STATE OF UTAH
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER QUALITY
SALT LAKE CITY, UTAH 84114-4870

Ground Water Discharge Permit
Permit No. UGW350001

In compliance with the provisions of the Utah Water Quality Act, Title 19, Chapter 5, Utah Code Annotated 1953, as amended, the Act

Kennecott Barneys Canyon Mining Company
4700 Daybreak Parkway
South Jordan, Utah 84095

is granted a ground water discharge permit for the monitoring of the closed Barneys Canyon Mine and Cyanide Heap Leach Facility located at Barneys Canyon about 2 miles north of Copperton, Utah.

The facility is located about 10 miles southwest of Salt Lake City on the USGS quadrangle of Bingham Canyon, Utah. The property is primarily on Section 31, Township 2 South, Range 2 West; Sections 35 and 36, Township 2 South Range 3 West; and Sections 2 and 3, Township 3 South, Range 3 West, Salt Lake Base and Meridian.

The permit is based on representations made by the permittee and other information contained in the administrative record. It is the responsibility of the permittee to read and understand all provisions of this permit.

The facility shall be constructed per closure planning in accordance with conditions set forth in this permit and the Utah Ground Water Quality Protection Rules.

This ground water quality discharge permit supersedes all other ground water discharge permits previously issued for this facility.

This permit shall become effective on October 9, 2018.

This permit shall expire at midnight October 8, 2023.

Erica B. Gaddis

Erica Brown Gaddis, PhD
Director

DWQ-2018-010951

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PART I. SPECIFIC PERMIT CONDITIONS

Barneys Canyon Mine is undergoing closure and the approved closure plan includes Construction Permits with the Utah Division of Water Quality (DWQ). Buildings and other infrastructure have been removed or are in the process of being removed and the five leach pads are in various stages of reclamation. No water besides meteoric water has been added to the leach pads since 2013. The drainage water from the five leach pads will continue to be monitored and gathered and conveyed to Kennecott's Tailings lines during closure activities and during post-closure. Continued monitoring will occur for all wells during closure and post-closure.

A. GROUND WATER CLASSIFICATION.

Based on ground water quality samples collected from wells within the facility boundary, ground water is classified as Class II Drinking Water Quality Ground Water. Average concentrations calculated from the historical water quality sampling results are summarized in Table 1. All parameters in Table 1 are in units of milligrams per liter (mg/l) dissolved, except for pH.

B. GROUND WATER QUALITY STANDARDS AND GROUND WATER PROTECTION LEVELS.

Utah Ground Water Quality Standards and permit-specific ground water protection levels for the required parameters are listed in Table 2. All parameters in Table 2 are in units of milligrams per liter (mg/l) dissolved, except for pH.

1. Ground Water Quality Standards - The permittee shall comply with all Ground Water Quality Standards in R317-6-2 of the Utah Ground Water Quality Protection Rules (UAC R317-6). The ground water around the site must comply with the applicable protection level for each of the standards contained in R317-6-2 even though this permit does not require monitoring for each specific chemical listed in the Rules. Therefore, the permittee shall not contaminate ground water by discharging compounds such as metals, leachates, acid, pesticides or volatile organic compounds not specified in the permit.

2. Ground Water Protection Levels – The ground water protection levels listed in Table 2 are based on compounds that may be in the discharge and therefore have the potential to contaminate ground water, and must be met at the downgradient wells. Ground water quality monitoring will be required to demonstrate that ground water protection levels have not been exceeded in compliance monitoring wells.

3. Exceedance of Ground Water Protection Levels - Out-of-compliance will be determined in accordance with R317-6-6.16 of the Ground Water Quality Protection Rules. Out-of-compliance exists when two (2) consecutive samples from a

compliance monitoring well exceed the protection level and the mean by two standard deviations, as calculated from the background data set for that well.

C. PERMITTED FACILITIES.

1. Leach Pads - Design and construction of existing pads BC-1, BC-2, BC-3, BC-4 and BC-5 incorporated Best Available Technology at the time. The leach pads were built as designed according to the construction permit issued on March 24, 1989 with a liner system from top to bottom as follows:

   a. Three (3) to 5-foot thick solution collection system of fine grained ore.

   b. 60-mil high density polyethylene (HDPE) primary liner.

   c. 12-inch minimum thickness clay secondary liner with a maximum hydraulic conductivity of 1.0×10^{-7} centimeters per second (cm/sec).

   d. Below the clay secondary liner, a 6-inch leak detection layer with a hydraulic conductivity of 1.0×10^{-3} cm/sec or greater was constructed. At the bottom of the leak detection layer, slotted sloping HDPE (Pads BC1, BC2 and BC3) and PVC (Pads BC4 and BC5) leak detection pipes were installed to drain to a sump or port that can be monitored by instruments or visually inspected.

   e. 6-inch minimum thickness clay tertiary liner with a maximum hydraulic conductivity of 1.0×10^{-6} cm/sec.

   Barneys Canyon leach pads are in the process of closure. Part of the closure includes the placement of earthen buttresses around the basal portion of each pad to increase the stability of each pad. Design and construction was approved by DWQ. The buttress placement was completed in 2016 and 2017 for BC3 and BC5 respectively and the other pads are schedule to be completed during the 2018 to 2023 permit term. As part of the closure and buttress additions, the leak detection system outlined in 1.d is no longer required. Drainage from each pad, due to meteoric inputs, will continue to be captured and monitored and routed to Kennecott's Tailings Lines system via pad drainage collection sumps and conveyance system.

2. Process Ponds - Two process ponds with a total capacity of 10,800,000 gallons were designed and constructed according to the construction permit issued March 24, 1989. A third process pond with a capacity of 4,300,000 gallons was designed and constructed according to the construction permit issued August 2, 1995.

   As part of the DWQ approved Construction Plan, the ponds have been taken out of service and each respective pond liner and sump are in the process of being removed and the ponds area will be re-contoured as part of heap leach closure activities.

3. Closure Construction

The permittee has obtained construction permits from the DWQ for closure construction which incorporates management of potential discharge of pollutants to waters of the state.

Any revisions or modifications to the approved closure plans and specifications for existing facilities must be submitted to DWQ for review and approval before changes to the approved closure plan or implementation thereof.

Table 1: Ground Water Quality Average Concentrations

Well ID	pH	TDS (mg/l)	Nitrate (mg/l)	Sulfate (mg/l)	Total Cyanide (mg/l)	Arsenic (mg/l)	Chromium (mg/l)	Mercury (mg/l)	Selenium (mg/l)
BCG281	7.25	965	0.73	53	0.007	0.005	0.02	<0.0002	<0.002
BCG282	7.33	829	1.5	74	0.007	0.010	0.01	<0.0002	0.004
BCG283	7.25	999	3.5	58	0.007	0.014	0.01	<0.0002	0.005
BCG284	7.32	592	1.3	32	0.005	0.006	0.01	<0.0002	0.003
BCG285	7.30	538	0.34	32	0.006	0.005	0.01	<0.0002	<0.002
VWW31	7.37	580	1.01	30	0.006	0.007	0.01	<0.0002	0.003
BCG848	7.13	848	1.41	109	0.012	0.008	0.01	<0.0002	0.006
BCG849	6.84	1436	3.76	223	0.008	0.006	0.01	<0.0002	0.006
BCG496	7.37	973	0.49	132	0.005	0.010	<0.01	<0.0002	0.003
BCG850	7.21	641	1.64	25	0.006	0.008	0.01	<0.0002	0.004
*BCG851A	7.28	862	1.32	116	0.010	0.012	<0.01	<0.0002	0.005
BCG851B	7.20	761	0.93	96	0.007	0.007	0.01	<0.0002	0.005
BCG852	7.36	597	1.4	28	0.007	0.008	0.01	<0.0002	0.004
**BCG2846	7.20	742	1.4	26	0.006	0.005	0.01	<0.0002	0.003

*data from 8/18/2011 to 1/8/2013 not included in calculation due to out of trend data

** New well drilled in 2015.

Table 2: Ground Water Protection Levels

Well ID	pH	TDS (mg/l)	Nitrate (mg/l)	Arsenic (mg/l)	Total Cyanide (mg/l)	Chromium (mg/l)	Mercury (mg/l)	Selenium (mg/l)
BCG281	6.5-8.5	1349	2.5	0.013	0.05	0.03	0.0005	0.013
BCG282	6.5-8.5	1036	2.5	0.013	0.05	0.03	0.0005	0.013
BCG283	6.5-8.5	1248	5.0	0.017	0.05	0.03	0.0005	0.013
BCG284	6.5-8.5	740	2.5	0.013	0.05	0.03	0.0005	0.013
BCG285	6.5-8.5	673	2.5	0.013	0.05	0.03	0.0005	0.013
VWW31	6.5-8.5	724	2.5	0.013	0.05	0.03	0.0005	0.013
BCG848	6.5-8.5	1079	3.4	0.013	0.05	0.03	0.0005	0.013
BCG849	6.5-8.5	1795	5.8	0.013	0.05	0.03	0.0005	0.013
BCG496	6.5-8.5	1217	2.5	0.013	0.05	0.03	0.0005	0.013
BCG850	6.5-8.5	802	2.5	0.013	0.05	0.03	0.0005	0.013
BCG851A	6.5-8.5	1077	2.6	0.016	0.05	0.03	0.0005	0.013
BCG851B	6.5-8.5	951	2.5	0.013	0.05	0.03	0.0005	0.013
BCG852	6.5-8.5	747	2.5	0.013	0.05	0.03	0.0005	0.013
BCG2846	6.5-8.5	927	2.5	0.013	0.05	0.03	0.0005	0.013
Ground Water Quality Standard	6.5-8.5	Class Specific	10	0.05	0.2	0.1	0.002	0.05

D. COMPLIANCE MONITORING.

During the period beginning with the effective date of the permit and lasting the term of the permit or as stated in the approved closure plan, the permittee shall demonstrate maintenance of Best Available Technology (BAT) and demonstrate that ground water protection levels have not been exceeded.

1. Ground Water Monitoring - The wells listed in Table 3 shall be monitored to demonstrate compliance with Part I.B.

Table 3: Monitoring Wells Located with Kennecott Coordinate System

Well ID	Northing	Easting	Elevation (top of casing)	Screened Depth	Gravel Pack Depth
Upgradient Well					
BCG281	N31733	E9976	6172	157-197	134-197
Downgradient Compliance Monitoring Wells					
BCG282	N31929	E16958	5528	155-205	146-205
BCG283	N30463	E17248	5577	176-226	164-229
BCG284	N28189	E16954	5578	418-468	409-469
BCG285	N29480	E14795	5770	81-131	72-132
VWW-31 (Copperton)	N27100	E20100	5368	149-1218	--
BCG848	N30090	E17070	5541	132-172	119-200
BCG849	N30546	E13745	5753	206-226	195-226
BCG496	N31224	E16854	5548	206-226	195-226
BC850	N28352	E17095	5551	205-245	200-253
BC851A	N30161	E18064	5454	58-78	52-78
BC851B	N30158	E18061	5453	120-160	115-164
BC852	N28367	E18240	5543	160-200	155-206
BCG2846	N33045	E17365	5449	130-170	115-170

2. Procedures for Well Monitoring

a. Routine Monitoring

All monitoring wells shall be analyzed for the following parameters:

1) Field Parameters: pH, conductivity, temperature, ground water elevation.

2) Laboratory Parameters: total dissolved solids, major ions (Ca, Cl, K, Mg, Na and SO_4), alkalinity, dissolved metals (As, Cr, Hg, Se, Tl), nitrate, and cyanide (total).

b. If total cyanide exceeds the ground water protection level in a well, the permittee shall analyze for cyanide amenable to chlorination for that well.

c. Accelerated Background Monitoring

Any new monitoring wells which may be required by the Director during the term of this permit shall be sampled at least eight times over a one-year or longer time span for all the parameters listed above in Part I.D.2.a. Data from background sampling shall be used to establish background concentrations of these constituents and also protection levels.

d. Frequency

All wells will be sampled semi-annually with the exception of any well exceeding compliance limits. Wells exceeding compliance limits will be sampled quarterly. Seeps or springs will be sampled semi-annually and flows measured quarterly. Ground water elevations shall be measured semi-annually in all monitoring wells.

e. Sampling

Sampling shall be conducted according to the sampling protocol contained in the Groundwater Characterization Plan (GCMP). Samples shall be collected of the ground water only after removal or purging of the equivalent of three casing volumes of standing water from the well bore. For low-yielding wells where this is not possible, evacuation procedures shall conform to the RCRA Ground Water Monitoring Technical Enforcement Guidance Document.

f. Laboratory Approval

All analyses shall be performed by a laboratory certified by the State of Utah according to methods cited in R317-6-6.3L. Detection limits for all parameters except cyanide amenable to chlorination are to be equal or less than the ground water quality standard, or the ground water protection level, whichever is less in

Table 2. Analytical methods used for sample analyses will be consistent with past permits for comparability and consistent with Kennecott's Quality Assurance Plan in its GCMP. Other analytical methods shall be used only with permission of the Director.

g. Damage to Monitoring Wells

If any monitoring well is damaged or is otherwise rendered inadequate for its intended purpose, the Director shall be notified within five days in writing.

h. Additional Wells

If additional downgradient wells are required, they will be monitored in accordance with the above requirements.

i. Seeps and Springs

For informational purposes only, sampling locations designated as BCS2845A, and D in the North Barneys drainage shall be sampled twice per year according to procedures described in the December 16, 2015 letter "Report for the Water Quality Characterization of Spring Water Flow in North Barneys Canyon Drainage". This letter and the "North Barneys Drainage Seep Collection System Operations and Maintenance Plan" are attached in Appendix A.

3. BAT Performance Monitoring –

a. No discharge of drainage water from the leach pads to ground water is allowed. Maintenance of this performance standard will be demonstrated by monitoring pad flows and inspection of the pad sumps and conveyance system.

The leach pads drain from west to east and were previously permitted with DWQ. A HDPE liner was placed over clay and a collection system consisting of screened drains lies on top of the HDPE at the eastern end of each pad. The screened drains will be covered with granular backfill and then covered with the final leach pad cover. Each leach pad has three to five screened drains (depending on the leach pad size) designed to gravity drain any flow into the collection system. The screened drains are designed where if one drain cannot manage the flow, the excess flow drains to the adjacent drain. A piezometer will be installed at the lowest elevation drain to monitor water levels which could indicate if the screen is plugged with fines or collapsed. Any water level measurement less than one foot below the top of the buttress liner is a failure of the performance standard and shall be repaired to assure water ponding does not occur. Water level measurements for each piezometer shall be measured quarterly.

b. Final cover over the leach pads shall be maintained in a stable condition to prevent generation of contact water. Any erosional features that expose former ore material in the leach pad are a failure of this performance standard and must be repaired immediately.

c. Reporting

Reporting procedures in Part I.E.2 must be followed as applicable.

E. REPORTING REQUIREMENTS.

1. Routine Reporting - The permittee shall furnish the Director with semi-annual monitoring reports of compliance monitoring. Reports shall include the following information:

a. Reports of analyses of well samples as required in Part I.D.1.

A report of ground water elevations as measured in all monitoring wells (except VWW31) within a 6-day period during the semi-annual period covered by the report, and corresponding with the time of sampling. A summary of the measured depth to water and ground water elevations shall be prepared and submitted with the semi-annual report.

Semi-annual reports shall be submitted to the Director according to the following schedule:

Reporting Period	Report Due On
January-June	August 15
July-December	February 15

Failure to submit reports within the time frame due shall be deemed as noncompliance and may result in enforcement action.

2. Reporting of BAT Failure – Failure to maintain BAT performance standards as described in Part I.D.3 shall be reported to the Director in accordance with the requirements of Part II.I. of this permit. The written submission shall contain:

a. A description of and duration of the BAT failure, laboratory analytical results and contaminant volumes/quantities when applicable;

b. The cause of failure; and

c. Steps taken or planned to reduce, eliminate or prevent recurrence.

d. The permittee shall prepare and submit within 30 days unless waived by the Director: (1) a plan and time schedule for assessment of the source, extent and potential dispersion of the contamination, (2) an evaluation of potential remedial action required to restore BAT and to restore and maintain ground water quality to ensure that the Ground Water Quality Standards will not be exceeded at compliance monitoring points.

3. Out of Compliance Reporting - In the event that the facility becomes out of compliance as defined in Part I.F.1.b, the reporting schedule in Part I.F shall be implemented.

4. Contingency Plan - In the event of a BAT failure, the permittee shall prepare a plan and make arrangements to correct the failure as approved by the Director.

F. OUT-OF-COMPLIANCE STATUS

Information must be provided to the Director if the facility becomes out of compliance. Immediate action is required to identify the problem, report, and repair the facility. Out-of-compliance is defined below:

1. Ground Water Monitoring
Exceedance of the protection level (Table 2) at any downgradient compliance monitoring well shall constitute noncompliance with this permit according to the following:

a. Probable Out-of-Compliance Status - If the concentration of a pollutant from any compliance monitoring well exceeds the protection level as defined in Parts I.B.2 and I.B.3 of this permit, the Permittee shall:

i. Notify the Director in writing of the probable out-of-compliance status within 30 days of receipt of the initial analytical data.

ii. Implement an accelerated schedule of quarterly ground water sampling and analysis for parameters requested by the Director. This quarterly sampling will continue for at least two quarters or until the compliance status can be determined by the Director. Reports of the results of this sampling will be submitted to the Director as soon as they are available, but not later than 45 days from each date of sampling.

b. Out-of-Compliance Status

i. Notification and Accelerated Monitoring - Upon determination by the permittee, in accordance with UAC R317-6-6.17 and Part I.B.3 that an out-of-compliance status exists, the permittee shall:

1) Verbally notify the Director of the out-of-compliance status within 24 hours of verification, and provide written notice within 5 calendar days of the detection, and

2) Immediately implement an accelerated schedule of quarterly ground water monitoring which shall continue for at least two quarters or until the facility is brought into compliance.

ii. Source and Contamination Assessment Study Plan - Within 30 days of the verbal notice to the Director, the permittee shall submit an assessment study plan and compliance schedule for:

1) Assessment of the source or cause of the contamination, and a determination of steps necessary to correct the source.

2) Assessment of the extent of the ground water contamination and any potential dispersion.

3) Evaluation of potential remedial actions to restore and maintain ground water quality, and ensure that ground water quality standards will not be exceeded at the downgradient compliance monitoring wells.

c. Probable Out-of-Compliance for Total Dissolved Solids

In the event that Total Dissolved Solids (TDS) exceeds protection levels in any well and no other parameters exceed protection levels, the permittee shall prepare a report on the cause of the exceedance for submission with the next regular semi-annual monitoring report. The report must include information such as an analysis of major ion chemistry in the ground water and drainage pad water, geographic distribution of ground water chemistry and other factors at the site sufficiently detailed to determine whether the TDS exceedance was due to mining activities or natural variation.

Upon examining the information in the report, if the Director determines that the exceedance was due to contact water, the permittee shall follow the procedures in Parts I.F.1.a and b. Based on available information, the Director may require changes in the monitoring plan or changes in mine closure operations if needed to protect ground water quality.

2. Failure to Maintain Best Available Technology Required by Permit

Kennecott is required to maintain BAT in accordance with the approved design and practice for this permit. Failure to maintain BAT or maintain the approved design and practice shall be a violation of this permit. In the event a compliance action is initiated against the permittee for violation of permit conditions relating to BAT, the permittee may affirmatively defend against that action by demonstrating the following:

a. The permittee submitted notification in accordance with R317-6-6.13;

b. The failure was not intentional or caused by the permittee's negligence, either in action or failure to act;

c. The permittee has taken adequate measures to meet permit conditions in a timely manner or has submitted for Director approval, an adequate plan and schedule for meeting permit conditions; and

d. The provisions of UCA 19-5-107 have not been violated.

G. CLOSURE REQUIREMENTS.

1. The heap leach pads reclamation has been designed in such a way that ground water pollution is prevented. The heap leach pads closure design has been submitted to DWQ and accepted with the issuance of construction permits for the implementation of the design. Any additional ore heap leach closure scenario that envisions the release of contact water to the environment will require that approved water quality criteria be met for three consecutive quarterly samples before contact water release can occur upon review and approval by the Director. The sampling procedure must be per the closure plan. In no case shall the closure criteria for this heap leach project result in degradation of the surface or ground water quality including beneficial uses thereof in the vicinity.

2. The oxide waste rock dumps and the sulfide waste rock repositories have been capped in accordance with the approved Waste Rock Management Plan accepted by DWQ on October 19, 1999. The ore remaining in the small sulfide ore stockpile at the implementation of the final closure design is currently being used at Kennecott facilities and/or will be securely disposed within the heap leach pads as described in the DWQ approved closure construction permits.

3. A closure document has been submitted and approved by the DWQ and Division of Oil, Gas and Mining. The approved plan is being implemented during closure of the Barneys Canyon Mining facility.

H. MINE WATER USE.

Water from the mine pits may be conveyed for use at Kennecott Utah Copper's Copperton Concentrator and for closure related activities at Barneys. The water may not be used or disposed of otherwise without prior approval from the Division of Water Quality Director. The mine pit water must not be otherwise discharged from company property.

I. COMPLIANCE SCHEDULE.

1. Sulfide Ore Stockpile Footprint Remediation – In a letter dated December 16, 2015, Kennecott identified the former sulfide ore stockpile footprint on the Barneys 6300 waste rock as a likely source of degraded water quality that is surfacing in the springs in the North Barneys Canyon drainage. The stockpile footprint also happens to coincide with a topographic low feature on the waste rock, infiltrating meteoric water through the acid generating material.

   Within 360 days of the effective date of this permit, Kennecott shall submit for Director review and approval a plan and schedule for addressing the former sulfide ore stockpile footprint as part of the Barneys mine closure activities.

PART II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. REPRESENTATIVE SAMPLING. Samples collected in compliance with the monitoring requirements established under Part I shall be representative of the monitored activity.

B. ANALYTICAL PROCEDURES. Water sample analysis must be conducted according to test procedures specified under UAC R317-6-6.3.L, unless other test procedures have been specified in this permit.

C. PENALTIES FOR TAMPERING. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. REPORTING OF MONITORING RESULTS. Monitoring results obtained during each semi-annual reporting period specified in the permit shall be submitted to the Director at the following address:

Utah Division of Water Quality
P.O. Box 144870
Salt Lake City, Utah 84114-4870
Attention: Ground Water Protection Section
or
Electronic Reporting:
https://deq.utah.gov/water-quality/water-quality-electronic-submissions

E. COMPLIANCE SCHEDULES. If compliance schedules are included as part of the ground water discharge permit, compliance or noncompliance with interim or final requirements of the schedule shall be submitted no later than 14 days following schedule date for accomplishing the requirement.

F. ADDITIONAL MONITORING BY THE PERMITTEE. If the permittee monitors any pollutant more frequently than required by this permit, using approved test procedures as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted. Such increased frequency shall also be indicated.

G. RECORDS CONTENTS.

1. Records of monitoring information shall include:

   a. The date, exact place, and time of sampling or measurements:

   b. The individual(s) who performed the sampling or measurements;

   c. The date(s) and time(s) analyses were performed;

   d. The individual(s) who performed the analyses;

   e. The analytical techniques or methods used; and,

   f. The results of such analyses.

H. RETENTION OF RECORDS. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least five years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

I. TWENTY-FOUR HOUR NOTICE OF NON-COMPLIANCE REPORTING.

1. The permittee shall verbally report any non-compliance which may endanger public health or the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Utah Division of Environmental Quality 24 hour number, (801) 536-4123, or to the Division of Water Quality, Ground Water Protection Section at (801) 536-4300, during normal business hours (Monday thru Friday 8:00 am - 5:00 pm Mountain Time).

2. A written submission shall also be provided to the Director within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain the information requested in Part I.E.

3. Reports shall be submitted to the addresses in Part II.D, Reporting of Monitoring Results.

J. OTHER NON-COMPLIANCE REPORTING. Instances of non-compliance not required to be reported within 24 hours, shall be reported at the time that monitoring reports for Part II.D are submitted.

K. INSPECTION AND ENTRY. The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

PART III. COMPLIANCE RESPONSIBILITIES

A. DUTY TO COMPLY. The permittee must comply with all conditions of this permit. Any permit non-compliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in non-compliance with permit requirements.

B. PENALTIES FOR VIOLATIONS OF PERMIT CONDITIONS. The Act provides that any person who violates a permit condition implementing provisions of the Act is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions is subject to a fine not exceeding $25,000 per day of violation. Any person convicted under Section 19-5-115 of the Act a second time shall be punished by a fine not exceeding $50,000 per day. Nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for non-compliance.

C. NEED TO HALT OR REDUCE ACTIVITY NOT A DEFENSE. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. DUTY TO MITIGATE. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. PROPER OPERATION AND MAINTENANCE. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. UNFORESEEN EVENTS. The conditions of this permit described in Part II.I.1 shall not prohibit the permittee from taking emergency action to prevent the loss of life, personal injury, severe property damage, and to protect public health and the environment.

PART IV. GENERAL REQUIREMENTS

A. PLANNED CHANGES. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required when the alteration or addition could significantly change the nature of the facility or increase the quantity of pollutants discharged.

B. ANTICIPATED NON-COMPLIANCE. The permittee shall give advance notice of any planned changes in the permitted facility or activity which may result in non-compliance with permit requirements.

C. PERMIT ACTIONS. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated non-compliance, does not stay any permit condition.

D. DUTY TO REAPPLY. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

E. DUTY TO PROVIDE INFORMATION. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

F. OTHER INFORMATION. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director, it shall promptly submit such facts or information.

G. SIGNATORY REQUIREMENTS. All applications, reports or information submitted to the Director shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer.

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

   c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

i. The authorization is made in writing by a person described above and submitted to the Director, and,

ii. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

2. Changes to Authorization. If an authorization under Part IV.G.1 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.G.1 must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

3. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. PENALTIES FOR FALSIFICATION OF REPORTS. The Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

I. AVAILABILITY OF REPORTS. Except for data determined to be confidential by the permittee, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Director. As required by the Act, permit applications, permits, effluent data, and ground water quality data shall not be considered confidential.

J. PROPERTY RIGHTS. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

K. SEVERABILITY. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

L. TRANSFERS. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

M. STATE LAWS. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, penalties established pursuant to any applicable state law or regulation under authority preserved by Section 19-5-115 of the Act.

N. REOPENER PROVISIONS. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. If new ground water standards are adopted by the Board, the permit may be reopened and modified to extend the terms of the permit or to include pollutants covered by new standards. The permittee may apply for a variance under the conditions outlined in R317-6.4.D.

2. Changes have been determined in background ground water quality.

APPENDIX A

NORTH BARNEYS CANYON DRAINAGE SPRING AND SEEP OPERATION, MAINTENANCE, AND SAMPLING DOCUMENTS

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North Barneys Drainage Seep Collection System Operations and Maintenance Plan

Operations

The North Barneys Drainage Seep Collection System (System) operates in passive mode. The System collects spring water at two locations within the North Barneys Drainage and gravity flows to the KUC's Tailing Pipelines. The first location (Box 1) is located at the toe of the Barneys Dump. Box 1 is fed shallow sub surface spring water through two 30 feet long French drain systems (Figure 1). The French drain systems for each consist of a perforated 6 inch HDPE pipe enveloped in course aggregate that is wrapped in a filter fabric. The second location (Box 2) is located approximately 2500 feet east of Box 1 in the Bancroft Springs area. Box 2 is fed shallow sub surface spring water through one 30 feet long French drain systems (Figure 2). The French drain system consist of a perforated 6 inch HDPE pipe enveloped in course aggregate that is wrapped in a filter fabric.

Figure 1.

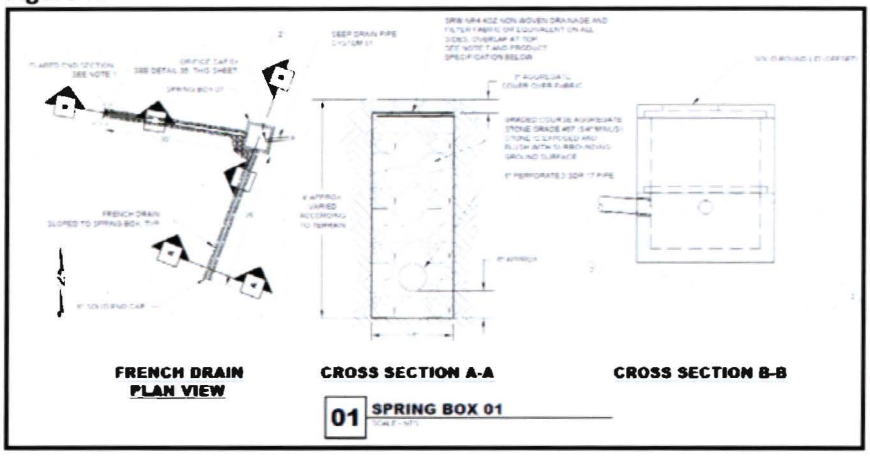
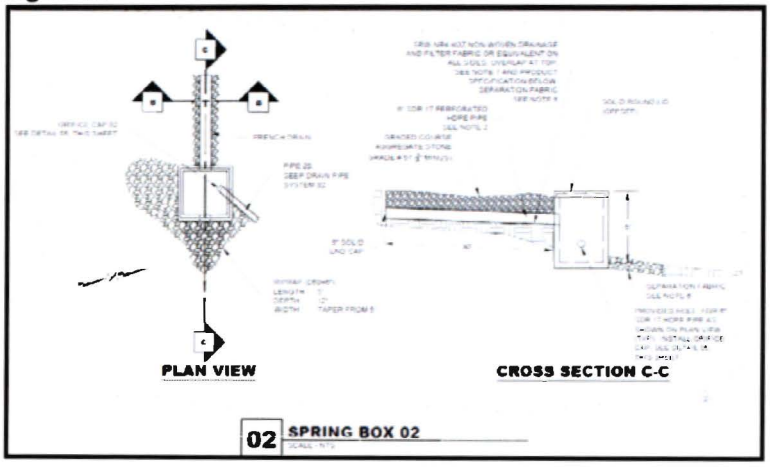


Figure 2.



Maintenance

The System is inspected on a quarterly basis. The inspection consists of; 1) Driving the pipeline route and visually inspecting the surface for any out of normal conditions such as ponded water, isolated wet surface expressions, surface voids and erosion; 2) Visually inspecting the area around Box 1 and 2 for any out of normal conditions such as ponded water, isolated wet surface expressions, surface voids and

erosion; 3) Visually inspecting the interior of Box 1 and 2 for any signs that may indicate the integrity of the box is compromised; 4) Measurement of the thickness of sediment in the bottom of the box, and; 5) Measurement of flows from pipes into the boxes and reconciliation of flows with a measurement of the combined flow into manhole 1 (Figure 3). The quarterly inspection is documented on the attached inspection checklist. Any issues noted in the inspection will require documented corrective action.

Figure 3

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North Barneys Drainage Seep Collection System Quarterly Inspection Form

Date: _____ Time: _____ Inspector: _____

Task	Observed Issue		Issue Description	Corrective Action
Pipeline Corridor	Yes	No		
Area Around Box 1	Yes	No		
Area Around Box 2	Yes	No		
Interior of Box 1	Yes	No		
	Thickness of Sediment*			
Interior of Box 1	Yes	No		
	Thickness of Sediment*			

*Remove sediment if within one inch of the bottom of any of the boxes pipes.

Pipe	Flow Measurement #1 (GPM)	Flow measurement #2 (GPM)	Flow measurement #3 (GPM)	Average
Box 1 (west)				
Box 1 (south)				
Box 2				
Total box flow for above pipes				
Manhole 1				
Percent difference (Total box flow vs Manhole 1)**				

**Investigate possible issue if there is a 10% discrepancy between the Boxes total flow versus Manhole 1 flow.

Rio Tinto

Kennecott Utah Copper
4700 Daybreak Parkway
South Jordan, Utah 84095
USA
T 801-204-2814
M 801-556-3317

December 16, 2015

Mr. Dan Hall
Department of Environmental Quality
Division of Water Quality
P.O. Box 144870
195 North 1950 West
Salt Lake City, Utah 84114-4870

ATTN: Mr. Brian Hamos

Subject: Report for Water Quality Source Characterization of Spring Water Flow in North Barneys Canyon Drainage

Dear Mr. Hall:

On behalf of Barneys Canyon Mining Company, Kennecott Utah Copper LLC (KUC) has prepared this report per a letter dated October 27, 2015 from Utah Department of Water Quality (DWQ) in response to a plan submitted by KUC in late September 2015. The plan submitted and approved by DWQ focuses on "Source Characterization Investigations for North Barneys Creek Spring Flow". Seven tasks were identified to better understand the hydrogeology and geochemistry for the spring water flow.

KUC has recently installed a six inch HPDE gravity pipeline to collect the spring water. The new line has two capture point boxes and began collecting water on December 4, 2015. The upper collection box is located at the base of the reclaimed toe of the Barneys 6300 waste rock pile and the second box is located immediately downstream of Bancroft Springs. It is important to note that the upper collection box is centered on North Barneys Drainage. Upper North Barneys Drainage was filled with waste rock so any infiltration into the waste rock would report to the North Barneys Drainage bottom. This aspect of drainage capture is discussed below under Task 5.

The seven tasks for assessing the source of the water quality and flow in North Barneys drainage are presented below.

1. **Provide all water quality data and location of samples for water associated with the springs sampled in North Barneys drainage and potential source water.**

   KUC has established three sampling locations (BCS2845A, C and D) on North Barneys Creek (Table 1 and Figure A). In addition, two additional samples (both labeled as BCS2845) were collected prior to the established sample locations. The three locations have been sampled four times in 2015 and the earlier samples were collected on February 2015 and May 2011. The sample identification and locations include:

   - BCG2845: Sample site near Bancroft Spring sampled on 5/16/2011 and 2/13/2015. Intermittent flow was noted in 2011 and no sampling was completed from 2012 through 2014.
   - BCS2845A: Located at the base of the reclaimed Barneys 6300 dump toe. Surface flow for North Barneys drainage originates at this site. Samples have been collected on 3/13, 6/19, 7/31 and 11/20, all in 2015.
   - BCS2845C: Sample site located immediately downstream of Bancroft Springs. Flow upstream is intermittent. Sample dates are same as BCS2845A.

- BCS2845D: Sample site is located approximately 900 feet down stream of BCS2845C. Sample dates are same as BCS2845A.

In addition, Barneys Pit Lake is sampled regularly. Although it appears that the groundwater quality in Barneys Pit does not correspond to the North Barneys drainage water quality, it is located upgradient and on the general groundwater flow path for North Barneys drainage. TDS concentrations of Barneys Pit Lake are approximately 3.5 times less than TDS at BCS2845A. KUC has collected samples for Barneys Pit on at least an annual basis since 2002 when the pit lake began forming. The data is included in Table 1 and the sample identification is BCS2733. BCG2733 water quality has not significantly changed since 2002 with neutral to alkaline pH, TDS in the 450 to 500 mg/l range and arsenic in the 0.040 mg/l range.

2. **Provide any historic water quality for drainage collected prior to mining.**

Prior to mining at Barneys, specifically, Barneys Pit, water sampling was conducted for existing springs. For the North Barneys drainage, one sample was collected from Bancroft Springs on April 6, 1988 with total arsenic measured at 32 ug/l. Results for this sample are also included in Table 1. The flow for Bancroft Springs was listed at 30 gpm in the spring of 1988.

3. **Provide hydrogeology sections: 1) one section parallel along drainage that begins at Barneys Pit and terminates at Copperton Improvements District Well W31 and 2) two sections perpendicular to drainage arranged north-south with western section across the upper seep at the base of the reclaimed waste rock toes and the second north-south section at Bancroft Springs. All geology data available will be used for the sections.**

Three figures have been prepared with a geologic plan view and three hydrogeology sections.

- Figure 1: Includes a geologic plan view map for area and the location of three cross sections.
- Figure 2: A-A' is an East-West hydrogeology section which begins at Barneys Pit and extends eastward to include Copperton Improvement District wells (W31 & W32).
- Figure 3: Two North-South hydrogeology sections were cut perpendicular to the east-west cross section, with the west most section located at the toe of the reclaimed Barneys 6300 waste rock and the east most section located just upstream of Bancroft Springs.

4. **Provide time series information for three sample sites on the North Barneys drainage with graphs for total dissolved solids, sulfate and arsenic and a discussion of the data.**
    - Graphs are presented for each of the three sample sites with metals grouped on one graph (total and dissolved arsenic and thallium) and TDS and SO4 on the second. Flow is shown on both graphs for each of the three sample sites. Supporting data is in Table 2.
    - No significant trends are apparent except for decreasing flow rates over time. Arsenic concentrations are greater at the downgradient sites for BCS2845C and D while thallium is greater upgradient.

5. **Present and discuss the history of the waste rock placed immediately upstream of the seep located at the base of the reclaimed waste rock toe. Items to include existing known geochemistry, when waste rock was placed and types of waste rock placed (a sulfide ore pile was located on top of the waste rock but was later removed). Searches of history will be made to better explain this history.**
    - Figure 4: Plan view topographic map. The topo is pre-mining from 1978 with outlines for both Barneys Pit and the Barneys 6300 waste rock. In addition, the former sulfide ore staged on the Barneys 6300 waste rock (~1992-2005) is shown. Other features include the spring capture locations on North Barneys drainage and the monitoring and production wells associated with Barneys.
        - Barneys pit excavation began in 1989 and the waste rock was placed adjacent to the north and east of the pit and the pit was mined out in the mid 1990s.
        - Barneys 6300 waste rock was placed in a North Barneys drainage (Figure 4). Generally the waste rock was dumped eastward and the outer eastern slope drains east. The waste rock footprint is approximately 113 acres. There is a topo low of approximately 10 acres located

on the top of the Barneys 6300 waste rock. The entire footprint of the Barneys 6300 waste rock lies within the surface capture area of North Barneys drainage.

- Beginning in approximately 1992 through 1999, sulfide ore was stacked on top of the 6300 Barneys waste rock in the topo low area. Based upon mapping by Barneys personnel and as seen on Google Earth, the footprint of the sulfide ore footprint was about 6.6 acres and it was not removed and taken to the Sulfide Mill area until late 2004/early 2005.
- Barneys 6300 waste rock and the sulfide ore stockpile were sampled in 1999. Field parameters of paste pH and paste conductivity were measured with a limited number of samples also analyzed for ABA characteristics (Table 3 and Figure 7). The sulfide ore is strongly net acid generating while the Barneys 6300 waste rock is strongly net neutralizing with few sulfides, relatively low total metals concentrations and abundant calcium carbonate.
- Observations of the former sulfide ore footprint made in November 2015 show local areas of sparse vegetation or no vegetation and abundant iron staining along with local sulfide rock still present. Based upon the observations, KUC will sample and map the residual sulfide ARD generating footprint.

- Figure 5: Based upon the topography for the North Barneys drainage and the location of the Barneys 6300 waste rock, a local watershed boundary was drawn which encompasses the waste rock area. The total acreage is approximately 160 acres and most if not all of this acreage would report to North Barneys drainage. North Barneys drainage is underlain with a thin colluvial/alluvium layer, clay with varying thickness and then volcanic bedrock. It is believed that meteoric water infiltrating the waste rock moves laterally and downward to the clay where it is perched and moves laterally downgradient to the eastern base of the reclaimed Barneys 6300 waste rock toe and reports to North Barneys drainage.
  - It is believed that the former sulfide ore stockpile footprint is generating most of the TDS and metals seen in the North Barneys drainage flow. Because the former sulfide pile was located in a topo low, meteoric water that infiltrated the pile and currently continues through the former footprint, is able to mobilize contaminates downward to the base of the waste rock. Because the pre-mine topography will continue to route meteoric infiltration through the subsurface to the underlying drainage, flow is and will be captured with the newly installed capture points and pipeline beginning at the base of the reclaimed waste rock in North Barneys drainage. Given the stockpile has been removed, significant additional contaminant loading is considered unlikely and water quality is anticipated to gradually improve.
  - During installation of the upgradient box in North Barneys drainage as part of the pipeline installation, it was noted that flow emanating from the reclaimed waste rock toe was conveyed along the base of the waste rock. Also during the excavation of the pipeline, it was noted that portions of the pipeline trench encountered volcanic bedrock or clay immediately above the bedrock. Both indications would support the observation that the flow is perched on top of the clay and/or the volcanic bedrock.

6. **Provide regional water table map that depicts all data points used to contour data.**

Figure 6: Water level map for Barneys area including North Barneys drainage.

- Water gradient is west to east.
- The water table beneath the Barneys 6300 waste rock is likely perched. The regional water table likely has a steeper gradient beginning at Barneys Pit that moves eastward into the basin.
- Barneys Mining has two monitoring wells located directly downgradient of North Barneys drainage (BCG284 and BCG850). It appears that BCG850 may be monitoring the perched aquifer and BCG284 may be monitoring the regional aquifer. Both wells are sampled regularly as part of the Barneys GWDP.

7. **Provide a monitoring plan for the capture points (two) on the springs that include frequency of sampling and flow measurements. It is anticipated that analytes will be same as those in**

Rio Tinto

groundwater discharge permit and that frequency of sampling and flow measurements will be semi-annual.

- During the pipeline installation to capture the springs in North Barneys drainage, two capture boxes (Figure 5) were installed with one located at the toe of the reclaimed Barneys 6300 waste rock toe and a second box immediately downgradient of Bancroft Springs. Based upon the sampling results for BCS2845A, C and D, it appears the water quality is similar with general salt and metals precipitate concentrations increasing proceeding downstream due to evaporation. It would appear the water seen in North Barneys originates from infiltration into the Barneys 6300 waste rock and with runoff from native soil adjacent to waste rock.
- It is anticipated flow may dry up downstream of the upper capture box over time due to where the water is sourced from upstream.
- Flow measurements will be collected twice a year at both capture boxes.
- Water samples will collected twice a year with one sample from each capture box.
- Analytes will be the same suite for the monitoring wells under the Barneys GWDP.

If you should have questions or comments on this report, please contact Brian Vinton at (801) 569-7887.

Sincerely,

Steve Schnoor
Manager, Environment, Land and Water
Kennecott Utah Copper LLC
On behalf of Barneys Canyon Mining Co.

Attachments

Table 1: North Barneys Drainage and Barneys Pit
Table 2: Time Series data for Three Seep Samples; TDS, SO4, As, Th and Flow
Table 3: Barneys Waste Rock and Sulfide Ore Sampling from 1999 on the Barneys 6300 Dump Level
Figure A: North Barneys Drainage Seep Sample Locations
Figure 1: Barneys Plan View and Section Locations
Figure 2: Hydrogeology Section A-A'. East-West section
Figure 3: Hydrogeology Sections B-B' and C-C'. North-South sections
Figure 4: Pre-Mining Topograph
Figure 5: Barneys Waste Rock Watershed
Figure 6: Barneys Water Table
Figure 7: Barneys Waste Rock and Sulfide Ore ABA Sampling

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Tables

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Figures

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Tables

Table 1: North Barneys Drainage and Barneys Pit Lake

Station	Date	Conductivity Field-T (uS/cm)	pH-T (Field)	Temperature-T (Field)	Flow (gpm)	Alkalinity-T (mg/L as CaCO3)	Aluminum-D (mg/L)	Aluminum-T (mg/L)	Antimony-D (mg/L)	Antimony-T (mg/L)	Arsenic-D (mg/L)	Arsenic-T (mg/L)	Barium-D (mg/L)	Barium-T (mg/L)	Cadmium-D (mg/L)	Cadmium-T (mg/L)	Calcium-T (mg/L)	Chloride-T (mg/L)	Chromium-D (mg/L)	Chromium-T (mg/L)	Copper-D (mg/L)	Copper-T (mg/L)	EPA Total Cyanide-T	Fluoride-T (mg/L)	Hardness-T (mg/L as CaCO3)	Iron-D (mg/L)	Iron-T (mg/L)	Lead-D (mg/L)	Lead-T (mg/L)	Magnesium-T (mg/L)	Manganese-D (mg/L)	Manganese-T (mg/L)	Mercury-T (mg/L)	Nickel-D (mg/L)	Nickel-T (mg/L)	Nitrate Nitrogen-T (mg/L)	Nitrite Nitrogen-T (mg/L)	Potassium-T (mg/L)	Selenium-D (mg/L)	Silver-D (mg/L)	Silver-T (mg/L)	Sodium-T (mg/L)	Sulfate-T (mg/L)	Thallium-D (mg/L)	Thallium-T (mg/L)	Titanium-D (mg/L)	Titanium-T (mg/L)	Total Dissolved Solids-T (mg/L)	Total Suspended Solids-T (mg/L)	Zinc-D (mg/L)	Zinc-T (mg/L)
BCS2845A	3/13/2015	2117	8.05	12.3	15.8	345	<0.02	0.037			0.038	0.036	0.082	0.089	<0.001	<0.001	172	280	<0.01	<0.01	<0.02	<0.02			840	<0.03	0.044	<0.005	<0.005	100	<0.01	<0.01	<0.0002			6.6	<0.04	4.9	0.022	<0.005	<0.005	131	428			<0.01	<0.01	1430	<3	0.013	0.093
BCS2845A	6/19/2015	2130	6.88	11.4	7.55	346					0.034	0.042	0.081	0.1	<0.001	<0.001	197	274	<0.005	<0.005	<0.01	<0.01			980	<0.03	0.363	<0.005	<0.005	119			<0.0002			6.7	<0.04	5.4	0.019	<0.005	<0.005	138	482	0.008	0.01			1240	4	0.011	0.033
BCS2845A	7/31/2015	2082	7.2	10.6	9.32	344					0.032	0.036	0.08	0.085	<0.001	<0.001	185	267	<0.005	<0.005	<0.01	<0.01			881	<0.03	0.048	<0.005	<0.005	102			<0.0002			6.3	<0.04	5	0.019	<0.005	<0.005	127	458	0.007	0.009			1470	14	0.011	0.021
BCS2845A	11/20/2015	2108	7.44	10.1	9.32	335					0.034		0.088		<0.001		177	267	<0.005		<0.01		<0.005		898	<0.03		<0.005		111			<0.0002			6.2	<0.04	5.4		<0.005		136		0.008				1440	<3	0.014	
BCS2845C	3/13/2015	2190	7.77	9.5	7.55	345	<0.02	0.357			0.051	0.065	0.048	0.066	<0.001	<0.001	171	348	<0.01	<0.01	<0.02	<0.02			801	<0.03	0.445	<0.005	<0.005	91	0.118	0.154	<0.0002			1.9	<0.04	3.7	0.015	<0.005	<0.005	145	362			<0.01	0.01	1410	24	<0.01	0.056
BCS2845C	6/19/2015	2240	7.31	13.8	4.57	391					0.114	0.14	0.062	0.072	<0.001	<0.001	202	363	<0.005	<0.005	<0.01	<0.01			948	<0.03	0.347	<0.005	<0.005	108			<0.0002			0.7	<0.04	4.6	0.005	<0.005	<0.005	164	389	0.004	0.005			1470	26	<0.01	<0.01
BCS2845C	7/31/2015	2057	7.68	14.5	4.57	410					0.12	0.135	0.062	0.069	<0.001	<0.001	204	370	<0.005	<0.005	<0.01	<0.01			916	<0.03	0.198	<0.005	<0.005	99			<0.0002			0.5	<0.04	4.8	0.006	<0.005	<0.005	154	392	0.004	0.005			1580	6	<0.01	<0.01
BCS2845C	11/20/2015	2239	7.67	6.7	2.33	394					0.035		0.047		<0.001		176	366	<0.005		<0.01		<0.005		830	<0.03		<0.005		95			<0.0002			1	<0.04	4		<0.005		141		0.003				1430	8	<0.01	
BCS2845D	3/13/2015	2126	8.22	7.8	13.4	292	<0.02	0.024			0.087	0.086	0.039	0.041	<0.001	<0.001	170	349	<0.01	<0.01	<0.02	<0.02			802	0.04	0.068	<0.005	<0.005	92	0.133	0.136	<0.0002			0.4	<0.04	4.2	0.008	<0.005	<0.005	155	363			<0.01	<0.01	1340	<3	<0.01	0.047
BCS2845D	6/19/2015	2330	7.28	15.7	4.57	365					0.19	0.223	0.056	0.063	<0.001	<0.001	187	379	<0.005	<0.005	<0.01	<0.01			894	<0.03	0.689	<0.005	<0.005	104			<0.0002			<0.2	<0.04	4.4	0.004	<0.005	<0.005	169	375	0.006	0.007			1420	190	<0.01	<0.01
BCS2845D	7/31/2015	2299	8.14	15.8	2.33	320					0.139	0.148	0.051	0.055	<0.001	<0.001	182	376	<0.005	<0.005	<0.01	<0.01			869	<0.03	0.063	<0.005	<0.005	101			<0.0002			<0.2	<0.04	4.9	0.004	<0.005	<0.005	161	386	0.005	0.005			1570	7	<0.01	0.07
BCS2845D	11/20/2015	2228	7.88	3.6	2.33	361					0.056		0.043		<0.001		189	375	<0.005		<0.01		<0.005		895	<0.03		<0.005		103			<0.0002			0.6	<0.04	4.9		<0.005		157		0.003				1430	3	<0.01	
Bancroft Springs	4/6/1988	1200	8.24	9	30	169			0.01	0.01	0.017	0.032	0.009	0.011	<0.005	<0.005	96	168	<0.010	<0.010	<0.010	<0.010	<0.005	0.1		<0.10	0.59	0.006	0.013	52.7	0.01	0.04	<0.001	0.03	0.06	0.49	<0.02	3.1	0.004	<0.010	<0.010	123	159					783		<0.010	0.01
BCS2845JI	5/16/2011	2370	8.01	13	<5	252					0.107		0.042		<0.001		190	454	<0.01		<0.02		<0.005		886	<0.02		<0.005	<0.005	100			<0.0002			1	<0.04	4.4	0.006	<0.005		178	503					1690	<3	<0.01	
BCS2845JI	2/13/2015	2229	7.4	14	~10	356					0.048		0.048	0.089	<0.001		178	346	<0.01		<0.02		<0.005		826	<0.02		<0.005		93			<0.0002			1.9	<0.04	3.9	0.013	<0.005		147	366					1440	23	<0.01	

Barneys Pit Lake	Date	* Conductivity Field-T (uS/cm)	* pH-T (Field)	* Temperature-T (Field)	*Flow-T (gpm)	Alkalinity-T (mg/L as CaCO3)	Aluminum-D (mg/L)	Aluminum-T (mg/L)	Antimony-D (mg/L)	Antimony-T (mg/L)	Arsenic-D (mg/L)	Arsenic-T (mg/L)	Barium-D (mg/L)	Barium-T (mg/L)	Cadmium-D (mg/L)	Cadmium-T (mg/L)	Calcium-T (mg/L)	Chloride-T (mg/L)	Chromium-D (mg/L)	Chromium-T (mg/L)	Copper-D (mg/L)	Copper-T (mg/L)	EPA Total Cyanide-T	Fluoride-T (mg/L)	Hardness-T (mg/L as CaCO3)	Iron-D (mg/L)	Iron-T (mg/L)	Lead-D (mg/L)	Lead-T (mg/L)	Magnesium-T (mg/L)	Manganese-D (mg/L)	Manganese-T (mg/L)	Mercury-T (mg/L)	Nickel-D (mg/L)	Nickel-T (mg/L)	Nitrate Nitrogen-T (mg/L)	Nitrite Nitrogen-T (mg/L)	Potassium-T (mg/L)	Selenium DRC-D (mg/L)	Silver-D (mg/L)	Silver-T (mg/L)	Sodium-T (mg/L)	Sulfate-T (mg/L)	Thallium-D (mg/L)	Thallium-T (mg/L)	Titanium-D (mg/L)	Titanium-T (mg/L)	Total Dissolved Solids-T (mg/L)	Total Suspended Solids-T (mg/L)	Zinc-D (mg/L)	Zinc-T (mg/L)
BCS2733	6/3/2002	694	7.93	16		214											67	58					<0.005							39			<0.0002					2.8				49	123					420	9		
BCS2733	6/3/2002	694	7.93	16		214					0.049		0.05		<0.001		67	58	<0.01		<0.02		<0.005					<0.005		39			<0.0002					2.8		<0.001		49	123					420	9	<0.01	
BCS2733	11/12/2002	1101	8.33	6		244					0.058		0.06		<0.001		85	173	<0.01		<0.02		<0.005					<0.005		55			<0.0002					4.9		<0.001		93	189	0.027				690	37	0.017	
BCS2733	5/28/2003	790	7.74	26							0.051	0.051	0.05	0.05	<0.001	<0.001	68	63	<0.01	<0.01	<0.02	<0.02				<0.3	<0.3	<0.005	<0.005	40								1.8	0.005	<0.001	<0.001	43	117	0.031	0.031			430	8	<0.01	<0.01
BCS2733	11/14/2003	757	8.2	8		230					0.05		0.06		<0.001		74	60	<0.01		<0.02		0.007					<0.005		38			<0.0002					1.6	0.004	<0.001		40	111					500	<3	<0.01	
BCS2733	3/19/2004	1211	7.02	10		334					0.016		0.107		<0.001		122	140	<0.01		<0.02		<0.005			<0.3		<0.005		53			<0.0002					2.7	0.007	<0.001		77	168	0.002				800	<3	<0.01	
BCS2733	8/31/2004	785	7.71	15		215					0.047		0.069		<0.001		64	62	<0.01		<0.02		0.005			<0.3		<0.005		39			<0.0002			0.2		1.5	0.004	<0.001		41	118	0.03				440	3	0.02	
BCS2733	3/29/2005	780	8.03	12.5		258					0.039		0.061		<0.001		79	56	<0.01		<0.02		0.005			<0.3		<0.005		38			<0.0002			0.2		1.4	0.004	<0.001		39	109	0.022				500	7	0.015	
BCS2733	12/31/2005	1050	7.42	12		221					0.045		0.072		<0.001		79	55	<0.01		<0.02		<0.005			0.032		<0.005		38			<0.0002			<0.2		1.5	0.004	<0.001		38	113	0.021				511	95	0.01	
BCS2733	4/21/2006	801	8.16	56		217					0.033		0.059		<0.001		69	53	<0.01		<0.02		<0.005			<0.02		<0.005		36			<0.0002			<0.2		1.5	0.004	<0.001		37	111	0.014				459	9	<0.01	
BCS2733	10/23/2006	740	8.11	15		198					0.032		0.064		<0.001		59	56	<0.01		<0.02		<0.005			<0.02		<0.005		38			<0.0002			<0.2		1.6	<0.002	<0.001		39	117	0.015				428	3	<0.01	
BCS2733	3/20/2007	590	8.45			158					0.026		0.049		<0.001		49	41	<0.01		<0.02		<0.005		242	<0.02		<0.005		29			<0.0002			<0.2		1.2	0.003	<0.001		30	80	0.012				326	<3	<0.01	
BCS2733	9/25/2007	740	7.97	18		189					0.033		0.066		<0.001		57	58	<0.01		<0.02		0.007		303	<0.02		<0.005		39			<0.0002			<0.2		1.3	0.003	<0.001		41	113	0.016				432	<3	0.011	
BCS2733	4/14/2008	270	8.04	18		58					0.011		0.022		<0.001		18	21	<0.01		<0.02		<0.005		83	<0.02		<0.005		9.2			<0.0002			<0.2		<0.5	<0.002	<0.001		11	31	0.004				122	4	<0.01	
BCS2733	10/28/2008	841	7.61	NA		200					0.032		0.063		<0.001		57	58	<0.01		<0.02		<0.005		295	<0.02		<0.005		37			<0.0002			<0.2		1.3	0.003	<0.001		38	112	0.017				436	<3	<0.01	
BCS2733	4/21/2009	760	8.06	16		206					0.033		0.062		<0.001		60	60	<0.01		<0.02		<0.005		302	<0.02		<0.005		37			<0.0002			<0.2		1.5	0.003	<0.001		38	111	0.018				428	<3	<0.01	
BCS2733	10/15/2009	710	8.17	13		201					0.034		0.062		<0.001		47	57	<0.01		<0.02		<0.005		257	<0.02		<0.005		34			<0.0002			<0.2		1.5	0.003	<0.001		34	115	0.017				432	<3	<0.01	
BCS2733	4/20/2010	740	8.2	11		201					0.034		0.061		<0.001		59	57	<0.01		<0.02		<0.005		300	<0.02		<0.005		37			<0.0002			<0.2		1.3	0.003	<0.001		38	101	0.015				402	<3	<0.01	
BCS2733	6/30/2010	705	7.7	20.06		184					0.033		0.058		<0.001		49	61	<0.01		<0.02		<0.005		271	<0.02		<0.005		36			<0.0002			<0.2		1.4	0.003	<0.001		38	112	0.017				366	<3	<0.01	
BCS2733	6/30/2010	660	7.62	19.8		179					0.034		0.058		<0.001		49	57	<0.01		<0.02		<0.005		275	<0.02		<0.005		37			<0.0002			<0.2		1.4	0.003	<0.001		39	104	0.017				368	<3	<0.01	
BCS2733	6/30/2010	670	7.64	18.8		179					0.034		0.059		<0.001		50	60	<0.01		<0.02							<0.005		36								1.4	0.003			38	103	0.017				368		<0.01	
BCS2733	6/30/2010	680	6.81	8		203					0.033		0.063		<0.001		53	60	<0.01		<0.02							<0.005		35								1.3	0.003			36	104	0.017				388		<0.01	
BCS2733	6/30/2010	670	7.06	7		203					0.034		0.063		<0.001		56	61	<0.01		<0.02							<0.005		36								1.4	0.003			38	104	0.017				396		<0.01	
BCS2733	6/30/2010	680	6.73	6.5		217					0.045		0.068		<0.001		59	60	<0.01		<0.02							<0.005		37								1.4	0.003			38	102	0.018				394		<0.01	
BCS2733	6/30/2010	680	6.65	5.5		217					0.058		0.071		<0.001		61	60	<0.01		<0.02							<0.005		37								1.3	0.003			38	97	0.018				400		<0.01	
BCS2733	10/14/2010	712	8.2	16.7		187					0.037		0.061		<0.001		53	67	<0.01		<0.02		<0.005		297	<0.02		<0.005		40			<0.0002					1.6	0.003	<0.001		42	111	0.017				396	<3	<0.01	
BCS2733	5/16/2011	690	8.25	14		189					0.036		0.059		<0.001		51	61	<0.01		<0.02		<0.005		267	<0.02		<0.005		34			<0.0002			<0.2	<0.04	1.5	0.003	<0.001		35	99	0.02				368	3	<0.01	
BCS2733	10/18/2011	710	8.18	15		172					0.036		0.062		<0.001		49	59	<0.01		<0.02		<0.005		271	<0.02		<0.005		36			<0.0002			<0.2		1.4	0.003	<0.001		37	101	0.013				394	<3	<0.01	
BCS2733	4/24/2012	713	8.1	18.1		190					0.033		0.062		<0.001		53	61	<0.01		<0.02		<0.005		281	<0.02		<0.005		36			<0.0002			<0.2	<0.04	1.7	0.003	<0.001		36	102	0.01				408	<3	<0.01	
BCS2733	11/6/2012		8.11	13		189					0.037		0.062		<0.001		53	59	<0.01		<0.02		<0.005		289	<0.02		<0.005		38			<0.0002			<0.2	<0.04	1.6	0.003	<0.001		40	110	0.011				414	<3	<0.01	
BCS2733	5/17/2013	728	8.31	11.2		195					0.036		0.06		<0.001		50	55	<0.01		<0.02		<0.005		269	<0.02		<0.005		35			<0.0002			<0.2	<0.04	1.4		<0.005		36	99	0.011				358	<3	<0.01	
BCS2733	10/1/2013	738	8.22	19		196					0.04		0.054		<0.001		48	60	<0.01		<0.02		<0.005		272	<0.02		<0.005		37			<0.0002			<0.2	<0.04	1.3		<0.005		39	97	0.01				396	7	<0.01	
BCS2733	10/8/2014	757	8.17	19		179					0.043		0.056		<0.001		45	56	<0.01		<0.02		<0.005		260	<0.02		<0.005		36			<0.0002			<0.2	<0.04	1.5		<0.005		39	102	0.01				388	<3	<0.01	
BCS2733	11/20/2015	1035	8.13	7.90		186					0.049		0.06		<0.001		52	56	<0.005		<0.01		<0.005		290	<0.02		<0.005		39			<0.0002			<0.2	<0.04	1.7		<0.005		39		0.011				400	3	<0.01	

Table 2: Barneys Waste Rock and Sulfide Ore Sampling from 1999 on the Barneys 6300 Dump Level. (See Figure 7 for Sample Locations)

Sample ID	Rock Type	Material Placement Date	Paste pH	Paste Conductivity (umhos/cm)	Total Sulfur (%)	Sulfate Sulfur (%)	Residual Sulfur (%) (1)	Acid Potential (2)	Sobek NP (3)	ABA Potential (4)	NPR (5)
BARN99-59	Run of mine waste from Barneys Pit	1992	8.31	479							
BARN99-60	Run of mine waste from Barneys Pit	1992	8.46	112							
BARN99-61	Run of mine waste from Barneys Pit	1992	7.71	135	0.03	<0.01	0.03	1	40	39	40
BARN99-62	Run of mine waste from Barneys Pit	1992	8.14	113							
BARN99-63	Run of mine waste from Barneys Pit	1992	7.87	368							
BARN99-64	Run of mine waste from Barneys Pit	1992	7.19	379	0.03	<0.01	0.03	1	28	27	28
BARN99-75	Sulfide Ore staged on top of Barneys Pit waste rock	1998	2.39	10,300	2.38	1.17	1.21	38	0	-38	<0.1
BARN99-76	Sulfide Ore staged on top of Barneys Pit waste rock	1997	2.88	8770							
BARN99-78	Sulfide Ore staged on top of Barneys Pit waste rock	1999	6.89	3320	0.93	0.51	0.42	13	96	83	7.4

(1) Residual Sulfur = Total sulfur - sulfate sulfur

(2) Acid Potential = (residual sulfur) X (31.25), reported as lbs of $CaCO_3$ per 1000 lbs of rock

(3) Neutralization Potential reported as lbs of $CaCO_3$ per 1000 lbs of rock

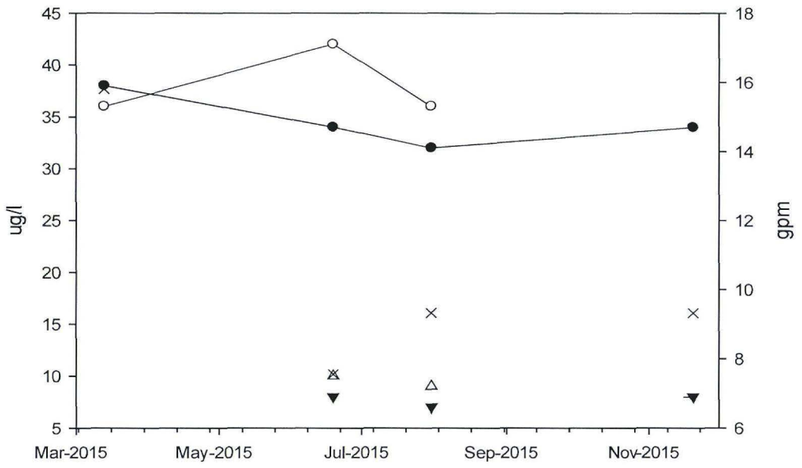
(4) Acid/Base Accounting Potential = NP - AP, reported as lbs of $CaCO_3$ per 1000 lbs of rock

(5) NPR = NP/AP

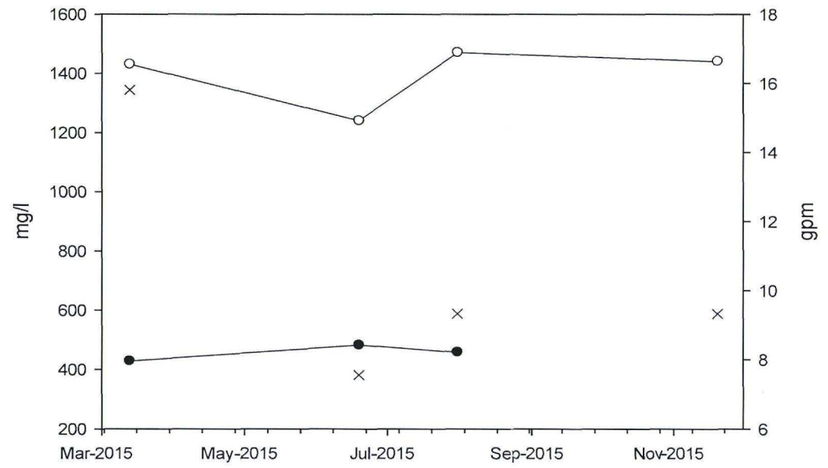
Table 3: Time Series for Select Analytes for North Barneys Drainage Samples

Date	BCS2845A Flow-T (gpm)	BCS2845A Arsenic-D (ug/L)	BCS2845A Arsenic-T (ug/L)	BCS2845A Thallium-D (ug/L)	BCS2845A Thallium-T (ug/L)	BCS2845A Sulfate-T (mg/L)	BCS2845A Total Dissolved Solids-T (mg/L)	BCS2845C Flow-T (gpm)	BCS2845C Arsenic-D (ug/L)	BCS2845C Arsenic-T (ug/L)	BCS2845C Thallium-D (ug/L)	BCS2845C Thallium-T (ug/L)	BCS2845C Sulfate-T (mg/L)	BCS2845C Total Dissolved Solids-T (mg/L)	BCS2845D Flow-T (gpm)	BCS2845D Arsenic-D (ug/L)	BCS2845D Arsenic-T (ug/L)	BCS2845D Thallium-D (ug/L)	BCS2845D Thallium-T (ug/L)	BCS2845D Sulfate-T (mg/L)	BCS2845D Total Dissolved Solids-T (mg/L)
3/13/2015	15.8	38	36			428	1430	7.55	51	65			362	1410	13.4	87	86			363	1340
6/19/2015	7.55	34	42	8	10	482	1240	4.57	114	140	4	5	389	1470	4.57	190	223	6	7	375	1420
7/31/2015	9.32	32	36	7	9	458	1470	4.57	120	135	4	5	392	1580	2.33	139	148	5	5	386	1570
11/20/2015	9.32	34		8			1440	2.33	35		3			1430	2.33	56		3			1430

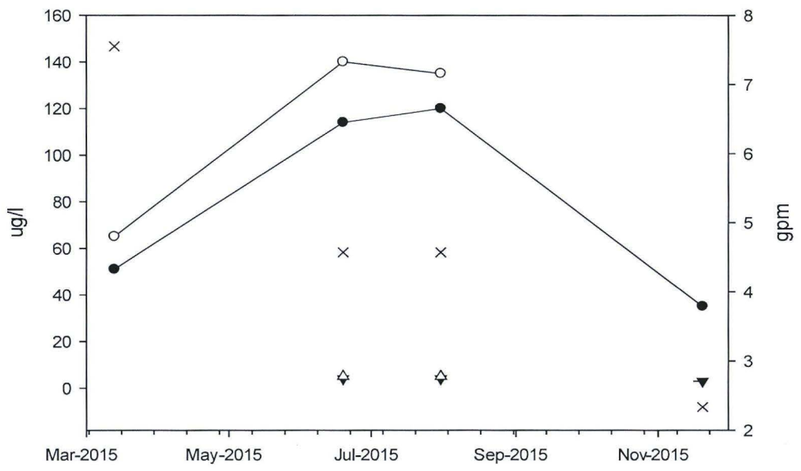
BCS2845A



BCS2845A



BCS2845C



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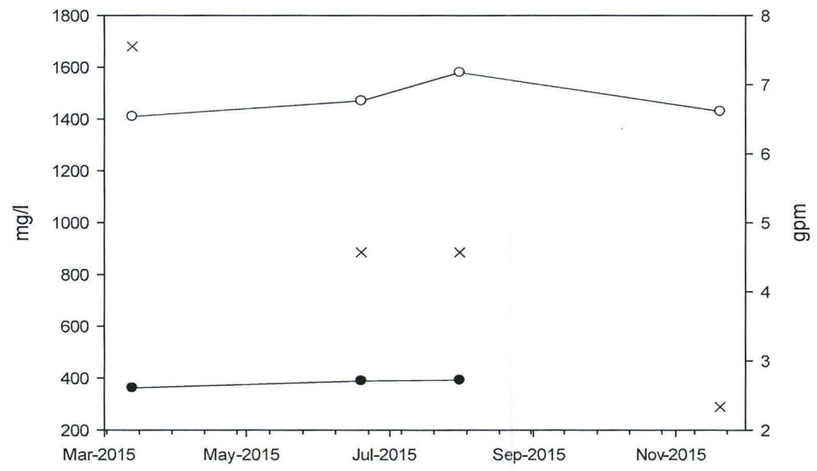

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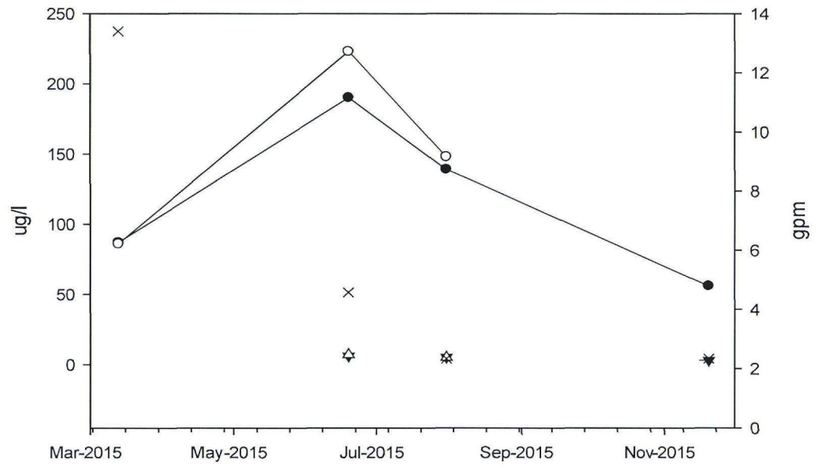

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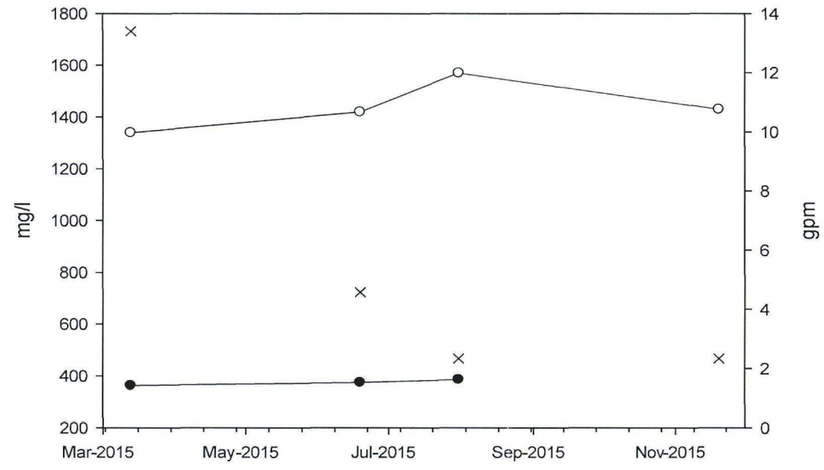
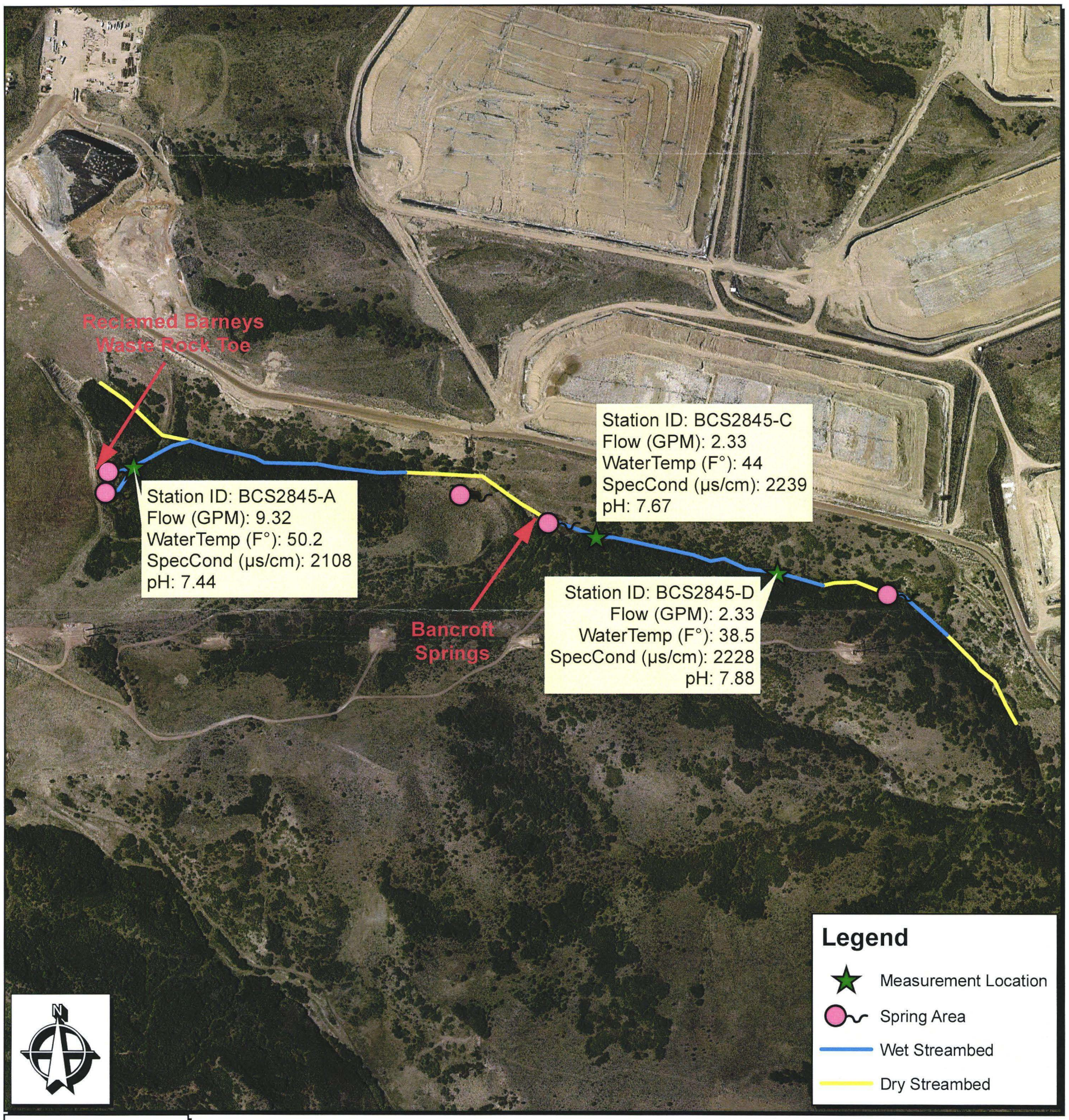


Rio Tinto

Figures

FIGURE A: NORTH BARNEYS DRAINAGE BCS2845 MEASUREMENTS

Rio Tinto
Kennecott Utah Copper

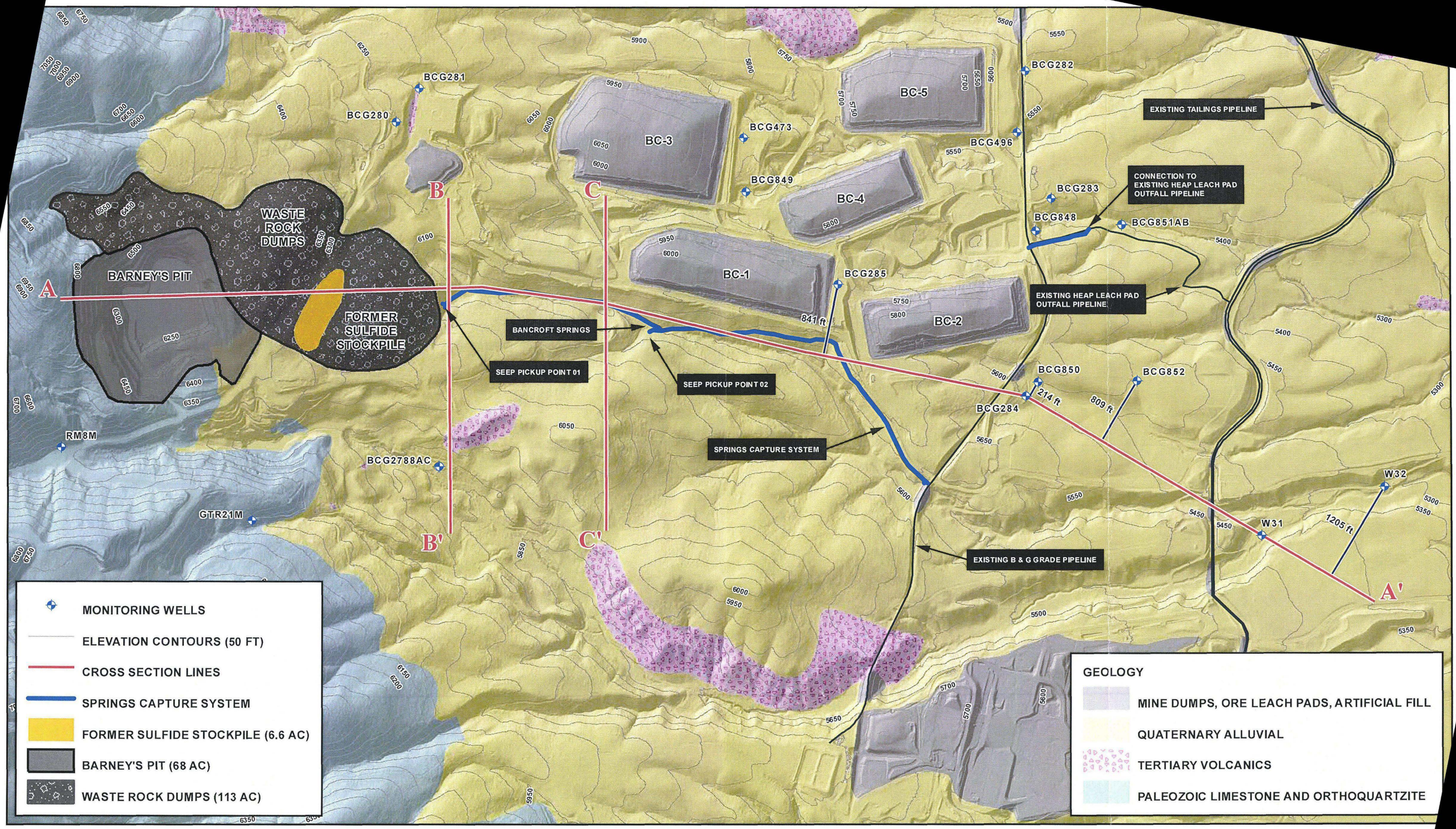


1 inch = 700 feet

0 0.05 0.1 0.2 Miles

Date: 11/20/2015
GIS User: ted.balling

Coordinate System: NAD 1983 StatePlane Utah Central FIPS 4302 Feet
Path: H:\Home Drive\Barneys\Photos & GIS Files\BarneysSeep.mxd



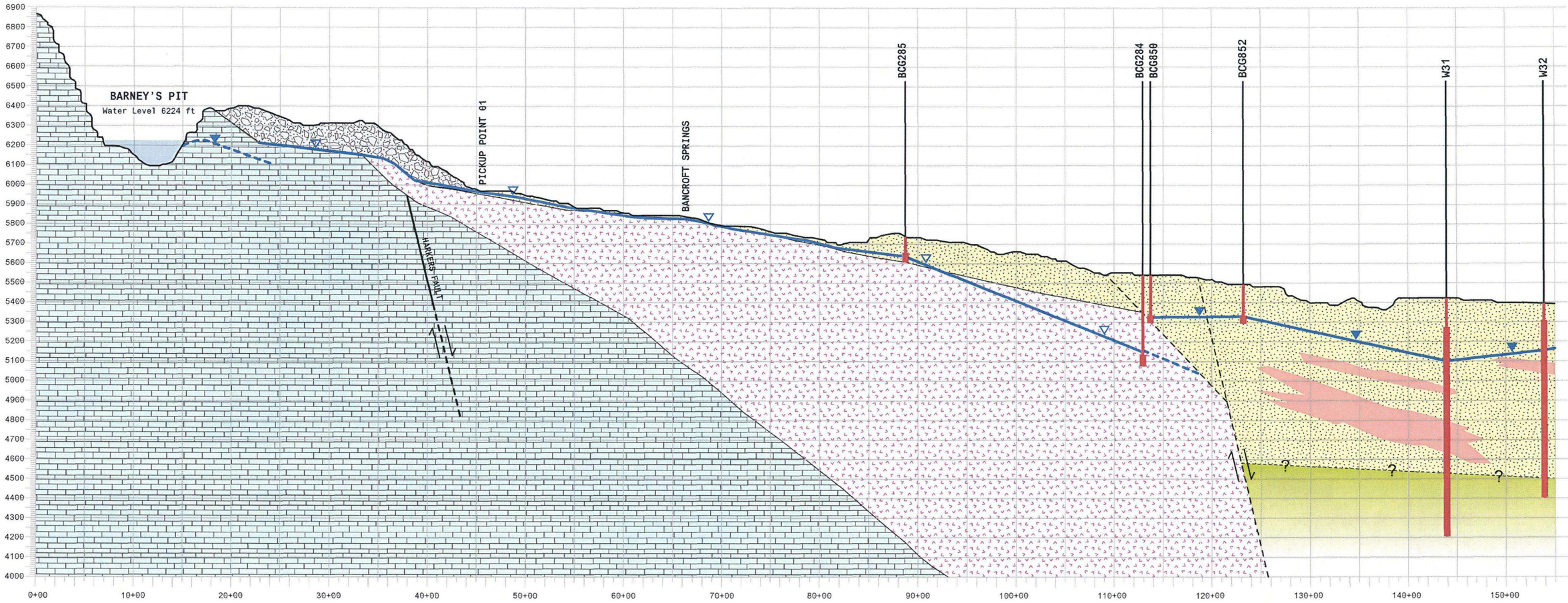
Rio Tinto
Kennecott Copper
ON BEHALF OF BARNEY'S CANYON MINING COMPANY

DATE: 12/7/2015 3:05:31 PM
ED BY: TERESA.COCKAYNE
FIG1_BARNEYS_PLANVIEWMAP

FIGURE
BARNEY'S GEOLOGIC CROSS SECTIO

A

A'



A PROFILE A-A'

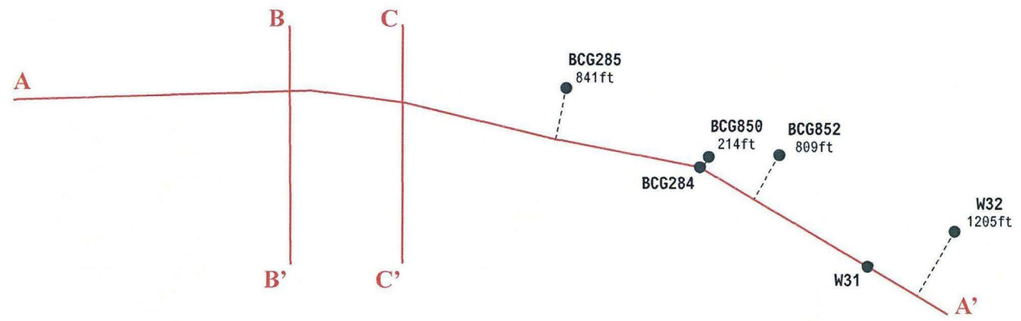
HZ: 1" = 1,000', VT: 1"=500'

LOOKING NORTH

0' 1000'

1in = 1000ft

MONITOR WELL LOC ID	LOCATION		ELEVATION (top of casing)	TOTAL DEPTH (ft bgl)	SCREEN INTERVAL (ft bgl)
	NORTHING	EASTING			
BCG285	29480	14795	5770.2	131	81-131
BCG284	28189	16955	5576.9	469	418.5-468.5
BCG850	28353	17096	5550.1	246	205-245
BCG852	28367	18240	5542.8	164	160-200
W31	26581	19664	5360.6	1220	149-1218
W32	27145	21075	5325.0	1000	84-989



LEGEND

MONITORING WELL

WATER LEVEL (DASHED WHERE INFERRED)

TOPOGRAPHY SURFACE

FAULT (DASHED WHERE INFERRED)

WASTE ROCK DUMP

ALLUVIAL

VOLCANIC GRAVEL & CLAY

JORDAN NARROWS UNIT

TERTIARY VOLCANICS

PALEOZOIC SANDSTONE AND ORTHOQUARTZITE

Figure 2

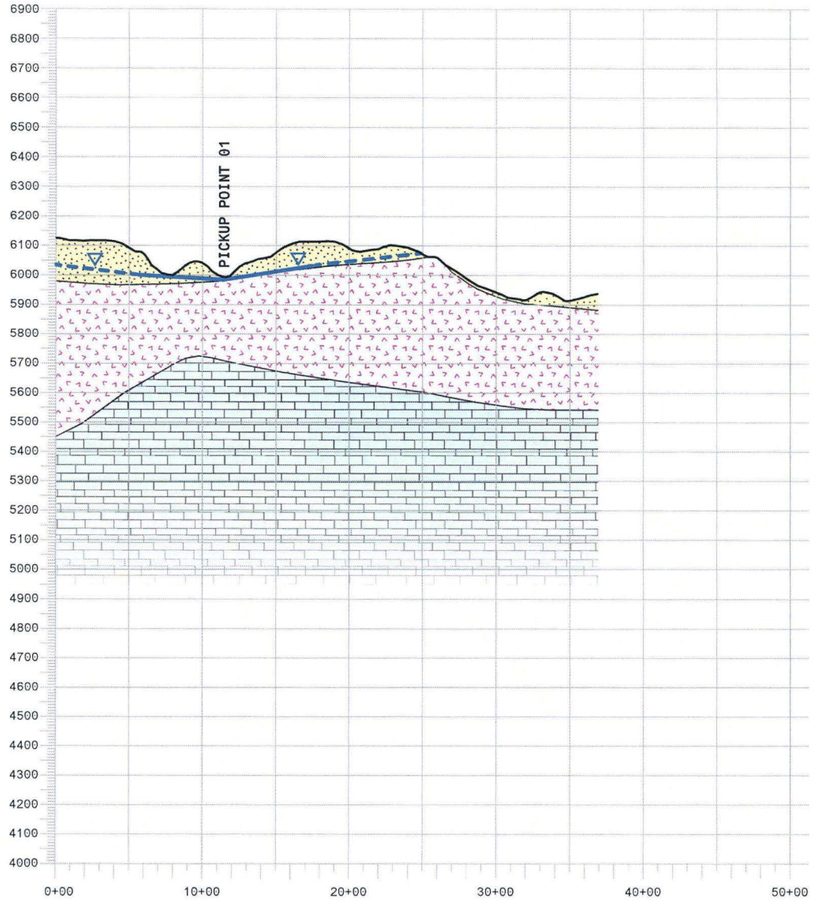
RioTinto

RIO TINTO KENNECOTT COPPER

ON BEHALF OF BARNEY'S CANYON MINING CO

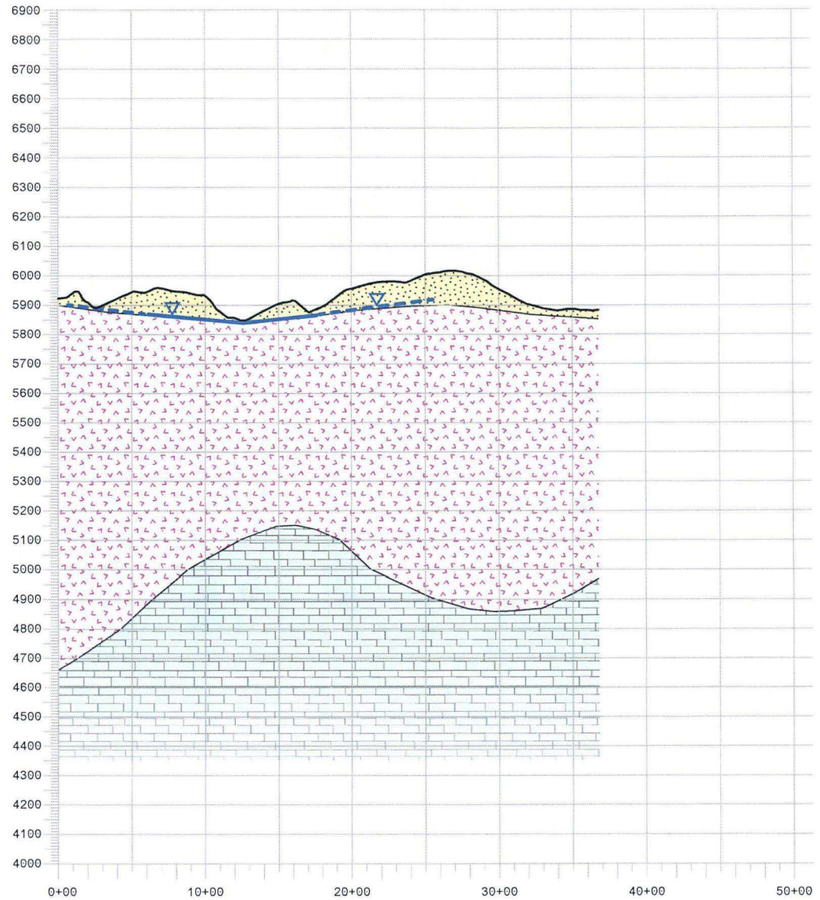
BARNEY'S CANYON GEOLOGIC CROSS SECTION A-A'

B



B’

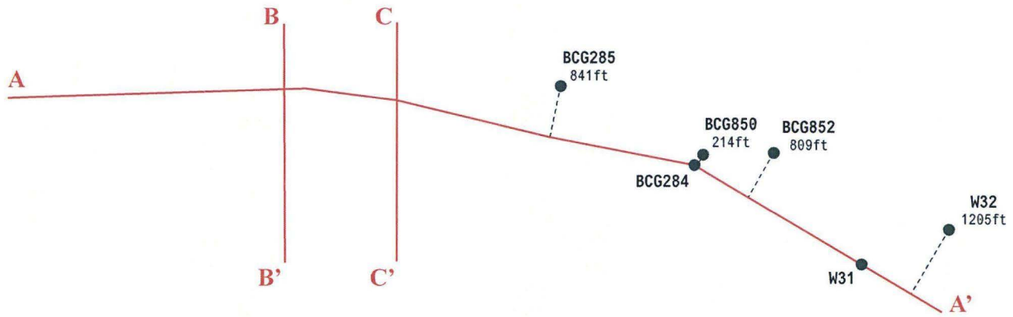
C



C’

B PROFILE B-B’
HZ: 1" = 1,000', VT: 1"=500'
LOOKING WEST

0’ 1000’
1in = 1000ft



C PROFILE C-C’
HZ: 1" = 1,000', VT: 1"=500'
LOOKING WEST

0’ 1000’
1in = 1000ft

LEGEND

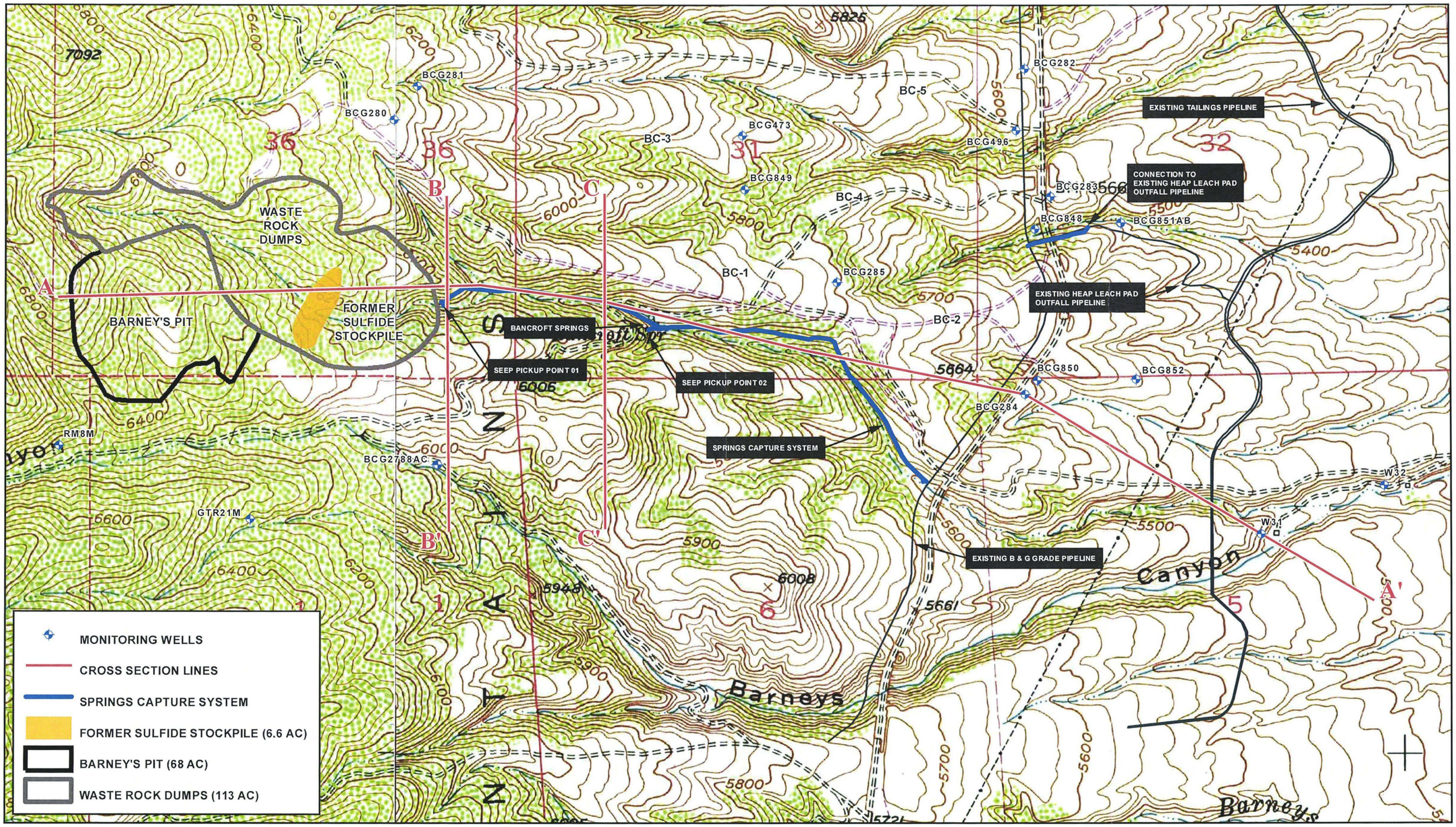
- TOPOGRAPHY SURFACE
- WATER LEVEL (DASHED WHERE INFERRED)
- ALLUVIAL
- PALEOZOIC SANDSTONE AND ORTHOQUARTZITE
- TERTIARY VOLCANICS

Figure 3

RioTinto

RIO TINTO KENNECOTT COPPER
ON BEHALF OF BARNEY'S CANYON MINING CO

BARNEY'S CANYON
GEOLOGIC CROSS SECTION
B-B’ AND C-C’



Rio Tinto
Kennecott Copper
ON BEHALF OF BARNEY'S CANYON MINING COMPANY

DATE: 12/7/2015 3:06:48 PM
CREATED BY: TERESA.COCKAYNE
DOCUMENT NAME: FIG4_BARNEYS_TOPOMAP

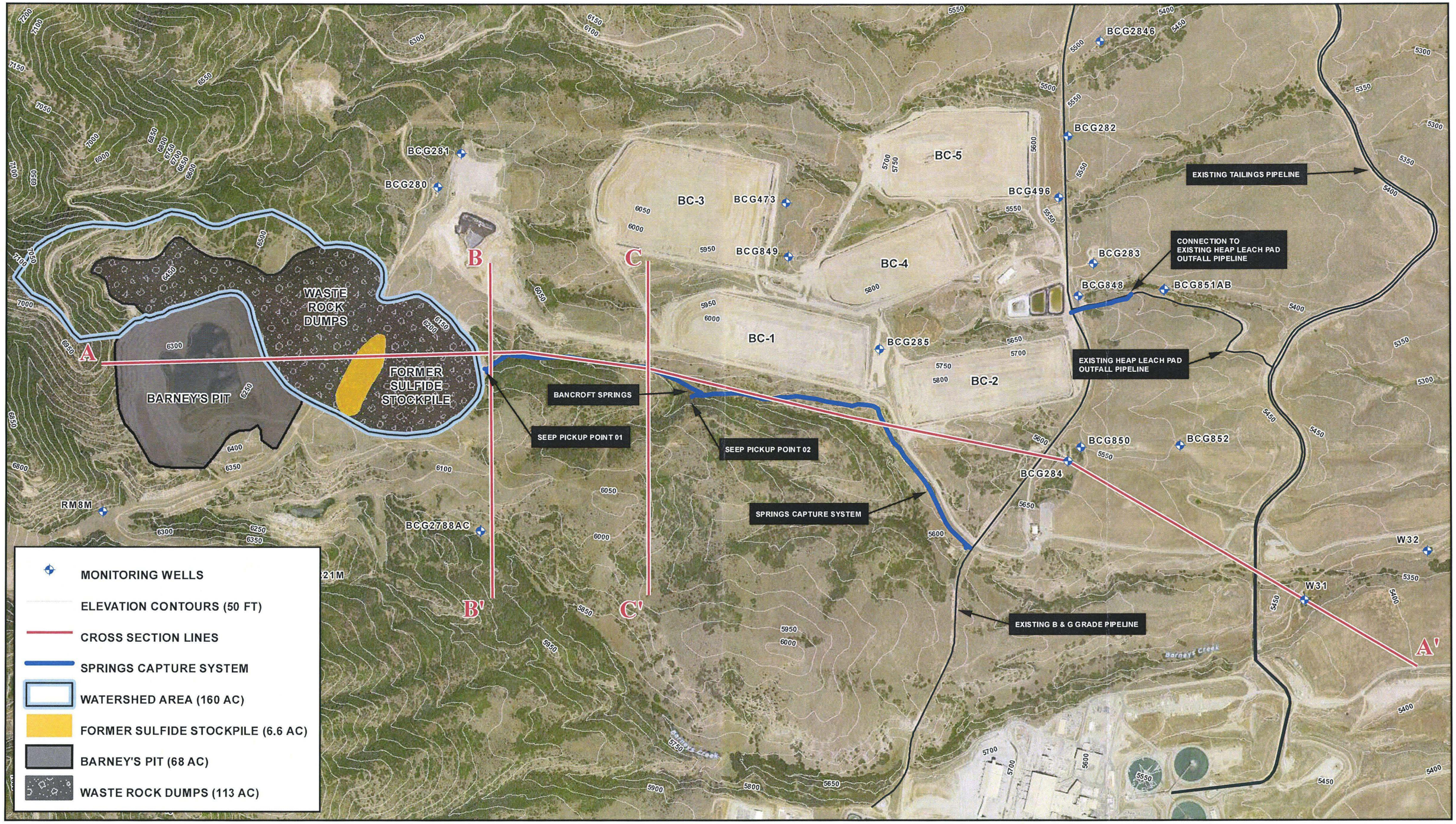
N W E S

0 0.05 0.1 0.2 0.3 0.4 0.5 MI

0 250 500 1,000 1,500 2,000 2,500 FT

FIGURE 4

BARNEY'S TOPOGRAPHIC MAP
SOURCE: USGS 1978



Rio Tinto
Kennecott Copper
ON BEHALF OF BARNEY'S CANYON MINING COMPANY

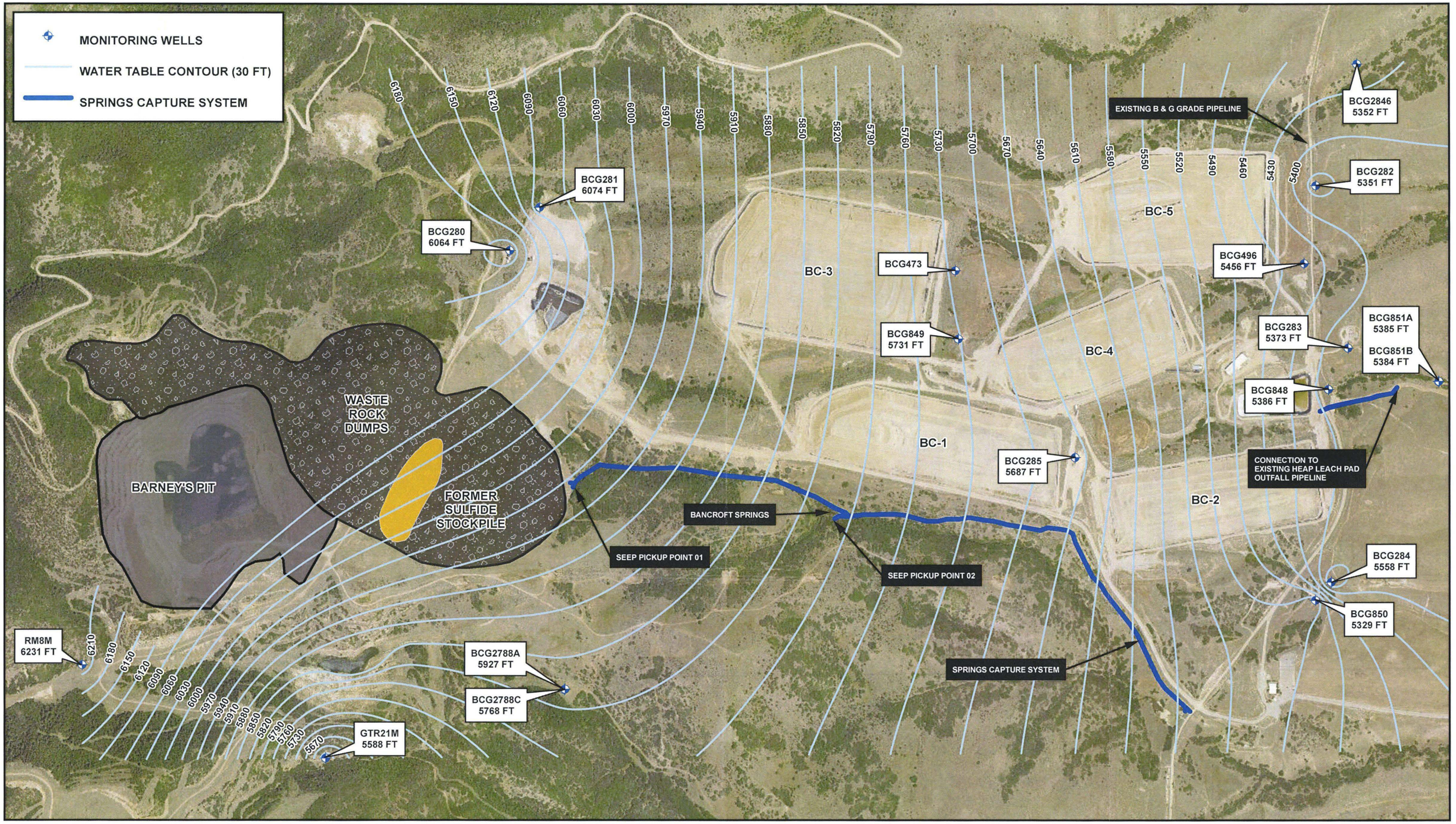
DATE: 12/7/2015 3:09:20 PM
CREATED BY: TERESA.COCKAYNE
DOCUMENT NAME: FIG5_BARNEYS_WATERSHED

N W E S

0 0.05 0.1 0.2 0.3 0.4 0.5 MI

0 250 500 1,000 1,500 2,000 2,500 FT

FIGURE 5
WATERSHED AREA FOR BARNEY'S WASTE ROCK



Rio Tinto
Kennecott Copper
ON BEHALF OF BARNEY'S CANYON MINING COMPANY

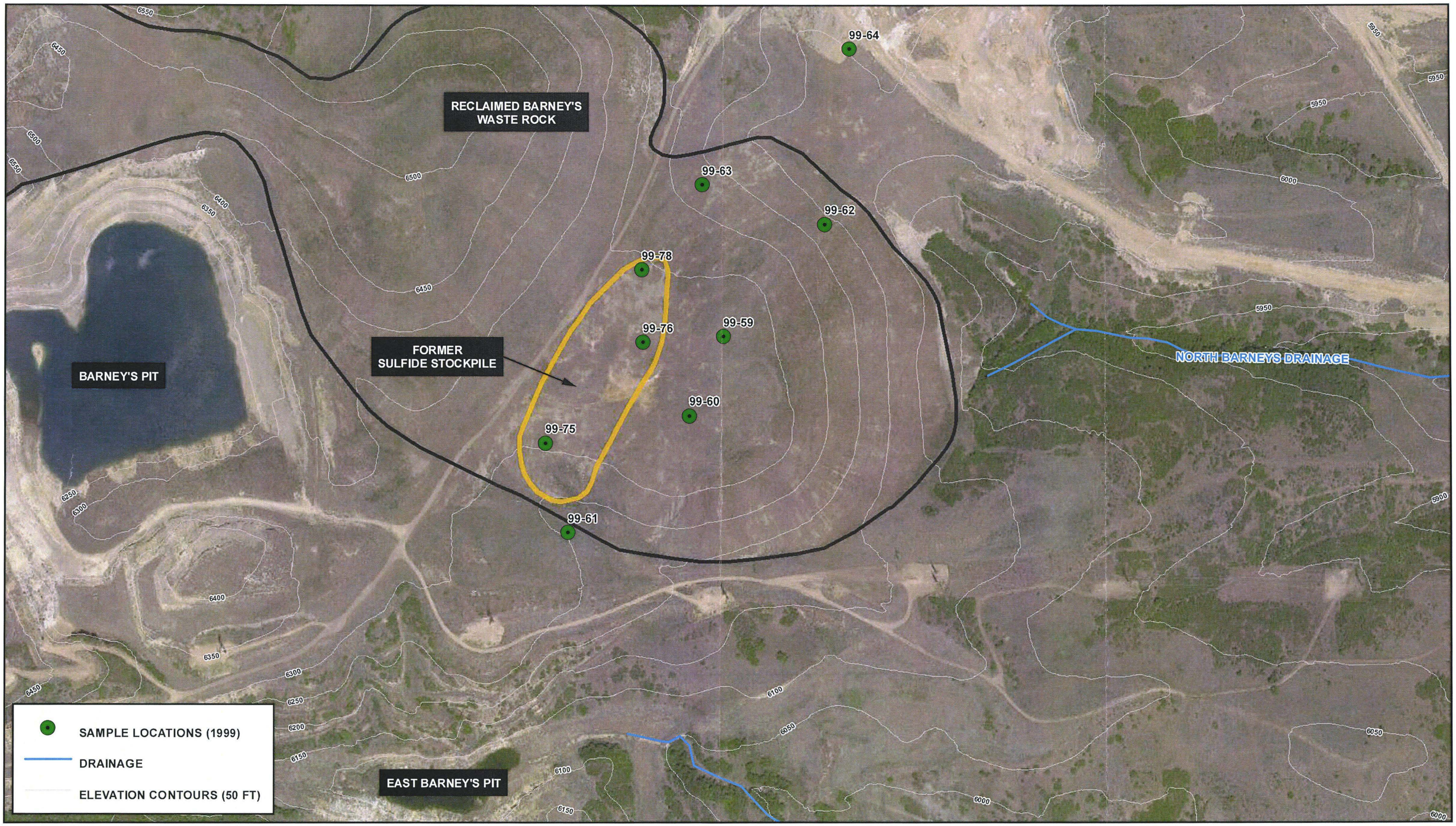
DATE: 12/15/2015 3:32:48 PM
CREATED BY: TERESA.COCKAYNE
DOCUMENT NAME: FIG6_BARNEYS_WATERTABLE

N W E S

0 0.05 0.1 0.2 0.3 0.4 0.5 MI

0 250 500 1,000 1,500 2,000 2,500 FT

FIGURE 6
BARNEY'S CONTOURED TOP OF WATER TABLE



Rio Tinto
Kennecott Copper
ON BEHALF OF BARNEY'S CANYON MINING COMPANY

DATE: 12/7/2015 3:50:21 PM
CREATED BY: TERESA.COCKAYNE
DOCUMENT NAME: FIG7_BARNEYS_SAMPLING

FIGURE 7
SAMPLE LOCATIONS FROM 1999

DWQ-2018-010949