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**VA101-18/26-1**

## **PEND OREILLE MINE - TAILINGS DISPOSAL FACILITY #3**

# **2019 DAM SAFETY INSPECTION REPORT**

Rev	Description	Date
0	Issued in Final	March 12, 2020

## EXECUTIVE SUMMARY

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Bruno Borntraeger, P.Eng. and Cyrus Niamir, P.E. of Knight Piésold Ltd. (KP) completed the annual dam safety inspection (DSI) of Tailings Disposal Facility (TDF) #3 and associated works at the Pend Oreille Mine on September 25, 2019. The mine is currently owned and operated by Teck Washington Incorporated (TWI). This dam inspection report describes the condition of the various components of the engineered TDF located at the historical #3 tailings disposal site. The components were inspected and found to be in good condition and operating well. This annual inspection report is written to meet the reporting requirements of the Teck Guideline for Tailings and Water Retaining Structures (TWRS, 2019), specifically Appendix V.

The Pend Oreille Mine is located in northeast Washington State and has a mining history dating back over seventy years. The mine site was re-opened in 2004 and operated until 2009 when it was placed in care and maintenance. Mining operations resumed in 2014. The mine re-entered care and maintenance in August 2019, just prior to this annual inspection. TDF #3 contains mill tailings and supernatant water. The reconstructed TDF #3 provides containment utilizing two earthfill embankments with an impoundment double lined with 60 mil High Density Polyethylene (HDPE). A basin underdrain system is present along the top of the upper liner, and will be used to enhance consolidation in the tailings mass prior to TSF closure. A leakage collection and recovery system (LCRS) between the liners collects and removes seepage from beneath the primary (upper) liner.

The total amount of tailings deposited in TDF #3 since 2004 is 5,328,000 tons. A total of 2,942,000 tons of tailings were deposited in the facility from 2004 to 2009 when mine operations were suspended followed by 2,386,000 tons of tailings deposited since the mine re-opened in December 2014 and closed in August 2019. Approximately 370,000 tons were deposited into the facility between the 2018 and 2019 dam safety inspections.

The TDF #3 dam hazard consequence classification was reviewed and updated during the last Dam Safety Review (DSR) in 2014. Both the NE and NW Embankments have a hazard class 2 or “Significant” classification under WAC 173-175-130.

TWI conducts routine inspections of TDF #3, particularly after the spring thaw to check the liner system for any winter damage. Some minor tears in the geomembrane liner were discovered over the course of the year. Depending on the severity of the tear, it was either patch welded immediately, sand bagged or sealed with tailings. There were no major issues noted during the inspection or reported during the past year. No significant construction activities took place over the course of the year.

Instrumentation records indicate the facility is performing within the design objectives. The basin underdrain piezometers recorded pore pressures consistent with the tailings pond elevation as expected, as no pumping of the basin underdrain system has been incorporated since October 26, 2015. Piezometers situated between the liners indicate the LCRS system is performing within design tolerances, as pore pressures within the LCRS were typically negligible with minor fluctuations observed during brief periods when LCRS recovery increased prior to the tailings solids blinding off localized defects. The LCRS pump was replaced in December 2016 and an increase in LCRS pore pressures were noted in the first half of 2017. The pump operating levels settings were adjusted, and the pore pressures decreased, but not to historical levels. The LCRS system is effectively collecting leakage through the upper liner and controlling the head on the bottom liner within design tolerances.

Pumping of the basin underdrain system would be reinstated if the performance of the LCRS deteriorates and/or operation of the basin underdrain is utilized to enhance tailings consolidation. Pumping the basin underdrain will be required prior to facility closure in order to further consolidate the tailings mass prior to grading and capping.

The survey monuments recorded no significant movement over the past 12 months. Six embankment foundation piezometers (three at each embankment) were installed in July 2019. These are monitored by TWI and will be reported on as part of this report moving forward. The groundwater elevation at the downstream toe of the embankments is as expected.

The pond surface elevation increased by approximately 3.15 feet from 2,396.0 ft. to 2,399.15 ft. between October 2018 and July 2019 due to ongoing tailings deposition and surface water inputs. The stored volume of tailings solids is estimated to be 101.3 million cubic feet and the stored pond volume is estimated to be 24.9 million cubic feet (571.6 ac-ft). Approximately, 42.4 million cubic feet of storage volume remains between the pond surface water elevation and the freeboard elevation of 2,414 ft. Additional storage capacity can be obtained by reducing the pond volume to the targeted operational volume of 190.5 acre-feet. The maximum theoretical storage volume remaining to the maximum filling elevation of 2,414 ft is 59.0 million cubic feet assuming the pond volume is reduced to the target operational pond volume. To-date, the dry density of the tailings is approximately 105 pounds per cubic foot (pcf), which is consistent with the facility design and meeting design objectives.

The current impoundment freeboard is 20.9 feet, significantly greater than the minimum freeboard requirement of 6 feet. The floating evaporators were operated to remove excess pond water, although there was a net increase in pond volume by approximately 7% between October 2018 and July 2019. It is expected that the volume of water has decreased since July 2019, but no current survey data was made available to KP. TDF #3 has approximately 3.1 years of capacity for tailings deposition below the freeboard requirement assuming a tailings deposition rate of 2,000 tpd. Additional tailings storage capacity can be obtained by reducing the pond volume.

The Operations, Maintenance and Surveillance (OMS) Manual for TDF #3 was recently revised in February 2020 by KP and recommendations noted from the 2019 Annual Inspection were incorporated into this revision. The revised OMS Manual has been updated reflect the changes in operation specifically the move to care and maintenance. The Emergency Action Plan (EAP) was last revised in October 2019 by TWI and includes relevant emergency information useful for emergency training, planning, mitigation and response. This EAP update also reflects the changes to operation. The last Dam Safety Review was completed in 2014. The next Dam Safety Review is planned for spring 2020.

The following table provides a summary of deficiencies and non-conformances including the status of previous recommendations.

### TDF #3 Annual Inspection - 2019 Deficiencies

ID#	Deficiency	Applicable Regulation or Reference	Recommended Action	Priority	Recommended Deadline/ Status
2019-1	No bathymetric survey has been performed following switch to care and maintenance.	DSI, TWRS	Perform bathymetric survey of current pond and tailings surface	4	August 2020
2019-2	A DSR was not performed in 2019. Last DSR was 2014. DSRs to occur every 5 years.	DSI, TWRS, Ecology	Perform DSR Q2 2020	3	August 2020
2019-3	OMS Manual to reflect operation changes – specifically the switch to care and maintenance.	OMS Manual	Update OMS Manual	4	<b>Completed February 2020</b>
2018-1	OMS Manual must reflect mine personnel changes and meet current Teck requirements.	OMS Manual, TWRS	Update OMS Manual	4	<b>Completed May 2019</b>
2018-2	EAP must reflect mine personnel changes and meet current Teck requirements.	Emergency Action Plan, TWRS	Update EAP	4	<b>Completed October 2019</b>
2018-3	As a result of updates to current practice and as stated in the TDF #3 2018 risk assessment (H&A 2018), the foundation design assumptions should be re-assessed.	2018 Risk Assessment (H&A)	Conduct foundation site characterization program	3	<b>Completed November 2019</b>
2018-4	An updated water balance was not provided to the EoR as part of this review.	DSI, TWRS	KP to review existing water balance and update. This should be updated annually.	3	<b>Completed March 2020</b>
2017-1	Excess water accumulated in TDF #3 – current volume greater than design target pond volume.	OMS Manual, DSI, TWRS, CDA	Reduce pond volume. Available options: <ul style="list-style-type: none"> <li>• Diversion ditch installation</li> <li>• Increased Evaporator use</li> <li>• Water Treatment Plant</li> </ul>	3	August 2020

**NOTES:**

1. PRIORITY 1 - A HIGH PROBABILITY OR ACTUAL DAM SAFETY ISSUES CONSIDERED IMMEDIATELY DANGEROUS TO LIFE, HEALTH OR THE ENVIRONMENT, OR A SIGNIFICANT RISK OF REGULATORY ENFORCEMENT.
2. PRIORITY 2 - IF NOT CORRECTED, COULD LIKELY RESULT IN DAM SAFETY ISSUES AS NOTED ABOVE; OR, A REPETITIVE DEFICIENCY THAT DEMONSTRATES A SYSTEMATIC BREAKDOWN OF PROCEDURES.
3. PRIORITY 3 - SINGLE OCCURRENCES OF DEFICIENCIES OR NON-CONFORMANCES THAT ALONE WOULD NOT BE EXPECTED TO RESULT IN DAM SAFETY ISSUES.
4. PRIORITY 4 - BEST MANAGEMENT PRACTICE - FURTHER IMPROVEMENTS ARE NECESSARY TO MEET INDUSTRY BEST PRACTICES OR REDUCE POTENTIAL RISKS.

A few additional recommendations from the 2019 annual inspection are noted below:

- Conduct annual pond bathymetry surveys to verify pond size and confirm evaporation efficiency
- Update the water balance annually prior to the annual dam safety inspection
- Review and update consequence classification for the TDF as part of the next DSR
- Continue to remove weeds from the embankment slopes
- Continue to remove burrowing animals from the embankments
- Continue monitoring surface monuments on a monthly basis
- Continue monitoring pore pressures at all piezometer locations

To reduce supernatant pond volume, KP suggests exploring the following options:

- Installation of diversion ditches upstream of TDF #3 below highway 31 to divert runoff (particularly during freshet) away from the facility
- Increase evaporator efficiency by minimizing down-time
- Installation of additional evaporators
- Installation of a water treatment plant
- Storing surplus water within underground mine workings

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Appendix D	Facility Data Sheet
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## ABBREVIATIONS

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BU .....	Basin Underdrain
CDA.....	Canadian Dam Association
DSI .....	Dam Safety Inspection
DSR.....	Dam Safety Review
EAP .....	Emergency Action Plan
Ecology.....	Washington State Department of Ecology
ft .....	Feet
GBE.....	Great Basin Environmental
gpm .....	Gallons per Minute
HDPE .....	High Density Polyethylene
HSRC .....	Health Safety and Reclamation Code of BC
IDF.....	Intensity Duration Frequency
LCRS.....	Leakage Collection Removal System
MAC .....	Mining Association of Canada
mil.....	Thousands of an Inch
NE .....	Northeast
NPDES.....	National Pollutant Discharge Elimination System (NPDES)
NW .....	Northwest
OMS .....	Operations, Maintenance and Surveillance
RCRA.....	Resource Conservation and Recovery Act
RCW.....	Revised Code of Washington
TDF .....	Tailings Disposal Facility
TWI.....	Teck Washington Incorporated
WAC.....	Washington Administrative Code



## 1.0 INTRODUCTION

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### 1.1 SCOPE AND OBJECTIVES

This annual DSI includes the review and evaluation of the adequacy of performance and operation of TDF #3, with specific attention on short-term physical condition and surveillance results. The 2019 DSI included a site inspection and the review of the following information:

- Instrumentation data
- Water balance
- Climate data
- Design criteria
- Bathymetric data
- Deposition plan
- Monthly reports
- Facility performance
- OMS and EAP documents
- Any third-party audits

Deficiencies, non-conformances and opportunities for improvement are identified as part of this annual inspection and review.

### 1.2 REGULATORY REQUIREMENTS AND GUIDELINES

#### 1.2.1 GENERAL

TDF #3 has been developed under the standards outlined in the Washington State Department of Ecology Dangerous Waste Regulations Conditional Exemption. Permits, guidelines and regulatory requirements applicable to the Pend Oreille Mine TDF #3 are included in the following sections.

#### 1.2.2 PERMITS

- Washington State Department of Ecology (Department of Ecology) National Pollutant Discharge Elimination System (NPDES) Permit (WA-0001317)
- Department of Ecology Dangerous Waste Regulations (WAC-173-303 with Conditional Exemption)
- Resource Conservation and Recovery Act (RCRA)
- Washington Metals Mining and Milling Operations Act (RCW 78.56)
- Water Pollution Control Act (RCW 90.48)

#### 1.2.3 GUIDELINES

- Teck Tailings Water and Retaining Structures Guidelines 2019 (TWRS, 2019)
- Washington State Department of Ecology – Dam Safety Guidelines (Ecology)
- Canadian Dam Association Safety Guidelines (CDA)
- Mining Association of Canada (MAC)
- Health Safety Reclamation Code of BC (HSRC) Guidelines

### 1.3 FACILITY DESCRIPTION AND BACKGROUND INFORMATION

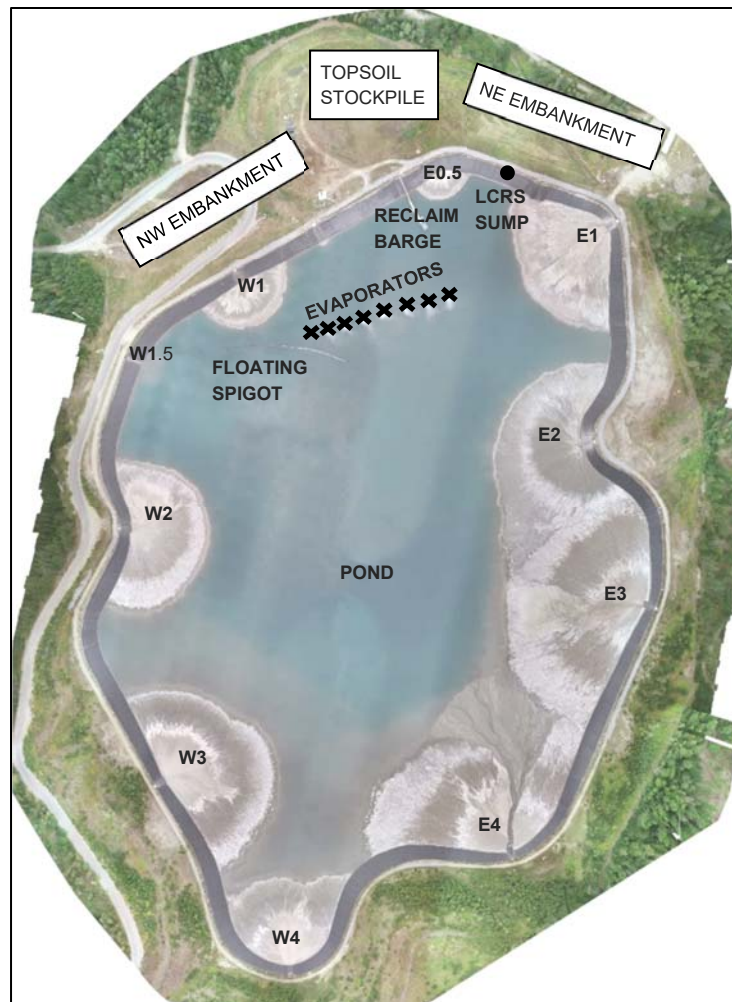
The Pend Oreille Mine is located in northeast Washington State, approximately 80 miles north of Spokane and 12 miles south of the Canadian border. The mine property is accessible by paved road from a turnoff on Highway 31, located approximately two miles north of the town of Metaline Falls. The Pend Oreille Mine site has a mining history dating back over seventy years. Tailings disposal took place at three separate facilities identified as Tailings Disposal Facilities #1, #2, and #3. The mine location is shown on Figure 1.1.



**Figure 1.1 Pend Oreille Mine Location**

The mine site was re-opened in 2004 and operated until 2009 when it was placed in care and maintenance. The mine resumed operations in December 2014. The mine re-entered care and maintenance in August 2019, just prior to this annual inspection. The mill tailings, derived from a conventional lead-zinc flotation process, are contained in an engineered TDF located on the historical #3 tailings disposal site. The reconstructed TDF #3 provides containment utilizing two earthfill embankments designated the northeast (NE) and northwest (NW) embankments. The entire impoundment area of TDF #3 is double lined with 60 mil High Density Polyethylene (HDPE). An engineered leakage recovery system (LCRS) between the liners collects and removes seepage from beneath the primary (upper) liner to an LCRS sump. The LCRS sump is accessed through riser pipes located on the upstream slope of the embankment. A submersible pump re-circulates leakage from the LCRS sump to the tailings pond and flows are measured through a totalizing flow meter. During operations, tailings are discharged into the facility from individual discharge points along either of the two distribution tailings pipelines. Tailings discharge (spigot) points along the west

tailings distribution pipeline are designated W1, W1.5, W2, W3, and W4, and along the east tailings distribution pipeline are designated E0.5, E1, E2, E3, and E4. A floating spigot was added in 2018 from Spigot W1.5. A floating reclaim barge is used to pump water back to the mill during operations. A recent drone flyover overview of TDF #3 is shown on Figure 1.2.



**Figure 1.2 General Arrangement**

The most recent construction program was the Stage 2 expansion constructed between September 2006 and August 2007. The expanded facility operated briefly with tailings deposition until mid-2009 when the mine transitioned to a period of care and maintenance. New tailings and reclaim piping systems were installed prior to the resumption of operations in December 2014.

## 2.0 SITE INSPECTION AND PERFORMANCE ASSESSMENT

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### 2.1 GENERAL

Bruno Borntraeger, P.Eng. and Cyrus Niamir, P.E. of Knight Piésold Ltd. carried out an annual inspection on September 25, 2019. The 2019 inspection included the following:

- Review of the Leachate Collection and Removal System (LCRS) leakage rate monitoring
- Review of vibrating wire piezometer monitoring records
- Review of tailings deposition
- Inspection of the geomembrane condition in the Stage 2 impoundment
- Inspection of the embankments at the northwest and northeast end of the facility
- Inspection of the Stage 2 crest, slopes and survey monuments
- Inspection of the historic “sink hole” upstream of the facility
- Inspection of tailings and reclaim piping systems on the crest of the embankments
- Inspection of the evaporator system at Tailings Disposal Facility #3
- Inspection of the Reclaim Barge and LCRS pump back systems

Site inspection forms are provided in Appendix A. A series of photographs collected during the site inspection are provided in Appendix B. Pond and tailings beach configurations at the time of the inspection are shown schematically on Figure 2.1.

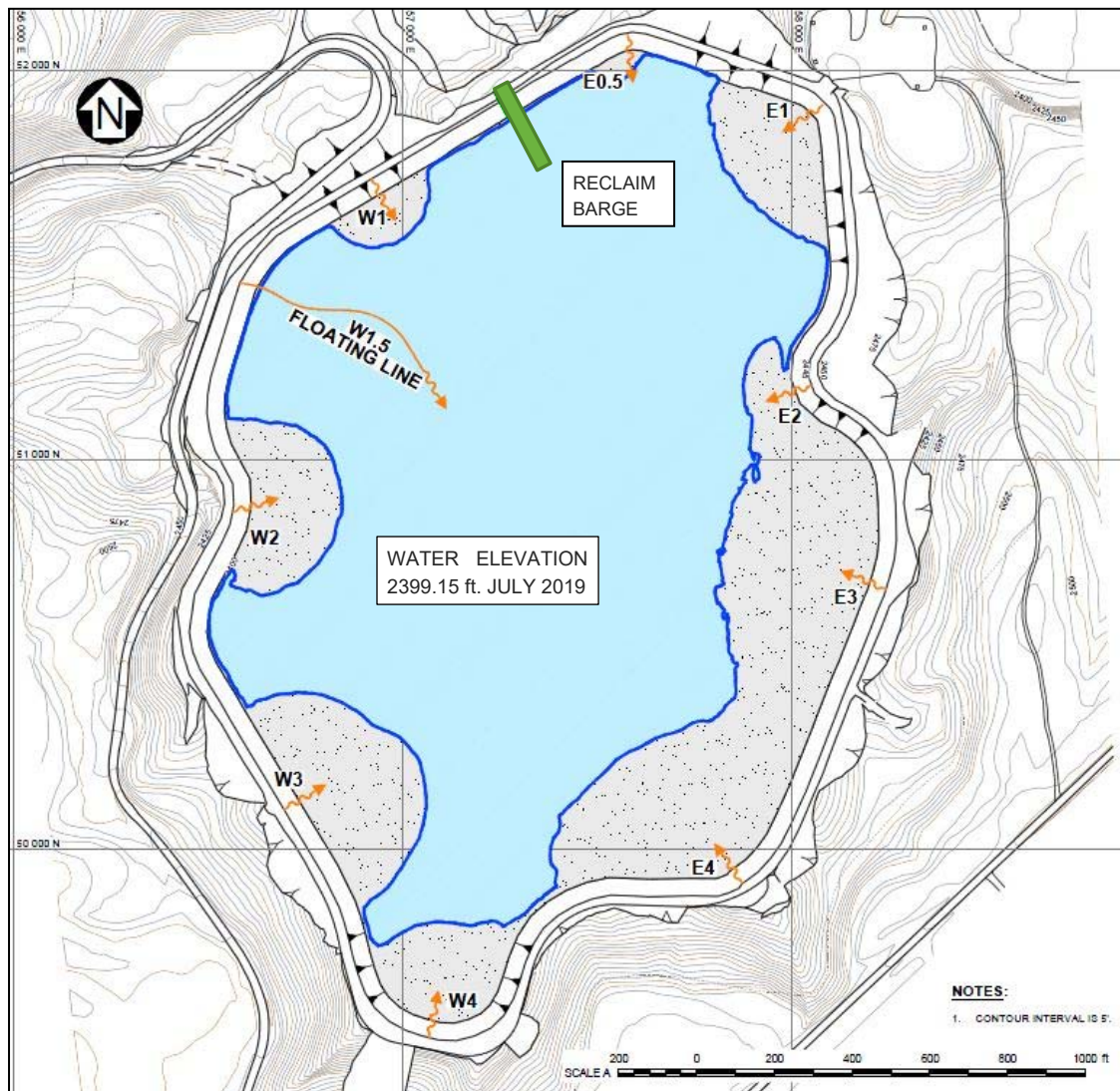


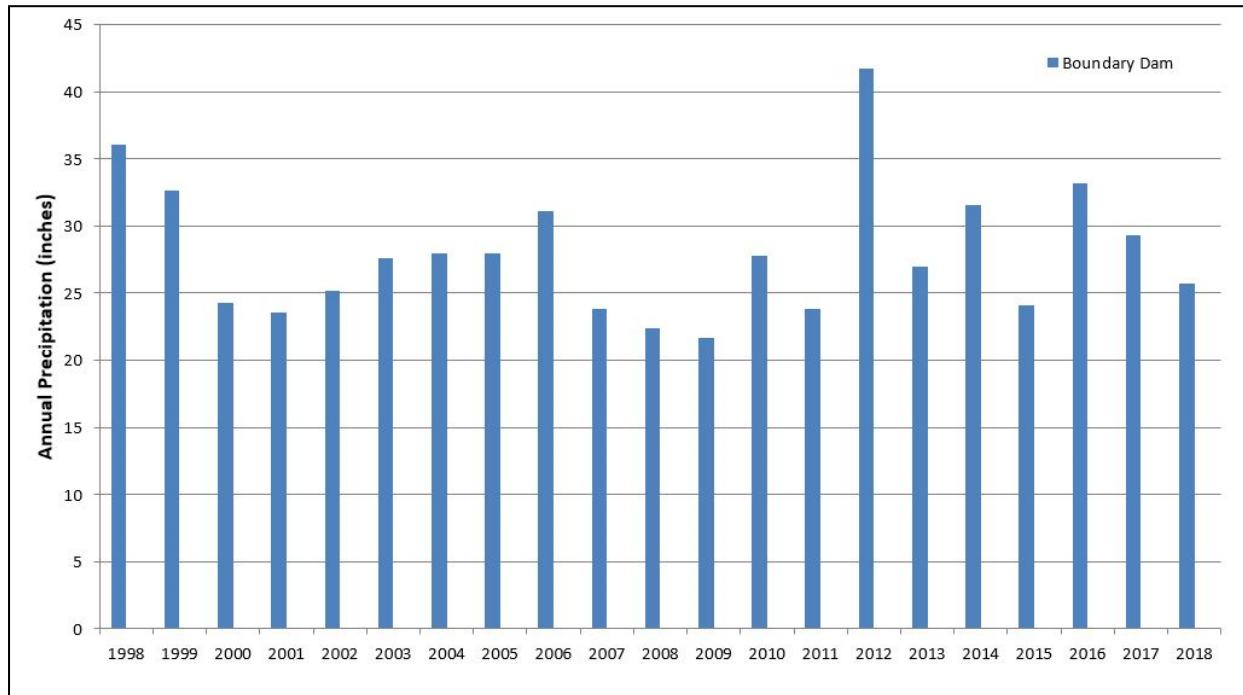
Figure 2.1 Pond and Tailings Beach Schematic

## 2.2 CLIMATE DATA

The climate of the project area is semi-arid, with moderate annual rainfall, cold winters and warm summers. A number of long-term regional climate stations - specifically Metaline Falls, Boundary Dam and Northport - are located in the vicinity of the Pend Oreille Mine and provide a climate database for the site. The following is an approximate summary of the site climate data:

- Mean Temperature: 44°F
- Typical Daily High Temperature (August): 83°F
- Typical Daily Low Temperature (January): 15°F
- Design Wind Speed: 60 mph
- Annual Precipitation: 30 inches – 30% snow, 70% rain
- Annual Evaporation: 20 inches

Pend Oreille Mine annual precipitation and evaporation is estimated from a meteorological station at Boundary Dam, located approximately 12 miles north of the mine site. The annual precipitation from 1998 to 2018 is shown below in Figure 2.2.



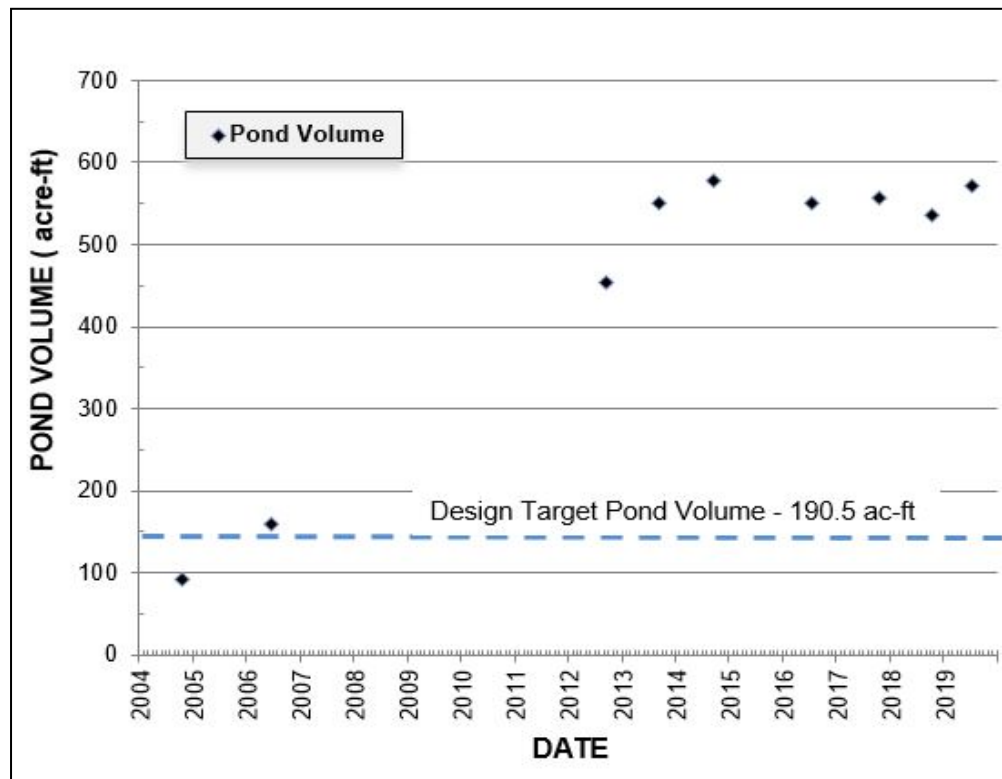
**Figure 2.2 Boundary Dam Annual Precipitation**

Return period storm precipitation values are presented in the Operations, Maintenance and Surveillance Manual Rev 5 (KP, 2020a). These values are reviewed on an annual basis and are deemed to be appropriate for 2019. The above climate data remains valid and representative for the Pend Oreille Mine.

## 2.3 WATER MANAGEMENT

TWI has continued with a program of enhanced evaporation to control the water inventory in the facility. Large floating fan forced evaporators were operated in 2019. Evaporator run times were provided by TWI and reviewed by KP as part of this inspection. Specific evaporator runtimes were observed to vary significantly. Increased evaporator efficiency, with an emphasis on maintenance, is a main goal for 2020.

A volumetric survey conducted in July 2019 provided an updated pond volume estimate. A pond volume of 24.9 million cubic feet (571.6 ac-ft) was estimated from the bathymetry survey in 2019 compared to 23.3 million cubic feet (534.9 ac-ft) in 2018, indicating an increase of 7% in the water storage inventory. The pond volume versus time is shown on Figure 2.3.



**Figure 2.3 TDF #3 Pond Volume versus Time**

The targeted operational design pond volume of 190.5 acre-feet is included on the plot. The pond volume increased substantially during the 2009 to 2014 care and maintenance period as expected. The implementation of the evaporative program combined with tailings void losses during ongoing tailings deposition between 2014 and 2019 has halted the upward trend but has not made sufficient progress in decreasing the pond volume downwards towards the design target volume.

The following is a list of options that have been discussed to reduce water levels during the care and maintenance period:

- Increased evaporation efficiency using current evaporator setup
- Installation and use of additional evaporators
- Treatment and discharge of the water (water treatment plant)

TDF #3 has a freeboard requirement of six feet for containment of the design storm event. The facility currently has approximately 20.85 feet of freeboard available for tailings solids storage, and storm water storage. The 2014 Dam Safety Review (DSR) recommended a review of the design storm and freeboard requirements to reflect updated procedures in the Department of Ecology Technical Memorandum. The design storm review was completed for the OMS Manual and this confirmed that a minimum of six feet of freeboard is appropriate.

## 2.4 WATER BALANCE

A water balance framework was developed by KP in 2014 and updated in March 2020 (KP, 2020b). The update incorporates changes to the operation of TDF #3, specifically the transition to care and maintenance. The water balance is prepared in Excel and is intended to be used as a tool for water management planning. The 2020 update includes user-specified variable inputs that can be used to predict surplus or deficit water volumes under different mitigation scenarios.

## 2.5 TAILINGS IMPOUNDMENT

The tailings pond level was at an elevation 2,399.15 ft on July 6, 2019 (last survey measurement available). A total of 2,942,000 tons of tailings were deposited into the facility prior to July 1, 2009, after which tailings discharge was suspended. An additional 2,386,000 tons of tailings were discharged into the facility from the start-up in December 2014 to July 6, 2019. Approximately 375,000 tons of tailings were deposited between the 2018 annual inspection and the most recent survey measurement. The amount of tailings in the facility as of July 6, 2019 is 5,328,000 tons. A small additional amount of tailings is not captured in this estimate as it was deposited between July 6 and July 31, 2019. To-date, the dry density of the tailings is approximately 105 pounds per cubic foot (pcf), which is consistent with the facility design and meeting design objectives.

Generally, tailings deposition in 2019 focussed on building up the beach along the southern end of the facility to establish an overall slope that mimics the slope of the projected final closure surface and displaces the pond towards the north. During the winter and spring, spigotting primarily occurred at W2, W3, W4, E2, E3, and E4. During the summer months, spigotting primarily occurred at W1.5 with occasional deposition taking place at W1, E0.5 and E1 to plug minor leaks in the liner. A sketch showing the design sequential filling plan for the facility is presented on Figure 2.4. The tailings deposition practices and basin filling sequence have generally confirmed with this design sequential filling plan. As previously noted, the deposition plan is on hold following the transition to care and maintenance.

As expected, some minor defects in the geomembrane liner were discovered during routine inspections over the course of the year. Depending on its severity, defects were either patched immediately, sand bagged or sealed with tailings. There were no major performance issues reported during this annual period.



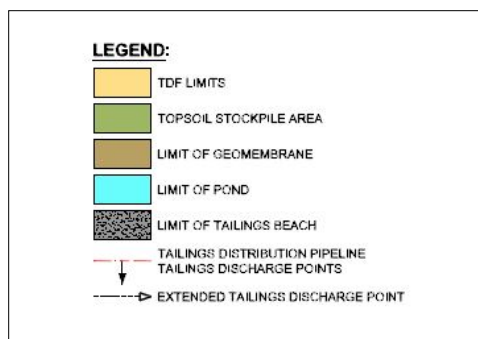
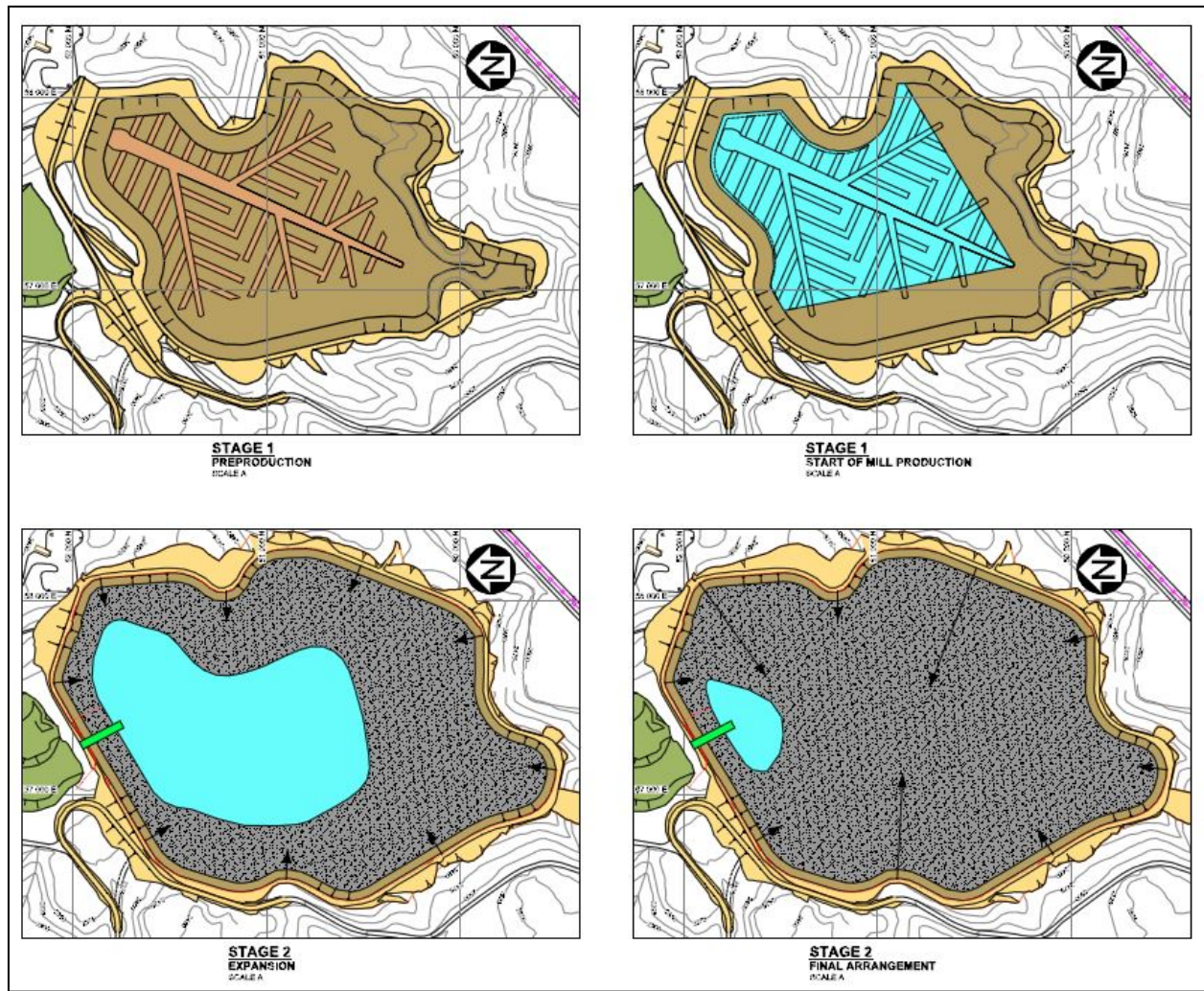


Figure 2.4 Design Sequential Filling Plan

## 2.6 TAILINGS EMBANKMENT

No signs of distress were noted during the inspection of the NE and NW Embankments. No seepage, wet or soft spots were observed on the downstream slopes. The embankment slopes were approximately planar and there was no evidence of cracking, bulging, or slumping in the embankment fill. The embankment crest appeared to be level with no signs of differential settlement or distress. The abutments appear sound with no evidence of erosion, seepage, settlement or cracking. There was some evidence of animal burrowing at the toe of the NE embankment. TWI implements an ongoing pest control program during the summer months, which has proven effective in decreasing the number of animal burrowing incidents. The reclaimed downstream embankment slopes were mowed during the summer as part of the ongoing maintenance of the embankments. Tree growth on the abutments and a removal program are in place for the abutments where past tree growth has occurred. No significant construction activities took place over the course of the year.

## 2.7 TAILINGS BASIN PERIMETER ROAD AND UPPER BASIN SLOPES

Rockfill was placed along the perimeter road of the TDF in low areas with poor drainage to improve water management and surface water runoff. The minor depression previously referred to as a “sink hole” on the upper slope of the basin, was inspected and no issues were noted. The wildlife fence was inspected, and repairs completed as needed.

## 2.8 LCRS MONITORING

Water reporting to the LCRS is pumped out via the LCRS riser pipes and the flow volume is measured. The daily and 7-day average leakage flow rates from the LCRS are provided on Figure 2.5. The LCRS flow rates fluctuated above and below the Level 1 Action Leakage Rate of 5 gpm from September 2014 to March 2015, then dropped below the Level 1 Action Leakage Rate in March 2015 and stabilized in the range of 0 to 2.5 gpm. The drop to historical LCRS leakage rates (July 2004 to July 2009) was expected once active tailings deposition resumed around the facility via the spigot points.

Leakage rates remained at historical levels from March 2015 to February 2016. The LCRS flow rates fluctuated above and below the Level 1 Action Leakage Rate from February 2016 to June 2016. Leakage rates peaked at 23 gpm in July 2016, just below the Level 3 Action Leakage Rate and two liner leaks were suspected: one near the barge area and one near the LCRS area. Tailings discharge and sand bag placement were focused at suspected leak areas and leakage rates decreased to the range of 2 to 4 gpm, which are below the Level 1 Action Leakage Rate of 5 gpm.

In January 2017, the leakage rate again exceeded the Level 1 Action Leakage Rate peaking in May 2017 at approximately 10 gpm. Suspected liner leaks were sealed, and the leakage rate was reduced to below the Level 1 Action Leakage Rate in August 2017. The leakage rate hovered around the Level 1 Action Leakage Rate in 2018. Selective spigotting on the north end of the impoundment resulted in a slight lowering of the leakage rate from summer to fall 2018.

Leakage rates held steady at slightly higher than Level 1 Action Leakage rates levels, from 2018 to summer 2019. Leakage rates dropped back to historical levels and below the Level 1 Action Leakage Rate in the last few months before the September 2019 annual inspection.

TWI continues to monitor leakage rates and uses acoustic sounding methods to detect leaks as necessary.

## 2.9 PIEZOMETER MONITORING

Five vibrating wire piezometers (BU-1 to BU-5) monitor pore pressures within the basin underdrain and three vibrating wire piezometers (LCRS-1 to LCRS-3) operate in the LCRS collection trench. Basin Underdrain and LCRS piezometer readings are obtained on a daily basis and the results are summarized in Appendix C. Six vibrating wire piezometers (DH19-01 VWP-1 to VWP-3 and DH19-02 VWP-1 to VWP-3) were installed in July 2019 and the preliminary readings are summarized in Appendix F.

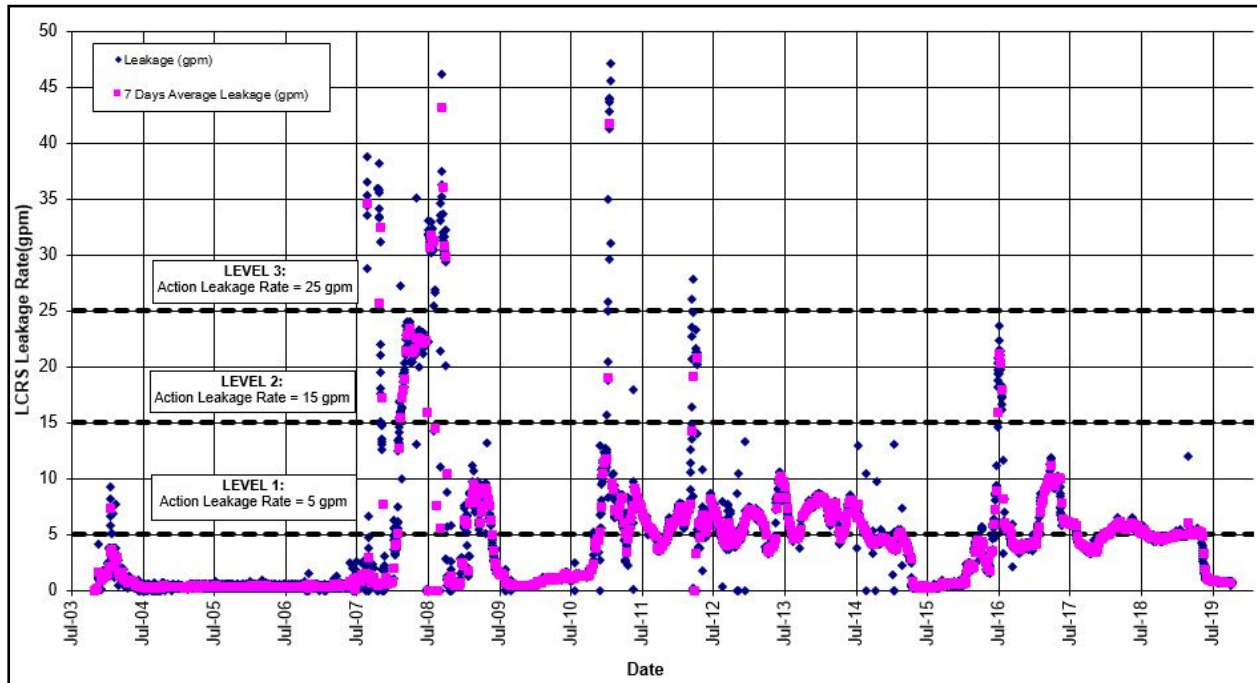
Basin Underdrain piezometers (BU-1 to BU-5) record hydrostatic pore pressures consistent with the tailings pond water elevation and fluctuate with the pond water level. Readings are adjusted for barometric pressure and show a slight jump upwards at the start of 2008 when the old barometer was replaced with a new barometer. A similar rise/step occurred in May 2012 with a new barometer replacement. Piezometer BU-3 did not function correctly when first installed in 2003. The original readout box was replaced with a new piezometer readout box in May 2009. The BU-3 piezometer readings starting in May 2009 follow the trends of the other functioning Basin Underdrain piezometers. Piezometer BU-3 data was previously not reported in annual inspection reports due to erroneous readings but has been added since 2014 when the monitoring data indicated similar responses and trends with the other four Basin Underdrain piezometers. The Basin Underdrain piezometers recorded pore pressures mirroring the increasing tailings pond elevation, which is consistent with expectations. Piezometer BU-5 has experienced a period of fluctuating and scattered data points commencing in July 2014. There is no significant trend discerned for the scatter of points within the data cluster.

The Basin Underdrain pumping system was commissioned in September 2012. A downward trend was immediately noted in the Basin Underdrain piezometers situated in the sand and gravel underdrains and the piezometers located between the underdrains also demonstrated pore pressure reductions at slower rates. The pumping rate in the Basin Underdrain decreased from the higher initial rate of 100 gpm to 40 gpm and the pore water pressures in the Basin Underdrain piezometers responded to reflect hydrostatic conditions within the tailings mass. The Basin Underdrain pump ceased operation in July 2013, was replaced in September 2013, and dewatering of the underdrain continued at a pumping rate between 40 and 55 gpm. Basin Underdrain pump operations were suspended permanently in October 26, 2015 and will resume during the closure phase.

Prior to 2017, the piezometers installed in the LCRS (LCRS-1, 2 & 3) trench typically indicated negative pore water pressures confirming the LCRS trench sand and gravel was unsaturated and drained. There was a period in early 2017 where leakage rates were consistently between 5 and 10 gpm. The higher levels recorded in the LCRS were found to be indicative of minor leaks. As noted in the 2018 DSI, the pore pressures had levelled off around the Level 1 Action Leakage Rate level indicating that there was still room for improvement if the additional leaks were sealed. Effective placement of tailings on the liner in key areas have since lowered leakage rates to historical levels. At the time of this report, the leakage rate into the LCRS is approximately 1 gpm, which is well below the Level 1 Action Leakage Rate of 5 gpm.

The LCRS system is effectively collecting leakage through the upper liner and controlling the head on the bottom liner within design tolerances. Pumping the basin underdrain will be required prior to facility closure in order to further consolidate the tailings mass prior to grading and capping. This can only occur once the surface water volume is fully removed and meets closure capping requirements. Pumping of the Basin Underdrain system would only be required if performance of the LCRS deteriorated and operation of the

Basin Underdrain was needed to enhance tailings consolidation during operations or care and maintenance.



**LCRS LEAKAGE RATE TRIGGERS**  
 LEVEL 1 - UNUSUAL CONDITIONS THAT DO NOT YET REPRESENT A POTENTIAL EMERGENCY BUT DO REQUIRE PROMPT INVESTIGATION AND RESOLUTION. AN INTERNAL ACTION PLAN IS DEVELOPED.  
 LEVEL 2 - CONDITIONS THAT REPRESENT A POTENTIAL EMERGENCY, IF SUSTAINED OR ALLOWED TO PROGRESS, BUT NO EMERGENCY SITUATION IMMINENT. AN INTERNAL ACTION PLAN IS DEVELOPED.  
 LEVEL 3 - AN EMERGENCY DEFINED BY FAILURE OF A SIGNIFICANT COMPONENT. SUCH FAILURE MAY HAVE ALREADY OCCURRED, OR BE IMMINENT. LEAKAGE RATES IN EXCESS OF THIS RATE MUST BE REPORTED TO DEPARTMENT OF ECOLOGY.

**NOTES:**

1. HYDROSTATIC MEASUREMENTS WERE NOT AVAILABLE BETWEEN NOVEMBER 21-24, 2003 DUE TO FILLING AND DRAINING OF THE LCRS FOR THE LEAK DETECTION SURVEY.

**Figure 2.5 LCRS Leakage Rate vs. Time**

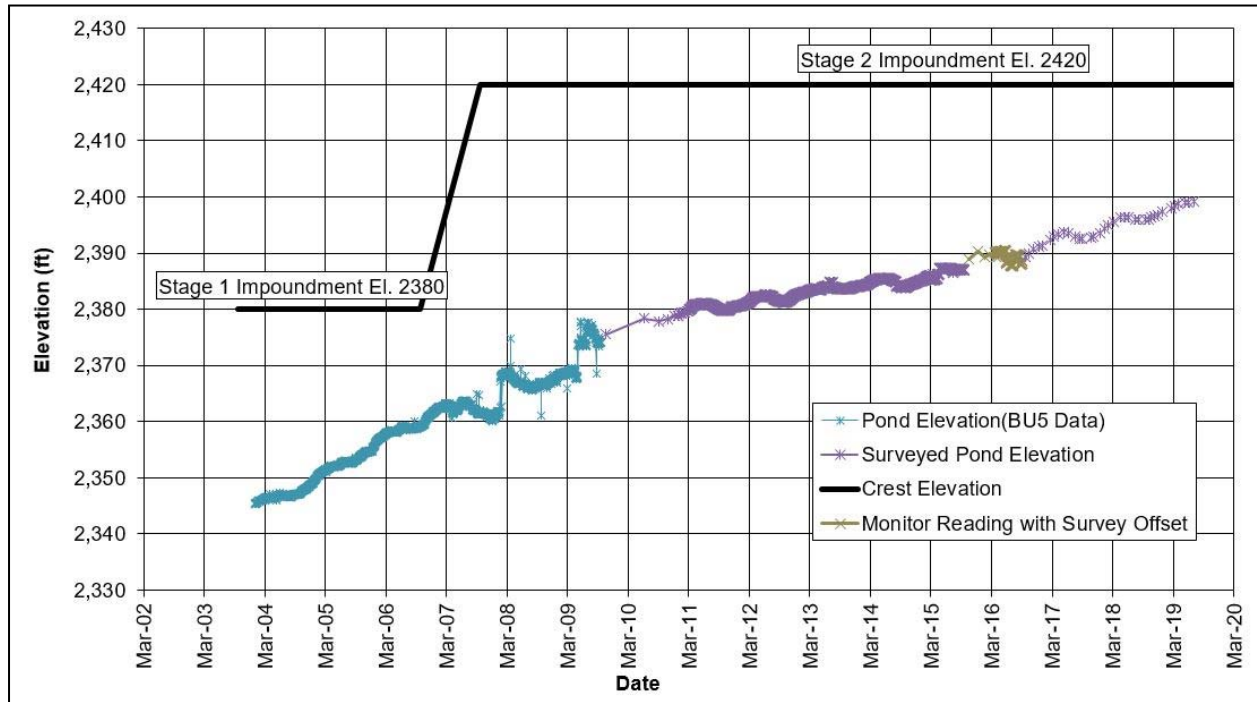
**2.10 SURVEY MONUMENTS**

Ongoing surveillance of potential dam movement using survey monuments M5 (NW Dam crest) and M6 (NE Dam crest) continued on a monthly basis in 2019. The surveillance data is summarized in Appendix C.

At M5, the survey movement monitoring in 2019 was within the tolerances specified in the OMS Manual. Measured movement at M6 was consistent and continued to be slightly outside the 2 inch tolerance during most of 2019 but did not extend any further from the datum. As noted in previous inspections, the survey movement monitoring at M6 implies the dam crest is moving laterally inwards towards the impoundment side which is not realistic. It is likely that M6 has been impacted by surface equipment, possibly snow moving equipment. KP recommends further monitoring and incremental review during 2020 to determine if the monument datum should be adjusted.

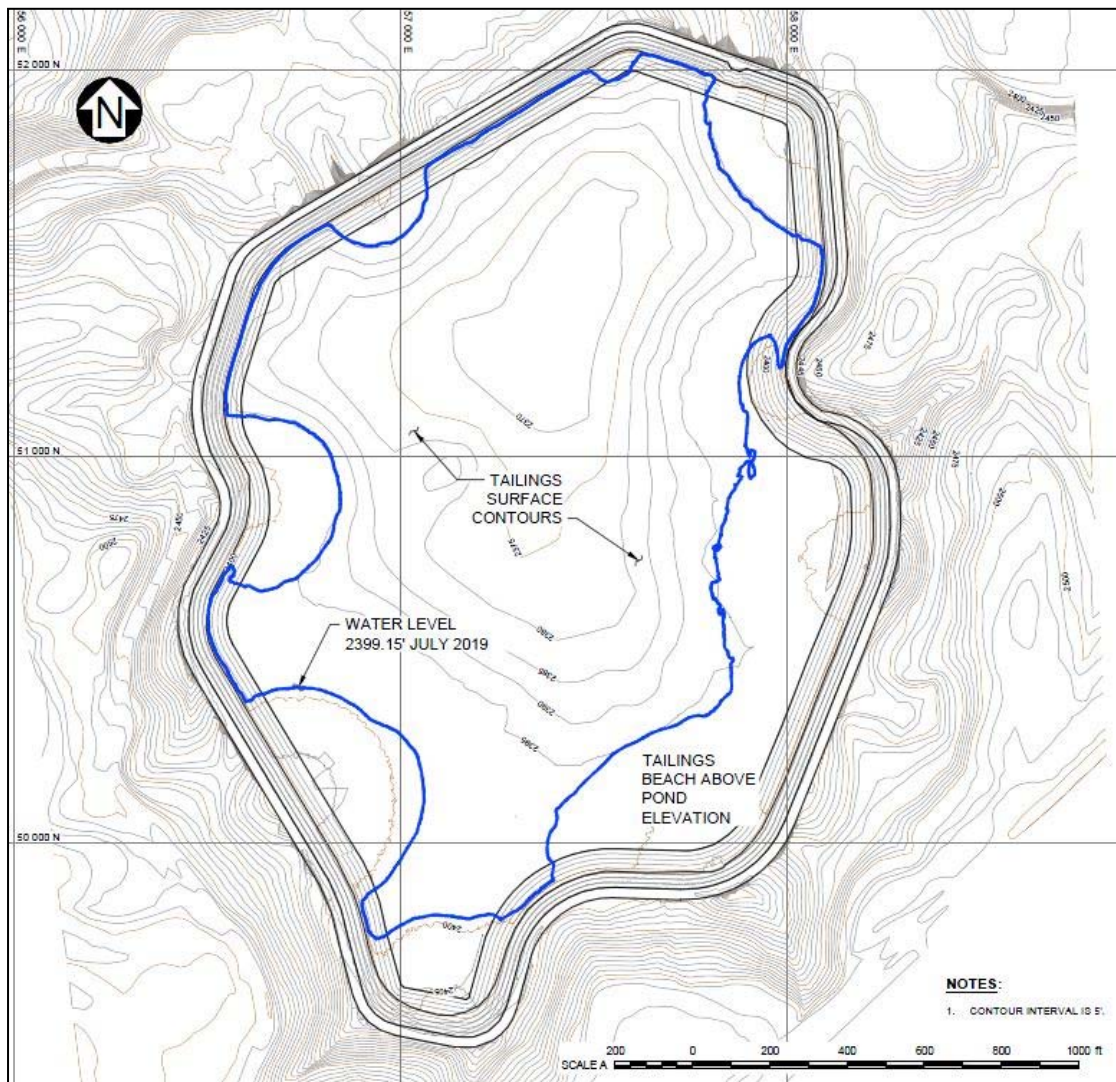
## 2.11 FILLING SCHEDULE

Tailings deposition resumed in December 2014 and was halted on August 1, 2019. There is sufficient capacity remaining in the facility for tailings solids and storm water storage based on the updated filling curve on Figure 2.6. Survey measurements have recently been the most reliable source for determining pond elevation.



**Figure 2.6 Filling Curve**

TWI completed a bathymetric survey in July 2019 and the volumes for tailings solids and pond water were updated. The tailings solids volume is approximately 101,300,000 ft<sup>3</sup> and the water volume is approximately 24,900,000 ft<sup>3</sup>. The plan view bathymetric survey is shown on Figure 2.7.



**Figure 2.7 Bathymetric Survey Plan**

Currently 42.4 million cubic feet of storage volume remains between the pond surface water elevation and the freeboard elevation of 2,414 ft. Additional tailings solids storage capacity can be obtained by reducing the pond volume to the targeted operational design volume. The remaining tailings solids storage volume is 59.0 million cubic feet had the pond volume been reduced to the design operational value at the freeboard elevation of 2,414 ft. Reduction of the operational pond volume is a TWI objective during this period of care and maintenance.

## 2.12 2019 DEPOSITION PLAN

The Pend Oreille Mine has entered a period of care and maintenance and tailings deposition is on hold. Generally, during operations, the following deposition sequencing is utilized to infill TDF #3:

In the winter months, tailings are deposited in the south and east of the facility to cover areas of the liner without tailings beaches and to maintain the northern slope. The spring months see the focus shifted to the

west side of the impoundment to cover exposed areas of liner. During summer months, a mobile floating line is utilized to deposit coarser tailings at the center of the impoundment to infill at the deepest point. A bathymetric survey is completed to help identify where the water depth is the greatest. In the fall months, tailings deposition resumes on the south side of the impoundment. The goal of this deposition sequencing is to minimize future closure costs by preventing pooling of water on the southern beaches while maintaining a 1% slope to the north.

## 2.13 SURFACE WATER CONTROL

Inspection of the surface water control measures at the TDF confirmed the surface water drainage works, such as ditches, culverts and drains are in reasonably good condition. Surface water drainage works were added to the perimeter bench to direct runoff into the impoundment as part of the Stage 2 Expansion. These structures have been functioning properly. It should be noted that the result of the perimeter bench drainage works is an increase the supernatant pond volume. Installation of diversion ditches upstream of the perimeter bench would serve to reduce the catchment area below Highway 31 that reports to TDF #3 and is a recommend action of the 2020 water balance update (KP, 2020b).

## 2.14 MECHANICAL PERFORMANCE

Evaluation of mechanical performance of TDF #3 was limited to the review of the facility pumps, piping and evaporators. Generally, all pumps and pipes at TDF #3 functioned properly in 2019. The following major maintenance activities were performed between the 2018 and 2019 inspections:

- Evaporator eight was switched out in May 2019
- The LCRS pump was replaced in June 2019
- The barge pump motor and gauge were replaced over the course of the year

Evaporators generally functioned properly throughout the year, although at the time of inspection, six of eight evaporators were not functioning and required minor maintenance to become operational. Evaporator recommendations are provided in Section 4.

## 2.15 HYDROGEOLOGICAL AND GEOCHEMICAL PERFORMANCE

Knight Piésold does not review hydrogeological and geochemical performance as part of the scope of the Annual Dam Safety Inspection. TWI did not report any anomalies in the hydrogeological and geochemical performance of the TDF to KP in 2019.

## 3.0 DAM SAFETY ASSESSMENT

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### 3.1 DESIGN BASIS REVIEW

The fundamental objective for the design of the TDF was to develop an efficient and economic design that satisfied the objectives for maintaining the high level of environmental protection outlined in the Conditional Exemption to the Washington State Dangerous Waste Regulations. The principal requirements of the design are as follows:

- Permanent, secure, and total confinement of all solids within an engineered facility.
- Control, collection and removal of free-draining liquids from the tailings mass during operations to the maximum practical extent and the prevention of uncontrolled leakage from the facility.
- The inclusion of monitoring features to ensure that the performance goals are achieved.
- Staged development to minimize site disturbances and visual impacts associated with mine development while allowing for the necessary flexibility to accommodate changes in mine operations.

The facility data sheet is provided in Appendix D. The main conclusions from the compliance review of the design basis are as follows:

- The current pond operating volume is considerably larger than the stated design target pond volume. Reducing pond volume by means of increased evaporation and/or a water treatment plant is necessary for maximizing storage and preparing for closure.
- A drilling and foundation characterization program was completed in 2019. The TDF #3 foundation soils have been reviewed and updated as part of a separate report, referenced in Appendix E.
- The current facility complies with the remaining design criteria.

### 3.2 HAZARDS AND FAILURE MODES REVIEW

#### 3.2.1 SUMMARY

The primary hazards and failure modes of TDF #3 are discussed in a third-party risk assessment conducted by Haley & Aldrich (H&A, 2018). The hazards, failure modes and mitigation measures are discussed in Table 3.1.



**Table 3.1 Summary of Hazards, Failure Modes and Mitigation Measures**

Hazard	Failure Mode	Mitigation Measures
Excess water – reduction of freeboard	Overtopping	Remove excess water to achieve targeted operational design pond volume – water treatment plant, diversion ditch installation and/or increased evaporator operation. Recommendations are detailed in Section 4 of this report. <i>PROPOSED</i>
Earthquake and Liquefaction Potential	Embankment Slope Failure	Report on TDF #3 geotechnical characterization and foundation assessment improves confidence in design and results in a reduction of this failure rating. <i>COMPLETE</i>
Piping	Embankment Slope Failure	Embankments are designed with defensive measures against internal erosion. Previous leaks in the geomembrane have been blinded off by tailings particles. <i>COMPLETE</i>
Tailings Delivery Line Blockage	Unplanned Release	Tailings are not delivered to the TDF during care and maintenance. <i>COMPLETE</i>
Underground Mine Workings	Unplanned Release	Inspection and report (KP, 2001) on the Underground Workings were completed by KP in 2001. The evaluation found that the workings had favourable geometry and were in good condition, therefore did not appear to pose a subsidence risk for the structures and tailings at TDF #3. It was recommended that the Underground Workings be inspected and monitored on a regular basis to confirm that the openings perform in an acceptable manner. The Underground Workings continued to be monitored until 2014 when it was deemed inappropriate to keep monitoring by TWI. Access into the workings have been barricaded at the Pend Oreille Mine underground access point with a tunnel plug. Previous studies indicate that in the event of a tailings subsidence breach, the tailings would migrate downwards into the workings where there is no credible lateral discharge point. <i>COMPLETE</i>
Wildfire	Unplanned Release	Emergency Action Plan updated October 2019. <i>COMPLETE</i>

### 3.2.2 2019 TDF #3 GEOTECHNICAL ASSESSMENT

A site investigation and geotechnical characterization program was undertaken in 2019 to address the risks identified in a third-party risk assessment report. The report (KP, 2019c) identified three risks associated with the NE and NW Embankment foundations:

- Foundation failure due to earthquake loading
- Static loading failure of foundations soils due to saturated foundation conditions
- Static liquefaction (undrained shearing) of the foundation soils

This program provided data to define the condition and strength characteristics of the foundation materials, and to determine the potential for liquefaction and susceptibility to earthquake loading.

KP coordinated and oversaw the geotechnical SI program, which comprised the following:

- Geotechnical logging of two sonic drillholes
- Seismic Cone Penetration Testing (SCPT) at nine locations
- Installation of six grouted-in-place vibrating wire piezometers (VWPs)
- Installation of two 10-channel data loggers to collect instrumentation readings
- Laboratory testing of foundation samples
- Geotechnical data compilation, characterization and reporting
- Update to site specific hazard assessment and dynamic response analysis

The site investigation plan is shown on Figure 3.1. The results of the SI program indicate the following:

- Data collected through drilling and SCPT methods supports the original characterization that the foundation encountered at the NW and NE Embankments is within the Glaciolacustrine Silt and Sand unit, with some instances of Outwash Sand and Gravel units.
- SCPT results within the foundation suggest that the silt materials are highly stiff with depth and the sand materials are medium dense to dense. Standard Penetration Testing (SPT) results indicate that the foundation material is compact.
- Pore pressure dissipation (PPD) tests performed during the CPT program generally exhibit low to zero pore pressure within the foundation, which are indicative of drained conditions.
- VWP's installed within the foundation have measured a stable, deep phreatic surface of approximately 100 ft below ground surface at the NW Embankment and 83 ft below ground surface at the NE Embankment.
- The foundation materials are generally stiff resulting in high calculated Cyclic Resistance Ratios (CRR) values.

Site response analyses were completed to determine Cyclic Stress Ratio (CSR); the CSR were compared to the CRR values and they indicate that seismic liquefaction is not expected under the Safety Evaluation Earthquake (SEE). The SEE, previously referred to as the Maximum Design Earthquake (MDE), corresponds to a one in 2,475-year event – appropriate for a Hazard Class 2 facility (DSR, 2014). Limited deformation of the TDF is acceptable under seismic loading from an SEE event, provided that the overall stability and integrity of the facilities is maintained and that there is no release of stored tailings or water.

Stability analyses were performed to evaluate if the presence of shallow saturated glaciolacustrine or deeper-lying contractive glaciofluvial materials pose a risk to dam safety.

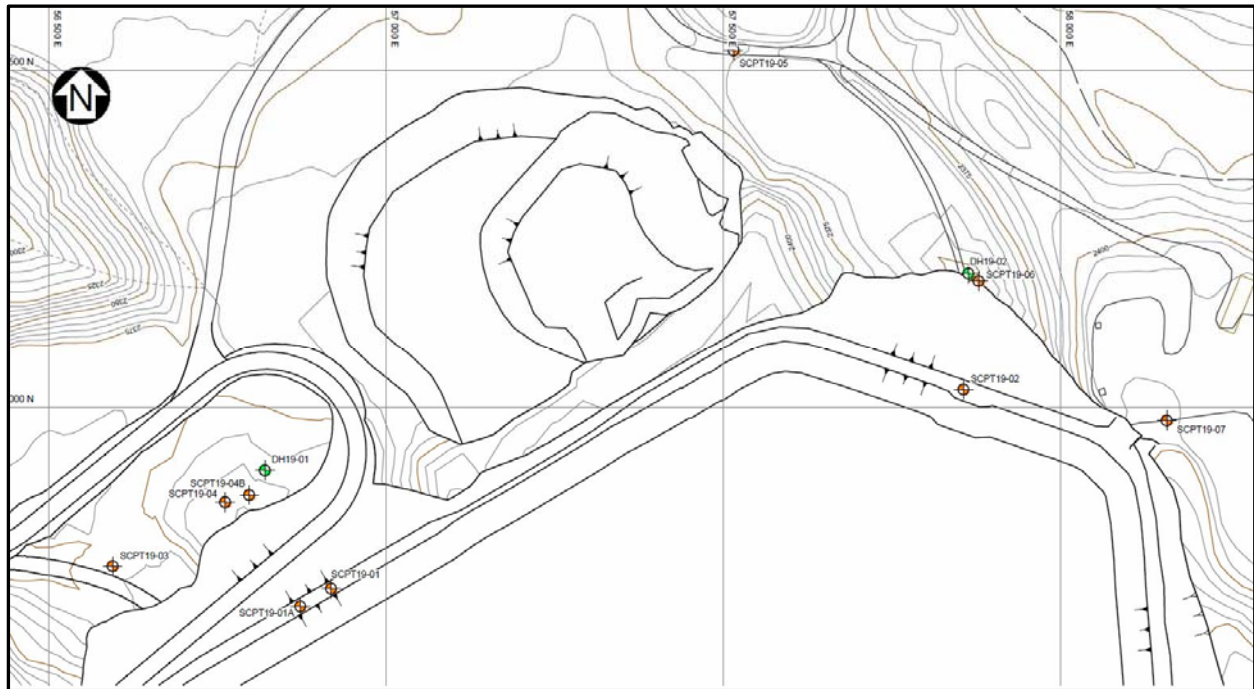
#### Contractive Glaciofluvial Materials

Potentially contractive glaciofluvial materials below 2,274 ft were modelled using the yield strength ratio, which was calculated using the Olson & Stark, 2003 method. The yield strength ratio is used to evaluate the potential for flow liquefaction in this material. The values for yield strength ratio were calculated using the CPT data to determine the  $q_{c1}$  value. The yield shear strength ratio is the peak shear strength available during undrained loading normalized by the pre-failure vertical effective stress. An average value for yield strength was determined from the calculated values below 2,274 ft.

#### Surficial Glaciolacustrine Materials

Due to a higher moisture content in the glaciolacustrine materials seen at one of the drillhole locations, an additional analysis was run using the peak undrained shear strengths measured by the consolidated undrained (CU) triaxial testing. Values of total shear strength ( $\phi$ ) represent the peak undrained shear strength that were used for the mohr-coulomb material model in the analyses.

The results of the stability analyses indicate that these conditions have a minimal impact on dam stability, and the minimum stability requirements outlined by SEE are achieved for these foundation conditions. More information can be found in the referenced report (KP, 2019c).



DRILLHOLE LOCATIONS		
ID	EASTING (ft)	NORTHING (ft)
DH19-01	56,820	51,908
DH19-02	57,863	52,200
SCPT19-01	56,972	51,733
SCPT19-01A	56,873	51,707
SCPT19-02	57,856	52,027
SCPT19-03	56,595	51,766
SCPT19-04	56,761	51,860
SCPT19-04B	56,797	51,871
SCPT19-05	57,515	52,530
SCPT19-06	57,878	52,189
SCPT19-07	58,157	51,981

Figure 3.1 2019 TDF #3 Site Investigation Plan

### 3.3 DAM CLASSIFICATION REVIEW

The TDF #3 dam classification was reviewed and updated in the second Dam Safety Review (DSR) during 2014. Both the Northeast and Northwest dams have a hazard class 2 or “Significant” classification under WAC 173-175-130. Since this assessment was completed, populations, structures, and topography downstream of the embankments are largely unchanged. The TDF itself has undergone little to no changes in the last five years and the operating practices and physical performance of the TDF have continued to be acceptable. It is concluded that the dam classification is still applicable and should remain unchanged. It is recommended that the dam classification be reviewed as part of the upcoming 2020 DSR.

### 3.4 OMS AND EAP REVIEW

The OMS Report and EAP are reviewed annually as part of this DSI. The TDF #3 OMS Report was last revised in February 2020 (Rev 5). A summary of the topics included in the report is as follows:

- Personnel, roles and responsibilities
- Design basis criteria
- Embankment design information
- Instrumentation and monitoring design criteria
- Operating instructions for operable mechanisms
- Dam surveillance
- Maintenance instructions and forms

The emergency preparedness information for TDF #3 is located in the Emergency Action Plan (EAP, 2019) for TDF-3 prepared by GeoEngineers Inc. in 2014 and last revised by TWI in October 2019. The topics covered include the following:

- Potential emergency events
- Potential impacts
- Event detection
- Emergency level determination
- Notification and communication
- Expected actions
- Key contacts, roles and responsibilities

The material contained in both reports are deemed relevant and applicable following KP's review of these reports.

## 4.0 SUMMARY AND RECOMMENDATIONS

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Bruno Borntreger, P.Eng. and Cyrus Niamir, P.E. of Knight Piésold Ltd. completed a DSI of Tailings Disposal Facility #3 and associated works on September 25, 2019 as part of the routine dam safety inspection program implemented annually by TWI. Visual inspection of the facility and review of instrumentation records have confirmed that TDF #3 is performing within design tolerances. Upstream and downstream conditions of both NE and NW Embankments are acceptable. There were no significant changes to the facility over the course of 2019. On August 1, 2019, the mine entered a care and maintenance phase and tailings deposition was halted at TDF #3. The OMS manual, EAP and water balance have been updated to capture these operational changes.

The TDF #3 dam consequence classification was established during the last Dam Safety Review (DSR) in 2014. Both the NE and NW Embankments have a hazard class 2 or “Significant” classification under WAC 173-175-130. This should be reviewed as part of the next DSR and should incorporate evaluation and upgrades to the consequence classification as appropriate and based on Teck’s updated corporate governance (2019). The last Dam Safety Review was completed in 2014. The next Dam Safety Review is overdue and should be completed in 2020.

A summary of the current deficiencies noted in the 2019 DSI are presented in Table 4.1.

**Table 4.1 TDF #3 Annual Inspection - 2019 Deficiencies**

ID#	Deficiency	Applicable Regulation or Reference	Recommended Action	Priority	Recommended Deadline/ Status
2019-1	No bathymetric survey has been performed following switch to care and maintenance.	DSI, TWRS	Perform bathymetric survey of current pond and tailings surface	4	August 2020
2019-2	A DSR was not performed in 2019. Last DSR was 2014. DSRs to occur every 5 years.	DSI, TWRS, Ecology	Perform DSR	3	August 2020
2019-3	OMS Manual to reflect operation changes – specifically the switch to care and maintenance.	OMS Manual	Update OMS Manual	4	<b>Completed February 2020</b>
2018-1	OMS Manual must reflect mine personnel changes and meet current Teck requirements.	OMS Manual, TWRS	Update OMS Manual	4	<b>Completed May 2019</b>
2018-2	EAP must reflect mine personnel changes and meet current Teck requirements.	Emergency Action Plan, TWRS	Update EAP	4	<b>Completed October 2019</b>
2018-3	As a result of updates to current practice and stated in the TDF #3 2018 risk assessment (H&A 2018), the foundation design assumptions should be re-assessed.	2018 Risk Assessment (H&A)	Conduct foundation site characterization program	3	<b>Completed November 2019</b>
2018-4	An updated water balance was not provided to the EoR as part of this review.	DSI, TWRS	KP to review existing water balance and update. This should be updated annually.	3	<b>Completed March 2020</b>
2017-1	Excess water accumulated in TDF #3 – current volume greater than design target pond volume.	OMS Manual, DSI, TWRS, CDA	Reduce pond volume. Available options: <ul style="list-style-type: none"> <li>• Diversion ditch installation</li> <li>• Increased Evaporator use</li> <li>• Water Treatment Plant</li> </ul>	3	August 2020

**NOTES:**

1. PRIORITY 1 - A HIGH PROBABILITY OR ACTUAL DAM SAFETY ISSUES CONSIDERED IMMEDIATELY DANGEROUS TO LIFE, HEALTH OR THE ENVIRONMENT, OR A SIGNIFICANT RISK OF REGULATORY ENFORCEMENT.
2. 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.
3. PRIORITY 3 - SINGLE OCCURRENCES OF DEFICIENCIES OR NON-CONFORMANCES THAT ALONE WOULD NOT BE EXPECTED TO RESULT IN DAM SAFETY ISSUES.
4. PRIORITY 4 - BEST MANAGEMENT PRACTICE - FURTHER IMPROVEMENTS ARE NECESSARY TO MEET INDUSTRY BEST PRACTICES OR REDUCE POTENTIAL RISKS.

A few additional recommendations from the 2019 annual inspection are noted below:

- Conduct annual pond bathymetry surveys to verify pond size and confirm evaporation efficiency
- Update the water balance annually prior to the annual dam safety inspection
- Review and update consequence classification for the TDF as part of the next DSR
- Continue to remove weeds from the embankment slopes
- Continue to remove burrowing animals from the embankments
- Continue monitoring surface monuments on a monthly basis
- Continue monitoring pore pressures at all piezometer locations

To reduce supernatant pond volume, KP suggests exploring the following options:

- Installation of diversion ditches upstream of TDF #3 below highway 31 to divert runoff (particularly during freshet) away from the facility
- Increase evaporator efficiency by minimizing down-time
- Installation of additional evaporators
- Installation of a water treatment plant
- Storing surplus water within underground mine workings

## 5.0 CERTIFICATION

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This report was prepared and reviewed by the undersigned.

Prepared:

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Cyrus Niamir, P.E. Washington State  
Senior Engineer

Reviewed:

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Bruno Borntraeger, P.Eng.  
Specialist Geotechnical Engineer | Associate

Reviewed:

---

Ken Brouwer, P.E. Washington State  
Principal

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Approval that this document adheres to the Knight Piésold Quality System:



## Appendix A

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### Site Inspection Forms

(Tables A-1 to A-9)

**TABLE 1A**

**TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE**

**TDF #3 2019 DAM SAFETY INSPECTION  
NORTHEAST EMBANKMENT CREST**

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northeast Embankment</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Wearing course for trafficability		X		
	2. SURFACE CRACKING	None observed		X		
	3. SINKHOLES, ANIMAL BURROWS	None observed		X		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	No offsets or displacements		X		
	5. HORIZONTAL ALIGNMENT	Good. No evidence of misalignment or displacements		X		
	6. RUTS AND/OR PUDDLES	None observed		X		
	7. VEGETATION	Weeds cut back along crest periodically in the summer		X		
	8. BERMS	Safety berms in good conditon		X		
	9. FREEBOARD	Filling well below freeboard limit		X		
	10. ABUTMENT CONTACT	Good. No Evidence of seepage, leakage, drainage, etc.		X		
ADDITIONAL COMMENTS: _____						
_____						
_____						
_____						

\\KPL\VA-Prj\$\1101\00018\26\VA\Report\Rev 0\Appendix A\TDF #3 InspectionChecklist\_Rev 0.xls\1A NE Embankment Crest

0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RVW'D

**TABLE 2B**

**TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE**

**TDF #3 2019 DAM SAFETY INSPECTION  
NORTHEAST EMBANKMENT DOWNSTREAM SLOPE**

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northeast Embankment</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS	None observed		X		
	2. SEEPAGE	None observed		X		
	3. SLIDE, SLOUGH, SCARP	None observed		X		
	4. EMBANKMENT ABUTMENT CONTACT	No surface runoff, erosion, seepage or distortions		X		
	5. SINKHOLE/ANIMAL BURROWS	Some animal burrows observed at toe. To be monitored. Continue following animal control plan.				X
	6. EROSION	None noted		X		
	7. UNUSUAL MOVEMENT	None noted		X		
	8. VEGETATION	Grass cover well established. Downstream slope mowed periodically		X		
ADDITIONAL COMMENTS: _____ _____ _____						

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0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RWW'D

TABLE 1C

TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE

TDF #3 2019 DAM SAFETY INSPECTION  
NORTHEAST EMBANKMENT UPSTREAM SLOPE

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northeast Embankment</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	Slopes planar and no noted distortions		X		
	2. SLOPE PROTECTION TYPE AND CONDITION	Geomembrane lined slope - adequate wrinkles and no excessive tension in liner noted. Minor repairs in the spring - LCRS flows decreased		X		
	3. SINKHOLE/ANIMAL BURROWS	None observed		X		
	4. EMBANKMENT ABUTMENT CONTACT	No distortion noted in liner slope		X		
	5. EROSION	None observed		X		
	6. UNUSUAL MOVEMENT	None observed		X		
	7. VEGETATION	None observed		X		
ADDITIONAL COMMENTS: _____ _____ _____ _____						

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0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RW'D

**TABLE 2A**

**TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE**

**TDF #3 2019 DAM SAFETY INSPECTION  
NORTHWEST EMBANKMENT CREST**

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northwest Embankment</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Wearing course for trafficability		X		
	2. SURFACE CRACKING	None observed		X		
	3. SINKHOLES, ANIMAL BURROWS	None observed		X		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	No offsets or displacements		X		
	5. HORIZONTAL ALIGNMENT	Good. No evidence of misalignment or displacements		X		
	6. RUTS AND/OR PUDDLES	None observed		X		
	7. VEGETATION	Weeds cut back along crest periodically in the summer		X		
	8. BERMS	Safety berms in good conditon		X		
	9. FREEBOARD	Filling well below freeboard limit		X		
	10. ABUTMENT CONTACT	Good. No evidence of seepage, leakage, drainage, etc.		X		
ADDITIONAL COMMENTS: _____ _____ _____						

\\KPL\VA-Prj\$\1101\00018\26\VA\Report\Rev 0\Appendix A\TDF #3 InspectionChecklist\_Rev 0.xls]1A NE Embankment Crest

0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RVW'D

**TABLE 2B**

**TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE**

**TDF #3 2019 DAM SAFETY INSPECTION  
NORTHWEST EMBANKMENT DOWNSTREAM SLOPE**

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northwest Embankment</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS	None observed		X		
	2. SEEPAGE	None observed		X		
	3. SLIDE, SLOUGH, SCARP	None observed		X		
	4. EMBANKMENT ABUTMENT CONTACT	No surface runoff erosion, seepage or distortions		X		
	5. SINKHOLE/ANIMAL BURROWS	Some animal burrows observed at toe. To be monitored. Continue following animal control plan.				X
	6. EROSION	None noted		X		
	7. UNUSUAL MOVEMENT	None noted		X		
	8. VEGETATION	Grass cover well established. Downstream slope mowed periodically		X		
ADDITIONAL COMMENTS: _____ _____ _____						

\\KPLIVA-Prj\$1101\00018\26\A\Report\Rev 0\Appendix A\TDF #3 InspectionChecklist\_Rev 0.xls]1A NE Embankment Crest

0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RVW'D

TABLE 2C

TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE

TDF #3 2019 DAM SAFETY INSPECTION  
NORTHWEST EMBANKMENT UPSTREAM SLOPE

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northwest Embankment</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	Slopes planar and no noted distortions		X		
	2. SLOPE PROTECTION TYPE AND CONDITION	Geomembrane lined slope - adequate wrinkles and no excessive tension in liner noted. Minor repairs in the spring - LCRS flows decreased		X		
	3. SINKHOLE/ANIMAL BURROWS	None observed		X		
	4. EMBANKMENT ABUTMENT CONTACT	No distortion noted in liner slope		X		
	5. EROSION	None observed		X		
	6. UNUSUAL MOVEMENT	None observed		X		
	7. VEGETATION	None observed		X		
ADDITIONAL COMMENTS: _____						
_____						
_____						
_____						

\\KPL\VA-Prj\$1101\00018\26\A\Report\Rev 0\Appendix A\[TDF #3 InspectionChecklist\_Rev 0.xls]1A NE Embankment Crest

0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RWW'D

TABLE 3A

TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE

TDF #3 2019 DAM SAFETY INSPECTION  
INSTRUMENTATION, BASIN UNDERDRAIN & LEAKAGE COLLECTION AND REMOVAL SYSTEM

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northeast and Northwest Embankments</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
INSTR.		Vibrating Wire Piezometers located in Basin Underdrain, LCRS and embankment toes. OMS frequency to be reviewed with change to care and maintenance status.			X	
	1. PIEZOMETERS				X	
	2. OBSERVATION WELLS	Water quality monitoring wells located around facility			X	
	3. STAFF GAUGES	Water level measured using water level indicator and checked with survey			X	
	4. INCLINOMETERS	None	X			
	5. SURVEY MOVEMENT MONUMENTS	Two permanent monuments: M5 and M6			X	
	6. FLOW MONITORING DEVICES	LCRS and Basin Underdrain Systems pumped out			X	
	7. FREQUENCY OF READINGS	Follows OMS frequency. OMS frequency to be reviewed with change to care and maintenance status.			X	
	8. REPORTING OF READINGS	Follows OMS frequency. OMS frequency to be reviewed with change to care and maintenance status.			X	
ADDITIONAL COMMENTS: <u>6. LCRS is pumped out and flow rate is measured using a totalizer.</u> <u>Basin Underdrain pumping not required at this time</u>						

\\KPL\VA-Prj\$\1\01\00018\26\A\Report\Rev 0\Appendix A\[TDF #3 InspectionChecklist\_Rev 0.xls]1A NE Embankment Crest

0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RW'D



TABLE 3B

TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE

TDF #3 2019 DAM SAFETY INSPECTION  
TAILINGS AND RECLAIM SYSTEM

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northeast and Northwest Embankments</u>						
INSPECTION DATE: <u>September 26, 2019</u>						
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR
T & R	1. POND WATER LEVEL	Below high water mark from spring freshet		X		
	2. TAILINGS BEACH	Build up progressed as planned		X		
	3. TAILINGS LINE	New floating line operated in central basin area		X		
	4. TAILINGS DISCHARGE HOUSES	Functioning and maintained		X		
	5. SPIGOTS	Spigots all functional		X		
	6. BARGE	Floating barge and walkway functioning as designed. Monitored and inspected per OMS requirements		X		
	7. RECLAIM LINE	Monitored and inspected as per OMS requirements		X		
ADDITIONAL COMMENTS: <u>Tailings and reclaim will not function during care and maintenance. Tailings and reclaim functioned properly in the previous year.</u> _____ _____ _____						

\\KPLVA-Prj\$\1101\00018\26\A\Report\Rev 0\Appendix A\TDF #3 InspectionChecklist\_Rev 0.xls\1A NE Embankment Crest

0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RWW'D

TABLE 3C

TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE

TDF #3 2019 DAM SAFETY INSPECTION  
SURROUNDING AREA

Print Mar/12/20 9:27:29

NAME OF DAM: <u>Northeast and Northwest Embankments</u>							
INSPECTION DATE: <u>September 26, 2019</u>							
AREA INSPECTED	CONDITION	OBSERVATIONS	N/A	NO ACTION	MONITOR	REPAIR	
SURROUNDING AREA	1. MINE SITE ACCESS ROAD DOWN NW DAM DS SLOPE	Good condition and surface water runoff controls functioning		X			
	2. PERIMETER ROAD	Maintained and majority covered with wearing course		X			
	3. SINKHOLE ON SLOPE	Inspected - no change		X			
	4. WILDLIFE FENCE	Periodically inspected and repaired			X		
	5. SURFACE WATER RUNOFF	Localized runoff ponds are directed into facility at specific locations		X			
	6. VEGETATION UPPER BASIN SLOPES	Grassy slopes revegetated and tree growth noted		X			
ADDITIONAL COMMENTS: _____ _____ _____							

\\KPL\VA-Prj\$1101\00018\26\A\Report\Rev 0\Appendix A\[TDF #3 InspectionChecklist\_Rev 0.xls]1A NE Embankment Crest

0	12MAR'20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RVWD'

## Appendix B

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### Site Inspection Photographs

(Pages B-1 to B-14)

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 1** – View of tailings basin from the south.



**PHOTO 2** – View of north side of tailings basin from the west.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 3** – View of east side of tailings basin from the west.



**PHOTO 4** – View of south side of tailings basin from the west.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 5** – Evaporators from the northwest. Two operational at time of inspection.



**PHOTO 6** – Reclaim barge and upstream northwest embankment.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 7** – Reclaim barge, walkway and evaporators.



**PHOTO 8** – Downstream face of northwest dam from toe.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 9** – TDF #3 perimeter road connecting northeast and northwest Dams.



**PHOTO 10** – Downstream face of northeast dam from crest.



## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 11** – Downstream face of northeast dam from toe.



**PHOTO 12** – Piezometer installed at northeast dam toe.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 13** – Animal burrow at downstream toe of northeast dam.



**PHOTO 14** – Tailings beach at northwest end of facility

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 15** – E1 tailings discharge spigot looking south.



**PHOTO 16** – Upstream dam slopes and reclaim barge from the east.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 17** – Northeast portion of facility looking north.



**PHOTO 18** – E2 tailings discharge spigot looking south.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 19** – E2 tailings discharge hut.



**PHOTO 20** – Eastern facility slopes and tailings deposition.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 21** – Eastern portion of facility looking north.



**PHOTO 22** – Western portion of facility looking north.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 23** – “Sink hole” location upstream of TDF#3 basin.



**PHOTO 24** – Western portion of facility and W3 tailings discharge spigot looking north.

## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 25** – Conetec CPT rig – Performing CPT at the northwest dam.



**PHOTO 26** – Yellow Jacket Rig – Performing sonic drilling at northwest dam.



## TDF #3 2019 DAM SAFETY INSPECTION



**PHOTO 27** – Vibrating wire piezometer installation in standpipe at northwest dam.



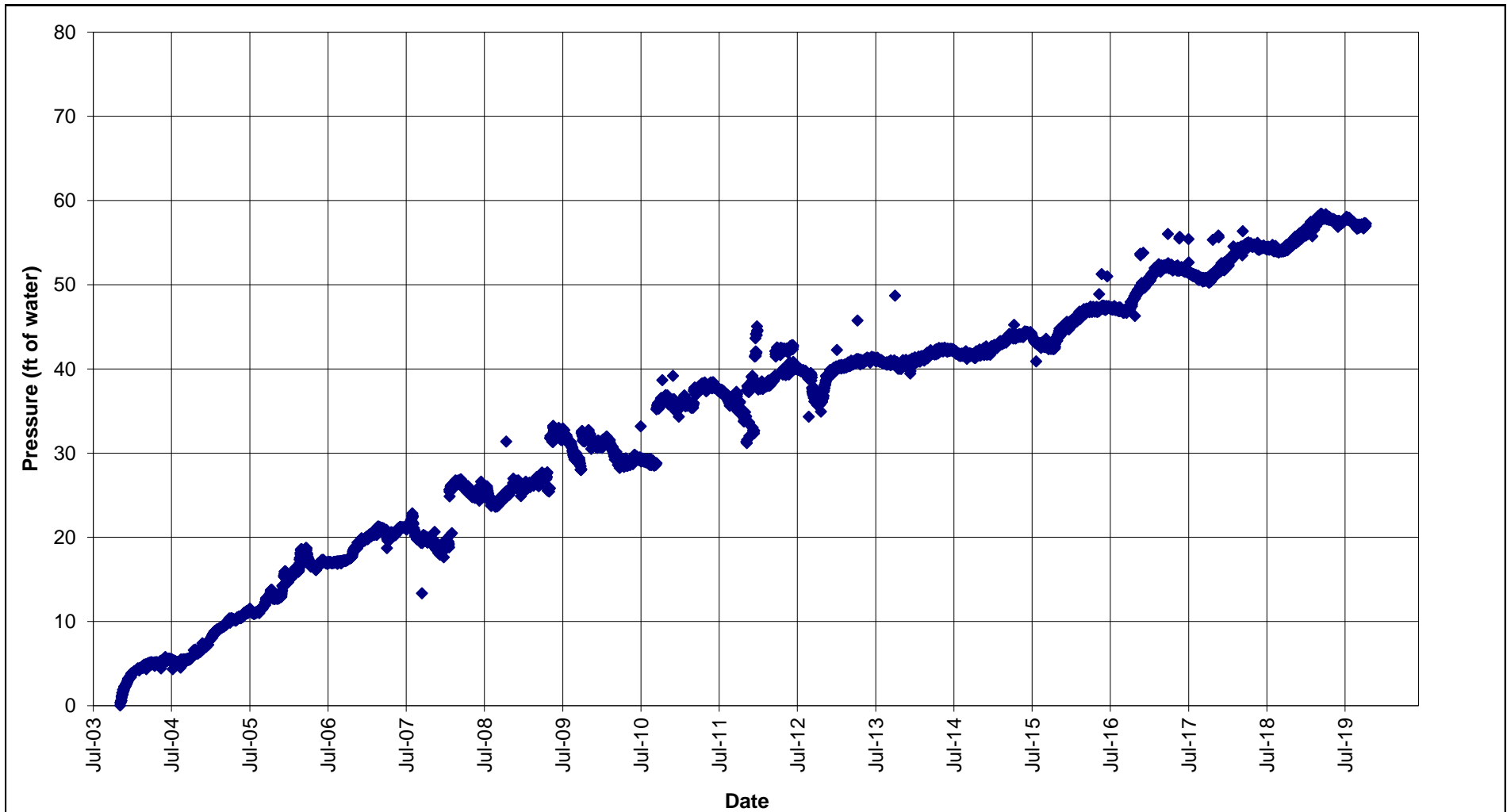
**PHOTO 28** – Conetec CPT rig – Performing CPT on crest of dam.


## Appendix C

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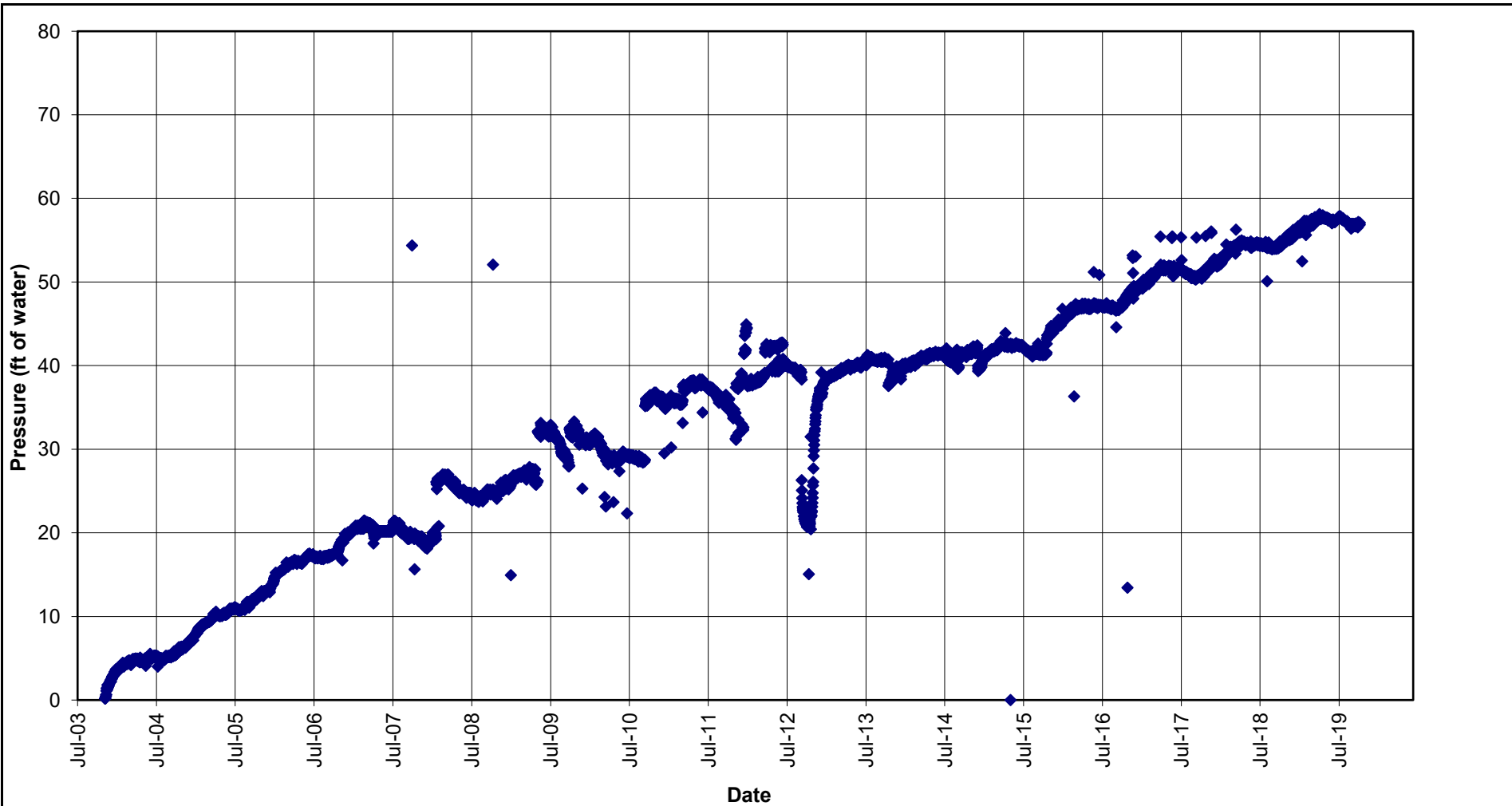
### Instrumentation Records


(Figures C-1 to C-12)



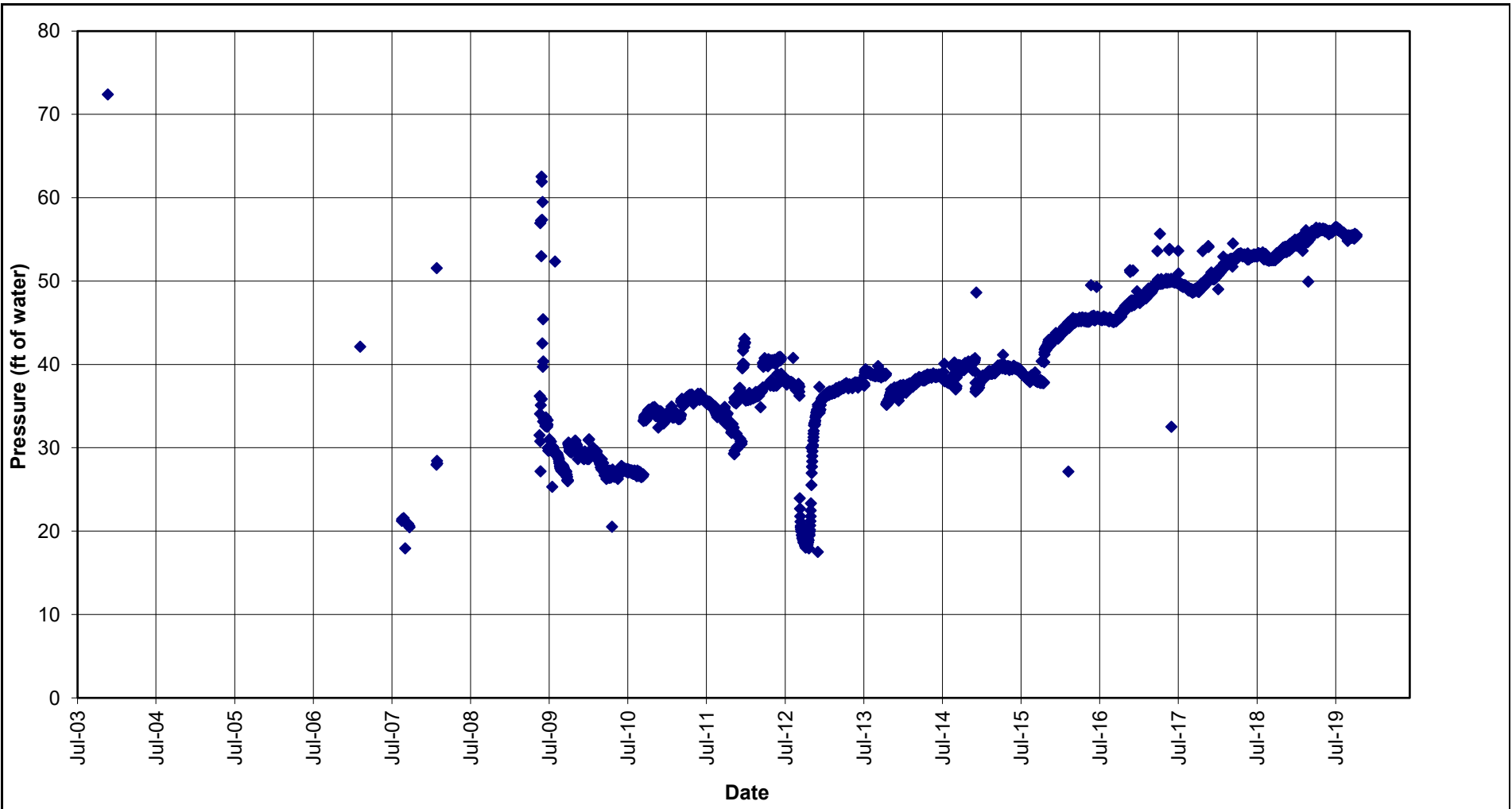
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PEND OREILLE MINE	
TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER BU-1	
	P/A No. VA101-18/26
	REF. NO. 1
<b>FIGURE C-1</b>	
REV 0	


0	29OCT'19	ISSUED WITH REPORT	CBN	BB	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



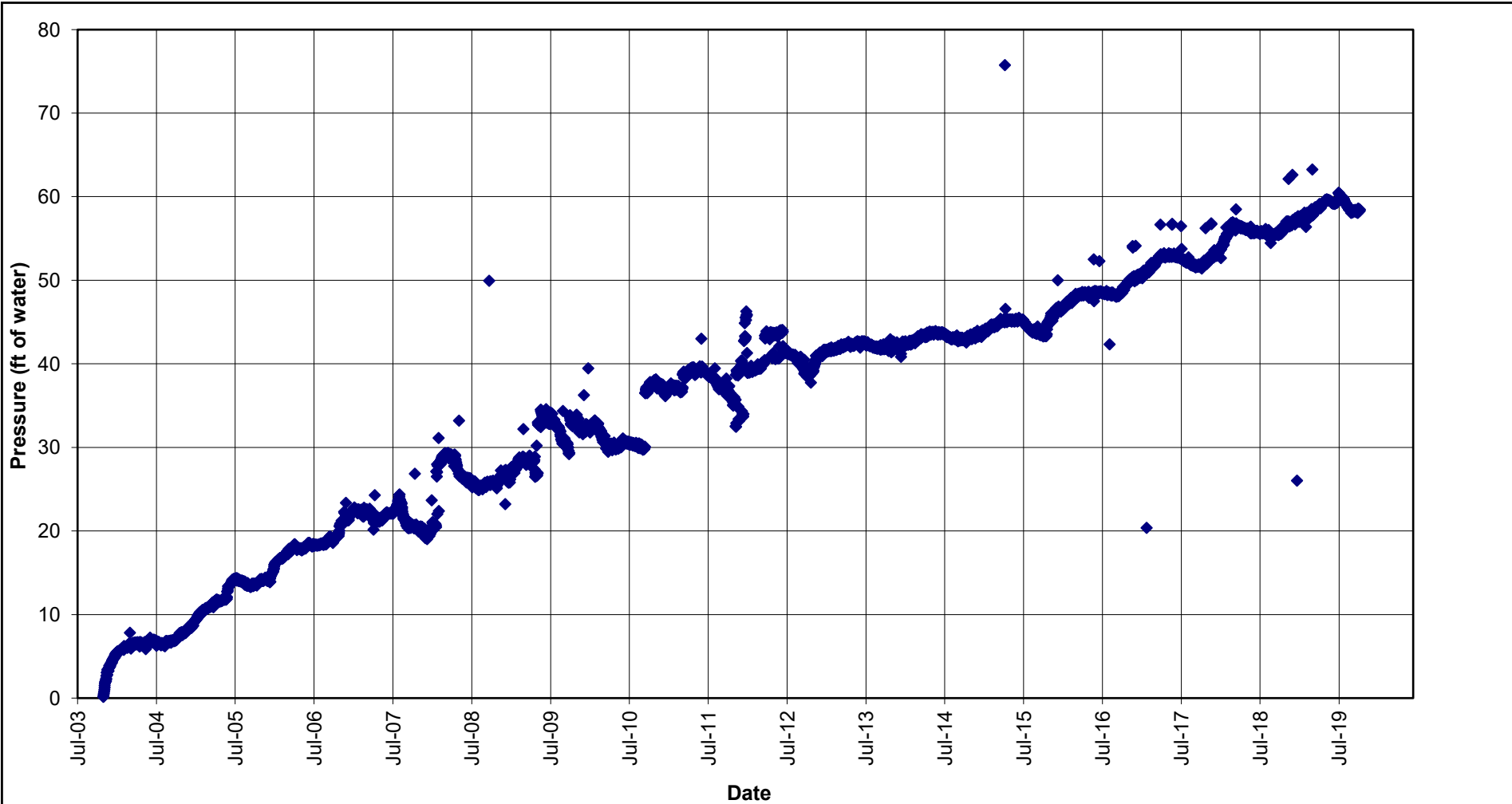
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PEND OREILLE MINE	
<b>TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER BU-2</b>	
	P/A No. VA101-18/26
<b>FIGURE C-2</b>	
REF. NO. 1	REV 0


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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



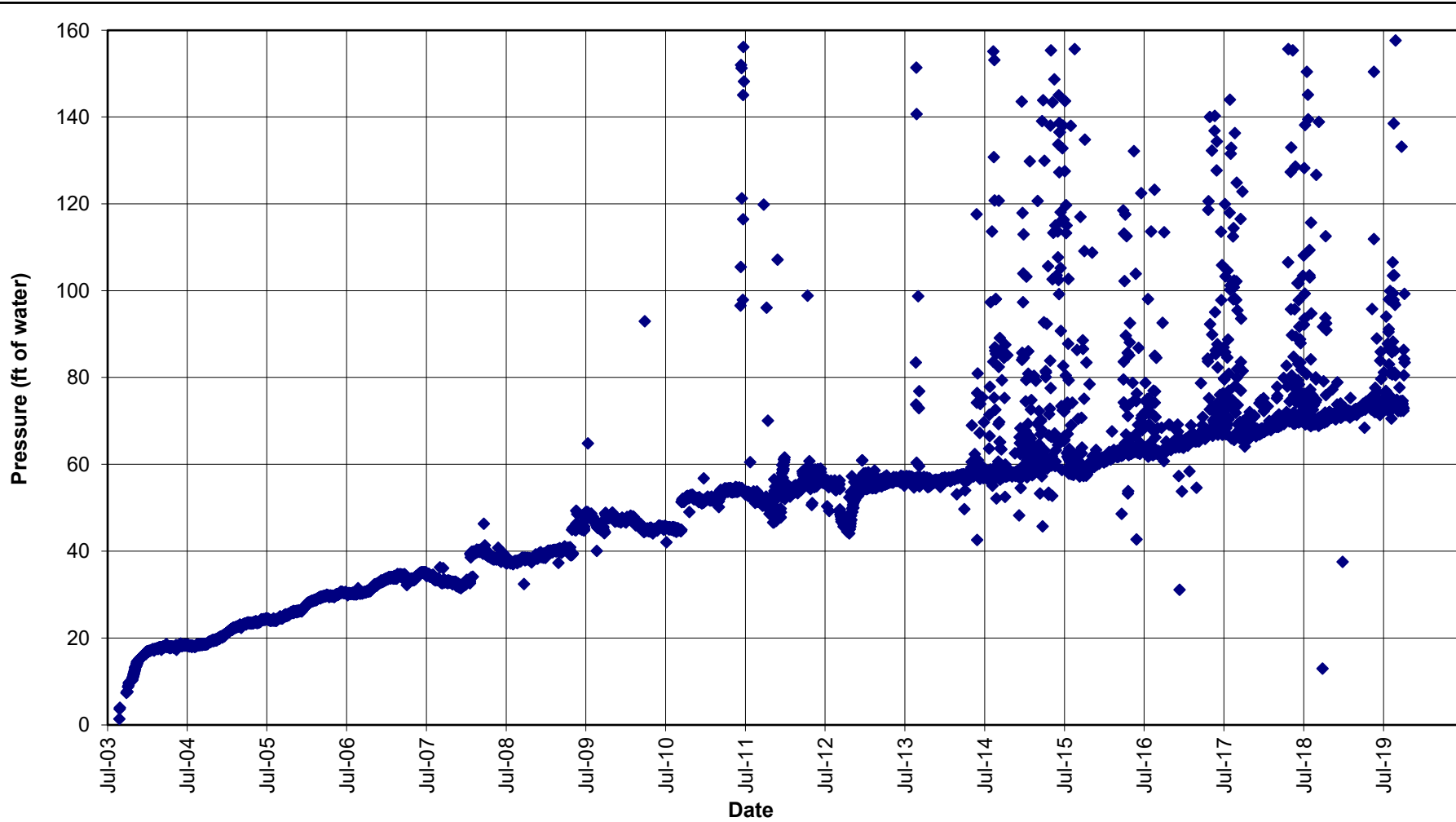
TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
<b>TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER BU-3</b>	
	P/A No. VA101-18/26
<b>FIGURE C-3</b>	
REF. NO. 1	REV 0


REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	29OCT'19	ISSUED WITH REPORT	CBN	BB	KJB



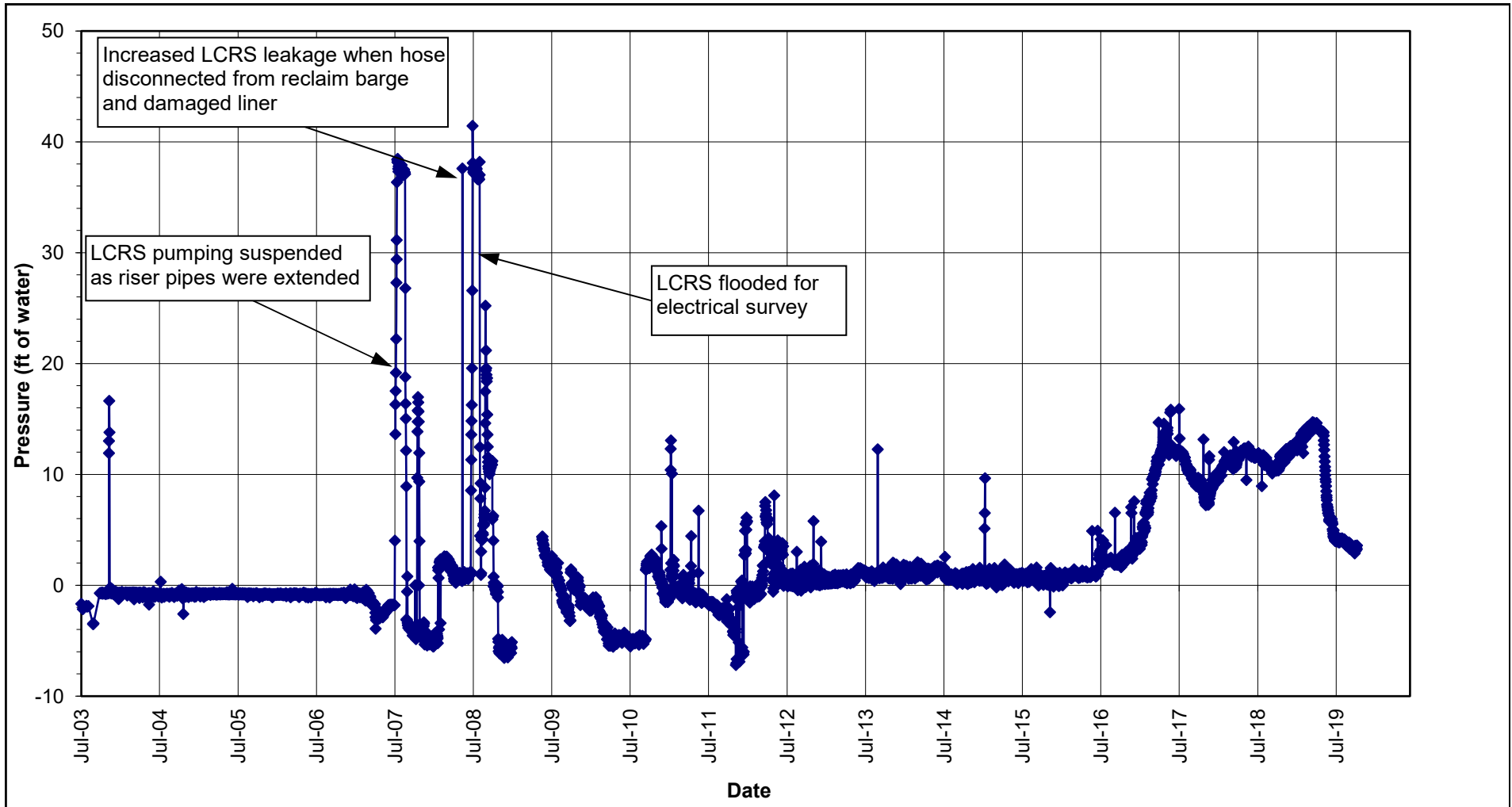
TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
<b>TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER BU-4</b>	
	P/A No. VA101-18/26
REF. NO. 1	<b>FIGURE C-4</b>
REV 0	


0	29OCT'19	ISSUED WITH REPORT	CBN	BB	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER BU-5	
	P/A NO. VA101-18/26
	REF. NO. 1
<b>FIGURE C-5</b>	
REV 0	

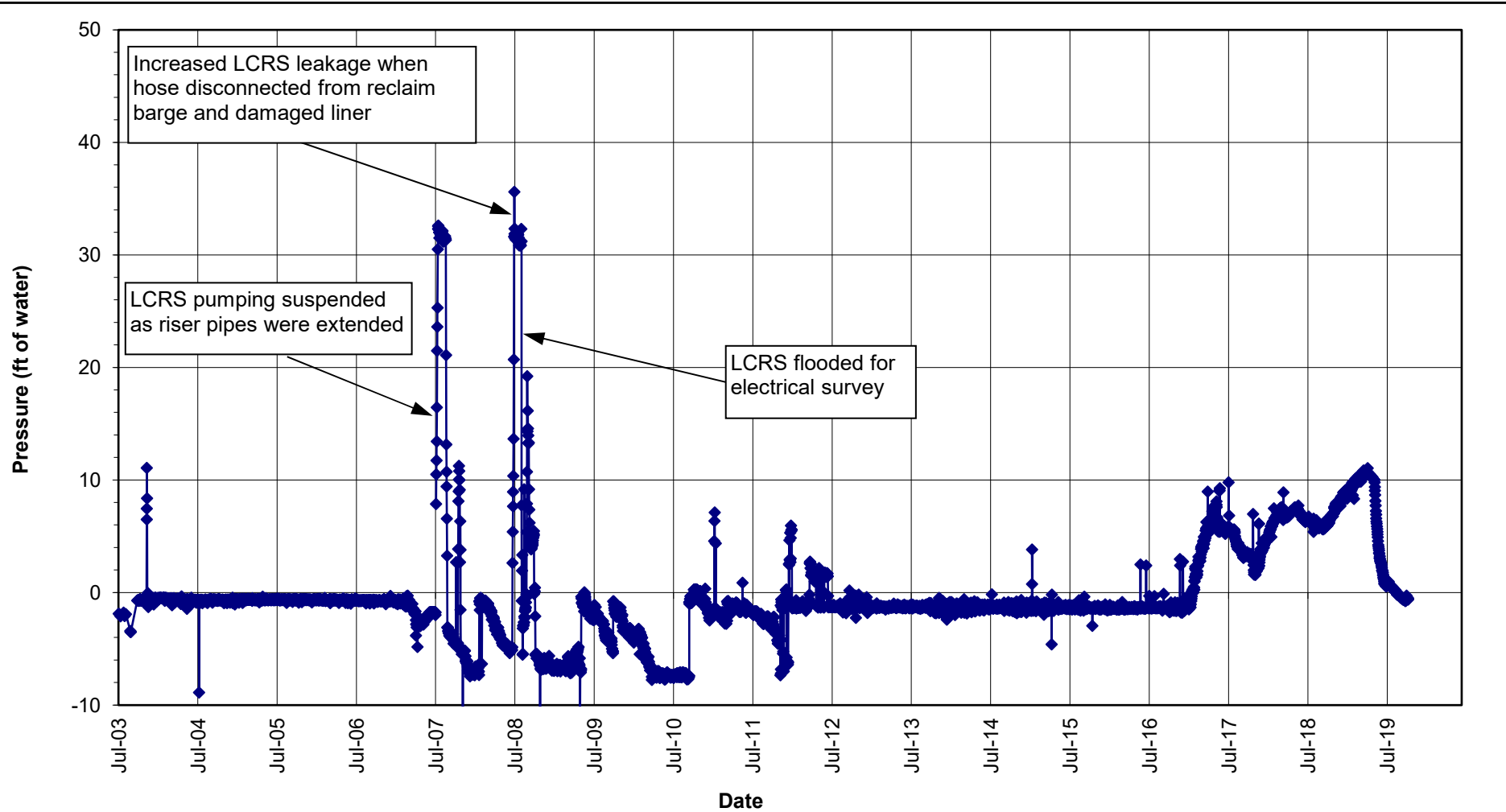
0	29OCT'19	ISSUED WITH REPORT	CBN	BB	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D




TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
<b>TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER LCRS-1</b>	
	P/A No. VA101-18/26
	REF. NO. 1
<b>FIGURE C-6</b>	
REV 0	

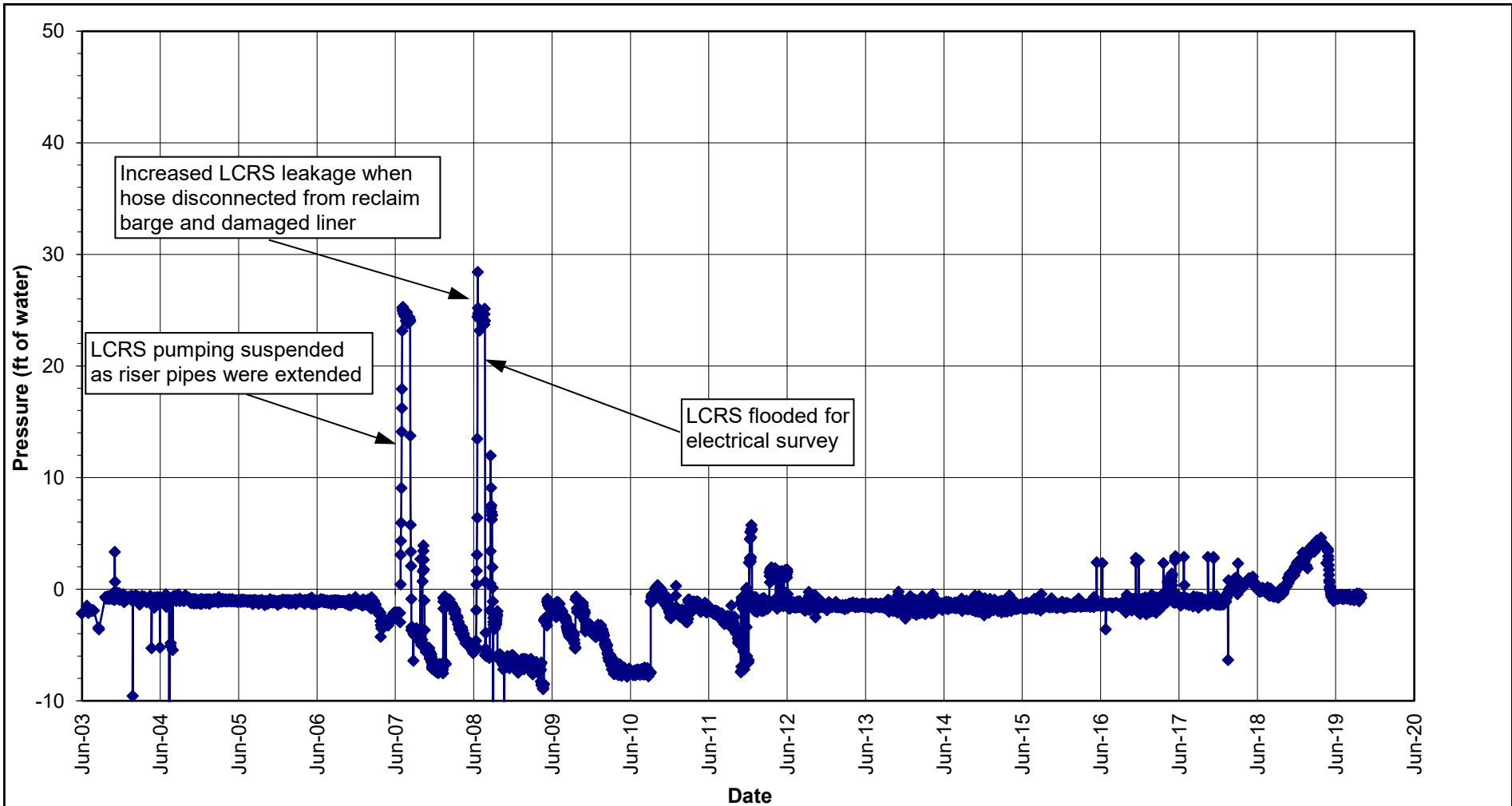
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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D






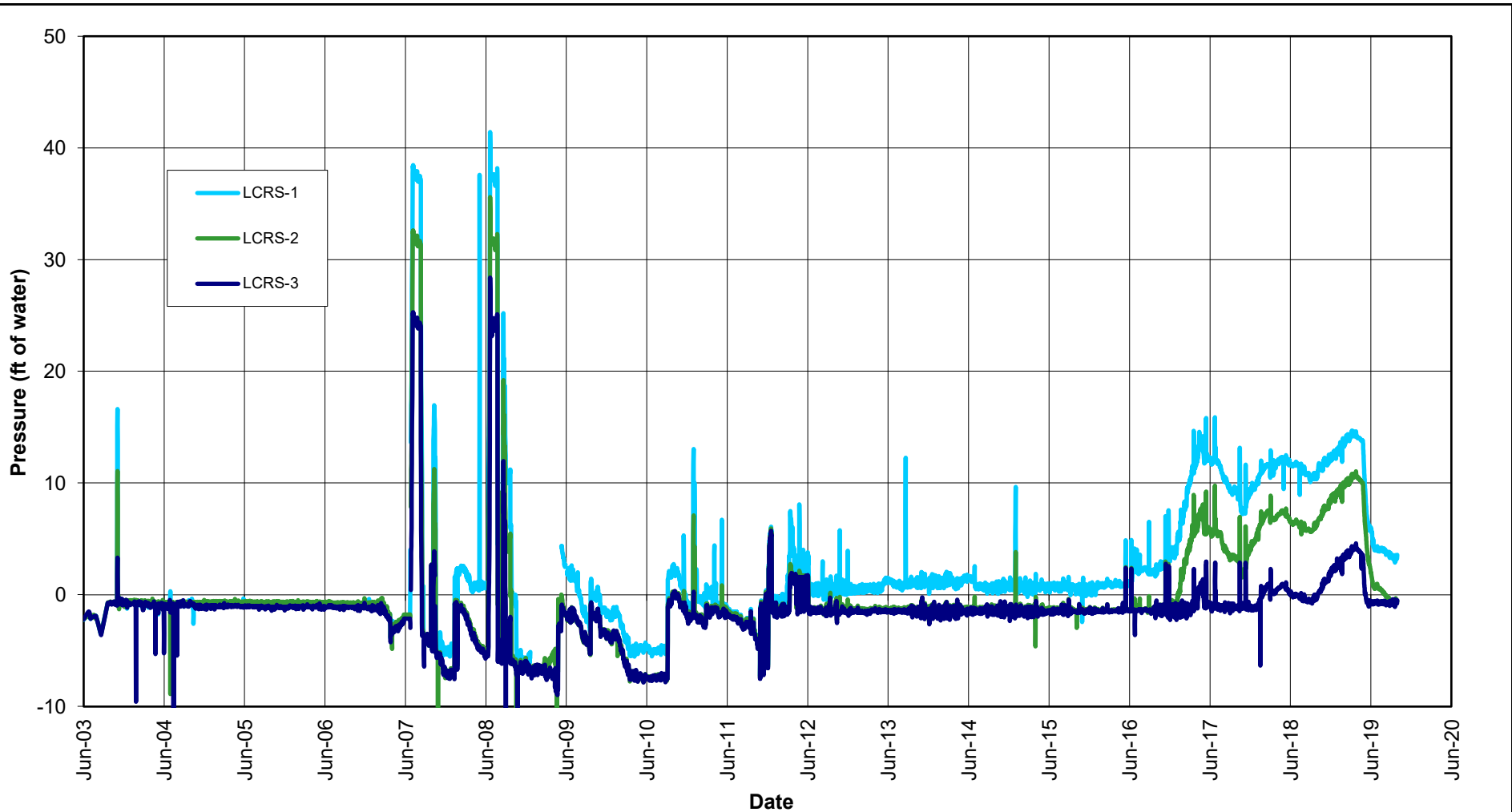
TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
<b>TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER LCRS-2</b>	
 Knight Piésold CONSULTING	P/A No. VA101-18/26
REF. NO. 1	
<b>FIGURE C-7</b>	
REV 0	


0	29OCT'19	ISSUED WITH REPORT	CBN	BB	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



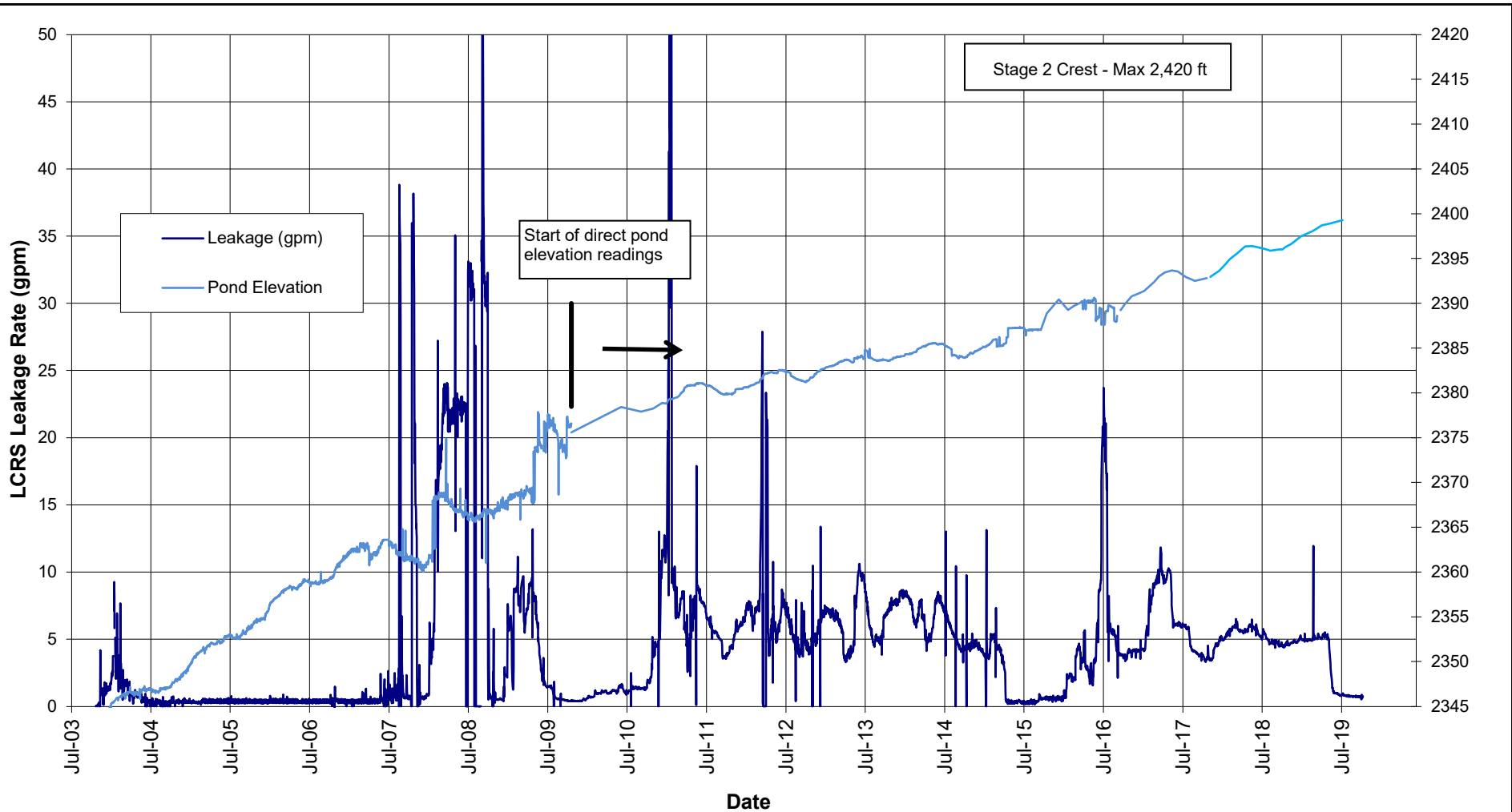
TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR PIEZOMETER LCRS-3	
	P/A No. VA101-18/26 REF.NO. 1 <b>FIGURE C-8</b> REV 0


0	29OCT'19	ISSUED WITH REPORT	CBN	BB	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
<b>TAILINGS DISPOSAL FACILITY #3 CALCULATED PRESSURE FOR LCRS PIEZOMETERS</b>	
	P/A No. VA101-18/26 REF. NO. 1
<b>FIGURE C-9</b>	
REV 0	

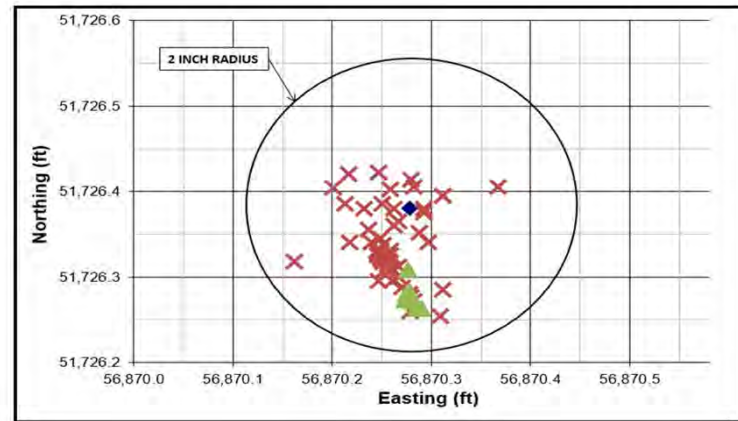
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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



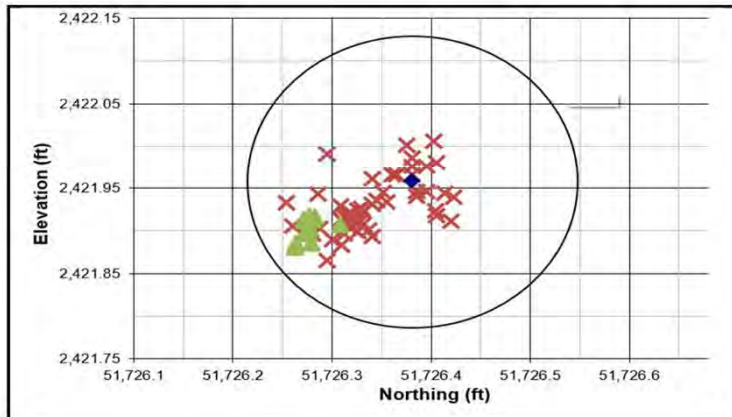
TECK WASHINGTON INCORPORATED	
PEND OREILLE MINE	
TAILINGS DISPOSAL FACILITY #3 LCRS LEAKAGE RATE	
	P/A NO. VA101-18/26 REF. NO. 1
<b>FIGURE C-10</b>	
REV 0	

0	29OCT'19	ISSUED WITH REPORT	CBN	BB	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

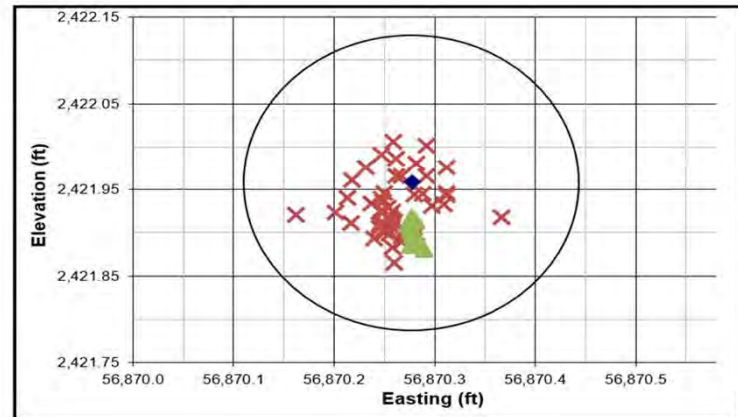
✕ 2009 to 2017 Readings    ▲ 2018 readings    ◆ Initial Survey




M5 Plan View



M5 Elevation vs. Northing

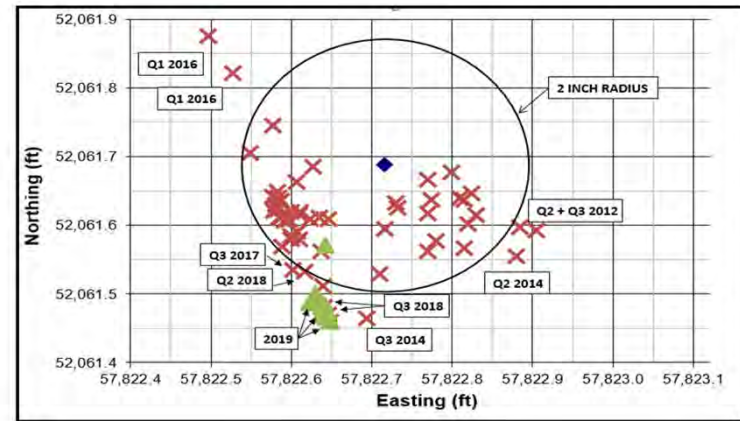


M5 Elevation vs. Easting

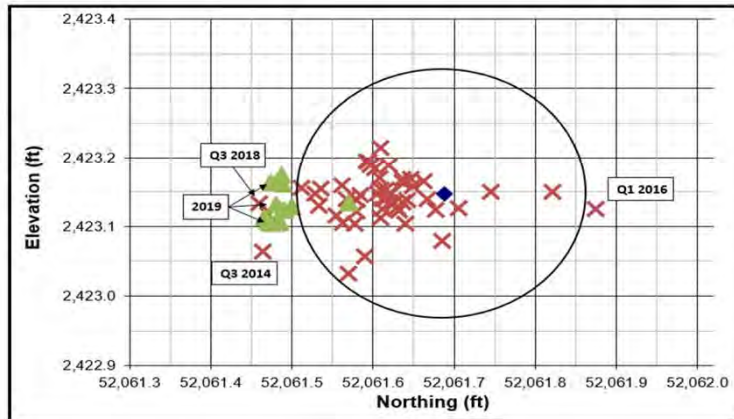
TECK WASHINGTON INCORPORATED		
PEND OREILLE MINE		
NORTHWEST EMBANKMENT M5 SURVEY MONUMENT		
	P/A NO. VA101-18/26	REF. NO. 1
	<b>FIGURE C-11</b>	
REV 0	REV 0	REV 0

REV	DATE	DESCRIPTION	PREP'D	RVWD
0	12MAR'20	ISSUED WITH REPORT	CBN	BB

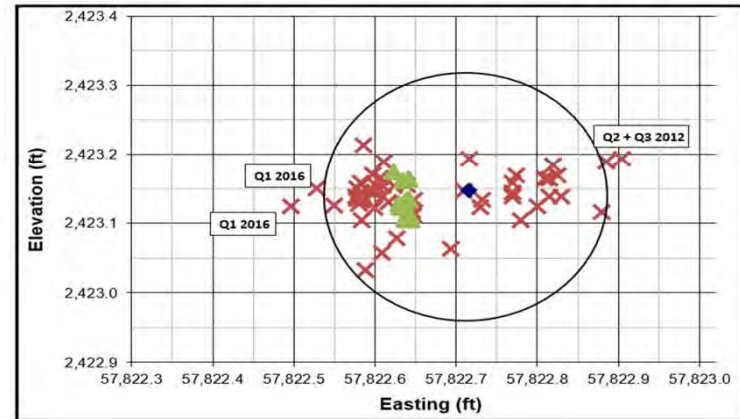
✖ 2009 to 2017 Readings    ▲ 2018 readings    ◆ Initial Survey



M6 Plan View



M6 Elevation vs. Northing



M6 Elevation vs. Easting

TECK WASHINGTON INCORPORATED		
PEND OREILLE MINE		
<b>NORTHEAST EMBANKMENT M6 SURVEY MONUMENT</b>		
<b>Knight Piésold</b> CONSULTING	P/A NO. VA101-18/26	REF. NO. 1
	<b>FIGURE C-12</b>	
		REV 0

0	12MAR'20	ISSUED WITH REPORT	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RVWD

## Appendix D

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### Facility Data Sheet

(Table D.1)

**TABLE D.1**
**TECK WASHINGTON INCORPORATED  
PEND OREILLE MINE**
**TDF #3 2019 DAM SAFETY INSPECTION  
FACILITY DATA SHEET**

Print Mar/12/20 9:52:49

Item	Value
<b>General</b>	
Owner	Teck Washington Incorporated
Operator	Teck Washington Incorporated
Facility Name	Tailings Disposal Facility #3
Purpose	Water and Tailings Impoundment
Consequence Classification	Significant, Hazard Class 2
Status	Care and Maintenance. No active deposition.
<b>Impoundment Data</b>	
Catchment Area	360 acres
Current Freeboard	20.85 feet
Minimum Freeboard	6 feet
Design Target Pond Volume	190.5 acre-ft
Current Storage	2,900 acre-ft
Maximum Storage (to Minimum Freeboard Elevation)	3,900 acre-ft
<b>Northwest Dam</b>	
National Inventory of Dams ID	WA00640
State Identification Number	PO62-640
Location	Lat:48.8827 Long:-117.3512
Type	Zoned Earthfill Embankment
Height	67 feet
Crest Length	800 feet
Crest Width	25 feet
Upstream Slope	2.5H:1V
Downstream Slope	2H:1V
<b>Northeast Dam</b>	
National Inventory of Dams ID	WA00641
State Identification Number	PO62-641
Location	Lat:48.8835 Long:-117.3472
Type	Zoned Earthfill Embankment
Height	72
Crest Length	500
Crest Width	25
Upstream Slope	2.5H:1V
Downstream Slope	2H:1V
<b>Outlet Details</b>	
Outlet Type	Reclaim Barge Mounted Pump
Pump Type	National Pump: #MC14HC-03-16061, 150HP, 1800 RPM, 3-stage vertical turbine pump
Pump Length	2,700 feet
Outlet Controls	Variable Frequency Drive
Spillway	None (Zero Discharge)

\\KPL\VA-Prj\$\1\01\00018\26\A\Report\Rev 0\Appendix D\Facility Data Sheet.xlsx]Table D.1

0	12MAR20	ISSUED WITH REPORT VA101-18/26-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RW'D



## Appendix E

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### Reference Documents

(Table E.1)

**TABLE E.1**
**TECK WASHINGTON INCORPORATED  
 PEND OREILLE MINE**
**TDF #3 2019 DAM SAFETY INSPECTION  
 REFERENCE DOCUMENTS**

Print Mar/12/20 9:53:37

Report	Author	Date	Reference
Tailings Disposal Facility #3 And Ancillary Works, Stage 1 Detailed Design Report. Ref. No. 31032/5-2, Rev 0	Knight Piésold Ltd.	Apr-01	KP, 2001a
Inspection of Underground Workings Letter Ref. No. 1-1772R0	Knight Piésold Ltd.	Jul-01	KP, 2001b
Tailings Disposal Facility #3, Detailed Design of Tailings Cover. Ref. No. 31032/3-1, Rev 1	Knight Piésold Ltd.	Nov-01	KP, 2001c
Stage 1 2001 Construction Report. Ref. No. 31032/5-5, Rev 0	Knight Piésold Ltd.	Nov-01	KP, 2001d
Report on 2003 Stage 1 Construction. Ref. No. VA101-18/3-1, Rev 0	Knight Piésold Ltd.	Dec-03	KP, 2003
2006/2007 Stage 2 Expansion Construction Report. Ref. No. VA101-00018/11-1, Rev 0	Knight Piésold Ltd.	Jan-08	KP, 2008
Pend Oreille Mine Water Balance Model Ref. No. VA14-00089	Knight Piésold Ltd.	Mar-14	KP, 2014a
TDF-3 Dam Safety Review No. 2	GeoEngineers Inc.	Oct-14	DSR, 2014
2014 Dam Safety Inspection Report	Knight Piésold Ltd.	Nov-14	KP, 2014b
Guideline for Tailings and Water Retaining Structures	Teck Resources Ltd.	Nov-14	TWRS, 2014
Emergency Action Plan for TDF-3	GeoEngineers Inc.	Nov-14	EAP, 2014
Dangerous Waste Regulations Chapters 173-303	Washington State Department of Ecology	Dec-14	-
TDF #3 Operation and Maintenance Manual. Ref. No. VA101-00018/2-1, Rev 3	Knight Piésold Ltd.	Dec-15	KP, 2015
Report on 2015 Annual Inspection. Ref. No. VA101-00018/19-1, Rev 0	Knight Piésold Ltd.	Mar-16	KP, 2016
Report on 2016 Annual Inspection. Ref. No. VA101-00018/20-1, Rev 0	Knight Piésold Ltd.	Jan-17	KP, 2017a
TDF #3 Closure Planning. Ref. No. VA101-00018/21-1, Rev 0	Knight Piésold Ltd.	Sep-17	KP, 2017b
2017 Annual Inspection Report. Ref. No. VA101-00018/22-1, Rev 0	Knight Piésold Ltd.	Feb-18	KP, 2018
Preliminary Risk Assessment of TDF #3	Haley & Aldrich, Inc.	Oct-18	H&A, 2018
Guideline for Tailings and Water Retaining Structures	Teck Resources Ltd.	Jan-19	TWRS, 2019
2018 Annual Inspection Report. Ref. No. VA101-00018/23-1, Rev 0	Knight Piésold Ltd.	Mar-19	KP, 2019a
Emergency Action Plan Update	GeoEngineers Inc.	Oct-19	EAP, 2019
2019 TDF #3 Site Investigation Data Report. Ref. No. VA101-00018/25-1 Rev A	Knight Piésold Ltd.	Nov-19	KP, 2019c
National Inventory of Dams Online: <a href="http://nid.usace.army.mil/cm_apex/f?p=838:4:0::NO">http://nid.usace.army.mil/cm_apex/f?p=838:4:0::NO</a>	Unite States Army Corps of Engineers	Accessed Nov 2019	-
TDF #3 Operation and Maintenance Manual. Ref. No. VA101-00018/28-1, Rev 5	Knight Piésold Ltd.	Feb-20	KP, 2020a
Pend Oreille Mine TDF #3 Water Balance Update Ref. No. VA20-00345	Knight Piésold Ltd.	Mar-20	KP, 2020b

\\KPL\VA-Pj\1\01\00018\26\A\Report\Rev 0\Appendix E\Appendix E -Reference Document List.xlsx\Reference Documents

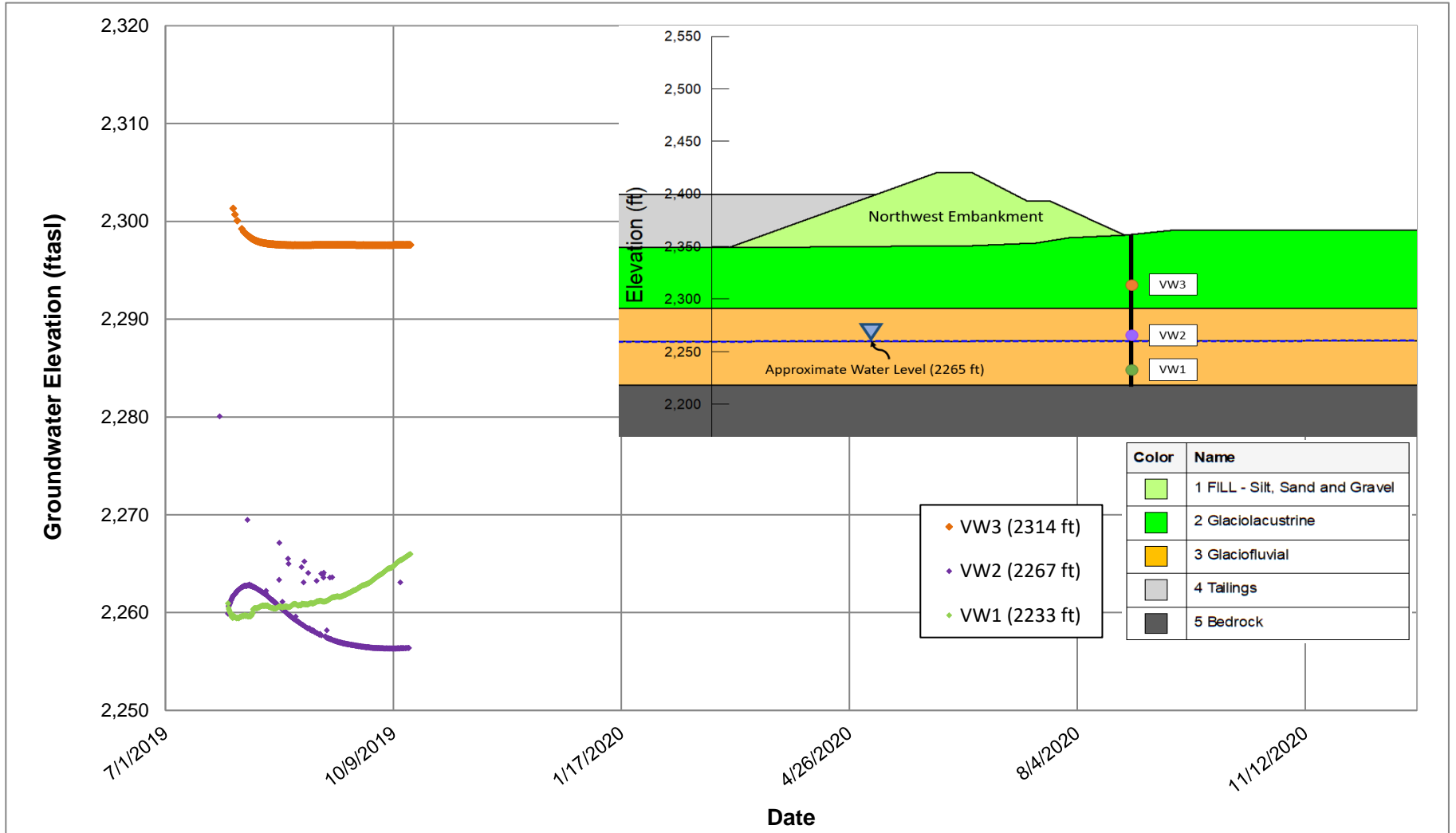
0	12MAR'20	ISSUED WITH REPORT VA101-18/28-1	CBN	BB
REV	DATE	DESCRIPTION	PREP'D	RVW'D

## Appendix F

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### Foundation Piezometer Data

(Figures F-1 to F-2)

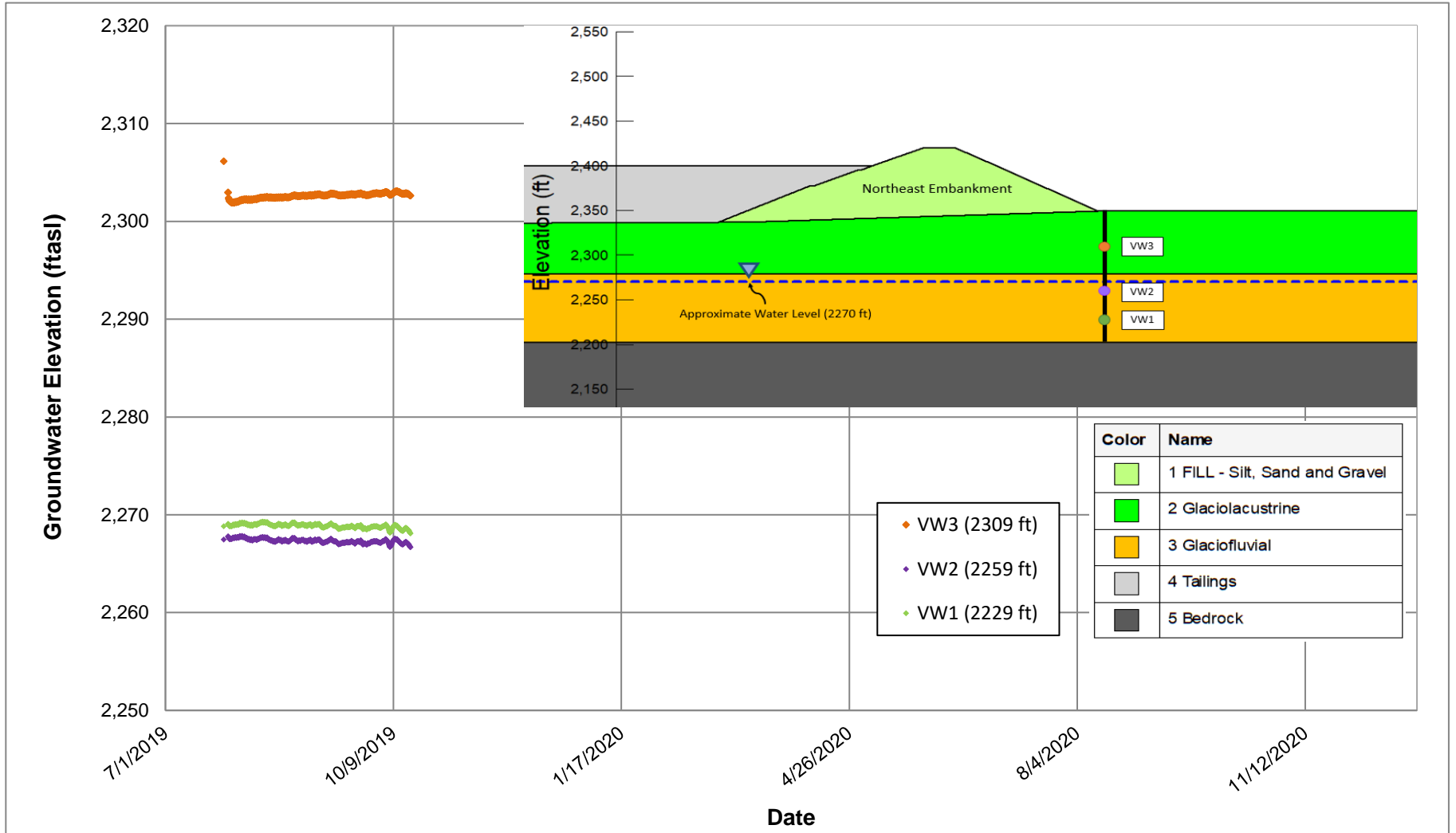


**NOTES:**

- GROUND ELEVATION IS 2367 ft ABOVE SEA LEVEL.
- SENSOR DEPTHS SHOWN IN LEGEND ARE VERTICAL DEPTHS BELOW GROUND SURFACE.
- VW3 AND VW2 LOCATED ABOVE THE WATER TABLE.
- VW1 = 132 ft BELOW GROUND SURFACE, VW2 = 98 ft BELOW GROUND SURFACE AND VW3 = 51 ft BELOW GROUND SURFACE.


TECK WASHINGTON INC.	
PEND OREILLE MINE	
<b>DH19-01 PIEZOMETER DATA GROUNDWATER ELEVATION</b>	
	P/A NO. VA101-00018/26
	REF. NO 1
<b>FIGURE F-1</b>	
	REV 0

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29NOV'19	ISSUED WITH REPORT	DMA	CBN



**NOTES:**

1. GROUND ELEVATION IS 2350 ft ABOVE SEA LEVEL.
2. SENSOR DEPTHS SHOWN IN LEGEND ARE VERTICAL DEPTHS BELOW GROUND SURFACE.
3. VW3 LOCATED ABOVE THE WATER TABL
4. VW1 = 121 ft BELOW GROUND SURFACE, VW2 = 91 ft BELOW GROUND SURFACE AND VW3 = 41 ft BELOW GROUND SURFACE.

TECK WASHINGTON INC.	
PEND OREILLE MINE	
<b>DH19-02 PIEZOMETER DATA GROUNDWATER ELEVATION</b>	
	P/A NO. VA101-00018/26
	REF. NO 1
<b>FIGURE F-2</b>	
REV 0	

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29NOV'19	ISSUED WITH REPORT	DMA	CBN