

March 20, 2023

Ms. Stephanie Autut
Executive Director,
Nunavut Water Board
P. O. Box 119
Gjoa Haven, Nunavut
X0B 1J0

Dear Ms. Autut:

Pursuant to Part B, Article 1 of Water Licence 1BR-CUL1828, please find attached an electronic copy of the 2022 Annual Water Licence Report for the Cullaton Lake property.

Should you have any questions or comments regarding this report, or any other Cullaton Lake matter, please do not hesitate to contact me at (705) 632-1871.

Sincerely,



Paul Brugger, P. Eng.
Closed Properties Manager, Eastern Canada Sites

Cc Andrew Keim, Manager, Water Resources, Crown-Indigenous Relations and Northern Affairs Canada
Clark Burton, Director, North America Closure

Attachment: As stated

**CULLATON LAKE GOLD MINES LTD.
WATER LICENCE 1BR-CUL1828**

ANNUAL WATER LICENCE REPORT 2022

PREPARED on behalf of:

BARRICK GOLD INC.

**By P.J. Brugger and Associates
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Campbellford, ON
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March 2023

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EXECUTIVE SUMMARY

The Cullaton Lake Gold mine is a recognized closed mine site located in the southern part of the Kivalliq Region in the Nunavut Territory. The property is 645 km north of Thompson, Manitoba and 250 km west of Arviat, Nunavut.

The 2022 site activities consisted of one site visit from August 31st to September 4th, 2022, to conduct the annual site inspection, biennial geotechnical inspection, quadrennial aquatic program and continue airstrip shrub maintenance. Completion of the replacement survival shelter project was re-scheduled to 2023 due to construction crew domestic flight issues.

Summarized, the results of the various site inspections and monitoring indicate that:

- The site remains in good and stable condition. Natural vegetation continues to slowly overtake the site.
- The tailings storage facility (Tailings Pond No. 1) dam and dry cover portion of the tailings continue to remain stable. The water level of the cover pond has risen approximately 10cm above the last measurement in September 2021. The water level has now recovered to slightly below the spillway invert.
- The aquatic sediment and benthic environment immediately downstream of both the main site and Shear Lake site has not deteriorated compared to the last program conducted in 2018.
- Water quality downstream of the main site and Shear Lake site met Canadian Council of Ministers of the Environment (CCME) guidelines for all parameters except for copper and iron at Shear Lake. The concentration of copper was 0.00231 mg/l as compared to the CCME guideline of 0.002 mg/l for the Hardness indicated and the iron concentration was 0.402 mg/l as compared to the CCME guideline of 0.3 mg/l.
- Permafrost was found at an average depth of approximately 2.5 meters in the dry portion of the tailings over on September 2, 2022.

Airstrip and access road shrub maintenance will continue in 2023, along with the conclusion of the airstrip survival shelter replacement during one site visit in mid to late August. The old shelter will be stripped to clean wood and burned following transition to the new shelter.

1.0 SITE BACKGROUND / LOCATION

Cullaton Lake Gold Mines Ltd. is a wholly owned subsidiary of Barrick Gold Inc. (Barrick) which in turn is a wholly owned subsidiary of Barrick Gold Corporation.

The Cullaton Lake Gold mine is a recognized closed mine site located in the south central part of the Kivalliq Region in the Nunavut Territory. The property is 250 km west of Arviat, Nunavut, 400 km northwest of Churchill, Manitoba, and 645 km north of Thompson, Manitoba (see Figure 1). The mine was in operation for four years from 1981 to 1985. Following operation, the mine was in a care and maintenance mode from 1985 to 1991.

1.1 CLOSURE AND POST CLOSURE MAINTENANCE HISTORY

Decommissioning was initiated in 1991 with the rehabilitation of Tailings Pond No. 1, which included construction of a spillway in the dam and the covering of exposed tailings with water or till/mine rock. In addition, the water level in Tailings Pond No. 2 (the polishing pond) was lowered by partial removal of the dam (see Figures 2 and 3 for site features and historic monitoring locations).

Between 1991 and 1993, the freshwater intake, pump house and pipelines at the old diamond drill camp on the Kognak River were dismantled and removed. In 1995 and 1996 the mill buildings were dismantled. Some of the inert, non-salvageable material was crushed and placed in the quarry pit. In 1997, additional cover material was placed over the tailings area and the area was seeded and fertilized with a special arctic seed mix, along with the former mill site. During the winter of 1998/99 some salvageable equipment and material was removed from the property.

During the summer of 2001, all remaining inert material was placed in the former quarry pit and covered with till. All waste oils and hydraulic fluids, as well as tires and batteries were removed from equipment prior to burial and subsequently airlifted to Thompson, Manitoba for proper disposal. In addition, low grade waste rock at the Shear Lake Portal area that had been determined to be acid generating was collected and encapsulated in till adjacent to the portal.

During the 2005 annual inspection, minor maintenance items identified during the 2004 inspection were corrected. These included a second application of seed and fertilizer on the Encapsulated Waste Rock (EWR) cover at Shear Lake and erosion repairs to the EWR cover, Tailings Pond No. 1 spillway and the quarry pit landfill cover.

During the 2006 annual inspection, a small above-water exposed section of rubber liner on the upstream side of the tailings dam south of the No.1 Spillway was removed.

In response to a request from Barrick in 2006 to return the property to the crown, Indian and Northern Affairs Canada (now Crown – Indigenous Relations and Northern Affairs Canada (CIRNAC)) initiated a review to assess closure conditions. CIRNAC visited the site in Sept 2006 and commissioned BGC Consulting Ltd. (BGC) to conduct a desk top review of the closure history and monitoring results.

The BGC report indicated for a variety of reasons that CIRNAC should not accept return of the property. In response, CIRNAC, BGC, Barrick and Trow Consulting (now EXP

Services Inc.) personnel met on the site during the 2007 annual inspection on July 5, to discuss the report findings and confirm a newly identified pH issue at Shear Lake. In addition, Barrick volunteered to complete an Ecological Risk Assessment (ERA) to determine a) whether the mitigation efforts at Cullaton Lake have adequately addressed the requirements of the approved 1996 Abandonment and Reclamation Plan, and b) whether the new ARD issue at Shear Lake is having any significant ecological effects.

In 2008 Barrick and Gartner Lee personnel visited the site on 4 occasions to collect field data for completing the ERA. During the August trip, a minor amount of scrap metal was also retrieved from the north bank of the Kognak river and from the former bunkhouse area.

The ERA was finalized and submitted to CIRNAC in August 2009. The report indicated that the surface waters at the site were not significantly impacted by the former mine operation or existing conditions. The findings were not acknowledged by CIRNAC. In April 2014, CIRNAC issued a response letter to Barrick's request to return the property to the Crown, re-stating recommendations outlined by BGC in their March 2007 report. Following a subsequent meeting between the Nunavut Water Board, CIRNAC and Barrick in Iqaluit in April 2015, Barrick proposed by letter dated June 11, 2015 (the June 2015 Letter) to undertake several of the recommendations in the April 2014 letter, including the completion of a Dam Safety Review, a financial assurance review and regular airstrip maintenance; and proposed to initiate an adaptive monitoring plan involving additional water quality and benthic /sediment monitoring aimed at producing additional support for the ERA. Barrick also indicated in the June 2015 letter that it will not be seeking to relinquish the property to the government for the immediate future.

The Dam Safety Review was completed by Thurber Engineering and submitted to CIRNAC and the NWB in August 2016. Airstrip maintenance was initiated in 2015. Additional biological field work to support the adaptive monitoring plan was completed in 2016 and 2018.

In 2017 a drone aerial survey was conducted to gather additional data for generating up-to-date site plans and remote historic refuse identified proximate to the site by CIRNAC was collected and stored at the airstrip for removal in 2018.

A new Closure and Reclamation Plan (C&R Plan) was developed and submitted on June 30th, 2017, pursuant to the action plan outlined in the 2016 CIRNAC water license inspection report and based on the adaptive monitoring plan proposed by Barrick in 2015. Following several discussions between Barrick and CIRNAC throughout 2018, principally on the amount of Financial Assurance required to implement the plan, the new C&R Plan was accepted and renewal Water License 1BR-CUL1828 was issued on October 15th, 2018. Site monitoring and maintenance as outlined in the water license has continued since then.

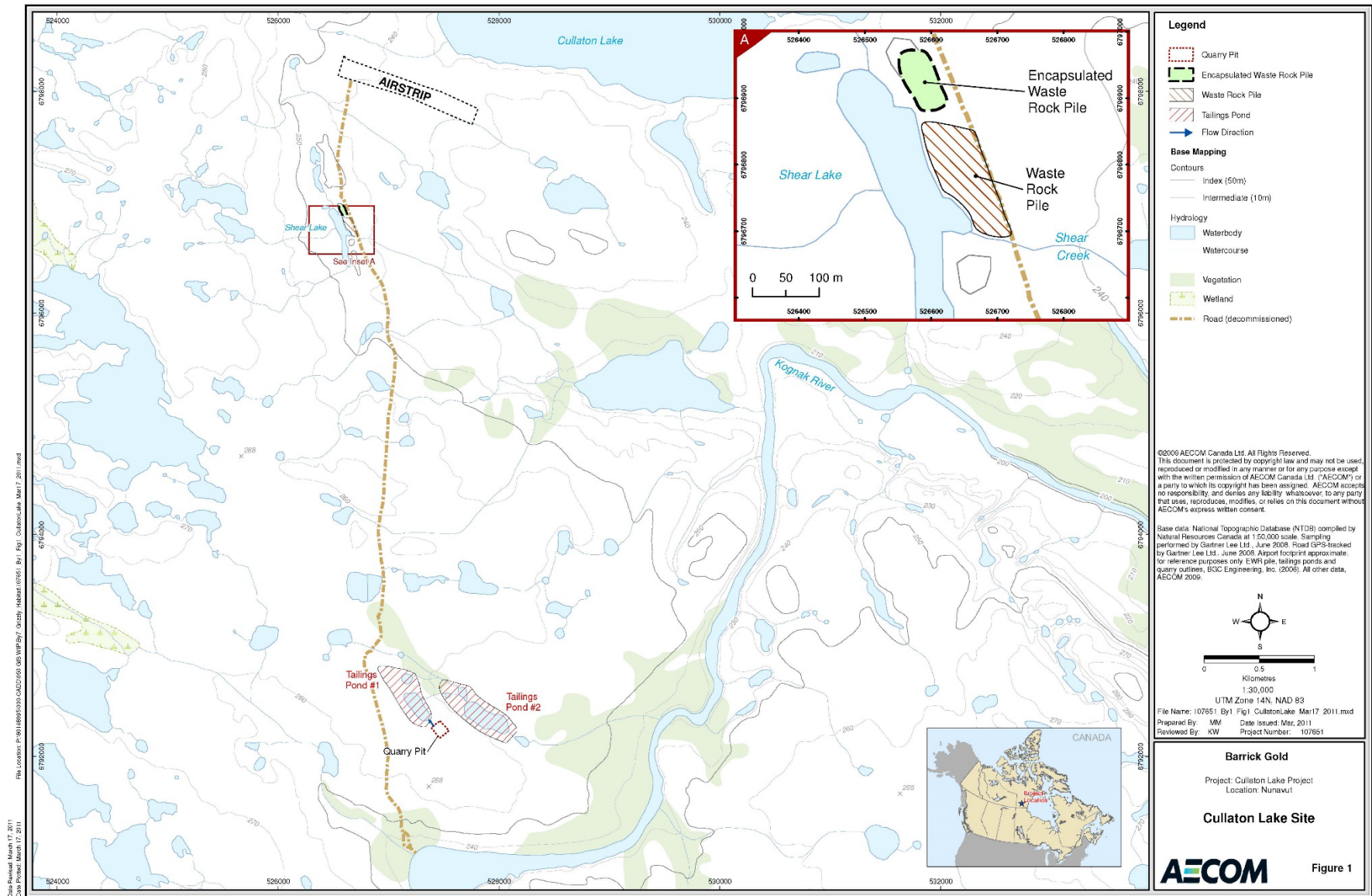




Figure 2: Cullaton Lake Shear Lake site showing features and surface water monitoring location.

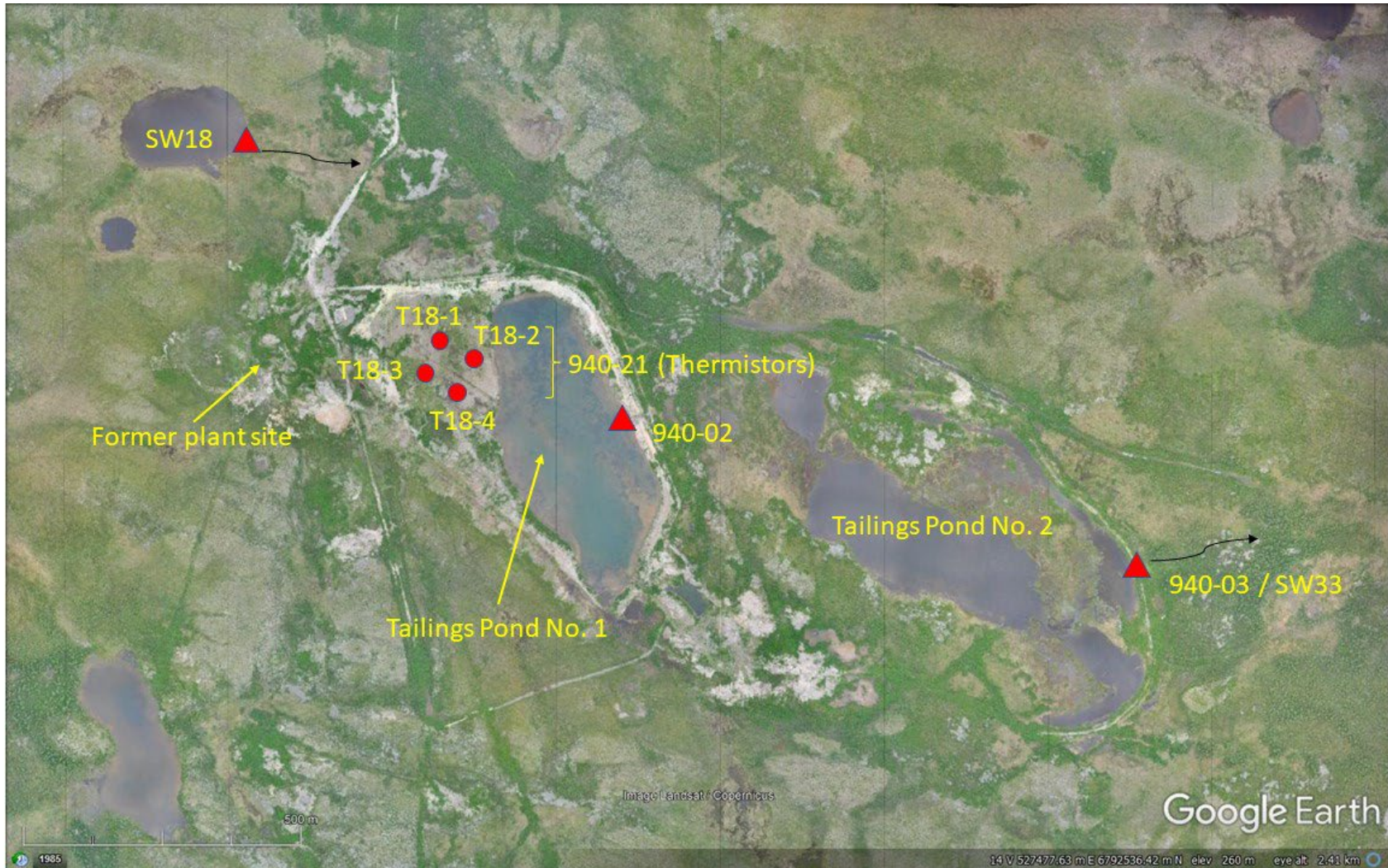


Figure 3: Cullaton Lake main site showing features, water sampling and thermistor stations.

2.0 WATER LICENCE SUPPLEMENTAL CONDITIONS AND NOTES

Management of Cullaton Lake is conducted pursuant to Water Licence 1BR-CUL1828, which was issued on October 15th, 2018 to renew previously issued license number 1BR-CUL1118. The following provides a historic summary of supplemental conditions and notes pursuant to previous licences:

Name Change:

On November 13, 2003, application was made to the Nunavut Water Board to change the name on Licence NWB1CUL0207 from Homestake Canada Inc. to Barrick Gold Inc. to reflect changes resulting from the 2001 merger of Barrick Gold Corporation and Homestake Mining Company.

Amendment for Encapsulated Waste Rock at Shear Lake:

Part F, Item 5 of Licence NWB1CUL0207 required submission of an application for amendment to the approved Abandonment and Restoration Plan by January 1, 2003 (subsequently extended to March 31, 2003) for the new waste rock disposal area on the shores of Shear Lake. The application for amendment with supporting documentation was submitted to the Nunavut Water Board on March 31, 2003. The amendment was granted on June 6, 2005. In addition, station 940-25 was removed from the monitoring program and replaced with station 940-27, intended to monitor any seepage from the encapsulated waste rock down-gradient to Shear Lake Creek.

The amendment required that suitable as-built drawings for the encapsulated waste rock be submitted within 6 months of the date of the amendment. Drawings were submitted on Dec 5, 2005.

The amendment also required that Section 4.4 of the Approved Abandonment and Restoration Plan be revised to incorporate the latest information with respect to the closure of the Shear Lake Waste Rock disposal area. The revision was submitted concurrent with the 2005 Annual Report.

Contingency Plan to Address Seepage Issues at the Encapsulated Waste Rock

Part F, Item 6, Amendment No. 1 of Licence NWB1CUL0207 required the submission of a Contingency Plan to address the potential of the permafrost not to re-aggrade into the waste rock pile / cover as anticipated, the clogging of the passive treatment system due to the relatively flat terrain and the remediation or mitigation of sediments contaminated with levels of metals in excess of CCME guidelines due to seepage from the encapsulated waste rock pile. The contingency plan for clogging of the passive treatment system and contamination remediation was submitted concurrent with the 2005 Annual Report and under separate cover. In the same document Barrick requested that the requirement for a Contingency Plan to address the possibility of permafrost not re-aggrading into the waste rock be deleted from the Licence since this condition was identified as an “added benefit” and not a design parameter as specified by URS ¹.

¹ Assessment of Closure Options and Impacts, Shear Lake Zone Waste Rock Dump, Cullaton Lake Mine Nunavut, March 2003, URS Norecol, Dames & Moore Inc.

Amendment for Encapsulated Waste Rock Thermistors:

Water Licence NWB1CUL0207 required the installation of thermistors in the encapsulated waste rock at Shear Lake. An unsuccessful attempt to install the thermistors was made in July 2003. A report detailing this attempt was submitted to the Nunavut Water Board on November 25, 2003 and requested that this requirement be removed from the Licence. The request was granted on June 6, 2005 and station 940-26 was removed from the monitoring program.

Site Map:

Part G, Item 4a of Licence NWB1CUL0207 required submission to the Board of a Site Map of the Project Environmental Impact Area with active Surveillance Network Program (SNP) Stations within 60 days of issuance of the Licence. The required site map was submitted to the Nunavut Water Board on December 16, 2002.

GPS Coordinates:

Part G, Item 4b of Licence NWB1CUL0207 required submission of GPS coordinates of all surface and subsurface sampling points. The required GPS coordinates were submitted to the Nunavut Water Board on August 29, 2003.

Miscellaneous:

The NWB noted the following in their October 10, 2006 review of the 2005 Annual Water Licence report:

1. While the 2004 reported detection limit for nickel had been lowered as previously requested, the detection limit for arsenic was now higher than previously reported (1µg/l compared to 0.1 µg/l). To clarify the issue the NWB requested that detection limits proposed for the 2007 monitoring be included in the 2006 annual report.

ALS Environmental has been engaged since 2014 and detection limits have been adjusted slightly to reflect their standard. The new detection limits are at or lower than as indicated below:

Licence Parameter	Method Detection Limit
Total Suspended Solids	3 mg/l
Total Cyanide	0.002 mg/l
Total Arsenic	1 µg/l
Total Copper	1 µg/l
Total Lead	1 µg/l
Total Mercury	0.000005 mg/l
Total Nickel	2 µg/l
Total Zinc	3 µg/l

2. The NWB commented on the 2005 anomalous zinc value from the Quarry Pit water cover station 940-23 (.065 mg/l). Follow-up annual monitoring for the period 2005 to 2018 indicated zinc values ranged from a low of 0.006mg/l to 0.065 mg/l with a 14-year average of 0.022mg/l. The CCME objective of 0.030 mg/l was exceeded twice during the 14-year period: the original exceedance of 0.065 mg/l in 2005 and a second exceedance of 0.0504 in 2012. Elevated zinc levels are attributed to the presence of the solid metal waste buried in the quarry pit landfill. The quarry pit water cover does not discharge.
3. The NWB requested that the Spill Response Plan contact number for the INAC Water Resources Inspector be changed.

The required change was made to the 2006 and subsequent versions.

On review of the 2008 annual report, the NWB requested that the NT-NU spill report form be included with the spill contingency plan. The form was included with the 2009 plan and subsequent plans.

4. The NWB requested that water quality and thermistor data be also provided in Excel format, in order to allow for easier data analysis.

The 2006 data was provided in Excel format via e-mail on October 12, 2006. Subsequent results in Excel format are provided concurrent with the annual reports for years in which monitoring takes place.

Water Licence 1BR-CUL1118 included a recommendation by Environment Canada and INAC to replace the non-functioning tailings cover thermistors. The 4 thermistors on the tailings cover were replaced in September 2018.

Part C, Item 1 of Water Licence 1BR-CUL1828 required the submission of security in the amount of \$3,702,660 by November 15th, 2018. The security was submitted to the NWB and CIRNAC as a bond on November 15th, but with subsequent revisions requested by CIRNAC, it was approved as an amendment to the original Standby Letter of Credit on June 20th, 2019.

3.0 2022 ACTIVITIES

The 2022 site visit was conducted from the morning of August 31st to late afternoon on September 4th, 2022. Personnel attending the site during this trip included:

Paul J. Brugger, P.Eng., Closed Properties Manager, Eastern Canada, Barrick Gold Inc.

Renata Klassen, M.Sc., P.Eng., Geotechnical Engineer, Exp Services Inc.

Ian MacLeod, B.Sc., R.P.Bio., P.Bio., Senior Fisheries Biologist, Palmer Environmental Consulting Group

Noel and Paul Dumas - Labourers provided by McCreedy Campground, Thompson, Manitoba

Access during the trip was provided by a Wings over Kississing Cessna Grand Caravan chartered from Thompson Manitoba. During this campaign the following activities were performed:

- Mr. Brugger performed a general site inspection, assisted with the aquatic monitoring program, recorded thermistor readings and supervised the shrub maintenance program.
- Ms. Klassen performed the annual geotechnical inspection on August 31st and September 1st and left the site on September 1st.
- Mr. MacLeod performed the aquatic morning program on August 31st and September 1st and left the site on September 1st.
- McCreedy employees arrived on September 1st and continued brushing the airstrip until the late afternoon of September 4th.

3.1 SITE INSPECTION GENERAL FINDINGS

The site inspection was performed on September 2nd and 3rd, 2022, and indicated that the site remains undisturbed, stable and generally in good condition. The following key findings were noted:

The Tailings Pond No. 1 water level continues to recover, now approximately 10cm above the September 2021 reading (See Photo 12 in Appendix 1).

The minor subsidence found on the B-Zone fresh air raise in 2018 and subsequently filled in 2019 remains unchanged. (See Photos 13 and 14 in Appendix 1). The affected area will continue to be monitored during future inspections until stability is confirmed.

The minor subsidence areas on the quarry pit landfill remain largely unchanged. Most of the affected areas are occupied by arctic ground squirrels (See Photos 17 and 18 in Appendix 1).

Wildlife damage to the 2018 installed thermistors remained unchanged from 2021 (See Photos 19 and 20 in Appendix 1). Contrary to previously stated intentions, thermistors 18-2 and 18-3 were not repaired to their upright position, as observed wildlife activity in the area is continuing. They are functioning sufficiently left lying on the ground and it is felt that resetting them vertically will expose them to future damage, which may ultimately cause them to stop recording completely.

The site access road continues to be difficult to negotiate as shrub vegetation continues to fill in the trail.

Additional select photos are included in Appendix 1.

3.2 AQUATIC MONITORING PROGRAM

Pursuant to Part E, Item 7 of Water License 1BR-CUL1828, effluent discharging from the tailings containment area was found within the limits set out in Item 7 as described below.

Parameter	Maximum Concentration of any Grab Sample (mg/l)	940-02 TP No. 1 at spillway Aug 31 st , 2022	940-03 TP No. 2 at spillway Aug 31 st , 2022
Total Arsenic	0.30	0.00294	0.00343
Total Copper	0.20	0.00096	0.00128
Total Cyanide (1)	0.80	<0.0046	<0.0035
Total Lead	0.20	0.00005	<0.00005
Total Nickel	0.30	0.00053	0.00242
Total Zinc	0.30	<0.003	<0.003
Total Suspended Solids	25	<3.0	<3.0
Oil and Grease	No visible sheen	None present	None present
pH	Between 6.0 and 9.5	7.74	8.25

Table 3.1: August 31st, 2022 water quality results for license parameters.

Notes:

- (1) Total cyanide was not analyzed as it is not included in the parameters listed in Part K, Item 10 but is listed in Part E, Item 7. The 5 year past averages are shown for reference.

Pursuant to the parameters outlined in Part K, Item 10, duplicate water sampling was completed on August 31st, 2022 at the 4 stations identified in Part K, Item 8 (see Figures 2 and 3 for locations). Complete results for the parameters outlined are included in the aquatic report attached as Appendix 2. The following is a summary description of the sampling activities and results:

Station 940-2 (Tailings Pond No. 1 at discharge to Tailings Pond No. 2) – Duplicate water samples labelled 940-02A and 940-02B were collected on August 31st, 2022.

Results indicated that all parameters were below the limits prescribed in the Water Licence as indicated in Table 3.1 above and also below Canadian Council of Ministers of the Environment (CCME) guidelines.

Station 940-3 / SW33 (Tailings Pond No. 2) – Duplicate water samples labelled 940-03 / SW33A and 940-03 /SW33B were collected on August 31st, 2022. Results indicated that all parameters were below the limits prescribed in the Water Licence as indicated in Table 3.1 above and also below CCME guidelines.

Station SW18 (Background station) – Duplicate water samples labelled SW18A and SW18B were collected on August 31st, 2022. Results indicated that all parameters were below CCME guidelines.

Station SW9 (Shear Creek downstream of Shear Lake site) – Duplicate water samples labelled SW9A and SW9B were collected on August 31st, 2022. Results indicated that all parameters were below CCME guidelines except for copper and iron. The concentration of copper was 0.00231 mg/l as compared to the CCME guideline of 0.002 mg/l for the Hardness indicated and the iron concentration was 0.402 mg/l as compared to the CCME guideline of 0.3 mg/l.

Water quality results are also provided separately in an excel file for NWB use.

Station 940-3 / SW33 and SW9 Sediment and Benthic Monitoring – Pursuant to the approved Adaptive Management Plan monitoring program, the quadrennial sediment and benthic monitoring was performed on August 31st and September 1st, 2022 at stations 940-3 /SW33 and SW9, in conjunction with the above surface water quality monitoring program. The report is included as Appendix 2. Summarized the monitoring program indicated that:

- Water quality continues to show stable or improved conditions.
- Sediment and benthic quality indicate no deterioration from the last program completed in 2018.

3.3 THERMISTOR MONITORING

Pursuant to Part K, Item 8, permafrost depth recorded on September 2nd, 2022 in the tailings cover ranged from 2.2m below surface in T18-1 (2.1m in 2020) to 2.7m below surface in T18-2 (2.9m in 2020) for an average of 2.5m. Thermistor results are provided separately as an excel file.

3.4 GEOTECHNICAL INSPECTION

Pursuant to Part E, Article 6c and 6d of Water Licence 1BR-CUL1828, Renata Klassen, M.Sc., P. Eng. (EXP Services Inc.) performed a geotechnical inspection of the tailings dam and the Shear Lake EWR on August 31st and September 1st, 2022. The inspection report was submitted to the NWB on October 27th, 2022, with a copy to INAC.

In summary, the geotechnical inspection report indicated that:

- The tailings dam remains stable and is continuing to serve its function of retaining the Tailings Pond No 1 tailings and water cover.
- Vegetation continues to take hold on the EWR and is helping to reduce erosion.

4.0 IMPLEMENTATION OF SPILL RESPONSE PLAN

Pursuant to Part I, Article 1 of Water Licence 1BR- CUL1828, the 2022 Spill Response Plan has been reviewed and will remain implemented for 2023. The current Spill Response Plan is included as Appendix 3.

5.0 REVIEW OF ABANDONMENT AND RESTORATION PLAN

Pursuant to Part J, Article 2 of the Water Licence, a review of the Closure and Restoration Plan (CRP) was performed in February 2023. There was no Progressive Rehabilitation conducted during the previous year and there are no current changes to the CRP.

6.0 IMPLEMENTATION OF QUALITY ASSURANCE / QUALITY CONTROL

Pursuant to Part K, Article 2 of the Water License, the Cullaton Lake Water Quality Monitoring QA/QC Plan dated March 25, 2011 remains implemented.

7.0 2023 PROPOSED PROGRAM

An 8 - day site visit is planned for mid to late August to complete the following activities:

- The annual general site inspection will be completed.
- Airstrip and access road shrub removal will continue.
- Remaining construction of the new survival shelter will be completed (metal roof installed and fixtures moved over from the existing shelter). Once this is complete, the old shelter will be stripped of non-combustible or oil-based materials and burned.
- Non-combustible refuse will be collected and removed from site on backhaul flights to Thompson Manitoba for proper disposal.

Appendix 1

Cullaton Lake September 2022 Site Photos



Photo 1: Cullaton Lake main site, looking west on September 1st, 2022 (R. Klassen photo).



Photo 2: Shear Lake site, looking northwest on September 1st, 2022 (R. Klassen photo).



Photo 3: Access road to Shear lake with Encapsulated Waste Rock in distance.



Photo 4: Former Shear Lake Portal.



Photo 5: Encapsulated Waste Rock cover top looking north.



Photo 6: Shear Lake low pH pool area.



Photo 7: Healthy vegetation downstream (left side of photo) of low pH pool.



Photo 8: Shear Creek at access road crossing, looking upstream to SW9 water quality monitoring station.



Photo 9: Tailings Pond No 1 dry cover vegetation, looking southeast on September 3rd, 2022.



Photo 10: Tailings Pond No 1 water cover looking southeast.



Photo 11: Tailings Pond No. 1 spillway (dry) looking upstream.



Photo 12: Tailings Pond No .1 reference for water level at spillway (Renate Klassen photo).



Photo 13: Small area of subsidence at B-zone Vent Raise in 2019 after filling.



Photo 14: Filled area in 2022.



Photo 15: B-Zone Portal looking west.



Photo 16: B-Zone raise looking west.



Photo 17: Quarry Pit main subsidence area – no change from previous years.



Photo 18: Quarry Pit main subsidence area looking east.



Photo 19: T2 thermistor casing damage.



Photo 20: T3 thermistor casing damage.



Photo 21: Old survival shelter on leaving site.



Photo 22: New survival shelter on leaving site.

Appendix 2

2022 Aquatic Monitoring Report



470 Granville Street, Suite 630, Vancouver, BC V6C 1V5
Tel: 604-629-9075 | www.pecg.ca

Cullaton Lake Mine Closed Site Aquatic Monitoring Report

2022 Open-water Season

Palmer Project #
140052

Prepared For
Barrick Gold Inc.

March 17, 2023

Executive Summary

This report describes the results of sampling conducted in 2022 on the aquatic receiving environment at the Cullaton Lake Mine Site, which consisted of water quality, sediment quality, and benthic invertebrates. The purpose of this sampling was to support the adaptive management plan for the closed site.

Water, sediment and benthic invertebrate sampling was conducted between August 31 and September 1, 2022. Water was collected from four sites: one located on Shear Creek, downstream of the waste rock pile (SW9), two within the tailings pond area (940-2 and SW33), and one in the natural pond located upstream of the tailings ponds (SW18). Sediment was collected from SW33 and SW9. Substrate was too compact at SW18 at the time of the assessment for sampling. The water and sediment samples were analyzed for general chemistry (physical tests and anions/nutrients) and metal concentrations.

Water samples collected from SW9 showed exceedances of Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for copper and iron. Sites SW18, SW33, and 940-2 had no CCME exceedances.

Sediment samples collected in at SW33 (Tailings Pond #2 drainage channel) showed elevated levels of metals, with exceedances of CCME Interim Sediment Quality Guidelines (ISQG) for arsenic, chromium and copper. No metals exceeded the CCME Probable Effects Levels (PEL) at SW33. Sediment samples collected at SW9 (Shear Creek downstream of the waste rock pile) showed an elevated level of arsenic exceeding the CCME PEL but there were no other CCME ISQG or PEL exceedances.

Benthic samples were collected at SW9 (Shear Creek downstream of the waste rock pile) and SW33 (Tailings Pond #2 drainage channel), the only two sites with flowing water during the 2022 field program. The benthic invertebrate samples collected from SW9 and SW33 were heavily dominated by the order diptera. In general, values for abundance and Chironomidae richness were higher in 2022 than in previous years. Taxa richness and diversity at both sites remained similar among years and sites. Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness and %EPT also remained comparable among years and sites, however, a trend of increasing EPT richness and %EPT were noted at SW9.

The results from the analysis of samples collected in 2022 provide no indication that aquatic conditions have deteriorated since 2018, and water quality results continue to point more to improved or stable conditions. It is recommended that sampling of water quality be completed in 2 years (2024) and sediment quality and benthic invertebrate community in 4 years (2026), as described in the 2018 Closure and Reclamation Plan for the Cullaton Lake Mine.

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Appendix D.	Biologica Datasheets

1. Introduction

The Cullaton Lake Mine site is a closed mine site that is monitored by Barrick Gold Inc. (Barrick) with a post-closure water monitoring program, as required under the existing Water Licence as well as the Cullaton Lake Mine Closure and Reclamation Plan (CRP) dated August 10, 2018, as approved by the Nunavut Water Board (NWB). This CRP closely follows the specific requirements pertaining to the content of a closure and reclamation plan as outlined in Mackenzie Valley Land and Water Board / Aboriginal Affairs and Northern Development Canada (MVLWB/AANDC; 2013).

The updated CRP laid out a post-closure aquatic monitoring program that has taken the form of an Adaptive Monitoring Plan. This plan has been designed to have a sufficient spatial and temporal resolution to identify any trends indicating a change in ecological risk at the site, as well as to ensure early detection of any changes.

Monitoring of the Cullaton Lake Mine Site during the 2022 open water season consisted of surface water, sediment, and benthic invertebrate sampling. This report outlines the methods and results of the 2022 aquatics sampling program as part of the post-closure monitoring plan for the Cullaton Lake Mine.

2. Methods

2.1 Study Area

The Cullaton Lake property is located in Nunavut, Canada approximately 230 km west of Arviat, Nunavut. The mine site is situated between Cullaton Lake and the Kognak River (Figure 2-1). The property consists of a gravel airstrip and road, encapsulated waste rock pile, covered dry tailings, and a flooded tailings pond.

The design of the 2022 aquatic monitoring program was based on previous sampling programs conducted at the Project site, allowing for the assessment of temporal and spatial trends. The sampling locations included in the 2022 program include a subset of sites used in 2008 as a component of a monitoring program to support a screening level risk assessment (AECOM, 2009) as well as the 2016 and 2018 monitoring programs completed by PEGG (PEGG, 2017; PEGG, 2019). All sampling locations are within the previously defined Shear Lake study area and Tailings Impoundment study area (PEGG, 2017). Both study areas flow into the Kognak River, however, they have no influence on each other and are not hydrologically connected.

The CRP (PEGG, 2018) outlines several modifications to the aquatics monitoring program, including the reduction of sampling sites from nine to the four shown in Table 2-1. On Shear Creek, SW9 was selected for ongoing sampling because this site has gravel and cobble substrate, which is suitable for benthic sampling, and is immediately downstream from the waste rock pile.

Table 2-1. Sampling sites included in the 2018 post-closure monitoring plan for the Cullaton Lake Mine Site.

Waterbody	Site Name	UTM (Zone 14V)		Site Description
		Easting	Northing	
Shear Creek	SW9	526735	6796688	Shear Lake outlet; Shear Creek downstream of waste rock pile.
Unnamed Creek	SW18	526743	6793024	100m upstream of Site SW18u. Upstream reference for Tailings Pond #1.
Unnamed Creek's origin natural pond	SW18 - Post*	526760	6793012	~75m upstream of SW18 where the water source of the unnamed creek, a natural pond, is located. Near the outlet of the natural pond, there is a post with a sign SW18 .
Tailings Pond #1 outlet	940-2	528506	6792438	Tailings Pond #1 discharge
Tailings Pond #2 Drainage Channel	SW33 (940-3)	528273	6792794	Drainage channel downstream of Tailings Pond #2.

Note: *The unnamed creek (SW18) was dry at the time of sampling, therefore, the surface water sample was collected from the water source, a natural pond upstream of the unnamed creek (SW18 - Post). The coordinates for SW18 - Post were approximated using GIS.

Site SW18u was sampled by AECOM (2009) and PECG (2017) as a reference location. Due to confounding factors such as the access road and anthropogenic influences from past mining activities, the sampling location for this site during 2018 surveys aimed to shift 100 m upstream from its historic location (SW18u). In 2022, the field crew observed dry conditions at SW18u and SW18 in the unnamed creek. Further upstream of SW18 in the unnamed creek, a post with a sign SW18 was observed located near the outlet at a natural pond which feeds into the unnamed creek (SW18 - Post). This is where sampling was conducted in 2022.

From the Water License, site 940-2 was carried forward into the monitoring plan. Site SW9 was proposed in the monitoring plan. Both sites were sampled in 2022.

Site SW33 was sampled at the same location as station 940-3 from the past Water License. In 2018, this site was intended to be moved downstream of the diversion channel so that it captured water from both the Tailings Pond #2 outlet and the diversion channel. However, assessments of the new site during the 2018 and 2022 field visits found that the channel was undefined, and no flowing water was evident. Therefore, site SW33 remained at the same location as in previous years, at the outlet of Tailings Pond #2.

2.2 Field and Lab Methods

On August 31 to September 1, 2022, a trained aquatic ecologist of Palmer travelled to the closed Cullaton Lake Mine Site in southeastern Nunavut. Site-level descriptions, photographs, and field notes for each sampling location are provided in Appendix A.

2.2.1 Surface Water Quality

As outlined in the CRP (PECG, 2018) and conducted during the 2018 and 2022 monitoring programs, several modifications were made to the 2016 water quality program as per the Water License (PECG, 2017). This included the reduction of sampling sites from nine to the four shown in Table 2-1 and focusing on assessing parameters that help support the assessment of water quality effects on the receiving environment. Parameters that were analyzed include:

- Physical parameters: pH, conductivity, total dissolved solids (TDS), total suspended solids (TSS), hardness, acidity and ion balance;
- Anions and nutrients: alkalinity, chloride, sulphate, total organic carbon (TOC); and
- Total Metals: Al, Sb, As, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Hg, Mo, Ni, Se, As, Th, U, V, Zn (Parameters of interest are Al, As, Cd, Cu, Co, Fe, Hg and Zn).

Field collection of water samples followed the BC Field Sampling Manual (Clarke, 2002). Surface water sampling was conducted on August 31 and September 1 of 2022, at four sites (Table 2-2). Adjustments were made to sampling locations 940-2 and SW18 to account for environmental conditions, as described in Section 2.1

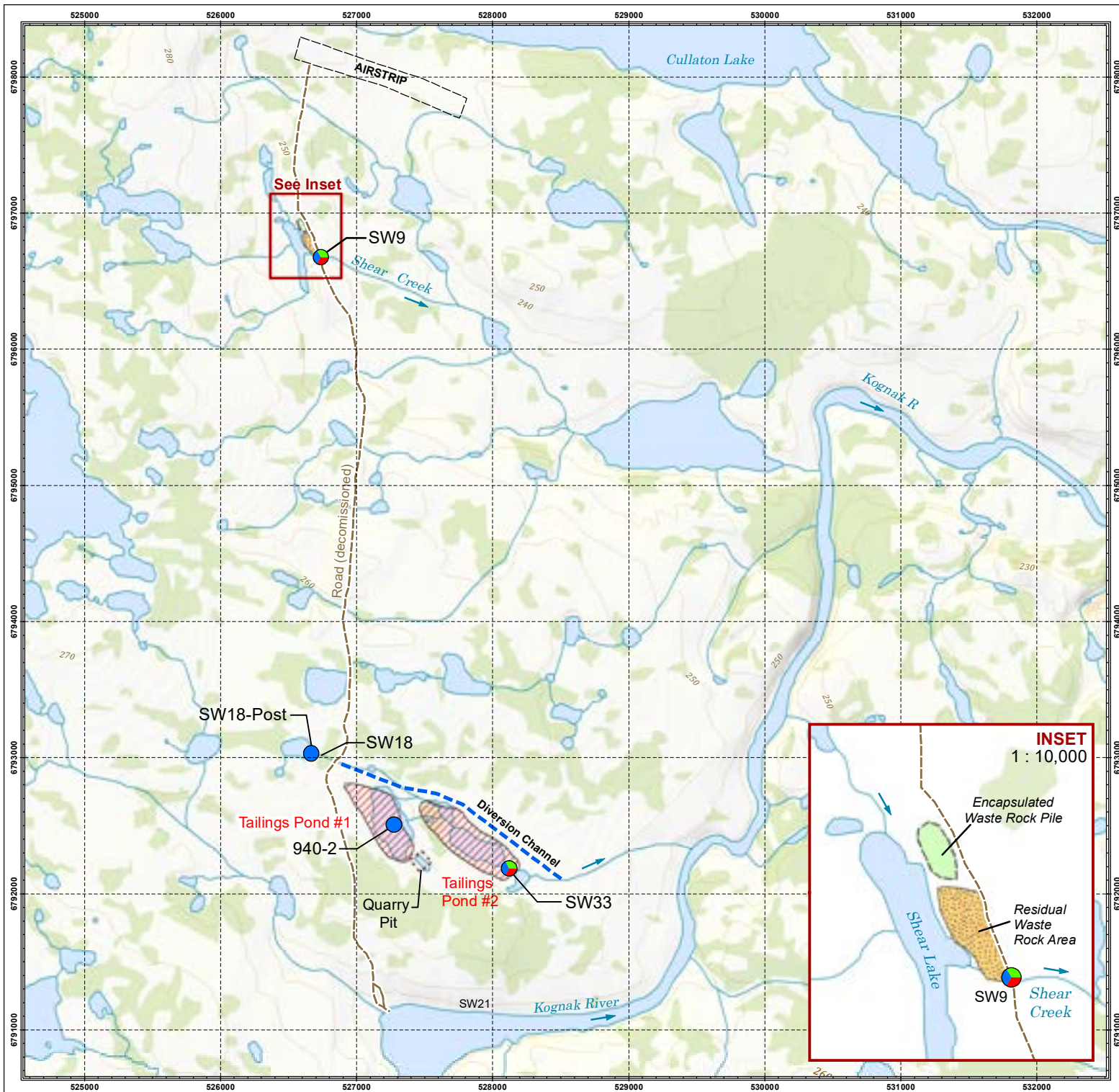
Table 2-2. Sampling sites and samples collected in 2022, Cullaton Lake Mine Site.

Waterbody	Site Name	Sample Type Collected
Shear Creek	SW9	<ul style="list-style-type: none">• Surface water• Sediment quality• Benthic community
Unnamed Creek	SW18	<ul style="list-style-type: none">• Surface water¹
Tailings Pond #1 outlet	940-2	<ul style="list-style-type: none">• Surface water²
Tailings Pond #2 Drainage Channel	SW33 (940-3)	<ul style="list-style-type: none">• Surface water• Sediment quality• Benthic community

Notes:

¹The unnamed creek was dry at the time of sampling, therefore, the surface water sample was collected from the water source, a natural pond upstream of the unnamed creek (SW18 - Post).

²The outlet was dry at the time of sampling, therefore, the surface water sample was collected from within the Tailings Pond.



LEGEND

Samples Taken

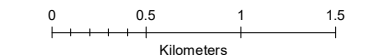
- Water Quality
- Sediment
- Benthic Invertebrates

Map Features

- Diversion Channel
- Watercourse
- Direction of Flow
- Contour (10 m interval)
- Road (decommissioned)
- Vegetation
- Encapsulated Rock Pile
- Residual Waste Rock Area
- ▨ Tailings Pond
- Quarry Pit

Site Descriptions

- SW9:** Shear Lake outlet; Shear Creek downstream of waste rock pile.
- SW18:** 100m upstream of Site SW18u. Upstream reference for Tailings Pond #1.
- SW18 (Post):** ~75 m upstream of SW18 where the water source of the unnamed creek, a natural pond, is located. Near the outlet of the natural pond, there is a post with a sign "SW18".
- 940-2:** Tailings Pond #1 discharge
- SW33:** Drainage channel downstream of Tailings Pond #2.
- (940-3)**



COORDINATE SYSTEM: NAD 1983 UTM ZONE 14 N
SCALE: 1:40,000

NOTES

1. Base data supplied by Natural Resources Canada (Canvec, CDED) and contains information licensed under the Open Government Licence - Canada, 2016.
2. Tailings, Waste Rock Piles, Quarry, Airstrip, Road redrawn from "Cullaton Lake Project: 2008 Sampling Locations" ©2009 AECOM Canada Ltd.

Client: Barrick Gold
Project: Cullaton Lake OEGG

PREPARED BY:

DRAWN: S. Murray
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PROJECT: 140054
UPDATED: Jan 24, 2023



**Aquatics
Monitoring Stations**

FIGURE 2-1

Water quality samples for general chemical parameters were collected in pre-cleaned 1 L plastic bottles supplied by ALS Environmental (ALS). Samples for total metals were collected in 120 mL acid-washed plastic bottles supplied by the laboratory and preserved in the field with laboratory-supplied nitric acid. Samples for anions and total organic carbon (TOC) were collected in 120 mL bottles and preserved in the field with laboratory-supplied sulphuric acid. A complete list of parameters analyzed, and their detection limits can be found in Appendix B.

Nitrile gloves were worn throughout water quality sampling. Once samples were collected and labelled, they were immediately stored in coolers with ice packs. Samples were stored at temperatures ≤ 5 °C throughout sample collection and shipping to the lab. Chain of custody were included with each shipment.

In addition, field parameters were measured *in situ* and were taken at each station using a YSI Pro pH/dissolved oxygen/conductivity handheld meter. Measurements included pH, temperature, dissolved oxygen, and specific conductivity. All field parameters and relevant notes were recorded in a field log book on waterproof paper.

2.2.1.1 Data Analysis

Water quality data were compared to up-to-date Canadian Environmental Quality Guidelines (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2001).

2.2.2 Sediment

Field sampling for sediment quality was conducted in accordance with ENV (2016) procedures. Two sediment samples, from sites SW9 and SW33, were collected in 2022 (Table 2-2). No sediment was collected from site SW18 due to the dry creek conditions. As per the CRP, sediment was not to be sampled from site 940-2.

At site SW9, fine-grained sediment was targeted from the top 3 to 5 cm of depositional areas. Sediment samples were collected using a plastic scoop utensil and transferred into 250 mL glass jars provided by ALS. Samples were collected immediately downstream of water quality and benthic sampling locations to prevent disturbance of these sites. Nitrile gloves were worn while collecting the sediment, and a depth measurement and photo were taken at each sampling location.

Sediment samples were analyzed for moisture, pH and metals by ALS. In the laboratory, samples were manually disaggregated (homogenized) with a wooden mallet, dried at 60°C, sieved through a 63 μm mesh and then tested for metals using inductively coupled plasma mass spectrometry (ICP/MS). Lower-size fractions (< 63 μm) are generally analyzed for metals because they are more bioavailable to benthic invertebrates and generally have higher concentrations of metals compared to coarse sediment (ENV 2016).

Sediment samples were analyzed for metals, total organic carbon, total sulphur and nutrients by ALS. Full laboratory data, including detection limits and parameters sampled, are shown in Appendix B.

2.2.2.1 Data Analysis

Sediment samples collected in the Project area were compared to federal quality guidelines: CCME Interim Sediment Quality Guidelines for inorganic metals (CCME 2001). Guidelines are only available for a limited number of metal concentrations (total metals) in sediments. Currently, ISQGs and PELs are recommended for 7 metals: arsenic, cadmium, chromium, copper, lead, mercury and zinc. Definitions of these numerical guidelines for the protection of aquatic life are as follows (CCME 1999):

- Interim Sediment Quality Guidelines (ISQG): generally reflective of threshold effect levels (TELs), which are the concentrations below which there are unlikely to be any adverse biological effects.
- Probable Effects Level (PEL): concentration above which adverse effects are expected to frequently occur.

2.2.3 Benthic Invertebrates

Biomonitoring of benthic invertebrates provides insight into the long-term health of aquatic ecosystems, due to their sedentary nature, relatively long life cycles, and high community diversity. In 2022, benthic invertebrate samples were only collected at two sites, SW9 and SW33 (Figure 2-1; Table 2-2). Both sites have been identified as sites that are potentially mine-influenced. All other sites were dry and therefore could not be sampled.

The Canadian Aquatic Biomonitoring Network (CABIN, ECCC 2012) field sampling protocol was performed at the two sites within the Cullaton Lake Mine Site. At each site, a CABIN field sheet was completed, and kick-net sampling was conducted, with a target of five 3-minute kick-net samples per site. Due to low water conditions and a lack of suitable riffle areas, only two replicate samples were collected at each site sampled. The CABIN method entails kick-net sampling for benthic invertebrates in the erosional zone (riffle, straight run, or rapid) of a representative watercourse reach. Habitat parameters such as stream substrate, channel dimensions (widths and depths), velocity measurements, and *in situ* water quality measurements were collected at each site in the vicinity of the benthic invertebrate kick-net area. *In situ* water quality measurements were taken with a YSI digital handheld meter. Other observations such as macrophyte coverage, streamside vegetation, and slope were evaluated within the entire reach (ECCC 2012). These data are included in raw format (field datasheets) in Appendix C.

For benthic invertebrate sampling, a triangular kick-net sampler with 400-micron mesh and detachable collection cup was employed. To collect a sample the collector walked backward in the upstream direction, tracing a zig-zag pattern, and dragging the net along the bottom. The collector kicked the substrate in front of the net while moving upstream. Sampling was timed for 3 minutes. Two non-overlapping areas were sampled within each site. The samples were collected moving upstream, and sample areas were chosen to include erosional habitat, where present. Each sample was distributed into sampling jars, preserved using 85% ethanol and submitted to Biologica Environmental Services Ltd. (Victoria, BC) for taxonomic analysis. Benthic invertebrates were identified to the lowest possible taxonomic group.

2.2.3.1 Data Analysis

CABIN field sheets were used to collect all the data required for input into the CABIN database, and are provided in Appendix D. These data include general site and location information, reach data (*i.e.* habitat types, canopy coverage, periphyton coverage, etc.), basic water chemistry, slope, widths, depth, velocity, and substrate data. Analysis of the benthic invertebrate data using the Reference Condition Approach (RCA) as adopted from Environment Canada's Canadian Aquatic Biomonitoring Network (CABIN) protocols cannot be performed at the time of writing as a reference model for Nunavut has not yet been developed by Environment Canada. However, the use of CABIN method ensures a standardized sampling protocol and the associated dataset provides context for the taxonomic data which would be more difficult to interpret in isolation. Environment Canada are in the process of developing a reference model for Nunavut, and once available, the RCA can be applied to the data to further assess aquatic ecosystem condition.

The following traditional benthic community descriptors are presented for the 2022 data:

- Abundance, calculated as the mean number of individuals across the replicate samples, per site;
- Taxa richness, calculated as the mean number of families across the replicate samples, per site;
- EPT taxa richness, defined as the mean number of mayfly (Ephemeroptera), stonefly (Plecoptera) and caddisfly (Trichoptera) families per site. These three orders of aquatic insects are typically most sensitive to habitat disturbance;
- Percentage EPT, calculated as the mean percentage of individuals in the EPT families at each site; and
- Shannon-Wiener diversity index H' , defined as:

$$H' = - \sum_{i=1}^R p_i (\ln p_i),$$

Where R is taxa richness, and p_i is the total number of individuals in the i^{th} species divided by the total number of organisms in the sample. The index presented is the mean value across the two samples.

Benthic invertebrate abundance and community metrics are reported for each site as the mean of the two samples collected. Percentage composition was calculated by dividing the biomass (number of individuals) of dominant taxa groups by the total biomass.

2.3 Quality Assurance and Quality Control

All field sampling was completed by two experienced field technicians, with the same methods employed at each site for consistency. All field data were transcribed into excel spreadsheets, plotted where appropriate, and used to calculate metrics that aided data interpretation. Original field notes were consulted where necessary to identify transcription errors or potential field equipment errors.

2.3.1 Surface Water Quality

Appropriate measures were taken to reduce the potential for water sample contamination. Samples were collected mid-stream, where practical, in pre-cleaned and labelled sample bottles provided by ALS. Nitrile gloves were worn during sample collection, and sample bottles were rinsed before filling. The samples were maintained at or below 5 degrees Celsius between collection and delivery to the laboratory. The samples were shipped to ALS. Recommended holding times were met for all samples. Chain of Custody forms accompanied all samples. Laboratory procedures followed ENV guidelines for analytical laboratories (ENV 2015).

2.3.2 Sediment Quality

Appropriate measures were taken to reduce the potential for sediment sample contamination. Field staff wore nitrile gloves when sampling and used pre-cleaned sample bottles supplied by ALS. Care was taken to prevent the inner portion of the sample container and caps from touching anything other than the sample itself. Samples were maintained at about 5 degrees Celsius between collection and delivery to ALS. Chain of Custody forms accompanied all samples.

The ALS Group's Environmental Division is a full-service, testing, research, and consulting laboratory specializing in environmental chemistry, and has over thirty years of experience providing analytical services to the environmental consulting industry. The analyses they conduct routinely involve trace-level determinations in a variety of sample matrices and require stringent quality control. ALS Environmental laboratories use a Quality Management System that is subject to periodic audits by local accreditation bodies. Accreditations are based on the requirements of ISO/IEC 17025:2005.

2.3.3 Benthic Invertebrates

To minimize the potential for contamination, the kick-net and collection cap were examined prior to and following sampling for any insects that remained, and thoroughly rinsed in the creek.

Biologica Environmental Services Ltd. has over ten years of experience in the taxonomic analysis of benthic invertebrates from streams, rivers and lakes. The following QA/QC procedures are followed by Biologica Environmental Services Ltd. :

- **Sorting efficiency:** this is an estimate of the percent of organisms recovered from the sample, which is done by performing randomly selected re-sorting on sorted material with an expectation of >95% efficiency in the sorting process
- **Taxonomic efficiency:** 10% of the identified sample vials were re-identified and re-enumerated by a second certified taxonomist. The two results were compared with simple statistics.
- **Taxonomic precision:** Biologica maintains in-house reference collections that are verified by a second in-house taxonomist, as well as externally by other laboratories or CABIN taxonomists. Any taxa that are new to the CABIN database are also sent to the ECCC CABIN taxonomist for verification.

- CABIN verification: Biologica participates in CABIN auditing, where two samples are sent to CABIN in order to check sorting efficiency, but also identification agreement. Biologica's agreement rate is generally ~95-98% with the CABIN taxonomists.

All sample errors were within the acceptable limits for CABIN Laboratory methods (less than 5% error) and passed testing according to the CABIN misidentification protocols. Full results from the taxonomic QC Audit are available in the Methods and QC Report prepared by Biologica Environmental Services Ltd. for the Cullaton Lake benthic invertebrate samples included in Appendix D.

3. Results and Discussion

3.1 Surface Water Quality

Table 3-1 shows select water quality parameters compared with CCME guidelines for sites SW18, SW9, SW33, and 940-2 for 2022, 2020, 2018 and 2016. Due to the dry creek conditions during the 2022 sampling, water samples for sites SW18 and 940-2 were collected at the edge of the water source of the channels these sites are located on. For site SW18, the water source of the unnamed creek, a natural pond upstream of the unnamed creek (SW18 - Post) was sampled as the upstream reference for Tailings Pond #1. For site 940-2, the edge of Tailings Pond #1 near the Tailing Pond #1 outlet was sampled. It should be noted that similar dry conditions were observed in 2018, where site 940-2 was sampled at the same location.

At site SW9 in Shear Creek, downstream of the waste rock pile, copper and iron were the only exceedances that occurred in the 2022 samples (0.00231 mg/L compared to the CCME copper guideline value of 0.002 mg/L and 0.402 mg/L compared to the CCME iron guideline value of 0.3 mg/L; Table 3-1), as also observed in the 2016, 2018, and 2020 samples. At site SW9, aluminum remained below the CCME guideline in 2022 compared to the exceedance observed in 2020.

At site 940-2, aluminum, arsenic, copper, iron, and lead have all decreased below the CCME guidelines compared to what was observed in 2018. At site SW33, aluminum and copper remain below the CCME guideline as in 2018 and 2020 compared to the exceedance observed in 2016.

No CCME guidelines were exceeded at sites SW18 (upstream reference for Tailings Pond #1), 940-2 (Tailings Pond #1 discharge), and SW33 (Tailings Pond #2 discharge), indicating no significant contaminant loading from Tailings Pond #1 and Tailings Pond #2.

3.2 Sediment Quality

Two sediment samples were collected in the 2022 field season. Dry creek conditions and compact substrate prevented sampling at sites SW18 in 2018 and 2022. Table 3-2 shows the sediment quality parameters compared with CCME guidelines. Only parameters for which there are CCME guidelines are shown in Table 3-2, results for the full suite of parameters are provided in Appendix B.

In 2022, site SW9 showed elevated arsenic exceeding the ISQG and PEL, which is consistent with 2016 data. In 2018, however, arsenic in site SW9 only exceeded the ISQG and not the PEL guideline. No other metals exceeded the ISQG and PEL guideline at site SW9 in 2022. Cadmium shows a slight increase since 2018 but remains below the concentration measured in 2016. Lead is elevated compared to 2016 and 2018 but remains below ISQG and PEL guidelines. Sediment collected at site SW9 in 2022 showed decreased levels of chromium, copper and zinc compared to samples collected in 2016 and 2018.

At site SW33, arsenic, chromium and copper exceeded the ISQG guideline in 2020. No other metals exceeded the ISQG and PEL guideline at site SW33 in 2022. Site SW33 was not sampled in 2018 as the substrate was too compact and could not be sampled. In 2016, chromium and copper exceeded the ISQG guideline, while arsenic exceeded the PEL guideline.

Table 3-1. Comparison of 2022, 2020, 2018 and 2016 water quality sampling results with CCME guidelines, Cullaton Lake.

Parameter	MRL ¹	CCME Guideline	Units	2022				2020 ²				2018			2016	
				SW18	SW33 (940-3)	940-2	SW9	SW18	SW33 (940-3)	940-2	SW9	SW33 (940-3)	940-2	SW9	SW33 (940-3)	SW9
Physical Tests (Water)																
Conductivity	1	-	uS/cm	76.5	336	185	37.8	71.5	401	264	42.6	425	311	44.4	344	47
Hardness (as CaCO ₃), from total Ca/Mg	0.51	-	mg/L	39.5	149.0	71.1	15.8	38.0	169.0	103.0	18.6	190	134	17.6	156	20
pH	0.1	6.5-9.0	pH	7.76	8.25	7.74	7.19	7.55	8.12	7.85	6.97	8.28	7.97	6.97	8.3	7.2
Total Suspended Solids	3	-	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	2.2	87.3	4	4.6	2.2
Total Dissolved Solids	4	-	mg/L	64	206	118	25.9	68	246	151	38	274	197	30.4	235	45
Anions and Nutrients (Water)																
Acidity (as CaCO ₃)	2	-	-	-	-	-	-	2.4	<2.0	<2.0	2.6	-	-	-	-	-
Alkalinity, Bicarbonate (as CaCO ₃)	2	-	-	-	-	-	-	39.3	138	59.3	10.9	-	-	-	-	-
Alkalinity, Carbonate (as CaCO ₃)	2	-	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	-	-	-	-	-
Alkalinity, Hydroxide (as CaCO ₃)	2	-	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	-	-	-	-	-
Alkalinity, Total (as CaCO ₃)	1	-	mg/L	34.3	116	34.5	9.2	39.3	138	59.3	10.9	139	55.4	7.2	115	12
Bicarbonate (HCO ₃)	1.2	-	mg/L	41.8	142	42.1	11.2	-	-	-	-	-	-	-	-	-
Carbonate (CO ₃)	0.6	-	mg/L	<0.60	<0.60	<0.60	<0.60	-	-	-	-	-	-	-	-	-
Chloride (Cl)	0.5	120	mg/L	<0.50	1.51	0.7	<0.50	0.33	2.4	1.04	0.36	3.39	1.3	<0.50	1.9	<0.50
Computed Conductivity	-	-	uS/cm	74.2	331	173	36.1	-	-	-	-	-	-	-	-	-
Conductivity % Difference	-	-	%	-3.1	-1.6	-6.9	-4.5	-	-	-	-	-	-	-	-	-
Hardness (as CaCO ₃)	-	-	mg/L	38	140	65.4	14.9	-	-	-	-	-	-	-	-	-
Hydroxide (OH)	0.34	-	mg/L	<0.34	<0.34	<0.34	<0.34	-	-	-	-	-	-	-	-	-
Ion Balance	-	-	%	Low EC	97.7	97.6	Low EC	-	-	-	-	-	-	-	-	-
Langelier Index	-	-	-	-1	0.4	-0.8	-2.5	-	-	-	-	-	-	-	-	-
Saturation pH	-	-	pH	8.78	7.83	8.58	9.7	-	-	-	-	-	-	-	-	-
TDS (Calculated)	-	-	mg/L	36.9	186	93.9	18.1	-	-	-	-	-	-	-	-	-
Sulfate (SO ₄)	0.3	-	mg/L	1.27	53.5	43.3	6.13	1.61	81.8	70.3	7.4	85.3	97	10.6	71	7.9
Anion Sum	-	-	me/L	0.71	3.48	1.61	0.31	0.83	4.52	2.68	0.38	4.64	3.16	0.37	NA	NA
Cation Sum	-	-	me/L	0.83	3.4	1.57	0.34	0.83	4.12	2.47	0.48	4.79	3.45	0.45	NA	NA
Cation - Anion Balance	-	-	%	Low EC	-1.1	-1.2	Low EC	0.3	-4.7	-4	11.1	1.6	4.3	10.8	NA	NA

Parameter	MRL ¹	CCME Guideline	Units	2022				2020 ²				2018			2016	
				SW18	SW33 (940-3)	940-2	SW9	SW18	SW33 (940-3)	940-2	SW9	SW33 (940-3)	940-2	SW9	SW33 (940-3)	SW9
Organic / Inorganic Carbon (Water)																
Total Organic Carbon	0.5	-	mg/L	16.7	19.3	2.88	7.99	27.7	15.5	<5.0	11.3	15.2	2.54	6.88	13	9.5
Total Metals (Water)																
Aluminum (Al)-Total	0.003	pH ≥ 6.5 = 0.1	mg/L	0.0313	0.0091	0.0042	0.0724	0.0393	0.0089	0.0068	0.189	0.027	0.413	0.0925	0.11	0.13
Antimony (Sb)-Total	0.0001	-	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	0.00015	0.00045	<0.00010	<0.00020	<0.00020
Arsenic (As)-Total	0.0001	0.005	mg/L	0.00168	0.00343	0.00294	0.00041	0.0019	0.0024	0.0038	<0.0010	0.00315	0.0502	0.00039	0.0031	0.00046
Barium (Ba)-Total	0.0001	-	mg/L	-	-	-	-	-	-	-	-	0.0248	0.0384	0.0116	-	-
Beryllium (Be)-Total	2E-05	-	mg/L	-	-	-	-	-	-	-	-	<0.000020	0.000024	<0.000020	-	-
Bismuth (Bi)-Total	5E-05	-	mg/L	-	-	-	-	-	-	-	-	<0.000050	0.000187	<0.000050	-	-
Boron (B)-Total	0.01	1.5	mg/L	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	-	-
Cadmium (Cd)-Total	5E-06	Variable ¹	mg/L	<0.0000050	<0.0000050	<0.0000050	6.7E-06	<0.0000050	<0.0000050	<0.0000050	0.0000173	<0.0000050	0.0000172	0.0000102	<0.000010	0.00002
Calcium (Ca)-Total	0.05	-	mg/L	10.3	34.6	18.3	4.4	10	39.4	26.6	5.04	43.6	34.5	4.7	-	-
Chromium (Cr)-Total	0.0001	0.0089	mg/L	0.00037	0.0003	0.00081	0.00049	0.00031	0.0002	0.00025	0.0006	0.00018	0.00314	0.00034	0.00036	0.00048
Cobalt (Co)-Total	0.0001	-	mg/L	<0.00010	0.00032	0.00127	0.00045	<0.00010	0.00051	0.0019	0.00107	0.0005	0.00326	0.00073	0.00052	0.00093
Copper (Cu)-Total	0.0005	Variable ²	mg/L	0.00106	0.00128	0.00096	0.00231	0.0011	0.0016	0.0012	0.0033	0.00236	0.00378	0.00275	0.0027	0.0031
Iron (Fe)-Total	0.01	0.3	mg/L	0.112	0.144	0.024	0.402	0.138	0.083	0.103	0.525	0.117	3.9	0.535	0.27	0.43
Lead (Pb)-Total	5E-05	Variable ³	mg/L	<0.000050	<0.000050	0.00005	<0.000050	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	0.0165	0.00005	<0.000090	<0.000090
Lithium (Li)-Total	0.001	-	mg/L	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	0.0016	<0.0010	0.001	0.0017	<0.0010	<0.0010	<0.0020	<0.0020
Magnesium (Mg)-Total	0.005	-	mg/L	3.35	15.2	6.17	1.18	3.14	17	8.88	1.45	19.7	11.6	1.43	-	-
Manganese (Mn)-Total	0.0001	Variable ⁴	mg/L	0.00577	0.0369	0.00476	0.0217	0.00573	0.00815	0.00896	0.0302	0.0253	0.106	0.0324	0.034	0.029
Mercury (Hg)-Total	5E-06	0.000026	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000052
Molybdenum (Mo)-Total	5E-05	0.073	mg/L	0.000081	0.000237	0.000444	<0.000050	0.000056	0.000358	0.000824	<0.000050	0.000815	0.0019	<0.000050	0.00056	<0.00020
Nickel (Ni)-Total	0.0005	Variable ⁵	mg/L	0.00178	0.00242	0.00053	0.00237	0.0021	0.0026	<0.0020	0.0038	0.0036	0.00488	0.00266	0.0033	0.0037
Phosphorus (P)-Total	0.05	-	mg/L	-	-	-	-	-	-	-	-	<0.050	<0.050	<0.050	-	-
Potassium (K)-Total	0.05	-	mg/L	0.922	1.91	1.31	0.6	0.793	2.15	1.9	0.671	2.54	1.94	0.82	-	-
Selenium (Se)-Total	5E-05	0.001	mg/L	<0.000050	0.00012	0.000069	<0.000050	0.000056	0.000076	0.000101	0.000051	0.0001	0.000158	<0.000050	<0.000100	<0.00010
Silicon (Si)-Total	0.1	-	mg/L	-	-	-	-	-	-	-	-	0.12	1.59	0.37	-	-
Silver (Ag)-Total	1E-05	0.00025	mg/L	-	-	-	-	-	-	-	-	0.000013	0.000035	<0.000010	0.000017	<0.000010
Sodium (Na)-Total	0.05	-	mg/L	1.06	13.9	5.9	0.711	0.98	15.9	8.23	0.892	21.3	10.6	0.937	-	-
Strontium (Sr)-Total	0.0002	-	mg/L	-	-	-	-	-	-	-	-	0.227	0.168	0.017	-	-
Sulfur (S)-Total	0.5	-	mg/L	-	-	-	-	-	-	-	-	31.8	36.3	3.45	-	-

Parameter	MRL ¹	CCME Guideline	Units	2022				2020 ²				2018			2016	
				SW18	SW33 (940-3)	940-2	SW9	SW18	SW33 (940-3)	940-2	SW9	SW33 (940-3)	940-2	SW9	SW33 (940-3)	SW9
Thallium (Tl)-Total	1E-05	0.0008	mg/L	-	-	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Total	0.0001	-	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-	-	-	-
Tin (Sn)-Total	0.0001	-	mg/L	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	-	-
Titanium (Ti)-Total	0.0003	-	mg/L	-	-	-	-	-	-	-	-	0.00067	0.0062	0.00091	-	-
Uranium (U)-Total	1E-05	0.015	mg/L	0.000062	0.000728	0.000095	0.000085	0.000074	0.00129	0.000262	0.000133	0.00248	0.000882	0.000099	0.0013	0.00012
Vanadium (V)-Total	0.0005	-	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.0005	<0.00050	<0.00050	0.00062	<0.00050	0.00115	<0.00050	0.00041	<0.00020
Zinc (Zn)-Total	0.003	-	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.007	<0.0030	0.0012	0.0024
Zirconium (Zr)-Total	0.0003	-	mg/L	-	-	-	-	-	-	-	-	<0.00030	0.00032	<0.00030	-	-
Dissolved Metals (Water)																
Calcium (Ca)-Dissolved	0.05	-	mg/L	9.89	32	16.9	4.12	-	-	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	0.005	-	mg/L	3.24	14.6	5.64	1.12	-	-	-	-	-	-	-	-	-

Values **bolded** and highlighted as **red** text exceed CCME guidelines.

Note:

*The sample location for 940-2 was dry. This sample was collected from within the tailings pond. There was no discharge to the environment.

**The sample location for SW18 was dry at the time of sampling, therefore, the surface water sample was collected from the water source, a natural pond upstream, SW18 - Post.

¹ Method Reporting Limit (MRL) changes over the years. As such, Table 3-1 indicates the most recent MRLs. To view historic MRLs, refer to previous reports (PECG 2017, PECG 2019, and P.J. Brugger and Associates. 2020).

² Two replicates per site were collected in 2020 as reported in P.J. Brugger and Associates. 2020. In Table 3-1, only the first replicate has been presented and screened.

Variable¹: The CCME guideline for cadmium is hardness dependent:

- When the water hardness is > 0 to < 17 mg/L, the guideline is 0.00004 mg/L.
- At hardness ≥ 17 to ≤ 280 mg/L, the CCME is calculated using this equation: guideline (µg/L) = 10{0.83(log[hardness]) - 2.46 }.
- At hardness > 280 mg/L, the is 0.00037 mg/L.

Variable²: The CCME guideline for copper is hardness dependent:

- When the water hardness is 0 to < 82 mg/L, the guideline is 0.002 mg/L.
- At hardness ≥ 82 to ≤ 180 mg/L the guideline is calculated using this equation: guideline (µg/L) = 0.2 * e{0.8545[ln(hardness)]-1.465}.
- At hardness > 180 mg/L, the guideline is 0.004 mg/L.

Variable³: The CCME guideline for lead is hardness dependent:

- When the hardness is 0 to ≤ 60 mg/L, the guideline is 0.001 mg/L.
- At hardness >60 to ≤ 180 mg/L the CCME is calculated using this equation: guideline (µg/L) = e{1.273[ln(hardness)]-4.705}.
- At hardness >180 mg/L, the guideline is 0.007 mg/L.

Variable⁴: The CCME guideline for manganese is determined using the CWQG calculator in Appendix B of the Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life: Manganese (2019).

Variable⁵: The CCME guideline for nickel is hardness dependent:

- When the water hardness is 0 to ≤ 60 mg/L, the guideline is 0.025 mg/L.
- At hardness > 60 to ≤ 180 mg/L the guideline is calculated using this equation: guideline (µg/L) = e{0.76[ln(hardness)]+1.06}.
- At hardness >180 mg/L, the CWQG is 150 µg/L (= 0.150 mg/L).

Table 3-2. Comparison of 2022, 2018 and 2016 sediment quality results, Cullaton Lake Mine Site.

Parameter	Units	ISQG	PEL	2022		2018	2016		
				SW33	SW9	SW9	SW33	SW9	SW18
Arsenic (As)	mg/kg	5.9	17	13.4	<u>17.1</u>	14	<u>81.4</u>	<u>18.6</u>	<u>120</u>
Cadmium (Cd)	mg/kg	0.6	3.5	0.072	0.269	0.107	0.3	1.05	0.13
Chromium (Cr)	mg/kg	37.3	90	44.5	23.6	54.7	46.2	57.1	67.5
Copper (Cu)	mg/kg	35.7	197	77.2	24.1	42.4	60.9	72.6	45.4
Lead (Pb)	mg/kg	35	91.3	4.42	10.5	9.26	5.5	8.3	12.6
Mercury (Hg)	mg/kg	0.17	0.486	-	-	0.0466	0.054	0.098	0.010
Zinc (Zn)	mg/kg	123	315	27.4	53.3	64.5	60.1	86	196

Note:
ISQG = interim sediment quality guideline; exceedances **bolded**
PEL = probable effects levels; exceedances **bolded** and underlined

3.3 Benthic Invertebrates

The benthic invertebrate community descriptor results for total abundance, taxa richness, EPT (Ephemeroptera, Plecoptera, Trichoptera) taxa richness, Chironomidae richness, % EPT, and the Shannon-Wiener biodiversity index are provided in Table 3-3. Note that, consistent with sampling in 2018, stream conditions only allowed for two samples to be taken at each site in the 2022 field season; the lack of replication restricted the interpretation of data. Benthic invertebrate samples were not collected from sites SW18 and 940-2 due to dry creek conditions.

Table 3-3. Comparison of 2022, 2018 and 2016 benthic community metrics results, Cullaton Lake Mine Site.

Year	2022		2018		2016	
Site	SW9	SW33	SW9	SW33	SW9	SW33
Sample number (n)	2	2	2	2	5	5
Mean Abundance	11640	7278	1333	654	3915 ± 1859	1953 ± 1290
Mean Taxa Richness	18.5	17.5	31.5	33.5	22.4 ± 2.3	35 ± 2.3
Mean EPT taxa richness	7	2	5	2	4.0 ± 1.6	2.2 ± 1.1
Mean Chironomidae Richness	77.83	67.75	15.5	12	11.6 ± 1.3	18.8 ± 4.4
Mean % EPT	37.84%	3.60%	6.99%	0.86%	5.17% ± 2.09%	1.48% ± 1.22%
Mean Shannon-wiener H' (log 10)	1.01	1.33	1.09	1.03	0.77 ± 0.07	1.09 ± 0.09

Note: 2016 values are mean ± standard deviation

Figure 3-1 to Figure 3-6 show plots of the benthic invertebrate community descriptors at sites SW9 and SW33 for 2022, 2018 and 2016 sampling. Both the Shear Creek site (SW9) and the tailings area site (SW33) showed similar trends in total abundance between 2022, 2018 and 2016. Overall, total abundance

across both sites was greater in 2022 compared to 2018 and 2016 (Figure 3-1). Taxonomic richness was overall lower in 2022 compared to 2018 and 2016 (Figure 3-2) for both sites. EPT richness was overall comparable among years at site SW33. EPT richness at site SW9 however displays a trend of increasing EPT richness over the years (Figure 3-3). Chironomidae richness was overall substantially greater in 2022 than in 2018 and 2016 (Figure 3-4) for both sites. % EPT generally appears comparable among years and sites, except for a considerable increase seen at site SW9 in 2022 (Figure 3-5). Shannon-Wiener biodiversity index remained relatively similar among sites and years (Figure 3-6).

Figure 3-7 shows the relative abundance of taxa groups (*i.e.* community composition) by site and year. Diptera was the dominant order at both sites for 2022, 2018 and 2016 (>60% of individuals). The percentage of orders Ephemeroptera, Plecoptera and Trichoptera was low at both sites. These three orders of aquatic insects are typically most sensitive to pollution and are used as an indicator of aquatic ecosystem health.

In general, values for abundance and Chironomidae richness were higher in 2022 than in previous years. Taxa richness and diversity at both sites remained low comparable among years and sites. EPT richness and %EPT also remained low comparable among years and sites, however, a trend of increasing EPT richness and %EPT were noted at SW9. The low values of these parameters are attributable to the northern conditions at the sites.

Northern aquatic environments tend to have lower diversity than southern aquatic systems due to the long periods of ice cover and general low nutrient status. Bed roughness, substrate, and flow velocities are factors that influence benthic community structure. Generally, slow-flow areas support decomposer communities that tolerate lower dissolved oxygen levels and higher organic matter and sedimentation (e.g. silt-tolerant oligochaetes, chironomids). Riffle-dwelling communities are more sensitive to increasing pollution than communities in the pools or slow-flowing areas in the same stream. Coarse substrate (cobble and gravel) is preferred by many EPT species, while finer substrate (sand, silt and organics) generally supports more Diptera and Oligochaeta. While the benthic invertebrate community structure at Cullaton Lake is representative of northern aquatic environments, results from 2022 point towards a possible improvement in health for the benthic invertebrate communities downstream of the waste rock pile and Tailings pond #2.

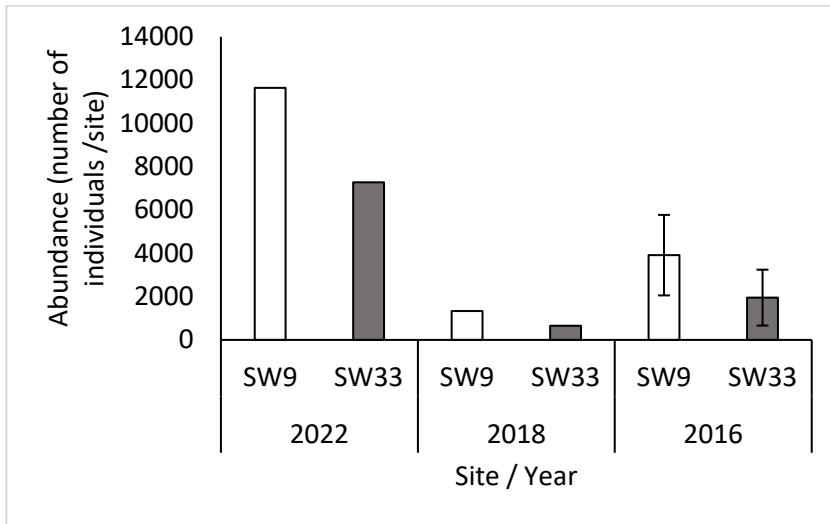


Figure 3-1. Benthic invertebrate community abundance

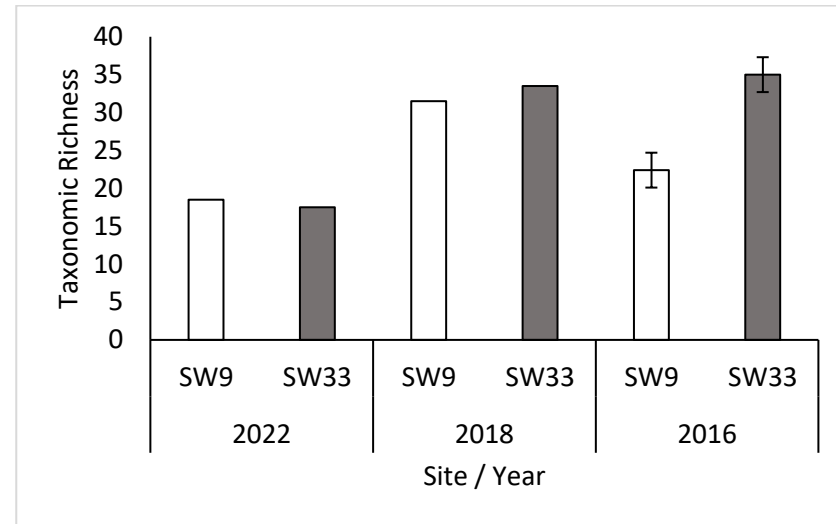


Figure 3-2. Benthic invertebrate community taxonomic richness

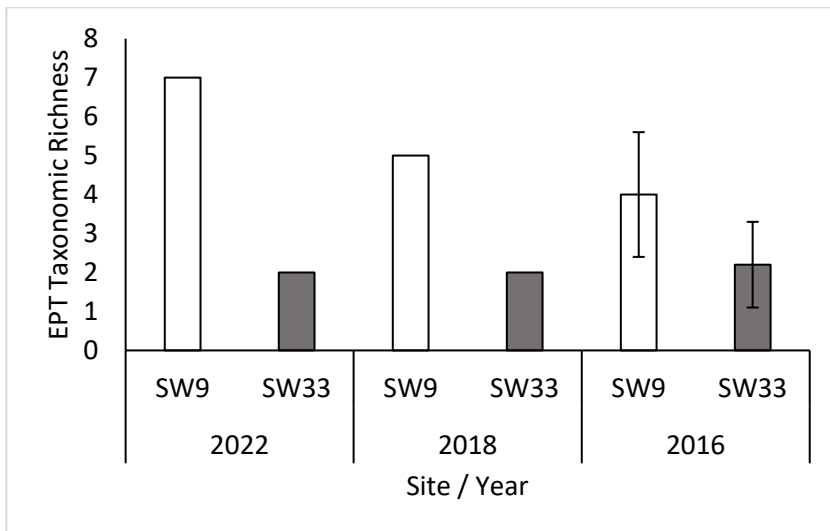


Figure 3-3. Benthic invertebrate community EPT taxonomic richness

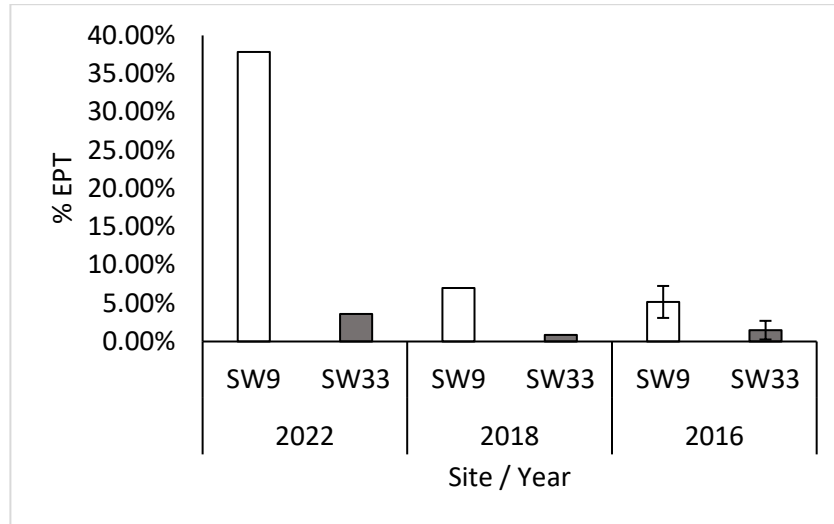


Figure 3-5. Benthic invertebrate community % EPT

Figure 3-4. Benthic invertebrate community chironomidae richness

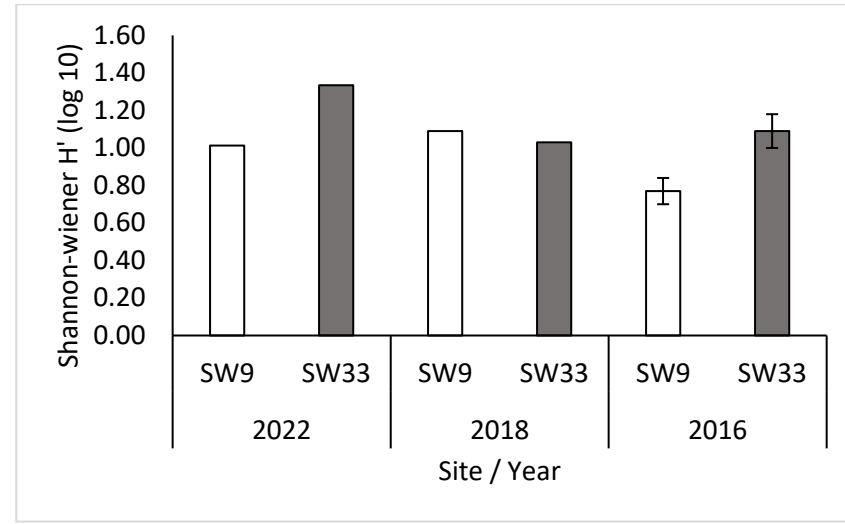


Figure 3-6. Benthic invertebrate community Shannon-Wiener indices

Notes for Figures 3-1 to 3-6:

- Shaded bars on plots indicate the sites in the tailings area.
- Sample numbers for 2022 data are n =2
- Sample numbers for 2018 data are n =2
- Sample numbers for 2016 data are n =5
- Error bars denote the standard deviation from the mean.

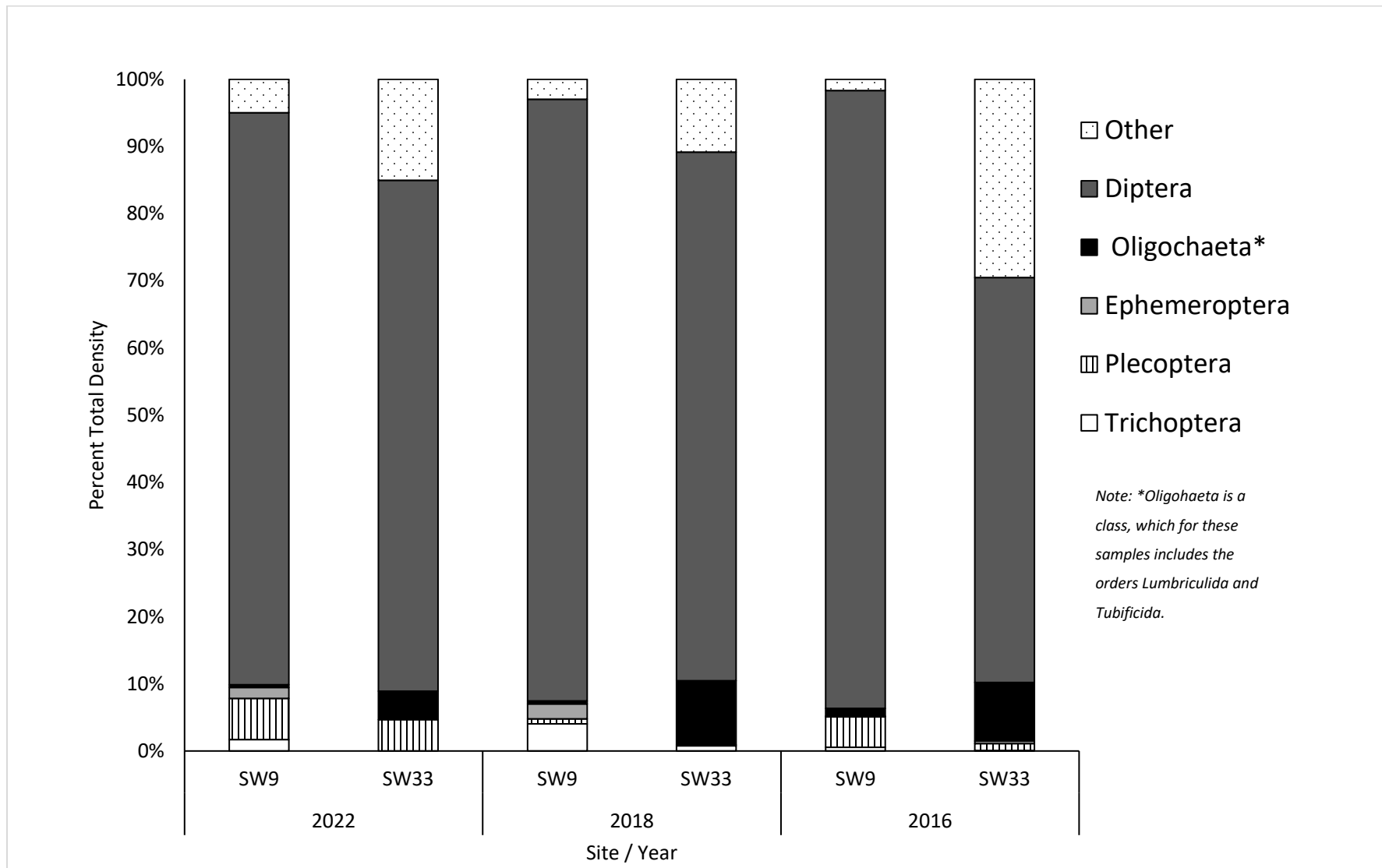


Figure 3-7. Benthic invertebrate community composition by site and year, Cullaton Lake

4. Summary and Conclusions

The purpose of the 2022 water, sediment, and benthic invertebrate sampling was to support the 2018 Closure and Reclamation Plan (PECG, 2018). As outlined in the CRP, water quality sampling is to be completed every two years. In conjunction with the surface water quality program in 2022, sampling of the sediment and benthic invertebrate community were also required.

Water, sediment, and benthic community sampling completed in 2022 as part of the CRP were restricted due to the low flow and/or dry conditions throughout the Cullaton Lake Mine Site. Due to dry conditions, water samples for sites SW18 and 940-2 were collected at the water source of channels these sites are located on. Sediment samples were collected at sites SW33 and SW9. Dry creek conditions and compact substrate prevented sampling at sites SW18. SW33 and SW9 were also sampled for benthic invertebrates. Benthic invertebrate samples were not collected from sites SW18 and 940-2 due to dry creek conditions.

Water quality, sediment quality, and benthic community composition showed similar values to those observed in 2018 and 2016. The results from samples collected provide no indication that aquatic conditions have deteriorated since 2018, and water quality results continue to point more towards improved or stable conditions. It is recommended that sampling of water quality be completed again in 2 years (2024) and sediment quality and benthic invertebrate community in 4 years (2026), as described in the 2018 Closure and Reclamation Plan for the Cullaton Lake Mine.

5. Certification

This report was prepared, reviewed and approved by the undersigned:

Prepared By:



Shreya Jain, M.Sc., B.I.T.
Fisheries Biologist

Reviewed By:



Ian Macleod, B.Sc., R.P.Bio., P.Biol.
Senior Fisheries Biologist

Approved By:



May Mason, M.Sc., R.P.Bio.
Aquatic Ecologist and CCO

6. References

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- PECG, Palmer Environmental Consulting Group Inc. 2018. Cullaton Lake Mine Closure and Reclamation Plan. Report prepared for Barrick Gold Inc. August 10, 2018.
- PECG, Palmer Environmental Consulting Group Inc. 2019. Cullaton Lake Mine Closed Site Aquatic Monitoring Report. 2018 open-water season. Report prepared for Barrick Gold Inc. March 26, 2019.

Appendix A

Field Sampling Locations and Photolog

SW9 – CABIN

Project 14054	Cullaton Lake 2018
Site Name	SW9 CABIN
Date	September 1, 2022
Time	10:02 AM
UTM	14V 526735 6796688
Observations	Shear Creek just below road crossing. Water levels very low. Open, wide channel with riffle habitat at ford; channel tapering downstream and densely covered by shrubs. CABIN completed; 2 replicate kick samples completed at site. Sediment and water samples were also collected.

Photos



Looking downstream at SW9



Looking upstream at SW9



Looking across at SW9



Substrate at SW9



SW9 post at site SW9

940-2

Project 14054	Cullaton Lake 2018
Site Name	940-2
Date	August 31, 2022
Time	5:05 PM
UTM	14V 05285066 6792438
Observations	Outflow channel dry and stagnant water downstream. CABIN not completed. Water samples were collected from within tailings pond.

Photos



Looking across the dry outflow channel at Tailings Pond #1 (to the right)



Tailings Pond #1 outlet where water sampling for 940-2 was conducted

SW33 – CABIN

Project 14054	Cullaton Lake 2018
Site Name	SW33 (940-3)
Date	August 31, 2022
Time	7:04 PM
UTM	14V 528273 6792794
Observations	Creek flowing out of Tailings Pond #2. Straight, narrow riffle with cobble/gravel substrate. Channel flows into grassy area. Sampling location was not moved to the confluence of this creek with the diversion channel as there was no defined channel observed at this new location. CABIN completed; 2 replicate kick samples completed at this site. Sediment was also collected at this site. Water samples were collected immediately upstream of where the berm of the tailings pond intersects the channel.

Photos



Looking upstream towards Tailings Pond #2



Looking downstream and includes SW33 post with sign



Looking across SW33 and includes SW33 post with sign



Substrate at SW33



Looking downstream of reach where channel enters grassy area

SW18

Project 14054	Cullaton Lake 2018
Site Name	SW18
Date	August 31, 2022
Time	2:24 PM
UTM	14V 0526748 6793014
Observations	No defined channel at SW18. Wet grassy area with pockets of stagnant water. CABIN and sediment samples were not completed at this site. Water sample was taken upstream at the water source which is a natural pond (SW18 - Pond).

Photos



No flowing water at SW18



Small pockets of stagnant water at SW18



Water sample taken here by SW18 - Post (located at the natural pond near the outlet of the unnamed creek)

Appendix B

ALS Laboratories Datasheets



Barrick Gold of North America.
ATTN: Paul Brugger
1084 County Rd 8
Campbellford ON K0L 1L0

Date Received: 02-SEP-22
Report Date: 23-SEP-22 14:34 (MT)
Version: FINAL

Client Phone: 705-632-1871

Certificate of Analysis

Lab Work Order #: L2731391
Project P.O. #: NOT SUBMITTED
Job Reference: CULLATION LAKE
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 1329 Niakwa Road East, Unit 12, Winnipeg, MB R2J 3T4 Canada | Phone: +1 204 255 9720 | Fax: +1 204 255 9721
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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2731391-11 SEDIMENT 31-AUG-22 18:45 SW33	L2731391-12 SEDIMENT 01-SEP-22 08:20 SWQ9		
Grouping	Analyte				
SOIL					
Physical Tests	pH (pH units)	6.55	5.98		
Metals	Aluminum (Al) (ug/g)	8460	6440 <small>DLM</small>		
	Antimony (Sb) (ug/g)	0.22	1.00 <small>DLM</small>		
	Arsenic (As) (ug/g)	13.4	17.1 <small>DLM</small>		
	Barium (Ba) (ug/g)	31.7	82.1 <small>DLM</small>		
	Beryllium (Be) (ug/g)	0.27	0.48 <small>DLM</small>		
	Bismuth (Bi) (ug/g)	<0.20	1.63 <small>DLM</small>		
	Boron (B) (ug/g)	<5.0	<10 <small>DLM</small>		
	Cadmium (Cd) (ug/g)	0.072	0.269 <small>DLM</small>		
	Calcium (Ca) (ug/g)	3030	1390 <small>DLM</small>		
	Chromium (Cr) (ug/g)	44.5	23.6 <small>DLM</small>		
	Cobalt (Co) (ug/g)	12.3	59.2 <small>DLM</small>		
	Copper (Cu) (ug/g)	77.2	24.1 <small>DLM</small>		
	Iron (Fe) (ug/g)	19500	60700 <small>DLM</small>		
	Lead (Pb) (ug/g)	4.42	10.5 <small>DLM</small>		
	Lithium (Li) (ug/g)	14.2	5.8 <small>DLM</small>		
	Magnesium (Mg) (ug/g)	6290	2460 <small>DLM</small>		
	Manganese (Mn) (ug/g)	187	1960 <small>DLM</small>		
	Molybdenum (Mo) (ug/g)	0.38	1.08 <small>DLM</small>		
	Nickel (Ni) (ug/g)	39.4	32.6 <small>DLM</small>		
	Phosphorus (P) (ug/g)	577	330 <small>DLM</small>		
	Potassium (K) (ug/g)	670	1460 <small>DLM</small>		
	Selenium (Se) (ug/g)	0.27	0.64 <small>DLM</small>		
	Silver (Ag) (ug/g)	0.29	0.37 <small>DLM</small>		
	Sodium (Na) (ug/g)	98	<100 <small>DLM</small>		
	Strontium (Sr) (ug/g)	19.3	7.4 <small>DLM</small>		
	Sulfur (S) (ug/g)	1200	7600 <small>DLM</small>		
	Thallium (Tl) (ug/g)	0.056	0.11 <small>DLM</small>		
	Tin (Sn) (ug/g)	<2.0	<4.0 <small>DLM</small>		
	Titanium (Ti) (ug/g)	403	262 <small>DLM</small>		
	Tungsten (W) (ug/g)	1.52	31.7 <small>DLM</small>		
	Uranium (U) (ug/g)	1.49	1.71 <small>DLM</small>		
	Vanadium (V) (ug/g)	27.1	27.2 <small>DLM</small>		
	Zinc (Zn) (ug/g)	27.4	53.3 <small>DLM</small>		
	Zirconium (Zr) (ug/g)	3.4	2.8 <small>DLM</small>		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L2731391-1 SURFACE WATE 31-AUG-22 18:37 940-02A	L2731391-2 SURFACE WATE 31-AUG-22 18:37 940-02B	L2731391-3 SURFACE WATE 31-AUG-22 18:15 940-03/SW33A	L2731391-4 SURFACE WATE 31-AUG-22 18:15 940-03/SW33B	L2731391-5 SURFACE WATE 01-SEP-22 08:20 SW9A	
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (umhos/cm)	185	181	336	336	37.8
	pH (pH units)	7.74	7.77	8.25	8.26	7.19
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	118	100	206	197	25.9
Anions and Nutrients	Acceptable % Difference	PASS	PASS	PASS	PASS	PASS
	Alkalinity, Total (as CaCO3) (mg/L)	34.5	36.1	116	116	9.2
	Bicarbonate (HCO3) (mg/L)	42.1	44.0	142	142	11.2
	Carbonate (CO3) (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60
	Chloride (Cl) (mg/L)	0.70	0.68	1.51	1.51	<0.50
	Computed Conductivity (uS/cm)	173	175	331	328	36.1
	Conductivity % Difference (%)	-6.9	-3.4	-1.6	-2.3	-4.5
	Hardness (as CaCO3) (mg/L)	65.4	66.5	140	139	14.9
	Hydroxide (OH) (mg/L)	<0.34	<0.34	<0.34	<0.34	<0.34
	Ion Balance (%)	97.6	97.7	97.7	96.8	Low EC
	Langelier Index	-0.8	-0.8	0.4	0.4	-2.5
	Saturation pH (pH)	8.58	8.56	7.83	7.83	9.70
	TDS (Calculated) (mg/L)	93.9	95.3	186	185	18.1
	Sulfate (SO4) (mg/L)	43.3	43.2	53.5	53.2	6.13
	Anion Sum (me/L)	1.61	1.64	3.48	3.48	0.31
	Cation Sum (me/L)	1.57	1.60	3.40	3.37	0.34
	Cation - Anion Balance (%)	-1.2	-1.1	-1.1	-1.6	Low EC
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	2.88	2.74	19.3	14.8	7.99
Total Metals	Aluminum (Al)-Total (mg/L)	0.0042	0.0038	0.0091	0.0100	0.0724
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00294	0.00298	0.00343	0.00344	0.00041
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000067
	Calcium (Ca)-Total (mg/L)	18.3	18.3	34.6	34.0	4.40
	Chromium (Cr)-Total (mg/L)	0.00081	0.00025	0.00030	0.00035	0.00049
	Cobalt (Co)-Total (mg/L)	0.00127	0.00127	0.00032	0.00033	0.00045
	Copper (Cu)-Total (mg/L)	0.00096	0.00096	0.00128	0.00131	0.00231
	Iron (Fe)-Total (mg/L)	0.024	0.025	0.144	0.144	0.402
	Lead (Pb)-Total (mg/L)	0.000050	0.000052	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0015	0.0016	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.17	6.07	15.2	15.5	1.18
	Manganese (Mn)-Total (mg/L)	0.00476	0.00420	0.0369	0.0368	0.0217
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2731391-6 SURFACE WATE 01-SEP-22 08:20 SW9B	L2731391-7 SURFACE WATE 31-AUG-22 14:30 SW18A	L2731391-8 SURFACE WATE 31-AUG-22 14:30 SW18B	L2731391-9 SURFACE WATE 01-SEP-22 12:00 FIELD BLANK 1	L2731391-10 SURFACE WATE 01-SEP-22 12:00 FIELD BLANK 2
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (umhos/cm)	37.9	76.5	75.0	1.2	1.3
	pH (pH units)	7.14	7.76	7.77	6.07	6.04
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	26.3	64	69	<4.0	<4.0
Anions and Nutrients	Acceptable % Difference	PASS	PASS	PASS	NOVALUE	NOVALUE
	Alkalinity, Total (as CaCO3) (mg/L)	8.7	34.3	34.0	1.0	<1.0
	Bicarbonate (HCO3) (mg/L)	10.6	41.8	41.5	1.2	<1.2
	Carbonate (CO3) (mg/L)	<0.60	<0.60	<0.60	<0.60	<0.60
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Computed Conductivity (uS/cm)	36.0	74.2	73.7	1.60	0.75
	Conductivity % Difference (%)	-5.1	-3.1	-1.7	28.4	-53.1
	Hardness (as CaCO3) (mg/L)	15.0	38.0	37.7	<1.0	<1.0
	Hydroxide (OH) (mg/L)	<0.34	<0.34	<0.34	<0.34	<0.34
	Ion Balance (%)	Low EC	Low EC	Low EC	Low TDS	Low TDS
	Langelier Index	-2.6	-1.0	-1.0	-6.3	-7.7
	Saturation pH (pH)	9.73	8.78	8.78	12.38	13.74
	TDS (Calculated) (mg/L)	18.0	36.9	36.7	<1.0	<1.0
	Sulfate (SO4) (mg/L)	6.20	1.27	1.30	<0.30	<0.30
	Anion Sum (me/L)	0.30	0.71	0.71	<0.10	<0.10
	Cation Sum (me/L)	0.35	0.83	0.82	<0.10	<0.10
	Cation - Anion Balance (%)	Low EC	Low EC	Low EC	Low TDS	Low TDS
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	7.77	16.7	16.4	<0.50	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0714	0.0313	0.0315	0.0065	0.0065
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00039	0.00168	0.00170	<0.00010	<0.00010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	4.37	10.3	10.5	0.074	0.067
	Chromium (Cr)-Total (mg/L)	0.00055	0.00037	0.00055	0.00022	0.00024
	Cobalt (Co)-Total (mg/L)	0.00043	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00231	0.00106	0.00107	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.400	0.112	0.112	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	1.17	3.35	3.34	<0.0050	<0.0050
	Manganese (Mn)-Total (mg/L)	0.0213	0.00577	0.00585	<0.00010	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2731391-1	L2731391-2	L2731391-3	L2731391-4	L2731391-5
		Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
		Sampled Date	31-AUG-22	31-AUG-22	31-AUG-22	31-AUG-22	01-SEP-22
		Sampled Time	18:37	18:37	18:15	18:15	08:20
		Client ID	940-02A	940-02B	940-03/SW33A	940-03/SW33B	SW9A
Grouping	Analyte						
WATER							
Total Metals	Molybdenum (Mo)-Total (mg/L)		0.000444	0.000436	0.000237	0.000232	<0.000050
	Nickel (Ni)-Total (mg/L)		0.00053	0.00056	0.00242	0.00242	0.00237
	Potassium (K)-Total (mg/L)		1.31	1.31	1.91	1.93	0.600
	Selenium (Se)-Total (mg/L)		0.000069	<0.000050	0.000120	0.000076	<0.000050
	Sodium (Na)-Total (mg/L)		5.90	5.89	13.9	14.0	0.711
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000095	0.000091	0.000728	0.000721	0.000085
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Dissolved Metals Filtration Location		LAB	LAB	LAB	LAB	LAB
	Calcium (Ca)-Dissolved (mg/L)		16.9	17.2	32.0	31.6	4.12
	Magnesium (Mg)-Dissolved (mg/L)		5.64	5.73	14.6	14.5	1.12

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2731391-6	L2731391-7	L2731391-8	L2731391-9	L2731391-10
		Description	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE	SURFACE WATE
		Sampled Date	01-SEP-22	31-AUG-22	31-AUG-22	01-SEP-22	01-SEP-22
		Sampled Time	08:20	14:30	14:30	12:00	12:00
		Client ID	SW9B	SW18A	SW18B	FIELD BLANK 1	FIELD BLANK 2
Grouping	Analyte						
WATER							
Total Metals	Molybdenum (Mo)-Total (mg/L)		<0.000050	0.000081	0.000074	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)		0.00241	0.00178	0.00180	<0.00050	<0.00050
	Potassium (K)-Total (mg/L)		0.593	0.922	0.923	<0.050	<0.050
	Selenium (Se)-Total (mg/L)		<0.000050	<0.000050	0.000053	<0.000050	<0.000050
	Sodium (Na)-Total (mg/L)		0.706	1.06	1.10	0.274	0.256
	Thorium (Th)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)		0.000086	0.000062	0.000062	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Dissolved Metals	Dissolved Metals Filtration Location		LAB	LAB	LAB	LAB	LAB
	Calcium (Ca)-Dissolved (mg/L)		4.14	9.89	9.80	0.069	0.068
	Magnesium (Mg)-Dissolved (mg/L)		1.14	3.24	3.22	<0.0050	<0.0050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO ₃)	B	L2731391-1, -2, -3, -4, -5, -6, -7, -8
Duplicate	Chromium (Cr)	DUP-H	L2731391-11, -12
Matrix Spike	Total Organic Carbon	MS-B	L2731391-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2731391-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2731391-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2731391-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2731391-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2731391-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2731391-1, -10, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-CO3CO3-CALC-WP	Water	Alkalinity, Carbonate	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by carbonate is calculated and reported as mg CO ₃ 2-/L.			
ALK-HCO3HCO3-CALC-WP	Water	Alkalinity, Bicarbonate	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by bicarbonate is calculated and reported as mg HCO ₃ -/L			
ALK-OH-OH-CALC-WP	Water	Alkalinity, Hydroxide	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by hydroxide is calculated and reported as mg OH-/L.			
ALK-TITR-WP	Water	Alkalinity, Total (as CaCO ₃)	APHA 2320B
The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. Total alkalinity is determined by titration with a strong standard mineral acid to the successive HCO ₃ ⁻ and H ₂ CO ₃ endpoints indicated electrometrically.			
C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP
Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO ₂ which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
CL-IC-N-WP	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-SCREEN-WP	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other test eg. IC, TDS, TSS, etc			
EC-WP	Water	Conductivity	APHA 2510B
Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.			
HARDNESS-CALC-WP	Water	Hardness Calculated	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-T-CVAA-WP	Water	Mercury Total	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
IONBALANCE-CALC-WP	Water	Ion Balance Calculation	APHA 1030E

Reference Information

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance (as % difference) cannot be calculated accurately for waters with very low electrical conductivity (EC), and is reported as "Low EC" where EC < 100 uS/cm (umhos/cm). Ion Balance is calculated as:

$$\text{Ion Balance (\%)} = \frac{[\text{Cation Sum} - \text{Anion Sum}]}{[\text{Cation Sum} + \text{Anion Sum}]}$$

MET-200.2-CCMS-WT Soil Metals in Soil by CRC ICPMS EPA 200.2/6020B (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H₂S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

MET-D-CCMS-WP Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020B (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-WP Water Total Metals in Water by CRC ICPMS EPA 200.2/6020B (mod.)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

PH-WP Water pH APHA 4500H

The pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.

PH-WT Soil pH MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

SO4-IC-N-WP Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TOTSUS-WP Water Total Suspended Solids APHA 2540 D (modified)

Total suspended solids in aqueous matrices is determined gravimetrically after drying the residue at 103 – 105°C.

TDS-WP Water Total Dissolved Solids (TDS) APHA 2540 SOLIDS C,E

A well-mixed sample is filtered through a glass fiber filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2C. The increase in vial weight represents the total dissolved solids.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Reference Information

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L2731391

Report Date: 23-SEP-22

Page 1 of 9

Client: Barrick Gold of North America.
 1084 County Rd 8
 Campbellford ON K0L 1L0

Contact: Paul Brugger

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-WP		Water						
Batch	R5858318							
WG3762342-29	LCS							
Alkalinity, Total (as CaCO3)			101.6		%		85-115	09-SEP-22
WG3762342-26	MB							
Alkalinity, Total (as CaCO3)			1.2	B	mg/L		1	09-SEP-22
Batch	R5859076							
WG3762549-19	LCS							
Alkalinity, Total (as CaCO3)			102.6		%		85-115	12-SEP-22
WG3762549-16	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	12-SEP-22
C-TOC-HTC-WP		Water						
Batch	R5858024							
WG3762259-14	LCS							
Total Organic Carbon			105.0		%		80-120	10-SEP-22
WG3762259-13	MB							
Total Organic Carbon			<0.50		mg/L		0.5	10-SEP-22
Batch	R5859189							
WG3762554-2	LCS							
Total Organic Carbon			104.2		%		80-120	12-SEP-22
WG3762554-1	MB							
Total Organic Carbon			<0.50		mg/L		0.5	12-SEP-22
CL-IC-N-WP		Water						
Batch	R5858696							
WG3761371-2	LCS							
Chloride (Cl)			97.9		%		90-110	06-SEP-22
WG3761371-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	06-SEP-22
EC-WP		Water						
Batch	R5858318							
WG3762342-28	LCS							
Conductivity			100.4		%		90-110	09-SEP-22
WG3762342-26	MB							
Conductivity			<1.0		umhos/cm		1	09-SEP-22
Batch	R5859076							
WG3762549-18	LCS							
Conductivity			98.6		%		90-110	12-SEP-22
WG3762549-16	MB							
Conductivity			<1.0		umhos/cm		1	12-SEP-22



Quality Control Report

Workorder: L2731391

Report Date: 23-SEP-22

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WP		Water						
Batch	R5857197							
WG3762016-6	LCS							
Mercury (Hg)-Total			92.2		%		80-120	09-SEP-22
WG3762016-5	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	09-SEP-22
MET-D-CCMS-WP		Water						
Batch	R5859186							
WG3762230-2	LCS							
Calcium (Ca)-Dissolved			92.9		%		80-120	12-SEP-22
Magnesium (Mg)-Dissolved			97.2		%		80-120	12-SEP-22
WG3762230-1	MB							
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-SEP-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	12-SEP-22
MET-T-CCMS-WP		Water						
Batch	R5857977							
WG3761737-2	LCS							
Aluminum (Al)-Total			100.4		%		80-120	09-SEP-22
Antimony (Sb)-Total			103.1		%		80-120	09-SEP-22
Arsenic (As)-Total			98.0		%		80-120	09-SEP-22
Cadmium (Cd)-Total			98.9		%		80-120	09-SEP-22
Calcium (Ca)-Total			100.1		%		80-120	09-SEP-22
Chromium (Cr)-Total			100.6		%		80-120	09-SEP-22
Cobalt (Co)-Total			98.3		%		80-120	09-SEP-22
Copper (Cu)-Total			98.2		%		80-120	09-SEP-22
Iron (Fe)-Total			94.1		%		80-120	09-SEP-22
Lead (Pb)-Total			97.9		%		80-120	09-SEP-22
Lithium (Li)-Total			102.3		%		80-120	09-SEP-22
Magnesium (Mg)-Total			105.3		%		80-120	09-SEP-22
Manganese (Mn)-Total			99.4		%		80-120	09-SEP-22
Molybdenum (Mo)-Total			98.3		%		80-120	09-SEP-22
Nickel (Ni)-Total			96.6		%		80-120	09-SEP-22
Potassium (K)-Total			96.7		%		80-120	09-SEP-22
Selenium (Se)-Total			96.5		%		80-120	09-SEP-22
Sodium (Na)-Total			98.5		%		80-120	09-SEP-22
Thorium (Th)-Total			95.8		%		80-120	09-SEP-22
Uranium (U)-Total			99.6		%		80-120	09-SEP-22
Vanadium (V)-Total			99.3		%		80-120	09-SEP-22



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WP		Water						
Batch	R5857977							
WG3761737-2	LCS							
Zinc (Zn)-Total			97.9		%		80-120	09-SEP-22
WG3761737-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	09-SEP-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	09-SEP-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	09-SEP-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	09-SEP-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	09-SEP-22
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	09-SEP-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	09-SEP-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	09-SEP-22
Iron (Fe)-Total			<0.010		mg/L		0.01	09-SEP-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	09-SEP-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	09-SEP-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	09-SEP-22
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	09-SEP-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	09-SEP-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	09-SEP-22
Potassium (K)-Total			<0.050		mg/L		0.05	09-SEP-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	09-SEP-22
Sodium (Na)-Total			<0.050		mg/L		0.05	09-SEP-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	09-SEP-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	09-SEP-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	09-SEP-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	09-SEP-22
PH-WP		Water						
Batch	R5858318							
WG3762342-27	LCS							
pH			7.04		pH units		6.9-7.1	09-SEP-22
Batch	R5859076							
WG3762549-17	LCS							
pH			6.99		pH units		6.9-7.1	12-SEP-22
SO4-IC-N-WP		Water						



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WP								
Batch	R5858696							
WG3761371-2	LCS							
Sulfate (SO4)			99.9		%		90-110	06-SEP-22
WG3761371-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	06-SEP-22
SOLIDS-TOTSUS-WP								
Batch	R5856356							
WG3761467-2	LCS							
Total Suspended Solids			97.7		%		85-115	07-SEP-22
WG3761467-1	MB							
Total Suspended Solids			<3.0		mg/L		3	07-SEP-22
TDS-WP								
Batch	R5858180							
WG3761468-2	LCS							
Total Dissolved Solids			98.2		%		85-115	07-SEP-22
WG3761468-1	MB							
Total Dissolved Solids			<4.0		mg/L		4	07-SEP-22
MET-200.2-CCMS-WT								
Batch	R5861299							
WG3763019-2	CRM	WT-SS-2						
Aluminum (Al)			100.0		%		70-130	15-SEP-22
Antimony (Sb)			94.2		%		70-130	15-SEP-22
Arsenic (As)			98.9		%		70-130	15-SEP-22
Barium (Ba)			94.0		%		70-130	15-SEP-22
Beryllium (Be)			109.5		%		70-130	15-SEP-22
Bismuth (Bi)			0.14		mg/kg		0-0.34	15-SEP-22
Boron (B)			9.3		mg/kg		3.5-13.5	15-SEP-22
Cadmium (Cd)			112.0		%		70-130	15-SEP-22
Calcium (Ca)			98.4		%		70-130	15-SEP-22
Chromium (Cr)			97.5		%		70-130	15-SEP-22
Cobalt (Co)			99.9		%		70-130	15-SEP-22
Copper (Cu)			99.6		%		70-130	15-SEP-22
Iron (Fe)			99.0		%		70-130	15-SEP-22
Lead (Pb)			99.3		%		70-130	15-SEP-22
Lithium (Li)			117.9		%		70-130	15-SEP-22
Magnesium (Mg)			103.9		%		70-130	15-SEP-22
Manganese (Mn)			99.3		%		70-130	15-SEP-22



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	Soil							
Batch	R5861299							
WG3763019-2 CRM		WT-SS-2						
Molybdenum (Mo)			93.5		%		70-130	15-SEP-22
Nickel (Ni)			102.6		%		70-130	15-SEP-22
Phosphorus (P)			99.2		%		70-130	15-SEP-22
Potassium (K)			96.3		%		70-130	15-SEP-22
Selenium (Se)			0.12		mg/kg		0-0.34	15-SEP-22
Silver (Ag)			91.5		%		70-130	15-SEP-22
Sodium (Na)			105.8		%		70-130	15-SEP-22
Strontium (Sr)			92.6		%		70-130	15-SEP-22
Thallium (Tl)			0.072		mg/kg		0.029-0.129	15-SEP-22
Tin (Sn)			95.4		%		70-130	15-SEP-22
Titanium (Ti)			91.8		%		70-130	15-SEP-22
Uranium (U)			98.9		%		70-130	15-SEP-22
Vanadium (V)			98.1		%		70-130	15-SEP-22
Zinc (Zn)			96.9		%		70-130	15-SEP-22
Zirconium (Zr)			99.3		%		70-130	15-SEP-22
WG3763019-4 LCS		1+2						
Aluminum (Al)			98.5		%		80-120	15-SEP-22
Antimony (Sb)			101.6		%		80-120	15-SEP-22
Arsenic (As)			95.2		%		80-120	15-SEP-22
Barium (Ba)			93.8		%		80-120	15-SEP-22
Beryllium (Be)			102.6		%		80-120	15-SEP-22
Bismuth (Bi)			96.2		%		80-120	15-SEP-22
Boron (B)			101.7		%		80-120	15-SEP-22
Cadmium (Cd)			99.9		%		80-120	15-SEP-22
Calcium (Ca)			98.4		%		80-120	15-SEP-22
Chromium (Cr)			95.5		%		80-120	15-SEP-22
Cobalt (Co)			97.0		%		80-120	15-SEP-22
Copper (Cu)			94.1		%		80-120	15-SEP-22
Iron (Fe)			94.3		%		80-120	15-SEP-22
Lead (Pb)			99.0		%		80-120	15-SEP-22
Lithium (Li)			106.1		%		80-120	15-SEP-22
Magnesium (Mg)			100.4		%		80-120	15-SEP-22
Manganese (Mn)			96.8		%		80-120	15-SEP-22
Molybdenum (Mo)			95.2		%		80-120	15-SEP-22



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT								
	Soil							
Batch	R5861299							
WG3763019-4	LCS	1+2						
Nickel (Ni)			95.0		%		80-120	15-SEP-22
Phosphorus (P)			93.2		%		80-120	15-SEP-22
Potassium (K)			97.3		%		80-120	15-SEP-22
Selenium (Se)			94.8		%		80-120	15-SEP-22
Silver (Ag)			81.9		%		80-120	15-SEP-22
Sodium (Na)			99.2		%		80-120	15-SEP-22
Strontium (Sr)			94.4		%		80-120	15-SEP-22
Sulfur (S)			92.5		%		80-120	15-SEP-22
Thallium (Tl)			94.6		%		80-120	15-SEP-22
Tin (Sn)			98.2		%		80-120	15-SEP-22
Titanium (Ti)			92.5		%		80-120	15-SEP-22
Tungsten (W)			96.8		%		80-120	15-SEP-22
Uranium (U)			96.2		%		80-120	15-SEP-22
Vanadium (V)			97.9		%		80-120	15-SEP-22
Zinc (Zn)			94.9		%		80-120	15-SEP-22
Zirconium (Zr)			90.7		%		80-120	15-SEP-22
WG3763019-1	MB							
Aluminum (Al)			<50		mg/kg		50	15-SEP-22
Antimony (Sb)			<0.10		mg/kg		0.1	15-SEP-22
Arsenic (As)			<0.10		mg/kg		0.1	15-SEP-22
Barium (Ba)			<0.50		mg/kg		0.5	15-SEP-22
Beryllium (Be)			<0.10		mg/kg		0.1	15-SEP-22
Bismuth (Bi)			<0.20		mg/kg		0.2	15-SEP-22
Boron (B)			<5.0		mg/kg		5	15-SEP-22
Cadmium (Cd)			<0.020		mg/kg		0.02	15-SEP-22
Calcium (Ca)			<50		mg/kg		50	15-SEP-22
Chromium (Cr)			<0.50		mg/kg		0.5	15-SEP-22
Cobalt (Co)			<0.10		mg/kg		0.1	15-SEP-22
Copper (Cu)			<0.50		mg/kg		0.5	15-SEP-22
Iron (Fe)			<50		mg/kg		50	15-SEP-22
Lead (Pb)			<0.50		mg/kg		0.5	15-SEP-22
Lithium (Li)			<2.0		mg/kg		2	15-SEP-22
Magnesium (Mg)			<20		mg/kg		20	15-SEP-22
Manganese (Mn)			<1.0		mg/kg		1	15-SEP-22



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT		Soil						
Batch	R5861299							
WG3763019-1	MB							
Molybdenum (Mo)			<0.10		mg/kg		0.1	15-SEP-22
Nickel (Ni)			<0.50		mg/kg		0.5	15-SEP-22
Phosphorus (P)			<50		mg/kg		50	15-SEP-22
Potassium (K)			<100		mg/kg		100	15-SEP-22
Selenium (Se)			<0.20		mg/kg		0.2	15-SEP-22
Silver (Ag)			<0.10		mg/kg		0.1	15-SEP-22
Sodium (Na)			<50		mg/kg		50	15-SEP-22
Strontium (Sr)			<0.50		mg/kg		0.5	15-SEP-22
Sulfur (S)			<1000		mg/kg		1000	15-SEP-22
Thallium (Tl)			<0.050		mg/kg		0.05	15-SEP-22
Tin (Sn)			<2.0		mg/kg		2	15-SEP-22
Titanium (Ti)			<1.0		mg/kg		1	15-SEP-22
Tungsten (W)			<0.50		mg/kg		0.5	15-SEP-22
Uranium (U)			<0.050		mg/kg		0.05	15-SEP-22
Vanadium (V)			<0.20		mg/kg		0.2	15-SEP-22
Zinc (Zn)			<2.0		mg/kg		2	15-SEP-22
Zirconium (Zr)			<1.0		mg/kg		1	15-SEP-22
PH-WT		Soil						
Batch	R5865657							
WG3764307-1	LCS							
pH			7.04		pH units		6.9-7.1	22-SEP-22

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH							
	1	31-AUG-22 18:37	09-SEP-22 14:37	0.25	212	hours	EHTR-FM
	2	31-AUG-22 18:37	09-SEP-22 14:37	0.25	212	hours	EHTR-FM
	3	31-AUG-22 18:15	09-SEP-22 14:37	0.25	212	hours	EHTR-FM
	4	31-AUG-22 18:15	09-SEP-22 14:37	0.25	212	hours	EHTR-FM
	5	01-SEP-22 08:20	09-SEP-22 14:37	0.25	198	hours	EHTR-FM
	6	01-SEP-22 08:20	09-SEP-22 14:37	0.25	198	hours	EHTR-FM
	7	31-AUG-22 14:30	09-SEP-22 14:37	0.25	216	hours	EHTR-FM
	8	31-AUG-22 14:30	09-SEP-22 14:37	0.25	216	hours	EHTR-FM
	9	01-SEP-22 12:00	12-SEP-22 13:27	0.25	265	hours	EHTR-FM
	10	01-SEP-22 12:00	12-SEP-22 13:27	0.25	265	hours	EHTR-FM

Legend & Qualifier Definitions:

- EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
- EHTR: Exceeded ALS recommended hold time prior to sample receipt.
- EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
- EHT: Exceeded ALS recommended hold time prior to analysis.
- Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2731391 were received on 02-SEP-22 11:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878



L2731391-COFC

COC Number: 17 -

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Report To Contact and company name below will appear on the final report		Report Select Report Format: <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply		Priority (Business Day)		Turnaround													
Company: Barrick Gold Corp		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		4 day [P4-20%] <input type="checkbox"/>		1 Business day [E - 100%] <input type="checkbox"/>													
Contact: Paul Brugger		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked		3 day [P3-25%] <input type="checkbox"/>		Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] <input type="checkbox"/>													
Phone: 705-632-1871, cell 807-631-4895		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		2 day [P2-50%] <input type="checkbox"/>															
Company address below will appear on the final report		Email 1 or Fax: pbrugger@barrick.com		Date and Time Required for all E&P TATs:															
Street: 1084 County Rd 8		Email 2		For tests that can not be performed according to the service level selected, you will be contacted.															
City/Province: Campbellford, ON		Email 3		Analysis Request															
Postal Code: K0L 1L0				Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below															
Invoice To		Invoice Distribution		NUMBER OF CONTAINERS															
Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																	
Copy of Invoice with Report <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Email 1 or Fax: pbrugger@barrick.com, jan.macleod@pc.gc.ca																	
Company: Barrick Gold Corp		Email 2: nasubmitinvoice@barrick.com																	
Contact: AllisonBrown@barrick.com																			
Project Information		Oil and Gas Required Fields (client use)																	
ALS Account # / Quote #: 14983 / Q82014		AFE/Cost Center: PO#																	
Job #: Cullaton Lake		Major/Minor Code: Routing Code:																	
PO / AFE:		Requisitioner:																	
LSD:		Location:																	
ALS Lab Work Order # (lab use only):		ALS Contact:		Sampler: Paul Brugger, Jan MacLeod															
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	Alkalinity	Acidity	Chloride	Conductivity	Hardness	Total Mercury	Ion Balance	Total Metals - Al, As, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Ni, N, Pb, Se, Sn, Th, U, V, Z	REP - TB-BARRICK-T-MET	pH, Sulfate, TDS, TOC, TSS	pH	FIELD PH	FIELD TEMPERATURE	SAMPLES ON HOLD	SUSPECTED HAZARDOUS (see Special Instructions)
940-02a		31-Aug-22	19:37	Surface Water	x	x	x	x	x	x	x	x	x	x		8.74	7.4		
940-02b		31-Aug-22	19:32	Surface Water	x	x	x	x	x	x	x	x	x	x		8.34	7.4		
940-03/SW33a		31-Aug-22	18:15	Surface Water	x	x	x	x	x	x	x	x	x	x		8.4	6.1		
940-03/SW33b		31-Aug-22	18:15	Surface Water	x	x	x	x	x	x	x	x	x	x		8.4	6.1		
SW9a		01-Sep-22	08:20	Surface Water	x	x	x	x	x	x	x	x	x	x		8.3	6.3		
SW9b		01-Sep-22	08:20	Surface Water	x	x	x	x	x	x	x	x	x	x		8.7	6.3		
SW18a		31-Aug-22	14:30	Surface Water	x	x	x	x	x	x	x	x	x	x		9.61	6.0		
SW18b		31-Aug-22	14:30	Surface Water	x	x	x	x	x	x	x	x	x	x		9.61	6.0		
Field Blank 1		01-Sep-22	12:00	Surface Water	x	x	x	x	x	x	x	x	x	x		-	-		
Field Blank 2		01-Sep-22	12:00	Surface Water	x	x	x	x	x	x	x	x	x	x		-	-		
SW 33		31-Aug-22	18:45	Sediment						x	x			x		8.4	6.1		
SW 09		01-Sep-22	08:20	Sediment						x	x			x		8.3	6.3		
Drinking Water (DW) Samples (client use)		Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)		SAMPLE CONDITION AS RECEIVED (lab use only)															
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Special DLs: TB-BARRICK-T-MET		Frozen <input type="checkbox"/>		SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>													
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Added 2 Sediment sample jars. To be analysed for metals and pH.		Ice Packs <input type="checkbox"/>		Ice Cubes <input type="checkbox"/>													
				Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>		Cooling Initiated <input type="checkbox"/>													
				INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C													
				4.4															
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)		FINAL SHIPMENT RECEPTION (lab use only)															
Released by: Jan MacLeod		Received by: O.A.		Received by:		Received by:													
Date: 02/09/22		Date: SEP 02 2022		Date:		Date:													
Time: 8:00		Time: 11:45 AM		Time:		Time:													

Appendix C

CABIN Datasheets

Field Crew: IM / PB Site Code: SWQ 9
 Sampling Date: (DD/MM/YYYY) 01/09/2022

Photos
 Field Sheet Upstream Downstream Across Site Aerial View
 Substrate (exposed) Substrate (aquatic) Other _____

REACH DATA (represents 6 times bankfull width)

- Habitat Types: (check those present)
 Riffle Rapids Straight run Pool/Back Eddy
- Canopy Coverage: (stand in middle of stream and look up, check one)
 0% 1-25% 26-50% 51-75% 76-100%
- Macrophyte Coverage: (not algae or moss, check one)
 0% 1-25% 26-50% 51-75% 76-100%
- Streamside Vegetation: (check those present)
 ferns/grasses shrubs deciduous trees coniferous trees
- Dominant Streamside Vegetation: (check one)
 ferns/grasses shrubs deciduous trees coniferous trees
- Periphyton Coverage on Substrate: (benthic algae, not moss, check one)
 1 - Rocks are not slippery, no obvious colour (thin layer < 0.5 mm thick)
 2 - Rocks are slightly slippery, yellow-brown to light green colour (0.5-1 mm thick)
 3 - Rocks have a noticeable slippery feel (footing is slippery), with patches of thicker green to brown algae (1-5 mm thick)
 4 - Rocks are very slippery (algae can be removed with thumbnail), numerous large clumps of green to dark brown algae (5 mm -20 mm thick)
 5 - Rocks are mostly obscured by algal mat, extensive green, brown to black algal mass may have long strands (> 20 mm thick)

Note: 1 through 5 represent categories entered into the CABIN database.

BENTHIC MACROINVERTEBRATE DATA

Habitat sampled: (check one) riffle rapids straight run

400 µm mesh Kick Net	<u>2 x Kicks</u>
Person sampling	<u>Jan Macleod</u>
Sampling time (i.e. 3 min.)	<u>2 x 3 min</u>
No. of sample jars	<u>2 per kick</u>
Typical depth in kick area (cm)	<u>7 cm</u>

Preservative used: formalin 10%
 Sampled sieved on site using "Bucket Swirling Method":
 YES NO
 If YES, debris collected for QA/QC
 ← 4 total

Note: Indicate if a sampling method other than the recommended 400 µm mesh kick net is used.



Field Crew: IM IPB Site Code: swa 9
 Sampling Date: (DD/MM/YYYY) 01/09/2022

WATER CHEMISTRY DATA Time: 0940 (24 hr clock) Time zone: Central

Air Temp: 5.5 (°C) Water Temp: 6.3 (°C) pH: 8.3
 Specific Conductance: 28.0 (µs/cm) DO: ✓ (mg/L) Turbidity: clear (NTU)

- Check if water samples were collected for the following analyses:
- TSS (Total Suspended Solids)
 - Nitrogen (i.e. Total, Nitrate, Nitrite, Dissolved, and/or Ammonia)
 - Phosphorus (Total, Ortho, and/or Dissolved)
 - Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate)
 - Other metals
- ALS

Note: Determining alkalinity is recommended, as are other analyses, but not required for CABIN assessments.

CHANNEL DATA

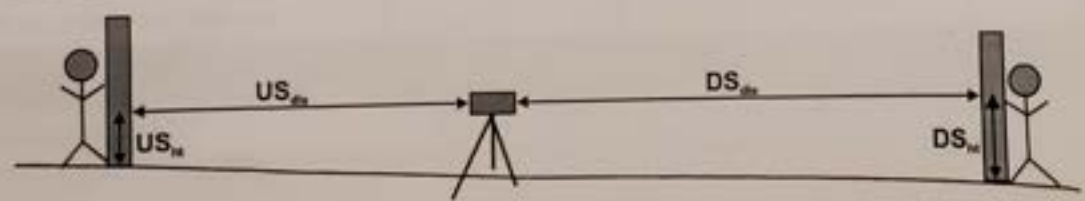
Slope - Indicate how slope was measured: (check one)

- Calculated from map**
 Scale: _____ (Note: small scale map recommended if field measurement is not possible - i.e. 1:20,000).
 contour interval (vertical distance) _____ (m),
 distance between contour intervals (horizontal distance) _____ (m)
 slope = vertical distance/horizontal distance = _____

OR

- Measured in field**
 Circle device used and fill out table according to device:
 a. Survey Equipment b. Hand Level & Measuring Tape Climo

Measurements	Upstream (U/S)	Downstream(D/S)	Calculation
*Top Hairline (T)			
*Mid Hairline (ht) OR			
*Height of rod			
*Bottom Hairline (B)			
*Distance (dis) OR			$US_{dis} + DS_{dis} =$
*T-B x 100	$*US_{ht} = T-B$	$*DS_{ht} = T-B$	$DS_{ht} - US_{ht} =$
Change in height (Δht)			
Slope (Δht/total dis)			<u>1%</u>



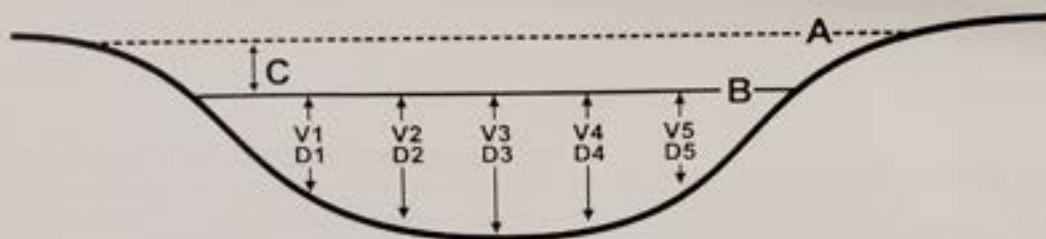
Field Crew: IM/PPD Site Code: 5409
 Sampling Date: (DD/MM/YYYY) 01/09/2022

Widths and Depth

Location at site: between kick 1+2 (Indicate where in sample reach, ex. d/s of kick area)

A - Bankfull Width: 2.2 (m) B - Wetted Stream Width: 1.59 (m)

C - Bankfull-Wetted Depth (height from water surface to Bankfull): 9 (cm)



Note:
 Wetted widths > 5 m, measure a minimum of 5-6 equidistant locations;
 Wetted widths < 5 m, measure 3-4 equidistant locations.

Velocity and Depth

Check appropriate velocity measuring device and fill out the appropriate section in chart below. Distance from shore and depth are required regardless of method:

- Velocity Head Rod (or ruler):** Velocity Equation (m/s) = $\sqrt{2(\Delta D/100) \cdot 9.81}$
 Rotary meters: Gurley/Price/Mini-Price/Propeller (Refer to specific meter conversion chart for calculation)
 Direct velocity measurements: Marsh-McBirney Sontek or Other _____

	1	2	3	4	5	6	AVG
Distance from Shore (m)	25	50	75	100	1.25	1.50	
Depth (D) (cm)	6	9	11	8	6	3	7.2
Velocity Head Rod (ruler)							
Flowing water Depth (D ₁) (cm)	6	9	11.4	8.1	6.3	3	
Depth of Stagnation (D ₂) (cm)	6	9	10.8	7.8	5.9	3	
Change in depth ($\Delta D = D_2 - D_1$) (cm)	0	0	0.6	0.3	0.4	0	
Rotary meter							
Revolutions							
Time (minimum 40 seconds)							
Direct Measurement or calculation							
Velocity (V) (m/s)	0	0	0.34	0.24	0.28	0	0.14

Field Crew: FM/PBSite Code: Sw 9Sampling Date: (DD/MM/YYYY) 01/09/2022**SUBSTRATE DATA****Surrounding/Interstitial Material**

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	1
0.1-0.2 cm (coarse sand)	2
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

- Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.
- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.
- Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

Diameter (cm)	E	Diameter (cm)	E	Diameter (cm)	E	Diameter (cm)	E				
1	7	0	26	16	51	3	76	7			
2	6		27	5	52	14	77	9			
3	5		28	3	0	53	5	78	5	0	
4	6		29	4		54	5	79	9		
5	8		30	10		55	17	80	3		
6	4		31	9		56	6	81	4		
7	4		32	6		57	2	82	4		
8	3		33	8		58	6	83	4		
9	4		34	5		59	6	.25	84	22	
10	6	.25	35	11		60	13		85	7	
11	6		36	4		61	8		86	5	
12	6		37	3		62	7		87	10	
13	7		38	5		63	12		88	12	0.5
14	5		39	6	.25	64	5		89	10	
15	12		40	9		65	3		90	3	
16	8		41	4		66	6		91	6	
17	9		42	9		67	4		92	7	
18	9		43	7		68	10	.5	93	6	
19	5		44	4		69	9		94	5	
20	5	0	45	7		70	5		95	6	
21	11		46	9		71	8		96	5	
22	7		47	5		72	3		97	4	
23	11		48	4		73	6		98	2	0
24	9		49	8	0	74	4		99	12	
25	16		50	7		75	10		100	5	

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.

Field Crew: IM, PB Site Code: 940-3 SW17
 Sampling Date: (DD/MM/YYYY) 31/08/2022

Occupational Health & Safety: Site Inspection Sheet completed

PRIMARY SITE DATA

CABIN Study Name: Callaton Local Basin Name: _____

River/Stream Name: TSF outlet Stream Order: (map scale 1:50,000) 1

Select one: Test Site Potential Reference Site

Geographical Description/Notes: 14V 528273 6792290 ←
Outlet of TSF immediately DS of TSF, upstream of
undefined wetland.

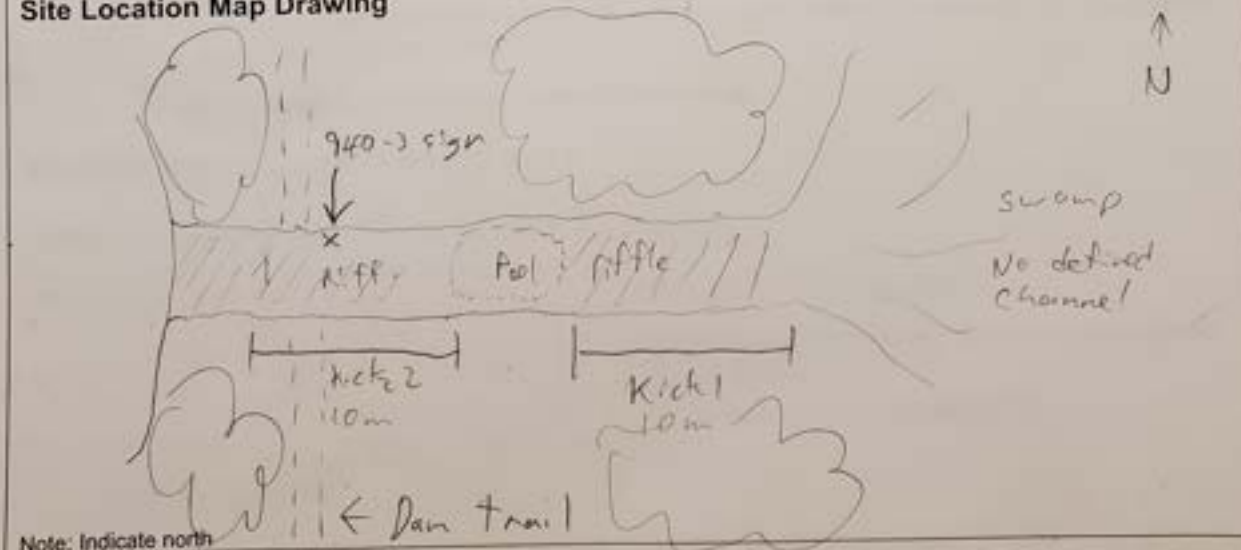
Surrounding Land Use: (check those present) Information Source: Visual
 Forest Field/Pasture Agriculture Residential/Urban
 Logging Mining Commercial/Industrial Other Muskog

Dominant Surrounding Land Use: (check one) Information Source: Visual
 Forest Field/Pasture Agriculture Residential/Urban
 Logging Mining Commercial/Industrial Other Old mine

Location Data

Latitude: _____ N Longitude: - _____ W (DMS or DD)
 Elevation: 256 (fast or masl) GPS Datum: GRS80 (NAD83/WGS84) Other: _____

Site Location Map Drawing



Field Crew: IMIPG Site Code: SW 33
 Sampling Date: (DD/MM/YYYY) 31/08/2022

Photos

Field Sheet
 Upstream
 Downstream
 Across Site
 Aerial View
 Substrate (exposed)
 Substrate (aquatic)
 Other _____

REACH DATA (represents 6 times bankfull width)

- Habitat Types: (check those present)
 - Riffle Rapids Straight run Pool/Back Eddy
- Canopy Coverage: (stand in middle of stream and look up, check one)
 - 0% 1-25% 26-50% 51-75% 76-100%
- Macrophyte Coverage: (not algae or moss, check one)
 - 0% 1-25% 26-50% 51-75% 76-100%
- Streamside Vegetation: (check those present)
 - ferns/grasses shrubs deciduous trees coniferous trees
- Dominant Streamside Vegetation: (check one)
 - ferns/grasses shrubs deciduous trees coniferous trees
- Periphyton Coverage on Substrate: (benthic algae, not moss, check one)
 - 1 - Rocks are not slippery, no obvious colour (thin layer < 0.5 mm thick)
 - 2 - Rocks are slightly slippery, yellow-brown to light green colour (0.5-1 mm thick)
 - 3 - Rocks have a noticeable slippery feel (footing is slippery), with patches of thicker green to brown algae (1-5 mm thick)
 - 4 - Rocks are very slippery (algae can be removed with thumbnail), numerous large clumps of green to dark brown algae (5 mm -20 mm thick)
 - 5 - Rocks are mostly obscured by algal mat, extensive green, brown to black algal mass may have long strands (> 20 mm thick)

Note: 1 through 5 represent categories entered into the CABIN database.

BENTHIC MACROINVERTEBRATE DATA

Habitat sampled: (check one) riffle rapids straight run

400 µm mesh Kick Net	<input checked="" type="checkbox"/>
Person sampling	<u>Ian Madead</u>
Sampling time (i.e. 3 min.)	<u>3 min + 2</u>
No. of sample jars	<u>2 / sample</u>
Typical depth in kick area (cm)	<u>10 cm</u>

Preservative used: formalin 10%
 Sampled sieved on site using "Bucket Swirling Method":
 YES NO
 If YES, debris collected for QA/QC
4 total

Note: Indicate if a sampling method other than the recommended 400 µm mesh kick net is used.



Field Crew: INIPB Site Code: SW33
 Sampling Date: (DD/MM/YYYY) 31/08/2022

WATER CHEMISTRY DATA Time: 16:00 (24 hr clock) Time zone: Central
 Air Temp: 6.0 (°C) Water Temp: 6.1 (°C) pH: 8.4
 Specific Conductance: 238.0 (µs/cm) DO: / (mg/L) Turbidity: clear (NTU)

Check if water samples were collected for the following analyses:
 TSS (Total Suspended Solids)
 Nitrogen (i.e. Total, Nitrate, Nitrite, Dissolved, and/or Ammonia) ALS
 Phosphorus (Total, Ortho, and/or Dissolved)
 Major Ions (i.e. Alkalinity, Hardness, Chloride, and/or Sulphate) Other metals

Note: Determining alkalinity is recommended, as are other analyses, but not required for CABIN assessments.

CHANNEL DATA

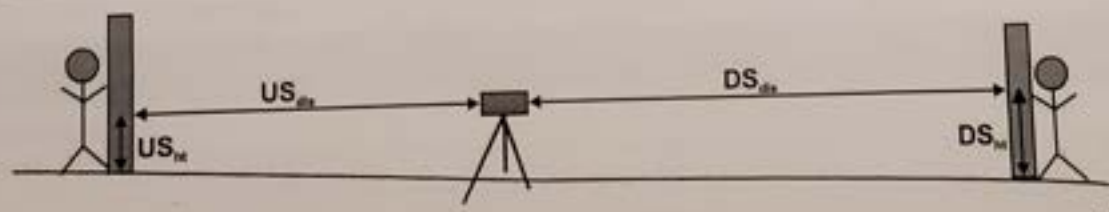
Slope - Indicate how slope was measured: (check one)

Calculated from map
 Scale: _____ (Note: small scale map recommended if field measurement is not possible - i.e. 1:20,000)
 contour interval (vertical distance) _____ (m),
 distance between contour intervals (horizontal distance) _____ (m)
 slope = vertical distance/horizontal distance = _____

OR

Measured in field
 Circle device used and fill out table according to device:
 a. Survey Equipment b. Hand Level & Measuring Tape Clino

Measurements	Upstream (U/S)	Downstream(D/S)	Calculation
*Top Hairline (T)			
*Mid Hairline (ht) OR			
*Height of rod			
*Bottom Hairline (B)			$US_{ds} + DS_{ds} =$
*Distance (dis) OR			$DS_{ht} - US_{ht} =$
*T-B x 100	$*US_{ds} = T-B$	$*DS_{ds} = T-B$	
Change in height (Δht)			
Slope (Δht /total dis)			<u>2%</u>



Field Crew: IM/PG

Site Code: Sw33

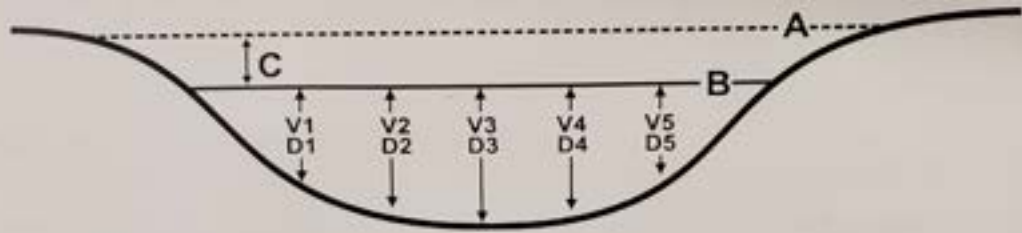
Sampling Date: (DD/MM/YYYY) 31/08/2022

Widths and Depth

Location at site: @ trail, between kick (Indicate where in sample reach, ex. d/s of kick area)

A - Bankfull Width: 2.23 (m) B - Wetted Stream Width: 1.29 (m)

C - Bankfull-Wetted Depth (height from water surface to Bankfull): 9 (cm)



Note:
Wetted widths > 5 m, measure a minimum of 5-6 equidistant locations;
Wetted widths < 5 m, measure 3-4 equidistant locations.

Velocity and Depth

Check appropriate velocity measuring device and fill out the appropriate section in chart below. Distance from shore and depth are required regardless of method:

- Velocity Head Rod (or ruler):** Velocity Equation (m/s) = $\sqrt{2(\Delta D/100) \cdot 9.81}$
- Rotary meters:** Gurley/Price/Mini-Price/Propeller (Refer to specific meter conversion chart for calculation)
- Direct velocity measurements:** Marsh-McBirney Sontek or Other _____

	1	2	3	4	5	6	AVG
Distance from Shore (m)	20	40	50	60	80	100	
Depth (D) (cm)	8	10	12	12	9	6	9.5
Velocity Head Rod (ruler)							
Flowing water Depth (D ₁) (cm)	6	10.5	13	13.3	10	6.5	
Depth of Stagnation (D ₂) (cm)	8	9.5	11.8	12.0	9	6.0	
Change in depth (ΔD=D ₂ -D ₁) (cm)	0	1.0	1.2	1.3	1.0	0.5	
Rotary meter							
Revolutions							
Time (minimum 40 seconds)							
Direct Measurement or calculation							
Velocity (V) (m/s)	0	0.44	0.49	0.51	0.44	0.31	0.36



Field Crew: IM/P6Site Code: 5-37Sampling Date: (DD/MM/YYYY) 31/08/2022**SUBSTRATE DATA****Surrounding/Interstitial Material**

Circle the substrate size category for the surrounding material.

Substrate Size Class	Category
Organic Cover	0
< 0.1 cm (fine sand, silt or clay)	1
0.1-0.2 cm (coarse sand)	2
0.2-1.6 cm (gravel)	3
1.6-3.2 cm (small pebble)	4
3.2-6.4 cm (large pebble)	5
6.4-12.8 cm (small cobble)	6
12.8-25.6 cm (cobble)	7
> 25.6 cm (boulder)	8
Bedrock	9

100 Pebble Count & Substrate Embeddedness

- Measure the intermediate axis (100 rocks) and embeddedness (10 rocks) of substrate in the stream bed.
- Indicate B for bedrock, S for sand/silt/clay (particles < 0.2 cm) and O for organic material.
- Embeddedness categories (E): Completely embedded = 1, 3/4 embedded, 1/2 embedded, 1/4 embedded, unembedded = 0

	Diameter (cm)	E	Diameter (cm)	E	Diameter (cm)	E	Diameter (cm)	E		
1	8		26	8	51	5	76	2		
2	3		27	12	52	5	77	1		
3	7		28	16	53	6	78	6		
4	5		29	13	0.25	54	4	79	4	0.25
5	5		30	8	55	3	80	8		
6	2		31	4	56	15	81	9		
7	3		32	8	57	4	82	16		
8	4		33	4	58	23	83	7		
9	11	0.25	34	2	59	9	0.25	84	13	
10	8		35	9	60	2	85	6		
11	8		36	3	61	5	86	4		
12	2		37	5	62	3	87	6		
13	6		38	8	63	18	88	8		
14	2		39	4	0.50	64	22	89	4	
15	6		40	2	65	11	90	5	0.75	
16	3		41	12	66	1	91	4		
17	8		42	7	67	16	92	12		
18	4		43	5	68	18	93	5		
19	8	0	44	3	69	10	0	94	5	
20	5		45	11	70	1	95	8		
21	8		46	5	71	5	96	4		
22	13		47	8	72	11	97	2		
23	7		48	6	73	4	98	2		
24	6		49	8	74	7	99	4		
25	9		50	4	0.25	75	16	100	7	0.25

Note: The Wolman D50 (i.e. median diameter), Wolman Dg (i.e. geometric mean diameter) and the % composition of the substrate classes will be calculated automatically in the CABIN database using the 100 pebble data. All 100 pebbles must be measured in order for the CABIN database tool to perform substrate calculations.

Appendix D

Biologica Datasheets



Freshwater Benthic Enumeration and Identification Methods

Client: Palmer Environmental

Project: Cullaton

Protocol: CABIN

Sample Inventory

Sample arrival: 6-Sept-22

Number of samples: 4

Number of jars: 8

Screen size: 400 μ m

Biologica project number: fb22-159

The chain of custody documents were checked and approved with the client. Samples were transferred from formalin into 70% ethanol and stained with Rose Bengal to aid in sorting. Each sample was provided a unique identification number and placed in the queue for analysis.

Table 1. Summary of benthic samples processed for Palmer Environmental Cullaton, 2022.

Client Sample ID	Replicate	Date Sampled	Biologica Sample ID	# of Jars	Sub-sample	Organisms Counted
SW33-1	1	31-Aug-22	fb22-159-001	2	12/100	333
SW33-2	2	31-Aug-22	fb22-159-002	2	5/100	589
SWQ9-1	1	01-Sep-22	fb22-159-003	2	5/100	504
SWQ9-2	2	01-Sep-22	fb22-159-004	2	5/100	661

Sample Processing

Sorting:

Samples were sorted using dissecting microscopes at 10–40x magnification by trained personnel.

Samples were subsampled using a Marchant box. Splitting of the sample was performed as detailed in the Environment and Climate Change Canada CABIN Laboratory Methods document (2020). A minimum 300 count, or 5 cell minimum was sorted. In the case of low organism abundance samples that did not reach a 300 count within 50% of the sample the entire sample were sorted whole.

To minimize potential sorter bias, samples were distributed among technicians such that no one person sorted all the replicates of a given sample or station.

Sorting QA/QC:

To ensure sorting efficiency was >95%, whole and/or partial sub-samples were re-sorted. Sorting efficiency was calculated using the following equation (where total count = final total number of organisms in sample):

Sorting efficiency = $[1 - (\# \text{ of organisms in spot check or re-sort} / \text{total organisms})] \times 100$

*Total organisms includes the original count and the number found from the re-sort

All samples checked must meet or exceed 95% sorting efficiency. Any samples falling below 95% sorting efficiency were re-sorted in their entirety, and additional checks were undertaken as necessary. For quality assurance, QA re-sorts were performed on 10% of samples. One sample was randomly selected and re-sorted in its entirety. Refer to Table 2 for sorting efficiency results.

Table 2. Summary of sorting QA/QC results for Palmer Environmental Cullaton, 2022.

Client Sample ID	Replicate	Biologica Sample ID	Sorting Efficiency QA: Whole Re-sort
SW33-1	1	fb22-159-001	96.96%
SW33-2	2	fb22-159-002	
SWQ9-1	1	fb22-159-003	
SWQ9-2	2	fb22-159-004	

Identification:

All organisms were identified using a combination of dissecting (10–40x) and compound (100–1000x) microscopes and standard taxonomic keys (see methodological and taxonomic references) to the level specified by the client: species or LPL (lowest practicable level). As required, chironomids and oligochaetes were cleared and slide-mounted. All specimens were archived in air-tight glass vials with glycerin and 70% ethanol for long-term storage. Taxonomic data were recorded in Biologica’s custom database.

Identification QA/QC:

For quality assurance of identification, 10% of samples were randomly selected and re-identified by a second trained taxonomist. Refer to Table 3 for QA results. Standard taxonomic effort and a list of Biologica’s taxonomists certified by the Society of Freshwater Science (SFS) are presented in Tables 4 and 5, respectively.

Table 3. Summary of taxonomic QA/QC results for Palmer Environmental Cullaton, 2022.

Client Sample ID	Replicate	Biologica Sample ID	% Taxonomic Agreement	% Similarity in Enumeration
SW33-1	1	fb22-159-001	99.69%	98.20%

% Identification Agreement:

$100 - [(\# \text{ of disagreements} / \text{total abundance of QA sample}) \times 100]$

**differences in resolution are not considered disagreements*

% Enumeration Agreement:

$100 - [(\text{difference in abundance between samples} / \text{total abundance of original sample}) \times 100]$

Table 4. Standard Taxonomic Effort as required by CABIN protocol.

Group	Taxa	Level of Identification
Insects	Coleoptera	Genus
	Chironomidae	Genus (Note: require slide mounts)

Group	Taxa	Level of Identification
	Diptera	Genus
	Ephemeroptera	Genus
	Heteroptera	Genus
	Lepidoptera	Genus
	Megaloptera	Genus
	Odonata	Genus
	Plecoptera	Genus
	Trichoptera	Genus
Non Insects	Amphipoda	Family/Genus
	Bryozoa	Phylum
	Bivalvia	Genus
	Cnidaria	Family/Genus
	Collembola	Family/Genus (with caution)
	Decapoda	Family/Genus
	Gastropoda	Genus
	Hirudinea	Family/Genus
	Hydrachnidae	Family/Genus
	Isopoda	Family/Genus
	Clitellata (Oligochaeta)	Family/Genus
	Polychaeta	Family/Genus
	Platyhelminthes	Class
Excluded Taxa	Cladocera	Taxa are not generally benthic and, in some cases, may bias samples collected in close proximity to reservoirs or lakes.
	Copepoda	Some taxa are small and not adequately sampled using a 400 µm kicknet. Can be found in extremely high numbers and may bias a sample.
	Ostracoda	Taxa can be found in high numbers and may bias a sample.
	Rotifera	Taxa are not generally benthic and, in some cases, may bias samples collected in close proximity to reservoirs or lakes.
	Nematoda	Taxa are not adequately sampled using a 400 µm kicknet.
	Non-aquatic taxa	Terrestrial drop-ins such as earth worms, spiders, some beetles, and bugs are not part of the aquatic benthic community.
	Porifera	Taxa are colonial and cannot be quantified as number of individuals per sample like other benthic taxa.

Table 5. Taxonomists certified by the Society of Freshwater Science (SFS).

Taxonomist	Certification	Certification Expiry*
Robynn Holma	North American Chironomidae	2022

Taxonomist	Certification	Certification Expiry*
	Western Arthropods	2022
	Western EPT	2024
	Western Chironomidae	---
	Eastern EPT	2022
	Eastern Arthropods	2024
Karen Hoban	Western EPT	2022
	Western Arthropods	2022
	Eastern EPT	2025
	Eastern Arthropods	2025
Breanna Bomback	North American Chironomidae	2025
Hiroki Tomoe	North American Oligochaeta	2020

*Certifications renewal has been delayed due to COVID-19 and certificates have been extended by SFS until such time as testing can be resumed.

Data

All data were recorded in Biologica's custom database. Results were provided to the Palmer Environmental project manager in Excel spreadsheets via email.

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Appendix 3
2023 Spill Response Plan

CULLATON LAKE ENVIRONMENTAL SPILL RESPONSE PLAN

COMPANY INFORMATION

Cullaton Lake Gold Mines Ltd. is wholly owned by Barrick Gold Inc. The Barrick head office responsible for the site is located at:

Barrick Gold Inc.
BCE Place, Canada Trust Tower, Suite 3700
161 Bay Street, P.O. Box 212
Toronto, Ontario
M5J 2S1

The site manager is:

Paul Brugger,
Barrick Gold Inc.
1084 County Rd 8
Campbellford, Ontario
K0L 1L0
Phone: 705-632-1871
Cell: 807-631-4895
e-mail: pbrugger@barrick.com

SITE LOCATION:

The Cullaton Lake property is located in the southern part of the District of Keewatin in the Nunavut Territory. The property is 250 km west of Arviat, NU, 400 km northwest of Churchill, Manitoba and 645 km north of Thompson, Manitoba. A topographic map is attached as Figure 1.

PROJECT HISTORY AND CURRENT ACTIVITY:

Cullaton Lake operated as an underground gold mine for four years from 1981 to 1985. Decommissioning and reclamation began in 1991 and was completed in 2001. By the end of 2001, all mine buildings had been removed, roads were decommissioned and the tailings impoundment area was reclaimed. No chemicals, fuels or reagents remain on site.

Present site activities consist of a single one to five day annual visit for inspection, monitoring and maintenance purposes. The site is dormant and uninhabited for the remainder of the year.

REVISIONS AND EFFECTIVE DATE OF PLAN:

This plan was last reviewed and revised on February 8, 2023 and is effective until March 31, 2024.

SPILL CONTROL AND REPORTING PROCEDURES:

Should it be necessary to mobilize contractors to the site for any reason in the future, the contractor will be required to supply spill control and clean up materials, have a spill control plan and train personnel in spill response procedures.

Upon discovery of a spill, the person discovering the spill will take the following actions:

INITIAL ACTIONS:

- a. Stop the flow if possible.
- b. Eliminate open flame ignition sources (i.e. extinguish cigarettes, shut off motors (from a remote location if surrounded by vapours)).
- c. Contain flow of fuel by dyking, barricading or blocking flow by any means available. Use earth-moving equipment if available. A dam made of earth or other available fill can be quickly constructed to contain and prevent a spill from spreading. If the ground is permeable, it may be necessary to excavate a shallow depression and line it with plastic to prevent the spill from seeping away.

ACTION IN CASE OF FIRE:

- a. Use CO₂, dry chemical, foam or water spray (fog), although water may spread the fire.
- b. Use jet streams to wash away burning gasoline.
- c. Use fog streams to protect any rescue team and trapped people.
- d. Use water to cool surface of tanks.
- e. Divert the oil or gasoline to an open area and let it burn off under control. If the fire is put out before all the fuel is consumed, beware of re-ignition. Rubber tires are almost impossible to extinguish after igniting with fire. Remove vehicles with burning tires from the danger area.

RECOVERY PROCEDURE:

- a. Unburned oil or gasoline can be soaked up by sand and peat moss, or by commercial absorbents such as Graboil.
- b. If necessary, contaminated soil should be excavated and disposed of as per the following section.
- c. Fuel entering the ground can be recovered by digging sumps or trenches.

DISPOSAL:

- a. Evaporation may be used if appropriate.
- b. Disposal as per the approved Abandonment and Restoration (1996) Plan.

REPORTING:

An individual discovering a spill must report it as soon as possible to the 24 hour Spill Report Line by calling:

(867) 920-8130

(1) A person reporting a spill shall give as much of the following information as possible:

- date and time of spill
- location of spill
- direction spill is moving
- name and phone number of a contact person close to the location of the spill
- type and description of contaminant spilled including an estimate of the quantity
- cause of spill
- status of spill (i.e. continuing or stopped)
- action taken to contain, recover, clean-up, and dispose of contaminant
- name, address and phone number of person reporting the spill
- name of owner, or person in charge or control of contaminant at time of spill

(2) No person shall delay reporting a spill because of lack of knowledge of the factors listed in subsection (1).

(3) The person reporting the spill shall also contact:

- CIRNAC Manager of Field Operations at: **(867) 975-4295**
- Environment Canada at **(867) 920-8130**
- Government of Nunavut Environmental Protection at **(867) 975-7700**
- Kivalliq Inuit Association at **1-800-220-6581**
- Barrick Gold Corporation :
 - Paul Brugger,
Site Manager
Phone: **(705) 632-1871**
Cell: (807)-631-4895

 - Alternate:
Clark Burton,
Director, NA Closure
Phone: **(702) 522-6938**
Cell: (775) 934-8624
- If required:
 - RCMP – Arviat at **(867) 857-0123**
 - Arviat Hospital at **(867) 857-3100**
 - Arviat Fire Response at **(867) 857-9999**

(4) The attached NT-NU Spill Report will also be completed and submitted to the Nunavut spills reporting office at fax: (867) 873-6924 or email spills@gov.nt.ca

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND
OTHER HAZARDOUS MATERIALS



NT-NU 24-HOUR SPILL REPORT LINE

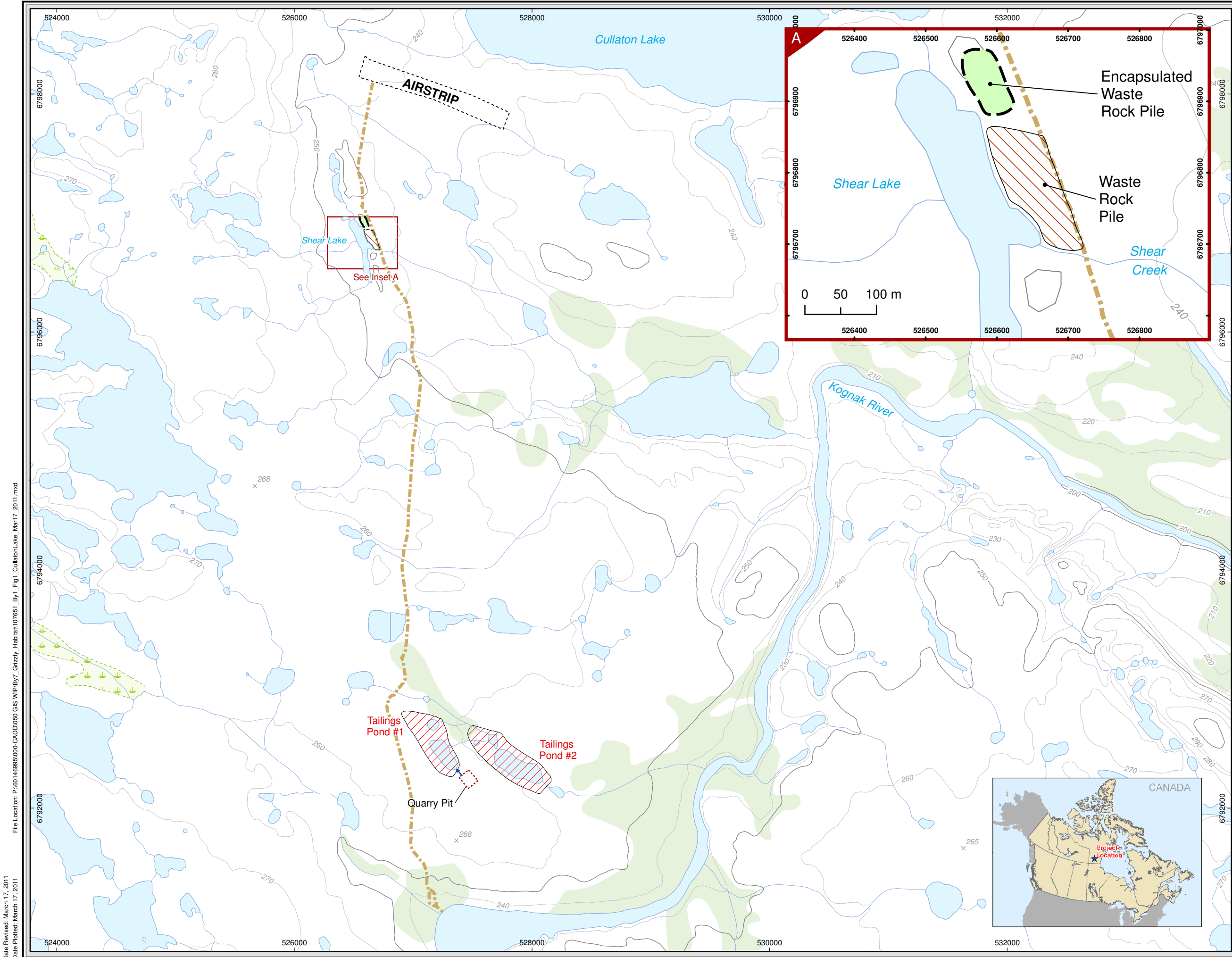
Tel: (867) 920-8130 • Fax: (867) 873-6924 • Email: spills@gov.nt.ca

REPORT LINE USE ONLY

A	Report Date: MM DD YY	Report Time:	<input type="checkbox"/> Original Spill Report		Report Number:
	Occurrence Date: MM DD YY	Occurrence Time:	OR <input type="checkbox"/> Update # _____ to the Original Spill Report		
C	Land Use Permit Number (if applicable):		Water Licence Number (if applicable):		
D	Geographic Place Name or Distance and Direction from the Named Location:			Region: <input type="checkbox"/> NT <input type="checkbox"/> Nunavut <input type="checkbox"/> Adjacent Jurisdiction or Ocean	
E	Latitude: _____ Degrees _____ Minutes _____ Seconds		Longitude: _____ Degrees _____ Minutes _____ Seconds		
F	Responsible Party or Vessel Name:		Responsible Party Address or Office Location:		
G	Any Contractor Involved:		Contractor Address or Office Location:		
H	Product Spilled: <input type="checkbox"/> Potential Spill	Quantity in Litres, Kilograms or Cubic Metres:	U.N. Number:		
I	Spill Source:	Spill Cause:	Area of Contamination in Square Metres:		
J	Factors Affecting Spill or Recovery:	Describe Any Assistance Required:	Hazards to Persons, Property or Environment:		
K	Additional Information, Comments, Actions Proposed or Taken to Contain, Recover or Dispose of Spilled Product and Contaminated Materials:				
L	Reported to Spill Line by:	Position:	Employer:	Location Calling From:	Telephone:
M	Any Alternate Contact:	Position:	Employer:	Alternate Contact Location:	Alternate Telephone:

REPORT LINE USE ONLY

N	Received at Spill Line by:	Position:	Employer:	Location Called:	Report Line Number:
Lead Agency: <input type="checkbox"/> EC <input type="checkbox"/> CCG/TCMSS <input type="checkbox"/> GNWT <input type="checkbox"/> GN <input type="checkbox"/> ILA <input type="checkbox"/> AANDC <input type="checkbox"/> NEB <input type="checkbox"/> Other: _____			Significance: <input type="checkbox"/> Minor <input type="checkbox"/> Major <input type="checkbox"/> Unknown		File Status: <input type="checkbox"/> Open <input type="checkbox"/> Closed
Agency:		Contact Name:		Contact Time:	
Lead Agency:					
First Support Agency:					
Second Support Agency:					
Third Support Agency:					



Legend

- Quarry Pit
- Encapsulated Waste Rock Pile
- Waste Rock Pile
- Tailings Pond
- Flow Direction

Base Mapping

Contours

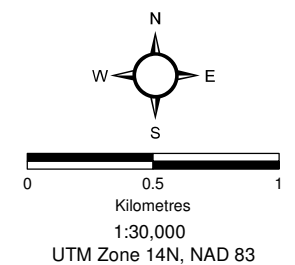
- Index (50m)
- Intermediate (10m)

Hydrology

- Waterbody
- Watercourse
- Vegetation
- Wetland
- Road (decommissioned)

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Base data: National Topographic Database (NTDB) compiled by Natural Resources Canada at 1:50,000 scale. Sampling performed by Gartner Lee Ltd., June 2008. Road GPS-tracked by Gartner Lee Ltd., June 2008. Airport footprint approximate; for reference purposes only. EWR pile, tailings ponds and quarry outlines, BGC Engineering, Inc. (2006). All other data, AECOM 2009.



File Name: 107651_By1_Fig1_CullatonLake_Mar17_2011.mxd
 Prepared By: MM Date Issued: Mar, 2011
 Reviewed By: KW Project Number: 107651



Barrick Gold

Project: Cullaton Lake Project
 Location: Nunavut

Cullaton Lake Site

Figure 1

Date Revised: March 17, 2011
 Date Plotted: March 17, 2011
 File Location: P:\60146995\000-CADD\050-GIS\WIP\ByZ_Grizzly_Habla\107651_By1_Fig1_CullatonLake_Mar17_2011.mxd