



November 30, 2021

Alexco Keno Hill Mining Corp.  
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ISSUED FOR USE  
FILE: 704-ENG.WARC04064-01  
Via Email: stolgyesi@alexcoresource.com

**Attention:** Sebastien Tolgyesi, P.Eng., P.Geo.  
Operations Manager

**Subject:** 2021 Annual Geotechnical Inspection – Mining Related Structures  
Bellekeno Mine – Keno City, YT

## 1.0 INTRODUCTION

NND EBA Land Protection Corp. operating as NELPCo Limited Partnership (NELPCo) was retained Alexco Keno Hill Mining Corp (Alexco) to complete the 2021 geotechnical inspection of the structures related to development of the Bellekeno Mine near Keno City, Yukon.

NELPCo is a limited partnership corporation owned by the NND Development Corporation (NNDDC) and Tetra Tech Canada Inc. (Tetra Tech). The inspection was conducted by Tetra Tech, NELPCo's exclusive engineering services provider.

Authorization to complete this work was received by way of an Alexco Purchase order (PO #00753) dated July 9, 2021. Please see the enclosed report provided by Tetra Tech which summarizes the finding from the annual inspection, and corresponding recommendations.

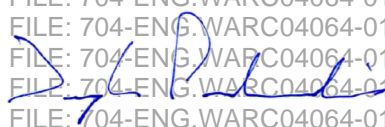
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### 3.0 CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,  
NELPCo Limited Partnership

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# APPENDIX A

## LIMITATIONS ON THE USE OF THIS DOCUMENT

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# LIMITATIONS ON USE OF THIS DOCUMENT

## GEOTECHNICAL

### 1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of NELPCO Limited Partnership's (NELPCo) Client (the "Client") as specifically identified in the NELPCO Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). NELPCO does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by NELPCO.

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Both electronic file and/or hard copy versions of NELPCO's Instruments of Professional Service shall not, under any circumstances, be altered by any party except NELPCO. NELPCO's Instruments of Professional Service will be used only and exactly as submitted by NELPCO.

Electronic files submitted by NELPCO have been prepared and submitted using specific software and hardware systems. NELPCO makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

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Services performed by NELPCO for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

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### 1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with NELPCO with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for NELPCO to properly provide the services contracted for in the Contract, NELPCO has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

### 1.5 INFORMATION PROVIDED TO NELPCO BY OTHERS

During the performance of the work and the preparation of this Professional Document, NELPCO may have relied on information provided by third parties other than the Client.

While NELPCO endeavours to verify the accuracy of such information, NELPCO accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

### 1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to NELPCO at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

NELPCO is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

## 1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, NELPCO has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

## 1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. NELPCO does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

## 1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

## 1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. NELPCO does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

## 1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

## 1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

## 1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

## 1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

## 1.15 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

## 1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

## 1.17 SAMPLES

NELPCO will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

## 1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. NELPCO cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

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Bellekeno Mine – Keno City, YT

## 1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech), NELPCo's exclusive engineering service provider, was retained by Alexco Keno Hill Mining Corp (Alexco) to complete the 2021 annual geotechnical inspection of structures related to development of the Bellekeno Mine near Keno City, Yukon. Authorization to complete this work was received by way of an Alexco purchase order (PO# 00753) dated July 09, 2021.

## 2.0 SCOPE OF SERVICES

The following is Tetra Tech's scope of services for the 2021 annual inspection as was presented in the email submitted to Alexco on June 16, 2021:

- Complete a visual inspection of the earth structures identified by Alexco, which include:
  - Bellekeno Mine
    - Potentially acid generating (PAG) waste storage facility;
    - Bellekeno Road waste rock pile;
    - Bellekeno 625 water treatment ponds and discharge line;
    - Lightning Creek bridge abutments (Onek and Bellekeno);
    - Mill water storage ponds; and
    - Dry stacked tailings facility, including readings of the slope indicators and thermistor cables that are still operational within and around the dry stacked tailings facility.

The location of these structures is shown on Figure 1.

While on site, a sludge containment storage area located at Alexco's Birmingham property was also inspected.

Finally, an inspection report will be prepared that documents the results of the inspection, including a summary of the stability, integrity, and status of all the inspected structures, and any recommendations for remedial actions.

## 3.0 INSPECTION SUMMARY AND RECOMMENDATIONS

The 2021 annual inspection was completed by Tetra Tech representatives Mr. Richard Trimble, P.Eng., and Mr. Taylor Pasloski, P.Eng. on August 26, 2021 along with Alexco representatives Mr. Sebastien Tolgyesi, P.Eng., P.Geo. and Mr. Neil Chambers, P.Eng. The following sections summarize observations for each structure and describe remedial actions required to improve stability, if necessary. The recommended remedial actions have been separated into geotechnical stability concerns and ongoing facility maintenance to assist in the prioritization of remedial efforts. Selected photographs taken during the inspection are included where appropriate.

### 3.1 Bellekeno Mine

#### 3.1.1 PAG Waste Facility

The PAG waste storage facility is located south of the Bellekeno portal, as shown on Figure 1. The facility has not been used since mining operations were suspended in 2013, but currently contains some volume of waste rock. At the time of the inspection, the perimeter berms appeared intact with no visible sign of instability. Some water was accumulated in the base of the storage facility and the entrance was in rough shape. If the PAG is extended beyond the access berm, the berm, liner, and underlay should be replaced and repaired. It is understood that this PAG material will eventually be moved back underground.



Photo 1: Bellekeno PAG Storage Facility (August 26/21)

### 3.1.2 Bellekeno Road Waste Rock Pile

The Bellekeno waste rock pile forms a portion of the Bellekeno Haul Road and is located north of the Bellekeno portal, as shown on Figure 1. At the time of the inspection the side slopes of the waste rock pile appeared to be intact and stable. No remedial action is required.



Photo 2: Bellekeno Road Waste Rock Pile/Haul Road (August 26/21)

### 3.1.3 Bellekeno 625 Water Treatment Ponds

The Bellekeno 625 water treatment ponds are located north of the Bellekeno 625 portal, as shown on Figure 1. The facility consists of two water treatment ponds that were both operating at the time of inspection. The primary treatment pond was operating at the discharge invert elevation with a freeboard of 0.5 m below the perimeter berm crest at the time of the inspection. The secondary pond was also operating at the discharge elevation, with a freeboard of 0.5 m in the south end. Treated water discharges through an HDPE pipe onto the hillside above Lightning Creek.

A small rip in the liner was identified at the end of the secondary pond, above the water and near pond outlet. The rip should be repaired.





Photo 3: Small Rip in Liner at Bellekeno 625 Water Treatment Ponds (August 26/21)

The pipe from the treated water pond discharges directly onto the natural soils above Lightning Creek without any protection from erosion. The discharge pipe was still unhooked at a coupler upstream from the original discharge location. The outlet of the pipe has subsided into the ground and only the top half of the pipe was exposed, and the ground was starting to erode. The pipe should be elevated or moved so that the outlet is unobstructed. If further erosion takes place, riprap armoring must be installed.



Photo 4: Bellekeno 625 Water Treatment Ponds, Discharge Location (August 26/21)

### 3.1.4 Lightning Creek Bridge Abutments (Bellekeno Haul Road)

The Lightning Creek Bridge on the Bellekeno Haul Road is located southwest of Keno City, as shown on Figure 1. The bridge is a single span steel structure with a wooden deck founded on earthfilled timber cribbed abutments. The abutments were stable at the time of the inspection and are sufficiently protected by riprap armouring from erosion of Lightning Creek.

Minor erosion was identified near the bridge abutment as shown in Photo 5. This erosion should be backfilled with coarse rock and the berms built up to maintain stability. The abutments should be monitored for future erosion.



Photo 5: Bellekeno Haul Road, Approach Erosion (August 26/21)

### 3.1.5 Lightning Creek Bridge Abutments (Onek Road)

The Lightning Creek Bridge on the Onek Road is located east of Keno City, as shown on Figure 1. The bridge is a single span steel structure founded on earth filled timber cribbing abutments. The abutments were stable at the time of the inspection and are sufficiently protected from erosion by riprap. No remedial action is required for the Lightning Creek Bridge on the Onek Road at this time.



Photo 6: Lightning Creek Bridge Abutments, Onek Road (August 26/21)

### 3.1.6 Mill Water Storage Ponds

The two mill water storage ponds are located at the Keno Hill District Mill Site, west of Keno City, as shown on Figure 1. At the time of the inspection the mill was operating, and both ponds contained some water with a freeboard of about 1.2 m below the perimeter berms in the older pond, and an estimated 2.4 m of freeboard in the newer pond. No remedial action is required for these ponds.



Photo 7: Mill Water Storage Pond (August 26/21)



Photo 8: Mill Water Storage Pond (August 26/21)

### 3.1.7 Dry Stacked Tailings Facility

The dry stacked tailings facility (DSTF) is located at the Keno Hill District Mill Site west of Keno City, as shown on Figure 1. Mining production has resumed since the previous inspection and tailings have been placed for the first time since 2013. All the tailings previously placed have been regraded, covered with organic materials and glacial till, then seeded as part of the progressive reclamation activities.

The condition of the DSTF requires immediate attention:

- A “sinkhole” and blow out (Photo 9 and Photo 10) were identified on the north end of the DSTF;
- Where the new tailings were placed, precipitation caused some tailings to erode (Photo 11) and accumulate in the runoff collection ditch;
- A shallow rotational failure (Photo 12) was identified on the north end of the DSTF, which has filled the runoff collection ditch; and
- A tension crack on the surface of the DSTF was observed near the approximate location of a tension crack identified in previous inspections.

The approximate location of all instabilities identified during the inspection are shown on Figure 2. The runoff berm should be cleaned out of tailings and other material from the shallow failure. The erosion gullies should be repaired, and the tailings should either be reclaimed or temporarily covered to reduce future erosion. The sinkhole, blow out, shallow failure, and tension cracks should be excavated to competent ground (no deeper than 2.5 m or to the liner), backfilled with excavated soil, and compacted with a backhoe bucket. The replaced material should be sloped no steeper than 3H:1V.

In addition to covering the tailings to prevent erosion, Alexco requested the use of velocity dissipation structures within the runoff berm of the DSTF to contain any eroded tailings and to help reduce operational maintenance. Tetra Tech has no reservations with this proposal. The dissipation structures should be constructed of granular soils free of fines and inspected and maintained frequently to ensure accumulated tailings do not exceed the runoff berm.

All of these locations should continue to be monitored and repaired as necessary over the year so that the potential for water ingress into the DSTF is reduced. Ideally, the repairs should be capped higher than the surrounding terrain to keep surface runoff water away.

It is recommended that the locations of all these instabilities be mapped, and new locations (if any), along with associated photographs, be added to an annual survey and submitted to the geotechnical engineer. The annual survey should be done in the spring, prior to any repairs.



Photo 9: DSTF Sinkhole (August 26/21)



Photo 10: DSTF Blow-Out (August 26/21)



Photo 11: DSTF Tailings Erosion (August 26/21)



Photo 12: DSTF Shallow Failure into Runoff Collection Ditch (August 26/21)

### 3.1.8 Instrumentation

Performance of the DSTF is monitored by taking regular readings on the instrumentation installed during and after construction. DSTF instrumentation consists of seven ground temperature cables installed to monitor permafrost (six in natural soils adjacent to the DSTF and one through tailings placed within the DSTF footprint), and three slope indicators installed to monitor lateral movement of the foundation soils. The locations of installed DSTF instrumentation are shown on Figure 2.

It should be noted that some critical instrumentation located within and adjacent to the DSTF is in need of repair and/or replacement. As further described below, the ground temperature cable in the centre of the DSTF (BH40) is the most critical of these installations and must be replaced as soon as possible.

#### 3.1.8.1 Background Ground Temperature Readings

Updated ground temperature readings were collected from five of the six ground temperature cables installed in natural soils adjacent to the DSTF during the inspection. Readings were not collected from BH17 as the protective steel casing has been damaged, making the ground temperature cable inaccessible. The protective casing should be repaired or removed to allow for instrumentation readings.

As indicated on the updated ground temperature profiles included in Appendix B, the ground temperatures near surface have stabilized. Ground temperature at depth have indicated that ground temperature has decreased over the last few years. Some of the beads on ground temperature cables indicating temperatures less than  $-3^{\circ}\text{C}$  may have been compromised and continued annual instrumentation readings are recommended to monitor ground temperature conditions.

The ground temperature cable installed in BH40, which extends through the tailings and into the foundation soils below to DSTF has been damaged and requires replacement. This is a critical installation needed to confirm design assumptions and provide ongoing temperature monitoring.

Access to BH15, BH18, and BH32 has overgrown with vegetation over the years and should be cleared to allow access for future monitoring.

#### 3.1.8.2 Slope Indicator Readings

An updated lateral movement profile developed from readings collected from the slope indicator installed in BH36 is included in Appendix C. 50 mm of lateral movement was identified in BH36 since the last measurement. Tetra Tech does not consider this movement to be of concern at this time, but annual monitoring should continue. Alexco has excavated an area to the north west of the slope indicator to use as a laydown area. The movement identified in BH36 is in the direction of the laydown, and the displacement is considered as “creep” (or relaxing) of the soil towards the excavation.

BH38 was blocked off with what is assumed ice at approximately 5 m. The slope indicator should be cleaned out and preserved using liquid suitable for use in permafrost conditions. The slope indicator located at BH28 is blocked and was not recorded. This instrument has been non-operational for several years and should be replaced.

## 3.2 Birmingham Mine

### 3.2.1 Sludge Containment Facility

A lined pad was constructed below the water treatment plant at Alexco's Birmingham property to support a sludge containment bag. The water treatment plant was currently in operation at the time of the inspection, and no instabilities were noted. No remedial action is required for the facility.



Photo 13: Birmingham Mine (August 26/21)



## 4.0 CONCLUSION AND RECOMMENDATIONS

The structures inspected pose no significant risk to the environment or human health and safety in their current condition. The remedial actions recommended in the previous sections of this report are summarized in Table 4.1.

**Table 4.1: Summary of Remedial Recommendations**

| Structure  | Stability Recommendations   | Maintenance Recommendations  |
|--|---|--|
| <b>BELLEKENO</b>                                       |   |  |
| PAG Waste Storage Facility                             | <ul style="list-style-type: none"> <li>▪ None</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Repair access;</li> <li>▪ Repair and replace berm, liner, and underlay if extending the PAG beyond the access berm.</li> </ul>  |
| Bellekeno Road Waste Rock Pile                         | <ul style="list-style-type: none"> <li>▪ None</li> </ul>  | <ul style="list-style-type: none"> <li>▪ None</li> </ul>   |
| Bellekeno 625 Water Treatment Ponds                    | <ul style="list-style-type: none"> <li>▪ None</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Repair rip near secondary pond outlet;</li> <li>▪ Discharge line unhooked at coupler. Lift or move discharge hose to clear outlet. Monitor erosion and place riprap if required.</li> </ul>   |
| Lightning Creek Bridge Abutments (Bellekeno Haul Road) | <ul style="list-style-type: none"> <li>▪ None</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Backfill erosion at bridge abutment with granular soil;</li> <li>▪ Monitor for further erosion.</li> </ul>  |
| Lightning Creek Bridge Abutments (Onek Road)           | <ul style="list-style-type: none"> <li>▪ None</li> </ul>  | <ul style="list-style-type: none"> <li>▪ None</li> </ul>   |
| Mill Water Storage Ponds                               | <ul style="list-style-type: none"> <li>▪ None</li> </ul>  | <ul style="list-style-type: none"> <li>▪ None</li> </ul>   |
| Dry Stacked Tailings Facility                          | <ul style="list-style-type: none"> <li>▪ Repair or remove casing at BH17 to allow for ground temperature monitoring;</li> <li>▪ Install a new ground temperature cable to replace damaged cable at BH40;</li> <li>▪ Purge and clean BH38 and preserve using liquid suitable for use in permafrost conditions (silicone oil); and</li> <li>▪ Replace the slope indicator located at BH28.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Repair sink hole and blow out;</li> <li>▪ Clean out runoff berm of tailings and repair erosion gullies;</li> <li>▪ Repair shallow failure;</li> <li>▪ Repair tension crack;</li> <li>▪ Reclaim or cover fresh tailings to reduce erosion;</li> <li>▪ Annual spring survey and photographs of instabilities, prior to repairs;</li> <li>▪ Continue annual instrumentation readings to monitor DSTF foundation conditions; and</li> <li>▪ Trim vegetation for future access to BH15, BH18, and BH32.</li> </ul> |
| <b>BIRMINGHAM</b>                                      |   |  |
| Sludge Containment Facility                            | None  | None   |

## 5.0 LIMITATIONS OF REPORT

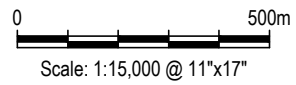
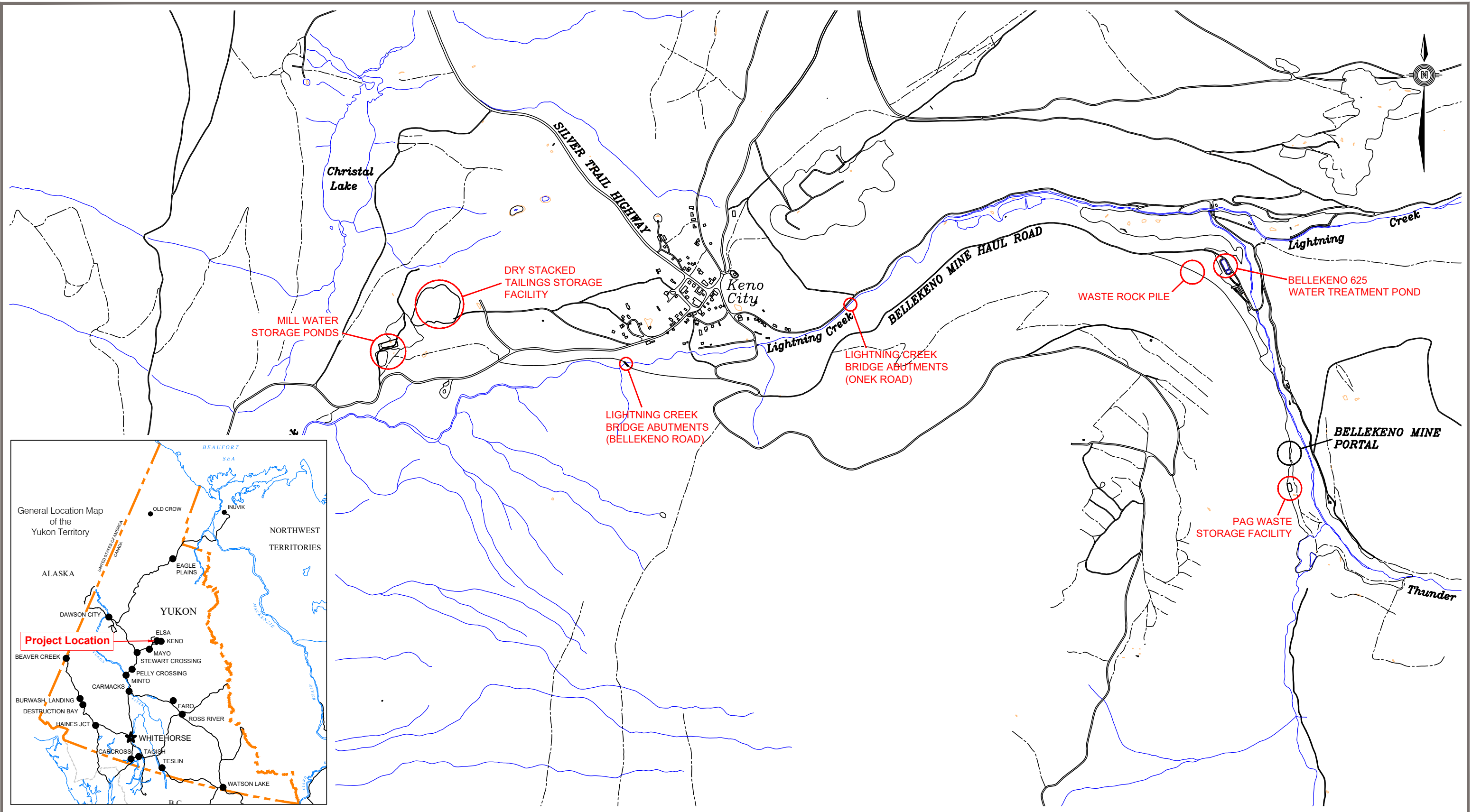
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## FIGURES

- Figure 1 Site Plan Showing Structure Locations
- Figure 2 Site Plan Showing Borehole and Instrument Locations

Q:\Whitehorse\Drawings\Keno\ENG.WARC04064-01 - 2021 AKHM Annual Inspection\ENG.WARC04064-01 Fig\_1\_RD.dwg [FIGURE 1] September 29, 2021 - 3:18:38 pm (BY: PASL.OSKI, TAYLOR)



**NOTES**  
 CONTOUR INFORMATION IS BASED ON DRAWING PROVIDED BY ALEXCO RESOURCE INC.



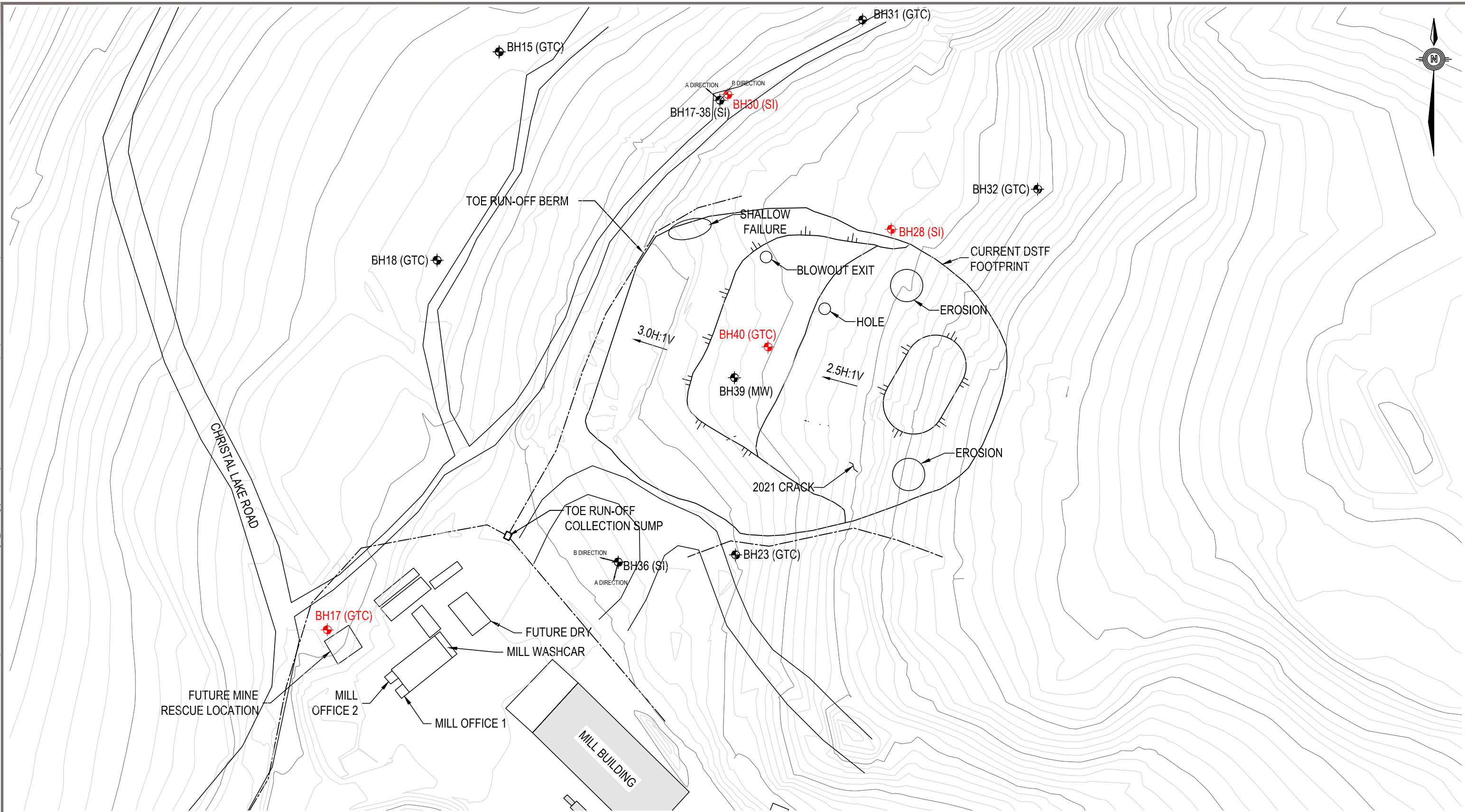
**2021 AKHM ANNUAL INSPECTION  
 BELLEKENO MINE SITE - KENO CITY, YUKON**

**SITE PLAN SHOWING  
 STRUCTURE LOCATIONS**

|                                 |                            |            |          |
|---------------------------------|----------------------------|------------|----------|
| PROJECT NO.<br>ENG.WARC04064-01 | DWN<br>TP                  | CKD<br>JRT | REV<br>0 |
| OFFICE<br>EBA-WHSE              | DATE<br>September 29, 2021 |            |          |

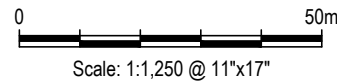
**Figure 1**

Q:\WhitehorseData\2021 drawings\Keno\ENG.WARC04064-01 - 2021 AKHM Annual Inspection\ENG.WARC04064-01 Fig.2\_RD.dwg [FIGURE 2] November 03, 2021 - 12:51:07 pm (BY: PASLOSKI, TAYLOR)



**LEGEND**

- GTC - GROUND TEMPERATURE CABLE
- SI - SLOPE INDICATOR
- MW - MONITORING WELL



**NOTE**

INSTRUMENTATION SHOWN IN RED HAS BEEN DAMAGED OR DESTROYED AND IS NOT READABLE. SOME OF THESE NEED TO BE REPAIRED AND/OR REPLACED. SEE ACCOMPANYING REPORT TEXT.

CLIENT



2021 AKHM ANNUAL INSPECTION  
BELLEKENO MINE SITE - KENO CITY, YUKON

**SITE PLAN SHOWING  
BOREHOLE AND INSTRUMENTATION LOCATIONS**

|                                 |                            |            |          |
|---------------------------------|----------------------------|------------|----------|
| PROJECT NO.<br>ENG.WARC04064-01 | DWN<br>TP                  | CKD<br>JRT | REV<br>0 |
| OFFICE<br>EBA-WHSE              | DATE<br>September 29, 2021 |            |          |

**Figure 2**

## APPENDIX A

### TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

# LIMITATIONS ON USE OF THIS DOCUMENT

## GEOTECHNICAL

### 1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

### 1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

### 1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

### 1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

### 1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

### 1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.



## 1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

## 1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

## 1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

## 1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

## 1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

## 1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

## 1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

## 1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

## 1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

## 1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

## 1.17 SAMPLES

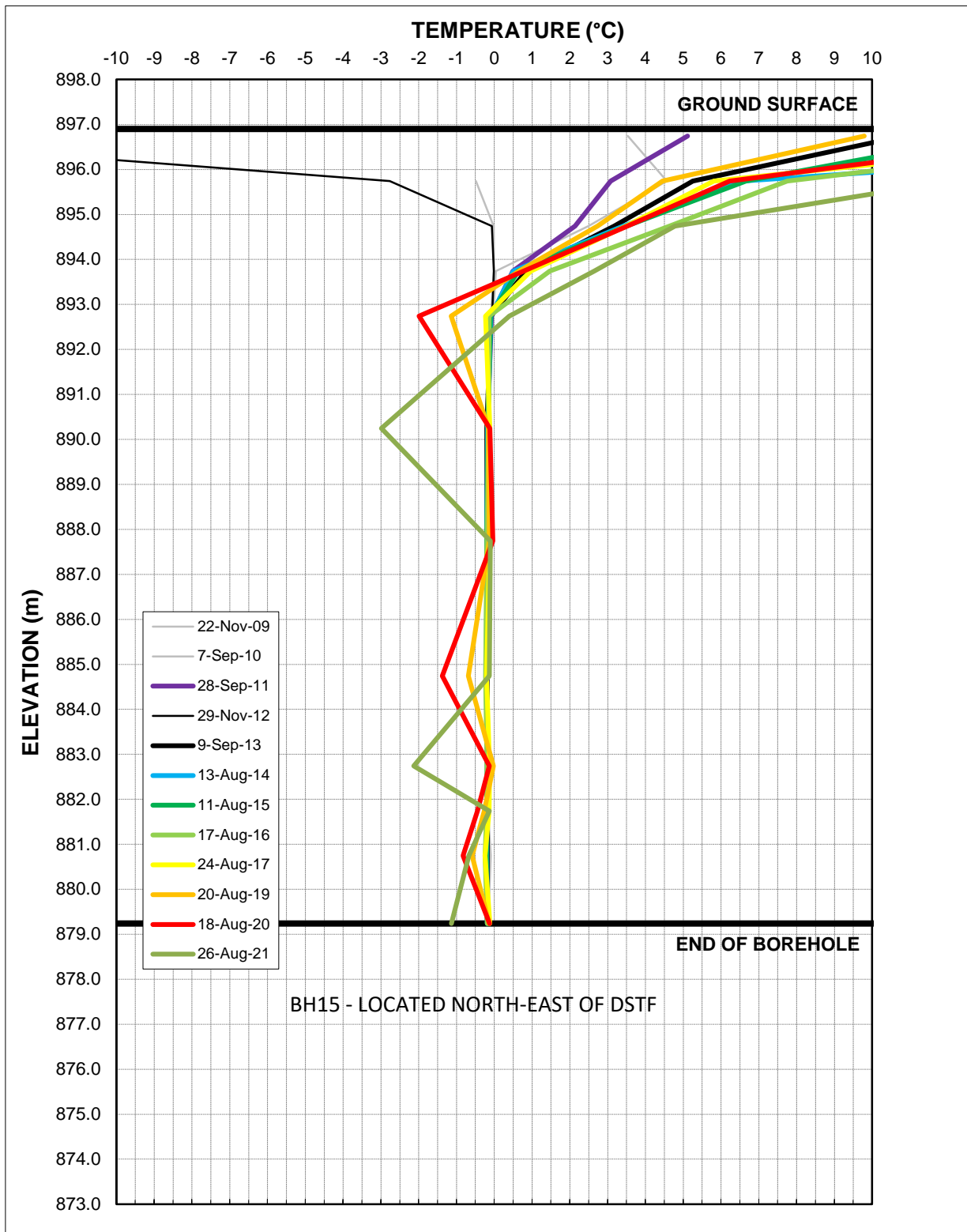
TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

## 1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

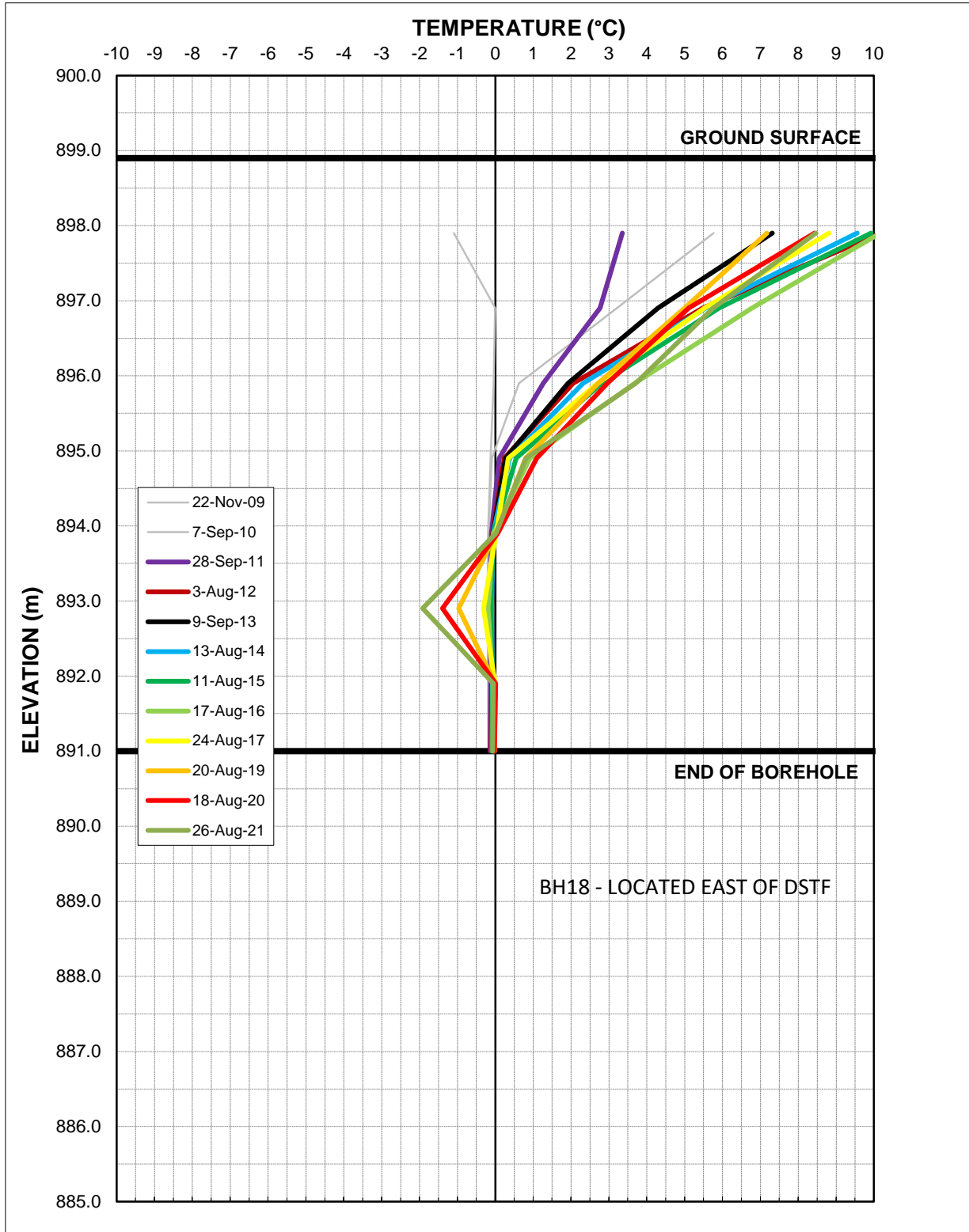
## APPENDIX B

### GROUND TEMPERATURE PROFILES



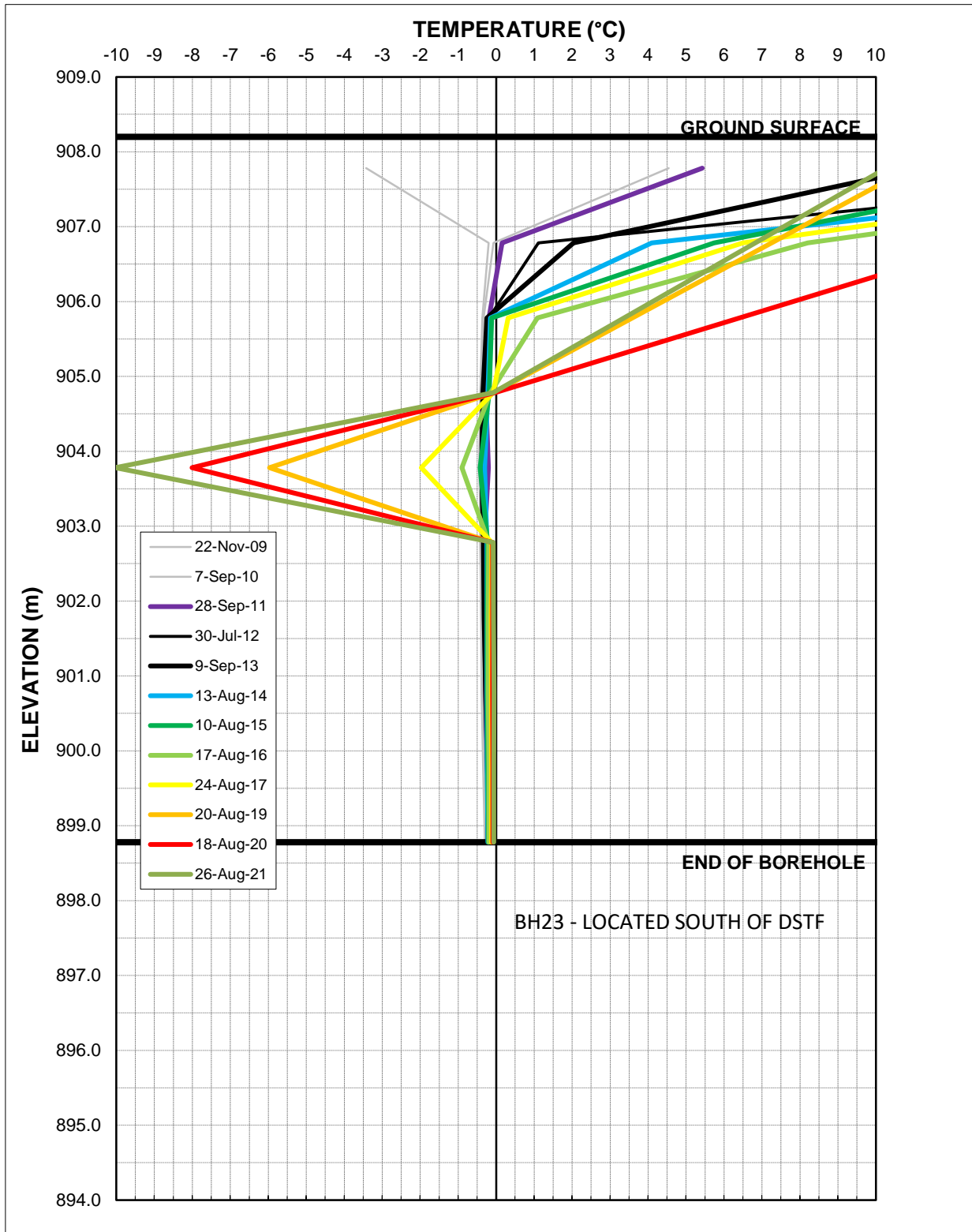
Install Date      August 30, 2009  
 Last Updated     August 26, 2021  
 Cable No:         2207

**Ground Temperature Profile**  
**Keno Hill District Mill Site Borehole BH15**  
**Figure T1**



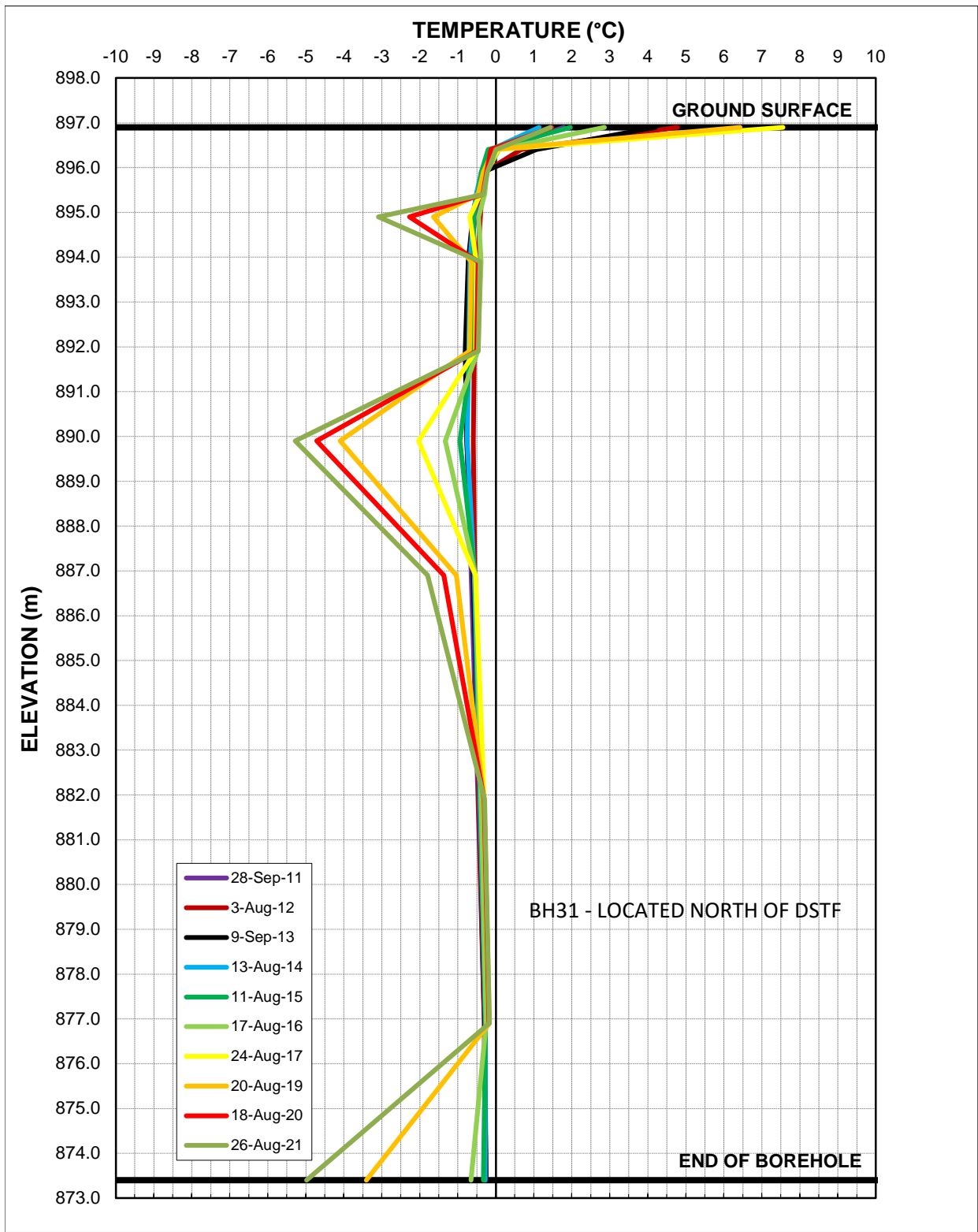
Install Date      September 2, 2009  
 Last Updated     August 26, 2021  
 Cable No:        2209

**Ground Temperature Profile**  
**Keno Hill District Mill Site Borehole BH18**  
**Figure T3**



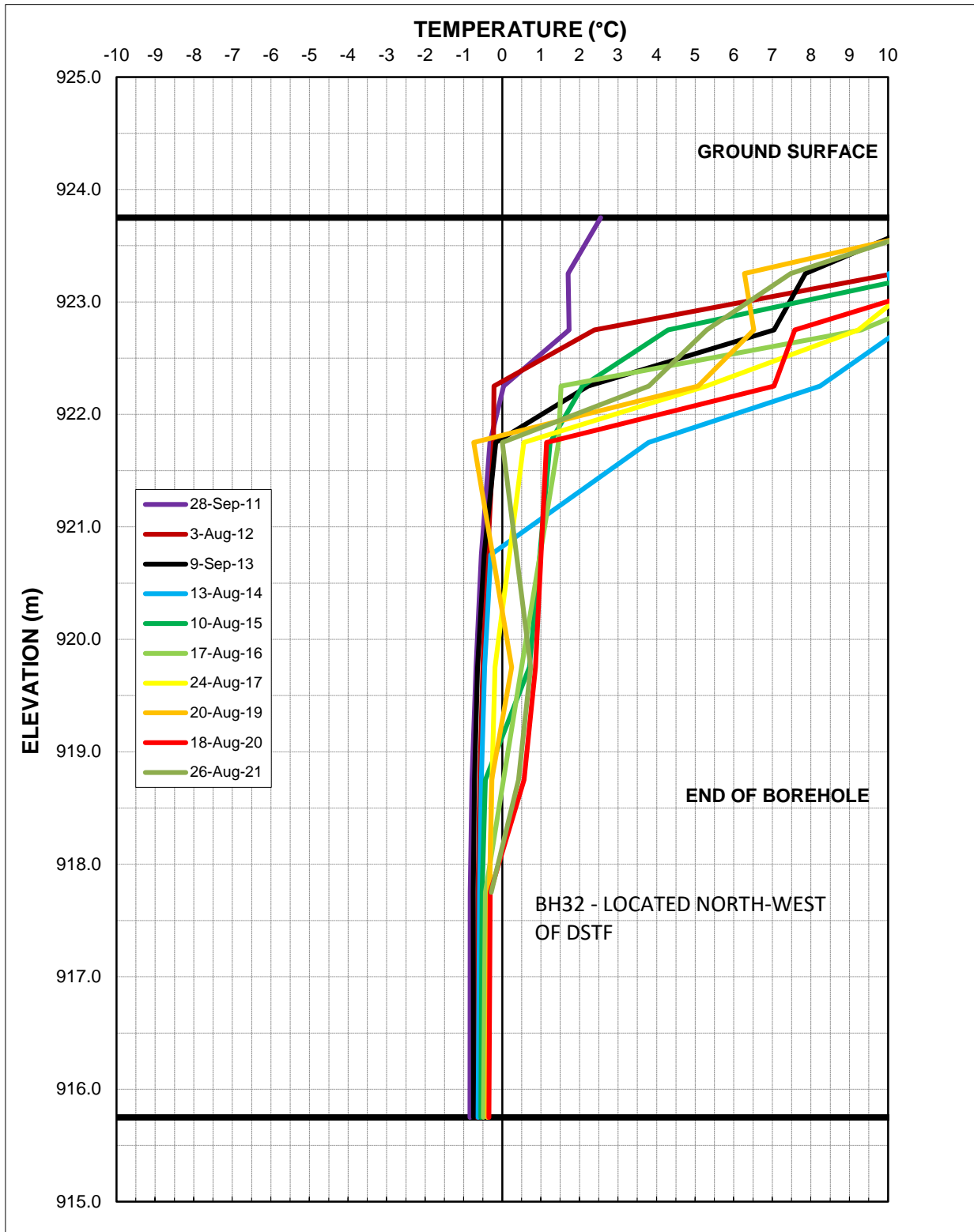
Install Date      September 29, 2009  
 Last Updated    August 26, 2021  
 Cable No:        2210

**Ground Temperature Profile**  
**Keno Hill District Mill Site Borehole BH23**  
**Figure T4**



Install Date      February 22, 2011  
 Last Updated     August 26, 2021  
 Cable No:        2263

**Ground Temperature Profile**  
**Keno Hill District Mill Site Borehole BH31**  
**Figure T5**



Install Date      February 22, 2011  
 Last Updated     August 26, 2021  
 Cable No:        2264

**Ground Temperature Profile**  
**Keno Hill District Mill Site Borehole BH32**  
**Figure T6**

## APPENDIX C

### SLOPE INDICATOR PROFILE



Borehole : Borehole 36  
 Project : Keno Hill District Mill  
 Location : DSTF  
 Northing : 7086872  
 Easting : 483931  
 Collar : 908.1

Spiral Correction : N/A  
 Collar Elevation : 0.00 meters  
 Reading Depth : 14.5 meters  
 A+ Groove Azimuth : 165  
 Base Reading : 2011 Dec 14 16:52  
 Applied Azimuth : 0.0 degrees

