REPORT

2022 Annual Facility Performance Report for South Tailings Pond and North Tailings Pond

Teck Coal Limited, Fording River Operations

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Executive Summary

This report presents the 2022 annual facility performance report (AFPR) for the South Tailings Pond (STP) and North Tailings Pond (NTP) tailings storage facilities (TSFs) at the Teck Coal Limited, Fording River Operations (FRO) site, located near Elkford, British Columbia. The reporting period for the data review is from 1 September 2021 through 31 August 2022, unless otherwise noted.

Review of Key Hazards

Potential credible failure modes for the STP and NTP facilities include the following:

- **Internal erosion (suffusion and piping)**
  - For both the STP and NTP, filter compatibility is generally met between till fill material and coarse rejects or combined coarse and fine rejects shell and the foundation flood plain sand and gravel; however, it is not met for the tailings and the flood plain sand and gravel. Migration of the tailings through the sand and gravel has not historically been observed and low seepage gradients are expected.
  - At the STP, internal erosion as a result of seepage along the decommissioned gas pipeline through the West Dam at the north abutment has a low likelihood of occurrence. FRO is developing a plan to properly abandon this section of the decommissioned pipeline.
- **Overtopping**
  - Pond elevation in the NTP and STP was maintained around the operating range target. Standard operating procedures for the STP and a trigger action response plan (TARP) for the NTP provide direction if a water elevation approaches a trigger level.
  - For the STP facility, the construction of an emergency spillway was completed in July 2021 (Golder 2020b, 2021). With the spillway in place, the STP is not susceptible to an overtopping failure mode as a result of an extreme storm event.
  - Liquefaction of the STP tailings beach during a seismic event could result in tailings beach displacement that results in a wave that could overtop the Main Dam. Additional analyses have been carried out and are being used to inform controls which FRO can implement.
- **Instability**
  - Static and seismic stability assessments (Golder 2018a) indicated the factors of safety for failure surfaces that involve the full width of the dam crest meet or exceed design criteria.
  - Riprap protection (for a 200-year return period flood level) is in place along the NTP dam toe and part of the STP dam toe to mitigate against instability of the dams' toes from erosion from the Fording River.
    - The NTP and STP dams' toes remains susceptible to flood events in the Fording River greater than a 200-year return period, and the southern section of the STP dam toe requires a plan to add flood protection.
    - FRO is undertaking the STP Floodplain Widening Project along the downstream toe of the STP West Dam to reduce the risk of this hazard to the STP. Phase 1 construction, which included Fording River floodplain widening, was completed in 2022. Phase 2 is expected to be completed in 2025.

- **Release of tailings, mine-affected water, or water through pipeline failure around either the STP or NTP**
  - This failure mode is managed through inspection of active pipelines.

Consequence of Failure

The STP and NTP facilities' consequence of failure is Very High, considering the guidelines for consequence classification in Section 3.4 of the Health, Safety and Reclamation Code Guidance Document (Ministry of Energy and Mines 2016).

Summary of Significant Changes in Instrumentation or Visual Monitoring Records

South Tailings Pond

The 2022 dredging season was between 14 April and 21 October 2022. A total of 1.86 million dry metric tonnes of tailings was dredged from the STP and sent to the Turnbull TSF.

There were no significant changes in visual monitoring records, instrumentation, dam stability, or surface water control for the STP since the 2021 annual report.

South Tailings Pond Emergency Spillway

No water from the pond was reported to have overflowed the spillway invert and entered the emergency spillway during the reporting period. Based on a visual inspection carried out during the 7 September 2022 site visit by the Engineer of Record (EoR), degradation of the riprap was observed in multiple areas of the spillway channel where the riprap did not meet material specifications. In response, a riprap quality monitoring program is to be developed to monitor the spillway riprap in these areas.

North Tailings Pond

There were no significant changes in visual monitoring records, instrumentation, dam stability, or surface water control for the NTP since the 2021 annual report.

Significant Changes in Stability and/or Water Control

South Tailings Pond

Bathymetric surveys were completed by FRO on 10 April (before dredging began), 30 June (interim), and 1 October (interim) as part of monitoring storage capacity in the STP. A post-dredging survey was not completed in 2022.

In order to manage acutely toxic water from Lake Mountain Pit and Swift Pit mining operations, Teck discussed with the EoR to temporarily exceed the high operating range of 1,636.1 m in the STP during upset conditions (pump maintenance, dredge installations, and other unplanned activities that would limit the capacity of water that can be pumped out of STP) and would result in an increase of water stored in STP. Teck proposed and carried out the following activities to manage the temporary increase in the STP water level between April and May 2022:

- Lower water levels in STP ahead of anticipated dredge or pump maintenance.
- Temporarily increase water levels above 1,636.1 m with real-time water level monitoring and do not exceed a maximum water level of 1,636.35 m. Limit inflows into the STP during the dredge maintenance/connection period. Monitor the weather forecast before deciding to exceed 1,636.1 m.

- Return water levels below 1,636.1 m following dredge operation as soon as practical (within two weeks of reaching the maximum water level).

To satisfy the permit for spillway construction (Permit Amendment C-3 Approving South Tailings Pond Spillway), an environmental design flood (EDF) event reassessment (Golder 2022b) was prepared which included the assessment of a passive EDF management plan (with no pumping). The normal operating pond elevation should continue to be evaluated on an annual basis with available pumping from the STP pond to confirm the necessary storage, volume, and pumping rates are adequate to manage the estimated EDF inflow volume.

North Tailings Pond

A new area along the downstream toe of the NTP dam near the south abutment approximately 3 m wide and 0.5 m deep was found to have been disturbed by heavy equipment and should be repaired by FRO maintenance. The area of the downstream toe of the NTP dam that was excavated for a monitoring well installation program in 2019 had not been repaired. These excavated areas are to be backfilled and graded.

During the reporting period, FRO constructed a raw coal stockpile over an existing overburden stockpile located at the northwest end of the NTP facility. To meet the acceptance criteria, a 20 m wide berm of waste rock material with a 2H:1V face slope angle was recommended to be placed around the overburden stockpile.

Operation, Maintenance, and Surveillance Manual and Emergency Preparedness and Response Plan

FRO last completed an update of the operation, maintenance, and surveillance (OMS) manuals for the STP and NTP in July and August 2022 (FRO 2022a,b). A review of these versions of the OMS manuals for the STP and NTP were completed as part of this AFPR.

FRO last completed an update of the emergency response plan (ERP) for the tailings facilities at FRO in May 2020 (EP.009.R1; FRO 2020b).

The current emergency preparedness plan for tailings facilities is dated 25 May 2020 (EP.008.R2; FRO 2020c).

The current Tailings Impoundment Flood Response Protocol for the Fording River is dated 15 May 2020 (EP.010.R0; FRO 2020a).

Teck personnel at FRO carry out regular testing of the ERP, with the most recent internal tabletop exercise carried out on 15 June 2022, as part of the ERP for flood response. The ERP tabletop considered a flood condition on site where the Flood Response TARP had been triggered, which has implications for the facilities downstream, including the STP and NTP.

Recommendations

Table E-1 summarizes the status of previous priority level 1 and 2 recommended actions from the 2021 annual report (Golder 2022a). There are no new priority level 1 or 2 recommended actions from the 2022 AFPR. Recommendations of other priorities are presented in the report body.

A number of recommendations are in progress, and some are incomplete, but WSP considers the work to be appropriately prioritized based on good communication between the EoR team and the FRO tailings team.

Table E-1: Current Status of Previous Recommend Priority 1 and 2 Actions for the South Tailings Pond and North Tailings Pond Facilities

Facility	ID Number	Deficiency or Non-conformance	Applicable Regulation, Guideline or OMS Manual Reference	Recommended Action	Priority Level	Recommended Timing for the Action	Status as of March 2023
STP	2015-12b	Riprap erosion protection along downstream toe north of STP Sta. 0+680, no riprap south of STP Sta. 0+680; risk-informed protection requirements not yet defined.	HSRC §10.1.8	Implement required protection measures for the operational phase according to the as-defined schedule.	2	2024	**In progress** – Phase 1 construction for the Fording River floodplain widening was completed in 2022 and Phase 2 is scheduled to be completed by 2025.
NTP	2015-06	Risk-informed criteria for flood erosion protection along toe of dams not defined.	CDA 2013 §6.2	Design and implement the required flood protection measures for downstream toe of dam along the Fording River including consideration of the Fording River Multiplate embankment upstream of the NTP.	2	2023	**Incomplete**

OMS = operation, maintenance, and surveillance; STP = South Tailings Pond; Sta. = Station; CDA = Canadian Dam Association; HSRC = Health, Safety and Reclamation Code; NTP = North Tailings Pond.

Priority Level	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant risk of regulatory enforcement.
2	If not corrected could likely result in dam safety issues leading to injury, environmental impact or significant regulatory enforcement; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.

Source: HSRC Guidance Document, Section 4.2 (Ministry of Energy and Mines 2016).

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1.0 INTRODUCTION

1.1 Purpose, Scope of Work, Method

WSP Canada Inc. (WSP), has completed this annual facility performance report (AFPR) for the South Tailings Pond (STP) and North Tailings Pond (NTP) facilities at the Teck Coal Limited, Fording River Operations (FRO) site, located near Elkford, BC. The reporting period for the data review is from 1 September 2021 to 31 August 2022, unless otherwise noted.

The report is based on a site visit carried out by Golder Associates Ltd. (now known as WSP Canada Inc.) from 7 to 8 September 2022, discussions with FRO staff, and review of data provided by FRO. This report consists of the following and was prepared with consideration of the Teck Resources Limited Guideline for Tailings and Water Retaining Structures (Teck Resources 2019):

- a summary of the site conditions and background information for the facilities
- a summary of the operation, construction, and maintenance activities for the reporting period
- facility consequence of failure and review of required operational documents
- site photographs and records of dam inspections
- review of dredging data
- review of assessment of dam safety relative to potential failure modes
- recommended actions

Photographs of the STP and NTP from the site inspection are presented in Appendix A and a summary of the observations is included in the inspection reports in Appendix B and Appendix C for the STP and NTP, respectively.

FRO switched coordinate systems on 25 October 2016 from FRO Mine Grid to Universal Transverse Mercator (UTM) with elevations referenced to the Elk Valley Elevation Datum. All coordinates presented in this report are in UTM with elevations referenced to the Elk Valley Elevation Datum unless otherwise noted.

The previous annual inspection for this facility was carried out in May 2021 and is reported in the 2021 annual report (Golder 2022a).

This report is to be read in conjunction with the Study Limitations provided at the end of the report.

1.2 Regulatory Requirements

1.2.1 BC Health, Safety and Reclamation Code

This report was prepared in accordance with Part 10.5.3 of the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (EMLI 2022), which sets out the minimum frequency for inspection of tailings storage facilities (TSFs) and associated dams. It is understood that this report will be submitted by FRO to the Chief Inspector of Mines.

The guidelines for annual reports provided in the HSRC Guidance Document (Ministry of Energy and Mines 2016, Section 4.2) were considered where applicable during the preparation of this report.

1.2.2 Permits and Licences

Specific amendments to the permits concerning the STP and NTP include:

- Permit C-3 Amendment to permit approving work system – South Tailings Pond tailings dredging project. Issued by the Ministry of Energy, Mines and Petroleum Resources. 27 April 1995.
- Permit C-3 Amendment to permit approving work system and reclamation program – Raising the South Tails Pond Dyke. Issued by the Ministry of Energy, Mines and Petroleum Resources. 30 June 2008.
- Permit C-3 Amendment to permit approving work system and reclamation program – Turnbull South Pit Tailings Storage Facility. Issued by the Ministry of Energy and Mines. 14 November 2013.
- Permit C-3 Amendment to permit approving work system and reclamation program – Turnbull South Pit Tailings Storage Facility East Pipeline Route. Issued by the Ministry of Energy and Mines. 6 May 2015.
- Permit C-3 Amendment to permit approving work system and reclamation program – Fording River Swift Mine Plan and Reclamation Program. Issued by the Ministry of Energy and Mines. 15 December 2015.
- Permit C-3 Amendment to permit approving work system and reclamation program – Approving South Tailings Pond Spillway. Issued by the Ministry of Energy and Mines. 3 July 2020.
- Permit 424 Amendment to authorized discharges. Issued by the Ministry of Environment. 6 December 2016.
- Permit 424 Amendment to authorized discharges – Request for additional site water pumping to maintain freeboard at the South Tailings Pond. Issued by the Ministry of Environment. 22 March 2018.
- Permit 424 Amendment to authorized discharges – Request for additional site water pumping to maintain freeboard at the North Tailings Pond. Issued by the Ministry of Environment. 2 January 2019.

2.0 BACKGROUND

2.1 Fording River Operations Tailings Storage

The FRO site is an open pit coal mine located near Elkford, BC, which currently has two tailings pond facilities on site along the Fording River: the NTP and STP. FRO currently has two permitted destinations for in-pit tailings storage: the 2P 3P TSA and the Turnbull TSF. This AFPR report is for the STP and NTP facilities.

The STP facility is located south of the processing plant, on the east side of the Fording River. The STP is composed of two dams: the Main and West dams. Tailings discharge from the wash plant, within the processing plant, is currently directed to the STP.

The NTP facility is located on the west side of the Fording River across from the processing plant. The NTP has been essentially filled to its design capacity and is currently inactive.

A location and plan view of the STP and NTP facilities are shown in Figure 1.

2.1.1 Description of Tailings Facilities (South Tailings Pond and North Tailings Pond)

At the STP, the earth fill dams provide the following:

- impoundment of the tailings slurry
- storage of settled tailings
- temporary storage of runoff, excess slurry water, and water from pit dewatering or sediment ponds (when viable based on freeboard)
- reservoir of water as the main reclaim source of the coal processing plant

At the NTP, the earth fill dam provides storage for settled tailings and only retains a small pond, which receives runoff from the local tailings surface area and small surrounding catchment area. This facility is not in active use.

In the past, tailings were discharged to the STP and NTP alternately. The tailings stream has never discharged to both ponds concurrently. The NTP is essentially full, and tailings have not been deposited there since 2006.

Tailings are seasonally dredged from the STP to increase available tailings storage capacity. Previously, the dredged tailings were pumped to the NTP, 2 Pit, or 3 Pit South (Golder 2016a). Dredging operations to the NTP ended in 2006. Dredging to 2 Pit was discontinued in 2004. No dredged tailings have been sent to 3 Pit South since 6 October 2015. Pipelines that crossed the STP West Dam crest and then the Fording River via a pipe bridge that were used historically to dredge tailings from the STP to 2 Pit and 3 Pit South were removed in July 2021.

Seasonal dredging from the STP to the Turnbull TSF started in 2016 and is planned to continue until the Turnbull TSF reaches capacity.

2.1.2 Coal Processing Waste Materials

The raw coal delivered to the breaker at FRO contains high-ash material in the form of carbonaceous mineral rock. To meet product specifications, this high-ash rock is separated from the raw coal at the wash plant within the processing plant. The high-ash waste consists of a coarse fraction and a fine fraction. Since 2005, a portion of the fine fraction has been separated from the remainder of the slurry flotation tailings and mixed with the coarse

rejects (CR) to produce and combined coarse and fine rejects (CCFR). CCFR is currently hauled by truck to a designated CCFR storage facility (i.e., spoil); however, both the CR and CCFR materials have been used in the construction of the downstream dam shell for the NTP and STP dams.

2.1.3 Tailings Description

The flotation tailings from the wash plant are a slurry and are sent via pipeline to the STP where they are hydraulically deposited from the north single point discharge. Site drainage is typically directed to the STP but may be directed to the North Loop Settling Pond. When directed to the STP, site runoff and sediments are added to the tailings line and discharged into the STP. Site drainage includes wash water from the dryer building and clean coal building, water used in the plant site area, and surface water runoff from the plant site area and nearby waste rock piles.

Particle size distribution testing of tailings samples collected at the north end of the STP was carried out in 2018 (Golder 2020a) using a laser diffraction method. Six tests were conducted using samples from depths between 2.4 and 16 m. The results show that the particle size of the tailings has sand content from 5% to 68% and fines content from 32% to 95%. Atterberg limits tests were carried out on the same six samples. One of the samples was found to be non-plastic and the others had low plasticity, with liquid limit from 32% to 49% and corresponding plasticity index from 4% to 8%. Specific gravity ranged from 1.4 to 1.9 and an in situ dry density averaged 858 kg/m^3 considering four Shelby tube samples.

2.2 Overview of Design, Construction, and Previous Operation

A summary of the STP and NTP design, dam construction, and past operation is presented in the following subsections. Additional details of construction history are presented in the operation, maintenance, and surveillance (OMS) manuals (FRO 2022a,b).

2.2.1 Design Parameters for the South Tailings Pond and North Tailings Pond

The following design parameters apply to the STP and NTP. Typical sections of the dams are shown in Figure 4 and Figure 5 for the STP and in Figure 8 for the NTP.

2.2.1.1 Foundation Materials

The retention dams at the STP and the NTP are founded on Fording River flood plain sands and gravels, dense glacial till soils, or shale bedrock.

A subsurface investigation was completed by FRO to compile in situ density data and subsurface stratigraphy under the STP and NTP dams (FRO 2016).

2.2.1.2 Embankment Fill Materials

Materials that were used to construct the dams were till fill, CR, and CCFR.

2.2.1.3 Till Fill

A zone of compacted glacial till fill forms the upstream face of the retaining dams. This till fill zone serves as a low-permeability zone to minimize seepage through the dam rather than as structural support. The glacial till material was sourced locally on site.

2.2.1.4 Coarse Rejects and Combined Coarse and Fine Rejects

At both the STP and the NTP, support for the low-permeability zone of the dams is provided by compacted CR or CCFR. The CR is a waste product generated at the wash plant and consists of sand and gravel-sized, well-graded, washed crushed rock material.

For the 2010 and 2012 raises of the STP dams, CCFR was used in place of the CR following modifications to the wash plant waste streams. The CCFR is formed by combining the CR with finer material previously sent to the tailings ponds as tailings. The CCFR contains approximately 2% to 10% material finer than 0.075 mm. The engineering properties of the CCFR are similar to those of the CR and used in slope stability analysis (Golder 2018a).

Golder personnel were on site throughout the 2012 and 2013 dam raise construction period to provide quality control services following the quality control specifications from Golder (2011). Results of the quality control program related to the dam raise, including construction observations and deficiencies noted by the Golder personnel and recommendations to address the deficiencies, are included in the construction record reports (Golder 2013, 2014d).

2.2.2 South Tailings Pond

A plan view of the STP facility is shown in Figure 2 and Figure 3. The STP occupies a total area of approximately 80 ha and is located to the south of the processing plant, on the east side of a realigned reach of the Fording River. The STP facility was developed on the flood plain of the Fording River. The Fording River was diverted to a new alignment outside the footprint of the STP by excavating a new channel through a topographic bench on the west side of the Fording River flood plain. This topographic bench consists of native glacial till soils overlying Fernie Shale. Confinement at the STP is provided by the Main Dam, which extends across the width of the Fording River flood plain, and by the West Dam, which extends parallel to the east side of the Fording River diversion channel. The West Dam is primarily founded on the glacial till bench.

Initial construction of the STP dams was performed between 1977 and 1979 based upon a design by Golder (1976). From 1983 to 2013, the STP dams were raised in six stages using the downstream construction method:

1) 1983 to 1984 (FCL 1984)
2) 1985 to 1990 (FCL 1988, 1989, 1990)
3) 1993
4) 2008 (Golder 2009)
5) 2010 (FRO 2010)
6) 2012 to 2013 (Golder 2013, 2014d)

The design crest elevation of 1,637.85 m was specified in the original design report (reported as elev. 1,638.3 m FRO Mine Grid in Golder [1976]), and this elevation was reached for the Main Dam with construction carried out in 2013. The design crest elevation of the north end of the West Dam is 1,639.5 m, and this elevation was reached with construction carried out in 2013; however, a section of the north abutment was not completed due to the gas pipeline in this area. Designs of the north and south abutment sections of the dam are presented in the design update report and design drawings (Golder 2011, 2012a). The latest construction summary of the STP raise is reported in the construction record report (Golder 2014d).

The current minimum crest of the STP dam is elev. 1,637.85 m (confirmed with 2021 LiDAR survey data from FRO).

The dam's construction prior to the 2008 raise was wider than design, which created a bench along the length of the facility when the 2008 and later lifts were constructed, as shown in the sections in Figure 4 and Figure 5.

The June 2013 flooding of the Fording River caused high flows along the downstream toe of the STP West Dam, which eroded the foundation soils and a minor portion of the CR shell. Repairs to the West Dam downstream toe area were completed in 2013.

Riprap upgrades were completed for the STP in 2016, and construction was carried out under the direction of Kerr Wood Leidal Associates Ltd. (KWL) as Designer of Record (DoR). KWL oversaw the placement of approximately 2.5 m thickness of riprap by FRO and FRO contractors along the existing STP riprap alignment for scour protection and to accommodate the revised 200-year return period (Q200) design flow (KWL 2017b). During construction, KWL provided oversight to the gradation and quality of the riprap, which was sourced on site. A construction completion report and record drawings for these riprap upgrades are included in KWL (2017b). Golder provided on-site services to oversee resloping of the till bench and cutting into weathered bedrock for key in of the riprap material and monitored seepage conditions and signs of instability (Golder 2017a).

One recommendation remains outstanding from the reconstruction and riprap upgrades (Golder 2014c): river flood protection south of STP Sta. 0+680 needs to be completed to improve long-term stability of the STP structure (recommendation 2015-12 in Table 21). Flood protection upgrades south of Sta. 0+680 have not been completed. Riprap along this area has been included in the detailed design of the STP flood widening project (KCB 2020) with plans for construction to be completed by 2025.

A 168 mm outer diameter, 160.3 mm internal diameter steel pipeline crosses beneath the north abutment of the STP at Sta. -0+185 m and continues under the tailings along the western side of the railway embankment, then crosses under the STP's south abutment at approximately Sta. 1+850. This was previously used as a high-pressure gas pipeline, which was decommissioned and purged in 2020 by FortisBC, the owner of the pipeline. A portion of the gas pipeline from the tree island (along the railway embankment) to downstream of the STP south abutment was backfilled with a sanded grout mix provided by CIF Construction Ltd., which was supplemented with hydrated bentonite. Approximately 525 linear metres of the pipeline was backfilled and grouting was completed in one day on 28 June 2020. The grouted pipeline was then capped by FRO. The construction record report of the decommissioning and grouting of the gas line is provided in Golder (2020c). A section of the decommissioned steel pipeline that was not grouted remains under the north abutment. WSP is working with FRO to develop a plan to properly abandon this section of the decommissioned pipeline.

An environmental design flood (EDF) is defined as the most severe flood that is to be managed without release of untreated water to the environment (CDA 2019). The 100-year return period, 10-day rain-on-snow event was adopted as the EDF (Golder 2020b).

Golder carried out a site investigation in December 2018 on the tailings at the STP. The investigation included six cone penetration tests (CPTs), two seismic CPTs, sonic drilling, electronic field vane shear testing, vibrating wire (VW) piezometer installation, and laboratory testing. The data collected from the site investigation are summarized in a report by Golder (2020a). Results from the site investigation were used for liquefaction assessment and bearing capacity of tailings (Golder 2020a) as well as an assessment of potential of dam overtopping due to displacement induced by tailings liquefaction. Locations of the boreholes and VW piezometers are shown in Figure 3. A study was carried out to address recommended action 2017-05 in Table 21; however,

due to high levels of uncertainty in the results, additional analyses have been recommended to better characterize the failure potential of saturated tailings block and the resulting wave attenuation potential.

Signage was placed at the dam toe, crest, and vicinity of the STP in June 2019 to notify passersby that the structure is a tailings dam and to provide direction and contact information to report any issues observed or any proposed work in the vicinity.

Following the reclassification of the STP dam from a High to a Very High consequence structure, the hydrologic assessment of the STP (Golder 2018a) identified that the STP facility without a spillway did not have sufficient capacity to store the 72-hour inflow design flood (IDF) as required by the HSRC (EMLI 2022).

Detailed design for an emergency spillway for the operation phase for the STP facility was completed in 2020 (Golder 2020b) and permitted for construction; construction was completed in July 2021. The spillway was designed to safely convey a peak flow of 16.3 m^3/s resulting from the 24-hour probable maximum flood (PMF) event through the spillway to downstream of the dam. This exceeds the Very High requirement and aligns with Teck's approach of extreme external load adoption for operating facilities with potential failure modes leading to flow failures. The spillway design consists of the following:

- a spillway invert (20 m long) with a 53 m wide base and a concrete sill with invert elevation at 1,637.1 m
- a spillway chute (78 m long) consisting of a channel, chute, and stilling basin; the chute tapers from 53 m at its connection with the spillway invert to 36 m at the stilling basin
- a channel stilling basin to account for a hydraulic jump that is expected at the base of the spillway chute during spillway flow events
- a spillway channel (440 m long) that starts at 36 m in width then tapers to 10 m except for the portion of the spillway channel that will act as an access road

2.2.2.1 Main Dam

The STP Main Dam, which extends across the Fording River flood plain, has a maximum height of approximately 35 m. A typical section of the STP Main Dam is presented in Figure 4. The Main Dam was constructed and raised using a downstream construction method. It consists of a low-permeability starter dam of compacted glacial till soil with a cut-off through the sand and gravel into the underlying in situ till. Raises above the starter dam included an inclined low-permeability zone of compacted glacial till soil on the upstream side of the dam, supported by a zone of compacted CR or CCFR. The compacted CR or CCFR zone that forms the downstream shell of the Main Dam provides the structural strength of the dam.

As indicated in Figure 4, discontinuous flood plain sands and gravels extend beneath the whole downstream shell of the Main Dam. These sands and gravels extend through the Fording River flood plain gravels and are joined to in situ glacial till soils that underlie the flood plain gravels. These flood plain sediments are pervious and serve as an underdrain for the dam.

The Main Dam abuts high ground at the location of the reclaim barge. The south abutment till blanket and dam tie into both the high ground and in situ soil in the railway embankment. The till blanket was constructed to reduce potential seepage losses from the STP south abutment and to mitigate against a preferential flow path at the dam's tie-in to the south abutment.

A dam breach and inundation study was conducted to assess the potential for inundation in the immediate downstream area of the Main Dam, which now includes the active water treatment facility-south (AWTF-S) and

was used to inform emergency planning. The FRO tailings team has worked with the AWTF-S team to update training and emergency planning for workers at the water treatment facility.

2.2.2.2 West Dam

The STP West Dam is founded on the till bench that borders the western edge of the Fording River diversion channel and on a portion of the Fording River flood plain. It was constructed and raised using a downstream construction method. A typical section through the West Dam, presented in Figure 5, consists of a low-permeability zone of compacted glacial till soil on the upstream side of the STP West Dam, supported by a zone of compacted CR or CCFR. The West Dam abuts into the railway embankment at the north abutment. The West Dam ranges from a height of 16 m near Sta. 0+400 to 24 m near the transition to the Main Dam.

A key-in excavation was constructed for a portion of the north abutment, and the excavation was filled with compacted till. The construction of the north abutment section between Sta. -0+160 and -0+223 was not completed in 2013 due to proximity to the high-pressure gas pipeline. An interim berm was constructed approximately parallel to the gas pipeline.

Tailings were observed to periodically back up at the north single point discharge channel area and the backed-up tailings would cause the tailings pipeline to become partially submerged. In 2018 and 2019, FRO contracted an earthworks company to excavate, with a long-arm excavator, tailings from the main discharge channel to direct tailings flow away from the discharge point and toward the main reclaim pond. The excavated tailings were stockpiled to the west of the channel and spread locally in the area using a dozer. The stockpiled tailings were regraded in 2019 across a larger area (than the stockpile) and to slope the tailings to the topography of the STP facility and dam, where elevation is the highest at the north end and slopes down toward the south. The EoR provided recommendations (Golder 2019) to FRO's safe work plan of this work regarding the maximum elevation of the graded surface tailings, setback between the graded tailings and STP dam upstream slope, and geotechnical considerations for safe working conditions in this area.

The tailings pipeline was extended upstream in 2020 to allow tailings to deposit farther upstream from the north abutment area in response to past occurrences of tailings backup at the discharge point. The extended pipeline lowers the risk of tailings backing up and overtopping at the north abutment of the STP.

2.2.2.3 Railway Embankment

A segment of the railway embankment south of the loading loop traverses an area that impounds tailings in the STP facility. A stability assessment of the embankment was previously carried out by Golder in 1984 (Golder 1984) and updated in 2010 (Golder 2010). The 1984 assessment recommended a buttress on both sides of the railway embankment to maintain stability of the embankment with respect to the increase in the pond elevation. FRO constructed this buttress in stages as the tailings and STP pond level increased between 1985 and 2014.

In 2010, Golder (2010) recommended that FRO grout the existing culverts that conveyed surface runoff through the railway embankment, install new culverts at a higher elevation, and backfill the area east of the railway embankment to provide further buttressing for the railway embankment to improve stability. The corrugated steel culverts passing through the railway embankment were filled with concrete during 2009 and 2010 to prevent the flow of tailings from the STP to the east as the tailings level rose above the elevation of the existing culverts. The unused culverts were properly closed and abandoned, and in 2010 the area of the railway embankment was backfilled and graded. Surface runoff from the area upslope of the railway embankment, including Blackmore Creek, is now diverted around the backfilled area into the STP through twin 0.8 m diameter culverts installed in 2010.

A till cut-off was constructed through the rejects buttress fill that runs parallel to the railway embankment (Golder 2013).

Three culverts were installed in 2015 under the railway track to pass pipelines (two at 0.6 m diameter and one at 0.3 m diameter) as part of the STP to Turnbull TSF tailings transfer project. These culverts are located just north of the twin Blackmore Creek culverts.

2.2.2.4 South Tailings Pond Emergency Spillway

The STP emergency spillway invert is located on the Main Dam at the south abutment and is bounded by the Main Dam access road and the railway embankment as shown in Figure 2. The spillway was constructed in two phases from September 2020 to July 2021 following the Issued for Construction Drawings and Specifications (Golder 2020b). During spillway construction, Golder provided full-time construction supervision, field design support, and quality assurance. Details of construction are reported in the construction record report Golder (2021) and signed off by the spillway DoR, who noted that the construction work met the intent of the design, with noted deficiencies and recommendations. The design intent of the STP emergency spillway is to discharge excess water from the STP during extreme precipitation events. The spillway is sized to pass the PMF (1:10,000-year precipitation event).

The following are the main deficiencies and recommendations:

- The protection to the clarified water pipeline did not follow the supplemental instructions and had to be field fit. This section of the spillway should be clearly marked so no heavy equipment can drive over this area (recommendation 2022-01 in Table 21).
- Approximately 1,591 m^3 of the 4,482 m^3 (35%) of the Class 10 kg and Class 50 kg riprap sourced from the Swift South Spoil placed during Phase I did not meet the specifications for micro-deval.
- Approximately 2,891 m^3 of the 4,482 m^3 (65%) of the Class 10 kg and Class 50 kg riprap sourced from the Swift Pit placed during Phase I did not meet the specifications for absorption, micro-deval, and soundness.
- Golder informed Teck that the riprap was deficient and did not approve placement as the riprap has the potential to deteriorate over time. Teck acknowledged the deficiency and agreed to accept the deterioration risk to accommodate the construction schedule. Golder recommended that Teck document this project decision along with estimates of potential future repair costs and that Teck develop a long-term monitoring and mitigation plan for the riprap. The monitoring plan should include annual inspections consisting of visual and photographic assessment of the riprap to evaluate any breakage or deterioration, change in riprap gradation, change in extent of surface cover or other deficiencies. Golder recommended establishing at least five test sections within the spillway and checking the riprap condition at the same test sections every year.

2.2.3 North Tailings Pond

A plan view of the NTP facility is shown in Figure 6 and Figure 7. The NTP was developed on a segment of the Fording River flood plain and occupies a total area of approximately 40 ha. In the 1970s, the Fording River was diverted into a new constructed channel (McElhanney 1969) to allow construction of the NTP on the west side of the Fording River flood plain (Golder Brawner 1969). Along the eastern and southeastern sides of the NTP facility, confinement for water and the stored tailings is provided by a zoned earth fill dam that has a maximum height of approximately 24 m. The NTP dam was designed and constructed using a downstream construction method. A confining dam is not required along the west side of the facility because the natural ground to the west of the NTP is higher than the stored tailings or pond level.

A typical section through the zoned earth fill NTP dam is presented in Figure 8. The crest of the dam was raised in stages, as the tailings storage requirements increased progressively during the early years of operation at FRO. Stage 1 of the dam was constructed entirely of compacted glacial till soil, complete with a compacted glacial till cut-off that extends through the Fording River flood plain gravels and is joined to in situ glacial till soils that underlie the flood plain gravels.

During subsequent stages of construction, the compacted glacial till was extended upward in the form of an inclined zone on the upstream side of the NTP dam. Structural support for this inclined till zone is provided by compacted CR. As shown in Figure 8, the in situ fluvial sands and gravels of the Fording River flood plain extend beneath the cross-section of the dam. These fluvial sediments have a high hydraulic conductivity and serve as an underdrain that promotes downward seepage from the facility.

The original design for the NTP was completed by Golder (Golder Brawner 1969, 1970). Construction of the NTP was initiated in 1971 (Golder Brawner 1971), and the facility was put into service in March 1972. The NTP dam was raised four times between 1973 and 1979 (Golder Brawner 1973, 1974a,b, 1975a,b; Golder 1979) using a downstream construction method and reached its current elevation in 1979. The NTP facility was at its tailings storage capacity by 1980 (Golder 1981). Between 1980 and 1991, the NTP was inactive, and the facility was dewatered and excavated using scrapers to recover additional tailings storage capacity (FCL 1981; Golder 1981). The NTP was put back into active use and refilled with tailings between 1993 and 1997, after which the facility was again inactive. From 2001 to 2002, the NTP was dredged, and the tailings were sent to 2 Pit and 3 Pit South. Dredged tailings from the STP were used to fill the excavated areas of the NTP seasonally between 2004 and 2006. No tailings have been sent to the NTP since 2006, and the tailings pipeline has been partially removed.

The design crest of the NTP dam is elev. 1,653 m with minimum elevation of the NTP dam crest at elev. 1,652.6 m (confirmed with 2021 LiDAR survey data from FRO).

Following the flood of June 1995, riprap was placed along the downstream/eastern toe of the dam, as well as along the opposite (left) side of the Fording River channel. The condition of the riprap placed in 1995 had degraded by the time of the 2006 dam safety review (DSR), and review of the riprap sizing and placement was recommended by Golder. Assessment of the riprap was performed by KWL (2007, 2009).

Between 19 and 20 June 2013, a significant 48-hour rainfall event (approximately 1:150 to 1:200-year return) occurred, which resulted in flooding of the Fording River. High flows along the toes of the NTP dam triggered major erosion of the CR shell. Golder was retained by FRO to provide geotechnical input for flood repairs of the NTP dam. KWL was retained to provide recommendations for sizing and placement of the riverbank protection along the downstream dam toe (KWL 2014). The dam shell was rebuilt using compacted CCFR material. A total CCFR fill of approximately 22,350 m³ was placed and compacted between 3 July and 8 August 2013

(Golder 2014b). Riprap revetment construction was carried out along the toe of NTP dam under the direction of KWL in 2013 and 2014. A major deflection structure in the Fording River, a main source of the concentrate flow that led to the erosion, was removed in 2013 as part of flood repair works.

In 2016, FRO constructed a sediment pond north of the NTP facility (the Liverpool Sediment Pond); the outlet channel from this pond is routed through the north end of the NTP tailings deposit and includes a fish barrier weir constructed through the north abutment of the NTP dam (AMEC-FW 2017).

Additional riprap upgrade works were designed, and construction was carried out under the direction of KWL as DoR in 2016 and 2017 (KWL 2017a). The 2016 work included placing riprap of approximately 2.5 m thickness along the existing NTP riprap alignment for scour protection and to accommodate the revised 200-year return period (Q200) design flow plus freeboard. During 2017, riprap construction was completed under the direction of KWL, which included the excavation and placement of approximately 150 m of riprap at the upstream end of the NTP and the placement of approximately 745 m of riprap over the existing bank protection. During construction, KWL provided oversight to the gradation and quality of the riprap, which was sourced on site. A construction completion report and record drawings for these riprap upgrades are included in KWL (2017b).

Golder completed a screening-level flowability assessment of the tailings within NTP in 2016 (Golder 2017c) to assess the possibility of revising the NTP from a tailings dam to a mine waste facility or “landform” per Section 10.6.12 of the HSRC (Ministry of Energy and Mines 2017).

In September 2018, FRO installed two monitoring wells at the toe of the NTP dam to support the NTP transition scope of the Flood Mitigation Project. The locations of these monitoring wells are shown in Figure 7.

On 18 May 2019, a VW piezometer was installed in the NTP pond to monitor pond elevation. A data logger was installed for the piezometer, and it is connected to GeoExplorer. Readings from the NTP pond piezometer are live on GeoExplorer and are recorded every six hours.

A staff gauge was installed in the NTP pond in October 2019 to also monitor pond elevation. The staff gauge has been calibrated regularly as part of maintaining accurate readings.

2.3 Site Seismicity

The site is located in an area of relatively low seismicity in BC. Golder developed a site-specific seismic hazard model for the FRO site based on historical seismicity and a review of geological and paleoseismological features (Golder 2016b). The site-specific model included four area sources from the 5th Generation Seismic Hazard Model and nine faults and fault segments mapped in northwest Montana. The 5th Generation Seismic Hazard Model was developed by Natural Resources Canada for use in the 2015 National Building Code of Canada.

Probabilistic analysis results from site-specific hazard model are listed in Table 1. All site-specific peak ground acceleration values were evaluated for a soil Site Class C as described in the 2010 National Building Code of Canada (NRCC 2010) as this represents WSP’s understanding of the general foundation conditions at the dam locations. Note the NRCC 2015 description for Site Class was not published at the time of writing the site-specific seismic hazard model report.

Table 1: Fording River Operations Site Seismic Hazard Values

Exceedance Probability	Return Period (years)	Peak Ground Acceleration (g)
40% in 50 years	100	0.020
10% in 50 years	475	0.063
5% in 50 years	1,000	0.097
2% in 50 years	2,475	0.158
1% in 50 years	5,000	0.222
½% in 50 years	10,000	0.300

Notes: Source Golder 2016b. For firm ground site class "C," very dense soil and soft rock foundation, as defined by 2010 National Building Code of Canada (NRCC 2010). Return periods are not exact representations of annual exceedance probabilities; rounding per Canadian Dam Association (CDA 2013, 2019) is shown. FRO (Fording River Operations) site coordinates: 50.202°N, 114.876°W.

2.4 Key Operational Components

2.4.1 Freeboard Management

The minimum required freeboard during the IDF event and maximum operating water levels for the STP and NTP are summarized in Table 2.

With the spillway construction complete at the STP, the resulting minimum required freeboard during the IDF event and EDF storage volume required below the spillway invert are summarized in Table 2.

For the NTP, the maximum operating water level must be 1.9 m below the minimum dam crest elevation to store the IDF while maintaining the required minimum freeboard.

Table 2: Maximum Pond Elevation or Pond Volume and Freeboard Levels

Parameter	STP (m)	NTP (m)
Minimum dam crest elevation	1,637.85[(a)]	1,652.60[(b)]
Spillway invert elevation	1,637.10	n/a
Minimum required freeboard (while passing IDF)	0.40	n/a
Minimum required freeboard (while storing IDF)	n/a	0.35
IDF maximum water level (dam crest elevation minus the minimum freeboard)	1,637.45	1,652.25
Maximum operating water level to allow for storage of the IDF	n/a	1,650.70
EDF storage volume required between operating pond and spillway invert, with no pumping	463,381 m^3	n/a

(a) Minimum Main Dam crest elevation following 2013 dam raise construction reported in Golder (2014d), checked with 2021 LiDAR survey data from FRO.

(b) Dam crest elevation from 2018 LiDAR, checked with 2021 LiDAR survey data from FRO.

Source: Golder 2018a, 2020b.

n/a = not applicable; STP = South Tailings Pond; NTP = North Tailings Pond; IDF = inflow design flood; EDF = environmental design flood; FRO = Fording River Operations.

2.4.2 Control of Inflows and Outflows

Floating reclaim pumps are used to recirculate water from the STP to the processing plant. Water demand at the plant is greater than the volume of water that is available from recirculation of tailings slurry transport water alone, creating a water deficit in the STP facility water balance. Makeup water is added to the STP from various locations on site to satisfy the reclaim water demand.

In the event of high water levels, the current STP water level standard operating procedures from Appendix B of the STP OMS manual (FRO 2022a) or the NTP water level trigger action response plan (TARP) from Appendix B of the NTP OMS manual (FRO 2022a,b) would be followed.

There are no permanent working pumps at the NTP. A portable pump and pipeline are in place to pump water from the NTP to the STP when required.

2.5 Key Personnel

The EoR for the STP and NTP dams is John Cunning, P.Eng., an employee of WSP Canada Inc. The DoR for the STP spillway is Adriana Parada, P.Eng., also an employee of WSP Canada Inc.

KWL has historically been responsible for hydraulics-related works and has completed a Fording River hydraulics assessment (KWL 2017c) and prepared design and construction record reports for erosion protection along the STP and NTP dam toes following the 2013 flood event (KWL 2017a,b). Jason Miller of KWL is the DoR for the erosion protection works for both the STP and NTP facilities.

The Qualified Person (QP) for the STP and NTP is James Campbell, P.Eng., Senior Tailings Engineer, who is an employee of Teck. Mr. Campbell became the QP on 4 May 2021.

2.6 Quantifiable Performance Objectives

Quantifiable performance objectives (QPOs) have been established for the STP and NTP with consideration of the credible failure modes for the facilities. Golder (2018) presents updated the QPOs for piezometers and GPS units at the STP and NTP based on a stability update.

2.6.1 Instability

2.6.1.1 Piezometers

Slope stability analysis of the STP and NTP dams (Golder 2018a) informed the initial development of warning and alarm QPOs. The warning and alarm QPOs were developed based on stability assessments (Golder 2018a) and presented in the Elk Valley Elevation Datum system, rounded to the nearest 0.1 m. These QPOs are included in the 2022 version of the OMS manuals (FRO 2022a,b) for the STP and NTP.

Three VW piezometers (at BH-CPT18-05A and -07A) were installed in 2018 within the STP tailings deposit. No QPOs are required for these instruments as they were not installed for dam safety reasons. These sensors are connected to the GeoExplorer system.

Seven piezometers were installed in three locations (CP17-NTP-01, -02, and -04) within the NTP tailings deposit in November and December 2017. These are being monitored to support NTP facility closure studies, and no QPOs are required for these instruments.

The piezometer QPOs are presented in Table 3.

Table 3: Piezometer Instrumentation Trigger Levels for the South Tailings Pond and North Tailings Pond

Dam	Monitoring Instrument	Warning Water Elevation (m)
NTP	TH15-05	>1,646.5
	TH15-06	>1,643.5
	TH15-07	>1,640.5
STP – Main Dam	SP-3	>1,604.0
	SP-5	>1,603.5
	TH15-04	>1,603.5
	TH15-01/VW-5	>1,617.5
	TH15-02/VW-4	>1,624.0
STP – West Dam	TH15-03/VW-1/VW-2	>1,627.5
	SP-W1	>1,623.1
	SP-W3	>1,623.0
	VW-3	>1,627.0

NTP = North Tailings Pond; STP = South Tailings Pond; > = greater than.

2.6.1.2 Dam Crest Displacement Monitoring

The STP has nine GPS units to monitor displacements. FRO ceased the use of prisms on the NTP dam in May 2018 due to difficulties with surveying in winter (i.e., snow cover on the prisms) and with backsight readings. The prisms were replaced with GPS units, with three units installed at the NTP in June 2018. Dam crest displacement monitoring is considered a best practice, and warning levels for displacement data from the GPS units have been established.

Data from the GPS units are reviewed by FRO as part of the tailings dam inspections for the STP and NTP (weekly to monthly for the STP and monthly for the NTP) to check for movements or trends of concern. The data and results of the routine FRO review are provided to the EoR team on a monthly basis for review.

Table 4 provides the trigger levels for GPS units on the STP and NTP dams from Golder (2018a).

Table 4: GPS Monitoring Instrumentation Trigger Levels for Both South and North Tailings Ponds

Dam	Monitoring Instrument	Survey Data	Warning	Alarm
STP and NTP	GPS	3D displacement (or cumulative relative displacement)	>100 mm	>150 mm
		3D point velocity with 12-point averaging	>100 mm/day	>150 mm/day

Note: Discuss with Engineer of Record prior to zeroing displacement data.
STP = South Tailings Pond; NTP = North Tailings Pond; > = greater than.

2.6.1.3 Slope Inclinometers

In total, there are seven slope inclinometers (Table 5): four inclinometers are installed in the STP dam (TH15-01 to TH15-04) and three are installed in the NTP (TH15-05 to TH15-07). These were installed during 2015 drilling as a best practice, and not in response to any dam displacement concerns. Slope inclinometers are to be read at a minimum of once per annum.

Table 5: Slope Inclinometer Summary

Location	Test Hole	Approximate A-A Axis Azimuth (°)	Hole Depth (m)	Casing Stickup (m)	Start Depth (m)	Reading Intervals (m)
STP	TH15-01	310	41.00	0.8	40.0	1.0
	TH15-02	10	40.00	1.0	40.0	1.0
	TH15-03	30	30.05	1.1	30.0	1.0
	TH15-04	15	6.00	1.0	6.0	1.0
NTP	TH15-05	235	20.90	0.9	21.0	1.0
	TH15-06	290	29.20	1.0	29.0	1.0
	TH15-07	305	40.80	0.9	41.0	1.0

Source: Summary table provided by email (Roseingrave 2017, pers. comm.).
STP = South Tailings Pond; NTP = North Tailings Pond.

FRO and the EoR discussed challenges with setting QPOs for inclinometers as they are not a critical dam safety control, and it is not practical to set QPOs for inclinometers. Monitoring inclinometers is considered a best practice and Table 6 has been updated to provide suggested screening trigger levels for review of the inclinometer data.

Table 6: Trigger Levels for Slope Inclinometers

Monitoring Instrument	Trigger Level	Severity	
		Acceptable	Warning
Slope inclinometer	Downstream displacement at depth greater than 1 m	<5 mm/year	>5 mm and <15 mm/year

Note: Trigger levels provided are for readings measured at depths greater than 1 m below ground surface.
> = greater than; < = less than.

2.6.2 Pond Water Level

The warning and alarm triggers shown in Table 7 are currently used by FRO for the STP and NTP facilities' water level elevations. The NTP water level TARP is provided in Appendix C of the OMS manual (FRO 2022b). The STP water level standard operating procedures is provided in Appendix B of the OMS manual (FRO 2022a).

The STP water level standard operating procedures (version 2022.01) is the most recent update by FRO.

Table 7: Water Level Triggers for the South Tailings Pond and the North Tailings Pond

Dam	Survey Data	High Operating Range (EVED)	Critical Water Level (NTP) High Level Warning (STP) (EVED)
NTP	Water level	>1,650.4 m	>1,650.7 m
STP	Water level	>1,636.1 m	>1,636.6 m

NTP = North Tailings Pond; STP = South Tailings Pond; > = greater than; EVED = Elk Valley Elevation Datum.

The STP spillway construction is complete and the STP water level TARP warning and alarm triggers have been updated in the OMS manual.

2.6.3 Swift Area Blasting

The Swift mining area has active open pit mining operations located near the STP and NTP dams. A blast monitoring TARP has been prepared to monitor potential effects from this nearby blasting within 900 m of the STP and NTP dams. The response framework for the monitoring data is described in Golder (2018b), and the TARP is included in Appendix C of the OMS manuals (FRO 2022a,b).

3.0 OPERATION, MAINTENANCE, AND CONSTRUCTION DURING 2021/2022 REPORTING PERIOD

A summary of the operations, maintenance, and any construction activities for the 2021/2022 reporting period is presented in the following sections.

3.1 Operations

3.1.1 South Tailings Pond

The STP was active, and tailings were deposited into the STP throughout the reporting period. The STP dams were inspected by FRO tailings personnel throughout the year per the inspection schedule outlined in Section 5.4 of the OMS manual (FRO 2022a). The STP dams were inspected weekly between May and October and twice per month between November and April. The inspections were completed at the required frequency, and the EoR team has reviewed them as part of this annual review.

The 2022 dredging season was between 14 April and 21 October 2022. A total of 1.86 million dry metric tonnes of tailings was dredged from the STP and sent to the Turnbull TSF.

Bathymetric surveys were completed by FRO on 10 April 2022 (before dredging began), 30 June 2022 (interim), and 1 October 2022 (interim) as part of monitoring storage capacity in the STP. A post-dredging survey was not completed in 2022. The storage capacity and operating pond volume of the STP are to be confirmed after each bathymetric survey is completed (recommended action 2020-03 in Table 21).

In order to manage acutely toxic water from Lake Mountain Pit and Swift Pit mining operations, Teck discussed with the EoR to temporarily exceed the high operating range of 1,636.1 m during pump maintenance, dredge installations, or other activities that limit the capacity of water that can be pumped out of the STP, which results in a net positive water balance in the STP. Teck proposed to the following to manage the temporary increases in the STP water level between April and May 2022:

- Lower water levels in the STP ahead of anticipated dredge or pump maintenance.
- Temporarily increase water levels above 1,636.1 m with real-time water level monitoring and do not exceed a maximum water level of 1,636.35 m. Limit inflows into the STP during the dredge maintenance/connection period. Monitor the weather forecast before deciding to exceed 1,636.1 m.
- Return water levels below 1,636.1 m following dredge operation as soon as practical (within two weeks of reaching the maximum water level).

To satisfy the permit for spillway construction (Permit Amendment C-3 Approving South Tailings Pond Spillway), Golder (2022b) presents an EDF re-assessment, which included the assessment of a passive EDF management plan (with no pumping). The normal operating pond elevation should continue to be evaluated on an annual basis

with available pumping from the STP pond to confirm the necessary storage, volume, and pumping rates are adequate to manage the estimated EDF inflow volume.

3.1.2 South Tailings Pond Emergency Spillway

No water from the pond overflowed the spillway invert and entered the emergency spillway during the reporting period. Based on a visual inspection carried out during the 7 September 2022 site visit by the EoR, degradation of the riprap was observed in multiple areas of the spillway channel (Photographs 15 and 16 in Appendix A) where the riprap did not meet material specifications (Golder 2021). As per the STP OMS manual (FRO 2022a), annual inspections should be conducted at five test locations to monitor and evaluate material breakage or deterioration, change in gradation, change in extent of cover, and other deficiencies. WSP will work with Teck to close STP recommended action 2021-01 in Table 21.

3.1.3 North Tailings Pond

The NTP was not operational and there was no tailings deposition during the reporting period. The NTP dam was inspected monthly by FRO tailings personnel. The inspections were completed at the required frequency, and the NTP dam inspection reports have been reviewed by the EoR team

3.2 Maintenance

No maintenance occurred at the STP or NTP in the reporting period.

3.3 Construction

3.3.1 South Tailings Pond

A temporary pump system was installed in October 2021 to pump water from the STP to the Turnbull TSF as part of managing additional inflows to the STP from Shandley Pit dewatering.

In the fall of 2021, FRO started earthwork excavation to widen the west bank of the Fording River along the STP West Dam (KCB 2020). Earthworks for phase 1 of the STP floodplain widening project were completed in August 2022. The floodplain has now been widened to approximately 80 m to the elevation of the 25-year flood level (Photograph 5 in Appendix A). As part of the STP floodplain widening project, the pipeline bridge that crossed the Fording River at the West Dam was removed in October 2021.

3.3.2 North Tailings Pond

During the reporting period, FRO constructed a raw coal stockpile over an existing overburden stockpile located at the northwest end of the NTP facility. To meet the acceptance criteria, a 20 m wide berm of waste rock material placed with a 2H:1V face slope angle was recommended to be placed around the overburden stockpile.

4.0 REVIEW OF CLIMATE DATA AND WATER BALANCE

4.1 Climatic Review

Three local climate monitoring stations exist at FRO: waste water treatment plant, A Spoil, and Brownie Spoil. Records were available from the waste treatment plant and Brownie Spoil weather stations during the reporting period of 1 September 2021 to 31 August 2022. Only limited precipitation data were available for the A Spoil station; it has therefore been excluded from the climate data review.

The Fording River Cominco station is the closest regional Environment and Climate Change Canada station to the FRO site; however, the station has not published precipitation data since 2017. The waste water treatment plant station has been used as the main precipitation station for the Fording River Cominco infilling gap process since December 2013 and now makes up the majority of the dataset. As a result, a new combined dataset, hereafter referred to as the Fording River (infilled) dataset, has been used for the climate review. The waste water treatment plant station precipitation data were used over the entire the reporting period.

The total precipitation recorded at the Fording River (infilled) and Brownie Spoil stations over the reporting period is shown in Table 8 with their monthly total precipitation presented in Chart 1. For comparison purposes, the long-term (1970 to 2021) average monthly precipitation at FRO (from the Fording River Cominco infilled dataset) is also presented in Chart 1. The long-term (1970 to 2021) average annual precipitation at the mine site is estimated to be 631 mm.

Note that data presented in Table 8 and Chart 1 for the Fording River (infilled) and Brownie Spoil stations are raw data; no adjustments for station elevation or undercatch were made.

Table 8: Total Precipitation from 1 September 2021 to 31 August 2022

Weather Station	Total Precipitation (mm)
Fording River (infilled)	669
Brownie Spoil	617

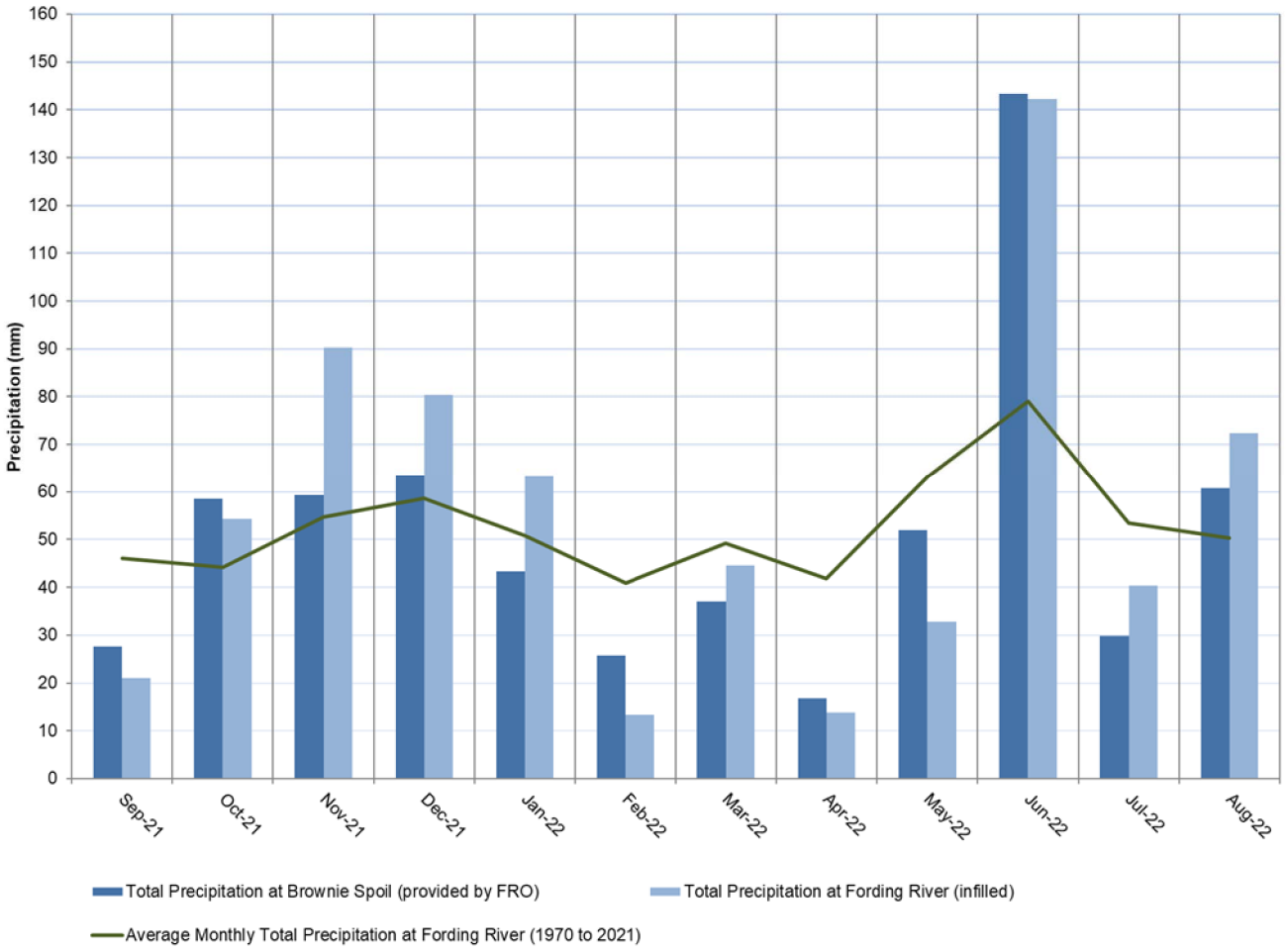


Chart 1: Monthly Precipitation Data from 1 September 2021 to 31 August 2022

The precipitation data in Table 8 indicate that the annual precipitation used for the Fording River (infilled) dataset from 1 September 2021 to 31 August 2022 was higher than the long-term average of 631 mm, whereas the corresponding annual precipitation received at the Brownie Spoil weather station was lower than the long-term annual average. A similar observation could be made from Chart 1.

Freshet typically starts in April to May at FRO with higher runoff flow events expected during those months as a result of combined rainfall and snowmelt.

4.2 Water Balance

4.2.1 South Tailings Pond

The water balance for STP from 1 September 2021 to 31 August 2022 is summarized in Table 9 using climate inputs from the waste water treatment plant station.

Table 9: South Tailings Pond Water Balance – 1 September 2021 to 31 August 2022

IN	Annual Volume (m^3)	OUT	Annual Volume (m^3)	Total Inventory Change (m^3)
Calculated Parameters				
Surface water runoff	111,000	Evaporation	207,000	
Precipitation	226,000	Water retained in tailings	-277,000[(a)]	
Tailings slurry	23,619,000	–	–	
Measured Parameters				
Makeup water	5,712,000	Dredged slurry to Turnbull TSF	2,283,000	
Miscellaneous	1,500,000	Clarified water return	22,459,000	
–	–	Water to Turnbull	495,000	
Estimated Parameters				
–	–	Seepage loss	5,529,000	
Sum	**31,166,000**	**Sum**	**31,283,000**	**-118,000**

Note: 12-month volumes and total inventory change may not exactly equal the sum of inflows and/or outflows due to rounding.

(a) A lower tonnage of tailings solids in the tailings slurry was delivered to the STP from the wash plant than what was dredged from the STP to the Turnbull TSF.

TSF = tailings storage facility.

The water balance assessment is based on the flow and water data provided by FRO and the values presented have been interpreted based on the available data provided. For the reporting period, the water balance model estimates a decrease in volume in the STP pond. Seepage losses in the water balance are estimated and actual values may not be as assumed in the water balance.

No facility performance issues were noted associated with the precipitation observed on site or considering the water balance during the reporting period.

4.2.2 North Tailings Pond

The water balance for NTP from 1 September 2021 to 31 August 2022 is summarized in Table 10 using climate inputs from the waste water treatment plant station.

Table 10: North Tailings Pond Water Balance – 1 September 2021 to 31 August 2022

IN	Annual Volume (m^3)	OUT	Annual Volume (m^3)	Total Inventory Change (m^3)
Surface water runoff	294,000	Evaporation and seepage loss	299,000	
Precipitation	35,000	Pumping to STP	6,000	
Sum	**329,000**	**Sum**	**305,000**	**25,000**

Note: 12-month volumes and total inventory change may not exactly equal the sum of inflows and/or outflows due to rounding.
STP = South Tailings Pond.

The water balance assessment is based on the flow and water data provided by Teck and the values presented have been interpreted based on the available data provided. For the reporting period, the water balance model estimates a small increase in volume in the NTP pond. The observed pond elevations indicate a small decrease in pond volume. Seepage losses in the water balance are estimated and actual values may not be as assumed in the water balance.

No facility performance issues were noted associated with the precipitation observed on site or considering the water balance during the reporting period.

4.3 Water Quality

It is understood that FRO Environment submits water quality monitoring results to the BC Ministry of Environment and Climate Change Strategy as part of compliance monitoring. The assessment of the water quality results is beyond the scope of this AFPR.

5.0 TAILINGS FACILITY DAM SAFETY ASSESSMENT

This section presents the dam safety assessment of the STP and NTP facilities based on the observations and data review for each of the failure modes that are most relevant to this type of dam.

5.1 Site Visit

The site inspections at the STP and NTP were carried out on 7 and 8 September 2022 by John Cunning, P.Eng., and Colin McGrath, P.Eng., of WSP. Mr. Cunning and Mr. McGrath were accompanied by FRO staff David Walker, P.Eng., tailings engineer, on 7 September, and by Spencer Costigan, EIT, tailings engineer, on 8 September. The temperature during the two-day visit ranged from approximately 10°C to 25°C and the weather was overcast to sunny.

Appendix A presents a summary of photographs of the STP and NTP from the site inspection. The location, direction, and number for each photograph are noted in Figure 2 (for the STP) and Figure 6 (for the NTP). The STP was observed to be in good condition at the time of the 2022 annual inspection. A new area along the downstream toe of the NTP dam near the south abutment approximately 3 m wide and 0.5 m deep was found to have been disturbed by heavy equipment and should be repaired by FRO maintenance (Photograph 26 in Appendix A; NTP recommended action 2022-01). The area of the downstream toe of the NTP dam that was excavated for a monitoring well installation program in 2019 had not been repaired. The excavated areas should be backfilled and graded (NTP recommendations 2019-03 and 2022-01 in Table 21).

A summary of the observations is included in the inspection reports in Appendix B and Appendix C for the STP and NTP, respectively.

Details of the site inspection are discussed in Sections 5.5 and 5.6.

5.2 Review of Background Information

FRO provided the following information for this AFPR:

- 2021 and 2022 FRO site LiDAR topographic data and orthophotos
- tailings pond bathymetric data for the STP from the April, June, and October 2022 surveys
- dredging records for the STP to Turnbull TSF
- tailings pond water levels in STP and NTP
- VW piezometer level data
- GPS monitoring data and slope inclinometers on the STP and NTP
- records of routine visual inspections by FRO qualified personnel
- site climate data from 1 September 2021 to 31 August 2022

5.3 Consequence of Failure

Teck has advised that they are aligned with the Global Industry Standard on Tailings Management (GISTM; GTR 2020), which, in turn, is consistent with their safety culture. Teck has further advised that they will adopt extreme consequence case design loading for any facility with a credible catastrophic flow-type failure mode. For facilities without a credible catastrophic flow-type failure mode, Teck will reduce credible risks based on the As Low As Reasonably Practicable (ALARP) principle. Adopting this approach meets or exceeds regulatory requirements, aligns with Teck's goal to eliminate any risk for loss of life, and is consistent with the GISTM (GTR 2020).

The STP and NTP facilities' consequence of failure is Very High, considering the guidelines for consequence classification in Section 3.4 of the HSRC Guidance Document (Ministry of Energy and Mines 2016). Teck has met or exceeded the requirements for the STP and NTP facilities for such a classification, except for the riprap erosion protection along the downstream toe of each dam with recommended actions 2015-12b (STP) and 2015-6 (NTP) in Table 21.

5.4 Review of Operational Documents

5.4.1 Operation, Maintenance, and Surveillance Manual

The OMS manual for the STP is Version 2022.01 issued July 2022 (FRO 2022a). The OMS manual for the NTP is Version 2022.01 issued in August 2022 (FRO 2022b). A review of these versions of the OMS manuals was completed by WSP as part of this AFPR.

5.4.2 Emergency Preparedness Plan / Emergency Response Plan / Flood Response Protocol

FRO last completed an update to the emergency response plan (ERP) for the tailings facilities at FRO in May 2020 (EP.009.R1; FRO 2020b).

The current emergency preparedness plan for tailings facilities is dated 25 May 2020 (EP.008.R2; FRO 2020c).

The current Tailings Impoundment Flood Response Protocol for the Fording River is dated 15 May 2020 (EP.010.R0; FRO 2020a).

Teck personnel at FRO carry out regular testing of the ERP, with the most recent internal tabletop exercise carried out on 15 June 2022 as part of the ERP for flood response. The ERP tabletop considered a flood condition on site where the Fording River Multiplate Embankment TARP had been triggered, which has implications for the facilities downstream, including the STP and NTP.

5.4.3 Dam Safety Review

A DSR was completed by a third-party consultant (SNC-Lavalin 2020) in 2019. The DSR for the STP and NTP dams concluded that the dams are reasonably safe despite the identified deficiencies and non-conformances. The next DSR should initiated in 2024 based on the regulatory requirements.

5.5 Assessment of South Tailings Pond Safety Relative to Failure Modes and Facility Performance

The record of inspection for the FRO STP conducted by the EoR team on 7 September 2022 is included in Appendix B. Figure 3 provides a plan of the STP with the locations of the monitoring points. Typical sections of the STP dams are shown in Figure 4 and Figure 5.

This section presents an assessment of dam safety for the STP dam based on observations and data review.

Potential hazards and failure modes were reviewed as part of this AFPR and are summarized in Table 11. The performance of the STP facility relative to each failure mode is discussed in the following sections.

Table 11: Assessment of South Tailings Pond Dam Safety Relative to Potential Failure Modes

Potential Failure Mode	Observations/Data	Comments
Internal erosion (suffusion and piping)	Filter compatibility is generally met between till fill material and CR or CCFR shell and foundation flood plain sand and gravel; however, it is not met for the tailings and the flood plain sand and gravel. Ongoing seepage monitoring at West Dam since 2015. Internal erosion as a result of seepage along the decommissioned gas pipeline through the West Dam at the north abutment has a low likelihood of occurrence.	Migration of the tailings through the sand and gravel is considered low likelihood. West Dam seepage continues to be monitored and not noted as increasing. FRO plans on removing a portion of the decommissioned gas line upstream of the north abutment, backfilling the excavation with compacted till, placing fill at this area of the north abutment and regrading to drain towards the pond, and extending the makeup water pipelines to reduce the risk of back-up at the north abutment in 2023.

Table 11: Assessment of South Tailings Pond Dam Safety Relative to Potential Failure Modes

Potential Failure Mode	Observations/Data	Comments
Overtopping	Spillway has been constructed. Pond elevation was maintained near or below normal operating range target throughout the reporting period. The STP water level TARP which was replaced with standard operating procedures in May 2022 was being followed in response to high pond water level conditions.	The construction of a spillway to accommodate a PMF event has been completed. Liquefaction of the tailings beach during a seismic event could result in tailings beach displacement that results in a wave that could overtop the Main Dam. Additional analyses have been carried out and are being used to inform controls which FRO can implement.
Instability	No evident instability.	Static and seismic stability assessments (Golder 2018a) indicated that the FoS for failure surfaces that involve the full width of the dam crest meet or exceed static and pseudo-static slope stability FoS design criteria considering 2017 maximum phreatic conditions. Phreatic conditions at piezometer locations during the 2021/2022 reporting period were at or lower than the maximum phreatic conditions from 2017 that were used in the previous stability assessment (Golder 2018a) except VW-4 (2) and TH15-02, which showed slight increases but were still below the warning water elevation.
River erosion along dam toe	Based on observations from the 2022 annual riprap inspection (Appendix E), the riprap appeared to be in good conditions. Continued weathering of individual riprap pieces along the entire length of the STP protection was observed, but the intermittent degradation has not affected the overall integrity of the riprap. No erosion observed along downstream toe observed or reported during 2022 freshet river flows in the Fording River.	Phase 1 of the STP Flood Plain Widening Project was completed in August 2022 and construction for Phase 2 is planned to be completed by 2025.
Tailings, mine-affected water, or water pipeline failure	No leakage reported from active tailings pipelines.	Continue to manage this failure mode by routine inspection of the pipelines.

CR = coarse rejects; CCFR = combined coarse and fine rejects; STP = South Tailings Pond; TARP = trigger action response plan; PMF = probable maximum flood; FoS = factor(s) of safety.

5.5.1 Internal Erosion (Suffusion and Piping)

5.5.1.1 Design Basis and Existing Controls

The following filter relationships were checked for the STP:

- compatibility between the tailings and the upstream till blanket
- compatibility between the upstream till blanket and CR/CCFR shell
- compatibility between the till cut-off and flood plain sand and gravel foundation
- compatibility between the CR or CCFR shell and the flood plain sand and gravel foundation
- compatibility between tailings and the flood plain sand and gravel foundation
- internal stability of the CR/CCFR shell

Filter compatibility was reviewed based on gradation quality control data from the 2008, 2012, and 2013 as-built reports, as well as the 2002 till evaluation, which were used to confirm filter compatibility of all materials placed (Golder 2002, 2009, 2013, 2014d).

Various methods were used to check filter compatibility, including the United States Department of the Interior, Bureau of Reclamation (USBR 1977), the Sherard criteria (Sherard et al. 1984; Sherard and Dunnigan 1989), the Terzaghi method (Terzaghi 1922), US Army Corps of Engineers (USACE 2004), Kenney and Lau (1985), Li et al. (2009), and Fell et al. (2005).

A filter compatibility and internal stability assessment was completed by Golder in 2015 in response to a February 2015 Ministry of Energy, Mines and Petroleum Resources (formerly the Ministry of Energy and Mines) order to undertake an assessment to determine if the tailings facilities dams may be at risk of internal erosion (Golder 2015a).

All materials generally have filter compatibility by all methods except between the tailings and the flood plain sand and gravel. The potential filter inadequacy between the foundation and tailings will not impact the stability of the dam, as the dam stability is not reliant on the tailings. Migration of the tailings through the sand and gravel is expected to be contained by the till cut-off and is therefore a low risk. No tailings have been observed downstream to date.

The internal stability of the CR shell was confirmed (Golder 2015a).

There are some gaps in construction quality control records, particularly for the 1983 to 1984, 1985 to 1990, and 1993 raises; however, the gradation of the CR and CCFR filter/shell material created by the wash plant appears to have remained relatively consistent since the 1970s (Golder 2015a). Where data were available, they indicated that filter compatibility between the local till and the CR/CCFR was achieved. Gaps in the construction quality control records are considered to be very low risk.

Based on the performance of the dam over the last 40 plus years, piping through the dam due to filter-incompatible materials is considered to have at most a rare likelihood of occurrence as it has not historically been observed. Internal erosion as a result of seepage along the decommissioned gas pipeline through the uncompleted portion of the West Dam at the north abutment has a low likelihood of occurrence.

Continual seepage is evident in the foundation materials below the toe of the STP dam, particularly along the slope below the West Dam, which has been monitored and reported for many years. Cloudy seepage water can indicate internal erosion, but records of the seepage from the STP indicate clear water. Regular inspections for evidence of increased seepage and piping should continue. Quantitative monitoring of seepage at the West Dam began in late 2015 in response to a visual observation of increased year-over-year seepage rates. The critical hydraulic gradient through the Main Dam is to be assessed to better quantify the likelihood of a piping failure through the dam occurring and possibly impacting the AWTF-S downstream of the dam (recommended action 2020-05 in Table 21).

Instrumentation Data – Seepage Monitoring

In 1979, shortly after the STP was put into operation, it became apparent that at some locations beneath the bottom of the STP, the lower gravel stratum had hydraulic connection with the surficial flood plain gravels that extend over the base of the pond. It is understood that the STP water balance showed unexpected losses.

The total seepage losses from the pond are not measured directly. The estimated rate of seepage loss noted in previous water balances for the STP contains uncertainties resulting from inaccuracies in the water balance modelling, such as not accounting for the mass balance.

Seepage losses from the STP from 1989, 2000, 2003, and 2006 through 2022 are shown in Table 12. Seepage rates from 2016 onwards have been estimated from the GoldSIM model as part of the water balance.

Table 12: Fording River Operations Reported Seepage Losses from the South Tailings Pond

Year	Approximate Average Pond Elevation (m)	Historical FRO Reported Seepage (m^3/min)	GoldSIM Seepage (m^3/min)
1989	1,629.1	7.5	n/a
2000	1,629.7	4.3	n/a
2003	1,629.5	5.5	n/a
2006	1,629.7	0.4	n/a
2007	1,629.0	3.2	n/a
2008	1,629.5	2.8	n/a
2009	1,630.0	2.3	n/a
2010	1,630.1	1.5	n/a
2011	1,631.9	3.4	n/a
2012	1,632.9	3.9	n/a
2013	1,634.5	10.6	n/a
2014	1,635.5	13.1	n/a
2015	1,636.3	n/a	9.9
2016	1,636.3	n/a	10.4
2017	1,636.2	n/a	5.0
2018	1,636.4	n/a	4.8
2019	1,636.5	n/a	4.7
2020	1,636.4	n/a	4.8
2021	1,636.0	n/a	9.4
2022	1,636.0	n/a	10.5

Note: Pond elevations reported in Elk Valley Elevation Datum.

FRO = Fording River Operations; n/a = not applicable.

In response to an increase in the observed seepage below the south end of the West Dam, FRO installed two seepage collection pipes within the seepage area in 2015. Seepage can also be observed and is monitored through twin culverts downstream of the north end of the West Dam. During the reporting period, seepage data from the collection pipes were only taken during the 2022 site inspection visit. Photograph 8 in Appendix A shows the locations of the collection pipes and the estimated flow measurements during the site inspection. Seepage data should be collected at least annually in this area.

5.5.1.2 Observed Performance

The key observations made during the STP dam inspection were as follows:

- Seepage continues along the presumed till/bedrock contact in the diversion channel till slope below the West Dam (Appendix A, Photograph 8). The seepage has pushed up mats of organics and created a hummocky, broken surface area. This is consistent with previous years' observations in this area. Ground movement of the surficial organic soils was noted in this area.
  - Seepage from the two collection pipes in this area was measured on the 7 September site visit and recorded to be 0.04 L/s from north pipe and 0.07 L/s from the south pipe. The majority of the seepage in the area of the pipe outlets was bypassing the pipes and was flowing out of the slope, and the flow was estimated to be around 0.33 to 0.42 L/s.
  - Red staining was noted in some areas of seepage along the bedrock contact, consistent with observations from previous years.
- Water was observed to be ponding in portions of the ditch along the downstream toe of the West Dam, south of approximately Sta. 0+800. The water is likely from surface runoff and seepage exiting the dam. Vegetation growth was also observed along these ditches.
- All observed seepage, including external seepage water, was clear and had no sediments.
- No zones of subsidence or any sinkholes were observed that would indicate voids due to either suffusion or piping.
- Visual monitoring during routine inspections by FRO tailings personnel did not observe any signs of seepage related to the pipeline through the uncompleted portion of the north abutment of the West Dam. This is currently a construction deficiency in the facility. FRO plans on removing a portion of the decommissioned gas line upstream of the north abutment, backfilling the excavation with compacted till, placing fill at this area of the north abutment and regrading to drain towards the pond, and extending the makeup water pipelines in 2023 all to reduce the risk of back-up at the north abutment as required to address the deficiency as noted in recommended action 2017-01 in Table 21.
- The current and critical seepage gradients are unknown. WSP will work with FRO to complete this in 2023 (STP recommended action 2020-05).

5.5.2 Overtopping

5.5.2.1 Design Basis and Existing Controls

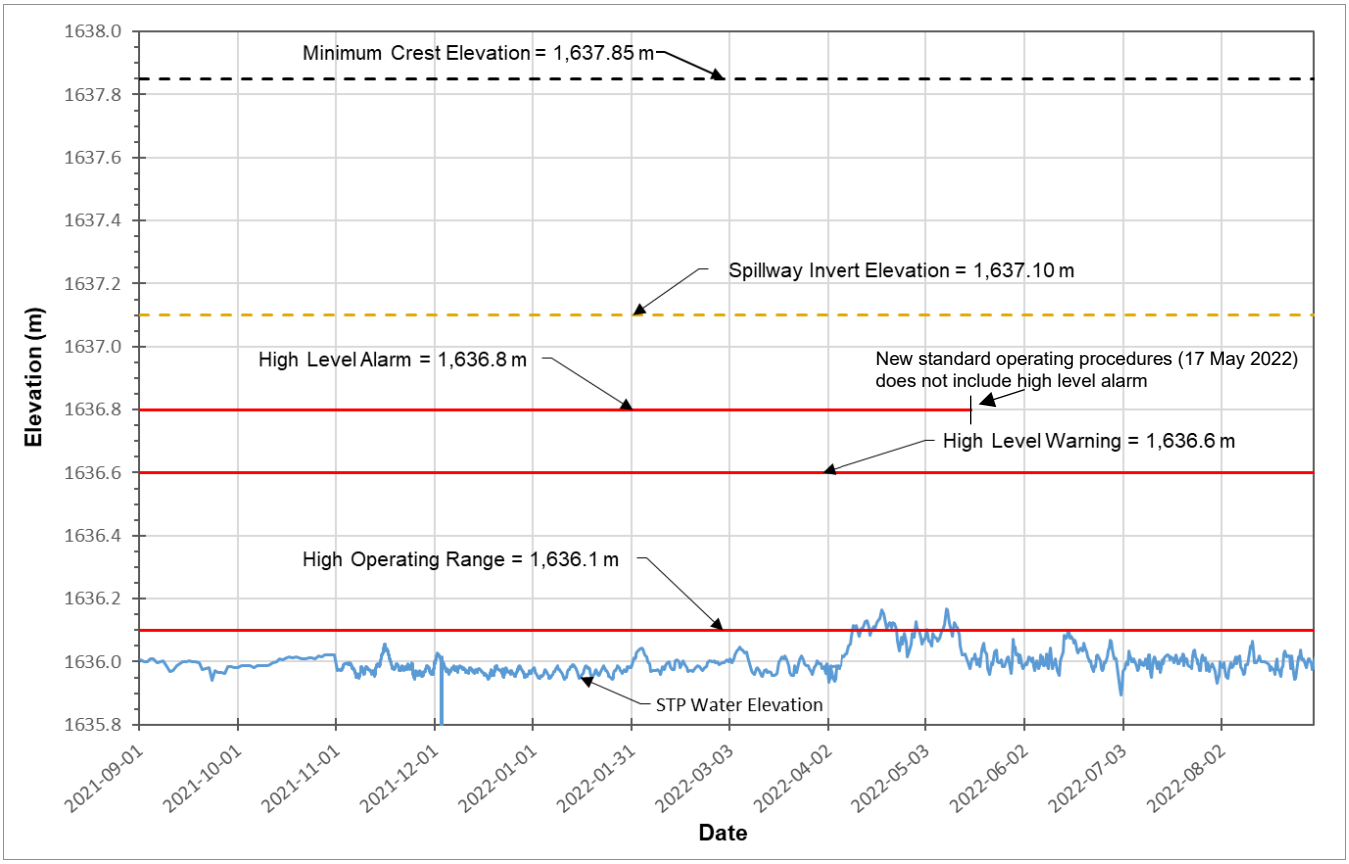
As part of the detailed design for the STP spillway (Golder 2020b), IDF and freeboard assessments were conducted. Key design parameters are as follows:

- The spillway was sized for the Extreme events as directed by FRO and used the PMF as the design event. The 24-hour spring PMF is assumed for the IDF. Rainfall depth was estimated to be 319 mm and snowmelt depth was estimated to be 61 mm.
- The 100-year return period, 10-day duration rain-on-snow event was selected for the Environmental Design Event. The rain-on-snow depth is estimated to be 327.2 mm. The EDF is defined as the volume resulting from the Environmental Design Event that is to be managed without release of untreated water to the environment (CDA 2019).
- Based on the spillway construction record, recent surveys of the STP facility and tailings deposit, and the current target normal operating pond elevation of a maximum of 1,636.1 m, the STP can store about 345,000 m^3 between the normal operating pond and the spillway invert. FRO operations can pump water at a rate of 28,800 m^3/day from the pond during an EDF event (Golder 2022b). The stage–storage relationship for the STP facility is dynamic and depends on tailings deposition and dredging activities. Therefore, the normal operating pond elevation should be evaluated along with available pumping from the STP annually to confirm the necessary storage. This annual review requirement is included in the OMS Manual (FRO 2022a).

The trigger levels of the STP were updated considering the spillway construction and are presented in the STP OMS manual (FRO 2022a).

Instrumentation Data

Chart 2 presents the pond elevation data for 1 September 2021 to 31 August 2022 at the STP based on data received from FRO. Pond water levels in the STP are monitored in real time with a water level sensor located on the water reclaim barge, and levels are actively managed by FRO processing plant personnel. The pond elevation data were provided in Mine Grid then converted to Elk Valley Elevation Datum by WSP.



Note: Pond elevations reported in Elk Valley Elevation Datum.

Chart 2: South Tailings Pond Water Elevation from 1 September 2021 to 31 August 2022

The STP water level is shown to have been generally maintained below the high operating range water elevations during the reporting period except for periods in April and May 2022, as discussed in Section 3.1.1.

In the event of water levels above the high operating range at the STP, the current version of the STP water level standard operating procedures (Appendix B in STP OMS; FRO 2022a) would be followed. Water management options for STP during freshet are also included in the OMS manual.

5.5.2.2 Observed Performance

The operating pond volume on 10 April 2022 prior to the start of dredging was about 358,000 m^3, which was greater than the minimum water reservoir volume of 300,000 m^3.

Dredging operations at the STP were started as part of the plan to manage the tailings volume in the facility. FRO dredged 1.86 million dry metric tonnes from 14 April to 21 October 2022. Based on the 1 October 2022 bathymetric survey, which was conducted while dredging operations were still ongoing, the pond volume of the STP was estimated to be 870,000 m^3. Available storage above the pond in October 2022 was about 340,000 m^3, which is about 123,000 m^3 less than required to store the EDF volume without pumping. Based on the EDF reassessment completed by Golder (2022b), with total pumping to other water storage facilities operating, the net inflow during the design EDF can be contained. In the event of inflows greater than cannot be managed with pumping, the STP facility pond would discharge through the spillway to the downstream environment without dam safety concerns. The normal operating pond elevation is evaluated along with available pumping from the STP

annually to confirm that the necessary storage, volume, and pumping rates are adequate to manage the estimated EDF inflow volume per the STP OMS manual (FRO 2022a).

As a result of the EDF reassessment, Golder (2022c) presents a water quality screening-level assessment to assess a comparison of water quality concentrations within the STP to the BC water quality guidelines for the protection of aquatic life. Based on this screening level assessment, it was recommended that concentrations of concern be compared to level 1, level 2, and level 3 aquatic screening values. Further details are provided in Golder (2022c).

The key observations made during the STP dam inspection were as follows:

- Mine water, site drainage, and water from the Turnbull TSF is being managed by pumping into the STP pond as part of makeup water, while following the STP Water Level Standard Operating Procedures in Appendix B of the STP OMS manual (FRO 2022a). Actions are carried out if the pond elevation exceeds defined trigger levels.
- The pond was clear and free of major debris.
- Minor rutting was observed on the dam crest.

Construction of the STP emergency spillway was completed in July 2021 and a construction record report was issued (Golder 2021). With the spillway now in place, the STP is not susceptible to an overtopping failure mode as a result of an extreme storm event.

5.5.3 Instability

5.5.3.1 Design Basis and Existing Controls

Details of the assessment and results from updated stability and liquefaction assessments were provided in Golder (2018a). A brief summary of the conclusions is provided below:

- The liquefaction assessment results indicated that the saturated soils below the dam are unlikely to liquefy during the design earthquake of halfway between the 1:2,475-year and 1:10,000-year event.
- Both static and pseudo-static conditions were considered in the stability assessment. However, the post earthquake conditions were not analyzed in the foundation because the liquefaction assessment results indicated that the alluvial soils below the dams and dam materials are not susceptible to liquefaction during the design earthquake event as the factors of safety (FoS) against liquefaction were found to be above unity (i.e., FoS against liquefaction >1.0). The results of the stability assessment indicated that the FoS for failure surfaces that fully involve the crest of the STP dam met or exceeded static and pseudo-static slope stability design criteria.
- The STP West Dam is susceptible to instability from erosion during flooding of the Fording River. KWL assessed Fording River flood flows and designed riprap armouring for a portion of the West Dam downstream toe, which was constructed in 2016 (KWL 2017b). The south section of the West Dam from the old pipe bridge southward (south of Sta. 0+680) does not have any erosion protection but consists partially of bedrock, which provides some erosion protection. Detailed design of the STP floodplain widening (KCB 2020) includes proposed riprap armouring for this section of the West Dam; however, FRO is revising this design to meet permitting requirements.

Instrumentation Data – Dam Displacement Monitoring

There are nine operational GPS units used for displacement monitoring on the STP West and Main dams.

A summary of the GPS units in use during the 2022 reporting period is presented in Table 13.

Table 13: GPS Monitoring Locations on South Tailings Pond

GPS Identification	Reading Start Date	Northing (m)	Easting (m)	Location Description
STP-GPS 01	October 2018	5,560,728.9	651,109.0	West Dam – crest
STP-GPS 02	August 2016	5,560,621.6	651,163.7	West Dam – crest above flood construction
STP-GPS 03	April 2016	5,560,537.4	651,186.9	West Dam – flood construction toe
STP-GPS 04	May 2017	5,560,540.1	651,239.9	West Dam – crest above flood construction
STP-GPS 05	October 2014	5,560,441.9	651,355.6	West Dam – crest above flood construction
STP-GPS 07	December 2013	5,560,259.9	651,525.9	West Dam – crest
STP-GPS 08	July 2018	5,560,152.6	651,659.4	West Dam – crest
STP-GPS 09	April 2019	5,560,081.1	651,844.7	Main Dam – crest
STP-GPS 11	July 2018	5,560,089.4	652,051.2	Main Dam – crest

Note: Northings and eastings reported in FRO UTM; sensor locations downloaded from GeoExplorer.
STP = South Tailings Pond; FRO = Fording River Operations; UTM = Universal Transverse Mercator.

Hourly readings from 1 September 2020 to 31 August 2021 were recorded in real time via GeoExplorer for each of the GPS units. The initial readings of the GPS units were used as locations of the GPS monitors and are shown in Figure 3. The tracked location (i.e., northing and easting), 3D point velocity, cumulative relative displacement, and elevation for each of the GPS monitors were downloaded from GeoExplorer for the Main Dam and West Dam. Due to the way GPS elevation is referenced at FRO, the change in elevation data instead of the measured elevation data is reviewed, as shown in Appendix D.

A review of the GPS data shown in Appendix D did not indicate data or data trends of concern.

The survey data on the Main and West dams indicated little crest displacement during the reporting period.

GPS unit STP-GPS 06 was decommissioned in February 2020 as it is no longer needed and has been removed from the STP.

Instrumentation with no communications for over seven days should be inspected and repaired within the allotted time for the specific instrument as outlined in the OMS manual (FRO 2022b).

Instrumentation Data – Slope Inclinometers

Slope inclinometers were installed at four locations in 2015 along the STP crest (Table 14) to monitor horizontal movement in the dam in addition to the GPS data. The A axis is oriented in the upstream to downstream direction (with negative displacements in the downstream direction) and the B axis is oriented along the dam centreline. The locations of the inclinometers on the STP are presented in Figure 3.

Table 14: South Tailings Pond Inclinometers

Inclinometer ID	Northing (m)	Easting (m)	Elevation (m)	A-A Axis Azimuth (°)	Probe Serial No.	Reel Serial No.
TH15-01	5,560,086.2	652,037.3	1,638.2	310	DP15600000	DR21300000
TH15-02	5,560,093.0	651,786.4	1,638.3	10		
TH15-03	5,560,550.6	651,227.5	1,638.7	30		
TH15-04	5,559,997.8	652,003.4	1,604.6	15		

Notes: Azimuth is approximate. The upper wheel should face the indicated direction for the first set of readings. Northings and Eastings are reported in Universal Transverse Mercator and elevations are reported in Elk Valley Elevation Datum.

Inclinometer data were supplied to WSP by FRO. Readings have been taken approximately quarterly at the STP inclinometers since December 2015. Starting in September 2018, and as discussed with the EoR, FRO has been reading the inclinometers three times per year (shortly before freshet, in the latter part of freshet, and in late summer). Based on the data observed to date, the frequency at which readings are taken from the inclinometers can be updated to a minimum of once per year.

A total of two readings were taken at each of the four inclinometers within the AFPR reporting period. Inclinometer data were collected and plotted by FRO and are shown with a plan view of each inclinometer location by WSP in Appendix D. Data readings are from 11 January 2016 to 24 March 2022 and include the initial reading from 18 December 2015 as a reference line.

The inclinometer readings do not indicate any significant trends in deformation, and the maximum cumulative downstream deflection does not exceed 5 mm over a year for depths greater than 2 m below ground, which is in the acceptable range for the slope inclinometer QPO (Table 6).

Instrumentation Data – Piezometers on Main Dam

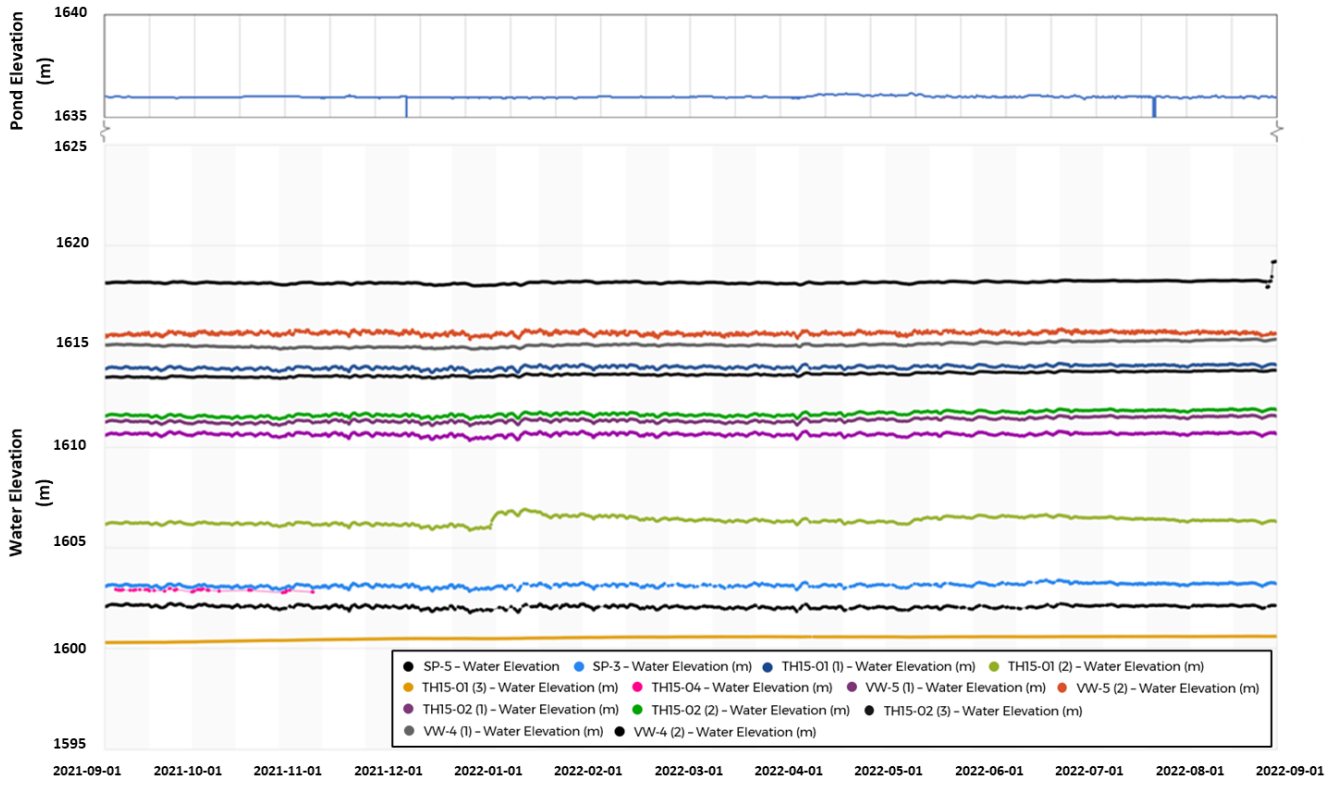
The VW piezometer and standpipe locations are shown in plan in Figure 3. A summary of the VW piezometer locations and sensor depths on the Main Dam is shown in Table 15. The performance at each VW piezometer was evaluated by assessing whether the warning levels were exceeded. The warning levels were confirmed in Golder (2018a) and are used in GeoExplorer.

Table 15: South Tailings Pond Main Dam Piezometer Installation Details and Performance Summary

Borehole/Piezometer ID	Northing (m)	Easting (m)	Top of Well Elevation (m)	Data Logger Serial No.	Piezometer Serial No.	GeoExplorer Sensor No.	Piezometer Tip Elevation (m)	Soil Unit of Piezometer Sensor	Warning Water Elevation (m)	Minimum Recorded Water Level (2021/2022) (m)	Maximum Recorded Water Level (2021/2022) (m)	Warning Water Elevation Exceeded?	Comments
VW-4	5,560,100.6	651,758.7	1,639.2	DT08079	VW27921	2	1,617.2	Coarse rejects (compacted)	>1,624.0	1,617.9	1,619.2	No	No concerns
				DT08082	VW27920	1	1,615.0			dry	1,615.4	No	No concerns, minimum recorded water level less than sensor elevation (dry)
VW-5	5,560,106.2	652,102.4	1,639.2	DT08073	VW27929	2	1,615.5	Coarse rejects (compacted)	>1,617.5	dry	1,615.9	No	No concerns, minimum recorded water level less than tip elevation (dry)
				DT08075	VW27930	1	1,610.4			dry	1,610.8	No	No concerns, minimum recorded water level less than tip elevation (dry)
TH15-01	5,560,086.2	652,037.3	1,638.2	DT04498	VW33227	1	1,611.1	Dam fill	>1,617.5	1,613.7	1,614.2	No	No concerns
					VW33229	2	1,604.9	Dam fill/foundation fluvial sands and gravel		1,605.9	1,606.9	No	No concerns
					VW33244	3	1,600.9	Foundation fluvial sands and gravel		dry	dry	No	Likely malfunctioning, indicating negative water pressure, VWP should be checked and troubleshooted.
TH15-02	5,560,093.0	651,786.4	1,638.3	DT04499	VW33238	3	1,612.2	Granular drain	>1,624.0	1,613.4	1,613.8	No	No concerns
					VW33233	2	1,605.5	Foundation fluvial sands and gravel		1,611.4	1,611.9	No	No concerns
					VW33243	1	1,601.5	Bedrock		1,611.1	1,611.6	No	No concerns
TH15-04	5,559,997.8	652,003.4	1,604.6	DT09637	VW33224	n/a	1,599.6	Foundation fluvial sands and gravel	>1,603.5	1,602.8	1,603.0	No	No concerns
SP-3	5,560,032.4	652,043.8	1,610.4	DT08083	VW27931	n/a	1,600.6	Foundation fluvial sands and gravel	>1,604.0	1,602.8	1,603.4	No	No concerns
SP-5	5,560,057.5	652,163.7	1,605.0	DT08074	VW27918	n/a	1,595.9	Foundation fluvial sands and gravel/till contact	>1,603.5[(a)]	1,601.8	1,602.2	No	No concerns

Notes: Northings and eastings are reported in Universal Transverse Mercator and elevations are reported in Elk Valley Elevation Datum. Warning water elevations from GeoExplorer.
n/a = not applicable; > = greater than.

Chart 3 presents the piezometer readings for 1 September 2021 to 31 August 2022 as well as the pond elevation over the same time period. The piezometer plots were taken from GeoExplorer. The number in parentheses next to the piezometer ID indicates the sensor number in GeoExplorer (for boreholes with more than one piezometer). The sensor number can be found in Table 15.



Note: Elevations reported in Elk Valley Elevation Datum.

Chart 3: Main Dam Vibrating Wire Piezometer and Standpipe Water Elevations and South Tailings Pond Elevation from 1 September 2021 to 31 August 2022

The phreatic level readings for the reporting period were generally stable, with very little to no response to spring freshet.

Instrumentation Data – Piezometers on West Dam

WSP installed two VW piezometers (boreholes BH-CPT18-05A and -07A) in the tailings of the STP during the 2018 drilling program. The readings from these piezometers are not provided in this section as they do not monitor the water levels in the dam, though they are shown in plan view in Figure 3.

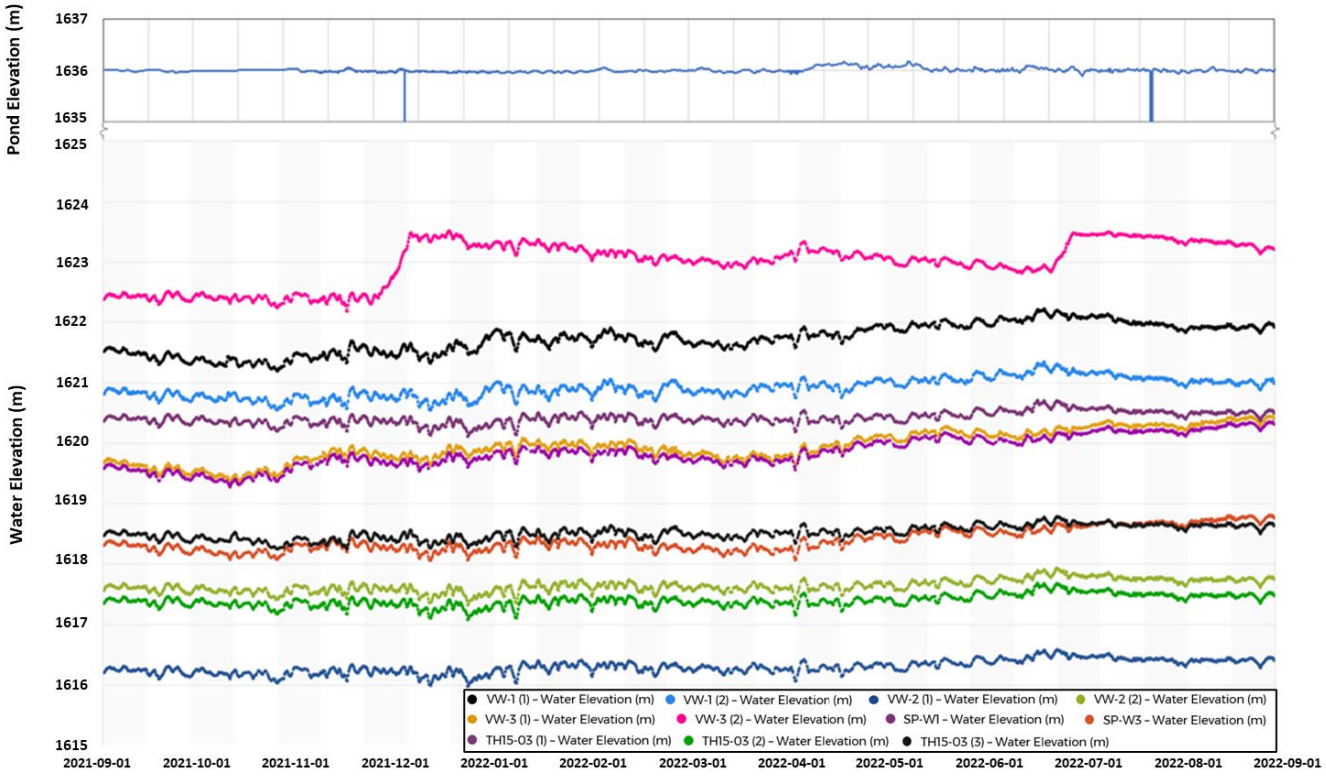
A summary of the VW piezometer locations and sensor depths on the West Dam is shown in Table 16.

Table 16: South Tailings Pond West Dam Piezometer Installation Details and Performance Summary

Borehole/Piezometer ID	Northing (m)	Easting (m)	Top of Well Elevation (m)	Data Logger Serial No.	Piezometer Serial No.	GeoExplorer Sensor No.	Piezometer Tip Elevation (m)	Warning Water Elevation (m)	Minimum Recorded Water Level (2021/2022) (m)	Maximum Recorded Water Level (2021/2022) (m)	Warning Water Elevation Exceeded?	Comments
VW-1	5,560,710.9	651,118.1	1,640.0	DT08070	VW27922	2	1,620.4	>1,627.5	1,620.5	1,621.2	No	No concerns
				DT08078	VW27923	1	1,606.4		1,621.1	1,622.2	No	No concerns
VW-2	5,560,494.1	651,310.0	1,639.3	DT08076	VW27926	2	1,616.9	>1,627.5	1,617.3	1,617.8	No	No concerns
				DT08077	VW27928	1	1,610.5		1,616.0	1,616.5	No	No concerns
VW-3	5,560,278.9	651,509.5	1,638.9	DT08071	VW27925	2	1,622.3	>1,627.0	dry	1,623.1	No	No concerns, minimum recorded water level less than tip elevation (dry)
				DT08072	VW27924	1	1,611.4		1,619.0	1,620.7	No	Two increasing trends November 2021 and June 2022. Increases were followed by declining water levels.
TH15-03	5,560,550.6	651,227.5	1,638.7	DT04500	VW33225	3	1,618.2	>1,627.5	dry	1,618.7	No	No concerns, minimum recorded water level less than tip elevation (dry)
					VW33228	1	1,614.2		1,620.1	1,620.6	No	No concerns
					VW33226	2	1,612.2		1,617.1	1,617.6	No	No concerns
SP-W1	5,560,273.7	651,497.3	1,633.9	DT08081	VW27927	n/a	1,613.4	>1,623.1	1,618.9	1,620.5	No	No concerns
SP-W3	5,560,255.0	651,481.4	1,624.5	DT08080	VW27919	n/a	1,615.0	>1,623.0	1,617.8	1,618.8	No	No concerns

Note: Northings and eastings are reported in Universal Transverse Mercator and elevations are reported in Elk Valley Elevation Datum.
n/a = not applicable; > = greater than.

The locations of VW piezometers and standpipes are presented in plan in Figure 3. Chart 4 presents the piezometer readings from 1 September 2021 to 31 August 2022 as well as the pond elevation over the same time period. The piezometer data were taken from GeoExplorer, and the pond elevation was provided by FRO.



Note: Elevations reported in Elk Valley Elevation Datum.

Chart 4: West Dam Vibrating Wire Piezometer and Standpipe Water Elevations and South Tailings Pond Elevation from 1 September 2021 to 31 August 2022

As reported in the 2021 annual report (Golder 2022a), water elevations in some West Dam VW piezometers reported an increase in April 2022 likely due to 2022 dredging activities. The trend on these water elevations through March 2022 is generally stable.

No warnings were triggered in GeoExplorer for the piezometers.

5.5.3.2 Observed Performance

The key observations made during the STP dam inspection related to assessment of instability were as follows:

- No significant evidence of slope instability on the constructed dam (i.e., significant sloughing, cracking, crest subsidence) was observed during the 2022 AFPR.
- Minor rutting was observed on the dam crest due to traffic and usage by the dredging crew.
- Minor erosion has been noted on the downstream slope over the years, generally in the CR material, except for a major vertical erosion gully on the downstream slope of the Main Dam above the seepage collection well. The gully should continue to be monitored. FRO has repaired previous erosion channels present on the STP by placing breaker rock over geotextile on the eroded areas, creating armoured channels. Current and future erosion should continue to be monitored and repaired in a similar or equivalent manner as part of ongoing maintenance.
- The downstream slope has sections steeper than the design, but the overall embankment has been constructed wider than the design. The over-steepened areas are susceptible to increased erosion but are not an overall stability concern.

5.5.3.3 River Erosion Protection (KWL)

KWL completed the annual inspection of the riprap along the toe of the STP on 26 July 2022. The annual riprap inspection is provided in Appendix E.

The existing riprap covers only a portion of the STP embankment downstream toe from approximately sta. 0+250 to 0+680.

5.5.4 Release of Tailings, Mine-Affected Water, or Water through Pipeline Failure

5.5.4.1 Design Basis

The pipelines present at the STP and its vicinity are as follows:

- tailings pipeline from the plant to the STP, crossing the West Dam at the north abutment
- dredged tailings pipeline from the STP to the Turnbull TSF, located along the southeast side of the STP
- reclaim water pipeline from the STP to the plant and from the Turnbull TSF to the STP, located on the east side of the STP
- makeup water pipeline from the Kilmarnock ponds, located on the Main Dam on south side of the STP

A failure of one of these pipelines could release tailings, mine-affected water, or water.

5.5.4.2 Observed Performance

This failure mode is managed by routine inspections of the pipelines. FRO reports that the pipelines operated well and were in good condition during the reporting period.

5.6 Assessment of North Tailings Pond Relative to Credible Failure Modes and Facility Performance

The record of the site inspection for the FRO NTP conducted by the EoR team on 8 September 2022 is included in Appendix C. A plan of the NTP with the locations of the monitoring points is shown in Figure 7, and a typical section of the NTP retaining dam is shown in Figure 8.

This section presents an assessment of dam safety for the NTP dam based on observations and data review. Potential hazards and failure modes were reviewed as part of this AFRP and are summarized in Table 17. The performance of the NTP Facility relative to each failure mode is discussed in the following sections.

Table 17: Assessment of North Tailings Pond Dam Safety Relative to Potential Failure Modes

Potential Failure Mode	Observations/Data	Comments
Internal erosion (suffusion and piping)	Filter compatibility is generally met between till fill materials and CR shell and foundation flood plain sand and gravel; however, this is not met for the tailings and the foundation flood plain sand and gravel. Abandoned pipelines pass through the dam section; pipelines are capped on the upstream side of dam.	Migration of the tailings through the sand and gravel is expected to be contained by the till cut-off and therefore a low risk. Abandoned pipelines exist through the dam (Golder 2015). Material and water may preferentially flow along the pipes, creating a void or potential internal erosion pathway. A risk assessment was completed in 2021 and certain pipelines were prioritized for backfilling; FRO is developing a plan to remove these as part of the NTP decommissioning project.
Overtopping	Throughout the reporting period, the NTP pond level was maintained below the High level alarm elevation.	Updated IDF and freeboard assessment was completed for Very High dam classification (Golder 2018a); freeboard increased to 1.9 m.
Instability	No evident instability.	Static and seismic stability assessments were completed for the Very High dam classification (Golder 2018a) and the results indicated that the FoS for failure surfaces that involve the full width of the dam crest meet or exceed the static and pseudo-static slope stability FoS design criteria considering the 2017 maximum phreatic conditions.
River erosion along dam toe	Based on observations from the 2022 annual riprap inspection (Appendix E), the riprap appeared to be in good conditions except in areas where it is up to 0.4m lower than the design elevation.	Signs of settling or subsidence in the riprap should be confirmed by survey and levels of protection should be raised if required, and FRO should seek opportunities to cost-effectively achieve the intended 1 m freeboard.
Mine-affected water pipeline failure	No leakage reported from tailings pond water pipeline. No longer sending makeup water from the Kilmarnock ponds.	Continue to manage this failure mode by routine inspection of the pipeline while in use from the NTP to the STP.

CR = coarse rejects; NTP = North Tailings Pond; TARP = trigger action response plan; STP = South Tailings Pond; IDF = inflow design flood; FRO = Fording River Operations; FoS = factor(s) of safety.

5.6.1 Internal Erosion (Suffusion and Piping)

Internal erosion of a dam can be caused by materials migrating out of the dam, leaving voids. This generally happens with materials that do not have filter compatibility; that is, the fines fraction of one material can migrate into or through the voids of the adjacent material under a sufficient hydraulic gradient. Piping is induced by regressive erosion of particles toward an outside environment until a continuous pipe is formed. Suffusion is the migration of soil particles through the soil matrix and can occur in a single material. If a material is internally stable, it is considered resistant to suffusion.

5.6.1.1 Design Basis and Existing Controls

The following filter relationships were checked for the NTP:

- compatibility between the tailings and the upstream till blanket
- compatibility between the upstream till blanket and CR or the CCFR shell
- compatibility between the till cut-off and flood plain sand and gravel foundation
- compatibility between the CR or CCFR shell and the flood plain sand and gravel foundation
- compatibility between the tailings and the flood plain sand and gravel foundation
- internal stability of the CR shell

Filter compatibility was reviewed based on grain size distributions in the construction records (Golder Brawner 1973, 1974b); data obtained during an investigation of the existing coal tailings in 2 Pit, 3 Pit, and the NTP (Golder 2012b); data from the 2013 NTP flood repair works; and results from the 2015 site investigation (FRO 2016).

Various methods are available to check filter compatibility, including the Terzaghi method, the Sherard and Dunnigan criteria, and the USACE criteria (Terzaghi 1922; Sherard et al. 1984; Sherard and Dunnigan 1989; USACE 2004). The CR shell, which acts as a filter for the upstream till blanket, was constructed in accordance with the design. While not explicitly stated in the reports (Golder Brawner 1973, 1974b), the Terzaghi method was likely the method used to confirm filter compatibility during design and construction.

A filter compatibility and internal stability assessment was completed by Golder in 2015 in response to a February 2015 Ministry of Energy, Mines and Petroleum Resources order to undertake an assessment to determine if the tailings facilities dams may be at risk of internal erosion (Golder 2015a). The Sherard and Dunnigan criteria and the USACE criteria were also checked in this document. Filter compatibility was rechecked using the Sherard and Dunnigan criteria after additional foundation information was obtained in 2015.

All materials generally have filter compatibility by all methods except between the tailings and the flood plain sand and gravel. The potential filter inadequacy between the foundation and tailings will not impact the stability of the dam, as the dam stability is not reliant on the tailings. Migration of the tailings through the sand and gravel is expected to be contained by the till cut-off and therefore a low risk.

The internal stability of the CR shell was confirmed (Golder 2015a).

There are some gaps in construction quality control records. Where data were available, they indicated that filter compatibility was achieved. The gaps in the quality control records are considered to be low risk to confirming filter compatibility.

Based on the performance of the dam over the last 45 plus years, piping due to filter-incompatible material or suffusion of internally unstable material is considered to have less than a very rare likelihood of occurrence and has not historically been observed.

5.6.1.2 Observed Performance

The key observations made during the NTP dam inspection were as follows:

- No significant zones of external seepage were observed that would indicate the possible development of internal piping.
- No zones of subsidence or sinkholes were observed that would indicate voids due to either suffusion or piping.

5.6.2 Overtopping

5.6.2.1 Design Basis and Existing Controls

The CDA (2013) provides two calculations for freeboard; the more critical of the two cases sets the minimum freeboard:

- No overtopping by 95% of the waves caused by the most critical wind with a return period of 1 in 1,000 years, with the pond at its maximum normal operating elevation.
- No overtopping by 95% of the waves caused by the most critical wind with a return period of 1 in 2 years (for Very High consequence structures), with the pond at the maximum level during the passage of IDF.

The current minimum crest elevation of the dam at the NTP is 1,652.6 m (confirmed with 2021 lidar).

The HSRC Guidance Document (Ministry of Energy and Mines 2016) recommends that the IDF be designed to 2/3 between the 1,000-year flood/storm event and the PMF for a structure classified as Very High consequence. Teck's internal policy adopts the minimum design criteria that exceeds requirements from the HSRC and adopts design criteria of the Extreme dam class if a facility has potential loss of life for credible failure modes.

For impoundments with no emergency spillway, HSRC Section 10.1.8 (EMLI 2022) requires a minimum storage volume to contain runoff from a 72-hour IDF.

As a result of the reclassification of the NTP dam from High to Very High, its freeboard assessment was updated with the HSRC requirements for a Very High consequence facility. The result of the updated assessment (Golder 2018a) indicated the following:

- To store the IDF while maintaining the minimum freeboard, the maximum operating pond elevation is 1,650.7 m, 1.9 m below the minimum dam crest.
- The required minimum freeboard is 0.35 m with the IDF level at elev. 1,652.25 m.

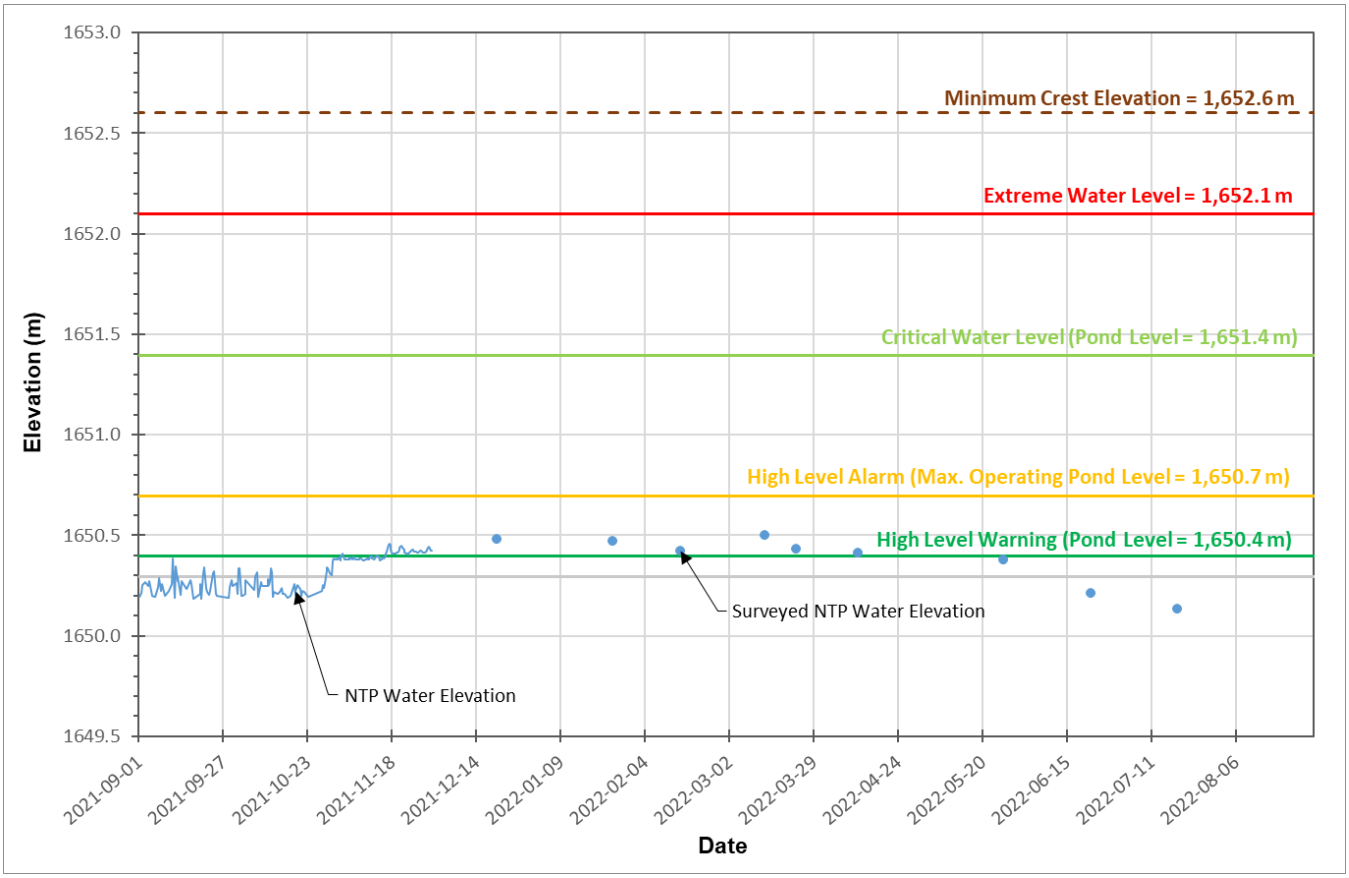
The NTP currently has no inputs of water except direct precipitation and some runoff from a small local catchment area, with outputs from the retained pond being evaporation and seepage. The water levels are maintained below freeboard by pumping excess water to the STP. If critical water levels in the pond are approached, the NTP water level TARP in Appendix C of the OMS manual (FRO 2022b) includes pumping and water diversion strategies for the NTP. The NTP is permitted to discharge into the STP only. The freeboard of 1.9 m (as assessed for Very High consequence structures) will be maintained with normal operations or emergency pumping as necessary.

The NTP is not equipped with an emergency spillway. A passive method of controlling water elevation would be a best practice. Golder (2015b) presents feasibility level drawings for an emergency spillway at the NTP.

An overtopping failure caused by landslide is a possible failure mode for the NTP due to the adjacent CR spoil to the west of the NTP. The CR spoil was resloped in 2015 per previous Golder recommendations and FRO analyses (Golder 2014a,e; FRO 2014). This work was performed to reduce the hazard of a potential spoil failure to impact the NTP and create wave action that could potentially overtop and breach the NTP dam. Based on stability and runout analyses, failure of the reconfigured CR spoil and subsequent wave generation is considered nearly impossible.

Instrumentation

Pond elevation data were recorded by a VW piezometer until the end of November 2021 and the data was downloaded by WSP from GeoExplorer. Following November 2021, the pond elevation was manually surveyed approximately once per month by FRO for the remainder of the reporting period. The VW piezometer was set up to collect readings every six hours. Chart *5* presents the measured and surveyed pond elevations during the reporting period. In December 2021, FRO installed a stilling well at the NTP to record the NTP pond elevations in real time; however, the VW piezometer was damaged in July 2022 and should be replaced following NTP recommended action 2022-02 in Table 21.



Note: Elevations reported in Elk Valley Elevation Datum.
NTP = North Tailings Pond.

Chart 5: North Tailings Pond Water Elevation from 1 September 2021 to 31 August 2022

The pond elevation at the NTP was maintained below the maximum operating pond level (1,650.7 m) during the reporting period.

5.6.2.2 Observed Performance

The key observations made during the NTP dam inspection were as follows:

- The tailings have filled most of the area upstream of the NTP dam, and there is a small reclaim pond at the southern end. The fetch distance on the surface of the NTP is short, so the potential for generation of significant waves when a pond is present is small.
- Unused and damaged pipelines that extend through the crest of the dam should ideally be removed or grouted to eliminate the hazard of future deformation or settlement of the abandoned pipes creating low points in the dam crest (locations shown in Golder 2017b).
- All pipes should continue to be inspected as part of the monthly NTP inspections to confirm that they remined capped on the upstream side. Pipes should be removed or grouted as part of the NTP decommissioning plan.
- The VW piezometer installed within the stilling well was not functioning at the time of the inspection and should be fixed.

An NTP pond stage–storage curve was prepared using data from the October 2021 bathymetry survey (WSP 2023) and the 2021 LiDAR survey. Review of the 2021 NTP pond stage–storage curve indicates that sediment buildup is not resulting in an NTP pond volume reduction.

5.6.3 Instability

The stability of the NTP is monitored with piezometers, inclinometers, GPS units, and regular visual inspections.

5.6.3.1 Design Basis

The drainage conditions beneath the NTP dam are favourable with respect to structural stability. The downstream slope of sections rebuilt after the June 2013 flood is less steep (1.5 to 1.75H:1V) than the original design (1.3 to 1.4H:1V).

As a result of the reclassification of the NTP dam from High to Very High, its slope stability and liquefaction assessments were updated to comply with the Very High consequence design criteria (Golder 2018a). This event corresponded to a peak ground acceleration of 0.23 g and a mean moment magnitude of 6.2 based on the probabilistic analysis results from the site-specific hazard assessment (Golder 2016b). WSP will work with FRO in 2023 to update the slope stability and liquefaction analyses based on extreme loading conditions to align with the GISTM.

Details of the assessment and results were provided in Golder (2018a). A brief summary of the conclusions is provided below:

- The liquefaction assessment update was done for a Very High dam class and considered the 2017 topography along with the 2016 and 2017 riprap construction along the toe of the NTP dam and the maximum piezometer readings up to the end of 2017. The results indicated that the saturated soils below the dam are unlikely to liquefy during the design earthquake event.
- The dam stability update used design criteria for a Very High consequence facility based on HSRC Guidance Document (Ministry of Energy and Mines 2016) Section 3.3 and CDA (2019) for minimum FoS. A sensitivity case was analyzed for post earthquake conditions for loose CR layers identified in the NTP. Both static and

pseudo-static conditions were considered in the stability assessment. However, the post-earthquake conditions were not analyzed in the foundation because the liquefaction assessment results indicated that the alluvial soils below the dams and dam materials are unlikely to liquefy during the design earthquake event. The results of the stability assessment indicated that the FoS for failure surfaces that fully involve the crest of the NTP dam exceeded the Very High consequence static and pseudo-static slope stability design criteria.

The NTP is also susceptible to instability from erosion during flooding of the Fording River. River erosion has been assessed by KWL, and riprap was placed on the toe of the dam in late 2016 and 2017 (KWL 2017b) to mitigate against river erosion up to a 200-year return period design flow. Risk-informed criteria should be established for the flood erosion protection along the toe of the NTP dam (recommended action 2015-06 in Table 21).

Instrumentation Data – Crest Displacement Monitoring

Four GPS monitors are located on the dam crest and have replaced the prisms to monitor crest displacement.

GPS data were downloaded from GeoExplorer for dates from 1 September 2021 to 31 August 2022. The survey data are summarized in Appendix D.

The initial coordinates of the GPS units at the NTP are listed in Table 18. Due to the manner in which GPS elevation is referenced at FRO, only change in elevation data is reviewed, as shown in Appendix D.

Table 18: Instrument Monitoring Locations on North Tailings Pond

Instrument Identification	Reading Start Date	Northing (m)	Easting (m)	Location Description
NTP-GPS 01	October 2014	5,562,143.7	651,102.6	Crest
NTP-GPS 02	June 2018	5,561,994.1	651,130.2	Crest
NTP-GPS 03	June 2018	5,561,641.8	651,047.0	Crest
NTP-GPS 04	June 2018	5,561,379.6	650,902.6	Crest

Note: Northings and eastings reported in FRO UTM; sensor locations downloaded from GeoExplorer.
NTP = North Tailings Pond; FRO = Fording River Operations; UTM = Universal Transverse Mercator.

Generally, the GPS devices are recorded on an hourly frequency which could be reduced to daily readings in GeoExplorer. The survey data indicated little crest displacement during the reporting period. Minor spikes in the data are most likely noise in the system and are not a concern. Movements are well below the GeoExplorer alarm trigger for 3D point velocity (150 mm/day, QPO alarm) and the updated QPOs provided by Golder (2018a) and listed in Section 2.6. No warnings were triggered in the reporting period.

A latent alarm is triggered in GeoExplorer when the measurement age of the GPS unit is greater than a day on the NTP. Any offline monitors will be inspected and repaired within one week (FRO 2022b).

Instrumentation Data – Slope Inclinometers

Slope inclinometers were installed at three locations in 2015 along the NTP crest (Figure 7) to monitor horizontal movement in the dam. The A axis is oriented in the upstream to downstream direction (with negative displacements in the downstream direction) and the B axis is oriented along the dam centreline. The locations of the inclinometers at the NTP are presented in Table 19.

Table 19: North Tailings Pond Inclinometers

Inclinometer ID	Northing (m)	Easting (m)	Elevation (m)	A-A Axis Azimuth (°)	Probe Serial No.	Reel Serial No.
TH15-05	5,561,992.0	651,130.8	1,653.6	235	DP15600000	DR21300000
TH15-06	5,561,641.0	651,047.2	1,653.7	290		
TH15-07	5,561,379.7	650,904.4	1,653.4	305		

Notes: Azimuth is approximate. The upper wheel should face the indicated direction. Elevations are reported in Elk Valley Elevation Datum.

Slope inclinometer data were supplied to WSP by FRO. Readings were collected approximately quarterly at the NTP inclinometers since December 2015. Starting in September 2018, and as discussed with the EoR, FRO has been reading the inclinometer three times per year (shortly before freshet, in the latter part of freshet, and in late summer). Based on the data observed to date, the frequency at which readings are taken from the inclinometers can be updated to a minimum of once per year.

A total of two readings were taken at each of the three inclinometers within the AFPR reporting period. Inclinometer data were collected and plotted by FRO. Inclinometer data were collected and plotted by FRO and are shown with a plan view of each inclinometer location by WSP in Appendix D. Data readings are from 12 January 2016 to 24 March 2022 and include the initial reading from 18 December 2015 as a reference line.

The inclinometer readings do not indicate any significant trends in deformation and the maximum cumulative downstream deflection below a depth of 2 m from the crest does not exceed 5 mm over a year, which is in the acceptable range for the slope inclinometer QPO (Table 5).

Instrumentation Data – Piezometers

VW piezometers were installed in 2015 at three locations along the NTP crest to monitor water levels in and below the dam (Figure 7). Seven piezometers were installed at three locations in the NTP tailings, upstream of the dam, in 2018 (Norwest 2018).

The piezometers located in the NTP dam are listed in Table 20. Data for the piezometers were downloaded from GeoExplorer. The piezometer readings from 1 September 2021 to 31 August 2022 are presented in Chart 6. Readings have been taken at TH15-05, TH15-06, and TH15-07 since August 2015.

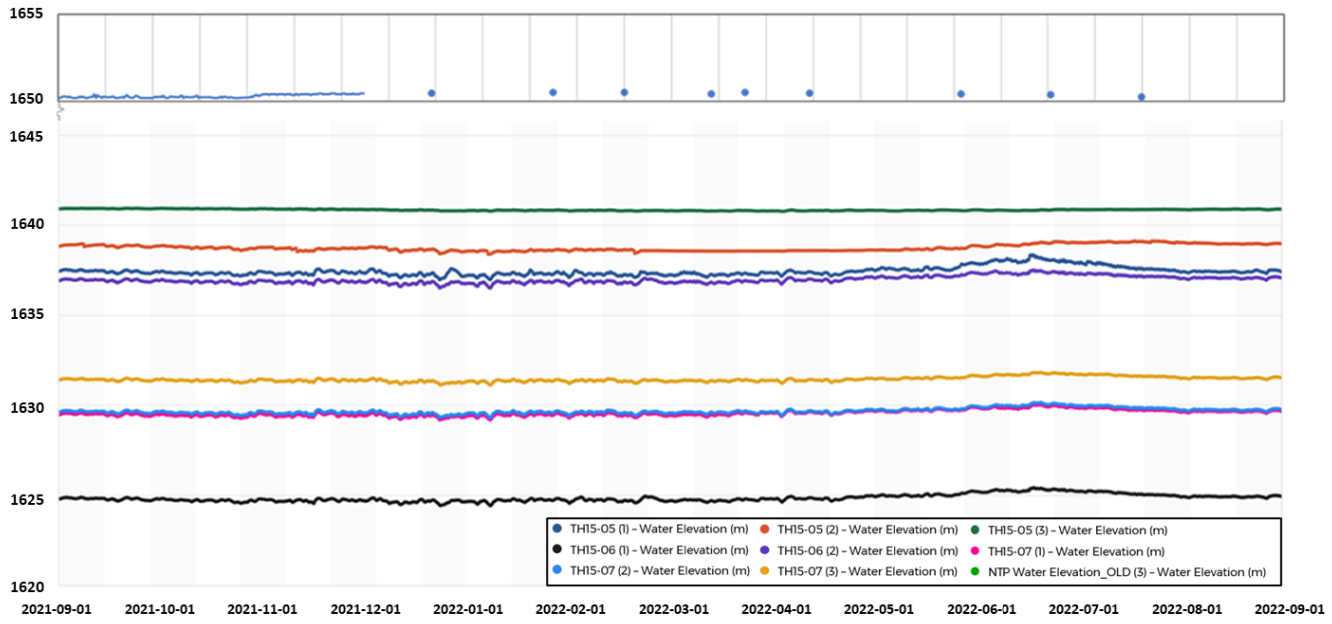
The piezometers in the NTP tailings were not reviewed as part of this AFPR as they do not monitor dam performance.

Table 20: North Tailings Pond Piezometer Installation Details and Performance Summary

Borehole/ Piezometer ID	Northing (m)	Easting (m)	Collar Elevation (m)	Data Logger Serial No.	Piezometer Serial No.	GeoExplorer Sensor No.	Piezometer Tip Elevation (m)	Warning Water Elevation (m)	Minimum Water Elevation (2021/2022) (m)	Maximum Water Elevation (2021/2022) (m)	Warning Water Elevation Exceeded?	Comments
TH15-05	5,561,992.0	651,130.8	1,653.6	DT09633	VW33222	3	1,641.3	>1,646.5	dry	dry	No	Reading negative pressure head (dry)
				DT09636	VW33223	2	1,638.7		dry	1,639.1	No	No concerns, minimum recorded water level less than tip elevation (dry)
				DT09638	VW33241	1	1,636.6		1,637.0	1,638.4	No	No concerns
TH15-06	5,561,641.0	651,047.2	1,653.7	DT09641	VW33240	2	1,628.5	>1,643.5	1,636.5	1,637.5	No	No concerns
				DT09643	VW33239	1	1,626.3		dry	dry	No	Reading negative pressure head (dry)
TH15-07	5,561,379.7	650,904.4	1,653.4	DT094501	VW33231	3	1,630.0	>1,640.5	1,631.1	1,631.8	No	No concerns
					VW33230	2	1,624.0		1,629.3	1,630.2	No	No concerns
					VW33242	1	1,614.7		1,629.2	1,630.0	No	No concerns

Note: Coordinates are reported in Universal Transverse Mercator and are elevations reported in Elk Valley Elevation Datum.

n/a = not applicable.



Note: Elevations reported in Elk Valley Elevation Datum.

Chart 6: North Tailings Pond Vibrating Wire Piezometers and Pond Elevation from 1 September 2021 to 31 August 2022

The phreatic level readings for the time period were generally stable, with minor gradual increases noted around spring freshet in early April 2022 and June 2022 due to a high precipitation event on site. No warnings were triggered in GeoExplorer for these piezometers.

All piezometers on the NTP collect data in real time. The piezometers should continue to be monitored regularly as outlined in the OMS manual (FRO 2022b).

For instruments that have had no communication or live data for seven days or less, FRO will follow actions outlined in Section 5.1 of the OMS manual (FRO 2022b) to check on the instrument and inform/notify the appropriate personnel.

5.6.3.2 Observed Performance

No evidence of slope instability was observed during the 2022 AFPR. The key observations made during the NTP dam inspection were as follows:

- The downstream slope and toe of the NTP dam near the north abutment at Sta. 1+375 has been damaged by heavy equipment (Photograph 21 in Appendix A). The downstream shell should be repaired following NTP recommendation 2022-01 in Table 21.
- A temporary berm was placed on the NTP crest to restrict entry within a blast radius. The berm was placed the previous day and was not removed following the blast (Photograph 26 in Appendix A).
- The area downstream of the NTP dam near Sta. 1+250 where ponding has historically been observed was dry at the time of the inspection. The area should continue to be monitored during monthly inspections for observations of ponding water.

- Parts of the area downstream of the dam toe near Sta. 1+350 were excavated for the drill pad of a monitoring well installation program in 2019. The area is to be regraded (recommended action 2019-03 in Table 21).

5.6.3.3 River Erosion Protection (KWL)

KWL completed the annual inspection of the riprap along the toe of the NTP on 26 July 2022. The annual riprap inspection is provided in Appendix E.

The existing riprap covers the NTP embankment downstream toe from approximately sta. 0+00 to 1+075.

5.6.4 Release of Mine-Affected Water through Pipeline Failure

5.6.4.1 Design Basis

There is a pipeline that runs around the NTP that pumps water from the Swift and Lake Mountain Pits to the STP. This pipeline is also used to pump water from the NTP to the STP when NTP water levels are high. A failure of this pipeline could release tailings-affected water.

5.6.4.2 Observed Performance

This failure mode is managed by routine inspections of the pipeline.

6.0 SUMMARY AND RECOMMENDATIONS FOR THE 2022 ANNUAL FACILITY PERFORMANCE REPORT

6.1 Summary of Activities during Reporting Period

The following activities were completed for the STP during the reporting period:

- Dredging occurred from 14 April to 21 October 2022. A total of 1.86 million dry metric tonnes of tailings were dredged from the STP and sent to the Turnbull TSF.
- Three bathymetric surveys were conducted by FRO to monitor remaining capacity in the facility. In 2022, the surveys were conducted on 10 April, 30 June, and 1 October 2022.
- The high operating range pond elevation was temporality exceeded in April and May 2022 to accommodate additional effluent water from the Liverpool Pond, with additional controls in place.
- The EDF was re-assessed to satisfy the permit for construction of the emergency spillway, which included an assessment of a passive EDF management plan with no pumping.
- A temporary pump system was installed in October 2021 to pump water from the STP to the Turnbull TSF as part of managing additional inflows to the STP from Shandley Pit dewatering.
- No water from the pond overflowed the spillway invert and entered the emergency spillway during the reporting period.
- Routine inspections of the STP by FRO tailings personnel were conducted during the reporting year at the following frequencies:
  - once per week from May to October
  - twice a month from November to April

The following activities were completed for the NTP during the reporting period:

- A raw coal stockpile was constructed over an existing overburden stockpile located at the northwest end of the facility.
- Monthly inspections were conducted by FRO tailings personnel.

6.2 Summary of Climate and Water Balance

The climate data during the reporting period indicate the annual precipitation received for the Fording River (infilled) dataset was higher than the long-term annual average whereas the annual precipitation received at the Brownie Spoil weather station was lower than the long-term annual average.

6.3 Summary of Performance and Changes

Based on the visual observations during the 7 and 8 September 2022 site visit, the STP and NTP facilities appeared safe with no deficiencies requiring immediate actions and are considered to be meeting their design intent.

At the NTP facility, along the toe at approximately Sta. 1+375 towards the south abutment, damage from heavy equipment to the downstream shell was observed. The area of the downstream toe that was excavated for access to a monitoring well installation program in 2019 had not been repaired. These two areas are to be backfilled and graded (recommended actions 2019-03 and 2022-01 in Table 21).

6.4 Consequence of Failure

The STP and NTP facilities' consequence of failure is Very High, considering the guidelines for consequence classification in Section 3.4 of the HSRC Guidance Document (Ministry of Energy and Mines 2016).

6.5 Recommendations

Table 21 summarizes the status of recommended actions from the 2021 annual inspection (Golder 2022) and new recommended actions from the 2022 AFPR. Completed actions are shown with grey shading. Items from the 2021 annual report that are incomplete have been brought forward into the 2022 AFPR recommendations. There is one new recommended action for the STP and two new recommended actions for the NTP based on this 2022 AFPR.

Table 21: Status of 2021 Recommended Actions and New Actions from the 2022 Annual Facility Performance Report for the South and North Tailings Pond Facilities

Facility	ID Number	Deficiency or Non-conformance	Applicable Regulation, Guideline or OMS Manual Reference	Recommended Action	Priority Level	Recommended Timing for Action	Status as of March 2023
STP	2015-12b	Riprap erosion protection along downstream toe north of STP Sta. 0+680, no riprap south of STP Sta. 0+680; risk informed protection requirements not yet defined.	HSRC §10.1.8	Implement required protection measures for the operational phase according to the as-defined schedule.	2	2025	**In progress** – Phase 1 construction for the Fording River floodplain widening was completed in 2022 and Phase 2 is scheduled to be completed by 2025.
	2017-01	North abutment construction deficiencies.	HSRC §10.5.1(3)	Address construction deficiency by commencing planning in 2023 and follow up with mitigation works in the fall of 2023.	3	Q4 2023	**In progress** – FRO developing a plan to execute the recommended mitigations plan, with execution in 2023.
	2017-05	Potential overtopping hazard due to tailings liquefaction and redistribution during seismic event needs to be assessed.	n/a	Update liquefaction and overtopping assessment for tailings within facility based on most recent bathymetric and lidar surveys.	3	2023	**In progress** – WSP to finalize in 2023.
	2018-05	No closure plan for STP.	HSRC §10.6.7 MAC TSM	Advance closure plan for STP.	4	2023	**In progress**
	2020-01	Current freeboard trigger levels in the OMS manual do not apply to the facility with an emergency spillway.	Permit condition from Permit C-3 Amendment (July 2020) HSRC §10.1.13 HSRC Guidance Document §4.4.1	Spillway is constructed, update the water level QPOs and freeboard values in the OMS manual.	3	Q2 2022	**Complete**
	2020-05	The critical hydraulic gradient through the Main Dam is unknown.	HSRC Guidance Document §3.3.1 CDA 2013 §6.6	Complete an assessment to determine the current and critical hydraulic gradients in the Main Dam to better quantify the likelihood of a piping failure.	3	2023	**Incomplete** – WSP to develop scope of work and carry out this task in Q2 2023.
	2021-01	Riprap quality in portions of the emergency spillway do not meet design specifications.	n/a	Develop a long-term monitoring and mitigation plan for the riprap including annual inspections consisting of visual and photographic assessments of the riprap to evaluate any breakage or deterioration, change in riprap gradation, change in extent of surface cover or other deficiencies. At least five test sections within the spillway should be established to check the riprap condition at the same test sections every year. Setup the proposed monitoring stations and procedures to complete the annual inspections in consultation with the spillway DoR.	3	Q4 2023	**Incomplete** – recommended timing updated from 2022, details to be captured in next OMS manual update. WSP to support and provide guidance to FRO.
	2021-02	STP facility does not store the passive EDF volume over operating pond and below spillway invert.	HSRC §10.1.12, Permit condition from Permit C-3 Amendment (July 2020)	OMS manual should be updated with an EDF management plan.	3	2022	**Complete**
	2022-01	Potential for damage to the clarified water pipeline.	n/a	Delineate the section of the spillway where the clarified water pipeline crosses beneath such that no heavy mobile equipment can drive overtop.	4	Q4 2023	**New recommendation**

Table 21: Status of 2021 Recommended Actions and New Actions from the 2022 Annual Facility Performance Report for the South and North Tailings Pond Facilities

Facility	ID Number	Deficiency or Non-conformance	Applicable Regulation, Guideline or OMS Manual Reference	Recommended Action	Priority Level	Recommended Timing for Action	Status as of March 2023
NTP	2015-05a,b	No passive emergency system against overtopping; emergency system requires active response.	n/a	Assess the need for spillway after establishing an NTP closure plan.	4	2023	**In progress**
				If required, determine a construction schedule.	4	2024	**Incomplete**
	2015-06	Risk-informed criteria for flood erosion protection along toe of dams not defined.	CDA 2013 §6.2	Design and implement the required flood protection measures for downstream toe of dam along the Fording River including consideration of the Fording River Multiplate embankment upstream of the NTP.	2	2023	**Incomplete**
	2015-07b	Buried pipes passing through crest locations.	n/a	Execute abandonment plan for identified pipes.	3	2024	**Incomplete** – to be included as part of the NTP decommissioning project.
	2016-06	No closure plan for NTP.	HSRC §10.6.7 MAC TSM	Develop a closure plan for NTP.	4	2023	**In progress**
	2019-03	A part of the downstream toe area below the NTP dam was excavated for access to a monitoring well installation program in 2019.	HSRC §10.5.8	Backfill and grade the excavated area.	3	Q3 2023	**Incomplete**
	2022-01	A small area of the downstream slope and toe of the NTP shell near the south abutment has been damaged (excavated) by heavy equipment.	n/a	Backfill and grade the excavated area.	3	2023	**New recommendation**
	2022-02	Unable to carry out real-time pond water level monitoring.	FRO 2022a	Repair the VW piezometer and datalogger at stilling well.	3	2023	**New recommendation**

Note: Grey-shaded rows indicate completed actions.

OMS = operation, maintenance, and surveillance; STP = South Tailings Pond; Sta. = Station; HSRC = Health, Safety and Reclamation Code; FRO = Fording River Operations; MAC = Mining Association of Canada; TSM = Towards Sustainable Mining; NTP = North Tailings Pond; QPO = quantifiable performance objective; VW = vibrating wire.

Priority Level	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant risk of regulatory enforcement.
2	If not corrected could likely result in dam safety issues leading to injury, environmental impact or significant regulatory enforcement; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice – Further improvements are necessary to meet industry best practices or reduce potential risks.

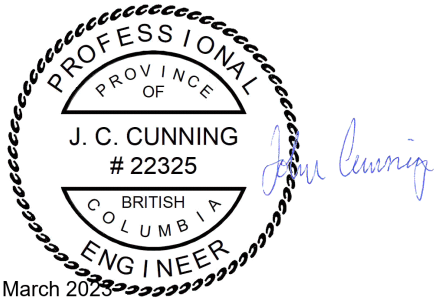
Source: HSRC Guidance Document, Section 4.2 (Ministry of Energy and Mines 2016).

7.0 CLOSURE

The reader is referred to the Study Limitations section, which follows the text and forms an integral part of this report.

We trust the above meets your present requirements. If you have any questions or further requirements, please contact the undersigned.

WSP Canada Inc.



23 March 2023

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Fellow Geotechnical Engineer

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PERMIT TO PRACTICE #1000200
Engineers & Geoscientists BC

https://golderassociates.sharepoint.com/sites/158990/project files/6 deliverables/issued/2022-118-r-rev0-1300- stp ntp afpr/22516328-2022-118-r-rev0-1300- stp ntp afpr 23mar_23.docx

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STUDY LIMITATIONS

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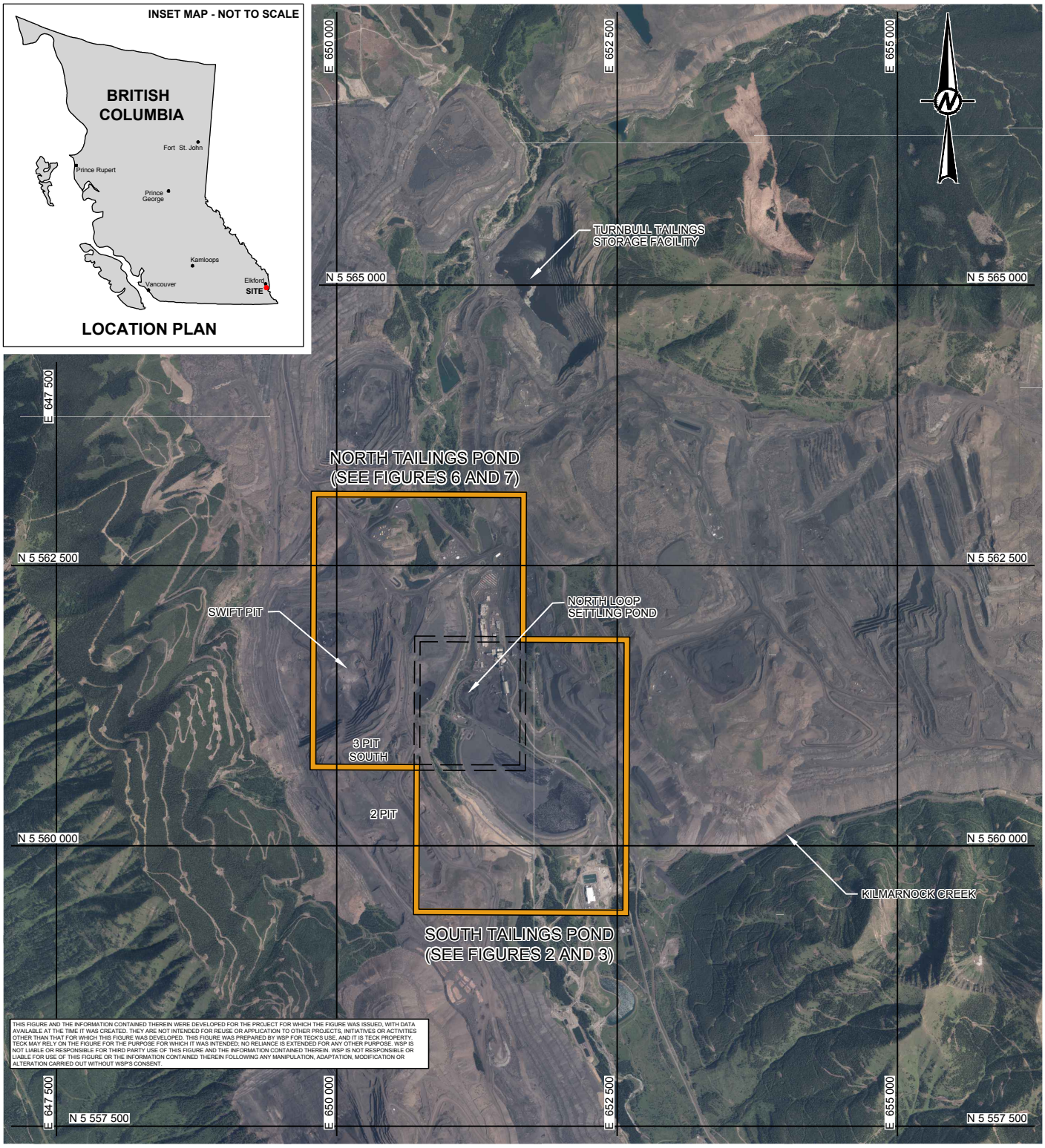
Figures



REFERENCE

1. 2022 AERIAL PHOTO PROVIDED BY TECK COAL LIMITED, RECEIVED: 21 OCTOBER 2021,DATES FLOWN: 26 JUNE 2022 AND 15 JULY 2022.

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO ELK VALLEY ELEVATION DATUM.

0 1,000 2,000

1:50,000 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

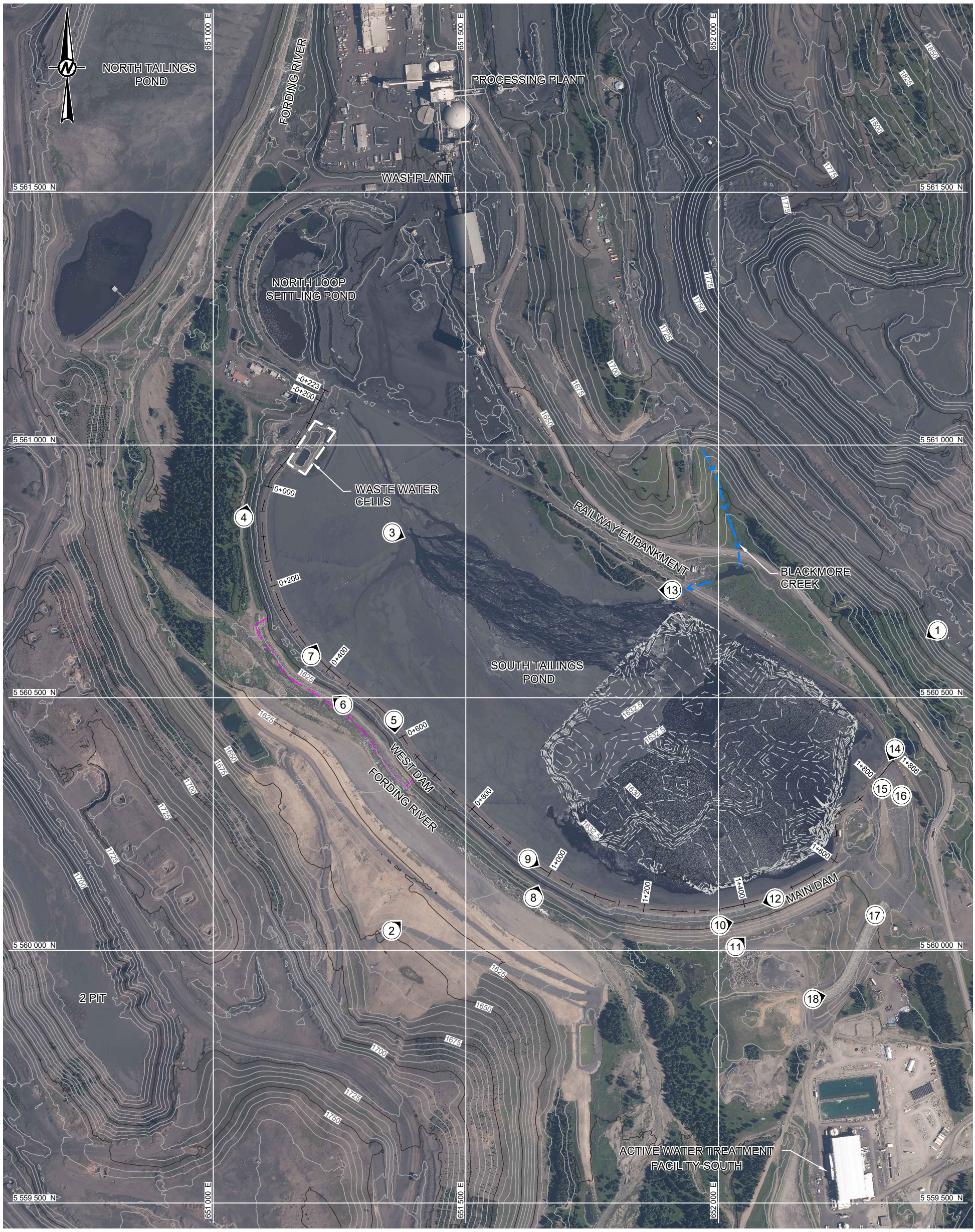
PROJECT
2022 ANNUNAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

CONSULTANT

YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

TITLE
FORDING RIVER OPERATIONS SITE PLAN

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	1



LEGEND

- 2022 TOPOGRAPHIC CONTOURS
- 2022 BATHYMETRY CONTOURS
- EXTENT OF STP DOWNSTREAM RIPRAP
- # 2022 SITE VISIT PHOTOGRAPH LOCATION
- 1+000 STP DAM REFERENCE LINE AND STATION

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO ELK VALLEY ELEVATION DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN AT 5.0 m MINOR AND 25.0 m MAJOR INTERVAL.
4. BATHYMETRY CONTOURS SHOWN AT 0.5 m MINOR AND 2.5 m MAJOR INTERVAL.

REFERENCES

1. 2022 LIDAR TOPOGRAPHY AND AERIAL PHOTO PROVIDED BY TECK COAL LIMITED, RECEIVED: 21 OCTOBER 2022, DATES FLOWN: 26 JUNE 2022 AND 15 JULY 2022.
2. STP RIPRAP EXTENTS PROVIDED BY KERR WOOD LEIDAL ASSOCIATES LTD. RECEIVED: 17 JANUARY 2018.
3. 2022 BATHYMETRY DATA SURVEYED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS ON 1 OCTOBER 2022. FILE NAME: "STP_Depth applied-2022-10-01.00t.dxf".

0 125 250
1:7,500 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

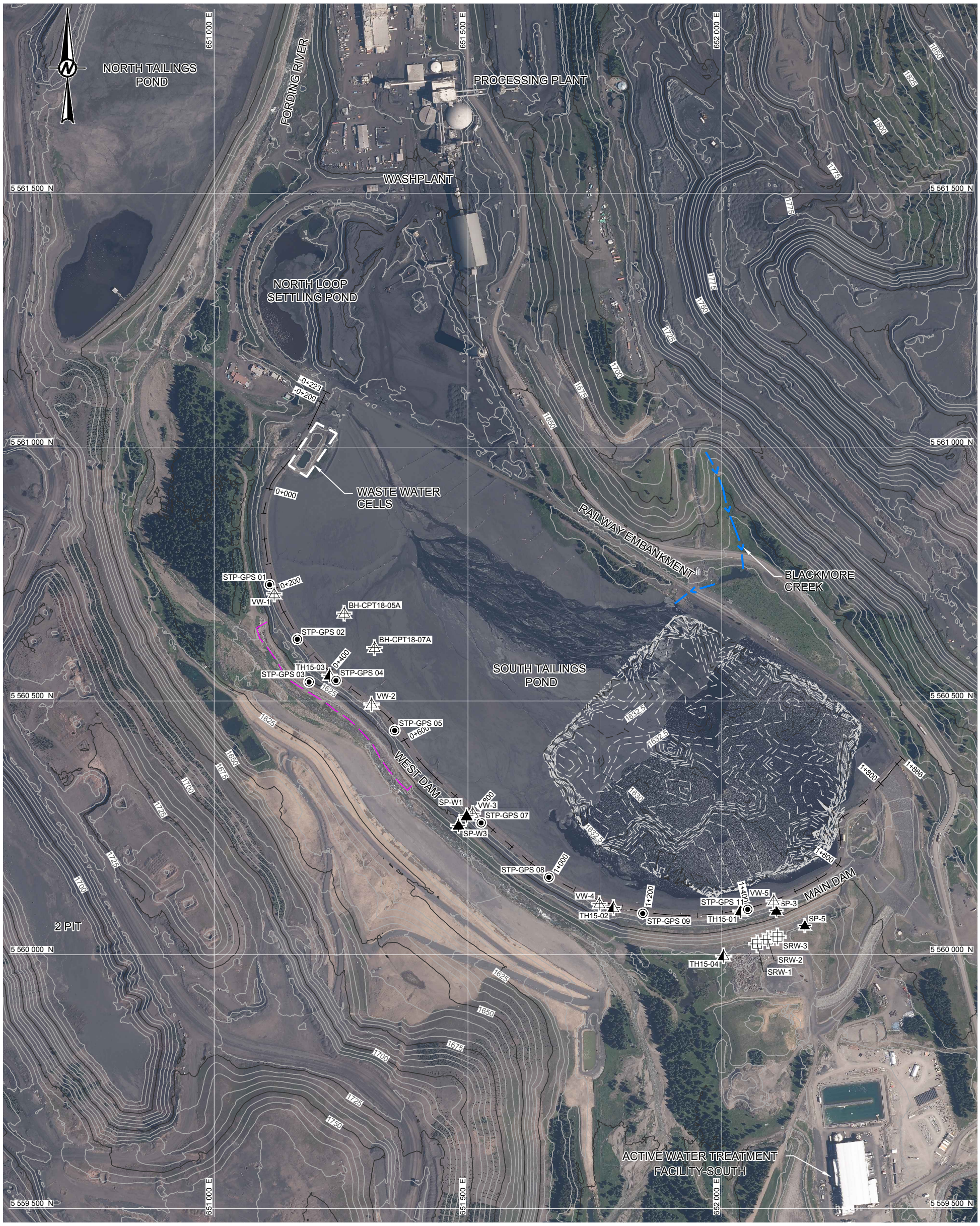
CONSULTANT
wsp

YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND
2022 SITE VISIT PHOTOGRAPH LOCATIONS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	2



LEGEND

- 2022 TOPOGRAPHIC CONTOURS
- 2022 BATHYMETRY CONTOURS
- EXTENT OF STP DOWNSTREAM RIPRAP
- GPS MONITORING LOCATION
- VIBRATING WIRE PIEZOMETER LOCATION
- VIBRATING WIRE PIEZOMETER AND INCLINOMETER LOCATION
- RETROFIT STANDPIPE WITH VIBRATING WIRE PIEZOMETER LOCATION
- SEEPAGE RETURN WELL LOCATION
- STP DAM REFERENCE LINE AND STATION (1+000)

0 125 250
1:7,500 METRES

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO ELK VALLEY ELEVATION DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN AT 5.0 m MINOR AND 25.0 m MAJOR INTERVAL.
4. BATHYMETRY CONTOURS SHOWN AT 0.5 m MINOR AND 2.5 m MAJOR INTERVAL.

REFERENCES

1. 2022 LIDAR TOPOGRAPHY AND AERIAL PHOTO PROVIDED BY TECK COAL LIMITED, RECEIVED: 21 OCTOBER 2022, DATES FLOWN: 26 JUNE 2022 AND 15 JULY 2022.
2. STP RIPRAP EXTENTS PROVIDED BY KERR WOOD LEIDAL ASSOCIATES LTD. RECEIVED: 17 JANUARY 2018
3. GPS MONITORING LOCATIONS BASED ON INITIAL READINGS OF DATA DOWNLOADED FROM GEOEXPLORER ACCESSED 13 DECEMBER 2017.
4. LOCATIONS OF STANDPIPE PIEZOMETERS BASED ON SURVEY DATA DOWNLOADED FROM GEOEXPLORER, ACCESSED 13 DECEMBER 2017.
5. LOCATIONS OF 2014 VIBRATING WIRE PIEZOMETERS BASED ON SURVEY DATA DOWNLOADED FROM GEOEXPLORER, ACCESSED 13 DECEMBER 2017.
6. LOCATIONS OF 2015 VIBRATING WIRE PIEZOMETERS AND INCLINOMETERS BASED ON SURVEY DATA DOWNLOADED FROM GEOEXPLORER, ACCESSED 13 DECEMBER 2017.
7. 2022 BATHYMETRY DATA SURVEYED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS ON 1 OCTOBER 2022. FILE NAME: "STP_Depth applied-2022-10-01.00t.dxf".
8. SEEPAGE RETURN WELL LOCATIONS APPROXIMATED FROM 2018 AERIAL PHOTO.
9. LOCATIONS OF 2018 VIBRATING WIRE PIEZOMETERS BASED ON SURVEY DATA FROM GEOEXPLORER, ACCESSED 24 OCTOBER 2019.

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

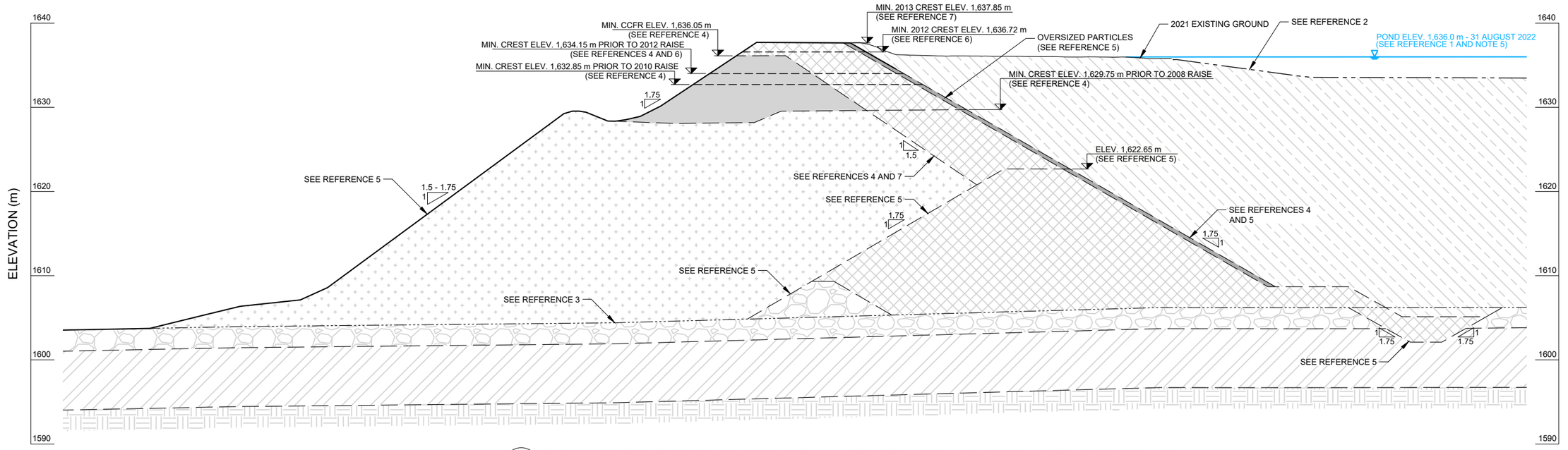
CONSULTANT
wsp

PROJECT
2022 ANNUNAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND MONITORING LOCATIONS

YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	3



SCALE 1:500 m

A

TYPICAL SECTION THROUGH MAIN DAM (STN 1+150 TO STN 1+600) AND WEST DAM (STN 0+000 TO 0+400)

LEGEND

- 2021 GROUND SURFACE
- APPROXIMATE POND ELEVATION
- APPROXIMATE PREVIOUSLY DESIGNED CREST
- APPROXIMATE ORIGINAL GROUND SURFACE
- APPROXIMATE MATERIALS BOUNDARY BENEATH SURFACE
- APPROXIMATE TAILINGS SURFACE (FROM BATHYMETRY)
- COARSE REJECTS (CR)
- COMBINED COARSE AND FINE REJECTS (CCFR)
- TILL
- IN SITU TILL
- FLOODPLAIN DEPOSITS (SAND AND GRAVEL)
- TAILINGS
- BEDROCK

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. MATERIALS SHOWN SCHEMATICALLY ONLY.
3. RIPRAP PRESENT FROM APPROXIMATELY STN. 0+205 TO STN. 0+680, NOT SHOWN ON SECTION.
4. ELEVATIONS ARE REFERENCED TO THE ELK VALLEY ELEVATION DATUM.
5. POND GENERALLY AT SOUTH END OF STP ONLY (SEE FIGURE 2 AND 3).

REFERENCES

1. POND ELEVATION IS FROM SURVEYED STP POND DATA, 31 AUGUST 2022.
2. TAILINGS SURFACE SHOWN FOR MAIN DAM SECTION AND BASED ON 2022 BATHYMETRY AT STN. 1+420 PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, SURVEYED: 1 OCTOBER 2022.
3. ORIGINAL GROUND ESTIMATED BASED ON 1968 ORIGINAL GROUND SURFACE CONTOURS PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, FILE NAME: "1968_CONTOURS_BG.dwg", RECEIVED: 8 DECEMBER 2015 AND GOLDER. 1976. TAILINGS STORAGE PROPOSED 1977 EXTENSION. REPORT PREPARED FOR FORDING COAL LTD. REFERENCE NO. V75193. SUBMITTED JANUARY 1976 (GROUND SURFACE DIGITIZED BY GOLDER FROM COMINCO DRAWING (UNNAMED), FIGURE 1 LOCATION OF BOREHOLES).
4. FRO. 2010. SOUTH TAILINGS POND DESIGN AND CONSTRUCTION REPORT JULY-SEPTEMBER 2010. SUBMITTED NOVEMBER 2010.
5. GOLDER. 1976. REPORT TO FORDING COAL LTD. ON TAILINGS STORAGE PROPOSED 1977 EXTENSION. REPORT PREPARED FOR FORDING COAL LTD. REFERENCE NO. V75193. SUBMITTED JANUARY 1976.
6. GOLDER. 2013. SOUTH TAILINGS POND DAM 2012 CONSTRUCTION DAM RAISE AS-BUILT REPORT. REPORT PREPARED FOR TECK COAL LIMITED FORDING RIVER OPERATIONS. PROJECT NO. 1214270098-2013-303-R-REV0-6400. SUBMITTED 1 APRIL 2013.
7. GOLDER. 2014d. SOUTH TAILINGS POND DAM CONSTRUCTION RECORD REPORT FOR THE 2013 DAM RAISE. REPORT PREPARED FOR TECK COAL LIMITED FORDING RIVER OPERATIONS. REFERENCE NO. 1314270098-2014-542-R-REV0-6000. SUBMITTED 30 OCTOBER 2014.

0 10 20
1:500 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT
wsp

YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

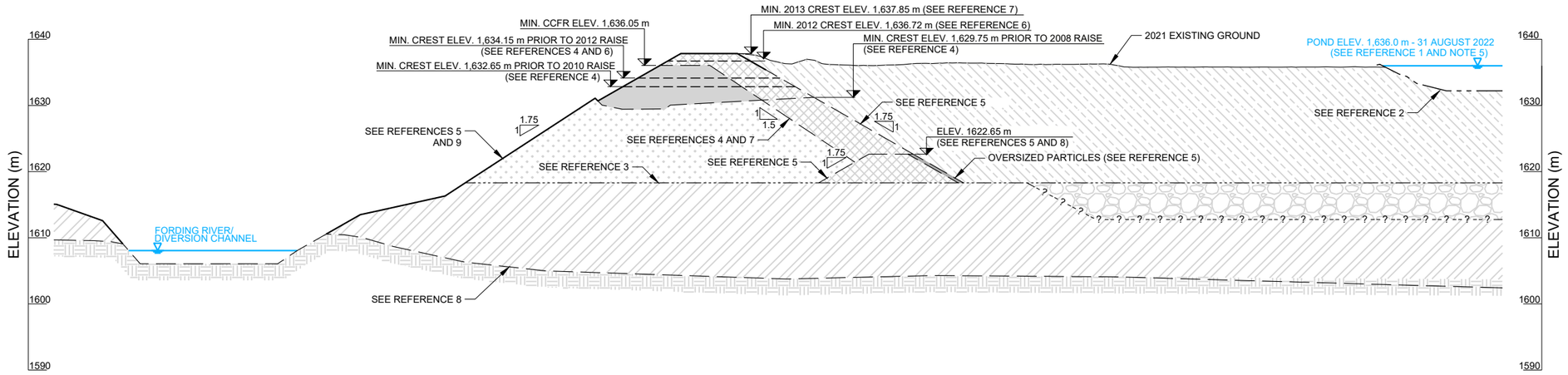
PROJECT
2022 ANNUNAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND
TYPICAL SECTION THROUGH MAIN DAM (STN. 1+150 TO 1+600) AND WEST DAM (STN. 0+000 TO 0+400)

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm



SCALE 1:750 m

B

TYPICAL SECTION THROUGH WEST DAM (STN 0+400 TO 1+150)

LEGEND

- 2021 GROUND SURFACE
- APPROXIMATE POND AND RIVER ELEVATION
- APPROXIMATE PREVIOUSLY DESIGNED CREST
- APPROXIMATE ORIGINAL GROUND SURFACE
- APPROXIMATE MATERIALS BOUNDARY BENEATH SURFACE
- APPROXIMATE TAILINGS SURFACE (FROM BATHYMETRY)
- COARSE REJECTS (CR)
- COMBINED COARSE AND FINE REJECTS (CCFR)
- TILL
- IN SITU TILL
- FLOODPLAIN DEPOSITS (SAND AND GRAVEL)
- TAILINGS
- BEDROCK

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. MATERIALS SHOWN SCHEMATICALLY ONLY.
3. RIPRAP PRESENT FROM APPROXIMATELY STN. 0+205 TO STN. 0+680, NOT SHOWN ON SECTION.
4. ELEVATIONS ARE REFERENCED TO THE ELK VALLEY ELEVATION DATUM.
5. POND GENERALLY AT SOUTH END OF STP ONLY (SEE FIGURES 2 AND 3).

REFERENCES

1. POND ELEVATION IS FROM FROM SURVEYED STP POND DATA, 31 AUGUST 2022.
2. TAILINGS SURFACE FOR WEST DAM SECTION BASED ON 2022 BATHYMETRY AT STN. 1+040 PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, SURVEYED: 1 OCTOBER 2022.
3. ORIGINAL GROUND ESTIMATED BASED ON 1968 ORIGINAL GROUND SURFACE CONTOURS PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, FILE NAME: "1968_CONTOURS_BG.dwg", RECEIVED: 8 DECEMBER 2015 AND GOLDER. 1976. TAILINGS STORAGE PROPOSED 1977 EXTENSION. REPORT PREPARED FOR FORDING COAL LTD. REFERENCE NO. V75193. SUBMITTED JANUARY 1976 (GROUND SURFACE DIGITIZED BY GOLDER FROM COMINCO DRAWING (UNNAMED), FIGURE 1 LOCATION OF BOREHOLES).
4. FRO. 2010. SOUTH TAILINGS POND DESIGN AND CONSTRUCTION REPORT JULY-SEPTEMBER 2010. SUBMITTED NOVEMBER 2010.
5. GOLDER. 1976. REPORT TO FORDING COAL LTD. ON TAILINGS STORAGE PROPOSED 1977 EXTENSION. REPORT PREPARED FOR FORDING COAL LTD. REFERENCE NO. V75193. SUBMITTED JANUARY 1976.
6. GOLDER. 2013. SOUTH TAILINGS POND DAM 2012 CONSTRUCTION DAM RAISE AS-BUILT REPORT. REPORT PREPARED FOR TECK COAL LIMITED FORDING RIVER OPERATIONS. REFERENCE NO. 1214270098-2013-303-R-REV0-6400. SUBMITTED 1 APRIL 2013.
7. GOLDER. 2014d. SOUTH TAILINGS POND DAM CONSTRUCTION RECORD REPORT FOR THE 2013 DAM RAISE. REPORT PREPARED FOR TECK COAL LIMITED FORDING RIVER OPERATIONS. REFERENCE NO. 1314270098-2014-542-R-REV0-6000. SUBMITTED 30 OCTOBER 2014.
8. GOLDER. 2015. SOUTH TAILINGS POND WEST DAM GEOPHYSICAL INVESTIGATION. REPORT PREPARED FOR TECK COAL LIMITED FORDING RIVER OPERATIONS. REFERENCE NO. 1522835-2015-002-R-REV0-3000. SUBMITTED 26 MAY 2015.
9. KWL. 1976. DRAWING NO. 8-76-3. DRAWING PREPARED FOR FORDING COAL LTD. SUBMITTED 1976.

0 12.5 25
1:750 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT
wsp

YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

PROJECT
2022 ANNUNAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND
TYPICAL SECTION THROUGH WEST DAM (STN. 0+400 TO 1+150)

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

0

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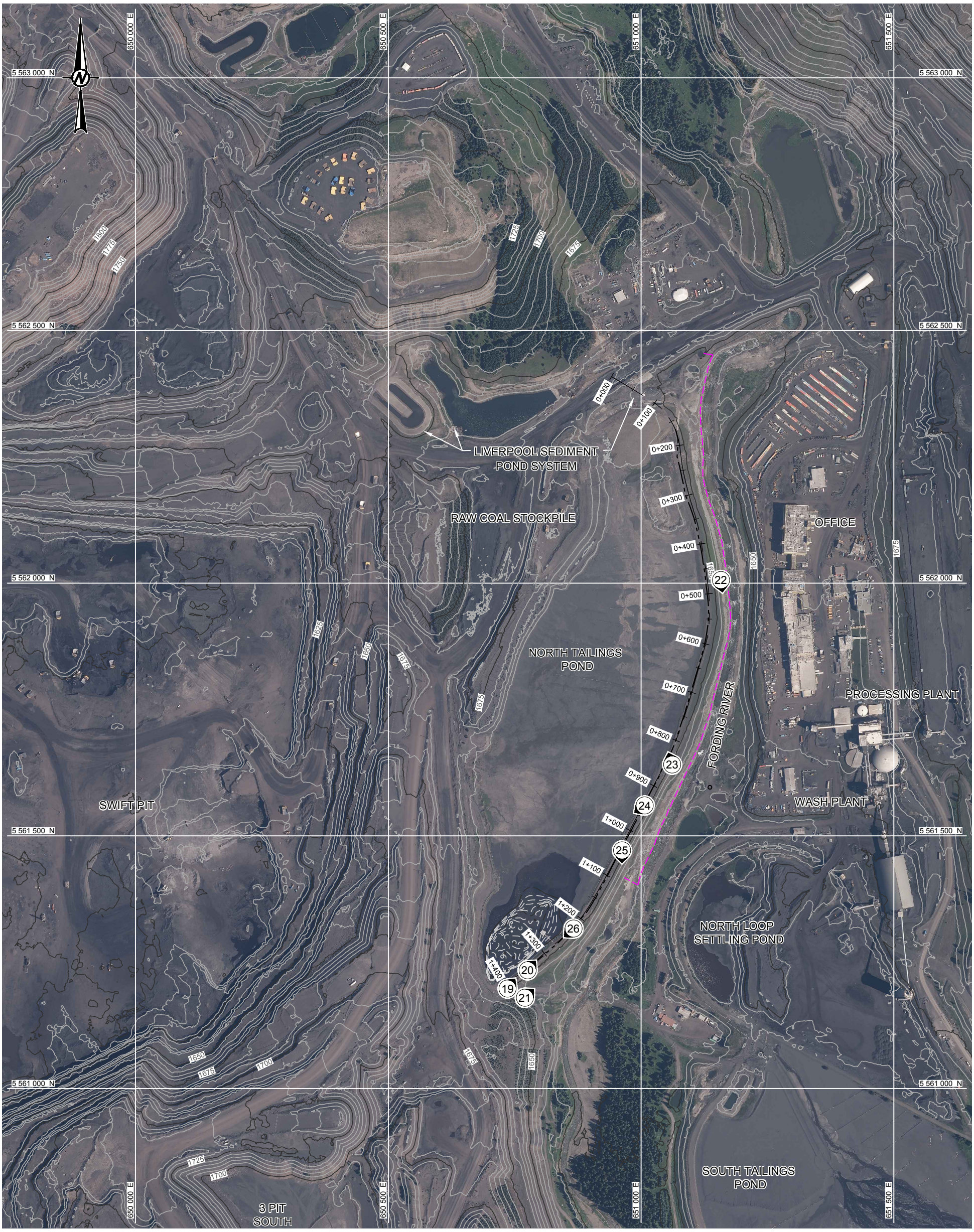


LEGEND

- 2022 TOPOGRAPHIC CONTOURS
- 2022 BATHYMETRY CONTOURS
- 2017 NTP CREST SURVEY
- EXTENT OF NTP DOWNSTREAM RIPRAP
- (#) 2021 SITE VISIT PHOTOGRAPH LOCATION
- 1+000 NTP DAM REFERENCE LINE AND STATION

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO ELK VALLEY ELEVATION DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN AT 5.0 m MINOR AND 25.0 m MAJOR INTERVAL.
4. BATHYMETRY CONTOURS SHOWN AT 0.5 m MINOR AND 2.5 m MAJOR INTERVAL.

REFERENCES

1. 2022 LIDAR TOPOGRAPHY AND AERIAL PHOTO PROVIDED BY TECK COAL LIMITED, RECEIVED: 21 OCTOBER 2022, DATES FLOWN: 26 JUNE 2022 AND 15 JULY 2022.
2. 2022 BATHYMETRY DATA SURVEYED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS ON 1 OCTOBER 2022. FILE NAME: "STP_Depth applied-2022-10-01.00t.dxf".
3. 2017 NTP CREST SURVEY PROVIDED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS. RECEIVED: 8 JANUARY 2018. FILE NAME: NTP CREST SURVEY - 171121C.XLS.
4. RAW COAL STOCKPILE CONTOURS PROVIDED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS. RECEIVED: 1 DECEMBER 2022, FILE NAME: 221126_Lees Lake and NTP Stk.dxf.

0 125 250
1:7,500 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT
wsp

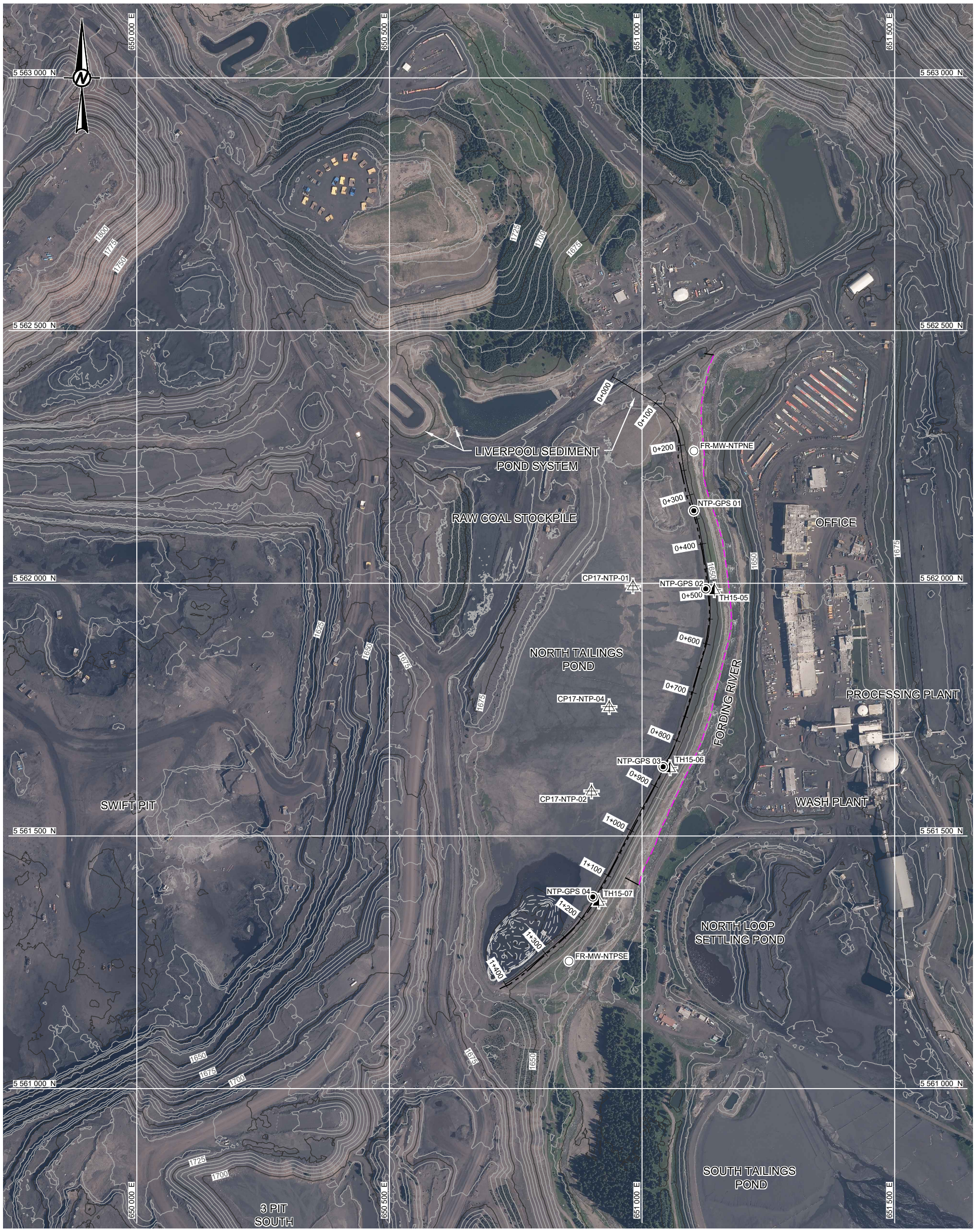
YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
NORTH TAILINGS POND
2022 SITE VISIT PHOTOGRAPH LOCATIONS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
0 25 mm



LEGEND

- 2022 TOPOGRAPHIC CONTOURS
- 2022 BATHYMETRY CONTOURS
- 2017 NTP CREST SURVEY
- EXTENT OF NTP DOWNSTREAM RIPRAP
- GPS MONITORING LOCATION
- FRO MONITORING WELL LOCATION
- VIBRATING WIRE PIEZOMETER LOCATION
- VIBRATING WIRE PIEZOMETER AND INCLINOMETER LOCATION
- NTP DAM REFERENCE LINE AND STATION (1+000)

0 125 250
1:7,500 METRES

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES ARE IN UTM ZONE 11, ELEVATIONS ARE REFERENCED TO ELK VALLEY ELEVATION DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN AT 5.0 m MINOR AND 25.0 m MAJOR INTERVAL.
4. BATHYMETRY CONTOURS SHOWN AT 0.5 m MINOR AND 2.5 m MAJOR INTERVAL.

REFERENCES

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2. 2022 BATHYMETRY DATA SURVEYED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS ON 1 OCTOBER 2022. FILE NAME: "STP_Depth applied-2022-10-01.00t.dxf".
3. GPS MONITORING LOCATIONS BASED ON INITIAL READINGS OF DATA FROM GEOEXPLORER, ACCESSED: 13 DECEMBER 2017.
4. LOCATION OF INCLINOMETERS AND ALL VIBRATING WIRE PIEZOMETERS (EXCEPT FOR CP17-NTP-01, -02, AND -04) DOWNLOADED FROM FRO'S GEOEXPLORER, ACCESSED ON 13 DECEMBER 2017.
5. 2017 NTP CREST SURVEY PROVIDED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS. RECEIVED 8 JANUARY 2018. FILE NAME: NTP CREST SURVEY - 171121C.xls
6. LOCATION OF VIBRATING WIRE PIEZOMETERS CP17-NTP-01, -02, AND -04 FROM NORWEST CORPORATION. 2018. FORDING RIVER OPERATIONS NORTH TAILINGS POND - GEOTECHNICAL INVESTIGATION RESULTS. PROJECT NO. 324-37. 17 MAY 2018.
7. RAW COAL STOCKPILE CONTOURS PROVIDED BY TECK COAL LIMITED, FORDING RIVER OPERATIONS. RECEIVED: 1 DECEMBER 2022, FILE NAME: 221126_Lees Lake and NTP Stk.dxf.

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

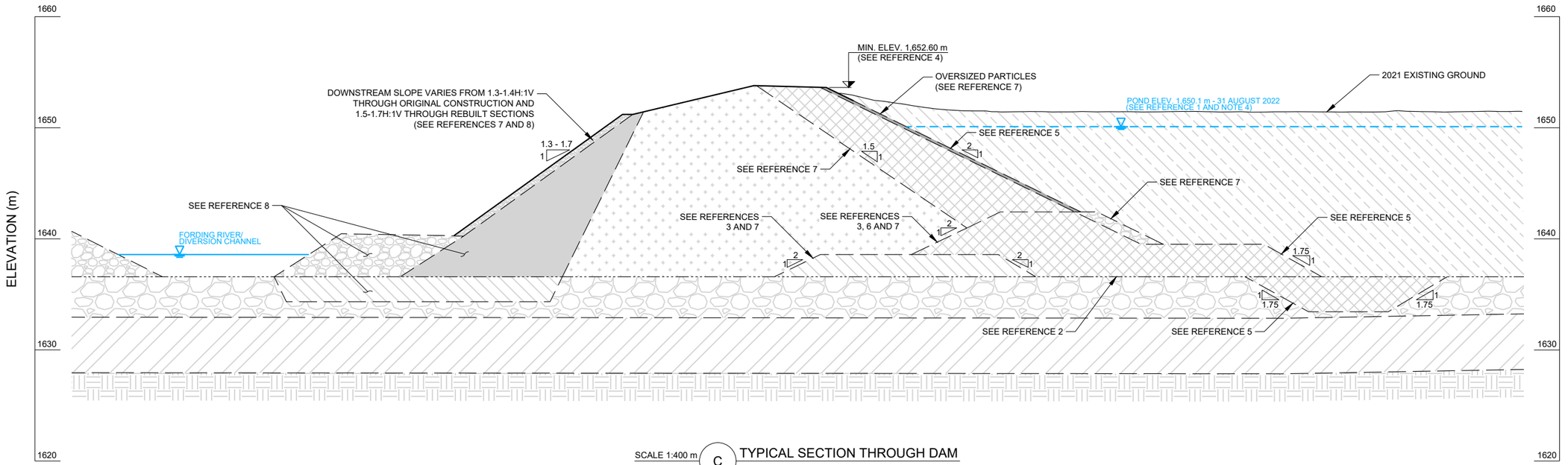
CONSULTANT
wsp

YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
NORTH TAILINGS POND MONITORING LOCATIONS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	7



SCALE 1:400 m C TYPICAL SECTION THROUGH DAM

LEGEND

- 2021 GROUND SURFACE
- APPROXIMATE POND AND RIVER ELEVATION
- APPROXIMATE ORIGINAL GROUND SURFACE
- APPROXIMATE MATERIALS BOUNDARY BENEATH SURFACE
- COARSE REJECTS (CR)
- COARSE REJECTS (CR) OR REBUILT WITH COMBINED COARSE AND FINE REJECTS (CCFR)
- TILL
- IN SITU TILL
- FLOODPLAIN DEPOSITS (SAND AND GRAVEL)
- FLOODPLAIN DEPOSITS (SAND AND GRAVEL) OR REBUILT RIPRAP
- RIPRAP
- TAILINGS
- TOPSOIL
- BEDROCK

NOTES

1. ALL UNITS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. MATERIAL ZONING SHOWN SCHEMATICALLY ONLY.
3. ELEVATIONS ARE REFERENCED TO THE ELK VALLEY ELEVATION DATUM.
4. POND GENERALLY AT SOUTH END OF NTP FACILITY ONLY (SEE FIGURE 6 AND 7).

REFERENCES

1. POND ELEVATION IS FROM MEASURED NTP POND DATA, 31 AUGUST 2022.
2. ORIGINAL GROUND ESTIMATED BASED ON 1968 ORIGINAL GROUND SURFACE CONTOURS PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS, FILE NAME: "1968_CONTOURS_BG.dwg", RECEIVED: 8 DECEMBER 2015.
3. COMINCO (COMINCO LTD.). 1973. FEASIBILITY PROPOSAL FOR FORDING OPERATIONS TAILINGS DIKE EXTENSION TO ELEVATION 5,400 FEET. SUBMITTED 3 JULY 1973.
4. 2017 NTP CREST SURVEY PROVIDED BY TECK COAL LIMITED FORDING RIVER OPERATIONS. RECEIVED 8 JANUARY 2018. FILE NAME: NTP CREST SURVEY - 171121C.xls
5. GOLDER BRAWNER. 1970. SECOND REPORT TO COMINCO LTD., ON TAILINGS POND AND DYKE PROPOSED FORDING RIVER COAL PROJECT FORDING RIVER BRITISH COLUMBIA. REPORT PREPARED FOR COMINCO LTD. REFERENCE NO. V6994. SUBMITTED APRIL 1970.
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0 10 20
1:400 METRES

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT

YYYY-MM-DD	2023-03-10
DESIGNED	P. AMINI-MOTLAGH
PREPARED	A. WANG
REVIEWED	C. MCGRATH
APPROVED	J. CUNNING

PROJECT
2022 ANNUNAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
NORTH TAILINGS POND
TYPICAL SECTION THROUGH DAM

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
22516328	1000/1300/2022-118	0	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Path: \\golder.gds\complexdata\ata\office\Vancouver\CAD-GIS\Client\Teck Coal\Fording River\99_PROJECTS\22516328\1000\1300\2022-118\02_PRODUCTION\DWG\ | File Name: 22516328-1000-1300-118-08.dwg

APPENDIX A

Site Photographs

PHOTOGRAPH 1 **7 September 2022**

South Tailings Pond (STP) overview, looking west.

PHOTOGRAPH 2 **7 September 2022**

South Tailings Pond (STP) overview, looking east.

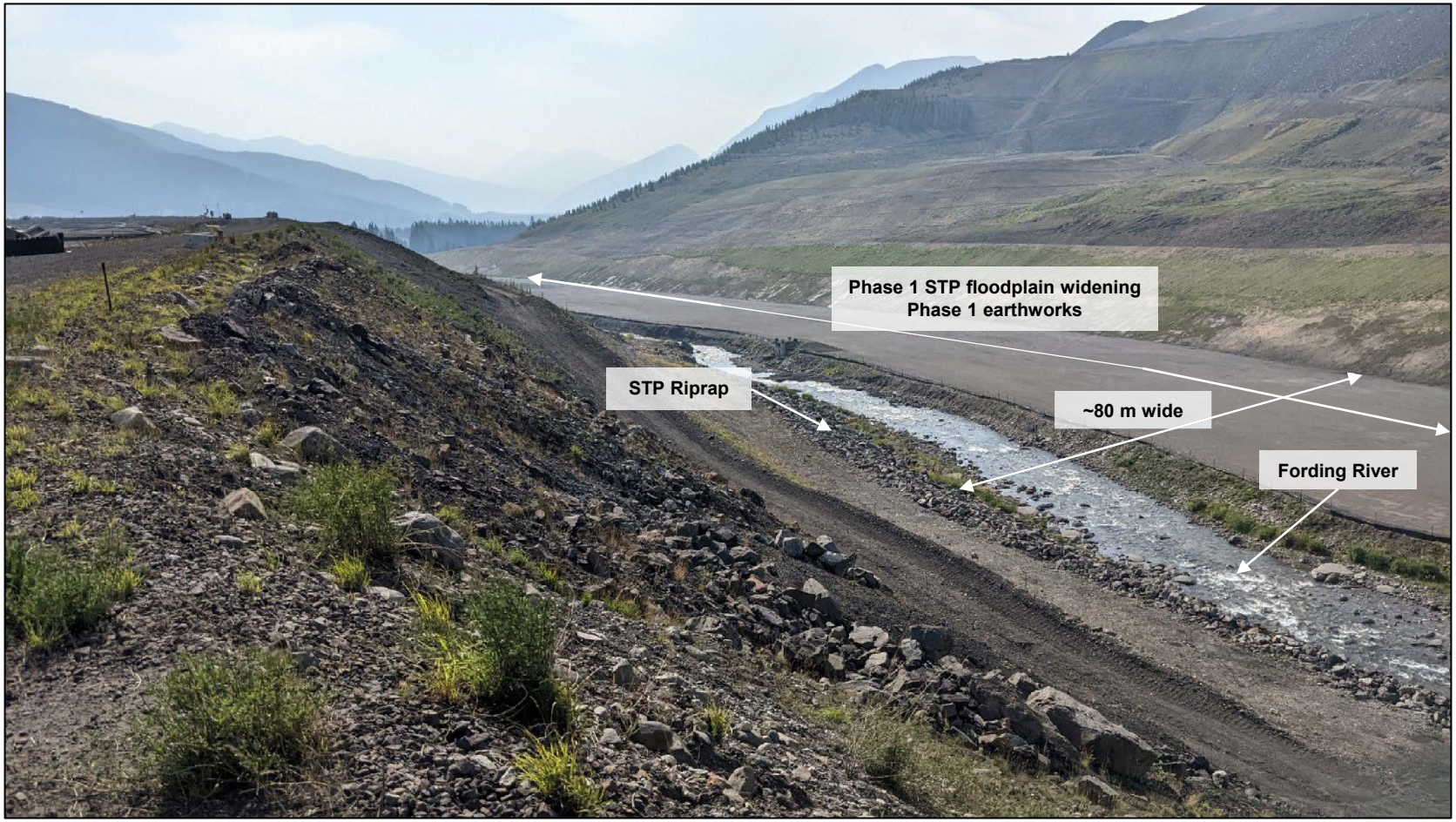
PHOTOGRAPH 3 **7 September 2022**

STP tailings pipeline at north single point discharge, north beach area, looking southeast.

PHOTOGRAPH 4 **7 September 2022**

STP West Dam downstream slope, looking northeast from approximately Sta. 0+050.

PHOTOGRAPH 5 **7 September 2022**



STP West Dam downstream slope, along Fording River, and widened floodplain, looking southwest from approximately Sta. 0+550.

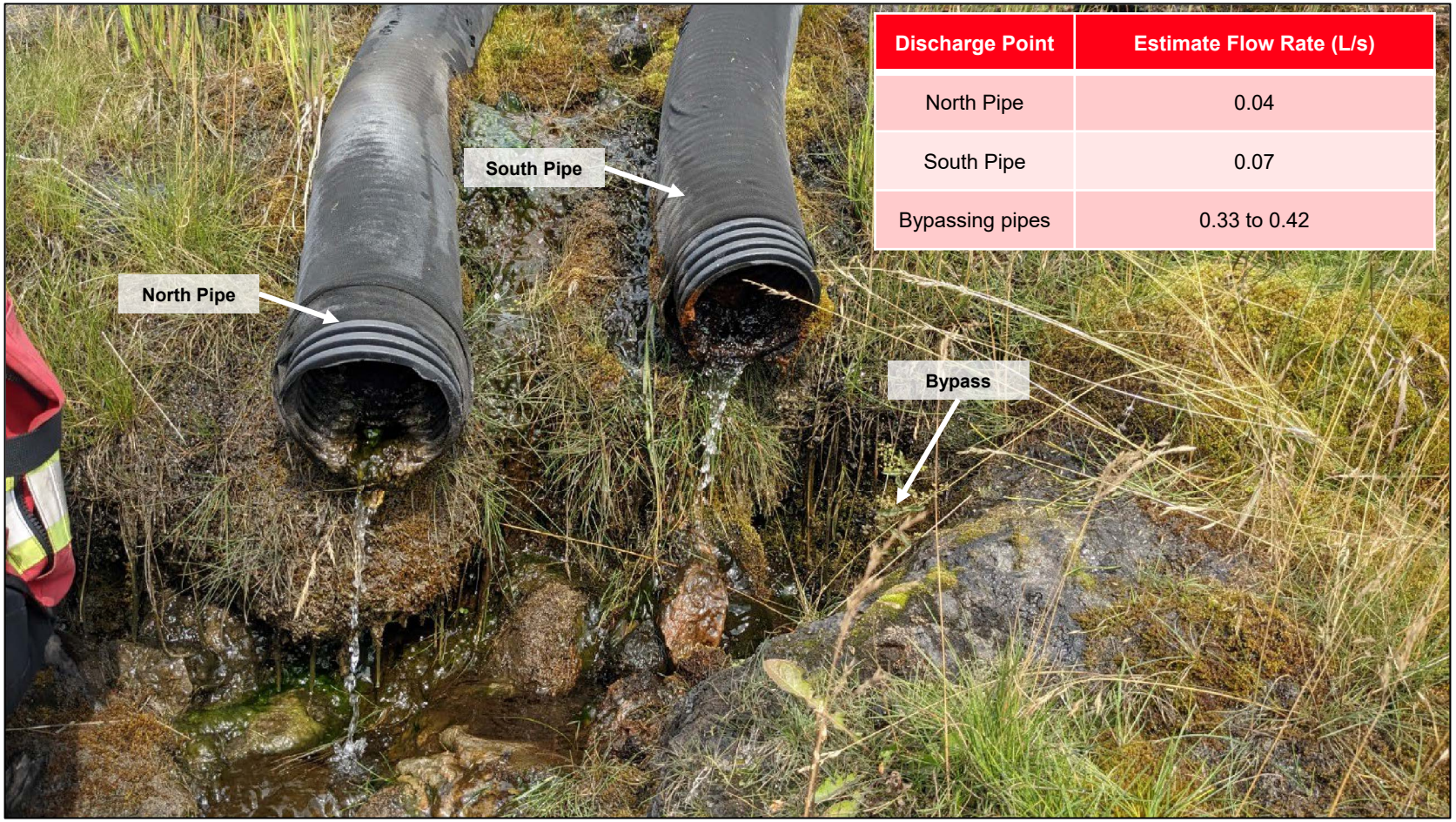
PHOTOGRAPH 6 **7 September 2022**

STP West Dam downstream slope and riprap along Fording River, looking northwest from approximately Sta. 0+450.

PHOTOGRAPH 7 **7 September 2022**

Silt fences installed at northern end of STP beach, looking northeast from approximately Sta. 0+375.

PHOTOGRAPH 8 **7 September 2022**



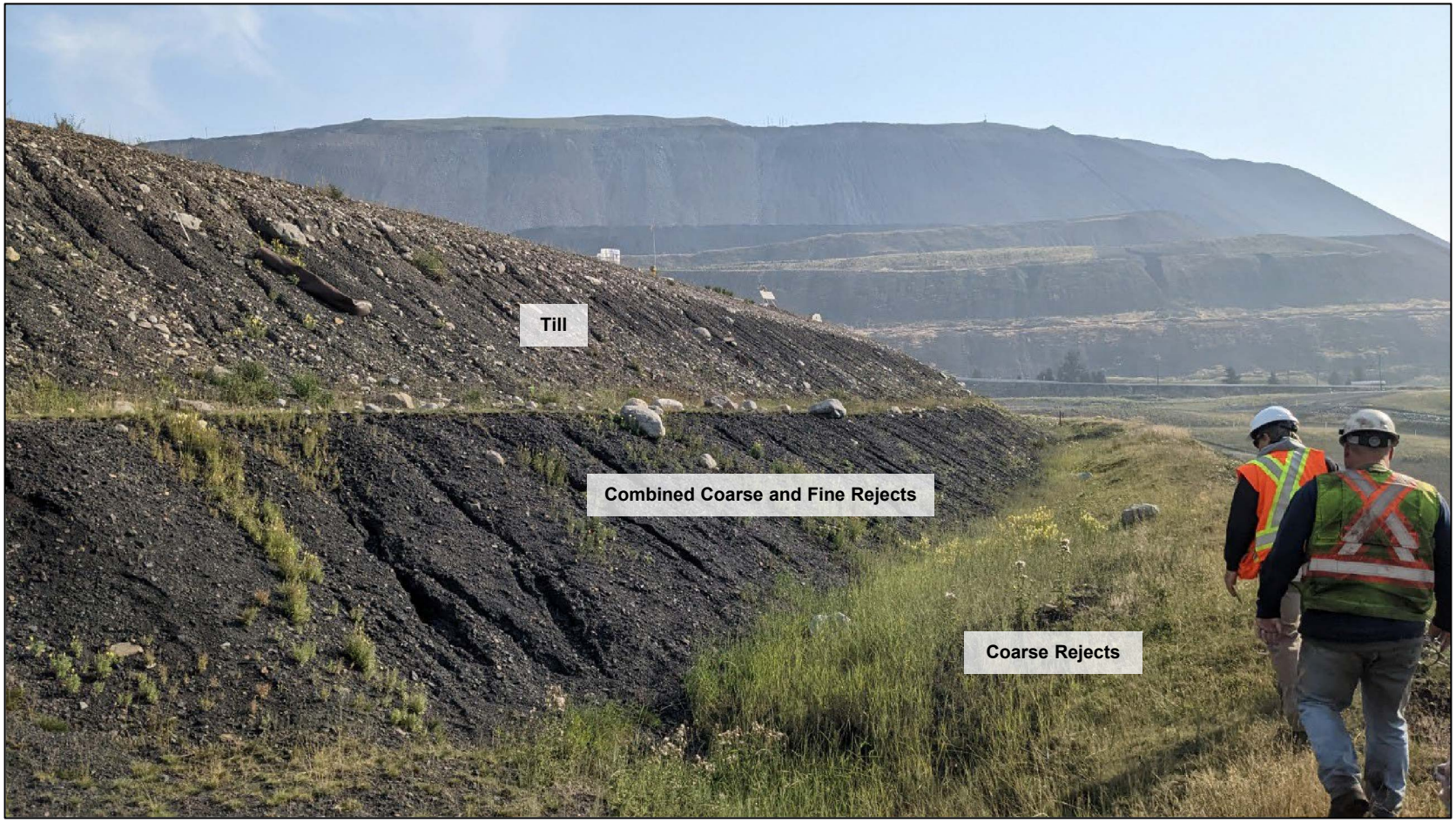
Discharge Point	Estimate Flow Rate (L/s)
North Pipe	0.04
South Pipe	0.07
Bypassing pipes	0.33 to 0.42

Seepage collection pipes in till slope below West Dam, looking northeast from approximately Sta. 1+000.

PHOTOGRAPH 9 **7 September 2022**

STP West Dam crest, looking southeast from approximately Sta. 0+950.

PHOTOGRAPH 10 **7 September 2022**



STP Main Dam downstream slope showing till, CCFR, and CR slopes, looking east from approximately Sta. 1+350.

PHOTOGRAPH 11 **7 September 2022**

STP Main Dam downstream slope showing surficial erosion, looking northeast from approximately Sta. 1+375.

PHOTOGRAPH 12 **7 September 2022**

STP Main Dam crest and upstream beach, looking southwest from approximately Sta. 1+450.

PHOTOGRAPH 13 **7 September 2022**

STP reclaim water pipeline from Turnbull TSF, looking northwest.

PHOTOGRAPH 14 **7 September 2022**

STP spillway channel and concrete sill at invert, looking southwest from STP south abutment.

PHOTOGRAPH 15 **7 September 2022**

STP spillway channel Class 10 kg riprap at approximately spillway Sta. 0+025.

PHOTOGRAPH 16 **7 September 2022**

STP spillway channel Class 50 kg riprap at approximately spillway Sta. 0+090.

PHOTOGRAPH 17 **7 September 2022**

STP spillway channel Class 250 kg riprap at approximately spillway Sta. 0+350.

PHOTOGRAPH 18 **7 September 2022**

STP spillway channel outlet, looking northeast.

PHOTOGRAPH 19 **8 September 2022**

North Tailings Pond (NTP) overview of pond and upstream slope at south end, looking north from approximately Sta. 1+400.

PHOTOGRAPH 20 **8 September 2022**

NTP Dam upstream slope and crest at south end, looking northeast from approximately Sta. 1+350.

PHOTOGRAPH 21 **8 September 2022**

NTP Dam downstream slope and toe, damage from heavy equipment, looking northeast from approximately Sta. 1+375.

PHOTOGRAPH 22 **8 September 2022**

NTP Dam downstream slope and riprap along Fording River, looking southwest from approximately Sta. 0+475.

PHOTOGRAPH 23 **8 September 2022**

NTP capped and unused dual reclaim pipes on upstream slope and crossing under crest, looking northwest from approximately Sta. 0+850.

PHOTOGRAPH 24 **8 September 2022**

NTP Dam crest, upstream slope, and tailings surface, steel pipe runs under dam crest valves observed to be closed, looking southwest from approximately Sta. 0+950.

PHOTOGRAPH 25 **8 September 2022**

NTP Dam crest, downstream slope, and riprap along Fording River, looking southwest from approximately Sta. 1+050.

PHOTOGRAPH 26 **8 September 2022**

NTP Dam crest with temporary berm placed on crest, looking southwest from approximately Sta. 1+225.

APPENDIX B

South Tailings Pond Inspection Report

Client:	**Teck Coal Limited, Fording River Operations**	**By:**	**Colin McGrath, P.Eng.**
Project:	**22516328 – 2022 Annual Facility Performance Report**	**Date:**	**7 September 2022**
Location:	**South Tailings Pond**	**Reviewed By:**	**John Cunning, P.Eng.**

GENERAL INFORMATION			
Dam Type:	Zoned Earth Fill		
Weather:	Sunny, moderate winds	**Temp:**	20-25°C

	INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
1.0	**DAM CREST**			
1.1	Crest Elevation	Elev. 1,637.85 m (minimum) for Main Dam confirmed with 2021 LiDAR survey		
1.2	Reservoir Level/ Freeboard	Elev. 1636.0 m (31 August 2022)	1, 12	1.1 m below spillway invert
1.3	Distance to Tailings Pond	Wide beach upstream along south abutment, 5 to 20 m wide beach near barge at Sta. 1+600 with increasing beach width to over 30 m at Sta. 1+400, wide beach upstream of West Dam	12	
1.4	Surface Cracking	None		
1.5	Unexpected Settlement	None		
1.6	Lateral Movement	None		
1.7	Other Unusual Conditions	None		
2.0	**UPSTREAM SLOPE**			
2.1	Slope Angle	Generally 1.4 to 1.75H:1V	12	Crest graded to drain upstream Riprap placed along upstream slope of Main Dam and part of West Dam
2.2	Signs of Erosion	None		
2.3	Signs of Movement (Deformation)	None		
2.4	Cracks	None		
2.5	Face Liner Condition (if applicable)	Not applicable		
2.6	Other Unusual Conditions	Vegetation growing on slopes		Erosion area in tailings upstream near former dredge pipeline

	INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
3.0	**DOWNSTREAM SLOPE**			
3.1	Slope Angle	± 1.5 to 1.75H:1V	10, 11	Lower portion of Main Dam slope locally over-steepened with respect to design, bench in Main Dam slope provides overall slope around 1.75H:1V
3.2	Signs of Erosion	Yes	11	Main Dam above seepage collection well West Dam/Main Dam contact
3.3	Signs of Movement (Deformation)	None		
3.4	Cracks	None		
3.5	Seepage or Wet Areas	Yes		Seepage through till bench at West Dam, ponding on riprap surfacing material
3.6	Vegetation Growth	Yes		On Main Dam and parts of West Dam
3.7	Other Unusual Conditions	None		
4.0	**DOWNSTREAM TOE AREA**			
4.1	Seepage from Dam	None		
4.2	Signs of Erosion	No		
4.3	Signs of Turbidity in Seepage Water	None		
4.4	Discoloration/Staining	None		
4.5	Outlet Operating Problem (if applicable)	N/A		
4.6	Other Unusual Conditions	Ground squirrel holes along West Dam, badger den at Main Dam near emergency riprap		
5.0	**ABUTMENTS**			
5.1	Seepage at Contact Zone (Abutment/ Embankment)	None		
5.2	Signs of Erosion	None		
5.3	Vegetation Growth	None		
5.4	Presence of Rodent Burrows	None		
5.5	Other Unusual Conditions	Yes		Make-up water pipelines crossing crest at north abutment
6.0	**RESERVOIR**			
6.1	Stability of Slopes	Good		

INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
6.2 Distance to Nearest Slide (if applicable)	Rail embankment adjacent to impoundment, South Spoil above railway		
6.3 Estimate of Slide Volume (if applicable)	N/A		
6.4 Floating Debris	None		
6.5 Other Unusual Conditions	Yes		Raised beach at north end (as constructed) Waste water cells at north abutment area
7.0 EMERGENCY SPILLWAY/ OUTLET STRUCTURE	None		
7.1 Surface Condition	Some areas with weathering of riprap materials	15, 16	Sporadic weathering of riprap (shale particles) estimated as ~5 to 10% of surface area
7.2 Signs of Erosion	None		
7.3 Signs of Movement (Deformation)	None		
7.4 Cracks	None		
7.5 Settlement	None		
7.6 Presence of Debris or Blockage	None		
7.7 Closure Mechanism Operational	None		
7.8 Slope Protection	None		
7.9 Instability of Side Slopes	None		
7.10 Other Unusual Conditions	Riprap quality	15, 16, 17	Higher quality riprap placed onward from Sta. 0+310

INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
8.0 INSTRUMENTATION			
8.1 Piezometers	Yes		West Dam: ■ 2 standpipes (not read) ■ 2 retrofit standpipes with vibrating wire ■ 4 VW piezometers Main Dam: ■ 1 standpipe (not read) ■ 2 retrofit standpipes with vibrating wire ■ 5 VW piezometers In tailings: ■ 2 VW piezometers Locations shown in plan in Figure 3 of the AFPR report
8.2 Settlement Cells	None		
8.3 Thermistors	None		
8.4 Settlement Monuments (GPS)	Yes		GPS units monitor crest and toe movements – see Appendix D of the AFPR report. Locations shown in plan in Figure 3 of the AFPR report.
8.5 Accelerograph	None		
8.6 Inclinometer	Yes		West Dam ■ 1 location Main Dam ■ 3 locations See Appendix D of the AFPR report. Locations shown in plan in Figure 3 of the AFPR report
8.7 Weirs and Flow Monitors	Yes	8	Below West Dam, seepage flow monitoring from collection pipes, north seepage area culverts, and ditch at south end of West Dam see Section 5.5.1.2 of the AFPR report
8.8 Data Logger(s)	Yes		On piezometers and GPS units, all instrumentation connected to GeoExplorer system

INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
8.9 Other	Water level sensor, staff gauge, and camera		A sensor and staff gauge are mounted on the reclaim barge. A camera was installed in August 2020 to view the STP West Dam and Fording River for real-time visual monitoring
9.0 DOCUMENTATION			
9.1 Operation, Maintenance and Surveillance (OMS) Manual	FRO South Tailings Pond Operation, Maintenance and Surveillance Manual		
9.1.1 OMS Manual Exists	Yes		
9.1.2 OMS Manual Reflects Current Dam Conditions	Yes		
9.1.3 Date of Last Revision	July 2022		Version 2022.01 (FRO 2022a)
9.2 Emergency Response Plan (ERP)	ERP: Internal to Teck		STP included in site tailings facilities ERP. (SP&P EP.009.R1)
9.2.1 ERP Exists	Yes		
9.2.2 ERP Reflects Current Conditions	Yes		
9.2.3 Date of last revision	25 May 2020		
9.3 Emergency Preparedness Plan (EPP)	EPP: Internal to Teck		STP included in site tailings pond dam breach EPP (SP&P EP.008 R2)
9.3.1 EPP Exists	Yes		
9.3.2 ERP Reflects Current Conditions	Yes		
9.3.3 Date of last revision	25 May 2020		
10.0 NOTES • Weathering and degradation of some riprap at spillway			
Inspectors:	Colin McGrath, P.Eng., and John Cunning, P.Eng.	**Date:**	7 September 2022

APPENDIX C

North Tailings Pond Inspection Report

Client:	**Teck Coal Limited, Fording River Operations**	**By:**	**Colin McGrath, P.Eng.**
Project:	**22516328 – 2022 Annual Facility Performance Report**	**Date:**	**8 September 2022**
Location:	**North Tailings Pond**	**Reviewed By:**	**John Cunning, P.Eng.**

GENERAL INFORMATION			
Dam Type:	Zoned Earth Fill		
Weather:	Overcast, moderate winds	**Temp:**	10°C

	INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
1.0	**DAM CREST**		20, 26	
1.1	Crest Elevation	Elev. 1,652.60 m (minimum) for Main Dam confirmed with 2021 LiDAR survey		
1.2	Reservoir Level/ Freeboard	Elev. 1650.13 m (20 July 2022)	19	2.47 m freeboard
1.3	Distance to Tailings Pond	**Full beach** Approx. Sta. 0+000 to 1+100 **0 m (south end)** Approx. Sta. 1+100 to 1+400	24	Usually no beach at south end
1.4	Surface Cracking	None		
1.5	Unexpected Settlement	None		
1.6	Lateral Movement	None		
1.7	Other Unusual Conditions or Structures	Yes Temporary berm placed on dam crest	23 24 26	Site 1 – old tailings line capped at upstream Site 2 – Dual steel lines capped Site 3 – Steel pipe valve closed Site 4 – black PVC open, visible on downstream only Berm placed on dam crest to restrict access for blasting, not removed
2.0	**UPSTREAM SLOPE**			
2.1	Slope Angle	Generally 1.4 to 1.5H:1V	24	
2.2	Signs of Erosion	None		
2.3	Signs of Movement (Deformation)	None		
2.4	Cracks	None		
2.5	Face Liner Condition (if applicable)	Not applicable		
2.6	Other Unusual Conditions	Abandoned pipes		

	INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
3.0	**DOWNSTREAM SLOPE**			
3.1	Slope Angle	1.4 to 1.75H:1V	25	Original design of 1.4H:1V; rebuilt design of 1.5 to 1.75H:1V following 2013 flood repairs
3.2	Signs of Erosion	Minor surficial erosion		Original design of 1.4H:1V; rebuilt design of 1.5 to 1.75H:1V following 2013 flood repairs
3.3	Signs of Movement (Deformation)	None		
3.4	Cracks	None		
3.5	Seepage or Wet Areas	Dry		
3.6	Vegetation Growth	Yes	21, 25	Good grass growth along most areas of the downstream slope
3.7	Other Unusual Conditions	Yes	21	Damage from heavy equipment to coarse rejects (CR) shell at downstream slope / toe area near Sta. 1+375
4.0	**DOWNSTREAM TOE AREA**		22	
4.1	Seepage from Dam	None		
4.2	Signs of Erosion	None		
4.3	Signs of Turbidity in Seepage Water	None		
4.4	Discoloration/Staining	None		
4.5	Outlet Operating Problem (if applicable)	N/A		
4.6	Other Unusual Conditions	Yes	21	Wet area at downstream toe near Sta. 1+250, damage from heavy equipment to CR shell at downstream slope / toe area near Sta. 1+375
5.0	**ABUTMENTS**			
5.1	Seepage at Contact Zone (Abutment/ Embankment)	None		
5.2	Signs of Erosion	None		
5.3	Vegetation Growth	None		
5.4	Presence of Rodent Burrows	None		
5.5	Other Unusual Conditions	None		

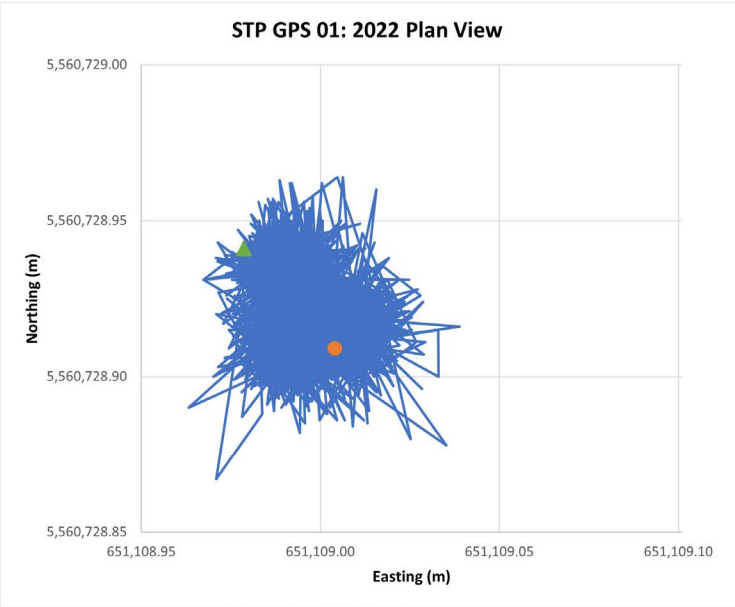
INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
6.0 RESERVOIR		19, 24	
6.1 Stability of Slopes	Good		Monitoring in place
6.2 Distance to Nearest Slide (if applicable)	N/A		Coal stockpile to the west
6.3 Estimate of Slide Volume (if applicable)	TBC		
6.4 Floating Debris	None		
6.5 Other Unusual Conditions	Yes		Barge is crooked from being stuck in tailings, barge not in use Silt fences installed on tailings surface for dust control New coal stockpile at north end
7.0 EMERGENCY SPILLWAY/ OUTLET STRUCTURE			
7.1 Surface Condition	N/A		
7.2 Signs of Erosion	N/A		
7.3 Signs of Movement (Deformation)	N/A		
7.4 Cracks	N/A		
7.5 Settlement	N/A		
7.6 Presence of Debris or Blockage	N/A		
7.7 Closure Mechanism Operational	N/A		
7.8 Slope Protection	N/A		
7.9 Instability of Side Slopes	N/A		
7.10 Other Unusual Conditions	N/A		
8.0 INSTRUMENTATION			
8.1 Piezometers	Yes		Piezometers installed in three vertical boreholes drilled on the dam crest in 2015. Seven piezometers installed in tailings in 2017 to support closure studies. See Section 5.5.1.3 of the AFPR report for details on the instrumentation
8.2 Settlement Cells	None		
8.3 Thermistors	None		

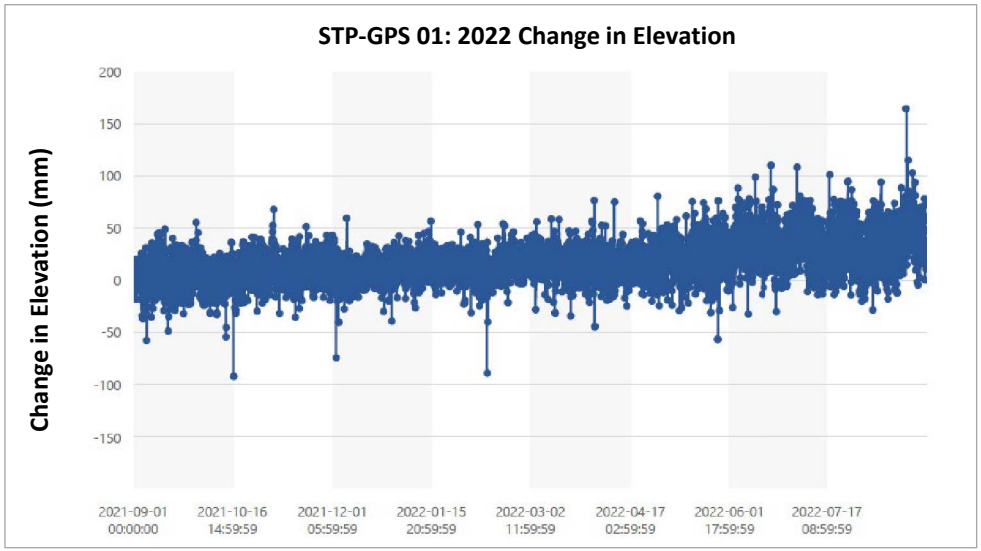
INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
8.4 Settlement Monuments (GPS)	Yes		GPS units monitor crest and toe movements – see Appendix D of the AFPR Locations shown in plan Figure 7 of the AFPR report
8.5 Accelerograph	None		
8.6 Inclinometer	Yes		Three inclinometers installed in 2015 See Appendix D of the AFPR. Locations shown in plan in Figure 7 of the AFPR
8.7 Weirs and Flow Monitors	None		
8.8 Data Logger(s)	Yes		On piezometers and GPS, all instrumentation connected to GoeExplorer system
8.9 Other	Water level monitor		Piezometer has been placed in ponded water to read water level in the pond Piezometer damaged (not reading) at time of inspection due to damage from heavy equipment
9.0 DOCUMENTATION			
9.1 Operation, Maintenance, and Surveillance (OMS) Manual	FRO North Tailings Pond Operation, Maintenance and Surveillance Manual		
9.1.1 OMS Manual Exists	Yes		
9.1.2 OMS Manual Reflects Current Dam Conditions	Yes		
9.1.3 Date of Last Revision	August 2022		Version 2022.01
9.2 Emergency Response Plan (ERP)	ERP: internal to Teck		NTP included in site tailings facilities ERP. (SP&P EP.009.R1)
9.2.1 ERP Exists	Yes		
9.2.2 ERP Reflects Current Conditions	Yes		
9.2.3 Date of last revision	25 May 2020		
9.3 Emergency Preparedness Plan (EPP)	EPP: Internal to Teck		NTP included in site tailings pond dam breach EPP (SP&P EP.008 R2)
9.3.1 EPP Exists	Yes		
9.3.2 ERP Reflects Current Conditions	Yes		

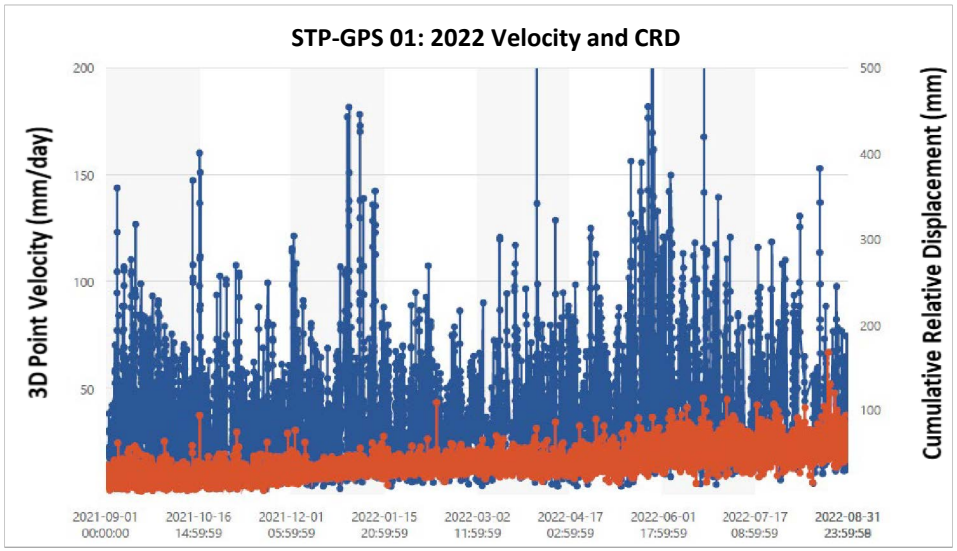
	INSPECTION ITEM	OBSERVATIONS/DATA	PHOTO	COMMENTS & OTHER DATA
9.3.3	Date of last revision	25 May 2020		Version R2
10.0	**NOTES** • Areas at the downstream slope (Sta. 1+250 and 1+375) are to be backfilled and regarded. • VWP and data logger (for pond elevation monitoring) were not functioning during the time of the inspection and are to be repaired.			
Inspectors:		Colin McGrath, P.Eng., and John Cunning, P.Eng.	**Date:**	8 September 2022

APPENDIX D

Instrumentation Data







LEGEND

- INITIAL READING (SEPTEMBER 2021)
- 2021/2022 READINGS
- LAST READING (August 2022)

NOTES

1. DATA DOWNLOADED FROM GEOEXPLORER IN SEPTEMBER 2022.

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

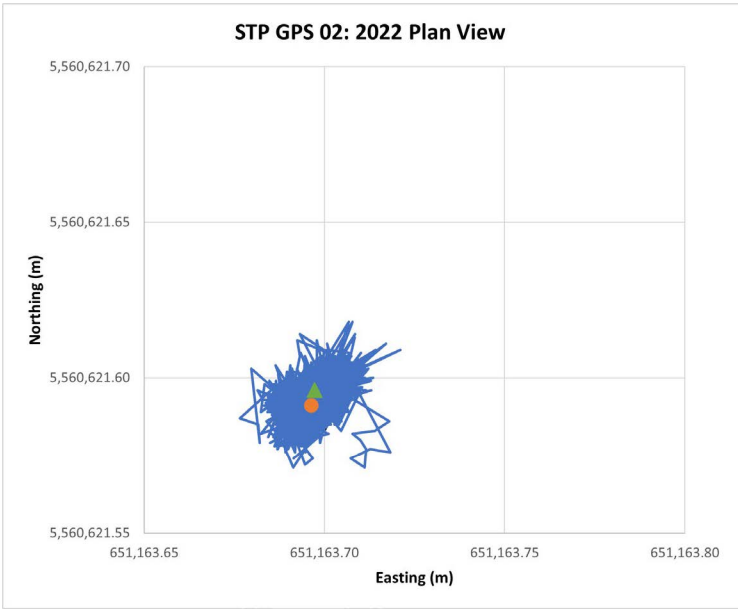
CONSULTANT

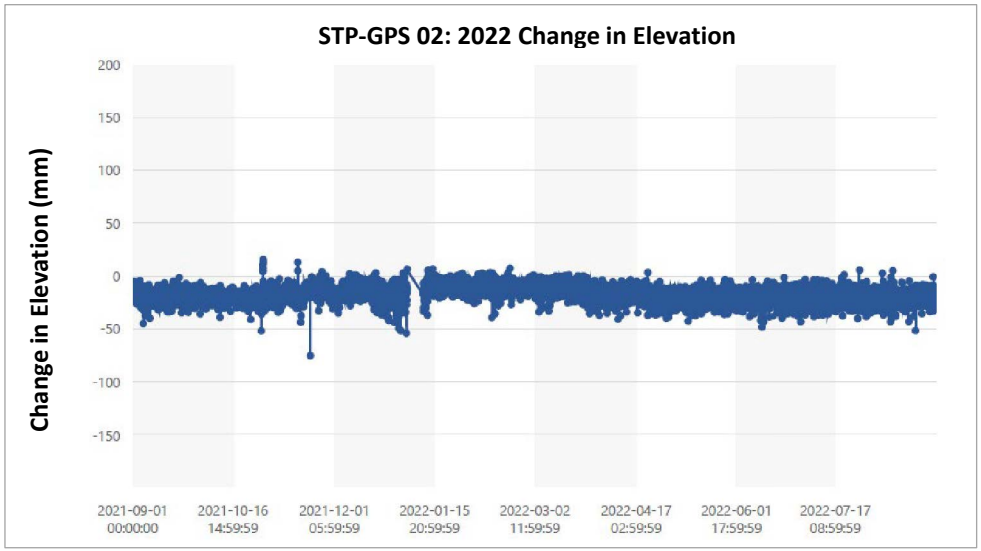
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

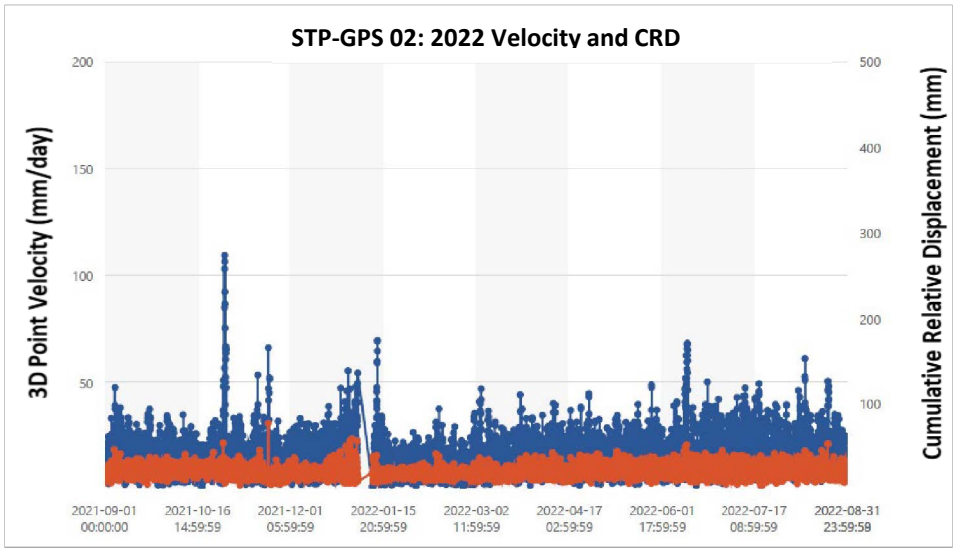
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 01

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-1**







LEGEND

- INITIAL READING (SEPTEMBER 2021)
- 2021/2022 READINGS
- LAST READING (August 2022)

NOTES

1. DATA DOWNLOADED FROM GEOEXPLORER IN SEPTEMBER 2022.

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

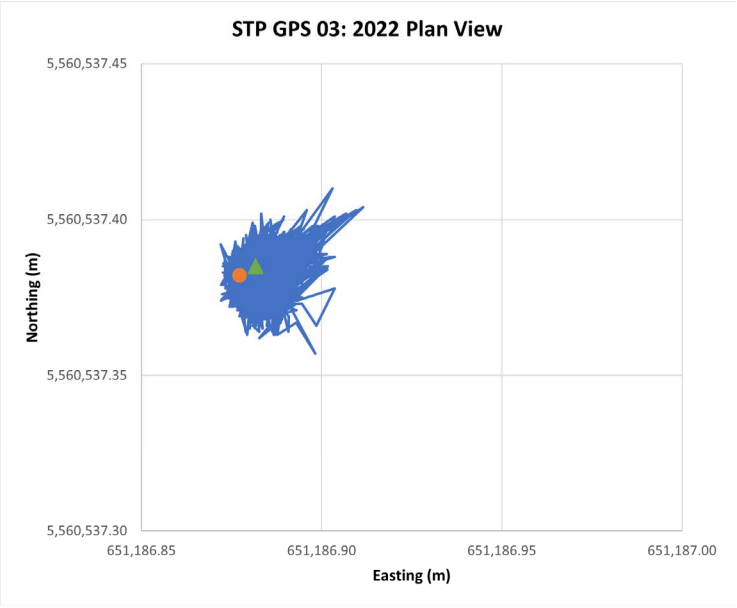
CONSULTANT

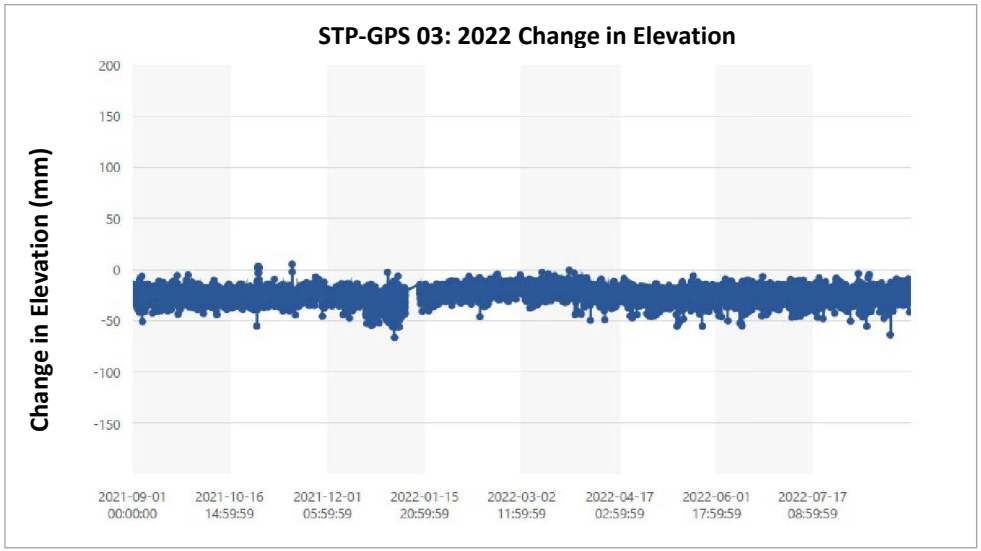
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

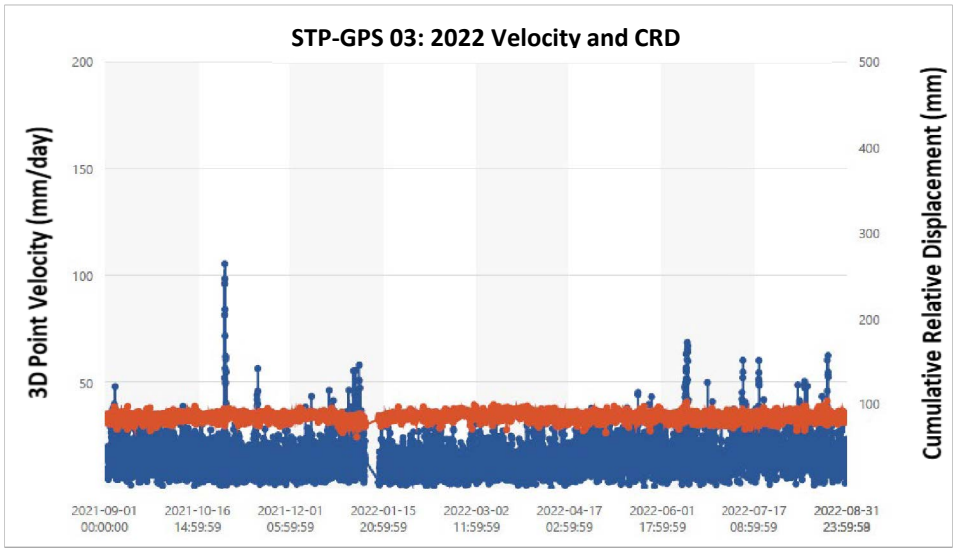
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 02

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-2**







LEGEND

- INITIAL READING (SEPTEMBER 2021)
- 2021/2022 READINGS
- LAST READING (August 2022)

NOTES

1. DATA DOWNLOADED FROM GEOEXPLORER IN SEPTEMBER 2022.

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

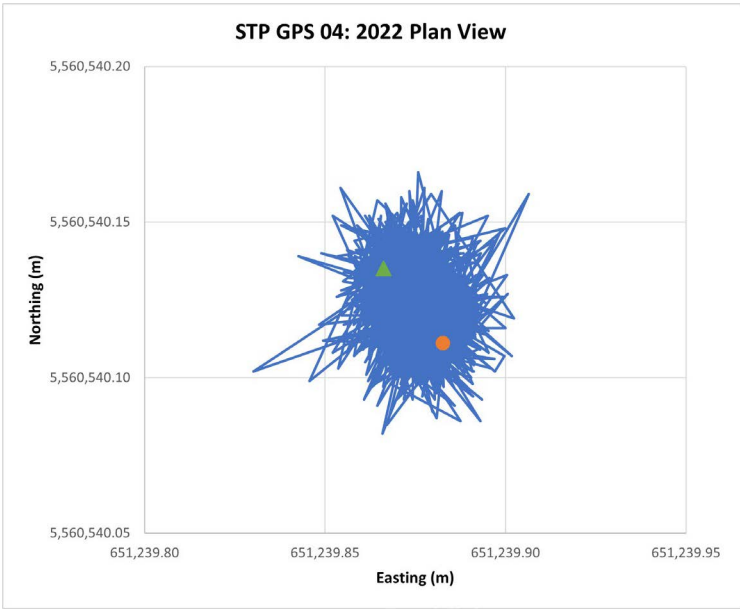
CONSULTANT

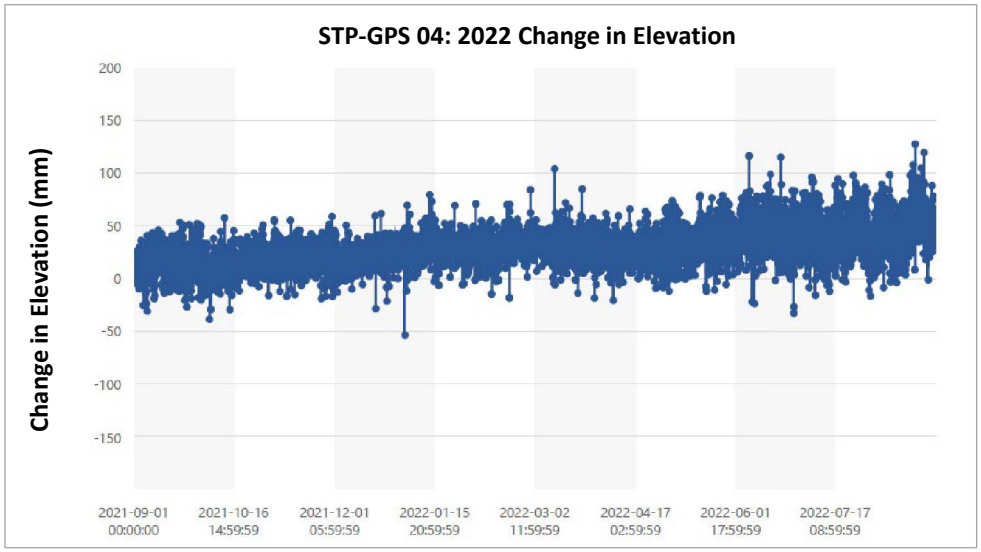
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

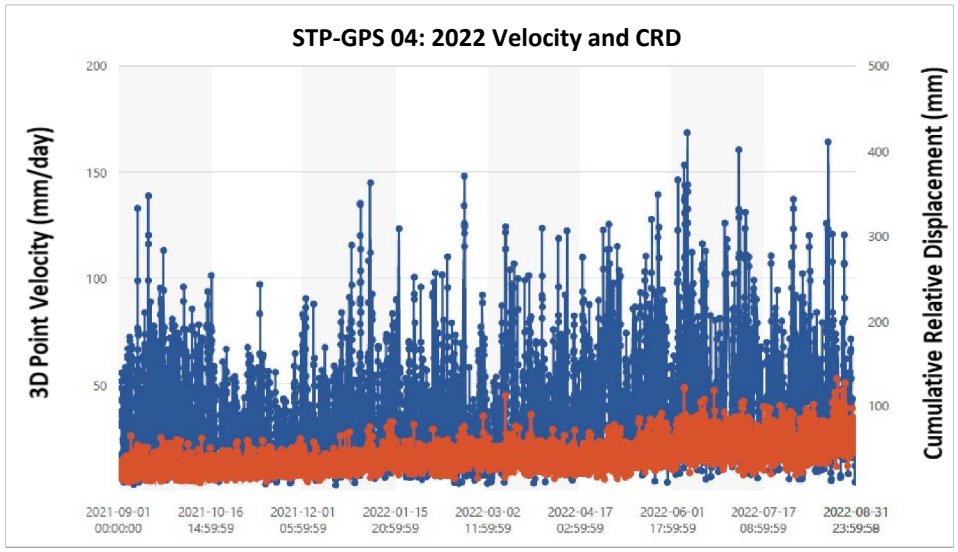
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 03

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-3**







LEGEND

- INITIAL READING (SEPTEMBER 2021)
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- LAST READING (August 2022)

NOTES

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

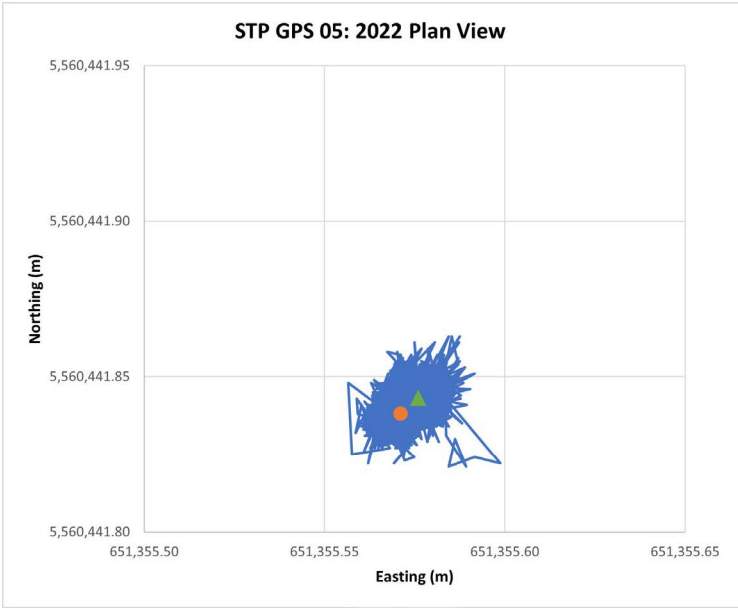
CONSULTANT
wsp

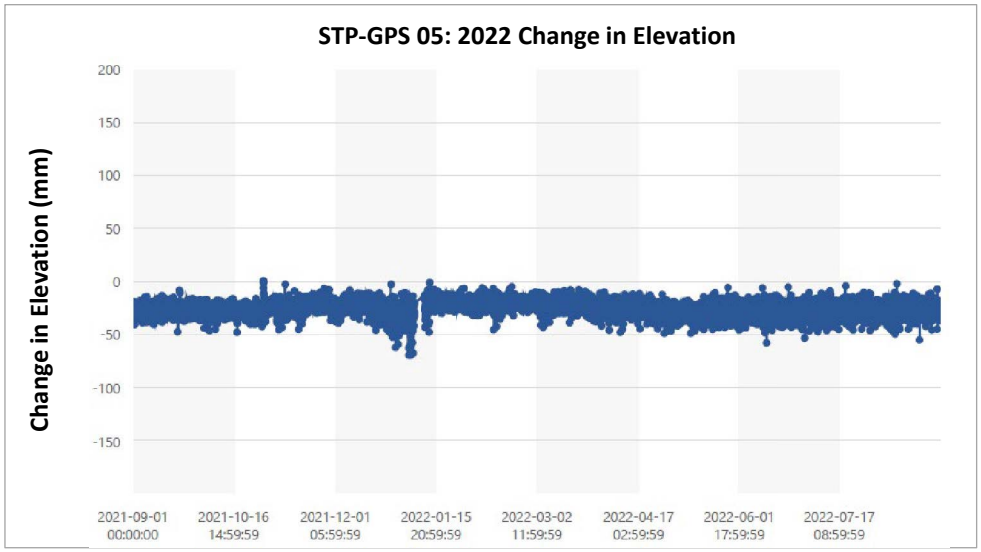
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

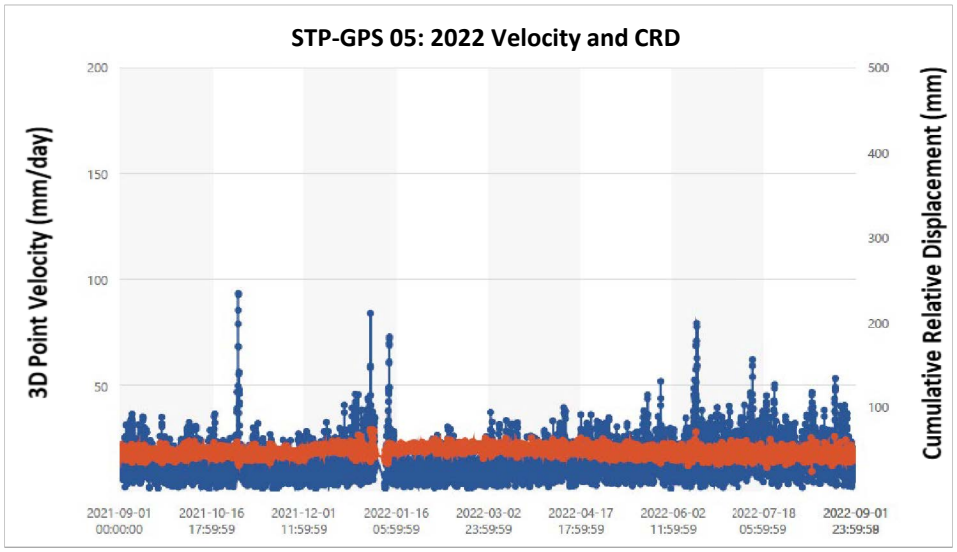
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 04

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-4**







LEGEND

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NOTES

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TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT

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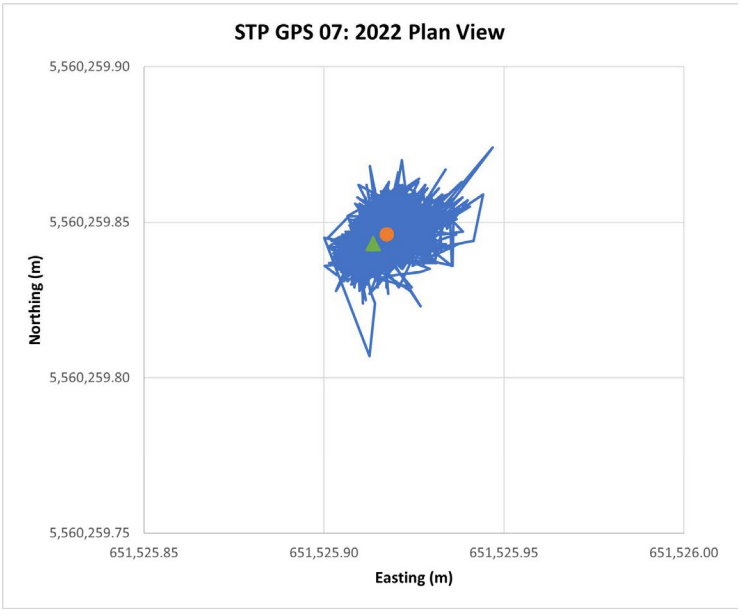
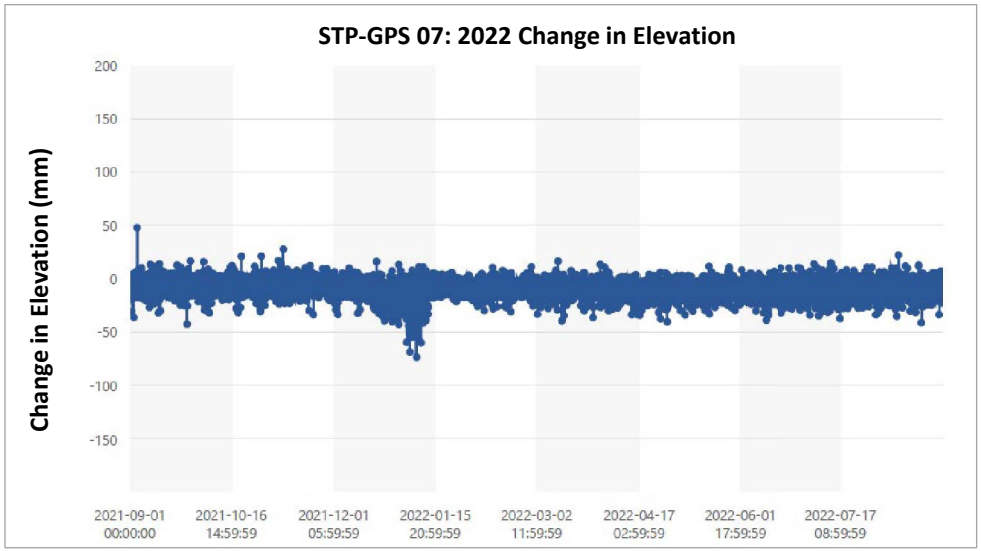
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

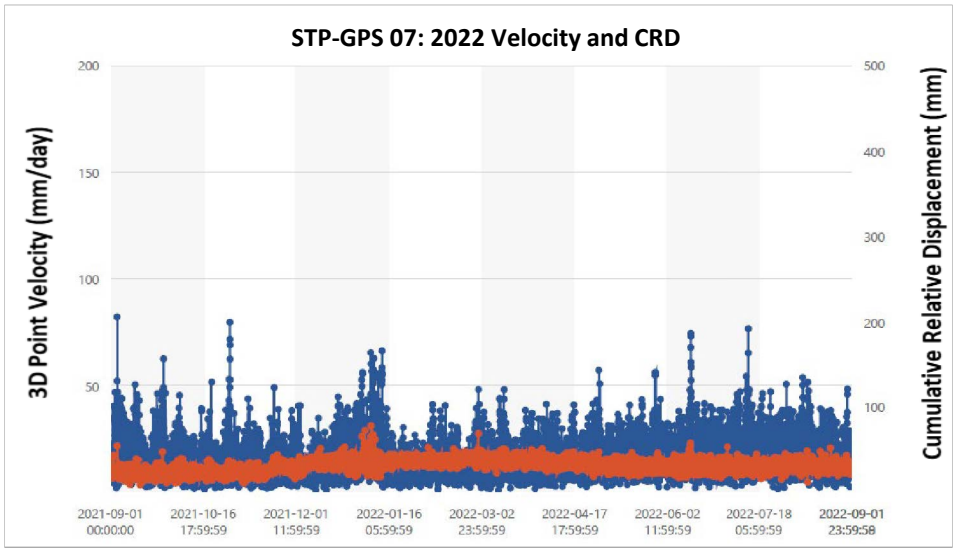
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 05

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-5**







LEGEND

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NOTES

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TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT

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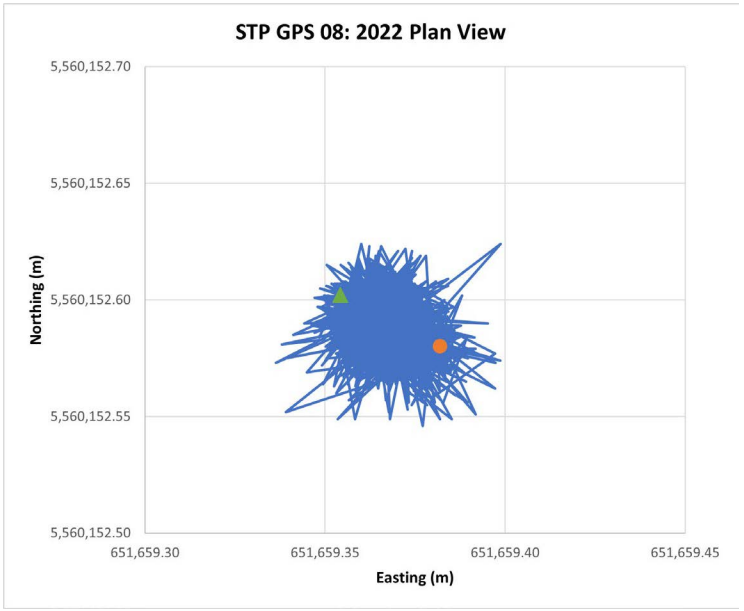
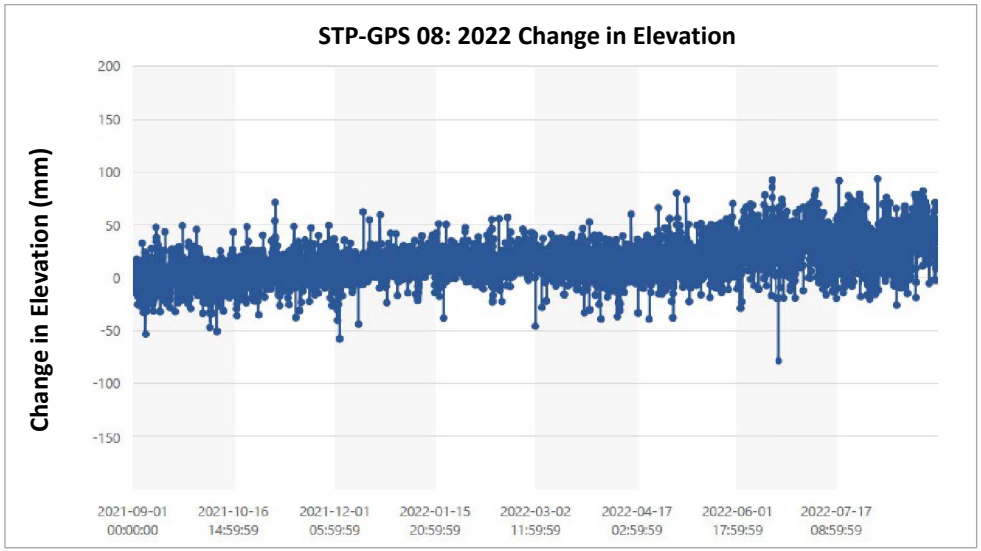
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

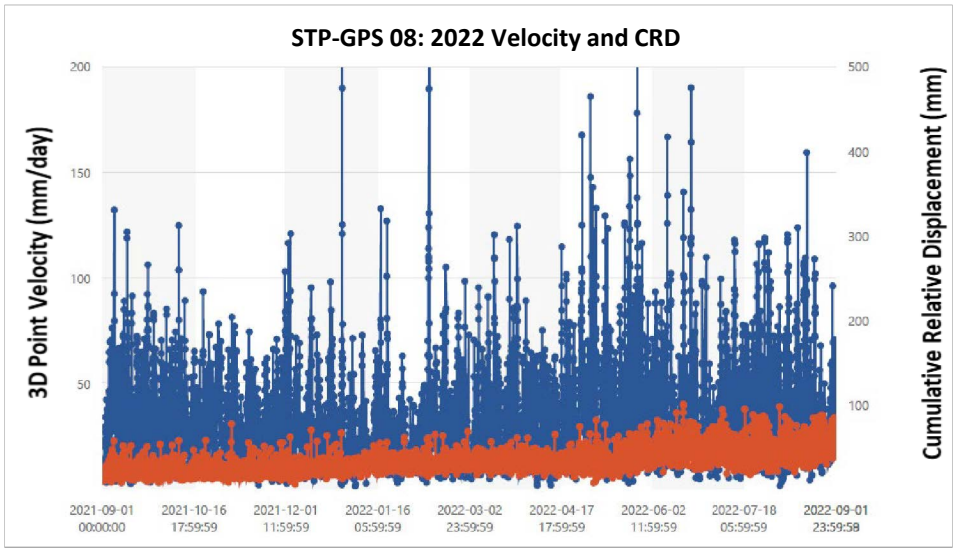
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 07

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-6**







LEGEND

- INITIAL READING (SEPTEMBER 2021)
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NOTES

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

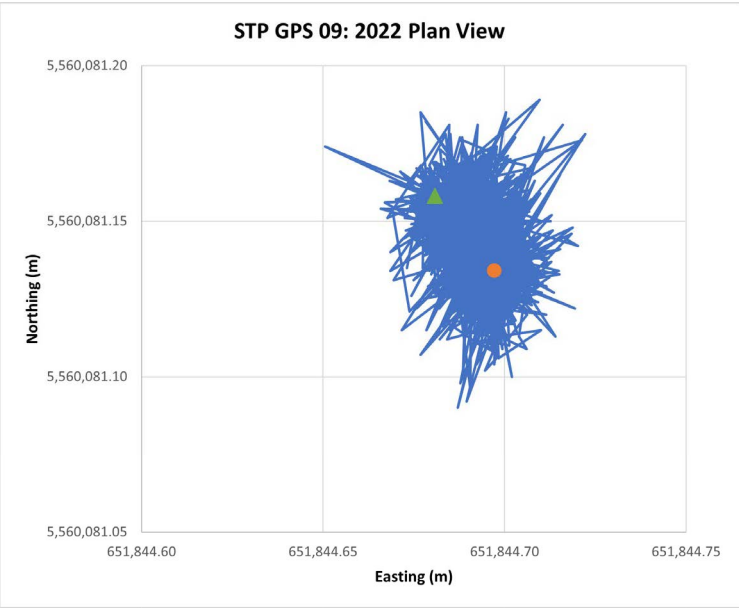
CONSULTANT
wsp

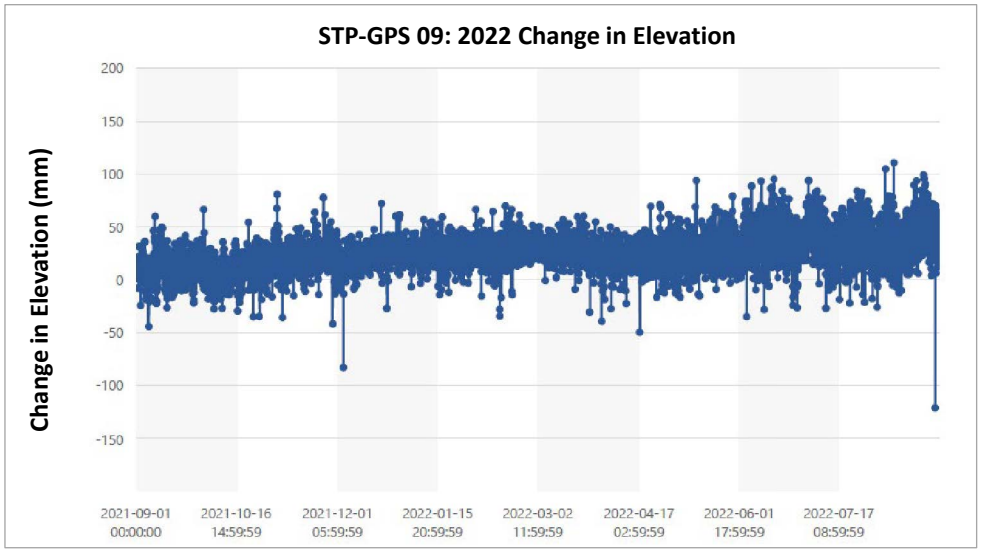
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

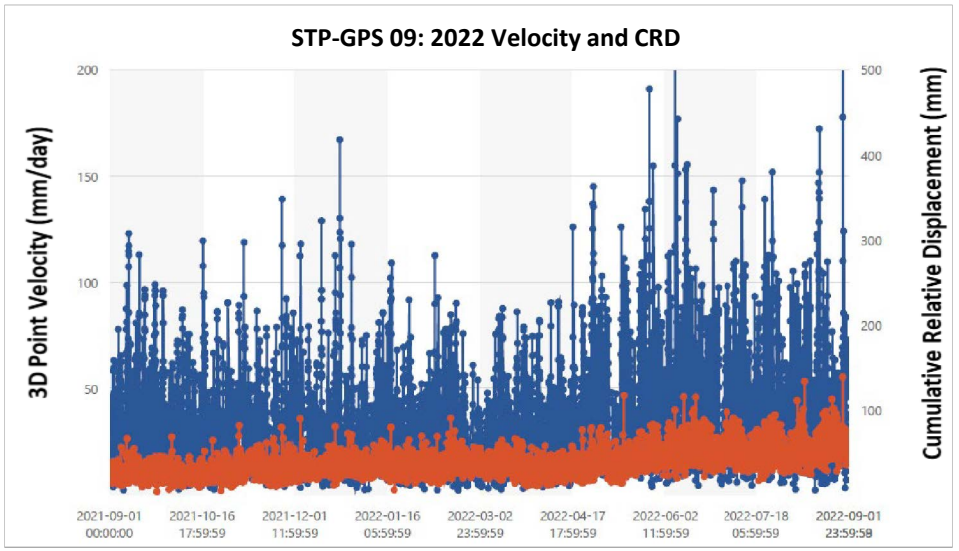
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 08

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-7**







LEGEND

- INITIAL READING (SEPTEMBER 2021)
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- LAST READING (August 2022)

NOTES

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

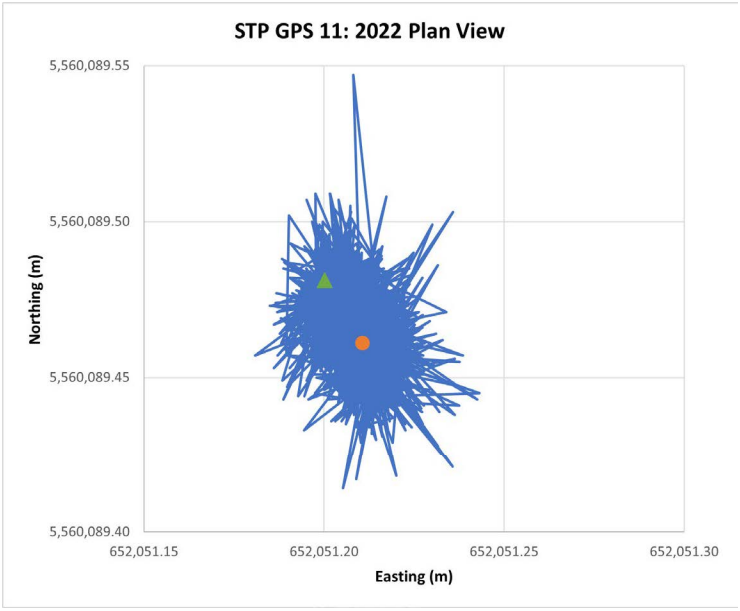
CONSULTANT

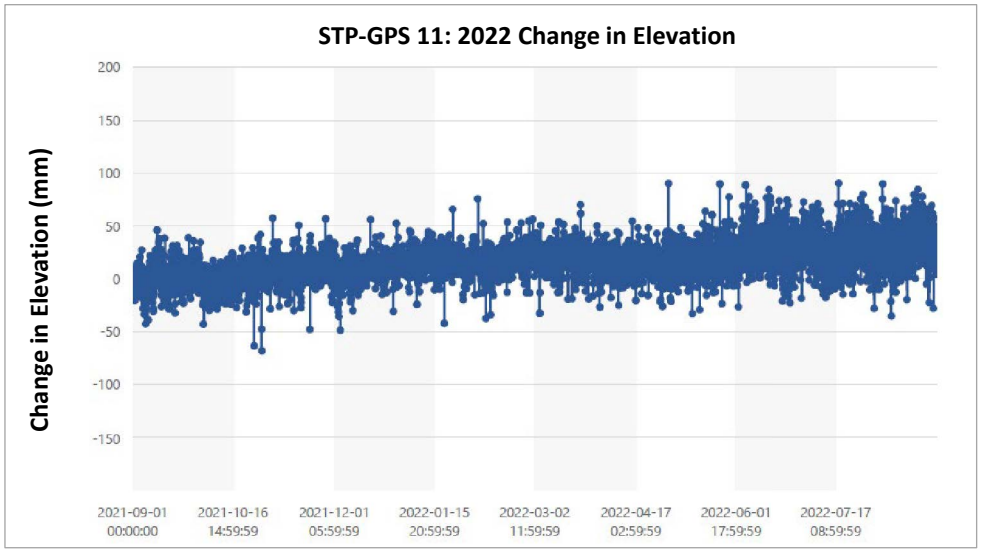
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

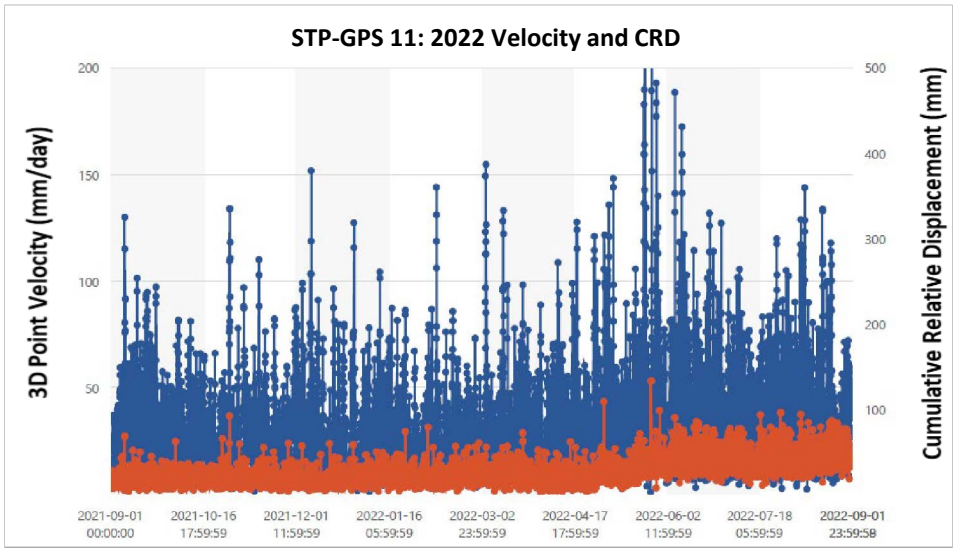
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 09

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-8**







LEGEND

- INITIAL READING (SEPTEMBER 2021)
- 2021/2022 READINGS
- LAST READING (August 2022)

NOTES

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

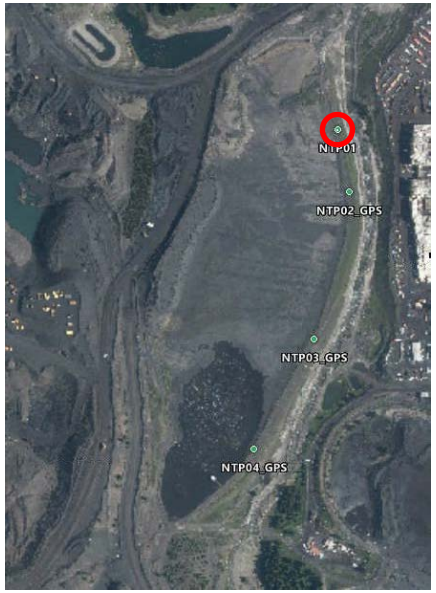
CONSULTANT
wsp

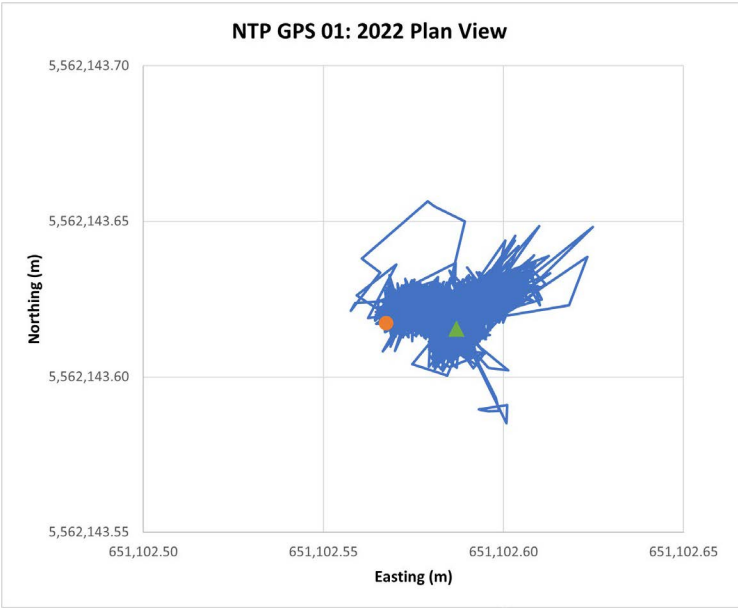
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

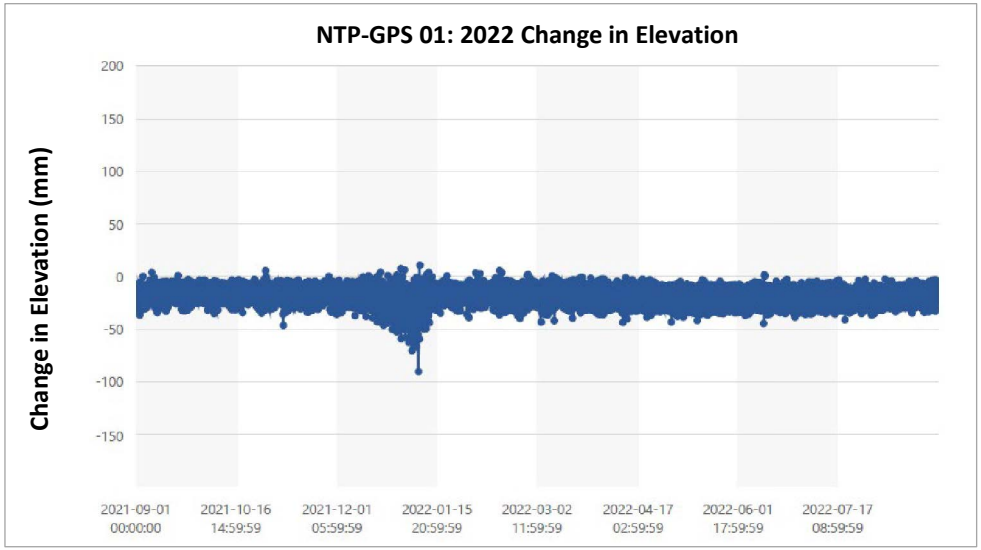
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

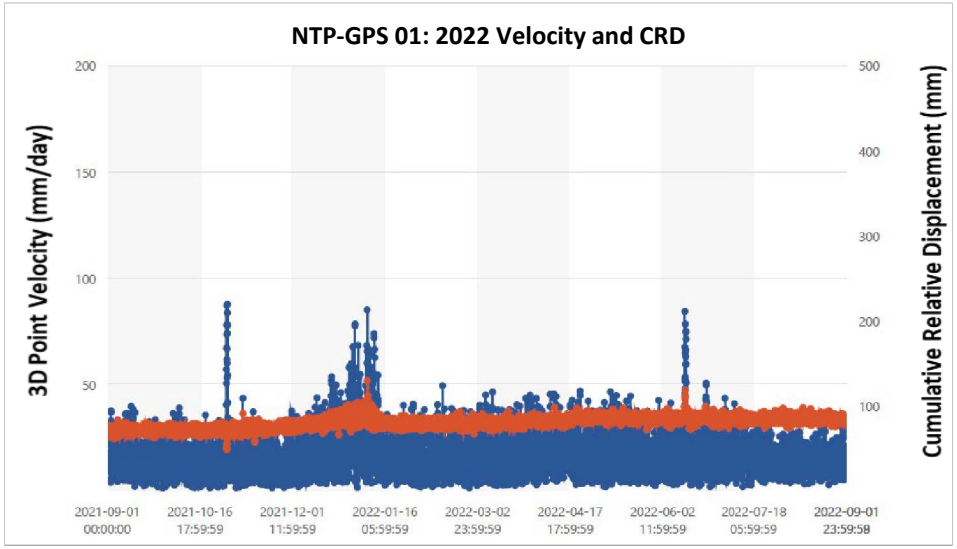
TITLE
SOUTH TAILINGS POND – GPS MONITORING DATA
STP-GPS 11

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-9**









LEGEND

- INITIAL READING (SEPTEMBER 2021)
- 2021/2022 READINGS
- LAST READING (August 2022)

NOTES

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

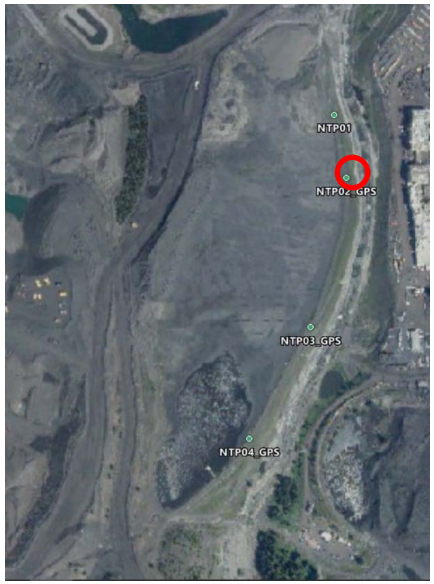
CONSULTANT

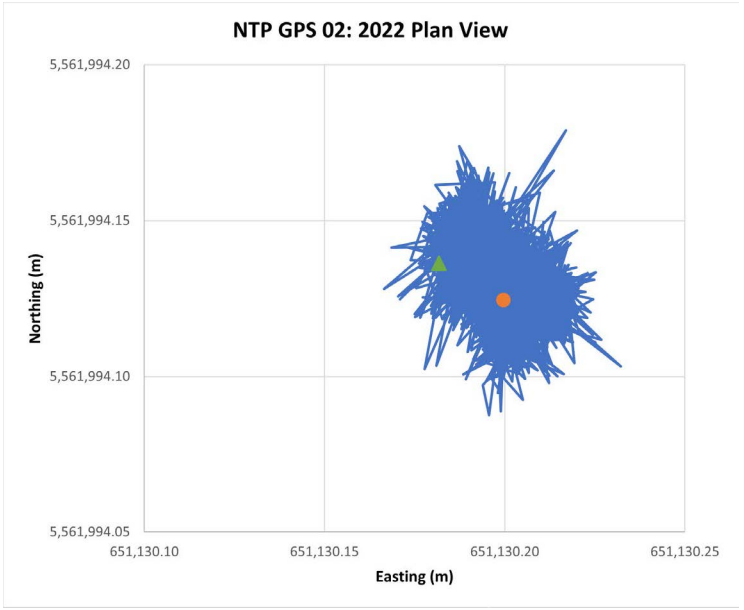
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

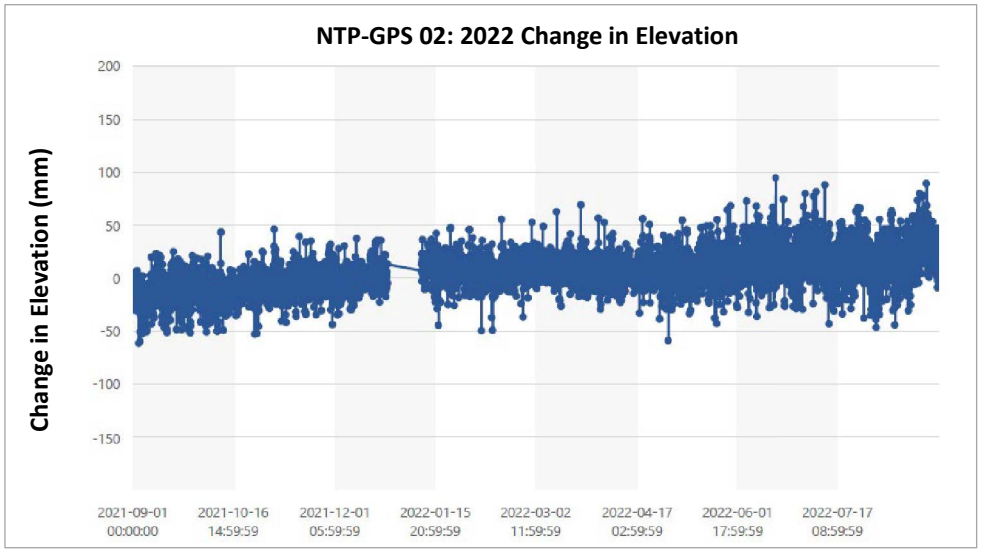
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

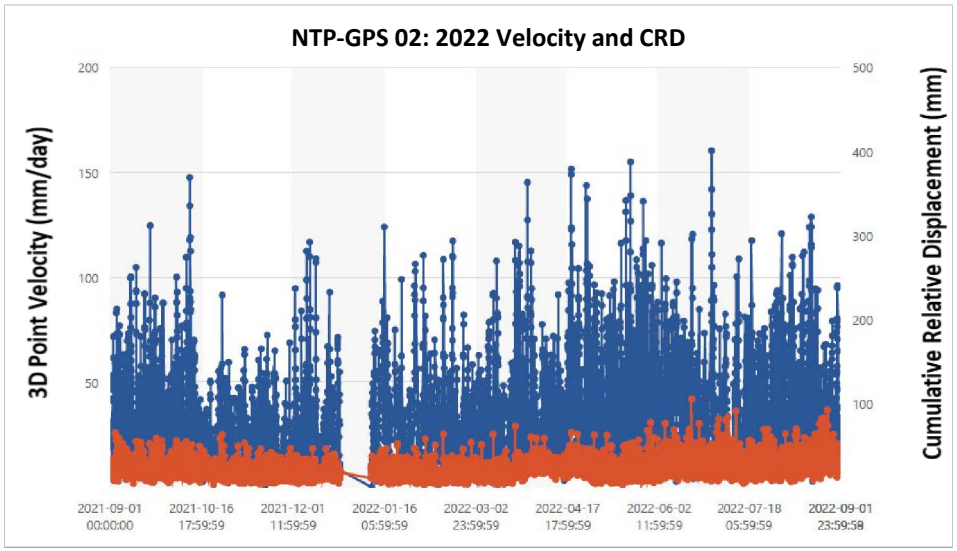
TITLE
NORTH TAILINGS POND – GPS MONITORING DATA
NTP-GPS 01

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-10**









LEGEND

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- 2021/2022 READINGS
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NOTES

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

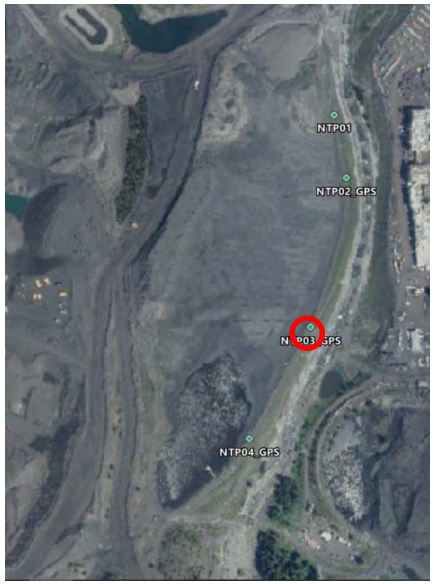
CONSULTANT
wsp

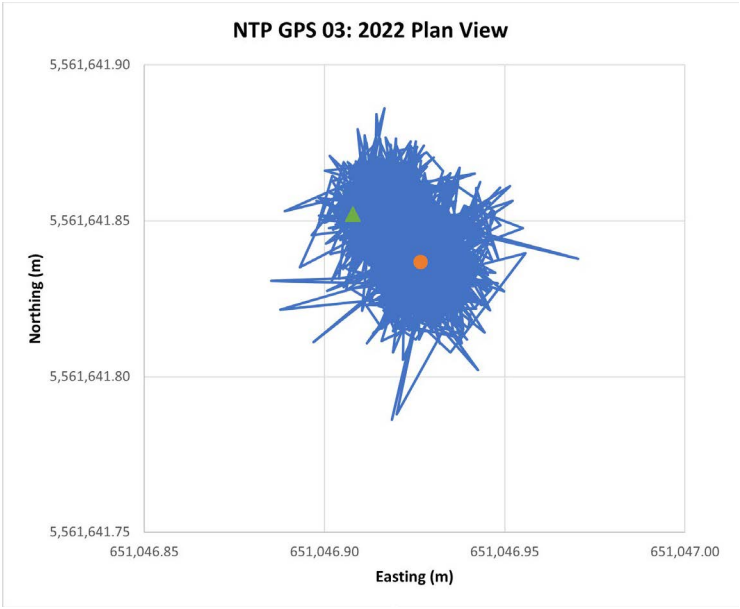
YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

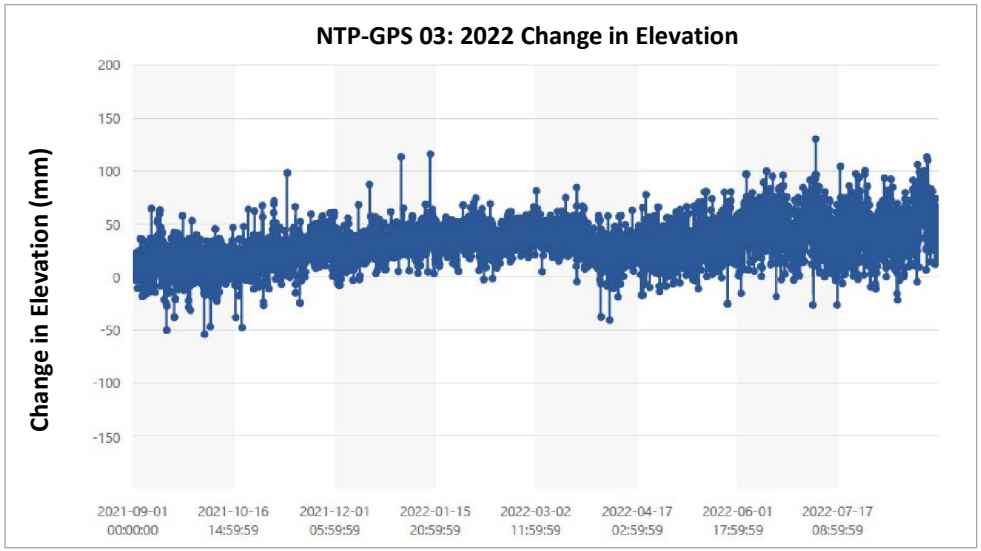
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

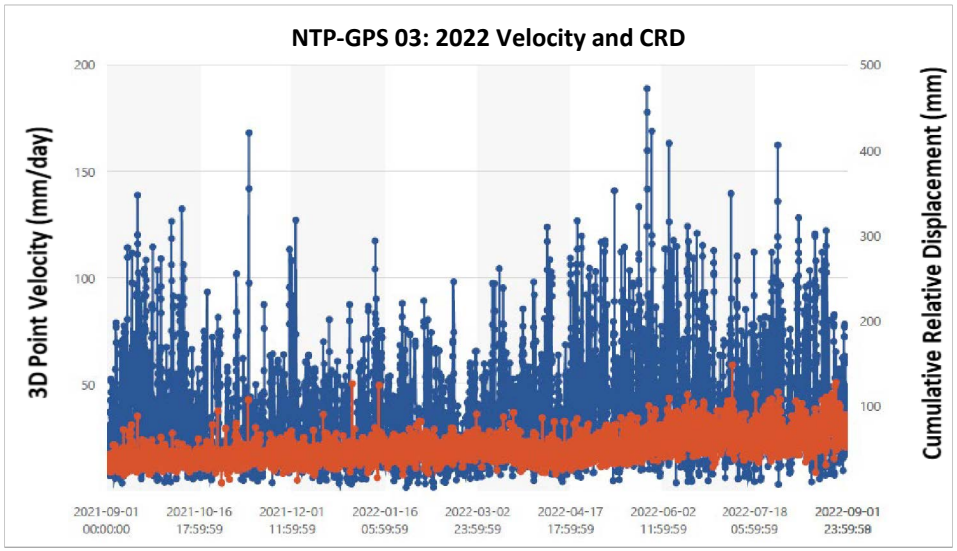
TITLE
NORTH TAILINGS POND – GPS MONITORING DATA
NTP-GPS 02

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-11**









LEGEND

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NOTES

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ELKFORD, B.C.

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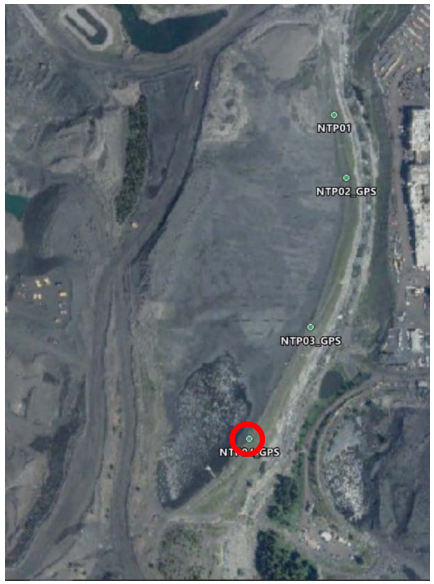
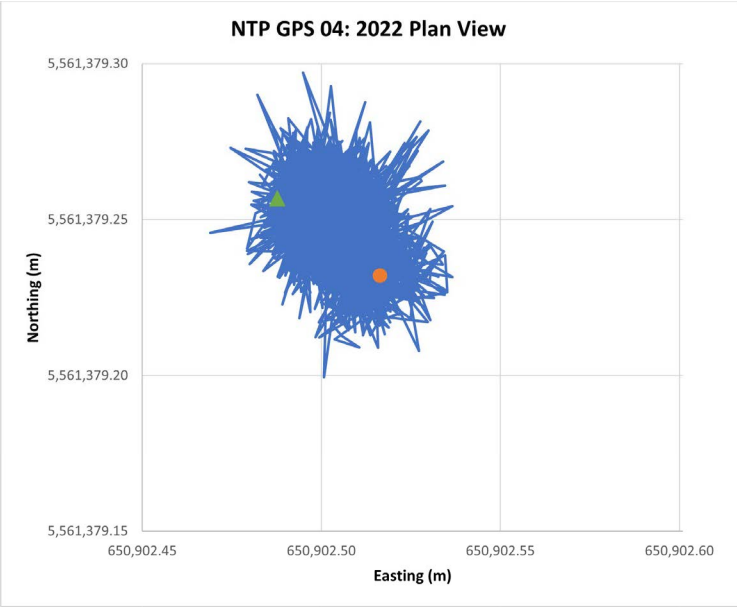
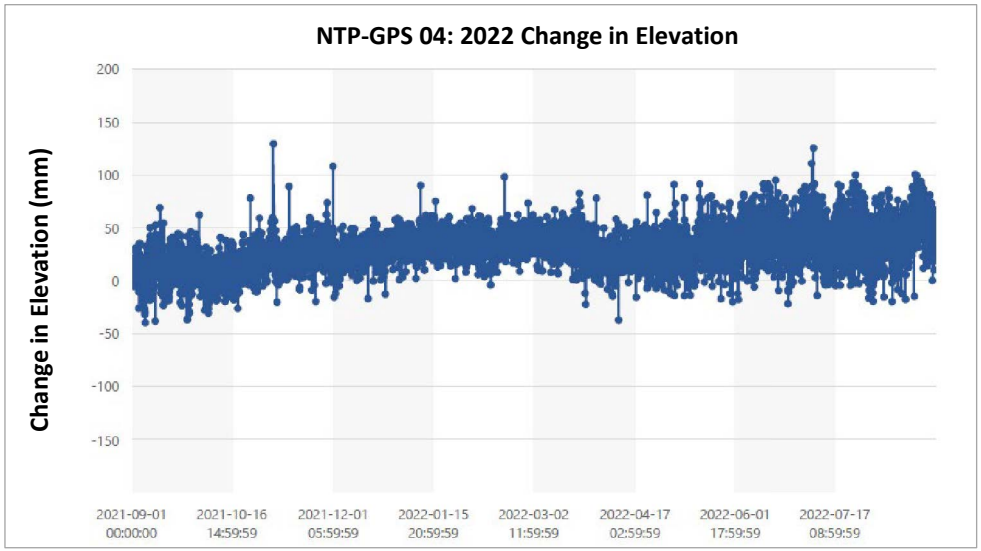
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

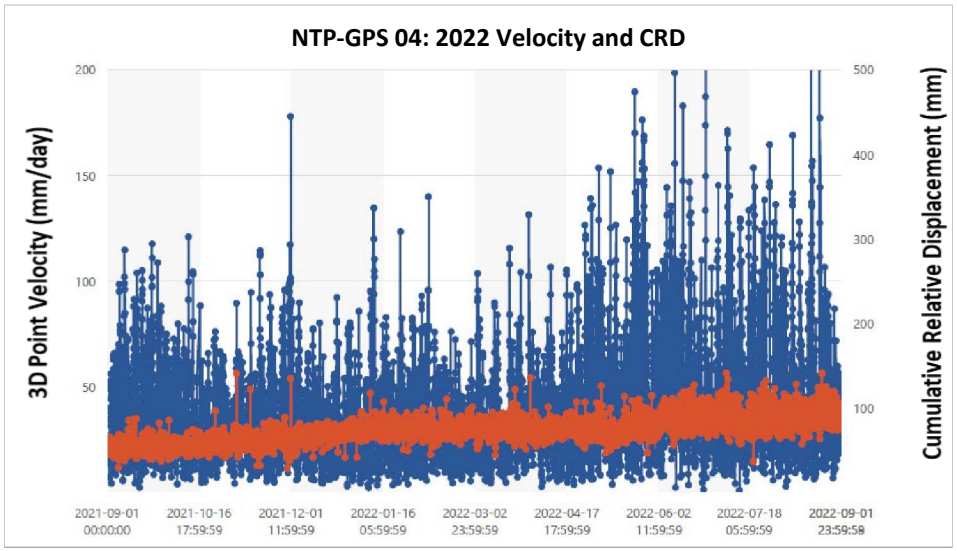
TITLE
NORTH TAILINGS POND – GPS MONITORING DATA
NTP-GPS 03

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-12**









LEGEND

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NOTES

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CLIENT
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FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT
wsp

YYYY-MM-DD	2023-03-23
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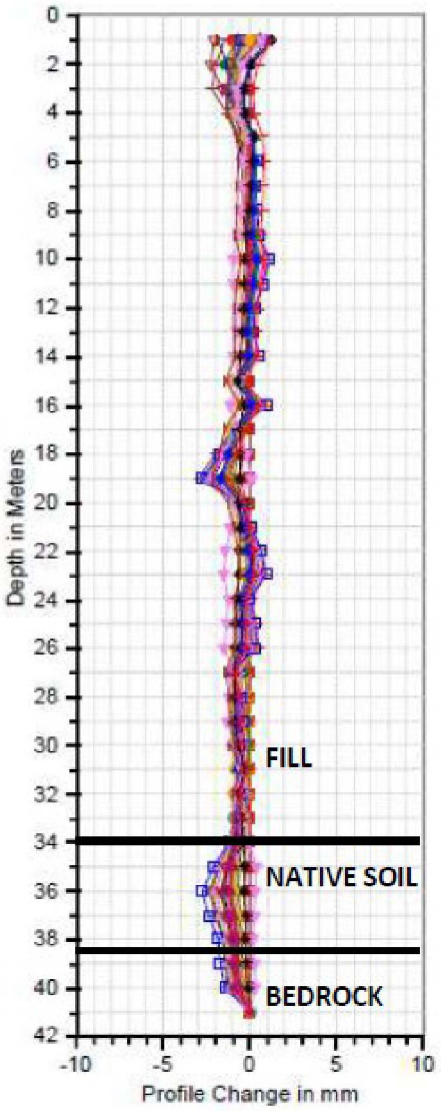
PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

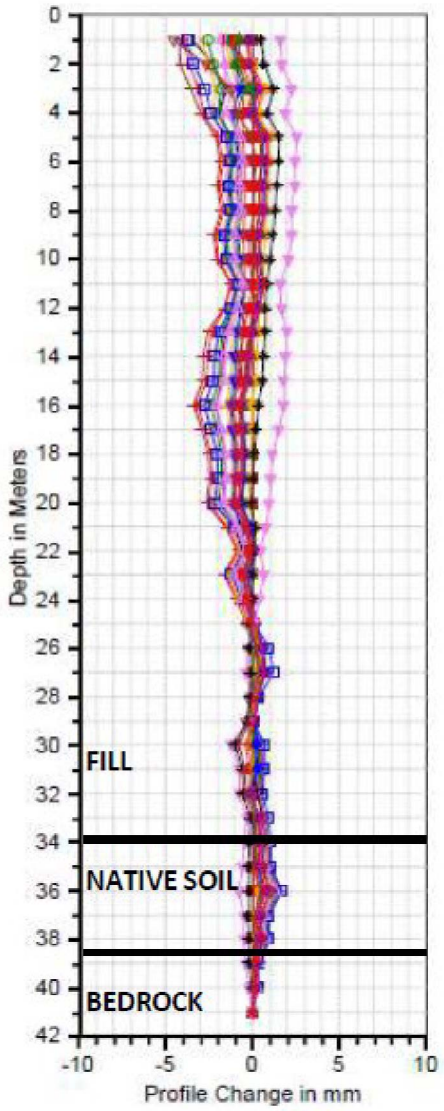
TITLE
NORTH TAILINGS POND – GPS MONITORING DATA
NTP-GPS 04

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-13**

DIRECTION A



DIRECTION B



LEGEND

12/18/2015	1/11/2016	3/4/2016
4/4/2016	7/6/2016	8/12/2016
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5/4/2017	7/21/2017	3/20/2018
7/13/2018	9/27/2018	3/15/2019
6/24/2019	12/5/2019	4/20/2020
7/7/2020	5/14/2021	6/24/2021
11/25/2021	3/24/2022	

NOTES
1. DATA PROVIDED BY FORDING RIVER OPERATIONS OCTOBER 2022.
2. LOCATIONS FROM GEOEXPLORER.
3. A-A AXIS AZIMUTH PROVIDED BY FORDING RIVER OPERATIONS 15 NOVEMBER 2017.
4. ELEVATIONS ARE IN ELK VALLEY ELEVATION DATUM..

CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

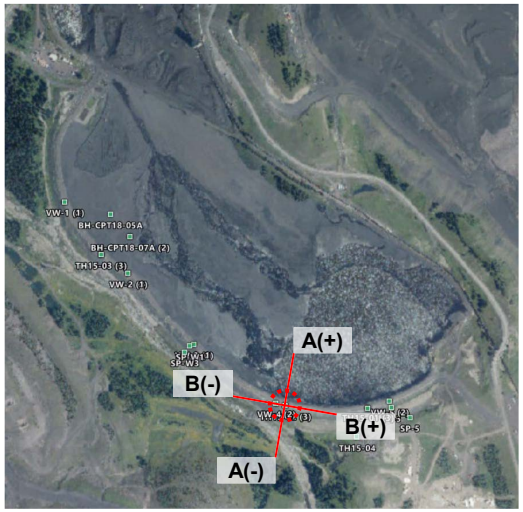
CONSULTANT
wsp

YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND - SLOPE INCLINOMETER DATA TH15-01

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-14**



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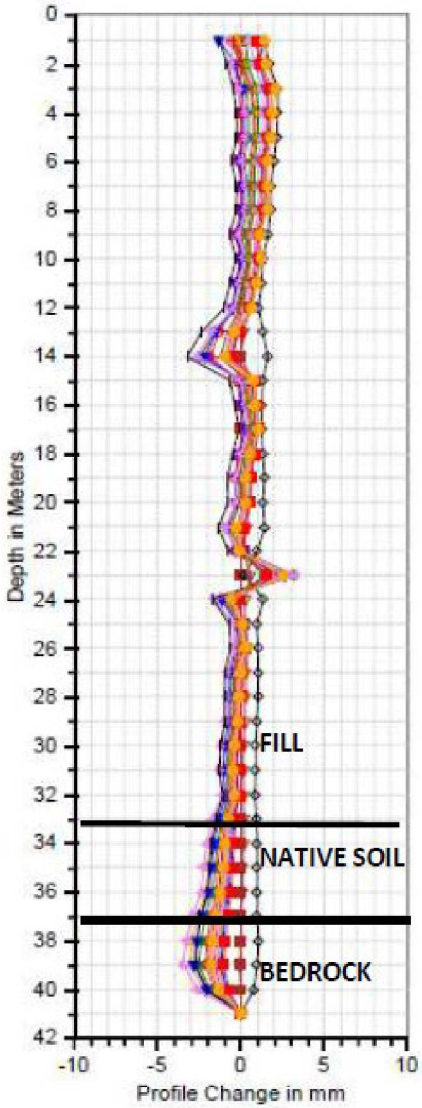

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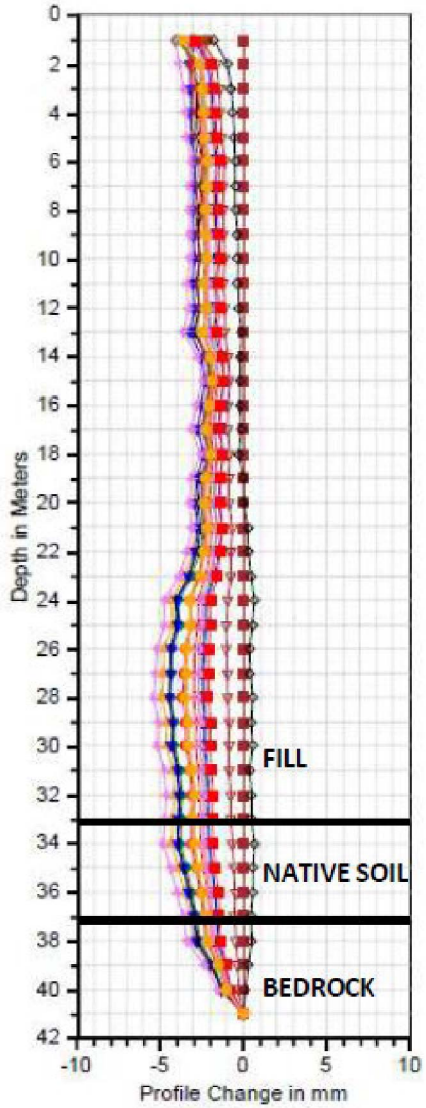

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7/7/2020	5/14/2021	6/24/2021
10/18/2021	3/24/2022	

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YYYY-MM-DD	2023-03-23
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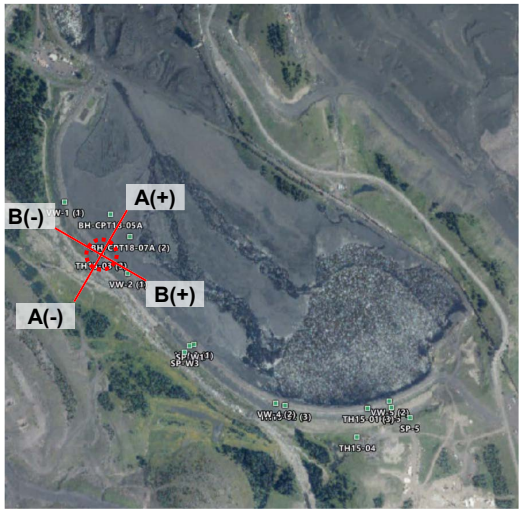
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND - SLOPE INCLINOMETER DATA TH15-02

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-15**



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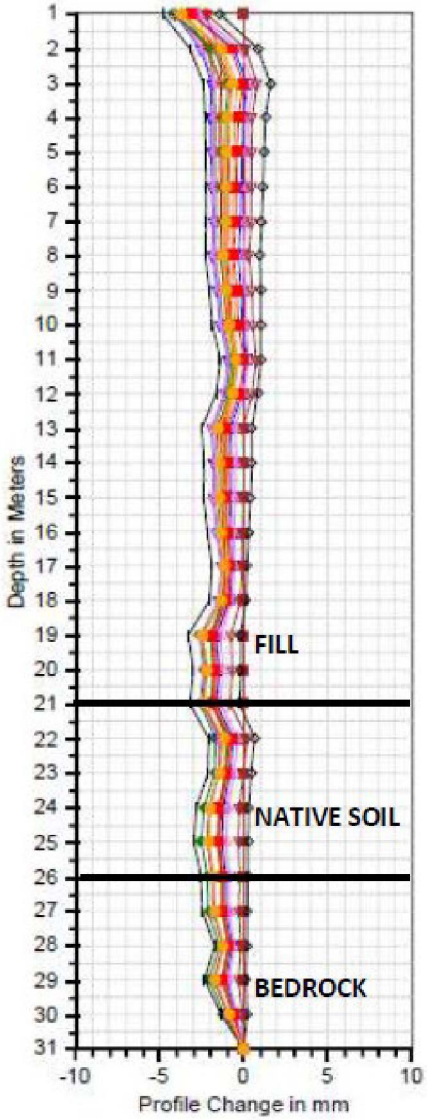

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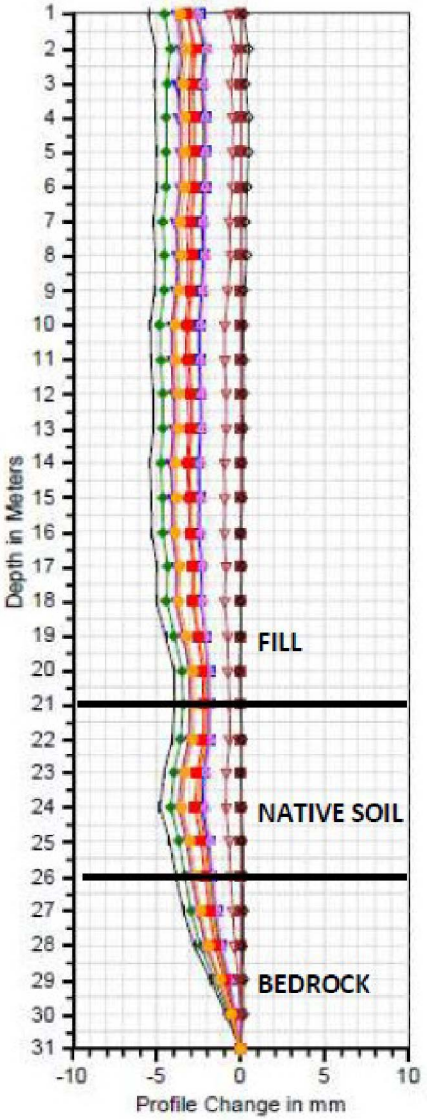

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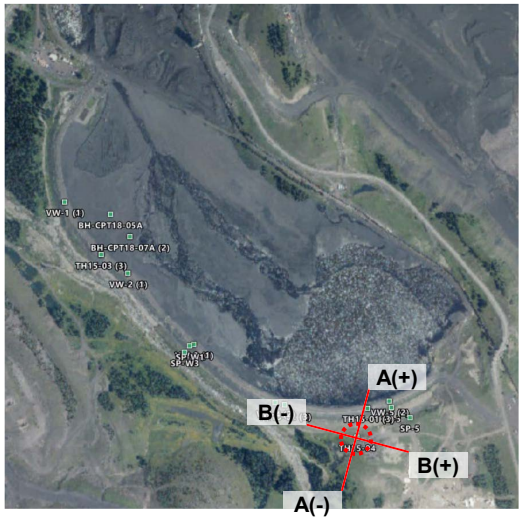
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND - SLOPE INCLINOMETER DATA TH15-03

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-16**



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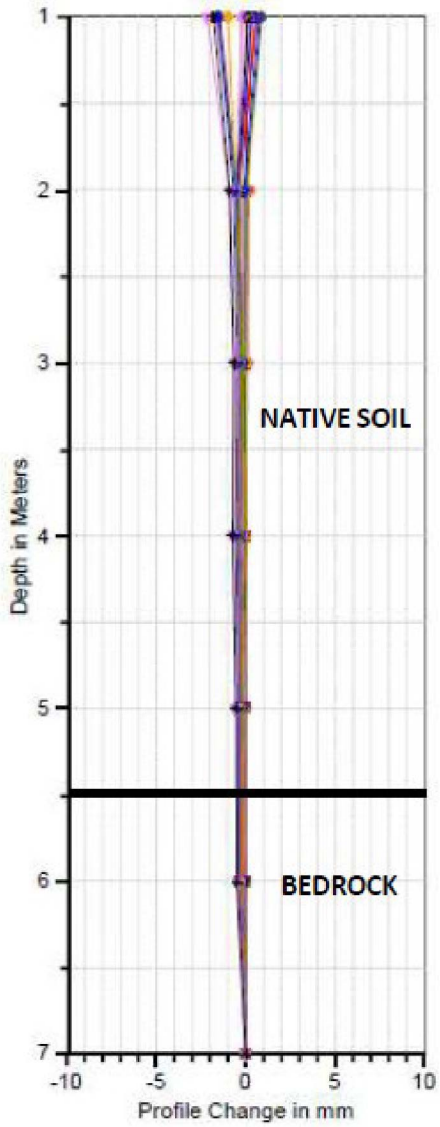

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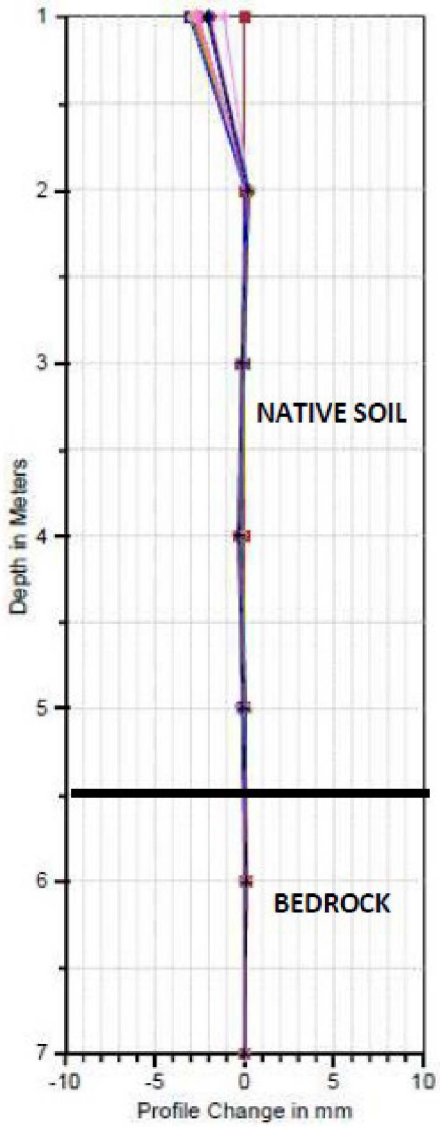

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DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
SOUTH TAILINGS POND - SLOPE INCLINOMETER DATA TH15-04

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-17**

LEGEND

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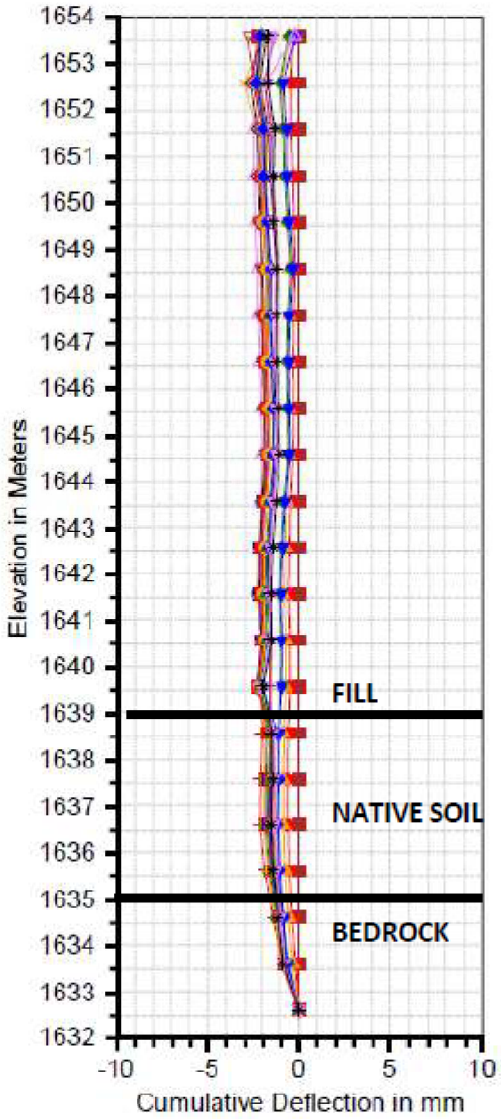

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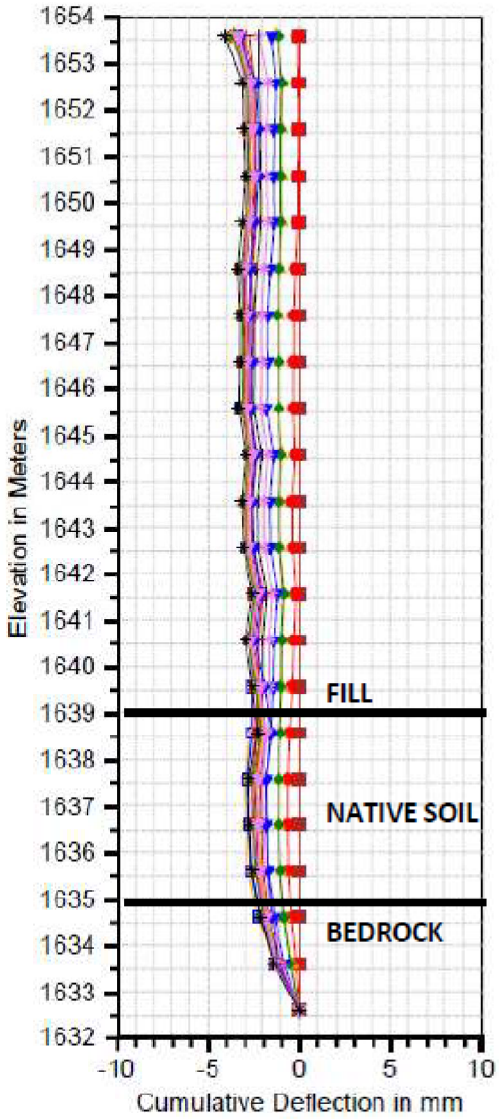

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

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YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
NORTH TAILINGS POND - SLOPE INCLINOMETER DATA TH15-05

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-18**

LEGEND

12/18/2015, 1/23/2017, 4/20/2017, 7/19/2017, 11/14/2017, 3/20/2018, 7/13/2018, 9/26/2018, 4/2/2019, 6/24/2019, 11/27/2019, 4/20/2020, 7/7/2020, 5/13/2021, 6/24/2021, 10/18/2021, 3/24/2022

NOTES
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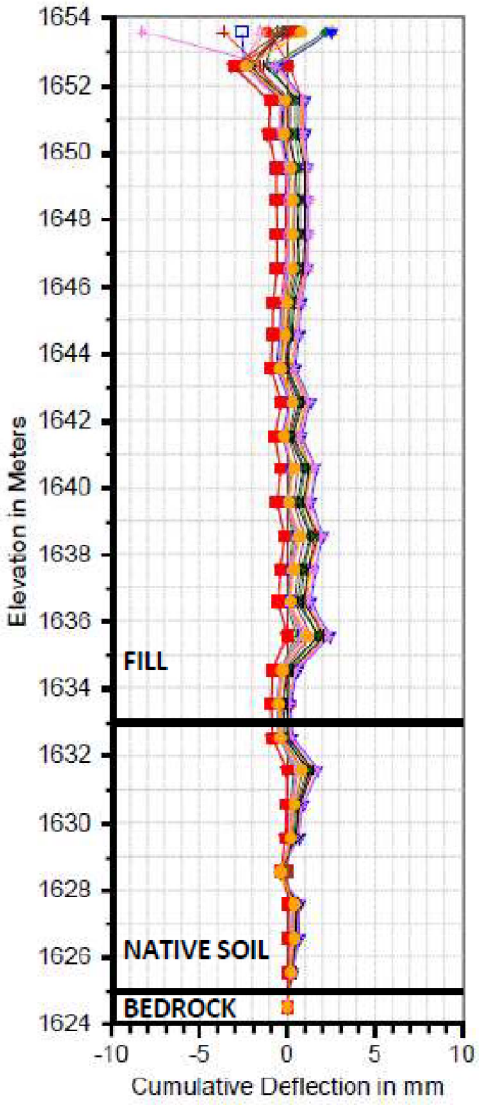
2. LOCATIONS FROM GEOEXPLORER.
3. A-A AXIS AZIMUTH PROVIDED BY FORDING RIVER OPERATIONS 15 NOVEMBER 2017.
4. ELEVATIONS ARE IN ELK VALLEY ELEVATION DATUM..

DIRECTION A



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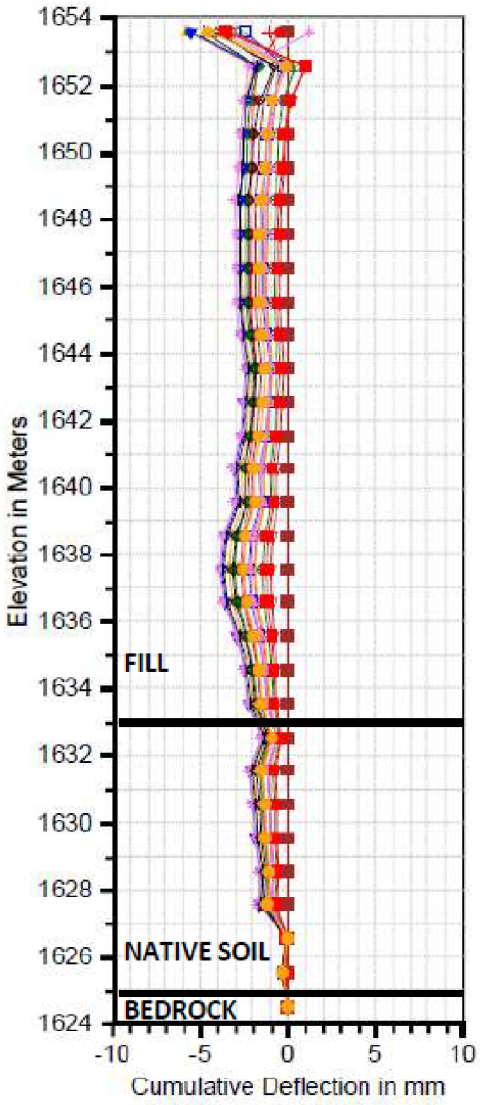

: COAL LIMITED
DING RIVER OPERATIONS
ELK VALLEY, B.C.

CONSULTANT

wsp

YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
NORTH TAILINGS POND - SLOPE INCLINOMETER DATA TH15-06

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-19**

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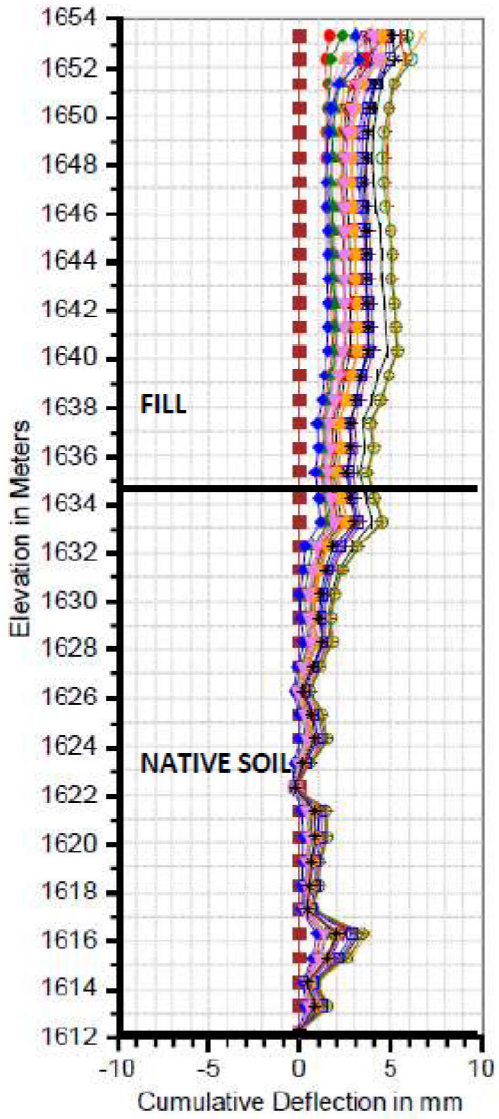

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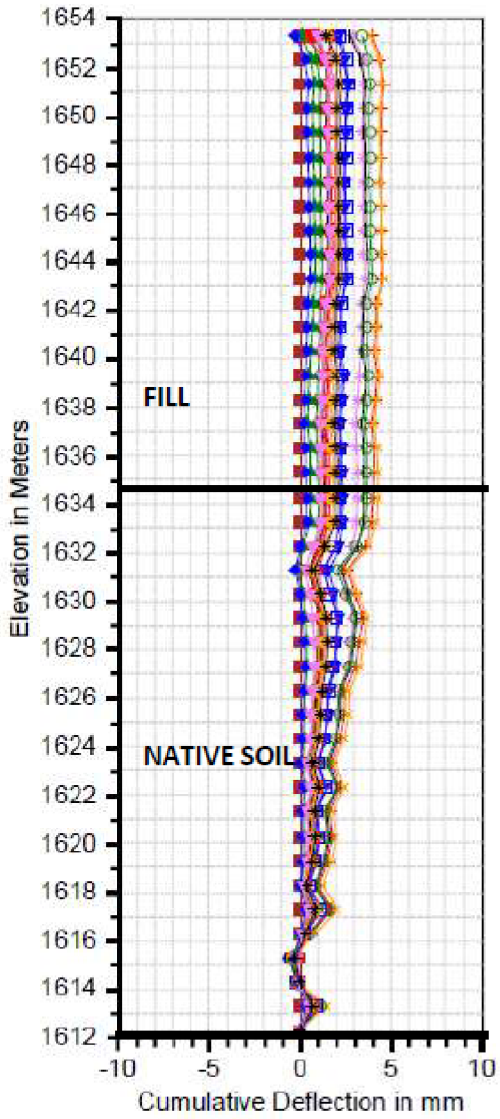

LEGEND

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4/2/2019	6/24/2019	11/27/2019
4/20/2020	7/7/2020	5/14/2021
7/5/2021	10/18/2021	3/24/2022

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CLIENT
TECK COAL LIMITED
FORDING RIVER OPERATIONS
ELKFORD, B.C.

CONSULTANT
wsp

YYYY-MM-DD	2023-03-23
PREPARED	P. Amini-Motlagh
DESIGN	P. Amini-Motlagh
REVIEW	C.McGrath
APPROVED	J.Cunning

PROJECT
2022 ANNUAL FACILITY PERFORMANCE REPORT FOR SOUTH TAILINGS POND AND NORTH TAILINGS POND

TITLE
NORTH TAILINGS POND - SLOPE INCLINOMETER DATA TH15-07

PROJECT No.	Phase/Task/Doc.	Rev.	FIGURE
22516328	**1000/1300/2022-118**	**0**	**D-20**

APPENDIX E

KWL Riprap Inspection Report

KERR WOOD LEIDAL
consulting engineers

Okanagan
202 - 3334 30th Avenue
Vernon, BC V1T 2C8
T 250 503 0841
F 250 503 0847

Technical Memorandum

DATE: January 21, 2023

TO: David Walker, P.Eng.
Teck Coal Ltd. – Fording River Operations

CC: John Cunning, P.Eng.
Golder Associates Ltd.

FROM: Jason Miller, P.Eng.

RE: **TECK COAL LIMITED – FORDING RIVER OPERATIONS**
2022 NTP and STP Riprap Inspection
Our File 0008.359-300

Introduction

Teck Coal Ltd. – Fording River Operation (FRO) retained Kerr Wood Leidal Associates Ltd. (KWL) to complete an inspection of the riprap bank protection works along the North Tailings Pond (NTP) and South Tailings Pond (STP) dams adjacent to the Fording River. Jason Miller, P.Eng. of KWL is the design engineer of record for the bank protection works.

The riprap inspection is a component of the Annual Facility Performance Report (AFPR) currently being completed by Golder Associates Ltd. (Golder). Golder is the Engineer of Record (EoR) for the NTP and STP tailings storage facilities at FRO. This technical memorandum summarizes the findings of KWL's riprap inspection and will be appended to the 2022 AFPR.

Background

KWL has a long history working at FRO. KWL was involved in the design and construction of the Fording River diversion to allow the construction of the STP. KWL has also provided hydrotechnical support to FRO following major flood events on the Fording River.

A severe flood on the Fording River in June 2013 caused extensive damage to FRO infrastructure and necessitated emergency mitigation works. Post-flood works included design and construction of a new riprap revetment to protect the NTP and part of the STP. Construction of bank protection works occurred in 2013, 2014, 2016 and 2017. Upon completion, continuous bank protection works had been constructed along the Fording River channel where it flows along the toe of the NTP dam, and along about one-third of the channel where it flows along the toe of the STP dam. The existing NTP and STP riprap was designed to the 200-year return period flood.[1]

[1] Kerr Wood Leidal Associates Ltd. 2016 Bank Protection Design for NTP/STP – Design Brief. Prepared for Teck Coal Ltd. – Fording River Operations. January 2017.

FRO is continuing a parallel process to establish appropriate Fording River flood risk mitigation for long-term operation of its tailings storage facilities. As such, FRO has widened the floodplain across from the STP. Design work is ongoing to reduce the risk of erosion to both the NTP and STP due to extreme flood events.

Field Inspection

A site visit was conducted on July 26, 2022 by Jason Miller, P.Eng. of KWL to assess the condition of the NTP and STP riprap bank protection works. The assessment began at the NTP and then moved to the STP. At the time of the inspection the ground and riprap were snow-free.

NTP Inspection

Riprap extends from upstream of the NTP to about Sta. 1+075 of the Golder NTP dam baseline as shown on Figure 1. Visual inspection of the lower riprap slope is impeded by gravel placed over the riprap during 2013 construction. The upper riprap slope placed during 2016/2017 is visible. The 2022 riprap inspection confirmed the riprap appears to be in good condition. Details of the inspection are provided below.

The section of riprap from approximately Sta. 0+100 to 0+200 is set back from the river and fully buried and no part of the revetment is visible. The surface above the riprap was checked for signs of movement such as cracks or settlement. The top of a narrow (1 m wide) section of riprap has been exposed between the NTP Sumps where water overflows from one cell to the next. The exposed riprap appears to be in good condition. A previously noted hole around Sta. 0+140 m (north of the Liverpool outlet culvert crossing) does not appear to have changed since the 2020 inspection when it was first noted. The hole is 0.9 m wide by 0.6 m long and appears to be material that has migrated into the void spaces between the riprap (i.e., interlocked riprap is visible in the hole just below the gravel surface). It does not appear that any riprap has moved as this is an isolated location with no other visible signs of movement.

Downstream of the fully buried section, gravel-covered sections of the revetment top and slope were checked for signs of movement such as cracks or openings in the gravel along the slope that would indicate voids developing within the revetment or settlement of the upper riprap. At several locations identified in previous annual riprap inspections between Sta. 0+175 and Sta. 0+550 along the right bank, the surface gravel has eroded to some extent but the extent and severity of erosion has not increased since 2021. In the erosion areas, the banks are over-steepened at 1 horizontal to 1 vertical (1H:1V) due to the loss of the gravel cast over the slope. Loss of the surface material has not impacted the riprap slope. No additional visual signs of movement were observed over the length of the revetment slope.

A small 0.35 m diameter sinkhole remains on top of the riprap about 1.5 m from the top of the slope (approximate Sta. 0+710) with no visible changes since it was observed in 2019. The 0.3 m deep opening appears to be the result of finer road surface material migrating into the void spaces between the large riprap pieces. This in not unexpected given the method of construction and is not considered evidence of a problem.

The exposed toe and slope of the revetment was observed and appears to be in good condition with no visual signs of scour or displacement except as noted above.

Some of the locally supplied rock is known to weather and degrade. Degradation was observed on several rocks along the revetment with minimal change from the 2021 riprap inspection. The degradation is intermittent and has not affected the overall integrity of the protection works. If degradation becomes more widespread, the average size (mass) of the riprap will decrease and rock interlocking may be compromised. Both processes can reduce the level of protection provided by the riprap. Remedial work may be required if future inspections confirm ongoing weathering and degradation. This year's inspection did not include any test holes to review rock degradation below the visible rock layer.

Previously, test holes were excavated in 2016 and 2017 during riprap upgrades. These test holes found the riprap placed in 2013 to be of good quality, but the riprap gradation was smaller than the expected gradation at the top of the test holes. This may be a result of selective placement to construct an access road on top of the revetment. At this time, further test pitting is not suggested as the exposed riprap is in good condition and it is reasonable to assume that degradation of the buried rock is similar to that of exposed sections.

Generally, the crest of the NTP riprap revetment is within ±0.1 m of the design elevation (i.e. peak water level expected during 200-year return period flood plus 1 m freeboard); however, there are a few areas where the riprap crest is up to 0.4 m lower than the design elevation (refer to profile on record drawings in in completion report). The low areas correspond to approximate stationing 0+215 to 0+290, 0+470 to 0+545, 0+625 to 0+665, 0+685 to 0+755 and 0+920 to 0+940.[2] This effectively reduces the freeboard in these areas from the design freeboard of 1.0 m to 0.6 m.

A reduced freeboard means that the revetment has a reduced capacity to handle variations from the design conditions; 0.6 m freeboard is considered the minimum acceptable freeboard for many flood protection projects throughout BC. Particular attention regarding signs of settlement or water nearing the crest should be paid to these areas on annual inspection and during high water events. Signs of settling or subsidence should be confirmed by topographic survey and levels of protection should be raised if required. No evidence of systematic settling or subsidence was observed during the 2021 inspection. FRO should take advantage of future opportunities to cost-effectively raise the revetment to achieve the design freeboard (e.g., if future work is required along the river side slope of the NTP).

STP Inspection

A riprap revetment protects the STP embankment toe from Sta. 0+240 to 0+685 of the Golder STP dam baseline (refer to Figure 2). Most of the riprap slope is exposed and visible along the length of the revetment, except for a 20 m length at the upstream end which is covered in finer rock (200 mm minus rock). The riprap is well interlocked with smaller riprap filling the voids of the larger riprap. The riprap slope is generally about 2H:1V, except for a 20 m long section (Sta. 0+270 to Sta. 0+290) that is 1.5H:1V. The riprap appears to be in good condition. Details of the inspection are provided below.

The top of the riprap apron is covered in river gravel and is not visible for inspection; its condition is assumed similar to that observed along the revetment slope. The gravel-covered apron was checked for signs of movement such as cracks or openings in the gravel that would indicate voids or settlement developing within the toe apron. No signs of movement were observed.

The Fording River currently flows on the opposite side of the channel from the STP for more than half of the length of the revetment. Between Sta. 0+500 and 0+685 the active channel flows directly against the riprap embankment. The scour at the riprap apron noted at Sta. 0+670 in 2021 appears to have remained the same and has not impacted the riprap slope that is set behind the riprap apron. This area should be monitored for further erosion and material displacement.

Since 2021, there has been continued gradual weathering (cracking and flaking) of individual riprap pieces along the entire length of the STP protection works. Currently, the degradation remains intermittent and has not affected the overall integrity of the protection works. If degradation becomes more widespread, the average size (mass) of the riprap will decrease and rock interlocking may be compromised. Both processes can reduce the level of protection provided by the riprap. Remedial work may be required if future inspections confirm ongoing weathering and degradation.

[2] Kerr Wood Leidal Associates Ltd. 2016/2017 Bank Protection for NTP/STP – Completion Report. Prepared for Teck Coal Ltd. – Fording River Operations. December 2017.

Directly across from the STP, FRO has excavated the right bank of the Fording River to widen the floodplain. The right bank appears to be lower than the top of riprap elevation. The pipe bridge at the downstream end of the STP riprap has also been removed. The concrete footings remain on both the left and right banks of the Fording River.

General Observations

All riprap used for NTP and STP bank protection works was salvaged from toes of spoils, sorted from spoils, or hauled directly from the pit. The resistance to weathering is therefore expected to vary locally throughout both revetments. Over time, inspections may identify pockets of more resistant and/or less resistant material. More frequent visual monitoring by FRO staff should occur in areas where a significant portion of the riprap slope (i.e., more than the occasional rock) is found to be showing signs of degradation. Presently there are no areas identified as requiring increased monitoring.

Teck currently has a stockpile of riprap located south of the STP for use at either tailings facility in case of an emergency. KWL reviewed the stockpile as part of the riprap inspection to confirm it remains suitable for use. The stockpile of rock was sourced from on-site mining operations, same as the rock used to build the riprap bank protection for the tailings facilities, and more recently replacement rock from a regional quarry. Like the other riprap on site, some of the rock sourced on site is weathering and degrading. At this time, the rock remains suitably sized for emergency use on the Fording River. The stockpile should be reviewed annually as part of the NTP/STP riprap inspection to confirm it remains suitable for use.

Teck may consider using drone imagery to capture the riprap embankment on an annual basis as a secondary tool for comparing the riprap condition year over year. Where settlement, cracking, voids, or other signs of movement become visible on the surface, test pits should be completed to confirm the quality and integrity of buried riprap (and if needed, remediated). Each annual inspection should review the inspection history and highlight potential changes.

Summary

Exposed riprap along the NTP and STP is generally in good condition and is designed to provide erosion protection during a 200-year return period flood. The western (first) cell of the NTP Sumps has spilled over the buried riprap, as per the intended design of the sumps, exposing a narrow section of the riprap. The integrity of the riprap remains good at this location. There appears to have been minimal change to the banks along the NTP since the 2021 annual inspection and no follow up works are required. The riprap at the STP appears to be in generally the same condition as observed during the 2021 annual inspection. Since 2021, the right bank of the STP has been excavated to an elevation below the top of the STP riprap and the floodplain widened. The pipe bridge from the STP has been removed; however the concrete footings remain in place.

There continues to be deterioration of some of the riprap from weathering located intermittently along the NTP and STP riprap revetments. This is also expected to be the case for buried riprap. A couple of sinkholes on the top of the riprap identified in previous annual inspections are still present; however, the field assessment did not identify any significant changes that raises concerns about the performance of concealed (i.e., buried or gravel-covered) riprap, and the condition of the concealed riprap is assumed to be comparable or better than that of equivalent exposed sections.

Test pits may be required if surface deformation suggests potential problems with buried riprap. For example, if future inspections document ongoing surface anomalies in the vicinity of the surface depressions at NTP Sta. 0+140 and 0+710. Mitigative action (e.g., riprap replacement) may be required if several rocks near one another show evidence of degradation.

The emergency stockpile of riprap located south of the STP continues to experience weathering but remains suitable for use in case of emergency.

Recommendations

Inspections of the riprap and riprap stockpile should be completed at least annually. The riprap should continue to be monitored for weathering during these annual inspections. Teck may consider developing a standard flight path and obtain drone imagery of the riprap embankment on an annual basis as a secondary tool to monitor the condition of the riprap. This would allow the imagery to be compared year over year to help identify areas that may be deteriorating faster than others.

Supplementary inspections should continue to be conducted after high water events on the Fording River, which include freshet or precipitation driven events. Any deficient sections should be repaired as soon as possible to limit further degradation and risk to the NTP or STP.

There are areas along the NTP riprap where the riprap is up to 0.4 m lower than the design elevation. This reduces the freeboard in these areas to 0.6 m. Particular attention should be paid to these areas on annual inspection and during high water events. Signs of settling or subsidence should be confirmed by survey and levels of protection should be raised if required. Teck should seek opportunities to cost-effectively achieve the intended 1 m freeboard (e.g., by combining with an independent but adjacent construction project).

Design of the riprap erosion protection works was based on the 200-year return period flood, which is subject to numerous uncertainties. For example, the energy of the flood can significantly change channel conditions. In addition, larger floods are possible, including the breach of an upstream valley-spanning structure like the Fording River Multiplate embankment. The design and status of the NTP and STP riprap should be reviewed and revised as needed within the context of FRO's larger review of design and performance requirements for the NTP and STP tailings storage facilities.

Closure

We trust this provides a satisfactory assessment of the riprap protection along the NTP and STP. Should you have any questions, please contact the undersigned.

KERR WOOD LEIDAL ASSOCIATES LTD.

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Encl.: Enclosure-A: Photographs
Figure 1: North Tailings Pond
Figure 2: South Tailings Pond

Statement of Limitations

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Revision History

Revision #	Date	Status	Revision Description	Author
0	January 21, 2023	Final		JM

Proudly certified as a leader in quality management under Engineers and Geoscientists BC's OQM Program from 2013 to 2021.

Enclosure-A: Photographs

Photo 1: Looking upstream at riprap along the right bank, upstream of the NTP setback riprap.

Photo 2: Riprap exposed where NTP Sumps spill from one cell to the next across the setback riprap.

Photo 3: Looking downstream at riprap along right bank (Sta. 0+125)

Photo 4: Riprap degradation due to weathering on several pieces of riprap (approx. Sta. 0+550)

Photo 5: Looking upstream at NTP riprap (from approx. Sta. 0+550)

Photo 6: Looking downstream at NTP riprap (from approx. Sta. 0+550)

Photo 7: Looking upstream at NTP riprap (from approx. Sta. 0+900)

Photo 8: Looking downstream at start of STP riprap (from approx. Sta. 0+250)

Photo 9: Looking downstream at STP riprap (from approx. Sta. 0+300)

Photo 10: Riprap degradation due to weathering on several pieces of riprap (approx. Sta. 0+275)

Photo 11: Looking downstream at STP riprap (from approx. Sta. 0+600). The right bank has been excavated/widened and the pipe bridge removed

Photo 12: Erosion along the toe apron of the STP riprap at Sta. 0+670 remains the same as 2021

Photo 13: Emergency riprap stockpile south of STP

Photo 14: Riprap at emergency riprap stockpile

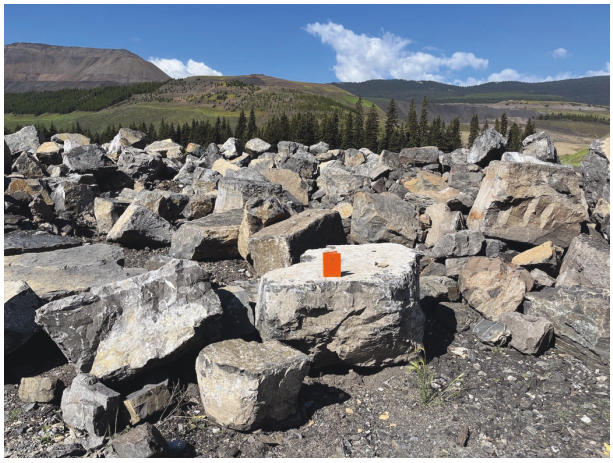
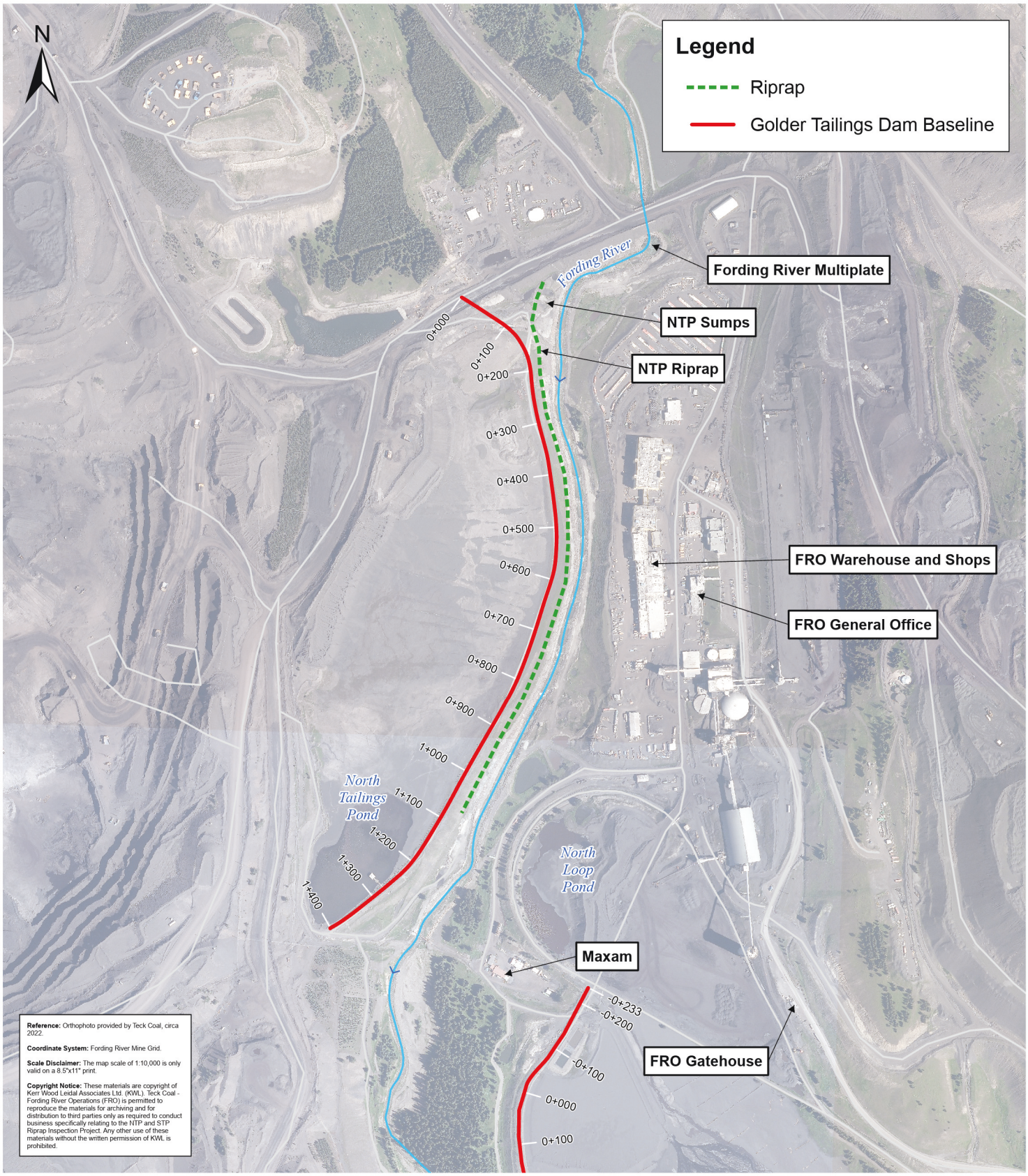


Photo 15: Riprap at emergency riprap stockpile

Teck Coal - Fording River Operations (FRO)

NTP and STP Riprap Inspection

KERR WOOD LEIDAL consulting engineers



Project No. 8-359

Date December 2022

Scale 1:10,000

0 50 100 200 Meters

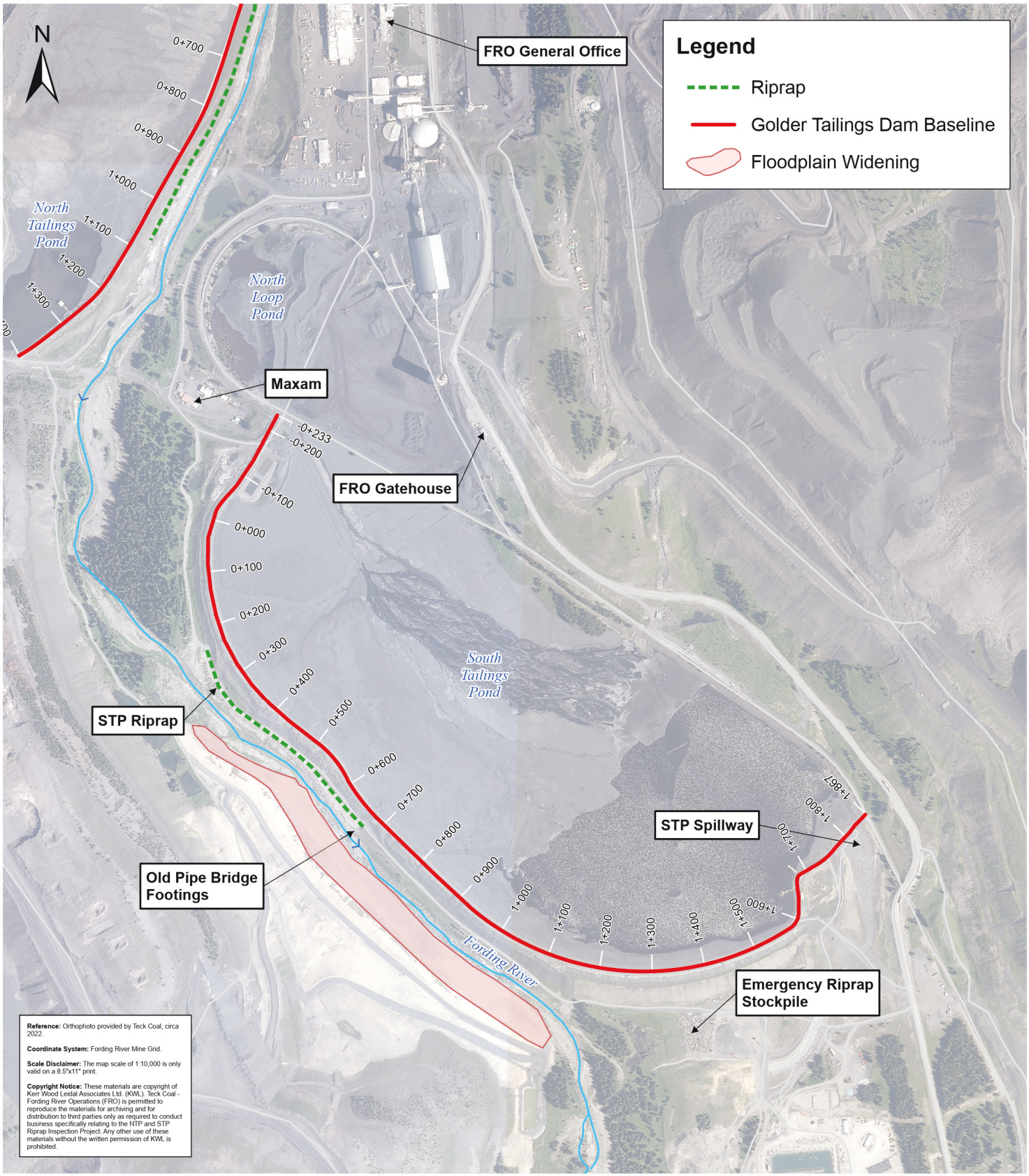
North Tailings Pond

Figure 1

Teck Coal - Fording River Operations (FRO)

NTP and STP Riprap Inspection

KERR WOOD LEIDAL consulting engineers



Reference: Orthophoto provided by Teck Coal, circa 2022.

Coordinate System: Fording River Mine Grid.

Scale Disclaimer: The map scale of 1:10,000 is only valid on a 8.5"x11" print.

Project No.	8-359
Date	December 2022
Scale	1:10,000

0 50 100 200 Meters

South Tailings Pond

Figure 2

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