Klohn Crippen Berger

Teck Metals Ltd.

Pine Point Mine Tailings Impoundment Area

2022 Annual Facility Performance Review

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September 2022

Klohn Crippen Berger

September 19, 2022

Teck Metals Ltd.
Kimberley Operations
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Michelle Unger
Pine Point Site Manager

Dear Ms. Unger:

Pine Point Mine Tailings Impoundment Area
2022 Annual Facility Performance Review

We are pleased to submit the 2022 Annual Facility Performance Review for the Pine Point Mine Tailings Impoundment Area.

Please contact us if you have any questions regarding this report.

Yours truly,

KLOHN CRIPPEN BERGER LTD.

Maggie Smith, P.Eng.
Project Manager

MS:dl/jc/db

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Teck Metals Ltd.

Pine Point Mine Tailings Impoundment Area

2022 Annual Facility Performance Review

EXECUTIVE SUMMARY

This report presents the 2022 Annual Facility Performance Review (AFPR) by Klohn Crippen Berger Ltd. (KCB) for Teck Metals Ltd.'s (Teck) Pine Point Mine Tailings Impoundment Area (TIA). This report was prepared to fulfill the requirements of a Geotechnical Inspection Report as stated in the Water License MV2017L2-0007 (Part F, Cl.7) (valid to October 24, 2027). The reporting period for this document is August 2021 through June 2022.

The annual inspection of the TIA was conducted on June 21, 2022 by the incoming Engineer of Record (EoR), Ms. Maggie Smith, P.Eng., and the current EoR, Mr. Daniel Klassen, P.Eng., as representatives of KCB. The Responsible Tailings Facility Engineer (RTFE), Mr. Silawat Jeeravipoolvarn, P.Eng., of Teck, and the Tailings Surveillance Officer, Mr. Clell Crook, C.E.T., of Maskwa Engineering Ltd. also attended the inspection. Routine inspections during the reporting period were carried out by the Tailings Surveillance Officer. No event driven inspections were triggered during the reporting period.

This executive summary is provided in accordance with Teck's "Guideline for Tailings and Water Retaining Structures" (Teck 2019) and in anticipation for meeting the requirements of the Global Industry Standard on Tailings Management (GISTM) by the 2023 reporting year.

Summary of Facility Description

The Pine Point Mine operated from 1964 to 1988, and the TIA has been in active care and maintenance since 1988. The TIA includes the following:

- North Dyke, East Dyke, West Dyke, and South Dyke, impounding approximately 50 to 60 million tonnes of lead-zinc tailings, covering an area of approximately 700 ha. Most of the tailings surface is currently covered with approximately 0.15 m of gravel material.
- Main Pond which is present continuously upstream of the North Dyke.
- Polishing Pond is a serpentine pond, contained by the North Dyke and the Internal Dyke, that is used to treat and release water from the Main Pond.
- Main Pond Spillway and the Polishing Pond Spillway are both reinforced concrete channels that allow water to discharge from the TIA at El. 202.5 m, which is 1 m below the minimum crest elevation of 203.5 m.

Summary of Key Hazards

KCB understands that Teck's long-term goal for their tailings facilities is to reach landform status, with all potential failure modes that could result in catastrophic release of tailings and/or water being either not present or having been reduced to non-credible. Teck's long-term goal for the Pine Point TIA is for all potential failure modes to be non-credible, based on extreme loading conditions, or to manage the risk to ALARP (i.e., as low as reasonably practicable) using appropriate loading conditions when it is not practicable to address extreme loading conditions.

The Pine Point TIA risk register was reviewed by Teck and KCB in November 2021. There were no changes to the key hazards and the existing controls were adequate to manage potential failure modes.

To supplement the risk register review, Teck, with support from KCB, conducted a credible catastrophic failure mode assessment in April 2022. Teck's definition of a "catastrophic" failure is one with a risk to life safety or irreversible impact to a rare or valued ecosystem, social, or cultural heritage element. The assessment concluded that, based on the available information and current understanding of the site, there are no credible "catastrophic" failure scenarios for the Pine Point TIA. The assessment will be updated following the planned geotechnical and hydrotechnical design update.

The following is a summary of the controls in place at the Pine Point TIA to manage the risks associated with the key failure modes for the facility. The overtopping and slope instability failure modes are credible (though non-catastrophic), while the internal erosion failure mode is not credible for the current and historic loading conditions. Based on the observations above and the available information, Teck is managing the potential failure mechanisms for the TIA appropriately and is taking appropriate steps to address relevant data gaps.

Overtopping:

- The maximum pond level during the reporting period was El. 201.7 m, which is 0.8 m below the spillway invert and 1.8 m below the dyke crest. This meets the water license freeboard requirement of 1 m.
- The operational controls to prevent overtopping at the TIA include annual seasonal water treatment campaigns, pond level predictions based on site-specific snow survey monitoring, and a Trigger Action Response Plan (TARP) that identifies when to mobilize water treatment or request emergency decant based on pond level and the 7-day forecast. Site personnel measure the pond level during routine inspections, and remotely view pond levels daily via a web camera during and following freshet. If a high-water level event does occur, five emergency syphons are available to manage the risk of overtopping.
- The engineering controls to prevent overtopping include the two emergency spillways sized for the 1/1000-year summer storm (Golder 2021a). The flood routing and spillway capacity are in the process of being updated and will be used to evaluate and refine the TARP.
- The design and operational controls in place manage storm events up to the 1/1,000-yr storm. Based on Teck's tailings governance and the risk assessment framework, the potential impacts of such an event would not be catastrophic to health and safety or the environment, nor from a community relations, reputation, legal, or financial perspective.

Internal Erosion and Piping:

- The controls to prevent internal erosion consist of fill materials that are internally stable under the current loading conditions, restricting the pond to the northern portion of the

facility, and active management of the pond level through annual seasonal water treatment campaigns.

- The good performance of the TIA, with no change to the operating conditions of the Main Pond, indicates that the operational and engineering controls are adequate to prevent internal erosion and piping for the existing conditions in the facility.

Slope Instability:

- The good performance of the TIA indicates the engineering controls are adequate to prevent slope instability at the TIA under the current loading conditions. A stability assessment of the TIA was completed as part of the 2014 DSR (SRK 2016); it concluded the dykes met design criteria under static and the 1/2,475 yr event pseudo-static loading conditions.
- The operational controls to prevent slope instability at the TIA include active management of pond level, monitoring of the phreatic surface in the facility, as well as the three visual inspections per year of the condition of the dykes.
- The potential for toe erosion during flood routing to affect embankment stability should be evaluated, particularly at the spillway outlets and at the access road culvert located at the southwest corner of the facility. This assessment will be completed based on the outcomes of the ongoing flood routing update.
- The design and operational controls in place manage slope instability for the current loading conditions and for earthquakes up to the 1/2,475-yr event. Based on Teck's tailings governance and the risk assessment framework, the potential impacts of such an event would not be catastrophic to health and safety or the environment, nor from a community relations, reputation, legal, or financial perspective.

Summary of Significant Changes

There have been no significant changes at the TIA during the reporting period other than the placement of rounded riprap on portions of the upstream face of the North Dyke in October 2021. Overall, the dykes are in good condition with no significant changes to performance observed.

Summary of Instrumentation Data

There are 20 vibrating wire piezometers (VWPs) installed at several locations around the TIA, including two that measure the Main Pond water level and one measuring barometric pressure. Piezometers are set up to record readings twice per day. Data can be accessed remotely by site personnel. There have been some challenges with maintaining consistency and reliability in the readings; specifically, the VWP dataloggers lost power between November and December 2021. The disruption was likely related to the impact of below average temperatures on the batteries. In lieu of automatic recordings, manual VWP measurement readings were collected on June 16, 2022.

Based on the available data, there were no significant changes in measured piezometric levels during the reporting period compared to the historic trends.

Operations Maintenance and Surveillance Manual and Mine Emergency Response Plan

The Operations Maintenance and Surveillance (OMS) Manual was last revised in May 2020 (Teck 2020) and the Mine Emergency Response Plan (MERP) for the Pine Point Mine was last revised November 2021 (Teck 2021).

The current versions of the OMS Manual (Teck 2020) and MERP (Teck 2021) were appropriate for the condition of the facility during the reporting period. Routine review and update to both documents were in progress at the time of writing this report.

Dam Safety Review

There are no requirements to complete a DSR for the Pine Point Mine TIA based on the relevant permits and licenses for the site; however, Teck do complete DSRs as part of their internal governance program for facilities that retain fluids and have a credible failure mode. The most recent DSR was completed by SRK in 2014 (SRK 2016) and recommended that the next DSR to take place not later than 2024 which is consistent with the frequency of DSRs (5 to 10 years) recommended for this type of structure in the 2019 CDA Technical Bulletin on Application of Dam Safety Guidelines to Mining Dams (CDA 2019).

Summary of Recommendations

The Pine Point Mine TIA appears to be in good condition and there are no major concerns related to the safety of the facility. Dam safety recommendations identified during past AFPRs, and from the 2022 AFPR, are summarized in Table ES-1. The priority assigned to each recommendation are based on Teck's priority ratings:

1. A high probability or actual TIA 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 TIA 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 TIA safety issues.
4. Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks.

Table ES-1 Summary of Deficiencies and Recommendations

Structure	ID No.	Deficiency or Non Conformance	Applicable Regulation or OMS Reference	Recommended Action	Priority	Recommended Deadline (Status)
Previous AFPR Recommendations Ongoing						
TIA Instrumentation	2019-02	Instrumentation installed in 2018 requires integration into OMS procedures.	Cl. 4.2 and 4.3 of OMS Manual	Establish procedures for frequency of data acquisition and review. Establish baseline readings and levels for alert and emergency response, with corresponding update of OMS Manual.	4	Deadline updated to Q2 2023 to allow time for completion of 2021-03
TIA	2020-03	Freeboard limits require update for 2019 storage curve, 2020 climate assessment, review of design criteria, and evaluation of spillway.	Cl. 2.7.3.2.3 of OMS Manual	Review flood storage capacity, water handling practices, determine capacity of spillway and update freeboard limits. Incorporate these changes in the OMS Manual.	3	Finalize report by Q4, 2022
TIA Instrumentation	2021-01	VWP anomalous readings. PP-VWP-2018-02A PP-VWP-2018-02B PP-VWP-2018-05 PP-VWP-2018-08 PP-VWP-2018-09 PP-VWP-2020-11A	None	Troubleshoot VWP calibration / data acquisition and data reduction. Assess the importance of these instruments for TIA surveillance and repair, replace or decommission faulty or damaged instruments where necessary.	4	Q3/Q4 2022 (Planned)
North Dyke	*2021-02*	*Absence of riprap on the upstream slope, resulting in erosion damage.*	*None*	*Adequately sized riprap should be placed in locations that do not have riprap protection.*	*2*	*Completed*
TIA	2021-03	Previous stability assessments were based on limited site characterization data.	None	Update stability assessments and review filter compatibility for the dykes based on the 2018 and 2020 site investigation data.	4	Q1 2023 (Planned)
TIA	*2021-04*	*Failure modes have not been evaluated to determine if they are credible.*	*None*	*Perform a credible failure modes assessment.*	*4*	*Completed*
Main Pond Spillway, Polishing Pond Spillway	2021-05	The spillways are vulnerable to blockage by woody debris.	None	Develop a plan to manage debris in the pond and add to the OMS Manual.	3	Q4 2022 (Planned)
TIA Instrumentation	2021-06	The remote camera system for monitoring the staff gauge is vulnerable to water damage during high pond levels.	None	Relocate the remote camera system to above the high-water level of the Main Pond.	4	Q3/Q4 2022 (Planned)

Structure	ID No.	Deficiency or Non Conformance	Applicable Regulation or OMS Reference	Recommended Action	Priority	Recommended Deadline (Status)
2022 AFPR Recommendations						
North Dyke	2022-01	No documentation of the riprap placed during the reporting period.	Section 5.7 of OMS Manual	Prepare a record document of the North Dyke riprap placement.	4	Q4 2022 (Planned)
Main Pond	2022-02	Updated TARP (2022) is not included in the current OMS.	Cl. 2.7.3.2.3 of OMS Manual	Incorporate the updated TARP into the OMS.	3	Q1 2023 (Planned)
TIA Instrumentation	2022-03	VWP datalogger reliability.	Cl. 4.2 and 4.3 of OMS Manual	Include a review of the status of the VWP dataloggers prior to freshet and replace batteries, as needed. Include this as regular maintenance in the OMS.	4	Q4 2022: Coincide with OMS update for 2019-02 recommendation
South Dyke	2022-04	The culvert at the southwest corner of the TIA inspected during the site visit may not have been accounted for in the flood routing assessment.	None	Evaluate the potential for toe erosion during flood routing at the southwest access road culvert.	4	Q4 2023 (Planned)

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CLARIFICATIONS REGARDING THIS REPORT

This report is an instrument of service of Klohn Crippen Berger Ltd. (KCB). The report has been prepared for the exclusive use of Teck Metals Ltd. (Client) and the applicable regulatory authorities for the specific application to the 2022 Annual Facility Performance Review of the Pine Point Tailings Impoundment Area, and it may not be relied upon by any other party without KCB's written consent.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered. KCB makes no warranty, express or implied.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The Executive Summary is a selection of key elements of the report. It does not include details needed for the proper application of the findings and recommendations in the report.
3. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
4. The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.
5. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.

1 INTRODUCTION

1.1 Purpose, Scope of Work and Methodology

This report presents the 2022 Annual Facility Performance Review (AFPR) by Klohn Crippen Berger Ltd. (KCB) for Teck Metals Ltd.'s (Teck) Pine Point Mine Tailings Impoundment Area (TIA). This report was prepared to fulfill the requirements of a Geotechnical Inspection Report as stated in the Water License MV2017L2-0007 (Part F, Cl.7) (valid to October 24, 2027).

This report covers a reporting period from August 2021 to June 2022, with the exception of climate data which covers September 2021 through May 2022.

The following activities were undertaken by KCB:

- Site inspection on June 21, 2022 by the incoming Engineer of Record (EoR) Ms. Maggie Smith, P.Eng., and the current EoR, Mr. Daniel Klassen, P.Eng., both of KCB.
- Review instrumentation and confirm that readings are within acceptable limits.
- Review and update the list of outstanding recommendations from the previous AFPR.

During the site inspection, KCB representatives were accompanied by the Responsible Tailings Facility Engineer (RTFE), Mr. Silawat Jeeravipoolvarn, P.Eng. (Teck) and the Tailings Surveillance Officer, Mr. Clell Crook, C.E.T. (Maskwa Engineering Ltd.).

The inspection was conducted, and this report was prepared, in accordance with the Teck Guideline for Tailings and Water Retaining Structures (Teck 2019).

1.2 Regulatory Requirements

The following regulations, permits, and licenses are applicable to the TIA:

- Mackenzie Valley Resources Management Act, S.C. 1998, c.25 (2017);
- Mackenzie Valley Waters Act, S.N.W.T, 2015, C.1 (2016);
- Northwest Territories Mine Health and Safety Act, S.N.W.T, c.25 (1995);
- Northwest Territories Mine Health and Safety Regulations, R-125-95 and amendments (2018);
- Water License MV2017L2-0007 (Type B) (valid to 24 October 2027); and
- Type A Land Use Permit MV2019X0006 and amendment granted 17 September 2020 to incorporate lease boundary L-2000009T (valid to 15 May 2024) and amendment 9 September 2021 for the installation of evaporators and associated land upgrades for the infrastructure.

KCB has also reviewed the performance of the TIA relative to the following contemporary guidance documents:

- Teck's Guideline for Tailings and Water Retaining Structures (TWRS) (Teck 2019);
- "Dam Safety Guidelines 2007 (revised in 2013)", by the Canadian Dam Association (CDA 2013);
- "Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams", by the Canadian Dam Association (CDA 2019);
- "Tailings Management: Good Practice Guide", by the International Council on Mining and Metals (ICMM 2021);
- "A Guide to the Management of Tailings Facilities" version 3.2, by the Mining Association of Canada (MAC 2021a); and
- "Developing an Operation, Maintenance, and Surveillance Manual for Tailings and Water Management Facilities", version 2.1, by the Mining Association of Canada (MAC 2021b).

1.3 Facility Description

The Pine Point Mine is located in Northwest Territories about 7 km south of Great Slave Lake and 75 km east of the town of Hay River (Figure 1). The TIA is approximately 200 metres above sea level and occupies terrain that gently slopes towards the northwest at slopes generally less than 1%.

The mine was operated by Teck from 1964 to 1988. Teck is no longer responsible for the open pits and underground workings, but maintains responsibility of the TIA, which was constructed in 1965 and operated up to 1988. Since 1988, the TIA has been in the active care phase of closure, as defined by CDA (2019).

The TIA covers approximately 700 ha and is contained on four sides by earth fill dykes and natural topography. The South Dyke and East Dyke terminate in existing topography on the east side of the TIA. Due to local topography, the TIA only requires a small portion of the east side to be retained behind the East Dyke. A site plan and the general arrangement of the TIA are presented in Figure 2.

Approximately 50 to 60 million tonnes of tailings are stored in the TIA (Golder 2020b). The Main Pond has a current capacity for storing runoff (i.e., available water storage) of approximately 1.7 Mm^3, measured to the spillway invert (El. 202.5 m) (Golder 2022). The dykes are approximately 8.8 km long, and up to 9 m high. The original dyke was designed and constructed in the mid 1960s, and the last three raises were completed in 1976, 1981, and 1987. The dykes are constructed of a stiff clayey silt upstream zone and a sand and gravel downstream zone (see Appendix V). Dyke configurations are summarized in Table 1.1.

The downstream slopes of the dykes vary between 2H:1V and 1.5H:1V. Figures showing the downstream slope grades are included in the 2021 AFPR (KCB 2021).

Table 1.1 Dyke Configurations (Golder 2022)

Dyke Name	Max. Height (m)	Length (km)	Typical Crest Width (m)	Upstream Slope (typical)	Downstream Slope (typical) [1]	Min. Crest Elev. (m)
North	9	3.01	8	1.5H : 1V	1.5 to 2H : 1V	203.5
West	9	2.31	9	1.5H : 1V	1.5 to 2H : 1V	204.0
South	4	2.48	5	1.5H : 1V	1.75 to 2H : 1V	209.9
East	2	0.63	6.5	1.5H : 1V	1.5H : 1V	203.5

Note:
[1] From 2021 Annual Facility Performance Review (KCB 2021).

Since transitioning to closure, most of the tailings surface has been covered with approximately 0.15 m of locally borrowed alluvial gravel to control wind erosion of the tailings.

Water management for the TIA includes a serpentine Polishing Pond located adjacent to the North Dyke, separated from the main reservoir storage area by the Internal Dyke. A culvert passes through the Internal Dyke and is fitted with a gate valve to control the flow into the Polishing Pond. The water treatment typically occurs over 4 to 6 weeks every summer. A lime solution ($Ca(OH)_2$) is prepared in a slurry tank and pumped into the water flowing in the culvert between the Main Pond and the Polishing Pond.

Two concrete spillways are present on the North Dyke of the TIA. The Main Pond Spillway and Polishing Pond Spillway both allow impounded water to discharge through the North Dyke into the downstream environment (Figure 2). The spillways are reinforced concrete channels, which passively release water from the TIA when the pond level rises above El. 202.5 m, 1 m below the minimum crest elevation of the dykes. The Main Pond Spillway invert is typically dry, whereas treated water is annually conveyed, via siphons, through the Polishing Pond Spillway into the surrounding environment during the annual water treatment campaigns.

A facility data sheet that summarizes key information for the TIA is presented in Appendix I.

1.4 Background Information and History

1.4.1 Design and Construction History

The chronology of significant design and construction activities is as follows:

- The original dyke configuration was constructed in the mid 1960s. There are no documents that outline or detail the original design and construction of the TIA dykes.
- There are no documents that outline or detail dyke raises prior to 1976.
- 1976 raising of the North Dyke and West Dyke by 2.1 m, and an additional raise and extension of the East Dyke.
- 1981 raising of the West Dyke by up to 3 m and foundation stripping along the toe of the South Dyke to install a cut-off key.

- 1987 raising of the South Dyke, West Dyke, and North Dyke with an earthfill cap in the order of about 0.15 m to 1.0 m.
- 1988 closure of the mine, followed by placement of approximately 0.15 m of gravel to cover the tailings surface in 1990 and 1991.
- 2008 regrading and widening (to about 7.3 m) of the North Dyke in conjunction with placement of 6-inch minus gravel along about 750 m of the upstream face of the North Dyke.
- 2012 construction of reinforced concrete headwalls in the Main Pond Spillway and the Polishing Pond Spillway.
- 2018 and 2021 placement of riprap on the upslope side of the North Dyke.

2 SITE ACTIVITIES DURING THE 2021-2022 REPORTING PERIOD

The TIA is a closed facility in the active care phase of closure. Teck continues to manage the water level in the Main Pond by treating water in the Polishing Pond. Scheduled and event-driven inspections and maintenance work are carried out on an as-required basis. Requirements for routine inspection and monitoring, and event-driven inspections are presented in the Operation, Maintenance and Surveillance (OMS) Manual (Teck 2020).

The following inspections were carried out during the reporting period:

- Fall 2021 Inspection: October 24, 2021 by the Tailings Surveillance Officer;
- Freshet/Spring 2022 Inspection: May 19, 2022 by the Tailings Surveillance Officer; and
- Annual Inspection: June 21, 2022 by the RTFE, EoR and Tailings Surveillance Officer.

Additional site visits and inspections were performed as follows:

- September 21, 2021: instrumentation maintenance on PP-VWP-2018-06, 08, and 09 by the Tailings Surveillance Officer;
- May 5 to 7 and May 10, 2022: east drainage area reconnaissance and East Diversion Ditch performance inspection by Barr accompanied by the RTFE and the Tailings Surveillance Officer (Barr 2022); and
- June 16, 2022: manual readings of all vibrating wire piezometers (VWP) and some instrumentation troubleshooting by the Tailings Surveillance Officer.

The following activities were completed on site during the reporting period:

- Rounded riprap was placed on the upstream slope of the North Dyke between October 14 and October 23, 2021. Geotextile was placed along some portions of this segment; and
- Water treatment activities were mobilized on June 20, 2022. Discharge of treated waters began on June 30, 2022.

Recommendation/Action:

Prepare a record report that documents the North Dyke riprap placement, including sizing and thickness of the riprap and the extent of the geotextile (2022-01).

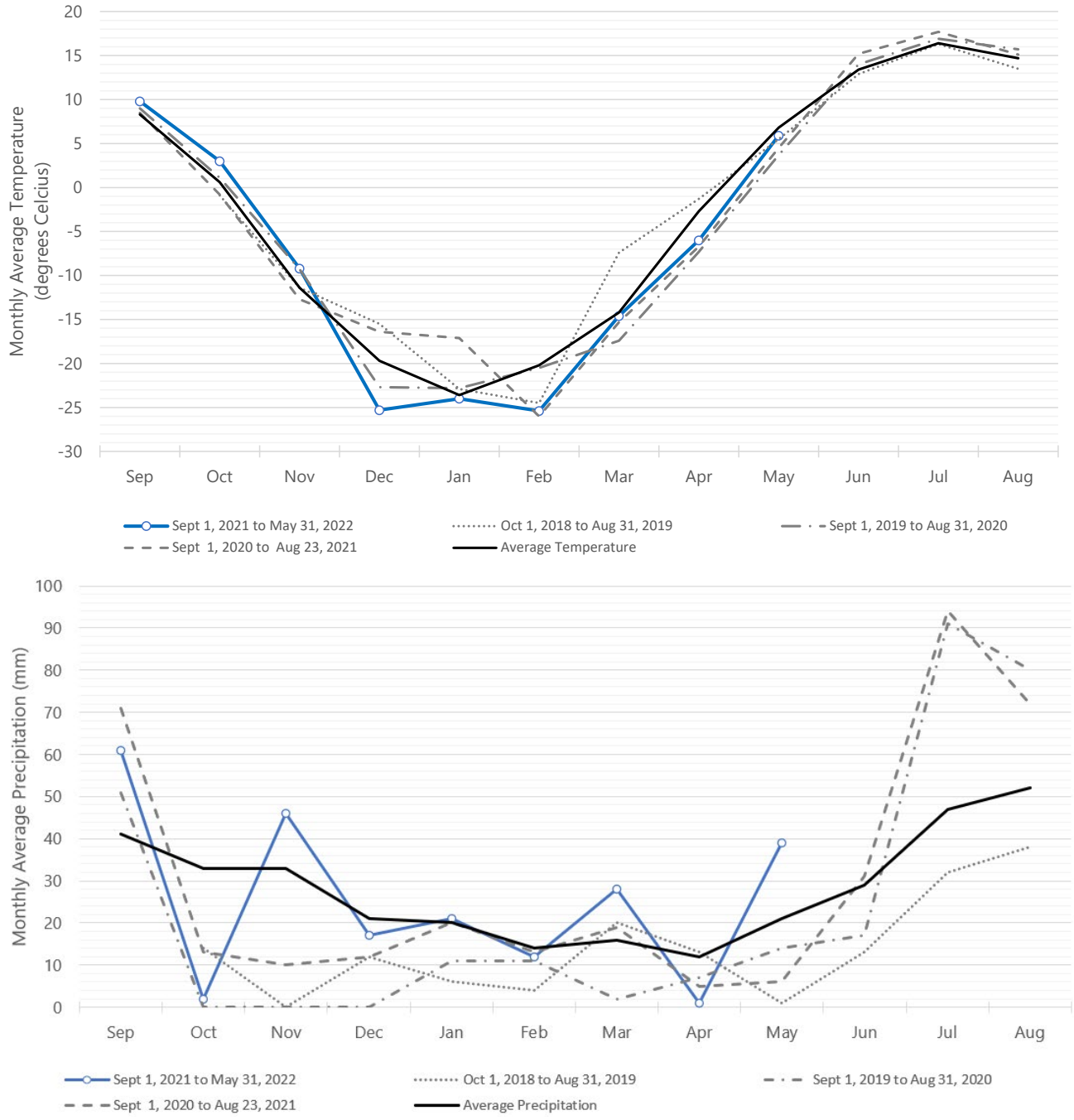
3 CLIMATE DATA AND WATER BALANCE REVIEW FOR THE 2021-2022 REPORTING PERIOD

3.1 Climate Data

Site-specific average monthly temperatures, rainfall, snowfall and precipitation were developed from regional climate datasets as part of water balance modelling work (Barr 2021). This data, along with the 2021 and 2022 monthly precipitation and average air temperature, provided via email communication from Teck, are presented on Figure 3.1.

The climate data for this reporting period indicates conditions at the site were colder than average, particularly in December through February, and wetter than average, particularly in September, November, March and May.

Figure 3.1 Mean Monthly Average Air Temperature and Total Precipitation



Note:

(1) The site-specific average monthly temperature, rainfall, snowfall and precipitation are from Barr (2021). The site-specific climate data was developed using regional climate datasets from six Environment Canada climate stations which have data from 1953 to present (sporadic data only at some stations). Snowfall includes wind-induced undercatch adjustment.

3.2 Water Balance

The water balance for the TIA Main Pond that is the basis of the current OMS Manual (Teck 2020) was developed by Golder based on data from 1993 to 2017. This water balance uses a spreadsheet model accounting for inflows (annual precipitation) and outflows (evaporation, evapotranspiration, and infiltration that were combined into a single term called total losses), and surface release of treated discharge. The annual equivalent precipitation was 542 mm. Net water released (treated discharge) was 28 mm, or 252,000 m^3 using the assumed watershed area of 900 ha, or about 5% of the equivalent precipitation. The total losses, including evaporation, evapotranspiration, and infiltration were calculated by difference as 514 mm.

An updated water balance and water quality model for the TIA was prepared in GoldSim and is currently in DRAFT (Barr 2021). A key component of the update is that the total contributing area to the Main Pond (within the footprint of the surrounding dykes) was revised to be about 690 ha based on updated topographic information. Of that 690 ha, about 48 ha (~7%) of the footprint is "semi-contributing" (i.e., contribute runoff flow only during large runoff or freshet events). The model was calibrated to pond level measurements, water treatment discharge rates, and to the emergency decant which occurred in May 2018. A summary of the TIA Main Pond inflows and outflows is presented in Table 3.1. The water balance is not updated annually and, therefore, the 2021/2022 climate data has not been incorporated into the values presented in Table 3.1.

Note that the water balance assumes that the East Diversion Ditch is directing non-contact water away from the TIA (Figure 2). This ditch has historically had some known restrictions such as culverts not functioning, high points, etc. Portions of the ditch were regraded in the fall of 2021 and the ditch was visually inspected during the 2022 freshet and a rain-on-snow event in May 2022. The 2021 maintenance work was effective and the ditch was flowing well and properly during freshet (Barr 2022).

Table 3.1 Summary of TIA Water Balance Flows under Current Conditions, Without Climate Change (Barr 2021)

Model Flow Path	Average Year Annual Volume	Annual Average Flow	Wet Year Annual Volume	Dry Year Annual Volume
Inflows to the TIA Main Pond				
Precipitation to the pond	0.15 Mm^3 (375 mm/yr)	410 m^3/day	0.19 Mm^3 (425 mm/yr)	0.10 Mm^3 (300 mm/yr)
Runoff from tailings	0.62 Mm^3	1,700 m^3/day	0.79 Mm^3	0.39 Mm^3
Run-on from East Drainage Area (EDA)[(1)]	0.27 Mm^3	740 m^3/day	0.33 Mm^3	0.17 Mm^3
Saturated flow from tailings	0.01 Mm^3	25 m^3/day	0.01 Mm^3	0.01 Mm^3
Total inflows to the TIA Main Pond	**1.05 Mm^3**	**2,875 m^3/day**	**1.32 Mm^3**	**0.67 Mm^3**
Outflows from the TIA Main Pond				
Evaporation	0.33 Mm^3 (655 mm/yr)	900 m^3/day	0.36 Mm^3 (645 mm/yr)	0.27 Mm^3 (665 mm/yr)
Discharge	0.56 Mm^3	1,535 m^3/day	0.80 Mm^3	0.27 Mm^3
Seepage	0.16 Mm^3	440 m^3/day	0.16 Mm^3	0.13 Mm^3
Total outflows from the TIA Main Pond	**1.05 Mm^3**	**2,875 m^3/day**	**1.32 Mm^3**	**0.67 Mm^3**

Note:
(1) Includes some runoff from the coarse tailings in the southern portion of the TIA that drain to a ditch that also collects EDA runoff.

4 SITE OBSERVATIONS FOR THE 2021-2022 REPORTING PERIOD

4.1 AFPR Visual Inspection

The annual inspection for the AFPR was conducted on June 21, 2022 and the following areas were visited:

- South Dyke
- West Dyke
- North Dyke, Main Pond Spillway and Polishing Pond Spillway
- East Dyke

Weather during the site visit transitioned between cloudy and sunny with a temperature of approximately 22°C.

Based on the site visit, the TIA was in good visual condition with no significant items of concern noted. No recommendations for maintenance were made during the site visit. Site observations were made at the areas listed above and also at the Polishing Pond Dykes and portions of the East Diversion Ditch and East Contact Water Ditch. Observations and recommendations from the site visit are summarized below, specific locations referenced are shown on Figure II-1. Selected photographs taken during the inspection are presented in Appendix II, and the TIA inspection form is presented in Appendix III.

South Dyke

- The South Dyke crest and upstream and downstream slopes were in good condition (Photo II-1 to Photo II-6).
- There was ponded water near the downstream toe of the South Dyke in various locations. The Tailings Surveillance Officer indicated these are permanent pond features (Photo II-1 and Photo II-5).
- There was no ponded water on the upstream side of the South Dyke, the tailings surface was dry. There are some areas of exposed tailings (Photo II-2).
- There were minor rills at several locations on the upstream and downstream slopes of the dyke; none requiring immediate maintenance or repair (Photo II-2 and Photo II-3).
- There is minor vegetation on the upstream and downstream slopes (Photo II-4 and Photo II-5). Any vegetation near Location 5 (Figure II-1) in excess of the criteria for removal described in the OMS Manual (Teck 2020) (trunk diameter larger than 100 mm on the South or East Dykes, or larger than 20 mm on the North or West Dykes) should be cleared.
- There was a small crest parallel crack near the eastern end of the South Dyke. The Tailings Surveillance Officer indicated cracking of this nature is typical in the spring and that these cracks self-heal.

- There is a culvert located under the access road entering at the southwest corner of the TIA. The culvert was clear but there is overgrown vegetation in the inlet area (Photo II-6). It is unclear whether this culvert has been accounted for in the flood routing assessment. If not, this will be evaluated based on the outcome of the updated flood routing assessment.

Recommendation/Action:

Evaluate the potential for toe erosion during flood routing at the southwest access road culvert (2022-04).

West Dyke

- The West Dyke crest and upstream and downstream slopes were in good condition (Photo II-7 to Photo II-12).
- Maintenance was completed at the two locations of "severe erosion" identified in the 2021 AFPR (Photo II-10 and Photo II-11). The maintenance consisted of regrading the dyke fill, and granular materials were not imported for use. There has been some washing of the fines from the repaired areas and there is minor rilling on the slope.
- Ponding was observed downstream of the toe in some areas, including two larger ponds at the north end. At the dyke toe minor seepage with red staining was observed flowing into these larger ponds (Photo II-10). The seepage water was clear.

North Dyke

- The North Dyke crest and upstream and downstream slopes were in good condition (Photo II-13 to Photo II-21). Some minor rutting of the crest and rills on the slopes, but none requiring immediate repair.
- The Main Pond was in contact with the upstream slope of the North Dyke across most of its length, apart from a ~200 m zone near the northwest corner. The riprap placed in 2021 is in good condition (Photo II-18, Photo II-19, Photo II-20).
- Ponds were observed downstream of the toe in some areas (Photo II-14, Photo II-15, Photo II-17). No active seepage was observed at the downstream toe.
- Woody debris has been piled near the corner of the North and West Dykes (Photo II-40). This debris is within the Main Pond limits during the inflow design flood and could therefore be mobilized and block the spillway.

East Dyke

- The East Dyke crest and upstream and downstream slopes were in good condition (Photo II-22).
- There is a permanent pond near the southern end and a seasonal pond near the northern end (Photo II-22).

Main Pond Spillway

- The concrete Main Pond Spillway structure appeared to be in good condition (Photo II-23, Photo II-24, Photo II-25).
- There are dead trees in the Main Pond, and it is possible that debris mobilized during an extreme flood could reduce the flow capacity of one or both spillways.

Recommendation/Action:

Develop a plan to manage debris in the pond and add to the OMS Manual (2021-05).

Polishing Pond Dykes

- The Polishing Pond Dykes were in good condition (Photo II-26 to Photo II-31).
- There has been erosion of the upstream slope of the North Dyke and along the Finger Dykes at the Polishing Pond winter water level. This erosion is not currently a major issue, but the condition of the dyke should be inspected during future site inspections and Teck may choose to repair it before the condition deteriorates as part of a best management practice.

Polishing Pond Spillway

- The concrete Polishing Pond Spillway structure appeared to be in good condition (Photo II-32 and Photo II-35).
- There was no flow in the siphons during the inspection. There was some minor flow in the gravels downstream of the spillway outlet; the seepage was clear (Photo II-35).

East Contact Water Ditch

- There was flow in the East Contact Water Ditch weir (Photo II-36).

East Diversion Ditch

- There was ponded water at the inlet to the East Diversion Ditch (Photo II-1) and flow in the northern portion of the East Diversion Ditch (Photo II-37, Photo II-38 and Photo II-39).
- There was a minor slump in the side of the repaired section of the ditch (Photo II-39) which could restrict flow if it retrogresses. This slump does not impact the TIA's ability to manage the design flood; however, Teck could consider maintenance of the ditch as a best management practice.

4.2 Pond Management

4.2.1 General Description

The Main Pond water level is managed via treatment at the Polishing Pond, and discharge through siphon lines over the Polishing Pond Spillway to the receiving environment. Treated water is released annually, during the summer months.

The water level at the Main Pond and the Polishing Pond is measured at the culvert (Figure 2) between the two ponds via a staff gauge and by a VWP installed at the same location. The staff gauge can be monitored remotely by a camera.

Teck updated the Trigger Action Response Plan (TARP) for pond management in April 2022. The updated version considers calculated flood routing water levels, historic water levels and dyke performance, annual water level forecasting based on manual snowpack measurements, active (daily) pond level monitoring, and daily precipitation forecasts. The alert water level limits defined in the TARP are shown in Figure 3.

The TARP alert level of El. 201.1 m is based on draft flood routing modeling that is currently being updated by Golder.

Recommendation/Action:

Incorporate the updated TARP into the OMS (2022-02).

4.2.2 Water Discharge Volumes

2021 Water Treatment

Water treatment was carried out at the TIA from May 6 to September 12, 2021, with a total treated volume of 1,141,030 m^3. For comparison, 383,451 m^3 of treated water was released in 2020 (Golder 2020b). The increased water treatment undertaken in 2021 was in part due to a higher Main Pond water level at the onset of freshet, compared to previous years.

2022 Water Treatment

Water treatment activities were mobilized on June 20, 2022 and discharge of treated waters began on June 30, 2022.

The predicted 2022 discharge volume is approximately 540,000 m^3 and the treatment campaign will be completed when the pond level is at El. 200.3 m. Water treatment is expected to draw down the pond to this level in August 2022.

4.2.3 Pond Management Review

Pond levels exceeded the TARP Level El. 201.1 m from May 3, 2022 to the end of the current reporting period (Figure 4). Teck followed the TARP (Figure 3), initiated daily monitoring, and started water treatment as soon as practicable. The rainfall forecast did not exceed 100 mm during this time and therefore the potential for overtopping was not considered.

The maximum pond level during the reporting period was El. 201.7 m, which is 1.8 m below the dyke crest. This meets the water license freeboard requirement of 1 m.

4.3 Instrumentation Review

There are 20 VWPs installed at several locations around the TIA as shown in Figure 5 and listed in Table 4.1. The VWPs are installed in dyke fill, natural foundation material, and tailings. Two

piezometers are dedicated to measuring the Main Pond water level; and one piezometer measures the barometric pressure. The VWPs record measurements twice per day and are connected to a remote monitoring system, enabling site personnel to review data in real time using GeoExplorer software.

Piezometer readings were downloaded on June 10, 2022 from GeoExplorer and plotted as equivalent piezometric surface elevations versus time in Appendix IV. There have been some challenges with maintaining consistency and reliability in the readings. Specifically, the VWP dataloggers lost power between November and December 2021. The disruption was likely related to the impact of below average temperatures on the batteries. In lieu of automatic recordings, manual VWP measurement readings were collected on June 16, 2022 and are included in Table 4.1 as well as in Appendix IV.

There are no alert level thresholds associated with the TIA VWPs. There is an open recommendation (2019-02) to establish alert levels for these instruments, and this will be done in conjunction with planned stability analyses of the TIA.

There are on-going efforts to review the VWP data, installation details and calculation settings in GeoExplorer.

Recommendation/Action:

> *Include a review of the status of the VWP dataloggers prior to freshet and replace batteries, as needed. Include this as regular maintenance in the OMS (2022-03).*

The following instruments have anomalous data, possibly due to malfunction or errors in recording the data.

- **PP-VWP-2018-01B**: Considered not functioning as of 2020 DSI (Golder, 2020b). Significant and instantaneous increase in pressure recorded is anomalous and unexplained.
- **PP-VWP-2018-02A, -02B**: Considered not functioning as of 2020 DSI (Golder, 2020b). Significant and instantaneous increase/decrease in pressure recorded is anomalous and unexplained.
- **PP-VWP-2018-06**: The VWP data reader appears to be malfunctioning as of Sept 30, 2020.
- **PP-VWP-2020-12**: The VWP cable was damaged by a grader in November 2021.

There is an open recommendation to troubleshoot the VWP data (2021-01). A review of the instrumentation installation details and data is currently ongoing.

Table 4.1 June 2022 Piezometer Readings

Piezometer ID	Location ID	Serial Number	Install Unit	Tip El.[4] (masl)	Equivalent Piezometric Elevation (masl)[5]	Measurement Date yyyy-mm-dd
PP-VWP-2020-11A	BH20-G-30	VW52436	Dyke Fill	198.9	200.7	2022-06-16
PP-VWP-2020-11B		VW69397	Lower Sand & Gravel	194.3	198.6	2022-06-16
PP-VWP-2020-11C		VW69396	Glacial Till	182.2	197.6	2022-06-16
PP-VWP-2020-12	Main Pond[1]	VW52445	Pond	197.4	N/A	N/A
PP-VWP-2020-13	Near BH20-G-30[2]	VW69514	Air Pressure	N/A	N/A	N/A
PP-VWP-2018-01A	BH18-B-01	VW52439	Upper Sand & Gravel	199.4	204.9	2022-06-16
PP-VWP-2018-01B		VW52429	Tailings	200.7	205.0[6]	2022-06-16
PP-VWP-2018-02A	BH18-B-02	VW52433	Upper Sand & Gravel	203.0	211.9[6]	2022-06-16
PP-VWP-2018-02B		VW52430	Tailings	204.5	205.3[6]	2022-06-16
PP-VWP-2018-03A	BH18-B-03	VW53440	Lower Sand & Gravel	192.9	202.8	2022-06-16
PP-VWP-2018-03B		VW53435	Upper Glaciolacustrine	197.3	202.9	2022-06-16
PP-VWP-2018-03C		VW53441	Tailings	198.8	203.0	2022-06-16
PP-VWP-2018-04A	BH18-B-04	VW53434	Upper Sand & Gravel	199.4	N/A	N/A
PP-VWP-2018-04B		VW53438	Tailings	200.4	202.8	2022-06-16
PP-VWP-2018-05	BH18-B-05	VW53432	Upper Glaciolacustrine	191.6	196.0	2022-06-16
PP-VWP-2018-06	BH18-B-06	VW53431	Lower Sand & Gravel	196.4	199.2	2022-06-16
PP-VWP-2018-07	BH18-G-26	VW52444	Dyke Fill	195.2	Dry[7]	2022-06-16
PP-VWP-2018-08	BH18-G-27	VW52442	Dyke Fill	200.5	Dry[7]	2022-06-16
PP-VWP-2018-09	BH18-G-31	VW52443	Dyke Fill	198.4	Dry[7]	2022-06-16
PP-VWP-2018-10	Main Pond[3]	VW42437	Pond	N/A[8]	201.6[9]	N/A

Notes:

(1) Monitors Main Pond water level at North Dyke. The instrument was damaged by a grader in November 2021.

(2) Instrument measuring barometric pressure – installed with interface in steel mount across the crest of access road from borehole BH20-G-30.

(3) Monitors Main Pond water level near Polishing Pond Internal Dyke, near the southeast corner of the Polishing Pond.

(4) VWP tip elevation based on the value reported in Golder (2020a) and Golder (2021b).

(5) VWP piezometric elevations calculated using manual data measurement based on the tip elevations recorded on the installation log, not the elevations from GeoExplorer, in the locations where different.

(6) Piezometric elevations shown indicate VWPs that are considered to be not functioning due to the record having significant and instantaneous increase/decrease in pressure recorded is anomalous and unexplained.

(7) VWPs recording negative pressures have been interpreted as dry.

(8) Tip elevation not surveyed. VWP calculations (Figure 5) use a tip elevation of 199.6 m; this has been developed by back-calculating the elevation to match the staff gauge readings.

(9) Main Pond water elevation from staff gauge reading on June 20, 2022.

The June 2022 VWP manual readings are consistent with the historic data (Appendix IV), and a preliminary review of the instrumentation data indicates the following:

- Foundation VWPs:
  - The piezometric conditions below the North Dyke do not respond to pond level fluctuations.
  - The foundation installation located 135 m north of the North Dyke (PP-VWP-2018-06) fluctuates seasonally. Due to the distance from the North Dyke, KCB interprets this to be related to regional groundwater recharge after freshet and not that it indicates a hydraulic connection with the Main Pond.
  - There is some, subdued, seasonal fluctuation of the foundation pressures under the tailings that could be related to the Main Pond water levels.
- Dyke Fill:
  - The installations in the North Dyke (PP-VWP-2018-07, PP-VWP-2018-08 and PP-VWP-2018-09) record piezometric pressures near or below the VWP tip installations, indicating the dyke shells are free draining.
  - PP-VWP-2020-11A responds to pond level. A preliminary review indicates this VWP is installed near the upstream crest of the dyke and therefore potentially installed in the dyke core.
- Tailings:
  - Two of the four tailings installations are malfunctioning.
  - The tailings installations record similar pressures to the paired foundation installations, indicating a hydraulic connection between the tailings and the foundation.

5 TAILINGS FACILITY ASSESSMENT

5.1 Failure Modes Review

KCB understands that Teck's long-term goal for all of their tailings facilities is to reach landform status, with all potential failure modes that could result in catastrophic release of tailings and/or water being either not present or having been reduced to non-credible. Teck's long-term goal for the Pine Point TIA is for all potential failure modes to be non-credible, based on extreme loading conditions, or to manage the risk to ALARP (i.e., as low as reasonably practicable) using appropriate loading conditions when it is not practicable to address extreme loading conditions.

The Pine Point TIA risk register was also reviewed by Teck and KCB in November 2021. There were no changes to the key hazards and the existing controls were adequate to manage potential failure modes.

To supplement the risk review, Teck, with support from KCB, conducted a credible catastrophic failure mode assessment in April 2022. Teck's definition of a "catastrophic" failure is one with a risk to life safety or irreversible impact to a rare or valued ecosystem, social or cultural heritage element. The assessment concluded that, based on the available information and current understanding of the site, there are no credible "catastrophic" failure scenarios for the Pine Point TIA. The assessment will be updated following the planned geotechnical and hydrotechnical design update.

The following is a summary of the controls in place at the Pine Point TIA to manage the risks associated with the key failure modes for the facility. The overtopping and slope instability failure modes are credible (though non-catastrophic), while the internal erosion failure mode is not credible for the current and historic loading conditions. Based on the observations above and the available information, Teck is managing the potential failure mechanisms for the TIA appropriately and is taking appropriate steps to address relevant data gaps.

Overtopping:

- There is a permanent Main Pond in the TIA that drains into the Polishing Pond via a culvert. The Main Pond Spillway and Polishing Pond Spillway are designed to discharge to the downstream environment to manage the risk of overtopping the TIA dykes during storms up to and including the 1/1000 year event (Golder 2021a) with 0.5 m of freeboard.
- The operational controls to prevent overtopping at the TIA include annual seasonal water treatment campaigns, pond level predictions based on site-specific snow survey monitoring, and a Trigger Action Response Plan (TARP) that identifies when to mobilize water treatment or request emergency decant based on pond level and the 7-day forecast. Site personnel measure the pond level during routine inspections, and remotely view the pond level daily via a web camera during and following freshet.
- In a high-water level, five emergency syphons are available to manage the risk of overtopping.
- The maximum pond level during the reporting period was El. 201.7 m, which is 1.8 m below the dyke crest. This meets the water license freeboard requirement of 1 m.

- The engineering controls to prevent overtopping include the two emergency spillways sized for the 1/1000-year summer storm (Golder 2021a). The flood routing and spillway capacity are in the process of being updated and will be used to evaluate and refine the TARP. The spillway capacity and freeboard limits are in the process of being updated and will be used to evaluate and refine the TARP.
- The design and operational controls in place manage storm events up to the 1/1,000-yr storm. Based on Teck's tailings governance and the risk assessment framework, the potential impacts of such an event would not be catastrophic to health and safety or the environment, nor from a community relations, reputation, legal, or financial perspective.

Internal Erosion and Piping:

- The Main Pond is adjacent to the North Dyke, and does not pond against the South Dyke, East Dyke, or West Dyke. There are limited records available for the construction of the dykes; however, historical cross sections from 1981 suggest the dykes were constructed in two zones: an upstream zone comprising stiff to very stiff clayey silt, and a downstream zone comprising dense sands with some gravel.
- The controls to prevent internal erosion consist of fill materials that are internally stable under the current loading conditions, restricting the pond to the northern portion of the facility, and active management of the pond level through annual seasonal water treatment campaigns. Teck is planning to evaluate the filter compatibility of the dyke fill based on data collected during the 2018 and 2020 site investigations.
- There were no signs of internal erosion during the annual site inspection, and the Main Pond water elevation and VWP readings indicate seasonal fluctuations but no long-term trends.
- The good performance of the TIA, with no change to the operating conditions of the Main Pond, indicates that the operational and engineering controls are adequate to prevent internal erosion and piping for the existing conditions in the facility.

Slope Instability:

- The dykes have been observed over many years since construction and no visual signs of instability have been documented, based on a review of the available records.
- The good performance of the TIA indicates the engineering controls are adequate to prevent slope instability at the TIA under the current loading conditions.
    - A stability assessment of the TIA was completed as part of the 2014 dam safety review (DSR) (SRK 2016) and indicated that the dykes met design criteria under static and pseudo-static (1/2,475 year event) loading conditions. An update of the stability analyses for the dykes is planned by KCB for Q1 2023 based on the data collected during the 2018 and 2020 site investigations which were undertaken to better characterize conditions within the dykes and foundation.

  - The 2014 slope stability analyses used a design PGA value, based on the 2010 NBCC seismic hazard calculator, of 0.019 g for the 1/1000 year event and 0.036 g for the 1/2,475 year event (SRK 2016). That analysis found that failure modes triggered by earthquakes are effectively managed for the TIA. These design PGA values are greater than those recommended by the 2015 NBCC update (NRC 2015).
- Visual observations indicate there are no significant erosion features on the crest or slopes of the dykes. The minor erosion rills observed on some of the dykes are very common for this type of facility and are not expected to rapidly develop into erosion gullies that could threaten the stability of the dykes. The upstream slope of the North Dyke is in contact with the Main Pond, and the slope is protected from erosion by riprap.
- The potential for toe erosion during flood routing to affect embankment stability should be evaluated; particularly at the spillway outlets and at the access road culvert located at the southwest corner of the facility. This will be evaluated based on the outcome of the updated flood routing assessment.
- The operational controls to prevent slope instability at the TIA include active management of pond level, monitoring of the phreatic surface in the facility as well as the three visual inspections per year of the condition of the dykes. Particular attention (daily monitoring) is paid to pond levels and piezometer data the during freshet when pond levels are at their highest. TARPs are in place to mobilize emergency decant should the pond levels exceed targets.
- The design and operational controls in place manage slope instability for the current loading conditions and for earthquakes up to the 1/2,475-yr event. Based on Teck's tailings governance and the risk assessment framework, the potential impacts of such an event would not be catastrophic to health and safety or the environment, nor from a community relations, reputation, legal, or financial perspective.

5.2 Dam Safety Review

SRK completed the last DSR on the TIA in 2014, with the site inspection conducted on July 8, 2014.

There are no requirements to complete a DSR for the Pine Point Mine TIA based on the relevant permits and licenses for the site; however, Teck do complete DSRs as part of their internal governance program for facilities that retain fluids and have a credible failure mode. The most recent DSR was completed by SRK in 2014 (SRK 2016) and recommended that the next DSR to take place not later than 2024 (SRK 2016) which is consistent with the frequency of DSRs (5 to 10 years) recommended for this type of structure in the 2019 CDA Technical Bulletin on Application of Dam Safety Guidelines to Mining Dams (CDA 2019).

5.3 Operations Maintenance and Surveillance Manual and Mine Emergency Response Plan Review

The OMS Manual was last revised in May 2020 (Teck 2020) and the Mine Emergency Response Plan (MERP) for the Pine Point Mine was last revised November 2021 (Teck 2021).

The current versions of the OMS Manual (Teck 2020) and MERP (Teck 2021) were appropriate for the condition of the facility during the reporting period. Routine review and update to both documents were in progress at the time of writing this report.

5.4 Physical Performance

Geotechnical

The TIA has performed adequately for over 55 years, and there is no record of significant deformations since operations ceased in 1988. No signs of instability were observed during the annual inspection of the dykes.

The most recent stability assessment of the TIA was conducted in 2014 as part of the DSR (SRK 2016). The stability assessment was undertaken to update the models based on more recent piezometric elevation data, changes to the earthquake design ground motions, and changes to the understanding of the stratigraphy. According to SRK, previous stability assessments were based on historical information presented in the 1981 and 2009 TIA stability assessments. Site investigations were undertaken in 2018 and 2020, and the reports were finalized on September 15, 2021. The data obtained during these investigations will be used to revise the stability assessments of the dykes.

There is an open recommendation to update the stability assessments and review the filter compatibility of the dykes (2021-03).

Hydrotechnical

The Main Pond and Polishing Pond spillways are inspected during routine inspections and are in good condition. The flow capacity of the Main Pond Spillway and Polishing Pond Spillway was assessed by Golder as part of assessing the interim freeboard limits for managing the pond during spring 2021 freshet (Golder 2021a). As noted in Section 5.1, work to update the freeboard limits and flood routing are in progress.

5.5 Operational Performance

The Pine Point Mine TIA has been closed for about 35 years and, as indicated in Section 2, the only operational requirement is for Teck to continue water treatment via the Polishing Pond. Water treatment volumes for the reporting period are discussed in Section 4.2.2.

6 CONCLUSIONS AND RECOMMENDATIONS

The Pine Point Mine TIA appears to be in good condition and there are no major concerns related to the safety of the facility. Dam safety recommendations identified during past AFPRs, and from the 2022 AFPR, are summarized in Table 6.1. The priority assigned to each recommendation are based on Teck's priority ratings:

1. A high probability or actual TIA 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 TIA 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 TIA safety issues.
4. Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks.

Table 6.1 Summary of Deficiencies and Recommendations

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Action	Priority	Recommended Deadline (Status)
Previous AFPR Recommendations Ongoing						
TIA Instrumentation	2019-02	Instrumentation installed in 2018 requires integration into OMS procedures.	Cl. 4.2 and 4.3 of OMS Manual	Establish procedures for frequency of data acquisition and review. Establish baseline readings and levels for alert and emergency response, with corresponding update of OMS Manual.	4	Deadline updated to Q2 2023 to allow time for completion of 2021-03
TIA	2020-03	Freeboard limits require update for 2019 storage curve, 2020 climate assessment, review of design criteria, and evaluation of spillway.	Cl. 2.7.3.2.3 of OMS Manual	Review flood storage capacity, water handling practices, determine capacity of spillway and update freeboard limits. Incorporate these changes in the OMS Manual.	3	Finalize report by Q4, 2022
TIA Instrumentation	2021-01	VWP anomalous readings. PP-VWP-2018-02A PP-VWP-2018-02B PP-VWP-2018-05 PP-VWP-2018-08 PP-VWP-2018-09 PP-VWP-2020-11A	None	Troubleshoot VWP calibration / data acquisition and data reduction. Assess the importance of these instruments for TIA surveillance and repair, replace or decommission faulty or damaged instruments where necessary.	4	Q3/Q4 2022 (Planned)
North Dyke	*2021-02*	*Absence of riprap on the upstream slope, resulting in erosion damage.*	*None*	*Adequately sized riprap should be placed in locations that do not have riprap protection.*	*2*	*Completed*
TIA	2021-03	Previous stability assessments were based on limited site characterization data.	None	Update stability assessments and review filter compatibility for the dykes based on the 2018 and 2020 site investigation data.	4	Q1 2023 (Planned)
TIA	*2021-04*	*Failure modes have not been evaluated to determine if they are credible.*	*None*	*Perform a credible failure modes assessment.*	*4*	*Completed*
Main Pond Spillway, Polishing Pond Spillway	2021-05	The spillways are vulnerable to blockage by woody debris.	None	Develop a plan to manage debris in the pond and add to the OMS Manual.	3	Q4 2022 (Planned)
TIA Instrumentation	2021-06	The remote camera system for monitoring the staff gauge is vulnerable to water damage during high pond levels.	None	Relocate the remote camera system to above the high-water level of the Main Pond.	4	Q3/Q4 2022 (Planned)

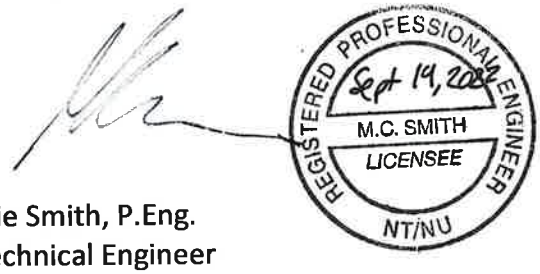
Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Action	Priority	Recommended Deadline (Status)
2022 AFPR Recommendations						
North Dyke	2022-01	No documentation of the riprap placed during the reporting period.	Section 5.7 of OMS Manual	Prepare a record document of the North Dyke riprap placement.	4	Q4 2022 (Planned)
Main Pond	2022-02	Updated TARP (2022) is not included in the current OMS.	Cl. 2.7.3.2.3 of OMS Manual	Incorporate the updated TARP into the OMS.	3	Q1 2023
TIA Instrumentation	2022-03	VWP datalogger reliability.	Cl. 4.2 and 4.3 of OMS Manual	Include a review of the status of the VWP dataloggers prior to freshet and replace batteries, as needed. Include this as regular maintenance in the OMS.	4	Q4 2022: Coincide with OMS update for 2019-02 recommendation
South Dyke	2022-04	The culvert at the southwest corner of the TIA inspected during the site visit may not have been accounted for in the flood routing assessment.	None	Evaluate the potential for toe erosion during flood routing at the southwest access road culvert.	4	Q4 2023

7 CLOSING

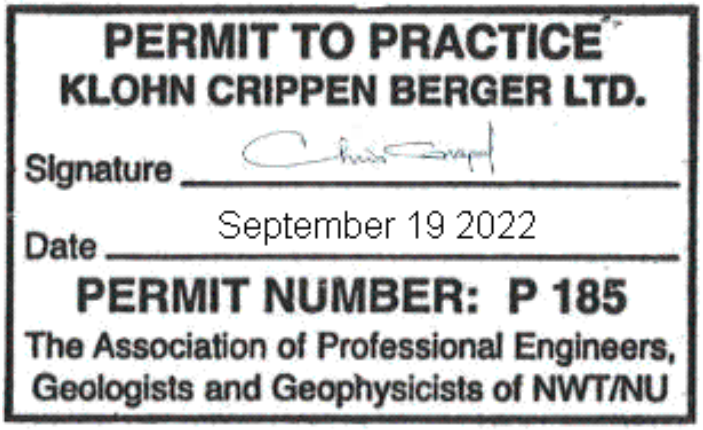
We thank you for the opportunity to work on this project. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

KLOHN CRIPPEN BERGER LTD.



Maggie Smith, P.Eng.
Geotechnical Engineer



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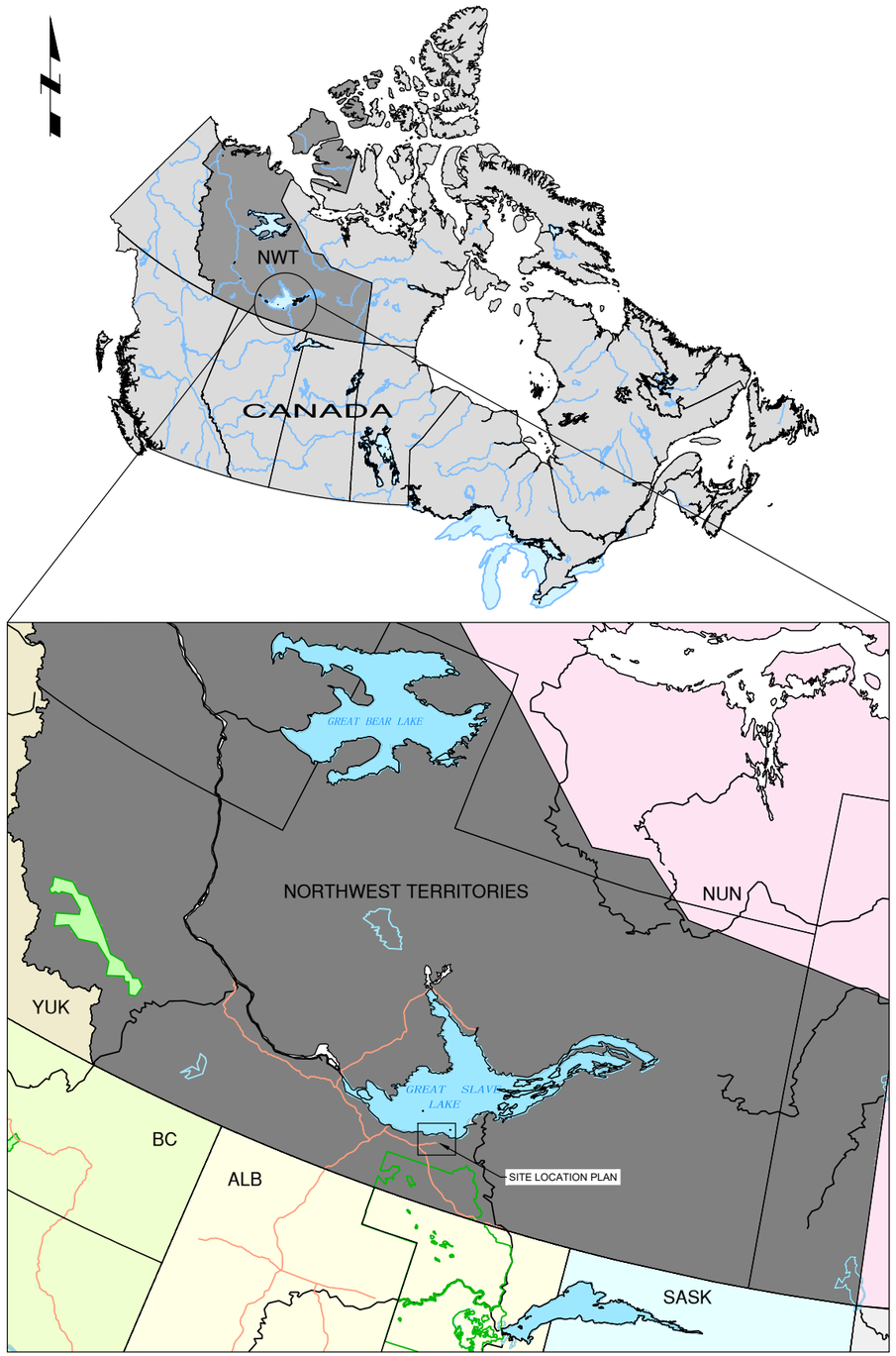
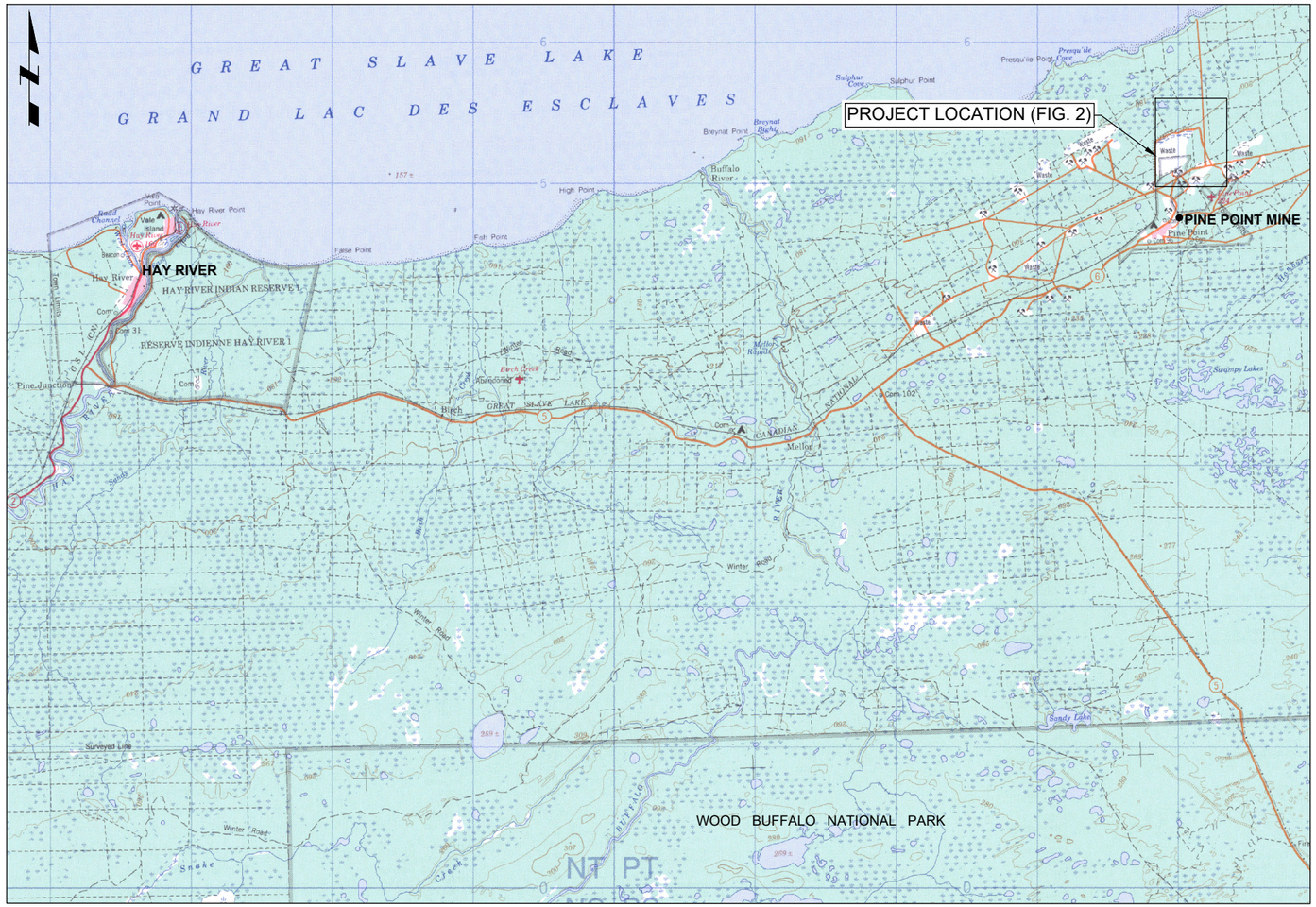
FIGURES

Figure 1 Site Location Plan
Figure 2 Site Layout Tailings Impoundment Area
Figure 3 TARP Pond Level Management
Figure 4 Historic and Current Pond Levels
Figure 5 Instrumentation and Monitoring Well Plan



INSET MAP
NOT TO SCALE



SITE LOCATION PLAN
SCALE A

NOTE

1. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE REPORT: PINE POINT MINE TAILINGS IMPOUNDMENT AREA, 2022 ANNUAL SUMMARY OF TAILINGS FACILITY PERFORMANCE

REFERENCES

1. TOPOGRAPHIC MAP OBTAINED FROM NATURAL RESOURCES CANADA
2. PROJECTION: TRANSVERSE MERCATOR. DATUM: NAD83 (CSRS), COORDINATE SYSTEM: UTM ZONE 11N

LEGEND

- ROAD
- RIVER
- WATER BODY
- NATIONAL PARK

SCALE A 0 10 km

CLIENT: Teck

Klohn Crippen Berger

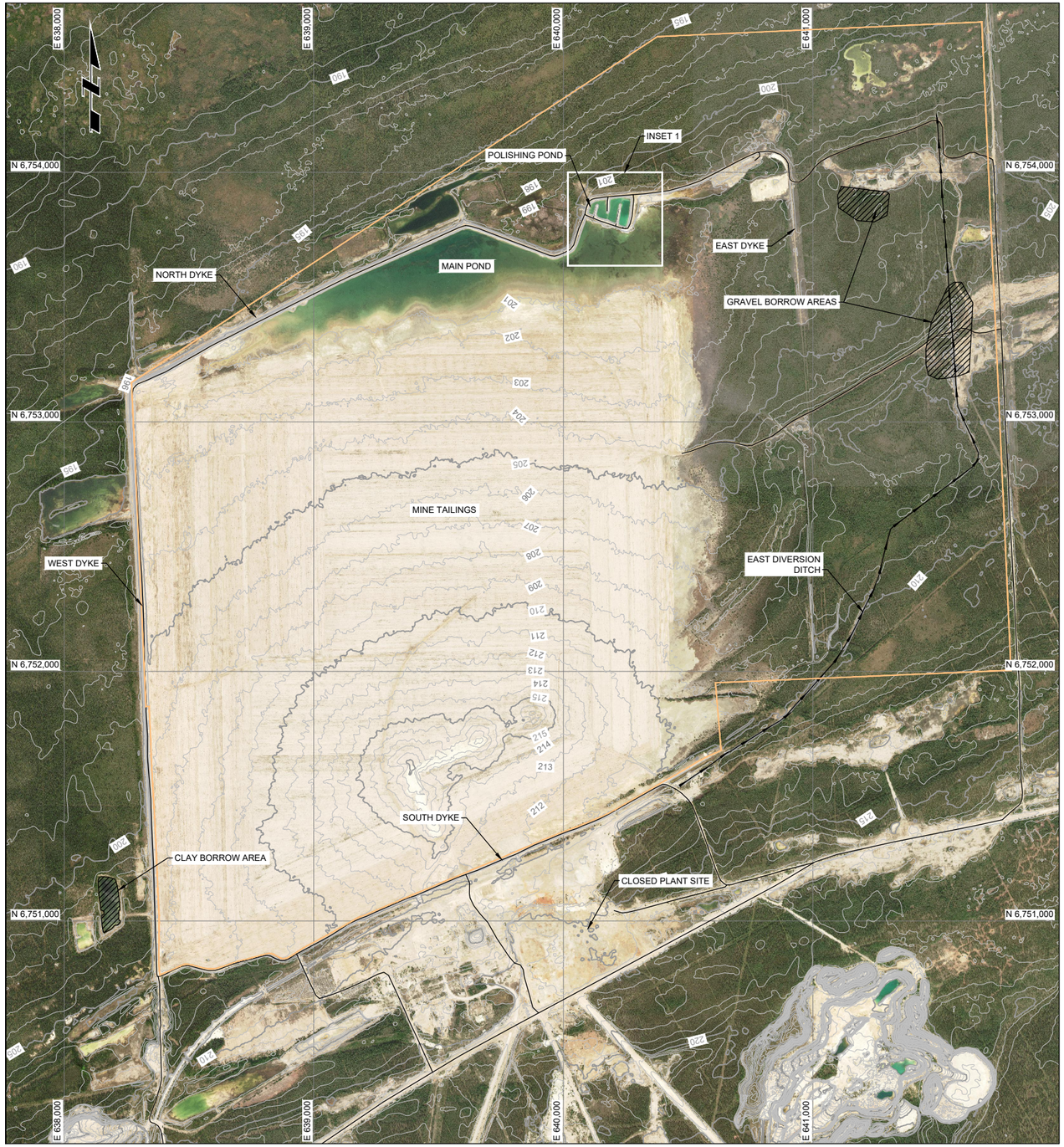
PROJECT: PINE POINT MINE TAILINGS IMPOUNDMENT AREA
2022 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: SITE LOCATION PLAN

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M10397A02	1

KCB-FIG-0-L

SAVE DATE: 2022-07-07 (5:02 PM)
FILE PATH: Z:\M\VC\RM\10397A02-TML-PINE POINT 2022 DAM SAFETY\400 DRAWINGS\CAD\05-FIGURES\M10397A02 - FIG 1 - SITE LOCATION PLAN.DWG (HYANG)



SITE PLAN
SCALE A

INSET 1 : POLISHING POND PLAN
SCALE B

NOTES
1. ALL UNITS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
2. GRID IS DISPLAYED IN UTM NAD83, ZONE11. ELEVATIONS SHOWN IN METRES.
3. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE REPORT:
   PINE POINT MINE TAILINGS IMPOUNDMENT AREA,
   2022 ANNUAL SUMMARY OF TAILINGS FACILITY PERFORMANCE

REFERENCES
1. SURFACE LEASE BOUNDARY OBTAINED FROM TECK METALS LTD.
   TYPE A LAND USE PERMIT MV2019X0006. RECEIVED: 16 JUNE 2021.
   FILE NAME: PP_Leases2021.shp.
2. IMPOUNDMENT AREA TOPOGRAPHIC AND ORTHOPHOTO DATA OBTAINED
   FROM TECK METALS LTD.
   FILE NAME: PinePoint_2019_1m_contours.dwg
   pine_point_wo4077_ortho_tile01-09.zip

LEGEND
- PINE POINT MINE SURFACE LEASE BOUNDARY
- TAILINGS IMPOUNDMENT AREA ACCESS ROAD
- MAJOR TOPOGRAPHIC CONTOUR (INTERVAL= 5m)
- MINOR TOPOGRAPHIC CONTOUR (INTERVAL = 1m)
- EAST DIVERSION DITCH
- EXISTING BORROW AREA

SCALE B 0 50 m

SCALE A 0 500 m

CLIENT: Teck

Klohn Crippen Berger

PROJECT
PINE POINT MINE TAILINGS IMPOUNDMENT AREA
2022 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE
SITE LAYOUT
TAILINGS IMPOUNDMENT AREA

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M10397A02	2

KCB-FIG-D-L

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Monitor, forecast and storm watch.

Level >= 201.1 m?

No

Yes

7 days forecast with rainfall >=100 mm?

Yes

No

Based on pond level, weather forecast, can the TIA pass the expected strom without overtopping?

Overtopping not expected

Overtopping expected

Low Level A: Holding pattern - start water treatment as soon as practical; dyke inspection, continue to monitor the the water level and forecast; get authorize emergency decant inplace; get equipment and people ready for emergency discharge

If conditions deteriorate and that ovetopping is expected

Medium Level A: lower the water to an acceptable level to prepare for the strom using both water treatment and emergency discharge

Level >=201.1 m but <201.9 m?

Yes

Start water treatment as soon as practical

No

Level >=201.9 m but < 202.4 m?

Yes

No

Is the level trending upward or downward based on pond level forecast, weather forecast and site conditions?

Steady and trending to lower level

Trending to higher level

Low Level B: Holding pattern - start water treatment immediately; dyke inspection, continue to monitor the the water level and forecast; get authorize emergency decant inplace; get equipment and people ready for emergency discharge

If conditions deteriorate and water trending toward higher level, or when water level above 202.0 m and is evaluated by EOR as the geotechnical stability issues

Medium Level B: lower the water to <201.9 m (or as determined based on available information) by emergency discharge

Level >=202.4 m but <202.9 m and TIA safety issues are not expected

Yes

No,TIA safety issue is expected

Medium Level C: Pull back water treatment personnel

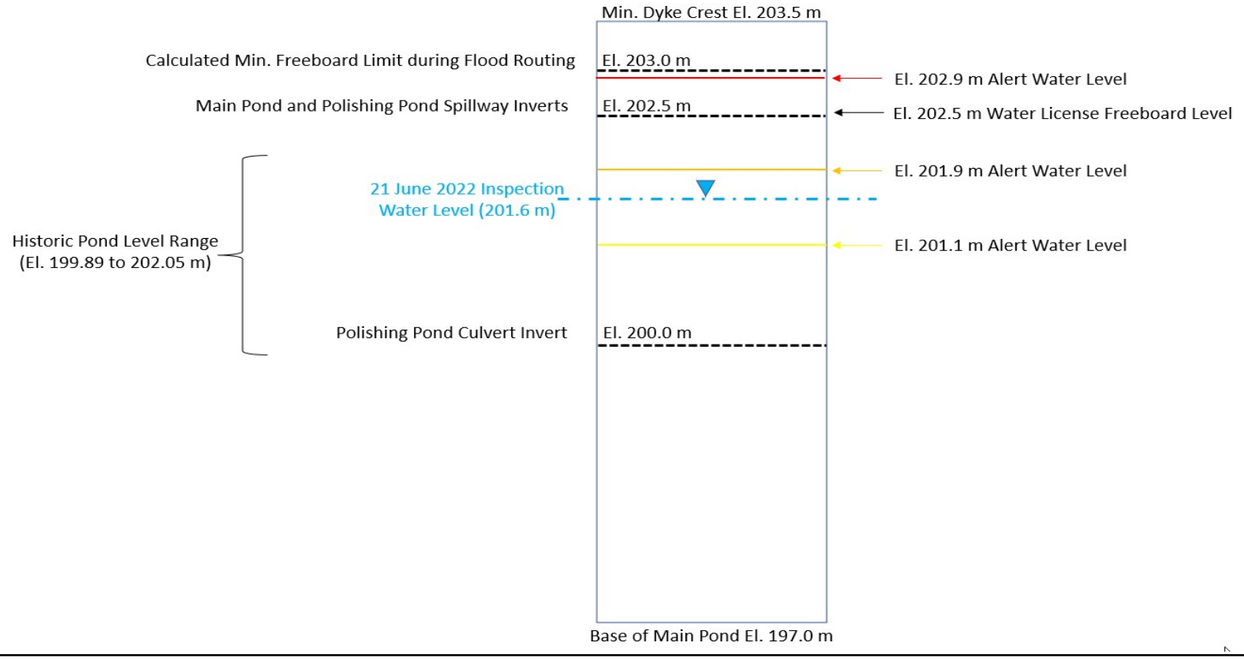
High Level - Activate Incident Command

Normal

Low

Medium

High



CLIENT: Teck

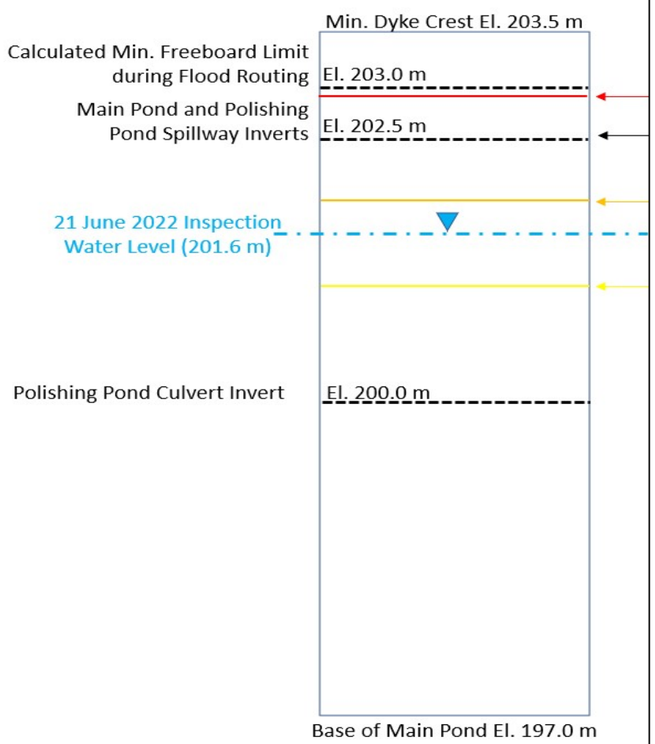
Klohn Crippen Berger

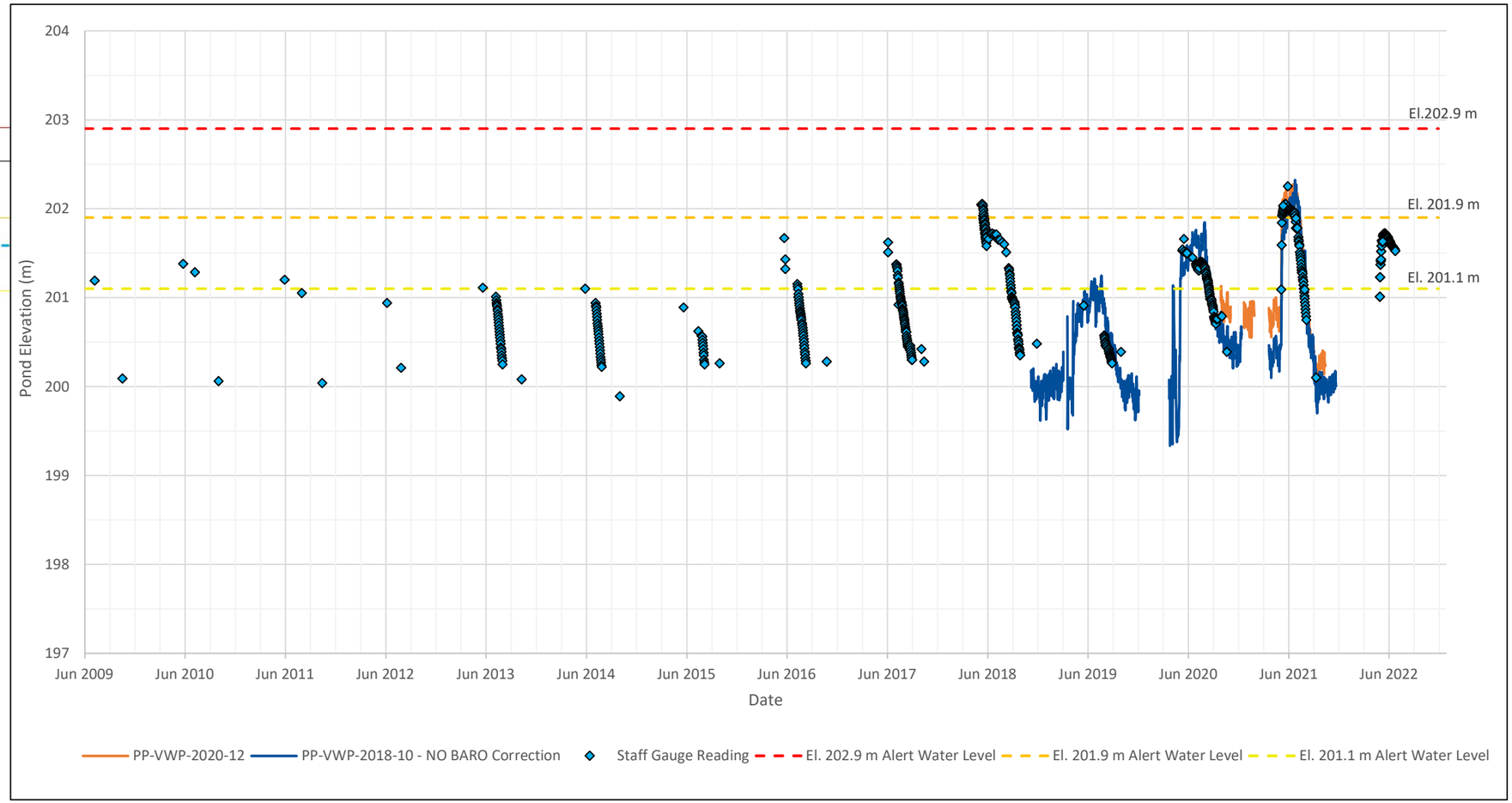
PROJECT: PINE POINT MINE TAILINGS IMPOUNDMENT AREA
2022 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: TARP POND LEVEL MANAGEMENT

PROJECT No. M10397A02

FIG No. 3





INSTRUMENTATION NOTES:

-Instrument PP-VWP-2018-10: Tip elevation unconfirmed. Readings presented in this figure use a tip elevation of 199.6 m.

-Instrument PP-VWP-2020-12: Tip elevation at El. 197.4 m. VWP was damaged by grader, last available reading was on November 04, 2021.

NOTES:

IMAGERY DATA SOURCE: ESRI
DATA PROJECTION: NAD83, ZONE 11N

VWP PIEZOMETRIC ELEVATIONS CALCULATED USING THE TIP ELEVATIONS RECORDED ON THE INSTALLATION LOG, NOT THE ELEVATIONS FROM GEOEXPLORER, IN THE LOCATIONS WHERE DIFFERENT.

CLIENT: Teck

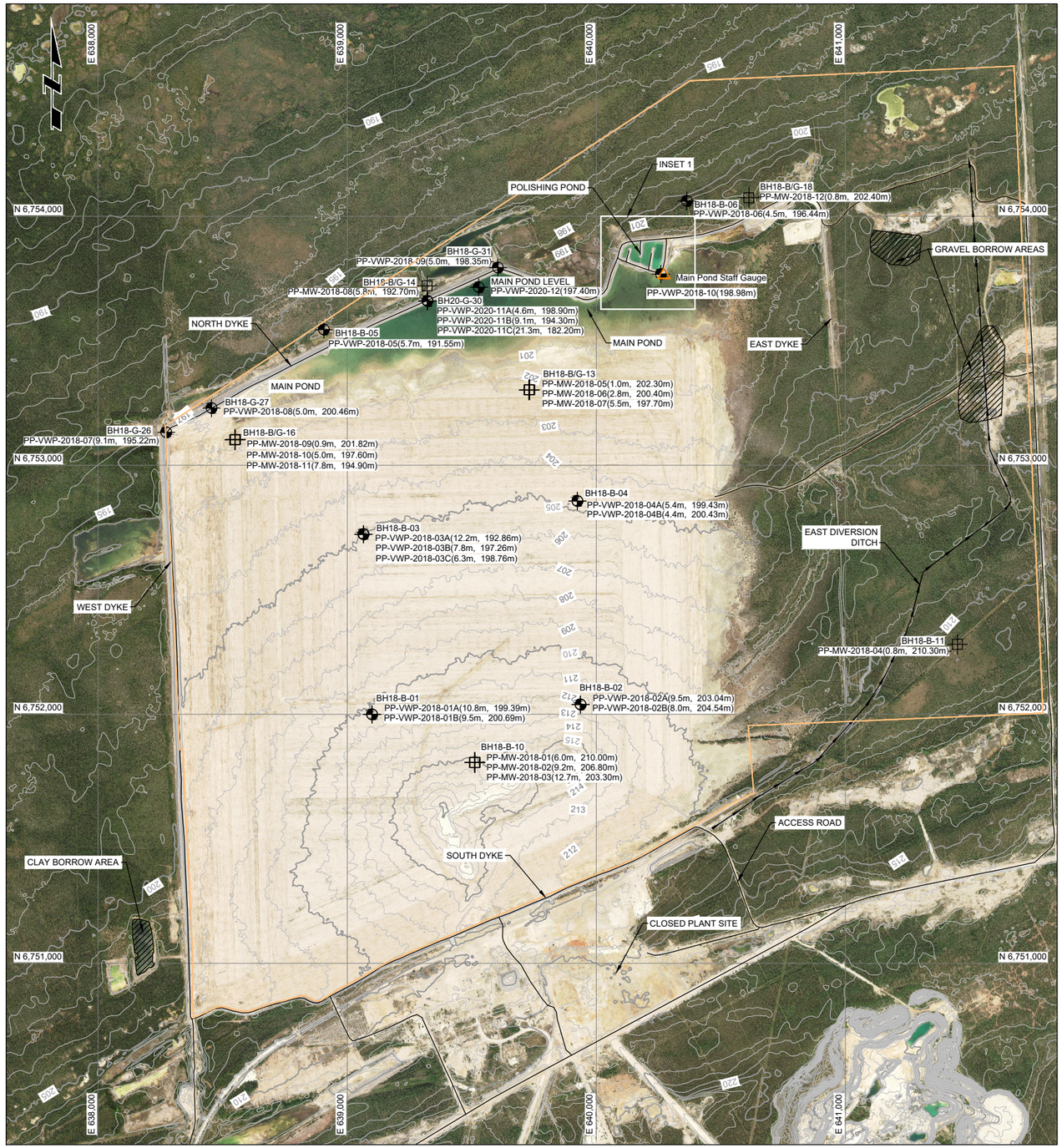
Klohn Crippen Berger

PROJECT: PINE POINT MINE TAILINGS IMPOUNDMENT AREA
2022 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: HISTORIC AND CURRENT POND LEVELS

PROJECT No.: M10397A02

FIG No.: 4



SITE PLAN
SCALE A

INSET 1 : POLISHING POND PLAN
SCALE B

PIEZOMETER INSTALL
PP-VWP-2018-02A(8.0m, 202.12m)
PINE POINT — YEAR — (DEPTH OF TIP m, ELEVATION OF TIP m)
VIBRATING WIRE PIEZOMETER — NUMBER

MONITORING WELL INSTALL
PP-MW-2018-02(6.0m, 198.12m)
PINE POINT — YEAR — (DEPTH TO TOP OF SCREEN m, ELEVATION OF TOP OF SCREEN m)
MONITORING WELL — NUMBER

SCALE B 0 50 m
SCALE A 0 500 m

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
2. GRID IS DISPLAYED IN UTM NAD83, ZONE11. ELEVATIONS SHOWN IN METRES.
3. THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE REPORT:
   PINE POINT MINE TAILINGS IMPOUNDMENT AREA,
   2022 ANNUAL SUMMARY OF TAILINGS FACILITY PERFORMANCE

REFERENCES

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   TYPE A LAND USE PERMIT MV2019X0006. RECEIVED: 16 JUNE 2021.
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   FILE NAME: PinePoint_2019_1m_contours.dwg
   pine_point_wo4077_ortho_tile01-09.zip

LEGEND

- PINE POINT MINE SURFACE LEASE BOUNDARY
- TAILINGS IMPOUNDMENT AREA ACCESS ROAD
- MAJOR TOPOGRAPHIC CONTOUR (INTERVAL= 5m)
- MINOR TOPOGRAPHIC CONTOUR (INTERVAL = 1m)
- EAST DIVERSION DITCH
- EXISTING BORROW AREA
- EXISTING VIBRATING WIRE PIEZOMETER
- EXISTING MONITORING WELL
- STAFF GAUGE

CLIENT: Teck

Klohn Crippen Berger

PROJECT: PINE POINT MINE TAILINGS IMPOUNDMENT AREA
2022 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: INSTRUMENTATION AND MONITORING WELL PLAN

SCALE	PROJECT No.	FIG. No.
AS SHOWN	M10397A02	5

KCB-FIG-01-L

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APPENDIX I

Facility Data Sheet

Appendix I
Facility Data Sheet

TAILINGS IMPOUNDMENT AREA PHYSICAL DESCRIPTION

Tailings Impoundment Area (including dykes)	Approximately 7,000,000 m^2
Tailings quantity impounded	Approximately 50,000,000 to 60,000,000 tonnes
Main Pond Capacity (to invert of spillway El. 202.5)	Approximately 1,740,000 m^3
Main Pond Spillway Capacity	Unknown
Polishing Pond Spillway Capacity	Unknown
Catchment Area	Approximately 14.9 km^2

DYKE PHYSICAL DESCRIPTION

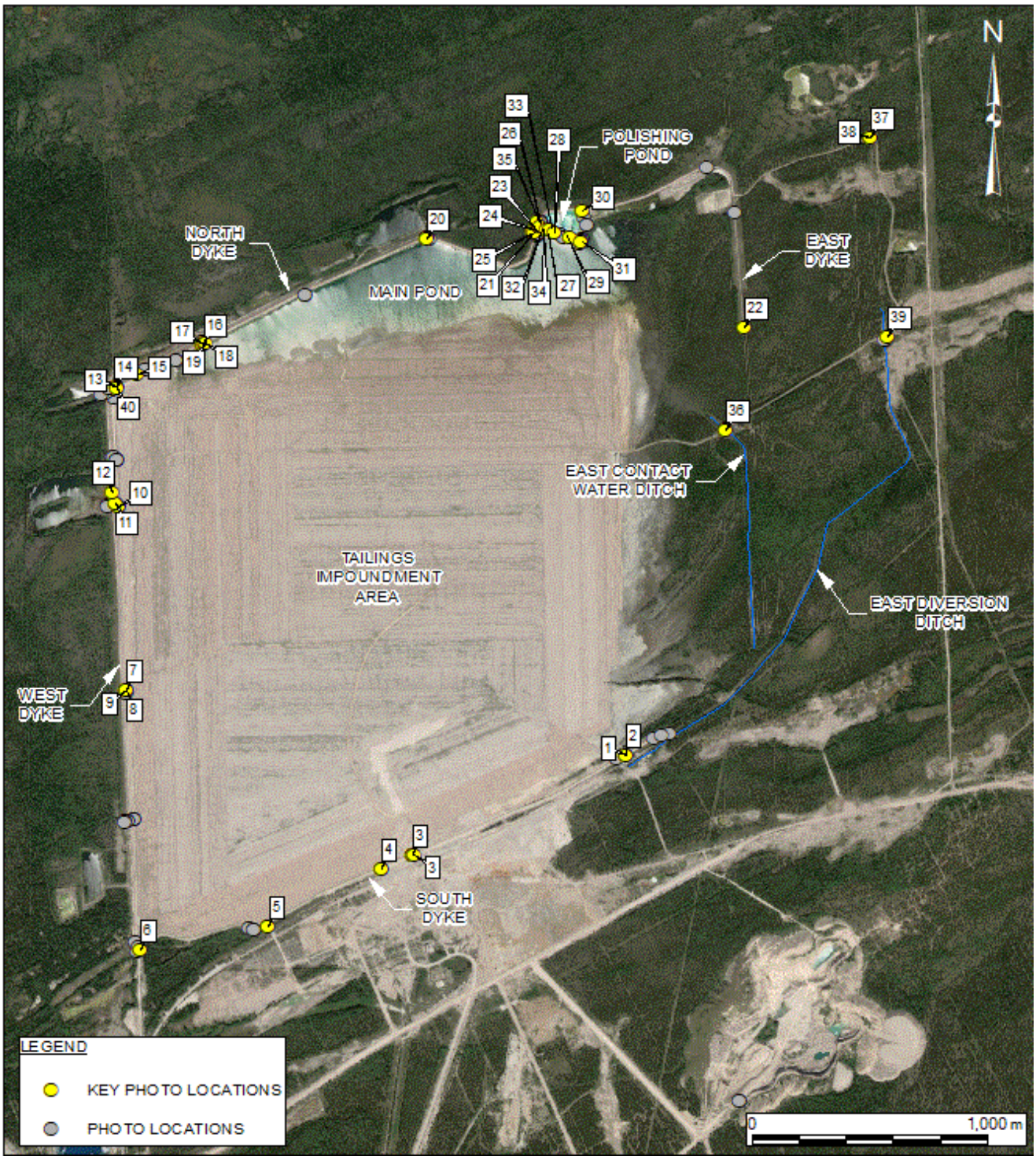
	North Dyke	West Dyke	East Dyke	South Dyke
Embankment Type	Earthfill			
Embankment Height (m)	1.5 to 9	4 to 9	1 to 2	0 to 4
Embankment Length (m)	3,010	2,310	628	2,480
Embankment Crest Width (m)	8	9	6.5	5
Embankment Downstream Slope Gradient	1.5 to 2H : 1V	1.5 to 2H : 1V	1.5H: 1V	1.75 to 2H : 1V
Embankment Upstream Slope Gradient	1.5H : 1V			

APPENDIX II

June 2022 Photographs

Appendix II
June 2022 Photographs

Figure II-1 Inspection Observation/Photo Locations



South Dyke

Photo II-1 South Dyke – looking southwest, permanent pond at downstream toe

Photo II-2 South Dyke – looking east, minor rills on upstream slope, exposed tailings

Photo II-3 South Dyke – looking east, rutting on crest and rills on downstream slope

Photo II-4 South Dyke – looking west at the downstream slope

Photo II-5 South Dyke – looking southeast, vegetation on downstream slope and permanent pond at toe

Photo II-6 South Dyke – looking east, culvert inlet at southwest access road

West Dyke

Photo II-7 West Dyke – looking north

Photo II-8 West Dyke – looking southwest at the downstream slope

Photo II-9 West Dyke – looking south-southeast at the upstream crest and tailings surface

Photo II-10 West Dyke – looking west at the permanent pond downstream

Photo II-11 West Dyke – looking south at an area of 2021 maintenance that saw some minor rill erosion during the 2022 spring melt

Photo II-12 West Dyke – looking north at the downstream slope

North Dyke

Photo II-13 North Dyke – looking east, some rutting on dyke crest

Photo II-14 North Dyke – looking east at the downstream slope and permanent pond at toe

Photo II-15 North Dyke – looking east at the downstream slope

Photo II-16 North Dyke – looking east at the downstream slope

Photo II-17 North Dyke – looking west at the downstream slope and permanent pond

Photo II-18 North Dyke – looking west at the downstream slope where riprap was placed in 2021

Photo II-19 North Dyke – looking south at the 2021 riprap and the trees in the pond

Photo II-20 North Dyke – looking east at the upstream slope and 2021 riprap installation

Photo II-21 North Dyke – looking southwest at the downstream slope

East Dyke

Photo II-22 East Dyke – looking north at the downstream slope and at the permanent pond located at the downstream toe

Main Pond Spillway

Photo II-23 Mail Pond Spillway – looking north at the spillway outlet

Photo II-24 Main Pond Spillway – looking at the inlet to see the height of the clay plug upstream of the concrete wall

Photo II-25 Main Pond Spillway – looking south into the spillway and at the material at the outlet

Polishing Pond

Photo II-26 Polishing Pond – looking south; some wave erosion at the winter pond level

Photo II-27 Polishing Pond – looking northeast at the northern finger dyke

Photo II-28 Polishing Pond – looking east at the middle finger dyke and a silt fence

Photo II-29 Polishing Pond – looking east at the southern finger dyke and silt fences

Photo II-30 Polishing Pond – looking north at the toe of the North Dyke; erosion at the winter water level. Note: photo taken June 22 and Polishing Pond water level was lowered by approx. 0.5 m as the water treatment started on June 21

Photo II-31 Polishing Pond – looking south at the culvert inlet

Polishing Pond Spillway

Photo II-32 Polishing Pond Spillway – looking at the inlet

Photo II-33 Polishing Pond Spillway – looking north at the inlet

Photo II-34 Polishing Pond Spillway – looking north at the outlet

Photo II-35 Polishing Pond Spillway – looking at the outlet

East Contact Water Ditch

Photo II-36 East Contact Water Ditch – looking south at the weir

East Diversion Ditch

Photo II-37 East Diversion Ditch – looking north

Photo II-38 East Diversion Ditch – looking south

Photo II-39 East Diversion Ditch – looking north at a section of 2021 maintenance

Miscellaneous

Photo II-40 Looking southeast at the debris piles

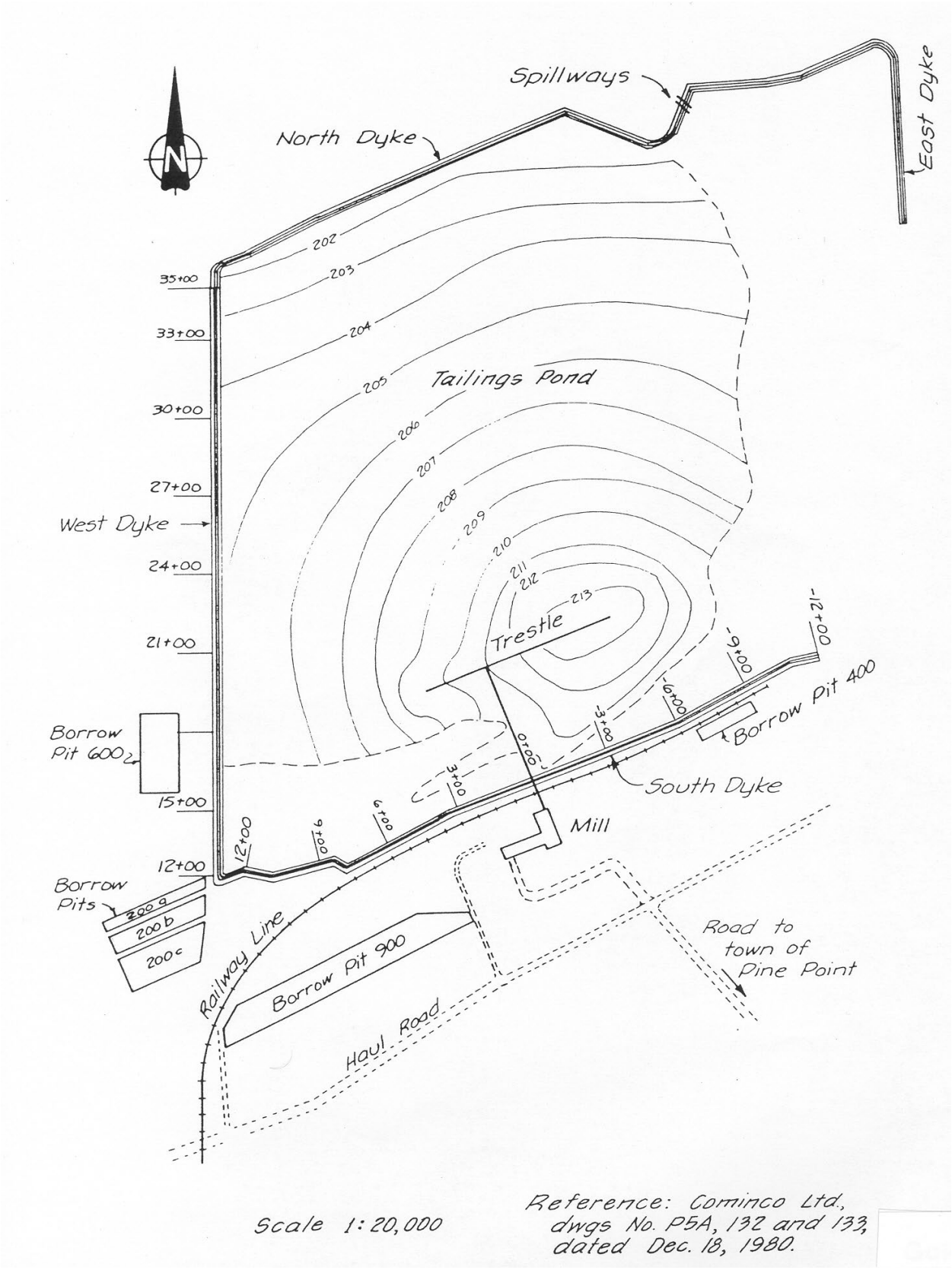
APPENDIX III

Inspection Forms

Inspection Forms

Date: June 21, 2022		Inspected By: Maggie Smith P.Eng., and Daniel Klassen, P.Eng.
Weather: Cloudy and sunny, approximately 22 °C		
Tailings Pond Information:		
Pond Elevation: 201.60 m		Operating Limits: Alert 201.1 m, 201.9 and 202.9 m.
Crest Elevation: 203.50 m		Freeboard: 1.9 m.
Dyke Inspection Check List (✓ = checked and no problems; x = not checked)		
Check: Upstream Slope of Dyke, Crest and Downstream Slope of Dyke		
South Dyke	**Checked**	**Comment**
Ponded Water	✓	Ponds downstream at approx. -9+00 and +8+00. U/S dry.
Erosion	✓	Downstream slope has minor rills near 0+00. Some minor rutting on the crest in various locations.
Settlement/Depressions	✓	No settlement observed.
Cracks/Movement	✓	Crest parallel crack near -8+00, Tailings Surveillance Officer says these are typical cracks that self-heal.
Debris: on upstream side.	✓	None.
Vegetation	✓	Minor vegetation on downstream and upstream slopes. Vegetation on the downstream slope around +8+00. Any vegetation in excess of 100 mm diameter should be cleared, as per the OMS.
Other – (photos)		
Notes:		
West Dyke		
Ponded Water	✓	Large ponds in old borrow pits at toe near +30+000 and +35+000.
Erosion	✓	Minor rills on downstream slope at a few locations. The 2021 rill/erosion maintenance areas on the downstream slope has seen minor washout of fines.
Settlement/Depressions (on dam crest)	✓	None.
Sinkholes	✓	None.
Cracks/Movement	✓	None.
Debris	✓	Wood debris has been piled on the tailings near 36+00.
Vegetation	✓	Sparse, minor vegetation on upstream and downstream slopes.
Other – (photos)	✓	
Notes:		

North Dyke	Checked	Comment
Ponded Water	✓	Main Pond begins approx. 200 m east of NW corner, continues across most of north dyke. Ponds downstream of toe in old borrow pits.
Erosion	✓	Minor rilling and erosion of fines from 2021 rill maintenance areas.
Settlement/Depressions	✓	None.
Sinkholes	✓	None.
Cracks/Movement	✓	Crest parallel crack near apex of dogleg. Tailings Surveillance Officer says this is typical and self heals.
Debris	✓	Woody debris along upstream slope at pond high water level.
Vegetation	✓	Minor vegetation on upstream and downstream slopes.
Main Pond Spillway	✓	Small ponds at spillway outlet.
Treatment Spillway	✓	Small pond at spillway outlet and evidence of some flow. Clear water.
Other – (photos)		
Notes:		
East Dyke		
Ponded Water	✓	Pond upstream at southern end.
Erosion	✓	None.
Settlement/Depressions	✓	None.
Sinkholes	✓	None.
Cracks/Movement	✓	None.
Debris	✓	None.
Vegetation	✓	More vegetation than other dykes, both U/S and D/S. Some trunks > 20 mm in diameter.
Other – (photos)		
Notes:		


Spillways
East Dyke
North Dyke
N
202
203
204
205
Tailings Pond
206
207
208
209
210
211
212
213
Trestle
35+00
33+00
30+00
27+00
West Dyke
24+00
21+00
15+00
12+00
Borrow Pit 600
Borrow Pits
200a
200b
200c
-12+00
-9+00
-6+00
-3+00
0+00
3+00
6+00
9+00
12+00
Borrow Pit 400
South Dyke
Mill
Railway Line
Borrow Pit 900
Haul Road
Road to town of Pine Point
Scale 1:20,000
Reference: Cominco Ltd., dwgs No. P5A, 132 and 133, dated Dec. 18, 1980.

Tailings Impoundment Inspection
Explanation of Details

Ponded Water:

Look for pools of water against the inside or outside slopes of the Dyke structure. The pooled water is a potential source of water to erode the dyke and therefore the presence of any water must be recorded. Ideally the GPS location should be noted in the comments area.

Another aspect of pooled water is that it may be a source of seepage water at the outside toe of the dyke therefore where pooled water is observed look for increased seepage at the toe. The presence of water at the dyke face can be an indication of increased water levels within the dyke which can decrease Dyke stability.

Erosion:

The presence of small rills, up to 0.3m deep, on the downstream face of the dyke are normal and of no concern. If the rills start eroding into channels greater than 0.3 m and are cutting into the crest more than 0.5 m then the rills must be filled to prevent further progress.

Erosion can also be caused by wave action on the pooled water. Erosion has been occurring on the inside slope of the North Dyke and will soon require placement of material to armor the dyke face. Erosion into the till core must be prevented therefore any excessive erosion must be reported. Ideally record the GPS location so the area can be found on future inspections.

Settlement/Depressions:

Settlement or depressions in the crest or slopes indicate groundwater erosion of the interior of the dyke. Look for any visible seepage at the toe of the dyke. This is a very serious problem and it must be investigated by a professional.

Ideally record the GPS location so the depression can be easily found.

Sinkholes:

Sinkholes are localized deep depressions and are another indication of interior erosion of the dyke. This is a very serious problem and it must be investigated by a professional.

Ideally record the GPS location so the depression can be easily found.

Cracks/Movement:

Cracks accompanied by movement are an indication of a dyke failure and material would probably be seen flowing from the toe of the dyke. This is a very serious situation which must be reported immediately and be investigated by a professional. Ideally record the GPS location so the area can be easily found.

Debris:

Accumulation of debris on the dyke can prevent inspection of the dyke and should be removed.

Vegetation:

Small vegetation on the slopes of the dykes is good to minimize surface erosion. Larger vegetation hinders inspections of the dyke and can damage the dyke if root systems penetrate the till core or large root systems are ripped out by the wind. Therefore any trees on the dyke slopes over 1” diameter should be removed.

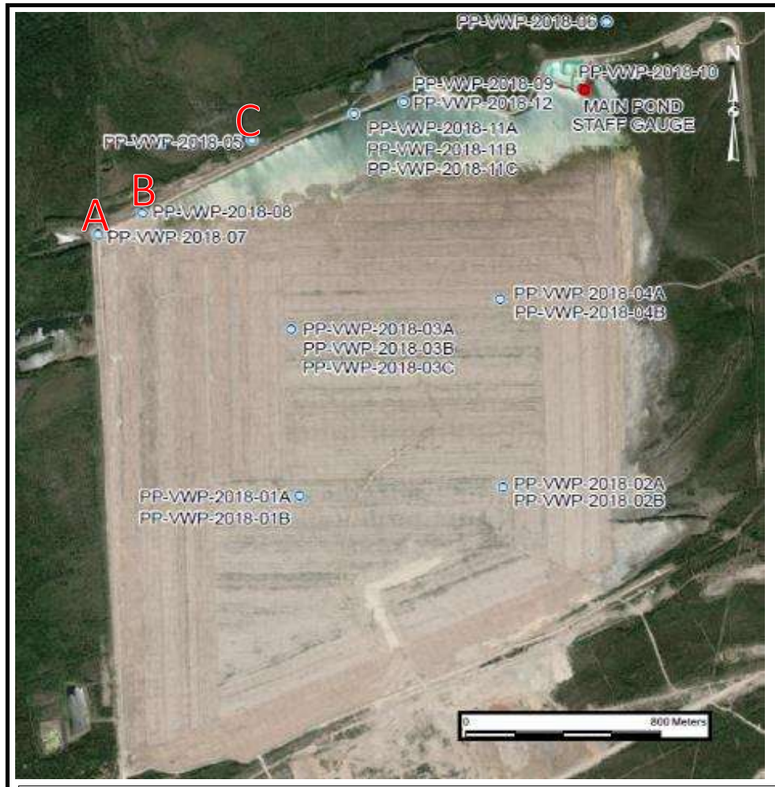
Photos:

A log of photos should be maintained.

Locations of key photos should be noted so future photos are taken from the same spot of area looking at the same feature.

APPENDIX IV

Vibrating Wire Piezometer Plots



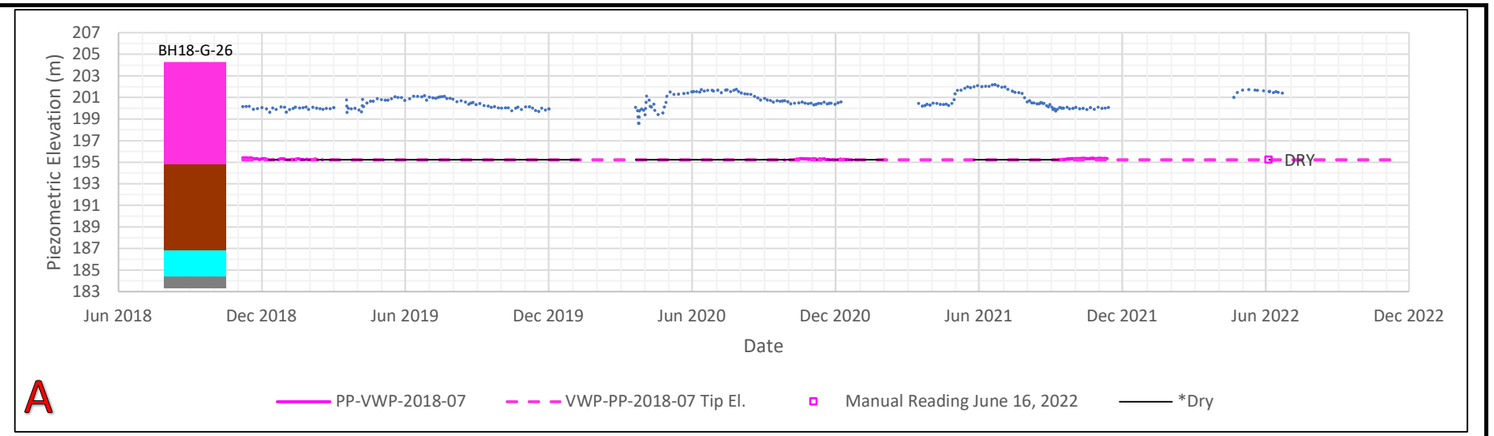
INSTRUMENTATION NOTES:

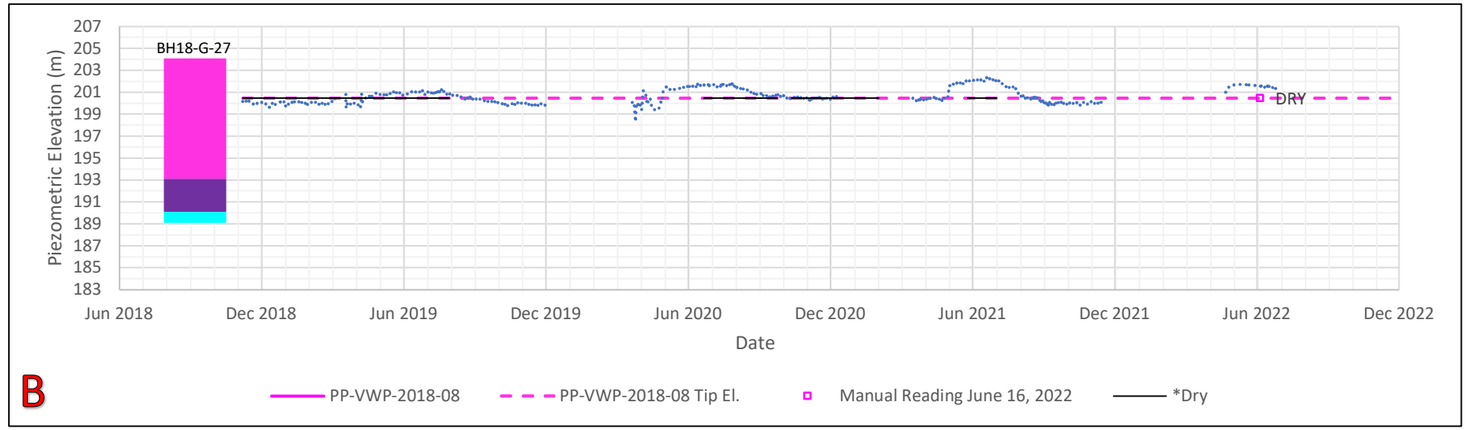
A -Instrument PP-VWP-2018-07: Pressure head readings fluctuate both positive and negative indicating the piezometric surface is near the tip elevation of the instrument.

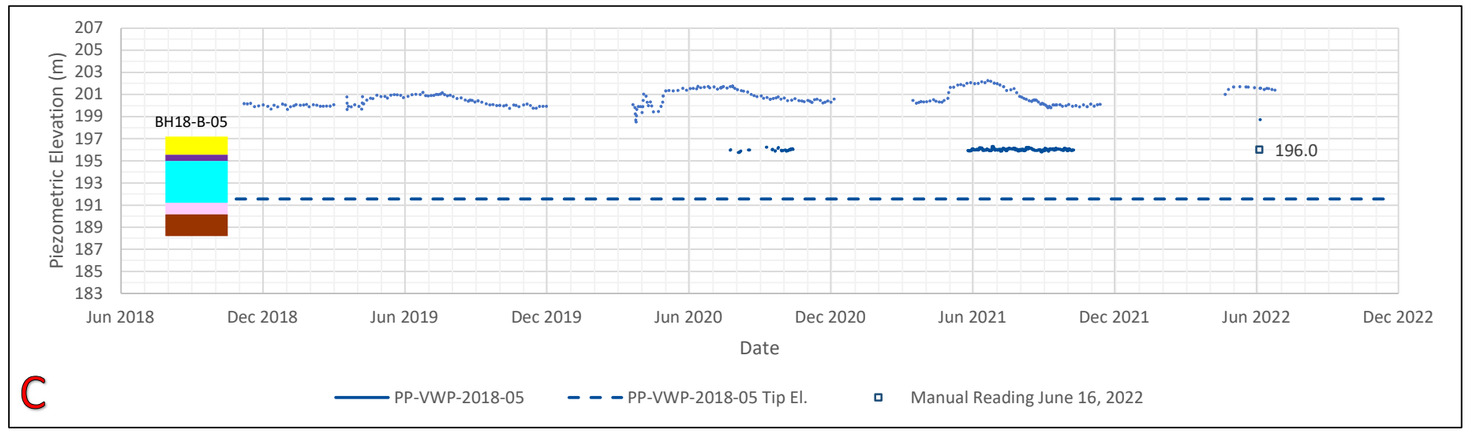
B -Instrument PP-VWP-2018-08: Pressure head readings are consistently negative indicating the piezometric surface is below the tip elevation of the instrument.

C -Instrument PP-VWP-2018-05: No observations of note.

* VWP readings indicate piezometric level below the VWP tip.







LEGEND

- MAIN POND WATER LEVEL
- VWP RECORDINGS
- VWP TIP
- MANUAL VWP RECORDINGS

VWP TIP INSTALL STRATA

- DYKE FILL
- TAILINGS
- FOUNDATION
- FOUNDATION

STICKLOG OF BH WHICH VWP IS INSTALLED

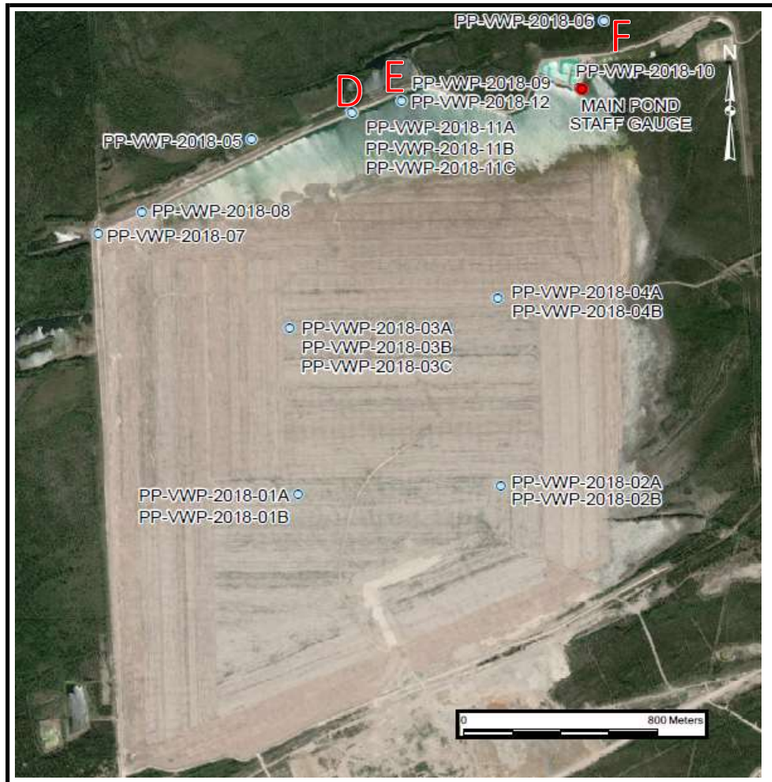
- DYKE FILL
- TAILINGS
- PEAT
- UPPER SAND & GRAVEL
- UPPER GLACIOLACUSTRINE
- LOWER SAND & GRAVEL
- LOWER GLACIOLACUSTRINE
- GLACIAL TILL

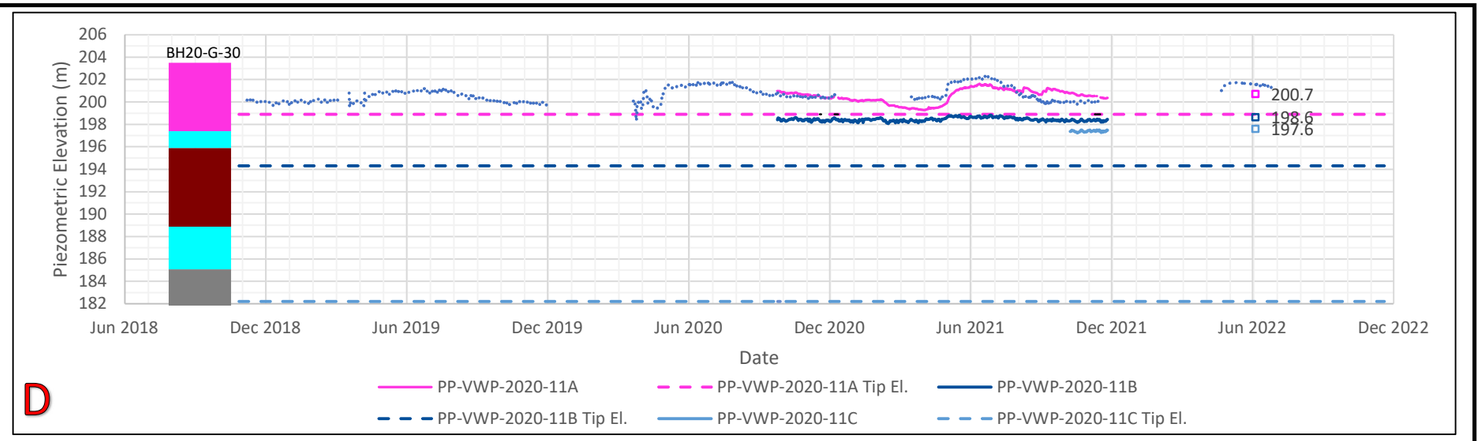
NOTES:

IMAGERY DATA SOURCE: ESRI
DATA PROJECTION: NAD83, ZONE 11N

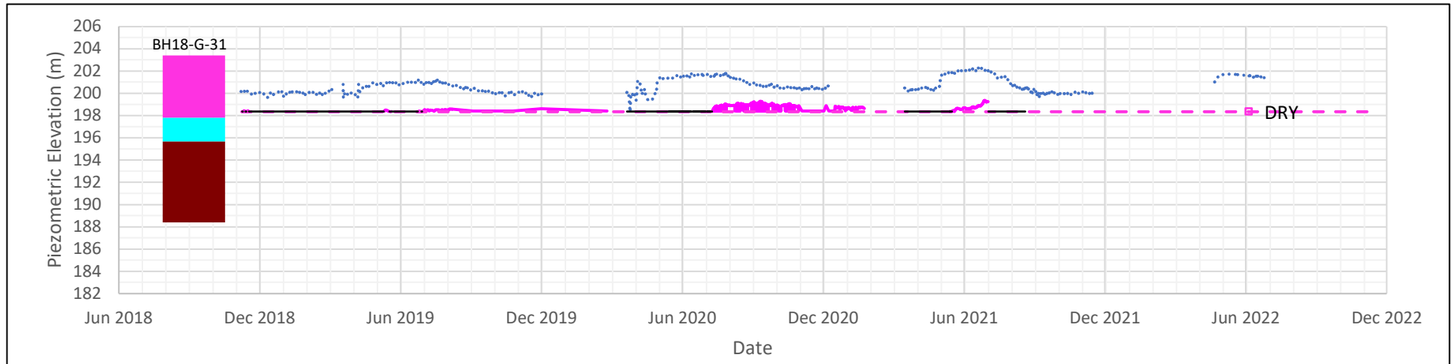
VWP PIEZOMETRIC ELEVATIONS CALCULATED USING THE TIP ELEVATIONS RECORDED ON THE INSTALLATION LOG, NOT THE ELEVATIONS FROM GEOEXPLORER, IN THE LOCATIONS WHERE DIFFERENT.

FIG No. IV-1

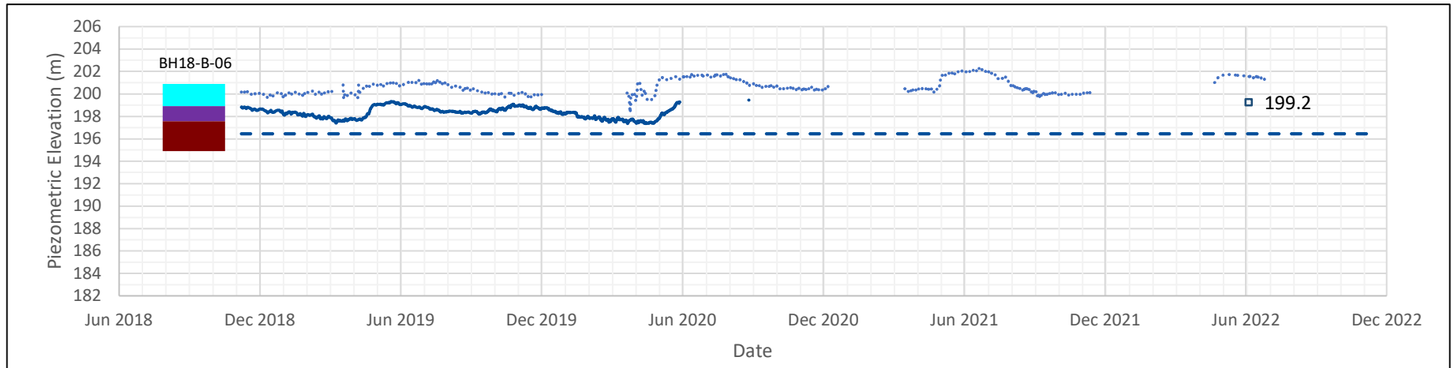




D



E



F

INSTRUMENTATION NOTES:

D -Instrument PP-VWP-2018-11A, -11B, -11C: No observations of note.

E -Instrument PP-VWP-2018-09: Pressure head readings are negative. Piezometric levels cannot be determined from negative pressure readings. The VWP datalogger appears to be malfunctioning as of July 10, 2021.

F -Instrument PP-VWP-2018-06: The VWP datalogger appears to be malfunctioning as of Sept 30, 2020.

* VWP readings indicate piezometric level below the VWP tip.

LEGEND

- MAIN POND WATER LEVEL
- VWP RECORDINGS
- VWP TIP
- MANUAL VWP RECORDINGS

VWP TIP INSTALL STRATA

- DYKE FILL
- TAILINGS
- FOUNDATION
- FOUNDATION

STICKLOG OF BH WHICH VWP IS INSTALLED

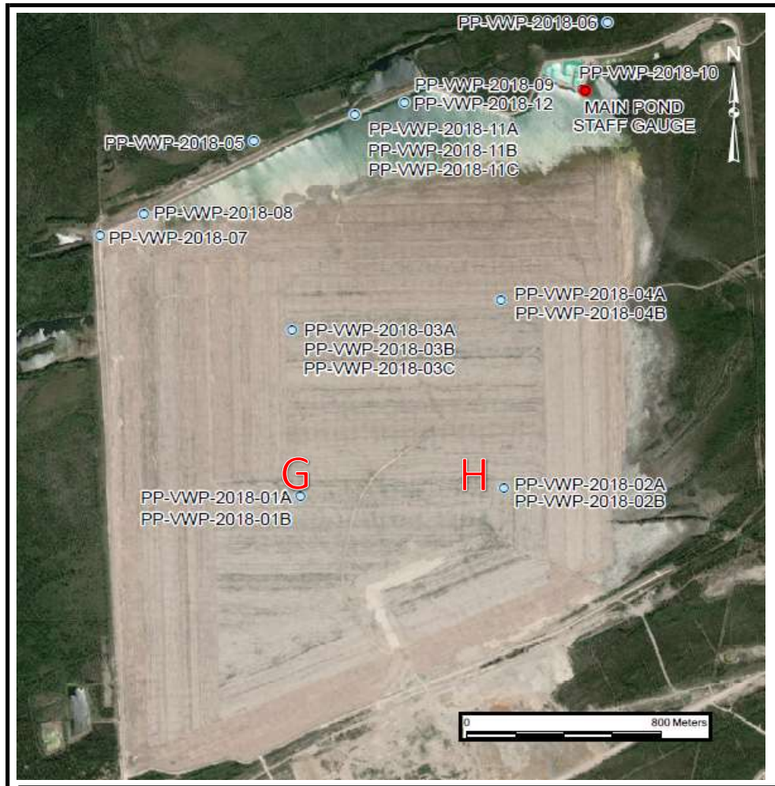
- DYKE FILL
- TAILINGS
- PEAT
- UPPER SAND & GRAVEL
- UPPER GLACIOLACUSTRINE
- LOWER SAND & GRAVEL
- LOWER GLACIOLACUSTRINE
- GLACIAL TILL

NOTES:

IMAGERY DATA SOURCE: ESRI
DATA PROJECTION: NAD83, ZONE 11N

VWP PIEZOMETRIC ELEVATIONS CALCULATED USING THE TIP ELEVATIONS RECORDED ON THE INSTALLATION LOG, NOT THE ELEVATIONS FROM GEOEXPLORER, IN THE LOCATIONS WHERE DIFFERENT.

FIG No. IV-2



INSTRUMENTATION NOTES:

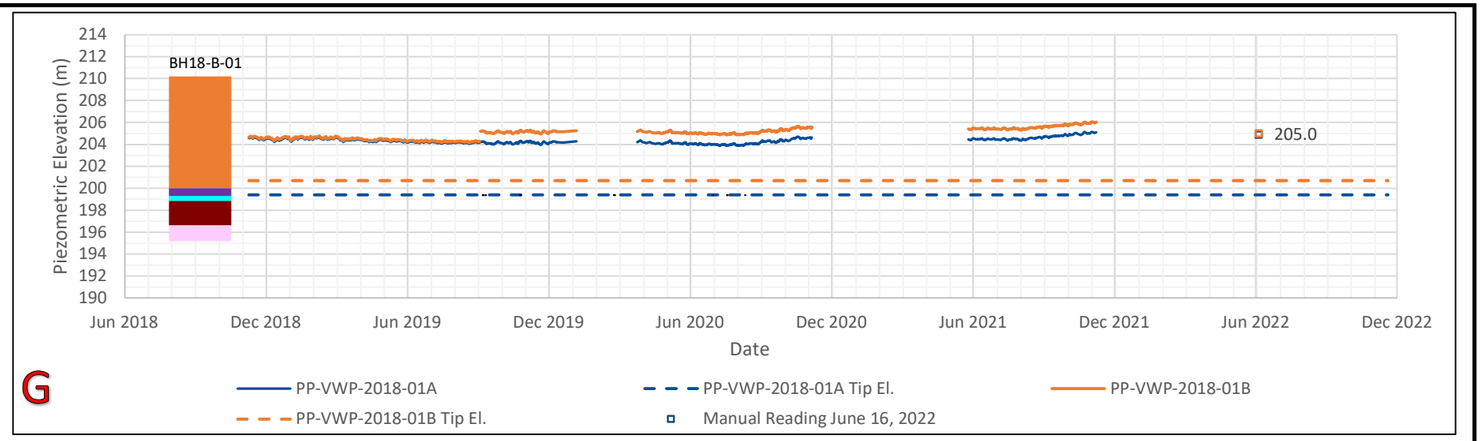
G

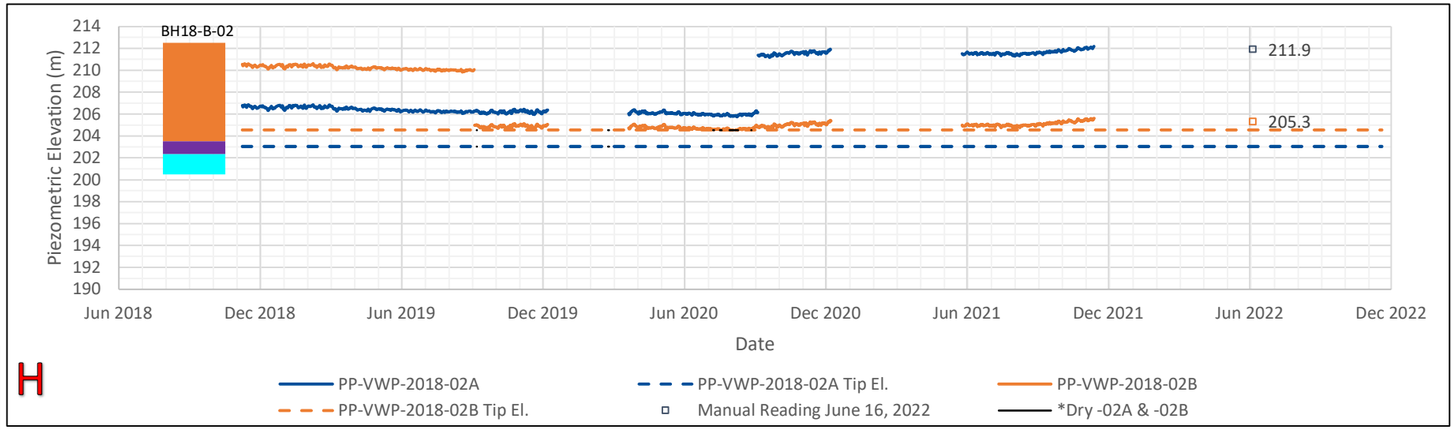
-Instrument PP-VWP-2018-01A: No observations of note.

-Instrument PP-VWP-2018-01B: Considered not functioning as of annual inspection report (Golder 2020). Significant and instantaneous increase in pressure recorded is anomalous and unexplained.

H

-Instrument PP-VWP-2018-02A, -02B: Considered not functioning as of annual inspection report (Golder 2020). Significant and instantaneous increase/decrease in pressure recorded is anomalous and unexplained.





LEGEND

- MAIN POND WATER LEVEL
- VWP RECORDINGS
- VWP TIP
- MANUAL VWP RECORDINGS

VWP TIP INSTALL STRATA

- DYKE FILL
- TAILINGS
- FOUNDATION
- FOUNDATION

STICKLOG OF BH WHICH VWP IS INSTALLED

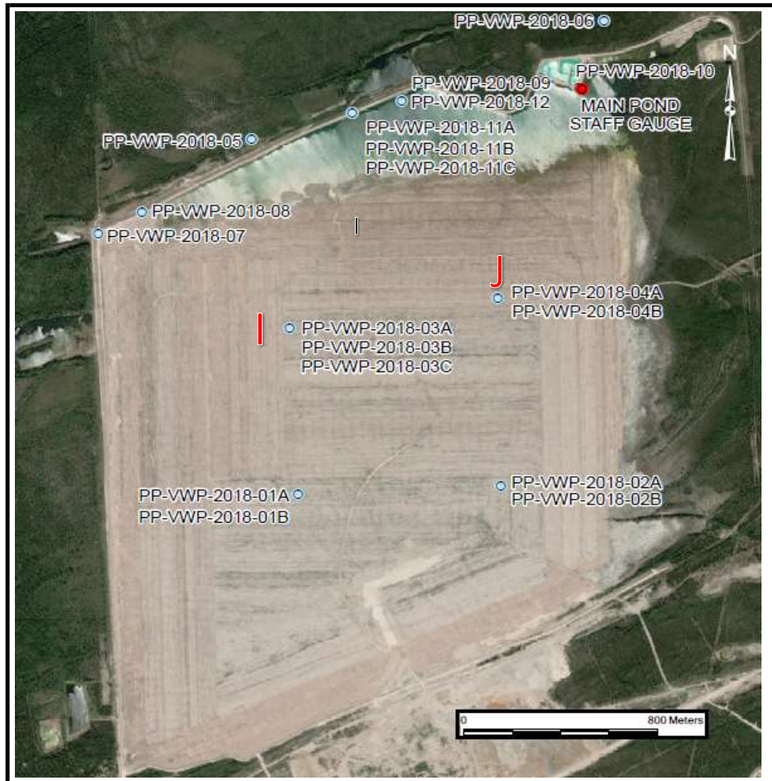
- DYKE FILL
- TAILINGS
- PEAT
- UPPER SAND & GRAVEL
- UPPER GLACIOLACUSTRINE
- LOWER SAND & GRAVEL
- LOWER GLACIOLACUSTRINE
- GLACIAL TILL

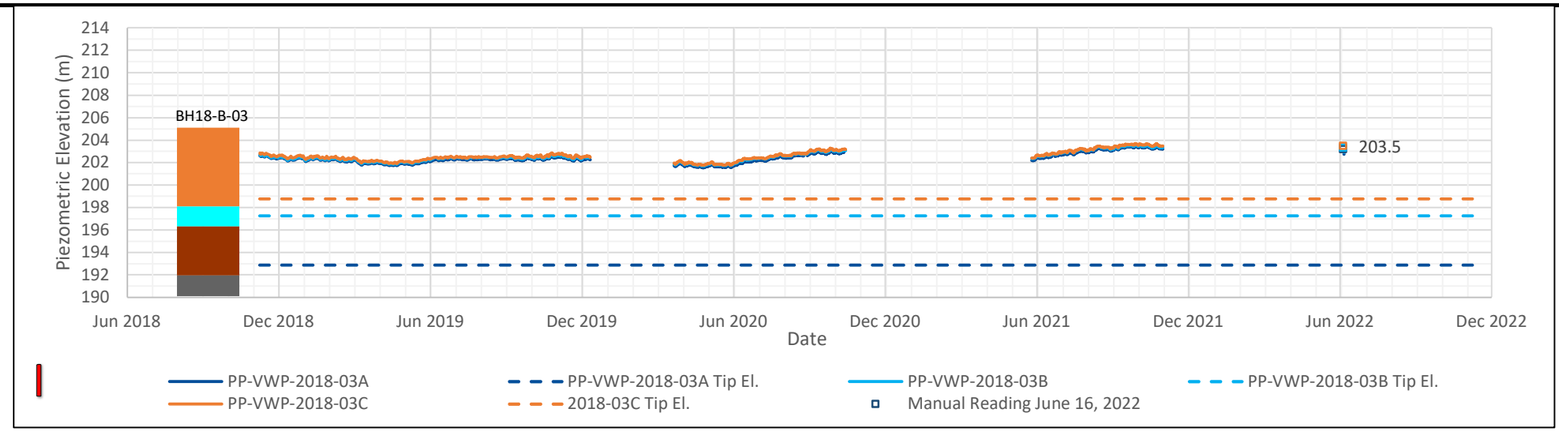
NOTES:

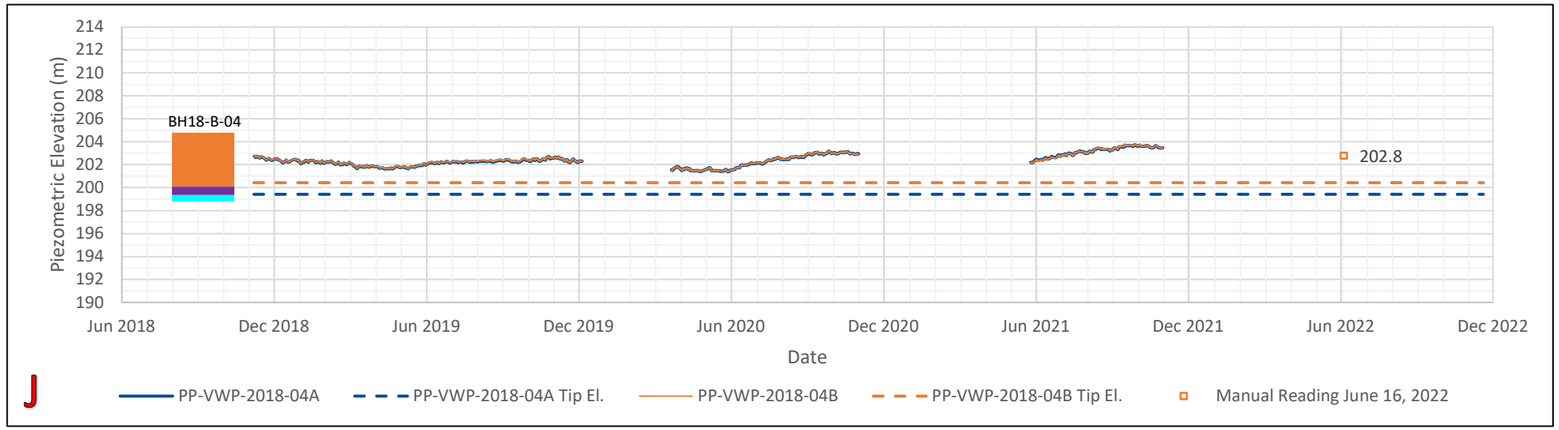
IMAGERY DATA SOURCE: ESRI
DATA PROJECTION: NAD83, ZONE 11N

VWP PIEZOMETRIC ELEVATIONS CALCULATED USING THE TIP ELEVATIONS RECORDED ON THE INSTALLATION LOG, NOT THE ELEVATIONS FROM GEOEXPLORER, IN THE LOCATIONS WHERE DIFFERENT.

FIG No. IV-3







INSTRUMENTATION NOTES:

I -Instrument PP-VWP-2018-03A, -03B, -03C: No observations of note.

J -Instrument PP-VWP-2018-04A: No manual reading recorded on June 16, 2022.

-Instrument PP-VWP-2018-04B: No observations of note.

LEGEND

- MAIN POND WATER LEVEL
- VWP RECORDINGS
- VWP TIP
- MANUAL VWP RECORDINGS

VWP TIP INSTALL STRATA

- DYKE FILL
- TAILINGS
- FOUNDATION
- FOUNDATION

STICKLOG OF BH WHICH VWP IS INSTALLED

- DYKE FILL
- TAILINGS
- PEAT
- UPPER SAND & GRAVEL
- UPPER GLACIOLACUSTRINE
- LOWER SAND & GRAVEL
- LOWER GLACIOLACUSTRINE
- GLACIAL TILL

NOTES:

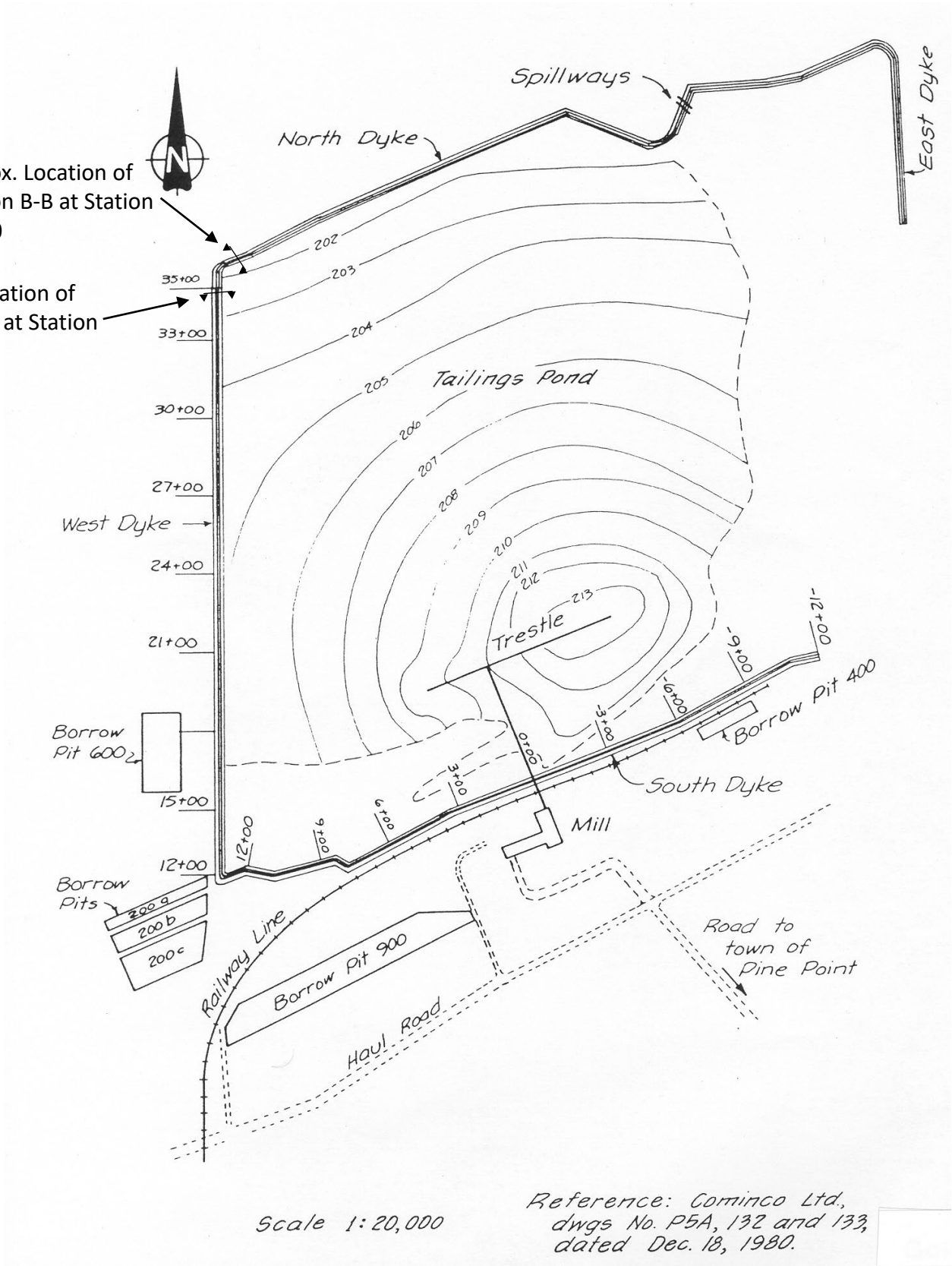
IMAGERY DATA SOURCE: ESRI
DATA PROJECTION: NAD83, ZONE 11N

VWP PIEZOMETRIC ELEVATIONS CALCULATED USING THE TIP ELEVATIONS RECORDED ON THE INSTALLATION LOG, NOT THE ELEVATIONS FROM GEOEXPLORER, IN THE LOCATIONS WHERE DIFFERENT.

FIG No. IV-4

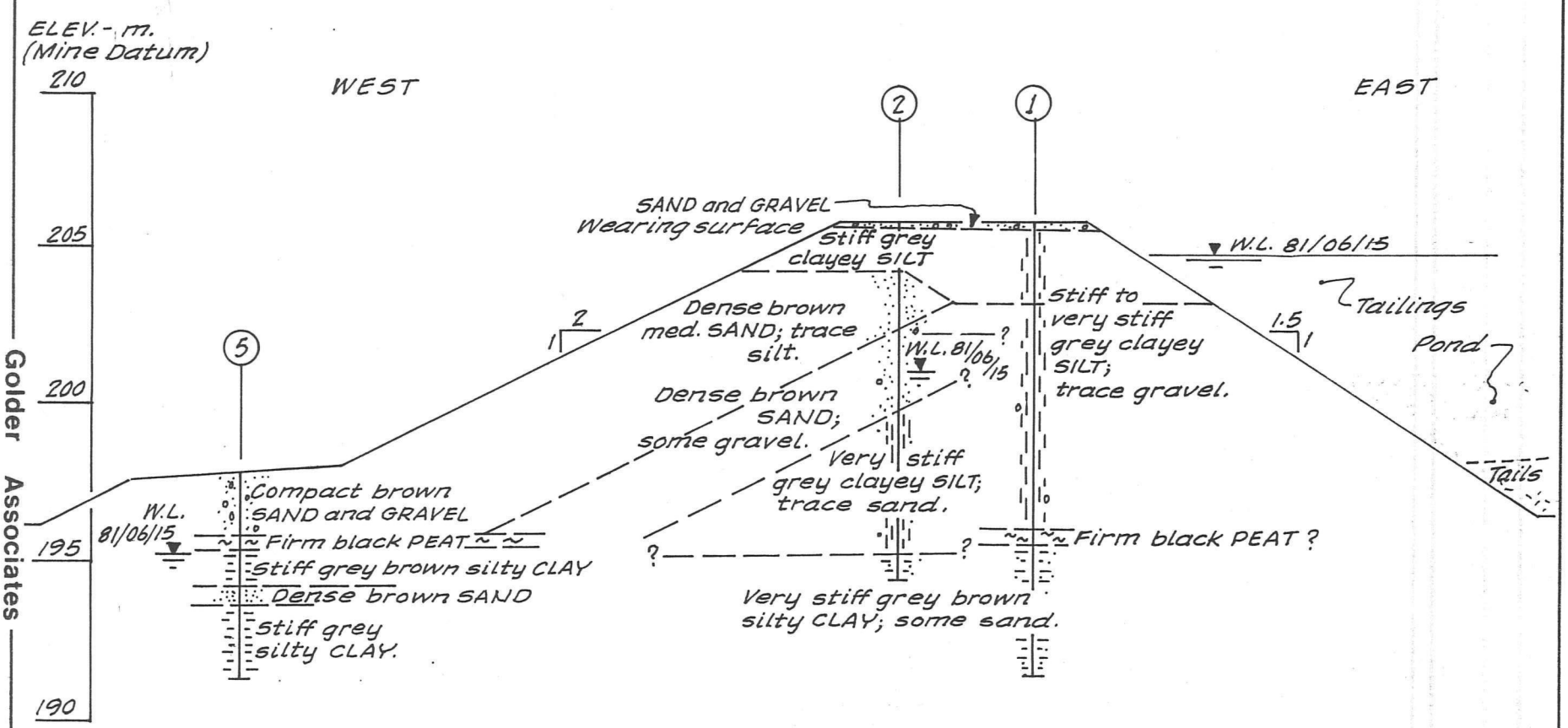
APPENDIX V

TIA Dyke Historical Cross-Sections


Spillways
East Dyke
North Dyke
N
Approx. Location of Section B-B at Station 36+50
Approx. Location of Section A-A at Station 35+40
35+00
33+00
30+00
27+00
West Dyke
24+00
21+00
15+00
12+00
202
203
204
205
Tailings Pond
206
207
208
209
210
211
212
213
Trestle
-12+00
-9+00
-6+00
-3+00
0+00
3+00
6+00
9+00
12+00
Borrow Pit 400
Borrow Pit 600
South Dyke
Mill
Borrow Pits
200a
200b
200c
Railway Line
Borrow Pit 900
Haul Road
Road to town of Pine Point
Scale 1:20,000
Reference: Cominco Ltd., dwgs No. P5A, 132 and 133, dated Dec. 18, 1980.

PROJECT NO. 812-1116 DRAWN Mg. REVIEWED JH DATE July '81

INFERRED STRATIGRAPHY Sta. 35+40 - WEST DYKE.



SECTION A-A
Station 35+40 - West Dyke

Scale: 1:200

LEGEND:

(5) Location of Borehole.

NOTES:

1. For location of Section, see Fig. 2.
2. Section partially inferred from construction records.
3. Black peat removed from under toe berm of west dyke south of Sta. 35+00.

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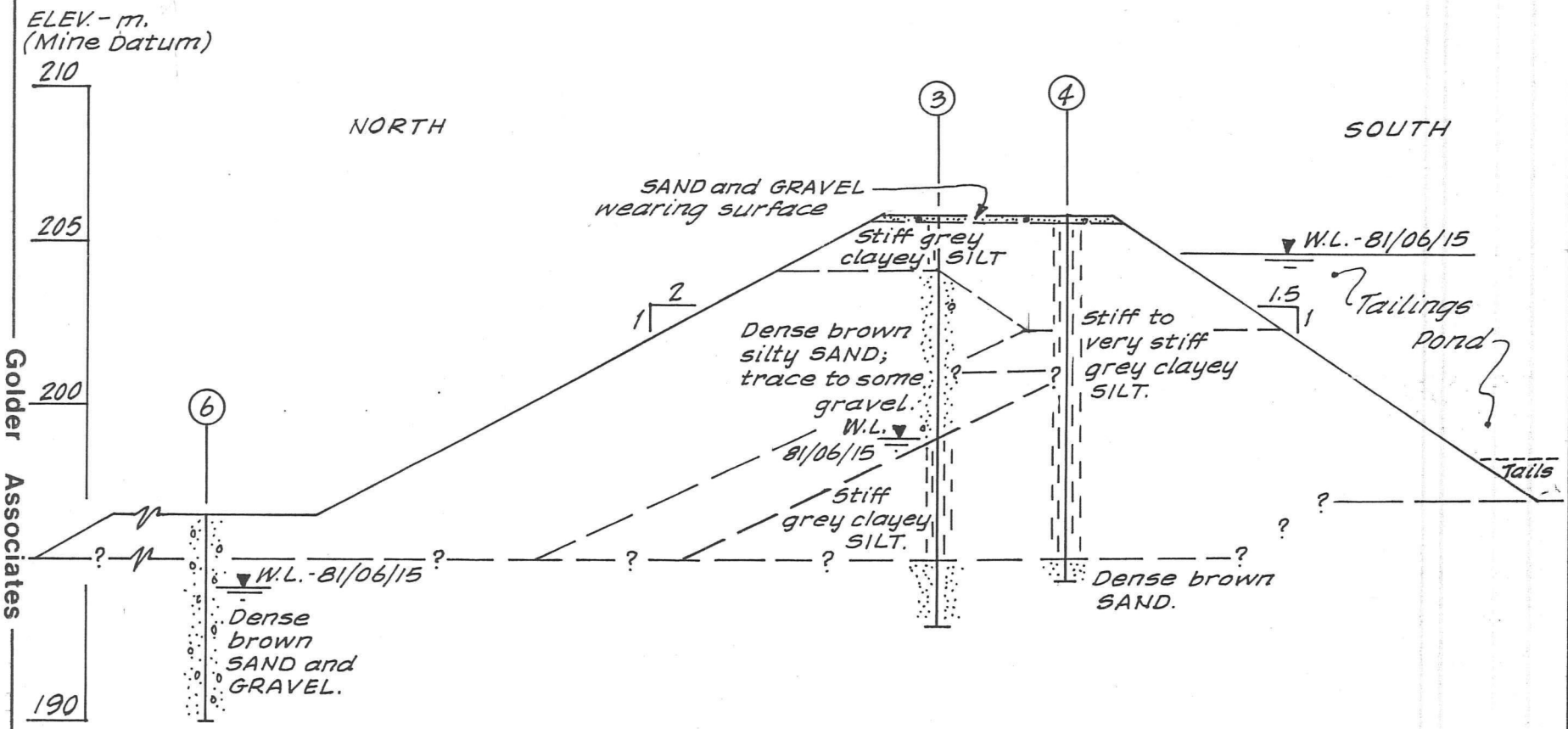
Figure 3

PROJECT NO. 812-1116 DRAWN hg REVIEWED ..... DATE July 181

INFERRED STRATIGRAPHY
Sta. 36+50 - NORTH DYKE



SECTION B-B
Station 36+50 - North Dyke

Scale: 1:200

LEGEND:
(6) Location of Borehole.

NOTES:
1) For location of Section, see Fig. 2.
2) Section partially inferred from construction records.

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Figure 4