

# Annual Quartz Mining License Report for 2023

Property: Sä Dena Hes Mine  
Company: Sä Dena Hes Operating Corporation  
c/o Teck Resources Limited  
Permit #: QML-0004

Effective Date: March 28, 2024

## Executive Summary

The Annual Reclamation Report for 2023 for the Sä Dena Hes (SDH) mine site was prepared by Teck Resources Limited on behalf of Sä Dena Hes Mining Corporation, as required in accordance with Yukon Quartz Mining License QML-0004. This annual report describes the progress of closure and reclamation related activities at the Sä Dena Hes Mine in 2023.

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

Permanent closure and decommissioning activities commenced in 2013 and were completed in 2015. Reclamation activities conducted at the site included applying a simple cover constructed of natural glacial till materials to most mine disturbed areas. This cover was constructed to limit the release of contaminants to the air, water and land. Surface contouring and vegetation have been completed for protection against water erosion. A revegetation program was implemented once the cover system was finished in 2015.

Monitoring of surface water and groundwater quality was completed in 2023 in accordance with Water Use License QZ16-051. Overall, the 2023 water quality monitoring program did not identify any signs of deteriorating water quality at the receiving environment station and no follow-up management measures were deemed necessary.

Routine physical work conducted at the site in 2023 included clearing ice and debris from culverts along the site access road.

An Annual Facility Performance Review (AFPR) was completed for the Tailings Management Area, which indicated that the North Embankment is currently stable and functioning in accordance with design parameters. Both the Sediment Retaining Structure (SRS) and North Drainage Channel were also functioning in accordance with their design parameters, though the AFPR noted some minor repairs needed for both structures. These minor repairs were completed in August. Observations made regarding erosion beneath the SRS spillway resulted in a recommendation from the Engineer of Record to decommission the structure within a five-year timeline if it is not reconstructed.

The 2023 geotechnical inspections indicated that all the geotechnical structures are stable and are functioning in accordance with the closure design.

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March 2024, prepared by Ensero Solutions (*Electronically Submitted as Separate File*)

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## 1.0 Introduction

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

Teck submitted notice to begin “Permanent Closure” to the Ministry of Energy, Mines and Resources (EMR) on February 17, 2012. The Detailed Decommissioning and Reclamation Plan (DDRP) (Teck, 2012) (Teck, 2013) was revised to plan for permanent closure. Permanent closure and decommissioning activities were carried out in 2014 and in 2015. A final DDRP was submitted in August 2015 (Teck, 2015) to account for amendments issued in 2014 and 2015. In 2015 Teck amended the Quartz Mining License (QML-0004), which expires on December 31, 2040. The current status of the site is Permanent Closure and Reclamation.

The objectives of the decommissioning and reclamation plan are to ensure the:

- Protection of public health and safety;
- Implementation of environmental protection measures that minimize adverse environment impacts;
- Land use is commensurate with surrounding lands;
- Post closure monitoring of the site is completed to assess effectiveness of closure measures for the long term.

Reclamation activities conducted at the site included applying a simple cover constructed of natural glacial till materials to most mine disturbed areas. This cover limits the release of contaminants to the air, water and land. Surface contouring and vegetation have been completed for protection against water erosion. A revegetation program was implemented once the cover system was finished in 2015.

The Yukon Water Board regulates water management of the mine site. Water Use Licence QZ16-051 addressing permanent closure came into effect on April 1, 2017. Teck retains a Surface Lease 105A10-011 on the property that was renewed in 2021 and expires in 2041.

## 2.0 2023 Decommissioning and Reclamation Activities

The QML and Water Use Licence both require post-reclamation environmental monitoring, physical/geotechnical inspections, and maintenance of constructed/engineered structures to be completed under the *Environmental Monitoring, Surveillance and Reporting Plan* (EMSRP, Alexco, 2017) and *Adaptive Management Plan* (AMP, Alexco, 2018).

The following summarizes the activities with details further discussed within the subsequent sections:

- Surface Water and Groundwater Quality Monitoring/Sampling
  - Bi-monthly/quarterly surface water and groundwater monitoring and sampling was conducted from January to December as per the Water Use Licence QZ16-051.
- Terrestrial Monitoring
  - The five-year re-vegetation assessment is considered complete. There were no activities other than to take photographs at the eight permanent photo hubs that were installed in 2020.
- Aquatic Resources Monitoring
  - Aquatic resource monitoring is a biennial program under QZ16-051 and will take place again in 2024.
- Physical/geotechnical inspections
  - Spring and fall routine site inspections of physical/geotechnical features were completed by Teck and the site caretaker.
  - The 2023 Annual Facility Performance Review of the Tailings Management area and annual geotechnical inspections were completed by the Engineer of Record (EoR) on June 6 and 7, 2023. As per the QML-0004, the associated annual inspection reports were submitted in September 2023.
- Maintenance of the site access road and constructed/engineered structures on the mine site, including:
  - Inspection of and removal of debris and ice from access road culverts;
  - Inspections of the North Pond drainage swale and clearing any blockages if encountered;
  - Minor repairs of items noted during annual facility performance inspections, including:
    - Repair of a surficial slump in the downstream slope of the Sediment Retention Structure (SRS) near the east abutment.
    - Replacement of displaced rip rap immediately upstream of the North drainage channel at the outlet to the SRS Pond.
    - Repair of an erosion gully on the berm along the west bank of the North drainage channel, adjacent to the aforementioned rip rap.

### **3.0 2024 Decommissioning and Reclamation Activities**

Over the course of 2024 Teck will continue to carry out site inspections and complete maintenance to correct any issues that may be identified. Additionally, the post closure monitoring as outlined in the EMSRP and AMP will be conducted in 2024 as per the Water Licence issued in April 2017.

In March 2024 Teck submitted a Project Plan to Yukon Energy, Mines and Resources to complete an upgrade to the North Embankment of the Tailings Management Area (TMA). This upgrade was initiated to fulfill a recommendation from the Engineer of Record (EoR) to prevent future overtopping events caused by ponded snowmelt water, like the erosion event that occurred in 2022. Pending the receipt of authorization to do so Teck will seek to complete pre-development activities in 2024 in preparation for full completion of the upgrade that will occur in 2025. These activities may include clearing vegetation along access trails following the close of the bird nesting window as well as the digging, screening, and stockpiling of rock material from the quarry at KM17 of the site access road.

#### **4.0 Effectiveness of the Remediation Measures**

All of the physical remediation and revegetation activities for the site were completed in 2015. Based on observations made during current monitoring programs, the remediation measures that have been carried out appear to be effective. Most of the site's engineered structures remain to be in good condition with no signs of movement or erosion with the exception of a few small areas identified in previous reports and observation of erosion beneath the SRS spillway. Erosion beneath the spillway does not impede the functionality of the structure, but it will require reconstruction if it is not decommissioned before 2028.

## **5.0 Map showing the status of all decommissioning and reclamation activities**

All the physical remediation and revegetation activities were completed in 2015. In the 2015 Annual Report, several drawings were included within the AMEC 2015 As-built report. Due to the limited physical work completed in 2023 there are no updated maps included within this report.



## 6.0 Inspection of Engineered Structures

The 2023 inspection of the structures and features associated with the Tailings Management Area at SDH was completed by SRK Consulting (SRK) on June 6 and 7, 2023. The inspection report *Sä Dena Hes Mine, Yukon Territory 2023 Annual Facility Performance Review – SDH Tailings Management Area, dated August 2023*, (SRK, 2023) was submitted to EMR in September 2023.

The report presents SRK's observations of the following structures and features of the Tailings Management Area (TMA), identifies any deficiencies and provides recommendations where appropriate:

- The North Embankment (formerly referred to as the North Dam)
- Tailings Cover
- North Drainage Channel
- Sediment Retaining Structure (SRS)

The 2023 inspection indicated that the North Embankment is currently stable and functioning in accordance with design parameters. It was also noted that there were no signs of instability following the repairs that were made to the North Embankment following the erosion event that occurred in 2022.

Both the Sediment Retaining Structure (SRS) and North Drainage Channel were also functioning in accordance with their design parameters, though the AFPR noted some minor repairs needed for both structures that were completed in August of 2023 (see recommendations 2023-5 to 2023-7 below). Observations made regarding erosion beneath the SRS spillway resulted in a recommendation from the Engineer of Record to reconstruct the spillway or decommission the structure within a five-year timeline (before 2028).

Activities carried out in 2023 to address recommendations outlined in the most recent TMA Annual Facility Performance Review as well as those from previous years include:

- **2021-3:** North Embankment – One of the long-term goals for the TMA was to reduce all potential catastrophic failure modes to non-credible, which resulted in a recommendation to undertake a credible failure modes assessment for the TMA. A credible failure mode review was undertaken for the TMA and determined that there are no catastrophic failure modes for the facility.
- **2021-4:** North Embankment - A review and revision of trigger action alert levels from the piezometers installed in the North Embankment was completed in 2023 for incorporation into future editions of the TMA's Operations, Maintenance and Surveillance (OMS) Manual. The review was focused on establishing additional trigger levels that considered seasonal freshet conditions that are to be expected and do not create dam safety concerns.
- **2022-2:** Tailings Cover – Repairs were made to an erosion gully that was present in the reclamation cover north of the SRS pond and noted during the 2022 inspection.

- **2022-4:** North Embankment and Tailings Cover – Updates were made to the TMA’s OMS Manual to include monitoring for the development of a pond against the North Embankment and maintenance to clear drainage pathways on the tailings cover during the snowmelt period. These revised processes were implemented during the 2023 freshet period.
- **2023-3:** Tailings Cover - A review of cover drainage network was addressed as part of the North Embankment Enhancement design that was completed in 2023. The review resulted in the incorporate of design considerations that aim to reduce the amount of ponding and provide engineered erosion protection along the drainage pathways.
- **2023-5:** SRS - A slough discovered on the downstream slope of the east abutment during the AFPR inspection was repaired.
- **2023-6:** North Drainage Channel – Rip rap that had moved immediately upstream of the channel outlet to the SRS Pond was replaced.
- **2023-7:** North Drainage Channel - An erosion gully that was present on the berm of the west bank of the channel was repaired.

The recommendations and timelines (highlighted in bold text) for the 2023 *TMA Annual Facility Performance Review* (AFPR) that remain open/in-progress include:

- **2022-3:** North Embankment – Drainage channel blockages on cover during snowmelt resulted in formation of a pond adjacent to embankment, and the pond overtopped the North Embankment, forming an erosion gully on the dam. Modify the embankment to eliminate this risk in the future – **Q3 2025.**  
**Teck has updated the planned date for this work with the EoR’s endorsement from the end of 2024 as originally outlined in the AFPR report.**
- **2023-1:** North Embankment – Install a new seepage monitoring station near the embankment toe as part of North Embankment Upgrades – **Q3 2025**  
**Teck has updated the planned date for this work with the EoR’s endorsement from the end of 2024 as originally outlined in the AFPR report.**
- **2023-2:** North Embankment – To improve the understanding of the contributions of seepage through the embankment and from groundwater recharge, consider installing additional piezometers in the tailings upstream of the embankment and in the embankment fill and foundation in the downstream slope of the embankment – **Q3 2025**  
**Teck has updated the planned date for this work with the EoR’s endorsement from the end of 2024 as originally outlined in the AFPR report)**
- **2023-4:** SRS – Create and execute a plan to decommission the SRS by 2028 – **end of 2028**

The 2023 geotechnical inspection of the following engineering structures, work, and installations was completed by SRK Consulting (SRK) on June 6 and 7, 2023:

- Main Zone and Jewelbox Ore Zones: Pits, Waste Rock Dumps, and Portals
- Burnick Ore Zone Waste Rock Dumps and Portals (1200 and 1300)
- The South Drainage Channel and Camp Creek Drainage Channel

- The North Creek Channel that was reclaimed following decommissioning of the North Creek Dike and Second Crossing of the North Creek
- The Landfill area.

The inspection report *2023 Annual Geotechnical Inspection, Sä Dena Hes Mine, Watson Lake, Yukon dated August 2023*, (SRK., 2023a) was submitted to EMR in September 2023.

The 2023 geotechnical inspection indicated that all structures and features listed above are stable and functioning in accordance with the closure design parameters. No actions or recommendations arose out of this inspection.

## 7.0 Results of Studies and Monitoring Programs

### 7.1 Water Licence Monitoring

The water quality standards and monitoring requirements are managed under Water Licence QZ16-051 Effective Date April 1, 2017 with the expiry date of December 31, 2040.

The licence describes the water quality monitoring program for post closure monitoring, which is the applicable program for the current status of the SDH (Permanent Closure and Reclamation). The water quality program outlines the sampling sites, frequency and required water quality parameters.

As required by Licence QZ16-051, water quality data is reported quarterly to the Yukon Territory Water Board. The 2023 monitoring results are discussed in the annual report prepared by Ensero Solutions entitled *Sä Dena Hes – 2023 Annual Report Yukon Water Licence QZ16-051 dated March 2023* (Ensero Solutions, 2024). The report provides a detailed analysis of data and is included as Appendix B. Surface and groundwater water quality monitoring conducted under the AMP are also included in the water licence monitoring requirements. The AMP describes a means of interpreting data to indicate if water quality is changing from conditions observed over the past 20 years. The plan also describes when and how changes in water quality require a response.

In 2023, samples from all the required water quality monitoring stations met the standards in licence QZ16-051 for all water quality parameters at stations MH-11, MH-12 and MH-15. In 2023, there was one AMP ST2 trigger at MH-02, for total lead in February 2023, as well as various AMP ST1 triggers at the mine source groundwater wells. All AMP exceedances in 2023 were attributed to seasonal variation. Overall, the 2023 water quality monitoring program did not identify any signs of deteriorating water quality at the receiving environment stations.

### 7.2 Aquatics Resource Monitoring

No aquatics resource monitoring occurred in 2023. The next biennial aquatics resource monitoring program is scheduled for 2024.

### 7.3 Vegetation Monitoring

In 2015, a total 27,000 plugs were planted of *Salix alaxensis*, *S. bebbiana*, *S. barclayi*, *S. planifolia* and *Populus balsamifera* were installed in several discrete areas throughout the reclaim, south pond, north pond and mill areas. The remaining open areas of these sites were planted with approximately 70,000 alder (*Alnus viridis crispa*) plugs. The alder were planted at a much lower density than the other tree species.

The fifth year of revegetation monitoring was conducted in 2020 by Laberge Environmental Services. The detailed results of the monitoring are included in the attached report entitled

“Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2020” dated January 2021 (Laberge, 2021). The next reclamation monitoring event is not required until 2025. However, between monitoring events, annual photos are taken to document changes. Eight permanent photo hubs were established in 2020 throughout the revegetated areas and photos are taken at these hubs each summer. The locations of the photo hubs are displayed in Figure A.1 in Appendix A. Photographs that have been taken of each site since 2020 are included for comparison purposes in Appendix A.

Table 7.1 Locations of Permanent Photo Hubs, July 2020

Hub #	Latitude	Longitude	Site Description	Bearing (°)
PH-1	60.53885°	128.85624°	At Revegetation sign at the North Embankment	70 to 80
PH-2	60.53144°	128.85213°	North end of South tailings facility near VMP-2; near old access road	360 view
PH-3	60.52005°	128.87726°	Jewel box, at MW13-02 and GP3	346
PH-4	60.54871°	128.85471°	Landfill at MW14-02	360 view
PH-5	60.53388°	128.85292°	South end of north tailings facility near VMP-4	5 and 65
PH-6	60.52305°	128.86575°	Mill area near access road	360 view
PH-7	60.52457°	128.84914°	Reclaim and Borrow pit G – near osprey nest	360 view
PH-8	60.55294°	128.87687°	Burnick, GP-6 & MW13-06	220

VMP – Vegetation monitoring plot; GP – Grass monitoring plot

## 8.0 Invasive Plants

There were no formal assessments of invasive plants completed in 2023. It is expected the areas that were previously identified as containing invasive species will decrease in size as individual plants continue to be removed manually. Similar to past observations, the most common invasive species encountered was *Crepis tectorum*, (narrowleaf hawksbeard) and was generally found sporadically along the roadsides within the study area and has increased near monitoring plot VMP-9 at the landfill site (Laberge 2021). As the alders increase in size on site, the hawksbeard should eventually die off. These areas continue to be monitored and any individual invasive plants discovered across the site are hand-pulled to ensure that the remaining population is manageable.

## **9.0 Spills and Accidents**

There were no reportable spills or accidents in 2023.

## **10.0 Wildlife Incidents and Other Accidents**

There were no direct wildlife incidents or other accidents reported in 2023. There is continued beaver activity in the area resulting in the periodic deposition of material in culverts along the main access road and in the North Creek Channel. Response measures include the clearing of the culverts and, when deemed necessary, trapping of the beavers by the owner of the trapline that encompasses the site within the harvest season.



### **11.0 Site Improvements to address Sediment and Erosion**

Following the erosion event that occurred on the North Embankment in 2022 a recommendation was made by the facility's EoR to raise the dam's crest to prevent future overtopping events caused by pooled water arising from the spring melt. An engineered design for this enhancement was developed in 2023 and a Project Plan was submitted to Yukon Energy Mines and Resources for review in March 2024. Pending the receipt of authorization pre-development activities for the project will occur Q3 2024 and full execution is planned for Q3 2025.

## 12.0 Closing

I trust this report meets the requirements under Part 5, Section 11.4 of QML-0004. Please contact Ray Proulx at (250) 467-3194 or [Ray.Proulx@teck.com](mailto:Ray.Proulx@teck.com) if you have any questions regarding this report.

A handwritten signature in black ink, appearing to read "Ray Proulx". The signature is written in a cursive, flowing style.

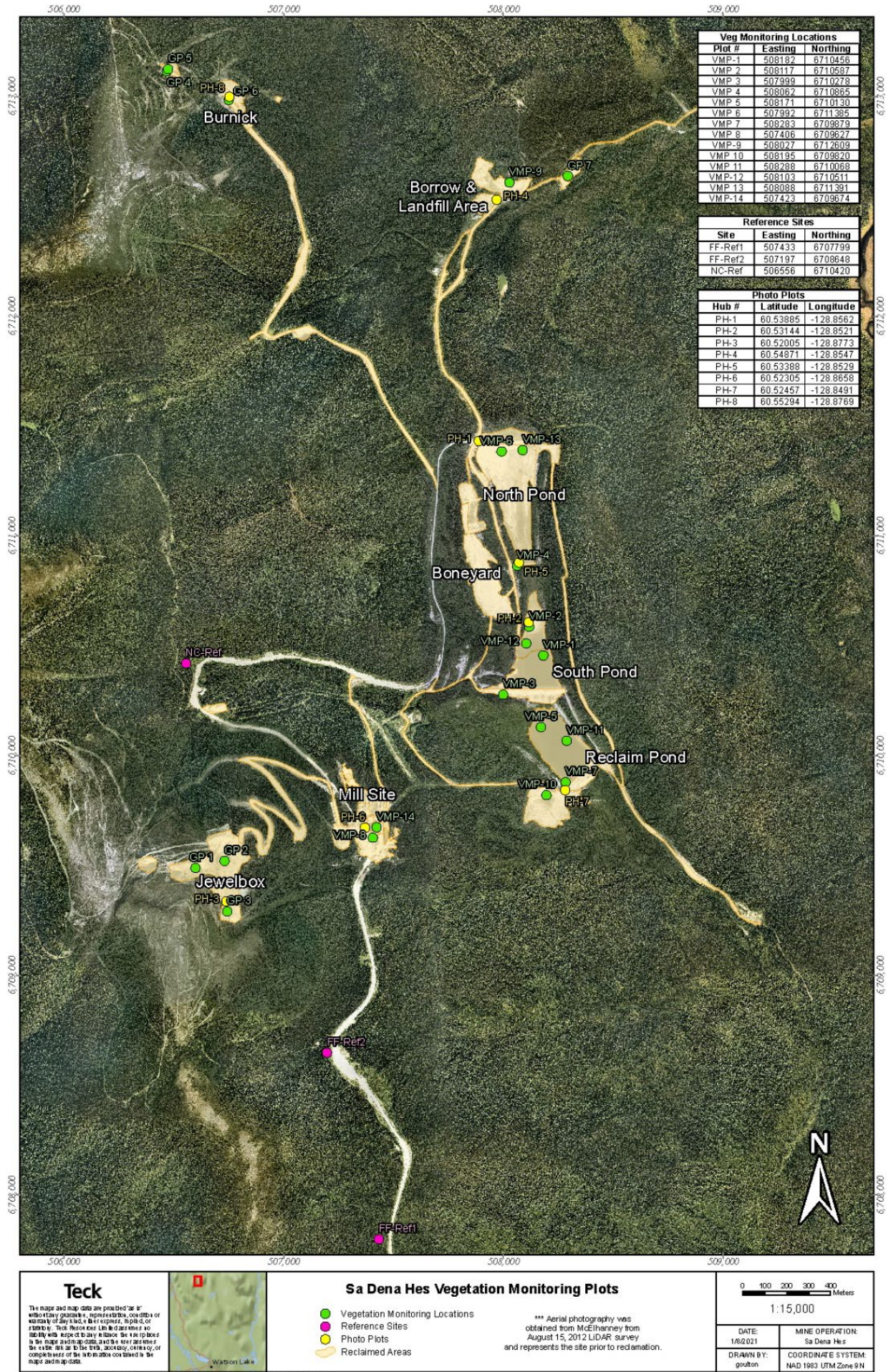
Ray Proulx, B.Sc.  
Ray Proulx, Site Manager  
Teck Legacy Properties

### 13.0 References

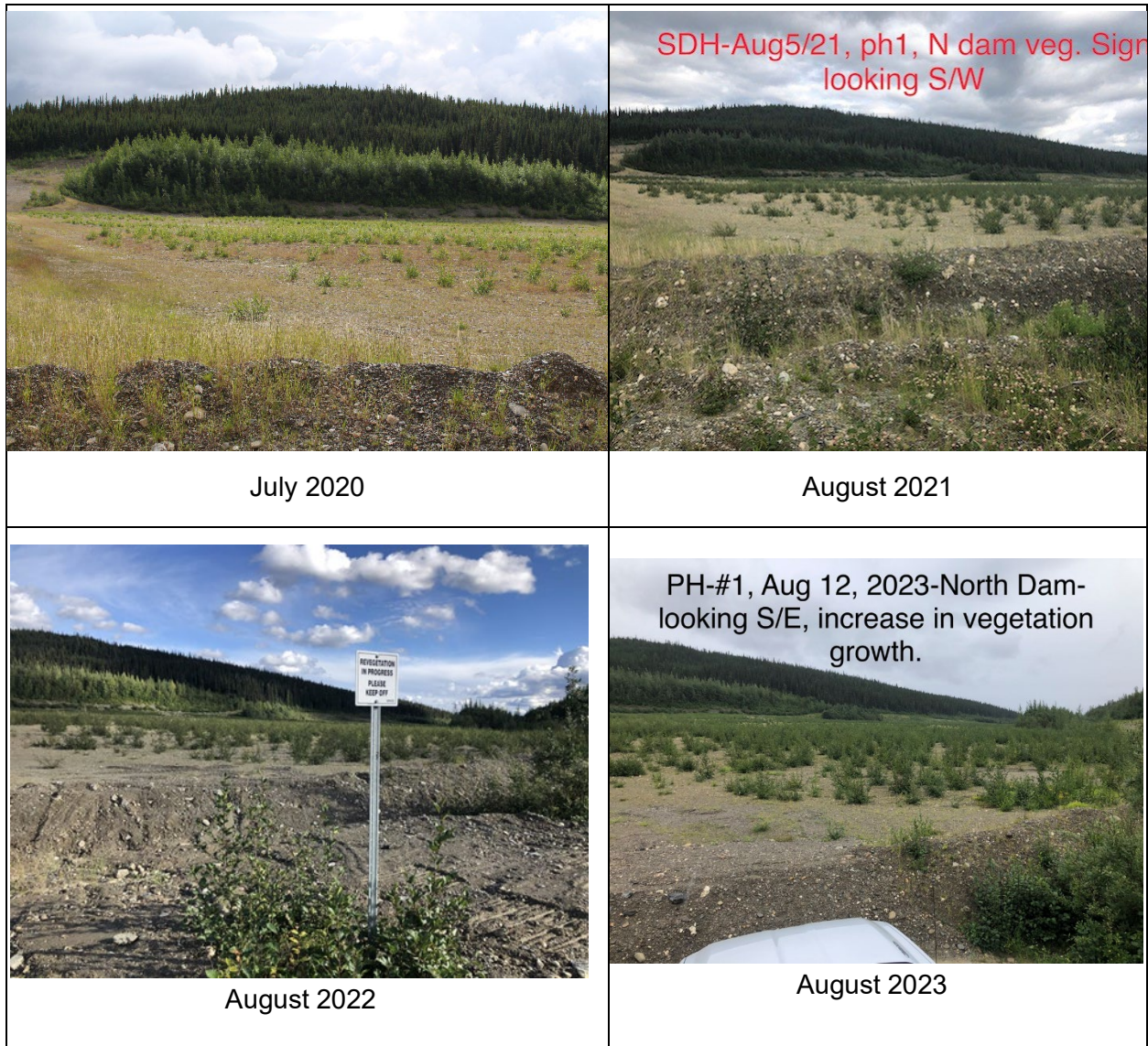
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- Alexco. (2018). *Sa Dena Hes Mine - Post-Reclamation Adaptive Management Plan, dated February 12, 2018.*
- Ensero Solutions. (2024). *Sä Dena Hes – 2023 Annual Report Yukon Water Licence QZ16-051 dated March 2024.*
- Laberge. (2021). *Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2020, prepared by Laberge Environmental Services, dated January 2021.*
- SRK. (2023). *Sä Dena Hes Mine, Yukon Territory, 2023 Annual Facility Performance Review - SDH Tailings Management Area, prepared by SRK Consulting (Canada) Inc., dated August 2023.*
- SRK. (2023a). *2023 Annual Geotechnical Inspection, Sä Dena Hes Mine, Watson Lake, Yukon, prepared by SRK Consulting (Canada) Inc., dated August 2023.*
- Teck. (2012). *Sa Dena Hes Mine, Detailed Decommissioning and Closure Plan, Jan. 2012 update, prepared by Teck Resources Limited, Jan. 28, 2012.*
- Teck. (2013). *Sa Dena Hes Mine, Detailed Decommissioning and Closure Plan, March 2013 Update-Final, prepared by Teck Resources Limited .*
- Teck. (2015). *Sa Dena Hes Mine, Detailed Decommissioning and Reclamation Plan August 2015 Update. Prepared by Teck Resources Limited, August 31, 2015.*
- Teck. (2018). *Water Licence #QZ16-051 – Sa Dena Hes Mine – Submission of Revised Adaptive Management Plan, dated March 7, 2018.*

APPENDIX A  
REVEGETATION MONITORING PLOTS AND PHOTOS

**A.1 Revegetation Map**



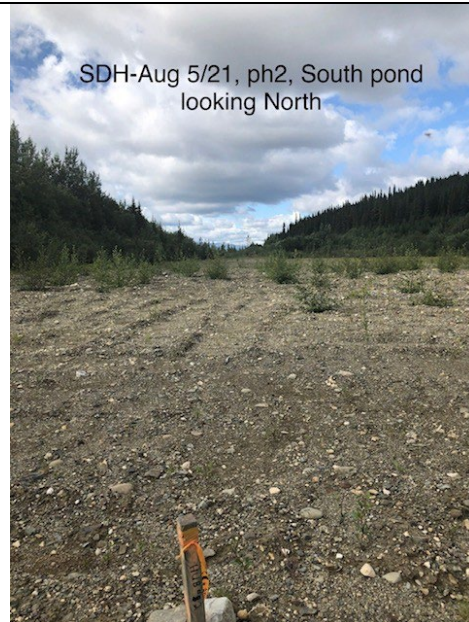
**A.2 Photo Hub 1 – At Revegetation Sign at the North Embankment**



**A.3 Photo Hub 2 – North End of South Tailings Facility Near VMP-2**



July 2020



August 2021



August 2022

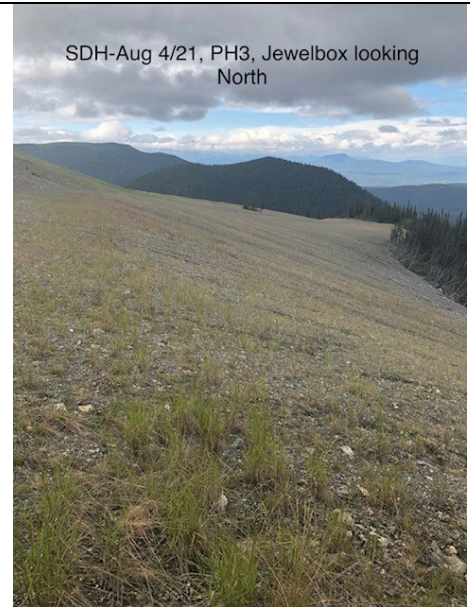


August 2023

**A.4 Photo Hub 3 – Jewelbox Near GP3 and MW13-02**



July 2020



August 2021



August 2022



August 2023



**A.5 Photo Hub 4 – Landfill at MW14-02 and VMP-9**



July 2020



PH-4, Aug 2/21, landfill, looking N/W

August 2021



August 2022

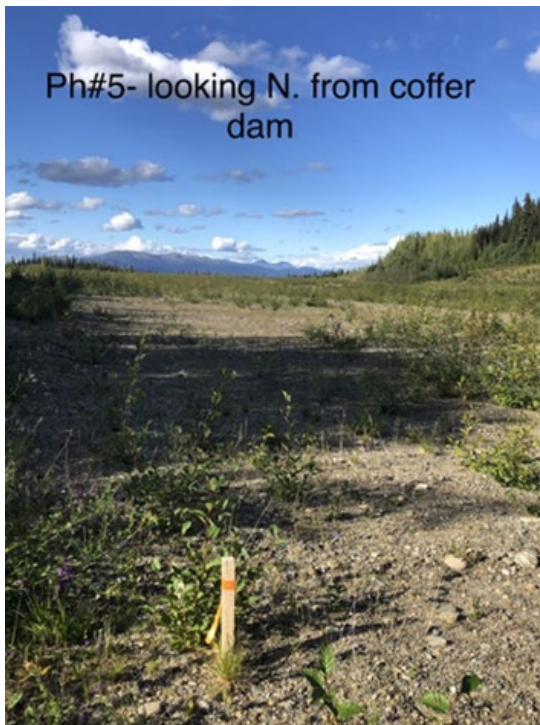


Aug 13, 2023- pH#4-landfill-  
North

August 2023

**A.6 Photo Hub 5 – South End of North Tailings Facility (VMP-4)**

July 2020



August 2022



August 2023

**A.7 Photo Hub 6 – Mill Site**



August 2021



August 2022



August 2023

**A.8 Photo Hub 7 – Reclaim Pond**



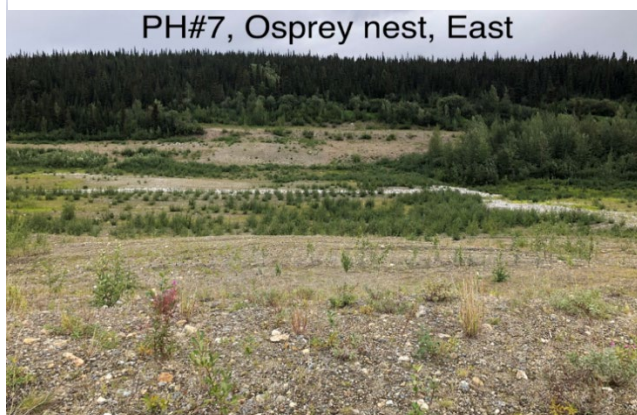
July 2020



August 2021



August 2022



August 2023

**A.9 Photo Hub 8 – Burnick, GP-6, and MW13-06**



August 2021



August 2022



APPENDIX B  
SÄ DENA HES – 2023 ANNUAL REPORT YUKON WATER LICENCE  
QQ16-051 DATED MARCH 2024, PREPARED BY ENSERO SOLUTIONS  
*(Electronically Submitted as Separate File)*