Klohn Crippen Berger

Teck Coal Ltd.

Quintette Coal Operations

Shikano North Tailings Dam

2021 Annual Summary of Tailings Facility Performance

M09684A20.730

March 2022

March 25, 2022

Teck Coal Ltd.
P.O. Box 1500
23097 Murray Forest Service Road
Tumbler Ridge, British Columbia
V0C 2W0

Mr. Ray Proulx
Site Lead, Care and Maintenance

Dear Mr. Proulx:

Quintette Coal Operations
Shikano North Tailings Storage Facility
2021 Annual Facility Performance Review

We are pleased to submit the 2021 Annual Facility Performance Review Report for the Shikano North Tailings Storage Facility.

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

Yours truly,

KLOHN CRIPPEN BERGER LTD.

Max Cronk, P.Eng.
Project Manager
Civil Engineer

MC/RWC:jc

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Teck Coal Ltd.

Quintette Coal Operations

Shikano North Tailings Dam

2021 Annual Summary of Tailings Facility Performance

EXECUTIVE SUMMARY

Klohn Crippen Berger Ltd. (KCB) was engaged by Teck Coal Ltd. (Teck) to complete the 2021 Annual Facility Performance Review of the Shikano North Tailings Storage Facility (SNTSF) at the Quintette Coal Operations (QCO) mine site.

The site visit was completed on July 12, 2021 by Mr. Bob Chambers, P.Eng. of KCB, Mr. Max Cronk, P.Eng. of KCB, and Mr. Mark Slater, P.Eng., of Teck. Mr. Chambers is the Engineer of Record (EoR) representing KCB for the SNTSF, while Mr. Slater is the Responsible Tailings Facility Engineer (RTFE) for Teck.

The period considered for climate data and instrumentation is from September 2020 to August 2021, henceforth referred to as the "review period".

This summary section is provided in accordance with the Health, Safety and Reclamation Code (HSRC), and Teck's "Guideline for Tailings and Water Retaining Structures" (Teck 2019a). We also understand that Teck makes these annual reports available for public viewing prior to their full conformance with the Global Industry Standard on Tailings Management (GISTM) in 2023. This summary is provided solely for purposes of overview. Any party who relies on this report must read the full report. This summary omits a number of details, any one of which could be crucial to the proper application of this report.

Summary of Facility Description

QCO is an idle open pit coal mine located in the Peace River District in the foothills of the Rocky Mountains, approximately 16 km south of Tumbler Ridge, British Columbia. The site was operated from 1982 until 2000, at which time operations were suspended. Portions of the site have been reclaimed, but otherwise the site has been under care and maintenance since operations were suspended. Teck have full-time staff on site for environmental sampling, inspections, and maintenance activities.

SNTSF was commissioned in 1997 and received tailings until operations were suspended in 2000. Tailings are retained by the Shikano North Tailings Dam (SNTD), which is a cross-valley rockfill dam that was built across the mined-out Shikano North Pit. The SNTD crest is approximately 200 m long and at El. 828 m. The SNTD has a maximum height of 45 m (crest to downstream toe) with a 2H:1V downstream slope and a 2.25H:1V upstream slope.

The SNTD was designed as a "flow-through" rockfill embankment with internal granular filters and a non-woven geotextile to restrict fine coal tailings passing through the embankment while allowing water to seep through the structure. Seepage is routed to Sedimentation Pond S3 through a seepage collection pipe before being discharged to the environment towards the Murray River (west of the SNTD).

Summary of Key Potential Hazards and Failure Modes

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. Commensurately, given the nature of the SNTSF, Teck's long-term goal for the SNTSF is for all potential failure modes to be non-credible based on extreme loading conditions, or loading conditions appropriate using the principles of ALARP (i.e., As Low as Reasonably Practicable) when it is not practical to consider extreme conditions. Evaluation of failure modes with respect to this goal is ongoing. However, the SNTSF is not seen as having the potential for a catastrophic flow failure in its current configuration.

A risk register has been developed for the SNTSF. The risk assessment for the SNTSF was reviewed by Teck and KCB representatives in 2021. There have been no changes to the key hazards and the existing controls were adequate to manage potential failure modes within compliance and risk limits.

Potential Consequence of Failure

Teck provided the following statement regarding the consequence classification of the facility:

> *Teck are aligned with the most conservative interpretation of the GISTM which, in turn, is consistent with their safety culture. Commensurately, Teck has advised that consequence classification is not a part of their tailings management governance and has asked that it not be reported in this AFPR. Instead, Teck will adopt the extreme consequence case design loading for any facility with a credible catastrophic flow failure mode. For facilities without a credible failure mode in terms of a life safety issue, Teck will reduce credible risks to As Low As Reasonably Practicable (ALARP). This consequence case applies for both earthquake and flood scenarios for all tailings facilities, consistent with the GISTM. Adopting this approach meets or exceeds any regulatory requirements, aligns with Teck's goal to eliminate risk for loss of life, and is consistent with the GISTM. This approach is consistent with industry-leading best practices and has an added benefit of providing accurate narratives to communities about the safety of tailings facilities that could impact them and who share Teck's approach of one life is one too many to be at risk.*

The SNTSF meets HSRC requirements, and as noted in an earlier section, evaluations under extreme loading scenarios are on-going.

Instrumentation and/or Visual Monitoring

Visual inspections were performed in accordance with the frequency specified in the OMS Manual and there were no observations of concern noted.

Piezometers were read during the site visit, and readings were consistent with typical post-operation readings. Piezometer readings were all below their threshold values.

The survey monuments were not read in 2021. Teck are continuing to trial alternative methods for monitoring embankment displacements.

The level of instrumentation and surveillance at the facility is considered adequate for the facility under current conditions, and no changes are required at this time. As noted in the OMS Manual (Teck 2019a), the adequacy of the existing instrumentation is to be reviewed if the facility is to be re-activated.

Surface Water Management

There were no changes to surface water management during the review period. Estimated seepage rates based on a simplified water balance accounting calculation are consistent with estimates made since 2013. The facility operates with approximately 32 m of freeboard under normal conditions and is capable of storing the Probable Maximum Flood (PMF).

Operation, Maintenance, and Surveillance Manual

The Operation, Maintenance and Surveillance (OMS) Manual (Teck 2019a) which was updated in March 2019 remains appropriate for the facility. An update to the OMS Manual was in progress at the time of writing.

Emergency Preparedness and Response Plan

Teck developed an Emergency Preparedness and Response Plan (EPRP) for the SNTD in 2019, and the plan remains appropriate for the facility.

Dam Safety Review

Teck engaged Thurber Engineering Ltd. to perform a Dam Safety Review (DSR) for the SNTD in 2020. The site visit was completed in September, 2020 and the evaluation and reporting was in progress at the time of writing. The HSRC requires that DSRs be performed at least once every 5 years. The next DSR should be scheduled to be initiated within 2025 to comply with the HSRC requirements.

Summary of Recommendations

The observed performance of the SNTSF is consistent with past behavior and expectations, and there were no safety concerns related to facility performance noted during the review period.

Recommendations related to the SNTSF are summarized in Table E-1. There are no new recommendations for this AFPR, and all recommendations from previous reviews have been addressed and closed. Preliminary recommendations issued following the site visit that were closed before this report was issued are not shown in Table E-1. Each recommendation has been assigned a priority using the 2016 HSRC Guidance Document priority definitions:

- Priority 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.
- Priority 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.
- Priority 3: Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
- Priority 4: Best Management Practice – further improvements are necessary to meet industry best practices or reduce potential risks.

Table E-1 Summary of Recommendations

ID Number	Deficiency or Non-Conformance	Applicable Regulation or OMS Manual Reference	Recommended Action	Priority	Recommended Deadline (Status)
Previous Recommendations Closed / Superseded					
SNTD-2018-01	*Upper and Lower Met rain gauges unreliable in winter*	*n/a*	*Repair or improve the Upper and Lower Met Climate Station rain gauges to improve reliability of precipitation measurements during the winter months.*	*4*	*Prior to re-start of operations (CLOSED - This is not a safety risk under current conditions and so the recommended timeline has been revised to be done prior to a re-start of operations. A note to this effect should be included in the OMS Manual by Q4 2021 to close-out the recommendation in this report.)*
SNTD-2019-02	*Survey Datum*	*n/a*	*Confirm that the drone LiDAR and crest monument surveys are being done using the same survey datums, and confirm key facility metrics (e.g., crest, downstream slope, etc.).*	*4*	*Q4 2021 (CLOSED – Teck had further discussions with drone LiDAR contractor, and are continuing to review alternate technologies with improved repeatability for tracking on-going changes to the facility.)*
SNTD-2020-02	*Annual Site Visit Scheduling*	*n/a*	*Include recommendation in OMS Manual that the annual site visits are to be completed in late May or early June*	*4*	*Q2 2022 (CLOSED – not applicable to this facility as vegetation is not a significant issue)*
Previous Recommendations Ongoing - None					
2021 Recommendations - no new recommendations					

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CLARIFICATIONS

This report is an instrument of service of Klohn Crippen Berger (KCB). The report has been prepared for the exclusive use of Teck Coal Ltd. (Client) for the specific application to the Quintette Coal Operations, 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.
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5. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.

LIST OF ABBREVIATIONS

Abbreviation	Definition
AFPR	Annual Facility Performance Review
ALARP	As Low As Reasonably Practicable
CDA	Canadian Dam Association
CSP	Corrugated Steel Pipe
DSR	Dam Safety Review
EDGM	Earthquake Design Ground Motion
EMLI	Ministry of Energy, Mines, and Low Carbon Innovation
ENV	Ministry of Environment (BC)
EoR	Engineer of Record
EPRP	Emergency Preparedness and Response Plan
FoS	Factor of Safety
HSRC	Health, Safety and Reclamation Code for Mines in BC
IDF	Inflow Design Flood
InSAR	Interferometric Synthetic Aperture Radar
KC	Klohn Crippen Consultants Ltd.
KCB	Klohn Crippen Berger Ltd.
LiDAR	Light Detection and Radar
MEM	Ministry of Energy and Mines
MERP	Mining Emergency Response Plan
OMS	Operational, Maintenance and Surveillance
PMF	Probable Maximum Flood
QCO	Quintette Coal Operations
RTFE	Responsible Tailings Facility Engineer
SNTD	Shikano North Tailings Dam
SNTSF	Shikano North Tailings Storage Facility
TSF	Tailings Storage Facility
TWRS	Tailings and Water Retaining Structures

1 INTRODUCTION

1.1 General

Klohn Crippen Berger Ltd. (KCB) was engaged by Teck Coal Ltd. (Teck) to complete the 2021 Annual Facility Performance Review (AFPR) for the Shikano North Tailings Storage Facility (SNTSF) at the Quintette Coal Operations (QCO) mine site.

This AFPR was undertaken to comply with Section 10.5.3 of the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (EMLI 2021). This report covers the period from September 2020 to August 2021, herein referred to as the "review period," and was prepared following:

- Section 4.2 "Annual Tailings Facility and Dam Safety Inspection Report" of the 2016 HSRC Guidance Document (MEM 2016); and
- Guideline for Tailings and Water Retaining Structures (TWRS) (Teck 2019b).

The site visit was completed on July 12, 2021 by Mr. Bob Chambers, P.Eng. of KCB, Mr. Max Cronk, P.Eng. of KCB, and Mr. Mark Slater, P.Eng., of Teck. Mr. Chambers is the Engineer of Record (EoR) as a representative of KCB for the SNTSF, while Mr. Slater is the Responsible Tailings Facility Engineer (RTFE) for Teck.

We understand that Teck makes these annual reports available for public viewing prior to their full conformance with the Global Industry Standard on Tailings Management (GISTM) in 2023.

1.2 Facility Description

QCO is an idle open pit coal mine located in the Peace River District in the foothills of the Rocky Mountains, approximately 16 km south of Tumbler Ridge British Columbia. The site location is shown on Figure 1.

The site was operated from 1982 until 2000, at which time operations were suspended. Portions of the site have been reclaimed, but otherwise the site has been under care and maintenance since operations were suspended. Teck have full-time staff on site for environmental sampling, inspections and maintenance activities.

SNTSF is located approximately 2.5 km west of the QCO Plantsite and gatehouse as shown on Figure 2. Tailings are retained in the facility by the Shikano North Tailings Dam (SNTD), which is a cross-valley rockfill dam that was built across the mined-out Shikano North Pit. A general arrangement of the SNTSF is shown on Figure 3.

The SNTSF was designed by Klohn Crippen Consultants Ltd. (KC 1996), a predecessor company to KCB. The facility was commissioned in 1997 and received tailings until operations were suspended in 2000. The SNTD was designed as a "flow-through" rockfill embankment with internal granular filters and a non-woven geotextile filter fabric to restrict fine coal tailings passing through the embankment while allowing water to seep through the embankment. Three 1 m thick "windows" of high-permeability

gravel, upstream of the filters, were introduced as a design modification during construction to encourage flow through the embankment (i.e., enough flow to be consistent with the design concept) because the material available for fine filter construction had a permeability lower than expected (KC 1997). Seepage flows are collected by a buried corrugated steel pipe (CSP) system about 60 m downstream of the dam; the pipe discharges to an open channel which reports to S3 Pond.

The SNTD was raised to the current crest elevation in two stages:

- Stage I (May to November 1996): crest raised to El. 810 m.; and
- Stage II (December 1998 to March 1999): crest raised to El. 829 m (actual crest elevation is El. 828 m based on recent LiDAR surveys).

Construction record reports were issued following each raise (KC 1997 and KC 1999b). No construction or performance related issues were noted in the construction record documents, 1999 Annual Review (KC 1999a). No construction has been carried out at the SNTD since Stage II was completed in 1999.

During operations, tailings were discharged from the eastern edge of the impoundment which formed a tailings beach sloping towards the embankment. Excess water would pond against the embankment face and seep through the upstream filters as designed. When mining operations were suspended, tailings stored in the impoundment were well below design capacity. based on the 2010 LiDAR, the current tailings level in the impoundment is approximately El. 796 m, which is approximately 32 m below the crest.

Key facility metrics are summarized in Table 1.1. Select construction record drawings are included in Appendix II, and a summary of key reference documents is included in Appendix III.

Table 1.1 Key Facility Metrics

Item	Information
Embankment Type	Zoned Earthfill
Foundation	Bedrock
Construction Methodologies	Centreline Raise
Years of Operation	1997 to 2000
Maximum Embankment Height	45 m (crest to downstream toe)
Crest Elevation	El. 828 m
Crest Length	200 m
Crest Width	10 m
Embankment Slopes	Upstream 2.25H:1V Downstream 2H:1V
Impoundment Area	24 ha
Design Storage Capacity	6.0 million m^3
Volume of Tailings Stored	2.8 million m^3
Consequence Classification	Significant
Inflow Design Flood (IDF)	$^1/_3$ between 975-year and Probable Maximum Flood
Earthquake Design Ground Motion (EDGM)	Peak Ground Acceleration: 0.3 g (>10,000-year earthquake)
Catchment Area	76.4 ha
Access to Facility	Approximately 4.6 km along the mine access roads

In 2013 and 2014, Teck received the following permit amendments authorizing a restart of QCO mining operations:

- Ministry of Energy and Mines (MEM), Permit No. C-156 (amended June 20, 2013); and
- Ministry of Environment (ENV), Permit PE-06739 (amended July 9, 2014).

If operations were to resume, fine coal tailings would be discharged into the facility which would be a significant change to the existing condition. However, Teck have deferred the restart of operations pending an improvement in market conditions. This report is based on the existing condition of the structure on the inspection date and does not consider a potential future restart of the QCO. The 2014 ENV Permit PE-06739 includes provisions for water quality monitoring of the SNTD that apply to the existing condition of SNTD.

2 SUMMARY OF ACTIVITIES DURING THE REVIEW PERIOD

Teck completed routine inspections of the facility as specified in the Operation, Maintenance, and Surveillance (OMS) Manual. There were no construction or maintenance activities undertaken or required during the review period.

3 CLIMATE, WATER MANAGEMENT AND WATER ACCOUNTING

3.1 Climate

The climate of the region is dictated by a variety of factors including latitude, altitude, and location relative to the mountain barrier (Teck 2013). The region encompassing the site is occasionally subject to intense low pressure systems that draw warm, tropical air into the region from the Gulf of Mexico (Teck 2013).

KCB reviewed climate data from two nearby climate stations (i.e., Lower Met Climate Station and Chetwynd Airport Climate Station), which are summarized in Table 3.1. The location of the Lower Met Climate Station is shown in Figure 2. Data from Upper Met Climate Station were not available for review.

Precipitation and temperature data from Lower Met and Chetwynd Airport climate stations are summarized in Table 3.2. The data has been corrected for orographic effects using the corrections from the Baseline Hydrology and Design Basis (Teck 2013). The data indicate that the review period was drier than a typical year.

The rain gauge at the Lower Met Climate Station is not heated, so precipitation data during freezing conditions can be unreliable. As a result, climate data from Environment Canada Chetwynd Airport Climate Station were used to supplement the precipitation readings from September to April.

Table 3.1 Summary of Climate Stations

Climate Station	Alternate Name	Monitored By	Station No.	Location	Elevation (m)	Period of Record
Lower Met	Plantsite	Teck	n/a	On site (2.5 km east of SNTSF)	914	1983 to present
Chetwynd Airport	n/a	Environment Canada	1181508	86 km North of QCO	610	1982 to present

Table 3.2 Precipitation and Temperature at SNTSF for the Review Period

Month	SNTD Mean Annual Precipitation[1] Distribution (mm)	Corrected SNTD 2020-2021 Precipitation[2],[3] (mm)	Lower Met Climate Station Average Temperature[4] (°C)	Lower Met Climate Station 2020 – 2021 Daily Average Temperatures[5] (°C)
September	45	40	10.1	6.1
October	50	70	3.6	-2.3
November	56	50	-3.7	-6.0
December	39	11	-6.8	-5.8
January	45	18	-10.7	-7.5
February	34	20	-5.4	-18.1
March	34	15	-2.1	-5.2
April	28	11	3.5	-3.0
May	34	78	8.3	2.4
June	73	11	12.3	8.1
July	73	50	14.5	No data available
August	50	65	13.9	No data available
Total	**561**	**439**	-	-

Notes:

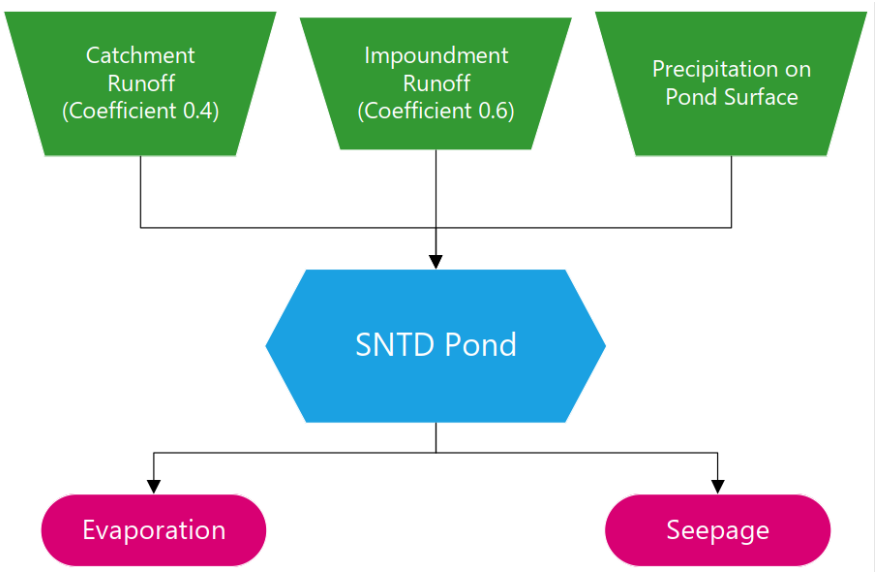
1. Monthly precipitation values are based on the mean annual precipitation-elevation relationship and monthly distribution outlined in the Baseline Hydrology and Design Basis Report (Teck 2013).
2. October 2020 to April 2021 precipitation values were interpreted from Chetwynd Airport Climate Station data, with mean annual precipitation and elevation correction from Baseline Hydrology and Design Basis Report (Teck 2013).
3. September 2020 and May 2021 to August 2021 precipitation values were interpreted from Lower Met Climate Station data with mean annual precipitation-elevation correction from the Baseline Hydrology and Design Basis Report (Teck 2013).
4. Average monthly temperatures are from the Quintette Plantsite as outlined in the Baseline Hydrology and Design Basis Report (Teck 2013).
5. Daily maximum, minimum, and average temperatures are based on daily temperature readings that were taken at the Lower Met Climate Station.

3.2 Water Management

Under normal and flood conditions, the primary inflows into the impoundment are runoff from the catchment and impoundment, and direct precipitation on the pond. The total catchment area reporting to the SNTSF is 76 ha, of which the pond and impoundment are 24 ha and the upstream catchment is 52 ha. The catchment area is shown on Figure 4.

Water ponds on the tailings beach in a shallow depression, formed by tailings consolidation, approximately 30 m upstream of the embankment slope. As there is no spillway or other surface water discharge from the facility, the outflows are evaporation and seepage through the embankment or into the foundation. Figure 3.1 is a simplified water accounting diagram for the facility.

Figure 3.1 SNTD Water Accounting Diagram



A rockfill berm was constructed downstream of the dam with a surface at El. 780 m. Seepage through the embankment is collected in a 750 mm diameter CSP culvert that is buried in the rockfill zone downstream of the embankment. The CSP conveys the flow to an open channel which conveys it to S3 Pond. The portion of the CSP buried in the rockfill is perforated, with an invert at about El. 778 m. Discharge from the S3 Pond is monitored under the ENV Permit PE-06739 which requires quarterly water quality measurements (suspended solids and metals), and weekly flow measurements between April and October of each year.

3.3 Water Accounting

A simplified water accounting calculation for the review period is summarized in Table 3.3. The estimated seepage losses from the impoundment are similar to the estimated average annual seepage rates over the past 7 years, which ranged from 2 L/s (KCB 2013) to 8 L/s (KCB 2019). Seepage rates fluctuate over the year.

The flow rate in the channel between SNTSF and S3 Pond during the site visit was estimated at approximately 5 L/s, which is similar to the flow rate observed during previous site visits.

Table 3.3 Simplified Water Accounting for the Review Period

Inflow / Outflow		Value	Unit
Inflow	Runoff from Upstream Catchment[1]	92,000	m^3
	Precipitation on Tailings Beach (excluding pond)[2]	59,000	m^3
	Precipitation on Pond[3]	5,000	m^3
Outflows	Evaporation from Pond Surface[4]	6,000	m^3
	Estimated Seepage Losses[5]	150,000 (5 L/s)	m^3

Notes:
1. Assumed average runoff coefficient of 0.4.
2. Assumed average runoff coefficient of 0.6.
3. Assumed average pond elevation of E. 797 m.
4. Evaporation rate for this site is 548 mm/year based on the evaporation-elevation relationship from Baseline Hydrology and Design Basis Report (Teck 2013).
5. The remainder of inflows minus evaporation and seepage losses.

3.4 Freeboard and Flood Storage

Under normal conditions, the facility has approximately 32 m of freeboard. During flood events, runoff accumulates on the tailings surface and is stored in the impoundment. The minimum IDF specified in the HSRC for the SNTSF is the 72-hour 1/3 between 975-year and Probable Maximum Flood (PMF). KCB performed a simplified assessment assuming the 72-hour PMF volume is equal to 3 x the 24-hour PMF volume which is a conservative approach (KCB 2019). Even under this conservative assumption, there is 18 m of freeboard following the 72-hour PMF (KCB 2019) which far exceeds the minimum freeboard (0.5 m) required by the permit PE-06739.

4 MONITORING PROGRAM AND SITE OBSERVATIONS

4.1 Overview

The monitoring program for the SNTSF is summarized in Table 4.1, along with comments on activities during the review period. The monitoring program is appropriate for the facility under existing conditions given the long history of good performance and large flood storage capacity.

Table 4.1 Summary of SNTSF Monitoring Program

Surveillance Type/Task	Frequency	Responsible	OMS Manual Compliance Met?	Notes for Review Period
Visual Inspection	Monthly - April to October	Facility Surveillance Officer	Y	Checked as part of the routine sampling and flow monitoring at S3. Documented, scanned, and stored on the Teck network.
Routine Inspections	Three times per year	Facility Surveillance Officer	Y	Routine inspections were completed in May, July, and September 2021.
Piezometers	Annual	Facility Surveillance Officer	Y	Read by KCB on behalf of Teck during the annual site visit. All piezometers were below threshold levels.
Survey Monuments	Annual	Teck	Y	The survey monuments were not read in 2021. An InSAR survey was conducted instead, covering the time period from 2016 to 2020 and no changes of concern were identified. Teck are planning further InSAR surveys to further evaluate the effectiveness for use at QCO.
Event-Driven Inspections	As required[3]	Facility Surveillance Officer	Y	No event-driven inspections were triggered.
Annual Facility Performance Review	Annual	EoR	Y	This report
Dam Safety Review	Every 5 years	Third Party Consultant/ Qualified Registered Professional Engineer	Y	Site visit was completed by Thurber Engineering Ltd. in September 2020. Preliminary findings were provided to Teck and no immediate concerns noted. The report was in progress at the time of writing.

4.2 Visual Inspections

Routine visual inspections were completed by the Facility Surveillance Officer, and there were no concerns observed during the review period. Inspection observations are documented on a standard form and uploaded to Teck's SharePoint site.

4.3 Annual Site Visit Observations and Photographs

The following is a summary of the key observations from the annual site visit by the EoR. Select photographs from the site visit are included in Appendix I, and site visit waypoints are included on Figure 3.

- **Crest**: Good condition. No signs of cracking, settlement, sinkholes, erosion, excessive vegetation, or animal activity.
- **Downstream Slope and Abutments**: Good condition. No signs of cracking, sloughing, slumping, erosion, seepage, excessive vegetation, or animal activity.
- **Upstream Slope and Abutments**: Good condition. No signs of cracking, sloughing, slumping, erosion, excessive vegetation, or animal activity.
- **Tailings Impoundment**: The impoundment area was sparsely vegetated near the pond and embankment. Away from the pond, the tailings surface is well drained and can be walked on. The ponded area appears to be smaller than that of the 2020 inspection (likely due to the drier year), and the pond level was well below the freeboard monitoring stake.
- **Historic Slumping of Pit Wall:** A historic slumping failure is present on the eastern side of the impoundment in the old pit wall (approximately 480 m southeast from the upstream face of the embankment). No changes have been observed in the area since it was first observed in 2012, and this is not a dam safety concern.
- **Seepage Collection Pipe:** Flow from the seepage collection pipe was observed and estimated to be approximately 5 L/s, which is similar to the flow rate observed in previous years.

4.4 Piezometers

There are 10 functional pneumatic piezometers installed at the SNTD (refer to Figure 3). The piezometers are read annually during the annual facility performance review site visit. The piezometers were read on July 12, 2021, and the readings are summarized in Table 4.2. Piezometric elevations are plotted on the embankment cross-section on Figure 5, and historical piezometric readings are summarized on Figure 6. The piezometric levels measured in 2021 were all below threshold values and do not indicate any concerning trends.

Similar to previous years, P96-9 and P96-10 continue to read a small positive pressure head and the inferred water elevation is above the current pond and tailings level. There is no visible seepage from the upstream face of the embankment, and P96-4 historical readings indicate the water level in the embankment fill is below tailings level. These observations suggest that the readings in P96-9 and

P96-10 may be the result of either locally entrained water around the tip or instrument error. This is not a concern, and no follow up action is required.

Two piezometers require maintenance and should be fixed prior to the next annual site visit:

- Piezometer P96-3 did not have a fitting and could not be read. The fitting should be replaced; and
- Piezometer P96-8 fitting was observed to be leaking, and should be either tightened or replaced.

The above were noted to Teck personnel during the site visit.

Based on the review of the available instrumentation data, the suite of instruments and reading frequency remains sufficient for monitoring the existing condition of the SNTD.

Table 4.2 Summary of 2021 Piezometer Readings

Piezo No.	Status	Unit	Tip El. (m)	Pressure Reading (psi)	Piezometric El. (m)	Threshold Level 1 El. (m)	Comments
P96-1	Not Functional	Embankment, downstream of filter zone	767.2	-	-	-	Dry
P96-2	Not Functional	Embankment, downstream of filter zone	777.2	-	-	-	Did not stabilize
P96-3	Not Functional	Embankment, downstream of filter zone	770.0	-	-	786	Fitting was missing
P96-4	Not Functional	Embankment, downstream of filter zone	780.1	-	-	-	Did not stabilize
P96-5	Functional	Embankment, upstream of filter zone	780.0	4.9	783.4	797	
P96-6	Functional	Embankment, upstream of filter zone	780.0	2.6	781.8	797	
P96-7	Functional	Embankment, upstream of filter zone	790.1	0.5	790.5	803	
P96-8	Functional	Embankment, upstream of filter zone	790.2	3.0	792.3	803	Fitting was leaking
P96-9	Functional	Embankment, upstream of filter zone	800.0	0.3	800.2	805	
P96-10	Functional	Embankment, upstream of filter zone	800.0	1.5	801.1	805	
P95KC-2A	Functional	Rock abutment	755.4	0.0	Dry	790	Dry
P95KC-2B	Functional	Rock abutment	776.2	0.2	776.3	790	
P95KC-3A	Not Functional	Rock abutment	762.8	-	-	-	Not Found
P95KC-3B	Functional	Rock abutment	781.3	0.0	Dry	-	Not Found
P98-1	Unknown	-	810.5	-	-	-	Not Found
P98-2	Unknown	-	810.5	-	-	-	Not Found

4.5 Survey Monument Pins

There are four survey monument pins installed on the crest of the SNTD. The monuments consist of steel pins with plates attached to the base, buried 1 m below the crest surface (KC 1999b). The survey monuments were not read in 2021 and an InSAR survey was conducted in lieu surveying the monuments (Section 4.6) to improve the repeatability between surveys and to cover a wider area than captured by the survey monuments. To date, none of the monuments indicate a trend of horizontal movement or significant crest settlement, and given the relatively slow rate of movement observed to date, this is considered acceptable.

4.6 Aerial Survey

In 2020, Teck retained TRE Altamira to complete an Interferometric Synthetic Aperture Radar (InSAR) survey of QCO site to estimate incremental displacements at the QCO site since 2015. A preliminary assessment of the data indicated that the SNTD (beach and embankment) has, on average, settled less than 10 mm since 2015. This is less than the magnitude of settlement over the same period based on survey monuments (~40 mm). Neither monitoring method indicate displacement trends or magnitude of concern (i.e., no slumping or toe bulging). Teck are planning to conduct additional InSAR surveys in the future to monitor displacements, and KCB are supportive of Teck's plan.

4.7 Pond Level

Pond level in the SNTD is visually monitored as an indication of potential change in the impoundment water balance (i.e. is water accumulating). A pond level stake is installed where tailings beach meets the upstream rockfill zone. This is not associated with a dam failure mode given the significant freeboard capacity available (Section 3.4). The pond was well below the pond level stake during inspections that occurred during the review period.

4.8 Sinkholes

There are a number of sinkholes on the tailings beach; the location of the sinkholes are shown on Figure 3. The sinkholes were first observed during a site visit in 2010 (KCB 2011), but may have been present or started to develop prior to this date. The cause of these features is most likely the migration of tailings into the upstream coarse rockfill shell (2 m minus waste rock) (Figure 5), which is upstream of the filter zones. The sinkholes are considered a local condition and not a risk to the SNTD integrity.

The sinkholes are monitored for changes during visual inspections. No obvious changes were noted in the sinkholes between the 2020 and 2021 inspections.

4.9 Water Quality

As noted in Section 3.1, seepage that is collected in the seepage collection system downstream of SNTSF eventually reports to S3 Pond. Under the ENV Permit PE-06739, the water quality monitoring point for S3 Pond is located at the S3 Pond Spillway. The monitoring program at S3 Pond consists of:

- Weekly flow rate measurements (April 1 to October 31); and
- Quarterly sampling for field turbidity; laboratory turbidity and total suspended solids; and metal and non-metal parameters as defined by the permit.

Teck report on the water quality monitoring program to ENV. Teck have confirmed that there have been no non-conformances and that monitoring frequency meets permit requirements.

5 TAILINGS FACILITY SAFETY ASSESSMENT

5.1 Design Basis Review

The design basis for the facility is documented in the design report (KC 1996) and the feasibility design update (KCB 2012), and the key design criteria from the original design basis are summarized in Table 5.1. These design criteria were adopted assuming that the tailings level within the impoundment would be at El. 824 m, whereas under current conditions the tailings elevation is approximately El. 796 m; as a result, and as discussed in Section 3.4, the flood storage under existing conditions significantly exceeds the design criteria from the HSRC and the original design basis.

Table 5.1 Summary of Key Original Design Criteria

Parameter	Original Design Criteria	Current Conditions
Inflow Design Flood – Operations	Designed to store a 200-year 24-hour flood at the end of operations	Existing facility exceeds the flood storage criteria. Facility can store three consecutive 24-hour PMFs with 18 m freeboard
Inflow Design Flood – Closure	Designed to route a 24-hour PMF through the closure spillway *Note that the closure spillway has not been constructed, and was to be constructed at the end of operations*	
Earthquake Design Ground Motion	Designed for a horizontal seismic coefficient of 0.15 g (equivalent to a Peak Ground Acceleration of 0.3 g), which is greater than a 10,000-year earthquake (Note 1)	Existing facility exceeds these criteria Static FoS: >1.6 Pseudo-Static FoS: >1.1
Factor of Safety – Static Long Term	1.5	
Factor of Safety – Pseudo-Static	1.0	

Notes:
1. From site-specific seismic hazard assessment, 10,000-year PGA is 0.17 g.

5.2 Dam Safety Review

The latest DSR was performed in 2020 by Thurber Engineering Ltd. The site visit was completed in September 2020 and the report was in progress at the time of writing this report. The HSRC requires that DSRs be performed at least once every 5 years; the next DSR should be scheduled to be initiated in 2025.

5.3 Failure Mode 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 SNTD is for all potential failure modes to be non-credible based on extreme loading conditions, or loading conditions appropriate using the principles of ALARP (i.e., As Low as Reasonably Practicable) when it is not practical to consider extreme conditions. Evaluation of potential failure modes with respect to this goal is ongoing.

The most recent failure modes review was conducted in November 2021. There were no changes to the key hazards and the existing controls were adequate to manage potential failure modes. The following is a summary of the controls in place to manage the three key hazards / failure modes for tailings facilities identified in the ICMM Good Practice Guide (ICMM 2021):

- **Overtopping:** Under normal conditions, the facility maintains approximately 32 m of freeboard. The facility can also store three consecutive 24-hour PMFs while maintaining more than 18 m of freeboard, which significantly exceeds the design criteria required under the HSRC (KCB 2021).
- **Internal Erosion and Piping:**
  - Under the existing configuration and piezometric conditions, internal erosion cannot progress to the point of a major failure that would result in a downstream breach. The embankment is a "flow-through" design with two upstream filter zones and a geotextile to manage potential internal erosion risks. The embankment continues to show no signs of internal erosion or piping, which is demonstrated by the clear seepage discharged into the CSP and the visual observations of the embankment (e.g., no sinkholes observed on the embankment structure). The seepage gradients under existing conditions are much lower than those assumed in design, and lower than those that were present during operations.
  - Sinkholes have formed on the tailings beach but are localized features, caused by tailings migrating into the upstream coarse rockfill shell (2 m minus waste rock). These features do not represent a dam safety concern.
- **Slope Instability:**
  - The facility continues to show no signs of instability based on visual observations and ongoing monitoring of the piezometers. The embankment is a coarse rockfill structure founded on bedrock with a downstream slope of 2H:1V. Slope stability analysis for the design had factor of safety (FoS) greater than 1.6 under the full pond and tailings levels (i.e., El. 824 m) (KC 1996), which complies with the HSRC requirements. The FoS under the current tailings load (i.e., El. 796 m) is higher than the design analysis given that the tailings level is significantly lower than what was assumed in design. The design accounted for weak planes in the abutment rock, and slope inclinometers were installed during early operations to monitor movements. No movement was observed in the inclinometers, which were monitored until 1998.
  - The dam fill and foundation units are not susceptible to significant strength loss under seismic loads at the site. A horizontal seismic coefficient of 0.15 g (equivalent to a peak ground acceleration of 0.3 g) was adopted for design, which exceeds the 10,000-year earthquake (0.17 g) (KCB 2020).
  - The facility continues to show no signs of surface erosion that could impact embankment stability. Both the upstream and downstream slopes are covered with coarse rockfill to protect against surface erosion. A small erosion gully was observed during the 2017 site

visit on the upstream slope and left abutment wall contact; however, the gulley has not changed significantly since that time is not a concern for embankment integrity.

Based on the above, key hazards related to the SNTSF are being managed effectively under current conditions, and the SNTSF is not seen as having the potential for a catastrophic flow failure in its current configuration.

5.4 Upstream and Downstream Conditions Review

There have been no changes to the upstream or downstream conditions during the review period.

5.5 Potential Consequence of Failure

Teck provided the following statement regarding the consequence classification of the facility:

> *Teck are aligned with the most conservative interpretation of the GISTM which, in turn, is consistent with their safety culture. Commensurately, Teck has advised that consequence classification is not a part of their tailings management governance and has asked that it not be reported in this AFPR. Instead, Teck will adopt the extreme consequence case design loading for any facility with a credible catastrophic flow failure mode. For facilities without a credible failure mode in terms of a life safety issue, Teck will reduce credible risks to As Low As Reasonably Practicable (ALARP). This consequence case applies for both earthquake and flood scenarios for all tailings facilities, consistent with the GISTM. Adopting this approach meets or exceeds any regulatory requirements, aligns with Teck's goal to eliminate risk for loss of life, and is consistent with the GISTM. This approach is consistent with industry-leading best practices and has an added benefit of providing accurate narratives to communities about the safety of tailings facilities that could impact them and who share Teck's approach of one life is one too many to be at risk.*

The SNTSF meets HSRC requirements and evaluations under extreme loading scenarios are on-going.

5.6 Physical Performance

5.6.1 Geotechnical

The facility has performed adequately for over 20 years and has shown no indications of geotechnical instability. There were no changes to the geotechnical characteristics of the facility during the review period. As noted in Section 4, there were no threshold exceedances or unusual conditions observed during the review period, and instrumentation readings were consistent with historic trends and expected behaviour.

5.6.2 Hydrotechnical

The hydrotechnical performance of the facility during the review period was consistent with historic trends and expectations. There have been no changes to the water management system since

operations ceased in 2000. As noted in Section 4, there were no pond level exceedances or unusual conditions observed during the review period.

5.7 Operational Performance

The SNTSF has been inactive since 2000 and there are no operational requirements under existing conditions.

5.8 Documentation Review

The Operations, Maintenance and Surveillance (OMS) Manual was reviewed in 2021 and remains appropriate for the facility. An update was in progress at the time of writing to bring the document into the new Teck template for OMS Manuals.

The Emergency Preparedness and Response Plan (EPRP) was incorporated into the Mine Emergency Response Plan (MERP) for QCO in 2019 and remains appropriate for the facility.

6 SUMMARY AND RECOMMENDATIONS

The observed performance of the SNTSF is consistent with past behavior and expectations, and there were no safety concerns related to facility performance noted during the review period.

Recommendations related to the SNTSF are summarized in Table 6.1. There are no new recommendations for this AFPR, and all recommendations from previous reviews, which were all of the lowest level of priority, have been addressed and closed. Preliminary recommendations issued following the site visit that were closed before this report was issued have not been included in Table 6.1. Each recommendation has been assigned a priority using the 2016 HSRC Guidance Document priority definitions:

- Priority 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.
- Priority 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.
- Priority 3: Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
- Priority 4: Best Management Practice – further improvements are necessary to meet industry best practices or reduce potential risks.

Table 6.1 Summary of Recommendations

ID Number	Deficiency or Non-Conformance	Applicable Regulation or OMS Manual Reference	Recommended Action	Priority	Recommended Deadline (Status)
Previous Recommendations Closed / Superseded					
SNTD-2018-01	*Upper and Lower Met rain gauges unreliable in winter*	*n/a*	*Repair or improve the Upper and Lower Met Climate Station rain gauges to improve reliability of precipitation measurements during the winter months.*	*4*	*Prior to re-start of operations (CLOSED - This is not a safety risk under current conditions and so the recommended timeline has been revised to be done prior to a re-start of operations. A note to this effect should be included in the OMS manual by Q4 2021 to close-out the recommendation in this report.)*
SNTD-2019-02	*Survey Datum*	*n/a*	*Confirm that the drone LiDAR and crest monument surveys are being done using the same survey datums, and confirm key facility metrics (e.g., crest, downstream slope, etc.).*	*4*	*Q4 2021 (CLOSED – Teck had further discussions with drone LiDAR contractor, and are continuing to review alternate technologies with improved repeatability for tracking on-going changes to the facility.)*
SNTD-2020-02	*Annual Site Visit Scheduling*	*n/a*	*Include recommendation in OMS Manual that the annual site visits are to be completed in late May or early June*	*4*	*Q2 2022 (CLOSED – not applicable to this facility as vegetation is not a significant issue)*
Previous Recommendations Ongoing - None					
2021 Recommendations – No new recommendations					

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.
B.C. Permit to Practice No. 1000171

Max Cronk, P.Eng.
Project Manager
Civil Engineer

Robert W. Chambers, P.Eng.
Senior Geotechnical Engineer, Principal

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
R. W. CHAMBERS
25 March 2022

MC/RWC:jc

REFERENCES

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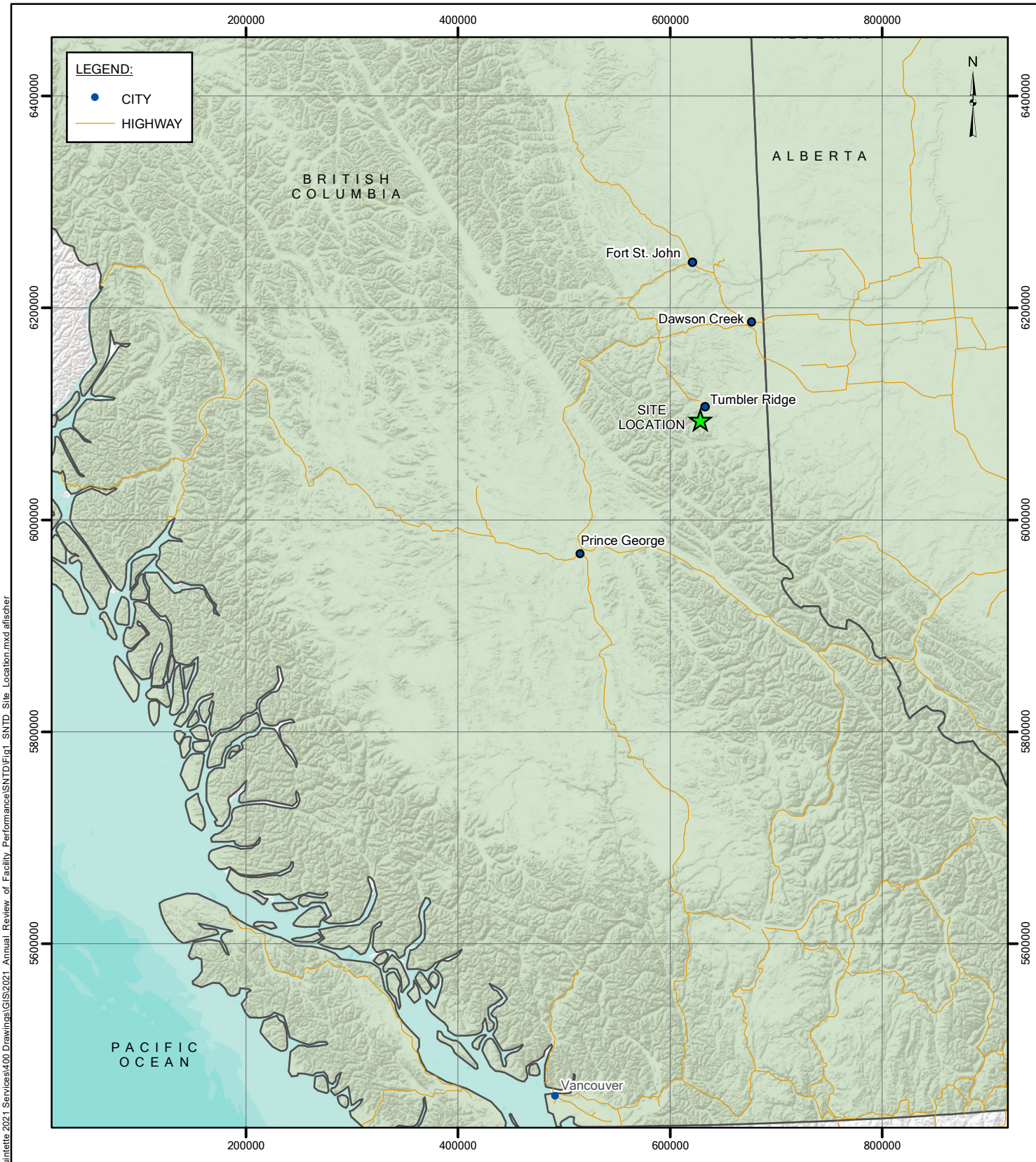
Teck Resources Ltd. (Teck). 2019b. “Guideline for Tailings and Water Retaining Structures”. January.

FIGURES



NOTES:
1. PROJECTION: NAD83 UTM ZONE 10N.
2. BASE DATA: ESRI.

SCALE 0 100,000 m

CLIENT: Teck

Klohn Crippen Berger

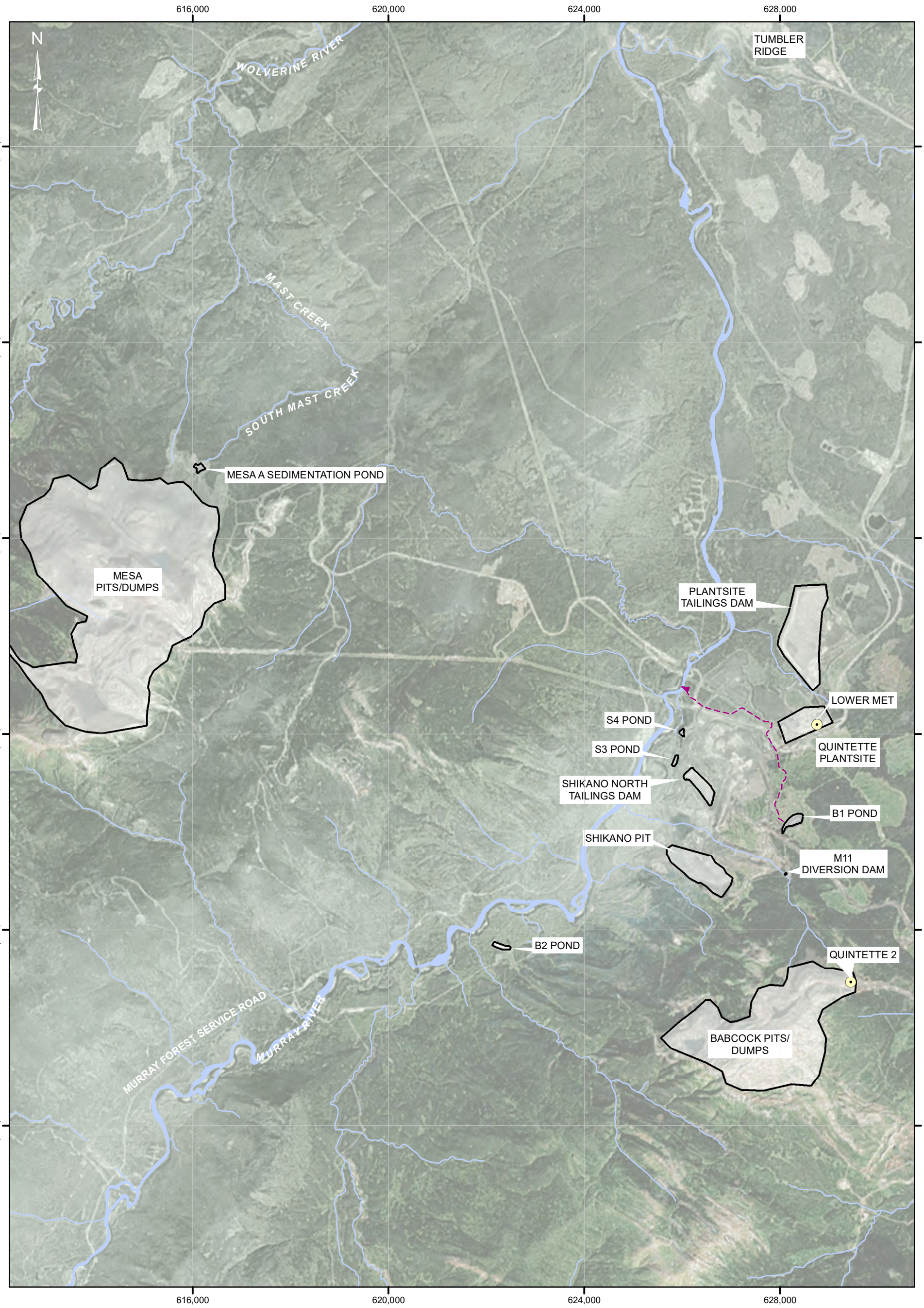
PROJECT: QUINTETTE COAL OPERATIONS
2021 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: SITE LOCATION

PROJECT No. M09684A20

FIG No. 1

Path: \\int.klohn.com\ProjData\MVCR\M09684A20 - TCL-Quintette 2021 Services\400 Drawings\GIS\2021 Annual Review of Facility Performance\SNTD\Fig1 SNTD Site Location.mxd afischer



NOTES:
1. DATUM, PROJECTION: NAD83, UTM ZONE 10N.
2. IMAGERY: ESRI.

LEGEND:

- CLIMATE STATION
- M11/M15 CHANNEL
- CREEK/RIVER
- STRUCTURE BOUNDARY

SCALE 0 2,500 m

CLIENT: Teck

Klohn Crippen Berger

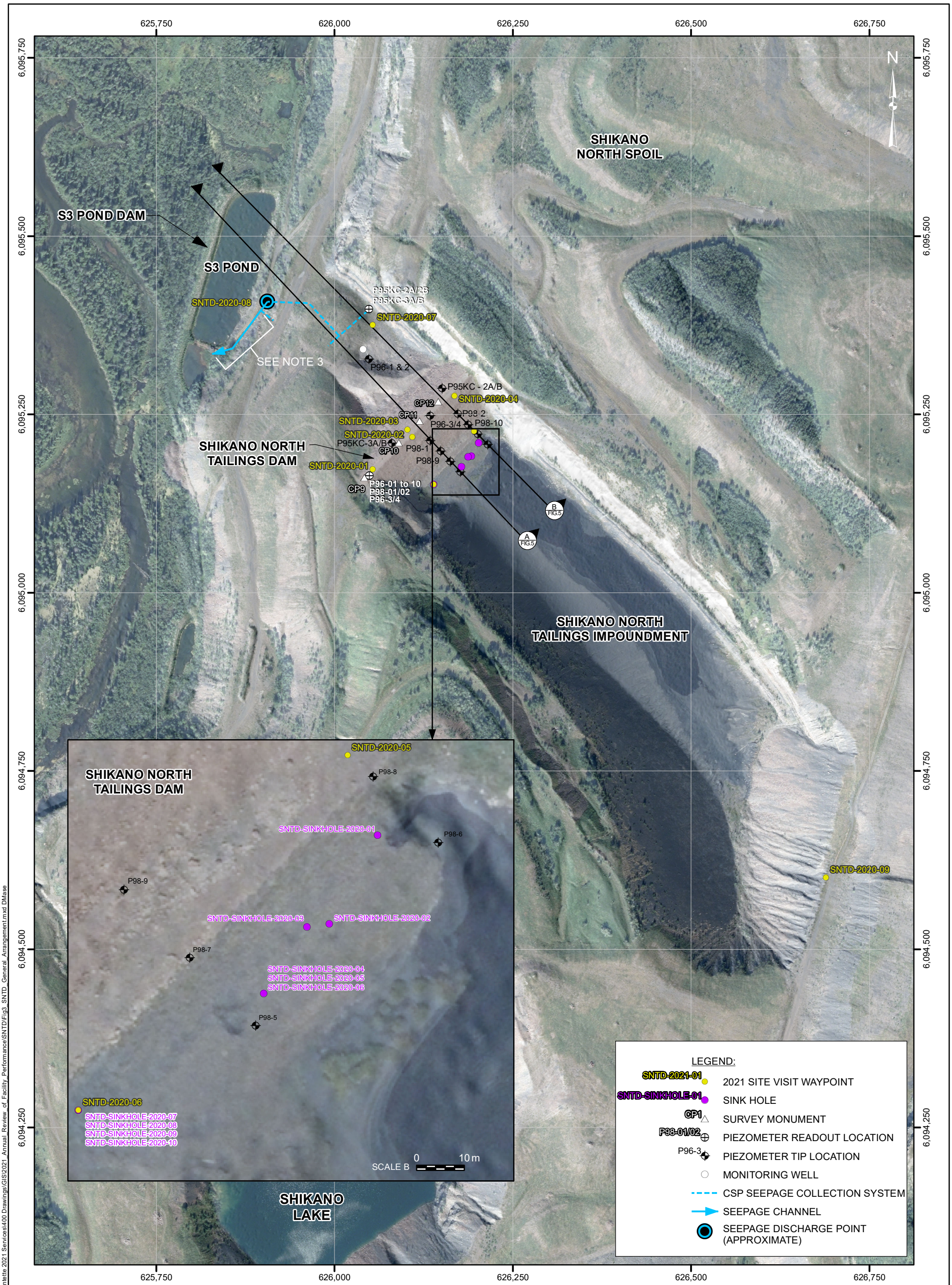
PROJECT: QUINTETTE COAL OPERATIONS
2021 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: GENERAL SITE PLAN

PROJECT No. M09684A20

FIG No. 2

Path: \\int.klohn.com\ProjData\MVCRM\09684A20 - TCL-Quintette 2021 Services\400 Drawings\GIS\2021_Annual_Review_of_Facility_Performance\SNTD\Fig2_SNTD_General_SitePlan.mxd DMase



NOTES:
1. PROJECTION: NAD83 UTM ZONE 10N.
2. ORTHOPHOTO PROVIDED BY TECK.
   SOURCE: AIRBORNE IMAGING. 2020. "FINAL SURVEY REPORT: 15997 QUINETTE/BULLMOOSE FOR TECK METALS". AUGUST 20.
3. THIS PART OF SEEPAGE COLLECTION PIPE WAS LIKELY REPLACED WITH OPEN CHANNEL.

SCALE A 0 150 m

CLIENT: Teck

Klohn Crippen Berger

PROJECT: QUINTETTE COAL OPERATIONS
2021 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: SHIKANO NORTH TAILINGS DAM GENERAL ARRANGEMENT

PROJECT No. M09684A20

FIG No. 3

Path: \\int.klohn.com\ProjData\M\VCRM09684A20 - TCL-Quintette 2021 Services\400 Drawings\GIS\2021 Annual Review of Facility Performance\SNTD\Fig3_SNTD_General_Arrangement.mxd DMase

NOTES:
1. PROJECTION: NAD83 UTM ZONE 10N.
2. ORTHOPHOTO PROVIDED BY TECK.
   SOURCE: AIRBORNE IMAGING. 2020. "FINAL SURVEY REPORT: 15997 QUINETTE/BULLMOOSE FOR TECK METALS". AUGUST 20.

SCALE 0 150 m

CLIENT: Teck

Klohn Crippen Berger

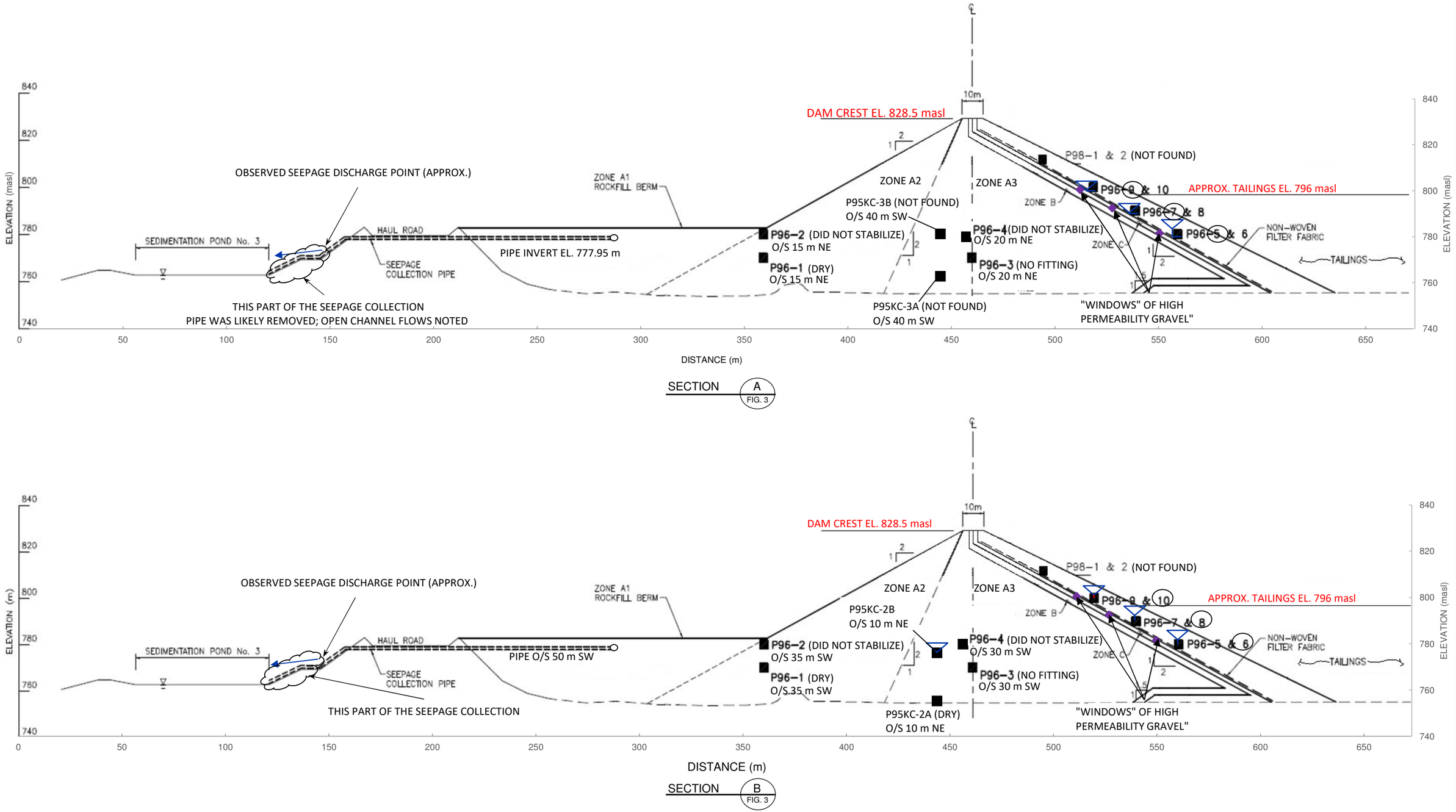
PROJECT: QUINTETTE COAL OPERATIONS
2021 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: SHIKANO NORTH TAILINGS DAM CATCHMENT

PROJECT No. M09684A20

FIG No. 4

Path: \\nt.klohn.com\ProjData\M\VCRM09684A20 - TCL-Quintette 2021 Services\400 Drawings\GIS\2021_Annual_Review_of_Facility_Performance\SNTD\Fig4_SNTD_Catchment.mxd DMase



SECTION A
FIG. 3

SECTION B
FIG. 3

NOTES:

1. CONSTRUCTION RAMP ON DOWNSTREAM SIDE OF DAM IS NOT SHOWN.

REFERENCES:

KLOHN CRIPPEN CONSULTANTS LTD. (KC). 1999. "SHIKANO NORTH TAILINGS IMPOUNDMENT - STAGE 2 AS-BUILT REPORT". JULY.

LEGEND:

JULY 12, 2021 WATER LEVEL

CLIENT: Teck

Klohn Crippen Berger

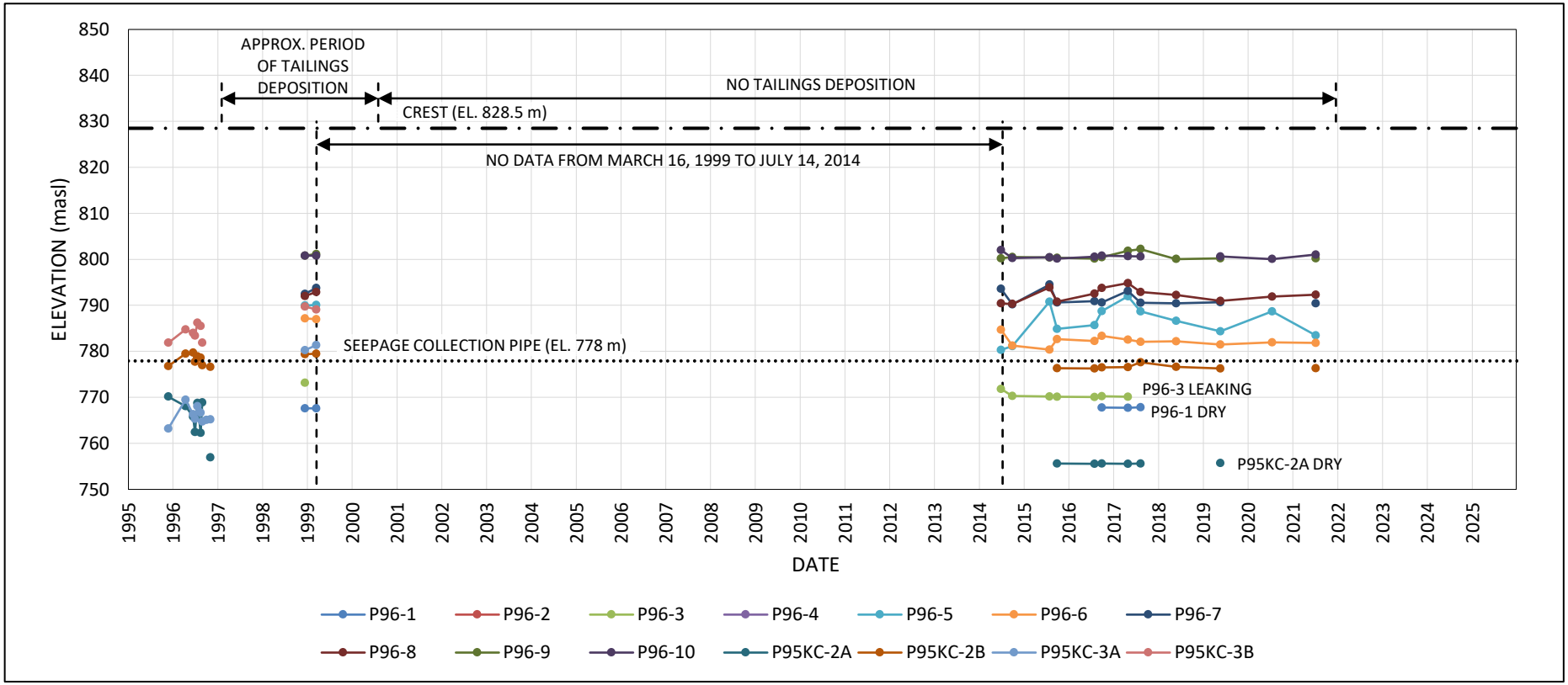
PROJECT: QUINTETTE COAL OPERATIONS
2021 ANNUAL FACILITY PERFORMANCE REVIEW

SHIKANO NORTH TAILINGS DAM
SCHEMATIC SECTIONS A AND B
WITH 2021 PIEZOMETER READINGS

PROJECT No. M09684A20

5

Date & Time: 2021-12-24 16:50
Figure File: C:\Users\mcronk\Desktop\211223 Shikano Piezometer (version 1) (version 1).xlsx]Figure 5



NOTES:

1. P96-1 HAS BEEN DRY SINCE 2016.
2. P96-2 HAS BEEN PLUGGED SINCE IT WAS INSTALLED IN 1996.
3. P96-3 HAS BEEN LEAKING SINCE 2016.
4. P96-4 HAS NOT STABILIZED SINCE READINGS WERE RE-INITIATED IN 2014 AND IS PRESUMED TO BE PLUGGED. PRIOR TO THAT, THE INSTRUMENT WAS DRY IN 1998 AND 1999.
5. P96-7 AND P96-9 WERE DRY IN 2020, BUT BECAME WET AGAIN IN 2021.
6. P96-10 WAS DRY IN 2018, BUT BECAME WET AGAIN IN 2019.
7. P9KC-2A WAS DRY IN 2018, 2020 AND 2021.
8. P95KC-2B WAS DRY IN 2020 BUT BECAME WET AGAIN IN 2021.
9. P95KC-3A AND P95KC-3B HAVE NOT BEEN LOCATED SINCE READINGS WERE RE-INITATED IN 2014. PRE-2014 DATA ARE SHOWN ON THE PLOT.
10. P98-1 and P98-2 HAVE NOT BEEN LOCATED SINCE READINGS WERE RE-INITATED IN 2014. BOTH INSTRUMENTS WERE DRY BASED ON THE MOST RECENT READINGS TAKEN IN 1999.

CLIENT: Teck

Klohn Crippen Berger

PROJECT: QUINTETTE COAL OPERATIONS
2021 ANNUAL FACILITY PERFORMANCE REVIEW

TITLE: SHIKANO NORTH TAILINGS DAM
HISTORICAL PIEZOMETER DATA

PROJECT No. M09684A20

FIG. No. 6

Date & Time: 2021-12-24 16:50
Figure File: C:\Users\mcronk\Desktop\[211223 Shikano Piezometer (version 1) (version 1).xlsx]Figure 5

APPENDIX I

Photographs

Appendix I
Inspection Photographs

LEGEND:

- SNTD = Shikano North Tailings Dam
- SNTD-2021-## refers to 2021 site visit photograph location, as shown on Figure 3

Photographs were taken during site inspection on July 12, 2021.

Photo I-1 Downstream slope – looking northeast from the left abutment (SNTD-2021-01)

Photo I-2 Upstream slope – looking northeast from the left abutment (SNTD-2021-01)

Photo I-3 Embankment crest – looking northeast from the left abutment (SNTD-2021-01)

Photo I-4 Impoundment – looking southeast (SNTD-2021-02)

Photo I-5 Embankment crest – looking southwest from the right abutment (SNTD-2021-03)

Photo I-6 Upstream slope – looking southwest from the right abutment (SNTD-2021-03)

Photo I-7 Downstream slope – looking southwest from the right abutment (SNTD-2021-03)

Photo I-8 Sinkhole on the tailings beach (SNTD-2021-05)

Photo I-9 Sinkhole on the tailings beach (SNTD-2021-06)

Photo I-10 Sinkhole on the tailings beach (SNTD-2021-07)

Photo I-11 Freeboard monitoring stake (SNTD-2021-09)

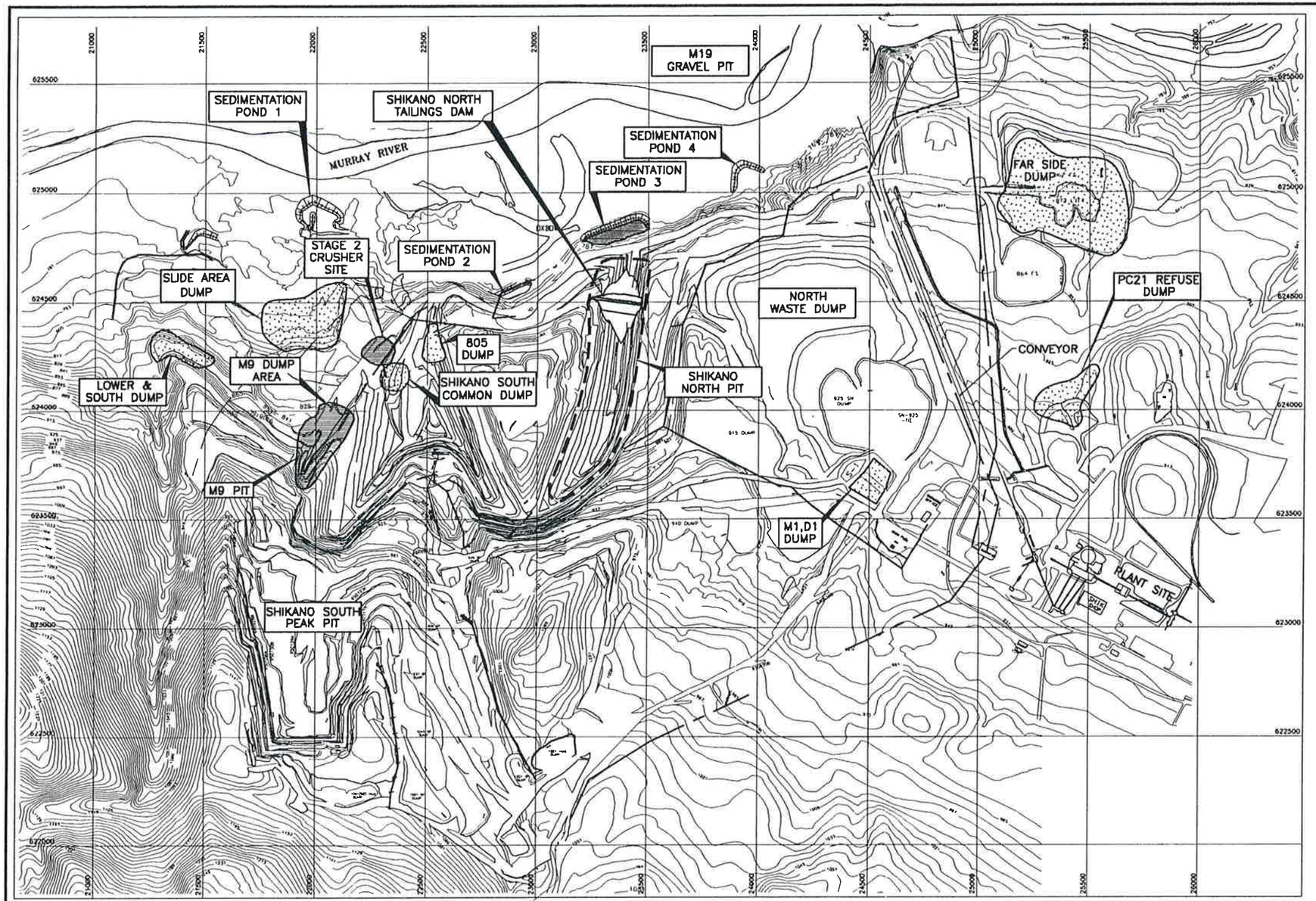
Photo I-12 Sinkhole on the tailings beach (SNTD-2021-10)

Photo I-13 Downstream slope – looking south from the right abutment (SNTD-2021-11)

Photo I-14 Seepage collection pipe outflow channel (no waypoint)

APPENDIX II

Select Dam Record Drawings



LEGEND

SHIKANO NORTH PIT \ WORK AREA

DISPOSAL AREA

ISSUED FOR AS-BUILT

200m 0 600m
SCALE

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
H. D. PLEWES
Sept 7/99

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
2	JULY 99	ISSUED FOR AS-BUILT	ENL	TDP	HDP	HDP
1	OCT 98	ISSUED FOR CONSTRUCTION	PSK	TDP	HDP	HDP
0	OCT 98	ISSUED FOR TENDER	PSK	TDP	HDP	HDP

DRAWING NO. | REFERENCE DRAWING

SEAL

CLIENT: Quintette Operating Corp.

KLOHN-CRIPPEN

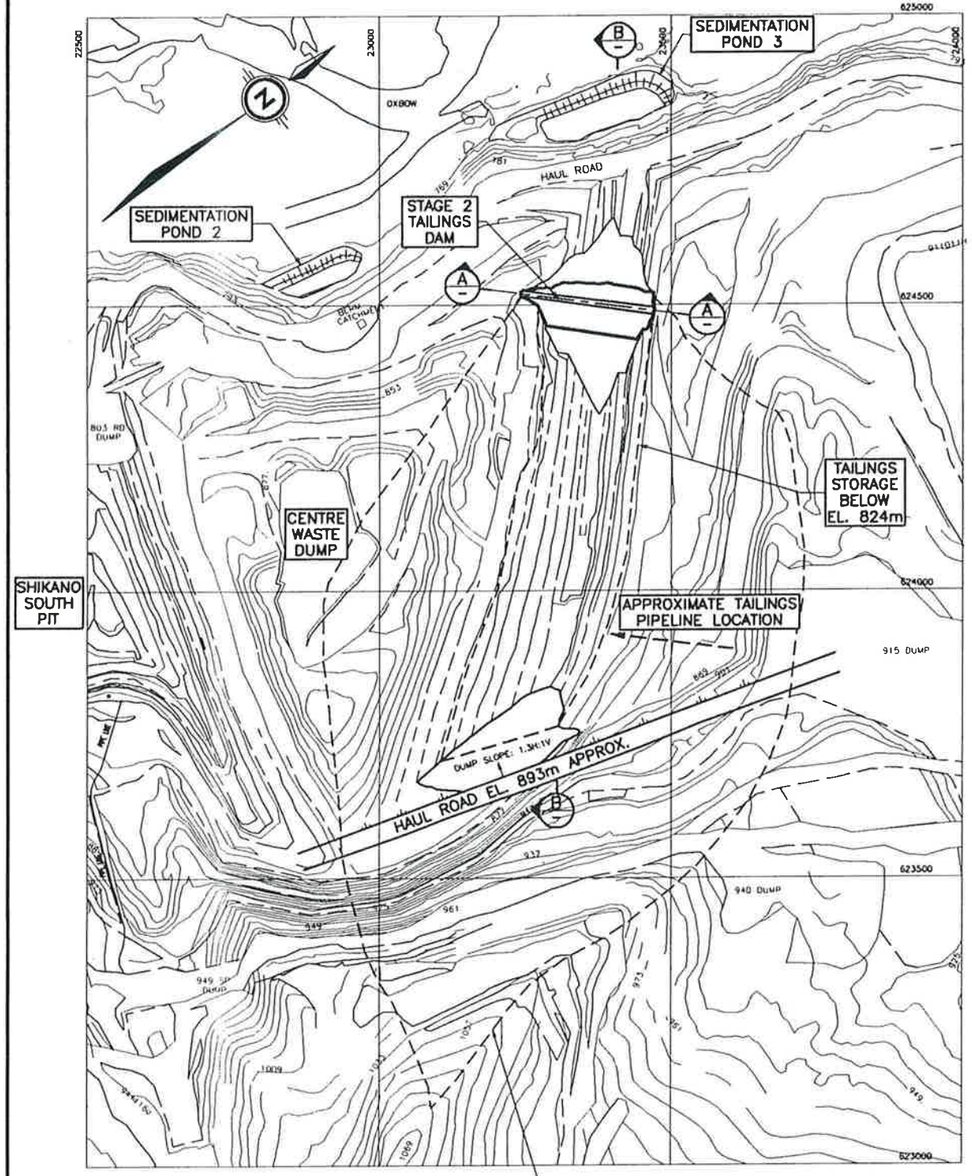
PROJECT: SHIKANO NORTH TAILINGS IMPOUNDMENT

TITLE: GENERAL SITE ARRANGEMENT

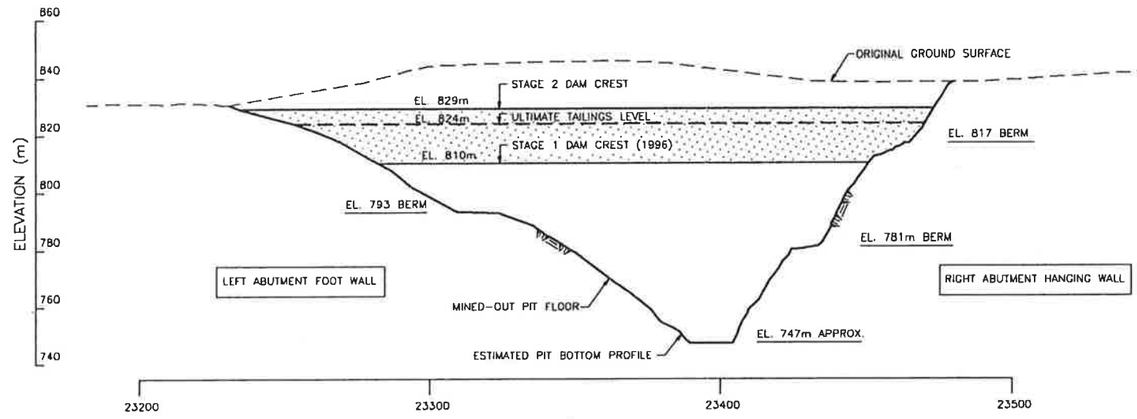
SCALE	PROJECT No.	DWG. No.	REV
AS SHOWN	PM6970 16	D-16000	2

CANCEL PRINTS BEARING PREVIOUS

KCC-A3



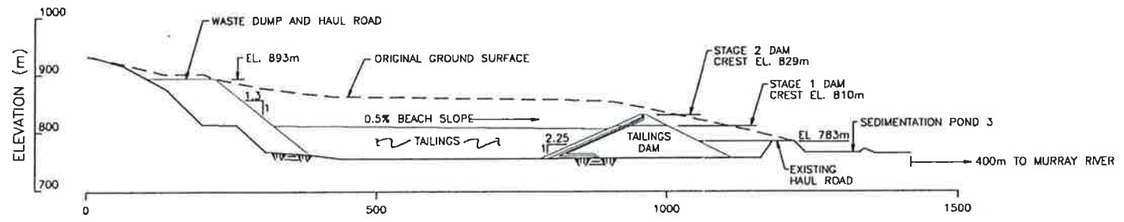
PLAN
SCALE: A



SECTION (A)
SCALE: B

LEGEND:

STAGE 2 DAM RAISE



SECTION (B)
SCALE: A

ISSUED FOR AS-BUILT

SCALE B: 20m 0 60m

SCALE A: 100m 0 300m

SCALE

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA H. D. PLEWES 7/99

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
2	JULY 99	ISSUED FOR AS-BUILT	ENL	TDP	HDP	HDP
1	OCT 98	ISSUED FOR CONSTRUCTION	PSK	TDP	HDP	HDP
0	OCT 98	ISSUED FOR TENDER	PSK	TDP	HDP	HDP

DRAWING NO. | REFERENCE DRAWING

SEAL

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

CLIENT: Quintette Operating Corp.

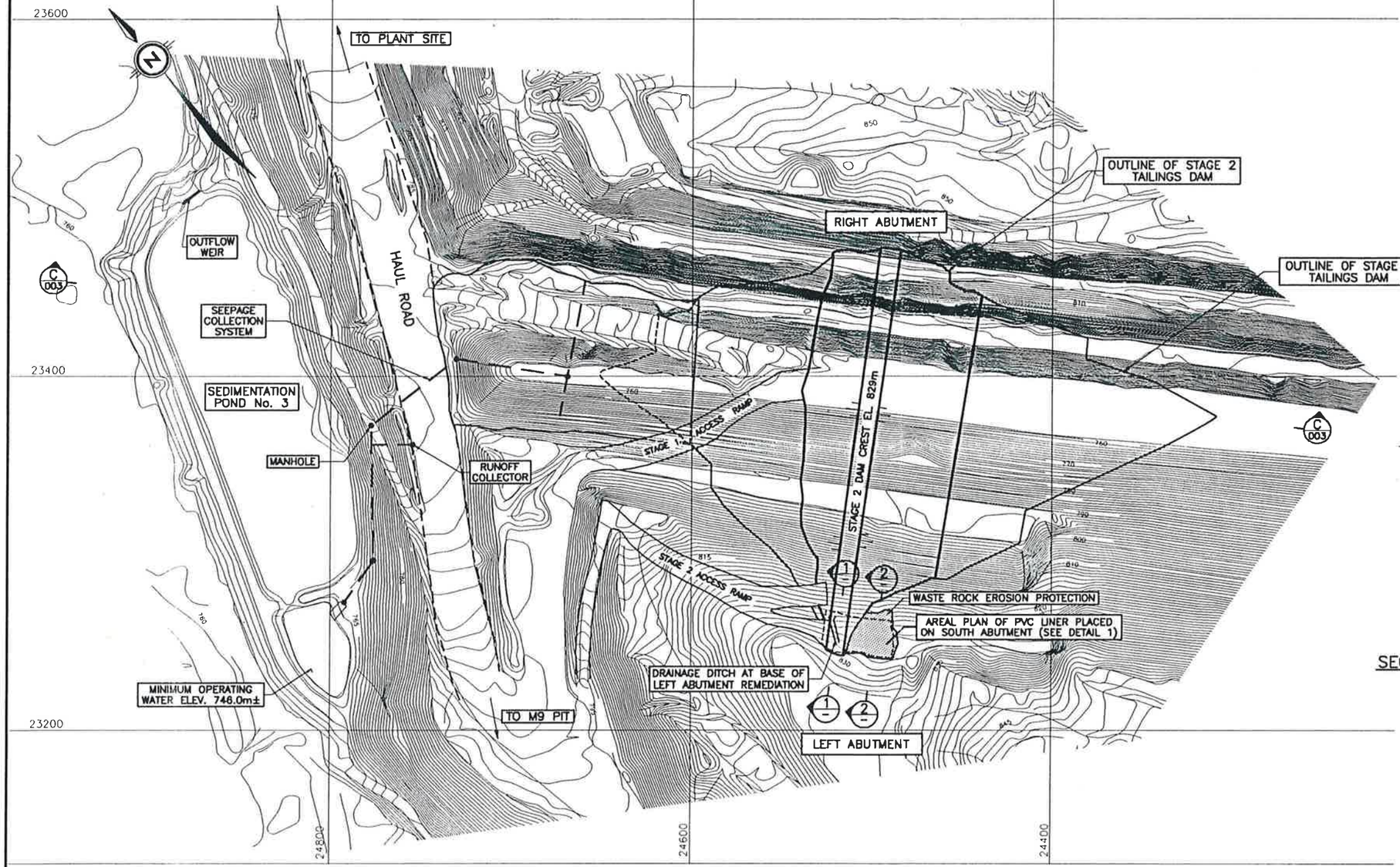
KLOHN-CRIPPEN

PROJECT: SHIKANO NORTH TAILINGS IMPOUNDMENT

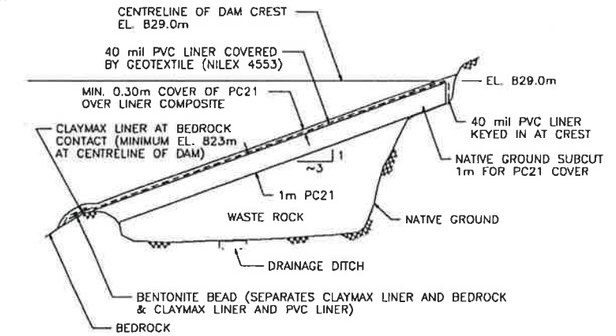
TITLE: ARRANGEMENT PLAN AND SECTIONS OF TAILINGS IMPOUNDMENT SITE

SCALE	PROJECT No.	DWG. No.	REV.
AS SHOWN	PM6970 16	D-16001	2

CANCEL PRINTS BEARING PREVIOUS



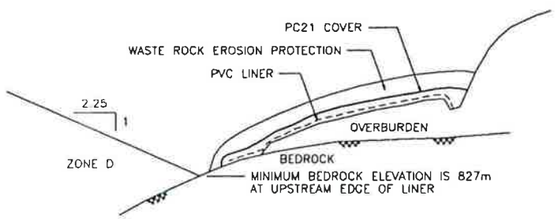
PLAN



SECTION (1) TYPICAL LEFT ABUTMENT REMEDIATION
N.T.S.

NOTES:

1. TOPOGRAPHY ACQUIRED FROM AERIAL PHOTOGRAPHY TAKEN SEPT.8, 1995 AND SUPPLIED BY QUINTETTE OPERATING CORPORATION.
2. TOPOGRAPHY FOR LEFT ABUTMENT REMEDIATION SUPPLIED BY CONTRACTOR.



SECTION (2) TYPICAL LEFT ABUTMENT LINER EXTENSION
N.T.S.

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — H. D. PLEWES — 7/99

ISSUED FOR AS-BUILT

0 100m
SCALE

NO	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
2	JULY 99	ISSUED FOR AS-BUILT	ENL	TDP	HDP	HDP
1	OCT 98	ISSUED FOR CONSTRUCTION	PSK	TDP	HDP	KDP
0	OCT 98	ISSUED FOR TENDER	PSK	TDP	HDP	KDP

DRAWING NO. | REFERENCE DRAWING

SEAL

CLIENT: Quintette Operating Corp.

KLOHN-CRIPPEN

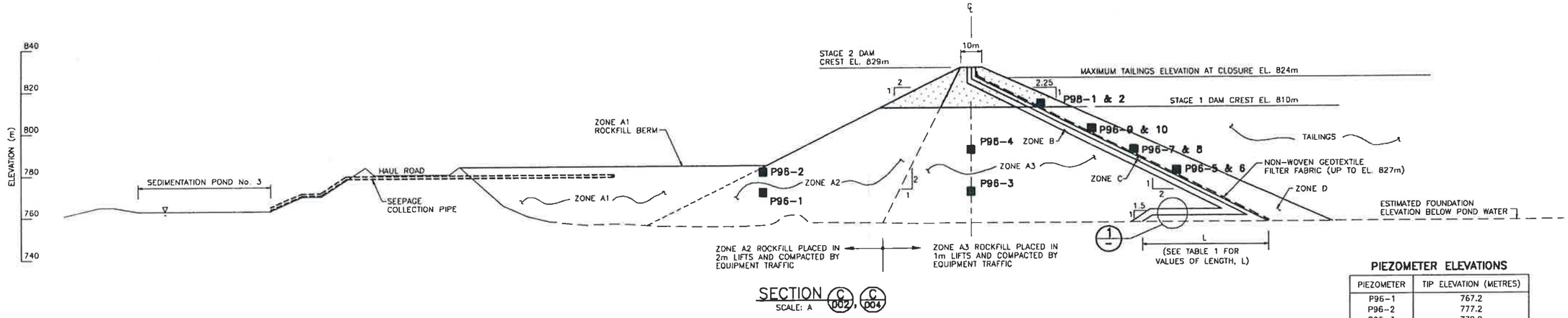
PROJECT: SHIKANO NORTH TAILINGS IMPOUNDMENT

TITLE: STAGES 1 AND 2 TAILINGS DAM PLAN

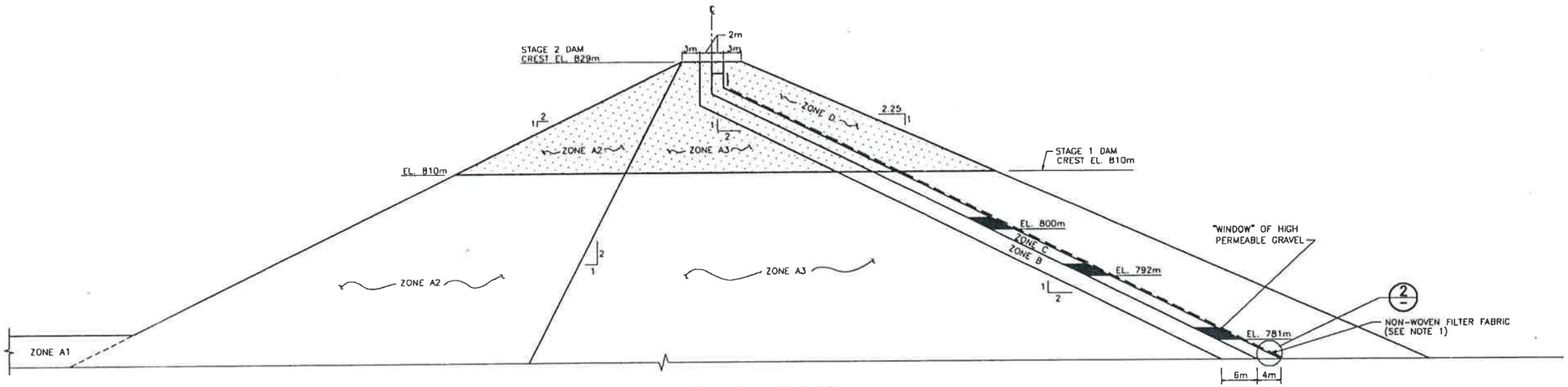
SCALE	PROJECT No.	DWG No.	REV
AS SHOWN	PM6970 16	D-16002	2

CANCEL PRINTS BEARING PREVIOUS

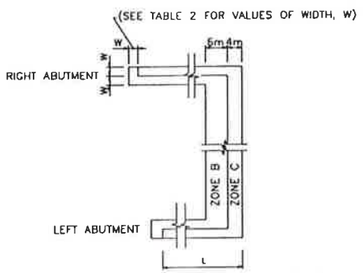
KCC-A3



SECTION (C/002), (C/004)
SCALE: A



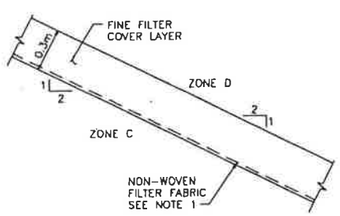
DETAIL OF DAM CREST
SCALE: B



(SEE TABLE 1 FOR VALUES OF LENGTH, L)

DETAIL (1/-)
SCALE: C

PLAN VIEW OF FILTER ZONES AGAINST ABUTMENT WALLS



DETAIL (2/-)
SCALE: D

GEOTEXTILE PROTECTIVE COVER

TABLE 1
FILTER ARM EXTENSION LENGTHS

FOUNDATION ELEVATION (m)	LENGTH, L (METRES) RIGHT ABUTMENT	LEFT ABUTMENT
810.0 - 815.5	30	20
815.5 - 816.5	28	20
816.5 - 817.5	26	20
817.5 - 818.5	24	20
818.5 - 819.5	22	20
819.5 - 820.5	20	20
820.5 - 821.5	18	18
821.5 - 821.6	15	15
821.6 - 822.5	13	13
822.5 - 823.5	11	11
823.5 - 824.5	9	9
824.5 - 825.5	9	9
825.5 - 825.6	7	7
825.6 - 826.5	7	7
826.5 - 827.5	7	7
827.5 - 828.5	7	7
828.5 - 829.0	6	6

TABLE 2
FILTER ARM WIDTHS

FOUNDATION ELEVATION (m)	WIDTH , W (METRES)* LEFT ABUTMENT	RIGHT ABUTMENT
810.0-829.0	2.5	1.677

* EQUIVALENT HORIZONTAL THICKNESS. PERPENDICULAR THICKNESS TO ABUTMENT WALL IS 1.5m

STAGE 2 DAM RAISE MATERIAL ZONES

ZONE	DESCRIPTION	MATERIAL DESCRIPTION
A2	DOWNSTREAM SHELL	WASTE ROCK < 2m
A3	ROCKFILL SELECT	WASTE ROCK < 1m
B	COARSE FILTER	150mm MINUS
C	FINE FILTER	38mm MINUS
D	UPSTREAM SHELL	WASTE ROCK < 2m

PIEZOMETER ELEVATIONS

PIEZOMETER	TIP ELEVATION (METRES)
P96-1	767.2
P96-2	777.2
P96-3	770.0
P96-4	780.1
P96-5	780.0
P96-6	780.0
P96-7	790.1
P96-8	790.2
P96-9	800.0
P96-10	800.0
P98-1	810.5
P98-2	810.5

LEGEND:

96-10
■ PIEZOMETERS INSTALLED IN TAILINGS DAM

NOTES:

1. FILTER FABRIC LAID ON THE UPSTREAM SIDE OF ZONE C FINE FILTER. FILTER FABRIC OVERLAP > 0.3m ON DAM FACE, AND EXTENDS 1m UP DAM ABUTMENTS. FILTER FABRIC COVERED BY 0.3m OF ZONE C FINE FILTER.
2. PIEZOMETER LEADS FOR P96-3 AND 4 AND P98-1 AND 2 EXTENDED TO LOCATION OF PIEZOMETER LEADS FOR P96-5 TO 10.
3. PIEZOMETER LEADS FOR P96-3 TO P96-10 AND P98-1 AND 2 ARE EXTENDED IN A PVC CONDUIT UP THE LEFT ABUTMENT TO THE STAGE 2 DAM CREST.

ISSUED FOR AS-BUILT

SCALE D: 0 2m
SCALE C: 0 80m
SCALE B: 0 40m
SCALE A: 0 100m
SCALE

NO	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
2	JULY 99	ISSUED FOR AS-BUILT	ENL	TDP	HDP	
1	OCT 98	ISSUED FOR CONSTRUCTION	PSK	TDP	HDP	
0	OCT 98	ISSUED FOR TENDER	PSK	TDP	HDP	

DRAWING NO. | REFERENCE DRAWING

SEAL: PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, H. D. PLEWES

CLIENT: Quintette Operating Corp.

KLOHN-CRIPPEN

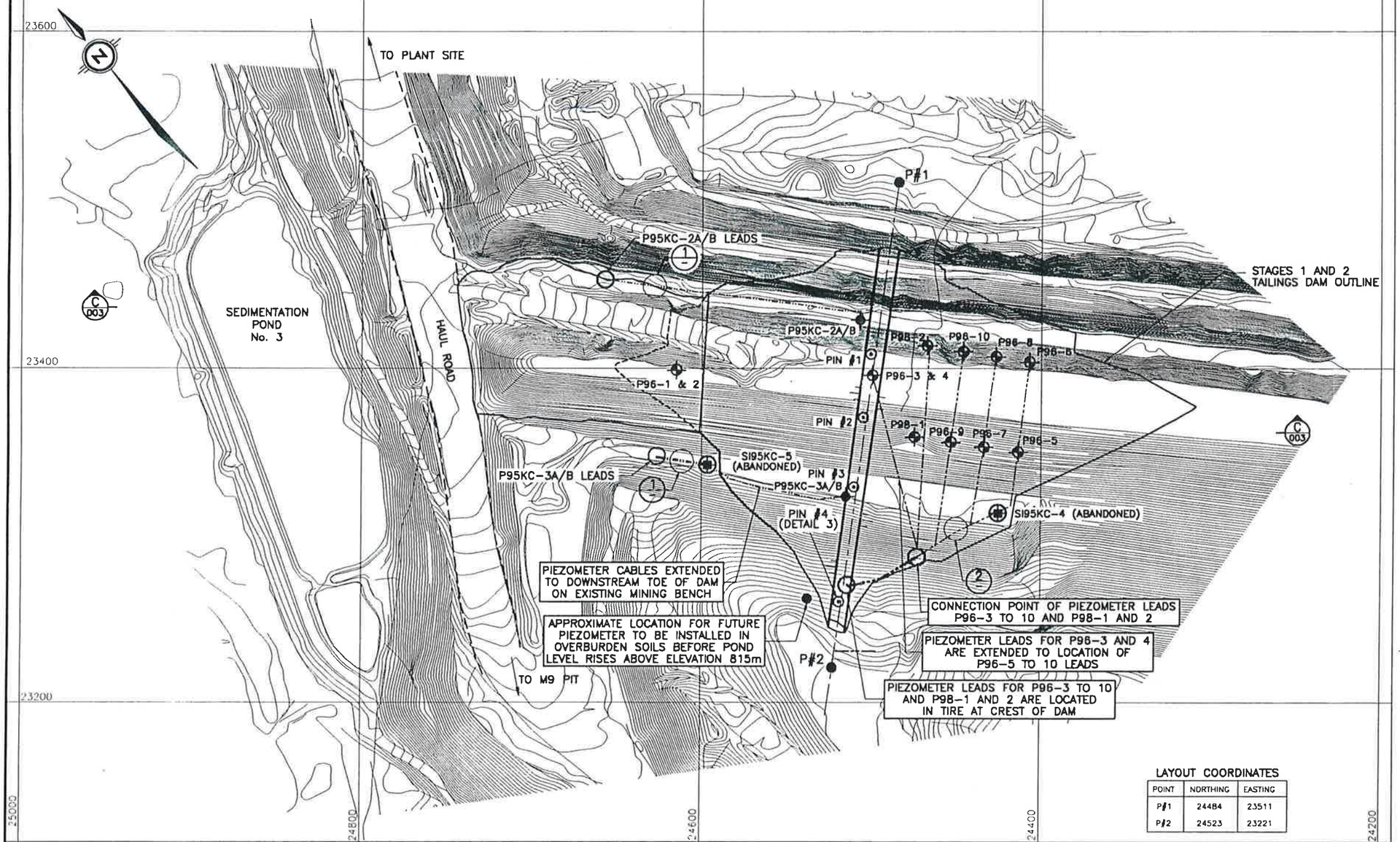
PROJECT: SHIKANO NORTH TAILINGS IMPOUNDMENT

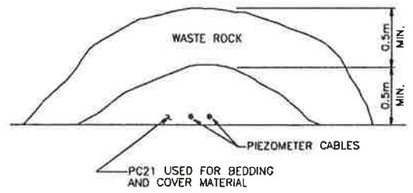
TITLE: STAGES 1 AND 2 TAILINGS DAM SECTIONS AND DETAILS

SCALE	PROJECT No.	DWG No.	REV
AS SHOWN	PM6970 16	D-16003	2

CANCEL PRINTS BEARING PREVIOUS

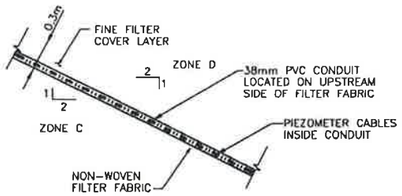
ACC-A3





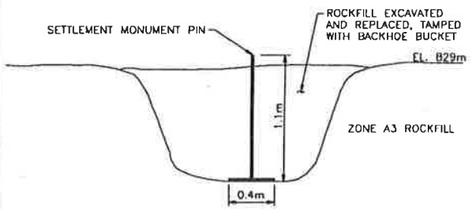
DETAIL 1
SCALE: B

BEDDING AND COVER MATERIAL FOR EXTENSION OF EXISTING PIEZOMETERS P95KC-3A/B



DETAIL 2
SCALE: B

EXTENSION OF PIEZOMTERS UP LEFT ABUTMENT



DETAIL 3
SCALE: N.T.S.

DETAIL OF SURVEY MONUMENTS INSTALLED ON STAGE 2 DAM CREST

LAYOUT COORDINATES

POINT	NORTHING	EASTING
P#1	24484	23511
P#2	24523	23221

NOTES:

1. TOPOGRAPHY ACQUIRED FROM AERIAL PHOTOGRAPHY TAKEN SEPT. 8, 1995 AND SUPPLIED BY QUINTETTE OPERATING CORPORATION (QOC).
2. TOPOGRAPHY FOR LEFT ABUTMENT REMEDIATION SUPPLIED BY CONTRACTOR.

LEGEND:

- P96-5 — LOCATION OF PIEZOMETERS INSTALLED IN STAGE 1
- EXISTING PIEZOMETERS P95KC-2A/B AND P95KC-3A/B
- EXISTING SLOPE INCLINOMETER SIKC95-5
- TIRE LOCATIONS TO PROTECT END OF PIEZOMETER CABLES AND SLOPE INCLINOMETERS.
- PIEZOMETER CABLES
- PIEZOMETER CABLES ENCLOSED IN PVC
- PIN #1 — DAM SETTLEMENT MONUMENTS SURVEY POINTS

ISSUED FOR AS-BUILT

SCALE B: 0 2m
SCALE A: 0 100m
SCALE

NO.	DATE	ISSUE / REVISION	DRAWN	CHK'D	DESIGN	APP'D
2	JULY 99	ISSUED FOR AS-BUILT	ENL	TDP	HDP	HDP
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DRAWING NO. | REFERENCE DRAWING

SEAL: PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — H. D. PLEWES

CLIENT: Quintette Operating Corp.

KLOHN-CRIPPEN

PROJECT: SHIKANO NORTH TAILINGS IMPOUNDMENT

TITLE: STAGES 1 AND 2 TAILINGS DAM INSTRUMENTATION PLAN AND DETAILS

SCALE	PROJECT No.	DWG. No.	REV.
AS SHOWN	PM6970 16	D-16004	2

CANCEL PRINTS BEARING PREVIOUS

APPENDIX III

Register of Reference Documents

Appendix III
Register of Reference Documents

Document Title	Author	Date of Issue
Shikano Geological Report Text	Quintette Coal Limited	May-85
Shikano North Tailings Impoundment - Design Report	Klohn Crippen	23-Jun-95
Shikano North Tailings Impoundment - Pervious Tailings Dam Option - Design Report	Klohn Crippen	09-Feb-96
Shikano North Tailings Impoundment - 1995 Geotechnical Investigations, Data Report	Klohn Crippen	09-Feb-96
Shikano North Tailings Impoundment 1996 As-Built Report	Klohn Crippen	14-Mar-97
Shikano North Tailings Impoundment 1997 Annual Review	Klohn Crippen	20-Feb-88
Shikano North Tailings Impoundment 1998 Annual Review	Klohn Crippen	05-Mar-99
Shikano North Tailings Impoundment - Stage 2 As-Built Report	Klohn Crippen	09-Jul-99
Shikano North Tailings Impoundment 1999 Annual Review	Klohn Crippen	06-Dec-99
Quintette Project - Baseline Climate & Hydrology Conditions	Clearwater Consultants Ltd.	17-Aug-11
Quintette Coal Project: 2012 Dam Inspections: Plantsite Tailings Dam, M11 Diversion Dam, Shikano North Tailings Dam	Klohn Crippen Berger Ltd.	Dec-12
Tailings Water Balance, Seepage Rates and Preliminary Seepage Reclaim Design	Klohn Crippen Berger Ltd.	30-Apr-13
Shikano North Tailings Dam - 2013 Dam Safety Inspection Report	Klohn Crippen Berger Ltd.	09-Dec-13
Quintette Dam Safety Review Shikano North Tailings Storage Facility	Klohn Crippen Berger Ltd.	27-May-14
Shikano North Tailings Dam – 2014 Dam Safety Inspection Report – Revision 1	Klohn Crippen Berger Ltd.	26-Nov-14

Document Title	Author	Date of Issue
Shikano North Tailings Dam - Response to February 3, 2014 MEM Memorandum	Klohn Crippen Berger Ltd.	29-Jun-15
Shikano North Tailings Dam – 2015 Dam Safety Inspection Report	Klohn Crippen Berger Ltd.	04-Mar-16
Shikano North Tailings Storage Facility Engineer of Record	Klohn Crippen Berger Ltd.	23-Sep-16
Quintette Coal Operations – Shikano North Tailings Dam Water Management, Water Balance and Quantifiable Performance Objectives	Klohn Crippen Berger Ltd.	22-Dec-16
Shikano North Tailings Dam – 2016 Dam Safety Inspection Report	Klohn Crippen Berger Ltd.	22-Dec-16
Shikano North Tailings Dam – 2017 Dam Safety Inspection Report	Klohn Crippen Berger Ltd.	16-Mar-18
Shikano North Tailings Dam – 2018 Dam Safety Inspection Report	Klohn Crippen Berger Ltd.	25-Mar-19
Shikano North Tailings Dam – 2019 Dam Safety Inspection Report	Klohn Crippen Berger Ltd.	17-Mar-20
Shikano North Tailings Dam – 2020 Dam Safety Inspection Report	Klohn Crippen Berger Ltd.	26-Mar-21