BACK RIVER PROJECT
Responses to 2022 Annual Report Comments

August 30, 2023

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1. Introduction

Sabina Gold & Silver Corp. (Sabina), submitted its 2022 Annual Report to the Nunavut Impact Review Board (NIRB) on 31 March 2023, as required by the Back River Gold Mine Project Certificate No. 007. Interested Parties were then requested by the NIRB to provide comments on the 2021 Annual Report

On or around 8 June 2023, the NIRB received comments from the following interested parties:

- Kitikmeot Inuit Association (KIA) = 46 comments
- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) = 14 comments
- Government of Nunavut (GN) = 8 comments
- Environment and Climate Change Canada = 3 comment
- Fisheries and Oceans Canada (DFO) = 4 comments
- Transport Canada (TC) = 3 comments

Section 2 provides responses to the comments received deferred in the original 4 April 2022 submission.

2. Responses to Comments

2.1 RESPONSE TO KITIKMEOT INUIT ASSOCIATION

KIA-NIRB-01: Beginning of Project Construction Phase

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- NIRB Annual Report Executive Summary, pp. iv and vi
- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
- Project Certificate Conditions No. 41, 45, 46

Sabina, Back River Project, Wildlife Mitigation and Monitoring Program Plan (Version 12, April 2023)

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 5 and August 19, 2022)

- KIA-NIRB-14

Summary:

There are inconsistent statements in the 2022 NIRB Annual Report regarding when the Back River Project Construction Phase began/will begin (i.e., in 2022, 2023, or beyond).

Detailed Review Comment

In the "Environmental Monitoring Programs" section of the 2022 NIRB Annual Report Executive Summary, Sabina states that "In 2022 our environmental monitoring activities continued at the Back River Project in alignment with Sabina's Construction Phase and related activities." However, the 2022 Pre-Construction WMMP Report states that the Back River Project was still in the Pre-construction Phase in 2022 (despite drilling and blasting activities); thus, wildlife and mitigation monitoring activities were limited to those outlined in Table 6.2-1 of the WMMP Plan for Baseline/Pre-construction. It is unclear if Sabina made a typo in the Annual Report Executive Summary, or if there was ambiguity even for the Proponent as to whether 2022 Project activities constituted Pre-construction or Construction. The KIA notes that we have commented on this issue previously (e.g., KIA-NIRB-14 for the 2021 NIRB Annual Report review).

Nonetheless, in "The Year Ahead" section of the Executive Summary, Sabina states that in 2023 they will "proceed with full scale construction of the Project. Monitoring programs are being enhanced to ensure that construction activities conform to Sabina's licenses and authorizations." This statement suggests that the Back River Project will be entering the Construction Phase in 2023. However, in the "Next Steps" responses under Project Certificate Conditions (PCCs) No. 41, 45, and 46, Sabina states that they will continue to conduct mitigation and monitoring relevant for the Pre-construction Phase. These are likely copy-and-paste errors; however, if Sabina believes that the Project will still be in the Pre-construction Phase in 2023, clarification and justification need to be provided. As Sabina acknowledged, there are different/more wildlife monitoring efforts needed during the Construction Phase.

Finally, Sabina refers to WMMP Plan V.11 (Dec 2022) throughout the 2022 NIRB Annual Report. However, this version was not appended to the annual report, and only WMMP Plan V.12 (Apr 2023) was available on the NIRB Registry. Therefore, WMMP Plan V.12 was referred to when developing these 2022 NIRB Annual Report review comments. *Note: the KIA understands that V.12 includes measures for the proposed Energy Centre; comments on these updates will be provided under a separate cover.*

Recommendation/Request:

- Please clarify if the Construction Phase will begin in 2023.
- Please clarify if enhanced wildlife monitoring programs, as described in the WMMP Plan for the Construction Phase, will be implemented in 2023.Importance of Issue:
- Please include the WMMP Plan V.11 as an appended or independent document on the NIRB Registry.

Importance of Issue:

Low

B2Gold Nunavut Response:

1. Back River will be in construction phase in 2023 and the wildlife monitoring is updated to match this change in status.
2. Note that many of the construction monitoring programs are to occur within the first three years of construction; therefore, some programs began in 2023, while others have been deferred to 2024 or 2025.

KIA-NIRB-02: WMMP Plan commitments prior to Construction.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Project Certificate Condition No. 45 Sabina, Back River Project, Wildlife Mitigation and Monitoring Program Plan (Version 12, April 2023)

- Sections 7.2.1.3, 7.2.17, 9.1.2.3, 9.1.3.2, 9.2.1.4, 10.2.1.1, 10.2.1.2, 10.2.2.2, 11.2.1.1, 11.2.2.2, 12.2.2.2, 13.2.2.3

Summary:

Sabina intends for the Back River Project to enter the Construction Phase in earnest in 2023. However, there are numerous "prior to construction" commitments in the Wildlife Mitigation and Monitoring Program Plan (WMMP Plan) that appear to be outstanding. Sabina should confirm the progress of this work.

Detailed Review Comment

Assuming the Back River Project is entering the Construction Phase in 2023 (see KIA-TC-01: Project Construction Phase beginning in 2023), there are numerous commitments made in the WMMP Plan that need to be addressed prior to construction; however, it is unclear whether Sabina has completed these requirements. For example, Sabina states that detailed Standard Operating Procedures (SOPs¬) will be produced for:

- Human Activity Monitoring (Section 7.2.1.7)

- Skirting and Building Monitoring (Section 9.2.1.3)

- Waste Management Monitoring (Section 9.2.1.4)

- Pit and Quarry Wall Nest Monitoring (Section 10.2.1.1)

- Pre-clearing Surveys for Raptor Nests (Section 10.2.1.2)

- Waterbird Monitoring on Project Ponds (Section 11.2.1.1)

The commitments for Skirting and Building Monitoring (grizzly bear and wolverine) and for Pit and Quarry Wall Nest Monitoring (raptors) also specify that the detailed SOP will be produced and distributed to the NIRB and the KIA for review and comment.

Furthermore, Sabina states that detailed methods for regional monitoring for bird VECs, including raptors (Section 10.2.2.2), waterbirds (Section 11.2.2.2, both staging surveys and breeding surveys), and upland birds (Section 12.2.2.2), will be described in the WMMP Plan prior to construction of the Project. Sabina makes the same statement about providing detailed methods in the WMMP Plan for Marine Bird Monitoring during Project Shipping (Section 13.2.2.3); however, Sabina's Marine Shipping Wildlife Mitigation and

Monitoring SOP (Version F.1 from Nov 2022 appended to the 2022 WMMP Report) may be intended to meet this commitment.

Additional commitments in the WMMP Plan include: Caribou

- Section 7.2.1.3 (Active Caribou Monitoring by Wildlife Monitors) – "Sabina will develop a Wildlife Monitoring Training Program for wildlife monitors. Details of the training program will be shared with the KIA and GN prior to construction of the Project."

The WMMP Plan outlines three options for active caribou monitoring: Observation Blinds, Tower Cameras, and Vehicle-Based Monitoring. Sabina states that testing of human observers and camera technology (including tower installation) will be conducted to determine/ensure that caribou can be detected within and beyond the trigger.

distances for management actions, and that the results of this testing will be reported to the KIA and GN. It is unclear if Sabina has completed this testing and has proven methods ready to use for active caribou monitoring when the Construction Phase begins.

Waterbirds & Marine Birds

- Sections 11.2 and 13.2 – *"Prior to construction, or first shipment, for the Project, Sabina will meet with ECCC and other interested parties, on the regional monitoring priorities, objectives and methods for Waterbird and Marine Bird VECs."*

The KIA is aware of some "prior to construction" commitments in the WMMP Plan that Sabina has completed, including development of SOPs for Incidental Wildlife Observations (Section 7.2.1.4; Version A.1 from Dec 2022 appended to the 2022 WMMP Report) and Seal Lair Monitoring (Section 14.2.1.1; Version 1 from Feb 2018 appended to the 2018 NIRB Annual Report). However, Sabina should confirm if these abovementioned tasks have also been completed (or are in progress). It may be helpful to revise completed commitments to past tense and/or include a table of related/relevant Project documents in the next iteration of the WMMP Plan.

Finally, the KIA notes that in Section 7.2.2.4 (Regional Collar Monitoring for Zone of Influence) of the WMMP Plan, Sabina has altered wording from the 2019 version of the plan regarding updating the WMMP to *"1) confirm that data suitable to meet these technical specifications and monitoring needs are available, 2) demonstrate that relevant data-sharing agreements are in place with government data suppliers, and 3) provide the minimum number of collars that would need to be deployed on the relevant herds in order to calculate a ZOI. The revised WMMP shall be submitted to NIRB for review."* The timing to complete this task changed from "prior to construction" to "during the construction phase." It is unclear if this change was agreed upon by NIRB and interested parties.

Recommendation/Request:

The KIA recommends/requests the following:

- Please clarify if detailed SOPs have been developed for the six wildlife monitoring activities noted in the Detailed Review Comment above.

- Please distribute the detailed SOPs for Skirting and Building Monitoring and Pit and Quarry Wall Nest Monitoring to the KIA for review.

- Please clarify if Sabina has met with ECCC and other interested parties on the regional monitoring program for waterbird and marine bird VECs.

- Please include detailed methods for regional bird VEC monitoring in the next iteration of the WMMP Plan (working from V.12) or a separate but appended document, if appropriate.

- Please clarify if a Wildlife Monitoring Training Program has been developed; if so, please share the program details with the KIA.

- Please clarify if testing of human observers and tower camera technology has been completed to effectively implement the Active Caribou Monitoring program.

- Please consider revising the next iteration of the WMMP Plan (working from V.12) for clarity, and to demonstrate compliance, regarding these "prior to construction" commitments (e.g., by writing in past tense and including a table of compliance with related Project documents indicated).

- Please clarify if relevant parties agreed that WMMP updates regarding regional ZOI monitoring can be delayed until after the Project's Construction Phase begins.

Importance of Issue:

High

B2Gold Nunavut Response:

1. The following SOPs have been created and distributed to staff: Human Activity Monitoring, Skirting and Building Monitoring, Waste Management Monitoring, and Pre-Clearing Surveys for Nests. The other two SOPs mentioned by the reviewer (Pit and Quarry Wall Nest Monitoring and Waterbird Monitoring on Project Ponds) will be developed prior to the 2024 season, as there are no project ponds or pit walls to date.

2. As requested by the reviewer, the building skirting SOP is provided. The pit wall monitoring SOP will be provided when it is completed.

3. No, the bird monitoring plan has not been shared with ECCC to date. The monitoring is scheduled to begin in 2024 or 2025 (required to begin during first 3 years of construction) and will therefore be shared and discussed with ECCC in fall or winter 2023 or 2024.

4. The detailed methods for regional bird monitoring will be provided to the KIA in a separate SOP when it is available.

5. The Wildlife Monitoring Training Program for on-site technicians has focused on the content in the WMMP Plan and SOPs and is being conducted on site by ERM biologists and B2Gold Environment staff. Training focuses on monitoring requirements from the WMMP Plan, timing/schedule of monitoring programs, objectives of monitoring programs, and methods. This is supplemented with detailed SOPs and posters around site. This training program will be reviewed after the 2023 season and adaptively modified and enhanced in 2024 where required.

6. The WMMP includes several options for how to observe caribou and B2Gold has chosen to use human observers. There is currently no camera program to compare these observations against.

7. Strictly speaking, the WMMP Plan is where the plan to monitor is discussed and compliance to the plan is described in the annual compliance report. However, in the next iteration of the WMMP Plan, B2Gold will consider highlighting the one-time commitments that have been completed prior to construction as complete.

8. The KIA comment is referring to Commitment GN12b which is included in the WMMP. B2Gold has confirmed both data aspects of the commitment – 1) that data suitable for regional analysis is

available (these data are available from the GNWT) and 2) demonstrate a relevant data sharing agreement is in place (this data sharing agreement is already in place with the GNWT). The next iteration of the WMMP will be updated to include this information.

KIA-NIRB-03: Marine wildlife monitoring in 2022 limited to 1/5 vessels.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- NIRB Annual Report Executive Summary, p. v
- Project Certificate Conditions No. 58, 64
- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 7A, Marine Shipping SOP – Wildlife Mitigation and Monitoring, ENVIRO-02 (Version F.1, 10 November 2022)

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 5, 2022)

- KIA-NIRB-09

Summary:

Only one of five sailings in 2022 completed marine mammal and bird surveys. None of the sailings traversing the Western Route conducting marine wildlife monitoring (neither dedicated surveys nor recording incidental observations).

This is a recurring issue, and corrective actions need to be taken to ensure compliance with PCC No. 58 and 64.

Detailed Review Comment

In the "Environmental Monitoring Programs" section of the 2022 NIRB Annual Report Executive Summary, Sabina states that "each vessel transiting through the Arctic Passage and into Bathurst Inlet had onboard observers completing marine mammal and seabird monitoring programs." To address PCC No. 58 (Seaducks and Waterfowl Mitigation Measures), Sabina explains that five vessels/sailings occurred during the 2022 shipping season and that 33 marine wildlife surveys were conducted over 38 hours.

These statements in the main body of the 2022 NIRB Annual Report are inaccurate, as it is evident in the 2022 Pre- construction WMMP Report that marine wildlife monitoring was limited. Of the five sailings completed, only the MV Aujaq (one of two vessels to traverse the Eastern Route) completed marine mammal and seabird surveys. This means none of the three vessels traversing the Western Route, including through the Lambert Channel (a "highly risk intolerant" key habitat site for migratory birds), completed marine wildlife surveys. Furthermore, based on the lack of information in the 2022 WMMP Report (see also KIA-NIRB-04: Data collection for marine wildlife monitoring), it appears that none of these vessels recorded incidental observations of marine mammals and birds either. Based on Figure 7.1-1, the *Risco Reegan* arguably spent the most time travelling through highly risk intolerant areas (Bathurst/Elu Inlets), between September 1 and October 22. Thus, it would have been informative for this vessel, in particular, to have conducted marine wildlife monitoring.

The KIA has previously submitted comments on missing marine wildlife monitoring data (e.g., KIA-NIRB-09 for the 2021 NIRB Annual Report review). In response, Sabina stated that *"Data collection in 2021 for the marine mammal and seabird monitoring program was much improved in 2021 compared to previous years. Sabina reinforced the importance of recording marine mammal and seabird sightings to the vessel companies and provided each vessel with updated guidance documents (brochure and SOP). This effort by Sabina did improve data collection and will be reinforced again for the 2022 shipping season. Sabina will continue to ensure that the shipping companies' data collection improves by reiterating the requirement and distributing the training documentation again in 2022."* Although the KIA appreciates Sabina's efforts, there appears to be an ongoing issue with vessel operators. Sabina needs to identify and provide potential solutions to any constraints that prevent compliance with PCCs No. 58 and 64 (specifically, implementation of the required measures).

The KIA notes that Incidental Observations is now a separate procedure (Section 3.4.1) in the updated Marine Shipping Wildlife Mitigation and Monitoring SOP (Version F.1, Nov 2022). This SOP change may need to be accompanied by refresher training for vessel operators. If they are unable to complete dedicated surveys, for whatever reason, it is hoped that they can at least record incidental marine wildlife observations.

Recommendation/Request:

The KIA recommends/requests the following:

- Please explain why 4/5 sailings in 2022 did not complete marine wildlife surveys or record incidental observations.
- Please investigate the cause(s) of vessel operator non-compliance with the Marine Shipping Wildlife Mitigation and Monitoring SOP and propose solutions to improve implementation.
- Please consider additional training for vessel operators in addition to distributing the guidance documentation. Perhaps there is a lack of understanding that can be rectified through communication.

Importance of Issue:

High

B2Gold Nunavut Response:

1. Prior to the shipping season in 2022, B2Gold Nunavut had multiple conversations and meetings with the shipping companies regarding the importance of recording sightings of marine mammals and marine birds while services the Back River Project. In addition, updated SOPs were distributed to the captains and crew, along with updated data sheets. One of the five vessels went above recording incidental sightings and dedicated time to search for both marine mammals and marine birds; however, the other four vessels did not record any sightings. B2Gold has requested that the companies also report if no marine mammals or marine birds were observed during each trip, despite looking for them while in transit. With shipping upcoming for the 2023 season, B2Gold has reinforced the requirements with shippers and that they are a critical part of B2Gold Nunavut's license to operate and must be strictly adhered to.

2. B2Gold will be following up with the vessel operators to investigate why they did not record marine mammal and bird observations.

3. B2Gold has already had multiple phone calls and emails with planned 2023 vessel operators to underline the importance of marine mammal and bird observations and how to do the monitoring. Vessel operators have confirmed they will comply for the 2023 shipping season.

KIA-NIRB-04: Data collection for marine wildlife monitoring in 2022.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Project Certificate Conditions No. 58, 64
- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 7A, Marine Shipping SOP – Wildlife Mitigation and Monitoring, ENVIRO-02 (Version F.1, 10 November 2022)

Summary:

Marine wildlife monitoring in 2022 had some questionable methods and results. The majority of marine wildlife monitoring in 2022 was conducted while the vessel was anchored, which is not the intention of the program. The observation of "grey seal" is suspicious based on the species' known range. Observation dates are inconsistent with the timing of sailing to and from the MLA.

Detailed Review Comment

The *MV Aujaq* was the only vessel to complete marine wildlife monitoring in 2022. They reported five sightings of two marine mammal species (grey seal, polar bear) and nine sightings of five marine bird species (northern fulmar, glaucous gull, herring gull, red-necked phalarope, and unknown gull). However, the methods and results presented in the 2022 WMMP Report raise a few concerns.

Section 7.1.2.1 states that *"Of the 18 seabird surveys, four were completed while the vessel was moving and the remaining 14 while the vessel was anchored. Similarly, four of the 15 marine mammal surveys were completed while the vessel was moving, and the remaining 11 while the vessel was anchored."* Although the Marine Shipping Wildlife Mitigation and Monitoring SOP does not explicitly state that surveys are intended for moving vessels, it should be generally understood that this is the case, since the primary purpose of marine wildlife monitoring is to mitigate potential impacts to seabirds (PCC No. 58) and marine mammals (PCC No. 64) during Project shipping.

Table 7.1-2 shows that in one instance, 10 grey seals were observed travelling 50 m from the vessel; in another instance, one grey seal was observed 10 m from the vessel (no behaviour noted). According to the federal Marine Mammal Regulations, vessels must remain >100 m away from marine mammals in the water. Since Section 7.1.2.1 indicates that none of the wildlife sightings indicated requirements for management activity, it is assumed that these two observations were made while the vessel was anchored. However, Sabina should confirm that this is true.

The grey seal (*Halichoerus grypus*) observations themselves are also questionable. Grey seal is not included as a likely species in the Marine Shipping Wildlife Mitigation and Monitoring SOP; only ringed seal, fur seal, and bearded seal are included in Table 3.2-1. Rather, grey seal occurs on both sides of the North Atlantic Ocean; in Canada, species observations and range maps are restricted to the Maritimes: https://www.inaturalist.org/taxa/41733-Halichoerus- grypus. The KIA suspects that "grey seal" may have been recorded as a description rather than a species. If true grey seals were observed along Project shipping routes (as shown in Figure 7.1-3), these would be unusual occurrences that deserve further investigation (e.g., potential climate change effects?).

Appendix 7B presents a table of marine wildlife (mislabeled as birds only) observations during shipping in 2022. All observations were made from the *MV Aujaq* (which is the only vessel that completed marine wildlife surveys). It is unclear if Appendix 7B is presenting survey data or incidental observations (or both). The KIA suspects that these are survey data, and that none of the vessels (including *MV Aujaq*) recorded incidental observations of marine wildlife.

Sabina's reporting in the main body of the 2022 WMMP Report is also confusing; in Section 7.1.2.2, Sabina refers to marine mammal surveys, but Table 7.1-2 is labelled as incidental observations. By contrast, there is no mention of either "survey" or "incidental" when discussing seabird observations in Section 7.1.2.3 and Table 7.1-3. Finally, in the marine wildlife Incidental Observations Section 7.3, Sabina refers to the lack of marine mammals recorded in camp wildlife logs in 2022, rather than incidental observations made during shipping. Overall, it is unclear how data were collected, which may have implications/limitations for confidence in understanding the species that could be/are being impacted by shipping and will be impacted by cumulative shipping effects in the future, to understand whether mitigation and avoidance distances are being followed.

Furthermore, the dates in Appendix 7B do not correspond to Section 7.1.2.1 in the main 2022 WMMP Report, which states that the *MV Aujaq* completed surveys between August 29 and September 28, and Table 7.1-1, which shows that this vessel left the port in Becancour, Québec on August 13 and left the Back River Marine Laydown Area (MLA) on September 3.

Some of the dates in Appendix 7B are suspected to have the month and day switched; however, one entry of "11/10/2022" is likely outside the sailing windows, regardless of month-day format. It is unclear if these errors occurred at the data collection or entry stage. Regardless, additional quality control checks are needed to ensure that data are correct.

Recommendation/Request:

The KIA recommends/requests the following:

- Please ensure that vessel operators understand that the Marine Shipping Wildlife Mitigation and Monitoring SOP is intended to be used while vessels are moving and clarify this within the SOP itself during the next update.
- Please confirm whether the seals observed in close proximity (10 m and 50 m) required mitigation actions or did not because the vessel was anchored.
- Please confirm that the species identification of grey seal (Halichoerus grypus) is correct or incorrect.
- Please correct the marine wildlife observation dates from 2022 and ensure that surveyors collect and/or enter data correctly in the future.

Importance of Issue:

High

B2Gold Nunavut Response:

1. B2Gold will clarify with the vessel operators that MMSO observations are meant to be conducted when the vessel is moving. This information is already included in the SOP. Vessels contracted by the Back River project are required to record incidental sightings of marine mammals and marine birds while the vessel is moving. Section 3.1 of the marine SOP lists the overview of the marine wildlife monitoring, and states that dedicated surveys may be conducted when timing allows but are not

required. Section 14.2.2 of the WMMP Plan states that "Marine mammal surveys will be conducted as incidental observations by the ship's bridge crew". The SOP will be updated to ensure this is clear, and that dedicated surveys are optional if timing allows, and to ensure crew focus on recording all incidental sightings. Methods for dedicated surveys were included in the SOP in case shipping companies had the opportunity to go above and beyond what is required for the Back River Project. One vessel in 2022 did complete dedicated surveys, which is more than is required for the Back River project and contracted shipping companies. This will be stated explicitly in future iterations of the SOP and in the 2023 annual WMMP Report to avoid any further confusion.

2. The seals observed less than 100 m from the vessel are confirmed to be sightings while the vessel was at anchor. This will be stated explicitly in future iterations of the WMMP Report if sightings occur closer than 100 m from the vessel while it is at anchor.

3. B2Gold agrees that the sighting of a grey seal is questionable, given the species range. Greater attention to QA/QC of the data, as well as clear statements regarding possible misidentification of species by observers will be included in future WMMP Reports.

4. B2Gold will ensure dates are QA/QC'd to avoid any confusion regarding timing of sightings and will stress the importance of accurate recording of data while on the vessel.

KIA-NIRB-05: Suggested improvements for marine wildlife survey forms.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 7A, Marine Shipping SOP – Wildlife Mitigation and Monitoring, ENVIRO-02 (Version F.1, 10 November 2022)

Summary:

Missing marine wildlife survey data in 2022 are likely due to data form deficiencies. The KIA thanks Sabina for recent updates and provides further suggestions for improvement.

Detailed Review Comment

Some missing data in Appendix 7B (marine wildlife observations in 2022) can likely be attributed to deficiencies with the data sheets and/or Marine Shipping Wildlife Mitigation and Monitoring SOP instructions. For example, there are many "NR" entries (presumably meaning "Not Recorded"), primarily for bird observations, including for time, lat/long coordinates, and mitigation action (y/n). This is likely due to having dedicated fields for this information on the Marine Mammal Survey – Sightings Form, but which are lacking on the Seabird Survey – Sightings Form. For example, the seabird form includes time and location fields for the survey as a whole (i.e., transect start and end) but not for individual species observations.

In addition, Sabina's summary table in Appendix 7B has a column for "Closest Approach (m)", which was left blank for all entries. However, there is only one space to record Distance (m) on both marine mammal and bird data sheets; thus, it may not be clear to the surveyor that a minimum distance estimate also needs to be documented.

The KIA appreciates that Sabina tried to incorporate our suggestions into the updated marine mammal and seabird survey forms. However, the new row for Mitigation makes less sense when a single data sheet is used for multiple species observations. Information about mitigation actions and results should be recorded for each sighting. We understand that there is limited space to add more columns to the bottom portion of the forms, but there may be other ways to make this work. For example, Sabina could create a two-page form with the General, Vessel, Environmental, Survey (Transect) Information on one page, and the second page can be dedicated to species observations, reformatted to fit all the necessary fields.

Recommendation/Request:

The KIA recommends/requests the following:

- Please consider setting up the marine mammal and seabird survey forms with the same fields (default to collecting more data).
- Please include SOP instructions and a data field for "Closest Approach (m)" to ensure that surveyors record this information.
- Please revise/reformat the data forms to allow filling in mitigation actions and results for each species observation.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold thanks the reviewer for suggestions regarding the seabird sighting and marine mammal sighting datasheets. These forms will be reviewed and will be updated and simplified to ensure no confusion, considering the reviewers suggestions. In addition, it will be reiterated in the SOP and to shipping companies that the vessel crew prioritize recording all incidental sightings of marine mammals and marine birds while in transit to remain in compliance with the WMMP Plan, and that conducting dedicated surveys is simply additional if timing allows but is not required.

2. The mitigation section of the datasheet will be reviewed; however, mitigation is not always required for each sighting (e.g., a sighting of a marine mammal swimming 500 m away from the vessel) and will therefore not be included for each sighting.

KIA-NIRB-06: New/updated components of Marine Shipping Wildlife SOP.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 7A, Marine Shipping SOP – Wildlife Mitigation and Monitoring, ENVIRO-02 (Version F.1, 10 November 2022)

Summary:

Maps showing sensitive habitats for marine birds in the Northwest Territories (NT) and sensitive habitats for marine mammals in NU require clarification and improvement.

Sabina should also consider updating their mapping using other available datasets.

Detailed Review Comment

The KIA appreciates that Sabina tried to incorporate our suggestions into the latest Marine Shipping Wildlife Mitigation and Monitoring SOP (Nov 2022). Clarification and/or improvements could be made for the following new/updated components of the SOP:

Sensitive habitat for marine birds in NT

The list of sensitive habitats in NT in Section 2.1 does not match what is presented on Figure 2.1-3, and neither fully reflect the sensitive habitats identified in source referenced (Latour et al., 2008). The list has a typo (should be Kukjutkuk, not Kugluktuk; the former is in the NT and the latter is in NU), Mackenzie River Delta and Beaver Lake are missing (but shown on the map), and the Cape Parry site is mislabeled as Amundsen Gulf on the map.

According to (Latour et al., 2008), the following key habitat sites may be relevant to the Project's Western Shipping Route. In particular, NT Site 7 – Harrowby Bay is highly relevant for the Project and needs to be added to the list and map. Reference to this map should also be included in Table 3.5-1 (Recommended Shipping Mitigation Responses for Seabirds and Marine Mammals).

NT Site 4 – Tahiryuak Lake*

NT Site 5 – Kagloryuak River Valley* NT Site 6 – Cape Parry - included.

NT Site 7 – Harrowby Bay

NT Site 8 – Lower Anderson River (and Mason River) NT Site 9 – Kugaluk River*

NT Site 10 – McKinley Bay – Phillips Island - included. NT Site 11 – Kukjutkuk and Hutchison Bays - included.

NT Site 12 – Mackenzie River Delta - included.

NT Site 13 – Ramparts River Wetlands (Tu'eyeta)

NT Site 14 – Lower Mackenzie River Islands - included.

NT Site 15 – Brackett (Willow) Lake

NT Site 16 – Middle Mackenzie River Islands - included. NT Site 17 – Southeastern Mackenzie Mountains

NT Site 18 – Mills Lake - included. NT Site 19 – Beaver Lake - included.

NT Site 20 – North Arm, Great Slave Lake* NT Site 21 – Northwest Point

NT Site 22 – Slave River Delta*

NT Site 23 – Sass and Nyarling Rivers*

**Note: Sites 4, 5, 9, 20, 22, 23 are unlikely to be potentially impacted by the Project; however, they should be presented on the Figure 2.1-3 map as they occur in the geographic area shown.*

Sensitive habitat for marine mammals along the Eastern Shipping Route in NU

Sabina has provided a source reference for the sensitive habitat data shown on Figure 2.1-2 (Stephenson & Hartwig, 2010). The KIA reviewed this document, which includes marine mammal species distribution maps in the Canadian Arctic; however, it is unclear how Figure 2.1-2 in the SOP was derived from the reference data. For example, which species, seasonal ranges, or other features were considered? The polygon in M'Clintock Strait does not appear to be encompassed by any of the (Stephenson & Hartwig, 2010) maps; does it come from Traditional Knowledge?

The KIA also recommends updating both marine mammal and seabird sensitive habitat maps using Canada's Arctic Marine Atlas (Oceans North Conservation Society et al., 2018), if the spatial data can be shared. Chapter 6 (marine mammals) and includes species maps as well as an overall Marine Mammal Concentration Areas map; these maps include data from (Stephenson & Hartwig, 2010) and other sources. Similarly, Chapter 5 (waterbirds) includes species maps (ranges and documented occurrences) and Designated Sites; the latter includes data from (Latour et al., 2008) and other Important Bird Areas (IBAs).

Vessel tracks

In Section 7.1.1.1, Sabina states that ERM needed to acquire archived Automatic Identification System (AIS) data from a commercial AIS supplier (Vesseltracker) to produce the tracks shown on Figures 7.1-1 and 7.1-2. Sabina also explains that these data vary in frequency from <1 hr to >12 hr between recorded locations (which explains why some ships appear to travel overland on the maps).

However, Section 4 (End of Trip Reporting Requirements) in the Marine Shipping Wildlife Mitigation and Monitoring SOP indicates that the vessel operator needs to submit a spatial file of the shipping route to the Sabina Environment Team after each shipping trip. Can these data not be used to general the vessel tracks maps instead of using AIS, or are they the same data? If ERM needed to purchase data from Vesseltracker, does this imply that vessel operators in 2022 did not adhere to the SOP reporting requirements?

Recommendation/Request:

The KIA recommends/requests the following:

- Please include NT Site 7 – Harrowby Bay on Figure 2.1-3 (Sensitive Habitat and Setbacks for Seabirds and Seaducks along the Western Shipping Route in NWT).
- Please consider adding the other identified NT Sites on Figure 2.1-3 for transparency/completeness.

- Please explain how Figure 2.1-2 (Sensitive Habitat for Marine Mammals along the Eastern Shipping Route in Nunavut) was created from the data shown in (Stephenson & Hartwig, 2010), especially the polygon in M'Clintock Strait.

- Please consider updating the sensitive habitat maps to reflect a consolidation of data, such as those presented in Canada's Arctic Marine Atlas.

- Please clarify if vessel operators in 2022 submitted spatial files of their shipping route to Sabina, and if these data are different from (and more precise than) AIS and can be used to generate the maps showing vessel tracks.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold will add NT Site 7 – Harrowby Bay and the other relevant NT sites – to the maps in the next iteration of the SOP.

2. B2Gold will review the polygons made for the sensitive marine mammal habitat in Figure 2.1-2 and update them if there are any existing errors incorporating the data from Stephenson & Hartwig (2010).

3. The vessel companies do not provide the vessel tracks. This was included in the SOP to attempt to obtain the most accurate track information. However, vessel companies do not provide this information to Back River (or to other projects that we are aware of). Therefore, B2Gold obtained the data from the vessel tracking company to ensure tracks were reported in the WMMP Report. The reporting requirement will be removed from the next iteration of the SOP.

KIA-NIRB-07: Footprint development discrepancies in 2021 and 2022.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Project Certificate Condition No. 32
- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 19, 2022)

- KIA-NIRB-11

Summary:

There has been an approximately 6 ha discrepancy in the habitat loss calculations for the MLA Property for the past two years of annual reporting, as presented in Sabina's response to PCC No. 32 and WMMP reporting.

Detailed Review Comment

The KIA appreciates Sabina's response to our KIA-NIRB-11 comment for the 2021 NIRB Annual Report review and inclusion of Table 4.5.9-1 when addressing PCC No. 32. However, there are "(a)" superscripts next to many ecosystem types in this table that are not explained.

Table 4.5.9-1 shows that 88.3 ha of ecosystem/vegetation loss has occurred at the Goose Property and 37.4 ha at the MLA Property in 2022, for a total of 125.7 ha. However, Table 3.2-1 in the 2022 WMMP Report shows that 88.1 ha and 31.7 ha have been lost at the Goose Site and MLA, respectively, totaling 119.8 ha. There is a 5.9 ha, primarily from the MLA, which is not accounted for in the WMMP Report.

The KIA also noted 5.7 ha discrepancy between MLA calculations for the PCC No. 32 response versus 2021 WMMP Report calculations in our KIA-NIRB-11 comment. We had requested clarification on this difference, which Sabina did not respond to, to the best of our knowledge.

Recommendation/Request:

The KIA recommends/requests the following:

- Please explain what the (a) superscripts in Table 4.5.9-1 refer to.
- Please explain the recurring discrepancy in habitat loss calculations for the MLA Property. Is there a habitat type that is not being considered for WMMP reporting?

Importance of Issue:

Low

B2Gold Nunavut Response:

1. B2Gold has investigated the discrepancy and concluded that Saltwater (mapping code MW) habitat from the non-vegetated ecosystems was not being considered in the WMMP report from 2021 and 2022. B2Gold appreciates the KIA bringing this discrepancy to our attention and will ensure this habitat type is included in calculations moving forward.

KIA-NIRB-08: Presentation of helicopter flight tracks.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report

Sabina, Back River Project, Wildlife Mitigation and Monitoring Program Plan (Version 12, April 2023)

- Section 7.1.5.7

Summary:

Sabina has provided maps showing flight tracks in response to various intervenors' review comments. The way these data are presented may not be the most useful, and Sabina's interpretation of the results is unclear.

Detailed Review Comment

In the 2022 WMMP Report, Sabina has provided Figures 5.1- 1 and 5.1-2 showing the frequency of helicopter flights below 610 m in July-August and in November 2022, respectively, and a brief discussion of the results in Section 5.1.2.2. While the KIA appreciates the inclusion of these flight tracks, we have some feedback on how they are presented.

Sabina states that in the figures, dark green indicates one flight over the season. However, the figure legends indicate that dark green represents 1-25 flights. It may be that there was only one flight; however, it is impossible to tell with this method of binning. Sabina also states that Figure 5.1-1 *"shows that the vast majority of helicopter flights were localized to the area surrounding the Goose Site where drilling activities occurred."* It is unclear how Sabina reached this conclusion, as the heat map appears to show the George Exploration Camp with the "hottest" colour (red, representing 150-175 flights), while the Goose Property has dark orange (125-150 flights) at most. This is an important point to correct if an incorrect conclusion has been made, as the George deposit is closer to Bathurst caribou calving grounds.

It is also unclear how the maps were created – do flights need to have the same flight track to be counted cumulatively, or do the maps show the number of points at the same coordinates (i.e., density) regardless of the overall track? If one allows greater variation in flight paths, such as analyzing by trip (e.g., MLA to George flights, MLA to Goose flights, etc.), how would this affect the heat mapping? It would also be more informative to have summary statistics of helicopters flying below 610 m compared to the total number of flights. There is currently no 'denominator' for comparison to be confident of Sabina's statement that *"pilots avoided flying close to the ground even when wildlife were absent."* Ultimately, the KIA wanted assurance that helicopters were complying with Section 7.1.5.7 of the WMMP Plan and were not flying below 610 m when caribou were observed.

Recommendation/Request:

The KIA recommends/requests the following:

- Please elaborate on how the flight tracking map Figures 5.1-1 and 5.1-2 were produced with respect to how flights or points were summed to create the heat map bins.

- Please revisit conclusions that were reached by Sabina about the vast majority of flights being associated with Goose camp given that the heat map appears to indicate more activity around the George Camp. Does the heat map perhaps indicate flight hours rather than number of flights, and helicopters spent more time in the air around George? Please explain.

- Please consider creating heat maps by flight trip (i.e., same origin and destination) or other approaches to test the validity of Sabina's interpretations.

- Please provide summary statistics for the number of helicopter flights below 610 m compared to the total number of flights in 2022

Importance of Issue:

High

B2Gold Nunavut Response:

1. The flight tracking maps uses points to calculate the heat maps since the amount of time in a particular area (indicated by points) is indicative of disturbance at that location.

2. As discussed in the response to GN-AR#08, B2Gold will review how the helicopter flight data is presented and update the analysis and presentation of these data following comments from the KIA and GN.

KIA-NIRB-09: Wolverine observations and deterrence measures.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 5D, Incidental Terrestrial Wildlife Observations, 2022

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 5, 2022)

- Appendix A, Wildlife Deterrence for Environment Staff: Pre-construction, Construction, and Operations (Version B.1, 20 July 2020)

Summary:

There are inconsistencies with the number of wolverine observations and incidents requiring deterrence. It is unclear if Red-level responses were applied when wolverines were observed <1 km from site. Additional mitigation measures may be needed if the number of aggressive/habituated wolverines is increasing.

Detailed Review Comment

In Section 5.5.2.2 (Camp and Waste Management, Monitoring for Grizzly Bears and Wolverine) of the 2022 WMMP Report, Sabina states that *"There were 13 reports of aggressive or habituated wolverines, all occurring between November 20 and December 20. Of these instances, deterrent measures were deployed in seven cases (bear bangers in four, rubber bullets in one, and a combination of both in two). Nine of these reports occurred from November 21 to November 24, and are believed to have been the same wolverine. This wolverine was found within the incinerator building on November 21, and deterred using rubber bullets and bear bangers."*

A summary log of Incidental Terrestrial Wildlife Observations in 2022 is presented in Appendix 5D. This table includes seven additional records of wolverine being deterred from the incinerator in October and prior to November 20; and there are no wolverine deterrence incidents after November 29 (in contrast to Sabina's statement, as quoted above). Clarification is needed for these differences; perhaps it is a matter of incidental observations vs. other types of observations (e.g., during waste management inspections?), or aggressive/habituated animals vs. non-aggressive animals.

In Section 5.7.2 (Other Terrestrial Mammal Incidental Observations), Sabina describes 20 sightings of a single wolverine in February, March, April, July, August, September, November, and December 2022, all occurring within 1 km of the Goose Site. However, Appendix 5D includes incidental wolverine observations in months not noted by Sabina (i.e., May, June, October) and is also missing observations in some months noted (i.e., February, March, April). Part of these inconsistencies may be due to date mix-ups, including switching the day and month fields when entering data (see KIA-TC-04: Data collection for marine wildlife monitoring).

Furthermore, according to the Wildlife Deterrence for Environment Staff SOP (Version B.1 from Jul 2020 appended to Sabina's responses to the 2021 NIRB Annual Report review), Table 3, wolverines observed <1 km from site should have triggered a red caution level and response.

Sabina does not indicate in the 2022 WMMP Report whether appropriate responses were implemented.

Overall, it appears that there was an unusually high number of wolverine incidents in 2022, especially at the incinerator. It may be informative for Sabina to compare these data to previous years. Sabina states in Section 5.5.2.2 that they *"re- evaluated the measures taken to keep the camp clean and free of attractants, and also ensured animals were precluded from accessing the incinerator. Sabina continues to ensure safety of personnel and wildlife by meeting all waste management requirements and minimizing attractants on site."* However, if wolverines are becoming increasingly habituated and aggressive, further mitigation measures may be needed.

Recommendation/Request:

The KIA recommends/requests the following:

- Please explain the discrepancies in wolverine observation and deterrence reporting presented in Section 5.5.2.2, Section 5.7.2, and Appendix 5D.

- Please clarify if Red-level responses, as per the Wildlife Deterrence for Environment Staff SOP, were implemented when wolverines were observed <1 km from site.

- Please consider comparing the number of wolverine incidents in 2022 with previous years, to inform adaptive management if needed.

- Can Sabina provide more information on what may have been attracting wolverine to the incinerator, and the precise adaptive management measures taken to prevent future incidents?

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold acknowledges this discrepancy and will ensure that data are more clearly presented for incidental observations and deterrence event reporting moving forward. After inspecting raw data forms, B2Gold confirms the data in Appendix 5D is correct regarding incidental observations of wildlife. Further deterrence events occurred aligning with the in-text references and were recorded in an Aggressive Wildlife Response Log. This document was not included as an appendix but will be included in future versions of the WMMP Report. Reporting will also be clarified to ensure incidental observations are presented separately from aggressive wildlife which have been deterred by Project staff.

2. Higher numbers of wolverine incidents requiring deterrence were recorded in 2022 versus prior years. Adaptive management activities following these incidents in 2022 included auditing waste management, reminding site services staff the importance of cleanliness and housekeeping around all potential attractants, and the crucial nature of ensuring wildlife do not access attractants on-site. Additional maintenance was also conducted on the incinerator to ensure waste does not accumulate prior to incineration, reducing potential for attraction. Due to repeated interactions reflecting habituated behaviour, two wolverines were destroyed in early 2023 (which will be reported in further detail in the 2023 WMMP Report). Following this, the adaptive management activities described above appear to have strongly reduced any wolverine encounters or attractions to site.

KIA-NIRB-10: Facilities camera monitoring in 2022.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report

Sabina, Back River Project, Wildlife Mitigation and Monitoring Program Plan (Version 12, April 2023)

- Sections 7.2.1.5, 8.2.1.1, 9.2.1.1
- Table 6.2-1

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 5, 2022)

- KIA-NIRB-7

Summary:

Further information is needed regarding the Facilities Camera Monitoring program that was only implemented for up to three months in 2022, as well as future plans (beginning in 2023) for this program during the Project's Construction Phase.

Detailed Review Comment

Section 5.6.1 and Table 5.6-1 of the 2022 WMMP Report indicate that six wildlife cameras were deployed around the Goose Camp for approximately 1.5-3 months in the fall/winter of 2022 (end of September to mid-late December). Half the cameras deployed ran out of batteries earlier than expected. As this monitoring program moves forward, will it be feasible to complete monthly camera checks and battery changes?

The batteries were presumably changed at the end of December 2022, since Sabina also states that the cameras continue to operate and will be supplemented with additional cameras in 2023. No further details are provided about the plans for 2023; however, the KIA expects that additional cameras will be placed around Project facilities and infrastructure as per Section 5.6 of the 2022 WMMP Report and Section 7.2.1.5 of the WMMP Plan. These locations include:

- Caribou road crossing ramps compared to roadside locations without ramps.
- Waste management facilities
- Goose camp (if more than six cameras are needed)
- MLA
- Modification PDA (i.e., the Energy Centre)
- Tailings impoundment facility
- "Other sites as the need arises."

Sabina does not explain why the Facilities Camera Monitoring program did not begin until essentially October 2022 and was restricted to the Goose Camp. The KIA previously commented on the lack of on-site camera monitoring reporting in KIA-NIRB-7 for the 2021 NIRB Annual Report review. Sabina responded that they have placed cameras for monitoring at site in 2022, and that results from this monitoring program will be presented in the 2022 Annual Report. The KIA was surprised to learn that an on-site camera monitoring program is not already in place. Table 6.2-1 of the WMMP Plan shows that an on-site camera monitoring program for caribou, muskox, and grizzly bear is required and ongoing for Baseline/Pre-Construction, and the Project has been in the Pre-Construction phase for several years. If camera monitoring had begun and continued throughout the pre-construction phase as noted in Table 6.2-1, there would be sufficient data by this point to look for trends.

The KIA notes that within the main body of the WMMP Plan, triggers for monitoring using on-site cameras for caribou, muskox, and grizzly bear note that: *"the on-site camera monitoring program will be in place throughout construction and operations of the Project"* (Sections 7.2.1.5, 8.2.1.1, 9.2.1.1). Thus, these sections appear to contain a typo, as the Pre-Construction phase is not included, although it was marked off in Table 6.2-1. The KIA believes that Pre- Construction camera monitoring is warranted based on the objectives of this monitoring program. From Section 7.2.1.5 regarding caribou: *"The objective of the on-site camera program is to monitor caribou (and other wildlife VECs activities around Project infrastructure, including:*

1. Locations that are not staffed for long periods of time (e.g., on roads, camps, MLA);

2. Areas with and without mitigation structures or activities to evaluate the efficacy of mitigation activities (e.g., at-road crossing structures); and

3. The time of year when caribou use the Project site."

Similar objectives are written for muskox and grizzly bear in Sections 8.2.1.1 and 9.2.1.1 of the WMMP Plan. Another objective for muskox is "monitoring areas identified as important for muskox from land user knowledge (e.g., eskers, windswept benches) and at points with high numbers of muskox identified during baseline studies (e.g., the hilly area west of the MLA)." These objectives could apply to any Project phase. Implementing the on-site camera monitoring program during Pre-Construction would allow for collection of more data to evaluate the accuracy of the Project's environmental impact predictions and to better inform mitigation and adaptive management for wildlife VECs.

Although the KIA appreciates that Sabina finally commenced the on-site camera monitoring program in 2022, it is unclear why the cameras were not deployed until the fall of 2022.

This program quickly ran into logistical issues (camera/battery failure), and it is also unclear if Sabina has developed solutions to these issues such that a full-scale facilities camera monitoring program can be reliably implemented as the Back River Project enters the Construction Phase in 2023.

Recommendation/Request:

The KIA recommends/requests the following:

- Please provide rationale for the methods used (including timing, number of cameras, locations) for the facilities camera monitoring program in 2022.

- Please provide assurance that measures are being taken to ensure continuous camera operation (as much as possible), such as the use of high-quality batteries (e.g., Energizer Ultimate Lithium) and regular, timely checks to allow for battery changes, data downloading, fixing, cleaning of debris from lenses, and to ensure any overturned cameras can be placed upright again.

- Please provide further information regarding plans for the facilities camera monitoring program in 2023 (e.g., timing, number of cameras, locations).

- Please clarify in the WMMP Plan when the on-site camera monitoring program is supposed to occur. If it was meant to be ongoing during Baseline/Pre- construction, Sabina has not been following the plan until now.

Importance of Issue:

High

B2Gold Nunavut Response:

1. In 2022, cameras were placed at facilities that could act as attractants to wildlife and following methods outlined in the WMMP Plan (Section 7.2.1.5). The timing of the camera program was limited to the second half of the year due to logistical issues with getting to the Back River site. However, in 2023, these cameras have been in place year-round.

2. Measures are being taken to ensure winter operations of cameras, including the use of Energizer Ultimate Lithium batteries. Therefore, it is anticipated that cameras will remain operational through the spring, summer, and fall season, with regular checks for battery life and camera position, and regular downloading of the photos. During the winter, the cameras will be checked more regularly (once a week).

3. The facilities monitoring program in 2023 will continue with the same methods and camera locations used in 2022. Five new infrastructure cameras will be placed at the MLA, and the six at Goose continue to function and are checked monthly.

4. As stated in the WMMP Plan Section 7.2.1.5, The on-site camera monitoring program will be in place throughout construction and operations of the Project. Therefore, it was scheduled to begin during construction; however B2Gold began this program in 2022, prior to construction.

KIA-NIRB-11: Deterrence of red foxes and other wildlife

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 5B, Facilities Camera Monitoring Data, 2022
    - Appendix 5C, Incidental Wildlife Observations SOP, ENVIRO-14 (Version A.1, 30 December 2022)
    - Appendix 5D, Incidental Terrestrial Wildlife Observations, 2022

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 5, 2022)

- Appendix A, Wildlife Deterrence for Environment Staff: Pre-construction, Construction, and Operations (Version B.1, 20 July 2020)

Summary:

Red foxes were attracted to the incinerator, kitchen, and other Project areas in 2022; these incidents sometimes required deterrence, according to incidental wildlife logs. Additional mitigation measures may be required to prevent red foxes from becoming habituated and/or aggressive.

Detailed Review Comment

In addition to the prevalence of wolverine observations at the incinerator (see KIA-NIRB-09: Wolverine observations and deterrence measures), there appeared to be attraction issues with red foxes. In Section 5.6.2 (Facilities Camera Monitoring results) of the 2022 WMMP Report, Sabina describes red foxes (and common ravens) *"attempting to access inorganic waste at camera BR02 (located at the incinerator)."* No further details were provided; however, is it possible that the animals were seeking food containers that were not properly rinsed and/or securely stored before incineration?

Appendix 5B presents a summary of Facilities Camera Monitoring Data in 2022. In two instances on November 2, a red fox (perhaps the same animal) was detected at the incinerator camera BR02 and there are comments of *"Staff taking photos up close"* and *"Up close with staff."* The actions of the Project staff may be contributing to habituation of the animal. Although red foxes are not amongst the carnivore species that require deterrence (as per the Wildlife Deterrence for Environment staff SOP), there is still a risk (both to human safety and animal welfare) to allowing red foxes and other wildlife to become habituated to humans and Project activities. This should be apparent after the incident on November 8, 2022, when a staff member was bit on the leg by a small carnivore identified as either a fox or wolverine (Section 9 of the 2022 WMMP Report).

Furthermore, Appendix 5D includes two incidents where red fox was (had to be?) deterred – one on October 1 at the Goose camp and incinerator, and one on November 8 near the weather station. There was also an incident on November 22 when a fox was *"Trying to get in kitchen"* (and was presumably deterred, though this is not mentioned in the Comments).

Additional mitigation may be needed if red foxes are becoming increasingly habituated and potentially aggressive (see also KIA-NIRB-09: Wolverine observations and deterrence measures).

Recommendation/Request:

The KIA recommends/requests the following:

- Please consider revising the Wildlife Deterrence for Environment Staff SOP to include red fox as a species that should be deterred from site.

- Please ensure that Project staff are trained and reminded of wildlife awareness and sensitivity protocols. Were any corrective actions taken after the facilities camera monitoring data showed staff getting up close to the red fox?

- Please consider reviewing the Project's waste management procedures and implementing additional measures to mitigate wildlife attraction, where possible.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. The deterrent SOP will be revised to include fox in the next iteration.

2. The camp onboarding program includes training for Project personnel on wildlife awareness and sensitivity. B2Gold has ensured the waste monitoring and mitigation program is implemented in 2023, and that all staff are educated as part of the training.

3. Waste management measures are reviewed regularly. An additional incinerator was brought online in 2023 and waste management has significantly improved.

KIA-NIRB-12: Spring stand-watch surveys and incidental observations.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- NIRB Annual Report Executive Summary, p. v
- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 5D, Incidental Terrestrial Wildlife Observations, 2022

Sabina, Back River Project, 2023 FEIS Addendum (March 2023)

- Section 2.3.6.4, Mitigation for Direct Mortality

Summary:

Sabina states in the NIRB Annual Report Executive Summary that spring migration stand-watch surveys were completed in 2022; however, only incidental observations of migrating geese were discussed in the 2022 WMMP Report.

Detailed Review Comment

In the "Environmental Monitoring Programs" section of the 2022 NIRB Annual Report Executive Summary, Sabina states that *"Spring migration stand-watch surveys were completed to assess spring bird migration around the Project site."* However, spring stand-watch surveys were not reported in the 2022 WMMP Report. The KIA notes that Sabina confirms in the 2023 FEIS Addendum that *"Additional baseline surveys for the spring migration period were conducted in May 2022 (data have not been included in this document) to provide additional context and data regarding spring migratory bird movements"* (Section 2.3.6.4, Mitigation for Direct Mortality, p. 2-79). As such, detailed methods and results for these spring 2022 surveys have not been made available by Sabina in any Project document.

Rather, incidental bird observations were discussed with respect to migration timing in Section 6.3 of the 2022 WMMP Report – on June 28, 2022, a flock of approximately 100 geese fly over the Goose Camp area. (Note: there is an incidental observation of 100 geese flying over the Goose camp on September 17, 2022, as noted in Appendix 5D. However, this may be the same observation and a date error; see also KIA-NIRB-09: Wolverine observations and deterrence measures) Sabina then discusses 'trends' in incidental observations from previous years: *"In 2020 there were two sightings: on May 17, a flock of 200 geese was observed flying overhead at Goose. The species of geese was not determined. On September 4, 2020, another flock of approximately 200 geese was observed flying overhead at Goose. The species of geese was not determined. These sightings provide information regarding timing of spring and fall migration. For example, a large flock of approximately 200 geese was observed on the same date (May 17) in 2019. Perhaps this indicates general timing for geese spring migration passing over the Goose site and illustrates the importance of recording incidental observations of notable bird sightings."*

Although we agree that it is important to record incidental observations of notable bird sightings, it is difficult to draw conclusions from a few incidental observations. Migration tends to occur over a period of a few weeks, not just a single day. If information about the timing of spring and fall migration is needed, such as for the proposed Energy Centre, systematic migration stand-watch surveys must be completed over a suitably long period of time.

Recommendation/Request:

The KIA recommends/requests the following:

- Please provide detailed methods and results for the 2022 spring migration baseline surveys (e.g., methods, results) conducted for the 2023 FEIS Addendum.

- Please explain why these surveys were not described in the 2022 WMMP Report.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold has included the baseline summary for migratory bird surveys for the FEIS Addendum for KIA's review. This baseline was also provided with the FEIS Addendum in May 2023.

2. These surveys are not described in the WMMP Report as they were conducted for the Modification, to collect additional data on migratory birds near the proposed winter turbines. This is not part of the annual WMMP Report or the WMMP Plan and is therefore not included in the WMMP Report.

KIA-NIRB-13: Pre-clearing surveys for nesting birds at Echo Pit.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report

Summary:

Clarification is needed as to whether pre-clearing nest survey transects were fully aligned with construction of the Echo Pit in 2022.

Detailed Review Comment

In Section 6.2.1 (Timing of Ground Clearing) of the 2022 WMMP Report, Sabina states that "Most ground clearing at the MLA and Goose was conducted during 2022 between August 16 and December, per the WMMP Plan. Clearing did occur within the nesting period at Echo Pit, and pre-clearing surveys were conducted on August 8 which resulted in no nests being identified (Figure 6.2-1)." The referenced map figure shows Project components that were constructed in 2022 versus prior to 2022. Project infrastructure is not labelled on the map, but it is assumed that the bird survey transect lines overlap the aforementioned Echo Pit. However, the transects do not cover the entire construction polygon; the surveys appear to have been completed farther west of the Echo Pit, covering portions of newly constructed site roads. Did the proposed location of the Echo Pit change?

Clarification is needed on where clearing was conducted during the bird nesting window.

Recommendation/Request:

The KIA recommends/requests the following:

- Please clarify which areas constructed in 2022 (as shown on Figure 6.2-1) were cleared during the bird nesting window.

- Please confirm that pre-clearing surveys for nesting birds were performed in the areas that were ultimately cleared during construction activities in 2022.

Importance of Issue:

Low

B2Gold Nunavut Response:

1. B2Gold confirms that the areas that overlap with the bird survey transects were cleared during the bird nesting window and no breeding birds or nests were observed.

2. B2Gold confirms that pre-clearing surveys were performed in the areas that were cleared during the sensitive bird nesting window in 2022.

KIA-NIRB-14: Wildlife species of conservation concern statuses.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 7A, Marine Shipping SOP – Wildlife Mitigation and Monitoring, ENVIRO-02 (Version F.1, 10 November 2022)
- Appendix E, 2022 Vegetation Monitoring Field Program Results – Winter Road Realignment (Technical Memorandum, 10 January 2023)
- Appendix I, Oil Pollution Prevention Plan & Oil Pollution Emergency Plan (February 2023)

Summary:

Territorial statuses gathered from NatureServe for wildlife species of conservation concern are either incorrect or less conservative than they should be.

Detailed Review Comment

In Section 8 of the 2022 WMMP Report, Sabina outlines the federal (COSEWIC and *SARA* Schedule 1) and territorial conservation status changes for wildlife species at risk (SAR) confirmed or have the potential to occur at the Project. Sabina states that the COSEWIC statuses for three bird species and one marine mammal species changed since the SAR table was updated for the 2021 WMMP Report; however, these changes are not described further, nor are they identified in Table 8-1.

Within Table 8-1, territorial statuses for "full species" are current to 2020 as presented in the *2020 Wild Species Report* (CESCC, 2022), while information about subspecies or populations were gathered from NatureServe. The statuses for some species, including Beverly/Ahiak, Bathurst, Dolphin and Union, and Peary caribou, are either incorrect or the less conservative subnational ranking listed on NatureServe:

Species/VEC	Table 8-1	NatureServe
Beverly/Ahiak and Bathurst	Apparently Secure	Imperiled/Apparently Secure (S2S4)
Dolphin and Union	Apparently Secure	Imperiled (S2)
Peary Caribou	Imperiled	Critically Imperiled/Vulnerable (S1S3)
Red Knot (Calidris canutus islandica)	Imperiled	Apparently Secure (S4B)
Killer Whale (NW Atlantic/Eastern Arctic pop.)	Vulnerable	Imperiled/ Vulnerable (S2S3)
Narwhal	Apparently Secure	Vulnerable (S3)

Please present the more conservative/higher risk conservation status for these species. The KIA notes that the 2022 Vegetation Monitoring Program (VMP) did default to the more conservative territorial statuses for vegetation SAR observed during 2022 surveys. Furthermore, please ensure that SAR listings and statuses, and known or potential occurrence at the Project site, are consistent between related documents, such as the WMMP Plan, Marine Shipping Wildlife Mitigation and Monitoring SOP, and Oil Pollution Prevention Plan & Oil Pollution Emergency Plan (OPPP/OPEP). When the requested revisions are made, the SAR table in the 2022 WMMP Report will be the most up-to- date and should be copied to other Project documents.

Recommendation/Request:

The KIA recommends/requests the following:

- Please present the most conservative territorial status for wildlife species at risk, similar to what is being done for vegetation.

- Please ensure that all Project documents that discuss species at risk are updated annually to match the most up-to-date information for species, statuses, statuses, and known/potential occurrence at the Project.

Importance of Issue:

Low

B2Gold Nunavut Response:

1. B2Gold will ensure that the most conservative territorial status for wildlife species at risk is presented in future WMMP Reports.

2. B2Gold will ensure that all Project documents that discuss species at risk are updated annually to match the most up-to-date information for species, statuses, statuses, and known/potential occurrence at the Project.

KIA-NIRB-15: Incidental Wildlife Observations SOP.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 5C, Incidental Wildlife Observations SOP, ENVIRO-14 (Version A.1, 30 December 2022)
    - Appendix 5D, Incidental Terrestrial Wildlife Observations, 2022
    - Appendix 7A, Marine Shipping SOP – Wildlife Mitigation and Monitoring, ENVIRO-02 (Version F.1, 10 November 2022)

Sabina, Back River Project, Wildlife Mitigation and Monitoring Program Plan (Version 12, April 2023)

- Sections 7.2.1.4, 10.1.1

Summary:

A draft version of Sabina's Incidental Wildlife Observations SOP has been included as Appendix 5C of the 2022 WMMP Report. The KIA has reviewed this SOP and offers some feedback regarding species identification guidance, the need for clear and consistent instructions, consideration of management responses, and inclusion of bird VECs.

Detailed Review Comment

As noted in KIA-NIRB-02: WMMP Plan commitments prior to Construction, Section 7.2.1.4 of the WMMP Plan requires the development of this detailed incidental observations SOP and also states that *"The SOP will include training requirements for staff, methods for monitoring, and data sheets."* This draft Version A.1 SOP has limited details about training in Section 2; Sabina provides basic wildlife identification guidance during employee training, including for common wildlife such as caribou, muskox, fox, wolverine, grizzly bear, and various bird species (including raptors, waterbirds, and songbirds). Wolf and moose are missing from this list, despite being species that tend to be recorded on camp wildlife logs (Appendix 5D). Sabina states that they also provide species identification guidance in poster or digital form; the KIA has not seen these documents but would suggest something similar to the Common Marine Mammal and Seabird ID Guides that were included in the latest iteration of the Marine Shipping Wildlife Mitigation and Monitoring SOP (Version F.1, Nov 2022). It would also be useful to include guides for wildlife species of conservation concern known to (or that could) occur at the Project (i.e., species listed in Table 8-1 of the 2022 WMMP Report).

Section 2 of the SOP also lists the information that should be recorded whenever wildlife is observed, including:

- Type of interaction if applicable (e.g., attraction, nesting, collision)
- Condition (e.g., limping, wounded, unable to fly)
- Any damage to or interaction with Project infrastructure (e.g., building skirting, vehicles).

However, there are no dedicated fields on the Incidental Wildlife Observation Datasheet to include these details. The form instructions for "Condition of Animals" are to circle Alive, Dead, or Injured, with no additional space for elaboration. Any vehicle collisions require filling out a separate form; however, the only space to describe other interactions or damage to infrastructure is in the "Other Notes" field (which has brief, unrelated instructions).

Conversely, the datasheet has fields for "Habitat Description" and "Photos," which are not included in the SOP instructions. As discussed in KIA-NIRB-05: Suggested improvements for marine wildlife survey forms, SOPs and datasheets need to have clear and consistent instructions and dedicated fields to ensure that the required/desired data are collected. For example, the summary log of incidental observations in Appendix 5D has columns for Distance from Camp, Direction from Camp, and Direction Travelling. However, these data fields were incompletely or rarely filled out for 2022 observations, which may be due to the lack of dedicated fields on the datasheet and/or unclear instructions.

In addition, the KIA notes that mitigation responses are sometimes noted for incidental observations (Appendix 5D). For example, various observations of wolverine, red fox, wolf, and bear noted deterrence or notifying personnel. Only one record of a wolf 2 km from Goose on September 22 specified that a bear banger was used. It would be highly informative to include instructions in the SOP and fields on the datasheet to record whether management actions were needed (y/n), details of the management response (e.g., site alert, deterrence measures), and results of the actions (e.g., animal moved away).

For the Incidental Wildlife Observation Datasheets, the KIA appreciates that the "Species" field now includes a field specifically for birds. However, the instructions at the top of both datasheets (general and wildlife collision), explaining when to complete these forms, still do not mention bird VECs. Raptors should be included as direct mortality due to collisions was rated as a residual effect in the FEIS (summarized in Section 10.1.1 of the WMMP Plan).

Furthermore, since Sabina acknowledged the value of recording notable bird sightings, such as large flocks of migrating geese (see KIA-NIRB-12: Spring stand-watch surveys and incidental observations), additional instructions to record incidental bird observations should be included on the datasheet.

Recommendation/Request:

The KIA recommends/requests the following:

- Please expand on the list of common wildlife that may be observed and consider developing guides similar to those for common marine mammals and seabirds in the Marine Shipping Wildlife Mitigation and Monitoring SOP (if not already done).

- Please consider adding species of conservation concern known to (or that could) occur at the Project to the wildlife identification guidance documents.

- Please revise Section 2 of the Incidental Wildlife Observations SOP and the datasheets to have clear and consistent instructions and include dedicated data fields where needed.

- Please consider adding instructions and data fields for management responses (e.g., if any were needed, details, results).

- Please clarify, in the SOP and at the top of the datasheet, that observations of bird VECs (especially raptors, species of conservation concern, and large flocks) warrant documentation.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold has guides to common wildlife in the Project area which are displayed as posters and photos in Project buildings, however these will be reviewed and updated if necessary.

2. B2Gold will include common species at risk that occur on site.

3. Incidental sighting SOP and the data sheets will be reviewed and edited for consistency for the 2024 season, and more details regarding bird sightings and any required mitigation will be added.

KIA-NIRB-16: Dates of incidental wildlife observations.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 5D, Incidental Terrestrial Wildlife Observations, 2022

Summary:

There are discrepancies in the dates of incidental terrestrial mammal and bird observations that need to be investigated and corrected.

Detailed Review Comment

The incidental wildlife observations highlighted in Section 5.7.2 (mammals) and Section 6.3 (birds) of the 2022 WMMP Report differ in dates from the summary log presented in Appendix 5D. The following observations are assumed to be the same based on number of animals and location:

Species (Count)	Sections 5.7.2, 6.3	Appendix 5D
Muskox (50)	July 27	November 26
Grizzly bear (2, sow and cub)	September 28	November 29
Moose (2)	August 11	June 16
Moose (3)	November 29	December 14
Geese (100)	June 28	September 17
Snowy owl (1)	November 26	November 24
Swans (6)	September 25	November 22

As discussed in KIA-NIRB-09: Wolverine observations and deterrence measures, there are also discrepancies between dates (months) presented in the main body of the 2022 WMMP Report and Appendix 5D. There may also be data collection or data entry issues associated with other incidental observations in Appendix 5D. Furthermore, date issues were also present for marine wildlife observations (see KIA-NIRB-04: Data collection for marine wildlife monitoring). Sabina needs to investigate the cause(s) of these data inconsistencies and take corrective actions to ensure that the issue does not recur. Although it is unlikely that analyses will (or can) be completed using incidental observations, there may be seasonal information that can be gleaned to inform adaptive management, if needed. If dates are incorrect, assumptions about when adaptive management may be needed may also be incorrect.

Recommendation/Request:

The KIA recommends/requests the following:

- Please investigate and correct the date discrepancies for incidental wildlife observations collected in 2022.
- Please note the corrective actions under ISO 9001: 2015 certification to catch these ongoing data entry errors internally, whether they be caused by Sabina or an ISO certified environmental consulting company.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold will review all incidental sightings and dates to see where the errors lie (recording error or reporting error) and ensure these errors do not occur in the 2023 WMMP Report.

KIA-NIRB-17: Corrective actions taken after wildlife biting incident

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 9A, Wildlife Incident Report, November 8, 2022

Sabina, Back River Project, Wildlife Mitigation and Monitoring Program Plan (Version 12, April 2023)

- Section 9.1.7.1

Summary:

The wildlife incident in 2022 resulting in human injury necessitates a change in wildlife management policy and protocol; the status of these required changes is pending.

Detailed Review Comment

In Section 9 of the 2022 WMMP Report, Sabina describes a wildlife incident that resulted in human injury – a small carnivore in the GS-02 generator shack at Goose bit a staff member on the leg. Sabina states that *"An incident report was completed (Appendix 9A), and corrective actions implemented to mitigate access for wildlife to the generator shack.*

Mitigation actions taken include installation of wire mesh over vent louvres on the building intake duct, and a safety presentation to all staff regarding wildlife interactions, precautions, and waste management."

On the Incident Report – Long Form in Appendix 9A, corrective actions consisted of *"wire screen placed on intake duct"* immediately on November 8, 2022. Under preventive actions, *"Incorporate requirement of guarding building openings into existing Wildlife Management SOP"* was noted without a completion date. Has this action since been implemented? Please provide the "existing Wildlife Management SOP" for review by the KIA and other interested parties. As noted in KIA-NIRB-09: Wolverine observations and deterrence measures, there appears to have been increased attraction of wolverine to the incinerator in 2022; this Wildlife Management SOP may need to be further revised and improved. In addition, the development and implementation of a Skirting and Building Monitoring SOP, as noted in KIA-NIRB-02: WMMP Plan commitments prior to Construction, should be accelerated to prevent wildlife incidents, like the one on November 8, 2022, from recurring.

The KIA also notes that the WMMP Plan currently describes a reactive, rather than proactive, approach; in Section 9.1.7.1 (design mitigation for attraction of grizzly bear and wolverine), Sabina states that *"If wildlife are able to access buildings through vents, windows, or by other means, then measures will be taken to exclude wildlife."* It is important to make this policy/protocol change and to install the guards on all building openings as soon as possible to prevent further wildlife incidents where animals become aggressive from being "cornered."

Recommendation/Request:

The KIA recommends/requests the following:

- Please implement the Preventive Actions noted on the November 8, 2022, Incident Report as soon as possible, if they have not already been completed.

- Please distribute the "Wildlife Management SOP" to the KIA and other interested parties for review.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. As noted in the Incident Report the "preventive action" of placing screening over the building air intake to exclude small mammals has already been conducted.

2. The WMMP Plan will be updated to include mitigation for doors so that wildlife doesn't enter through open doors.

3. Note that the WMMP Plan already includes proactive camp inspections and repair and installation of skirting and conducting camp cleanups to limit attraction and exclude wildlife from camp buildings.

4. The Wildlife Management SOP is the "Wildlife Deterrence SOP".

KIA-NIRB-18: Selection and monitoring of new vegetation plots due to WIR realignment

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Project Certificate Conditions No. 28, 34, 45, 80
- Appendix E, 2022 Vegetation Monitoring Field Program Results – Winter Road Realignment (Technical Memorandum, 10 January 2023)

Sabina, Back River Project, 2023 Winter Ice Road Technical Memorandum (December 2022)

Sabina, Back River Vegetation Monitoring Plan (January 2020)

- Section 5.5

Golder, 2019 Vegetation Monitoring Program, Technical Memorandum (18 February 2020)

- Figure 2

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 19, 2022)

- KIA-NIRB-11

Summary:

Ten new vegetation monitoring plots were established in 2022 due to the proposed WIR re-alignment. It is unclear if new plots will need to be created whenever the WIR alignment changes, and how long-term monitoring can be completed (as per the Back River Vegetation Monitoring Plan) if the plots change each year. It is also unclear if the new plots will still be paired with existing plots to enable before-after and control-impact analyses. The 2022 VMP field program only assessed the new plots, whereas the existing plots were last surveyed in 2019; thus, it is unclear how data can be compared during the next comprehensive WIR vegetation monitoring event.

Detailed Review Comment

As part of addressing PCC No. 34 (Vegetation Monitoring Plan; to minimize potential impacts to vegetation along the winter road/trail routings and around project sites), Sabina states that *"in 2022, ten new vegetation monitoring plots were established due to proposed re-alignment of the Winter Ice Road. The results of the monitoring are attached in Appendix E (2022 VMP Report)."* However, Sabina explains under several PCCs (No. 28, 45, 80) that the WIR was not constructed in 2022 due to an accident resulting in a fatality. As such, the WIR has not been constructed since 2019. The original paired vegetation monitoring plots were established along the WIR in July 2018 and 2019 (Section 1, 2022 VMP Report).

In their plan for the 2023 WIR, Sabina states that they anticipate "slight variations in routing to occur should construction or operational challenges exist" (Section 2, 2023 WIR Technical Memorandum, Dec 2022). Thus, it appears that the WIR alignment may change on an annual basis (when constructed). Does Sabina expect to need new vegetation monitoring plots whenever the WIR is re-aligned? If so, how can a rigorous VMP be developed "to allow for long term monitoring of winter usage of this road" (Section 5.5, Back River Vegetation Monitoring Plan, Jan 2020)? The KIA has previously commented on the lack of trend analyses for the Back River VMP (e.g., KIA-NIRB-11 from the 2021 NIRB Annual Report review). Sabina has stated in the past that there were insufficient monitoring data for analysis but responded to KIA-NIRB-11

that vegetation trend analysis will be completed every three years. If new monitoring plots need to be continually established, the three-year threshold may never be reached for certain locations.

Section 5.5 of the Vegetation Monitoring Plan also explains that "Paired treatment, located in the path of the WIR and control (located adjacent to the WIR) plots have been established between the MLA and Goose Mine area along the WIR (Figure 1). Where possible, selected plots had pre- existing data available on baseline (pre-operational) vegetation conditions, to facilitate before-after as well as control-impact type comparisons." Table 1 of the 2022 VMP Report presents a list of the new vs. replaced monitoring plots. While Figure 2 in this report does not include all VMP plots, including the replaced ones (which would have been helpful for the reviewer), a visual comparison of Figure 2 in this report versus Figure 2 of the 2019 VMP Report indicates that the new plots are likely near the old ones. However, it is unclear if the plots are also matched with respect to vegetation association and structural stage (i.e., does this information in Table 1 apply to the new plots, old plots, or both?). Ultimately, it is expected that the new 2022 plots were designed to be paired with existing plots (as per the Vegetation Monitoring Plan); however, Sabina does not explicitly state this in the 2022 NIRB Annual Report.

Finally, Sabina states in Section 6.0 of the 2022 VMP Report that "The vegetation plots assessed during the 2022 field program are only a small subset of the total WIR vegetation monitoring program. They represent areas that have been realigned since the original plots were established in 2018. The next WIR vegetation monitoring event, which will be after three years of WIR construction has occurred, will be a more comprehensive assessment of all the established plots and analysis of plot data." However, it is unclear how data from the next WIR vegetation monitoring event will be analyzed for the new and existing plots if the former has data from 2022 and the latter have not been monitored since 2019 (except for aerial photographs for some plots in 2022). It would have been more prudent to complete the 2022 field program for all WIR plots to establish the same 'baseline' for the next comprehensive field campaign.

Recommendation/Request:

The KIA recommends/requests the following:

- Please clarify if the WIR alignment is expected to change during each year of construction, and if new vegetation monitoring plots will be established each time.
- Please consider keeping previously established plots in case they become 'relevant' again due to future WIR realignments.
- If new plots are continually needed, please explain how a long-term monitoring program, according to the Vegetation Monitoring Plan for WIR monitoring, can be developed, with sufficient data for trend analyses.
- Please clarify if the new 2022 plots were still designed to be paired with existing plots and explain how these paired treatments can be compared if one set of data is from 2022 and the other from 2019.
- In future years, please complete all WIR vegetation plots in addition to new plots added for realignment to ensure that data are comparable at the subsequent monitoring period.

Importance of Issue:

High

B2Gold Nunavut Response:

The Winter Ice Road (WIR) is not expected to change alignment every year. However, needed changes were made in 2022 to improve the safety and efficiency of the route. Because existing winter ice road plots were on the old alignment, it was decided that the best practice would be to create new vegetation monitoring plots going forward. The monitoring in 2022 represented the second monitoring event of the WIR. Future events will monitor both the existing and newly established WIR monitoring plots.

Existing WIR plots that were established at the beginning of the VMP will continue to be monitored over the life of the project. Only a small subset of plots that were newly established in 2022 will be missing data from the first monitoring event in 2019.

Of the ten newly established WIR monitoring plots in 2022, seven were experimental plots and three were reference plots. Five of the newly established experimental plots are paired with existing reference plots that were monitoring during the first WIR monitoring event in 2019. Two of the newly established reference plots were relocated to be geographically closer to their paired experimental location and one reference plot was newly established to replace an existing reference plot that was within the new WIR alignment. The objective of the paired plot design is to evaluate the effects of the WIR on specific vegetation associations. Some pairs will have missing data from 2019 because they were established in 2022, however the majority will have multiple years data for comparison moving forward.

The next WIR monitoring event will monitor each of the experimental and reference plots that were established in either 2019 or 2022.

KIA-NIRB-19: Vegetation associations for new plots established in 2022.

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix E, 2022 Vegetation Monitoring Field Program Results – Winter Road Realignment (Technical Memorandum, 10 January 2023)

Sabina, Back River Vegetation Monitoring Plan (January 2020)

- Section 5.5

Summary:

There is a discrepancy regarding the vegetation association for new plot BRR006Ea. In addition, new plot BRR040Ea is categorized as tussock meadow, which is not a vegetation association mentioned in the 2020 Vegetation Monitoring Plan, and it is unclear if there is a suitable plot amongst the previously established plots to act as a paired reference.

Detailed Review Comment

Table 1 of the 2022 VMP Report shows that of the 10 new plots established in 2022, five represent dry-sparse tundra, three represent mesic dwarf-shrub tundra, and one each represents raised bog complex and tussock meadow.

However, raised bog complex is not included as a vegetation association in the results tables in Section 3.0. In Table 9, plot BRR006Ea is categorized as mesic dwarf-shrub tundra instead of raised bog complex; however, it is unclear which table contains the erroneous vegetation association.

Sabina states in Section 5.5 of the 2020 Vegetation Monitoring Plan that *"The most common vegetation associations sampled along the WIR alignment are Dry Sparse Tundra, Mesic Dwarf Tundra, and Raised Bog Complex."* Tussock meadow is not mentioned as a vegetation association within which the paired monitoring plots were established in 2018/2019, unless Undifferentiated Tundra has since been refined. As shown in the 2022 field program results, the tussock meadow experimental plot BRR040Ea has reference plot for comparison. It is also unclear if there are previously established plots in tussock meadow habitat that would be suitable reference(s). Without paired treatments, Sabina would not be following their Vegetation Monitoring Plan for WIR monitoring (see also KIA-NIRB-18: Selection and monitoring of new vegetation plots due to WIR realignment).

Recommendation/Request:

The KIA recommends/requests the following:

- Please correct the discrepancy in vegetation association for new plot BRR006Ea.

- Please clarify if new plot BRR040Ea is located in a habitat type (tussock meadow) without a suitable paired reference amongst previously established plots. If so, please explain what monitoring data from BRR040Ea will be compared to.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

Table 1 of Appendix E, 2022 Vegetation Monitoring Field Program Results – Winter Road Realignment included an error identifying plot BRR006Ea as the vegetation association – raised bog complex, when in fact it was mesic dwarf-shrub tundra. Subsequent tables in Appendix E correctly include data from plot BRR06Ea as the mesic dwarf-shrub tundra vegetation association.

Plot BRR040Ea is located in the habitat type tussock meadow, and although this is not a vegetation association listed in the VMP, it is described in the Back River Project 2012 Ecosystems and Vegetation Baseline Report and Final Environmental Impact Statement (FEIS). The paired reference plot, BRR040R, was first established in 2019 and was identified as tundra seepage vegetation association. However, it was noticed that the tundra seepage vegetation association has not been described in the Vegetation Baseline Report or the FEIS. Based on the vegetation found in the reference plot, it is likely that the tundra seepage vegetation association is more accurately classified as tussock meadow. This was the only plot in 2019 of that vegetation association. Going forward, paired plots BRR040Ea and BRR040R will be classified as tussock meadow.

KIA-NIRB-20: Vegetation species of conservation concern found during 2022 field program

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix E, 2022 Vegetation Monitoring Field Program Results – Winter Road Realignment (Technical Memorandum, 10 January 2023)
- Appendix B, 2022 Species List

Sabina, Back River Vegetation Monitoring Plan (January 2020)

- Section 6

Summary:

According to current territorial conservation statuses, six vulnerable and one critically imperiled vegetation species were found during 2022 field surveys. Sabina states that the critically imperiled species may be locally common and does not describe mitigation measures to avoid potential impacts to this species (or other rare plants). Two species observed in 2022 are not known to be present in Nunavut; their identities may warrant re-evaluation as genus *Polytrichum* includes three other territorial species of conservation concern.

Detailed Review Comment

Table 2 of the 2022 VMP Report presents a list of territorial species of conservation concern (erroneously labelled as "Federally Listed") observed during 2022 vegetation surveys, including six vulnerable species and one critically imperiled species. Sabina states that, *"Although [red-stemmed feather moss, Pleurozium schreberi] is considered critically imperiled in Nunavut, it was observed in the Project area at both experimental and reference vegetation plots in 2018, 2019, 2021, and 2022, suggesting it may be locally common. It is possible that the Project area is near the edge of its range where found."*

Despite the possibility that red-stemmed feather moss is locally common, Sabina should take measures to avoid potential impacts to this territorially critically imperiled species. If locally common, but regionally rare, this area could be an important location for maintaining the regional presence of this species. However, there are no mitigation measures mentioned in the 2022 VMP Report or specified in Section 6 of the 2020 Vegetation Monitoring Plan for rare plants/species of conservation concern. Thus, it is unclear if Sabina has taken/is taking/will take measures to protect rare plants (including federally listed species at risk).

The KIA also notes that Sabina states in Section 6.0 (Recommendations) that *"In future vegetation monitoring programs where species listed by the CESCC is observed, a collection of the species is recommended. These collections can be sent to a taxonomist for expert verification."* This statement suggests that there may be doubts about the species identifications presented in Table 2 and/or Table B1 (Species Observed During 2022 Field Surveys). In Table B1, two bryophyte species were observed in 2022 that are not known in Nunavut (according to (CESCC, 2022): common haircap moss (Polytrichum commune) and sickle-leaved golden moss (Tomentypnum falcifolium). Perhaps these species could also be considered 'rare plants' at the northern edge of their ranges, or perhaps these plants were misidentified at the species level, but the genus is correct. There is only one Tomentypnum species known in Nunavut (T. nitens, S4 = Apparently Secure). However, there are several other Polytrichum species in Nunavut, including three that are species of conservation concern: P. swartzii (S1S3 = Critically Imperiled/Vulnerable), P. hyperboreum (S3 = Vulnerable), and P. piliferum (S3S4 = Vulnerable/

Apparently Secure). It would be informative to confirm the identity of these species and to ascertain if they are also species of conservation concern.

Recommendation/Request:

The KIA recommends/requests the following:

- Please clarify whether the Back River Project is planning and implementing mitigation and management for rare plants, including both federally listed species at risk and territorial species of conservation concern.

- Please confirm if Polytrichum commune and Tomentypnum falcifolium (shown in Table B1) were correctly identified to the species level as they are not known in Nunavut. If they are correct, please discuss whether these species could be considered rare plants in Nunavut.

Importance of Issue:

Low

B2Gold Nunavut Response:

The FEIS (Volume 5, Section 4.3.2.2) outlines the rationale for identifying special landscape features which includes their likelihood to support rare plant species and communities. Losses of special landscape features are tracked annually to bring awareness and to help reduce the overall impact to rare plants.

The results of baseline surveys found that 60% of rare plant species observed were located within one kilometer of Bathurst Inlet due to the wide diversity of habitats and high species diversity. It was also found that rare plant 'hotspots' in the Regional Study Area (RSA) occurred outside of the Potential Development Area (PDA). These were observed along the length of the Bathurst Inlet shoreline between the MLA PDA and the Western River estuary. The location of the PDA was determined with these considerations of known rare plant occurrences and rare plant habitats. While locations of specific rare plant species observed through monitoring are not managed directly, their presence and additional population information are documented in annual vegetation monitoring reports when observed to inform future development of the project.

Bryophyte species such as *Polytrichum commune* and *Tomentypnum falcifolium* can be difficult to accurately identify in the field and were identified based on the field ecologist's expertise and experience identifying bryophytes in the field. Further investigation of these species by a bryophyte taxonomist would be necessary to confirm their identity and to consider them rare plants in Nunavut. Future vegetation surveys will include collection of potentially rare species for additional confirmation by expert taxonomists.

KIA-NIRB-21: Ambiguities and missing information in 2022 VMP Report

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix E, 2022 Vegetation Monitoring Field Program Results – Winter Road Realignment (Technical Memorandum, 10 January 2023)
    - Appendix A, Photographs

Sabina, Back River Project, Responses to 2021 Annual Report Comments (August 19, 2022)

- KIA-NIRB-15

Sabina, Back River Vegetation Monitoring Plan (January 2020)

Summary:

A few WIR vegetation monitoring parameters are described in the Methods but not presented in the Results. It is unclear how vegetation is defined as a surface substrate, especially in relation to other vascular vegetation measures. Two plot photographs are duplicated.

Detailed Review Comment

There are a few details within the 2022 VMP Report that the KIA would like clarification on:

Table 5: Average Surface Substrate Cover by Strata

It is unclear how the average percent cover for Vegetation can be so low (<1.0 for dry-sparse tundra plots, 0.0 for mesic dwarf-shrub tundra and tussock meadow plots) when Tables 3 and 4 indicate that there is sufficient vegetation to calculate average height and cover by strata, respectively. For example, despite 0.0% vegetation cover as a surface substrate for experimental plots in mesic dwarf-shrub tundra, the vascular vegetation could still be categorized into 40.0% shrub, 0.7% forb, and 35.0% graminoid?

Furthermore, the KIA previously commented in KIA-NIRB-15 for the 2021 NIRB Annual Report review that fungi, water, and decaying wood were noted in the Methods as surface substrates but were not included in the results. Sabina has amended the Methods (Section 4.0) in the 2022 VMP report to include surface water, litter, decaying wood, and live ground cover as examples of surface substrate. Decaying wood is still missing from Table 5; it is unclear if none was found on the plots, since Animal Pellets are included in the table despite all values being 0.0. The KIA wonders if decaying wood should be part of the Vegetation Monitoring Plan at all, given the lack of trees in the Arctic environment to create course woody material (often assessed as cover in plans developed for other areas) or if this is a copy and paste error from an SOP developed original for another area.

Wildlife sign

Data for wildlife sign (also noted in KIA-NIRB-15) continue to be missing from the 2022 VMP Report. As noted above, Animal Pellets are included in Table 5 as a type of surface substrate; however, collection of wildlife sign information, as outlined in the Methods section, appears to serve a separate objective.

Photo monitoring

In Appendix A of the 2022 VMP Report, Photo 16 for BRR021 (dry sparse tundra) is the same as Photo 17 for BRR038 (mesic dwarf-shrub tundra). One of these photos is incorrect.

Recommendation/Request:

The KIA recommends/requests the following:

- Please clarify how vegetation is defined as a surface substrate (Table 5), and how it relates to other measurements of vascular plants (Tables 3 and 4).
- Please clarify if decaying wood (as a surface substrate) and wildlife sign (as a separate data collection component) were assessed and observed on the new 2022 monitoring plots. Please provide the correct plot photograph(s) for BRR021 and BRR038.
- Please consider the usefulness of including decaying wood as a surface substrate in the Arctic tundra environment.

Importance of Issue:

Low

B2Gold Nunavut Response:

Table 5 of Appendix E, 2022 Vegetation Monitoring Field Program Results – Winter Road Realignment contained an error of incorrectly labelled column headings. The corrected table is presented below. The surface substrate percentage of vegetation in the corrected table aligns with the measurements of vascular plants in Tables 3 and 4.

Table 1: Average Surface Substrate Cover by Strata

Vegetation Association	Average Percent Cover (%)								
	Vegetation	Terricolous Lichen	Saxicolous Lichen	Moss	Bare Ground	Rock	Water	Litter	Animal Pellets
Dry-sparse tundra (TH)									
Experimental	50.2	30.8	<1.0	13.0	1.3	<1.0	0.0	3.4	0.0
Reference	61.6	21.9	<1.0	11.3	<1.0	1.4	0.0	3.4	0.0
Mesic dwarf-shrub tundra (TL)									
Experimental	56.9	9.9	0.0	20.1	<1.0	<1.0	0.0	11.9	0.0
Reference	66.0	20.0	0.0	10.0	0.0	0.0	0.0	2.0	0.0
Tussock meadow (WT)									
Experimental	61.0	0.0	0.0	1.0	1.0	6.0	1.0	30.0	0.0

Decaying wood has not been observed at the vegetation monitoring plots due to the nature of the woody plants that grow in the Project Area. This will be clearer in future vegetation monitoring reports to avoid confusion. In past monitoring events, animal pellets have been present, thus this cover type is included as a column in the overall table structure. However, in 2022 plots did not have animal pellet cover indicated by the 0.0 average percent cover across the monitoring plots, but the column was retained in Table 5's structure to allow for easy, visual comparison with previous years.

The duplicated plot photograph was of plot BRR021. The correct photo of plot BRR038 is below:

Photo 17: BRR038, mesic dwarf-shrub tundra – July 21, 2022

KIA-NIRB-22: Pre-blasting SOP – inconsistencies with WMMP Plan

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 5A, Wildlife Monitoring and Mitigation for Blasting, Preconstruction, Construction and Operations, SOP ENVIRO-07 (Version C.1, 4 November 2022)

Sabina, Back River Project, Wildlife Mitigation and Monitoring Program Plan (Version 12, April 2023)

- Sections 10.1.3.2, 7.1.5.8, 9.1.3.6

Summary:

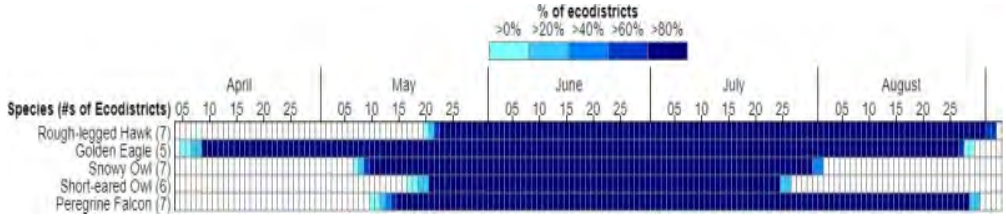
There are inconsistencies between the Wildlife Monitoring and Mitigation for Blasting SOP and the WMMP Plan related to the raptor nesting period, caribou group mitigation, applicability to large predator species, and setback distances for blasting in quarries and other (not open pit) blasting.

Detailed Review Comment

There are details within the Wildlife Monitoring and Mitigation for Blasting SOP that are inconsistent with information presented in the WMMP Plan or require additional clarification/precision:

Section 2.4, Raptor Survey

In the SOP, the bird breeding season is written as March to July; however, Section 10.1.3.2 of the WMMP Plan states April 15 to August 15. The KIA notes that the latter window is generally consistent with the ECCC migratory bird nesting period for nesting zone N9 (Arctic Plains and Mountains; Bird Conservation Region 3), where the Project is located. However, when using the Birds Canada Nesting Calendar Query Tool (Rousseu & Drolet, 2015) and a more refined analysis of ecodistricts around Bathurst Inlet, raptors are observed to nest between April 1 and August 31. The earliest breeding raptor is the golden eagle, a cliff-nesting species of conservation concern, considered Vulnerable in Nunavut (CESCC, 2022). Please consider extending the timing window for which raptor nest surveys and mitigation should be completed.



Section 3.1, Large Mammal Mitigation

In Tables 1 and 2, please edit "Group of 1-25 animals" to be more precise (e.g., "Group of 1-24 animals" or "<25 animals") as there is greater mitigation for caribou in groups of ≥25. In addition, the Table 1 entry for "Group of 1-25 animals" is written as applicable all year. However, Section 7.1.5.8 of the WMMP Plan includes consideration of <25 caribou during calving, post-calving, and early summer (June 5 – July 31). During this timing window, behavioural monitoring will be conducted, and adaptive management undertaken if needed (e.g., cessation of blasting "should animals respond significantly to blasting"). Please include another row in Table 1 for this seasonal consideration.

Table 2 indicates that the trigger/setback distance for caribou for management of blasting in quarries and other blasts (side from open pits) is 2.5 km. However, Section 7.1.5.8 of the WMMP Plan does not specify 2.5 km and states, "Generally, construction and quarry blasts are much smaller than those in the open pits during operations and therefore may require a smaller setback distance. These distances will be *determined based on the size of the planned blasts using the same 96 dB buffer as the main pit blasts*." Is there modelling to support the 2.5 km setback distance presented in the SOP?

Can Sabina guarantee that blasting in quarries and other blasts will not require a setback distance larger than 2.5 km?

Recommendation/Request:

- Please correct the discrepancy in raptor nesting period between the Pre-blasting Survey SOP and WMMP Plan. Please also consider extending the raptor nesting window in the WMMP Plan to be from April 1 to August 31.

- Please be more precise about the trigger number of animals (<25) for caribou mitigation in Tables 1 and 2. Please also include the calving, post-calving, and early summer consideration for open bit blasting.

- Please provide rationale for the 2.5 km setback distance for blasting in quarries and other blasts (Table 2) and confirm that larger blasts will not be used for the Project.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold will review and correct discrepancies between the Pre-blasting Survey SOP and WMMP Plan.

2. B2Gold will consider revising the numbers to ensure triggers are clear (i.e., 1-25, 1-24, or <25 and ≥25).

3. Calving is considered separately in Tables 1 and 2. The rows outlining mitigation triggers for "all year" include all other times of year, which include post-calving and early summer.

4. The Back River Project will have open pits and quarries. The blasting in open pits will typically be much larger than that in quarries – both in the depth of the blasted area and the surface area. Mitigation for the larger open pit blasts is discussed in the WMMP Plan Section 7.1.5.2 – cease blasting when a group of 25 caribou are within 4 km (5 km during calving). Mitigation for the smaller quarry blasts is based on noise level, but for operational use a distance of 2.5 km was used (half of the calving setback for calving period of 5 km).

KIA-NIRB-23: Pre-blasting SOP survey datasheet

References:

Sabina, Back River Project, 2022 Annual Report (March 31, 2023)

- Appendix G, 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
    - Appendix 5A, Wildlife Monitoring and Mitigation for Blasting, Preconstruction, Construction and Operations, SOP ENVIRO-07 (Version C.1, 4 November 2022)

Summary:

Clarification is needed for the use of tower cameras as part of pre-blasting surveys and how desk-based review of caribou collar data (and potentially tower camera data) will be reported. The case-specific blast safety distance should be added on the Pre-blasting Survey Datasheet. Data fields for behavioural monitoring and mitigation/management actions could be improved.

Detailed Review Comment

The KIA is providing some suggestions for improvement and requests for clarification for the Pre-blasting Survey Datasheet (vA.1 from July 2020; Attachment A of the Wildlife Monitoring and Mitigation for Blasting SOP):

- Tower Camera is indicated a type of monitoring for large mammals. However, tower cameras were not noted in Section 2.3 of the SOP for large mammal surveys; only review of caribou collar data and ground-based (height of land) surveys are mentioned. It is unclear whether tower camera data would be used as an additional pre-field, desk-based review (similar to the use of collar data) or if these cameras could be a potential substitute for ground-based surveys. Sabina should clarify the purpose, locations, and other methodology information for the tower cameras (e.g., do they have a 360° view, as required during ground-based surveys?), if this monitoring option is used.

- It is unclear whether the desk-based large mammal surveys (review of caribou collar data and potential review of tower camera data, depending on Sabina's response to the previous bullet) require filling out the Pre-blasting Survey Datasheet. The "Type of Monitoring" field allows for circling one or multiple options. Portions of the datasheet may be difficult to complete for desk-based review (e.g., precise location information, distance from wildlife to blast, animal behaviour) and it is unclear how useful this reporting would be if collar data are either one day behind (during calving and post-calving) or up to one week behind (rest of the year). If review of collar and/or camera data does not require filling out this datasheet, are Project staff required to complete a different form or another kind of reporting when caribou are observed?

- There is a field for "Wildlife Within Trigger Distances?" with Yes/No options. These distances presumably refer to those presented in Tables 1 and 2 of the SOP. However, given that the blast safety distance is determined on a case-by-case basis by the Blasting Manager, it would be better to include a separate field to record the specific blast safety distance, ideally signed off by the Blasting Manager.

- The "Animal Behaviour" field could be improved to record more information for behavioural monitoring to inform adaptive management. For example, separate fields for pre-blasting, during blasting, and post-blasting behaviour would enable more systematic data collection for analysis, and also provide clearer instructions for the surveyor.

- Similarly, the "Notes" field currently has brief instructions to record any mitigation actions. Specific fields should be added to ensure that the required information is recorded, as per Section 4 of the SOP: management action(s) taken, including duration of any blast shutdowns and criteria used to approve resumption of activities; and any communication with the KIA and GN DOE or Conservation Officers.

Minor typo issue: under the "Wildlife Observed?" field, there is a note stating, "(If "No" proceed to Section 4)". The instructions are likely pointing to the Other Information section of the form; however, the headings on the datasheet have no numbering.

Recommendation/Request:

- Please revise the Pre-blasting Survey Datasheet (and the Wildlife Monitoring and Mitigation for Blasting SOP, where appropriate) with the KIA's recommendations in the detailed review comment.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. B2Gold will review and updated the blasting SOP and data sheets to be simpler to use.

2. Note, that formal behaviour monitoring has a specific monitoring form and methods which are recorded separately. The observation field on the blasting data sheet is meant as an incidental observation.

KIA-NIRB-24: Regulatory inspections

References:

Annual Report, Section 4.4 Regulatory Compliance

Summary:

Summary of inspections by regulators and landowner do not indicate what actions were by Sabina in response to issues raised.

Detailed Review Comment

The Annual Report summarizes issues identified by the KIA, CIRNAC and NIRB during their inspections of the project in 2022 but does not indicate what action has been taken by Sabina to address these concerns. In particular,

- KIA noted that culverts at Echo Crossing and Gander need to be installed, and measures should be implemented to mitigate water flowing into the underground portal, and
- CIRNAC noted issues with sediment erosion control measures, storage of hazardous waste and material, operation of a sump, berm integrity, spill remediation, and wastewater disposal from washing vehicles.

Recommendation/Request:

Please include a summary in the Annual Report of Sabina's response to each of the issues raised by regulatory agencies during their 2022 inspections.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

Sabina commits to including a summary in the Annual Report of responses to each of the issues raised by regulatory agencies during inspections going forward.

KIA-NIRB-25: Climate station

References:

Annual Report, Section 4.5.2 Climate and Meteorology

Summary:

Location and relation of Lupin A Station and Goose Station needs to be clarified.

Detailed Review Comment

The total rainfall recorded at the Goose station in 2022 is reported to be lower than the climate normal for 1981-2010 recorded at the Lupin A station. The location of the Lupin A station is not provided, and thus it is not possible to determine if data from the Goose station is representative of Lupin A station precipitation conditions.

Recommendation/Request:

Please describe the applicability of the climate data collected at the Lupin A station to conditions at the Goose station, including what factors were considered when comparing stations.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

Lupin A climate data, in the form of climate normals, is the most applicable climate data available to make comparisons with meteorological data observed at the Goose station. Applicability of the Lupin A Station was determined based proximity and local geography. Lupin A is the closest station to the Goose Station with published climate normals data. The Lupin A Station is located approximately 220 kilometres west and at a similar latitude to that of the Goose Station (i.e., 65°45’33.000 north and 111°15’00.000 west). The physical geography around the Lupin A Station is also comparable to that around the Goose Station, which consists of low topographic relief and a tundra environment.

KIA-NIRB-26: Climate change.

References:

Annual Report Appendix B – 2022 Annual Geotechnical Inspection Report

Summary:

Clarification on incorporation of climate change in the design of project infrastructure and operation.

Detailed Review Comment

The geotechnical inspection is meant to ensure that the project's surface infrastructure maintains permafrost integrity. The Report states that "underbuilding of roads and pads will result in permafrost damage because of thermal erosion, which will require ongoing maintenance and notable remediation costs at closure."

It is not clear whether design and operating considerations account for projected (and observed) climate change in the region, and how climate change is anticipated to affect thermal erosion.

Recommendation/Request:

Please indicate if the Geotechnical Inspection Report's evaluation of project impact on the continuous permafrost incorporates predicted (and observed) climate warming in the region, and how climate change influences anticipated thermal erosion.

Importance of Issue:

Low

B2Gold Nunavut Response:

Yes, design and operational considerations at the Back River project have generally accounted for climate change in the region and the associated thermal impacts. In addition to this, B2Gold have considered the impacts of concentrated surface water flow paths and their associated potential impacts of thermal erosion of ice rich overburden in the critical infrastructure (ponds, diversions, waste storage area) designs.

In general, the concentrated surface flow paths are seen as the primary mechanism for rapid onset of thermal erosion during the operations period. During the operation life of the permitted Back River project, climate change has an impact, but it is often not a significant design driver (often still governed by larger return period flood events and not the changes in the climate or thermal boundary conditions). As the main water management infrastructure is planned to be either decommissioned or breached at closure (for all ponds and dams) the long term climate change (which typically has a larger impact) becomes less critical (as not retaining water behind these structures at closure). Nonetheless climate change has been considered in all phases of the Goose critical infrastructure designs.

As an example, predictions and calculations completed as part of the recent Primary Pond designs did consider climate change. See the attachments submitted as part of the December 2022 "Back River Responses to Primary Pond Report Comments"; specifically, Attachment 2 – Hydrology Update, with an overview of climate change impacts on hydrology, and Attachment 3 – Thermal Analysis, which includes climate change boundary conditions.

Looking at areas of active construction, the primary camp pad area is now at the design thickness (which is a thickness of 2+ m in most areas that are constructed over overburden permafrost). This fill will help

to minimize the thermal impacts to the permafrost in those areas. The roads however are still in a partially built state and need additional fill in multiple areas to help to limit impacts to the permafrost. Many of these roads continue to be in process of being expanded (widened) and /or being built up as more material became available from the developments around Goose and MLA site. A review of all the road and pad thickness will be completed as part of and document in the 2023 Annual Geotechnical Inspection.

The required fill thickness will ultimately be related to the underlying foundation conditions (i.e., thicker fill thickness required over areas with more ice rich overburden permafrost and less fill placed over thaw stable terrain, such as exposed bedrock). The current road thickness is not at final grade and will be built up in most area. The long term plans are to build up the road thicknesses (typically to the range of 1.5m). Road monitoring for impacts to permafrost that include early onset of thermal erosion will be included as part of the site-specific ground thermal monitoring plan that B2Gold is current developing. This comment (KIA-NIRB-26) will be revisited and further commented on as part of the 2023 Annual Geotechnical Inspection (AGI).

KIA-NIRB-27: Water crossings.

References:

Annual Report Appendix B – 2022 Annual Geotechnical Inspection Report, Attachment 1 – Summary of 2022 AGI Observations and Recommendations

Summary:

No timetable is provided for revisiting and enhancing drainage at Goose Neck Crossing area.

Detailed Review Comment

The summary indicates that "Sabina also indicated that they would revisit the Goose Neck crossing area to see if additional culvert or drainage measures will be required or suggested to avoid any excessive ponding and/or to reduce the likelihood of the road washing out in a larger storm event."

No timeline is given for this assessment of whether additional mitigation measures are required for the Goose Neck crossing area.

Recommendation/Request:

Please indicate when an assessment will be conducted to determine whether additional culvert or drainage measures are required for the Goose Neck crossing, and if they are required, when they will be implemented.

Importance of Issue:

Low

B2Gold Nunavut Response:

B2Gold Nunavut will provide this information as part of the 2023 Annual Report.

KIA-NIRB-28: Marine shipping monitoring.

References:

Annual Report Appendix G – 2022 Pre-construction Wildlife Mitigation and Monitoring Plan, Section 7. Marine Mammals and Seabirds.

Summary:

Inconsistency in marine mammal and seabird observation by transport vessels.

Detailed Review Comment

Marine mammal and seabird observations are required to be recorded by vessel crew members during all sailings.

However, Section 7.1.2 Results and Discussion indicates that surveys were not conducted on all vessel trips. It appears that surveys were not conducted for the following trips:

- MV Aujaq August 23-28, 2022 inbound trip,
- MV Donaugracht August 13-23 inbound trip and September 3 outbound trip,
- MV Henry Christoffersen September 7-12 inbound trip, September 17 outbound trip, September 24-October 5 inbound trip, October 8 outbound trip,
- Risco Reegen October 22 inbound trip, undated outbound trip.

Recommendation/Request:

Please explain what procedures have been implemented to ensure that gaps in vessel monitoring will be avoided in future for marine mammal and seabird sightings for all marine shipping trips.

Importance of Issue:

High

B2Gold Nunavut Response:

Please see the response to KIA-NIRB-03.

KIA-NIRB-29: Species at risk

References:

Annual Report Appendix G – 2022 Pre-construction Wildlife Mitigation and Monitoring Plan, Section 7. Marine Mammals and Seabirds.

Summary:

Complete documentation of sightings, observations, and locations of marine mammals and seabirds on marine shipping trips.

Detailed Review Comment

One Red-necked Phalarope (listed as special concern federally and vulnerable in the territory) was observed during a vessel trip but the location was not recorded. Documenting location of sightings for marine mammals and seabirds is important to identify sensitive habitat that could be adversely affected by shipping activity and to assess risk of shipping on observed species.

Recommendation/Request:

Please ensure that vessel crew members are trained in the importance of providing detailed records of marine mammal and seabird observations during vessel trips, including all the data listed in Section 7.1.1.2. Please ensure that survey records are reviewed periodically by a qualified person during the shipping season so that proper documentation is occurring. If required information is missing, the crew members responsible for the missing observations should be provided with additional training.

Importance of Issue:

High

B2Gold Nunavut Response:

Please see the response to KIA-NIRB-03.

KIA-NIRB-30: Seal lairs

References:

Annual Report Appendix G – 2022 Pre-construction Wildlife Mitigation and Monitoring Plan, Section 7.2 Seal Lair Mitigation and Monitoring.

Summary:

Specification of minimum setback distance for identified seal lairs needs to be provided.

Detailed Review Comment

Sabina indicates that "if construction of the on-ice landing strip or the WIR [Winter Ice Road] occurs during the seal pupping period (i.e., after February 15), then pre- construction surveys will be conducted, and construction will be altered to avoid any identified seal lairs".

Has a recommended minimum setback distance been identified between seal lairs and construction activity?

Recommendation/Request:

Please identify a minimum setback distance to separate construction activity from any known seal lairs, based on the best available science on protecting seals from disturbance during the reproductive period.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

1. A minimum setback for seal lairs is listed in the WMMP Plan Section 14.1.3.3 Winter Ice Road Management – as 50 m.

KIA-NIRB-31: Spill modelling

References:

Annual Report Appendix I – Oil Pollution Emergency Plan, Section 5.3 Bathurst Inlet Physical Environment and Sensitivities

Summary:

Incorporation of climate change into spill modelling is required.

Detailed Review Comment

Sabina concludes from its spill modelling that "Regardless of diesel amounts, spill occurring in mild to moderate wind conditions generally did not progress past a few kilometres from the source location."

More intense and more frequent storms due to climate change may generate stronger winds in the project area. It is not clear if spill modelling considers the impact of climate change on spill dispersion.

Recommendation/Request:

Please incorporate the impact of climate change (i.e., greater wind speeds and more frequent storms) into spill modelling and discuss how it is expected to affect spill dispersion.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

B2Gold Nunavut commits to including the revisions to Section 5.3 of the OPEP to incorporate the impact of climate change considerations in the 2023 Annual Report.

KIA-NIRB-32: Fuel transfer procedures

References:

Annual Report Appendix I – Oil Pollution Emergency Plan, Annex 5 OPPP & OPEP Specifics, Section 7.1.3 Communications

Summary:

Clarification of major and severe environmental conditions that would affect fuel transfer from ship to shore.

Detailed Review Comment

Sabina lists conditions under which the transfer of fuel must be stopped immediately, including if there is a *"major increase in wind and/or swells (supplier)" and if there is "severe deterioration in ice or visibility conditions."*

These are generalized conditions that are not well-defined, and thus the determination of what is "major" or "severe" could be subjective, differing between individual operators.

Recommendation/Request:

Please identify specific parameters that define what constitutes a 1) major increase in winds above which fuel transfers should be stopped and 2) severe deterioration in ice or visibility conditions below which fuel transfers should be stopped.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

B2Gold Nunavut commits to including the revisions to Annex 5 of the OPEP in the 2023 Annual Report.

KIA-NIRB-33: Phytoplankton sampling at reference stations

References:

Annual Report Appendix J – Marine Monitoring Report, Section 4.3 Phytoplankton

Summary:

Affects of reduced sampling at reference station on statistical data needs to be discussed.

Detailed Review Comment

Sabina reports that samples were collected in triplicate at the MLA stations but only in duplicate at the reference stations *"due to equipment and time constraints."* Information should be provided on what will be done to prevent these problems in future. Reduced sampling at the reference stations affects the statistical rigour of comparisons between sites.

In addition, phytoplankton samples were only collected at REF-04 and REF-05, not at REF-01 and REF-02.

Recommendation/Request:

Please explain how these sampling issues will be avoided in future so that the same number of samples are collected at all stations, and all reference stations are sampled. Please discuss how reduced sampling may affect interpretation of the 2022 results.

Importance of Issue:

Low

B2Gold Nunavut Response:

The filtering apparatus supplied to Nunami Stantec during the August 2022 monitoring event was malfunctioning during the onset of filtering activities. Nunami Stantec staff were able to mitigate the apparatus issues using materials available on-site; however, the remedied apparatus resulted in exceptionally long filtering times on the order of 10 to 20 times what would be considered a 'normal' filtering time. Although triplicate samples were collected at each station, Stantec staff did not have sufficient time to filter all samples prior to the charter flight leaving the site. As such, Nunami Stantec staff prioritized filtering duplicate samples at all locations, then proceeded with filtering the remaining triplicate samples until it was time to leave the site. Only the MLA stations were filtered in triplicate for this reason.

During the April 2023 monitoring event (not yet reported on), Nunami Stantec provided a more thorough bench test of the filtering apparatus prior to going to site, thereby confirming that the apparatus was functioning properly. No filter issues occurred during the April 2023 program, and it is anticipated that the same apparatus will be used for future monitoring events. As such, no phytoplankton sampling issues are expected for future monitoring events.

Phytoplankton samples were not collected at REF-01 and REF-02 as these sites were not deemed as appropriate reference location sites. Nunami Stantec field staff conducted visual observations of the sediment from several reference sites that were explored until they found an approximate match to the sediment encountered at the MLA stations. REF-01 and REF-02 were not considered appropriate matches to the MLA stations; therefore, no phytoplankton sampling or water quality sampling was conducted at these stations. Grain size analysis samples were collected from REF-01 and REF-02 to quantitatively confirm Nunami Stantec's field-based opinion that the sediment did not match what was encountered at the MLA stations.

It is not likely that the reduced sampling rate at the reference stations affected the interpretation of results. The chlorophyll a concentrations reported at the reference stations are similar to each other, both between duplicates collected from the same reference station and between the reference stations themselves This is expected as the two reference stations were collected very close to each other and from the same depth. As such, it is expected that triplicate samples, had they been collected, would likely have had similar concentrations to the duplicate results.

KIA-NIRB-34: Chlorophyll measurements

References:

Annual Report Appendix J – Marine Monitoring Report, Section 4.3 Phytoplankton

Summary:

Clarification of what falls in and out of established range for Chlorophyll measurements.

Detailed Review Comment

One Red-necked Phalarope (listed as special concern federally and vulnerable in the territory) was observed during a vessel trip but the location was not recorded. Documenting location of sightings for marine mammals and seabirds is important to identify sensitive habitat that could be adversely affected by shipping activity and to assess risk of shipping on observed species.

Recommendation/Request:

Sabina reports that chlorophyll-a ranged from 0.418 to 0.436 µg/L at reference stations and *"generally 0.142 to 0.270 µg/L at the MLA stations."* It is not clear what is meant by "generally." Were there some samples outside this range? If so, they should be reported and discussed.

Importance of Issue:

Low

B2Gold Nunavut Response:

The range of chlorophyll concentrations at the MLA stations ranged from a mean low of 0.142 ug/L to a mean high of 0.270 ug/L. As such, the ranges presented in the report are correct, and the term 'generally' will not be used in future reports for this scenario. Note that the ranges presented here represent averages of the duplicate or triplicate samples collected at the reference stations and the MLA stations, respectively, and that individual samples may be present outside of these ranges. The chlorophyll a sample results for each sample are provided in Appendix E of the report.

KIA-NIRB-35: Fish Passage

References:

4.5.8 Freshwater Aquatic Environment - Project Certificate Condition No. 26

Summary:

Clarification of what falls in and out of established range for Chlorophyll measurements.

Detailed Review Comment

The results indicate stream velocities were mitigated by the installed rock weirs in 2021 and 2022 to below maximum thresholds for Arctic grayling. No information is provided on whether similar results are predicted for expected future stream velocities.

Recommendation/Request:

Perform a stream flow study to determine if the rock weir structures will maintain <1.5 m/s maximum allowable thresholds for Arctic grayling under all expected spring flow conditions.

Importance of Issue:

High

B2Gold Nunavut Response:

The Rascal Stream diverted flows, modelled velocities, and a fish passage assessment downstream of Gosling Pond 1 to Goose Lake have been assessed in Golder's 2020 *Fish Passage Evaluation, Mitigation, and Monitoring for the Rascal Stream Diversion* study (Attachment A. This study has been submitted and reviewed by DFO. The results of the velocity modelling was that mean channel velocities remain below 1.6 m/s at the single governing cross-section and below 1.2 m/s for all other assessed locations for a June 90th percentile flow rate, without the installation of rock weir structures. June flows were the greatest predicted flows, therefore the June 90th percentile flow rate was selected as a representative high flow condition for fish passage assessments.

Velocity mitigation (rock weir structures) were recommended for two segments within the Gosling Pond 1 to Goose Lake reach to improve fish passage for Arctic Grayling and were installed during the summer of 2020. Observations from the 2021 and 2022 freshet Arctic Grayling monitoring programs (Golder 2022 and WSP 2023) indicate that adult Arctic Grayling can navigate within the Goose Lake to Gosling Pond 1 reach, and that the rock weir structures were aiding adult Arctic Grayling by diversifying flow conditions for upstream passage of fish and providing velocity reductions.

Based on the above model results for a June 90th percentile flow rate without rock weir structures and observations during consecutive freshet periods, B2Gold is of the opinion that no additional desktop stream flow study is required to determine if the rock weir structures will maintain <1.5 m/s maximum allowable thresholds for Arctic grayling under expected spring flow conditions. Furthermore, B2Gold has committed to monitor the Arctic Grayling migration period during freshet, for up to 6 years with duration and frequency to be based on monitoring results, to determine if the rock weir velocity migration are functioning effectively for Arctic Grayling. Additional details on the monitoring commitments are provided in Attachment A Golder's 2020 Rascal Stream Fish Passage Evaluation – Addendum. This monitoring plan has submitted and reviewed by DFO.

KIA-NIRB-36: Fish Passage

References:

4.5.8 Freshwater Aquatic Environment - Project Certificate Condition No. 26

Summary:

The installation of the Rascal Stream diversion channel would be the next step, followed by monitoring of flows and fish movements under spring flow conditions to evaluate the effectiveness of mitigations and determine whether additional velocity mitigation is required in Rascal Stream West. Collaboration with DFO, KIA, and other interested parties will continue into 2023.

Detailed Review Comment

KIA needs to review the design information for the diversion channel as well as any modelling that has been performed to determine if flows in the channel will maintain <1.5 m/s maximum allowable thresholds for Arctic grayling under all expected spring flow conditions.

Recommendation/Request:

Please provide diversion channel designs and any flow modelling.

Importance of Issue:

High

B2Gold Nunavut Response:

The diversion channel's conceptual design, flows, resulting velocities, and a fish passage assessment were completed in Golder's 2020 *Fish Passage Evaluation, Mitigation, and Monitoring for the Rascal Stream Diversion* study (Attachment A). This study has been submitted and reviewed by DFO. The report included the following summary for the fishway design:

- The channel is approximately 115 m in length with a slope of 0.002 m/m (0.2%).
- The diversion channel consists of a low-flow channel section and a high flow channel section where the high flow channel section ties-in with the existing ground.
- The conceptual diversion channel design includes well-graded rock (100 to 200 mm diameter) lining the channel, with the voids filled in with gravel or smaller cobbles as available on site.
- The channel lining for the diversion channel is designed to the 1-in-100-year flow event.
- Representative flows were modelled to support channel sizing and assessment of fish passage through the channel, and for June, the Q90 flow is estimated to be 1.1 m3/s for the diversion channel, resulting in an estimated maximum water depth of 0.36 m for a typical cross-section, an average water depth of 0.18 m, a top width of 8.3 m, and an average flow velocity of 0.69 m/s.
- The flow velocities at the June Q90 flow within the diversion channel are expected to result in a swim distance before fatigue for Arctic Grayling of 78 m (assuming a fork length of 25 cm for an adult Arctic Grayling; based on 50% prediction interval from salmonid fatigue equation [Katopodis and Gervais 2016]).

- The mapped diversion channel length is 115 m, but it is anticipated that backwater effects from Gosling Pond 1 will reduce the effective velocities in the downstream reach.

B2Gold is committed to provide as-built drawings and results from fish and fish habitat monitoring post-construction, including results from monitoring during the spring 2024 freshet. Additional details on the monitoring commitments are provided in Golder's 2020 Rascal Stream Fish Passage Evaluation – Addendum. This monitoring plan has submitted and reviewed by DFO.

KIA-NIRB-37: Desalination discharge

References:

Section 4.5.12 Marine Environment - Project Certificate Condition No. 62; Appendix J

Summary:

Sabina collected control and discharge area samples from the MLA during desalination activities in August of 2022. There were no exceedances of CCME at either the Marine Laydown area or the reference site. Phytoplankton biomass (as Chlorophyl a) was slightly higher at the reference site, but within previous natural variability.

Detailed Review Comment

Desalination output into the environment is not provided in the methods or results summary. Is it just high salinity brine, as suggested in Appendix J? What is the average rate of discharge?

Recommendation/Request:

Please provide information on the discharge to the marine environment.

Importance of Issue:

Low

B2Gold Nunavut Response:

Nunami Stantec sampled the water in the marine environment at the discharge pipeline location (MLA station BRP-46) during the August 2022 monitoring event and the results are presented in the report.

Potable water is extracted for the MLA camp via the desalination plant and the higher salinity brine reject is discharged back to the receiving environment. The average rate of discharge is 2-3 m3/day.

KIA-NIRB-38: Underground Ramp

References:

Operations Overview \ 2022 HIGHLIGHTS AND CHALLENGES

Summary:

Approximately 1,500 m of exploration underground ramp completed.

Detailed Review Comment

No information about the development of the exploration underground ramp was included in the 2022 Annual Report. KIA's consultant should indicate the conditions encountered during the construction of the exploration underground ramp. In particular, the consultants should indicate if permafrost conditions were encountered during the excavation of the ramp, or if inflow of saline water or freshwater was experienced during the development of the ramp.

Recommendation/Request:

In case inflow into the ramp was experienced, the consultants should indicate the type of water (saline or fresh), the amount, the quality and the discharge point.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

Due to the installation of a fence around the permitter of the exploration underground ramp and a fully walled and enclosed steel barrier that extends approx. 500m from the ramp entrance minimal inflows were experienced at the exploration underground ramp during freshet. No saline water has been experienced during the development of the ramp.

KIA-NIRB-39: Project Certificate Condition No. 18

References:

Methods

Summary:

Field permeability (packer testing) was also completed on a subset of the drill holes. Initial results of drilling at the western ridge indicate that the bedrock in the area does not have a high permeability, with few joints and fractures present, as well as clay infilling and no visible ice within the drill hole.

Detailed Review Comment

Packer Testing should be conducted only in bedrock formations. Hydraulic conductivity testing using different methods such as Single Well Response Tests (SWRTs) could be considered for select formations, unfrozen soils, or areas of thick clay infilling. The tests should be conducted during the open season and within the shallow strata above the permafrost.

Recommendation/Request:

The evaluation of the water quality and quantity circulating within the infill geotechnical material should be determined and its effect (in terms of thermal alteration) on the permafrost should be included in the annual report and submitted to the Nunavut Impact Review Board.

Importance of Issue:

Low

B2Gold Nunavut Response:

It should be noted that the Tailings Storage Facility (TSF) is not in the current mine plans. Tailings deposition would be completed into the mined out (empty) pits (Tailings Facilities or TFs). B2Gold only plans to proceed with construction of the TSF in the future if water or waste management plans require. This would be reassessed in the coming years (post mill start up) as the mine plans on site advance with ongoing development and exploration.

As per the Type A water license requirements, B2Gold will have to submit an engineering report for the TSF 60 days before construction. This package would provide additional design and characterization details for the TSF and immediately surrounding areas. B2Gold commits to having discussions around this topic as part of the design and construction process for the TSF.

For some additional context, comments on packer testing, SWRTs, percolation testing and current design considerations are overviewed below.

Additional comments:

It is agreed that packer testing is typically best completed in bedrock formations. However, frozen permafrost in cold regions, also allows some opportunity for packer testing to be attempted in overburden sections. Due to the typically low permeability of the frozen soils around the Back River project, past packer testing in the permafrost has been of limited success (for example packer testing attempted as part of the 2021 drilling activities at the Primary Pond footprint). The primary complication with the use of single well response tests would be similar to the issues experienced with packer testing. The SWRTs typically involve pumping at a constant or variable rate and measure changes in water levels, and/or measuring responses to a water-level displacement from either a slug (injection) or bail (removal) test. In frozen environments, and with ice rich soil and negative (often -4^{o}C or colder) ground

temperatures, typically the ground responses are very slow and the water in the holes end up freezing before useful information can be collected. Alternately very high pressures have to be introduced to the system, which can result in some located hydro jacking, and/ or highly saline water (often at warmer temperatures) end up having to be used which can promote some localized melting around the boreholes. The latter testing approaches will give some results but end up leading to erroneous or higher hydraulic conductivity readings that are not reflective of actual ground characteristics.

As a result, and as detailed in the sitewide earthwork technical specifications, around the water and tailings storage facility, aadditional characterization of the overburden and permafrost is planned to be completed immediately before construction (typically in winter). This would be planned to be done through a series of percolation test holes.

The percolation testing will be comprised of:

- Drilling of spaced test holes down at least one run (a couple meters) into bedrock. Note for the western ridge at the TSF area this would be a series of drill holes spaces a couple hundred meters apart.

- Collection of samples (typically samples collected every 0.5m in the top approx. 5m of each hole and then at approximately 1m intervals below that.

- Completing laboratory testing on all of the collected samples. This will be mainly index testing (i.e., visual identifications, moisture contents, some particle size distribution and Atterberg Limit testing as applicable, and salinity testing on subset of the sample).

- Completing of the percolation (more falling head) type testing on site. This will involve filling the holes with lukewarm water (typically more in the 15oC range) and then measuring the drop in head (elevation) with time. This ends up being somewhat like a modified SWRT.

An example of this additional characterization being carried out immediately before construction, would be the percolation hole drilling and testing that was completed in quarter one 2023 at the Primary Pond location. Generally the percolation testing is planned for any pond or containment structure where the designs will ‘key-into’ the underlying permafrost.

In addition to the additional site investigate data, for the critical infrastructure, the design concepts typically include elements of:

- Having adequate fill thickness to promote the aggregation / raising of the active layer to at least the ground level, or into (within) the infrastructure fill.

- Cutting off or having a key trench that goes below the active layer into the continuous permafrost foundation. The cut-off is then typically provided by an impermeable (e.g., liner) design element and maintain a frozen foundation.

- Setting normal operating levels that are typically below the active layer of the surrounding ground.

    - In the case of the TSF tailings can also be used to develop tailings deposition landforms (beach) that can help to mitigate any potential for seepage (stretch out seepage pathways) and reduce thermal loading adjacent to areas of critical infrastructure, such as dams that rely on permafrost for containment and stability.

Attachment B presents a past perimeter seepage analysis that was done for the TSF in 2018. As detailed above, B2Gold commits to having discussions around this topic as part of the design and construction process for the TSF. These potential future discussions (if the TSF is brough back into the mine plans) may involve or require revisiting the past seepage analysis work that was previous completed. At this time, the construction of the TSF is not part of the current mine plans.

KIA-NIRB-40: Appendix D. Sabina's Back River Blasting Plan for Plant Site and Portal Decline

References:

Blasting

Summary:

The blasting plan focuses on assessing the radius of which detonations may impact fish or fish habitat, and to provide mitigation measures to avoid the death of fish and harmful alteration, disruption, or destruction (HADD) of fish habitat.

Detailed Review Comment

Explosives used in construction have been implicated as sources of NO3 (Nitrate) or NH4 (Ammonia). A Nitrate Management Plan was not included in the 2022 Annual Report. The actual pathway of the nitrates into the groundwater/surface water can vary and should be assessed prior to start blasting.

Recommendation/Request:

To ensure all potential pathways are being actively managed, in-house procedures should be developed to ensure that corrective actions should be implemented in case of increase of NO3 or NH4 in groundwater and surface water.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

B2Gold highlights that providing a blasting plan that focuses on assessing the radius of which detonations may impact fish or fish habitat, and to provide mitigation measures to avoid the death of fish and harmful alteration, disruption, or destruction (HADD) of fish habitat was a direct requirement of term and condition 25 of Back River Project Certificate.

KIA-NIRB-41: Terrestrial Environment / Permafrost Monitoring

References:

Project Certificate Condition No. 12

Summary:

No information has been provided.

Detailed Review Comment

Sabina states on page 4-33 that "A summary of that [ground temperature] data is presented in the 2022 [Annual Geotechnical Inspection] AGI report (Appendix B).". However, no ground temperature data are presented in the 2022 AGI (dated March 31, 2023).

It is worth noting that the 2022 AGI report highlights specific areas for which ground temperature monitoring should be completed, such as Marine Laydown Area (MLA) airstrip (Attachment 2 of 2022 AGI report).

Recommendation/Request:

It is requested that Sabina provides updated data on the ground temperatures, i.e., the permafrost characteristics, as part of the annual AGI reports, regardless of project phase and/or construction activities.

Importance of Issue:

Moderate

B2Gold Nunavut Response:

B2Gold will provide an update on the ground temperatures, thermal monitoring, as part of the 2023 AGI report.

For clarity, there was a typographical error. The comment on page 4-33 should have read "A summary of that [ground temperature] data is presented in the 2021 [Annual Geotechnical Inspection] AGI report (Attachment 2)." The text should have said 2021 and not 2022 and the reference should have been to Attachment 2.

The summary of the past ground temperature data is presented in Attachment C (attached to these IR responses). As part of the site wide thermal monitoring plan, currently being worked on, B2Gold is planning to complete an audit to see if any additional readings can be collected from any of the historic ground temperature cable (GTC) locations.

As part of the 2023 activities, a series of ground temperature cables have been recently installed at specific active construction areas (such as at the Primary Pond location and at the Goose Camp site). Measurement from these recently installed GTC will be included as part of the 2023 annual AGI report.

KIA-NIRB-42: Effects Assessment for the Employment VSEC

References:

FEIS Volume 8, Section 3.5.5.3

Summary:

The Project is anticipated to increase employment and income levels within the Kitikmeot Region and Nunavut, as well as elsewhere in Canada. The provision of employment opportunities has the potential to result in substantial positive benefits for the Kitikmeot. Increased income and employment levels are anticipated to have a positive residual effect on the Employment VSEC (FEIS Volume 8, Section 3.5.5.3).

Detailed Review Comment

The FEIS notes the expectation that the provision of employment opportunities has the potential to result in substantial positive benefits for the Kitikmeot. Inuit are mainly for support (24) and para-professional (18) positions at Sabina's operations. Few or no Inuit are in professional (2) and management (0) jobs (See Table 4.3).

Also striking is the median income for non-Indigenous residents of Nunavut is $76, 379 higher than Inuit residents of Nunavut (page 28).

Sabina identifies the top three reasons for Inuit employee turn-over in 2022.

In Appendix C page 35 Sabina refers to career development plans for every Inuit employee over the next two years.

In Appendix C. page 34, Inuit employees ask for increased recruitment and employment of Inuit, especially in small communities.

Recommendation/Request:

What specific mitigation measures is Sabina taking to 1) increase Inuit employees in professional and management positions, 2) close the wage gap and 3) decrease turn-over in order to reach "substantial positive benefits" for Kitikmeot Inuit?

KIA strongly supports career development plans for every Inuit employee as a commitment and expects the plans to be in place within 2 years, and to be renewed and updated regularly.

Importance of Issue:

High

B2Gold Nunavut Response:

B2Gold continues to work towards maximizing Inuit employment at the Back River Project in all career categories. In 2022, 80 Inuit worked at the Project which represents an increase of 67 workers from 2021. As the Project nears operations, additional Inuit specific employment and training initiatives will be introduced and targeted across career levels.

Career development plans are being created for each interested Inuit employee at the Project and serve as an important means for Inuit to plan the next steps in their careers, including potential advancement into professional and management positions. A recent example is a Kitikmeot Inuk employee who has

advanced from a skilled trade position at the Project to leadership and continues to develop supervisory skills. Additionally, B2Gold has advanced a second Kitikmeot Inuk employee from a front-line position into a heavy equipment operator role. These plans will identify the necessary skills and experience to be developed and will identify any training required before advancing further. B2Gold expects to address the current backlog in creating career development plans for Inuit over the next 18-24 months. Following this, career development plans are anticipated to be created for new Inuit employees after 9 rotations of their start of employment and be regularly updated thereafter.

In the meantime, existing supervisors and managers at the Project are encouraged to identify Inuit individuals with the potential and/or desire to advance into professional and management positions. Managers are to provide support to these individuals where possible and identify a need for a career development plan to the Human Resources department. B2Gold also supports Inuit post-secondary educational initiatives within communities, with the goal of increasing Inuit educational attainment and employment rates over time (e.g., through local achievement awards, and a post-secondary education application fee program). B2Gold also maintains active relationships with various working groups and government agencies tasked with increasing Inuit employment and skills development in the Kitikmeot Region.

We do not discriminate in our pay practices between northern and southern employees. No ‘wage gap’ exists between Inuit and non-Inuit who work in the same position at the Project, the only exception to this is individuals with historically higher rates of pay who maintain those rates. Wages for positions at the Project are based on industry averages and adjusted to reflect realities of living and working in Nunavut.

Turnover is being addressed by B2Gold in an ongoing manner. B2Gold regularly tracks reasons for Inuit turnover and monitors for emerging trends. We also expect turnover to reduce and stabilize following construction, as has been evidenced at other northern mining operations. Other notable initiatives B2Gold is employing to address turnover include:

- We are currently working with a Kitikmeot-based, Inuit-led organization to develop a comprehensive and culturally relevant Inuit employee support program. This is expected to be rolled out before the end of 2023.

- Construction of a new hard wall camp, with improved accommodations and amenities over the existing exploration camp, is expected to improve site conditions and support a decrease in turnover.

- Career development plans for Inuit employees are also expected to support a decrease in turnover.

- B2Gold routinely re-engages qualified Inuit employees who have worked on the Project previously, where appropriate.

KIA-NIRB-43: Effects Assessment for the Education and Training VSEC

References:

FEIS Volume 8, Section 3.5.5.3

Summary:

The Project is anticipated to increase the capacity of the labour force in the Kitikmeot Region. At present, Kitikmeot residents face a number of barriers to employment including lack of experience and opportunity. The Project has the potential to alter outcomes for those who become employed directly or indirectly, increasing the ability of individuals and communities to engage in the wage economy. The increased capacity of the labour force is anticipated to have a positive residual effect on regional levels of employment generally, and on the Employment VSEC (FEIS Volume 8, Section 3.5.5.3).

Detailed Review Comment

What specific mitigation measures does Sabina propose to ensure Inuit are training in transferrable skills to increase the capacity of the Kitikmeot Inuit labour force?

Recommendation/Request:

What specific mitigation measures does Sabina propose to ensure Inuit are training in transferrable skills to increase the capacity of the Kitikmeot Inuit labour force?

Importance of Issue:

High

B2Gold Nunavut Response:

B2Gold reported information on current training programs and jobs offering transferable skills in its 2022 Socio-Economic Monitoring Report (e.g., in Appendices D and F). As the Project nears operations, additional employment and training initiatives will be introduced for Inuit and will be targeted across career levels. We anticipate the list of transferable skills offered at the Project to grow over time, and for Inuit to be provided with opportunities to obtain these skills. However, some of the most important transferrable skills currently offered are gained through day-to-day employment at the Project. Through this many Inuit have gained work-related and mining-specific experience, developed life skills, obtained training, and have been provided opportunities to advance further in their chosen careers.

B2Gold is also working to secure partnerships that will develop projects in Kitikmeot Region communities funded through the IIBA's Regional Wealth Program. This program aims to create long-term employment opportunities in Kitikmeot communities outside of mining and is supported by a substantial initial investment by B2Gold (i.e., $4 million). It is anticipated that once local projects begin to be funded through this program they will also help increase the capacity of the Kitikmeot Region's labour force in non-mining fields.

KIA-NIRB-44: Effects Assessment for the Education and Training VSEC

References:

FEIS Volume 8, Section 3.5.5.4

Summary:

The Project may create increased demand for education and training programs as a result of the provision of employment and contracting opportunities. Overall, increases to the demand for education and training are considered to have a positive residual effect on the Education and Training VSEC (FEIS Volume 8, Section 3.5.5.4).

Detailed Review Comment

Sabina conducted a 2022 Inuit Personnel Survey Report for the Back River Project. At Appendix C, page 34, Sabina summarized feedback from Inuit employees that additional training and career advancement opportunities are required.

Recommendation/Request:

In addition to the Career Advancement Plans, what is Sabina doing now to increase the amount of training of Inuit for supervisory positions, and transferable skills in preparation for operations?

Importance of Issue:

High

B2Gold Nunavut Response:

Career development plans with B2Gold are available for Inuit employees and create an important avenue for individuals interested in supervisory and professional positions. Additional experience and training must occur before these achievements can be fully realized. We continue to make meaningful gains in this area. For example, 91,171 hours of Project labour were performed by Inuit in 2022 (representing an increase of 77,434 hours from 2021), and 3,259 hours of Inuit training were provided (representing an increase of 3,167 hours from 2021). B2Gold looks forward to additional successes in these areas in the years to come.

There are further initiatives B2Gold is undertaking to increase the amount of Inuit training for supervisory positions, and transferable skills in preparation for operations, including:

- On site trainers will be hired to increase B2Gold 's capacity to deliver training programs.
- B2Gold is currently developing a mentorship program to partner new or less experienced Inuit employees with more senior employees, to support informal training and employment guidance through mentorship.

KIA-NIRB-45: Terms & Conditions for the Education and Training VSEC

References:

Term and Condition 73

Summary:

The Proponent is encouraged to work with training organizations and/or government departments offering mine-related or other training to ensure that Project-specific training programs can yield additional opportunities for residents and employees to gain meaningful and transferable skills and certifications. (Term and Condition 73)

Detailed Review Comment

Sabina notes that Inuit training was focused on site orientation (256), Inuit cultural awareness (75) and WHMIS (41). No Inuit were trained in First Aid, Mine Arc, and WSCC Supervisor training. However non-Inuit were trained in these areas (Table 7.1, p. 50).

Recommendation/Request:

Sabina should do more to increase the training of Inuit in transferrable skill areas.

Importance of Issue:

High

B2Gold Nunavut Response:

As already noted in other responses to KIA, training of Inuit in transferrable skills at the Project is anticipated to increase as our construction activities proceed and we move into operations. However, B2Gold will also be developing an Inuit Training Plan to help guide our activities in this area. We anticipate this plan will be integrated with existing socio-economic management plans for the Project, and reflect commitments made within those plans and in the IIBA. B2Gold anticipates an initial version of this plan will be available to parties by March 2024 or earlier.

KIA-NIRB-46: Terms & Conditions for the Health and Community Well- Being VSEC

References:

Term & Condition 83

Summary:

The Proponent is strongly encouraged to communicate and collaborate with the GN and the NHC on potential housing initiatives with a view to enhancing employee access to a range of housing options, including homeownership.

Initiatives may include, but are not limited to, the provision of financial literacy, financial planning, and personal budgeting training (Term & Condition 83).

Detailed Review Comment

Sabina states at page 55 that it is developing a specific Inuit Employee Support Program which may involve financial literacy and related training.

Recommendation/Request:

KIA is supportive of an Inuit Employee Support Program and is seeking a clear plan from Sabina to develop training on financial literacy, financial planning and personal budget training. This will assist in Sabina meeting its FEIS predictions of increased positive impacts for Inuit.

Importance of Issue:

High

B2Gold Nunavut Response:

B2Gold is committed to ensuring KIA is engaged in the development of its Inuit Employee Support Program, which will contain financial literacy, financial planning, and personal budget training. A draft version of this program is currently being developed by a Kitikmeot-based, Inuit-led organization and will be shared with KIA for comment once complete.

2.2 RESPONSE TO CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA

CIRNAC-#1: Permafrost Mapping and Monitoring

References:

- Back River Project Certificate (PC) Term and Condition (T&C) #11: Terrestrial Environment – Permafrost Mapping and Monitoring
- Back River Project 2022 Annual Report, Page 3-1, 4-30 to 4-31
- Sabina's Responses to 2021 Annual Report Comments

Issue/Rationale:

Project Certificate T&C #11 states that "During construction, the Proponent shall, on an annual basis, provide additional permafrost mapping information documented in fulfillment of this Term and Condition in the Proponent's annual report to the Nunavut Impact Review Board."

Sabina did not address comments related to CIRNAC #1 (Permafrost Mapping and Monitoring) in their Responses to 2021 Annual Report Comments. Sabina did not provide permafrost mapping in their 2022 Annual Report.

In their 2022 Annual Report, Sabina stated that construction activities were underway in 2022. These construction activities included construction for fuel tanks at Goose Property and at the Marine Laydown Area (MLA); expansion of the Goose Property and MLA site road network up to approximately 20 km; and completion of pads for the permanent camp, plant, and fuel storage areas.

No information was included in the 2022 Annual Report with regard to permafrost and ground temperature data during the 2022 construction activities listed above. The annual permafrost monitoring/mapping information is required to document permafrost temperature, thickness of seasonal thaw, and amount of ground ice in the project development area. This information should be made available to inform the detailed design of project infrastructure.

In their 2022 Annual Report, Sabina states that as part of the 2023 scope of work, they will revisit past thermistor and Ground Temperature Cables (GTCs), and will take readings where possible, and generate an initial draft of Goose site Thermal Monitoring Plan. Sabina also describes that in 2023, GTCs will be installed within, upstream, and downstream of the proposed Primary Pond structure. It is unclear if Sabina is also considering installing new GTCs around the Project Area including both Goose and the MLA sites.

Recommendation:

CIRNAC recommends that Sabina:

a) Provide ground temperature/permafrost monitoring data for the fuel tank construction and other construction-related activities that occurred in 2022.

b) Provide permafrost monitoring and ground temperature data collected during construction, and on any subsequent phases, in the future annual reports.

c) Confirm what parts of the Project Area will be included in the 2023 Thermal Monitoring Plan.

B2Gold Nunavut Response:

B2Gold will provide an update on the ground temperatures, thermal monitoring, as part of the 2023 AGI report.

1. No ground temperature monitoring data was collected for the fuel tank farm construction. This was not collected as the foundation of the fuel tanks are on bedrock (i.e., not on permafrost overburden). As part of the site-wide thermal monitoring plans B2Gold will consider installing a GTC near (adjacent to) each of the tank farms. At the MLA access to a drill is currently limited, thus installation of a GTC at that location would be a secondary priority and may be delayed until appropriate equipment is in the area.

2. At the time of this response, 2023 GTCs have been installed at the Primary Pond area and at the Goose Camp Pad. Measurements from these cables will be included in the 2023 AGI report.

3. The Back River site wide Thermal Monitoring Plan is currently in development. The focus of the initial monitoring will be around active construction or project areas. The initial sites for thermal monitoring are expected to include: Primary Pond, Goose Camp, Goose Tank Farm (to be installed), downstream of the future Echo Waste Rock Storage Area (WRSA).

CIRNAC-#2: Permafrost Monitoring

References:

- Back River Project Certificate T&C #12: Terrestrial Environment – Permafrost Monitoring
- Back River Project 2022 Annual Report, Page 3-1, 4-32 to 4-35
- Sabina's Responses to 2021 Annual Report Comments

Issue/Rationale:

Sabina did not address comments related to CIRNAC #2 (Permafrost Monitoring) in their Responses to 2021 Annual Report Comments.

CIRNAC acknowledges that it may not be feasible to monitor permafrost conditions over the entire potential development area, but monitoring should take place in key areas that are or will be developed. In addition to the main project infrastructure, these include the existing roadways, quarries, and waste storage areas.

In the 2022 Annual Report, Sabina stated that construction activities were underway in 2022, including construction for fuel tanks at Goose and at the MLA, that the Goose and MLA site road network was expanded up to approximately 20 km of all-weather roads, and that pads were completed for the permanent camp, plant, and fuel storage areas. However, no information was included in the 2022 Annual Report with regard to permafrost and ground temperature data. The annual permafrost monitoring information is required to monitor changes in permafrost conditions and to monitor the effects of the Project on permafrost conditions.

In the 2022 Annual Report, Sabina stated that all available ground temperature data was reviewed, and a summary of that data was presented in the 2022 Annual Geotechnical Inspection (AGI) report that was appended to the 2022 Annual Report (Appendix B).

In their 2022 Annual Report, Sabina stated that as part of the 2023 scope of work, they will revisit past thermistor and Ground Temperature Cables (GTCs), and will take readings where possible, and generate an initial draft of Goose site Thermal Monitoring Plan. Sabina also described that in 2023, GTCs will be installed within, upstream, and downstream of the proposed Primary Pond structure. It is unclear if Sabina is also considering installing new GTCs around the Project Area including both Goose and the MLA sites.

Recommendation:

CIRNAC recommends that Sabina:

a) Begin permafrost monitoring in developed and planned areas throughout the Project to establish baseline information and supplement the data collected during the Environmental Impact Statement phase.

b) Submit the updated data to NIRB as part of the annual reporting.

c) Provide ground temperature/permafrost monitoring data for the fuel tank construction and other construction-related activities that occurred in 2022.

d) Provide permafrost monitoring and ground temperature data collected during construction, and on any subsequent phases, in the annual reports.

e) Provide the summary of ground temperature data that was said to have been reviewed in the 2022 Annual Geotechnical Inspection (AGI) report.

f) Confirm what parts of the Project Area will be included in the 2023 Thermal Monitoring Plan.

B2Gold Nunavut Response:

Please see the response to IR KIA-NIRB-41 and CIRNAC-#1.

1. Permafrost monitoring has started in 2023. This includes, at the time of writing these responses (August 2023), monitoring at the Primary Pond location and at the Goose camp. The selection of additional locations for GTC installation, to be included into the site wide thermal monitoring plans, is currently in progress. All newly installed GTC locations will be documented in the 2023 AGI.

2. B2Gold will submit updated data to NIRB as part of the annual reporting as available.

3. No new GTCs were installed on site in 2022. Detailed on GTCs that have been installed in 2023 will be provided as part of the 2023 AGI.

4. Available GTC collected during, and post construction will be presented in the 2023 AGI.

5. Please see the response to IR KIA-NIRB-41.

6. Please see c) in the response to CIRNAC-#1. Note that as part of the Primary Pond construction ongoing logging / mapping of the key trench excavation surfaces were also completed. The Primary Pond is in a partially constructed state (only a portion of the key trench completed to date). All the key trench logging will be presented as part of the Primary Pond as-built report that will be submitted 90 days post the completion of that construction (at this time expected to be around winter 2024-2025).

CIRNAC-#3: Sensitive Landform Mitigation and Monitoring

References:

- Back River PC T&C #13: Terrestrial Environment - Sensitive Landform Mitigation and Monitoring
- Back River Project 2021 Annual Report, Page 3-1 and 4-33 to 4-34
- Sabina's Responses to 2021 Annual Report Comments
- Back River Project 2022 Annual Report, Page 3-1 and 4-36

Issue/Rationale:

Reporting requirements for PC T&C #13 state that Sabina shall provide the results of additional geotechnical investigations, along with any associated mitigation and monitoring measures, in the annual report to the NIRB.

Sabina did not address comments related to CIRNAC #3 (Sensitive Landform Mitigation and Monitoring) in their Responses to 2021 Annual Report Comments.

Sabina stated in the 2021 Annual Report that geotechnical investigations were undertaken in 2021 (geotechnical drilling at Goose), but the results were not provided to the NIRB. In CIRNAC's comments to the 2021 Annual Report, CIRNAC recommended that Sabina provide the results or status update of the geotechnical investigations undertaken in 2021 in the 2022 Annual Report. The results of the 2021 geotechnical investigations were not provided in the 2022 Annual Report.

Recommendation:

CIRNAC recommends that Sabina provide the results or status update of the geotechnical investigations undertaken in 2021, and any subsequent geotechnical investigations, in the 2023 Annual Report.

B2Gold Nunavut Response:

In 2021 geotechnical drilling was only completed at the Primary Pond and Umwelt Dam (Saline Water Pond) locations. A summary of the Primary Pond drilling was submitted as part of the December 2022 design package for that pond.

Attachment E presents an overview of the subsurface drilling that was completed prior to construction at the Primary Pond. This includes the 2021 drilling results. For completeness a similar summary for the Umwelt Dam (Saline Water Pond) will be produced and included in the 2023 annual reporting package.

In quarter one (Q1) of 2023, percolation drilling was also completed at the Primary Pond location. The as-built locations of this percolation testing are shown in the figures presented in Attachment E. Note that the results of the percolation testing would be documents in detail as part of the Primary Pond as-built report. The Primary Pond as-built report will be submitted 90 days post the completion of that pond construction (at this time expected to be around winter 2024-2025).

Additional geotechnical investigations have been completed 2023. These include foundation checks (mainly test pitting and a couple air rotary drill holes) completed at the Goose camp and plant pads, and at the MLA tank farm. An overview of the 2023 geotechnical investigations will be presented as part of the 2023 annual reporting.

CIRNAC-#4: Waste Management Plan

References:

- Back River PC T&C #14: Terrestrial Environment – Waste Management Plan
- Back River Project 2022 Annual Report, Page 4-37
- Back River Project 2021 Annual Report, Pages 4-32 and 4-35
- Sabina's Responses to 2021 Annual Report Comments
- Sabina's Responses to 2020 Annual Report Comments

Issue/Rationale:

Sabina did not address comments related to CIRNAC #4 (Waste Management Plan) in their Responses to 2021 Annual Report Comments.

As per the 2020 Annual Report, Sabina submitted the Landfill and Waste Management Plan (LWMP) to the NIRB in 2017 and was expected to update and submit it again to the NIRB following approval of the amendment to the water licence. The 2021 Annual Report indicates that the plan was updated and approved by the Nunavut Water Board (NWB), but further updates are required to address current practices at the Project site. Sabina is currently updating the plan and will provide it to NWB and the NIRB. Sabina has not indicated when they plan on submitting the updated plan (third version).

As per the 2022 Annual Report, Sabina submitted an updated LWMP (August 2022) to the NWB on September 1, 2022, for review and approval. The 2022 Annual Report indicates that once approved by the NWB, the updated LWMP will be submitted to the NIRB in the following year's annual report. The updated LWMP was not included in the 2022 Annual Report.

Additionally, T&C#14 states "*the Proponent shall provide a Waste Management Plan that describes how the local environment, including permafrost integrity and water quality, will not be harmed by wastes at project landfills*". The Landfill and Waste Management Plan (2017), which was included in the 2020 Annual Report, but not the 2021 Annual Report or the 2022 Annual Report, appears to discuss how permafrost has influenced design methodology, but it does not thoroughly consider how the Project impacts permafrost integrity as intended in T&C #14. To comply with T&C #14, impacts to permafrost integrity and appropriate mitigations shall be considered and included in the LWMP.

Recommendation:

CIRNAC recommends that Sabina:

a) Provide a timeline for the anticipated submission of the updated Landfill and Waste Management Plan to the NIRB.

b) Include a statement describing how permafrost integrity will be impacted, and how these impacts will be managed/mitigated, at the project landfill when completing updates to the Landfill and Waste Management Plan.

B2Gold Nunavut Response:

B2Gold Nunavut cannot comment on ongoing NWB procedural timelines but will provide the updated management plan as soon as it is approved. Permafrost integrity is discussed with the updated management plan.

CIRNAC-#5: Waste Management Pre-construction, Construction and Operations Standard Operating Procedures (SOP)

References:

- Sabina's Responses to 2021 Annual Report Comments
- Back River Project 2021 Annual Report – Part 2 - Appendix F,
- 2021 Pre-Construction Wildlife Mitigation and Monitoring Program Report Appendix 5D, Waste Management Preconstruction, Construction, and Operations SOP, Section 6
- FEIS Volume 10, Part 12 – Hazardous Materials Management Plan, Section 7.3.4
- FEIS Volume 10, Part 10 – Waste Management Plan, Section 7.3
- FEIS Volume 10, Part 10 – Waste Management Plan, Section 7.4

Issue/Rationale:

Sabina did not address comments related to CIRNAC #5 (Waste Management Pre-construction, Construction and Operations Standard Operating Procedures (SOP)) in their Responses to 2021 Annual Report Comments.

In the Waste Management Preconstruction, Construction, and Operations SOP—submitted in Appendix F of the 2021 Annual Report—it is not clear whether hazardous waste will be stored separately from other waste materials, which they should be. The SOP is also inconsistent with statements on waste segregation in the FEIS (i.e., FEIS Vol 10, Part 10, Section 7.3.4). The SOP should clearly define how hazardous waste will be handled and stored and should be consistent with the commitments made in the FEIS.

Recommendation:

CIRNAC recommends that Sabina:

a) Clarify which of the waste materials listed in the Waste Management Preconstruction, Construction, and Operations SOP can be stored indoors as opposed to at the lined containment facilities.

b) Replace references to "hazardous materials" with "hazardous waste materials" where appropriate.

c) Update the SOP to clarify that hazardous waste materials or incompatible waste streams will be kept separate from nonhazardous wastes while the Camp Manager (or designated Personnel) performs the waste consolidation to align with the FEIS Volume 10, Part 10 and 12.

B2Gold Nunavut Response:

B2Gold Nunavut commits to providing this information in the 2023 Annual Report.

CIRNAC-#6: Hydrogeology and Groundwater Quantity and Quality – Geotechnical Characterization Program.

References:

- Back River PC T&C #18: Hydrogeology and Groundwater Quantity and Quality - Geotechnical Characterization Program
- Back River Project 2022 Annual Report, Pages 4-44 to 4-45
- Sabina's Responses to 2021 Annual Report
- Back River Project 2021 Annual Report, Pages 4-41 to 4-42

Issue/Rationale:

Reporting requirements for PC T&C #18 state that Sabina shall provide the results of an infill geotechnical characterization program, along with associated mitigation measures, in the annual report to the NIRB. Sabina stated that geotechnical investigations were undertaken in 2021, but the results were not provided in the 2021 Annual Reports to the NIRB.

Sabina's 2022 Annual Report stated that the 2021 geotechnical investigation *"did not focus on the TSF [Tailings Storage Facility] Containment Dam but the other key infrastructure locations"* and therefore the geotechnical investigation report was not provided. Sabina then stated that the remaining infill geotechnical investigation will be completed *"immediately prior to TSF Dam Construction if constructed".* Sabina further stated that *"Sabina's currently approved mine plan no longer contains a TSF structure and its associated dam".*

CIRNAC acknowledges Sabina's response to the 2021 Annual Report where Sabina stated that *"should Sabina elect to develop the TSF for the purpose of tailings storage, Sabina will implement this infill geotechnical program in compliance with T&C #18."*

Recommendation:

CIRNAC recommends that Sabina provide results of the infill geotechnical characterization program and any required mitigation measures in the Annual Report to the NIRB should construction of the Tailings Storage Facility Dam resume.

B2Gold Nunavut Response:

B2Gold will provide results of the infill geotechnical characterization program and any required mitigation measures in the Annual Report to the NIRB should construction of the Tailings Storage Facility Dam resume.

CIRNAC-#7: Hydrological Features and Hydrogeology -Thermal Monitoring

References:

- Back River PC T&C #20: Hydrological Features and Hydrogeology
- Back River Project 2022 Annual Report, to NIRB, Pages 29 to 30
- Back River Project 2021 Annual Report, to NIRB, Pages 4-40
- Back River Project 2020 Annual Report, to NIRB, Pages 4-45
- FEIS Addendum-Vol 6-Pt 1-IA2E Freshwater Environment, Pages 6-4 and 6-11
- NIRB Final Hearing Report Back River Gold Mine Project, Section 4.6 – Hydrological Features and Hydrogeology

Issue/Rationale:

In the 2021 Annual Report, Sabina indicated that a thermal monitoring plan is in preparation. CIRNAC notes that though the plan is in preparation, there are deficiencies in the thermal modelling that has been completed to date, and care should be taken to ensure the adequacy of the thermal baseline data. CIRNAC notes that, though there seems to be baseline data between 2007 and 2014, hydrological and hydrogeological processes are not static and can vary widely from season to season, year to year, and decade to decade. For this reason, data collected between 2007 and 2014 is insufficient to adequately characterize the baseline hydrological characteristics.

In their response to CIRNAC's comments, Sabina stated that the baseline was deemed "adequate" during the FEIS process, committed to collecting additional hydrology data, and indicated that an updated groundwater model will be provided in August.

CIRNAC notes that even though the results of the analysis are adequate, it is expected that they will support the development of groundwater models for further assessment, including extension of the model domain to -900 metres, and work to model and evaluate total metals concentrations in groundwater prior to and during operations. The groundwater model results and further assessments appear to not have been completed, even though the comment is noted by Sabina as being addressed.

Recommendation:

CIRNAC recommends that Sabina:

a) Explain the rationale for discontinuing Hydrology Baseline Reports beyond the year 2014.

b) Resume the Hydrology Baseline Reports where construction has not started.

c) Provide a discussion of hydrology data collection in future annual reports.

d) Provide the updated groundwater modelling information.

B2Gold Nunavut Response:

1. Baseline local hydrometric data (water levels and flows) collected up to 2014, supplemented by regional long-term records to understand variability in the hydrologic regime in the FEIS Study Areas, were deemed adequate to support the FEIS process. B2Gold is committed to further understanding the hydrological and hydrogeological regime, and has therefore collected hydrometric data within the Goose Lake watershed in 2021 to 2023 at tributaries to Goose Lake and at the Goose Lake Outflow.

2. The collection of baseline hydrometric data and subsequent reporting within annual hydrology baseline reports has been completed from 2021 to 2023 and will continue in subsequent years.

3. B2Gold will provide a discussion of hydrology data collection in future annual reports.

4. The updated groundwater modelling was completed as part of the 2022 Water and Load Balance (Appendix C [Updated Predictions of Groundwater Inflow – Back River Project] to the Back River Project: Water and Load balance Report), which was provided the NWB.

CIRNAC-#8: Aquatic Effects Monitoring Plan

References:

- Back River PC T&C #21: Groundwater and Surface Water Quality, Sediment Quality and Freshwater Aquatic Environment – Aquatic Effects Monitoring Plan
- Back River Project 2022 Annual Report, pages 4-50 to 4-51
- Back River Project 2021 Annual Report, Pages 4-46 to 4-47
- Back River Project 2020 Annual Report, Pages 62 - 63
- Sabina's Responses to 2020 and 2021 Annual Report Comments

Issue/Rationale:

Project Certificate T&C #21 requires an Aquatic Effects Monitoring Plan (AEMP) to include "sufficient sampling and monitoring programs to appropriately characterize the receiving environment to ensure that adequate data is available to assess impact predictions made within the Final Environmental Impact Statement." Reporting requirements for Project Certificate T&C #21 state that Sabina should provide results of the AEMP program "annually thereafter or as may otherwise be required by the NIRB."

The results of the 2021 data were not provided in the 2021 Annual Report or the 2022 Annual Report as recommended by CIRNAC. The AEMP was also not provided in the 2021 Annual Report. CIRNAC notes that the updated plan, as well as the results of the AEMP, are required to evaluate whether the impact predictions in the FEIS are still valid.

Section 4.5.7 of the 2022 Annual Report does not mention the completion or stakeholder review of the 2021 AEMP, however the Aquatic Baseline Report completed by WSP (2022) in Appendix C states that it was completed. The results of the 2021 AEMP should be added to the 2022 Annual Report so that it is captured for future reviews and reference purposes.

Additional baseline data including ice-cover and open water sampling in Goose Lake, Propeller Lake, and Reference B Lake, as well as open water sampling in outflow streams from each of the lakes was collected in 2022 in response to technical comments on the Aquatic Baseline Synthesis Report by Kitikmeot Inuit Association (KIA), CIRNAC, and Environment and Climate Change Canada (ECCC), and to support the next update to the AEMP. The results of the 2022 baseline sampling were provided in Appendix C.

Based on Section 4.5.7 of the 2022 Annual Report, the AEMP is still being updated to include a number of changes such as commitments made and the terms and conditions of the Type A Water license, update to the Project description, recommendations based on Aquatic Baseline Synthesis Report, and updates to reflect an updated mine plan alignment with additional modelling completed in 2022. CIRNAC understands that the full AEMP will be implemented when discharge activities start, with results submitted annually; however, until that time, any updated AEMP reports should be included in future annual reports.

Recommendation:

CIRNAC recommended that Sabina:

a) Provide the summarized results of the 2021 data collection in the next annual report.

b) Include any updated AEMP reports in future annual reports.

B2Gold Nunavut Response:

1. Baseline data collected in 2021 were summarized in the Sabina Gold & Silver Corp. Back River Project – 2021 Aquatic Baseline Report. This report was omitted from the 2021 or the 2022 Annual Reports and will be included in the next annual report. As noted by the reviewer, baseline data collected in 2022 were summarized in the Sabina Gold & Silver Corp. Back River Project – 2022 Aquatic Baseline Report and was included in the 2022 Annual Report attached in Appendix C.

2. The objectives of baseline data collection in 2021 and 2022 were to address commitments made by Sabina in response to the Nunavut Water Board (NWB) technical review of the Aquatic Baseline Synthesis Report (Golder 2019), to support the update of the AEMP design, and to collect additional data for the Hydrodynamic model for the project. Data collected in 2021 and 2022 will be added to the baseline dataset (compiled to date) that is being developed to support data interpretation in future AEMPs.

3. The updated AEMP design plan will be submitted to NWB for approval at least 90 days prior to the start of the construction, as directed by the NWB in the Type A Water Licence and NIRB Project Certificate Term and Condition #21. Once the AEMP design is submitted and approved by the NWB for implementation "prior to construction" (i.e., triggered by dewatering), results of monitoring with be submitted to the NWB as required under the Type A Water Licence, and a summary of results will be submitted in the NIRB Annual report or as directed in Appendix A to the Project Certificate.

Baseline water quality data collected in the future, until the start of the AEMP implementation, will continue to be summarized in aquatic baseline reports and included in future annual reports submitted to NIRB.

CIRNAC-#9: Vegetation Monitoring Plan

References:

- Back River PC T&C #34: Vegetation – Vegetation Monitoring Plan
- Back River Project 2022 Annual Report, Pages 4-78 to 4-79
- Back River Project 2022 Annual Report, Appendix E - Vegetation Monitoring Program
- Sabina's Responses to 2021 Annual Report Comments Back River Project 2021 Annual Report, Pages 4-73 to 4-74
- Back River Project 2021 Annual Report, Appendix F
- Sabina's Responses to 2020 Annual Report Comments Pages 30-37
- Back River Project FEIS Addendum, Volume 5, Page 5-20

Issue/Rationale:

In response to comments received on the Back River Project 2020 Annual Report, Sabina committed to amending the January 2020 Vegetation Monitoring Plan. An updated or amended Vegetation Monitoring Plan was not included (or referred to) in the 2022 Annual Report and the Vegetation Monitoring Program memo on the 2022 monitoring activities (Appendix E of 2022 Annual Report) does not state which monitoring plan it was conducted under.

The 2022 Annual Report states that Sabina conducted invasive plant monitoring as part of the Vegetation Monitoring Program on July 2 to 11, 2022 (Appendix E). However, this appendix provides only baseline results of vegetation community composition within the ten new 1m x1m vegetation monitoring plots established due to proposed re-alignment of the Winter Ice Road. It also includes photos of the 1m x 1m veg monitoring plots at MLA and Goose in 2022, as required under the 2020 Vegetation Monitoring Plan, however the photos provided are aerial photos which show very little detail and are insufficient for identification of invasive plant species.

The 2022 Vegetation Monitoring Program report (Appendix E of 2022 Annual Report) says no invasive species were detected within the new Winter Ice Road (WIR) monitoring plots, however one vascular plant was identified only as a graminoid (a grass-type plant), with no genus or species provided. There are at least two grass-type plant species that are considered non-native/invasive in Nunavut but there is no explanation provided of how this unidentified species was determined to be non-invasive.

The 2020 Monitoring Plan provides a schedule of required monitoring activities but does not provide the actual calendar years that each survey type will be completed.

Recommendation:

CIRNAC recommends that Sabina:

a) Provide a timeline for submitting the updated Vegetation Monitoring Plan to the NIRB. If the update is simply including the new 2022 WIR monitoring locations and an amended monitoring schedule, this should be clarified, and the plan resubmitted.

b) Clarify if 2022 invasive species monitoring was limited to the ten new vegetation monitoring plots established along the WIR in 2022, or if surveys of larger Project areas were conducted.

c) As part of vegetation plot monitoring, provide ground-level photo, with scale included, of all monitored plots, to aid in interannual comparison of vegetation communities.

d) Provide a detailed schedule by calendar year for all plant- related survey requirements and include in the updated Vegetation Monitoring Plan.

e) Clarify how unknown graminoid species detected in new 2022 WIR vegetation monitoring plots was determined to be non- invasive.

B2Gold Nunavut Response:

The January 2020 Vegetation Monitoring Program (VMP) has not been updated; however, the 2022 Annual Report included a commitment in Project Certificate Condition No. 34 that included a schedule of closure and post-closure monitoring that will be implemented when applicable.

As per the monitoring schedule in the January 2020 Vegetation Monitoring Program, non-native plant monitoring is to occur every three years during construction and operation. This was last conducted in 2021 and is planned to be conducted again in 2024. The ten new vegetation monitoring plots established in 2022 were to capture occurrences of non-native plant species. No non-native species were observed in 2022.

Field-based photography of all monitoring plots was not able to be conducted in 2022. Photos of additional monitoring plots not included in Appendix E - Vegetation Monitoring Program are provided below:

Photo 1: BRR010 – Shrubby tundra – July 21, 2022

Photo 2: BRR011 – Undifferentiated Tundra - July 21, 2022

Photo 3: BRR012 – Mesic Dwarf Tundra - July 21, 2022

Photo 4: BRR013– Mesic Dwarf Tundra - July 21, 2022

Photo 5: BRR017- Dwarf Shrub-Herb Esker - July 21, 2022

Photo 6: BRR018 – Shrubby tundra - July 21, 2022

Photo 7: BRR019 – Mesic Dwarf Tundra - July 21, 2022

Photo 8: BRR020 – Raised Bog Complex - July 21, 2022

Photo 9: BRR022– Mesic Dwarf Tundra - July 21, 2022

Photo 10: BRR023 – Raised Bog Complex - July 21, 2022

Photo 11: BRR032R – Dry Sparse Tundra - July 21, 2022

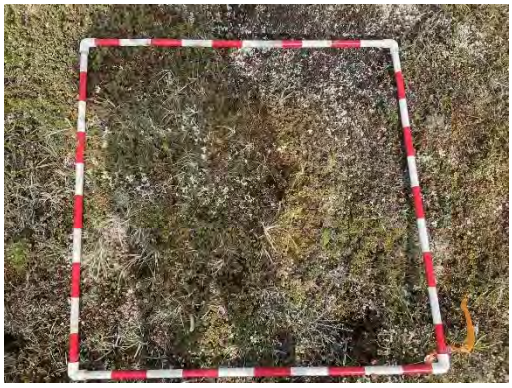


Photo 12: BRR033R - Dry Sparse Tundra – July 20, 2022

CIRNAC-#10: Revegetation and Reclamation

References:

- Back River PC T&C #35: Vegetation - Revegetation and Reclamation
- Back River Project 2021 Annual Report, Page 4-75
- Back River Project 2022 Annual Report, Page 4-80

Issue/Rationale:

Project Certificate T&C #35 requires Sabina to develop a progressive revegetation program and submit the program and results in their annual report to the NIRB. In the 2022 Annual Report, Sabina stated that the program was provided to the NIRB on December 13, 2021, but did not include the program or any results in the 2022 Annual Report.

The 2022 Annual Report states that the 2021 Interim Closure and Reclamation Plan (ICRP) included a conceptual progressive revegetation program that was approved by the NWB and was provided to the NIRB on December 13, 2021. This ICRP was also stated to have been further updated in 2022/23 as part of the amendment application process and is currently under review by the NIRB.

In the 2022 Annual Report states, Sabina committed to providing information on revegetation strategies in fulfillment of PC T&C #36 in the annual report to the NIRB within three years from the commencement of construction. Based on the start of Project construction in 2020, information on the revegetation strategies should be provided to the NIRB in 2023.

Recommendation:

CIRNAC recommends that Sabina provide the progressive revegetation program and any results with future annual reports. This shall be provided in the 2023 annual report to the NIRB to meet PC T&C #36, which requires submission of this information within three years from the 2020 commencement of construction.

B2Gold Nunavut Response:

Information on the research of revegetation strategies will be provided to the NIRB in 2023.

CIRNAC-#11: Marine Environment – General

References:

Back River PC T&C #62: Marine Environment – General

- Back River Project 2022 Annual Report
- Back River Project 2021 Annual Report, Pages 4-117 to 4- 118
- Back River Project 2020 Annual Report, Pages 4-108 to 4- 109
- Sabina's Responses to 2020 Annual Report Comments
- Back River Project FEIS, Supporting Volume 7, Page 2-33

Issue/Rationale:

Sabina did not address comments related to CIRNAC #11 (Marine Environment – General) in their Responses to 2021 Annual Report Comments. In reviewing the 2021 Annual Report, CIRNAC recommended that Sabina provide the summarized results of the 2021 data collection, including, where available, mapping of sampling locations, sample collection notes, water quality data, analytical chemistry results in the next annual report. The 2021 results should be added to the 2022 Annual Report for review and reference purposes.

Although there are many references to both baseline data collection and the 2021 sampling discussed above, the 2021 Monitoring Report did not present the data for analysis (i.e., mapping of sampling locations, sample collection notes, water quality data, analytical chemistry results, etc.).

Recommendation:

CIRNAC recommends that Sabina:

a) Provide the summarized results of the 2021 data collection in the next annual report.

b) Include the annual AEMP reports in any future annual reports.

B2Gold Nunavut Response:

1. B2Gold will include the summarized results of the 2021 data collection in the 2023 annual report.
2. Please see the response to CIRNAC-8.

CIRNAC-#12: Tailings Management Plan

References:

- Back River Project 2021 Annual Report, Page 4-41
- Back River Project 2021 Annual Report, Appendix K
- Back River Project Responses to 2021 Annual Report Comments
- Back River Project 2022 Annual Report, Page 4-42, 4-43

Issue/Rationale:

Sabina has updated the Tailings Management Plan (TMP) and has submitted it to the Nunavut Water Board for approval. But, as it was not submitted in the 2022 Annual Report to the Nunavut Impact Review Board (NIRB), the updated TMP was not reviewed.

Recommendation:

CIRNAC recommends that Sabina provide an updated version of the Tailings Management Plan to the NIRB, reflecting the current approved practices to be used on site, in future annual reports.

B2Gold Nunavut Response:

Once the Nunavut Water Board (NWB) has approved the Tailings Management Plan, it will be provided to the NIRB. This is standard procedure as the plan may be subject to change while undergoing review through the NWB process.

CIRNAC-#13: Aquatic Baseline Report

References:

- Back River PC T&C #21: Groundwater and Surface Water Quality, Sediment Quality and Freshwater Aquatic Environment – Aquatic Effects Monitoring Plan

- Aquatic Baseline Report, WSP 2022 - Appendix C

Issue/Rationale:

The report states that the NWB reviewed the Aquatic Baseline Synthesis Report in 2020 and Sabina was committed to (as it relates to water quality):

- Collect water quality data in Propeller Lake in year 8 and to then collect 3 years of data.

- Collect another year of under-ice water quality data in Goose Lake and Reference B Lake

The report states that the collection of additional data in 2021 and 2022 was to address these commitments; however, the 2021 report has not been provided for review. The 2022 report summarizes the baseline data collected in 2022 and not 2021. This presents a gap in the data provided for review through the Annual Reporting requirements.

Additional baseline data including ice-cover and open water sampling in Goose Lake, Propeller Lake, and Reference B Lake, as well as open water sampling in outflow streams from each of the Lakes was collected in 2022 in response to technical comments on the Aquatic Baseline Synthesis Report. This included one under ice sampling event in April 2022 and two open water sampling events. Some data gaps were identified as part of the outflow stream sampling due to ice conditions.

Section 2.3 states that samples were collected at 1.5 m and 3 m below ice surface due to "field crew error". This error did not result in an impact to the data collected; however, to prevent such errors in the future, a lessons learned should be conducted with the field crew.

Section 3 states that metals (primarily chromium) as part of the August sampling event at Reference B Lake were elevated in four samples and an exceedance was noted in one sample. It was reported that this data is not considered representative; however, no reasoning was provided. It was noted that some hold times were also exceeded.

It is noted that the surface water results are compared to drinking water criteria. Has it been confirmed that lake water or water from the steams are used for drinking water? Or are these guidelines being used in the absence of surface water criteria for certain parameters?

No recommendations were provided as part of the report. As this is still baseline sampling with the purpose to provide a more robust dataset for comparison in the future, uncertainties need to be removed where possible and field findings need to be confirmed as part of future sampling events.

Recommendation:

CIRNAC recommends that Sabina:

a) Provide the summarized results of the 2021 data collection in the next annual report.

b) Conduct the stream sampling events when the streams are free of ice (open water) to prevent future data gaps.

c) Conduct lessons learned with the project team to reduce field errors, data gaps, and exceeding hold times for laboratory analysis.

d) Resample to confirm the concentrations of chromium at Reference B Lake.

e) Provide the rationale for the selection of water quality guidelines.

B2Gold Nunavut Response:

1. See response provided to CIRNAC #8. The 2021 Aquatic Baseline Report will be included in the next annual report.

2. Open-water sampling at streams targeted freshet and summer flow conditions. These streams are generally small and shallow with low flows and water levels during summer, many being ephemeral and flowing only during freshet. Freshet represents a short window on the streams' hydrograph for the area and planning efforts were made to sample during peak freshet to capture high snow melt flows. Water samples from the streams were also collected a few weeks after spring melt. Therefore, open-water season data were collected in the sampled streams in 2021 and 2022.

3. The project-specific work instructions provided to field crews will be updated to highlight the risks of field errors and data gaps, and include mitigation measures. These will be communicated to the field crews during the pre-field meeting for each sampling program. To comply with sample holding time requirements and maintain sample integrity, water samples for laboratory analysis were shipped from site by air and submitted to the laboratory as soon as possible after collection. However, holding time exceedances are a common issue for water samples collected in remote areas, particularly for constituents with short holding times.

4. Five water samples were collected within a relatively small area at Reference B Lake in August 2022. In four of these samples, total chromium concentrations were non-detect (<0.04 µg/L), and in one sample chromium concentration was 16.2 µg/L, which is more than 400 times greater than the total chromium detection limit, thereby strongly suggesting a laboratory error. This concentration is not considered to be representative of Reference B Lake and was recommended to be interpreted with caution (WSP 2022). The remaining four sample results for Reference B Lake, along with available baseline data from previous years, provide sufficient information on total chromium concentrations in August 2022; thus, re-sampling is not planned.

   Overall, the baseline dataset collected at Reference B Lake during open water conditions consists of 27 samples collected between 2010 and 2018. Total chromium in most of these samples was lower than the detection limit of 0.06 µg/L and was detected only in two samples at concentrations of 0.11 µg/L and 0.12 µg/L. Under ice-covered conditions, a total of 18 samples were collected at Reference B Lake between 2011 and 2022 with total chromium concentrations being non-detect (i.e., less than 0.04 µg/L or 0.06 µg/L) in approximately half of the samples,

and detected concentrations in the rest of the samples ranging from 0.051 µg/L to 0.1 µg/L (Golder 2019; WSP 2022).

Data collected at Reference B Lake will be used to characterize baseline conditions in the lake and calculate seasonal normal ranges for the AEMP. The number of samples collected at Reference B Lake are considered sufficient for this purpose (Golder 2019). Samples will continue to be collected at Reference B Lake in the future under the AEMP programs.

5. Comparison of water quality data to drinking water guidelines is commonly done for waterbodies that are, or could potentially be a drinking water source. Comparison to drinking water guidelines is used to evaluate suitability of water as a drinking water source for people and wildlife. Selection of water quality guidelines and benchmarks is detailed in the AEMP design, and will be based on current and applicable federal aquatic life guidelines for the protection of aquatic life (e.g., CCME 1999), drinking water quality guidelines (Health Canada 2020), and approved site-specific water quality objectives for the Project.

CIRNAC-#14: Spills

References:

- Back River PC T&C #89: Accidents and Malfunctions - Spills
- Back River Project 2021 Annual Report, Section 4.4.2 – Unauthorized Discharges and Spills, Page 4-3
- Back River Project 2021 Annual Report, Appendix F: 2021 Pre- Construction Wildlife Mitigation and Monitoring Plan
- Back River Project, Spill Contingency Plan, Final Environmental Impact Statement Supporting Volume 10: Management Plans, November, 2015, Revision G.1.
- Back River Project 2022 Annual Report, Section 4.4.2 – Unauthorized Discharges and Spills, Page 4-4 and 4.5.
- Back River Project 2022 Annual Report, Appendix I. Oil Pollution Emergency Plan

Issue/Rationale:

Section 4.4.2 of the 2022 Annual Report indicates that there were unauthorized discharges or spills in 2022. Five discharges or spills are presented in Table 4.4-1. This Table presents information on the date of the occurrence, the substance lost, the volume lost, the cause, the location and mitigation measures. Four of these discharges/spills were reported as having been remediated while one is under investigation.

When discussing spills within Appendix I. Oil Pollution Emergency Plan, spills are referred to using several units including litres, m^3, and tonnes which could lead to confusion around the size of a spill event and associated response measures. Additional information required in relation to spill events including status of clean-up, reporting of the spill event, disposal/treatment locations for contaminated materials/product, post-spill monitoring/remediation activities and site photographs, is outlined in the Spill Contingency Plan. Where detailed reports are prepared in relation to spill events, these reports should be referenced in this Section and appended to the Annual Report.

Recommendation:

CIRNAC recommends that Sabina:

a) Where detailed reports are prepared in relation to spill events, append them to the Annual Report.

b) Use consistent units (litres, m^3, or tonnes) when discussing spill events to avoid confusion around appropriate response measures.

c) Clarify wording in Section 8.5 - Contaminated Soil Treatment and Disposal – page 8-8 of Appendix I— when can soils be treated on site, where on site, when should they be sent for off-site treatment/disposal, testing requirements. Relevant details may be included in the Spill Contingency Plan and should be referenced within this Section.

B2Gold Nunavut Response:

B2Gold Nunavut thanks CIRNAC for the review comments and will endeavour to incorporate them in future annual reporting.

2.3 RESPONSE TO GOVERNMENT OF NUNAVUT

GN AR-#01: Project Outside of Calving Area

Terms and Conditions:

Project Certificate T&Cs #38, 41, 42, 52

References:

- Sabina 2022 Annual Report Appendix G. 2022 Pre- Construction Wildlife Mitigation and Monitoring Program Report
- NIRB Project Certificate No. 007

Identification of Issue:

The use of incidental observations and selected seasonal data on caribou numbers near the project site to confirm that the Project does not overlap with caribou calving areas is inappropriate.

Importance to Review and Supporting Rationale:

The summary of incidental observations of caribou included in the Wildlife Mitigation and Monitoring Program (WMMP) Report Table 5.7-3 does not confirm that the project is outside calving areas, as stated in the report, "The sightings of caribou in 2019 were of large groups (greater than 100 or greater than 1,000) travelling past the area (presumably migrating to the calving area), confirming that the Project does not overlap with the calving grounds." (WMMP Report, S.5.7.1).

Rather, these observations support the observations included in S.2.4 of the WMMP Report provided by Inuit Qaujimajatuqangit (IQ) holders that the patterns of seasonal utilization for the herd's ranges are variable. Furthermore, there are requirements for the Proponent (e.g., Project Certificate Terms and Conditions 42, 52) to consider such seasonal variability and potential for range shifts, meaning that high variability in caribou presence within the Project Development Area (PDA) is expected, and is not demonstrative of fidelity to calving grounds outside the PDA.

The site-observation data from 2018-2022 show substantial fluctuations from year to year and within each season, which suggests that the project is within important portions of the herd's range and that minimizing disturbance through the implementation of the Proponent's Caribou Management System (CMS) is needed for maximizing the herd's available range.

Lastly, incidental, site-based observations do have value, but they are inherently opportunistic and limited, and are not part of a complete range use study. Without the addition of deliberate, consistent data collection (e.g., aerial surveys, dedicated monitoring, long-term collar programs), these site-based observations alone cannot be used to confirm whether the project area overlaps, or not, with calving grounds.

Recommendations:

The Government of Nunavut recommends:

- The Proponent refrain from drawing conclusions about caribou range use without sufficient data to support them. Following the positive construction decision, monitoring programs will increase in scale and scope, providing additional data about caribou range use, and the GN looks forward to working with the Proponent to evaluate caribou range use within the PDA and the surrounding area.

B2Gold Nunavut Response:

B2Gold agrees the text should be more specific. The analysis of collar data in the FEIS indicated that the Goose site did not overlap the calving range of Bathurst or Beverly/Ahiak caribou. The lack of incidental observations during the calving period is consistent with that conclusion but cannot be used alone to determine herd overlaps. As noted by the reviewer, as the project moves into Construction the monitoring programs will ramp up and more data will be available to draw conclusions on. B2Gold looks forward to collaborating with the GN on these monitoring programs whenever possible.

GN AR-#02: Carnivore Interactions

Terms and Conditions:

Project Certificate T&C #48

References:

- Draft Sabina SOP ENVIRO-06 V.B.1, 2020. Included as Appendix A to Response to Comments on 2021 Annual Report (220808-12MN036-B2Gold Nunavut Responses to 2021 Annual Report Comments-IA2E.pdf)
- Sabina 2022 Annual Report Appendix G. 2022 Pre- Construction Wildlife Mitigation and Monitoring Program Report
- NIRB Project Certificate No. 007

Identification of Issue:

There is an issue of recurring carnivore interactions at project site. The Proponent is required to develop and implement mitigation measures and monitoring programs to limit the attraction of predators and scavengers to Project facilities, and to limit impacts from specific project activities.

Monitoring whether bears and wolverines are attracted to the Project's camps was identified as a community concern during the review phase of the Project and is built into the Wildlife Mitigation and Monitoring Program (WMMP) (WMMP Report, S.2.4, pg. 2-5).

Importance to Review and Supporting Rationale:

The Proponent has consistently made efforts to limit carnivore interactions with project infrastructure and has similarly acted promptly to remedy deficiencies. Despite these efforts, attractants have still proven to be an issue, as evidenced by consistent observations of carnivores interacting with the site, one of which resulted in the injury of a staff member inside a generator shack.

In the generator shack incident, the Proponent quickly took efforts to ensure the safety of staff and to install wire mesh to prevent wildlife entry through the ventilation louvres of the shack. The Proponent clearly describes the steps taken to mitigate the issue in the 2022 Annual Report.

In a similar instance on November 21, 2022, a wolverine was found within the incinerator building, which was deterred using the Standard Operating Procedure (SOP) for wildlife deterrence (SOP-ENVIRO-06-Version B.1, 2020). It appears that appropriate steps were taken to review waste management practices and inspecting infrastructure for ways to prevent wildlife access, per the terms of the SOP. However, the description of any subsequent action is only given in general, non-specific terms.

Recommendations:

The Government of Nunavut recommends the following:

- The Proponent provide the same level of detail used to describe the mitigations resulting from the generator shack incident also be provided for the incinerator building incident and subsequent actions taken to prevent recurrence.

This could include whether changes to waste management practices were made (and which changes) or if stricter enforcement was applied (and to which practices), as well as whether any structural changes to the building were made and an accompanying description.

This information is valuable to both demonstrate that concrete actions were taken and to help the Proponent and other operators apply effective mitigation actions for wildlife deterrence.

B2Gold Nunavut Response:

Thank you for the comment. Carnivores being attracted to mine sites is a consistent issue at mines across the Arctic, particularly wolverines and foxes and B2Gold has measures such as camp inspections, waste inspections and camp hardening (e.g., covers on vents, skirts on buildings) to address this issue. B2Gold will use the report from the generator shack incident as a standard for any future incident reports with clear outcomes, recommendations and record of their completion.

GN AR-#03: Vegetation Monitoring

Terms and Conditions:

Project Certificate T&C # 34

References:

- Sabina 2022 Annual Report Appendix E 2022 Vegetation Monitoring Field Program Results - Winter Road Realignment
- Sabina 2019 Annual Report Appendix C 2019 Vegetation Monitoring Program
- NIRB Project Certificate No. 007

Identification of Issue:

A stated objective of the Vegetation Monitoring Program (VMP), (S.3.0, pg. 3) is to "Measure direct loss and indirect effects to plant communities as a result of the construction and operations of the WIR (Winter Ice Road)." The report also states (S.6.0, pg. 12) that "Annual photographic monitoring of the WIR is a requirement of the VMP and is to be conducted each summer following construction of the WIR."

Despite this, the Vegetation Monitoring Report doesn't include monitoring for existing vegetations sites along the WIR; only information about new sites identified along the new WIR alignment is provided. The Proponent does not indicate why annual photos or other monitoring did not take place for existing plots.

Importance to Review and Supporting Rationale:

The Vegetation Monitoring Field Program (VMP) Results are limited in scope to introducing 10 new plots to address realignment of the Winter Ice Road (WIR). It's not clear why the field effort did not include photographic monitoring and plot assessment for pre-existing sites or even any reference or comparison to the sites developed as part of the VMP in 2018 and 2019. The 2019 VMP included 56 total locations, 15 of which were adjusted, similar to the current report, and the creation of 24 new plots.

Given the intent to monitor the potential impact of WIR construction and operations on vegetation, the eventual goal of assessing vegetation recovery, and the fact that field staff were on site in 2022, there is an expectation that all vegetation plots would be visited as part of the monitoring effort.

Recommendations:

The Government of Nunavut recommends the following:

a) The Proponent provide an explanation of why sites established in 2018/2019 were not evaluated during the 2022 field season, and why only creation of new/relocated plots to address WIR realignment were considered in the VMP fieldwork.

b) The Proponent ensure that all plots receive photographic monitoring, which is a requirement of the VMP, in order to support "evaluating trends and determining if there are statistical differences in plant species composition and abundance between impacted experimental WIR plots and reference plots." (VMP S.6.0, pg. 12)

B2Gold Nunavut Response:

1. The WIR has not been constructed each year since 2018, which is why vegetation monitoring has not yet been completed. A monitoring event to evaluate the previously established WIR monitoring plots as well the vegetation, lichen and non-native plant monitoring in the PDA is being planned for 2024.

2. A selection of the WIR monitoring plots did receive photographic monitoring but were omitted from Appendix E Vegetation Monitoring Field Program Results. These photos are provided in the response to CIRNAC#9 – Vegetation Monitoring Plan. WIR monitoring plots are being photographed in 2023 and will be provided in the 2023 Annual Report.

GN AR-#04: Unauthorized discharges

Terms and Conditions:

Pollution Prevention

References:

- Sabina 2022 Annual Report
- Response to Comments on 2021 Annual Report (220808- 12MN036-B2Gold Nunavut Responses to 2021 Annual Report Comments-IA2E.pdf)

Identification of Issue:

Reporting spills and including spill data within the Annual Report has been inconsistent over the reporting period. While the 2022 report is an improvement, the Proponent maintains records of all spills and the GN believes that these should be included in the appropriate section of the Annual Report, along with those that meet the reporting requirement.

Importance to Review and Supporting Rationale:

The Proponent has stated that it "maintains a complete record of all spills, regardless of size, and ensures spills are cleaned up promptly and fully in accordance with the Spill Contingency Plan to ensure they are not lingering in the environment" and that the Proponent "reports all spills triggering NT/NU reporting thresholds to the NT/NU Spills Line and includes such spills in the Annual Report to both the NIRB and the NWB." (Response to 2021 AR Comments, pg. 102).

Recommendations:

The Government of Nunavut (GN) would like to clarify that the reporting threshold is where there is a legal requirement to report. Below that threshold, there remains a GN recommendation to report. Spill data is kept by the Proponent for all spills and is shared with the Kitikmeot Inuit Association (KIA) per the terms of the new Framework Agreement. The GN would encourage the Proponent to report all spills, regardless of volume, and include data for all spills in future Annual Reports.

The GN also commends the Proponent for switching to propylene glycol within equipment to eliminate the risks to wildlife associated with ethylene glycol.

B2Gold Nunavut Response:

B2Gold Nunavut will provide information reporting for all spills in future annual reports.

GN AR-#05: Dust Suppression

Terms and Conditions:

Project Certificate T&C #03

References:

- Sabina 2022 Annual Report
- Response to Comments on 2021 Annual Report (220808- 12MN036-B2Gold Nunavut Responses to 2021 Annual Report Comments-IA2E.pdf)

Identification of Issue:

Review of Air Quality Mitigation and Monitoring Program updates and dust suppression practices were not addressed in the 2022 Annual Report.

Importance to Review and Supporting Rationale:

The Proponent responded to the Government of Nunavut's (GN)'s past comment about the need for dust suppression as follows, "Sabina has commissioned a review of the Air Quality Mitigation and Monitoring Program (AQMMP) to occur in 2022. The review will include specific recommendations regarding tangible triggers for the initiation of dust mitigation measures to be employed in future summer seasons."

Per the Proponent's description of next steps for the implementation of Term and Condition #03, "proposed updates to the Fugitive Dust Reduction Plan (FDRP) and AQMMP are planned for May of 2023 to align with advances to monitoring technologies and to reflect the current understanding of the project." and that, "updates will address issues that have been noted with current air quality monitoring program."

Recommendations:

Recognizing that modifications to fugitive dust management will not likely be reported until the 2023 Annual Report, the Government of Nunavut recommends the following:

a) The Proponent clarify its dust suppression activities in 2022 and the approach that will be applied this year, before the FDRP and AQMMP are updated. In its response to the GN, the Proponent stated, "Currently, as soon as the wet season ends (freshet) and dust begins to generate from vehicular or aircraft traffic, Sabina commences dust suppression."

b) The Proponent provide additional detail on dust suppression methods, frequency, and any thresholds used to initiate dust suppression efforts. This information is valuable to assess the extent to which dust suppression is taking place at the site, and how it is being applied to newly constructed areas of the Project Development Area, noting the expansion of the airstrip and the 20km of all-weather roads now at the site.

B2Gold Nunavut Response:

B2Gold Nunavut will provide this information in the 2023 Annual Report.

GN AR-#06: Caribou Observations and Blasting Activity

Terms and Conditions:

Project Certificate T&Cs # 39, 40, 41, 44

References:

- Sabina 2022 Annual Report
- Sabina 2022 Annual Report Appendix G. 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report

Identification of Issue:

The Government of Nunavut (GN) appreciates the improved reporting relative to monthly blasting activity and location as reported in this year's annual report. While this is a noted improvement, there is still a lack of transparency in how blasting activity, Caribou Management System (CMS) level changes, and incidental caribou observations by site staff are reported.

Caribou observations are reported in terms of number of animals observed and the date of observations. Blasting is reported as a simple count by month. This prevents any cross-referencing of blasting events with the presence of caribou at the site as noted by staff observations. It also prevents comparison of pre-blast surveys and incidental observations.

Improved reporting and transparency are desired relative to the CMS, blasting activity, and caribou observations.

Importance to Review and Supporting Rationale:

There were 3,630 caribou observed in 38 separate reports on 34 different days from February 2022 to October 2022 (note that the observation of 40 caribou on 9/10/2021 was removed from these totals). There were 39 blasting events during this same period, but the Proponent states that no caribou were observed during pre-blasting surveys.

While it is possible that caribou presence in the Project area did not overlap with blasting activity, the way this information is presented in the Annual Report (i.e., daily observations vs. monthly blasting counts) does not enable reviewers to agree, or not, with Sabina's statement.

A CMS Level 2 Notification was issued from June 5-July 31, and a Level 3-Alert was "triggered on multiple times when caribou were sighted in the Project area…" While it is encouraging to see the CMS actively implemented, additional detail on when CMS levels were triggered is beneficial to correlate them with site-based incidental observations.

Recommendations:

The Government of Nunavut recommends the following:

a) The Proponent provide blasting activity specific dates; continuing to report monthly totals are still useful for reviewers.

b) The Proponent also report the dates that CMS Levels were triggered. This has only been partially done in the Report.

As additional monitoring activities are implemented, reporting that helps draw the connection between site staff observing caribou and other wildlife and actions taken to prevent disturbance and impacts to caribou would be beneficial.

The GN recognizes the efforts of the proponent to mitigate the impacts of Project activity on caribou, muskox, and other wildlife in the Project area and recommends these changes to better demonstrate that effort.

B2Gold Nunavut Response:

B2Gold agrees that sharing data that show caribou observations, mitigation measures and normal operation are an important aspect of the WMMP report. For the 2023 wildlife report, B2Gold will report all those data that are available. If specific dates are not available, B2Gold will ensure that these data are collected going forward.

GN AR-#07: Traffic Data Collection on the Winter Ice Road

Terms and Conditions:

Project Certificate T&C # 45

References:

- Sabina 2022 Annual Report
- Sabina Wildlife Mitigation and Monitoring Program
- Sabina 2022 Annual Report Appendix G. 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report

Identification of Issue:

As the Project expands and vehicle traffic on the Winter Ice Road (WIR) increases, the GN sees a need to collect traffic count data on the WIR to better understand the potential impact of this vehicle traffic on caribou movements in proximity to the WIR. This traffic data would support the Proponent in evaluating the extent of caribou-road interactions. Movement of caribou across the WIR is an important consideration within the Project Wildlife Mitigation and Monitoring Program.

Importance to Review and Supporting Rationale:

The Proponent describes in the next steps portion for Project Certificate Condition 45, "An analysis was conducted comparing collar data from caribou in 2019 (WIR active) to 2017 and 2018 (no WIR), which reported [no] change or delay in caribou movement during 2019 when the WIR was active. This analysis was appended to the 2019 WMMP Report."

Increased traffic levels, particularly those associated with the transportation of supplies from the Marine Laydown Area, may have an impact on the behaviour of caribou crossing the WIR. Access to traffic data would provide additional insight into any observations of avoidance or delay in caribou crossing the road. Collecting traffic data is a common practice for sites with large connecting roads (e.g., BIMC Mary River Project, AEM Meadowbank Mine), and given the length and location of the WIR within caribou habitat, the GN believes collection of vehicle traffic data (vehicle type, frequency) on the WIR is appropriate.

Recommendations:

The Government of Nunavut recommends:

- The Proponent collect basic traffic data during the construction and operation of the WIR. This includes vehicle frequency and type. Example types could be light vehicles (e.g., 3/4 ton pickup trucks), transport (e.g., semi-tractor trailers hauling fuel or other supplies) and heavy equipment (e.g., loaders, graders, etc.)

The GN is interested in discussing this topic at the next CTAG meeting.

B2Gold Nunavut Response:

For the 2023 wildlife report, B2Gold will report all those data that are available. If specific truck classes and vehicle numbers per day are not available, B2Gold will ensure that these data are collected going forward.

GN AR-#08: Helicopter Flight Heights and Pilot Observations

Terms and Conditions:

Project Certificate T&Cs #60, 61

References:

- GN Technical Review Comments on 12MN001 TMAC Resources' DEIS for Phase 2 of the Hope Bay Belt Project, 2017 (170523-12MN001-GN Technical Review Comments-IMTE.pdf).
- GN Technical Review Comments on 08MN053 BIMC Phase 2 Development of the Mary River Project, 2019 (08MN053 - BIMC Phase 2 TRCs – FINAL.pdf).
- GN Technical Review Comments on 16MN036 AEM EIS for the Whale Tail Pit Project, 2017 (170328-16MN056-GN Technical Comment Submission.pdf).
- Maier, J. A. K., 1996. Ecological and Physiological Aspects of Caribou Activity and Responses to Aircraft Overflights. University of Alaska, Fairbanks.
- NIRB Project Certificate No. 007
- Sabina 2022 Annual Report Appendix G. 2022 Pre-Construction Wildlife Mitigation and Monitoring Program Report
- Wolfe, S. A., Griffith B., and Wolfe, C. A. G., 2000. Response of reindeer and caribou to human activities, Polar Research (19(1), 63-73.

Identification of Issue:

The Government of Nunavut (GN) continues to flag the issue of helicopter flights below the recommended altitude of 610 m above ground level (AGL), the reporting format for helicopter flights, pilot observations, and the Proponent's response to the GN's past comments on this issue.

Importance to Review and Supporting Rationale:

Regarding helicopter use, caribou have been shown to exhibit increased movement and flight responses to aircraft overflights, which increase with the relative intensity of noise associated with that aircraft (Maier, 1996). Caribou reacted to helicopter overflights most strongly during the calving season, yet more than 80% of caribou had a strong reaction (running away) from small aircraft overflights in the winter (Wolf, et al., 2000). This emphasizes the broad reach that helicopter operations can have on caribou.

Caribou exhibit a more intense response to helicopters than fixed-wing aircraft at low altitudes (<400m), and flight response to both types of aircraft dissipates as overflight altitude increases. Similarly, cows with calves are more likely to respond to helicopter overflights than other demographic groups (Wolfe, et al., 2000).

Given the evidence for the impacts of low altitude helicopter overflights on caribou, most operating mines in Nunavut have adopted a flight height standard as a key mitigation measure. For example, the primary mitigation measure for minimizing disturbance of wildlife, in particular ungulates, by helicopters at the AEM Whale Tail Pit Project is to "maintain ferrying flight altitudes of 610 m when feasible", except during take-offs and landings (Table 4, TEMP App 8-E.7) (GN 2017). Likewise, AEM (formerly TMAC) lists 610 m

during the calving season for their Hope Bay belt, and Baffinland Iron Mines requires all project-related aircraft to fly at or above 650 m, subject to safety requirements, to reduce impacts to caribou.

The GN raises the issue of the absence of pilot observations of wildlife, as there were more than 3,600 caribou observations by site staff, and the Proponent committed to elevating its effort in communicating to pilots the requirement to report wildlife observations. The GN is seeking additional information to better understand why pilots did not observe wildlife.

These observations are particularly important in compliance with the Wildlife Mitigation and Monitoring Program (WMMP) approach to drill moves (WMMP S.5.1.2.2), "drill moves were only conducted when caribou were not within the disturbance buffers described above and in the WMMP Plan." Given the nature of drill sites, pilots would have the best point of view to observe whether caribou were in the vicinity of drilling equipment prior to the move, but there is no indication that any survey, however brief, for caribou within the stated buffers was undertaken prior to initiating the move. The GN requests an explanation of how caribou are surveyed within the stated buffers prior to drill moves.

Lastly, regarding flight reporting format, the GN appreciates the improvements in clarifying the number of flights per colour spectra, however the bin categorization still does not provide clarity as to the number of flights in each area. The report text states "dark green indicates one flight over the season" but the map legend indicates the same colour for anywhere between 1-25 flights.

Recommendations:

As indicated in previous comments, the GN fully recognizes the nature of helicopter operations and how they support the Back River Project. The GN does not expect the 610 m AGL flight level to be applied in poor weather conditions or low ceilings, or for hauling external loads (e.g., during drill relocation). Furthermore, the GN recognizes that the 610 m requirement on short trips (2-3 km) places additional and unnecessary strain on operations.

As such, the GN recommends the following:

- Apply the 610 m AGL flight level in the following instances to reduce potential impact to caribou in the Project Development Area:
    - Ferrying, transits, non-external cargo moves, passenger flights, and similar flights longer than 10 km.
- Adjust the map legend (Fig. 5.1-1 and 5.1-2) in the WMMP report to better describe the number of flights throughout the Project Development Area.
- As above, the GN requests an explanation of how caribou are surveyed within the stated buffers prior to drill moves.

B2Gold Nunavut Response:

As discussed in the response to KIA-NIRB-08, B2Gold will review how the helicopter flight data is presented and update the analysis and presentation of these data following comments from the KIA and GN.

2.4 RESPONSE TO ENVIRONMENT AND CLIMATE CHANGE CANADA

ECCC-1: Challenges with Air Quality Monitoring

References:

Sabina Back River Project 2022 Annual Report, Project Certificate Conditions No. 2 and 3

Comment

For Project Certificate Condition No. 2, the report states "No results from the air quality monitoring program in 2022 have been received due to logistical issues with collecting and shipping sample containers. The issues have been noted and Sabina is working on addressing them for the current and future air quality monitoring programs." For Project Certificate Condition No. 3, the report states "Proposed updates to the FDRP and AQMMP are planned for May of 2023 to align with advances to monitoring technologies and to reflect the current understanding of the project. Moreover, the updates will address issues that have been noted with current air quality monitoring program." With the Project moving into full construction in 2023, air emissions will increase substantially, and therefore a timely resolution to these issues is becoming increasingly urgent.

Recommendation/Request:

ECCC requests that a firm timeline be provided for resolution to the air quality monitoring challenges with updates provided to agencies before construction activities attain maximum intensity. If the resultant monitoring detects air quality impacts greater than anticipated, ECCC requests information be provided on mitigation responses.

B2Gold Nunavut Response:

The challenges that were identified during the 2022 air quality monitoring program were addressed before the commencement of the 2023 air quality monitoring program. The 2023 air quality monitoring program consists of passive NO_2 sampling and dustfall sampling. The passive NO_2 and dustfall samples are collected monthly and shipped to an external laboratory for analyses. Laboratory results will be analyzed at the completion of the 2023 air quality monitoring program, which will include comparisons to applicable standards. If exceedances to the applicable standards occurred during the 2023 air quality monitoring program, an appropriate mitigation response will be drafted and communicated.

ECCC-2: Management of Potentially Acid Generating (PAG) Rock

References:

Sabina Back River Project 2022 Annual Report – Appendix B, Attachment 1 Summary of Observation and Recommendations – Goose Inspection Item – Road thickness 3

Comment

In their report, the Proponent's consultant SRK indicated that it is "unaware of the Sabina quarry, run of mine, and underground rock geochemical sampling and monitoring plans. Therefore, SRK is unable to comment on the quality of this rockfill material or suitability for use as construction material. It is suggested that Sabina implement a program to track where any underground waste rock (or if / when PAG encountered in the pit pre-stripping and early development activities) is placed. *Sabina has indicated to SRK that they do now have a tracking plan in place and that site geochemical sampling plans and programs (as have been submitted as part of license submissions) have been followed in 2022. A review of the geochemical sampling and tracking plan was not done as part of the 2022 AGI but is suggested to be completed in 2023".*

ECCC acknowledges the response from Sabina about putting in place a tracking plan that determines the suitability of the construction material; however, it is not clear if the proponent has any plans, or any mitigation strategy should the tracking plan identify that PAG rock was used for construction.

Recommendation/Request:

ECCC recommends that the proponent explain how they would manage any PAG rock identified by the tracking plan that was used in construction.

B2Gold Nunavut Response:

Any PAG rock identified will be managed as per Section 6.1 of the 220430 2AM-BRP1831 Waste Rock Management Plan of the Back River Project Type A Water Licence:

"All PAG will be placed in the WRSAs in a manner that will allow the encapsulation of this material by NPAG rock on closure such that PAG rock will become fully frozen and inactive following closure. Overburden on the Property is considered NPAG material, and as such may be segregated for use as a cover material. Overburden which is not structurally suitable (e.g., high silt content) will be co-disposed with waste rock, with ultimate placement at least 20 m from the outer edge of the WRSAs to maintain overall pile stability. This management approach will facilitate a long term chemically and physically stable closure state."

ECCC-3: Compliance Monitoring

References:

2022-043 Lead Agency CIRNAC – Feb 17, 2022 – Fuel release to ice – No enforcement action taken.

Comment

The Project is not currently subject to the *Metal and Diamond Mining Effluent Regulations* (MDMER) and majority of the site is located on Inuit Owned Land exempting it from the Storage Tank Systems Regulations. It has been noted that a fuel storage tank system has been constructed on the property which would be subject to the Environmental Emergency regulations for diesel fuel and / or gasoline. It is expected that Back River is moving towards becoming an active mine and becoming subject to the MDMER.

Recommendation/Request:

- No onsite inspections were conducted over the 2022 field season at Back River

B2Gold Nunavut Response:

The Back River Project is registered under the Environmental Emergency Regulations for both Diesel and Ammonium Nitrate. The Project will become subject to the MDMER when triggered.

2.5 RESPONSE TO FISHERIES AND OCEANS CANADA

DFO-1: Effects Monitoring

References:

Condition No. 93

Comment

Ensure protection of the marine environment.

Recommendation/Request:

DFO would like to remind the Proponent to send a Request for Review for their Shoreline Pad Expansion prior to construction. An update may necessary to the existing DFO Letter of Advice (18-HCAA-00971) to reflect planned in-water works.

B2Gold Nunavut Response:

B2Gold acknowledges DFO's request and is committed to submit a Request for Review application if, and when the shoreline pad is expanded.

DFO-2: Effects Monitoring

References:

Appendix B (Geotechnical Inspection)

Comment

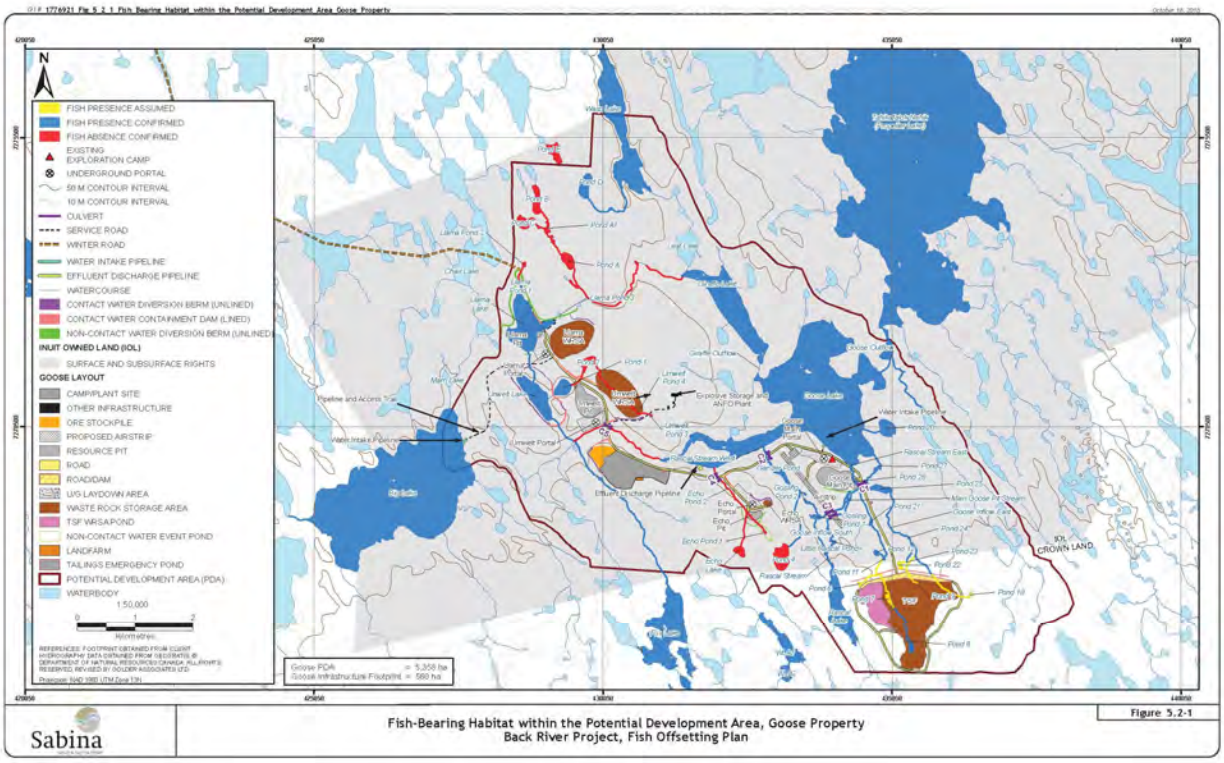
Improperly sized and installed culverts may impede fish passage.

Recommendation/Request:

Confirm that culverts G15, G21 and G23 are not located in fish-bearing streams as they appear to be perched.

B2Gold Nunavut Response:

Crossing G15, G21, and G23 are not located at a watercourse, or near known fish-bearing locations. The crossings are designed to convey surficial flows over land during wetted periods of the open water season. Included below is snapshot of a figure from the Fisheries Act Authorization application.



DFO-3: Effects Monitoring

References:

2022 Pre-Construction and Wildlife Mitigation Program, Section 7.1.2.2 Marine Mammal Sightings

Comment

In section 3.4.2.1 (Marine Mammal Survey) of the Marine Shipping – Wildlife Mitigation and Management, it is noted that "the observer will document if any mitigation was undertaken (see Table 3.5-1) and, if mitigation was required, a description of the mitigation action taken (e.g., change in course or speed) and the result of the mitigation action (e.g., maintained a buffer of x meters from the animal and if it continued swimming)."

Grey seals were observed at 10 to 300 m from a vessel during shipping.

There is no information on if mitigation measures were implemented (e.g., maintain a distance of 100 m; reduce noise by 1.2-2.8 dB for every 1 knot reduction in speed)

Recommendation/Request:

Provide details on mitigation measures undertaken following sightings of marine mammals.

B2Gold Nunavut Response:

Insert response

DFO-4: Effects Monitoring

References:

2022 Pre-Construction and Wildlife Mitigation Program, underwater noise during shipping

Comment

Underwater noise from shipping vessels can have a negative impact on marine mammals by reducing their ability to travel, communicate, and find food. Five vessels serving the Project travelled in 2022.

Recommendation/Request:

DFO suggests underwater noise from shipping vessels be monitored and, if necessary, mitigated.

B2Gold Nunavut Response:

Insert response

2.6 RESPONSE TO TRANSPORT CANADA

TC-1: Marine Safety and Security

Comment

a) Compliance and Inspections:

Transport Canada completed an onsite inspection of the Project's Oil Handling Facility (OHF) in August 2022. No issues or concerns were identified from the exercise or inspection. The Project was in compliance with the regulatory requirements of part 8 of the *Canada Shipping Act, 2001* (CSA 2001) and the Environmental Response Regulations.

b) Information regarding the Oil Pollution Emergency Plan (OPEP) and Oil Pollution Prevention Plan (OPPP) for the Project:

For the information of the Board and the Proponent, under section 12 of the Environmental Response Regulations passed pursuant to CSA 2001, there is a requirement for the owner of an OHF to complete annual reviews and if necessary update the Project's Oil Pollution Emergency Plan (OPEP) and Oil Pollution Prevention Plan (OPPP). If plans are updated, they must be submitted to Transport Canada no later than one year after the update. As required under the CSA 2001, the facility will need to notify Transport Canada of proposed changes to the OHF's operations relating to the loading or unloading of oil to or from vessels (180 days in advance of the change). The facility is also required to submit a revised OPEP/OPPP 90 days before a change in operation.

Recommendation/Request:

Transport Canada recommends to the Board and the Proponent that an up-to-date OPEP and OPPP continue to be included in future annual reports for the Sabina Back River Gold Project.

Additional Information:

a) Additional Information – Marine Safety and Security:

Transport Canada would like to remind the Proponent of two particular pieces of information regarding marine safety and security:

- Before the facility interfaces with a foreign flagged vessel or a Canadian flagged vessel on an international voyage, Sabina Gold and Silver Corporation is required to comply with the *Marine Transportation Security Act* and Regulations. At present, the facility does not fall under the Marine Security regulatory requirements.

- Marine shipping standard operating procedure: Vessel operators serving the Project should be made aware of the 2023 Annual Notice to Mariners, and in particular section A2 Marine Mammal Guidelines and Marine Protected Areas and section 7A Voyage Planning for Vessels Intending to Navigate in Canada's Northern Waters (see: Annual Notice to Mariners at https://publications.gc.ca/collections/collection_2023/mpo-dfo/Fs151-4- 2023-eng.pdf).

B2Gold Nunavut Response:

B2Gold appreciates TC's confirmation of being in compliance with relevant requirements of the Canada Shipping Act, 2001 (CSA 2001) and the Environmental Response Regulations. B2Gold will continue to include updated OPEP and OPPP in annual reports to the NIRB. In regard to the Marine Transportation Security Act and Regulations prior to interfacing with a foreign flagged vessel or a Canadian flagged vessel on an international voyage, B2Gold is currently communicating with Transport Canada.

TC-2: Navigation Protection

Comment

As Sabina noted in its 2022 Annual Report for the Project, Transport Canada's Navigation Protection Program has issued authorizations for various works associated with the Project:

- 2012-600767-002 - Navigation Protection Act – MLA Discharge Pipeline Authorization
- 2012-600767-003 - Navigation Protection Act – MLA Intake Pipeline Authorization
- 2012-600767-006 - Navigation Protection Act – MLA Lightering Barge Authorization

No compliance issues with these authorizations were noted in 2022. No site visits of the works, e.g., discharge pipeline, were conducted in 2022.

Recommendation/Request:

B2Gold Nunavut Response:

This verification is appreciated, thank you.

TC-3: Transportation of Dangerous Goods

Comment

a) Inspections:

A Transportation of Dangerous Goods (TDG) inspection was not conducted by Transport Canada for the Project in 2022. Transport Canada's TDG group did not receive any complaints or concerns about the Project in 2022. No enforcement actions were undertaken.

b) Hazardous water/materials information:

Sabina's 2022 Annual Report does not provide any information regarding the shipping of dangerous/hazardous goods. In keeping with Transport Canada's comments for the 2020 and 2021 Annual Reports for the Project, the Department recommends:

Future annual reports for the Back River Gold Mine Project provide information and copies of documents regarding the transportation of dangerous goods for the Project, including *nil* comments. Part of this information would be the inclusion of all hazardous waste manifests for the Project, if any. This information would support Transport Canada's reviews of future annual reports.

Recommendation/Request:

B2Gold Nunavut Response:

Information regarding hazardous materials that are sent from the Back River Project to waste management facilities are and have been provided in the Nunavut Water Board Type A Water Licence (2AM-BRP1831) annual reports for the Back River Project. Sabina can provide this information in the NIRB annual reports going forward.

ATTACHMENT A

FISH PASSAGE EVALUATION, MITIGATION, AND MONITORING FOR THE RASCAL STREAM DIVERSION

TECHNICAL MEMORANDUM

DATE 29 June 2020 **Reference No.** 18114181-062-TM-Rev0

TO Merle Keefe, Manager, Environmental Permitting
Sabina Gold & Silver Corp.

CC Jen Range, Curtis VanWerkhoven

FROM Cam Stevens **EMAIL cestevens@golder.com**

FISH PASSAGE EVALUATION, MITIGATION, AND MONITORING FOR THE RASCAL STREAM DIVERSION

Introduction

Sabina Gold & Silver Corporation (Sabina) plans to advance the construction of the Back River Project where a key construction activity will be the extension of the existing airstrip. An environmental constraint for planned works requires that Rascal Stream East, a fish-bearing stream, be diverted through a constructed channel to Gosling Pond 1, where flows will combine with Rascal Stream West. As per conditions of the Back River Project *Fisheries Act* Authorization and commitments for the Nunavut Impact Review Board (NIRB) Project Certificate, Sabina must demonstrate that the diversion of water can provide suitable conditions for the migration of Arctic Grayling from Goose Lake to access upstream spawning habitats on Rascal Stream East and West (Figure 1).

Although the diversion of water has the potential to increase the abundance and quality of habitat downstream of the diversion channel, including habitats in Rascal Stream West Reach 2 and 3, the presence of existing physical barriers or impediments to passage under baseline conditions in Reach 1 (Sabina 2017) may limit the productive capacity of habitat to support Arctic Grayling populations. As a follow up to the 'Rascal Stream Fishway Hydrotechnical Assessment' (Golder 2020), the goal of this technical memorandum was to evaluate how the proposed diversion channel may affect spring flow conditions for upstream passage of spawning Arctic Grayling in the Rascal Stream system, followed by recommendations to mitigate potential barriers for movements that may ultimately enhance the productive capacity of habitat for Arctic Grayling.

The first objective of this technical memorandum was to evaluate upstream passage of Arctic Grayling for the hydrological estimates below the diversion channel that were provided for spring (June) in the 'Rascal Stream Fishway Hydrotechnical Assessment' (Golder 2020). The evaluation was completed by applying fish passage criteria derived from previously published fatigue equations for salmonids (Katopodis and Gervais 2016).
Given that physical barriers or impediments to passage may be present under baseline conditions in lower Rascal Stream West (Sabina 2017), the second objective was to provide recommendations on the design of naturalized, in-stream structures to mitigate the potential effects of high velocities on upstream passage of Arctic Grayling. Although recommendations on where to deploy mitigation were also provided, the specific locations will be field-fit to best address 'pinchpoints' in the lower reach of Rascal Stream West (Sabina 2017). Proposed fish habitat features for the diversion channel itself are also presented. The third objective of this technical memorandum was to provide recommendations to monitor the effects of the diversion channel and the diversion of water on Arctic Grayling in the Rascal Stream system.

Golder Associates Ltd.
16820 107 Avenue, Edmonton, Alberta, T5P 4C3, Canada T: +1 780 483 3499 F: +1 780 483 1574

433000 433500

7270000

Goose Lake

XS15

XS64

XS109

XS115

XS154

XS194

Rascal Stream West Reach 1

VIEW UPSTREAM TOWARDS BRIDGE CROSSING AT SHALLOW RUN HABITAT TYPE AT RSW1 (20 JUNE 2019).

VIEW DOWNSTREAM TOWARDS BRIDGE CROSSING IN RIFFLE HABITAT AT RSW1 (20 JUNE 2019).

SEE FIGURE 2, DETAILS A AND B FOR CONCEPTUAL ROCK WEIR DESIGNS AT 7 m SPACING FOR 75 m UPSTREAM OF THE BRIDGE, AND AT 17 m SPACING FOR 59 m STARTING APPROXIMATELY 95 m UPSTREAM OF THE BRIDGE

Gander Pond

433500 434000

7269000

Gosling Pond 2

Rascal Stream West Reach 3

Main Goose Pit Stream Reach 3

Rascal Stream East Reach 4

Gosling Pond 1

SEE FIGURE 2, DETAILS C AND D FOR CONCEPTUAL DIVERSION CHANNEL DESIGN.
CHANNEL LENGTH IS 115 m WITH AN APPROXIMATE SLOPE OF 0.002 m/m

Rascal Stream West Reach 7

Rascal Stream East Reach 5

Little Rascal Pond

7268500

Goose Lake

Gander Pond

Gosling Pond 2

Gosling Pond 1

Little Rascal Pond

Pond 4

LEGEND

- CONTOUR (1m INTERVAL)
- HEC-RAS MODELLED CROSS SECTIONS (XS#)
- RASCAL STREAM
- WATERCOURSE
- WATERBODY

PROPOSED INFRASTRUCTURE

- AREA REQUIRES VELOCITY MITIGATION AT 7 m SPACING
- AREA REQUIRES VELOCITY MITIGATION AT 17 m SPACING
- RASCAL STREAM DIVERSION CHANNEL
- AIRSTRIP EXTENSION
- PROPOSED CONTAINMENT BERM
- PROPOSED DIVERSION BERM

0 100 200

1:4,000 METRES

REFERENCE(S)

HYDROLOGY LAYERS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED, REVISED BY GOLDER ASSOCIATES LTD.
PROJECTION: UTM ZONE 13 DATUM: NAD 83

CLIENT
SABINA GOLD & SILVER CORP.

PROJECT
BACK RIVER PROJECT ENVIRONMENT AND PERMITTING

TITLE
RASCAL STREAM CONCEPTUAL DIVERSION FISHWAY AND FISH PASSAGE VELOCITY MITIGATION

CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-19
DESIGNED	NG
PREPARED	CO
REVIEWED	CV
APPROVED	CS

PROJECT NO.	CONTROL	REV.	FIGURE
18114181	4500/4530	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

Fish Passage Evaluation

Methods

Barriers to fish can occur through the occurrence of natural or artificial obstacles for upstream movements, which can be in the form of permanent barriers that occur under all flow conditions (e.g., topography barriers such as waterfalls) or temporary/seasonal barriers that may only restrict fish passage under certain flow conditions, such as high velocities. The main concern related to the diversion of flows from Rascal Stream East to Rascal Stream West is effects of high velocities downstream of the diversion channel during spring conditions when adult Arctic Grayling migrate to upstream spawning habitats. Specifically, the hydrotechnical assessment identified the reach in the vicinity of the road crossing (Rascal Stream West Reach 1) as the area with highest modelled velocities under baseline conditions and the greatest modelled changes in velocities under diverted flows (Golder 2020). Therefore, the spatial extent of this evaluation focused on the lower 220 m of Rascal Stream West Reach 1 (Figure 1), relying on hydraulic model results summarized for Station No. 15, 64, 115, 154, and 194 in Golder (2020). Results for Station No. 15 and Station No. 64 were assumed to represent hydrological conditions in the vicinity of the clear-span bridge that was constructed (fall 2018) approximately 50 m upstream of Goose Lake. Above Station No. 194, the stream gradient is reduced closer to the outlet of Gander Pond and remains relatively flat through upstream sections of Rascal Stream West and East (Golder 2020).

Fish speed and stamina, locomotion, and the mechanics of fish swimming are important considerations in the assessment of fish passage (Katopodis and Gervais 2016). To determine whether adult Arctic Grayling (25-cm length) are able to navigate lower Rascal Stream West, a fatigue curve (or formula) for Salmonids (Katopodis and Gervais 2016) was applied to generate endurance values (seconds) and distances (m) at a range of swimming speeds. The selected parameter coefficients for the formula were those representing the median statistic. A more conservative set of parameters was deemed unrealistic for setting velocity criteria because Arctic Grayling have been described as very efficient swimmers, capable of swimming fast over long periods of time (Deegan et al. 2005), and also because the predicted flows represent average channel velocities that would be greater than bottom or margin velocities that can be exploited by fish (Katopodis and Gervais 2016).

The fatigue equation was defined by the following relationship between dimensionless (fish speed, U*) and dimensionless endurance time (t*) (Katopodis and Gervais 2016):

$$U_* = 4.004(t_*)^{-0.25}$$

Where: $U_* = U / \sqrt{gl}$ and $t_* = t / \sqrt{l/g}$

Where:

U = fish swimming speed

t = endurance time (seconds)

l = fish length (metres)

g = gravitational acceleration (9.81 m/s^2)

Results from the application of the fatigue equation show that for example, in a flow velocity of 1.0 m/s, the maximum distance that an adult Arctic Grayling can swim before fatigue would be 26 m based on an optimal swim speed of 1.4 m/s. If the predicted velocity for a section of Rascal Stream West Reach 1 was above the distance-specific threshold calculated for Arctic Grayling using the fatigue equation from Katopodis and Gervais (2016), then that reach section was deemed impassable for that velocity. Predicted velocities were also provided over a range of discharge conditions for the month of June (0.5 to 2.0 m^3/s; where 2.0 m^3/s was the calculated Q90 [90^{th}-percentile of flows] flow for June). Each velocity prediction was then linked to the predicted number of days in June that are above the respective discharge flow for each velocity (to characterize the duration of higher flow conditions). The predicted velocity at the 1.8 m^3/s discharge was also explicitly assessed for fish passage unless otherwise stated in the results. This approach assumed that high velocities during peak freshet that delay migrations by up to 3 days do not have any measurable effect on reproductive success for Arctic Grayling (Stewart et al. 2007).

The baseline and diversion scenario modelled hydraulic parameters and statistics for fish passage for Rascal Stream West Reach 1 are provided in Tables 1 to 5.

Results and Discussion

Rascal Stream West Reach 1

The flow velocity estimates for the lowermost section of Rascal Stream West (HEC-RAS modelled Station No. 15) (hereinafter, all stations are referenced to the HEC-RAS modelled stations, not chainage from the Goose Lake inlet) were deemed passable for upstream movement of adult Arctic Grayling under a range of flow scenarios in June (Table 1). The maximum daily averaged velocity for the month of June was 0.47 m/s, which will be passable over an assessment distance of 49 m (Station No. 15 to 64). Under a velocity of 0.47 m/s, an adult Arctic Grayling was predicted to swim 249 m before fatigue.

The velocity estimates for Station No. 64 were deemed non-passable for upstream movement of adult Arctic Grayling (Table 2). Even under late June conditions, velocities remain relatively high at 0.89 m/s and non-passable over an assessment distance of 51 m (Station No. 64 to 115). The recommended spacing for velocity mitigation is a minimum of 7 m to maintain passage under velocities of 1.58 m/s, which was the maximum daily velocity for Station No. 64. Unlike other stations, Station No. 64 was characterized by peak velocities at a discharge of approximately 1.3 m^3/s (versus 2.0 m^3/s), which was assumed to reflect the channel morphology and depth of the banks at that location where higher flows can spill over into a wider floodplain, reducing the predicted mean velocity through the cross-section of the stream.

The velocity estimates for Station No. 115 were determined to be passable for upstream movement of adult Arctic Grayling under a range of flow scenarios in June (Table 3). The maximum daily velocity for the month of June was 0.56 m/s, which is predicted to be passable over an assessment distance of 39 m (Station No. 115 to 154). Under a velocity of 0.56 m/s, an adult Arctic Grayling was predicted to swim 148 m before fatigue.

The velocity estimates for Station No. 154 were deemed non-passable for upstream movement of adult Arctic Grayling through most of June, assuming an assessment distance of 40 m (Station No. 154 to 194) (Table 4). Although velocities were deemed passable under late June conditions of 0.55 m^3/s or less, velocities at discharge conditions of 0.60 m^3/s or greater were not passable for fish. The recommended spacing for velocity mitigation was set at 17 m (or less) to maintain fish passage at a discharge of 1.80 m^3/s.

The velocity estimates for Station No. 194 were deemed passable for upstream movement of adult Arctic Grayling under a range of flow scenarios in June (Table 5). The maximum daily velocity for the month of June was 0.83 m/s, which would be passable over an assessment distance of 26 m (Station No. 194 to 220). Under a velocity of 0.83 m/s, an adult Arctic Grayling was predicted to swim 46 m before fatigue. Fish passage above Station No.194 is not expected to be an issue for migrating Arctic Grayling because of the flatter topography that characterizes upper regions of the Rascal Stream basin.

Table 1: Fish Passage Statistics for Rascal Stream West Outflow Station No. 15 (Station No. 15 to 64)

Average Daily Discharge (m^3/s)	Water Top Width (m)	Average Water Depth (m)	Channel Velocity (m/s)	[a]Distance Before Fatigue (m)	[b]Passable based on Velocity? (yes/no)	No. of Days Above Average in June	
						Baseline Case	Diverted Case
0.50	28.33	0.05	0.34	662	Yes	3	19
0.55	29.82	0.05	0.35	602	Yes	3	18
0.60	31.27	0.05	0.35	602	Yes	2	16
0.65	32.63	0.06	0.36	553	Yes	2	15
0.70	33.36	0.06	0.36	553	Yes	2	14
0.75	33.96	0.06	0.37	513	Yes	1	13
0.80	34.54	0.06	0.38	474	Yes	1	12
0.85	35.10	0.06	0.39	434	Yes	1	11
0.90	35.65	0.06	0.39	434	Yes	1	10
0.95	36.18	0.07	0.40	405	Yes	1	10
1.00	36.69	0.07	0.40	405	Yes	0	9
1.05	37.19	0.07	0.41	378	Yes	0	8
1.10	37.67	0.07	0.42	351	Yes	0	8
1.15	38.15	0.07	0.42	351	Yes	0	7
1.20	38.61	0.07	0.43	324	Yes	0	7
1.25	39.07	0.07	0.43	324	Yes	0	7
1.30	40.32	0.07	0.43	324	Yes	0	6
1.35	41.68	0.07	0.43	324	Yes	0	6
1.40	42.97	0.08	0.43	324	Yes	0	5
1.45	44.21	0.08	0.44	305	Yes	0	5
1.50	45.24	0.08	0.44	305	Yes	0	5
1.55	46.21	0.08	0.44	305	Yes	0	4
1.60	47.16	0.08	0.44	305	Yes	0	4
1.65	48.07	0.08	0.44	305	Yes	0	4
1.70	48.86	0.08	0.45	286	Yes	0	4
1.75	49.11	0.08	0.45	286	Yes	0	4
1.80	49.34	0.08	0.45	286	Yes	0	3
1.85	49.57	0.08	0.46	267	Yes	0	3
1.90	49.81	0.08	0.46	267	Yes	0	3
1.95	50.04	0.08	0.47	249	Yes	0	3
2.00	50.26	0.08	0.47	249	Yes	0	3

Notes: Outlier at 0.05 m^3/s removed; Q90 June velocity = 0.47 m/s; [a] Assuming a fork length of 25 cm for an adult Arctic Grayling; based on 50% prediction interval from salmonid fatigue equation (Katopodis and Gervais 2016); [b] Successful fish passage is based on a 49 m assessment distance

Table 2: Fish Passage Statistics for Rascal Stream West Outflow at Station No. 64 (Station No. 64 to 115)

Average Daily Discharge (m^3/s)	Water Top Width (m)	Average Water Depth (m)	Channel Velocity (m/s)	[a]Distance Before Fatigue (m)	[b]Passable based on Velocity? (yes/no)	No. of Days Above Average in June	
						Base Case	Diverted Case
0.50	11.35	0.05	0.89	37	No	3	19
0.55	11.34	0.05	0.99	27	No	3	18
0.60	11.29	0.05	1.13	18	No	2	16
0.65	11.33	0.05	1.17	16	No	2	15
0.70	11.34	0.05	1.26	13	No	2	14
0.75	11.36	0.05	1.32	11	No	1	13
0.80	11.40	0.05	1.36	10	No	1	12
0.85	11.43	0.05	1.40	9	No	1	11
0.90	11.46	0.05	1.44	9	No	1	10
0.95	11.50	0.06	1.47	8	No	1	10
1.00	11.54	0.06	1.50	8	No	0	9
1.05	11.58	0.06	1.52	7	No	0	8
1.10	11.62	0.06	1.54	7	No	0	8
1.15	11.68	0.06	1.53	7	No	0	7
1.20	11.71	0.07	1.56	7	No	0	7
1.25	11.76	0.07	1.58	7	No	0	7
1.30	11.82	0.07	1.57	7	No	0	6
1.35	11.86	0.07	1.58	7	No	0	6
1.40	12.56	0.10	1.10	20	No	0	5
1.45	12.61	0.10	1.12	19	No	0	5
1.50	12.65	0.10	1.13	18	No	0	5
1.55	12.69	0.11	1.15	17	No	0	4
1.60	12.74	0.11	1.16	17	No	0	4
1.65	12.77	0.11	1.18	16	No	0	4
1.70	12.81	0.11	1.19	15	No	0	4
1.75	12.85	0.11	1.21	15	No	0	4
1.80	12.89	0.11	1.22	14	No	0	3
1.85	12.93	0.12	1.24	14	No	0	3
1.90	12.97	0.12	1.25	13	No	0	3
1.95	13.01	0.12	1.26	13	No	0	3
2.00	13.05	0.12	1.27	13	No	0	3

Notes: Outliers at 0.35 and 0.4 m^3/s removed; Q90 June velocity = 1.27 m/s; [a] Assuming a fork length of 25 cm for an adult Arctic Grayling; based on 50% prediction interval from salmonid fatigue equation (Katopodis and Gervais 2016); [b] Successful fish passage is based on a 51 m assessment distance

Table 3: Fish Passage Statistics for Rascal Stream West Outflow at Station No. 115 m (Station No. 115 to 154)

Average Daily Discharge (m^3/s)	Water Top Width (m)	Average Water Depth (m)	Channel Velocity (m/s)	[a]Distance Before Fatigue (m)	[b]Passable based on Velocity? (yes/no)	No. of Days Above Average in June	
						Base Case	Diverted Case
0.50	8.00	0.15	0.42	351	Yes	3	19
0.55	8.00	0.16	0.42	351	Yes	3	18
0.60	8.00	0.18	0.42	351	Yes	2	16
0.65	8.00	0.19	0.43	324	Yes	2	15
0.70	8.00	0.20	0.44	305	Yes	2	14
0.75	8.00	0.21	0.44	305	Yes	1	13
0.80	8.00	0.22	0.45	286	Yes	1	12
0.85	8.00	0.24	0.45	286	Yes	1	11
0.90	8.00	0.25	0.46	267	Yes	1	10
0.95	8.00	0.26	0.46	267	Yes	1	10
1.00	8.00	0.27	0.47	249	Yes	0	9
1.05	8.00	0.28	0.47	249	Yes	0	8
1.10	8.00	0.29	0.48	235	Yes	0	8
1.15	8.00	0.30	0.48	235	Yes	0	7
1.20	8.00	0.31	0.49	221	Yes	0	7
1.25	8.00	0.32	0.49	221	Yes	0	7
1.30	8.00	0.33	0.50	207	Yes	0	6
1.35	8.00	0.34	0.50	207	Yes	0	6
1.40	8.00	0.35	0.51	195	Yes	0	5
1.45	8.00	0.36	0.51	195	Yes	0	5
1.50	8.00	0.36	0.52	185	Yes	0	5
1.55	8.00	0.37	0.52	185	Yes	0	4
1.60	8.00	0.38	0.52	185	Yes	0	4
1.65	8.00	0.39	0.53	175	Yes	0	4
1.70	8.00	0.40	0.53	175	Yes	0	4
1.75	8.00	0.41	0.54	164	Yes	0	4
1.80	8.00	0.42	0.54	164	Yes	0	3
1.85	8.00	0.43	0.54	164	Yes	0	3
1.90	8.00	0.43	0.55	156	Yes	0	3
1.95	8.00	0.44	0.55	156	Yes	0	3
2.00	8.00	0.45	0.56	148	Yes	0	3

Notes: Outlier removed at 0.15 m^3/s; Q90 June velocity = 0.56 m/s; [a] Assuming a fork length of 25 cm for an adult Arctic Grayling; based on 50% prediction interval from salmonid fatigue equation (Katopodis and Gervais 2016); [b] Successful fish passage is based on a 39 m assessment distance

Table 4: Fish Passage Statistics for Rascal Stream West Outflow at Station No. 154 (Station No. 154 to 194)

Average Daily Discharge (m^3/s)	Water Top Width (m)	Average Water Depth (m)	Channel Velocity (m/s)	[a]Distance Before Fatigue (m)	[b]Passable based on Velocity? yes/no	No. of Days Above Average in June	
						Base Case	Diverted Case
0.50	9.29	0.07	0.82	47	Yes	3	19
0.55	9.59	0.07	0.85	42	Yes	3	18
0.60	9.86	0.07	0.87	40	No	2	16
0.65	10.11	0.07	0.89	37	No	2	15
0.70	10.31	0.07	0.92	33	No	2	14
0.75	10.52	0.08	0.94	31	No	1	13
0.80	10.81	0.08	0.94	31	No	1	12
0.85	11.03	0.08	0.96	29	No	1	11
0.90	11.16	0.08	0.99	27	No	1	10
0.95	11.39	0.08	1.00	26	No	1	10
1.00	11.63	0.09	1.00	26	No	0	9
1.05	11.84	0.09	1.01	25	No	0	8
1.10	12.03	0.09	1.02	25	No	0	8
1.15	12.19	0.09	1.04	23	No	0	7
1.20	12.38	0.09	1.04	23	No	0	7
1.25	12.48	0.09	1.07	21	No	0	7
1.30	12.64	0.09	1.08	21	No	0	6
1.35	12.82	0.10	1.09	20	No	0	6
1.40	12.99	0.10	1.10	20	No	0	5
1.45	13.18	0.10	1.10	20	No	0	5
1.50	13.36	0.10	1.10	20	No	0	5
1.55	13.46	0.10	1.12	19	No	0	4
1.60	13.60	0.10	1.13	18	No	0	4
1.65	13.78	0.11	1.13	18	No	0	4
1.70	13.90	0.11	1.15	17	No	0	4
1.75	14.04	0.11	1.16	17	No	0	4
1.80	14.18	0.11	1.16	17	No	0	3
1.85	14.38	0.11	1.16	17	No	0	3
1.90	14.40	0.11	1.19	15	No	0	3
1.95	14.55	0.11	1.19	15	No	0	3
2.00	14.67	0.11	1.20	15	No	0	3

[a] Assuming a fork length of 25 cm for an adult Arctic Grayling; based on 50% prediction interval from salmonid fatigue equation (Katopodis and Gervais 2016); [b] Successful fish passage is based on a 40 m assessment distance; Notes: Q90 June velocity = 1.2 m/s

Table 5: Fish Passage Statistics for Rascal Stream West Outflow at Station No. 194 (Station No. 194 to 220)

Average Daily Discharge (m^3/s)	Water Top Width (m)	Average Water Depth (m)	Channel Velocity (m/s)	[a]Distance Before Fatigue (m)	[b]Passable based on Velocity? (yes/no)	No. of Days Above Average in June	
						Base Case	Diverted Case
0.50	19.87	0.04	0.62	109	Yes	3	19
0.55	20.85	0.04	0.63	104	Yes	3	18
0.60	21.95	0.04	0.64	99	Yes	2	16
0.65	23.08	0.04	0.65	95	Yes	2	15
0.70	23.93	0.04	0.66	90	Yes	2	14
0.75	24.69	0.05	0.67	87	Yes	1	13
0.80	25.28	0.05	0.68	83	Yes	1	12
0.85	25.81	0.05	0.68	83	Yes	1	11
0.90	26.14	0.05	0.70	76	Yes	1	10
0.95	26.67	0.05	0.71	73	Yes	1	10
1.00	27.34	0.05	0.71	73	Yes	0	9
1.05	27.97	0.05	0.72	70	Yes	0	8
1.10	28.56	0.05	0.72	70	Yes	0	8
1.15	29.13	0.05	0.73	67	Yes	0	7
1.20	29.65	0.06	0.73	67	Yes	0	7
1.25	29.99	0.06	0.75	62	Yes	0	7
1.30	30.55	0.06	0.75	62	Yes	0	6
1.35	31.04	0.06	0.76	59	Yes	0	6
1.40	31.56	0.06	0.76	59	Yes	0	5
1.45	32.05	0.06	0.76	59	Yes	0	5
1.50	32.58	0.06	0.77	57	Yes	0	5
1.55	32.92	0.06	0.77	57	Yes	0	4
1.60	33.23	0.06	0.78	55	Yes	0	4
1.65	33.55	0.06	0.78	55	Yes	0	4
1.70	33.86	0.06	0.79	53	Yes	0	4
1.75	34.16	0.06	0.79	53	Yes	0	4
1.80	34.46	0.07	0.80	51	Yes	0	3
1.85	34.78	0.07	0.80	51	Yes	0	3
1.90	35.00	0.07	0.81	49	Yes	0	3
1.95	35.27	0.07	0.82	47	Yes	0	3
2.00	35.57	0.07	0.83	46	Yes	0	3

[a] Assuming a fork length of 25 cm for an adult Arctic Grayling; based on 50% prediction interval from salmonid fatigue equation (Katopodis and Gervais 2016); [b] Successful fish passage is based on a 26 m assessment distance; Notes = Q90 June velocity = 0.83 m/s

Diversion channel

The diversion channel is proposed between the Rascal Stream East Reach 5 and the Gosling Pond 1. The channel is approximately 115 m in length with a slope of 0.002 m/m (0.2%). The diversion channel consists of a low-flow channel section and a high flow channel section (Figure 2) where the high flow channel section ties-in with the existing ground. The low-flow channel has a sinuosity (ratio of actual low-flow channel path length divided by shortest path length) of 1.2 within the diversion channel to reflect the sinuosity observed in the upstream Rascal Stream East Reach 5. The geometry of the diversion channel is provided in Figure 2 Cross-Section D. The conceptual diversion channel design includes well-graded rock (100 to 200 mm diameter) lining the channel, with the voids filled in with gravel or smaller cobbles as available on site. The channel lining for the diversion channel is designed to the 1-in-100-year flow event.

For the diverted scenario, flows from Rascal Stream East Reach 5 are diverted into the constructed channel. Representative flows were modelled to support channel sizing and assessment of fish passage through the channel. In June, the Q90 flow is estimated to be 1.1 m^3/s (Golder 2020) for the diversion channel, resulting in an estimated maximum water depth of 0.36 m for a typical cross-section, an average water depth of 0.18 m, a top width of 8.3 m, and an average flow velocity of 0.69 m/s. The flow velocities at the June Q90 flow within the diversion channel are expected to result in a swim distance before fatigue for Arctic Grayling of 78 m (Assuming a fork length of 25 cm for an adult Arctic Grayling; based on 50% prediction interval from salmonid fatigue equation [Katopodis and Gervais 2016]). The mapped diversion channel length is 115 m, but it is anticipated that backwater effects from Gosling Pond 1 will reduce the effective velocities in the downstream reach.

Velocity Mitigation

There are a number of engineering methods or tools that have been proven or have the potential to increase fish productivity. Many of these methods are described in detail in Department of Fisheries and Oceans' (DFO) review of methods to offset or mitigate impacts of development projects (Loughlin and Clarke 2014). Physical habitat manipulations are a commonly applied method in fish habitat management (Loughlin and Clarke 2014), and a common type of physical habitat manipulation is the installation of in-stream structures (reviewed in Stewart et al. 2009; reviewed in Whiteway et al. 2010). In-stream structures are typically installed with the expectation that the improved and/or created physical habitat will result in the increase in the abundance or biomass of salmonids (Roni et al. 2006). The installation of structures or enhancement of the natural channel to address physical barriers to fish, for example, through the creation of a fish ladders or boulder weirs, are obvious methods of increasing fish access and productivity (Loughlin and Clarke 2014).

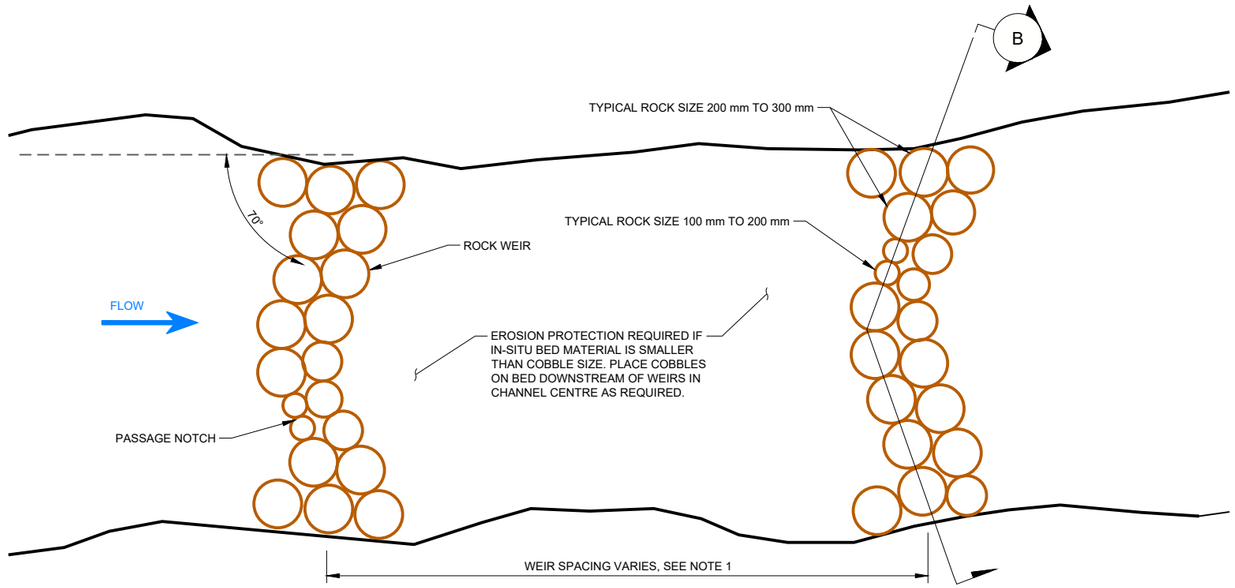
For Rascal Stream West Reach 1, the installation of large rocks at high flow velocity locations is proposed as a means to dissipate energy, reduce flow velocities, and increase water depth to mimic riverine habitats that would be passable for fish (Franklin et al. 2012). The boulders will be combined with natural substrate in the channel to provide greater surface roughness and flow complexity compared to existing conditions. The boulders will also be positioned in rows forming weirs at regular intervals to produce a series of pools where fish are likely to find resting zones (Baki et al. 2019). Both small and large boulders will be used to provide small openings, hereafter called passage notches, which provide a minimum water level in each pool and maintain habitat connectivity between pools. The notches allow for fish passage criteria to be met for low to high flows (Gordon et al. 2016; Baki et al. 2019). It is also expected that the fish will preferentially pass through weir notches rather than over weir crests during high flows (Turek et al. 2016).

The proposed rock weir design for lower Rascal Stream West will follow the concept evaluated in Baki et al. (2019), who demonstrated that the rock weir with notch design can provide suitable hydraulics for fish migrations and sufficient fish resting areas in weir pools (Figure 2). Design considerations include the following:

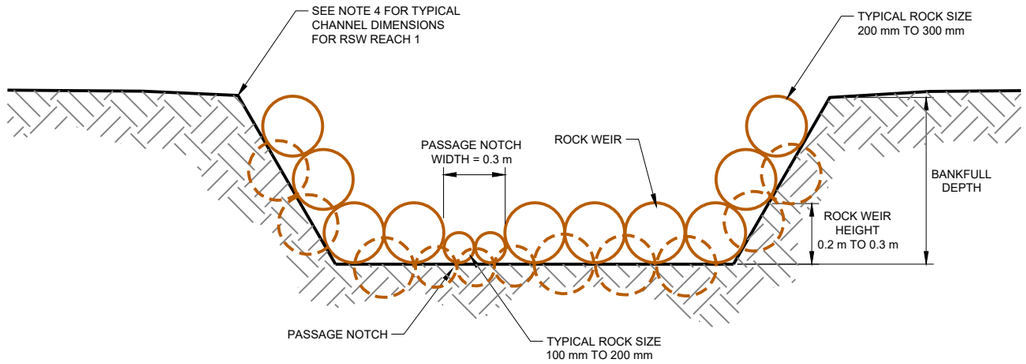
- Based on the fish passage evaluation, rock weirs are recommended with an approximate spacing of 7 m for the stream section between Station No. 40 (halfway between Station No. 15 and 64) and Station No. 115, which includes the stream section under the bridge, and rocks weirs are also recommended with a spacing of 17 m for the stream section between Station No. 135 (halfway between Station No. 115 and 154) and Station No. 194, which starts approximately 95 m upstream of the bridge
- Targeted locations for rock weir installation include channel sections where there are well-defined banks and a narrowing in the channel relative to typical channel dimensions for the reach
- Each rock weir will be positioned across the channel with a slight point or bend mid-channel to form a wide V-shape facing upstream
- Boulders (200 to 300 mm diameter) will be used to form the base of the weir, spanning the width of the stream channel, and reinforced with multiple layers of boulders, as needed
- A notch (200 to 300 mm width) with typical rock size 100 to 200 mm diameter will be created within each weir (alternating sides for consecutive weirs) to enable fish passage during high or low-flow conditions
- Cobble-size substrate (64 to 200 mm diameter) will be placed on the downstream side of the weir to provide erosion protection for the natural stream bed
- Rock weirs installation should occur during low-flow conditions (late summer) prior to operation of the diversion channel, and future monitoring will confirm migration functions are maintained over long-term
- Stability of rock is designed to the 1-in-100-year flow event

For the diversion channel, the hydraulic parameters (water depth, top width, and average flow velocities) estimated for the diversion channel were made without inclusion of fish habitat features (i.e., boulder clusters). Boulder clusters (150 to 200 mm diameter) are recommended to be placed at a maximum spacing of 20 m within the low-flow channel to diversify habitat and to attract fish to move through the diversion channel during a range of flow conditions. Furthermore, the installed boulder clusters will provide sufficient fish resting areas in pools downstream of the boulder clusters at high flows. Design considerations include the following, and are shown in Figure 2:

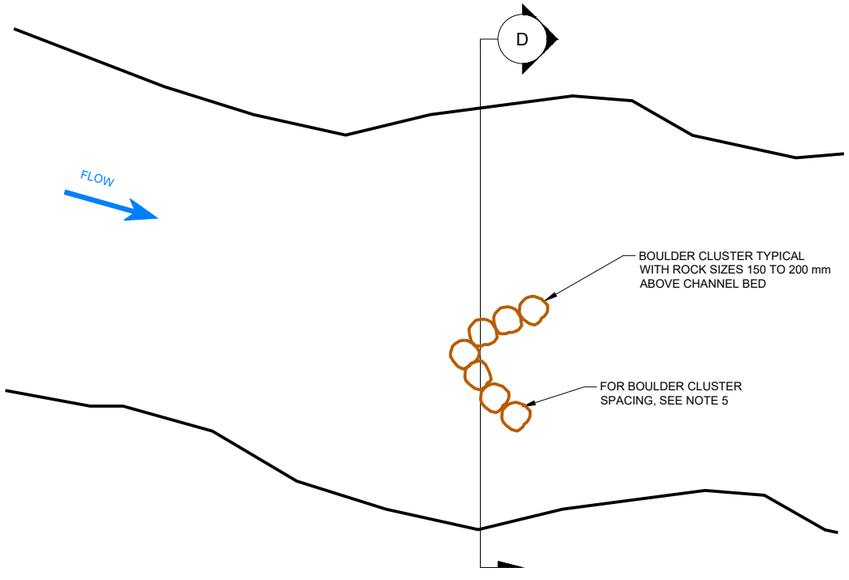
- Each boulder cluster will be positioned within the low-flow channel covering approximately one-third of the channel to form a wide V-shape facing upstream
- Boulders (150 to 200 mm diameter) will be used to form the base of the boulder cluster and reinforced with multiple layers of boulders, as needed
- Boulder cluster installation should occur in dry conditions prior to flows diverted into the diversion channel
- Stability of rock is designed to the 1-in-100-year flow event



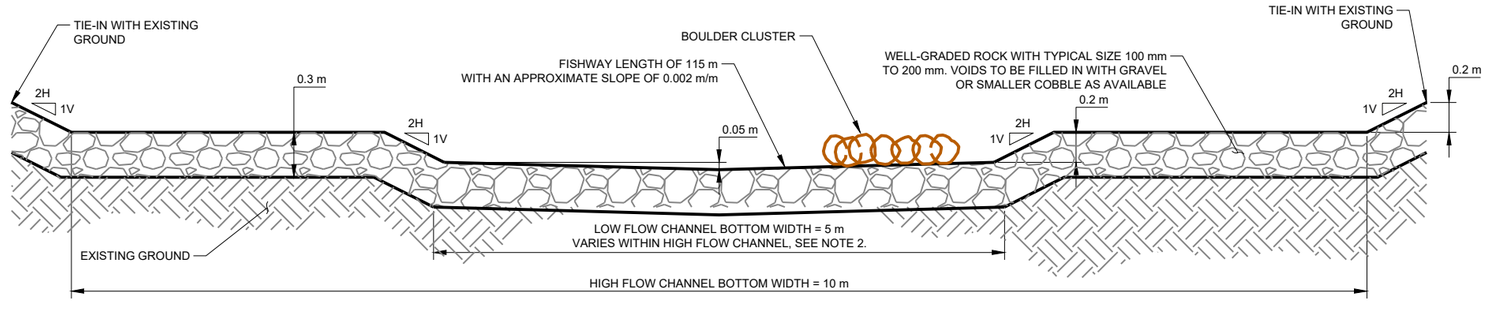
NTS A RSW REACH 1 ROCK WEIR



NTS B CROSS-SECTION RSW REACH 1 ROCK WEIR



NTS C DETAIL - RASCAL STREAM FISHWAY BOULDER CLUSTER



NTS D CROSS-SECTION - CONSTRUCTED RASCAL STREAM FISHWAY

NOT FOR CONSTRUCTION

NOTES

1. ROCK WEIRS ARE PLACE AT 7 m SPACING FOR 75 m UPSTREAM OF THE BRIDGE, AND AT 17 m SPACING FOR 59 m STARTING APPROXIMATELY 95 m UPSTREAM OF THE BRIDGE.
2. THE CONSTRUCTED FISHWAY LOW FLOW CHANNEL SHOULD ACHIEVE A SINUOSITY OF 1.2 TO MIMIC THE NATURAL RASCAL STREAM EAST REACH 5.
3. ALL DESIGNS PRESENTED ARE CONCEPTUAL DESIGNS AND THEREFORE ALL GEOMETRY AND MATERIALS SHALL BE CONFIRMED DURING ADVANCED DESIGN AND PRIOR TO CONSTRUCTION.
4. TYPICAL CHANNEL DIMENSIONS IN RSW REACH 1 AT RUN AND RIFFLES IDENTIFIED FOR ROCK WEIR INSTALLS TYPICALLY HAVE BANKFULL WIDTHS OF 2 m TO 8 m AND BANKFULL DEPTHS OF 0.1 m TO 0.5 m
5. BOULDER CLUSTERS TO BE SPACED A MAXIMUM OF 20 m WITHIN THE RASCAL STREAM FISHWAY.

CLIENT
SABINA GOLD & SILVER CORP.

PROJECT
BACK RIVER PROJECT ENVIRONMENT AND PERMITTING

CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-29
DESIGNED	NG
PREPARED	MSH
REVIEWED	CV
APPROVED	NS

TITLE
RASCAL STREAM CONCEPTUAL DIVERSION FISHWAY AND FISH PASSAGE VELOCITY MITIGATION DESIGNS

PROJECT NO.	CONTROL	REV.	FIGURE
18114181	4500/4530	0	2

Monitoring Plan

A monitoring program will be implemented to determine if the proposed diversion channel and downstream rock weir velocity migration are functioning effectively for Arctic Grayling. Monitoring will commence during Year 1, following the expansion of the airstrip, and implementation of fish passage mitigation activities, and may continue for up 6 years in total. The duration and frequency of monitoring may be adjusted depending on results from early monitoring efforts, for example, if results from Year 2 clearly demonstrate that fish passage and rock weir integrity can be maintained during high flows, then the frequency of monitoring could be reduced.

The proposed monitoring schedule includes annual hydrotechnical and fish habitat inspections, and annual reports during the monitoring period with detailed biological monitoring and reporting starting Year 2 (or earlier depending on when the Goose Camp is open). Three years of detailed biological monitoring is recommended, including detailed biological monitoring during Year 6, which would be the first year that recruits could return from adults that spawned in Year 1 (based on age at maturity statistics provided in Stewart et al. [2007]).
The conceptual Construction Erosion and Sediment Control Plan (ESCP) to be implemented during construction of the diversion channel and rock weir mitigation is provided in Appendix A.

The duration of monitoring when combined with the proposed level of annual effort is expected to adequately demonstrate that the mitigation objectives have been achieved. The monitoring effort will allow Sabina to confirm assessment predictions made as part of the environmental assessment (e.g., that increased flows on Rascal Stream West have the potential to benefit the Arctic Grayling population).

Two types of monitoring activities will be completed: annual inspections (as functional monitoring) and biological monitoring (as effectiveness monitoring). Annual inspections by a qualified aquatic specialist is recommended to collect data to characterize habitat functions and suitability, including data on the physical integrity of the rock weirs, natural channel below the diversion and the diversion channel. Field measurements related to annual inspections are recommended to include (but not limited to) the following:

- Rascal Stream West Reach 1
  - Measurement of discharge and characterization of depths, velocities, channel widths (wetted and bankfull), and substrate composition collected at three representative cross-sections between rock weirs to demonstrate the effectiveness of the installed rock weirs and measure hydraulic parameters between weir pools
  - Rock weir habitat characterization such as depths, velocities, channel widths (wetted and bankfull), and substrate composition collected on transects deployed within the weir pool and immediately downstream of the weir
  - Physical dimensions of each rock weir and notch mapped either on-screen or on grid paper showing measurements of width, depth and length of the rock weir and notch
  - Qualitative characterization of the integrity of each rock weir and the passability of each rock weir, supported by photographs (upstream, downstream, left downstream bank, and right downstream bank views)

- Diversion Channel
  - Measurement of discharge and characterization of depths, velocities, channel widths (wetted and bankfull), and substrate composition collected at a representative transect of the fishway
  - Qualitative inspection of the diversion channel bed and banks, and any evidence of channel erosion, migration, and sediment transport, supported by photographs
  - Boulder cluster habitat characterization such as depths, velocities, channel widths (wetted and bankfull), and substrate composition collected on transects deployed within the cluster pool and immediately downstream of the cluster
  - Qualitative characterization of the integrity of each boulder cluster and the passability of each boulder cluster, supported by photographs (upstream, downstream, left downstream bank, and right downstream bank views)
- Rascal Stream West (Gosling Pond 1 to Gander Pond)
  - Characterization of pond outlets (number, locations, condition, etc.) at Gosling Pond 1, Gosling Pond 2, and Gander Pond, supported by photographs
  - Quantitative measurements of depths, velocities, channel widths (wetted and bankfull), and substrate composition collected at four representative cross-sections on Rascal Stream West Reach 2 and 3 (two cross-sections per reach)
  - Qualitative inspection of the stream bed and banks, and any evidence of channel erosion, migration, and sediment transport, supported by photographs

Based on the outcome of an annual inspection of the diversion channel and rock weirs, maintenance or installation of erosion and sediment control mitigation measures will be immediately conducted where needed for minor disturbances such as boulders displaced due to high flows or ice scour. If major repairs or improvements are noted during the inspection, recommendations for additional work will be provided in the annual inspection report. Inspection reports will be submitted to DFO by January 31 of any given year that observational monitoring is carried out.

Biological monitoring by qualified aquatic specialists is recommended to confirm passage of Arctic Grayling through lower Rascal Stream West. The scope of monitoring includes detailed habitat measurements collected concurrently with monitoring of the Arctic Grayling spawning migration. The biological monitoring scope should span a minimum of two years of data collection using RFID (radio frequency identification) tags inserted within adult fish that would be tracked using multiple detection arrays deployed throughout the Rascal Stream system. The first two years of RFID fish tracking would be combined with a two-way trap installed at the mouth of the creek where fish would be enumerated and tagged during their migration, subsequent biological monitoring years would only include data collected from the remotely deployed detection arrays (assuming sufficient numbers of fish were tagged during the previous trapping years). The seasonal timing of detailed biological monitoring will cover the upstream migration during spring freshet conditions, assumed to be a minimum 2-week window in early to mid-June.

Field measurements related to biological monitoring are recommended to include (but not be limited to) the following:

- Daily discharge and continuous water temperature data at predetermined locations for Rascal Stream West Reach 1 for the duration of the upstream migration period
- Length and weight of captured adult fish, enumeration of migrating adult fish captured in the two-trap installed at the confluence with Goose Lake for the duration of the upstream migration period
- 'Recapture' movement data of tagged fish to be collected at antennae array loggers positioned at multiple locations in Rascal Stream East and West

Closure

This technical memorandum was prepared and reviewed by the undersigned.

Golder Associates Ltd.

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Water Resources Specialist

Cam Stevens, MSc, PhD
Aquatic Biologist, Associate

REGISTERED PROFESSIONAL ENGINEER
29 JUN 20
N.P. SCHMIDT
LICENSEE
N.W.T.

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature
Date 29 JUNE 2020
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

Nathan Schmidt, PhD, PEng, CPESC
Principal, Senior Water Resources Engineer

https://golderassociates.sharepoint.com/sites/101666/technical work/4000_hydrology/2020 rascal report update and velocity assessment/may 2020 fish passage and conceptual drawings/rev0 (working)/18114181-062-tm-rev0-rascal diversion eval 29jun_20.docx

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APPENDIX A

Conceptual Construction Erosion and Sediment Control Plan

Introduction and General Notes

The following recommended conceptual construction erosion and sediment control plan (ESCP) is aimed to minimize sediment runoff and effects to the fish communities during construction of the velocity mitigation measures at Rascal Stream West Reach 1 and the diversion channel downstream of Rascal Stream East Reach 5 connecting Gosling Pond 1 (see Figure 1 in the main body of the Technical Memorandum). Sediment runoff is considered a deleterious substance that can adversely affect fish and fish habitat.

The following represents a conceptual-level ESCP, that should be formalized prior to construction. In addition, these measures are not exhaustive and should be adapted by the Contractor as necessitated by changing site conditions. This ESCP is intended to provide Erosion and Sediment Control procedures and measures associated with construction, with the long-term erosion and sediment control monitoring described in the main Technical Memorandum.

During general construction activities, the objective is to prevent erosion and sediment mobilization into Rascal Stream downstream of the proposed works. The work area must be isolated from all flowing water without disrupting flow to downstream areas.

Machinery crossing (fording) of a stream or watercourse shall be avoided unless necessary. If fording cannot be avoided, machinery crossing shall be limited to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, a temporary crossing structure must be constructed. Spill kits shall have enough capacity to contain the largest potential spill on-site and accessible at all times.

Construction Sequence

The proposed fish passage mitigation activities will include the hand-placement of rock weirs in the Rascal Stream West Reach 1 at selected areas, and the construction of the Rascal Stream Diversion Channel. The proposed construction sequence is summarized below.

- Hand-placement of rock weirs in Rascal Stream West Reach 1 for reaches and spacing as described in the “Velocity Mitigation” Section of the main Technical Memorandum and Figure 1 and 2.
- Isolation of the construction area for the Rascal Stream Diversion Channel without creation of fish barriers in all natural stream reaches during construction.
- Construction of the Rascal Stream Diversion Channel and in-stream boulder clusters as described in the “Velocity Mitigation” Section of the main Technical Memorandum and Figure 1 and 2.
- Construction of diversion berm along Rascal Stream East Reach 5 and Rascal Stream Diversion Channel. Isolation of the construction areas for the diversion berm and silt fencing erosion and sediment control shall be completed prior to construction of the diversion berm. The timing of the complete diversion of flows into the Rascal Stream Diversion Channel with construction of the diversion berm may be delayed until a later date, if desired based on the construction schedule for the airstrip extension.

Construction Erosion and Sediment Control in Rascal Stream West Reach 1

It is recommended that the installation of rock weirs in Rascal Stream West Reach 1 should take place during low flow open water season, preferably in August or September after migration of fish, to minimize effects to spawning activity, egg stranding and fish migration. The installation of rock weirs should commence before completion of the Rascal Stream Diversion Channel.

The rock weirs will be manually placed (hand-placement), with no heavy equipment required around the watercourse for installation of these weirs. Material used for construction of the weirs and erosion protection downstream of the weirs will composed of clean (free of silts, clays and organics), non-potentially acid generating rock. It is recommended that material stockpiles be placed at the edge of the haul road near the bridge to reduce disturbance to the riparian zone and Rascal Stream. Temporary material stockpiles must be located at least 15 m away from watercourses or other potential off-site transport pathways (i.e., ditches) on flat, stable ground.

Construction Erosion and Sediment Control for Rascal Stream Diversion Channel

There are two phases of the Rascal Stream Diversion Channel:

(1) construction of the diversion channel between Rascal Stream East Reach 5 and Gosling Pond 1; and

(2) construction of a diversion berm to the east of the diversion channel, which can be completed at a later date if desired depending on the schedule for construction of the airstrip extension.

The following ESC measures should be implemented for construction of the diversion channel:

- Placement of silt fences (two rows) at the Rascal Stream Diversion Channel inlet to Gosling Pond 1 across the entire channel transect in a U-shape (convex) with the bulge facing upstream to capture transported sediment during flushing of the diversion channel when under controlled flows. Once the diversion channel is activated, silt fences shall be re-installed as to not span the entire channel. See Figure 1 below.
- Placement of silt fence (one row) parallel to the Rascal Stream Diversion Channel in J-shapes outside of the zone of construction on the topographically lower (north) side of the channel to prevent mobilized sediment due to construction from entering downstream watercourses (i.e., Main Goose Pit Stream Reach 3). See Figure 1 below.
- Construct a sump at the downstream end of the Rascal Stream Diversion Channel to collect groundwater or runoff and any mobilized sediment from the construction zone. See Figure 1 below.
- Sediment laden water that accumulates in the isolated work area during construction (from groundwater, rainfall, or potential flooding) must be pumped to a vegetated buffer in an area that will prevent direct flow to a watercourse. Determining a sufficient distance from the watercourse will be at the discretion of the environmental monitor to allow the water to infiltrate to ground, prior to re-entering the watercourse and without causing further erosion. The pump outlet must be stabilized to prevent erosion from discharge flow velocity.

- Installation of a temporary berm (using well-graded gravels and cobbles along with a layer of impervious poly sheeting) installed to bankfull height at the upstream end of the Rascal Stream Diversion Channel, to keep fish and water out of the construction zone with continued passage from Rascal Stream East Reach 5 through Rascal Stream East Reach 4.
- All equipment and materials (e.g., cobbles and gravel) used to construct the diversion must be clean (borrowed material should be washed on-site prior to placement) and not contain any substances that could be harmful to fish, wildlife or aquatic ecosystems. Vehicles and equipment shall arrive on-site in a clean condition (i.e., pressure-washed prior to arrival on-site and clean and free of deleterious substances such as oil, grease, and soil).
- Fines and substrates used for lining the diversion channel must be composed of clean rock (i.e., non-potentially acid generating rock).
- Refuelling equipment (e.g., pumps) or other mobile or large equipment, refilling small field containers, and conducting fuel transfers must be completed a minimum of 30 metres from any watercourse.
- If access roads are required, grade roads in such a manner as to avoid materials from being directed into any watercourses when practical.
- Should turbidity values increase beyond those stipulated in environmental permits or regulatory guidelines, work should slow, or potentially halt, until background turbidity values have re-established before continuing.
- During excavations, temporary material stockpiles must be located at least 15 m away from watercourses or other potential off-site transport pathways (i.e., ditches) on flat, stable ground. Temporary stockpiles should be inspected twice daily and if sediment from temporary stockpiles is mobilized due to precipitation, silt fences shall be installed downstream of stockpiles to intercept mobilized sediment from entering watercourses.
- Soil disturbance must not occur during heavy rain conditions.
- Prior to introducing flow into the new channel, wash fines/substrate at the upstream end of the isolated new channel area, using pumped water (or from a partial diversion) from the Rascal Stream East Reach 5, and pump it out at the downstream end of the isolated area into an upland area (location/distance from the stream channel determined by the Environmental Monitor), until it flows clear.
- Upon completion of project works, remove the temporary silt fences and restore the sump area from the upstream end first to minimize sediment disturbance.

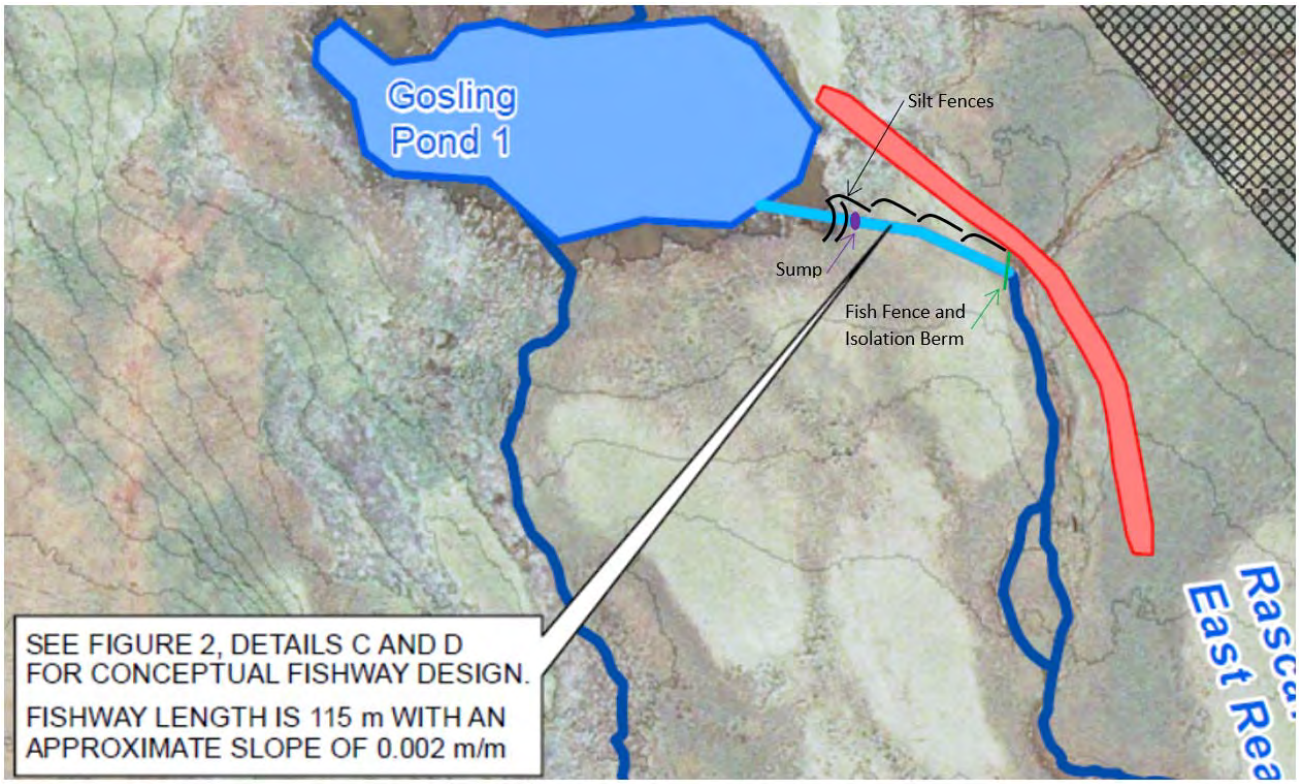

Figure 1: Conceptual Erosion and Sediment Control Measures

Construction Monitoring

The implemented ESC measures need to be regularly monitored to identify any maintenance or repair required, particularly during and after rainfall events. Twice daily visual inspections of the Rascal Stream Diversion Channel and Rascal Stream Reach 1 are recommended.

Water quality monitoring upstream and downstream of the Rascal Stream Diversion Channel, and at Rascal Stream at the Mouth during construction will confirm adherence to water quality standards. Additionally, it will help to identify exceedances early, so that measures can be implemented to manage effects and help to quantify the geographical extent, duration, and magnitude of the release for potential restoration requirements and incident reporting. The Environmental Monitor will dictate water sampling locations, parameters, frequencies, and monitor criteria threshold limits consistent with applicable water quality guidelines for characterization of unauthorized discharges of sediment-laden run-off.

ATTACHMENT B

BACK RIVER PROJECT: TAILINGS STORAGE FACILITY PERIMETER SEEPAGE ANALYSIS

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Memo

To:	Catherine Paul	**Client:**	Sabina Gold & Silver Corp.
From:	Osvaldo N. Ledesma Erick Lino	**Project No:**	1CS020.011
Reviewed By:	Arcesio Lizcano, PhD Maritz Rykaart, PhD, PEng	**Date:**	June 7, 2018
Subject:	Back River Project: Tailings Storage Facility Perimeter Seepage Analysis		

1 Introduction

1.1 Context

The Tailings Storage Facility (TSF) is expected to store approximately 3.2 Mm^3 of tailings over a period of about two years. In addition, the TSF will be used for water storage throughout the life of the Project to a full supply level of 305.0 m. Environmental containment for the TSF is provided by a frozen foundation dam which includes a geosynthetic (High Density Polyethylene) liner keyed into underlying permafrost. Thermal modeling has confirmed that this dam will perform for the design life of the structure (SRK 2015a).

1.2 Objective

During the May 2018 Technical Meetings in Cambridge Bay, reviewers questioned the likelihood of surficial seepage around the perimeter of the TSF in areas where engineered containment dams are not planned. This memo provides technical details to address these concerns, and provide context as to where, and what quantities of surficial seepage may be encountered.

2 Conceptual Model

The Project site is located in cold continuous permafrost, with an active layer that seasonally thaws to a depth of between 1.0 and 2.4 m. Therefore, there is no groundwater table and any surficial seepage from ponds are limited to seasonal flow within the active layer. Geotechnical site characterization in the form of drilling has however confirmed that in select locations, in the vicinity of the TSF, there may be weathered bedrock to depths of 2.0 to 3.0 m which may act as seepage pathways (SRK 2015a).

Figure 01 shows a plan view of the TSF area complete with the TSF containment dam (North Dam) and South Dyke. Perimeter seepage could occur in areas where weathered bedrock is present at elevations below elevation 305.0 m.

In order to determine potential seepage pathways from the TSF perimeter, the following assumptions were made:

- Constant active layer thickness of 2.4 m; and
- Constant weathered bedrock layer of 3.0 m.

Based on these assumptions, a ground elevation of 308.0 m indicates locations of natural seepage barriers due to bedrock, as illustrated in Figure 01. Note the active layer thickness is not considered because the weathered zone exceeds the active layer thickness and becomes the governing factor in this assessment. Key cross- and long-sections illustrated in Figures 02 and 03 demonstrate how these natural seepage barriers would function.

In accordance with this assessment of physical ground conditions, surficial seepage from the TSF can only occur along cross-section 1, as illustrated in Figure 01 and 02. However, when looking at long-section 2, also illustrated in Figure 02, seepage along this front is not continuous, but would occur along four distinct areas (A_1, A_2, A_3 and A_4). Should seepage from these areas materialize it could emerge in Rascal Lake downgradient from the TSF at elevation 300.0 m.

3 Seepage Analysis

Steady state seepage outflow through long-section 2 was conservatively calculated using Darcy's equation for flow through a porous media. All calculations assume water flow through a weathered bedrock layer with a constant thickness of 3.0 m, for water levels in the TSF ranging from 304.5 to 305.0 m elevation. A constant hydraulic conductivity of 5.0E-05 m/s was assumed for the weathered bedrock (SRK 2015b). Calculation details are included in 0 of this memo, and results are summarized in Table 1.

Table 1. Steady State Outflow Seepage (m^3/day) from the TSF

Elevation	Exposed Seepage Surface Area [m^2]	Total Seepage Outflow [m^3/day]
304.5	222.6	1.1
305.0	254.0	1.4

The results presented in Table 1 illustrate the maximum upper bound of seepage that may occur along long-section 2 of the perimeter of the TSF. These flows are unlikely to ever materialize for the following reasons:

- The flow travel time from the TSF to Rascal Lake, should it occur, assuming a hydraulic gradient of 1.0 for the four areas in question range between 21 and 36 months. Summer conditions, with a fully developed active layer thickness exist for only about 4 months of the year (with the maximum thickness lasting less than 1 month) and therefore even if flow was to occur, it would take between 5.0 and 9.0 years to manifest itself. In reality, the hydraulic gradient is at least three orders of magnitude lower, which means the actual flow travel time is in the decadal scale and unlikely to ever be observed;

- The weathered rock zone thickness is not constant and the likelihood of continuous flow paths as a result of weathering is improbable as these are random unconnected discontinuities. Therefore, actual flows, should they occur is expected to be significantly less than calculated;
- The hydraulic conductivity assumed for the analysis assumes no ice saturation, and it is known that considerable ice saturation exist which will result in lower hydraulic conductivities and thus possible orders of magnitude lower flow.

Seepage along long-section 2, should it occur, would be of concern as it would drain towards Rascal Lake, although as stated it would take decades and is unlikely to ever realize. Mitigation strategies to preclude such flow could include mitigation in the form of rock grouting, or revising the TSF layout so the pond would be on the eastern extremity of the TSF to ensure environmental containment.

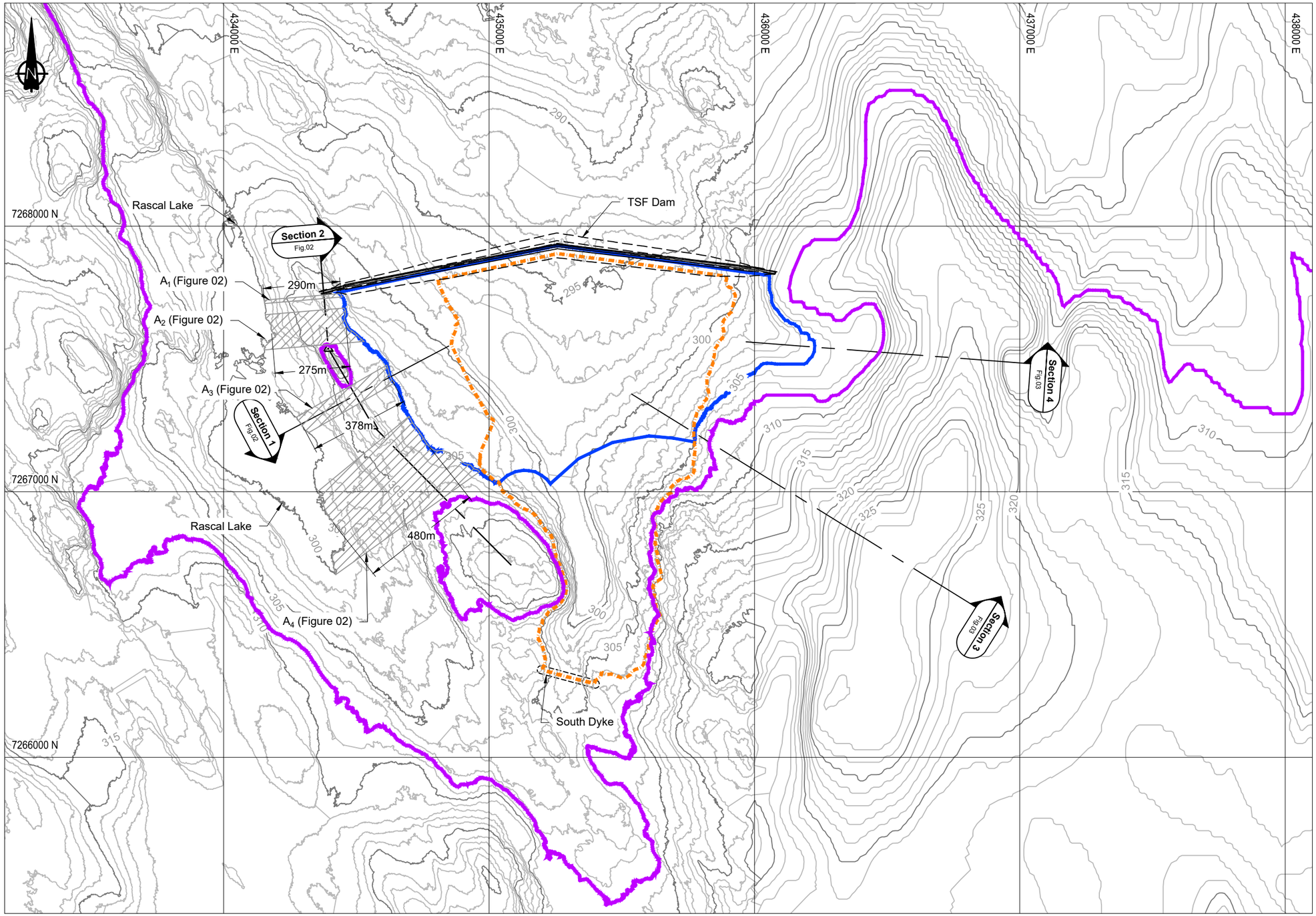
However, given the low likelihood of this flow ever materializing, a more prudent approach would be to conduct thermal monitoring along long-section 2, within the areas of concern to observe for changing conditions which may suggest advancement of a seepage front. Should such changes be observed, based on the seepage travel time there would be years to implement appropriate mitigation measures.

4 References

SRK Consulting (Canada) Inc., 2015a. Tailings Management System Design Report. Back River Property, Nunavut, Canada. Prepared for Sabina Gold & Silver Corp. October 2015.

SRK Consulting (Canada) Inc., 2015b. Hydrogeological Characterization and Modeling Report of the Proposed Back River Project. Prepared for Sabina Gold & Silver Corp. October 2015.

Figures



LEGEND

- TSF Dam
- Tailings Ultimate Boundary
- Water Ultimate Boundary El.305.0m
- Natural Barrier El. 308.0m
- Seepage Area

NOTES

1. Contours shown at 1m interval.

REFERENCE

1. NAD83 UTN Zone 13
2. NTS Mapsheet: 076

0m 100 200 300 400 500 600

srk consulting

SRK JOB NO.: 1CS020.011.1100

FILE NAME: Extended Goose Contours.dwg

Sabina GOLD & SILVER CORP.

Back River Project

Environmental Containment Analysis

Tailings Storage Facility
Plan View

DATE:	APPROVED:	FIGURE:
May 2018	MR	01

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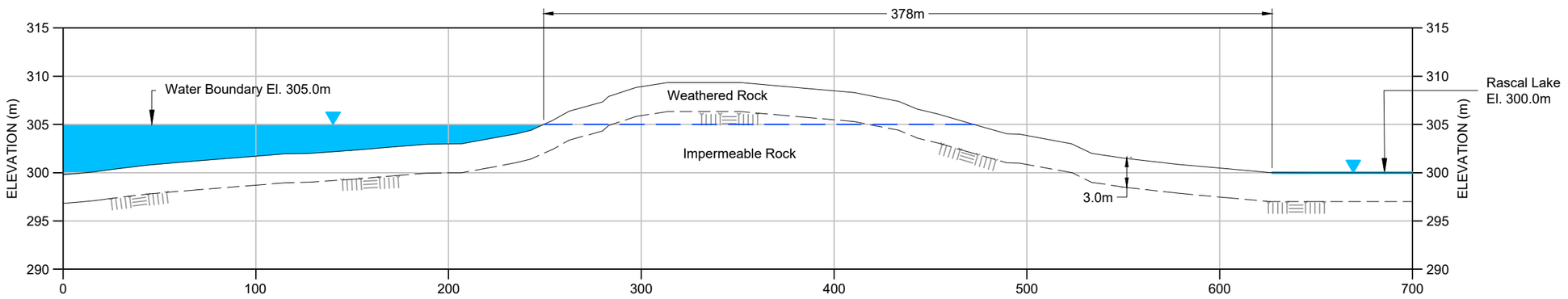

Section 1

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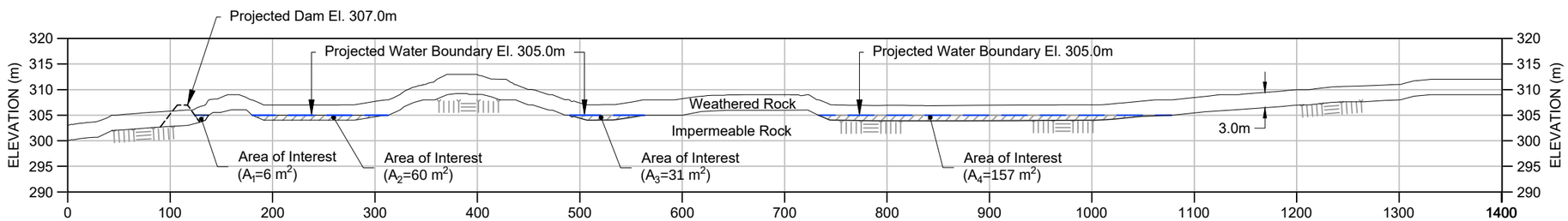

Section 2

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Five Times Vertical Exaggeration

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Back River Project

Environmental Containment Analysis

Tailings Storage Facility
Sections 1 and 2

DATE:	APPROVED:	FIGURE:
May 2018	MR	02

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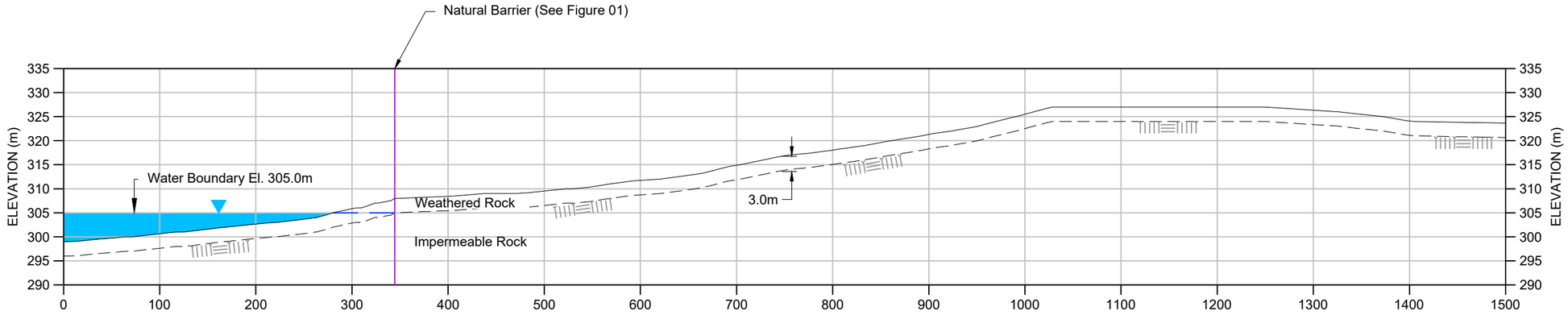
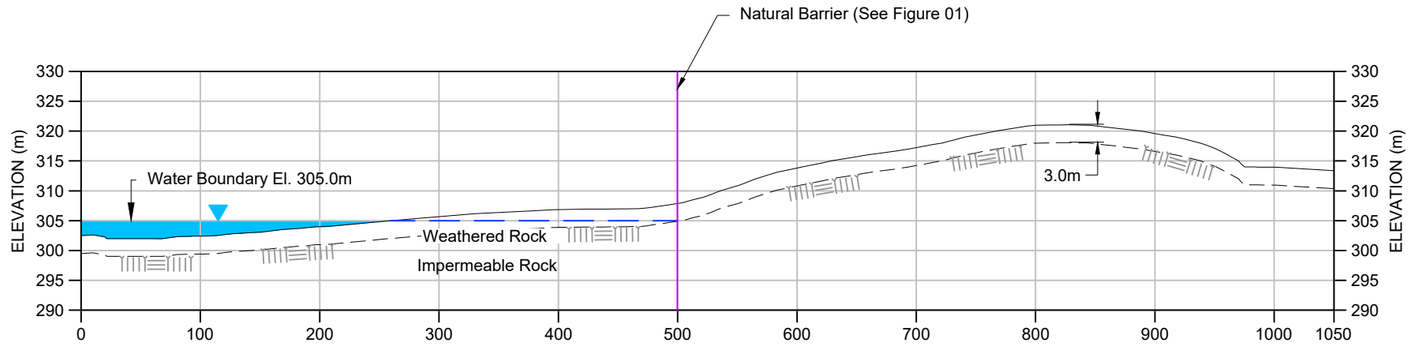
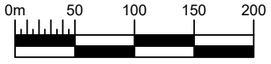


Section 3



Section 4



Five Times Vertical Exaggeration

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Back River Project

Environmental Containment Analysis

Tailings Storage Facility
Section 3 and 4

DATE:	APPROVED:	FIGURE:
May 2018	MR	03

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Appendix A – Seepage Calculation

Introduction

Water seepage along the perimeter of the Tailings Storage Facility (TSF) can only occur through the weathered rock layer. Under these conditions, there are two possible flow scenarios as shown in Figure A below:

- Flow through the ground with a sloping surface from a high elevation (e.g., the full supply level of the TSF) to a lower ground water elevation (Figure A, Inset 1). This is the case for section1 in Figure 02; or
- Flow through the ground with a horizontal surface from a high elevation (e.g., the TSF at full supply level) to a lower elevation (e.g., water level at Rascal Lake) (Figure A, Inset 2). This case does not exist for the TSF.

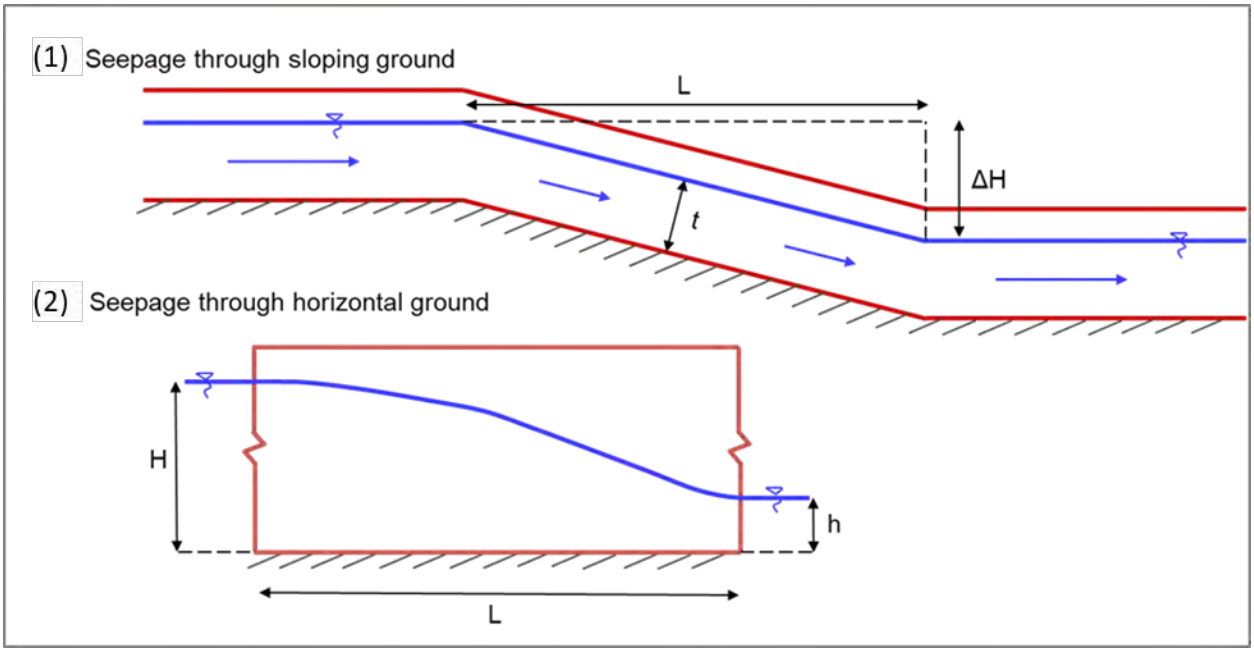


Figure A. Seepage flow scenarios.

Calculations

In the case of horizontal flow, seepage q_h per unit width can be calculated as follows:

$$q_h = k \cdot \frac{(H^2 - h^2)}{2L} \quad (1)$$

Figure A, Inset 2 includes the variables of Equation (1) where H is the water height above the impermeable layer at the TSF, h is the natural water height above the impermeable layer at a natural reservoir, L is the distance between the exit surface at the TSF and the entrance point at the natural reservoir, and k is the hydraulic conductivity of the weathered bedrock layer.

In the case of flow through a sloped terrain, total seepage per width unit q_s can be calculated as follows:

$$q_s = k \cdot \frac{\Delta H}{L} \cdot t \quad (2)$$

Figure A, Inset 1 includes the variables of Equation (2) where ΔH is the height difference between the reservoir level (TSF) and the lower receptor point (Rascal Lake), and t is the height of the water table above the impermeable layer. When considering the area of the section where the water flows, Equation (2) can be rewritten as:

$$q_s = k \cdot \frac{\Delta H}{L} \cdot A \quad (3)$$

Geotechnical Parameters

The only geotechnical parameter that is relevant to these calculations is the hydraulic conductivity of the weathered bedrock layer. This value ranges between 1.0×10^{-11} and 6.0×10^{-6} (171005 2AM-BRP----MAD App F-5_HydrogCharactModelRpt-IMLE). The selected value, based on engineering judgement is $k = 5.0 \times 10^{-6}$ m/s.

The geometric parameters required to calculate seepage through long-section 2 are shown in Figures 01 and 02, while Table A1 shows a summary of the calculations.

Table A1. Seepage Calculation Summary, Section 1

Area	k [m/s]	ΔH [m]	L [m]	A [m^2]	Total seepage [m^3/d]
A_1	5.0 E-6	4.5 (304.5 – 300.0)	290.0	6.0	0.04
A_2			275.0	60.0	0.47
A_3			378.0	31.0	0.18
A_4			480.0	157.0	0.71
Total			n/a	254.0	1.40
A_1	5.0 E-6	5.0 (305.0 – 300.0)	290.0	3.6	0.02
A_2			275.0	49.0	0.35
A_3			378.0	17.0	0.09
A_4			480.0	153.0	0.62
Total			n/a	222.6	1.08

Note:

The areas considered in the flow estimation are shown in Figure 02

ATTACHMENT C

BACK RIVER PROJECT - GROUND TEMPERATURE DATA REVIEW

Back River Project
Ground Temperature Data Review

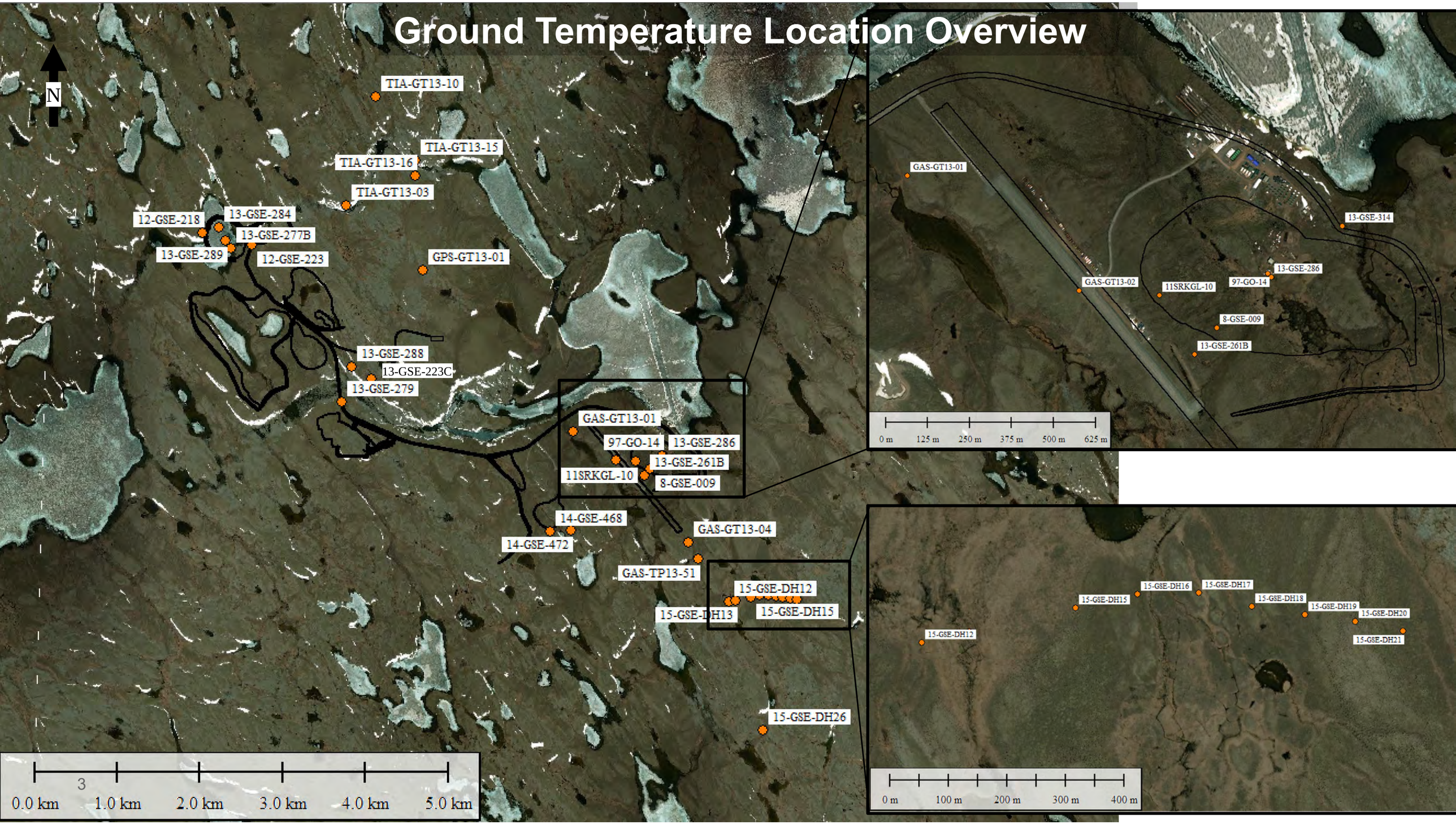
March 2022

srk consulting

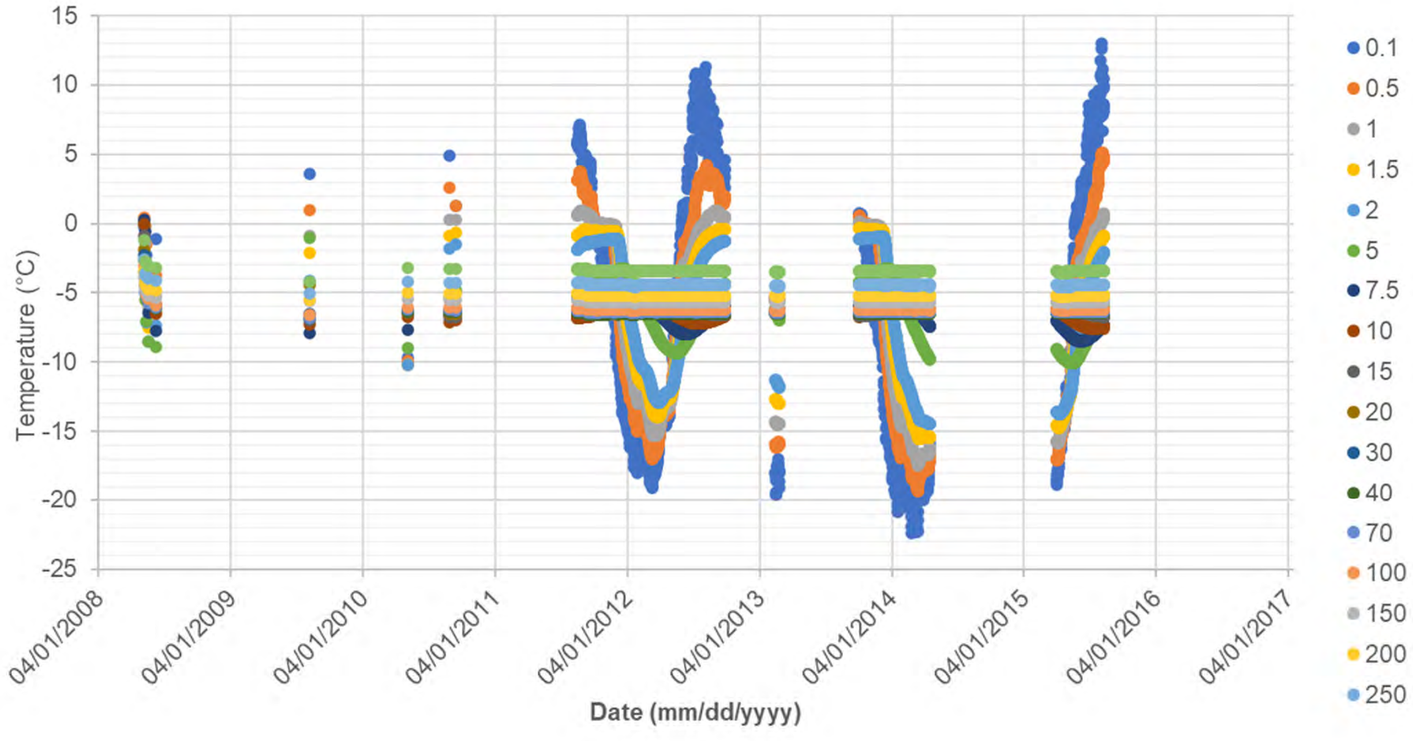
Ground Temperature Site Summary

Property	Location	Drillhole ID	Year of Installation	Northing	Easting	GTC Length [m]	Logger Type	Logger ID	From	To	SRK Note
Goose OP/UG	Goose Main	13-GSE-261B	2013	7,269,381	433,838	560	Permanent	DL13	4/28/2013	4/1/2015	Record with lowermost nodes provide valid data
		13-GSE-286	2013	7,269,612	434,066	210	Permanent	DL04	4/9/2013	4/15/2014	Record continuous over period
		13-GSE-314	2013	7,269,764	434,278	210	Permanent	DL02	5/8/2013	11/19/2013	Record continuous over period
		11SRKGL-10	2011	7,269,557	433,734	21.5	Permanent	38910	4/4/2015	4/6/2015	Record of single ground temp. profile
		08-GSE-009	2008	7,269,461	433,904	300	Permanent	41212	5/9/2008	8/13/2015	Record not continuous with data gaps
		97-GO-14	1997	7,269,623	434,056	7	-	-	-	-	No Data
	Umwelt	13-GSE-288	2013	7,270,686	430,310	560	Permanent	DL03	5/9/2013	10/26/2014	Record shows nodes not functioning properly
		13-GSE-279	2013	7,270,260	430,189	560	Permanent	DL12	4/18/2013	4/3/2015	Record below 110 mbgs nodes functioning, nodes above largely damaged
		12-GSE-233C	2012	7,270,546	430,544	565	Permanent	Q23936_Logger3			
	Llama	13-GSE-277B	2013	7,272,125	428,852	265	Permanent	DL04 - removed	4/3/2013	11/19/2013	Record nearly continuous over period, GTC damaged during 2013 breakup
		13-GSE-284	2013	7,272,370	428,710	390	Permanent	DL05 - removed	4/12/2013	5/22/2013	GTC damaged during 2013 breakup
		13-GSE-289	2013	7,272,218	428,790	660	Permanent	DL06 - removed	5/4/2013	6/14/2013	Data not reliable GTC damaged during 2013 breakup
		12-GSE-218	2012	7,272,301	428,508	390	Permanent	Q23420_Logger2	10/12/2012	11/23/2014	Record with valid measurements from 7/19/2014 to 11/23/2014
		12-GSE-223	2012	7,272,161	429,104	285	Permanent	Q23420_Logger1	7/30/2012	4/19/2014	Record valid up to 4/19/2014
		12-GSE-223C							8/29/2012	8/5/2015	Record not continuous with data gaps
	Echo	14-GSE-468	2014	7,268,705	432,707	375	Permanent	DL8001453	7/20/2014	4/2/2015	Record continuous over period
		14-GSE-472	2014	7,268,724	432,957	375	Permanent	DL06	7/20/2014	4/2/2015	Record nearly continuous over period
Goose Infrastructure	OLD TIA	TIA-GT13-03	2013	7,272,636	430,246	17	Permanent	DL8001317	5/26/2013	12/4/2013	Record nearly continuous over period
		TIA-GT13-10	2013	7,273,951	430,604	17	Permanent	DL8001318	5/27/2013	5/6/2014	Record with some data gaps
		TIA-GT13-15	2013	7,273,180	431,079	17	Permanent	DL8001320	5/27/2013	5/6/2014	Record continuous over period
		TIA-GT13-16	2013	7,272,989	431,079	17	Permanent	DL8001319	5/27/2013	4/30/2014	Record nearly continuous over period
	Goose Airstrip	GAS-GT13-01	2013	7,269,913	432,983	17	Permanent	TBD	5/27/2013	5/6/2014	Record continuous over period
		GAS-GT13-02	2013	7,269,571	433,495	27	Permanent	DL8001315	5/25/2013	4/2/2015	Record nearly continuous over period
		GAS-GT13-04	2013	7,268,574	434,367	27	-	-	5/25/2013	6/19/2014	Record has limited number of manual measurements over period
		GAS-TP13-51	2013	7,268,379	434,496	3	-	-	8/27/2013	6/19/2014	Record has limited number of manual measurements over period
	Plant Site	GPS-GT13-01	2013	7,271,857	431,171	17	-	-	10/3/2013	6/19/2014	Record has one valid temp profile
	TSF	15-GSE-DH12	2015	7,267,857	434,863	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH13	2015	7,267,876	434,944	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH15	2015	7,267,916	435,125	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH16	2015	7,267,940	435,231	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH17	2015	7,267,942	435,336	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH18	2015	7,267,919	435,427	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH19	2015	7,267,905	435,517	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH20	2015	7,267,893	435,603	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH21	2015	7,267,877	435,685	15	-	-	4/11/2015	8/14/2015	Record has several manual measurements
		15-GSE-DH26	2015	7,266,311	435,268	15	-	-	4/17/2015	8/16/2015	Record has two manual measurements

Ground Temperature Location Overview



08-GSE-009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04/01/2014
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04/01/2016
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Date (mm/dd/yyyy)
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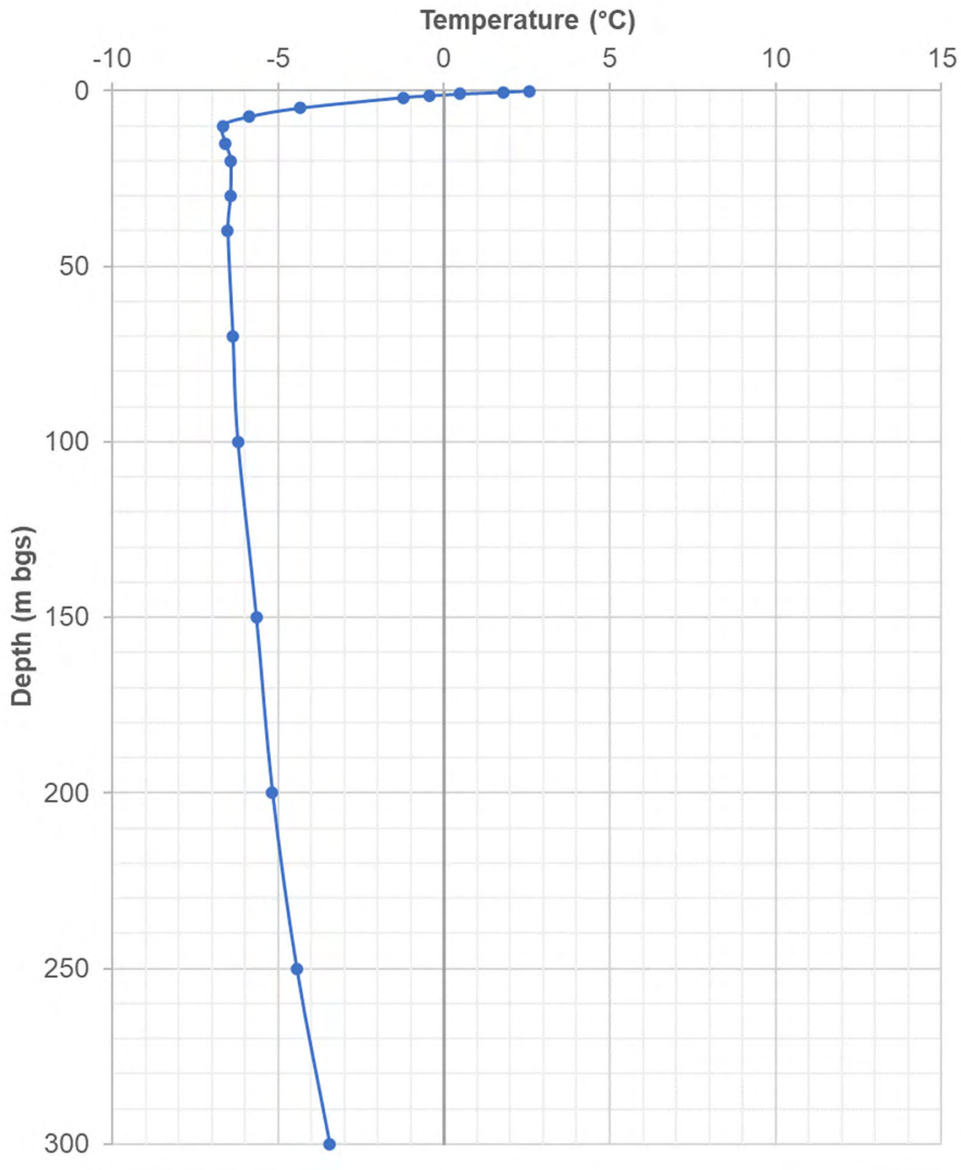
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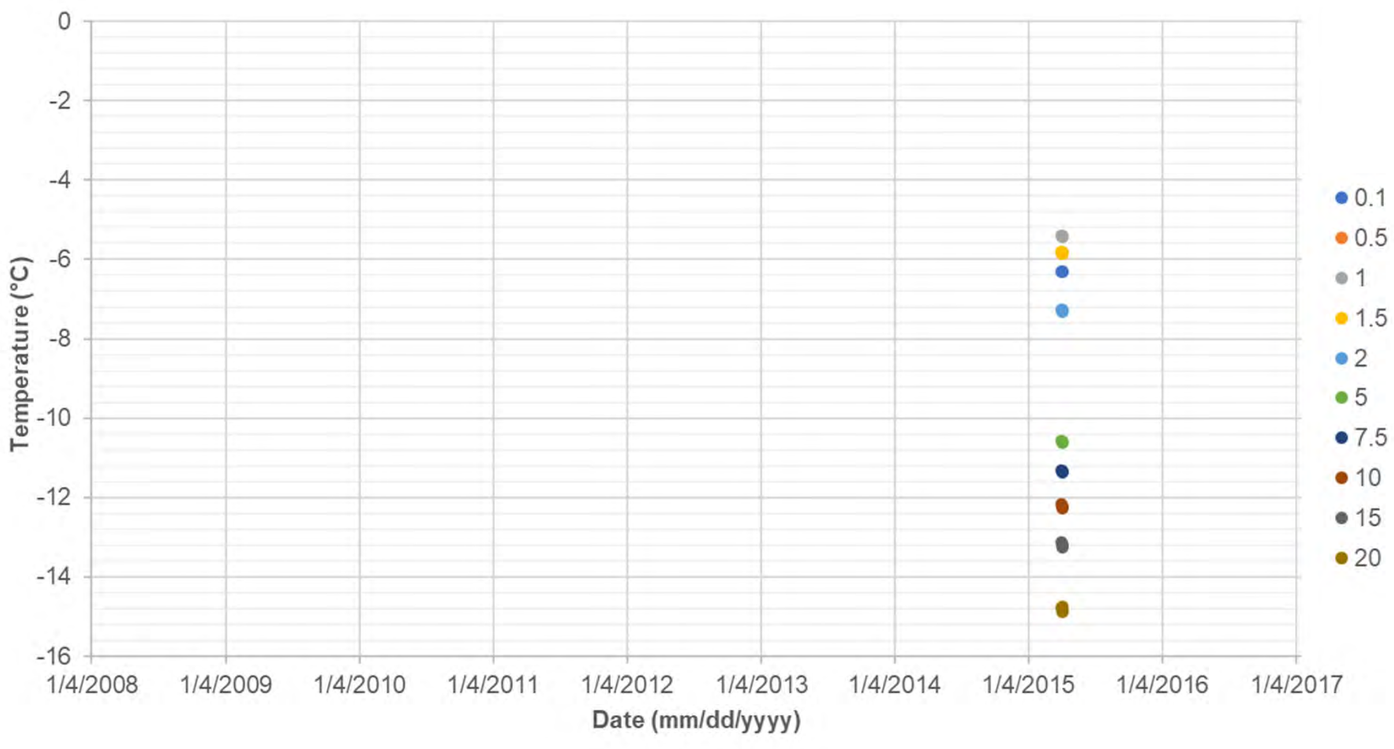
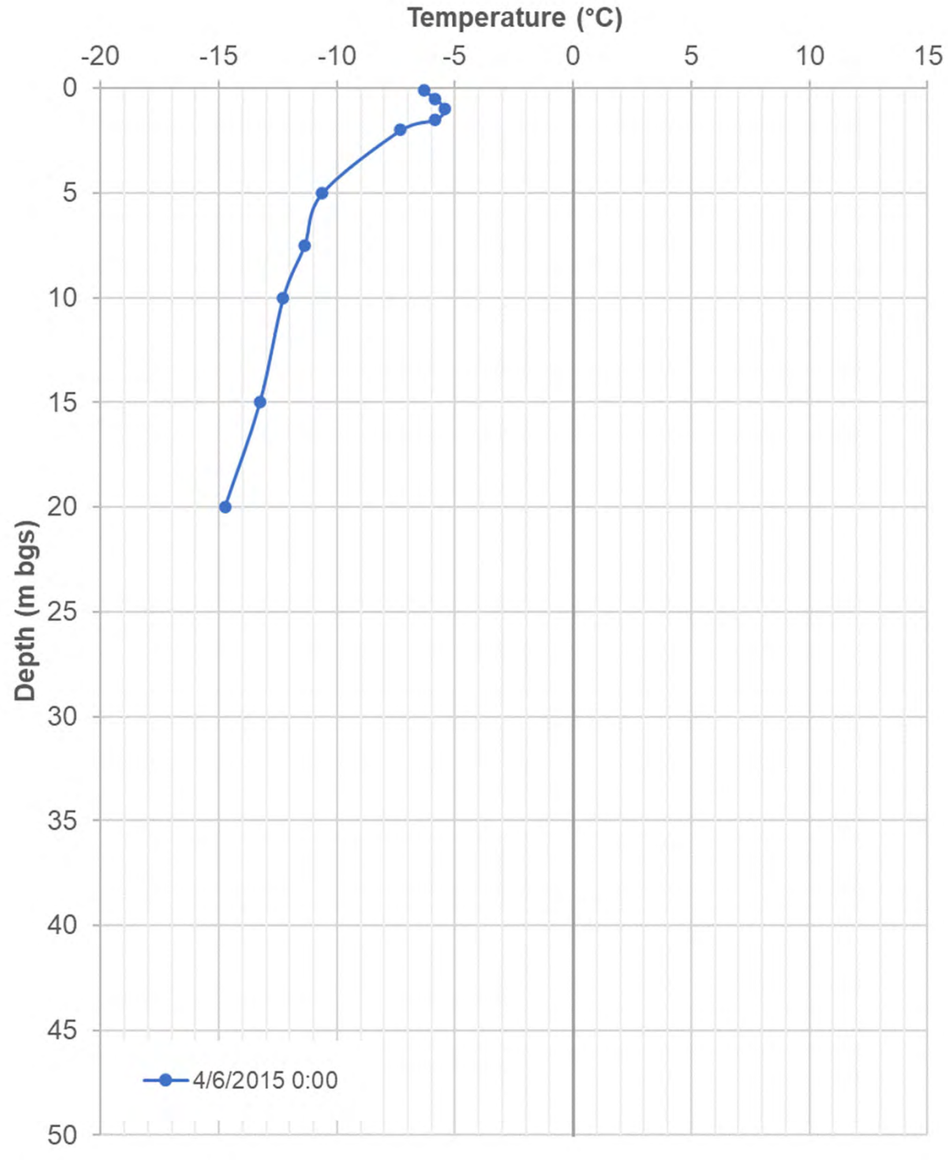
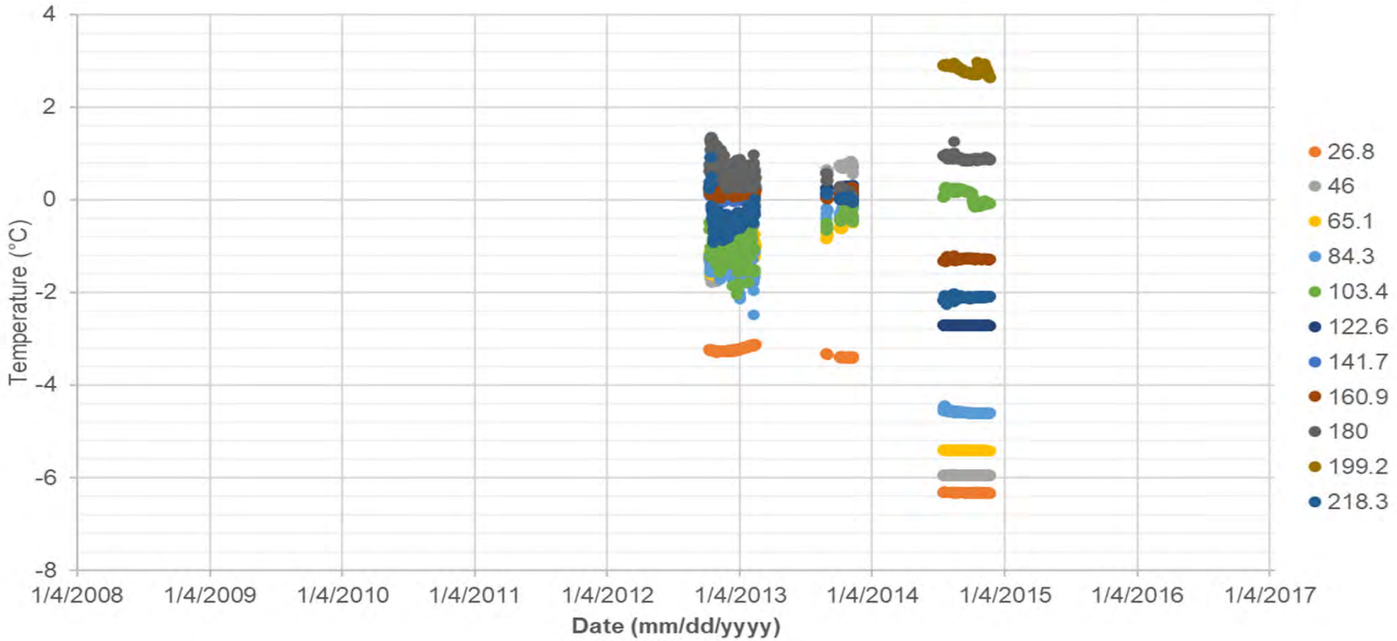
-5
0
5
10
15
Depth (m bgs)
0
50
100
150
200
250
300

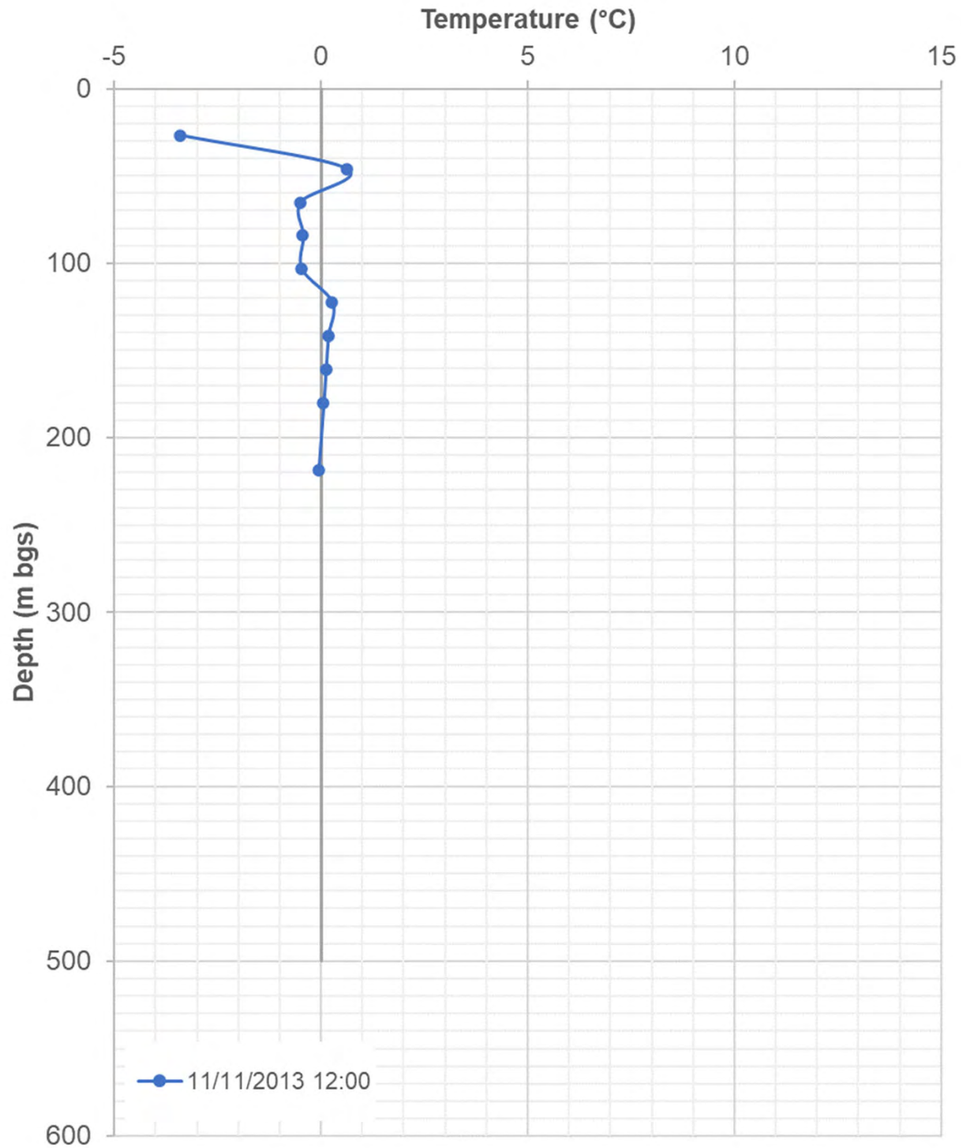
11SRKGL-10


Temperature (°C)
0
-2
-4
-6
-8
-10
-12
-14
-16
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
0.1
0.5
1
1.5
2
5
7.5
10
15
20

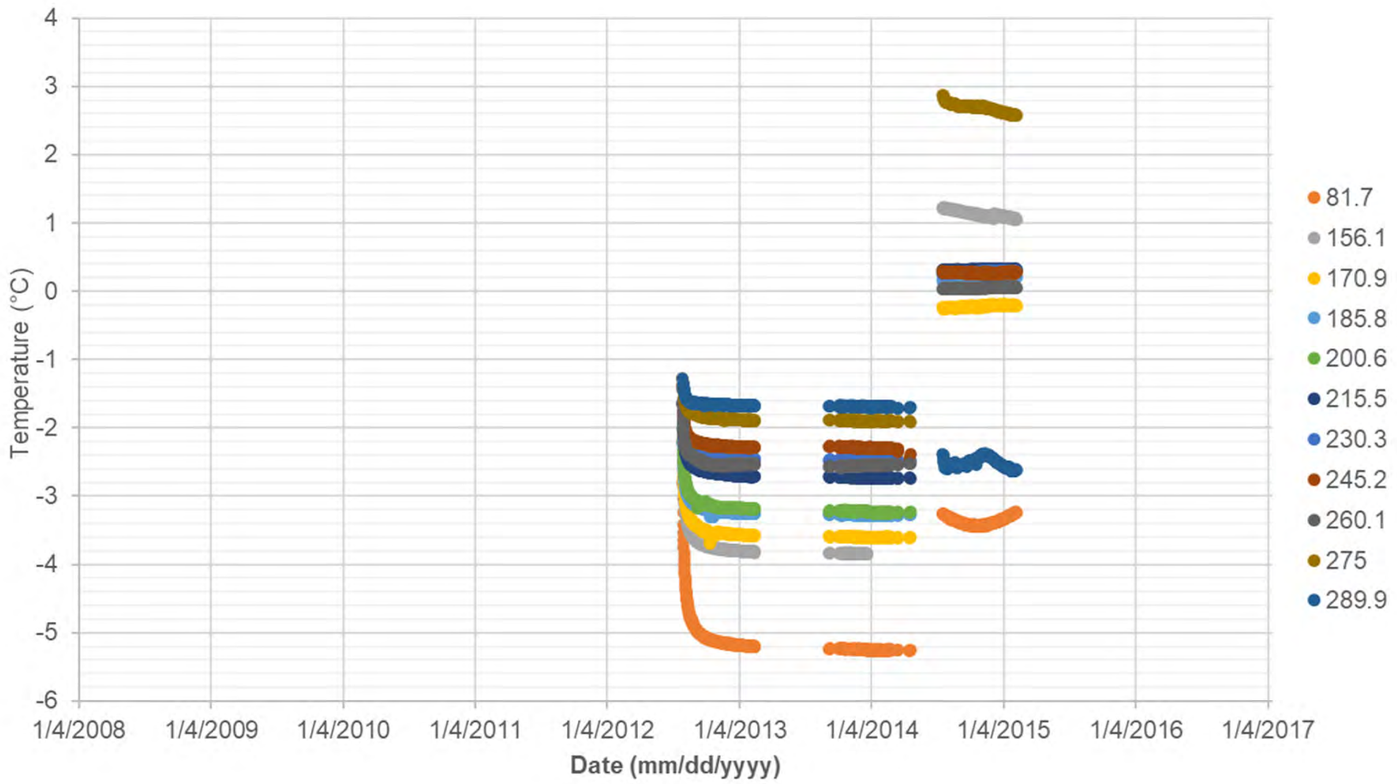

Temperature (°C)
-20
-15
-10
-5
0
5
10
15
0
5
10
15
20
25
30
35
40
45
50
Depth (m bgs)
4/6/2015 0:00

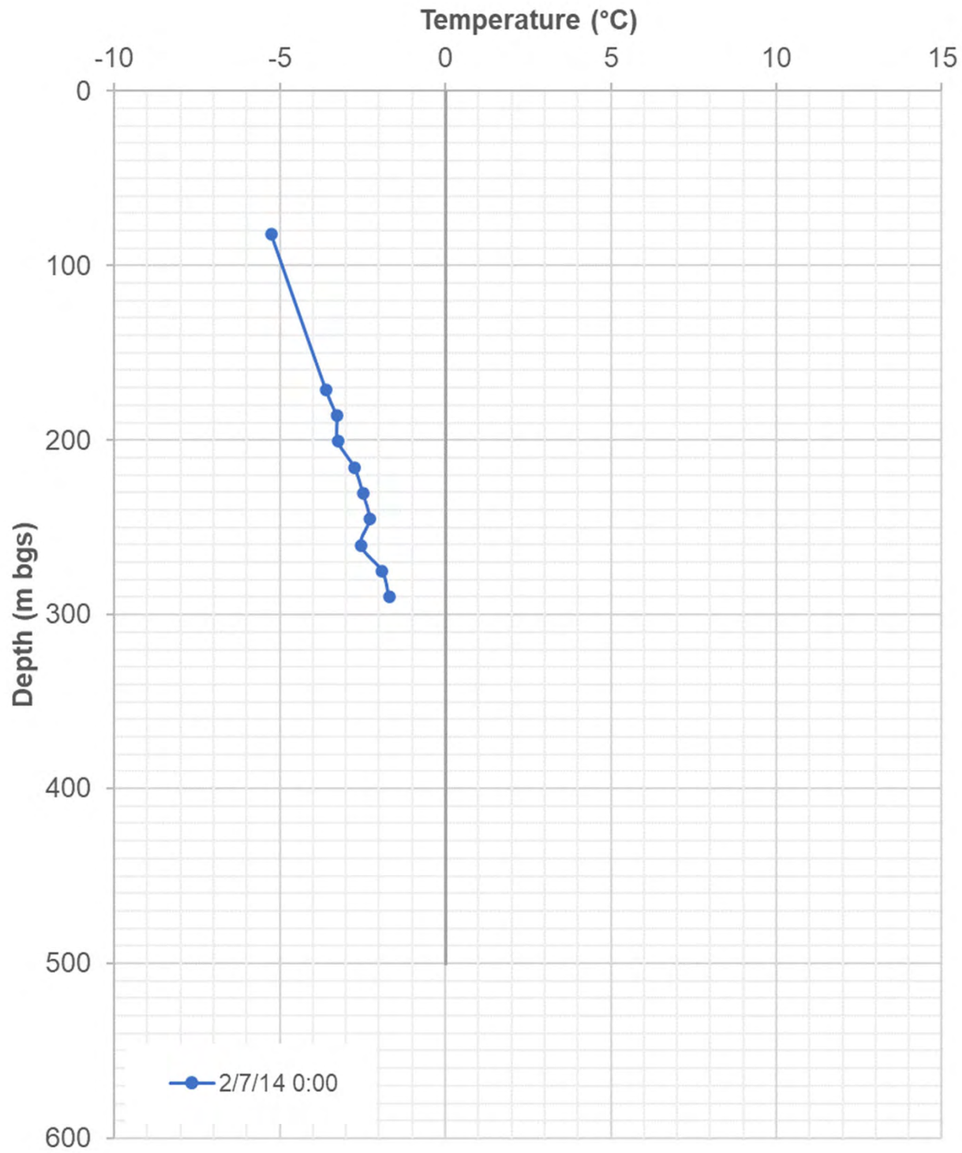
12-GSE-218


Temperature (°C)
4
2
0
-2
-4
-6
-8
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
26.8
46
65.1
84.3
103.4
122.6
141.7
160.9
180
199.2
218.3

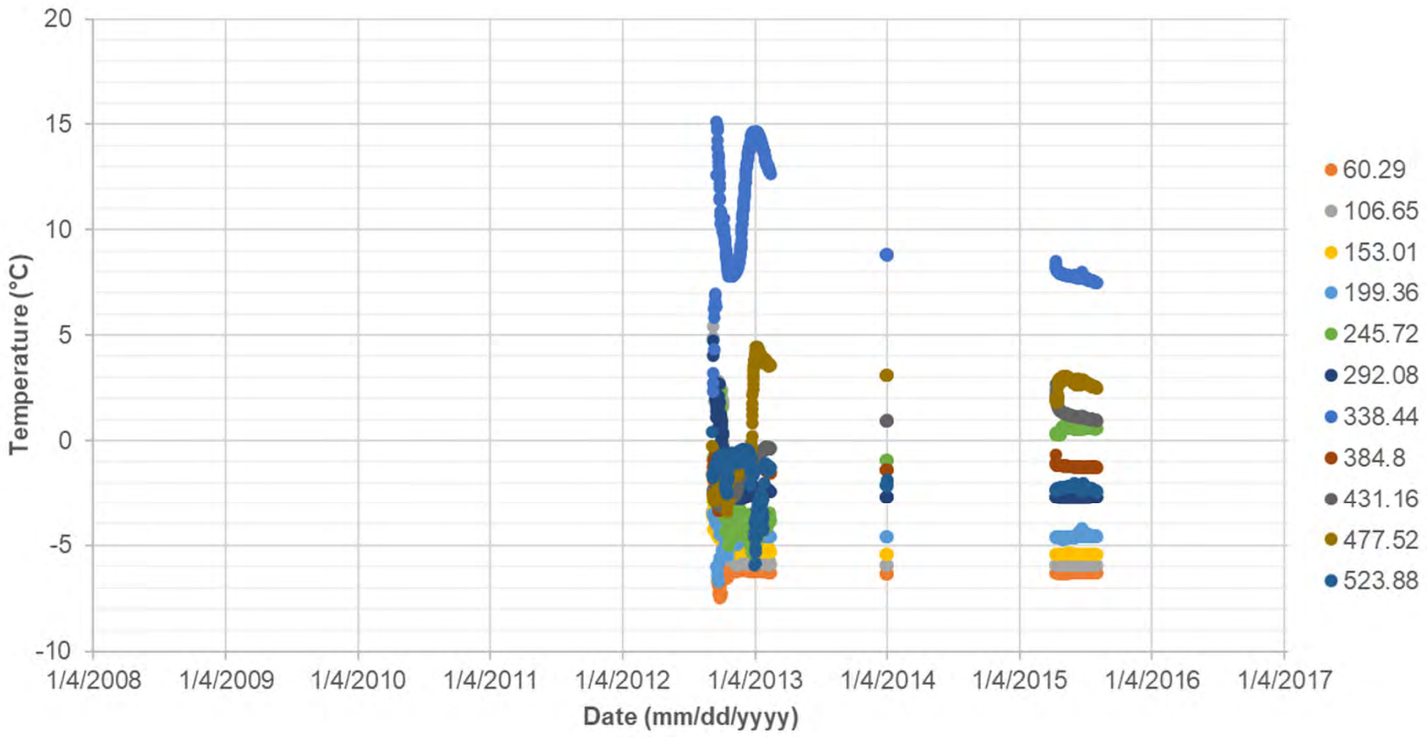

Temperature (°C)
-5
0
5
10
15
Depth (m bgs)
0
100
200
300
400
500
600
11/11/2013 12:00

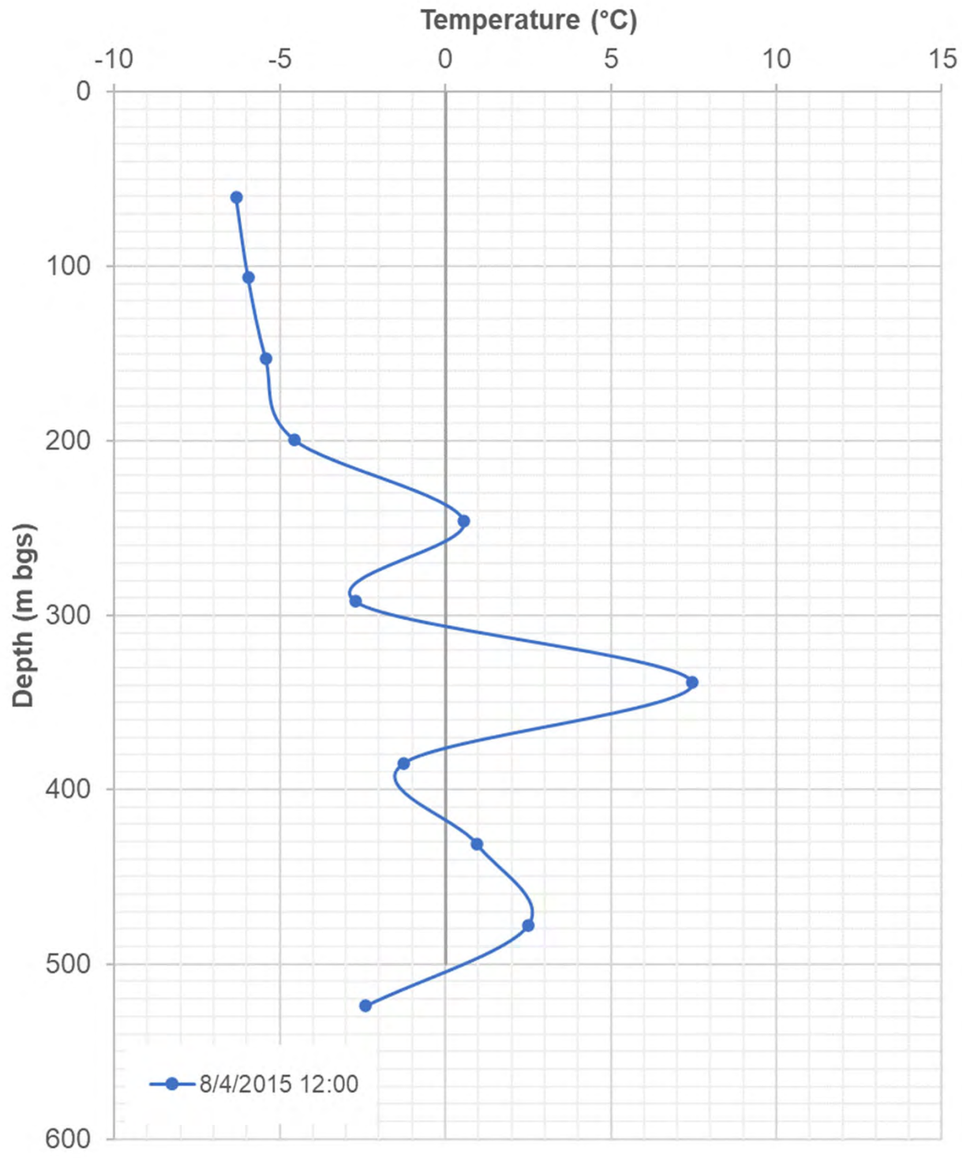
12-GSE-223


Temperature (°C)
4
3
2
1
0
-1
-2
-3
-4
-5
-6
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
81.7
156.1
170.9
185.8
200.6
215.5
230.3
245.2
260.1
275
289.9

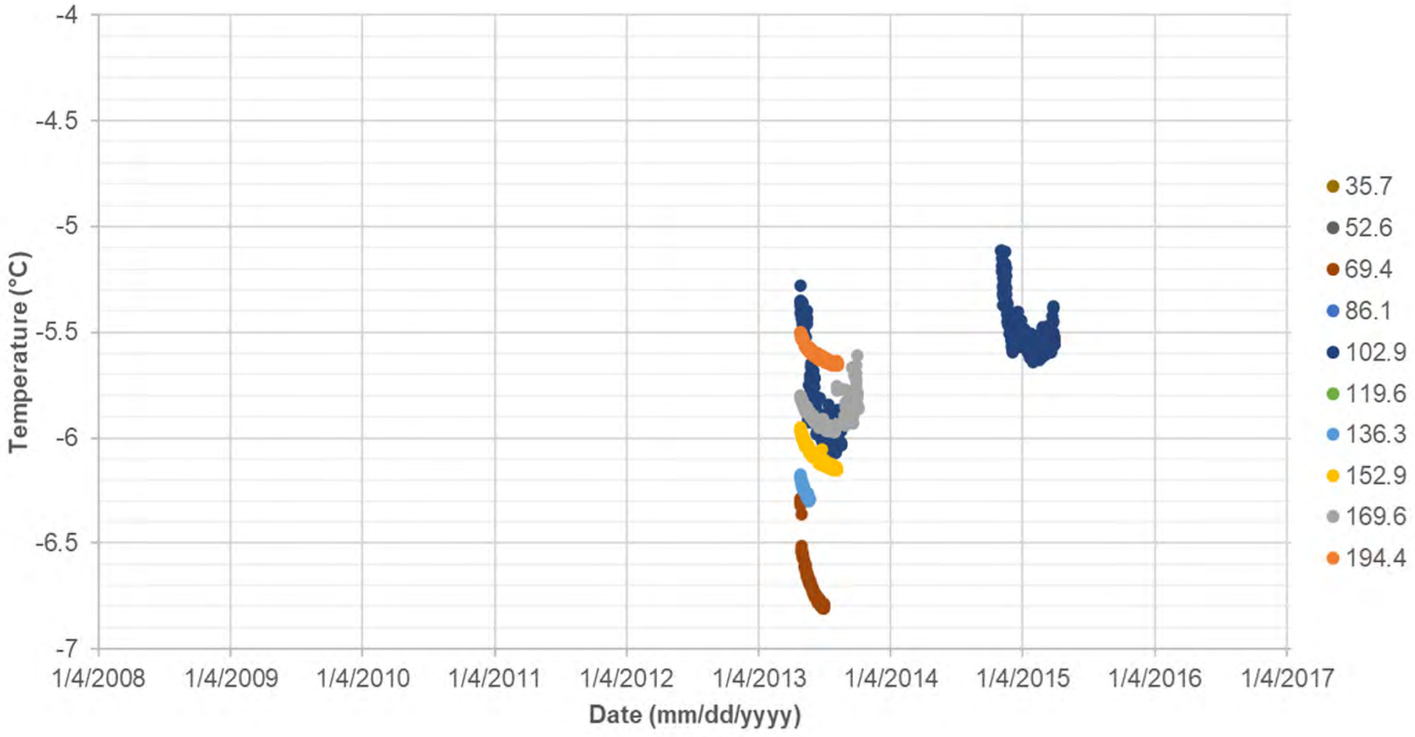

Temperature (°C)
-10
-5
0
5
10
15
0
100
200
300
400
500
600
Depth (m bgs)
2/7/14 0:00

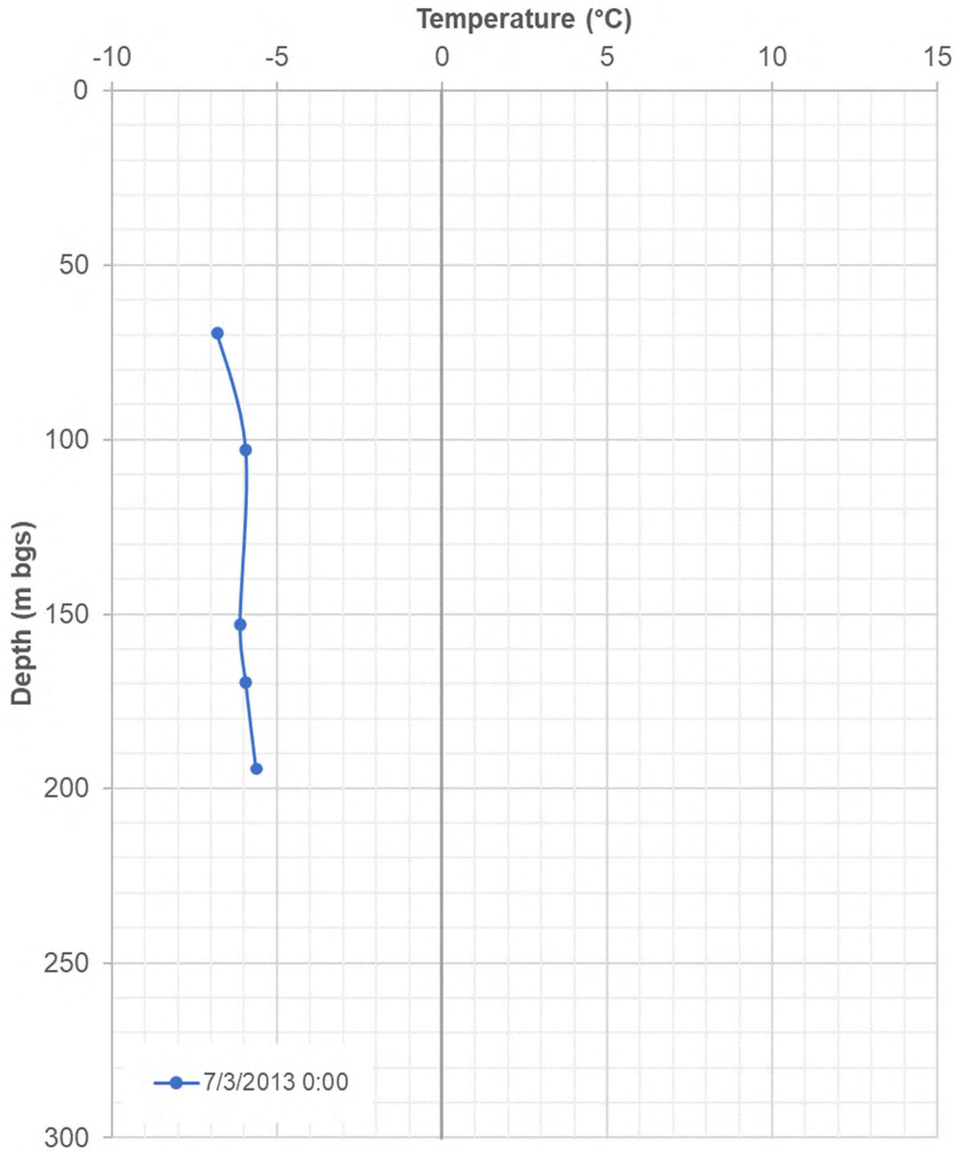
12-GSE-223C


Temperature (°C)
20
15
10
5
0
-5
-10
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
60.29
106.65
153.01
199.36
245.72
292.08
338.44
384.8
431.16
477.52
523.88

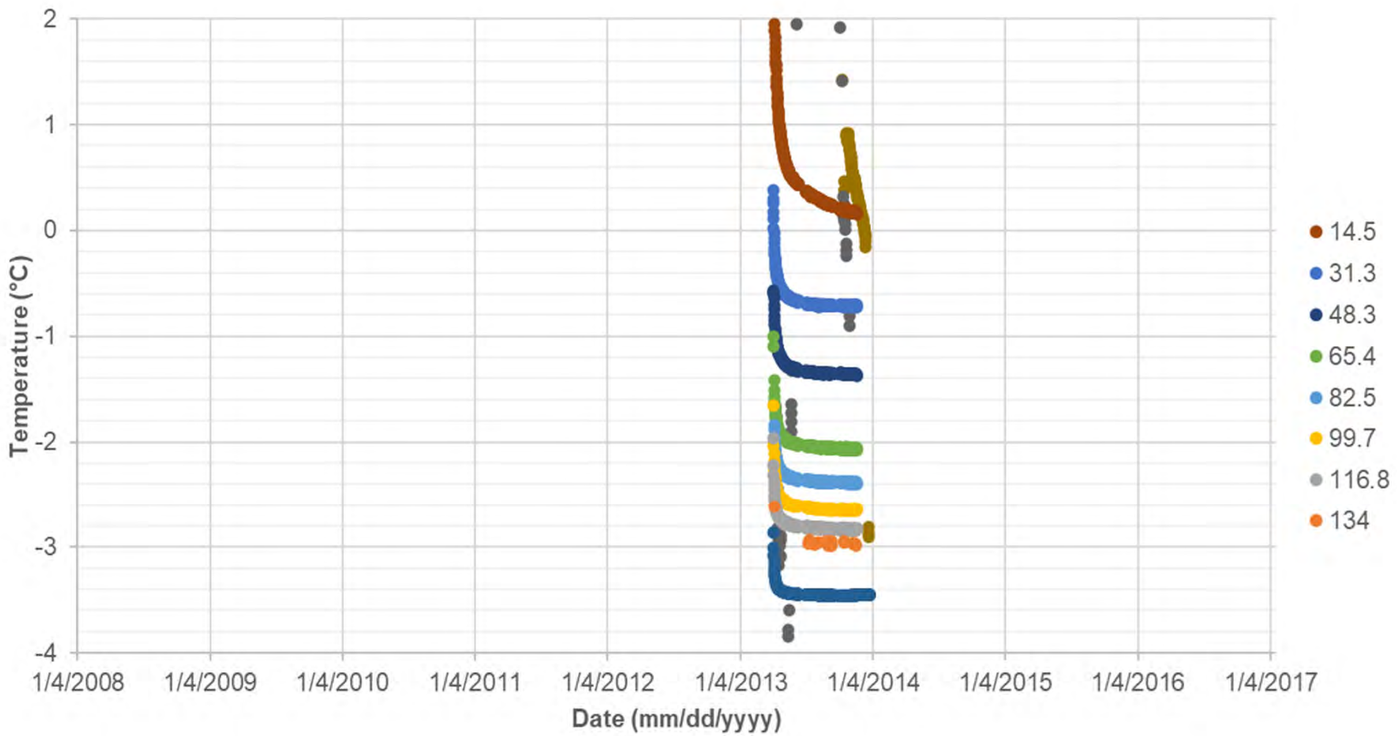

Temperature (°C)
-10
-5
0
5
10
15
0
100
200
300
400
500
600
Depth (m bgs)
8/4/2015 12:00

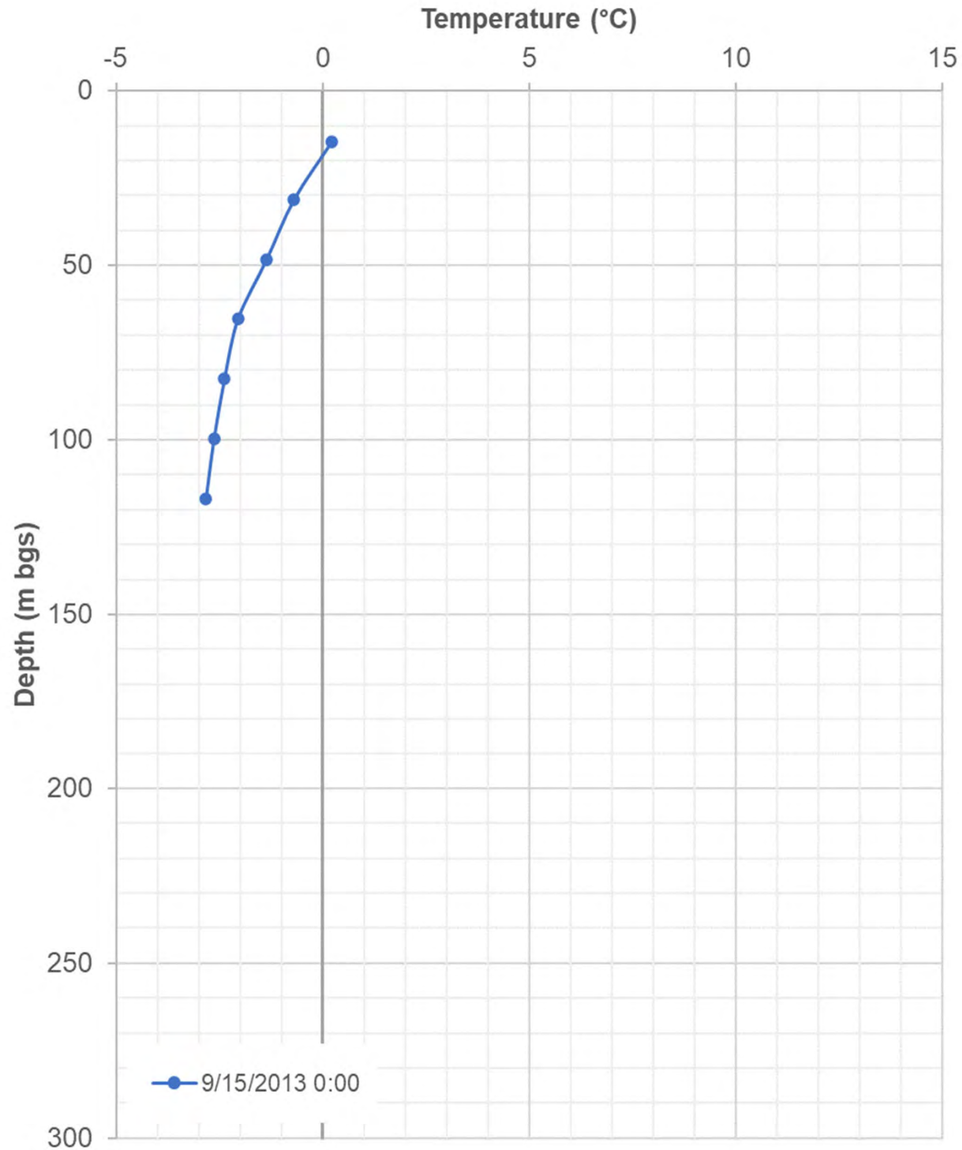
13-GSE-261B


-4
-4.5
-5
-5.5
-6
-6.5
-7
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
35.7
52.6
69.4
86.1
102.9
119.6
136.3
152.9
169.6
194.4

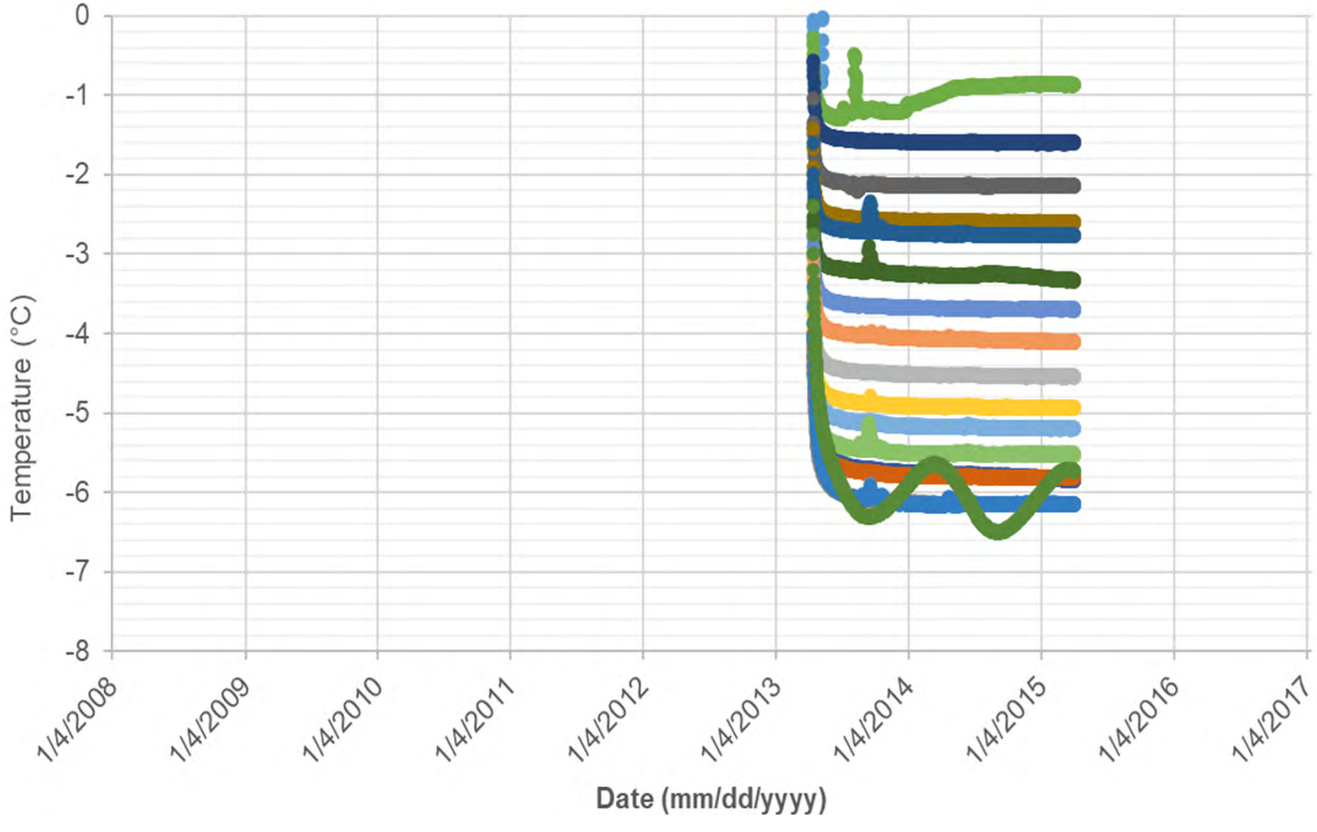

Temperature (°C)
-10
-5
0
5
10
15
0
50
100
150
200
250
300
Depth (m bgs)
7/3/2013 0:00

13-GSE-277B

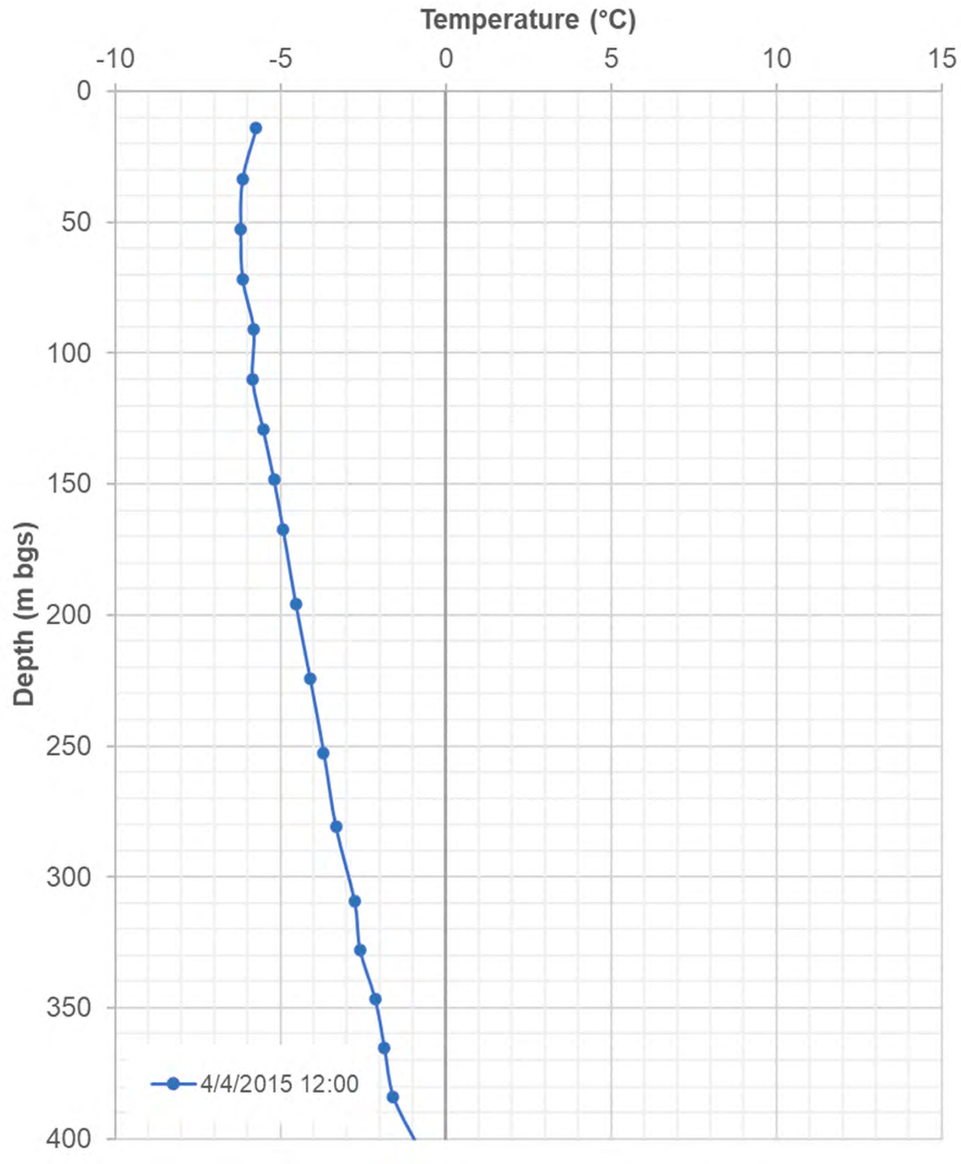

2
1
0
-1
-2
-3
-4
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
14.5
31.3
48.3
65.4
82.5
99.7
116.8
134


Temperature (°C)
-5
0
5
10
15
0
50
100
150
200
250
300
Depth (m bgs)
9/15/2013 0:00

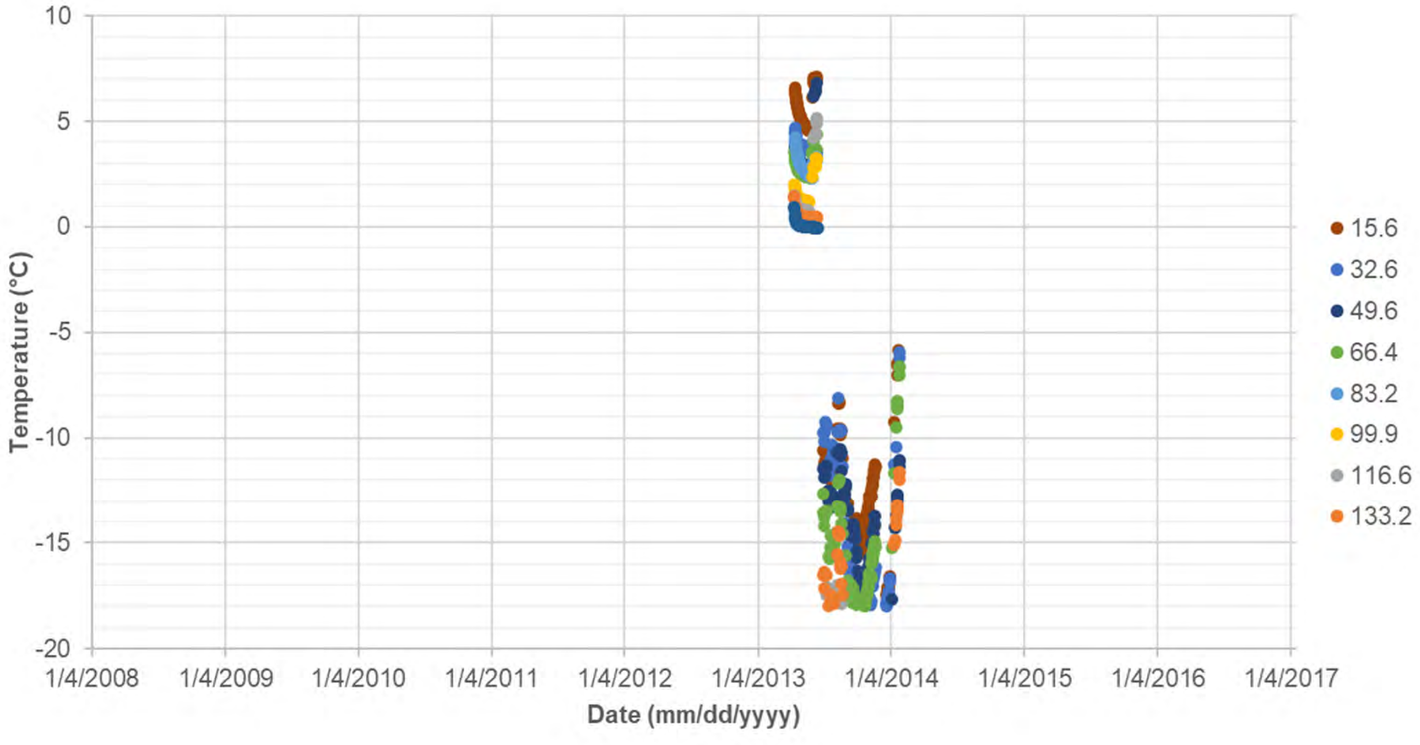
13-GSE-279

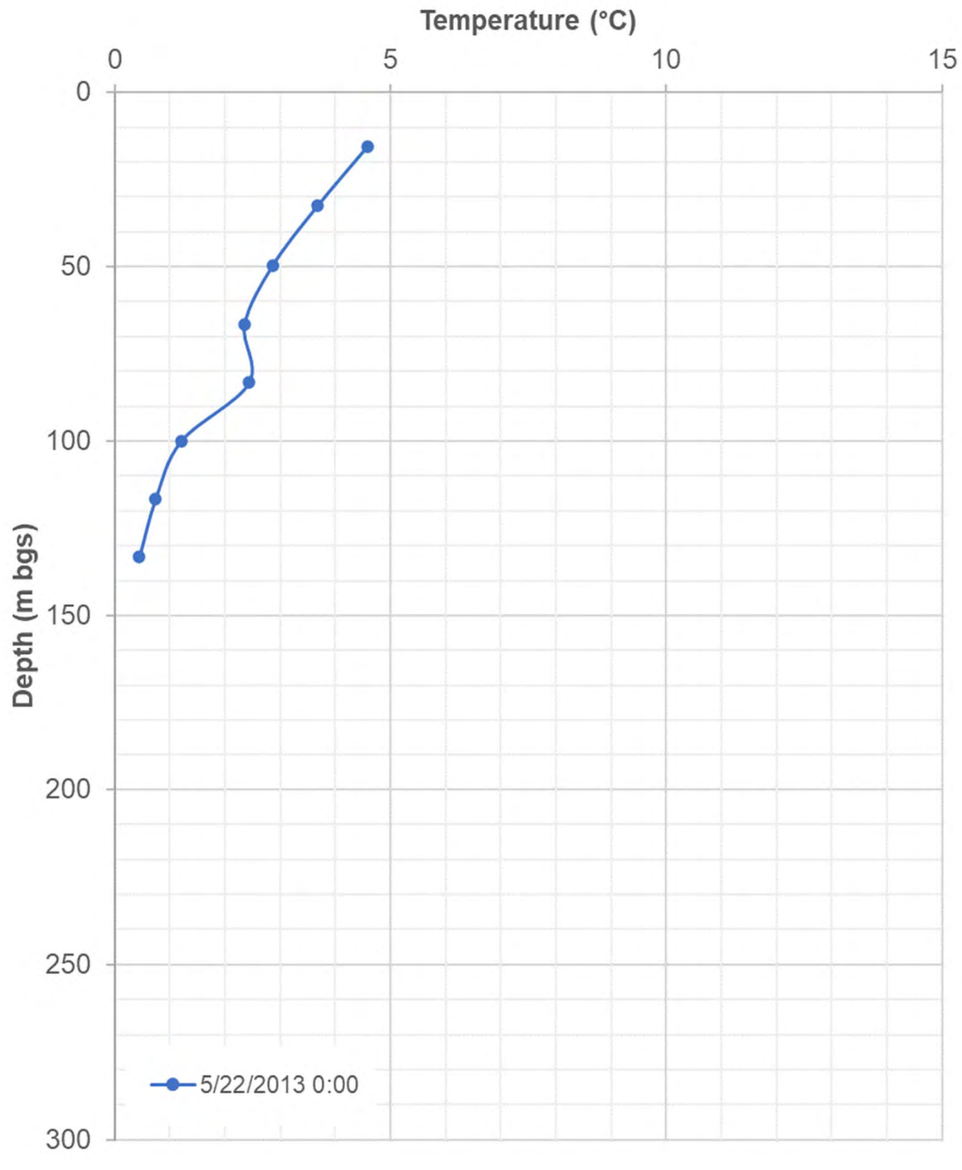

0
-1
-2
-3
-4
-5
-6
-7
-8
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)


493.8
475.8
457.7
439.4
421
402.5
383.9
346.7
327.9
309.2
280.9
252.6
224.2
195.8
167.3
148.3
129.2
110.1
91
71.8
33.4
14.2

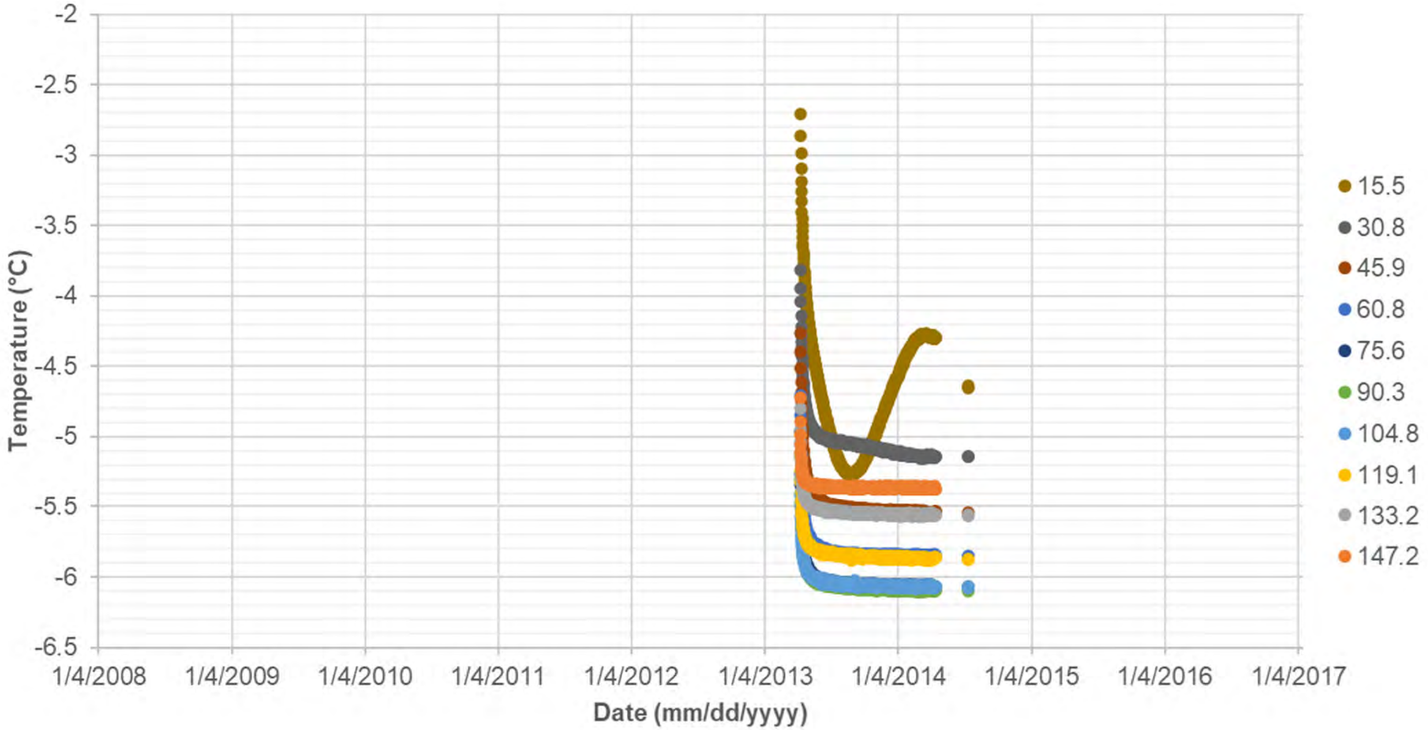

Temperature (°C)
-10
-5
0
5
10
15
0
50
100
150
200
250
300
350
400
Depth (m bgs)
4/4/2015 12:00

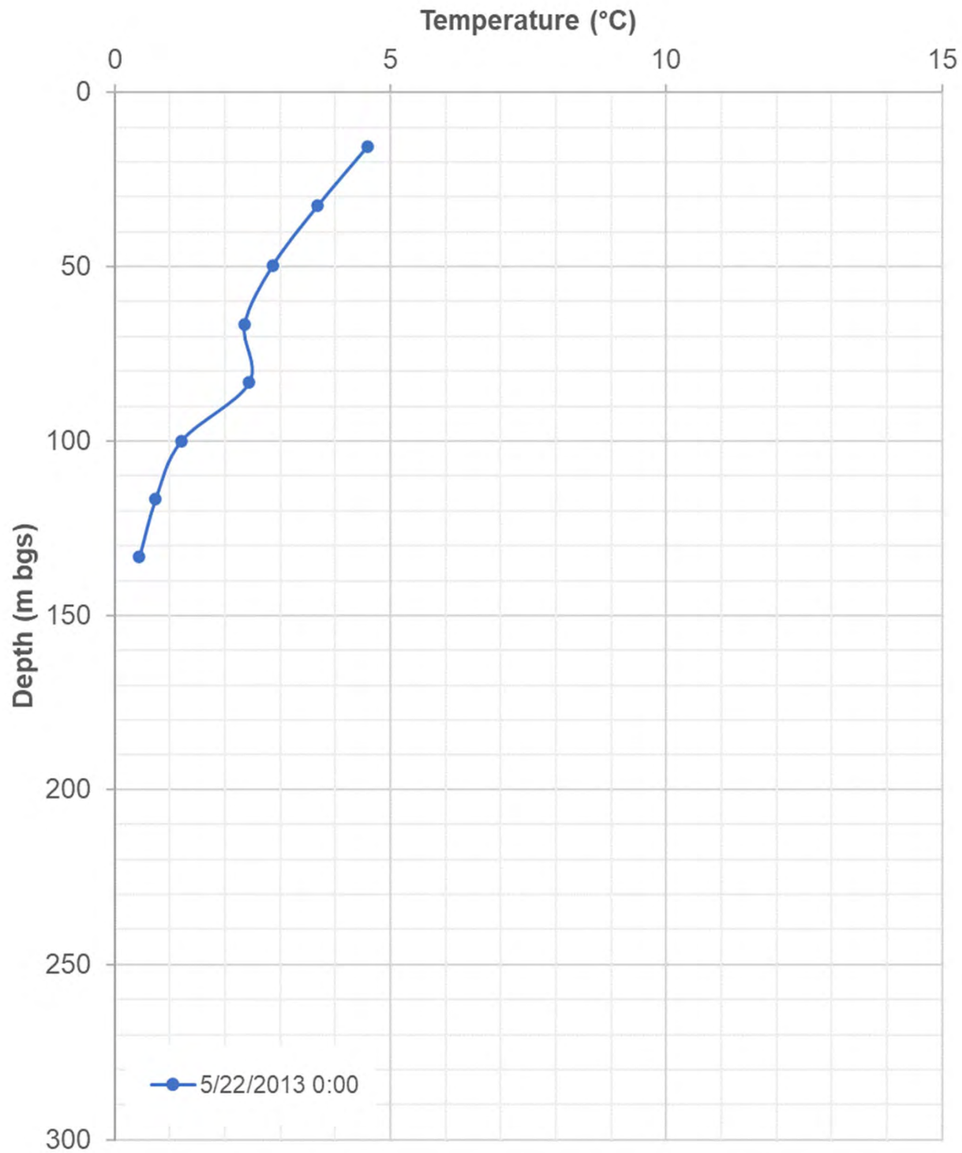
13-GSE-284


10
5
0
-5
-10
-15
-20
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15.6
32.6
49.6
66.4
83.2
99.9
116.6
133.2

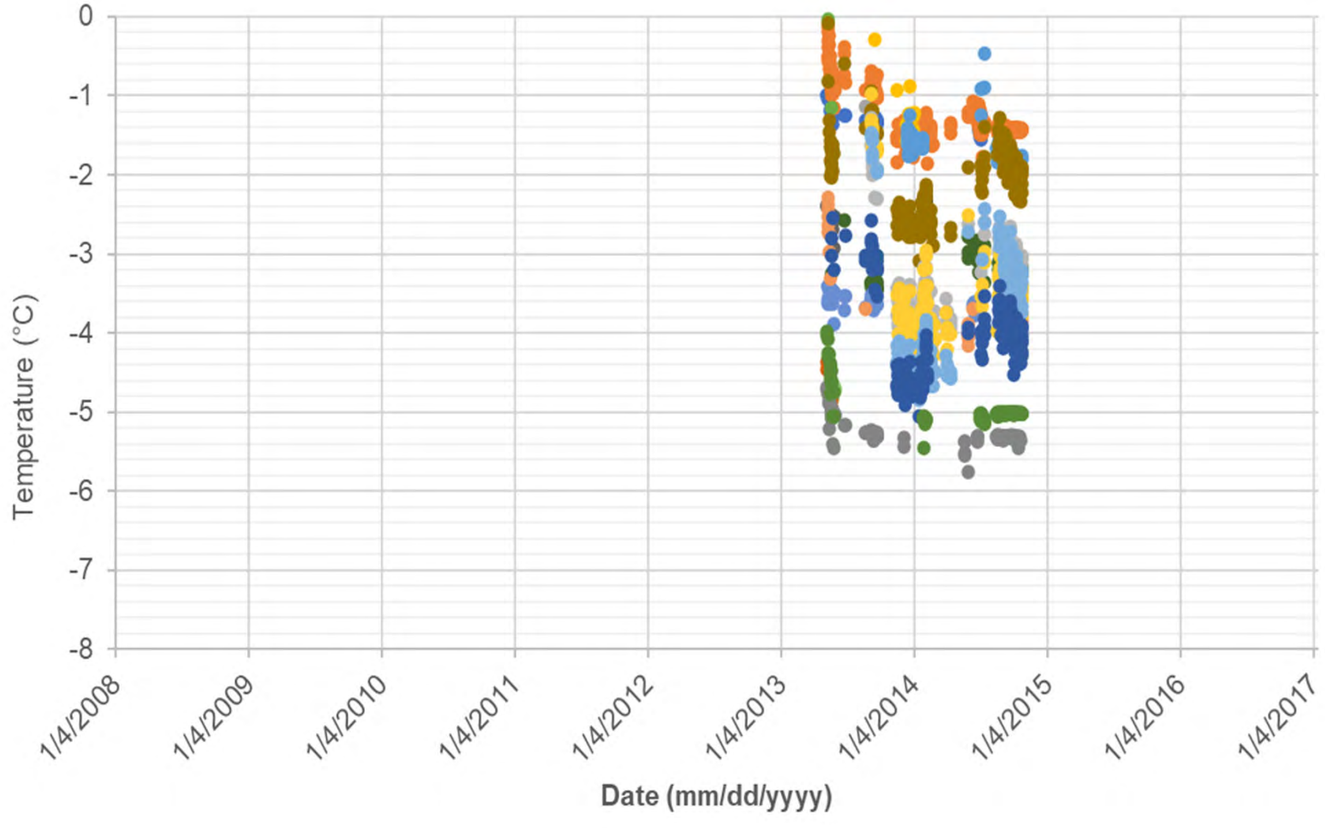

Temperature (°C)
0
5
10
15
0
50
100
150
200
250
300
Depth (m bgs)
5/22/2013 0:00

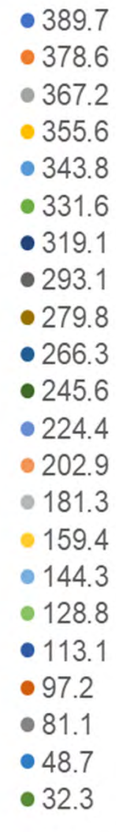
13-GSE-286

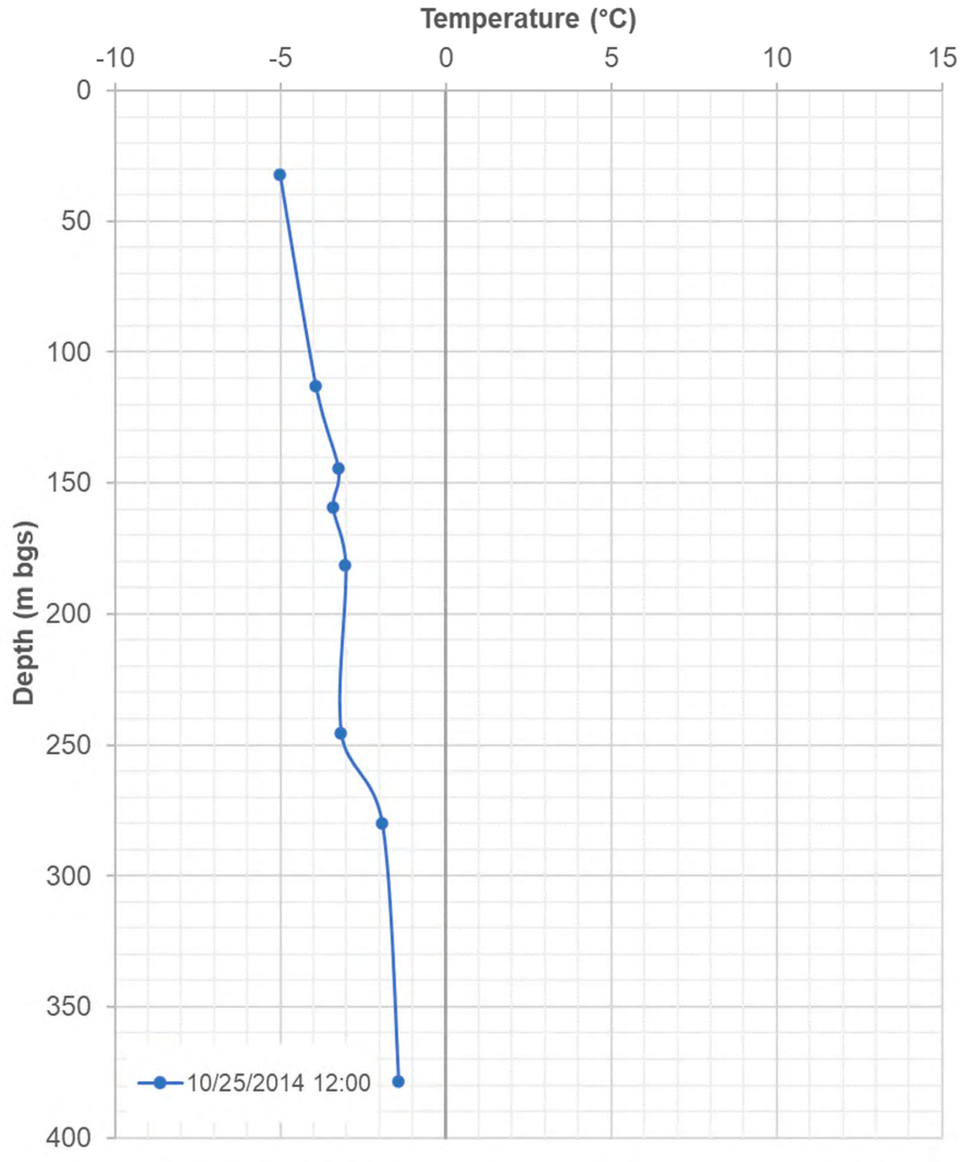

-2
-2.5
-3
-3.5
-4
-4.5
-5
-5.5
-6
-6.5
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15.5
30.8
45.9
60.8
75.6
90.3
104.8
119.1
133.2
147.2


Temperature (°C)
0
5
10
15
0
50
100
150
200
250
300
Depth (m bgs)
5/22/2013 0:00

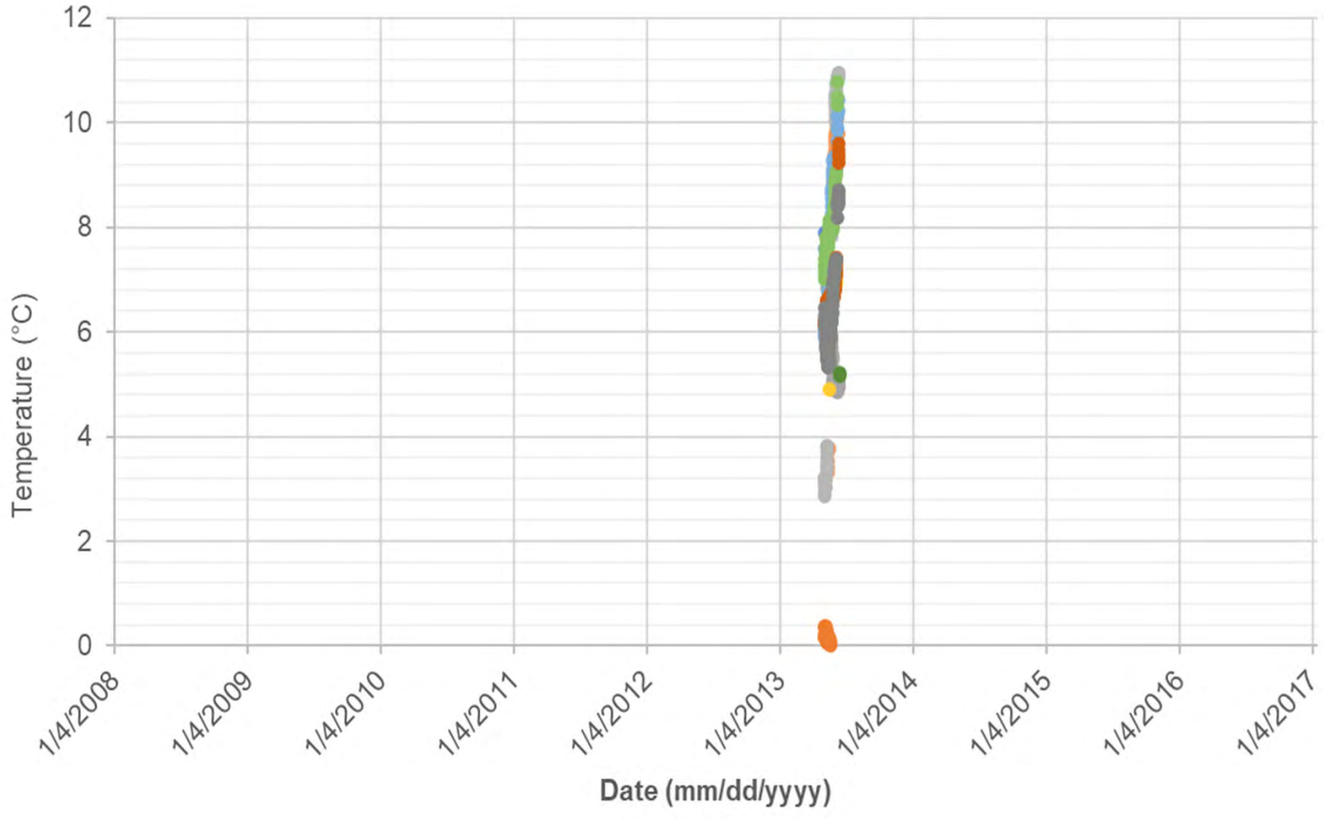
13-GSE-288

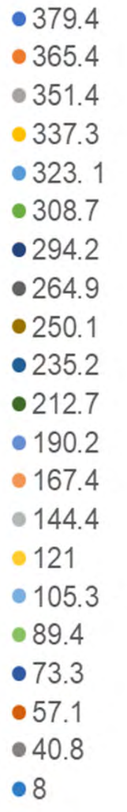

0
-1
-2
-3
-4
-5
-6
-7
-8
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)

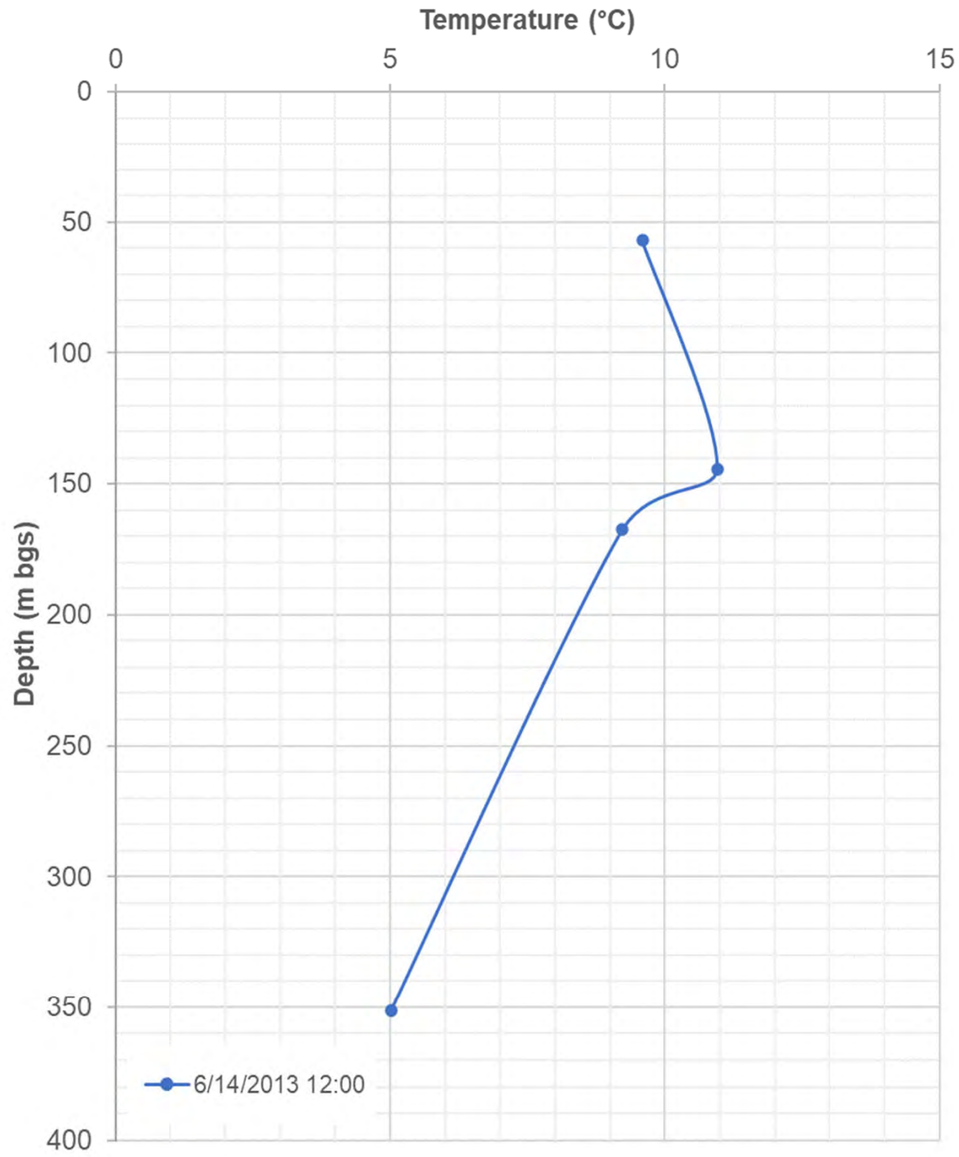

389.7
378.6
367.2
355.6
343.8
331.6
319.1
293.1
279.8
266.3
245.6
224.4
202.9
181.3
159.4
144.3
128.8
113.1
97.2
81.1
48.7
32.3


Temperature (°C)
-10
-5
0
5
10
15
0
50
100
150
200
250
300
350
400
Depth (m bgs)
10/25/2014 12:00

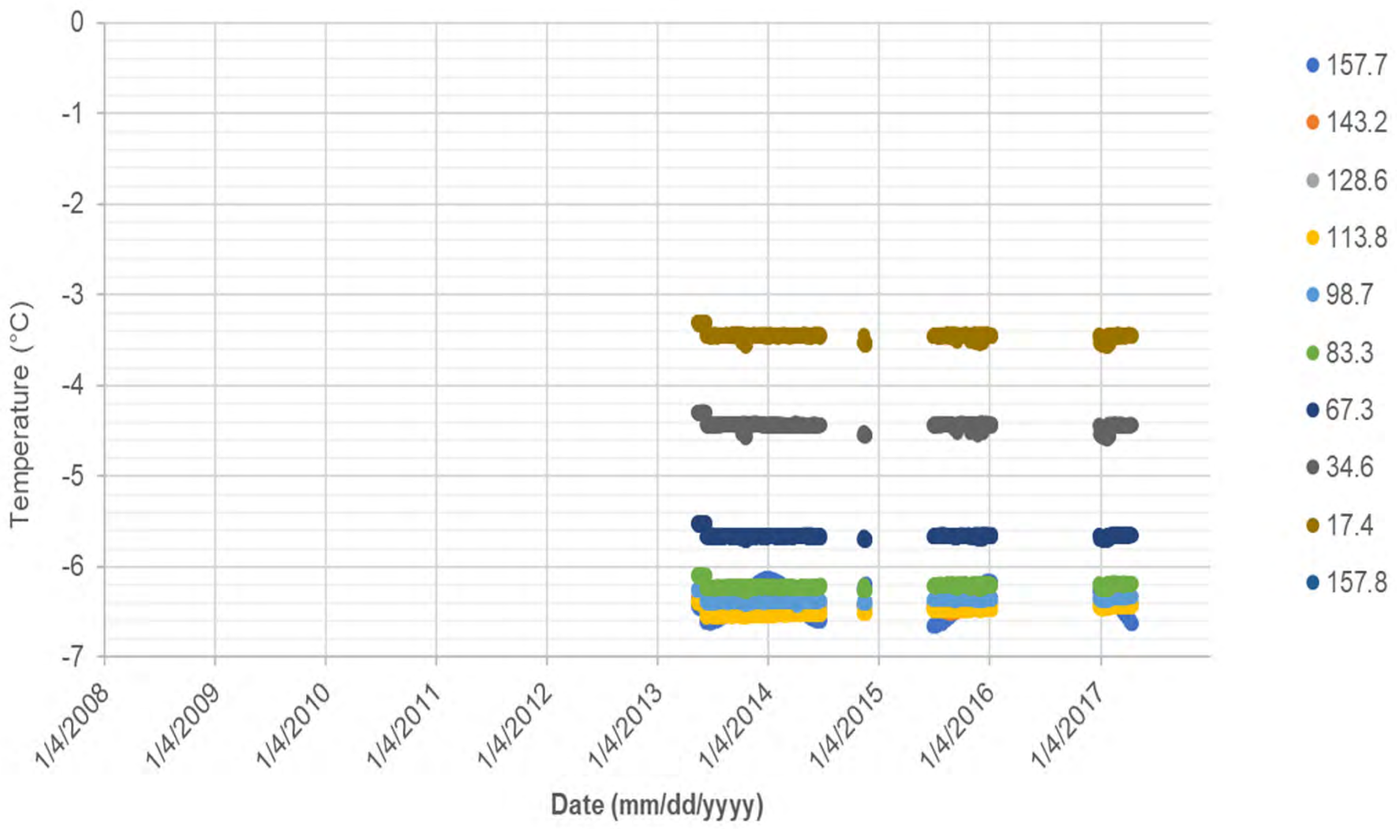
13-GSE-289

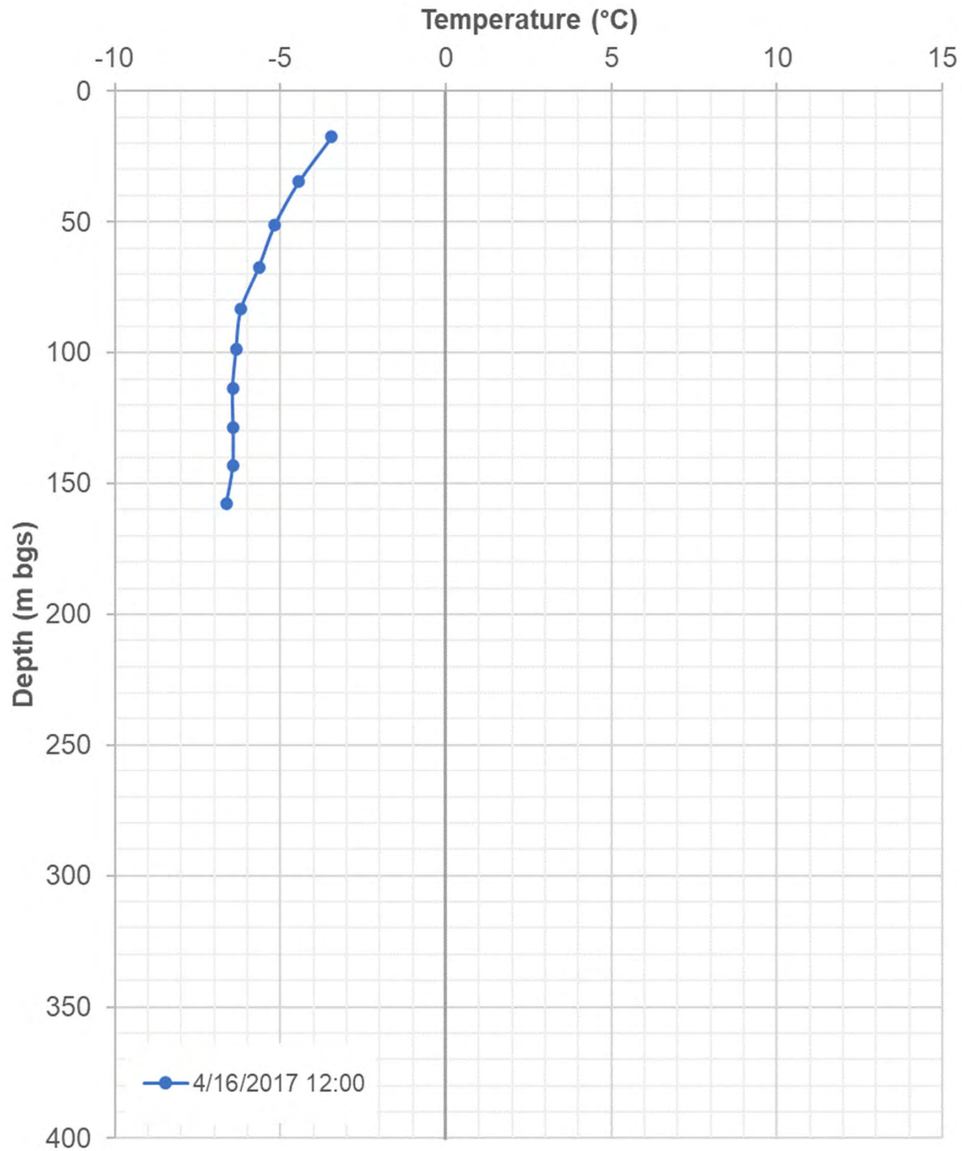

12
10
8
6
4
2
0
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)


379.4
365.4
351.4
337.3
323. 1
308.7
294.2
264.9
250.1
235.2
212.7
190.2
167.4
144.4
121
105.3
89.4
73.3
57.1
40.8
8

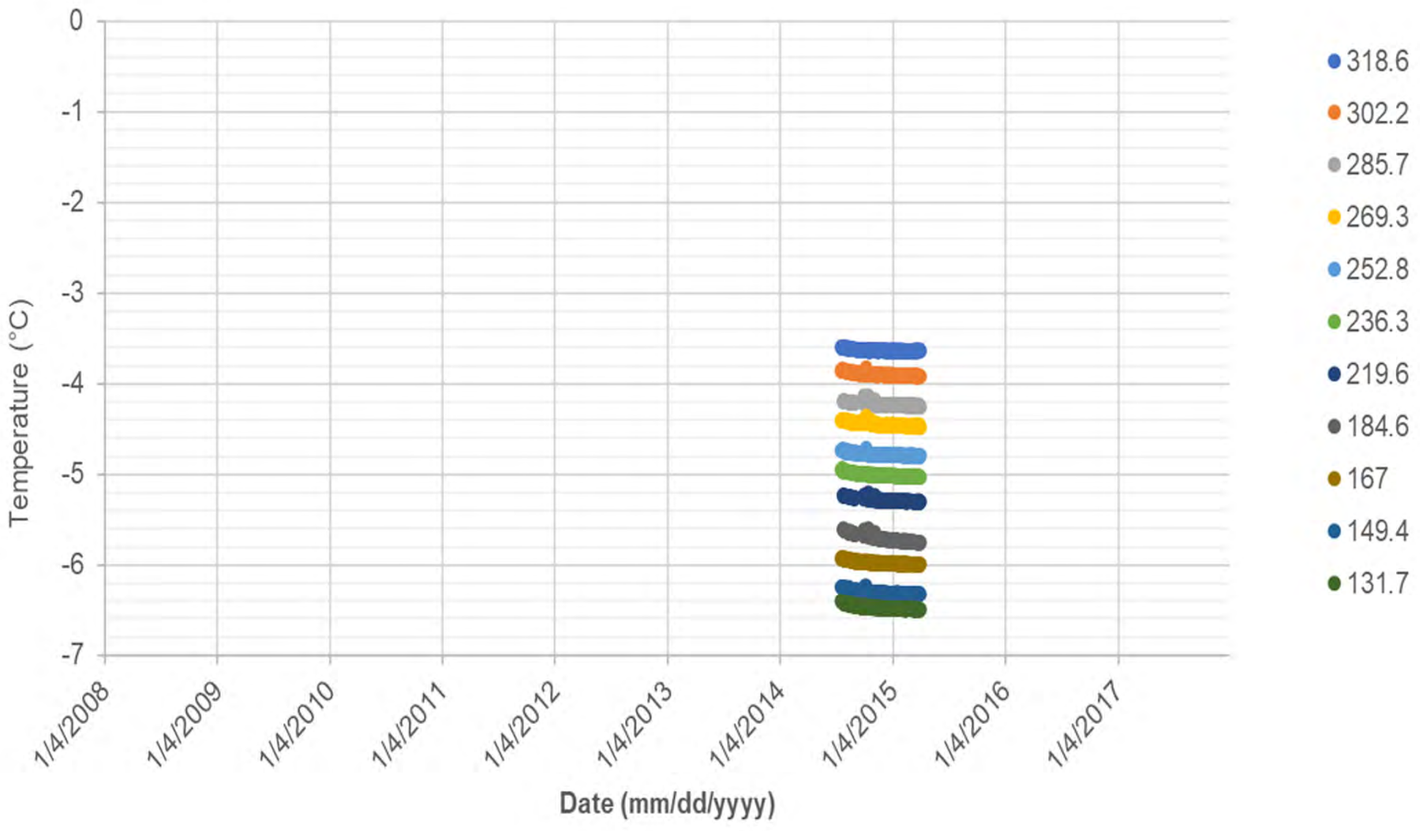

Temperature (°C)
0
5
10
15
0
50
100
150
200
250
300
350
400
Depth (m bgs)
6/14/2013 12:00

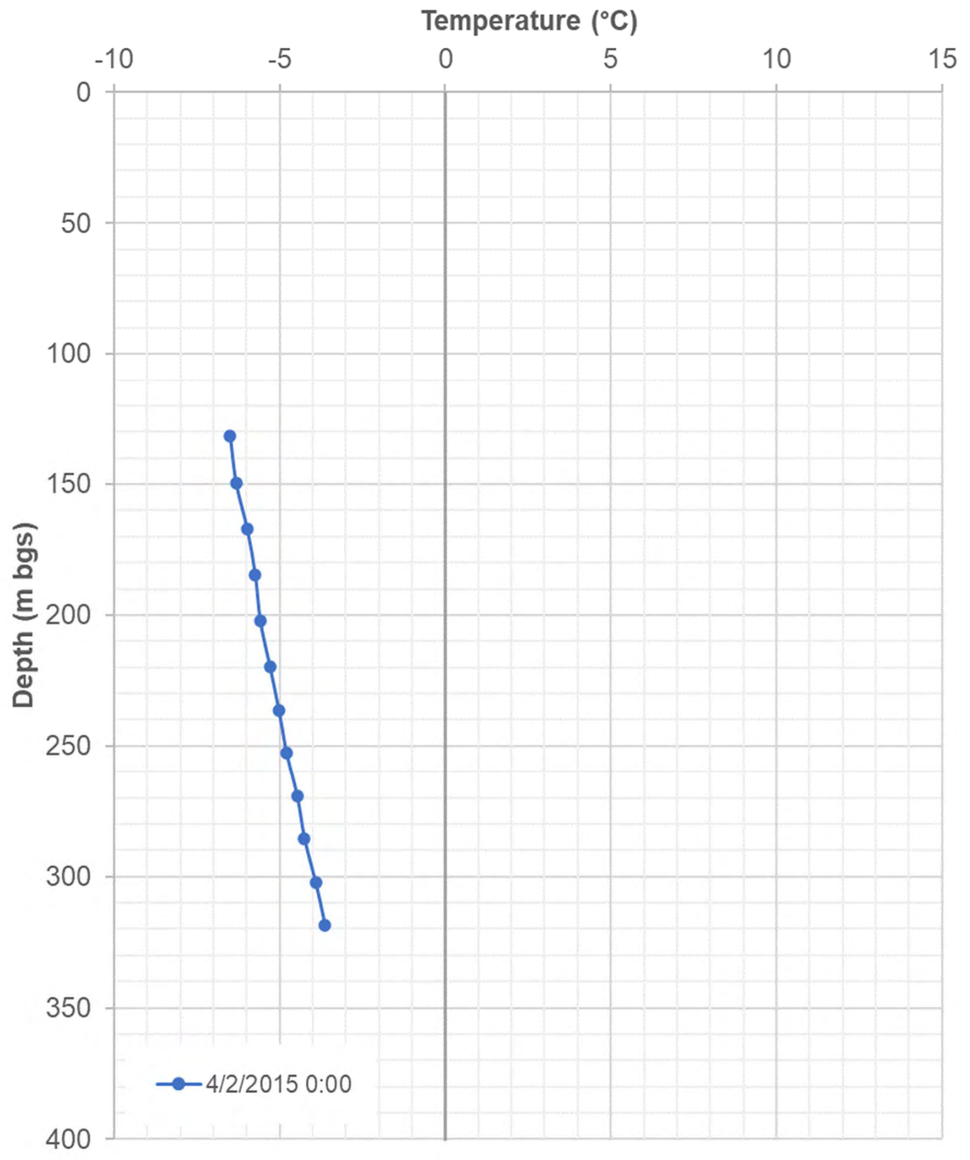
13-GSE-314


Temperature (°C)
0
-1
-2
-3
-4
-5
-6
-7
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
157.7
143.2
128.6
113.8
98.7
83.3
67.3
34.6
17.4
157.8

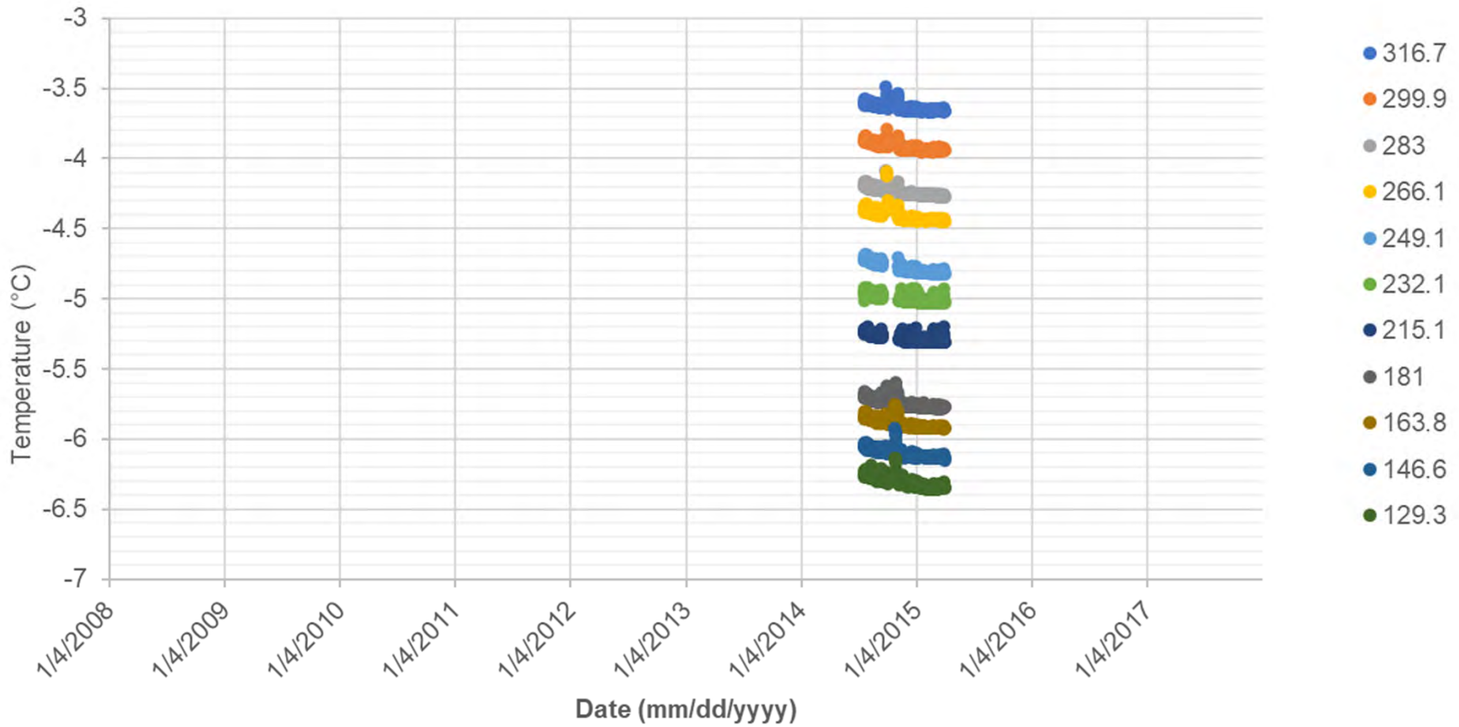

Temperature (°C)
-10
-5
0
5
10
15
0
50
100
150
200
250
300
350
400
Depth (m bgs)
4/16/2017 12:00

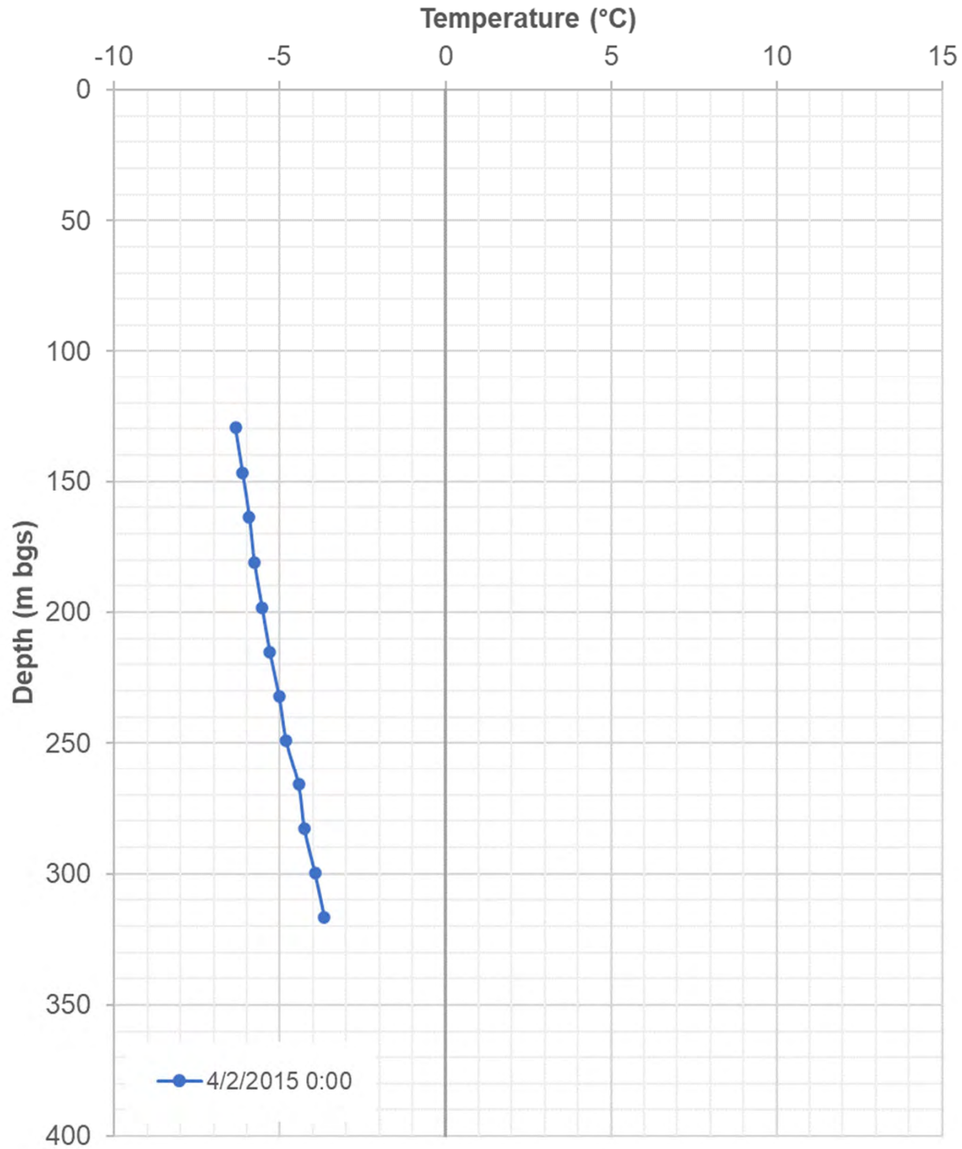
14-GSE-468


0
-1
-2
-3
-4
-5
-6
-7
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
318.6
302.2
285.7
269.3
252.8
236.3
219.6
184.6
167
149.4
131.7

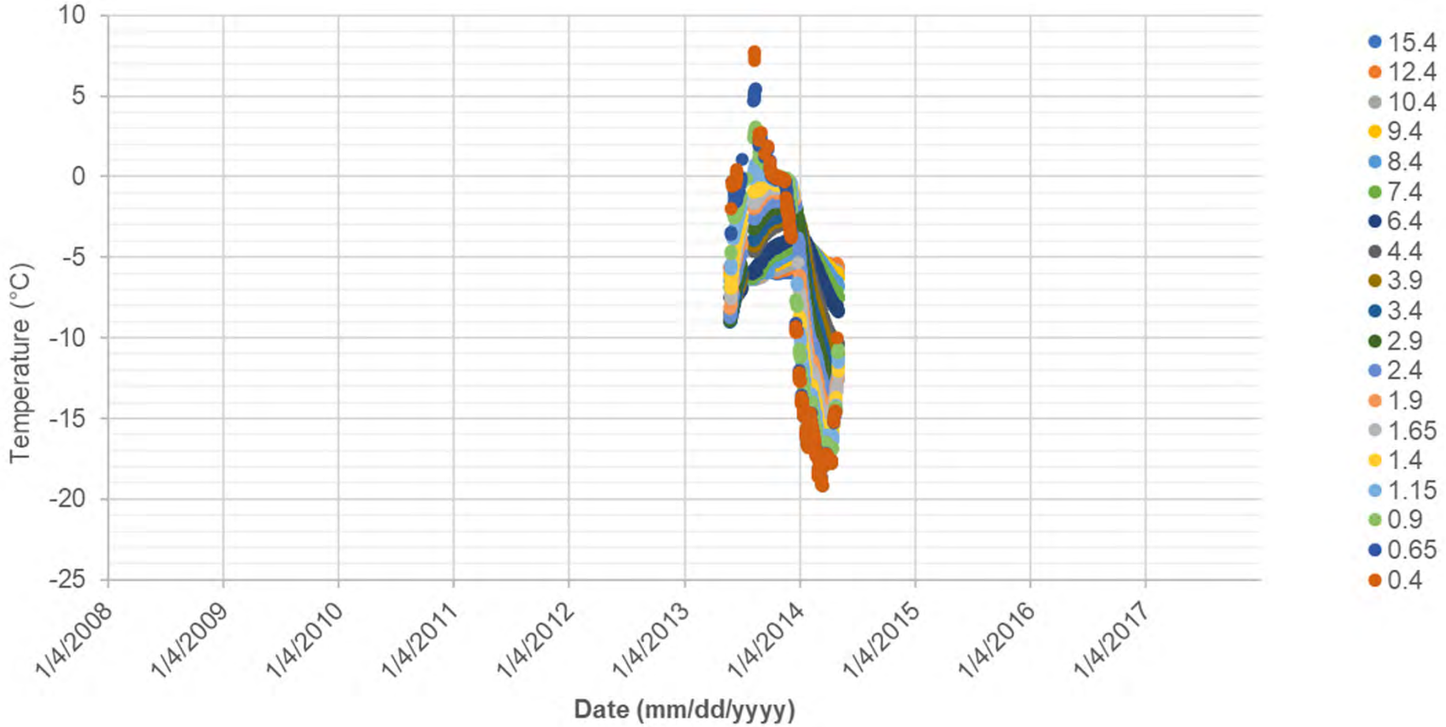

Temperature (°C)
-10
-5
0
5
10
15
0
50
100
150
200
250
300
350
400
Depth (m bgs)
4/2/2015 0:00

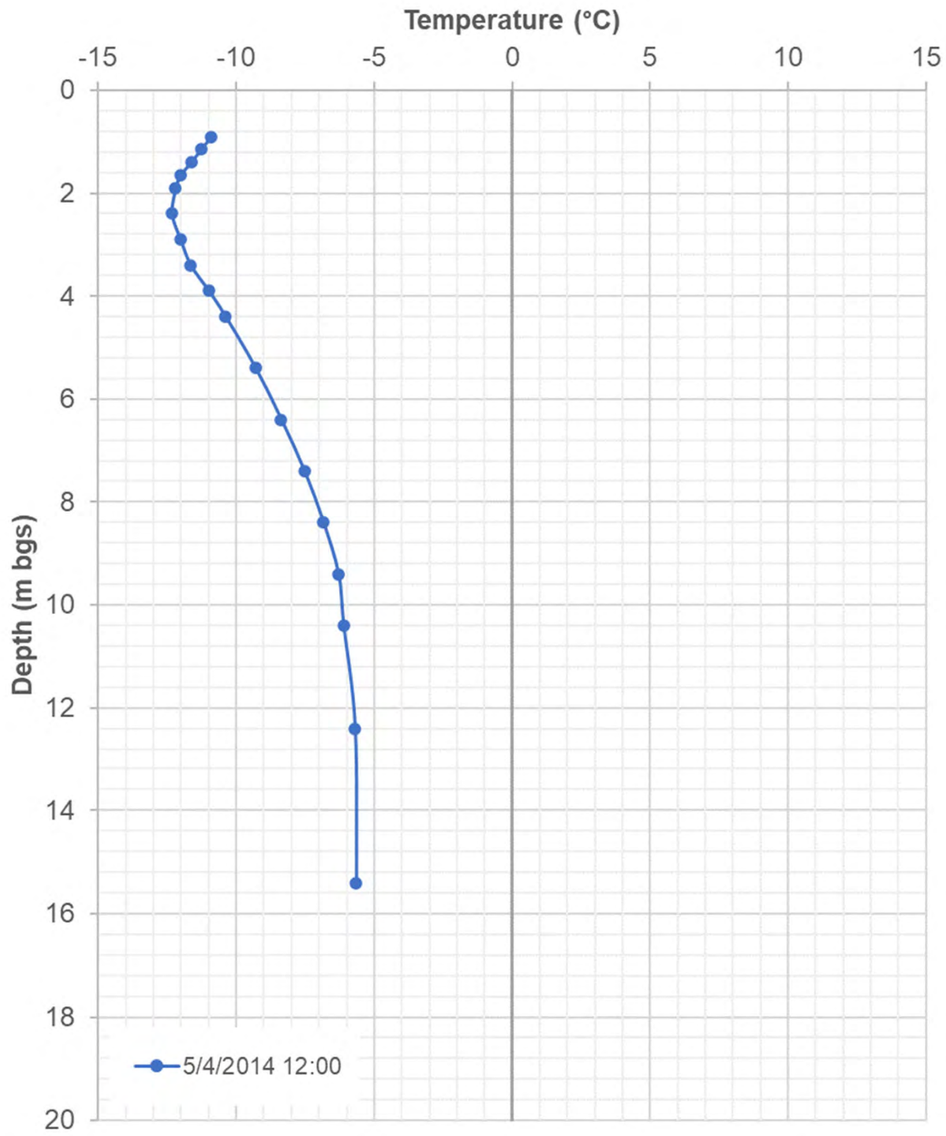
14-GSE-472


-3
-3.5
-4
-4.5
-5
-5.5
-6
-6.5
-7
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
316.7
299.9
283
266.1
249.1
232.1
215.1
181
163.8
146.6
129.3

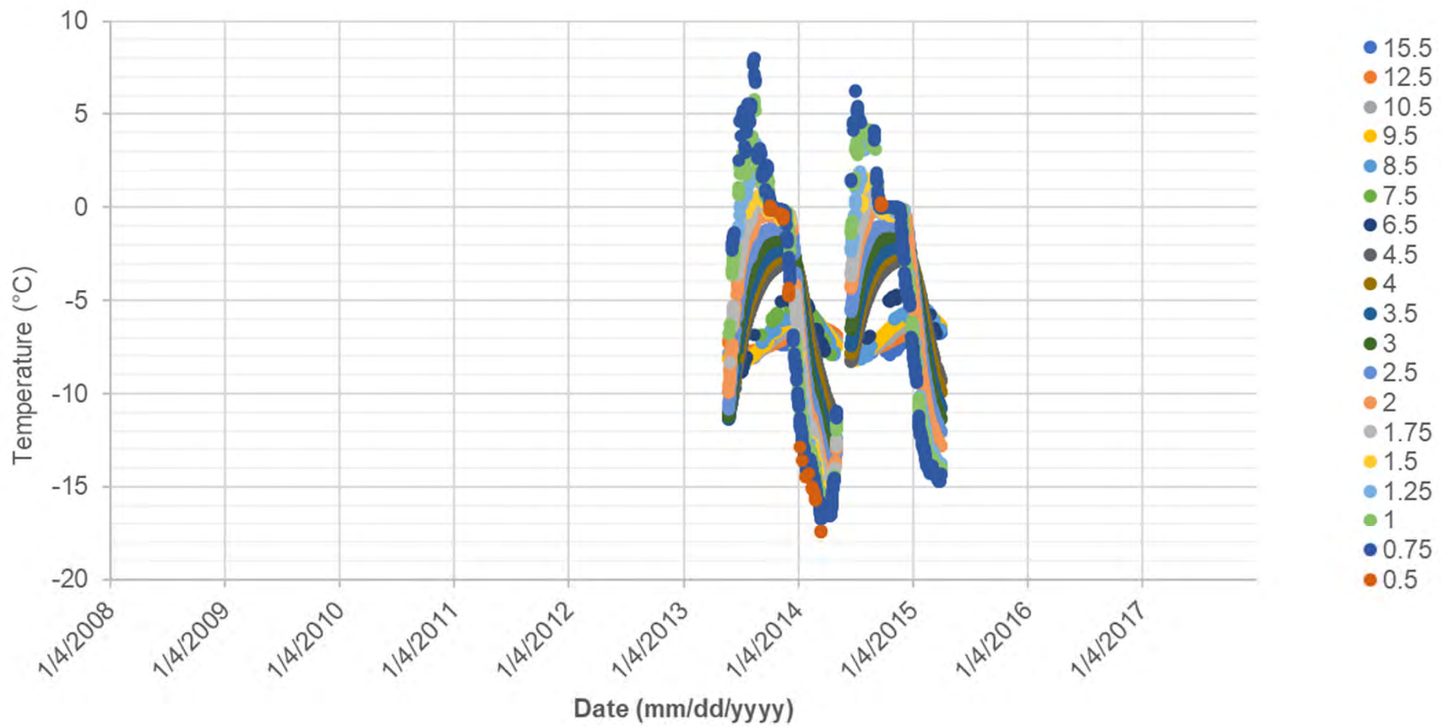

Temperature (°C)
-10
-5
0
5
10
15
0
50
100
150
200
250
300
350
400
Depth (m bgs)
4/2/2015 0:00

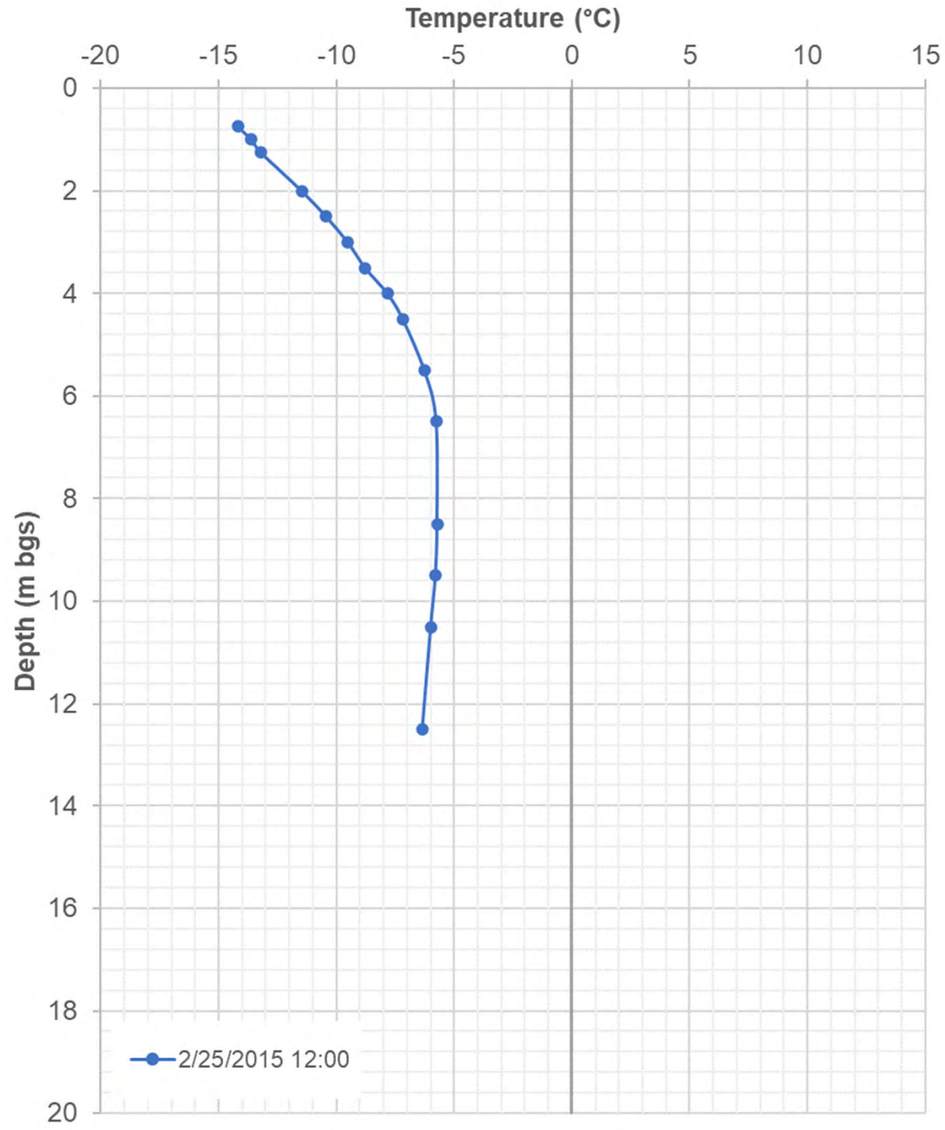
GAS-GT13-01


Temperature (°C)
10
5
0
-5
-10
-15
-20
-25
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15.4
12.4
10.4
9.4
8.4
7.4
6.4
4.4
3.9
3.4
2.9
2.4
1.9
1.65
1.4
1.15
0.9
0.65
0.4

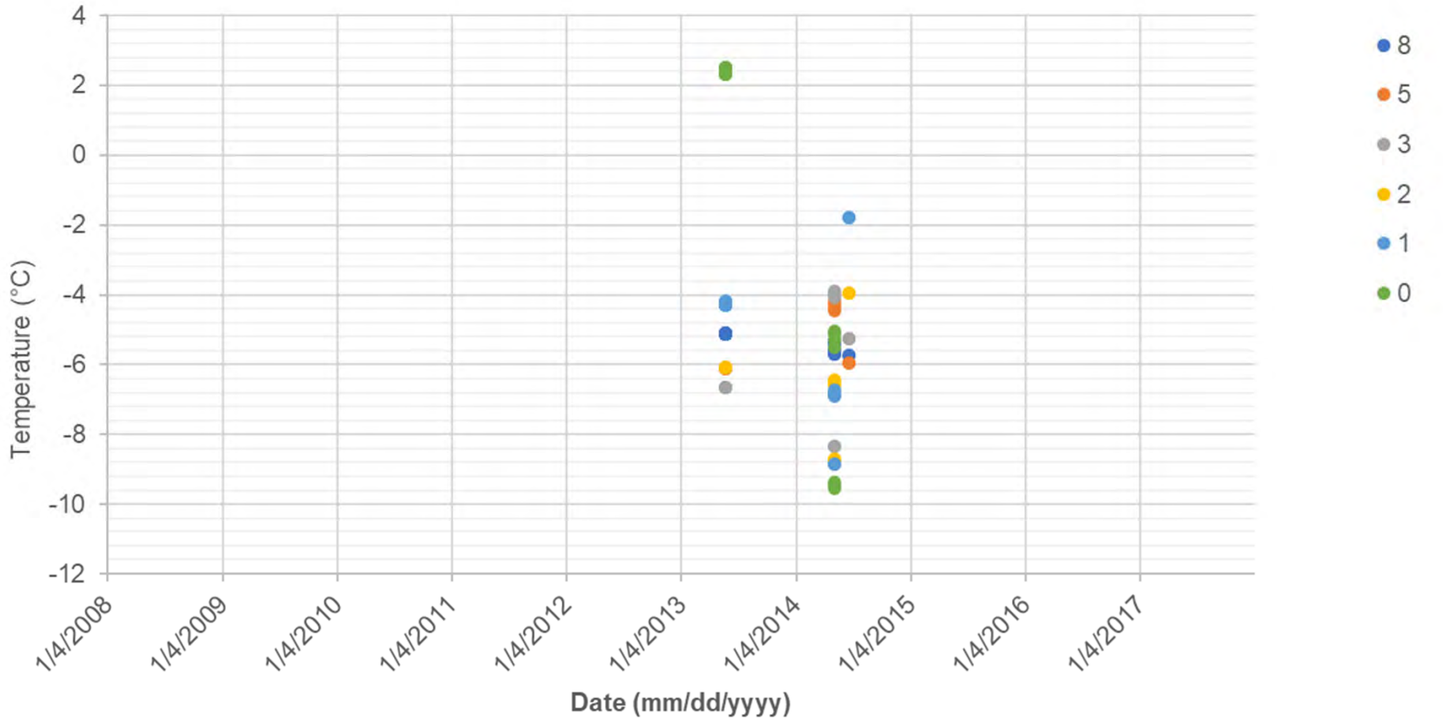

Temperature (°C)
-15
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
5/4/2014 12:00

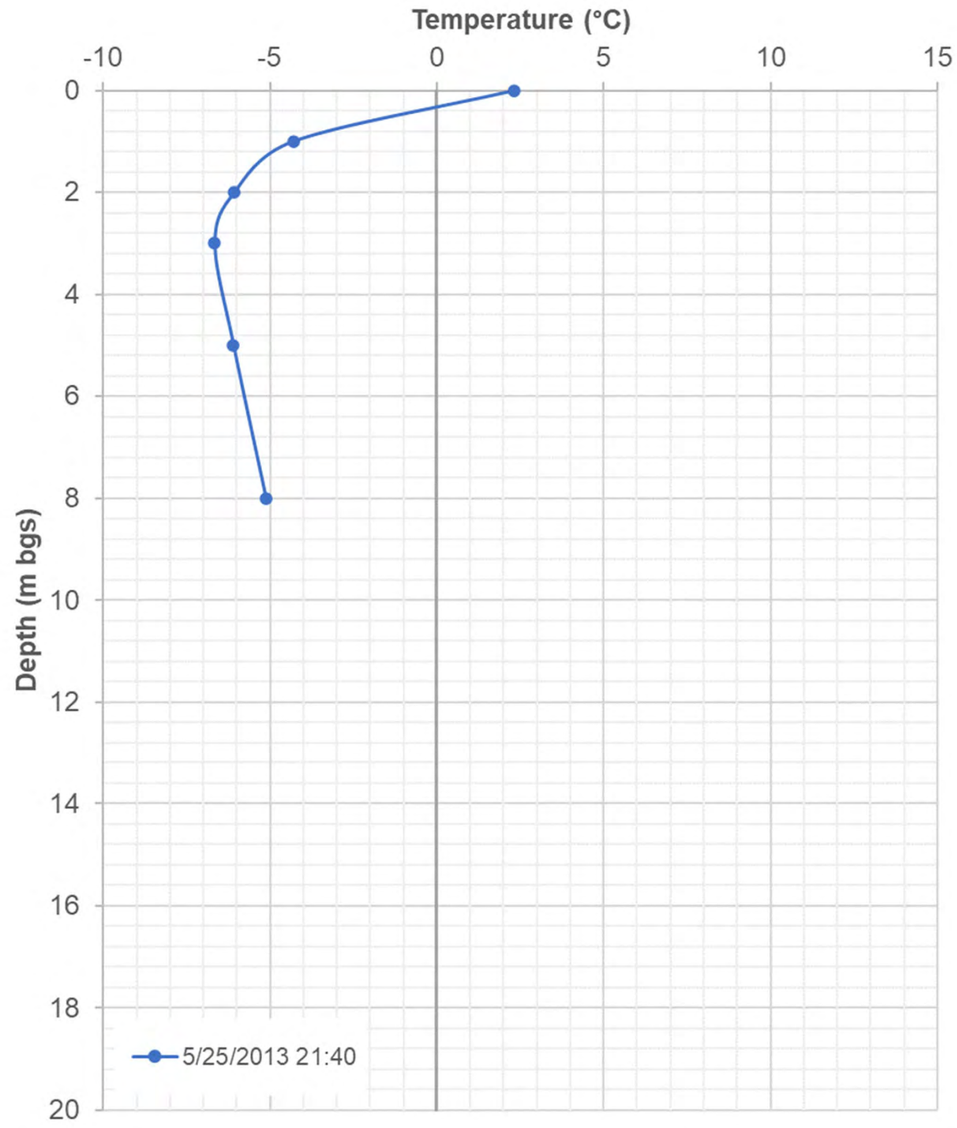
GAS-GT13-02


10
5
0
-5
-10
-15
-20
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15.5
12.5
10.5
9.5
8.5
7.5
6.5
4.5
4
3.5
3
2.5
2
1.75
1.5
1.25
1
0.75
0.5

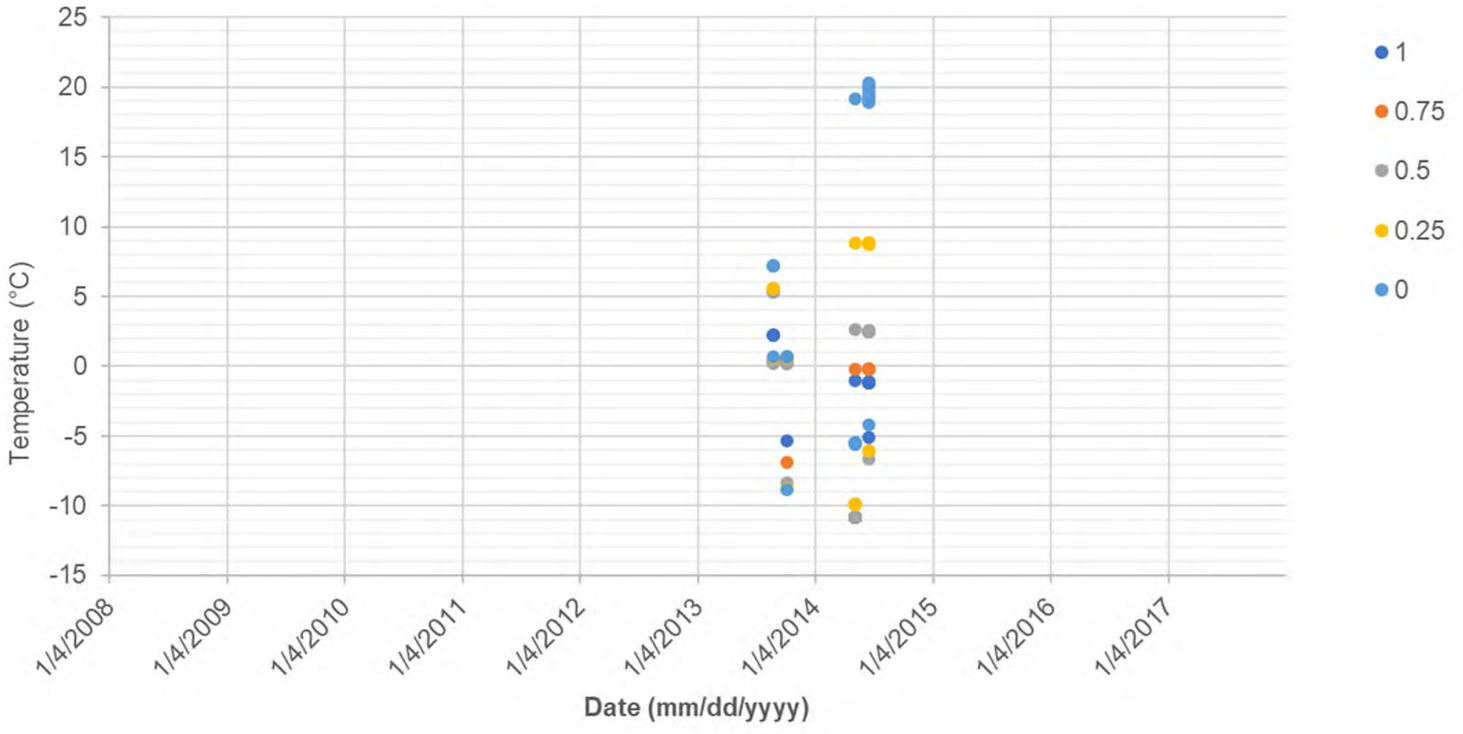

Temperature (°C)
-20
-15
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
2/25/2015 12:00

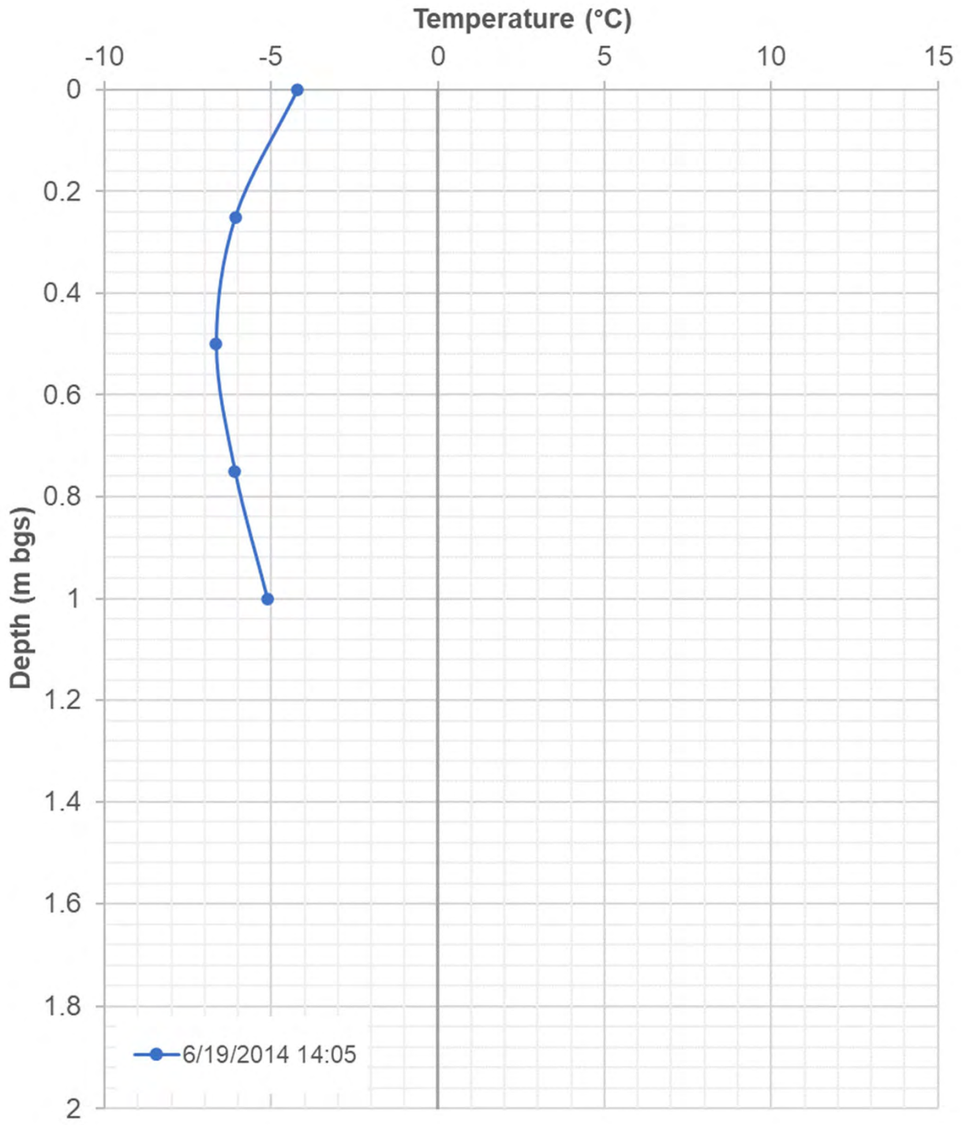
GAS-GT13-04


Temperature (°C)
4
2
0
-2
-4
-6
-8
-10
-12
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
8
5
3
2
1
0

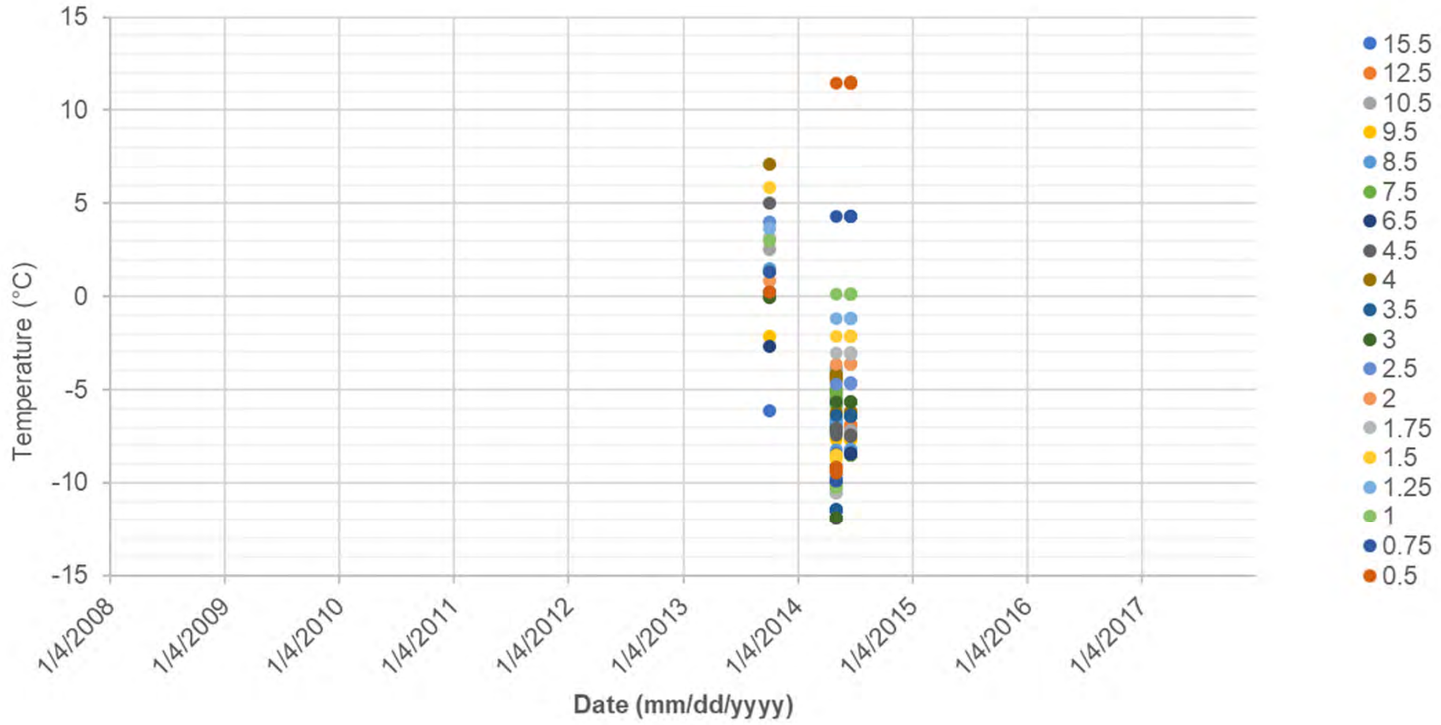

Temperature (°C)
-10
-5
0
5
10
15
Depth (m bgs)
0
2
4
6
8
10
12
14
16
18
20
5/25/2013 21:40

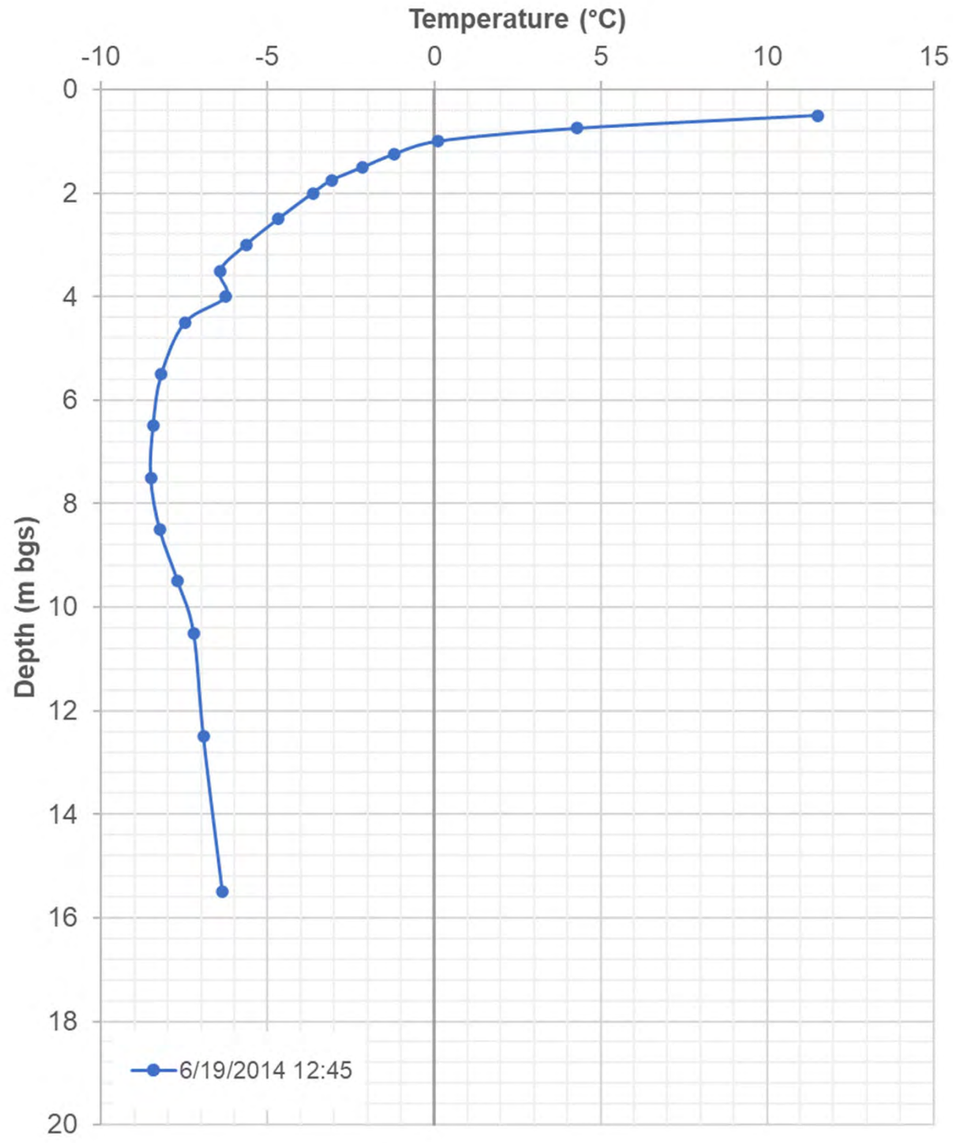
GAS-TP13-51


Temperature (°C)
25
20
15
10
5
0
-5
-10
-15
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
1
0.75
0.5
0.25
0

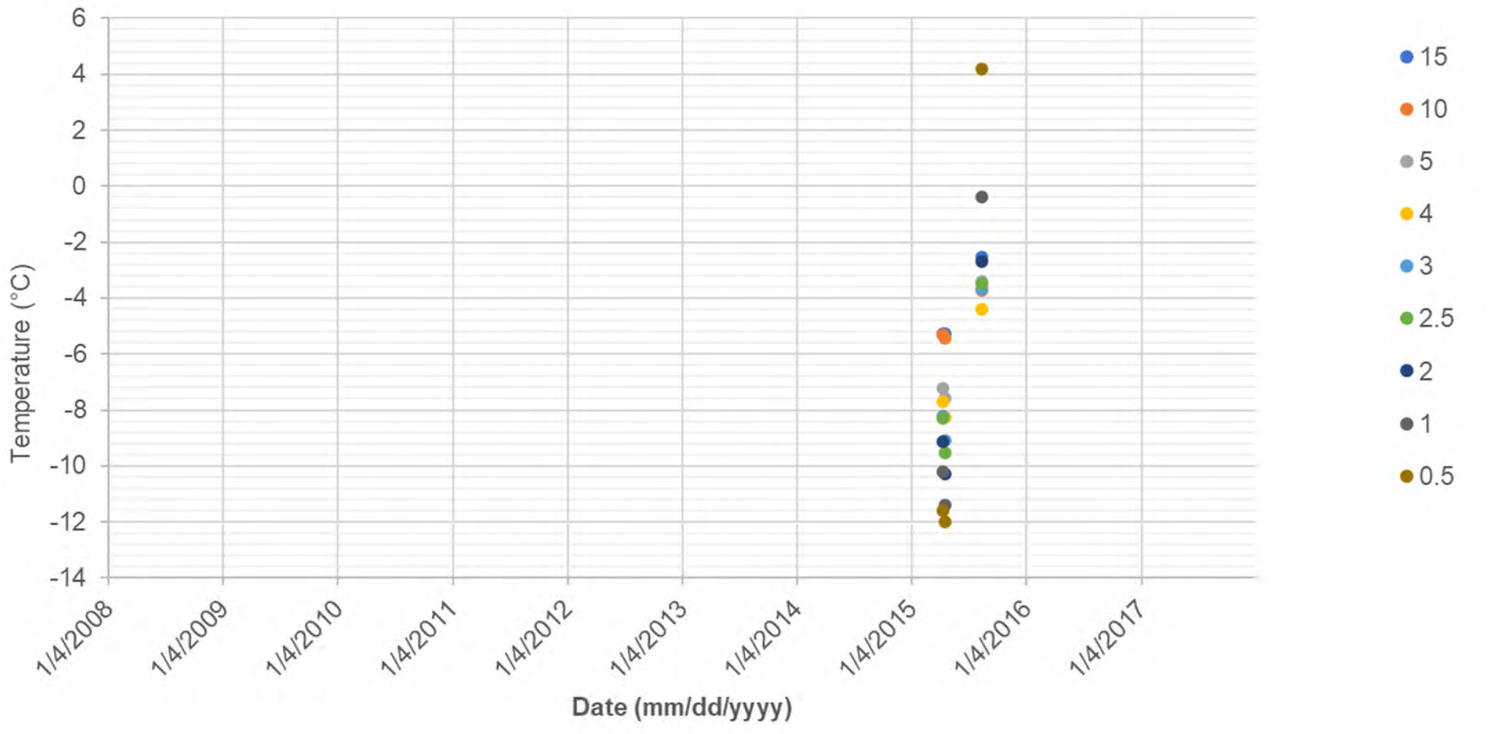

Temperature (°C)
-10
-5
0
5
10
15
Depth (m bgs)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
6/19/2014 14:05

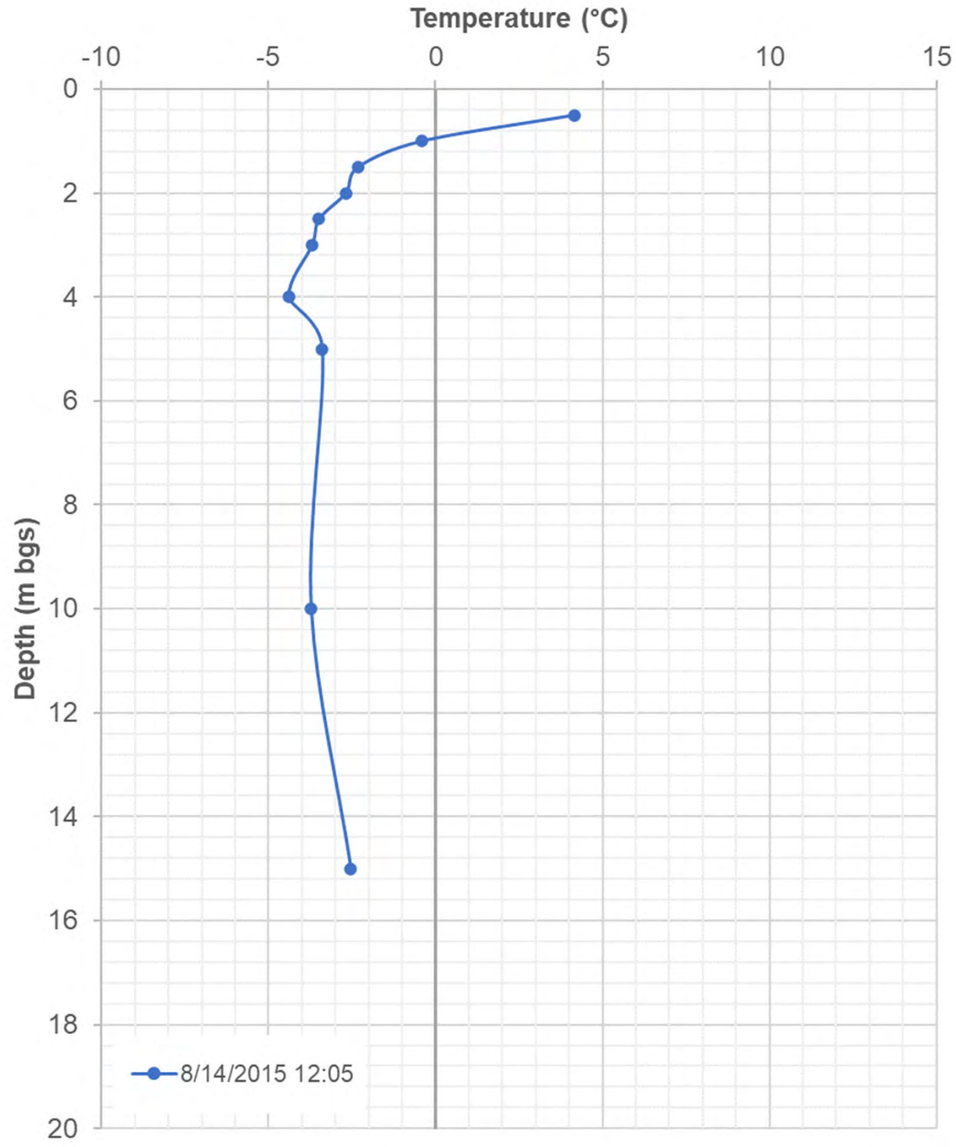
GPS-TP13-01


Temperature (°C)
15
10
5
0
-5
-10
-15
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15.5
12.5
10.5
9.5
8.5
7.5
6.5
4.5
4
3.5
3
2.5
2
1.75
1.5
1.25
1
0.75
0.5

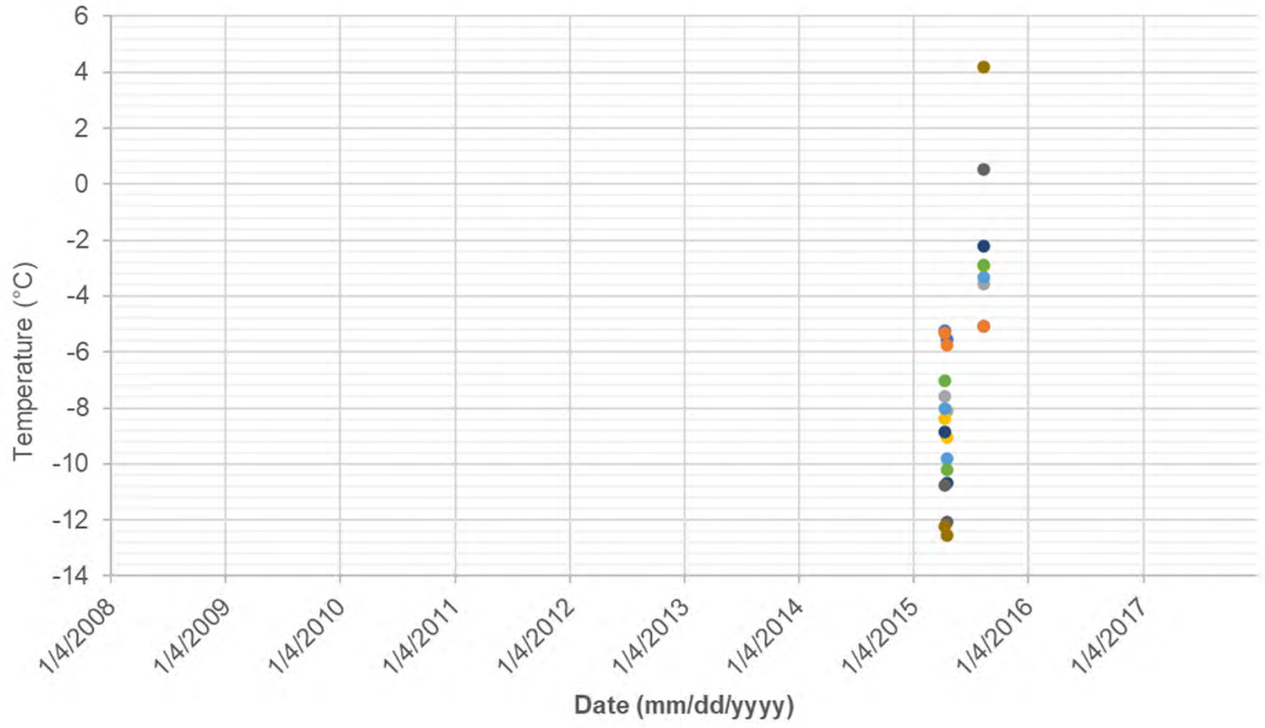

Temperature (°C)
-10
-5
0
5
10
15
Depth (m bgs)
0
2
4
6
8
10
12
14
16
18
20
6/19/2014 12:45

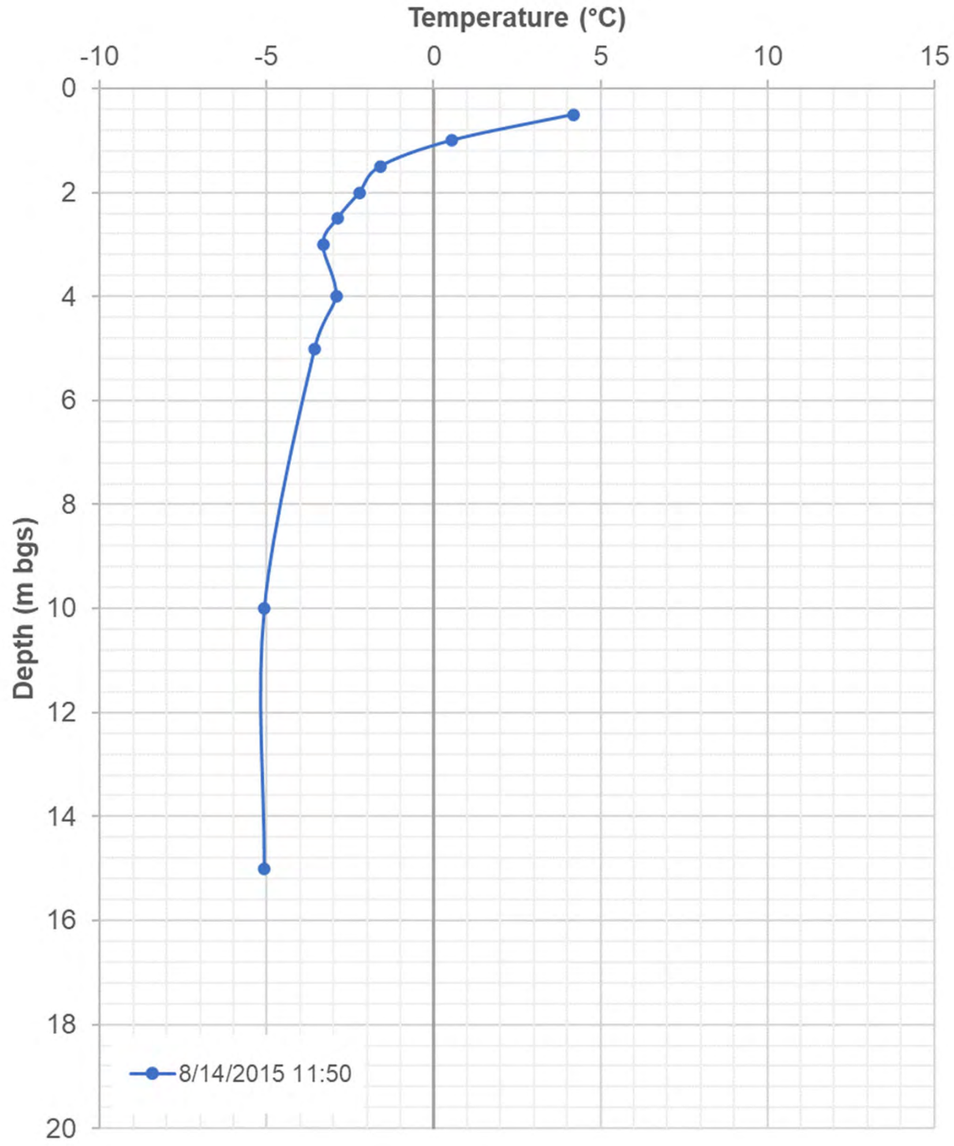
15-DH12


6
4
2
0
-2
-4
-6
-8
-10
-12
-14
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

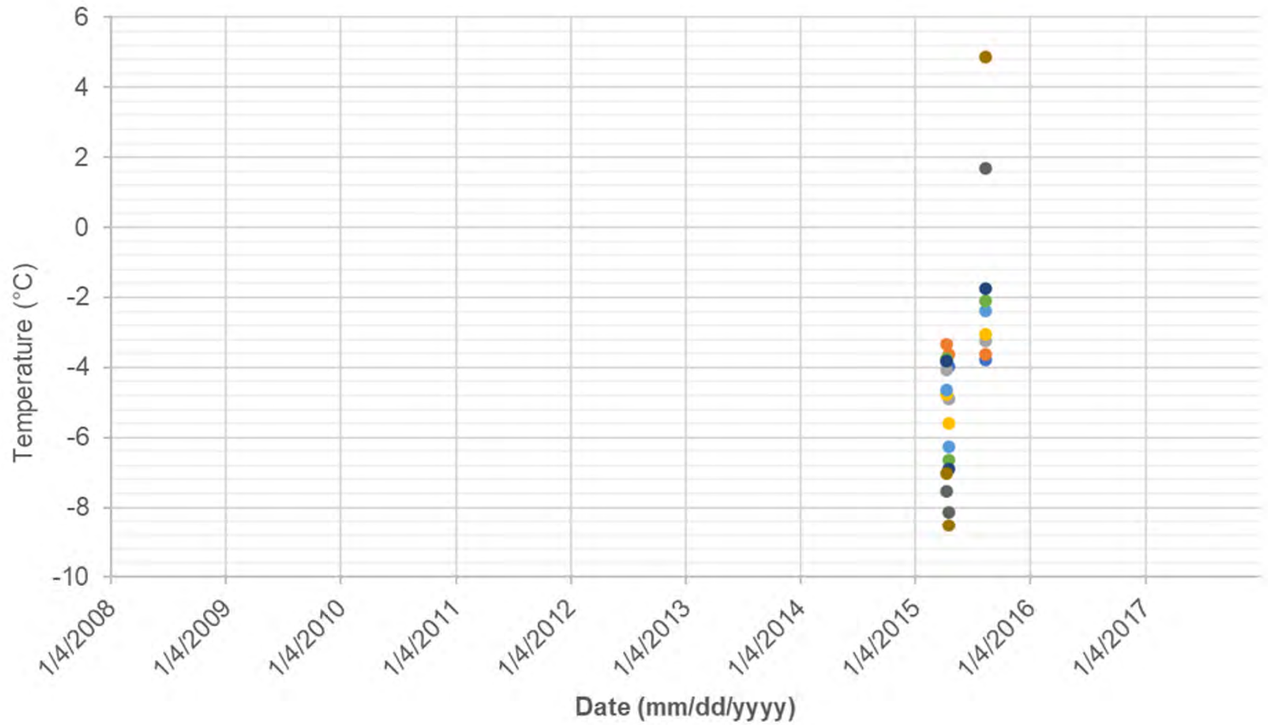

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 12:05

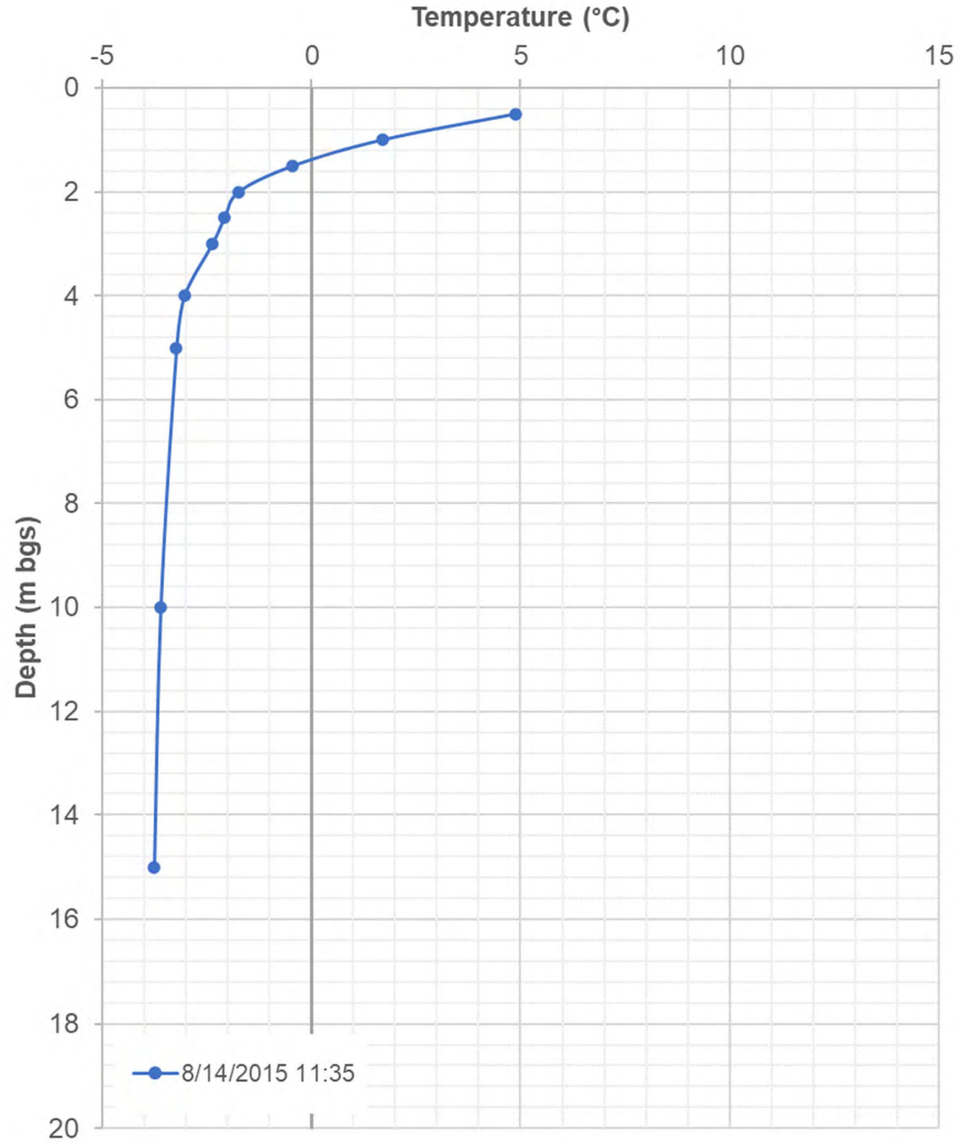
15-DH13


6
4
2
0
-2
-4
-6
-8
-10
-12
-14
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

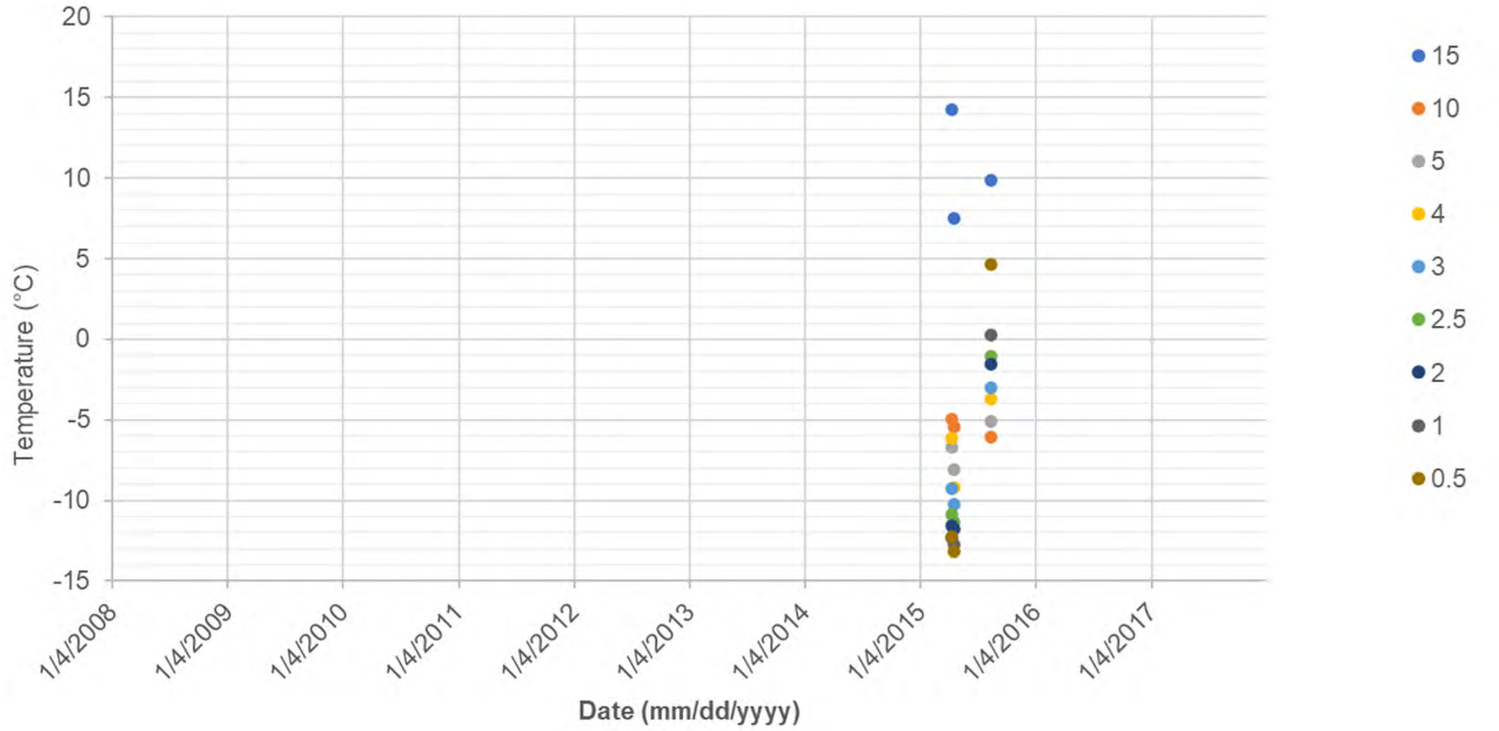

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 11:50

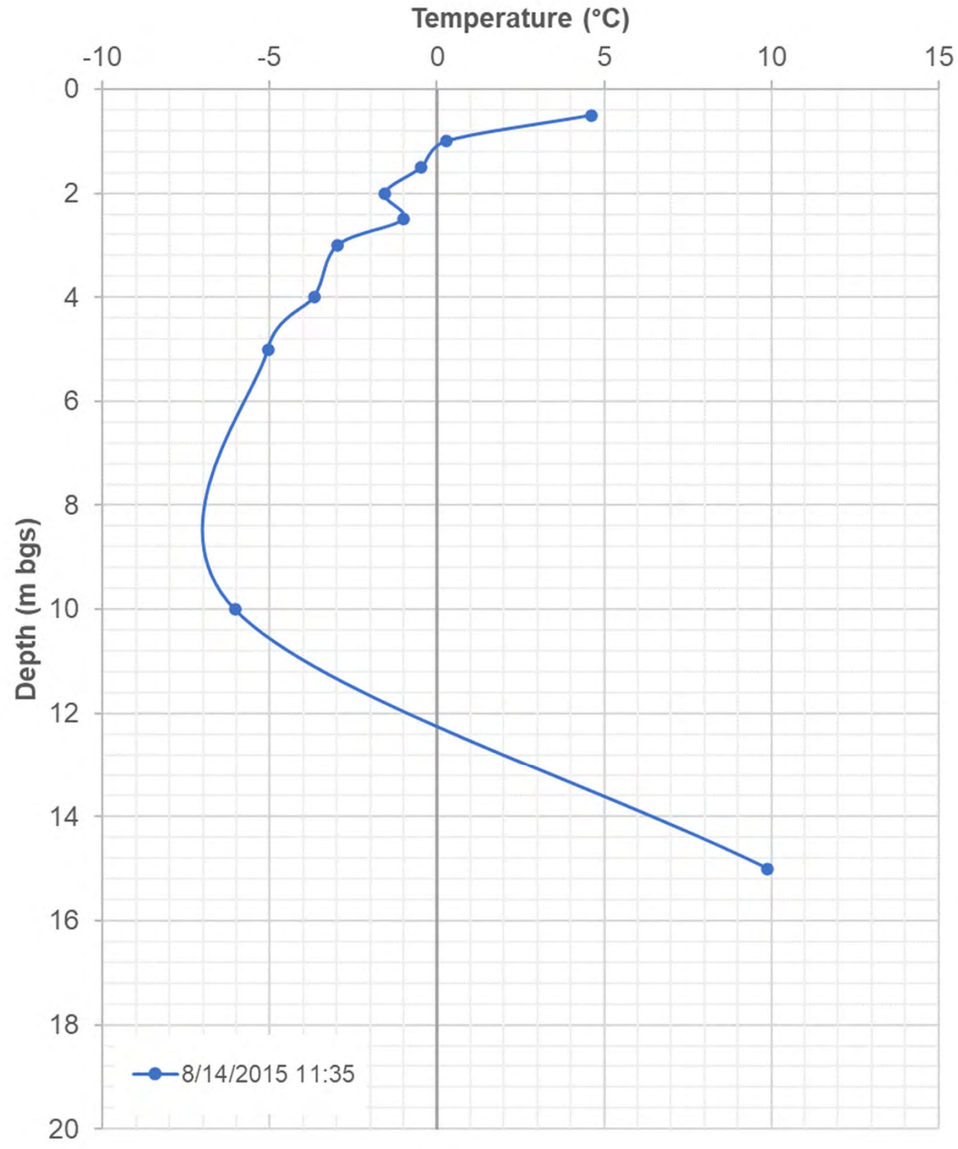
15-DH15


6
4
2
0
-2
-4
-6
-8
-10
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

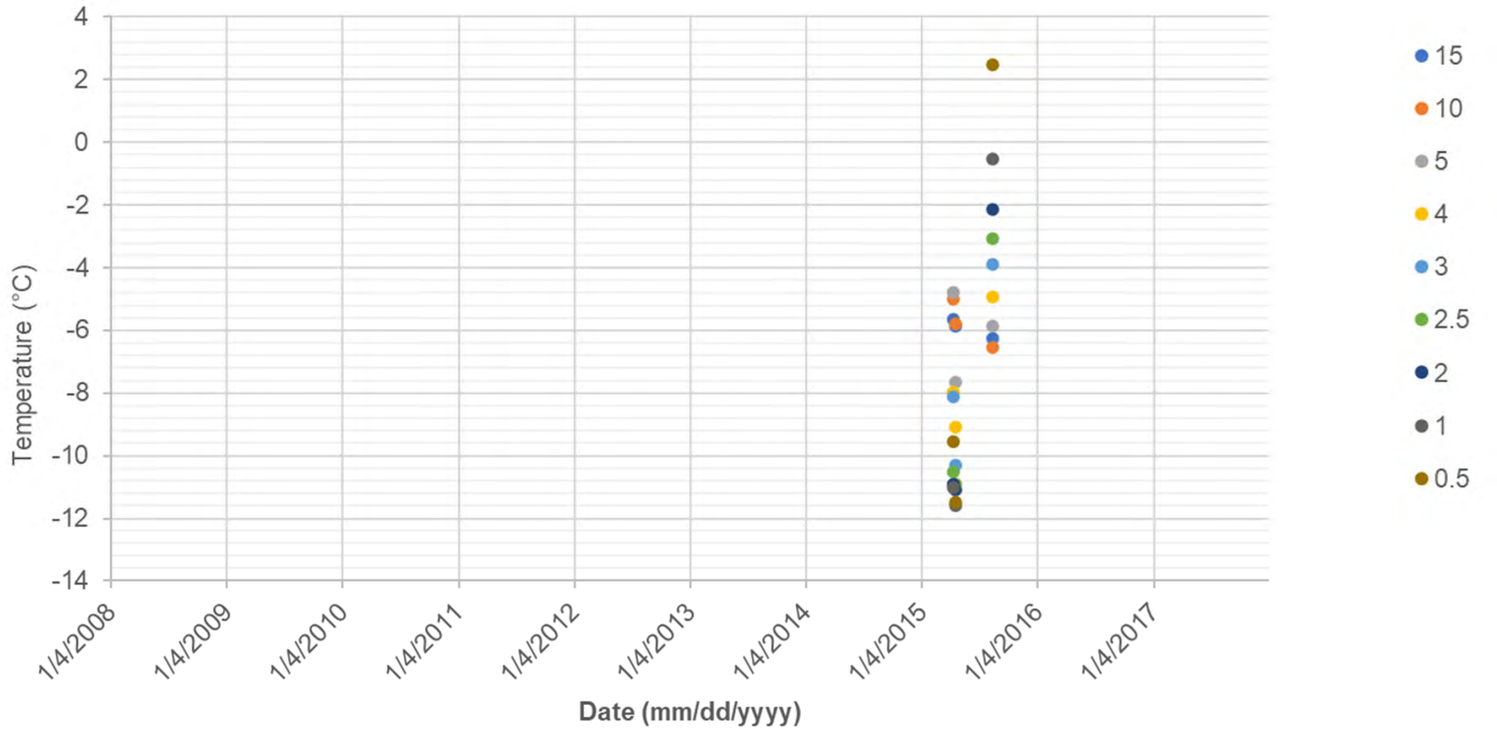

Temperature (°C)
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 11:35

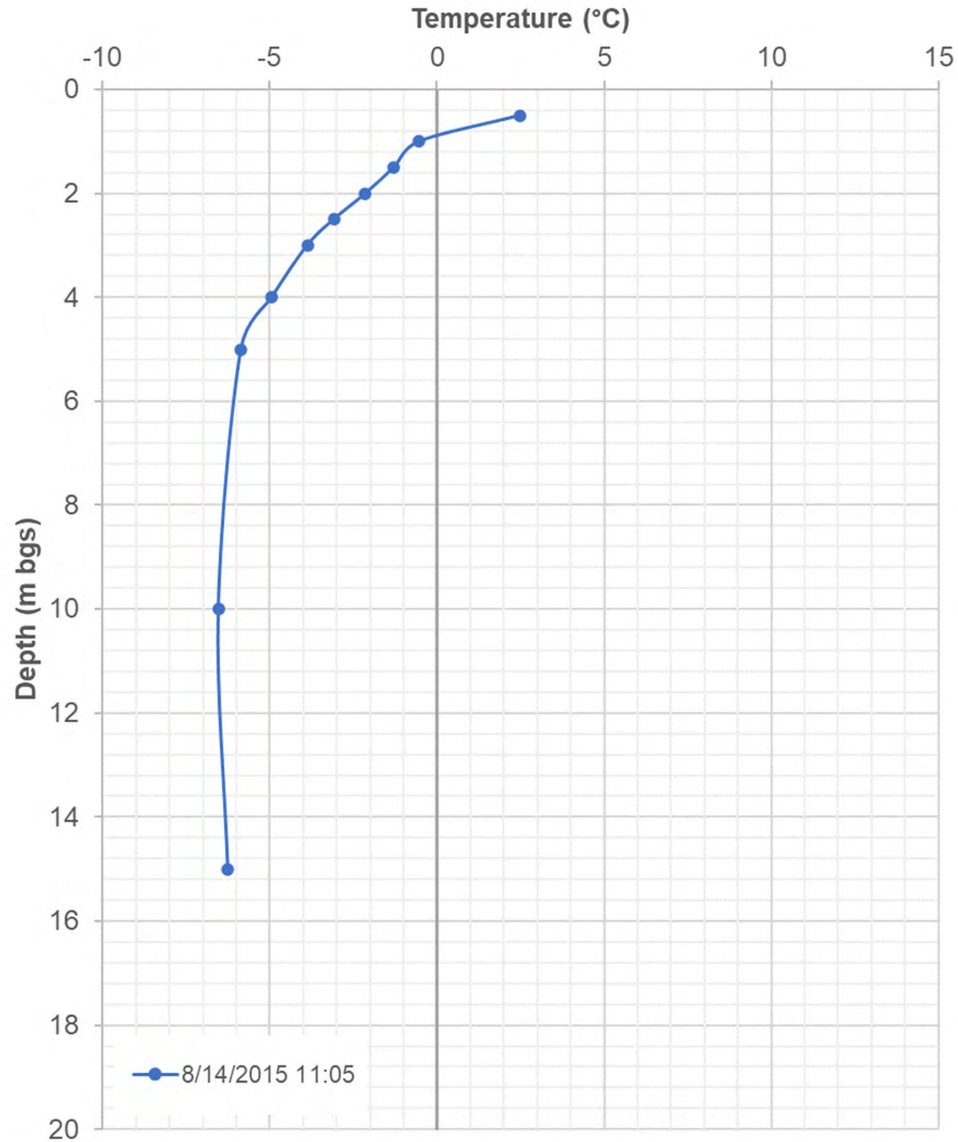
15-DH16


20
15
10
5
0
-5
-10
-15
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

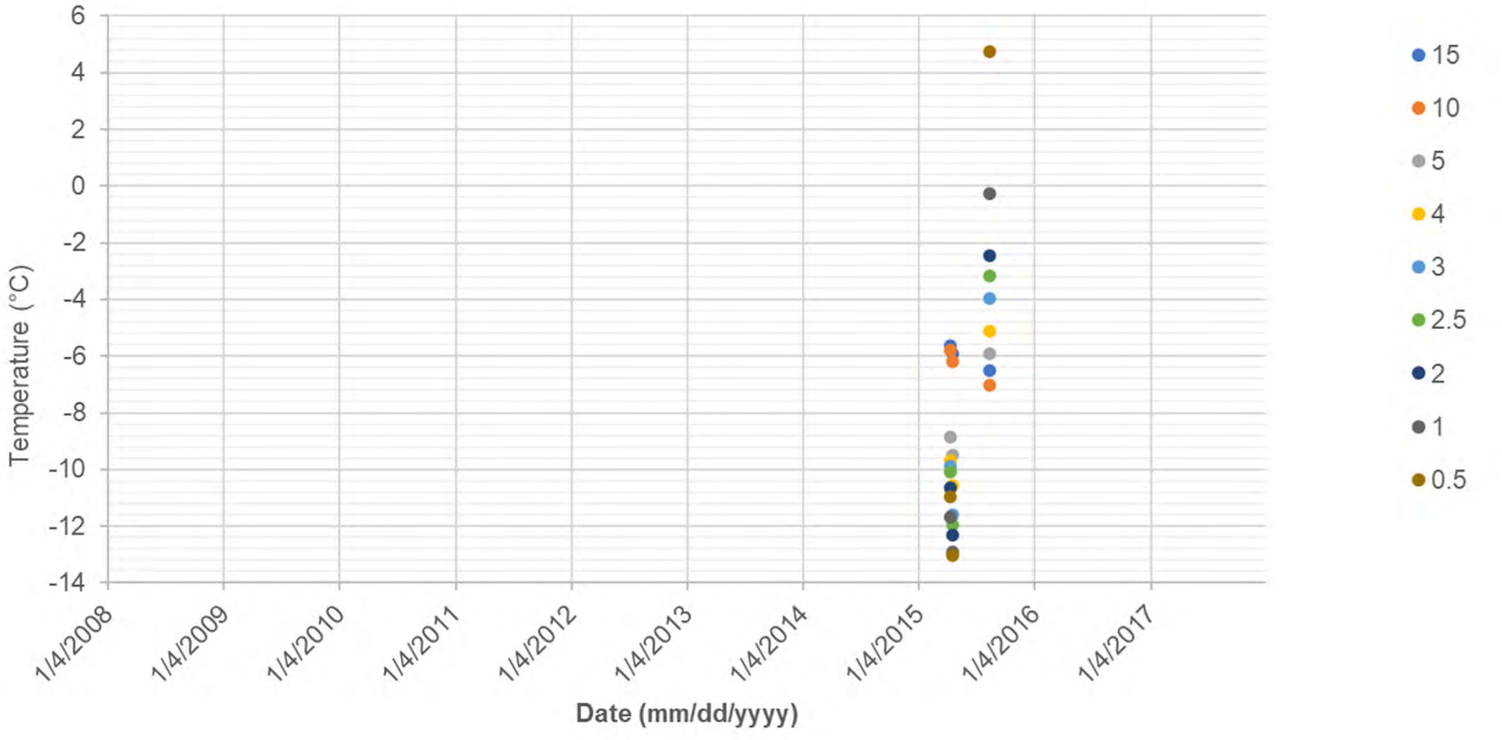

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 11:35

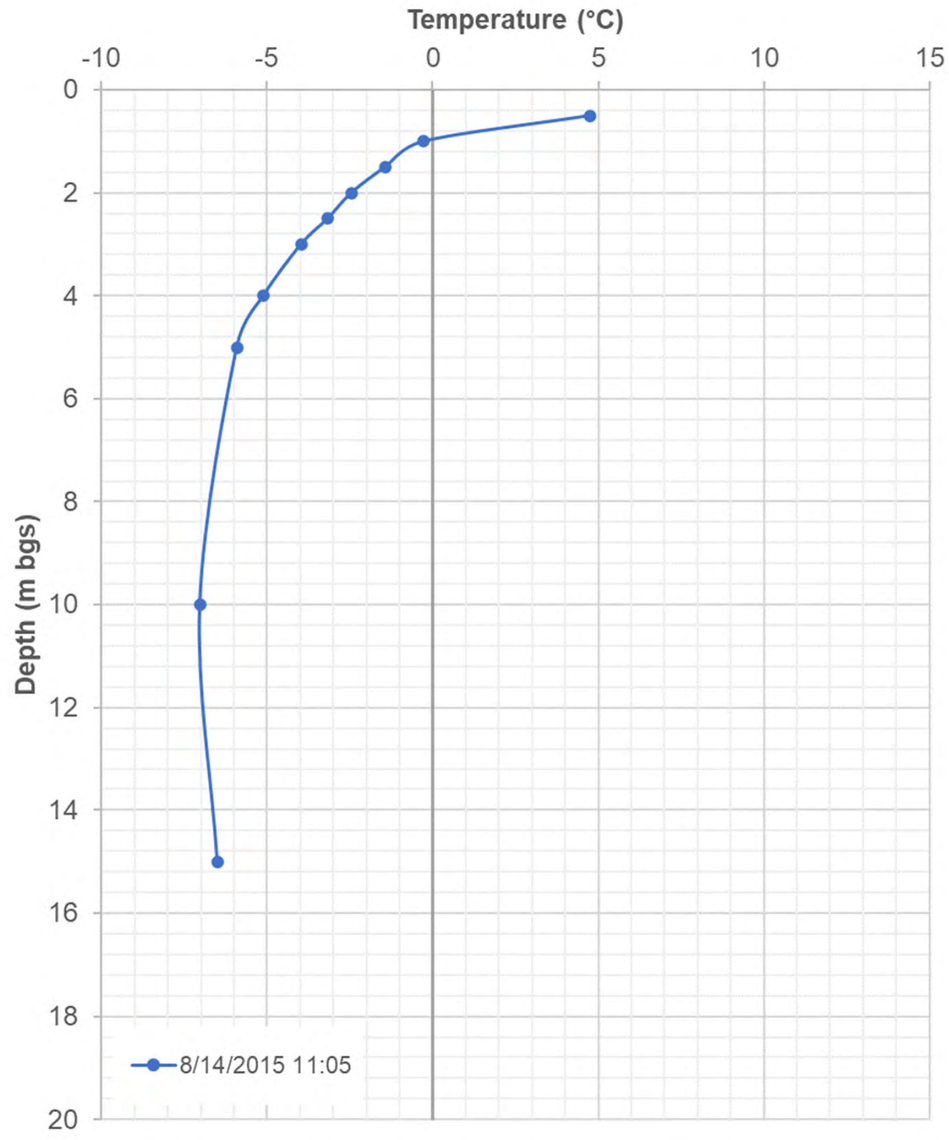
15-DH17


4
2
0
-2
-4
-6
-8
-10
-12
-14
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

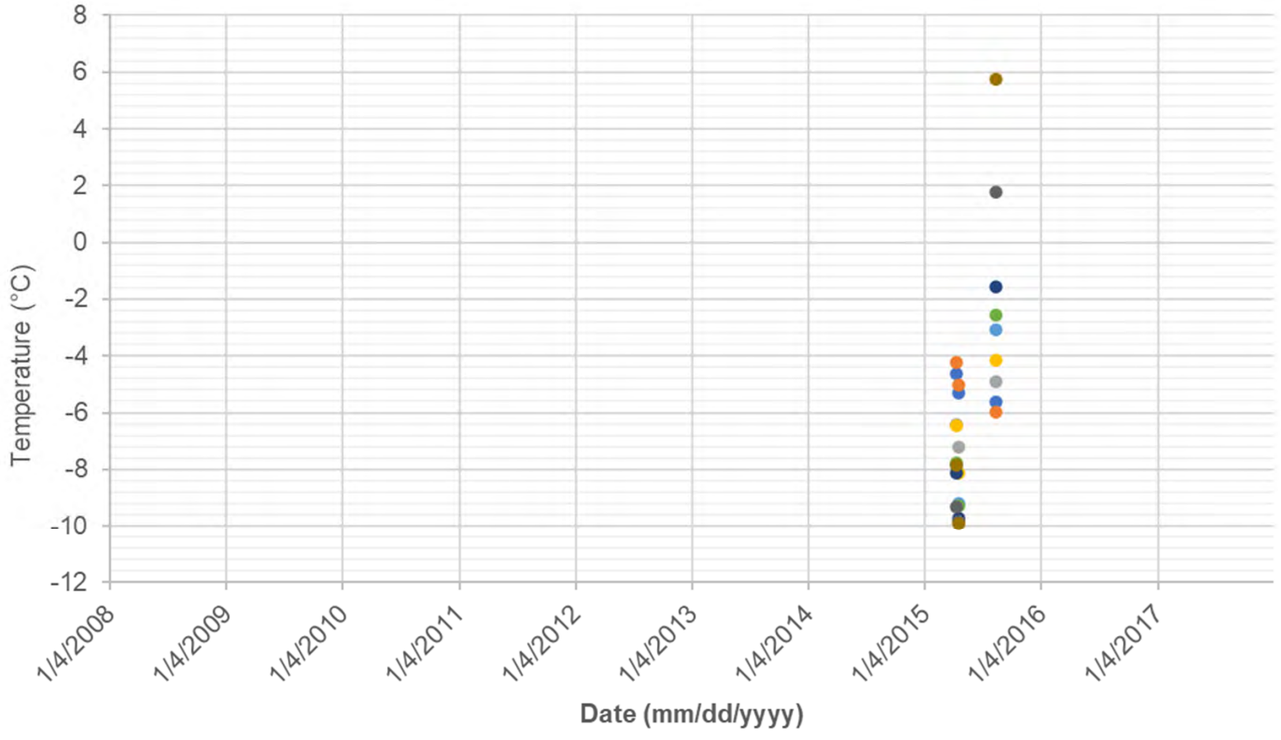

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 11:05

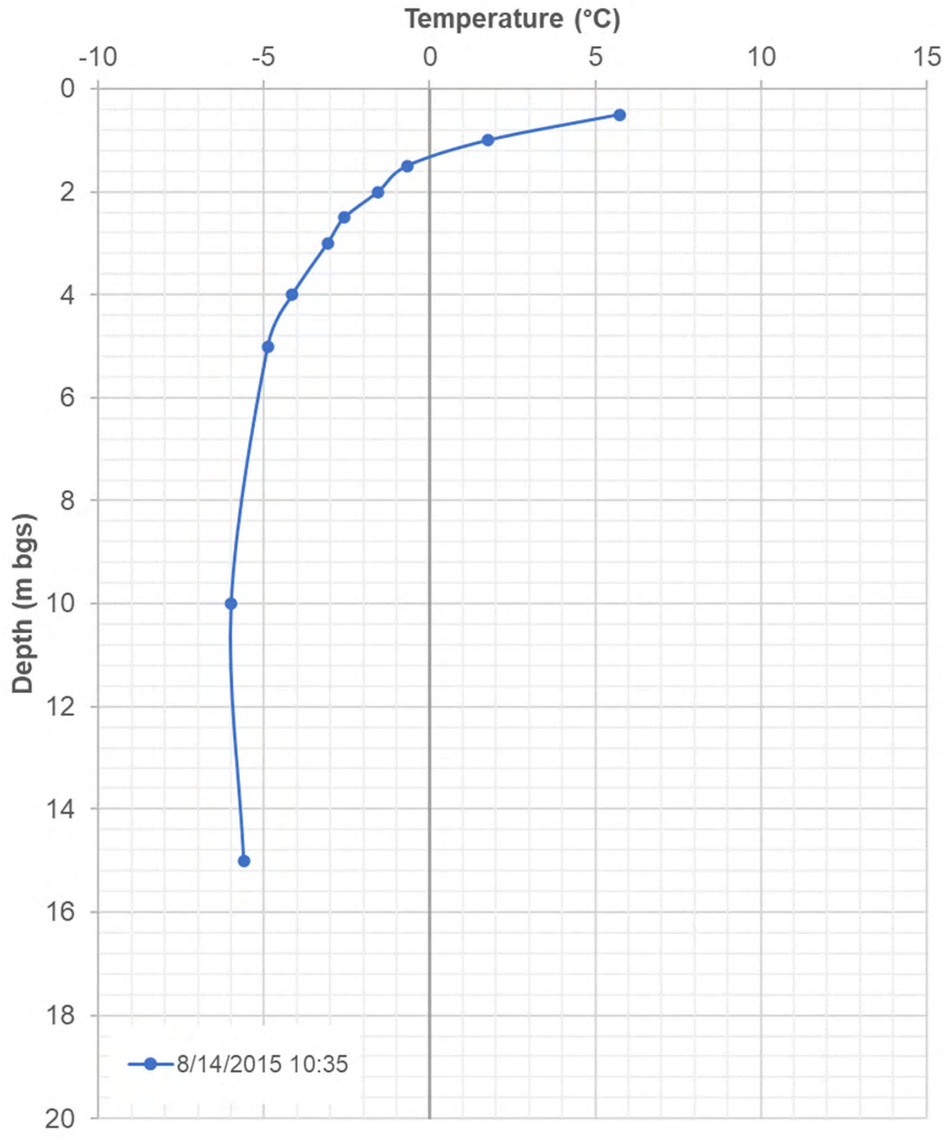
15-DH18


6
4
2
0
-2
-4
-6
-8
-10
-12
-14
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

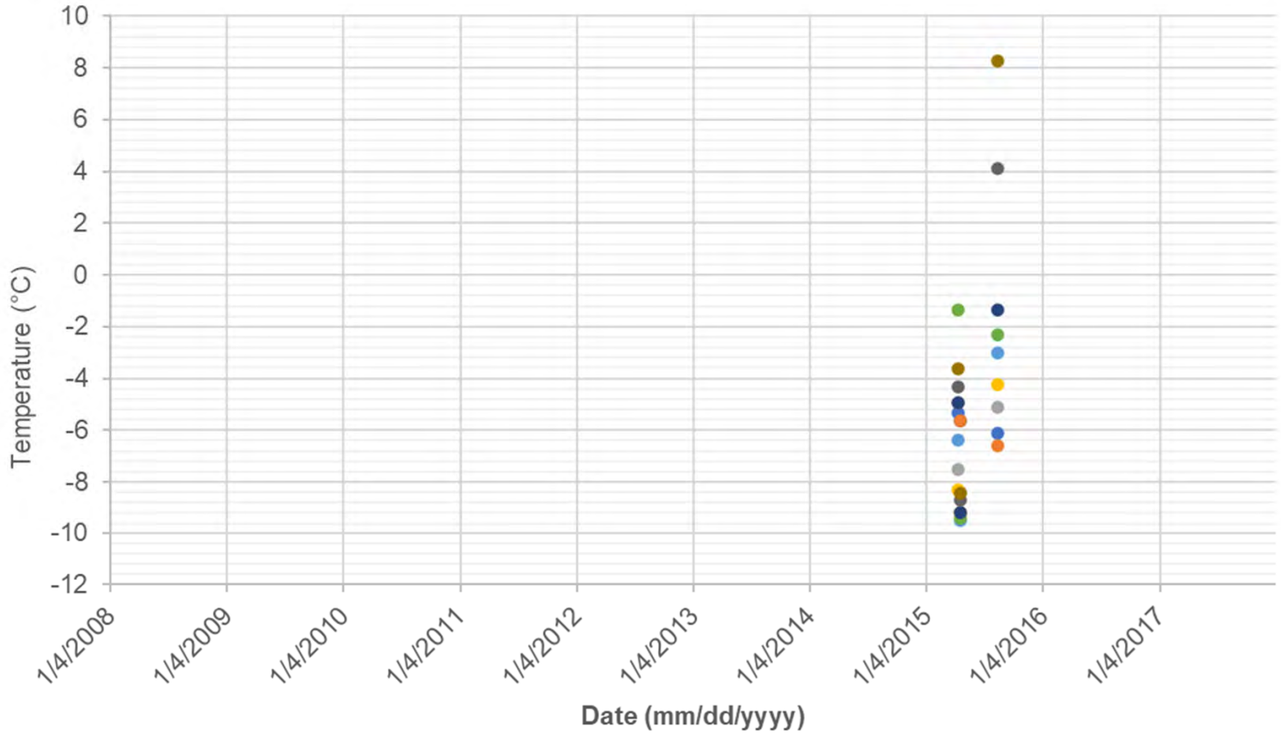

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 11:05

15-DH19

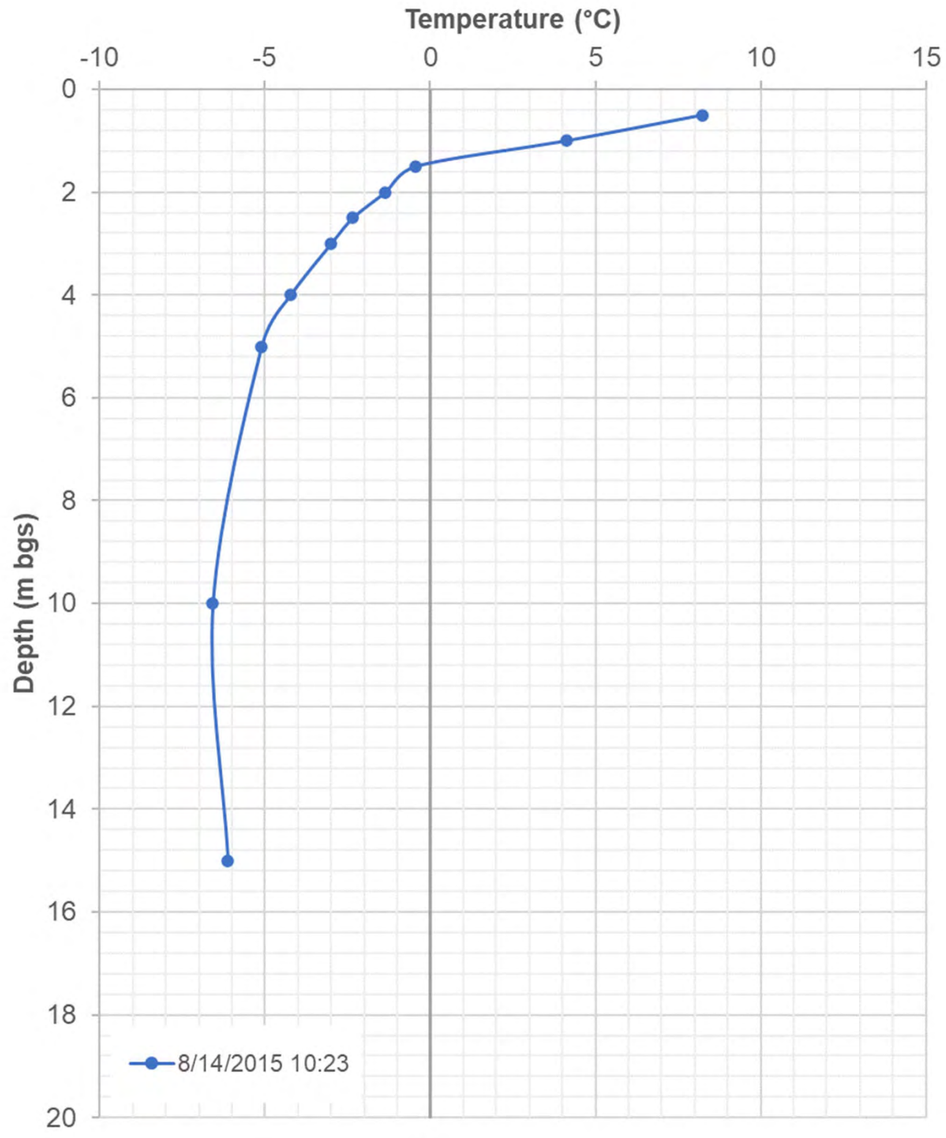

8
6
4
2
0
-2
-4
-6
-8
-10
-12
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5


Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 10:35

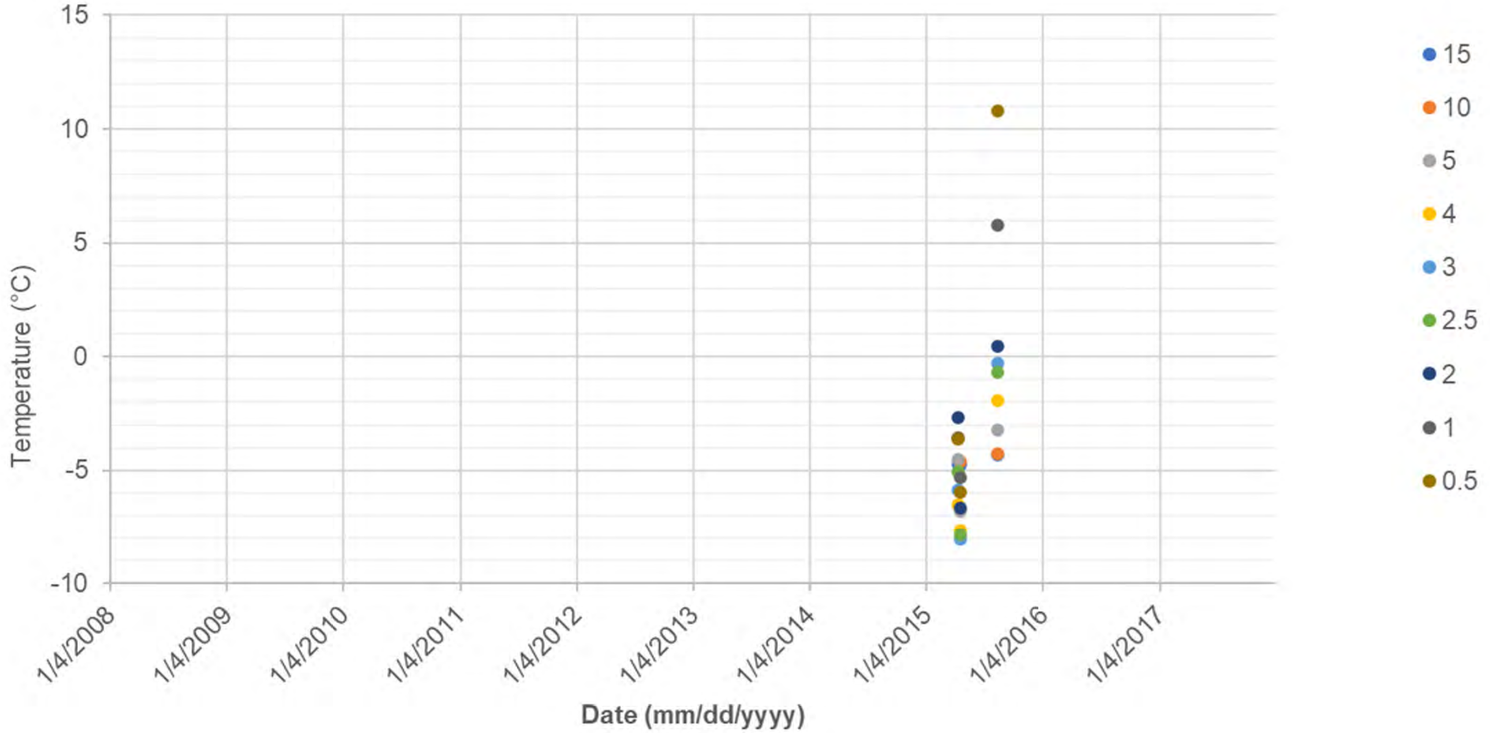
15-DH20

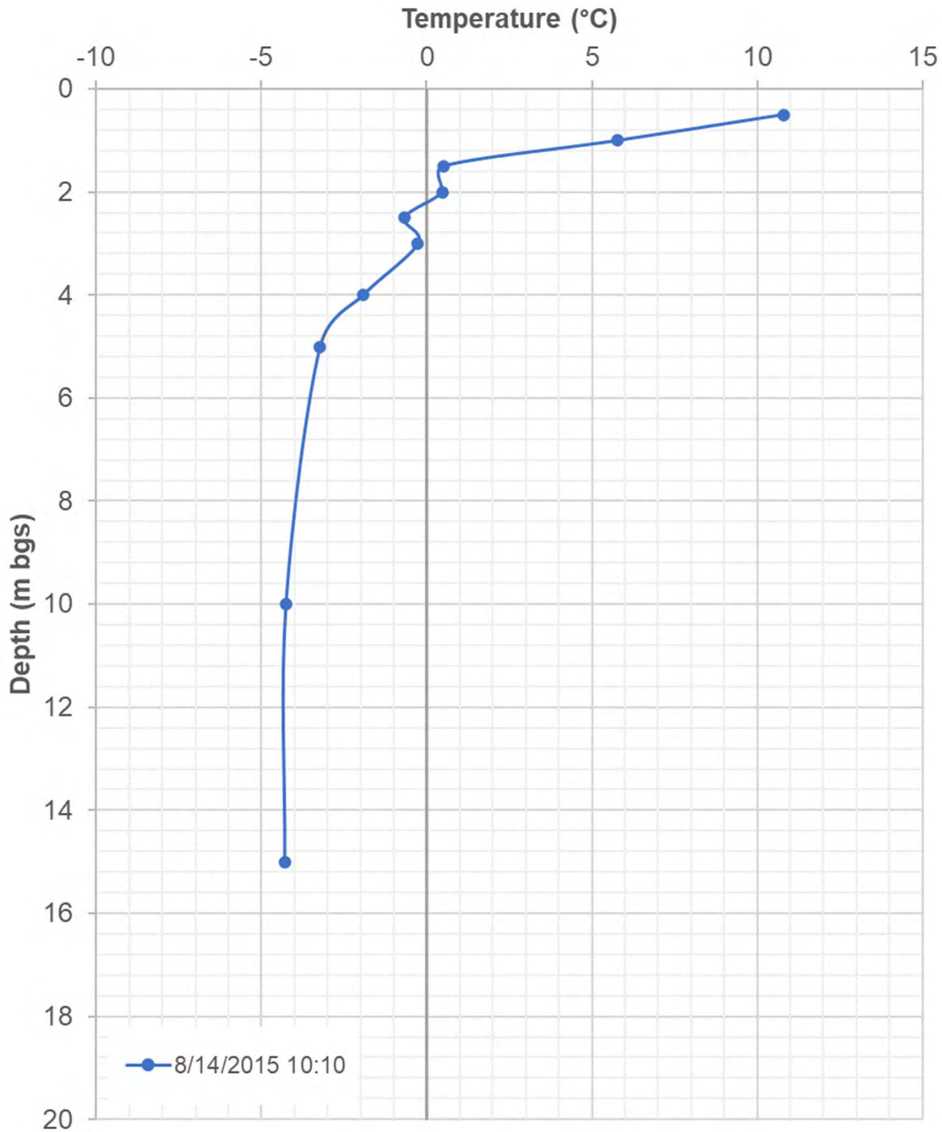

10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)


15
10
5
4
3
2.5
2
1
0.5

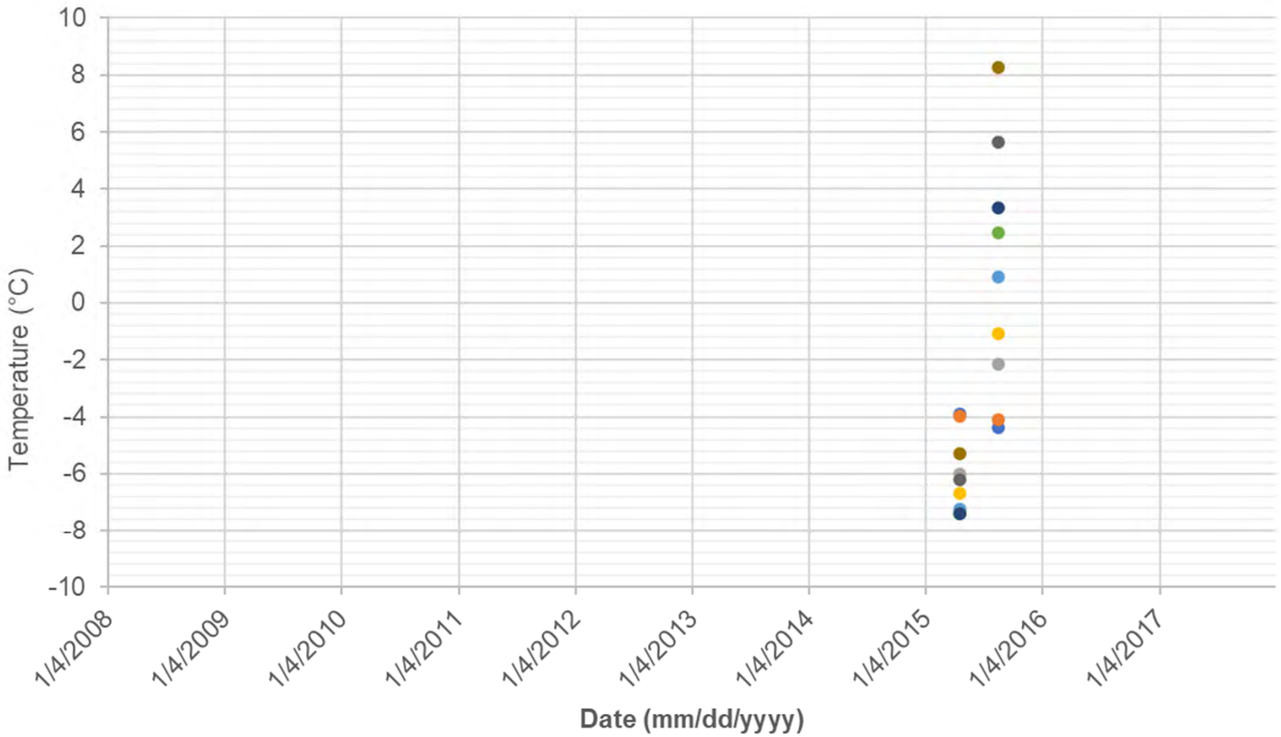

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 10:23

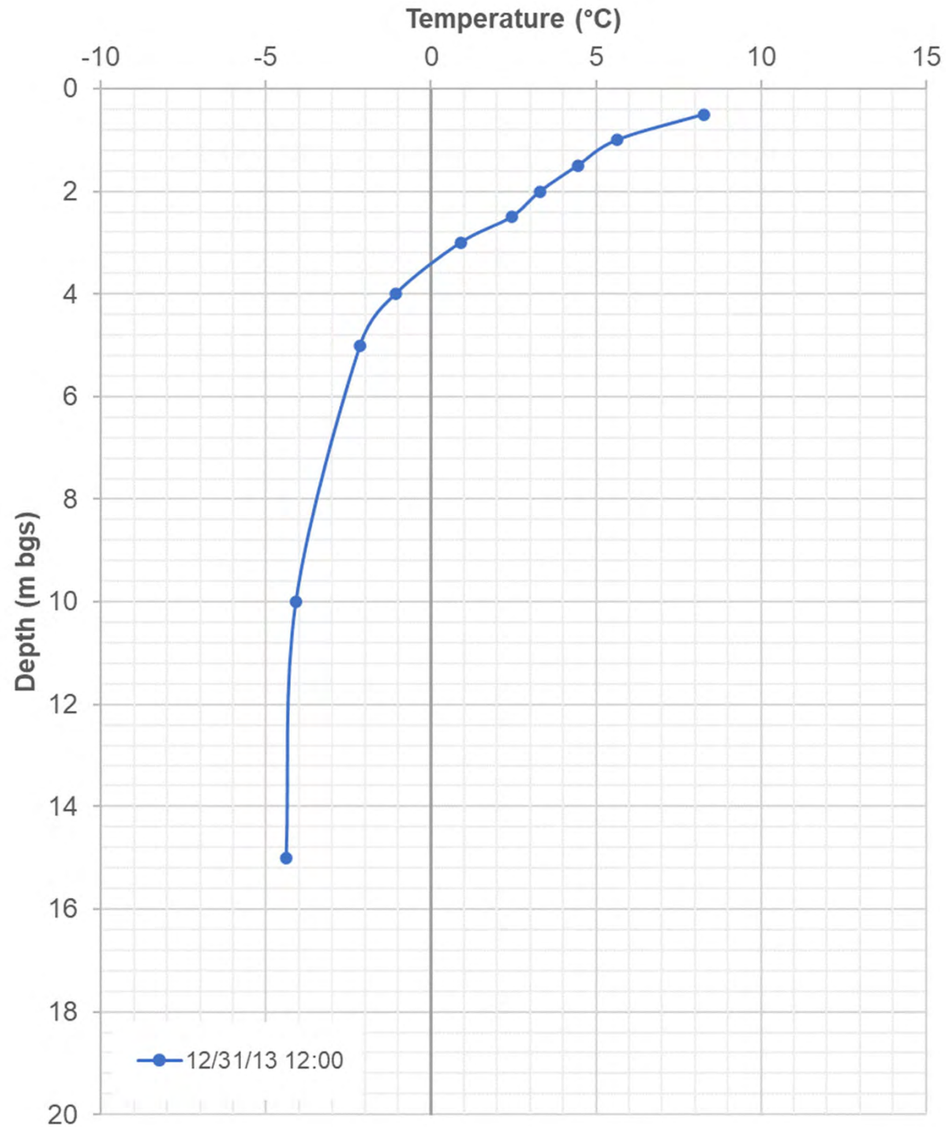
15-DH21


15
10
5
0
-5
-10
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

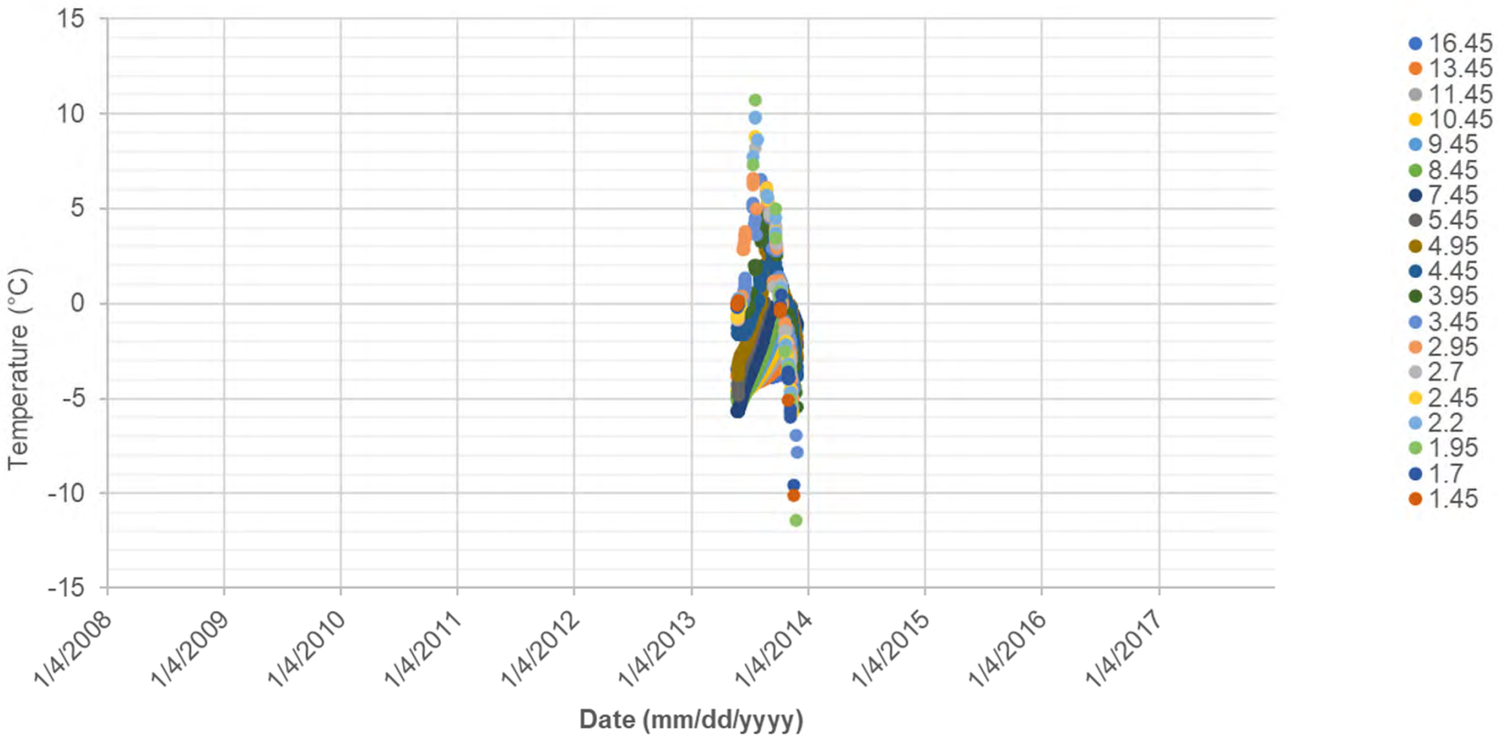

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
8/14/2015 10:10

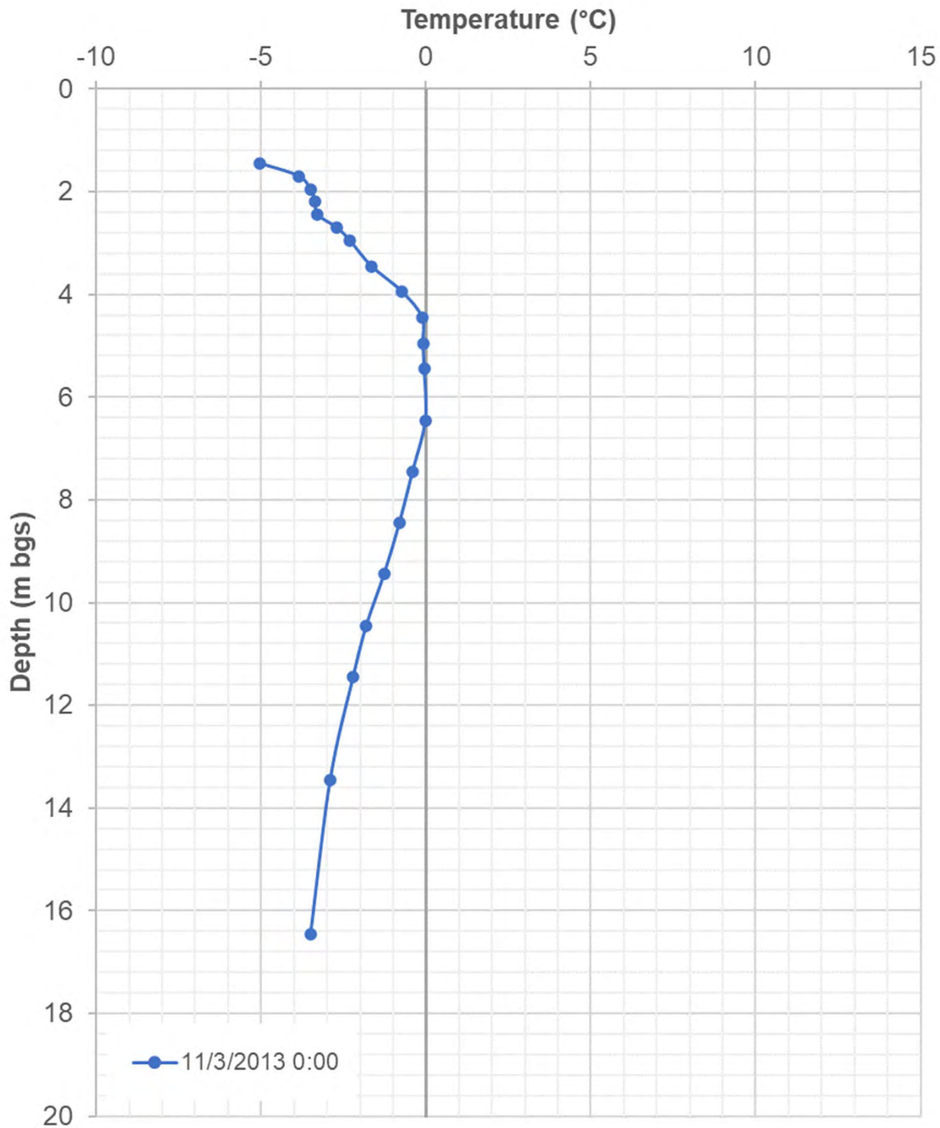
15-DH26


10
8
6
4
2
0
-2
-4
-6
-8
-10
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
15
10
5
4
3
2.5
2
1
0.5

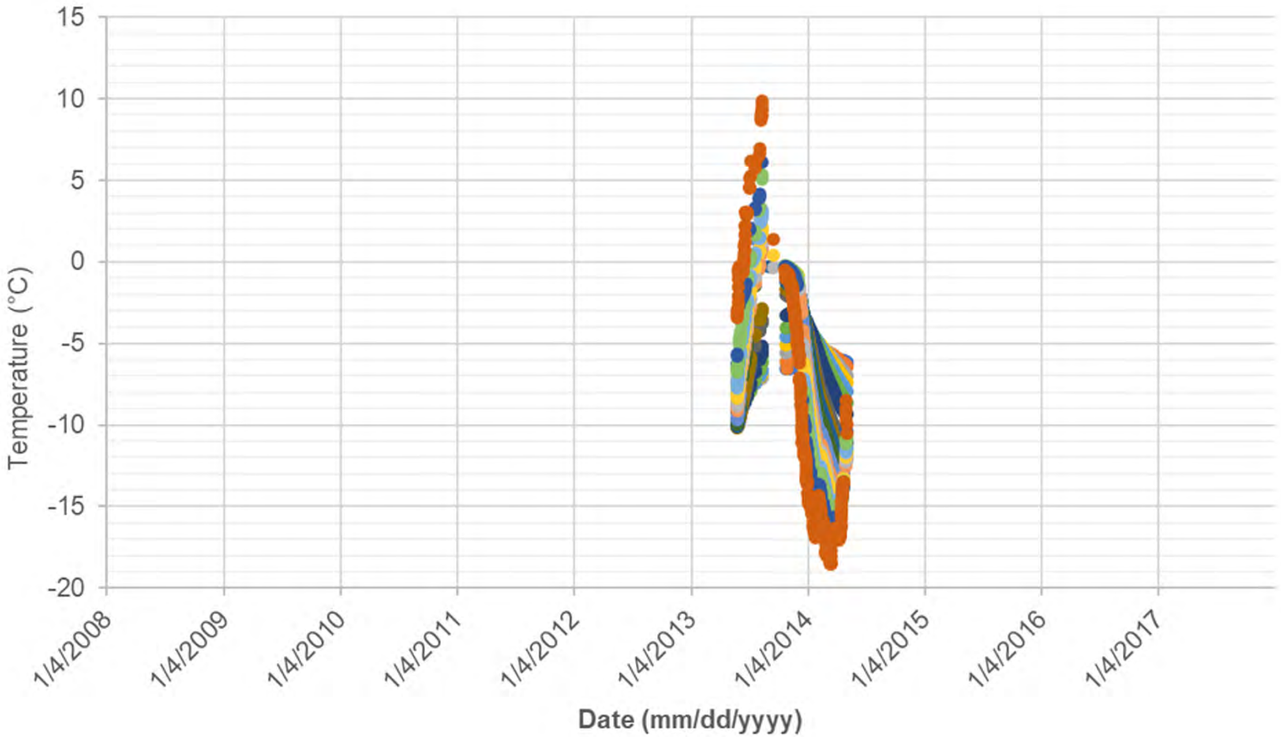

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
12/31/13 12:00

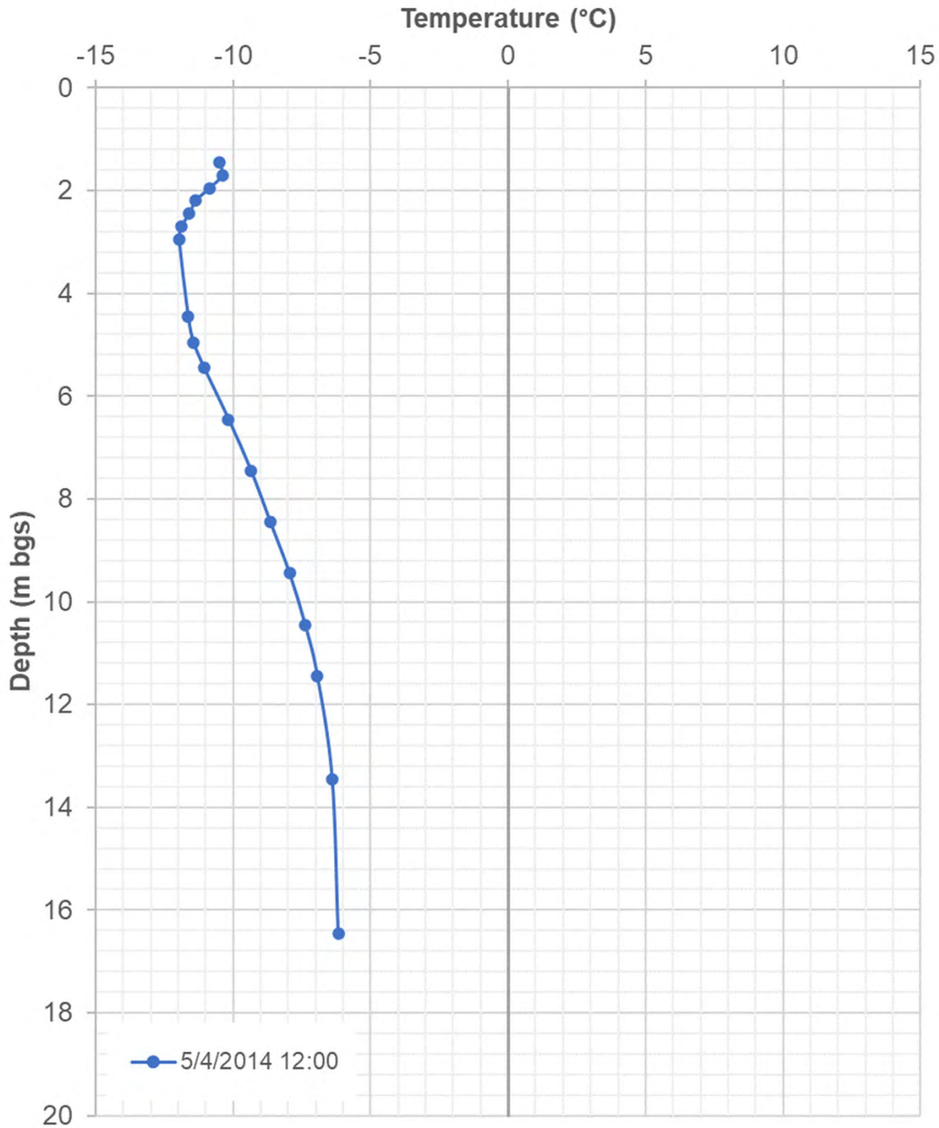
TIA-GT13-03


15
10
5
0
-5
-10
-15
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
16.45
13.45
11.45
10.45
9.45
8.45
7.45
5.45
4.95
4.45
3.95
3.45
2.95
2.7
2.45
2.2
1.95
1.7
1.45

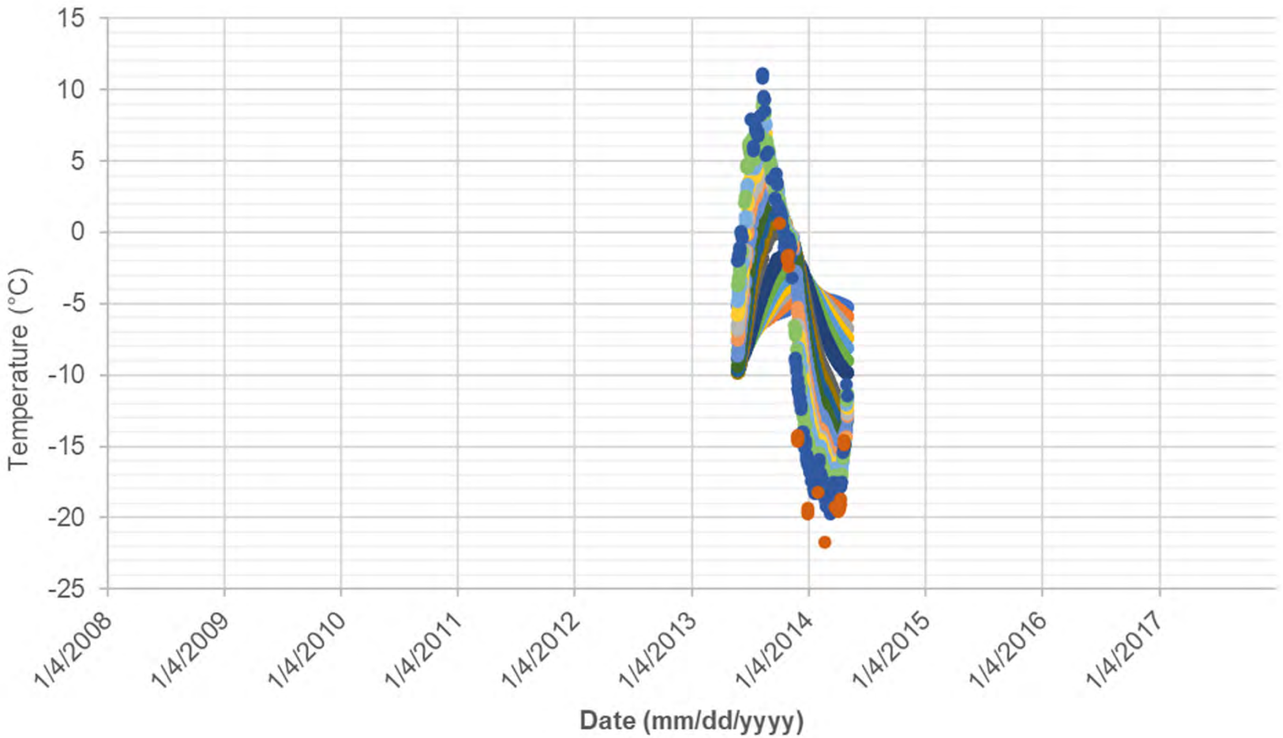

Temperature (°C)
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
11/3/2013 0:00

TIA-GT13-10


15
10
5
0
-5
-10
-15
-20
Temperature (°C)
1/4/2008
1/4/2009
1/4/2010
1/4/2011
1/4/2012
1/4/2013
1/4/2014
1/4/2015
1/4/2016
1/4/2017
Date (mm/dd/yyyy)
16.45
13.45
11.45
10.45
9.45
8.45
7.45
5.45
4.95
4.45
3.95
3.45
2.95
2.7
2.45
2.2
1.95
1.7
1.45


Temperature (°C)
-15
-10
-5
0
5
10
15
0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
5/4/2014 12:00

TIA-GT13-15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-5
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-15
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1/4/2014
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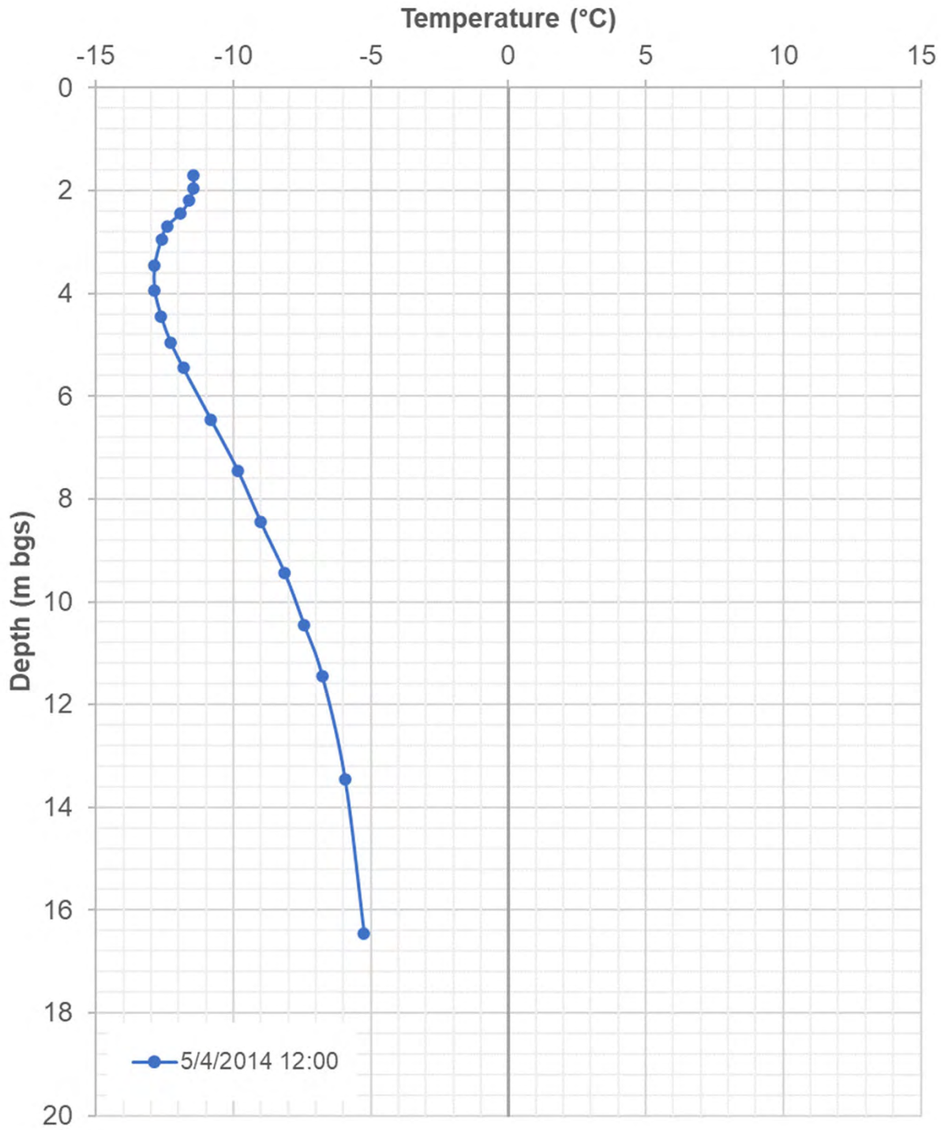
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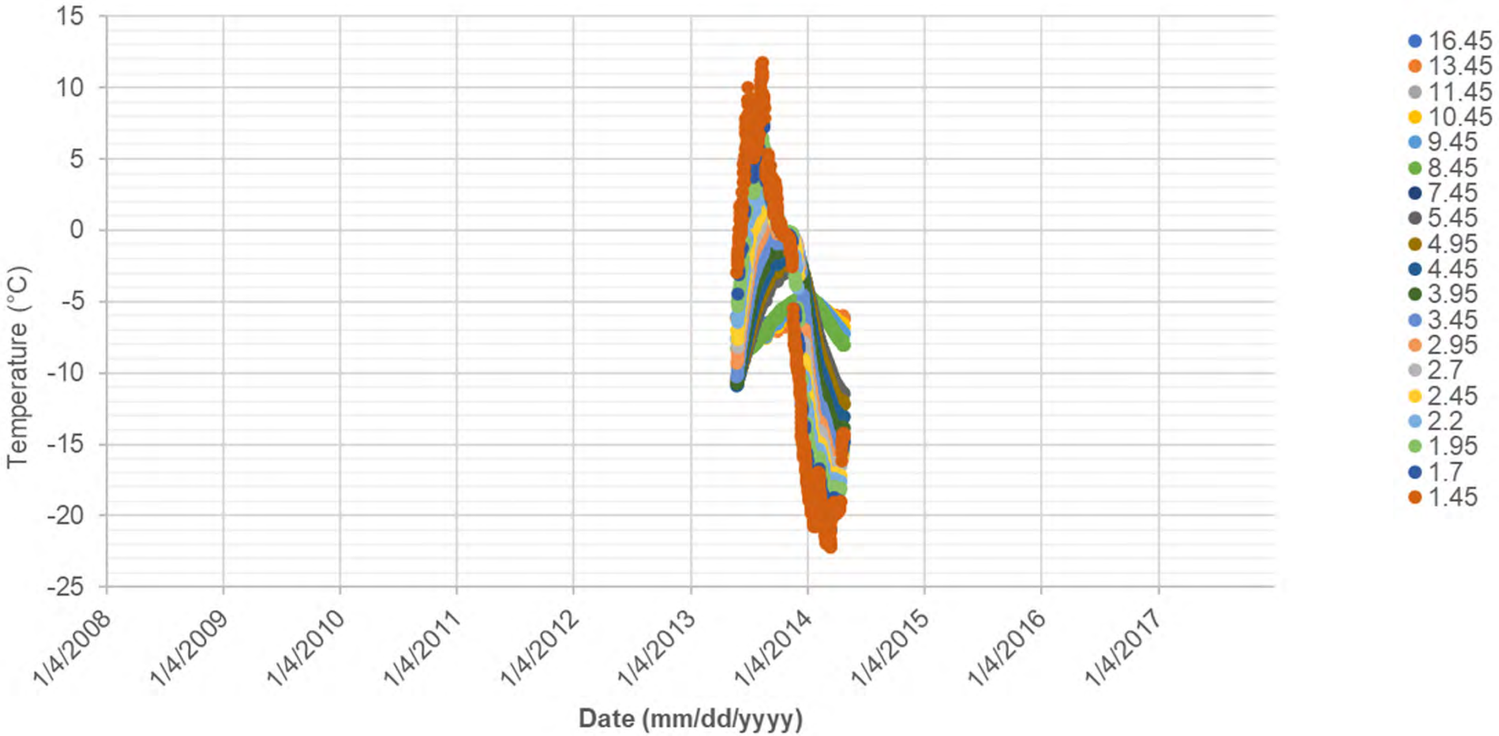
5/4/2014 12:00

TIA-GT13-16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Date (mm/dd/yyyy)
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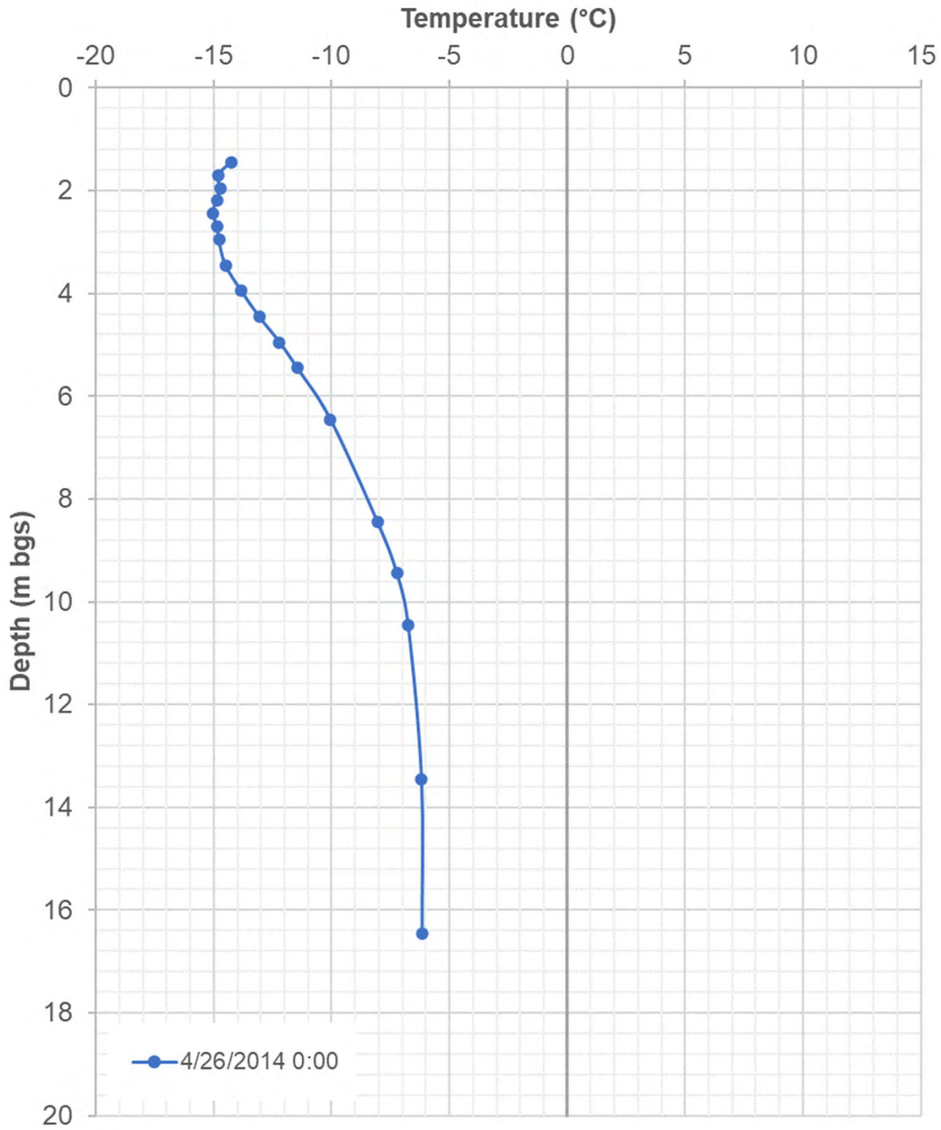
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0
2
4
6
8
10
12
14
16
18
20
Depth (m bgs)
4/26/2014 0:00

ATTACHMENT D

PRIMARY POND DAM – SUBSURFACE MODEL OVERVIEW

srk consulting

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Memo

To	File	**Project**	1CS020.020
From	Jasur Umarov, John Kurylo	**Reg. No.**	EGBC 1003655
Reviewed By	Christopher Stevens	**Date**	November 29, 2022
Client	Sabina Gold and Silver Corp.		

Subject Primary Pond Dam – Subsurface Model Overview

1 Introduction

SRK Consulting (Canada) Inc. was retained by Sabina Gold & Silver Corp. (Sabina) to complete the detailed geotechnical engineering of the Primary Pond Dam (the Dam) at the Goose Property which is part of the Back River Project. SRK has reviewed the available geotechnical investigation data and overburden isopach models (developed by Sabina) to develop 2D subsurface models (cross-sections) in support of detail design of the Primary Pond Dam.

Previous subsurface models have been limited to overburden isopach models developed by Sabina's geology team using exploration and geotechnical drillholes completed between 1992 to 2020 (Figure 1). These models lack description of overburden material type and ground ice conditions which are important aspects of the subsurface stratigraphy to consider during design of the Primary Pond Dam. A geotechnical investigation program has also been completed more recently near the proposed dam in 2021 (SRK 2022).

This memorandum documents relevant geotechnical information used to develop an updated subsurface model of foundation conditions near the Primary Pond. The specific objectives were to:

- Develop representative cross-sections along the proposed Primary Pond Dam profile (in 2D);
- Update the existing bedrock contact surface with additional geotechnical drillhole data;
- Update the overburden stratigraphy with additional drillhole and laboratory testing; and
- Update the ground ice and permafrost conditions with recent field observations and drillhole data.

2 Subsurface Model

2.1 Available Information

The subsurface model presented in this memorandum is based on the geotechnical drillholes investigated by SRK between 2015 and 2021 (SRK 2015; SRK 2018; SRK 2022). The subsurface models also incorporate the bedrock contact through review of existing overburden isopach models

developed by Sabina, which incorporate exploration and geotechnical drilling programs completed from 1992 to 2020.

Figure 1 shows the location of available drillhole and test pit locations around the proposed Primary Pond Dam. SRK's review of the exploration drillhole database and geotechnical drillholes was limited to locations where drillhole logs were available. This included geotechnical logs for those completed by SRK in 2015, 2018 and 2021 (Figure 2). Information from other exploration and geotechnical drillholes was limited to collar locations and the bedrock contact provided by Sabina.

2.2 Section Locations

A two-dimensional subsurface model was developed along four (4) representative cross-sections through the proposed Primary Pond Dam (Sections A-A' to D-D') and one (1) profile section along the length of the dam (Section E-E'). The rationale for selection of each cross-section is presented in Table 1. Figure 2 shows the location of the cross-sections.

Table 1: Subsurface Model Cross-Sections and Rationale

Cross-Section Name	Rationale
Section A-A'	Section intersects the greatest fill thickness for the proposed embankment (approximately 9 m) and is inferred to have that greatest overburden thickness (approximately 10 m) along the dam alignment.
Section B-B'	Section intersects the reclaim road, which is proposed to be placed over an existing tundra creek channel with relatively thick overburden.
Section C-C'	Section intersects undulating bedrock with moderate overburden thickness.
Section D-D'	Section with the deepest expected overburden and section to allow some correlation to drillholes located upstream of the dam.
Section E-E'	Section located along the proposed dam centerline.

2.3 Methodology

Material Type and Ground Ice

The 2D cross-sections with interpretive stratigraphy were developed to show the primary material type and ground ice conditions (ground ice type and visible excess ground ice content). Material type was based on geotechnical logging of the recovered soil core using ASTM D2488-17 (ASTM 2017). Field descriptions of the material type have been confirmed with particle size distribution results completed on select samples in the laboratory. Ground ice type and visible estimation of excess ground ice content were based on ASTM D4083 (ASTM 2016). Additional detail is provided in the corresponding geotechnical field investigation reports in Attachment 2.

The drill datasets were screened to determine which drillholes were suitable for analysis based on proximity to the proximity to the sections and data availability. Typically, drillholes were only used if located within 100 m of the proposed 2D section (Figure 4).

After preliminary screening of the datasets, the subsurface model sections were developed as follows:

- Step 1: Identify all the material types reported in the geotechnical investigation drillhole logs.
- Step 2: Generate 'stick logs' of the selected drillholes for each section, using the primary material type, ground ice type, and excess ground ice content determined by visual field inspection of the recovered core.
- Step 3: Extrapolate between the primary material types to create an interpreted sub-surface layer.

Bedrock Contact

The interpreted bedrock surface (contact) for the Back River Goose property was refined in the 2D cross-sections around the proposed Primary Pond Dam area using 2021 geotechnical drillholes (SRK 2022). The interpreted bedrock surface was inferred from the overburden isopach models created by Sabina's geology personnel.

In April 2021, SRK was provided with the following geological model files that correspond to various areas around the site:

- *OVB EC_OVB_surface copy.dxf*
- *OVB EC_OVB_24Jul2014 copy.dxf*
- *OVB_LL.dxf*
- *OVB_UM.dxf*
- *Overburden_CK.dxf*
- *Overburden_GM.dxf*
- *Overburden_NUV.dxf*
- *Overburden_SLSH.dxf*

The boundaries of each model is provided in Figure 1. The models relevant to the Primary Pond Dam are shown in Figure 2:

- *OVB_LL.dxf* (west area of the Primary Pond Dam)
- *OVB_UM.dxf* (center and area of the Primary Pond Dam)

The bedrock surface was inferred by extracting the bottom boundary of the overburden isopach model, assuming that the bottom of overburden would correspond to bedrock contact. The inferred bedrock surface was then updated based on the 2021 drillholes (SRK 2022) in the 2D cross-sections around the proposed Primary Pond Dam.

The top of bedrock for 2021 drillholes was defined as the top of the weathered bedrock layer. Where data regarding weathered bedrock was not available, intact bedrock was used. It was assumed that the overburden models created by Sabina are based on all investigation holes prior to and including drillholes completed in 2020.

The surficial extent of bedrock and areas with a relatively thin veneer of overburden (0 to 3 m) was mapped from air photos (Figure 5). The map provides an additional dataset used to interpret subsurface conditions along the cross-sections.

2.4 Results

The subsurface model developed for each cross-section is shown in Figures A.1 to E.2. Two figures have been generated for each cross-section. The first figure shows the cross-section with primary material type, ground ice type, and visible estimation of excess ground ice. The second figure shows the same cross-section information with the interpreted subsurface layers added. The existing ground surface (top of the overburden surface) is based on the topographic survey completed Sabina and provided to SRK in April 2021. The proposed Primary Pond Dam shell and key trench are provided for additional context.

SRK's review of the data indicates that the Primary Pond Dam profile extends across exposed bedrock, bedrock with thin overburden, and several depressions in the bedrock surface with relatively thick overburden soil (Figure E.2). For some of the cross-sections, the drillholes are offset to the section line and the bedrock surface may differ from the confirmed drillhole intersect. The three geotechnical investigations also confirmed that the foundation is characterized by relatively thin organics that are typically underlain by coarse-grained sand and gravel with intervals of boulders, followed by silt above the top of bedrock. Soil pore water salinity has been determined from laboratory testing to average 23 ppt. The average pore water freezing point depression is calculated to be -1.4°C. Visible ground ice more than 60% by volume has been observed to occur within the overburden soil. Relatively high ground ice content is associated with Vs, ICE, and ICE w/ Soil. There is not a clear association of ice content with primary material type.

Drillhole logs and core box photos of the drillholes used in the subsurface model development are provided in Attachments 2 and 3, respectively.

Attachments:

Attachment 1 Figures
Attachment 2 Drillhole Logs
Attachment 3 Core Box Photos

References

ASTM. 2016. ASTM D4083-89 (2016) Standard Practice for Description of Frozen Soils (Visual-Manual Procedure).

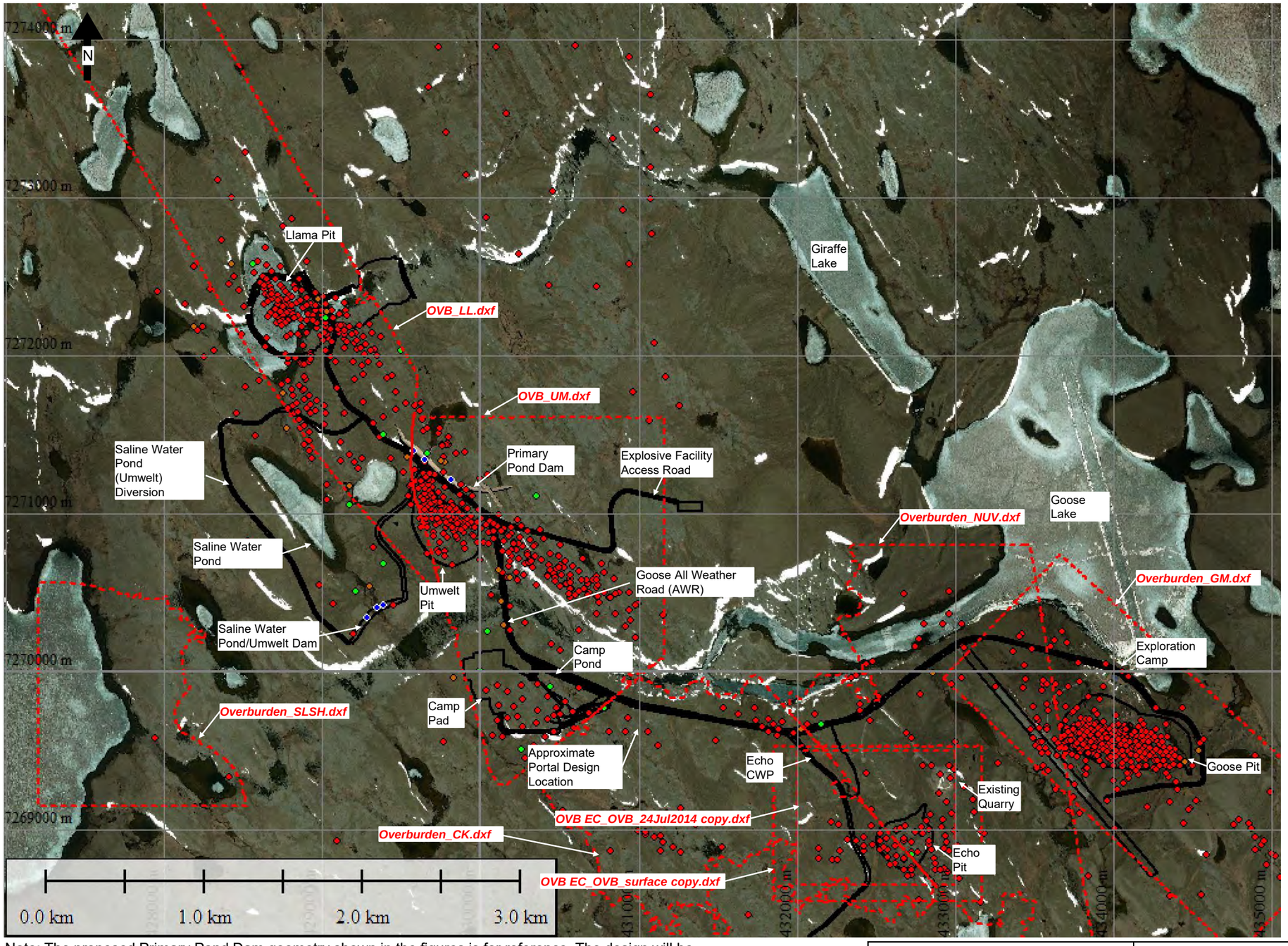
ASTM. 2017. ASTM D2488-17 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures). ASTM International. West Conshohocken, PA. 2017.

SRK Consulting (Canada) Inc. 2015. Goose Property - 2015 Overburden Geotechnical Investigation Program. Report prepared for Sabina Gold & Silver Corp. Project No. 1CS020.009.

SRK Consulting (Canada) Inc. 2018. Goose Property - 2018 Overburden Geotechnical Investigation Program. DRAFT Report prepared for Sabina Gold & Silver Corp. Project No. 1CS020.016.

SRK Consulting (Canada) Inc. 2022. 2021 Geotechnical Field Investigation. DRAFT Report prepared for Sabina Gold & Silver Corp. Project No. 1CS020.020. In Progress.

Attachment 1 Figures



LEGEND:

- Drillholes Used in Generating Bedrock Surface (provided by Sabina)
- Goose Property - 2015 Overburden Geotechnical Investigation Program (SRK 2015)
- Goose Property - 2018 Overburden Geotechnical Investigation (SRK 2018)
- Goose Property - 2021 Overburden Geotechnical Investigation (SRK 2022)
- Proposed Back River Infrastructure Linework
- Boundary of Generated Bedrock Surfaces (provided and generated by Sabina)
- Proposed Primary Pond Dam

Note: The proposed Primary Pond Dam geometry shown in the figures is for reference. The design will be confirmed during completion of the detailed design.

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Job No: 1CS020.020
Filename: BackRiver_SubsurfaceModel_Figures.pptx

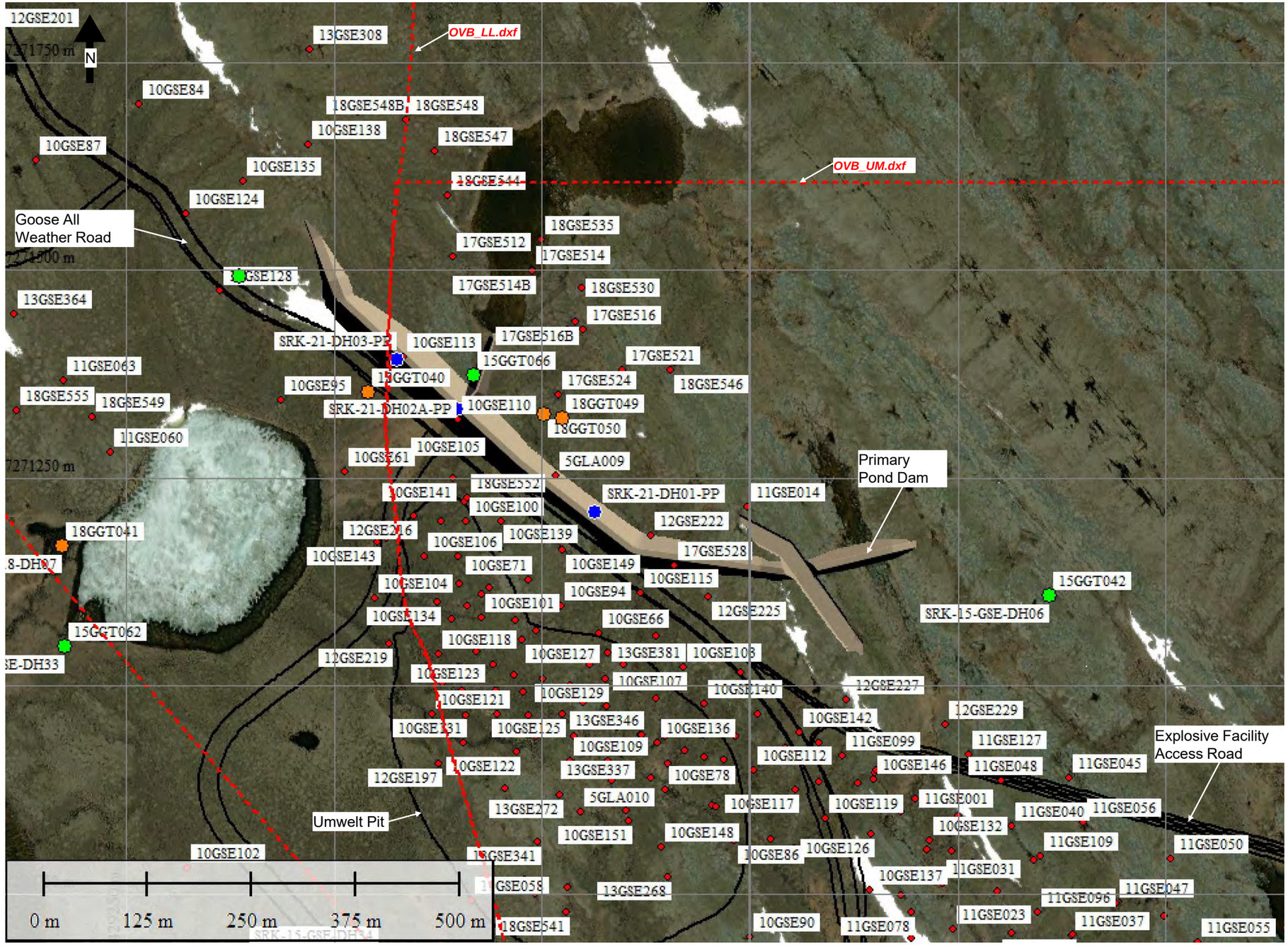
Sabina GOLD & SILVER CORP

Back River Project

Primary Pond Dam
Subsurface Model Overview

Overview of Available Drillholes

Date:	Approved:	Figure:
Nov 2022	JBK	1



LEGEND:

- Drillholes Used in Generating Bedrock Surface (provided by Sabina)
- Goose Property - 2015 Overburden Geotechnical Investigation Program (SRK 2015)
- Goose Property - 2018 Overburden Geotechnical Investigation (SRK 2018)
- Goose Property - 2021 Overburden Geotechnical Investigation (SRK 2022)
- Proposed Back River Infrastructure Linework
- Boundary of Generated Bedrock Surfaces (provided and generated by Sabina)
- Proposed Primary Pond Dam

srk consulting

Job No: 1CS020.020

Filename: BackRiver_SubsurfaceModel_Figures.pptx

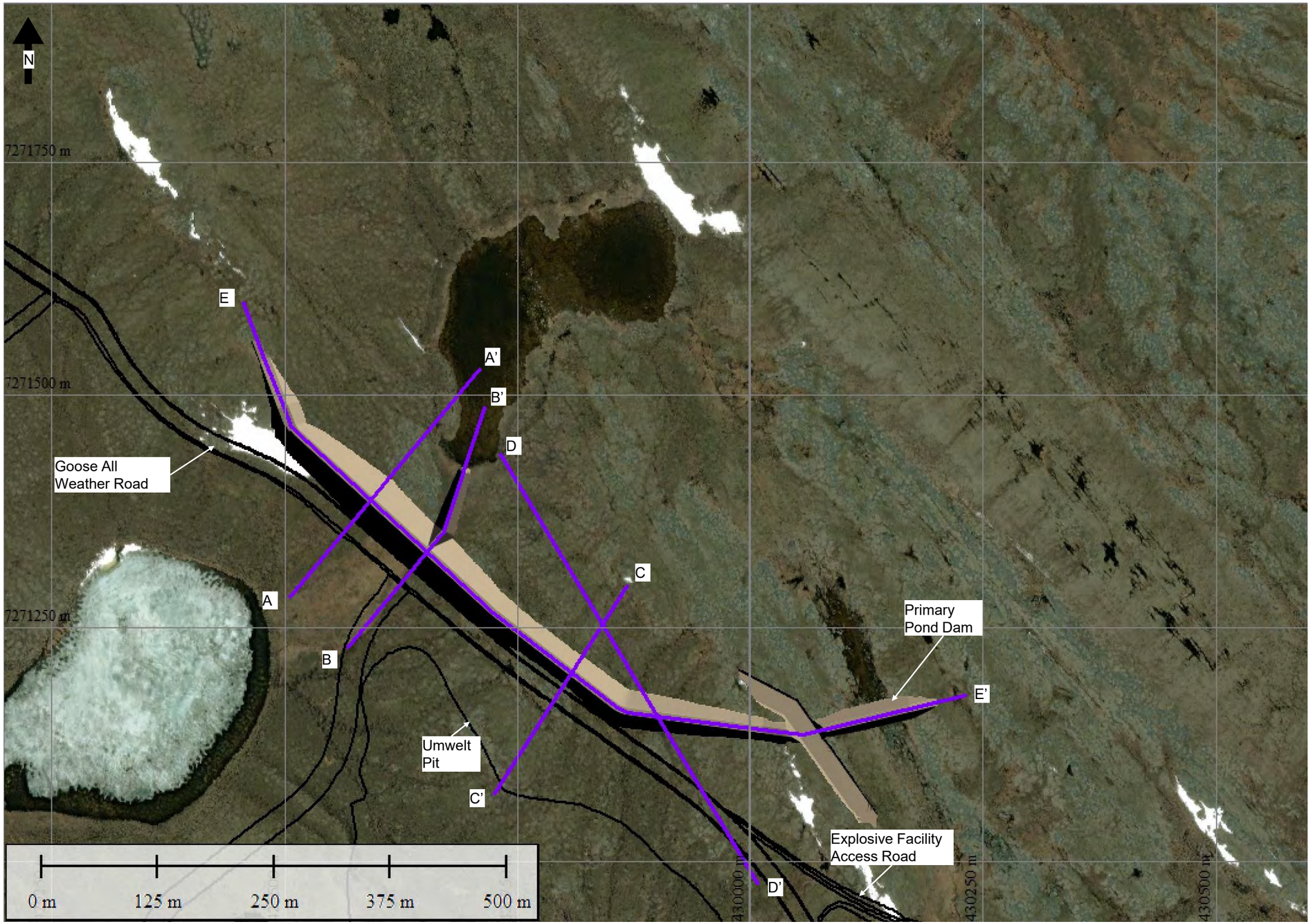
Sabina GOLD & SILVER CORP.

Back River Project

Primary Pond Dam
Subsurface Model Overview

Overview of Available Drillholes at the Primary Pond Dam Area

Date:	Approved:	Figure:
Nov 2022	JBK	2



LEGEND:

- Proposed Back River Infrastructure Linework
- Proposed Primary Pond Dam
- Section Location

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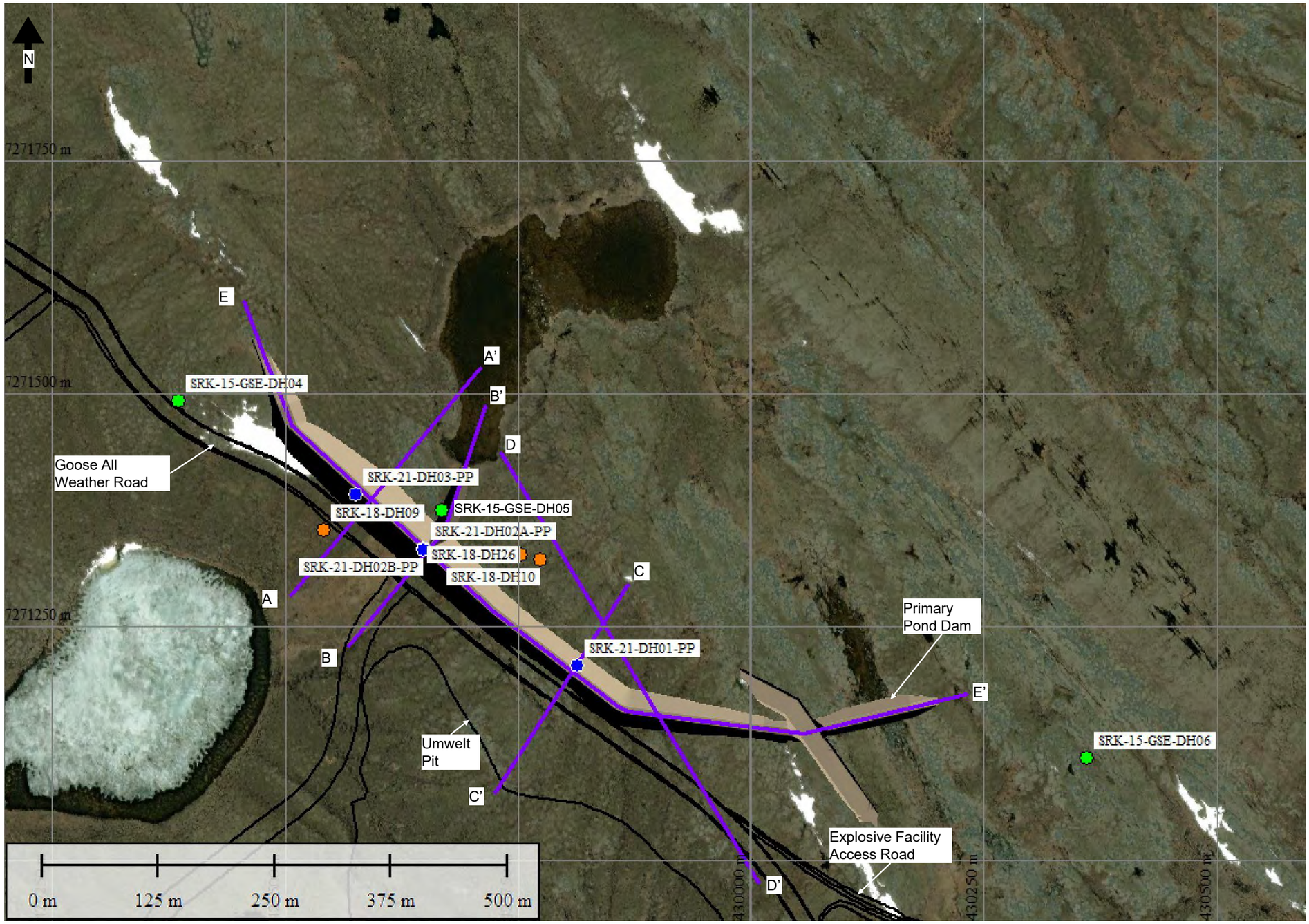
Job No: 1CS020.020
Filename: BackRiver_SubsurfaceModel_Figures.pptx

Back River Project

Primary Pond Dam
Subsurface Model Overview

Location of Selected Cross-Sections

Date:	Approved:	Figure:
Nov 2022	JBK	**3**



LEGEND:

- Goose Property - 2015 Overburden Geotechnical Investigation Program (SRK 2015)
- Goose Property - 2018 Overburden Geotechnical Investigation (SRK 2018)
- Goose Property - 2021 Overburden Geotechnical Investigation (SRK 2022)
- Proposed Back River Infrastructure Linework
- Proposed Primary Pond Dam
- Section Location

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Filename: BackRiver_SubsurfaceModel_Figures.pptx

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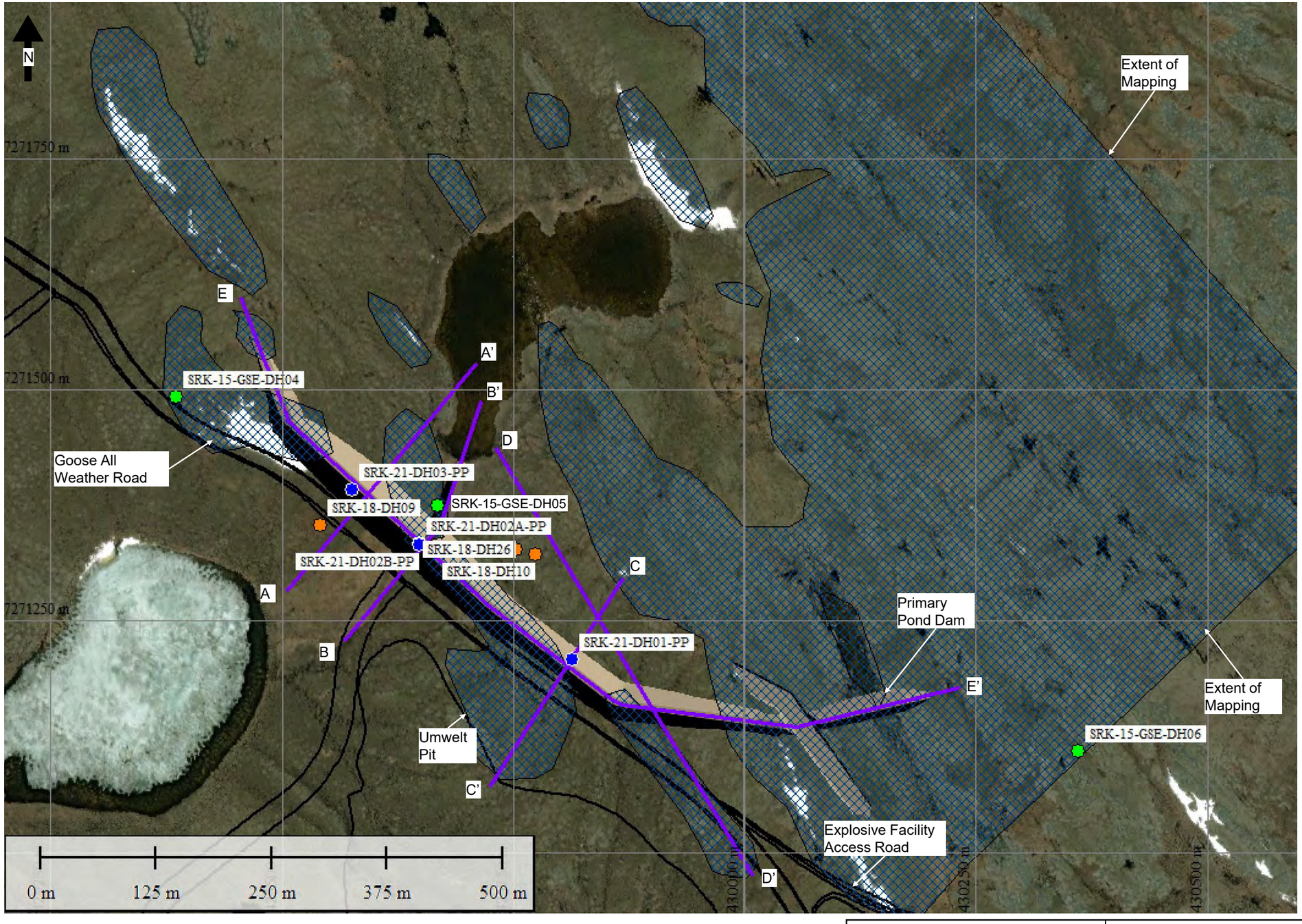
Back River Project

Primary Pond Dam
Subsurface Model Overview

Geotechnical Drillholes Used to Develop the Subsurface Model Sections

Date:	Approved:	Figure:
Nov 2022	JBK	4



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- Goose Property - 2015 Overburden Geotechnical Investigation Program (SRK 2015)
- Goose Property - 2018 Overburden Geotechnical Investigation (SRK 2018)
- Goose Property - 2021 Overburden Geotechnical Investigation (SRK 2022)
- Proposed Back River Infrastructure Linework
- Proposed Primary Pond Dam
- Section Location
- Bedrock Outcrop and Till Veneer (0 to 3 m)

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Job No: 1CS020.020

Filename: BackRiver_SubsurfaceModel_Figures.pptx

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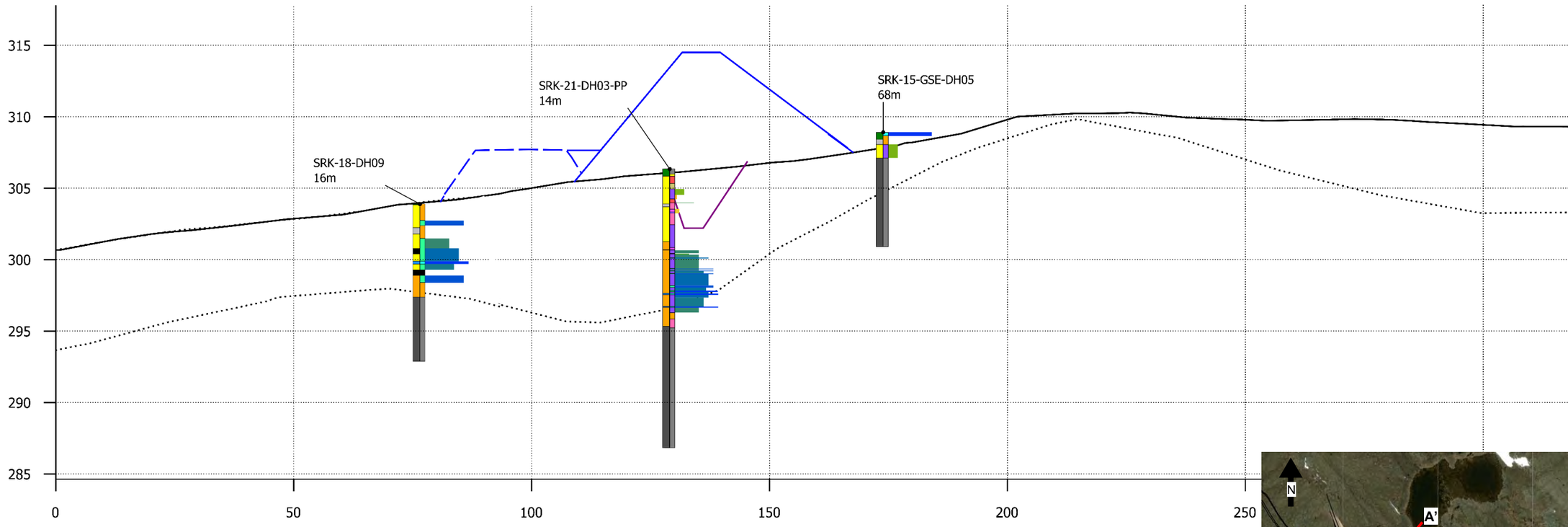
Back River Project

Primary Pond Dam
Subsurface Model Overview

Bedrock Outcrop and Till Veneer (0 to 3 m) from Air Photos

Date:	Approved:	Figure:
Nov 2022	JBK	5



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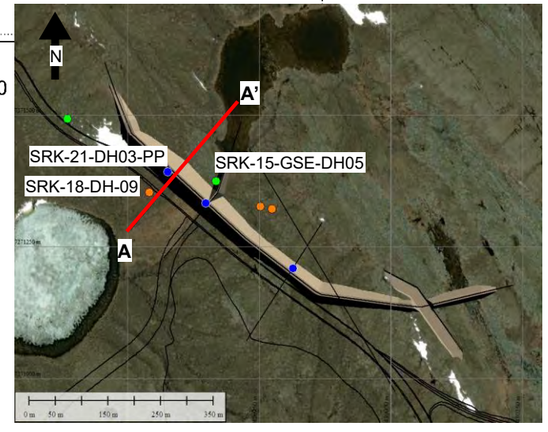

Legend

Primary Material Type - Left Side of the Stick Log

Bedrock	Gravel	No Recovery	Sand
Boulder/Cobbles	Ice	Organics	Silt

Ground Ice Type - Middle of the Stick Log

Ice	Nbn	Uf	Vs
Ice w/ Soil	Nf	Vc	Vx
Nbe	No Recovery	Vr	

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 — 25 — 50 — 75 — 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

A: 429505, 7271283
A': 429709, 7271528

Scale: 1:850
Vertical exaggeration: 3x

0m — 100m

Note: Excess ice content is determined by visual estimations in the field

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Job No: 1CS020.020
Filename: BackRiver_SubsurfaceModel_Figures.pptx

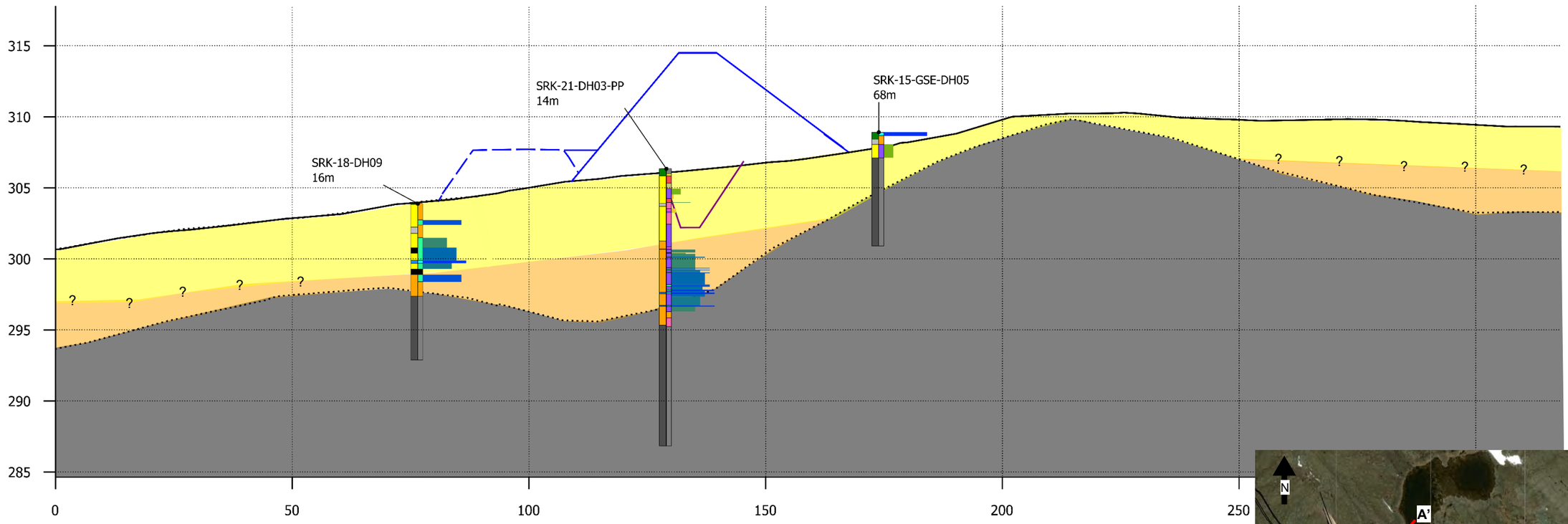
Sabina GOLD & SILVER CORP.

Back River Project

Primary Pond Dam
Subsurface Model Overview

Section A-A'
Stick Logs

Date: Nov 2022
Approved: JBK
Figure: **A.1**



Section A-A'

Legend

Primary Material Type - Left Side of the Stick Log

- Bedrock
- Boulder/Cobbles
- Gravel
- Ice
- No Recovery
- Organics
- Sand
- Silt

Ground Ice Type - Middle of the Stick Log

- Ice
- Ice w/ Soil
- Nbe
- Nbn
- Nf
- No Recovery
- Uf
- Vc
- Vr
- Vs
- Vx

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 — 25 — 50 — 75 — 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- --?--? Layer interpretation with greatest uncertainly or extrapolation with limited data
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Note: Excess ice content is determined by visual estimations in the field

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
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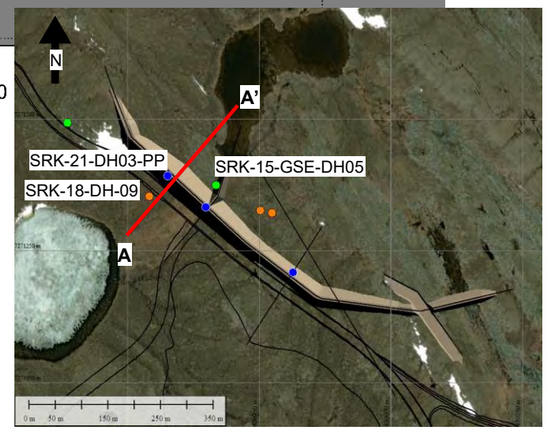
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	



Location

A:	429505, 7271283
A':	429709, 7271528

Scale: 1:850

Vertical exaggeration: 3x

0m — 100m

srk consulting

Sabina GOLD & SILVER CORP.

Job No: 1CS020.020

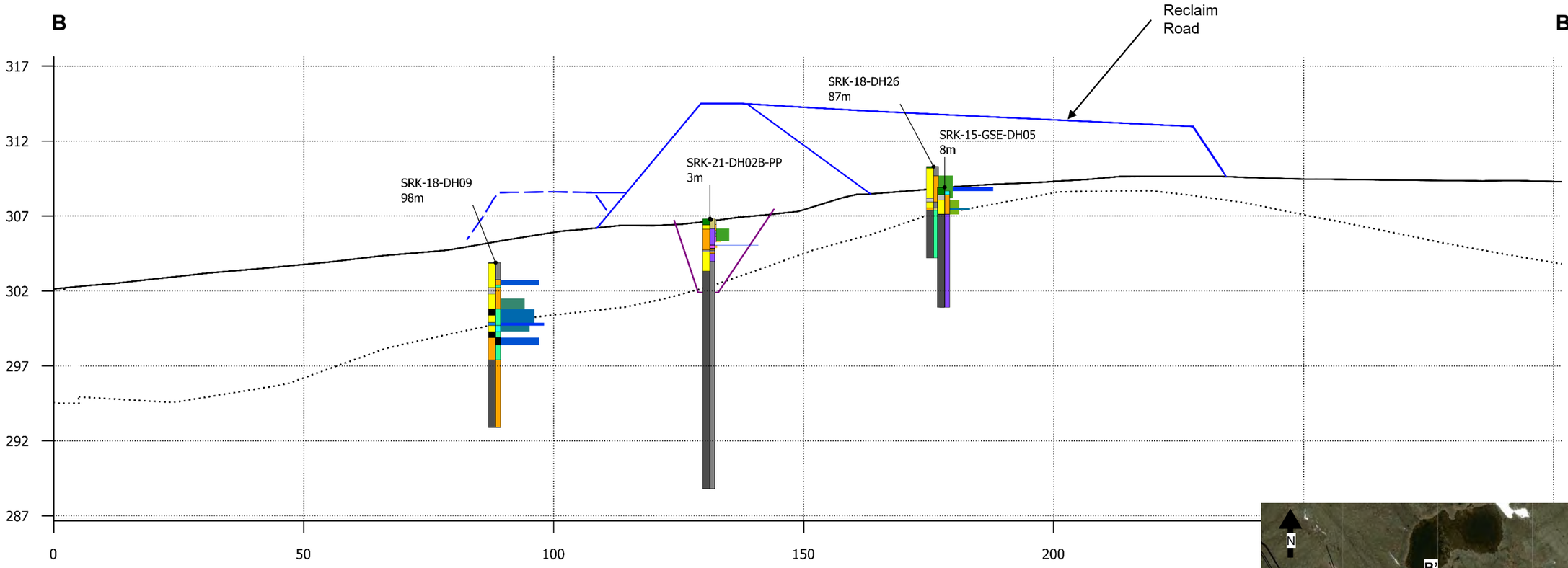
Filename: BackRiver_SubsurfaceModel_Figures.pptx

Back River Project

Primary Pond Dam
Subsurface Model Overview

Section A-A'
Interpreted Subsurface Stratigraphy

Date: Nov 2022 | Approved: JBK | Figure: **A.2**



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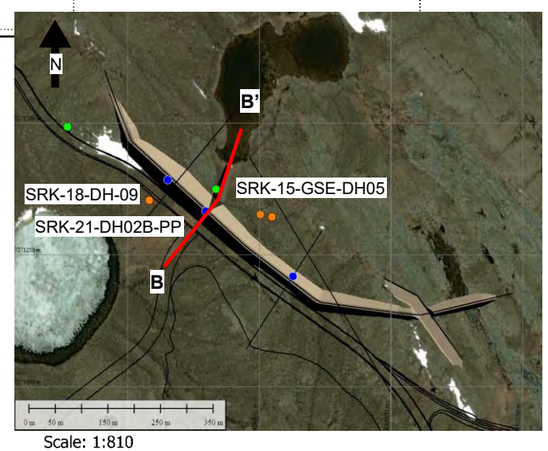

Scale: 1:810

Vertical exaggeration: 3x

0m 100m

Legend

Primary Material Type - Left Side of the Stick Log

- Bedrock
- Boulder/Cobbles
- Gravel
- Ice
- No Recovery
- Organics
- Sand
- Silt

Ground Ice Type - Middle of the Stick Log

- Ice
- Ice w/ Soil
- Nbe
- Nbn
- Nf
- No Recovery
- Uf
- Vc
- Vr
- Vs
- Vx

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 25 50 75 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

B: 429568, 7271229

B': 429715, 7271487

Note: Excess ice content is determined by visual estimations in the field

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Job No: 1CS020.020

Filename: BackRiver_SubsurfaceModel_Figures.pptx

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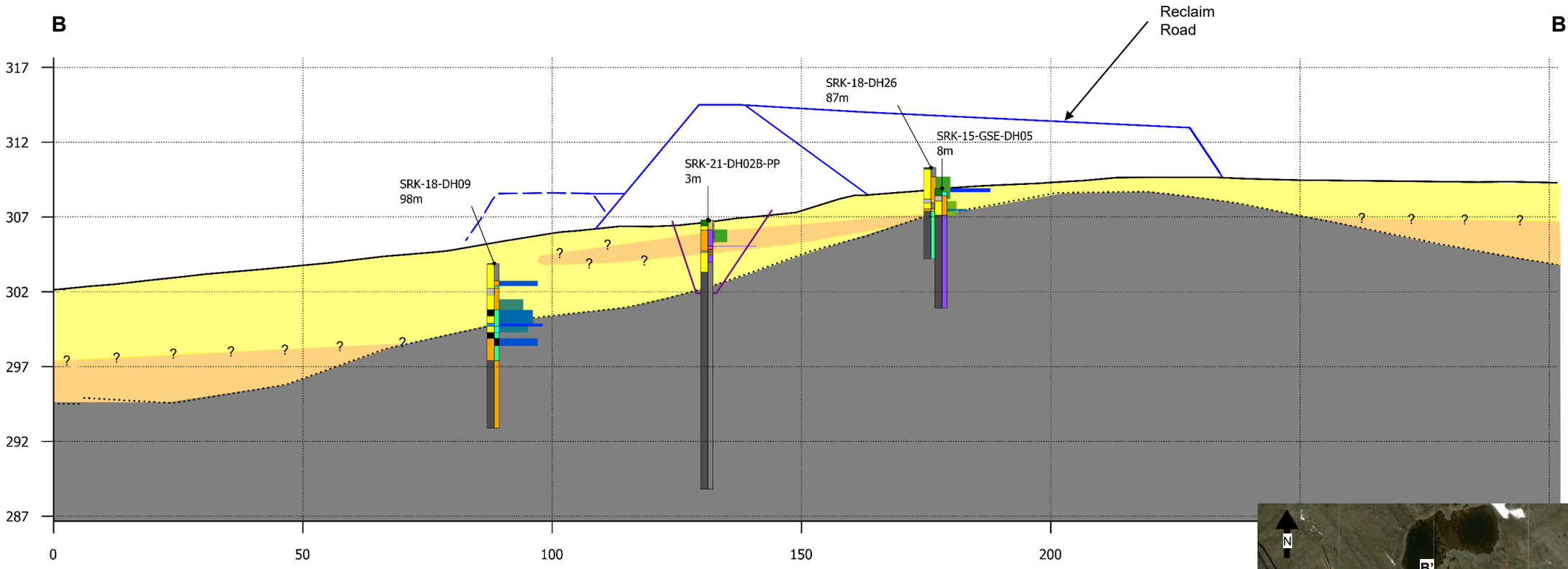
Back River Project

Primary Pond Dam
Subsurface Model Overview

Section B-B'
Stick Logs

Date: Nov 2022 | Approved: JBK | Figure: **B.1**



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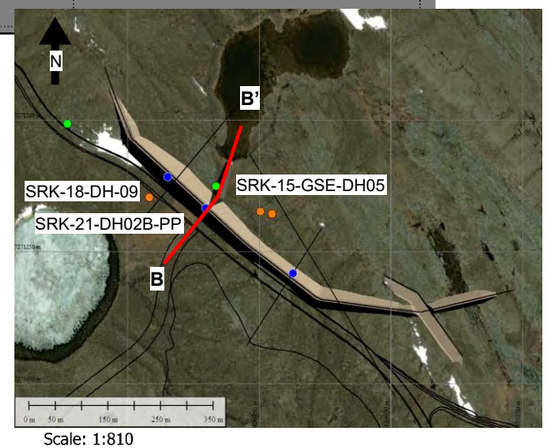

Scale: 1:810

Vertical exaggeration: 3x

Legend

Primary Material Type - Left Side of the Stick Log

Bedrock	Gravel	No Recovery	Sand
Boulder/Cobbles	Ice	Organics	Silt

Ground Ice Type - Middle of the Stick Log

Ice	Nbn	Uf	Vs
Ice w/ Soil	Nf	Vc	Vx
Nbe	No Recovery	Vr	

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 25 50 75 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- --?--? Layer interpretation with greatest uncertainly or extrapolation with limited data
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Note: Excess ice content is determined by visual estimations in the field

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

B: 429568, 7271229

B': 429715, 7271487

0m 100m

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Job No: 1CS020.020

Filename: BackRiver_SubsurfaceModel_Figures.pptx

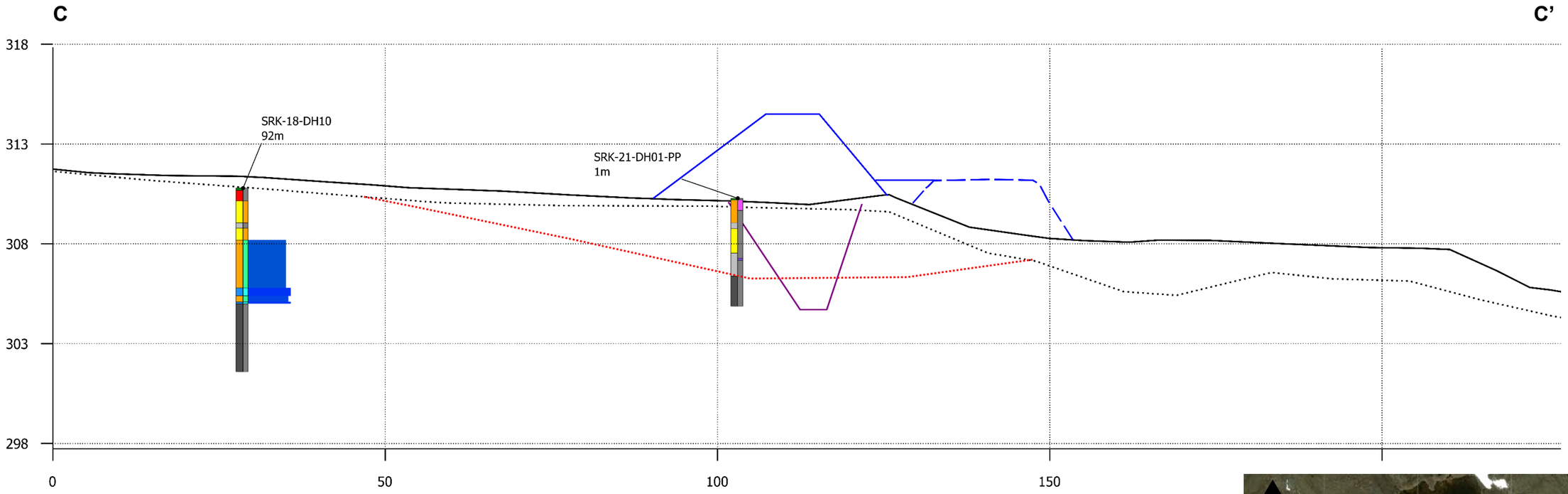
Sabina GOLD & SILVER CORP.

Back River Project

Primary Pond Dam
Subsurface Model Overview

Section B-B'
Interpreted Subsurface Stratigraphy

Date: Nov 2022 | Approved: JBK | Figure: **B.2**



Section C-C'

Legend

Primary Material Type - Left Side of the Stick Log

- Bedrock
- Boulder/Cobbles
- Gravel
- Ice
- No Recovery
- Organics
- Sand
- Silt

Ground Ice Type - Middle of the Stick Log

- Ice
- Ice w/ Soil
- Nbe
- Nbn
- Nf
- No Recovery
- Uf
- Vc
- Vr
- Vs
- Vx

Excess Ground Ice Content (%) - Right Side of the Stick Log

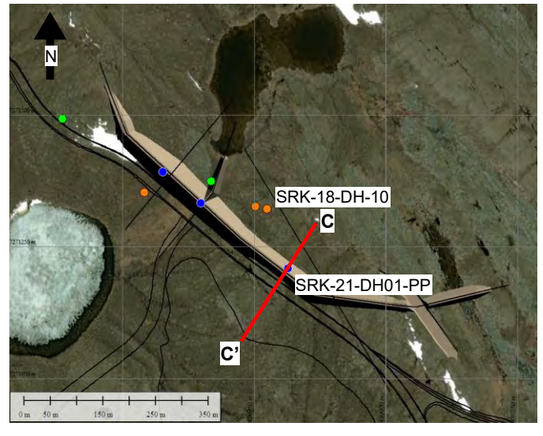
0 — 25 — 50 — 75 — 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	



Location

C: 429868, 7271296

C': 429694, 7271023

Scale: 1:600

Vertical exaggeration: 3x

0m — 100m

Note: Excess ice content is determined by visual estimations in the field

srk consulting

Job No: 1CS020.020

Filename: BackRiver_SubsurfaceModel_Figures.pptx

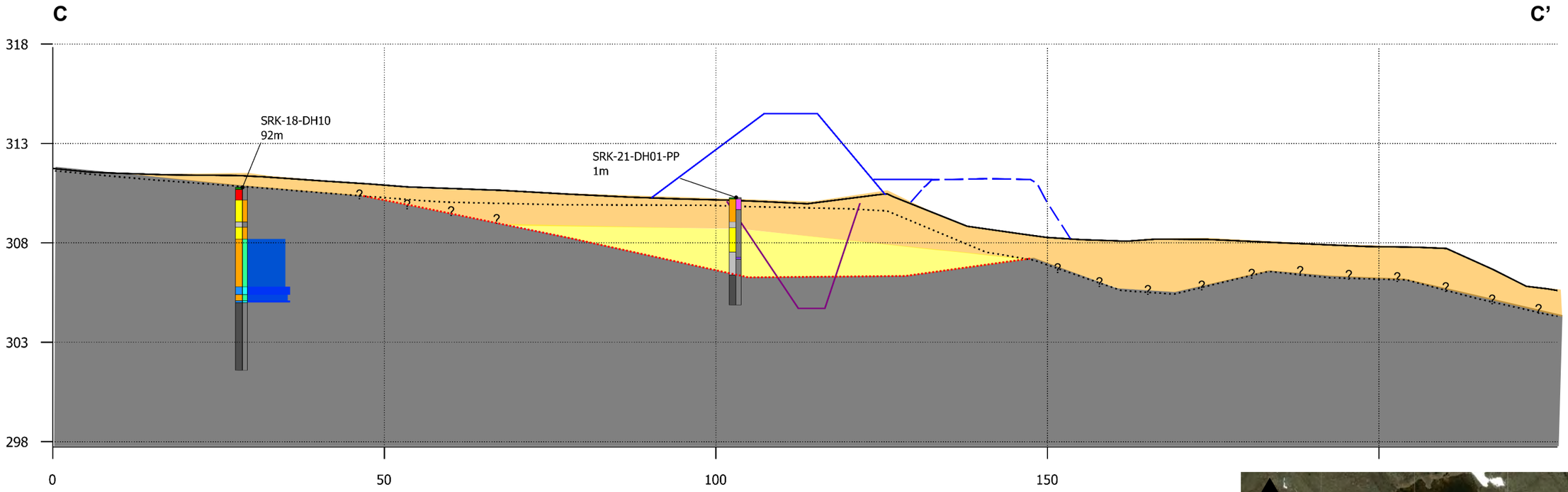
Sabina GOLD & SILVER CORP.

Back River Project

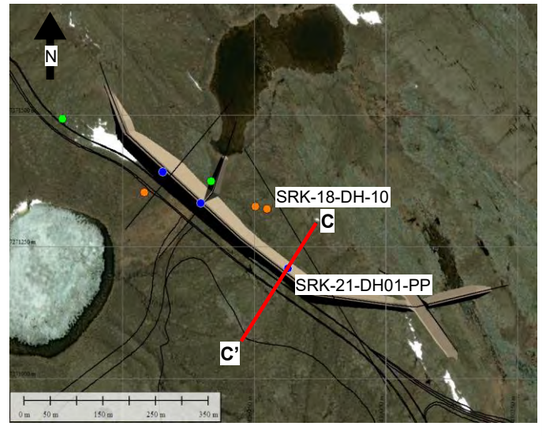
Primary Pond Dam
Subsurface Model Overview

Section C-C'
Stick Logs

Date:	Approved:	Figure:
Nov 2022	JBK	**C.1**



Section C-C'



Legend

Primary Material Type - Left Side of the Stick Log

- Bedrock
- Boulder/Cobbles
- Gravel
- Ice
- No Recovery
- Organics
- Sand
- Silt

Ground Ice Type - Middle of the Stick Log

- Ice
- Ice w/ Soil
- Nbe
- Nbn
- Nf
- No Recovery
- Uf
- Vc
- Vr
- Vs
- Vx

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 — 25 — 50 — 75 — 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- --?--? Layer interpretation with greatest uncertainly or extrapolation with limited data
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

C: 429868, 7271296

C': 429694, 7271023

Scale: 1:600

Vertical exaggeration: 3x

0m — 100m

Note: Excess ice content is determined by visual estimations in the field

srk consulting

Job No: 1CS020.020

Filename: BackRiver_SubsurfaceModel_Figures.pptx

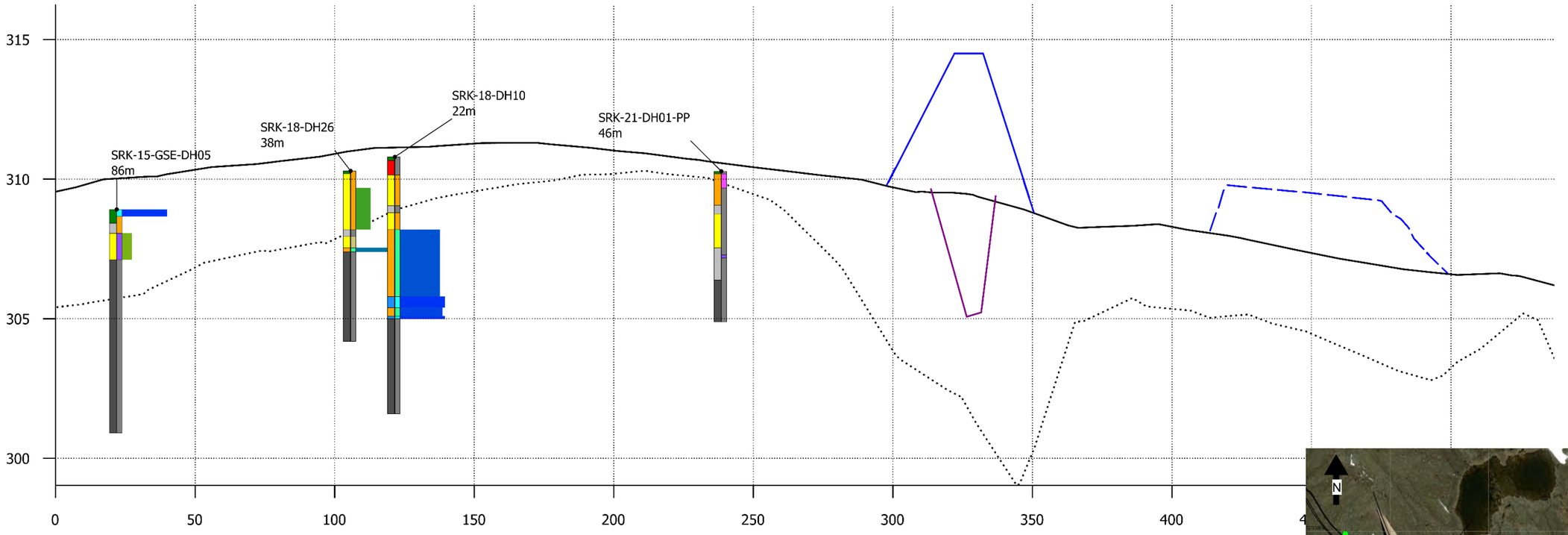
Sabina GOLD & SILVER CORP.

Back River Project

Primary Pond Dam
Subsurface Model Overview

Section C-C'
Interpreted Subsurface Stratigraphy

Date: Nov 2022 | Approved: JBK | Figure: **C.2**



Section D-D’

Legend

Primary Material Type - Left Side of the Stick Log

Bedrock	Gravel	No Recovery	Sand
Boulder/Cobbles	Ice	Organics	Silt

Ground Ice Type - Middle of the Stick Log

Ice	Nbn	Uf	Vs
Ice w/ Soil	Nf	Vc	Vx
Nbe	No Recovery	Vr	

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 — 25 — 50 — 75 — 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

D: 429731, 7271436
D’: 430007, 7270976

Scale: 1:1,500
Vertical exaggeration: 10x
0m — 100m

Note: Excess ice content is determined by visual estimations in the field

srk consulting

Sabina GOLD & SILVER CORP.

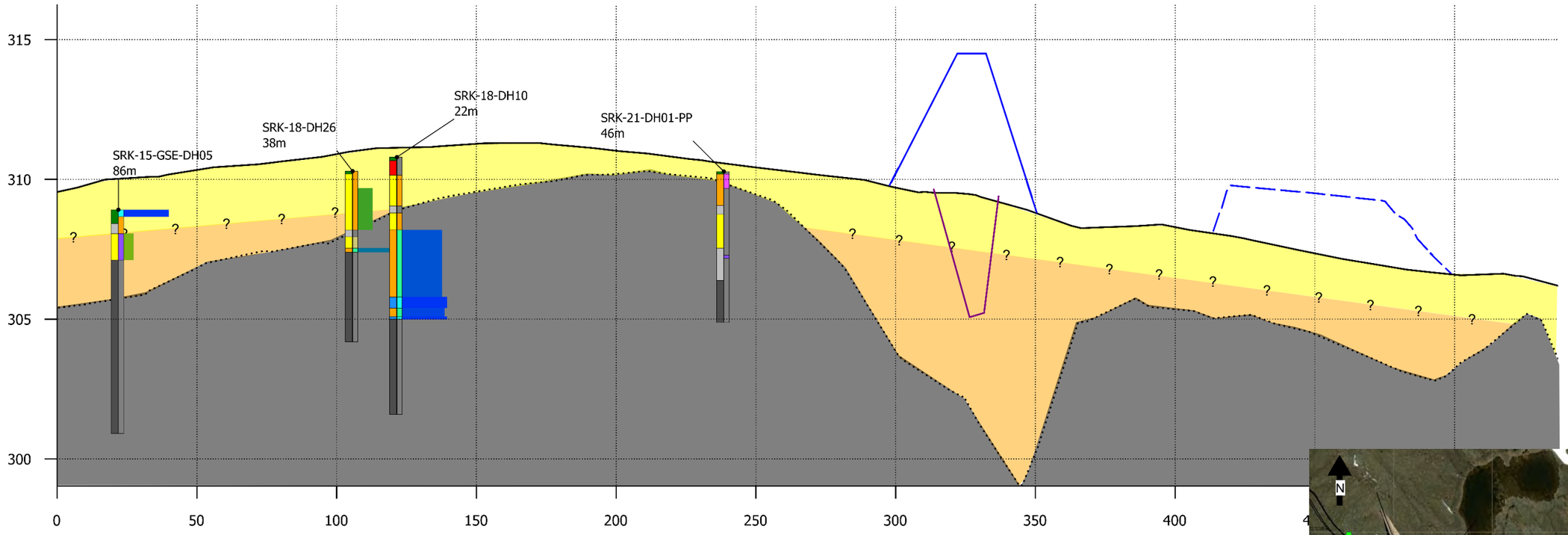
Job No: 1CS020.020
Filename: BackRiver_SubsurfaceModel_Figures.pptx

Back River Project

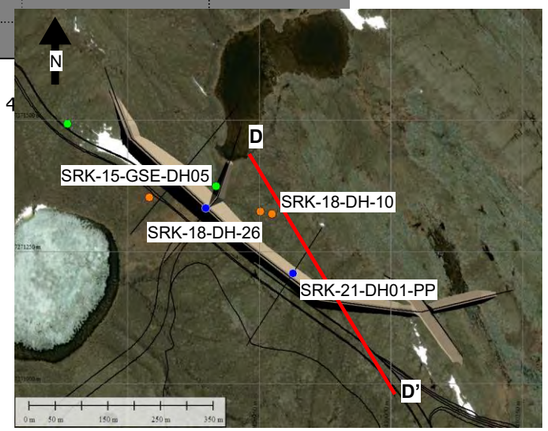
Primary Pond Dam
Subsurface Model Overview

Section D-D’
Stick Logs

Date: Nov 2022
Approved: JBK
Figure: **D.1**



Section D-D'



Legend

Primary Material Type - Left Side of the Stick Log

- Bedrock
- Boulder/Cobbles
- Gravel
- Ice
- No Recovery
- Organics
- Sand
- Silt

Ground Ice Type - Middle of the Stick Log

- Ice
- Ice w/ Soil
- Nbe
- Nbn
- Nf
- No Recovery
- Uf
- Vc
- Vr
- Vs
- Vx

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 25 50 75 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- --?--? Layer interpretation with greatest uncertainly or extrapolation with limited data
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

D: 429731, 7271436
D': 430007, 7270976

Scale: 1:1,500
Vertical exaggeration: 10x
0m 100m

Note: Excess ice content is determined by visual estimations in the field

srk consulting

Sabina GOLD & SILVER CORP.

Job No: 1CS020.020
Filename: BackRiver_SubsurfaceModel_Figures.pptx

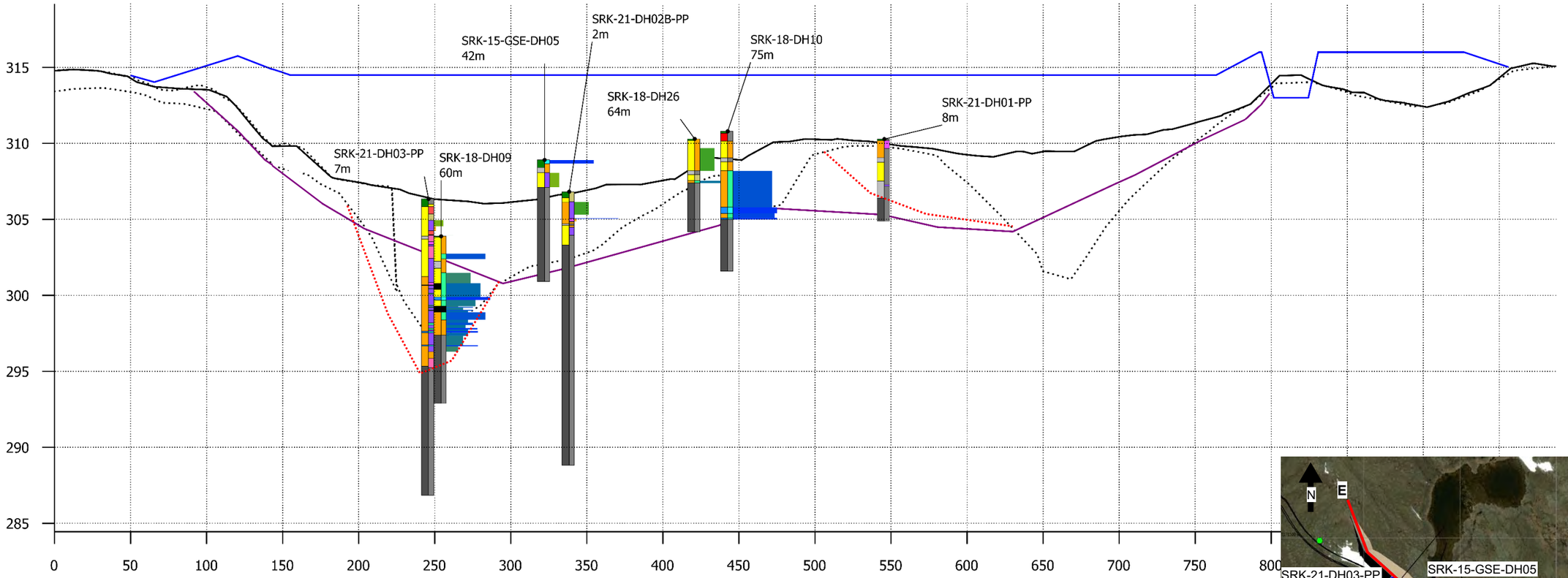
Back River Project

Primary Pond Dam
Subsurface Model Overview
Section D-D'
Interpreted Subsurface Stratigraphy

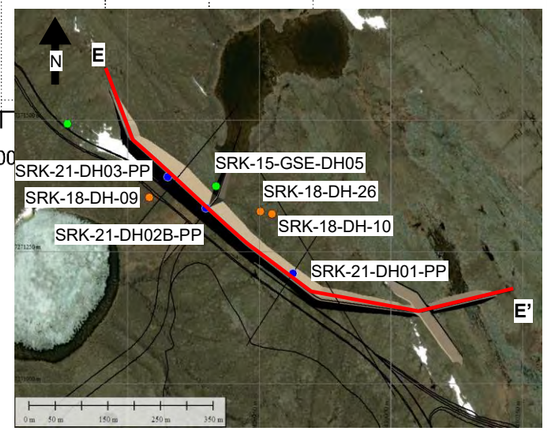
Date: Nov 2022 | Approved: JBK | Figure: **D.2**

E

E’



Section E-E’



Legend

Primary Material Type - Left Side of the Stick Log

- Bedrock
- Boulder/Cobbles
- Gravel
- Ice
- No Recovery
- Organics
- Sand
- Silt

Ground Ice Type - Middle of the Stick Log

- Ice
- Ice w/ Soil
- Nbe
- Nbn
- Nf
- No Recovery
- Uf
- Vc
- Vr
- Vs
- Vx

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 25 50 75 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

E: 429456, 7271600

E’: 430231, 7271178

Scale: 1:2,700

Vertical exaggeration: 10x

0m 100m

Note: Excess ice content is determined by visual estimations in the field

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Job No: 1CS020.020

Filename: BackRiver_SubsurfaceModel_Figures.pptx

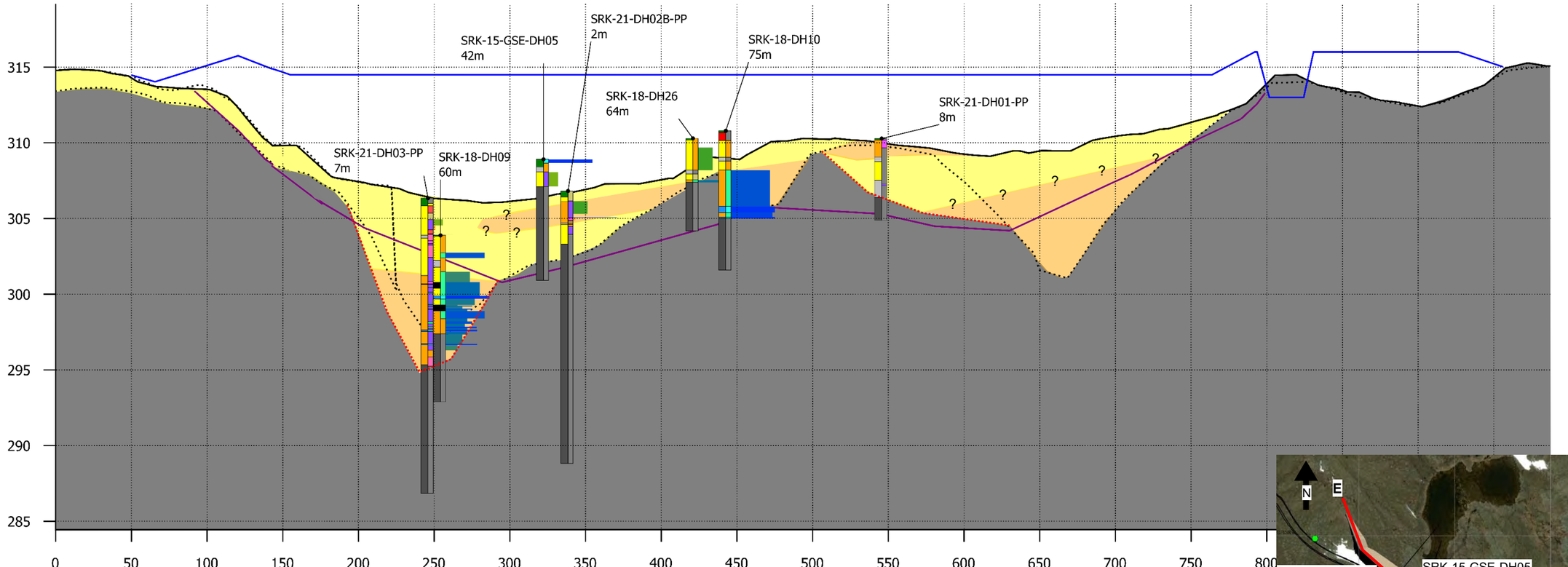
Sabina GOLD & SILVER CORP.

Back River Project

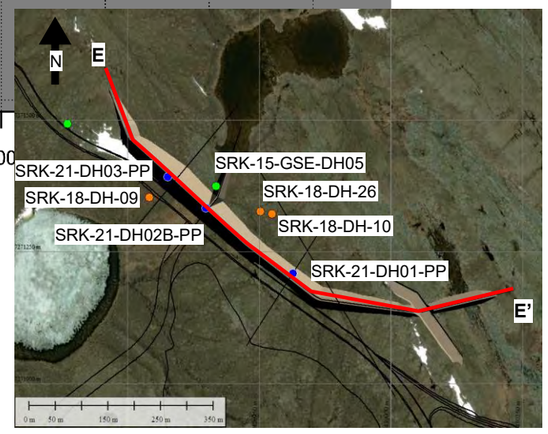
Primary Pond Dam
Subsurface Model Overview

Section E-E’
Stick Logs

Date:	Approved:	Figure:
Nov 2022	JBK	**E.1**



Section E-E'



Legend

Primary Material Type - Left Side of the Stick Log

- Bedrock
- Boulder/Cobbles
- Gravel
- Ice
- No Recovery
- Organics
- Sand
- Silt

Ground Ice Type - Middle of the Stick Log

- Ice
- Ice w/ Soil
- Nbe
- Nbn
- Nf
- No Recovery
- Uf
- Vc
- Vr
- Vs
- Vx

Excess Ground Ice Content (%) - Right Side of the Stick Log

0 25 50 75 100

Surfaces

- Ground Surface - From Sabina
- Bedrock Surface - from Sabina
- Goose AWR
- Proposed Primary Pond Dam Key Trench
- Proposed Primary Pond Dam Shell
- Estimated Bedrock Surface Based on 2021 Drilling
- --?--? Layer interpretation with greatest uncertainly or extrapolation with limited data

Note: Excess ice content is determined by visual estimations in the field

Ground Ice Type Description

Uf: Unfrozen	Vx: Individual Ice Inclusions
Nf: Poorly Bonded	Vc: Ice Coatings on Particles
Nbn: Well Bonded - No Excess Ice	Vr: Randomly Oriented Ice Formations
Nbe: Well Bonded - Excess Ice	Vs: Stratified Ice Formations
ICE: Ice without soil inclusions	
ICE w/ soil: Ice with soil inclusions	

Location

E: 429456, 7271600
E': 430231, 7271178

Scale: 1:2,700
Vertical exaggeration: 10x
0m 100m

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Back River Project

Job No: 1CS020.020
Filename: BackRiver_SubsurfaceModel_Figures.pptx

Primary Pond Dam
Subsurface Model Overview

Section E-E'
Interpreted Subsurface Stratigraphy

Date: Nov 2022 | Approved: JBK | Figure: **E.2**

Attachment 2 Drillhole Logs

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Sabina GOLD & SILVER CORP

HOLE ID:	**SRK-15-GSE-DH04**
LOCATION:	Kitikmeot, Nunavut
PROJECT NO:	1CS020.009
DRILLING CONTRACTOR:	Major Drilling
DRILLING TYPE & CORE DIA:	Diamond Drilling, HQ
LOGGED BY:	SA
BORING DATE:	10-Apr-15 To 10-Apr-15
FACILITY:	Primary CW Collection Pond Diversion
SABINA HOLE ID:	**15GGT065**
COORDINATES:	429386.2 E 7271492.8 N
DATUM:	UTM Zone 13
GROUND ELEV (m):	308.38
AZIMUTH:	0
DIP:	-90
EOH ELEV. (m):	299.88
TOTAL DEPTH (m):	8.5

PROJECT: Back River

CLIENT: Sabina Gold & Silver Corp

Lithological Symbol

ORGANICS, CLAY, SILT, SAND, GRAVEL, COBBLE, BOULDER, BEDROCK, RUBBLE ZONE, SNOW, ICE, LAKE

Ice Description

Nf: No visible ice, Poorly Bonded
Nbn: No visible ice, Well Bonded - No Excess Ice
Nbe: No visible ice, Well Bonded - Excess Ice
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Random or Irregularly Oriented Ice Formations
Vs: Stratified / Distinctly Oriented Ice Formations

Drill Depth (m) | MC (%) PL (%) LL (%) | RQD (%) | Recovery (%) | PSD Gravel/Sand/Fines% | FF/m | Ave IRS (MPa) | Sample Type: Grab Geotech, Geochem (c) & Grab Geotech (t), Concrete Aggregate, Frozen, Geochem | Thermistor ID: Thermistor Bead | Soil Description | Additional Comments

Drill Depth (m)	Soil Description	Additional Comments
0	ORGANICS, dark brown to black	Nf: No visible ice
0.5	COBBLE, some gravel, trace sand, dark brown (10YR2/2), gap graded, wet, sub-angular, non-plastic, non-cohesive, oxidized	Nbn
0.8	Silty SAND, some gravel, dark grey (10YR4/1), well graded, wet, sub-angular, non-plastic, non-cohesive	Vr: 10% excess water
1.0	SAND and SILT, trace gravel, grey (2.5YR/5/1), well graded, wet, sub-rounded, non-plastic, non-cohesive	
1.2	ICE	Ice: Ice and soil - about 10% soil
1.5	COBBLE	
1.6	SAND and SILT, trace gravel, grey (2.5YR/5/1), well graded, wet, sub-rounded, non-plastic, non-cohesive	Vr: 10% excess water
2.0	BOULDER	
2.4	BEDROCK: Greywacke, dark grey	
8.5		

2823

2824

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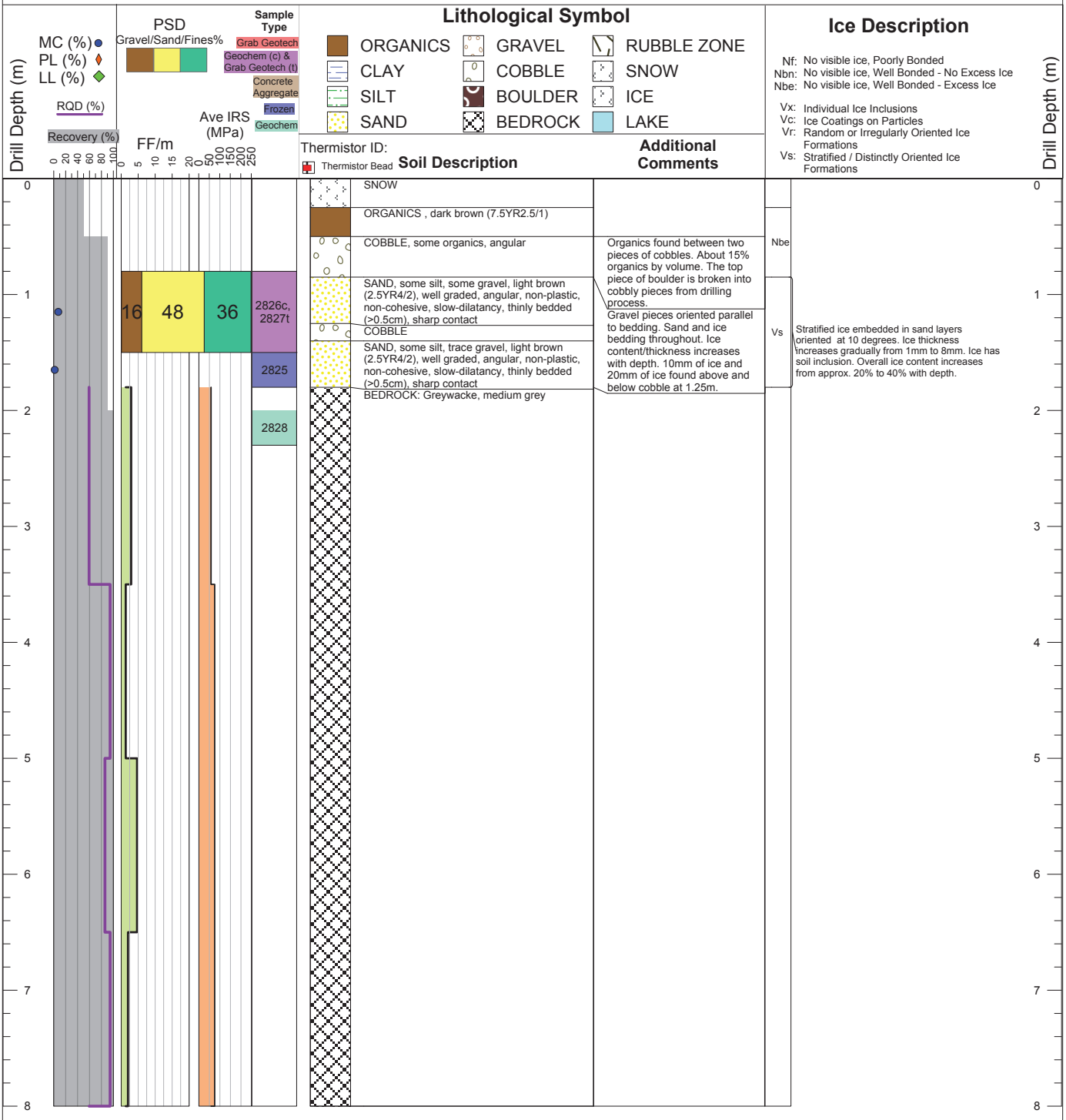
Sabina GOLD & SILVER CORP

HOLE ID:	SRK-15-GSE-DH05
LOCATION:	Kitikmeot, Nunavut
PROJECT NO:	1CS020.009
DRILLING CONTRACTOR:	Major Drilling
DRILLING TYPE & CORE DIA:	Diamond Drilling, HQ
LOGGED BY:	KK
BORING DATE:	10-Apr-15 To 10-Apr-15
FACILITY:	Primary CW Collection Pond Diversion
SABINA HOLE ID:	15GGT066
COORDINATES:	429668.8 E 7271373.4 N
DATUM:	UTM Zone 13
GROUND ELEV (m):	308.91
AZIMUTH:	0
DIP:	-90
EOH ELEV. (m):	300.91
TOTAL DEPTH (m):	8

PROJECT: Back River

CLIENT: Sabina Gold & Silver Corp



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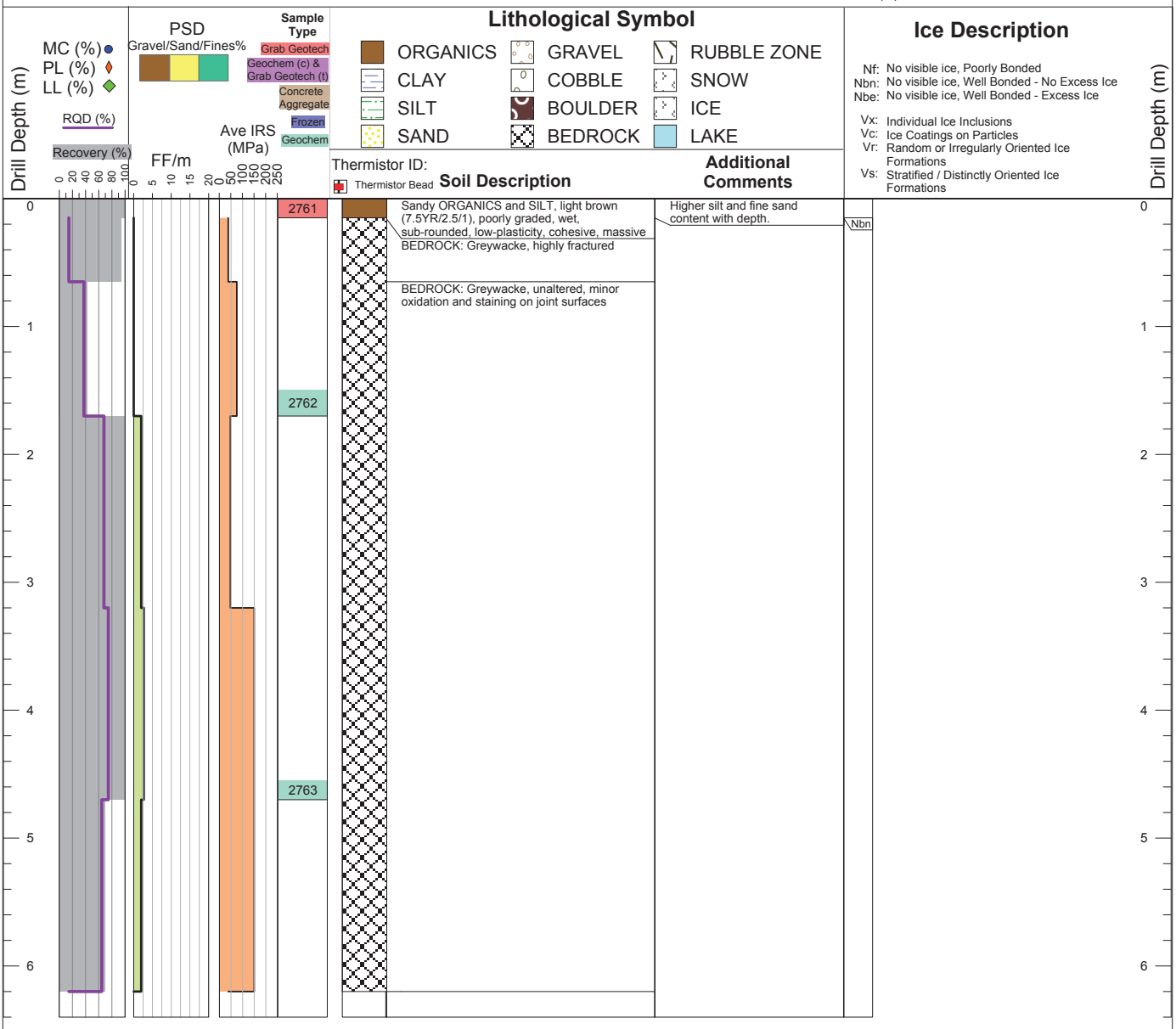
Sabina GOLD & SILVER CORP

PROJECT: Back River

CLIENT: Sabina Gold & Silver Corp

HOLE ID:	**SRK-15-GSE-DH06**
LOCATION:	Kitikmeot, Nunavut
PROJECT NO:	1CS020.009
DRILLING CONTRACTOR:	Major Drilling
DRILLING TYPE & CORE DIA:	Diamond Drilling, HQ
LOGGED BY:	SA
BORING DATE:	3-Apr-15 To 3-Apr-15
FACILITY:	Umwelt Waste Rock Pile

SABINA HOLE ID:	**15GGT042**
COORDINATES:	430360.6 E 7271108.2 N
DATUM:	UTM Zone 13
GROUND ELEV (m):	318.12
AZIMUTH:	0
DIP:	-90
EOH ELEV. (m):	311.92
TOTAL DEPTH (m):	6.2



Ice Description

Nf: No visible ice, Poorly Bonded
Nbn: No visible ice, Well Bonded - No Excess Ice
Nbe: No visible ice, Well Bonded - Excess Ice

Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Random or Irregularly Oriented Ice Formations
Vs: Stratified / Distinctly Oriented Ice Formations

srk consulting

Sabina GOLD & SILVER CORP

PROJECT: 2018 Geotechnical Investigation
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-18-DH09 (18GGT40)
LOCATION: PRIMARY POND HAUL ROAD DAM
PROJECT NO: 1CS020.016
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: M. Stephenson

DRILLING DATE: 26-Mar-18 **TO:** 26-Mar-18
COORDINATES: 429,542 E 7,271,352 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 303.89
AZIMUTH: 0 **DIP:** -90
TOTAL DEPTH (m): 11.00
WATER LEVEL (masl): -

Drillhole Log

Depth (m) | Elev. (masl) | Recovery (%) | RQD (%) | Sample Type* | Lithologic Symbol (Organics, Clay, Silt, Sand, Gravel, ICE, Boulder/Cobbles, Bedrock, No Recovery)

USCS	Soil Description	Drilling Notes & Additional Comments	Permafrost Symbol	Excess Ice Content (%)**	Permafrost Description
OL/OH	Organic Soil (OL/OH) - Very soft, wet, dark brown. Rootlets present.				
SW	Well Graded Sand with Gravel (SW) - Sand is coarse, little gravel, few cobble, wet when thawed (frozen), reddish brown, angular, sharp contact (< 10 cm). Trace organics, gravel up to 30 mm (avg. 5 mm).		Nbe		
			ICE w/ soil	0.9	Clear, hard, vertical foliations.
Bldr	Boulder/Cobbles (Bldr) - Very dark gray. Coarse grained, mafic, some quartz and potassium feldspar.		Nbe		
SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - Little gravel, few silt, wet when thawed (frozen), gray, non-plastic, angular. Sand is fine to coarse, gravel up to 20 mm (avg. 5 mm), black cobble from 2.85-2.95 m.	Noticeably low density due to high ice content.	ICE w/ soil	0.6	Hard, cloudy, difficult to see ice in photos as it looks like a gray, fine grained soil.
SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - Sand is fine to coarse, little gravel, few silt, wet when thawed (frozen), gray, angular.			0.8	Hard, clear.
ICE	ICE		ICE		
SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - Sand is fine to coarse, little gravel, few silt, wet when thawed (frozen), gray, angular.		ICE w/ soil	0.7	
ML	Sandy Silt with Gravel (ML) - Little sand, little gravel, wet when thawed (frozen), gray, non-plastic, angular.			0.9	
			Nbe		
Bldr	Boulder/Cobbles (Bldr) - Large 40 cm boulder. Dark gray, greywacke.		Vs		Stratified ice up to 2 cm thick on top of cobbles.
SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - Little gravel, few silt, wet when thawed (frozen), gray, non-plastic, angular.				
Bldr	Boulder/Cobbles (Bldr) - Large 40 cm boulder. Dark gray, greywacke.				
SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - Little gravel, few silt, wet when thawed (frozen), gray, non-plastic, angular.				
	Bedrock - Fine grained greywacke, mafic, very dark gray, competent rock. Few oxidized fracture surfaces.				

Sample 206443 | 206444 | 206445 | 206446 | 206447

Salinity (ppt) | Atterberg Limits (Moisture Content, Liquid Limit, Plastic Limit) (%) | Moisture Content > 100% (%) | PSD (%) Gravel / Sand / Silt / Clay (%) | PVC Installation/ Backfill

Permafrost Description
Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
**Excess ice content determined by visual estimation in the field

* Cons.: Consolidation Test
Triax.: Triaxial Compression Test
Uniax.: Uniaxial Compression Test

PVC Installation Details
Bentonite Chips
2" PVC

srk consulting

Sabina GOLD & SILVER CORP

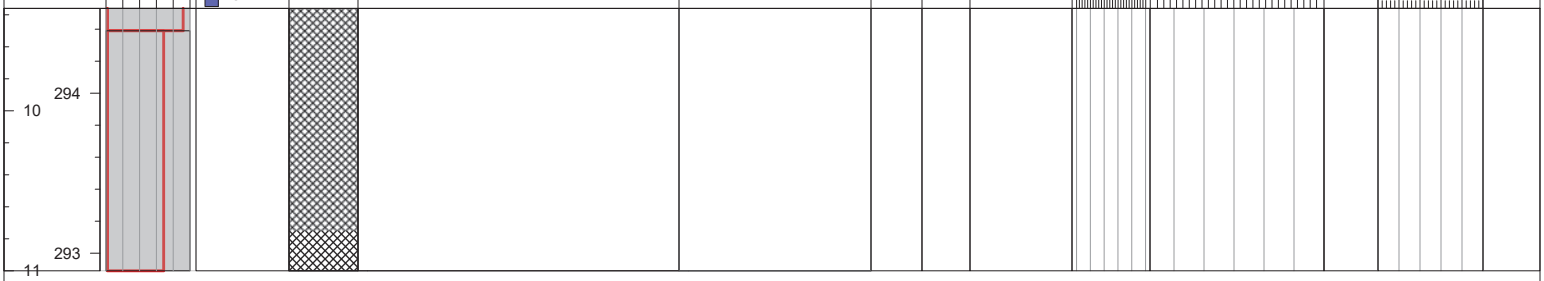
PROJECT: 2018 Geotechnical Investigation
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-18-DH09 (18GGT40)
LOCATION: PRIMARY POND HAUL ROAD DAM
PROJECT NO: 1CS020.016
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: M. Stephenson

DRILLING DATE: 26-Mar-18 **TO:** 26-Mar-18
COORDINATES: 429,542 E 7,271,352 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 303.89
AZIMUTH: 0 **DIP:** -90
TOTAL DEPTH (m): 11.00
WATER LEVEL (masl): -

Drillhole Log

Depth (m) | Elev. (masl) | Recovery (%) | RQD (%) | Sample Type* (Grab, Creep, Cons., Th.Cons., Triax., Uniax.) | Lithologic Symbol (Organics, Clay, Silt, Sand, Gravel, ICE, Boulder/Cobbles, Bedrock, No Recovery) | USCS | Soil Description | Drilling Notes & Additional Comments | Permafrost Symbol | Excess Ice Content (%)** | Permafrost Description | Salinity (ppt) | Atterberg Limits (Moisture Content, Liquid Limit, Plastic Limit) (%) | Moisture Content > 100% (%) | PSD (Gravel / Sand / Silt / Clay (%)) (%) | PVC Installation/ Backfill



Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery

**Excess ice content determined by visual estimation in the field

* Cons.: Consolidation Test
Triax.: Triaxial Compression Test
Uniax.: Uniaxial Compression Test

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

Sabina GOLD & SILVER CORP

PROJECT: 2018 Geotechnical Investigation
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-18-DH10 (18GGT49)
LOCATION: PRIMARY POND HAUL ROAD DAM
PROJECT NO: 1CS020.016
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: M. Stephenson

DRILLING DATE: 06-Apr-18 **TO:** 06-Apr-18
COORDINATES: 429,775 E 7,271,321 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 310.79
AZIMUTH: 0 **DIP:** -90
TOTAL DEPTH (m): 9.20
WATER LEVEL (masl): -

Drillhole Log

Depth (m) | Elev. (masl) | Recovery (%) | RQD (%) | Sample Type* (Grab, Creep, Cons., Th.Cons., Triax., Uniax.)

Lithologic Symbol: Organics, Clay, Silt, Sand, Gravel, ICE, Boulder/Cobbles, Bedrock, No Recovery

Depth (m)	Elev. (masl)	Sample	USCS	Soil Description	Drilling Notes & Additional Comments	Permafrost Symbol	Excess Ice Content (%)**	Permafrost Description
0	310		OL/OH	Organic Soil (OL/OH) - Trace sand, very soft, wet, dark brown. Rootlets present.				
0	310		GW	Well Graded Gravel (GW) - Trace sand, very loose, wet, very dark gray, subangular to subrounded. Equal mixture of dark grey and dark red gravel particles up to 60 mm (avg. 20-30 mm).				
1	309		SM	Silty Sand with Gravel (SM) - Sand is medium, some gravel, little silt, wet when thawed (frozen), olive, angular to subangular. Gravel up to 70 mm (avg. 5-10 mm), primarily mafic, few dark red particles.				
1	309	29213				Nbe		Trace Vx and Vc (hard, clear).
2	308			Boulder/Cobbles (Bldr) - Trace sand, trace gravel, wet, dark gray, angular to subangular. Sand and gravel infilling fractures.				
2	308		SM	Silty Sand with Gravel (SM) - Sand is medium, some gravel, little silt, wet when thawed (frozen), olive, angular to subangular. Gravel up to 80 mm (avg. 5-10 mm), primarily mafic but few dark red particles.				
2	308	29214						
3	307		ML	Silt (ML) - Trace sand, trace gravel, wet when thawed (frozen), gray, angular to subangular. Gravel 5-10 mm, sand is fine.				
3	307	29215						
4	306	29216				ICE w/ soil	0.9	Hard, clear, soil is mostly in horizontal to diagonal layers but also evenly dispersed throughout ice in some areas, some longitudinal ice striations present.
5	305	29217						
5	305			ICE		ICE		Very clear, few air bubbles, no soil.
5	305	29218	ML	Silt (ML) - Trace sand, trace gravel, wet when thawed (frozen), gray, angular to subangular. Gravel 5-10 mm, sand is fine.		ICE w/ soil	0.95	Hard, clear, soil is mostly in horizontal to diagonal layers but also evenly dispersed throughout ice in some areas, some longitudinal ice striations present.
6	304			ICE		ICE		
6	304			Bedrock - Dark greenish gray. Mafic, fine grained, white veins (likely quartz) up to 10 mm thick running mainly longitudinally but also in random directions, trace oxidation on fracture surfaces.				
8	302			Bedrock - Dark greenish gray. Mafic, fine grained, no oxidation on fracture surfaces.	Rubble zone. Core barrel blocked.			Hard, clear.
9	302				Rubble zone. Core barrel blocked.			

Salinity (ppt) | Atterberg Limits (Moisture Content, Liquid Limit, Plastic Limit) (%) | Moisture Content > 100% (%) | PSD (Gravel / Sand / Silt / Clay) (%) | PVC Installation/ Backfill

Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery

**Excess ice content determined by visual estimation in the field

* Cons.: Consolidation Test
Triax.: Triaxial Compression Test
Uniax.: Uniaxial Compression Test

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

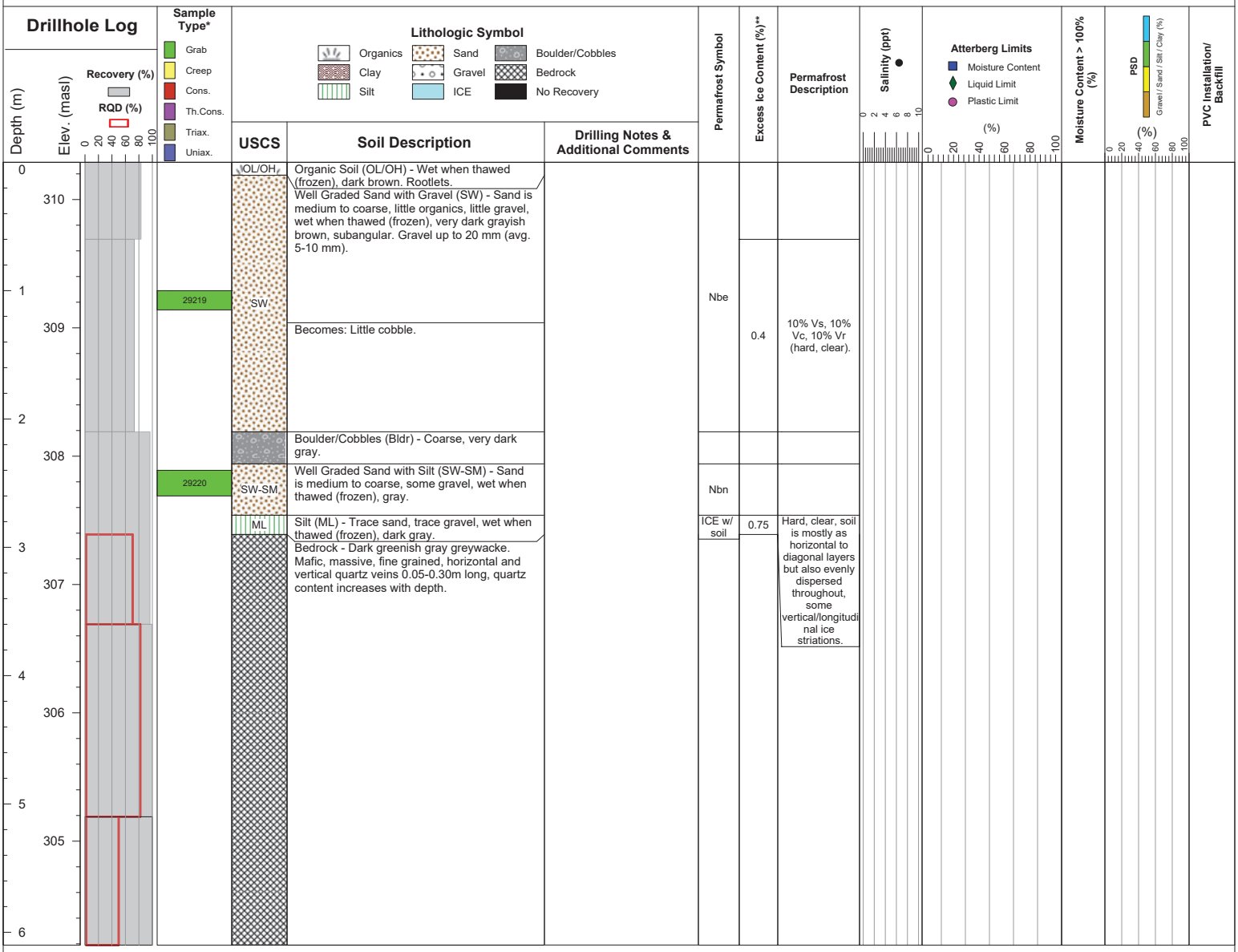
Sabina GOLD & SILVER CORP

PROJECT: 2018 Geotechnical Investigation
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-18-DH26 (18GGT50)
LOCATION: PRIMARY POND HAUL ROAD DAM
PROJECT NO: 1CS020.016
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: M. Stephenson/S. Sam

DRILLING DATE: 06-Apr-18 **TO:** 06-Apr-18
COORDINATES: 429,753 E 7,271,326 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 310.29
AZIMUTH: 0 **DIP:** -90
TOTAL DEPTH (m): 6.10
WATER LEVEL (masl): -

Drillhole Log



USCS	Soil Description	Drilling Notes & Additional Comments	Permafrost Symbol	Excess Ice Content (%)**	Permafrost Description
OL/OH	Organic Soil (OL/OH) - Wet when thawed (frozen), dark brown. Rootlets.				
SW	Well Graded Sand with Gravel (SW) - Sand is medium to coarse, little organics, little gravel, wet when thawed (frozen), very dark grayish brown, subangular. Gravel up to 20 mm (avg. 5-10 mm).		Nbe	0.4	10% Vs, 10% Vc, 10% Vr (hard, clear).
SW	Becomes: Little cobble.				
Bldr	Boulder/Cobbles (Bldr) - Coarse, very dark gray.				
SW-SM	Well Graded Sand with Silt (SW-SM) - Sand is medium to coarse, some gravel, wet when thawed (frozen), gray.		Nbn		
ML	Silt (ML) - Trace sand, trace gravel, wet when thawed (frozen), dark gray.		ICE w/ soil	0.75	Hard, clear, soil is mostly as horizontal to diagonal layers but also evenly dispersed throughout, some vertical/longitudinal ice striations.
	Bedrock - Dark greenish gray greywacke. Mafic, massive, fine grained, horizontal and vertical quartz veins 0.05-0.30m long, quartz content increases with depth.				

Salinity (ppt)
Atterberg Limits: Moisture Content, Liquid Limit, Plastic Limit (%)
Moisture Content > 100% (%)
PSD: Gravel / Sand / Silt / Clay (%)
PVC Installation/ Backfill

Permafrost Description
Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
**Excess ice content determined by visual estimation in the field

* Cons.: Consolidation Test
Triax.: Triaxial Compression Test
Uniax.: Uniaxial Compression Test

PVC Installation Details
Bentonite Chips
2" PVC

srk consulting

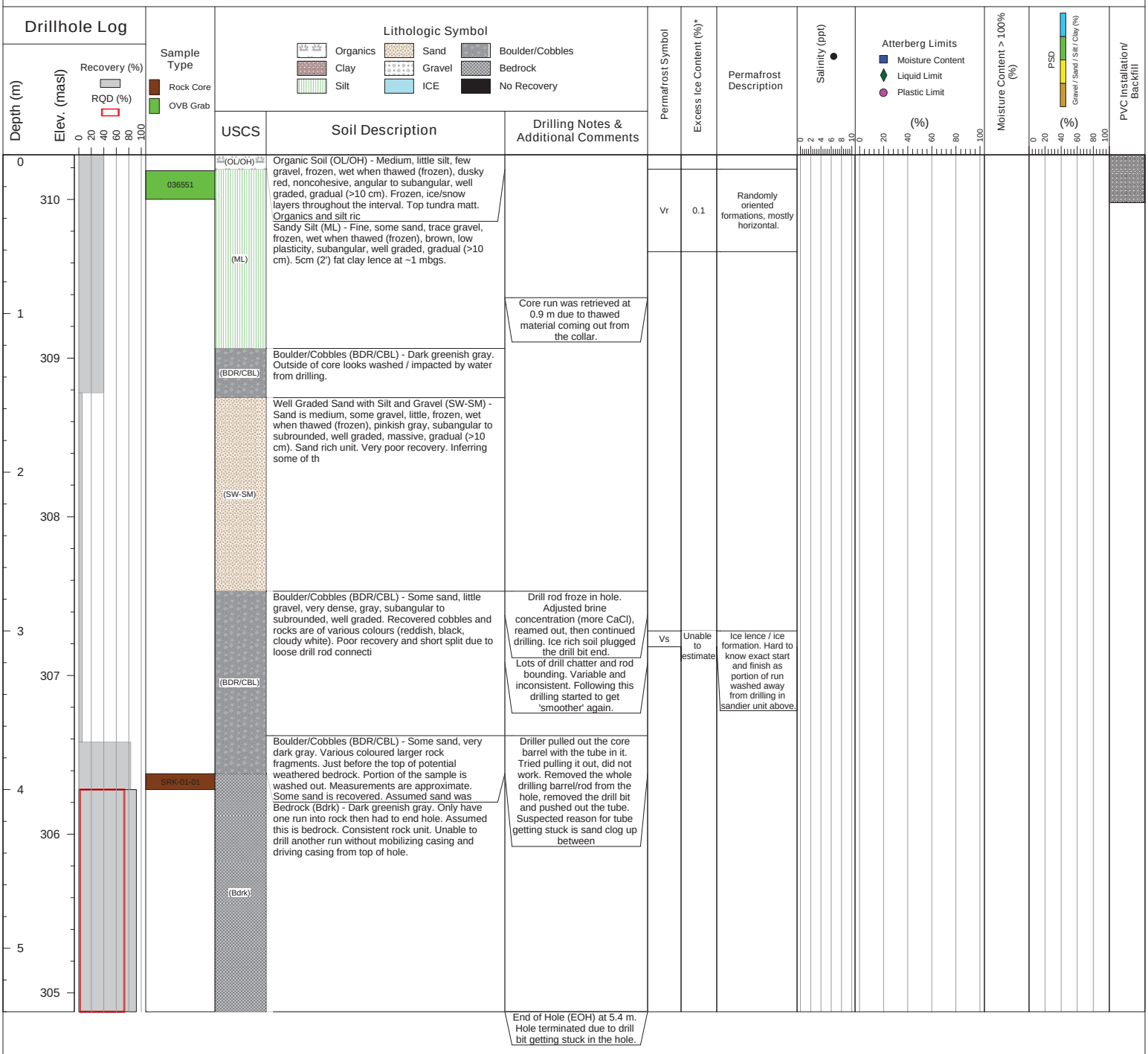
Sabina GOLD & SILVER Corp

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH01-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JU/JBK

DRILLING DATE: 13-Apr-21 TO: 14-Apr-21
COORDINATES: 429,814 E 7,271,208 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 310.3
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 5.40
DEPTH TO BEDROCK (m): 3.90
WATER LEVEL (masl): -

Drillhole Log



Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

Sabina GOLD & SILVER Corp

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH02A-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JBK

DRILLING DATE: 14-Apr-21 TO: 14-Apr-21
COORDINATES: 429,649 E 7,271,332 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 306.8
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 1.50
DEPTH TO BEDROCK (m): -
WATER LEVEL (masl): -

Drillhole Log

Depth (m) | Elev. (masl) | Recovery (%) | RQD (%) | Sample Type (Rock Core, OVB Grab) | Lithologic Symbol (Organics, Clay, Silt, Sand, Gravel, ICE, Boulder/Cobbles, Bedrock, No Recovery)

USCS	Soil Description	Drilling Notes & Additional Comments	Permafrost Symbol	Excess Ice Content (%)*	Permafrost Description
(OL/OH)	Organic Soil (OL/OH) - Medium, few silt, trace sand, frozen, wet when thawed (frozen), brown. Top tundra matt. Very fibrous. Frozen. Rich brown colour.		Nbn	0.05	Well bonded frozen tundra (organics and organic rich soil).
(SM)	Silty Sand (SM) - Sand is fine, some silt, few gravel, frozen, wet when thawed (frozen), grayish brown, slow dilatancy, non-plastic, cohesive, subangular to subrounded, well graded, massive, gradual (>10 cm). Fines around some of the outside portion of co		Nbe	0.1	Well bonded with a little bit of excess ice.
(SW)	Well Graded Sand with Gravel (SW) - Sand is medium, little gravel, trace silt, frozen, wet when thawed (frozen), reddish brown, no dilatancy, non-plastic, noncohesive, subangular to subrounded, well graded, massive, sharp (< 10 cm).		Vs	0.15	Some stratified / distinct ice layers through section. Clear ice lence form 0.8 to 0.83 m.
(BDR/CBL)	Boulder/Cobbles (BDR/CBL) - Dark greenish gray. Cobble with one joint in it. From surrounding bedrock, looks like similar rock unit to surrounding outcrops. Dark, fine grained.	Ice rich zone. End of core looks like ice rich soil washed out.	Vr	0.2	Ice coatings to notable ice and random irregular oriented ice formations.
(SM)	Silty Sand with Gravel (SM) - Sand is fine, little silt, few gravel, frozen, wet when thawed (frozen), gray, slow dilatancy, non-plastic, noncohesive, subangular to subrounded, well graded, massive, gradual (>10 cm). Ice in core. more ice around lower por	End of Hole (EOH) at 1.5 m. Hole terminated due to drill rods getting stuck in hole. Sand grabbing bit. Bit broke off from rods. Drill in same / similar area. Move hole forward to east by ~0.4m and restart hole.			

Sample 036552 (SM); Sample 036553 (SM)

Salinity (ppt) | Atterberg Limits (Moisture Content, Liquid Limit, Plastic Limit) (%) | Moisture Content > 100% (%) | PSD (Gravel / Sand / Silt / Clay (%)) (%) | PVC Installation/ Backfill

Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

Sabina GOLD & SILVER Corp

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH02B-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JU/JBK

DRILLING DATE: 14-Apr-21 TO: 15-Apr-21
COORDINATES: 429,649 E 7,271,332 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 306.8
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 18.00
DEPTH TO BEDROCK (m): 3.50
WATER LEVEL (masl): -

Drillhole Log

Lithologic Symbol: Organics, Clay, Silt, Sand, Gravel, ICE, Boulder/Cobbles, Bedrock, No Recovery

Sample Type: Rock Core, OVB Grab

Recovery (%), RQD (%)

Depth (m)	Elev. (masl)	Sample	USCS	Soil Description	Drilling Notes & Additional Comments	Permafrost Symbol	Excess Ice Content (%)*	Permafrost Description
0	306		(OL/OH)	Organic Soil (OL/OH) - Medium, few silt, trace sand, frozen, wet when thawed (frozen), brown. Top tundra matt. Very fibrous. Frozen. Rich brown colour.	Water on top of the sample. Likely the drilling brine.	Nbn		
1	305	036554	(SM)	Silty Sand with Gravel (SM) - Sand is medium, some silt, little gravel, frozen, wet when thawed (frozen), grayish brown, slow dilatancy, non-plastic, cohesive, subangular, well graded, massive, sharp (< 10 cm). Sharp transition from organic layer. Less sh				
		036555	(ML)	Sandy Silt with Gravel (ML) - Fine, little sand, little gravel, frozen, wet when thawed (frozen), dark olive gray, angular to subangular, well graded, thickly bedded, gradual (>10 cm). Little cobbles along the layer. 5cm cobble at 1.95-2m. Recovered core		Vs	0.4	Mainly stratified, some irregularly oriented formations.
		036556			The run was continuous with signs of small washout. Driller noted that the snow of top of ground was completely removed under the dill bit. Drilling started once snow was cleated to the ground surface.		0.1	
2						Ice	1	Clear, colourless.
						Vr	0.15	
			(BDR/CBL)	Boulder/Cobbles (BDR/CBL) - Very dark gray. Fine grained rock.		Nbe		Cobble between 1.95 and 2m.
		036557		Silty Sand (SM) - Sand is fine, some silt, frozen, wet when thawed (frozen), dark olive gray, subangular to subrounded, well graded, bedded, sharp (< 10 cm).		Nbe		Boulder between 2.1 and 2.22m.
		036558	(SM)	Becomes: Some gravel, little cobble, gray. Significantly more gravel and cobbles. Transition in ~ 5 cm.		Vs	0.08	Some boulders (up to 5 cm in the interval).
3	304			Becomes: Very loose, wet. Top 35 cm is washed out.				
		036559						
4	303			Weathered Bedrock (Bdrk) - Some gravel, very dark gray. Crushed up on the top. Orange (oxidation) staining from 3.6 to 3.8 m (close to vertical fracture (80 to 85 degrees from horizontal)).				
				Bedrock (Bdrk) - Very dark gray. Orange (oxidation) staining at 4.2m (close to horizontal fractures). Fracture likely 2-3cm wide or filled with fines.				
5	302			Bedrock (Bdrk) - Very dark gray. More frequent and larger oxidised fractures than the run above.				
6	301	SRK-02B-01		Bedrock (Bdrk) - Very dark gray.	Recovered the core at 7.2 due to difficulties with drilling. Drilled the 7.2-7.5 separately. Oxidised fractures from 6.4 to 7 m.			
	300							

Salinity (ppt)

Atterberg Limits: Moisture Content, Liquid Limit, Plastic Limit (%)

Moisture Content > 100% (%)

PSD (%) — Gravel / Sand / Silt / Clay (%)

PVC Installation/ Backfill

Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery

*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

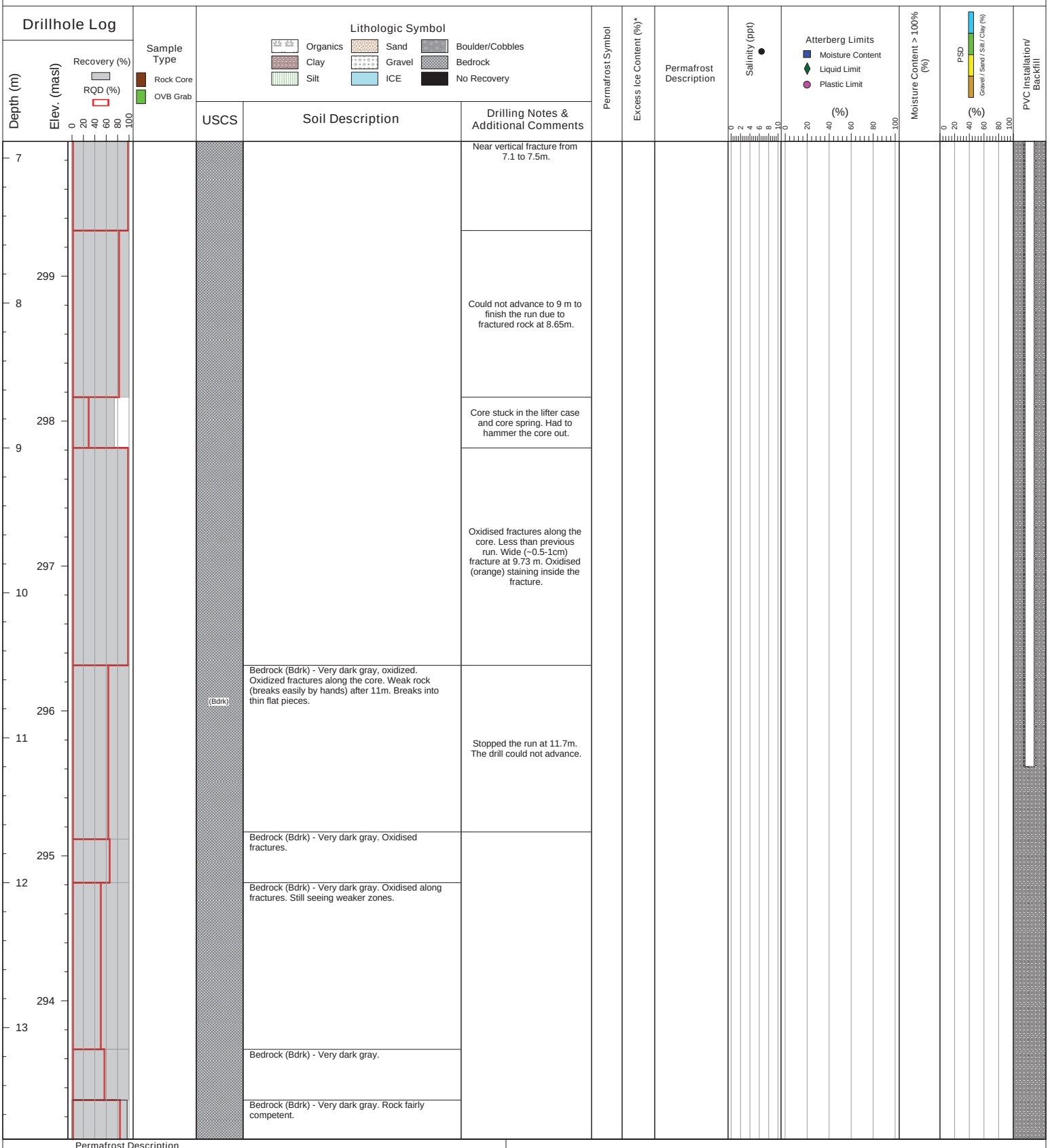
Sabina GOLD & SILVER Corp

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH02B-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JU/JBK

DRILLING DATE: 14-Apr-21 TO: 15-Apr-21
COORDINATES: 429,649 E 7,271,332 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 306.8
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 18.00
DEPTH TO BEDROCK (m): 3.50
WATER LEVEL (masl): -

Drillhole Log



Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
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ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

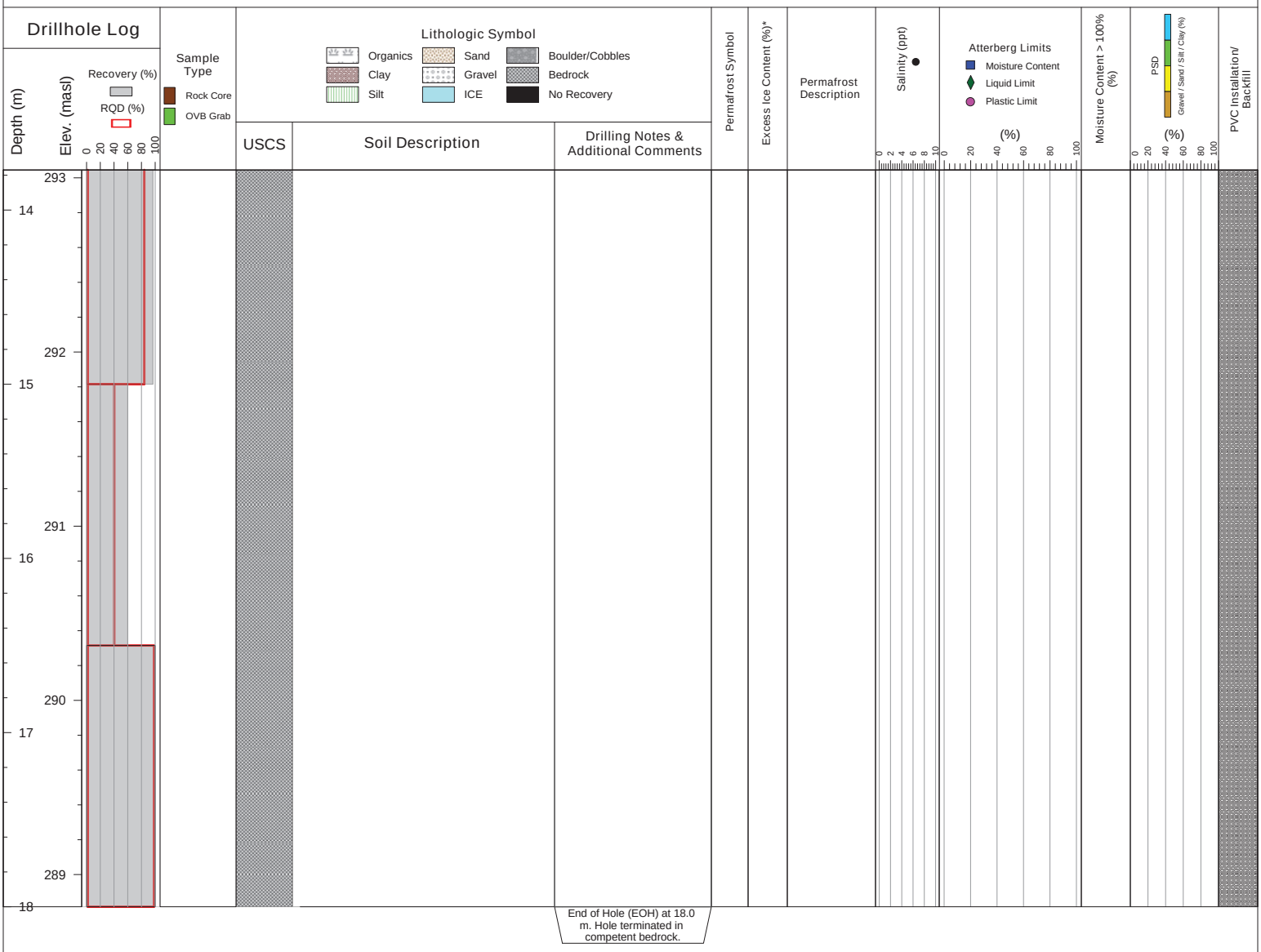
Sabina GOLD & SILVER CORP

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH02B-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JU/JBK

DRILLING DATE: 14-Apr-21 TO: 15-Apr-21
COORDINATES: 429,649 E 7,271,332 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 306.8
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 18.00
DEPTH TO BEDROCK (m): 3.50
WATER LEVEL (masl): -

Drillhole Log



Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
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ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

Sabina GOLD & SILVER Corp

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH03-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JU/JBK

DRILLING DATE: 16-Apr-21 TO: 16-Apr-21
COORDINATES: 429,577 E 7,271,392 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 306.3
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 19.50
DEPTH TO BEDROCK (m): 11.10
WATER LEVEL (masl): -

Drillhole Log

Lithologic Symbol: Organics, Clay, Silt, Sand, Gravel, ICE, Boulder/Cobbles, Bedrock, No Recovery

Sample Type: Rock Core, OVB Grab

Depth (m)	Elev. (masl)	Recovery (%) / RQD (%)	Sample	USCS	Soil Description	Drilling Notes & Additional Comments
0	306			(OL/OH)	Organic Soil (OL/OH) - Medium, some silt, little sand, semi-frozen, wet when thawed (frozen), brown. Tundra mat. Distinct dark brown layer at 0.5m. Fines and little sand washed up to the top. Top portion is wet, lower portion is frozen.	
1	305		036560	(SM)	Silty Sand with Gravel (SM) - Sand is medium, some gravel, some silt, frozen, wet when thawed (frozen), dark olive brown, subangular to subrounded, well graded, thickly bedded, gradual (>10 cm). little red and black cobble/boulders. 2 cm clay layer with s	
2	304		036561			
				(BDR/CBL)	Boulder/Cobbles (BDR/CBL) - Very dark gray, Angular. White and cloudy streaks at ~45 degree angle form the horizontal.	
3	303		036562	(SM)	Silty Sand with Gravel (SM) - Sand is coarse, some silt, some gravel, frozen, wet when thawed (frozen), dark olive brown, subangular to subrounded, well graded, thickly bedded, gradual (>10 cm). Boulder at 3.9 m.	
4	302		036563		Silty Sand (SM) - Sand is medium, some silt, little gravel, frozen, moist, dark olive brown, subangular to subrounded, well graded, thickly bedded, gradual (>10 cm). Coarse gravel/boulder at 5.1 m.	
			036564			
5	301		036565		Sandy Silt (ML) - Medium, some sand, few gravel, frozen, wet when thawed (frozen), gray, subangular to subrounded, well graded, massive. Silt is loosely suspended within ice stratifications.	
6	300		036566			

Permafrost Symbol	Excess Ice Content (%)*	Permafrost Description
Nf		Partially thawed. The middle of the core is hard.
Vc	0.03	Ice coating around coarser particles. Some horizontally stratified layers.
Nbn		
Vs	0.3	Ice formations are 3-4 mm in thickness. Clear and colourless. Mainly around larger particles. Air bubbles withing the ice layers.
	0.15	Clear and colourless. Individual ice inclusions (5-6 mm in dia) at ~2.2m.
Vc		
Vs	0.5	Mainly around larger articles. Some stratified formations.
Vx	0.05	Thick ice formations. Clear, colourless and hard.
Vr	0.2	More ice inclusions around the boulder.
Vs		Clear and colourless ice formations.
Vx	0.1	Clear and colourless ice. Up to 8mm dia inclusions.
	0.05	Same as above but smaller/thinner inclusions.
Vs	0.1	
		Thin stratifications.
Vr		Thicker (~3mm) stratifications. Clear and colourless.
Ice	0.6	
Vs		
Ice	0.4	Clear, colourless and hard horizontal layers of very thin ice.
Vs	0.6	
Ice w/ soil	0.8	Thin (~1-3mm) ice stratifications. Colourless, clear.
Vs	0.6	Clear, colourless and hard. Clear and colourless. Up to 1 cm thick stratifications. Clear and colourless.

Salinity (ppt)

Atterberg Limits: Moisture Content, Liquid Limit, Plastic Limit (%)

Moisture Content > 100% (%)

PSD (%) — Gravel / Sand / Silt / Clay (%)

PVC Installation/ Backfill

Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

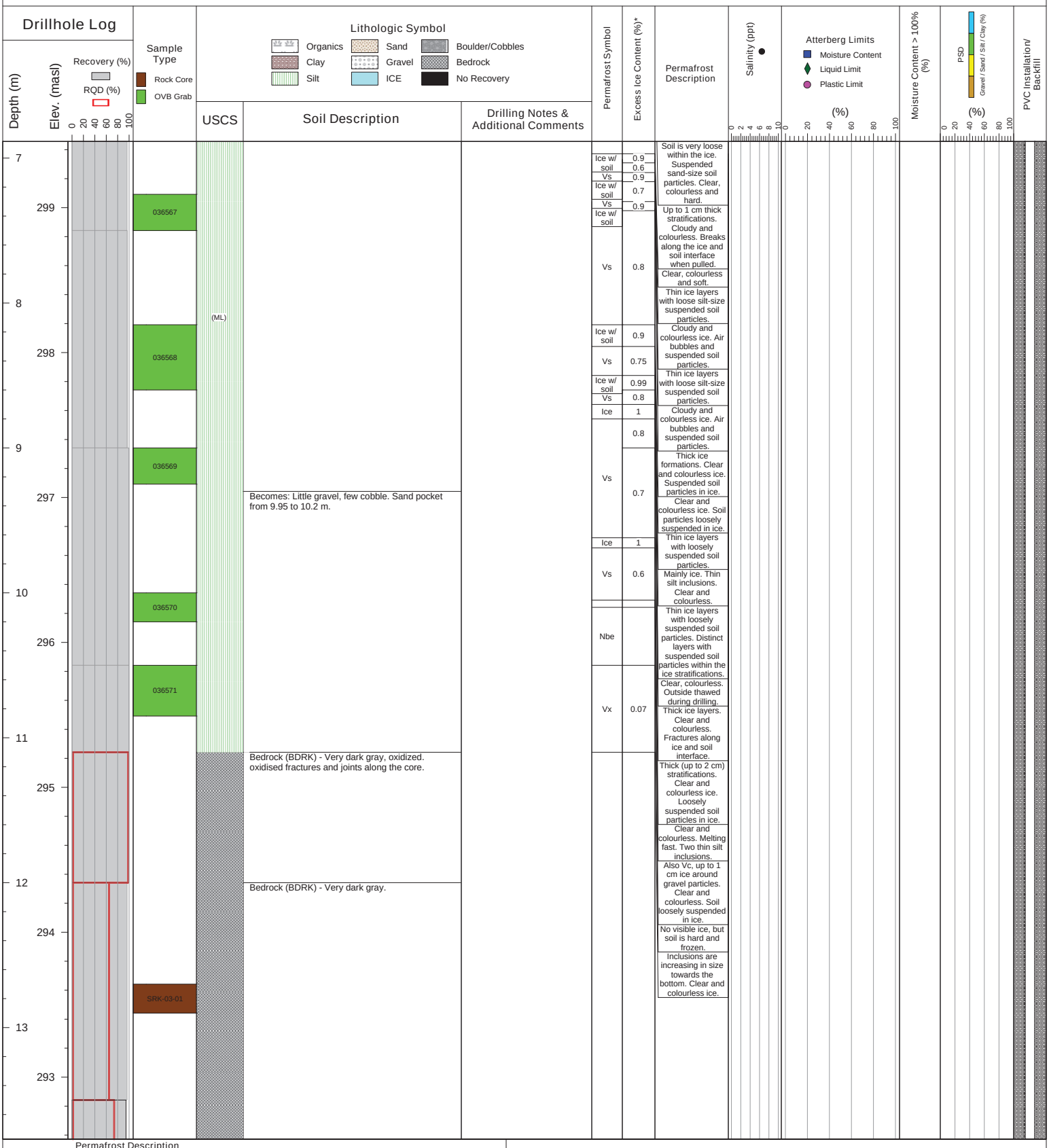
Sabina GOLD & SILVER CORP

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH03-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JU/JBK

DRILLING DATE: 16-Apr-21 TO: 16-Apr-21
COORDINATES: 429,577 E 7,271,392 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 306.3
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 19.50
DEPTH TO BEDROCK (m): 11.10
WATER LEVEL (masl): -

Drillhole Log



Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

srk consulting

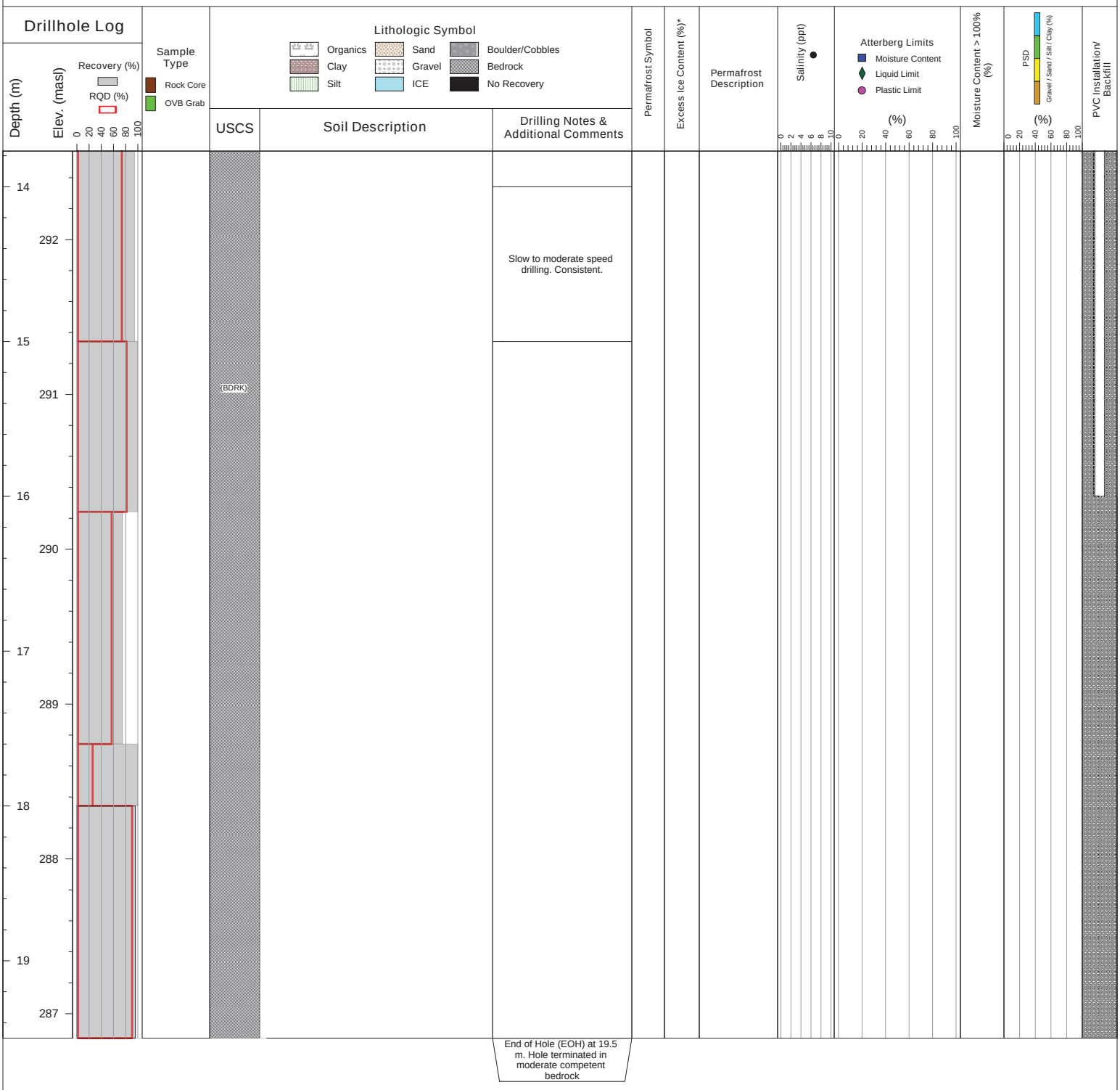
Sabina GOLD & SILVER CORP

PROJECT: 2021 Geotechnical Drilling
CLIENT: Sabina Gold & Silver Corp

DRILLHOLE ID: SRK-21-DH03-PP
LOCATION: Primary Pond Dam
PROJECT NO: 1CS020.021
DRILL TYPE: Diamond Drill
CORE DIA (mm): 63.5
CONTRACTOR: Major Drilling Group International
LOGGED BY: JU/JBK

DRILLING DATE: 16-Apr-21 TO: 16-Apr-21
COORDINATES: 429,577 E 7,271,392 N
DATUM: UTM Projection NAD83 Zone 13
GROUND ELEV. (masl): 306.3
AZIMUTH: 0 DIP: -90
TOTAL DEPTH (m): 19.50
DEPTH TO BEDROCK (m): 11.10
WATER LEVEL (masl): -

Drillhole Log



Permafrost Description

Uf: Unfrozen
Nf: Poorly Bonded
Nbn: Well Bonded - No Excess Ice
Nbe: Well Bonded - Excess Ice
ICE: Ice without soil inclusions
ICE w/ soil: Ice with soil inclusions
Vx: Individual Ice Inclusions
Vc: Ice Coatings on Particles
Vr: Randomly Oriented Ice Formations
Vs: Stratified Ice Formations
UN: Unknown, due to melting or no recovery
*Excess ice content determined by visual estimation in the field

PVC Installation Details

Bentonite Chips
2" PVC

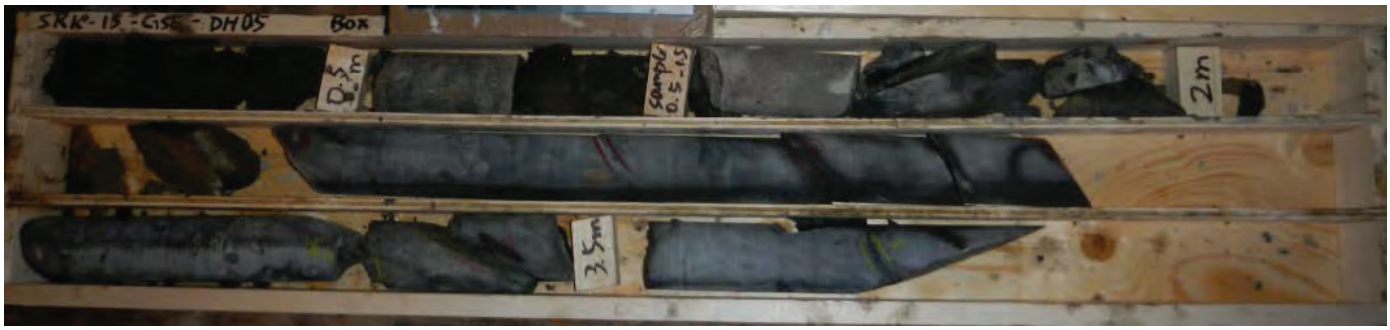
Attachment 3 Core Box Photos

SRK-15-GSE-DH04: 0 – 3.3m

SRK-15-GSE-DH04: 3.3 – 6.4m

SRK-15-GSE-DH04:6.4 – 8.5m

srk consulting	Sabina GOLD & SILVER CORP.	2015 Overburden Geotechnical Investigation Program		
		SRK-15-GSE-DH04		
		Core Box Photo Log		
Job No: 1CS020.009	Back River Project	Date: October 2015	Reviewed: EH	Figure: **DH04 - 1**
Filename: BackRiver_Corephotos_DH02-06.pptx				



SRK-15-GSE-DH05: 0 – 3.75m

SRK-15-GSE-DH05: 3.75 – 6.5m

SRK-15-GSE-DH05:6.45– 8m

srk consulting	Sabina GOLD & SILVER CORP.	2015 Overburden Geotechnical Investigation Program		
		SRK-15-GSE-DH05		
		Core Box Photo Log		
Job No: 1CS020.009	Back River Project	Date: October 2015	Reviewed: EH	Figure: **DH05 - 1**
Filename: BackRiver_Corephotos_DH02-06.pptx				

SRK-15-GSE-DH06: 0 – 3.74m

SRK-15-GSE-DH06: 3.74 – 6.2m

srk consulting	Sabina GOLD & SILVER CORP.	2015 Overburden Geotechnical Investigation Program		
		SRK-15-GSE-DH06		
		Core Box Photo Log		
Job No: 1CS020.009	Back River Project	Date: October 2015	Reviewed: EH	Figure: **DH06 - 1**
Filename: BackRiver_Corephotos_DH02-06.pptx				

Photo 26. SRK-18-DH09 (18GGT40)

Photo 27. SRK-18-DH09 (18GGT40) 0.0–4.2 m, box 1, 2018-03-26

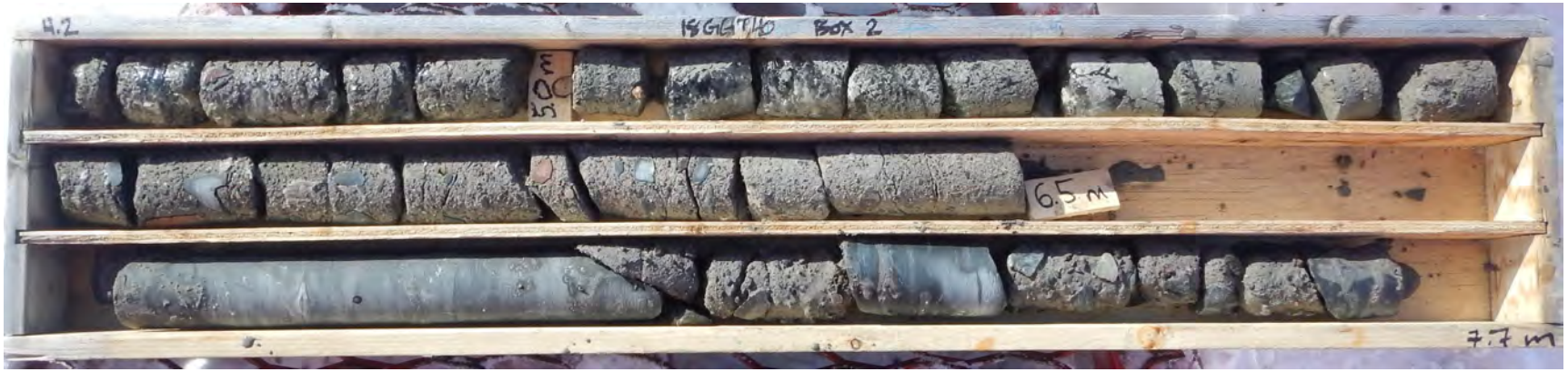


Photo 28. SRK-18-DH09 (18GGT40) 4.2–7.7 m, box 2, 2018-03-26

Photo 29. SRK-18-DH09 (18GGT40) 0.0–11.0 m, box 1-3, 2018-03-26

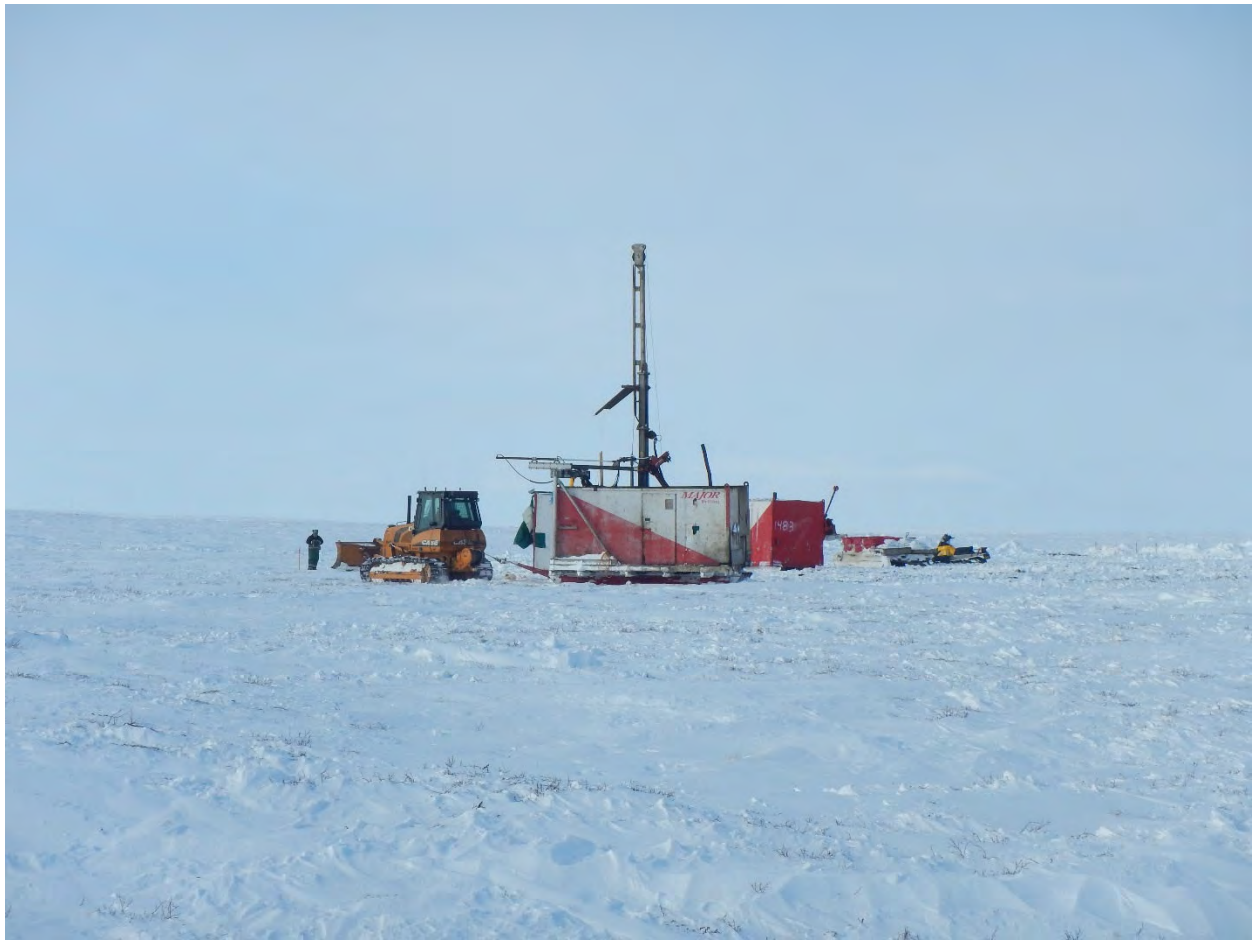


Photo 30. SRK-18-DH10 (18GGT49)

Photo 31. SRK-18-DH10 (18GGT49) 0.0–9.2 m, box 1-3, 2018-04-06

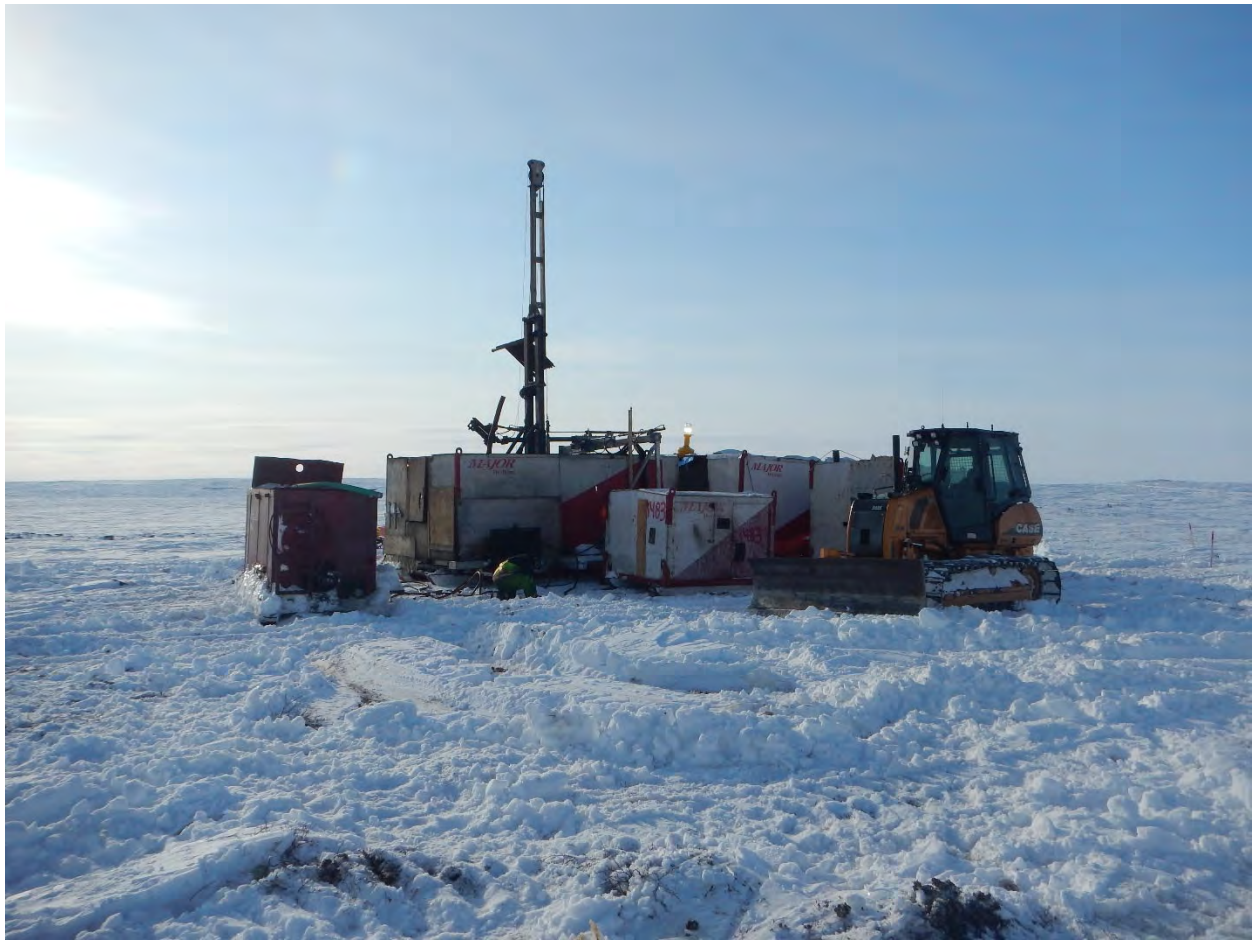


Photo 74. SRK-18-DH26 (18GGT50)

Photo 75. SRK-18-DH26 (18GGT50) 0.0–2.8 m, box 1, 2018-04-06

SRK-21-DH01-PP, 0.0-5.4 m, box 1 of 1

srk consulting	Sabina GOLD & SILVER CORP.	2021 Geotechnical Drilling Program **Core Box Photos** **SRK-21-DH01-PP** **Sheet 1 of 1**
Job No: 1CS020.021 Filename: AppC2_CoreBoxPhotos.pptx	Back River Project	Date: June 2021 | Approved: JBK | Figure: **C2.1**

SRK-21-DH02A-PP, 0.0-1.5 m, box 1 of 1

srk consulting	Sabina GOLD & SILVER CORP.	2021 Geotechnical Drilling Program **Core Box Photos SRK-21-DH02A-PP Sheet 1 of 1**		
Job No: 1CS020.021 Filename: AppC2_CoreBoxPhotos.pptx	Back River Project	Date: June 2021	Approved: JBK	Figure: **C2.2**

SRK-21-DH02B-PP, 0.0-3.75 m, box 1 of 6

SRK-21-DH02B-PP, 3.75-6.9 m, box 2 of 6

SRK-21-DH02B-PP, 6.9-9.6 m, box 3 of 6

srk consulting	Sabina GOLD & SILVER CORP.	2021 Geotechnical Drilling Program **Core Box Photos SRK-21-DH02B-PP Sheet 1 of 2**		
Job No: 1CS020.021 Filename: AppC2_CoreBoxPhotos.pptx	Back River Project	Date: June 2021	Approved: JBK	Figure: **C2.3**

SRK-21-DH02B-PP, 9.6-12.6 m, box 4 of 6

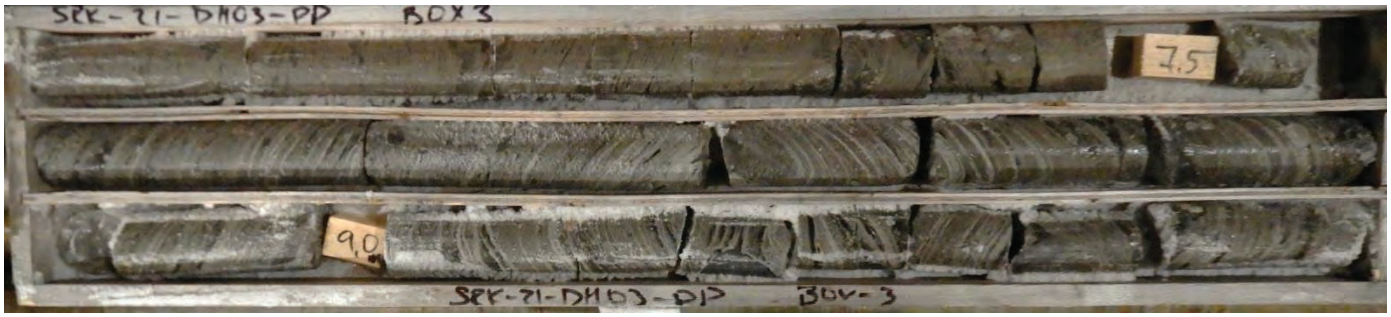
SRK-21-DH02B-PP, 12.6-16.1 m, box 5 of 6

SRK-21-DH02B-PP, 16.1-18.0 m, box 6 of 6

srk consulting	Sabina GOLD & SILVER CORP.	2021 Geotechnical Drilling Program **Core Box Photos SRK-21-DH02B-PP Sheet 2 of 2**		
Job No: 1CS020.021 Filename: AppC2_CoreBoxPhotos.pptx	Back River Project	Date: June 2021	Approved: JBK	Figure: **C2.4**

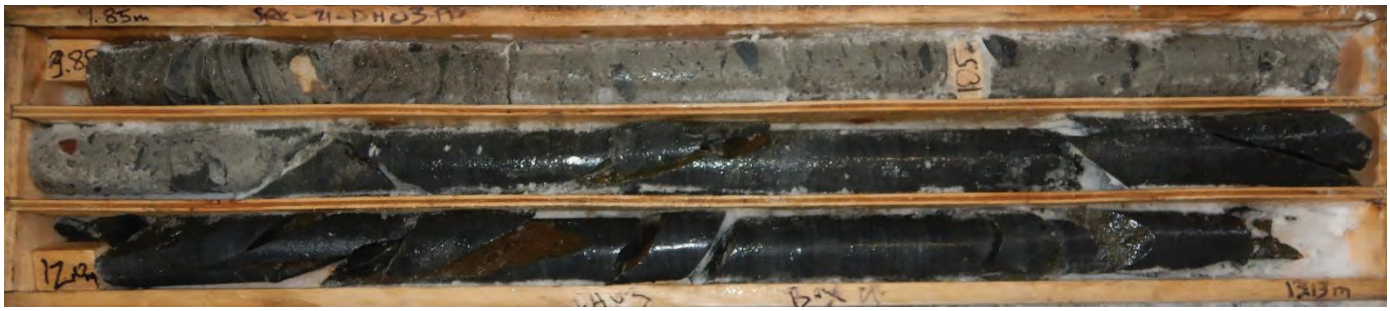
SRK-21-DH03-PP, 0.0-3.4 m, box 1 of 6

SRK-21-DH03-PP, 3.4-6.55 m, box 2 of 6

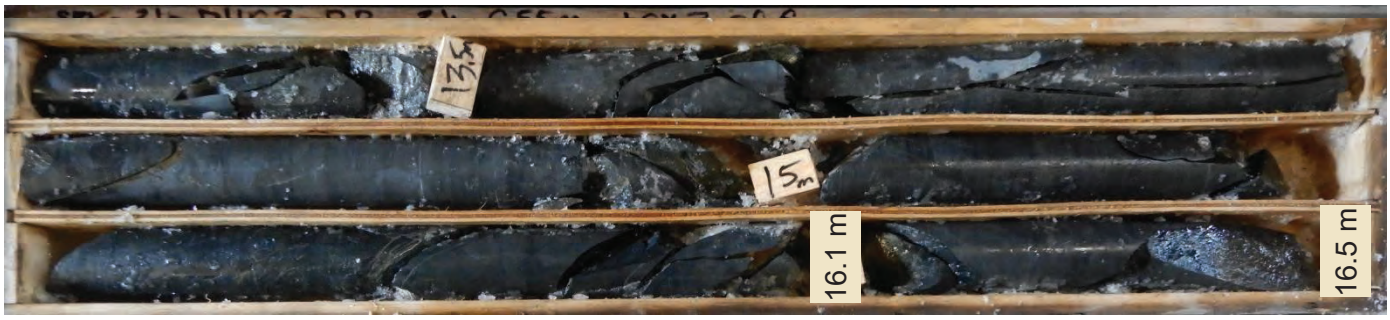


SRK-21-DH03-PP, 6.55-9.85 m, box 3 of 6

srk consulting	Sabina GOLD & SILVER CORP.	2021 Geotechnical Drilling Program **Core Box Photos SRK-21-DH03-PP Sheet 1 of 2**		
Job No: 1CS020.021 Filename: AppC2_CoreBoxPhotos.pptx	Back River Project	Date: June 2021	Approved: JBK	Figure: **C2.5**



SRK-21-DH03-PP, 9.85-13.13 m, box 4 of 6



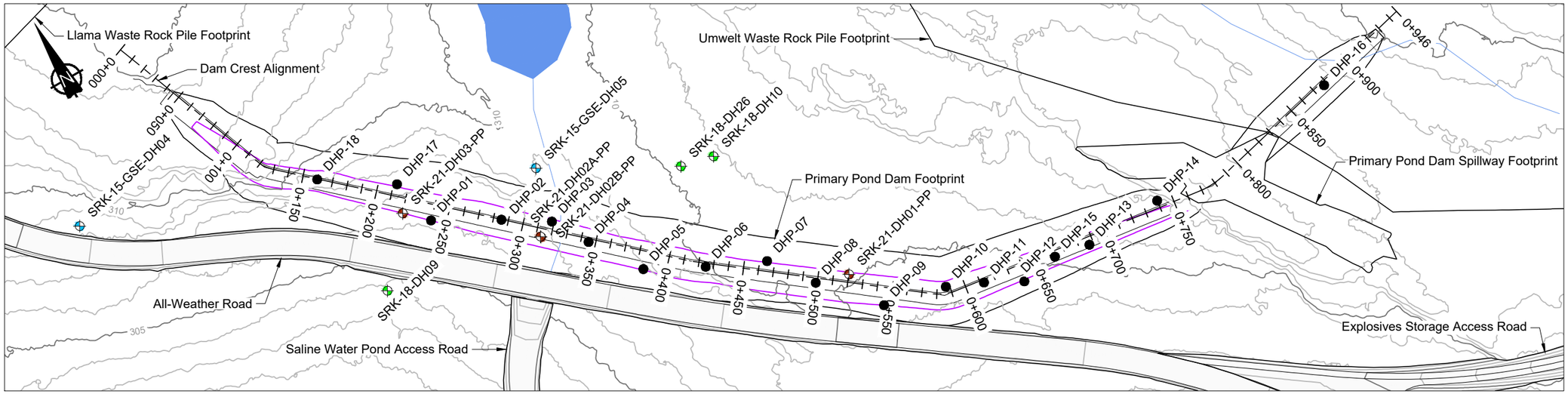
SRK-21-DH03-PP, 13.13-16.5 m, box 5 of 6

SRK-21-DH03-PP, 16.5-19.5 m, box 6 of 6

srk consulting	Sabina GOLD & SILVER CORP.	2021 Geotechnical Drilling Program **Core Box Photos SRK-21-DH03-PP Sheet 2 of 2**		
Job No: 1CS020.021 Filename: AppC2_CoreBoxPhotos.pptx	Back River Project	Date: June 2021	Approved: JBK	Figure: **C2.6**

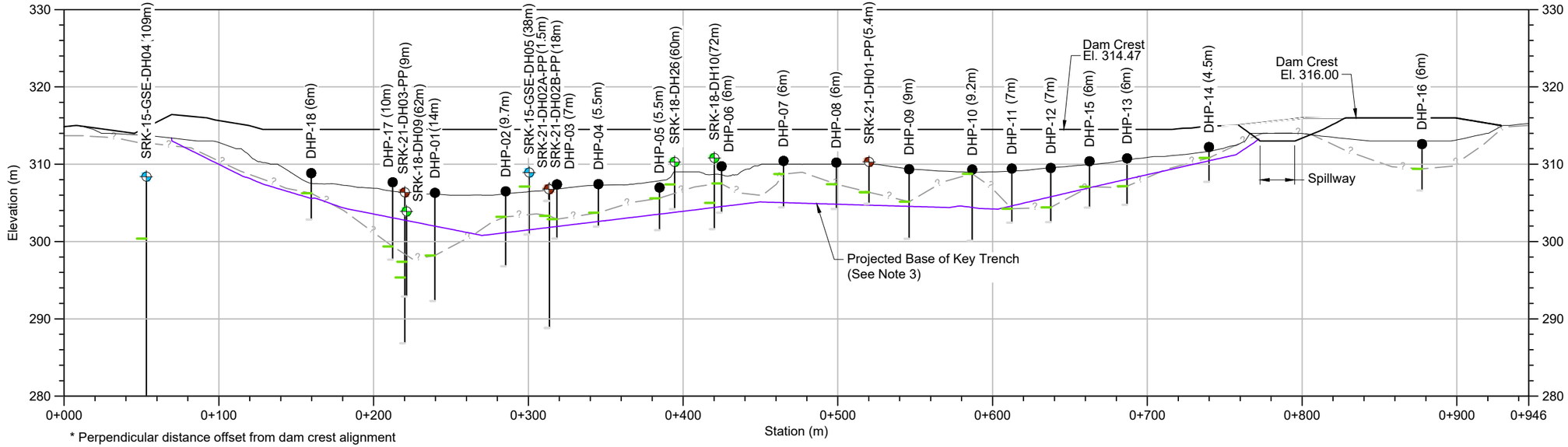
ATTACHMENT E

PRIMARY POND PERCOLATION HOLES



Primary Pond Dam Final Configuration Plan

0m 30 60 90 120



* Perpendicular distance offset from dam crest alignment

Primary Pond Dam Crest Profile

0m 6 12 18 24 Vertical

0m 30 60 90 120 Horizontal

LEGEND

- 2015 Drillholes
- 2018 Drillholes
- 2021 Drillholes
- 2022 Percolation Drillholes
- Drillholes Bedrock Contact
- End of Hole
- Contours
- Design Surface
- Excavation
- Existing Ground
- Inferred Bedrock
- Waterbody
- Other Design Infrastructure
- Primary Pond Design Infrastructure
- Primary Pond Design Key Trench

NOTES

1. Contours are shown at 1.0 m intervals.
2. All units are in meters unless otherwise specified.
3. Base of key trench on this profile is based on a section down the dam crest. Note that the key trench centerline and the dam crest centerline do not share the exact same alignment and overall the chainages vary in any given location (between the key trench and dam crest shown in these drawings) in the range of ±5 offset, ±50 station chainage.
4. Inferred Bedrock surface provided by Client and modified with 2021 and 2022 drillholes.

REFERENCES

NAD83 UTM Zone 13.

Sabina # SBR6SRK -22-C-PLN-0015

REFERENCE DRAWINGS		REVISIONS								
DRAWING NO.	DRAWING TITLE	NO.	DESCRIPTION	CHK'D	APP'D	DATE	NO.	DESCRIPTION	CHK'D	APP'D	DATE
--	--	--	--	--	--	--	AB-01	As-Built	JD/AT	JBK	02/2023
							0	Issued for Construction	JD/AT	JBK	11/2022
--	--	--	--	--	--	--	A	Issued for Permit	JD/AT	JBK	08/2022

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JU/JBK	SGE	JU/CS/AT
CHECKED:	APPROVED:	DATE:
JD/AT/VB	JBK	February 9, 2023

FILE NAME: CAPR000396 - UM-PP-Sample holes.dwg

Sabina GOLD & SILVER CORP

Back River

SRK JOB NO.: CAPR000396 REG. NO.:

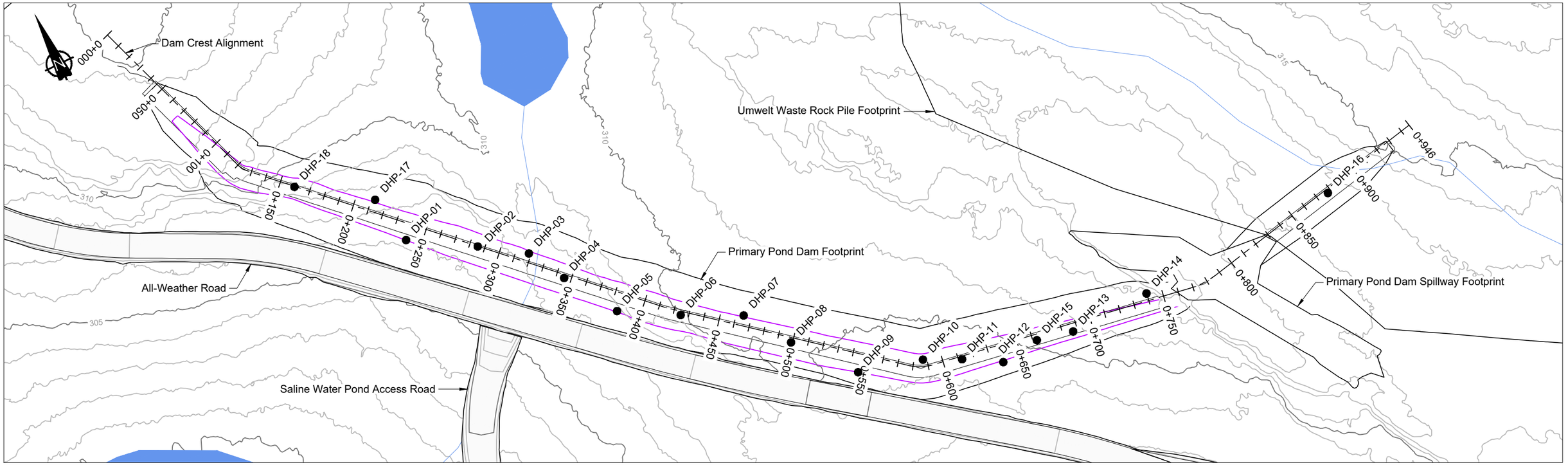
Primary Pond

DRAWING TITLE: Existing Foundation Investigation Plan View

DRAWING NO. UM-PP-104

REVISION NO. AB-01

C:\Users\sepp\SRK Consulting\F\5203 Goose Lake (Back River) - 1040_AutoCAD\ACAD_C3D\CAPR000396_WaterMgmt\Primary Pond\CAPR000396 - UM-PP-Sample holes.dwg



Proposed Percolation Hole Locations

As-built Drillholes				
Point #	Northing	Easting	Elevation	Description
203	7271147.72	430016.50	312.22	DHP-14
204	7271158.65	430151.27	312.60	DHP-16
205	7271439.81	429538.81	308.84	DHP-18
206	7271410.45	429583.27	307.66	DHP-17
207	7271378.26	429590.86	306.29	DHP-01
208	7271355.20	429631.72	306.49	DHP-02
209	7271337.32	429660.25	307.38	DHP-03
210	7271313.31	429674.62	307.42	DHP-04
211	7271279.45	429697.17	306.98	DHP-05

As-built Drillholes				
Point #	Northing	Easting	Elevation	Description
212	7271260.04	429733.96	309.72	DHP-06
213	7271242.82	429771.26	310.42	DHP-07
214	7271214.12	429792.15	310.21	DHP-08
215	7271178.42	429824.06	309.35	DHP-09
216	7271168.48	429865.92	309.30	DHP-10
217	7271158.18	429889.34	309.43	DHP-11
218	7271145.41	429913.02	309.51	DHP-12
219	7271149.42	429938.84	310.38	DHP-15
220	7271144.85	429962.74	310.75	DHP-13

NOTES

1. Contours are shown at 1.0m intervals.
2. All units are in meters unless otherwise specified.
3. It is suggested that an air-track drill (quarry drill) be used to complete the percolation testing.
4. Percolation holes to be advanced a minimum 2.0m into bedrock.
5. Percolation test boreholes should be a minimum of 4-6 inches (100-150mm) in diameter.
6. Air-track drill cuttings should be sampled every 0.5m for the upper (top) 4.0m below ground surface (bgs), and every 1m thereafter to a depth of 10.0mbgs. Material returned from a depth greater than 10mbgs should be sampled every 2.0m. Photographs should be taken of the collected samples in the field.
7. Observations of massive ground ice and crushed ice cuttings should be logged and sampled based on occurrence.
8. Collected samples should be double bagged, tied, and labeled at the time of field collection. All samples should be maintained in a frozen state until processed by the receiving laboratory to preserve moisture content.
9. Once all percolation test locations are drilled the testing will be completed on site as directed by the Engineer.

LEGEND

- Percolation Drillhole/Testing Location
- Contours
- Waterbody
- Other Design Infrastructure
- Primary Pond Design Infrastructure
- Primary Pond Key Trench Surface

REFERENCES

NAD83 UTM Zone 13.

0m 20 40 60 80 100

Sabina # SBR6SRK -22-C-PLN-0062

DRAWING NO.	DRAWING TITLE	NO.	DESCRIPTION	CHK'D	APP'D	DATE
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		0	Issued for Construction	JD/AT	JBK	11/2022
--	--	A	Issued for Permit	JD/AT	JBK	08/2022
REVISIONS						

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CHECKED:	APPROVED:	DATE:
JD/AT/VB	JBK	February 9, 2023

FILE NAME: CAPR000396 - UM-PP-Sample holes.dwg

Sabina GOLD & SILVER CORP

Back River

SRK JOB NO.: CAPR000396 REG. NO.:

Primary Pond

DRAWING TITLE: As-built Percolation Drillhole/Testing Locations Plan

DRAWING NO. UM-PP-105 REVISION NO. AB-01

C:\Users\sepp\SRK Consulting\FS203 Goose Lake (Back River) - 1940_AutoCAD\ACAD_C3D\CAPR000396_WaterMgmt\Primary Pond\CAPR000396 - UM-PP-Sample holes.dwg