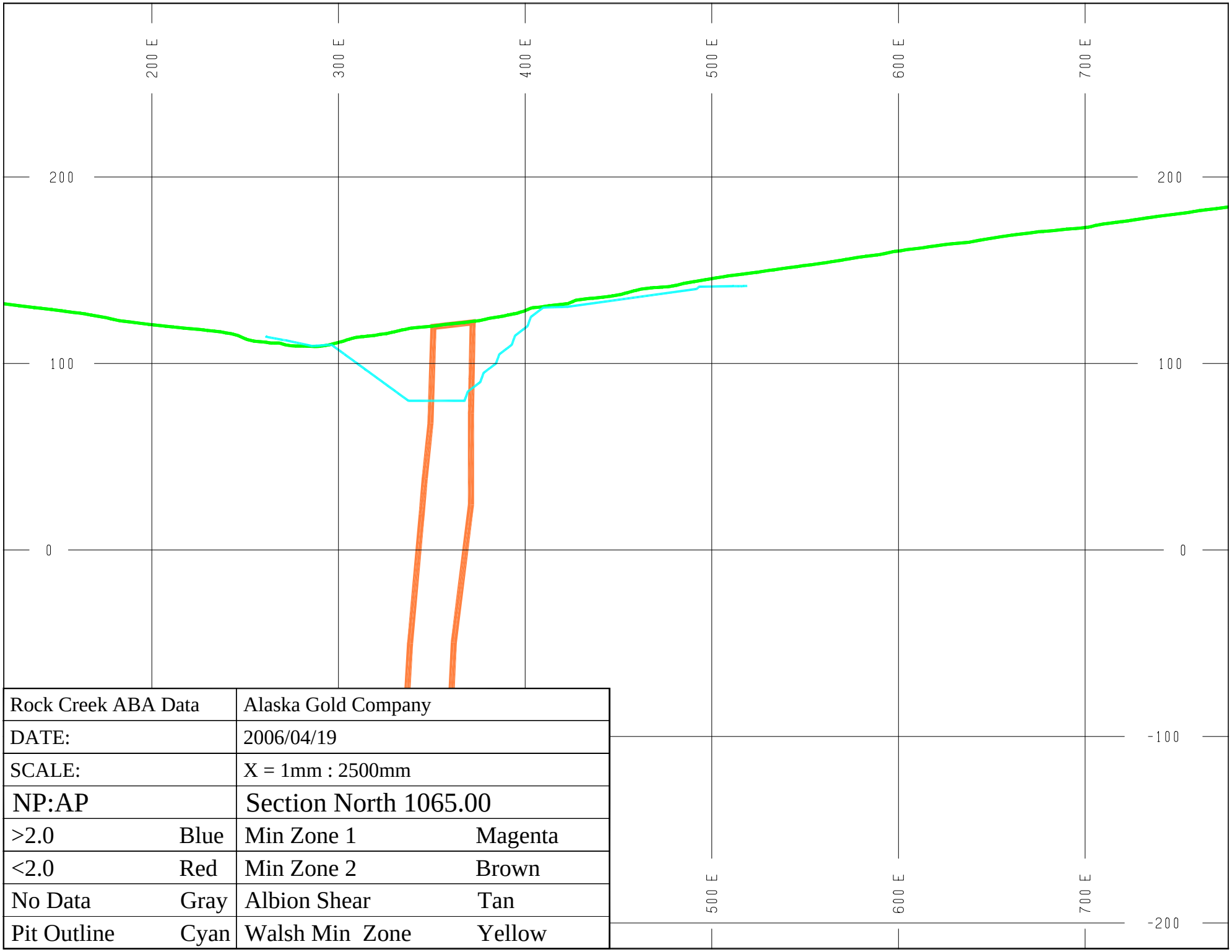
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1020.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



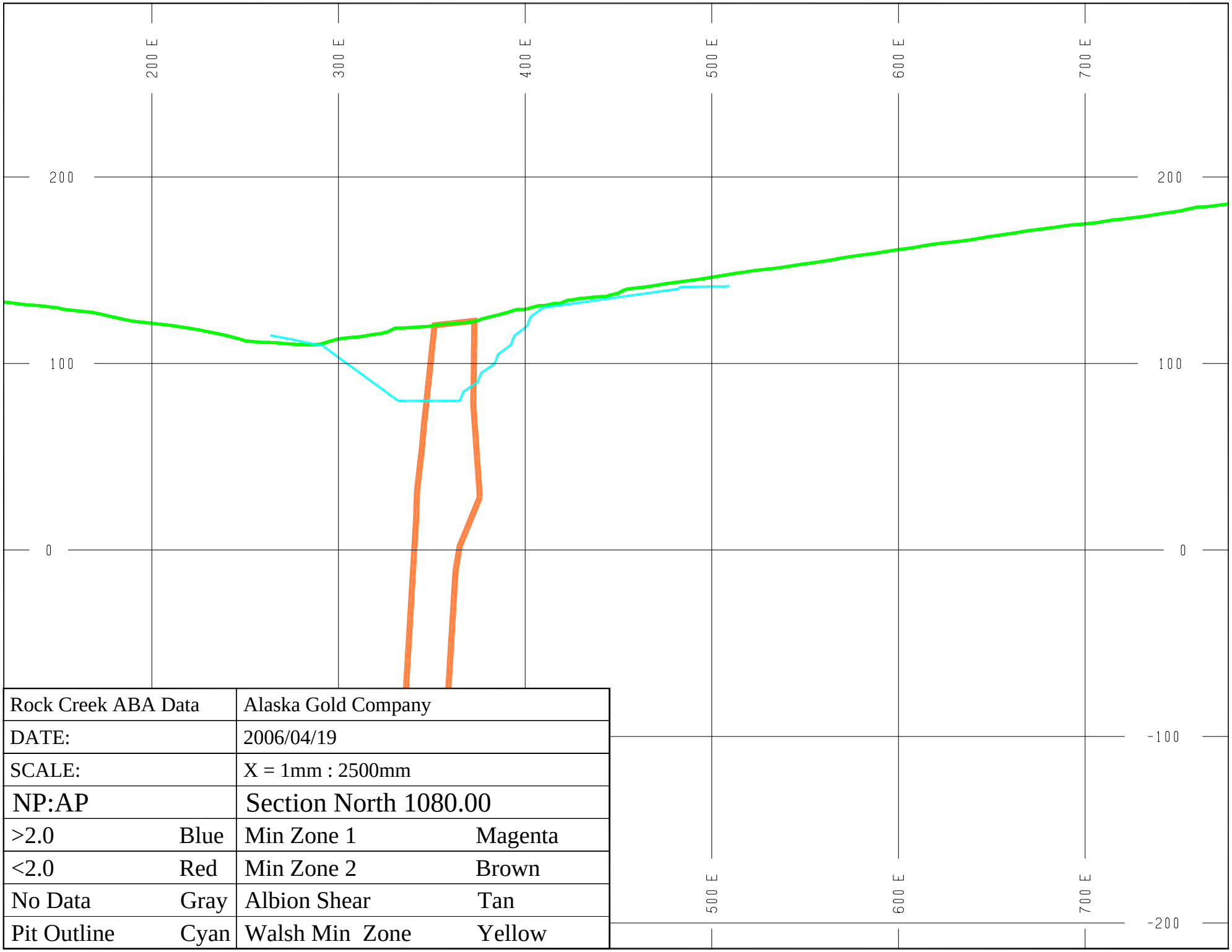
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1035.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



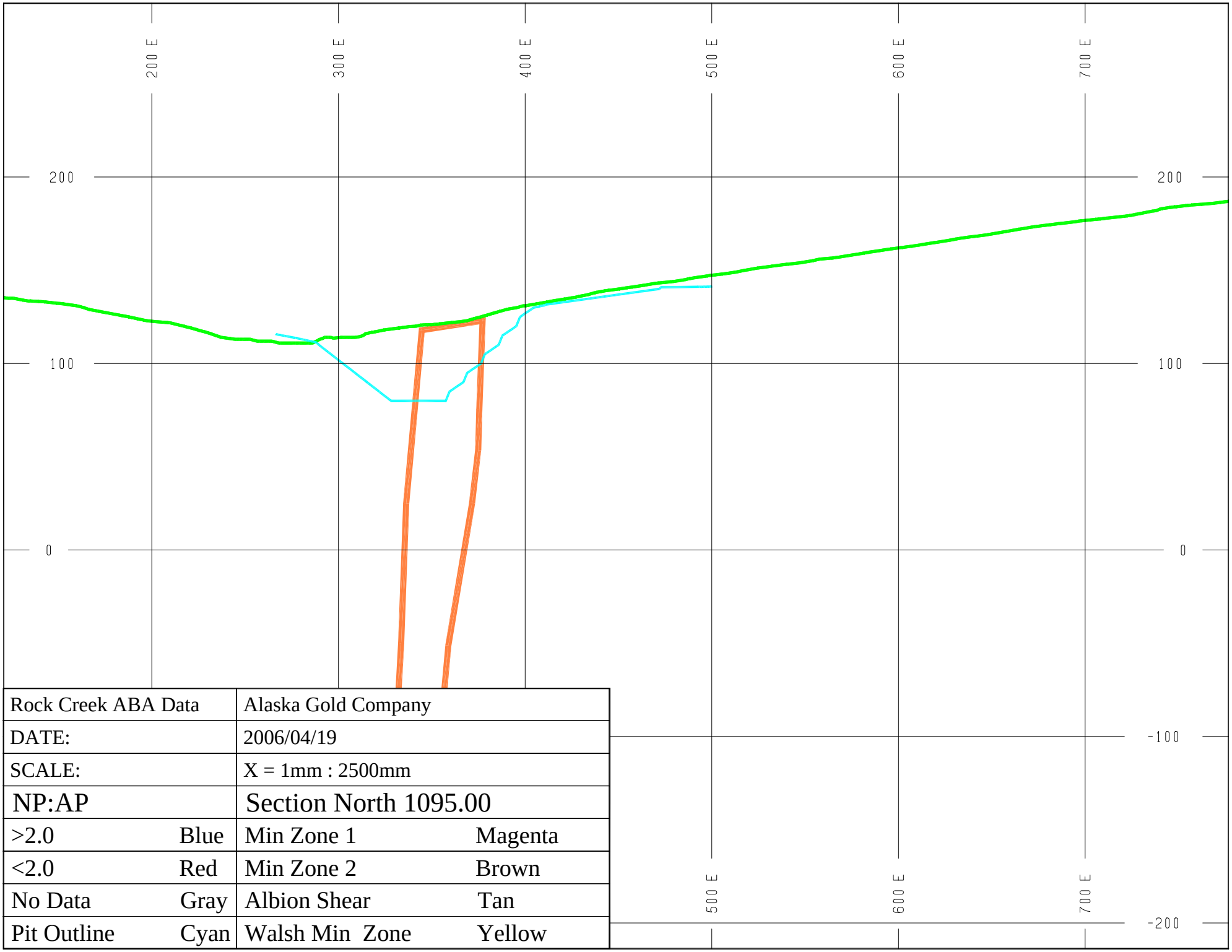
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1050.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



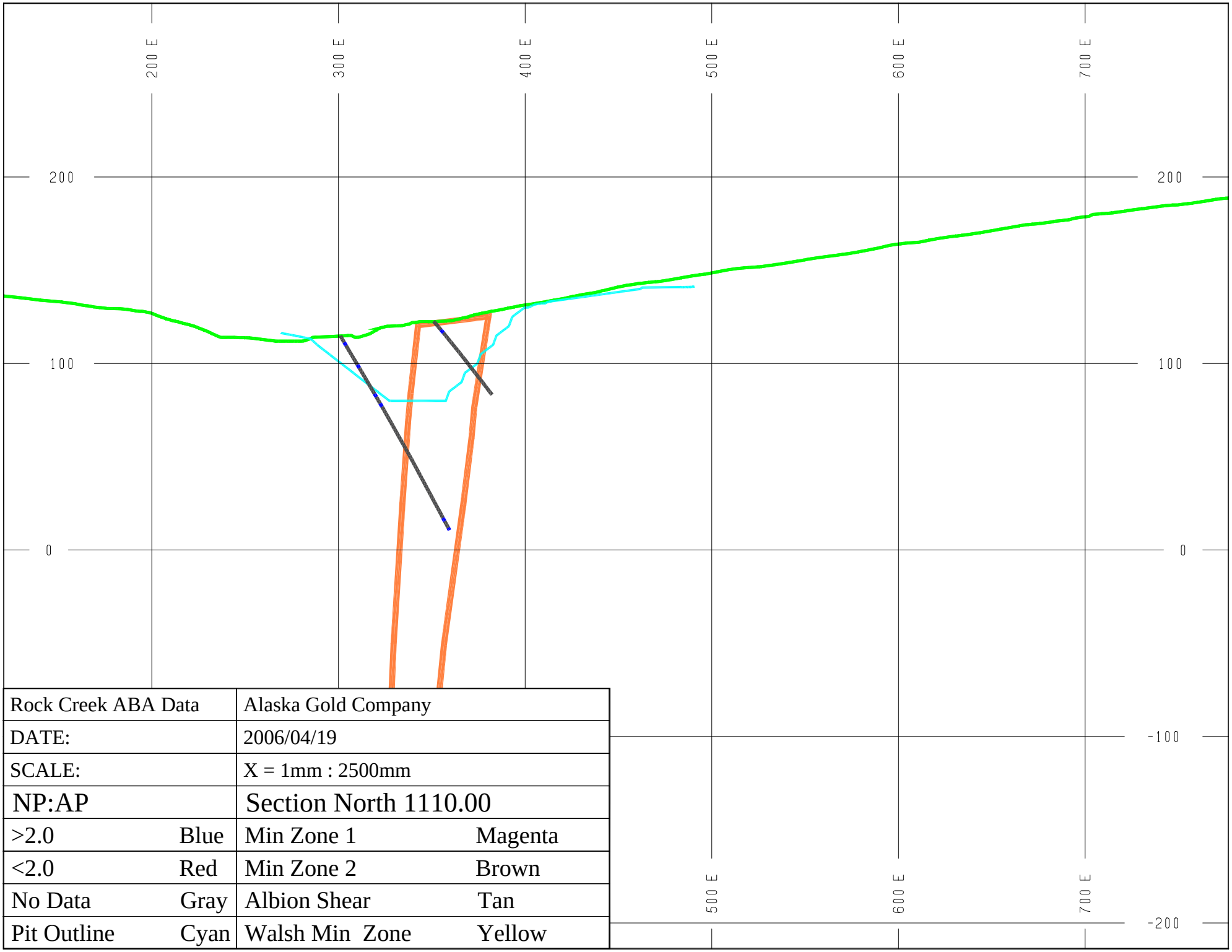
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1065.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



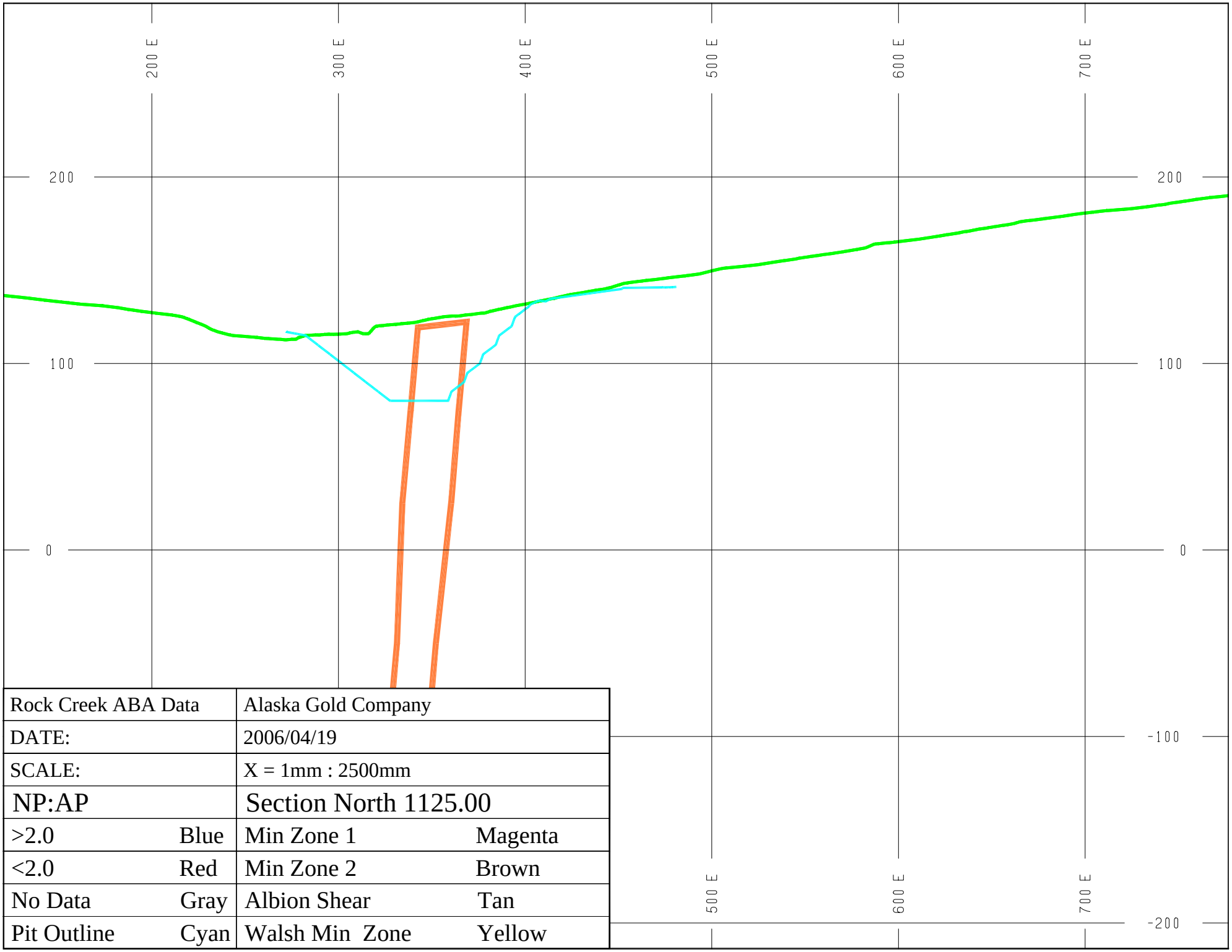
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1080.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



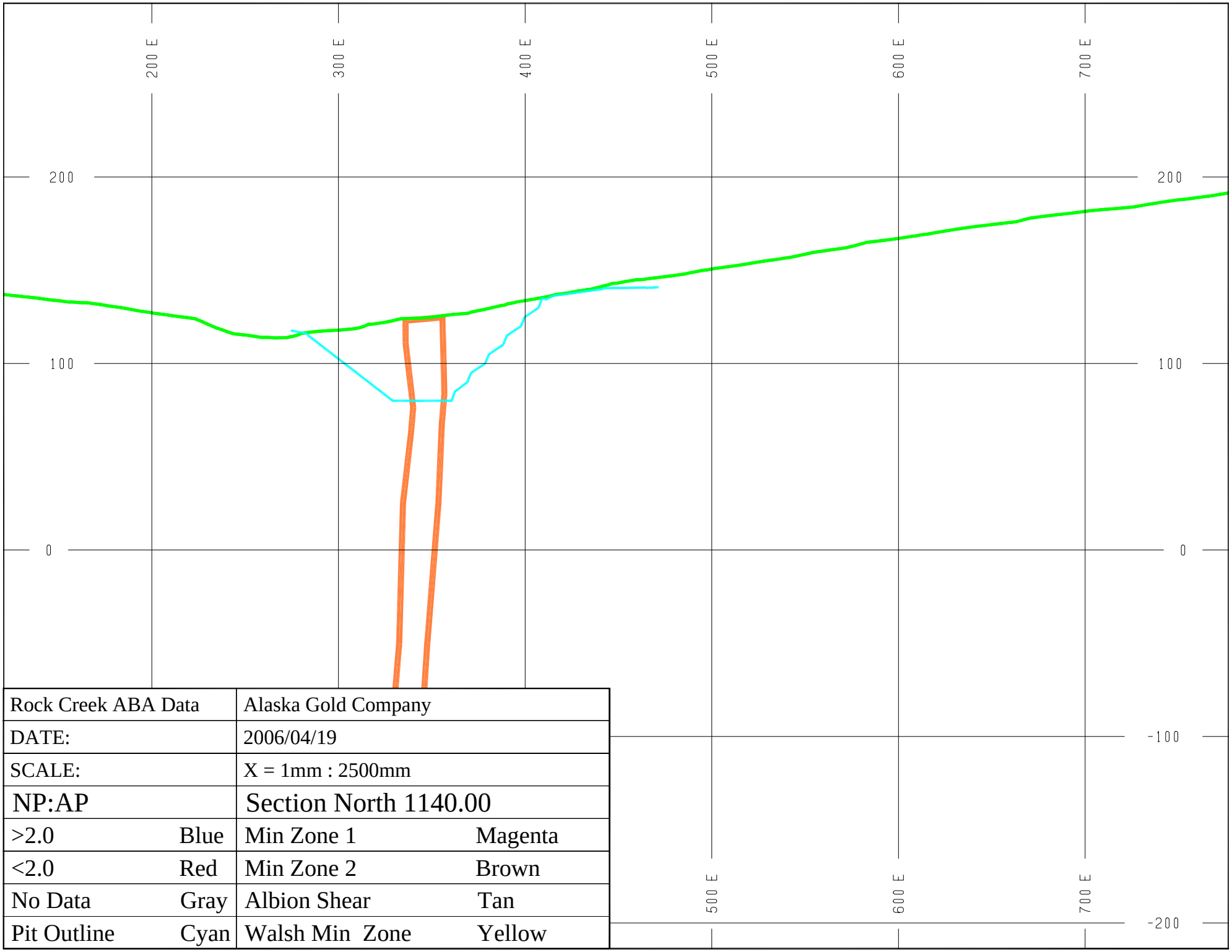
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1095.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



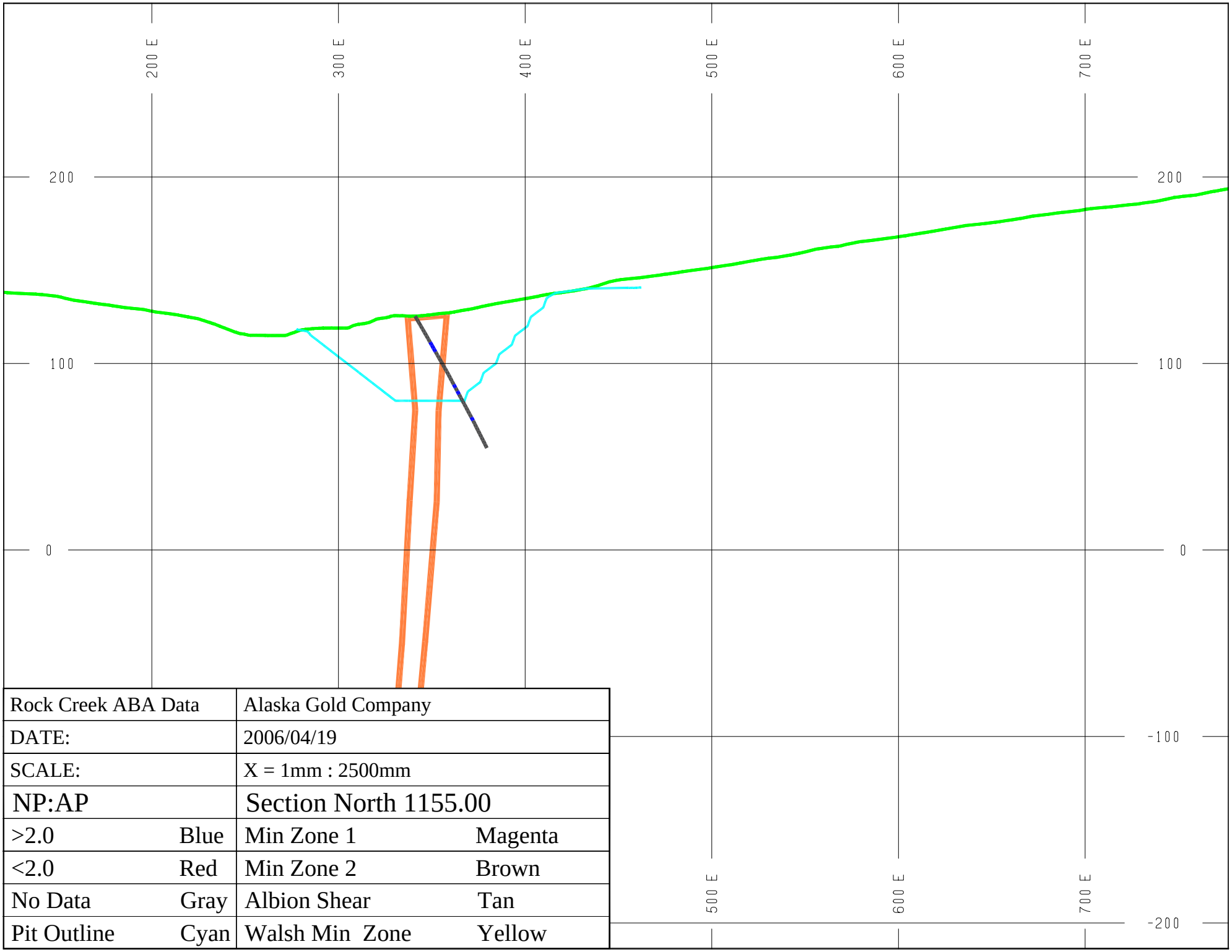
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1110.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



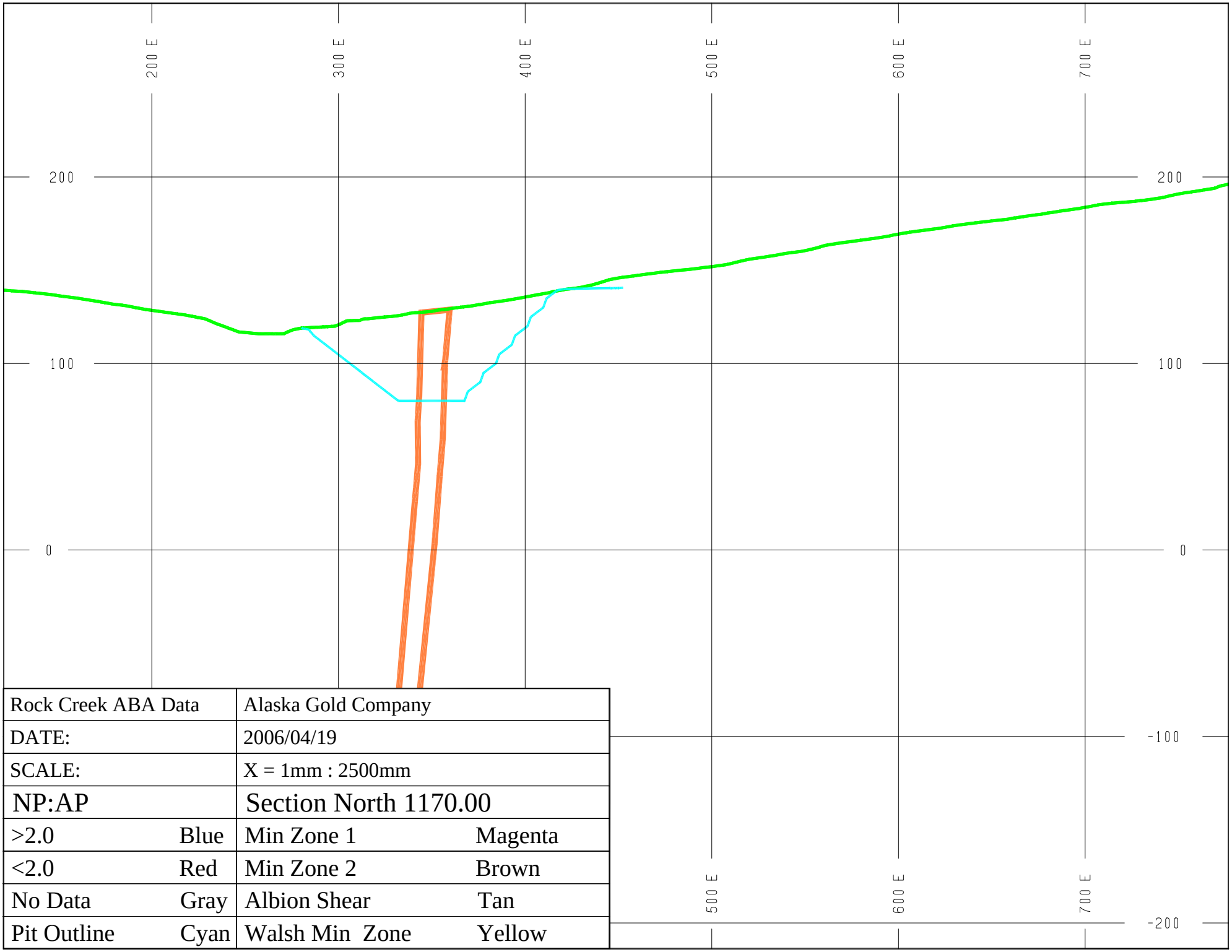
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1125.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



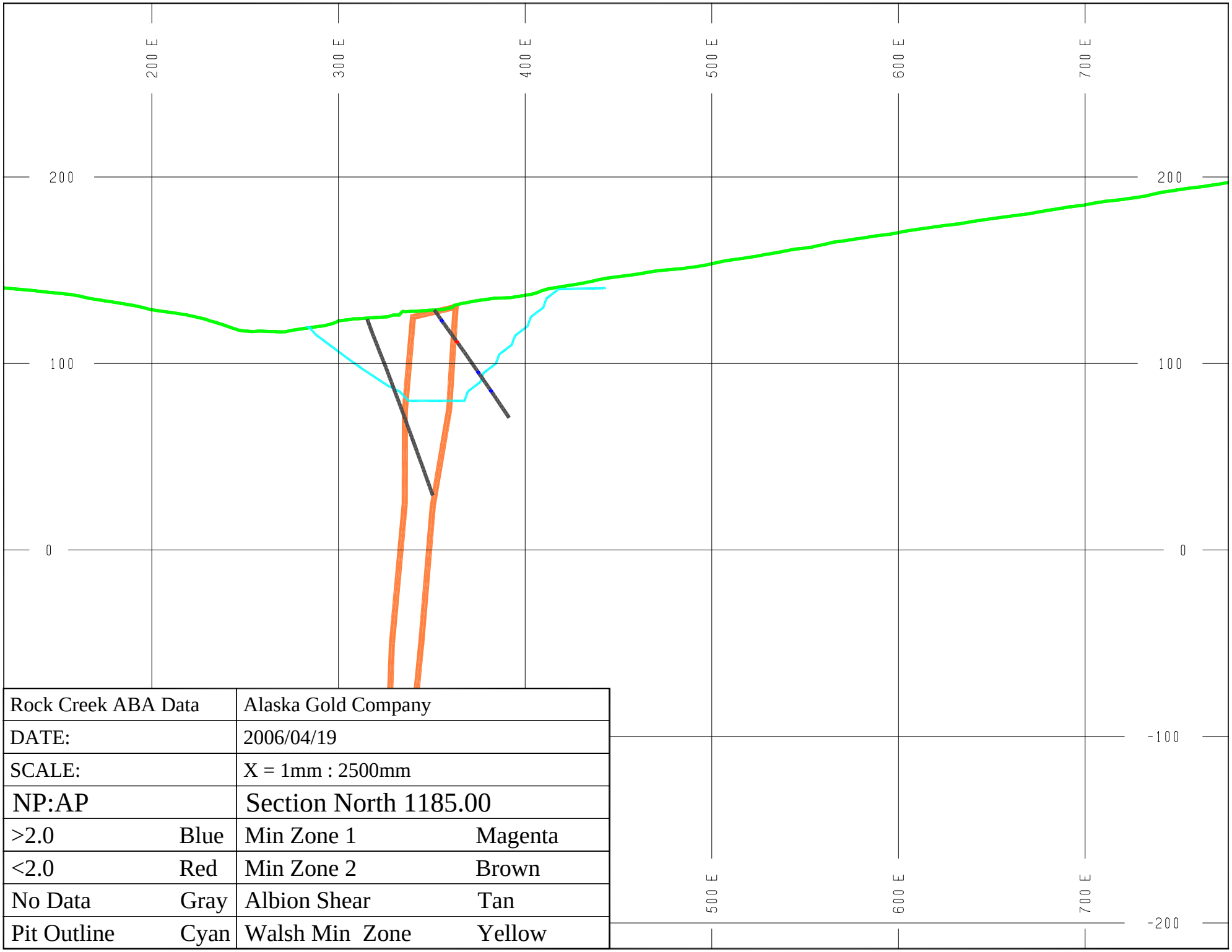
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1140.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



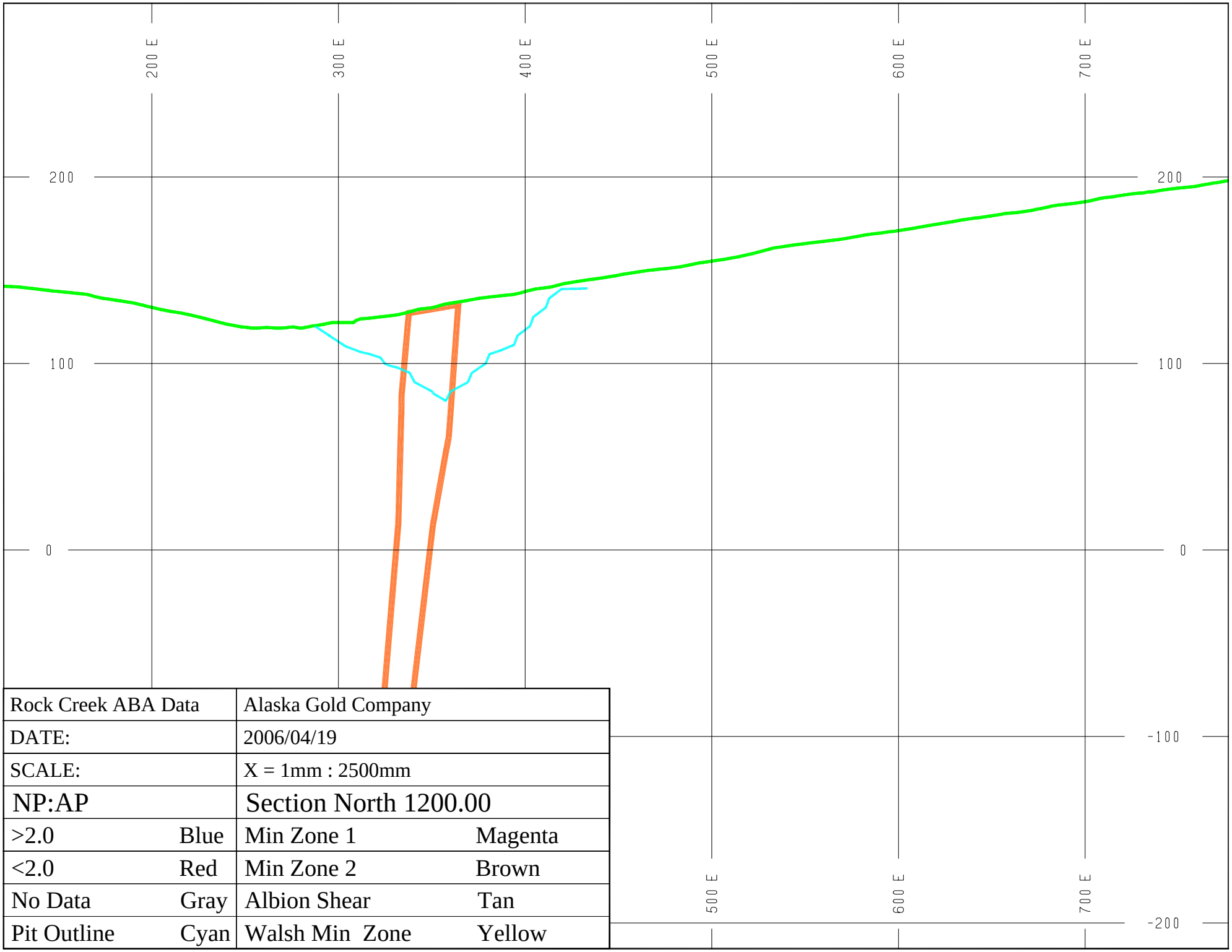
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1155.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



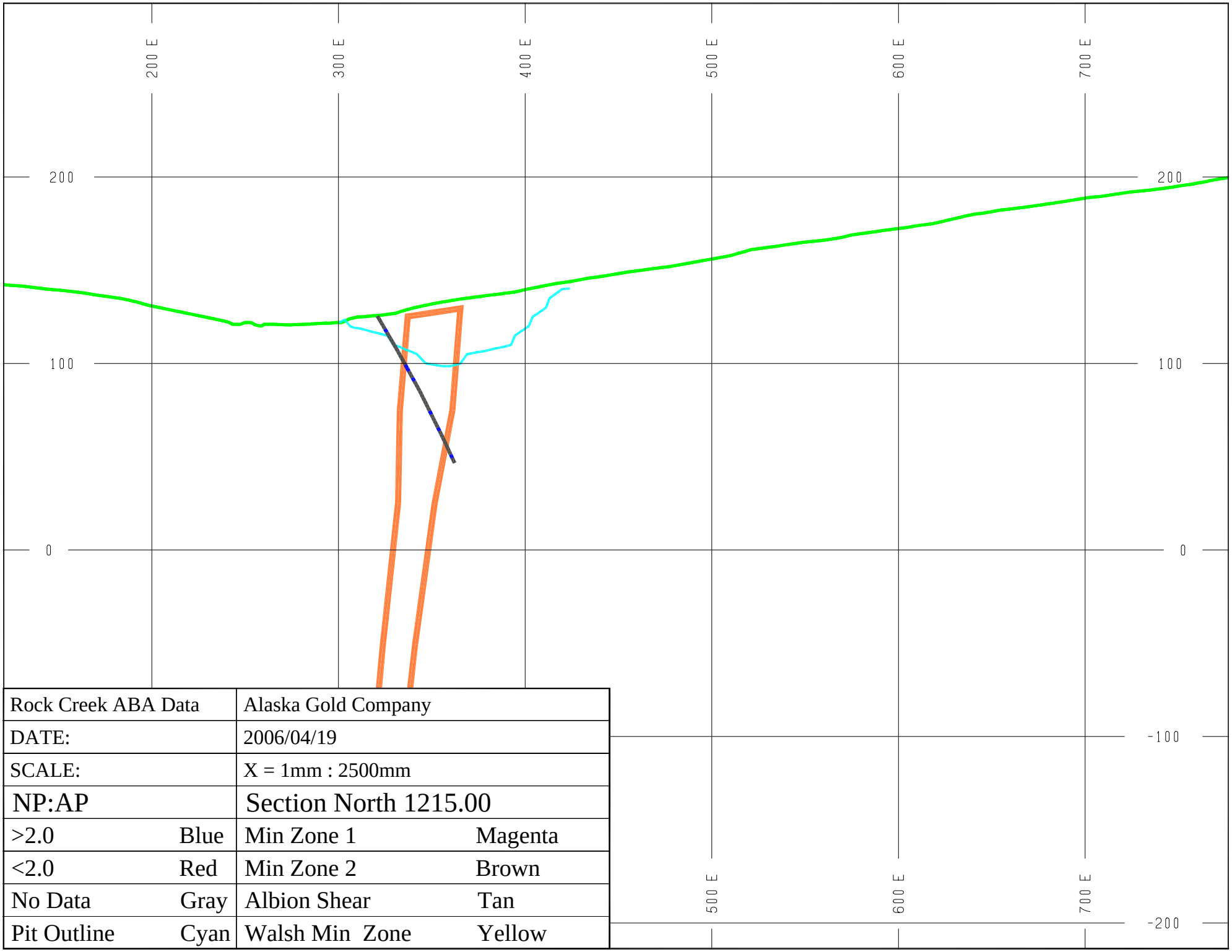
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1170.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



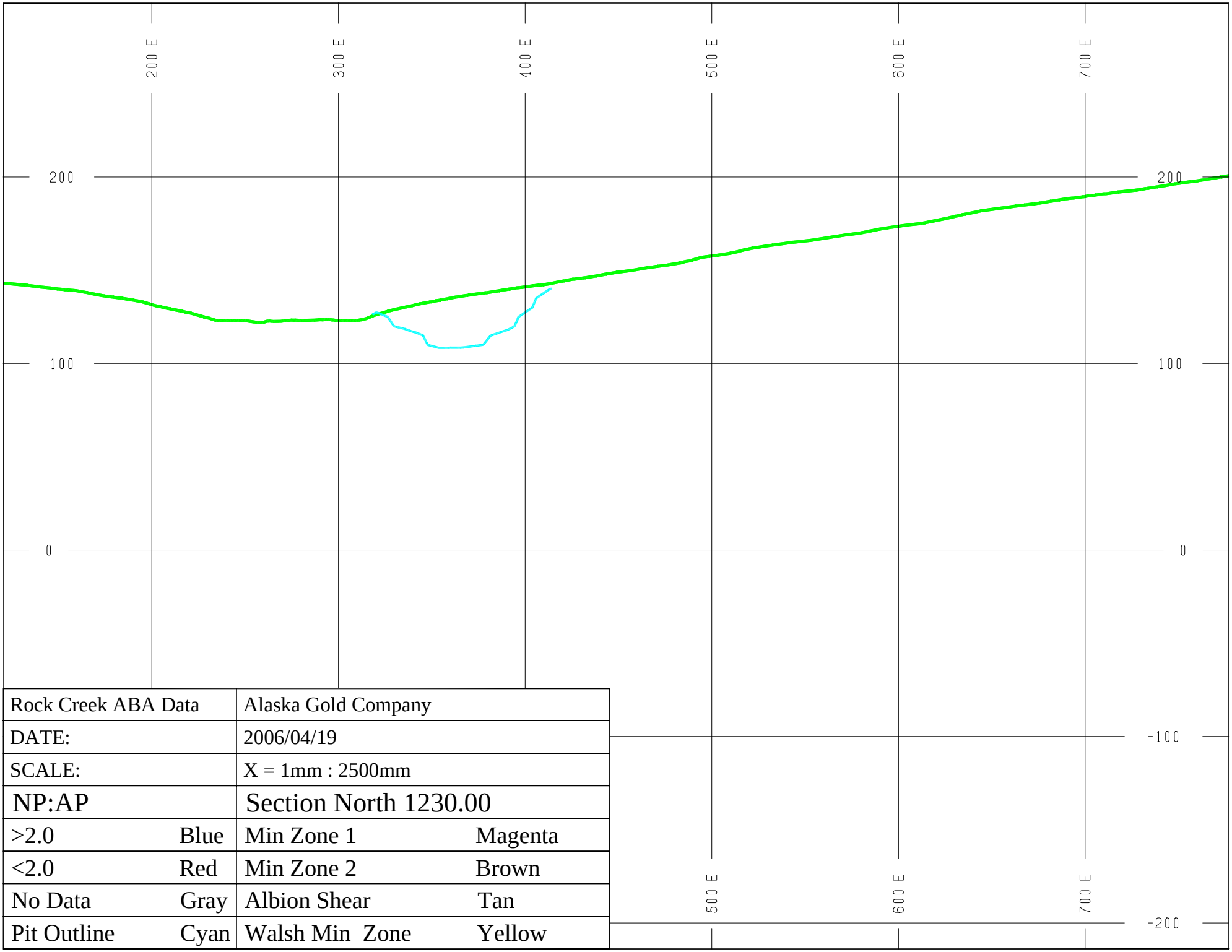
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1185.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



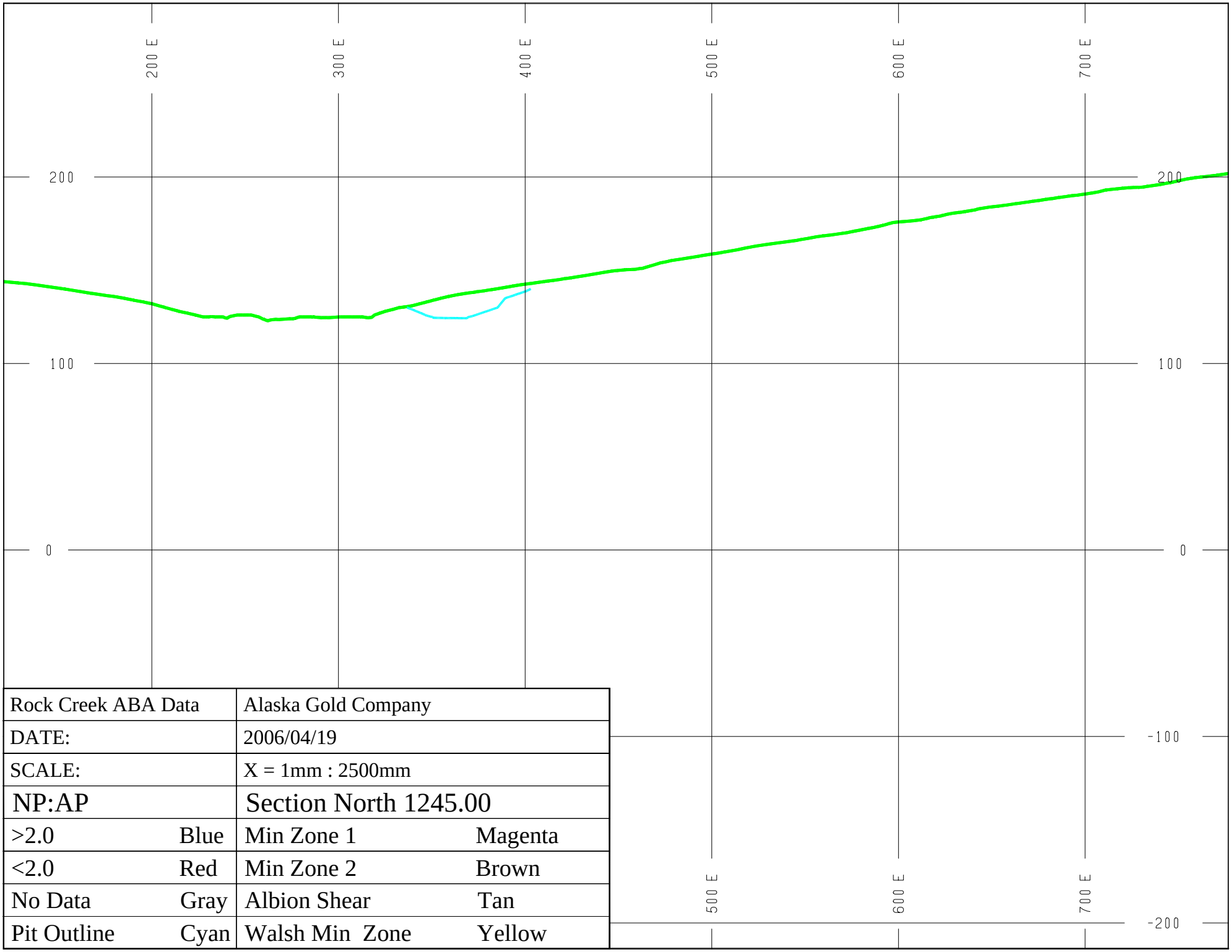
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1200.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



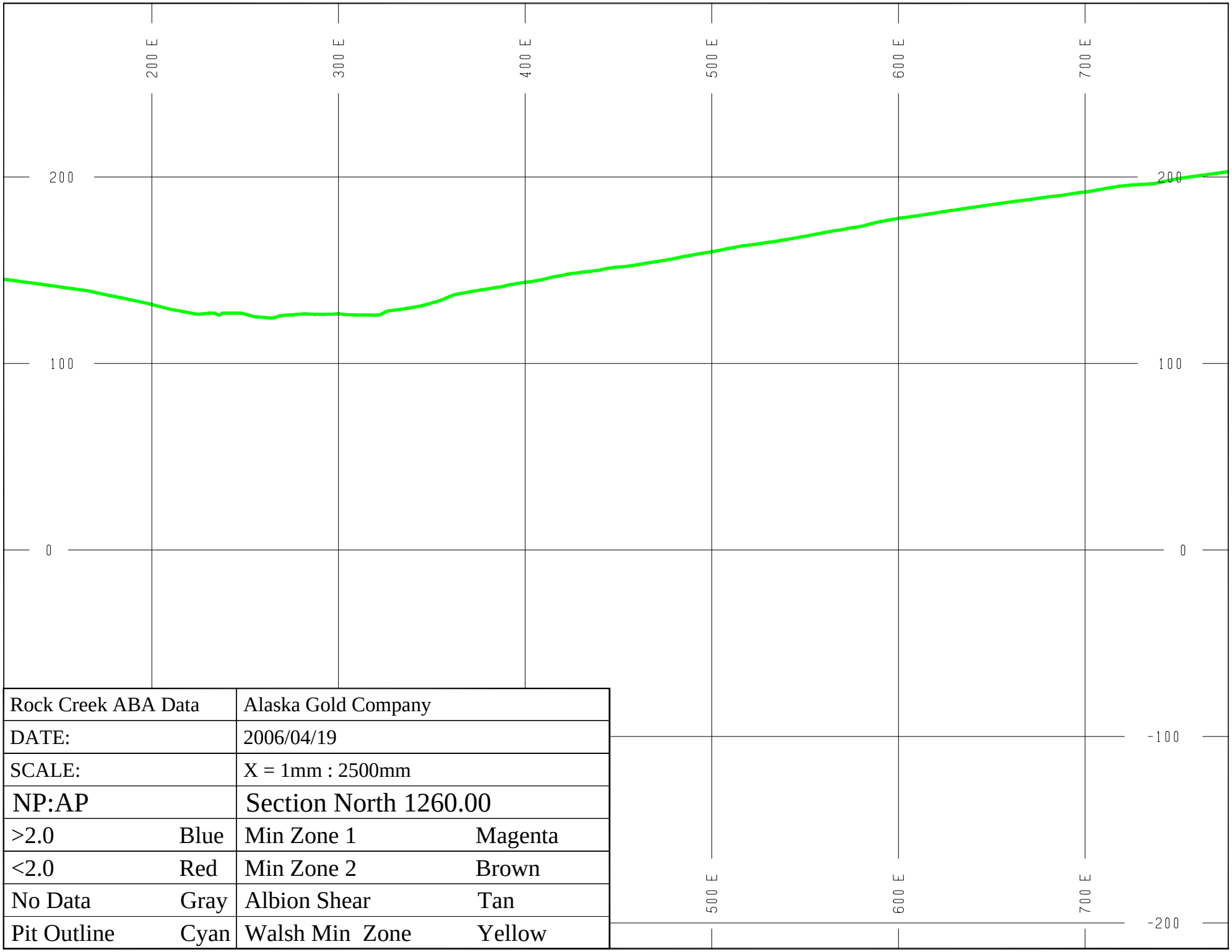
Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1215.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1230.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1245.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow



Rock Creek ABA Data		Alaska Gold Company	
DATE:		2006/04/19	
SCALE:		X = 1mm : 2500mm	
NP:AP		Section North 1260.00	
>2.0	Blue	Min Zone 1	Magenta
<2.0	Red	Min Zone 2	Brown
No Data	Gray	Albion Shear	Tan
Pit Outline	Cyan	Walsh Min Zone	Yellow

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007

To: Doug Nicholson (doug.nicolson@novagold.net)

Company: NovaGold Resources Inc.

Project No.: 2509

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date: March 27, 2006

Subject: Tailings and Development Rock Storage Facilities Geochemical Modeling

---

1 BACKGROUND

This Technical Memorandum presents the preliminary methods and results for the geochemical characterization in support of the Environmental Assessment and Reclamation Plan for the Rock Creek Project near Nome Alaska. The purpose of this project is to characterize any potential impacts to water quality from the mine material storage facilities and to provide recommendations for minimizing these impacts. These facilities include a tailings storage facility and two development rock storage sites.

Hydrogeologic and geochemical models were developed to predict the quantity and quality of facility runoff and seepage. Two cases were evaluated, a base case which consisted of the facilities with no cover, and an alternative case which simulated the facilities with a silt cover.

This assessment utilizes the available geochemistry data in predicting the post-closure tailings and development rock dump seepage and runoff water quality.

2 MINE OPERATION

The final mine design will be developed upon completion of the economic feasibility study, which is currently being developed. However, the working plan for the operation of the mine suggests that construction will begin by 2006 and continue for 3.5 to 4 years. The development rock and tailings storage facilities will be constructed during this time period. Upon completion of the mining, a closure plan will be implemented that will include construction of silt (borrow material) covers on each of the facilities. Initial estimates suggest that borrow material will be available for at least 1 foot of silt cover over both the tailings and development rock facilities. Therefore, two modeling scenarios were considered including one without a cover (considered the Base Case) and one with a 1-foot cover on each facility (considered the Alternative Case). An additional analysis with different cover thicknesses and designs may be conducted before the closure plan is finalized.

3 MODELING APPROACH

The modeling approach taken for this analysis conceptualizes the storage facilities as homogeneous mixtures of the site rock types within the tailings and the development rock. Due to the intensely folded and altered nature of the deposit geology, this conceptualization is considered valid. The covers are considered additional layers of different materials. The infiltrated water at each facility is simulated through volumetric and chemical mixing of infiltrated rainfall and runoff with specific chemical compositions produced from chemical reactions with the various rock types associated with each facility.

The hydrologic analysis, comprising an infiltration and runoff model, was used to develop input to the geochemical model from the end of mining operation to one hundred years post closure. The geochemical modeling uses geochemical test data to estimate the chemistry of water that contact site materials. These chemistry estimates are used in a thermodynamic chemical equilibrium model to simulate the final composition upon mixing of water compositions from each material type stored at the facility and the chemical reactions that occur as a result. Modeling method details are provided in the following sections.

4 HYDROLOGIC MODELING

An atmospheric boundary model for the tailings storage facility was developed to predict the approximate proportions of precipitation, runoff, and infiltration at the tailings surface. The hydrologic analysis was developed using the HELP model (EPA, 1994) based on precipitation records from the Nome Airport and scaled to site-specific flow measurements.

Table 1 shows climate data used as input to the HELP infiltration models.

Table 1 Average site specific climate data

Month	Average monthly temperature (°C)	Average monthly rainfall (inches)
January	-13.0	2.4
February	-13.0	2.0
March	-11.9	1.9
April	-6.5	1.8
May	1.7	1.7
June	7.9	2.6
July	10.3	5.9
August	9.8	8.2
September	5.6	6.3
October	-1.8	3.7
November	-8.3	2.7
December	-12.6	2.4

Precipitation data from the Nome Airport were scaled to the site using a uniform 2.0 multiplier. A synthetic weather generator was used to create daily precipitation and evaporation data from the site-specific mean monthly data and climate statistical data. The latitude for Nome was entered, and the growing season was assumed to last from the 120th day through the 270th day of the year.

One dimensional runoff and infiltration simulations were developed to evaluate the amount of infiltration into the facility during one hundred years after the end of the mining. Unit area (one acre) models were created for the first few feet of the storage facility for the Base Case and the Alternative Case. The entire tailings facility was simulated as a relatively flat surface (5% slope). Table 2 describes the model material layering and properties.

Table 2 Tailings storage facility hydrologic model structure and description

Base Case: Without Cover		
Layer	**Material**	**Thickness (ft)**
1	Development Rock	2
2	Tailings	1
3	Tailings	1
Alternative Case: With Cover		
Layer	**Material**	**Thickness (ft)**
1	Silt Cover	1
2	Development Rock	2
3	Tailings	1
Tailings	**Surface area (m^2)**	**Slopes (%)**
flat	1,056,560	5%

The tailings material was simulated as a loam (mixture of silt, clay, and sand) that had similar hydraulic properties to the tailings. The tailings facility has been designed with an upper layer of development rock. This layer provides drainage for the tailings and minimizes ponding on the tailings surface. For the Alternative Case a 1-foot cover of silt was added as a growth medium and low-permeability cover.

An atmospheric boundary model for the two development rock storage facilities was prepared to predict the proportions of precipitation, runoff, and infiltration at the dump surface. The hydrologic analysis for the development rock sites was conducted using HELP in a similar way to that described above for the tailings facility except for layering sequence and material characteristics, which are described below. The two development rock facilities were simulated with a HELP models, as summarized in Table 3.

Table 3 Development Rock storage facility hydrologic model structure and description

Base Case: Without Cover (Early Time)			Base Case: Without Cover (Late Time)		
Layer	**Material**	**Thickness (ft)**	**Layer**	**Material**	**Thickness (ft)**
1	Sandy-silt	0.5	1	Silty-clay	0.5
2	Development Rock	1	2	Development Rock	1
3	Development Rock	1	3	Development Rock	1
4	Development Rock	1	4	Development Rock	1

Alternative Case: With Cover (Early Time)			Alternative Case: With Cover (Late Time)		
Layer	**Material**	**Thickness (ft)**	**Layer**	**Material**	**Thickness (ft)**
1	Silt Cover	1	1	Silt Cover	1
2	Sandy-silt	0.5	2	Silty-clay	0.5
3	Development Rock	1	3	Development Rock	1
4	Development Rock	1	4	Development Rock	1

North Site	**Surface area (m^2)**	**Slopes (%)**	**South Site**	**Surface area (m^2)**	**Slopes (%)**
Flat	350,000	5%	flat	190,000	5%
Steep	160,000	30%	steep	135,000	30%

The development rock was modeled as a gravel material, and the models were created as separate one acre models for the relatively steep (3 to 1) and flat (5%) sloped areas. As was done with the tailings model, the Base Case was constructed without a cover, and the Alternative Case had a 1-foot cover of silt. Additionally, the development dumps had two modeling scenarios for early- and late-time that had slightly different material properties. The model assumes that the closure design will allow for the upper most development rock to be crushed and compacted. This enhances the weathering of the schist into silts and clays, resulting in a lower-permeability material. For the early time simulation, this upper layer was modeled as a sandy-silt, and the late time upper layer was a silty-clay material.

All of the models evaluated the early-time (up to 5 years after closure) and late-time (100 years after closure) behavior of the dumps. The unit-area results were scaled to the total surface areas of each facility and combined the steep and flat slope areas to produce the total runoff and infiltration for each facility. These results were used as input to the geochemical models.

5 GEOCHEMICAL MODELING

Geochemical mixing and equilibrium models were developed for the simulation of development rock and tailings seepage water quality using PHREEQC (USGS). One fundamental difference between these geochemical models was that the development rock site was assumed to contain only development rock material types, and the tailings were assumed to contain only the ore rock material types. The rock type materials used to develop the development rock storage facility model are summarized in Table 4.

Table 4 Abundance and description of material types

Description of rock types	Percent of Ore	Percent of development rock	Percent of rock types
Development Rock Quartzitic Graphite Schist (QGS)	NA	7	5.8
Development Rock Quartz-muscovite Schist (QMS)	NA	28	22.9
Development Rock and Ore Calcareous Schist (CS)	11	12	11.9
Development Rock Calcareous Quartz-muscovite Schist (CQMS)	NA	27	22.2
Development Rock Graphitic Quartz-muscovite Schist (GQMS)	NA	25	20.5
Ore Calcareous Quartz-muscovite Schist (CQMS)	27	NA	5.1
Ore Quartzitic Graphite Schist (QGS)	7	NA	1.3
Ore Quartz-muscovite Schist (QMS)	28	NA	5.3
Ore Graphitic Quartz-muscovite Schist (GQMS)	25	NA	4.7
Totals	98	99	100

Humidity Cell Test (HCT) results for each rock type were combined in proportion to their abundance in the facilities using the geochemical model, producing an estimate of the bulk runoff and seepage water chemistry (Table 5).

Table 5 HCT results used for input solutions to the geochemical models

	Development rock lithologic units					Tailings materials	
Compound	**Devel. QGS**	**Devel. QMS**	**Devel. CS**	**Devel. CQMS**	**Devel. GQMS**	**Albion**	**Tension Vein**
pH	7.75	7.8	7.97	7.87	7.91	7.63	7.92
Alkalinity	44	90	80	66	100	49.0	83.0
Silver	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Aluminum	0.054	0.0225	0.0225	0.0225	0.16	0.2250	0.0225
Arsenic	0.27	0.0078	0.051	0.007	5.6	3.5000	1.8000
Barium	0.05	0.005	0.005	0.005	0.023	0.005	0.013
Beryllium	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Calcium	21	28	55	47	37	22	39
Cadmium	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Chloride	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
Chromium	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Copper	0.0250	0.0250	0.0250	0.0250	0.0250	0.0250	0.0250
Fluoride	0.2800	0.0500	0.0500	0.0500	0.0500	0.1800	0.0500
Iron	0.0050	0.0050	0.0050	0.0050	0.0050	1.9000	2.6000
Mercury	0.0001	0.0001	0.0001	0.0001	0.5199	0.0001	0.0001
Potassium	1.2	0.74	1.7	1.4	0.25	0.25	0.68
Lithium	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500
Magnesium	4.4	5.9	12	14	11	9.2	9.9
Manganese	0.011	0.07	0.06	0.072	0.019	0.025	0.090
Nitrite (as NO2-)	0.005	0.021	0.1	0.072	0.005	0.005	0.005
Ammonium (as NH4+)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nitrate (as NO3-)	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Sodium	0.68	0.84	1.1	0.89	0.73	1.0	1.4
Nickel	0.005	0.005	0.005	0.005	0.005	0.005	0.018
Phosphorus	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lead	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Sulfate (as SO4-2)	30	31	140	140	57	49	42
Antimony	2	0.001	0.077	0.001	0.36	1.200	0.220
Selenium	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Strontium	0.050	0.050	0.140	0.110	0.11	0.050	0.050
Thallium	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Vanadium	0.005	0.005	0.015	0.02	0.005	0.005	0.015
Zinc	0.005	0.005	0.005	0.005	0.005	0.005	0.005

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, and NA is not available.

The relative contribution, in percent, of the equilibrated water chemistry from each of the above rock types was estimated from the results of the HCT tests, which are combined through geochemical modeling to simulate the chemistry water produced from reactions with minerals contained in the tailings and the development rock facilities, respectively. The runoff water quality for each facility was modeled for the case without a cover. The water quality of the runoff for the covered facilities was assumed to be similar to rainwater, which is considered pure water equilibrated with atmospheric gases. Additionally, the drainage from the drainage layer over the tailings was assumed to be similar to rainwater.

Laboratory testing is conducted under controlled and specific conditions including, in the case of HCTs, the sample mass and water volume used. Because test samples and water volumes are different in the field than in the laboratory, test results should be adjusted (scaled) to account for these differences. The HCT results were scaled to the site-specific field conditions by the relative change in rock surface area and volume of water flushed over or through the rock. This scaling was conducted for both the tailings and development rock, however, scaling to very fine grained materials such as mill tailings, generally results in overestimates of constituent concentrations.

The HCT effluent concentrations were divided by the surface area per unit mass and the pore volumes flushed during the laboratory test, resulting in mass of solute per unit surface area per pore volume of water flushed. The laboratory scale specific surface area for each of the rock types was estimated from the particle size analysis (GRAIN 3.0, from MDAG Publishing, www.mdag.com). The rates were converted back to field scale concentrations for the runoff and the infiltrated water by multiplying by the particle surface area and pore volumes that passed through the material in the time step (5 and 100 years) and then dividing by the total volume of runoff for the simulated period of time. This conversion was updated for each model time period. The specific surface areas used to estimate the field surface areas for the tailings were identical to those estimated for the HCT tests due to the fine-grained nature of the tailings and the laboratory tests. The development rock specific surface areas for each of the rock types were calculated based on the relationship 17.7 m^2 per kilogram of sample.

After scaling, the charge balance for each solution was checked. A charge balance is a comparison of the sum of the cations compared to the sum of the anions, which confirms the electro-neutrality requirement for natural waters. The geochemical model was used to modify the concentration of an element in order to correct for slight differences in the charge balance. Chloride and sodium were used to adjust the charge balance of the input waters because these elements do not play critical roles in geochemical reactions of concern for these simulations.

The geochemical modeling process involved a series of solution mixing, chemical reactions, and mineral surface adsorption modeling to predict the seepage/runoff composition at each selected output time. The process included:

1) Developing individual, charge-balanced waters which are representative of contact waters at the Rock Creek site.

2) Mixing the individual components in proportion to their quantities in the development rock dumps and tailings facilities to estimate an average seepage/runoff chemistry.

3) Equilibration of the mixed solutions with likely mineral phases and atmospheric gasses available for reaction (ferrihydrite, oxygen, and carbon dioxide).

4) Adsorption of specific compounds (arsenic, barium, lead, cadmium, copper, nickel, calcium, phosphate, zinc, beryllium, and sulfate) from solution onto ferrihydrite according to Dzombak and Morel (1990).

The result was a seepage/runoff chemistry after a given time period. This procedure was then repeated for the second time period (through 100 years).

6 RESULTS AND RECOMMENDATIONS

6.1 Tailings facility

The hydrological and geochemical results of the tailings models are presented in Tables 6 and 7, respectively. Table 6 shows the Base and Alternative Case runoff and infiltration rates at 5 and 100 years. The infiltration rates ranged from 288 gallons per minute (gpm) for the Base Case to 47 gpm for the Alternative Case indicating a 84 percent reduction in infiltration when the facility is covered with a silt cover. Infiltration was predicted to be from 9 to 52 percent of rainfall. This is considered a conservative range assuming the tailings are constructed as described above, using a passive rock drain system to reduce the head on the tailings surface.

The geochemical modeling predictions included are shown in Table 7. The scaled results are assumed to be conservative with respect to metals concentrations because scaling HCT tests to fine-grained tailings normally results in higher concentrations than will actually be observed. In addition, if reducing conditions develop in the tailings, certain metals would be removed from solution by precipitation as sulfide and/or metallic minerals. Although not simulated as part of this assessment, chemically reducing conditions are often developed in the deeper horizons of saturated tailings.

In the scaled simulation, arsenic and antimony exceeded the applicable water quality standard.

Table 6 Tailings facility hydrologic modeling results

Description	Rainfall (gpm)	Runoff (gpm)	Evaporation (gpm)	Drainage (gpm)	Infiltration (gpm)	Runoff (fraction)	Evaporation (fraction)	Drainage (fraction)	Infiltration (fraction)
No Cover with Light Vegetation	554	194	72	0	288	0.350	0.130	0.000	0.520
No Cover and Light Vegetation	554	194	72	0	288	0.350	0.130	0.000	0.520
Cover with Light Vegetation	554	393	114	0	47	0.710	0.205	0.000	0.085
Cover with Light Vegetation	554	393	114	0	47	0.710	0.205	0.000	0.085

Table 7 Prediction of tailings storage facility runoff and seepage composition through time after closure

	Standard		Devel. Rock (Time 5 yr)	Devel. Rock (Time 100 yr)	Devel. Rock (Time 5 yr)	Devel. Rock (Time 100 yr)
Compound*	**Value**	**Source**	**Base Case and Alternative Case Runoff**	**Base Case and Alternative Case Runoff**	**Base Case and Alternative Case Seepage**	**Base Case and Alternative Case Seepage**
pH	NS		6.7	6.7	6.7	6.7
Alkalinity	NS		74.2	74.2	73.7	73.7
Aluminum	0.087	2	0.0079	0.0079	0.0159	0.0159
Antimony	0.006	1	**0.0424**	**0.0424**	**0.0848**	**0.0848**
Arsenic	0.01	1	**0.353**	**0.353**	**0.703**	**0.703**
Barium	2	1	0	0	0	0
Beryllium	0.004	1	0.0001	0.0001	0.0001	0.0001
Boron	NS		0.000	0.000	0.000	0.000
Cadmium	0.00033	2	0.00008	0.00008	0.00017	0.00017
Calcium	NS		7.3	7.3	14.6	14.6
Chloride	230	2	0.1	0.1	0.2	0.2
Cobalt	NS		0.0000	0.0000	0.0000	0.0000
Chromium	0.1	1	0.001	0.001	0.001	0.001
Copper	0.013	2	0.001	0.001	0.002	0.002
Fluoride	4	1	0	1	0	0
Iron	1	2	0.0022	0.0022	0.0023	0.0023
Lead	0.004	2	0.0000	0.0000	0.0000	0.0000
Lithium	NS		0.010	0.010	0.019	0.019
Magnesium	NS		1.9	1.9	3.8	3.8
Manganese	NS		0.016	0.016	0.033	0.033
Mercury	7.7E-04	2	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Molybdenum	NS		0.000	0.000	0.000	0.000
Nickel	0.075	2	0.0033	0.0033	0.0065	0.0065
Nitrate (as NO3-)	10	1	0	0	1	1
Phosphorus	NS		0.04	0.04	0.09	0.09
Potassium	NS		0.12	0.12	0.25	0.25
Selenium	0.005	2	0.0005	0.0005	0.0010	0.0010
Silver	NS		0.0005	0.0005	0.0010	0.0010
Sodium	NS		20	20	12	12
Strontium	NS		0.0	0.0	0.0	0.0
Sulfate (as SO4-2)	NS		8.3	8.3	16.6	16.6
Thallium	0.002	1	0.0001	0.0001	0.0002	0.0002
Vanadium	NS		0.00	0.00	0.01	0.01
Zinc	0.169	2	0.0010	0.0010	0.0018	0.0018

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, and NS is no standard.
1 = Environmental Protection Agency (EPA) maximum contaminant limits (MCLs) are drinking water and groundwater quality standards.
2 = Chronic Aquatic Life Fresh Water criterion

6.2 Development rock facilities

The results of the models for the development rock facilities are shown in Tables 8 and 9. Table 8 contains the seepage flow rate for the 5 and 100 year simulations for the Base and Alternative Cases. The infiltration rates ranges from 137 gpm without cover to 30 gpm with cover. The development rock models also indicate that a silt cover will decrease, but not eliminate, infiltration into the facilities. The late time weathering of the upper layer of development rock also serves to decrease infiltration.

Preliminary results of the development rock geochemical modeling are presented in Table 9. None of the metals are predicted to exceed the applicable standards for both runoff and seepage.

Table 8 Development rock facility hydrologic modeling results

Year	Description	Rainfall (gpm)	Runoff (gpm)	Evaporation (gpm)	Infiltration (gpm)	Runoff (fraction)	Evaporation (fraction)	Infiltration (fraction)
5	No Cover and No Vegetation	438	216	86	137	0.493	0.196	0.312
100	No Cover and Light Vegetation	438	259	86	93	0.592	0.196	0.212
5	Cover with No Vegetation	438	323	85	30	0.738	0.194	0.068
100	Cover with Light Vegetation	438	288	91	58	0.658	0.209	0.133

Table 9 Prediction of development rock runoff and seepage composition through time after closure

	Standard		Devel. Rock (Time 5 yr)	Devel. Rock (Time 100 yr)	Devel. Rock (Time 5 yr)	Devel. Rock (Time 100 yr)
Compound*	**Value**	**Source**	**Base Case and Alternative Case Runoff**	**Base Case and Alternative Case Runoff**	**Base Case and Alternative Case Seepage**	**Base Case and Alternative Case Seepage**
pH	NS		6.7	6.7	6.7	6.7
Alkalinity	NS		80	80	80	80
Aluminum	0.087	2	< 0.0057	< 0.0057	< 0.0057	< 0.0057
Antimony	0.006	1	< 0.00012	< 0.00012	< 0.00012	< 0.00012
Arsenic	0.01	1	< 0.00026	< 0.00026	< 0.00026	< 0.00026
Barium	2	1	<0.00039	<0.00039	<0.00039	<0.00039
Beryllium	0.004	1	< 0.00007	< 0.00007	< 0.00007	< 0.00007
Boron	NS		< 0.013	< 0.013	< 0.013	< 0.013
Cadmium	0.00033	2	< 0.00027	< 0.00027	< 0.00027	< 0.00027
Calcium	NS		< 0.016	< 0.016	< 0.016	< 0.016
Chloride	230	2	< 0.11	< 0.11	< 0.11	< 0.11
Cobalt	NS		< 0.00074	< 0.00074	< 0.00074	< 0.00074
Chromium	0.1	1	< 0.00042	< 0.00042	< 0.00042	< 0.00042
Copper	0.013	2	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Fluoride	4	1	< 0.019	< 0.019	< 0.019	< 0.019
Iron	1	2	<0.0019	<0.0019	<0.0019	<0.0019
Lead	0.004	2	< 3.69E-05	< 3.69E-05	< 3.69E-05	< 3.69E-05
Lithium	NS		< 0.0017	< 0.0017	< 0.0017	< 0.0017
Magnesium	NS		< 0.012	< 0.012	< 0.012	< 0.012
Manganese	NS		< 0.0002	< 0.0002	< 0.0002	< 0.0002
Mercury	7.7E-04	2	3.1E-09	3.1E-09	6.2E-09	6.2E-09
Molybdenum	NS		0.000	0.000	0.000	0.000
Nickel	0.075	2	< 0.00078	< 0.00078	< 0.00078	< 0.00078
Nitrate (as NO3-)	10	1	< 0.0024	< 0.0024	< 0.0024	< 0.0024
Phosphorus	NS		< 0.0089	< 0.0089	< 0.0089	< 0.0089
Potassium	NS		< 0.078	< 0.078	< 0.078	< 0.078
Selenium	0.005	2	< 0.00019	< 0.00019	< 0.00019	< 0.00019
Silver	NS		< 0.00057	< 0.00057	< 0.00057	< 0.00057
Sodium	NS		30	30	30	30
Strontium	NS		< 0.00035	< 0.00035	< 0.00035	< 0.00035
Sulfate (as SO4-2)	NS		< 0.27	< 0.27	< 0.27	< 0.27
Thallium	0.002	1	< 0.00068	< 0.00068	< 0.00068	< 0.00068
Vanadium	NS		< 0.0018	< 0.0018	< 0.0018	< 0.0018
Zinc	0.169	2	< 0.00214	< 0.00214	< 0.00214	< 0.00214

6.3 Summary

Seepage and runoff rate predictions were developed for the tailings facility and two development rock dumps. These results were combined with a geochemical model to predict a range of concentrations for these waters, and to identify constituents of concern for closure and reclamation planning.

Runoff from the tailings facility ranges from 35 to 71 percent for the Base Case and Alternative Case, respectively. Infiltration for the Base Case is 52 percent and 9 percent for the Alternative Case. This results in a flow rate ranging from 47 to 228 gpm and represents a conservative estimate of long-term infiltration into the tailings facility and does not account for engineering controls such as freeze-back systems. Actual flows will likely be much lower than predicted.

Based on the available geochemical data, it is predicted that the tailings storage facility seepage will be of good quality with only arsenic and antimony in concentrations that exceed the applicable water quality standard of 0.01 and 0.006 mg/l, respectively. Seepage from the tailings facility will be controlled with engineered systems and design.

Based on this assessment, it is anticipated that long-term seepage from the tailings can be readily managed to negligible impacts to the environment. Because of the low seepage rates predicted for the tailings facility in the alternative case and the availability of space downgradient of the facility, passive treatment technologies may be a viable option for long-term management of the solutions. Additionally, cover thickness and design alternatives may be used to further limit the infiltration into the tailings.

Runoff from the development rock dumps ranges from 49 to 74 percent and infiltration ranges from 7 to 31 percent for the Alternative and Base Cases, respectively. Development rock dump runoff and seepage water chemistries were predicted to contain no constituents above the current water quality standards.

7 REFERENCES

Dzombak, D.A., and Morel, F.M.M., 1990. Surface complexation modeling--Hydrous ferric oxide: New York, John Wiley, 393 p.

EPA, 1994. The Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3. EPA Report EPA/600/R-94/168a. September, 1994.

Grain 3.0 from MDAG Publishing at www.mdag.com/grain30.html

Parkhurst, David L. and Appelo, C. A. J., 1999. User's Guide to PHREEQC (Version 2) - A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and inverse Geochemical Calculations. Water-Resources Investigations Report 99-4259.

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007

To: Doug Nicholson (doug.nicholson@novagold.net)

Company: NovaGold Resources Inc.

Project No.: 2509

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date May 26, 2006

Subject: Rock Creek Preliminary Pit Lake Geochemical Assessment

---

1 BACKGROUND

This Technical Memorandum presents the data, methods, and results for the geochemical characterization of the pit lake in support of the Environmental Assessment and Reclamation Plan for the Rock Creek Project near Nome Alaska. The purpose of this assessment is to characterize potential impacts to water quality from the mine pit lake and, if impacts are predicted, to provide recommendations for minimizing these impacts.

Post-closure pit lake water quality was predicted as the pit lake filled and at two points in time after the pit lake begins overflowing. These results were compared to applicable water quality standards and to the range of natural background water quality observed in Rock Creek. Three conditions, each with a high (rapid filling) and low flow (natural filling) case, were simulated in order to assess and minimize potential impacts to water quality at Rock Creek. The first simulation is the "conservative" condition, using average measured surface and ground water chemistry values and higher-than-expected groundwater inflow. The second is the "expected" condition which assumes less base flow contribution from groundwater to Rock Creek, which would result in overall better water quality of Rock Creek. And the final "sensitivity" condition simulates an increased groundwater flow contribution and a maximum observed arsenic concentration in order to predict the potential effects of arsenic and increased groundwater flow.

This assessment utilizes the available geochemistry data in predicting the post-closure pit lake water quality.

2 MINE OPERATION

The final mine design will be developed upon completion of the economic feasibility study. However, the working plan for the operation of the mine suggests that operations will begin in 2006 and continue for 3.5 to 4 years. The pit will be dewatered during this time and allowed to refill after completion of operations.

3 MODELING APPROACH

The modeling approach taken for this analysis conceptualizes the pit lake as a completely mixed reactor that results from the volumetric and chemical mixing of inflowing waters with specific chemical compositions. The pit lake is expected to mix seasonally due to wind-driven currents and seasonal changes in temperatures. The hydrologic analysis developed from a site-wide watershed model was based on site specific precipitation records from the Nome Airport and scaled to site flow measurements.

Watershed model results were used as input to the water balance model for the pit lake from the end of mining operations to closure plus one hundred years. The geochemical modeling uses geochemical test data to estimate the chemistry of water that contacts site materials and subsequently enters the pit. These chemistry estimates are used in a thermodynamic chemical equilibrium and mixing model to simulate the final composition upon mixing of different waters and the chemical reactions that occur as a result. Modeling method details are provided in the following sections.

4 HYDROLOGIC MODEL

The hydrologic pit lake water balance model was developed to predict the rate of pit filling through time, the proportion of various inputs to the lake, and the ultimate pit lake water level. Figure 4.1 shows the conceptual pit lake filling model. The model accounted for pit lake inflow and outflow components as part of a volume balance. Inflows included direct precipitation, Rock Creek surface water, overland flow as pit wall runoff, and groundwater. Outflows included evaporation and pit lake overflow once the pit lake water elevation reached the crest at the southern end of the pit.

Surface water and precipitation inflows were estimated based on Nome Airport mean monthly rainfall records, scaled by a factor of 2. This multiplier was based on measured flows on and around the Rock Creek project area. Groundwater inflow was based on preliminary aquifer testing and basin-scale water accounting calculations.

Currently, elevated metals concentrations observed in the Rock Creek are assumed to be from groundwater discharge. That is, groundwater that has been in contact with the ore body and related mineralization, flows upward into, and mixes with, the relatively clean surface runoff. This results in increasing concentrations in Rock Creek as a function of increasing amounts of groundwater discharge as it flows downstream. After the pit is excavated groundwater elevations will drop significantly upgradient of the pit and upward groundwater discharge into Rock Creek will be largely eliminated. This effect has been simulated and results represent expected conditions.

The points of time selected for the geochemical modeling corresponded to the 1/3 full lake, 2/3 full lake, full without overflow, and approximately 40 years after filling with overflow. For the Base Case model, these times were 0.4, 1.4, 3.3, and 43 years, and for the Alternative Case the simulation times were 0.3, 0.7, 1.6, and 43 years.

5 GEOCHEMICAL MODEL

PHREEQC (Parkhurst and Appelo 1999) was used for all geochemical speciation, mixing, and reaction modeling conducted for this assessment. PHREEQC is an industry standard computer program used worldwide for conducting geochemical calculations for predicting the chemistry of natural or impacted waters in the environment.

For this assessment, geochemical modeling was used to predict the composition of the pit lake water through time after operations cease and pit dewatering wells are turned off. As the pit lake fills, and eventually overflows, the composition of each of the water balance components mix and reactions with rock and air occur, resulting in evolving pit lake water quality.

Pit wall chemical reactions that occur during pit wall runoff and pit wall flooding as the pit lake fills occur in the damaged rock zone (DRZ) of the pit wall and may contribute significantly to the overall solute loading to the pit lake. The DRZ is conceptualized as the surface layer of the pit wall that has been damaged, or cracked, during mining, which may significantly increase the porosity and reactive surface area (Figure 4.1).

Site-specific information was used as input to the model when available, including the average composition of surface and groundwater, the composition of water equilibrated with the rock types, and the volumes and surface areas of the pit.

Table 5.1 lists the different rock types that were sampled for HCT analysis and their relative percentages within the exposed pit wall rock. It was assumed that a uniform mixture of the rock types in their relative percentages (Table 5.1) from the entire pit will be exposed at all times through mining and closure.

Table 5.1 Rock type percentages assumed for pit wall

Description of rock types	Percent of ore	Percent of development rock	Percent of pit wall rock types
Development Rock Quartzitic Graphite Schist (QGS)	NA	5.3	3.5
Development Rock Quartz-muscovite Schist (QMS)	NA	24.7	16.1
Development Rock and Ore Calcareous Schist (CS)	NA	11.8	7.7
Development Rock Calcareous Quartz-muscovite Schist (CQMS)	NA	35.5	23.2
Development Rock Graphitic Quartz-muscovite Schist (GQMS)	NA	22.6	14.7
Ore Composite	100	NA	34.7
Totals	100	99.9	99.9

5.1 Pit lake area estimation

The geochemical modeling requires estimates of the plan-view and actual (perpendicular) areas of the entire pit and the pit lake at each of the geochemical modeling simulation times. The plan area was estimated from site topographic maps, and the actual area is the surface area of the exposed surface of the pit walls at a perpendicular to the pit wall angle. The site plan was used to calculate these areas and associated incremental volumes as a function of elevation in the pit. The pit volume and stage data was used to determine elevations for the 1/3 full, 2/3 full, and full pit lake area calculations. Unsubmerged and submerged pit wall areas were then calculated.

5.2 Water quality of pit lake inflows

Specific water compositions were assigned to each of the inflow and outflow waters included in the pit lake water balance model. Table 5.2 contains the compositions assigned to each of the inflow components except for precipitation. Rainfall was simulated as pure water equilibrated with atmospheric gases.

Table 5.2 Input solution chemistries used for the pit lake geochemical modeling

Compound	Standard Value	Source	Devel. QGS	Devel. QMS	Devel. CS	Devel. CQMS	Devel. GQMS	Ore Composite	Surface water (Best)	Surface water (Worst)	Groundwater	Groundwater (sensitivity)
pH	6.5 – 8.5	1	7.8	7.8	8.0	7.9	7.9	7.8	7.4	7.4	8.0	8.0
Alkalinity	20 (min)	3	44	90	80	66	100	100	122	122	172	172
Silver	0.00693	2	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0000	0.0005	0.0000	0.0000
Aluminum	0.087	3	0.054	0.023	0.023	0.023	**0.160**	0.023	0.001	0.010	0.009	0.009
Arsenic	0.01	1	**0.270**	0.008	**0.051**	0.007	**5.600**	**0.095**	0.004	**0.040**	**0.042**	**0.052**
Barium	2	1	0	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0000	0.0002	0.0001	0.0001
Bromide	NS		----	----	----	----	----	----	0.01	0.05	0.00	0.00
Calcium	NS		21	28	55	47	37	50	42	42	58	58
Cadmium	0.00033	3	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	0.0000	0.0002	0.0001	0.0001
Chloride	230	3	0.5	0.5	0.5	0.5	0.5	0.5	2.5	2.5	2.2	2.2
Chromium	0.1	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.013	3	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.059**	0.000	0.001	0.001	0.001
Fluoride	4	1	0	0	0	0	0	0	0	0	0	0
Iron	1	3	0.005	0.005	0.005	0.005	0.005	0.005	0.002	0.020	0.452	0.452
Mercury	7.7E-04	3	5.0E-05	5.0E-05	5.0E-05	5.0E-05	5.0E-05	5.0E-05	1.3E-07	1.3E-06	1.0E-06	1.0E-06
Potassium	NS		1.2	0.7	1.7	1.4	0.3	1.4	0.2	0.2	0.2	0.2
Lithium	2.5	4	0.05	0.05	0.05	0.05	0.05	0.05	----	----	----	----
Magnesium	NS		4.4	5.9	12.0	14.0	11.0	13.0	8.8	8.8	13.0	13.0
Manganese	0.050		0.011	0.070	0.060	0.072	0.019	0.100	0.000	0.003	0.019	0.019
Nitrite (as NO2-)	NS		0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.3	0.3
Ammonium (as NH4+)	NS		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrate (as NO3-N)	10	1	1	1	1	1	1	1	0	1	0	0
Sodium	NS		1	1	1	1	1	10	2	2	2	2
Nickel	0.075	2	0.005	0.005	0.005	0.005	0.005	0.005	0.000	0.001	0.001	0.001
Dissolved Oxygen	NS		----	----	----	----	----	----	----	----	----	----
Phosphorus	NS		0.25	0.25	0.25	0.25	0.25	0.25	0.01	0.07	0.04	0.04
Lead	0.004	2	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	0.000	0.000	0.000	0.000
Sulfate (as SO4-2)	250	1	30	31	140	140	57	120	3	27	27	27
Antimony	0.006	1	**2.000**	0.001	**0.077**	0.001	**0.360**	**0.036**	0.000	0.000	0.000	0.000
Selenium	0.005	2	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0003	0.0025	0.0000	0.0000
Strontium	NS		0.1	0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.2	0.2
Thallium	0.0017	5	0.001	0.001	0.001	0.001	0.001	0.001	**0.004**	**0.042**	0.000	0.000
Vanadium	0.100	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zinc	0.169	2	0.005	0.005	0.005	0.005	0.005	0.005	0.000	0.002	0.002	0.002

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.

Groundwater concentrations are from the observed averages from well MW03-03, and surface water values (worst case and sensitivity run) are from the averages of Rock Creek collected (at ROCK1 surface water sampling location) upstream of the pit lake. Surface water values for the best case simulation are 1/10 metals dilution of the average values

1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.

2 = Acute Aquatic Life Fresh Water criterion, using calculated hardness from Average ROCK 1 composition

3 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness from average ROCK 1 composition

4 = Irrigation water criterion

5 = Human Health and Aquatic Organisms Criteria for NonCarcinogens

Groundwater inflow to the lake was assumed to be represented by the average composition of samples collected from the monitoring well MW03-03 from January of 2004 to November of 2005. The Groundwater inflow chemistry represented for the sensitivity run is contains the maximum arsenic value measured at MW03-03. Two water chemistry sets were developed to represent surface water inflow from Rock Creek. The first was calculated as the average chemical composition of samples collected upstream of the pit (at the location named ROCK1) from November 2003 to December of 2005 and represents a worst case scenario whereby groundwater is discharging to the creek as is currently occurring. The second set represents post-mining creek water whereby the groundwater elevations upgradient of the pit have declined due to drainage of the pit high wall and the poor-quality groundwater is not discharging upward into Rock Creek. It was assumed that reduction of groundwater discharge resulted in a 10:1 metals dilution of current average chemistry observed at ROCK1. The Rock Creek surface waters and groundwater are circum-neutral pH, calcium-bicarbonate waters with excess alkalinity. However, the groundwater does have a higher sulfate concentration than the surface water, and both the surface water (conservative condition) and groundwater compositions exceed the applicable arsenic water quality standard. Both surface water compositions also exceed the applicable standards for thallium.

Precipitation that lands on the pit walls and overland flow into the pit (not associated with Rock Creek) was considered pit wall runoff. Pit wall runoff is simulated to react with minerals contained in the exposed pit walls. The pit wall runoff and the submerged pit wall recirculation water compositions were estimated from humidity cell laboratory tests (HCT) scaled to field conditions and climate.

HCTs are kinetic tests commonly used for estimating weathering rates under accelerated weathering conditions. Approximately 1.2 Kg of sample, crushed to minus 1/4-inch, is subjected to weekly wet-dry cycles then flushed with water. The water is analyzed and the time-series chemistry data are used to estimate the short- and long-term weathering rates of the sample, and to estimate the chemistry of water that would contact similar materials on the mine site. These estimates are used to predict the water chemistry of pit wall runoff, and waste rock and tailings seepage by applying scaling calculations and site-specific climate data.

Week 33-36 composite samples were selected to represent long-term behavior for development QGS, CS, and CQMS. Week 53-56 composite samples were selected to represent long-term behavior for development QMS, GQMS and the ore composite. Results of the week 33-36 and 53-56 composite HCTs for the different rock types are summarized in Table 5.2. The HCTs resulted in circum-neutral pH, calcium-bicarbonate waters with excess alkalinity for all rock types. However, there were some rock types that had HCT data that exceeded the applicable water quality standards for aluminum, arsenic, antimony, cadmium, copper and lead. HCT results for each rock type were scaled to field conditions and combined in proportion to their abundance in the pit walls using the geochemical model, producing an estimate of the bulk pit wall runoff water chemistry.

5.3 Scaling to pit wall runoff and submerged mixing

Laboratory testing is conducted under controlled and specific conditions including, in the case of HCTs, the grain size and volume of water used. Because test samples and water volumes are different in the field than in the laboratory, test results were adjusted (scaled) to account for these differences. The HCT results were scaled to the site-specific field conditions by the relative change in rock surface area and volume of water flushed over the rock. This scaling was conducted for both the unsubmerged pit wall runoff and the water that enters the lake from the pit wall after submergence.

The HCT concentrations were multiplied by the water flushed through the cell, and divided by the surface area per unit mass and the pore volumes flushed during the laboratory test, which resulted in mass of solute per unit surface area per pore volume of water flushed. The test surface area per unit mass for each of the rock types was estimated from the particle size analysis (GRAIN 3.0, from MDAG Publishing, www.mdag.com).

The specific surface area of HCT material was assumed to be 17.7 m^2/Kg for all rock types, and samples contained from 1.46 to 1.854 Kg rock in the cells. Over the 36 weeks for the QGS, CS, and CQMS tests, 25.5 to 26.7 liters were flushed through the cells. The QMS, GQMS, and ore composite cells had 38.9 to 40.3 liters flushed through over 56 weeks.

The rates were converted back to field scale concentrations for the unsubmerged pit wall runoff by multiplying by the pit wall reactive surface area and pore volumes and dividing by the total volume of runoff for the simulated period of time. The volume of rock mass that contributes to mass loading to the pit lake was estimated by using an oxygen diffusion model which predicts the extent of pyrite oxidation into the pit wall as a function of moisture content, porosity of the pit wall, pyrite content, and time. The results indicated a production zone ranging from 2.8 to 4.2 ft depending on the time of exposure of the pit walls. The field scaling of the HCT data assumed that the DRZ porosity was 0.1, the rock density was 149 lb/ft^3 and the specific surface area was 1.5 ft2/lb. Scaling was updated for each model time period.

A similar analysis was prepared for the submerged pit wall. The laboratory flux rate was converted to the field scale with the submerged pit surface area and two submerged pit wall pore volumes for the volume of water passing through the submerged pit surface area. Two pore volumes were assumed to be mobilized from the submerged pit wall damaged rock zone.

After scaling, the charge balance for each solution was checked. A charge balance is a comparison of the sum of the cations compared to the sum of the anions, which confirms the electroneutrality requirement for natural waters. The geochemical model was used to modify the concentration of an element in order to correct for slight differences in the charge balance. Chloride and sodium were used to adjust the charge balance of the input waters because these elements do not play critical roles in geochemical reactions of concern for the Rock Creek pit lake simulations.

5.4 Pit lake modeling process

The geochemical modeling process involved a series of solution mixing, chemical reactions, and mineral surface adsorption modeling to predict the pit lake composition at each selected output time. The process included:

1) Developing individual, charge-balanced waters which are representative of contact waters at the Rock Creek site.

2) Mixing the individual components of pit wall runoff, in proportion to their quantities in the pit wall, to estimate an average pit wall runoff chemistry.

3) Mixing the individual components of the flushed DRZ chemistry in proportion to their quantities to estimate an average chemistry of water flushed from the damaged rock zone.

4) Mixing the pit wall solutions with the groundwater, surface water, and rainfall according to proportions from the pit lake water balance model.

5) Removing pure water from the pit lake to account for evaporation in quantities estimated from the pit lake water balance.

6) Equilibration of the pit lake water with likely mineral phases and atmospheric gasses available for reaction (ferrihydrite, oxygen, and carbon dioxide).

7) Adsorption of specific compounds (arsenic, barium, lead, cadmium, copper, nickel, calcium, phosphate, zinc, beryllium, and sulfate) from the pit lake onto ferrihydrite according to Dzombak and Morel (1990).

The result of the geochemical modeling was a pit lake solution chemistry after a given time period. This procedure was then repeated for each time period. The new solution chemistry from each time period was mixed with the pit lake composition from the previous time step.

6 RESULTS AND RECOMMENDATIONS

6.1 Water-balance model

The results of the water-balance model include pit lake volume and stage elevation for each month after the end of mining operation. Additionally, the volumes into and out of the pit lake were calculated for each component, and the pit lake inflow mixture percentages were developed for use in the geochemical model.

Table 6.1 summarizes the water-balance results and Figure 6.1 shows the pit filling curves for both the high and low flow cases for each simulation For the high flow simulation, the pit lake fills after 1.6 years and the pit fills after 3.3 years for the low flow simulation. The high flow model fills more rapidly due to the diversion of additional surface water into the pit during filling. In all cases and time steps, the surface water is the most significant inflow component, and groundwater and pit wall runoff also constitute a minor fraction of the inflow to the pit. Pit lake evaporation increases until the pit becomes full, and after the pit becomes full overflow occurs in both model cases.

6.2 Geochemical model

Tables 6.2 and 6.3 show the results of the geochemical pit lake models. The geochemical modeling predicted the pit lake chemical composition for each of the selected times for the Base and Alternative Cases for both the conservative and expected conditions. The conservative condition uses high-TDS surface water inflow from Rock Creek that is currently influenced by mineralized groundwater. The expected case uses low-TDS water for Rock Creek inflow that will likely flow into the pit after closure.

Conservative condition

The predicted pit lake compositions for both cases were similar. Both cases had a circum-neutral pH value of 7.9 throughout the modeled time period, and were of a calcium-bicarbonate water type with alkalinities ranging from 128 to 134 mg/l.

Many of the metals were predicted to have relatively low concentrations in both the base case (low-flow) and alternative cases (high-flow). Many of the metals concentrations were predicted to decrease over time for the alternative case, due primarily to ongoing dilution of pit wall runoff with Rock Creek inflows and sorption to ferrihydrite. For the Base Case, some of the constituents, including chloride and magnesium, were predicted to increase in concentration over time, interpreted to be a function of less Rock Creek inflow compared to evaporative losses. The alternative case did not significantly improve the pit lake water quality compared to the Base Case.

Table 6.1 Pit lake water balance results and mixing percentages

LOW FLOW WATER BALANCE

Time step	Time (years)	Pit lake elevation (meters amsl)	Pit lake volume (L)	Lake precipitation (L)	Groundwater inflow (L)	Pit wall runoff (L)	Surface water inflow (L)	Pit lake evaporation (L)	Pit lake overflow (L)
1	0.4	32	7.20E+08	6.73E+06	1.25E+08	2.74E+07	6.06E+08	3.53E+06	0.00E+00
2	1.4	51	1.81E+09	3.17E+07	2.53E+08	4.01E+07	7.49E+08	2.29E+07	0.00E+00
3	3.3	67	3.31E+09	8.05E+07	4.62E+08	5.57E+07	9.67E+08	6.89E+07	0.00E+00
4	43.3	68	3.42E+09	2.66E+09	1.01E+10	1.61E+09	2.86E+10	2.05E+09	4.08E+10

Time step	Time (years)	Pit lake volume (%)	Lake precipitation (%)	Groundwater inflow (%)	Pit wall runoff (%)	Surface water inflow (%)	Total inflow (%)	Pit Lake overflow (%)	Pit lake evaporation (%)
1	0.4	0%	1%	16%	4%	79%	100%	0%	1%
2	1.4	42%	2%	14%	2%	41%	100%	0%	1%
3	3.3	54%	2%	14%	2%	29%	100%	0%	2%
4	43.3	7%	6%	22%	3%	62%	100%	88%	4%

HIGH FLOW WATER BALANCE

Time step	Time (years)	Pit lake elevation (meters amsl)	Pit lake volume (L)	Lake precipitation (L)	Groundwater inflow (L)	Pit wall runoff (L)	Surface water inflow (L)	Pit lake evaporation (L)	Pit lake overflow (L)
1	0.3	32	7.54E+08	3.64E+06	2.09E+08	2.04E+07	5.22E+08	1.14E+06	0.00E+00
2	0.7	50	1.84E+09	3.31E+07	1.69E+08	4.31E+07	8.61E+08	2.21E+07	0.00E+00
3	1.6	66	3.37E+09	6.18E+07	4.64E+08	4.72E+07	9.95E+08	4.12E+07	0.00E+00
4	43.3	68	3.42E+09	3.74E+09	2.10E+10	2.60E+09	5.42E+10	2.11E+09	7.94E+10

Time step	Time (years)	Pit lake volume (%)	Lake precipitation (%)	Groundwater inflow (%)	Pit wall runoff (%)	Surface water inflow (%)	Total inflow (%)	Pit Lake overflow (%)	Pit lake evaporation (%)
1	0.3	0%	0%	28%	3%	69%	100%	0%	0%
2	0.7	40.5%	2%	9%	2%	46%	100%	0%	1%
3	1.6	53.9%	2%	14%	1%	29%	100%	0%	1%
4	43.3	4%	4%	25%	3%	64%	100%	93%	3%

Table 6.2 Prediction of pit lake composition through time after closure – worst case

				Low Flow Filling Scenario				High Flow Filling Scenario			
	Standard		ROCK1**	Time 1	Time 2	Time 3	Time 4	Time 1	Time 2	Time 3	Time 4
Compound*	Value	Source		0.33 years	1.42 years	3.25 years	43.25 years	0.33 years	0.67 years	1.58 years	43.25 years
pH	6.5 – 8.5	1	7.4	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Alkalinity	20 (min)	3	122	128	130	132	131	134	130	132	131
Aluminum	0.00693	2	0.0103	0.0097	0.0096	0.0095	0.0094	0.0096	0.0096	0.0095	0.0094
Antimony	0.087	3	0.0005	0.0005	0.0005	0.0005	0.0005	0.0004	0.0005	0.0005	0.0004
Arsenic	0.01	1	**0.040**	**0.038**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.037**	**0.036**
Barium	2	1	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Boron	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cadmium	NS		0.00018	0.00015	0.00015	0.00014	0.00014	0.00014	0.00015	0.00014	0.00014
Calcium	0.00033	3	42	43	44	44	44	45	44	44	44
Chloride	230	3	2.5	12.3	12.8	13.4	13.2	13.9	12.9	13.5	13.5
Cobalt	0.1	4	----	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chromium	0.013	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	4	1	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Fluoride	1	3	0	0	0	0	0	0	0	0	0
Iron	7.7E-04	3	0.0204	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Lead	NS		0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Lithium	2.5	4	----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	NS		8.8	9.1	9.3	9.5	9.4	9.7	9.3	9.5	9.4
Manganese	0.050	5	0.003	0.006	0.007	0.008	0.007	0.008	0.007	0.007	0.008
Mercury	7.7E-04	3	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06
Molybdenum	0.1	2	----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nickel	0.075	2	0.0012	0.0011	0.0011	0.0011	0.0011	0.0012	0.0011	0.0011	0.0011
Nitrate (as NO3-)	10	1	1	2	2	2	2	2	2	2	2
Phosphorus	NS		0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Potassium	NS		0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Selenium	0.005	2	0.0025	0.0020	0.0019	0.0018	0.0018	0.0017	0.0019	0.0018	0.0017
Silicon	NS		----	0.1712	0.2175	0.2652	0.2576	0.2884	0.2139	0.2610	0.2753
Silver	0.00693	2	0.0005	0.0004	0.0004	0.0004	0.0004	0.0003	0.0004	0.0004	0.0003
Sodium	NS		2	3	3	3	3	3	3	3	3
Strontium	NS		0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1
Sulfate (as SO4-2)	250	1	27.2	26.3	26.2	26.2	25.9	26.5	26.3	26.2	25.9
Thallium	0.0017	5	**0.0415**	**0.0330**	**0.0310**	**0.0291**	**0.0290**	**0.0288**	**0.0313**	**0.0293**	**0.0283**
Vanadium	0.100	4	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Zinc	0.169	3	0.0024	0.0020	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0018

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
Surface water values for the best case simulation are 1/10 metals dilution of the average values
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Acute Aquatic Life Fresh Water criterion, using calculated hardness from Average ROCK 1 composition
3 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness from average ROCK 1 composition
4 = Irrigation water criterion
5 = Human Health and Aquatic Organisms Criteria for NonCarcinogens

Table 6.3 Prediction of pit lake composition through time after closure – best case

				Low flow filling scenario				High flow filling scenario			
	Standard		ROCK1**	Time 1	Time 2	Time 3	Time 4	Time 1	Time 2	Time 3	Time 4
Compound*	Value	Source		0.33 years	1.42 years	3.25 years	43.25 years	0.33 years	0.67 years	1.58 years	43.25 years
pH	6.5 – 8.5	1	7.4	7.8	7.8	7.8	7.8	7.9	7.8	7.8	7.8
Alkalinity	20 (min)	3	122	115	115	115	114	116	114	114	113
Aluminum	0.00693	2	0.0010	0.0100	0.0099	0.0099	0.0098	0.0100	0.0099	0.0098	0.0098
Antimony	0.087	3	0.0000	0.0008	0.0008	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008
Arsenic	0.01	1	0.004	**0.010**	**0.012**	**0.013**	**0.013**	**0.013**	**0.011**	**0.012**	**0.013**
Barium	2	1	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Boron	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cadmium	NS		0.00002	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003
Calcium	0.00033	3	42	43	44	44	44	45	44	44	44
Chloride	230	3	2.5	27.8	27.4	27.1	26.8	27.3	27.5	27.1	26.7
Cobalt	0.1	4	----	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chromium	0.013	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	4	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoride	1	3	0	0	0	0	0	0	0	0	0
Iron	7.7E-04	3	0.0020	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Lead	NS		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Lithium	2.5	4	----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	NS		8.8	9.1	9.3	9.5	9.4	9.7	9.3	9.5	9.4
Manganese	0.050	5	0.000	0.004	0.005	0.005	0.005	0.006	0.004	0.005	0.006
Mercury	7.7E-04	3	1.3E-07	4.0E-07	4.4E-07	4.8E-07	4.7E-07	4.7E-07	4.3E-07	4.6E-07	4.7E-07
Molybdenum	0.1	2	----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nickel	0.075	2	0.0001	0.0003	0.0004	0.0004	0.0004	0.0005	0.0004	0.0004	0.0004
Nitrate (as NO3-)	10	1	0	1	1	1	1	1	1	1	1
Phosphorus	NS		0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
Potassium	NS		0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Selenium	0.005	2	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Silicon	NS		----	0.1712	0.2175	0.2652	0.2576	0.2884	0.2139	0.2610	0.2753
Silver	0.00693	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sodium	NS		2	3	3	3	3	3	3	3	3
Strontium	NS		0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1
Sulfate (as SO4-2)	250	1	2.7	6.8	7.9	9.0	8.8	9.5	7.8	8.9	9.2
Thallium	0.0017	5	**0.0042**	**0.0033**	**0.0031**	**0.0029**	**0.0029**	**0.0029**	**0.0031**	**0.0029**	**0.0028**
Vanadium	0.100	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc	0.169	3	0.0002	0.0005	0.0005	0.0006	0.0006	0.0006	0.0005	0.0006	0.0006

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
Surface water values for the best case simulation are 1/10 metals dilution of the average values
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Acute Aquatic Life Fresh Water criterion, using calculated hardness from Average ROCK 1 composition
3 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness from average ROCK 1 composition
4 = Irrigation water criterion
5 = Human Health and Aquatic Organisms Criteria for NonCarcinogens

The mean Rock Creek arsenic concentration at the ROCK1 sampling station is 0.040 mg/l, which appears to be a reasonable estimate of the background surface water concentrations at the site. The predicted pit lake arsenic concentrations for both cases at all time steps was predicted to be equal or lower than the background surface water concentrations. The lower predicted arsenic values result from the dilution effect of inflowing groundwater and sorption to ferrihydrite.

For both the base and alternative cases, the pit lake concentration exceeded the applicable water quality standards for arsenic (0.01 mg/l) and thallium (0.002 mg/l). The base case arsenic decreases from 0.040 to 0.037 mg/l and thallium decreases from 0.042 to 0.029 mg/l over the 43 years. The alternative case arsenic decreases from 0.037 to 0.036 mg/l and thallium remains stable at approximately 0.028 mg/l over the 43 years. These concentrations are a direct result of the predominance of Rock Creek water chemistry and does not represent a degradation of surface water quality in Rock Creek.

These results suggest that the pit lake will not significantly impact the surface water quality at the site after closure and may improve water quality from dilution with groundwater. Since, most of the water will flow from Rock Creek into the pit lake during spring runoff when concentrations are the lowest, predicted concentrations will likely be lower than predicted in this conservative condition. Additionally, the rapid pit filling closure scenario simulated with the Alternative Case model is not recommended for closure design, because it did not significantly improve water quality.

Expected condition

The predicted pit lake compositions for both the base case (low-flow) and alternative case (high-flow) models were similar. Both cases had a circum-neutral pH value of 7.8 throughout the modeled time period, and were of a calcium-bicarbonate water type with alkalinities ranging from 113 to 122 mg/l.

Dissolved concentrations of all constituents were generally low. For the base and alternative cases, the pit lake concentration exceeded the applicable water quality standards for arsenic (0.01 mg/l) and thallium (0.002 mg/l). The base case arsenic increases slightly from 0.010 to 0.013 mg/l, and thallium decreases from 0.0042 to 0.0029mg/l over the 43 years. The alternative case arsenic remains stable at approximately 0.013 mg/l, and thallium remains stable at approximately0.0029 mg/l.

The results of the expected case indicate that the pit lake will not impact the surface water quality at the site after closure and may improve water quality because of reducing or eliminating groundwater discharge to Rock Creek over the long term. Additionally, the rapid pit filling closure scenario simulated with the alternative case model is not recommended for closure design, because it did not significantly improve water quality.

Sensitivity run

A sensitivity simulation was conducted for the analysis of increased groundwater flow with the maximum observed arsenic value in order to predict the maximum effect of increased arsenic in groundwater on the pit lake chemistry at Rock Creek. Similar to the conservative and expected condition simulations, the sensitivity run includes a base case (low-flow) and an alternative case (high-flow). The results of the sensitivity run simulation are presented in Table 6.4.

The predicted pit lake compositions for both the base case and alternative case (high-flow) models were similar. Both cases had a circum-neutral pH value of 7.9 throughout the modeled time period, and were of a calcium-bicarbonate water type with alkalinities ranging from 122 to 142 mg/l.

Table 6.4 Prediction of pit lake composition through time after closure - sensitivity run

Compound*	Standard		ROCK1**	Low flow filling scenario				High flow filling scenario			
				Time 1	Time 2	Time 3	Time 4	Time 1	Time 2	Time 3	Time 4
	Value	Source		0.33 years	1.42 years	3.25 years	43.25 years	0.33 years	0.67 years	1.58 years	43.25 years
pH	6.5 – 8.5	1	7.4	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Alkalinity	20 (min)	3	122	135	133	135	142	137	132	135	134
Aluminum	0.00693	2	0.0103	0.0095	0.0095	0.0095	0.0092	0.0095	0.0096	0.0095	0.0093
Antimony	0.087	3	0.0005	0.0004	0.0005	0.0005	0.0004	0.0004	0.0005	0.0004	0.0004
Arsenic	0.01	1	**0.040**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**	**0.039**
Barium	2	1	0	0	0	0	0	0	0	0	0
Beryllium	0.004	1	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Boron	NS		----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cadmium	NS		0.00018	0.00014	0.00014	0.00013	0.00012	0.00013	0.00014	0.00013	0.00013
Calcium	0.00033	3	42	46	45	45	48	46	45	45	45
Chloride	230	3	2.5	14.1	13.5	14.1	16.2	14.7	13.5	14.2	14.3
Cobalt	0.1	4	----	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chromium	0.013	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	4	1	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoride	1	3	0	0	0	0	0	0	0	0	0
Iron	7.7E-04	3	0.0204	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Lead	NS		0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Lithium	2.5	4	----	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	NS		8.8	9.8	9.5	9.7	10.4	9.9	9.5	9.7	9.7
Manganese	0.050	5	0.003	0.008	0.008	0.008	0.011	0.009	0.007	0.008	0.009
Mercury	7.7E-04	3	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.2E-06	1.3E-06	1.3E-06	1.3E-06	1.3E-06
Molybdenum	0.1	2	----	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nickel	0.075	2	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012
Nitrate (as NO3-)	10	1	1	2	2	2	3	3	2	2	2
Phosphorus	NS		0.07	0.06	0.06	0.06	0.05	0.06	0.06	0.06	0.06
Potassium	NS		0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Selenium	0.005	2	0.0025	0.0017	0.0018	0.0016	0.0013	0.0016	0.0018	0.0017	0.0016
Silicon	NS		----	0.3114	0.2655	0.3205	0.4801	0.3462	0.2620	0.3156	0.3316
Silver	0.00693	2	0.0005	0.0003	0.0004	0.0003	0.0003	0.0003	0.0004	0.0003	0.0003
Sodium	NS		2	3	3	3	3	3	3	3	3
Strontium	NS		0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sulfate (as SO4-2)	250	1	27.2	26.4	26.3	26.2	26.2	26.5	26.3	26.2	26.0
Thallium	0.0017	5	**0.0415**	**0.0277**	**0.0292**	**0.0270**	**0.0208**	**0.0266**	**0.0294**	**0.0273**	**0.0263**
Vanadium	0.100	4	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01
Zinc	0.169	3	0.0024	0.0018	0.0019	0.0018	0.0016	0.0018	0.0019	0.0018	0.0018

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
Surface water values for the best case simulation are 1/10 metals dilution of the average values
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Acute Aquatic Life Fresh Water criterion, using calculated hardness from Average ROCK 1 composition
3 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness from average ROCK 1 composition
4 = Irrigation water criterion
5 = Human Health and Aquatic Organisms Criteria for NonCarcinogens

Formatted: D between Latin

Formatted: F Not Bold

Dissolved concentrations of all constituents were generally low. For the base and alternative cases, the pit lake concentration exceeded the applicable water quality standards for arsenic (0.01 mg/l) and thallium (0.002 mg/l). The base case arsenic remains stable at 0.039 mg/l, and thallium decreases from 0.0415 to 0.0208 mg/l over the 43 years. The alternative case arsenic remains stable at 0.039 mg/l, and thallium remains stable at approximately0.027 mg/l.

The results of the expected case indicate that the pit lake will not impact the surface water quality at the site after closure and may improve water quality because of reducing or eliminating groundwater discharge to Rock Creek over the long term. Additionally, the rapid pit filling closure scenario simulated with the alternative case model is not recommended for closure design, because it did not significantly improve water quality.

6.3 Summary

Based on this assessment, the Rock Creek pit lake water quality can be managed such that applicable water quality standards or background concentrations are not exceeded for all constituents. In the case of arsenic and thallium, predicted concentrations for the Conservative Condition are above the current drinking water standards of 0.01 mg/l and 0.002 mg/l, respectively. However, the natural background, average concentrations of arsenic and thallium in Rock Creek are 0.033 mg/l and 0.0415, which also exceed the current standards. In this case, the discharge to Rock Creek from the pit lake will have improved water quality over existing conditions pre-mining, due to diluting the creek water with additional clean surficial runoff.

The Expected Condition which simulates reduced naturally-impacted groundwater discharge to Rock Creek, results in water quality exceedances for arsenic and thallium. Background concentrations for Rock Creek are considered with a 10:1 metals dilution, and therefore only exceed the current water quality standards for thallium. Predicted arsenic values for both the base and alternative cases range from 0.010 to 0.013 mg/l and appear to be relatively stable through time. Predicted thallium concentrations range from 0.0028 to 0.0031 mg/l, which are less than the average background (with the 10/1 metals dilution) concentration of 0.0042 mg/l.

A Sensitivity Run was included, whereby groundwater inflow was increased and the representative groundwater chemistry contained the maximum measured value for arsenic concentration. The results indicate overall good water quality with the exception of arsenic and thallium exceedances. The predicted arsenic and thallium concentrations do not exceed the average background concentrations measured at Rock Creek. The discharge from the pit lake, along with clean surficial runoff, will dilute the creek water resulting in improved water quality from existing pre-mining conditions.

Rapid filling of the pit lake after closure reduces the time that reactive pit walls are exposed to oxygen. This reduces the total chemical mass load to the pit, but in this case it does not result in significant long-term benefits to the pit lake water quality.

7 REFERENCES

Dzombak, D.A., and Morel, F.M.M., 1990. Surface complexation modeling--Hydrous ferric oxide: New York, John Wiley, 393 p.

Parkhurst, David L. and Appelo, C. A. J., 1999. User's Guide to PHREEQC (Version 2) - A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and inverse Geochemical Calculations. Water-Resources Investigations Report 99-4259.

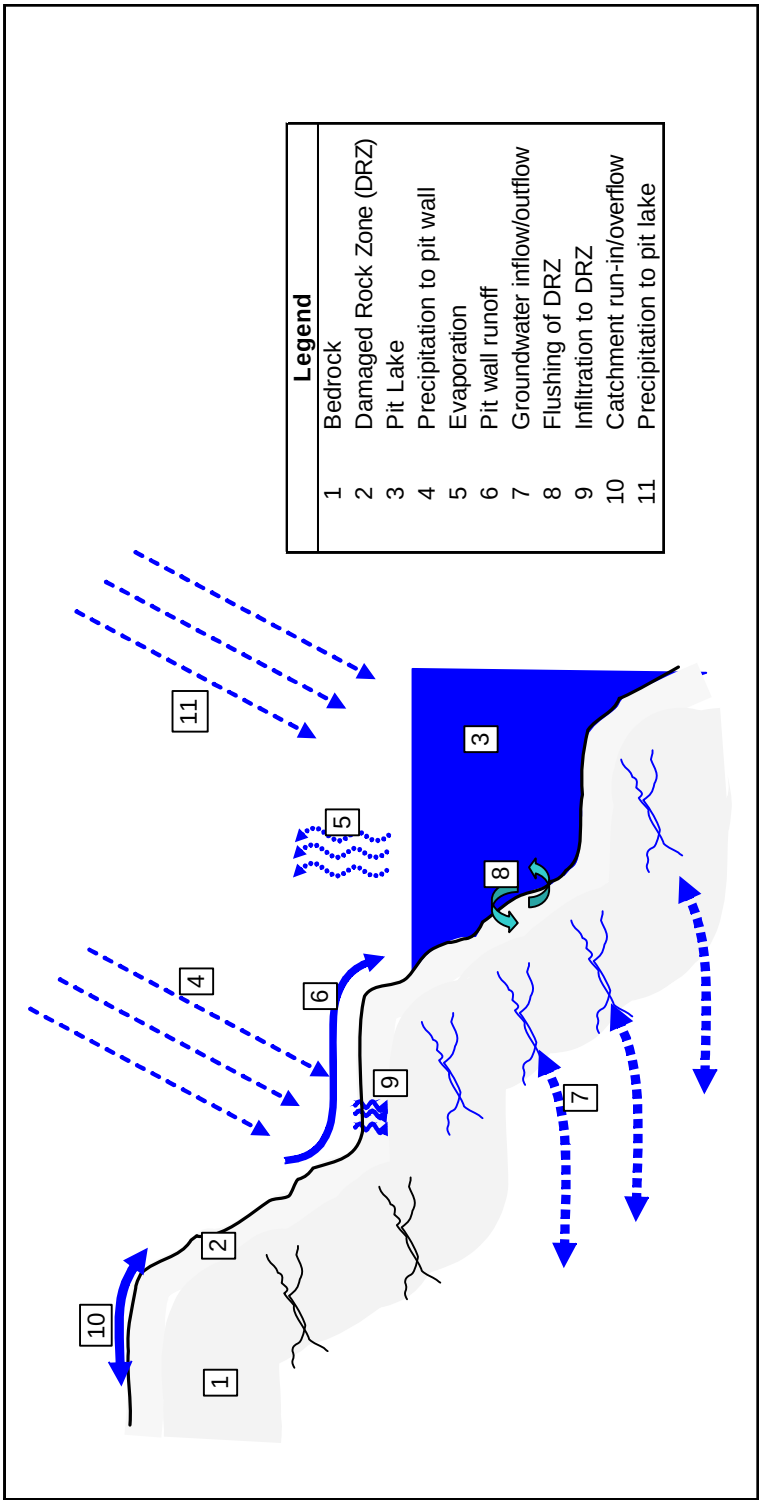
GRAIN 3.0.

FIGURES

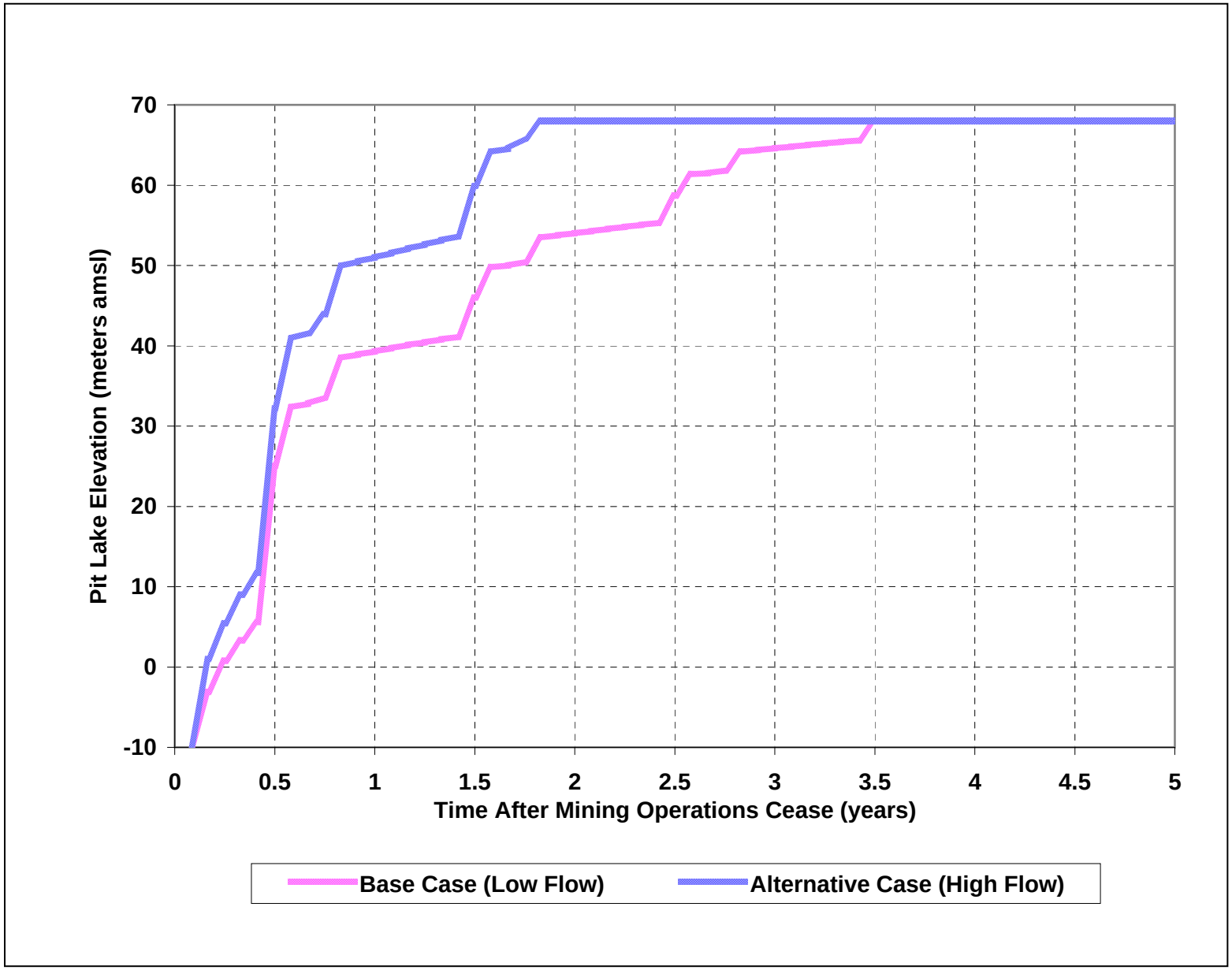
FIGURES

WATER MANAGEMENT CONSULTANTS

Figure 4.1 Pit lake conceptual water-balance model



2573-BIG HUR/AH
FIGURE-4.1



WATER MANAGEMENT CONSULTANTS

Figure 6.1 Predicted pit lake filling curves

F:\2509 - Rock Creek\2509 - Draft Final Memos March 2006\2509 Rock Creek Pit Lake\Support\2509 tables_MAR2006
Pit Figure 6.1

5/9/2006

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007

To: Doug Nicholson (doug.nicholson@novagold.net)

Company: NovaGold Resources Inc.

Project No.: 2573

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date: March 23, 2006

Subject: Big Hurrah Baseline Groundwater

---

1 INTRODUCTION

The Big Hurrah project area is located approximately 30 miles east of Nome, Alaska, on private lands owned by NovaGold Resources Inc. (NovaGold). Figure 1.1 is a generalized site location map showing the site layout and groundwater monitoring locations.

The regional drainage is controlled by Big Hurrah Creek, which empties into Norton Sound to the south of the project area. The project area straddles Big Hurrah Creek at its confluence with Little Hurrah Creek. Topography is moderately steep (up to 30% grade) along Big Hurrah, with steeper rock slopes along portions of Little and Big Hurrah Creeks. Thin soil overburden covers most of the slopes. The bottom of Little Hurrah Creek valley has a thin alluvial/colluvial deposit. Big Hurrah Creek alluvium has been re-worked as a result of historical dredge mining. Vegetation includes grasses, with brush in wet areas lower on the slopes.

The geology at Big Hurrah consists predominantly of structurally-complex schist and marble with abundant alteration-related carbonate, quartz, and graphite associated with secondary gold mineralization along veins. Mineralization at is hosted in quartz veins contained within mineralized zones that strike northwest dipping variably to the southwest and vary in thickness from less than a meter to greater than 10 meters. The mineralized zones can be traced along strike for roughly 400 meters and are cutoff by post-mineralization faults. There are five types of veining recognized at Big Hurrah. These mineralized zones are composed of sub-parallel “ribbon” veins and stockwork quartz veins that vary in thickness from a few millimeters to 5 cm. While the mineralized zones are quite consistent, individual quartz veins are very irregular and vary in thickness, pinching and swelling along strike and down dip. Gold often occurs along with graphite, scheelite, pyrite or arsenopyrite. Sulfide content of the veins averages about 1%.

A weather station was installed at Big Hurrah in the spring of 2005 and is currently logging data, however, a long-term data record for the site is not available. Figure 1.2 shows the average monthly temperature and rainfall used for the Rock Creek project area as collected from the Nome airport. The temperature reaches a maximum of around 10°C during July and a minimum of approximately -13°C in January. The majority of the precipitation occurs between July and October, and the mean annual precipitation is approximately 41 inches.

Groundwater flows through the project area from recharge areas located higher in the watershed south of the site, to discharge areas, along Big Hurrah Creek. Discharge of interflow or shallow groundwater occurs in a few areas on the slopes and along the banks of Big Hurrah Creek.

NovaGold is investigating the feasibility of an open-pit gold mine within the catchment of Big Hurrah Creek. The Big Hurrah deposit will be mined as an open pit mine to supply supplemental ore to the mill located at the Rock Creek project.

Development rock stripped from the pit will be placed into a development rock dump or used as rock fill material in haul road construction.

The Big Hurrah facilities will include a run-of mine ore stockpile, a truck maintenance shop, a small administration and mine dry building, and diesel fuel storage. Groundwater in the vicinity of the pit will be intercepted by pit perimeter wells before it enters the pit. Water will be treated, as necessary, and re-injected via infiltration galleries or injection wells. Surface water will be directed away from mine facilities and blowing snow will be intercepted, to the extent possible, to minimize snow-pack within the pit. Snowmelt and incident precipitation that is collected within the pit will be managed to limit contact with pit walls and treated, as necessary before disposal.

There are historical workings in the project area including a stamp mill and enclosing structure, a dis-used house, underground workings, and dredged tailings along Big Hurrah Creek.

The baseline monitoring program described in this report was developed to provide baseline water-quality data prior to mining activity at the site.

2 BASELINE MONITORING

NovaGold has instigated a groundwater monitoring program in preparation of permitting the Big Hurrah Mine. Baseline groundwater monitoring occurring between March 2005 through February 2006 is presented in this report. During some sampling events, it was only possible to obtain a sample from a subset of wells as some of the wells were frozen. Baseline sampling events have been completed with water-chemistry data available from the laboratory.

Monitoring well details are provided in Table 2.1 and their locations are shown in Figure 1.1. There are currently nine monitoring wells at six locations, designed and located to collect baseline groundwater chemistry and water-level data upgradient, within, and downgradient of the proposed mining facilities in surficial and deep hydrystratigraphies as warranted. Well HMW-5A, located in the footprint of the proposed pit (Figure 1.1), was designed to collect samples from historical workings for the estimation of potential impacts from historical mining activities and to provide an indication of the effects of natural mineralization on groundwater quality. HMW-5A will be abandoned when mining starts and will not be part of the long-term site monitoring plan. Two additional wells at HMW-2 have been proposed for a location upgradient of the site along Big Hurrah Creek (Figure 1.1). HMW-2 is located outside of the project boundary and access to this site had not been secured as of the writing of this report, however, negotiations are ongoing.

In addition to the baseline monitoring wells outlined above, data are presented from Camp Well 1, located immediately to the south of the shop area (Figure 1.1). This provides additional information on groundwater quality in the vicinity of the proposed pit. Since the well is periodically pumped for water supply, however, water level data were not presented in this summary.

Samples of springs are included in the surface water program.

Table 2.1 Monitoring well descriptions

Well ID	UTM Easting (m)	UTM Northing (m)	Collar elevation* (m amsl)	Purpose	Total depth drilled (m)	Top of screen (m)	Bottom of screen (m)	Top of filter pack (m)	Bottom of filter pack (m)	Depth of pump (m)
HMW-1A	536701.90	7169121.55	129.99	Upgradient of development rock facility	42.67	35.66	41.76	35.36	Not Available	39.62
HMW-3A	536639.17	7169729.60	64.73	Downgradient of development rock facility - deep	65.53	52.12	64.31	49.07	Not Available	60.96
HMW-3B	536622.90	7169727.32	65.00	Downgradient of development rock facility - shallow	15.36	12.31	15.36	8.84	Not Available	12.50
HMW-4A	536189.92	7169475.03	74.06	Upgradient of the pit - deep	50.29	21.34 39.93	24.38 46.02	19.20	Not Available	42.98
HMW-4B	536208.21	7169442.33	68.59	Upgradient of the pit - shallow	3.66	1.22	3.05	0.61	Not Available	No Pump
HMW-5A	536289.27	7169632.51	66.04	Monitor historical workings impact in/near pit	60.96	35.05 54.86	44.20 60.96	26.52	Not Available	59.13
HMW-6B	535876.05	7169963.13	49.15	Downgradient of mine facilities - deep	16.76	11.68	15.03	9.75	Not Available	13.41
HMW-6C	535903.64	7169956.16	51.45	Downgradient of mine facilities - shallow	3.66	0.41	3.46	Surface	Not Available	2.71
HMW-6D	535903.64	7169956.16	69.85	Downgradient of mine facilities	2.90	1.07	2.90	0.61	Not Available	2.44

m - meters
m amsl - meters above mean sea level
* HMW-6D collar elevation estimated from topographic map

Groundwater samples are collected from each monitoring well using methods outlined in the project Quality Assurance Project Plan (WMCI, 2004). Submersible sampling pumps were installed in each of the wells however, micropurge techniques are used when feasible. For each monitoring well, during each month, sampling includes:

- observations that are recorded using a field notebook, sample form, and chain of custody form;
- measurement of static water level and total depth used to calculate purge volume;
- decontamination of sampling equipment with detergent and rinsing with distilled water;
- well purging so that sampled water is representative of groundwater conditions;
- measurement of field parameters during well purging to verify that water quality has stabilized;
- field measurement of groundwater pH, electrical conductivity, temperature, redox potential, and depth to water;
- collection of groundwater samples for total metals, pH, alkalinity, ammonia, chloride, total and Wad cyanide, fluoride, nitrite and nitrate, total phosphorus, sulfate, sulfide, silicon, and TDS;
- samples are also collected for dissolved metals by passing the pump stream through an in-line disposable filter (one 0.45 micrometer filter should be used for each well each sample);
- quality-assurance and quality-control (QA/QC) samples (one duplicate and one equipment blank) are collected each sample round; and
- preservation of samples according to standard protocols, labeling with well name and date, storage at 4°C, and shipment to the laboratory.

The samples were analyzed at SGS Environmental Services in Anchorage using standard methods.

2.1 Water-level data

Water levels in the monitoring wells are measured to evaluate changes in groundwater elevation as part of the baseline data collection for the project area. Water level measurements have been collected beginning in October 2004 and are ongoing. Table 2.2 presents the measuring point elevations, groundwater elevations, average values, and ranges of water levels measured to date. The depth to groundwater and other field data are also contained in Table 2.3.

Figure 2.1 shows the groundwater elevation hydrograph for each of the monitoring wells. Long-term trends cannot be determined due to the limited data set available; however, these data indicate a change in water level that is likely due to seasonal fluctuations that relate to precipitation (Figure 1.2).

In general, the water levels mimic topography. It is likely that groundwater flow primarily occurs through interconnected bedrock fractures, underground workings, and through the unconsolidated alluvium in valley bottoms.

Table 2.2 Groundwater elevation data summary

Well I.D.	Measuring point elevation	Potentiometric elevation* October 2004	Potentiometric elevation* January 2005	Potentiometric elevation* March 2005	Potentiometric elevation* April 2005	Potentiometric elevation* May 2005	Potentiometric elevation* June 2005	Potentiometric elevation* September 2005	Potentiometric elevation* October 2005	Potentiometric elevation* November 2005	Potentiometric elevation* February 2006
	(m amsl)	(m amsl)	(m amsl)	(m amsl)	(m amsl)	(m amsl)	(m amsl)	(m amsl)	(m amsl)	(m amsl)	(m amsl)
HMW-1A	131.63	Well Completed July 2005						112.21	122.32	120.30	121.44
HMW3A	65.93	Well Completed June 2005						64.57	NM	65.52	Frozen
HMW-3B	65.99	59.60	59.29	58.98	58.69	NM	NM	61.26	61.27	60.51	61.20
HMW-4A	75.12	Well Completed June 2005					56.75	67.59	NM	66.50	67.36
HMW-4B	69.85	Well Completed August 2005						67.04	67.01	66.81	Frozen
HMW-5A	67.45	Well Completed September 2005							61.98	61.72	64.10
HMW-6B	50.62	50.20	46.67	49.33	49.36	NM	NM	50.26	NM	49.61	mechanical issues
HMW-6C	52.82	49.20	NM	49.06	49.03	NM	NM	49.15	NM	NM	mechanical issues
HMW-6D**	69.85	Well Completed October 2005							68.16	68.15	69.22

m amsl - meters above mean sea level
NM = Not Measured
* Open borehole measurement
** Measuring point elevation estimated from topographic map

Groundwater elevations generally mimic surface topography and the gradients are toward Big Hurrah Creek with upward hydraulic gradients apparent in the areas around HMW-3 and HMW-6. HMW-6B is an artesian well with water levels approximately 1 to 3 feet above ground surface, suggesting Big Hurrah Creek is a gaining stream along that reach.

2.2 Field parameter data

In addition to water levels, other field data are collected as part of the baseline data collection for the project area. Field data including well depths, well purging volumes, groundwater temperature, pH, electrical conductivity (EC), oxidation reduction potential (ORP), and ferrous iron concentrations have been collected since March 2005. The field data, including minimum, maximum, and averages, are provided in Table 2.3.

Table 2.3 Field parameter data summary

Parameter	Unit	Result	Result	Result	Result	Minimum	Average	Maximum
Well ID: HMW-1A								
Collection date:		27-Oct-05	30-Nov-05	6-Feb-06				
Collection time:								
Well diameter:	cm	10.16	10.16	10.16				
Depth to water:	m btoc	9.31	11.32	11.83		9.31	10.82	11.83
Total depth:	m btoc	41.76	41.76	41.76		41.76	41.76	41.76
Total volume purged:	liters	273	322	360		273	318	360
Temperature	^{o}C	0.6	0.6	0.6		0.6	0.6	0.6
pH	s.u.	7.29	7.51	7.67		7.29	7.49	7.67
EC	uS/cm	400	390	355		355	382	400
ORP								
Ferrous iron	mg/L	1.8	1.2	2.0		1.2	1.7	2.0
Well ID: HMW-3A								
Collection date:		5-Sep-05	27-Nov-05					
Collection time:								
Well diameter:	cm	10.16	10.16					
Depth to water:	m btoc	1.36	0.41			0.41	0.89	1.36
Total depth:	m btoc	64.31				64.31	64.31	64.31
Total volume purged:	liters	310	575			310	443	575
Temperature	^{o}C	4.8	1.7			1.7	3.2	4.8
pH	s.u.	6.76	7.52			6.76	7.14	7.52
EC	uS/cm	652	342			342	497	652
ORP								
Ferrous iron	mg/L	0.8	0.8			0.8	0.8	0.8
Well ID: HMW-3B								
Collection date:		1-Sep-05	30-Nov-05	6-Feb-06				
Collection time:								
Well diameter:	cm	5.08	5.08	5.08				
Depth to water:	m btoc	4.73	5.48	5.78		4.73	5.11	5.48
Total depth:	m btoc	15.24	15.24	15.24		15.24	15.24	15.24
Total volume purged:	liters	30	36	23		23	33	36
Temperature	^{o}C	4.8	4.8	0.5		0.5	4.8	4.8
pH	s.u.	6.72	7.47	7.53		6.72	7.10	7.47
EC	uS/cm	637	388	330		330	513	637
ORP								
Ferrous iron	mg/L	1.0	1.2	1.0		1.0	1.1	1.2

Table 2.3 Field parameter data summary (continued)

Well ID: HMW-4B								
Collection date:		6-Sep-05	27-Oct-05					
Collection time:								
Well diameter:	cm	10.16	10.16					
Depth to water:	m btoc	2.82	2.84			2.82	2.83	2.84
Total depth:	m btoc	3.66	3.66			3.66	3.66	3.66
Total volume purged:	liters	11	19			11	15	19
Temperature	^{o}C	3.6	1.5			1.5	2.6	3.6
pH	s.u.	6.47	7.60			6.47	7.04	7.60
EC	uS/cm	293	96			96	195	293
ORP	mV							
Ferrous iron	mg/L	0.0	0.0			0.0	0.0	0.0
Well ID: HMW-5A								
Collection date:		26-Oct-05	27-Nov-05	6-Feb-06				
Collection time:		15:00	13:44	14:45				
Well diameter:	cm	10.16	10.16	10.16				
Depth to water:	m btoc	5.47	5.74	4.76		4.76	5.32	5.74
Total depth:	m btoc	60.96	60.96	60.96		60.96	60.96	60.96
Total volume purged:	liters	568	681	511		511	587	681
Temperature	^{o}C	1.7	1.7	1.7		1.7	1.7	1.7
pH	s.u.	7.35	7.52	7.56		7.35	7.48	7.56
EC	uS/cm	272	262	252		252	262	272
ORP	mV	-58.8	-73.5	-88.1		-88.1	-73.4667	-58.8
Ferrous iron	mg/L	1.0	1.0	0.8		0.8	0.9	1.0
Well ID: HMW-6B								
Collection date:		17-Mar-05	25-Apr-05	1-Sep-05	1-Dec-05			
Collection time:		18:30	14:00					
Well diameter:	cm	5.08	5.08	5.08	5.08			
Depth to water:	m btoc	1.30	1.26	0.36	1.01	0.36	0.98	1.30
Total depth:	m btoc	17.00	17.00	14.94	14.94	14.94	15.97	17.00
Total volume purged:	liters	152	150	95	68	68.00	116.08	151.60
Temperature	^{o}C	1.4	4.2	2.1	1.7	1.39	2.35	4.22
pH	s.u.	7.50	6.17	7.36	8.04	6.17	7.27	8.04
EC	uS/cm	451	458	457	226	226.00	398.00	458.00
ORP	mV	18	-48			-48.00	-15.00	18.00
Ferrous iron	mg/L	0.6	0.6	0.8	0.6	0.60	0.65	0.80
Well ID: HMW-6C								
Collection date:		9-Mar-05						
Collection time:		15:30						
Well diameter:	cm	5.08						
Depth to water:	m btoc	3.76				3.76	3.76	3.76
Total depth:	m btoc	5.26				5.26	5.26	5.26
Total volume purged:	liters	42				42	42	42
Temperature	^{o}C	0.6				0.6	0.6	0.6
pH	s.u.	7.32				7.32	7.32	7.32
EC	uS/cm	291				291	291	291
ORP	mV	25				25	25	25
Ferrous iron	mg/L	0.8				0.8	0.8	0.8
Well ID: HMW-6D								
Collection date:		26-Oct-05	7-Feb-06					
Collection time:								
Well diameter:	cm	10.16	10.16					
Depth to water:	m btoc	1.69	1.94			1.69	1.82	1.94
Total depth:	m btoc	2.90	2.90			2.90	2.90	2.90
Total volume purged:	liters	72	57			57	65	72
Temperature	^{o}C	2.1	0.3			0.3	1.2	2.1
pH	s.u.	7.43	8.03			7.43	7.73	8.03
EC	uS/cm	164	156			156	160	164
ORP	mV							
Ferrous iron	mg/L	0.2	0.2			0.2	0.2	0.2

m btoc – meters below top of casing

Well purging and field water-quality parameters have been collected to confirm that each well was properly purged prior to groundwater sample collection. Water-quality parameters were measured three times during purging, and the values did not vary significantly for any of the wells. Micropurging techniques were used when feasible.

Observations (Table 2.3) indicate that some field water-quality values are consistent over the first sampling rounds for wells HMW-1A, HMW-3B, HMW-6B, and HMW-6C. Other parameters were not as close in value, such as pH. However, because water-quality data collection has just commenced, these value differences may be insignificant. In general, pH values ranged from 6.2 to 8.0 standard units, and temperatures ranged from 0.3 to 4.8°C. Conductivity values were consistent at each site, with an overall range of values from 96 umhos/cm observed at HMW-4B to 874 umhos/cm at HMW-1A. Ferrous iron was detected at each site, with the highest concentration of 2.0 mg/L at well HMW-1A.

2.3 Water quality data

Collection of groundwater samples and laboratory analysis began in March 2005 and is ongoing. Water chemistry data are presented in Appendix A in their entirety and summarized in Table 2.4. The analytical suite is shown in Table 2.4 and includes both total and dissolved constituents.

Figures 2.2 through 2.5 are Piper diagrams showing the relative proportions of major cations and anions for each of the wells over a specific time period. Piper diagrams are used to provide a visual representation of waters' major chemistry. As illustrated in Figures 2.2 through 2.5, the Piper plot contains two base triangles and a larger central grid that combines the constituents of the base triangles. The base triangles are used to plot major cations (positively charged ions) and anions (negatively charged ions) as percentages. Cations (calcium, magnesium, and potassium + sodium) are plotted on the left base triangle, while anions (sulfate, chloride, and alkalinity) are plotted on the right base triangle. The larger grid shows the contents of the base triangles combined to display the overall water type for a particular sample. Water samples of similar major chemistry tend to plot in the same regions of the chart. This plotting system allows the user to plot multiple samples and to show dominant water types and trends either spatially or through time.

At Big Hurrah, groundwater types are generally consistent across the site. Wells HMW-3A, HMW-3B, HMW-5A, and Camp Well 1 are considered calcium-bicarbonate type. HMW-1A is classified as calcium-magnesium-bicarbonate type. Wells HMW-6B and HMW-6C are calcium-magnesium-bicarbonate-sulfate type. These two wells represent groundwater immediately downgradient of the proposed pit and reflect the natural influence of mineralization on groundwater chemistry. Groundwater pH is circumneutral across the site, ranging from 7.3 to 7.7.

Metals concentrations are variable across the site with elevated arsenic (compared to drinking water standards) in wells HMW-5A and Camp Well 1. Wells HMW-5A, HMW-6B, HMW-6C, and Camp Well 1 contain elevated manganese concentrations. Arsenic concentrations are greatest near the proposed open pit, reflecting the increased natural mineralization in that area. Dissolved arsenic concentrations range from 1.5 micrograms/liter to a maximum of 79.3 ug/L in Camp Well 1. Dissolved manganese concentrations range from 1.0 ug/L in well HMW-4B to 160 ug/L in well HMW-6C. Total Dissolved Solids range from 84 mg/L in well HMW-4B to 358 mg/L in Camp Well 1. No long-term water quality trends are apparent at this time.

QA/QC methods in the laboratory include blanks, duplicates and spikes to verify that laboratory measurements meet the criteria of the selected methods. However, it is also necessary to collect and submit quality assurance samples from the field. For this site, this includes two duplicate samples from two of the wells and one equipment blank for each sampling round.

Table 2.4 Groundwater quality data summary

Statistics		HMW-1A			HMW-3B			HMW-4B			HMW-6B			HMW-3A	HMW-4A	HMW-5A	HMW-6C	HMW-6D	Camp Well 1
Analyte	Units	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Nov-05	Nov-05	Nov-05	Mar-05	Oct-05	May-05
Alkalinity	mg/L	315	325	340	287	301	312	56	74	100	133	139	143	298	156	202	78	90	229
Aluminum	ug/L	6	6	8	6	1253	4670	462	1537	2800	6	100	283	7	<6.2	<6.2	3490	34	<6.2
Ammonia-N	mg/L	0.031	0.041	0.072	0.031	0.036	0.070	<0.031	<0.031	<0.031	<0.031	<0.031	<0.031	0.139	0.041	0.048	0.085	0.087	<0.031
Antimony	ug/L	<0.31	<0.31	<0.31	0.31	0.40	1.13	0.31	0.31	0.50	0.31	0.38	0.59	1.34	0.73	4.08	1.85	<0.31	3.82
Arsenic	ug/L	1.5	1.5	2.9	1.5	2.1	4.8	1.5	2.8	6.8	1.5	2.8	4.3	<1.5	3.5	44.7	12.7	<1.5	86.0
Barium	ug/L	20	21	22	24	36	64	56	77	100	26	27	28	37	18	31	99	36	17
Beryllium	ug/L	<0.13	<0.13	<0.13	0.130	0.130	0.209	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	0.137	0.248	0.38	<0.13	<0.13
Cadmium	ug/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.050	0.563	1.340	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15	1.12	<0.05	0.492
Calcium	mg/L	89	93	99	84	91	95	27	32	41	48	52	54	84	63	69	35	43	80
Chloride	mg/L	2.55	2.71	2.88	2.76	2.92	3.03	2.85	3.05	3.45	2.80	3.16	3.39	2.78	2.69	2.85	2.67	3.19	2.87
Chromium	ug/L	<0.31	<0.31	<0.31	0.31	1.60	5.46	0.31	0.73	1.56	0.31	0.48	1.13	<0.31	<0.31	<0.31	3.76	<0.31	<0.31
Cobalt	ug/L	<1.2	<1.2	<1.2	0.60	2.38	3.78	1.20	1.20	1.89	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	9.9	<1.2	1.42
Conductivity	umhos/cm	NA	NA	NA	600	625	650	NA	NA	NA	430	430	430	NA	NA	NA	270	NA	650
Copper	ug/L	0.33	0.74	1.15	0.57	4.64	15.80	1.57	3.65	7.07	0.78	0.93	1.06	0.39	0.97	<0.31	44.3	0.65	9.04
Cyanide	mg/L	<0.0025	<0.0025	<0.0025	0.003	0.003	0.004	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.01	<0.0025	<0.0025
Fluoride	mg/L	0.067	0.094	0.136	0.042	0.060	0.070	0.038	0.042	0.048	0.083	0.085	0.087	0.076	0.093	0.104	0.061	0.091	0.102
Iron	mg/L	2.29	2.38	2.47	0.96	3.55	10.30	1.11	2.96	6.03	0.56	0.80	1.28	0.74	1.05	1.04	27.90	0.30	1.97
Lead	ug/L	0.062	0.062	0.078	0.062	0.904	3.180	1.570	3.073	5.730	0.234	0.333	0.527	0.088	<0.062	<0.062	5.7	<0.062	0.073
Magnesium	mg/L	53	55	58	31	33	34	4	6	7	22	24	25	38	16	22	12	11	33
Manganese	ug/L	47	52	55	39	75	162	21	59	127	68	76	86	11	81	88	900	50	156
Molybdenum	ug/L	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	12.80	3.75	<3.1	6.93
Nickel	ug/L	0.62	1.20	1.98	0.62	4.60	12.90	0.62	4.65	11.60	0.62	1.55	2.86	3.25	1.37	11.50	113	5.11	19.50
pH	pH units	NA	NA	NA	7.26	7.28	7.30	NA	NA	NA	7.70	7.70	7.70	NA	NA	NA	7.28	NA	7.30
Phosphorus	ug/L	<62	<62	<62	62	71	189	62	62	91	<62	<62	<62	<62	<62	<62	208	<62	<62
Potassium	ug/L	590	616	641	1020	1325	1820	364	396	413	241	318	364	1510	357	500	869	527	848
Selenium	ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Silicon	ug/L	1790	2343	2690	2230	3033	3440	3570	6373	9620	2500	3143	4280	4650	3720	3820	5470	2420	NA
Silver	ug/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	0.36	<0.31	<0.31
Sodium	ug/L	2250	2277	2330	2480	2618	2740	2430	2667	2860	5910	6293	6650	2640	2310	3360	3750	3250	3540
Strontium	mg/L	0.330	0.344	0.371	0.242	0.264	0.280	0.125	0.149	0.194	0.489	0.542	0.569	0.491	0.352	0.442	0.168	0.192	0.839
Sulfate	mg/L	102	124	167	57	58	60	24	28	36	85	93	97	58	57	57	58	58	96
Sulfide	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Thallium	ug/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31
Tin	ug/L	<0.31	<0.31	<0.31	0.31	3.29	12.70	0.31	0.60	1.48	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	0.41	<0.31	<0.31
Titanium	ug/L	63.9	87.9	101.0	36.4	86.0	115.0	28.8	52.9	70.9	66.2	70.4	77.1	33.8	35.6	40.4	48.7	57.1	60.9
Total Dissolved Solids	mg/L	436	455	488	346	354	369	84	120	180	235	259	275	340	231	279	153	173	358
Total Nitrate/Nitrite	mg/L	0.03	0.03	0.06	0.03	0.16	0.27	0.09	0.10	0.11	0.31	0.31	0.16	0.05	<0.031	0.04	0.09	0.08	0.06
Total Suspended Solids	mg/L	3.8	4.3	5.0	1.5	60	222	42	70	127	0.7	6.5	15.0	0.8	1.0	0.7	159	2.5	3.0
Vanadium	ug/L	6.20	6.20	7.98	6.20	6.20	6.21	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2
WAD CN	mg/L	<0.0025	<0.0025	<0.0025	0.0025	0.0025	0.0030	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.003	<0.0025	<0.0025
Zinc	ug/L	1.7	2.3	2.9	4.3	16.7	37.8	34.1	42.1	52.0	1.50	1.50	1.62	5.43	<1.5	<1.5	96	6	246

Table 2.4 Groundwater quality data summary (continued)

Statistics		HMW-1A			HMW-3B			HMW-4B			HMW-6B			HMW-3A	HMW-4A	HMW-5A	HMW-6C	HMW-6D	Camp Well 1
Analyte	Units	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Nov-05	Nov-05	Nov-05	Mar-05	Oct-05	May-05
Aluminum, dissolved	ug/L	6	12	18	6	11	24	6	9	15	6	9	15	34	9	21	<6.2	12	<6.2
Antimony, dissolved	ug/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	0.31	0.31	0.43	1.17	0.81	3.11	<0.31	<0.31	5.73
Arsenic, dissolved	ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	1.5	2.3	3.1	2.4	1.7	45.6	<1.5	<1.5	79
Barium, dissolved	ug/L	20	21	24	25	27	30	42	43	46	28	33	42	38	20	32	36	35	16
Beryllium, dissolved	ug/L	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.050	0.095	0.235	0.050	0.103	0.337	0.050	0.153	0.347	0.050	0.132	0.347	0.127	0.272	0.178	<0.05	<0.05	0.245
Calcium, dissolved	mg/L	90	92	95	88	90	95	27	39	60	30	44	52	87	63	69	36	42	78
Chromium, dissolved	ug/L	0.31	0.80	2.10	0.31	0.45	1.33	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	2.80
Cobalt, dissolved	ug/L	<1.2	<1.2	<1.2	1.20	1.20	1.53	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	1.43
Copper, dissolved	ug/L	0.31	0.66	1.21	0.37	0.55	0.69	<0.31	<0.31	<0.31	0.31	0.60	0.95	0.45	0.32	0.42	0.53	<0.31	0.67
Iron, dissolved	mg/L	1.54	2.07	2.36	1.00	1.07	1.14	0.01	0.29	0.85	0.01	0.33	0.51	0.75	1.05	1.04	0.28	0.13	1.9
Lead, dissolved	ug/L	<0.062	<0.062	<0.062	0.062	0.062	0.072	<0.062	<0.062	<0.062	0.062	0.062	0.072	<0.062	<0.062	<0.062	<0.062	<0.062	<0.062
Magnesium, dissolved	mg/L	54	54	54	32	32	35	4.0	8.4	15.7	5.4	17.1	23.6	38.7	16.4	22.5	11.2	10.6	32.0
Manganese, dissolved	ug/L	44	49	59	38	42	45	0.9	1.5	2.0	1.5	49.3	76.5	11.0	74	87	157	47	149
Molybdenum, dissolved	ug/L	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	13.30	<3.1	<3.1	6.8
Nickel, dissolved	ug/L	0.62	1.37	2.52	0.62	1.90	3.18	0.62	0.89	1.41	0.62	1.1	1.6	4.0	2.1	11.7	4.5	4.9	18
Phosphorus, dissolved	ug/L	<62	<62	<62	<62	<62	<62	62	62	64	62	62	64	<62	<62	<62	<62	<62	<62
Potassium, dissolved	ug/L	558	617	728	1080	1173	1390	174	205	254	188	314	382	1560	320	470	366	500	868
Selenium, dissolved	ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	1.50	1.50	1.50	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	2380	2473	2560	3210	3415	3620	1710	2003	2290	2010	2930	3680	4310	3700	3880	NA	2260	NA
Silver, dissolved	ug/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<62
Sodium, dissolved	ug/L	1980	2273	2650	2230	2538	3340	2120	2237	2310	2280	5653	7750	2520	2270	3170	3280	3110	3470
Strontium, dissolved	mg/L	0.326	0.337	0.359	0.247	0.263	0.279	0.123	0.201	0.354	0.125	0.399	0.549	0.507	0.361	0.442	0.164	0.187	0.819
Thallium, dissolved	ug/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31
Titanium, dissolved	ug/L	71.7	98.1	124.0	66.1	81.6	102.0	20.7	28.3	38.7	25.6	46.7	57.6	70.1	48.7	59.1	33.1	51.8	84.9
Vanadium, dissolved	ug/L	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	6.20	6.20	6.40	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	1.8	4.2	5.8	2.2	8.4	18.2	27.3	31.5	39.5	1.5	10.5	27.8	2.1	3.8	3.1	2.6	7.5	241
Mercury, total	ug/L	NA	NA	NA	3.0	3.0	3.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Average assumes non-detect results equal to half the detection limit

Wells HMW-3A, HMW-4A, HMW-5A, HMW-6C, HMW-6D, and Camp Well 1 contain data from less than 3 sampling events, and therefore statistics were not run on those samples. Chemistry is representative of the most recent data for each well.

NA = no analysis

Table 2.5 contains the laboratory analysis results for the original samples and field-duplicate samples. Relative percent differences between the original and the duplicate for each result are calculated for comparison. Significant differences (greater than PQL values) between duplicates were measured for many of the compounds. Relative difference values ranged from 0 to 200% but were generally low (i.e., less than 20%) for major ions. Higher relative differences were calculated for those constituents with low concentrations (e.g., metals), which is expected, because at lower concentrations, small differences in duplicate concentration can result in higher relative percent differences.

Table 2.6 contains the laboratory analysis results from each of the equipment blanks. The equipment blanks had some detected compounds, which are indicated in bold. The detection of arsenic and lead in the April 2005 equipment blank are reported as estimated values because they are near the Practical Quantitation Limit (PQL) for that analyte. These detections may be related to the sensitivity of the analysis and the decontamination techniques used between samples.

While total concentrations are measured in water collected from these wells, total concentrations do not represent background groundwater quality. Water flowing through aquifers is naturally filtered and particulates do not migrate through aquifer material. Only dissolved mass migrates with groundwater through aquifer matrix material or fractures. Because of this and the fact that wells have been slow to develop at this site, the focus of the baseline sampling and analysis has been on the dissolved fraction of the water chemistry. These data provide a more reliable representation of baseline aquifer water quality.

3 CONCLUSIONS

Data from four sampling rounds have been received from the laboratory and included in this baseline monitoring program for Big Hurrah. Data were summarized and a preliminary evaluation of the hydrogeology and water quality of the site prior to mining activities was conducted. This report focused on the physical properties of groundwater flow in the Big Hurrah area, as well as the evolution of groundwater chemistry as it flows through the subsurface.

Groundwater elevation measurements have been collected since October 2004 and are ongoing. Groundwater flow occurs primarily through interconnected bedrock fractures and the underground workings, and water levels mimic surface topography. Measured water levels appear to fluctuate with seasonal precipitation. Upward gradients are observed along Big Hurrah Creek suggesting groundwater discharge and a gaining stream reach in the project area.

The groundwater at Big Hurrah is predominantly of calcium-bicarbonate type. Where groundwater is in contact with, or immediately downgradient of, the mineralized zones, the water type is calcium-magnesium-bicarbonate-sulfate. pH values at Big Hurrah were neutral, and elevated manganese concentrations were measured at HMW-5A, HMW-6B, HMW-6C, and Camp Well 1. Elevated arsenic and TDS concentrations were also present at HMW-5A and Camp Well 1, reflecting the increased natural mineralization in that area.

Baseline monitoring is ongoing and sampling will continue until operations begin in 2007.

4 REFERENCES

WMCI, 2004. Rock Creek Property, Groundwater Sampling and Analysis Quality Assurance Project Plan. Water Management Consultants, Inc. April 2004

Table 2.5 Big Hurrah water quality data summary

Duplicates		March 2005			March 2005			Percent	April 2005			April 2005			Percent	September 2005			September 2005			Percent	November 2005			November 2005			Percent
		HMW-3B			Duplicate				HMW-6B			Duplicate				HMW-3B			Duplicate				HMW-3A			Duplicate			
Analyte	Units	Results	Result flag	MDL	Results	Result flag	MDL	Differ-ence	Results	Result flag	MDL	Results	Result flag	MDL	Differ-ence	Results	Result flag	MDL	Results	Result flag	MDL	Differ-ence	Results	Result flag	MDL	Results	Result flag	MDL	Differ-ence
Aluminum	ug/L	328		6.2	404		6.2	-20.8	14.6	J	6.2	19.9	J	6.2	-30.7	6.2	ND	6.2	15.3	J	6.2	-84.7	6.79	J	6.2	6.2	ND	6.2	9.1
Ammonia-N	mg/L	0.031	ND	0.031	0.116		0.031	-115.6	0.031	ND	0.031	0.031	ND	0.031		0.031	ND	0.031	0.031	ND	0.031		0.139		0.031	0.0918	J	0.031	40.9
Antimony	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.41	J	0.31	0.428	J	0.31	-4.3	0.31	ND	0.31	0.31	ND	0.31		1.34		0.31	1.4		0.31	-4.4
Arsenic	ug/L	1.5	ND	1.5	1.5	ND	1.5		4.25	J	1.5	5.79		1.5	-30.7	1.5	ND	1.5	1.5	ND	1.5		1.5	ND	1.5	2.62	J	1.5	-54.4
Barium	ug/L	29.6		0.94	29.1		0.94	1.7	27.2		0.94	27.7		0.94	-1.8	23.8		0.94	25.6		0.94	-7.3	37.1		0.94	35.4		0.94	4.7
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13		0.13	ND	0.13	0.13	ND	0.13		0.13	ND	0.13	0.13	ND	0.13		0.13	ND	0.13	0.279	J	0.13	-72.9
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05		0.05	ND	0.05	0.05	ND	0.05		0.05	ND	0.05	0.15	ND	0.15		0.05	ND	0.05	0.15	ND	0.15	
Chloride	mg/L	2.91		0.031	2.92		0.031	-0.3	3.39		0.031	3.42		0.031	-0.9	3.03		0.031	3.03		0.031	0.0	2.78		0.031	2.78		0.031	0.0
Chromium	ug/L	0.62	J	0.31	0.675	J	0.31	-8.5	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Cobalt	ug/L	1.2	ND	1.2	1.2	ND	1.2		1.2	ND	1.2	1.2	ND	1.2		3.78	J	1.2	5.29		1.2	-33.3	1.2	ND	1.2	1.2	ND	1.2	
Conductivity	umhos/cm	600		0.477	600		0.477	0.0	430		0.477	420		0.477	2.4	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	
Copper	ug/L	1.57		0.31	1.95		0.31	-21.6	0.945	J	0.31	0.941	J	0.31	0.4	0.633	J	0.31	0.655	J	0.31	-3.4	0.387	J	0.31	0.36	J	0.31	7.2
Cyanide	mg/L	0.004	J	0.0025	0.005		0.0025	-22.2	0.0025	ND	0.0025	0.0025	ND	0.0025		0.0025	ND	0.0025	0.0025	ND	0.0025		0.0025	ND	0.0025	0.0025	ND	0.0025	
Fluoride	mg/L	0.068	J	0.031	0.04	J	0.031	51.9	0.083	J	0.031	0.083	J	0.031	0.0	0.061	J	0.031	0.059	J	0.031	3.3	0.076	J	0.031	0.076	J	0.031	0.0
Iron	mg/L	1.87		0.0062	2.13		0.0062	-13.0	0.559		0.0124	0.566		0.0124	-1.2	0.958		0.0062	1.06		0.0124	-10.1	0.742		0.0062	0.759		0.0124	-2.3
Lead	ug/L	0.306		0.062	0.348		0.062	-12.8	0.238		0.062	0.252		0.062	-5.7	0.062	ND	0.062	0.062	ND	0.062		0.088	J	0.062	0.062	ND	0.062	34.7
Magnesium	mg/L	31.9		0.031	30.8		0.031	3.5	24.8		0.062	24.6		0.062	0.8	33		0.031	33.3		0.062	-0.9	37.6		0.031	38.1		0.062	-1.3
Manganese	ug/L	56.2		0.31	57.4		0.31	-2.1	67.8		0.31	69.6		0.31	-2.6	39.3		0.31	43		0.31	-9.0	11.1		0.31	11		0.31	0.9
Molybdenum	ug/L	3.1	ND	3.1	3.1	ND	3.1		3.1	ND	3.1	3.1	ND	3.1		3.1	ND	3.1	3.1	ND	3.1		3.1	ND	3.1	3.1	ND	3.1	
Nickel	ug/L	2.58		0.62	2.76		0.62	-6.7	1.47	J	0.62	1.5	J	0.62	-2.0	0.62	ND	0.62	0.62	ND	0.62		3.25		0.62	3.22		0.62	0.9
pH	pH units	7.26		0.1	7.31		0.1	-0.7	7.7		0.1	7.7		0.1	0.0	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	
Phosphorus	ug/L	62	ND	62	62	ND	62		62	ND	62	62	ND	62		62	ND	62	62	ND	62		62	ND	62	62	ND	62	
Potassium	ug/L	1260		150	1210		150	4.0	364	J	150	365	J	150	-0.3	1020		150	1090		150	-6.6	1510		150	1610		150	-6.4
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5		1.5	ND	1.5	1.5	ND	1.5		1.5	ND	1.5	1.5	ND	1.5		1.5	ND	1.5	1.5	ND	1.5	
Silicon	ug/L	3430		62	3460		62	-0.9	2650		62	2720		62	-2.6	2230		NA	2290		62	-2.7	4650		62	4720		62	-1.5
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Sodium	ug/L	2480		150	2410		150	2.9	6650		150	6790		150	-2.1	2610		150	2540		150	2.7	2640		150	2660		150	-0.8
Strontium	mg/L	0.257		0.0015	0.247		0.0015	4.0	0.569		0.003	0.559		0.003	1.8	0.278		0.0015	0.28		0.003	-0.7	0.491		0.0015	0.497		0.003	-1.2
Sulfate	mg/L	59.5		0.031	59.7		0.031	-0.3	96.5		0.31	98.2		0.31	-1.7	57.2		0.031	57.1		0.031	0.2	58		0.031	58.3		0.031	-0.5
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1		0.1	ND	0.1	0.1	ND	0.1		0.1	ND	0.1	0.1	ND	0.1		0.1	ND	0.1	0.1	ND	0.1	
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Tin	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Titanium	ug/L	91.5		1.5	95.3		1.5	-4.1	77.1		1.5	80.6		1.5	-4.4	101		1.5	110		1.5	-8.5	33.8		1.5	44.7		1.5	-27.8
Total Dissolved Solids	mg/L	346		3.1	339		3.1	2.0	266		3.1	249		3.1	6.6	369		3.1	366		3.1	0.8	340		3.1	350		3.1	-2.9
Total Nitrate/Nitrite	mg/L	0.27		0.031	0.031	ND	0.031	158.8	0.31	ND	0.31	0.31	ND	0.31		0.045	J	0.31	0.0575	J	0.031	-24.4	0.0545	J	0.031	0.0475	J	0.031	13.7
Total Suspended Solids	mg/L	16		0.3	24		0.15	-40.0	3.7		0.15	4		0.15	-7.8	1.5		0.15	1.7		0.15	-12.5	0.8		0.3	0.5		0.15	46.2
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2		6.2	ND	6.2	6.2	ND	6.2		6.2	ND	6.2	6.2	ND	6.2		6.2	ND	6.2	6.2	ND	6.2	
WAD CN	mg/L	0.003	J	0.0025	0.003	J	0.0025	0.0	0.0025	ND	0.0025	0.0025	ND	0.0025		0.0025	ND	0.0025	0.0025	ND	0.0025		0.0025	ND	0.0025	0.0025	ND	0.0025	
Zinc	ug/L	4.28	J	1.5	3.24	J	1.5	27.7	1.5	ND	1.5	3.67	J	1.5	-83.9	15.5		1.5	8.75		1.5	55.7	5.43		1.5	3.14	J	1.5	53.4

Table 2.5 Big Hurrah water quality data summary (continued)

Duplicates Analyte	Units	March 2005 HMW-3B			March 2005 Duplicate			Percent Differ-ence	April 2005 HMW-6B			April 2005 Duplicate			Percent Differ-ence	September 2005 HMW-3B			September 2005 Duplicate			Percent Differ-ence	November 2005 HMW-3A			November 2005 Duplicate			Percent Differ-ence
		Results	Result flag	MDL	Results	Result flag	MDL		Results	Result flag	MDL	Results	Result flag	MDL		Results	Result flag	MDL	Results	Result flag	MDL		Results	Result flag	MDL	Results	Result flag	MDL	
Aluminum, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2		6.2	ND	6.2	6.2	ND	6.2		23.6		6.2	6.2	ND	6.2	116.8	34.3		6.2	15.6	J	6.2	74.9
Antimony, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.426	J	0.31	0.371	J	0.31	13.8	0.31	ND	0.31	0.31	ND	0.31		1.17		0.31	1.19		0.31	-1.7
Arsenic, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5		3.1	J	1.5	3.07	J	1.5	1.0	1.5	ND	1.5	1.5	ND	1.5		2.38	J	1.5	1.7	J	1.5	33.3
Barium, dissolved	ug/L	24.6		0.94	24.5		0.94	0.4	29.5		0.94	28.8		0.94	2.4	30.1		0.94	27.7		0.94	8.3	37.5		0.94	34.2		0.94	9.2
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13		0.13	ND	0.13	0.13	ND	0.13		0.13	ND	0.13	0.13	ND	0.13		0.13	ND	0.13	0.13	ND	0.13	
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05		0.05	ND	0.05	0.05	ND	0.05		0.05	ND	0.05	0.106	J	0.05	-71.8	0.127	J	0.05	0.228	J	0.05	-56.9
Calcium, dissolved	mg/L	90.8		0.62	89.7		0.062	1.2	51.8		0.62	52.2		0.62	-0.8	88.8		0.062	89		0.062	-0.2	86.8		0.62	85.1		0.062	2.0
Chromium, dissolved	ug/L	1.33		0.31	1.96		0.31	-38.3	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2		1.2	ND	1.2	1.2	ND	1.2		1.53	J	1.2	1.86	J	1.2	-19.5	1.2	ND	1.2	1.2	ND	1.2	
Copper, dissolved	ug/L	0.691	J	0.31	0.615	J	0.31	11.6	0.952	J	0.31	0.636	J	0.31	39.8	0.687	J	0.31	0.548	J	0.31	22.5	0.446	J	0.31	0.31	ND	0.31	36.0
Iron, dissolved	mg/L	1.09		0.0124	1.08		0.0124	0.9	0.485		0.0124	0.502		0.0124	-3.4	0.998		0.0124	0.98		0.0124	1.8	0.752		0.0124	0.742		0.0124	1.3
Lead, dissolved	ug/L	0.062	ND	0.062	0.062	ND	0.062		0.062	ND	0.062	0.08	J	0.062	-25.4	0.072	J	0.062	0.062	ND	0.062	14.9	0.062	ND	0.062	0.062	ND	0.062	
Magnesium, dissolved	mg/L	31.8		0.62	31.3		0.062	1.6	23.6		0.62	24.4		0.62	-3.3	31.9		0.062	30.1		0.062	5.8	38.7		0.62	38		0.062	1.8
Manganese, dissolved	ug/L	42.1		0.31	44.3		0.31	-5.1	70		0.31	69.8		0.31	0.3	45.2		0.31	44		0.31	2.7	11		0.31	10.3		0.31	6.6
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1		3.1	ND	3.1	3.1	ND	3.1		3.1	ND	3.1	3.1	ND	3.1		3.1	ND	3.1	3.1	ND	3.1	
Nickel, dissolved	ug/L	1.81	J	0.62	1.63	J	0.62	10.5	1.58	J	0.62	1.54	J	0.62	2.6	0.62	ND	0.62	0.62	ND	0.62		3.98		0.62	3.76		0.62	5.7
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62		62	ND	62	62	ND	62		62	ND	62	62	ND	62		62	ND	62	62	ND	62	
Potassium, dissolved	ug/L	1080		150	1100		150	-1.8	382	J	150	384	J	150	-0.5	1390		150	1310		150	5.9	1560		150	1450		150	7.3
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5		1.5	ND	1.5	1.5	ND	1.5		1.5	ND	1.5	1.5	ND	1.5		1.5	ND	1.5	1.5	ND	1.5	
Silicon, dissolved	ug/L	NA	NA	NA					3100		62	3120		62		3620		NA	3270		62		4310		62	4110		62	
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Sodium, dissolved	ug/L	2230		150	2300		150	-3.1	6930		150	6900		150	0.4	3340		150	2990		150	11.1	2520		150	2360		150	6.6
Strontium, dissolved	mg/L	0.25		0.003	0.249		0.003	0.4	0.549		0.003	0.574		0.003	-4.5	0.277		0.003	0.258		0.003	7.1	0.507		0.003	0.498		0.003	1.8
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31		0.31	ND	0.31	0.31	ND	0.31	
Titanium, dissolved	ug/L	85.9		1.5	87.4		1.5	-1.7	56.9		1.5	56.7		1.5	0.4	102		1.5	92.9		1.5	9.3	70.1		1.5	65.5		1.5	6.8
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2		6.2	ND	6.2	6.2	ND	6.2		6.2	ND	6.2	6.2	ND	6.2		6.2	ND	6.2	6.2	ND	6.2	
Zinc, dissolved	ug/L	2.24	J	1.5	4.12	J	1.5	-59.1	1.5	ND	1.5	1.5	ND	1.5		18.2		1.5	9.48		1.5	63.0	2.14	J	1.5	3.18	J	1.5	-39.1

Result flags from database: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL.
Percent difference is left blank when both results are below detection or the difference is zero.

Table 2.6 Equipment blank sample analysis data summary

Equipment Blanks		March 2005			April 2005			September 2005			November 2005		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL
Aluminum	mg/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2
Ammonia-N	mg/L	0.052	J	0.031	0.065	J	0.031	0.031	ND	0.031	0.08	J	0.031
Antimony	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Arsenic	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5
Barium	ug/L	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.261	J	0.13
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.15	ND	0.15	0.15	ND	0.15
Calcium	mg/L	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.084	J	0.062
Chloride	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	1.32		0.031
Chromium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Cobalt	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2
Conductivity	umhos/cm	1.4		0.477	1.6		0.477	NA	NA	NA	NA	NA	NA
Copper	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1.33		0.31
Cyanide	mg/L	0.004	J	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025
Fluoride	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031
Iron	mg/L	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124
Lead	ug/L	0.062	ND	0.062	0.163	J	0.062	0.108	J	0.062	0.062	ND	0.062
Magnesium	mg/L	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062
Manganese	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Molybdenum	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1
Nickel	ug/L	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62
pH	pH units	5.78		0.1	6.3		0.1	NA	NA	NA	NA	NA	NA
Phosphorus	ug/L	62	ND	62	62	ND	62	62	ND	62	62	ND	62
Potassium	ug/L	150	ND	150	150	ND	150	150	ND	150	150	ND	150
Selenium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5
Silicon	ug/L	62	ND	62	NA	NA	NA	62	ND	62	62	ND	62
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Sodium	ug/L	150	ND	150	150	ND	150	150	ND	150	1390		150
Strontium	mg/L	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003
Sulfate	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031
Sulfide	mg/L	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1	0.1	ND	0.1
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Tin	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Titanium	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5
Total Dissolved Solids	mg/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1
Total Nitrate/Nitrite	mg/L	0.031	ND	0.031	0.34	J	0.31	0.043	J	0.031	0.031	ND	0.031
Total Suspended Solids	mg/L	0.15	ND	0.15	1.2		0.3	0.15	ND	0.15	0.15	ND	0.15
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2
WAD CN	mg/L	0.003	J	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0036	J	0.0025
Zinc	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	3.19	J	1.5

Table 2.6 Equipment blank sample analysis data summary (continued)

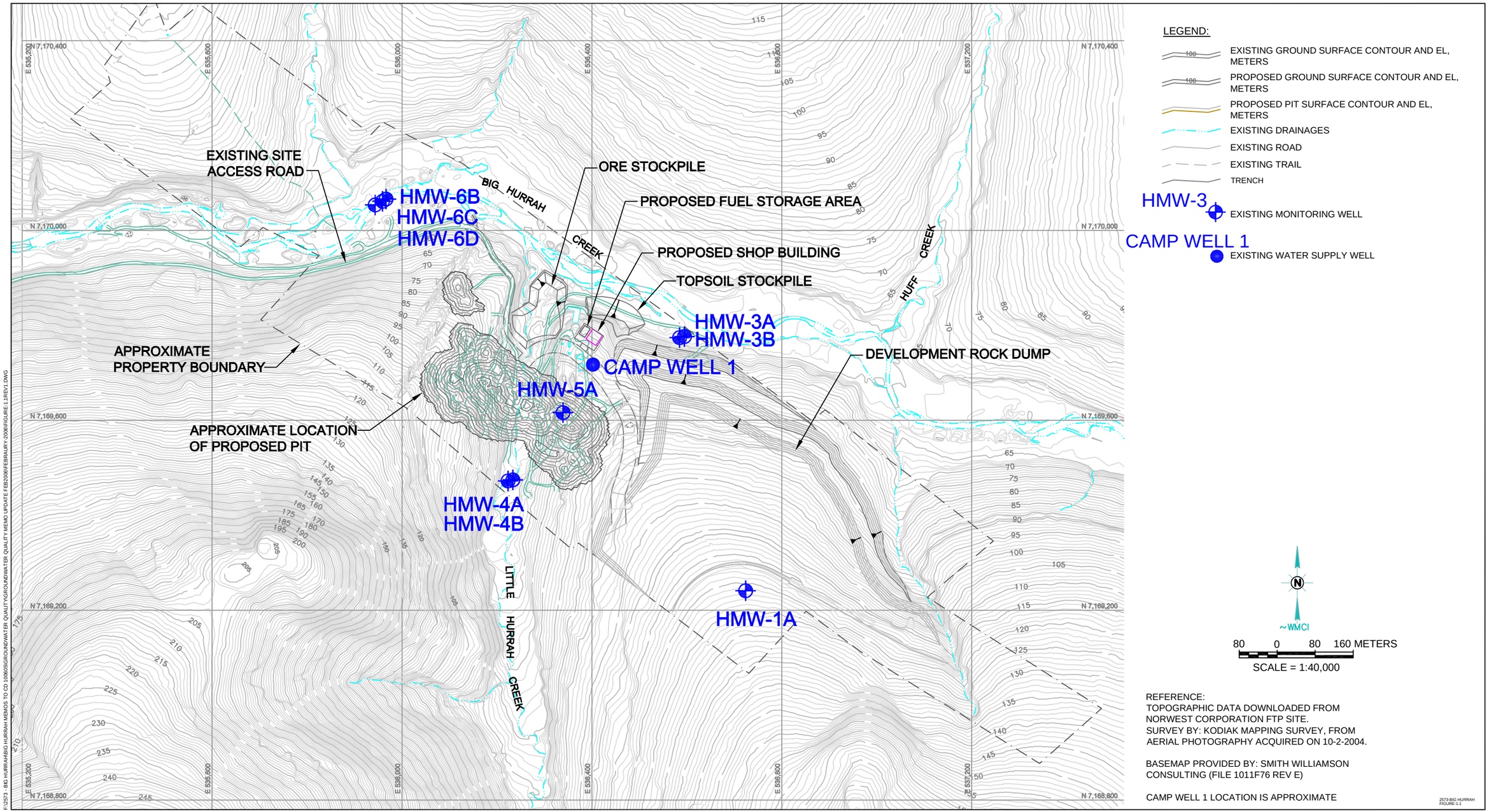
Equipment Blanks		March 2005			April 2005			September 2005			November 2005		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL
Aluminum, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	8.77	J	6.2
Antimony, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5	1.86	J	1.5	1.5	ND	1.5	1.76	J	1.5
Barium, dissolved	ug/L	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94	0.94	ND	0.94
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.05	ND	0.05	0.191	J	0.05
Calcium, dissolved	mg/L	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.114	J	0.062
Chromium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Cobalt, dissolved	ug/L	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2	1.2	ND	1.2
Copper, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	1.06		0.31
Iron, dissolved	mg/L	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124	0.0124	ND	0.0124
Lead, dissolved	ug/L	0.062	ND	0.062	0.085	J	0.062	0.062	ND	0.062	0.062	ND	0.062
Magnesium, dissolved	mg/L	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062
Manganese, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Molybdenum, dissolved	ug/L	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1	3.1	ND	3.1
Nickel, dissolved	ug/L	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62	0.62	ND	0.62
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62	62	ND	62	62	ND	62
Potassium, dissolved	ug/L	150	ND	150	150	ND	150	150	ND	150	150	ND	150
Selenium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5
Silicon, dissolved	ug/L	NA	NA	NA	NA	NA	NA	62	ND	62	184	J	62
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Sodium, dissolved	ug/L	150	ND	150	150	ND	150	150	ND	150	1370		150
Strontium, dissolved	mg/L	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31
Titanium, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2
Zinc, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.86	J	1.5	8.95		1.5

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL.

FIGURES

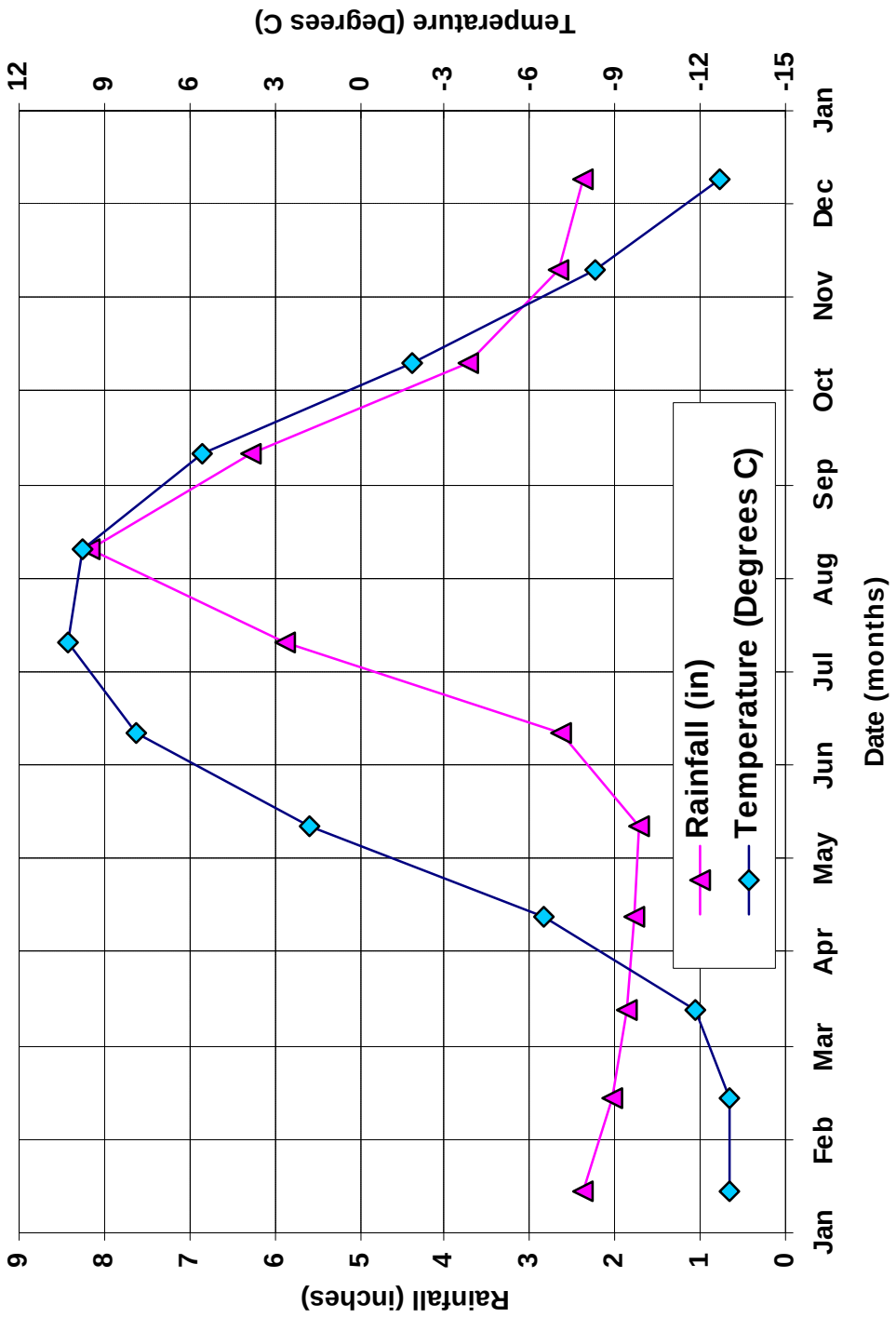
WATER MANAGEMENT CONSULTANTS

Figure 1.1 Big Hurrah preliminary site layout and monitoring well locations



WATER MANAGEMENT CONSULTANTS

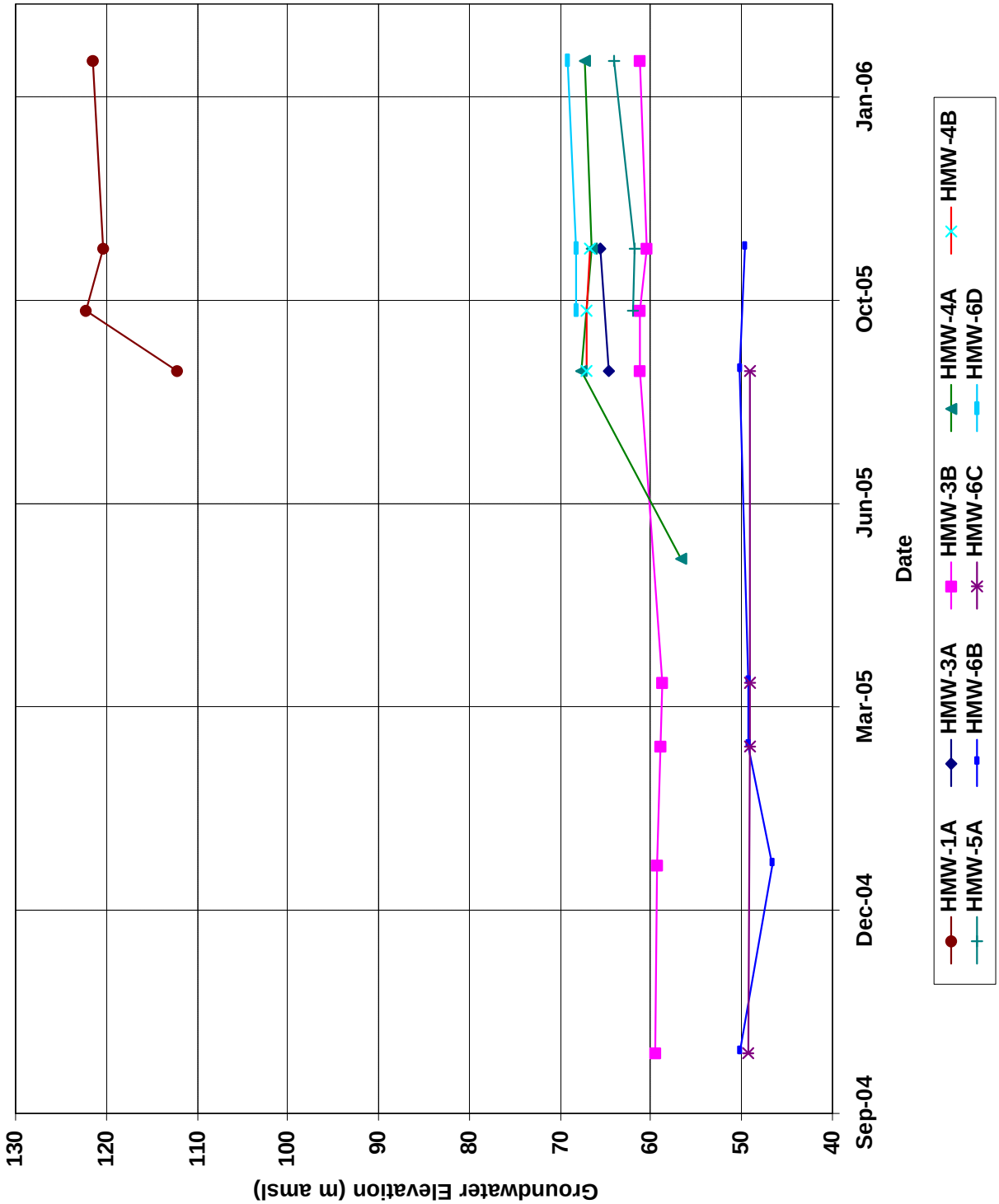
Figure 1.2 Monthly average climate data



F:\2573 - BIG HURRAH\BIG HURRAH MEMOS TO CD 100609\GROUNDWATER QUALITY\GROUNDWATER QUALITY MEMO UPDATE FEB2006\FEBRAURY-2006\FIGURE-1.2.DWG

WATER MANAGEMENT CONSULTANTS

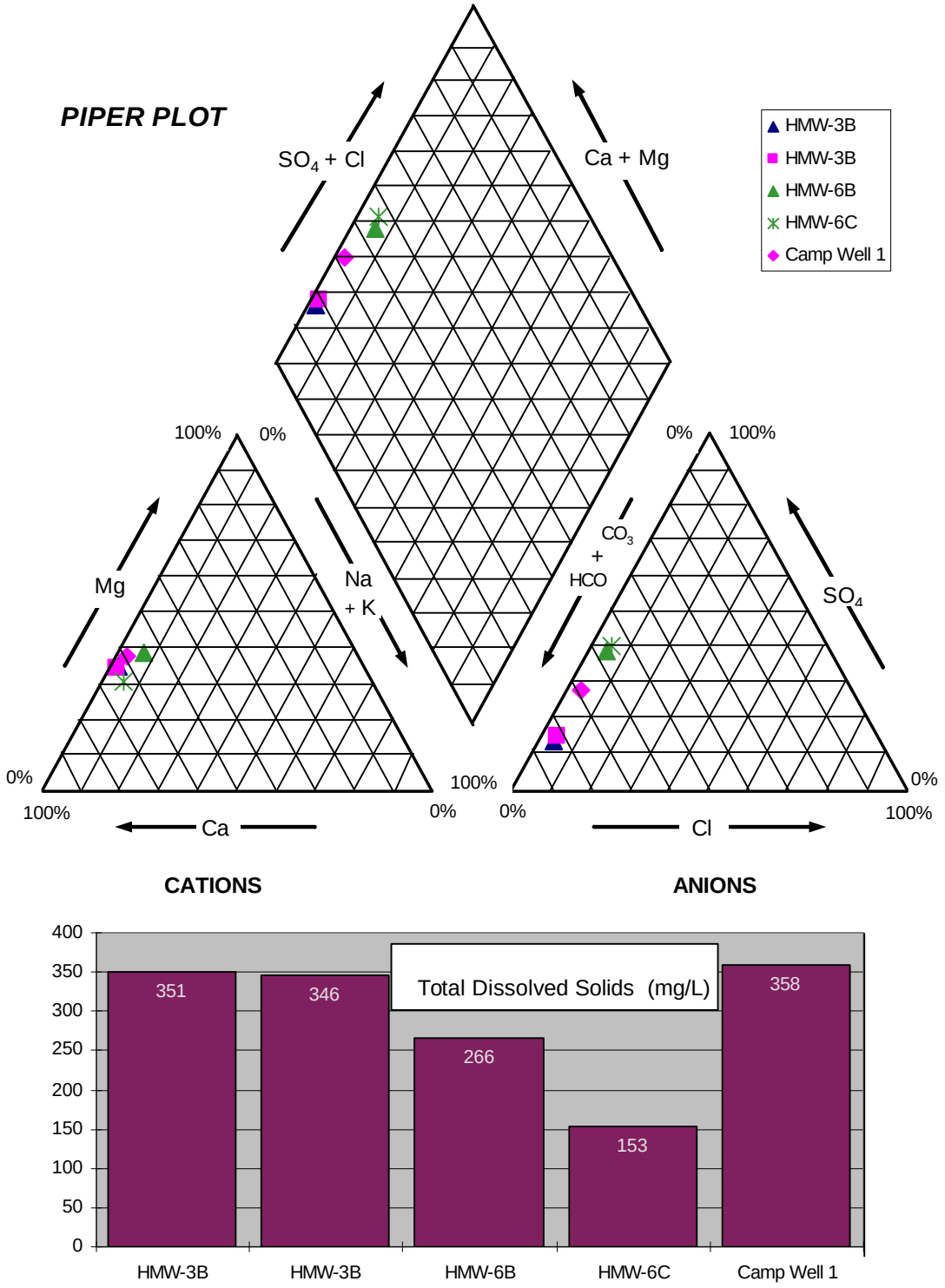
Figure 2.1 Groundwater elevation hydrograph for Big Hurrah monitoring wells



F:\2573 - BIG HURRAH\BIG HURRAH MEMOS TO CD 100605\GROUNDWATER QUALITY\GROUNDWATER QUALITY MEMO UPDATE FEB2006\FEBRAURY-2006\FIGURE-2.1.DWG

WATER MANAGEMENT CONSULTANTS

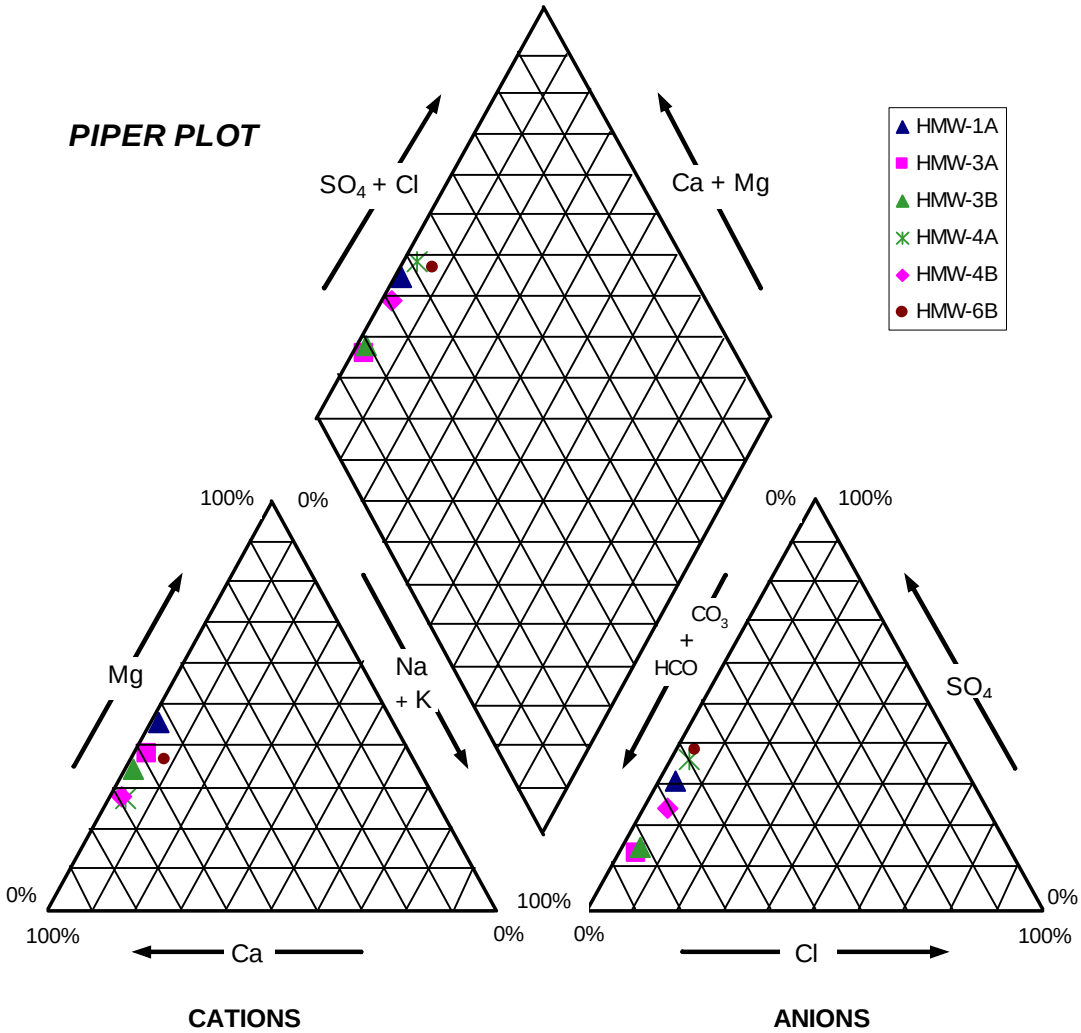
Figure 2.2 Hydrochemical typing of groundwaters at Big Hurrah, Alaska (March - May 2005)

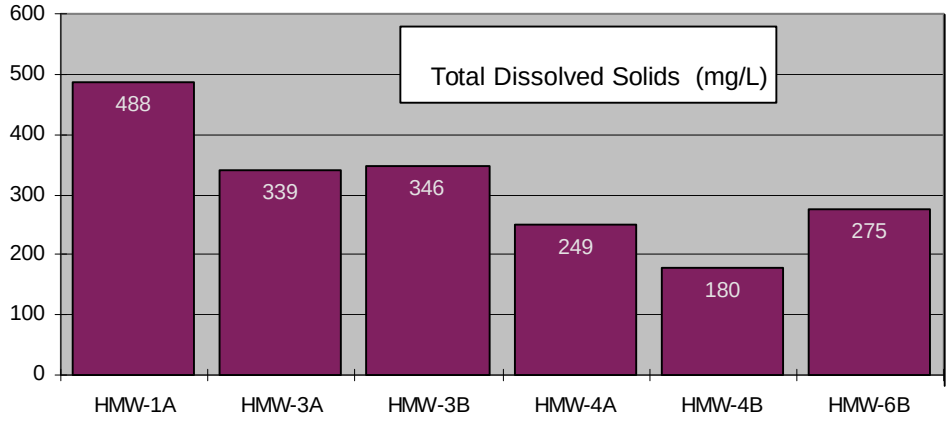


F:\2573 - BIG HURRAH\BIG HURRAH MEMOS TO CD 100605\GROUNDWATER QUALITY\GROUNDWATER QUALITY MEMO UPDATE FEB2006\FEBRAURY-2006\FIGURE-2.2.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.3 Hydrochemical typing of groundwaters at Big Hurrah, Alaska (September 2005)

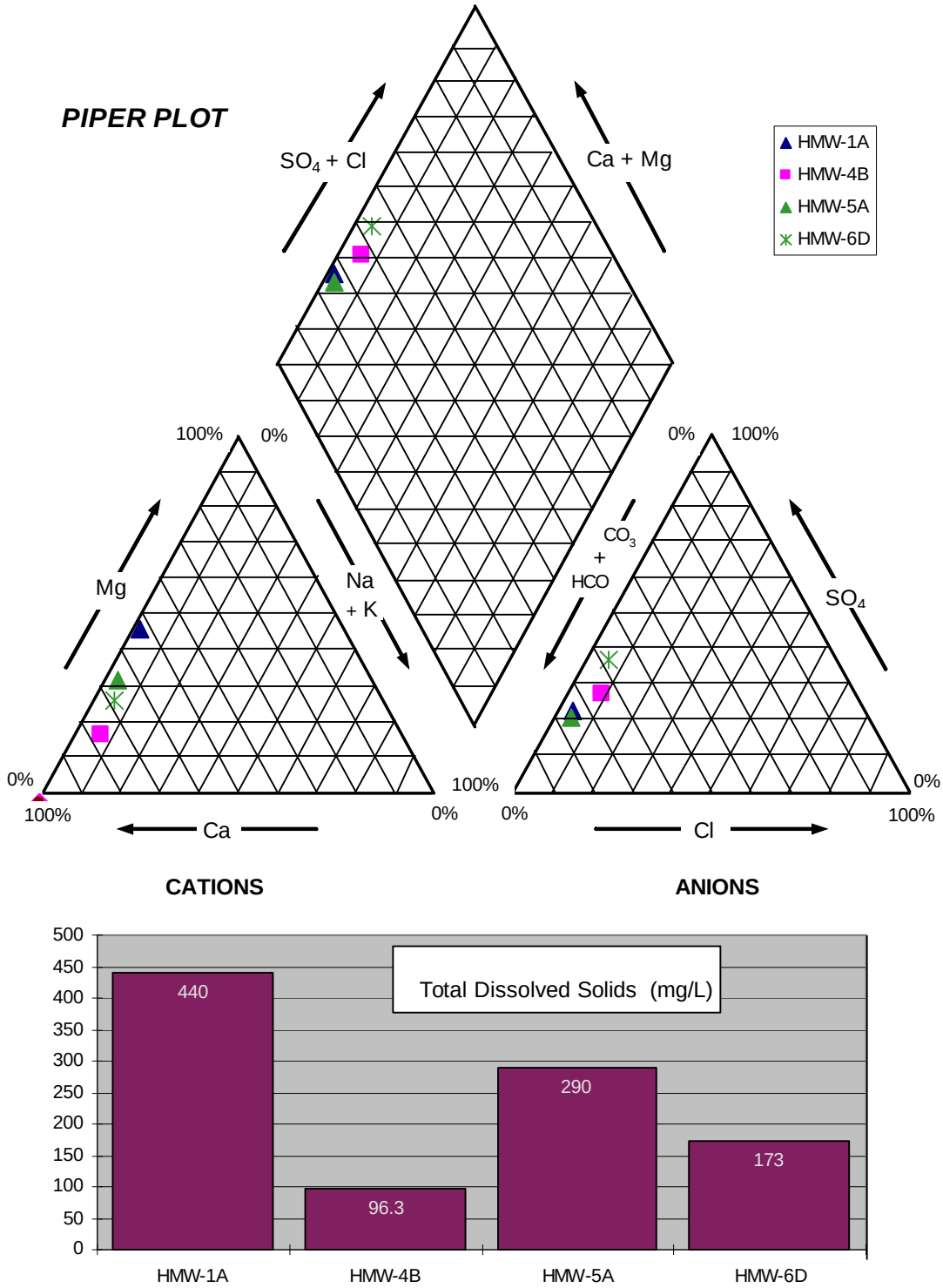




F:\2573 - BIG HURRAH\BIG HURRAH MEMOS TO CD 100605\GROUNDWATER QUALITY\GROUNDWATER QUALITY MEMO UPDATE FEB2006\FEBRAURY-2006\FIGURE-2.3.DWG

WATER MANAGEMENT CONSULTANTS

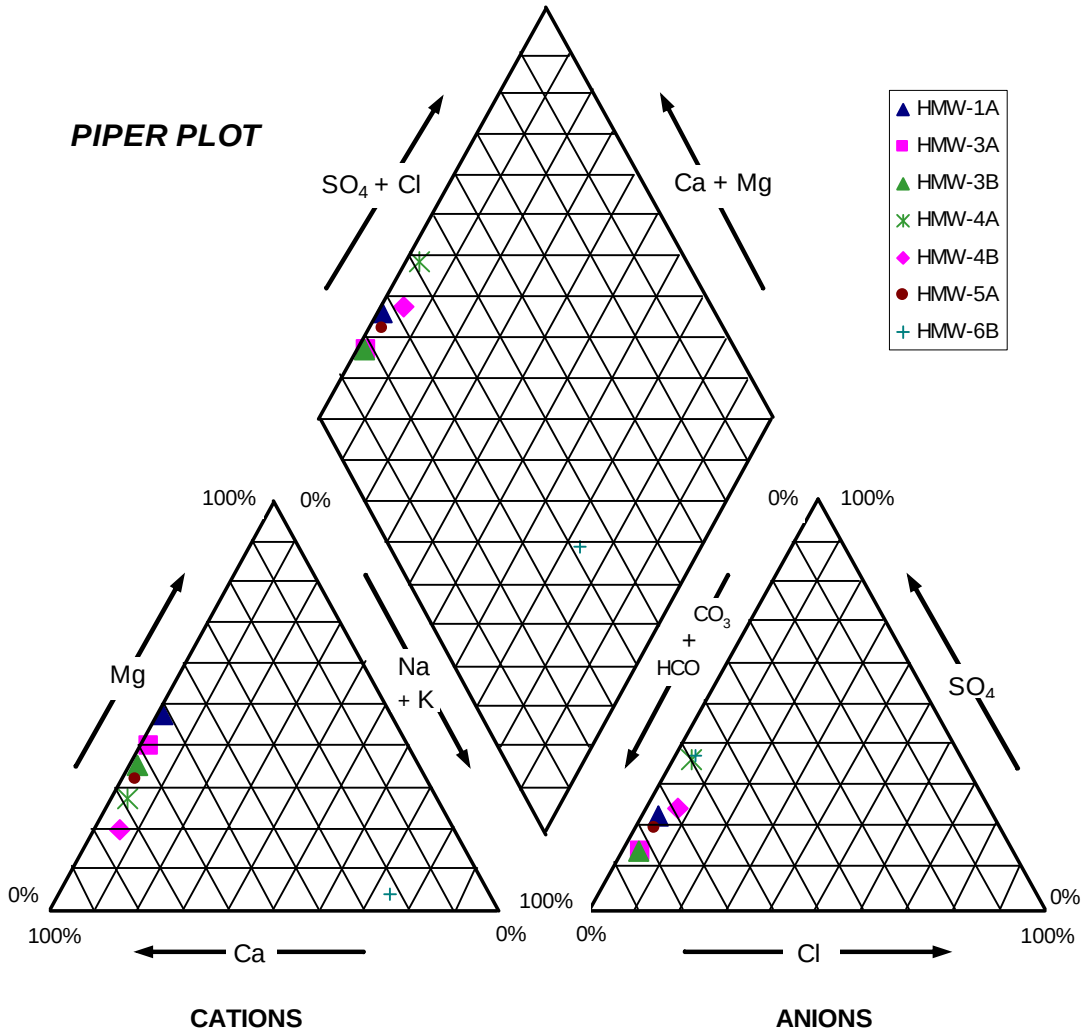
Figure 2.4 Hydrochemical typing of groundwaters at Big Hurrah, Alaska (October 2005)

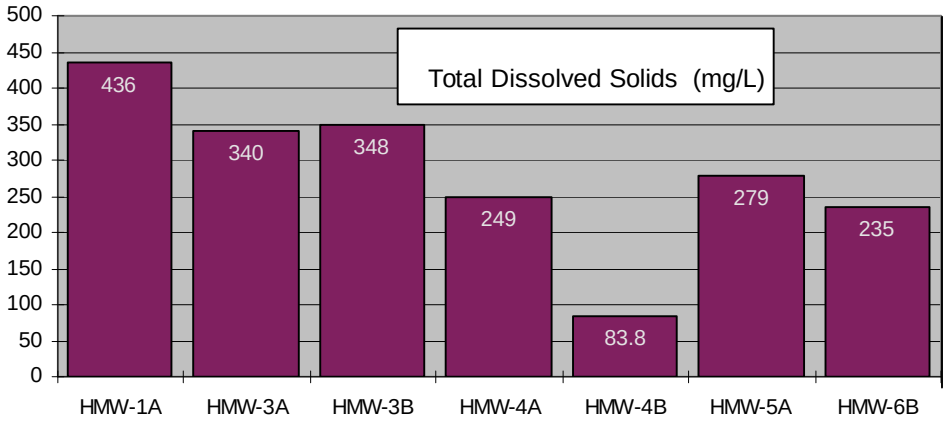


F:\2573 - BIG HURRAH\BIG HURRAH MEMOS TO CD 100605\GROUNDWATER QUALITY\GROUNDWATER QUALITY MEMO UPDATE FEB2006\FEBRAURY-2006\FIGURE-2.4.DWG

WATER MANAGEMENT CONSULTANTS

Figure 2.5 Hydrochemical typing of groundwaters at Big Hurrah, Alaska (November - December 2005)





F:\2573 - BIG HURRAH\BIG HURRAH MEMOS TO CD 100605\GROUNDWATER QUALITY\GROUNDWATER QUALITY MEMO UPDATE FEB2006\FEBRAURY-2006\FIGURE-2.5.DWG

APPENDIX A

Water chemistry data

Big Hurrah Water Quality Data Summary

HMW-1A		September 2005			October 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	340		3.1	319		3.1	315		3.1	315	325	340
Aluminum	ug/L	8.4	J	6.2	6.2	ND	6.2	6.2	ND	6.2	6.2	6.2	8.4
Ammonia-N	mg/L	0.031	ND	0.031	0.072	J	0.031	0.036	J	0.031	0.031	0.041	0.072
Antimony	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Arsenic	ug/L	1.5	ND	1.5	1.5	ND	1.5	2.9	J	1.5	1.5	1.5	2.9
Barium	ug/L	22		0.94	20		0.94	21		0.94	20	21	22
Beryllium	ug/L	0.130	ND	0.130	0.130	ND	0.130	0.130	ND	0.130	<0.13	<0.13	<0.13
Cadmium	ug/L	0.050	ND	0.050	0.050	ND	0.050	0.050	ND	0.050	<0.05	<0.05	<0.05
Calcium	mg/L	99		0.31	91		0.31	89		0.31	89	93	99
Chloride	mg/L	2.55		0.03	2.71		0.03	2.88		0.03	2.55	2.71	2.88
Chromium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Cobalt	ug/L	1.20	ND	1.20	1.20	ND	1.20	1.20	ND	1.20	<1.2	<1.2	<1.2
Conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	1.15		0.31	0.33	J	0.31	0.73	J	0.31	0.33	0.74	1.15
Cyanide	mg/L	0.003	ND	0.003	0.003	ND	0.003	0.003	ND	0.003	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.067	J	0.031	0.136	J	0.031	0.079	J	0.031	0.067	0.094	0.136
Iron	mg/L	2.29		0.01	2.38		0.01	2.47		0.01	2.29	2.38	2.47
Lead	ug/L	0.078	J	0.062	0.062	ND	0.062	0.062	ND	0.062	0.062	0.062	0.078
Magnesium	mg/L	58		0.031	54		0.031	53		0.031	53	55	58
Manganese	ug/L	55		0.31	47		0.31	53		0.31	47	52	55
Molybdenum	ug/L	3.10	ND	3.1	3.10	ND	3.1	3.10	ND	3.1	<3.1	<3.1	<3.1
Nickel	ug/L	0.62	ND	0.62	1.30	J	0.62	1.98	J	0.62	0.62	1.20	1.98
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	ug/L	62	ND	62	62	ND	62	62	ND	62	<62	<62	<62
Potassium	ug/L	590		150	641		150	617		150	590	616	641
Selenium	ug/L	1.50	ND	1.50	1.50	ND	1.50	1.50	ND	1.50	<1.5	<1.5	<1.5
Silicon	ug/L	1790		62	2550		62	2690		62	1790	2343	2690
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	2250		150	2250		150	2330		150	2250	2277	2330
Strontium	mg/L	0.371		0.002	0.330		0.002	0.330		0.002	0.330	0.344	0.371
Sulfate	mg/L	167		0.03	103		0.03	102		0.03	102	124	167
Sulfide	mg/L	0.10	ND	0.10	0.10	ND	0.10	0.10	ND	0.10	<0.1	<0.1	<0.1
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Tin	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Titanium	ug/L	101.0		1.5	98.9		1.5	63.9		1.5	63.9	87.9	101.0
Total Dissolved Solids	mg/L	488		3.10	440		3.10	436		3.10	436	455	488
Total Nitrate/Nitrite	mg/L	0.06	J	0.03	0.03	ND	0.03	0.03	ND	0.03	0.03	0.03	0.06
Total Suspended Solids	mg/L	5.0		0.3	3.8		0.3	4.1		0.3	3.8	4.3	5.0
Vanadium	ug/L	6.20	ND	6.20	6.20	ND	6.20	7.98	J	6.20	6.20	6.20	7.98
WAD CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Zinc	ug/L	2.89	J	1.50	1.71	J	1.50	2.44	J	1.50	1.71	2.35	2.89
Aluminum, dissolved	ug/L	18	J	6	6	ND	6	13	J	6	6	12	18
Antimony, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Barium, dissolved	ug/L	24		0.94	20		0.94	21		0.94	20	21	24
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13	0.13	ND	0.13	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05	0.24	J	0.05	0.05	0.10	0.24
Calcium, dissolved	mg/L	95		0.62	91		0.62	90		0.62	90	92	95
Chromium, dissolved	ug/L	2.10		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.80	2.10
Cobalt, dissolved	ug/L	1.20	ND	1.20	1.20	ND	1.20	1.20	ND	1.20	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	1.21		0.31	0.31	J	0.31	0.46	J	0.31	0.31	0.66	1.21
Iron, dissolved	mg/L	1.54		0.01	2.36		0.01	2.31		0.01	1.54	2.07	2.36
Lead, dissolved	ug/L	0.062	ND	0.062	0.062	ND	0.062	0.062	ND	0.062	<0.062	<0.062	<0.062
Magnesium, dissolved	mg/L	54		0.62	54		0.62	54		0.62	54	54	54
Manganese, dissolved	ug/L	59		0.31	44		0.31	45		0.31	44	49	59
Molybdenum, dissolved	ug/L	3.10	ND	3.10	3.10	ND	3.10	3.10	ND	3.10	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	0.62	ND	0.62	1.27	J	0.62	2.52		0.62	0.62	1.37	2.52
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62	62	ND	62	<62	<62	<62
Potassium, dissolved	ug/L	728		150	558		150	566		150	558	617	728
Selenium, dissolved	ug/L	1.50	ND	1.50	1.50	ND	1.50	1.50	ND	1.50	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	2480		62	2560		62	2380		62	2380	2473	2560
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	2650		150	2190		150	1980		150	1980	2273	2650
Strontium, dissolved	mg/L	0.359		0.003	0.326		0.003	0.326		0.003	0.326	0.337	0.359
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Titanium, dissolved	ug/L	124		1.50	99		1.50	72		1.50	72	98	124
Vanadium, dissolved	ug/L	6.20	ND	6.20	6.20	ND	6.20	6.20	ND	6.20	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	4.95	J	1.50	1.80	J	1.50	5.75		1.50	1.80	4.17	5.75
Mercury, total	ng/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-3A		September 2005			November 2005		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL
Alkalinity	mg/L	290		3.1	298		3.1
Aluminum	ug/L	55		6.2	7	J	6.2
Ammonia-N	mg/L	0.118		0.031	0.139		0.031
Antimony	ug/L	2.06		0.31	1.34		0.31
Arsenic	ug/L	1.5	ND	1.5	1.5	ND	1.5
Barium	ug/L	37		0.9	37		0.9
Beryllium	ug/L	0.13	ND	0.13	0.13	ND	0.13
Cadmium	ug/L	0.05	ND	0.05	0.05	ND	0.05
Calcium	mg/L	83		0.3	84		0.3
Chloride	mg/L	2.92		0.03	2.78		0.03
Chromium	ug/L	0.31	ND	0.31	0.31	ND	0.31
Cobalt	ug/L	1.20	ND	1.20	1.20	ND	1.20
Conductivity	umhos/cm	NA	NA	NA	NA	NA	NA
Copper	ug/L	0.62	J	0.31	0.39	J	0.31
Cyanide	mg/L	0.003	ND	0.003	0.003	ND	0.003
Fluoride	mg/L	0.073	J	0.031	0.076	J	0.031
Iron	mg/L	0.95		0.01	0.74		0.01
Lead	ug/L	0.067	J	0.062	0.088	J	0.062
Magnesium	mg/L	37		0.031	38		0.031
Manganese	ug/L	21		0.31	11.10		0.31
Molybdenum	ug/L	3.10	ND	3.10	3.10	ND	3.10
Nickel	ug/L	0.62	ND	0.62	3.25		0.62
pH	pH units	NA	NA	NA	NA	NA	NA
Phosphorus	ug/L	62	ND	62	62	ND	62
Potassium	ug/L	1550		150	1510		150
Selenium	ug/L	1.50	ND	1.50	1.50	ND	1.50
Silicon	ug/L	3430		62	4650		62
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31
Sodium	ug/L	2540		150	2640		150
Strontium	mg/L	0.520		0.002	0.491		0.002
Sulfate	mg/L	55		0.03	58		0.03
Sulfide	mg/L	0.10	ND	0.10	0.10	ND	0.10
Thallium	ug/L	0.31	ND	0.31	0.31	ND	0.31
Tin	ug/L	0.31	ND	0.31	0.31	ND	0.31
Titanium	ug/L	91.4		1.5	33.8		1.5
Total Dissolved Solids	mg/L	339		3.1	340		3.1
Total Nitrate/Nitrite	mg/L	0.03	ND	0.03	0.05	J	0.03
Total Suspended Solids	mg/L	14		0.3	1		0.3
Vanadium	ug/L	6.20	ND	6.20	6.20	ND	6.20
WAD CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025
Zinc	ug/L	3.35	J	1.50	5.43		1.50
Aluminum, dissolved	ug/L	17	J	6	34		6
Antimony, dissolved	ug/L	2.48		0.31	1.17		0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5	2.4	J	1.5
Barium, dissolved	ug/L	41		0.9	38		0.9
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13
Cadmium, dissolved	ug/L	0.12	J	0.05	0.13	J	0.05
Calcium, dissolved	mg/L	80		0.6	87		0.6
Chromium, dissolved	ug/L	2.43		0.31	0.31	ND	0.31
Cobalt, dissolved	ug/L	1.20	ND	1.20	1.20	ND	1.20
Copper, dissolved	ug/L	0.66	J	0.31	0.45	J	0.31
Iron, dissolved	mg/L	0.67		0.01	0.75		0.01
Lead, dissolved	ug/L	0.062	ND	0.062	0.062	ND	0.062
Magnesium, dissolved	mg/L	34		0.6	39		0.6
Manganese, dissolved	ug/L	22		0.3	11		0.3
Molybdenum, dissolved	ug/L	3.10	ND	3.10	3.10	ND	3.10
Nickel, dissolved	ug/L	0.62	ND	0.62	3.98		0.62
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62
Potassium, dissolved	ug/L	1860		150	1560		150
Selenium, dissolved	ug/L	1.50	ND	1.50	1.50	ND	1.50
Silicon, dissolved	ug/L	4190		NA	4310		62
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Sodium, dissolved	ug/L	2970		150	2520		150
Strontium, dissolved	mg/L	0.486		0.003	0.507		0.003
Thallium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Titanium, dissolved	ug/L	105.0		1.5	70.1		1.5
Vanadium, dissolved	ug/L	6.20	ND	6.20	6.20	ND	6.20
Zinc, dissolved	ug/L	6.08		1.50	2.14	J	1.50
Mercury, total	ng/L	NA	NA	NA	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-3B		March 2005			April 2005			September 2005			November 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	287		3.1	312		6.2	311		6.2	292		6.2	287	301	312
Aluminum	ug/L	328		6.20	4670		6.20	6.20	ND	6.20	9	J	6.20	6	1253	4670
Ammonia-N	mg/L	0.031	ND	0.031	0.044	J	0.031	0.031	ND	0.031	0.070	J	0.031	0.031	0.036	0.070
Antimony	ug/L	0.31	ND	0.31	1.13		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.40	1.13
Arsenic	ug/L	1.5	ND	1.5	4.8	J	1.5	1.5	ND	1.5	2.2	J	1.5	1.5	2.1	4.8
Barium	ug/L	30		0.94	64		0.94	24		0.94	25		0.94	24	36	64
Beryllium	ug/L	0.130	ND	0.130	0.209	J	0.130	0.130	ND	0.130	0.179	J	0.130	0.130	0.130	0.209
Cadmium	ug/L	0.050	ND	0.050	0.050	ND	0.050	0.050	ND	0.050	0.050	ND	0.050	<0.05	<0.05	<0.05
Calcium	mg/L	95		0.310	84		0.031	92		0.031	92		0.031	84	91	95
Chloride	mg/L	2.91		0.03	2.96		0.03	3.03		0.03	2.76		0.03	2.76	2.92	3.03
Chromium	ug/L	0.62	J	0.31	5.46		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	1.60	5.46
Cobalt	ug/L	1.20	ND	1.20	3.43	J	1.20	3.78	J	1.20	1.72	J	1.20	0.60	2.38	3.78
Conductivity	umhos/cm	600		0.48	650		0.48	NA	NA	NA	NA	NA	NA	600	625	650
Copper	ug/L	1.57		0.31	15.80		0.31	0.63	J	0.31	0.57	J	0.31	0.57	4.64	15.80
Cyanide	mg/L	0.004	J	0.003	0.00	ND	0.00	0.00	ND	0.003	0.003	ND	0.003	0.003	0.003	0.004
Fluoride	mg/L	0.068	J	0.031	0.042	J	0.031	0.061	J	0.031	0.070	J	0.031	0.042	0.060	0.070
Iron	mg/L	1.87		0.01	10.30		0.01	0.96		0.01	1.07		0.01	0.96	3.55	10.30
Lead	ug/L	0.306		0.062	3.180		0.062	0.062	ND	0.062	0.099	J	0.062	0.062	0.904	3.180
Magnesium	mg/L	32		0.031	31		0.031	33		0.031	34		0.031	31	33	34
Manganese	ug/L	56		0.31	162		0.31	39		0.31	42		0.31	39	75	162
Molybdenum	ug/L	3.10	ND	3.10	3.10	ND	3.10	3.10	ND	3.10	3.10	ND	3.10	<3.1	<3.1	<3.1
Nickel	ug/L	2.58		0.62	12.90		0.62	0.62	ND	0.62	2.62		0.62	0.62	4.60	12.90
pH	pH units	7.26		0.10	7.30		0.10	NA	NA	NA	NA	NA	NA	7.26	7.28	7.30
Phosphorus	ug/L	62	ND	62	189	J	62	62	ND	62	62	ND	62	62	71	189
Potassium	ug/L	1260		150	1820		150	1020		150	1200		150	1020	1325	1820
Selenium	ug/L	1.50	ND	1.50	1.50	ND	1.50	1.50	ND	1.50	1.50	ND	1.50	<1.5	<1.5	<1.5
Silicon	ug/L	3430		62	NA	NA	NA	2230		NA	3440		NA	2230	3033	3440
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	2480		150	2640		150	2610		150	2740		150	2480	2618	2740
Strontium	mg/L	0.257		0.002	0.242		0.002	0.278		0.002	0.280		0.002	0.242	0.264	0.280
Sulfate	mg/L	60		0.031	59		0.031	57		0.031	57		0.031	57	58	60
Sulfide	mg/L	0.10	ND	0.10	0.10	ND	0.10	0.10	ND	0.10	0.10	ND	0.10	<0.1	<0.1	<0.1
Thallium	ug/L	0.310	ND	0.310	0.310	ND	0.310	0.310	ND	0.310	0.310	ND	0.310	<0.31	<0.31	<0.31
Tin	ug/L	0.31	ND	0.31	12.70		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	3.29	12.70
Titanium	ug/L	91.5		1.5	115.0		1.5	101.0		1.5	36.4		1.5	36.4	86.0	115.0
Total Dissolved Solids	mg/L	346		3.1	351		3	369		3.1	348		3.1	346	354	369
Total Nitrate/Nitrite	mg/L	0.27		0.03	0.31	ND	0.31	0.05	J	0.31	0.31	ND	0.31	0.03	0.16	0.27
Total Suspended Solids	mg/L	16		0.3	222		0.2	2		0.2	2		0.2	2	60	222
Vanadium	ug/L	6.20	ND	6.20	6.21	J	6.20	6.20	ND	6.20	6.20	ND	6.20	6.20	6.20	6.21
WAD CN	mg/L	0.0030	J	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	0.0025	0.0030
Zinc	ug/L	4.28	J	1.50	37.80		1.50	15.50		1.50	9.23		1.50	4.28	16.70	37.80
Aluminum, dissolved	ug/L	6	ND	6	6	ND	6	24		6	13	J	6	6	11	24
Antimony, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Barium, dissolved	ug/L	25		0.9	26		0.9	30		0.9	26		0.9	25	27	30
Beryllium, dissolved	ug/L	0.130	ND	0.130	0.130	ND	0.130	0.130	ND	0.130	0.130	ND	0.130	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.050	ND	0.050	0.050	ND	0.050	0.050	ND	0.050	0.337	J	0.050	0.050	0.103	0.337
Calcium, dissolved	mg/L	91		0.6	88		0.1	89		0.1	95		0.1	88	90	95
Chromium, dissolved	ug/L	1.33		0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.45	1.33
Cobalt, dissolved	ug/L	1.20	ND	1.20	1.20	ND	1.20	1.53	J	1.20	1.20	ND	1.20	1.20	1.20	1.53
Copper, dissolved	ug/L	0.69	J	0.31	0.45	J	0.31	0.69	J	0.31	0.37	J	0.31	0.37	0.55	0.69
Iron, dissolved	mg/L	1.09		0.01	1.14		0.01	1.00		0.01	1.06		0.01	1.00	1.07	1.14
Lead, dissolved	ug/L	0.062	ND	0.062	0.062	ND	0.062	0.072	J	0.062	0.062	ND	0.062	0.062	0.062	0.072
Magnesium, dissolved	mg/L	32		0.6	32		0.1	32		0.1	35		0.1	32	32	35
Manganese, dissolved	ug/L	42		0.3	44		0.3	45		0.3	38		0.3	38	42	45
Molybdenum, dissolved	ug/L	3.10	ND	3.10	3.10	ND	3.10	3.10	ND	3.10	3.10	ND	3.10	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	1.81	J	0.62	2.31		0.62	0.62	ND	0.62	3.18		0.62	0.62	1.90	3.18
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62	62	ND	62	62	ND	62	<62	<62	<62
Potassium, dissolved	ug/L	1080		150	1090		150	1390		150	1130		150	1080	1173	1390
Selenium, dissolved	ug/L	1.50	ND	1.50	1.50	ND	1.50	1.50	ND	1.50	1.50	ND	1.50	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	NA	NA	NA	NA	NA	NA	3620		NA	3210		NA	3210	3415	3620
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	2230		150	2240		150	3340		150	2340		150	2230	2538	3340
Strontium, dissolved	mg/L	0.250		0.003	0.247		0.003	0.277		0.003	0.279		0.003	0.247	0.263	0.279
Thallium, dissolved	ug/L	0.310	ND	0.310	0.310	ND	0.310	0.310	ND	0.310	0.310	ND	0.310	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Titanium, dissolved	ug/L	85.90		1.50	66.10		1.50	102.00		1.50	72.40		1.50	66	82	102
Vanadium, dissolved	ug/L	6.20	ND	6.20	6.20	ND	6.20	6.20	ND	6.20	6.20	ND	6.20	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	2.24	J	1.50	2.63	J	1.50	18.20		1.50	10.50		1.50	2.2	8.4	18.2
Mercury, total	ng/L	NA	NA	NA	3.0		1.0	NA	NA	NA	NA	NA	NA	3.0	3.0	3.0

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-4A		September 2005			November 2005		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL
Alkalinity	mg/L	155		3.1	156		3.1
Aluminum	ug/L	45		6.20	6	ND	6.20
Ammonia-N	mg/L	0.031	ND	0.031	0.041	J	0.031
Antimony	ug/L	2.11		0.31	0.73	J	0.31
Arsenic	ug/L	1.5	ND	1.5	3.5	J	1.5
Barium	ug/L	21		0.94	18		0.94
Beryllium	ug/L	0.130	ND	0.13	0.137	J	0.13
Cadmium	ug/L	0.825		0.050	0.050	ND	0.050
Calcium	mg/L	63		0.31	63		0.31
Chloride	mg/L	2.59		0.03	2.69		0.03
Chromium	ug/L	0.31	ND	0.31	0.31	ND	0.31
Cobalt	ug/L	1.20	ND	1.20	1.20	ND	1.20
Conductivity	umhos/cm	NA	NA	NA	NA	NA	NA
Copper	ug/L	0.83	J	0.31	0.97	J	0.31
Cyanide	mg/L	0.003	ND	0.003	0.003	ND	0.003
Fluoride	mg/L	0.10	J	0.031	0.09	J	0.031
Iron	mg/L	1.13		0.01	1.05		0.01
Lead	ug/L	0.310		0.062	0.062	ND	0.062
Magnesium	mg/L	17.20		0.031	16.30		0.031
Manganese	ug/L	102.00		0.31	80.80		0.31
Molybdenum	ug/L	3.10	ND	3.10	3.10	ND	3.10
Nickel	ug/L	0.62	ND	0.62	1.37	J	0.62
pH	pH units	NA	NA	NA	NA	NA	NA
Phosphorus	ug/L	62	ND	62	62	ND	62
Potassium	ug/L	302	J	150	357	J	150
Selenium	ug/L	1.50	ND	1.50	1.50	ND	1.50
Silicon	ug/L	3060		62	3720		62
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31
Sodium	ug/L	2710		150	2310		150
Strontium	mg/L	0.382		0.002	0.352		0.002
Sulfate	mg/L	95		0.031	57		0.031
Sulfide	mg/L	0.10	ND	0.10	0.10	ND	0.10
Thallium	ug/L	0.310	ND	0.310	0.310	ND	0.310
Tin	ug/L	0.31	ND	0.31	0.31	ND	0.31
Titanium	ug/L	75.9		1.5	35.6		1.5
Total Dissolved Solids	mg/L	249		3.1	231		3.1
Total Nitrate/Nitrite	mg/L	0.03	J	0.03	0.03	ND	0.03
Total Suspended Solids	mg/L	6.0		0.3	1.0		0.3
Vanadium	ug/L	6.20	ND	6.20	6.20	ND	6.20
WAD CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025
Zinc	ug/L	9.39		1.50	1.50	ND	1.50
Aluminum, dissolved	ug/L	9	J	6.20	9	J	6.20
Antimony, dissolved	ug/L	1.95		0.31	0.81	J	0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5	1.7	J	1.5
Barium, dissolved	ug/L	21		0.94	20		0.94
Beryllium, dissolved	ug/L	0.130	ND	0.130	0.130	ND	0.130
Cadmium, dissolved	ug/L	0.151	J	0.050	0.272	J	0.050
Calcium, dissolved	mg/L	59		0.62	63		0.62
Chromium, dissolved	ug/L	1.99		0.31	0.31	ND	0.31
Cobalt, dissolved	ug/L	1.20	ND	1.20	1.20	ND	1.20
Copper, dissolved	ug/L	0.72	J	0.31	0.32		0.31
Iron, dissolved	mg/L	0.84		0.01	1.05		0.01
Lead, dissolved	ug/L	0.062	ND	0.062	0.062	ND	0.062
Magnesium, dissolved	mg/L	16		0.62	16		0.62
Manganese, dissolved	ug/L	91		0.31	74		0.31
Molybdenum, dissolved	ug/L	3.10	ND	3.10	3.10	ND	3.10
Nickel, dissolved	ug/L	0.62	ND	0.62	2.10		0.62
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62
Potassium, dissolved	ug/L	370	J	150	320	J	150
Selenium, dissolved	ug/L	ND	ND	1.50	1.50	ND	1.50
Silicon, dissolved	ug/L	3540		NA	3700		NA
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Sodium, dissolved	ug/L	2980		150	2270		150
Strontium, dissolved	mg/L	0.349		0.003	0.361		0.003
Thallium, dissolved	ug/L	0.310	ND	0.310	0.310	ND	0.310
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Titanium, dissolved	ug/L	77.90		1.50	48.70		1.50
Vanadium, dissolved	ug/L	6.20	ND	6.20	6.20	ND	6.20
Zinc, dissolved	ug/L	2.81	J	1.50	3.81	J	1.50
Mercury, total	ng/L	NA	NA	NA	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-4B		September 2005			October 2005			December 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	100		3.1	56		3.1	65		3.1	56	74	100
Aluminum	ug/L	462		6.2	1350		6.2	2800		6.2	462	1537	2800
Ammonia-N	mg/L	0.031	ND	0.031	0.03	ND	0.03	0.031	ND	0.031	<0.031	<0.031	<0.031
Antimony	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.50	J	0.31	0.31	0.31	0.50
Arsenic	ug/L	1.5	ND	1.5	1.5	ND	1.5	6.8		1.5	1.5	2.8	6.8
Barium	ug/L	76		0.94	56		0.94	100		0.94	56	77	100
Beryllium	ug/L	0.130	ND	0.130	0.13	ND	0.13	0.130	ND	0.130	<0.13	<0.13	<0.13
Cadmium	ug/L	0.323	J	0.050	0.05	ND	0.05	1.340		0.050	0.050	0.563	1.340
Calcium	mg/L	41		0.31	27		0.31	29		0.31	27	32	41
Chloride	mg/L	2.85		0.03	3.5		0.03	2.85		0.03	2.85	3.05	3.45
Chromium	ug/L	0.48	J	0.31	0.3	ND	0.3	1.56		0.31	0.31	0.73	1.56
Cobalt	ug/L	1.20	ND	1.20	1.2	ND	1.2	1.89	J	1.20	1.20	1.20	1.89
Conductivity	umhos/cm	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	2.32		0.31	1.6		0.31	7.07		0.31	1.57	3.65	7.07
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.038	J	0.031	0.05	J	0.03	0.041	J	0.031	0.038	0.042	0.048
Iron	mg/L	1.11		0.01	1.8		0.01	6.03		0.01	1.11	2.96	6.03
Lead	ug/L	1.570		0.062	1.9		0.1	5.730		0.062	1.570	3.073	5.730
Magnesium	mg/L	7.1		0.031	4.2		0.031	5.5		0.031	4	6	7
Manganese	ug/L	30		0.31	21		0.31	127		0.31	21	59	127
Molybdenum	ug/L	3.10	ND	3.10	3	ND	3	3.10	ND	3.10	<3.1	<3.1	<3.1
Nickel	ug/L	0.62	ND	0.62	2.1		0.6	11.60		0.62	0.62	4.65	11.60
pH	pH units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	ug/L	62	ND	62	62	ND	62	91	J	62	62	62	91
Potassium	ug/L	413	J	150	364	J	150	410	J	150	364	396	413
Selenium	ug/L	1.50	ND	1.50	1.5	ND	1.5	1.50	ND	1.50	<1.5	<1.5	<1.5
Silicon	ug/L	3570		62	5930		62	9620		62	3570	6373	9620
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	2710		150	2860		150	2430		150	2430	2667	2860
Strontium	mg/L	0.194		0.002	0.13		0.002	0.125		0.002	0.125	0.149	0.194
Sulfate	mg/L	36		0.03	25		0.03	24		0.03	24	28	36
Sulfide	mg/L	0.10	ND	0.10	0	ND	0.10	0.10	ND	0.10	<0.1	<0.1	<0.1
Thallium	ug/L	0.310	ND	0.310	0.31	ND	0.31	0.310	ND	0.310	<0.31	<0.31	<0.31
Tin	ug/L	0.31	ND	0.31	0.3	ND	0.3	1.48		0.31	0.31	0.60	1.48
Titanium	ug/L	70.9		1.5	29		1.5	59.0		1.5	28.8	52.9	70.9
Total Dissolved Solids	mg/L	180		3.1	96		3.1	84		3.1	84	120	180
Total Nitrate/Nitrite	mg/L	0.09	J	0.03	0.11		0.03	0.10		0.03	0.09	0.10	0.11
Total Suspended Solids	mg/L	42		0.3	42		0.3	127		0.3	42	70	127
Vanadium	ug/L	6.20	ND	6.20	6.2	ND	6.2	6.20	ND	6.2	<6.2	<6.2	<6.2
WAD CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Zinc	ug/L	34.1		1.5	52.0		1.5	40.2		1.5	34.1	42.1	52.0
Aluminum, dissolved	ug/L	6	ND	6.2	10	J	6.2	15	J	6.2	6	9	15
Antimony, dissolved	ug/L	0.31	ND	0.31	0	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5	2	ND	1.5	1.5	ND	1.5	<1.5	<1.5	<1.5
Barium, dissolved	ug/L	46		0.94	42		0.94	42		0.94	42	43	46
Beryllium, dissolved	ug/L	0.130	ND	0.13	0.13	ND	0.13	0.130	ND	0.13	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.086	J	0.05	0.05	ND	0.05	0.347	J	0.05	0.050	0.153	0.347
Calcium, dissolved	mg/L	60		0.62	27		0.62	30		0.62	27	39	60
Chromium, dissolved	ug/L	0.31	ND	0.31	0.3	ND	0.3	0.31	ND	0.31	<0.31	<0.31	<0.31
Cobalt, dissolved	ug/L	1.20	ND	1.20	1	ND	1	1.20	ND	1.20	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Iron, dissolved	mg/L	0.85		0.01	0.01	ND	0.01	0.01	ND	0.01	0.01	0.29	0.85
Lead, dissolved	ug/L	0.062	ND	0.062	0	ND	0	0.062	ND	0.062	<0.062	<0.062	<0.062
Magnesium, dissolved	mg/L	15.7		0.6	4.0		0.6	5.4		0.6	4.0	8.4	15.7
Manganese, dissolved	ug/L	2.0		0.3	0.9	J	0.3	1.5		0.3	0.9	1.5	2.0
Molybdenum, dissolved	ug/L	3.10	ND	3.10	3	ND	3	3.10	ND	3.10	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	0.62	ND	0.62	1.0	J	0.6	1.41	J	0.62	0.62	0.89	1.41
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62	64	J	62	62	62	64
Potassium, dissolved	ug/L	174	J	150	254	J	150	188	J	150	174	205	254
Selenium, dissolved	ug/L	1.50	ND	1.50	2	ND	2	1.50	ND	1.50	<1.5	<1.5	<1.5
Silicon, dissolved	ug/L	1710		NA	2290		NA	2010		NA	1710	2003	2290
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	2120		150	2310		150	2280		150	2120	2237	2310
Strontium, dissolved	mg/L	0.354		0.003	0.12		0.003	0.125		0.003	0.123	0.201	0.354
Thallium, dissolved	ug/L	0.310	ND	0.310	0.31	ND	0.31	0.310	ND	0.310	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	0.31	ND	0.31	0.3	ND	0.3	0.31	ND	0.31	<0.31	<0.31	<0.31
Titanium, dissolved	ug/L	38.70		1.50	20.7		1.5	25.60		1.50	20.70	28.33	38.70
Vanadium, dissolved	ug/L	6.20	ND	6.20	6.4	J	6.2	6.20	ND	6.20	6.20	6.20	6.40
Zinc, dissolved	ug/L	39.50		1.50	27.3		1.5	27.80		1.50	27.30	31.53	39.50
Mercury, total	ng/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-5A		October 2005			November 2005		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL
Alkalinity	mg/L	205		6.2	202		6.2
Aluminum	ug/L	6.2	ND	6.2	6.2	ND	6.2
Ammonia-N	mg/L	0.127		0.031	0.048	J	0.031
Antimony	ug/L	3.55		0.31	4.08		0.31
Arsenic	ug/L	47.2		1.5	44.7		1.5
Barium	ug/L	32.6		0.9	31.1		0.9
Beryllium	ug/L	0.130	ND	0.130	0.248	J	0.130
Cadmium	ug/L	0.150	ND	0.150	0.150	ND	0.150
Calcium	mg/L	70		0.62	69		0.62
Chloride	mg/L	2.82		0.03	2.85		0.03
Chromium	ug/L	0.31	ND	0.31	0.31	ND	0.31
Cobalt	ug/L	1.20	ND	1.20	1.20	ND	1.20
Conductivity	umhos/cm	NA	NA	NA	NA	NA	NA
Copper	ug/L	0.38	J	0.31	0.31	ND	0.31
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025
Fluoride	mg/L	0.146		0.031	0.104		0.031
Iron	mg/L	1.01		0.01	1.04		0.01
Lead	ug/L	0.062	ND	0.062	0.062	ND	0.062
Magnesium	mg/L	22		0.62	22		0.62
Manganese	ug/L	104		0.31	88		0.31
Molybdenum	ug/L	11.80		3.10	12.80		3.10
Nickel	ug/L	13.30		0.62	11.50		0.62
pH	pH units	NA	NA	NA	NA	NA	NA
Phosphorus	ug/L	62	ND	62	62	ND	62
Potassium	ug/L	561		150	500		150
Selenium	ug/L	1.50	ND	1.50	1.50	ND	1.50
Silicon	ug/L	3890		62	3820		62
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31
Sodium	ug/L	3420		150	3360		150
Strontium	mg/L	0.455		0.003	0.442		0.003
Sulfate	mg/L	61		0.031	57		0.031
Sulfide	mg/L	0.10	ND	0.10	0.10	ND	0.10
Thallium	ug/L	0.310	ND	0.310	0.310	ND	0.310
Tin	ug/L	0.31	ND	0.31	0.31	ND	0.31
Titanium	ug/L	94.9		1.5	40.4		1.5
Total Dissolved Solids	mg/L	290		3.1	279		3.1
Total Nitrate/Nitrite	mg/L	0.04	J	0.03	0.04	J	0.03
Total Suspended Solids	mg/L	1.70		0.15	0.70		0.15
Vanadium	ug/L	6.20	ND	6.20	6.20	ND	6.20
WAD CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025
Zinc	ug/L	2.55	J	1.50	1.50	ND	1.50
Aluminum, dissolved	ug/L	8.4	J	6.2	21.1		6.2
Antimony, dissolved	ug/L	3.63		0.31	3.11		0.31
Arsenic, dissolved	ug/L	44.4		1.5	45.6		1.5
Barium, dissolved	ug/L	33		0.94	32		0.94
Beryllium, dissolved	ug/L	0.130	ND	0.130	0.130	ND	0.130
Cadmium, dissolved	ug/L	0.050	ND	0.050	0.178	J	0.050
Calcium, dissolved	mg/L	71		0.06	69		0.06
Chromium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Cobalt, dissolved	ug/L	1.20	ND	1.20	1.20	ND	1.20
Copper, dissolved	ug/L	0.31	ND	0.31	0.42	J	0.31
Iron, dissolved	mg/L	0.95		0.01	1.04		0.01
Lead, dissolved	ug/L	0.062	ND	0.062	0.062	ND	0.062
Magnesium, dissolved	mg/L	22		0.062	23		0.062
Manganese, dissolved	ug/L	98		0.31	87		0.31
Molybdenum, dissolved	ug/L	11.90		3.10	13.30		3.10
Nickel, dissolved	ug/L	12.40		0.62	11.70		0.62
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62
Potassium, dissolved	ug/L	496	J	150	470	J	150
Selenium, dissolved	ug/L	1.50	ND	1.50	1.50	ND	1.50
Silicon, dissolved	ug/L	3940		62	3880		62
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Sodium, dissolved	ug/L	3390		150	3170		150
Strontium, dissolved	mg/L	0.445		0.003	0.442		0.003
Thallium, dissolved	ug/L	0.310	ND	0.310	0.310	ND	0.310
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Titanium, dissolved	ug/L	89.40		1.50	59.10		1.50
Vanadium, dissolved	ug/L	7.26	J	6.20	6.20	ND	6.20
Zinc, dissolved	ug/L	3.51	J	1.50	3.10	J	1.50
Mercury, total	ng/L	NA	NA	NA	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

For constituents with some detects, these were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-6B		April 2005			September 2005			December 2005			Statistics		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL	Result	Result Flag	MDL	Minimum	Average	Maximum
Alkalinity	mg/L	142		6.2	143		6.2	133		6.2	133	139.3	143
Aluminum	ug/L	15	J	6.2	6.2	ND	6.2	283		6.2	6	100	283
Ammonia-N	mg/L	0.031	ND	0.031	0.031	ND	0.031	0.031	ND	0.031	<0.031	<0.031	<0.031
Antimony	ug/L	0.41	J	0.31	0.31	ND	0.31	0.59	J	0.31	0.31	0.38	0.59
Arsenic	ug/L	4.3	J	1.5	1.5	ND	1.5	3.4	J	1.5	1.5	2.8	4.3
Barium	ug/L	27		0.94	26.3		0.94	28		0.94	26	27	28
Beryllium	ug/L	0.130	ND	0.130	0.13	ND	0.130	0.130	ND	0.130	<0.13	<0.13	<0.13
Cadmium	ug/L	0.050	ND	0.050	0.05	ND	0.050	0.050	ND	0.050	<0.05	<0.05	<0.05
Calcium	mg/L	53		0.062	54		0.062	48		0.062	48	52	54
Chloride	mg/L	3.39		0.03	3.28		0.03	2.80		0.03	2.80	3.16	3.39
Chromium	ug/L	0.31	ND	0.31	0.31	ND	0.31	1.13		0.31	0.31	0.48	1.13
Cobalt	ug/L	1.20	ND	1.20	1.2	ND	1.20	1.20	ND	1.20	<1.2	<1.2	<1.2
Conductivity	umhos/cm	430		0.477	NA	NA	NA	NA	NA	NA	430	430	430
Copper	ug/L	0.95	J	0.31	0.784	J	0.31	1.06		0.31	0.78	0.93	1.06
Cyanide	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Fluoride	mg/L	0.083	J	0.031	0.086	J	0.031	0.087	J	0.031	0.083	0.085	0.087
Iron	mg/L	0.56		0.01	0.559		0.01	1.28		0.01	0.56	0.80	1.28
Lead	ug/L	0.238		0.062	0.234		0.062	0.527		0.062	0.234	0.333	0.527
Magnesium	mg/L	25		0.062	24.7		0.062	22		0.062	22	24	25
Manganese	ug/L	68		0.31	73.8		0.31	86		0.31	68	76	86
Molybdenum	ug/L	3.10	ND	3.10	3.1	ND	3.10	3.10	ND	3.10	<3.1	<3.1	<3.1
Nickel	ug/L	1.47	J	0.62	0.62	ND	0.62	2.86		0.62	0.62	1.55	2.86
pH	pH units	7.70		0.10	NA	NA	NA	NA	NA	NA	7.70	7.70	7.70
Phosphorus	ug/L	62	ND	62	62	ND	62	62	ND	62	<62	<62	<62
Potassium	ug/L	364	J	150	241	J	150	349	J	150	241	318	364
Selenium	ug/L	1.50	ND	1.50	1.5	ND	1.50	1.50	ND	1.50	<1.5	<1.5	<1.5
Silicon	ug/L	2650		62	2500		62	4280		62	2500	3143	4280
Silver	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium	ug/L	6650		150	6320		150	5910		150	5910	6293	6650
Strontium	mg/L	0.569		0.003	0.568		0.003	0.489		0.003	0.489	0.542	0.569
Sulfate	mg/L	97		0.31	96.8		0.31	85		0.31	85	93	97
Sulfide	mg/L	0.10	ND	0.10	0.1	ND	0.10	0.10	ND	0.10	<0.1	<0.1	<0.1
Thallium	ug/L	0.310	ND	0.31	0.31	ND	0.31	0.310	ND	0.31	<0.31	<0.31	<0.31
Tin	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Titanium	ug/L	77.1		1.5	68		1.5	66.2		1.5	66.2	70.4	77.1
Total Dissolved Solids	mg/L	266		3.1	275		3.1	235		3.1	235	259	275
Total Nitrate/Nitrite	mg/L	0.31	ND	0.31	0.0365	J	0.31	0.04	J	0.31	0.31	0.31	0.16
Total Suspended Solids	mg/L	4		0.15	0.7		0.15	15		0.15	0.7	6.5	15.0
Vanadium	ug/L	6.2	ND	6.2	6.2	ND	6.2	6.2	ND	6.2	<6.2	<6.2	<6.2
WAD CN	mg/L	0.0025	ND	0.0025	0.0025	ND	0.0025	0.0025	ND	0.0025	<0.0025	<0.0025	<0.0025
Zinc	ug/L	1.5	ND	1.5	1.5	ND	1.5	1.6	J	1.5	1.50	1.50	1.62
Aluminum, dissolved	ug/L	6.2	ND	6.2	8.6	J	6.2	14.6	J	6.2	6.2	8.8	14.6
Antimony, dissolved	ug/L	0.43	J	0.31	0.31	ND	0.31	0.31	ND	0.31	0.31	0.31	0.43
Arsenic, dissolved	ug/L	3.1	J	1.5	3.0	J	1.5	1.5	ND	1.5	1.5	2.3	3.1
Barium, dissolved	ug/L	30		0.94	28.3		0.94	42		0.94	28	33	42
Beryllium, dissolved	ug/L	0.130	ND	0.130	0.13	ND	0.130	0.130	ND	0.130	<0.13	<0.13	<0.13
Cadmium, dissolved	ug/L	0.050	ND	0.050	0.05	ND	0.050	0.347	J	0.050	0.050	0.132	0.347
Calcium, dissolved	mg/L	52		0.62	51.8		0.62	30		0.62	30	44	52
Chromium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Cobalt, dissolved	ug/L	1.20	ND	1.20	1.2	ND	1.20	1.20	ND	1.20	<1.2	<1.2	<1.2
Copper, dissolved	ug/L	0.95	J	0.31	0.701	J	0.31	0.31	ND	0.31	0.31	0.60	0.95
Iron, dissolved	mg/L	0.49		0.01	0.508		0.01	0.01	ND	0.01	0.01	0.33	0.51
Lead, dissolved	ug/L	0.062	ND	0.062	0.072	J	0.062	0.062	ND	0.062	0.062	0.062	0.072
Magnesium, dissolved	mg/L	24		0.62	22.3		0.62	5.4		0.62	5.4	17.1	23.6
Manganese, dissolved	ug/L	70		0.31	76.5		0.31	1.5		0.31	1.5	49.3	76.5
Molybdenum, dissolved	ug/L	3.10	ND	3.10	3.1	ND	3.10	3.10	ND	3.10	<3.1	<3.1	<3.1
Nickel, dissolved	ug/L	1.58	J	0.62	0.62	ND	0.62	1.41	J	0.62	0.62	1.10	1.58
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62	64	J	62	62	62	64
Potassium, dissolved	ug/L	382	J	150	373	J	150	188	J	150	188	314	382
Selenium, dissolved	ug/L	1.50	ND	1.50	1.5	ND	1.50	1.50	ND	1.50	1.50	1.50	1.50
Silicon, dissolved	ug/L	3100		62	3680		62	2010		62	2010	2930	3680
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Sodium, dissolved	ug/L	6930		150	7750		150	2280		150	2280	5653	7750
Strontium, dissolved	mg/L	0.549		0.003	0.523		0.003	0.125		0.003	0.125	0.399	0.549
Thallium, dissolved	ug/L	0.310	ND	0.310	0.31	ND	0.310	0.310	ND	0.310	<0.31	<0.31	<0.31
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31	0.31	ND	0.31	<0.31	<0.31	<0.31
Titanium, dissolved	ug/L	56.90		1.50	57.6		1.50	25.60		1.50	25.60	46.70	57.60
Vanadium, dissolved	ug/L	6.20	ND	6.20	6.2	ND	6.20	6.20	ND	6.20	<6.2	<6.2	<6.2
Zinc, dissolved	ug/L	1.50	ND	1.50	2.99	J	1.50	27.80		1.50	1.50	10.51	27.80
Mercury, total	ng/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-6C		March 2005			April 2005		
Analyte	Units	Result	Result Flag	MDL	Result	Result Flag	MDL
Alkalinity	mg/L	78		3.1	NA	NA	NA
Aluminum	ug/L	3490		6.2	NA	NA	NA
Ammonia-N	mg/L	0.085	J	0.031	NA	NA	NA
Antimony	ug/L	1.85		0.31	NA	NA	NA
Arsenic	ug/L	12.7		1.5	NA	NA	NA
Barium	ug/L	99		0.94	NA	NA	NA
Beryllium	ug/L	0.380	J	0.130	NA	NA	NA
Cadmium	ug/L	1.12		0.050	NA	NA	NA
Calcium	mg/L	35		0.031	NA	NA	NA
Chloride	mg/L	2.67		0.03	NA	NA	NA
Chromium	ug/L	3.76		0.31	NA	NA	NA
Cobalt	ug/L	9.93		1.20	NA	NA	NA
Conductivity	umhos/cm	270		0.48	NA	NA	NA
Copper	ug/L	44.3		0.31	NA	NA	NA
Cyanide	mg/L	0.01		0.00	NA	NA	NA
Fluoride	mg/L	0.061	J	0.031	NA	NA	NA
Iron	mg/L	27.9		0.06	NA	NA	NA
Lead	ug/L	5.7		0.062	NA	NA	NA
Magnesium	mg/L	12		0.031	NA	NA	NA
Manganese	ug/L	900		0.31	NA	NA	NA
Molybdenum	ug/L	3.75	J	3.10	NA	NA	NA
Nickel	ug/L	113		0.62	NA	NA	NA
pH	pH units	7.28		0.10	NA	NA	NA
Phosphorus	ug/L	208		62	NA	NA	NA
Potassium	ug/L	869		150	NA	NA	NA
Selenium	ug/L	1.50	ND	1.50	NA	NA	NA
Silicon	ug/L	5470		62	NA	NA	NA
Silver	ug/L	0.36	J	0.31	NA	NA	NA
Sodium	ug/L	3750		150	NA	NA	NA
Strontium	mg/L	0.168		0.002	NA	NA	NA
Sulfate	mg/L	58		0.031	NA	NA	NA
Sulfide	mg/L	0.10	ND	0.10	NA	NA	NA
Thallium	ug/L	0.31	ND	0.31	NA	NA	NA
Tin	ug/L	0.41	J	0.31	NA	NA	NA
Titanium	ug/L	48.7		1.5	NA	NA	NA
Total Dissolved Solids	mg/L	153		3.1	NA	NA	NA
Total Nitrate/Nitrite	mg/L	0.09	J	0.03	NA	NA	NA
Total Suspended Solids	mg/L	159		0	NA	NA	NA
Vanadium	ug/L	6.20	ND	6.20	NA	NA	NA
WAD CN	mg/L	0.0030	J	0.0025	NA	NA	NA
Zinc	ug/L	96		1.50	NA	NA	NA
Aluminum, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2
Antimony, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5	2.5	J	1.5
Barium, dissolved	ug/L	36		0.94	45		0.94
Beryllium, dissolved	ug/L	0.13	ND	0.13	0.13	ND	0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05	0.05	ND	0.05
Calcium, dissolved	mg/L	36		0.062	36		0.062
Chromium, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Cobalt, dissolved	ug/L	1.20	ND	1.20	1.20	ND	1.20
Copper, dissolved	ug/L	0.53	J	0.31	0.31	ND	0.31
Iron, dissolved	mg/L	0.28		0.01	0.26		0.01
Lead, dissolved	ug/L	0.062	ND	0.062	0.069	J	0.062
Magnesium, dissolved	mg/L	11		0.062	11		0.062
Manganese, dissolved	ug/L	157		0.31	160		0.31
Molybdenum, dissolved	ug/L	3.10	ND	3.10	3.10	ND	3.10
Nickel, dissolved	ug/L	4.46		0.62	4.69		0.62
Phosphorus, dissolved	ug/L	62	ND	62	62	ND	62
Potassium, dissolved	ug/L	366	J	150	366	J	150
Selenium, dissolved	ug/L	1.50	ND	1.50	1.50	ND	1.50
Silicon, dissolved	ug/L	NA	NA	NA	NA	NA	NA
Silver, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Sodium, dissolved	ug/L	3280		150	3370		150
Strontium, dissolved	mg/L	0.164		0.003	0.164		0.003
Thallium, dissolved	ug/L	0.310	ND	0.310	0.310	ND	0.310
Tin, dissolved	ug/L	0.31	ND	0.31	0.31	ND	0.31
Titanium, dissolved	ug/L	33.1		1.5	31.0		1.5
Vanadium, dissolved	ug/L	6.2	ND	6.2	6.2	ND	6.2
Zinc, dissolved	ug/L	2.58	J	1.50	2.06	J	1.50
Mercury, total	ng/L	NA	NA	NA	20.2		1.0

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

HMW-6D		October 2005		
Analyte	Units	Result	Result Flag	MDL
Alkalinity	mg/L	90		3.1
Aluminum	ug/L	34		6.2
Ammonia-N	mg/L	0.087	J	0.031
Antimony	ug/L	0.31	ND	0.31
Arsenic	ug/L	1.5	ND	1.5
Barium	ug/L	36		0.94
Beryllium	ug/L	0.13	ND	0.13
Cadmium	ug/L	0.050	ND	0.050
Calcium	mg/L	43		0.031
Chloride	mg/L	3.19		0.03
Chromium	ug/L	0.31	ND	0.31
Cobalt	ug/L	1.20	ND	1.20
Conductivity	umhos/cm	NA	NA	NA
Copper	ug/L	0.65	J	0.31
Cyanide	mg/L	0.0025	ND	0.0025
Fluoride	mg/L	0.091	J	0.031
Iron	mg/L	0.30		0.06
Lead	ug/L	0.062	ND	0.062
Magnesium	mg/L	11		0.031
Manganese	ug/L	50		0.31
Molybdenum	ug/L	3.1	ND	3.1
Nickel	ug/L	5.11		0.62
pH	pH units	NA	NA	NA
Phosphorus	ug/L	62	ND	62
Potassium	ug/L	527		150
Selenium	ug/L	1.50	ND	1.50
Silicon	ug/L	2420		62
Silver	ug/L	0.31	ND	0.31
Sodium	ug/L	3250		150
Strontium	mg/L	0.192		0.002
Sulfate	mg/L	58		0.031
Sulfide	mg/L	0.10	ND	0.10
Thallium	ug/L	0.310	ND	0.310
Tin	ug/L	0.31	ND	0.31
Titanium	ug/L	57.1		1.5
Total Dissolved Solids	mg/L	173		3.1
Total Nitrate/Nitrite	mg/L	0.08	J	0.03
Total Suspended Solids	mg/L	3		0.3
Vanadium	ug/L	6.20	ND	6.20
WAD CN	mg/L	0.0025	ND	0.0025
Zinc	ug/L	6.4		1.5
Aluminum, dissolved	ug/L	12	J	6.2
Antimony, dissolved	ug/L	0.31	ND	0.31
Arsenic, dissolved	ug/L	1.5	ND	1.5
Barium, dissolved	ug/L	35		0.94
Beryllium, dissolved	ug/L	0.13	ND	0.13
Cadmium, dissolved	ug/L	0.05	ND	0.05
Calcium, dissolved	mg/L	42		0.062
Chromium, dissolved	ug/L	0.31	ND	0.31
Cobalt, dissolved	ug/L	1.20	ND	1.20
Copper, dissolved	ug/L	0.31	ND	0.31
Iron, dissolved	mg/L	0.13		0.01
Lead, dissolved	ug/L	0.062	ND	0.062
Magnesium, dissolved	mg/L	11		0.062
Manganese, dissolved	ug/L	47		0.31
Molybdenum, dissolved	ug/L	3.1	ND	3.1
Nickel, dissolved	ug/L	4.92		0.62
Phosphorus, dissolved	ug/L	62	ND	62
Potassium, dissolved	ug/L	500		150
Selenium, dissolved	ug/L	1.50	ND	1.50
Silicon, dissolved	ug/L	2260		NA
Silver, dissolved	ug/L	0.31	ND	0.31
Sodium, dissolved	ug/L	3110		150
Strontium, dissolved	mg/L	0.187		0.003
Thallium, dissolved	ug/L	0.310	ND	0.310
Tin, dissolved	ug/L	0.31	ND	0.31
Titanium, dissolved	ug/L	51.8		1.5
Vanadium, dissolved	ug/L	6.2	ND	6.2
Zinc, dissolved	ug/L	7.5		1.5
Mercury, total	ng/L	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

Big Hurrah Water Quality Data Summary

CampWell 1		May 2005		
Analyte	Units	Result	Result Flag	MDL
Alkalinity	mg/L	229		3.1
Aluminum	ug/L	6.2	ND	6.2
Ammonia-N	mg/L	0.031	ND	0.031
Antimony	ug/L	3.82		0.31
Arsenic	ug/L	86.0		1.5
Barium	ug/L	17		0.94
Beryllium	ug/L	0.13	ND	0.13
Cadmium	ug/L	0.492	J	0.050
Calcium	mg/L	80		0.062
Chloride	mg/L	2.87		0.03
Chromium	ug/L	0.31	ND	0.31
Cobalt	ug/L	1.42	J	1.20
Conductivity	umhos/cm	650		0.48
Copper	ug/L	9.04		0.31
Cyanide	mg/L	0.00	ND	0.00
Fluoride	mg/L	0.102		0.031
Iron	mg/L	1.97		0.01
Lead	ug/L	0.073	J	0.062
Magnesium	mg/L	33		0.062
Manganese	ug/L	156		0.31
Molybdenum	ug/L	6.93	J	3.10
Nickel	ug/L	19.50		0.62
pH	pH units	7.30		0.10
Phosphorus	ug/L	62	ND	62
Potassium	ug/L	848		150
Selenium	ug/L	1.50	ND	1.50
Silicon	ug/L	NA	NA	NA
Silver	ug/L	0.31	ND	0.31
Sodium	ug/L	3540		150
Strontium	mg/L	0.839		0.003
Sulfate	mg/L	96		0.31
Sulfide	mg/L	0.10	ND	0.10
Thallium	ug/L	0.31	ND	0.31
Tin	ug/L	0.31	ND	0.31
Titanium	ug/L	60.9		1.5
Total Dissolved Solids	mg/L	358		3.1
Total Nitrate/Nitrite	mg/L	0.06	J	0.03
Total Suspended Solids	mg/L	3.0		0.15
Vanadium	ug/L	6.2	ND	6.2
WAD CN	mg/L	0.0025	ND	0.0025
Zinc	ug/L	246		1.50
Aluminum, dissolved	ug/L	6.2	ND	6.2
Antimony, dissolved	ug/L	5.73		0.31
Arsenic, dissolved	ug/L	79.3		1.5
Barium, dissolved	ug/L	16		0.94
Beryllium, dissolved	ug/L	0.130	ND	0.130
Cadmium, dissolved	ug/L	0.245	J	0.050
Calcium, dissolved	mg/L	78		0.62
Chromium, dissolved	ug/L	2.80		0.31
Cobalt, dissolved	ug/L	1.43	J	1.20
Copper, dissolved	ug/L	0.67	J	0.31
Iron, dissolved	mg/L	1.86		0.01
Lead, dissolved	ug/L	0.062	ND	0.062
Magnesium, dissolved	mg/L	32		0.062
Manganese, dissolved	ug/L	149		0.31
Molybdenum, dissolved	ug/L	6.76	J	3.10
Nickel, dissolved	ug/L	18.00		0.62
Phosphorus, dissolved	ug/L	62	ND	62
Potassium, dissolved	ug/L	868		150
Selenium, dissolved	ug/L	1.50	ND	1.50
Silicon, dissolved	ug/L	NA	NA	NA
Silver, dissolved	ug/L	62	ND	62
Sodium, dissolved	ug/L	3470		150
Strontium, dissolved	mg/L	0.819		0.003
Thallium, dissolved	ug/L	0.31	ND	0.31
Tin, dissolved	ug/L	0.31	ND	0.31
Titanium, dissolved	ug/L	84.9		1.5
Vanadium, dissolved	ug/L	6.2	ND	6.2
Zinc, dissolved	ug/L	241		1.5
Mercury, total	ng/L	NA	NA	NA

MDL: method detection limit

Result flags: "ND" means not detected; "J" means result is estimated conc. that is less than PQL but greater than MDL; "NA" means no analysis, or data not available.

Statistics: For constituents with no detects, mean, max and min were not calculated

For constituents with some detections, non-detects were included in the calculation of average at half the detection limit.

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007
www.watermc.com

To: Doug Nicholson (doug.nicholson@novagold.net)

Company: NovaGold Resources Inc.

Project No.: 2573

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date: May 8, 2006

Subject: Big Hurrah Project – Preliminary Materials Geochemical Testing Results

---

1 BACKGROUND

Geochemical testing for the Big Hurrah project was conducted in a single phase, as sample material became available from the drilling programs in the summers of 2004 and 2005. The test results were interpreted, as necessary, for various purposes, including mine permitting support, mine-feasibility studies, operational decision making (e.g., selective handling), construction material selection, and preliminary closure study support. Static and kinetic testing was conducted on development rock and ore expected to be generated by the mining process. Testing is ongoing.

Confirmatory sampling and analysis was also conducted to support acid-base accounting data from Phase I in response to a request from Alaska Division of Natural Resources (DNR). The specific objective of the confirmatory sampling was to define the different sources of neutralizing potential present in the Rock Creek and Big Hurrah development rock and ore. This was completed in March 2006.

2 GEOCHEMICAL SAMPLING AND ANALYSIS

The geochemical sampling and analysis plan proposed sampling based on tonnages and rock types as summarized in Table 1, with a total of approximately 5 million tons (Mt) of excavated rock mass. Based on the percentages, which were provided by NovaGold, the focus of the sampling and analysis was on quartz graphite schist (QGS) and the graphite muscovite schist (GMS), which comprise the majority of the development rock and ore.

Table 1 Big Hurrah Project rock types and tonnages

Description of rock types	Tonnage of ore	Tonnage of development rock	Percent of ore	Percent of development rock
Quartzitic graphite schist (QGS)	490,000	2,152,280	66	52
Quartz-muscovite schist (QMS)	10,000	82,780	1	2
Ore graphite calcareous schist (GCS)	35,000	331,120	5	8
Marble (MBL)	20,000	206,950	3	5
Graphitic Marker Unit (GMU)	9,900	82,780	1	2
Graphitic-muscovite schist (GMS)	170,000	1,283,090	23	31
Ore quartz vein (QVN)	7,000	0	1	0
Totals	741,900	4,139,000	100	100

The following analytical testing was conducted, as presented in Table 2:

- paste pH and acid-base accounting (ABA),
- meteoric water mobility procedures (MWMP),
- detailed mineralogy including optical and scanning electron microscopy (SEM),
- bulk rock chemistry using ion-coupled plasma/mass spectrometry (ICP/MS) analysis,
- kinetic testing using humidity cell tests (HCTs), and
- confirmatory ABA including total inorganic carbon (TIC) and NP corrected for iron carbonate minerals.

Table 2 Big Hurrah geochemical sampling and analysis summary

Test type	Quantity	Lithologies	Status
Acid Base Accounting/pH	332	All	Complete
MWMP	3	QGS/GMS	Complete
XRD	3	QGS/GMS	Complete
ICP/MS	2047	All	Complete
Mineralogy	3	QGS/GMS	Complete
Humidity Cell Tests	3	QGS/GMS	Complete
Confirmatory ABA testing	34	QGS/GMS	Complete

Additional samples were analyzed using the alternative methods for determining NP as a confirmation of earlier findings and to reevaluate the acid generation/neutralization potential of the different rock types. A total of 34 representative samples were selected from two different rock types including GMS and QGS. The standard Sobek, siderite-corrected, and total inorganic carbon analytical methods were used for the determination and comparison of neutralization potential (NP) values.

Paste pH

Paste-pH values were determined for all samples. Paste-pH data provide a quantitative estimate of the pH of a lixiviant such as rainwater on initial contact with the test sample. Because of the short solid-solution reaction time accommodated by the test, paste-pH data reflect the net acid-generation/consumption potential of readily hydrolyzed mineral phases only. Typically, these include carbonates and sulfosalt weathering products.

Acid-base accounting

Acid-base accounting is an industry-standard procedure for appraising the acid generation (or acid consumption) potential of rock and soils. The procedure involves the assessment of two parameters:

- neutralization potential (NP), and
- acid-generation potential (AP).

These parameters are subsequently used to calculate interpretive indices, including net neutralization potential (NNP) and NP:AP ratios.

Neutralizing potential (NP)

Values of NP indicate the capacity of rock materials to buffer acidity produced by sulfide oxidation or other proton-generating reactions. Three analytical methods were used for the determination of NP values for comparison.

The standard Sobek method (Sobek, et al., 1978) is applied to a mixture containing 1-2 grams of crushed rock sample, and a volume of hydrochloric acid (HCl). The solution is heated for 2 hours in order to expel any dissolved carbon dioxide (CO_2) and bring the reaction to completion. A neutralizing potential (NP) is calculated based upon the normality of the acid and base applied, and the mass of the sample.

An alternative method used to determine NP values is the peroxide siderite correction for the Sobek method (Skousen, et al., 1997). This method addresses potential erroneously high NP calculations from the above described standard Sobek method. For this method, a 2 gram sample is boiled in HCl for 5 minutes, and then filtered. The filtrate is then added to a 30 percent peroxide solution and boiled for 5 minutes to drive the oxidation of ferrous to ferric iron. The solution is then titrated to determine the calcium carbonate equivalent for the acid consumed during the test.

For these methods described above, the results are normalized to a conventional unit of tons $CaCO_3$ (equivalent) per 1,000 tons of rock. The reported results do not necessarily imply that calcite ($CaCO_3$) is present.

The NP of the material may also be calculated based on the total inorganic carbon (TIC) content of the sample. TIC content is determined in the laboratory as the difference between the total carbon content and the total organic carbon (TOC) content. Total carbon is measured using the standard LECO furnace method. For TOC determination, inorganic carbon must be removed from the samples by bathing the samples in 2N HCl for 24 hours, followed by rinsing and centrifuging. The sample is then analyzed for TOC using the LECO furnace method. The difference between total carbon and TOC is the TIC content of the material. The NP is calculated based on the TIC, and converted to standard units (i.e., TIC, as percent carbon, is multiplied by a factor of 83.3 to convert to NP, as tons $CaCO_3$ per 1,000 tons of rock).

Acid generation potential (AP)

Numerous procedures exist for the determination of AP. All include the analytical derivation of the various forms of sulfur, including total and sulfide-sulfur. For all Big Hurrah samples, total sulfur was determined using a LECO induction furnace (EPA method 600). Sulfur speciation was then undertaken following the US-EPA method 600 sequential leach procedure, in which sulfate-sulfur and sulfide-sulfur are differentiated on the basis of their respective solubilities in HCl and HNO_3.

The potential proton yield is calculated in accordance with the stoichiometry of pyrite oxidation. Options for the derivation of AP using an appropriate sulfur value include:

- the assignment of total sulfur within a sample to stoichiometric pyrite;
- the analytical differentiation of sulfide-sulfur from other sulfur species, and assignment of the former to stoichiometric pyrite; and
- the mineralogical determination of pyrite sulfur.

The Sobek (1978) method, involving the use of sulfide-sulfur for AP calculation, is most widely deployed worldwide, and is most appropriate for determination of AP for unweathered rock samples. This procedure may be considered conservative for samples containing a significant component of sulfide-sulfur in non-pyrite phases. For this evaluation, values of AP were calculated for samples using both (a) total sulfur and (b) sulfide-sulfur data. All results were converted to ton equivalents of $CaCO_3$ per 1,000 tons of material, using a conventional multiplier of 31.25 (moles of calcite required to neutralize protons liberated by 1 mole of oxidized pyrite).

Meteoric Water Mobility Procedure (MWMP)

MWMP testing was conducted according to Standard Methods (1992). This method is a standard leach procedure involving a 24-hour, single-pass column leach using a 1:1 water to rock ratio. The extraction solution is distilled, de-ionized water. This method provides an indication of the propensity of minerals in the samples to leach under environmental conditions. Leachates from this test are not necessarily representative of long-term environmental exposure, rather they are more indicative of a “first flush” chemistry that results from dissolving the relatively mobile mineral salts. Results from these tests will be used in preliminary characterization of environmental behavior of materials and to define the next phase of geochemical testing of Big Hurrah site materials.

X-ray Diffraction (XRD)

XRD is used to identify and estimate the quantity of major rock-forming minerals of each sample. This mineralogical data helps verify the mineralogical sources of the key ABA species. For example, carbonate rocks which are in the form of siderite (or other iron carbonate minerals), will release iron in addition to the buffering carbonate. The type and quantity of mineral phases also influences how the rock will weather in the environment.

ICP/MS

Ion-coupled plasma/mass spectrometry (ICP/MS) testing is a pseudo whole-rock analysis whereby the material to be tested is digested (leached/dissolved) and the liquid is analyzed for elemental content. The degree of digestion depends on the particular method, but it is assumed that the digestion is complete enough to be representative of the bulk rock chemistry.

These analyses have been conducted routinely as part of the metallurgical analytical work, so existing data were available from the pulp samples. ICP/MS was also performed on samples collected for MWMP for the Phase I work.

Humidity cell testing (HCT)

Samples were collected from each of the major development rock lithologies. HCTs are kinetic tests. That is, they are intended to provide data as a function of time instead of a "snapshot" in time that results from static testing. This information is critical to understanding how materials respond to weathering through time as they are exposed to multiple wetting and drying cycles in the environment. Humidity cells, in particular, are designed to simulate multiple wetting and drying cycles to establish optimal conditions for weathering of the sample. Typically, 1.0 to 1.5 kg of material is placed in a column and undergoes weekly flushing using distilled water at a 1:1 water to rock ratio. The leachate from each week is analyzed for key parameters (volume of leachate recovered, pH, TDS, temperature, sulfate, iron, acidity, alkalinity, and redox potential). Samples are stored and combined into a composite representing four weeks and sent for detailed chemistry. Tests run a minimum of 20 weeks and are then stopped when parameter concentrations stabilize or indicate negligible weathering is occurring. Data are processed to estimate weathering rates and chemical mass release rates.

Carbonate neutralization depletion time calculations were conducted following the protocol for the interpretation of kinetic tests established by Price (1997). The carbonate molar ratio for each cell was calculated based on average values of calcium, magnesium and sulfate from stabilized kinetic test data. The sulfate production rate was also determined from stabilized kinetic data and used to calculate the rate of acid depletion in the sample. The original sulfide-sulfur content of the material (from ABA testing) was used to represent the initial, total AP of the sample. The rate of acid depletion was used to calculate the remaining AP in the sample, and corresponding time remaining until that AP is theoretically depleted. The rates of neutralization depletion was similarly calculated and compared to the total NP in the sample (based on initial ABA data). These data were used to estimate the remaining NP in the sample, and the corresponding time remaining until that NP is depleted. The NP depletion time was then compared to the AP depletion time to predict whether the sample will generate acid or be neutralizing over the long term.

Detailed mineralogy

Splits from the HCT samples were submitted for detailed mineralogy and ABA to allow more thorough interpretation of the kinetic test results in context with a clear understanding of the samples' acid generation or neutralizing potential, and their mineralogy. Detailed mineralogy includes doing optical characterization in hand sample and by optical microscope. This provided valuable information on rock type, mineralogy, the nature of the acid-generating and acid neutralizing mineral phases, alteration/reaction phases, grain size and porosity. The optical inspection was used to define further testing using scanning electron microscopy (SEM) and/or microprobe analysis.

3 TEST RESULTS AND INTERPRETATION

ABA

The purpose of ABA testing was to predict the tendency of a material to generate and/or neutralize acid. ABA provides a snapshot in time, based on the bulk chemistry of sulfur and neutralizing species only and does not account for the kinetics of the reactions. ABA does indicate if the neutralizing minerals and sulfur are present in quantities necessary to buffer pH in the neutral to slightly alkaline range or generate net acidity, assuming that the sample were taken to be representative of large-scale materials in which all the sulfide oxidized and all the neutralization potential were available.

There are numerous ABA analytical and interpretive methods. In general, sulfide-sulfur (e.g., pyrite sulfur) generates acid and neutralizing material neutralizes acid. The balance of these provides an indication of the potential net neutralizing potential (NNP) of the rock. NNP is calculated by subtracting the acid potential (AP) from neutralization potential (NP). The NP:AP ratio (calculated as the NP divided by the AP) is another calculation that is helpful in interpreting ABA data.

Some interpretation methods advocate using total sulfur to estimate the AP of the rock. This tends to result in more conservative (higher) estimates of AP because it includes the non-pyritic (sulfide-sulfur) species (e.g., sulfate- and organic-sulfur minerals), which do not contribute appreciably to the acid generating potential of the material. For purposes of comparison, both total and sulfide-sulfur are presented and used to estimate the AP of the materials, as well as the NNP and NP:AP ratios (Attachment 1). However, for the purpose of evaluating and interpreting the ABA data, this discussion focuses on the calculation of AP based on sulfide-sulfur analyses, which more accurately represent the acid generating component of the materials.

Various guidance criteria are published and used as general guidance and decision-making. In general, these criteria are divided into “potentially acid generating”, “potentially acid neutralizing”, and “uncertain behavior”. EPA Region 10 (1999) summarizes some of the interpretative methods as follows:

- NNP values of greater than 20 tons $CaCO_3$/1,000 tons (T $CaCO_3$) suggests a non acid-generating material;
- NNP values between -20 and 20 T $CaCO_3$ suggest an uncertain potential,
- NNP values less than -20 T $CaCO_3$ suggest the material is potentially acid generating,
- NP:AP values greater than 3:1 suggest a non acid-generating material,
- NP:AP values less than 3:1 but greater than 1:1 suggest and uncertain potential, and
- NP:AP values less than 1:1 suggest materials are potentially acid generating.

The NP:AP ratio, however, becomes uncertain at low NP or AP values and the NNP should be weighted more strongly in those cases.

ABA testing included systematic testing of all 2005 reverse circulation exploration drilling, on 15-ft composite intervals, for a total of 332 tests from 30 boreholes, ranging from 0 to 240-ft deep. Figure 1 illustrates the spatial distribution and depth of ABA sampling locations. Attachment 1 summarizes the ABA results in tabular format, and presents calculations of AP, NNP and NP:AP ratios using both total and sulfide-sulfur.

Figures 2 through 4 present the results of all ABA data as scatter plots (Figures 2 and 3) and a histogram (Figure 4), respectively. For each figure, the ABA data is presented based on both sulfide-sulfur (indication of acid-generating material) and total sulfur (most conservative estimate). The ratio of NP to AP (based on sulfide-sulfur) for all data ranges from 0.1 to 467, with an arithmetic mean of 13 and a geometric mean of 3.3, indicating overall non acid-generating material. The geometric mean gives a more realistic average, as there are a few extremely high NP:AP ratios in the data which act to skew the arithmetic mean. Of all of the 332 samples, there are 55 which have a NP:AP ratio less than 1.0, indicating potentially acid-generating material for approximately 17 percent of the samples.

If ore and development rock are considered separately (Figure 2), a clear distinction can be seen between the two material types. Average development rock ABA data is within the uncertain zone, bordering on non acid-generating, with a geometric mean NP:AP of 2.8; however, the average NNP of development rock is 59 T $CaCO_3$, indicating non acid-generating materials. Ore is interpreted as more acid neutralizing than the development rock with a geometric mean NP:AP ratio of 6.1 and average NNP of 105 T $CaCO_3$ (strongly non acid-generating).

XRD

XRD analyses were performed on approximately 50 drill core samples from Big Hurrah, including representative lithologies and some vein samples. Qualitative analysis confirmed the presence of iron bearing calcite and dolomite occurring in the development rock samples, and minor occurrence of ankerite (Ca, Fe carbonate) in minor tension veins and in some secondary carbonate veins found in the mineralized ribbon veins (personal communication via email; S. Hicks, February 28, 2006).

ICP/MS

ICP/MS results for the mine database are presented in Tables 3a and 3b for pulp and core samples, respectively. These include minimum, maximum, and average composition, by rock type. For purposes of comparison, the table includes a comparison with average crustal igneous rock composition. Bold values indicate a value that is higher than the average crustal concentration of igneous rocks. Statistics were developed by assuming that non-detects were equal to the detection limit, thereby resulting a conservative estimate of the average, minimum, and sometimes, of the maximum values.

Elements that consistently exceeded the average crustal concentration in igneous rocks included gold, silver, arsenic, molybdenum, cadmium, sulfur, antimony, and zinc. These are consistent in both development rock and ore. Elevated arsenic and antimony concentrations are in line with MWMP results described above and represent metals which are potentially available at concentrations that could enhance mobility in the environment during weathering. Some metals concentrations are generally higher in the ore than in the development rock because of the increased level of mineralization although this does not apply to all metals. For example arsenic and antimony concentrations are elevated in ore relative to development rock however, cobalt, copper and zinc are very similar in both populations.

ICP/MS analyses are valuable in estimating the elemental concentrations in the rocks and highlighting element concentrations that are elevated relative to average rock compositions. The data can be used also to hypothesize elements that may be of environmental concern under variable weathering conditions. At Big Hurrah, ABA results suggest that mine-affected waters will remain alkaline. Under these conditions, constituents that are mobile at circumneutral pH values (e.g., metal oxyanions), which are also elevated in elemental concentration, are of potential concern. Constituents that follow these criteria include antimony, arsenic, chromium, sulfate, and molybdenum. However, antimony, arsenic, and molybdenum also tend to adsorb strongly to organic and iron-hydroxide substrates, and so may be less mobile in the environment at circumneutral pH values. The mobility of these species is being verified using MWMP and humidity cell testing.

Table 3a ICP/MS (whole rock) elemental data summary – developme nt rock

Gold >0.6 g/t - ORE

Lithology		Au g/t	Ag_ppm	Al_%	As_ppm	Ba_ppm	Be_ppm	Ca_%	Cd_ppm	Co_ppm	Cr_ppm	Cu_ppm	Fe_%	K_%	La_ppm	Mg_%	Mn_ppm	Mo_ppm	Na_%	Ni_ppm	P_ppm	Pb_ppm	S_%	Sb_ppm	Sc_ppm	Sr_ppm	Ti_%	V_ppm	Zn_ppm
Average crustal igneous rocks		0.0036	0.15	7.95	1.8	595	3.6	3.62	0.19	23	198	97	4.22	2.57	18.00	1.76	937	1.20	2.81	94	1100	16.00	0.04	0.51	15.00	410	0.48	149.00	80
GMS	AVERAGE	**6.48**	**1.36**	1.35	**766**	359	0.64	0.84	**1.55**	14	54	42	3.63	0.22	**21.57**	0.90	353	**7.89**	0.02	63	541	7.54	**0.17**	**8.96**	3.94	47	0.01	38.21	**109**
	Max	101.50	12.10	2.56	3370	1360	1.00	9.87	25.00	30	190	113	5.11	0.40	40.00	2.33	937	30.00	0.07	306	1760	21.00	0.95	19.00	8.00	486	0.03	80.00	953
	Min	0.60	0.20	0.15	36	90	0.50	0.01	0.50	1	9	10	0.81	0.04	10.00	0.02	37	2.00	0.01	18	100	2.00	0.01	2.00	1.00	3	0.01	10.00	18
	Count	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
	Non detects	0	3	0	0	0	18	0	43	1	0	0	0	0	8	0	0	0	2	0	0	1	1	0	0	0	52	0	0
MBL	AVERAGE	**3.38**	**1.16**	0.52	**240**	267	0.51	**NA**	**1.52**	8	52	41	2.11	0.16	10.00	1.31	338	**8.25**	0.02	44	638	14.00	**0.90**	**12.25**	2.75	**700**	0.01	30.75	**101**
	Max	21.00	4.10	0.86	606	630	0.60	NA	7.20	14	166	125	3.91	0.27	10.00	1.71	597	24.00	0.04	74	2400	44.00	2.31	24.00	4.00	1255	0.01	81.00	342
	Min	0.76	0.40	0.20	27	70	0.50	4.12	0.50	3	8	4	0.52	0.03	10.00	0.58	192	2.00	0.01	12	150	4.00	0.01	2.00	2.00	213	0.01	11.00	23
	Count	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Non detects	0	0	0	0	0	11	0	9	0	0	0	0	0	4	0	0	0	1	0	0	0	4	0	0	0	16	0	0
MCS	AVERAGE	**1.11**	**0.30**	0.47	**421**	475	0.50	1.0350	**0.50**	10	125	21	2.59	0.18	10.00	0.84	310	**13.00**	0.02	61	370	3.50	**0.39**	**5.00**	2.50	71	0.01	31.00	47
	Max	1.40	0.30	0.54	595	670	0.50	1.18	0.50	11	161	22	3.04	0.19	10.00	0.99	377	17.00	0.02	70	440	5.00	0.40	7.00	3.00	71	0.01	35.00	53
	Min	0.81	0.30	0.39	246	280	0.50	0.89	0.50	8	88	19	2.14	0.16	10.00	0.69	242	9.00	0.02	52	300	2.00	0.37	3.00	2.00	71	0.01	27.00	41
	Count	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Non detects	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
OVB	AVERAGE	**3.45**	**9.21**	1.07	**512**	383	0.63	0.3133	**0.88**	12	79	48	3.38	0.20	**18.33**	0.57	312	**10.58**	0.03	52	422	8.75	**0.10**	**9.25**	3.42	38	0.01	36.42	**104**
	Max	10.80	47.70	1.86	2080	850	0.90	1.94	3.00	25	183	79	4.91	0.31	40.00	1.12	585	29.00	0.04	85	670	16.00	0.62	14.00	6.00	171	0.01	57.00	229
	Min	0.64	0.50	0.39	60	230	0.50	0.05	0.50	4	14	29	1.88	0.10	10.00	0.05	88	3.00	0.01	30	210	3.00	0.02	4.00	1.00	13	0.01	23.00	70
	Count	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Non detects	0	0	0	0	0	6	0	4	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	10	0	0
QGS	AVERAGE	**5.83**	**1.27**	0.68	**880**	301	0.54	**NA**	**2.36**	10	49	45	2.60	0.16	13.57	0.94	280	**12.76**	0.02	66	412	11.47	**0.82**	**12.38**	2.79	164	0.01	37.16	**151**
	Max	135.50	17.50	2.69	*	1130	1.10	NA	43.00	32	228	237	5.73	0.43	40.00	2.46	915	36.00	0.06	204	2470	190.00	3.49	57.00	7.00	1185	0.01	89.00	744
	Min	0.60	0.20	0.11	25	20	0.50	0.02	0.50	1	3	2	0.59	0.02	10.00	0.02	26	1.00	0.01	8	60	2.00	0.01	2.00	1.00	7	0.01	10.00	10
	Count	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238
	Non detects	0	2	0	0	0	170	0	93	0	0	0	0	0	78	0	0	0	30	0	0	6	6	0	0	0	219	0	0
QMS	AVERAGE	**5.56**	**2.48**	1.08	**681**	416	0.54	0.7700	**0.58**	9	51	36	3.34	0.18	16.25	0.81	266	**7.13**	0.03	43	531	11.25	**0.17**	**12.13**	4.25	54	0.01	31.88	**80**
	Max	18.60	5.30	1.52	1175	1200	0.70	5.46	0.90	17	166	53	4.31	0.25	30.00	1.81	728	29.00	0.04	60	620	25.00	0.89	26.00	6.00	215	0.01	65.00	96
	Min	1.33	0.40	0.34	123	200	0.50	0.04	0.50	4	8	21	2.17	0.10	10.00	0.07	103	2.00	0.02	16	420	3.00	0.02	2.00	3.00	15	0.01	13.00	41
	Count	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Non detects	0	0	0	0	0	4	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0
QVN	AVERAGE	**22.19**	**2.96**	0.46	**684**	285	0.51	0.3145	**0.59**	5	23	35	1.73	0.09	11.82	0.33	138	**4.91**	0.01	28	271	4.73	**0.13**	**5.73**	2.09	26	0.01	18.91	26
	Max	75.50	10.50	1.45	3450	640	0.60	2.56	1.20	17	73	90	3.99	0.20	30.00	1.44	569	14.00	0.03	53	570	17.00	0.87	17.00	5.00	116	0.01	41.00	71
	Min	1.92	0.20	0.06	41	30	0.50	0.01	0.50	1	12	3	0.51	0.01	10.00	0.01	42	1.00	0.01	8	40	2.00	0.01	2.00	1.00	1	0.01	4.00	3
	Count	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Non detects	0	0	0	0	0	9	1	9	3	0	0	0	0	6	1	0	0	7	0	0	3	3	3	2	0	11	0	0

* Values measured exceeded the high limit of detection for the analytical method
NA - Not available

MWMP

Three MWMPs were conducted on three development rock samples for Big Hurrah. These include:

1. HC05-286, 10-12m – Quartz Graphite Schist development rock
2. HC05-288, 4-6m – Graphite Muscovite Schist development rock
3. HC05-288, 16-18m – Quartz Graphite Schist development rock

The complete laboratory report is provided as Attachment 2. Data indicate that only arsenic and antimony exceed the primary drinking water standards in the test extract. Arsenic concentrations range from 0.0071 mg/l (Test 3) to 0.016 mg/l (Test 2) compared to a standard of 0.01 mg/l, which will take effect in January of 2006. Antimony concentrations range from 0.0026 mg/l (Test 2) to 0.38 mg/l (Test 1) compared to the standard of 0.006 mg/l.

The MWMP uses a low water to rock ratio (1:1) compared to what is predicted to occur on site at Big Hurrah. The higher flushing rate likely to occur at Big Hurrah will serve to dilute concentrations significantly compared to the MWMP results. In addition, MWMP results are not appropriate for predicting long-term weathering of mine-related materials because MWMP represents only the rinsing of soluble salts from the outer mineral surfaces. MWMP results represent a conservative estimate of the first flush chemistry from recently-exposed materials.

Table 3b ICP/MS (whole rock) elemental data summary – ore

Gold >0.6 g/t - ORE

Lithology		Au g/t	Ag_ppm	Al_%	As_ppm	Ba_ppm	Be_ppm	Ca_%	Cd_ppm	Co_ppm	Cr_ppm	Cu_ppm	Fe_%	K_%	La_ppm	Mg_%	Mn_ppm	Mo_ppm	Na_%	Ni_ppm	P_ppm	Pb_ppm	S_%	Sb_ppm	Sc_ppm	Sr_ppm	Ti_%	V_ppm	Zn_ppm
Average crustal igneous rocks		0.0036	0.15	7.95	1.8	595	3.6	3.62	0.19	23	198	97	4.22	2.57	18.00	1.76	937	1.20	2.81	94	1100	16.00	0.04	0.51	15.00	410	0.48	149.00	80
GMS	AVERAGE	**6.48**	**1.36**	1.35	**766**	359	0.64	0.84	**1.55**	14	54	42	3.63	0.22	**21.57**	0.90	353	**7.89**	0.02	63	541	7.54	**0.17**	**8.96**	3.94	47	0.01	38.21	**109**
	Max	101.50	12.10	2.56	3370	1360	1.00	9.87	25.00	30	190	113	5.11	0.40	40.00	2.33	937	30.00	0.07	306	1760	21.00	0.95	19.00	8.00	486	0.03	80.00	953
	Min	0.60	0.20	0.15	36	90	0.50	0.01	0.50	1	9	10	0.81	0.04	10.00	0.02	37	2.00	0.01	18	100	2.00	0.01	2.00	1.00	3	0.01	10.00	18
	Count	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
	Non detects	0	3	0	0	0	18	0	43	1	0	0	0	0	8	0	0	0	2	0	0	1	1	0	0	0	52	0	0
MBL	AVERAGE	**3.38**	**1.16**	0.52	**240**	267	0.51	**NA**	**1.52**	8	52	41	2.11	0.16	10.00	1.31	338	**8.25**	0.02	44	638	14.00	**0.90**	**12.25**	2.75	**700**	0.01	30.75	**101**
	Max	21.00	4.10	0.86	606	630	0.60	NA	7.20	14	166	125	3.91	0.27	10.00	1.71	597	24.00	0.04	74	2400	44.00	2.31	24.00	4.00	1255	0.01	81.00	342
	Min	0.76	0.40	0.20	27	70	0.50	4.12	0.50	3	8	4	0.52	0.03	10.00	0.58	192	2.00	0.01	12	150	4.00	0.01	2.00	2.00	213	0.01	11.00	23
	Count	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Non detects	0	0	0	0	0	11	0	9	0	0	0	0	0	4	0	0	0	1	0	0	0	4	0	0	0	16	0	0
MCS	AVERAGE	**1.11**	**0.30**	0.47	**421**	475	0.50	1.0350	**0.50**	10	125	21	2.59	0.18	10.00	0.84	310	**13.00**	0.02	61	370	3.50	**0.39**	**5.00**	2.50	71	0.01	31.00	47
	Max	1.40	0.30	0.54	595	670	0.50	1.18	0.50	11	161	22	3.04	0.19	10.00	0.99	377	17.00	0.02	70	440	5.00	0.40	7.00	3.00	71	0.01	35.00	53
	Min	0.81	0.30	0.39	246	280	0.50	0.89	0.50	8	88	19	2.14	0.16	10.00	0.69	242	9.00	0.02	52	300	2.00	0.37	3.00	2.00	71	0.01	27.00	41
	Count	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Non detects	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
OVB	AVERAGE	**3.45**	**9.21**	1.07	**512**	383	0.63	0.3133	**0.88**	12	79	48	3.38	0.20	**18.33**	0.57	312	**10.58**	0.03	52	422	8.75	**0.10**	**9.25**	3.42	38	0.01	36.42	**104**
	Max	10.80	47.70	1.86	2080	850	0.90	1.94	3.00	25	183	79	4.91	0.31	40.00	1.12	585	29.00	0.04	85	670	16.00	0.62	14.00	6.00	171	0.01	57.00	229
	Min	0.64	0.50	0.39	60	230	0.50	0.05	0.50	4	14	29	1.88	0.10	10.00	0.05	88	3.00	0.01	30	210	3.00	0.02	4.00	1.00	13	0.01	23.00	70
	Count	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Non detects	0	0	0	0	0	6	0	4	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	10	0	0
QGS	AVERAGE	**5.83**	**1.27**	0.68	**880**	301	0.54	**NA**	**2.36**	10	49	45	2.60	0.16	13.57	0.94	280	**12.76**	0.02	66	412	11.47	**0.82**	**12.38**	2.79	164	0.01	37.16	**151**
	Max	135.50	17.50	2.69	*	1130	1.10	NA	43.00	32	228	237	5.73	0.43	40.00	2.46	915	36.00	0.06	204	2470	190.00	3.49	57.00	7.00	1185	0.01	89.00	744
	Min	0.60	0.20	0.11	25	20	0.50	0.02	0.50	1	3	2	0.59	0.02	10.00	0.02	26	1.00	0.01	8	60	2.00	0.01	2.00	1.00	7	0.01	10.00	10
	Count	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238	238
	Non detects	0	2	0	0	0	170	0	93	0	0	0	0	0	78	0	0	0	30	0	0	6	6	0	0	0	219	0	0
QMS	AVERAGE	**5.56**	**2.48**	1.08	**681**	416	0.54	0.7700	**0.58**	9	51	36	3.34	0.18	16.25	0.81	266	**7.13**	0.03	43	531	11.25	**0.17**	**12.13**	4.25	54	0.01	31.88	**80**
	Max	18.60	5.30	1.52	1175	1200	0.70	5.46	0.90	17	166	53	4.31	0.25	30.00	1.81	728	29.00	0.04	60	620	25.00	0.89	26.00	6.00	215	0.01	65.00	96
	Min	1.33	0.40	0.34	123	200	0.50	0.04	0.50	4	8	21	2.17	0.10	10.00	0.07	103	2.00	0.02	16	420	3.00	0.02	2.00	3.00	15	0.01	13.00	41
	Count	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Non detects	0	0	0	0	0	4	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7	0	0
QVN	AVERAGE	**22.19**	**2.96**	0.46	**684**	285	0.51	0.3145	**0.59**	5	23	35	1.73	0.09	11.82	0.33	138	**4.91**	0.01	28	271	4.73	**0.13**	**5.73**	2.09	26	0.01	18.91	26
	Max	75.50	10.50	1.45	3450	640	0.60	2.56	1.20	17	73	90	3.99	0.20	30.00	1.44	569	14.00	0.03	53	570	17.00	0.87	17.00	5.00	116	0.01	41.00	71
	Min	1.92	0.20	0.06	41	30	0.50	0.01	0.50	1	12	3	0.51	0.01	10.00	0.01	42	1.00	0.01	8	40	2.00	0.01	2.00	1.00	1	0.01	4.00	3
	Count	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Non detects	0	0	0	0	0	9	1	9	3	0	0	0	0	6	1	0	0	7	0	0	3	3	3	2	0	11	0	0

* Values measured exceeded the high limit of detection for the analytical method
NA - Not available

MWMP is a leach procedure that involves rinsing samples with water. Generally, the procedure rinses readily mobile phases, especially efflorescent salts and fine-grained, reactive minerals from the rock surface and does not weather the sample. The results provide an indication of what constituents are mobilized by an initial contact with water, and it is assumed that there is a potential correlation between the results of the MWMP and what constituents could pose a longer-term risk. However, this would have to be verified by kinetic testing, if necessary.

Results are typically compared to water-quality standards, but because this procedure mobilizes the weathered and reactive salts on the rock surface, and because of the water to rock ratio (1:1), concentrations are, by design, higher than what would likely be observed in the field as runoff and lower than what would be expected to infiltrate. Any exceedence of water quality standards are not conclusive, but only serve to indicate potential constituents of concern.

Standards were exceeded for antimony, arsenic, beryllium, cadmium, and manganese. Of the development rock samples, Test 1 (QGS) resulted in exceedences for arsenic, antimony, beryllium, cadmium, and manganese, and Test 2 (QMS) resulted in exceedences of manganese. Of the ore samples, all tests resulted in exceedences of antimony, Tests 6, 7, and 9 exceeded the arsenic standard, and Test 9 also exceeded the standard for manganese. These results indicate that some of the rock types have readily soluble metalliferous phases, that, when rinsed with water are readily dissolved. This could be because of weathering of the sample during storage and transport or that samples have genetic metalliferous mineral phases that are readily soluble. It is not possible to determine this from the Phase I test results.

HCT

Samples include development rock representing QGS lithology (two samples) and GMS (one sample). These lithologies were selected because they comprise the vast majority of the development rock that will be generated at Big Hurrah. The two samples of QGS represent different acid-base characteristics based on ABA testing so that the range of QGS is represented in the HCTs. The GMS is representative of average ABA characteristics of the GMS material.

Results from the humidity cell tests are provided in Attachment 3. A graph for each humidity cell is shown containing alkalinity, acidity, pH, and sulfate concentrations through time. In addition, the full suite of analytes (including metals) is provided in tabular format.

Cell 1 (QGS) is ongoing in its 30th week. The pH has been relatively stable between 7.3 and 7.9 since Week 5. Sulfate has gradually decreased over time and stabilized at Week 13 between 84 and 108 mg/L. There has been no measurable acidity, and alkalinity has stabilized at Week 16 between 85 and 90 mg/L. Arsenic concentrations have remained steady throughout the test, and antimony concentrations have gradually decreased through time.

Cell 2 (QGS) is ongoing in its 30th week. The pH has been relatively stable between 7.0 and 7.8 since Week 3. Sulfate has gradually decreased over time; however, the sulfate concentrations do not appear to have stabilized. There has been no measurable acidity, and alkalinity has fluctuated between approximately 30 and 150 mg/L. Antimony and arsenic concentrations peaked near the midpoint of the test and have gradually decreased through time.

Cell 3 (GMS) is ongoing in its 30th week. The pH has been relatively stable between 7.0 and 7.8 since Week 3. Sulfate has fluctuated throughout the test with a median value of 773mg/L. There has been no measurable acidity, and alkalinity has fluctuated between approximately 22 and 155 mg/L. Antimony and arsenic concentrations were very low, at or below detection, through time.

Results from the depletion time calculations for development rock lithologies in Cells 1, 2 and 3 are presented in Table 4. Depletion time calculations require that leachate concentrations are stable; none of the HCTs have completely stabilized, however estimated depletion calculations have been made using the most recent data. Depletion time estimates were calculated based on sulfate mass generated (for acid depletion) and calcium and magnesium mass generated (for neutralization depletion). Depletion rates were compared to sulfide sulfur (converted to the carbonate equivalent) AP and carbonate NP to estimate whether NP or AP would be depleted first. For Cells 1 and 3, NP was predicted to far outlast AP. For Cell 2 (QMS acidic), the sulfate concentrations are very low indicating negligible pyrite oxidation is occurring. With such low rates of pyrite oxidation, it is likely that pyrite is relatively unreactive and/or unavailable for reaction. For this reason, Cell 2 was not used in the determination of a NP:AP molar ratio.

Detailed mineralogy

Detailed mineralogy includes characterizing the rock under optical microscope and SEM to determine the nature of acid-generating and acid-neutralizing phases, efflorescent salts, alteration products, and the source of metals of concern in the various mineral phases. The petrographic report for Big Hurrah samples is included in Attachment 4.

The mineralogy study indicates that the principal rock type in the three samples is biotite-quartz-(plagioclase) schist. Sericite, pyrite, calcite, leucoxene, and chlorite are present as replacement or secondary hydrothermal alteration products. Veinlets of quartz, pyrite and carbonate exist in each of the samples.

The pyrite exhibits two stages of development. The earliest phase is a porous, lower reflective stage that is overgrown by a more-reflective, homogeneous stage that commonly exhibits euhedral forms. Traces of chalcopyrite, marcasite, and native gold are present within the later stage pyrite. Oxidation preferentially develops goethite within the earlier porous pyrite stage, commonly leaving rims of unoxidized homogeneous pyrite.

All samples contain carbonate, although oxidized samples may contain less due to acid consumption (reaction) of the carbonate with sulfuric acid during sulfide oxidation.

4 CONFIRMATORY ABA TESTING RESULTS USING ALTERNATE NP DETERMINATIONS

Thirty-four additional samples were analyzed using the standard and alternate methods for determining NP, as a confirmation of earlier findings and to reevaluate the acid generation/neutralization potential of the different rock types. Samples were selected from two different rock types and analyzed using the standard ABA testing procedures. In addition, the siderite-corrected Sobek and the total inorganic carbon analytical methods were used for the determination and comparison of NP values. The results of this testing are presented in Attachment 5. Table 5 presents the ranges and geometric average values of NP based on lithology, using the three alternate NP determinations. Correlation data between the alternate NP determinations are presented graphically in Attachment 5. Based on the correlation plots, the siderite-corrected Sobek method predicted NP values 15 percent below the standard Sobek method on average, and the total inorganic carbon determination of NP predicted values 24 percent below the standard Sobek.

Table 4 NP and AP depletion calculation results summary

Rock Type	HCT #	Ca (mg/L)	Mg (mg/L)	SO4 (mg/L)	Carbonate molar ratio	Initial AP (Sulfide S) (%)	AP depletion rate (mg SO4/kg/wk)	AP depletion rate (mg $CaCO_3$/kg/wk)	Remaining AP (weeks)	Initial NP(g $CaCO_3$/kg)	NP depletion rate (mg $CaCO_3$/kg/wk)	Remaining NP (weeks)	Prediction of outcome	NP:AP molar ratio
QGS	1	58	4	98	1.58	0.71	43	45	**495**	78	71	**1103**	Non Acid	1.6
QGS	2	10	4.4	7.5	5.51	0.94	3.8	4.0	**7412**	50	22	**2292**	Acid	----
GMS	3	210	6.7	285	1.86	0.35	131	136	**80**	58	254	**229**	Non Acid	1.9

The AP depletion rate is based on the sulfate production rate over the period of stable kinetic data.
Humidity Cell #2 has not stabilized; therefore, depletion calculations have not been made.

Table 5 NP value summary statistics

	Standard Sobek			Siderite-corrected Sobek			TIC		
Lithology	**MIN**	**MAX**	**GEOMEAN**	**MIN**	**MAX**	**GEOMEAN**	**MIN**	**MAX**	**GEOMEAN**
QGS	3	224	59	20	133	60	17	133	55
GMS	1 U	203	38	16	191	62	8.3	175	51

A summary table and series of figures are included in Attachment 5 that present the confirmation ABA data based on determinations of NP using (1) the standard Sobek method; (2) siderite-corrected Sobek method; and (3) total inorganic carbon carbonate determination. The NP:AP ratios and NNP values are calculated using each of the three NP determinations, and using both total sulfur and sulfide sulfur for calculating AP.

The first series of figures present the results of the confirmatory ABA data using the NP values determined by the standard Sobek method. These data are presented as scatter plots, and are grouped first by lithology and then by ore versus development rock samples. For each scatter plot, the ABA data are presented as both total sulfur (most conservative estimate) and sulfide sulfur (indication of acid generating material). As presented in the summary table, the NP:AP ratios (based on sulfide-sulfur) using the standard ABA methods range from 0.08 to 60, with an arithmetic mean of 6.9 and a geometric mean of 3.0 indicating overall non acid-generating material. Of the 34 samples, there are 6 which have a NP:AP ratio of less than 1.0, indicating potentially acid-generating material for approximately 18 percent of the samples.

The second series of figures present the results of the confirmatory ABA data using the NP values determined by the siderite-corrected Sobek method. These data are presented as scatter plots, and are grouped first by lithology and then by ore versus development rock samples. The NP:AP (based on sulfide-sulfur) ratio for the confirmatory ABA data ranges from 0.57 to 57 with an arithmetic mean of 6.8 and a geometric mean of 3.7, indicating overall non acid-generating material. Of the 34 samples, there are 4 which have a NP:AP ratio of less than 1.0, indicating potentially acid-generating material for less than 12 percent of the samples.

The third series of figures present the results of the confirmatory ABA data using the NP values determined based on the total inorganic carbon content. The NP:AP (based on sulfide-sulfur) ratio for the confirmatory ABA data ranges from 0.39 to 27 with an arithmetic mean of 4.7 and a geometric mean of 2.8 indicating overall unknown to non acid-generating material. Of the 34 samples, there are 5 which have a NP:AP ratio of less than 1.0, indicating potentially acid-generating material for approximately 15 percent of the samples.

The NNP values for the confirmation samples, calculated using the three alternate NP values, are presented in histograms in Attachment 5. For each data set, the majority of the samples are considered non-acid generating with some samples in the zone of uncertainty, and one sample in the potentially acid generating zone using the standard Sobek method.

Based on these data, the standard Sobek method generally predicts the highest value of NP in the samples followed by the siderite-corrected Sobek method, and then the total inorganic carbon determination. Some anomalous results appear to result from analytical error. However, the overall interpretation of acid generation/neutralization capacity of the samples data does not significantly differ based on the different methodologies. These results confirm the original ABA test data and interpretations from Phase I.

5 PAG DEVELOPMENT ROCK ESTIMATE BASED ON SITE-SPECIFIC NP:AP RATIO

For the purpose of development rock management, the percentage of potentially acid generating (PAG) development rock has been estimated based on a site-specific NP:AP ratio for the Big Hurrah materials. The site-specific NP:AP ratio is calculated from the NP and AP depletion rates measured in the two HCTs of non-acid generating waste rock samples once depletion rates had stabilized (Price, W.A. and Errington, J.C., 1998). This method assumes that the available NP in the samples persists over time, which has been evaluated based on the depletion time calculations which predict that NP will far outlast AP in these samples (Section 3, HCT). The NP:AP ratios are calculated for each HCT, and the results are weighted based on the quantity of mined material represented by that HCT lithology. NovaGold may, in the future, initiate additional HCTs of representative waste rock samples in order to refine this site-specific value. Data are presented below in Table 6.

Table 6 Big Hurrah Site Specific NP:AP Ratio for Development Rock

Client ID	Development Rock Quantity		AP depletion rate	NP depletion rate	NP:AP molar ratio
	Mass of mined rock (ton)	Percent of QGS and GMS development rock	(mg/kg/wk)	(mg/kg/wk)	
HCT 1 (QGS), 4269, 60-75	2,152,280	63%	45	71	1.6
HCT 3 (GMS), 4269, 50-60	1,283,090	37%	136	254	1.9
Site-specific NP:AP ratio (weighted average value for development rock):			79	139	1.7

As presented in this table, the site-specific NP:AP ratio for non-acid generating development rock at Big Hurrah is 1.7. In order to estimate the approximate percentage of development rock which will be considered PAG material, all of the development rock ABA data are presented in a scatter plot (Figure 5) and compared to the site-specific NP:AP ratio of 1.7. The ABA data presented in Figure 5 are based on siderite-corrected NP values and sulfide-sulfur AP values.

Table 7 presents a comparison of the estimated PAG material using the various corrections to the NP value, as determined through the confirmatory ABA testing (Section 4). The estimated percentage of PAG material varies from 33 percent, based on the standard Sobek determination of NP, to 48 percent, based on modifying the NP value using both siderite and TIC calculated corrections. For the purpose of planning and development rock handling, the siderite-corrected NP values are used to estimate PAG material quantity. Approximately 38% (106 samples) of development rock samples plot below the site-specific NP:AP ratio. Therefore, approximately 38% of development rock will be considered PAG material. Actual PAG material quantities will be defined by operational sampling and analysis during mining.

Table 7 PAG development rock estimates based on NP corrections

	NP:AP NP by standard Sobek (AP by sulfide S)		NP:AP NP with siderite correction (AP by sulfide S)		NP:AP NP with siderite/ TIC correction (AP by sulfide S)	
	(# Samples)	**(Percent)**	**(# Samples)**	**(Percent)**	**(# Samples)**	**(Percent)**
NP:AP < 1.7	91	33%	106	**38%**	135	48%
NP:AP > 1.7	188	67%	173	**62%**	144	52%
Total	279	100%	279	**100%**	279	100%

Attachment 6 presents borehole locations of ABA samples and illustrative cross-sections indicating the location of potentially acid generating rock within the proposed pit outline. Potentially acid generating material was defined, for this evaluation, based on a preliminary estimate of the site-specific NP:AP ratio of 2.0.

6 SUMMARY

Bulk rock elemental chemistry indicates several elements that are elevated relative to average igneous rocks. These include gold, silver, arsenic, molybdenum, cadmium, sulfur, antimony, and zinc. Of these, antimony and arsenic are indicated at elemental concentrations which could, if mobilized in the environment, pose an environmental risk. Based on MWMP leach testing, only arsenic and antimony are indicated at elevated concentrations in first flush of the materials.

Average ABA data for both ore and development rock samples indicate overall non acid-generating material, with a geometric mean NP:AP ratio of 3.3. Of the 332 samples tested, 55 samples (17 percent) indicated potentially acid-generating material. Considered separately, average development rock ABA data is within the uncertain zone, bordering on non acid-generating, with an NP:AP ratio of 2.8; and ore is interpreted as even more acid neutralizing than the development rock with a geometric mean NP:AP ratio of 6.1. Confirmatory ABA data for 34 additional samples of both ore and development rock also indicate an overall non acid-generating material with a geometric mean NP:AP ratio of 3.0. The confirmatory samples were also analyzed using alternate methods for determining NP, as a confirmation of earlier findings and to reevaluate the acid generation/neutralization potential of the different rock types. The two alternate methods for determining NP are the siderite-corrected Sobek method and the total inorganic carbon method. The standard Sobek method generally predicts the highest value of NP in the samples followed by the siderite-corrected Sobek method (15 percent lower), and then the total inorganic carbon determination (24 percent lower). The lower siderite-corrected values are qualitatively confirmed by the reported presence of iron carbonate minerals observed during mineralogical analysis. However, the overall interpretation of acid generation/neutralization capacity of the samples data does not significantly differ based on the different methodologies. Of the 34 samples tested using the alternate NP methods, 4 to 5 samples (between 12 to 15%) indicated potentially acid-generating material, which is consistent with earlier findings. Both ore and development rock samples are interpreted as non acid-generating. Assuming all of the neutralizing potential (NP) of the rock samples is available for reaction, the ABA results suggest that the development rock and ore material will not pose a risk of acid generation in the short or long term. The few samples categorized in the uncertain range, could potentially generate acid in the long term, however the effects may be localized and may be mitigated by the other, non acid-generating/net neutralizing tonnage of rock material.

The static test results presented in this memorandum indicate that acid rock drainage is not likely at the Big Hurrah site. Based on our understanding of the Rock Creek materials, and in comparing the Rock Creek and Big Hurrah bulk rock (ICP/MS) chemistry data, it is probable that metals availability will be significantly (one order of magnitude) lower at the Big Hurrah site. While a direct correlation between metals concentration and mobility cannot be made, the much lower metals concentrations at Big Hurrah will likely result in lower aqueous (i.e., mobile) concentration of these metals in site runoff.

These interpretations are supported by the kinetic test results at 30 weeks. All three samples generated alkaline leachate with circumneutral pH and no measurable acidity.

Short- and medium-term kinetic test data indicate all materials at the Big Hurrah site will not generate acid. Two of the HCTs have stabilized and indicate long-term neutralizing conditions based on depletion calculations. The third test (acid QGS) had not stabilized, but the later weeks resulted in low sulfate production indicating very low pyrite oxidation rates. Such low oxidation rates indicate pyrite is not available for significant reaction to occur, especially in the long term. Metals concentrations are low compared to Rock Creek materials.

For the purpose of development rock management, the percentage of PAG development rock has been estimated based on a site-specific NP:AP ratio for the Big Hurrah materials. Approximately 38% of development rock samples plot below the site-specific NP:AP ratio of 1.7; therefore, approximately 38% of development rock will be considered PAG material. This material will be stockpiled near the edge of the open pit during mining, and then backfilled into the open pit at closure for inundation and isolation by the pit lake.

7 REFERENCES

ASTM, 1996. ASTM D5744-96 – Standard Test Method for Accelerated Weathering of Solid materials Using a Modified Humidity Cell.

British Columbia Acid Mine Drainage Task Force, 1989. Draft Acid Rock Drainage Guide, BiTech Publishers Ltd., Vancouver, British Columbia.

Price, W.A. and Errington, J.C., 1998. Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage – Draft #1. Chapter 10. British Columbia Ministry of Employment and Investment, Energy and Mineral Division. August 1998.

EPA, 1999. EPA and Hardrock Mining: A Sourcebook for Industry in the Northwest and Alaska. Draft Guidance Document from EPA Region 10; EPA-10-R-99-016.

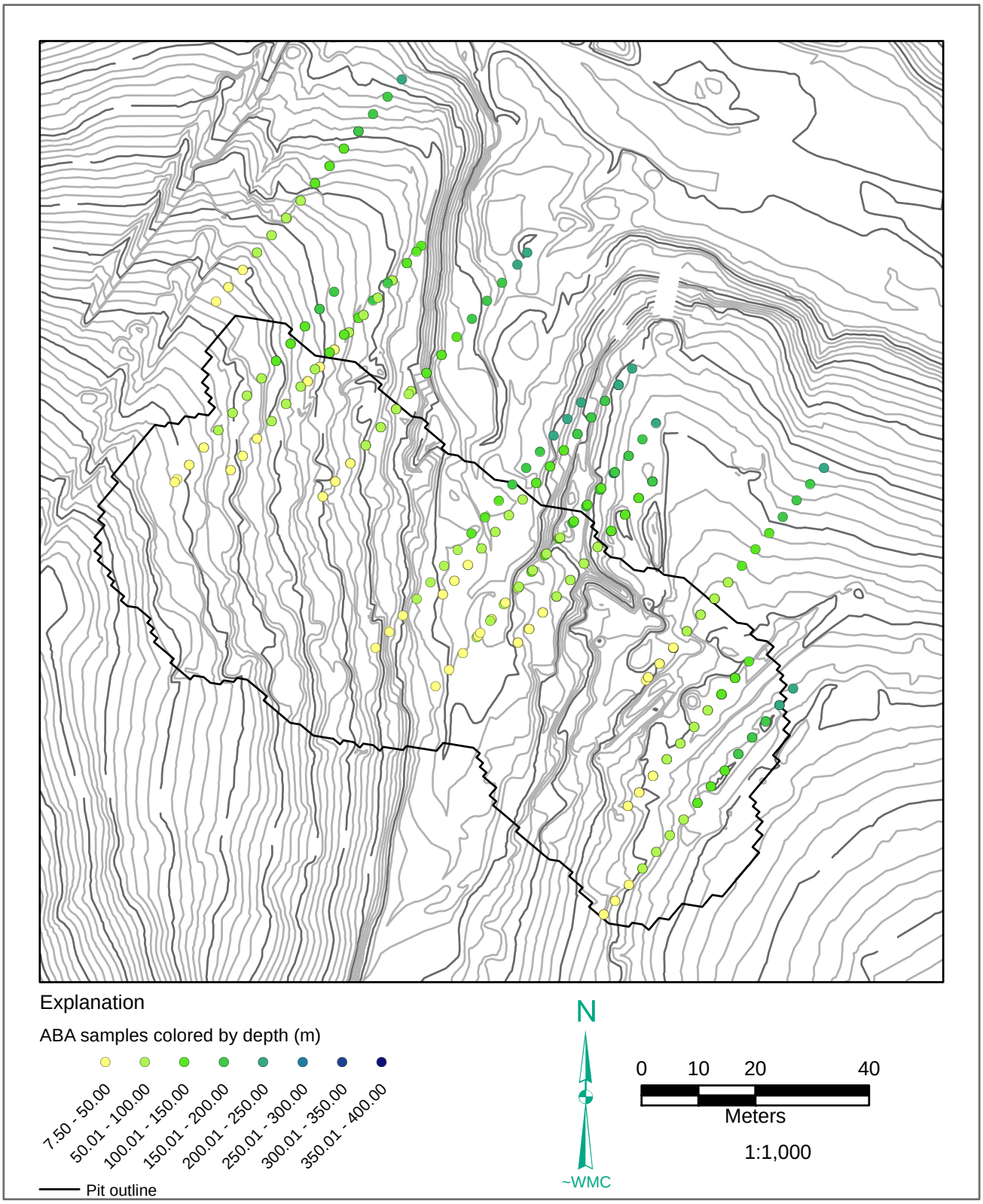
MEND, 1994. Handbook for Wasterock Sampling Techniques. MEND Report 4.5.1-2. June.

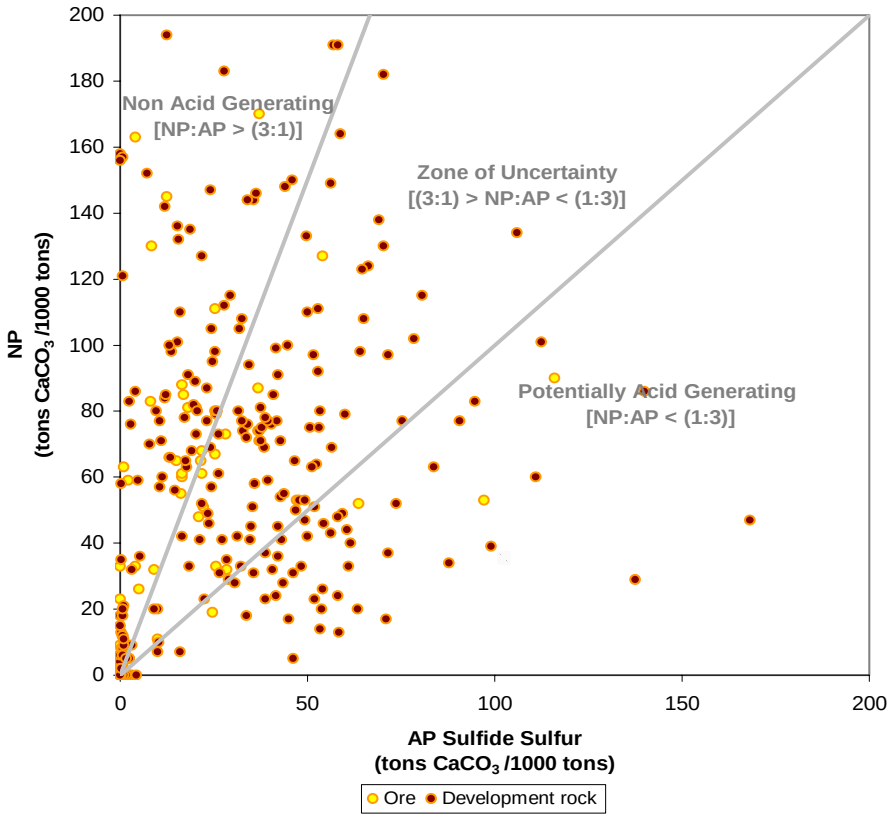
Sobek, A.A., W.A. Schuller, J.R. Freeman, and R.M. Smith, 1978. Field and laboratory methods applicable to overburden and minesoils. U.S. E.P.A. Report EPA-600/2-78-054.

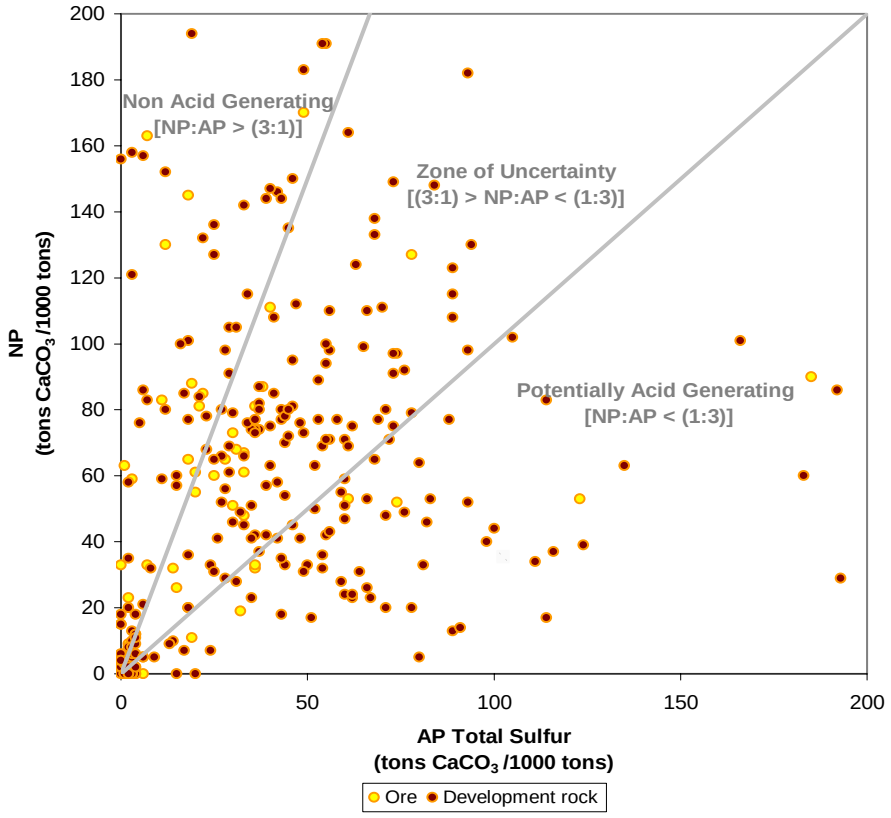
FIGURES

WATER MANAGEMENT CONSULTANTS

Figure 1 Spatial distribution and depth of ABA samples





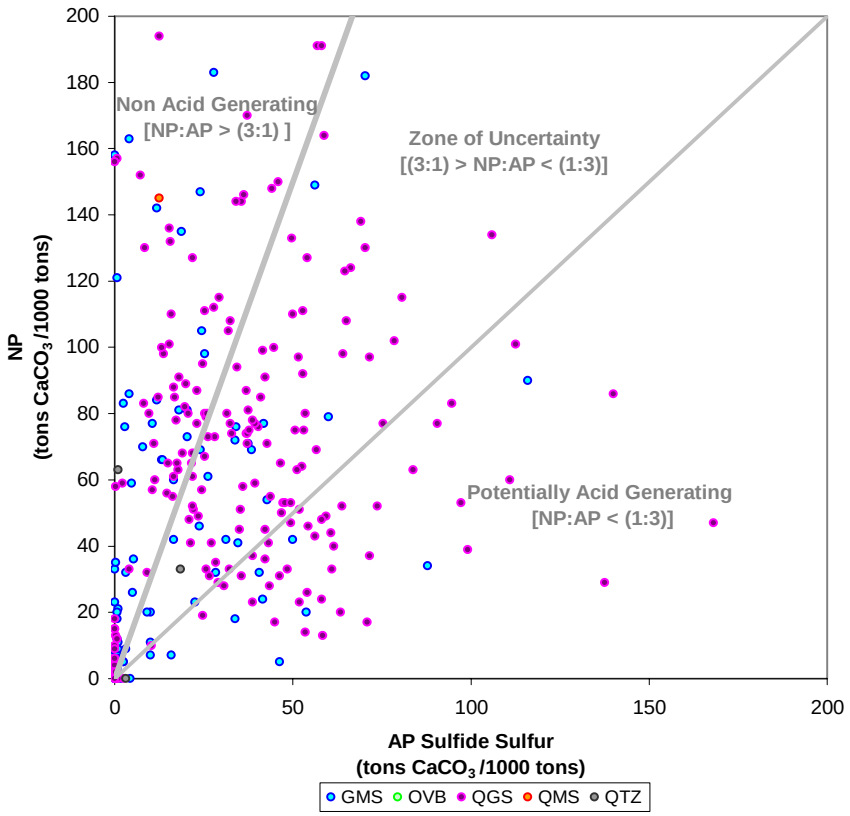


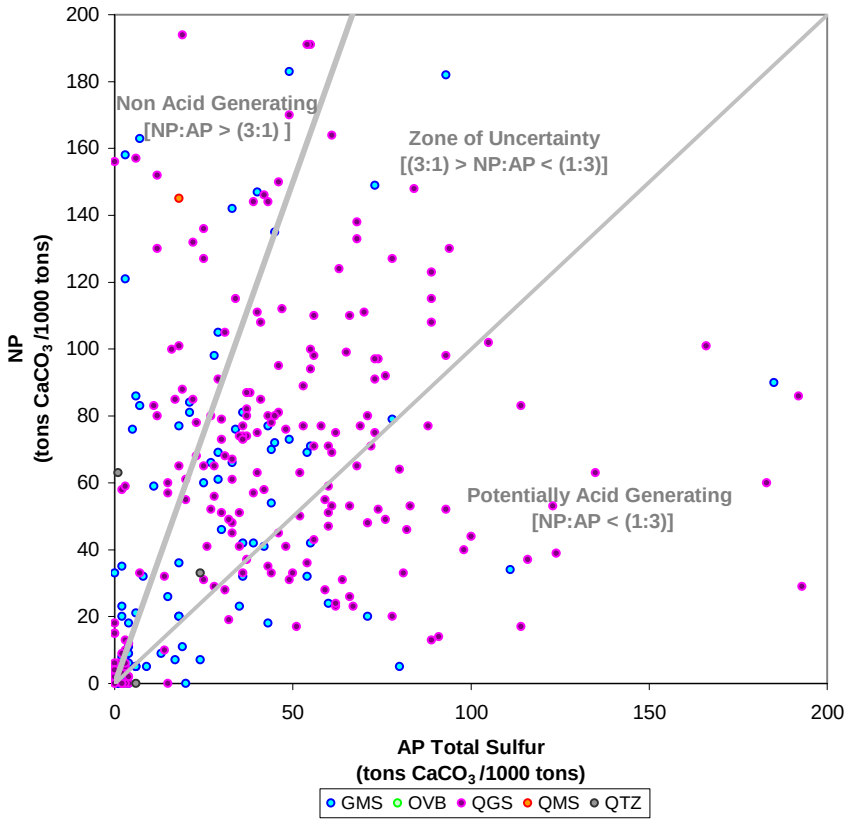
WATER MANAGEMENT CONSULTANTS
Denver, CO

ABA SCATTER PLOTS BY ORE AND DEVELOPMENT ROCK

CLIENT: NovaGold RESORCES, INC.		PROJECT: BIG HURRAH	
JOB: 2509	FILE: FIGURE-2.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 2	

F:\2573 - BIG HURRAH\2573 - FINAL MEMOS APRIL 2006\GEOCHEM MEMO APR06\2573-MEMO-MAY-2006\FIGURE-2.DWG

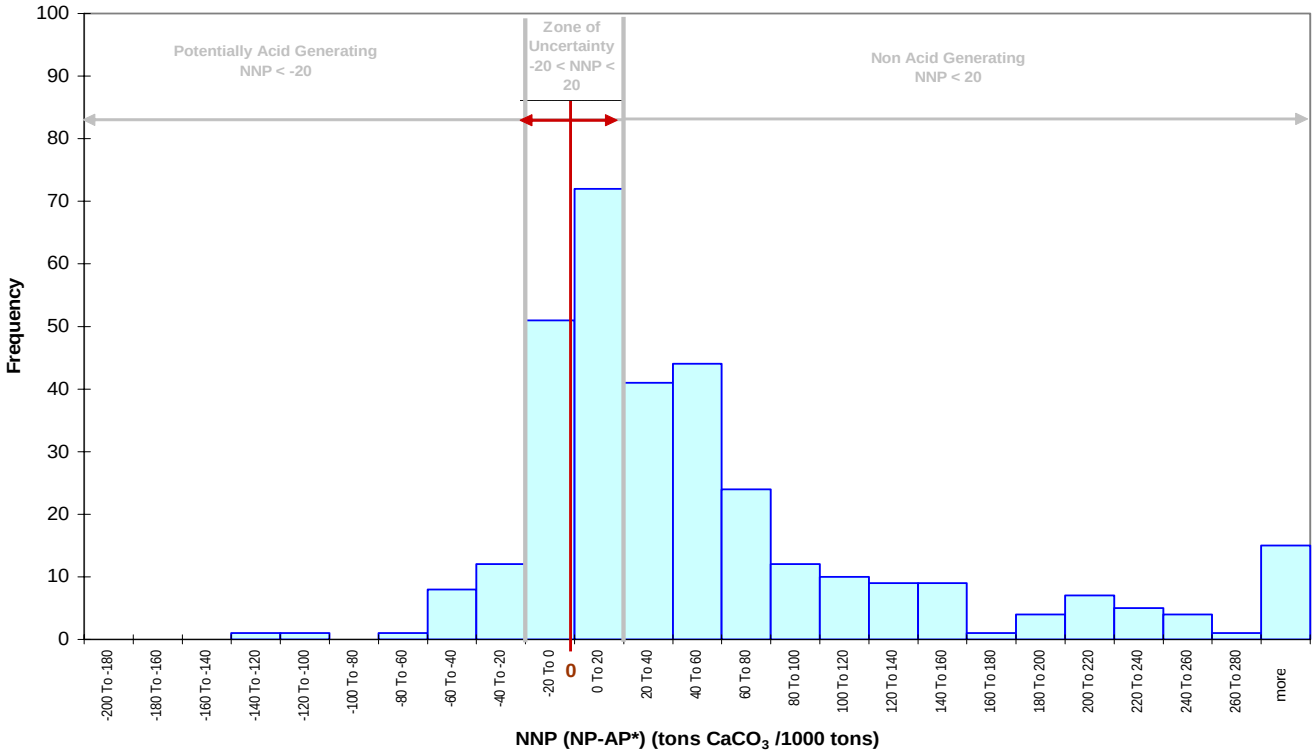




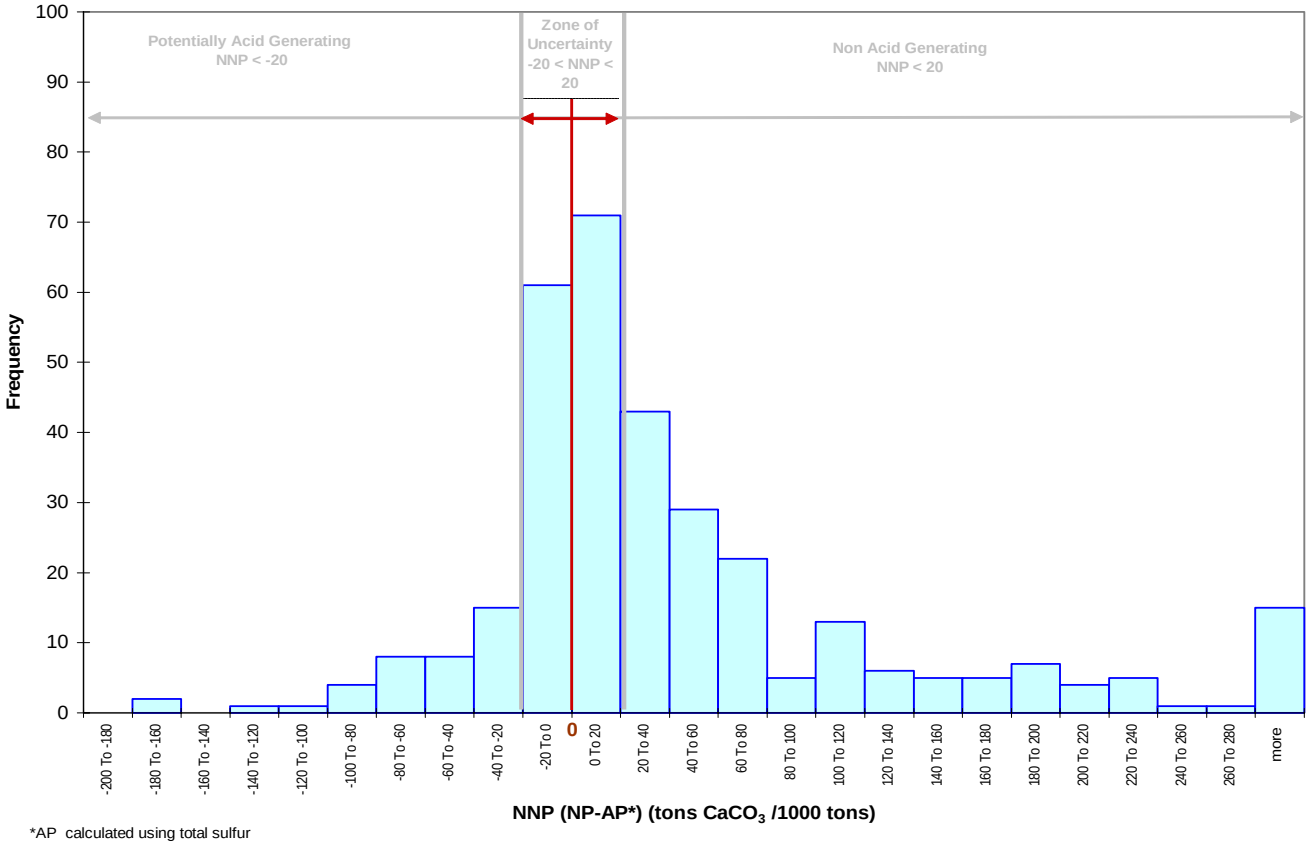
F:\2573 - BIG HURRAH\2573 - FINAL MEMOS APRIL 2006\GEOCHEM MEMO APR06\2573-MEMO-MAY-2006\FIGURE-3.DWG

WATER MANAGEMENT CONSULTANTS
Denver, CO

ABA SCATTER PLOTS BY LITHOLOGY			
CLIENT: NovaGold RESORCES, INC.		PROJECT: BIG HURRAH	
JOB: 2509	FILE: FIGURE-3.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 3	



*AP calculated using sulfide sulfur

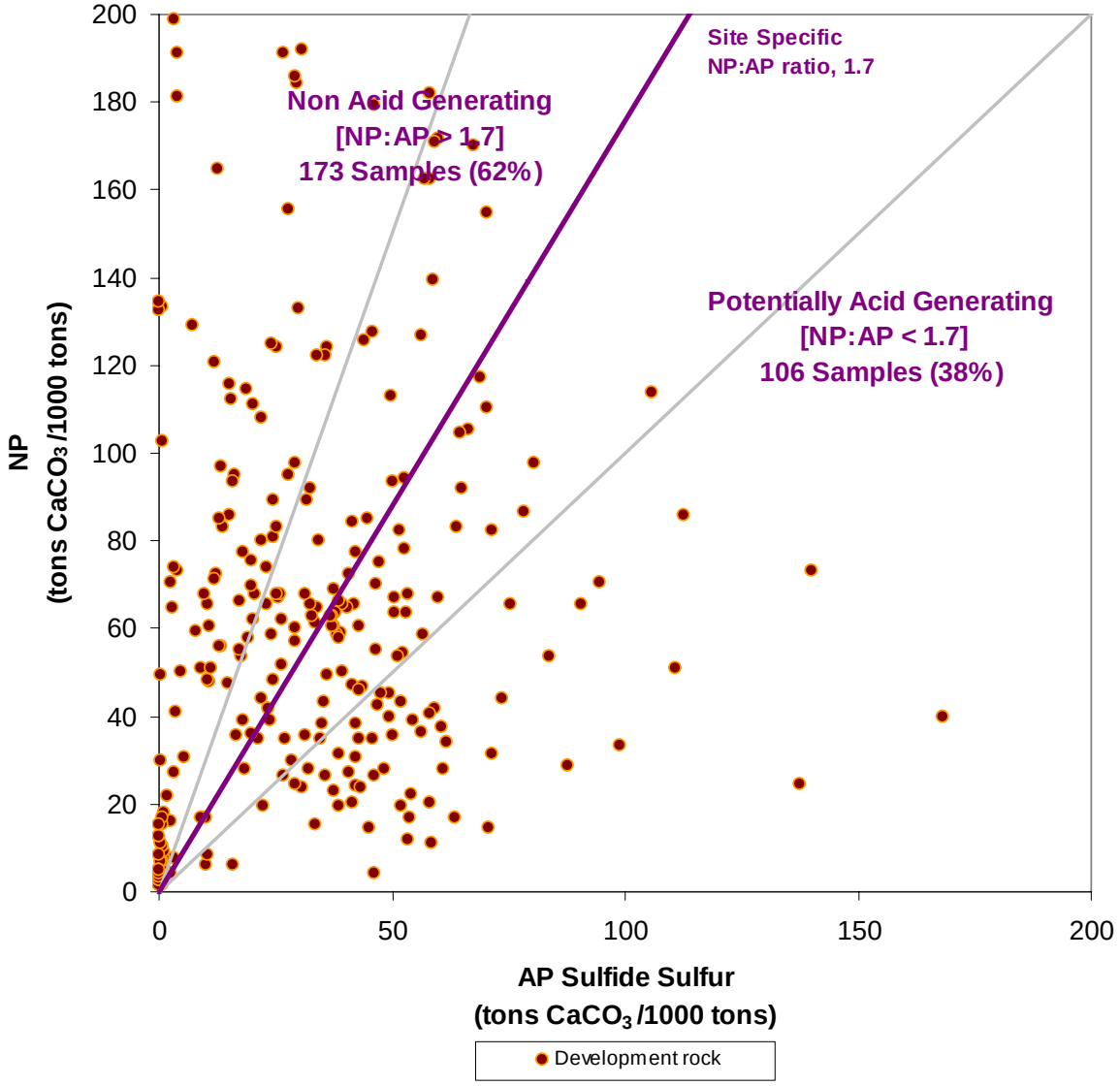


*AP calculated using total sulfur

F:\2573 - BIG HURRAH\2573 - FINAL MEMOS APRIL 2006\GEOCHEM MEMO APR06\2573-MEMO-MAY-2006\FIGURE-4.DWG

WATER MANAGEMENT CONSULTANTS
Denver, CO

NET NEUTRALIZATION DATA HISTOGRAM			
CLIENT: NovaGold RESORCES, INC.		PROJECT: BIG HURRAH	
JOB: 2509	FILE: FIGURE-4.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 4	



AP is calculated based on sulfide-sulfur.
NP is based on siderite-corrected values.

WATER MANAGEMENT CONSULTANTS
Denver, CO

PAG DEVELOPMENT ROCK BASED ON SITE SPECIFIC NP:AP RATIO

CLIENT: NovaGold RESORCES, INC.		PROJECT: BIG HURRAH	
JOB: 2509	FILE: FIGURE-5.DWG	DRAWN: RN	CHECKED: PR
DATE: MAY 2006		FIGURE: 5	

F:\2573 - BIG HURRAH\2573 - FINAL MEMOS APRIL 2006\GEOCHEM MEMO APR06\2573-MEMO-MAY-2006\FIGURE-5.DWG

ATTACHMENT 1

ABA Results

Attachment 1
ABA Results - Ore Rock
Big Hurrah Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP* T CaCO3	AP*		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
4251015-030	7.7	32	14	9	18	23	2.3	3.5
4251030-045	8.2	279	38	38	241	241	7.3	7.3
4251225-240	8.4	65	18	15	47	50	3.6	4.3
4253105-120	8.0	87	38	37	49	50	2.3	2.4
4253150-165	8.2	19	32	25	-13	-6	0.6	0.8
4253165-180	8.2	83	11	8	72	75	7.5	10.2
4254135-150	7.8	170	49	37	121	133	3.5	4.6
4254150-165	7.8	272	90	49	182	223	3.0	5.6
4255005-015	7.2	6	1	1	5	5	6.0	6.0
4255075-090	7.6	90	185	116	-95	-26	0.5	0.8
4255105-120	8.1	48	33	21	15	27	1.5	2.3
4255120-135	8.1	67	33	25	34	42	2.0	2.6
4255150-165	8.1	287	56	43	231	244	5.1	6.6
4259045-060	7.1	53	123	97	-70	-44	0.4	0.5
4259060-075	7.4	52	74	64	-22	-12	0.7	0.8
4259090-105	7.8	73	30	28	43	45	2.4	2.6
4260105-120	8.0	81	21	18	60	63	3.9	4.5
4261045-060	6.5	2	1	1	1	1	2.0	2.0
4261060-075	5.8	1.0	6	3	-5	-2	0.2	0.3
4264030-045	6.4	1.0	2	0	-1	1	0.5	3.3
4264045-060	7.4	5	2	1	3	4	2.5	8.0
4266005-15	7.4	33	1	1	32	32	33.0	33.0
4270015-030	7.7	23	2	1	21	22	11.5	23.0
4270030-045	7.6	163	7	4	156	159	23.3	40.1
4270045-060	8.0	594	11	11	583	583	54.0	55.9
4270060-075	7.7	283	14	12	269	271	20.2	23.8
4272005-015	7.4	9	2	1	7	8	4.5	9.0
4272060-075	7.0	51	30	22	21	29	1.7	2.3
4272120-135	7.9	130	12	8	118	122	10.8	15.4
4273005-015	8.0	216	4	2	212	214	54.0	115.2
4273015-030	8.1	467	5	1	462	466	93.4	467.0
4273075-090	7.0	32	36	28	-4	4	0.9	1.1
4274135-150	7.7	53	61	47	-8	6	0.9	1.1
4275030-045	7.0	26	15	5	11	21	1.7	5.2
4276045-060	7.7	222	31	21	191	201	7.2	10.4
4277105-120	7.9	127	78	54	49	73	1.6	2.3
4277165-180	8.0	55	20	16	35	39	2.8	3.4
4277180-195	8.2	59	3	2	56	57	19.7	27.0
4277195-210	8.1	286	50	35	236	251	5.7	8.1
4278105-120	8.5	473	14	10	459	463	33.8	47.3
4279015-030	6.8	3	2	1	1	3	1.5	3.0
4279060-075	7.2	60	25	17	35	43	2.4	3.6
4279075-090	8.4	373	3	5	370	368	124	79.6
4279090-105	8.0	225	32	24	193	201	7.0	9.2
4280105-120	7.8	65	28	22	37	43	2.3	3.0
4281015-030	6.4	6	2	1	4	5	3.0	6.0
4281030-045	5.7	5	6	3	-1	3	0.8	2.0
4281060-075	7.7	33	7	4	26	29	4.7	8.1
4281075-090	7.8	85	22	17	63	68	3.9	5.0
4281090-105	7.5	33	36	26	-3	7	0.9	1.3
4281105-120	7.7	68	31	22	37	46	2.2	3.1
4281120-135	7.8	111	40	25	71	86	2.8	4.4
4282045-060	8.0	483	5	2	478	481	96.6	220.8
4282075-090	8.1	88	19	17	69	71	4.6	5.3
4282090-105	7.6	61	20	17	41	44	3.1	3.7
4282105-120	7.1	61	33	22	28	39	1.8	2.8
4283045-060	7.2	11	19	10	-8	1	0.6	1.1
4283060-075	8.1	63	1	1	62	62	63.0	67.2
4285060-075	8.0	81	36	20	45	61	2.3	4.0
4285075-090	8.2	145	18	13	127	133	8.1	11.6
4285090-105	8.6	496	18	14	478	482	27.6	35.3
STATISTICS								
Count	61	61	61	61	61	**61**	61	**61**
Minimum	5.7	1.0	1.0	0.3	-95	**-44**	0.2	**0.3**
Maximum	8.6	594	185	116	583	**583**	124	**467**
Geometric Mean	7.6	58	14	9	na	**na**	4.1	**6.1**
Arithmetic Mean	7.6	125	27	20	98	**105**	13	**24**

NP = Neutralizing Potential (EPA Sobek, et.al., 1978 protocol)
AP = Acid-generating potential (EPA Sobek, et al., 1978 protocol). Calculated based on total sulfur or sulfide-sulfur, as [sulfur] * 31.25 multiplier.
NNP = Net neutralization potential. Calculated as NP - AP.
NP:AP = Ratio of NP divided by AP.
Total Sulfur = Total Sulfur (EPA M600),
Sulfide-S = Sulfide sulfur (EPA M600).
T CaCO3 = Ton CaCO3 per ton of material.
* Non-detected values of AP and NP are substituted with the method detection limit (1.0 T CaCO3/ton material) for calculations.

Attachment 1
ABA Results - Development Rock
Big Hurrah Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
4251000-015	6.5	10	3	1	7	9	3.3	10.0
4251045-060	8.2	437	65	47	372	390	6.7	9.3
4251060-075	7.9	115	89	81	26	34	1.3	1.4
4251075-090	7.8	52	93	74	-41	-22	0.6	0.7
4251090-105	8.1	108	89	65	19	43	1.2	1.7
4251105-120	7.9	23	67	52	-44	-29	0.3	0.4
4251120-135	8.2	74	37	37	37	37	2.0	2.0
4251135-150	8.1	51	60	52	-9	-1	0.9	1.0
4251150-165	8.1	64	80	53	-16	12	0.8	1.2
4251165-180	8.1	98	56	14	42	84	1.8	7.1
4251180-195	8.2	92	76	53	16	39	1.2	1.7
4251195-210	8.3	81	46	38	35	44	1.8	2.2
4251210-225	8.3	85	41	41	44	44	2.1	2.1
4252000-015	7.5	15	1	1	14	14	15.0	15.0
4252015-030	8.3	279	39	26	240	253	7.2	10.8
4252030-045	8.2	778	12	10	766	768	64.8	80.3
4252045-060	7.9	75	73	51	2	24	1.0	1.5
4252060-075	8.1	148	84	44	64	104	1.8	3.4
4252075-090	8.0	91	73	42	18	49	1.2	2.2
4252090-105	7.7	23	62	39	-39	-16	0.4	0.6
4252105-120	7.7	40	98	62	-58	-22	0.4	0.6
4252120-135	7.7	44	100	61	-56	-17	0.4	0.7
4252135-150	7.9	59	60	39	-1	20	1.0	1.5
4252150-165	8.0	112	47	28	65	84	2.4	4.0
4252165-180	8.0	99	65	42	34	57	1.5	2.4
4252180-195	8.0	94	55	34	39	60	1.7	2.7
4252195-210	8.2	57	15	11	42	46	3.8	5.4
4253000-015	4.8	1	15	3	-14	-2	0.1	0.4
4253015-030	6.8	84	21	12	63	72	4.0	7.1
4253030-045	7.9	24	60	42	-36	-18	0.4	0.6
4253045-060	7.9	69	54	38	15	31	1.3	1.8
4253060-075	7.7	83	114	95	-31	-12	0.7	0.9
4253075-090	7.6	60	183	111	-123	-51	0.3	0.5
4253090-105	8.0	76	48	40	28	36	1.6	1.9
4253120-135	8.1	211	48	46	163	165	4.4	4.6
4253135-150	8.1	98	28	25	70	73	3.5	3.9
4254005-015	7.6	3	1	1	2	2	3.0	3.0
4254015-030	6.7	42	36	17	6	25	1.2	2.5
4254030-045	7.1	63	40	18	23	45	1.6	3.5
4254045-060	7.8	63	52	51	11	12	1.2	1.2
4254060-075	7.8	101	166	113	-65	-12	0.6	0.9
4254075-090	7.9	75	62	53	13	22	1.2	1.4
4254090-105	8.0	79	30	26	49	53	2.6	3.1
4254105-120	8.0	71	72	43	-1	28	1.0	1.7
4254120-135	7.7	71	60	37	11	34	1.2	1.9
4254165-180	7.8	202	88	60	114	142	2.3	3.4
4254180-195	6.6	89	53	20	36	69	1.7	4.5
4254195-210	7.9	97	74	52	23	45	1.3	1.9
4255015-030	6.8	66	33	13	33	53	2.0	5.0
4255030-045	7.0	135	45	19	90	116	3.0	7.2
4255045-060	7.7	73	49	20	24	53	1.5	3.6
4255060-075	7.9	42	55	50	-13	-8	0.8	0.8
4255090-105	7.7	33	81	61	-48	-28	0.4	0.5
4255135-150	8.4	152	12	7	140	145	12.7	21.1
4259005-015	6.3	1.0	4	0.6	-3	0	0.3	1.6
4259015-030	6.5	5.0	9	3	-4	3	0.6	2.0
4259030-045	7.5	77	43	42	34	35	1.8	1.8
4259075-090	7.7	47	214	168	-167	-121	0.2	0.3
4259105-120	7.8	37	37	39	0	-2	1.0	1.0
4259120-135	8.0	74	36	37	38	37	2.1	2.0
4259135-150	8.2	144	39	36	105	108	3.7	4.0
4259150-165	8.0	74	35	33	39	41	2.1	2.3
4260005-015	7.2	5	3	1	2	4	1.7	5.3
4260015-030	7.1	1	2	1	-1	0	0.5	1.6
4260030-045	7.4	7	17	16	-10	-9	0.4	0.4
4260045-060	8.0	61	29	26	32	35	2.1	2.3
4260060-075	8.0	76	34	34	42	42	2.2	2.2
4260075-090	8.1	105	29	24	76	81	3.6	4.3
4260090-105	8.0	69	29	24	40	45	2.4	2.9
4260120-135	7.9	289	56	53	233	236	5.2	5.4
4260135-150	7.9	182	93	70	89	112	2.0	2.6
4260150-165	8.0	268	74	57	194	211	3.6	4.7
4261005-015	6.4	1	4	1	-3	0	0.3	1.0
4261015-030	7.4	3	2	1	1	2	1.5	3.0
4261030-045	6.6	1	2	1	-1	0	0.5	1.0
4261075-090	7.2	33	24	18	9	15	1.4	1.8

Attachment 1
ABA Results - Development Rock
Big Hurrah Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
4261090-105	7.6	31	25	27	6	4	1.2	1.2
4262005-015	6.7	2	4	1	-2	1	0.5	3.2
4262015-030	6.1	1	3	1	-2	0	0.3	1.6
4262030-045	6.7	1	2	1	-1	0	0.5	1.0
4262045-060	6.5	1	3	1	-2	0	0.3	1.6
4262060-075	6.3	1	3	2	-2	-1	0.3	0.6
4262075-090	7.3	54	44	43	10	11	1.2	1.3
4262090-105	7.7	105	31	32	74	73	3.4	3.3
4262105-120	7.7	29	28	29	1	0	1.0	1.0
4262120-135	7.9	201	60	59	141	142	3.4	3.4
4264005-015	6.8	1	1	1	0	0	1.0	1.0
4264060-075	6.9	1	3	1	-2	0	0.3	1.0
4264075-090	7.8	86	6	4	80	82	14.3	21.2
4264090-105	7.7	75	40	38	35	37	1.9	2.0
4264105-120	7.6	45	33	35	12	10	1.4	1.3
4264120-125	7.8	28	31	31	-3	-3	0.9	0.9
4265005-015	7.0	1	1	1	0	0	1.0	1.0
4265015-030	6.7	1	1	1	0	0	1.0	1.0
4265030-045	6.9	1	2	1	-1	0	0.5	1.0
4265045-060	7.4	83	7	3	76	81	11.9	33.2
4265060-075	7.3	279	59	49	220	230	4.7	5.7
4265075-090	7.6	149	73	56	76	93	2.0	2.6
4265090-105	7.3	49	76	59	-27	-10	0.6	0.8
4265105-120	7.7	69	61	57	8	12	1.1	1.2
4265120-135	7.7	82	37	20	45	62	2.2	4.2
4265135-150	7.8	71	56	11	15	60	1.3	6.5
4265150-165	7.8	136	25	15	111	121	5.4	8.9
4265165-180	7.8	91	29	18	62	73	3.1	5.0
4265180-195	7.9	85	17	12	68	73	5.0	7.0
4265195-210	7.7	49	32	23	17	26	1.5	2.1
4266015-030	7.7	158	3	1	155	157	52.7	158.0
4266030-045	7.6	76	5	3	71	73	15.2	27.0
4266045-060	7.6	60	15	11	45	49	4.0	5.3
4266060-075	7.3	146	42	36	104	110	3.5	4.0
4266075-090	7.6	115	34	29	81	86	3.4	3.9
4266090-105	7.6	150	46	46	104	104	3.3	3.3
4266105-120	7.7	214	53	58	161	156	4.0	3.7
4266120-135	7.7	138	68	69	70	69	2.0	2.0
4266135-150	7.4	97	73	72	24	25	1.3	1.4
4266150-165	7.4	45	46	42	-1	3	1.0	1.1
4267005-015	6.6	1.0	2.0	1.0	-1	0	0.5	1.0
4267015-030	7.0	5.0	2.0	1.0	3	4	2.5	5.0
4267030-045	7.0	3.0	3.0	0.6	0	2	1.0	4.8
4267045-060	6.4	3.0	2.0	1.0	1	2	1.5	3.0
4267060-075	6.2	1.0	3.0	0.9	-2	0	0.3	1.1
4267075-090	6.5	1.0	2.0	1.0	-1	0	0.5	1.0
4267090-105	7.9	127	25	22	102	105	5.1	5.8
4267105-120	7.8	78	23	17	55	61	3.4	4.5
4267120-135	7.6	80	27	21	53	59	3.0	3.9
4267135-150	7.9	101	18	15	83	86	5.6	6.6
4267150-165	7.8	56	28	15	28	41	2.0	3.8
4267165-180	7.7	77	36	23	41	54	2.1	3.3
4268000-015	7.0	13	3	1	10	12	4.3	13.0
4268015-030	7.2	21	6	1	15	20	3.5	22.4
4268030-045	7.1	41	42	35	-1	6	1.0	1.2
4268045-060	7.4	24	62	58	-38	-34	0.4	0.4
4268060-075	7.5	33	50	48	-17	-15	0.7	0.7
4268075-090	7.5	43	56	56	-13	-13	0.8	0.8
4268090-105	7.7	77	69	75	8	2	1.1	1.0
4268105-120	7.9	77	88	91	-11	-14	0.9	0.8
4268120-135	7.7	124	63	66	61	58	2.0	1.9
4268135-150	7.9	191	55	57	136	134	3.5	3.4
4268150-165	8.0	164	61	59	103	105	2.7	2.8
4269005-015	7.0	2	1	1	1	1	2.0	2.0
4269015-030	6.6	8	2	1	6	7	4.0	8.0
4269030-045	6.5	20	18	10	2	10	1.1	2.0
4269045-060	6.9	66	27	13	39	53	2.4	4.9
4269060-075	7.6	95	46	25	49	70	2.1	3.8
4269075-090	7.8	452	32	33	420	419	14.1	13.8
4269090-105	8.4	909	10	7	899	902	90.9	126.5
4269105-120	8.2	892	4	2	888	890	223.0	407.8
4269120-135	8.4	786	16	10	770	776	49.1	81.1
4269135-150	8.4	801	22	18	779	783	36.4	45.0
4269150-165	8.0	278	63	71	215	207	4.4	3.9
4269165-180	8.1	191	54	58	137	133	3.5	3.3
4269180-195	8.2	144	43	34	101	110	3.3	4.2

Attachment 1
ABA Results - Development Rock
Big Hurrah Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
4269195-210	8.0	77	58	39	19	38	1.3	2.0
4270005-015	7.2	12	4	1	8	11	3.0	19.2
4270075-090	7.2	10	14	10	-4	0	0.7	1.0
4270090-105	7.1	41	48	43	-7	-2	0.9	1.0
4270105-120	7.5	51	35	35	16	16	1.5	1.4
4270120-135	7.4	102	105	78	-3	24	1.0	1.3
4270135-150	7.8	217	38	30	179	187	5.7	7.3
4270150-165	8.0	132	22	16	110	116	6.0	8.4
4270165-180	8.2	100	16	13	84	87	6.3	7.6
4270180-195	8.2	80	12	10	68	70	6.7	8.3
4270195-210	8.1	68	23	19	45	49	3.0	3.6
4270210-225	8.0	57	39	24	18	33	1.5	2.3
4272015-030	6.5	12	4	1	8	11	3.0	19.2
4272030-045	7.3	5	2	1	3	4	2.5	5.0
4272045-060	6.6	6	1	1	5	5	6.0	6.0
4272075-090	7.1	52	27	22	25	30	1.9	2.4
4272090-105	7.1	65	25	18	40	48	2.6	3.7
4272105-120	7.3	17	51	45	-34	-28	0.3	0.4
4272135-150	7.5	111	70	53	41	58	1.6	2.1
4273030-045	7.8	3	1	1	2	2	3.0	3.0
4273045-060	8.0	35	2	1	33	34	17.5	35.0
4273060-075	6.8	18	43	34	-25	-16	0.4	0.5
4273090-105	6.3	26	66	54	-40	-28	0.4	0.5
4273105-120	6.5	77	53	33	24	45	1.5	2.4
4273120-135	7.4	13	89	58	-76	-45	0.1	0.2
4273135-150	7.8	20	78	63	-58	-43	0.3	0.3
4273150-165	7.8	37	116	72	-79	-35	0.3	0.5
4273165-180	7.8	55	59	44	-4	11	0.9	1.3
4274005-015	7.7	3	2	1	1	2	1.5	3.0
4274030-045	7.3	1	1	1	0	0	1.0	1.0
4274045-060	6.7	1	20	4	-19	-3	0.1	0.2
4274060-075	6.6	23	35	23	-12	1	0.7	1.0
4274075-090	6.1	34	111	88	-77	-54	0.3	0.4
4274090-105	7.2	33	44	32	-11	1	0.8	1.0
4274105-120	7.7	31	49	36	-18	-5	0.6	0.9
4274120-135	7.7	48	71	58	-23	-10	0.7	0.8
4274150-165	7.8	50	52	47	-2	3	1.0	1.1
4274165-180	7.9	100	55	45	45	55	1.8	2.2
4274180-195	8.2	194	19	13	175	182	10.2	15.5
4274195-210	8.3	157	6	1	151	156	26.2	251.2
4274210-215	8.4	234	8	3	226	231	29.3	74.9
4275005-015	7.9	58	2	1	56	57	29.0	58.0
4275015-030	7.3	8	3	1	5	7	2.7	12.8
4275045-060	3.5	5	80	46	-75	-41	0.1	0.1
4275060-075	6.5	29	193	138	-164	-109	0.2	0.2
4275075-090	7.5	86	192	140	-106	-54	0.4	0.6
4275090-105	7.9	123	89	65	34	58	1.4	1.9
4275105-120	8.0	53	83	48	-30	5	0.6	1.1
4275120-135	8.0	80	37	25	43	55	2.2	3.2
4276015-030	7.9	35	43	28	-8	7	0.8	1.2
4276030-045	8.0	71	55	38	16	34	1.3	1.9
4276060-075	7.9	80	43	26	37	54	1.9	3.1
4276075-090	7.9	53	66	49	-13	4	0.8	1.1
4276090-100	7.9	268	100	76	168	192	2.7	3.5
4277005-015	7.5	4	1	1	3	3	4.0	4.0
4277015-030	6.9	5	3	1	2	4	1.7	5.3
4277030-045	6.0	20	71	54	-51	-34	0.3	0.4
4277045-060	7.6	32	54	41	-22	-9	0.6	0.8
4277060-075	7.8	134	226	106	-92	28	0.6	1.3
4277075-090	7.8	63	135	84	-72	-21	0.5	0.8
4277090-105	8.1	58	42	36	16	22	1.4	1.6
4277120-135	8.0	108	41	33	67	76	2.6	3.3
4277135-150	8.1	78	44	39	34	39	1.8	2.0
4277150-165	8.0	98	93	64	5	34	1.1	1.5
4277210-225	8.1	133	68	50	65	83	2.0	2.7
4278005-015	7.4	4	1	1	3	3	4.0	4.0
4278015-030	6.8	2	2	1	0	1	1.0	2.0
4278030-045	5.7	9	13	3	-4	6	0.7	2.9
4278045-060	7.2	36	18	5	18	31	2.0	6.8
4278060-075	7.0	70	44	8	26	62	1.6	9.0
4278075-090	8.1	225	35	4	190	221	6.4	55.4
4278090-105	8.1	110	56	16	54	94	2.0	6.9
4278120-135	7.9	226	42	31	184	195	5.4	7.4
4278135-150	7.7	17	114	71	-97	-54	0.1	0.2
4278150-165	7.8	14	91	53	-77	-39	0.2	0.3
4278165-180	7.7	39	124	99	-85	-60	0.3	0.4

Attachment 1
ABA Results - Development Rock
Big Hurrah Project - Preliminary Materials Geochemical Testing Results. December 23, 2005

CLIENTID	pH, Saturated Paste	NP T CaCO3	AP		NNP		NP:AP	
			AP Total Sulfur T CaCO3	AP Sulfide-S T CaCO3	NNP Total Sulfur T CaCO3	NNP Sulfide-S T CaCO3	NP:AP Total Sulfur	NP:AP Sulfide-S
4278180-195	8.0	80	71	53	9	27	1.1	1.5
4278195-210	8.1	87	37	23	50	64	2.4	3.8
4279005-015	6.8	1	2	1	-1	0	0.5	1.0
4279030-045	5.2	9	4	1	5	8	2.3	9.6
4279045-060	6.2	7	24	10	-17	-3	0.3	0.7
4279105-120	7.6	110	66	50	44	60	1.7	2.2
4279120-135	7.7	36	54	42	-18	-6	0.7	0.9
4280005-015	6.6	6	3	1	3	5	2.0	6.0
4280015-030	5.7	6	4	1	2	5	1.5	9.6
4280030-045	5.1	11	4	1	7	10	2.8	11.7
4280045-060	4.9	5	6	2	-1	3	0.8	3.2
4280060-075	6.9	46	30	24	16	22	1.5	1.9
4280075-090	7.2	79	78	60	1	19	1.0	1.3
4280090-105	7.6	130	94	70	36	60	1.4	1.8
4280120-135	7.7	80	45	32	35	48	1.8	2.5
4280135-150	7.7	73	36	26	37	47	2.0	2.8
4281005-015	6.4	2	4	1	-2	1	0.5	2.0
4281045-060	6.6	42	39	31	3	11	1.1	1.3
4282005-015	6.6	18	1	1	17	17	18.0	18.0
4282015-030	5.9	18	4	1	14	17	4.5	28.8
4282030-045	7.5	121	3	1	118	120	40.3	193.6
4282060-075	7.6	41	26	21	15	20	1.6	1.9
4282120-135	8.2	358	19	15	339	343	18.8	23.4
4282135-150	7.9	47	60	49	-13	-2	0.8	1.0
4282150-165	7.5	46	82	54	-36	-8	0.6	0.8
4282165-180	7.7	31	64	46	-33	-15	0.5	0.7
4282180-195	7.6	28	59	43	-31	-15	0.5	0.6
4282195-210	7.8	41	35	27	6	14	1.2	1.5
4283005-015	7.6	15	1	1	14	14	15.0	15.0
4283015-030	7.3	20	2	1	18	19	10.0	32.0
4283030-045	7.0	20	18	9	2	11	1.1	2.2
4283075-090	7.2	65	68	47	-3	18	1.0	1.4
4284005-015	8.2	156	1	1	155	155	156.0	156
4284015-030	7.9	241	56	32	185	209	4.3	7.6
4284030-045	8.2	600	28	17	572	583	21.4	36.2
4284045-060	8.2	213	6	4	207	209	35.5	52.4
4284060-075	8.2	142	33	12	109	130	4.3	12.0
4284075-090	8.1	147	40	24	107	123	3.7	6.1
4284090-105	8.0	183	49	28	134	155	3.7	6.6
4285000-015	7.9	32	8	3	24	29	4.0	10.2
4285015-030	8.0	59	11	5	48	54	5.4	12.6
4285030-045	7.8	77	18	11	59	66	4.3	7.2
4285045-060	7.6	72	45	34	27	38	1.6	2.1
STATISTICS								
Count	271	271	271	271	271	**271**	271	**271**
Minimum	3.5	1.0	1.0	0.6	-167	**-121**	0.1	**0.1**
Maximum	8.4	909	226	168	899	**902**	223	**408**
Geometric Mean	7.4	na	na	na	na	**na**	1.7	**2.8**
Arithmetic Mean	7.5	90	42	31	48	**59**	5.5	**10.5**

NP = Neutralizing Potential (EPA Sobek, et.al., 1978 protocol)
AP = Acid-generating potential (EPA Sobek, et al., 1978 protocol). Calculated based on total sulfur or sulfide-sulfur, as [sulfur] * 31.25 multiplier.
NNP = Net neutralization potential. Calculated as NP - AP.
NP:AP = Ratio of NP divided by AP.
Total Sulfur = Total Sulfur (EPA M600),
Sulfide-S = Sulfide sulfur (EPA M600).
T CaCO3 = Ton CaCO3 per ton of material.
* Non-detected values of AP and NP are substituted with the method detection limit (1.0 T CaCO3/ton material) for calculations.

ATTACHMENT 2

MWMP Laboratory Report

McCLELLAND LABORATORIES, INC.

1016 Greg Street, Sparks, Nevada 89431 (775) 356-1300
FAX (775) 356-8917
E-MAIL mli@mettest.com

August 26, 2005

Mr. Doug Nicholson
Nova Gold Resources
P.O. Box 82430
Fairbanks, AK 99708

Dear Doug:

Enclosed is our report concerning Meteoric Water Mobility Procedure (MWMP) materials characterization testwork and analyses conducted on three Big Hurrah rock samples.

Enclosed also is our invoice (MLI Job No. 3078 / 6398) for the completed work.

MWMP extraction tests were conducted on the three rock samples at a 100%-2" feed size to assess the potential for constituent mobility by contact with meteoric water. MWMP extracts were filtered (0.45µm), preserved and submitted to a certified environmental analytical laboratory (WET Lab) for an NDEP - Profile II suite of constituent analyses.

MWMP extract analysis results are compared with current U.S. EPA drinking water standards in Table A. Only those constituent concentrations which exceeded respective primary and secondary drinking water maximum contaminant levels (MCL) are included in the table. Values in italics represent secondary constituent concentrations which exceeded the lower MCL range, but were within the upper MCL range limit.

Table A. - Current Drinking Water MCL's vs MWMP Extract Data, mg/L
Big Hurrah Rock Samples

		MWMP Extract		
Constituent	MCL	HC05-286, 10-12m (500007)	HC05-288, 4-6m (500052)	HC05-288, 16-18m (500058)
Al	0.05-0.2		0.35	
Sb	0.006	0.38		0.27
As	0.05			
Ba	2.0			
Be	0.004			
Cd	0.005			
Cl	250-400			
Cr	0.1			
Cu	1.3			
F	2.0-4.0			
Fe	0.3-0.6			
Pb	0.015			
Mg	125-150			
Mn	0.05-0.1			
Hg	0.002			
Ni	0.1			
N	10.0			
pH	6.5-8.5			
Se	0.05			
Ag	0.1			
SO_4	250-500	*300*		
Tl	0.002			
TDS	500-1,000	*560*		
WAD CN	0.2			
Zn	5.0			

Constituent mobility was minimal for the three samples. Antimony was the only primary constituent mobilized to the extent that concentration exceeded the primary MCL (sample 500007 and 500058 only). Sulfate and TDS (both secondary) concentrations in the extract from sample 500007 did not exceed the upper MCL range limit. Only Al (secondary) concentration exceeded the secondary MCL for sample 500052.

We appreciated the opportunity to serve you on the Big Hurrah project.

Sincerely,

Gene

Gene E. McClelland
Metallurgist/President

GEM:cd
Enclosure

McCLELLAND LABORATORIES, INC.

1016 Greg Street, Sparks, Nevada 89431 (775) 356-1300
FAX (775) 356-8917
E-MAIL mli@mettest.com

Report
on
Materials Characterization Tests and Analyses - Three Big Hurrah Rock Samples
MLI Job No. 3078
August 26, 2005

for

Mr. Doug Nicholson
Nova Gold Resources
P.O. Box 82430
Fairbanks, AK 99708

TABLE OF CONTENTS

SUMMARY OF WORK PERFORMED 1
Table 1. - Sample Inventory and Rec'd Dry Weights, Big Hurrah Rock Samples 1

SAMPLE PREPARATION PROCEDURES 1

METEORIC WATER MOBILITY PROCEDURE AND RESULTS 2
Table 2. - Profile II Analytical Results, Big Hurrah Rock Samples, 100%-2" Feeds 3
Table 3. - MWMP Extraction Test Data, Big Hurrah Rock Samples, 100%-2" Feeds . . . 4

APPENDIX . . . . . .

McCLELLAND LABORATORIES, INC.

1016 Greg Street, Sparks, Nevada 89431 (775) 356-1300
FAX (775) 356-8917
E-MAIL mli@mettest.com

Report
on
Materials Characterization Tests and Analyses - Three
Big Hurrah Rock Samples
MLI Job No. 3078
August 26, 2005

for

Mr. Doug Nicholson
Nova Gold Resources
P.O. Box 82430
Fairbanks, AK 99708

SUMMARY OF WORK PERFORMED

A total of three Big Hurrah rock samples (see Table 1) were received for materials characterization testwork and analyses. An MWMP extraction test was conducted on each sample at a 100%-2" feed size to assess potential for regulated constituent mobility from the solids by contact with meteoric water. MWMP extracts were analyzed for NDEP-Profile II constituents, excluding WAD cyanide.

Table 1. - Sample Inventory and Rec'd Dry Weights, Big Hurrah Rock Samples

Hole Number	Interval, Meters	Sample Number	Lithology	Received wt., kg
HC05-286	10-12	500007	QGS	4.439
HC05-288	4-6	500052	GMS	4.066
HC05-288	16-18	500058	QGS	4.927

SAMPLE PREPARATION PROCEDURES

The three samples were received by MLI on August 3, 2005, and each weighed approximately 5 kg. Samples appeared to be RC cuttings and were received at a 100%-2" feed size. Each sample (as received feed size) was blended and split to obtain ~ 100 g for feed moisture content determination. Rejects were used in entirety for column percolation MWMP's. Analyses were not conducted on the sample feeds.

METEORIC WATER MOBILITY PROCEDURE AND RESULTS

A column percolation MWMP extraction test was conducted on each Big Hurrah rock sample (100%-2") to assess potential for regulated constituent mobility from the solids by contact with meteoric water. The ASTM standard MWMP extraction procedure (ASTM-E2242-02) was used for materials characterization of the three samples.

All MWMP extraction test apparatus was washed with detergent and rinsed with deionized water (DI H_2O), then treated with dilute HCl solution and repeatedly rinsed with DI H_2O to provide a clean environment for conducting the MWMP's.

DI H_2O at pH 5.34 was used as extraction fluid. Extraction fluid (influent) was applied to the ~ 5 kg rock sample charges using peristaltic pumps to ensure 24 hour application at constant rate. After 24 hours, effluent volumes were measured by weighing. At least two liters of each effluent was filtered through a 0.45µm filtration apparatus to produce extracts. Extracts were appropriately preserved and delivered to Western Environmental Testing Laboratories (WET Lab) for Profile II analyses, excluding WAD cyanide.

Profile II analytical results are provided in Table 2. MWMP extraction test data is provided in Table 3. WET Lab report sheets and QA/QC documents for Profile II analyses are provided in the Appendix to this report.

Table 2. - Profile II Analytical Results, Big Hurrah Rock Samples, 100%-2" Feeds

	MWMP Extract		
Analysis, mg/L	HC05-286, 10-12m (500007)	HC05-288, 4-6m (500052)	HC05-288, 16-18m (500058)
Alkalinity, CaCO3	140	66	180
CO3, CaCO3	2.4	<1.0	4.8
HCO3	170	80	210
Aluminum	<0.045	0.35	<0.045
Antimony	0.38	0.0026	0.27
Arsenic	0.015	0.016	0.0071
Barium	0.048	0.036	0.16
Beryllium	<0.0010	<0.0010	<0.0010
Bismuth	<0.10	<0.10	<0.10
Boron	<0.10	<0.10	<0.10
Cadmium	<0.0010	<0.0010	<0.0010
Calcium	58	45	58
Chloride	8.1	8.5	2.1
Chromium	<0.0050	<0.0050	<0.0050
Cobalt	<0.010	<0.010	<0.010
Copper	<0.050	<0.050	<0.050
Fluoride	0.79	0.57	0.63
Gallium	<0.10	<0.10	<0.10
Iron	0.015	0.013	<0.010
Lead	<0.010	<0.010	<0.010
Lithium	0.42	<0.10	<0.10
Magnesium	60	5.8	42
Manganese	0.043	0.014	0.014
Mercury	<0.00010	<0.00010	0.00025
Molybdenum	0.25	<0.10	0.099
Nickel	<0.010	<0.010	<0.010
Nitrate as N	<1.0	<1.0	<1.0
Nitrite as N	0.16	0.28	0.099
pH, stu	8.14	7.94	8.22
Phosphorus	<0.50	<0.50	<0.50
Potassium	26	22	40
Scandium	<0.10	<0.10	<0.10
Selenium	0.043	0.0084	0.039
Silver	<0.0050	<0.0050	<0.0050
Sodium	13	12	7.8
Strontium	1.1	0.23	0.29
Sulfate	300	110	170
Thallium	<0.0010	<0.0010	<0.0010
Tin	<0.10	<0.10	<0.10
Titanium	<0.10	<0.10	<0.10
Total Dissolved Solids	560	240	460
Vanadium	0.073	<0.010	0.054
Zinc	<0.010	<0.010	<0.010
Cations, meq/L	9.06	3.81	7.71
Anions, meq/L	9.38	3.87	7.23
Balance, %	1.7	<1.0	3.2

Table 3. - MWMP Extraction Test Data, Big Hurrah Rock Samples, 100%-2" Feeds

Drill	Interval,	Sample	Temp °C		Volume, L		pH			Moisture, wt. pct.		Distribution, wt. pct.[1)]	
Hole	meters	Number	Start	End	Inf.	Eff.	Inf.	Eff.	Extract	Feed	Residue	+2"	-2"
HC05-286	10-12	500007	23.1	23.2	4.439	3.498	5.34	7.96	8.14	0.2	15.7	0.0	100.0
HC05-288	4-6	500052	23.1	23.2	4.066	2.948	5.34	7.84	7.94	0.3	20.8	0.0	100.0
HC05-288	16-18	500058	23.1	23.2	4.927	3.893	5.34	8.02	8.22	0.1	15.7	0.0	100.0

1) Distribution before preparation to 100%-2".

Gene E. McClelland
Metallurgist/President

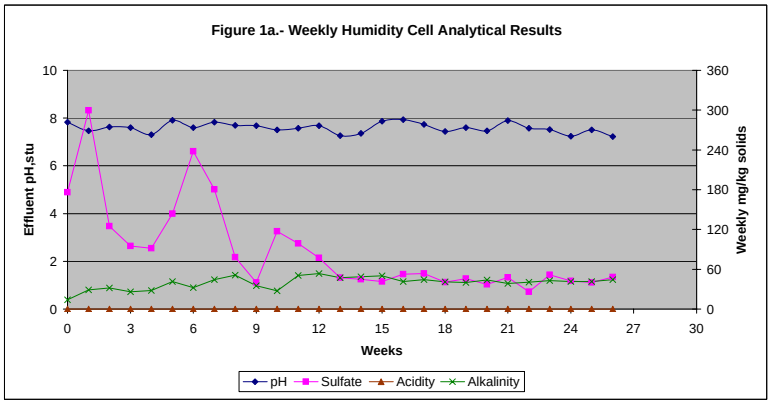
ATTACHMENT 3

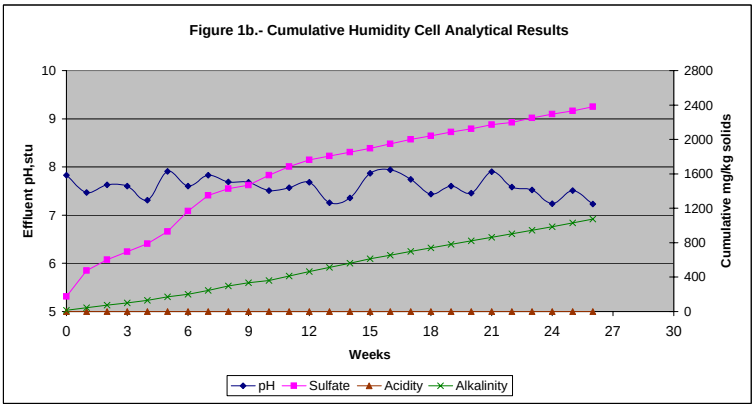
HCT Results

Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3076

Table 1 . - Humidity Cell Analytical Results, 4269, 60-75 (1.4797 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.719	7.83	157	0.65	0.00	0.000	0.000	0.00	0.00	362.0	175.90	175.90	0.0	0.00	0.00	29.00	14.09	14.09
1	0.759	7.47	197	0.64	0.01	0.005	0.005	0.01	0.00	584.0	299.56	475.46	0.0	0.00	0.00	56.00	28.72	42.81
2	0.841	7.63	172	0.35	0.00	0.000	0.005	0.00	0.00	220.0	125.10	600.56	0.0	0.00	0.00	56.00	31.84	74.65
3	0.765	7.60	183	0.33	0.00	0.000	0.005	0.00	0.00	184.0	95.13	695.69	0.0	0.00	0.00	50.00	25.85	100.50
4	0.621	7.31	172	0.35	0.03	0.013	0.018	0.01	0.02	218.0	91.49	787.18	0.0	0.00	0.00	67.00	28.12	128.62
5	0.810	7.91	148	0.17	0.03	0.016	0.034	0.03	0.00	263.0	143.97	931.15	0.0	0.00	0.00	76.00	41.60	170.22
6	0.783	7.60	190	0.64	0.04	0.021	0.055	0.00	0.04	450.0	238.00	1169.15	0.0	0.00	0.00	61.00	32.26	202.48
7	0.673	7.83	177	0.41	0.04	0.018	0.073	0.00	0.04	397.0	180.56	1349.71	0.0	0.00	0.00	98.00	44.57	247.05
8	0.745	7.69	175	0.37	0.05	0.025	0.098	0.03	0.02	155.0	78.04	1427.75	0.0	0.00	0.00	102.00	51.36	298.41
9	0.474	7.68	164	0.33	0.11	0.035	0.133	0.02	0.09	125.0	40.04	1467.79	0.0	0.00	0.00	110.00	35.24	333.65
10	0.554	7.51	178	0.61	0.08	0.030	0.163	0.00	0.08	313.0	117.17	1584.96	0.0	0.00	0.00	73.00	27.33	360.98
11	0.738	7.57	180	0.40	0.13	0.065	0.228	0.00	0.13	198.0	98.70	1683.66	0.0	0.00	0.00	102.00	50.84	411.82
12	0.723	7.68	143	0.37	0.11	0.054	0.282	0.00	0.11	158.0	77.19	1760.85	0.0	0.00	0.00	110.00	53.74	465.56
13	0.731	7.26	148	0.30	0.00	0.000	0.282	0.00	0.00	96.0	47.40	1808.25	0.0	0.00	0.00	96.00	47.40	512.96
14	0.724	7.36	142	0.27	0.00	0.000	0.282	0.00	0.00	92.0	45.04	1853.29	0.0	0.00	0.00	100.00	48.96	561.92
15	0.728	7.87	161	0.26	0.00	0.000	0.282	0.00	0.00	84.0	41.33	1894.62	0.0	0.00	0.00	102.00	50.18	612.10
16	0.724	7.94	239	0.31	0.01	0.005	0.287	0.00	0.01	108.0	52.82	1947.44	0.0	0.00	0.00	85.00	41.57	653.67
17	0.727	7.74	140	0.30	0.02	0.010	0.297	0.00	0.02	109.0	53.55	2000.99	0.0	0.00	0.00	90.00	44.22	697.89
18	0.729	7.44	247	0.24	0.04	0.020	0.317	0.01	0.03	82.0	40.39	2041.38	0.0	0.00	0.00	83.00	40.89	738.78
19	0.727	7.60	225	0.24	0.10	0.049	0.366	0.02	0.08	93.0	45.70	2087.08	0.0	0.00	0.00	82.00	40.29	779.07
20	0.725	7.46	183	0.25	0.01	0.005	0.371	0.00	0.01	76.0	37.24	2124.32	0.0	0.00	0.00	90.00	44.10	823.17
21	0.707	7.90	179	0.25	0.00	0.000	0.371	0.00	0.00	100.0	47.80	2172.12	0.0	0.00	0.00	81.00	38.72	861.89
22	0.734	7.58	102	0.20	0.05	0.025	0.396	0.00	0.05	53.0	26.29	2198.41	0.0	0.00	0.00	82.00	40.68	902.57
23	0.724	7.52	180	0.26	0.01	0.005	0.401	0.00	0.01	106.0	51.84	2250.25	0.0	0.00	0.00	88.00	43.04	945.61
24	0.732	7.24	193	0.23	0.04	0.020	0.421	0.03	0.01	86.0	42.53	2292.78	0.0	0.00	0.00	84.00	41.54	987.15
25	0.716	7.51	213	0.25	0.09	0.044	0.465	0.01	0.08	83.0	40.15	2332.93	0.0	0.00	0.00	86.00	41.60	1028.75
26	0.726	7.23	193	0.25	0.04	0.020	0.485	0.00	0.04	98.0	48.11	2381.04	0.0	0.00	0.00	90.00	44.18	1072.93

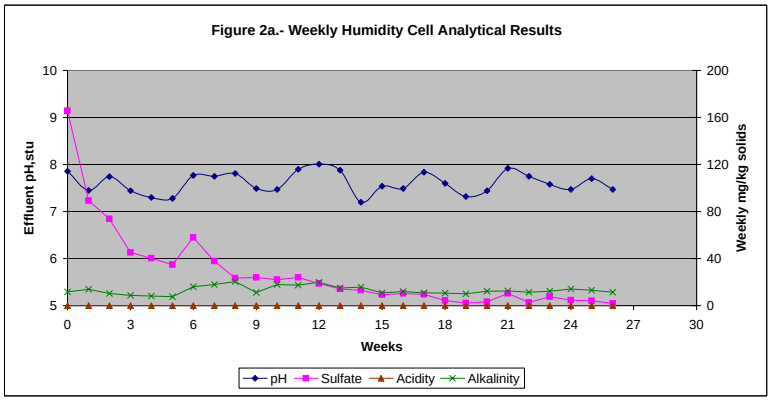


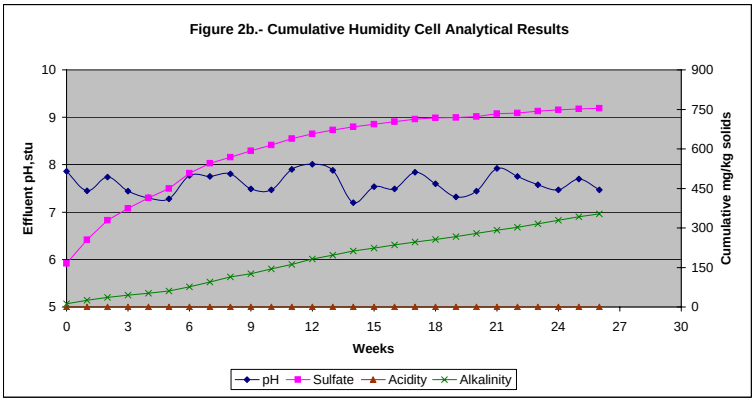


Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3076

Table 2 . - Humidity Cell Analytical Results, 4266, 150-160 (1.471 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.721	7.86	161	0.57	0.00	0.000	0.000	0.00	0.00	338.0	165.67	165.67	0.0	0.00	0.00	24.00	11.76	11.76
1	0.760	7.45	202	0.31	0.00	0.000	0.000	0.00	0.00	173.0	89.38	255.05	0.0	0.00	0.00	27.00	13.95	25.71
2	0.724	7.74	185	0.24	0.00	0.000	0.000	0.00	0.00	150.0	73.85	328.90	0.0	0.00	0.00	21.00	10.34	36.05
3	0.745	7.44	199	0.19	0.01	0.005	0.005	0.00	0.01	89.0	45.07	373.97	0.0	0.00	0.00	17.00	8.61	44.66
4	0.701	7.30	183	0.36	0.02	0.010	0.015	0.00	0.02	84.5	40.27	414.24	0.0	0.00	0.00	17.00	8.10	52.76
5	0.709	7.28	182	0.17	0.00	0.000	0.015	0.00	0.00	72.5	34.92	449.16	0.0	0.00	0.00	16.00	7.71	60.47
6	0.790	7.77	189	0.20	0.04	0.021	0.036	0.00	0.04	108.0	57.97	507.13	0.0	0.00	0.00	30.00	16.10	76.57
7	0.709	7.75	193	0.21	0.01	0.005	0.041	0.00	0.01	78.5	37.84	544.97	0.0	0.00	0.00	37.00	17.83	94.40
8	0.713	7.81	200	0.15	0.07	0.034	0.075	0.01	0.06	48.0	23.27	568.24	0.0	0.00	0.00	42.00	20.36	114.76
9	0.719	7.49	186	0.15	0.12	0.059	0.134	0.02	0.10	49.0	23.95	592.19	0.0	0.00	0.00	23.00	11.24	126.00
10	0.719	7.47	196	0.16	0.09	0.044	0.178	0.01	0.08	45.0	22.00	614.19	0.0	0.00	0.00	37.00	18.08	144.08
11	0.738	7.90	213	0.14	0.08	0.040	0.218	0.02	0.06	48.0	24.07	638.26	0.0	0.00	0.00	35.00	17.55	161.63
12	0.716	8.01	181	0.13	0.12	0.058	0.276	0.00	0.12	38.5	18.74	657.00	0.0	0.00	0.00	41.00	19.95	181.58
13	0.739	7.88	163	0.13	0.03	0.015	0.291	0.01	0.02	28.0	14.06	671.06	0.0	0.00	0.00	30.00	15.07	196.65
14	0.722	7.20	179	0.12	0.01	0.005	0.296	0.00	0.01	26.5	13.00	684.06	0.0	0.00	0.00	32.00	15.70	212.35
15	0.662	7.54	181	0.11	0.02	0.009	0.305	0.01	0.01	20.5	9.22	693.28	0.0	0.00	0.00	24.00	10.79	223.14
16	0.739	7.49	265	0.12	0.01	0.005	0.310	0.00	0.01	20.5	10.30	703.58	0.0	0.00	0.00	24.00	12.06	235.20
17	0.732	7.84	237	0.11	0.02	0.010	0.320	0.00	0.02	19.0	9.45	713.03	0.0	0.00	0.00	22.00	10.95	246.15
18	0.739	7.60	250	0.11	0.01	0.005	0.325	0.00	0.01	8.5	4.27	717.30	0.0	0.00	0.00	21.00	10.55	256.70
19	0.743	7.32	234	0.11	0.02	0.010	0.335	0.02	0.00	4.5	2.27	719.57	0.0	0.00	0.00	20.00	10.10	266.80
20	0.744	7.44	185	0.11	0.03	0.015	0.350	0.02	0.01	6.5	3.29	722.86	0.0	0.00	0.00	24.00	12.14	278.94
21	0.740	7.92	194	0.11	0.01	0.005	0.355	0.00	0.01	20.5	10.32	733.18	0.0	0.00	0.00	25.00	12.58	291.52
22	0.736	7.75	119	0.10	0.02	0.010	0.365	0.01	0.01	5.5	2.75	735.93	0.0	0.00	0.00	23.00	11.51	303.03
23	0.747	7.58	186	0.11	0.00	0.000	0.365	0.00	0.00	15.0	7.62	743.55	0.0	0.00	0.00	24.00	12.19	315.22
24	0.741	7.47	199	0.10	0.06	0.030	0.395	0.01	0.05	9.0	4.53	748.08	0.0	0.00	0.00	28.00	14.10	329.32
25	0.741	7.70	254	0.11	0.02	0.010	0.405	0.00	0.02	8.0	4.03	752.11	0.0	0.00	0.00	26.00	13.09	342.41
26	0.738	7.47	209	0.10	0.07	0.035	0.440	0.01	0.06	4.0	2.01	754.12	0.0	0.00	0.00	23.00	11.54	353.95





Mr. Doug Nicholson / **Nova Gold Resources**
MLI Job No. 3076

Table 3 . - Humidity Cell Analytical Results, 4269, 50-60 (1.4871 Kg)

					Total Fe					SO_4=			Acidity, $CaCO_3$ Equivalents			Alkalinity, $CaCO_3$ Equivalents		
Week	Vol. L	Effluent pH	Redox, mV (vs Ag/AgCl)	Conductivity mS/cm	mg/l	mg/kg	Cum. mg/kg	Fe^{2}+ mg/l	Fe^{3}+ mg/l	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg	mg/l	mg/kg	Cum. mg/kg
0	0.746	7.42	179	1.57	0.00	0.000	0.000	0.00	0.00	860.0	431.42	431.42	0.0	0.00	0.00	20.00	10.03	10.03
1	0.725	5.32	264	2.78	0.54	0.263	0.263	0.54	0.00	1920.0	936.05	1367.47	0.0	0.00	0.00	25.00	12.19	22.22
2	0.820	7.57	198	2.50	0.00	0.000	0.263	0.00	0.00	1970.0	1086.54	2454.01	0.0	0.00	0.00	119.00	65.63	87.85
3	0.768	7.64	203	1.79	0.00	0.000	0.263	0.00	0.00	2220.0	1146.50	3600.51	0.0	0.00	0.00	95.00	49.06	136.91
4	0.631	6.96	204	1.89	0.02	0.008	0.271	0.00	0.02	1805.0	765.89	4366.40	0.0	0.00	0.00	124.00	52.62	189.53
5	0.913	7.48	196	1.58	0.01	0.006	0.277	0.00	0.01	1950.0	1196.67	5563.07	0.0	0.00	0.00	98.00	60.14	249.67
6	0.767	7.77	208	1.40	0.01	0.005	0.282	0.00	0.01	1200.0	618.68	6181.75	0.0	0.00	0.00	107.00	55.17	304.84
7	0.725	7.83	210	1.47	0.04	0.020	0.302	0.03	0.01	1040.0	507.03	6688.78	0.0	0.00	0.00	128.00	62.40	367.24
8	0.716	7.81	190	0.85	0.03	0.014	0.316	0.02	0.01	450.0	216.66	6905.44	0.0	0.00	0.00	103.00	49.59	416.83
9	0.495	7.51	189	0.78	0.05	0.017	0.333	0.05	0.00	445.0	148.12	7053.56	0.0	0.00	0.00	118.00	39.28	456.11
10	0.722	7.23	212	2.62	0.11	0.053	0.386	0.10	0.01	405.0	196.63	7250.19	0.0	0.00	0.00	41.00	19.91	476.02
11	0.718	7.44	229	2.28	0.15	0.072	0.458	0.05	0.10	400.0	193.07	7443.26	0.0	0.00	0.00	34.00	16.41	492.43
12	0.714	7.37	198	2.27	0.12	0.058	0.516	0.01	0.11	400.0	192.02	7635.28	0.0	0.00	0.00	22.00	10.56	502.99
13	0.707	7.12	159	2.05	0.11	0.052	0.568	0.03	0.08	1405.0	668.25	8303.53	0.0	0.00	0.00	78.00	37.10	540.09
14	0.706	7.00	168	1.52	0.03	0.014	0.582	0.02	0.01	1185.0	562.82	8866.35	0.0	0.00	0.00	32.00	15.20	555.29
15	0.712	7.26	173	1.37	0.01	0.005	0.587	0.00	0.01	20.0	9.57	8875.92	0.0	0.00	0.00	15.00	7.18	562.47
16	0.821	7.53	261	1.14	0.01	0.006	0.593	0.00	0.01	735.0	405.53	9281.45	0.0	0.00	0.00	98.00	54.07	616.54
17	0.764	7.56	150	0.44	0.00	0.000	0.593	0.00	0.00	190.0	97.61	9379.06	0.0	0.00	0.00	111.00	57.03	673.57
18	0.810	7.59	126	0.37	0.02	0.011	0.604	0.01	0.01	100.0	54.47	9433.53	0.0	0.00	0.00	132.00	71.90	745.47
19	0.728	7.50	140	1.28	0.00	0.000	0.604	0.00	0.00	86.0	42.10	9475.63	0.0	0.00	0.00	136.00	66.58	812.05
20	0.702	7.39	194	1.03	0.01	0.005	0.609	0.00	0.01	325.0	153.46	9629.09	0.0	0.00	0.00	134.00	63.27	875.32
21	0.545	7.62	194	1.09	0.00	0.000	0.609	0.00	0.00	695.0	254.71	9883.80	0.0	0.00	0.00	134.00	49.11	924.43
22	0.743	7.75	107	0.55	0.01	0.005	0.614	0.00	0.01	310.0	154.93	10038.73	0.0	0.00	0.00	147.00	73.47	997.90
23	0.727	7.58	181	0.55	0.00	0.000	0.614	0.00	0.00	210.0	102.65	10141.38	0.0	0.00	0.00	155.00	75.76	1073.66
24	0.732	7.36	196	0.39	0.06	0.030	0.644	0.03	0.03	200.0	98.45	10239.83	0.0	0.00	0.00	133.00	65.47	1139.13
25	0.726	7.73	205	0.39	0.01	0.005	0.649	0.00	0.01	170.0	82.98	10322.81	0.0	0.00	0.00	148.00	72.24	1211.37
26	0.726	7.40	196	0.37	0.04	0.020	0.669	0.01	0.03	165.0	80.50	10403.31	0.0	0.00	0.00	25.00	12.20	1223.57

Figure 3a.- Weekly Humidity Cell Analytical Results

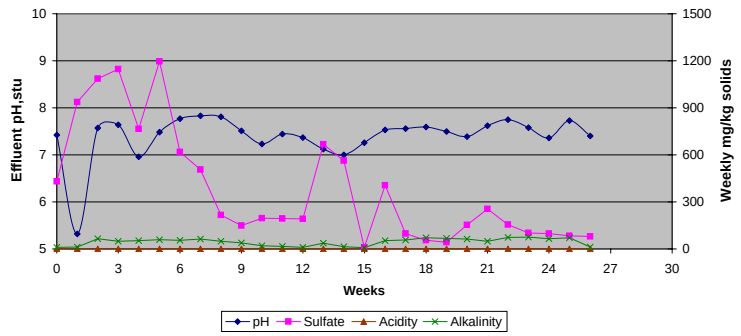
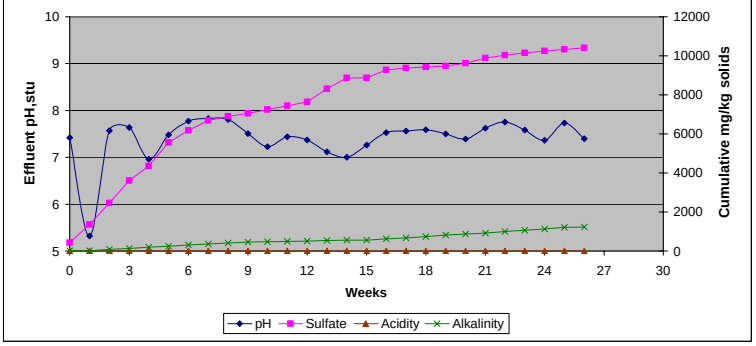


Figure 3b.- Cumulative Humidity Cell Analytical Results



ATTACHMENT 4

Petrographic Report

PETROGRPAHIC ANALYSIS OF SAMPLES 4269060-075, 4266150-160, & 4269050-060

For

WATER MANAGEMENT CONSULTANTS
1875 Lawrence Street, Suite 500
Denver, CO 80202

12 October 2005

By

ECONOMIC GEOLOGY CONSULTING
8205 White Falls Drive
Reno, NV 89506-3163
Tel/FAX 775.677.9065
Cell: 775.772.7899
e-Mail: Thompsontommyt@aol.com

PETROGRAPHY OF SAMPLES
4269060-075, 4266150-160, & 4269050-060

Introduction

Three pulps were forwarded to EGC on 14 June from Chemex Laboratories. Representative material from each was shipped to Spectrum Petrographics (Vancouver, WA) for preparation of polished thin sections. Six weeks were needed for the standard section preparation (**Fig. 1**).

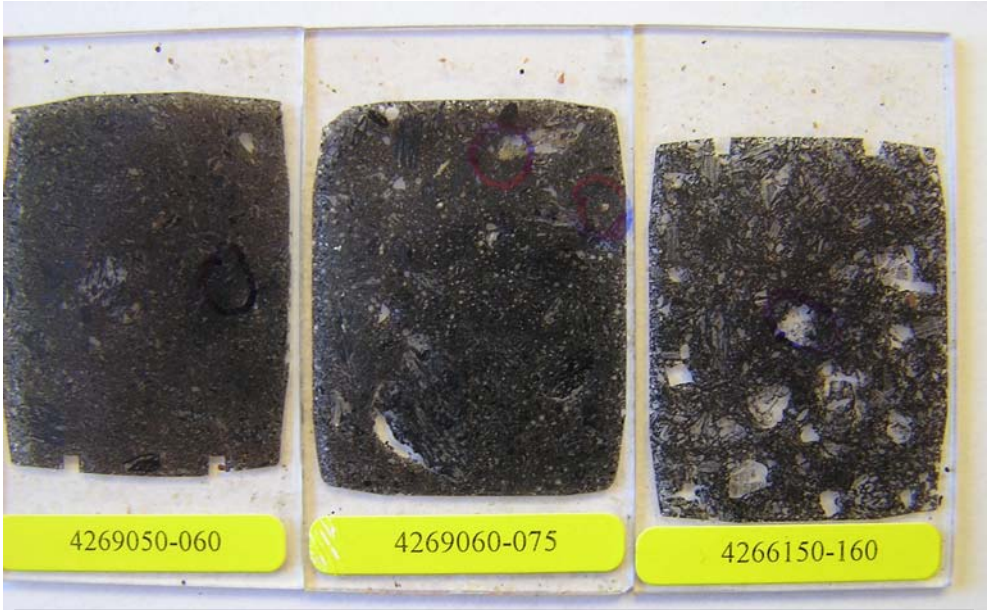


Figure 1. Polished thin sections showing size distribution of analyzed fragments.

The sections were analyzed in the order of receipt in the EGC lab. The description of the samples with p**hotomicrographs is presented below. No attempt has been made to make modal estimates of the** pulp samples as there is almost certainly sample bias in selecting large enough chips for section preparation. Rather, the relative proportions of mineral assemblages will be given in describing the material.

Petrographic Descriptions*

The principal rock type in all three samples is biotite-quartz-(plagioclase) schist (**Fig. 2**). In 4269060-075 and 4269050-060 biotite dominates over quartz; however, in 4266150-160 the rock appears to be a biotite quartzite with granular quartz aggregates that extend parallel to biotite schistosity (**Fig. 3**). Virtually all of the biotite has been converted to sericite + pyrite (**Fig. 4**) or chlorite + leucoxene (**Fig. 5**) + pyrite. Carbonate flooding along biotite cleavage planes is

Photomicrographs (Figures 2-10) are in APPENDIX A.

common, and veinlets of quartz, pyrite ± carbonate are present in all samples. The quartz in veinlets ranges from granular to local prismatic to euhedra (in voids) and is overgrown by pyrite. The pyrite exhibits 2 stages of development. The earliest phase is a porous, lower reflective stage that is overgrown by a more-reflective, homogeneous stage that commonly exhibits euhedral forms (**Figs. 6 & 7**). Traces of chalcopyrite, marcasite, and native gold (**Fig. 8**) are present within the later stage pyrite. Oxidation, particularly in the 4269050-060 sample, preferentially develops goethite within the earlier porous pyrite stage, commonly leaving rims of unoxidized homogeneous pyrite (**Fig. 9**). Sample 4266150-160 exhibits none of the porous pyrite stage, possibly a reflection of sampling bias.

All samples contain carbonate (**Fig. 10**), although the oxidized sample (4269050-060) may contain less due to acid consumption (reaction) of the carbonate with sulfuric acid during sulfide oxidation. Sample 4266150-160 contains notably more carbonate in the schist within metamorphic quartz bands.

APPENDIX A

PHOTOMICROGRAPHS
(Figures 2 – 10)

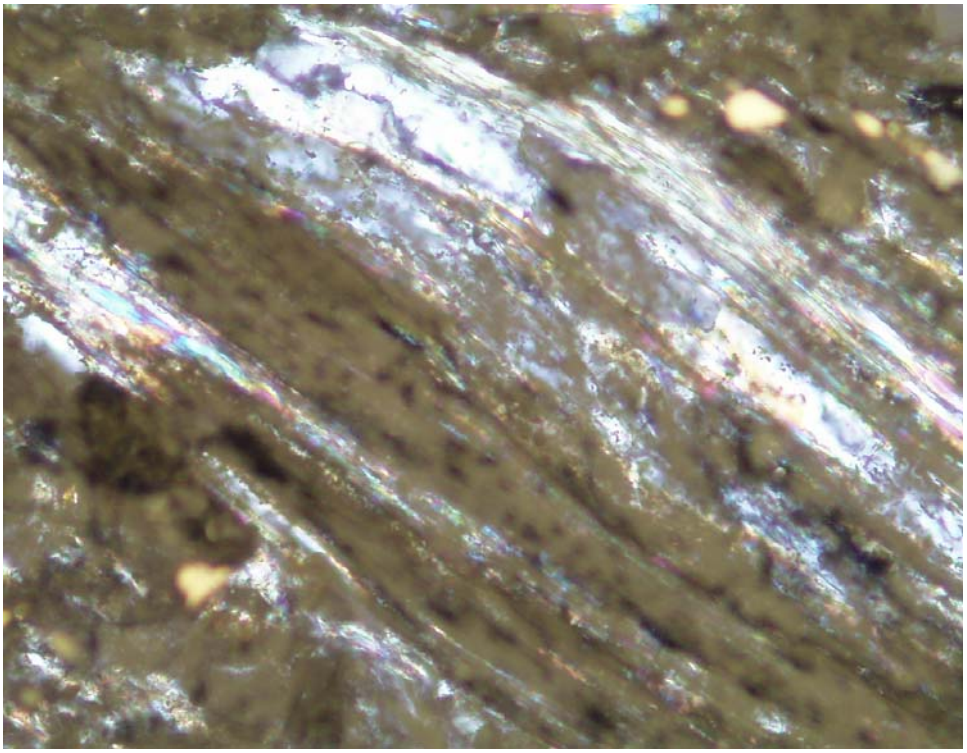


Figure 2. Biotite-quartz schist now altered to sericite-quartz schist with disseminated pyrite (opaques) concentrated in sericite bands (darker). Plane light. FOV = 0.43mm.

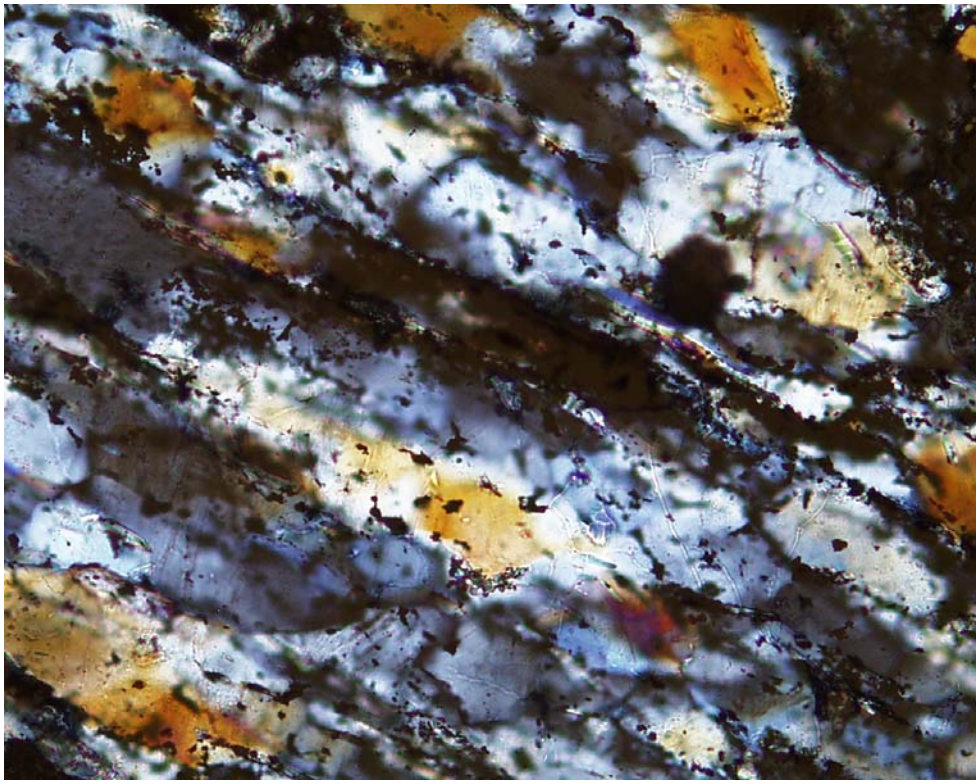


Figure 3. Schistosic quartzite with elongate quartz aggregates and sericite-pyrite in schistosic bands. Crossed nicols. FOV = 0.43mm.

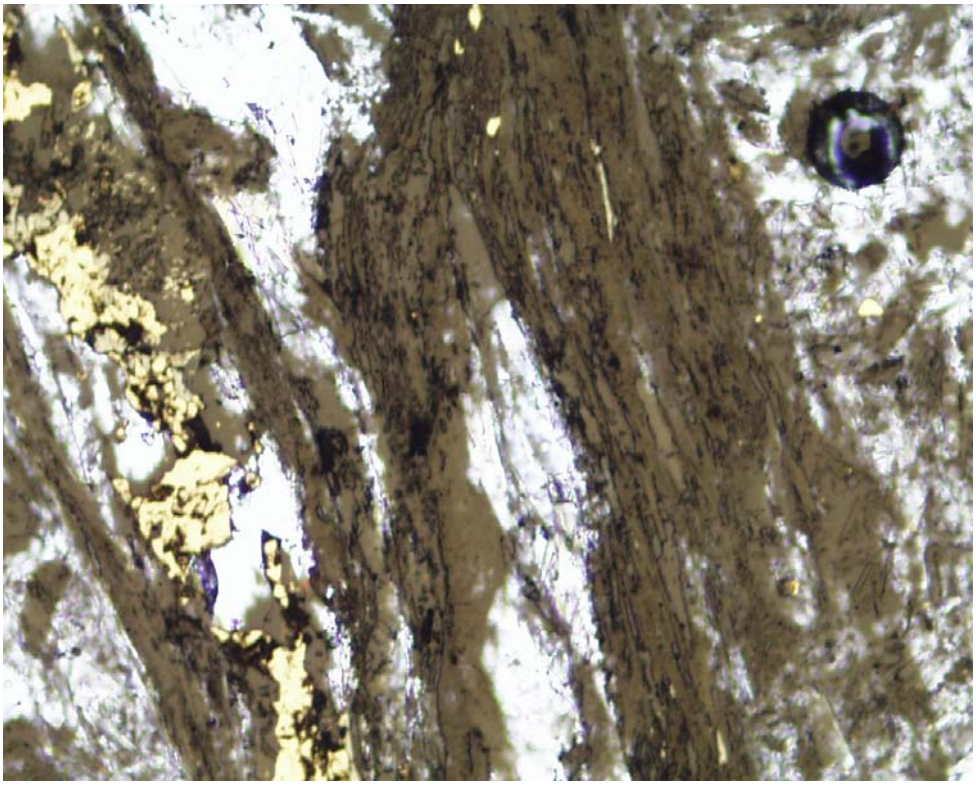


Figure 4. Sericite (darker layers with foliation)-quartz (white-clear)-pyrite alteration. Plane transmitted and reflected light. FOV = 0.85mm.

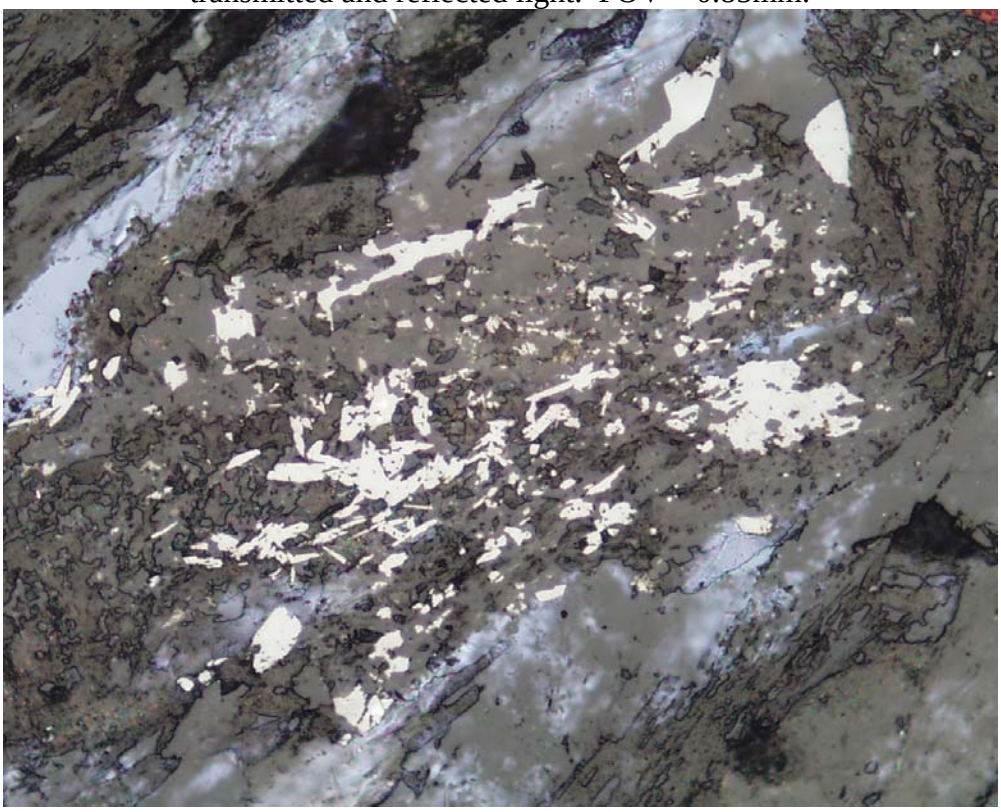


Figure 5. Leucoxene (white) in sericite, replacing biotite along schistose planes. Transmitted and plane light. FOV = 0.43mm.

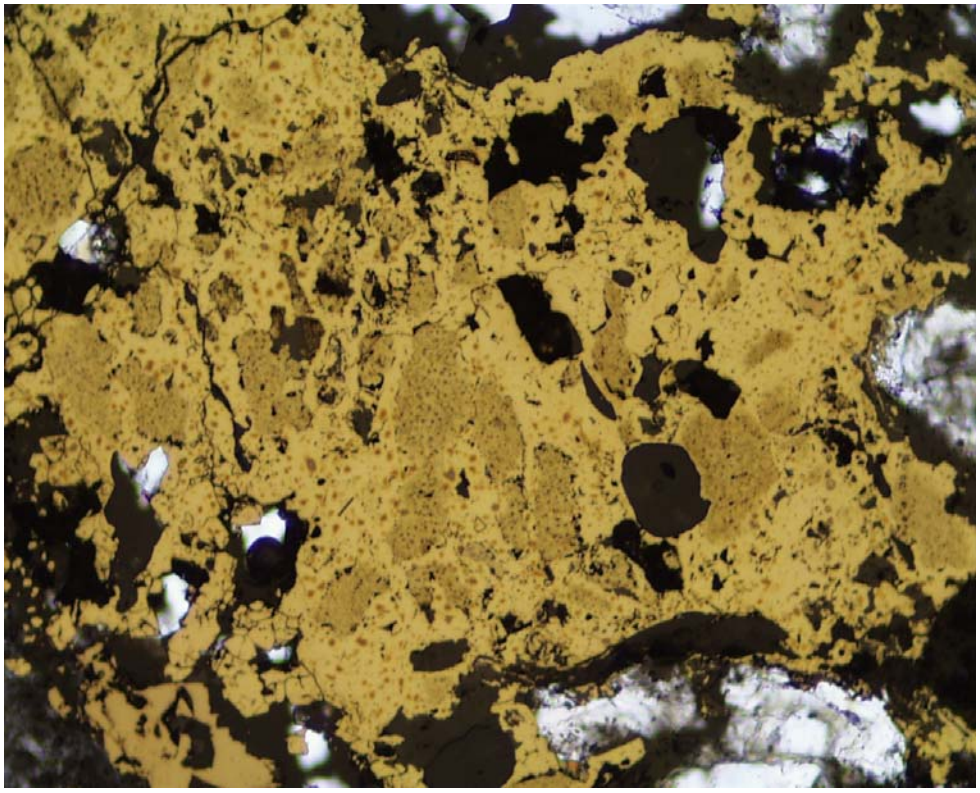


Figure 6. Two stages of pyrite with inner porous, less-reflective stage rimmed and replaced by homogeneous, reflective stage. Plane transmitted and reflected light. FOV = 0.85mm.

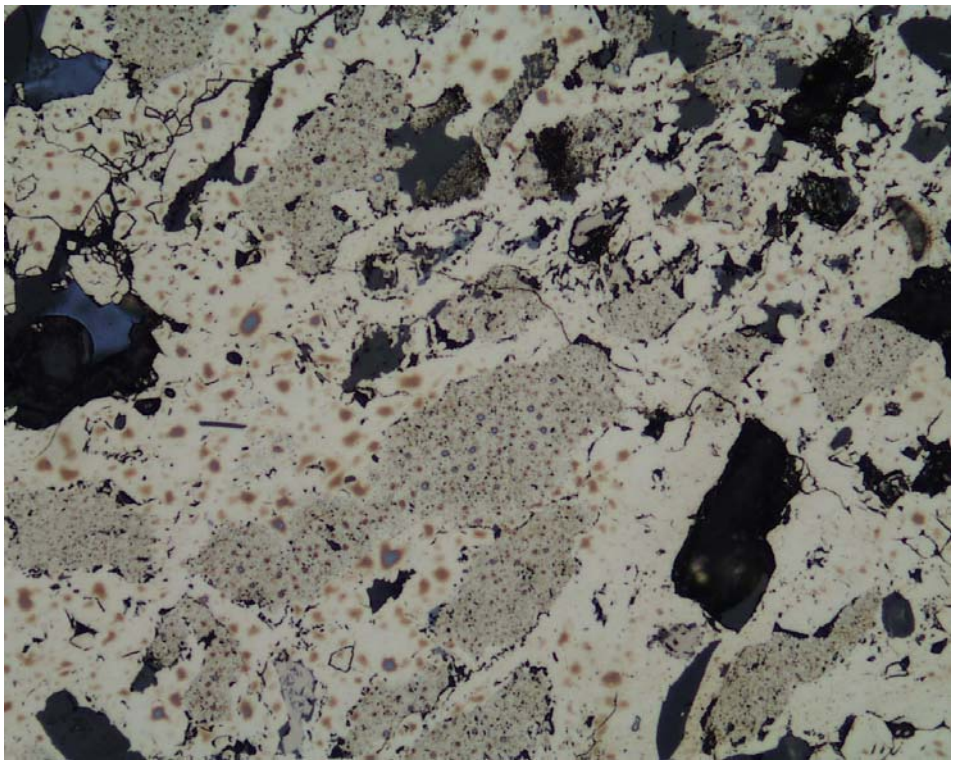


Figure 7. Two stages of pyrite (as in Figure 6) in reflected light. FOV = 0.43mm.

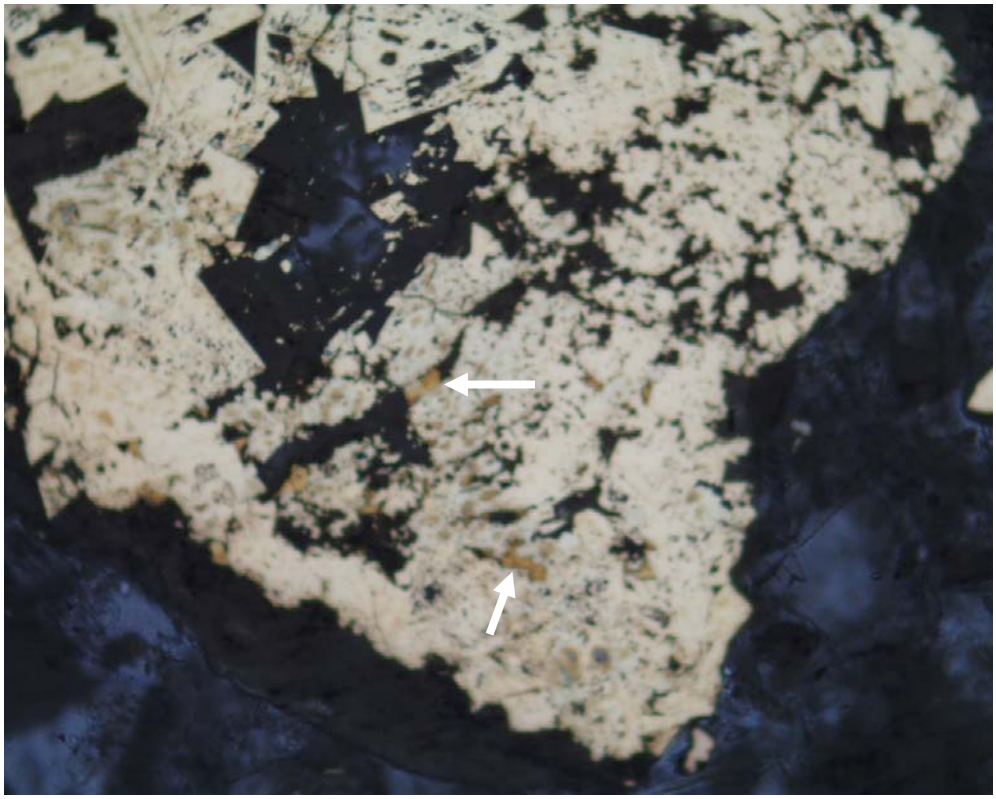


Figure 8. Gold (white arrows and elsewhere) within voids in pyrite. Reflected light. FOV = 0.43mm.

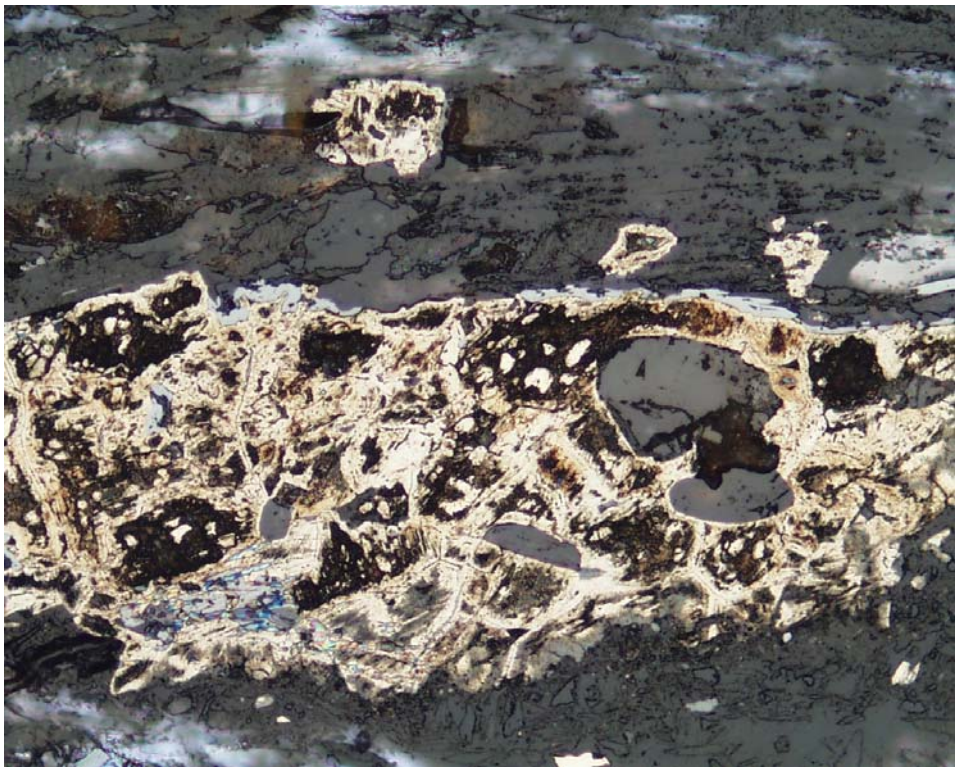


Figure 9A. Goethite replacement of porous pyrite leaving the rinds of reflective homogeneous pyrite unaffected. Plane transmitted and reflected light. FOV = 0.43mm.

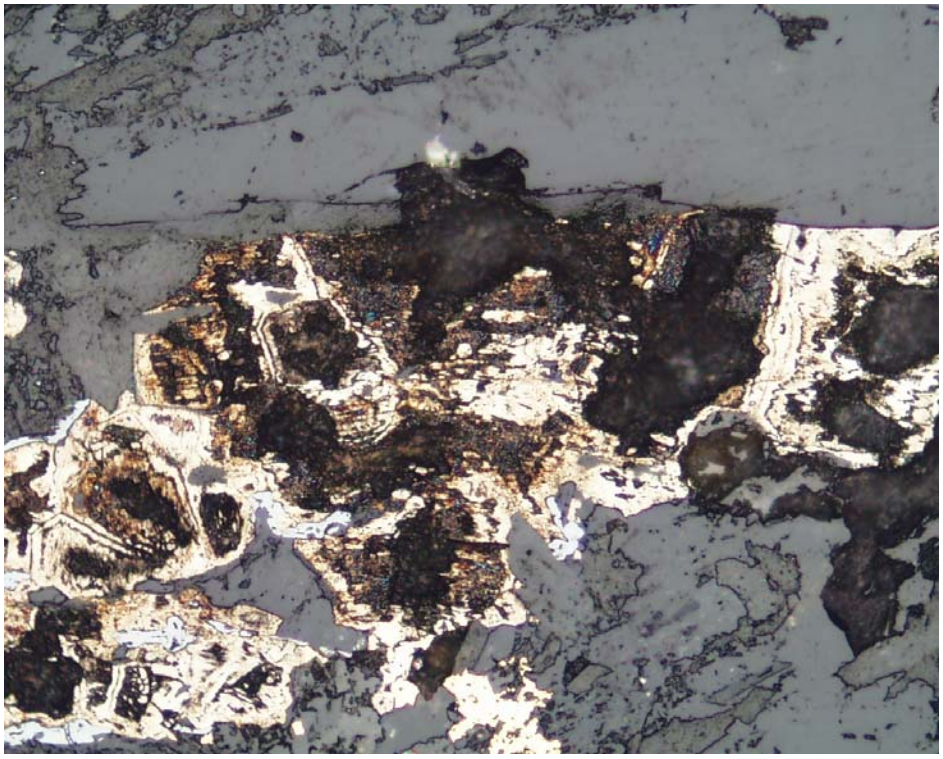


Figure 9B. Goethite replacement of porous, less-reflective pyrite leaving the homogeneous pyrite rind unaffected. Reflected light. FOV = 0.43mm.

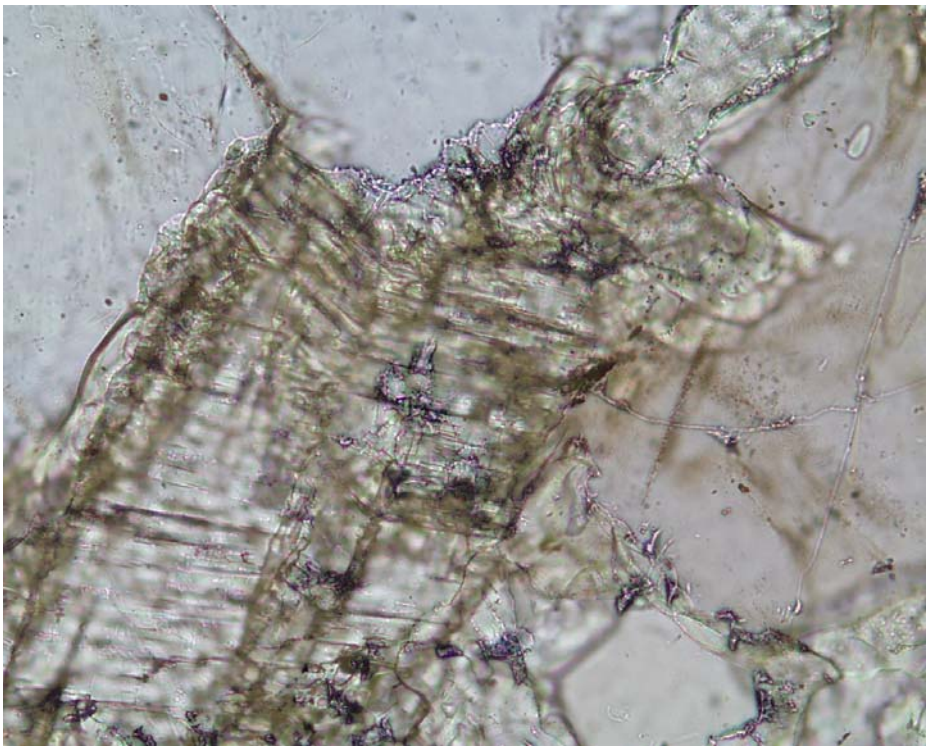


Figure 10. Calcite within clear quartz veinlet. Plane transmitted light. FOV = 0.43mm.

ATTACHMENT 5

Confirmation ABA Results

Confirmatory ABA Results Summary

Client ID	Ore/Development Rock Designation	Rock Type	Paste pH (su)	Sulfur Total (%)	Sulfur Pyritic Sulfide (%)	Sulfur Sulfate (%)	Sulfur Organic Residual (%)	Total Inorganic Carbon (TIC) %	ANP (t/Kt CaCO3) Standard Sobek	ANP (t/Kt CaCO3) Siderite Correction	ANP (t/Kt CaCO3) TIC (calc)
208750	ORE	GMS	8.4	0.06	0.03	0.01	0.03	0.3	56	53	24.99
209160	ORE	GMS	8.8	0.38	0.13	0.1	0.15	0.4	70	70	33.32
208642	WASTE	GMS	8.3	0.83	0.43	0.36	0.04	0.8	114	97	66.64
208946	WASTE	GMS	8.6	0.95	0.94	0.01	0.06	2	203	186	166.6
209090	WASTE	GMS	7.9	2.35	2.16	0.09	0.1	2.1	199	170	174.93
209157	WASTE	GMS	7.7	0.86	0.52	0.15	0.19	0.9	195	95	74.97
209176	WASTE	GMS	6.6	0.95	0.29	0.36	0.3	0.2	0	51	16.66
209258	WASTE	GMS	8.2	1.02	0.86	0.1	0.06	1.8	161	191	149.94
209356	WASTE	GMS	7.4	0.13	0.06	0.03	0.04	0.1	0	22	8.33
4269 050-060	WASTE	GMS	6.4	1.48	0.35	0.78	0.35	0.5	58	48	41.65
209008	ORE	QGS	8.4	0.16	0.18	0.01	0.01	0.3	40	20	24.99
209009	ORE	QGS	8.1	0.59	0.5	0.06	0.03	0.9	88	76	74.97
209027	ORE	QGS	8.5	0.5	0.4	0.06	0.04	1.4	134	111	116.62
209063	ORE	QGS	8.3	0.59	0.35	0.11	0.13	0.7	84	97	58.31
209141	ORE	QGS	7.7	1.61	1.44	0.08	0.09	0.5	50	43	41.65
209166	ORE	QGS	8.5	3.23	2.67	0.3	0.26	1.2	102	107	99.96
208508	WASTE	QGS	8.3	0.12	0.1	0.01	0.02	0.8	84	74	66.64
208652	WASTE	QGS	8.5	1.01	0.96	0.01	0.04	1.6	224	133	133.28
208798	WASTE	QGS	7.9	1.63	1.49	0.08	0.06	0.9	70	70	74.97
208878	WASTE	QGS	7.6	1.45	1.35	0.03	0.07	0.2	28	24	16.66
209012	WASTE	QGS	8.5	1.01	0.94	0.01	0.06	0.7	70	57	58.31
209047	WASTE	QGS	8.3	0.73	0.64	0.04	0.05	0.4	44	36	33.32
209076	WASTE	QGS	8.2	1.67	1.47	0.11	0.09	0.5	43	35	41.65
209145	WASTE	QGS	8.4	1.77	1.51	0.18	0.08	0.9	83	75	74.97
209168	WASTE	QGS	8.2	1.93	1.62	0.16	0.15	0.8	55	67	66.64
209181	WASTE	QGS	7.8	1.95	1.25	0.52	0.18	0.6	59	59	49.98
209202	WASTE	QGS	8.0	1.73	1.33	0.27	0.13	0.4	33	47	33.32
209248	WASTE	QGS	8.9	1.12	0.81	0.24	0.07	1.3	117	124	108.29
209323	WASTE	QGS	7.9	1.46	1.2	0.15	0.11	0.2	3	23	16.66
209362	WASTE	QGS	8.5	0.77	0.65	0.08	0.04	1.2	113	111	99.96
209369	WASTE	QGS	8.1	1.58	1.24	0.22	0.12	0.7	51	58	58.31
4266 150-160	WASTE	QGS	7.5	1.22	0.94		0.34	0.8	50	60	66.64
4269 060-075	WASTE	QGS	7.5	1.77	0.71	0.12	0.94	0.6	78	80	49.98

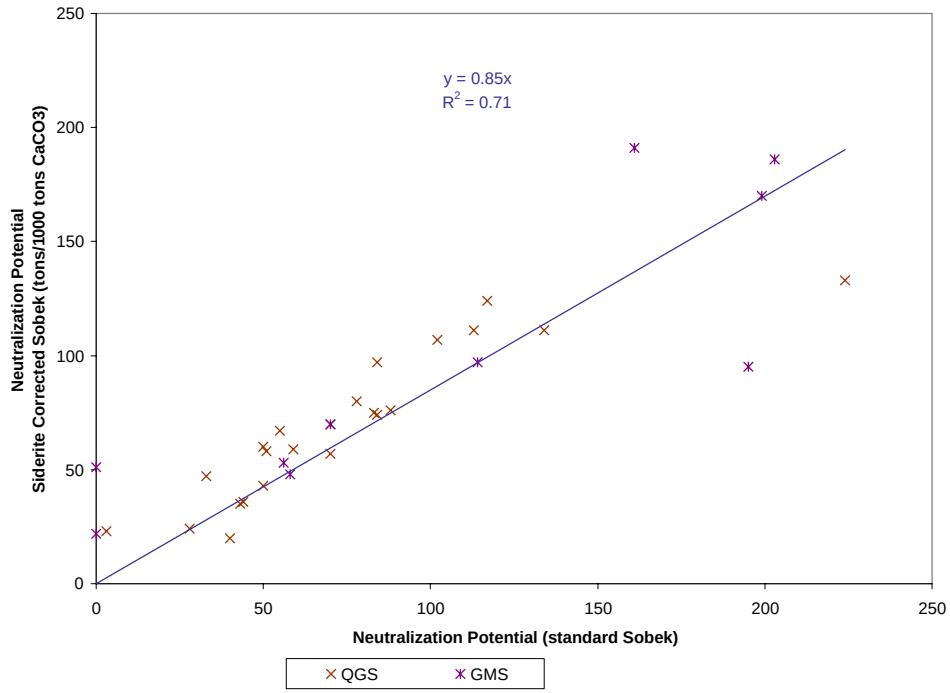
Confirmatory ABA Results Summary

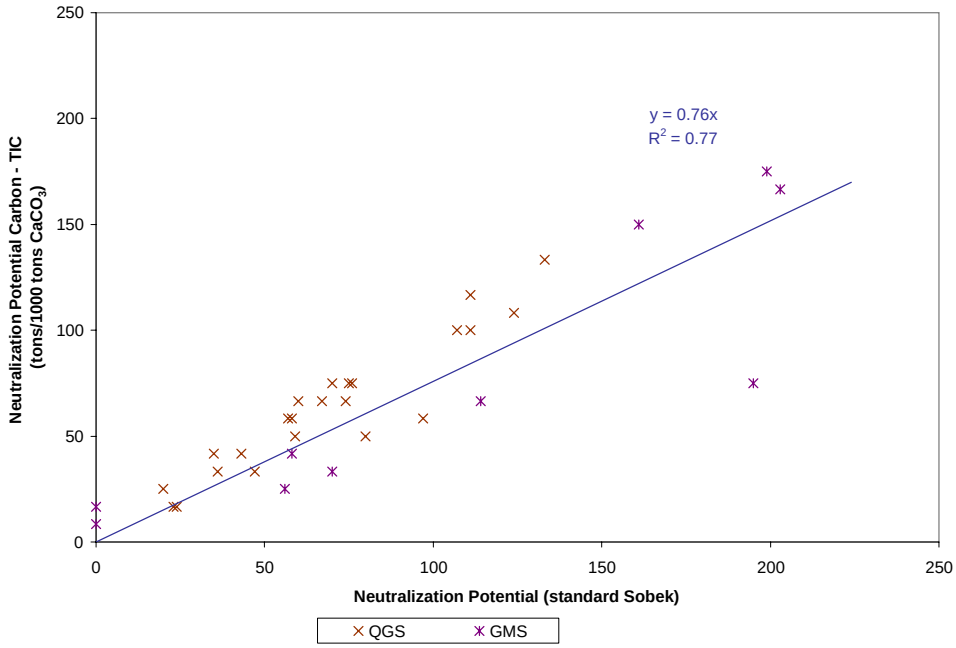
Client ID	Ore/Development Rock Designation	Rock Type	AP (t/Kt CaCO3)		NP/AP (Sobek)		NP/AP (Siderite)		NP/AP (TIC)		NP-AP (t/Kt CaCO3) Standard Sobek		NP-AP (t/Kt CaCO3) Siderite		NP-AP (t/Kt CaCO3) TIC	
			Total S	Sulfide S	Total S	Sulfide S	Total S	Sulfide S	Total S	Sulfide S	Total S	Sulfide S	Total S	Sulfide S	Total S	Sulfide S
208750	ORE	GMS	2	1	30	59.73	28.27	56.53	13.33	26.66	54.13	55.06	51.13	52.06	23.12	24.05
209160	ORE	GMS	12	4	6	17.23	5.89	17.23	2.81	8.20	58.13	65.94	58.13	65.94	21.45	29.26
208642	WASTE	GMS	26	13	4	8.48	3.74	7.22	2.57	4.96	88.06	100.56	71.06	83.56	40.70	53.20
208946	WASTE	GMS	30	29	7	6.91	6.27	6.33	5.61	5.67	173.31	173.63	156.31	156.63	136.91	137.23
209090	WASTE	GMS	73	68	3	2.95	2.31	2.52	2.38	2.59	125.56	131.50	96.56	102.50	101.49	107.43
209157	WASTE	GMS	27	16	7	12.00	3.53	5.85	2.79	4.61	168.13	178.75	68.13	78.75	48.10	58.72
209176	WASTE	GMS	30	9	0	0.00	1.72	5.63	0.56	1.84	-29.69	-9.06	21.31	41.94	-13.03	7.60
209258	WASTE	GMS	32	27	5	5.99	5.99	7.11	4.70	5.58	129.13	134.13	159.13	164.13	118.07	123.07
209356	WASTE	GMS	4	2	0	0.00	5.42	11.73	2.05	4.44	-4.06	-1.88	17.94	20.13	4.27	6.46
4269 050-060	WASTE	GMS	46	11	1	5.30	1.04	4.39	0.90	3.81	11.75	47.06	1.75	37.06	-4.60	30.71
209008	ORE	QGS	5	6	8	7.11	4.00	3.56	5.00	4.44	35.00	34.38	15.00	14.38	19.99	19.37
209009	ORE	QGS	18	16	5	5.63	4.12	4.86	4.07	4.80	69.56	72.38	57.56	60.38	56.53	59.35
209027	ORE	QGS	16	13	9	10.72	7.10	8.88	7.46	9.33	118.38	121.50	95.38	98.50	101.00	104.12
209063	ORE	QGS	18	11	5	7.68	5.26	8.87	3.16	5.33	65.56	73.06	78.56	86.06	39.87	47.37
209141	ORE	QGS	50	45	1	1.11	0.85	0.96	0.83	0.93	-0.31	5.00	-7.31	-2.00	-8.66	-3.35
209166	ORE	QGS	101	83	1	1.22	1.06	1.28	0.99	1.20	1.06	18.56	6.06	23.56	-0.98	16.52
208508	WASTE	QGS	4	3	22	26.88	19.73	23.68	17.77	21.32	80.25	80.88	70.25	70.88	62.89	63.52
208652	WASTE	QGS	32	30	7	7.47	4.21	4.43	4.22	4.44	192.44	194.00	101.44	103.00	101.72	103.28
208798	WASTE	QGS	51	47	1	1.50	1.37	1.50	1.47	1.61	19.06	23.44	19.06	23.44	24.03	28.41
208878	WASTE	QGS	45	42	1	0.66	0.53	0.57	0.37	0.39	-17.31	-14.19	-21.31	-18.19	-28.65	-25.53
209012	WASTE	QGS	32	29	2	2.38	1.81	1.94	1.85	1.99	38.44	40.63	25.44	27.63	26.75	28.94
209047	WASTE	QGS	23	20	2	2.20	1.58	1.80	1.46	1.67	21.19	24.00	13.19	16.00	10.51	13.32
209076	WASTE	QGS	52	46	1	0.94	0.67	0.76	0.80	0.91	-9.19	-2.94	-17.19	-10.94	-10.54	-4.29
209145	WASTE	QGS	55	47	2	1.76	1.36	1.59	1.36	1.59	27.69	35.81	19.69	27.81	19.66	27.78
209168	WASTE	QGS	60	51	1	1.09	1.11	1.32	1.10	1.32	-5.31	4.38	6.69	16.38	6.33	16.02
209181	WASTE	QGS	61	39	1	1.51	0.97	1.51	0.82	1.28	-1.94	19.94	-1.94	19.94	-10.96	10.92
209202	WASTE	QGS	54	42	1	0.79	0.87	1.13	0.62	0.80	-21.06	-8.56	-7.06	5.44	-20.74	-8.24
209248	WASTE	QGS	35	25	3	4.62	3.54	4.90	3.09	4.28	82.00	91.69	89.00	98.69	73.29	82.98
209323	WASTE	QGS	46	38	0	0.08	0.50	0.61	0.37	0.44	-42.63	-34.50	-22.63	-14.50	-28.97	-20.84
209362	WASTE	QGS	24	20	5	5.56	4.61	5.46	4.15	4.92	88.94	92.69	86.94	90.69	75.90	79.65
209369	WASTE	QGS	49	39	1	1.32	1.17	1.50	1.18	1.50	1.63	12.25	8.63	19.25	8.94	19.56
4266 150-160	WASTE	QGS	38	29	1	1.70	1.57	2.04	1.75	2.27	11.88	20.63	21.88	30.63	28.52	37.27
4269 060-075	WASTE	QGS	55	22	1	3.52	1.45	3.61	0.90	2.25	22.69	55.81	24.69	57.81	-5.33	27.79

Confirmatory ABA Results Summary

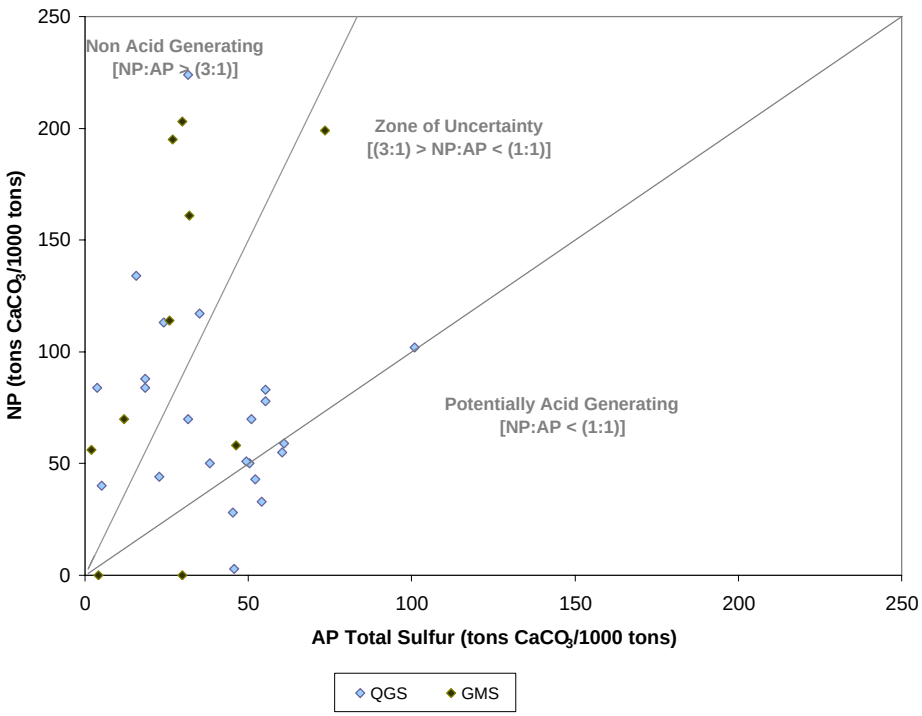
Client ID	Ore/Development Rock Designation	Rock Type	Interpretation based on NP:AP Sulfilde S (standard Sobek)	Interpretation based on NNP Sulfide S (Standard Sobek)	Interpretation based on NP:AP Sulfilde S (Siderite)	Interpretation based on NNP Sulfide S (Siderite)	Interpretation based on NP:AP Sulfilde S (TIC)	Interpretation based on NNP Sulfide S (TIC)
208750	ORE	GMS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209160	ORE	GMS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
208642	WASTE	GMS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
208946	WASTE	GMS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209090	WASTE	GMS	Zone of Uncertainty	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating
209157	WASTE	GMS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209176	WASTE	GMS	Potentially Acid Generating	Potentially Acid Generating	Non Acid Generating	Non Acid Generating	*Zone of Uncertainty*	*Zone of Uncertainty*
209258	WASTE	GMS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209356	WASTE	GMS	Potentially Acid Generating	Potentially Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	*Zone of Uncertainty*
4269 050-060	WASTE	GMS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209008	ORE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating	*Zone of Uncertainty*
209009	ORE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209027	ORE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209063	ORE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209141	ORE	QGS	Zone of Uncertainty	Non Acid Generating	*Potentially Acid Generating*	*Zone of Uncertainty*	*Potentially Acid Generating*	*Zone of Uncertainty*
209166	ORE	QGS	Zone of Uncertainty	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating	Zone of Uncertainty	*Zone of Uncertainty*
208508	WASTE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
208652	WASTE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
208798	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	Zone of Uncertainty	Non Acid Generating	Zone of Uncertainty	Non Acid Generating
208878	WASTE	QGS	Potentially Acid Generating	Potentially Acid Generating	*Potentially Acid Generating*	*Zone of Uncertainty*	*Potentially Acid Generating*	*Potentially Acid Generating*
209012	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating	Zone of Uncertainty	Non Acid Generating
209047	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	*Zone of Uncertainty*	*Zone of Uncertainty*	Zone of Uncertainty	*Zone of Uncertainty*
209076	WASTE	QGS	Potentially Acid Generating	Potentially Acid Generating	*Potentially Acid Generating*	*Zone of Uncertainty*	*Potentially Acid Generating*	*Zone of Uncertainty*
209145	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	Zone of Uncertainty	Non Acid Generating	Zone of Uncertainty	Non Acid Generating
209168	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	Zone of Uncertainty	*Zone of Uncertainty*	Zone of Uncertainty	*Zone of Uncertainty*
209181	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	Zone of Uncertainty	*Zone of Uncertainty*	Zone of Uncertainty	*Zone of Uncertainty*
209202	WASTE	QGS	Potentially Acid Generating	Potentially Acid Generating	Zone of Uncertainty	*Zone of Uncertainty*	*Potentially Acid Generating*	*Zone of Uncertainty*
209248	WASTE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209323	WASTE	QGS	Potentially Acid Generating	Potentially Acid Generating	*Potentially Acid Generating*	*Zone of Uncertainty*	*Potentially Acid Generating*	*Potentially Acid Generating*
209362	WASTE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating
209369	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	*Zone of Uncertainty*	*Zone of Uncertainty*	*Zone of Uncertainty*	*Zone of Uncertainty*
4266 150-160	WASTE	QGS	Zone of Uncertainty	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating
4269 060-075	WASTE	QGS	Non Acid Generating	Non Acid Generating	Non Acid Generating	Non Acid Generating	*Zone of Uncertainty*	Non Acid Generating

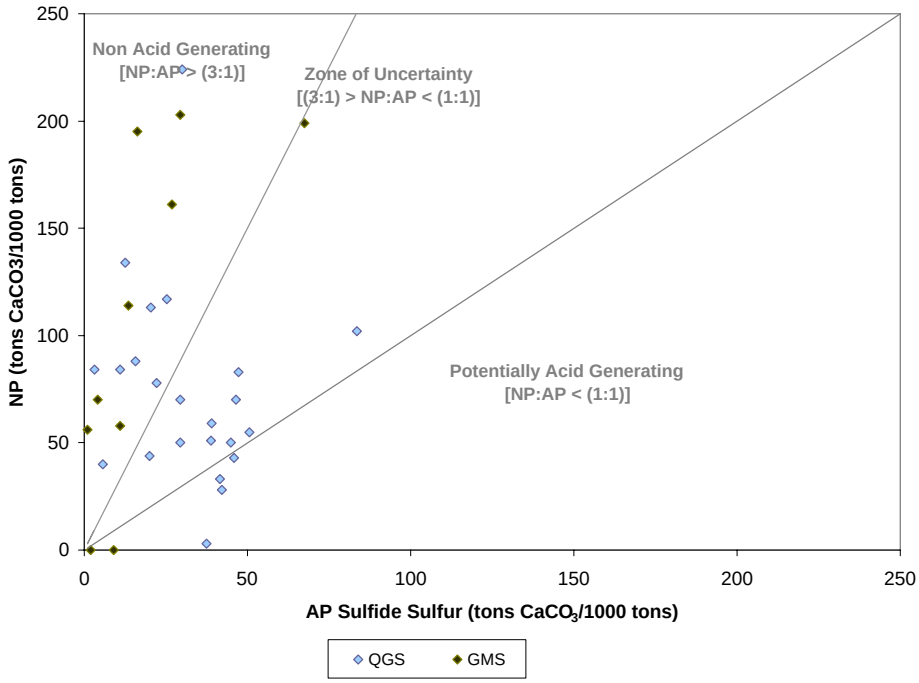
Confirmatory ABA - Correlation of Analytical Methods



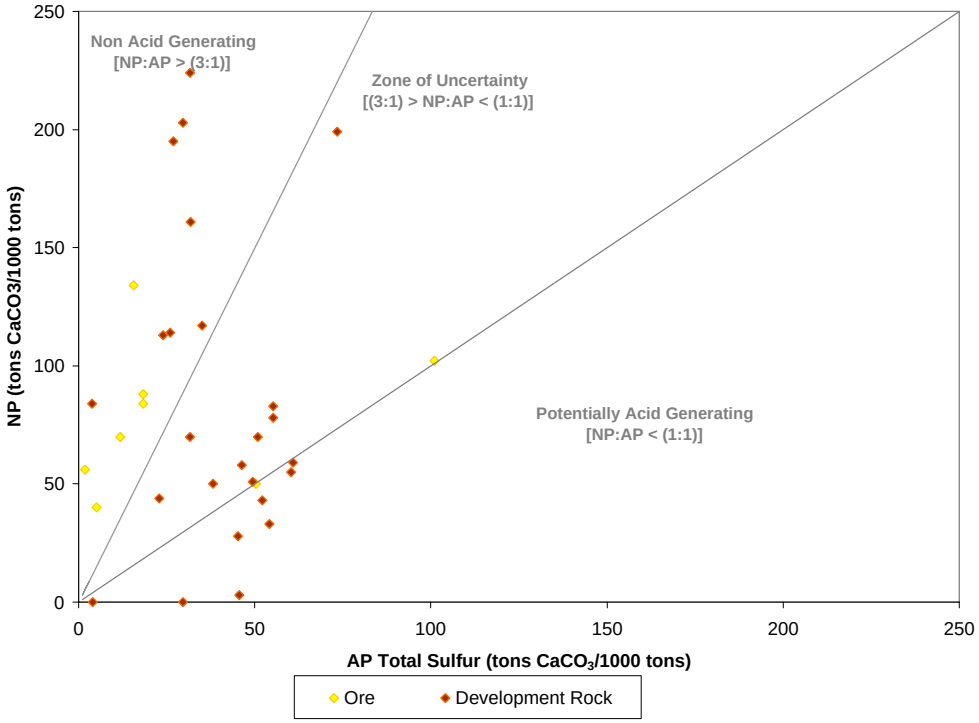


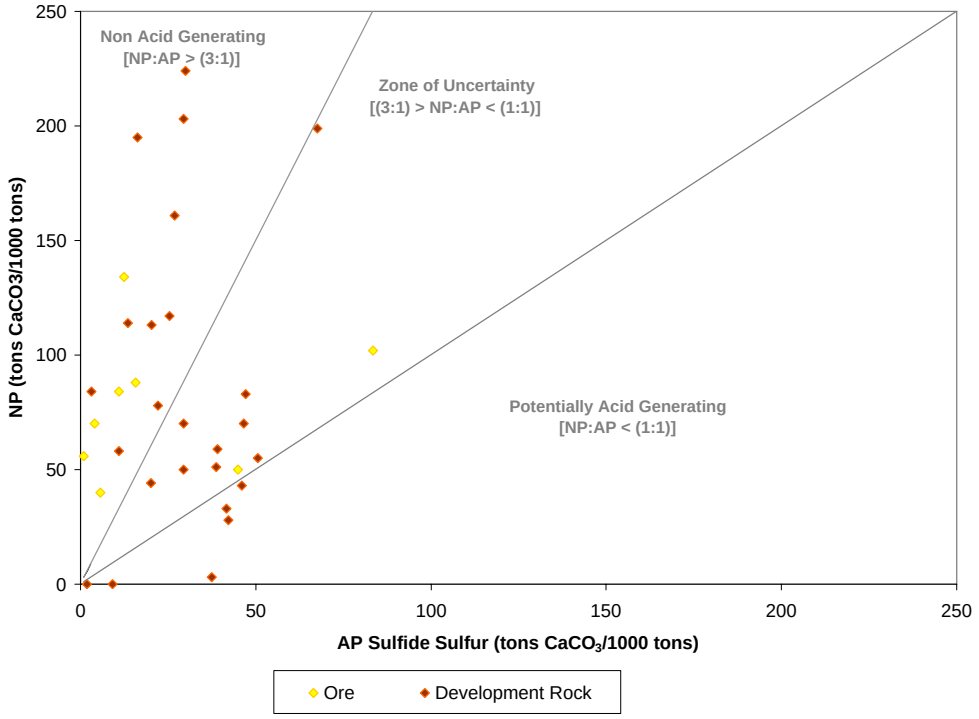
Confirmatory ABA - Scatter Plots by Lithology (Standard Sobek)



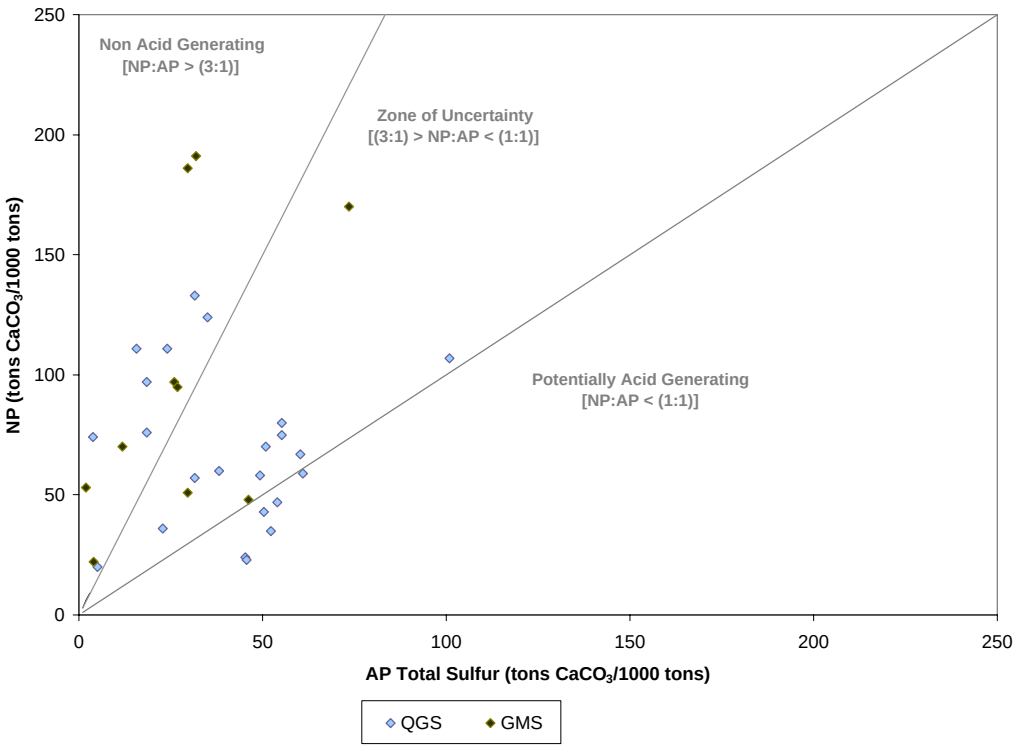


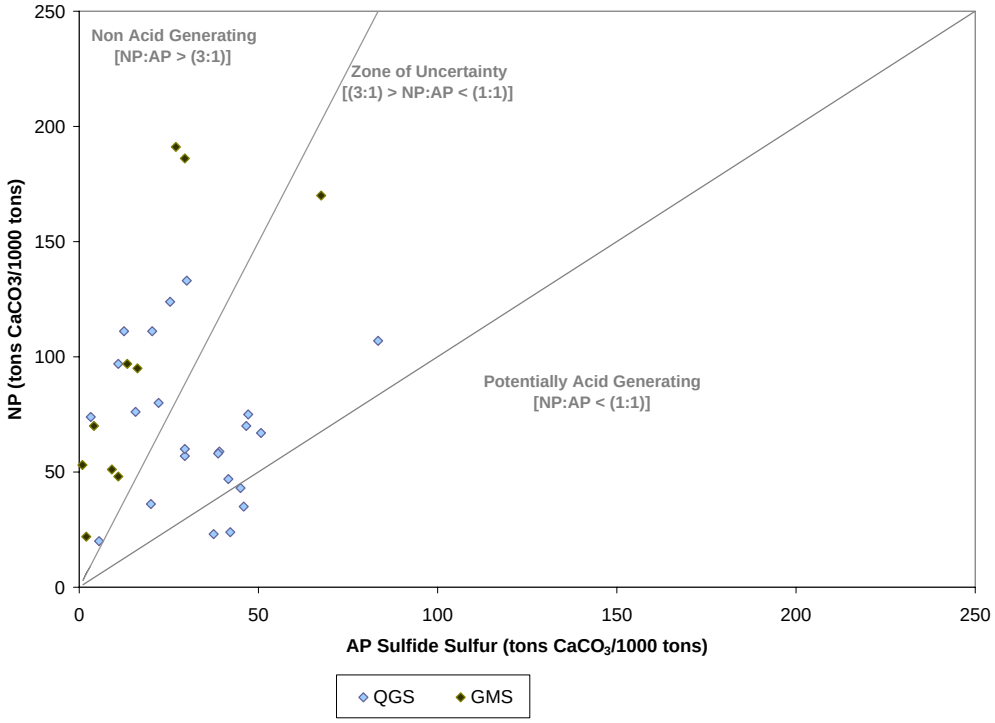
Confirmatory ABA - Scatter Plots by Ore and Development Rock (Standard Sobek)



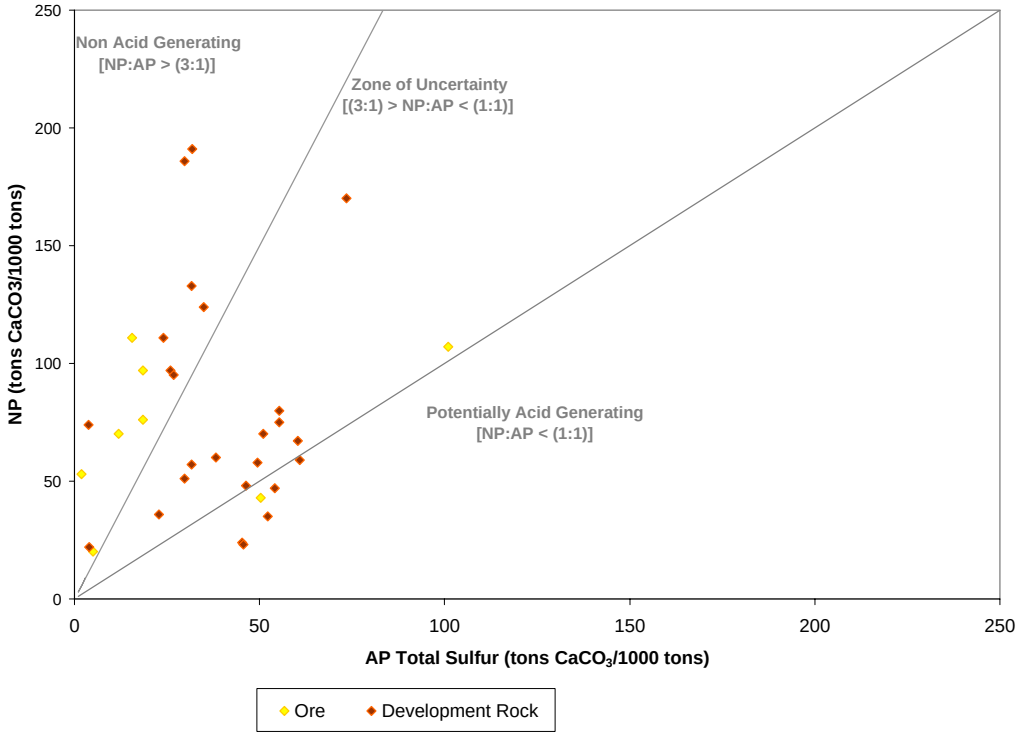


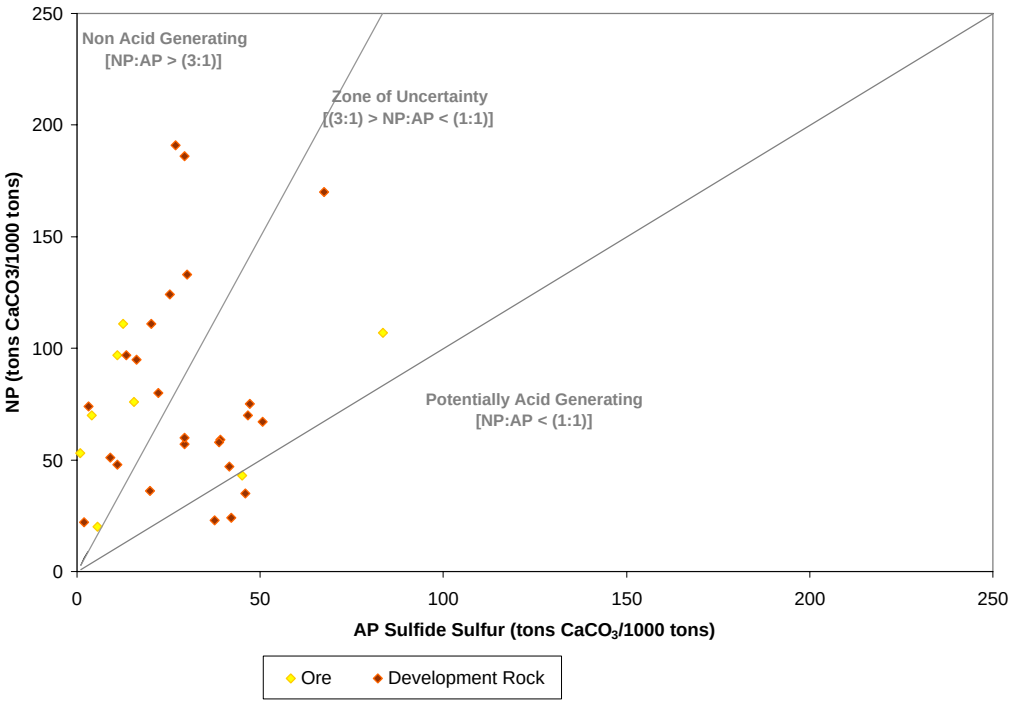
Confirmatory ABA - Scatter Plots by Lithology (Siderite Corrected Sobek)



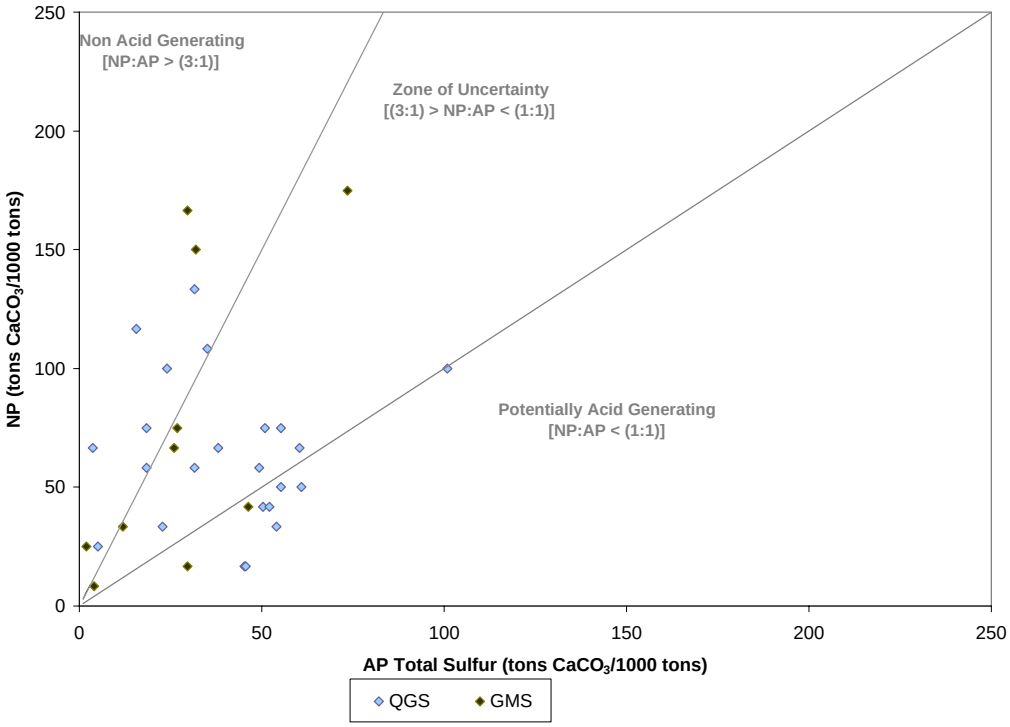


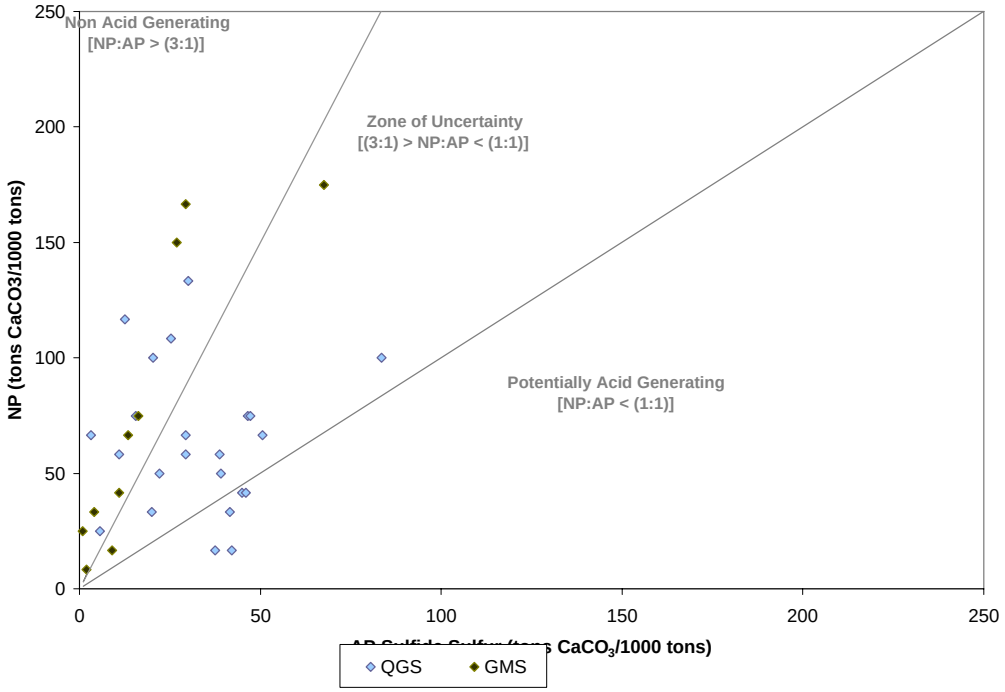
Confirmatory ABA - Scatter Plots by Ore and Development Rock (Siderite Corrected Sobek)



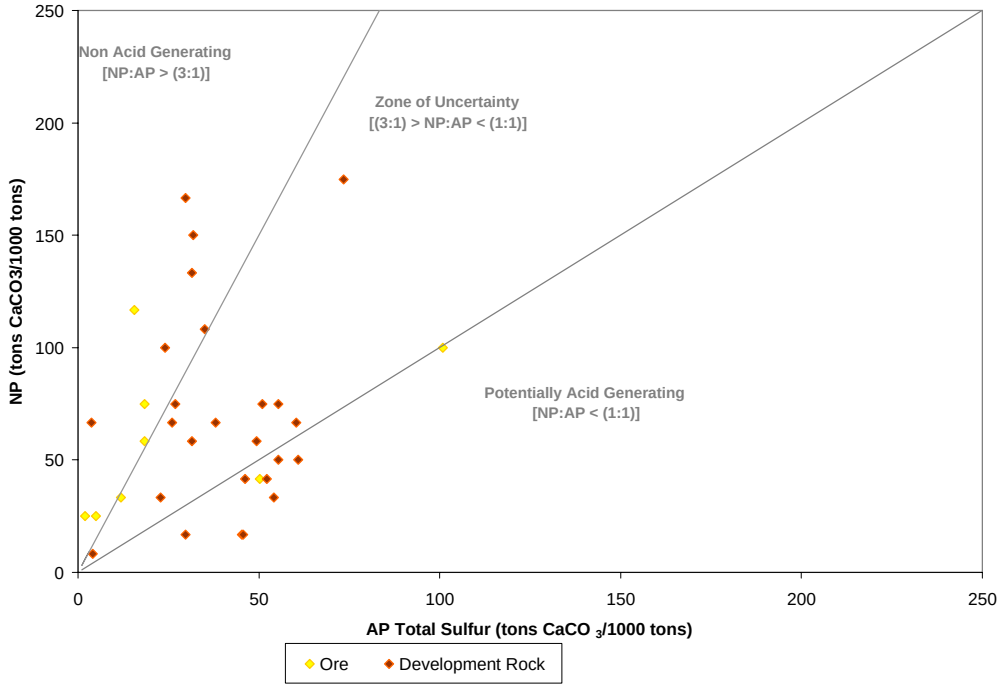


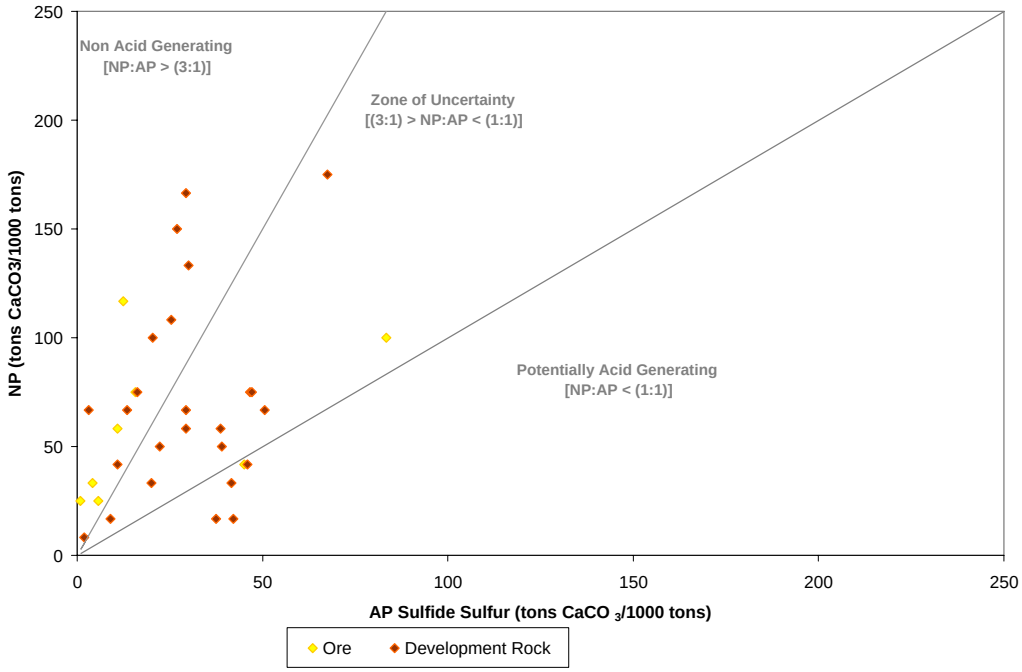
Confirmatory ABA - Scatter Plots by Lithology (Inorganic Carbon - Carbonate)



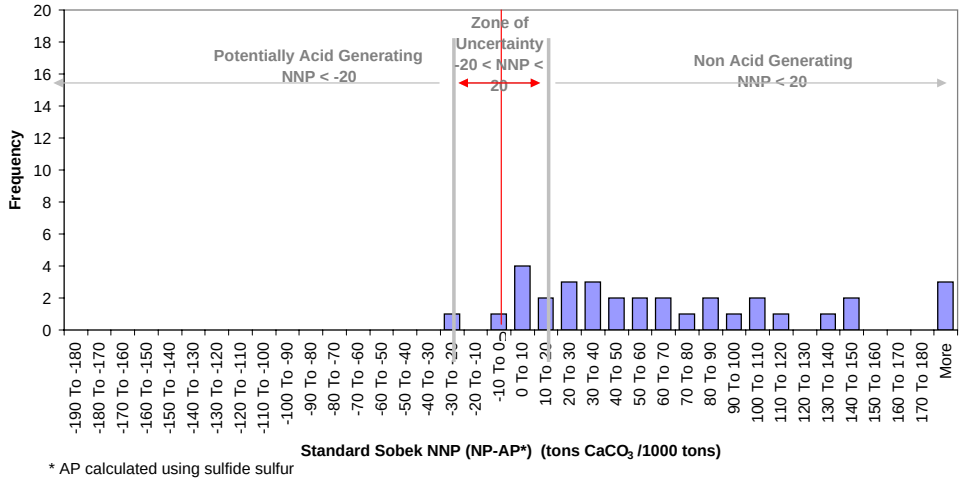


Confirmatory ABA - Scatter Plots by Ore and Development Rock (Inorganic Carbon - Carbonate)

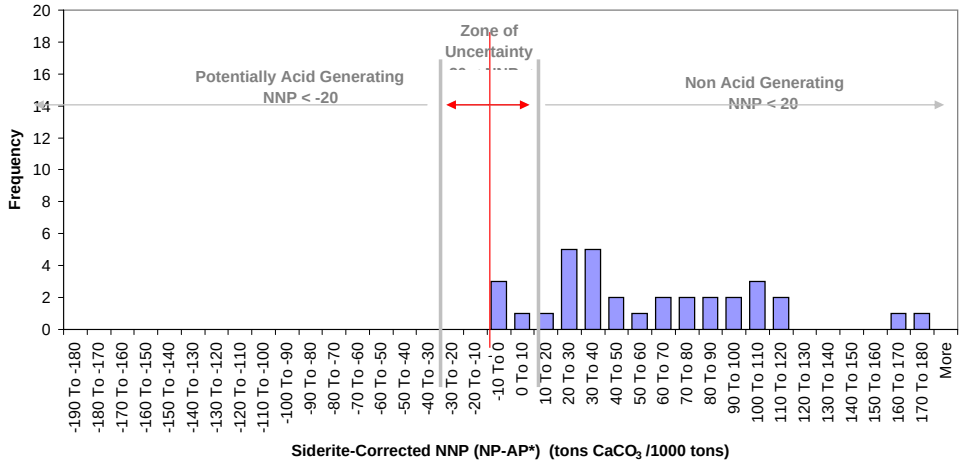




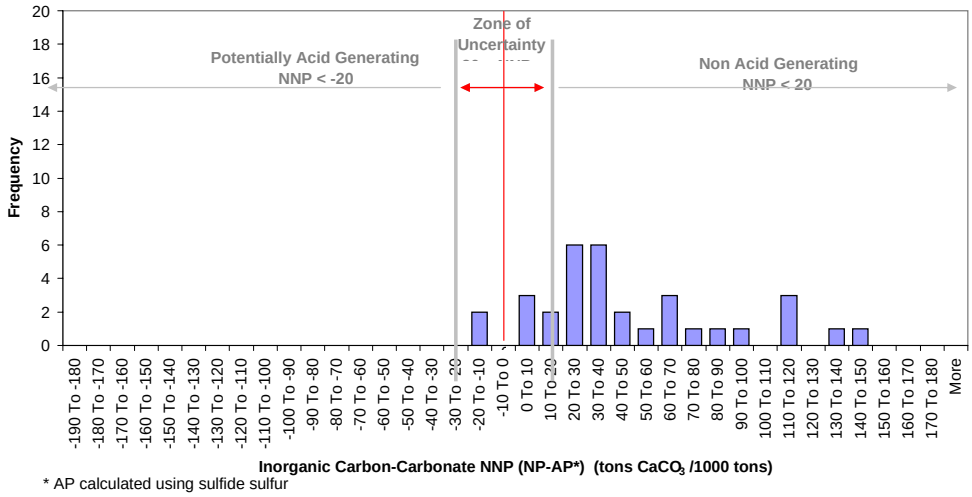
Confirmatory ABA - Net Neutralization Potential Histograms



* AP calculated using sulfide sulfur



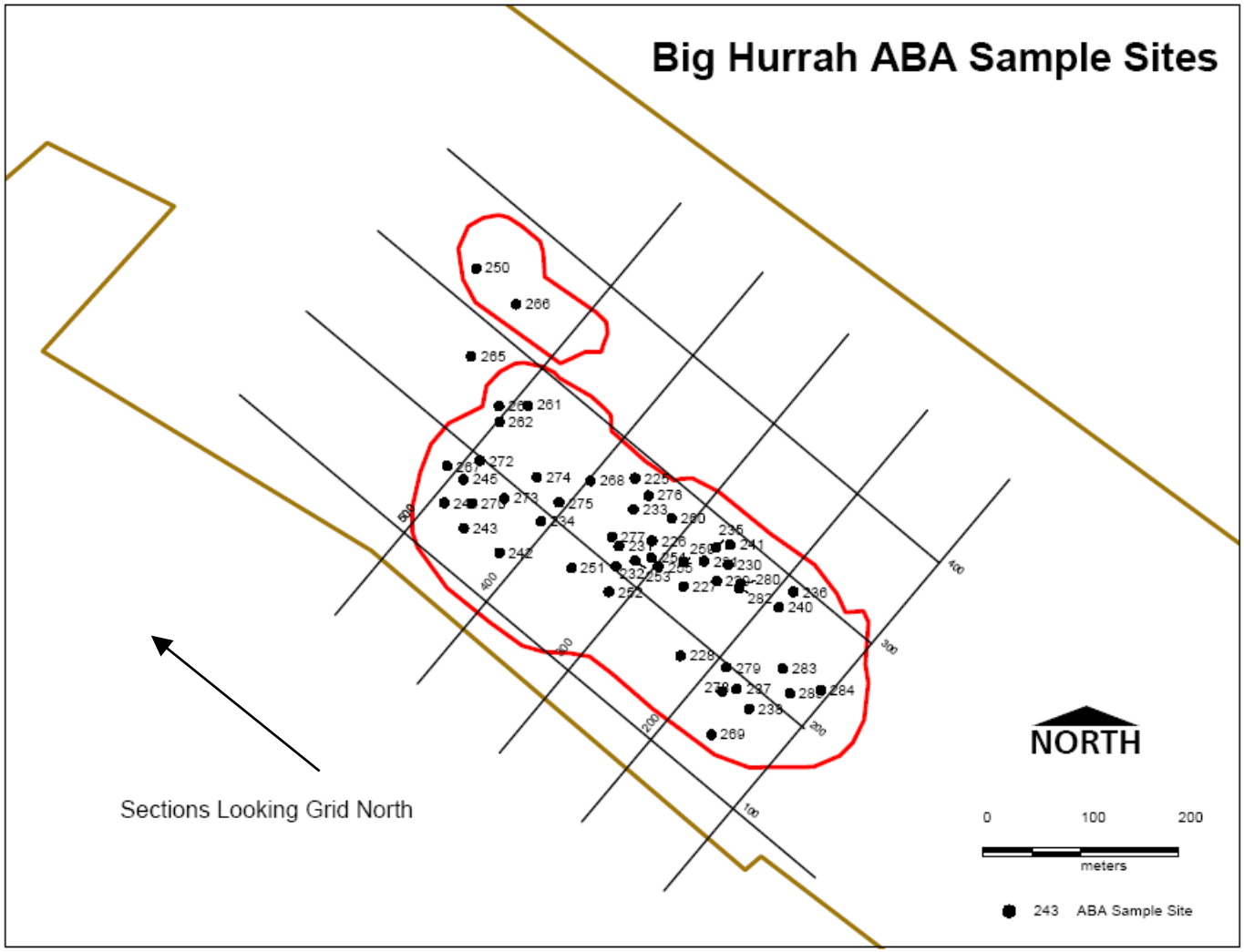
* AP calculated using sulfide sulfur

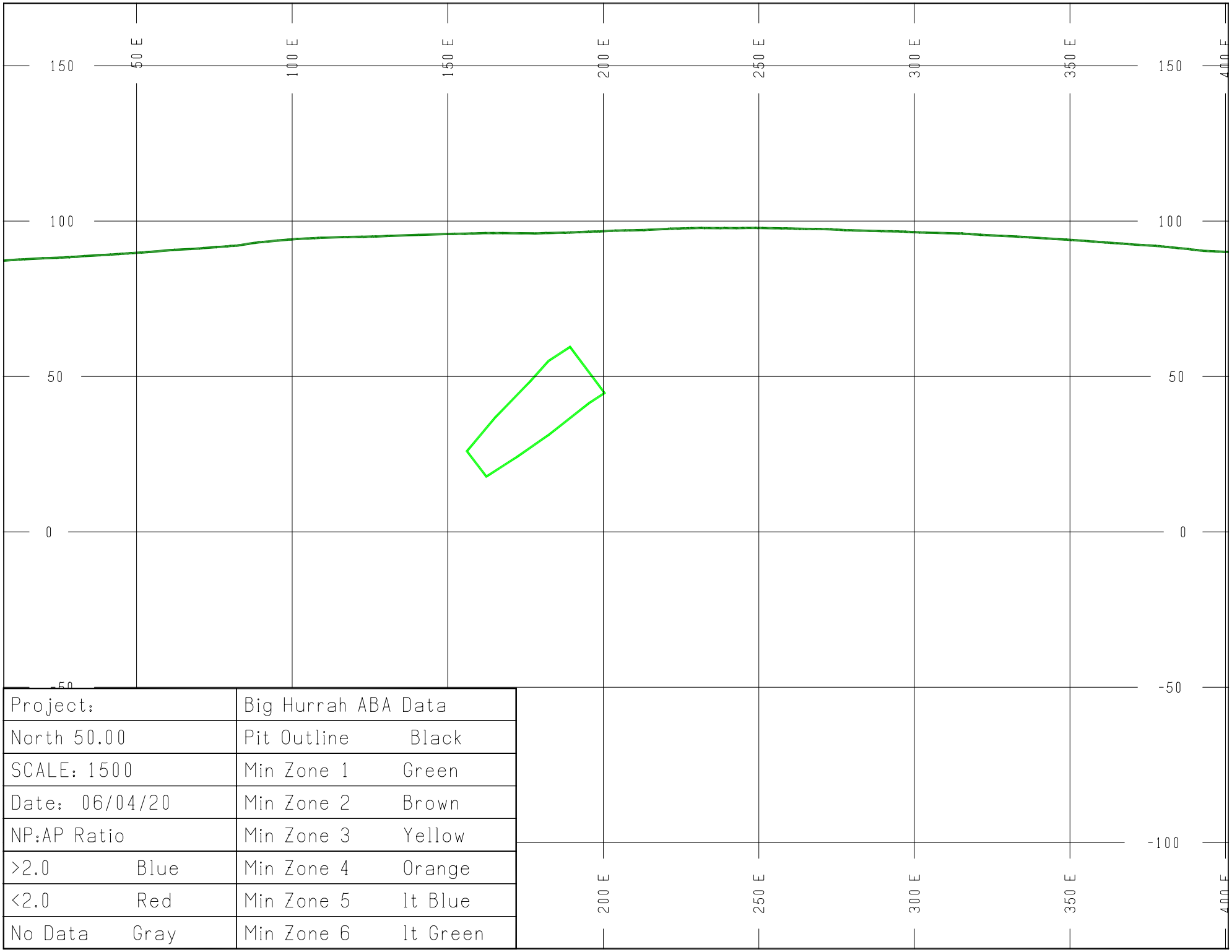


* AP calculated using sulfide sulfur

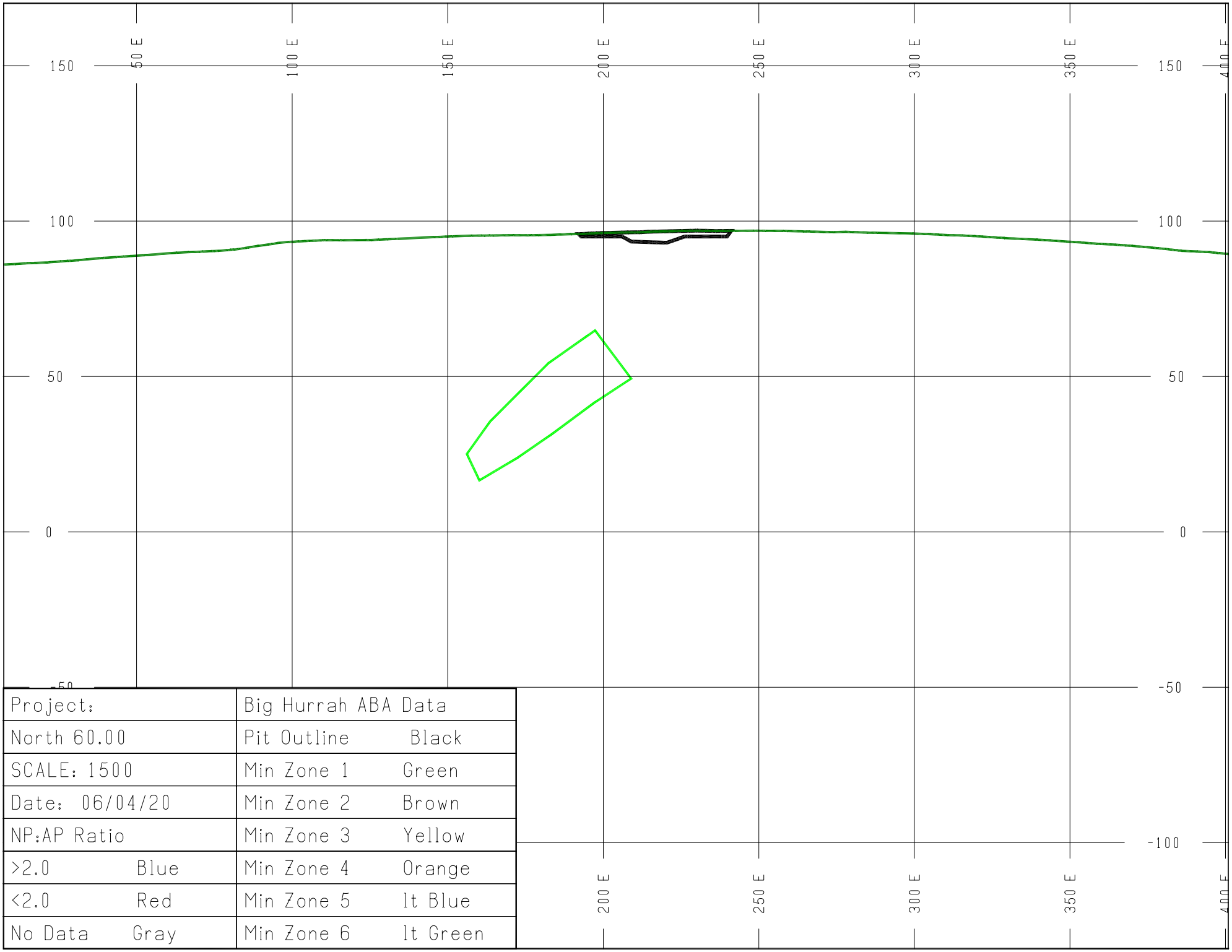
ATTACHMENT 6

Big Hurrah ABA Cross-sections

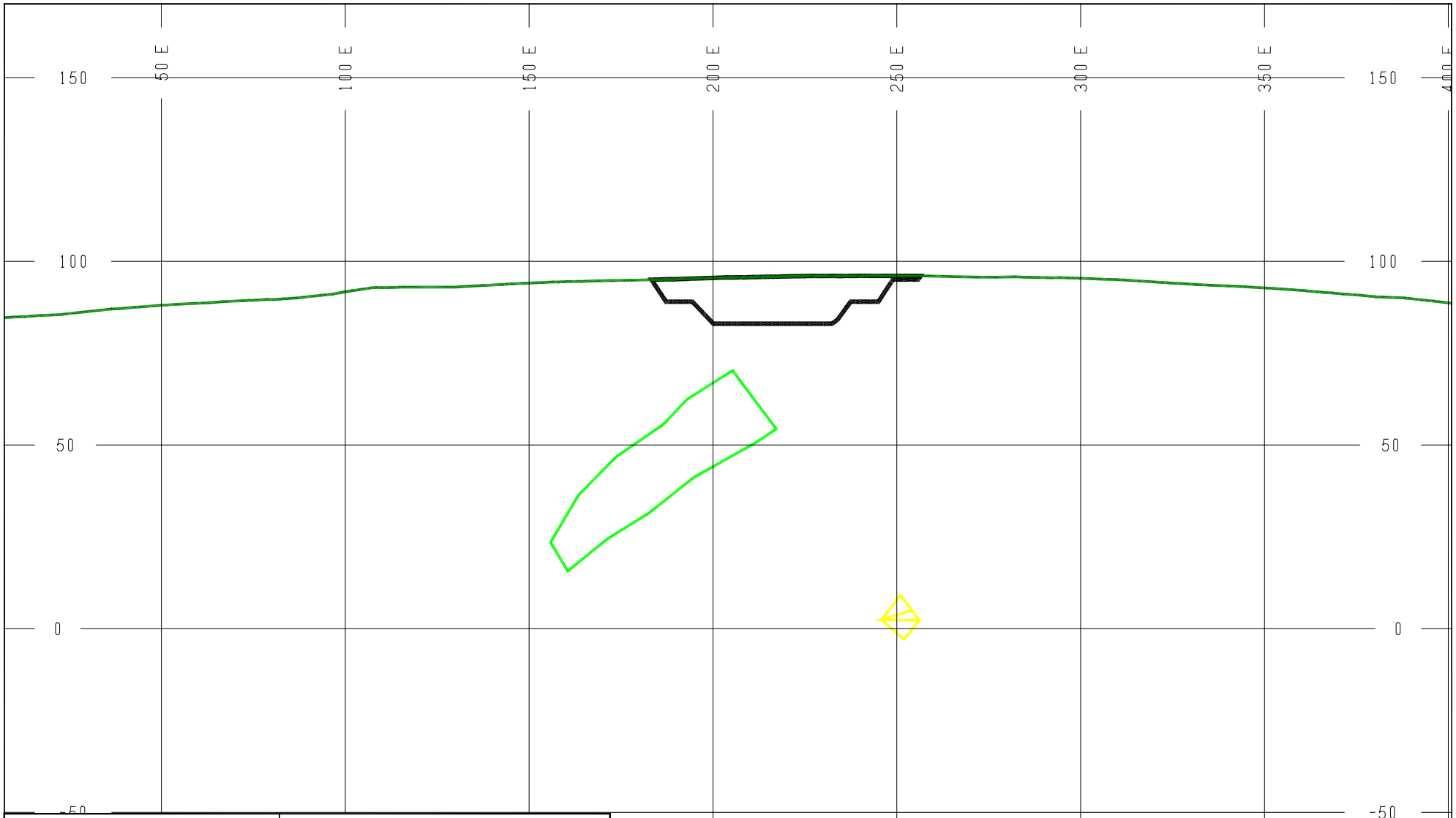

Big Hurrah ABA Sample Sites
Sections Looking Grid North
NORTH
0
100
200
meters
243 ABA Sample Site



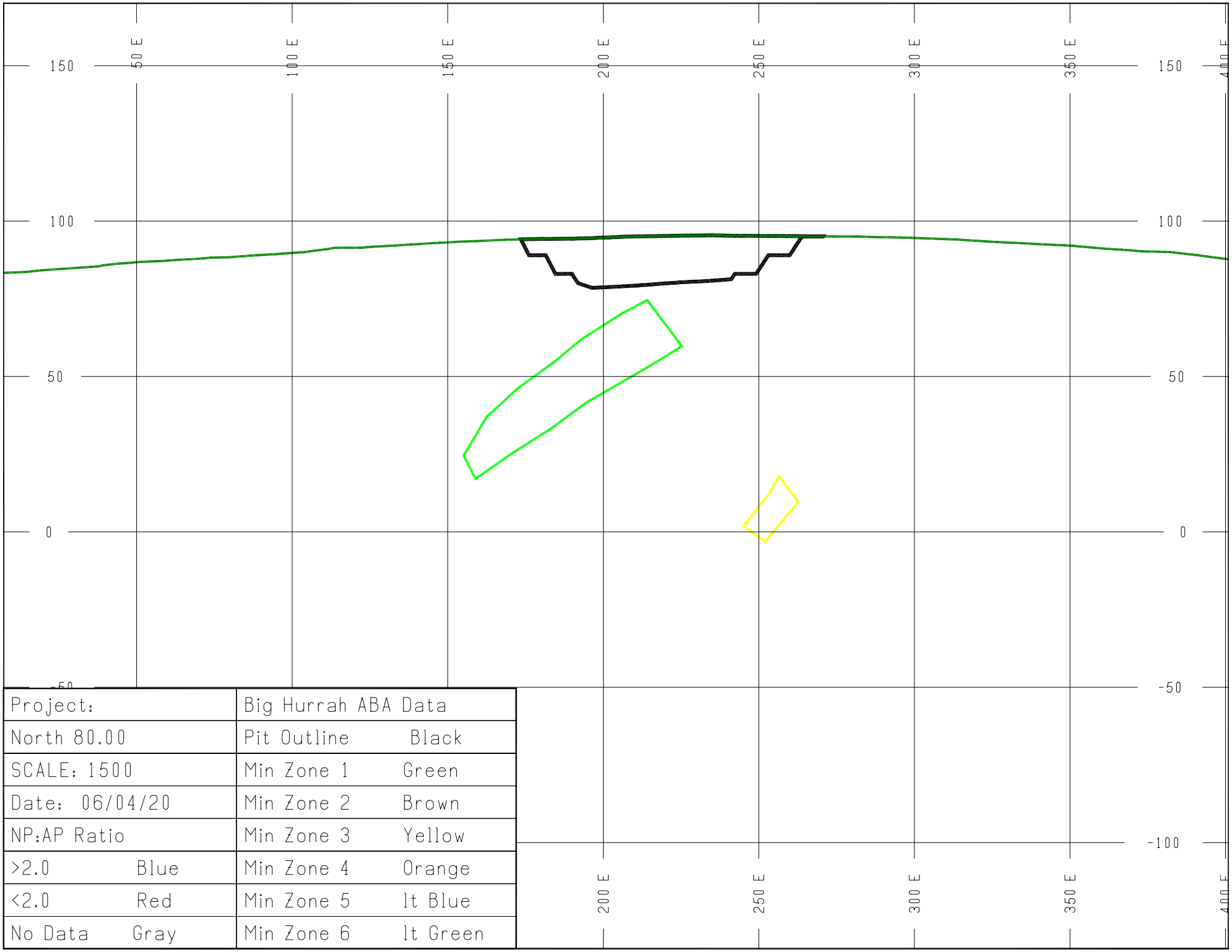
Project:		Big Hurrah ABA Data	
North 50.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



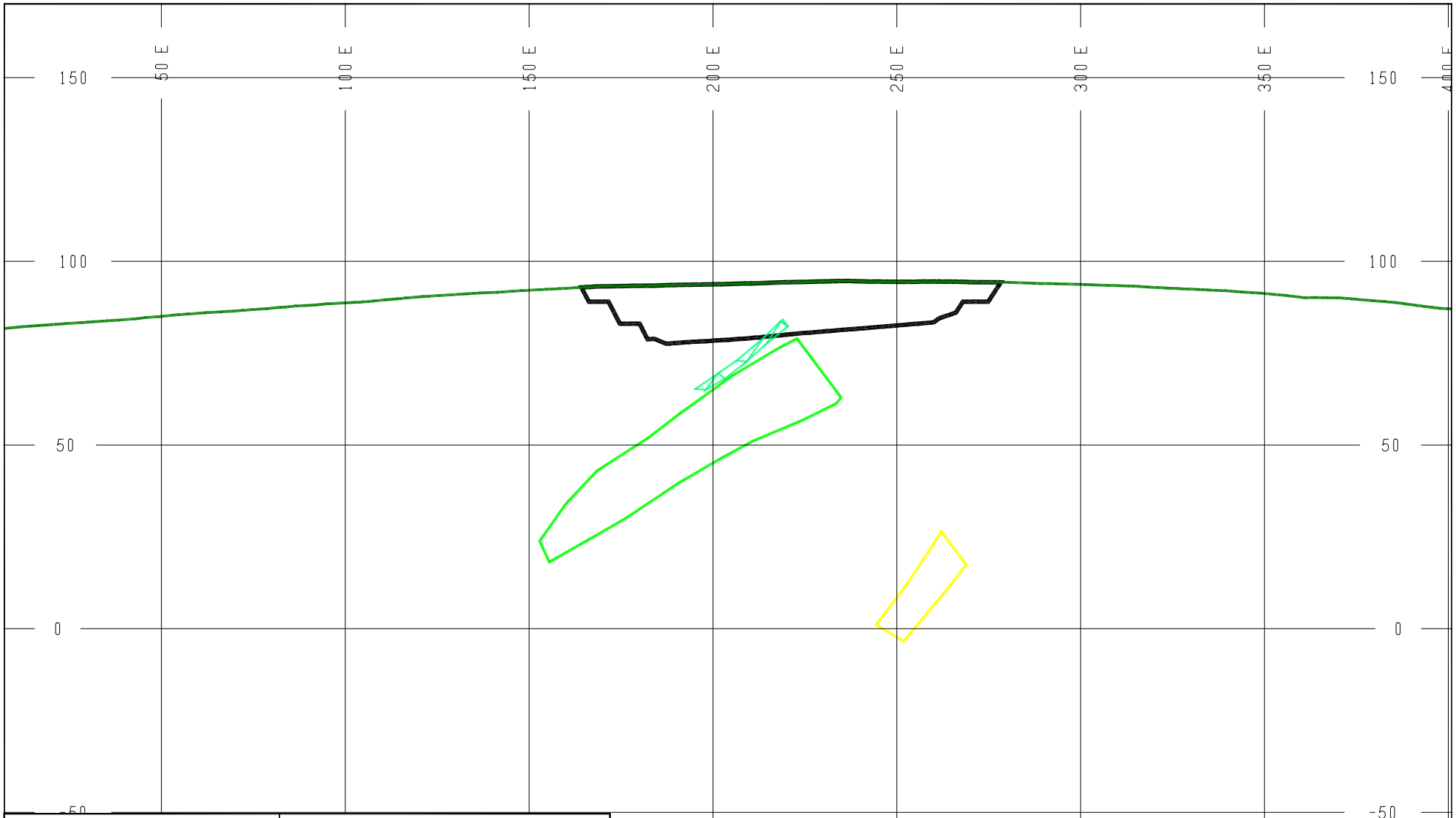
Project:		Big Hurrah ABA Data	
North 60.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



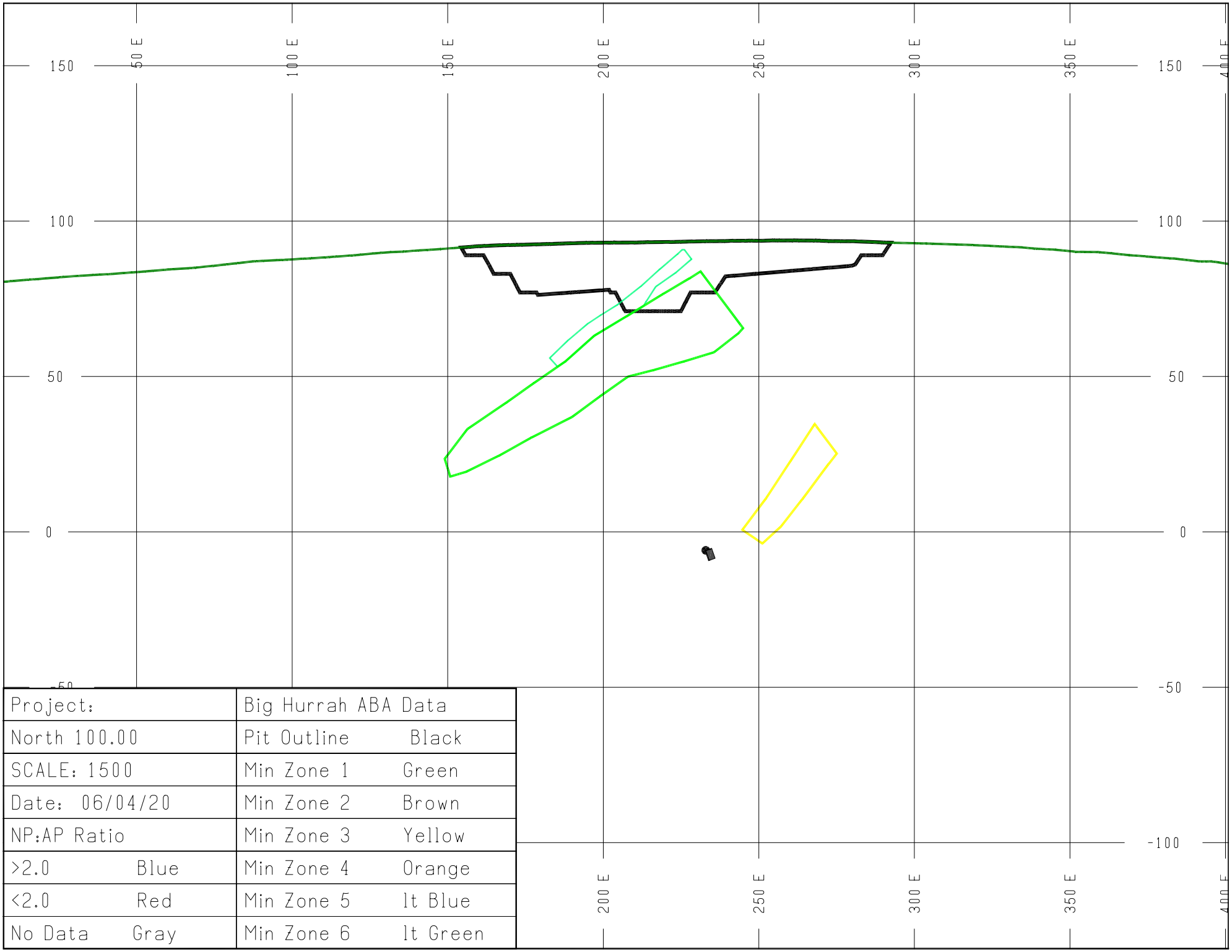
Project:		Big Hurrah ABA Data	
North 70.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



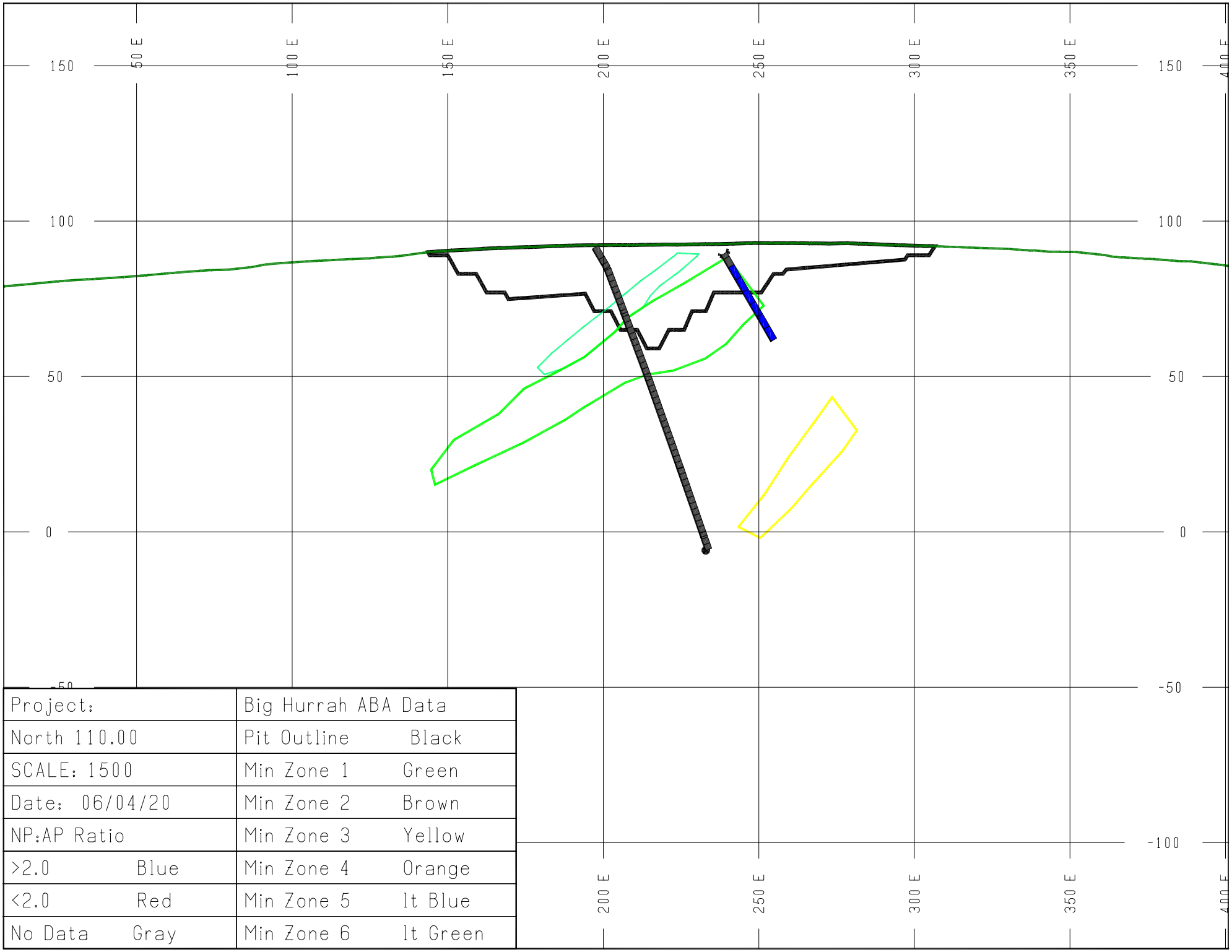
Project:		Big Hurrah ABA Data	
North 80.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



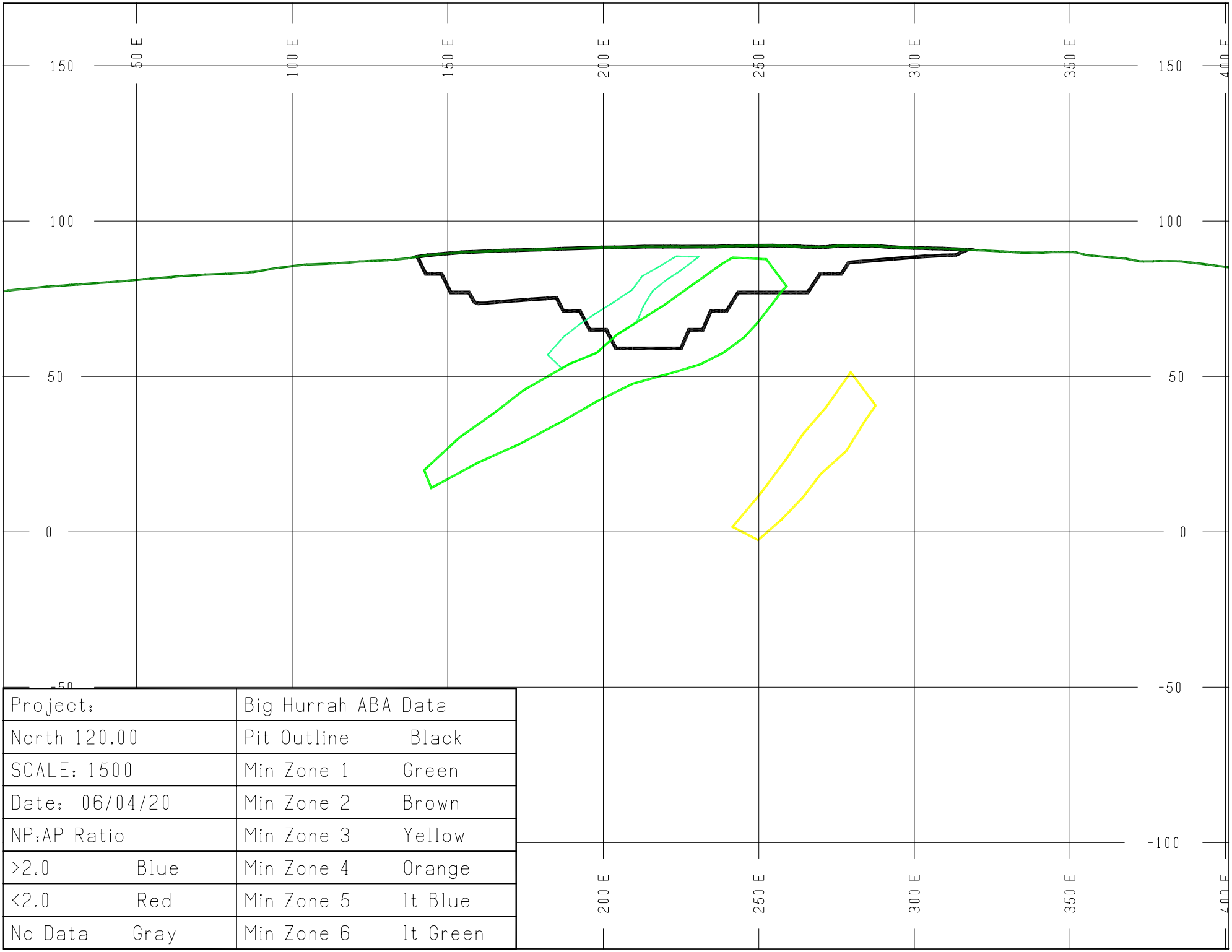
Project:		Big Hurrah ABA Data	
North 90.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



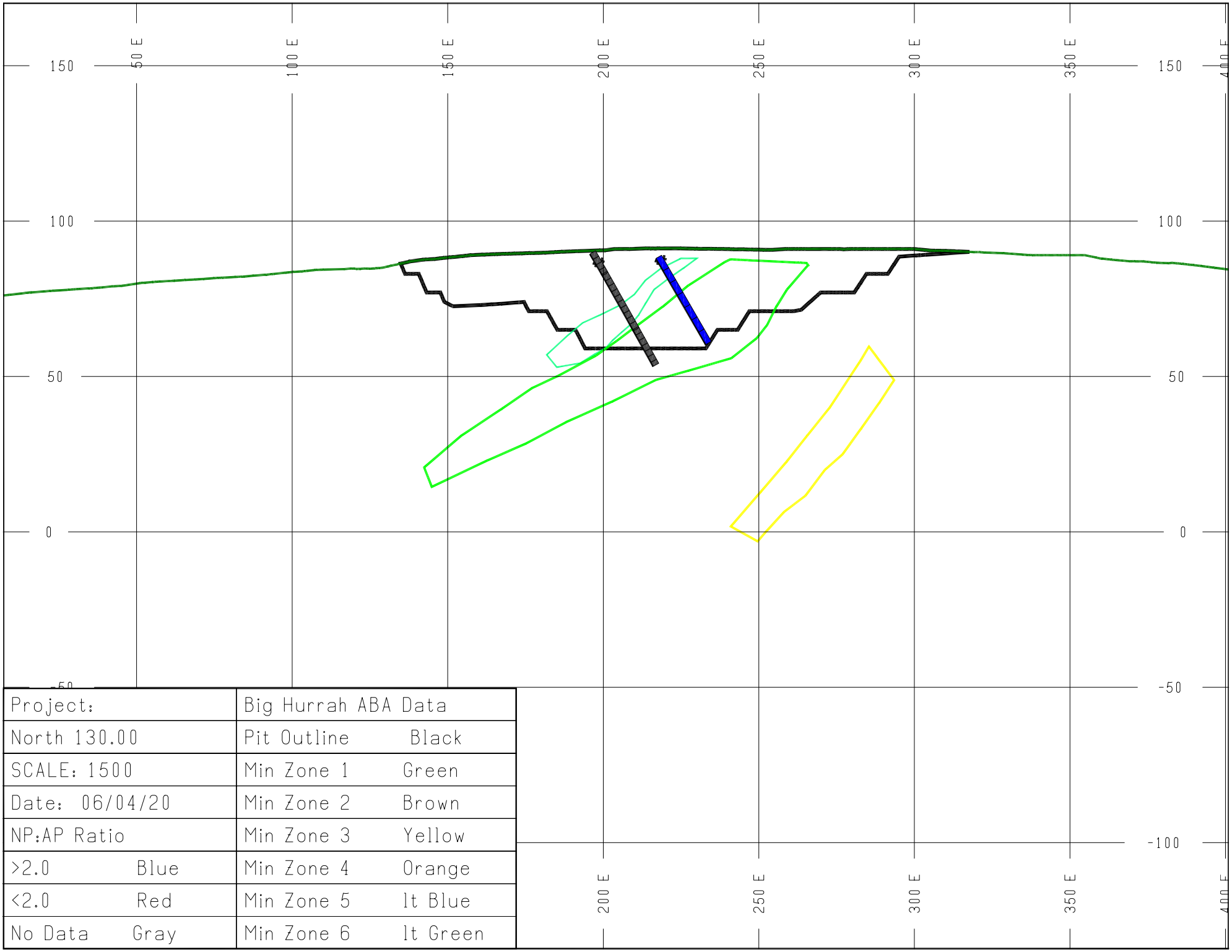
Project:		Big Hurrah ABA Data	
North 100.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



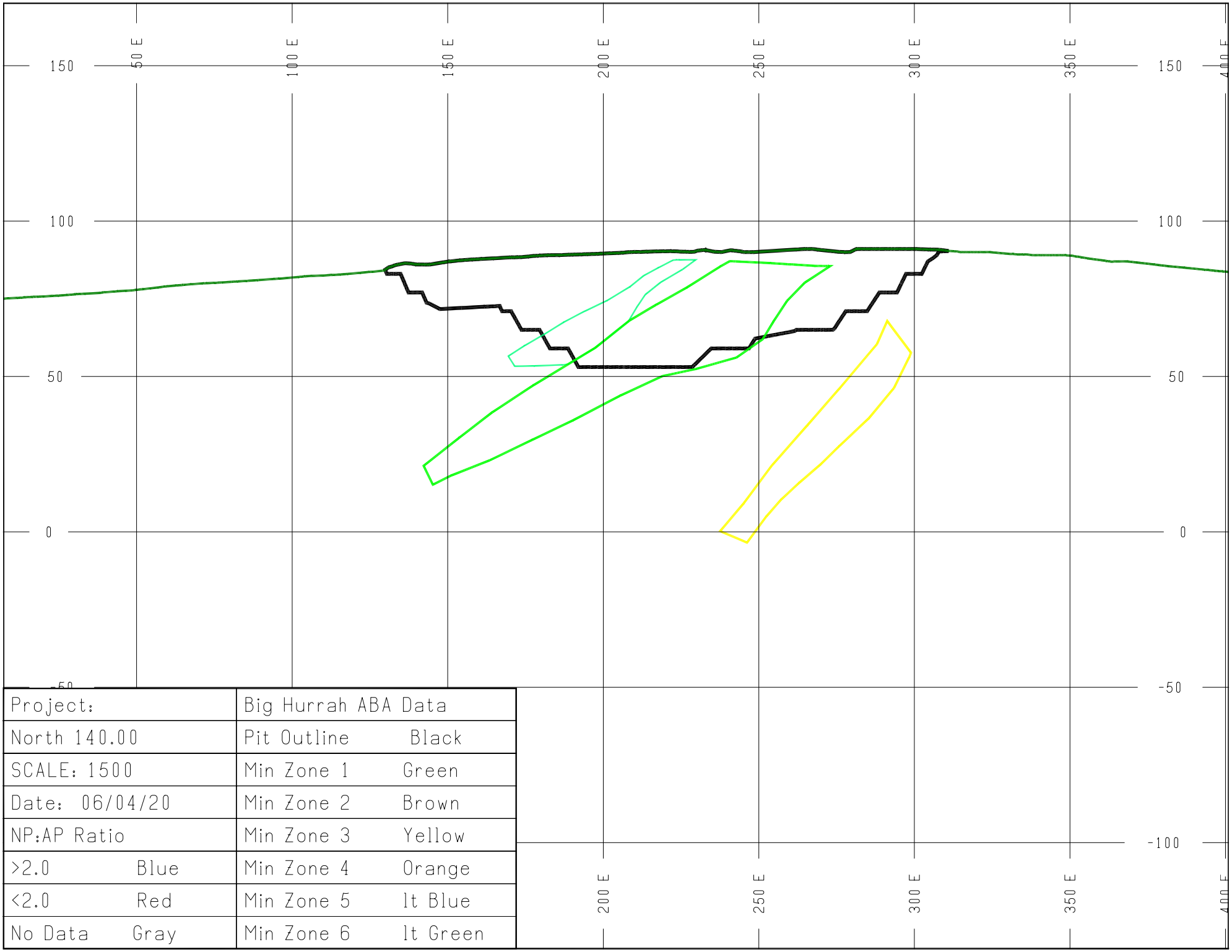
Project:		Big Hurrah ABA Data	
North 110.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



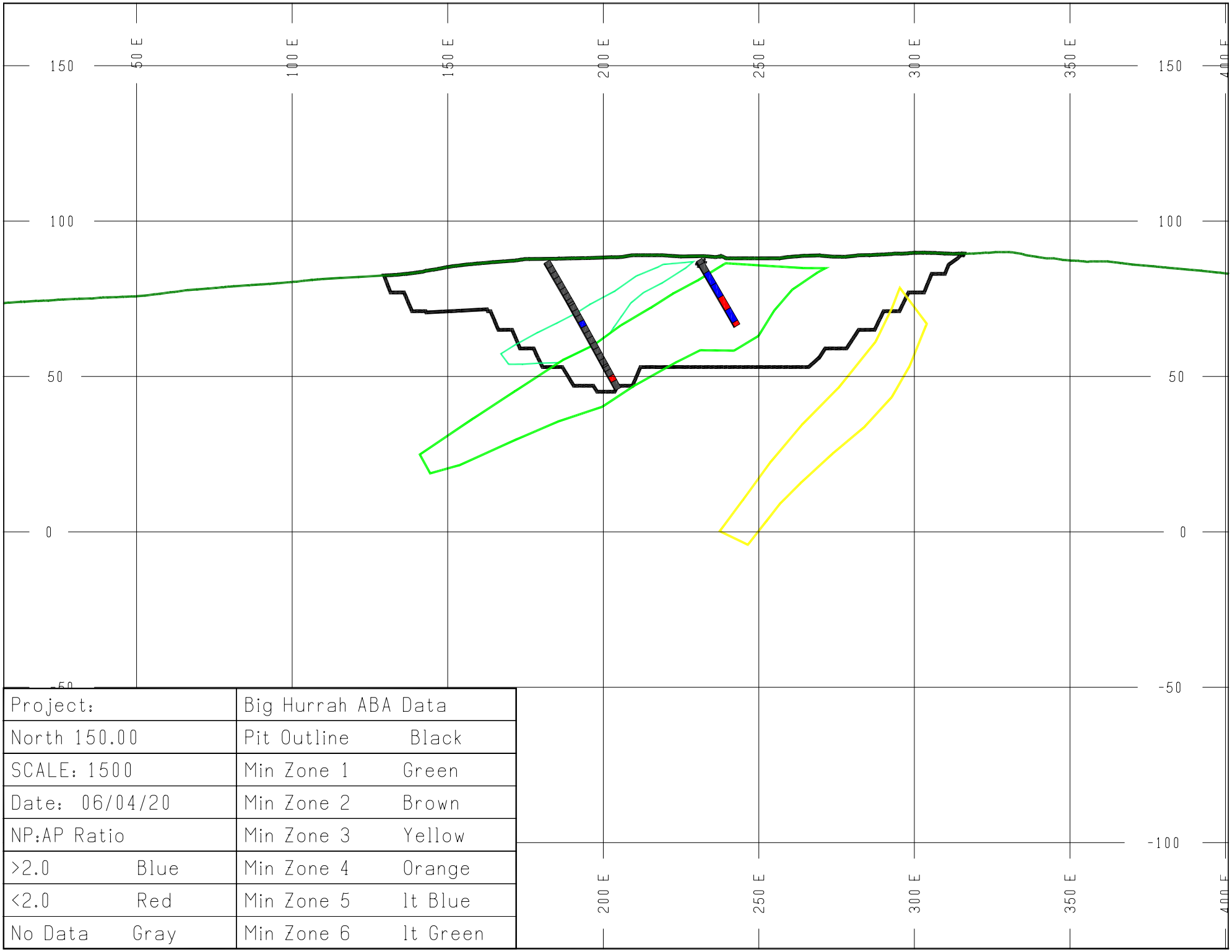
Project:		Big Hurrah ABA Data	
North 120.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



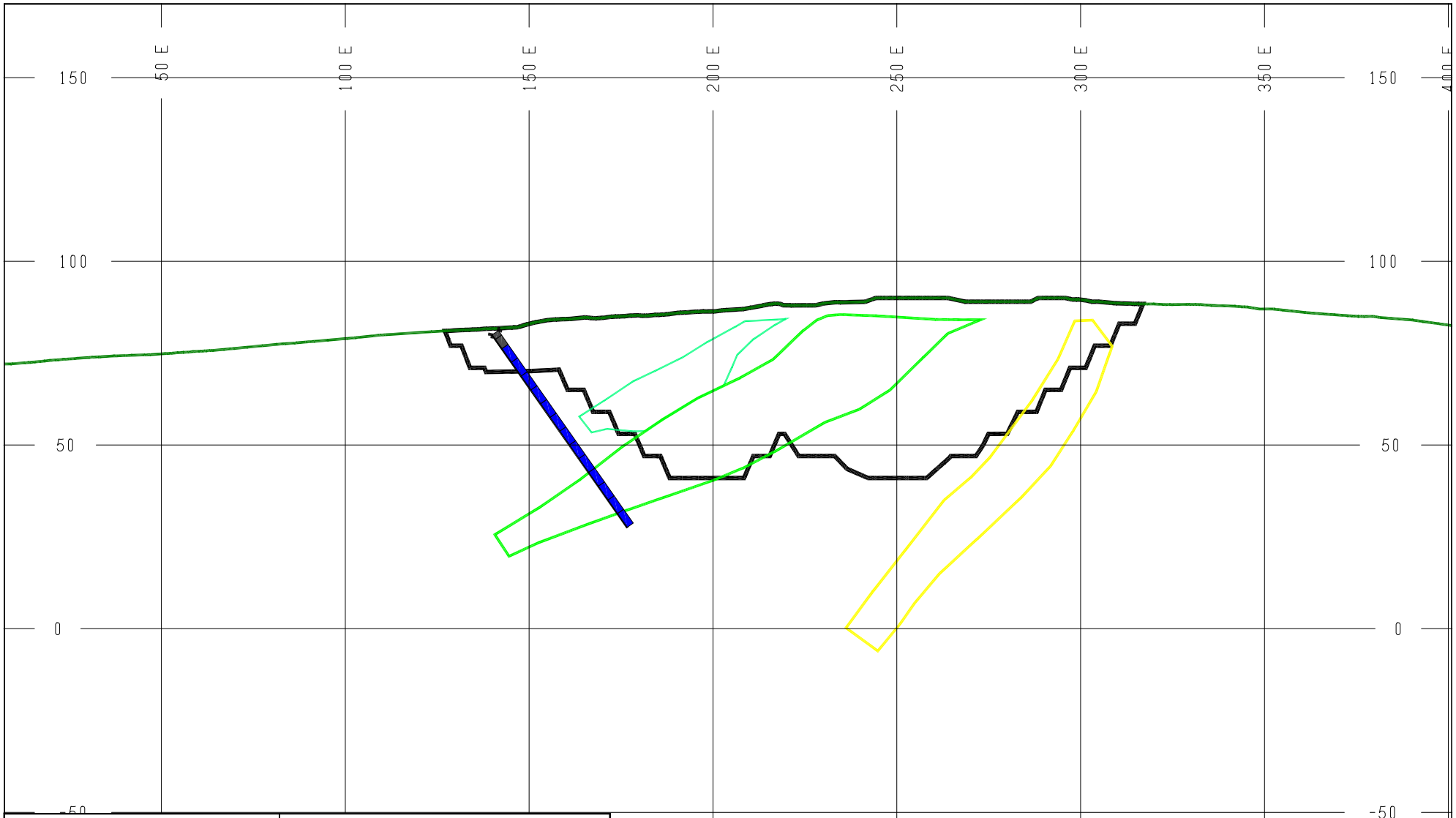
Project:		Big Hurrah ABA Data	
North 130.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



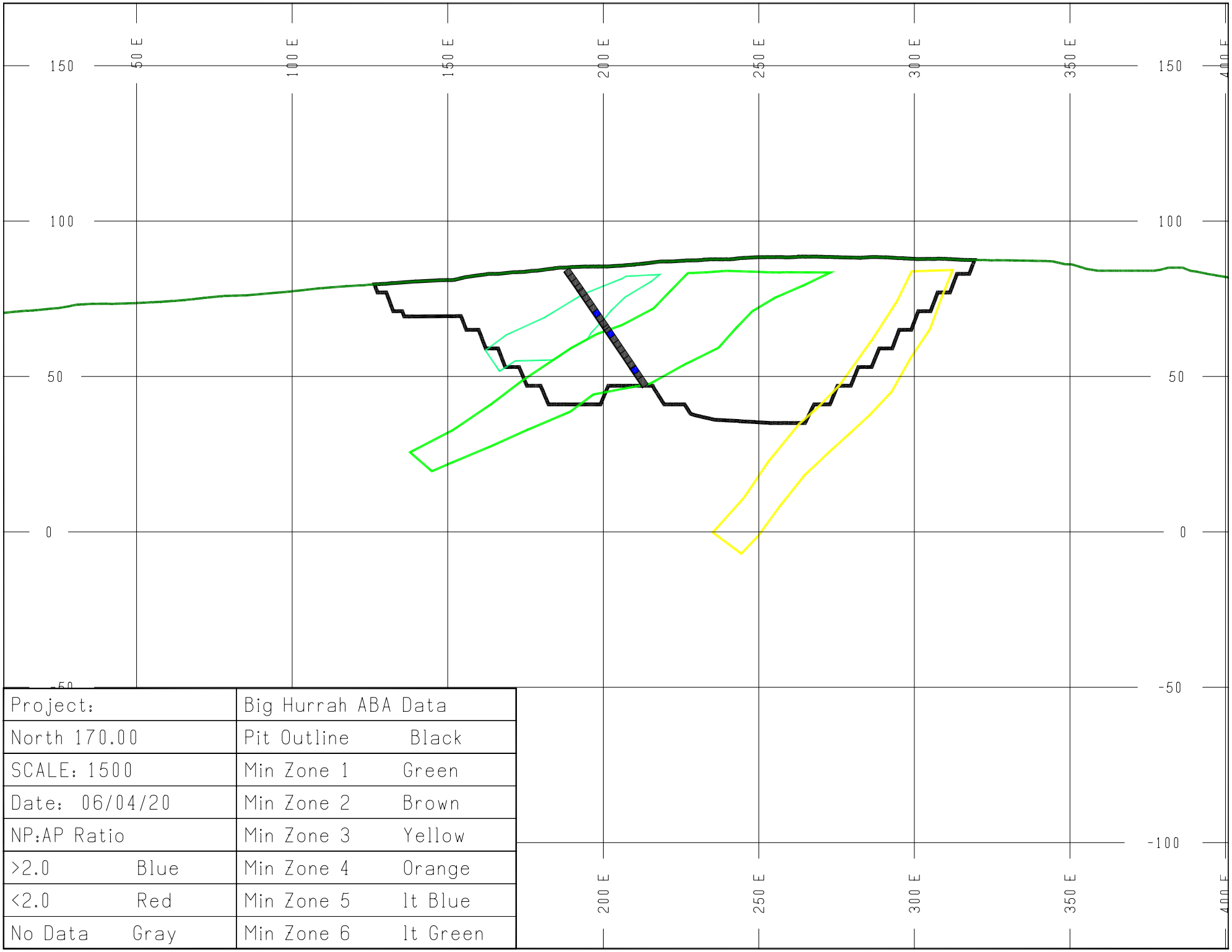
Project:		Big Hurrah ABA Data	
North 140.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



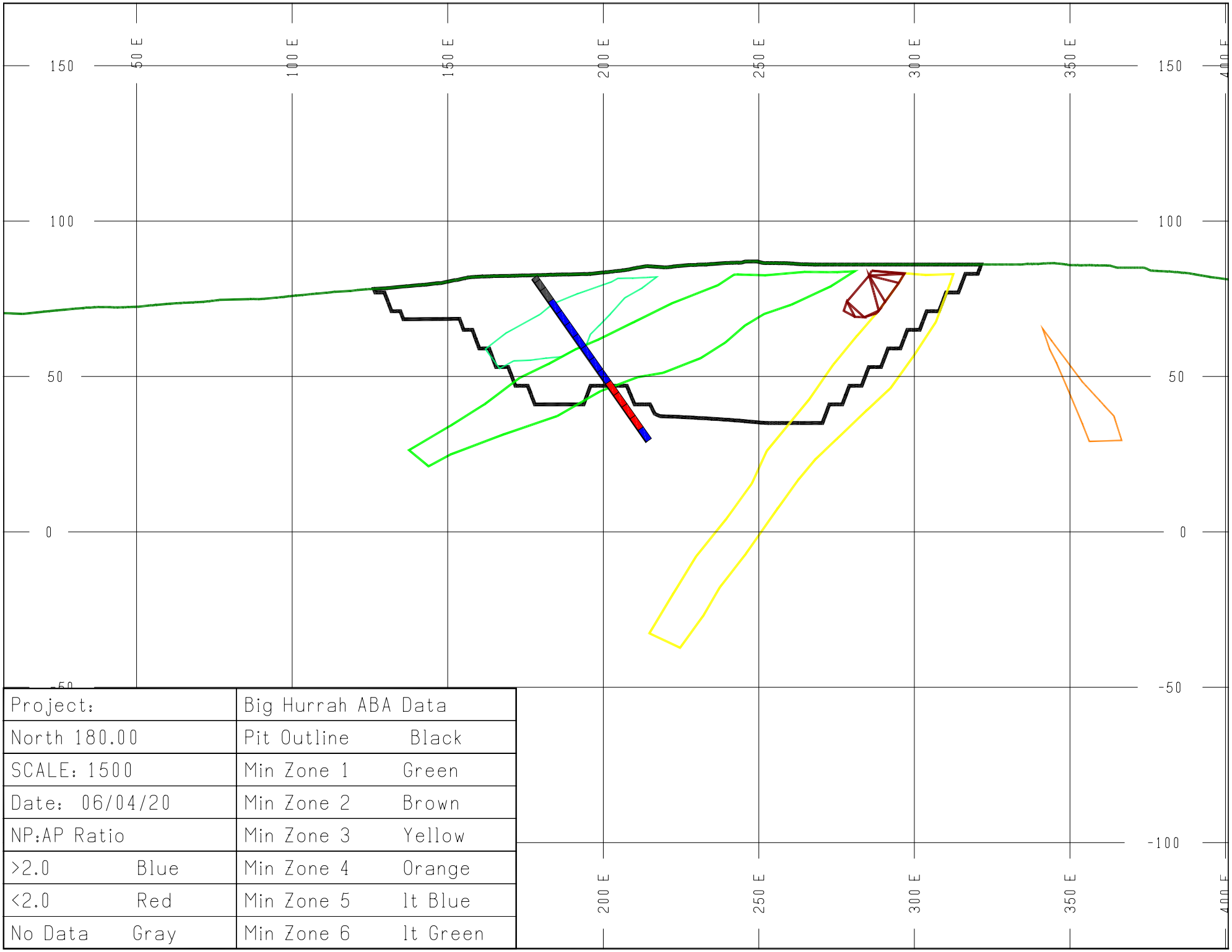
Project:		Big Hurrah ABA Data	
North 150.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



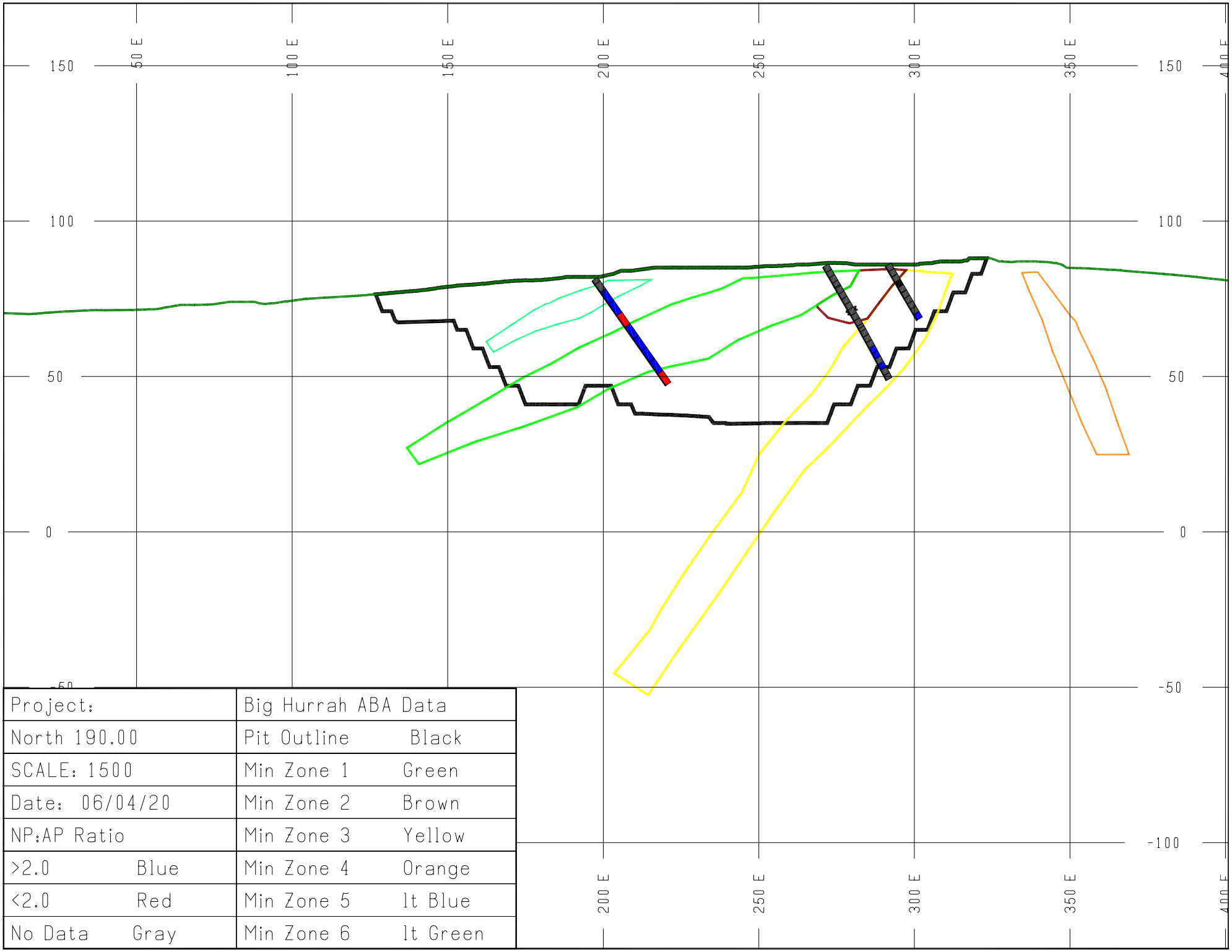
Project:		Big Hurrah ABA Data	
North 160.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



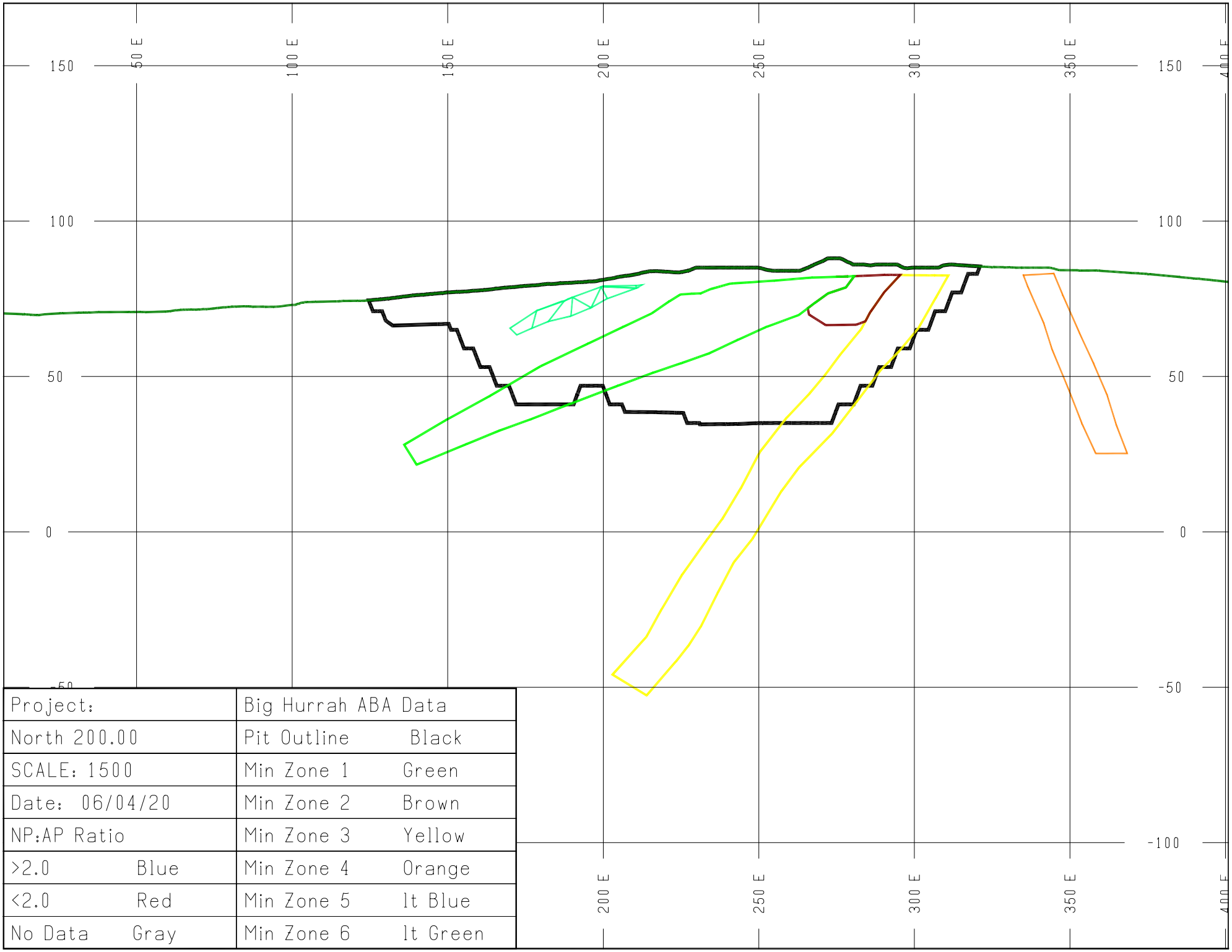
Project:		Big Hurrah ABA Data	
North 170.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



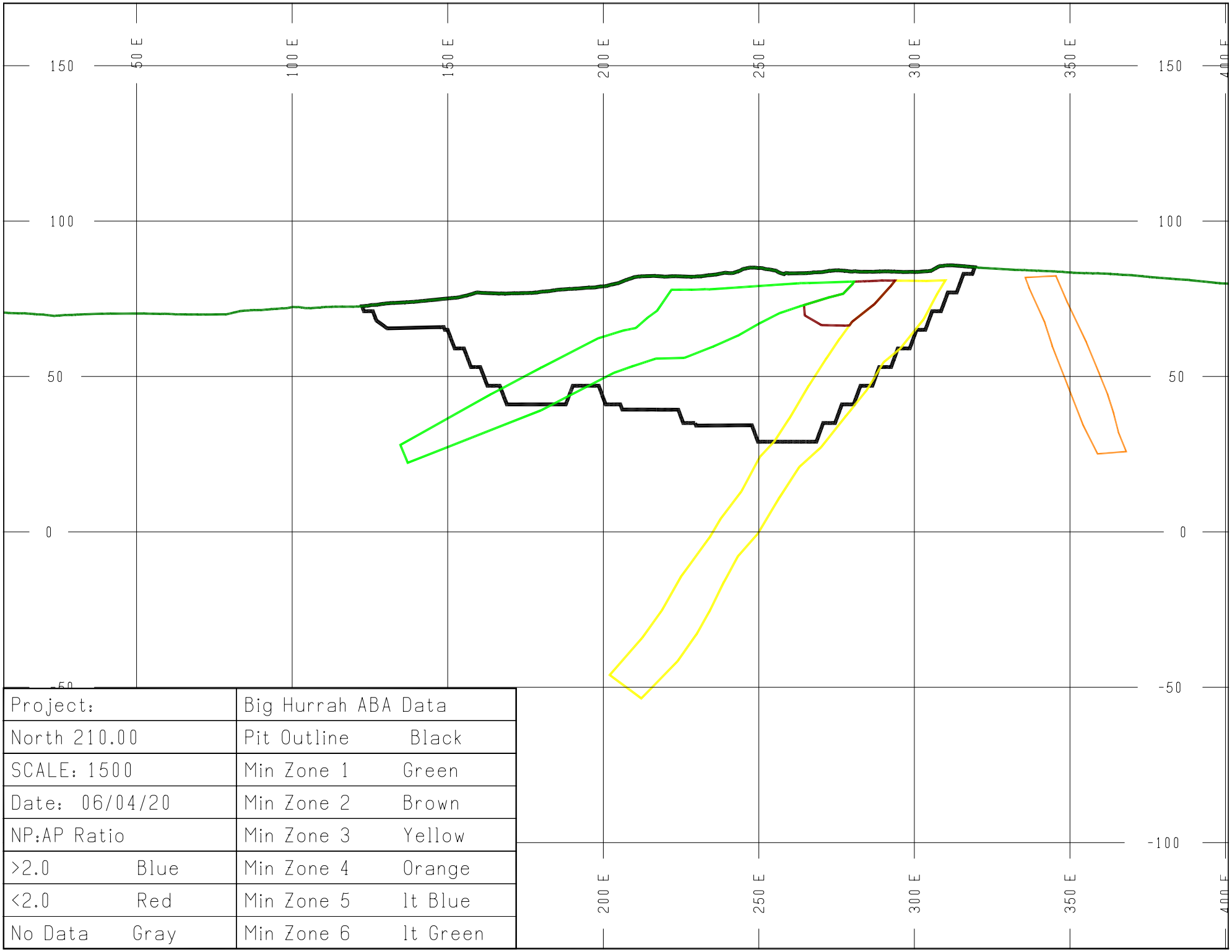
Project:		Big Hurrah ABA Data	
North 180.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



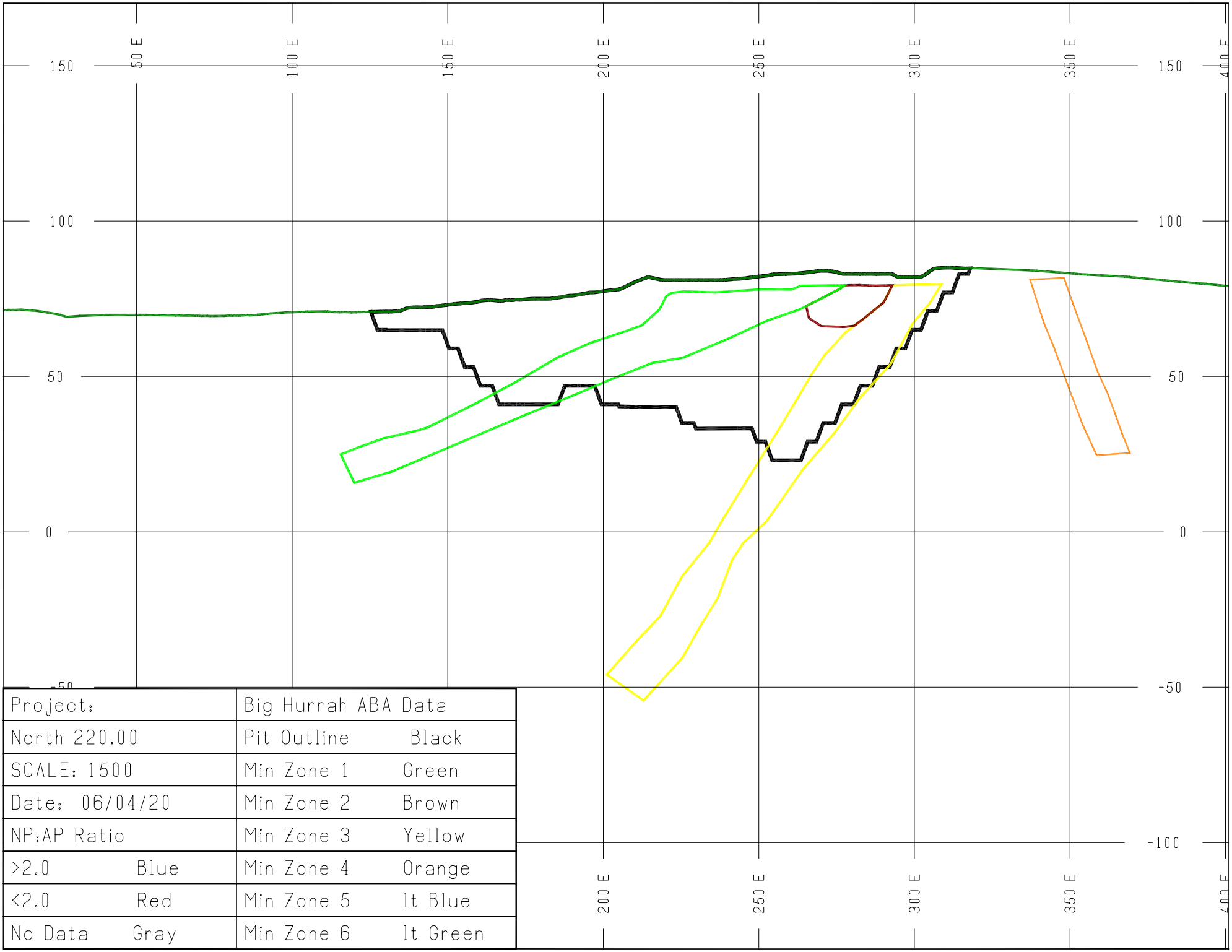
Project:		Big Hurrah ABA Data	
North 190.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



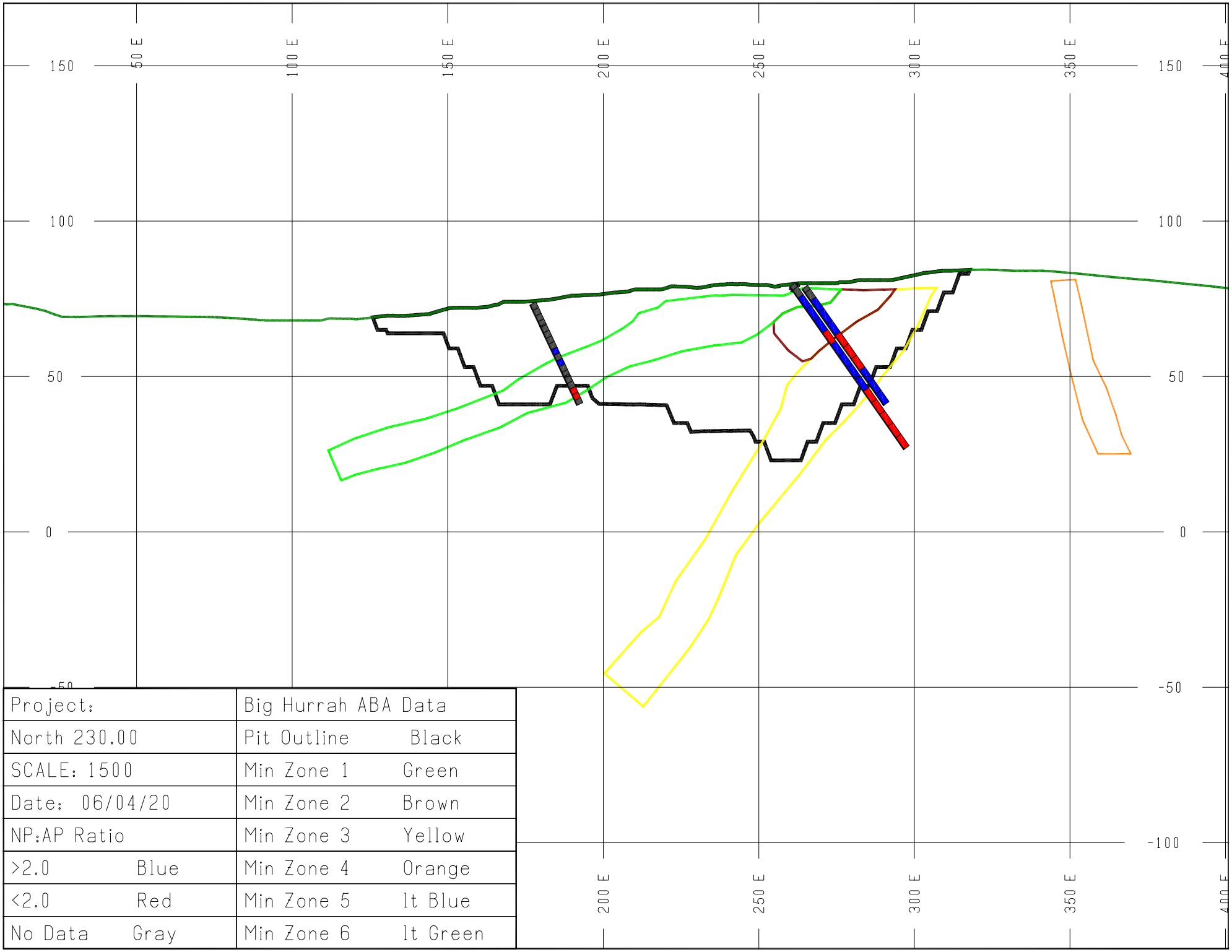
Project:		Big Hurrah ABA Data	
North 200.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



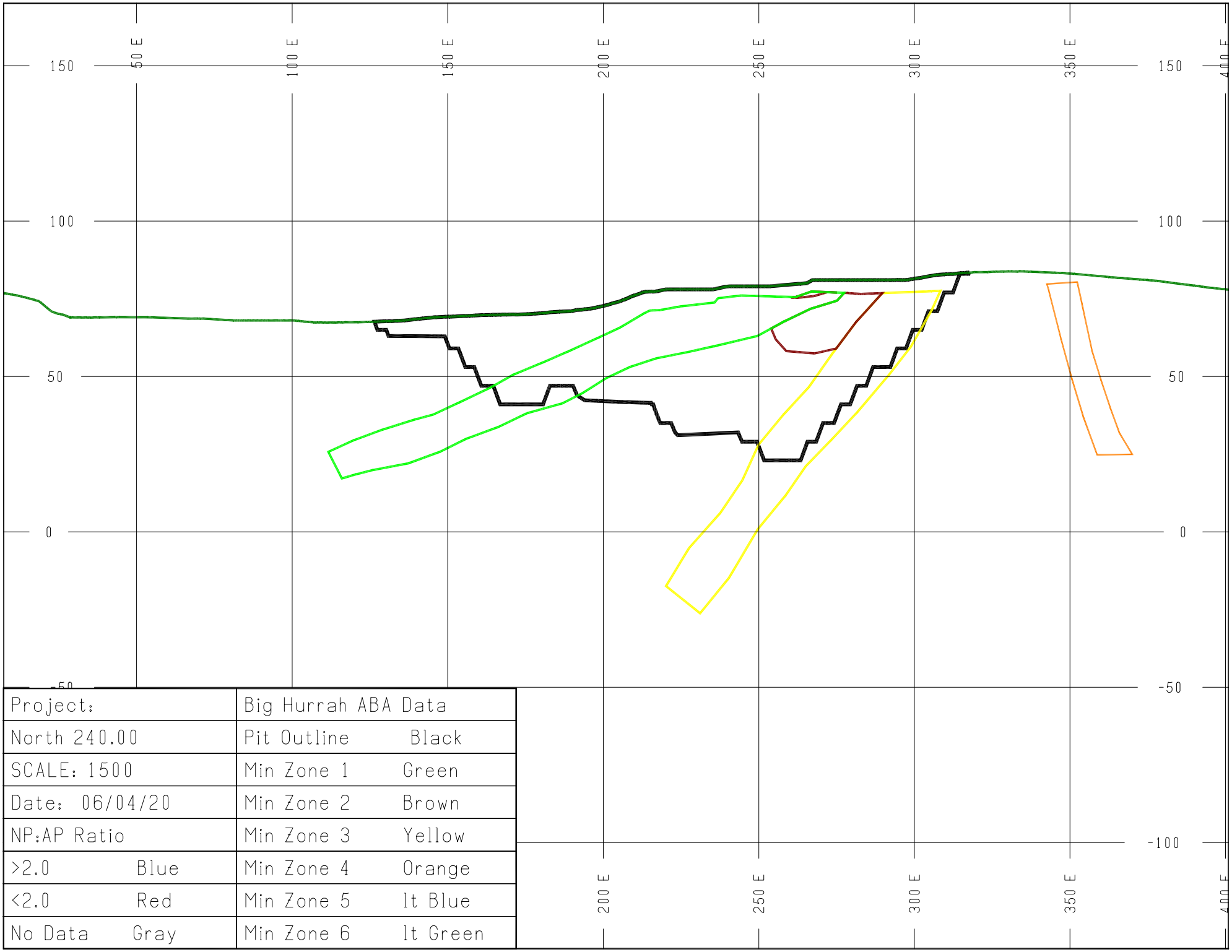
Project:		Big Hurrah ABA Data	
North 210.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



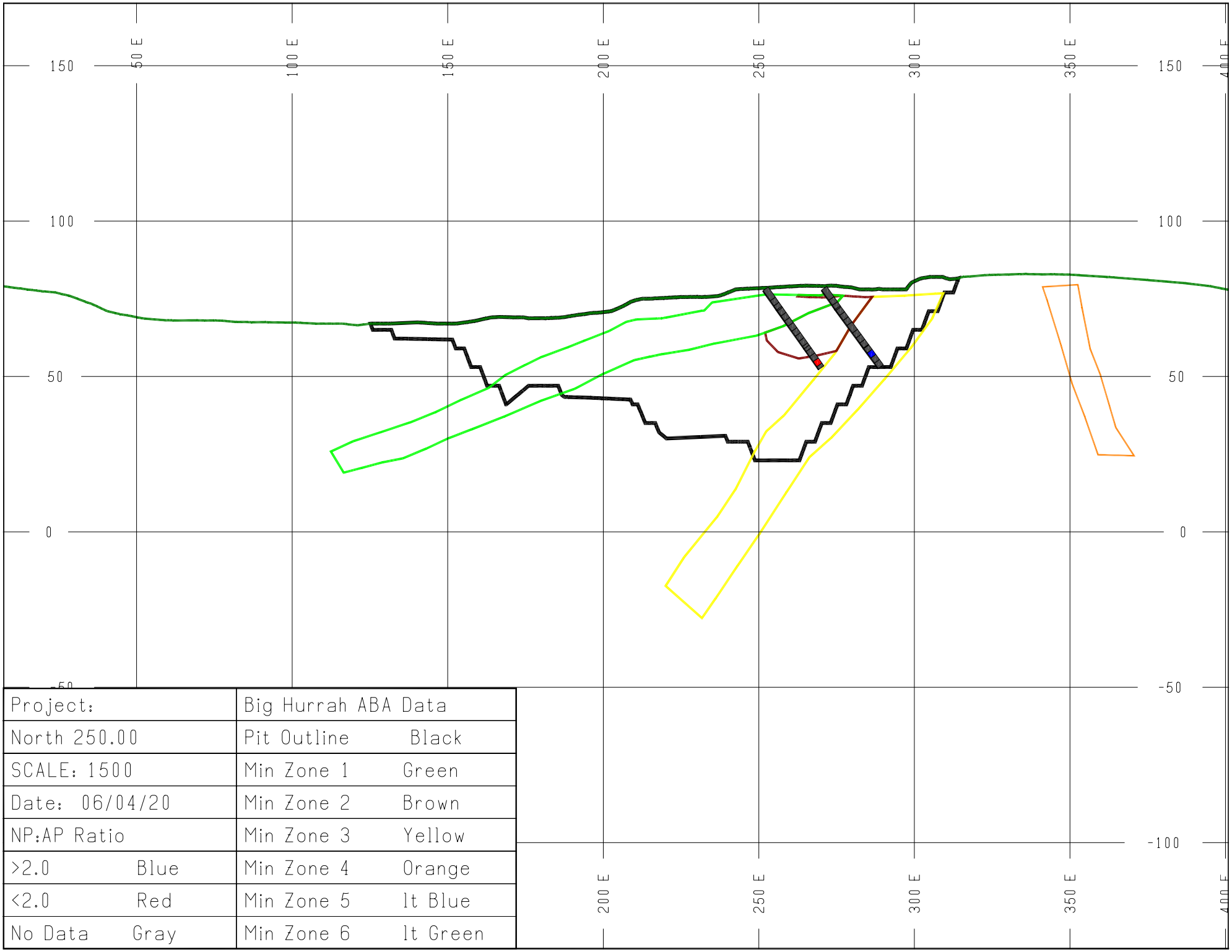
Project:		Big Hurrah ABA Data	
North 220.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



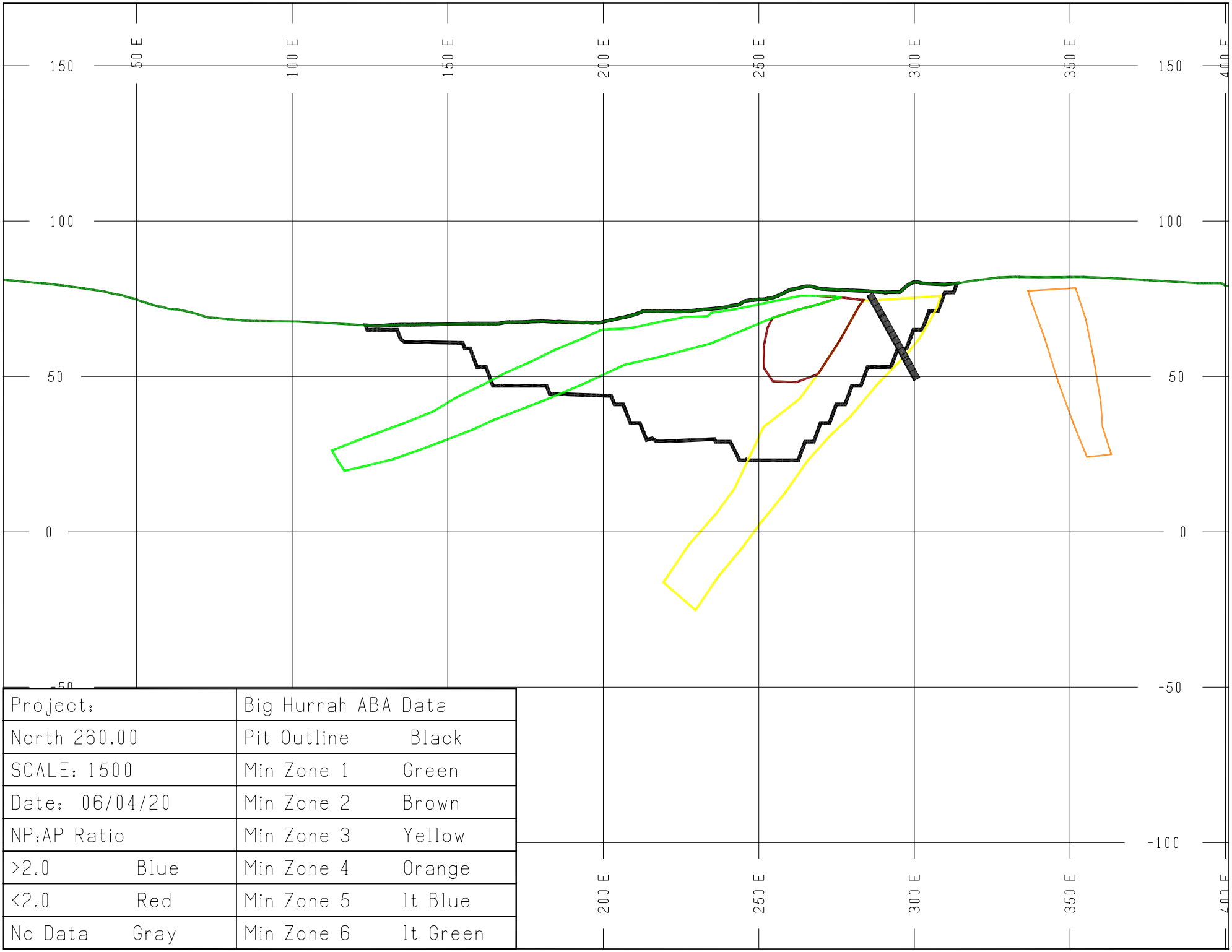
Project:		Big Hurrah ABA Data	
North 230.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



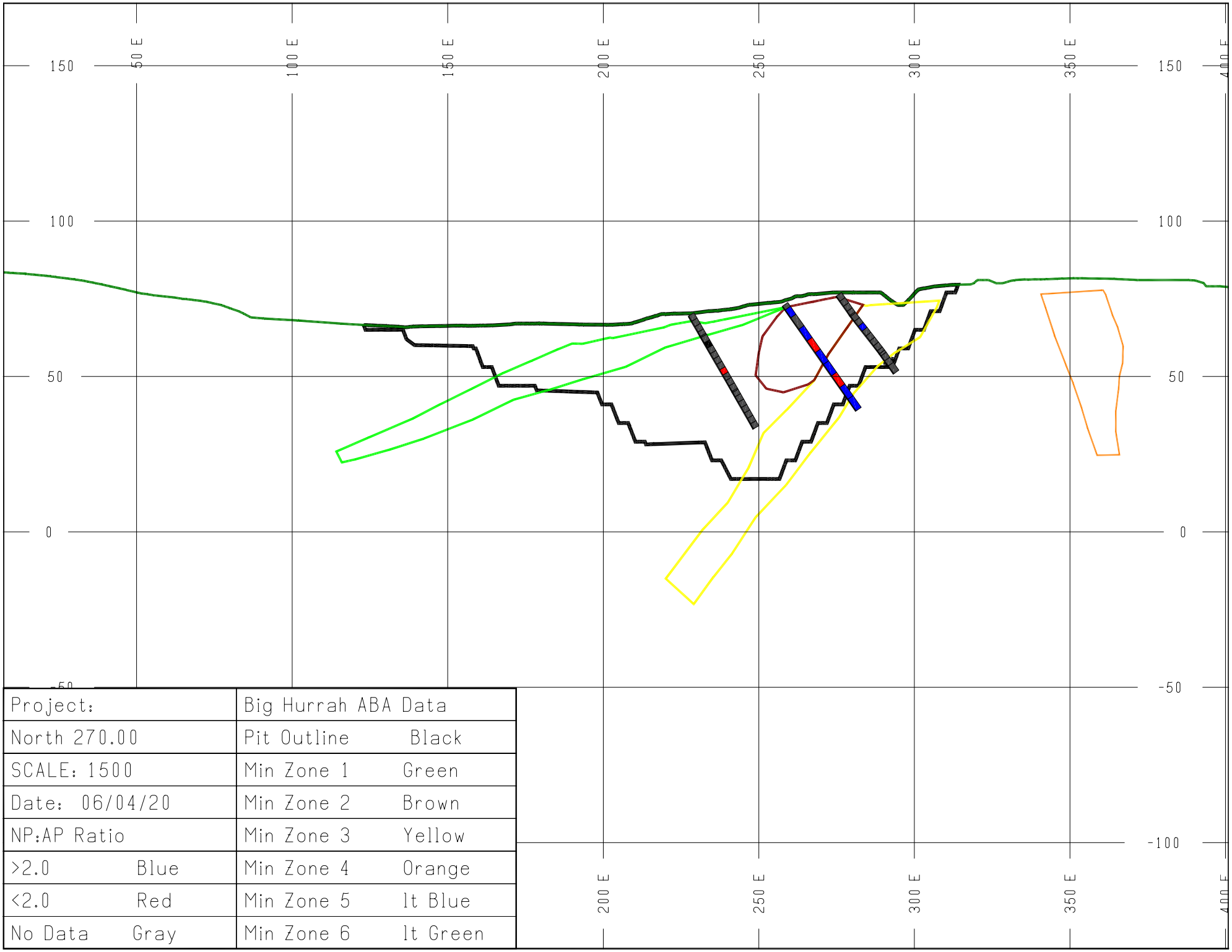
Project:		Big Hurrah ABA Data	
North 240.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



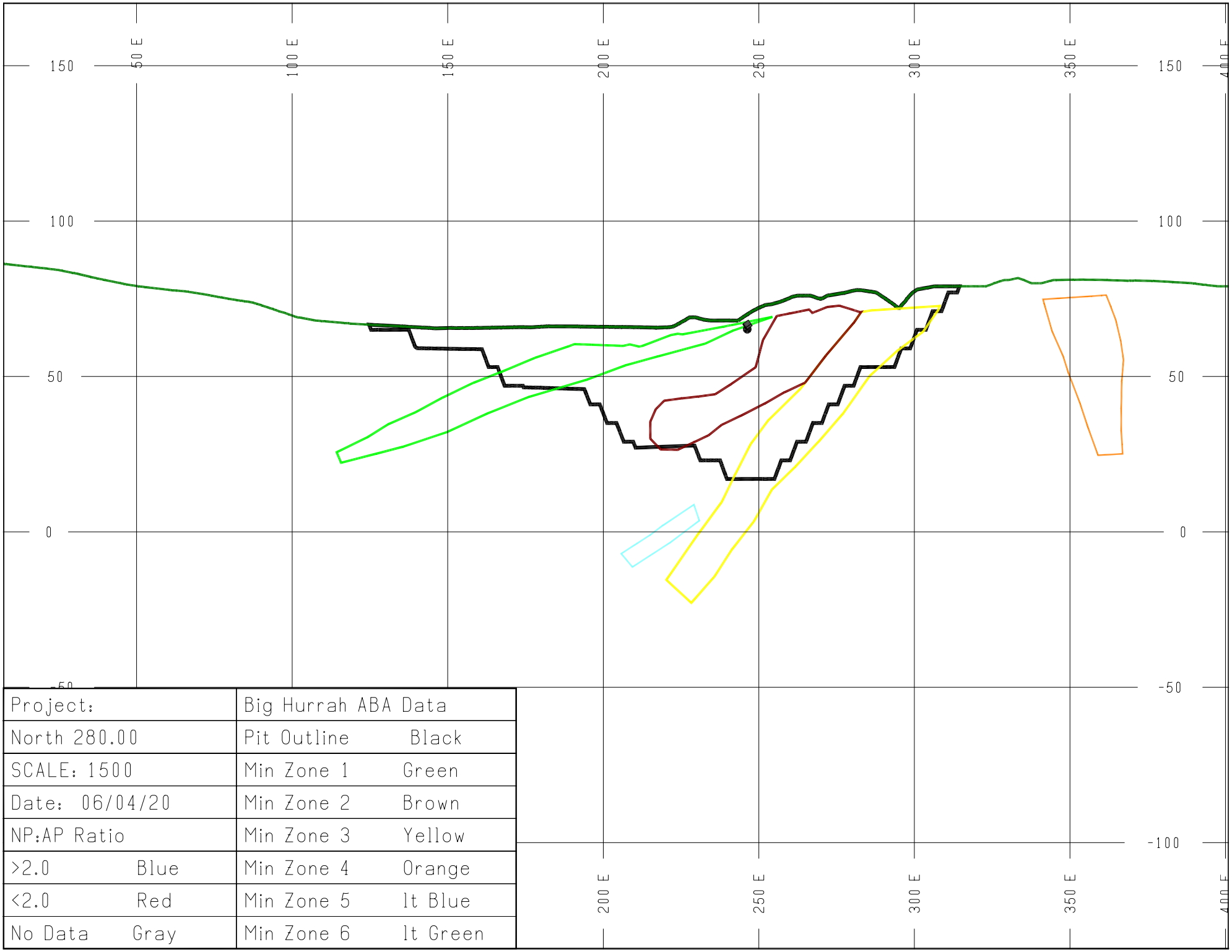
Project:		Big Hurrah ABA Data	
North 250.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



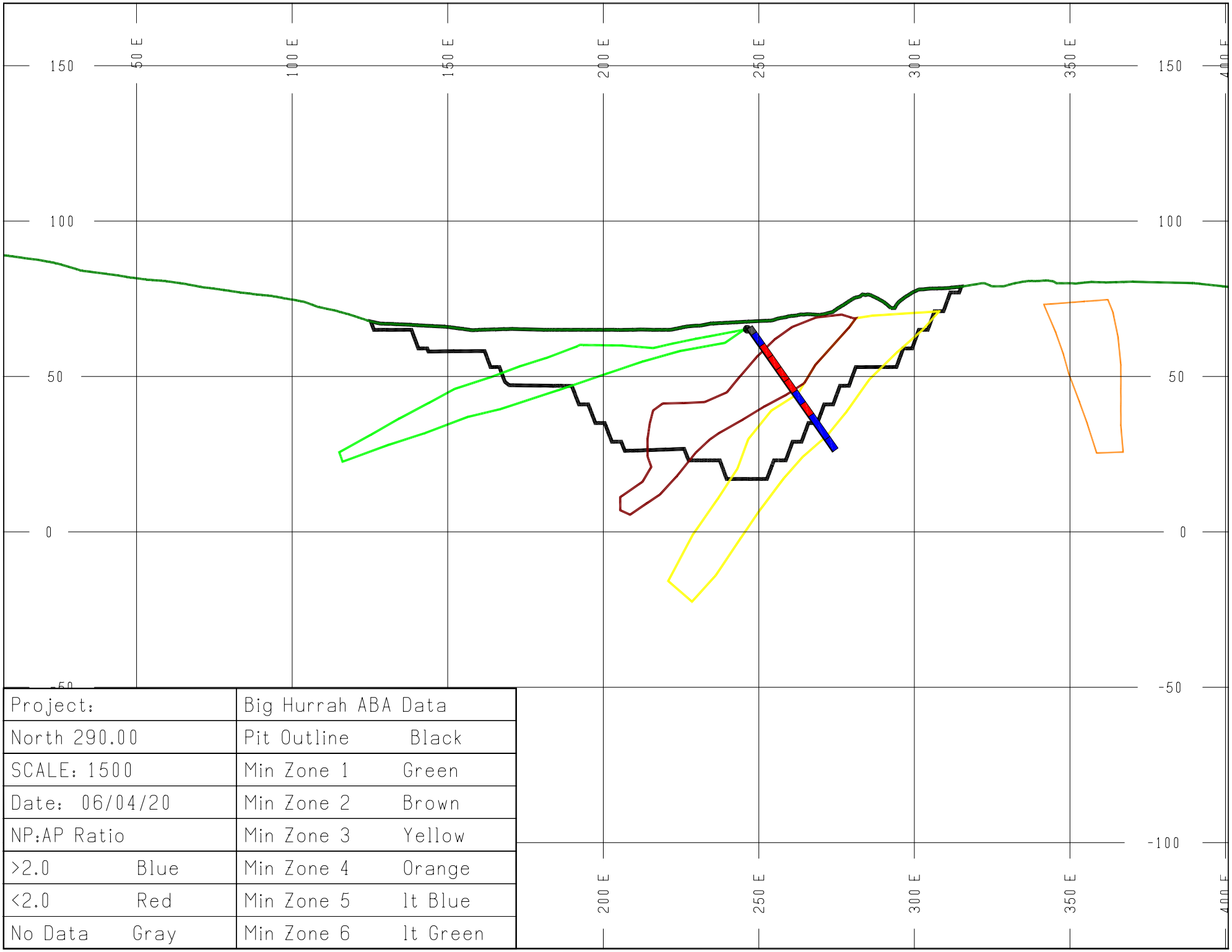
Project:		Big Hurrah ABA Data	
North 260.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



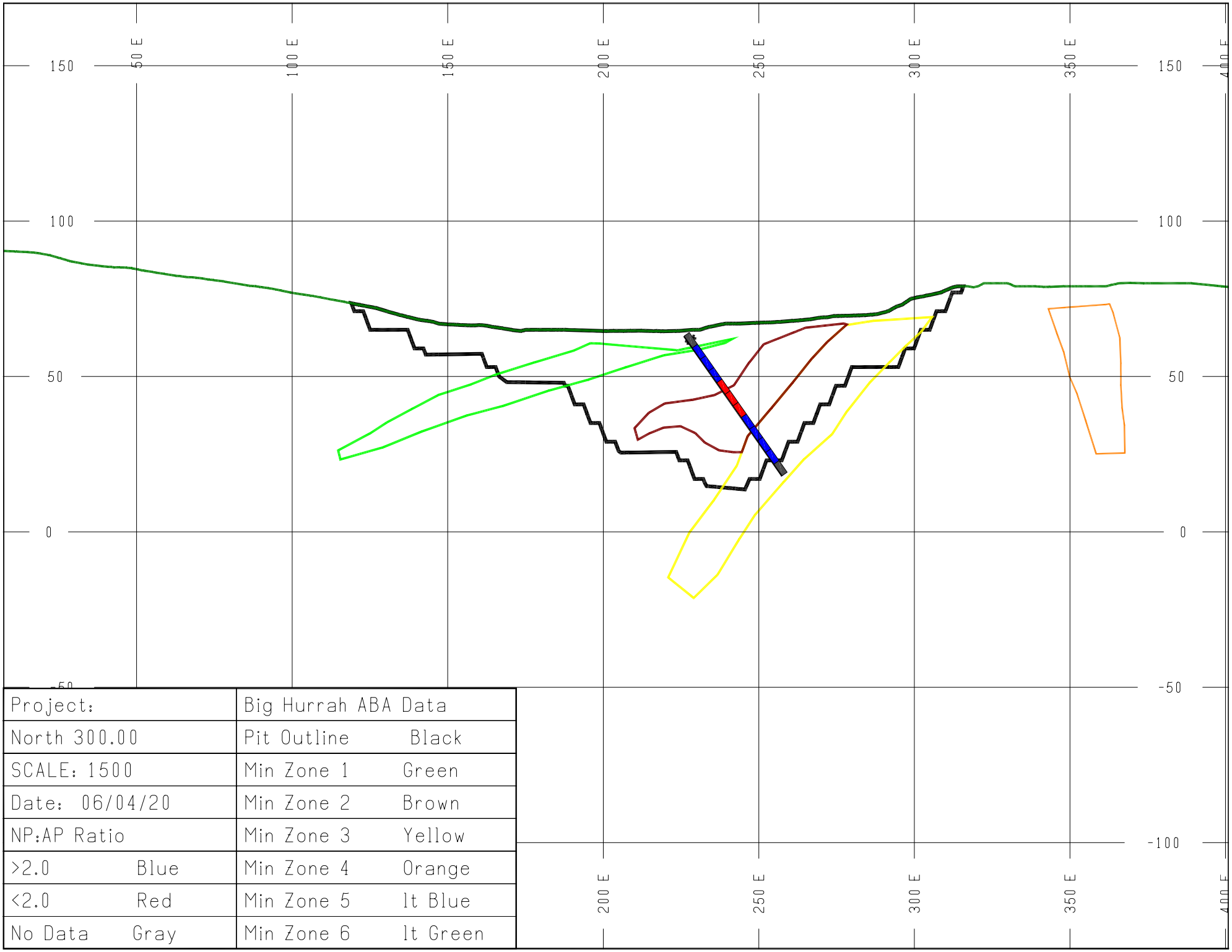
Project:		Big Hurrah ABA Data	
North 270.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



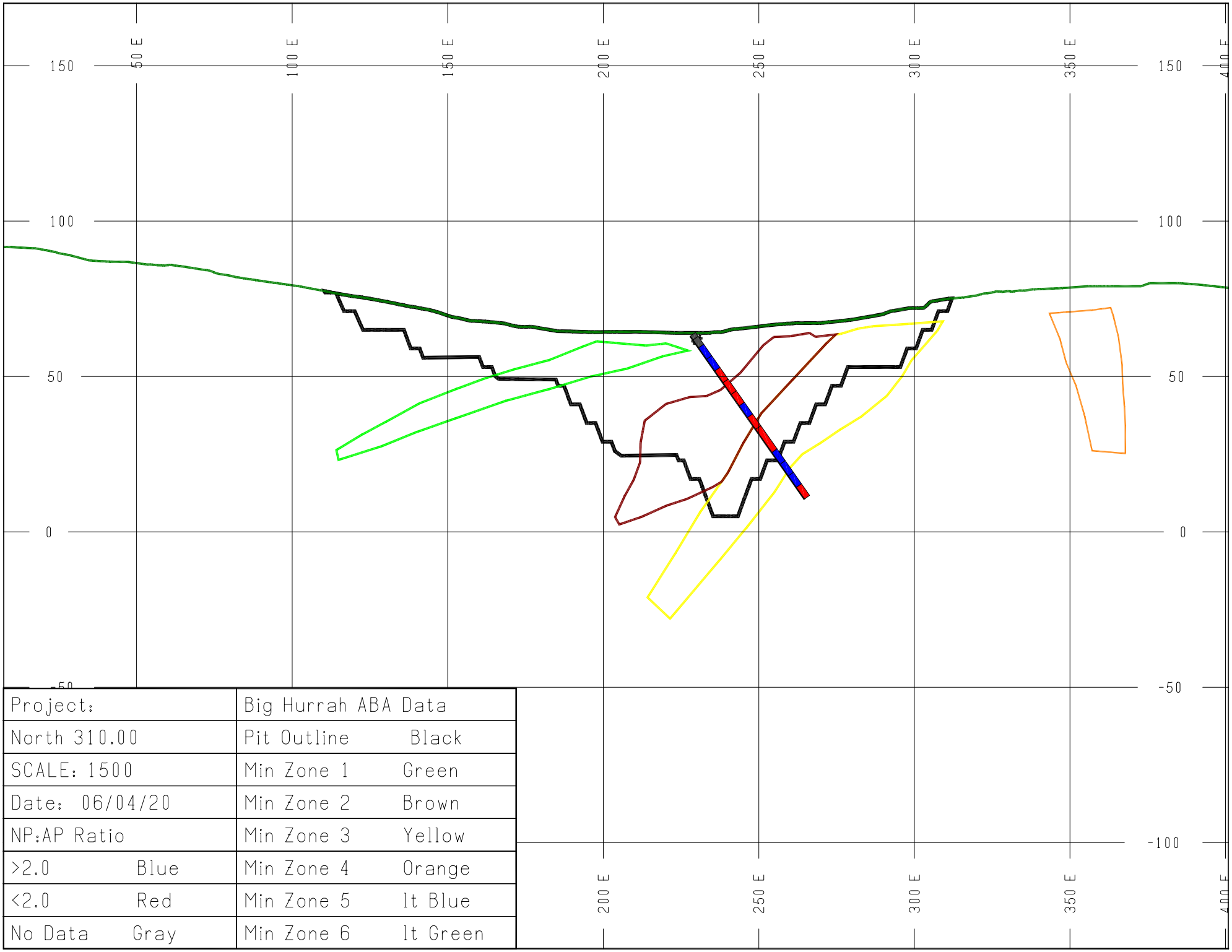
Project:		Big Hurrah ABA Data	
North 280.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



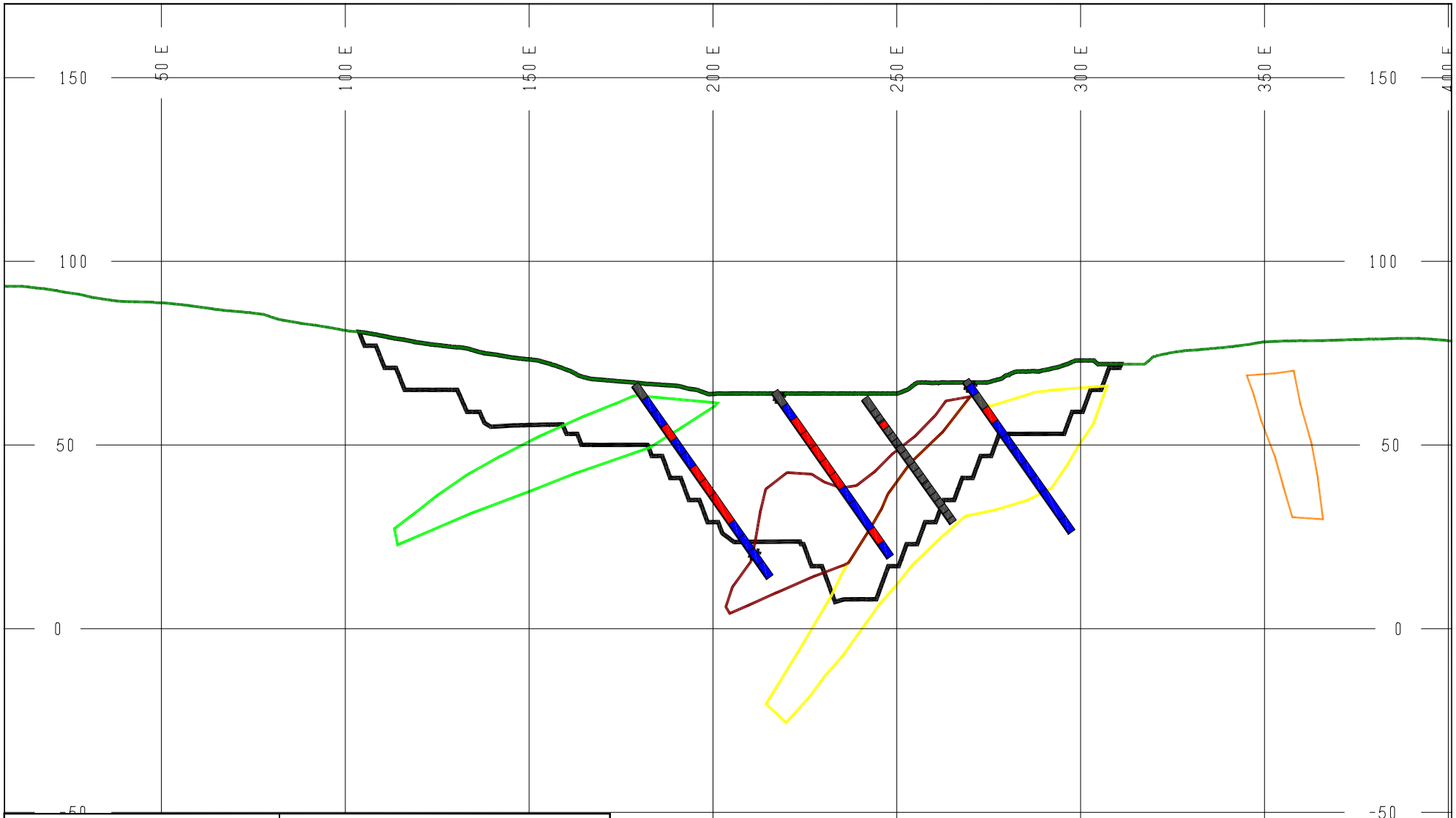
Project:		Big Hurrah ABA Data	
North 290.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



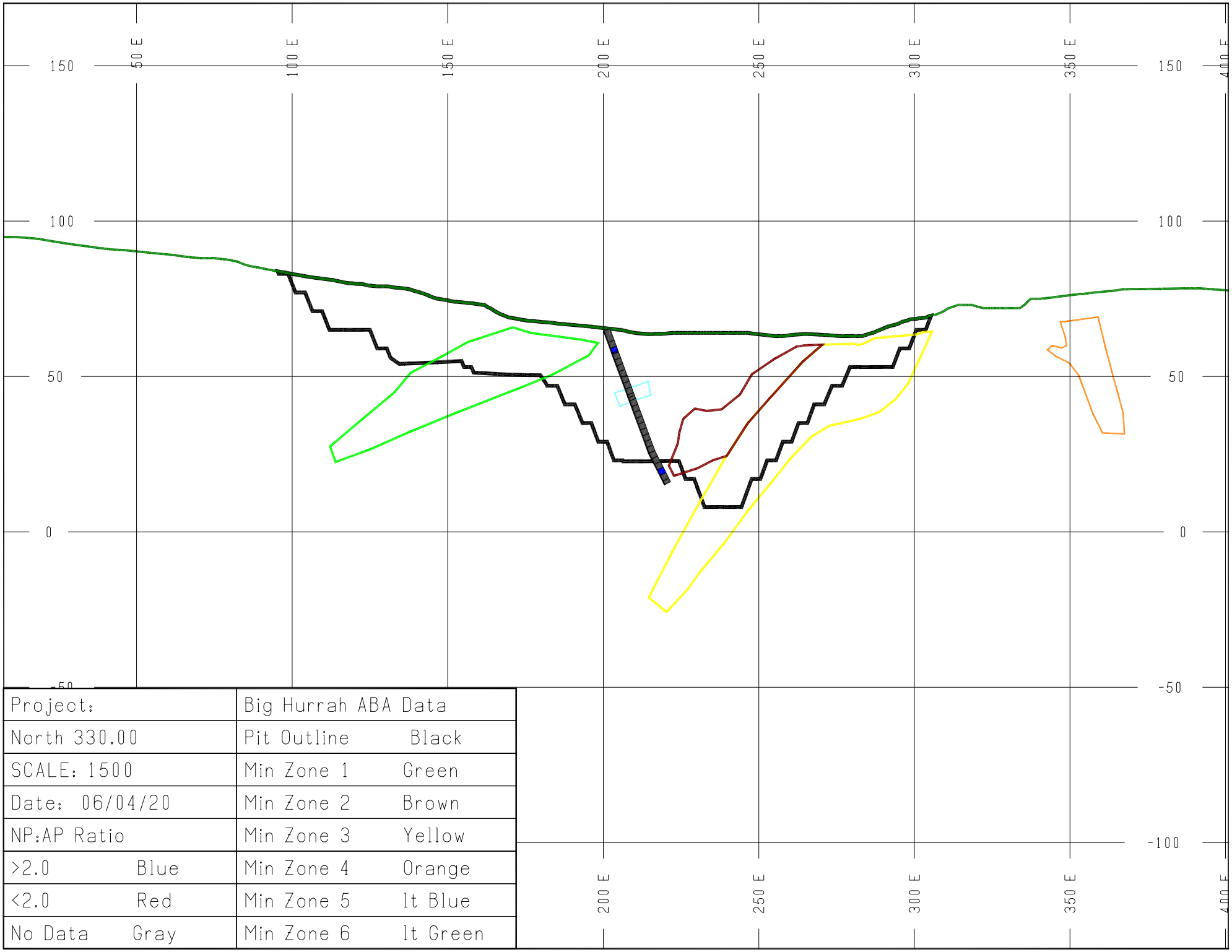
Project:		Big Hurrah ABA Data	
North 300.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



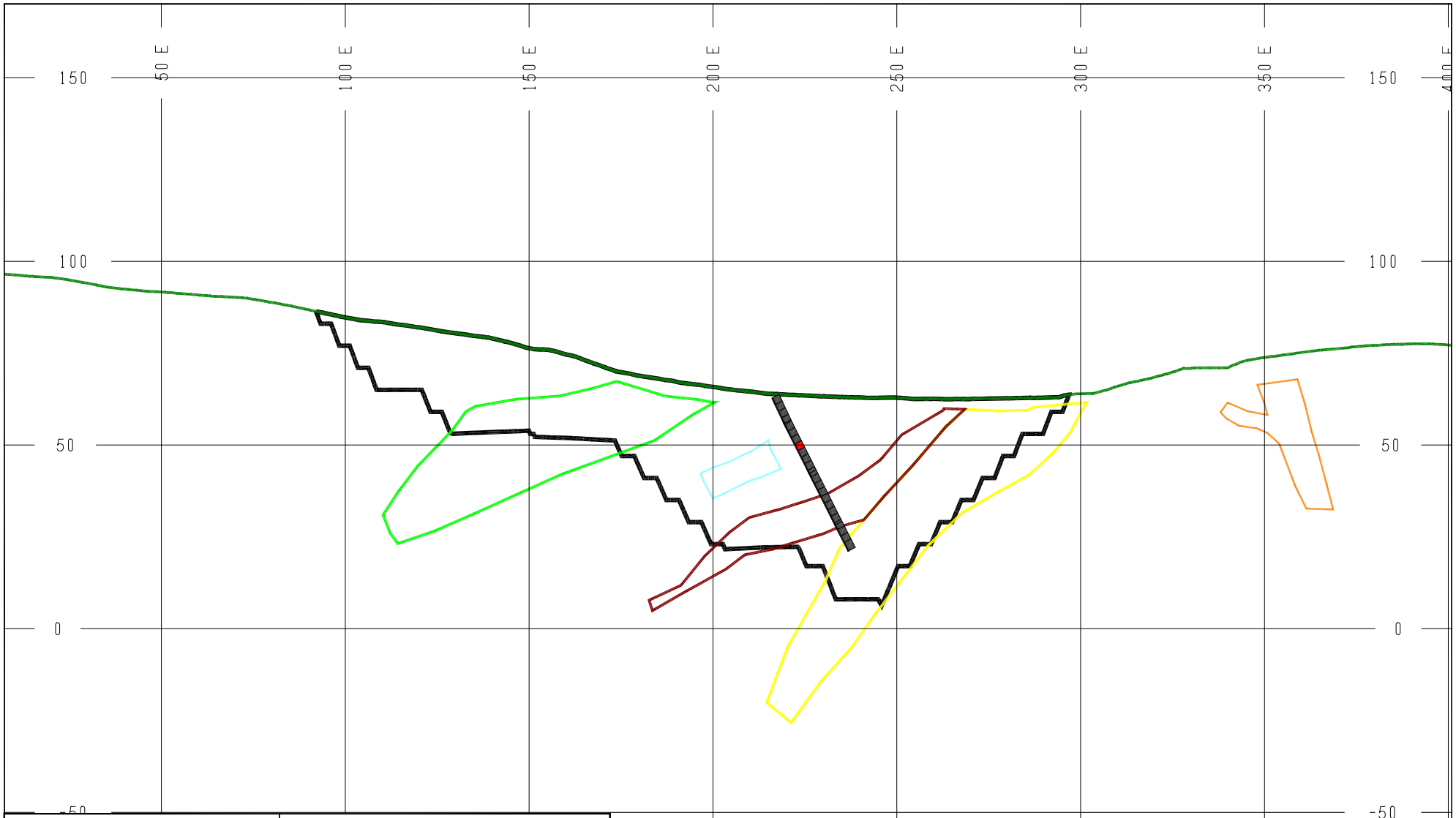
Project:		Big Hurrah ABA Data	
North 310.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



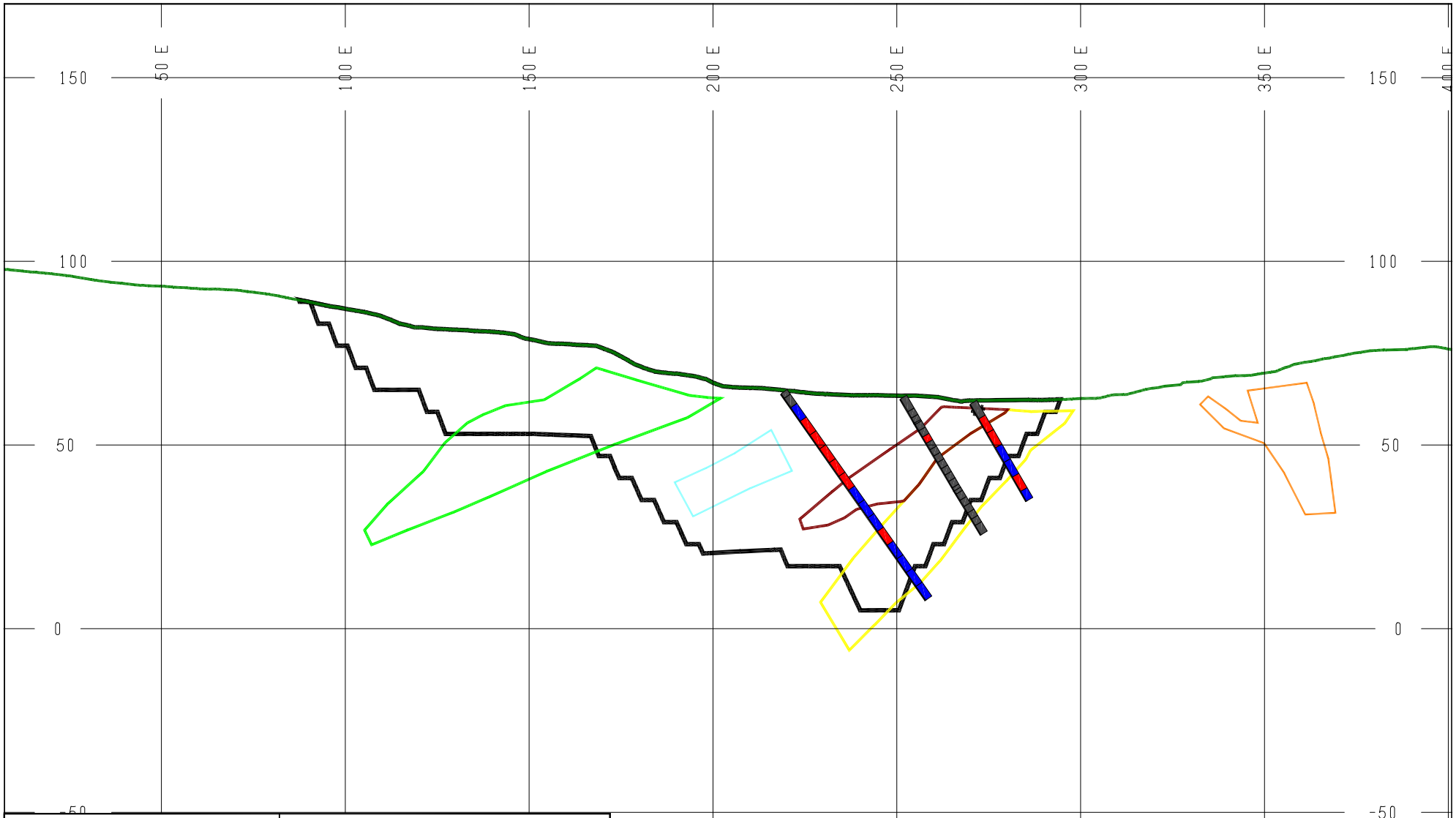
Project:		Big Hurrah ABA Data	
North 320.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



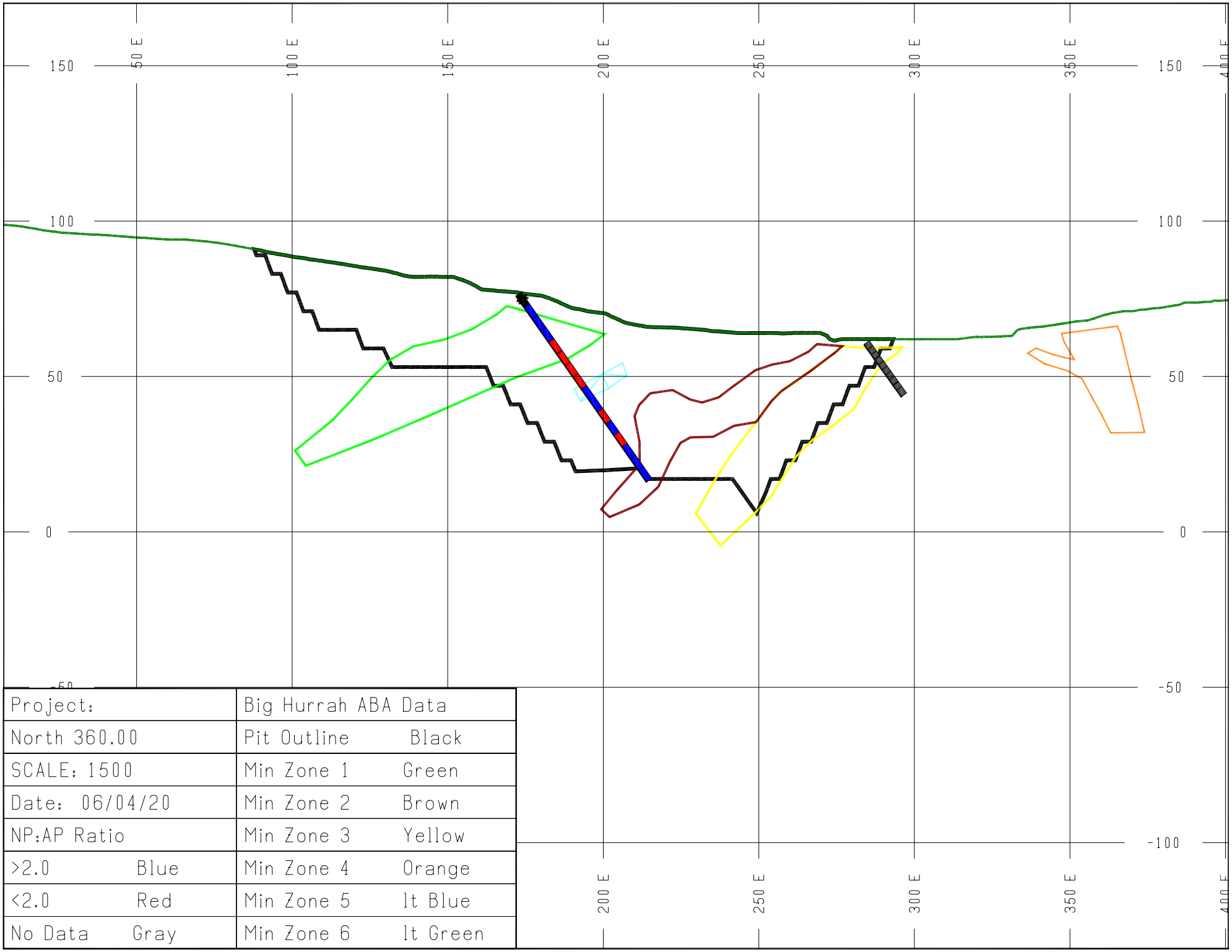
Project:	Big Hurrah ABA Data
North 330.00	Pit Outline Black
SCALE: 1500	Min Zone 1 Green
Date: 06/04/20	Min Zone 2 Brown
NP:AP Ratio	Min Zone 3 Yellow
>2.0 Blue	Min Zone 4 Orange
<2.0 Red	Min Zone 5 lt Blue
No Data Gray	Min Zone 6 lt Green



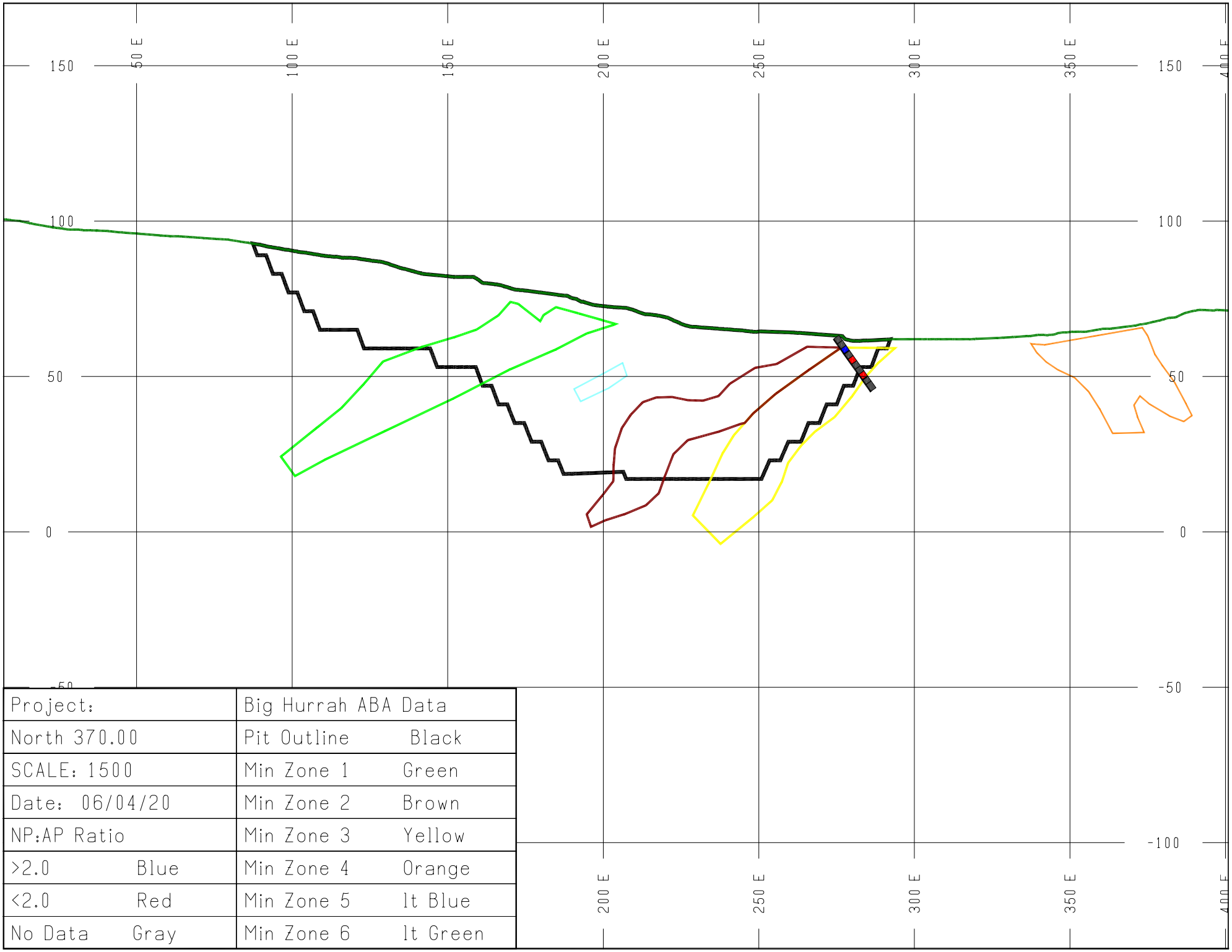
Project:		Big Hurrah ABA Data	
North 340.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



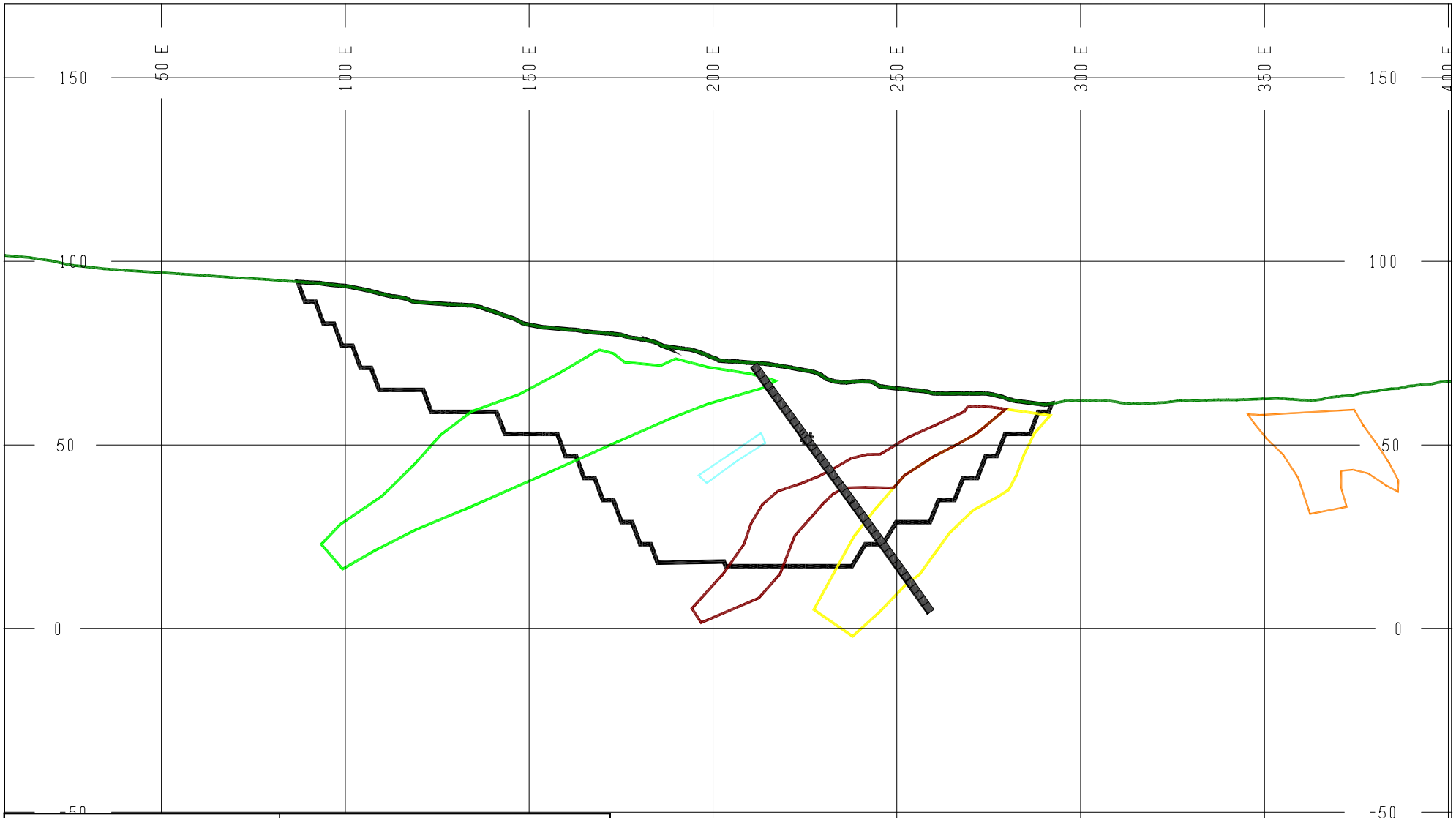
Project:		Big Hurrah ABA Data	
North 350.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



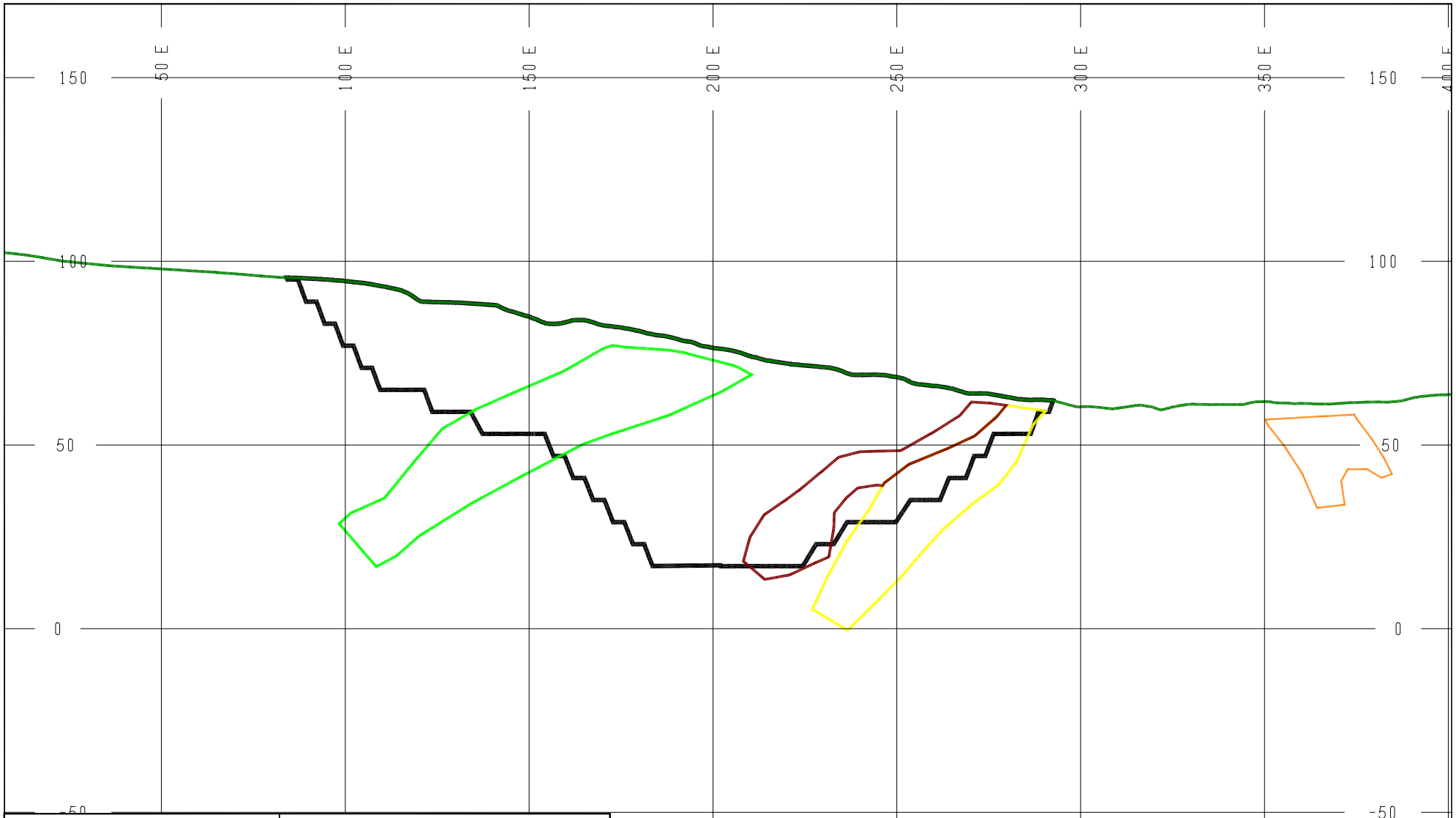
Project:		Big Hurrah ABA Data	
North 360.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



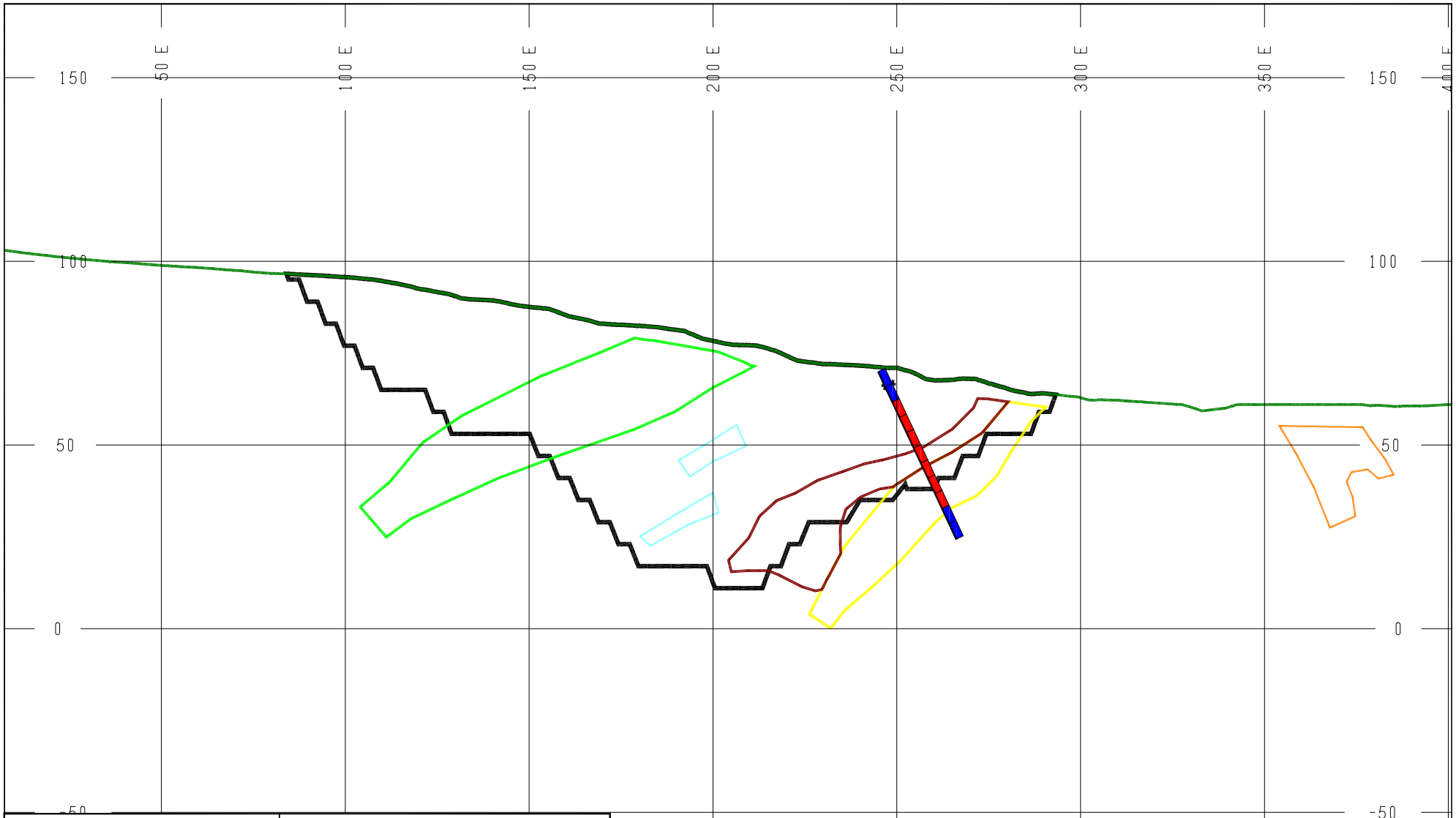
Project:		Big Hurrah ABA Data	
North 370.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



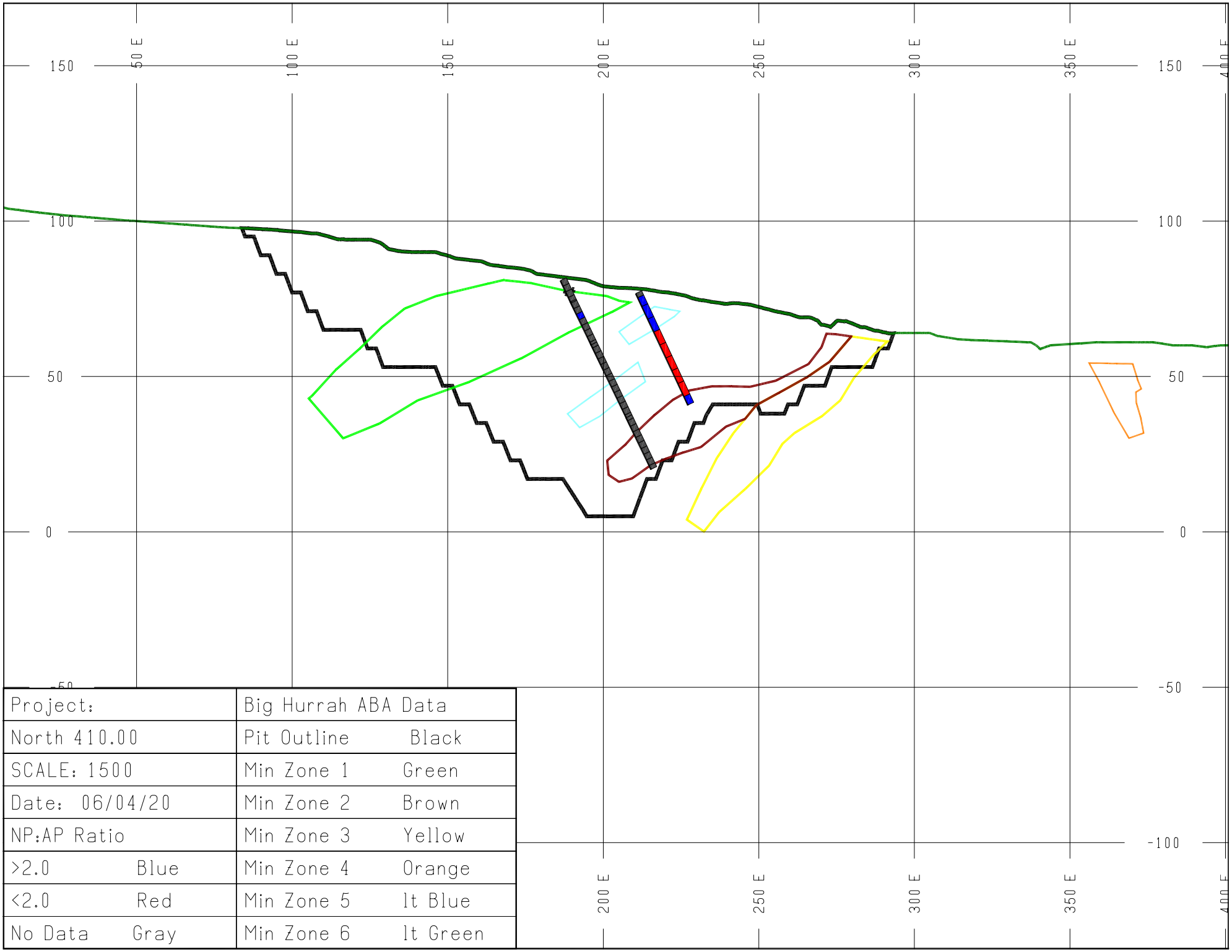
Project:	Big Hurrah ABA Data
North 380.00	Pit Outline Black
SCALE: 1500	Min Zone 1 Green
Date: 06/04/20	Min Zone 2 Brown
NP:AP Ratio	Min Zone 3 Yellow
>2.0 Blue	Min Zone 4 Orange
<2.0 Red	Min Zone 5 lt Blue
No Data Gray	Min Zone 6 lt Green



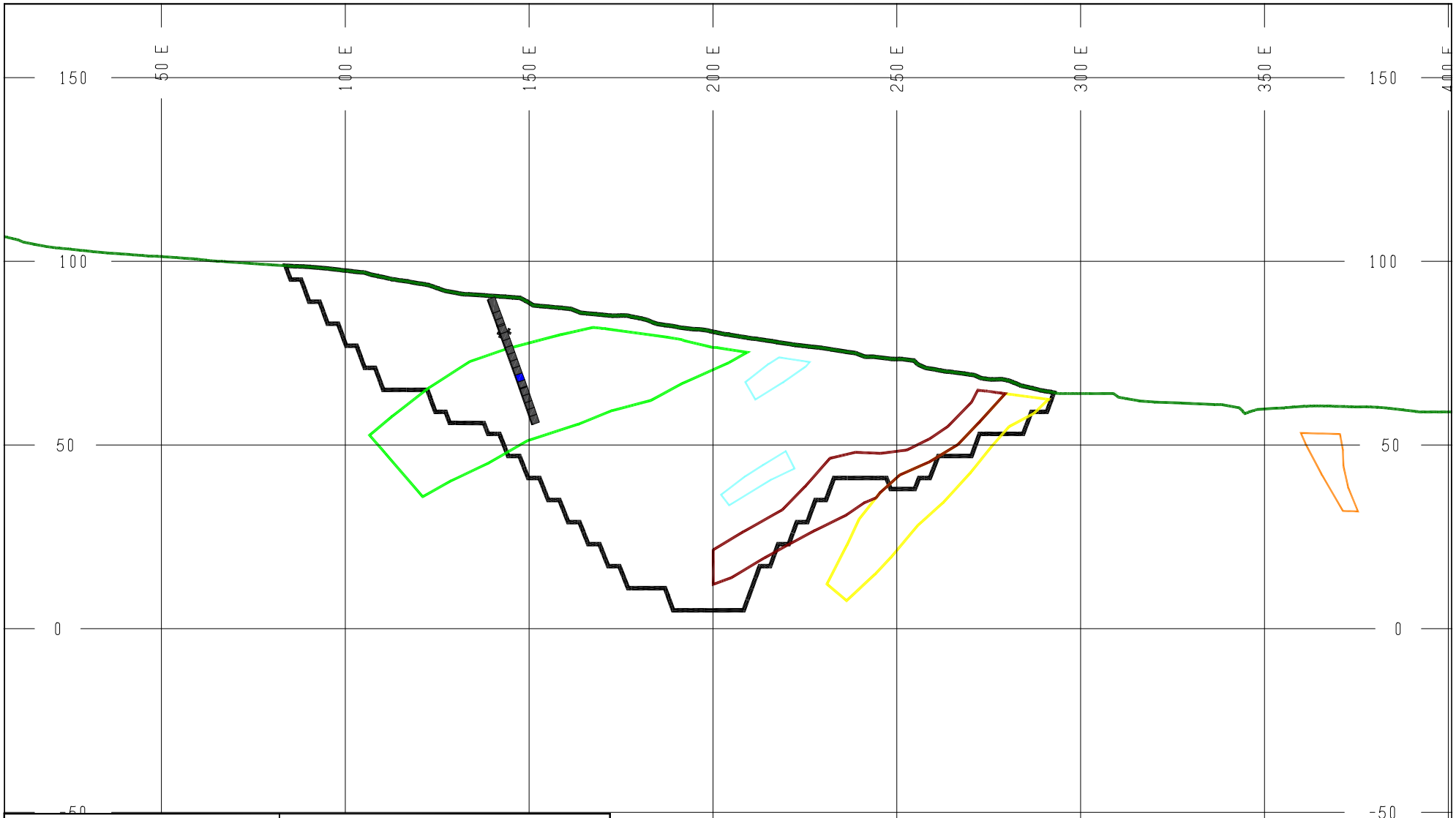
Project:		Big Hurrah ABA Data	
North 390.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



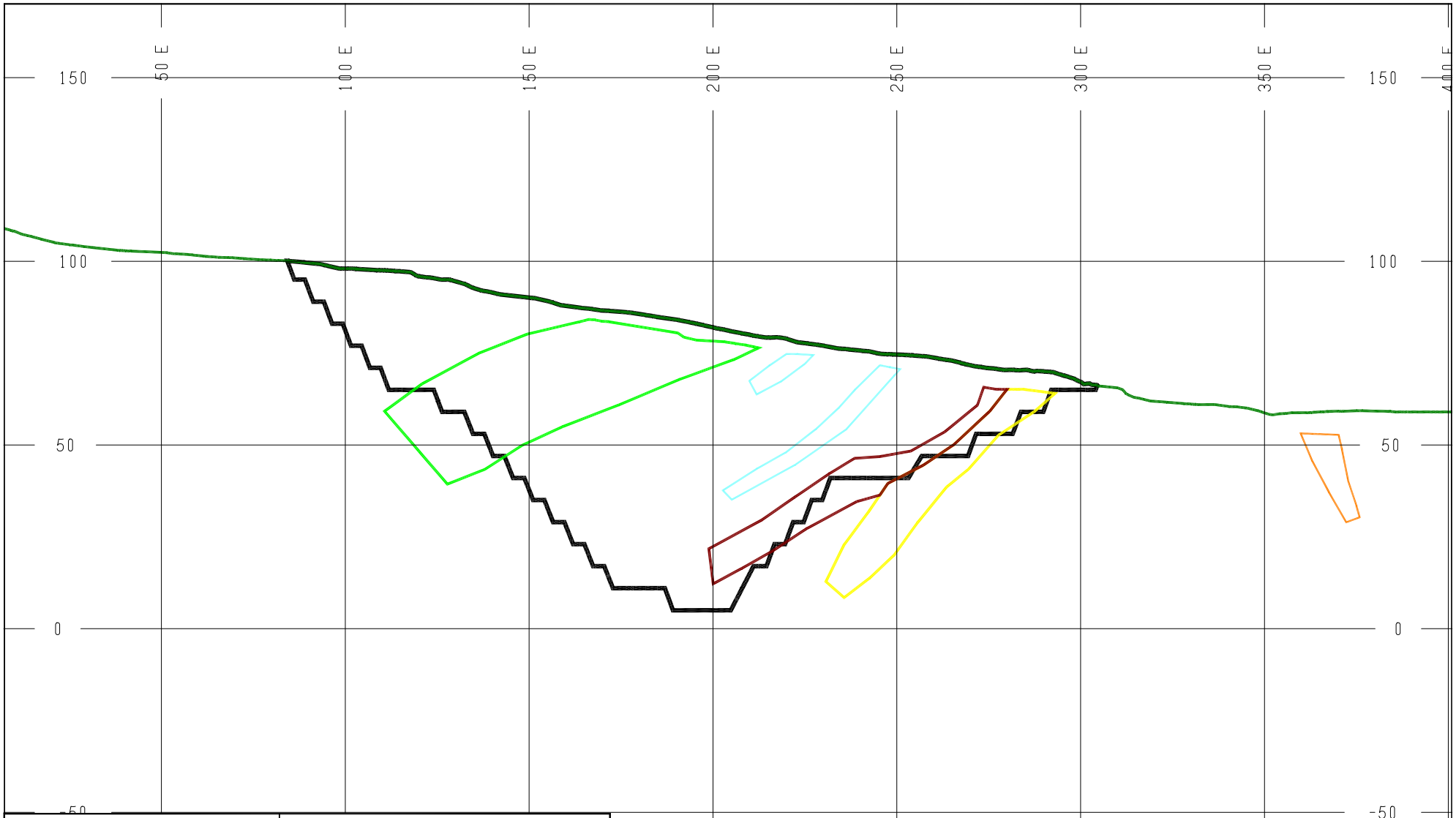
Project:		Big Hurrah ABA Data	
North 400.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



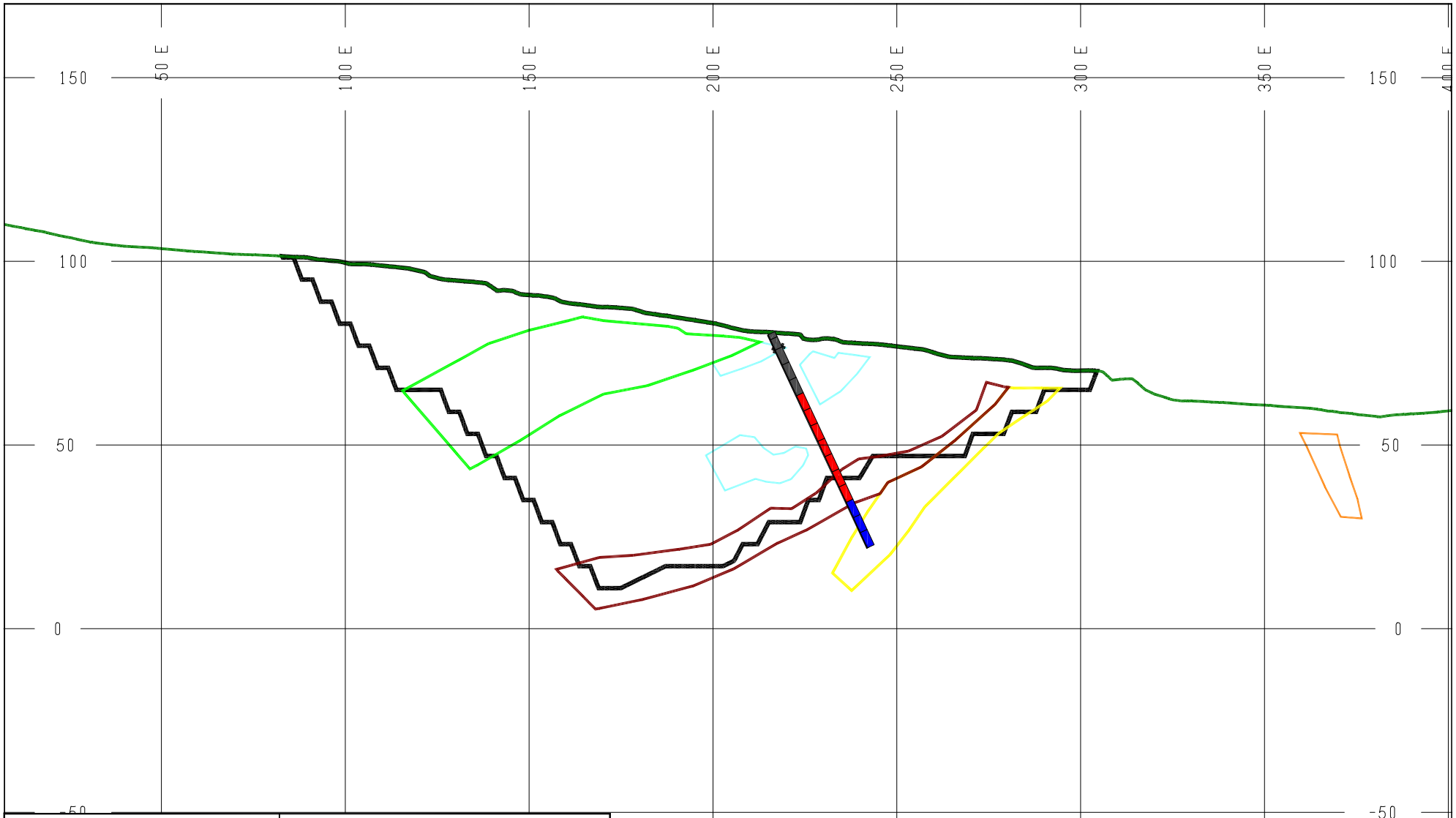
Project:		Big Hurrah ABA Data	
North 410.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



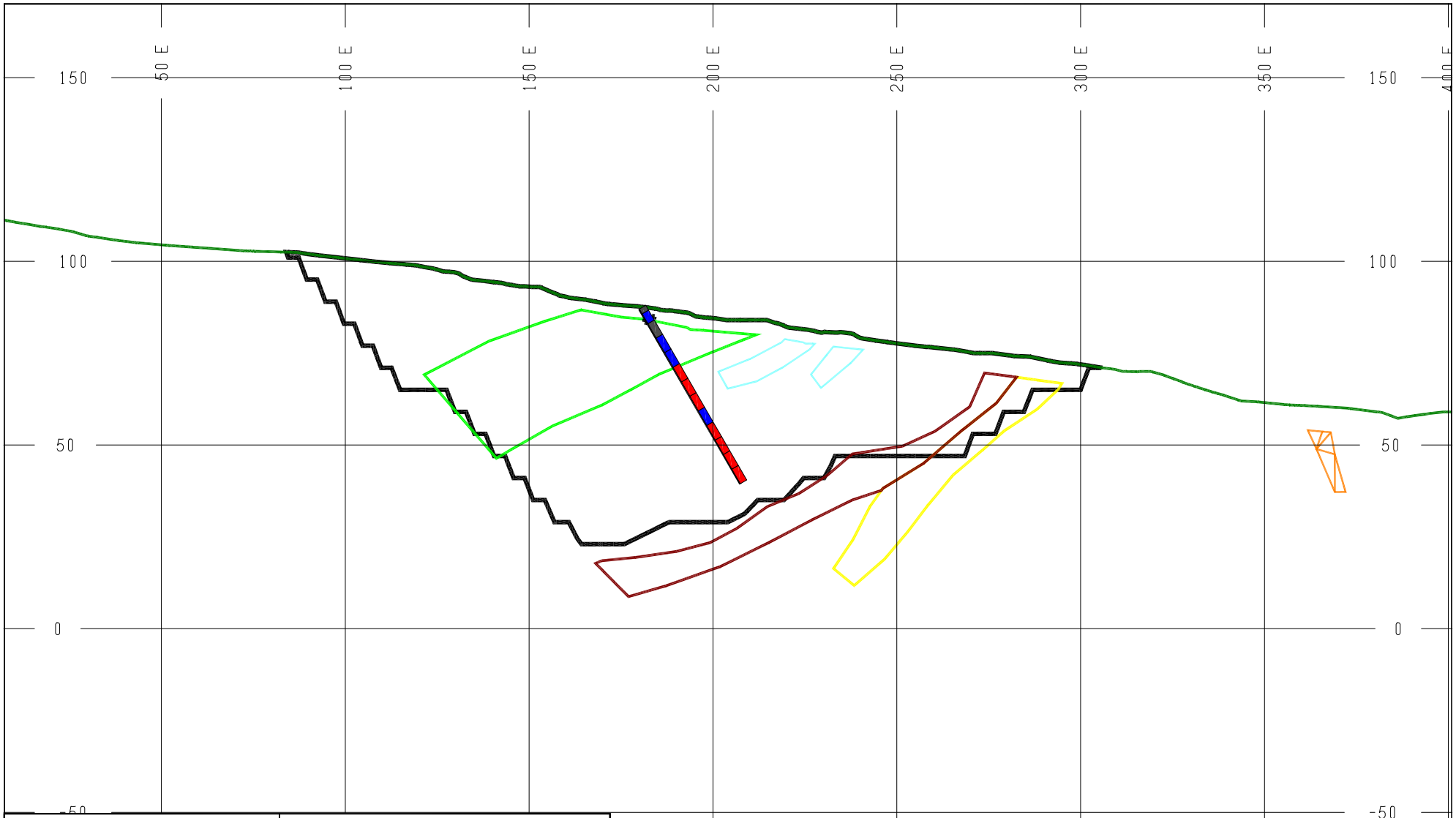
Project:		Big Hurrah ABA Data	
North 420.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



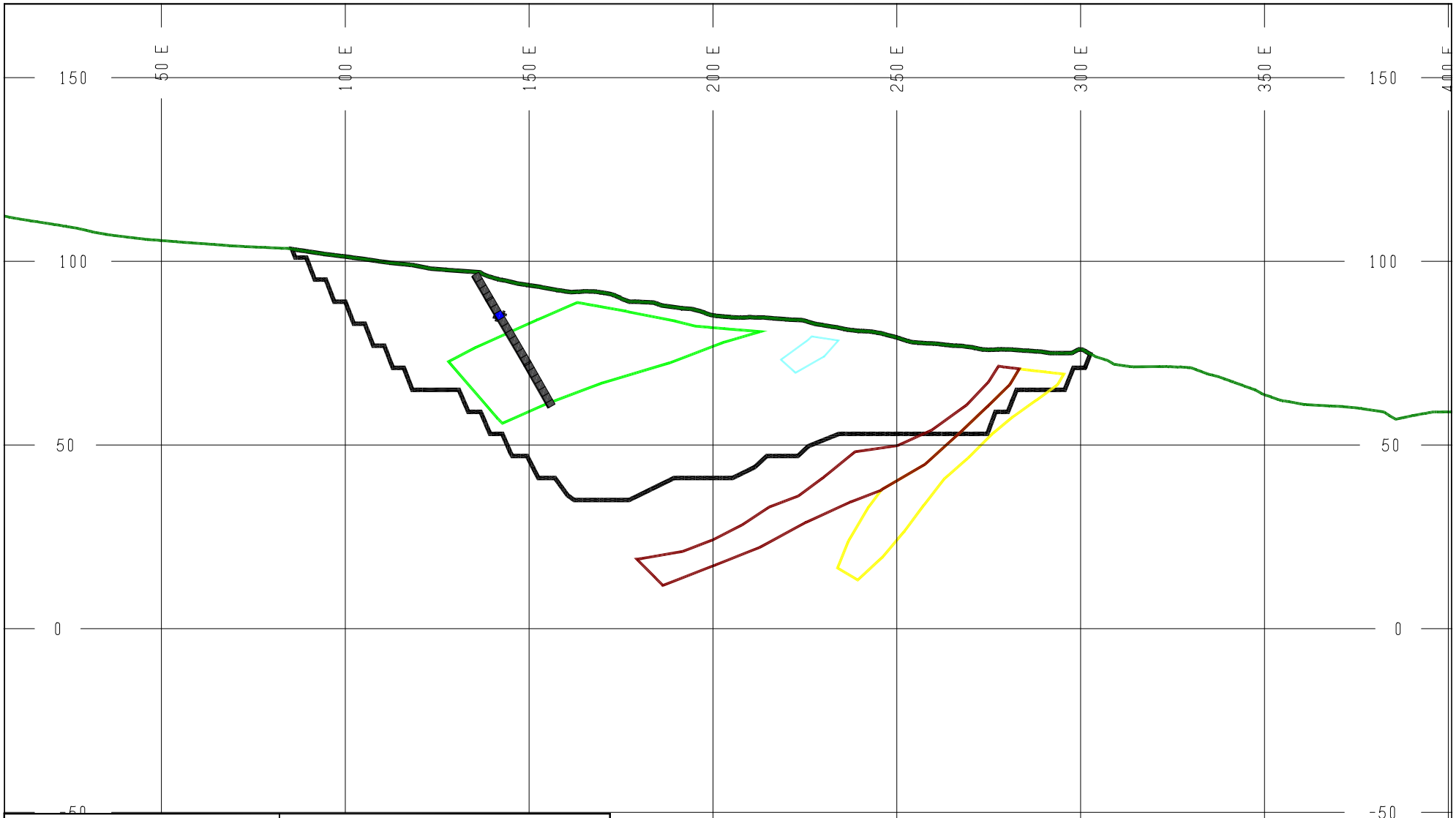
Project:		Big Hurrah ABA Data	
North 430.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



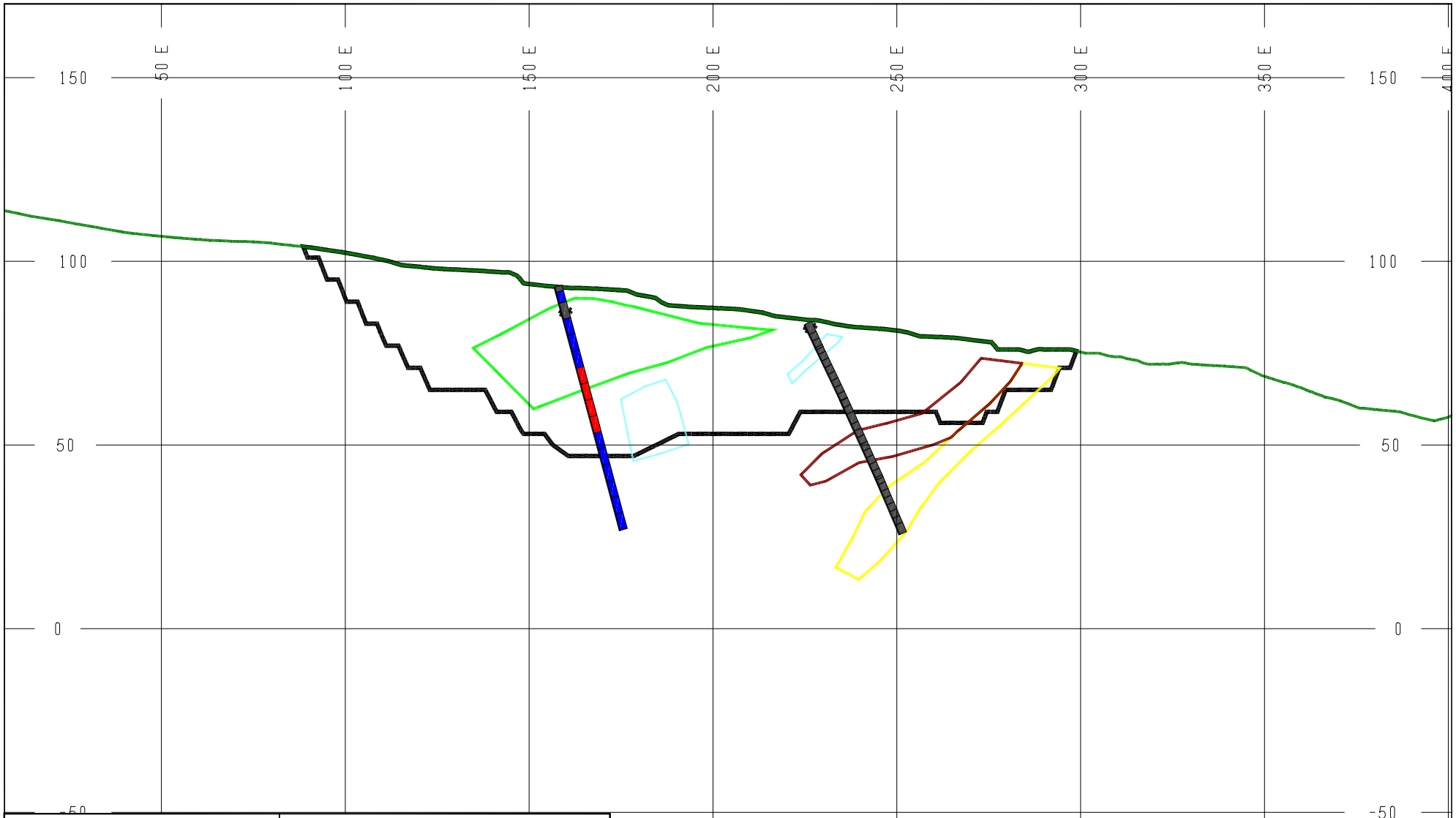
Project:		Big Hurrah ABA Data	
North 440.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



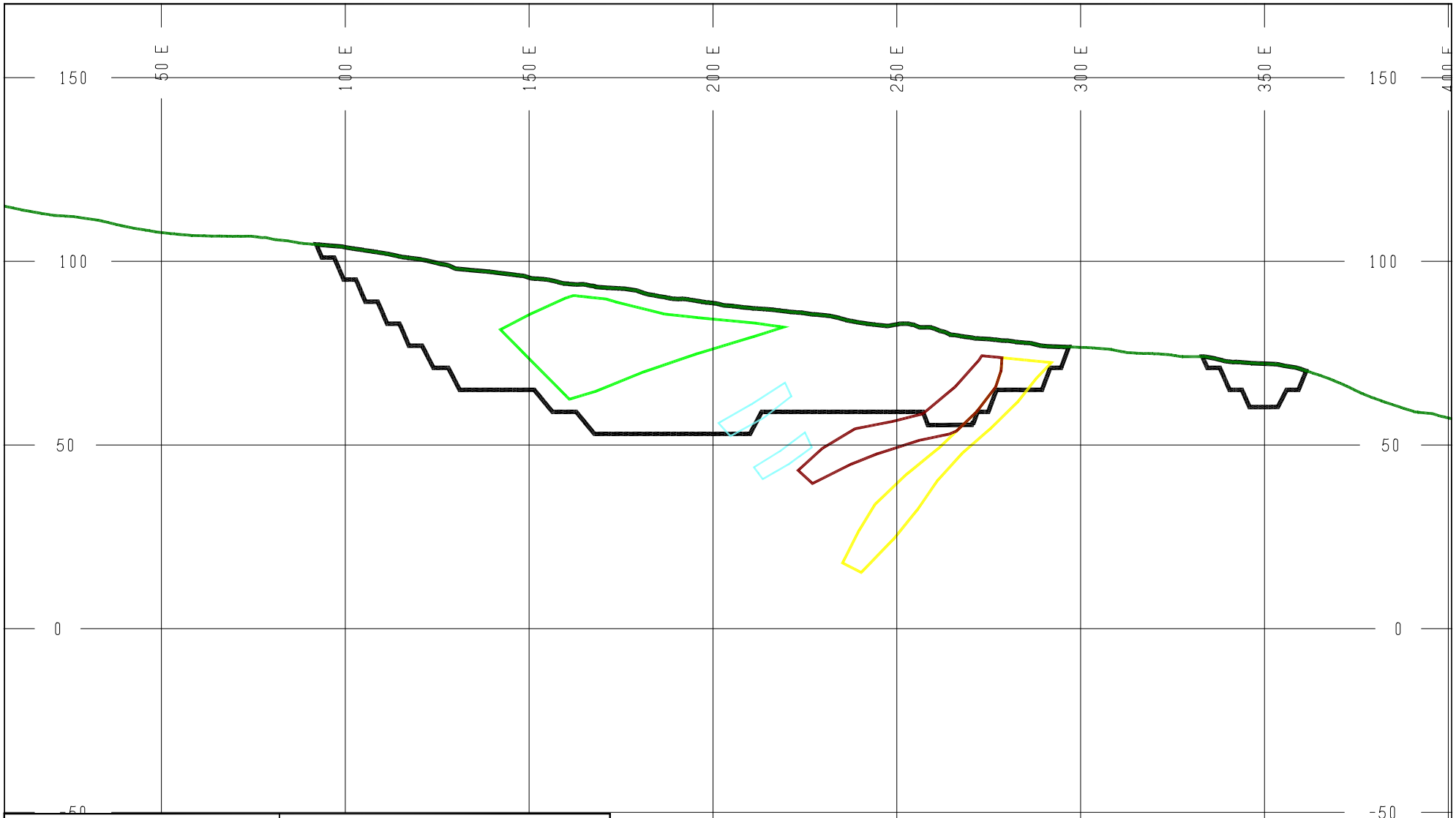
Project:		Big Hurrah ABA Data	
North 450.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



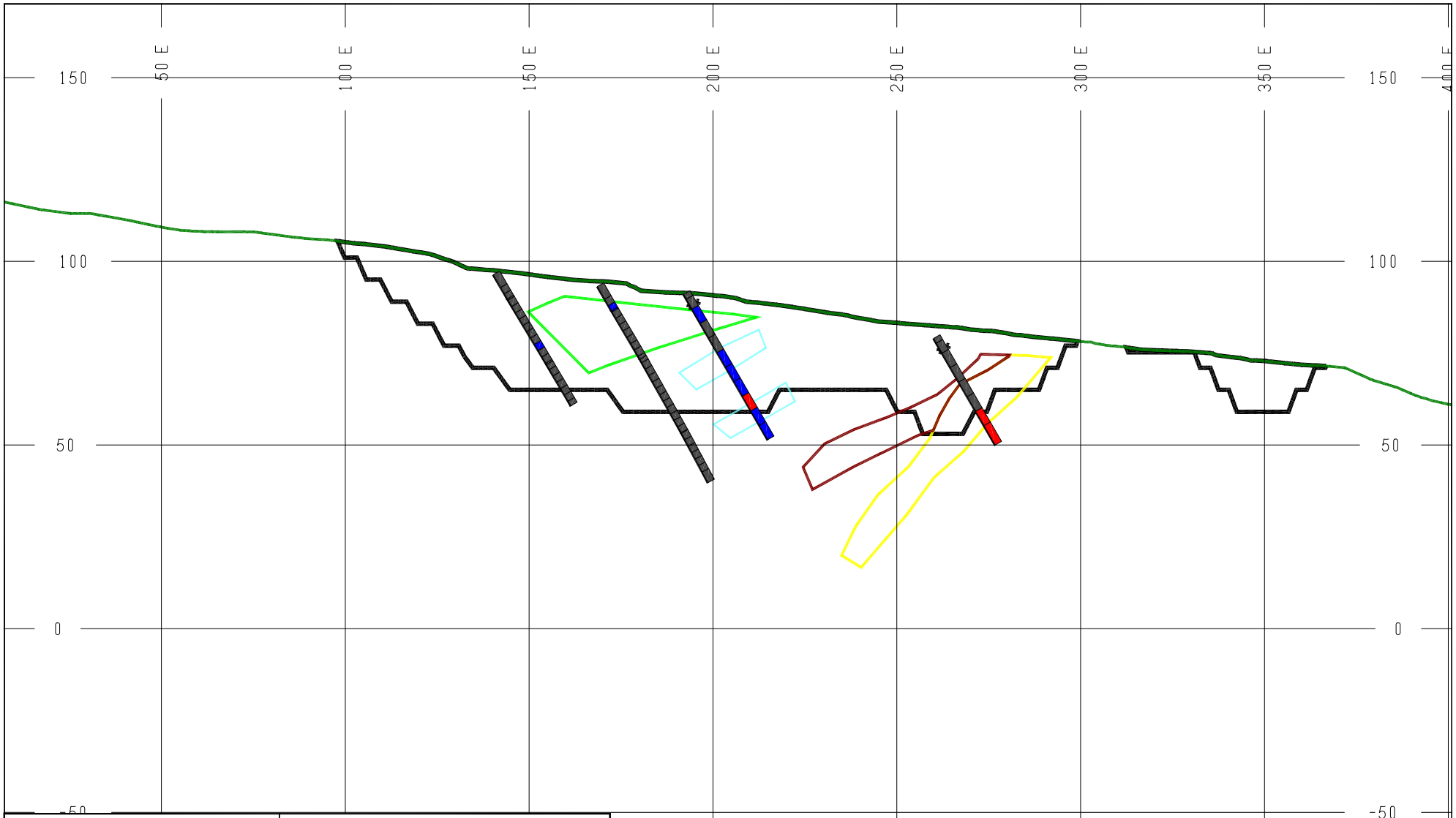
Project:		Big Hurrah ABA Data	
North 460.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



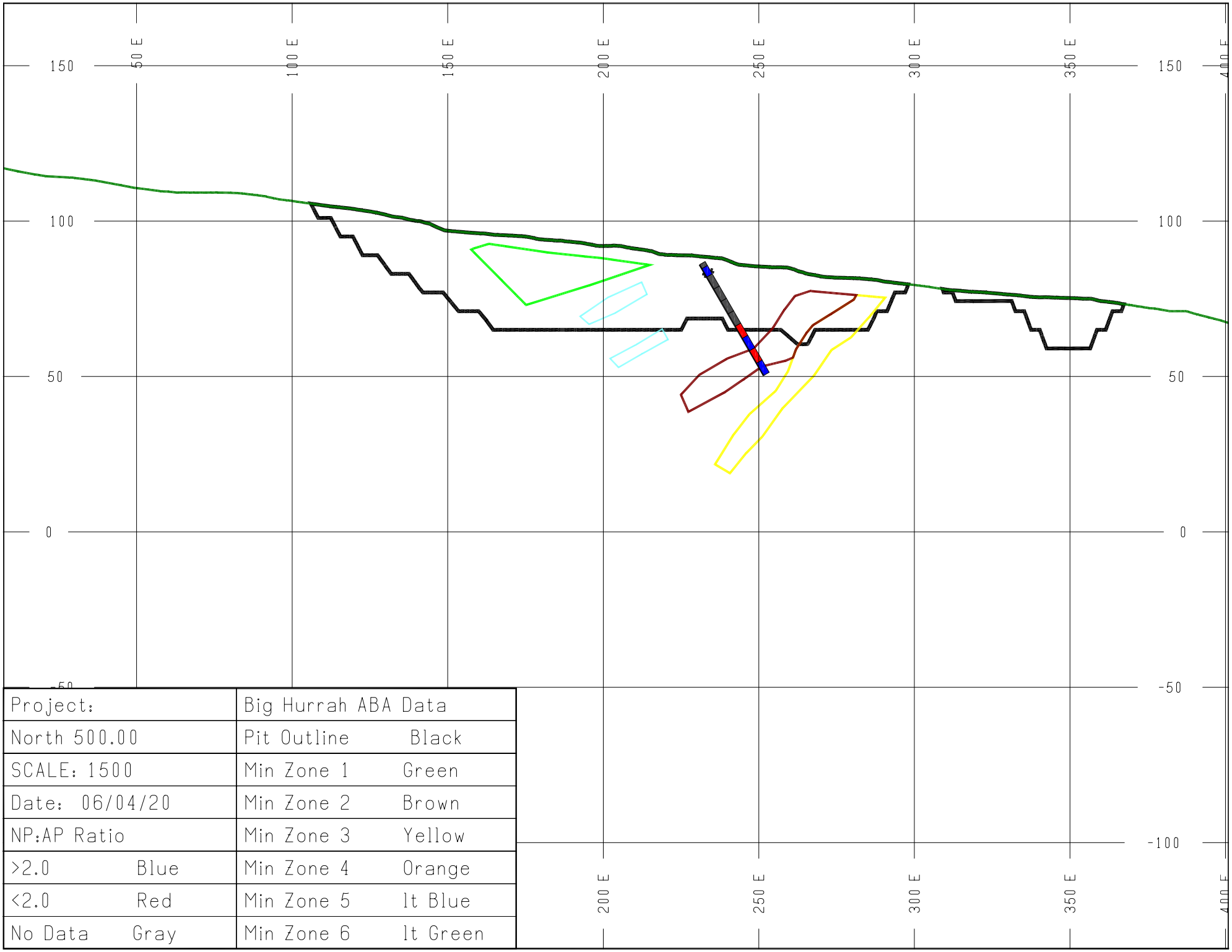
Project:		Big Hurrah ABA Data	
North 470.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



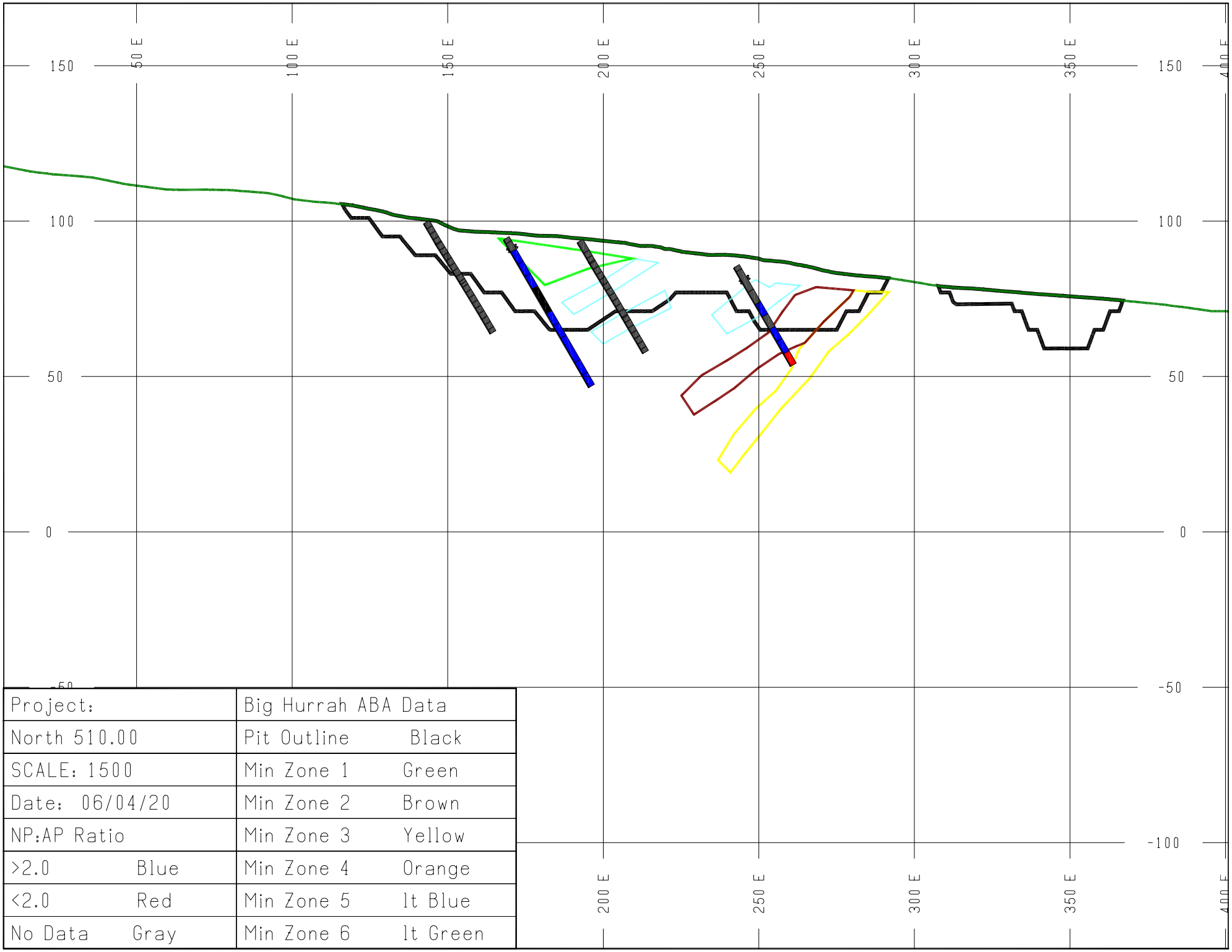
Project:		Big Hurrah ABA Data	
North 480.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



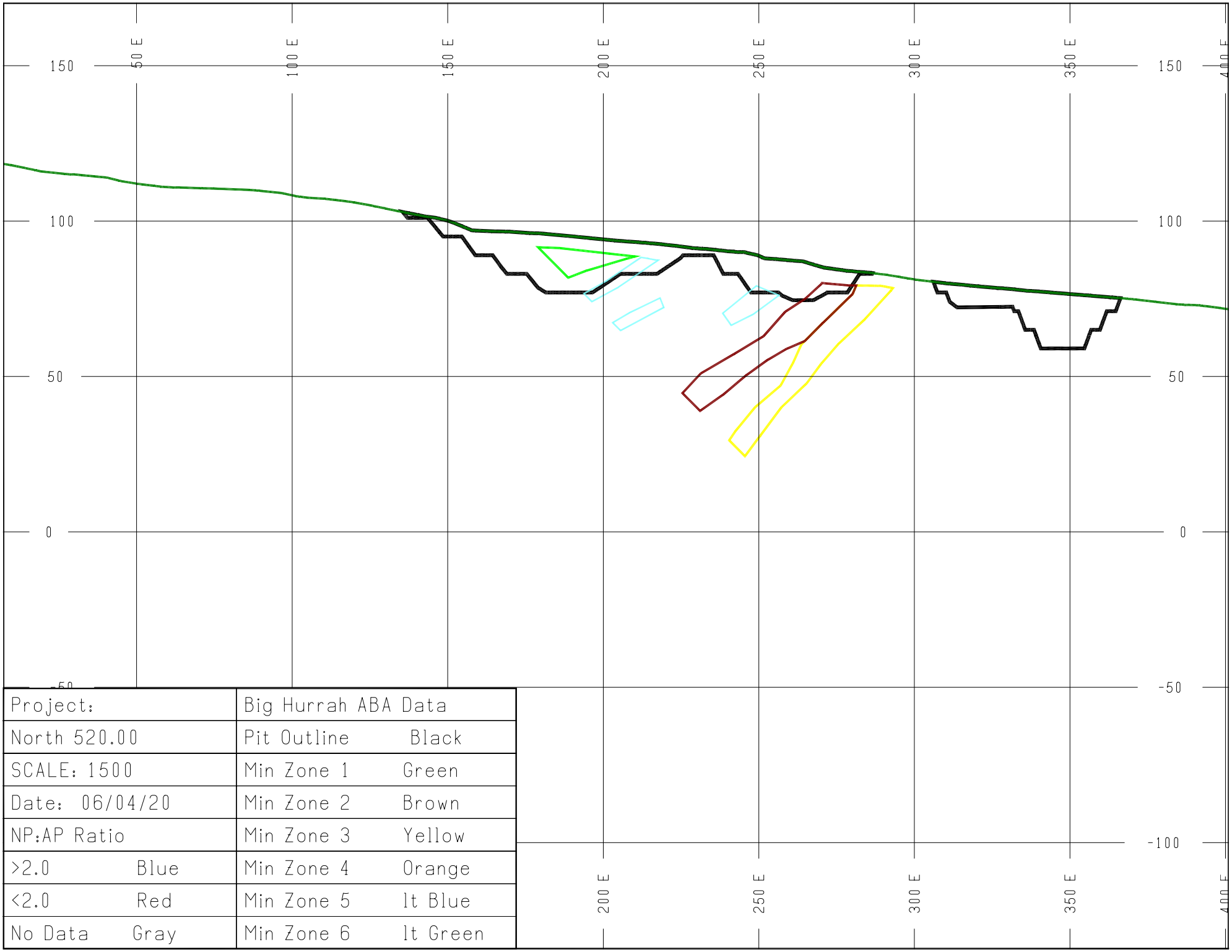
Project:		Big Hurrah ABA Data	
North 490.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



Project:	Big Hurrah ABA Data
North 500.00	Pit Outline Black
SCALE: 1500	Min Zone 1 Green
Date: 06/04/20	Min Zone 2 Brown
NP:AP Ratio	Min Zone 3 Yellow
>2.0 Blue	Min Zone 4 Orange
<2.0 Red	Min Zone 5 lt Blue
No Data Gray	Min Zone 6 lt Green

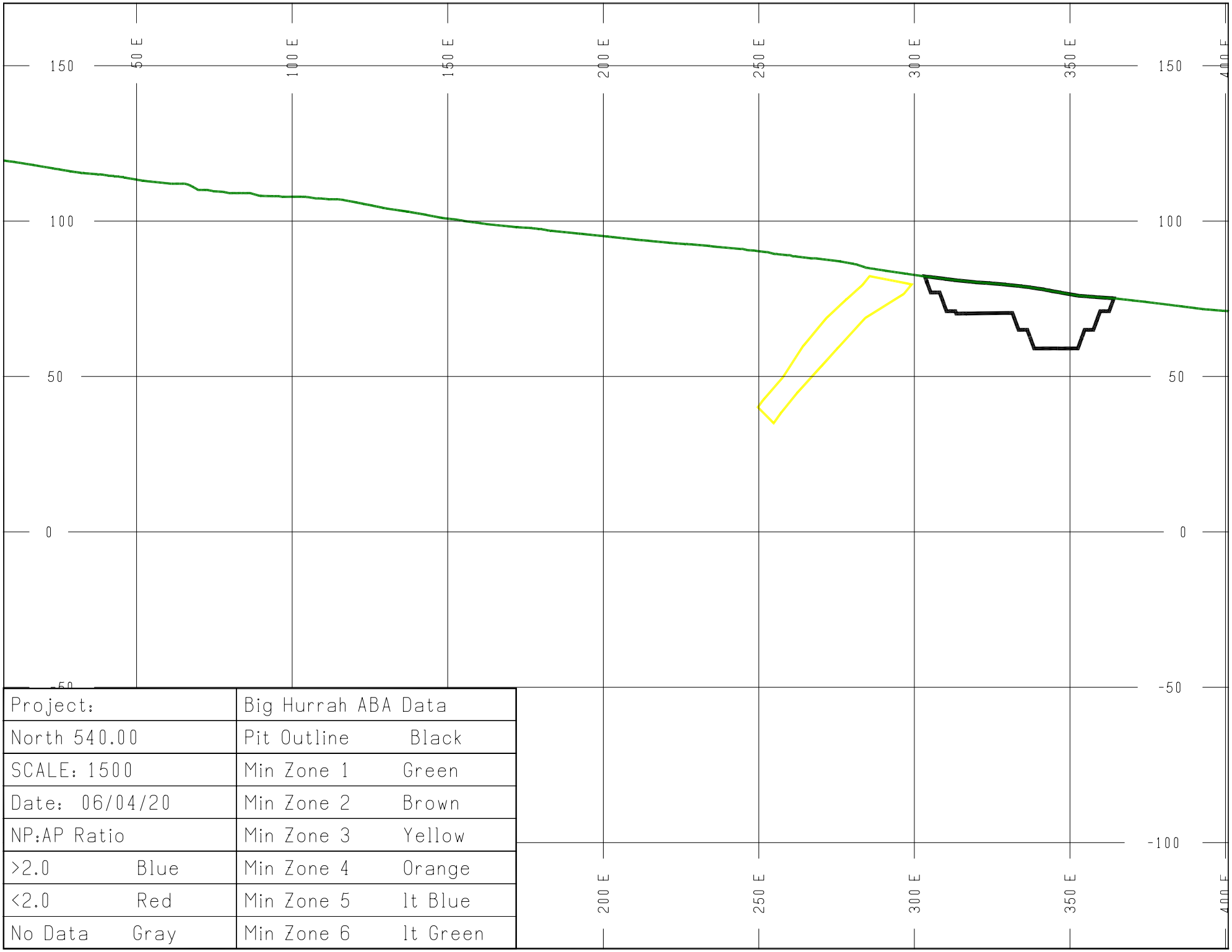


Project:		Big Hurrah ABA Data	
North 510.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green

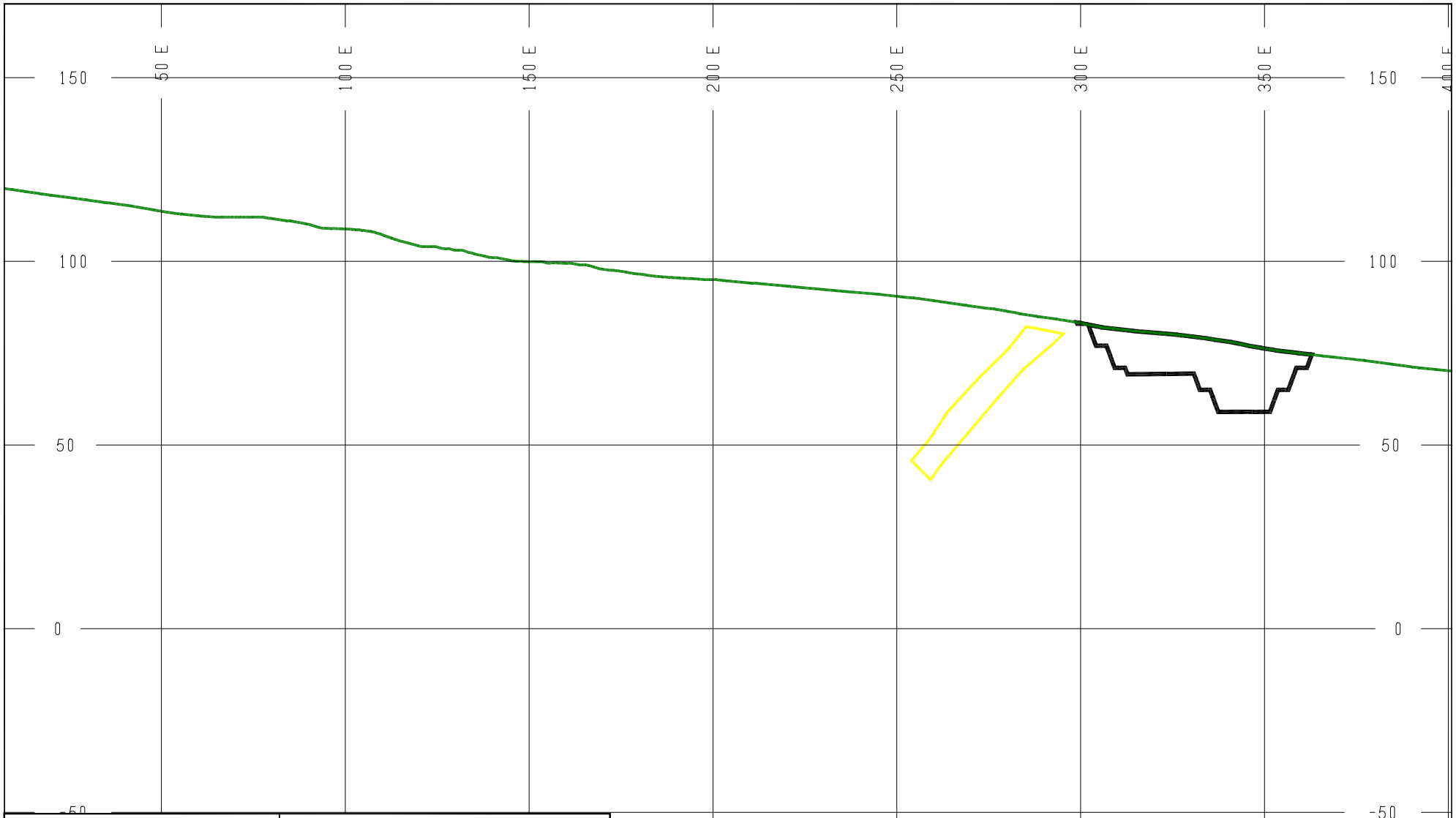


Project:		Big Hurrah ABA Data	
North 520.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green

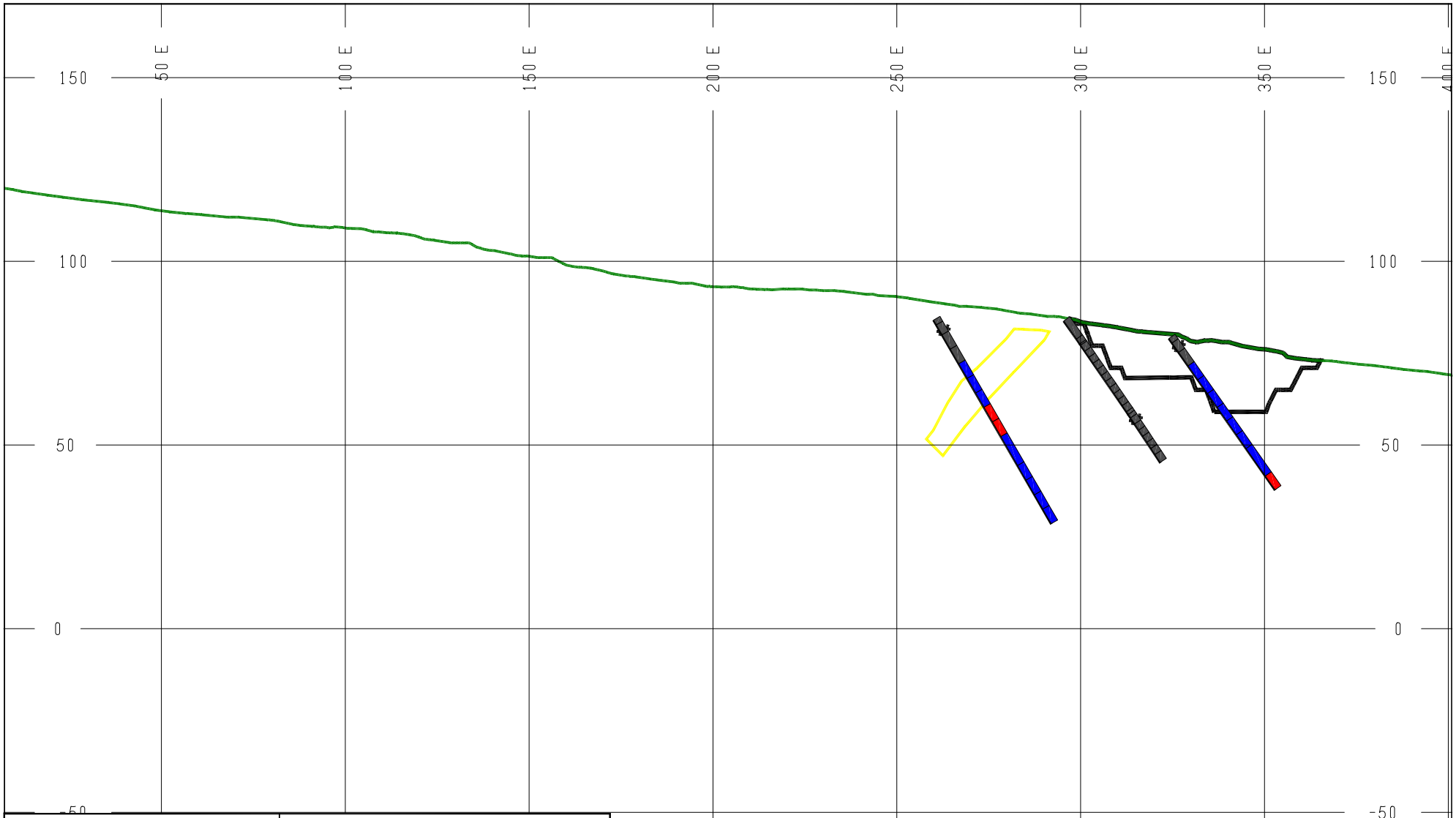
Project:		Big Hurrah ABA Data	
North 530.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



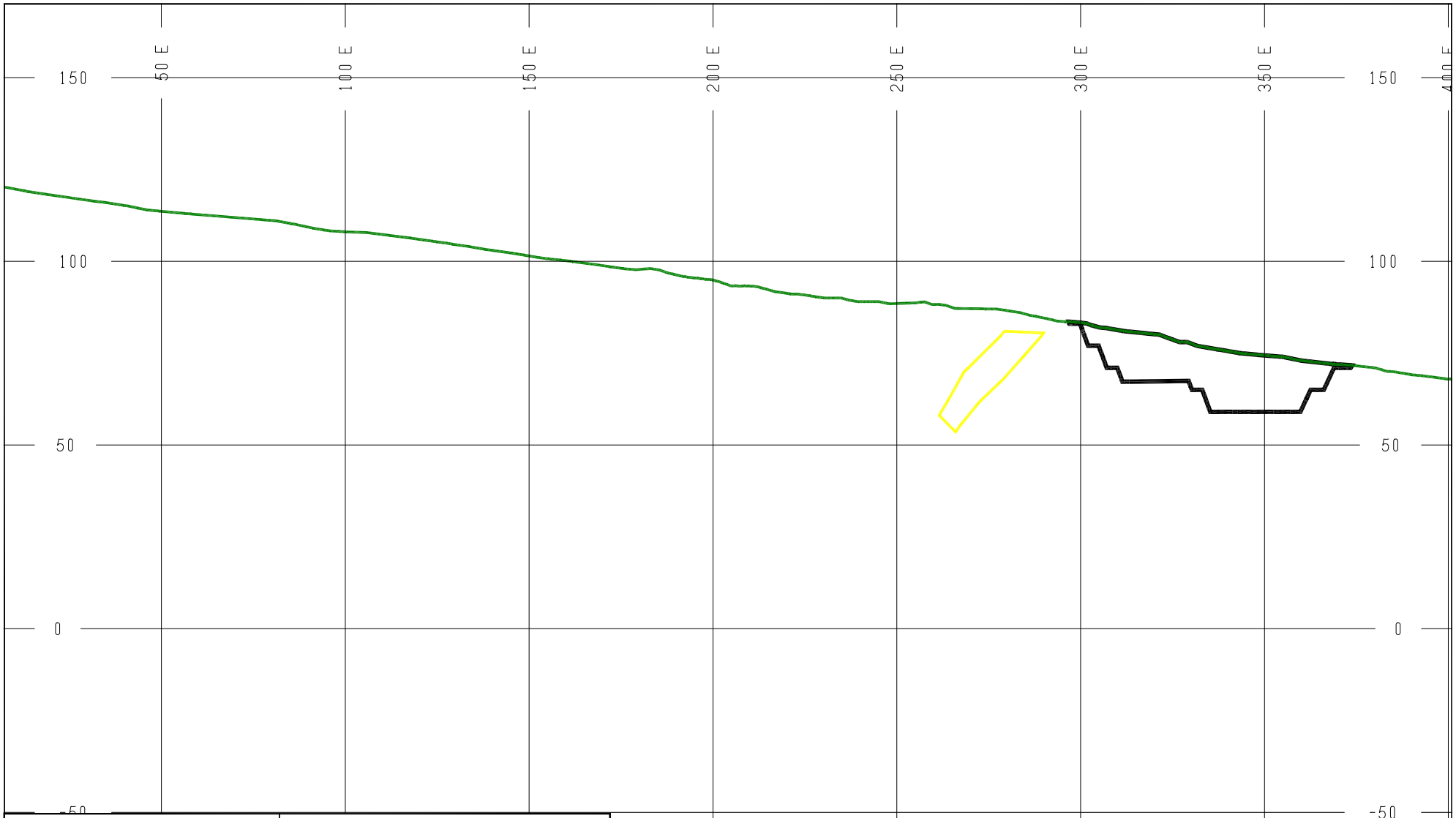
Project:		Big Hurrah ABA Data	
North 540.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



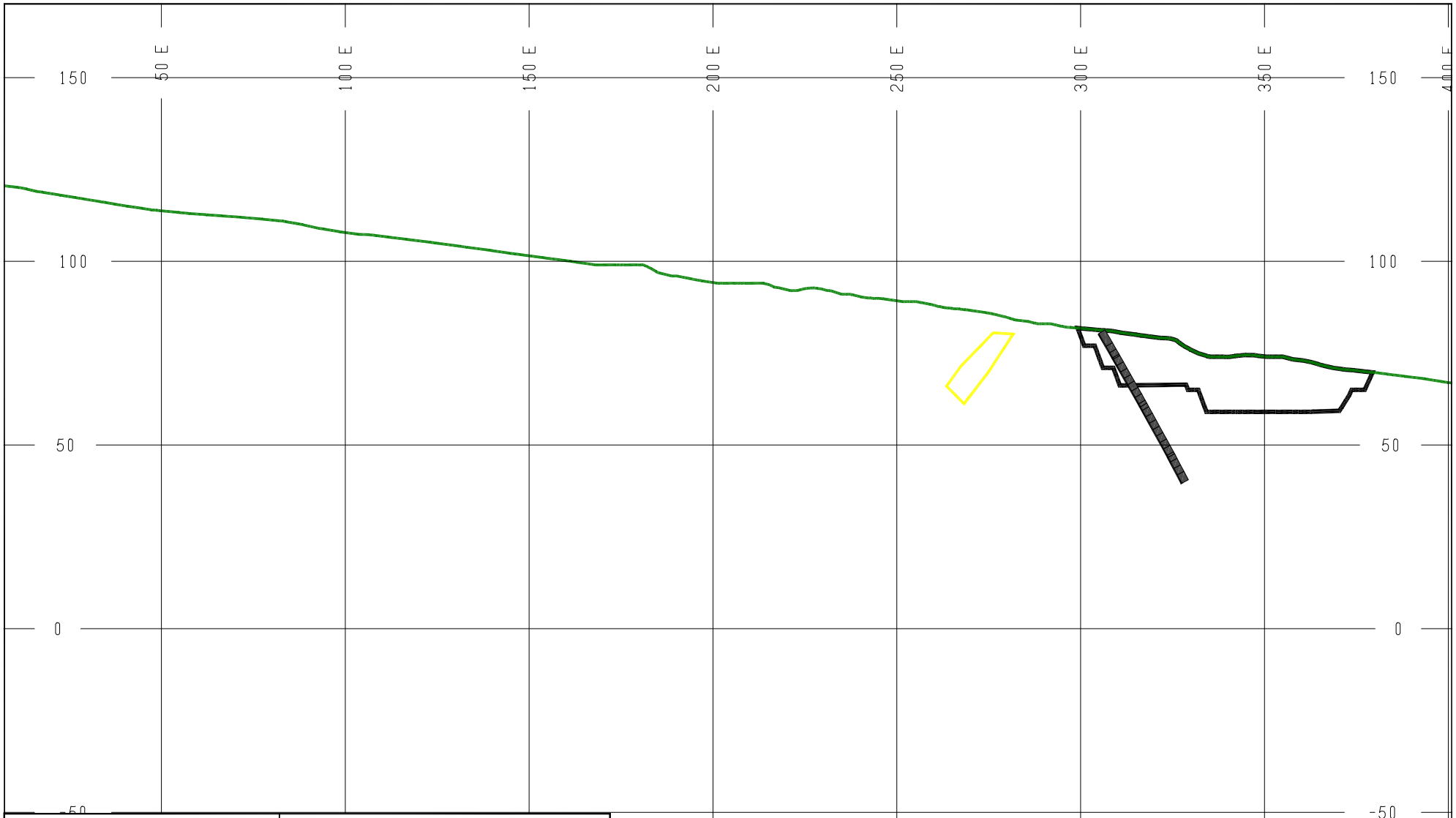
Project:		Big Hurrah ABA Data	
North 550.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



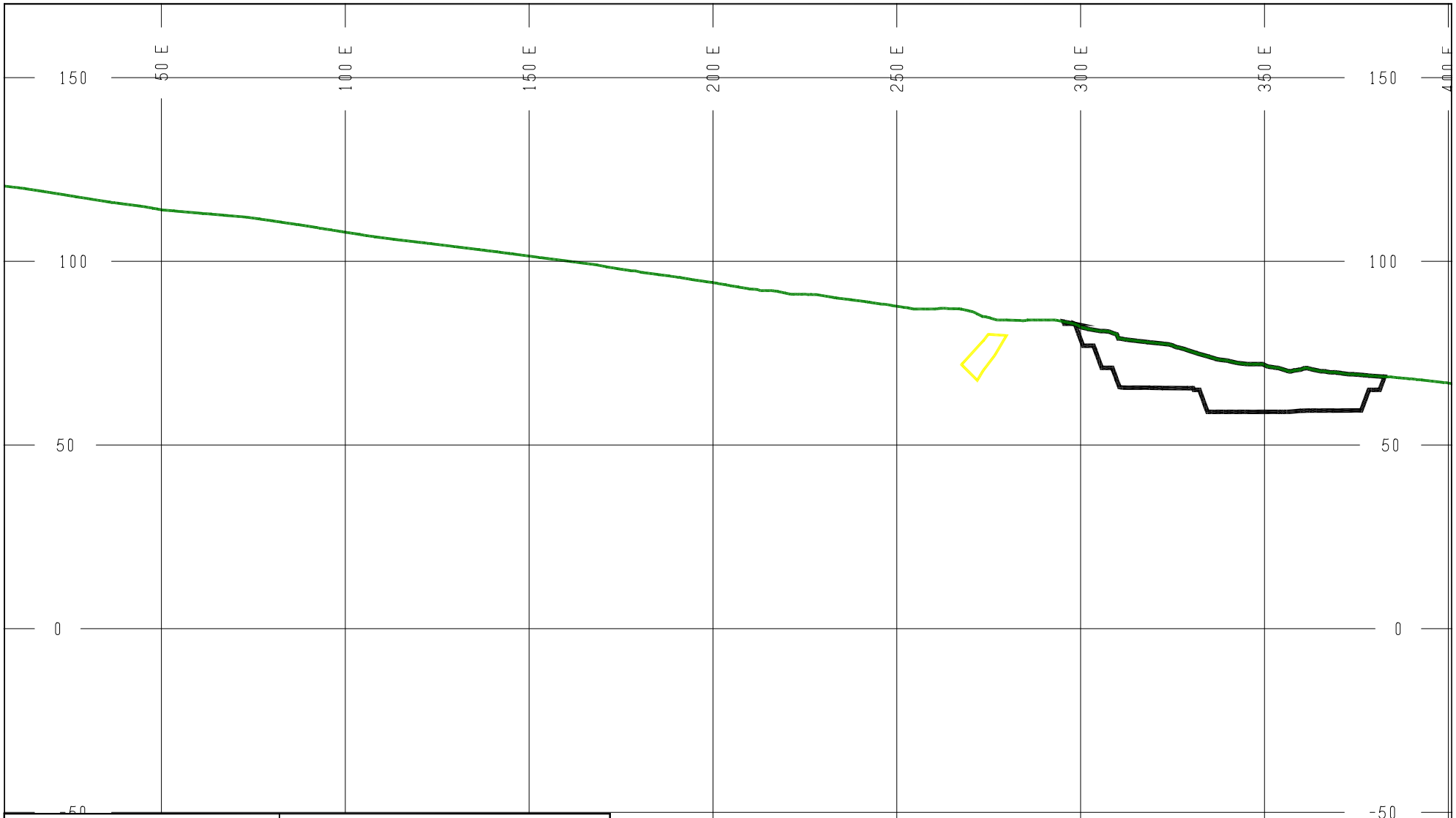
Project:		Big Hurrah ABA Data	
North 560.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



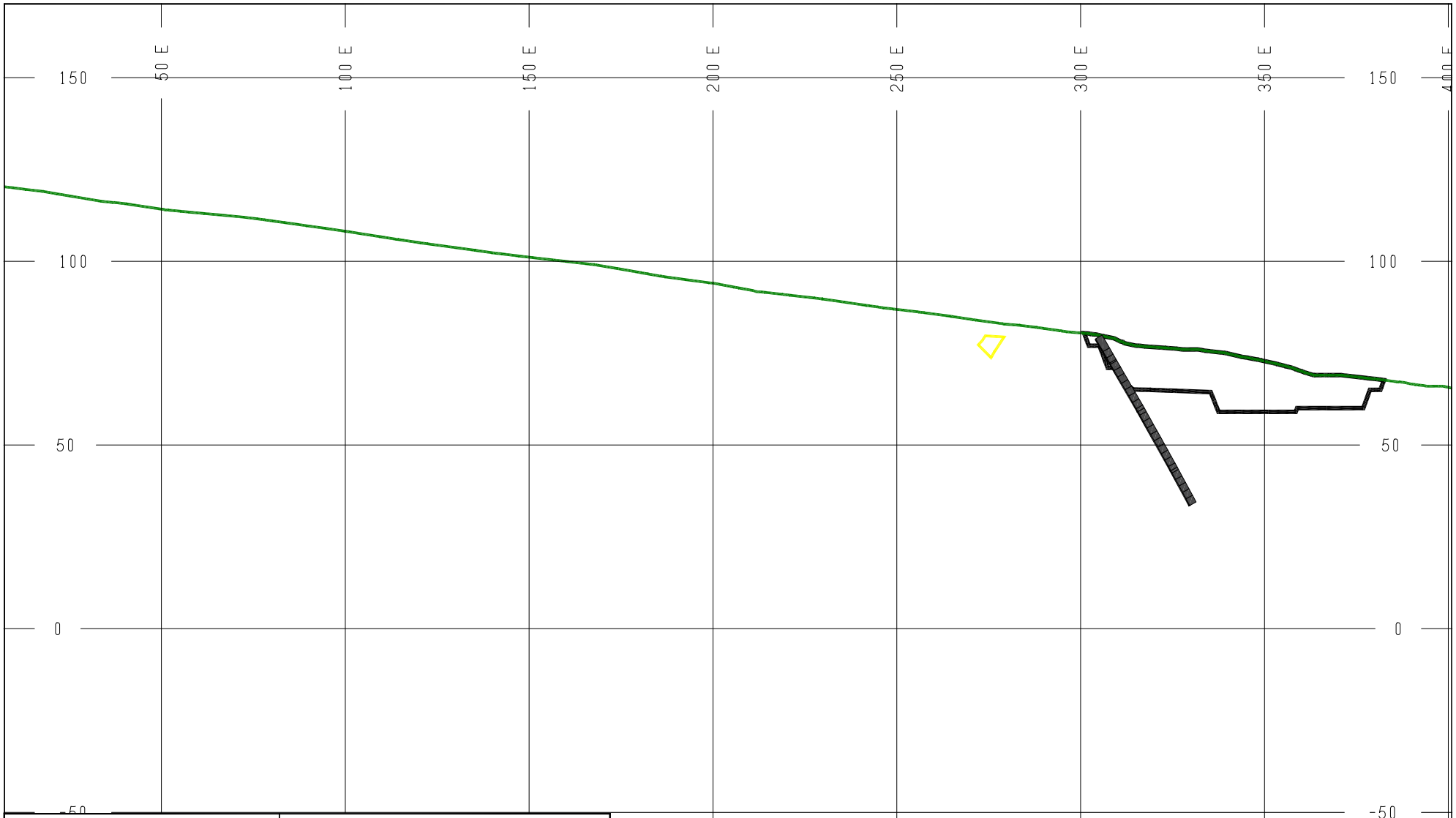
Project:		Big Hurrah ABA Data	
North 570.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



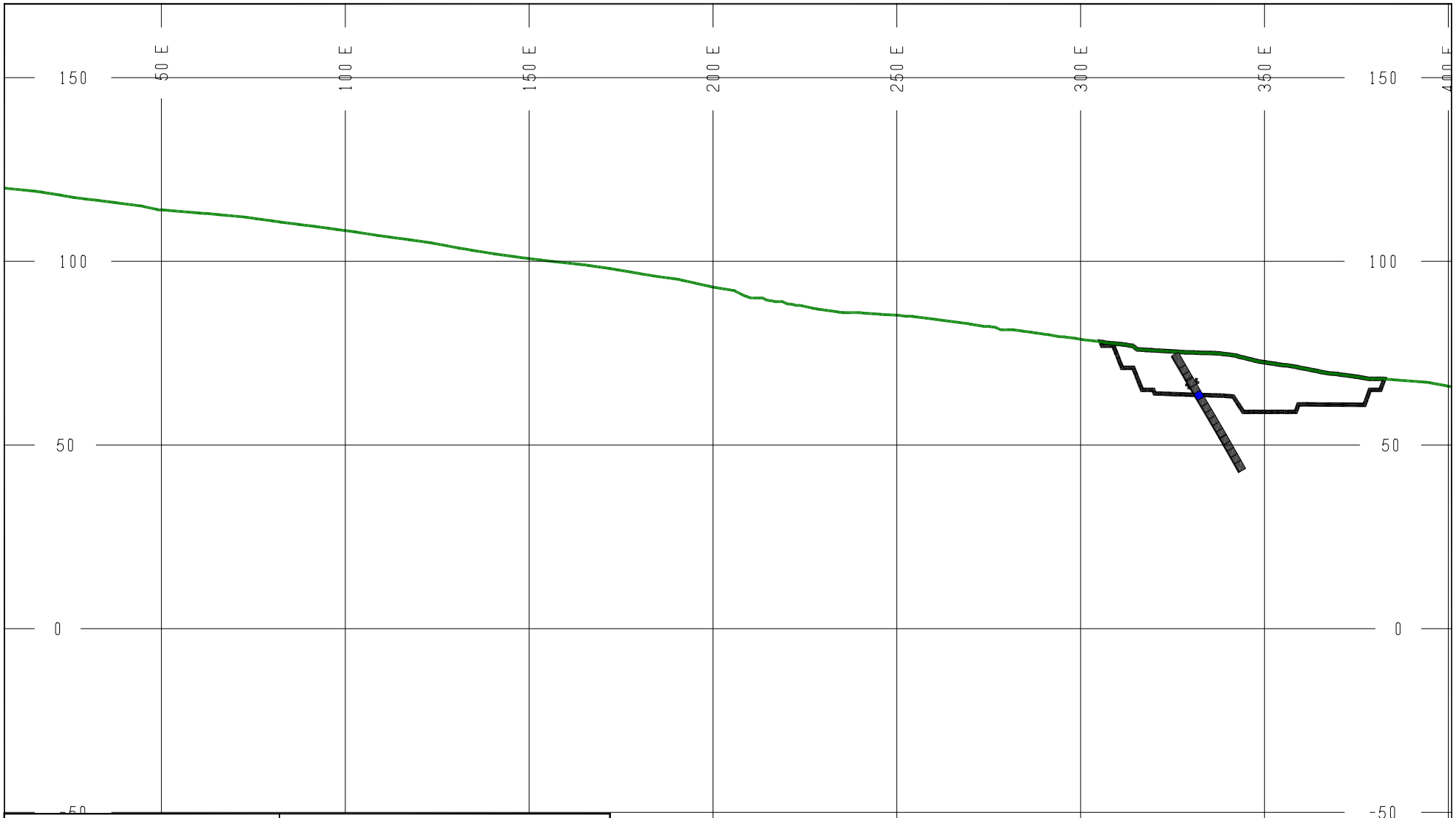
Project:		Big Hurrah ABA Data	
North 580.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



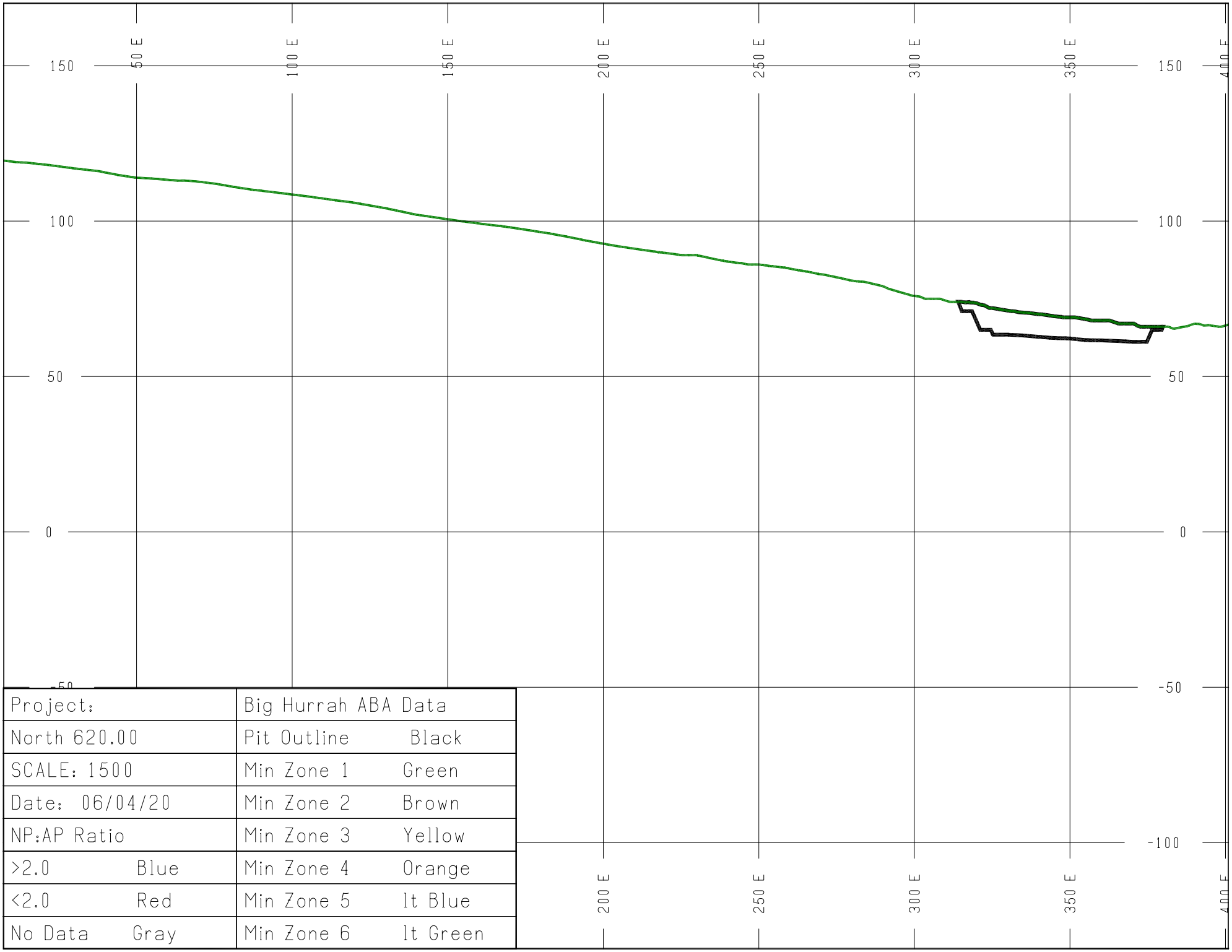
Project:		Big Hurrah ABA Data	
North 590.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



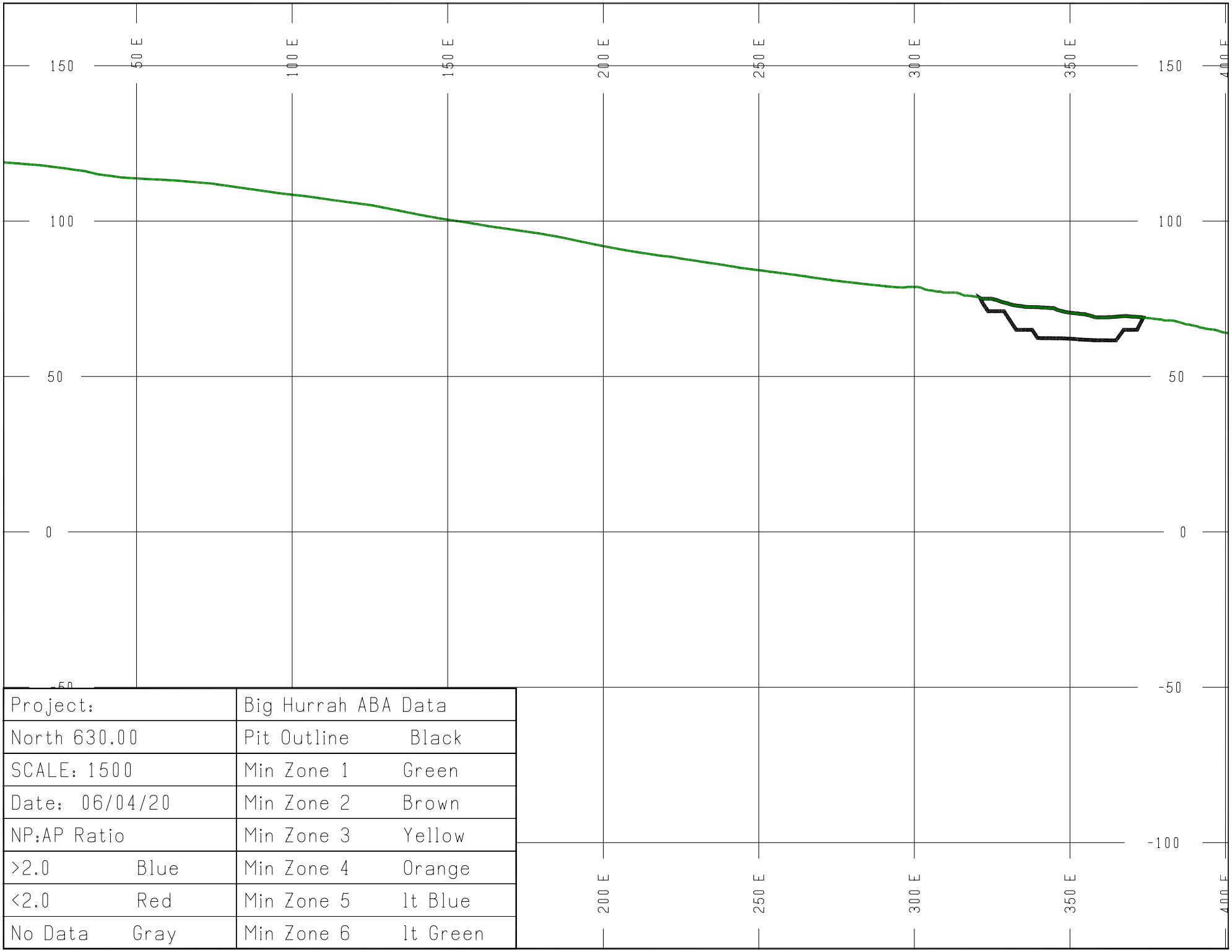
Project:		Big Hurrah ABA Data	
North 600.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



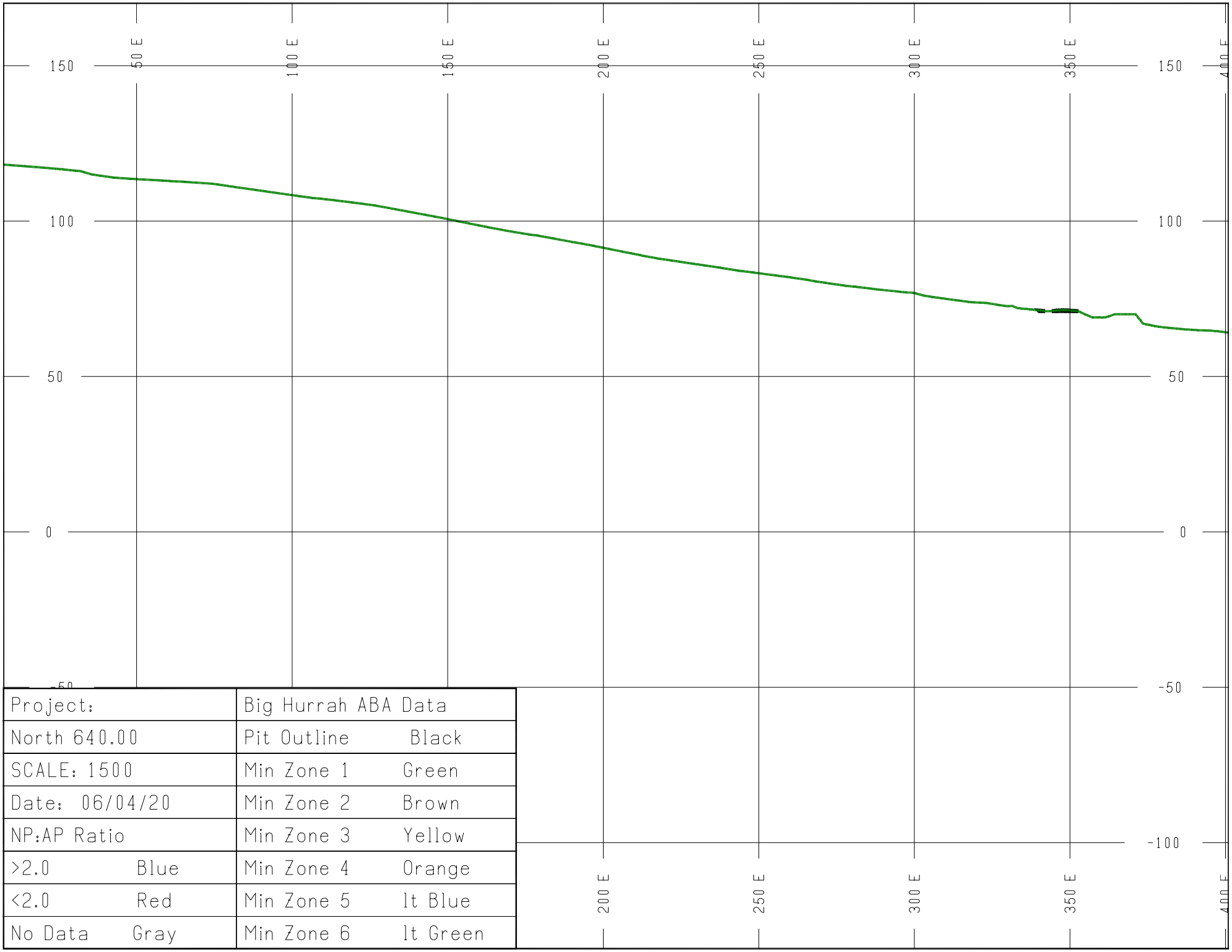
Project:		Big Hurrah ABA Data	
North 610.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



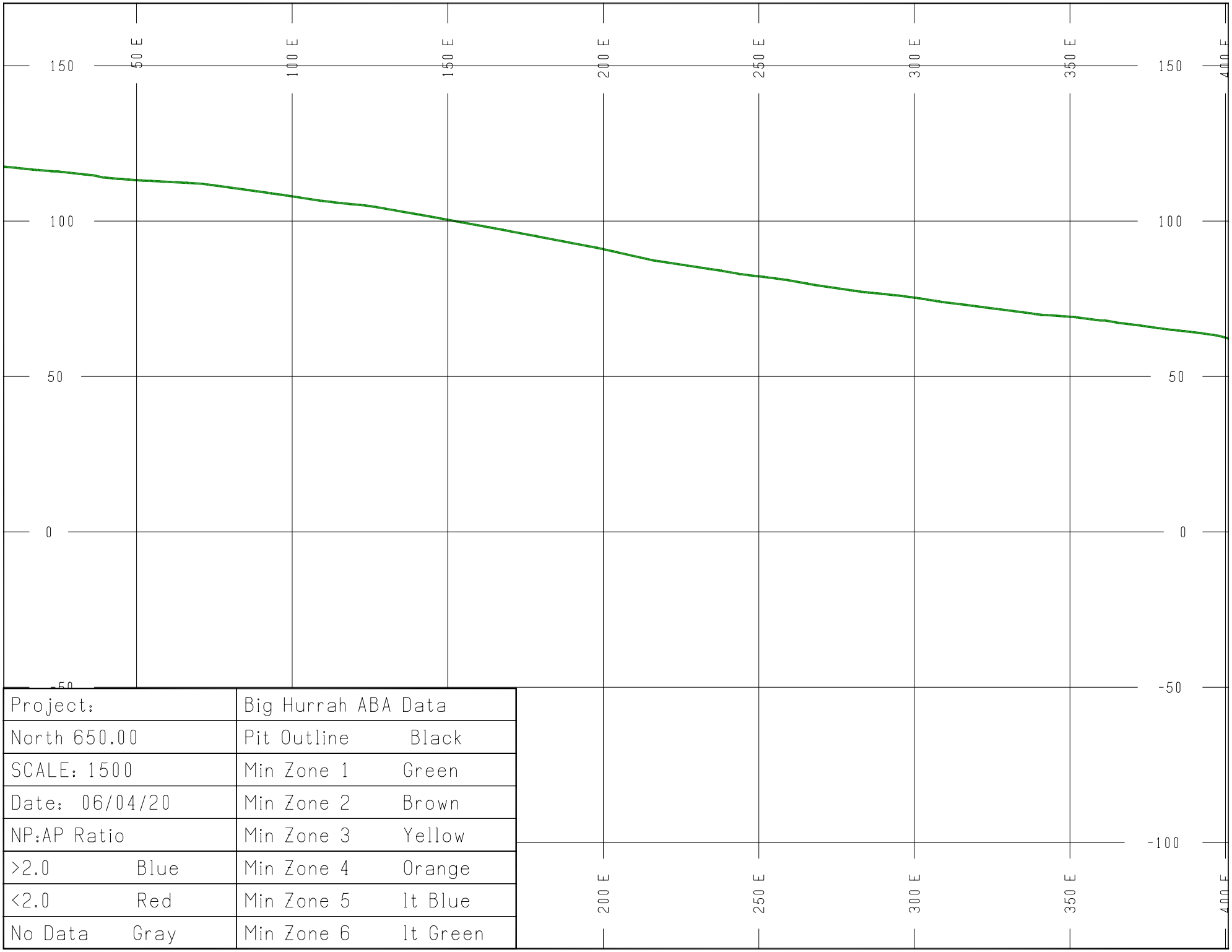
Project:		Big Hurrah ABA Data	
North 620.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



Project:		Big Hurrah ABA Data	
North 630.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



Project:		Big Hurrah ABA Data	
North 640.00		Pit Outline	Black
SCALE: 1500		Min Zone 1	Green
Date: 06/04/20		Min Zone 2	Brown
NP:AP Ratio		Min Zone 3	Yellow
>2.0	Blue	Min Zone 4	Orange
<2.0	Red	Min Zone 5	lt Blue
No Data	Gray	Min Zone 6	lt Green



Project:	Big Hurrah ABA Data
North 650.00	Pit Outline Black
SCALE: 1500	Min Zone 1 Green
Date: 06/04/20	Min Zone 2 Brown
NP:AP Ratio	Min Zone 3 Yellow
>2.0 Blue	Min Zone 4 Orange
<2.0 Red	Min Zone 5 lt Blue
No Data Gray	Min Zone 6 lt Green

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007

To: Doug Nicholson (doug.nicholson@novagold.net)

Company: NovaGold Resources Inc.

Project No.: 2573

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date: March 23, 2006

Subject: Big Hurrah Project Development Rock Storage Facility Geochemical Assessment

---

1 BACKGROUND

This Technical Memorandum presents the methods and results for the geochemical characterization in support of the Environmental Assessment and Reclamation Plan for the Big Hurrah Project near Nome Alaska. The purpose of this project is to characterize any potential impacts to water quality from the mine material storage facility and to provide recommendations for minimizing these impacts.

Hydrogeologic and geochemical models were developed to predict the quantity and quality of facility runoff and seepage. Two cases were evaluated, a base case which consisted of the facility with no cover, and an alternative case which simulated the facility with a silt cover.

This assessment utilizes the available geochemistry data in predicting the post-closure development rock dump seepage and runoff water quality. Currently, this data includes kinetic testing data from the Rock Creek lithologies. These lithologies have been correlated to similar lithologies that comprise the development rock at Big Hurrah. For this reason, the assessment is considered preliminary and will be updated as site-specific data become available, including kinetic (humidity cell) test data. These tests are currently ongoing.

2 MINE OPERATION

The current working plan for the operation of the mine indicates that operations will begin by 2007 and continue for four years, consisting of three to six months of stockpiling per year and hauling up to 12 months per year. The development rock storage facility will be constructed during this time period. Upon completion of the mining, a closure plan will be implemented that will include compaction and possible construction of a silt (borrow material) cover on facility. Initial estimates suggest that borrow material will be available for at least 1 foot of cover over the development rock facility. Therefore, two modeling scenarios were considered including one without a cover (considered the Base Case) and one with a 1-foot cover on the facility (considered the Alternative Case).

3 MODELING APPROACH

The modeling approach taken for this analysis conceptualizes the storage facility as homogenous system because of the homogenous nature of the ore body. The covers are considered additional layers of different materials. The seepage chemistry is predicted through volumetric and chemical mixing of infiltrated rainfall and runoff with specific chemical compositions produced from chemical reactions with the various rock types contained in the facility. The hydrologic analysis comprised an infiltration and runoff model, which was used to develop input to the geochemical model. The time period used in the simulations started at the end of mining operation and continued through one hundred years of post closure. The geochemical modeling uses geochemical test data to estimate the chemistry of water that contact site materials. These chemistry estimates are used in a thermodynamic chemical equilibrium model to simulate the final composition upon mixing of water compositions from each material type stored at the facility and the chemical reactions that occur as a result. Modeling method details are provided in the following sections.

4 HYDROLOGIC MODELING

An atmospheric boundary model for the development rock storage facility was prepared to predict the proportions of precipitation, runoff, and infiltration at the dump surface. The hydrologic analysis was developed using HELP (EPA, 1994) based on precipitation records from the Nome Airport and scaled to site flow measurements.

Table 1 includes climate data used as input to the HELP infiltration models.

Table 1 Average site specific climate data

Month	Average monthly temperature (°C)	Average monthly rainfall (inches)
January	-13.0	2.4
February	-13.0	2.0
March	-11.9	1.9
April	-6.5	1.8
May	1.7	1.7
June	7.9	2.6
July	10.3	5.9
August	9.8	8.2
September	5.6	6.3
October	-1.8	3.7
November	-8.3	2.7
December	-12.6	2.4

Precipitation data from the Nome Airport were scaled to the site using a uniform 2.0 multiplier. A synthetic weather generator was used to create daily precipitation and evaporation data from the site-specific mean monthly data and climate statistical data. The latitude for Nome was entered, and the growing season was assumed to last from the 120th day through the 270th day of the year.

Table 2 shows the layering sequence for used in the simulations. One dimensional runoff and infiltration simulations were prepared to evaluate the amount of infiltration into the facility during 100 years after the end of the mining.

Table 2 Development Rock storage facility hydrologic model structure and description

Base Case: Without Cover (Early Time)			Base Case: Without Cover (Late Time)		
Layer	**Material**	**Thickness (ft)**	**Layer**	**Material**	**Thickness (ft)**
1	Sandy-silt	0.5	1	Silty-clay	0.5
2	Development Rock	1	2	Development Rock	1
3	Development Rock	1	3	Development Rock	1
4	Development Rock	1	4	Development Rock	1

Alternative Case: With Cover (Early Time)			Alternative Case: With Cover (Late Time)		
Layer	**Material**	**Thickness (ft)**	**Layer**	**Material**	**Thickness (ft)**
1	Silt Cover	1	1	Silt Cover	1
2	Sandy-silt	0.5	2	Silty-clay	0.5
3	Development Rock	1	3	Development Rock	1
4	Development Rock	1	4	Development Rock	1

Two models were created to represent the side slopes (3 to 1) and top (5%) sloped areas. The development rock was modeled as a gravel material. The Base Case was simulated without a cover, and the Alternative Case had a 1-foot cover of silt. Additionally, the development dumps had two modeling scenarios for early- and late-time that had slightly different material properties. The model assumes that the closure design will allow for the uppermost development rock to be crushed and compacted. This enhances the weathering of the schist into silts and clays, resulting in a lower-permeability material. For the early time simulation, this upper layer was modeled as a sandy-silt, and the late time upper layer was a silty-clay material. Rapid decrepitation of on-site materials has been observed in the field.

All of the models evaluated the early-time (up to 5 years after closure) and late-time (100 years after closure) behavior of the dumps. The unit-area results were scaled to the total surface area of the facility and combined the steep and flat slope areas to produce the total runoff and infiltration. These results were used as input to the geochemical model.

5 GEOCHEMICAL MODELING

A geochemical mixing and equilibrium model was developed for the simulation of development rock dump seepage and runoff water quality using PHREEQC (USGS). The rock type materials used to create the development rock dump are summarized in Table 3. Humidity cell test results were used as input water chemistry. Data from three HCTs were used including acidic QGS, alkaline QGS, and average GMS materials. The remaining materials (QMS, GCS, and MBL) were included at equal percentages but not represented directly. Acidic and alkaline QGS were assumed to be in equal proportions in the development rock.

Table 3 Abundance of development rock material types at Big Hurrah

Description of rock types	Percent in development rock dump
Quartzitic graphite schist (QGS)	52
Quartz-muscovite schist (QMS)	2
Graphite calcite schist (GCS)	8
Marble (MBL)	5
Graphitic Marker Unit (GMU)	
Graphitic muscovite schist (GMS)	33
Totals	100

The relative contribution, in percent, of the equilibrated water chemistry from each of the above rock types was estimated from the results of the HCTs, week 17 through 20, which were combined through geochemical modeling to simulate the chemistry of water produced from reactions with minerals contained in the development rock facility. The runoff water quality for the facility was modeled for the case without a cover. The water quality of the runoff for the covered facilities was assumed to be similar to rainwater, which is considered pure water equilibrated with atmospheric gases.

Laboratory testing is conducted under controlled and specific conditions including, in the case of HCTs, the grain size and volume of water used. Because test samples and water volumes are different in the field than in the laboratory, test results should be adjusted (scaled) to account for these differences. The HCT results were scaled to the site-specific field conditions by the relative change in rock surface area and volume of water flushed over or through the rock.

The HCT concentrations were divided by the surface area per unit mass and the pore volumes flushed during the laboratory test, resulting in mass of solute per unit surface area per pore volume of water flushed. The laboratory scale specific surface area for each of the rock types was estimated from the particle size analysis (GRAIN 3.0, from MDAG Publishing, www.mdag.com). The rates were converted back to field scale concentrations for the runoff and the infiltrated water by multiplying by the particle surface area and pore volumes that passed through the material in the time step (5 and 100 years) and then dividing by the total volume of runoff for the simulated period of time. This conversion was updated for each model time period. The development rock specific surface areas for each of the rock types were estimated from an assumed mean particle size of 50 mm.

After scaling, the charge balance for each solution was checked. A charge balance is a comparison of the sum of the cations compared to the sum of the anions, which confirms the electro-neutrality requirement for natural waters. The geochemical model was used to modify the concentration of an element in order to correct for slight differences in the charge balance. Chloride and potassium were used to adjust the charge balance of the input waters because these elements do not play critical roles in geochemical reactions of concern for these simulations.

The geochemical modeling process involved a series of solution mixing, chemical reactions, and mineral surface adsorption modeling to predict the seepage/runoff composition at each selected output time. The process included:

1) Developing individual, charge-balanced waters which are representative of contact waters at the Big Hurrah site.

2) Mixing the individual components in proportion to their quantities in the development rock dumps facility to estimate an average seepage/runoff chemistry.

3) Equilibration of the mixed solutions with likely mineral phases and atmospheric gasses available for reaction (ferrihydrite, calcite, gibbsite, gypsum, manganite, oxygen, and carbon dioxide).

4) Adsorption of specific compounds (arsenic, barium, lead, cadmium, copper, nickel, calcium, phosphate, zinc, beryllium, and sulfate) from solution onto ferrihydrite according to Dzombak and Morel (1990).

The result was a seepage/runoff chemistry after a given time period. This procedure was then repeated for the second time period (through 100 years).

6 RESULTS AND RECOMMENDATIONS

The results of the models for the development rock facilities are shown in Tables 4 and 5. Table 4 contains the seepage flow rate for the 5 and 100 year simulations for the Base and Alternative Cases. The infiltration rates ranges from 30 gpm with cover and light vegetation to 136 gpm without cover or vegetation. The models also indicate that a silt cover will decrease, but not eliminate, infiltration into the facility. The late-time weathering of the upper layer of development rock also serves to decrease infiltration.

The results of the development rock geochemical modeling are presented in Table 5. No constituents are predicted to exceed the applicable water quality standards for runoff or seepage water.

Table 4 Development rock facility hydrologic modeling results

Year	Description	Rainfall (gpm)	Runoff (gpm)	Evaporation (gpm)	Infiltration (gpm)	Runoff (fraction)	Evaporation (fraction)	Infiltration (fraction)
5	No cover and no vegetation	438	216	86	136	0.493	0.196	0.312
100	No cover and light vegetation	438	259	86	93	0.592	0.196	0.212
5	Cover with no vegetation	438	323	85	30	0.738	0.194	0.068
100	Cover with light vegetation	438	288	91	58	0.658	0.209	0.133

Table 5 Development rock facility geochemical model results compared to surface water data and water quality standards

Compound	Standard		Surface water	Base Case Scenario		Alternative (Cover) Scenario	
Simulation	Value	Source		Seepage 5 years	Seepage 100 years	Seepage 5 years	Seepage 100 years
pH	NS		6.92	6.38	6.38	6.38	6.38
Alkalinity	NS		57	3.7	3.7	3.7	3.7
Silver	NS		0.0005	0.000	0.000	0.000	0.000
Aluminum	0.087	2	0.0096	0.001	0.001	0.001	0.001
Arsenic	0.01	1	0.002	0.00	0.00	0.00	0.00
Barium	2	1	0	0	0	0	0
Beryllium	0.004	1	0.0002	0.000	0.000	0.000	0.000
Calcium	NS		22	3.4	3.4	3.4	3.4
Cadmium	0.00033	2	0.00021	0.00003	0.00003	0.00003	0.00003
Chloride	230	2	2.6	0	0	0	0
Chromium	0.1	1	0.00	0.000	0.000	0.000	0.000
Copper	0.013	2	0.000	0.00	0.00	0.00	0.00
Fluoride	4	1	0	0	0	0	0
Iron	1	2	0.0192	0.0	0.0	0.0	0.0
Mercury	7.7E-04	2	7.06E-07	3.866E-06	3.866E-06	3.866E-06	3.866E-06
Potassium	NS		0.21	0.1	0.1	0.1	0.1
Lithium	NS		----	0.0000	0.0000	0.0000	0.0000
Magnesium	NS		4.3	0.2	0.2	0.2	0.2
Manganese	NS		0.000	0.03	0.03	0.03	0.03
Nitrate (as NO3-)	10	1	0	0	0	0	0
Sodium	NS		2	0.8	0.8	0.8	0.8
Nickel	0.075	2	0.0010	0.001	0.001	0.001	0.001
Phosphorus	NS		0.10	0.009	0.009	0.009	0.009
Lead	0.004	2	0.0001	0.000	0.000	0.000	0.000
Sulfate (as SO4-2)	NS		20	7.6	7.6	7.6	7.6
Antimony	0.006	1	0.0005	0.000	0.000	0.000	0.000
Selenium	0.005	2	0.002	0.000	0.000	0.000	0.000
Strontium	NS		0.1	0.010	0.010	0.010	0.010
Thallium	0.002	1	0.0005	0.000	0.000	0.000	0.000
Vanadium	NS		0.01	0.000	0.000	0.000	0.000
Zinc	0.169	2	0.0028	0.000	0.000	0.000	0.000

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness of 153 from average ROCK composition
Surface water values are from the averages of Little Hurrah Creek Upper samples collected (Site LHRU).
Concentrations in bold exceed current water quality standard values

6.1 Summary

Seepage and runoff rate predictions were developed for the proposed development rock dump at Big Hurrah. These results were combined with a geochemical model to predict a range of concentrations for these waters, and to identify constituents of concern for closure and reclamation planning. Runoff from the development rock dumps ranges from 49 to 74 percent and infiltration ranges from 7 to 31 percent for the Alternative and Base Cases, respectively. Development rock dump seepage and runoff water chemistries were predicted to contain no constituents above the current water quality standards.

7 REFERENCES

Dzombak, D.A., and Morel, F.M.M., 1990. Surface complexation modeling--Hydrous ferric oxide: New York, John Wiley, 393 p.

EPA, 1994. The Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3. EPA Report EPA/600/R-94/168a. September, 1994.

Grain 3.0 from MDAG Publishing at www.mdag.com/grain30.html

Parkhurst, David L. and Appelo, C. A. J., 1999. User's Guide to PHREEQC (Version 2) - A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and inverse Geochemical Calculations. Water-Resources Investigations Report 99-4259.

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS

1875 LAWRENCE STREET, SUITE 500
DENVER, COLORADO 80202, USA

TELEPHONE: (303) 297 9005
TELEFAX: (303) 297 9007
www.watermc.com

To: Doug Nicholson (doug.nicholson@novagold.net)

Company: NovaGold Resources, Inc.

Project No.: 2573

From: Brent Johnson (bjohnson@watermc.com)
Kenneth Carroll (kcarroll@watermc.com)

Date: May 8, 2006

Subject: Big Hurrah Pit Lake Geochemical Assessment

---

1 BACKGROUND

This Technical Memorandum presents the data, methods, and results for the geochemical characterization of the proposed Big Hurrah Pit Lake in support of the Environmental Assessment and Reclamation Plan for the Big Hurrah Project near Nome Alaska. The purpose of this assessment is to predict the water chemistry of the pit lake after closure and, if impacts are predicted, to provide recommendations for minimizing these impacts.

Post-closure pit lake water quality for two modeling scenarios (no backfill and potentially acid generating rock (PAG) backfill) was predicted as the pit lake filled and at two points in time after the pit lake begins overflowing. These results were compared to applicable water quality standards and to the range of natural background water quality observed in Little Hurrah Creek. Natural filling of the pit from upstream surface run-in and groundwater was simulated in the geochemical model.

This assessment utilized the available geochemistry data in predicting the post-closure pit lake water quality.

2 MINE OPERATION

The final mine design is ongoing. However, the current plan for the operation of the mine suggests that operations will begin by 2007 and continue for three years. The pit will be dewatered during this time and allowed to refill after completion of operations. PAG material will be identified during mining and placed in the PAG staging area adjacent to the pit. After mining, the PAG material will be placed in the pit and flooded with the pit lake, thereby eliminating acid generation by the material.

3 MODELING APPROACH

The modeling approach for the no backfill analysis conceptualizes the pit lake as a completely mixed reactor that results from the volumetric and chemical mixing of inflowing waters with specific chemical compositions. The pit lake is expected to mix seasonally due to wind-driven currents and seasonal changes in temperatures.

Alternatively, the PAG backfill analysis assumes approximately ¾ of the pit is backfilled with PAG development rock material. This assumption is based on the geochemical characterization of development rock and the calculated volume that would be considered PAG. The resulting pit lake chemistry would be a mixture of inflowing waters with specific chemical compositions along with a fraction of the chemical composition represented by the backfill pore water (30% porosity). The uppermost portion of the pit lake is expected to mix seasonally due to wind-driven and inflow currents and seasonal changes in temperatures.

The hydrologic analysis developed from a site-wide watershed model was based on site-specific precipitation records from the Nome Airport and scaled to site flow measurements. Watershed model results were used as input to the water balance model for the pit lake from the end of mining operations to closure plus one hundred years. The geochemical modeling uses geochemical test data to estimate the chemistry of water that contacts site materials and subsequently enters the pit. These chemistry estimates are used in a thermodynamic chemical equilibrium and mixing model to simulate the final composition upon mixing of different waters and the chemical reactions that occur as a result. Modeling method details are provided in the following sections.

4 HYDROLOGIC MODEL

The hydrologic pit lake water balance model was developed to predict the rate of pit filling through time, the proportion of various inputs to the lake, and the ultimate pit lake water level. Figure 4.1 shows the conceptual pit lake filling model. The model accounted for pit lake inflow and outflow components as part of a volume balance. Inflows included direct precipitation, Little Hurrah Creek surface water, overland flow as pit wall runoff, and groundwater. Outflows included evaporation and pit lake overflow once the pit lake water elevation reached the crest at the northern end of the pit.

Surface water and precipitation inflows were estimated based on Nome Airport mean monthly rainfall records, scaled by a factor of 2. This multiplier was based on measured flows on and around the Big Hurrah Creek project area and is considered conservative. Groundwater inflow was based on preliminary aquifer testing and basin-scale water accounting calculations.

The points of time selected for the geochemical modeling corresponded to the full lake, full with overflow, and approximately 100 years after filling with overflow. These times were 0.4, 1.3, and 101.3 years for the no backfill model, and 0.4, 1.4, and 100.4 years for the PAG backfill model. Due to the relatively small size of the pit and the high volume of overland flow during spring runoff, the pit lake went from < 1% full to full with overflow within May of the first year after mine closure.

5 GEOCHEMICAL MODEL

PHREEQC (Parkhurst and Appelo, 1999) was used for all geochemical speciation, mixing, and reaction modeling conducted for this assessment. PHREEQC is an industry standard computer program used worldwide for conducting geochemical calculations for predicting the chemistry of natural or impacted waters in the environment.

For this assessment, geochemical modeling was used to predict the composition of the pit lake water through time after operations cease and pit dewatering wells are turned off. As the pit lake fills, and eventually overflows, the composition of each of the water balance components mix and reactions with rock and air occur, resulting in evolving pit lake water quality.

Pit wall chemical reactions that occur during pit wall runoff and pit wall flooding as the pit lake fills occur in the damaged rock zone (DRZ) of the pit wall and may contribute significantly to the overall solute loading to the pit lake. The DRZ is conceptualized as the surface layer of the pit wall that has been damaged, or cracked, during mining, which may significantly increase the porosity and reactive surface area (Figure 4.1).

For the backfill scenario, the initial lake water was predicted to be strongly influenced by the flushing of the PAG material. First flush chemistry data from the geochemical testing was used as the dominant input to the initial lake. After the pit fills, the chemical and flow contribution to the lake from the backfill declines significantly.

Site-specific information was used as input to the model when available, including the average composition of surface and groundwater, the composition of water equilibrated with the rock types, backfill composition and the volumes and surface areas of the pit.

Table 5.1 lists the different rock types and their relative percentages in rock excavated from the pit. These percentages were used to estimate the proportions of materials exposed in the pit wall. It was assumed that a uniform mixture of the rock types in their relative percentages from the entire pit will be exposed at all times through mining and closure.

Table 5.1 Rock type percentages assumed for ore and development rock

Description of rock types	Percent of ore	Percent of development rock
Quartzitic graphite schist (QGS)		52
Quartz-muscovite schist (QMS)		2
Graphite calcite schist (GCS)		8
Marble (MBL)		5
Graphitic Marker Unit (GMU)		2
Graphitic-muscovite schist (GMS)		31
Ore quartz vein (QVN)	100	0
Totals		100

5.1 Pit lake area estimation

The geochemical modeling requires estimates of the plan-view and actual (perpendicular) areas of the entire pit and the pit lake at each of the geochemical modeling simulation times. The plan area was estimated from site topographic maps and the actual area is the surface area of the exposed surface of the pit walls at a perpendicular to the pit wall angle. The site plan was used to calculate these areas and associated incremental volumes as a function of elevation in the pit. The pit volume and stage data was used to determine elevations for the ¾ full, and full pit lake area calculations.

5.2 Water quality of pit lake inflows

Specific water compositions were assigned to each of the inflow and outflow waters included in the pit lake water balance model. Table 5.2 contains the compositions assigned to each of the inflow components except for precipitation. Rainfall was simulated as pure water equilibrated with atmospheric gases.

Groundwater inflow to the lake was assumed to be represented by the average composition of samples collected from well HMW-5A from October and November of 2005. The water chemistry of inflow from Little Hurrah Creek was represented by the average chemical composition of samples collected upstream of the pit (at the location named Little Hurrah Creek - Upper) from June of 2004 through December 2005. Both the Little Hurrah Creek surface water and groundwater are circum-neutral, calcium-bicarbonate waters with alkalinity values of 57 mg/l in Little Hurrah Creek surface water and 204 mg/l in the groundwater at well HMW-5A. Groundwater at Big Hurrah contains elevated concentrations of magnesium, manganese, nickel, sulfate, strontium, and zinc. Groundwater exceeds the applicable water quality standard for arsenic and iron.

Precipitation that lands on the pit walls and overland flow into the pit (not associated with Little Hurrah Creek) was considered pit wall runoff. Pit wall runoff is simulated to react with minerals contained in the exposed pit walls. The pit wall runoff and the submerged pit wall recirculation water compositions were estimated from HCT data from Rock Creek samples scaled to field and climate conditions at Big Hurrah.

HCTs are kinetic tests commonly used for estimating weathering rates under accelerated weathering conditions. Approximately 1.2 Kg of sample, crushed to minus 1/4-inch, is subjected to weekly wet-dry cycles, and then flushed with water. The water is analyzed and the time-series chemistry data are used to estimate the short- and long-term weathering rates of the sample, and to estimate the chemistry of water that would contact similar materials on the mine site. These estimates are used to predict the water chemistry of pit wall runoff, and waste rock and tailings seepage by applying scaling calculations and site-specific climate data.

Week 17-20 composite samples were selected to represent long term behavior. Results of the Week 17-20 composite HCTs for the different rock types were used as input to the model and are summarized in Table 5.2. The HCTs resulted in neutral pH, calcium-bicarbonate waters with excess alkalinity for all rock types. However, all three rock types that had HCT data that exceeded the applicable water quality standards for cadmium, copper, and lead. QGS, both acid and alkaline, exceeded the applicable water quality standards for arsenic and antimony. Rock Creek HCT results for each rock type were scaled to Big Hurrah field conditions and combined in proportion to their abundance in the pit walls using the geochemical model, producing an estimate of the bulk pit wall runoff water chemistry.

5.3 Scaling to pit wall runoff and submerged mixing

Laboratory testing is conducted under controlled and specific conditions including, in the case of HCTs, the grain size and volume of water used. Because field test samples and water volumes are different than those in the laboratory setting, test results should be adjusted (scaled) to account for these differences. The HCT results were scaled to the site-specific field conditions by the relative change in rock surface area and volume of water flushed over the rock. This scaling was conducted for both the unsubmerged pit wall runoff and the water that enters the lake from the pit wall after submergence.

The HCT concentrations were multiplied by the water flushed through the cell, and divided by the surface area per unit mass and the pore volumes flushed during the laboratory test, which resulted in mass of solute per unit surface area per pore volume of water flushed. The test surface area per unit mass for each of the rock types was estimated from the particle size analysis (GRAIN 3.0, from MDAG Publishing, www.mdag.com).

The specific surface area of HCT material was assumed to be 17.7 m^2/Kg for all rock types. The HCT samples contained from 1.5 to 1.9 Kg rock in the cells, and over the 20 weeks 17.4 to 18.0 liters were flushed through the cells.

Table 5.2 Input solution chemistries used for the pit lake geochemical modeling

Compound	Standard		QGS (alk)	QGS (acid)	GMS	Surface water	Groundwater
	Value	Source					
pH	NS		7.82	7.34	8.03	6.92	7.44
Alkalinity	NS		110	32	160	57	204
Silver	NS		0.0025	0.0025	0.0025	0.0005	0.0002
Aluminum	0.087	2	0.0225	0.0225	0.0225	0.0096	0.0031
Arsenic	0.01	1	**0.016**	**0.023**	0.0093	0.002	**0.045**
Barium	2	1	0	0	0	0	0
Beryllium	0.004	1	0.0005	0.0005	0.0005	0.0002	0.0001
Calcium	NS		58	10	210	22	70
Cadmium	0.00033	2	**0.00050**	**0.00050**	**0.00130**	0.00021	0.00010
Chloride	230	2	0.5	0.5	0.5	2.6	2.8
Chromium	0.1	1	0.00	0.00	0.00	0.00	0.00
Copper	0.013	2	**0.025**	**0.025**	**0.025**	0.000	0.000
Fluoride	4	1	0	0	0	0	0
Iron	1.0	2	0.0050	0.0050	0.0050	0.0192	**1.0250**
Mercury	7.7E-04	2	5.00E-05	5.00E-05	2.20E-04	7.06E-07	0.00E+00
Potassium	NS		1.50	1.00	1.90	0.21	0.48
Lithium	NS		0.00	0.00	0.00	----	----
Magnesium	NS		4.4	4.4	6.7	4.3	22.4
Manganese	NS		0.280	0.029	1.900	0.000	0.093
Nitrite (as NO2-)	1	1	0.0	0.0	0.0	0.1	0.1
Nitrate (as NO3-)	10	1	1	1	1	0	0
Sodium	NS		0	0	0	2	3
Nickel	0.075	2	0.0050	0.0050	0.0560	0.0010	0.0121
Phosphorus	NS		0.25	0.25	0.25	0.10	0.03
Lead	0.004	2	**0.0050**	**0.0050**	**0.0050**	0.0001	0.0000
Sulfate	NS		98	25	510	20	59
Antimony	0.006	1	0.0026	**0.0180**	0.0013	0.0005	0.0034
Selenium	0.005	2	0.003	0.003	0.008	0.002	0.001
Strontium	NS		0.3	0.1	0.6	0.1	0.4
Thallium	0.002	1	0.0005	0.0005	0.0005	0.0005	0.0002
Vanadium	NS		0.01	0.01	0.01	0.01	0.01
Zinc	0.169	2	0.0050	0.0190	0.0050	0.0028	0.0033

Notes:
* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness of 153 from average ROCK composition.
Groundwater concentrations are from the observed averages from HMW- 5A, and surface water values are from the Little Hurrah Creek –Upper surface water site.
Concentrations in bold exceed water quality standard values

The rates were converted back to field scale concentrations for the unsubmerged pit wall runoff by multiplying by the pit wall reactive surface area and pore volumes and dividing by the total volume of runoff for the simulated period of time. The volume of rock mass that contributes to mass loading to the pit lake was estimated by using an oxygen diffusion model which predicts the extent of pyrite oxidation into the pit wall as a function of moisture content, porosity of the pit wall, pyrite content, and time. The results indicated a production zone ranging from 2.8 to 4.2 feet depending on the time of exposure of the pit walls. The field scaling of the HCT data assumed that the DRZ porosity was 0.1, the rock density was 149 lb/ft^3 and the specific surface area was 1.5 ft^2/lb. Scaling was updated for each model time period.

A similar analysis was prepared for the submerged pit wall. The laboratory flux rate was converted to the field scale with the submerged pit surface area and two submerged pit wall pore volumes for the volume of water passing through the submerged pit surface area. Two pore volumes were assumed to be mobilized from the submerged pit wall damaged rock zone.

After scaling, the charge balance for each solution was checked. A charge balance is a comparison of the sum of the cations compared to the sum of the anions, which confirms the electroneutrality requirement for natural waters. The geochemical model was used to modify the concentration of an element in order to correct for slight differences in the charge balance. Chloride and sodium were used to adjust the charge balance of the input waters because these elements do not play critical roles in geochemical reactions of concern for the Big Hurrah pit lake simulations.

5.4 Pit lake modeling process

The geochemical modeling process involved a series of solution mixing, chemical reactions, and mineral surface adsorption modeling to predict the pit lake composition at each selected output time. The process included:

1) Developing individual, charge-balanced waters which are representative of contact waters at the Big Hurrah site.

2) Mixing the individual components of pit wall runoff, in proportion to their quantities in the pit wall, to estimate an average pit wall runoff chemistry.

3) Mixing the individual components of the flushed DRZ and backfill chemistry in proportion to their quantities to estimate an average chemistry of water flushed from the damaged rock zone.

4) Mixing the pit wall solutions with the groundwater, surface water, and rainfall according to proportions from the pit lake water balance model.

5) Removing pure water from the pit lake to account for evaporation in quantities estimated from the pit lake water balance.

6) Equilibration of the pit lake water with likely mineral phases and atmospheric gasses available for reaction (ferrihydrite, oxygen, and carbon dioxide).

7) Adsorption of specific compounds (arsenic, barium, lead, cadmium, copper, nickel, calcium, phosphate, zinc, beryllium, and sulfate) from the pit lake onto ferrihydrite according to Dzombak and Morel (1990).

The result of the geochemical modeling was a pit lake solution chemistry after a given time period. This procedure was then repeated for each time period. The new solution chemistry from each time period was mixed with the pit lake composition from the previous time step.

6 RESULTS AND RECOMMENDATIONS

6.1 Water-balance model

The results of the water-balance model include pit lake volume and stage elevation for each month after the end of mining. Additionally, the water volumes into and out of the pit lake were calculated for each component, and the pit lake inflow mixture percentages were developed for use in the geochemical model.

Table 6.1 summarizes the water-balance results and Figure 6.1 shows the pit filling curves. For the simulation, the pit lake fills after 0.3 years. In all time steps, the surface water is the most significant inflow component, and groundwater and pit wall runoff contribute a very minor fraction of the inflow to the pit. Pit lake evaporation increases until the pit lake reaches its maximum extent and overflow occurs.

6.2 Geochemical model

Table 6.2 shows the results of the geochemical pit lake model. The geochemical modeling predicted the pit lake chemical composition for each of the selected times. The pit lake had neutral pH values throughout the modeled time period, with a range of 7.5 to 7.6, and was of a calcium-bicarbonate water type with alkalinity at approximately 57 mg/l as $CaCO_3$.

Metal concentrations in the pit lake are relatively low, due to the low metal concentration in the surface water contribution, which dominates the pit lake chemistry. Groundwater entering the pit contained the highest metal concentrations but was such a small percentage of the total inflow of the pit lake that the effects of the groundwater composition were insignificant.

Another contributing factor to the water chemistry is the rapid filling of the pit, submerging exposed wall rock in a short time, limiting the pyrite oxidation process. The pit filled within approximately one month's time, during the spring breakup. This high influx of buffered surface water diluted any potential contaminants to a level that is in compliance with applicable water quality standards.

The groundwater arsenic concentration at the monitoring well HMW-5A is 0.045 mg/l, which appears to be a reasonable estimate of the background groundwater concentrations at the site. The predicted pit lake arsenic concentrations at each of the time steps was predicted to be lower than the background groundwater concentrations due to dilution from inflowing surface water and sorption to ferrihydrite.

These results suggest that the pit lake will not significantly impact the surface water quality at the site after closure due to the rapid filling of the lake, limiting exposure of pit wall rocks, and the dilution of potential contaminants by neutral, high-buffering surface water entering the pit during heavy precipitation events.

Table 6.1 Pit lake (no backfill) water balance results and mixing percentages

				WATER BALANCE					
Time step	**Time (years)**	**Pit lake elevation (meters amsl)**	**Pit lake volume (L)**	**Lake precipitation (L)**	**Groundwater inflow (L)**	**Pit wall runoff (L)**	**Surface water inflow (L)**	**Pit lake evaporation (L)**	**Pit lake overflow (L)**
1	0.4	35.7	5.21 E+08	1.30E+06	2.91E+05	1.65E+07	5.08E+08	4.27E+06	0.00E+00
2	1.3	43.0	8.28E+08	1.86E+07	5.38E+05	1.53E+07	7.08E+08	1.29E+07	4.23E+08
3	101.3	43.0	8.28 E+08	2.19E+09	5.84E+07	1.41E+09	7.32E+10	2.00E+09	7.49E+10

Time step	**Time (years)**	**Pit lake volume (%)**	**Lake precipitation (%)**	**Groundwater inflow (%)**	**Pit wall runoff (%)**	**Surface water inflow (%)**	**Total inflow (%)**	**Pit Lake overflow (%)**	**Pit lake evaporation (%)**
1	0.4	0%	0.25%	0.06%	3.14%	96.49%	100%	0%	0.9%
2	1.3	41.3%	1.47%	0.04%	1.21%	55.99%	100%	33.43%	1.1%
3	101.3	1.1%	2.82%	0.08%	1.81%	94.22%	100%	96.36%	2.6%

Table 6.2 Pit lake (with backfill) water balance results and mixing percentages

				WATER BALANCE					
Time step	**Time (years)**	**Pit lake elevation (meters amsl)**	**Pit lake volume (L)**	**Lake precipitation (L)**	**Groundwater inflow (L)**	**Pit wall runoff (L)**	**Surface water inflow (L)**	**Pit lake evaporation (L)**	**Pit lake overflow (L)**
1	0.4	60.0	5.00 E+08	3.26 E+05	4.96 E+04	1.54 E+07	5.00 E+08	1.14 E+05	1.84E+07
2	1.4	60.0	5.00 E+08	1.20 E+07	4.96 E+04	3.62 E+06	5.03 E+08	4.21E+06	5.14E+08
3	100.4	60.0	5.00 E+08	1.21 E+09	4.96 E+04	3.62 E+06	5.04 E+08	4.21E+06	5.16E+08

Time step	**Time (years)**	**Pit lake volume (%)**	**Lake precipitation (%)**	**Groundwater inflow (%)**	**Pit wall runoff (%)**	**Surface water inflow (%)**	**Total inflow (%)**	**Pit Lake overflow (%)**	**Pit lake evaporation (%)**
1	0.4	0%	0.059%	0.009%	2.762%	90.012%	100%	3.304%	7.2%
2	1.4	49.0%	1.099%	0.005%	0.330%	45.889%	100%	46.938%	4.0%
3	100.4	50.8%	1.061%	0.004%	0.319%	44.351%	100%	45.364%	3.9%

Table 6.3 Prediction of pit lake composition (no backfill) through time after closure

Compound*	Standard		LHRU**	Time 1	Time 2	Time 3
	Value	Source		0.42 years	1.33 years	101.33 years
pH	NS		6.92	7.56	7.55	7.55
Alkalinity	NS		57	58	58	57
Aluminum	0.087	2	0.010	0.009	0.009	0.009
Antimony	0.006	1	0.0005	0.0003	0.0003	0.0003
Arsenic	0.01	1	0.002	0.002	0.002	0.002
Barium	2	1	0.03	< 0.00039	< 0.00039	< 0.00039
Beryllium	0.004	1	0.0002	0.0002	0.0002	0.0002
Boron	NS		< 0.01257	< 01257	< 01257	< 01257
Cadmium	0.00033	2	0.000207	0.000203	0.000202	0.000203
Calcium	NS		22	22	22	22
Chloride	230	2	2.6	6.7	6.7	6.7
Cobalt	NS		< 0.00074	< 0.00074	< 0.00074	< 0.00074
Chromium	0.1	1	0.00049	< 0.00042	< 0.00042	< 0.00042
Copper	0.013	2	0.0005	0.0005	0.0005	0.0004
Fluoride	4	1	< 0.19	< 0.19	< 0.19	< 0.19
Iron	1.0	2	0.0192	< 0.00186	< 0.00186	< 0.00186
Lead	0.004	2	0.000095	< 0.00003691	< 0.00003691	< 0.00003691
Lithium	NS		< 0.00168	< 0.00168	< 0.00168	< 0.00168
Magnesium	NS		4.3	4.2	4.2	4.3
Manganese	NS		0.0005	0.002	0.002	0.002
Mercury	7.70E-04	2	7.06E-07	9.32E-07	8.83E-07	8.33E-07
Nickel	0.075	2	0.0010	0.0010	0.0010	0.0010
Nitrogen, ammonia (as NH3)	NS		0.053	< 0.0023	< 0.0023	< 0.0023
Total Nitrogen	NS		NA	0.5	0.5	0.5
Phosphorus	NS		0.096	0.093	0.093	0.094
Potassium	NS		0.214	0.212	0.211	0.212
Selenium	0.005	2	0.0024	0.0023	0.0023	0.0023
Silver	NS		< 0.00057	< 0.00057	< 0.00057	< 0.00057
Sodium	NS		2.0	3.1	2.9	2.6
Strontium	NS		0.086	0.085	0.085	0.085
Sulfate (as SO_4^{-2})	NS		20	19.8	19.6	19.7
Titanium	NS		< 0.00092	< 0.00092	< 0.00092	< 0.00092
Thallium	0.002	1	< 0.000677	< 0.000677	< 0.000677	< 0.000677
Vanadium	NS		0.009	0.009	0.009	0.009
Zinc	0.169	2	0.0028	0.0027	0.0027	0.0027

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness of 153 from average ROCK composition
** Surface water concentrations are mean values from the LHRU surface water sampling location (assumed to be background levels)

Table 6.4 Prediction of pit lake composition (with backfill) through time after closure

Compound*	Standard		LHRU**	Time 1	Time 2	Time 3
	Value	Source		0.42 years	1.42 years	100.42 years
pH	NS		6.92	7.42	7.54	7.55
Alkalinity	NS		57	46	56	58
Aluminum	0.087	2	0.010	< 0.00568	0.009	0.010
Antimony	0.006	1	0.0005	**0.0977**	0.0056	0.0010
Arsenic	0.01	1	0.002	**0.038**	0.004	0.003
Barium	2	1	0.03	0.08	0.03	0.03
Beryllium	0.004	1	0.0002	< 0.00007	0.0002	0.0002
Boron	NS		< 0.01257	< 0.01257	< 0.01257	< 0.01257
Cadmium	0.00033	2	0.000207	0.000001	0.000199	0.000210
Calcium	NS		22	100	27	23
Chloride	230	2	2.6	5.8	7.6	7.1
Cobalt	NS		< 0.00074	< 0.00074	< 0.00074	< 0.00074
Chromium	0.1	1	0.00049	< 0.00042	0.00047	0.00050
Copper	0.013	2	0.0005	< 0.00202	0.0004	0.0005
Fluoride	4	1	< 0.19	1.4	0.1	0.1
Iron	1.0	2	0.0192	< 0.00186	< 0.00186	< 0.00186
Lead	0.004	2	0.000095	0.000008	0.000038	0.000045
Lithium	NS		< 0.00168	< 0.00168	< 0.00168	< 0.00168
Magnesium	NS		4.3	37.6	6.1	4.6
Manganese	NS		0.0005	0.0953	0.0057	0.0020
Mercury	7.70E-04	2	7.06E-07	1.75E-07	7.27E-07	8.99E-07
Nickel	0.075	2	0.0010	**0.2508**	0.0141	0.0023
Nitrogen, ammonia (as NH3)	NS		0.053	< 0.0023	< 0.0023	< 0.0023
Total Nitrogen	NS		NA	1.6	0.5	0.5
Phosphorus	NS		0.096	< 0.0085	0.092	0.097
Potassium	NS		0.214	13.976	0.938	0.292
Selenium	0.005	2	0.0024	**0.0219**	0.0034	0.0025
Silver	NS		< 0.00057	< 0.00057	< 0.00057	< 0.00057
Sodium	NS		2.0	19.2	3.2	2.2
Strontium	NS		0.086	0.314	0.100	0.090
Sulfate (as SO_4^{-2})	NS		20	394	40	22
Titanium	NS		< 0.00092	< 0.00092	< 0.00092	< 0.00092
Thallium	0.002	1	< 0.000677	< 0.000677	< 0.000677	< 0.000677
Vanadium	NS		0.009	0.047	0.012	0.010
Zinc	0.169	2	0.0028	0.0215	0.0038	0.0029

* Milligrams per liter used for all concentration data, one half the MDL was used for censored data, NA is not available, and NS is no standard.
1= Environmental Protection Agency (EPA) maximum contaminant limit (MCL) values for drinking water and groundwater quality standards.
2 = Chronic Aquatic Life Fresh Water criterion , using calculated hardness of 153 from average ROCK composition
** Surface water concentrations are mean values from the LHRU surface water sampling location (assumed to be background levels)

6.3 Summary

Two scenarios were developed; one without backfill and one with PAG backfill. The no-backfill scenario resulted in good water quality during pit filling and long term. For the backfill scenario, initial water quality is impacted due to flushing of the backfill as the pit fills. Antimony, arsenic, selenium, and nickel were elevated in early time due to backfill flushing. Subsequent time steps, which include overwhelming dilution by surface water, resulted in good water quality. After the pit lake is full, groundwater inflow which provides the flushing of the backfill, will be minimized and will have a negligible effect on water quality. Early-time pit lake chemistry will be manageable through diverting inflow water as necessary, to give the lake time for settling and subsequent improvement of quality, as necessary.

7 REFERENCES

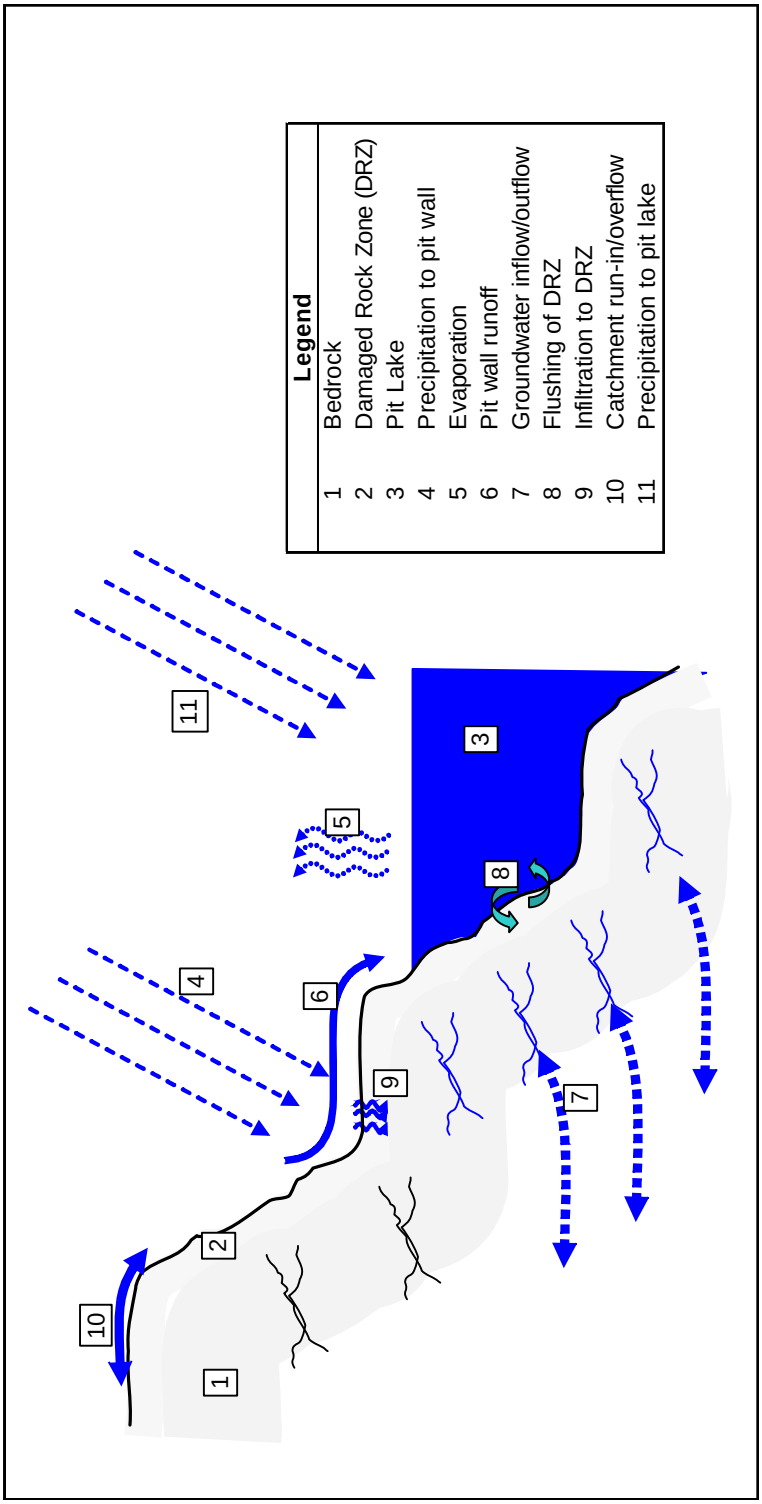
Dzombak, D.A., and Morel, F.M.M., 1990. Surface complexation modeling--Hydrous ferric oxide: New York, John Wiley, 393 p.

Parkhurst, David L. and Appelo, C. A. J., 1999. User's Guide to PHREEQC (Version 2) - A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and inverse Geochemical Calculations. Water-Resources Investigations Report 99-4259.

FIGURES

WATER MANAGEMENT CONSULTANTS

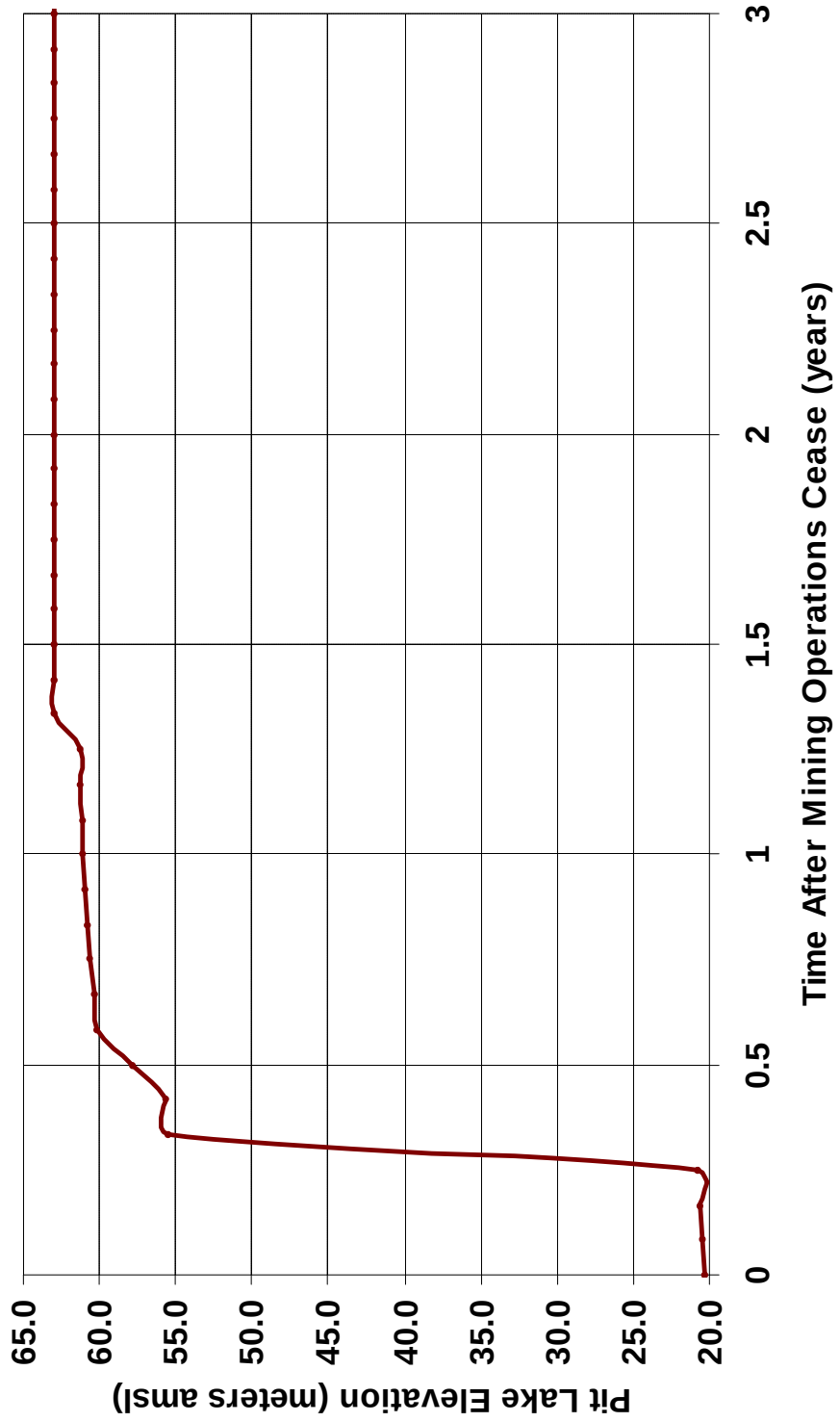
Figure 4.1 Pit lake conceptual water-balance model



2573-BIG HUR/AH
FIGURE-4.1

WATER MANAGEMENT CONSULTANTS

Figure 6.1 Big Hurrah predicted pit lake filling curve



2573-BIG HURRAH
FIGURE-6.1