APPENDIX 3-1: CLIMATE BASELINE

REPORT

Climate Baseline Update

Mount Polley Mine

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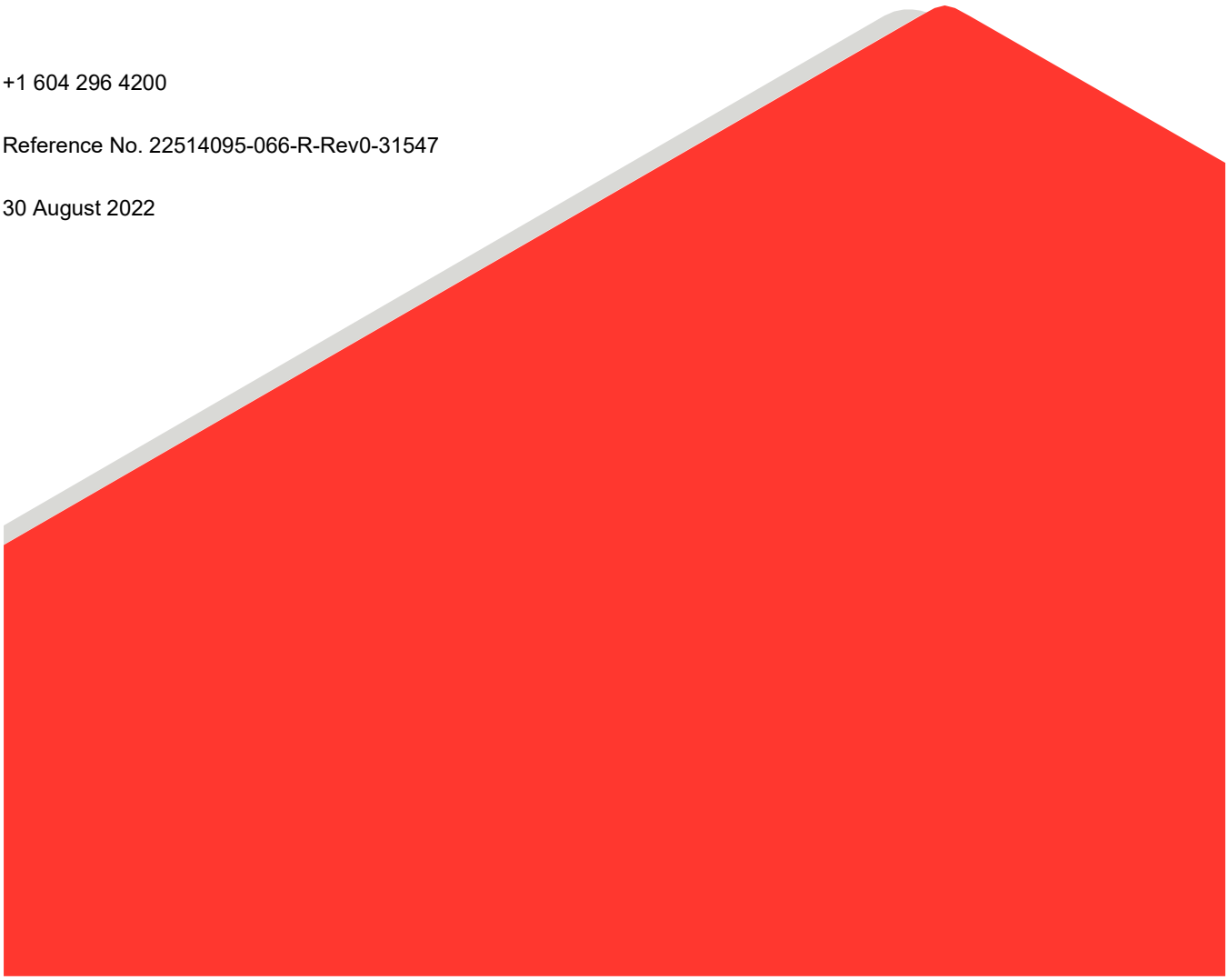
30 August 2022



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Executive Summary

This report provides a five-year update of climate baseline at Mount Polley Mine site (the Site) owned and operated by Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation. Updated baseline statistics are presented for precipitation (total precipitation, rainfall), air temperature, relative humidity, solar radiation, evaporation, snow depths, wind speed and directions. Updated climate change projections for the Site are also provided.

The 1974 to 1993 climate records from the nearby Environment and Climate Change Canada (ECCC) Likely climate station and 1995 to 2021 climate records from the local MPMC climate stations served as the basis for developing statistics for describing precipitation and temperature conditions for the Site. Records from regional and MPMC climate stations were reviewed to assist in characterizing climate parameters, such as relative humidity and solar radiation, and to support the identification of spatial trends. Local and regional climate station data were interrogated for inconsistencies or gaps, and then infilled using regional data and translation factors.

A summary of the updated baseline climate parameters developed in this study is provided in Table 1. The trends in climate parameters at the Site are similar to those at the ECCC regional stations considered in the study. An evaluation of future climate change projections indicates future climate at the Site will likely be warmer and wetter, with larger variations throughout the months.

Table 1: Summary of Key Mount Polley Climate Parameters

Parameter	Value
Mean annual total precipitation (mm)	612
1:2-year 24-hour rainfall (mm)	33
1:200-year 24-hour rainfall (mm)	69
Projected annual total precipitation anomaly from baseline for 2050's (%)	+5
Projected annual total precipitation anomaly from baseline for 2080's (%)	+8
Mean annual temperature (°C)	3.9
Average winter season (sub-zero mean monthly temperatures)	November to March
Projected annual air temperature anomaly from baseline for 2050's (°C)	+1.8
Projected annual air temperature anomaly from baseline for 2080's (°C)	+2.7
Mean annual relative humidity (%)	68.1
Mean annual solar radiation (W/m^2)	135
Mean annual shallow lake evaporation (mm)	673
Mean annual potential evapotranspiration (mm)	863
Mean snow water equivalent for the month of March (mm)	185

Note: Statistics are based on reviewed historical records from multiple climate stations and measured and derived data (where applicable).
mm = millimetre; ˚C = degrees Celsius; W/m^2 = watts per square metre.

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1.0 INTRODUCTION

1.1 Overview

Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation, owns and operates the Mount Polley Mine (the Mine). The Mine is a copper-gold mine located 56 km northeast of Williams Lake, British Columbia (BC).

1.2 Purpose

Guidance from the Global Industry Standard on Tailings Management (GISTM) published by the International Council on Mining & Metals (ICMM) (2020) stipulates under Requirement 2.1 that the environmental knowledge base including climate parameters should be updated every five years to capture uncertainties due to climate change.

The last climate baseline for the Mine site (the Site) was carried out by Golder Associates Ltd., a member of WSP (WSP Golder) in 2016, and MPMC has retained WSP Golder to prepare an update. The purpose of the update is to extend the existing long-term climate dataset for the Site using local and regional data collected in the last 5 years in support of design activities.

This report provides a climate baseline update for precipitation, air temperature, relative humidity, solar radiation, evaporation, wind speed and direction, and snow depths, and includes updated climate change projections for the Site.

1.3 Scope

The scope of work for this climate study included:

- Literature review of previous descriptions of climate conditions near the Site study area.
- Statistical analysis of historical climate records at different locations near the Site study area to develop statistics for climate variables, including precipitation (total precipitation, rainfall), air temperature, relative humidity, solar radiation, wind speed and direction, and snow cover properties.
- Mathematical modelling to calculate evaporation and potential evapotranspiration statistics for the Site study area.
- Statistical analysis of point climate data from downscaled circulation models using Shared Socioeconomic Pathways scenarios (ECCC 2022c) for future climate projections for the Site study area.

2.0 STUDY AREAS

The Site is located 56 km northwest of Williams Lake, British Columbia (BC) near the eastern edge of the Fraser Plateau physiographic subdivision, approximately 10 km west of its boundary with the Quesnel Highland subdivision, as defined by Holland (1976).

2.1 Local Study Area

Within the area of the Mine, the plateau has somewhat higher relief, with the Mine rising approximately 300 metres (m) above the surrounding terrain. Topographically, the Site area consists of north–south trending ridges of moderate elevation and relief. Local elevations range from 922 metres above sea level (masl) at Polley Lake to 1,266 masl at the top of Polley Mountain with an average elevation of 1,038 masl. The total surface area of the Site is 17.8 square kilometers (km^2).

The Site is located on the divide of two sub-watersheds within the Quesnel Lake watershed. The western watershed, which includes drainage from Bootjack Lake, discharges to the Quesnel River via Morehead Creek and drained approximately 60% of the Mount Polley area prior to Mine construction. The eastern watershed includes Polley Lake, which discharges to the east via Hazeltine Creek, Edney Creek, and the West Arm of Quesnel Lake. The Hazeltine Creek and Edney Creek watershed areas at Quesnel Lake are approximately 30.2 km^2 and 87.4 km^2, respectively. Approximately 10.5 km^2 that historically reported to this watershed is now within the Site contact water runoff collection system catchment.

Bootjack Creek is a small tributary of Hazeltine Creek downstream of Polley Lake. Historically, Bootjack Lake discharged into Hazeltine Creek via Bootjack Creek, but in 1913 a dam was constructed at the south end of Bootjack Lake and the flow direction was reversed in order to direct water into Morehead Lake for hydropower production. This resulted in 14 km^2 being diverted from the Hazeltine Creek catchment. The old Bootjack Lake Dam was upgraded by MPMC in 1997 as fulfillment of a Fish Habitat Compensation Agreement signed between MPMC and the regulating federal and provincial agencies. The Bootjack Lake watershed area is 11.2 km^2; approximately 2.3 km^2 that historically reported to this watershed is now within the Site contact water runoff collection system catchment. Currently, Bootjack Creek reports to Polley Lake.

The regional topography, water bodies, and pre-mining watersheds are shown in Figure 1. Mine Site water collection systems and catchment areas are not included in the scope of this report.

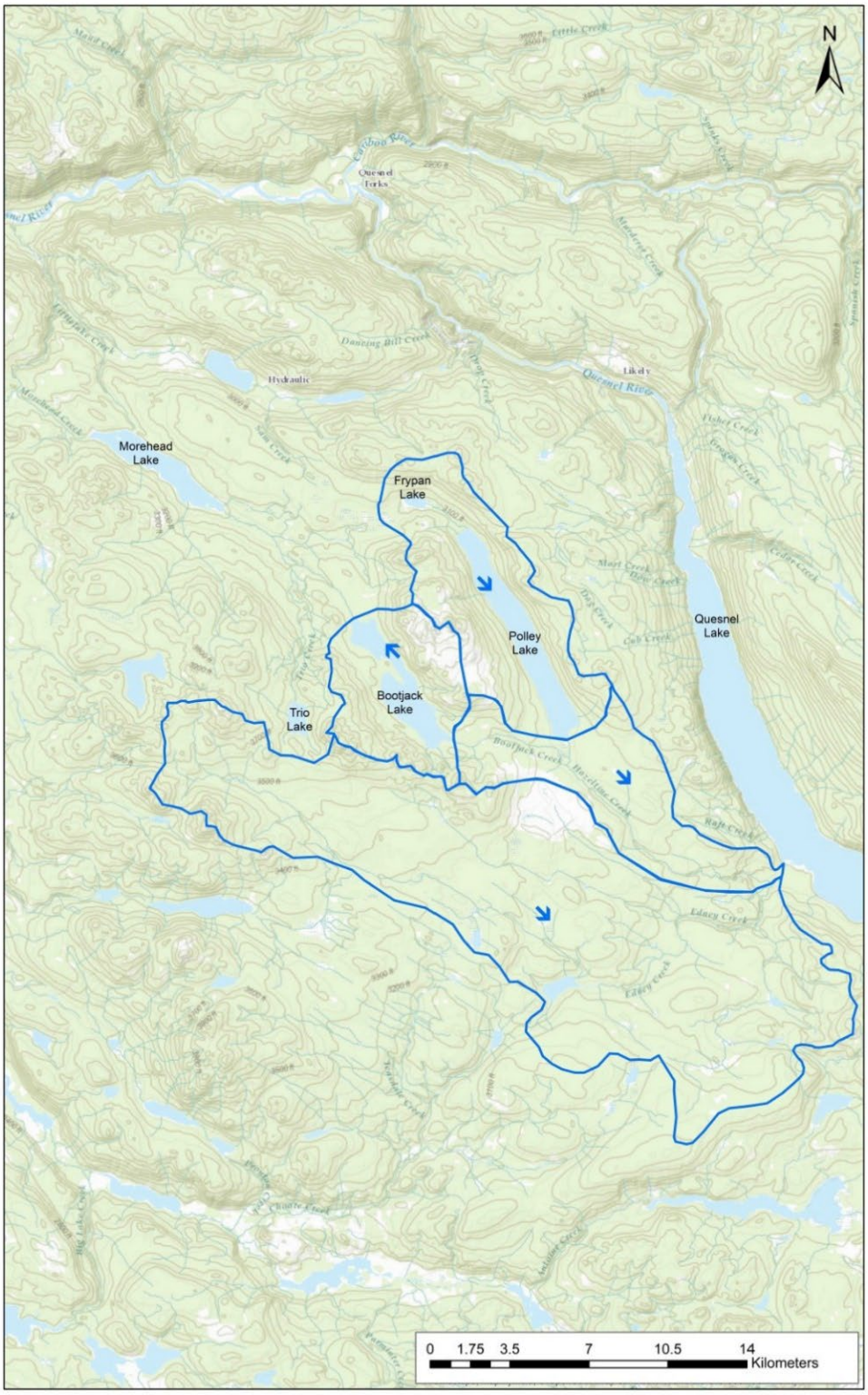
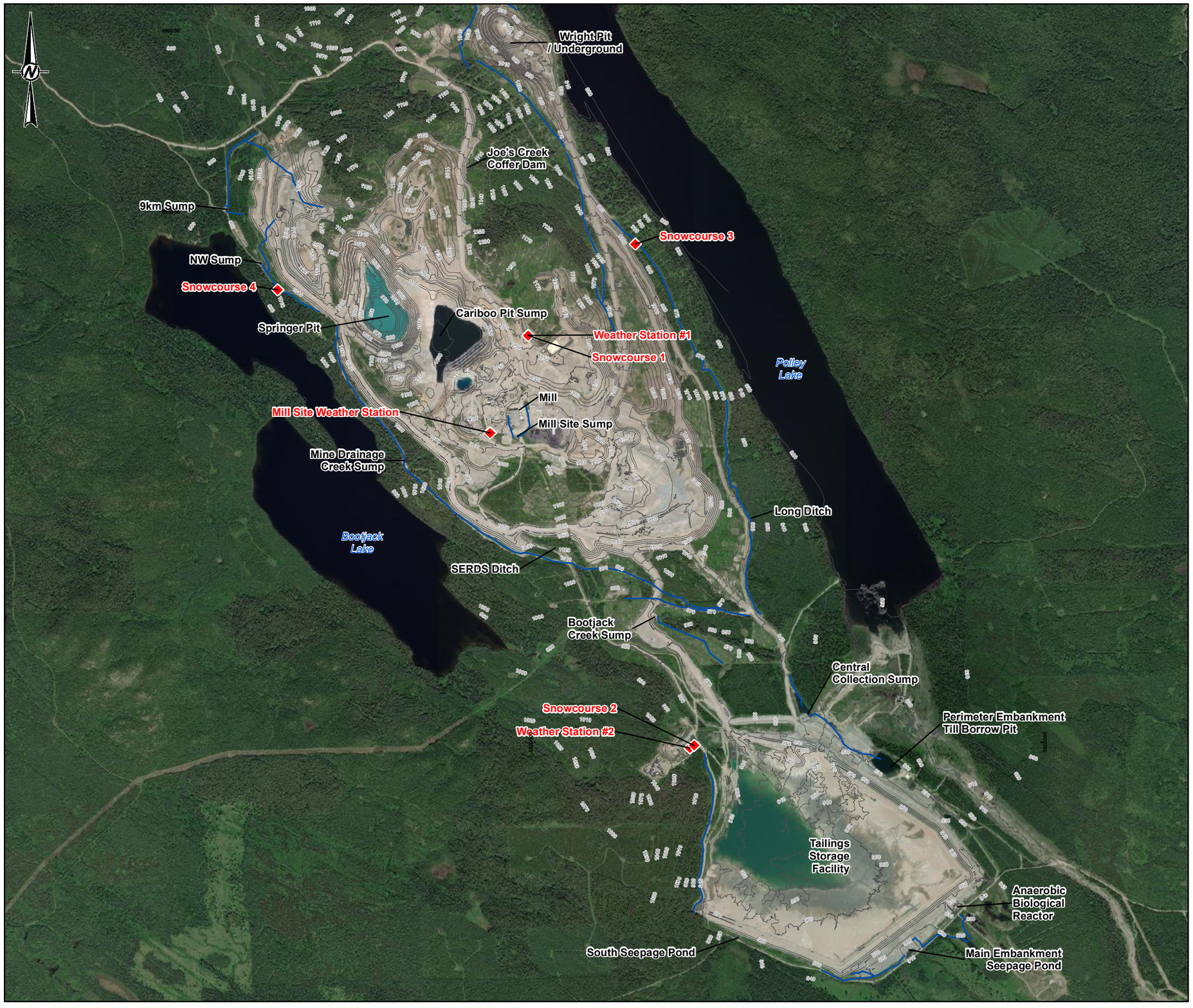


Figure 1: Mount Polley Mine Site and Surrounding Area Water Bodies and Topography Pre-Mining Activities

The Site study area is presented in Figure 2 The Site study area comprises the footprint of the physical infrastructure of the Mine and the tailings storage facility (TSF).



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- WATER COLLECTION DITCH
- CONTOUR (10m)

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REFERENCE(S)

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2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT
WATER MANAGMENT PLAN - BASELINE CLIMATE UPDATE

TITLE
MOUNT POLLEY SITE STUDY AREA CLIMATE STATIONS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-08-29
DESIGNED	DM
PREPARED	CDB
REVIEWED	DRW
APPROVED	JD

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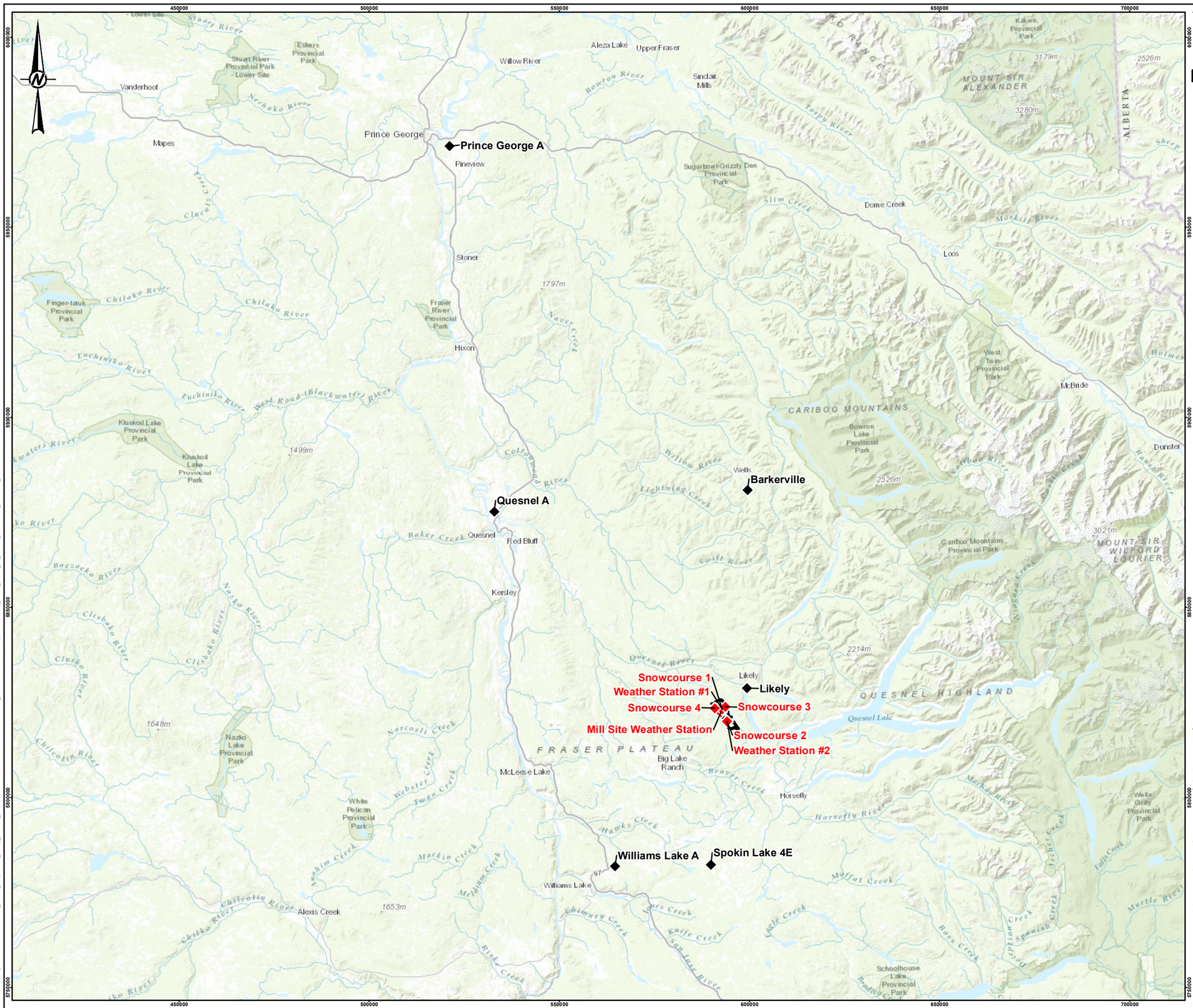
2.2 Regional Study Area

The regional study area (RSA) is comprised of the nearest Environment and Climate Change Canada (ECCC) climate stations (Figure 3). The RSA ECCC climate stations have elevations ranging from 1,283 m to 545 m with a mean elevation of 908 m, 130 m below the mean elevation of the Site study area.



LEGEND

- LOCAL CLIMATE STATION
- REGIONAL CLIMATE STATION
- PERMIT BOUNDARY

0 20 40

1:1,000,000 KILOMETRES

REFERENCE(S)

1. BASE IMAGERY SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT
WATER MANAGMENT PLAN - BASELINE CLIMATE UPDATE

TITLE
LOCAL AND REGIONAL CLIMATE STATIONS

CONSULTANT
WSP GOLDER

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PREPARED	CDB
REVIEWED	DRW
APPROVED	JD

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3.0 METHODS

3.1 Study Design

Climate parameters (e.g., precipitation, temperature, and evaporation) vary both spatially and temporally. They vary spatially in response to changes in elevation and/or overall circulation patterns, and temporally, across the seasons, and from year to year. Describing the climate conditions for a certain area means presenting the climate statistics that capture the variation, including both the average expected values and the extent of the variation around the average.

The summary statistics for precipitation, temperature, evaporation, relative humidity, solar radiation, wind speed and directions, and snow depths presented herein were prepared from historical measurements recorded at local climate stations, supported by data collected from nearby regional climate stations. Raw station data were interrogated for inconsistencies or gaps then infilled using regional data and translation factors to generate short duration (daily and sub-daily) and long-duration (Annual) estimates for a range of return periods (precipitation only) or percentiles (temperature, evaporation, relative humidity, and solar radiation only). Except for wind and snow cover, the datasets were extended using historical regional data and translation factors to include a range of possible weather events and climatic trends.

Future climate projections come from publicly available statistical downscaled future climate projections on a daily scale. Recognizing the inherent uncertainty with projections, multiple projections from multiple models and scenarios were included in the analysis. Therefore, the future projections are provided in terms of percentiles or exceedance probabilities. The following sections provide a summary of the climate stations used in this report.

3.2 Review of Existing Information

Climate conditions for the Site were estimated based on data from several meteorological stations in the region and at the Site (Figure 3). The meteorological stations are listed in Table 2 and Table 4.

3.2.1 Local Climate Stations

MPMC has operated climate stations on site since 1995, although the station data records are not continuous. From 1995 through 2012, MPMC maintained one climate station at the Mill Site that measured and recorded rainfall (1997 to 2012), temperature (1995 to 2012) and wind velocity and directions (1997 to 2003). In 2012, this station was replaced with two stations: one near the mill site (WS1) and one adjacent to the TSF (WS2). These new stations measure and record wind speed, relative humidity, solar radiation, temperature, and rainfall.

Rainfall was measured using a manual rain gauge from 1997 to present at each climate station, and in 2019 automated tipping rain gauges were added at WS1 and WS2. For this study, rainfall for the Site was averaged across all instruments that recorded rainfall on a given day. Relative humidity and solar radiation were recorded at WS1 and WS2 from 2019 to 2021, although records are not continuous. In addition, solar radiation was recorded at the Mill Site station from 2001 to 2003.

Details of these stations are provided in Table 2 and their locations are shown in Figure 2.

Table 2: Local Climate Stations for the Mount Polley Mine

Station Name	Northing (m N)[1]	Easting (m E)[1]	Elevation (masl)[2]	Data Type	Period of Record
Mill Site Weather Station	5822420	592495	1,118	R, T, WS, WD	1995-2012
Weather Station #1 (WS1) [near mill]	5822420	592792	1,171	R, T, RH, SR, E, WS	2012-2021[3]
Weather Station #2 (WS2) [TSF]	5819955	594059	964	R, T, RH, SR, E, WS	2012-2021[3]

1) UTM Coordinate system – Zone 10U.

2) Elevation for on-site climate stations measured with handheld GPS device.

3) Station still in operation.

TSF = tailings storage facility; masl = metres above sea level.

R = Rainfall; S = Snowfall; T = Temperature; RH = Relative Humidity; SR = Solar Radiation; E = Evaporation; WS = Wind Speed; WD = Wind Direction.

During the winter, snowpack is measured at four snow course sites at a minimum frequency of once per month, with more frequent measurements typically taken during the melt phase. The details of these snow course stations are provided in Table 3 and their locations are shown in Figure 2.

Table 3: Local Snow Course Sites at the Mount Polley Mine

Station Name	ID	Northing (m N)[1]	Easting (m E)[1]	Approximate Elevation (masl)[2]	Period of Record
Snow Course # 1 (near mill)	N/A	5823182	592792	1,171	1997–2010, 2015–current
Snow Course # 2 (near TSF)	N/A	5819976	594092	964	1997–current
Snow Course # 3	N/A	5823895	593632	976	2012–current
Snow Course # 4	N/A	5823537	590835	1,112	2015–current

1) UTM Coordinate system - Zone 10U.

2) Elevation for on-site climate stations measured with handheld GPS device.

masl = metres above sea level; N/A = not applicable; TSF = Tailings Storage Facility.

3.2.2 Regional Climate Stations

Five Environment and Climate Change Canada (ECCC) climate stations: Likely, Spokin Lake, Williams Lake, Barkerville, and Quesnel, were selected for the update due to their proximity to the Site, length of record, elevation range, and concurrent period of record with the local climate stations at the Site. In addition, the ECCC Prince George climate station was added to include an additional station with solar radiation data. Historical records were retrieved from ECCC's Historical Climate Data web server (ECCC 2022a). More recent records were compiled through e-mail correspondence with ECCC staff (ECCC 2022b). The regional climate station details are provided in Table 4, and their respective locations are shown in Figure 3.

Table 4: Regional Climate Stations for the Mount Polley Mine

Station Name (ID)	Northing (m N)[1]	Easting (m E)[1]	Elevation (masl)	Approximate Distance to Site (km)	Data Type	Period of Record[2]
Likely (1094616)	5828785	599332	724	9	P, R, S, T	1974-1993
Williams Lake A (1098940)	5781820	564666	940	50	P, R, S, T, RH, SR	1961-2021[4]
Spokin Lake 4E (1097646)	5782274	589827	1,033	40	P, R, S, T	1983-2021[4]
Barkerville (1090660)	5880996	599515	1,283	59	P, R, S, T	1888-2021[3, 4]
Quesnel A[5] (1096630)	5873987	546720	545	80	P, R, S, T, RH	1946-2021[4]
Prince George A (1096450)	5971423	521103	691	163	P, R, S, T, RH, SR	1973-1995

1) UTM Coordinate system – Zone 10U.
2) Length of record from start year to end year may not reflect the number of complete years of data.
3) Provisional data for the period January 2016 to December 2021 were provided by ECCC.
4) Station still in operation.
5) Combined record from Quesnel A and Quesnel Airport Auto stations. Stations are located at the same location.

ID = Identification; masl = metres above sea level; km = kilometre.
P = Precipitation; R = Rainfall; S = Snowfall; T = Temperature; RH = Relative Humidity; SR = Solar Radiation.

3.3 Data Processing

Climate parameter statistics for the Site were prepared using data from the three on-site climate stations operated by MPMC, and the five regional climate stations operated by ECCC (Sections 3.2.1 and 3.2.2). Data were interrogated for gaps and errors, and where appropriate, extended and filled with data from regional stations using translation factors derived from the available periods of record as described in Section 3.4. Local data were screened for outliers in the time series that may be indicative of errors or equipment malfunction. Potential high outliers were identified in the Mount Polley rainfall record in April 2009 but were not removed from the time series as there was insufficient evidence to support removal. In addition, climate parameter records were checked using the World Meteorological Organization (WMO) guidelines (WMO 2018) as reference. Monthly records were removed if there were more than five days missing, or more than 3 consecutive days missing. Annual records were only calculated using years with a complete dataset (twelve months).

3.4 Data Analysis

3.4.1 Precipitation

The MPMC precipitation dataset was extended and infilled using the available data record from the five regional stations as described below to derive a daily and 24-hour long-term synthetic precipitation dataset for the Site.

Extended MPMC Precipitation Data Record

The Likely ECCC Station data were considered to extend the precipitation record for the Site given the station's length of record and proximity to the Site. As the Likely ECCC station and MPMC climate stations do not have concurrent data sets, the mean monthly April-to-November rainfall distribution for the available data records were compared to evaluate the suitability of using the Likely station data to represent precipitation conditions at the Site. As shown in Figure 4, the Likely and Site station monthly precipitation distributions show a similar trend overall, with MPMC recording notably greater rainfall in April, and notably less rainfall in June and August relative to Likely. The notable differences in monthly rainfall between the MPMC and Likely datasets for the months of April, June, and August were investigated with the following observations:

- April: the length of record for MPMC is relatively short and is not continuous, and outliers have potential to bias mean monthly rainfall. As previously mentioned, potential high outliers were identified in the Mount Polley rainfall record in April 2009 but were not removed from the time series as there was insufficient evidence to support removal. However, if the potential high outlier data were to be removed, the mean monthly April values would be more aligned between the data sets (48.8 mm for MPMC versus of 33.1 mm for Likely).
- June: review of the MPMC and concurrent regional June monthly rainfall records for Barkerville, Spokin Lake, and Williams Lake indicate that relatively low June rainfall totals (compared to average values for the complete available data set from the regional stations) were recorded in several years during the 1997 to 2021 period of record (2002, 2003, 2006, 2009, 2014, 2019, and 2021). These years represent approximately 40% of the available June records for MPMC, suggesting the MPMC mean June rainfall may be biased low (i.e., due to shorter period of record used in computing the mean) compared to Likely.
- August: review of regional rainfall records for Barkerville, Spokin Lake, and Williams Lake from 1997 to 2021 (i.e., concurrent with the MPMC precipitation data set), indicate that regional mean August monthly rainfall records were 84%, 87%, and 85% of the mean of the full period of record, respectively, indicating that there has been reduction (compared to the longer-term mean) in August rainfall regionally in more recent years. In other words, the differences between MPMC and Likely mean August rainfall values may be attributed to differing precipitation trends in the respective reporting periods.

Based on above, the historical Likely ECCC Station record was considered acceptable for extending the historical precipitation record for the Site. Owing to the elevation difference between the Site and Likely ECCC Station, a precipitation-elevation orographic factor was applied to adjust the raw precipitation data from the Likely ECCC climate station to the Site. The adjustment was based on the April-to-November rainfall ranking factor of the raw Likely ECCC climate station and Site rainfall records.

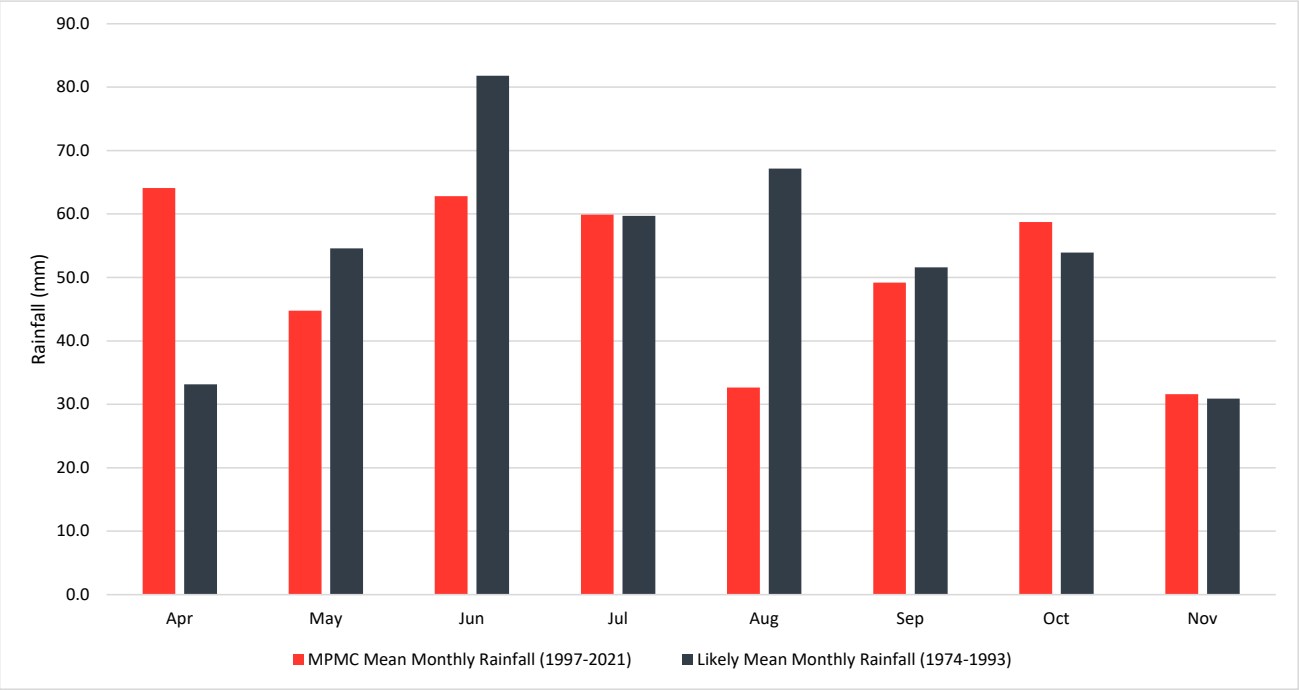


Figure 4: April-to-November Rainfall Distributions at Mount Polley Mine and ECCC Likely Climate Stations

MPMC Precipitation Data Gap Infilling

The priority sequence of concurrent regional climate station data used to infill gaps in the extended Site precipitation record was determined by analyzing measured daily rainfall from April to November for all climate stations; it was assumed that precipitation occurring between December and March occurred as snowfall. The regional climate station priority sequence considered the best-fit measured concurrent daily rainfall correlation (Rainfall Correlation), rainfall ranking correlation (Rainfall Rank), and percentage of time rain was recorded on the same day (Concurrent Daily Rain) between the raw data collected at the MPMC climate stations and each ECCC climate station (Table 5). Regional climate station precipitation data replaced missing rainfall data in the extended Site data record following the priority sequence, and all precipitation data from December to March as it was assumed precipitation during this period occurs as snowfall and daily snowfall is not recorded at the Site.

Table 5: Regional Climate Stations Priority Sequence for Precipitation Data Gap Infilling in Extended Record for MPMC

Priority	Station	Rainfall Correlation (R^2)	Rainfall Rank (R^2)	Concurrent Daily Rain (%)	Period of Record	Currently Active	Distance from site (km)
1	Williams Lake A	0.1950	0.9872	61.8	1960-2021	Yes	50
2	Spokin Lake 4E	0.1829	0.9747	65.8	1983-2021	Yes	40
3	Barkerville	0.1579	0.9216	66.4	1888-2021	Yes	59
4	Quesnel A	0.0502	0.9556	23.3	1946-2021	Yes	80

A precipitation-elevation orographic factor was applied to adjust the raw precipitation data from the ECCC climate stations used to infill gaps. The adjustment was based on the April-to-November rainfall ranking factor of the raw ECCC climate station and Site rainfall records.

Daily to 24-Hour, 3-day, and 10-day Precipitation

The daily long-term synthetic precipitation dataset was converted to 24-hour, 3-day, and 10-day precipitation by applying a factor of 1.13 (WMO 2009), 1.03, and 1.01 (Miller 1964), respectively.

3.4.2 Temperature

Similar to precipitation analysis above, the MPMC temperature dataset was extended and infilled using the available data record from the five regional stations to derive a long-term synthetic temperature dataset for the Site.

Extended MPMC Temperature Data Record

The Likely ECCC Station data were considered to extend the temperature record for the Site given the station's length of record and proximity to the Site. As the Likely ECCC station and MPMC climate stations do not have concurrent data sets, the mean monthly air temperature distributions for the Site and Likely climate stations were compared to evaluate the suitability of using the Likely station data to represent temperature conditions at the Site. As shown in Figure 5, the monthly distributions show similar trend with MPMC and the historical Likely ECCC Station record was considered acceptable for extending the historical temperature record for the Site. Owing to the elevation difference between the Site and Likely ECCC Station, a temperature-elevation orographic factor was applied to adjust the raw precipitation data from the Likely ECCC climate station used to extend the historical record. The adjustment was based on monthly regional lapse-rates as discussed below.

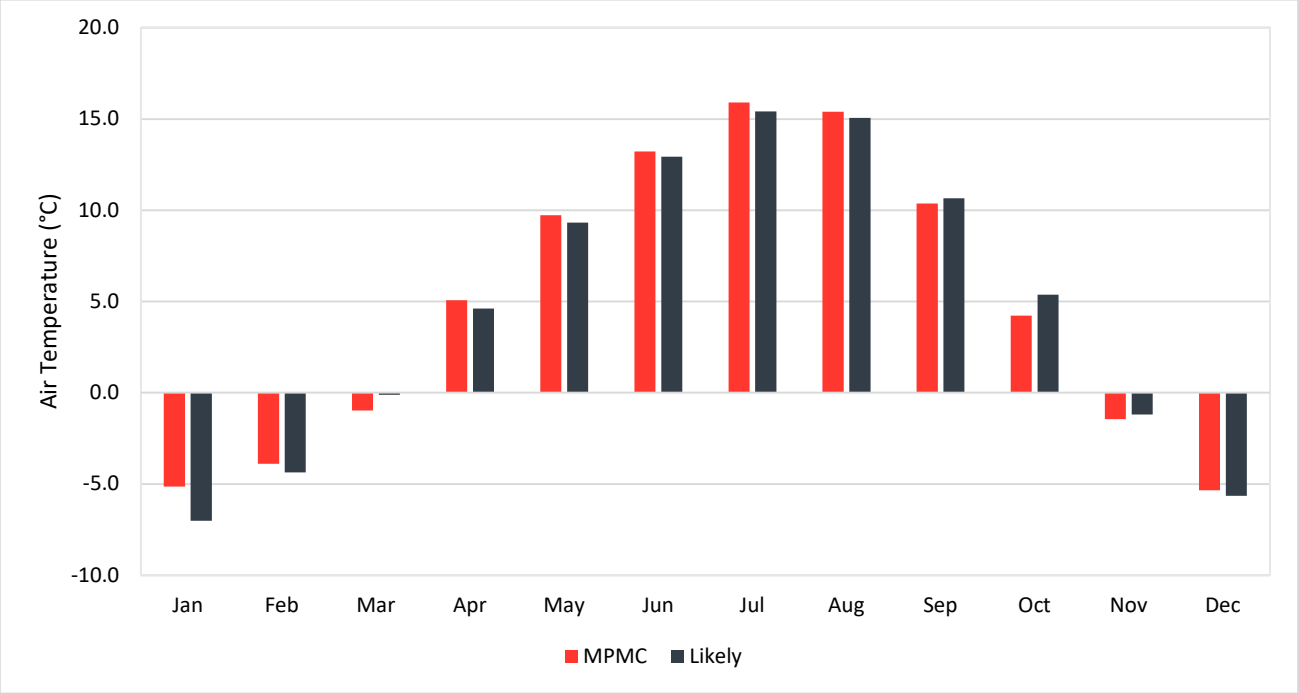


Figure 5: Mean Monthly Air Temperature Distributions for the Site and Likely ECCC Climate Station

ECCC Climate Normals for the regional climate stations were reviewed and are summarized in Table 6 and mean monthly air temperatures are presented in Figure 6. Comparing the Normals for the five regional ECCC Climate stations, there is an evident trend (the temperature lapse rate) of decreasing mean annual temperature with increasing elevation. The annual temperature lapse rate for the region is -0.47 °C / 100 m elevation increase. The lapse rate is larger for warmer months (April to October -0.55 °C / 100 m) and smaller for colder months (November to March -0.33 °C / 100 m). When analysed at a monthly level, the lapse rate is lowest for January (-0.09°C / 100 m) and highest for April, May, June, and July (-0.61°C / 100 m, -0.61°C / 100 m, -0.60°C / 100 m, and -0.59°C / 100 m, respectively). The R^2 of the linear trend is markedly lower for January (0.43) than for all the other months of the year (0.79 to 0.92), which suggests that temperature inversion may occur in the region in January. Lapse rates are presented in Table 7 and Figure 7.

Table 6: Monthly and Annual Air Temperature Climate Normals for Regional ECCC Climate Stations

Station Name	Quesnel A (545 masl)	Williams Lake A (940 masl)	Spokin Lake 4E (1,033 masl)	Barkerville (1,283 masl)	Likely (740 masl)
Time period for EC Climate Normals	1981-2010	1981-2010	1981-2010	1981-2010	1971-2000
Month	**Temperature (°C)**				
January	-6.9	-6.7	-7.6	-7.5	-7.0
February	-3.6	-4.1	-5.4	-5.9	-4.4
March	1.3	0.3	-1.2	-2.8	-0.1
April	6.4	4.9	3.7	1.4	4.6
May	11.1	9.6	8.0	6.2	9.3
June	14.7	13.3	11.4	10.0	12.9
July	16.8	16.0	13.4	12.3	15.4
August	16.4	15.3	12.8	12.8	15.1
September	11.5	10.6	8.5	8.0	10.7
October	5.5	4.6	3.4	2.4	5.4
November	-1.4	-2.3	-3.2	-4.3	-1.2
December	-5.9	-7.3	-7.7	-7.8	-5.7
Annual	**5.5**	**4.5**	**3.0**	**2.0**	**4.6**

masl = metres above sea level.

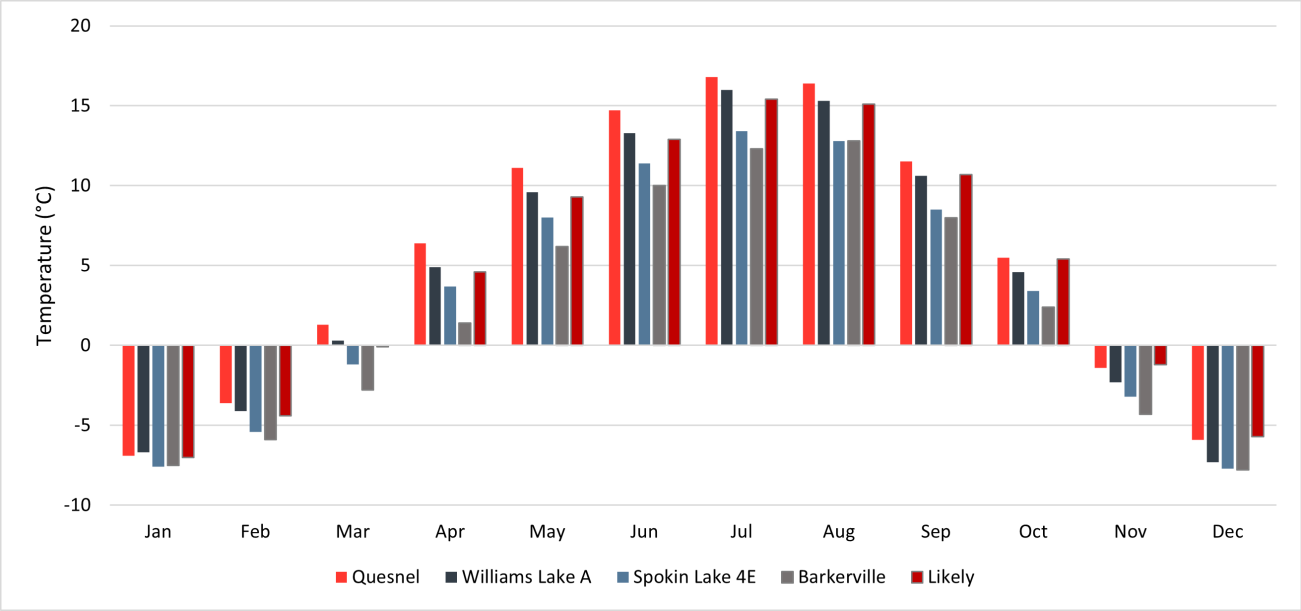


Figure 6: Mean Monthly Air Temperature for Regional ECCC Climate Stations (1971 to 2000 period of record for ECCC Likely; 1981 to 2010 period of record for remaining stations)

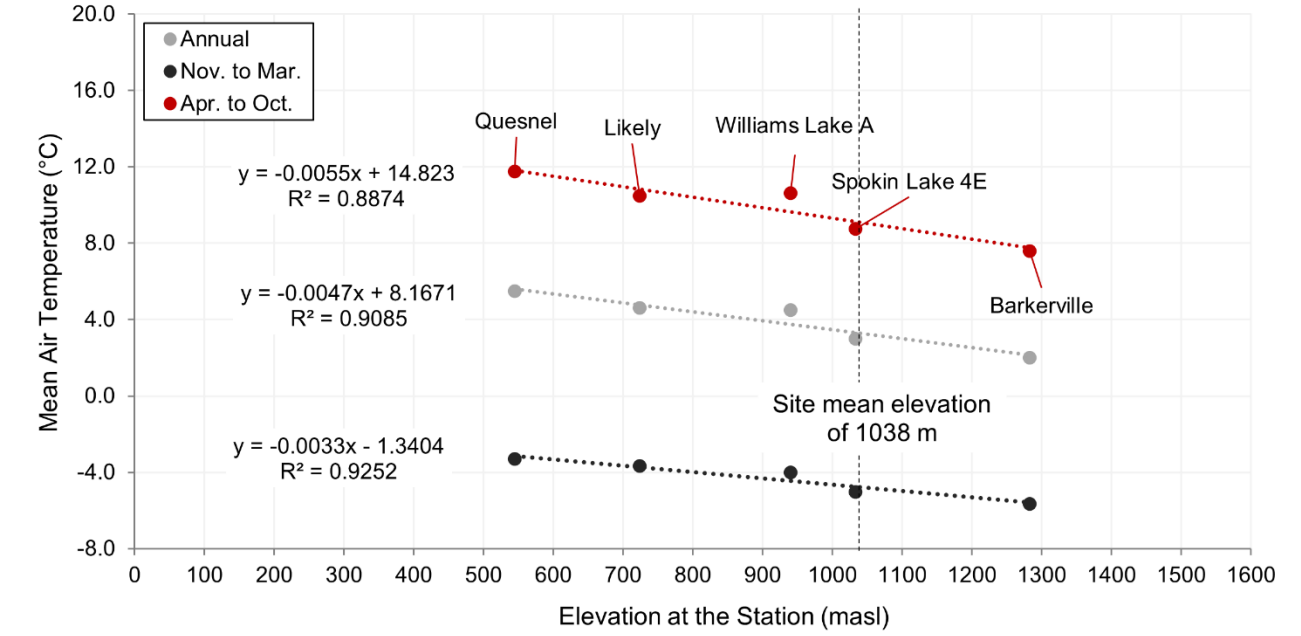


Figure 7 : Annual, April-to-October, and November-to-March Air Temperature Lapse Rates for Regional ECCC Climate Stations (1971 to 2000 period of record for ECCC Likely; 1981 to 2010 period of record for remaining stations)

Table 7: Monthly Air Temperature Lapse Rate Variation Among Five Regional ECCC Climate Stations (1971 to 2000 period of record for ECCC Likely; 1981 to 2010 period of record for remaining stations)

Month	Lapse Rate = °C Difference / 100 m Elevation Increase	R^2 of the Linear Trend
January	-0.09	0.43
February	-0.30	0.82
March	-0.51	0.86
April	-0.61	0.88
May	-0.61	0.89
June	-0.60	0.87
July	-0.59	0.81
August	-0.50	0.79
September	-0.49	0.85
October	-0.45	0.92
November	-0.43	0.90
December	-0.32	0.82
Annual	-0.47	0.91

MPMC Temperature Data Gap Infilling

The priority sequence of regional climate station data used to infill gaps in the extended Site air temperature record was based on the best-fit daily air temperature correlation (Temperature Correlation), air temperature ranking (Temperature Ranking), and concurrent daily temperature recordings between the MPMC climate stations and each ECCC climate station (Table 8).

Table 8: Regional Climate Stations Priority Sequence for Temperature Data Gap Infilling in Extended Record for MPMC

Priority	Station	Temperature Correlation (R^2)	Temperature Rank (R^2)	Concurrent Daily Temperature (%)	Period of Record	Currently Active	Distance from site (km)
1	Williams Lake A	0.8917	0.9942	93.5	1960-2021	Yes	50
2	Barkerville	0.8834	0.9951	99.0	1888-2021	Yes	59
3	Quesnel A	0.8628	0.9861	97.5	1946-2021	Yes	80
4	Spokin Lake 4E	0.8525	0.9810	99.5	1983-2021	Yes	40

Regional ECCC climate station daily air temperature data were adjusted using the monthly air temperature lapse-rate presented in Table 7 to derive representative air temperature at the Site.

3.4.3 Relative Humidity

Relative humidity data are available for the Site from 2019 to 2021 and for ECCC climate stations Quesnel (1953 to 2021) and Williams Lake (1961 to 2021). The MPMC WS1 relative humidity record is more complete than WS2's record; therefore, WS1 data were used for the analysis and infilled with WS2 data where necessary and if available. However, relative humidity data for the Site are insufficient for characterizing long-term climatic conditions of the Site due to the short period of record. Therefore, data from Quesnel and Williams Lake stations were reviewed and analyzed to define a representative relative humidity estimate for the Site. Comparisons between the Site data and each ECCC climate station data were made to determine which station best represents the potential relative humidity at the Site.

Figure 8 and Figure 9 present the comparison between concurrent daily relative humidity values at the ECCC Quesnel and MPMC climate stations (January 2019 to December 2021). The 15-day moving average indicates that the relative humidity is generally higher at the Site than at the ECCC Quesnel climate station. The two datasets are well correlated (R^2=0.96).

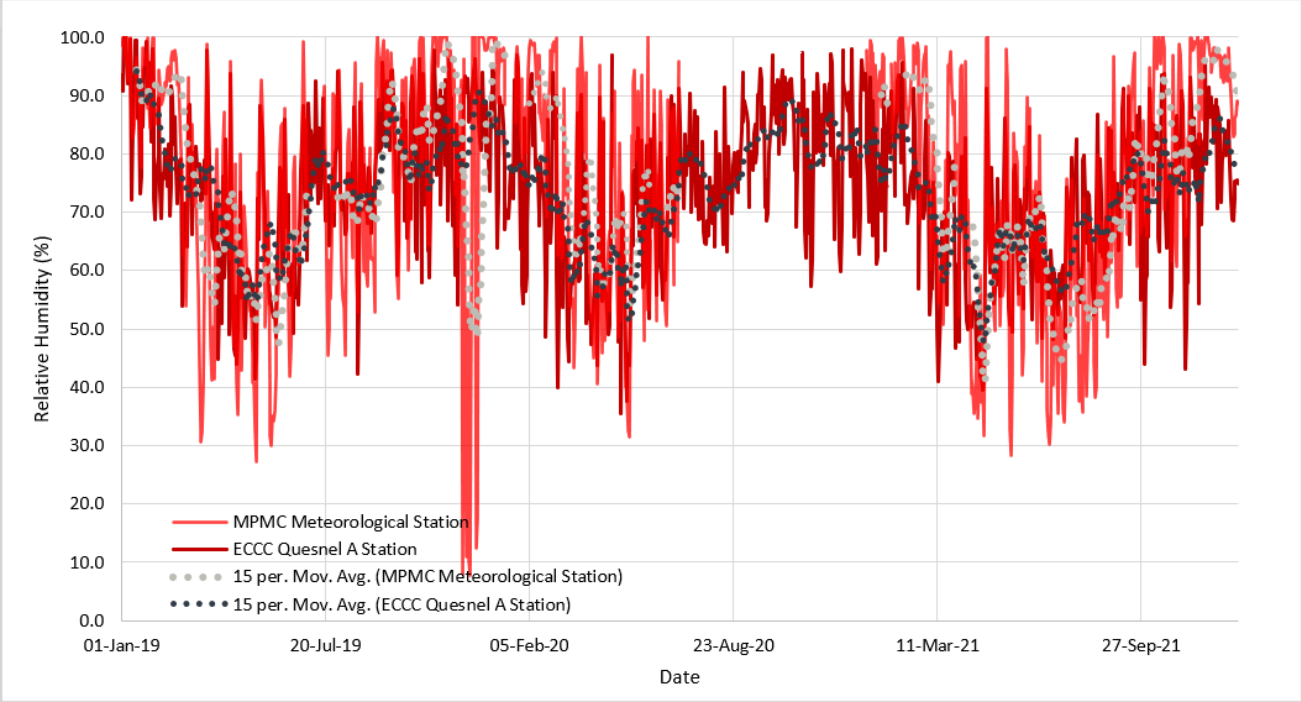


Figure 8: Concurrent Daily Relative Humidity Values at the MPMC and ECCC Quesnel Climate Stations (2019-2021)

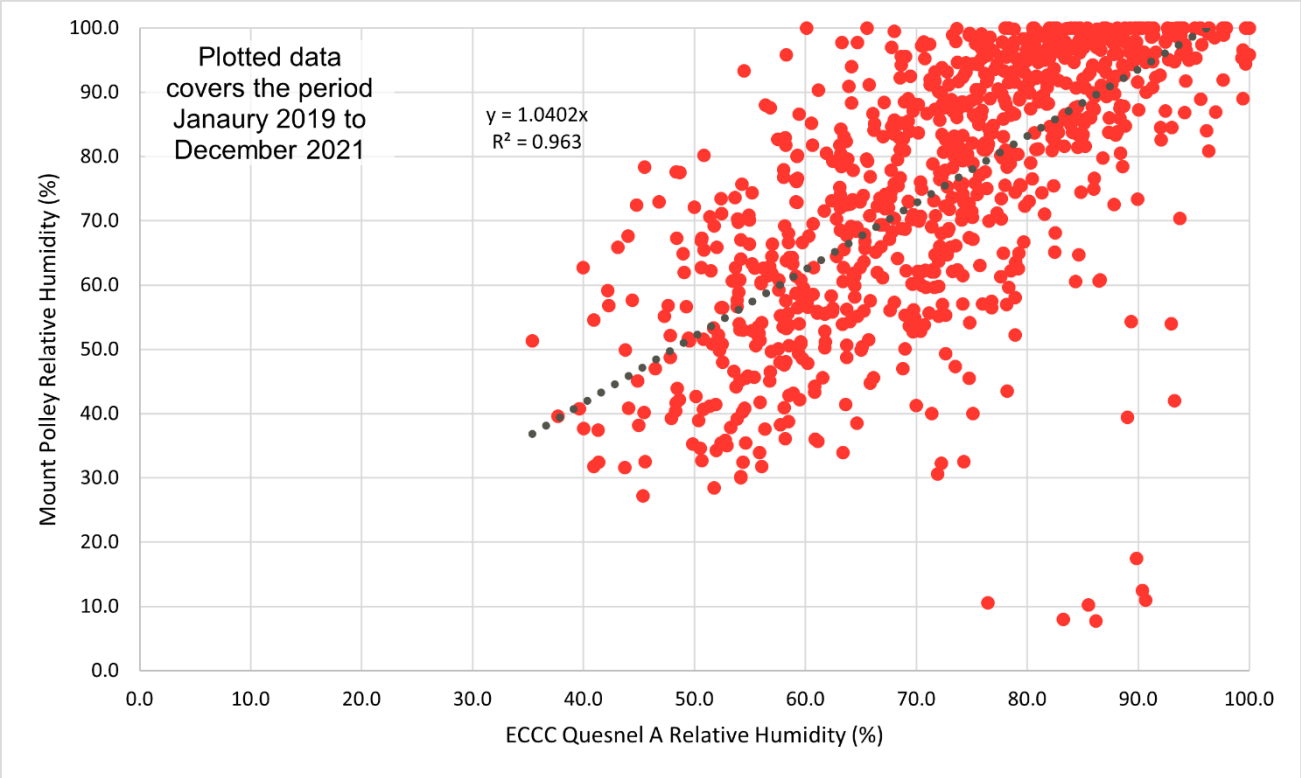


Figure 9: Correlation Relationship of Daily Relative Humidity Values at MPMC and ECCC Quesnel Climate Stations (2019-2021)

Figure 10 and Figure 11 present the comparison between concurrent daily relative humidity values at the ECCC Williams Lake and MPMC climate stations (January 2019 to December 2021). The 15-day moving average indicates that the relative humidity is generally higher at the Site than at ECCC Williams Lake climate station. The two datasets are very well correlated (R^2=0.98).

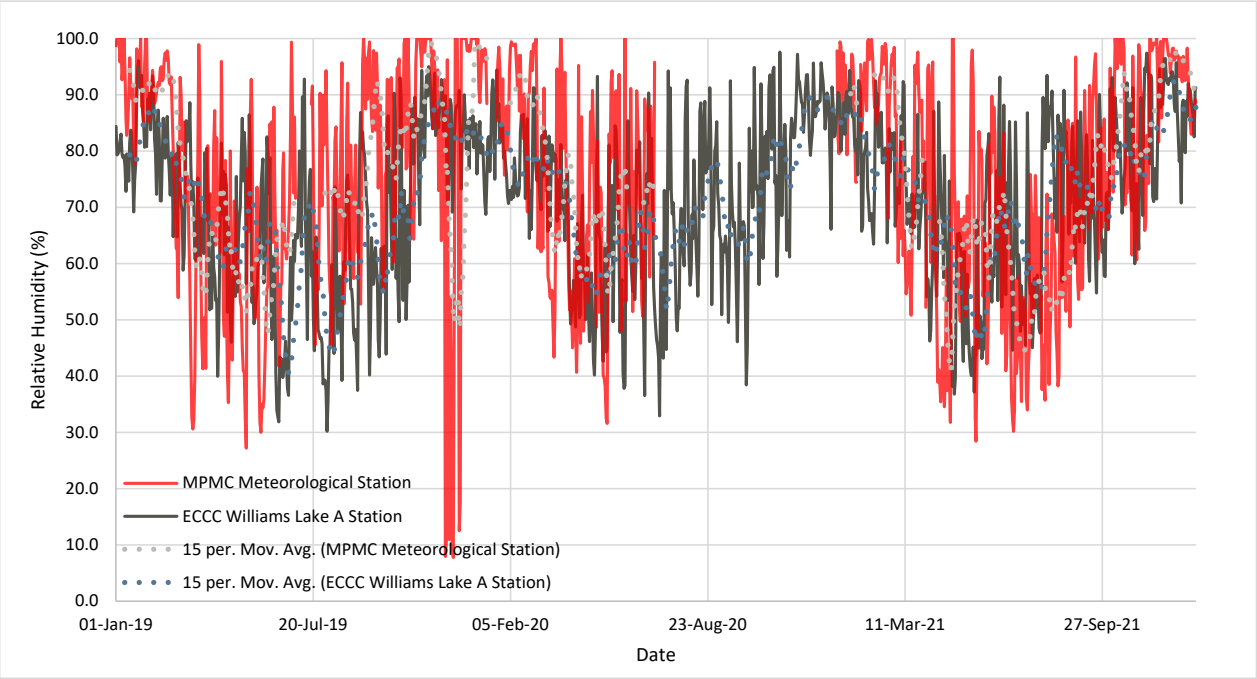


Figure 10 : Concurrent Daily Relative Humidity Values at MPMC and ECCC Williams Lake Climate Stations (2019-2021)

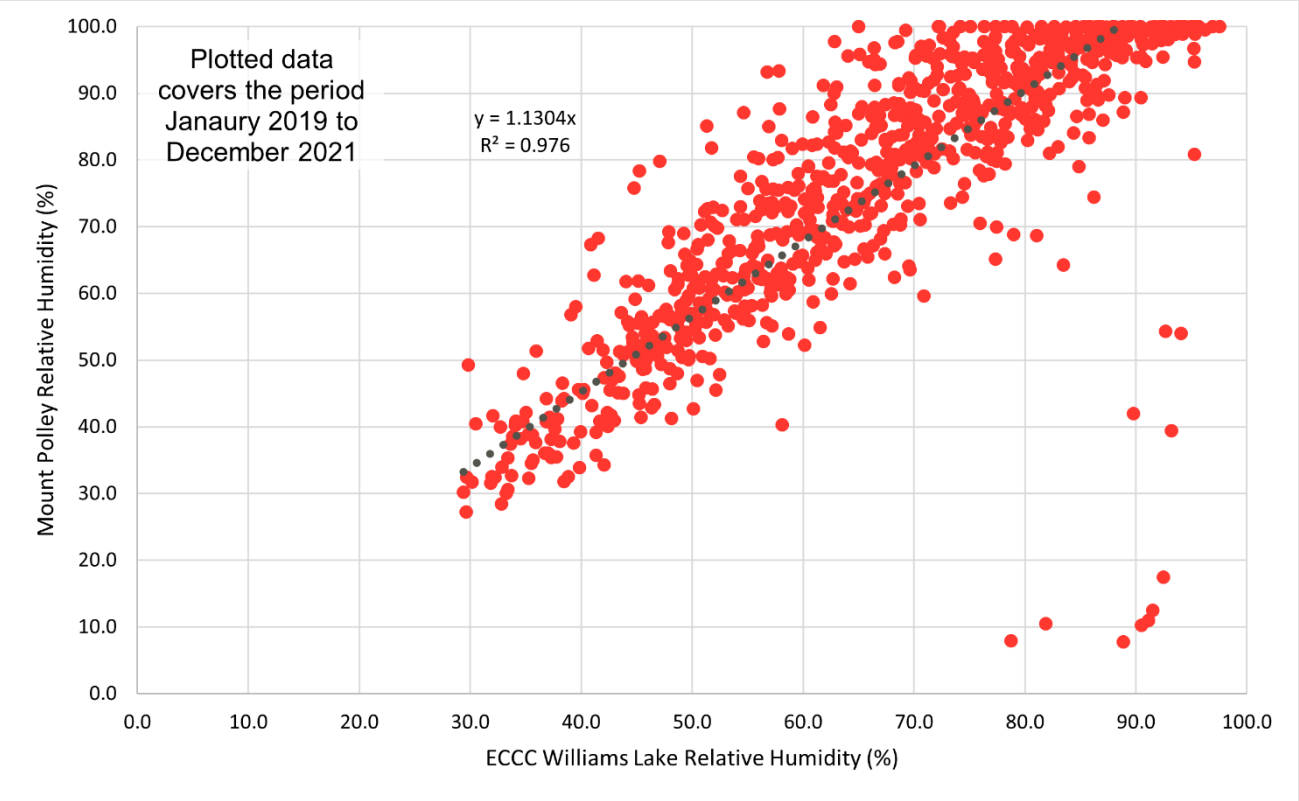


Figure 11 : Correlation Relationship of Daily Relative Humidity Values at MPMC and ECCC Williams Lake Climate Stations (2019-2021)

A long-term relative humidity time series for the Site was developed using ECCC Williams Lake A data infilled with ECCC Quesnel A data with an adjustment factor of 1.13 and 1.04 based on the relationships presented in Figure 11 and Figure 9, respectively.

3.4.4 Solar Radiation

Solar radiation data are available for the Site from 2001 to 2003 and 2019 to 2021, and for ECCC climate stations Williams Lake (1961 to 2001) and Prince George (1973 to 1995). Solar radiation data for the Site are insufficient for characterizing climatic conditions of the Site due to the short period of record, and as the data recorded in 2001 is incomplete and not concurrent with either ECCC climate station. However, as presented in Figure 12, a discernible trend in mean monthly solar radiation is apparent for MPMC solar radiation (2019 to 2021) and in data from the ECCC Williams Lake and Prince George climate stations. Figure 13 presents ECCC Williams Lake and Prince George mean monthly solar radiation correlation (R^2 = 0.98) from 1973 to 1995.

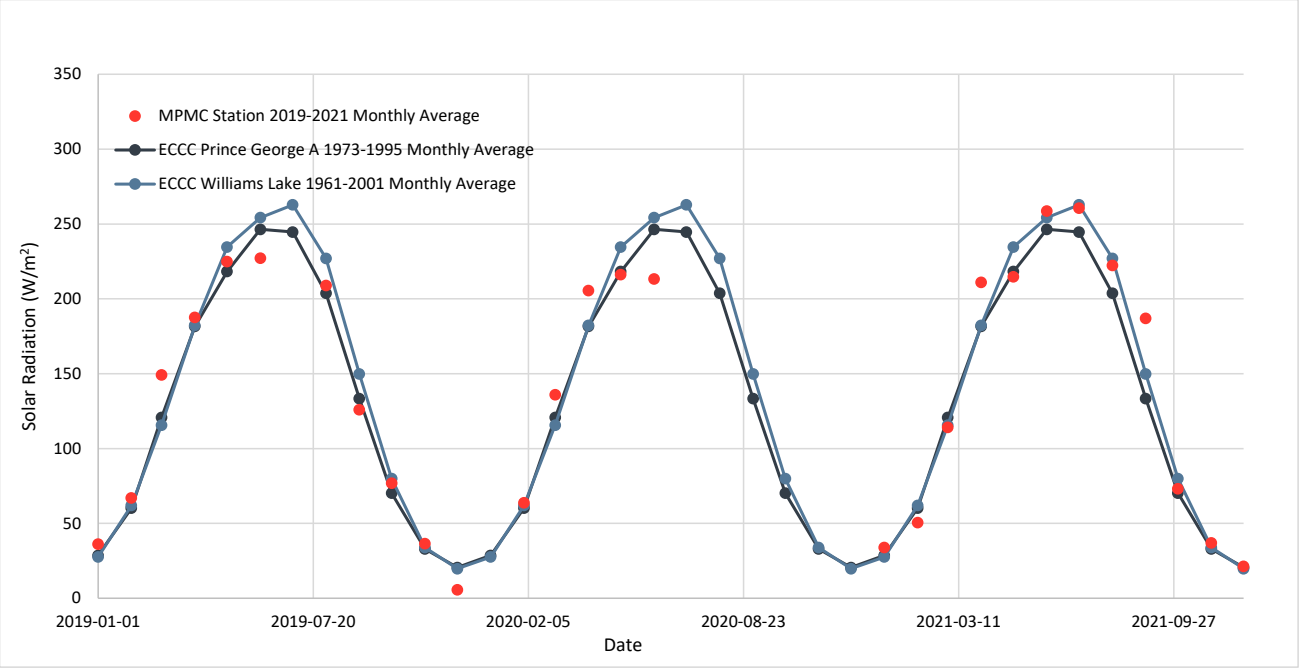


Figure 12 : Mean Monthly Solar Radiation for MPMC and ECCC Regional Climate Stations

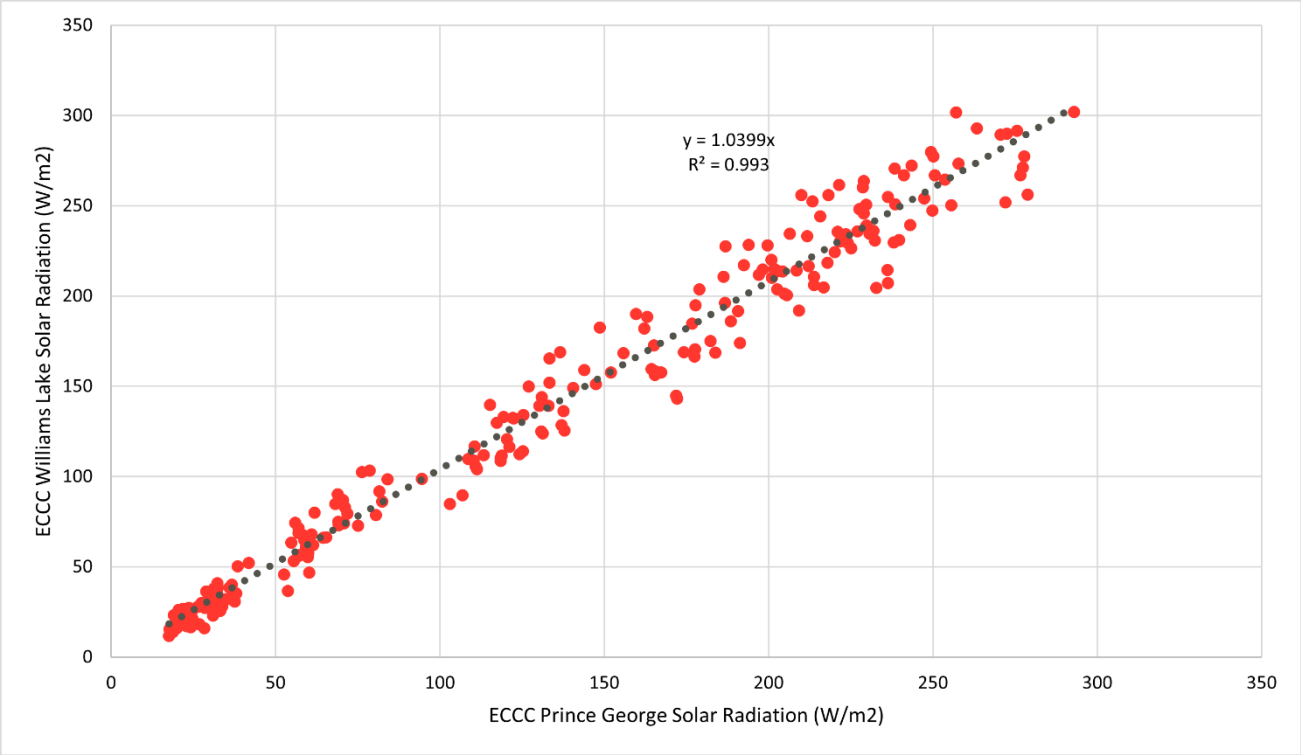


Figure 13 : Daily Solar Radiation Correlation Between ECCC Williams Lake and Prince George Climate Stations (1973-1995)

The strong correlation between ECCC Williams Lake and Prince George climate stations suggest there is little variation in solar radiation across the region. Based on the comparison of mean monthly solar radiation records and the proximity in distance to the Site, solar radiation statistics for the Site were determined from the ECCC Williams Lake data. Missing values were infilled by adjusting the Prince George records by a factor of 1.04 based on the relationship presented in Figure 13.

3.4.5 Evaporation and Evapotranspiration

Evaporation monitoring data are available for the Site from 2019 to 2021; however, the data are not continuous, and the length of record is not sufficient for characterizing the evaporation conditions at the Site. Therefore, a mathematical model (Morton 1983) was used to calculate evaporation and evapotranspiration (actual and potential) for the Site based on the long-term synthetic records for air temperature, relative humidity, and solar radiation. Evaporation in this study is defined as free water evaporation, or the amount of evaporation from open/free water surfaces (i.e., the water is returned to the atmosphere from lakes, ponds, and watercourses). Potential evapotranspiration is the water loss that occurs from a vegetated natural surface if there is no deficiency of water in the soil for use by vegetation (Thornthwaite 1948).

3.4.6 Wind Speed and Direction

Hourly wind speed and direction data are available for the Site from 1997 to 2003, and daily wind speed data are available from 2019 to 2021; however, the data are not continuous. The hourly wind speed and direction data available from 1997 to 2003 were used to develop wind rose plots. A wind rose depicts the relative frequency of wind from a given direction on a 16-point compass. Each ring on the wind rose represents a frequency of 2% of the data period. The length of the shaded bars on each wind rose petal represents the frequency of wind recorded from a given direction within a defined wind speed range. A wind rose is provided for the period of August 1997 to November 2003, and seasonal wind roses are presented to display seasonal variability in wind patterns, where the seasons have been defined as follows:

- Winter – December to February
- Spring – March to May
- Summer – June to August
- Autumn – September to November

Daily wind data recorded from 2019 to 2021 from WS1 and WS2 were wind speed only, no direction. The period of record for WS2 and 2020 are incomplete and are not included in the analysis. The relative frequency (%) of the magnitude of the daily wind speed data recorded at WS1 for 2019 and 2021 were compared in this study to the relative frequency (%) of wind speed magnitude of the data from 1997 to 2003.

3.4.7 Snow Cover Properties

Snow cover is an important climatic variable as it influences the spring freshet flow volume and distribution. Snow cover data at the Site are available monthly from manual measurements from 1997 to 2022, recorded as snow-water-equivalent (SWE). Measurements, although not continuous, are typically recorded at the beginning and end of a month, with the latter being representative of the monthly SWE.

4.0 RESULTS

The following section summarizes the precipitation, air temperature, relative humidity, solar radiation, evaporation and evapotranspiration, wind speed and direction, and snow cover baseline conditions at the Site.

4.1 Annual Precipitation

The Site experiences high summer precipitation due to summer storms, with the lowest monthly precipitation occurring in February. Precipitation typically occurs as snowfall starting in November and accumulates until March. Average annual precipitation at the Site is estimated to be 612 mm with a standard deviation of 118 mm. Frequency analyses of the derived long-term precipitation time series for the Site were undertaken to generate the variability in monthly and annual precipitation of the Site. Estimated annual wet and dry precipitation depths for a range of return periods are shown in Table 9, Figure 14, and Figure 15.

Table 9: Annual Precipitation Depths for the Site (1974-2021)

Return Period (yr)	Wet (mm)[1]	Dry (mm)[1]
5	714	508
10	768	459
25	825	412
50	861	386
100	893	366
200	922	349
Average	612	

1) Weibull distribution was selected based on the statistical distribution goodness-of-fit-test.

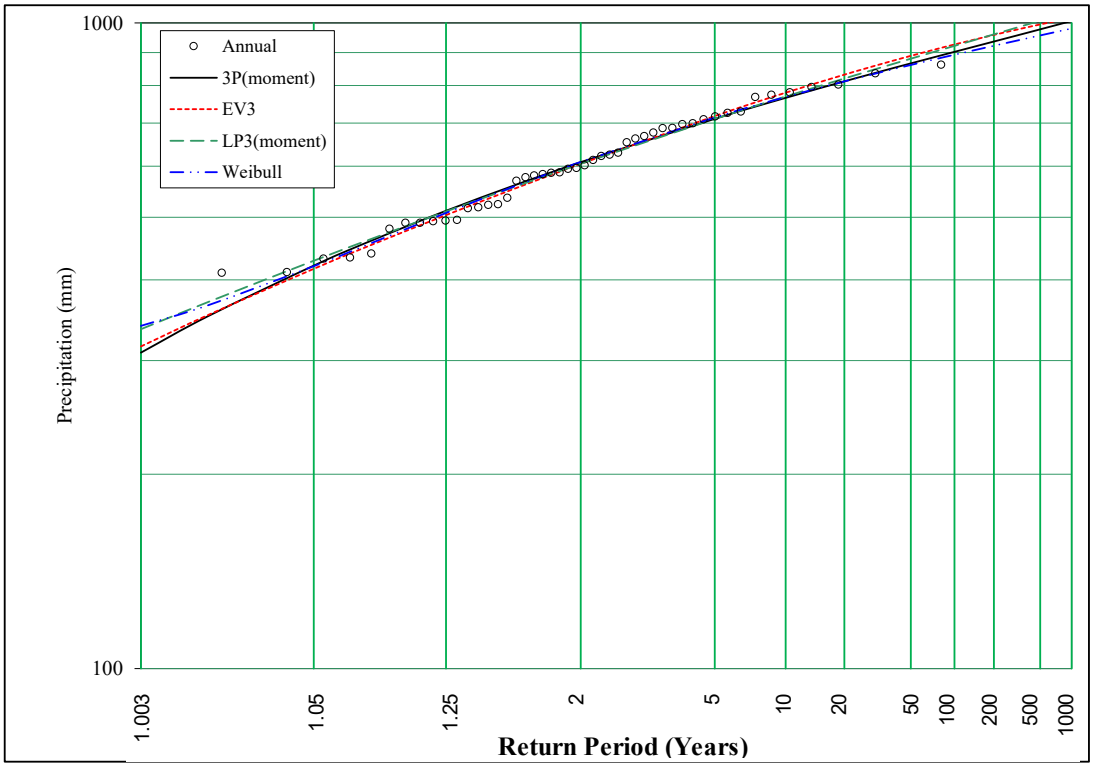


Figure 14 : Annual Precipitation Frequency Analysis – Wet Results

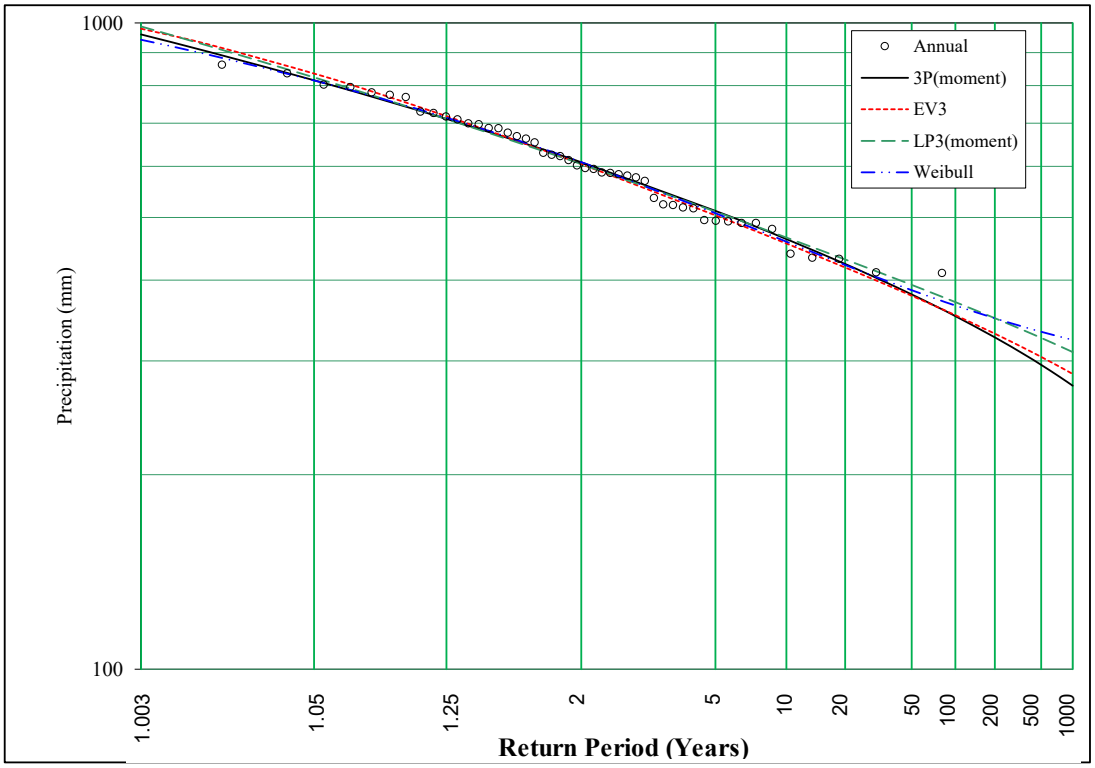


Figure 15 : Annual Precipitation Frequency Analysis - Dry Results

Monthly values for the 25- and 200-year return periods for wet and dry precipitation depths are presented in Table 10. Monthly values for the 1:25 year dry and wet precipitation for the 1:200 year dry and wet precipitation were assumed to follow the same monthly distribution as the average precipitation.

Table 10: Monthly Precipitation Depths for the Site (1974-2021)

Month[1]	Precipitation (mm)				
	Average	1:200 Year Wet	1:25 Year Wet	1:25 Year Dry	1:200 Year Dry
January	49.4	74.3	66.5	33.2	28.2
February	35.8	54.0	48.3	24.1	20.5
March	29.7	44.7	40.0	20.0	16.9
April	44.7	67.3	60.2	30.1	25.5
May	49.9	75.2	67.2	33.6	28.5
June	70.8	107	95.4	47.7	40.4
July	63.6	95.8	85.7	42.9	36.3
August	50.6	76.2	68.1	34.1	28.8
September	52.3	78.8	70.5	35.2	29.9
October	58.1	87.5	78.2	39.1	33.1
November	49.8	75.0	67.1	33.5	28.4
December	57.6	86.8	77.7	38.8	32.9
Annual Total[2]	**612**	**922**	**825**	**412**	**349**

1) Wet and Dry Monthly values assumed to follow the same monthly distribution as the Average.

2) Annual total precipitation depths were rounded to the nearest mm for presentation purposes; therefore, it may appear the sum of the monthly values do not equal the annual total.

4.2 Rainfall

Annual maximum series for 24-hour precipitation from the derived historical data set was used to undertake a frequency analysis to provide rainfall design values. Results are shown in Table 10. The 24-hour, 3-day, and 10-day annual, spring, and summer probable maximum precipitation (PMP) depths were estimated using the Hershfield method (WMO 2009).

Table 11: 24-hour Precipitation Depths for the Site (1974-2021)

Return Period (yr)	Depth (mm) [1, 2]
2	**33**
10	**47**
25	**54**
100	**64**
200	**69**
1000	**80**

1) Log Pearson III distribution was selected based on the statistical distribution goodness-of-fit test.

2) Values rounded up to the nearest mm.

Table 12: Annual, Spring, and Summer PMP Depths for the Site (1974-2021)

Period	Annual PMP[1] (mm)	Spring PMP[1, 2] (mm)	Summer PMP[1, 3] (mm)
24-Hour	224	192	191
3-Day[4]	339	272	294
10-Day[5]	562	295	486

1) The PMP does not have a return period.
2) Spring = March, April, May.
3) Summer = June, July, August.
4) Adjusted from fixed-time interval by a factor of 1.03 (Miller 1964).
5) Adjusted from fixed time interval by a factor of 1.01 (Miller 1964).

4.3 Air Temperature

Air temperature statistics for the Site were developed using historical data from the nearby ECCC climate station in Likely approximately 9 km northeast of the Site. The historical Likely data set was adjusted to the average elevation of the Mount Polley mine by applying the regional monthly lapse rate presented in Table 7. Data gaps were infilled using data from the four regional ECCC climate stations in a prioritized sequence and applying the monthly temperature lapse rate to adjust for elevation.

Monthly and annual air temperature statistics for the Site (1974-2021) are presented in Table 13 and Figure 16. The estimated mean annual temperature varies between 1.7°C and 6.3°C, with a long-term mean of 3.9°C. Mean monthly temperatures vary between –6.7°C in January and 15.1°C in July. The historical daily maximum and minimum air temperature from the derived long-term data set was 38.1°C in June 2021 (measured at the Site) and -39.8°C in December 1996, respectively. Mean monthly air temperatures generally turn positive in April and negative in November. The percentiles presented in Table 13 indicate the probability of the air temperature to be less than the calculated value for each period, i.e. the 25th percentile for the month of March indicates the monthly air temperature for March is 25% probable to be less than -2.2°C, or 75% probable to exceed -2.2°C. Larger variation between the 25th and 75th percentiles indicate greater variation in air temperature from the median during the month with the largest variations occurring in the winter months (December, January, and February).

Table 13: Derived Air Temperature (°C) Statistics for Mount Polley Mine, 1974 to 2021

Month	Temperature (°C)							
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile	Daily Maximum	Daily Minimum
January	-16.0	-6.7	-0.3	-8.7	-6.3	-4.0	11.2	-39.4
February	-13.0	-4.8	0.7	-7.7	-4.3	-2.1	13.6	-35.4
March	-6.7	-1.0	3.2	-2.2	-0.8	0.5	18.4	-32.7
April	-0.7	3.7	12.0	2.8	3.7	4.3	27.5	-16.7
May	5.2	8.5	13.1	7.5	8.3	9.6	33.1	-7.9
June	8.6	12.2	15.5	11.1	12.2	13.2	38.1	-4.9
July	11.8	15.1	21.2	13.3	14.8	16.4	36.0	0.6
August	11.0	14.6	17.1	13.6	14.8	15.7	33.0	-4.1
September	6.8	10.0	14.2	8.7	9.6	11.2	36.3	-7.1
October	0.8	4.1	8.7	3.4	4.1	4.7	31.1	-26.4
November	-13.7	-2.4	2.6	-3.8	-2.1	-0.4	17.3	-36.9
December	-13.7	-6.6	-1.2	-9.5	-5.5	-3.9	11.3	-39.8
Annual	**1.7**	**3.9**	**6.3**	**3.2**	**3.9**	**4.5**	**38.1**	**-39.8**

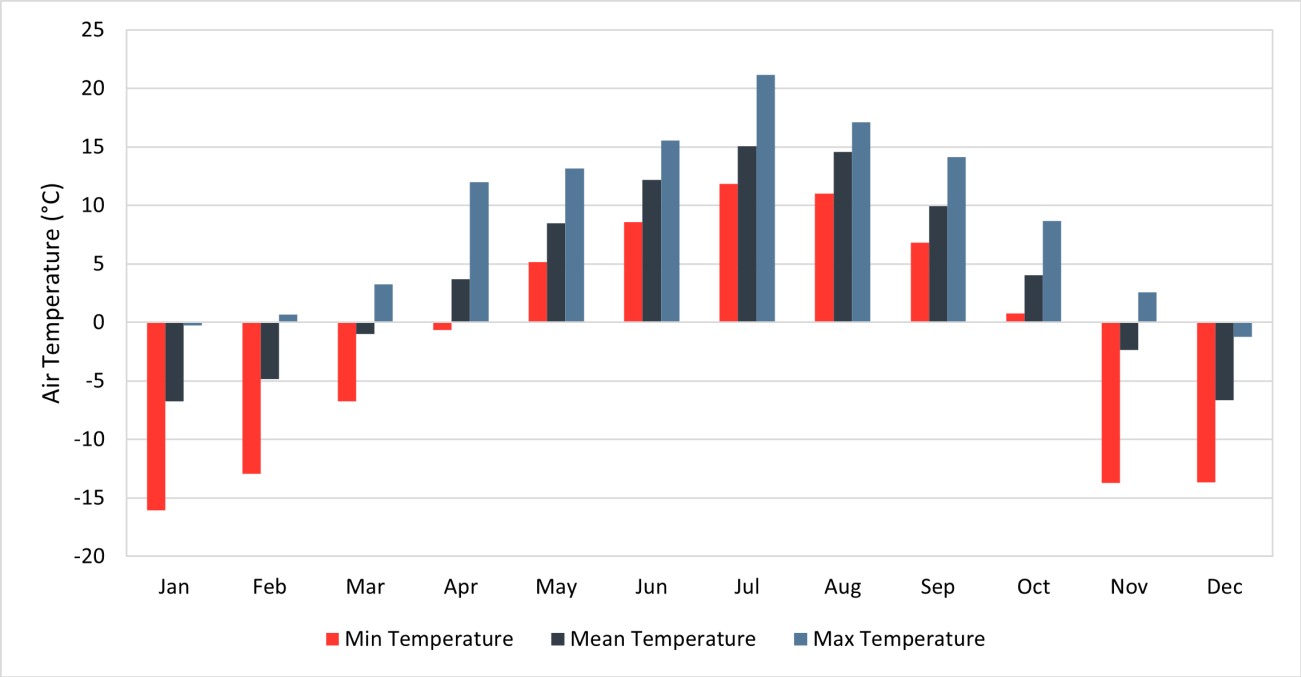


Figure 16 : Derived Monthly Air Temperature Statistics for Mount Polley Mine (1974-2021)

4.4 Relative Humidity

Statistics for relative humidity are presented in Table 14 and Figure 17. Mean annual relative humidity is 68.1%. Monthly mean values vary between 57.7% in April to 82.2% in December. The 25th and 75th percentiles for monthly relative humidity show little variation from the median indicating the Site experiences relatively constant relative humidity on a monthly basis from year to year.

Table 14: Derived Monthly and Annual Relative Humidity Statistics for the Site (1974-2021)

Month	Relative Humidity (%)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	69.2	81.3	90.1	78.9	81.7	84.0
February	65.5	75.0	84.8	72.0	75.6	77.8
March	55.4	64.9	76.2	61.0	64.0	68.3
April	47.9	57.7	69.4	54.9	57.4	60.5
May	45.6	58.1	70.3	54.1	57.8	61.5
June	44.2	60.4	72.4	54.4	60.2	67.7
July	42.2	59.0	72.9	52.6	58.6	65.9
August	48.4	60.2	81.2	55.0	58.8	63.6
September	47.5	66.4	79.1	61.3	66.1	71.3
October	54.3	72.3	86.7	69.7	72.0	76.1
November	61.4	80.1	87.8	77.6	80.4	83.5
December	70.8	82.2	89.3	78.9	82.6	85.0
Annual	**54.4**	**68.1**	**80.0**	**64.2**	**67.9**	**72.1**

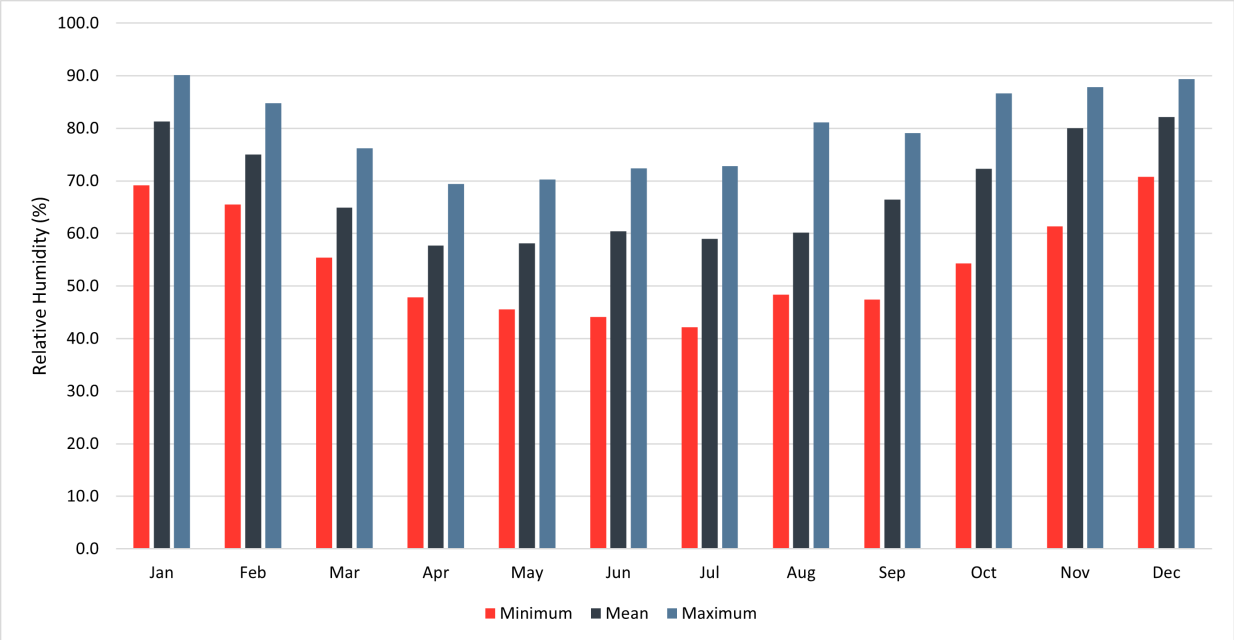


Figure 17 : Derived Monthly Relative Humidity for the Site (1974-2021)

4.5 Solar Radiation

Table 15 and Figure 16 present solar radiation statistics for the Site. Mean annual solar radiation is 135 W/m^2, with a minimum of 127 W/m^2 and maximum of 148 W/m^2. Mean monthly solar radiation varies between 20 W/m^2 in December to 257 W/m^2 in July following the same seasonal pattern for monthly air temperature. The 25th and 75th percentiles show greatest variation in solar radiation occurs in the summer months when solar radiation is greatest during the year, and less variation in winter months when solar radiation is lowest.

Table 15: Estimated Solar Radiation Statistics for the Site (1974-2001)

Month	Solar Radiation (W/m^2)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	16	27	40	23	27	32
February	37	60	86	54	61	67
March	85	114	152	108	113	123
April	143	180	215	161	179	201
May	196	230	275	214	227	250
June	192	246	302	228	244	267
July	211	257	318	234	258	276
August	158	225	261	211	228	248
September	99	152	188	139	149	168
October	55	79	103	71	79	86
November	23	33	50	28	32	37
December	12	20	27	18	20	23
Annual	**127**	**135**	**148**	**132**	**135**	**140**

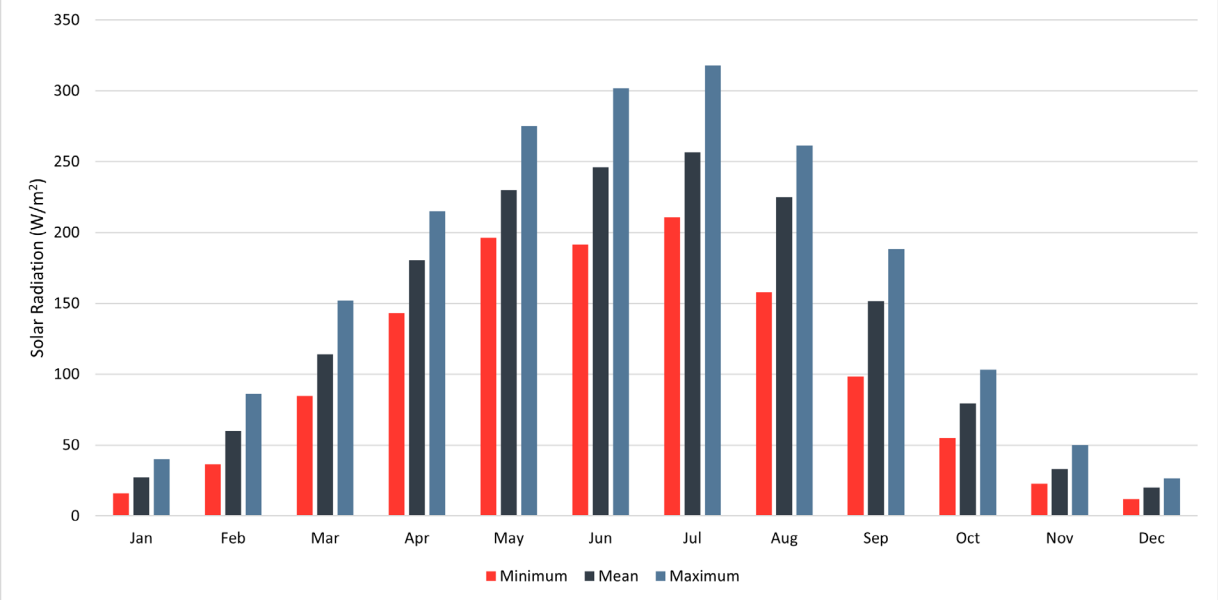


Figure 18 : Estimated Monthly Solar Radiation for the Site (1974-2001)

4.6 Evaporation and Evapotranspiration

The Morton model (Morton 1983) was applied to calculate monthly evaporation, potential evapotranspiration (PET), and actual evapotranspiration (AET) for the Site based on the air temperature, relative humidity, and solar radiation data presented in Sections 4.3, 4.4, and 4.5, respectively. The calculated evaporation rates are considered reflective of potential shallow lake evaporation rates; that is, there is no thermal impact of deeper water levels.

4.6.1 Shallow Lake Evaporation

Table 16 and Figure 19 present monthly statistics for shallow lake evaporation using the Morton Model. The mean annual evaporation rate is estimated to be 673 mm, varying between 606 mm and 762 mm. Mean monthly evaporation rates vary between 0 mm in December to 138 mm in July. The 25th and 75th percentiles indicate that greatest variation in monthly evaporation occurs in July when evaporation is greatest, and lowest variation occurs in January and December when evaporation is lowest.

Table 16 : Estimated Monthly and Annual Shallow Lake Evaporation Statistics for the Site (1974-2001)

Month	Shallow Lake Evaporation (mm)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	0	1	4	0	0	1
February	1	7	12	4	7	10
March	24	32	43	29	32	34
April	52	66	79	59	67	72
May	86	105	140	96	102	115
June	95	122	155	110	121	132
July	110	138	173	123	136	153
August	80	115	137	107	113	130
September	37	61	80	54	60	70
October	18	22	28	20	21	23
November	0	4	8	1	4	6
December	0	0	3	0	0	1
Annual	**606**	**673**	**762**	**648**	**670**	**699**

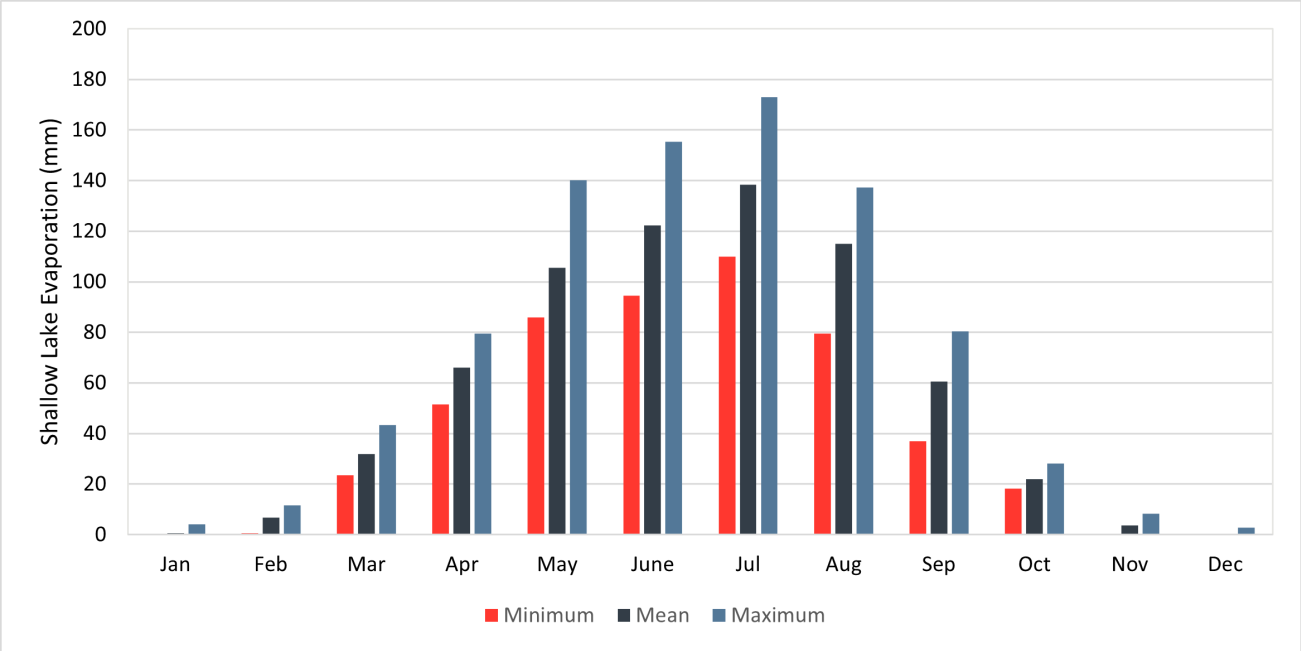


Figure 19 : Estimated Shallow Lake Evaporation Statistics for the Site (1974-2001)

4.6.2 Potential Evapotranspiration

Table 17 and Figure 20 present monthly statistics for PET using the Morton Model. The mean annual PET rate is estimated to be 863 mm, varying between 744 mm and 1022 mm. Mean monthly PET rates vary between 1 mm in December and January to 171 mm in July. The 25th and 75th percentiles indicate that greatest variation in monthly PET occurs in July when PET is greatest, and lowest variation occurs in January and December when PET is lowest. On an annual basis, PET rates are greater than shallow lake evaporation and AET since PET is not limited by the availability of water.

Table 17 : Estimated Monthly and Annual Potential Evapotranspiration Statistics for the Site (1974-2001)

Month	Potential Evapotranspiration (mm)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	0	1	5	0	0	2
February	1	7	11	4	7	10
March	24	41	59	34	42	45
April	68	92	112	83	93	102
May	103	134	178	120	131	149
June	113	150	195	125	155	174
July	124	171	240	151	166	191
August	84	151	199	135	152	174
September	54	89	117	71	89	108
October	17	24	40	20	23	26
November	0	4	9	1	4	6
December	0	1	4	0	0	1
Annual	**744**	**863**	**1022**	**815**	**856**	**925**

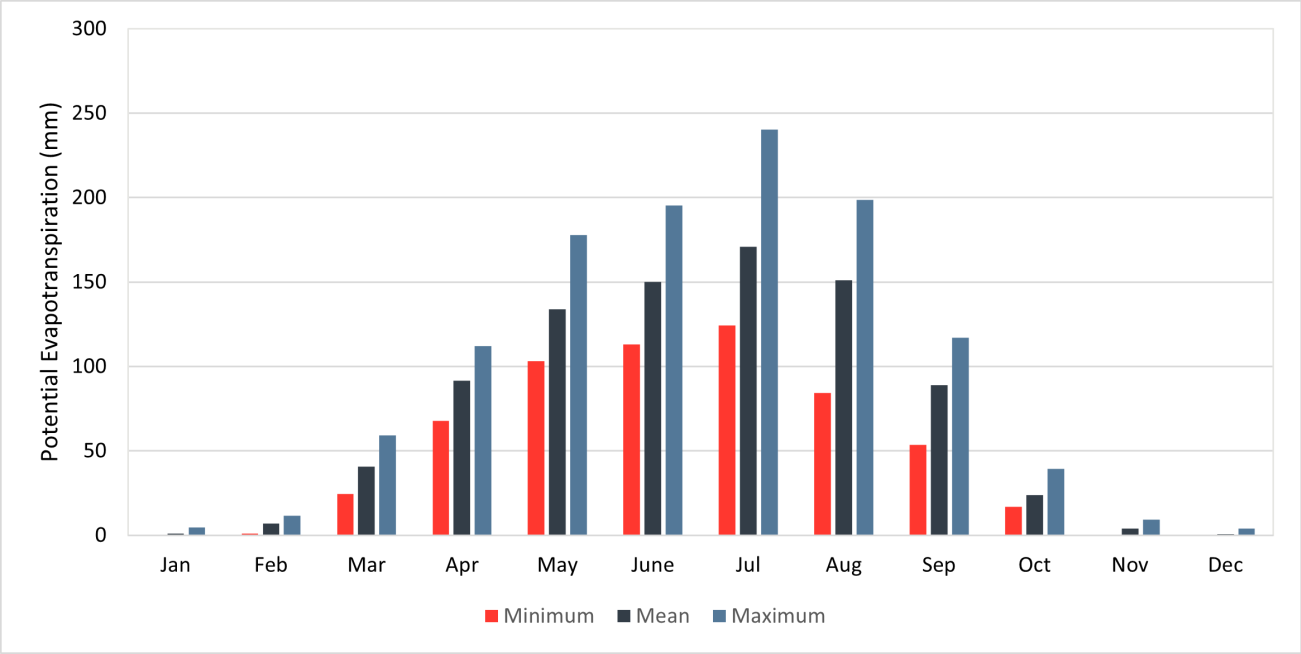


Figure 20 : Estimated Potential Evapotranspiration Statistics for the Site (1974-2001)

4.6.3 Actual Evapotranspiration

Table 18 and Figure 21 present monthly statistics for AET as calculated using the Morton Model. The mean annual AET rate is estimated to be 399 mm, varying between 319 mm and 449 mm. Mean monthly AET rates vary between 1 mm in December and January to 89 mm in July. The 25th and 75th percentiles indicate that greatest variation in monthly AET occurs in July when AET is greatest, and lowest variation occurs in January and December when AET is lowest. On an annual basis, AET at the Site is less than shallow lake evaporation and PET rates because AET is limited by the availability of water, particularly during the summer months when the air temperature is highest.

Table 18 : Estimated Monthly and Annual Actual Evapotranspiration Statistics for the Site (1974-2001)

Month	Actual Evapotranspiration (mm)					
	Minimum	Mean	Maximum	25th Percentile	50th Percentile	75th Percentile
January	0	1	5	0	0	2
February	1	7	11	4	7	9
March	15	18	25	17	18	19
April	16	31	47	26	30	35
May	42	64	84	60	63	68
June	48	80	98	75	80	86
July	61	89	105	83	89	99
August	51	63	78	57	63	69
September	10	23	35	18	22	29
October	11	17	22	16	17	18
November	0	4	9	1	4	6
December	0	1	4	0	0	1
Annual	**319**	**399**	**449**	**370**	**409**	**419**

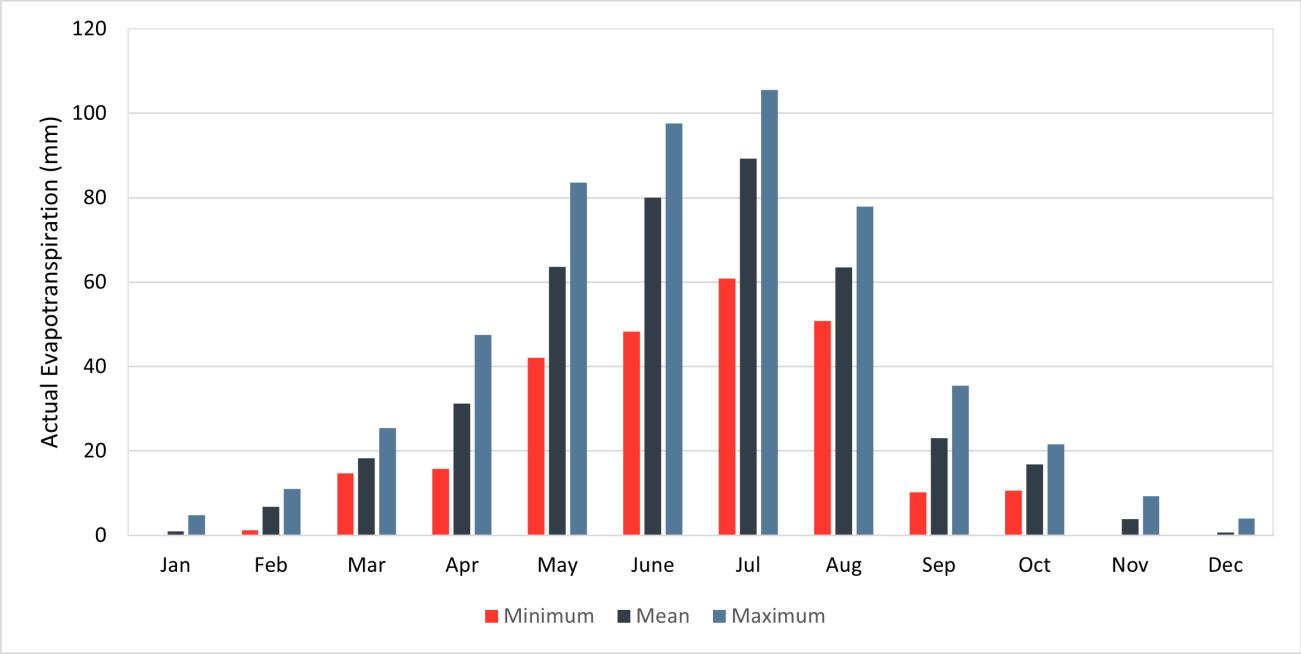


Figure 21 : Estimated Actual Evapotranspiration Statistics for the Site (1974-2001)

4.7 Wind Speed and Direction

A wind rose plot for the Site depicting the relative frequency of mean hourly wind speed and direction, and the seasonal distribution, between 29 August 1997 and 27 November 2003 is shown in Figure 22.

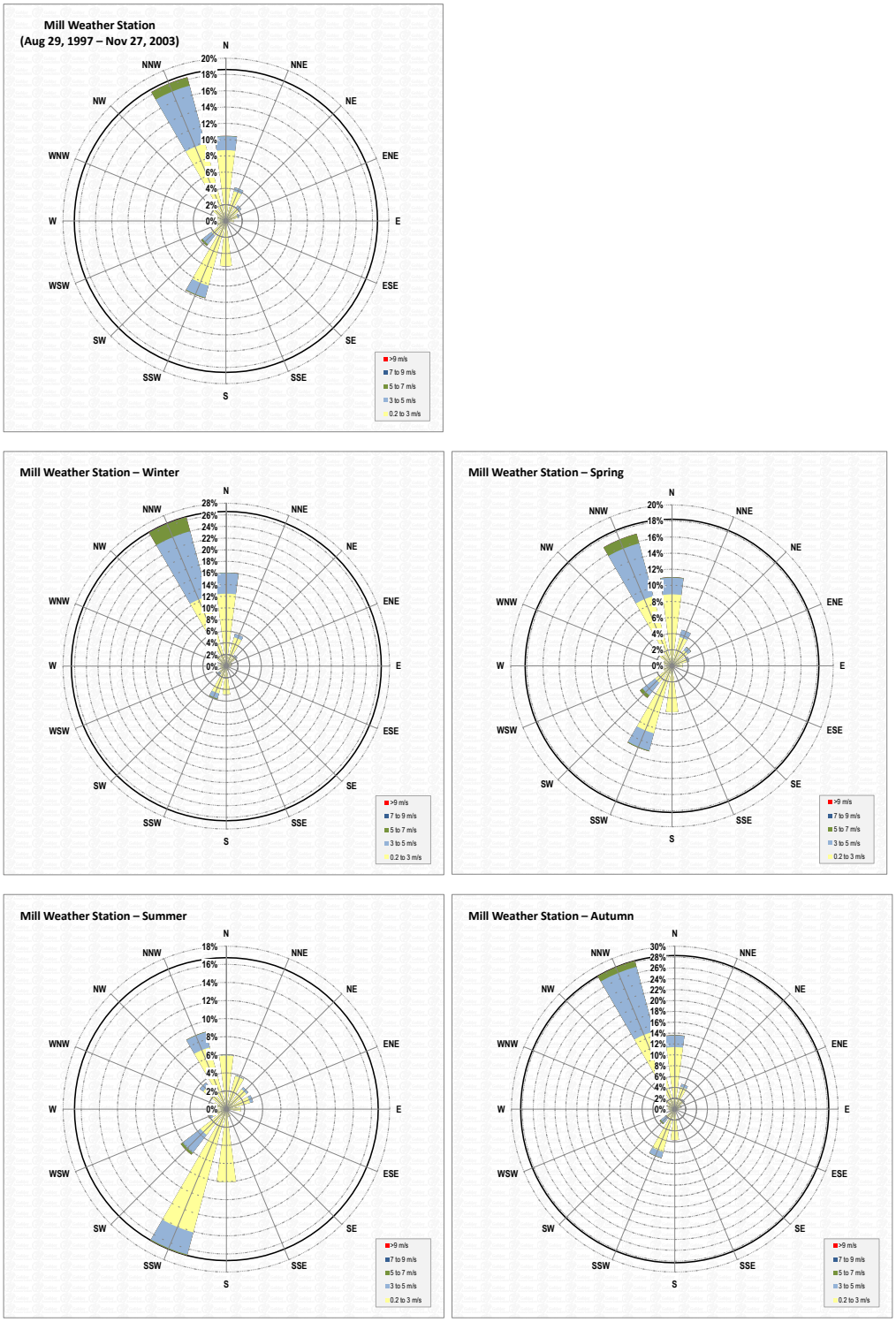


Figure 22: MPMC Station Monitoring Period and Seasonal Wind Roses - 29 August 1997 to 27 November 2003

Spring = March, April, May; Summer = June, July, August; Autumn = September, October, November; Winter = December, January, February.

Winds measured at the Site typically blew from the north-northwest, north, and south-southwest directions, with minimal winds from the east and the west. The spring, autumn, and winter seasonal wind roses were consistent with the wind rose pattern for the entire monitoring period; however, during the summer months, the majority of winds were from the south-southwest. Similarly, wind speeds in spring, autumn, and winter were generally consistent with the wind rose for the entire monitoring period, while wind speeds in summer were generally lower.

Wind speed measured and seasonal distributions at the Site from 2019 to 2021 were consistent with the relative frequency of wind speed magnitudes and the seasonal distributions recorded between 29 August 1997 and 27 November 2003 (Table 19 and Figure 23). A similar seasonal pattern in wind speed is identifiable with lower wind speeds in the summer months and higher wind speeds in the spring, autumn, and winter months (Table 20 and Figure 24). It is noted that the data from 2019 and 2021 are daily wind speed rather than hourly wind speed and only the relative frequency (%) of wind speed magnitude was compared.

Table 19: Comparison of Relative Frequency of Wind Speed from Mill Weather Station and Weather Station 1 for the Site

Wind Speed (m/s)	Mill Weather Station 29 August 1997 to 27 November 2003[1]	Weather Station 1 1 January 2019 to 31 December 2021[2]
calm	35%	28%
0.2 to 3 m/s	50%	56%
3 to 5 m/s	14%	13%
5 to 7 m/s	2%	3%
7 to 9 m/s	0%	0%
>9 m/s	0%	0%

1) Recorded as hourly wind speed.

2) Recorded as daily wind speed.

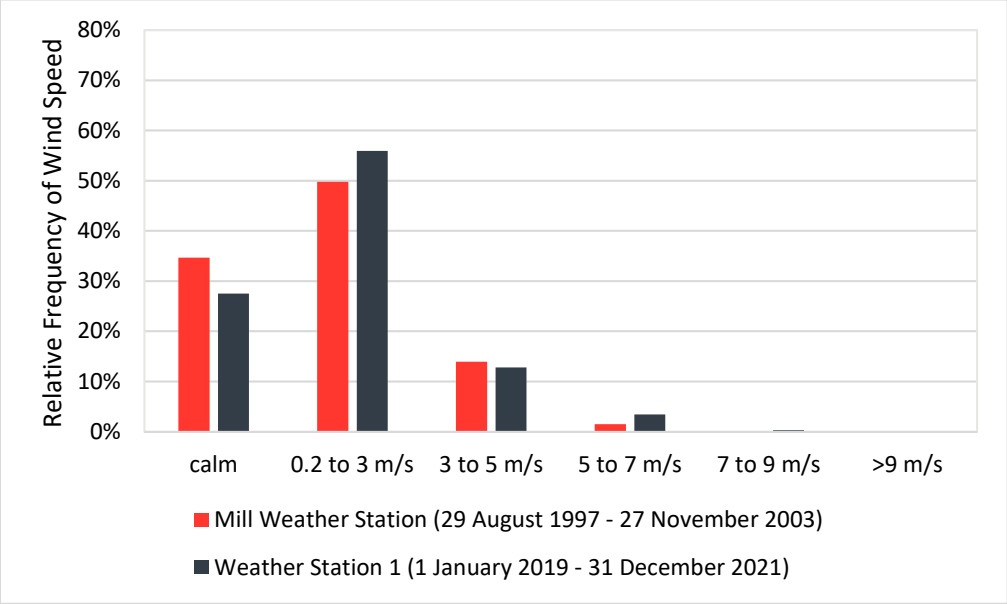


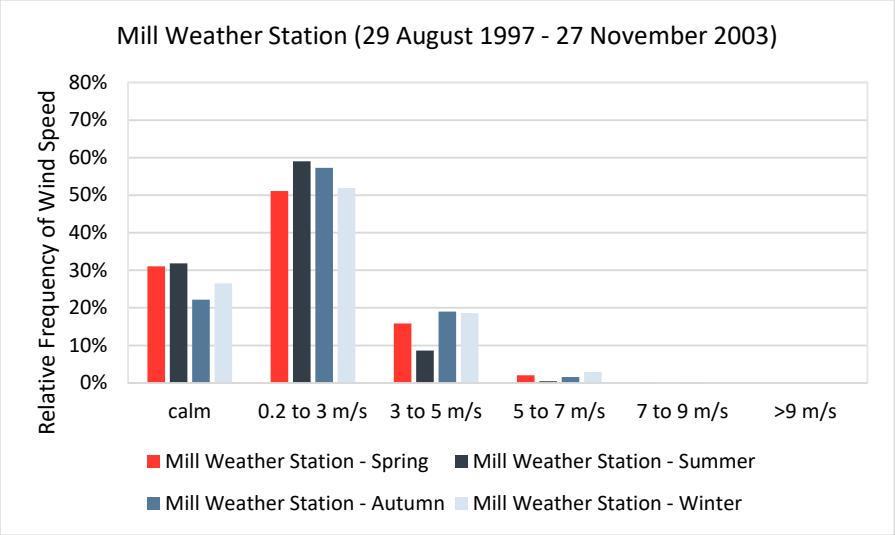
Figure 23: Comparison of Relative Frequency of Wind Speed from Mill Weather Station and Weather Station 1 for the Site

Table 20: Comparison of Relative Frequency of Wind Speed Seasonal Distributions from Mill Weather Station and Weather Station 1 for the Site

Wind Speed (m/s)	Mill Weather Station 29 August 1997 to 27 November 2003[1]				Weather Station 1 1 January 2019 to 31 December 2021[2]			
	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter
calm	31%	32%	22%	27%	23%	18%	31%	37%
0.2 to 3 m/s	51%	59%	57%	52%	58%	75%	46%	44%
3 to 5 m/s	16%	9%	19%	19%	13%	7%	17%	15%
5 to 7 m/s	2%	0%	2%	3%	5%	0%	6%	3%
7 to 9 m/s	0%	0%	0%	0%	1%	0%	0%	1%

1) Recorded as hourly wind speed.

2) Recorded as daily wind speed.



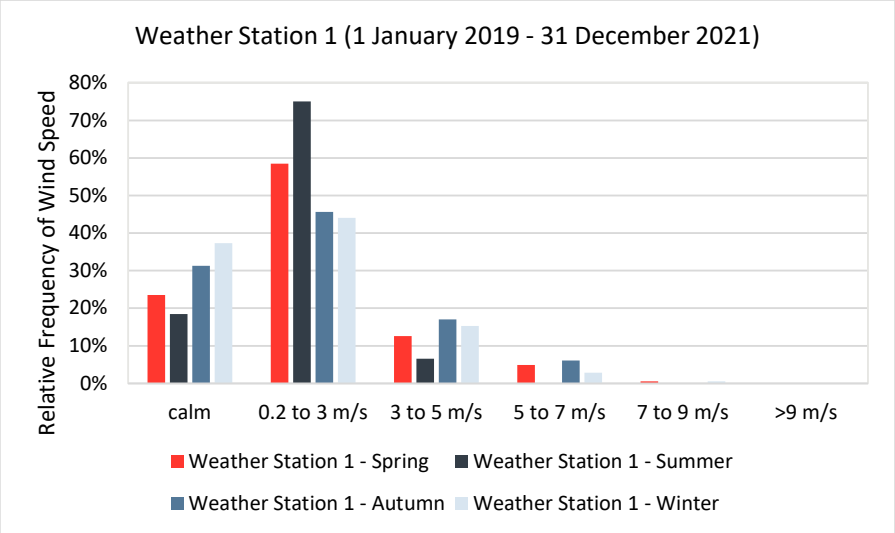


Figure 24: Comparison of Relative Frequency of Wind Speed Seasonal Distribution from Mill Weather Station and Weather Station 1 for the Site

4.8 Snow Cover Properties

Snow cover monthly statistics, reported as SWE, are presented in Table 21. At 50% exceedance, snow begins accumulating in November and achieves its maximum in March, reducing to 0 mm in April. The 5th and 95th percentiles and standard deviation values demonstrate the variability in the amount of SWE at the Site, with March having the greatest variability from year to year.

Table 21: Snow Water Equivalent for the Site (1997-2021)

Month	Number of Measurements	Mean (mm)	Minimum (mm)	Percentile					Maximum (mm)	Standard Deviation (mm)
				5%	25%	50%	75%	95%		
January	22	147	76	88	120	139	164	327	339	56
February	22	182	99	104	131	193	222	338	344	61
March	22	185	0	6	97	198	257	403	411	108
April	21	33	0	0	0	0	81	177	177	58
November	22	17	0	0	0	9	37	72	72	25
December	22	102	32	50	77	101	122	193	196	44

5.0 CLIMATE CHANGE PROJECTIONS

Future climate projections are important for understanding how climate is projected to change at the Site from the climate baseline. Future climate projections come from publicly available statistical downscaled future climate projections on a daily scale. Recognizing the inherent uncertainty with projections, multiple projections from multiple models and scenarios were included in the analysis presented herein, and the future projections are presented in terms of percentiles or exceedance probabilities. Changes to climate may influence how representative the statistics estimated based on historical data are for future time periods.

5.1 Data Sources for Future Climate

The Intergovernmental Panel on Climate Change (IPCC) is generally considered to be the definitive source of information related to past and future climate change as well as climate science. As an international body, the IPCC provides a common source of information relating to emission scenarios, provides third party reviews of models, and recommends approaches to document future climate projections. Periodically, the IPCC issues assessment reports summarizing the current state of climate science. The Sixth Assessment Report (AR6) (IPCC 2021) represents the most currently available complete synthesis of information regarding climate change.

5.2 Global Climate Change Projections

Future climate is typically projected using global circulation models (GCMs) that involve the mathematical representation of global land, sea, and atmosphere interactions over a long period of time. These GCMs have been developed by various government agencies, but they share a number of common elements as described by the IPCC (2021). The IPCC does not run the models but acts as a clearinghouse for the distribution and sharing of the model forecasts.

Global climate models require extensive inputs to characterize the physical processes and social development paths that could alter climate in the future. To represent the wide range of the possible inputs to global climate models, the IPCC has established a series of Shared Socioeconomic Pathways (SSPs) that help define the future levels of radiative forcing terms. Future climate projection data are available from approximately 30 GCMs and four main SSPs (SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5) in AR6 (ECCC 2022c).

The primary differentiating aspect of each model are the SSPs developed by the IPCC and presented in AR6 to quantify potential emission output scenarios (ECCC 2022c). The SSPs were created with varying assumptions about human developments and are designed to work in combination with an updated version of the Representative Concentration Pathways (RCPs) from the previous IPCC Fifth Assessment Report (AR5) (ECCC 2022c). The SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5 scenarios are the four common greenhouse gas concentration profiles that are widely used; SSP5-8.5 represents the most extreme scenario with the highest volume of greenhouse gases emitted (ECCC 2022c).

5.3 Regional Climate Change Projections

The climate change projection data available from ClimateData.ca portal provided by ECCC uses GCMs with RCP pathways from IPCC AR5 rather than the latest SSPs from AR6. Therefore, the data used in this study will be obtained from ClimateBC.ca provided by the University of British Columbia (UBC). This tool downscales PRISM (Daly et al. 2008) 1971-2000 gridded monthly climate normal data (800 x 800 m) to scale-free point locations and uses the scale-free data as a baseline to downscale more than 200 future climate variables for individual years and periods between 1901 and 2100 (Wang et al. 2016).

The ClimateBC (UBC 2022) tool that is currently managed by UBC uses the same data management framework as Coupled Model Intercomparison Project Number 6 (CMIP6) where the SSP emission profiles are coupled with GCMs. ClimateBC selected a subset of eight GCMs from the models contributing to the CMIP6 ScenarioMIP project based on the following criteria (UBC 2022):

- Minimum of three historical runs available.
- Minimum temperature and maximum temperature available for all runs.
- At least one run for each of the four main SSP marker scenarios.
- One model per institution.
- No closely related models based on Figure 5 in *Reduced global warming from CMIP6 projections when weighting models by performance and independence* (Brunner et al. 2020).
- No large biases over BC.
- Are within IPCCs transient climate response "likely[1]" range and Earth's equilibrium climate sensitivity "very likely[2]" range.

The eight GCMs presented in this report are ACCESS-ESM1-5, BC-CSM2-MR, CNRM-ESM2-1, GFDL-ESM4, GISS-E2-1-G, MIROC6, MPI-ESM1-2-HR, and MRI-ESM2-0.

Table 22: Inventory of Global Climate Models Referenced in this Study

Model	Source / Institution
ACCESS-ESM1-5	Commonwealth Scientific and Industrial Research Organisation
BC-CSM2-MR	Beijing Climate Center
CNRM-ESM2-1	CNRM (Centre National de Recherches Meteorologiques) and CERFACS (Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique)
GFDL-ESM4	National Oceanic and Atmospheric Administration, Geophysical Fluid Dynamics Laboratory
GISS-E2-1-G	Goddard Institute for Space Studies
MIROC6	JAMSTEC (Japan Agency for Marine-Earth Science and Technology), AORI (Atmosphere and Ocean Research Institute), NIES (National Institute for Environmental Studies), and R-CCS (RIKEN Center for Computational Science)
MPI-ESM1-2-HR	Max Planck Institute for Meteorology
MRI-ESM2-0	Meteorological Research Institute

The Site coordinates and elevation were entered into ClimateBC to extract site-specific model outputs (i.e., projections) for precipitation, air temperature, solar radiation, relative humidity, and precipitation as snowfall.

[1] Transient climate response metric in the range 1.4 to 2.2°C (66% likelihood) deemed as "likely" in AR6 (Hausfather et al. 2022).

[2] Equilibrium climate sensitivity metric in the range 2 to 5°C deemed as "very likely" in AR6 (Hausfather et al. 2022).

5.4 Climate Change Projections Results

The following sections build on the current climate baseline by providing the projected changes under future climate conditions for two future time horizons (2041-2070; 2050s, and 2071-2100; 2080s). Time horizons used for the available projections are by periods. Section 5.4.1 provides a description of future projected conditions for temperature and precipitation. Sections 5.4.2 through 5.4.5 provide the projected changes in relative humidity, solar radiation, evaporation, and snow cover. In all sections, projections are provided in terms of exceedance probability measured over the 32-member multi-model ensemble (i.e., 8 models and 4 SSPs). The focus of the results discussion is on the 50th percentile (median), while additional exceedance probabilities are available in the tables presented, including the maximum and minimum. Using the median, or 50th percentile, provides an indication of the middle of the projected changes from the multi-model ensemble.

5.4.1 Future Temperature and Precipitation Projections

This section provides the projected future mean temperature and total precipitation for the Site. The future climate projections are benchmarked against a modelled baseline (e.g., ClimateBC output of the baseline information available for the 32-member multi-model ensemble for the normal period of 1991-2020) and are described in terms of “anomaly” or change from the baseline.

Annual Temperature and Precipitation Projections

Comparisons of the future climate projections of temperature and precipitation for the Site for the 2050s (2041-2070) and 2080s (2071-2100) projection periods are shown as a scatter plot in Figure 25. The plots illustrate the projected change in temperature (vertical axis) and precipitation (horizontal axis) from the current climate baseline (1991 through 2020 normal period) for each of the models and the four SSPs considered in the IPCC’s AR6 (IPCC 2021). For reference, the current climate is shown as a solid circle where the axes intersect. The model projections are generally in the upper right quadrant of the plots, suggesting a future climate that will likely be warmer and wetter. There is a larger spread of future projected precipitation, with a majority of model runs projecting a wetter future climate. Precipitation projections typically have larger uncertainty than temperature projections due to the challenge of capturing precipitation in the climate models (temperature is better understood) (Araya-Osses et al. 2020).

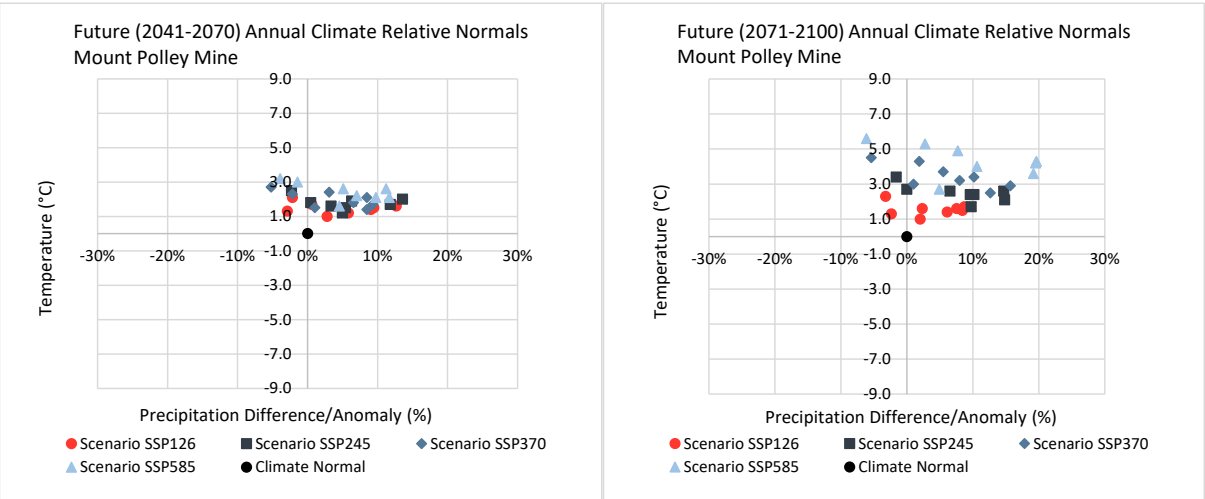


Figure 25: Scatter Plots Presenting Annual Temperature and Precipitation Projections for the 2050s and the 2080s for the Mount Polley Mine Area

Monthly Temperature and Precipitation Projections

Figure 26 and Figure 27 depict the projected anomalies in monthly temperatures for the Site for the 2050s and 2080s, respectively. The figures also show a dashed line which represents the median of all the modelled projections. The dotted lines in the figures represents the spread between the 5th percentile and the 95th percentile of the ensemble. The figures show projected increases in temperature for all months for the 2050s and the 2080s. For the 2050s (Figure 26) the projected increase in the median temperature (dashed line) is less in winter months and greater in the summer months, with an annual average increase of 1.8ºC. The 5th and 95th percentiles of the 2050s ensembles range from an increase of 1.2ºC to around 2.9ºC. The 95th percentile shows a larger variation throughout the months of the year compared to the 5th percentile, and a seasonal pattern arises for the summer months, with larger projected increases of 4.3°C.

The projected increase in the median temperature for the 2080s (Figure 27) is less in winter months and greater in the summer months, with an annual average increase of 2.7ºC. The 5th and 95th percentiles of the 2080s ensemble range from an increase of approximately 1.4ºC to 5.1ºC on average. The 95th percentile shows a larger variation throughout the months of the year and greatest variation in the summer months, with projected increases of 7ºC.

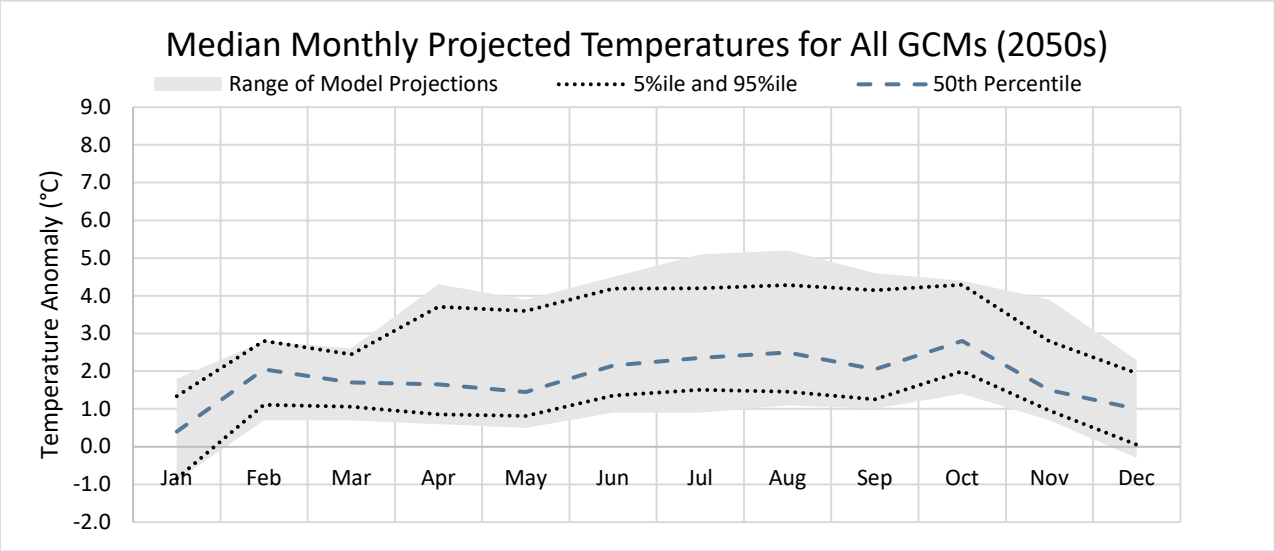


Figure 26: Monthly Projected Temperature Anomalies for the Mount Polley Mine Area (2050s)

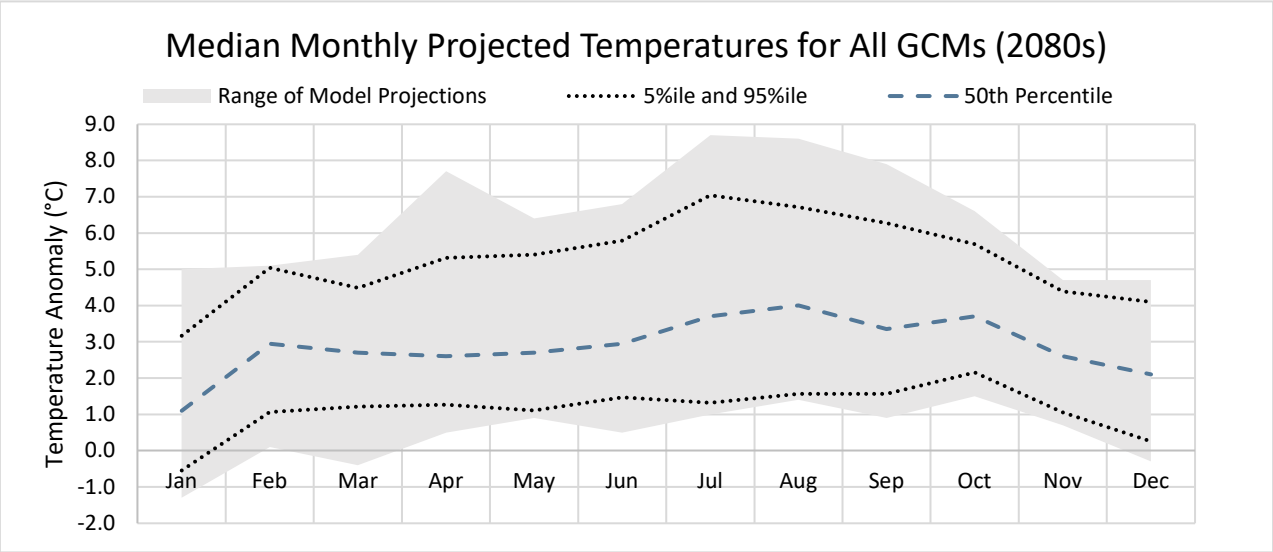


Figure 27: Monthly Projected Temperature Anomalies for the Mount Polley Mine Area (2080s)

Figure 28 and Figure 29 present the monthly projected precipitation anomalies for the Site for the 2050s and 2080s, respectively. For the 2050s (Figure 28) the projected median anomaly (dashed line) indicates changes in the seasonal distribution throughout the year, with an annual average increase of 5%, except for the summer where a slight decrease is projected for the months of June and July. The summer and fall months also present a larger spread in projections from the ensemble (shaded area on the graph), indicating less agreement between the projections. The 2080s (Figure 29) present similar behaviour to the 2050s except for an overall higher projected increase (around 8%), except for the months of June and July, where a decrease in precipitation is projected.

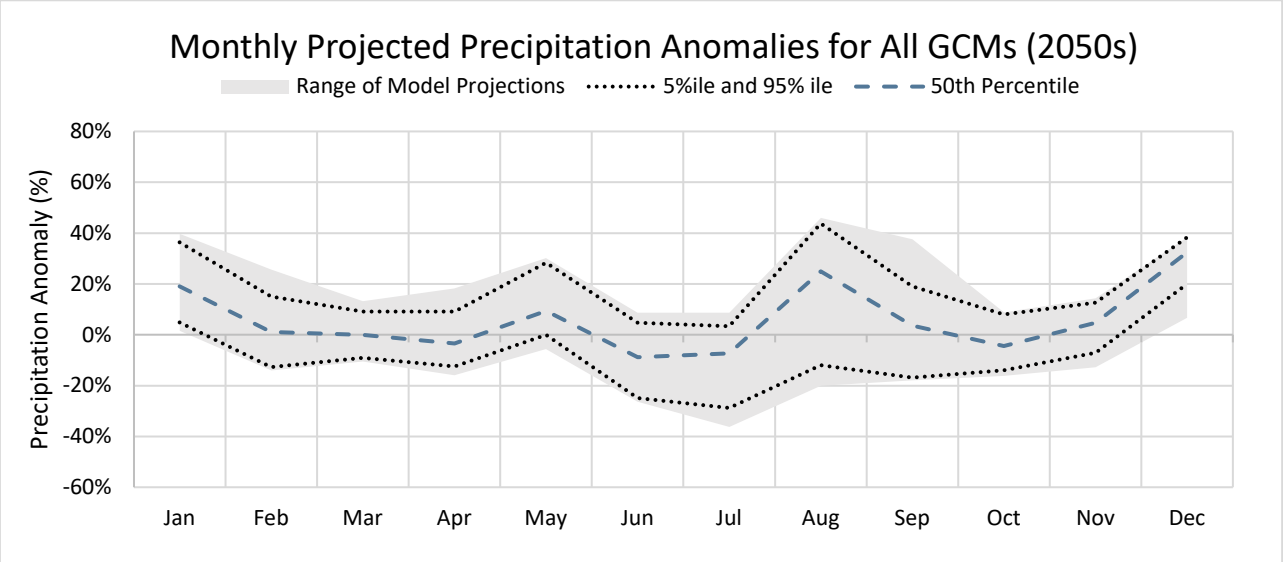


Figure 28: Monthly Projected Precipitation Anomalies for the Mount Polley Mine Area (2050s)

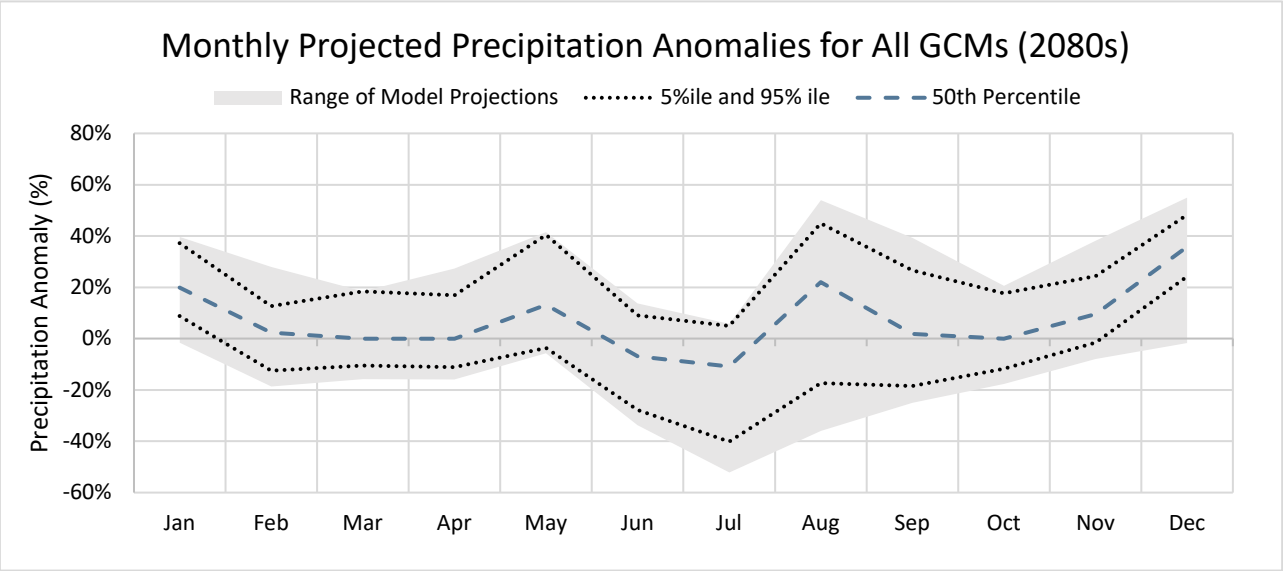


Figure 29: Monthly Projected Precipitation Anomalies for the Mount Polley Mine Area (2080s)

Overall, there is less variability and uncertainty (measured as the agreement within the ensemble or range of projected anomalies) during the 2050s. However, variability increases for both the precipitation and temperature anomalies during the 2080s.

Annual and Monthly Temperature and Precipitation Projections Summary

The projected future changes in the 2050s and 2080s from the baseline period (1991 through 2020) in monthly and annual temperatures are summarized in Table 23 and Table 24. In the 2050s, at 50% exceedance probability, the annual temperature is projected to increase by 1.8°C, with the biggest monthly increase of 2.8°C in October, and smallest monthly increase of 0.4°C in January. In the 2080s, at 50% exceedance probability, the annual temperature is projected to increase by 2.7°C, with the biggest monthly increase of 4.0°C in August, and smallest monthly increase of 1.1°C in January.

Table 23: Projected Anomalies in Monthly and Annual Temperature in the 2050s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	-0.9	-0.8	-0.4	0.1	0.4	0.6	1.1	1.3	1.7	1.8	0.3	0.6
February	0.7	1.1	1.2	1.6	2.1	2.4	2.8	2.8	2.8	2.8	2.0	0.6
March	0.7	1.1	1.1	1.4	1.7	2.1	2.2	2.4	2.6	2.6	1.7	0.5
April	0.6	0.9	0.9	1.3	1.7	2.1	3.1	3.7	4.3	4.3	1.9	0.9
May	0.5	0.8	0.9	1.2	1.5	2.7	3.5	3.6	3.8	3.9	1.9	1.0
June	0.9	1.4	1.4	1.7	2.2	2.5	3.2	4.2	4.4	4.5	2.2	0.9
July	0.9	1.5	1.6	1.8	2.4	3.1	4.1	4.2	4.8	5.1	2.6	1.0
August	1.1	1.5	1.7	2.2	2.5	3.2	3.9	4.3	5.0	5.2	2.7	0.9
September	1.0	1.3	1.5	1.7	2.1	2.8	4.0	4.1	4.5	4.6	2.4	0.9
October	1.4	2.0	2.2	2.4	2.8	3.6	4.0	4.3	4.4	4.4	2.9	0.8
November	0.7	1.0	1.1	1.2	1.5	2.1	2.6	2.8	3.6	3.9	1.7	0.7
December	-0.3	0.1	0.2	0.7	1.0	1.3	1.8	1.9	2.2	2.3	1.0	0.6
Annual	1.0	1.2	1.3	1.5	1.8	2.3	2.6	2.9	3.2	3.2	1.9	0.8

Table 24: Projected Anomalies in Monthly and Annual Temperature in the 2080s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	-1.3	-0.5	-0.2	0.4	1.1	1.8	2.7	3.2	4.5	5.0	1.2	1.3
February	0.1	1.1	1.4	2.1	3.0	3.6	5.0	5.0	5.1	5.1	3.0	1.3
March	-0.4	1.2	1.3	1.8	2.7	3.3	4.2	4.5	5.2	5.4	2.6	1.2
April	0.5	1.3	1.5	1.9	2.6	3.7	4.5	5.3	7.1	7.7	2.9	1.5
May	0.9	1.1	1.3	1.8	2.7	3.7	4.8	5.4	6.1	6.4	2.9	1.4
June	0.5	1.5	1.7	2.3	3.0	3.9	4.9	5.8	6.5	6.8	3.2	1.4
July	1.0	1.3	1.9	2.6	3.7	4.8	6.1	7.0	8.2	8.7	3.9	1.8
August	1.4	1.6	2.1	2.9	4.0	5.1	6.4	6.7	8.1	8.6	4.1	1.7
September	0.9	1.6	1.8	2.3	3.4	4.2	5.6	6.3	7.5	7.9	3.5	1.6
October	1.5	2.2	2.3	2.9	3.7	4.7	5.1	5.7	6.4	6.6	3.8	1.2
November	0.7	1.1	1.1	1.6	2.6	3.4	4.2	4.4	4.6	4.7	2.6	1.1
December	-0.3	0.3	0.6	1.2	2.1	2.9	3.5	4.1	4.5	4.7	2.1	1.2
Annual	1.0	1.4	1.5	2.0	2.7	3.8	4.5	5.1	5.5	5.6	3.0	1.4

The projected future changes in the 2050s and 2080s from the baseline period (1991 through 2020) in monthly and annual precipitation are summarized in Table 25 and Table 26. The annual precipitation in the 2050s is projected to increase by 5% from the baseline at the 50% exceedance probability. The projected highest monthly increases in the 2050s occur in the winter and August while small and negative changes are expected in June and July. The 2080s annual precipitation is projected to increase by 8% from the baseline, with the largest increases occurring in winter and August, and a small decrease in the summer months of June and July.

Table 25: Projected Anomalies in Monthly and Annual Precipitation in the 2050s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	2%	5%	8%	13%	19%	23%	35%	36%	39%	40%	19%	9%
February	-14%	-13%	-9%	-7%	1%	7%	14%	15%	23%	26%	1%	10%
March	-11%	-9%	-8%	-5%	0%	5%	8%	9%	12%	13%	0%	6%
April	-16%	-12%	-11%	-7%	-3%	2%	7%	9%	15%	18%	-2%	7%
May	-6%	0%	4%	8%	9%	15%	21%	28%	30%	30%	11%	8%
June	-26%	-25%	-21%	-18%	-9%	-3%	1%	5%	8%	9%	-9%	9%
July	-36%	-29%	-23%	-13%	-7%	-3%	0%	3%	8%	9%	-9%	10%
August	-20%	-12%	-2%	8%	25%	32%	34%	44%	46%	46%	20%	17%
September	-18%	-17%	-16%	-11%	4%	8%	14%	19%	34%	38%	1%	13%
October	-16%	-14%	-10%	-8%	-4%	-1%	4%	8%	9%	9%	-4%	6%
November	-13%	-7%	-5%	0%	5%	8%	11%	13%	14%	14%	4%	6%
December	7%	20%	22%	28%	33%	35%	38%	38%	38%	38%	31%	7%
Annual	-5%	-3%	-2%	1%	5%	9%	12%	12%	13%	14%	5%	5%

Table 26: Projected Anomalies in Monthly and Annual Precipitation in the 2080s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	-2%	9%	11%	14%	20%	27%	30%	37%	39%	40%	21%	9%
February	-19%	-12%	-7%	-2%	2%	7%	12%	13%	24%	28%	2%	9%
March	-16%	-11%	-8%	-5%	0%	8%	13%	18%	18%	18%	1%	9%
April	-16%	-11%	-9%	-7%	0%	12%	16%	17%	24%	27%	2%	11%
May	-6%	-4%	2%	8%	13%	19%	35%	40%	42%	42%	15%	12%
June	-34%	-28%	-24%	-18%	-7%	0%	5%	9%	13%	14%	-9%	12%
July	-52%	-40%	-30%	-19%	-11%	-3%	4%	5%	6%	6%	-13%	15%
August	-36%	-17%	-8%	8%	22%	29%	41%	45%	52%	54%	18%	20%
September	-25%	-18%	-15%	-4%	2%	15%	21%	27%	36%	39%	4%	15%
October	-18%	-12%	-10%	-6%	0%	9%	15%	18%	20%	21%	1%	10%
November	-8%	-2%	0%	4%	10%	16%	22%	24%	35%	38%	11%	9%
December	-2%	24%	25%	33%	36%	42%	47%	48%	53%	55%	36%	10%
Annual	-6%	-4%	-2%	2%	8%	10%	16%	19%	20%	20%	7%	7%

Comparison to Regional Projections

Within Canada there are two major sources of regional projections available: the ClimateData.ca portal (ClimateData 2022) and Canada's Changing Climate Report (Bush and Lemmen 2019). The ClimataData.ca portal provides summarized information about selected locations within Canada using a multi-model ensemble across multiple emission scenarios following IPCC AR5 RCPs (IPCC 2013). Canada's Changing Climate Report (Bush and Lemmen 2019) looks at changing climate trends across Canada and how regional changes fit within the national and global context of climate change. Both resources are used to provide context for the analysis of projections presented in Section 5.4.1 above.

Under a high emissions scenario (RCP 8.5), the ClimateData.ca portal projects a mean annual average temperature increase of 1.6ºC for the 2021 to 2050 period at the Site, 3.6ºC for the 2051 to 2080 period, and 5.1ºC for the end of the century relative to the climate normal period from 1981 to 2010 (ClimateData.ca 2022). This is consistent with the ensemble projections presented above that show increases of 1.8ºC for the 2050s (2041-2070) and 2.7ºC for the 2080s (2071-2100) relative to the modelled climate normal period from 1991 to 2020. Similarly, average annual precipitation is projected by ClimateData.ca to increase by 5% for the 2021 to 2050 period, 12% for the 2051 to 2080 period, and by 15% for the end of the century relative to climate normal period from 1951 to 1980 (ClimateData.ca 2022). These projected changes are consistent with the projections presented above considering the difference in the projection and normal periods (i.e., projection of 5% increase for the 2041 to 2070 period above compared to the 7% increase for the 2051 to 2080 period relative to normal period from 1991 to 2020).

Bush and Lemmen (2019) (Canada's Change Climate Report) does not include trends specifically for the Mine area; however, projections indicate an increase in both mean annual temperature and precipitation, with northern Canada expected to experience larger increases. Under a low emissions scenario (RCP 2.6) temperature is projected to increase by 1.8°C and by more than 6°C under a high emissions scenario (RCP 8.5) by the end of the century. Annual mean precipitation is projected to increase by 7% under a low emissions scenario (RCP 2.6) and by 24% under a high emissions scenario (RCP 8.5) by the end of the century (Bush and Lemmen 2019).

5.4.2 Future Relative Humidity Projections

Annual Projections

Comparison of the future mean annual relative humidity projections from all GCMs for the Mine area and 2050s and 2080s projection periods are shown in Table 27 and Figure 30, and Table 28 and Figure 31, respectively. Projections for the 2050s period shows little variation compared to the baseline period (1991 to 2020) for all climate models and all SSPs with an anomaly range of -2% to 2%. Projections for the 2080s period shows similar pattern to the 2050s period (-1% to 2% anomaly range) for SSP1-2.6 and SSP2-4.5, and greater variation for higher emissions scenarios SSP3-7.0 and SSP5-8.5 (-2% to 5% anomaly range).

Table 27: Projected Mean Annual Relative Humidity for all GCMs (2050s)

Climate Model	Relative Humidity Anomaly (%)			
	Scenario SSP1-2.6	Scenario SSP2-4.5	Scenario SSP3-7.0	Scenario SSP5-8.5
ACCESS-ESM1-5	1.0	2.0	2.0	2.0
BCC-CSM2-MR	0.0	0.0	0.0	1.0
CNRM-ESM2-1	0.0	0.0	0.0	0.0
GFDL-ESM4	0.0	-1.0	-2.0	-1.0
GISS-E2-1-G	1.0	0.0	1.0	1.0
MIROC6	1.0	1.0	1.0	1.0
MPI-ESM1-2-HR	-1.0	-1.0	-1.0	1.0
MRI-ESM2-0	0.0	0.0	-1.0	-1.0
Baseline	0.0	0.0	0.0	0.0
Anomaly Range	-1 to 1	-1 to 2	-2 to 2	-1 to 2

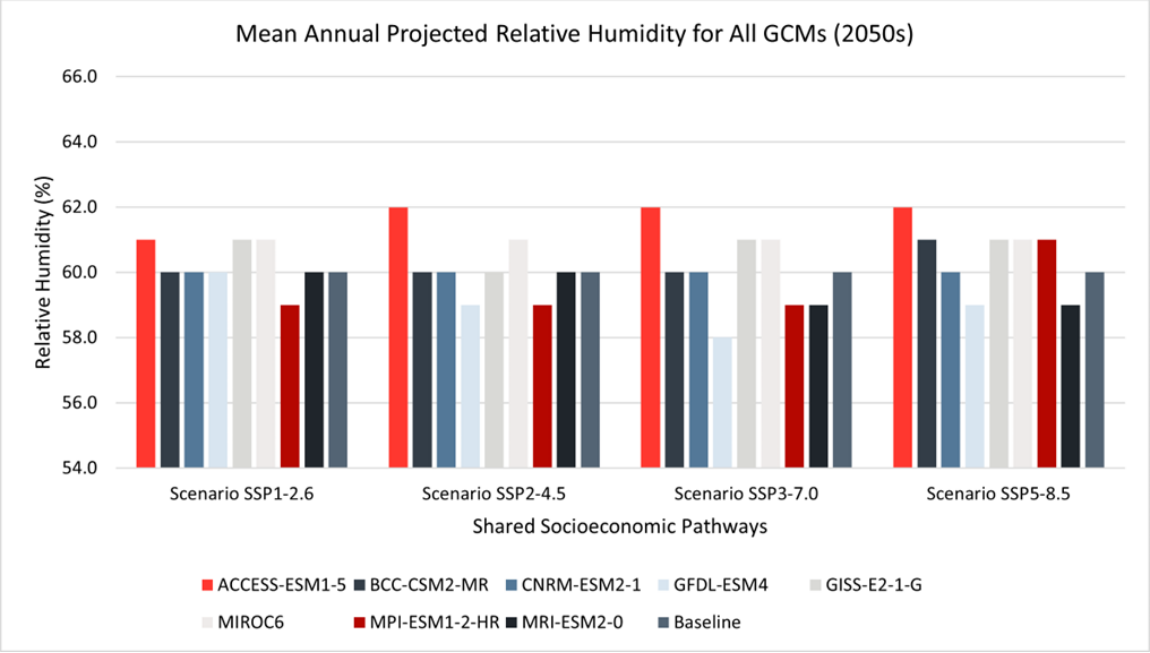


Figure 30: Projected Mean Annual Relative Humidity for all GCMs (2050s)

Table 28: Projected Mean Annual Relative Humidity for all GCMs (2080s)

Climate Model	Relative Humidity Anomaly (%)			
	Scenario SSP1-2.6	Scenario SSP2-4.5	Scenario SSP3-7.0	Scenario SSP5-8.5
ACCESS-ESM1-5	2.0	2.0	4.0	4.0
BCC-CSM2-MR	1.0	1.0	0.0	2.0
CNRM-ESM2-1	0.0	1.0	1.0	1.0
GFDL-ESM4	0.0	-1.0	-2.0	-1.0
GISS-E2-1-G	1.0	1.0	2.0	1.0
MIROC6	1.0	1.0	1.0	2.0
MPI-ESM1-2-HR	-1.0	-1.0	-1.0	5.0
MRI-ESM2-0	0.0	-1.0	-1.0	-1.0
Baseline	0.0	0.0	0.0	0.0
Anomaly Range	-1 to 2	-1 to 2	-2 to 4	-1 to 5

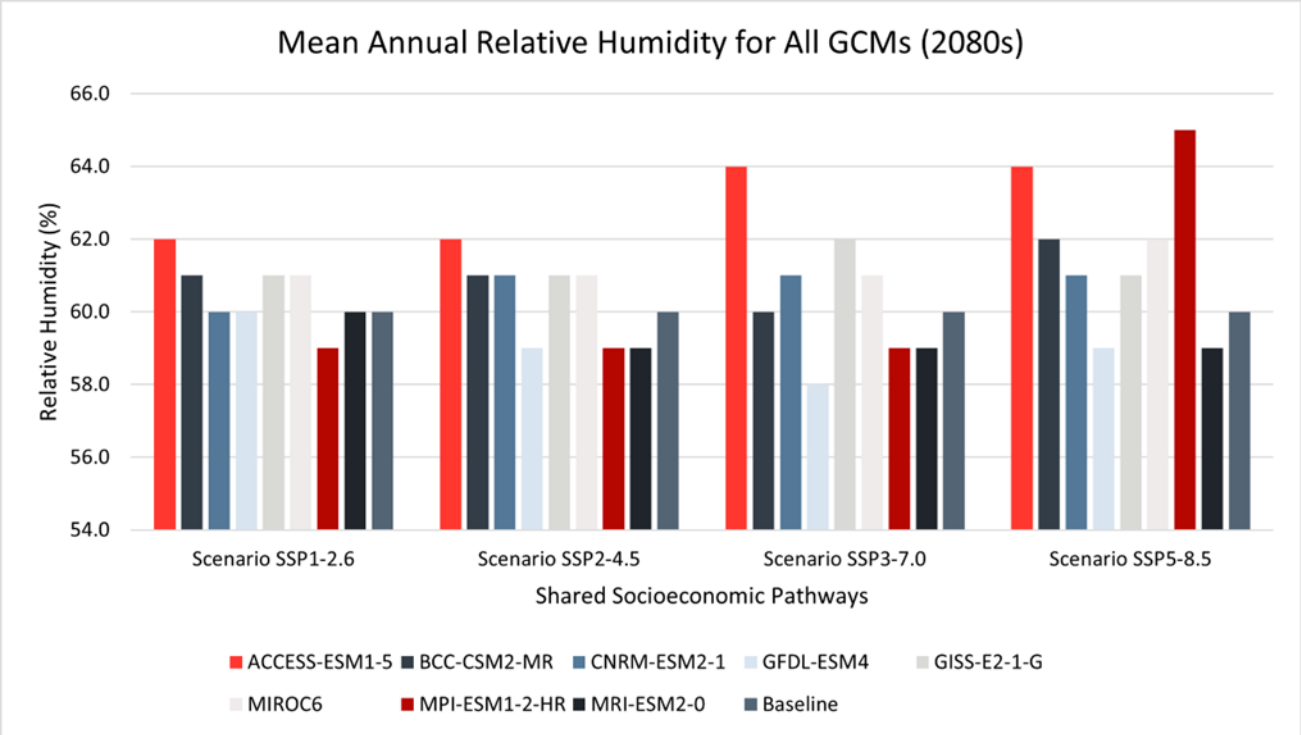


Figure 31: Projected Mean Annual Relative Humidity for all GCMs (2080s)

Monthly Projections

Figure 32 and Figure 33 depict the projected anomalies in monthly median relative humidity at the Site for the 2050s and 2080s, respectively. The figures also show a dashed line which represents the median of all the modelled projections. The dotted lines in the figures represent the spread between the 5th percentile and the 95th percentile of the ensemble. The figures show the projected seasonal pattern with increases in relative humidity for spring and summer months and decreases in relative humidity for winter months, with no change to the annual average. The 5th and 95th percentiles of the 2050s ensembles range from a decrease of -1.0% to an increase of 2.2% on average. The 5th and 95th percentile variations follow the projected median throughout the months of the year, with no discernible seasonal pattern. The 5th and 95th percentiles of the 2080s ensemble, range from a decrease of -1.0% to an increase of 4.0% on average. The 5th and 95th percentile variations are similar throughout the winter months of the year with larger projected uncertainty in the spring and summer months.

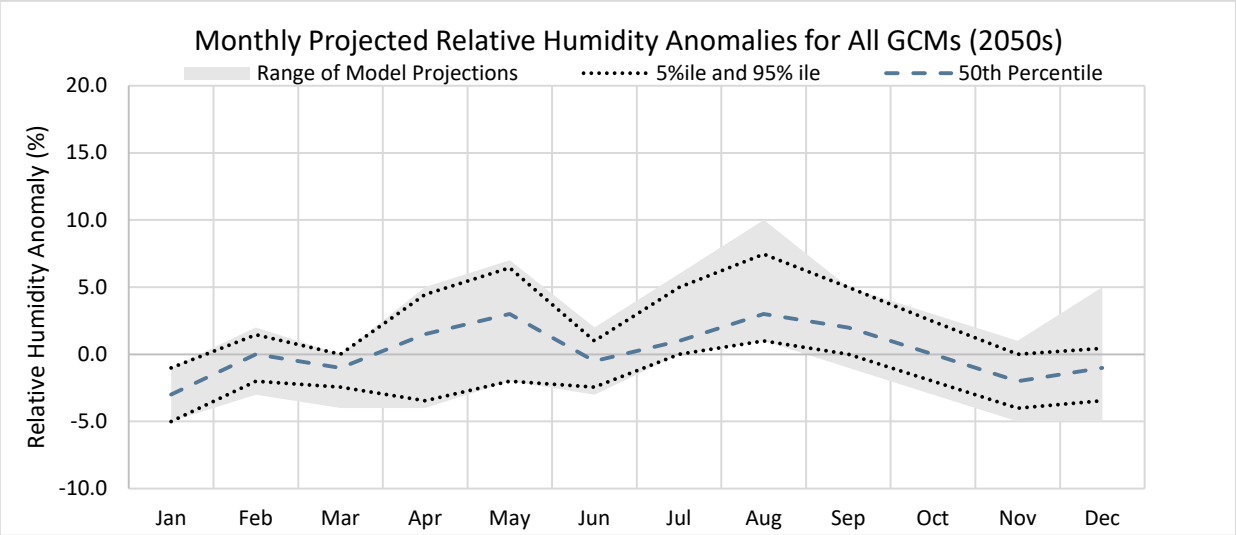


Figure 32: Monthly Projected Relative Humidity Anomalies for Mount Polley Mine Area (2050s)

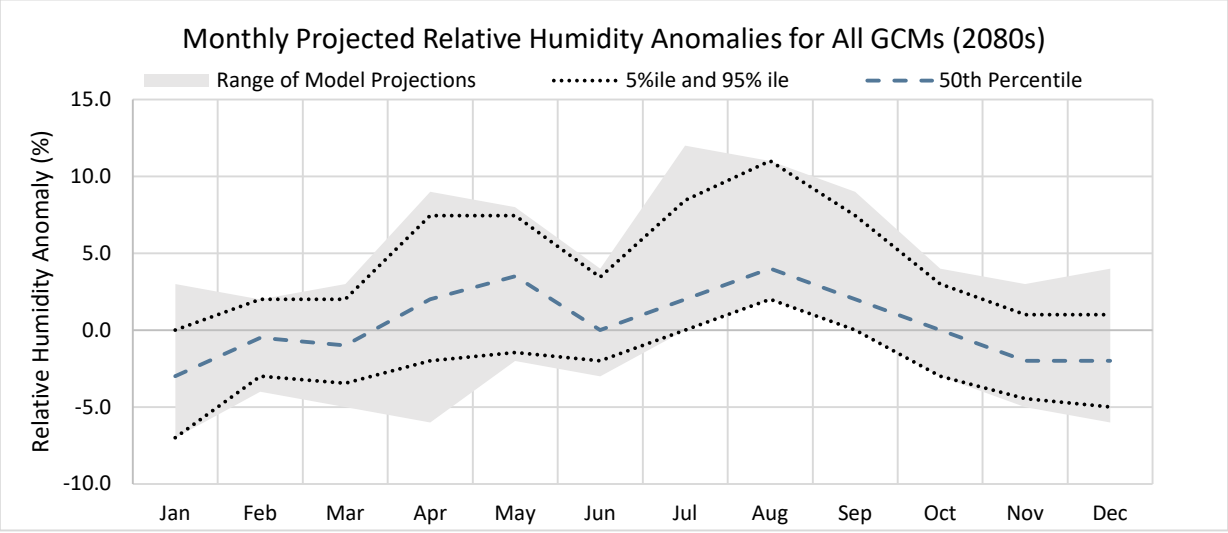


Figure 33: Monthly Projected Relative Humidity Anomalies for Mount Polley Mine Area (2080s)

Summary of Annual and Monthly Projections

The projected future changes in the 2050s and 2080s from the baseline period (1991 through 2020) in monthly and annual relative humidity are summarized in Table 29 and Table 30. In the 2050s, at 50% exceedance probability, the annual relative humidity is projected to remain the same as baseline conditions with monthly relative humidity increasing in spring and summer months (up to 3% absolute increase in May and August) and decreasing in fall and winter months (up to -3% absolute decrease in January). In the 2080s, at 50% exceedance probability, the annual relative humidity is projected to remain the same as baseline conditions with monthly relative humidity increasing in spring and summer months (up to 4% absolute increase in August) and decreasing in fall and winter months (up to -3% in January). There is greater variability in the range of relative humidity in the summer months (Figure 33).

Table 29: Projected Anomalies in Monthly and Annual Relative Humidity in the 2050s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	-5%	-5%	-5%	-4%	-3%	-1%	-1%	-1%	-1%	-1%	-3%	1%
February	-3%	-2%	-2%	-1%	0%	1%	1%	1%	2%	2%	0%	1%
March	-4%	-2%	-2%	-2%	-1%	0%	0%	0%	0%	0%	-1%	1%
April	-4%	-3%	-2%	0%	2%	3%	4%	4%	5%	5%	1%	2%
May	-2%	-2%	-1%	2%	3%	4%	6%	6%	7%	7%	3%	2%
June	-3%	-2%	-2%	-1%	-1%	1%	1%	1%	2%	2%	0%	1%
July	0%	0%	0%	1%	1%	2%	4%	5%	6%	6%	2%	2%
August	1%	1%	1%	2%	3%	5%	7%	7%	9%	10%	4%	2%
September	-1%	0%	1%	1%	2%	3%	4%	5%	5%	5%	2%	2%
October	-3%	-2%	-2%	-1%	0%	1%	2%	2%	3%	3%	0%	1%
November	-5%	-4%	-4%	-3%	-2%	-1%	0%	0%	1%	1%	-2%	2%
December	-5%	-3%	-3%	-3%	-1%	0%	0%	0%	4%	5%	-1%	2%
Annual	-2%	-1%	-1%	0%	0%	1%	1%	2%	2%	2%	0%	1%

Table 30: Projected Anomalies in Monthly and Annual Relative Humidity in the 2080s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	-7%	-7%	-6%	-5%	-3%	-1%	0%	0%	2%	3%	-3%	2%
February	-4%	-3%	-3%	-1%	-1%	1%	1%	2%	2%	2%	0%	2%
March	-5%	-3%	-2%	-2%	-1%	0%	1%	2%	3%	3%	-1%	2%
April	-6%	-2%	-2%	1%	2%	3%	5%	7%	9%	9%	2%	3%
May	-2%	-1%	0%	2%	4%	5%	7%	7%	8%	8%	3%	3%
June	-3%	-2%	-2%	-1%	0%	2%	3%	3%	4%	4%	0%	2%
July	0%	0%	0%	1%	2%	4%	7%	8%	11%	12%	3%	3%
August	2%	2%	2%	2%	4%	6%	9%	11%	11%	11%	5%	3%
September	0%	0%	1%	1%	2%	3%	7%	7%	9%	9%	3%	2%
October	-3%	-3%	-2%	-1%	0%	1%	3%	3%	4%	4%	0%	2%
November	-5%	-4%	-4%	-3%	-2%	0%	0%	1%	2%	3%	-2%	2%
December	-6%	-5%	-5%	-4%	-2%	0%	1%	1%	3%	4%	-2%	2%
Annual	-2%	-1%	-1%	-1%	1%	1%	2%	4%	5%	5%	1%	2%

5.4.3 Future Solar Radiation Projections

Annual Projections

Comparison of the future mean annual solar radiation projections for the Mine area for the 2050s and 2080s projection periods are shown in Table 31 and Figure 34, and Table 32 and Figure 35, respectively. Baseline solar radiation for the Site is from ECCC Williams Lake climate station for the period from 1961 through 2001 as modelled baseline solar radiation for the Site is not available. Projections for the 2050s period shows a mean annual solar radiation increase of 4.3% from baseline, with a range of 2.1% to 11.3% increase from baseline across all climate models and SSPs. Projections for the 2080s period shows a mean annual solar radiation increase of 5% from baseline, with a range of 1.2% to 12.2% increase from baseline across all climate models and SSPs.

Table 31: Projected Mean Annual Solar Radiation for all GCMs (2050s)

Climate Model	Solar Radiation Anomaly			
	Scenario SSP1-2.6	Scenario SSP2-4.5	Scenario SSP3-7.0	Scenario SSP5-8.5
ACCESS-ESM1-5	7.1%	6.3%	7.1%	7.1%
BCC-CSM2-MR	7.1%	7.1%	9.7%	11.3%
CNRM-ESM2-1	3.7%	3.7%	2.9%	2.9%
GFDL-ESM4	4.6%	4.6%	2.9%	2.9%
GISS-E2-1-G	4.6%	2.1%	2.1%	2.1%
MIROC6	4.6%	2.1%	2.1%	2.1%
MPI-ESM1-2-HR	2.1%	2.1%	2.9%	2.1%
MRI-ESM2-0	4.6%	4.6%	2.9%	4.6%
Baseline[a]	0%	0%	0%	0%
Anomaly Range	2.1% to 7.1%	2.1% to 7.1%	2.1% to 9.7%	2.1% to 11.3%

a) Baseline solar radiation for the Site is from ECCC Williams Lake climate station for a period from 1961 through 2001.

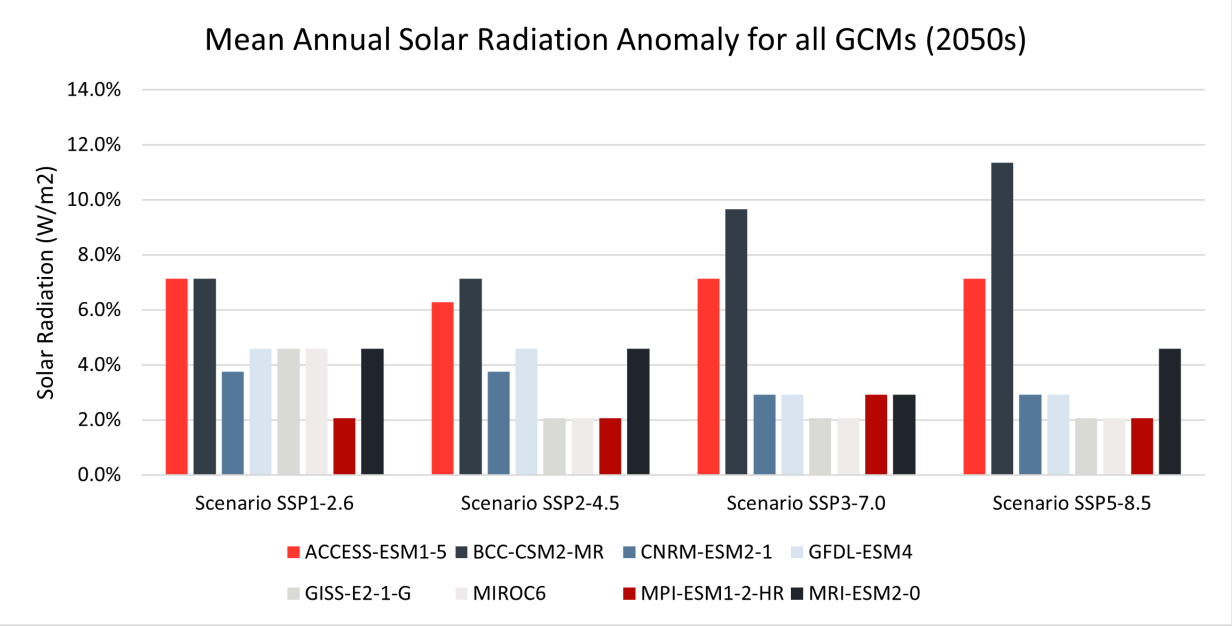


Figure 34: Projected Mean Annual Solar Radiation Anomaly for all GCMs (2050s)

Table 32: Projected Mean Annual Solar Radiation for all GCMs (2080s)

Climate Model	Solar Radiation Anomaly			
	Scenario SSP1-2.6	Scenario SSP2-4.5	Scenario SSP3-7.0	Scenario SSP5-8.5
ACCESS-ESM1-5	7.1%	7.1%	8.0%	8.0%
BCC-CSM2-MR	9.7%	10.5%	13.9%	12.2%
CNRM-ESM2-1	3.7%	2.1%	2.9%	0.4%
GFDL-ESM4	5.4%	4.6%	6.3%	2.1%
GISS-E2-1-G	5.4%	2.9%	2.9%	0.4%
MIROC6	4.6%	2.9%	2.1%	1.2%
MPI-ESM1-2-HR	2.9%	1.2%	2.9%	1.2%
MRI-ESM2-0	7.1%	4.6%	3.7%	2.9%
Baseline[a]	0%	0%	0%	0%
Anomaly Range	2.9% to 9.7	1.2% to 10.5%	2.1% to 13.9%	0.4% to 12.2%

a) Baseline solar radiation for the Site is from ECCC Williams Lake climate station for a period from 1961 through 2001.

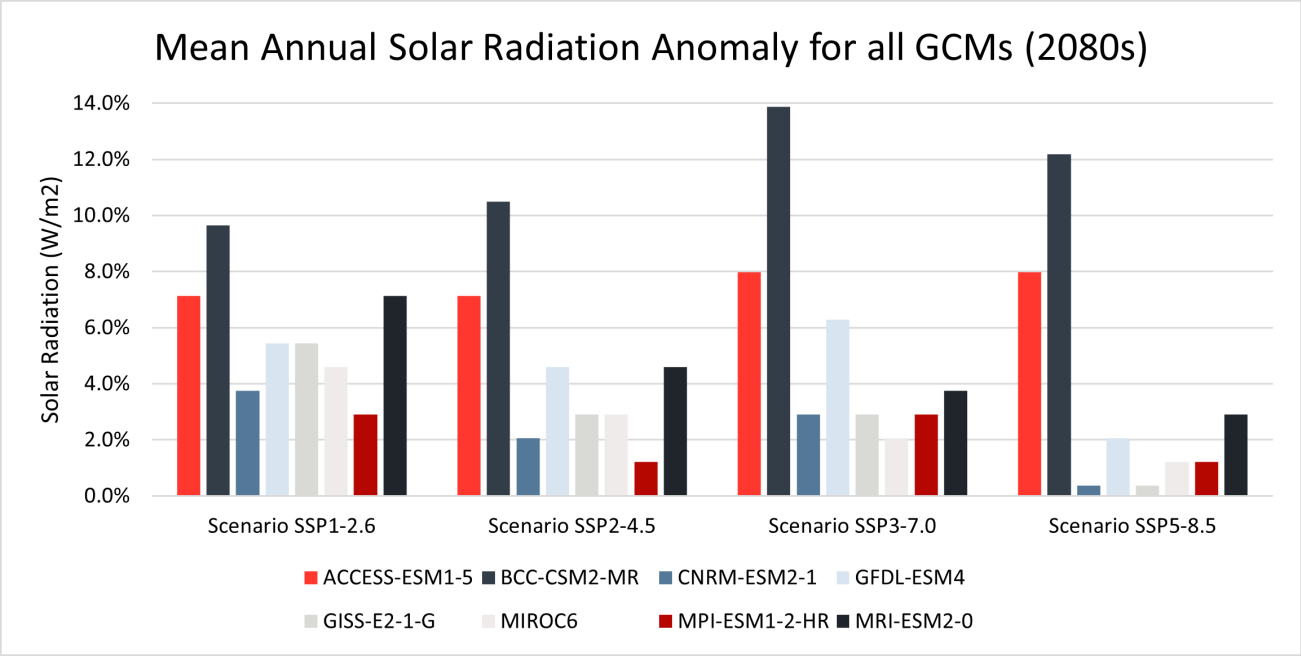


Figure 35: Projected Mean Annual Solar Radiation Anomaly for all GCMs (2080s)

Monthly Projections

Figure 36 and Figure 37 depict the projected anomalies in monthly solar radiation at the Site for the 2050s and 2080s, respectively. The figures also show a dashed line which represents the median of all the modelled projections. The dotted lines in the figures represents the spread between the 5th percentile and 95th percentile of the ensemble. The figures show projected increases in solar radiation for all months for the 2050s and the 2080s except for April, May, and October. For the 2050s (Figure 36) the projected increase in the solar radiation (dashed line) is greater in winter months and less in the summer months, with an annual average increase of 5.1 W/m^2. The 5th and 95th percentiles of the 2050s ensembles range from 2.8 W/m^2 to 11.3 W/m^2 on average with the largest variation occurring in the summer months. The 95th percentile shows a larger variation during the summer months, with projected increases of nearly 21.7 W/m^2.

The projected increase in the mean solar radiation for the 2080s (Figure 37) show a similar pattern to the 2050s period. The projected increase (dotted line) is greater in winter months and less in summer months, with an average annual increase of 5.1 W/m^2. The 5th and 95th percentiles of the 2080s ensemble range from 1.2 W/m^2 to 15.4 W/m2 on average. The 95th percentile shows a larger variation throughout the summer months, with projected increases of nearly 41.2 W/m^2. There is greater uncertainty in the projected solar radiation in July and August.

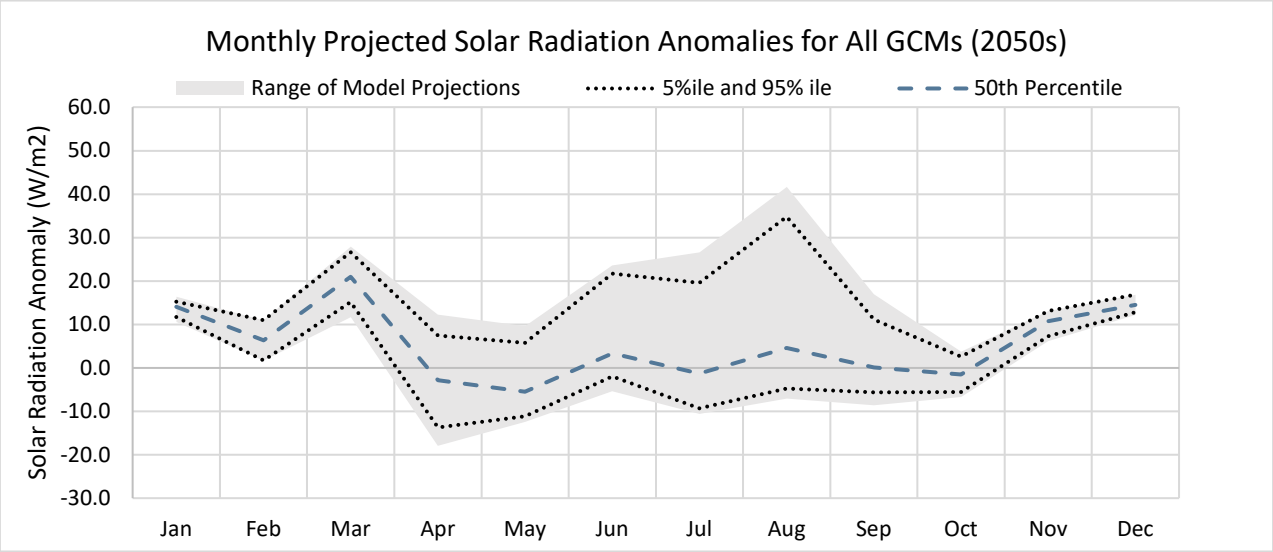


Figure 36: Projected Monthly Solar Radiation Anomalies for Mount Polley Mine Area (2050s)

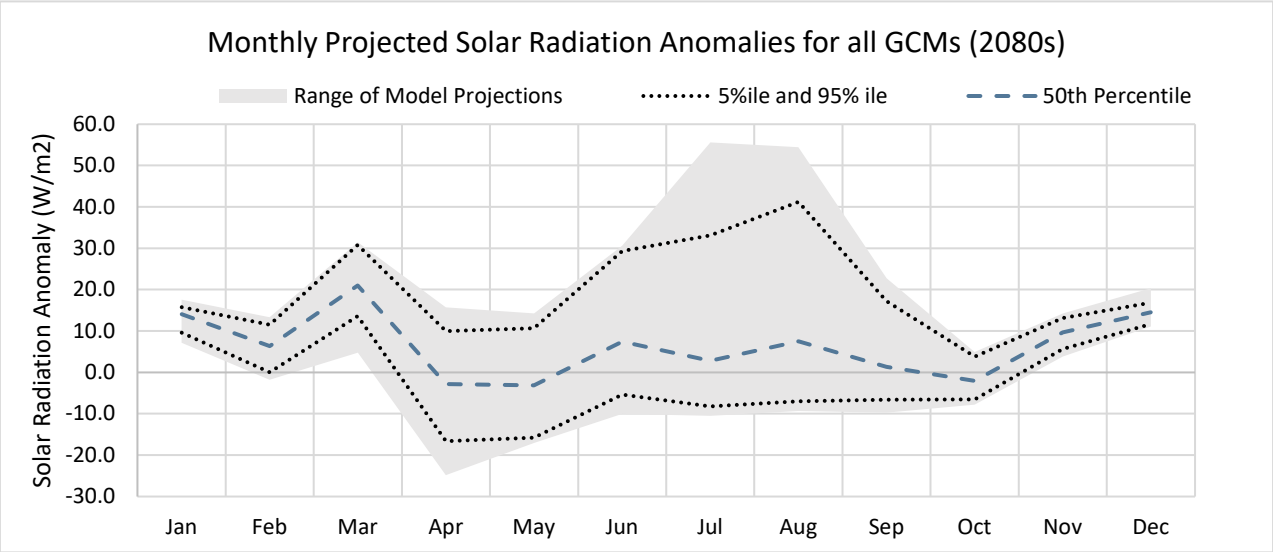


Figure 37: Projected Monthly Solar Radiation Anomalies for Mount Polley Mine Area (2080s)

Summary of Annual and Monthly Projections

The projected future changes in the 2050s and 2080s from the baseline period (Williams Lake 1961 through 2001) in monthly and annual solar radiation are summarized in Table 33 and Table 34. In the 2050s and 2080s, at 50% exceedance probability, the median annual solar radiation is projected to increase by 5.1 W/m^2. Monthly solar radiation is projected to increase for all months except April, May, and October.

Table 33: Projected Anomalies in Monthly and Annual Solar Radiation in the 2050s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	10.6	11.8	12.9	13.8	14.1	15.2	15.2	15.2	16.0	16.4	14.0	1.2
February	1.7	1.7	2.9	5.2	6.3	8.7	10.9	11.0	11.0	11.0	6.7	2.8
March	11.7	15.2	16.5	18.4	21.0	23.3	25.5	26.7	27.9	27.9	21.0	3.7
April	-17.9	-13.7	-8.6	-4.0	-2.8	1.2	4.0	7.5	11.2	12.2	-2.0	6.3
May	-12.4	-11.2	-10.1	-7.8	-5.5	-0.8	1.3	5.8	9.6	9.6	-4.4	5.3
June	-5.4	-1.9	-1.9	0.4	3.3	9.7	17.8	21.7	23.6	23.6	6.1	7.6
July	-10.5	-9.3	-8.2	-4.2	-1.3	4.2	11.3	19.6	26.6	26.6	1.2	9.1
August	-7.0	-4.7	-4.7	-0.1	4.6	10.4	27.3	34.8	41.3	41.7	7.7	12.1
September	-8.6	-5.6	-3.9	-2.8	0.1	4.5	8.7	11.1	15.1	16.9	1.1	5.8
October	-6.7	-5.5	-4.4	-2.0	-1.5	0.6	2.5	2.6	3.4	3.8	-1.0	2.6
November	6.2	7.3	7.4	9.6	10.8	10.8	12.0	13.1	13.1	13.1	10.2	1.7
December	12.2	12.8	13.4	14.5	14.5	15.7	16.7	16.8	16.8	16.8	14.8	1.2
Annual	2.8	2.8	2.8	2.8	5.1	6.9	9.8	11.3	14.8	15.6	5.9	3.3

Table 34: Projected Anomalies in Monthly and Annual Solar Radiation in the 2080s from Baseline

Month	Min	Percentiles								Max	Mean	Std. Dev.
		5%	10%	25%	50%	75%	90%	95%	99%			
January	7.1	9.5	10.6	12.6	14.1	14.4	15.2	15.8	17.2	17.6	13.3	2.2
February	-1.8	0.0	1.7	2.9	6.3	8.7	11.0	11.5	12.9	13.3	6.1	3.7
March	4.7	13.6	15.2	17.5	21.0	24.5	27.7	30.8	31.4	31.4	20.5	5.7
April	-24.9	-16.6	-15.4	-6.9	-2.8	3.3	8.7	9.9	13.9	15.7	-2.8	9.1
May	-17.1	-15.8	-14.5	-10.7	-3.1	-0.8	4.9	10.7	13.5	14.3	-4.0	8.0
June	-10.0	-5.4	-1.9	0.4	7.4	15.5	23.5	29.3	30.6	30.6	8.2	10.6
July	-10.5	-8.2	-5.9	-3.6	2.8	11.5	18.3	33.1	52.0	55.6	6.2	14.3
August	-9.4	-7.0	-0.1	2.2	7.5	12.7	32.8	41.2	51.9	54.4	10.3	14.2
September	-9.7	-6.7	-5.1	-3.9	1.3	5.6	9.8	17.2	22.0	22.7	2.0	7.5
October	-7.8	-6.6	-5.5	-4.4	-2.0	0.6	2.6	3.8	4.6	4.9	-1.6	3.3
November	3.8	5.6	7.3	8.5	9.6	10.8	12.0	13.1	13.9	14.3	9.4	2.3
December	11.0	11.7	12.2	13.4	14.5	15.7	15.7	16.8	19.3	20.3	14.3	1.9
Annual	0.5	1.2	1.7	3.7	5.1	9.8	13.0	15.4	18.3	19.0	6.6	4.7

5.4.4 Future Evaporation Projections

Evaporation and evapotranspiration projections are not available from ClimateBC or ClimateData.ca. However, evaporation and evapotranspiration are likely to change as dependent variables change, in particular air temperature. The extent of the change will depend on the climate change scenario.

5.4.5 Snow Cover Properties Projections

Potential changes in winter air temperature will likely lead to changes in snow cover properties and the annual SWE available for freshet. ClimateBC does not project snow cover and instead projects precipitation-as-snow (PAS) for future climate periods. PAS projections are indicative of the trends in total snow cover and SWE available to contribute to freshet flows, with less PAS resulting in less SWE. Table 35 summarizes ClimateBC projected PAS for future normal periods relative to the modelled baseline period (1991 through 2020) and indicates an overall decrease in PAS in the future. At 50% exceedance probability, the annual PAS is projected to decrease by 30 mm and 59 mm on average for the 2050s and 2080s, respectively.

Climate change model data published for the province of BC by ECCC (2019) project snow depth reduction relative to the 1986 to 2005 reference normal period using CMIP5 RCP (Table 36). At 50% exceedance, the snow cover depth is projected to decrease by 83 mm and 117 mm on average for the 2046-2065 and 2081-2100 normal periods, respectively.

Table 35: Projected Annual Precipitation-As-Snow Anomaly for the Mount Polley Mine Area

Shared Socioeconomic Pathway	Normal Period	Precipitation-as-Snow Anomaly Percentiles (mm)		
		25%	50%	75%
SSP1-2.6	2011-2040	-7	-4	2
	2041-2070	-23	-17	-13
	2071-2100	-25	-21	-18
SSP2-4.5	2011-2040	-11	-5	2
	2041-2070	-32	-27	-18
	2071-2100	-50	-47	-38
SSP3-7.0	2011-2040	-5	-2	2
	2041-2070	-41	-33	-16
	2071-2100	-78	-72	-55
SSP5-8.5	2011-2040	-6	-1	3
	2041-2070	-50	-43	-29
	2071-2100	-110	-95	-80
Average	2011-2040	-7	-3	2
	2041-2070	-36	-30	-19
	2071-2100	-66	-59	-48

Table 36: Snow Depth Change Relative to 1986 to 2005 Predictions for British Columbia (ECCC 2019)

Representative concentration Pathway	Normal Period	Snow Depth Change (mm)		
		25%	50%	75%
RCP2.6	2016-2035	-46.5	-41.4	-12.7
	2046-2065	-67.5	-61.3	-17.4
	2081-2100	-72.6	-68.4	-21.3
RCP4.5	2016-2035	-43.8	-39	-10
	2046-2065	-80.4	-80.5	-33.4
	2081-2100	-109.1	-105.4	-37
RCP8.5	2016-2035	-52.8	-50.1	-14.1
	2046-2065	-101	-105.7	-35.4
	2081-2100	-159.4	-176.4	-58.9

6.0 CONCLUSION AND RECOMMENDATIONS

This report provides the five-year update of climate baseline at Mount Polley Mine Site as per Requirement 2.1 of the Global Industry Standards on Tailings Management (GISTM). The purpose of the update is to extend the existing long-term climate data for the Site using local and regional data collected in the last five years. The last climate baseline update was carried out by WSP Golder in 2016.

This report provides an updated climate baseline for precipitation, air temperature, relative humidity, solar radiation, evaporation, wind speed and direction, and snow depths, and includes updated climate change projections for the Site. Overall, trends in these climate parameters at Mount Polley are similar to those at Environment and Climate Change Canada (ECCC) regional stations. Future climate projections for Mount Polley show that the future climate at the Site would likely be warmer and wetter, with larger variations throughout the months. The greatest variation would likely be in summer months with a projected summer temperature increase of 7°C and less summer precipitation by the year 2100. Annual temperature is projected to increase by 2.7°C and annual precipitation is projected to increase by 8% from the baseline by 2100.

The updated climate parameters and extended long-term climate dataset are deemed to be representative of the climate at the Site and are suitable for support of design and modelling activities. It is recommended that MPMC continue to monitor and record climate data, and that the climate parameters be updated a minimum of every five years to encompass local and regional data collected, and to reflect uncertainties due to climate change.

Signature Page

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REFERENCES

Araya-Osses, D., Casanueva, A., Román-Figueroa, C. et al. 2020. Climate change projections of temperature and precipitation in Chile based on statistical downscaling. Clim Dyn 54, 4309–4330 (2020). https://doi.org/10.1007/s00382-020-05231-4

Brunner L., A. G. Pendergrass, F. Lehner, A. L. Merrifield, R. Lorenz, and R. Knutti. 2020. Reduced Global Warming from CIMP6 Projections when Weighting Models by Performance and Independence. Earth Syst. Dynam., 11, 995-1012. https://doi.org/10.5194/esd-11-995-2020.

Bush, E. and Lemmen, D. S., editors. 2019. Canada's Changing Climate Report; Government of Canada, Ottawa, ON. 444 p.

ClimateData.ca. 2022. Download Station Data and Climate Models. Available at https://climatedata.ca. Accessed on 26 April 2022.

Daly, C; Halbleib, M; Smith, J. I; Gibson, W. P; Doggett, M. K; Taylor, G. H; Curtis, J, 2008. Physiographically sensitive mapping of temperature and precipitation across the conterminous United States. Int. J. Climatol., 28, 2031–2064.

ECCC (Environment and Climate Change Canada). 2022a. Historical Climate Data. http://climate.weather.gc.ca. Accessed 2 February 2022.

ECCC. 2022b. "RE: Barkerville Data- Station 1090660" by Electronic Mail from ec.climatouest-climatewest.ec@canada.ca on 9 February 2022.

ECCC. 2018. Received by Electronic Mail on 23 April 2018.

ECCC. 2022c. CMIP6 and Shared Socio-economic Pathways Overview. Available at https://climate-scenarios.canada.ca/?page=cmip6-overview-notes. Accessed on 22 April 2022.

ECCC. 2019. Canadian Climate Data and Scenarios – CMIP5. Modified 24 July 2019. http://climate-scenarios.canada.ca/files/cmip5/cmip5-plots/cmip5_ensembles_canada_summary.pdf. Accessed 3 May 2022.

ICMM (International Council on Mining and Metals). 2020. Global Industry Standard on Tailings Management. August 2020.

IPCC (Intergovernmental Panel on Climate Change). 2021. Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate. Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

IPCC. 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.

Hausfather, Z., K. Marvel, G. A. Schmidt, J. W. Nielsen-Gammon, and M. Zelinka. 2022. Climate simulations: recognize the “hot model” problem. Nature 605:26–29.

Holland, D. D. (1976). Landforms of British Columbia – a physiographic outline. Bulletin No. 48, B.C. Department of Mines and Petroleum Resources. Queen’s Printer. Victoria, B.C. 138 p. + map insert.

Morton F. I. 1983. Operational Estimates of Areal Evapotranspiration and their Significance to the Science and Practice of Hydrology. Journal of Hydrology 66: 1-76.

Golder. 2016. Mount Polley Mining Corporation. Mount Polley Mine Long Term Water Management Plan. Permit Amendment Application under the Environmental Management Act: Technical Assessment Report. Report submitted to Luke Moger, Mount Polley Mining Corporation, Golder Doc. No. 1411734-162-R-Rev0-16000. 17 October 2016Miller, J. F. 1964. Two- to Ten-Day Precipitation for Return Periods of 2 to 100 Years in the Contiguous United States. Engineering Division, Soil Conservation Service, United States Department of Agriculture.

Thornthwaite C. W. 1948. An Approach toward a Rational Classification of Climate. Geographical Review 38: 55-94.

UBC (University of British Columbia). 2022. ClimateBC Software version 7.30. https://climatebc.ca/. Accessed on 9 May 2022.

Wang T, Hamann A, Spittlehouse D, Carroll C. 2016. Locally Downscaled and Spatially Customizable Climate Data for Historical and Future Periods for North America. PLoS ONE 11(6): e0156720. doi:10.1371/journal.pone.0156720

WMO (World Meteorological Organization). 2018. Guide to Climatological Practices (WMO-No. 100). 2018 edition. Geneva.

WMO. 2009. Manual Estimation of Probable Maximum Precipitation (PMP) (WMO-No. 1045). Geneva.

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APPENDIX 3-2: CLIMATE CHANGE MEMO

TECHNICAL MEMORANDUM

DATE June 6, 2025 **Reference No.** CA0020527.4505-063-TM-Rev1-31153

TO Matt O'Leary
Mount Polley Mining Corporation

CC Lee Nikl, Jesse Maddaloni, and German Pizarro-Sala

FROM Patrick Breach and Janya Kelly **EMAIL patrick.breach@wsp.com; janya.kelly@wsp.com**

SUPPLEMENTARY CLIMATE CHANGE INFORMATION FOR MOUNT POLLEY MINE SITE

This technical memorandum provides complementary analyses for key climate statistics to support water management planning and design activities at Mount Polley Mine site (WSP 2022), focusing on extreme precipitation events under future climate conditions. The WSP Canada Inc. (WSP), (2022) climate study remains valid to characterize baseline climate conditions at the Mount Polley Mine site. This memo supplements the 2022 climate baseline with projected change for future climate, intended to be applied to the corresponding baseline climate statistics for the site. The information provided here is intended to support climate change considerations for closure design activities specific to the Mount Polley Mine site.

1.0 INTRODUCTION

Climate change has the potential to change future precipitation and temperature regimes that are important inputs for mining operations such as tailings management and the design of surface water infrastructure. For example, increasing magnitude and frequency of precipitation extremes, along with increasing temperatures may impact snowmelt and runoff inputs for site water management. To assess climate change impacts at the site-level, an understanding of baseline climate is important, as baseline conditions provide a reference point for applying estimates of projected changes in climate, generally obtained through Global Climate Models (GCMs). In WSP (2022) the baseline climate conditions are established by bringing together a set of regional climate stations to represent the site, which is used in this memo to provide current climate statistics.

In this memo, downscaled GCMs are used to estimate projected changes in climate at the site-level. Recognizing the inherent uncertainty with projections, the results in this report are based on multiple projections from multiple models and scenarios, or a multi-model ensemble, as recommended by the Intergovernmental Panel on Climate Change (IPCC) (IPCC 2021 p.221). The projections across the multi-model ensemble are summarized in terms of percentiles where the 50th percentile represents the median value and higher percentiles (e.g., 90th and 95th percentiles), represent extreme projections for the site. As climate science is continuously improved and new models and scenarios for future climate are released, the provided information acts as a basis for continual improvement at the site.

The following sections are provided in this memo to support considerations for climate change at the Mount Polley Mine site:

- Guidance on using the results including the selection of climate change projection percentiles for screening and design purposes (Section 2).
- A review of the methodology used to characterize the current and future climate conditions at the site (Section 3). Detailed descriptions of the data sources and approaches used are provided in Attachment 1.
- A summary of the current and future projections for annual and monthly temperature and precipitation, probable maximum precipitation and extreme precipitation statistics. Additional future climate statistics not provided in the report for extreme precipitation are provided in Attachment 2.

2.0 USING THE RESULTS

Uncertainties in climate projections arise from natural variability in the climate system, climate model structure, and assumed trajectories of greenhouse gas emissions. The interactions among the climate system's components drive cycles and fluctuations in atmospheric circulation, presenting a challenge for climate models to reliably simulate these natural variations. Although climate models are advanced, they are simplifications of reality and differ in their outputs due to variations in how processes are represented and the resolution of data. The largest source of uncertainty comes from future emissions scenarios, as there is a wide range of greenhouse gas concentrations that are possible depending on how we develop and mitigate our impact on climate.

Since no one model or climate scenario can be viewed as accurate, the IPCC recommends that climate change assessments use as many models and climate scenarios as possible, or a "multi-model ensemble" (IPCC 2021, p.221). For this reason, the multi-model ensemble approach is used to delineate the probable range of results and better capture the actual outcome (an inherent unknown). For example:

- The projections at the 50th percentile level represent the ensemble median projections. For a given climate statistic, 50% of the ensemble projections are smaller than the 50th percentile value.
- 95% of the ensemble projections are smaller than the 95th percentile value.

Percentiles for each climate projection are provided directly in the report, otherwise the set of percentiles are provided in Attachment 2.

When considering the impact of future projected climate, the level of conservatism can be adjusted by using the desired percentile (e.g., changing the percentile to a higher percentile to capture a lower risk tolerance) and future emissions scenario. The selection of future projections for site-specific applications should be based on the balance between the conservatism of the inputs into the design parameters and the consequential risks. Selecting values to use for the design basis from this report should consider the following key points to assess whether additional conservatism is necessary to account for uncertainty in future climate:

- Time period – depending on the infrastructure life span, the appropriate time period should be selected, while selecting a more conservative percentile as needed to account for continual changes in climate beyond the selected period. For example, if the closure period extends beyond 2100 (the limit of available climate projections) and if no adaptation measures are possible or practical, a more conservative (higher) percentile may be selected.

- Associated level of risk – if the infrastructure can be categorized as critical or high-risk infrastructure and if no adaptation measures are possible or practical, a more conservative percentile may be selected.
- Adaptive management capacity – Infrastructure may be adapted over time to changing climate. For example, additional pumping capacity could be added, or a secondary spillway channel could be added to manage additional water volumes. If this is the case, added conservatism may not be necessary for initial design, provided that adaptive management capacities are sufficient to accommodate more conservative percentiles of the climate projections.

This work should be evaluated and potentially updated as new climate science is developed, for example after the release of the latest assessment report by the IPCC. If there are additional questions regarding the use of the projections, please contact the authors.

3.0 APPROACH AND METHODOLOGY

The climate variables assessed in this report include annual and monthly temperature and precipitation, probable maximum precipitation, and extreme precipitation statistics. The following sections provide a high-level overview of the methodologies followed to develop the current and future climate statistics included in this report for Mount Polley Mine. More detailed information on each methodology is provided in Attachment 1: Detailed Methodology.

3.1 Current Climate Methodology

Using the baseline developed in WSP (2022) for the Mount Polley Mine site, current climate normals (averages) and trends for temperature and precipitation, Probable Maximum Precipitation or PMP (theoretical highest possible precipitation), and extreme precipitation statistics (in the form of depth-duration-frequency curves) are provided as a reference point for the application of future projected changes presented in Section 5.0.

Temperature and precipitation trends are established using Sen's slope estimation, which minimizes the influence of outliers on long term trends, while the significance level of each trend is obtained through Mann Kendall analysis. The PMP and extreme precipitation statistics are consistent with those presented in WSP (2022), with additional durations and return periods to supplement on-going technical studies at the site. The same methodologies as in WSP (2022) are used here. The Hershfield statistical method (WMO 2009) is used to estimate for PMP, and the Gumbel distribution is adopted in this study for the estimation of extreme precipitation statistics, with parameters estimated using the method of L-moments (Hogg et al. 1989).

3.2 Future Climate Methodology

The IPCC is generally considered to be the definitive source of information related to past and future climate change as well as climate science. As an international body, the IPCC provides a common source of information relating to emission scenarios, provides third party reviews of models, and recommends approaches to document future climate projections. Periodically, the IPCC issues assessment reports summarizing the most current state of climate science. The Sixth Assessment Report (AR6; IPCC 2021) represents the most current complete synthesis of information regarding climate change. The future climate projections come from publicly available statistically downscaled future climate projections based on the Sixth Assessment Report (AR6; IPCC 2021), on a daily scale.

Future climate is typically projected using GCMs that involve the mathematical representation of global land, sea and atmosphere interactions over a long period of time. These GCMs have been developed by various government agencies, but they share a number of common elements described by the IPCC. The IPCC does not run the models but acts as a clearinghouse for the distribution and sharing of the model forecasts. Future climate projection data are available from about 30 GCMs and five Shared Socioeconomic Pathways (SSPs) in AR6. The pathways include a suffix which specifies the radiative forcing projected to occur by 2100. For example, SSP2-4.5 denotes a pathway that is characterized includes climate change mitigation and adaptation options of SSP2, resulting in 4.5 W/m2 of radiative forcing by 2100. These SSPs are described more fully by O'Neil et al. (2014) and are summarized in Table 4 of Attachment 1.

The data used in this report is obtained from ClimateData.ca (2023). The data is comprised of GCM outputs, which are statistically downscaled using Bias Correction/Constructed Analogues with Quantile mapping reordering (BCCAQ) version 2 provided by the Pacific Climate Impacts Consortium (PCIC) to correct for systematic biases in temperature (systematic over or underestimation) and precipitation (frequent drizzle and underestimation of extremes). The IPCC describes future emission scenarios using Shared Socioeconomic Pathways (SSPs); however, this report focuses on the three SSPs (SSP1-2.6, SSP2-4.5 and SSP5-8.5) currently available from ClimateData.ca, capturing the lower to upper range of emission scenarios. The statistically downscaled models provide daily global climate scenarios, at a gridded resolution of approximately 10 km for the simulated period of 1950-2100 (ClimateData.ca 2023). The climate variables available from this dataset include minimum temperature, maximum temperature, and total precipitation. The selection of this data for this project is based on the available temporal and spatial resolution of the data. The availability of daily downscaled data allows for better characterization of the climate extremes, especially for precipitation. The availability of high spatial resolution (10 km instead of hundreds of km in GCMs) provides better representation for site-specific studies.

The model projections can be summarized for magnitude of change from the modelled baseline (representing the current climate regime in the model) for different time horizons. The time horizons applied to this study include the following:

- 1991 to 2020 (modelled baseline);
- 2041 to 2070 (2050s or mid-century);
- 2071 to 2100 (2080s or end-of-century).

The modelled baseline was chosen to represent the most recent WMO climate normal period to base projected changes in climate from this period to the 2050s and 2080s future periods. Each period is set at a length of 30 years to represent climatic conditions for each period while reducing the influence of climate oscillations that occur on interannual timescales including El-Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) (WMO 2017).

Annual and monthly changes in precipitation and temperature are estimated by calculating the changes between the future climate periods and the baseline period.

For extreme precipitation statistics (including probable maximum precipitation) under climate change there are two commonly used approaches including statistical and temperature scaling. The statistical approach relies on comparing statistical estimates of extreme precipitation (following the same methods applied for current climate in Section 3.1) between modelled baseline and future periods to estimate projected change. The temperature scaling approach relies on the assumption that increased temperatures will drive atmospheric moisture holding capacity through the Clausius–Clapeyron relationship, resulting in the potential for greater extreme rainfall amounts. The temperature scaling approach applies primarily to estimates of extreme rainfall for shorter durations, including the 1- to 3-day PMP, and shorter durations for intensity duration frequency (i.e., up to 3-day durations). For longer durations (e.g., beyond 3 days) the statistical approach may be preferred.

The results of the analyses outline above analysis are provided in terms of changes from the baseline period (1991-2020) to the two future periods (2050s and 2080s). This approach allows for climate model bias (in comparison to observational data) to be mitigated as only the projected changes are presented. Uncertainty in the projections from the multi-model ensemble are presented in the form of percentiles for each analysis. In this report, the 50th percentile is used to describe the projected change assessed for the climate variables. Attachment 2: Additional Climate Projection Statistics provides the projected changes from the multi-model ensemble using a set of percentiles to examine the range of results.

4.0 CURRENT CLIMATE

Section 4.0 provides a summary of the climate stations used here and in WSP (2022) to estimate current climate normals (averages) and trends, along with additional durations and return periods for PMP and extreme precipitation statistics. Select tables presented in this section are coloured using a gradient to aid in the visual representation of the values. The colour gradients provide a relative indication of the highest (red) and lowest (blue) values with transitional colours in between. Colours cannot be compared between tables, as the colour scale is relative for each.

4.1 Climate Stations Considered for Current Climate

To establish baseline climate conditions for the site, and to estimate current climate statistics provided in the following subsections, a set of regional climate stations were used in WSP (2022) to represent the site. Here the stations considered are provided in Table 1Table 1. This dataset covers the period of 1974-2021 for a total of 47 years and is comprised of 25% local data and 75% regional climate data. Of the local data considered, the Mill Site Station, Weather Station 1 (WS1) near the mill site, and Weather Station 2 (WS2) at the tailings storage facility (TSF) were considered. The regional climate data consists of Likely (1098940), Williams Lake A (1098940), Spokin Lake 4E (1097646), Barkerville (1090660), and Quesnel A (1096630). Details of how these stations were assessed and combined to represent the Mount Polley Mine site are provided in WSP (2022).

Table 1: Regional Climate Stations Considered to Represent Mount Polley Mine Site

Section Name	Climate ID	Location	Elevation (m)	Time Period Considered
Mill Site Station	—	52.54°N, 121.63°W	1118	1995-2012
WS1 (near mill)	—	52.54°N, 121.63°W	1171	2012-2021
WS2 (TSF)	—	52.52°N, 121.61°W	964	2012-2021
Likely	1098940	52.60°N, 121.53°W	724	1974-1993
Williams Lake A	1098940	52.18°N, 122.05°W	940	1961-2021
Spokin Lake 4E	1097646	52.18°N, 121.69°W	1033	1983-2021
Barkerville	1090660	53.07°N, 121.51°W	1283	1888-2021
Quesnel A	1096630	53.01°N, 122.30°W	545	1946-2021

4.2 Current Temperature and Precipitation

The climate normal or average is used to establish the current conditions, while the decadal trend indicates the direction and magnitude of how the indices are changing on average over a ten-year period. The analysis assessed the statistical significance of trends in mean temperature and total precipitation at the 90th, 95th, 99th and 99.9th percentile levels. Below the 90th percentile level a trend is deemed to be “not statistically significant”, while trends that are 0 when rounded to the first decimal place are labelled as “no apparent trend”.

Mean daily temperature was used for the calculation of annual and monthly statistics and trends (Table 2). The warmest month on average is the month of July with a mean temperature of 15.1°C, and the coldest is the month of January with a mean temperature of -6.7°C. The annual temperature was found to have a statistically significant upwards trend of 0.5°C per decade, significant at the 99.9th percentile with an average value of 3.9°C (Figure 1). On a monthly scale, statistically significant trends were found for March to August with magnitudes ranging from 0.3°C to 1.0°C per decade. Increasing temperatures in the Spring months can accelerate and shift the timing of snowmelt, potentially leading to changes in extreme rain-on-snow events. The greatest observed changes in temperature across Canada generally occur in the winter months when temperatures are lowest. For the Mount Polley Mine site. November and December have statistically significant increasing trends, while in January and February trends are either not detected or statistically significant. A review of the observations indicates that there is a high amount of variability in January and February temperatures which may be limiting the detection of trends. No statistically significant decreasing temperatures in any month were found.

Average annual total precipitation over the baseline period was calculated to be 612.9 mm with June being the wettest month (70.9 mm) and March being the driest (29.7 mm) on average (Table 2). The annual total precipitation was found to have a statistically significant decreasing trend of 31.9 mm per decade, significant at the 95th percentile (Figure 2). Statistically significant decreasing trend were found for the months of August, November, and December, with magnitudes ranging from 6.2 to 10.7 mm per decade. While, overall precipitation may be decreasing, extreme precipitation events may not follow the same pattern.

Table 2: Current Climate Long-Term Averages and Trends Over 1974 to 2021 Baseline Period

Climate Variables	Average	Decadal Trend	Statistical Significance
Average Annual Temperature [°C]	3.9	+0.5	significant at the 99.9th percentile
Average January Temperature [°C]	-6.7	+0.7	not statistically significant
Average February Temperature [°C]	-4.8	0	no apparent trend
Average March Temperature [°C]	-1.0	+0.5	significant at the 95th percentile
Average April Temperature [°C]	3.7	+0.3	significant at the 95th percentile
Average May Temperature [°C]	8.5	+0.8	significant at the 99.9th percentile
Average June Temperature [°C]	12.2	+0.7	significant at the 99.9th percentile
Average July Temperature [°C]	15.1	+1.0	significant at the 99.9th percentile
Average August Temperature [°C]	14.6	+0.7	significant at the 99.9th percentile
Average September Temperature [°C]	10.0	+0.3	not statistically significant
Average October Temperature [°C]	4.1	0	no apparent trend
Average November Temperature [°C]	-2.4	0	no apparent trend
Average December Temperature [°C]	-6.6	0	no apparent trend
Annual Total Precipitation [mm (equiv.)]	612.9	-31.9	Significant at the 95th percentile
January Total Precipitation [mm (equiv.)]	49.4	-2.7	not statistically significant
February Total Precipitation [mm (equiv.)]	35.8	+0.2	not statistically significant
March Total Precipitation [mm (equiv.)]	29.7	-1.7	not statistically significant
April Total Precipitation [mm (equiv.)]	44.7	+1.2	not statistically significant
May Total Precipitation [mm (equiv.)]	50.0	-2.5	not statistically significant
June Total Precipitation [mm (equiv.)]	70.9	-4.9	not statistically significant
July Total Precipitation [mm (equiv.)]	63.7	-2.1	not statistically significant
August Total Precipitation [mm (equiv.)]	50.6	-10.7	significant at the 99th percentile
September Total Precipitation [mm (equiv.)]	52.4	+2.5	not statistically significant
October Total Precipitation [mm (equiv.)]	58.2	-0.1	not statistically significant
November Total Precipitation [mm (equiv.)]	49.9	-6.2	significant at the 95th percentile
December Total Precipitation [mm (equiv.)]	57.7	-7.8	significant at the 99th percentile

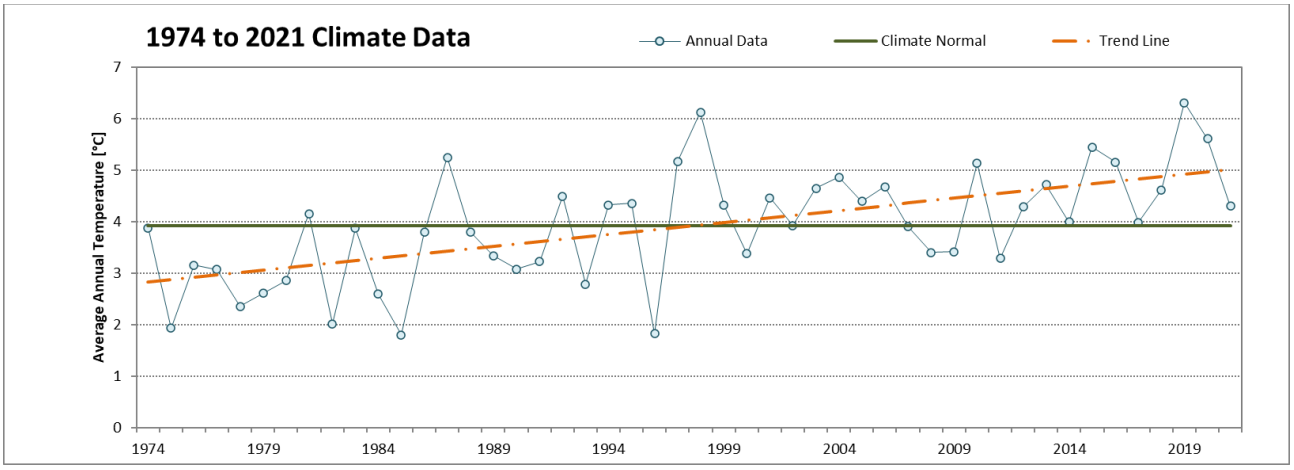

Figure 1: Current Climate Average Annual Temperature Analysis for Mount Polley Mine

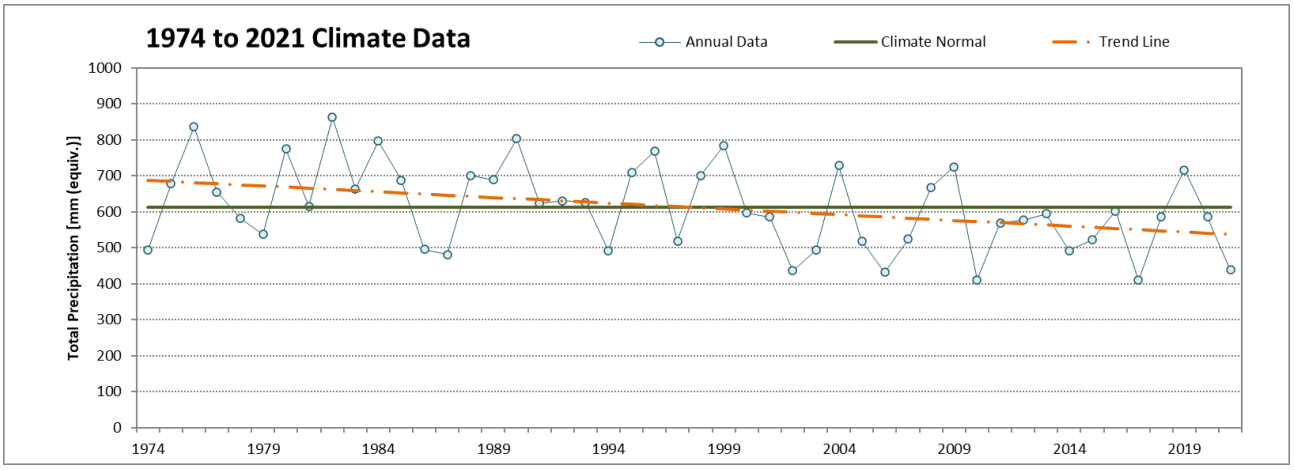

Figure 2: Current Climate Total Annual Precipitation Analysis for Mount Polley Mine

4.3 Current Probable Maximum Precipitation

24-hour and 72- hour probable maximum precipitation (PMP) provided in WSP (2022) were calculated with the Hershfield method (WMO 2009), and are presented in Table 3. In ECCC (2024), the PMP for 1-day, 2-day, and 3- day durations at the Barkerville (1090660) station approximately 60 km north of the site, is estimated as 210.3 mm, 288.8 mm, and 340.9 mm, respectively, which are aligned with those provided here.

Table 3: Probable Maximum Precipitation for Durations of 24-hour and 72-hour (WSP 2022)

*Duration	Probable Maximum Precipitation (mm)
24-Hour	224
72-Hour	339

* Note: 24- and 72-hour durations have been adjusted from 1- and 3-day durations by applying factors of 1.13 and 1.03, respectively based on Hopkinson (2001).

4.4 Current Extreme Precipitation

Extreme precipitation statistics are calculated from the annual maximum series of daily total precipitation by fitting a statistical distribution and extracting precipitation depths over a range of return periods (see Attachment 1 for details). Greater durations correspond to larger volumes of rainfall accumulated over a longer period, while the return period refers to the frequency of extreme precipitation (longer return period indicates a rarer event).
Over the current climate baseline, the 100-year event for a 1-day duration corresponds to a precipitation depth of 56.8 mm (Table 4). This number is only slightly less than the 62.1 mm for the same duration at Blue River CS (116OH99). This station is at a similar elevation to the site, located in a similar region on the leeward side of the Rocky Mountains with over 50 years of data.

Table 4: Extreme Precipitation Statistics Across Durations and Return Periods (mm)

Duration (days)	Return Period (years)										
	2	5	10	25	50	100	200	500	1,000	2,000	10,000
24-hour(1&2)	32.7	41.7	47.4	54.3	59.2	64.1	68.9	75.3	80.1	84.9	96.2
1(1)	29.0	36.9	41.9	48.0	52.4	56.8	61.0	66.6	70.9	75.1	85.1
2	38.5	50.3	58.1	68.0	75.4	82.7	89.9	99.5	106.7	114.0	130.7
3	43.5	58.6	68.6	81.3	90.6	99.9	109.2	121.4	130.7	139.9	161.4
4	48.8	66.0	77.3	91.7	102.3	112.9	123.4	137.3	147.8	158.3	182.6
5	53.8	73.5	86.5	103.0	115.2	127.3	139.4	155.3	167.3	179.4	207.3
6	58.3	80.5	95.2	113.8	127.6	141.3	154.9	172.9	186.5	200.1	231.6
7	61.5	84.8	100.2	119.7	134.2	148.5	162.8	181.7	195.9	210.2	243.3
10	72.4	98.6	116.0	138.0	154.3	170.5	186.6	207.9	224.0	240.1	277.4
20	101.7	138.3	162.5	193.1	215.8	238.3	260.8	290.4	312.8	335.2	387.2
30	124.8	165.3	192.1	225.9	251.0	276.0	300.8	333.6	358.3	383.1	440.5
50	168.2	213.6	243.8	281.8	310.1	338.1	366.0	402.8	430.7	458.5	523.1
75	216.9	270.6	306.2	351.1	384.4	417.5	450.4	493.9	526.8	559.6	635.9
90	242.7	301.3	340.1	389.2	425.5	461.6	497.6	545.0	580.9	616.7	700.0
120	296.1	361.7	405.2	460.2	500.9	541.4	581.7	634.9	675.1	715.2	808.5

(1) WSP (2022).
(2) Factor of 1.13 applied to 1-day duration to estimate 24-hour extreme precipitation following WMO (2009b).

5.0 FUTURE CLIMATE

The future projected changes in climate statistics developed in this section are intended to be applied to the baseline climate statistics provided in Section 4.0. Projected changes are provided in terms of percentiles across the multi-model ensemble; therefore, it is important to consider the percentile level used for a given application. More details about selecting percentiles to represent changes in climate variables are given in Section 2.0.

5.1 Future Temperature and Precipitation

Statistically downscaled projections of daily total precipitation and mean temperature variables are used to estimate the change in monthly mean, minimum, and maximum statistics from the model baseline to the 2050s and 2080s future periods. Changes in precipitation are provided as percentage changes from the current climate baseline, while changes in temperature are provided as absolute values in degree Celsius. This is typically done to facilitate the application of projected changes to the baseline values (Anandhi et al. 2011).

Annual average temperature is projected to change by 2.0°C in the 2050s and 2.7°C in the 2080s at the 50th percentile, indicating an increasing trend due to changing climate (Table 5 and Table 6). In the 2050s and 2080s, projected changes in mean monthly temperature range from 1.7°C to 2.5°C and 2.3°C to 3.7°C, respectively with the greatest changes occurring in the summer months at the 50th percentile. All months have a projected increase in mean temperature across the distribution of the multi-model ensemble. Therefore, it is very likely that temperature will become warmer at the Mount Polley Mine site in the future. Higher temperatures have the potential to increase evapotranspiration rates. This, combined with greater projected precipitation amounts could lead to changes in the frequency and magnitude of both drought and flooding events.

As presented in Section 4.2, the current average annual temperature has been trending upwards at a statistically significant rate of 0.5°C per decade. A more severe increase is projected in time periods further into the future based on the projected increases in temperature.

Table 5: Projected Changes in Annual and Monthly Mean Temperature for the 2050s

Month	Min.	5%	10%	25%	50%	75%	90%	95%	Max.	Mean	Std. Dev.
Jan	-0.1	0.5	0.9	1.3	1.8	2.6	3.5	3.9	5.6	2.0	1.1
Feb	0.1	0.4	0.6	1.1	1.7	2.3	3.1	3.4	4.9	1.8	1.0
Mar	0.0	0.6	0.8	1.2	1.7	2.3	2.8	2.9	3.8	1.7	0.8
Apr	0.7	0.9	1.0	1.4	2.1	2.8	3.7	4.0	5.2	2.2	1.0
May	-0.1	0.7	1.1	1.6	2.2	2.9	3.5	3.8	5.0	2.3	1.0
Jun	0.0	0.6	0.9	1.3	2.0	2.8	3.7	4.2	5.5	2.1	1.1
Jul	0.5	0.8	1.1	1.6	2.3	3.0	4.0	4.9	6.3	2.5	1.3
Aug	-0.4	0.8	1.2	1.7	2.5	3.4	4.3	4.9	6.4	2.6	1.3
Sep	-0.1	1.0	1.1	1.6	2.2	3.0	3.8	4.3	4.9	2.3	1.1
Oct	0.3	0.8	1.0	1.4	1.9	2.6	3.3	3.6	4.5	2.1	0.9
Nov	-0.1	0.5	0.8	1.4	2.1	3.0	4.2	4.5	5.4	2.3	1.2
Dec	0.7	0.7	0.8	1.3	2.1	2.9	3.7	4.4	5.1	2.2	1.2
Annual	0.7	1.0	1.3	1.5	2.0	2.7	3.4	4.0	4.5	2.2	0.9

Table 6: Projected Changes in Annual and Monthly Mean Temperature for the 2080s

Month	Min.	5%	10%	25%	50%	75%	90%	95%	Max.	Mean	Std. Dev.
Jan	-0.3	0.4	0.9	1.7	2.7	4.1	5.2	6.0	8.3	3.0	1.8
Feb	0.0	0.6	0.9	1.4	2.3	3.7	5.4	5.7	6.8	2.6	1.6
Mar	-0.3	0.6	0.9	1.6	2.5	3.7	5.0	5.4	6.3	2.7	1.6
Apr	0.5	1.0	1.2	2.1	2.9	4.2	5.7	7.1	7.9	3.3	1.8
May	0.8	1.2	1.5	2.1	3.0	4.3	5.1	6.1	8.2	3.3	1.6
Jun	0.1	0.7	1.1	1.8	2.7	4.1	5.7	6.5	8.7	3.2	1.9
Jul	0.1	0.9	1.2	2.0	3.3	5.1	7.3	8.8	11.9	3.9	2.5
Aug	0.4	1.2	1.7	2.2	3.7	5.5	7.5	8.7	11.3	4.1	2.4
Sep	0.0	0.8	1.3	1.9	3.2	4.7	6.5	7.7	9.2	3.6	2.1
Oct	-0.2	1.0	1.3	1.7	2.7	4.1	5.3	5.9	7.0	3.0	1.6
Nov	-0.4	0.9	1.2	1.9	3.1	4.3	5.5	6.5	8.3	3.2	1.8
Dec	0.4	1.2	1.3	1.8	3.2	4.3	5.4	7.6	9.2	3.3	1.9
Annual	0.6	1.2	1.4	1.8	2.7	4.3	5.4	6.8	8.4	3.3	1.7

Annual total precipitation is projected to increase by 8% in the 2050s and 10% in the 2080s, indicating an upward trend in precipitation on the annual scale at the 50th percentile (Table 7 and Table 8). In the 2050s, monthly total precipitation at the 50th percentile is projected to increase for almost all months, except for the months of July and August.

The high percentage changes in the precipitation during the winter months may lead to more snowfall and snowpack, however this also be impacted by changing temperatures. It should be noted that there is a large range of uncertainty for precipitation projections across the multi model ensemble, as all months show both increasing and decreasing total precipitation amounts for the minimum and maximum projected changes in both the 2050s and 2080s.

As presented in Section 4.2, the current annual total precipitation has statistically significant downward trend for the months of August, using future climate projections this decrease is projected to continue in the future.

Table 7: Projected Changes in Annual and Monthly Total Precipitation for the 2050s

Month	Min.	5%	10%	25%	50%	75%	90%	95%	Max.	Mean	Std. Dev.
Jan	-19%	-4%	-2%	2%	11%	19%	24%	28%	49%	11%	12%
Feb	-13%	-11%	-6%	-2%	7%	17%	28%	32%	40%	9%	13%
Mar	-17%	-11%	-8%	2%	7%	17%	28%	34%	43%	9%	14%
Apr	-10%	-7%	-2%	4%	11%	18%	27%	38%	45%	12%	12%
May	-7%	0%	3%	8%	16%	25%	34%	43%	54%	17%	13%
Jun	-26%	-17%	-14%	-2%	8%	16%	22%	28%	65%	7%	15%
Jul	-42%	-22%	-17%	-11%	-3%	4%	9%	14%	48%	-3%	13%
Aug	-52%	-31%	-21%	-13%	-3%	4%	16%	22%	39%	-4%	16%
Sep	-28%	-11%	-10%	-5%	5%	14%	29%	32%	43%	6%	15%
Oct	-8%	0%	2%	8%	14%	24%	33%	35%	49%	16%	12%
Nov	-19%	-12%	-6%	0%	9%	19%	26%	32%	43%	10%	13%
Dec	-12%	-6%	-3%	2%	10%	20%	27%	32%	38%	11%	12%
Annual	-2%	1%	2%	5%	8%	11%	14%	16%	25%	8%	5%

Table 8: Projected Changes in Annual and Monthly Total Precipitation for the 2080s

Month	Min.	5%	10%	25%	50%	75%	90%	95%	Max.	Mean	Std. Dev.
Jan	-10%	-5%	0%	7%	13%	24%	32%	40%	52%	15%	13%
Feb	-20%	-9%	-7%	-2%	8%	20%	31%	34%	53%	10%	15%
Mar	-18%	-9%	-6%	0%	8%	16%	29%	34%	54%	10%	14%
Apr	-12%	-4%	0%	8%	18%	31%	44%	55%	93%	21%	19%
May	-9%	-1%	5%	14%	22%	34%	46%	53%	68%	24%	17%
Jun	-24%	-15%	-11%	0%	10%	20%	31%	45%	76%	11%	18%
Jul	-50%	-34%	-23%	-16%	-6%	6%	15%	19%	30%	-6%	16%
Aug	-59%	-37%	-29%	-15%	-6%	5%	11%	22%	42%	-6%	18%
Sep	-21%	-11%	-6%	0%	10%	22%	28%	36%	55%	11%	15%
Oct	-2%	3%	4%	8%	22%	34%	48%	57%	95%	24%	18%
Nov	-15%	-4%	-1%	6%	16%	26%	42%	55%	87%	18%	19%
Dec	-14%	1%	3%	7%	15%	24%	34%	40%	55%	17%	13%
Annual	-2%	2%	4%	7%	10%	16%	21%	26%	38%	12%	7%

5.2 Future Probable Maximum Precipitation

With increasing temperatures due to climate change, atmospheric moisture holding capacity is anticipated to increase, thereby leading to greater magnitudes of probable maximum precipitation. Here the percentage change in PMP is estimated between the model baseline and future periods. In the 2050s at the 50th percentile, the 1-day, 2-day, and 3-day PMP are projected to increase by 15% (Table 9). In the 2080s an increase of 19%, 18%, and 16% is projected for the 1-day, 2-day, and 3-day PMP events, respectively (Table 10).

Table 9: Projected Changes in PMP for the 2050s

Statistic	1-Day	2-Day	3-Day
Min.	-24%	-30%	-31%
5%	-18%	-20%	-19%
10%	-10%	-12%	-11%
25%	1%	2%	2%
50%	15%	15%	15%
75%	32%	35%	29%
90%	54%	53%	45%
95%	62%	67%	69%
99%	77%	91%	112%
Max.	89%	94%	126%
Mean	19%	18%	19%
Std. Dev.	25%	26%	28%

Table 10: Projected Changes in PMP for the 2080s

Statistic	1-Day	2-Day	3-Day
Min.	-33%	-29%	-22%
5%	-16%	-13%	-13%
10%	-13%	-9%	-9%
25%	1%	-2%	0%
50%	19%	18%	16%
75%	36%	40%	39%
90%	63%	64%	53%
95%	68%	71%	63%
99%	77%	84%	83%
Max.	78%	87%	88%
Mean	21%	22%	20%
Std. Dev.	27%	28%	25%

Greater projected temperatures in the 2080s at the 50th percentile can be associated with greater atmospheric moisture holding capacity (Kunkel 2013; CSA 2019), which is anticipated to result in greater PMP projected further into the future. There is a considerable amount of uncertainty in PMP across the multi model ensemble as in both time periods there is a potential for increase and decrease across the range of projections. Therefore, a percentile should be selected to account for the level of risk associated with the application of these values (see Section 2.0).

The temperature scaling approach provides an alternative method to estimate projected changes in extreme rainfall including both the PMP event and extreme precipitation statistics provided in Section 2.0 (CSA 2019). Note that the projected changes presented in Table 11 using the temperature scaling approach are intended to apply uniformly across event durations (e.g., days, as provided in Table 9 or Table 12) and return periods (e.g., years, as provided in Table 12).

Table 11 presents the projected changes in extreme rainfall using the temperature scaling approach, which is based on a 7% increase per °C rise in mean annual temperature. At the 50-percentile, the PMP is projected to increase by 15% and 20% in the 2050s and 2080s, respectively which is larger than values reported in Table 12 and Table 13. This is due to a large increase in mean annual temperature in Northern Canada, which is the only input to the temperature scaling approach.

Table 11: Projected Changes in Probable Maximum Precipitation for the 2050s and 2080s based on Temperature Scaling Approach

Future Period	Min.	5%	10%	25%	50%	75%	90%	95%	99%	Max.	Mean	Std. Dev.
2050s	5%	7%	9%	11%	15%	20%	26%	31%	35%	36%	16%	6%
2080s	4%	8%	10%	13%	20%	34%	44%	58%	71%	77%	25%	13%

5.3 Future Extreme Precipitation

Projected changes in extreme precipitation statistics are provided across a set of durations and return periods for the 2050s and 2080s future periods at the 50th percentile. In the 2050s, the range of projected changes is 6% to 16% with a change of 12% for the 1-day, 100-year event (Table 12). In the 2080s, a range of projected changes of 10% to 19% is estimated, with a change of 17% for the 1-day, 100-year event (Table 13).

Lower duration events at higher return periods generally show greater projected changes than longer durations events above 20 days. This may be due to increased temperatures leading to more atmospheric moisture holding capacity playing a larger role in shorter durations and longer return periods where rainfall intensity is higher (CSA 2019). For longer duration events that may include multiple storm events, moisture limitations may not be present for the entire period.

The results of the temperature scaling approach provided in Table 11 also apply to extreme precipitation, as suggested in Canadian Standards Association (2019) and ClimateData.ca (2024) for incorporating climate change into intensity duration frequency curves in Canada. Depending on the desired level of conservatism for a given application, the provided changes from both approaches should be considered.

The results shown here for the 50th percentile may be used for screening purposes; however, for design of critical infrastructure a higher percentile could be considered to account for greater risk (see Attachment 2).

Table 12: Projected Changes in Extreme Precipitation Statistics at the 50th Percentile for the 2050s

Duration (days)	Return Period (years)										
	2	5	10	25	50	100	200	500	1000	2000	10000
1	9%	11%	12%	12%	12%	12%	12%	12%	12%	13%	13%
2	11%	11%	12%	13%	13%	13%	14%	14%	14%	15%	16%
3	10%	11%	11%	12%	13%	13%	14%	14%	14%	14%	15%
4	10%	11%	11%	11%	12%	12%	13%	13%	13%	14%	14%
5	11%	10%	10%	11%	11%	12%	12%	12%	12%	12%	13%
6	11%	10%	10%	11%	12%	13%	13%	13%	13%	13%	13%
7	10%	9%	10%	11%	11%	12%	12%	12%	13%	13%	13%
10	9%	9%	9%	10%	10%	11%	11%	12%	12%	12%	12%
20	10%	10%	11%	11%	12%	12%	13%	13%	13%	14%	14%
30	10%	10%	9%	9%	9%	9%	9%	9%	9%	9%	9%
50	8%	7%	8%	7%	7%	8%	8%	7%	7%	7%	7%
75	9%	8%	8%	8%	7%	7%	7%	7%	7%	7%	6%
90	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
120	7%	7%	7%	7%	7%	7%	7%	6%	6%	6%	6%

Table 13: Projected Changes in Extreme Precipitation Statistics at the 50th Percentile for the 2080s

Duration (days)	Return Period (years)										
	2	5	10	25	50	100	200	500	1000	2000	10000
1	14%	16%	18%	18%	17%	17%	18%	18%	18%	18%	18%
2	16%	17%	17%	18%	18%	18%	19%	19%	18%	18%	19%
3	13%	15%	17%	16%	17%	17%	17%	17%	17%	17%	17%
4	13%	15%	15%	15%	15%	15%	15%	15%	14%	14%	13%
5	13%	13%	15%	15%	15%	15%	16%	16%	16%	16%	15%
6	13%	12%	11%	12%	13%	14%	15%	14%	13%	13%	14%
7	13%	12%	12%	13%	12%	13%	13%	13%	13%	14%	14%
10	13%	13%	13%	13%	13%	14%	13%	14%	14%	15%	16%
20	14%	14%	14%	15%	16%	16%	16%	17%	16%	16%	16%
30	13%	13%	13%	14%	13%	13%	14%	13%	13%	13%	13%
50	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
75	11%	12%	12%	12%	12%	12%	11%	11%	11%	11%	12%
90	11%	11%	11%	11%	11%	11%	10%	10%	10%	10%	10%
120	11%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%

6.0 SUMMARY

This technical memorandum provides complementary analyses for key climate statistics to support water management planning and design activities at Mount Polley Mine site (WSP 2022), focusing on extreme precipitation events under future climate conditions. The WSP (2022) climate study remains a valid baseline study. This memo supplements the 2022 climate baseline with projected change for future climate, intended to be applied to the corresponding baseline climate statistics for the site. The information provided here is intended to support climate change considerations for closure design activities specific to the Mount Polley Mine site.

Analysis of the baseline climate conditions revealed the following findings:

- The warmest month on average is the month of July with a mean temperature of 15.1°C, and the coldest is the month of January with a mean temperature of -6.7°C. The annual temperature was found to have a statistically significant upwards trend of 0.5°C per decade, significant at the 99.9th percentile with an average value of 3.9°C. On a monthly scale, statistically significant trends were found for March to August with magnitudes ranging from 0.3°C to 1.0°C per decade. Increasing temperatures in the Spring months can accelerate snowmelt, potentially leading to an increase in extreme rain-on-snow events. No statistically significant decreasing monthly average temperatures were found.
- Average annual total precipitation over the baseline period was calculated to be 612.9 mm with June being the wettest month (70.9 mm) and March being the driest (29.7 mm) on average. The annual total precipitation was found to have a statistically significant decreasing trend of 31.9 mm per decade, significant at the 95th percentile. Statistically significant decreasing trend were found for the months of August, November, and December, with magnitudes ranging from 6.2 to 10.7 mm per decade. While overall precipitation may be decreasing, the region could still experience extreme precipitation events.

- PMP calculated with the Hershfield method, is estimated to range from 224 mm to 339 mm for 24- to 72-hour durations.
- Extreme precipitation statistics are calculated from the annual maximum series of daily total precipitation by fitting a statistical distribution and extracting precipitation depths over a range of return periods. Over the current climate baseline, the 100-year event for a 1-day duration corresponds to a precipitation depth of 56.8 mm.

Future climate conditions were assessed for the Mount Polley Mine site by calculating projected changes in the climate variables over a model baseline period and two future periods (2050s and 2080s) using a set of climate projection that make up a multi-model ensemble. The ensemble consisted of 26 statistically downscaled climate models from ClimateData.ca (2023), which includes three emission scenarios (SSP1-2.6, SSP2-4.5, and SSP5- 8.5) for precipitation, minimum and maximum temperature. The distribution of projected changes was summarized across the multi-model ensemble in terms of either percentage or absolute changes.

- Annual average temperature is projected to change by 2.0°C in the 2050s and 2.7°C in the 2080s at the 50th percentile, indicating an increasing trend due to changing climate. In the 2050s and 2080s, projected changes in mean monthly temperature range from 1.7°C to 2.5°C and 2.3°C to 3.7°C, respectively with the greatest changes occurring in the summer months at the 50th percentile.
- Annual total precipitation is projected to increase by 8% in the 2050s and 10% in the 2080s, indicating an upward trend in precipitation on the annual scale at the 50th percentile. In the 2050s, monthly total precipitation at the 50th percentile is projected to increase for almost all months, except for the months of July and August. The high percentage changes in the precipitation during the winter months may lead to more snowfall and snowpack, however this also be impacted by changing temperatures.
- The percentage change in PMP is estimated between the model baseline and future periods. In the 2050s at the 50th percentile, the 1-day, 2-day, and 3-day PMP are projected to increase by 15%. In the 2080s an increase of 19%, 18%, and 16% is projected for the 1-day, 2-day, and 3-day PMP events, respectively. Greater projected temperatures in the 2080s at the 50th percentile can be associated with greater atmospheric moisture holding capacity, which is anticipated to result in greater PMP projected further into the future. Using the temperature scaling approach, projected increases are estimated to be 15% for the 2050s and 20% for the 2080s, respectively, for the 1- to 3-day durations.
- Projected changes in extreme precipitation statistics are provided across a set of durations and return periods for the 2050s and 2080s future periods at the 50th percentile. In the 2050s, the range of projected changes is 6% to 16% with a change of 12% for the 1-day, 100-year event. In the 2080s, a range of projected changes of 10% to 19% is estimated, with a change of 17% for the 1-day, 100-year event. Lower duration events at higher return periods generally show greater projected changes than longer durations events above 20 days. This may be due to increased temperatures leading to more atmospheric moisture holding capacity playing a larger role in shorter durations and longer return periods where rainfall intensity is higher. The temperature scaling results provided for PMP also apply to extreme precipitation and should be considered alongside those provided using the statistical approach.

7.0 LIMITATIONS

The nature of the work undertaken is stochastic, with substantial inherent uncertainly around any given data points. The reader acknowledges that the uncertainty associated with any projections or forecasts is increased with how far into the future the projected period extends and is subject to future developments or intervening acts that may manifest in the interim period.

The information in this report was prepared using published data and information, technical journals, and articles as well as professional judgment and experience. No sampling or fieldwork was conducted in the course of this work.

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Attachments: Attachment 1: Detailed Methodology
Attachment 2: Additional Future Climate Statistics

https://wsponline.sharepoint.com/sites/gld-10023g/ca00205274505 deliverables/002_issued/063-tm-31153-climate change memo/rev1/ca0020527.4505-063-tm-rev1-31153-climate change memo 06jun_25.docx

REFERENCES

Anandhi A, Frei A, Pierson D, Schneiderman EM, Zion MS, Lounsbury D, and Adao HM. 2011. Examination of change factor methodologies for climate change impact assessment. Water Resources Research, 47: 1-10. doi: 0.1029/2010WR009104.

ClimateData.ca. 2023. Statistically Downscaled Climate Scenarios - BCCAQv2. Available at https://climatedata.ca/.

CSA (Canadian Standards Association). 2019. Draft Standard Plus 4013:19. Technical Guide Development, Interpretation and Use of Rainfall Intensity-Duration-Frequency (IDF) Information: Guideline for Canadian Water Resources Practitioners. 126p.

ECCC (Environment and Climate Change Canada). 2024. Short-Duration Rainfall Intensity-Duration-Frequency, Engineering Climate Datasets. Available at: https://open.canada.ca/data/en/dataset/15aa455c-9f9f-4405-8eee-4445d02fd35c

Hogg WD, Carr DA and Routledge B. 1989. Rainfall Intensity–Duration–Frequency Values for Canadian Locations. Environment Canada, Atmospheric Services, Ottawa. 35p. Available at http://publications.gc.ca/collections/collection_2019/eccc/en57-23/En57-23-1-85.pdf.

Hopkinson R. 2001. Rain 30 PMP Factors After Hershfield. Environment Canada. Available at: https://collaboration.cmc.ec.gc.ca/cmc/climate/Engineer_Climate/IDF/1-30_Day_IDF-1_30_jours_IDF/docs/EC_1-30-day_IDF_docs/Hopkinson_2001_Rain30_PMP_Factors_after_Hershfield.pdf

IPCC (Intergovernmental Panel on Climate Change). 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 3949 pp.

Kunkel KE. 2013. Probable Maximum Precipitation and Climate Change. Geophysical Research Letters, 40(7): 1402-1408. doi: 10.1002/grl.50334.

WMO (World Meteorological Organization). 2009. Manual on Estimation of Probable Maximum Precipitation (PMP). World Meteorological Organization (WMO). WMO-No. 1045. Geneva, Switzerland.

WMO. 2017. WMO Guidelines on the Calculation of Climate Normals. Technical report: WMO No. 1203. Geneva, Switzerland.

WSP (WSP Canada Inc.). 2022. Climate Baseline Update: Mount Polley Mine. Submitted to Mount Polley Mining Corporation, August 30, 2022. Reference No. 22514095-066-R-Rev0-31547.

ATTACHMENT 1

Detailed Methodology

Attachment 1 – Detailed Methodology

WSP Canada Inc. (WSP) has developed a standardized approach for developing site-specific climate change data sets, described in the following sections. The purpose of this approach is to provide a description of the current climate conditions using the most representative local data for the site of interest, to provide a description of the future climate conditions using publicly available climate projections, and to provide a range of projections on how the current climate may change in the future.

1.0 CURRENT CLIMATE DATASET DEVELOPMENT

To assess climate change impacts at the site-level, an understanding of baseline climate is important, as baseline conditions provide a reference point for applying estimates of projected changes in climate. Where available, the climate baseline is grounded in observations from local observation stations. Based on missing observational data, the baseline is established by using publicly available regional climate stations infilled with gridded or reanalysis data. Details regarding the development of the current climate baseline used in this memo to calculate current climate statistics are provided in WSP (2022).

1.1 Current Climate Temperature and Precipitation

Current climate temperature and precipitation are used to calculate the annual and monthly current climate normals and trends using the definitions provided in Table 1.2-1.

Table 1.2-1: Definition of Current Climate Variables

Climate Indices	Definition	Units
Average Annual Temperature	Calculated as the average of all the observed daily mean temperatures during the selected annual period. Each annual value is averaged over the period of the climate normal.	°C
Monthly Temperature	Calculated as the average of all the observed mean temperatures during the selected month. Each annual value is averaged over the period of the climate normal.	°C
Total Precipitation	Calculated as the sum of all the observed total precipitation during the selected annual period. Each annual value is averaged over the period of the climate normal.	mm
Monthly Precipitation	Calculated as the sum of all the observed total precipitation during the selected month. Each annual value is averaged over the period of the climate normal.	mm

Climate normals and trends are calculated using a method developed by the Finnish Meteorological Institute (Salmi et al. 2002) to assess climate changes from long-term climate observations. Both annual and seasonal climate normals and trends are calculated for the mean temperature and total precipitation. The climate normal is calculated as the average of a given climate parameter over the selected period, and the climate trend is calculated as the average change in the climate parameter per decade (i.e., the decadal trend or change). Potential trends in temperature and precipitation are evaluated by fitting a model to the data using the Sen's nonparametric model. The statistical significance of the observed trends are measured using the Mann-Kendall test (Kamal and Pachauri 2018). The Mann-Kendall test is applicable to the detection of a monotonic trend of a time series with no seasonal cycle. The analysis uses a two-tail test to measure statistical significance at the 90th, 95th, 99th, and 99.9th percentile levels. The significance levels are used to assess whether a trend is significantly different from no trend, given the variability in long-term climate patterns. The 95th percentile level is a commonly used threshold in scientific experiments to test whether a null hypothesis (e.g., no trend) can be rejected to state that the alternative hypothesis (long-term climate trend exists) is true. The additional significance levels are to discern cases where either the trend may be substantial (moderate to high value) but is less significant than the 95th percentile (e.g., 90th percentile), or cases where a trend may be smaller but shows a clear signal with minimal variability (e.g., 99th percentile and above).

1.2 Current Climate Probable Maximum Precipitation

Probable maximum precipitation (PMP) is defined as "*the greatest depth of precipitation for a given duration meteorologically possible for a design watershed or a given storm area at a particular location at a particular time of year, with no allowance made for long-term climatic trends"* (WMO 2009). The PMP is a theoretical value that represents the greatest amount of rain possible in a given area as opposed to a design storm that represents the greatest amount of rain observed in a given area. The WMO acknowledges that there is significant uncertainty regarding PMP calculations and recommends that a comparison of reported values is conducted.

There are two widely accepted approaches (meteorological and statistical) to estimate the PMP. The meteorological approach maximizes the moisture content or precipitable water of rainfall storm events while the statistical approach utilizes the historical annual maximum rainfall events to estimate the PMP.

The moisture maximization approach in a simple term can be estimated by:

$$\mathrm{PMP} = \mathrm{P_s} \times \frac{\mathrm{W_{max}}}{\mathrm{W_{storm}}} = \mathrm{P_s} \times \mathrm{r} \qquad \text{Equation 1}$$

Where P_s is the observed precipitation of a large storm, W_{max} is the maximum precipitable water at the same time of year in the same location, W_{storm} is the precipitable water of the observed storm, and r is the moisture maximization ratio. Precipitable water is the amount of water from condensation of all water vapour in an atmospheric column.

The statistical approach following the Hershfield method (WMO 2009) is as follows:

$$\mathrm{PMP} = \mathrm{X_n} + \mathrm{KS_n} \qquad \text{Equation 2}$$

Where X_n and S_n are the mean and standard deviation (respectively) of the annual maximum precipitation, and K is a frequency factor that is a function of X_n and rainfall intervals. In computing PMP with Equation 2, various adjustments are made, including:

- adjustment of Xn and Sn for the maximum observed events;
- adjustment of Xn and Sn for sample size;
- adjustment for fixed observational time intervals; and
- adjustment for the area.

In this work, the Hershfield method was used to estimate the current climate PMP, as the required calculation information was more readily available for the selected location compared to the meteorological method, which had missing information. The adjustments listed above are applied using Hopkinson (2001), which includes adjustment factors specific to Canadian climates.

1.3 Current Extreme Precipitation Statistics

Daily and multi-day precipitation statistics are calculated by estimating the depth of precipitation over a given duration for a set of return periods. This process is accomplished by extracting the annual maximum precipitation amounts in each year of the current climate baseline for a set of durations (i.e., 1-day, 2-day). The annual maximum precipitation amounts for each duration are then fitted to the Gumbel statistical distribution using the method of L-moments. The rainfall amounts corresponding to the set of return periods are extracted from the inverse cumulative distribution function of the fitted statistical distribution.

2.0 FUTURE CLIMATE

Future climate projections are important for understanding how climate is projected to change from the modelled baseline. The future climate projections come from publicly available statistical downscaled future climate projections on a daily scale. Recognizing the inherent uncertainty with projections, the results in this report have been derived by using multiple projections from multiple models and scenarios. Therefore, the future projections are provided in terms of percentiles across the multi-model ensemble.

2.1 Data Sources for Future Climate Projections

Future climate projections are important for understanding how climate is projected to change from the modelled baseline. The future climate projections come from publicly available statistically downscaled future climate projections on a daily scale.

2.1.1 Global Climate Change Projections

The Intergovernmental Panel on Climate Change (IPCC) is generally considered to be the definitive source of information related to past and future climate change as well as climate science. As an international body, the IPCC provides a common source of information relating to emission scenarios, provides third party reviews of models, and recommends approaches to document future climate projections. Periodically, the IPCC issues assessment reports summarizing the most current state of climate science. The Sixth Assessment Report (AR6; IPCC 2021a) represents the most current complete synthesis of information regarding climate change.

The future climate projections come from publicly available statistically downscaled future climate projections based on the Sixth Assessment Report (AR6; IPCC 2021a), on a daily scale.

Future climate is typically projected using global climate models (GCMs) that involve the mathematical representation of global land, sea, and atmosphere interactions over a long period of time. These GCMs have been developed by various government agencies, but they share a number of common elements described by the IPCC. The IPCC does not run the models but acts as a clearinghouse for the distribution and sharing of the model forecasts. Future climate projection data are available from over 30 GCMs and a range of emissions scenarios named Shared Socioeconomic Pathways (SSPs) representing a set of pathways for future climate to unfold which are summarized in Table 2.1-1. Where possible, the analogous pathway of the Representative Concentration Pathways (RCP) from the IPCC Fifth Assessment Report (AR5) are noted for each SSP from O'Neil et al. (2014).

Table 2.1-1: Characterization of Shared Socioeconomic Pathways in Intergovernmental Panel on Climate Change Sixth Assessment Report

SSP	Radiative Forcing in 2100	Characterization
SSP1	1.9 W/m^2 2.6 W/m^2	Sustainable development proceeds at a reasonably high pace.
SSP2	4.5 W/m^2	An intermediate case analogous to RCP 4.5 scenario.
SSP3	7.0 W/m^2	Unmitigated emissions are high due to moderate economic growth.
SSP4	3.4 W/m^2 6.0 W/m^2	A mixed world, with relatively rapid technological development in low carbon energy sources in key emitting regions, leading to relatively large mitigative capacity in places where it mattered most to global emissions.
SSP5	8.5 W/m^2	In the absence of climate policies, energy demand is high and most of this demand is met with carbon-based fuels. Analogous to RCP 8.5 scenario.

Source: O'Neil et al. 2014. W/m^2 = watts per square metre.

AR6 data are based on Coupled Model Intercomparison Project Phase 6 (CMIP6) which includes new and better representations of physical, chemical, and biological processes, along with higher resolution, compared to previous IPCC assessment reports. Additionally, CMIP6 models have a wider range of sensitivity compared to models used in CMIP5, which gives a larger ensemble for capturing uncertainty in future climate projections (IPCC 2021a).

The model projections can be summarized for magnitude of change from the modelled baseline for different time horizons. The time horizons applied to this study include the following:

- 1991 to 2020 (modelled baseline)
- 2041 to 2070 (2050s or mid-century)
- 2071 to 2100 (2080s or end-of-century)

The modelled baseline was chosen to represent the most recent WMO climate normal period to base projected changes in climate from this period to the 2050s and 2080s future periods. Each period is set at a length of 30 years to represent climatic conditions for each period while reducing the influence of climate oscillations that occur on interannual timescales including El-Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) (WMO 2017).

2.1.2 Regional Climate Change Projections

GCMs resolution is generally too coarse for direct use as it does not resolve weather and extreme weather patterns or climatology at local scales. Outside of using the GCM output directly, there are different options to analyze climate projections at a regional scale. Most downscaled climate datasets include minimum temperature, maximum temperature, and precipitation. The focus is on statistical or dynamically downscaled datasets which have a higher temporal and spatial resolution of the data; however, they may have limited variables available. The availability of daily downscaled data allows for better characterization of climate extremes, especially for precipitation. The availability of high spatial resolution (10 km instead of hundreds of km in global climate models or GCMs) provides better data to represent site-specific information for the study.

The data used in this report is obtained from ClimateData.ca (2023). The data are comprised of GCM outputs, which are statistically downscaled using Bias Correction/Constructed Analogues with Quantile mapping reordering (BCCAQ) version 2 provided by the Pacific Climate Impacts Consortium (PCIC) to correct for systematic biases in temperature (systematic over or underestimation) and precipitation (frequent drizzle and underestimation of extremes). The IPCC describes future emission scenarios using SSPs; however, this report focuses on the three SSPs (SSP1-2.6, SSP2-4.5, and SSP5-8.5) currently available from ClimateData.ca, capturing the lower to upper range of emission scenarios.

The statistically downscaled models provide daily global climate scenarios, at a gridded resolution of approximately 10 km for the simulated period of 1950-2100 (ClimateData.ca 2023). The climate variables available from this dataset include minimum temperature, maximum temperature, and precipitation. The selection statistically downscaled climate scenarios for this project are based on the available temporal and spatial resolution of the data. The availability of daily downscaled data allows for better characterization of the climate extremes, especially for precipitation. The availability of high spatial resolution (10 km instead of hundreds of km in GCMs) provides better representation for site-specific studies like this project.

Since no one model or climate scenario can be viewed as completely accurate, the IPCC recommends that climate change assessments use as many models and climate scenarios as possible, or a “multi-model ensemble” (IPCC 2021a, p.221). For this reason, the multi-model ensemble approach was used to delineate the probable range of results and better capture the actual outcome (an inherent unknown).

The downscaled data have a daily temporal resolution (GCMs typically have monthly temporal resolution), which allows for the characterization of future climate extremes. In addition, the improved horizontal resolution of 25 km in the downscaled data could better improve the representation of the Project, given the complex terrain in the rea of the Project.

2.2 Future Temperature and Precipitation

Minimum and maximum daily temperature from the multi-model ensemble of climate projections is first averaged into the mean temperature for all calendar months across all years in the model baseline and future time periods. In the case of mean temperature, annual mean values are calculated and averaged across years, while monthly averages are taken and averaged across calendar months. For precipitation annual and monthly totals are used. The percentage change for the annual and monthly values between the model baseline and future time periods is calculated for each member of the multi-model ensemble. The distribution of percentage changes across the multi-model ensemble is then provided using a set of percentiles.

2.3 Future Probable Maximum Precipitation

Projected changes in PMP are provided using both statistical and temperature scaling approaches. The statistical approach involves using the same methodology for current climate in Section 1.2, applied to the modelled baseline and future periods. The percentage change in PMP is then estimated, while the distribution of percentage changes across the multi-model ensemble is then provided using a set of percentiles.
The temperature scaling approach is outlined in Section 2.4 for extreme precipitation and is applicable also to PMP.

2.4 Future Extreme Precipitation Statistics

The following subsections outline detailed methodology for the statistical approaches used to estimate projected changes in climate for extreme rainfall including probable maximum precipitation and intensity-duration-frequency statistics.

2.4.1 Statistical Approaches

Consistent with all future projections, the ensemble approach will be used to describe the distribution of projected changes in extreme precipitation statistics. Methodology relating to projections of future extreme precipitation are provided in the subsections below.

The Quantile Distribution Mapping (QDM) method is used to calculate projected changes in precipitation statistics in the form of Intensity-Duration-Frequency (IDF) curves. The method is based on the Equidistant Quantile Matching (EQM) algorithm (Li and Wood 2010; Piani et al. 2010; Hassanzadeh et al., 2014; Srivastav et al., 2014; Cannon et al. 2015; Schardong et al. 2018). First, the model baseline, and modelled future annual maximum precipitation datasets are fitted to a statistical distribution for each event duration of interest. Next, rainfall depth quantiles for a set of return periods are extracted from the distributions using the inverse cumulative distribution function. Projected changes in climate (Δ_m) are calculated between the quantiles of the model baseline ($IDF_{baseline}$) and future (IDF_{future}) distributions for each duration and return period of the IDF curve. This is done using the following equation for a given duration i,

$$\Delta_{m_i} = \frac{\mathrm{IDF}_{\mathrm{future}_i}}{\mathrm{IDF}_{\mathrm{baseline}_i}} - 1 \qquad \text{Equation 4}$$

2.4.2 Temperature Scaling

The temperature scaling method outlined by the Canadian Standards Association (CSA) and Environment and Climate Change Canada (ECCC) relies on projected changes in temperature, which are assumed to increase atmospheric moisture holding capacity, allowing for greater rainfall extremes (CSA 2019; ClimateData.ca 2024). It is assumed that rainfall extremes will follow a 7% increase per °C temperature change, following the Clausius-Clapeyron scaling relationship (Kunkel et al. 2013).

In this study, projected changes in temperature are estimated using downscaled climate projections and guidance provided by ClimateData.ca (2024). The steps used are provided below:

1) Find the long-term (30-year mean) annual mean temperature change (ΔT) for the location of interest, timeframe and emission scenario.

2) Estimate the projected change in rainfall intensity (or depth) to be applied to all durations and return periods under consideration using the following equation:

$$\text{Projected Change } (\%) = 1.07^{\Delta \mathrm{T}} - 1 \qquad \text{Equation 5}$$

REFERENCES

CSA (Canadian Standards Association). 2019. Draft Standard Plus 4013:19. Technical Guide Development, Interpretation and Use of Rainfall Intensity-Duration-Frequency (IDF) Information: Guideline for Canadian Water Resources Practitioners. 126p.

ClimateData.ca. 2023. Statistically Downscaled Climate Scenarios - BCCAQv2. Available at https://climatedata.ca/.

ClimateData.ca. 2024. IDF Data and Climate Change. Learning Zone: Topic 6. Available at: https://climatedata.ca/resource/idf-data-and-climate-change/.

Kunkel KE. 2013. Probable Maximum Precipitation and Climate Change. Geophysical Research Letters, 40(7): 1402-1408. doi: 10.1002/grl.50334.

Hopkinson RF. 2001. Rain30 PMP Factors after Hershfield. Environment Canada, October 17th, 2001. Available at: https://collaboration.cmc.ec.gc.ca/cmc/climate/Engineer_Climate/IDF/1-30_Day_IDF-1_30_jours_IDF/docs/EC_1-30-day_IDF_docs/Hopkinson_2001_Rain30_PMP_Factors_after_Hershfield.pdf

IPCC (Intergovernmental Panel on Climate Change). 2021a. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 3949 pp.

IPCC. 2021b. IPCC WGI Interactive Atlas: Regional Information (Advanced). Available at: https://interactive-atlas.ipcc.ch/.

Kamal N, and Pachauri S. 2018. Mann-Kendall Tests – A Novel Approach for Statistical Trend Analysis. International Journal of Computer Trends and Technology, 63(1): 18-21. Doi: 10.14445/22312803/IJCTT-V63P104.

O'Neil BC, Kriegler E, Riahi K, Ebi KL, Hallegatte S, Carter TR, Mathur R, and van Vuuren D. 2014. A new scenario framework for climate change research: the concept of shared socioeconomic pathways. Climatic Change, 122: 387-400. doi: 10.1007/s10584-013-0905-2.

Piani C, Weedon GP, Best M, Gomes SM, Viterbo P, Hagemann S, and Haerter JO. 2010. Statistical Bias Correction of Global Simulated Daily Precipitation and Temperature for the Application of Hydrological Models. Journal of Hydrology, 395(3-4): 199–215. doi: 10.1016/j.jhydrol.2010.10.024.

Salmi T, Määttä A, Anttila P, Ruoho-Airola T, and Amnell T. 2002. Detecting Trends of Annual Values of Atmospheric Pollutants by the Mann-Kendall Test and Sen's Slope Estimates – The Excel Template Application MakeSens. Publications on Air Quality, No. 31.

WMO (World Meteorological Organization). 2009. Manual on Estimation of Probable Maximum Precipitation (PMP). World Meteorological Organization (WMO). WMO-No. 1045. Geneva, Switzerland.

WMO. 2017. WMO Guidelines on the Calculation of Climate Normals. Technical report: WMO No. 1203. Geneva, Switzerland.

WSP (WSP Canada Inc.). 2022. Climate Baseline Update: Mount Polley Mine. Submitted to Mount Polley Mining Corporation August 30, 2022. Reference No. 22514095-066-R-Rev0-31547.

ATTACHMENT 2

Additional Future Climate Statistics

Attachment 2 - Additional Climate Projection Statistics

Supplementary Climate Change Information for Mount Polley Mine Site (2024)

The nature of the work undertaken is stochastic with substantial inherent uncertainly around any given data points. The user acknowledges that the uncertainty associated with any projections or forecasts is increased with how far into the future the projected period extends and is subject to future developments or intervening acts which may manifest in the interim period.

See memo Section 2.0 for guidance on how to use the data provided in this attachment

Variable	Annual and Monthly Temperature Statistics
Units	°C
Area	Nearest Grid Cell to Mine site
Baseline	Projected changes calculated from model baseline (1991 - 2020)

Projected Changes in Annual and Monthly Temperature Statistics

Period	Month	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2050s	1	-0.1	0.0	0.5	0.9	1.3	1.8	2.6	3.5	3.9	4.9	5.6	2.0	1.1
2050s	2	0.1	0.2	0.4	0.6	1.1	1.7	2.3	3.1	3.4	4.3	4.9	1.8	1.0
2050s	3	0.0	0.0	0.6	0.8	1.2	1.7	2.3	2.8	2.9	3.6	3.8	1.7	0.8
2050s	4	0.7	0.7	0.9	1.0	1.4	2.1	2.8	3.7	4.0	4.5	5.2	2.2	1.0
2050s	5	-0.1	0.3	0.7	1.1	1.6	2.2	2.9	3.5	3.8	4.8	5.0	2.3	1.0
2050s	6	0.0	0.1	0.6	0.9	1.3	2.0	2.8	3.7	4.2	4.8	5.5	2.1	1.1
2050s	7	0.5	0.6	0.8	1.1	1.6	2.3	3.0	4.0	4.9	6.3	6.3	2.5	1.3
2050s	8	-0.4	0.2	0.8	1.2	1.7	2.5	3.4	4.3	4.9	5.8	6.4	2.6	1.3
2050s	9	-0.1	0.4	1.0	1.1	1.6	2.2	3.0	3.8	4.3	4.8	4.9	2.3	1.1
2050s	10	0.3	0.7	0.8	1.0	1.4	1.9	2.6	3.3	3.6	4.3	4.5	2.1	0.9
2050s	11	-0.1	0.3	0.5	0.8	1.4	2.1	3.0	4.2	4.5	5.1	5.4	2.3	1.2
2050s	12	0.7	0.7	0.7	0.8	1.3	2.1	2.9	3.7	4.4	5.1	5.1	2.2	1.2
2050s	Annual	0.7	0.8	1.0	1.3	1.5	2.0	2.7	3.4	4.0	4.4	4.5	2.2	0.9
2080s	1	-0.3	-0.2	0.4	0.9	1.7	2.7	4.1	5.2	6.0	7.6	8.3	3.0	1.8
2080s	2	0.0	0.0	0.6	0.9	1.4	2.3	3.7	5.4	5.7	6.5	6.8	2.6	1.6
2080s	3	-0.3	-0.1	0.6	0.9	1.6	2.5	3.7	5.0	5.4	6.2	6.3	2.7	1.6
2080s	4	0.5	0.8	1.0	1.2	2.1	2.9	4.2	5.7	7.1	7.8	7.9	3.3	1.8
2080s	5	0.8	0.8	1.2	1.5	2.1	3.0	4.3	5.1	6.1	8.2	8.2	3.3	1.6
2080s	6	0.1	0.4	0.7	1.1	1.8	2.7	4.1	5.7	6.5	8.6	8.7	3.2	1.9
2080s	7	0.1	0.4	0.9	1.2	2.0	3.3	5.1	7.3	8.8	11.1	11.9	3.9	2.5
2080s	8	0.4	0.8	1.2	1.7	2.2	3.7	5.5	7.5	8.7	10.8	11.3	4.1	2.4
2080s	9	0.0	0.1	0.8	1.3	1.9	3.2	4.7	6.5	7.7	9.0	9.2	3.6	2.1
2080s	10	-0.2	0.2	1.0	1.3	1.7	2.7	4.1	5.3	5.9	6.9	7.0	3.0	1.6
2080s	11	-0.4	0.1	0.9	1.2	1.9	3.1	4.3	5.5	6.5	8.1	8.3	3.2	1.8
2080s	12	0.4	0.4	1.2	1.3	1.8	3.2	4.3	5.4	7.6	8.6	9.2	3.3	1.9
2080s	Annual	0.6	0.8	1.2	1.4	1.8	2.7	4.3	5.4	6.8	7.9	8.4	3.3	1.7

Variable	Annual and Monthly Temperature Statistics
Units	%
Area	Nearest Grid Cell to Mine site
Baseline	Projected changes calculated from model baseline (1991 - 2020)

Projected Changes in Annual and Monthly Total Precipitation Statistics

Period	Month	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2050s	1	-19.1%	-10.4%	-3.9%	-1.6%	2.2%	10.9%	19.0%	24.2%	28.0%	45.0%	48.6%	11.3%	11.8%
2050s	2	-12.8%	-12.2%	-10.8%	-6.4%	-1.6%	7.2%	17.0%	27.7%	31.7%	37.1%	40.4%	8.9%	12.9%
2050s	3	-16.9%	-16.9%	-10.8%	-7.6%	1.7%	6.6%	17.4%	27.5%	34.0%	42.8%	43.0%	9.3%	13.7%
2050s	4	-9.7%	-9.4%	-7.5%	-2.5%	3.9%	10.9%	18.1%	27.0%	37.9%	42.9%	45.4%	12.0%	12.3%
2050s	5	-7.3%	-5.9%	-0.3%	3.2%	7.6%	16.4%	24.6%	34.2%	42.9%	49.0%	54.2%	17.5%	13.1%
2050s	6	-25.6%	-23.9%	-16.5%	-13.9%	-1.5%	7.7%	15.9%	21.8%	28.0%	48.0%	65.5%	7.3%	15.0%
2050s	7	-42.1%	-39.6%	-21.7%	-17.1%	-10.5%	-3.3%	4.2%	8.9%	13.7%	34.2%	48.2%	-2.9%	13.0%
2050s	8	-51.9%	-42.0%	-31.3%	-20.7%	-13.1%	-2.5%	4.3%	15.8%	22.2%	33.1%	39.1%	-3.8%	16.2%
2050s	9	-28.4%	-22.7%	-11.3%	-9.7%	-4.9%	4.9%	14.3%	29.1%	32.2%	39.7%	42.5%	6.5%	14.6%
2050s	10	-7.8%	-7.6%	-0.4%	1.7%	7.7%	14.0%	24.1%	32.5%	35.1%	47.1%	48.9%	16.0%	11.8%
2050s	11	-19.3%	-18.1%	-12.0%	-5.7%	0.4%	9.2%	19.4%	25.9%	32.1%	41.4%	42.8%	9.8%	13.5%
2050s	12	-12.4%	-10.9%	-5.6%	-3.1%	1.8%	10.4%	19.6%	26.9%	31.9%	36.1%	38.3%	11.3%	11.9%
2050s	Annual	-2.0%	-0.6%	0.8%	1.8%	4.8%	8.0%	11.2%	13.7%	16.2%	19.5%	24.7%	8.0%	4.9%
2080s	1	-10.2%	-7.3%	-4.8%	-0.5%	6.9%	13.4%	23.6%	32.1%	40.5%	47.2%	52.3%	15.2%	13.0%
2080s	2	-20.5%	-18.8%	-9.4%	-7.5%	-2.1%	8.1%	19.7%	31.2%	34.4%	45.7%	52.7%	9.9%	15.4%
2080s	3	-18.0%	-16.9%	-9.2%	-5.7%	0.1%	8.4%	16.0%	29.0%	34.0%	46.6%	53.6%	9.9%	14.0%
2080s	4	-12.4%	-8.6%	-4.0%	-0.3%	8.3%	18.4%	31.1%	44.1%	54.6%	73.5%	93.2%	21.3%	18.7%
2080s	5	-8.9%	-5.7%	-0.9%	5.3%	13.7%	21.8%	33.8%	45.6%	53.4%	67.9%	68.2%	24.2%	16.6%
2080s	6	-24.5%	-20.6%	-15.0%	-10.6%	-0.1%	10.4%	19.9%	31.1%	44.6%	59.1%	75.6%	11.3%	17.7%
2080s	7	-50.0%	-47.1%	-34.5%	-22.6%	-15.6%	-5.6%	5.6%	15.4%	18.9%	28.9%	29.9%	-5.8%	16.4%
2080s	8	-59.1%	-55.5%	-36.6%	-28.6%	-14.5%	-5.6%	5.0%	11.2%	22.0%	36.4%	42.3%	-6.3%	17.6%
2080s	9	-21.4%	-18.8%	-11.0%	-6.2%	0.0%	10.1%	21.6%	28.0%	35.9%	50.3%	55.4%	11.1%	15.3%
2080s	10	-2.2%	-1.8%	2.9%	3.6%	8.4%	21.7%	33.5%	48.4%	56.9%	77.4%	95.2%	23.7%	18.5%
2080s	11	-14.7%	-11.0%	-4.1%	-1.1%	6.1%	15.9%	26.0%	41.7%	54.7%	76.1%	87.5%	18.3%	18.6%
2080s	12	-13.8%	-12.0%	0.8%	3.1%	7.3%	15.3%	23.9%	34.5%	39.5%	51.9%	55.1%	16.9%	13.2%
2080s	Annual	-2.5%	-1.1%	1.8%	4.4%	7.5%	10.1%	16.4%	21.1%	25.8%	30.1%	38.2%	11.9%	7.3%

Variable	Extreme Precipitation Statistics
Units	%
Area	Nearest Grid Cell to Mine site
Baseline	Projected changes calculated from model baseline (1991 - 2020)

Extreme Precipitation Statistics for Selected Return Periods and Durations

Period	Return Period (years)	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2050s	2	1	-6.5%	-5.5%	-3.4%	-0.9%	5.1%	9.1%	14.9%	21.1%	23.6%	30.9%	35.5%	10.3%	8.4%
2050s	2	2	-8.5%	-8.4%	-1.8%	0.3%	4.9%	10.8%	15.6%	21.7%	24.2%	32.1%	36.0%	10.6%	8.6%
2050s	2	3	-7.7%	-5.2%	-1.6%	1.0%	4.4%	10.3%	15.1%	20.8%	24.7%	35.7%	41.0%	10.7%	8.6%
2050s	2	4	-8.5%	-7.2%	-0.7%	0.9%	5.6%	10.3%	15.1%	19.1%	23.4%	37.8%	38.4%	10.6%	8.3%
2050s	2	5	-8.5%	-8.5%	-1.7%	1.2%	4.7%	10.7%	14.1%	19.4%	21.1%	32.7%	38.9%	10.1%	8.0%
2050s	2	6	-10.1%	-8.5%	-3.1%	-0.4%	4.9%	10.8%	13.6%	19.9%	23.2%	31.8%	39.0%	10.1%	8.3%
2050s	2	7	-10.5%	-10.3%	-3.3%	-1.3%	5.3%	9.9%	14.3%	20.2%	24.2%	31.6%	37.8%	9.9%	8.5%
2050s	2	10	-6.9%	-6.8%	-3.7%	-1.3%	3.7%	9.4%	14.3%	20.5%	23.0%	33.2%	37.5%	9.8%	8.6%
2050s	2	20	-4.7%	-4.2%	-1.5%	1.0%	5.0%	10.0%	14.1%	21.4%	22.8%	38.1%	38.4%	10.5%	8.4%
2050s	2	30	-6.1%	-3.6%	-1.3%	0.6%	5.1%	9.9%	13.6%	19.4%	21.9%	35.2%	37.2%	10.0%	7.7%
2050s	2	50	-4.7%	-3.8%	-1.4%	0.4%	4.6%	8.0%	12.6%	17.0%	20.0%	27.6%	28.4%	8.8%	6.6%
2050s	2	75	-1.3%	-1.2%	-0.6%	0.1%	5.3%	8.6%	11.7%	16.1%	18.5%	23.2%	24.8%	8.6%	5.8%
2050s	2	90	-2.9%	-2.2%	-0.8%	0.3%	4.6%	7.4%	10.4%	15.2%	19.0%	22.7%	25.4%	7.9%	5.7%
2050s	2	120	-1.4%	-1.3%	-0.7%	1.2%	4.3%	7.1%	10.5%	14.4%	18.0%	20.7%	26.2%	7.7%	5.4%
2050s	5	1	-11.5%	-5.1%	-2.3%	-0.7%	5.1%	11.4%	16.7%	23.5%	33.5%	44.6%	52.6%	12.4%	10.9%
2050s	5	2	-14.8%	-8.5%	-1.8%	-0.4%	5.7%	11.4%	17.4%	27.0%	34.8%	43.1%	49.1%	12.5%	11.3%
2050s	5	3	-8.2%	-7.2%	-1.9%	1.0%	5.2%	10.5%	17.5%	27.3%	35.5%	45.6%	49.9%	12.8%	11.5%
2050s	5	4	-12.7%	-8.4%	-3.8%	2.2%	5.8%	10.7%	18.0%	28.6%	33.0%	46.9%	47.1%	12.6%	11.2%
2050s	5	5	-14.5%	-11.7%	-3.6%	0.9%	6.5%	10.5%	17.5%	24.1%	29.8%	41.8%	47.5%	11.9%	10.7%
2050s	5	6	-15.7%	-12.6%	-3.6%	1.3%	6.2%	9.8%	16.5%	27.2%	29.9%	37.5%	48.7%	11.9%	10.8%
2050s	5	7	-15.0%	-14.7%	-2.2%	0.2%	5.2%	9.3%	18.4%	27.6%	30.1%	36.2%	47.5%	11.6%	11.0%
2050s	5	10	-10.0%	-8.8%	-2.9%	-0.3%	4.7%	9.2%	16.7%	23.3%	30.7%	38.9%	49.0%	11.1%	10.7%
2050s	5	20	-5.8%	-5.3%	0.0%	1.7%	4.6%	9.9%	16.8%	21.7%	28.0%	46.1%	47.4%	11.8%	9.8%
2050s	5	30	-6.0%	-4.4%	-1.8%	0.7%	4.8%	9.6%	14.3%	19.8%	26.3%	41.4%	41.5%	10.3%	8.8%
2050s	5	50	-7.0%	-4.5%	-2.5%	1.1%	4.6%	7.3%	13.1%	16.7%	19.9%	28.9%	33.3%	8.7%	7.2%
2050s	5	75	-4.7%	-4.2%	-0.8%	0.8%	3.7%	8.5%	11.8%	16.5%	20.0%	27.2%	27.7%	8.4%	6.6%
2050s	5	90	-4.1%	-3.8%	-3.3%	0.2%	4.3%	6.9%	10.7%	15.9%	20.1%	23.5%	24.8%	7.6%	6.3%
2050s	5	120	-4.9%	-4.2%	-1.5%	0.0%	4.0%	7.1%	10.5%	15.6%	17.7%	21.9%	24.9%	7.6%	5.8%
2050s	10	1	-13.8%	-5.9%	-3.0%	-0.9%	4.3%	12.4%	19.0%	27.2%	38.4%	51.2%	60.5%	13.4%	12.7%
2050s	10	2	-17.5%	-10.1%	-4.0%	-0.6%	5.4%	12.0%	19.9%	28.9%	40.8%	51.1%	55.5%	13.4%	13.1%
2050s	10	3	-9.8%	-8.6%	-4.3%	-0.1%	5.5%	11.4%	19.5%	30.3%	40.6%	52.9%	54.1%	13.8%	13.4%
2050s	10	4	-15.3%	-10.1%	-5.9%	1.7%	5.5%	11.0%	20.6%	32.1%	38.8%	51.2%	51.6%	13.5%	13.2%
2050s	10	5	-17.3%	-13.7%	-5.8%	0.9%	6.0%	10.3%	18.5%	28.4%	35.2%	46.2%	51.7%	12.8%	12.5%
2050s	10	6	-18.3%	-14.5%	-5.2%	1.2%	5.6%	10.1%	18.4%	29.8%	34.5%	42.5%	53.4%	12.9%	12.5%
2050s	10	7	-17.2%	-16.7%	-3.6%	-0.8%	4.6%	9.7%	20.1%	30.6%	33.6%	41.7%	52.3%	12.4%	12.7%
2050s	10	10	-11.6%	-9.7%	-3.6%	0.3%	4.1%	8.8%	18.9%	25.6%	36.3%	44.9%	54.8%	11.8%	12.2%
2050s	10	20	-6.9%	-6.5%	-0.1%	0.7%	4.8%	10.9%	17.9%	23.7%	32.0%	50.2%	52.0%	12.5%	10.8%
2050s	10	30	-7.6%	-5.0%	-3.5%	-1.1%	3.7%	9.3%	14.5%	21.5%	28.3%	43.9%	45.1%	10.5%	9.8%
2050s	10	50	-8.7%	-5.5%	-2.7%	-0.6%	4.2%	7.6%	13.3%	18.5%	20.9%	29.6%	35.8%	8.7%	7.9%
2050s	10	75	-6.9%	-5.8%	-2.0%	-0.4%	2.4%	7.8%	12.2%	17.7%	21.6%	29.2%	29.4%	8.3%	7.5%

Extreme Precipitation Statistics for Selected Return Periods and Durations

Period	Return Period (years)	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2050s	10	90	-6.7%	-5.8%	-4.1%	-0.9%	2.5%	7.1%	11.5%	17.7%	20.4%	24.8%	25.7%	7.5%	7.1%
2050s	10	120	-8.0%	-6.7%	-1.9%	-0.6%	3.7%	6.5%	10.7%	16.6%	18.7%	22.7%	24.3%	7.5%	6.5%
2050s	25	1	-16.0%	-9.8%	-3.1%	-1.1%	5.4%	12.5%	21.7%	32.0%	43.7%	57.9%	68.0%	14.5%	14.8%
2050s	25	2	-20.1%	-12.5%	-5.9%	-1.0%	5.0%	13.2%	22.0%	31.6%	46.3%	59.3%	61.8%	14.4%	15.0%
2050s	25	3	-11.4%	-9.9%	-5.5%	-0.4%	5.6%	12.2%	21.6%	32.7%	46.1%	61.0%	61.4%	14.8%	15.4%
2050s	25	4	-17.8%	-11.7%	-8.0%	0.1%	5.5%	11.2%	21.8%	34.1%	44.8%	56.6%	58.4%	14.5%	15.3%
2050s	25	5	-19.9%	-15.7%	-8.0%	0.5%	5.9%	10.8%	20.3%	32.0%	40.8%	52.6%	55.9%	13.7%	14.4%
2050s	25	6	-20.8%	-16.3%	-6.6%	0.3%	4.4%	11.0%	20.7%	33.1%	38.9%	48.6%	58.3%	13.8%	14.4%
2050s	25	7	-19.3%	-18.6%	-5.1%	-1.8%	3.7%	11.0%	21.4%	34.3%	36.2%	47.6%	57.2%	13.3%	14.6%
2050s	25	10	-13.2%	-11.4%	-5.5%	-1.2%	3.1%	9.5%	20.1%	27.6%	40.1%	51.5%	60.8%	12.5%	13.8%
2050s	25	20	-8.7%	-7.3%	-1.5%	0.2%	4.6%	11.4%	19.4%	27.2%	35.8%	54.5%	56.9%	13.2%	12.1%
2050s	25	30	-9.3%	-8.9%	-4.2%	-2.2%	3.3%	9.5%	15.4%	23.3%	30.2%	46.5%	49.0%	10.7%	11.0%
2050s	25	50	-10.6%	-6.6%	-3.9%	-2.4%	3.1%	7.3%	13.3%	20.2%	23.7%	31.1%	38.5%	8.7%	8.9%
2050s	25	75	-9.2%	-7.4%	-4.4%	-2.1%	2.0%	7.6%	13.5%	18.9%	22.0%	31.0%	31.8%	8.2%	8.6%
2050s	25	90	-9.3%	-7.8%	-4.7%	-3.1%	2.2%	7.1%	12.2%	18.7%	22.7%	26.2%	28.3%	7.4%	8.1%
2050s	25	120	-11.2%	-9.3%	-2.9%	-1.9%	3.2%	7.2%	11.4%	18.2%	21.1%	23.6%	23.6%	7.5%	7.4%
2050s	50	1	-17.3%	-12.1%	-4.1%	-2.0%	4.7%	12.3%	23.2%	34.8%	46.9%	61.8%	72.4%	15.2%	16.1%
2050s	50	2	-21.6%	-14.6%	-7.3%	-1.9%	4.0%	13.2%	23.6%	33.7%	48.7%	64.3%	65.6%	15.0%	16.3%
2050s	50	3	-12.4%	-10.6%	-7.2%	-1.6%	4.6%	12.9%	22.6%	34.6%	49.4%	66.3%	67.1%	15.5%	16.7%
2050s	50	4	-19.2%	-12.7%	-9.0%	-1.3%	5.0%	11.7%	22.6%	35.4%	48.4%	59.8%	64.0%	15.1%	16.7%
2050s	50	5	-21.4%	-16.8%	-9.2%	-0.2%	5.2%	11.3%	22.1%	34.3%	44.2%	56.8%	58.4%	14.3%	15.6%
2050s	50	6	-22.2%	-17.4%	-7.4%	-1.3%	4.2%	12.2%	22.1%	36.2%	41.9%	52.2%	61.2%	14.4%	15.6%
2050s	50	7	-20.6%	-19.7%	-5.9%	-2.6%	2.7%	11.1%	23.3%	36.2%	38.8%	51.5%	60.1%	13.8%	15.8%
2050s	50	10	-14.1%	-12.6%	-6.6%	-1.8%	2.7%	10.4%	20.8%	28.6%	41.6%	55.7%	64.4%	12.9%	14.9%
2050s	50	20	-9.8%	-7.8%	-3.1%	0.1%	4.6%	12.4%	19.9%	28.7%	38.1%	57.1%	59.9%	13.7%	13.0%
2050s	50	30	-11.6%	-10.6%	-5.8%	-2.7%	3.3%	9.3%	15.7%	24.1%	31.4%	48.1%	51.4%	10.8%	11.8%
2050s	50	50	-11.7%	-8.4%	-5.2%	-3.5%	2.6%	7.3%	13.5%	21.8%	25.7%	32.3%	40.2%	8.7%	9.6%
2050s	50	75	-10.6%	-8.4%	-6.2%	-3.5%	1.5%	7.0%	13.8%	20.3%	22.8%	32.2%	33.2%	8.1%	9.4%
2050s	50	90	-10.9%	-9.0%	-6.0%	-4.4%	1.7%	6.9%	12.7%	19.8%	24.0%	28.1%	29.9%	7.4%	8.9%
2050s	50	120	-13.1%	-10.8%	-3.9%	-2.6%	2.2%	7.2%	11.9%	19.8%	22.6%	24.1%	24.5%	7.5%	8.1%
2050s	100	1	-18.3%	-14.0%	-4.4%	-2.5%	4.2%	12.3%	23.8%	37.2%	49.6%	65.2%	76.1%	15.7%	17.2%
2050s	100	2	-22.8%	-16.4%	-8.6%	-2.7%	3.8%	13.5%	24.2%	35.4%	50.8%	68.6%	68.7%	15.5%	17.3%
2050s	100	3	-13.1%	-11.4%	-7.9%	-2.2%	3.6%	13.2%	24.0%	36.1%	52.1%	70.8%	71.9%	16.0%	17.9%
2050s	100	4	-20.4%	-13.5%	-9.7%	-2.4%	4.2%	12.2%	23.5%	37.2%	51.5%	62.6%	68.7%	15.6%	17.8%
2050s	100	5	-22.6%	-17.7%	-10.2%	-0.8%	4.9%	11.5%	24.4%	35.9%	47.2%	60.4%	60.6%	14.8%	16.6%
2050s	100	6	-23.4%	-18.3%	-8.0%	-2.5%	4.2%	12.7%	23.2%	38.9%	44.4%	55.4%	63.7%	14.9%	16.6%
2050s	100	7	-21.7%	-20.7%	-7.1%	-3.0%	2.8%	11.6%	24.6%	37.5%	41.0%	55.0%	62.6%	14.3%	16.8%
2050s	100	10	-14.9%	-13.7%	-7.5%	-1.8%	1.6%	10.7%	22.1%	29.5%	43.0%	59.4%	67.6%	13.3%	15.8%
2050s	100	20	-10.8%	-8.3%	-4.5%	-0.3%	4.6%	12.4%	20.7%	30.3%	39.6%	59.3%	62.5%	14.1%	13.7%
2050s	100	30	-13.9%	-11.8%	-6.7%	-2.9%	3.4%	9.3%	16.0%	24.8%	32.4%	49.5%	53.5%	10.9%	12.5%
2050s	100	50	-12.7%	-10.3%	-6.0%	-4.1%	2.0%	7.8%	14.4%	22.9%	27.2%	33.2%	41.6%	8.8%	10.2%
2050s	100	75	-11.8%	-9.2%	-7.6%	-5.2%	1.1%	6.7%	14.5%	20.7%	23.6%	33.1%	34.4%	8.1%	10.1%
2050s	100	90	-12.3%	-10.0%	-7.3%	-5.4%	1.0%	6.9%	13.3%	20.7%	24.3%	30.4%	31.3%	7.3%	9.6%
2050s	100	120	-14.7%	-12.2%	-5.3%	-2.8%	1.9%	7.2%	12.7%	21.0%	22.8%	25.1%	25.3%	7.5%	8.7%
2050s	200	1	-19.2%	-15.6%	-4.7%	-2.8%	4.0%	12.0%	24.3%	39.2%	51.9%	68.1%	79.2%	16.2%	18.2%
2050s	200	2	-23.9%	-18.0%	-9.7%	-3.0%	3.8%	13.9%	24.7%	36.9%	52.5%	71.7%	72.6%	15.9%	18.2%
2050s	200	3	-13.8%	-12.4%	-8.5%	-2.8%	3.0%	13.6%	25.2%	37.2%	54.4%	74.8%	76.1%	16.5%	18.8%

Extreme Precipitation Statistics for Selected Return Periods and Durations

Period	Return Period (years)	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2050s	200	4	-21.4%	-14.2%	-10.3%	-3.3%	3.6%	12.7%	24.6%	39.1%	54.0%	65.6%	72.8%	16.1%	18.8%
2050s	200	5	-23.6%	-18.5%	-11.1%	-1.5%	4.3%	11.9%	25.7%	38.1%	49.7%	62.8%	63.8%	15.2%	17.5%
2050s	200	6	-24.5%	-19.0%	-8.6%	-3.6%	3.7%	13.2%	24.2%	41.0%	46.6%	58.1%	65.9%	15.4%	17.5%
2050s	200	7	-22.5%	-21.5%	-8.1%	-3.4%	2.2%	12.0%	25.9%	39.1%	43.6%	58.1%	64.8%	14.7%	17.7%
2050s	200	10	-15.6%	-14.5%	-8.3%	-2.4%	1.3%	11.1%	23.0%	30.2%	44.1%	62.7%	70.4%	13.6%	16.7%
2050s	200	20	-11.6%	-8.6%	-5.3%	-0.7%	4.8%	12.7%	20.8%	31.6%	41.0%	61.3%	64.8%	14.5%	14.4%
2050s	200	30	-15.8%	-12.8%	-8.0%	-3.0%	3.4%	9.2%	16.5%	25.7%	33.3%	50.8%	55.4%	11.1%	13.1%
2050s	200	50	-13.5%	-12.0%	-7.2%	-4.6%	1.4%	7.7%	14.4%	23.7%	27.7%	34.1%	42.9%	8.8%	10.8%
2050s	200	75	-12.9%	-10.2%	-8.6%	-6.6%	0.4%	6.7%	15.2%	21.7%	25.0%	34.0%	35.4%	8.1%	10.8%
2050s	200	90	-13.5%	-10.9%	-8.0%	-6.3%	0.5%	6.8%	13.8%	21.1%	25.7%	32.3%	32.5%	7.3%	10.2%
2050s	200	120	-16.1%	-13.3%	-6.4%	-3.0%	1.3%	6.6%	13.2%	21.8%	23.0%	26.0%	26.0%	7.5%	9.3%
2050s	500	1	-20.2%	-17.4%	-5.7%	-3.0%	4.0%	12.0%	24.7%	41.8%	54.4%	71.4%	82.6%	16.7%	19.3%
2050s	500	2	-25.0%	-19.7%	-10.9%	-3.8%	3.6%	14.1%	25.1%	38.5%	54.5%	75.2%	77.2%	16.4%	19.3%
2050s	500	3	-14.5%	-13.6%	-9.1%	-3.4%	2.5%	13.8%	26.6%	38.3%	57.0%	79.3%	80.9%	17.0%	20.0%
2050s	500	4	-22.5%	-15.0%	-10.9%	-4.4%	2.9%	13.1%	26.2%	40.8%	56.8%	69.7%	77.5%	16.6%	20.0%
2050s	500	5	-24.8%	-19.3%	-12.0%	-2.3%	3.7%	12.2%	26.7%	40.5%	52.6%	65.3%	67.7%	15.7%	18.5%
2050s	500	6	-25.6%	-19.8%	-9.2%	-4.8%	3.5%	13.1%	25.6%	42.5%	49.0%	61.2%	68.3%	15.9%	18.6%
2050s	500	7	-23.5%	-22.3%	-8.7%	-4.6%	1.6%	12.4%	27.2%	40.8%	46.5%	61.7%	67.3%	15.1%	18.7%
2050s	500	10	-16.4%	-15.5%	-9.2%	-2.8%	0.7%	11.6%	23.9%	31.1%	45.4%	66.5%	73.5%	14.0%	17.6%
2050s	500	20	-12.5%	-9.1%	-6.1%	-0.9%	5.1%	13.3%	20.9%	33.2%	42.6%	63.5%	67.5%	14.9%	15.2%
2050s	500	30	-18.0%	-13.9%	-9.6%	-3.4%	3.7%	8.7%	17.3%	26.8%	34.4%	54.1%	57.6%	11.2%	13.9%
2050s	500	50	-14.5%	-13.9%	-8.7%	-5.2%	0.7%	7.4%	15.1%	24.6%	28.0%	35.0%	44.4%	8.8%	11.5%
2050s	500	75	-14.1%	-11.7%	-9.7%	-7.9%	-0.2%	6.8%	15.6%	22.8%	26.7%	35.7%	36.6%	8.1%	11.5%
2050s	500	90	-14.9%	-12.0%	-9.2%	-7.4%	0.1%	6.8%	14.6%	21.6%	28.0%	34.1%	34.9%	7.3%	11.0%
2050s	500	120	-17.8%	-14.6%	-7.8%	-3.7%	0.6%	6.3%	13.7%	22.4%	24.5%	26.8%	27.1%	7.5%	10.0%
2050s	1000	1	-20.9%	-18.5%	-6.4%	-3.1%	4.2%	12.3%	25.5%	43.8%	56.0%	73.5%	84.8%	17.1%	20.0%
2050s	1000	2	-25.7%	-20.7%	-11.6%	-4.7%	3.5%	14.3%	25.6%	39.6%	55.8%	77.4%	80.3%	16.7%	20.0%
2050s	1000	3	-14.9%	-14.4%	-9.5%	-4.1%	2.1%	13.9%	27.5%	39.1%	58.7%	82.3%	84.1%	17.4%	20.7%
2050s	1000	4	-23.2%	-15.7%	-11.3%	-5.2%	2.5%	13.3%	27.8%	41.8%	58.6%	72.5%	80.6%	16.9%	20.8%
2050s	1000	5	-25.5%	-19.9%	-12.6%	-2.7%	3.4%	12.3%	27.1%	42.1%	54.6%	67.0%	70.3%	16.0%	19.2%
2050s	1000	6	-26.3%	-20.4%	-9.6%	-5.5%	3.4%	13.0%	26.8%	43.4%	50.7%	63.3%	69.9%	16.2%	19.3%
2050s	1000	7	-24.2%	-22.9%	-9.0%	-5.4%	1.4%	12.7%	27.5%	41.9%	48.4%	64.0%	68.9%	15.4%	19.4%
2050s	1000	10	-16.9%	-16.1%	-9.8%	-3.2%	0.8%	11.8%	24.4%	31.7%	46.2%	69.1%	75.6%	14.2%	18.3%
2050s	1000	20	-13.1%	-9.6%	-6.7%	-1.1%	4.8%	13.4%	21.2%	34.3%	43.7%	65.0%	69.2%	15.2%	15.8%
2050s	1000	30	-19.4%	-14.7%	-10.5%	-3.9%	3.6%	8.6%	17.9%	27.5%	35.0%	56.5%	59.0%	11.3%	14.4%
2050s	1000	50	-15.2%	-15.1%	-9.7%	-5.6%	0.2%	7.4%	15.7%	25.1%	28.4%	35.8%	45.3%	8.8%	11.9%
2050s	1000	75	-14.9%	-12.8%	-10.2%	-8.7%	-0.4%	6.7%	16.5%	23.3%	27.7%	37.1%	37.4%	8.1%	12.1%
2050s	1000	90	-15.8%	-12.6%	-10.2%	-8.4%	-0.1%	6.9%	15.4%	21.9%	29.4%	35.2%	36.6%	7.3%	11.5%
2050s	1000	120	-18.8%	-15.5%	-8.6%	-4.2%	0.3%	6.3%	14.1%	23.4%	25.2%	27.6%	27.8%	7.5%	10.4%
2050s	2000	1	-21.4%	-19.6%	-7.0%	-3.2%	3.9%	12.5%	26.1%	45.5%	57.5%	75.4%	86.7%	17.4%	20.7%
2050s	2000	2	-26.3%	-21.7%	-12.3%	-5.5%	3.4%	14.6%	26.2%	40.6%	56.9%	79.4%	83.0%	16.9%	20.6%
2050s	2000	3	-15.3%	-15.1%	-9.8%	-4.8%	1.8%	14.1%	28.5%	39.8%	60.2%	85.0%	86.9%	17.7%	21.4%
2050s	2000	4	-23.8%	-16.2%	-11.7%	-5.9%	2.3%	13.5%	28.5%	42.7%	60.2%	75.0%	83.4%	17.2%	21.4%
2050s	2000	5	-26.2%	-20.4%	-13.1%	-3.1%	3.1%	12.3%	27.4%	43.4%	56.3%	68.5%	72.6%	16.3%	19.8%
2050s	2000	6	-27.0%	-20.8%	-9.9%	-6.2%	3.0%	13.0%	27.8%	44.2%	52.1%	65.1%	71.4%	16.5%	19.9%
2050s	2000	7	-24.7%	-23.4%	-9.4%	-6.1%	1.1%	12.8%	27.7%	42.8%	50.1%	66.2%	70.3%	15.7%	20.0%
2050s	2000	10	-17.3%	-16.7%	-10.3%	-3.9%	0.7%	12.0%	24.9%	32.2%	47.0%	71.4%	77.4%	14.5%	18.9%

Extreme Precipitation Statistics for Selected Return Periods and Durations

Period	Return Period (years)	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2050s	2000	20	-13.6%	-10.4%	-7.1%	-1.4%	4.5%	13.7%	21.6%	35.4%	44.7%	66.3%	70.8%	15.4%	16.3%
2050s	2000	30	-20.6%	-15.4%	-11.4%	-4.4%	3.3%	8.8%	18.3%	28.1%	35.5%	58.6%	60.3%	11.4%	14.9%
2050s	2000	50	-16.3%	-15.9%	-10.5%	-5.9%	0.2%	7.5%	16.3%	25.4%	29.2%	37.0%	46.2%	8.9%	12.4%
2050s	2000	75	-15.6%	-13.7%	-10.7%	-9.3%	-0.7%	6.6%	16.9%	23.7%	28.7%	38.2%	38.5%	8.1%	12.5%
2050s	2000	90	-16.6%	-13.3%	-11.1%	-9.1%	-0.1%	6.9%	16.0%	22.2%	30.3%	36.1%	38.2%	7.3%	11.9%
2050s	2000	120	-19.8%	-16.2%	-9.4%	-4.6%	0.2%	6.3%	14.2%	24.5%	26.0%	28.4%	28.4%	7.5%	10.9%
2050s	10000	1	-22.5%	-21.5%	-8.2%	-3.3%	4.0%	12.9%	27.5%	48.9%	60.3%	79.0%	90.4%	18.0%	22.0%
2050s	10000	2	-27.5%	-23.5%	-13.3%	-6.9%	3.1%	15.5%	27.6%	42.4%	59.1%	83.3%	88.3%	17.5%	21.8%
2050s	10000	3	-16.5%	-16.2%	-10.3%	-5.9%	1.2%	14.8%	30.4%	41.3%	63.0%	90.3%	92.4%	18.3%	22.7%
2050s	10000	4	-25.0%	-17.3%	-12.3%	-7.2%	1.9%	14.1%	30.6%	45.1%	63.4%	79.8%	88.8%	17.8%	22.8%
2050s	10000	5	-27.4%	-21.3%	-14.1%	-3.8%	2.5%	12.5%	28.1%	46.0%	59.7%	71.4%	77.2%	16.9%	21.0%
2050s	10000	6	-28.2%	-21.7%	-10.5%	-7.4%	3.1%	12.9%	28.8%	46.3%	55.0%	68.7%	74.2%	17.1%	21.1%
2050s	10000	7	-25.8%	-24.4%	-10.2%	-7.5%	0.5%	12.9%	28.2%	44.6%	53.4%	70.3%	73.1%	16.2%	21.3%
2050s	10000	10	-18.2%	-17.8%	-11.2%	-5.1%	0.5%	12.4%	26.1%	33.2%	48.4%	76.0%	81.1%	14.9%	20.1%
2050s	10000	20	-14.7%	-11.9%	-7.8%	-2.0%	4.0%	14.2%	23.4%	37.4%	47.9%	68.9%	74.0%	15.9%	17.3%
2050s	10000	30	-23.0%	-16.7%	-13.1%	-5.2%	2.6%	9.1%	19.4%	29.3%	36.9%	62.9%	63.0%	11.6%	15.8%
2050s	10000	50	-18.8%	-17.4%	-12.0%	-6.5%	-0.4%	7.3%	16.9%	26.0%	30.8%	39.4%	48.0%	8.9%	13.2%
2050s	10000	75	-17.0%	-15.8%	-11.8%	-10.6%	-1.3%	6.3%	17.1%	25.1%	30.6%	39.9%	41.5%	8.1%	13.5%
2050s	10000	90	-18.2%	-15.2%	-12.8%	-10.3%	-0.7%	6.5%	16.4%	22.6%	31.7%	38.1%	41.5%	7.3%	12.9%
2050s	10000	120	-21.6%	-17.7%	-11.0%	-5.6%	0.0%	6.3%	14.6%	25.9%	28.1%	29.8%	30.2%	7.5%	11.7%
2080s	2	1	-8.2%	-4.9%	-1.3%	1.9%	5.7%	13.8%	22.9%	32.5%	38.6%	42.2%	44.9%	15.5%	12.1%
2080s	2	2	-10.2%	-9.1%	-0.9%	1.9%	6.2%	15.6%	23.4%	31.0%	34.9%	41.0%	42.8%	15.3%	11.5%
2080s	2	3	-7.6%	-6.8%	0.9%	2.5%	7.1%	13.3%	22.2%	30.1%	32.9%	39.3%	48.2%	15.1%	10.9%
2080s	2	4	-5.4%	-5.4%	-1.7%	4.5%	7.3%	13.1%	22.3%	30.0%	31.7%	41.2%	48.7%	15.1%	10.8%
2080s	2	5	-5.2%	-5.2%	-0.5%	3.5%	6.3%	13.1%	20.4%	29.1%	31.3%	42.6%	45.7%	14.2%	10.6%
2080s	2	6	-6.0%	-5.5%	-0.7%	2.4%	7.1%	12.8%	19.0%	29.5%	31.8%	43.0%	44.4%	14.1%	10.7%
2080s	2	7	-5.7%	-5.7%	-1.1%	1.0%	6.9%	12.9%	20.1%	30.2%	31.0%	44.6%	45.3%	14.1%	10.9%
2080s	2	10	-7.6%	-5.3%	-2.6%	1.4%	6.7%	12.7%	20.2%	29.2%	33.1%	45.1%	50.4%	14.3%	11.4%
2080s	2	20	-3.3%	-1.9%	1.3%	4.1%	8.5%	13.6%	20.2%	29.1%	32.7%	47.2%	48.1%	15.2%	10.4%
2080s	2	30	-3.5%	-1.2%	1.9%	3.2%	9.1%	12.6%	20.4%	27.2%	35.1%	45.6%	47.9%	15.2%	10.2%
2080s	2	50	-4.5%	-3.0%	2.4%	4.3%	8.2%	11.9%	19.2%	25.6%	30.3%	38.4%	43.6%	14.1%	9.0%
2080s	2	75	-1.7%	-1.6%	2.5%	4.5%	7.4%	11.4%	19.0%	22.9%	26.1%	34.4%	44.9%	13.4%	8.2%
2080s	2	90	-4.7%	-3.1%	2.4%	5.0%	6.9%	10.8%	17.4%	21.7%	25.3%	35.1%	45.6%	12.6%	8.2%
2080s	2	120	-3.9%	-2.6%	1.9%	3.7%	6.7%	11.2%	17.3%	21.1%	25.6%	33.1%	43.3%	12.3%	8.0%
2080s	5	1	-14.2%	-7.3%	-2.3%	-0.6%	5.4%	16.4%	24.9%	37.8%	42.3%	46.7%	49.8%	16.8%	14.2%
2080s	5	2	-14.8%	-10.2%	-5.2%	-0.6%	7.0%	16.7%	26.3%	34.8%	38.5%	45.9%	49.6%	17.1%	14.1%
2080s	5	3	-11.6%	-8.3%	-1.5%	0.1%	7.7%	15.2%	26.2%	32.7%	35.4%	47.0%	61.8%	16.7%	13.4%
2080s	5	4	-8.4%	-6.3%	-2.8%	1.5%	6.1%	15.4%	25.3%	34.3%	35.2%	52.3%	65.3%	16.2%	13.3%
2080s	5	5	-9.0%	-6.0%	-2.0%	1.1%	5.7%	13.2%	22.3%	31.8%	34.2%	52.4%	63.4%	15.0%	12.8%
2080s	5	6	-8.5%	-5.5%	-2.2%	1.8%	6.8%	11.5%	21.8%	32.5%	34.6%	54.3%	62.9%	15.2%	12.9%
2080s	5	7	-6.7%	-5.6%	-1.4%	0.9%	6.4%	11.8%	22.5%	31.6%	35.5%	54.0%	61.9%	15.0%	12.9%
2080s	5	10	-11.4%	-6.6%	-1.0%	1.0%	7.0%	12.5%	22.5%	30.6%	34.7%	54.0%	60.7%	15.2%	13.2%
2080s	5	20	-5.4%	-2.6%	1.8%	4.8%	8.4%	14.4%	21.6%	32.5%	35.4%	55.4%	57.6%	16.4%	12.1%
2080s	5	30	-4.9%	-2.6%	2.2%	4.0%	8.3%	12.9%	21.7%	29.4%	36.3%	55.2%	58.5%	15.5%	11.9%
2080s	5	50	-4.1%	-3.2%	0.2%	4.4%	7.7%	11.8%	18.8%	27.6%	29.7%	45.9%	50.8%	14.2%	10.2%
2080s	5	75	-5.0%	-2.6%	-1.1%	3.9%	7.2%	11.7%	17.8%	24.3%	27.6%	38.9%	50.4%	13.2%	9.2%
2080s	5	90	-5.0%	-3.5%	-0.6%	3.5%	7.0%	10.6%	17.6%	21.8%	26.0%	39.6%	49.9%	12.4%	9.0%

Extreme Precipitation Statistics for Selected Return Periods and Durations

Period	Return Period (years)	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2080s	5	120	-3.3%	-2.6%	0.3%	2.7%	6.7%	11.6%	17.8%	21.4%	25.9%	39.0%	47.3%	12.4%	8.9%
2080s	10	1	-17.0%	-9.1%	-3.2%	-1.1%	5.0%	17.9%	26.2%	40.8%	43.2%	51.9%	54.0%	17.5%	15.7%
2080s	10	2	-17.0%	-11.4%	-6.5%	-1.4%	5.7%	17.3%	28.0%	39.6%	43.7%	48.2%	52.9%	18.0%	15.8%
2080s	10	3	-13.5%	-9.0%	-3.1%	-0.8%	6.0%	16.6%	30.0%	35.0%	39.8%	50.9%	68.4%	17.6%	15.1%
2080s	10	4	-10.1%	-7.3%	-2.5%	0.3%	5.2%	14.8%	26.8%	36.8%	38.4%	57.8%	73.5%	16.8%	15.0%
2080s	10	5	-10.7%	-6.8%	-3.8%	-0.2%	4.4%	14.5%	23.5%	33.5%	37.3%	57.2%	72.3%	15.4%	14.3%
2080s	10	6	-10.0%	-7.6%	-2.4%	0.4%	6.0%	11.4%	23.8%	34.1%	37.7%	60.0%	72.5%	15.7%	14.3%
2080s	10	7	-7.2%	-6.2%	-2.0%	-0.1%	5.9%	11.9%	23.7%	32.5%	38.0%	58.8%	70.6%	15.6%	14.3%
2080s	10	10	-13.2%	-7.9%	-3.9%	-0.2%	6.9%	13.2%	23.6%	31.8%	38.2%	59.5%	65.9%	15.7%	14.5%
2080s	10	20	-6.5%	-3.2%	0.3%	4.7%	8.4%	14.0%	22.9%	34.0%	40.3%	61.8%	63.1%	17.1%	13.4%
2080s	10	30	-5.6%	-4.3%	1.3%	2.4%	7.3%	13.2%	20.5%	30.1%	39.3%	59.3%	65.7%	15.7%	13.1%
2080s	10	50	-4.4%	-4.3%	-0.9%	3.1%	7.2%	11.7%	18.6%	30.2%	32.5%	49.9%	54.5%	14.4%	11.2%
2080s	10	75	-8.7%	-5.5%	-1.0%	2.3%	7.1%	11.9%	17.5%	26.2%	30.1%	42.6%	53.3%	13.1%	10.1%
2080s	10	90	-7.0%	-5.6%	-1.2%	2.2%	6.4%	10.8%	17.0%	22.8%	28.2%	42.0%	52.2%	12.3%	9.9%
2080s	10	120	-6.5%	-5.6%	-2.6%	1.7%	6.2%	11.6%	17.2%	23.4%	26.5%	42.2%	49.5%	12.5%	9.8%
2080s	25	1	-19.7%	-10.9%	-6.6%	-3.4%	4.0%	18.1%	29.0%	43.8%	48.0%	57.2%	58.2%	18.2%	17.4%
2080s	25	2	-19.0%	-12.6%	-8.0%	-2.1%	4.7%	17.7%	32.1%	41.6%	48.1%	52.1%	56.1%	18.9%	17.6%
2080s	25	3	-15.3%	-9.8%	-5.2%	-2.4%	5.1%	16.3%	33.2%	38.0%	43.2%	54.7%	75.1%	18.4%	16.9%
2080s	25	4	-11.9%	-10.4%	-2.5%	-0.9%	4.5%	15.0%	28.0%	38.5%	41.8%	63.4%	81.8%	17.3%	16.9%
2080s	25	5	-12.4%	-9.5%	-4.2%	-1.4%	3.7%	14.5%	24.7%	35.8%	41.1%	62.1%	81.4%	15.8%	16.0%
2080s	25	6	-11.5%	-10.3%	-2.6%	-1.3%	5.9%	12.3%	25.8%	35.8%	40.7%	65.8%	82.5%	16.3%	16.0%
2080s	25	7	-8.1%	-7.8%	-3.1%	-0.7%	4.9%	12.5%	25.0%	35.1%	40.7%	63.6%	79.6%	16.1%	15.8%
2080s	25	10	-14.9%	-11.2%	-6.2%	-1.6%	6.5%	13.3%	25.3%	34.3%	41.8%	65.1%	71.2%	16.2%	16.0%
2080s	25	20	-7.5%	-4.6%	-1.5%	4.0%	7.8%	15.5%	22.8%	35.2%	45.8%	68.8%	69.4%	17.8%	15.0%
2080s	25	30	-6.3%	-6.1%	-1.0%	1.2%	7.0%	14.0%	21.9%	30.5%	42.8%	63.6%	73.2%	16.0%	14.5%
2080s	25	50	-7.1%	-6.0%	-1.3%	2.0%	6.2%	11.7%	20.1%	31.9%	36.5%	54.0%	58.5%	14.5%	12.5%
2080s	25	75	-12.4%	-8.8%	-1.2%	0.5%	6.7%	11.8%	16.9%	26.1%	33.1%	46.5%	56.4%	13.1%	11.3%
2080s	25	90	-10.9%	-8.2%	-2.5%	0.5%	5.0%	10.9%	17.5%	24.7%	30.3%	44.4%	54.6%	12.2%	10.9%
2080s	25	120	-10.6%	-9.6%	-2.8%	0.5%	5.3%	12.0%	17.7%	25.6%	28.9%	45.8%	51.8%	12.6%	10.9%
2080s	50	1	-21.3%	-11.9%	-8.2%	-4.2%	3.4%	17.1%	30.4%	44.8%	50.0%	60.4%	60.8%	18.6%	18.5%
2080s	50	2	-20.3%	-13.2%	-8.4%	-3.1%	4.8%	18.0%	33.5%	43.6%	50.6%	55.5%	58.1%	19.4%	18.7%
2080s	50	3	-16.3%	-10.2%	-6.1%	-3.1%	4.3%	16.7%	34.6%	39.6%	44.7%	57.7%	79.1%	18.9%	18.0%
2080s	50	4	-12.9%	-12.3%	-3.5%	-1.4%	3.7%	15.5%	29.3%	40.2%	43.8%	66.8%	86.9%	17.7%	18.1%
2080s	50	5	-13.4%	-11.1%	-4.4%	-2.2%	3.1%	14.9%	25.9%	37.3%	42.4%	65.1%	87.0%	16.1%	17.1%
2080s	50	6	-12.4%	-11.9%	-3.0%	-1.5%	5.1%	13.4%	27.0%	36.8%	42.8%	69.4%	88.8%	16.7%	17.1%
2080s	50	7	-9.4%	-8.3%	-4.6%	-0.5%	4.1%	12.4%	26.7%	36.8%	43.0%	66.6%	85.3%	16.5%	16.8%
2080s	50	10	-15.9%	-13.2%	-7.5%	-2.4%	6.0%	13.3%	26.2%	36.8%	44.1%	68.5%	74.5%	16.6%	17.0%
2080s	50	20	-8.2%	-5.4%	-2.9%	3.3%	7.2%	15.5%	24.6%	36.2%	49.2%	72.6%	74.6%	18.2%	16.1%
2080s	50	30	-7.3%	-6.8%	-2.3%	0.8%	6.4%	13.2%	23.2%	31.4%	45.0%	66.3%	78.0%	16.1%	15.5%
2080s	50	50	-8.7%	-7.0%	-1.3%	1.3%	5.6%	11.7%	21.4%	33.0%	39.4%	56.6%	60.9%	14.6%	13.4%
2080s	50	75	-14.6%	-10.8%	-2.2%	-0.4%	6.0%	12.0%	18.1%	26.3%	34.9%	49.1%	58.4%	13.1%	12.1%
2080s	50	90	-13.3%	-10.5%	-4.0%	-0.2%	4.3%	10.7%	17.6%	25.7%	32.9%	46.0%	56.1%	12.2%	11.7%
2080s	50	120	-13.1%	-12.1%	-3.3%	-0.1%	5.8%	11.9%	18.1%	26.5%	30.5%	48.0%	53.2%	12.7%	11.6%
2080s	100	1	-22.7%	-13.2%	-9.2%	-5.0%	3.4%	17.4%	31.4%	45.7%	52.7%	63.0%	63.3%	18.9%	19.4%
2080s	100	2	-21.3%	-13.8%	-9.0%	-4.0%	4.7%	18.4%	34.3%	45.4%	52.2%	58.4%	59.7%	19.9%	19.7%
2080s	100	3	-17.2%	-10.6%	-7.2%	-3.7%	3.6%	17.0%	36.1%	40.7%	47.3%	60.9%	82.5%	19.3%	19.0%
2080s	100	4	-13.8%	-13.8%	-4.3%	-2.2%	3.3%	15.4%	30.5%	41.2%	45.3%	69.7%	91.2%	18.0%	19.1%

Extreme Precipitation Statistics for Selected Return Periods and Durations

Period	Return Period (years)	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2080s	100	5	-14.3%	-12.4%	-5.2%	-3.0%	2.9%	15.4%	27.0%	39.2%	43.5%	67.7%	91.8%	16.4%	18.1%
2080s	100	6	-13.2%	-13.2%	-3.5%	-2.1%	4.2%	14.4%	28.3%	37.7%	44.6%	72.5%	94.2%	17.0%	18.1%
2080s	100	7	-10.5%	-8.7%	-4.7%	-1.1%	4.3%	12.5%	28.2%	38.3%	45.0%	69.2%	90.2%	16.8%	17.7%
2080s	100	10	-16.8%	-14.7%	-9.1%	-3.7%	5.5%	13.7%	26.0%	38.4%	46.0%	71.5%	77.3%	16.8%	17.9%
2080s	100	20	-8.7%	-6.1%	-4.2%	2.5%	6.3%	16.2%	25.6%	37.0%	52.2%	75.9%	79.1%	18.6%	17.0%
2080s	100	30	-8.3%	-7.4%	-2.7%	0.4%	6.0%	13.3%	24.2%	32.7%	46.9%	68.6%	82.1%	16.3%	16.3%
2080s	100	50	-10.0%	-7.8%	-2.4%	0.7%	5.2%	11.7%	21.7%	33.8%	41.8%	58.9%	63.1%	14.7%	14.1%
2080s	100	75	-16.5%	-12.6%	-2.9%	-1.1%	5.3%	11.7%	18.8%	26.5%	36.6%	51.4%	60.1%	13.0%	12.9%
2080s	100	90	-15.4%	-12.4%	-5.1%	-0.8%	3.3%	10.5%	18.1%	26.2%	34.7%	47.3%	57.4%	12.1%	12.4%
2080s	100	120	-15.3%	-14.1%	-3.7%	-0.5%	5.3%	11.8%	18.0%	27.1%	32.4%	50.1%	54.5%	12.8%	12.4%
2080s	200	1	-23.8%	-14.7%	-10.0%	-6.1%	3.0%	17.9%	32.3%	46.4%	55.2%	65.0%	65.8%	19.3%	20.3%
2080s	200	2	-22.1%	-14.4%	-9.5%	-4.7%	4.3%	18.7%	35.0%	46.8%	53.6%	60.9%	61.1%	20.3%	20.6%
2080s	200	3	-18.0%	-11.2%	-8.2%	-4.4%	3.0%	17.1%	37.0%	42.8%	49.6%	63.8%	85.4%	19.7%	19.8%
2080s	200	4	-15.3%	-14.7%	-5.0%	-3.2%	2.6%	15.3%	31.9%	42.4%	46.5%	72.2%	94.9%	18.3%	20.0%
2080s	200	5	-15.0%	-13.5%	-5.4%	-3.7%	2.5%	15.8%	27.6%	40.6%	44.5%	69.9%	96.0%	16.6%	18.9%
2080s	200	6	-14.5%	-14.0%	-3.9%	-2.7%	4.0%	14.6%	28.6%	39.5%	46.1%	75.2%	99.0%	17.3%	19.0%
2080s	200	7	-11.4%	-9.1%	-5.3%	-1.9%	3.8%	12.7%	29.4%	39.6%	46.6%	71.4%	94.5%	17.0%	18.5%
2080s	200	10	-17.5%	-16.1%	-10.4%	-4.7%	5.1%	13.4%	26.9%	39.5%	47.6%	74.0%	79.8%	17.1%	18.6%
2080s	200	20	-9.2%	-7.1%	-5.2%	1.7%	5.9%	16.3%	26.1%	38.9%	54.7%	78.8%	83.1%	19.0%	17.9%
2080s	200	30	-9.3%	-7.8%	-3.4%	-0.1%	5.6%	13.6%	24.1%	33.7%	48.5%	70.7%	85.8%	16.4%	17.1%
2080s	200	50	-11.1%	-8.6%	-3.3%	0.2%	4.8%	11.6%	22.3%	34.5%	44.0%	60.9%	65.0%	14.8%	14.9%
2080s	200	75	-18.2%	-14.1%	-3.8%	-1.9%	5.1%	11.4%	18.8%	26.8%	38.0%	53.4%	61.6%	13.0%	13.6%
2080s	200	90	-17.2%	-14.0%	-5.8%	-1.8%	2.9%	10.4%	19.2%	26.6%	36.2%	48.5%	58.6%	12.1%	13.0%
2080s	200	120	-17.1%	-15.9%	-4.0%	-0.9%	4.8%	12.1%	17.9%	27.7%	33.7%	51.9%	55.7%	12.9%	13.0%
2080s	500	1	-25.0%	-16.3%	-10.9%	-7.3%	2.7%	18.2%	33.0%	47.3%	58.0%	67.3%	68.7%	19.6%	21.3%
2080s	500	2	-23.1%	-15.6%	-10.0%	-5.5%	3.5%	18.5%	35.9%	48.9%	55.1%	63.0%	64.1%	20.8%	21.5%
2080s	500	3	-18.8%	-12.4%	-9.0%	-5.0%	2.3%	17.2%	38.1%	44.9%	52.1%	67.0%	88.7%	20.1%	20.8%
2080s	500	4	-16.9%	-15.7%	-6.0%	-4.1%	1.7%	14.6%	33.3%	43.7%	48.1%	75.0%	99.2%	18.6%	21.0%
2080s	500	5	-15.8%	-14.8%	-6.3%	-4.1%	2.6%	15.5%	28.1%	41.8%	45.5%	72.4%	100.7%	16.8%	19.9%
2080s	500	6	-15.9%	-14.8%	-4.6%	-3.6%	3.7%	13.8%	29.6%	41.1%	47.7%	78.3%	104.6%	17.6%	20.0%
2080s	500	7	-12.5%	-9.7%	-6.2%	-2.9%	3.2%	13.1%	30.6%	41.0%	48.4%	74.0%	99.5%	17.3%	19.4%
2080s	500	10	-18.3%	-17.6%	-11.5%	-5.5%	5.3%	13.8%	26.9%	40.7%	49.5%	76.9%	82.6%	17.4%	19.5%
2080s	500	20	-9.7%	-8.5%	-6.3%	0.7%	5.5%	16.5%	27.0%	39.9%	57.6%	82.1%	87.7%	19.4%	18.9%
2080s	500	30	-10.3%	-8.4%	-4.5%	-1.1%	5.1%	13.1%	23.9%	34.8%	50.4%	73.0%	90.0%	16.6%	18.0%
2080s	500	50	-12.4%	-9.4%	-3.4%	-0.4%	4.2%	11.8%	22.5%	35.3%	46.5%	63.2%	67.1%	14.9%	15.7%
2080s	500	75	-20.0%	-15.8%	-5.0%	-2.3%	4.1%	11.3%	19.0%	27.0%	39.7%	55.7%	63.3%	13.1%	14.4%
2080s	500	90	-19.2%	-15.9%	-6.1%	-3.3%	2.5%	10.3%	19.7%	27.9%	38.0%	49.8%	59.9%	12.1%	13.7%
2080s	500	120	-19.2%	-18.0%	-4.3%	-1.7%	4.3%	12.3%	19.2%	28.4%	35.0%	54.0%	57.0%	13.0%	13.8%
2080s	1000	1	-25.8%	-17.3%	-11.7%	-7.8%	2.4%	18.2%	33.6%	49.0%	59.1%	68.8%	70.6%	19.8%	21.9%
2080s	1000	2	-23.7%	-16.3%	-10.3%	-5.9%	3.0%	18.4%	36.5%	50.3%	56.1%	64.4%	66.2%	21.1%	22.2%
2080s	1000	3	-19.3%	-13.2%	-9.2%	-5.3%	1.9%	17.1%	39.0%	45.9%	53.7%	69.2%	90.8%	20.4%	21.5%
2080s	1000	4	-18.0%	-16.4%	-6.4%	-4.5%	1.7%	14.2%	34.3%	44.8%	49.7%	76.9%	101.9%	18.8%	21.7%
2080s	1000	5	-16.3%	-15.6%	-7.3%	-4.4%	2.4%	15.5%	28.3%	42.6%	47.4%	74.1%	103.8%	17.0%	20.6%
2080s	1000	6	-16.8%	-15.4%	-5.3%	-4.0%	3.6%	13.3%	30.6%	41.7%	48.8%	80.3%	108.2%	17.9%	20.6%
2080s	1000	7	-13.2%	-10.5%	-6.7%	-3.7%	2.8%	13.4%	31.3%	42.2%	49.6%	75.7%	102.8%	17.5%	20.0%
2080s	1000	10	-18.9%	-18.5%	-12.2%	-6.2%	5.1%	14.4%	26.9%	41.4%	50.8%	78.8%	84.4%	17.6%	20.1%
2080s	1000	20	-10.1%	-9.4%	-7.0%	-0.1%	5.4%	16.2%	27.7%	40.4%	59.6%	84.4%	90.9%	19.6%	19.6%

Extreme Precipitation Statistics for Selected Return Periods and Durations

Period	Return Period (years)	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2080s	1000	30	-11.0%	-8.7%	-5.2%	-1.7%	5.0%	13.0%	23.9%	35.5%	51.6%	74.6%	92.9%	16.7%	18.6%
2080s	1000	50	-13.2%	-10.0%	-4.1%	-0.8%	3.5%	11.9%	22.9%	35.8%	48.1%	64.7%	68.6%	15.0%	16.3%
2080s	1000	75	-21.3%	-17.0%	-5.8%	-2.7%	3.8%	11.5%	19.1%	28.0%	40.6%	57.3%	64.5%	13.1%	14.9%
2080s	1000	90	-20.5%	-17.1%	-6.2%	-4.0%	2.1%	10.3%	20.4%	28.9%	39.2%	50.7%	60.8%	12.1%	14.3%
2080s	1000	120	-20.6%	-19.3%	-4.7%	-1.8%	3.9%	12.3%	19.9%	29.2%	36.0%	55.5%	57.9%	13.0%	14.3%
2080s	2000	1	-26.5%	-18.2%	-12.2%	-8.2%	2.0%	18.2%	34.1%	50.7%	60.2%	70.2%	72.3%	20.1%	22.5%
2080s	2000	2	-24.2%	-17.0%	-10.6%	-6.3%	2.8%	18.5%	37.1%	51.5%	57.0%	66.3%	68.1%	21.3%	22.8%
2080s	2000	3	-19.8%	-13.9%	-9.4%	-5.8%	1.8%	16.9%	39.9%	46.7%	55.1%	71.1%	92.7%	20.7%	22.1%
2080s	2000	4	-18.9%	-16.9%	-6.9%	-4.8%	1.9%	13.8%	35.1%	45.7%	51.2%	78.5%	104.4%	19.0%	22.3%
2080s	2000	5	-16.8%	-16.3%	-8.1%	-4.7%	2.3%	15.5%	28.5%	43.3%	48.4%	75.5%	106.6%	17.1%	21.1%
2080s	2000	6	-17.6%	-15.9%	-5.7%	-4.3%	3.3%	13.1%	31.4%	42.3%	49.7%	82.1%	111.6%	18.1%	21.2%
2080s	2000	7	-13.7%	-11.3%	-7.2%	-4.2%	2.4%	13.6%	31.5%	43.2%	50.7%	77.2%	105.8%	17.7%	20.6%
2080s	2000	10	-19.3%	-19.3%	-12.9%	-7.0%	5.0%	15.1%	28.1%	42.0%	51.9%	80.5%	86.1%	17.8%	20.6%
2080s	2000	20	-10.4%	-10.2%	-7.5%	-1.0%	5.3%	16.3%	28.2%	41.0%	61.3%	86.3%	93.7%	19.9%	20.2%
2080s	2000	30	-11.7%	-9.1%	-5.8%	-2.2%	4.8%	13.0%	24.4%	36.5%	52.8%	76.0%	95.4%	16.8%	19.2%
2080s	2000	50	-14.0%	-10.5%	-4.8%	-1.4%	2.9%	11.8%	23.3%	36.3%	49.6%	66.1%	69.9%	15.1%	16.8%
2080s	2000	75	-22.4%	-18.0%	-6.5%	-3.2%	3.5%	11.4%	19.5%	29.0%	41.6%	58.8%	65.5%	13.1%	15.4%
2080s	2000	90	-21.7%	-18.2%	-6.4%	-4.5%	1.8%	10.2%	20.7%	29.7%	40.3%	51.5%	61.6%	12.1%	14.7%
2080s	2000	120	-21.8%	-20.5%	-5.3%	-1.9%	3.5%	12.5%	20.4%	30.5%	36.9%	56.8%	58.7%	13.1%	14.8%
2080s	10000	1	-27.9%	-20.0%	-13.2%	-9.1%	1.9%	18.2%	35.3%	53.6%	62.2%	73.5%	75.6%	20.5%	23.6%
2080s	10000	2	-25.3%	-18.3%	-11.1%	-7.7%	2.3%	19.0%	38.4%	54.3%	58.4%	69.9%	71.8%	21.9%	23.9%
2080s	10000	3	-20.7%	-15.2%	-10.0%	-6.7%	1.4%	16.8%	41.5%	48.9%	57.8%	74.8%	96.4%	21.2%	23.2%
2080s	10000	4	-20.7%	-18.0%	-7.9%	-5.5%	1.9%	13.1%	36.6%	47.8%	53.7%	81.8%	109.2%	19.4%	23.5%
2080s	10000	5	-17.7%	-17.7%	-9.8%	-5.2%	1.9%	15.4%	29.0%	44.7%	50.0%	78.4%	112.1%	17.4%	22.3%
2080s	10000	6	-19.2%	-16.9%	-6.9%	-5.1%	2.7%	13.7%	32.7%	43.3%	52.1%	85.7%	118.1%	18.4%	22.4%
2080s	10000	7	-14.9%	-12.7%	-8.1%	-5.0%	1.7%	13.6%	31.8%	44.8%	52.8%	80.2%	111.7%	18.1%	21.7%
2080s	10000	10	-21.1%	-20.5%	-14.1%	-7.6%	4.8%	16.1%	29.6%	43.2%	54.1%	83.9%	89.3%	18.1%	21.7%
2080s	10000	20	-11.9%	-11.2%	-8.4%	-2.4%	5.2%	16.5%	29.6%	42.0%	64.7%	90.3%	99.5%	20.4%	21.5%
2080s	10000	30	-12.9%	-10.4%	-7.0%	-3.6%	4.2%	13.2%	26.2%	38.3%	55.0%	79.4%	100.5%	17.0%	20.3%
2080s	10000	50	-15.4%	-11.4%	-5.9%	-2.5%	2.0%	11.5%	23.6%	37.3%	52.4%	69.1%	72.5%	15.3%	17.8%
2080s	10000	75	-24.5%	-20.0%	-8.3%	-4.7%	2.9%	11.5%	20.7%	30.8%	43.7%	61.8%	67.6%	13.1%	16.4%
2080s	10000	90	-23.9%	-20.4%	-7.8%	-5.9%	2.0%	9.9%	21.1%	30.8%	42.5%	53.4%	63.3%	12.1%	15.7%
2080s	10000	120	-24.1%	-22.8%	-6.5%	-2.7%	2.9%	12.2%	21.6%	33.0%	38.9%	59.6%	60.4%	13.2%	15.8%

%=percentile

Variable	Probable Maximum Precipitation Statistics
Units	%
Area	Nearest Grid Cell to Mine site
Baseline	Projected changes calculated from model baseline (1991 - 2020)

Probable Maximum Precipitation Statistics for Selected Durations

Period	Duration (days)	Minimum	1%	5%	10%	25%	50%	75%	90%	95%	99%	Maximum	Mean	Standard Deviation
2050s	1	-24.5%	-23.9%	-17.9%	-10.2%	1.0%	14.6%	31.9%	54.2%	62.4%	77.5%	89.1%	19.1%	25.0%
2050s	2	-30.0%	-27.6%	-19.8%	-12.3%	1.6%	15.3%	34.6%	52.8%	66.7%	91.3%	94.3%	18.3%	26.3%
2050s	3	-31.4%	-25.5%	-18.7%	-10.5%	2.4%	14.5%	29.3%	45.3%	68.6%	111.9%	125.6%	19.0%	28.0%
2050s	4	-32.6%	-22.4%	-16.7%	-14.9%	2.8%	12.6%	32.7%	54.5%	71.0%	112.3%	123.2%	19.3%	28.3%
2050s	5	-35.3%	-29.9%	-16.8%	-9.7%	2.0%	10.1%	35.8%	49.1%	60.3%	88.9%	110.4%	17.5%	25.9%
2050s	6	-32.9%	-26.7%	-18.8%	-11.5%	0.5%	11.3%	33.7%	60.5%	66.5%	90.7%	95.2%	18.0%	27.2%
2050s	7	-29.0%	-27.7%	-16.1%	-12.4%	-1.8%	13.1%	32.2%	56.4%	66.3%	98.3%	103.5%	17.0%	27.2%
2080s	1	-32.5%	-29.1%	-16.4%	-12.5%	1.4%	18.6%	36.1%	63.1%	68.1%	77.2%	77.7%	20.6%	26.6%
2080s	2	-28.6%	-17.7%	-12.8%	-9.0%	-1.5%	18.4%	39.5%	63.7%	71.0%	83.8%	87.3%	21.6%	27.6%
2080s	3	-22.5%	-20.5%	-13.3%	-9.4%	-0.5%	15.7%	39.4%	53.3%	63.1%	83.2%	87.6%	20.0%	25.4%
2080s	4	-21.9%	-21.2%	-12.8%	-7.9%	-0.1%	12.4%	38.6%	58.7%	65.2%	92.5%	110.7%	19.8%	26.8%
2080s	5	-23.3%	-21.1%	-12.1%	-8.1%	-2.1%	12.1%	33.2%	50.9%	58.9%	91.8%	131.2%	17.8%	25.7%
2080s	6	-26.9%	-21.4%	-9.7%	-8.2%	1.2%	13.4%	34.5%	51.9%	58.3%	91.2%	154.8%	19.6%	27.2%
2080s	7	-21.1%	-19.0%	-10.7%	-8.0%	-1.2%	14.5%	30.6%	50.6%	58.2%	84.4%	142.8%	18.4%	25.6%

APPENDIX 3-3: TAILINGS STORAGE FACILITY SITE CHARACTERIZATION REPORT

REPORT

Tailings Storage Facility Site Characterization Report

Mount Polley Mine

Submitted to:

Mount Polley Mining Corporation

PO Box 12
Likely BC V0L 1N0

Attention: Matt O'Leary

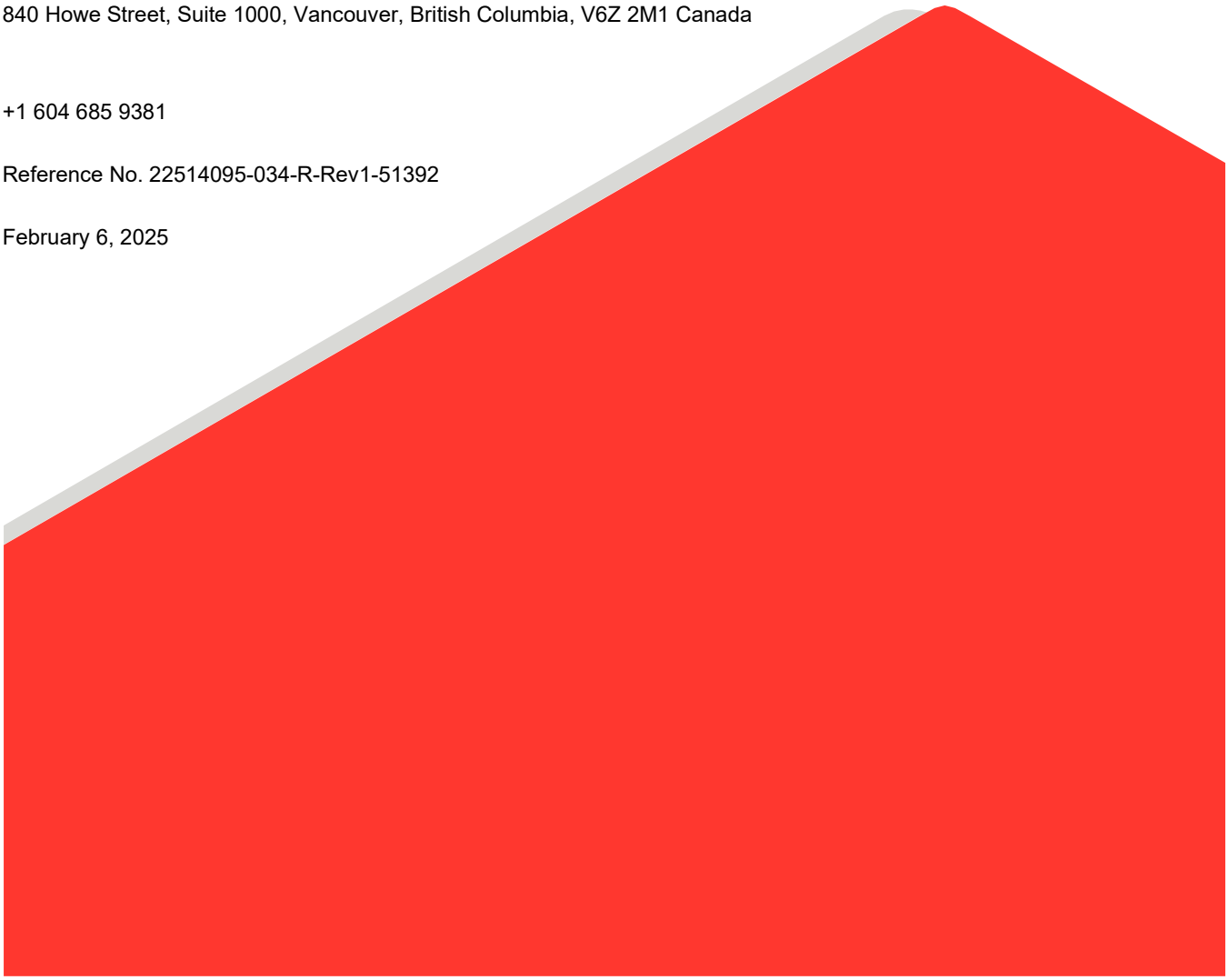
Submitted by:

WSP Canada Inc.
840 Howe Street, Suite 1000, Vancouver, British Columbia, V6Z 2M1 Canada

+1 604 685 9381

Reference No. 22514095-034-R-Rev1-51392

February 6, 2025



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1.0 INTRODUCTION

The Mount Polley Mine is a copper and gold mine operated by Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation. The mine site is located approximately 56 km northeast of Williams Lake, British Columbia, near the town of Likely. The mine is situated between Polley Lake and Bootjack Lake, and key components include open pits; waste rock dump sites; crusher, process plant, and administrative buildings; water management systems; and the tailings storage facility (TSF). The mine began production in 1997 and tailings generated at the process plant have been deposited as a low solids content slurry in the TSF located approximately 3 km southeast of the process plant.

The 23 June 2016 amendment of the *Mines Act* Permit M-200 authorized construction and operation of the TSF to elevation 970 m (Golder 2015g); however, mining operations were suspended in May 2019 when the TSF embankment crest elevation was about 968 m.

As part of the restart of mining operations, MPMC requested WSP Canada Inc. (WSP) to advance the design of a raise of the TSF embankment above elevation 970 m. Approximately 63 million tonnes of tailings are planned to be produced and deposited in the TSF until the end of operations at the Mount Polley Mine (approximately 8.5 years of production at about 20,000 tonnes per day). Deposition of tailings generated at the process plant into the TSF resumed in June 2022 and construction to raise the TSF embankment crest to elevation 970 m restarted in July 2022. In 2024, rockfill placement to widen and re-slope the downstream slope of the TSF embankments from 1.3H:1V to 2H:1V commenced.

This report presents a site characterization for the embankment foundation of the Mount Polley TSF. Site conditions are summarized with respect to climate, geology, seismicity, geotechnical conditions, hydrogeology, and geochemical conditions. Investigations of the TSF foundation site are listed for reference. A discussion of site conditions and features with the potential to impact the TSF is presented with the TSF design approach.

The Engineers and Geoscientists British Columbia (formerly The Association of Professional Engineers and Geoscientists of British Columbia, APEGBC) site characterization for dam foundation guidelines (APEGBC 2016) were followed during the preparation of this report. It is intended that this report be updated with data from future site investigations and with observations and data from construction and operation of the facility over the life of the TSF. Should the understanding and interpretation of site conditions change with time, then required changes will be documented in future revisions of this report.

This report is to be read with the Study Limitations section, which forms an integral part of this document.

MPMC defined and uses the coordinate system tailings grid for the TSF. All coordinates and elevations are presented in tailings grid.

2.0 TAILINGS STORAGE FACILITY DESCRIPTION

The TSF includes one embankment that is approximately 4.6 km in length and has a maximum height of about 55 m as of the end of 2024 The embankment is subdivided into three sections, referred to as the Main Embankment, Perimeter Embankment, and South Embankment. The general layout of the TSF embankment is shown in Figure 1 and Figure 2. The embankment has incorporated a staged expansion design utilizing modified centreline and centreline construction methods. The general zoning of the TSF embankment includes the following:

- upstream fill comprising selected fill or tailings sand
- low permeability till core
- filter zone
- transition zone
- rockfill forming the downstream zone of the embankment and the downstream buttress along the Perimeter and Main Embankments.

Refer to the following design reports for additional information:

- *Tailings Storage Facility Detailed Design to Elevation 970 m* (Golder 2015g)
- *Tailings Storage Facility Life of Mine Feasibility Design* (Golder 2015h)
- *Tailings Storage Facility Elevation 970 m Downstream Embankment Reslope* (WSP 2023a)

3.0 FOUNDATION INVESTIGATIONS AND STUDIES

The foundation investigations and studies considered for the TSF foundation characterization are listed below. Details of report contents and scope of investigations are summarized in APPENDIX A.

A layout of the TSF with the locations of the site investigations are shown in Figure 1 and Figure 2.

Geotechnical Investigations

- *Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility* (KP 1990)
- *Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility* (KP 1995a)
- *Stage 2A Tailings Facility Construction Selected Excerpts from Reference Information* (KP 1997d)
- *Mount Polley Mine Project: Tailings Storage Facility 2011 Geotechnical Site Investigation* (AMEC 2012)
- *Mount Polley Dam Failure – Site Investigation Progress Report No. 2* (KCB 2015c)
- *Report on Mount Polley Tailings Storage Facility Breach* (IEEIRP 2015)
- *Mount Polley Dam Failure – Advanced Laboratory Testing Program Progress Report No. 4* (KCB 2015b)
- *Laboratory Testing Results from Mount Polley Mine* (Golder 2015a)
- *2015 Geotechnical Investigation Factual Report* (Golder 2015d)
- *2016 TSF Geotechnical Investigation Factual Report* (Golder 2017)
- *2018 TSF Geotechnical Investigation Factual Report* (Golder 2018)
- *2021/2022 Tailings Storage Facility Geotechnical Investigation Factual Report (WSP Golder 2022b)*
- 2023 Tailings Storage Facility Corner 1 Geotechnical Investigation Factual Report *(WSP. 2024a).*

2023 Tailings Storage Facility Corner 1 Geotechnical Investigation Factual Report (WSP 2024a) Hydrogeology Investigations

- *1996 Groundwater Monitoring Well Installation Program* (KP 1997b)
- *Mount Polley Mine Hydrogeology Assessment and Data Review* (AMEC 2013)
- *Installation and Testing of New Monitoring Wells near the TSF, SERDS, Cariboo Pit and Wight Pit – Mount Polley Mine* (Golder 2016d)

Geological Interpretations

- *Surficial Geology and Quaternary Geological Overview of the Mt. Polley Tailings Storage Facility (TSF) Area, British Columbia* (Golder 2015c)

Documents related to TSF Designs

- *Response to Review Comments on Tailings Embankment Design* (KP 1996)
- Mount *Polley Project Tailings Storage Facility Updated Design Report* (KP 1997c)
- *Mount Polley Stage 6 TSF Design* (KP 2007b)

TSF Construction Record Reports

- *Mount Polley Mine Tailings Storage Facility Report on 1998 Construction and Annual Inspection* (KP 1999)
- *Mount Polley Mine Tailings Storage Facility Report on 1999 Construction* (KP 2000)
- *Mount Polley Mine Tailings Storage Facility Report on Stage 3 Construction* (KP 2001)
- *Mount Polley Mine Tailings Storage Facility Report on Stage 4 Construction* (KP 2007a)
- *Mount Polley Mine Tailings Storage Facility Report on Stage 6A Construction* (KP 2009)
- *2015 Freshet Management Embankment As-Built Construction* (Golder 2015f)
- *2023 Tailing Storage Facility Construction Record Report (WSP 2024b)*

4.0 CLIMATE

The five-year update of the climate baseline for the site is presented in WSP Golder (2022a) and includes precipitation, air temperature, relative humidity, solar radiation, evaporation, snow depths, and wind speed and direction. An updated analysis of baseline and future climate change conditions, focussing on extreme precipitation events, was undertaken for the Mount Polley Mine Site (2024c).

The 1974 to 1993 climate records from the nearby Environment and Climate Change Canada Likely climate station and 1995 to 2021 climate records from the local MPMC climate stations served as the basis for developing statistics for describing precipitation and temperature conditions for the site. Records from local, regional, and MPMC climate stations were reviewed to assist in characterizing climate parameters.

The site experiences high summer precipitation due to summer storms, and the lowest monthly precipitation occurs in February. Precipitation typically occurs as snowfall starting in November and accumulating until March. Average annual precipitation at the site is estimated to be 612 mm with a standard deviation of 118 mm based on precipitation records for the site from 1974 to 2021. Typically, the increase of temperatures over 0°C starts in March, leading to freshet until June.

Projected climate changes indicate the site will likely be warmer and wetter. For extreme precipitation increases, the range of projected changes is 6% to 16% for the 2050s, and 10% to 19% for the 2080s. Lower duration events at higher return periods generally show greater projected changes than longer durations events above 20 days.

A summary of the updated baseline climate parameters is provided in Table 4-1.

Table 4-1: Summary of Key Climate Parameters for the Mount Polley Mine

Parameter	Value
Mean annual total precipitation (mm)	613
1:2-year 24-hour rainfall (mm)	33
1:10-year 24-hour rainfall (mm)	47
1:200-year 24-hour rainfall (mm)	72
Projected annual total precipitation anomaly from baseline for 2050s (%)	+8
Projected annual total precipitation anomaly from baseline for 2080s (%)	+10
Projected 50th percentile increase in 3- day probable maximum precipitation (PMP) from baseline for 2050s (%)	+19%
Projected 50th percentile increase in 3- day probable maximum precipitation (PMP) from baseline for 2080s (%)	+14%
Mean annual temperature (°C)	3.9
Average winter season (sub-zero mean monthly temperatures)	November to March
Mean snow water equivalent for the month of March (mm)	185
Projected annual air temperature anomaly from baseline for 2050s (°C)	+1.7 – 2.5
Projected annual air temperature anomaly from baseline for 2080s (°C)	+2.3 – 3.7
Mean annual shallow lake evaporation (mm)	673
Mean annual potential evapotranspiration (mm)	863

Note: Statistics are based on reviewed historical records from multiple climate stations and measured and derived data (where applicable).

5.0 QUATERNARY GEOLOGY

This section provides an overview of the Quaternary geology of the TSF embankment area, including geomorphological setting, regional and local geology, stratigraphic interpretation of subsurface investigation data, and interpreted depositional environment and Quaternary history of the area.

5.1 Regional Geomorphological Setting

The region is located on the eastern edge of the Interior Plateau, at the boundary between the Quesnel Highlands and the Fraser Plateau (Holland 1976; Bichler and Bobrowsky 2003). Terrain and geomorphology of the region comprises flat and gently rolling topography with hummocky bedrock exposures, dissected by a network of streams and lakes (Holland 1976; McAndless and Taylor 2006). Surface drainage patterns are influenced by bedrock topography; most of the stream valleys in the region have a northwest orientation and drain southward toward the lowland area north of the western arm of Quesnel Lake (Bichler and Bobrowsky 2003).

During the late Pleistocene, the area of the TSF was covered by the Cordilleran Ice Sheet (Clague 1987, 1988). The gently undulating topography and surface expression of the lowland area at the head of the west arm of Quesnel Lake is the result of glacial erosion and deposition of Quaternary sediments in an environment that evolved initially as a result of glacial advance followed by glacial retreat and inundation by meltwater, creating a glacial lake (glaciolacustrine) environment (Golder 2015c). Glacial landforms within the region include streamlined landforms associated with ground moraine, such as flutings, drumlins, drumlinoid ridges, and craig and tail features (Bichler and Bobrowsky 2003). These landforms indicate a predominantly northwesterly ice flow direction for the Cordilleran Ice Sheet in the Quesnel region (Clague 1988; Bichler and Bobrowsky 2003; Hashmi et al. 2015).

The topography around and above the TSF is generally flat with a gently sloping hill along the western perimeter. As such there is no credible rockfall, debris flow, glacier or snow avalanche hazard within the local area of the TSF.

5.2 Regional Surficial Geology

The regional surficial geology is predominantly the result of erosion and deposition associated with the late Pleistocene (Wisconsinan) glacial episode referred to as the Fraser Glaciation (Clague 1987, 1988).

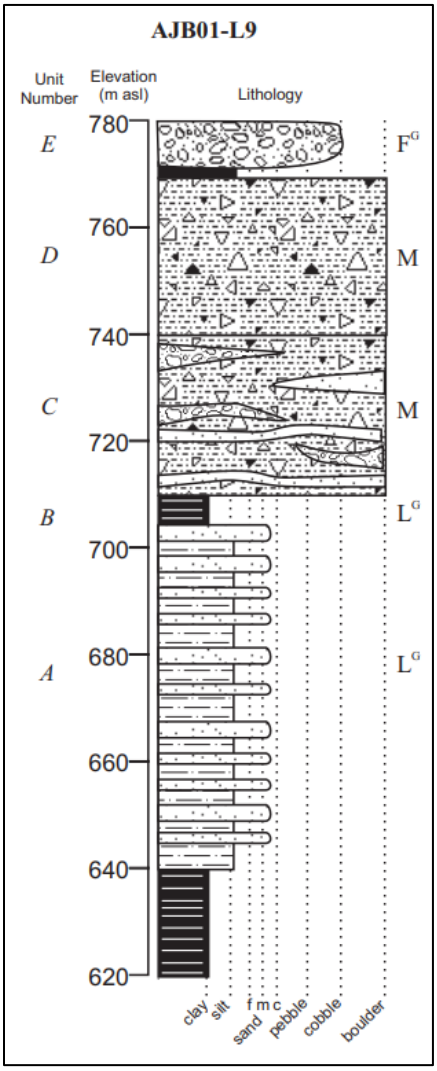
The regional surficial geology is dominated by till, glaciofluvial, and glaciolacustrine sediments of the Fraser Glaciation (Bichler and Bobrowsky 2003; McAndless and Taylor 2006). The glacial stratigraphy locally contains colluvial deposits derived from landslides initiating on valley walls during the late Pleistocene and Holocene (Clague 1988; Bichler and Bobrowsky 2003). Holocene fluvial deposits overlie the glacial deposits in areas local to watercourses and waterbodies throughout the region (Bichler and Bobrowsky 2003).

Bichler and Bobrowsky (2003) identified an “advance glaciolacustrine unit” (Illustration 5-1, Units A and B) that is overlain by a sequence consisting of basal till with intercalated glaciofluvial and glaciolacustrine sediments (Units C and D). This stratigraphic sequence is evident in available subsurface investigation data from the TSF area (Section 5.4). Basal till within the region is typically matrix-supported diamicton massive to weakly stratified, with faceted striated cobbles and boulders (Clague 1988) and is interpreted to have been deposited during net glacial advance (Bichler and Bobrowsky 2003).

Glaciolacustrine sediments are present within most of the basal till in the major valleys (Illustration 5-1, Units A and B). These deposits are typically characterized by sub-horizontal, rhythmically bedded sand, silt, and clay in a coarsening upwards sequence. The unit is capped by fine-grained sediment, either rhythmically bedded or massive clay or silt, with local dropstones (Bichler and Bobrowsky 2003).

Glaciofluvial deposits are common within the major valleys, deposited in a succession of well-defined terraces (Clague 1988; Bichler and Bobrowsky 2003). Glaciofluvial sediments typically comprise moderately sorted, weakly to moderately compacted cobble or boulder gravel with a sand matrix (Illustration 5-1, Unit E). Gravel is also present locally in the form of hummocky blankets at higher elevations. Glaciofluvial fan deposits occur within valleys, with a similar composition to that of the glaciofluvial sediments, but typically with a greater sand content (Bichler and Bobrowsky 2003).

Morainal (ablation) till deposits more than 1 m thick are widespread and typically comprise poorly sorted, moderately to well-compacted silty clay diamicton. In the area of the TSF, these deposits are interpreted as ablation till (Illustration 5-1, Units C and D), deposited during net glacial recession (Clague 1988; Bichler and Bobrowsky 2003).



Source: Bichler and Bobrowsky 2003.

asl = above sea level; F^G = glaciofluvial deposits; M = basal till; L^G = glaciolacustrine deposits.

Illustration 5-1: Stratigraphic Column

5.3 Local Surficial Geology

A number of geotechnical subsurface investigations have been carried out in the TSF area (Section 3.0). The local surficial geology comprises Quaternary glacial sediments overlain by fill / anthropogenic deposits. A generalized stratigraphic sequence for the Quaternary sediments in the TSF area is presented in Illustration 5-2. The generalized stratigraphy reflects interpretations of the subsurface geology from geotechnical investigations conducted in the area of the TSF.

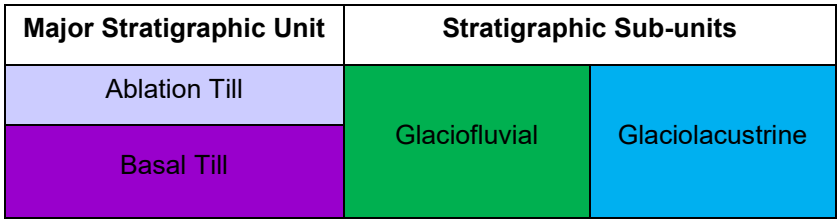


Illustration 5-2: Generalized Stratigraphic Column for Quaternary Sediments of the Tailings Storage Facility Embankment Area

This stratigraphic sequence is generally applicable to the mine area and TSF, with local variations associated with the depositional and erosional history of a particular area. The surficial geological units of the TSF embankment area are interpreted to represent two main stages of the Fraser Glaciation: the advance stage and recessional stage (Bichler and Bobrowsky 2003). Basal till is punctuated by glaciofluvial and glaciolacustrine deposits that typify the early stages of deposition (advance stage), represented in the TSF area by basal till and associated sub-units. The ablation till and some layers of the glaciofluvial and glaciolacustrine sub-units were likely deposited during the recession stage of glaciation (Section 5.5).

Available mapping indicates the TSF area is underlain by altered, deformed, and brecciated volcanic and intrusive igneous rocks of the Late Triassic Nicola Group, with local sandstone and conglomerate of the Kamloops Group, Dragon Mountain Formation and some unnamed sediment groups (Logan et al. 2007).

5.4 Stratigraphic Interpretation

5.4.1 Methods

Stratigraphic correlations developed from borehole data from the TSF area are presented as a series of interpretive geological cross-sections (Figure 3 to Figure 9). The stratigraphic interpretation conducted as part of this TSF foundation characterization study expands on the methods and geological interpretation and correlation completed by Golder in 2015, with updates to the previous work based on recent, detailed geological data from boreholes located close to the cross-section profile lines. General procedures used in development of the updated cross-sections and stratigraphic correlations are summarized as follows:

- **Lateral offset, priority and inferred boundaries**—Preference was given to incorporating geological data from boreholes located close to the cross-section lines and to boreholes that had the most detailed geological descriptions of the subsurface conditions encountered. Boreholes that were farther from cross-section lines were reviewed for geological correlation criteria, including information on the specific stratigraphic sequence and elevations of contacts between the different geological units. Boreholes with significant lateral offset from the lines of cross-section were generally omitted given the high degree of uncertainty in projection of the data.

- **Contact type**—Borehole logs with detailed geological descriptive information were used to determine the typical contact type between units (i.e., sharp or gradational).
- **Characteristics**—Geotechnical laboratory testing results were used to assist with distinguishing between geological units where available.

The geological criteria used to develop key stratigraphic correlations between different units are detailed in subsequent sections, with specific criteria for the glaciolacustrine deposits presented in Table 5-1. The criteria were applied to the geological descriptions in each of the boreholes used in the data compilation and review, and stratigraphic correlations identified.

Table 5-1: Stratigraphic Criteria for the Glaciolacustrine Sub-units

Geological Property	Typical Description
Unified Soil Classification System (USCS)[a]	CL, CI, CH, or ML
Structure	Laminated, varved, or massive
Particle size distribution	Less than 5% gravel and 20% sand
Atterberg limits – plasticity index	10 to 25 (typically correlated to intermediate or high plasticity descriptions)
Typical stratigraphic location	Overlying or interbedded with glaciofluvial units

a) From the USCS Group Symbols: CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay, CH = high-plastic clay, ML = inorganic silt with slight or low plasticity.

Interpretation of borehole data is necessarily subjective due to the different terminology used and the consistency with which it is applied. For example, lamination, varving, and bedding were apparently used interchangeably in some of the descriptions of surficial deposits in the different borehole records both among the various consultant data sets, as well as within data obtained from individual consultants.

The scope of each previous investigation determined the level of detail included on the borehole logs in terms of stratigraphic unit descriptions, and whether geotechnical testing was completed. For example, the 2022 and 2023 geotechnical investigations (WSP Golder 2022b, WSP 2024a) focused on identifying the glaciolacustrine unit, and therefore the borehole logs segregate units at a detailed scale accompanied by extensive geotechnical testing. In contrast, in the Knight Piésold Ltd. (KP) 1989 report, borehole records provide much less detail in terms of stratigraphic segregation of units and geotechnical testing. Not all borehole logs reviewed had plasticity ratings for stratigraphic units, nor did the associated investigation include Atterberg limits for every layer of the glaciolacustrine unit. In some factual reports, borehole records were not updated to reflect the geotechnical testing results of various surficial units. Therefore, review of both data sets was important to provide accurate stratigraphic interpretation. The Unified Soil Classification System was not used to describe surficial sediment textures in all factual reports, with some instead referring to the Wentworth Scale.

For presentation purposes on the interpretive geological cross-sections (Figure 3 to Figure 9), units of glacial sediment typically less than 0.5 m thick, as described in borehole records, were not shown on the cross-sections due to the scale of the section. This was specifically the case for thinner layers of the glaciofluvial and glaciolacustrine sub-units that were incorporated into adjacent units for cross-section presentation purposes. Similarly, small-scale interbedding, particularly among the glaciofluvial and glaciolacustrine sub-units, has not been shown on some sections.

In some areas of the TSF, the geological contact between glacial sediments and bedrock was difficult to identify accurately given the intensity of bedrock weathering. Therefore, the position of the surficial sediment-bedrock contact should be considered approximate in many parts of the TSF area.

5.4.2 Glacial Environments and Depositional Processes

Depositional environments associated with glacial sediments are inherently complex, particularly in ice-front or ablation zone settings, which are typically associated with glaciofluvial and glaciolacustrine deposits and sedimentation processes.

Glacial lakes disrupt the flow of meltwater and intercept glacial sediment being generated by processes such as ablation (ice removal) (Tweed and Carrivick 2015). Variability in the types of flow processes and meltwater velocities can complicate stratigraphic interpretation of glacial lake deposits. Sediment deposition and distribution in glaciolacustrine environments can be associated with gravity, turbidity, and density flows or currents (Carrivick and Tweed 2013). These flows can lead to structures and stratified deposits that may be interpreted as a mix of glaciofluvial and glaciolacustrine materials, particularly near the edges of a glacial lake where streams enter and exit an otherwise stagnant body of water. Sediment deposition in proximal zones of ice-marginal lakes can also be influenced by proglacial (ice front) activity.

Hillslope processes and valley tributaries entering the ablation zone following glacial retreat can also impact glaciolacustrine depositional environments (Carrivick and Tweed 2013). Ice contact deltas and the up-ice side of grounded fans can have similar characteristics to diamictic-textured till materials (Carrivick and Tweed 2013). Mass movement of valley hillslopes via processes such as slumps, debris slides, and debris flows can cause material to enter the subaqueous or water-free environment (depending on timing) and mix with existing sediments. Valley tributary systems entering the glaciofluvial and glaciolacustrine environments may also result in flow overlap and inter-fingering deposits. These mixing environments can lead to discontinuous and complex textures and structures. These processes and conditions were taken into consideration in the course of carrying out stratigraphic correlations for the TSF area.

5.5 Depositional Environment and Quaternary History of the Tailings Storage Facility Embankment Foundation Area

The stratigraphic interpretation of the TSF area generally correlates with that described by Bichler and Bobrowsky (2003), and the Golder (2015c) interpretation.

Two main stages of glacial activity can be interpreted from the surface and subsurface geological record in the TSF embankment area:

1) Advance Stage

2) Recessional Stage

5.5.1 Advance Stage

Depositional environments that developed during the late Pleistocene (Wisconsinan) Fraser Glaciation were dominated in the early stages by glacial advance of the Cordilleran ice sheet over much of central British Columbia (Clague 1987, 1988). Basal till and moraine punctuated by glaciofluvial and glaciolacustrine deposits typify the early stages of deposition, represented in the TSF area by basal till and associated sub-units.

These deposits are present across the TSF area, except in the South Embankment where bedrock is at a relatively high elevation, and the basal till unit is interpreted to be not present. The total maximum thickness of the advance glacial deposits is approximately 40 m (Figure 3 to Figure 9).

The basal till unit typically comprises a mixture of silt/clay with sand and gravel, punctuated by interbedded layers of glaciofluvial and glaciolacustrine sub-units. The relative consistency of the basal till is typically stiff to hard as a result of deposition under or in contact with glacial ice. Sediment comprising the glaciofluvial and glaciolacustrine units was transported from the area of the glacial ice sheet by meltwater streams and accumulated in lakes and stream channels in a pro-glacial (ice marginal) environment in front of the glacier. These sub-units are interpreted to represent hiatuses and/or minor localized glacial retreat, with some glaciofluvial deposits likely representing ice-frontal meltwater channel deposits. The glaciolacustrine and glaciofluvial materials were subsequently overridden and compacted by the glacial ice.

5.5.2 Recessional Stage

Ablation till and some layers of the glaciofluvial and glaciolacustrine sub-units were likely deposited during the recessional stage of glaciation, when ice stagnation, retreat and melting were the dominant processes.

The ablation till unit typically comprises firm to stiff silt and silty clay, with secondary components of gravel and sand. Fines were typically non-plastic or of low plasticity, and locally mottled. Pockets of organic material, mottled fines and iron oxide staining were encountered towards the top of the unit. These characteristics are typical of subaerially exposed sediments, allowing for weathering and development and/or deposition of organic materials.

Glaciofluvial deposits were observed locally at various levels within the ablation till unit. These discontinuous silty sand layers may represent late-stage, short-lived advance during the early-stage net glacial recession, marked by isolated glaciofluvial environments.

The glaciolacustrine sub-unit encountered near the base of the ablation till is interpreted to have formed during early-stage net glacial recession, in areas of localized ponding of glacial meltwater. These glaciolacustrine deposits likely represent the approximate upper boundary of the pro-glacial basal till and associated sub-units.

The Klohn Crippen Berger Ltd. (KCB 2015a) summary report presents an alternative interpretation for the Quaternary history of the TSF area, instead suggesting two separate glaciations: the penultimate glaciation and the Fraser Glaciation. The key difference between the KCB (2015a) interpretation of the Quaternary history of the TSF area and the interpretation presented in this report is that of the ablation till unit, which was interpreted by KCB to represent basal till deposited during advance of a second glaciation rather than ablation till deposited during retreat of the Fraser Glaciation:

- The basal till unit was interpreted by KCB (2015a) to be deposited during net advance of the penultimate glaciation.
- The ablation till unit was interpreted to be basal in origin, deposited during net advance of glaciers in the Fraser Glaciation. Interfingering of the glaciofluvial and glaciolacustrine deposits within the till unit was interpreted to represent multiple periods of glacial advance and retreat during the Fraser Glaciation.
- The diamicton within the ablation till unit was interpreted to be due to the presence of subglacial landforms mapped in the vicinity of the TSF area.
- Layers of the glaciolacustrine and glaciofluvial sub-units were interpreted to be deposited during glacial retreat of the penultimate glacial period, and during advance of the Fraser Glaciation.

5.5.3 Geological Units of the Tailings Storage Facility Embankment Foundation Area

5.5.3.1 Ablation Till Unit

The ablation till unit in the TSF area is interpreted as till derived from sediment entrained within the glacial ice and deposited directly by melting ice (ablation), typically in the terminus portion of the glacier. It commonly overlies basal till since it is deposited in the latest stages of glaciation. In the TSF area, these deposits are interpreted to be associated with glacial recession.

The main variables used to identify the ablation till unit were elevation, stratigraphic position, and typical unit thickness. The general elevation range of the base of the unit was estimated from borehole data to be between 925 and 940 m but may be as low as 910 m (e.g., Main Embankment).

The ablation till unit typically comprises firm to stiff silt and silty clay, with components of gravel and sand. Pockets of organic material, mottled fines, and iron oxide staining have been described towards the top of the unit. Fines are typically non-plastic or of low plasticity and are occasionally mottled.

Contacts between the ablation till unit and the overlying anthropogenic materials are sharp. The contact between the ablation till unit and underlying basal till unit is typically gradational, except where separated by the glaciolacustrine or glaciofluvial sub-units.

5.5.3.2 Basal Till Unit

Basal till is formed by the subglacial deposition of sediment carried within or below the glacier. In the TSF area, the basal till is interpreted to have been deposited during net glacial advance (Clague 1988).

The basal till unit underlies the ablation till unit and occurs at elevations between approximately 875 and 930 m, with the top contact of the unit typically between 895 and 915 m. The basal till unit is typically stiff to hard, and is composed of a mixture of silt, clay, sand, and gravel with some cobbles. The basal till unit differs from the ablation till unit in terms of elevation, sequence of deposition, gradation, and colour. Both the basal and ablation till units are grey to brown; however, mottling associated with oxidation and iron staining, and local pockets of organic material have been observed in the ablation till.

5.5.3.3 Glaciolacustrine Sub-unit

Glaciolacustrine deposits result from settlement of suspended sediment within lakes or sub-glacial meltwater, typically creating layers of silt and clay with laminated or varved (seasonal layering) structures (Tweed and Carrivick 2015).

Stratigraphic criteria for identifying glaciolacustrine deposits are presented in Table 5-1. The key controlling variables were structure, texture, and plasticity, where available. The glaciolacustrine sub-unit typically comprises silt, silty clay, or clay with lesser fine sand, with a varved or laminated structure. Locally, this unit may be more massive and lack a layered structure. Plasticity of this unit is typically medium to high. Trace gravel has been noted locally within the glaciolacustrine sub-unit and may represent dropstones; sand and clay lenses are recorded within some layers of this unit.

The glaciolacustrine sub-unit is interpreted to include all stratigraphic horizons with a layered structure and descriptions indicating deposition in a glacial lake or subglacial setting. This differs slightly from the geotechnical interpretation of the unit, which also applies geotechnical parameters to classify the unit (Table 5-1). As such, there are some locations where the glaciolacustrine sub-unit shown in the geological cross-section has been identified based on geological interpretation only. For example, at approximate Station 0+450 in the South

Embankment, the glaciolacustrine sub-unit has been identified at the base of the ablation till based on descriptions in borehole logs and interpreted depositional setting (Figure 3). At this location (boreholes VW11-02 and GA16-19), a layer of non-plastic to low plasticity silt with some clay and sandy to trace sand was described as bedded with local dropstones. This layer is interpreted to have been deposited in a glaciolacustrine environment, but it has geotechnical characteristics that differ from the intermediate and high plasticity glaciolacustrine units identified at the Main and Perimeter embankments (Section 7.3.4).

The glaciolacustrine sub-unit was typically observed near the base of the ablation till unit. It typically overlies or is interbedded with the glaciofluvial sub-unit throughout the basal till at elevations between approximately 900 and 920 m, with some layers locally occurring as low as 887 m elevation (Perimeter Embankment). Reported thicknesses of glaciolacustrine deposits in the TSF area vary from approximately 0.3 to 15 m.

The glaciolacustrine sub-unit encountered near the base of the ablation till is interpreted to have formed during early-stage net glacial recession, in areas of localized ponding of glacial meltwater.

5.5.3.4 Glaciofluvial Sub-unit

Glaciofluvial deposits, sometimes referred to as outwash deposits, comprise sediments and landforms produced by glacial meltwater streams. The outwash sediment typically comprises cobbles, gravel and sand, with minor silt and silty clay. Glaciofluvial deposits may show a lateral decrease in grain size due to relatively rapid downstream movement of sediment. A depositional pattern known as braiding is also typical due to a lack of distinct channelling of sediment and high sediment load. The key controlling variables for identifying glaciofluvial deposits are texture (sand and gravel dominated), grading, and sorting (where available).

A discontinuous silty and fine to coarse sand unit with trace fine gravel was identified locally within the ablation till unit between approximately 920 m and 936 m elevation (Main Embankment). This may represent late-stage, short-lived advance activity during the early-stage net glacial recession, marked by isolated glaciofluvial environments.

The glaciofluvial sub-unit encountered within the basal till is typically interbedded with the glaciolacustrine sub-unit and is sub-divided into sand-dominated and gravel-dominated units. The sand-dominated glaciofluvial sub-unit typically comprises fine- to coarse-grained sand with trace silt, or silty sand with trace gravel noted locally. This sub-unit was recorded extensively throughout the basal till unit from approximately elevation 882 m to 924 m (Perimeter Embankment). Recorded thicknesses of the sand-dominated glaciofluvial layers within the TSF area ranged from approximately 0.15 to 12 m.

The gravel-dominated glaciofluvial sub-unit was identified locally within the Main Embankment and Perimeter Embankment only. The sub-unit typically comprises fine- to coarse-grained gravel with some sand, silt, and cobbles and was typically deposited in sequence with the sand-dominated glaciofluvial sub-unit. The gravel-dominated unit occurs between approximately elevation 886 m (Main Embankment) and 924 m (Perimeter Embankment) elevation, with recorded thicknesses ranging from approximately 0.3 to 3 m.

Glaciofluvial sub-unit layer thicknesses were noted to vary spatially within the same layer, which is typical of stream deposition. Bifurcation (branching) and interfingering with adjacent units are also common stratigraphic characteristics of the glaciofluvial sub-unit. However, as previously noted, such detailed stratigraphic correlations were only possible where boreholes were located close to the line of the cross-section. As such, it is likely that these features are more common within the TSF area than is currently presented on the cross-sections.

Contacts between the glaciofluvial sub-unit and the glaciolacustrine sub-unit are typically sharp, and contacts with the basal till unit are commonly gradational.

The glaciofluvial sub-unit within the basal till is inferred to correlate with sand lenses described in the regional surficial stratigraphy by Bichler and Bobrowsky (2003), interpreted to represent ice-frontal meltwater channel deposits.

5.5.3.5 Bedrock

Weathered bedrock was encountered across the TSF area between approximately 873 and 968 m elevation. Bedrock described in boreholes typically comprised sand and gravel with some fines, recorded as weathered volcaniclastic conglomerate, volcanic debris or completely weathered bedrock. Locating the contact between the bedrock and overlying till was inherently difficult at many borehole locations given the highly weathered nature of the upper part of the bedrock. As such, the weathered bedrock can be difficult to distinguish from the overlying surficial deposits in the zone of contact (Panteleyev et al. 1996; Golder 2015c).

6.0 SEISMIC HAZARD

The Mount Polley TSF site is located within the Canadian Cordillera, part of the North American Cordillera that was formed by convergent tectonic processes and the successive accretion of a number of allochthonous terranes to the ancient western margin of the North American plate, likely beginning sometime in the Late Triassic to Early Jurassic (approximately 180 to 200 million years ago) (Monger and Price 1979; Price 1994, 2000; Ricketts 2008; Monger 1989).

The present-day tectonics of western Canada are strongly influenced by the effects of relative motions of the Pacific and North America plates and remnants of the former Farallon plate that was largely subducted. The modern Explorer, Juan de Fuca, and Gorda plates are the remains of the much larger Farallon plate.

The Cascadia subduction zone (CSZ) marks the boundary where the Juan de Fuca, Explorer, and Gorda plates are being subducted beneath western North America. The 1,200 km long CSZ extends from northern California to British Columbia and is approximately 460 km west of the Mount Polley Mine at its closest approach. The present-day convergence (subduction) velocity ranges from about 43 mm/yr for the Juan de Fuca plate that decreases to the northwest to about 20 mm/yr for the Explorer plate (North America fixed). The CSZ has produced repeated great earthquakes (i.e., above moment magnitude (**M**)8) throughout the Holocene Epoch. The most recent CSZ great earthquake was an estimated **M**9.0 in January of 1700. The Cascadia subduction interface is currently locked and accumulating strain toward a future large or great earthquake (e.g., Dragert et al. 1994; Hyndman and Wang 1995; Mazzotti et al. 2003).

The southern Canadian Cordillera, where the Mount Polley Mine is located, has relatively low rates of historical seismicity relative to the CSZ. However, intermediate-to-large magnitude earthquakes have been recorded. For example, a **M**6.0 earthquake in 1918 had an epicentre approximately 220 km east of the site and a **M**5.5 earthquake occurred in 1986 with an epicentre approximately 200 km north of the site. Both earthquakes occurred in the “Rocky Mountain Trench” that marks the boundary between the western Foreland Fold and Thrust Belt and the Quesnel terrane and other terranes. The 1986 earthquake had a thrust fault mechanism, which is consistent with the general structural trends mapped in the area (e.g., Rogers et al. 1990).

WSP developed a site-specific seismic hazard model for the Mount Polley site based on source models developed for the 6th Generation Canadian National Seismic Hazard Model (Canada SHM6) and a review of geological and paleoseismological features (APPENDIX B). Both near-field, moderate-magnitude crustal earthquakes and far-field subduction interface earthquakes contribute to the site seismic hazard. The shallow crustal earthquake sources are dominated by moderate-magnitude earthquakes (**M**6.0 to **M**6.5) close to the site (i.e., less than 60 km away) at all annual exceedance probabilities. The contribution to hazard at the site from CSZ sources is from large earthquakes (**M**8+) at 450 to 550 km from the site at all annual exceedance probabilities and spectral periods of interest.

Probabilistic analysis results from the site-specific hazard model are listed in Table 6-1.

Table 6-1: Site-Specific Accelerations (5%-damped) for Selected Annual Exceedance Probabilities and Spectral Periods at the Mount Polley Tailings Storage Facility Site (V_{S30} = 849 m/s)

Performance Level – Annual Exceedance Probability	Spectral Period (s)	Acceleration[a] (g)					
		Mean	Fractile				
			5th	15th	50th (median)	85th	95th
1/1,000	PGA	0.026	0.023	0.023	0.025	0.028	0.028
	0.5	0.033	0.030	0.030	0.033	0.035	0.036
	1.0	0.020	0.017	0.017	0.019	0.021	0.023
	1.5	0.015	0.012	0.012	0.015	0.017	0.018
1/2,475	PGA	0.048	0.042	0.042	0.046	0.053	0.054
	0.5	0.054	0.050	0.050	0.053	0.057	0.058
	1.0	0.030	0.026	0.027	0.030	0.033	0.035
	1.5	0.023	0.018	0.019	0.022	0.026	0.027
1/5,000	PGA	0.076	0.067	0.067	0.073	0.084	0.085
	0.5	0.079	0.073	0.073	0.079	0.083	0.084
	1.0	0.042	0.036	0.038	0.041	0.045	0.048
	1.5	0.031	0.024	0.025	0.029	0.036	0.037
1/10,000	PGA	0.116	0.102	0.102	0.111	0.128	0.128
	0.5	0.114	0.106	0.106	0.115	0.119	0.121
	1.0	0.057	0.050	0.052	0.057	0.060	0.065
	1.5	0.041	0.032	0.034	0.039	0.047	0.048

a) 5%-damped, mean, geometric-mean, peak horizontal acceleration.

PGA = peak ground acceleration.

7.0 GEOTECHNICAL CONDITIONS

This section presents a summary of results of geotechnical testing and interpreted geotechnical parameters.

A summary of available geotechnical data collected during subsurface investigations in the area of the TSF embankment is provided in APPENDIX C (Tables C1 to C5). This includes information related to boreholes, test pits, cone penetration tests (CPTs), monitoring wells and other instrumentation, and laboratory index testing results. The subsurface investigation locations are shown relative to the TSF embankment in Figure 1 and Figure 2. Surficial geological cross-sections were developed for the encountered foundation conditions which are shown in Figure 3 to Figure 9.

The following stratigraphic units were identified in the foundation of the TSF embankment.

- **Till**—The till is generally a mixture of gravel, sand, and low plastic fines ranging from silt to silty clay. The material is generally cohesive with a consistency from firm to hard. The average water content of laboratory tests is approximately 12% (ranges from 2% to 33%). Results of geotechnical testing are presented in Section 7.1.
- **Glaciofluvial units**—The glaciofluvial units are generally gravelly sandy silt to silty sand with trace gravel. The material is generally non-cohesive with a compactness ranging from compact to very dense. The fines content of laboratory tests ranges from about 4% to 100% and are generally non-plastic (note that samples selected for testing are typically bias towards samples with higher fines content with some plasticity).The average water content of laboratory tests is approximately 17% (ranges from 2% to 34%). Results of geotechnical testing are presented in Section 7.2.
- **Glaciolacustrine units**—The glaciolacustrine units are generally silty clay to clay with trace to some sand. The fines are generally intermediate to high plasticity. The material is generally cohesive with a consistency ranging from firm to very stiff. The average water contents and clay contents of the glaciolacustrine units vary based on location. Results of geotechnical testing are presented in Section 7.3.
- **Highly weathered bedrock**—Generally weathered volcaniclastic conglomerate, volcanic debris or completely weathered bedrock.

7.1 Till

Till has been encountered during many previous subsurface investigations carried out near the foundation of the TSF. Representative samples were collected throughout the investigations with selected samples chosen for subsequent laboratory testing. The laboratory testing programs generally included a range of index and/or advanced laboratory tests dependent on the specific objective at the time. A summary of the index properties for the samples of till is presented in Table 7-1.

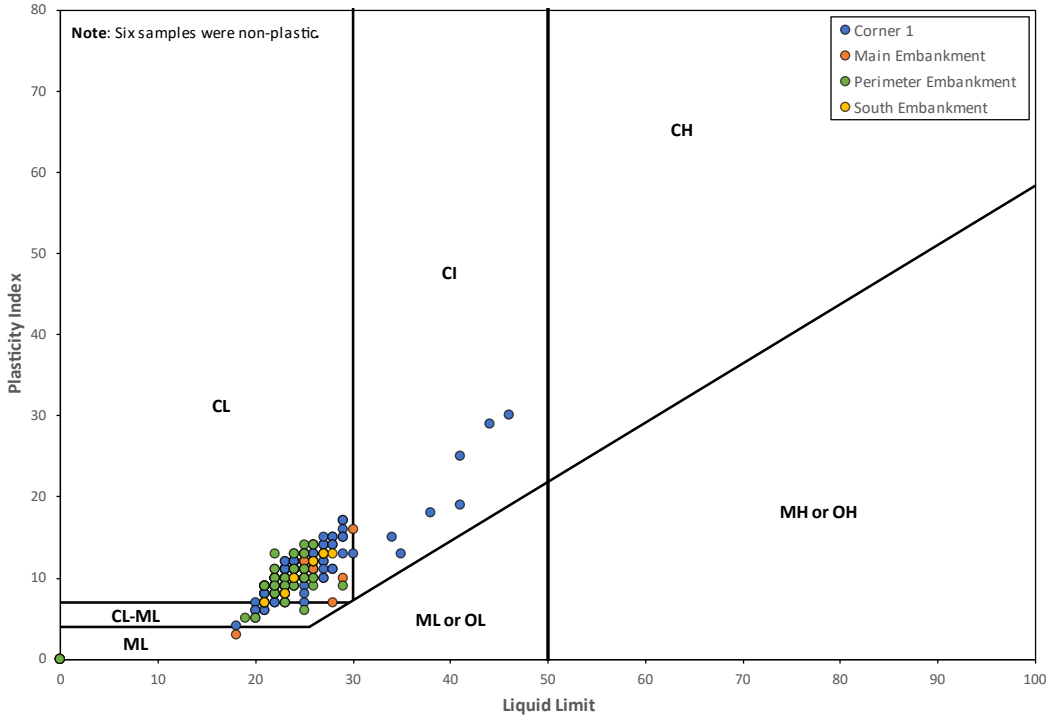
The Atterberg limit results for each embankment are shown graphically in Illustration 7-1. The fines are generally non-plastic or low plasticity and range from silt to silty clay (ML to CL, respectively). Seven test results were outside of this general range and had an intermediate plasticity. Six of the samples with an intermediate plasticity were collected from the Corner 1 Embankment.

The natural water content results were plotted against elevation, which is shown in Illustration 7-2. The average water content of the till was approximately 12% and ranged from 2% to 34%.

Table 7-1: Summary of Index Properties of Till

Index Property		Average	Minimum	Maximum	Number of Tests
Gradation	Gravel (%)	14	0	45	245
	Sand (%)	35	3	61	
	Fines (%)	51	16	97	
Liquid limit[a]		25	18	46	197
Plastic limit[a]		14	9	22	
Plasticity index[a]		11	3	30	
Water content (%)		12.0	2.0	34.0	1943
Specific gravity of solids		2.76	2.73	2.78	6

a) Atterberg limits exclude six non-plastic results.



CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay; CH = high-plastic clay; CL-ML = low-plastic silty clay to clayey silt; ML = inorganic silt with slight or low plasticity; MH = high-plastic silt, generally classified as clayey silt; OL = low-plastic organic silt; OH = high-plastic organic silt.

Illustration 7-1: Plasticity Chart of Till Samples

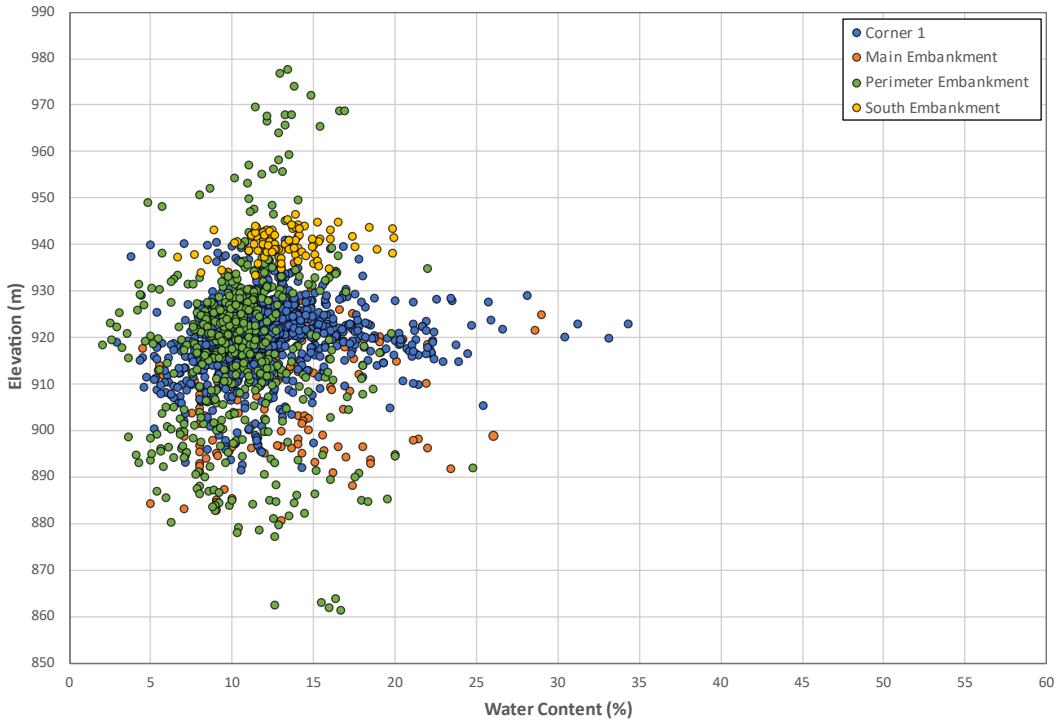


Illustration 7-2: Water Content versus Elevation of Till Samples

A summary of the shear strength test results from till samples is presented in Table 7-2. The peak friction angle ranged from 30 to 41 degrees with a cohesion of 0 kPa.

Pressuremeter test results indicate the friction angle of the till at the Corner 1 Embankment ranges between 36 and 48 degrees, with an average of about 40 degrees (IEEIRP 2015).

Table 7-2: Shear Strength Test Results of Till

Borehole / Test Pit No.	Sample No.	Sample Type	Elevation (m)	Peak Shear Strength Parameter		Source
				Friction Angle (degrees)	Cohesion (kPa)	
TP95-27	n/a	Grab	926.2	35	0	KP (1995a)
TP95-37	n/a	Grab	937.0	35	0	
MR14-105	4B	Thin-walled tube	927.8	34	0	IEEIRP (2015)
MR14-106	2	Thin-walled tube	924.6	34	0	
MR14-111	5A	Thin-walled tube	922.9	35	0	
MR14-113	1C	Thin-walled tube	928.0	33	0	
SH14-10A	12	Sonic core	922.4	41	0	KCB (2015b)
	10	Sonic core	921.6	30	0	
	14	Sonic core	918.7	37	0	
TP14-01	BS-01	Block	n/a	34	0	
	BS-01	Block	n/a	33	0	

n/a = not applicable, not available

The median shear wave velocity measured in the till foundation ranged from about 320 to 400 m/s at the Corner 1 Embankment (Golder 2016a).

7.2 Glaciofluvial Unit

A summary of index laboratory testing completed on select glaciofluvial samples collected from the foundation of the TSF embankment is presented in Table 7-3. Atterberg limit tests were generally only carried out on samples described as exhibiting some plastic behaviour. Similarly, gradation tests were typically carried out on samples visually interpreted to have higher fines content.

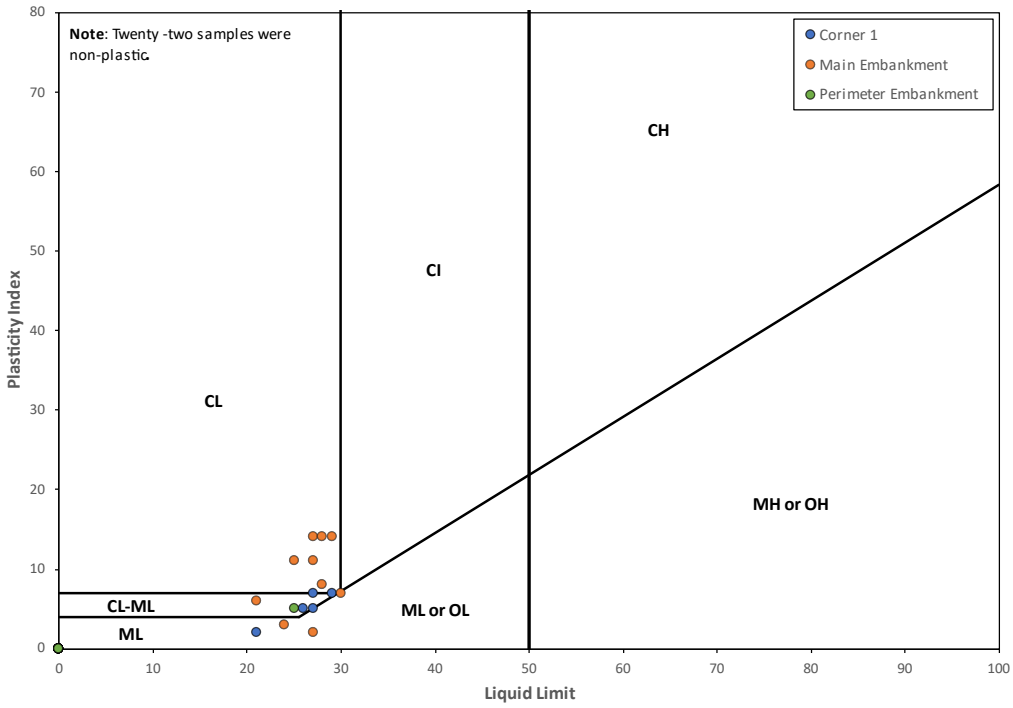
A total of 38 Atterberg limit tests have been completed on select samples of glaciofluvial material. The Atterberg limit tests indicate that fines in the selected samples are generally non-plastic to low plastic material and range from silt to silty clay (ML to CL, respectively). Twenty-two of the 38 test results were non-plastic. The material is generally non-cohesive with a compactness ranging from compact to very dense. The Atterberg limit results for each embankment are shown graphically in Illustration 7-3.

The natural water content results were plotted against elevation, which is shown in Illustration 7-4. The average water content of the glaciofluvial was approximately 17% and ranged from 2% to 34%.

Table 7-3: Summary of Index Properties of Glaciofluvial Unit

Index Property		Average	Minimum	Maximum	Number of Tests
Gradation	Gravel (%)	6	0	47	43
	Sand (%)	32	0	85	
	Fines (%)	63	4	100	
Liquid limit[a]		26	21	30	16
Plastic limit[a]		19	13	25	
Plasticity index[a]		8	2	14	
Water content (%)		16.7	2.2	33.9	444
Specific gravity of solids		2.78	2.78	2.78	1

a) Atterberg limits exclude 22 non-plastic results.



CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay; CH = high-plastic clay; CL-ML = low-plastic silty clay to clayey silt; ML = inorganic silt with slight or low plasticity; MH = high-plastic silt, generally classified as clayey silt; OL = low-plastic organic silt; OH = high-plastic organic silt.

Illustration 7-3: Plasticity Chart of Glaciofluvial Samples

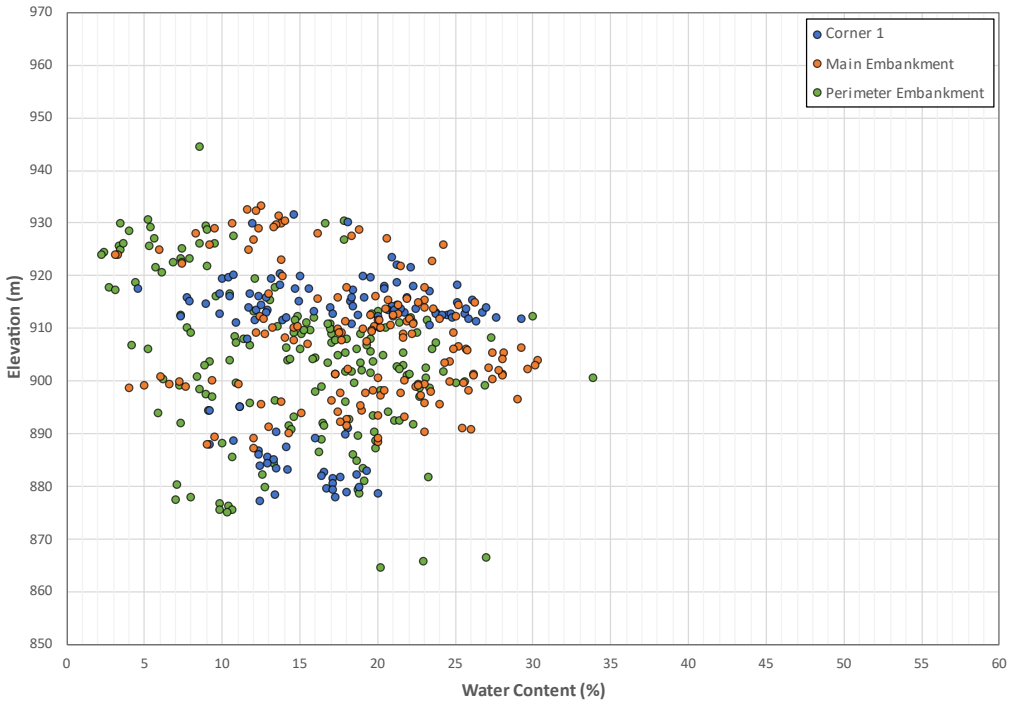


Illustration 7-4: Water Content versus Elevation of Glaciofluvial Samples

A summary of the shear strength test results from glaciofluvial samples is presented in Table 7-4. The peak friction angles were 35 and 36 degrees with a cohesion of 0 kPa.

Table 7-4: Shear Strength Test Results of Glaciofluvial Unit

Borehole / Test Pit No.	Sample No.	Sample Type	Elevation (m)	Peak Shear Strength Parameter		Source
				Friction Angle (degrees)	Cohesion (kPa)	
Central Collection Sump	n/a	Thin-walled tube	n/a	36	0	Golder (2015d)
GA15-21	9 (C|U)	Thin-walled tube	902.5	35	0	

n/a = not applicable, not available.

7.3 Glaciolacustrine Unit

Glaciolacustrine deposits were identified along the Main, Perimeter, and Corner 1 embankments:

- **Main Embankment**—A semi-continuous layer of glaciolacustrine sediment is present at an elevation of approximately 900 to 910 m and extends along the length of the Main Embankment. A shallower layer of glaciolacustrine sediment near elevation 920 m was identified near Station 2+400 and 2+750. Results of geotechnical testing completed on samples of glaciolacustrine sediment from the Main Embankment are presented in Section 7.3.1.
- **Perimeter Embankment**—The glaciolacustrine deposits are not continuous and their elevations generally range between about 885 and 935 m. Results of geotechnical testing completed on samples of glaciolacustrine sediment from the Perimeter Embankment are presented in Section 7.3.2.
- **Corner 1 Embankment**—Upper and lower glaciolacustrine deposits are present at this location. The upper glaciolacustrine deposit is a semi-continuous layer between approximate elevations 918 and 925 m from approximate Station 20+000 to 20+300. The lower glaciolacustrine deposit is also a semi-continuous layer between approximate elevations 900 and 918 m. Results of geotechnical testing completed on samples of glaciolacustrine sediment from the Corner 1 Embankment are presented in Section 7.3.3.

A layer of low plasticity silty clay interpreted to have deposited in a glaciolacustrine environment was encountered directly above bedrock near Station 1+100 at the South Embankment; however, the geotechnical testing completed on the material showed it not to be representative of the intermediate or high plasticity glaciolacustrine units found within the footprint of the Corner 1, Main, and Perimeter embankments (Golder 2017). The results of the geotechnical testing are presented in Section 7.3.4.

Clay speciation analyses have been completed on 13 glaciolacustrine samples collected at the Main, Perimeter and Corner 1 embankments. The results and composition of select clay species are presented in Appendix G.

7.3.1 Main Embankment

A summary of the index properties for samples of glaciolacustrine sediment collected from the foundation of the Main Embankment is presented in Table 7-5.

The Atterberg limit results are shown graphically in Illustration 7-5. The fines are generally a low to intermediate plastic material and range from silt to silty clay (ML to CI, respectively). Six results were outside of this general range and were either non-plastic or had a high plasticity.

The natural water content results were plotted against elevation, which is shown in Illustration 7-6. The average water content in samples of glaciolacustrine sediment from the Main Embankment was approximately 26% and ranged from 6% to 42%.

The natural water content results were also plotted against clay content as shown in Illustration 7-7. A total of 44 hydrometer test results were available for glaciolacustrine samples from the Main Embankment foundation. The average clay content (defined as particles smaller than 0.002 mm) of the glaciolacustrine samples was approximately 30% and ranged from 7% to 49%. A general trend of increasing water content with increasing clay content can be seen in the illustration.

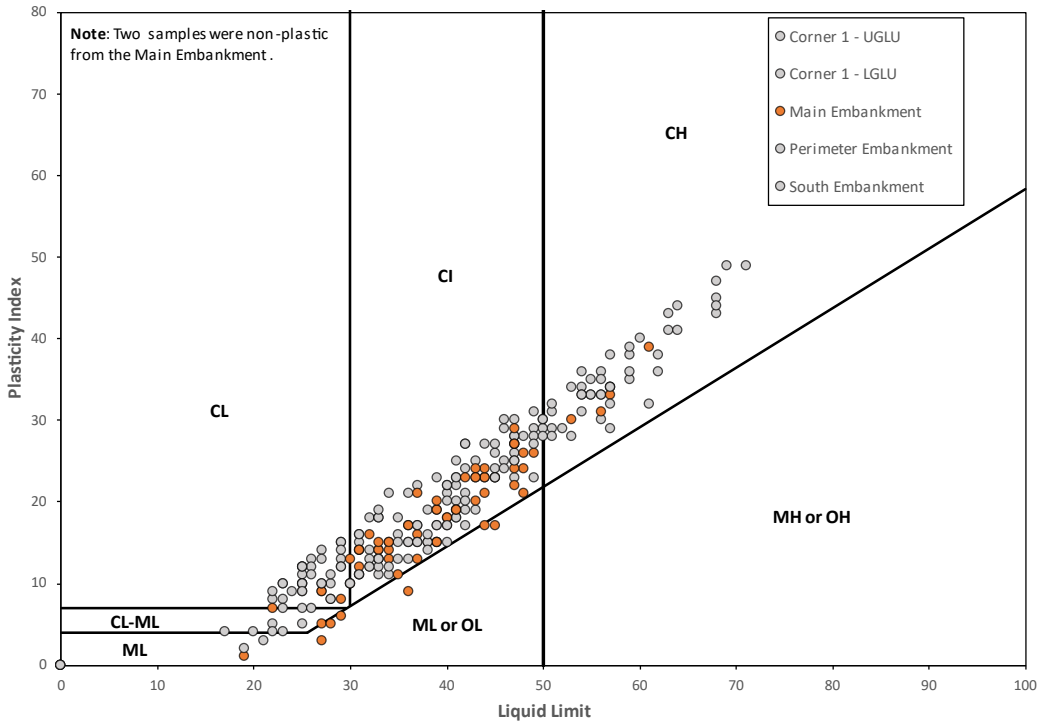
All available test results for glaciolacustrine samples collected from the foundation of the other embankments were incorporated into the illustrations for comparison.

Table 7-5: Summary of Index Properties of Glaciolacustrine at the Main Embankment

Index Property		Average	Minimum	Maximum	Number of Tests
Gradation	Gravel (%)	0	0	5	52
	Sand (%)	6	0	40	
	Fines (%)	94	60	100	
	Silt (%)	65	44	92	44
	Clay[a] (%)	30	7	49	
Liquid limit[b]		39	19	61	62
Plastic limit[b]		21	15	28	
Plasticity index[b]		17	1	39	
Water content (%)		26.1	6.3	42.1	179
Specific gravity of solids		2.75	2.65	2.80	8

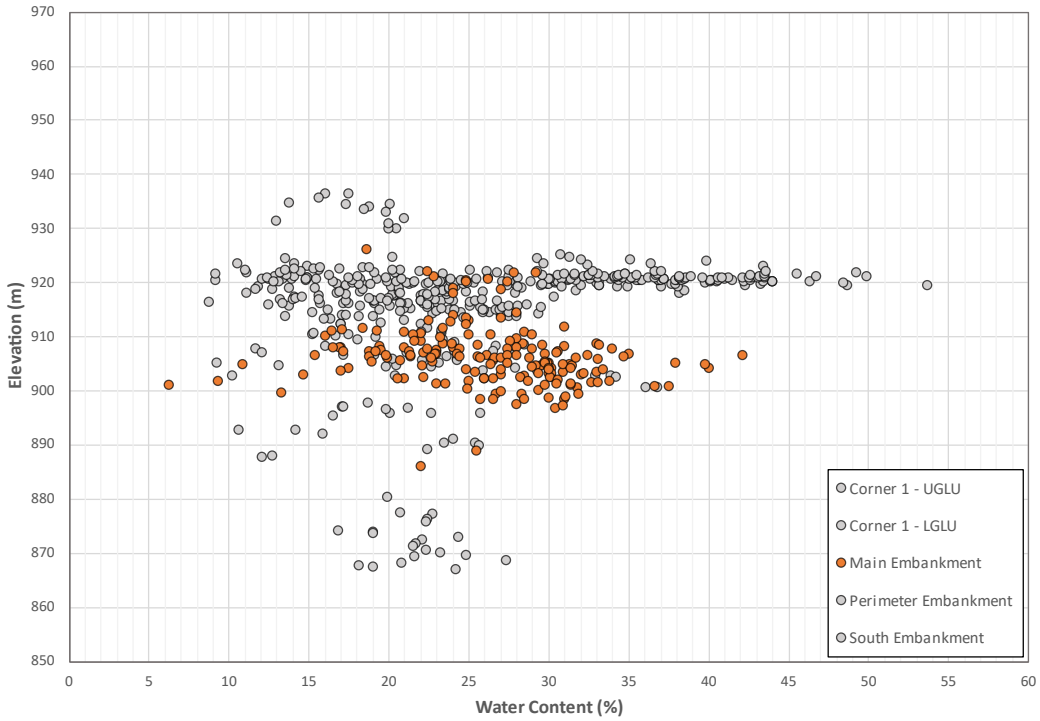
a) Clay is defined as particles smaller than 0.002 mm.

b) Atterberg limits exclude two non-plastic results from the Main Embankment.



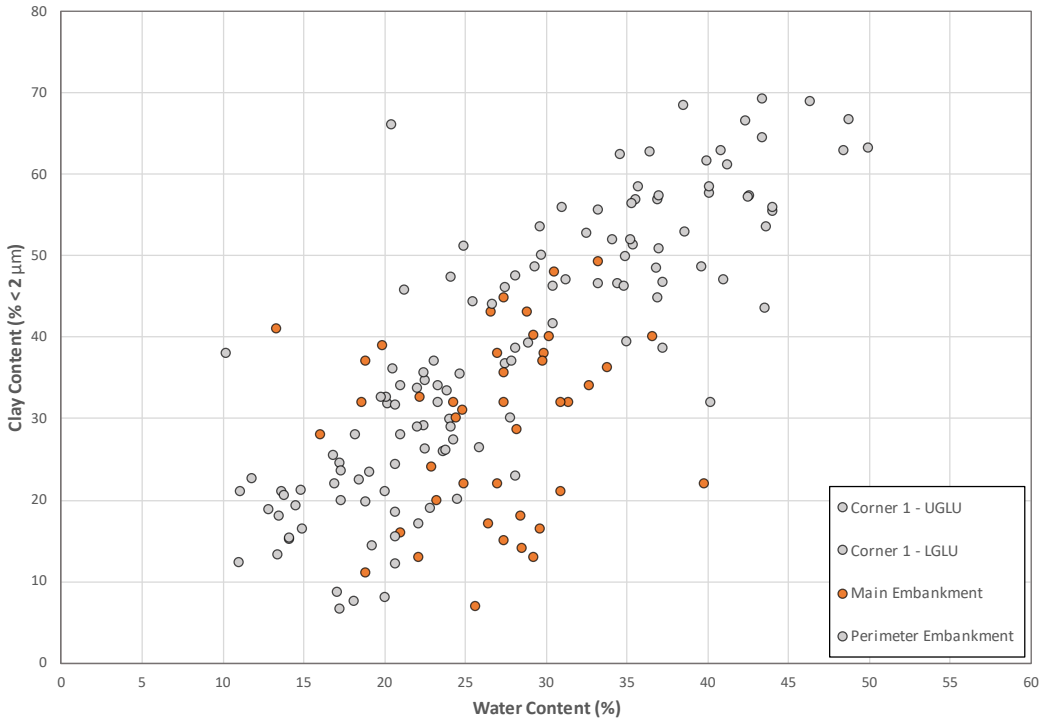
CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay; CH = high-plastic clay; CL-ML = low-plastic silty clay to clayey silt; ML = inorganic silt with slight or low plasticity; MH = high-plastic silt, generally classified as clayey silt; OL = low-plastic organic silt; OH = high-plastic organic silt.

Illustration 7-5: Plasticity Chart of Glaciolacustrine Samples from the Main Embankment



LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-6: Water Content versus Elevation of Glaciolacustrine Sediment Samples from the Main Embankment



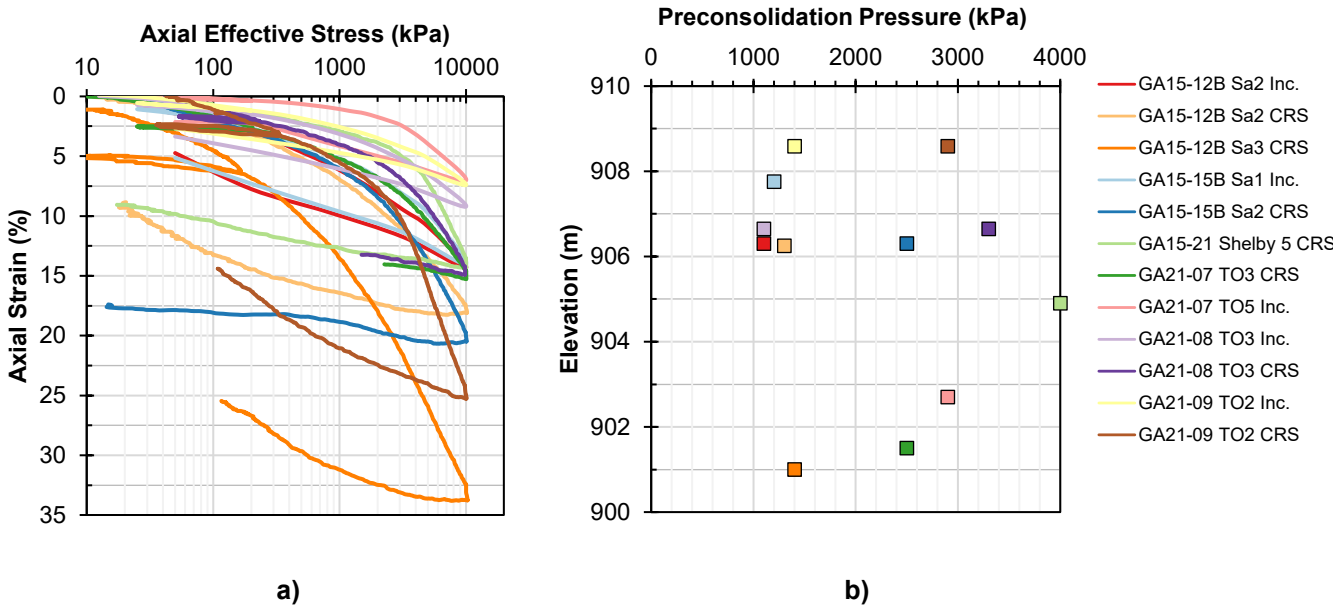
LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-7: Water Content versus Clay Content of Glaciolacustrine Samples from the Main Embankment

The results of consolidation tests carried out on sonic drilling and thin-walled tube samples of glaciolacustrine material from the Main Embankment are shown in Table 7-6 and Illustration 7-8a. Illustration 7-8b presents the preconsolidation pressures estimated using the Casagrande method.

Table 7-6: Consolidation Test Results of Glaciolacustrine Samples at the Main Embankment

Borehole No.	Sample No.	Sample Type	Elevation (m)	Estimated Preconsolidation Pressure (kPa)		Source
				Casagrande	Strain Energy	
GA15-12B	2	Sonic core	906.3	1,100	1,200	Golder (2015d)
GA15-12B	2	Sonic core	906.3	1,300	1,500	
GA15-12B	3	Sonic core	901.0	1,400	1,200	
GA15-15B	1	Thin-walled tube	907.8	1,200	1,400	
GA15-15B	2	Thin-walled tube	906.3	2,500	2,700	
GA15-21	5	Thin-walled tube	904.9	4,000	4,000	
GA21-07	TO3	Thin-walled tube	902.7	2,900	3,000	WSP Golder (2022b)
GA21-07	TO5	Thin-walled tube	901.5	2,500	2,600	
GA21-08	TO3	Thin-walled tube	906.6	1,100	1,100	
GA21-08	TO3	Thin-walled tube	906.6	3,300	3,400	
GA21-09	TO2	Thin-walled tube	908.6	1,400	1,300	
GA21-09	TO2	Thin-walled tube	908.6	2,900	2,800	



CRS = constant rate of strain; Inc. = incremental load.

Illustration 7-8: a) Consolidation Test Results on Glaciolacustrine Sediment Samples at the Main Embankment and b) Inferred Preconsolidation Pressure from Laboratory and Cone Penetration Test Data

The quality of the samples was assessed using two different methods. Lunne et al. (1997) use the $\Delta e/e_0$ value to evaluate the sample quality, where Δe is the change in sample void ratio caused by reapplying the in situ effective stress (σ_{v0}'), and e_0 is the initial void ratio of the soil. Karlsrud and Hernandez-Martinez (2013) use the M_0/M_L value for sample quality evaluation, where M_0 is the maximum constrained modulus in the overconsolidated stress range and M_L is the minimum constrained modulus after the preconsolidation pressure. Table 7-7 shows the sample quality assessment based on values of $\Delta e/e_0$ and M_0/M_L and Table 7-8 presents the results of the assessment.

Table 7-7: Sample Quality Assessment Criteria

Sample Quality	Lunne et al. (1997)		Karlsrud and Hernandez-Martinez (2013)
	$\Delta e/e_0$ for OCR = 1-2	$\Delta e/e_0$ for OCR = 2-4	
1 – Very good to excellent	<0.04	<0.03	>2.0
2 – Good to fair	0.04–0.07	0.03–0.05	1.5–2.0
3 – Poor	0.07–0.14	0.05–0.10	1.0–1.5
4 – Very poor	>0.14	>0.10	<1.0

e_0 = initial void ratio; Δe = change in sample void ratio caused by reapplying σ_{v0}'; σ_{v0}' = in situ effective stress; OCR = overconsolidation ratio.

Table 7-8: Quality Assessment of Glaciolacustrine Sediment Samples from the Main Embankment

Borehole No.	Sample No.	Sample Type	Consolidation Test	Lunne et al. (1997)	Karlsrud and Hernandez-Martinez (2013)
GA15-12B	2	Sonic core	Incremental load	Poor	Very poor
GA15-12B	2	Sonic core	CRS	Very poor	Poor
GA15-12B	3	Sonic core	CRS	Very poor	Very poor
GA15-15B	1	Thin-walled tube	Incremental load	Poor	Very poor
GA15-15B	2	Thin-walled tube	CRS	Good to fair	Poor
GA15-21	5	Thin-walled tube	CRS	Very good to excellent	Good to fair
GA21-07	TO3	Thin-walled tube	CRS	Poor	Poor
GA21-07	TO5	Thin-walled tube	Incremental load	Very good to excellent	Poor
GA21-08	TO3	Thin-walled tube	Incremental load	Good to fair	Very poor
GA21-08	TO3	Thin-walled tube	CRS	Poor	Poor
GA21-09	TO2	Thin-walled tube	Incremental load	Good to fair	Very poor
GA21-09	TO2	Thin-walled tube	CRS	Poor	Good to fair

CRS = constant rate of strain.

The results of the laboratory consolidation tests were compared with the interpreted preconsolidation pressure from CPTs carried out along the Main Embankment. The preconsolidation pressure (σ'_p) from the CPT data was estimated as $\sigma'_p = 0.33 (q_t - \sigma_{vo})$ (Mayne 2001). The comparison is shown in Illustration 7-9. Tests corresponding to very poor quality samples, using either of the two methods, are excluded from the comparison. The CPT data are seen to correlate reasonably well with the laboratory consolidation tests and provide a degree of confidence in the CPT interpreted preconsolidation pressure.

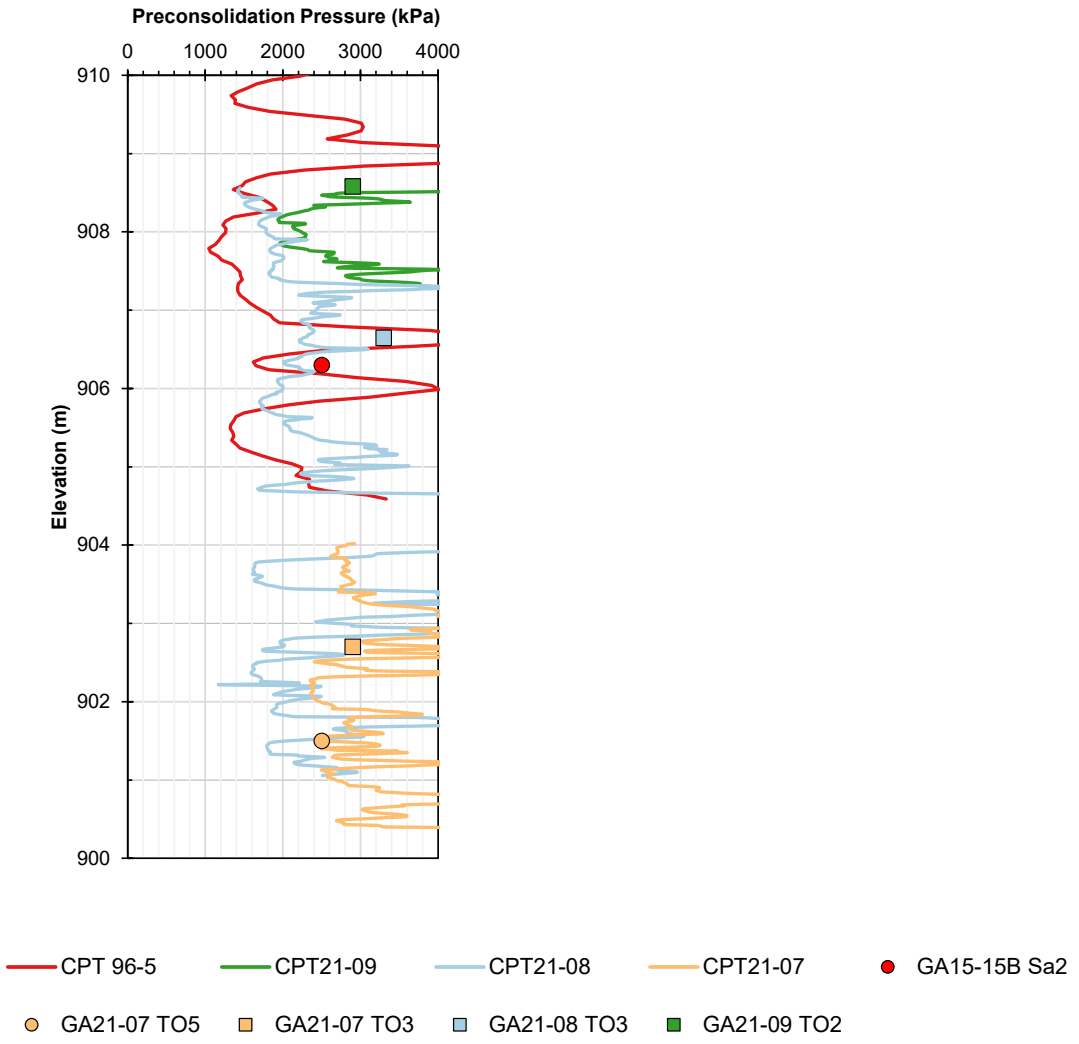


Illustration 7-9: Preconsolidation Pressure Comparison between Laboratory and Cone Penetration Test Data

The interpretations of CPTs from 1996 are presented in Golder (2015e). The interpretations of CPTs from 2021 are presented in WSP (2023). Illustration 7-10a presents the preconsolidation pressure interpreted from all CPT data obtained at the elevation of the semi-continuous layer of glaciolacustrine soil (typically between approximate elevation 900 and 910 m). The interpreted preconsolidation pressure is generally greater than 1,200 kPa. A few points have a preconsolidation pressure between 1,000 and 1,200 kPa, as can be seen at an elevation of about 917 m for sounding PRW96-1, just below elevation 915 m for CPT96-1, and just below elevation 908 m for CPT96-5.

As shown in Illustration 7-10b, the preconsolidation pressure interpreted from CPT21-07 data near elevation 922 m (higher elevation glaciolacustrine deposit present between approximate Station 2+400 and 2+750) is greater than 850 kPa.

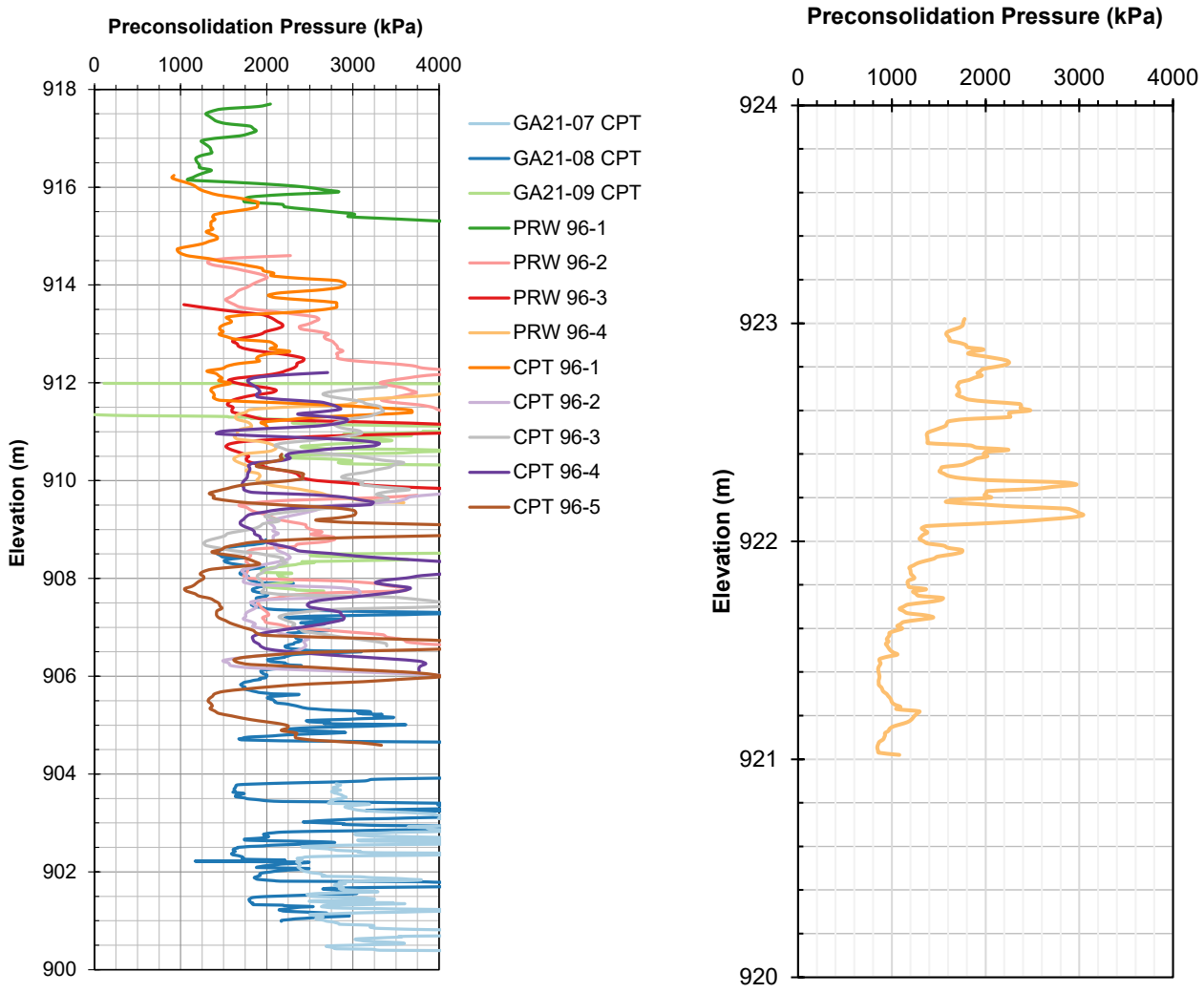


Illustration 7-10: a) Inferred Preconsolidation pressure from Main Embankment Cone Penetration Test Data between Elev. 900 and 918 m and b) Inferred Preconsolidation pressure from Main Embankment CPT21-07 Data between Elev. 921 and 923 m.

The undrained shear strength was measured in the laboratory with simple shear tests on glaciolacustrine sediment samples from the Main Embankment (Golder 2015d; WSP Golder 2022b). A summary of the simple shear test results is presented in Table 7-9. The overconsolidation ratio (OCR) is presented for samples consolidated in the laboratory beyond the estimated preconsolidation pressure of the sample prior to shearing.

Table 7-9: Simple Shear Test Results of Glaciolacustrine Sediment Samples at the Main Embankment

Borehole No.	Sample No.	Sample Type	Initial Water Content (%)	Plasticity Index	Initial Vertical Effective Stress (kPa)	OCR	Maximum Undrained Shear Strength Ratio	Undrained Shear Strength Ratio at 20% Strain
GA15-12B	2	Sonic core	23.0	17	300	n/a	0.50	0.48
			22.5		900	n/a	0.32	0.30
			18.0		1,200	n/a	0.39	0.39
			18.1		1,200	n/a	0.36	n/a
GA15-12B	3	Sonic core	29.6	22	300	n/a	0.28	0.28
			38.9	n/a	900	n/a	0.26	0.23
			37.5	n/a	1,200	n/a	0.24	0.22
			27.4	n/a	300	4.0	0.71	n/a
GA15-15B	2	Thin-walled tube	30.1	27	300	n/a	0.41	0.40
			29.2	24	600	n/a	0.37	0.33
	1	Thin-walled tube	27.8	19	2,500	n/a	0.27	0.22
			24.8	17	300	8.3	0.99	0.84
GA15-21	5	Thin-walled tube	23.8	19	400	n/a	0.62	n/a
			30.9	22	800	n/a	0.32	n/a
			26.4	19	2,000	n/a	0.23	n/a
GA21-07	TO3	Thin-walled tube	22.5	19	500	4.8	0.68	0.55
			24.8	n/a	1,200	2.0	0.37	0.21
			27.9	n/a	2,400	1.0	0.23	0.17
GA21-08	TO3	Thin-walled tube	25.4	20	500	4.8	0.69	0.66
			26.7	n/a	1,200	2.0	0.40	0.37
			26.1	n/a	2,400	1.0	0.23	0.19
	TO5	Thin-walled tube	26.7	21	300	8.0	0.74	0.63

n/a = not applicable, not available.
OCR = overconsolidation ratio.

Illustration 7-11a presents the undrained shear strength ratio function obtained following the SHANSEP (Stress History and Normalized Soil Engineering Properties) method (Ladd and Foot 1974). The results of the tests completed on samples collected from the Perimeter Embankment (Table 7-13 in Section 7.3.2) are also included in the illustration. The samples used to determine the SHANSEP parameters were reconsolidated to a vertical effective stress of 2,400 kPa and then the stresses were reduced to achieve the desired OCR before shearing them. Illustration 7-11b shows the undrained shear strength ratio function corresponding to a preconsolidation pressure of 1,200 kPa and compares it with results of simple shear tests carried out on specimens that were directly reconsolidated to different effective vertical stresses.

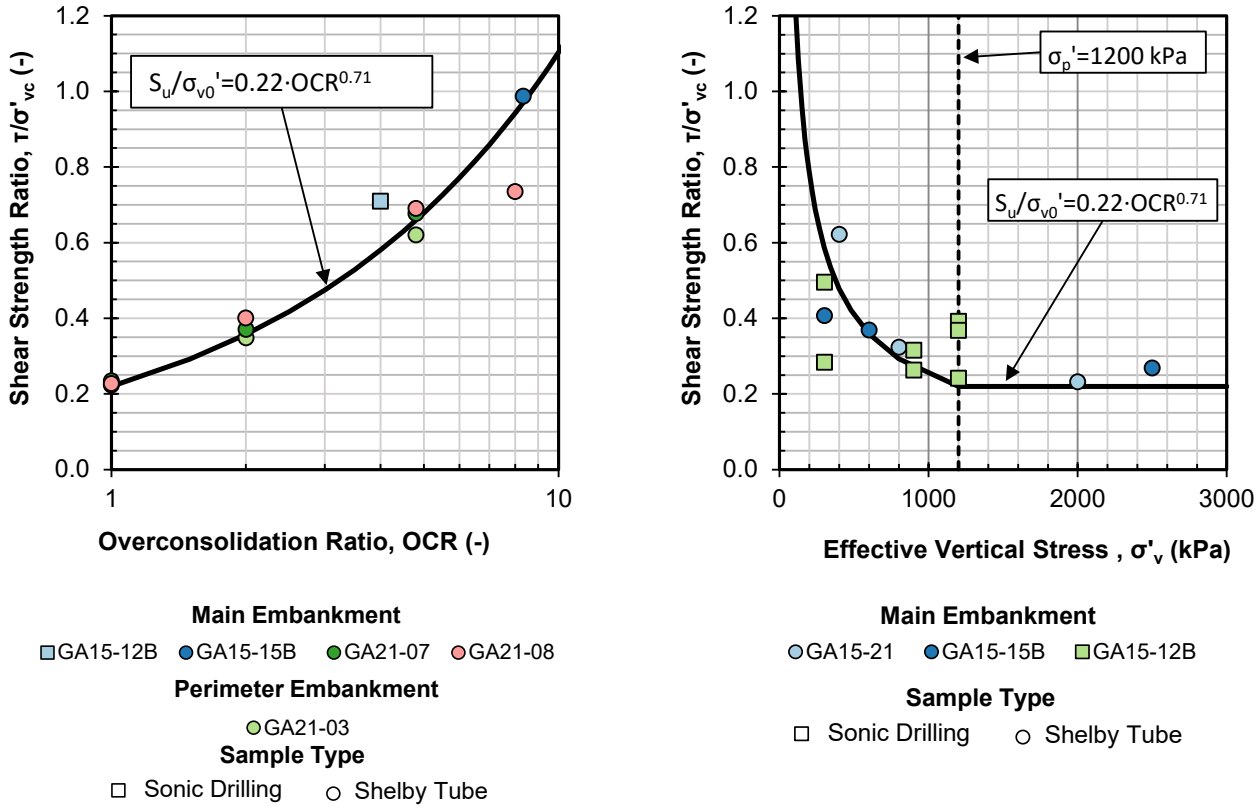


Illustration 7-11: Simple Shear Test Results on Glaciolacustrine Sediment at the Main Embankment and Perimeter Embankment a) Undrained Shear Strength Ratio Function Estimated Following the SHANSEP Method and b) Undrained Shear Strength Ratio Function for a Preconsolidation Pressure of 1,200 kPa

Undrained shear strength profiles were inferred using the data from CPTs carried out in 1996 and 2021 assuming an average N_{kt} factor of 15. The interpretations of CPTs from 1996 are presented in Golder (2015e). The interpretation of CPTs carried out in 2021 is presented in WSP (2023b). The undrained shear strength profiles show a strength greater than that calculated using the SHANSEP model with a preconsolidation value of 1,200 kPa. The sensitivity interpreted from the CPT data generally ranges between 2 and 3.

The effective friction angle of undisturbed glaciolacustrine sediment samples from the Main Embankment was measured in direct shear tests and triaxial tests.

Direct shear tests were conducted on a sample collected downstream of the Main Embankment, adjacent to the Seepage Collection Pond, at a depth of 2.5 to 3.0 m (KP 2007b). No index properties were available for this sample. The peak friction angle was 26 degrees, and the residual friction angle was 23 degrees (with zero cohesion).

Triaxial tests were conducted on a reconstituted sample from the foundation of the Main Embankment (KP 1995a). The sample had a water content of 28.5% and contained 40% sand and 46% silt size particles. The peak friction angle was 33 degrees, assuming zero cohesion.

The undrained cyclic strength of undisturbed glaciolacustrine sediment samples from the Main Embankment were measured in cyclic direct simple shear tests (WSP Golder 2022b). Illustration 7-12 shows the test results in terms of the cyclic strength ratio (CSR) required to generate single-amplitude shear strains of 3% during uniform cyclic loading.

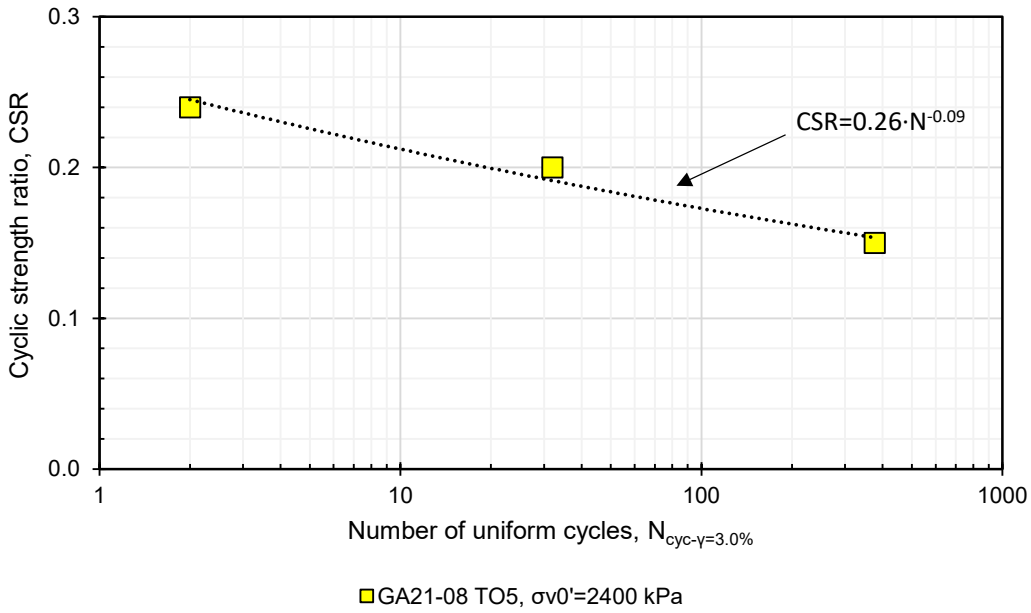


Illustration 7-12: Cyclic Strength Ratio Required to Cause Cyclic Failure (3% Strain) Versus the Number of Uniform Loading Cycles for Glaciolacustrine Sediment Samples Collected from the TSF Main Embankment.

7.3.2 Perimeter Embankment

A summary of the index properties for samples of glaciolacustrine material collected from the foundation of the Perimeter Embankment is presented in Table 7-10.

The Atterberg limit results are shown graphically in Illustration 7-13. The fines are generally a low to intermediate plastic material and range from silt to silty clay (ML to CI, respectively). Six results were outside of this general range and were either a non-plastic silt (ML) or a high plastic clay (CH).

The natural water content results were plotted against elevation, which is shown in Illustration 7-14. The average water content of the glaciolacustrine samples from the Perimeter Embankment was approximately 21% and ranged from 9% to 37%.

The natural water content results were also plotted against clay content as shown in Illustration 7-15. A total of 22 hydrometer test results were available for glaciolacustrine samples from the Perimeter Embankment foundation. The average clay content of the glaciolacustrine samples was approximately 29% and ranged from 7% to 71%. A general trend of increasing water content with increasing clay content can be seen in the illustration.

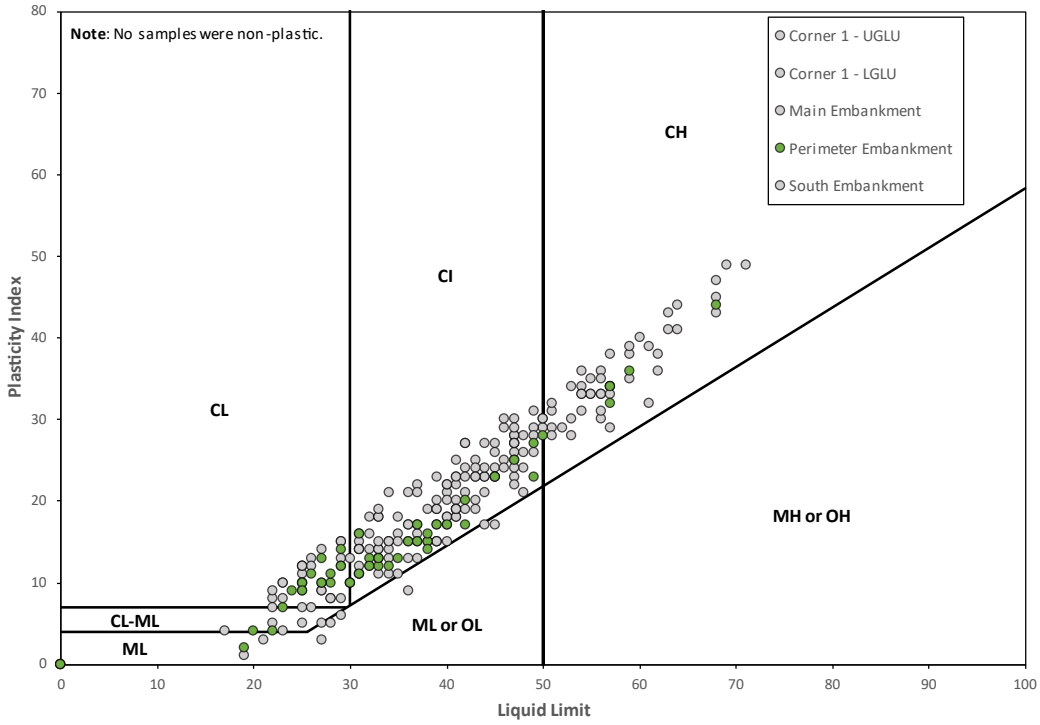
All available test results for glaciolacustrine samples collected from the foundation of the other embankments were incorporated into the illustrations for a comparison.

Table 7-10: Summary of Index Properties of Glaciolacustrine at the Perimeter Embankment

Index Property		Average	Minimum	Maximum	Number of Tests
Gradation	Gravel (%)	1	0	7.2	37
	Sand (%)	9	0	36	
	Fines (%)	91	60	100	
	Silt (%)	63	29	81	22
	Clay[a] (%)	29	7	71	
Liquid limit[b]		36	19	68	44
Plastic limit[b]		20	14	26	
Plasticity index[b]		16	2	44	
Water content (%)		21.0	9.0	37.0	118

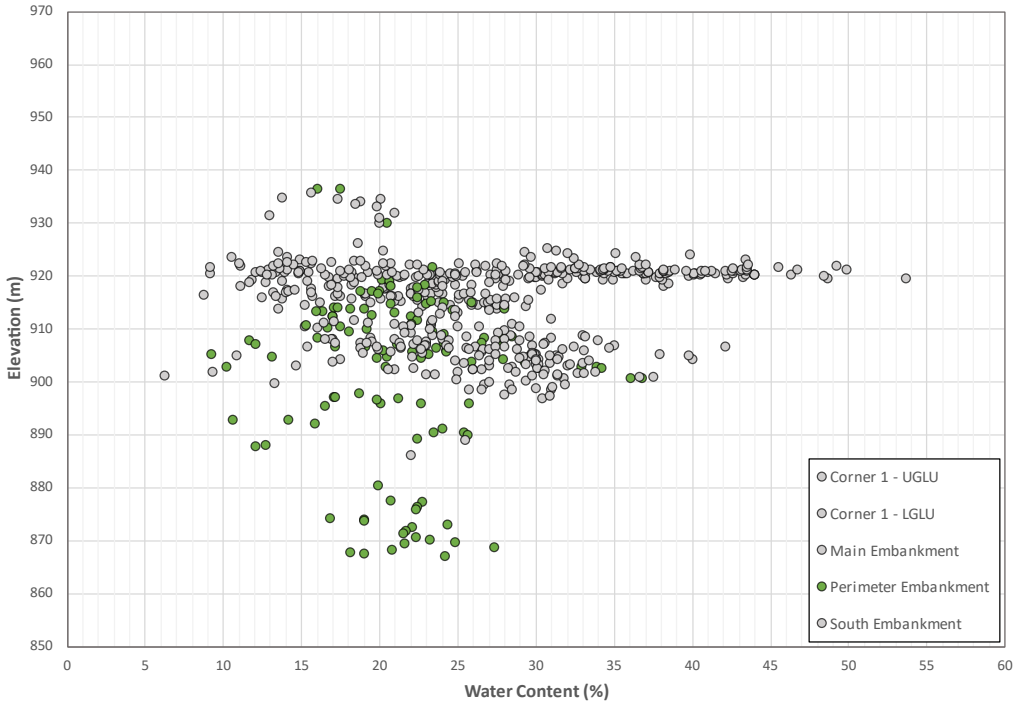
a) Clay is defined as particles smaller than 0.002 mm.

b) Atterberg limits exclude two non-plastic samples from the Perimeter Embankment.



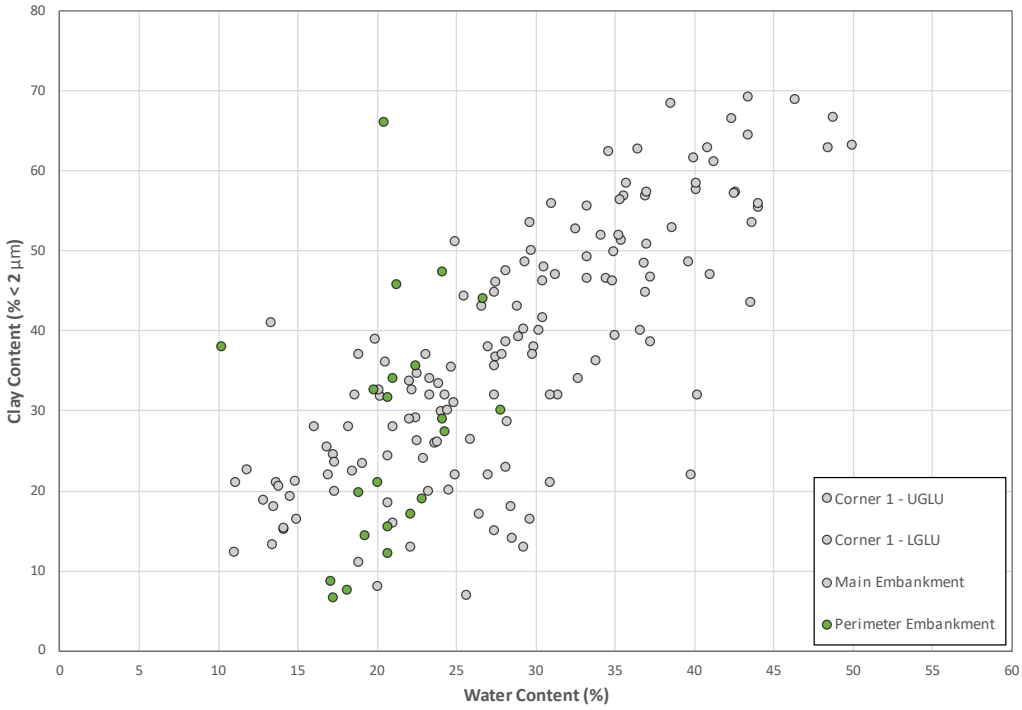
CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay; CH = high-plastic clay; CL-ML = low-plastic silty clay to clayey silt; ML = inorganic silt with slight or low plasticity; MH = high-plastic silt, generally classified as clayey silt; OL = low-plastic organic silt; OH = high-plastic organic silt.

Illustration 7-13: Plasticity Chart of Glaciolacustrine Samples from the Perimeter Embankment



LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-14: Water Content versus Elevation of Glaciolacustrine Samples from the Perimeter Embankment



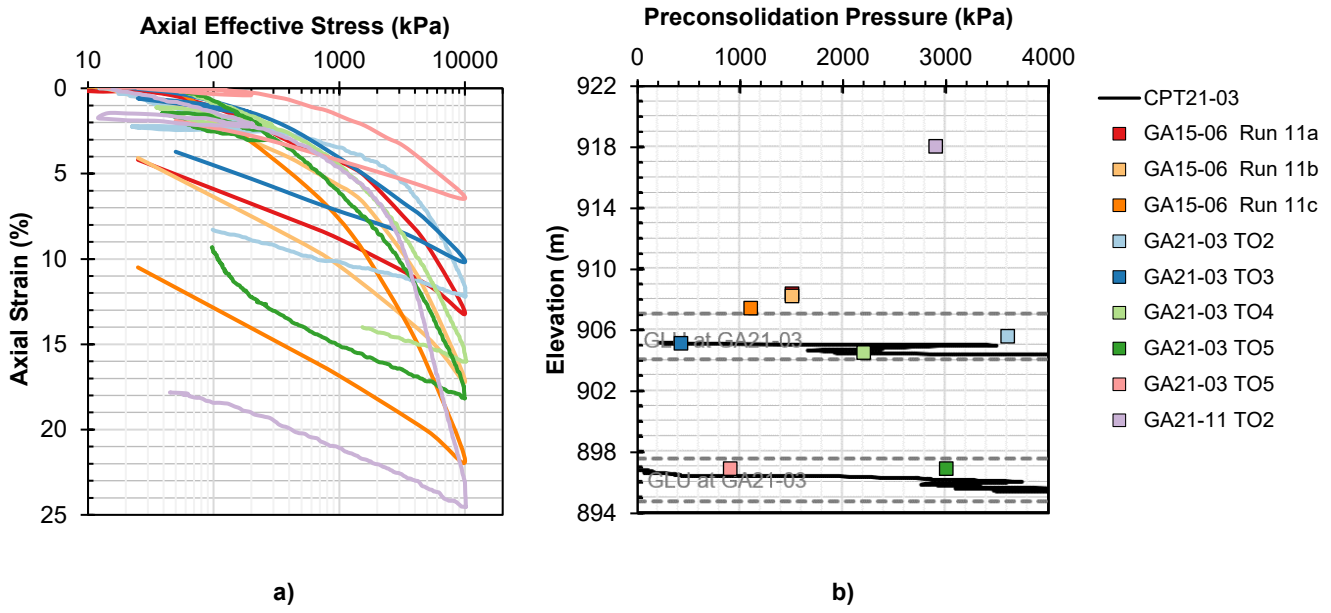
LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-15: Water Content versus Clay Content of Glaciolacustrine Samples from the Perimeter Embankment

Table 7-11 and Illustration 7-16a show the results of consolidation tests carried out on sonic drilling and thin walled-tube samples of glaciolacustrine soil from the Perimeter Embankment. Illustration 7-16b presents the preconsolidation pressures estimated using the Casagrande method and compares them with the interpreted preconsolidation pressure from CPT21-03 carried out in the Perimeter Embankment. The preconsolidation pressure (σ'_p) from the CPT data was estimated as $\sigma'_p = 0.33 (q_t - \sigma_{vo})$ (Mayne 2001) and is generally greater than 1,500 kPa after the initial push of the cone. The interpretations of CPTs carried out in 2021 are presented in WSP (2023b).

Table 7-11: Consolidation Test Results of Glaciolacustrine Samples at the Perimeter Embankment

Borehole No.	Sample No.	Sample Type	Elevation (m)	Estimated Preconsolidation Pressure (kPa)		Source
				Casagrande	Strain Energy	
GA15-06	Run 11a	Sonic core	908.4	1,500	1,500	Golder (2015d)
GA15-06	Run 11b	Sonic core	908.3	1,500	1,500	
GA15-06	Run 11c	Sonic core	907.5	1,100	1,200	
GA21-03	TO2	Thin-walled tube	905.6	3,600	3,800	WSP Golder (2022b)
GA21-03	TO3	Thin-walled tube	905.2	420	480	
GA21-03	TO4	Thin-walled tube	904.6	2,200	2,500	
GA21-03	TO5	Thin-walled tube	896.9	3,000	3,100	
GA21-03	TO5	Thin-walled tube	896.9	900	900	
GA21-11	TO2	Thin-walled tube	918.1	2,900	2,700	



GLU = glaciolacustrine unit.

Illustration 7-16: a) Consolidation Test Results on Glaciolacustrine Samples at the Perimeter Embankment and b) Inferred Preconsolidation Pressure from Laboratory and Cone Penetration Test Data

The quality of the samples was assessed using the methods proposed by Lunne et al. (1997) and Karlsrud and Hernandez-Martinez (2013). A description of both methods is presented in Section 7.3.1. The results of the assessment are summarized in Table 7-12.

Table 7-12: Quality Assessment of Glaciolacustrine Samples from the Perimeter Embankment

Borehole No.	Sample No.	Sample Type	Consolidation Test	Lunne et al. (1997)	Karlsrud and Hernandez-Martinez (2013)
GA15-06	Run 11a	Sonic core	Incremental	Poor	Poor
GA15-06	Run 11b	Sonic core	Incremental	Very poor	Poor
GA15-06	Run 11c	Sonic core	Incremental	Very poor	Very poor
GA21-03	TO2	Thin-walled tube	CRS	Poor	Good to fair
GA21-03	TO3	Thin-walled tube	Incremental	Good to fair	Very poor
GA21-03	TO4	Thin-walled tube	CRS	Very poor	Poor
GA21-03	TO5	Thin-walled tube	CRS	Good to fair	Poor
GA21-03	TO5	Thin-walled tube	Incremental	Very good to excellent	Poor
GA21-11	TO2	Thin-walled tube	CRS	Very good to excellent	Very good to excellent

CRS = constant rate of strain.

The peak undrained shear strength was measured in the laboratory with simple shear tests on glaciolacustrine soil samples from the Main Embankment and Perimeter Embankment (Golder 2015d; WSP Golder 2022b). A single undrained shear strength ratio function was obtained following the SHANSEP method, as shown in Illustration 7-11. A summary of the simple shear test results from the Perimeter Embankment is presented in Table 7-13.

Table 7-13: Simple Shear Test Results of Glaciolacustrine Samples at the Perimeter Embankment

Borehole No.	Sample No.	Sample Type	Initial Water Content (%)	Plasticity Index	Initial Vertical Effective Stress (kPa)	OCR	Maximum Undrained Shear Strength Ratio	Undrained Shear Strength Ratio at 20% Strain
GA21-03	TO4	Thin-walled tube	21.3	15	500	4.8	0.62	0.56
			19.8	n/a	1,200	2.0	0.35	0.34
GA21-03	TO5	Thin-walled tube	23.3	28	2,400	1.0	0.22	0.19

OCR = overconsolidation ratio.

7.3.3 Corner 1 Embankment

Upper and lower glaciolacustrine sediments are present at the Corner 1 Embankment. The upper glaciolacustrine unit (UGLU) was identified as the stratum through which the 2014 failure developed and was the focus of the subsequent forensic investigations (IEEIRP 2015; KCB 2015b,c). As such, the characterization of the UGLU is presented in more detail than for the other soil units.

7.3.3.1 Upper Glaciolacustrine Unit

The UGLU generally consists of intermediate plasticity silty clay to high plasticity clay with trace to some sand and is firm to stiff. The UGLU deposit is a semi-continuous layer between about elevation 918 and 925 m from approximately Station 20+000 to 20+300. The maximum thickness of the UGLU within the breach area at Corner 1 is about 3 m as indicated from the forensic investigation carried out by the Independent Expert Engineering Investigation and Review Panel (IEEIRP 2015). The foundation investigations completed in 2016 and 2023 support an interpretation for a semi-continuous layer downstream of the breach area (Golder 2017, WSP 2024a). Figure 11 illustrates the interpreted thickness contours of the UGLU at Corner 1. A summary of the index properties for samples of UGLU collected from the Corner 1 Embankment is presented in Table 7-14.

The Atterberg limit results are shown graphically in Illustration 7-17. The fines are generally an intermediate to high plasticity material and range from silty clay to clay (CI to CH, respectively). Thirty-one results were outside of this general range and were either a low plasticity silt (ML) or a low plasticity silty clay (CL).

The natural water content results were plotted against elevation, which is shown in Illustration 7-18. The water content of the UGLU ranges from 9% to 54%, with a mean of approximately 29%. The water content of the UGLU is generally much higher compared to the glaciolacustrine sediment encountered at the other embankments as shown in the illustration.

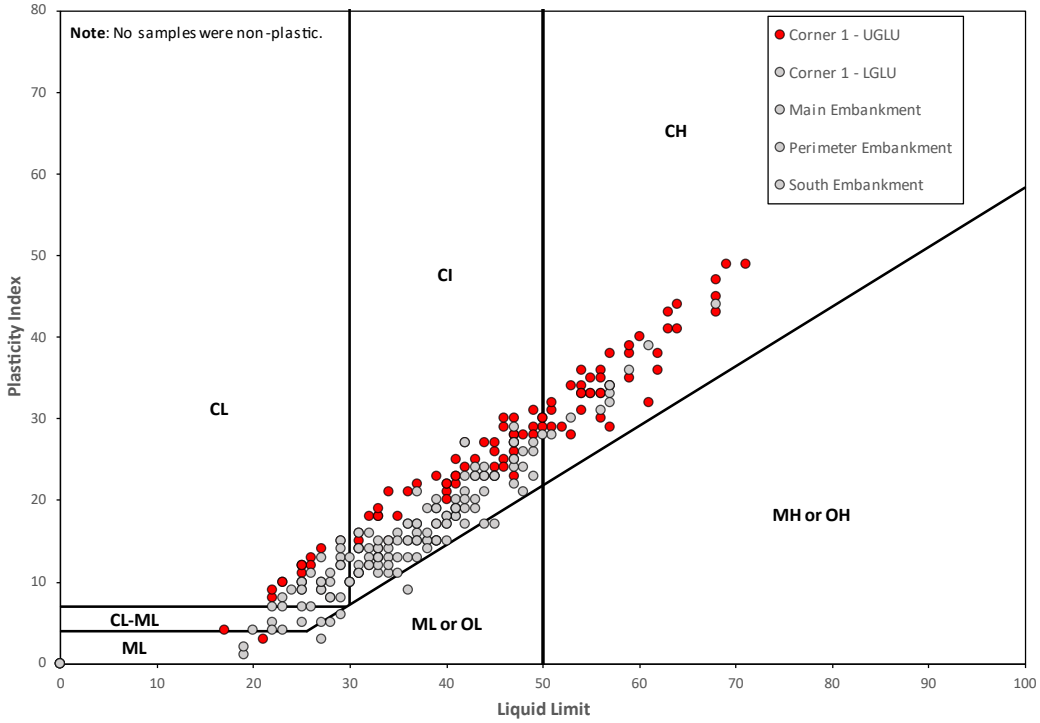
The natural water content results were also plotted against clay content as shown in . A total of 81 hydrometer test results were available for the UGLU sampled from the foundation of the Corner 1 Embankment. The clay content of the UGLU ranges from 8% to 69%, with a mean of approximately 45%. The clay content of the UGLU is generally much higher compared to the glaciolacustrine material encountered at the other embankments as shown in the illustration. A general trend of increasing water content with increasing clay content can also be seen in the illustration.

All available test results for glaciolacustrine samples collected from the foundation of the other embankments were incorporated into the illustrations for a comparison.

Table 7-14: Summary of Index Properties of Upper Glaciolacustrine Unit

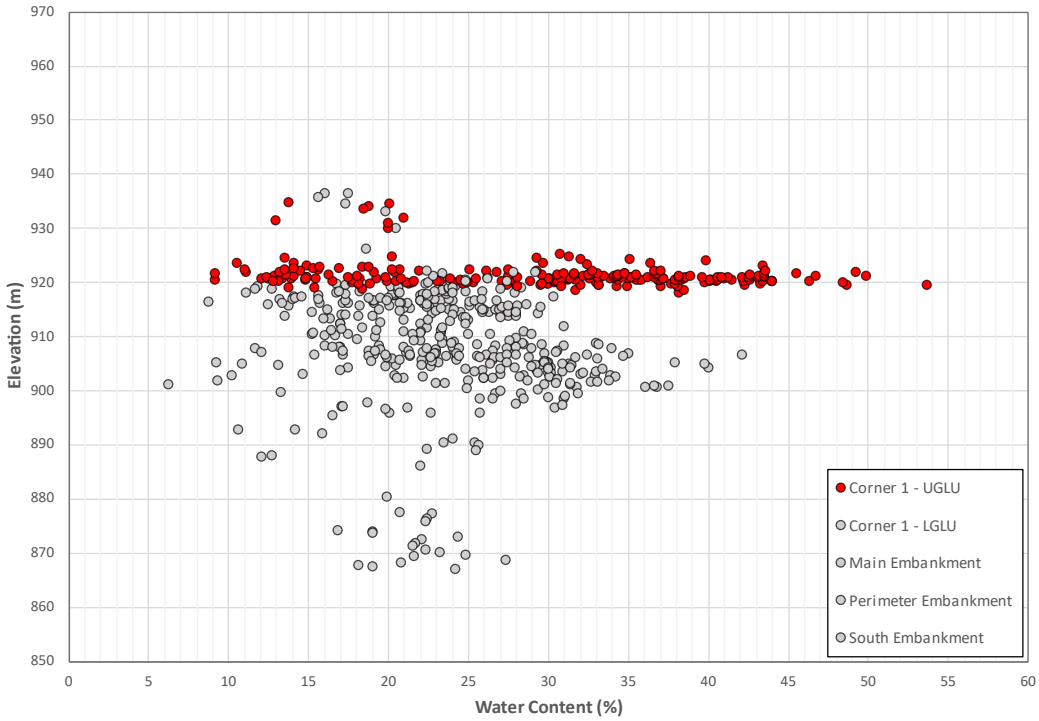
Index Property		Average	Minimum	Maximum	Number of Tests
Gradation	Gravel (%)	3	0	32	83
	Sand (%)	10	0	35	
	Fines (%)	87	43	100	
	Silt (%)	43	20	72	81
	Clay[(a)] (%)	45	8	69	
Liquid limit		45	17	71	106
Plastic limit		19	13	29	
Plasticity index		26	3	49	
Water content (%)		29.0	9.0	54.0	220
Specific gravity of solids		2.80	2.75	2.87	12

a) Clay is defined as particles smaller than 0.002 mm.



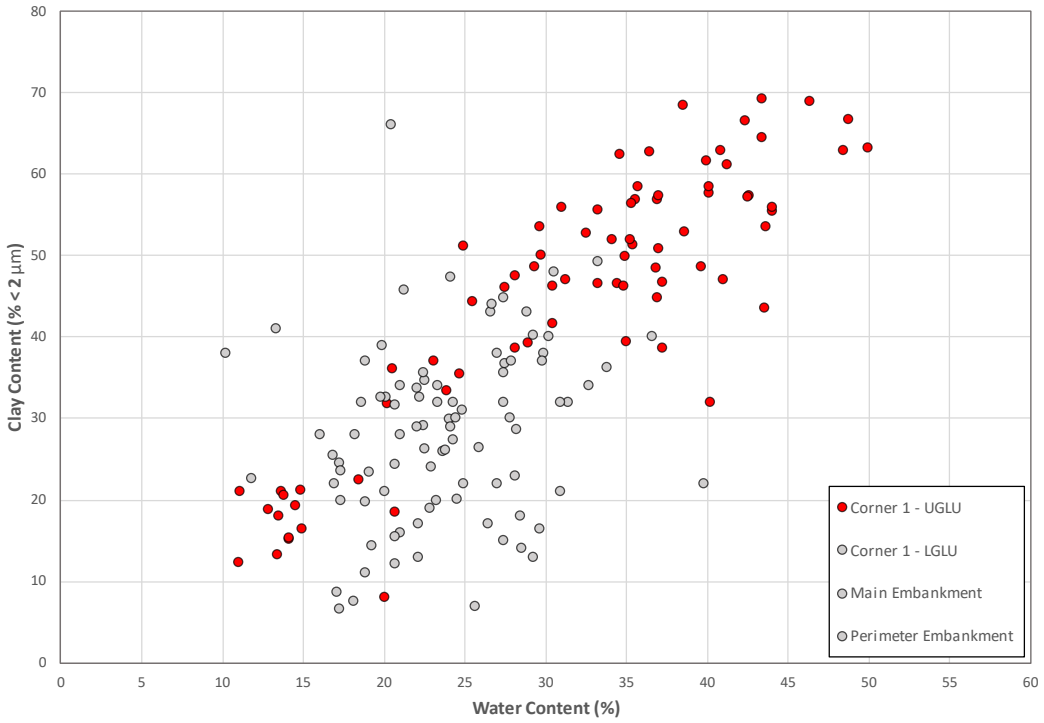
CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay; CH = high-plastic clay; CL-ML = low-plastic silty clay to clayey silt; ML = inorganic silt with slight or low plasticity; MH = high-plastic silt, generally classified as clayey silt; OL = low-plastic organic silt; OH = high-plastic organic silt.

Illustration 7-17: Plasticity Chart of Upper Glaciolacustrine Unit Samples from the Corner 1 Embankment



LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-18: Water Content versus Elevation of Upper Glaciolacustrine Unit Samples from the Corner 1 Embankment



LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-19: Water Content versus Clay Content of Upper Glaciolacustrine Unit Samples from the Corner 1 Embankment

Table 7-15 summarizes all consolidation test results carried out on UGLU samples.

Illustration 7-20 shows the consolidation test results carried out on UGLU samples that at the time of sampling were located downstream or near the toe of the Perimeter Embankment at Corner 1. The results show that the UGLU has a preconsolidation pressure, σ'_p, of about 400 kPa.

Estimated hydraulic conductivity from consolidation tests was about 5×10^{-10} m/s for stresses between 100 and 800 kPa, and a coefficient of consolidation (c_v) of about 5×10^{-7} m^2/s. The coefficient of consolidation estimated from pore pressure response in the field following rockfill placement (using piezometer VST14-03) was 6×10^{-7} m^2/s.

Illustration 7-21 shows the consolidation test results carried out on three UGLU samples that at the time of sampling were located under the elevation 970 m Perimeter Embankment crest (GA23-01 TO4) and buttress (GA23-07 TO1). The in situ vertical effective stress at the time of sampling was estimated to be about 1,000 kPa at sample GA23-01 TO4 and about 370 kPa at sample GA23-07 TO1.

The results indicate a preconsolidation pressure, σ'_p, of about 360 kPa and 570 kPa for sample GA23-01 TO4 which differs from the estimated in situ vertical effective stress of about 974 kPa. The results indicate a preconsolidation pressure, σ'_p, of about 380 kPa for sample GA23-07 TO1 which correlates well with the estimated in situ vertical effective stress of about 370 kPa.

The preconsolidation pressures estimated from laboratory tests on GA23-01 TO4 samples were compared to the interpreted preconsolidation pressure from CPT23-01. The preconsolidation pressure (σ'_p) from the CPT data was estimated as $\sigma'_p = 0.33 (q_t - \sigma_{vo})$ (Mayne 2001). The comparison is shown in APPENDIX D. The CPT data are seen to correlate reasonably well with the laboratory consolidation tests, although, the quality of the laboratory samples was assessed to be very poor to poor as presented in Table 7-18.

Table 7-15: Consolidation Test Results of Upper Glaciolacustrine Unit Samples

Borehole No.[a)]	Sample No.	Sample Type	Elevation (m)	Estimated Preconsolidation Pressure (kPa)	Source
MR14-106C	1C	Thin-walled tube	920.9	454	IEEIRP (2015)
MR14-106E	2B	Thin-walled tube	921.1	474	
MR14-106E	2C	Thin-walled tube	920.8	300	
MR14-106E	4B	Thin-walled tube	920.0	535	
MR14-106E	4D	Thin-walled tube	919.8	446	
MR14-106F	3B	Thin-walled tube	920.2	443	
MR14-106G	3A	Thin-walled tube	920.4	510	
MR14-106H	1B	Thin-walled tube	921.1	449	
MR14-107	6C-1	Thin-walled tube	921.6	330	
MR14-107A	1B	Thin-walled tube	921.0	516	
MR14-107B	1B	Thin-walled tube	921.5	312	
RH14-03A	SS-03	Thin-walled tube	920.4	390	KCB (2015b)
RH14-10	SS-01	Thin-walled tube	920.8	380	
RH14-10	SS-02	Thin-walled tube	920.2	380	
RH14-22	SS-02	Thin-walled tube	920.5	400	
RH14-22A	SS-02	Thin-walled tube	920.5	420	
TP14-01	BS-02	Block	n/a	410	
GA16-09	6B	Thin-walled tube	920.2	590	Golder (2017)
GA23-01[b)]	TO4 - H[d)]	Thin-walled tube	919.7	360	WSP (2024a)
GA23-01[b)]	TO4 - V[e)]	Thin-walled tube	919.7	570	
GA23-07[c)]	TO1	Thin-walled tube	921.7	380	

n/a = not available.

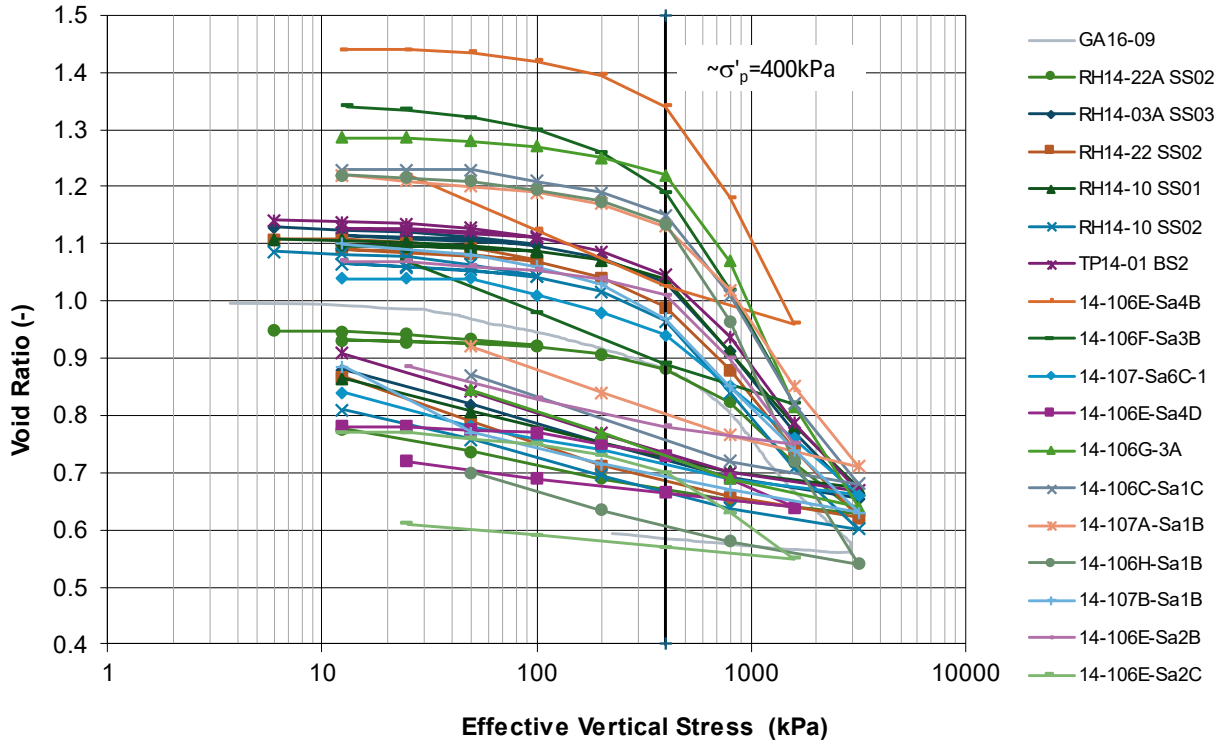
a) samples reported in IEEIRP (2015), KCB (2015b) and Golder (2017) were sampled downstream or near the toe of the Perimeter Embankment at Corner 1.

b) sample GA23-01 TO4 was sampled from under the elevation 970 m Perimeter Embankment crest (approximately 43 m of fill placed over the foundation).

c) sample GA23-07 TO1 was sampled from under the Perimeter Embankment buttress (approximately 14 m of fill placed over the foundation).

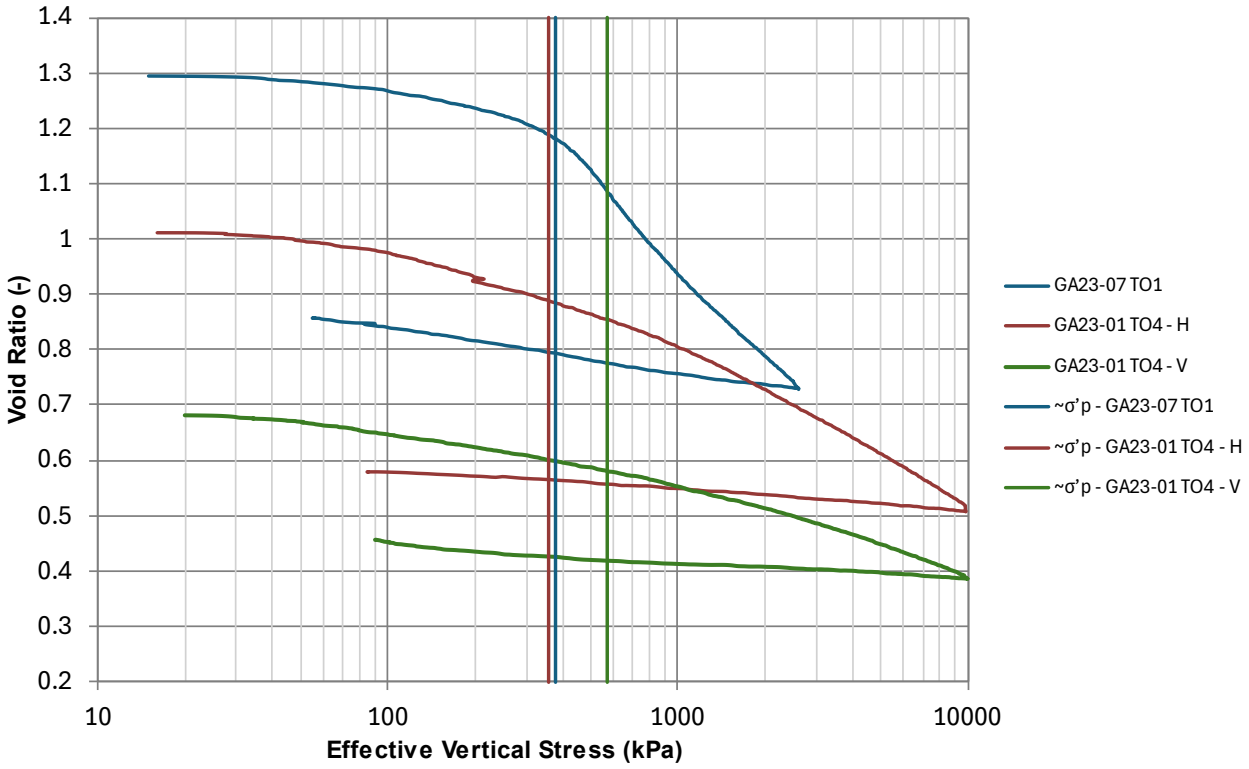
d) sample tested horizontally.

e) sample tested vertically.



σ'_p = preconsolidation pressure.

Illustration 7-20: Consolidation Test Results on Upper Glaciolacustrine Unit Samples



σ'_p = preconsolidation pressure.

Illustration 7-21: Consolidation Test Results on Upper Glaciolacustrine Unit Samples Collected from under the Elevation 970 m Corner 1 Perimeter Embankment Crest and Buttress

The quality of the samples was assessed using the methods proposed by Lunne et al. (1997) and Karlsrud and Hernandez-Martinez (2013). A description of both methods is presented in Section 7.3.1. The results of the assessment are summarized in Table 7-16.

Table 7-16: Quality Assessment of Upper Glaciolacustrine Unit Samples

Borehole No.	Sample No.	Sample Type	Consolidation Test	Lunne et al. (1997)	Karlsrud and Hernandez-Martinez (2013)
MR14-106C	1C	Thin-walled tube	Incremental	Very good to excellent	Good to fair
MR14-106E	2B	Thin-walled tube	Incremental	Very good to excellent	Very good to excellent
MR14-106E	2C	Thin-walled tube	Incremental	Good to fair	Very poor
MR14-106E	4B	Thin-walled tube	Incremental	Very good to excellent	Very good to excellent
MR14-106E	4D	Thin-walled tube	Incremental	Good to fair	Poor
MR14-106F	3B	Thin-walled tube	Incremental	Good to fair	Poor
MR14-106G	3A	Thin-walled tube	Incremental	Very good to excellent	Very good to excellent
MR14-106H	1B	Thin-walled tube	Incremental	Very good to excellent	Very good to excellent
MR14-107	6C-1	Thin-walled tube	Incremental	Poor	Very poor
MR14-107A	1B	Thin-walled tube	Incremental	Very good to excellent	Poor
MR14-107B	1B	Thin-walled tube	Incremental	Poor	Poor
RH14-03A	SS-03	Thin-walled tube	Incremental	Good to fair	Poor
RH14-10	SS-01	Thin-walled tube	Incremental	Very good to excellent	Very good to excellent
RH14-10	SS-02	Thin-walled tube	Incremental	Good to fair	Poor
RH14-22	SS-02	Thin-walled tube	Incremental	Poor	Poor
RH14-22A	SS-02	Thin-walled tube	Incremental	Good to fair	Poor
TP14-01	BS-02	Block	Incremental	Very good to excellent	Poor
GA16-09	6B	Thin-walled tube	CRS	Poor	Very good to excellent
GA23-01[b)]	TO4 – H[d)]	Thin-walled tube	CRS	Very Poor	Poor
GA23-01[b)]	TO4 – V[e)]	Thin-walled tube	CRS	Very Poor	Very Poor
GA23-07[c)]	TO1	Thin-walled tube	CRS	Poor	Good to fair

CRS = constant rate of strain.

a) samples reported in IEEIRP (2015), KCB (2015b) and Golder (2017) were sampled downstream or near the toe of the Perimeter Embankment at Corner 1.

b) sample GA23-01 TO4 was sampled from under the elevation 970 m Perimeter Embankment crest (approximately 43 m of fill placed over the foundation).

c) sample GA23-07 TO1 was sampled from under the Perimeter Embankment buttress (approximately 14 m of fill placed over the foundation).

d) sample tested horizontally.

e) sample tested vertically.

The peak undrained shear strength of UGLU samples were measured in the laboratory with simple shear tests. A summary of the simple shear test results is presented in Table 7-17.

Table 7-17: Simple Shear Test Results of Upper Glaciolacustrine Unit Samples

Borehole No.	Sample No.	Initial Water Content (%)	Plasticity Index	Initial Vertical Effective Stress (kPa)	Static Bias (kPa)	OCR	Maximum Undrained Shear Strength Ratio	Undrained Shear Strength Ratio at 20% Strain
MR14-106A	1C-T1	43.1	31	600	n/a	1.0	0.22	0.18
MR14-106A	1C-T2	36.6	31	600	60	1.0	0.23	n/a
MR14-106A	1C-T3	38.2	31	600	120	1.0	0.26	0.22
MR14-106A	1C-T4	33.1	31	300	60	1.47	0.28	0.25
MR14-106C	1B-T2	43.2	33	600	150	1.0	0.27	0.15
MR14-106C	1B-T3	38.9	33	600	60	1.0	0.21	0.17
MR14-106G	2B-T1	43.5	21	600	60	1.0	0.21	0.17
MR14-106G	B-T2	38.3	21	600	120	1.0	0.26	0.22
MR14-107	6C-T1	43.5	23	300	30	1.1	0.27	0.22
MR14-107	6C-T2	42.6	23	300	30	1.1	0.25	0.20
MR14-107A	1A-T1	42.7	34	600	n/a	1.0	0.21	0.15
MR14-107A	1A-T2	42.1	34	600	n/a	1.0	0.20	0.18
SH14-10A	6	34.9	28	400	n/a	n/a	0.26	0.22
RH14-03A	SS-03	40.2	16	400	n/a	n/a	0.24	0.17
RH14-10	SS-01	37.2	23	400	n/a	n/a	0.23	0.16
RH14-10	SS-01	39.9	23	800	n/a	n/a	0.18	0.17
RH14-10	SS-02	36.1	35	800	n/a	n/a	0.20	0.18
RH14-10	SS-02	28.3	35	400	n/a	n/a	0.26	0.19
RH14-10	SS-02	40.3	35	100	n/a	4.0	0.66	0.53
RH14-22	SS-02	37.7	24	400	n/a	n/a	0.25	0.18
RH14-22	SS-02	40.5	24	100	n/a	4.0	0.63	0.52
RH14-22A	SS-02	36.3	30	800	n/a	n/a	0.18	0.17
RH14-22A	SS-02	39.4	30	400	n/a	n/a	0.26	0.20
RH14-22A	SS-02	35.5	30	100	n/a	4.0	0.60	0.51
TP14-01	BS-02	38.9	22	100	n/a	4.0	0.61	0.60
TP14-01	BS-02	34.5	22	400	n/a	n/a	0.26	0.17
TP14-01	BS-02	36.5	22	800	n/a	n/a	0.20	0.16
GA23-02	TO2	31.2	30	1000	n/a	n/a	0.20	0.15
GA23-02 (PR)				1000	n/a	n/a	0.19	0.18
GA23-07	TO1	45.4	45	1000	n/a	n/a	0.20	0.16
GA23-07 (PR)				1000	n/a	n/a	0.21	0.17
GA23-07	TO1	50.6	n/a	1000	120	n/a	0.22	0.19
GA23-07 (PR)				1000	120	n/a	0.23	0.18

n/a = not available, not applicable.

OCR = overconsolidation ratio.

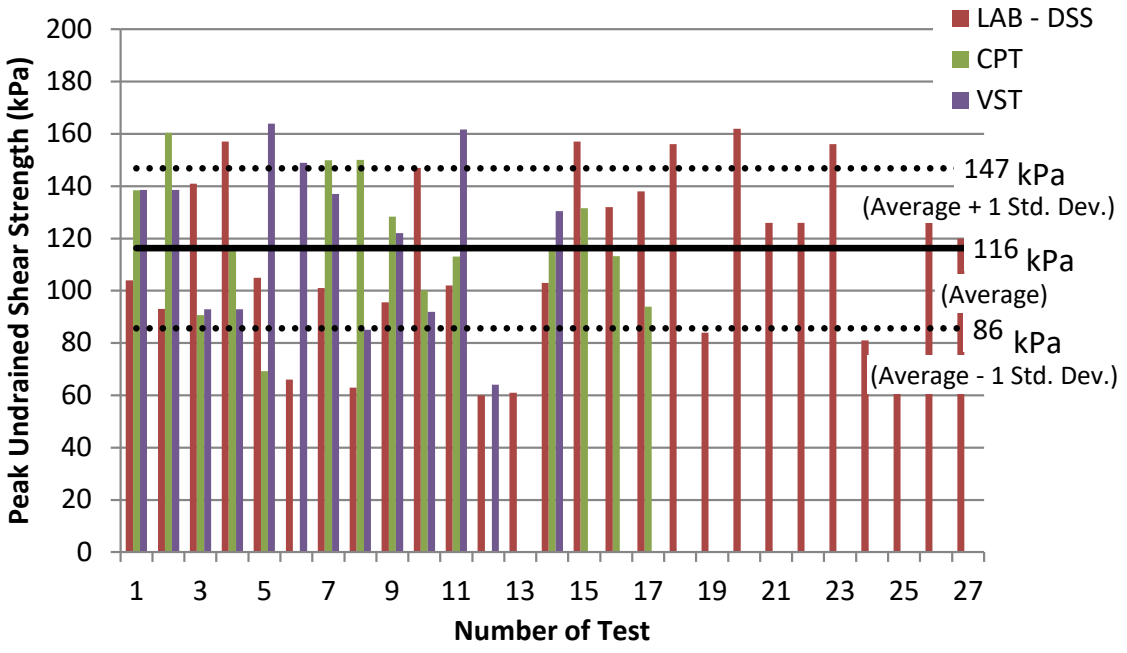
PR = post-reconsolidation monotonic shear test.

The peak undrained shear strength and remoulded (residual) undrained shear strength were measured with an electronic field vane during the forensic investigations (IEEIRP 2015; KCB 2015c). The peak and remolded undrained shear strengths were also estimated from CPT data collected during the forensic investigations. The sensitivity of the UGLU was inferred to be about 2 to 3 based on average CPT tip resistance within and outside of the breach area (IEEIRP 2015). The undrained shear strength, s_u, was estimated using the cone tip resistance, q_t, total overburden stress, σ'_{v0}, and bearing factor, N_{kt}, as follows:

$$s_u = \frac{q_t - \sigma_{v0}}{N_{kt}}$$

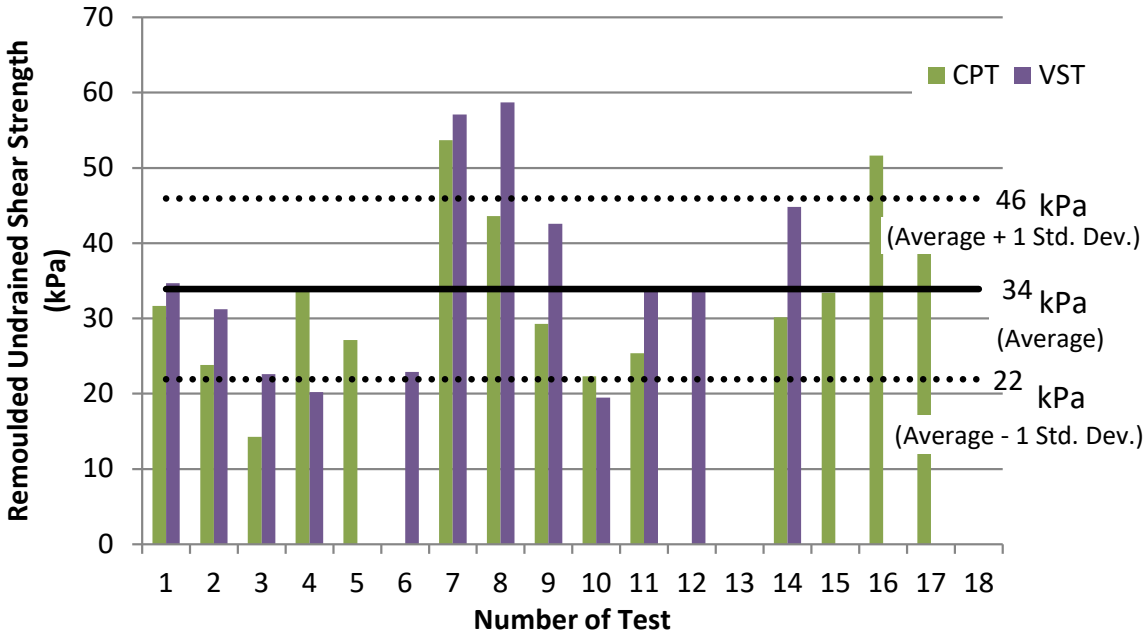
A value N_{kt} of 15 was used. The remoulded shear strength, s_{u_r}, was estimated directly from the sleeve friction resistance, f_s.

Illustration 7-22 and Illustration 7-23 show the average values and standard deviation for the peak and remoulded undrained shear strengths, respectively, estimated for UGLU that at the time of sampling or testing was located downstream or near the toe of the Perimeter Embankment at Corner 1. The peak undrained shear strength includes values estimated from the field vane test, CPTs, and simple shear tests. The remoulded undrained shear strength includes values from the field vane tests and CPTs.



LAB - DSS = direct simple shear; CPT = cone penetration test; VST = vane shear test.

Illustration 7-22: Peak Undrained Shear Strength Estimated for the Upper Glaciolacustrine Unit



CPT = cone penetration test; VST = vane shear test.

Illustration 7-23: Remoulded Undrained Shear Strength Estimated for the Upper Glaciolacustrine Unit

The peak and remolded undrained shear strengths were also estimated using CPT data collected during the foundation investigation in 2016 downstream of the zone of the breach (Golder 2017). The estimated peak and remolded undrained shear strengths were typically greater than the averages estimated at the zone of the breach.

Illustration 7-22 and Illustration 7-23 show the peak and remoulded undrained shear strengths, respectively, estimated for UGLU that at the time of sampling or testing was located under the elevation 970 m Corner 1 Embankment crest (CPT23-01 and CPT23-02) and slope (CPT23-03). The peak and remoulded undrained shear strength include values estimated from CPTs and simple shear tests. The simple shear test data includes peak and post-peak undrained shear strength results for 20% and 100% shear strains; as well as post-reconsolidation peak and post-peak shear strength results.

CPT23-01, CPT23-02 and CPT23-03 were located within a few metres from CPT14-15, CPT14-03 and CPT14-06A, respectively, to compare potential changes on consolidation and strength of the UGLU after construction of the embankment to elevation 970 m. Previously these locations (CPT14-15, CPT14-03 and CPT14-06A) were near the toe or downstream of the embankment that breached in 2014. The peak and remoulded undrained shear strength estimated using the CPT14-15, CPT14-03 and CPT14-06A data is included in illustrations 7-24 and 7-25 for comparison.

The estimated peak and remoulded undrained shear strength of the UGLU at CPT23-02 and CPT23-03 correlates well with expected values after consolidation of the UGLU under the embankment; however, the estimated peak and remoulded undrained shear strength of the UGLU at CPT23-01 showed little change compared to CPT14-15 and differs from expected values after consolidation of the UGLU under the embankment.

The CPT data and interpretations from the 2023 CPT soundings are presented in APPENDIX D.

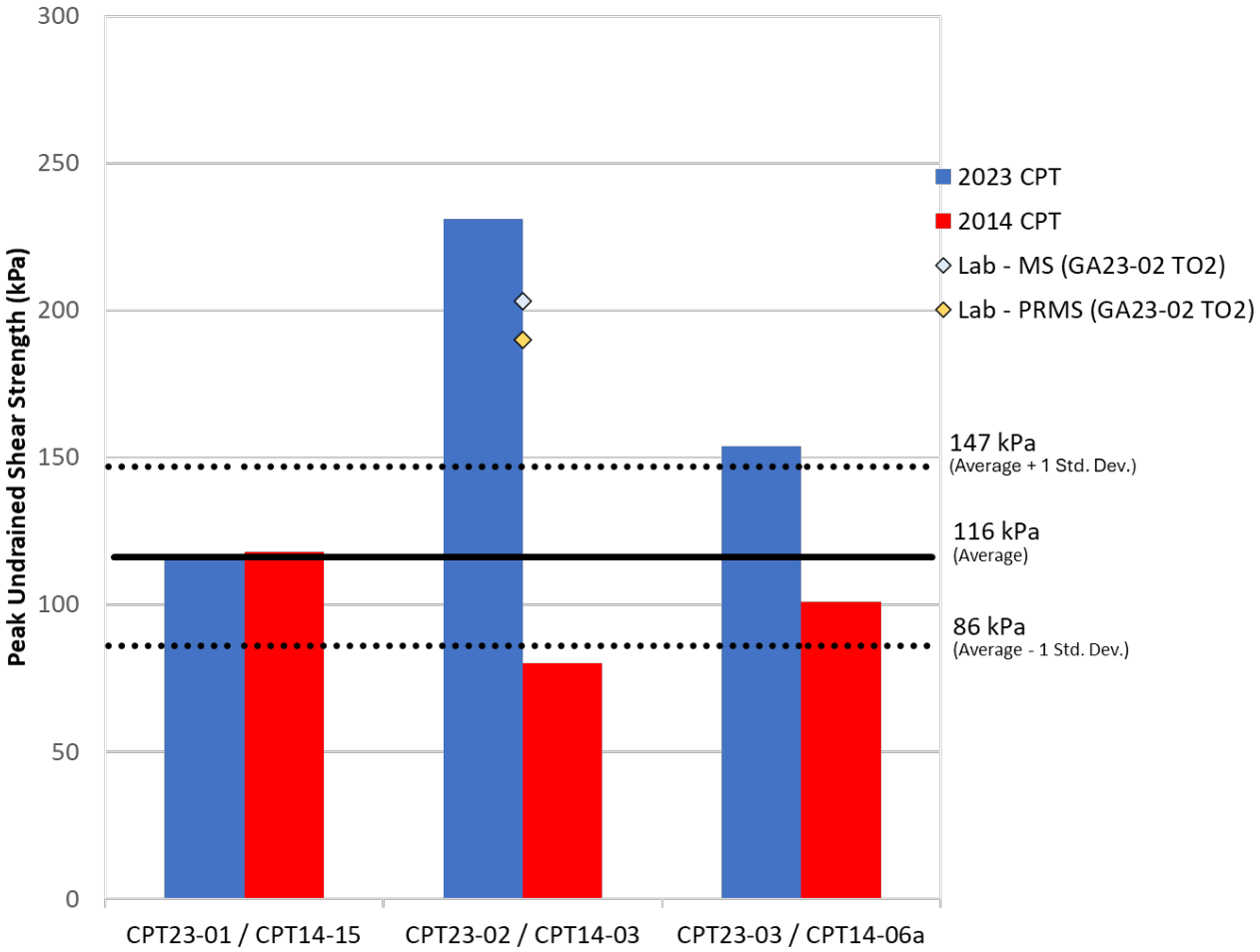


Illustration 7-24: Peak Undrained Shear Strength Estimated for the Upper Glaciolacustrine Unit under the El. 970 m Corner 1 Embankment

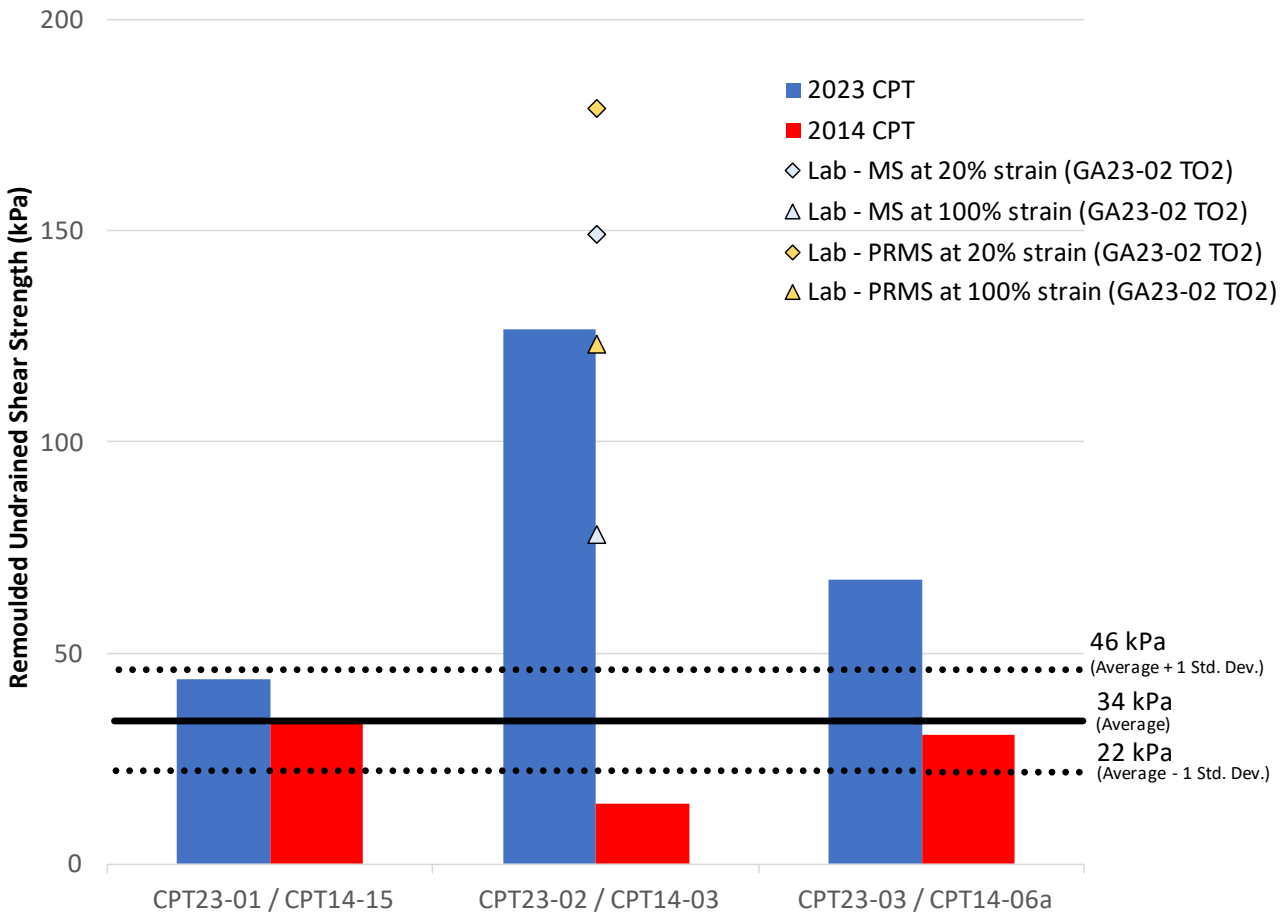
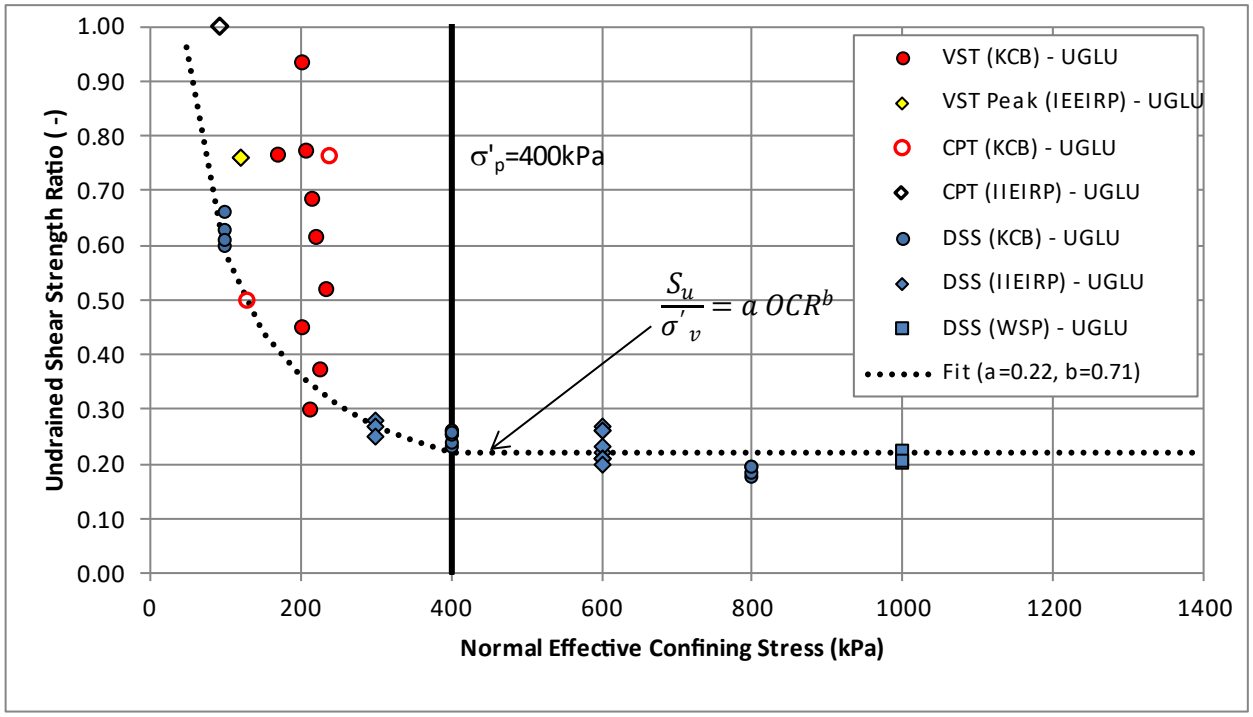


Illustration 7-25: Remoulded Undrained Shear Strength Estimated for the Upper Glaciolacustrine Unit under the El. 970 m Corner 1 Embankment

Illustration 7-26 shows the shear strength ratio estimated from simple shear tests at various effective vertical stress levels. Data obtained from the field vane and CPT is also included in the illustration. The undrained shear strength ratio function based on the SHANSEP method is included in Illustration 7-26. The undrained shear strength ratio (s_u/σ'_v) of the UGLU decreases with increasing effective vertical stress level. For stresses higher than the estimated preconsolidation pressure, the undrained shear strength ratio is constant at $s_u/\sigma'_v = 0.22$.



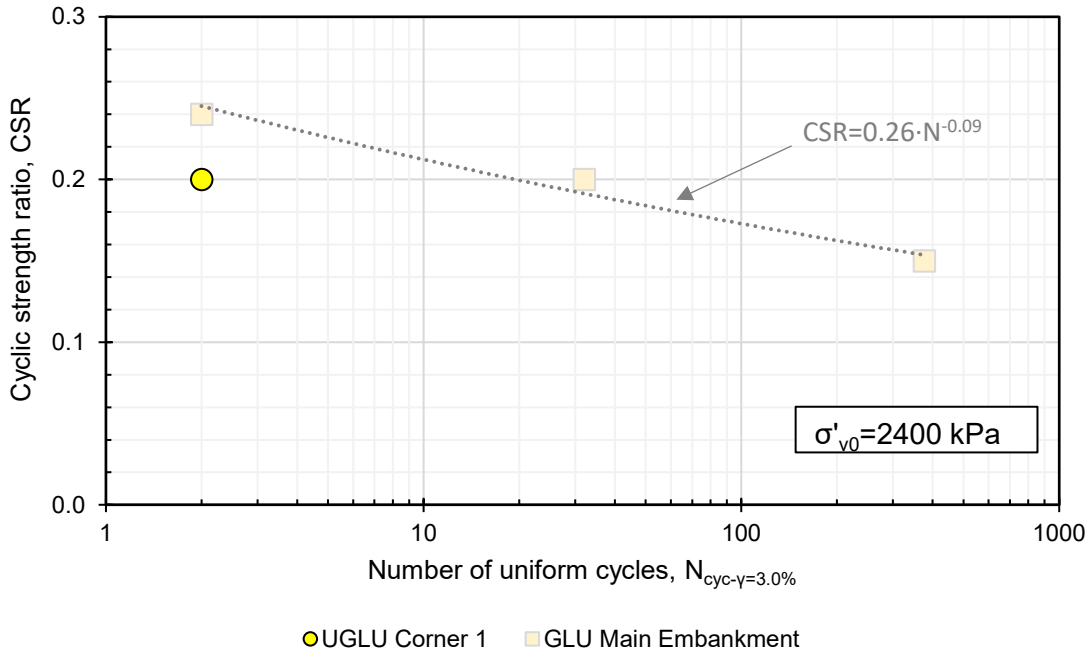
CPT = cone penetration test; OCR = overconsolidation ratio; s_u = undrained shear strength; σ'_p = preconsolidation pressure; σ'_v = effective vertical stress; SS = simple shear; UGLU = upper glaciolacustrine unit; VST = vane shear test.

Illustration 7-26: Peak Undrained Shear Strength Ratio Estimated for the Upper Glaciolacustrine Unit

The IEEIRP report presents stability analyses using a range of strength ratios from 0.22 to 0.27, with the IEEIRP "favouring a result above the average, say 0.25." The deformation analyses carried out by the IEEIRP using PLAXIS indicated collapse occurring at an undrained strength ratio of 0.29.

The peak and residual effective friction angles of the UGLU were measured on undisturbed samples in direct shear tests. The peak effective friction angle was also measured in a triaxial test, with the specimen rotated to allow failure along the GLU. The peak effective friction angle ranged from 19 to 31 degrees, and the residual effective friction angle ranged from 11 to 28 degrees, assuming zero cohesion and for normal stresses up to 800 kPa.

The undrained cyclic strength of the UGLU was measured on a single thin-walled tube sample in a cyclic direct simple shear test. Illustration 7-27 shows the test result in terms of the CSR required to generate peak (single-amplitude) shear strains of 3% during uniform cyclic loading. The test result is compared with other results obtained on glaciolacustrine samples from the Main Embankment.



σ_v'= effective vertical stress; GLU = glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-27: Cyclic Strength Ratio Required to Cause Cyclic Failure (3% strain) versus the Number of Uniform Loading Cycles for the Upper Glaciolacustrine Unit

7.3.3.2 Lower Glaciolacustrine Unit

The lower glaciolacustrine unit (LGLU) deposit is a semi-continuous layer between approximate elevation 900 and 918 m. The maximum thickness of the LGLU within the breach area at Corner 1 is approximately 5 m.
The foundation investigations completed in 2016 and 2023 also confirmed that the LGLU extended downstream of the breach area (Golder 2017, WSP 2024a). A summary of the index properties for samples of the LGLU collected from the Corner 1 Embankment is presented in Table 7-18.

The Atterberg limit results are shown graphically in Illustration 7-28. The fines are generally a low to intermediate plastic material and range between silty clay (CL), clayey silt (ML) and silty clay (CI). One test was outside of this general range, resulting in a high plasticity clay (CH).

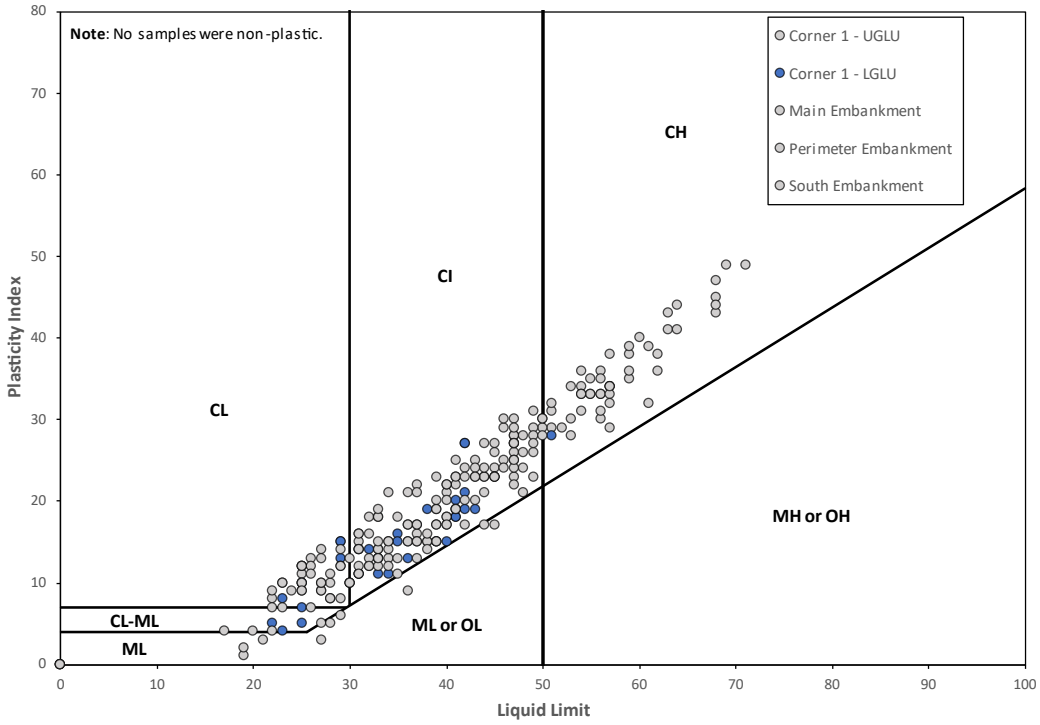
The natural water content results were plotted against elevation, which is shown in Illustration 7-29. The average water content of the LGLU is approximately 21% and ranges from 9% to 30%. The water content of the LGLU is generally much lower compared to the UGLU also encountered at the Corner 1 Embankment.

The natural water content results were also plotted against clay content as shown in Illustration 7-30. A total of 26 hydrometer test results were available for the LGLU sampled from the foundation of the Corner 1 Embankment. The average clay content of the LGLU is approximately 28% and ranges from 20% to 37%.
The average clay content of the LGLU is about 17% lower than the UGLU.

Table 7-18: Summary of Index Properties of Lower Glaciolacustrine Unit

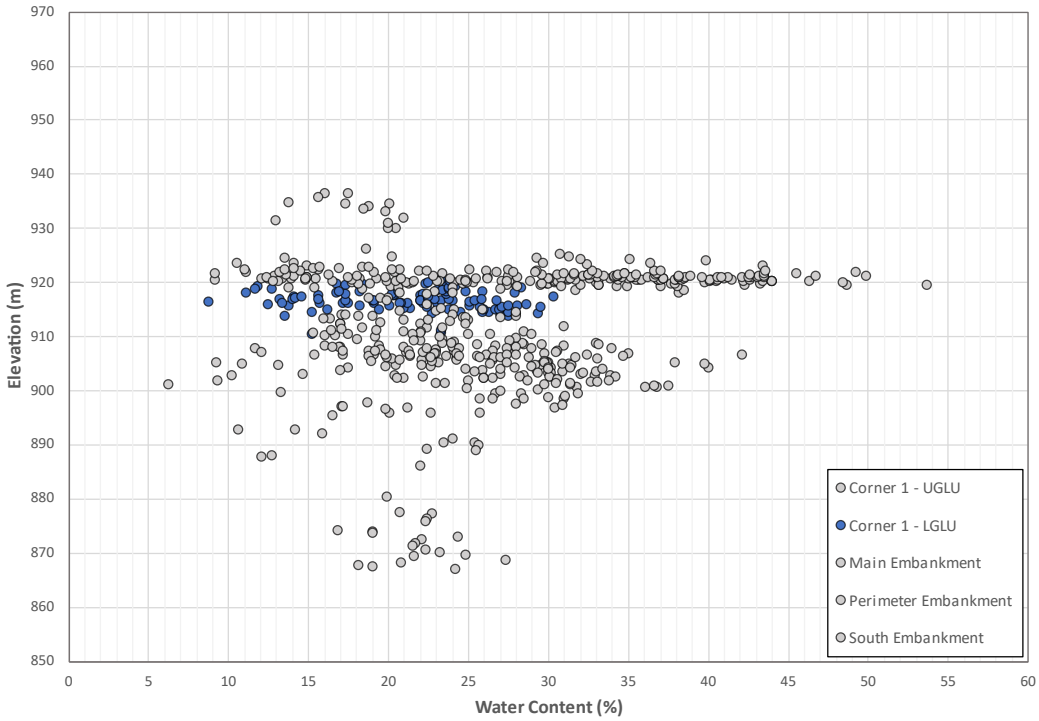
Index Property		Average	Minimum	Maximum	Number of Tests
Gradation	Gravel (%)	2	0	21	26
	Sand (%)	6	0	21	
	Fines (%)	92	58	100	
	Silt (%)	65	35	76	26
	Clay[(a)] (%)	28	20	37	
Liquid limit		34	22	51	35
Plastic limit		20	14	25	
Plasticity index		14	4	28	
Water content (%)		21.2	8.8	30.3	105
Specific gravity of solids		2.75	2.75	2.75	1

a) Clay is defined as particles smaller than 0.002 mm.



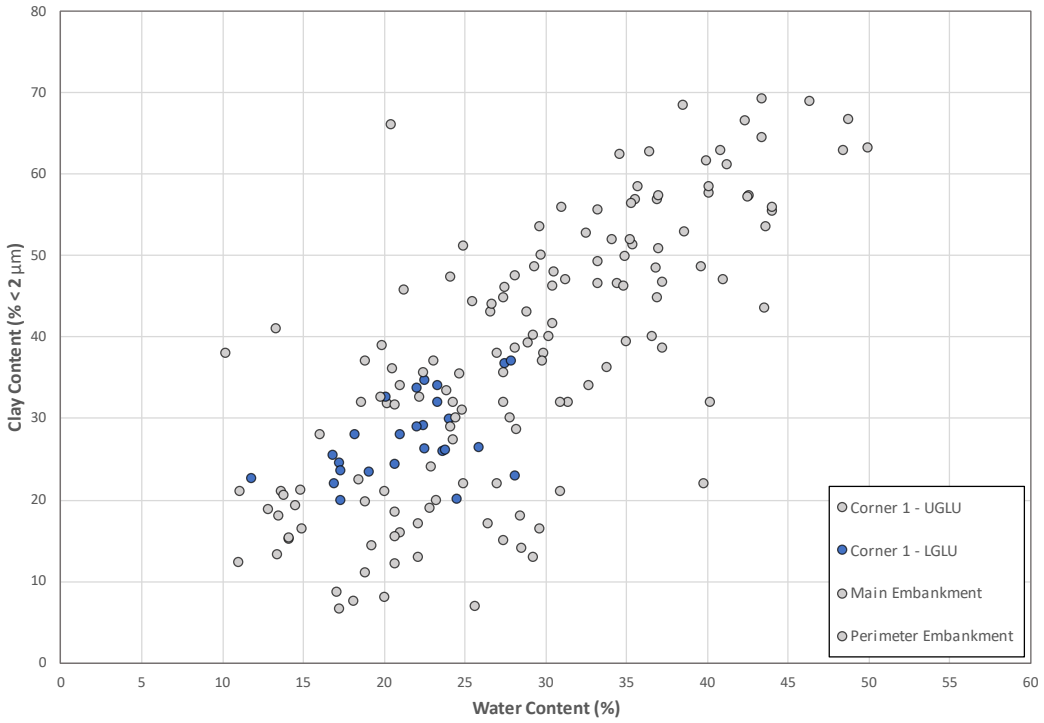
CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay; CH = high-plastic clay; CL-ML = low-plastic silty clay to clayey silt; ML = inorganic silt with slight or low plasticity; MH = high-plastic silt, generally classified as clayey silt; OL = low-plastic organic silt; OH = high-plastic organic silt.

Illustration 7-28: Plasticity Chart of Lower Glaciolacustrine Unit Samples from the Corner 1 Embankment



LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-29: Water Content versus Elevation of Lower Glaciolacustrine Unit Samples from the Corner 1 Embankment



LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-30: Water Content versus Clay Content of Lower Glaciolacustrine Unit Samples from the Corner 1 Embankment

Table 7-19 and Illustration 7-31 show the results of consolidation tests carried out on the LGLU samples. The results show that the LGLU has a preconsolidation pressure, σ'_p, between about 700 and 1,200 kPa.

Table 7-19: Consolidation Test Results of Lower Glaciolacustrine Unit Samples

Borehole No.	Sample No.	Sample Type	Elevation (m)	Estimated Preconsolidation Pressure (kPa)	Source
MR14-107A	6B	Thin-walled tube	916.7	701	IEEIRP (2015)
MR14-110	6B	Thin-walled tube	916.3	794	
SH14-10A	17	Sonic core	915.3	Preconsolidation pressure appears to exceed applied maximum load	KCB (2015b)
Central Collection Sump	4-bottom	Thin-walled tube	n/a	700–1,000	Golder (2015d)

n/a = not available.

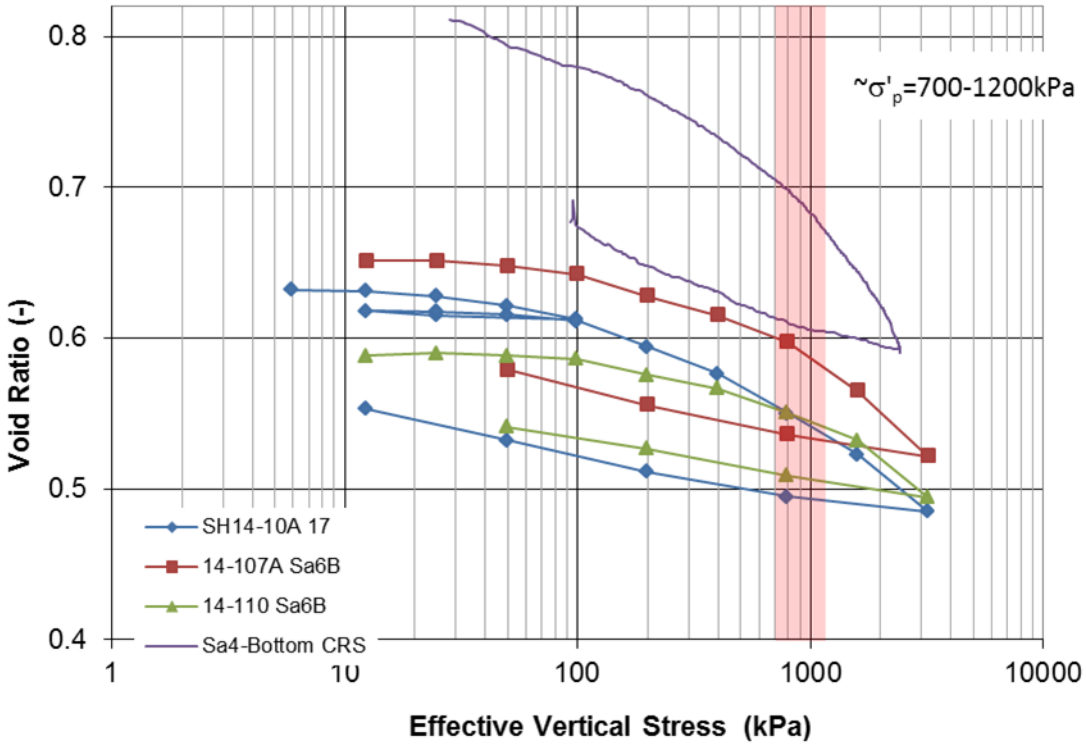


Illustration 7-31: Consolidation Test Results on Lower Glaciolacustrine Unit Samples

The quality of the samples was assessed using the methods proposed by Lunne et al. (1997) and Karlsrud and Hernandez-Martinez (2013). A description of both methods is presented in Section 7.3.1. The results of the assessment are summarized in Table 7-20.

Table 7-20: Quality Assessment of Lower Glaciolacustrine Unit Samples

Borehole No.	Sample No.	Sample Type	Consolidation Test	Lunne et al. (1997)	Karlsrud and Hernandez-Martinez (2013)
MR14-107A	6B	Thin-walled tube	Incremental	Good to fair	Very poor
MR14-110	6B	Thin-walled tube	Incremental	Very good to excellent	Very poor
SH14-10A	17	Sonic core	Incremental	Poor	Very poor

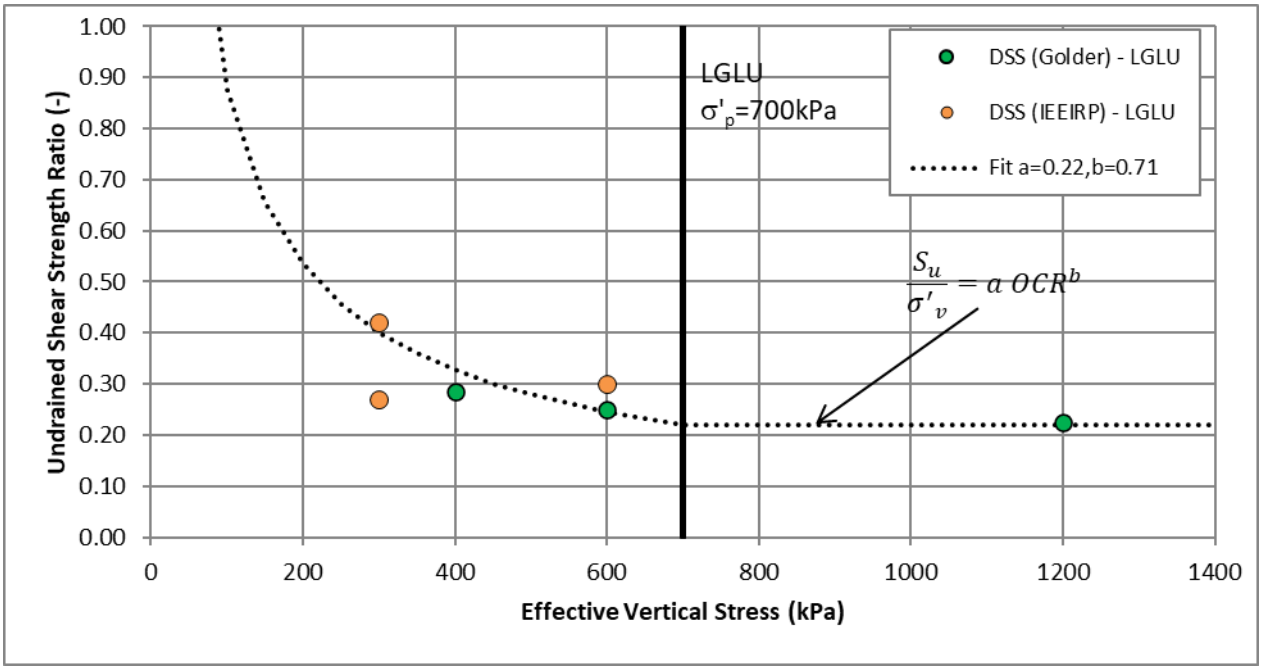
The peak undrained shear strength of LGLU samples was measured in the laboratory with simple shear tests. A summary of the simple shear test results is presented in Table 7-21.

Table 7-21: Simple Shear Test Results of Lower Glaciolacustrine Unit Samples

Borehole No.	Sample No.	Initial Water Content (%)	Plasticity Index	Initial Vertical Effective Stress (kPa)	Static Bias (kPa)	OCR	Maximum Undrained Shear Strength Ratio	Undrained Shear Strength Ratio at 20% Strain
MR14-107A	7	22.2	15	600	n/a	1.2	0.30	0.25
MR14-109	6B	22.2	13	300	30	2.5	0.42	0.35
MR14-110	6C	21.2	15	300	30	2.6	0.27	0.22
Central Collection Sump	1-bottom	17.9	7	400	n/a	n/a	0.28	n/a
	2-bottom	26.0	12	600	n/a	n/a	0.25	n/a
	3-bottom	21.5	-	400	n/a	3.0	0.53	n/a
	4-bottom	25.8	17	1,200	n/a	n/a	0.23	0.17

n/a = not available, not applicable.
OCR = overconsolidation ratio.

Illustration 7-32 presents the undrained shear strength ratio function from the SHANSEP method using a preconsolidation pressure of 700 kPa. For stresses higher than the estimated preconsolidation pressure, the undrained shear strength ratio is constant at $s_u/\sigma'_v = 0.22$.



σ'_p = preconsolidation pressure; σ'_v = effective vertical stress; s_u = undrained shear strength; LGLU = lower glaciolacustrine unit; OCR = overconsolidation ratio; SS = simple shear.

Illustration 7-32: Peak Undrained Shear Strength Ratio Estimated for the Lower Glaciolacustrine Unit

A peak effective friction angle of 33 degrees and a residual effective friction angle of 25 degrees were measured on a single undisturbed sample of LGLU in a direct shear test (KCB 2015b).

7.3.4 South Embankment

One of the objectives of the 2016 foundation investigation was to confirm the characteristics of the soil previously identified as of glaciolacustrine origin in borehole VW11-02 (AMEC 2012) and to provide limits on the areal extent of this material along the South Embankment.

The material previously identified as of glaciolacustrine origin was encountered in boreholes DH98-BL-03 and VW11-02, which were drilled near a small tributary of Edney Creek (near Station 1+100). Boreholes GA16-17 and GA16-19 drilled within the area also encountered a bedded, silty soil. The area is estimated to extend about 100 m along the alignment of the South Embankment.

The description of the material intersected in borehole DH98-BL-03 is “Silt, glaciolacustrine, glaciofluvial. Rel. low permeability.” (KP 1999). The description of the material intersected in borehole VW11-02 is “SILT, some clay to clayey, trace sand, low plasticity to non-plastic, hard, […], varved”. The plastic and liquid limits were reported as 20% and 28%, respectively, and the natural water content was reported as 17% (AMEC 2012). Borehole GA16-19 was drilled within 5 m of VW11-02 and intersected material described as “sandy, clayey SILT, trace gravel.” Bedding was observed in the material intersected in GA16-19 but was not described as varved. The plastic and liquid limits were reported as 19% and 26%, respectively, and the natural water content was reported as 16% (Golder 2017). The material intersected in borehole GA16-17 (downstream of GA16-19) is described as “sandy SILT to SILTY SAND, trace gravel; brown; non-cohesive” with a measured water content of 20% (Golder 2017). The thickness of the material encountered in the four boreholes ranges from 0.5 to 1.5 m. In these four boreholes, the silty layer directly overlies bedrock.

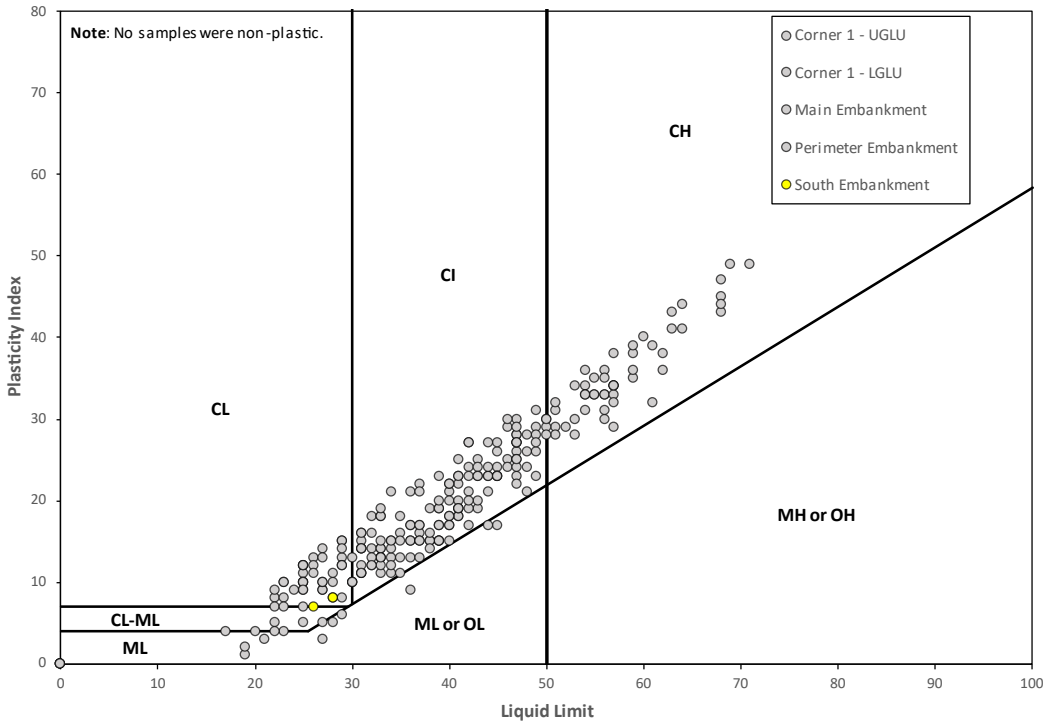
A summary of the index properties for the samples of the low plasticity silty clay collected from the foundation of the South Embankment (near Station 1+100) is presented in Table 7-22.

The Atterberg limits and natural water content results against elevation are shown graphically in Illustration 7-33 and Illustration 7-34, respectively. All available test results for glaciolacustrine samples collected from the foundation of the other embankments were incorporated into the illustrations for a comparison. The fines are a low plastic silty clay with a natural water content ranging from 15% to 20%.

The low plasticity and relatively low water content of the silty clay layer encountered at these locations are not representative of the intermediate or high plasticity glaciolacustrine units found within the footprint of the Corner 1 Embankment. Also, CPT16-19 refused at the depth of the low plasticity silty clay layer, with a tip resistance (greater than 20 MPa) and sleeve friction (greater than 500 kPa) greater than the typical values obtained in glaciolacustrine units at the Corner 1 and Main embankments.

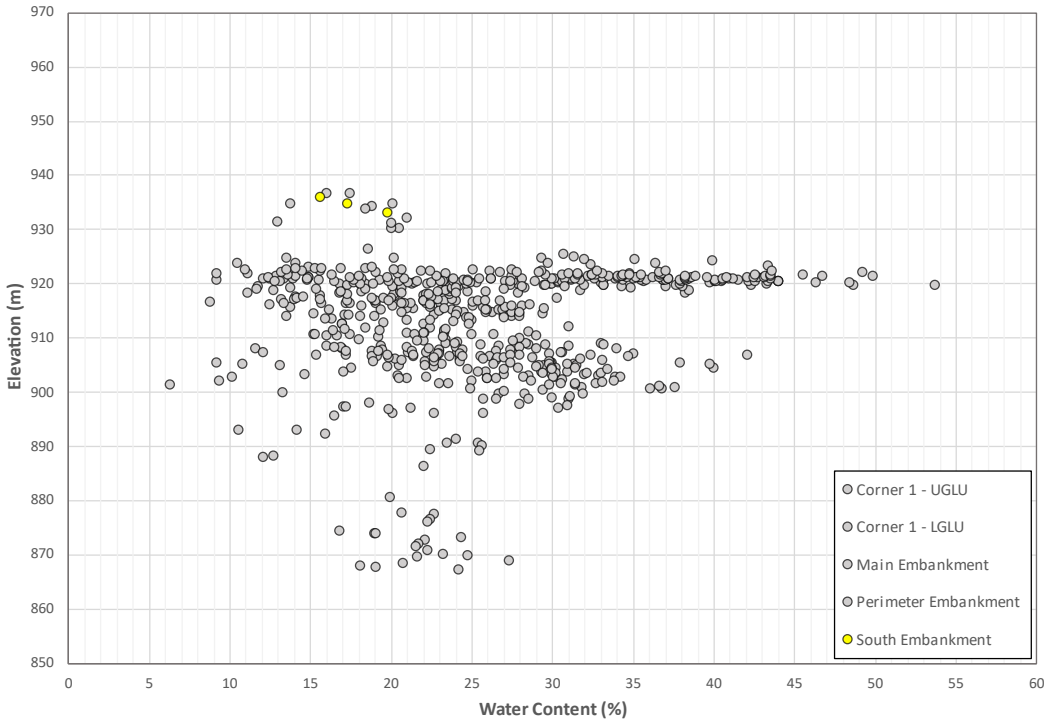
Table 7-22: Summary of Index Properties of Low Plasticity Silty Clay at the South Embankment

Index Property	Average	Minimum	Maximum	Number of Tests
Liquid limit	27	26	28	2
Plastic limit	20	19	20	
Plasticity index	8	7	8	
Water content (%)	17.6	15.6	19.8	3



CL = low-plastic clay, generally classified as silty clay; CI = intermediate-plastic clay, generally classified as silty clay; CH = high-plastic clay; CL-ML = low-plastic silty clay to clayey silt; ML = inorganic silt with slight or low plasticity; MH = high-plastic silt, generally classified as clayey silt; OL = low-plastic organic silt; OH = high-plastic organic silt.

Illustration 7-33: Plasticity Chart of Low Plasticity Silty Clay Samples from the South Embankment



LGLU = lower glaciolacustrine unit; UGLU = upper glaciolacustrine unit.

Illustration 7-34: Water Content against Elevation of Low Plasticity Silty Clay Samples from the South Embankment

7.4 Material Parameters for Stability Analyses

The material parameters for stability analyses are presented in Table 7-23.

Till and glaciofluvial materials vary in gradation depending on location, elevation, and depositional history; however, the results of the laboratory testing show a relatively consistent high strength. The shear strength parameters selected for the foundation till and glaciofluvial layers represent an average for the materials. The strength parameters are consistent with the parameters used in previous design analyses, testing results and analyses of the Corner 1 Perimeter Embankment breach carried out by the IEEIRP (2015), and the results of laboratory testing completed by KCB (2015b,c).

Glaciolacustrine soils have been analyzed using total stress (undrained) strength parameters. The total stress approach uses the SHANSEP model that accounts for preconsolidation of the soil. The preconsolidation pressure that has been selected for modelling the strength of each of the glaciolacustrine soil layers is based on the data collected for the specific layer and soils in the immediate area. The data used include the results of the laboratory strength testing, CPT profiles, the response of the soils during in situ testing and sampling (e.g., not being able to push a shear vane into the soil layer and bending of Shelby tubes during sampling) and correlation with index testing. Along the Perimeter and Main embankments, the preconsolidation pressure values selected for the analyses are at or below the lower bound of the values calculated from the laboratory consolidation tests and estimated from the CPT profiles.

Table 7-23: Foundation Material Parameters for Stability Analyses

Material	Unit Weight (kN/m^3)	Shear Strength	Pore Pressure Coefficient B-bar[(a)]	Notes
Foundation till	22	ϕ' = 34° c = 0 kPa	0.2	Triaxial testing of samples of till by IEEIRP (2015) and KCB (2015b)
Glaciofluvial	22	ϕ' = 34° c = 0 kPa	0.2	Triaxial testing of undisturbed glaciofluvial samples by Golder (2015d)
UGLU (Corner 1 Embankment)	18	Peak: $T = 0.22\ \sigma_v' \ OCR^{0.71}$ Where σ'_p = 400 kPa Remoulded: S_{ur} = 22 kPa	0.46 (peak)	Field and laboratory test programs by IEEIRP (2015), KCB (2015b,c) and WSP (2024a) including vane shear tests, CPT, and direct simple shear, direct shear, and triaxial testing. Laboratory and CPT data do not provide conclusive evidence that the UGLU that sheared in 2014 might have regained strength after reloading it by construction of the embankment (WSP 2024a). Remoulded undrained shear strength selected as the average minus one standard deviation of the measured undrained shear strength values
LGLU (Corner 1 Embankment)	20	$T = 0.22\ \sigma_v' \ OCR^{0.71}$ Where σ'_p = 700 kPa	0.2	Field and laboratory test programs by IEEIRP (2015), KCB (2015b,c) and Golder (2017, 2019) including vane shear tests, CPT, and direct simple shear, direct shear, and triaxial testing
GLU (Perimeter Embankment)	20	$T = 0.22\ \sigma_v' \ OCR^{0.71}$ Where σ'_p = 900 kPa	0.2	Consolidation testing by Golder on samples from boreholes GA15-06, GA21-03, and GA21-11 at Perimeter Embankment indicate preconsolidation pressure from 900 to 3,600 kPa (excluding the samples assessed to be of very poor quality). σ'_p = 900 kPa selected as the design basis

Table 7-23: Foundation Material Parameters for Stability Analyses

Material	Unit Weight (kN/m^3)	Shear Strength	Pore Pressure Coefficient B-bar[(a)]	Notes
GLU (Main Embankment)	20	$T = 0.22\ \sigma_v'\ OCR^{0.71}$ Where $\sigma'_p = 1{,}200$ kPa	0.2	Field and laboratory test programs by KP (2007b), AMEC (2012), Golder (2015d), and WSP Golder (2022b) including vane shear tests, CPT, direct simple shear, direct shear, and triaxial testing Consolidation tests indicate a range of preconsolidation pressure from 2,500 kPa to 4,000 kPa (excluding the samples assessed to be of very poor quality) and CPT data indicate a minimum preconsolidation pressure of about 1,200 kPa. $\sigma'_p = 1{,}200$ kPa selected as the design basis
		$T = 0.22\ \sigma_v'\ OCR^{0.71}$ Where $\sigma'_p = 850$ kPa (GLU at approx. elev. 922 Station 2+400 and 2+750)		Field and laboratory test programs by AMEC (2012), Golder (2015d) and WSP Golder (2022b) CPT21-07 data indicate a minimum preconsolidation pressure of about 850 kPa. $\sigma'_p = 850$ kPa selected as the design basis
Low plasticity silty clay (Sta. 1+100 South Embankment)	20	$T = 0.22\ \sigma_v'\ OCR^{0.71}$ Where $\sigma'_p = 1{,}200$ kPa	0.2	Index laboratory testing by Golder (2017)

a) Refer to Section 7.4.1 for explanation of selected B-bar values.

T = shear strength; σ_v'= effective vertical stress; ϕ_p' = peak friction angle; c = cohesion; CPT = cone penetration test; GLU = glaciolacustrine unit; LGLU = lower glaciolacustrine unit; OCR = overconsolidation ratio; σ'_p = preconsolidation pressure; UGLU = upper glaciolacustrine unit.

7.4.1 Pore Pressure Response within the Foundation Soils

Excess pore pressures are generated within soils when a load is applied at a rate faster than water can drain from the pore spaces in the soil. The amount of excess pore pressure depends directly on the magnitude of the applied load, the permeability of the soil, and the rate of application. The pore pressure response within the soil units can be interpreted by means of the pore pressure coefficient B-bar, defined as the change in pore pressure over the change in confining stress (Skempton 1954).

Pore pressure response was measured within the glaciolacustrine, till, and glaciofluvial layers within the Corner 1 area by vibrating wire piezometers (VWPs) monitored during construction of the 2015 Freshet Management Embankment, and at a single location along the Perimeter Embankment during the buttress construction.

Pore pressure response in the UGLU (Corner 1 Embankment) was measured with VWP VST14-03, located beneath the zone of compacted rockfill for the 2015 Freshet Management Embankment construction. The maximum B-bar measured was 0.46 at an intermediate stage of construction, and at the end of fill placement (Golder 2015b). It was determined that the glaciolacustrine soils will take approximately one year to dissipate excess pore water pressures based on the rate of consolidation measured in the laboratory and the field.

Pore pressure responses in the till and glaciofluvial layers were measured with VWP SH14-07, located adjacent to the zone of upstream fill placement. The maximum B-bar measured was 0.23 at the initial piezometer readings following fill placement. The B-bar values decreased to maximums of 0.19 and 0.15 with further fill placement (Golder 2015b). The decrease in the pore pressure and hence B-bar is due to drainage from the soil occurring at a rate faster than the rate of load application.

Only the VWPs installed in borehole GA15-06 at Station 3+400 (Perimeter Embankment) showed a pore pressure response to the approximately 5 m high buttress rockfill constructed along the Perimeter Embankment in 2015. All other VWPs installed along the foundation of the Perimeter Embankment buttress did not record a response to the construction of the buttress. The maximum B-bar measured was 0.16 (Golder 2015e).

VWPs B6, B7, B11, and B12 installed in till and glaciolacustrine layers in the foundation of the Main Embankment buttress recorded excess pore water pressure when rockfill was stockpiled for embankment construction in 2022. The maximum B-bar values measured in till and glaciolacustrine soil were 0.12 and 0.13, respectively.

8.0 HYDROGEOLOGY

Much of the factual and conceptual understanding of groundwater conditions near the TSF was obtained from Golder (2016b,c), Golder (2021), and MPMC (2021).

8.1 Hydrogeological Units and their Properties

The hydrostratigraphy at the TSF includes mine waste materials (tailings), fill materials associated with engineered structures (TSF embankment), soil deposits, bedrock formations, and bedrock structures. The key native hydrogeological units which form the foundation of the TSF are depicted in the cross-sections in Figure 3 to Figure 9 and are listed in Table 8-1, along with a summary of hydraulic conductivity estimates associated with these units.

The locations of the boreholes and monitoring wells listed in Table 8-1 are shown in Figure 1 and Figure 2. Completion details related to the boreholes, test pits, cone penetration tests (CPTs), and the monitoring wells are provided in APPENDIX C (Tables C1 to C5). Single-well response test analyses that were completed in 2022 to obtain in situ hydraulic conductivity estimates are provided in APPENDIX F. Analyses regarding the hydraulic conductivity estimates based on grain size using HydrogeoSieveXL™ (an Excel-based tool to estimate hydraulic conductivity from grain-size analyses) are provided in APPENDIX F. Details on the hydraulic conductivity estimates for the glaciolacustrine unit from the analysis of CPT dissipation tests are provided in APPENDIX D. All other hydraulic conductivity estimates outlined in Table 8-1 are from historical reports referenced in the table.

Table 8-1: Hydrogeological Units and Hydraulic Conductivity (K) Test Results

Hydrostratigraphic Unit	Borehole / Monitoring Well	Source / Consultant	Method	Estimated Hydraulic Conductivity (m/s)	Material Description (as summarized from original log)
Ablation till	MP89-231	IMC (1990)	Packer test	6.4×10^{-8}	Silty till 9–12 m depth
	GA21-01 GA21-02 GA21-03 GA21-05 GA21-06 GA21-07 GA21-08	Appendix F	HydrogeoSieveXL (grain-size analysis for 10 soil samples)	Range: 2×10^{-8} to 2×10^{-6} Geomean: 2×10^{-7}	Variable
Basal till	GW00-1B	Appendix E	Solid slug and bailer	3×10^{-6}	Silt till with sand interbed
	GW00-3B	Appendix E	Solid slug	8×10^{-7}	Silt till with silt / fine sand interbed
	GW16-4B	Golder (2016d)	Solid slug	2×10^{-5}	Silty sand
	GW21-06	Appendix E	Solid slug	1×10^{-5}	Inferred sand and gravel till
	GW21-09	Appendix E	Solid slug	1×10^{-6}	Silty clay / silt and sand
	MP89-232	IMC (1990)	Packer test	7.7×10^{-8}	Clayey silt till 15–18 m depth
	MP89-233	IMC (1990)	Packer test	1.1×10^{-7}	Sandy till 12–18 m depth
	MP89-234	IMC (1990)	Packer test	1.4×10^{-7}	Clayey sand (till) 6–12 m depth
	GA21-01 GA21-02 GA21-03 GA21-05 GA21-06 GA21-08 GA21-09	Appendix F	HydrogeoSieveXL (grain-size analysis for 7 soil samples)	Range: 4×10^{-8} to 2×10^{-6} Geomean: 3×10^{-7}	Variable
Glaciolacustrine	GA21-08 GA21-11	Appendix F	HydrogeoSieveXL (grain-size analysis for 5 soil samples)	Range: 2×10^{-10} to 7×10^{-8} Geomean: 7×10^{-9}	Silty clay or sandy silty clay
	CPT 23-01	Appendix D	CPT dissipation tests; Corner 1 Only (6 tests)	3.0×10^{-9}	CPT23-01 (917.26 m): Silty clay, med. plast., tre sand and gravel, laminated (LGLU).
	CPT 23-02			4.5×10^{-9}	CPT23-02 (919.78 m): Clay, high plast., some sand, trace gravel, varved (UGLU)
	CPT 23-03			8.8×10^{-9}	CPT23-02 (917.84 m): Silty clay, low-med. plast., trace sand and gravel, faintly laminated (LGLU)
				1.0×10^{-8}	CPT23-02 (916.85 m): Silty clay, low-med. plast., trace sand and gravel, faintly laminated (LGLU)
				1.5×10^{-7}	CPT23-02 (914.09 m): Silty clay, med. plast., trace sand and gravel, laminated (LGLU)
				4.2×10^{-8}	CPT23-03 (921.47 m): Silty clay, med. plast., some sand, trace gravel, laminated (UGLU)
				Geomean: 1.4×10^{-8}	
	CPT21-03 CPT21-07 CPT21-08 CPT21-09	WSP (2023)	CPT dissipation tests (6 tests)	Range: 3×10^{-9} to 6×10^{-8} Geomean: 2×10^{-8}	CPT21-03 and CPT21-07: High plast. clay, trace sand, varved CPT21-08 (906.2 m): Silty clay, med. plast., trace sand, laminated CPT21-08 (901.8 m): Silty clay, medium past., varved CPT21-09 (910.9 m): Sandy silty clay, med. plast., laminated. CPT21-09 (908.3 m): Silty clay to clay, low to high plast., trace sand, laminated.
Glaciofluvial	GW16-2A	Golder (2016d)	Pneumatic test	8×10^{-4}	Sandy silty gravel
	GW16-2B	Golder (2016d)	Pneumatic test	2×10^{-4}	Sand and gravel
	GW96-2B	Appendix E	Solid slug and bailer	4×10^{-4}	Sand and gravel
	GW96-4B	Appendix E	Solid slug	2×10^{-6}	Sand some gravel
	GW16-3B	Golder (2016d)	Solid slug	8×10^{-6}	Silty sand and gravel
	GA21-06	Appendix F	HydrogeoSieveXL (grain-size analysis for 1 soil sample)	3×10^{-5}	Gravelly sand

Table 8-1: Hydrogeological Units and Hydraulic Conductivity (K) Test Results

Hydrostratigraphic Unit	Borehole / Monitoring Well	Source / Consultant	Method	Estimated Hydraulic Conductivity (m/s)	Material Description (as summarized from original log)
Weathered bedrock	GW16-3A	Golder (2016d)	Recovery test	$<10^{-10}$	Weathered bedrock (silty clay)
	GW16-4A	Golder (2016d)	Recovery test	1×10^{-7}	Weathered bedrock (clayey silt and sand)
	GW96-2A	Appendix E	Solid slug	3×10^{-6}	Inferred weathered volcanic conglomerate (gravel with some coarse sand)
	MP89-231	IMC (1990)	Packer test	1.6×10^{-8}	Soft volcanics 30–37 m depth
	MP89-232	IMC (1990)	Packer test	3.2×10^{-8}	Fractured volcanics 32–37 m depth
	MP89-233	IMC (1990)	Packer test	2.2×10^{-7} 1.6×10^{-7} 1.7×10^{-7}	Soft rock 30–37 m depth Broken rock 37–46 m depth Broken rock 49–55 m depth
	MP89-235	IMC (1990)	Packer test	5.1×10^{-6}	Highly fractured bedrock in contact with overburden 6–12 m depth
Competent bedrock	GW16-5A	Golder (2016d)	Solid slug	5×10^{-6}	Inferred competent bedrock
	GW16-5B	Golder (2016d)	Recovery test	2×10^{-7}	Inferred competent bedrock
	MP89-231	IMC (1990)	Packer test	2.9×10^{-9}	Competent bedrock 37–43 m depth
	MP89-232	IMC (1990)	Packer test	1.0×10^{-7}	Competent bedrock 43–46 m depth
	MP89-234	IMC (1990)	Packer tests	3.2×10^{-9} 3.3×10^{-8}	Competent bedrock 30–37 m depth Competent bedrock 46–49 m depth
	MP89-235	IMC (1990)	Packer tests	8.6×10^{-10} 4.0×10^{-9} 1.1×10^{-7}	Very competent bedrock 12–18 m depth; Competent bedrock 18–30 m depth; Slightly fractured bedrock 30–43 m depth
	MP89-236	IMC (1990)	Packer tests	2.7×10^{-7} 2.7×10^{-8} 2.0×10^{-8} 7.7×10^{-9}	Bedrock 8–12 m depth Bedrock 14–24 m depth Bedrock 24–37 m depth Bedrock 35–46 m depth

CPT = cone penetration test.

UGLU=Upper Glaciolacustrine Unit

LGLU=Lower Glaciolacustrine Unit

8.1.1 Surficial Native Deposits

The surficial deposits underlying the TSF consist of glacial deposits, predominantly till (ablation till and basal till) with interbeds of glaciofluvial and glaciolacustrine sediments. The relative distribution of the till, glaciofluvial, and glaciolacustrine sediments varies by location according to the depositional and erosional history of the area as shown on the cross-sections (Figure 3 to Figure 9). The combined thickness of the glacial deposits range from approximately 5 m along a bedrock knoll near the South Embankment to approximately 60 m along portions of the Main Embankment. During foundation preparation at the North Abutment of the TSF in 2022, the thickness of the glacial deposits was observed to be on the order of 2 m. Additional test pits need to be excavated when construction resumes in 2023 to confirm the glacial deposit thickness.

The TSF till core has been keyed into the foundation till. Where the natural surficial till along and upstream of the till core alignment was observed to be less than 2 m thick, and was underlain by glaciofluvial/glaciolacustrine sediments, a low permeability till liner was constructed with a nominal thickness of at least 2 m (KP 1997a, 2011 Section 2.2; Golder 2016b, Section 3.3.1.7).

Based on the information outlined in Table 8-1 above, the hydraulic conductivity of the foundation till (ablation till and basal till) is highly variable, ranging from 1×10^{-5} m/s to 2×10^{-8} m/s. The hydraulic conductivity of the till liner was estimated by KP (2005) to be on the order of 1×10^{-8} m/s. The range in hydraulic conductivity for the glaciofluvial units, 8×10^{-4} m/s to 2×10^{-6} m/s, confirms that these units are more permeable and may act as preferential pathways for seepage from the TSF. Conversely, the range in hydraulic conductivity for the glaciolacustrine deposits, 7×10^{-8} m/s to 2×10^{-10} m/s (excluding one potential outlier of 2×10^{-7} m/s), confirms that these units have a low permeability and may act as barriers for seepage migration and/or as confining units where they occur directly above glaciofluvial units, and could potentially cause artesian pressures in the underlying glaciofluvial units.

A previous hydrogeological assessment by Golder (2016c), which involved development of a numerical groundwater flow model for the TSF area, estimated the bulk horizontal and vertical hydraulic conductivity of the foundation soils to be on the order of 5×10^{-7} m/s and 5×10^{-8} m/s respectively (i.e., an anisotropy of 10:1), based on the results of model calibration to observed hydraulic heads and seepage flow rates at the facility. Therefore, these calibrated values are considered representative of the composite foundation overall.

8.1.2 Bedrock

The upper portion of the bedrock beneath the TSF is weathered and/or fractured and consists predominantly of volcanic conglomerate based on drilling observations in the TSF footprint prior to mining (IMC 1990).
The thickness of this weathered bedrock zone is highly variable and is inferred to range from 2 to 40 m based on borehole logs for the 1996 series monitoring wells (KP 1997b) and the 2015 series boreholes (Golder 2015d).
The underlying competent bedrock consists of Nicola Group volcanics that, according to the local geology map (Logan et al. 2007), likely consist of undivided mafic volcanic and volcanoclastic rocks and/or intrusive rocks (pseudoleucite syenite).

Based on the information outlined in Table 8-1, the hydraulic conductivity of weathered bedrock is highly variable, ranging from 5×10^{-6} m/s to 1×10^{-10} m/s in the vicinity of the TSF. Competent bedrock had a similar range in hydraulic conductivity as that of weathered bedrock (5×10^{-6} m/s to 9×10^{-10} m/s). The calculated geometric mean of the individual tests for weathered and competent bedrock is approximately 9×10^{-8} m/s and 3×10^{-8} m/s respectively. Based on the results of packer testing at two boreholes, the hydraulic conductivity of competent bedrock is expected to generally decrease with depth (as seen at MP89-236), except where bedrock fractures are encountered (as seen at MP89-235).

8.2 Groundwater Recharge/Discharge and Tailings Storage Facility Seepage

The central area of the mine site is a topographic high consisting of Polley Mountain, which reaches an elevation of approximately 1,255 m. The TSF is located about 3 km southeast of this location in a topographically low area with an original ground surface elevation of approximately 920 to 940 m. Topographic high areas are typically areas where groundwater recharge occurs, whereas topographic low areas are typically areas where groundwater discharge occurs.

8.2.1 Recharge Areas

Groundwater recharge from precipitation near the TSF is expected to occur primarily along topographic highs, such as upgradient of the western boundary of the TSF, between the TSF and Bootjack Lake. The recharge rate in this area was estimated to be approximately 20% of average annual precipitation based on the results of numerical model calibration for a groundwater flow model of the TSF area (Golder 2016c).

Prior to construction of the TSF, groundwater discharge to ground surface was reported to occur within the footprint of the TSF, as indicated by the presence of a small pond and two swampy marsh-like areas within this footprint. This is supported by the observation of a near-surface water table, artesian pressures measured below the west side of the TSF footprint, and upward groundwater flow gradients measured along the Main and Perimeter embankments, as described in Section 8.4.1). However, the construction of the TSF and the presence of the TSF Pond changed the groundwater conditions such that the TSF Pond is now a source of groundwater recharge (i.e., contributes to seepage through the foundation). The TSF Pond level rose from approximately 938 to 962 m between 2016 and 2018 (Section 8.3), and then remained relatively stable thereafter, at an elevation of approximately 962 to 963 m. The TSF Pond elevation is inferred to control the amount of seepage that reports to the TSF seepage collection systems, as described in Section 8.2.2.

8.2.2 Tailings Storage Facility Seepage

Seepage through the TSF embankment is collected at the downstream seepage collection ponds and ditches. The seepage collection ponds and ditches are unlined and are reportedly installed within till. Limited recharge is expected to occur from the seepage collection systems to the groundwater system.

The primary systems that report to the seepage collection ponds and ditches are:

- foundation drains that underlie the downstream shell of the dam
- upstream toe drains within the South, Main, and Perimeter Embankments
- four passive pressure relief wells (PRW96-1 to PRW96-4) and trenches installed below the Main Embankment

Measured flows reporting to the TSF seepage collection systems ranged between about 2,500 and 6,200 m^3/d (29 and 72 L/s) in 2021 (Golder 2022a). Most of the seepage (70% to 80%) is from the upstream drain at Corner 1 (21 to 45 L/s), with the remaining (20% to 30%) being a combination of flow from upstream drains, seepage through the embankments, flow from passive pressure relief wells and runoff (8 to 27 L/s). Golder (2015g) previously reported measured flows from the foundation drains to be on the order of 80 L/s in 2014 prior to the breach. Although not explicitly stated in the Golder (2015g) report, the foundation drains are considered to be connected to the upstream drains, and flow measurements through the embankment and from the pressure relief wells without the contribution from the upstream drains is not available.

Seepage losses through the foundation on the order of 35 to 294 m^3/d (0.4 to 3.4 L/s, about 2.2 L/s on average) were estimated to bypass the downstream seepage collection ditches and ponds based on estimates in previous design reports which considered TSF embankment elevations of 960 m (KP 1995b) and 965 m (KP 2005). More recent estimates of the seepage losses are not available.

8.2.3 Discharge Areas

The primary groundwater discharge areas downgradient of the TSF footprint include Edney Creek, Edney Creek tributaries, and Hazeltine Creek.

Within the TSF embankment foundation, there are four passive pressure relief wells and connecting trenches that were installed within native soils in 1996 (KP 1997c, Section 5.2.2). These wells act to reduce the artesian pressures along the foundation of the Main Embankment and constitute a discharge area for groundwater. The pressure relief wells are situated directly below the Main Embankment between approximately Station 1+800 and 2+300 (see Figure 1) and consist of auger holes drilled to a depth of between 10 and 22 m and backfilled with filter sand. The pressure relief trenches were excavated and backfilled with gravelly sand. Because these wells are buried below the embankment, direct flow measurement from the wells is not possible. As indicated in Section 8.2.2, flows from these wells are routed to the TSF Main Embankment Seepage Collection Pond.

8.3 Hydraulic Heads and Vertical Hydraulic Gradients

The most recent groundwater level data is reported in the *2021 Annual Groundwater Monitoring Report* (Golder 2022b). The following information is based on that report.

Hydraulic Heads

Groundwater monitoring has been ongoing at the mine site since 1995 with the objectives to monitor direction, quantity, and quality of groundwater flow near all mine facilities. As part of this program, eight monitoring well pairs (each with one deeper well and one shallow well, and typically one bedrock and one overburden well per pair) and three single monitoring wells, all situated next to the outer perimeter of the TSF, are monitored monthly to annually, depending on location. The well locations are shown on the plan in Illustration 8-1, and also shown on the cross-sections in Figure 3 to Figure 9. Completion details for the wells are provided in APPENDIX C (Table C4). The monitoring well locations include the following, listed from west to east:

- Northwest Side: GW14-1
- South Embankment: GW16-5A/B, GW00-1A/B, GW00-2A, GW00-3A/B, GW96-4A/B
- Main Embankment: GW16-4A/B, GW96-3A, GW16-3A/B
- Perimeter Embankment: GW96-2A/B, GW16-2A/B

Source: Golder (2021) modified Figure 6.

Illustration 8-1: Shallow Hydraulic Head Contours for November 2020

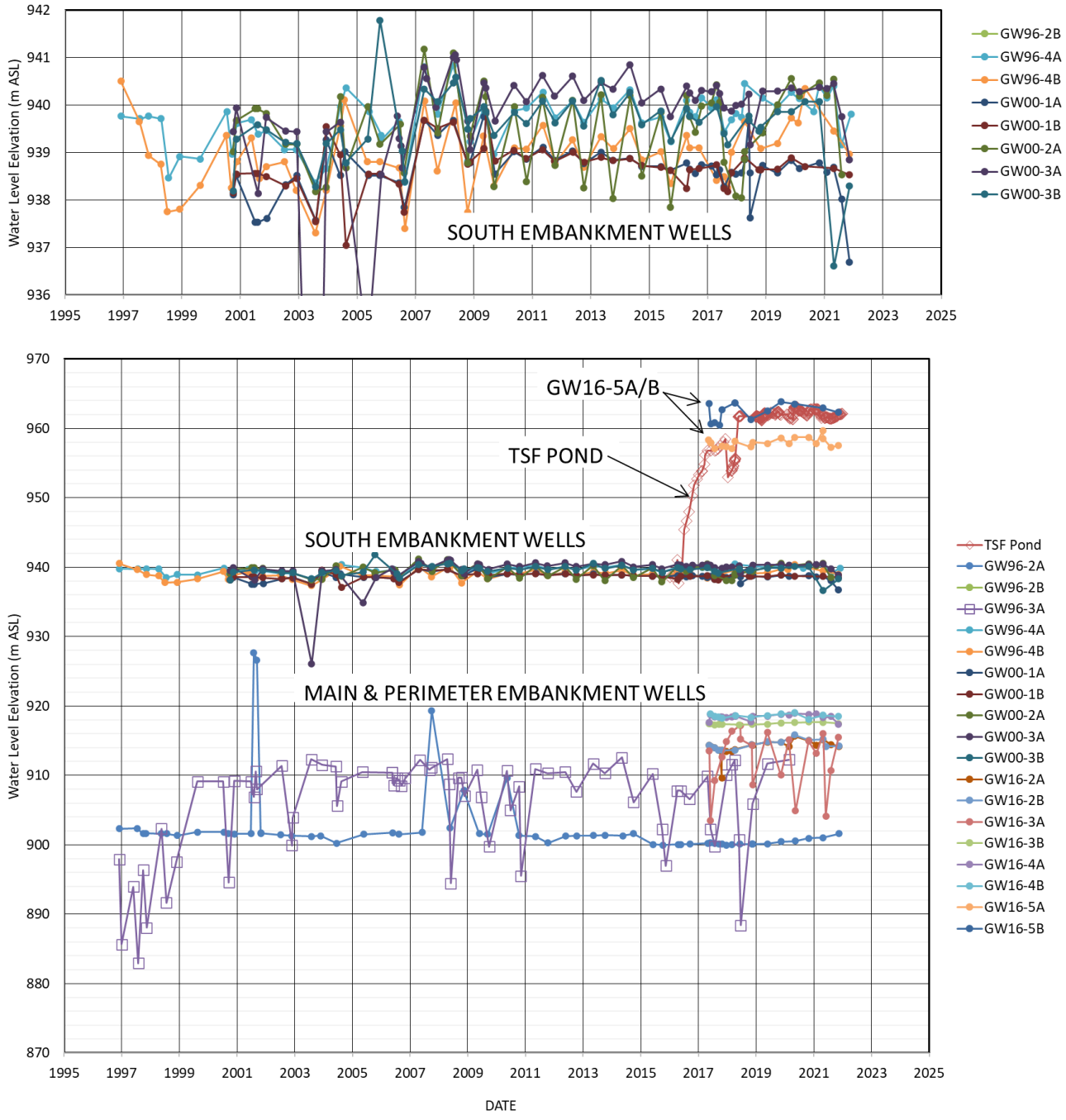
Hydraulic heads around the TSF ranged from a high of 963 m (at GW16-5B) on the northwest side of the facility to a low of 915 m (at GW96-2B) on the northeast side in 2021. As shown on the time-series water level plot in Illustration 8-2, the hydraulic heads have remained fairly constant over time since approximately 2003, excluding seasonal water level fluctuations of approximately 2 to 3 m at most locations (the small seasonal variation relative to the total head change across the facility suggests that these seasonal variations are unlikely to affect overall interpretation of groundwater flow directions near the TSF). Conversely, the TSF Pond level rose from approximately 938 m to approximately 962 m between 2016 and 2018, and then remained relatively stable thereafter at an elevation between 961 and 963 m. Currently, the monitoring well nest located at the west end of the South Embankment (GW16-5A/B) has hydraulic heads that are relatively close to the TSF Pond level, whereas hydraulic heads along the remaining perimeter of the facility are significantly lower. Although not shown in Illustration 8-1, the surface water level in Bootjack Lake, situated approximately 2 km northwest of the TSF, was approximately 987 m in 2021 (approximately 24 m higher than the current TSF Pond level), and the groundwater level within the bedrock knoll in between the TSF and Bootjack Lake was inferred to be higher relative to the lake level based on measured groundwater levels to the northwest of the TSF and closer to Polley Mountain (GW96-7; approximately 1,017 m). The distribution in hydraulic heads indicates that the groundwater flow direction is radially outward from the TSF towards the southwest, southeast, and northeast, with some groundwater inflow into the facility from the northwest. Groundwater flow direction is discussed in more detail in Section 8.4.

Next to the Perimeter Embankment, the hydraulic head observed in the deep well screen at GW96-2A completed in weathered bedrock (901.61 m on 25 November 2021) is significantly lower than would be expected based on nearby surface water elevations in Edney Creek and Hazeltine Creek, with surface water level elevations being about 10 m higher. The high hydraulic conductivity results for GW96-2A at an elevation of 878 m (3×10^{-6} m/s, see Table 8-1) indicates a possible zone of enhanced permeability at this location. According to Golder (2016c), the low water level measurement in GW96-2A suggests the well could be connected locally, through this enhanced permeability zone, to farther down-gradient and downstream areas of Hazeltine Creek. Based on the groundwater quality results for the TSF described in Section 9.5 and considering the groundwater quality trends for this well from pre-mining to present shown in Figure 10, this well does not appear to be influenced by seepage from the TSF. This suggests that the inferred enhanced permeability zone at GW96-2A is not hydraulically connected to the TSF.

Vertical Hydraulic Gradients

Data from the multi-level wells from 2019 onwards indicated mostly downward (shallow to deep) vertical hydraulic gradients around the TSF perimeter with the following exceptions:

- A consistently upward hydraulic gradient, observed from November 2019 to November 2021 next to the South Embankment close to the southwest corner of the facility (at GW96-4A/B and GW00-3A/B).
- Periodic flowing artesian conditions since approximately 2003 observed or inferred (water levels recorded at the top of the well collar on some occasions; however, the static water level height above the well collar has not been measured) at bedrock well GW96-3A situated southeast of the Main Embankment. This well location is situated downgradient of the four passive pressure relief wells described in Section 8.2.3 and next to the Main Embankment Seepage Collection Pond.



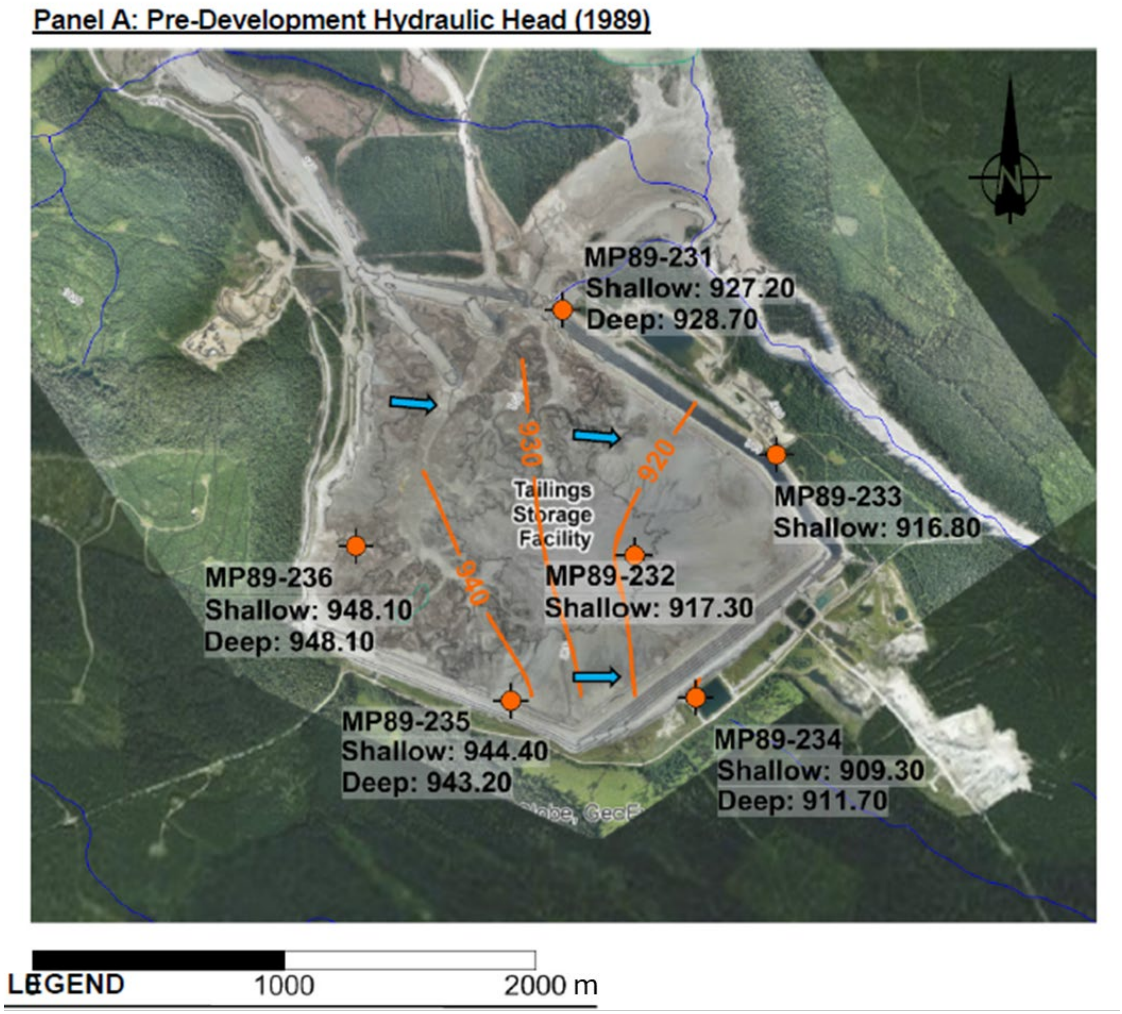
TSF = tailings storage facility.

Illustration 8-2: Tailings Storage Facility Pond Level and Surrounding Groundwater Levels over Time

8.4 Groundwater Flow Direction

8.4.1 Pre-development Groundwater Flow Direction

Prior to the TSF construction, hydraulic head measurements were collected by KP (1990) at 10 monitoring wells and piezometers. The inferred groundwater flow directions based on these data are presented in Illustration 8-3 below.



Source: KP 1990; modified from Figure 4 in Golder 2016c.

Illustration 8-3: Pre-development Hydraulic Heads and Groundwater Flow Direction

Based on the measured hydraulic heads, the groundwater flow direction prior to the development of the TSF was inferred to be from the west and northwest towards the east and southeast. The water table was observed to be near ground surface, with artesian pressures measured within the TSF basin at MP89-236 and upward groundwater flow gradients measured along the Main and Corner 1 embankments (MP89-234 and MP89-231). The observed upward gradients and artesian flow conditions are consistent with reported observations of two swampy areas and a small pond within the footprint of the TSF prior to development. A downward hydraulic gradient was observed at MP89-235, which is located near a bedrock ridge (topographic high) adjacent to and beneath the South Embankment.

8.4.2 Current Groundwater Flow Direction

The current groundwater flow direction in the area of the TSF is inferred to be partly dependent on the TSF Pond level. Provided that surface water level elevations within the TSF are above the surrounding shallow groundwater level, groundwater flow will be radial from the TSF towards the southwest, southeast, and northeast. However, when the TSF Pond level falls below the shallow groundwater levels on the west side of the TSF, then the TSF area becomes a flow-through environment, similar to pre-development conditions described above, with groundwater flow directed across the TSF from the west and northwest towards the east and southeast.

The plan in Illustration 8-1 shows the November 2020 hydraulic head contours and groundwater flow directions around the perimeter of the TSF. In 2020 and 2021, groundwater flow towards the TSF was from the upgradient, northwest side of the facility (i.e., area of GW14-1 and GW16-5A/B), originating from the area of Bootjack Lake and Polley Mountain. With the TSF Pond level at approximately 962 m, groundwater within the TSF footprint was inferred to flow radially outward towards the southwest (towards Edney Creek and its tributaries), southeast, and northeast (towards Hazeltine Creek).

8.5 Groundwater Use Downgradient of the Mine

A search in the Ministry of Environment's online database (iMapBC) in December 2022 indicated that there are no mapped aquifers within a radius of 10 km from the mine. The closest mapped aquifer, Fraser Plateau Lave Aquifer No. 124 IIIB (11), is a laterally extensive bedrock unit that was classified as having low demand and moderate vulnerability. The northern limit of this aquifer is situated more than 15 km south of the mine and is not considered to be hydraulically connected to groundwater from the mine area and the Hazeltine Channel corridor. This database search also indicated that water supply wells are not present in the immediate vicinity of the mine. The closest wells are approximately 6 km east, on the opposite (eastern) shore of Quesnel Lake. The database also contains information on water wells that are located northwest from the mine (near Little Lake) and southwest from the mine (near Gavin Lake) at a distance of at least 7 km. Considering these distances and the fact that several surface water features are between these wells and the mine, it is unlikely that seepage from the mine facilities could reach these wells or the closest mapped aquifer. A map showing the results of the water well search and the nearest mapped aquifer is included in APPENDIX E.

9.0 GEOCHEMICAL CONDITIONS

9.1 Monitoring Program

As stated previously, groundwater monitoring by MPMC has been ongoing at the mine site since 1995 with the objectives to monitor direction, quantity, and quality of groundwater flow near all mine facilities. The monitoring wells used to monitor groundwater levels around the perimeter of the TSF (listed in Section 8.3) are also used to monitor groundwater quality. The monitoring well network is shown in Illustration 8-1.

Groundwater samples from the monitoring wells are collected quarterly or semi-annually, depending on location, and are analyzed for field parameters, anions, nutrients, and dissolved metals and are reported annually. The analyses are focused on nine parameters of interest which included hardness, sulphate, nitrate, and the following dissolved metals: aluminum, arsenic, cadmium, molybdenum, and selenium.

The most recent groundwater quality data for the TSF area is reported in the *2021 Annual Groundwater Monitoring Report* (Golder 2022b). Water quality trend plots from this report are provided in Figure 10.

9.2 Baseline Groundwater Quality

The plots in Figure 10 provide information on baseline and early operations groundwater quality conditions, from 1996 to approximately 1999, at a few monitoring wells that were installed prior to or at the start of TSF operations in 1998 and continue to be monitored today. Based on these plots, baseline groundwater quality conditions are generally characterized by low concentrations of dissolved metals, sulphate, and nitrate and low to moderate hardness, with the exception of one monitoring well (GW96-3A) where concentrations of many parameters fluctuated substantially. The erratic results at GW96-3A suggest that non-natural factors (e.g., possible well contamination or well design flaws such as bentonite seal within the screened interval) were affecting the water quality results from this well. It should be noted that periodically flowing artesian conditions have been observed or inferred at this well and that it is situated next to the unlined Main Embankment Seepage Collection Pond (Section 8.3).

9.3 Tailings Storage Facility Tailings

The following information on metal leaching and acid rock drainage geochemistry is from the SRK *Derivation of Geochemical Source Terms, Mount Polley Mine* (Appendix C in Golder 2016b) and from Kennedy and Anglin (2016).

The Mount Polley copper-gold porphyry deposit is classified as an alkalic porphyry copper gold deposit. The mined mineralized zones are enriched in copper and selenium relative to global norms. Processing of the ore yields a copper sulphide concentrate. The tailings are lower in sulphide mineral content compared to the ore because most of the copper sulphides were removed through ore processing. In addition, mill process reagents, with the exception of lime, are not expected to be present within tailings. Furthermore, processing changes over time were minimal and not expected to affect the geochemical reactivity of the tailings; therefore, tailings geochemistry can be considered generally consistent over time.

Mount Polley tailings are classified as non-acid generating based on operational monitoring and testing of tailings spilled into Hazeltine Creek in August 2014. Compared to crustal normal concentrations, copper and selenium were present in the tailings sampled from Hazeltine Creek following the tailings release at order of magnitude higher concentrations, indicating tailings enriched in copper and selenium. However, average selenium concentrations in the operational tailings from within the TSF were lower than the spilled tailings in the creek and were similar to background levels (i.e., similar to average selenium concentrations in stream sediment samples from the region surrounding Mount Polley [Kennedy and Anglin 2016, Section 5.2.2]).

Humidity cell tests and column tests that ran for about 52 weeks and 35 weeks, respectively, using selected samples which had typical characteristics of tailings in the impoundment, were used to assess potential tailings leachate quality. The leachate quality from these tests is described below:

- pH typically between 8.0 and 8.2
- sulphate concentrations initially on the order of 1,000 mg/L, with decreasing concentrations over time that reached lower stabilized values
- highest copper concentration of 0.15 mg/L in one test, but with typical maximum concentrations of 0.02 mg/L in humidity cell test leachates and 0.05 mg/L in column test leachates
- highest selenium concentrations were 0.01 mg/L in humidity cell test leachates and 0.06 mg/L in column test leachates
- molybdenum concentrations initially between 2 and 3 mg/L in column leachates

9.4 Tailings Storage Facility Pond Water Quality

The quality of the TSF Pond water is monitored several times per year at monitoring location E1a as part of the Mount Polley Mine's Comprehensive Environmental Monitoring Plan under the *Environmental Management Act* Permit 11678 and *Mines Act* Permit M-200. The following water quality characteristics with respect to selected parameters of interest for this contact water (i.e., mine-affected water) from E1a were obtained from MPMC (2021, Section 4.10.1). Note that the mine was in care and maintenance between May 2019 and November 2021 so values for the period between 2012 and 2014 are also included below.

- Annual mean hardness of 450 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 438 mg/L.
- Annual mean chloride concentration of 8.9 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 24.3 mg/L.
- Annual mean sulphate concentration of 438 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 542 mg/L.
- Annual mean nitrate concentration of 1.9 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 6.4 mg/L.
- Annual mean total iron concentration of 0.188 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 0.272 mg/L.
- Annual mean total copper concentration of 0.357 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 0.010 mg/L.
- Annual mean total selenium concentration of 0.0292 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 0.0260 mg/L.
- Annual mean total molybdenum concentration of 0.158 mg/L in 2020. For comparison, the pre-breach (2012 to 2014) mean was 0.184 mg/L.

MPMC (2021) reports that, of the parameters of interest, total molybdenum and possibly chloride have shown a general increasing trend after post-breach deposition of tailings commenced. Total copper concentrations have increased in recent years due to seepage with high copper concentration from the heap leach trial area in the waste dump.

9.5 Groundwater Quality (2021)

Based on the inferred groundwater flow direction described in Section 8.4, the upgradient and downgradient wells relative to the TSF are as follows:

- upgradient wells:
  - west: GW14-1 (no water quality data available for this location)
  - southwest (Corner 4): GW16-5A/B (potentially side-gradient)
- downgradient wells:
  - South Embankment: GW00-1A/B, GW00-2A, GW00-3A/B, GW96-4A/B
  - Main Embankment: GW16-4A/B, GW96-3A, GW16-3A/B
  - Perimeter Embankment: GW96-2A/B, GW16-2A/B

The following summary on groundwater quality is based on information from the *2021 Annual Groundwater Monitoring Report* (Golder 2022b). This summary provides an overview of the 2021 groundwater quality results and the groundwater quality trends for monitoring wells located around the TSF (as shown in Figure 10).

Over the last decade or so, although there were increasing parameter of interest concentration trends at some locations, significant changes to groundwater quality at the perimeter of the TSF had not been identified except with respect to sulphate. Sulphate concentrations in the shallow groundwater downgradient of the TSF approached or reached levels observed in the TSF Pond water next to the Perimeter Embankment at GW16-2B and GW96-2B and next to the South Embankment at GW96-4B. The highest sulphate concentrations were observed at GW96-2B in November 2021 (543 mg/L). These wells are known or inferred to be completed in glaciofluvial units based on soil descriptions and the relatively high hydraulic conductivity results (Table 8-1). The remaining wells indicated relatively stable or slightly decreasing sulphate concentration trends.

Groundwater quality results for the upgradient well nest location, GW16-5A/B, indicated no significant trends since the installation of the wells in 2016. Furthermore, the water quality at this location appears to be similar to baseline or pre-development water quality (described in Section 9.2).

The 2021 groundwater quality results were compared to the British Columbia (BC) Ministry of Environment and Climate Change Strategy Contaminated Sites Regulation (BC ENV 1997) standards for protection of freshwater aquatic life and the BC Approved Water Quality Guidelines for protection of aquatic life (BCWQG AW; BC ENV 2021). An analysis of the results indicated no exceedances of the Contaminated Sites Regulation standards for protection of freshwater aquatic life and no exceedances of the BCWQG AW guidelines with the following exceptions concerning the BCWQG AW criteria only:

- pH above the guideline range (6.5 to 9.0) at one downgradient well location (GW00-3A, pH = 11), with two locations only slightly above the guidelines (GW00-1A, GW16-2A)
- sulphate concentrations above the chronic guideline (128 to 429 mg/L, hardness dependent) at several downgradient well locations (GW96-2B in November 2021 [543 mg/L] but not in May 2021: GW96-4B [471 to 507 mg/L]; GW00-1A [226 mg/L]; GW16-2B [475 to 518 mg/L])
- dissolved iron above the acute guideline (350 ug/L) at one downgradient well location (GW96-4B, 785 to 877 µg/L); elevated dissolved iron concentrations were observed at the two upgradient well locations (GW14-1 in February to August 2021 [1,120 to 1,300 µg/L] but non-detectable in November 2021 [<30 µg/L], and GW16-5A [675 to 716 µg/L]).

10.0 DISCUSSION

This section presents a discussion of potential dam safety issues related to site conditions, along with the TSF design approach to mitigate each issue.

A general embankment description is included in Section 2.0. With a 970 m crest elevation, the embankment is approximately 4.8 km in length and has a maximum height of 58 m. The embankment has incorporated a staged expansion design utilizing modified centreline and centreline construction methods. The zoning of the embankment includes a low permeability till core, filter, and transition zones and rockfill zones forming the downstream shell of the embankment and the downstream buttress.

The elevation 970 m TSF design description is presented in Golder (2015g). The design to raise to facility to 987 m follows the same philosophy and is presented in WSP Golder (2025).

10.1 Stability

Strength of Foundation Materials

Potential stability issues related to the strength of foundation materials include:

- insufficient strength in the foundation (i.e., glaciolacustrine layers) to resist the loads applied by the dam
- strain weakening of glaciolacustrine soils
- unidentified foundation conditions (e.g., unidentified glaciolacustrine deposits)

Multiple field investigations have been completed along the foundation of the embankment and buttress to delineate the extent and characterize the different foundation materials.

The weaker layers in the foundation of the embankment and buttress are the glaciolacustrine deposits. Extensive field and laboratory investigations have been completed to characterize the strength of the glaciolacustrine deposits.

The design approach is to analyze embankment stability and deformation considering the interpreted foundation conditions and includes:

- limit equilibrium analyses of downstream failure modes under static and pseudo-static conditions for the range of foundation conditions along the embankment
- limit equilibrium analyses with a range of glaciolacustrine deposits strength to assess sensitivity to potential variability
- stress-deformation analysis (2D FLAC model) to predict patterns of deformation and potential redistribution of stresses due to strain weakening of glaciolacustrine deposits

The design approach also follows the principles set out in the IEEIRP report of January 2015:

- Limit the amount of surface water to only that required for operation.
- Promote unsaturated conditions in the tailings with drainage provisions (i.e., minimum beach width and upstream drain).
- Achieve dilatant conditions throughout the tailings deposit (i.e., the existing tailings within the TSF drained and consolidated after the TSF breach in 2014 and the upstream drain promotes consolidation of new tailings).

Loading of Foundation Materials

The potential stability issue related to raising the TSF is the development of excess pore water pressure in the foundation materials during construction.

Extensive field and laboratory investigations have been completed to characterize the glaciolacustrine deposits.

The pore pressure response has been monitored within the glaciolacustrine deposits, till, and glaciofluvial layers during construction of the Corner 1 Embankment and Perimeter and Main embankment buttresses.

The design approach is to analyze embankment stability including the generation of excess pore water pressure due to loading of the foundation at key stages of construction.

Groundwater Conditions

The potential stability issue related to groundwater conditions is the failure of the Main Embankment vertical drain wells and the development of artesian pressures in the foundation.

The pore water pressure has been monitored within the glaciofluvial, till, and glaciolacustrine layers in the foundation of the Main Embankment. The readings show that the Main Embankment's vertical passive pressure relief wells continue to work and artesian pressures have not developed.

The design approach is to analyze embankment stability assuming that artesian pressures redevelop to the levels measured prior to the installation of the Main Embankment vertical drain wells.

10.2 Seepage

The potential seepage issue related to site conditions is the development of preferential flow pathways in the foundation soils (e.g., glaciofluvial layers) or bedrock, leading to increased seepage and potential groundwater quality issues.

- The design approach is to include suitable foundation preparation, placement of a filter blanket downstream of the till core and confirmation that a minimum thickness of competent till is present on surface along and upstream of the till core alignment. Where the thickness of competent till is adequate, the till core is keyed into the foundation till. Where the thickness of competent till is less than the minimum required, a till blank is constructed upstream of the till core and the till core is keyed into competent till or bedrock to cut-off through layers of higher hydraulic conductivity soils (e.g., glaciofluvial) or bedrock (e.g., fractured bedrock).
- For raises of the TSF, the thickness of competent till is confirmed during construction of the South and North abutments.

Monitoring data collected since 1996 shows that groundwater quality downgradient of the TSF is being affected by seepage from the TSF. The concentration of sulphate in groundwater downgradient of the TSF approached or reached levels observed in the TSF Pond water; however, it does not exceed the BC ENV (1997) Contaminated Sites Regulation water quality standards for protection of freshwater aquatic life. Additional groundwater monitoring downgradient of the TSF between monitoring wells showing elevated sulphate concentrations and surface water receptors should be planned.

11.0 CLOSURE

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

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

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https://wsponline.sharepoint.com/sites/gld-10023g/22514095 deliverables/002_issued/034-r-51392-foundation characterization report/rev1/22514095-034-r-rev1-51392-mt polley tsf dam site charact report 06feb_25.docx

REFERENCES

AMEC (AMEC Environment & Infrastructure, a division of AMEC Americas Limited). 2012. Mount Polley Mine Project: Tailings Storage Facility 2011 Geotechnical Site Investigation – FINAL. Prepared for Mount Polley Mining Corporation. Doc. No. VM00560.200.3. 28 March 2012.

AMEC. 2013. Mount Polley Mine Hydrogeology Assessment and Data Review. Prepared for Mount Polley Mining Corporation. 26 March 2013.

APEGBC (The Association of Professional Engineers and Geoscientists of British Columbia). 2016. The Professional Practice Guidelines – Site Characterization for Dam Foundations in BC. Version 1.2.

Bichler AJ, Bobrowsky PT. 2003. Quaternary geology of the Hydraulic map sheet, British Columbia (NTS 93A/12). British Columbia Geosciences, Research and Development Branch. Open File 2003-7. Scale 1:50,000.

BC ENV (British Columbia Ministry of Environment and Climate Change Strategy). 1997. Contaminated Sites Regulation. BC Reg. 375/96, O.C. 1480/96, under the Environmental Management Act. Includes amendments up to BC Reg. 179/2021, updated to 7 July 2021. https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/375_96_00.

BC ENV. 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture – Guideline Summary. Water Quality Guideline Series, WQG-20. Prov. B.C., Victoria B.C.

Carrivick JL, Tweed F. 2013. Quaternary Stratigraphy and History, Williams Lake, British Columbia. Quaternary Science Reviews, 78, pp. 34-52.

Clague JJ. 1987. Quaternary Stratigraphy and History, Williams Lake, British Columbia. Canadian Journal of Earth Science. Volume 24, pp. 147-158.

Clague JJ. 1988. Quaternary Stratigraphy and History, Quesnel, British Columbia. Géographie physique et Quaternaire. Volume 42, No. 3, pp. 279-288.

Dragert H, Hyndman RD, Rogers GC, Wang K. 1994. Current Deformation and the Width of the Seismogenic Zone of the Northern Cascadia Subduction Thrust, Journal of Geophysical Research, 99, pp. 653-668.

Golder (Golder Associates Ltd.). 2015a. Laboratory Testing Results from Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-012-TM-Rev0-2000. 26 March 2015.

Golder. 2015b. 2015 Freshet Management Embankment Design. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-008-R-Rev3-2000. 8 May 2015.

Golder. 2015c. Surficial Geology and Quaternary Geological Overview of the Mt. Polley Tailings Storage Facility (TSF) Area, British Columbia. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-058-R-Rev0-2000. 6 July 2015.

Golder. 2015d. 2015 Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-061-R-RevB-2000. 7 July 2015.

Golder. 2015e. Elevation 970 m Embankment Stability Analysis and Buttress Design. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-059-R-Rev0-3000. 10 July 2015.

Golder. 2015f. 2015 Freshet Management Embankment As-Built Construction. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-065-R-Rev0-2000. 4 September 2015.

Golder. 2015g. Tailings Storage Facility Detailed Design to Elevation 970 m. Prepared for Mount Polley Mining Corporation. Golder Doc. No.1413803-074-R-Rev0-3000. 3 November 2015.

Golder. 2015h. Tailings Storage Facility Life of Mine Feasibility Design. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-072-R-Rev0-9000. 3 November 2015.

Golder. 2016a. Seismic Deformation Analysis of the Tailings Storage Facility at Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1413803-097-R-Rev0-10000. 16 June 2016.

Golder. 2016b. Mount Polley Mine – Long Term Water Management Plan. Permit Amendment Application under the Environmental Management Act: Technical Assessment Report. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-162-R-Rev0-16000. 17 October 2016.

Golder. 2016c Predictions of Hydrogeological Conditions near the Tailings Storage Facility during Closure – Long Term Technical Assessment Report – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-161-TM-Rev0-16000. 17 October 2016.

Golder. 2016d. Installation and Testing of New Monitoring Wells near the TSF, SERDS, Cariboo Pit and Wight Pit – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1662612-058-TM-RevB-53100. 23 December 2016.

Golder. 2017. 2016 TSF Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1662612-114-R-Rev0-51121. 10 March 2017.

Golder. 2019. 2018 TSF Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1662612-210-R-Rev0-51121. 8 March 2019.

Golder. 2021. 2020 Annual Environmental Report – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 21452039-011-R-Rev0-32131. 31 March 2021.

Golder. 2022a. 2021 Annual Dam Safety Inspection for Tailings Storage Facility Embankment. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 22514095-010-R-Rev0-52334. 29 March 2022.

Golder. 2022b. 2021 Annual Groundwater Monitoring Report – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 22514095-022-R-Rev0-32100. 31 March 2022.

Hashmi S, Plouffe A, and Ward BC. 2015. Surficial Geology, Bootjack Mountain Area, British Columbia, Parts of NTS 93-A/5, NTS 93-A/6, NTS 93-A/11, and NTS 93- A/12. Geological Survey of Canada, Canadian Geoscience Map 209 (Preliminary). British Columbia Geological Survey, Geoscience Map 2015-02. Scale 1:50,000.

Holland S. 1976. Landforms of British Columbia, A Physiographic Outline, Bulletin 48. B.C. Ministry of Energy, Mines and Petroleum Resources, pp. 138.

Hyndman RD, Wang K. 1995. The Rupture Zone of Cascadia Great Earthquakes from Current Deformation and the Thermal Regime, Journal of Geophysical Research, 100, No. 22, pp. 133-154.

IEEIRP (Independent Expert Engineering Investigation and Review Panel). 2015. Report on Mount Polley Tailings Storage Facility Breach. Prepared for BC Ministry of Energy and Mines. 30 January 2015.

IMC (Imperial Metals Corporation). 1990. Mount Polley Project. Stage 1 Environmental and Socioeconomic Impact Assessment. Volume I of II. Submitted to BC Mine Development Steering Committee. July 1990.

Karlsrud K, Hernandez-Martinez FG. 2013. Strength and Deformation Properties of Norwegian Clays from Laboratory Tests on High-Quality Block Samples. Canadian Geotechnical Journal 50:1273–1293 (2013).

KCB (Klohn Crippen Berger Ltd.). 2015a. Mount Polley Tailings Dam Failure – A Summary of Opinions in Support of CIM Investigation. Prepared for the Ministry of Energy and Mines. Doc. No. M09954A01.730. 24 August 2015.

KCB. 2015b. Mount Polley Dam Failure – Advanced Laboratory Testing Program Progress Report No. 4. Prepared for BC Ministry of Energy and Mines. Doc. No. M09954A02.730. 12 February 2015.

KCB. 2015c. Mount Polley Dam Failure – Site Investigation Progress Report No. 2. Prepared for BC Ministry of Energy and Mines. Doc. No. M09954A02.730. 21 January 2015.

Kennedy CB, Anglin CD. 2016. Geochemistry of Tailings from Mount Polley Mine, British Columbia. Proceedings Tailings and Mine Waste 2016, Keystone, Colorado, USA. 2-5 October 2016.

KP (Knight and Piésold Ltd.). 1990. Geotechnical and Tailings Disposal Studies. Feasibility Study, Volume 3 of 5, Appendix XI. Mount Polley Project, Williams Lake, BC. Wright Engineers Limited. Prepared for Imperial Metals Corporation. June 1990.

KP. 1995a. Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility. Prepared for Imperial Metals Corporation. Reference No. 1623/1. 14 March 1995.

KP. 1995b. Tailings Storage Facility Design Report Volume I – Main Report. Prepared for Imperial Metals Corporation. Reference No. 1625/1. 26 May 1995.

KP. 1996. Response to Review Comments on Tailings Embankment Design. Prepared for Imperial Metals Corporation. Reference No. 1625/6. 25 January 1996.

KP. 1997a. Report on Stage Ia/Ib Construction. Prepared for Mount Polley Mining Corporation. Reference No. 10162/7-5. 14 August 1997.

KP. 1997b. 1996 Groundwater Monitoring Well Installation Program. Prepared for Mount Polley Mining Corporation. Reference No. 1628/4. 7 February 1997.

KP. 1997c. Mount Polley Project – Tailings Storage Facility Updated Design Report. Prepared for Mount Polley Mining Corporation. Reference No. 1627/2. 6 June 1997.

KP. 1997d. Stage 2A Tailings Facility Construction Selected Excerpts from Reference Information. Prepared for Mount Polley Mining Corporation. Reference No. 10162/9-2. 6 November 1997.

KP. 1999. Mount Polley Mine Tailings Storage Facility Report on 1998 Construction and Annual Inspection. Prepared for Mount Polley Mining Corporation. Reference No. 11162/10 1. 16 June 1999.

KP. 2000. Mount Polley Mine Tailings Storage Facility Report on 1999 Construction. Prepared for Mount Polley Mining Corporation. Reference No. 11162/13 5. 30 August 2000.

KP. 2001. Mount Polley Mine Tailings Storage Facility Report on Stage 3 Construction. Prepared for Mount Polley Mining Corporation. Reference No. 11162/14-3. 19 October 2001.

KP. 2005. Mount Polley Mine Design of the Tailings Storage Facility to Ultimate Elevation. Prepared for Mount Polley Mining Corporation. 14 March 2005.

KP. 2007a. Mount Polley Mine Tailings Storage Facility Report on Stage 4 Construction. Prepared for Mount Polley Mining Corporation. Reference No. VA101-1/10-1. 13 March 2007.

KP. 2007b. Mount Polley Stage 6 TSF Design. Letter to Mr. Chris Carr, Geotechnical Mines Inspector, Ministry of Energy, Mines and Petroleum Resources. Reference No. VA101 1/18 A.01. 19 December 2007.

KP. 2009. Mount Polley Mine Tailings Storage Facility Report on Stage 6A Construction. Prepared for Mount Polley Mining Corporation. Reference No. VA101-1/23-1. 10 July 2009.

KP. 2011. Tailings Storage Facility Report on Stage 6B Construction. Prepared for Mount Polley Mining Corporation. Reference No. VA101-1/29-1. 25 January 2011.

Ladd CC, Foot R. 1974. New Design Procedure for Stability of Soft Clays. J. Geotech. Engrg. Div., ASCE, 100(7), 763-786.

Logan JM, Bath A, Mihalynuk MG, Rees CJ, Ullrich TD, Friedman R. 2007. Regional Geology of the Mount Polley Area, central British Columbia. Geological Survey of Canada, Geoscience Map 2007-1. Scale 1:50,000.

Lunne T, Berre T, Strandvik S. 1997. Sample Disturbance Effects in Soft Low Plastic Norwegian Clay. In: Proceedings of the Conference on Recent Developments in Soil and Pavement Mechanics, Rio de Janeiro, June 1997, pp. 81–102.

Mayne PW. 2001. Invited Keynote: Stress-Strain-Strength-Flow Parameters from Enhanced In-Situ Tests. Proceedings, International Conference on In-Situ Measurement of Soil Properties and Case Histories (In-Situ 2001), Bali, Indonesia, 27-47.

Mazzotti S, Dragert H, Henton J, Schmidt M, Hyndman R, James T, Lu Y, and Cramer M. 2003. Current Tectonics of Northern Cascadia from a Decade of GPS Measurements, Journal of Geophysical Research, 108, 2554.

McAndless P, Taylor C. 2006. Surficial Geology of the Mount Polley Property: Summary of 2005 Exploration Work. Prepared for Mount Polley Mining Corporation. 2 April 2006.

Monger JWH. 1989. Chapter 2 – Overview of Cordilleran Geology, in Ricketts BD. ed., Western Canada Sedimentary Basin, Canadian Association of Petroleum Geology (Special Paper S30), pp. 9–32.

Monger JWH, Price RA. 1979. Geodynamic Evolution of the Canadian Cordillera - Progress and Problems: Canadian Journal of Earth Sciences Volume 16 (3), pp. 770-791.

MPMC (Mount Polley Mining Corporation). 2021. 2020 Annual Environmental Report for the Mount Polley Mine. 31 March 2021.

Panteleyev A, Bailey DG, Bloodgood MA, Hancock KD. 1996. Geology and Mineral Deposits of the Quesnel River – Horsefly Map Area, Central Quesnel Trough, British Columbia. BC Ministry of Energy and Mines. Bulletin 97. Scale 1:100,000.

Price RA. 1994. Cordilleran Tectonics and the Evolution of the Western Canada Sedimentary Basin. In: The Geological Atlas of the Western Canada Sedimentary Basin, Chapter 2, Canadian Society of Petroleum Geologists; Editors: G.D. Mossop and I. Shetsen.

Price RA. 2000. The Evolution of the Southern Cordilleran Foreland Thrust and Fold Belt and the Kinematics of Cordilleran Orogenesis. In: Conference Proceedings, GeoCanada 2000, Symposium and Field Trip, University of Calgary, Alberta.

Ricketts BD. 2008. Cordilleran Sedimentary Basins of Western Canada Record 180 Million Years of Terrane Accretion: K.J. Hsü, Series Editor: Sedimentary Basins of the World, Volume 5, The Sedimentary Basins of the United States and Canada, Andrew D. Miall (Editor). Elsevier, pp. 363-394.

Rogers GC, Cassidy JF, Ellis RM. 1990. The Prince George, British Columbia Earthquake of 21 March 1986, Bulletin of the Seismological Society of America, 80, No. 5, pp. 1144-1161.

Skempton AW. 1954. The Pore Pressure Coefficients A and B. Geotechnique Volume 4, pp. 143-147.

Tweed F, Carrivick JL. 2015. Deglaciation and Proglacial Lakes. Geology Today. 31. 10.1111/gto.12094.

WSP Golder (Golder Associates Ltd., a member of WSP). 2022a. Climate Baseline Update. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 22514095-066-R-Rev0-31547. 30 August 2022.

WSP Golder. 2022b. 2021/2022 Tailings Storage Facility Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 22514095-011-R-Rev0-51300. 18 October 2022.

WSP. 2023a. Mount Polley Mine tailings Storage Facility Embankment Construction to Elevation 970 m – Downstream Embankment Re-Slope. Prepared for Mount Polley Mining Corporation. Ref No. 23590671-086-TM-Rev0-51300. 6 December 2023.

WSP. 2023b. Tailings Storage Facility Site Characterization Report. Prepared for Mount Polley Mining Corporation. Ref No. 22514095-034-R-Rev0-51392. 2 September 2023.

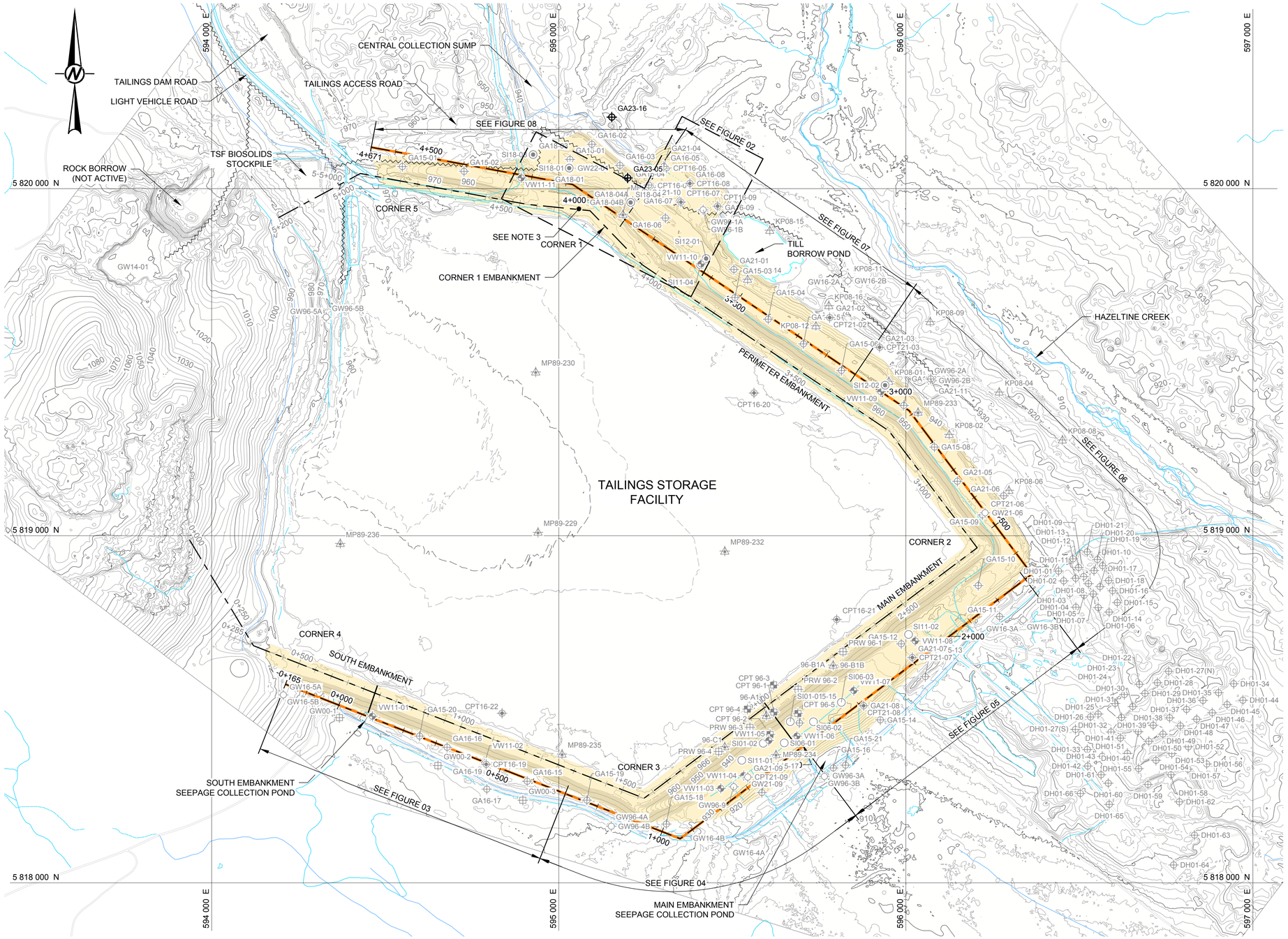
WSP. 2024a. 2023 Tailings Storage Facility Corner 1 Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Ref No. 23590671-094-R-Rev0-51691. 22 May 2024.

WSP. 2024b. 2023 Tailings Storage Facility Construction Record Report. Prepared for Mount Polley Mining Corporation. Ref No. CA0020527.4505-010-R-Rev0-52291. 28 March 2024.

WSP. 2024c. Supplementary Climate Change Information for Mount Polley Mine Site. Prepared for Mount Polley Mining Corporation. Ref No. CA0020527.4505-063-TM-RevA-31153. 11 October 2024.

WSP. 2025. Basis of Design and Design Criteria for Life of Mine Tailings Storage Facility Raise. Prepared for Mount Polley Mining Corporation. Ref No. CA0047730.8440-005TM-RevA-51293. 4 February 2025.

FIGURES



LEGEND

- SETOUT LINE - S.O.L. - ORIGINAL ALIGNMENT (SEE REFERENCE 1)
- TAILINGS STORAGE FACILITY (TSF) EMBANKMENT CENTERLINE
- GROUND CONTOURS (SEE REFERENCE 2)
- BATHYMETRY CONTOURS (SEE REFERENCE 3)
- STREAM (SEE REFERENCE 4)
- SITE ACCESS ROADS (SEE REFERENCE 4)
- GA23-01 — SONIC DRILLING, PIEZOMETER INSTALLATION - CORNER 1 EMBANKMENT (WSP, 2023)
- GA22-01 — SONIC DRILLING, PIEZOMETER INSTALLATION - CORNER 1 EMBANKMENT (GOLDER, 2022)
- GA21-10 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION - CORNER 1, PERIMETER AND MAIN EMBANKMENT (GOLDER, 2021)
- CPT21-09 — CPT - PERIMETER AND MAIN EMBANKMENT (GOLDER, 2021)
- GA18-01 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION - CORNER 1 (GOLDER, 2018)
- GA16-01 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION - CORNER 1 AND SOUTH EMBANKMENT (GOLDER, 2016)
- CPT16-04 — CPT - TAILINGS, CORNER 1 AND SOUTH EMBANKMENT (GOLDER, 2016)
- GW16-2A — SONIC DRILLING, MONITORING WELL INSTALLATION (GOLDER, 2016)
- GA15-01 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION (GOLDER, 2015)
- BGC-TP-2014 — TEST PIT (BGC / GOLDER, 2014)
- SI12-01 — ODEX, SI INSTALLATION - PERIMETER EMBANKMENT (AMEC, 2012)
- VW11-01 — SONIC DRILLING, PIEZOMETER INSTALLATION (AMEC, 2011)
- SI11-01 — SONIC DRILLING, SI INSTALLATION (AMEC, 2011)
- KP08-01 — SONIC DRILLING, SPT, BORROW PROGRAM (KP, 2008)
- SI06-01 — ODEX, SPT, SI INSTALLATION - MAIN EMBANKMENT (KP, 2006)
- SI01-01 — ODEX, SPT - MAIN EMBANKMENT (KP, 2001)
- DH01-01 — DRILLING, BORROW PROGRAM (KP, 2001)
- GW00-01 — ODEX, SPT, MONITORING WELL INSTALLATION - SOUTH EMBANKMENT (KP, 2000)
- CPT 96-1 — CPT - MAIN EMBANKMENT (KP / CONETEC, 1996)
- 96-A1 — SOLID/HOLLOW STEM AUGER, SPT, PIEZOMETER INSTALLATION - MAIN EMBANKMENT (KP / R.E. GRAHAM ENG., 1996)
- PRW96-01 — SOLID STEM AUGER, PRESSURE RELIEF WELL - MAIN EMBANKMENT (KP, 1996)
- GW96-1 — AIR ROTARY, SPT, MONITORING WELL INSTALLATION (KP, 1996)
- MP89-230 — CONDEMNATION BOREHOLES, PIEZOMETER INSTALLATION (KP, 1989)
- EMBANKMENT FOOTPRINT

GEOLOGICAL PROFILE REFERENCE LINE

GEOLOGICAL PROFILE STATION
GEOLOGICAL PROFILE REFERENCE LINE AND CHAINAGE
-0+165 0+... 4+671

0 200 400
1:6,000 METRES

THIS FIGURE IS INTENDED FOR CLIENT'S ONE TIME USE ONLY AND IT IS NOT INTENDED OR REPRESENTED BY WSP TO BE SUITABLE FOR REUSE BY ANY PARTY, INCLUDING, BUT NOT LIMITED TO, THE CLIENT, ITS EMPLOYEES, AGENTS, SUBCONTRACTORS OR SUBSEQUENT OWNERS ON ANY EXTENSION OF A SPECIFIC PROJECT OR FUTURE PROJECTS, WHETHER CLIENT'S OR OTHERWISE, WITHOUT WSP'S PRIOR WRITTEN PERMISSION. ANY MANIPULATION, ADAPTATION, MODIFICATION, ALTERATION, MISUSE OR REUSE UNAUTHORIZED BY WSP WILL BE AT CLIENT'S SOLE RISK. WSP EXPRESSLY DISCLAIMS ALL LIABILITY AGAINST ALL THIRD PARTIES RELYING, USING OR MAKING DECISIONS ON THIS FIGURE. THIRD PARTIES DO SO AT THEIR OWN RISK, EXCEPT WHERE WRITTEN AGREEMENT STATES OTHERWISE, THIS FIGURE IS THE PROPERTY OF WSP CANADA INC.

NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES AND ELEVATIONS SHOWN ARE REFERENCED TO TAILINGS GRID.
3. THE FORENSIC INVESTIGATION BOREHOLES NEAR CORNER 1 (FROM 2014) ARE NOT SHOWN ON THE FIGURE FOR CLARITY, REFER TO FIGURE 02.
4. THE FOLLOWING DRILLING INVESTIGATIONS ARE NOT SHOWN ON THE FIGURE FOR CLARITY: DH97-BA (KP 1997c), DH97-BA2 (IEERP 2015), DH98-BA2 (IEERP 2015), DH98-BA4 (IEERP 2015), DH98-BL (KP 1999), PRW98 (KP 1999), BH99 (KP 1999), AND DH99 (KP 2000).
5. BOREHOLES GA23-05 AND GA23-16 (WSP 2023) ARE PRESENTED IN THIS FIGURE. OTHER BOREHOLES COMPLETED AS PART OF THE 2023 DRILLING INVESTIGATION ARE PRESENTED IN FIGURE 02.
6. TEST PIT INVESTIGATIONS ARE NOT SHOWN ON THE FIGURE FOR CLARITY.

REFERENCES

1. S.O.L - ORIGINAL ALIGNMENT PROVIDED BY BGC ENGINEERING INC., DRAWING No. 01, DRAWING TITLE, "SI PLANNING PLAN MAP", PROJECT No. P14178, FILE NAME: "ACAD-01.dwg", DATED: SEPTEMBER 2014.
2. GROUND SURVEY PROVIDED BY MPMC, FILE NAME: "Tailings_Points_1m_18.10.2019.laz", SURVEYED: 18 OCTOBER 2019, RECEIVED: 09 FEBRUARY 2020.
3. BATHYMETRY CONTOURS PROVIDED BY MPMC, FILE NAME: "200617 sound.csv", SURVEYED: 17 JUNE 2020, RECEIVED: 23 JUNE 2020,
4. EXISTING SITE FEATURES PROVIDED BY MPMC, FILE NAME: "MtPolley2013-Pln.dwg", RECEIVED: 5 SEPTEMBER 2014, AND FILE NAME: "211012 SERD Site Plan.dxf", RECEIVED: 12 OCTOBER 2021.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-13
DESIGNED	AB
PREPARED	JSH
REVIEWED	JF
APPROVED	GPS

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
OVERVIEW BOREHOLE LOCATION PLAN

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	1	01

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

0 25mm

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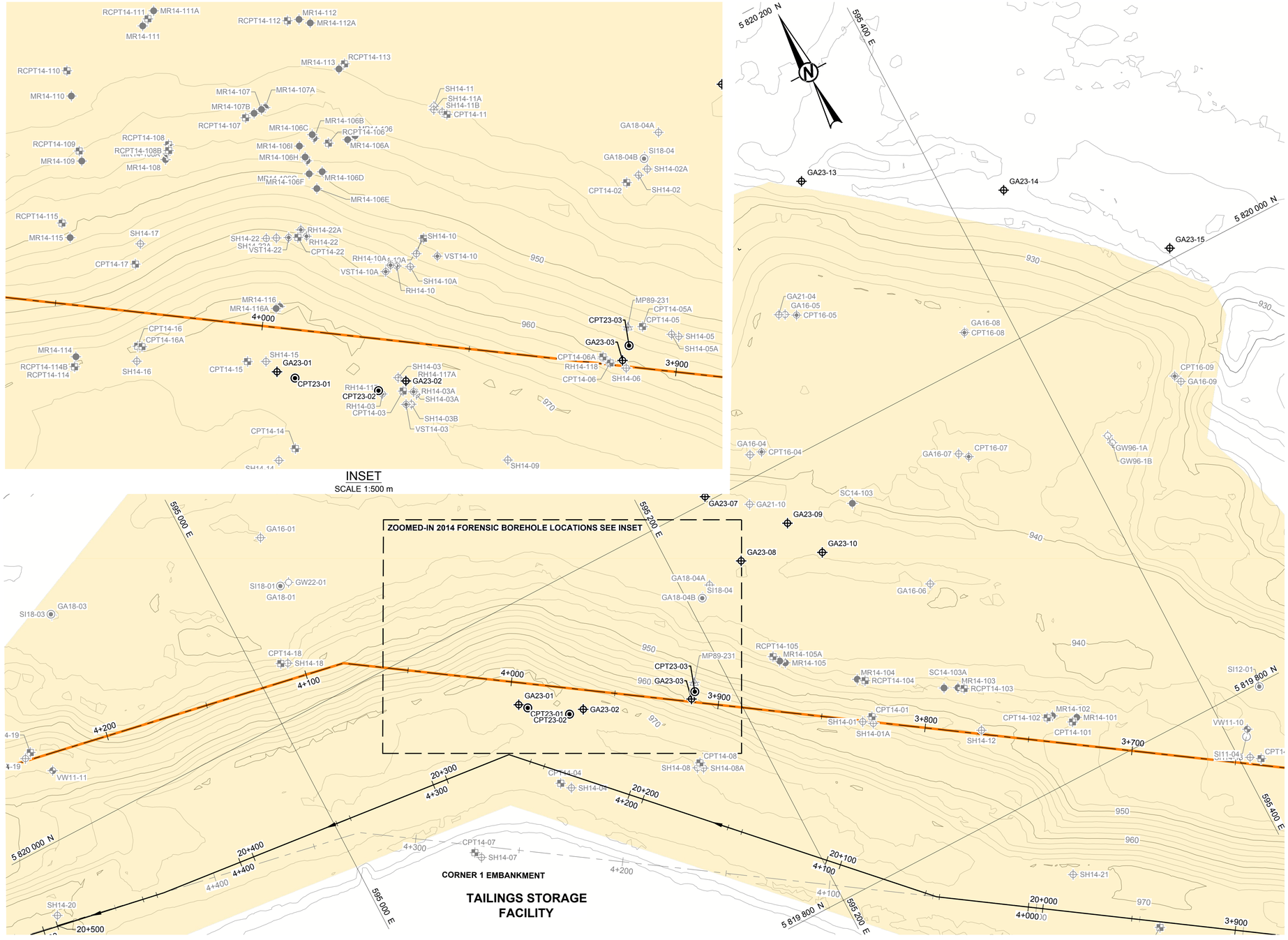
SCALE 1:500 m



CORNER 1 EMBANKMENT

TAILINGS STORAGE FACILITY

NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES AND ELEVATIONS SHOWN ARE REFERENCED TO TAILINGS GRID.
3. GA23-16 IS NOT DISPLAYED ON THIS PLAN FOR CLARITY.
4. GA23-05 IS NOT DISPLAYED ON THIS PLAN FOR CLARITY.
5. TEST PIT INVESTIGATIONS ARE NOT SHOWN ON THE FIGURE FOR CLARITY.

REFERENCES

1. S.O.L - ORIGINAL ALIGNMENT PROVIDED BY BGC ENGINEERING INC., DRAWING No. 01, DRAWING TITLE, "SI PLANNING PLAN MAP", PROJECT No. P14178, FILE NAME: "ACAD-01.dwg", DATED: SEPTEMBER 2014.
2. GROUND SURVEY PROVIDED BY MPMC, FILE NAME: "Tailings_Points_1m_18.10.2019.laz", SURVEYED: 18 OCTOBER 2019, RECEIVED: 09 FEBRUARY 2020.

LEGEND

- 3+800 — GEOLOGICAL PROFILE REFERENCE LINE AND CHAINAGE
- 20+200 — CORNER 1 PERIMETER EMBANKMENT ALIGNMENT
- 4+400 — SETOUT LINE - S.O.L. - ORIGINAL ALIGNMENT (SEE REFERENCE 1)
- 4+400 — TAILINGS STORAGE FACILITY (TSF) EMBANKMENT CENTERLINE
- GROUND CONTOURS (SEE REFERENCE 2)
- CPT23-03 — CPT - CORNER 1 EMBANKMENT (WSP, 2023)
- GA23-01 — SONIC DRILLING, PIEZOMETER INSTALLATION - CORNER 1 EMBANKMENT (WSP, 2023)
- GA22-01 — SONIC DRILLING, PIEZOMETER INSTALLATION - CORNER 1 EMBANKMENT (GOLDER, 2022)
- GA21-10 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION - CORNER 1, PERIMETER AND MAIN EMBANKMENT (GOLDER, 2021)
- GA18-01 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION - CORNER 1 (GOLDER, 2018)
- GA16-01 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION - CORNER 1 AND SOUTH EMBANKMENT (GOLDER, 2016)
- CPT16-04 — CPT - TAILINGS, CORNER 1 AND SOUTH EMBANKMENT (GOLDER, 2016)
- CPT14-101 / RCPT14-103 — CPT - CORNER 1 EMBANKMENT (THE PANEL, 2014)
- CPT14-01 — CPT - CORNER 1 EMBANKMENT (KCB, 2014)
- SH14-10 — SONIC DRILLING, SI, SAA, AND PIEZOMETER INSTALLATION - CORNER 1 EMBANKMENT (KCB, 2014)
- RH14-03 / VST 14-03 — MUD ROTARY, PIEZOMTER INSTALLATION - CORNER 1 EMBANKMENT (KCB, 2014)
- MR14-104 / SC14-103 / RH14-117 — MUD ROTARY - CORNER 1 EMBANKMENMT (THE PANEL, 2014)
- SI12-01 — ODEX, SI INSTALLATION - PERIMETER EMBANKMENT (AMEC, 2012)
- SI11-01 — SONIC DRILLING, SI INSTALLATION (AMEC, 2011)
- VW11-01 — SONIC DRILLING, PIEZOMETER INSTALLATION (AMEC, 2011)
- GW96-1 — AIR ROTARY, SPT, MONITORING WELL INSTALLATION (KP, 1996)
- MP89-230 — CONDEMNATION BOREHOLES, PIEZOMETER INSTALLATION (KP, 1989)
- EMBANKMENT FOOTPRINT

0 20 40
1:500 METRES

0 50 100
1:1,000 METRES

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CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-13
DESIGNED	AB
PREPARED	JSH
REVIEWED	JF
APPROVED	GPS

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
CORNER 1 EMBANKMENT BOREHOLE LOCATION PLAN

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	1	02

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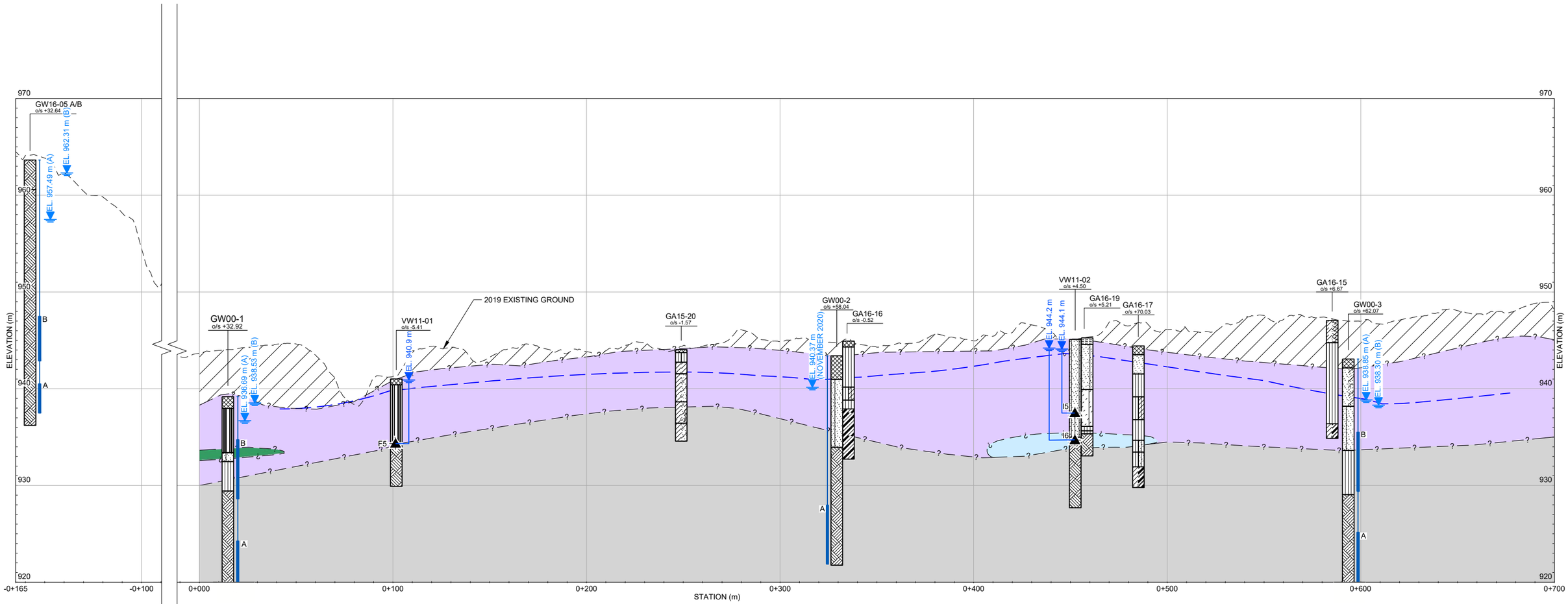

PROFILE - STA. -0+165 m TO 0+700 m

HORIZ. SCALE 1:2,000 m
VERT. SCALE 1:400 m

LEGEND

2019 EXISTING GROUND SURFACE — INFERRED STRATIGRAPHIC CONTACT
INFERRED WATER TABLE (PHREATIC SURFACE)

TEST HOLE LEGEND

BH19-02
o/s -88.59

DENOTES TEST HOLE TYPE, INVESTIGATION YEAR AND ID NUMBER
DENOTES PERPENDICULAR DISTANCE FROM TEST HOLE TO SECTION LINE IN METRES
GROUNDWATER LEVEL / PIEZOMETRIC HEAD IN NOVEMBER / DECEMBER 2021
EXISTING VIBRATING WIRE PIEZOMETER
MONITORING WELL SCREEN
TEST HOLE RECORD SHOWING SOIL CONDITIONS
(FOR DETAILED GEOTECHNICAL INFORMATION REFER TO RECORD OF BOREHOLE)

NOT USED FOR THE GEOLOGICAL PROFILE BOUNDARIES SYMBOLS SUMMARY

*	REVIEWED BOREHOLE LOG DATA ONLY. BOREHOLE LOG NOT USED FOR CREATING STRATIGRAPHIC BOUNDARIES.
**	BOREHOLE LOG DID NOT PROVIDE SUFFICIENT GEOLOGICAL DETAIL FOR INCLUSION IN STRATIGRAPHIC INTERPRETATION.

SOIL LITHOLOGY

FILL, PT - PEAT, OL - ORGANIC SILT, OH - ORGANIC SILT, CL - SILTY CLAY, TOPSOIL, CI - SILTY CLAY, CH - CLAY, MH - CLAYEY SILT, ML - CLAYEY SILT OR SILT, ASPHALT, SC - CLAYEY SAND, SW - WELL GRADED SAND, SM - SILTY SAND, SP - POORLY GRADED SAND, GC - CLAYEY GRAVEL, GM - SILTY GRAVEL, GP - POORLY GRADED GRAVEL, GW - WELL GRADED GRAVEL, BEDROCK

SOIL STRATIGRAPHY

FILL, ABLATION TILL, GLACIOLACUSTRINE SUB-UNIT, BASAL TILL, GLACIOFLUVIAL SUB-UNIT (SAND DOMINATED), GLACIOFLUVIAL SUB-UNIT (GRAVEL DOMINATED)

BEDROCK / WEATHERED BEDROCK

BEDROCK / WEATHERED BEDROCK

NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND MAY VARY FROM THAT SHOWN.
3. VARIOUS COMBINATIONS OF THE SYMBOLS HAVE BEEN USED TO REPRESENT TRANSITIONAL MATERIALS OR RANGES OF MATERIALS WITHIN A STRATUM.
4. PREFERENCE WAS GIVEN TO INCORPORATING GEOLOGIC DATA FROM BOREHOLES LOCATED CLOSE TO THE CROSS-SECTION LINES AND TO BOREHOLES THAT HAD THE MOST DETAILED GEOLOGIC DESCRIPTIONS OF THE SUBSURFACE CONDITIONS ENCOUNTERED. BOREHOLES THAT WERE FARTHER FROM CROSS-SECTION LINES WERE REVIEWED FOR GEOLOGICAL CORRELATION CRITERIA, INCLUDING INFORMATION ON THE SPECIFIC STRATIGRAPHIC SEQUENCE AND ELEVATIONS OF CONTACTS BETWEEN THE DIFFERENT GEOLOGIC UNITS. BOREHOLES WITH SIGNIFICANT LATERAL OFFSET FROM THE LINES OF CROSS-SECTION WERE GENERALLY OMITTED GIVEN THE HIGH DEGREE OF UNCERTAINTY IN PROJECTION OF THE DATA.

REFERENCE

1. EXISTING GROUND SURVEY PROVIDED BY MPMC,
FILE NAME: "Tailings_Points_1m_18.10.2019.laz", SURVEYED: 18 OCTOBER 2019, RECEIVED: 09 FEBRUARY 2020.

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0 10 20
VERT. SCALE 1:400 METRES

0 50 100
HORIZ. SCALE 1:2,000 METRES

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2023-07-25
DESIGNED	RG/CL
PREPARED	AW
REVIEWED	JF
APPROVED	GP

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
SURFICIAL GEOLOGY PROFILE (1 OF 6)
STA. -0+165 TO 0+700

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

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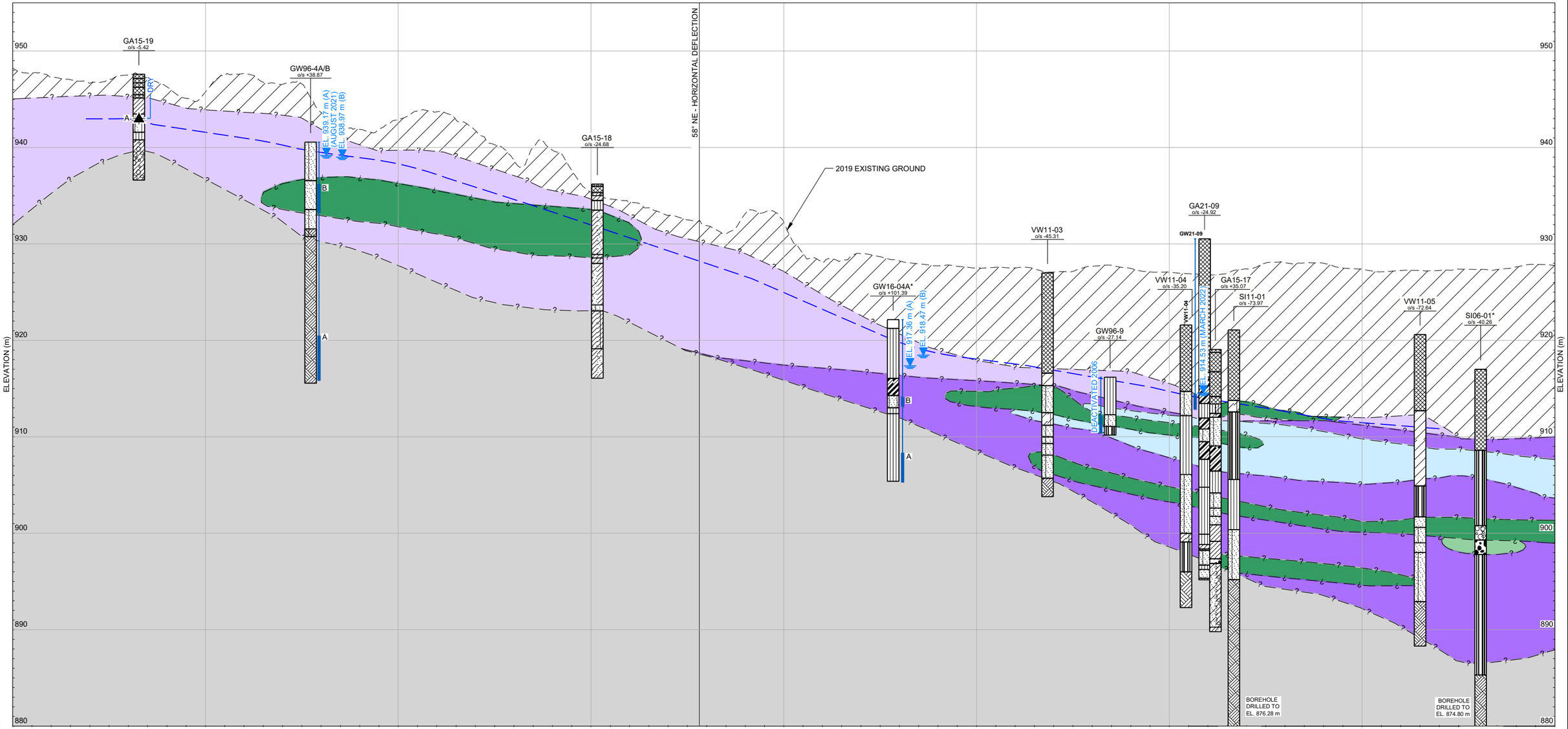

LEGEND

2019 EXISTING GROUND SURFACE — INFERRED STRATIGRAPHIC CONTACT

INFERRED WATER TABLE (PHREATIC SURFACE)

TEST HOLE LEGEND

BH19-02 — DENOTES TEST HOLE TYPE, INVESTIGATION YEAR AND ID NUMBER

o/s -88.59 — DENOTES PERPENDICULAR DISTANCE FROM TEST HOLE TO SECTION LINE IN METRES

GROUNDWATER LEVEL / PIEZOMETRIC HEAD IN NOVEMBER / DECEMBER 2021

EXISTING VIBRATING WIRE PIEZOMETER

MONITORING WELL SCREEN

TEST HOLE RECORD SHOWING SOIL CONDITIONS

(FOR DETAILED GEOTECHNICAL INFORMATION REFER TO RECORD OF BOREHOLE)

NOT USED FOR THE GEOLOGICAL PROFILE BOUNDARIES SYMBOLS SUMMARY

*	REVIEWED BOREHOLE LOG DATA ONLY. BOREHOLE LOG NOT USED FOR CREATING STRATIGRAPHIC BOUNDARIES.
**	BOREHOLE LOG DID NOT PROVIDE SUFFICIENT GEOLOGICAL DETAIL FOR INCLUSION IN STRATIGRAPHIC INTERPRETATION.

SOIL LITHOLOGY

FILL	TOPSOIL	ASPHALT	GC - CLAYEY GRAVEL
PT - PEAT	CI - SILTY CLAY	SC - CLAYEY SAND	GM - SILTY GRAVEL
OL - ORGANIC SILT	CH - CLAY	SW - WELL GRADED SAND	GP - POORLY GRADED GRAVEL
OH - ORGANIC SILT	MH - CLAYEY SILT	SM - SILTY SAND	GW - WELL GRADED GRAVEL
CL - SILTY CLAY	ML - CLAYEY SILT OR SILT	SP - POORLY GRADED SAND	BEDROCK

SOIL STRATIGRAPHY

FILL	GLACIOLACUSTRINE SUB-UNIT	GLACIOFLUVIAL SUB-UNIT (SAND DOMINATED)
ABLATION TILL	BASAL TILL	GLACIOFLUVIAL SUB-UNIT (GRAVEL DOMINATED)

BEDROCK / WEATHERED BEDROCK

BEDROCK / WEATHERED BEDROCK

NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND MAY VARY FROM THAT SHOWN.
3. VARIOUS COMBINATIONS OF THE SYMBOLS HAVE BEEN USED TO REPRESENT TRANSITIONAL MATERIALS OR RANGES OF MATERIALS WITHIN A STRATUM.
4. PREFERENCE WAS GIVEN TO INCORPORATING GEOLOGIC DATA FROM BOREHOLES LOCATED CLOSE TO THE CROSS-SECTION LINES AND TO BOREHOLES THAT HAD THE MOST DETAILED GEOLOGIC DESCRIPTIONS OF THE SUBSURFACE CONDITIONS ENCOUNTERED. BOREHOLES THAT WERE FARTHER FROM CROSS-SECTION LINES WERE REVIEWED FOR GEOLOGICAL CORRELATION CRITERIA, INCLUDING INFORMATION ON THE SPECIFIC STRATIGRAPHIC SEQUENCE AND ELEVATIONS OF CONTACTS BETWEEN THE DIFFERENT GEOLOGIC UNITS. BOREHOLES WITH SIGNIFICANT LATERAL OFFSET FROM THE LINES OF CROSS-SECTION WERE GENERALLY OMITTED GIVEN THE HIGH DEGREE OF UNCERTAINTY IN PROJECTION OF THE DATA.

REFERENCE

1. EXISTING GROUND SURVEY PROVIDED BY MPMC,
FILE NAME: "Tailings_Points_1m_18.10.2019.laz", SURVEYED: 18 OCTOBER 2019, RECEIVED: 09 FEBRUARY 2020.

PROFILE - STA. 0+700 m TO 1+500 m

HORIZ. SCALE 1:2,000 m

VERT. SCALE 1:400 m

THIS FIGURE IS INTENDED FOR CLIENT'S ONE TIME USE ONLY AND IT IS NOT INTENDED OR REPRESENTED BY WSP TO BE SUITABLE FOR REUSE BY ANY PARTY, INCLUDING, BUT NOT LIMITED TO, THE CLIENT, ITS EMPLOYEES, AGENTS, SUBCONTRACTORS OR SUBSEQUENT OWNERS ON ANY EXTENSION OF A SPECIFIC PROJECT OR FUTURE PROJECTS, WHETHER CLIENTS OR OTHERWISE, WITHOUT WSP'S PRIOR WRITTEN PERMISSION. ANY MANIPULATION, ADAPTATION, MODIFICATION, ALTERATION, MISUSE OR REUSE UNAUTHORIZED BY WSP WILL BE AT CLIENT'S SOLE RISK. WSP EXPRESSLY DISCLAIMS ALL LIABILITY AGAINST ALL THIRD PARTIES RELYING, USING OR MAKING DECISIONS ON THIS FIGURE. THIRD PARTIES DO SO AT THEIR OWN RISK, EXCEPT WHERE WRITTEN AGREEMENT STATES OTHERWISE, THIS FIGURE IS THE PROPERTY OF WSP.

0 10 20
VERT. SCALE 1:400 METRES

0 50 100
HORIZ. SCALE 1:2,000 METRES

CLIENT

MOUNT POLLEY MINING CORPORATION

CONSULTANT

wsp

YYYY-MM-DD	2023-07-25
DESIGNED	RG/CL
PREPARED	AW
REVIEWED	JF
APPROVED	GP

PROJECT

MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE

SURFICIAL GEOLOGY PROFILE (2 OF 6)
STA. 0+700 TO 1+500

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	0	04

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

25 mm

0

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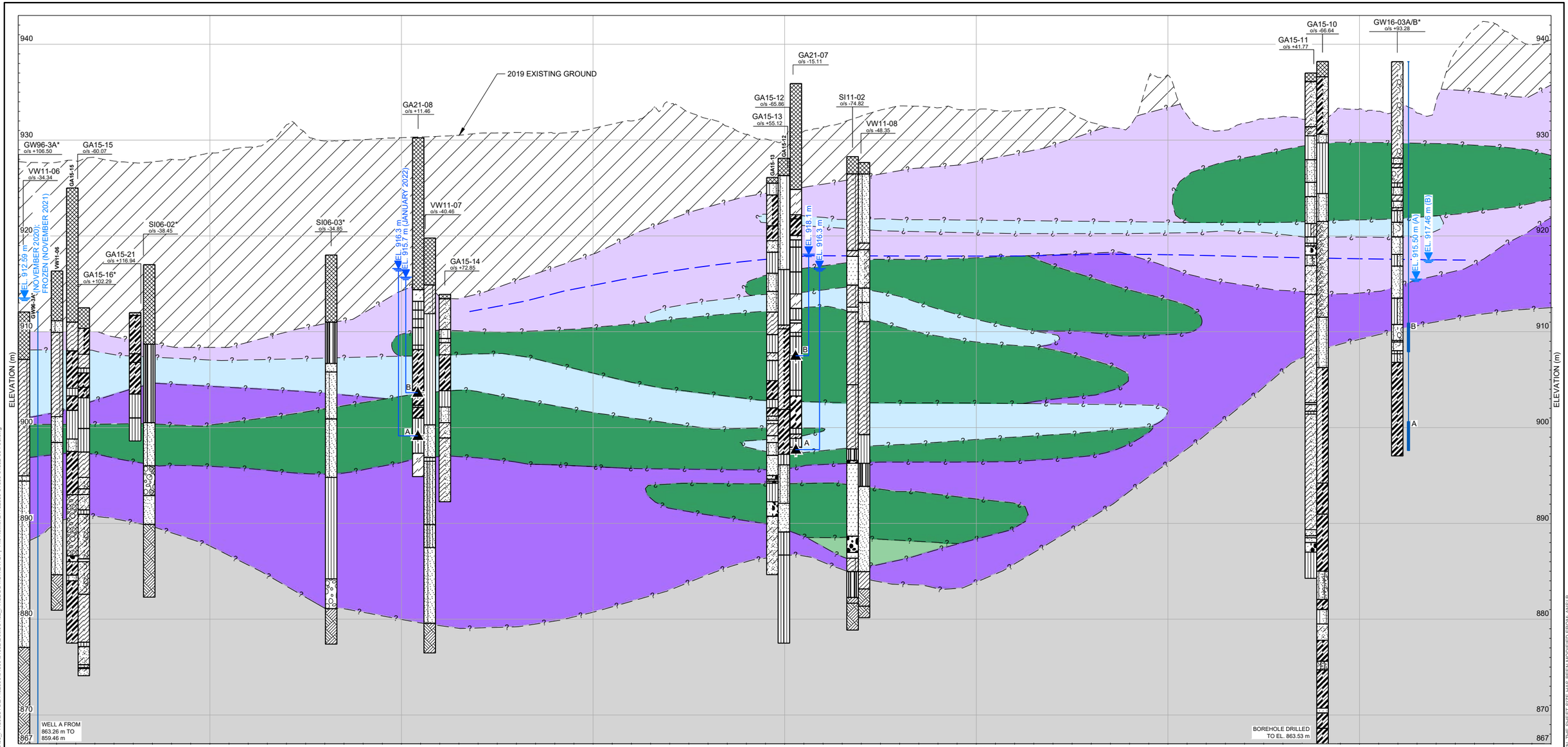

LEGEND

2019 EXISTING GROUND SURFACE — INFERRED STRATIGRAPHIC CONTACT

INFERRED WATER TABLE (PHREATIC SURFACE)

TEST HOLE LEGEND

BH19-02 o/s -88.59

- DENOTES TEST HOLE TYPE, INVESTIGATION YEAR AND ID NUMBER
- DENOTES PERPENDICULAR DISTANCE FROM TEST HOLE TO SECTION LINE IN METRES
- GROUNDWATER LEVEL / PIEZOMETRIC HEAD IN NOVEMBER / DECEMBER 2021
- EXISTING VIBRATING WIRE PIEZOMETER
- MONITORING WELL SCREEN
- TEST HOLE RECORD SHOWING SOIL CONDITIONS (FOR DETAILED GEOTECHNICAL INFORMATION REFER TO RECORD OF BOREHOLE)

NOT USED FOR THE GEOLOGICAL PROFILE BOUNDARIES SYMBOLS SUMMARY

*	REVIEWED BOREHOLE LOG DATA ONLY. BOREHOLE LOG NOT USED FOR CREATING STRATIGRAPHIC BOUNDARIES.
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SOIL LITHOLOGY

FILL	TOPSOIL	ASPHALT	GC - CLAYEY GRAVEL
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CL - SILTY CLAY	ML - CLAYEY SILT OR SILT	SP - POORLY GRADED SAND	BEDROCK

SOIL STRATIGRAPHY

FILL	GLACIOLACUSTRINE SUB-UNIT	GLACIOFLUVIAL SUB-UNIT (SAND DOMINATED)
ABLATION TILL	BASAL TILL	GLACIOFLUVIAL SUB-UNIT (GRAVEL DOMINATED)

BEDROCK / WEATHERED BEDROCK

BEDROCK / WEATHERED BEDROCK

NOTES

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REFERENCE

1. EXISTING GROUND SURVEY PROVIDED BY MPMC, FILE NAME: "Tailings_Points_1m_18.10.2019.laz", SURVEYED: 18 OCTOBER 2019, RECEIVED: 09 FEBRUARY 2020.

PROFILE - STA. 1+500 m TO 2+300 m

HORIZ. SCALE 1:2,000 m
VERT. SCALE 1:400 m

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0 10 20
VERT. SCALE 1:400 METRES

0 50 100
HORIZ. SCALE 1:2,000 METRES

CLIENT: MOUNT POLLEY MINING CORPORATION

CONSULTANT: wsp

YYYY-MM-DD	2023-07-25
DESIGNED	RG/CL
PREPARED	AW
REVIEWED	JF
APPROVED	GP

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
SURFICIAL GEOLOGY PROFILE (3 OF 6)
STA. 1+500 TO 2+300

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	0	05

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

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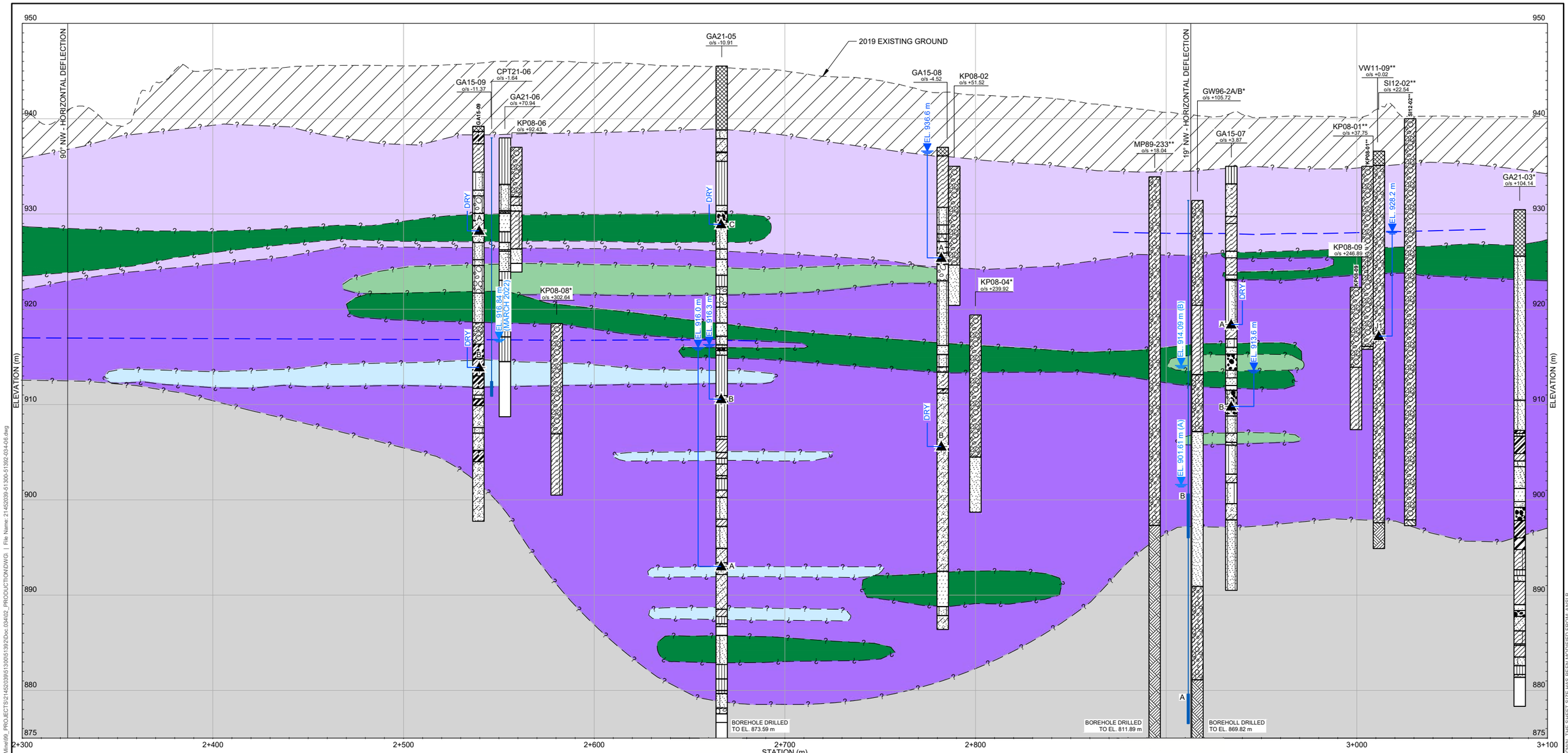
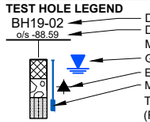


LEGEND

- 2019 EXISTING GROUND SURFACE
- INFERRED STRATIGRAPHIC CONTACT
- INFERRED WATER TABLE (PHREATIC SURFACE)

TEST HOLE LEGEND



- DENOTES TEST HOLE TYPE, INVESTIGATION YEAR AND ID NUMBER
- DENOTES PERPENDICULAR DISTANCE FROM TEST HOLE TO SECTION LINE IN METRES
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- MONITORING WELL SCREEN
- TEST HOLE RECORD SHOWING SOIL CONDITIONS (FOR DETAILED GEOTECHNICAL INFORMATION REFER TO RECORD OF BOREHOLE)

NOT USED FOR THE GEOLOGICAL PROFILE BOUNDARIES SYMBOLS SUMMARY

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SOIL LITHOLOGY

- FILL
- PT - PEAT
- OL - ORGANIC SILT
- OH - ORGANIC SILT
- CL - SILTY CLAY
- TOPSOIL
- CI - SILTY CLAY
- CH - CLAY
- MH - CLAYEY SILT
- ML - CLAYEY SILT OR SILT
- ASPHALT
- SC - CLAYEY SAND
- SW - WELL GRADED SAND
- SM - SILTY SAND
- SP - POORLY GRADED SAND
- GC - CLAYEY GRAVEL
- GM - SILTY GRAVEL
- GP - POORLY GRADED GRAVEL
- GW - WELL GRADED GRAVEL
- BEDROCK

SOIL STRATIGRAPHY

- FILL
- ABLATION TILL
- GLACIOLACUSTRINE SUB-UNIT
- BASAL TILL
- GLACIOFLUVIAL SUB-UNIT (SAND DOMINATED)
- GLACIOFLUVIAL SUB-UNIT (GRAVEL DOMINATED)

BEDROCK / WEATHERED BEDROCK

- BEDROCK / WEATHERED BEDROCK

NOTES

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REFERENCE

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PROFILE - STA. 2+300 m TO 3+100 m

HORIZ. SCALE 1:2,000 m
VERT. SCALE 1:400 m

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0 10 20
VERT. SCALE 1:400 METRES

0 50 100
HORIZ. SCALE 1:2,000 METRES

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2023-07-25
DESIGNED	RG/CL
PREPARED	AW
REVIEWED	JF
APPROVED	GP

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
SURFICIAL GEOLOGY PROFILE (4 OF 6)
STA. 2+300 TO 3+100

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	0	06

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

0 25 mm

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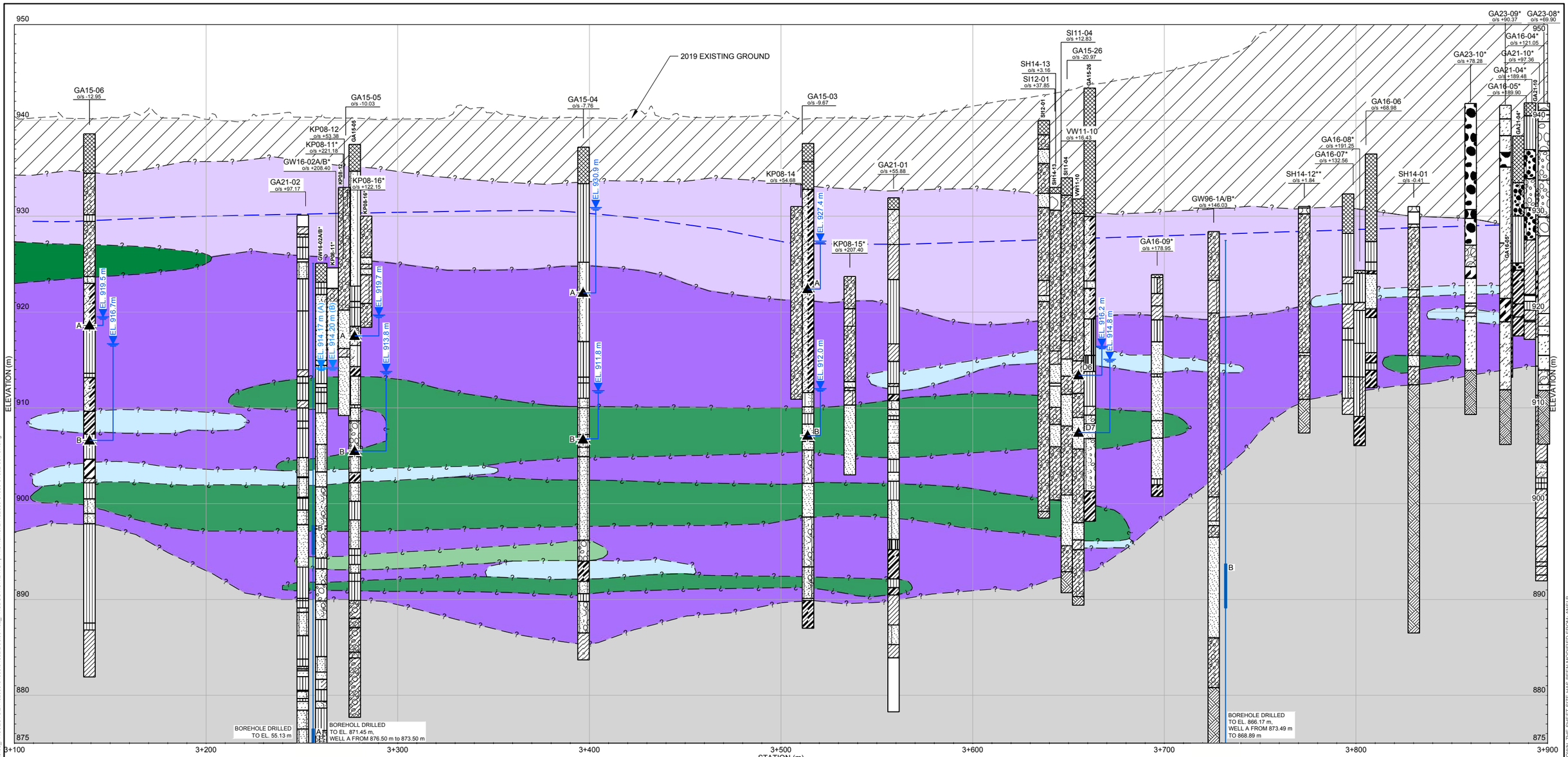

LEGEND

- 2023 EXISTING GROUND SURFACE
- —?— INFERRED STRATIGRAPHIC CONTACT
- INFERRED WATER TABLE (PHREATIC SURFACE)

TEST HOLE LEGEND

BH19-02 — DENOTES TEST HOLE TYPE, INVESTIGATION YEAR AND ID NUMBER
o/s -88.59 — DENOTES PERPENDICULAR DISTANCE FROM TEST HOLE TO SECTION LINE IN METRES
GROUNDWATER LEVEL / PIEZOMETRIC HEAD IN NOVEMBER / DECEMBER 2021
EXISTING VIBRATING WIRE PIEZOMETER
MONITORING WELL SCREEN
TEST HOLE RECORD SHOWING SOIL CONDITIONS (FOR DETAILED GEOTECHNICAL INFORMATION REFER TO RECORD OF BOREHOLE)

NOT USED FOR THE GEOLOGICAL PROFILE BOUNDARIES SYMBOLS SUMMARY

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SOIL LITHOLOGY

- FILL
- PT - PEAT
- OL - ORGANIC SILT
- OH - ORGANIC SILT
- CL - SILTY CLAY
- TOPSOIL
- CI - SILTY CLAY
- CH - CLAY
- MH - CLAYEY SILT
- ML - CLAYEY SILT OR SILT
- ASPHALT
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- GC - CLAYEY GRAVEL
- GM - SILTY GRAVEL
- GP - POORLY GRADED GRAVEL
- GW - WELL GRADED GRAVEL
- BEDROCK

SOIL STRATIGRAPHY

- FILL
- ABLATION TILL
- GLACIOLACUSTRINE SUB-UNIT
- BASAL TILL
- GLACIOFLUVIAL SUB-UNIT (SAND DOMINATED)
- GLACIOFLUVIAL SUB-UNIT (GRAVEL DOMINATED)

BEDROCK / WEATHERED BEDROCK

- BEDROCK / WEATHERED BEDROCK

NOTES

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REFERENCE

1. 2023 TOPOGRAPHY PROVIDED BY MPMC AS 0.1 m CONTOUR DATA, SURVEYED: 30 OCTOBER 2023; RECEIVED: 01 FEBRUARY 2024; FILE NAME: 231030-TSF Lidar Contor 0.1.dxf" .

PROFILE - STA. 3+100 m TO 3+900 m

HORIZ. SCALE 1:2,000 m
VERT. SCALE 1:400 m

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0 10 20
VERT. SCALE 1:400 METRES
0 50 100
HORIZ. SCALE 1:2,000 METRES

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-13
DESIGNED	RG/CL
PREPARED	JSH
REVIEWED	CL
APPROVED	GPS

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
SURFICIAL GEOLOGY PROFILE (5 OF 6)
STA. 3+100 TO 3+900

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	1	07

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

0 25 mm

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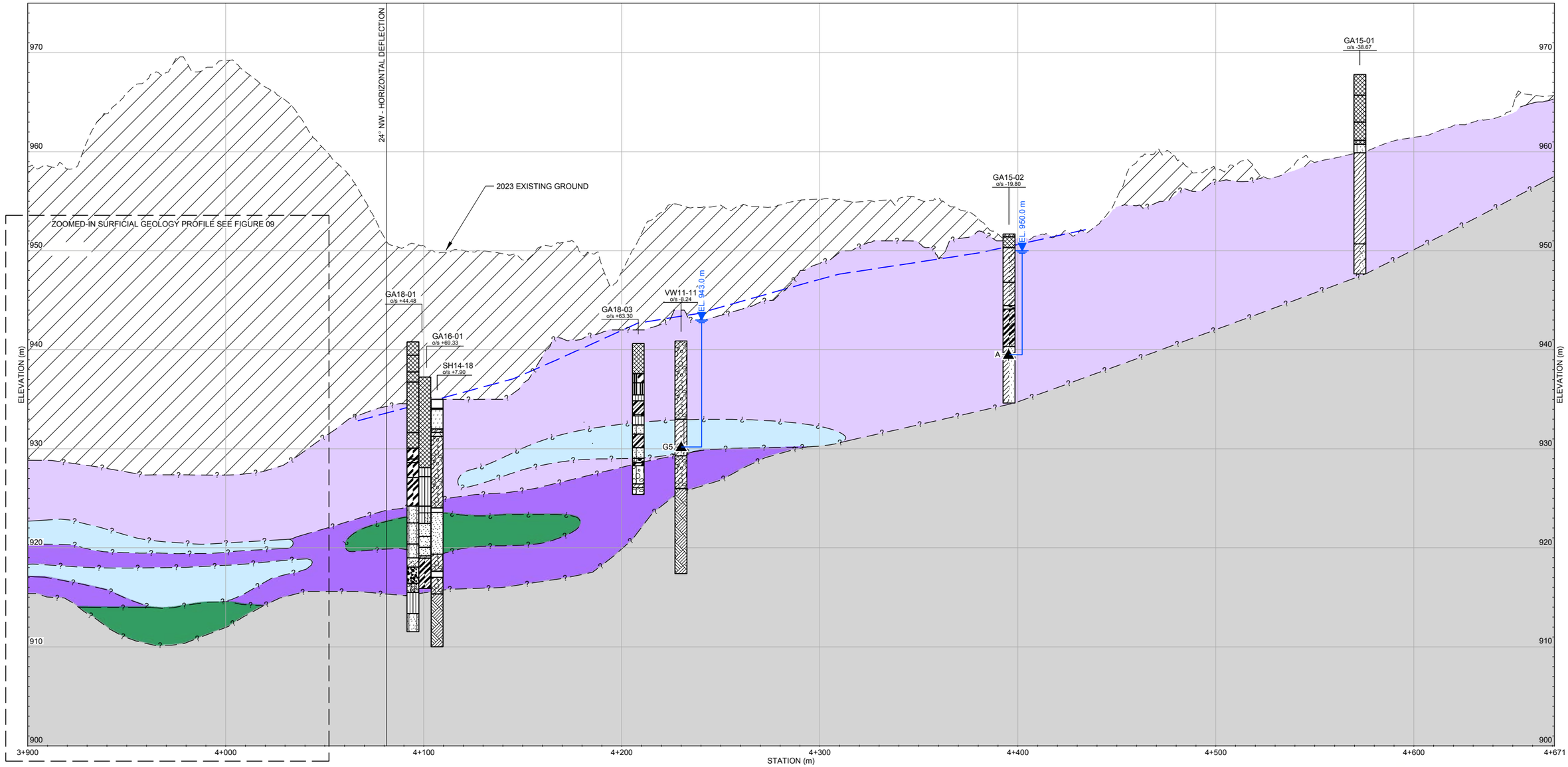

LEGEND

- 2023 EXISTING GROUND SURFACE
- INFERRED STRATIGRAPHIC CONTACT
- INFERRED WATER TABLE (PHREATIC SURFACE)

TEST HOLE LEGEND

BH19-02 o/s -88.59

- DENOTES TEST HOLE TYPE, INVESTIGATION YEAR AND ID NUMBER
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- SP - POORLY GRADED SAND
- GC - CLAYEY GRAVEL
- GM - SILTY GRAVEL
- GP - POORLY GRADED GRAVEL
- GW - WELL GRADED GRAVEL
- BEDROCK

SOIL STRATIGRAPHY

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- GLACIOLACUSTRINE SUB-UNIT
- BASAL TILL
- GLACIOFLUVIAL SUB-UNIT (SAND DOMINATED)
- GLACIOFLUVIAL SUB-UNIT (GRAVEL DOMINATED)

BEDROCK / WEATHERED BEDROCK

- BEDROCK / WEATHERED BEDROCK

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PROFILE - STA. 3+900 m TO 4+671 m

HORIZ. SCALE 1:2,000 m
VERT. SCALE 1:400 m

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0 10 20
VERT. SCALE 1:400 METRES

0 50 100
HORIZ. SCALE 1:2,000 METRES

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-13
DESIGNED	RG/CL
PREPARED	JSH
REVIEWED	CL
APPROVED	GPS

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
SURFICIAL GEOLOGY PROFILE (6 OF 6)
STA. 3+900 TO 4+671

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	1	08

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

0 25 mm

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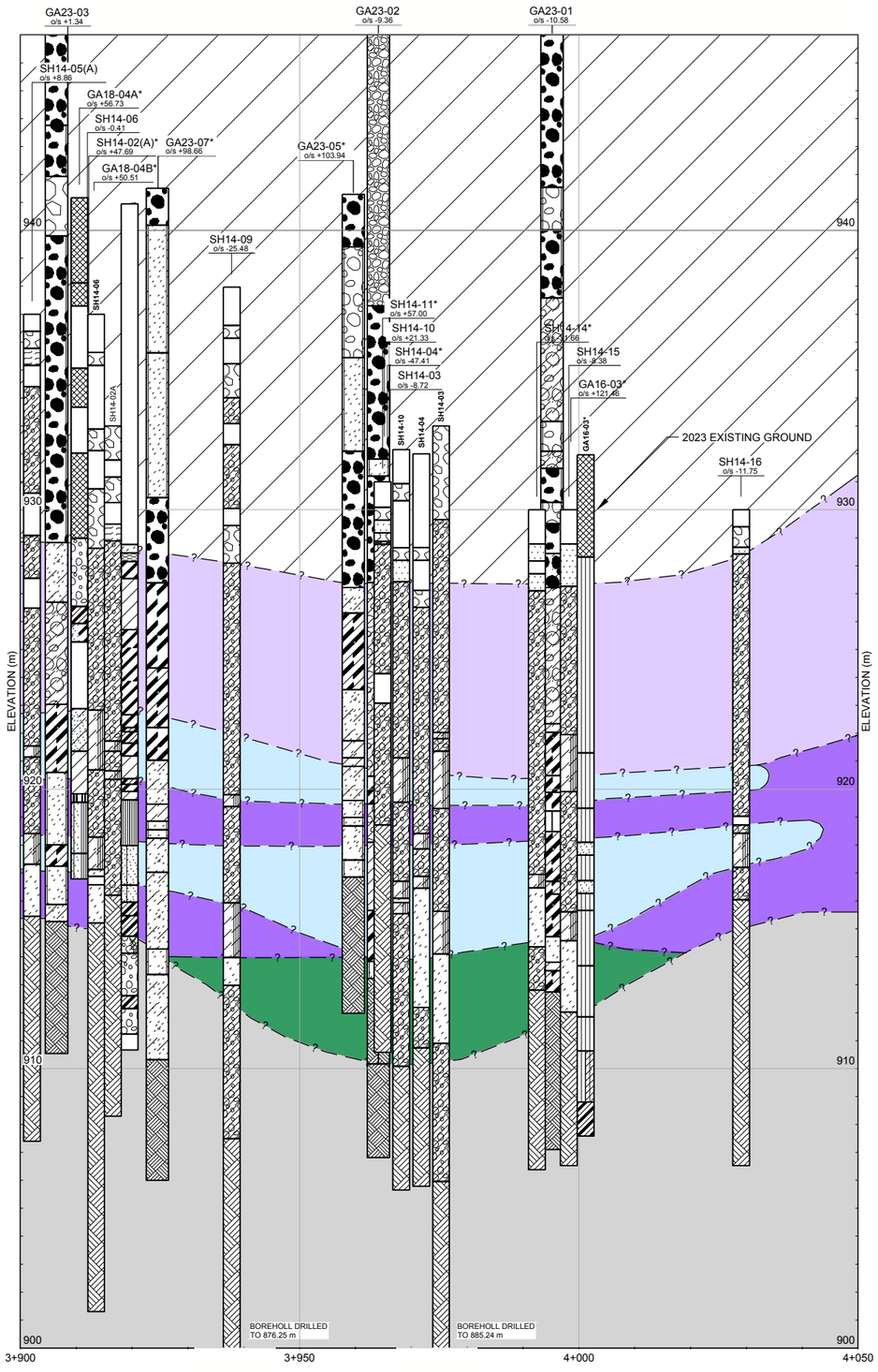

PROFILE - STA. 3+900 m TO 4+050 m
HORIZ. SCALE 1:1,000 m
VERT. SCALE 1:200 m

LEGEND

2023 EXISTING GROUND SURFACE — INFERRED STRATIGRAPHIC CONTACT

TEST HOLE LEGEND

BH19-02 — DENOTES TEST HOLE TYPE, INVESTIGATION YEAR AND ID NUMBER
o/s -88.59 — DENOTES PERPENDICULAR DISTANCE FROM TEST HOLE TO SECTION LINE IN METRES
GROUNDWATER LEVEL / PIEZOMETRIC HEAD IN NOVEMBER / DECEMBER 2021
EXISTING VIBRATING WIRE PIEZOMETER
MONITORING WELL SCREEN
TEST HOLE RECORD SHOWING SOIL CONDITIONS
(FOR DETAILED GEOTECHNICAL INFORMATION REFER TO RECORD OF BOREHOLE)

BOREHOLE LOGS SYMBOLS SUMMARY

*	REVIEWED BOREHOLE LOG DATA ONLY. BOREHOLE LOG NOT USED FOR CREATING STRATIGRAPHIC BOUNDARIES.
**	BOREHOLE LOG DID NOT PROVIDE SUFFICIENT GEOLOGICAL DETAIL FOR INCLUSION IN STRATIGRAPHIC INTERPRETATION.

SOIL LITHOLOGY

FILL	TOPSOIL	ASPHALT	GC - CLAYEY GRAVEL
PT - PEAT	CI - SILTY CLAY	SC - CLAYEY SAND	GM - SILTY GRAVEL
OL - ORGANIC SILT	CH - CLAY	SW - WELL GRADED SAND	GP - POORLY GRADED GRAVEL
OH - ORGANIC SILT	MH - CLAYEY SILT	SM - SILTY SAND	GW - WELL GRADED GRAVEL
CL - SILTY CLAY	ML - CLAYEY SILT OR SILT	SP - POORLY GRADED SAND	BEDROCK

SOIL STRATIGRAPHY

FILL	BASAL TILL
ABLATION TILL	GLACIOFLUVIAL SUB-UNIT (SAND DOMINATED)
GLACIOLACUSTRINE SUB-UNIT	GLACIOFLUVIAL SUB-UNIT (GRAVEL DOMINATED)

BEDROCK / WEATHERED BEDROCK

BEDROCK / WEATHERED BEDROCK

NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND MAY VARY FROM THAT SHOWN.
3. VARIOUS COMBINATIONS OF THE SYMBOLS HAVE BEEN USED TO REPRESENT TRANSITIONAL MATERIALS OR RANGES OF MATERIALS WITHIN A STRATUM.
4. PREFERENCE WAS GIVEN TO INCORPORATING GEOLOGIC DATA FROM BOREHOLES LOCATED CLOSE TO THE CROSS-SECTION LINES AND TO BOREHOLES THAT HAD THE MOST DETAILED GEOLOGIC DESCRIPTIONS OF THE SUBSURFACE CONDITIONS ENCOUNTERED. BOREHOLES THAT WERE FARTHER FROM CROSS-SECTION LINES WERE REVIEWED FOR GEOLOGICAL CORRELATION CRITERIA, INCLUDING INFORMATION ON THE SPECIFIC STRATIGRAPHIC SEQUENCE AND ELEVATIONS OF CONTACTS BETWEEN THE DIFFERENT GEOLOGIC UNITS. BOREHOLES WITH SIGNIFICANT LATERAL OFFSET FROM THE LINES OF CROSS-SECTION WERE GENERALLY OMITTED GIVEN THE HIGH DEGREE OF UNCERTAINTY IN PROJECTION OF THE DATA.

REFERENCE

1. 2023 TOPOGRAPHY PROVIDED BY MPMC AS 0.1 m CONTOUR DATA, SURVEYED: 30 OCTOBER 2023; RECEIVED: 01 FEBRUARY 2024; FILE NAME: 231030-TSF Lidar Contor 0.1.dxf" .

0 5 10
VERT. SCALE 1:200 METRES

0 25 50
HORIZ. SCALE 1:1,000 METRES

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CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-13
DESIGNED	RG/CL
PREPARED	JSH
REVIEWED	CL
APPROVED	GPS

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
ZOOMED-IN SURFICIAL GEOLOGY PROFILE
STA. 3+900 TO 4+050

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	1	09

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

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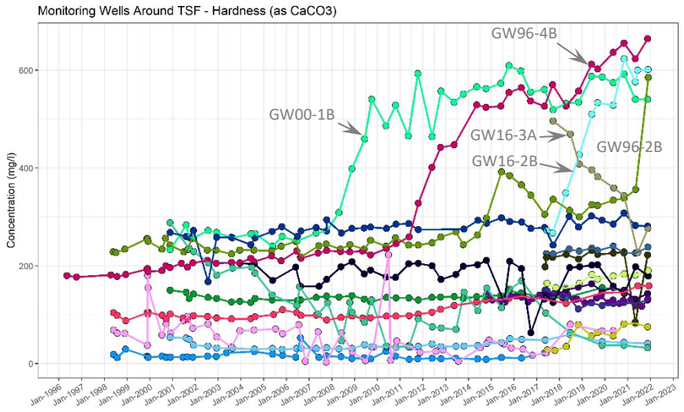
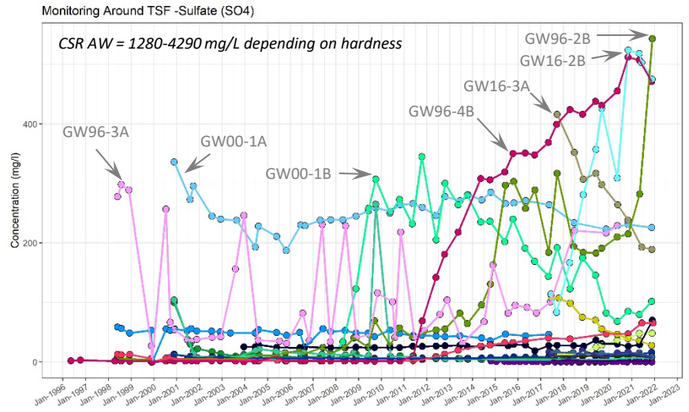
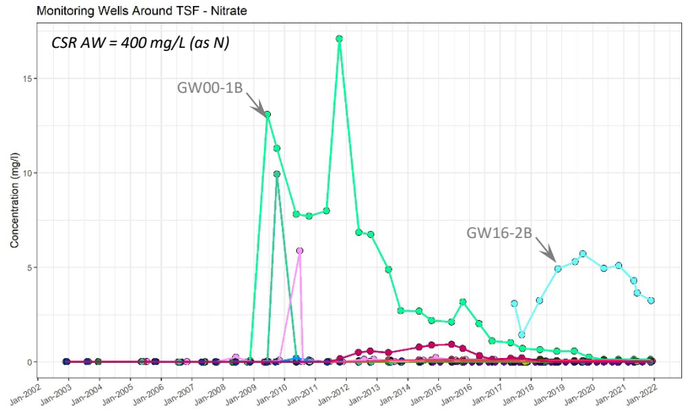
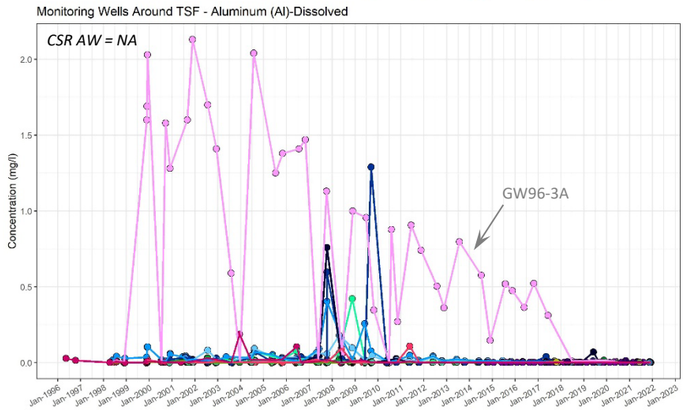
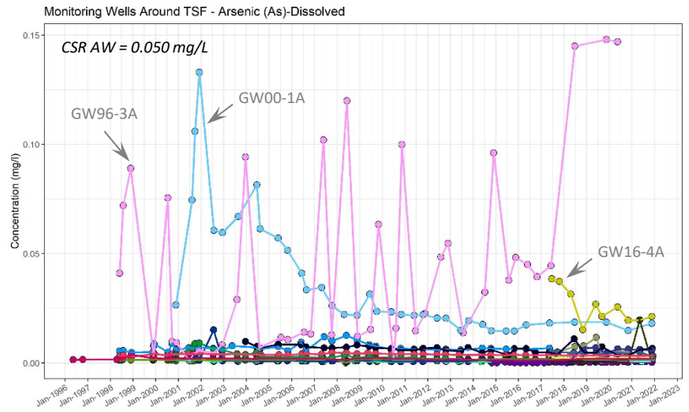
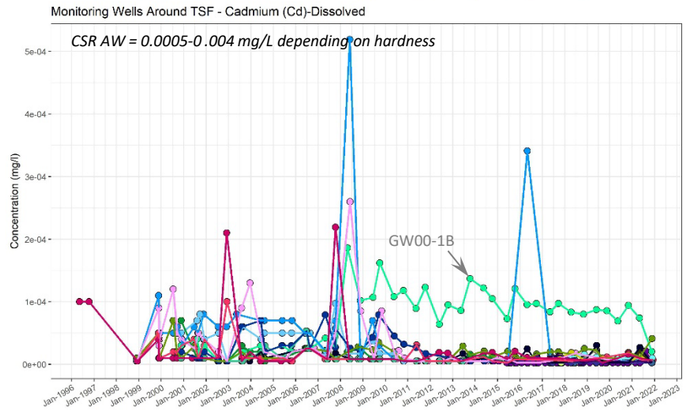


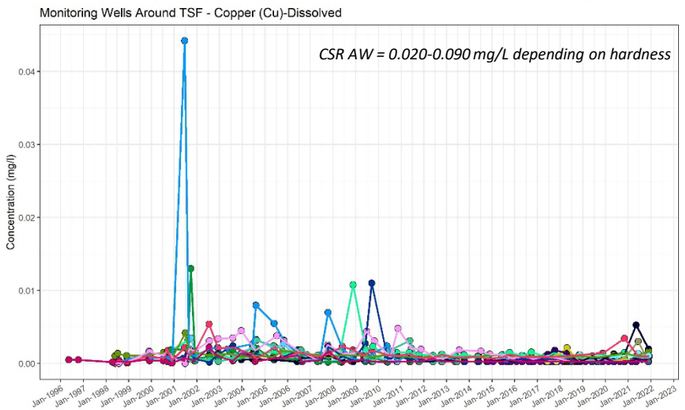


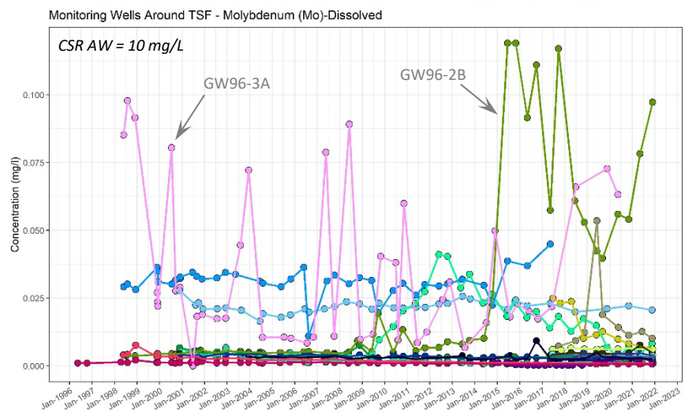


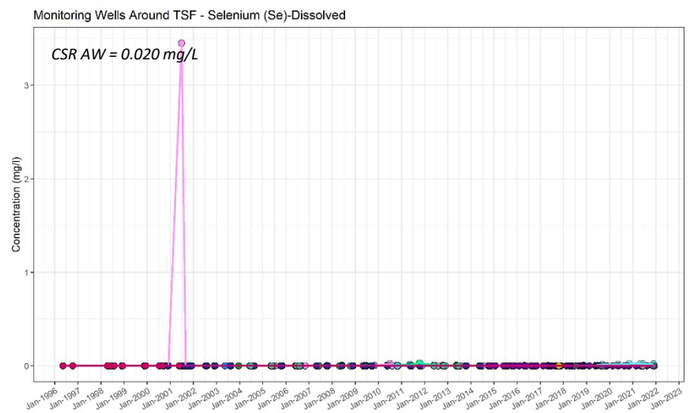












GW00-1A GW00-2A GW00-3B GW16-2A GW16-3A GW16-4A GW16-5A GW96-1A GW96-2B GW96-4A
GW00-1B GW00-3A GW14-1 GW16-2B GW16-3B GW16-4B GW16-5B GW96-2A GW96-3A GW96-4B

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

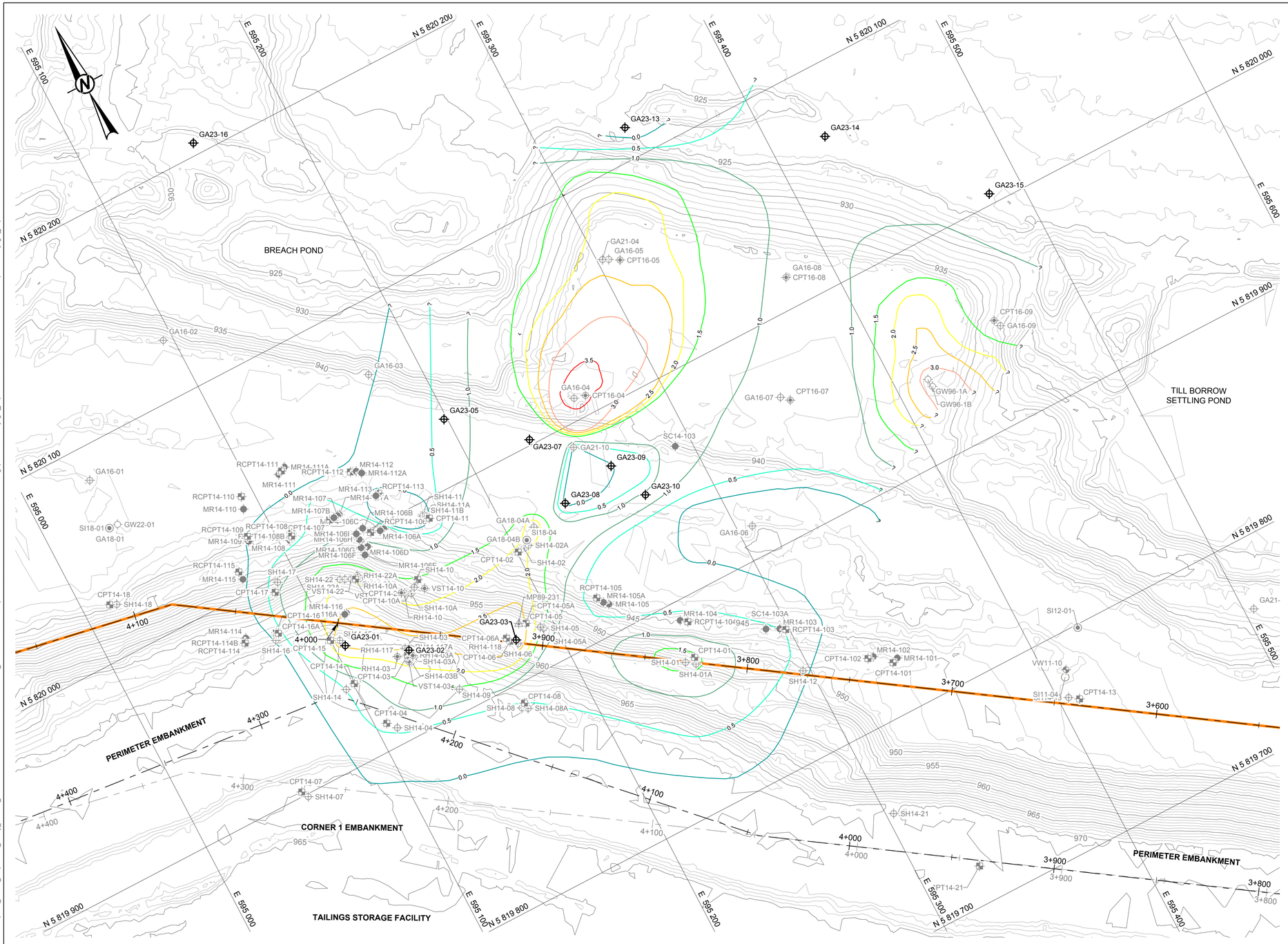
YYYY-MM-DD	2023-07-25
PREPARED	CR
DESIGNED	CR
REVIEWED	JF
APPROVED	GP

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
GROUNDWATER QUALITY TRENDS FOR THE TSF – 1996 to 2021 (FROM GOLDER 2022b, FIGURE 5)

PROJECT NO.		REV.	FIGURE
22514095	51300/51392/034	0	10

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



LEGEND

- 3+800 — GEOLOGICAL PROFILE REFERENCE LINE AND CHAINAGE
- 4+400 — TAILINGS STORAGE FACILITY (TSF) EMBANKMENT CENTRELINE
- 4+400 — SETOUT LINE - S.O.L. - ORIGINAL ALIGNMENT (SEE REFERENCE 1)
- GROUND CONTOURS (SEE REFERENCE 2)
- GA23-01 — SONIC DRILLING, PIEZOMETER INSTALLATION - CORNER 1 EMBANKMENT (WSP, 2023)
- GA22-01 — SONIC DRILLING, PIEZOMETER INSTALLATION (GOLDER, 2022)
- GA21-10 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION (GOLDER, 2021)
- GA18-01 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION (GOLDER, 2018)
- GA16-01 — SONIC DRILLING, SI AND PIEZOMETER INSTALLATION (GOLDER, 2016)
- CPT16-04 — CPT - TAILINGS, (GOLDER, 2016)
- CPT14-101 / RCPT14-103 — CPT - (THE PANEL, 2014)
- CPT14-01 — CPT - (KCB, 2014)
- SH14-10 — SONIC DRILLING, SI, SAA, AND PIEZOMETER INSTALLATION (KCB, 2014)
- RH14-03 / VST 14-03 — MUD ROTARY, PIEZOMTER INSTALLATION (KCB, 2014)
- MR14-104 / SC14-103 / RH14-117 — MUD ROTARY - (THE PANEL, 2014)
- SI12-01 — ODEX, SI INSTALLATION - PERIMETER EMBANKMENT (AMEC, 2012)
- SI11-01 — SONIC DRILLING, SI INSTALLATION (AMEC, 2011)
- VW11-01 — SONIC DRILLING, PIEZOMETER INSTALLATION (AMEC, 2011)
- GW96-1 — AIR ROTARY, SPT, MONITORING WELL INSTALLATION (KP, 1996)
- MP89-230 — CONDEMNATION BOREHOLES, PIEZOMETER INSTALLATION (KP, 1989)

GLU THICKNESS CONTOUR LEGEND

- 0.0 m
- 0.5 m
- 1.0 m
- 1.5 m
- 2.0 m
- 2.5 m
- 3.0 m
- 3.5 m

0 50 100
1:1,000 METRES

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NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATES AND ELEVATIONS SHOWN ARE REFERENCED TO TAILINGS GRID.
3. GROUND CONTOUR INTERVAL SHOWN AT 5 m MAJOR AND 1 m MINOR.

REFERENCES

1. S.O.L - ORIGINAL ALIGNMENT PROVIDED BY BGC ENGINEERING INC., DRAWING No. 01, DRAWING TITLE, "SI PLANNING PLAN MAP", PROJECT No. P14178, FILE NAME: "ACAD-01.dwg", DATED: SEPTEMBER 2014.
2. 2023 TOPOGRAPHY PROVIDED BY MPMC AS 0.1 m CONTOUR DATA, SURVEYED: 30 OCTOBER 2023; RECEIVED: 01 FEBRUARY 2024; FILE NAME: 231030-TSF Lidar Contor 0.1.dxf" .

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-13
DESIGNED	AB
PREPARED	JSH
REVIEWED	JF
APPROVED	GPS

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION

TITLE
CORNER 1 PERIMETER EMBANKMENT CONTOURS OF UPPER GLU THICKNESS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
21452039	51300/51392/034	0	11

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

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APPENDIX A

Summary of Investigations

GEOTECHNICAL INVESTIGATIONS

KP (Knight and Piésold Ltd.). 1990. Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility. Prepared for Imperial Metals Corporation. 12 June 1990.

Purpose

The main objectives and considerations of this study were to:

- present the design for the open pit, waste dumps, and tailings storage facility (TSF)
- provide input for the Stage 1 report and permit applications and become part of the overall Mount Polley Mine Feasibility Study

Scope

The scope related to the TSF foundation includes the following:

- site characteristics including hydrometeorology, regional geology, and seismicity
- geotechnical investigations carried out in the proposed TSF location consisting of field mapping, test pits and diamond drilling with permeability testing
  - Eighteen test pits (TPB-01 to TPB-18) were excavated within the proposed TSF footprint on 27/28 August 1989.
  - Eight condemnation boreholes (MP89-229 to MP89-236) were drilled in the proposed TSF footprint from 29 October 1989 to 12 November 1989.
    - Completion depths ranged from 73.2 to 121.9 m below ground surface.
    - Piezometers – 10 piezometers were installed in 6 boreholes (4 pneumatic and 6 standpipe piezometers).
    - Permeability testing consisted of the following:
      - packer tests – 21 tests conducted in 6 boreholes
      - falling head tests – 3 tests conducted in 3 boreholes
  - Laboratory testing of till samples collected from the test pits consisted of the following:
    - water content – 2 tests
    - Atterberg limits – 2 tests
    - sieve analysis – 2 tests
    - hydrometer – 2 tests
    - specific gravity – 1 test
    - modified Proctor – 1 test
    - permeability – 1 test
- identification of construction materials for the TSF

Data

- Appendix A – Climatological Summaries
- Appendix B – Discontinuity Data and Point Load Test Results
- Appendix C – Waste Rock Acid Generation Potential Testwork
- Appendix D – Laboratory Testwork on Tailings
- Appendix E – Geochemical Tests on Tailings
- Appendix F – Tailings Area B. Test Pit Logs, Borehole Logs and Permeability Test Results

KP (Knight Piésold Ltd.). 1995. Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility. Prepared for Imperial Metals Corporation. Document No. 1623/1. 14 March 1995.

Purpose

The main objectives and considerations for the geotechnical investigation were to evaluate the type and distribution of surficial materials and the near surface foundation conditions at the mill site, along access roads and pipeline routes, potential borrow areas, within the tailings basin, and at the Polley Lake dam site.

Scope

The geotechnical investigation program was undertaken from 11 to 17 January 1995.

- Four test pits (TP95-16 to TP95-19) were excavated north of the proposed TSF and partially along the proposed tailings and reclaim pipeline route.
- Three test pits (TP95-29 to TP95-31) were excavated on the ridge east of the tailings facility to investigate potential borrow sources for future embankment construction.
- Eleven test pits (TP95-26 to TP95-28 and TP95-32 to TP95-39) were excavated within the proposed TSF footprint.
- Laboratory testing of soil samples collected from the test pits consisted of the following:
  - visual description of soils
  - water contents – 7 tests
  - Atterberg limits – 6 tests
  - sieve analysis – 7 tests
  - hydrometer – 7 tests
  - specific gravity – 4 tests
  - consolidated undrained triaxial compression – 3 tests
  - modified Proctor – 3 tests
  - falling head permeameter – 5 tests

Data

- Appendix A – Test Pit Logs
- Appendix B – Detailed Laboratory Test Results

KP (Knight Piésold Ltd.). 1997. Stage 2A Tailings Facility Construction Selected Excerpts from Reference Information. Prepared for Mount Polley Mining Corporation. Document No. 10162/9-2. 6 November 1997.

Purpose

The main objective of this report was to provide further background information on the geotechnical conditions encountered within the TSF footprint for the tender of the Stage 2A construction.

The report presents the geotechnical investigations completed for the Stage 2A construction. The main objectives and considerations for the investigation were to:

- delineate suitable borrow materials within Borrow Area No. 4
- investigate foundation conditions at the Perimeter Embankment for future downstream expansions
- complete laboratory testing of waste dump materials and mill site processed rock

Scope

The geotechnical investigation program was undertaken from 30 September 1997 to 6 October 1997.

- Twenty-one test pits (TP97-BA4-F8 to TP97-BA4-J9) were excavated at Borrow Area No. 4. Completion depths ranged from 5.0 to 6.2 m below ground surface.
- Four test pits were excavated (TP97-PETP-1 to TP97-PETP-4) within the proposed Perimeter Embankment expansion footprint. Completion depths ranged from 5.0 to 5.4 m below ground surface.
- Laboratory testing of soil samples collected from the test pits consisted of the following:
  - visual description of soils
  - water contents – 95 tests

Data

- Appendix A – Stage 2A Investigations – Test Pit Logs
- Appendix B – Borrow Area #4 – Summary of Natural Moisture Content of Test Pit Samples
- Appendix C – Particle Size Analyses of Waste Dump Material and Millsite Processed Material
- Appendix D – Stage 1A/1B Construction Quality Assurance – Record Test Data
- Appendix E – Stage 1A/1B Construction Quality Assurance – Control Test Data and Gradation Plots
- Appendix F – Borrow Area #2 Test Pit Program – Summary of Natural Moisture Content of Test Pit Samples
- Appendix G – Borrow Area #3 Test Pit Program – Summary of Natural Moisture Content of Test Pit Samples

AMEC (AMEC Environment & Infrastructure, a division of AMEC Americas Limited). 2012. Mount Polley Mine Project: Tailings Storage Facility 2011 Geotechnical Site Investigation – Final. Prepared for Mount Polley Mining Corporation. Document No. VM00560.200.3. 28 March 2012.

Purpose

The main objectives and considerations for the geotechnical investigation were to:

- further characterize the glaciolacustrine soils within the TSF foundation
- install new instrumentation and replace non-functioning instrumentation in key locations for dam performance monitoring including pore pressure response and slope movements

Scope

The geotechnical investigation program was undertaken from 29 September 2011 to 11 October 2011.

- Fourteen sonic boreholes (VW11-01 to VW11-11 and SI11-01, SI11-02, and SI11-04) were drilled downstream of the Perimeter Embankment, Main Embankment and South Embankment.
  - Completion depths ranged from 11.1 to 49.4 m below ground surface.
  - Vibrating wire piezometers (VWPs) – 23 VWPs were installed in 11 boreholes.
  - Slope inclinometers (SIs) – Three SIs were installed.
  - Shelby tubes – Three thin-walled tubes were collected.
- Four sonic boreholes were drilled at two locations outside the TSF footprint (i.e., mine site area).
  - Monitoring wells – Four monitoring wells (GW11-1A/B and GW11-2A/B) were installed at two locations.
- Laboratory testing of soil samples collected from the boreholes consisted of the following:
  - visual description of soils
  - water contents – 199 tests
  - Atterberg limits – 20 tests
  - sieve analysis – 19 tests
  - hydrometer – 16 tests

Data

- Appendix A – 2011 Laboratory Testing Data
- Appendix B – 2011 Drill Hole Site Investigation Logs
- Appendix C – Drill Core Photographs
- Appendix D – Vibrating Wire Calibration Reports
- Appendix E – Instrumentation Readings
- Appendix F – Monitoring Well Drill Hole Logs

KCB (Klohn Crippen Berger Ltd.). 2015. Mount Polley Dam Failure – Site Investigation Progress Report No. 2. Prepared for BC Ministry of Energy and Mines. Document No. M09954A02.730. 21 January 2015.

Purpose

The main objectives and considerations for the geotechnical investigation were to:

- collect field data to help determine the August 2014 embankment failure mechanism
- characterize the profile and geotechnical properties of the foundation soils both inside and outside the failed area
- investigate and characterize any construction materials within the dam that may have influenced the failure mechanism
- locate the seat of the dam failure through the foundation materials, if applicable

This report supersedes the Site Investigation Progress Report No. 1 submitted to the BC Ministry of Energy and Mines on 12 December 2014.

Scope

The geotechnical investigation program was conducted between mid-September and late-November 2014.

- Visual reconnaissance and surficial mapping were conducted at the dam breach area to establish the post-failure configuration and provide insights into the nature of the failure mechanism.
- Geophysical surveys were conducted to estimate bedrock depth and approximate material boundaries within the dam failure area (Corner 1).
  - resistivity and induced polarity – 8 survey lines
  - seismic refraction – 6 survey lines
- Phase 1 – A sonic coring program was conducted to delineate the soil profile, obtain samples for geotechnical testing, and install instrumentation.
  - Thirty-two sonic boreholes (SH14-01 to SH14-22, with additional “A” and “B” designations) were drilled at 22 locations near the dam failure area (Corner 1).
    - Completion depths ranged from 1.8 to 72.4 m below ground surface.
    - Vibrating wire piezometers – Twenty-two VWPs were installed in 8 boreholes.
    - Slope inclinometers – Five SIs were installed.
    - Preserved core samples – Thirty-three preserved core samples were collected from three boreholes (SH14-03A, SH14-03B and SH14-10A).
    - Field tests – Pocket penetrometer, pilcon and/or torvane tests were conducted approximately every 0.5 m.

- Phase 2 – Cone penetration test (CPT) soundings and in situ testing were conducted to estimate the strength, hydraulic conductivity, and consolidation characteristics of the soil units.
  - Twenty-three CPTs were conducted at 19 locations within the dam failure area (Soundings CPT14-01 to CPT14-08, CPT14-10, CPT14-11, CPT14-13 to CPT14-19, CPT14-21, and CPT14-22).
    - Continuous resistivity measurements, and several shear wave velocity and porewater pressure tests, were completed.
  - Four vane shear test (VST) locations were completed within the dam failure area.
    - A total of 10 electronic VSTs were attempted in the upper glaciolacustrine unit.
  - Two boreholes contained standard penetration test (SPT) energy measurements.
- Phase 3 – Mud rotary drilling was carried out to conduct SPTs and retrieve high quality piston samples of relevant soils for laboratory test work.
  - Six mud rotary boreholes were drilled at three locations within the dam failure area (two per location).
    - Piston tubes – Seventeen thin-walled samples of the upper glaciolacustrine unit were collected.
    - Standard penetration tests – Thirty SPTs were conducted in the upper glacial till (VST14-22, VST14-10A, RH14-03, and CPT14-05A).
- Test pits and trenches were excavated to observe the conditions in the dam and foundation soils and recover block samples for laboratory testing.
  - One test trench was excavated in the dam till core.
  - One test pit was excavated in the up-thrusted toe bulge for block sampling (TP14-01).
    - A block sample of till and a block sample of upper glaciolacustrine material was collected from the test pit.
  - Bulk samples – Two bulk samples of till core were recovered for laboratory testing.
- Laboratory testing was conducted to determine the index, hydraulic conductivity, and strength properties of the various foundation soils and dam materials.
  - visual description of soils
  - water contents – 991 tests
  - Atterberg limits – 139 tests
  - sieve analysis – 127 tests
  - hydrometer – 125 tests
  - standard Proctor – 2 tests
  - specific gravity – 17 tests
  - organic contents – 3 tests
  - X-Ray diffraction – 12 tests on samples of upper and lower glaciolacustrine units
- The following advanced geotechnical tests were ongoing at the time of report preparation:
  - consolidated drained direct shear tests on samples of upper and lower glaciolacustrine units

- direct simple shear tests on samples of upper glaciolacustrine unit
- one-dimensional consolidation tests on samples of upper and lower glaciolacustrine units
- consolidated undrained monotonic triaxial compression tests on samples of till core, upper glacial till, and upper glaciolacustrine unit
- triaxial extension tests on samples of upper glacial till
- hydraulic permeability using triaxial cell (includes monotonic shear after completion of test)

Data

- Appendix I – Sonic Core Hole Logs
- Appendix II – Core Photographs
- Appendix III – Penetrometer Test Results on Sonic Core
- Appendix IV – Instrumentation Readings
- Appendix V – Standard Penetration Test Results
- Appendix VI – Sonic Core Sample Preservation
- Appendix VII – Thin-Walled Piston Tube Samples
- Appendix VIII – Test Pits and Block Sampling
- Appendix IX – Visual Reconnaissance and Field Mapping
- Appendix X – Observations During Core Excavation
- Appendix XI – Laboratory Index Test Results
- Appendix XII – Vibrating Wire Piezometer Calibration Records
- Appendix XIII – ConeTec In-situ Testing Report
- Appendix XIV – Frontier Geosciences Geophysics Report

IEEIRP (Independent Expert Engineering Investigation and Review Panel). 2015. Report on Mount Polley Tailings Storage Facility Breach. Prepared for BC Ministry of Energy and Mines. 30 January 2015.

Purpose

The main objectives and considerations for the forensic investigation were to:

- investigate and report on the cause of the TSF failure that occurred on 4 August 2014.
  - identify any mechanism(s) of failure of the TSF
  - identify any technical, management, or other practices that may have enabled or contributed to the mechanism(s) of failure; this may include an independent review of the design, construction, operation, maintenance, surveillance, and regulation of the TSF
  - identify any changes that could be considered to reduce the potential for future such occurrences
- make recommendations to government on actions that could be taken to ensure that a similar failure does not occur at other mine sites in BC
- comment on what actions could have been taken to prevent this failure and to identify practices or successes in other jurisdictions that could be considered for implementation in BC

Scope

The forensic investigation consisted of the following:

- Surface investigations were conducted to document geological and geotechnical features exposed in the breach area prior to disturbance by investigation activities or other operations.
- Subsurface investigations were conducted to examine the soil and groundwater conditions within the breach and surrounding area.
  - The sonic boreholes drilled by KCB in 2014 (SH14-01 to SH14-22, with additional “A” and “B” designations) were observed and independently logged.
    - No additional samples were collected for laboratory testing.
  - Rotary drilling was conducted to obtain disturbed and undisturbed samples of the upper glaciolacustrine unit and other soil units for laboratory testing.
    - Thirty-two mud rotary boreholes (MR14-101 to MR14-116) were drilled at 16 locations near the dam breach area (Corner 1).
      - Completion depths ranged from 2.6 to 16.9 m below ground surface.
      - Large penetration tests (LPTs) – Continuous LPTs were completed in boreholes MR14-116 and MR14-116A.
    - Three air rotary (ODEX) boreholes (RH14-117 to RH14-118) were drilled at two locations within the dam breach area.
      - Completion depths ranged from 13.1 to 18.0 m below ground surface.
    - Two soil core boreholes (SC14-103 and SC14-103A) were drilled at one location downstream of the Perimeter Embankment.
      - Completion depths were 9.8 m below ground surface.

  - In situ sampling methods consisted of direct push of thin-walled tubes, piston tube sampling and the Pitcher Sampler.
    - Pocket penetrometer and torvane testing was conducted on the soil at the end of the tubes after retrieval of a relatively undisturbed sample.
    - All undisturbed thin-walled tube samples were CT scanned.
  - CPTs and VSTs were conducted to characterize the foundation stratigraphy and to identify sampling locations for advanced laboratory testing.
    - Two CPTs and 15 resistivity cone penetration tests (RCPTs) were advanced at 15 locations near the dam breach area (soundings CPT14-101, CPT14-102, and RCPT14-103 to RCPT14-115).
      - Completion depths ranged from 1.3 to 17.1 m below ground surface.
      - Pore pressure dissipation tests were completed at selected locations.
    - Several in situ electronic VSTs were completed at five locations within the dam breach area, referred to as VST14-105 to VST14-107B, VST14-111, and VST14-112.
  - Pressuremeter testing (PMT) was conducted in the glacial till to obtain shear strength and shear modulus values.
    - Several PMTs were completed at three locations within the dam breach area, referred to as PMT14-105 to PMT14-106, and PMT14-108.
- Laboratory testing of soil samples collected from the test pits and boreholes.
  - visual description of soils
  - water contents – 261 tests
  - Atterberg limits – 121 tests
  - sieve analysis – 126 tests
  - hydrometer – 106 tests
  - specific gravity – 6 tests
  - consolidated undrained triaxial compression – 13 tests
  - one-dimensional consolidation using incremental loading – 19 tests
  - direct simple shear – 17 tests
  - direct shear – 1 test

Data

- Appendix A – Terms of Reference
- Appendix B – Supporting Information
- Appendix C – Surface Investigation
- Appendix D – Subsurface Investigation
- Appendix E – Laboratory Testing and Results
- Appendix F – Instrumentation and Monitoring
- Appendix G – Water Balance
- Appendix H – Breach Analysis
- Appendix I – B.C. Tailings Dam Failure Frequency and Portfolio Risk
- Appendix J – Cariboo Regional District Video

KCB (Klohn Crippen Berger Ltd.). 2015. Mount Polley Dam Failure – Advanced Laboratory Testing Program Progress Report No. 4. Prepared for BC Ministry of Energy and Mines. Document No. M09954A02.730. 12 February 2015.

Purpose

The main objective of this report was to present the procedures and results of the advanced geotechnical laboratory testing program carried out on soil samples collected during the site investigation program.

This report supersedes the Advanced Laboratory Testing Program Progress Report No. 3 submitted to the BC Ministry of Energy and Mines on 21 January 2015.

Scope

The advanced geotechnical laboratory testing program began in October 2014.

- Advanced geotechnical laboratory testing was conducted on the following samples:
  - preserved (sonic) core samples of upper glacial till, and upper and lower glaciolacustrine units
  - thin-walled piston tube samples of upper glaciolacustrine unit
    - Five thin-walled tubes were selected for advanced testing.
  - block samples of upper glacial till and upper glaciolacustrine unit
    - One of each soil unit was selected for advanced testing.
  - bulk samples of the compacted till core (i.e., glacial till)
- Laboratory testing of soil samples collected from the test pit and boreholes consisted of the following:
  - one-dimensional consolidation using incremental loading – 10 tests
  - direct shear – 15 tests
  - direct simple shear (including cyclic) – 15 tests
  - permeability and consolidated undrained triaxial compression – 8 tests
  - consolidated undrained triaxial compression – 4 tests
  - consolidated undrained triaxial extension – 1 test

Data

- Appendix I – Laboratory Testing Program
- Appendix II – Specimen Preparation
- Appendix III – One-Dimensional Consolidation Results
- Appendix IV – Direct Shear Results
- Appendix V – Direct Simple Shear Results
- Appendix VI – Triaxial Test Results
- Appendix VII – Photographs
- Appendix VIII – Interpretation of Triaxial Tests on Block Samples of UGLU

Golder (Golder Associates Ltd.). 2015. Laboratory Testing Results from Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Document No. 1413803-012-TM-Rev0-2000. 26 March 2015.

Purpose

The main objective of this technical memorandum was to present the results of the laboratory testing program carried out on the soil samples obtained at the Central Collection Sump

Scope

- Laboratory testing of soil samples collected from the Central Collection Sump consisted of the following:
  - visual description of soils
  - water contents – 3 tests
  - Atterberg limits – 3 tests
  - sieve analysis – 6 tests
  - hydrometer – 3 tests
  - specific gravity – 3 tests
  - consolidated undrained triaxial compression – 3 tests
  - one-dimensional consolidation using controlled-strain loading – 1 test
  - direct simple shear – 4 tests

Data

- Attachment 1 – Lab Results
- Attachment 2 – Photographs
- Attachment 3 – Calibration Certificates

Golder (Golder Associates Ltd.). 2015. 2015 Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Document No. 1413803-061-R-RevB-2000. 7 July 2015.

Purpose

The main objectives and considerations for the geotechnical investigation were to:

- better define foundation conditions along the Perimeter, Main, and South embankments to support studies regarding the stability of the embankments
- install instrumentation to monitor the performance of the embankments

Scope

The geotechnical investigation program was conducted from January 2015 to May 2015.

- Twenty sonic boreholes (GA15-01 to GA15-20) were drilled downstream of the TSF embankments.
  - Completion depths ranged from 9.5 to 74.7 m below ground surface.
  - Vibrating wire piezometers – Thirty-three VWPs were installed in 20 boreholes.
  - Slope inclinometers – Twenty-two SIs were installed.
  - Standard penetration tests – Three SPTs were conducted in 2 boreholes.
  - Vane shear tests – Several VSTs were attempted in the initial boreholes with a Nilcon vane. However, the soil was too stiff to penetrate.
  - Grab samples and thin-walled tube samples were collected for laboratory testing.
- Three additional sonic boreholes (GA15-12B, GA15-15B, and GA15-21 [beside GA15-16]) were drilled for thin-walled tube sampling.
- One test pit was excavated downstream of the Perimeter Embankment for thin-walled tube sampling.
- Laboratory testing of soil samples collected from the boreholes consisted of the following:
  - visual description of soils
  - water contents – 795 tests
  - Atterberg limits – 113 tests
  - sieve analysis – 113 tests
  - hydrometer – 50 tests
  - specific gravity – 7 tests
  - vane shear – 73 tests conducted in the laboratory
  - consolidated undrained triaxial compression – 1 test
  - one-dimensional consolidation using incremental loading – 5 tests
  - one-dimensional consolidation using controlled-strain loading – 4 tests
  - direct simple shear – 5 tests

Data

- Appendix A – Records of Boreholes

- Appendix B – Photographs of Sonic Core
- Appendix C – Laboratory Testing Results from Mount Polley Mine Technical Memo (Golder 2014)
  - Attachment 1 – Lab Results
  - Attachment 2 – Photographs
  - Attachment 3 – Calibration Certificates
- Appendix D – Calibration Certificates
- Appendix E – Laboratory Testing Results
  - Appendix E-1 – Routine Laboratory Testing Summary Table
  - Appendix E-2 – Routine Laboratory Test Results
  - Appendix E-3 – Advanced Laboratory Tests Results

Golder (Golder Associates Ltd.). 2017. 2016 TSF Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Document No. 1662612-114-R-Rev0-51121. 10 March 2017.

Purpose

The main objectives and considerations for the geotechnical investigation were to:

- better define foundation conditions downstream of the South Embankment around borehole VW11-02
- confirm the foundation conditions downstream of the buttress for the elevation 963 m Corner 1 Embankment
- assess the condition (i.e., dilative/contractive) of the tailings upstream of the Perimeter, Main, and South embankments
- install VWPs upstream of the embankments

Scope

The geotechnical investigation program was conducted from October 2016 to January 2017.

- Thirteen sonic boreholes (GA16-01 to GA16-09, GA16-15 to GA16-17, and GA16-19) were drilled downstream of the South Embankment and the Corner 1 Embankment. Four additional sonic boreholes were drilled to install vibrating wire piezometers within the TSF.
  - Completion depths ranged from 6.6 to 40.7 m below ground surface.
  - Vibrating wire piezometers – Eleven VWPs were installed in nine boreholes.
  - Slope inclinometers – Five SIs were installed.
  - Grab samples and four thin-walled piston tube samples were collected for laboratory testing.
- Nine CPTs were conducted from 6 to 17 January 2017.
  - Three CPTs were conducted on the tailings beach upstream of the Perimeter Embankment, Main Embankment, and South Embankment.
  - One CPT was conducted downstream of the South Embankment.
  - Five CPTs were conducted downstream of the Corner 1 Embankment.
- Laboratory testing of soil samples collected from the boreholes consisted of the following:
  - visual description of soils
  - water contents – 323 tests
  - Atterberg limits – 12 tests
  - sieve analysis – 3 tests
  - hydrometer – 3 tests
  - one-dimensional consolidation using controlled-strain loading – 1 test

Data

- Appendix A – Records of Boreholes
- Appendix B – Photographs of Sonic Core
- Appendix C – CPT Report
- Appendix D – Calibration Certificates
- Appendix E – Laboratory Testing

Golder (Golder Associates Ltd.). 2019. 2018 TSF Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Document No. 1662612-210-R-Rev0-51121. 8 March 2019.

Purpose

The main objective of the geotechnical investigation was to install additional instrumentation downstream of the Corner 1 Embankment to improve monitoring of embankment performance.

Scope

The geotechnical investigation program was conducted from 16 to 20 January 2018.

- Four sonic boreholes (GA18-01, GA18-03, GA18-04A, and GA18-04B) were drilled downstream of the Corner 1 Embankment.
  - Completion depths ranged from 15.2 to 29.7 m below ground surface.
  - Vibrating wire piezometers – Nine VWPs were installed in three boreholes.
  - Slope inclinometers – Three SIs were installed.
  - Grab samples were collected for laboratory testing.
- Laboratory testing of soil samples collected from the boreholes consisted of the following:
  - visual description of soils
  - water contents – 156 tests
  - Atterberg limits – 5 tests

Data

- Appendix A – Records of Boreholes
- Appendix B – Photographs of Sonic Core
- Appendix C – VWP Calibration Certificates
- Appendix D – Laboratory Testing

WSP Golder (Golder Associates Ltd., a member of WSP). 2022. 2021/2022 Tailings Storage Facility Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Document No. 22514095-011-R-Rev0-51300. 18 October 2022.

Purpose

The main objectives and considerations for the geotechnical investigation were to:

- confirm the foundation conditions downstream of the Perimeter Embankment buttress.
- complete additional in situ and laboratory testing to further refine the characterization of the glaciolacustrine units at the Main and Corner 1 embankments.

Scope

The geotechnical investigation program was conducted from 12 October 2021 to 4 December 2021 and 26 February 2022 to 1 March 2022.

- Eleven sonic boreholes (GA21-01 to GA21-11) were drilled downstream of the Corner 1 Embankment, Perimeter Embankment, and Main Embankment. Five additional sonic boreholes were drilled for thin-walled open tube sampling of encountered glaciolacustrine units.
  - Completion depths ranged from 20.9 to 75.0 m below ground surface.
  - Vibrating wire piezometers – Twenty VWPs were installed in eight boreholes.
  - Slope inclinometers – Five SIs were installed.
  - Monitoring wells – Two monitoring wells were installed.
  - Grab samples and thin-walled open tube samples were collected for laboratory testing. The Pitcher Sampler, Shelby tubes, and Lexan tubes were used to collect the thin-walled open tube samples.
- Six CPTs (soundings CPT21-02, CPT21-03, and CPT21-06 to CPT21-09) were conducted downstream of the Perimeter Embankment and Main Embankment.
- Laboratory testing of soil samples collected from the boreholes consisted of the following:
  - visual description of soils
  - water contents – 649 tests
  - Atterberg limits – 64 tests
  - sieve analysis – 80 tests
  - hydrometer – 45 tests
  - unit weight – 8 tests
  - one-dimensional consolidation using incremental loading – 6 tests
  - one-dimensional consolidation using controlled-strain loading – 8 tests
  - direct simple shear – 5 tests (with several points)
  - cyclic direct simple shear – 2 tests (with several points)

Data

- Appendix A – Records of Boreholes

- Appendix B – Photographs of Sonic Core
- Appendix C – Gregg Cone Penetration Test Summary Report
- Appendix D – Vibrating Wire Piezometer Calibration Certificates
- Appendix E – FP Innovations CT Scan Summary Report
- Appendix F – Laboratory Test Results
  - Appendix F1 – Particle Size Distribution
  - Appendix F2 – Atterberg Limits
  - Appendix F3 – Water Content
  - Appendix F4 – Unit Weight
  - Appendix F5 – Consolidation
  - Appendix F6 – Direct Simple Shear
  - Appendix F7 – Cyclic Direct Simple Shear

WSP. 2024. 2023 Tailings Storage Facility Corner 1 Geotechnical Investigation Factual Report. Prepared for Mount Polley Mining Corporation. Document No. 23590671-094-R-RevA-51691.

Purpose

The main objective for the geotechnical investigation was to collect additional data to characterize the Upper Glaciolacustrine Unit (Upper GLU) at Corner 1 after reconstruction of the embankment over the breach zone.

Scope

The geotechnical investigation program was conducted from 7 to 26 September and 5 to 23 October 2023.

- Twelve sonic boreholes were drilled at Corner 1. GA23-01 to GA23-03 drilled from the Perimeter Embankment crest, GA23-05 to GA23-10 drilled from the Perimeter Embankment buttress, GA23-13 to GA23-16 were drilled downstream of the Perimeter Embankment buttress. Two additional sonic boreholes were drilled for thin-walled open tube sampling of encountered glaciolacustrine units.
  - Completion depths ranged from 24.1 to 62.8 m below ground surface.
  - Vibrating wire piezometers –Fifteen VWPs were installed in six boreholes.
  - Slope inclinometers –Four SIs were installed.
  - Grab samples and thin-walled open tube samples were collected for laboratory testing.
- Three CPTs (soundings CPT23-01 to CPT23-03) were conducted.
- Three Test Pits
- Laboratory testing of soil samples collected from the boreholes consisted of the following:
  - visual description of soils
  - water contents
  - Atterberg limits – 37 tests
  - sieve analysis – 40 tests
  - hydrometer – 26 tests
  - x-ray diffraction – 5 tests
  - one-dimensional consolidation using controlled-strain loading – 3 tests
  - direct simple shear – 3 tests

Data

- Appendix A – Records of Boreholes
- Appendix B- Records of Test Pits
- Appendix C – Photographs of Sonic Core
- Appendix D – Gregg Cone Penetration Test Summary Report
- Appendix E – Vibrating Wire Piezometer Calibration Certificates
- Appendix F – FP Innovations CT Scan Summary Report
- Appendix G – Laboratory Test Results
  - Appendix G1 – Water Content

- Appendix G2 – Particle Size Distribution
- Appendix G3 – Atterberg Limits
- Appendix G4 – DSS Results
- Appendix G5 – CRS Results

- Appendix H – X Ray Diffraction Test Results

HYDROGEOLOGY INVESTIGATIONS

KP (Knight Piésold Ltd.). 1997. 1996 Groundwater Monitoring Well Installation Program. Prepared for Mount Polley Mining Corporation. Document No. 1628/4. 7 February 1997.

Purpose

The main objective was to install monitoring wells around the mine site for future groundwater quality sampling as part of the geotechnical evaluation of the open pits, waste dumps, and TSF.

Scope

The hydrogeological investigation program was conducted from 30 October 1996 to 6 December 1996.

- Eleven air rotary boreholes (GW96-1A/B to GW96-5A/B and GW96-9) were drilled at six locations around the perimeter of the TSF.
  - Completion depths ranged from 6.0 to 61.6 m below ground surface.
    - Monitoring wells – Eleven monitoring wells (GW96-1A/B to GW96-5A/B and GW96-9) were installed at six locations.
  - Standard penetration tests – SPTs were conducted in three boreholes (GW96-1A to GW96-3A).

Data

- Appendix A – Drillhole Logs
- Appendix B – Groundwater Monitoring Well Completion Details

AMEC (AMEC Environment & Infrastructure, a division of AMEC Americas Limited). 2013. Mount Polley Mine Hydrogeology Assessment and Data Review. Prepared for Mount Polley Mining Corporation. Document No. VM00560B. 26 March 2013.

Purpose

The main objectives of the hydrogeological assessment were to:

- provide a data gap analysis and attempt to resolve gaps in the available data
- characterize the local hydrogeological conditions at the mine site and develop a site-specific conceptual model
- identify surface and/or groundwater quality changes related to mining activity, specifically acid rock drainage
- determine infiltration rates into the Springer Pit and identify potential groundwater impacts related to the Springer Pit development
- identify areas of potential environmental concern and potential contaminants of concern

Scope

- A data review and compilation of relevant groundwater information collected from MPMC and the public domain was conducted.
  - Several existing monitoring wells where identified within the TSF area:
    - monitoring wells GW96-1A/B to GW96-5A/B
    - monitoring wells GW00-1A/B to GW00-3A/B
    - monitoring wells GW11-2A/B
- The hydrogeological investigation program was conducted from 14 November 2012 to 18 December 2012.
  - Two air rotary (ODEX) boreholes (SI12-01 and SI12-02) were drilled at two locations downstream of the Perimeter Embankment.
    - Completion depths were 41.5 and 42.7 m below ground surface.
    - Slope inclinometers – Two SIs (SI12-01 and SI12-02) were installed.
- A conceptual site model was developed and wells exhibiting significant changes in either baseline static water levels and/or water quality were identified.
  - Three monitoring wells installed downstream of the TSF began showing evidence of influence by mine operations:
    - GW96-2B – increased level of sulphates
    - GW96-4B – increased level of hardness, sulphates, and nitrate
    - GW00-1B – increased level of hardness, sulphates, nitrates, cadmium, molybdenum, and selenium
- Hydrogeological mapping was conducted to define discharge and recharge areas.
- One monitoring well was decommissioned.

Data

- Appendix A – Borehole Logs

Golder (Golder Associates Ltd.). 2016. Installation and Testing of New Monitoring Wells near the TSF, SERDS, Cariboo Pit and Wight Pit – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Document No. 1662612-058-TM-Rev0-53100. 23 December 2016.

Purpose

The main objective of the hydrogeological investigation was to enhance the existing monitoring well network and facilitate monitoring during ongoing operations and closure of the mine.

Scope

- Hydrogeological investigation program was conducted from 24 October 2016 to 4 December 2016.
  - Eight sonic boreholes (GW16-02A/B to GW16-05A/B) were drilled at four locations around the perimeter of the TSF.
    - Completion depths ranged from 9.1 to 53.6 m below ground surface.
    - Monitoring wells – Eight monitoring wells (GW16-02A/B to GW16-05A/B) were installed at four locations. Single-well response tests were conducted following well development at each location.

Data

- Attachment 1 – Borehole Logs
- Attachment 2 – Photographs of Well Completions
- Attachment 3 – Well Development Sheets
- Attachment 4 – Results of Hydraulic Conductivity Testing

GEOLOGICAL INTERPRETATIONS

Golder (Golder Associates Ltd.). 2015. Surficial Geology and Quaternary Geological Overview of the Mt. Polley Tailings Storage Facility (TSF) Area, British Columbia. Prepared for Mount Polley Mining Corporation. Document No. 1413803-058-R-Rev0-2000. 6 July 2015.

Purpose

The main objective of the geological overview was to provide an assessment of the surficial geology using existing geological and geotechnical data to develop an interpretation of the Quaternary deposits and geological history in the area of the TSF.

Scope

The geological overview assessment involved the following steps:

- review, compilation, and interpretation of existing subsurface and surface geological information such as:
  - subsurface geotechnical investigation data from borehole investigations
  - regional geological mapping
  - previous geotechnical reports on the TSF (both pre- and post-dam breach)
  - existing data on surficial geology and subsurface Quaternary geology
- providing local and regional Quaternary geological context for the surficial and bedrock materials present in the TSF area
- development of surficial geological cross-sections of the subsurface conditions in the TSF area

Data

- Figure 3 – Overview of Borehole and Section Locations
- Figures 4 to 9 – Surficial Geology Cross-Sections
- Figure 10 – Uppermost Native Clay Layer Elevation, Thickness
- Figure 11 – Contact Between Advance and Recessional Stage Deposits – Elevation Contour Plan
- Figures 12 to 15 – Composite Geological Cross-Sections Across TSF
- Appendix A – Records of Boreholes

DOCUMENTS RELATED TO TSF DESIGNS

KP (Knight Piésold Ltd.). 1996. Response to Review Comments on Tailings Embankment Design. Prepared for Imperial Metals Corporation. Reference No. 1625/6. 25 January 1996.

Purpose

The main objective of this study was to provide a response to the comments made by Mr. Brawner with respect to his review of the tailings embankment design. This report provides the following:

- modifications and recommendations pertaining to the embankment design
- review comments and concerns

Scope

The scope related to the TSF foundation includes the following:

- Test pit excavations near the Main Embankment to supplement the knowledge and understanding of the glacial materials within the valley.
  - Thirty-four test pits (TP95ME-01 to TP95ME-34) were excavated near the Main Embankment in early October 1995.
    - Completion depths ranged from 2.5 to 7.0 m below ground surface.
  - Six test pits were also excavated near the Seepage Collection Pond (TPS19, TPS20, TPS20.5, TPS21, TPS21.2, and TPS22).
    - Completion depths ranged from 4.0 to 6.5 m below ground surface.

Data

- Appendix A – Test Pit Logs from 1995 Supplementary Investigations

KP (Knight Piésold Ltd.). 1997. Mount Polley Project Tailings Storage Facility Updated Design Report. Prepared for Mount Polley Mining Corporation. Reference No. 1627/2. 6 June 1997.

Purpose

The main objective of this study was to provide an updated version of the original TSF design report. This report was prepared in response to:

- modifications to the embankment design
- review comments and concerns
- the additional detailed geological and geotechnical information gathered during the Stage 1A/1B construction program

Scope

The scope related to the TSF foundation includes the following:

- site characteristics including hydrometeorology, regional geology, and seismicity
  - seismic design parameters for the TSF embankments
- geotechnical investigations carried out during the Stage 1A/1B construction program in 1996 and 1997:
  - test pit excavations to identify suitable embankment fill materials in potential borrow sources including Borrow Areas No. 1, No. 2, and No. 3 (referred to as the Original Borrow Area, Future Borrow Area and Alternative Borrow Area, respectively), which are all within or near the TSF
    - Several test pits (96-43 to 96-55 and 96-84 to 96-108) were excavated in the three potential borrow sources during the 1996 construction program.
      - Completion depths ranged from 1.2 to 8.0 m below ground surface.
      - Laboratory testing of soil samples collected from the test pits consisted of the following:
        - index – water content, Atterberg limits, sieve analysis, hydrometer, and specific gravity
        - compaction – standard Proctor
        - permeability – falling head tests
        - shear strength – triaxial tests
    - Several test pits were also excavated in January 1997 (TP96-BA-E4 to TP96-BA-I9).
      - Completion depths up to 6.7 m below ground surface.
      - Laboratory tests were not specified in the report.
  - borehole investigations to define the maximum borrow depth in Borrow Areas No. 1 and No. 2
    - Twenty-eight boreholes (DH97-BA-F5 to DH97-BA-I8) were drilled with a solid and hollow stem auger in January 1997.
      - Completion depths were up to 17.0 m below ground surface.
      - SPTs were conducted in the boreholes.
    - Laboratory tests were not specified in the report.

- groundwater monitoring well drilling around the perimeter of the TSF for long-term groundwater quality monitoring
  - Eleven air rotary boreholes were drilled at six locations around the perimeter of the TSF from 30 October 1996 to 6 December 1996.
    - Monitoring wells – 11 monitoring wells (GW96-1A/B to GW96-5A/B and GW96-9) were installed at 6 locations.
    - Standard penetration tests – SPTs were conducted in three boreholes (GW96-1A to GW96-3A).
- test pit excavations to delineate the extent of the basin liners
  - Several test pits (96-1 to 96-42) were excavated to delineate the basin liner extents during the 1996 construction program.
    - Completion depths ranged from 1.1 to 7.3 m below ground surface.
    - In situ permeability testing consisted of field air entry permeameter tests of the underlying glaciolacustrine and glaciofluvial units.
  - Upper and lower basin liners were constructed near the Main Embankment.
- test pit excavations to investigate potential sand deposits for use as filter sand in the embankment drains
  - Several test pits (96-56 to 96-69 and 96-111 to 96-115) were excavated during the 1996 construction program.
    - Completion depths ranged from 4.3 to 8.2 m below ground surface.
  - Laboratory testing of soil samples collected from the test pits to evaluate suitability for filter sand consisted of the following:
    - 16 samples for index testing including water content, Atterberg limits, grain size analysis, and specific gravity
    - eight samples for effective strength parameters, compaction, and permeability testing
- borehole investigations to accompany the installation of instrumentation in the foundation soils of the Main Embankment
  - Four boreholes (96-A1, 96-B1a, 96-B1b, and 96-C1) were drilled with a solid and hollow stem auger in the Main Embankment footprint from 21 to 24 July 1996.
    - Completion depths ranged from 9.1 to 16.5 m below ground surface.
    - Vibrating wire piezometers – Six VWPs were installed in four boreholes.
    - Standard penetration tests – Sixty-four SPTs were conducted in three boreholes.
  - Laboratory tests were not specified in the report.
- CPT investigation to further investigate the foundation soils of the Main Embankment
  - Ten CPTs (soundings CPT96-1 to CPT96-5 and PRW96-1 to PRW96-4) were advanced in the Main Embankment footprint from 27 to 28 July 1996. Two soundings were advanced at PRW96-2, referred to as PRW96-2 (4) and PRW96-2 (4A).
    - Completion depths ranged from 7.65 to 15.85 m below ground surface.

        - Shear wave velocity tests were completed at 1 m intervals and several pore pressure dissipation tests.
    - Four boreholes (PRW96-1 to PRW96-4) were drilled with a solid stem auger beside their respective CPT location to serve as pressure relief wells from 27 to 28 July 1996.
        - Completion depths ranged from 9.9 to 22.1 m below ground surface.
        - Field tests – Pocket penetrometer and torvane tests were conducted at selected depths.
    - Four pressure relief trenches were also excavated downstream of the Main Embankment (test trenches PRT-01 to PRT-04).
- a detailed geological summary of the four main soil units encountered in the TSF foundation including ablation till, glaciolacustrine/glaciofluvial, basal till, and bedrock

Data

- Appendix A – Summary of Recent Geological Investigations
- Appendix B – Supplementary Investigation Reports
    - Appendix B1 – R.E. Graham Field Report
    - Appendix B2 – ConeTec Field Report

KP (Knight Piesold Ltd.). 2007. Mount Polley Stage 6 TSF Design. Letter to Mr. Chris Carr, Geotechnical Mines Inspector, Ministry of Energy, Mines and Petroleum Resources. Reference No. VA101-1/18-A.01. 19 December 2007.

Purpose

The main objective of this letter was to provide additional information on three items requested by Mr. Chris Carr:

- results of direct shear testing on lacustrine soils
- cross-sections showing stability analyses for dam raise to elevation 958 m
- slope inclinometer depth vs. cumulative displacement plots showing cumulative displacement from date of installation

Scope

The scope related to the TSF foundation includes the following:

- Two brass tube samples of a lacustrine unit were collected from a test pit (TP-07) excavated next to the Main Embankment Seepage Collection Pond on 13 May 2007.
- Testing consisted of the following:
  - direct shear – 1 test (with 3 points)

Data

- Appendix A – Direct Shear Testing Results

TSF CONSTRUCTION RECORD REPORTS

KP (Knight Piésold Ltd.). 1999. Mount Polley Mine Tailings Storage Facility Report on 1998 Construction and Annual Inspection. Prepared for Mount Polley Mining Corporation. Reference No. 11162/10-1. 16 June 1999.

Purpose

The main objectives of this report were to document the Stage 2A/2B construction program, which involved raising the Main and Perimeter embankments by 3 m to an elevation of 937 m and document the 1998 annual inspection. This report provides the following:

- discussion of the construction methods used during the program
- results of the quality assurance tests
- a review of the new instrumentation and monitoring results
- as-built drawings corresponding to the Stage 2A/2B construction program
- results of the investigations undertaken during the program
- results of the annual inspection

Scope

The scope related to the TSF foundation includes the following:

- Ten VWPs were installed in the foundation soils at the Main Embankment.
- Three pressure relief trenches (PRT98-01 to PRT98-03) and seven pressure relief wells (PRW98-01 to PRW98-07) were installed at the Main Embankment.
- Nineteen boreholes (DH98-BL-01 to DH98-BL-19) were drilled within the tailings basin to investigate the requirements for the basin liner in February 1998.
  - Completion depths ranged from 1.2 to 7.6 m below ground surface.
  - Grab samples were collected for laboratory testing.
- Forty-four boreholes (BH99-01 to BH99-44) were drilled within the tailings basin to investigate the requirements for the basin liner in 1999.
  - Completion depths ranged from 0.6 to 9.1 m below ground surface.
  - Grab samples were collected for laboratory testing.
- Laboratory testing of soil samples collected from the boreholes consisted of the following:
  - visual description of soils
  - ater contents
  - Atterberg limits
  - sieve analysis
  - hydrometer
  - consolidated undrained triaxial compression

Data

- Appendix A – Borrow Area and Basin Liner Investigations
- Appendix B – Construction Quality Assurance Record Test Summary Sheets
- Appendix C – Construction Quality Assurance Control Test Summary Sheets and Gradation Plots
- Appendix D – Consolidated Undrained Triaxial Test Results for R/ZS-12
- Appendix E – 1998 Construction Photos
- Appendix F – 1998 Annual Inspection Photos
- Appendix G – Piezometer Records
  - Appendix G1 – Tailings Piezometers
  - Appendix G2 – Embankment Foundation Piezometers
  - Appendix G3 – Embankment Fill Piezometers
  - Appendix G4 – Drain Piezometers

KP (Knight Piésold Ltd.). 2000. Mount Polley Mine Tailings Storage Facility Report on 1999 Construction. Prepared for Mount Polley Mining Corporation. Reference No. 11162/13-5. 30 August 2000.

Purpose

The main objective of this report was to document the Stage 2C construction program, which involved raising the Main and Perimeter embankments by 4 m to an elevation of 941 m. This report provides the following:

- discussion of the construction methods used during the program
- results of the quality assurance tests
- a review of the new instrumentation and monitoring results
- as-built drawings corresponding to the Stage 2C construction program
- results of the investigations undertaken during the program

Scope

The scope related to the TSF foundation includes the following:

- Ninety-one boreholes (DH99-45 to DH99-135) were drilled around the perimeter of the TSF to evaluate the potential for seepage infiltration into foundation materials during hydraulic placement of cycloned sand.
  - Completion depths ranged from 0.6 to 7.5 m below ground surface.
  - SPTs were conducted in some of the boreholes.
  - Grab samples were collected for laboratory testing.
- Twenty-four boreholes (DH99-136 to DH99-159) were drilled within Borrow Area No. 2 (downstream of the Main Embankment) to determine the availability and suitability of core zone material.
  - Completion depths ranged from 4.6 to 13.9 m below ground surface.

Data

- Appendix A – Investigations
- Appendix B – Construction Quality Assurance Control Test Summary Sheets and Gradation Plots
- Appendix C – Construction Quality Assurance Record Test Summary Sheets
- Appendix D – Stage 2C Construction Photos
- Appendix E – Stage 2C Design Modifications

KP (Knight Piésold Ltd.). 2001. Mount Polley Mine Tailings Storage Facility Report on Stage 3 Construction. Prepared for Mount Polley Mining Corporation. Reference No. 11162/14-3. 19 October 2001.

Purpose

The main objective of this report was to document the Stage 3 construction program which involved raising the TSF embankments to an elevation of 942.5 m. This report provides the following:

- discussion of the construction methods used during the program
- results of the quality assurance tests
- a review of the new instrumentation and monitoring results
- as-built drawings corresponding to the Stage 3 construction program
- results of the investigations undertaken during the program

Scope

The scope related to the TSF foundation includes the following:

- installation of four VWPs in the foundation soils
- geotechnical investigations conducted during the Stage 3 construction program
  - Three air rotary (ODEX) boreholes (GW00-01 to GW00-03) were drilled downstream of the South Embankment in August 2000.
    - Completion depths ranged from 21.0 to 24.3 m below ground surface.
    - Monitoring wells – Six monitoring wells (GW00-01A/B to GW00-03A/B) were installed at three locations.
    - SPTs were conducted in two boreholes.
  - Eighty boreholes (DH01-01 to DH01-80) were drilled to investigate the availability of glacial till within Borrow Areas No. 2, No. 3, and No. 5 in April 2001.
    - Completion depths ranged from 1.2 to 12.2 m below ground surface.
    - Grab samples were collected for laboratory testing.
  - Two air rotary (ODEX) boreholes (SI01-01 and SI01-02) were drilled downstream of the Main Embankment in July 2001.
    - Completion depths were 24.4 and 30.3 m below ground surface.
    - Slope inclinometers – Two SIs were installed.
    - SPTs were conducted in both boreholes.
  - Laboratory testing of soil samples collected from the boreholes consisted of the following:
    - visual description of soils
    - water contents
    - sieve analysis
    - hydrometer

Data

- Appendix A – Investigations
- Appendix B – Construction Quality Assurance Control Test Summary Sheets and Gradation Plots
- Appendix C – Construction Quality Assurance Record Test Summary Sheets
- Appendix D – Stage 3 Construction Photos
- Appendix E – Stage 3 Design Modifications

KP (Knight Piésold Ltd.). 2007. Mount Polley Mine Tailings Storage Facility Report on Stage 4 Construction. Prepared for Mount Polley Mining Corporation. Reference No. VA101-1/10-1. 13 March 2007.

Purpose

The main objective of this report was to document the Stage 4 construction program which involved raising the TSF embankments by 4 m to an elevation of 948 m. This report provides the following:

- discussion of the construction methods used during the program
- results of the quality assurance tests
- a review of the instrumentation monitoring results
- as-built drawings corresponding to the Stage 4 construction program
- results of the investigation undertaken during the program

Scope

The scope related to the TSF foundation includes the following:

- geotechnical investigation program conducted in May 2006
  - Three air rotary boreholes (SI06-01 to SI06-03) were drilled downstream of the Main Embankment.
    - Completion depths ranged from 34.7 to 42.2 m below ground surface.
    - Slope inclinometers – Three SIs were installed.
    - SPTs were conducted in all three boreholes.
- other relevant information:
  - Slope inclinometer SI01-01 was destroyed during Stage 4 construction.
- laboratory testing of soil samples collected from the boreholes:
  - visual description of soils
  - ater contents – 10 tests
  - Atterberg limits – 10 tests
  - sieve analysis – 10 tests
  - hydrometer – 10 tests
  - one-dimensional consolidation using incremental loading – 1 test

Data

- Appendix A – Laboratory Test Results
  - Appendix A1 – Zone S Control Results
  - Appendix A2 – Zone S Record Results
  - Appendix A3 – Zone U Results
- Appendix B – Inclinometer Installations

- Appendix B1 – Drill Logs
- Appendix B2 – Laboratory Test Results

- Appendix C – Nuclear Densometer Results
- Appendix D – Photographs

KP (Knight Piésold Ltd.). 2009. Mount Polley Mine Tailings Storage Facility Report on Stage 6A Construction. Prepared for Mount Polley Mining Corporation. Reference No. VA101-1/23-1. 10 July 2009.

Purpose

The main objective of this report was to document the Stage 6A construction program which involved raising the TSF embankments by 3 m to an elevation of 954 m. This report provides the following:

- discussion of the construction methods used during the program
- results of the quality assurance tests
- a review of the instrumentation monitoring results
- as-built drawings corresponding to the Stage 6A construction program
- results of the investigation undertaken during the program

Scope

The scope related to the TSF foundation includes the following:

- geotechnical investigation program conducted in May 2008
  - Eleven sonic boreholes (KP08-01, KP08-02, KP08-04, KP08-06, KP08-08, KP08-09, KP08-11, KP08-12, and KP08-14 to KP08-16) were drilled in a potential borrow area downstream of the Perimeter Embankment.
    - Completion depths ranged from 8.5 to 23.8 m below ground surface.
    - SPTs were conducted in most of the boreholes.
    - Grab samples were collected for laboratory testing.

Data

- Appendix A – Laboratory Test Results
  - Appendix A1 – Zone S Control
  - Appendix A2 – Zone S Record
  - Appendix A3 – Zone U Record
  - Appendix A4 – Zone F Record
  - Appendix A5 – Zone T Record
  - Appendix A6 – South Embankment Concrete Encasement – Concrete Strength Test Results
- Appendix B – Nuclear Densometer Results
  - Appendix B1 – Zone S Record
  - Appendix B2 – Zone U Record
- Appendix C – Piezometer Figures
  - Appendix C1 – Tailings Piezometers
  - Appendix C2 – Foundation Piezometers

- Appendix C3 – Fill Piezometers
- Appendix C4 – Drain Piezometers

- Appendix D – Inclinometer Data
- Appendix E – Photographs
- Appendix F – Site Investigation Drill Logs

Golder (Golder Associates Ltd.). 2015. 2015 Freshet Management Embankment As-Built Construction. Prepared for Mount Polley Mining Corporation. Document No. 1413803-065-R-Rev0-2000. 4 September 2015.

Purpose

The main objective of this report was to document the Freshet Management Embankment construction program. This report provides the following:

- summary of design and adjustments to accommodate conditions encountered during construction
- description of the major construction activities including water management
- summary of the construction quality assurance and construction quality control information
- as-built drawings
- as-built instrumentation installation
- construction documentation

Scope

The scope related to the TSF foundation includes the following:

- installation of five slope inclinometers (SI15-26 to SI15-30) during the construction program
  - Four slope inclinometers were installed in the cut-off wall, while the other was installed to replace two damaged slope inclinometers downstream of the Perimeter Embankment.
- installation of two shape accel arrays (SAAs) within existing slope inclinometers downstream of the Freshet Management Embankment
  - SAA15-01 was installed within slope inclinometer SH14-03.
  - SAA15-02 was installed within slope inclinometer SH14-16.

Data

- Appendix A – 2015 Freshet Management Embankment Issued for Construction Drawings and Construction Technical Specifications
- Appendix B – 2015 Freshet Management Embankment As-Built Construction Drawings
- Appendix C – Construction Photographs
- Appendix D – Construction Sign-Offs
- Appendix E – Cut-Off Wall As-Built Construction Report
- Appendix F – Geotechnical Instrumentation
- Appendix G – QA/QC Laboratory Test Results and Field Testing
- Appendix H – Construction Material Certificates
- Appendix I – Daily Reports
- Appendix J – Dayshift and Nightshift Reports
- Appendix K – Construction Meeting Minutes

WSP. 2024. 2023 Tailings Storage Facility Construction Record Report. Prepared for Mount Polley Mining Corporation. Document No. CA0020527.4505-010-R-Rev0-52291. 28 March 2024.

Purpose

The main objective of this report was to document the construction record of the embankments and abutment connections carried out in 2023.

- summary of design and adjustments to accommodate conditions encountered during construction
- description of the major construction activities
- summary of the construction quality assurance and construction quality control information
- representative cross-sections of the embankment construction
- construction documentation

Scope

The scope related to the TSF foundation includes the following:

- Eleven Test Pits were advanced to assess the foundation conditions within and upgradient of the North Abutment. Six Test Pits were located upgradient within the abutment footprint and five were located upgradient within the abutment footprint of potential future raises.
- Survey monument SM18-01 located on the crest of the Perimeter Embankment at Corner 1 was decommissioned.
- No new instrumentation was installed as part of the construction to raise the embankment to elevation 970 m.

Data

- Appendix A – IFC Drawings and Specifications
- Appendix B –Representative Cross-Sections
- Appendix C – Construction Photographs
- Appendix D – Construction Checklists
- Appendix E – QC Test Results
- Appendix F – QA Test Results
- Appendix G – Other Laboratory Test Results
- Appendix H – RFI Responses and Site Instructions
- Appendix I – North Abutment- Record of Test Pits

APPENDIX B

Site-Specific Seismic Hazard Assessment

REPORT

Site-Specific Seismic Hazard Assessment

Mount Polley TSF Site, British Columbia

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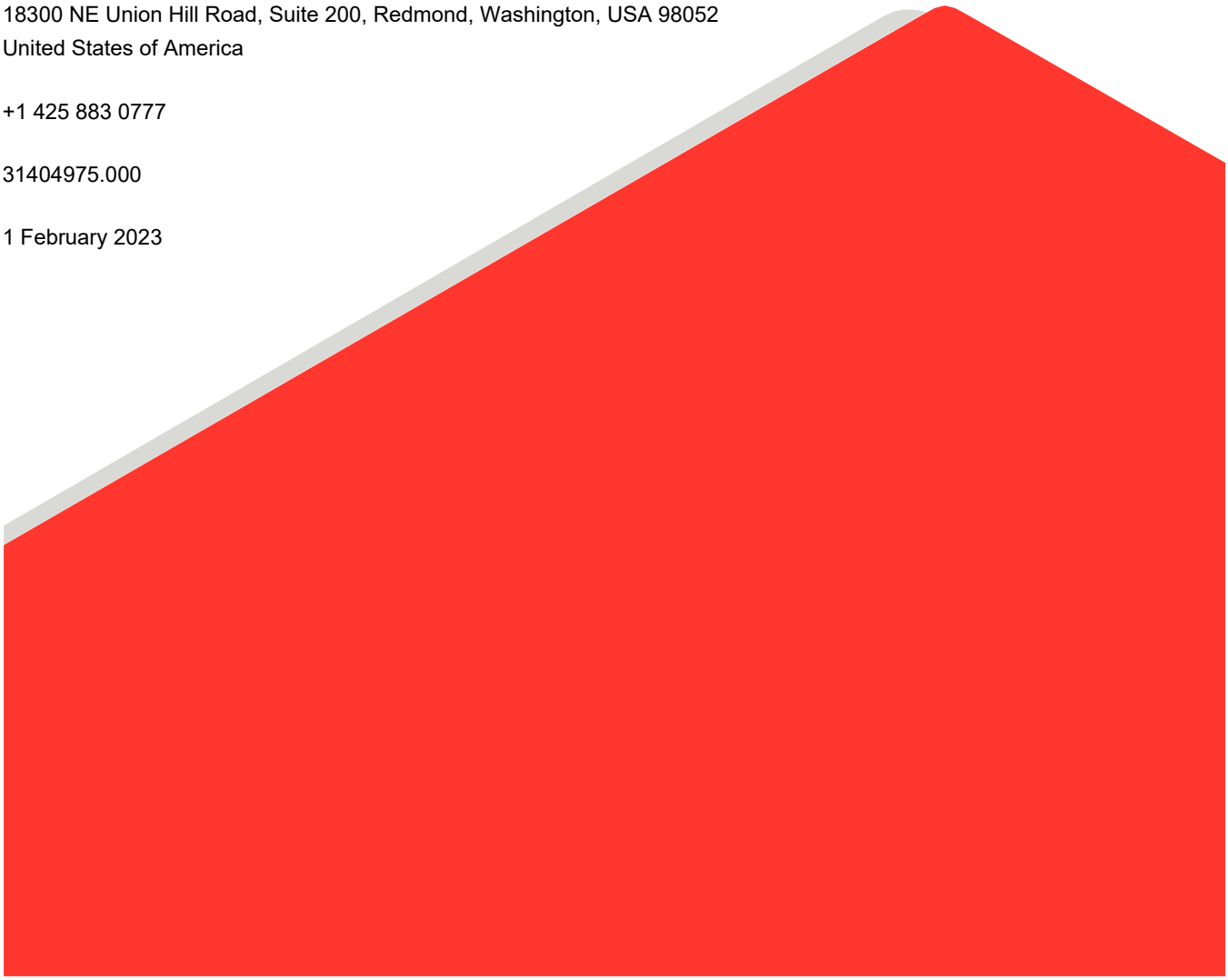

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APPENDIX A
Earthquake Acceleration Time Histories

Appendix B
Evaluation of the Time-Average Shear-Wave Velocity

DISCLAIMERS AND LIMITATIONS

Seismic hazard analysis and geotechnical earthquake engineering are dynamic and fast-evolving fields of research and engineering practice. The standard of practice in this technical area continues to develop as new information about the sources of earthquakes becomes available. Consequently, the results presented in this report should be reviewed when new data and/or new scientific theory becomes available.

WSP USA Inc (WSP USA). has prepared this report exclusively for the use of WSP Canada Inc (WSP Canada). for the Mount Polley TSF site. If there are significant changes in the nature, design, location, or site ground conditions, then WSP should be notified so that we can review our conclusions and recommendations. A written modification or verification of the changes can be provided, if required.

EXECUTIVE SUMMARY

This report presents the results of a site-specific probabilistic seismic hazard analysis (PSHA) undertaken by WSP USA Inc. (WSP USA) for the Mount Polley Tailings Storage Facility (TSF) site approximately 380 km northeast of Vancouver, British Columbia. The PSHA has been undertaken for a site at 52.509º N latitude and 121.588º W longitude. Appendix A provides details of the development of earthquake acceleration time histories. Appendix B presents the evaluation of the time-average shear-wave velocity in the 30 m below the ground surface (V_{S30}) used in this assessment.

The site-specific PSHA is based on seismic source models developed for the 6th Generation Canadian National Seismic Hazard Model (CanadaSHM6). WSP USA's review of the tectonic setting, historical earthquake activity rates, and earthquake epicenter distribution within about 500 km of Mount Polley found that the CanadaSHM6 seismic source models are appropriate for estimating the seismic hazard of the TSF site.

Source-to-site attenuation ground motion models (GMMs) for active shallow crustal sources were applied as in CanadaSHM6. For sources associated with the Cascadia subduction zone to the southwest of the site, WSP USA applied a weighted suite of the 2020 NGA-Sub GMMs to model the source-to-site attenuation of subduction earthquake strong ground motions.

Earthquake ground motions are reported as 5%-damped, mean uniform hazard acceleration response spectra at annual exceedance probabilities (AEPs) of 1/1,000, 1/2,475, 1/5,000 and 1/10,000 for the site-specific V_{S30} of 849 m/s. Table S-1 below lists the mean uniform hazard spectral ordinates for selected AEPs at horizontal peak ground acceleration (PGA), 0.5 s, 1.0 s, and 1.5 s spectral periods developed from the site-specific PSHA at the Mount Polley TSF site. The results at an AEP of 1/2,475 are slightly lower than CanadaSHM6 at spectral periods below ~2.0 s and slightly higher at spectral periods above 2.0 s. These differences are attributed to the different ground motion model selection and weighting, and site-specific V_{S30} of 847 m/s used in this assessment.

Deaggregations were performed for the total hazard and separately for active shallow crustal and subduction sources at 1/2,475 and 1/10,000 AEPs at selected spectral periods. The results show that both near-field, moderate-magnitude crustal earthquakes and far-field subduction interface earthquakes contribute to the site seismic hazard. The shallow crustal earthquake sources are dominated by moderate-magnitude earthquakes (**M**6.0 to **M**6.5) close to the site (i.e., <60 km) at all AEPs. The contribution to hazard at the site from Cascadia subduction zone sources is from large earthquakes (**M**8+) at 450 to 550 km from these at all AEPs and spectral periods of interest.

Table S-1: Site-specific accelerations (5%-damped) for selected annual exceedance probabilities and spectral periods at the Mount Polley TSF site, British Columbia, Canada (V_{S30} = 849 m/s)

Performance Level - AEP	Spectral Period (s)	Acceleration (g)[1]					
		Mean	Fractile				
			5th	15th	50th (median)	85th	95th
1/1,000	PGA	0.026	0.023	0.023	0.025	0.028	0.028
	0.5	0.033	0.030	0.030	0.033	0.035	0.036
	1.0	0.020	0.017	0.017	0.019	0.021	0.023

Performance Level - AEP	Spectral Period (s)	Acceleration (g)[1]					
		Mean	Fractile				
			5th	15th	50th (median)	85th	95th
	1.5	0.015	0.012	0.012	0.015	0.017	0.018
1/2,475	PGA	0.048	0.042	0.042	0.046	0.053	0.054
	0.5	0.054	0.050	0.050	0.053	0.057	0.058
	1.0	0.030	0.026	0.027	0.030	0.033	0.035
	1.5	0.023	0.018	0.019	0.022	0.026	0.027
1/5,000	PGA	0.076	0.067	0.067	0.073	0.084	0.085
	0.5	0.079	0.073	0.073	0.079	0.083	0.084
	1.0	0.042	0.036	0.038	0.041	0.045	0.048
	1.5	0.031	0.024	0.025	0.029	0.036	0.037
1/10,000	PGA	0.116	0.102	0.102	0.111	0.128	0.128
	0.5	0.114	0.106	0.106	0.115	0.119	0.121
	1.0	0.057	0.050	0.052	0.057	0.060	0.065
	1.5	0.041	0.032	0.034	0.039	0.047	0.048

Note:

1. 5%-damped, mean, geometric-mean, peak horizontal acceleration.

Eleven two-horizontal-component EATHs (22 records) were developed using amplitude scaling to the site-specific 1/2,475 AEP uniform hazard acceleration response spectrum within the period range of interest of 0.5 to 1.5 seconds (Appendix A). These 22 EATHs were developed with eight two-component (16) records from crustal earthquakes and three two-component (6) subduction interface earthquake records. Comparison of the intensity measures of the scaled EATHs to predicted $D_{5\text{-}75}$, $D_{5\text{-}95}$, CAV, and AI intensity measures indicates that the scaled EATHs are generally within the 16th and 84th percentile range of the empirically predicted values.

1.0 INTRODUCTION

This report provides earthquake ground motions estimated from a site-specific probabilistic seismic hazard analysis (PSHA) and deterministic seismic analysis (DSA) undertaken by WSP USA Inc. (WSP USA) for the Tailings Storage Facility (TSF) at the Mount Polley mine TSF site in British Columbia, Canada. Seismic parameters presented in this report can be used to support future engineering analysis at the Mount Polley TSF site.

1.1 Site Location

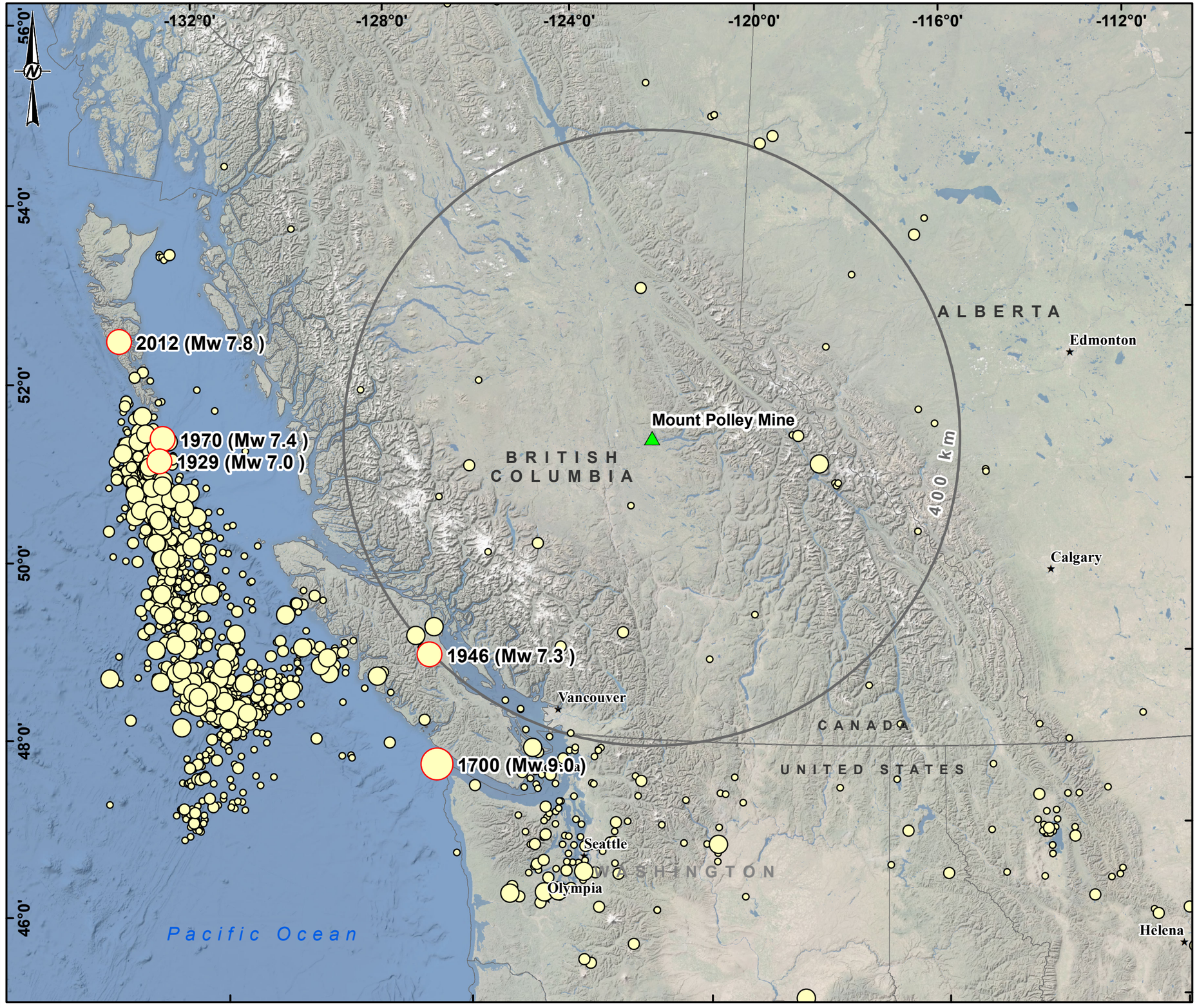
The Mount Polley TSF site is in British Columbia, about 380 km northeast of Vancouver (Figure 1). The site is at 52.509º N latitude and 121.588º W longitude, and hereinafter referred to as the 'site'.

1.2 Background

Mount Polley Mining Corporation (MPMC) requested WSP Canada Inc. (WSP Canada) to provide a series of work plans for ongoing engineering support of the Mount Polley Mine site development. One key task is to update the feasibility design for raising of the South, Main, and Perimeter embankments for the Mount Polley TSF. The design to be updated is that described in Golder (2015).

Dynamic analysis modelling requires input acceleration time histories that represent realistic earthquake ground motions for the annual exceedance probability (AEP) being considered. In turn, these acceleration time histories should reflect a state-of-practice seismic hazard analysis at the site. Because there have been several major developments in the assessment of seismic hazards in North America in recent years, and importantly the publication of the NGA-Subduction ground motion models, a revised site-specific seismic hazard analysis was included as part of Golder's work plan for stability analysis for the Mount Polley TSF.

This report presents the data, methods, and results of the site-specific PSHA undertaken to support seismic stress deformation modeling for the Mount Polley TSF. The work was undertaken by specialist staff from WSP USA Inc. and WSP New Zealand Limited (formerly Golder Associates New Zealand Ltd.) under an intercompany agreement with WSP Canada Inc. (WSP Canada). The agreed work scope of work for the PSHA and development of earthquake acceleration time histories provided in Appendix A is described in proposal 21452039-078-WP-Rev0-50000-TSF2022_28JAN_22. Further details are provided in Section 1.3 below.



LEGEND

Project Location

Earthquake Epicenter

Moment Magnitude (Mw)

- 4.0 - 4.9
- 5.0 - 5.9
- 6.0 - 6.9
- 7.0 - 7.9
- ≥ 8

(Year and magnitude labeled)

0 100 200 400

KILOMETERS

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 2011 UTM ZONE 11N
2. SERVICE LAYER CREDITS: USGS,NGA,NASA,CGIAR,GEBCO,N ROBINSON,NCEAS,NLS,OS,NMA,GEODATASTYRELSEN AND THE GIS USER COMMUNITY SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT

GOLDER ASSOCIATES LTD.

PROJECT

SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT FOR MOUNT POLLEY MINE, BRITISH COLUMBIA

TITLE

HISTORICAL EARTHQUAKE EPICENTERS IN SOUTHWESTERN CANADA

CONSULTANT

wsp

YYYY-MM-DD	2022-08-31
DESIGNED	-
PREPARED	HJ
REVIEWED	AK/ET
APPROVED	AH

PROJECT NO.	PHASE	REV.	FIGURE
6-DY039.00	-	0	1

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1.3 Work Scope

WSP USA has completed the following major tasks to develop earthquake ground motions, acceleration time histories (Appendix A), and evaluation of site time-average shear-wave velocity (Appendix B) for site-specific seismic hazard analysis at the Mount Polley TSF site:

- Reviewed existing reports and readily available published, unpublished, and on-line records of the tectonic, geologic and earthquake history of the region surrounding the site.
- Assessed available information and estimated the time-averaged shear-wave velocity of the site ground conditions beneath the Mount Polley TSF site (Appendix B).
- Developed a seismic source model based on the seismic sources in CanadaSHM6 within about 400 km of the Mount Polley TSF site.
- Evaluated and weighted appropriate site-to-source attenuation ground motion models (GMM) for southwest Canada.
- Developed probabilistic hazard curves for a ground condition with a V_{S30} of 849 m/s (i.e., time-averaged shear-wave velocity in the upper 30 m below a reference depth).
- Prepared site-specific, 5%-damped, spectral acceleration hazard curves for an AEP range from 1/10 to 1/10,000, and for discrete spectral periods at horizontal peak ground acceleration (PGA), 0.2 s, and 1.0 s.
- Developed site-specific, 5%-damped, uniform hazard response spectra (UHRS) horizontal mean values at AEPs of 1/2,475, 1/5,000, and 1/10,000 and spectral periods (T_S) up to 10 s.
- Developed spectral accelerations (S_a) mean values, and median values ± one and two standard deviations (i.e., ±1 sigma and ±2 sigma) for discrete spectral periods at PGA, 0.2 s, and 1.0 s or the selected AEPs.
- Developed probabilistic deaggregation analysis by magnitude, distance, and epsilon for mean values of PGA and S_a of 0.1 s, 0.2 s, 0.5 s, 1.0 s, 2.0 s, 5.0 s, and 10.0 s, and at AEPs of 1/2,475, 1/5,000, and 1/10,000.
- Evaluated the PGA and S_a values for the dam performance levels (e.g., OBE and SEE) as specified by CDA (2014) and ICMM (2019) bulletins.
- Assessment and incorporation of model uncertainties used to estimate mean ground motions at the site.
- Earthquake acceleration time histories as presented in Appendix A.
- Prepared this report with the data, methods, and results of the seismic hazard analysis used to develop the recommended seismic parameters at the site.

1.4 Terminology

The terminology used in PSHA is specialised and is often used inappropriately. Use of variable and different terms can result in some confusion. Table 2 lists key terms used in this report as well as alternative, similar terms that relate terms used in this report to other commonly used terms with similar definitions.

Table 2: Terminology Used in this Report

Terms and Units	Alternative Similar Terms (units and definition may very)
Spectral period (seconds, s)	Period, natural-period, period-of-vibration, natural frequency.
Acceleration[1] (percentage of gravitational acceleration, g)	Peak geometric-mean horizontal acceleration, spectral acceleration.
Annual exceedance probability (AEP, likelihood of being exceeded in 1 year)	Return period[2] (years), frequency, annual probability of exceedance (AEP).
Uniform hazard acceleration response spectrum	Uniform hazard curve, acceleration response spectrum, response spectrum, spectral response spectrum, uniform hazard mean acceleration response spectrum.
Ground motion model (GMM)	Ground motion prediction equation (GMPE), attenuation equation.
Deaggregation	Disaggregation, de-aggregation.

Notes:

1. Where we use the term 'acceleration' it refers to the mean (geometric-mean) horizontal peak acceleration response of a 5 %-damped, single degree of freedom pendulum.
2. The inverse of the AEP is approximately equal to the return period for AEP values less than about 1/100 (0.01).

1.5 Report Structure

This report has the following structure:

- **Section 2.0: Site Ground Conditions**
  Describes the near-surface ground conditions used in this assessment
- **Section 3.0: Seismic Source Models**
  Describes the approach adopted in this assessment to model the magnitude, location, and frequency of earthquakes in the region around the site that contribute to the earthquake ground motion hazard.
- **Section 4.0: Ground Motion Model Selection and Weighting**
  Describes the ground motion models selected to undertake the PSHA, including the rationale for their selection and weighting.
- **Section 5.0: Probabilistic Seismic Hazard Analysis**
  Describes the PSHA analytical procedures of this site-specific assessment.
- **Section 6.0: Deterministic Assessment**
  Describes consideration of an MCE scenario for this assessment.
- **Section 7.0: Site-specific Probabilistic Seismic Hazard Analysis Results**
  Describes the results from the PSHA for this site-specific assessment.
- **Section 8.0: Seismic Hazard Analysis Discussion and Recommendations**
  Presents comparison of results with previous studies, and discussion of applying the results to assist in selection of engineering design.
- **Section 9.0: Closing**

- **Appendix A**

  Earthquake Acceleration Time History Development for Mount Polley TSF, British Columbia, Canada

- **Appendix B**

  Evaluation of the Time-Average Shear-Wave Velocity

2.0 SITE GROUND CONDITIONS

Near-surface site ground conditions can have a significant influence on the earthquake ground motion at a site. The effects of near surface ground conditions are spectral period dependent. Softer site ground conditions cause damping of short period waves and amplification of long period waves, and the inverse is observed at stiffer sites. Site ground conditions are incorporated into PSHA using parameters related to the shear-wave velocity profile beneath the site as used in GMMs. The shear-wave velocity related parameters are:

- V_{S30}: The time-averaged shear-wave velocity of the upper 30 m of ground or a reference surface below the site.
- $Z_{1.0}$: The depth to a shear wave velocity of 1,000 m/s.
- $Z_{2.5:}$ The depth to a shear wave velocity of 2,500 m/s.

These parameters are typically derived from the ground surface. However, they can also be developed for a reference depth such as engineering bedrock, especially in the case where the outputs of the PSHA are being used as an input for seismic ground response analysis to model the effects of non-linear behavior of near surface materials on the seismic hazard or the base of geotechnical models to assess dynamic stability. In general, there should be a negligible amount of non-linear behavior of earth materials beneath the reference depth.

Earthquake ground motions reported in this seismic hazard assessment are for V_{S30} of 849 m/s for engineering bedrock. This value was estimated through communication with the project engineering team and is based on VSP analysis at three borehole locations along the Mount Polley TSF. Appendix B provides further details for the site V_{S30} analysis used for this assessment.

The Kaklamanos et al. (2011) method based on the ground surface V_{S30} was used to estimate the $Z_{1.0}$ and $Z_{2.5}$ parameter values of 20.5 m and 590 m, respectively.

3.0 SEISMIC SOURCE MODELS

Seismic source models are an input into site-specific PSHA. They describe the spatial distribution, likelihood and magnitude of future earthquakes that may affect the site. Because the location and magnitude of future earthquakes is unknowable, a range of methods is used to predict the location, likelihood, and magnitude of future earthquakes creating a set of weighted alternative seismic source models.

The seismic source model used for this assessment adopts seismic sources and their parameters as developed for the preliminary release of the 2020 National Hazard Model of Canada (Kolaj et al. 2020b). The following sections describe the seismotectonic setting of the Mount Polley TSF site, and the source model adopted from CanadaSHM6 for this site-specific analysis.

3.1 Seismotectonic and Geological Setting

The Mount Polley TSF site is located within the Canadian Cordillera, part of the North American Cordillera that was formed by convergent tectonic processes and the successive accretion of a number of allochthonous terranes[1] to the ancient western margin of the North American plate, likely beginning sometime in the Late Triassic to Early Jurassic (~180 to 200 million years ago (Ma)) (Ricketts 2008; Price, 2000, 1994; Monger 1989; Monger and Price 1979). The accretion of allochthonous terranes was diachronous along the North American plate margin, with numerous complexities related to the amalgamation of terranes prior to accretion (e.g., Monger 1989). The Mount Polley mine site is located within the Quesnel terrane, which consists of an island arc assemblage that developed outboard of the ancient North American continental margin and was accreted to the North American plate sometime in the latest Triassic or earliest Jurassic (~200 Ma) (Beatty et al. 2006). The Quesnel terrane hosts numerous porphyry copper-gold and other important mineral deposits related to various metallogenetic processes (Nelson and Colpron 2007). East of this terrane is the Foreland Fold and Thrust Belt, comprising amalgamated volcanic, island arc and oceanic terranes that were accreted onto the western edge of the North American craton during the Late Jurassic to Paleocene about 150 to 60 Ma, together with highly deformed sedimentary sequences mostly represented by the Canadian Rocky Mountains.

The seismotectonic setting of western Canada is complex and with a diverse range of earthquake sources. The present-day tectonics of western Canada are strongly influenced by the effects of relative motions of the Pacific and North America plates and remnants of the former Farallon plate that was largely subducted. The modern Explorer, Juan de Fuca, and Gorda plates are the remain of the much larger Farallon plate.

The Cascadia subduction zone (CSZ) marks the boundary where the Juan de Fuca, Explorer, and Gorda plates are being subducted beneath western North America. The 1,200-km-long CSZ extends from northern California to British Columbia and is ~460 km west of Mount Polley at its closest approach. The present-day convergence (subduction) velocity ranges from about 43 mm/yr for the Juan de Fuca plate that decreases to the northwest to about 20 mm/yr for the Explorer plate (North America fixed). The CSZ has produced repeated great earthquakes (i.e., greater than moment magnitude (**M**)8.0 throughout the Holocene Epoch (i.e., last 11,700 years). The most recent CSZ great earthquake was an estimated **M**9.0 in January of 1700. The Cascadia subduction interface is currently locked and accumulating strain toward a future large or great earthquake (e.g., Dragert et al. 1994, Hyndman and Wang 1995, Mazzotti et al. 2003). The CSZ has a high rate of historical seismicity relative to the southern Canadian Cordillera where the Mt Polley TSF site is located.

The southern Cordillera has relatively low rates of historical seismicity relative to the northern Cordillera and CSZ to the west. However, intermediate-to-large magnitude earthquakes have been recorded. For example, an **M**6.0 earthquake in 1918 had an epicenter ~ 220 km east of the site (Halchuk et al. 2015). An **M**5.5 earthquake occurred in 1986 with an epicenter ~200 km north of the site (Table 3). Both earthquakes occurred in the “Rocky Mountain Trench” that marks the boundary between the western Foreland Fold and Thrust Belt and the Quesnel terrane and other terranes. The 1986 earthquake had a thrust fault mechanism, which is consistent with the general structural trends mapped in the area (e.g., Rogers et al. 1990).

[1] Allochthonous terranes are assemblages or packages of rocks that are stratigraphically and structurally distinct from their neighbours. Each terrane has a distinct geological history that precedes its amalgamation to other terranes. Terranes are created by crustal- and lithosphere-scale plate tectonic processes. Many allochthonous terranes have been identified throughout western North America, including Alaska.

3.2 Canadian National Seismic Source Model

The preliminary 6th Generation Seismic Hazard Model of Canada (CanadaSHM6) was released in 2020 as the basis for the 2020 National Building Code of Canada (NBCC 2020). The CanadaSHM6source modelling approach is described in more detail by Kolaj et al. (2020b). Information and digital files for the model used in this assessment were gathered from GSC Open File 8630 by Kolaj et al. (2020b; updated 29 November 2021), downloaded directly from the Natural Resources Canada website.

The Kolaj et al. (2020b) model is divided into three main components based on location — western Canada, eastern Arctic Canada, and southeast Canada. This assessment used only the western Canada component of CanadaSHM6. Between CanadaSHM5 and CanadaSHM6 significant updates were made to the western Canada model, including improved characterization of the CSZ and addition of the Leech River Valley Fault – Devil's Mountain Fault system in southern Vancouver Island. This has resulted in an increase in the estimated seismic hazard in southern British Columbia.

The Kolaj et al. (2020a) seismic source model includes sources for the CSZ interface, CSZ in-slab, active crustal, and stable crustal earthquakes. The seismic sources adopted for this assessment are described in Section 3.4 and Section 3.5 below.

3.3 Earthquake Catalog

Development of a site-specific SHA requires a comprehensive understanding of the spatial and temporal distribution of historical earthquakes for the region surrounding the site. The Seismic Hazard Earthquake Epicenter File (SHEEF2010), developed by Halchuk et al. (2015), was used to compute the earthquake occurrence rates for areal sources in CanadaSHM5 and CanadaSHM6.

The SHEEF2010 catalog includes earthquakes with an original catalog earthquake magnitude of 2.5 or higher. The estimated earthquake moment magnitude (**M**) used in the catalog can be less. The SHEEF2010 is estimated by Halchuk et al. (2015) to be complete from 1900 through 2010 for all reported magnitudes.

Although the catalog ends in 2010, updating the catalog and recalculating the activity rates has not been considered for this analysis. The update was not undertaken because there are insufficient recorded earthquakes in the region surrounding the site since 2010 to cause a change in calculated earthquake activity rates. Figure 1 presents **M**4 and larger earthquakes from SHEEF2010 within ~700 km from the site. Table 3 lists the key parameters for historical earthquakes that have occurred within 200 km from the site. Only three of the recorded earthquakes exceeded **M**4, indicating a relatively low rate of historical earthquake activity.

Table 3: Earthquakes with M>3 Magnitude Recorded within 200 km of the Mount Polley TSF Site

Date	Time (UTC)	Latitude (ºN)	Longitude (ºW)	Moment Magnitude (M)	Depth [km]	Distance to TSF site [km]
14/12/1988	04:07	53.183	122.291	3.1	5	89
28/8/1962	19:19	51.7	121.9	4.3	0	92
13/12/1968	08:50	52.4	120.2	3.7	18	95

Date	Time (UTC)	Latitude (ºN)	Longitude (ºW)	Moment Magnitude (M)	Depth [km]	Distance to TSF site [km]
13/12/1968	08:50	52.4	120.2	3.7	18	95
13/11/1968	11:59	52.32	120.12	3.2	18	102
4/6/1967	03:26	52.2	120	3.4	0	114
28/7/1965	18:33	52.3	119.8	3.5	0	124
22/10/1983	22:14	51.62	120.48	3.9	18	125
26/8/1969	01:25	51.9	120	3	18	128
16/11/1981	14:21	51.72	120.22	3.4	18	128
6/3/1988	22:54	51.486	122.604	3	10	133
22/1/1983	13:40	53.06	119.75	3.3	18	138
10/8/1968	21:10	52.88	119.63	3.2	18	139
10/3/1981	10:01	52.85	119.5	3.5	18	146
11/1/1995	23:39	51.688	119.914	3.4	5	147
23/3/1982	19:15	52.9	119.5	3.8	18	148
3/12/1957	13:47	51.6	123.3	3.3	0	155
15/4/1999	13:14	52.329	119.309	3.1	10	156
26/2/2001	21:17	52.25	119.324	3.8	11	157
2/5/2007	20:46	52.932	119.308	3	1	161
27/11/1970	22:17	52.64	119.13	3.8	10	167
10/10/2007	17:50	52.885	124.072	3.9	22.3	173
14/5/1978	22:37	52.61	118.9	4.7	7	183
29/3/1964	10:59	52	119	3.2	0	186
16/5/1996	13:13	54.182	122.036	3.5	0	189
14/5/1978	22:37	52.603	118.791	5	10	190
22/5/1985	01:29	52.42	118.79	3.3	18	190
21/3/1986	23:56	54.24	122	5.5	10	195
27/7/1968	04:52	52.3	118.7	3	18	198
26/7/1968	22:23	52.28	118.68	3.3	18	200
30/12/2003	13:22	52.354	118.661	3.3	6.1	200

3.4 Shallow Crustal Sources

3.4.1 Uniform-area sources

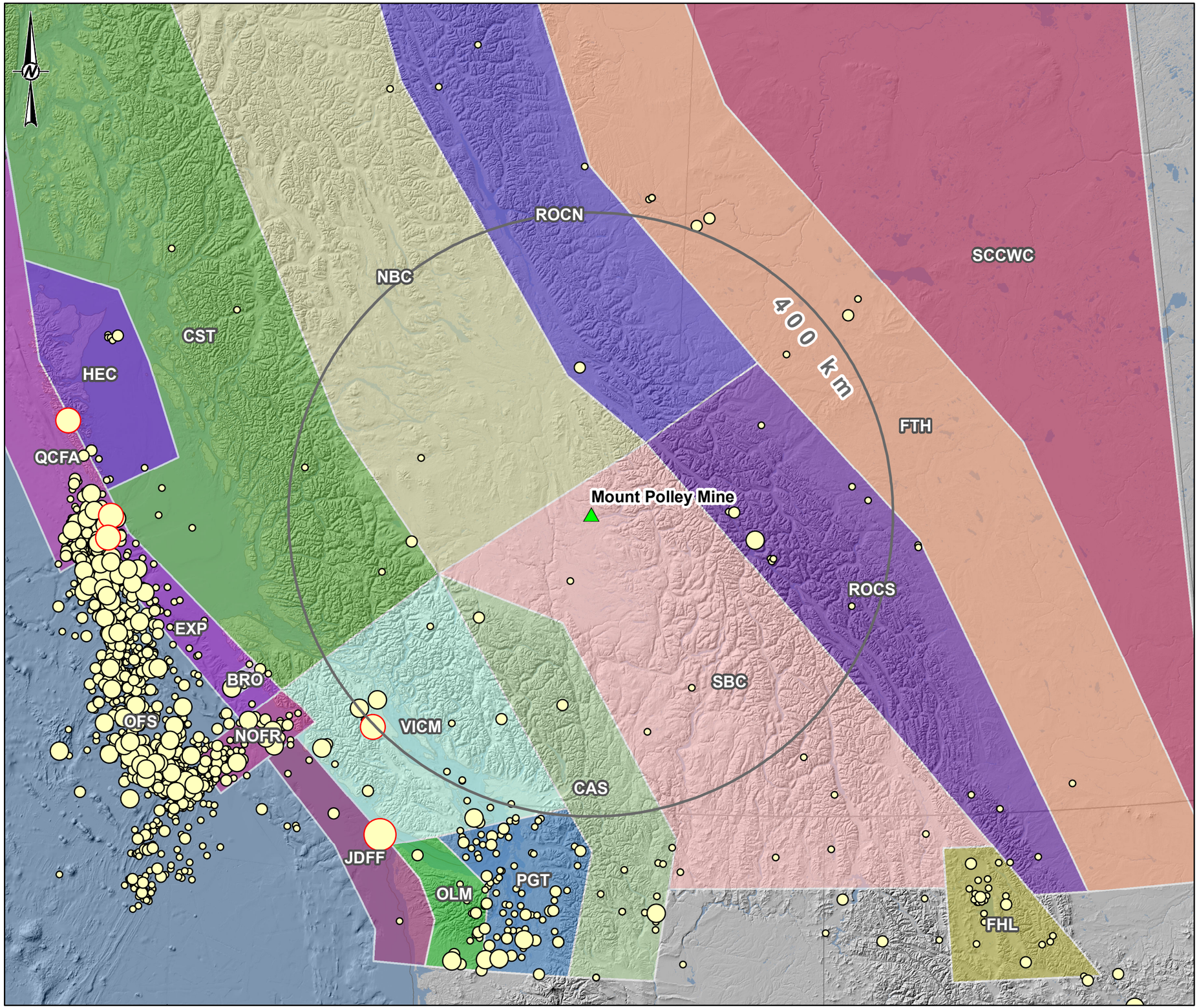
CanadaSHM6 uses uniform-area sources to model the occurrence of crustal seismicity not associated with known mapped seismogenic features such as seismically active faults or other seismogenic structures. There are eight crustal uniform-area sources within the Western CanadaSHM6 model within ~400 km of the site. These sources are described further below and shown in Figure 2.

- **Foothills (FTH):** Foreland Basin rocks located within the interior platform of western Canada immediately adjacent and east of the Canadian Cordillera. Characterized by very low rates of natural historical seismicity. In recent years oil and gas exploration has greatly increased the number of small earthquakes in the region. These “induced” earthquakes are not incorporated into this analysis because they contribute only to the short-term hazard locally and not the longer-term hazard considered here.
- **Rocky Mountain Fold/Thrust Belt North (ROCN):** Foreland fold and thrust belt of the Canadian Cordillera. This zone is characterized by slightly higher rates of historical seismicity compared to NBC and SBC. This source zone hosted an **M**5.5 earthquake in 1986.
- **Rocky Mountain Fold/Thrust Belt South (ROCS):** Foreland fold and thrust belt of the Canadian Cordillera. This zone is characterized by slightly higher rates of seismicity compared to the NBC and SBC sources zones (see below). This source zone hosted an **M**6.0 earthquake in 1918.
- **Northern British Columbia (NBC):** Interior of the Canadian Cordillera. This source zone has very low rates of historical seismicity. The eastern boundary of the NBC is the Rocky Mountain Trench. The northern boundary is marked by elevated seismicity rates interpreted to result from the transfer of strain from the Yakutat collision about 600 to 800 km to the west.
- **Southern British Columbia (SBC):** Interior of the Canadian Cordillera. This source zone has very low rates of historical seismicity. The Mount Polley TSF site is within this source zone. The eastern boundary of the SBC is the Rocky Mountain Trench. The western boundary is the Cascade Fold Belt.
- **Coastal Mountains (CST):** This source zone is underlain by the Middle Jurassic to Eocene Coastal Plutonic Complex with a relatively low rate of historical seismicity. The northern boundary is marked by elevated seismicity associated with the collision of the Yakutat Block with the North American Plate. The Yakutat Block is a composite oceanic-continental allochthonous terrane on the Pacific Plate.
- **Cascade Mountains (CAS):** The Cascade Fold Belt has historical seismicity rates higher than NBC and SBC source zones to the east.
- **Vancouver Island Coast Mountains (VICM):** This source zone is underlain by the Middle Jurassic to Eocene Coastal Plutonic Complex. This VICM has hosted numerous large crustal earthquakes in historical times including the 1949 **M**7.3 Vancouver Island earthquake. This source zone has earthquakes associated with ongoing arc volcanism.

Table 4 lists the parameters for the uniform-area sources adopted from CanadaSHM6.

The truncated Gutenberg-Richter (G-R) distribution is used to model earthquake occurrence rates within each uniform-area source zone. Three separate activity rates and three maximum earthquake magnitude (M_{max}) values are used to represent uncertainty in the estimation of the magnitude-recurrence parameters (Kolaj et al. 2020a).

For computational efficiency, these activity-rate- M_{max} pairs are collapsed down to a single weighted magnitude frequency distribution (MFD) for each area-source zone.



LEGEND

Project Location

Earthquake Epicenter

Moment Magnitude (Mw)

- 4.0 - 4.9
- 5.0 - 5.9
- 6.0 - 6.9
- 7.0 - 7.9
- ≥ 8

Seismic Source Zone

- BRO - BROOKS PENINSULA
- CAS - CASCADE MOUNTAINS
- CST - COASTAL MOUNTAINS
- EXP - EXPLORER PLATE BENDING
- FHL - FLATHEAD LAKE
- FTH - FOOTHILLS
- FWFA - FAIRWEATHER FAULT AREA
- HEC - HECATE
- JDFF - JUAN DE FUCA PLATE BENDING, OFFSHORE
- NBC - NORTHERN BRITISH COLUMBIA
- NOFR - NOOTKA
- OLM - OLYMPIC
- PGT - PUGET SOUND (shallow)
- QCFA - QUEEN CHARLOTTE FAULT AREA
- ROCN - ROCKY MOUNTAIN FOLD/THRUST BELT NORTH
- ROCS - ROCKY MOUNTAIN FOLD/THRUST BELT SOUTH
- SBC - SOUTHERN BRITISH COLUMBIA
- SCCWC - STABLE CRATONIC CORE WESTERN CANADA
- VICM - VANCOUVER ISLAND COAST MOUNTAINS

0 100 200 400

KILOMETERS

REFERENCE(S)

1. COORDINATE SYSTEM: WGS 1984 UTM ZONE 11N
2. SERVICE LAYER CREDITS: USGS,NGA,NASA,CGIAR,GEBCO,N ROBINSON,NCEAS,NLS,OS,NMA,GEODATASTYRELSEN AND THE GIS USER COMMUNITY

CLIENT

GOLDER ASSOCIATES LTD.

PROJECT

SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT FOR MOUNT POLLEY MINE, BRITISH COLUMBIA

TITLE

EARTHQUAKE EPICENTERS AND CRUSTAL SEISMIC SOURCES FOR SOUTHWESTERN CANADA

CONSULTANT

wsp

YYYY-MM-DD	2022-08-31
DESIGNED	-
PREPARED	HJ
REVIEWED	AK/ET
APPROVED	AH

PROJECT NO.	PHASE	REV.	FIGURE
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Table 4: Uniform-area Active Shallow Crust Source Parameters

Tectonic Region	Source Zone	Closest distance to TSF site (km)	Weighted Mmin[a]	Weighted Mmax[b]	Upper Seimogenic Depth [km]	Lower Seismogenic Depth [km]	Weighted Activity Parameters	
							N(0)[c]	b-value[d]
Active Shallow Crust	SBC	0	4.8	7.14	0	25	1955.607	1.0139
	CAS	142	4.8	7.14	0	25	111.204	0.765
	VICM	212	4.8	7.49	0	25	187.72	0.742
	CST	212	4.8	7.14	0	25	8948.44	1.0419
	NBC	30	4.8	7.14	0	25	234.184	0.869
	ROCN	113	4.8	7.19	0	25	267.36	0.834
	FTH	295	4.8	7.02	0	25	270.933	0.869
	ROCS	110	4.8	7.19	0	25	495.34	0.83

Notes:

a. Mmin is the minimum magnitude included in the source model and defines the lower magnitude truncation of the Gutenberg-Richter distribution.

b. Mmax is the maximum magnitude included in the source model and defines the upper magnitude truncation of the Gutenberg-Richter distribution. The Mmax is the weighted sum of the collapsed MFD.

c. N(0) is the annual number of earthquakes (N) at magnitude zero – this is the same as the a-value, a constant in the Gutenberg-Richter relationship. The N(0) value is the weighted sum of the collapsed MFD.

d. b-value is a constant in the Gutenberg-Richter relationship that describes the proportion of large magnitude earthquakes to small magnitude earthquakes. The b value is the weighted sum of the collapsed MFD.

3.4.2 Crustal Fault Sources

There are no known crustal seismogenic fault sources within 400 km of the Mount Polley TSF site. Accordingly, linear active crustal fault sources are not in the seismic source model. Earthquake occurrence near the site is instead modelled using shallow crustal uniform-area sources (Section 3.4.1) and CSZ sources (Section 3.5).

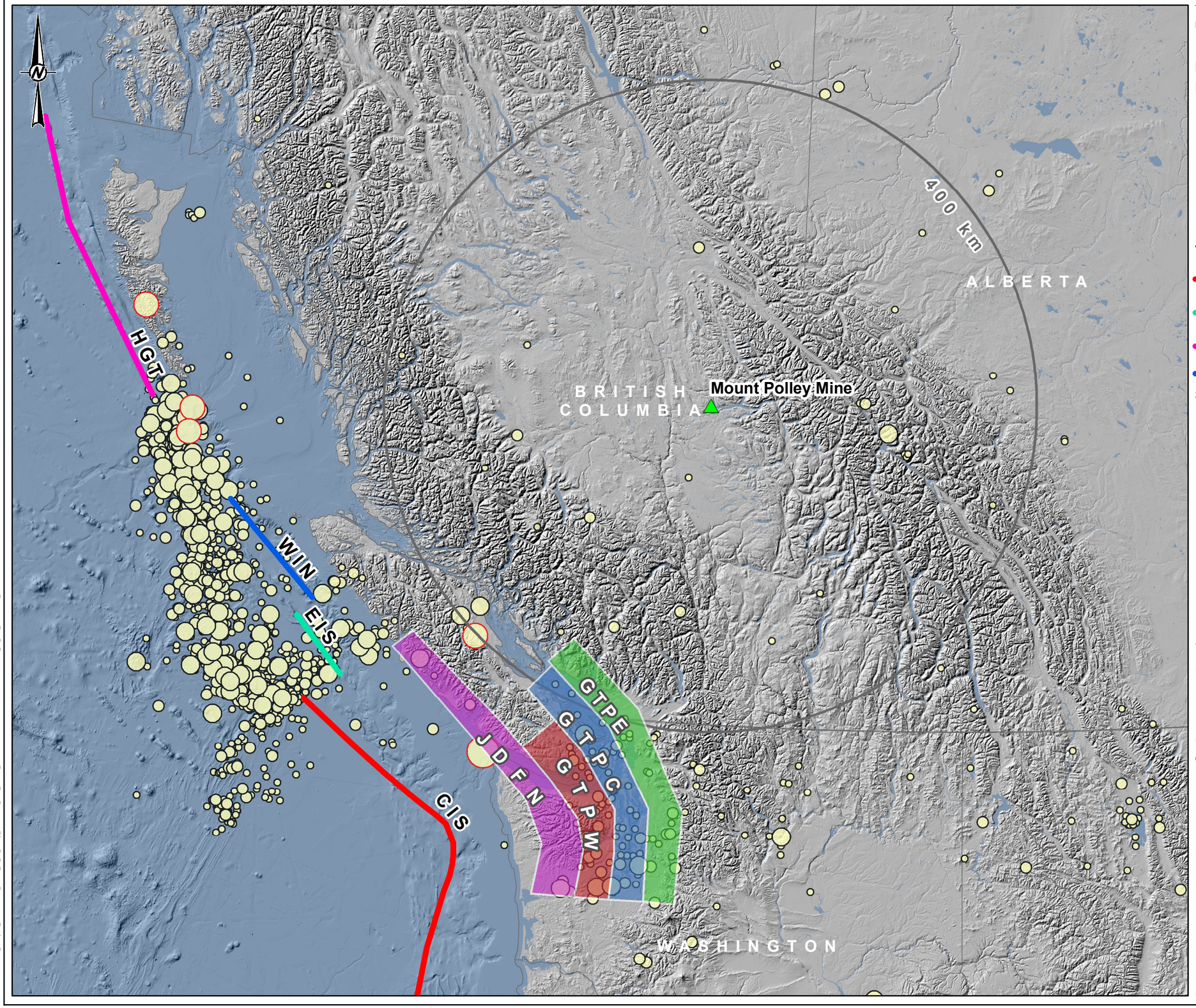
3.5 Subduction Sources

The CSZ marks the boundary where the Explorer, Juan de Fuca, and Gorda plates (i.e., remnants of the older Farallon plate) subduct beneath the North America plate. The CSZ is about 460 km from the site at its closest approach. CanadaSHM6 has separate subduction source models for the subduction interface fault and the subduction in-slab sources as shown in Figure 3. These models are used for this assessment.

3.5.1 Subduction Interface

The CSZ interface fault is the surface trace of the boundary between the subducting Juan de Fuca plate system, comprised of the Gorda, Juan de Fuca, and Explorer plates, and the overriding North American plate. The CSZ is a “mega-thrust” source known to generate great earthquakes (**M**>8.5) such as in 1700. In CanadaSHM6, the CSZ interface fault has four sections: the Cascadia Interface, the Explorer Interface, the Winona thrust fault, and the Haida Gwaii thrust fault. Compared to CanadaNSHM5, CanadaSHM6 incorporates an improved model for the Juan de Fuca segment of the Cascadia subduction zone by incorporating current understanding of the paleoseismic history rather than a simple deterministic scenario. The more refined approach has reduced the average inter-event period for great earthquakes to increase the estimated seismic hazard for many sites in the coastal regions of Western Canada.

Table 5 lists the parameters for the subduction interface sections adopted from CanadaSHM6.



LEGEND

Project Location

Earthquake Epicenter

Moment Magnitude (Mw)

- 4.0 - 4.9
- 5.0 - 5.9
- 6.0 - 6.9
- 7.0 - 7.9
- ≥ 8

Top of Subduction Interface Sources

- CIS - CASCADIA SUBDUCTION INTERFACE
- EIS - EXPLORER PLATE INTERFACE
- HGT - HAIDA GWAII THRUST FAULT
- WIN - WINONA THRUST FAULT

Subduction In-slab Sources

- GTPC - GEORGIA STRAIT PUGET SOUND CENTRAL
- GTPE - GEORGIA STRAIT PUGET SOUND EAST
- GTPW - GEORGIA STRAIT PUGET SOUND WEST
- JDFN - JUAN DE FUCA PLATE BENDING, ONSHORE (Deep)

0 100 200 400

KILOMETERS

REFERENCE(S)

1. COORDINATE SYSTEM: WGS 1984 UTM ZONE 11N
2. SERVICE LAYER CREDITS: USGS,NGA,NASA,CGIAR,GEBCO,N ROBINSON,NCEAS,NLS,OS,NMA,GEODATASTYRELSEN AND THE GIS USER COMMUNITY

CLIENT

GOLDER ASSOCIATES LTD.

PROJECT

SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT FOR MOUNT POLLEY MINE, BRITISH COLUMBIA

TITLE

EARTHQUAKE EPICENTERS AND SUBDUCTION ZONE SOURCES FOR SOUTHWESTERN CANADA

CONSULTANT

wsp

YYYY-MM-DD	2022-08-31
DESIGNED	-
PREPARED	HJ
REVIEWED	AK/ET
APPROVED	AH

PROJECT NO.	PHASE	REV.	FIGURE
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Table 5: Cascadia Subduction Zone Interface Seismic Source Parameters

Tectonic Region	Source Zone	Model and *Weight*	Closest distance to site (km)	Mmin	Mmax[1]			Upper Seimogenic Depth [km]	Lower Seismogenic Depth [km]	Weighted Activity Parameters[1]					
					U	P	L			N(0)			b-value		
										U	P	L	U	P	L
Subduction Interface	Cascadia Interface	Landward fault depth 31.0 km *(0.25)*	463	8.4	9.3	-	9.1	5.0	31.0	Not reported			Not reported		
		Landward fault depth 27.0 km *(0.50)*	482	8.4	9.3	-	9.1	5.0	27.0	Not reported			Not reported		
		Landward fault depth 23.0 km *(0.25)*	501	8.4	9.3	-	9.1	5.0	23.0	Not reported			Not reported		
	Explorer Interface	Landward fault depth 28.0 km *(0.25)*	471	7.5	-	8.5 *(1.0)*	-	5.0	28.0	-	0.0009 *(1.0)*	-	-	-2.1715 *(1.0)*	-
		Landward fault depth 22.0 km *(0.50)*	490	7.5	-	8.0 *(1.0)*	-	5.0	22.0	-	0.003 *(1.0)*	-	-	-2.1715 *(1.0)*	-
		Landward fault depth 16.0 km *(0.25)*	509	7.5	-	7.6 *(1.0)*	-	5.0	16.0	-	0.0067 *(1.0)*	-	-	-2.1715 *(1.0)*	-
	Winona Thrust Fault		522	7.0	7.7	7.4	7.1	2.0	5.0	2313.516	4522.26	18375.9	-	0.8 *(1.0)*	-
			522	7.0	7.7	7.4	7.1	2.0	5.0	0.0373	0.102	0.5471	-	0.0001 *(1.0)*	-
	Haida Gwaii Thrust Fault		635	7.0	8.2	8.0	7.8	3.0	22.0	7894.441	10205	16062.53	-	0.8 *(1.0)*	-
			635	7.0	8.2	8.0	7.8	3.0	22.0	0.0612	0.107	0.2483	-	0.0001 *(1.0)*	-

1 Values for Mmax and Weighted Activity parameters are listed as U = Upper, P = Preferred, L = Lower

3.5.2 Subduction In-slab

The CanadaSHM6 defines four in-slab sources within about 500 km of the site. Table 6 lists the parameters from CanadaSHM6 used in this assessment. These sources represent earthquakes occurring in the subducting Juan de Fuca plate that extends beneath most of Vancouver Island, Puget Sound, and northern Washington state in the USA (Figure 3).

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Table 6: Cascadia Subduction Zone In-slab Seismic Source Parameters

Tectonic Region	Seismic Source Zone	Closest distance to site (km)	Mmin	Mmax			Upper Seimogenic Depth [km]	Lower Seismogenic Depth [km]	Weighted Activity Parameters[1]					
				U	P	L			N(0)			b-value		
									U	P	L	U	P	L
Subduction In-slab	Georgia Strait Puget Sound Central	375	4.8	7.5	7.2	7.0	45	65	15.4	20	72.8	0.413	0.478	0.69
	Georgia Strait Puget Sound East	336	4.8	7.5	7.2	7.0	50	70	3.3	4.4	5.8	0.365	0.478	0.59
	Georgia Strait Puget Sound West	416	4.8	7.5	7.2	7.0	40	60	18.4	23.5	130.2	0.413	0.478	0.746
	Juan De Fuca Plate Bending, Onshore (Deep)	455	4.8	7.3	7.0	6.9	25	45	26.3	52.86	107.01	0.5351	0.69	0.8448

1. Values for Mmax and Weighted Activity parameters are listed as U = Upper, P = Preferred, L = Lower

3.6 Source Model Parameters

There are important parameter limits included in PSHA:

- **Source-to-site distance (R)** is the maximum distance from the site considered in the hazard calculation. The maximum r parameter (r_{max}) is selected considering the distribution of historical earthquake epicenters, limitations of the GMMs, and the AEPs and spectral periods of interest to the project. The r_{max} in CanadaSHM6 is defined depending on the tectonic region with the longest distance for the subduction sources (1000 km) and shorter distances for the crustal sources (400 to 600km).
- **Maximum earthquake magnitude (M_{max})** is the maximum earthquake magnitude expected from an earthquake source. Refer to Sections 3.4 and 3.5 for further details.
- **Minimum earthquake magnitude (M_{min})** is the minimum earthquake magnitude expected to result in some damage to the facility or site under study. Refer to Sections 3.4 and 3.5 for further details for M_{min} for the defined seismic sources.
- **Epsilon (ε)** is a standard deviation of the ground motion models above and below the median ground motion calculated from each GMM. Inclusion of excessively unlikely ground motions is computationally demanding with minimal gain in the earthquake ground motion prediction. Epsilon (ε) is truncated at five in CanadaSHM6, and was also applied in this assessment (i.e., the ground motions above and below five standard deviations of the median are not included in the hazard integral).

Epistemic uncertainty is incorporated using a logic-tree approach. GMMs are weighted and propagated through the logic tree to provide a suite of weighted results that are then summed. The CanadaSHM6 model trial version logic tree was collapsed (Kolaj et al. 2020b) to reduce the time required for calculation of the magnitude recurrence branches. The logic tree collapsing does not impact the mean hazard value obtained, only the hazard fractiles.

4.0 GROUND MOTION MODEL SELECTION AND WEIGHTING

Empirical ground motion models (GMM) are used to estimate the earthquake ground motions at a site for an earthquake with a magnitude, a rupture mechanism (e.g., normal, strike-slip, reverse or thrust), and a known source-to-site distance. The GMMs are developed for defined tectonic regions and seismic types (e.g., subduction zones or shallow crust). The GMMs used in this assessment are selected based on the similarity between the tectonic and geologic conditions in the region surrounding the site and the conditions in the regions from which earthquake recordings were selected to derive the GMMs.

4.1 Active Shallow Crustal Ground Motion Models

CanadaSHM6 uses the Pacific Earthquake Engineering Research Center (PEER) Next Generation of Ground Motion Attenuation Phase 2 Project (NGA-West2) GMMs to model source-to-site attenuation for all active shallow crustal sources. The NGA-West2 GMMs were developed for active tectonic regions based mostly on earthquake strong ground motion data recorded at seismically active, present-day tectonic plate boundaries, primarily from western United States, Japan, New Zealand, and other seismically active regions around the world.

The NGA-West2 GMMs were developed in a systematic process using improved strong ground motion recordings and considered the soil conditions at the ground motion recording stations, near-source saturation effects, and sedimentary basin and fault hanging-wall effects. These GMMs have been employed globally to model source-to-site attenuation from shallow crustal sources in PSHA. Spectral accelerations are estimated as a function of

earthquake magnitude, source-to-site distance, fault geometry, and time-averaged shear-wave velocity in the upper 30 m below the site ground reference surface (i.e., V_{S30}).

Table 7 lists the crustal GMMS used, their weights, and key distance measures.

4.2 Subduction Ground Motion Models

Subduction zone earthquake sources include both the subduction interface and subduction in-slab sources. GMMs have been developed for each of the interface and in-slab sources independently, but there is significant overlap in the development of GMMs for these sources because they are typically both used when a site is near a major subduction zone.

The selection and weighting of subduction GMMs for CanadaSHM6 is based on 15 discrete V_{S30} values. The V_{S30} value used in this assessment is not one of the pre-defined values in CanadaNSH6. Consequently, the use of GMMs in this assessment differs from that in CanadaSHM6.

This assessment uses three of the GMMs developed for the NGA-Sub project to model source-to-site attenuation for the subduction interface sources: Abrahamson and Gülerce (2020), Kuehn et al. (2020), and Parker et al. (2020). The Si (2020) GMM was developed specifically for Japanese subduction zones using only Japanese strong motion data. This GMM is not yet recommended for use outside Japan. The NGA-Sub project followed a similar methodology as the NGA-West2 project. The 2020 NGA-Sub GMMs are now considered the more advanced GMMs for subduction zone earthquakes because they have been developed using the similar robust and peer reviewed approach as used for the NGA-West2.

The Abrahamson et al. (2018) pre-NGA-Sub GMM was also used in this analysis because it was specifically developed for the CSZ as part of the BC Hydro assessment in 2012. Abrahamson et al. (2018) is an updated version of the BC Hydro GMM. The Abrahamson et al. (2018) central model was included with a relatively low weight to capture the epistemic uncertainty in CSZ ground motion predictions. The central, low, and high alternatives of Abrahamson et al. (2018) were included to capture the epistemic uncertainty for the in-slab sources.

Table 7: Selected Ground Motion Models and Weights used in this Assessment

Tectonic Region	GMMs	Weight	Primary distance metric[1]	Moment Magnitude (M) range	Source-to-site distance (km)
Active Shallow Crust	Abrahamson et al. (2014)	0.25	Rrup	3.0-8.5	0-300
	Boore et al. (2014)	0.25	Rjb	3.0-7.9	0-400
	Campbell and Bozorgnia (2014)	0.25	Rrup	3.3-8.5	0-300
	Chiou and Youngs (2014)	0.25	Rrup	3.5-8.5	0-300
Subduction Interface	Abrahamson and Gülerce (2020) *Cascadia-specific coefficients	0.35	Rrup	5.0-9.5	0-800
	Abrahamson et al. (2018)	0.15	Rrup	5.0-9.5	0-1000
	Kuehn et al. (2020)	0.35	Rrup	5.0-9.5	10-1000
	Parker et al. (2020)	0.15	Rrup	4.5-9.5	20-1000
Subduction In-slab	Abrahamson et al. (2018)	0.2	Rrup	5.0-9.5	0-1000
	Abrahamson and Gülerce (2020) *Cascadia-specific coefficients	0.4	Rrup	5.0-9.5	0-800
	Kuehn et al. (2020)	0.4	Rrup	5.0-9.5	10-1000

1. Distances metrics are Rrup for rupture plane distance, Rjb for Joyner-Boore distance as closest distance to the surface projection of the fault plane.

5.0 PROBABILISTIC SEISMIC HAZARD ANALYSIS

This section provides a general overview of the PSHA method as applied in the site-specific hazard assessment, including incorporation of uncertainties.

5.1 Methodology

PSHA is based on a method proposed by Cornell (1968) that essentially relates the recurrence of earthquakes in the seismic source models to the probability that an earthquake ground motion exceeds a certain value in a specific time period at a specific location (see following equation). This approach relies on the assumption that earthquakes occur randomly in space and time (i.e., Poisson process).

$$P(IM > s) = 1 - e^{-\varphi(s)t}$$

Where:

- *P* = probability
- *IM* = ground motion (also known as ground motion intensity measure)
- s = a specific value of ground motion
- φ(s) = annual exceedance probability (AEP)
- t = time period

For this assessment, the target annual exceedance probabilities (AEP) are 1/1,000, 1/2,475, 1/5,000 and 1/10,000. The annual probability of exceedance is calculated following equation:

$$(IM > x) = \sum_{i=1}^{n_{sources}} \lambda(M > m_{min}) \int_{m_{min}}^{m_{max}} \int_{0}^{r_{max}} P(IM > x|m,r) f_M(m,r) f_R(r) dr dm$$

Where:

- $n_{sources}$ = number of sources considered
- $\lambda(M>m_{min})$ = the rate of occurrence of earthquakes greater than m_{min} from the i_{th} source
- $P(IM>x \mid m,r)$ = the probability that *IM* exceeds x given magnitude *m* and distance *r*
- $f_M(m) f_R$® = probability density functions for magnitude *m* and distance r

The probabilistic analysis for this site was undertaken using the OpenQauke software (v.3.11.4) developed by the Global Earthquake Model Foundation (GEM, 2022).

5.2 Logic Tree Analysis

Epistemic uncertainty is the uncertainty associated with the simplified and imprecisely known scientific model of a natural process. This uncertainty is typically parameterized by considering alternative model input parameters to the PSHA (e.g., Abrahamson 2006, 2009). The input model parameters include the seismic source models, their recurrence parameters and maximum earthquake magnitudes, hypocentral depth, and ground motion model. Epistemic uncertainty is commonly accommodated through a logic-tree approach.

One of the planned changes for CanadaSHM6 was to implement the model in OpenQuake—an open-source seismic hazard and risk calculation software developed and maintained by the Global Earthquake Model Foundation (GEM 2022). Allen et al. (2020) converted CanadaSHM5 to OpenQuake to ensure the change in calculation software did not result in a change in hazard values.

As part of this implementation of the seismic source models in OpenQuake, the two magnitude-frequency distribution (MFD) branches of the logic tree, the three-alternative a- and b-value branches and three alternative M_{max} branches, were collapsed into a single MFD branch. This approach was used by Allen et al. (2020) to reduce the unreasonably long runtimes in OpenQuake v3.2 with nine weighted source model sub-branches for each earthquake source.

Variations in occurrence rates and M_{max} were collapsed into a combined, weighted average branch for computational efficiency. Allen et al. (2020) outlines in detail the implementation of CanadaSHM5 in OpenQuake and the differences in results between the two calculation software programs. While collapsing these two branches in the logic tree had a negligible impact on median hazard values, it limits the ability to perform a detailed analysis of the fractiles or model input sensitivity test. Improvements in computation runtimes in OpenQuake v.3.11 allow for a sensitivity analysis of a subset of spectral periods and return periods. The input parameters, logic tree, and weighting values used in this assessment are adopted from the Kolaj et al. (2020b) model and presented in Figure 4.

Figure 4 shows the source model logic tree used in this site-specific analysis.

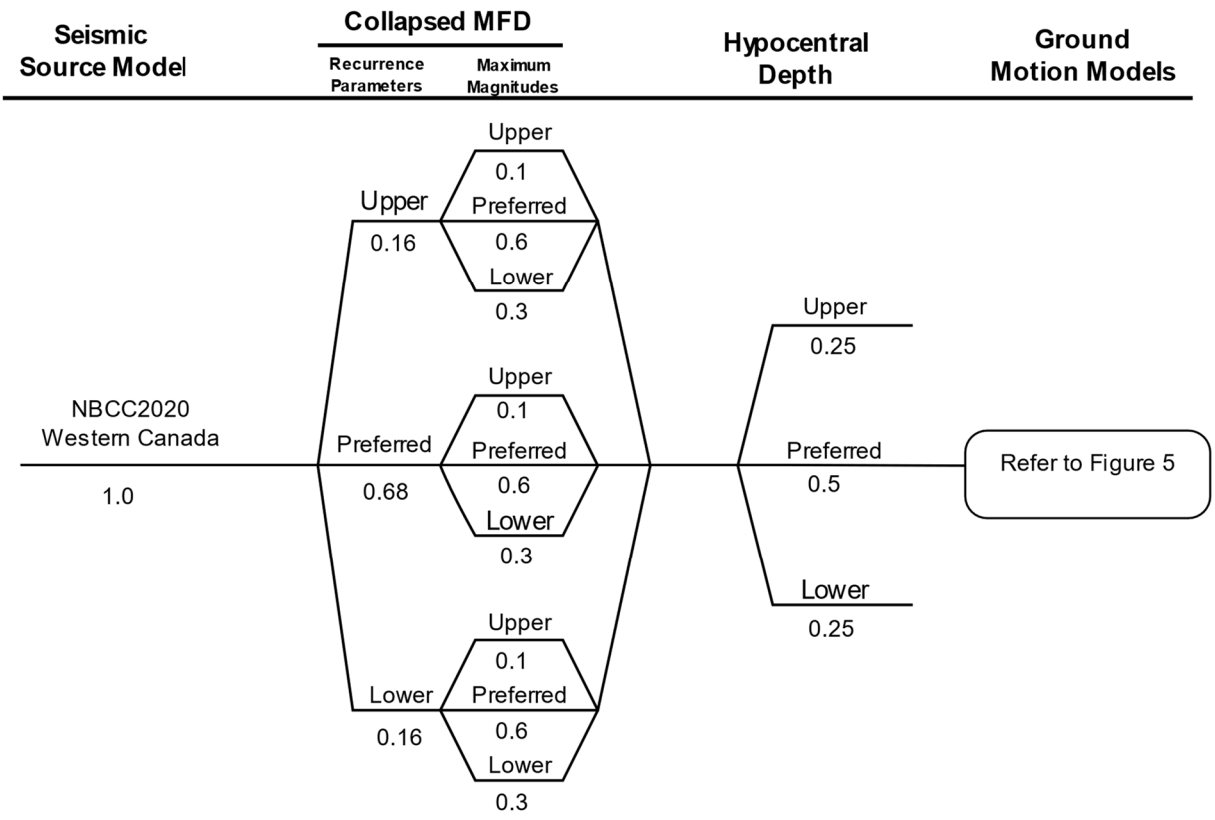

Figure 4 Seismic Source Model Logic Tree used in this assessment

Figure 5 shows the GMM logic and weighting as described in Section 4.0.

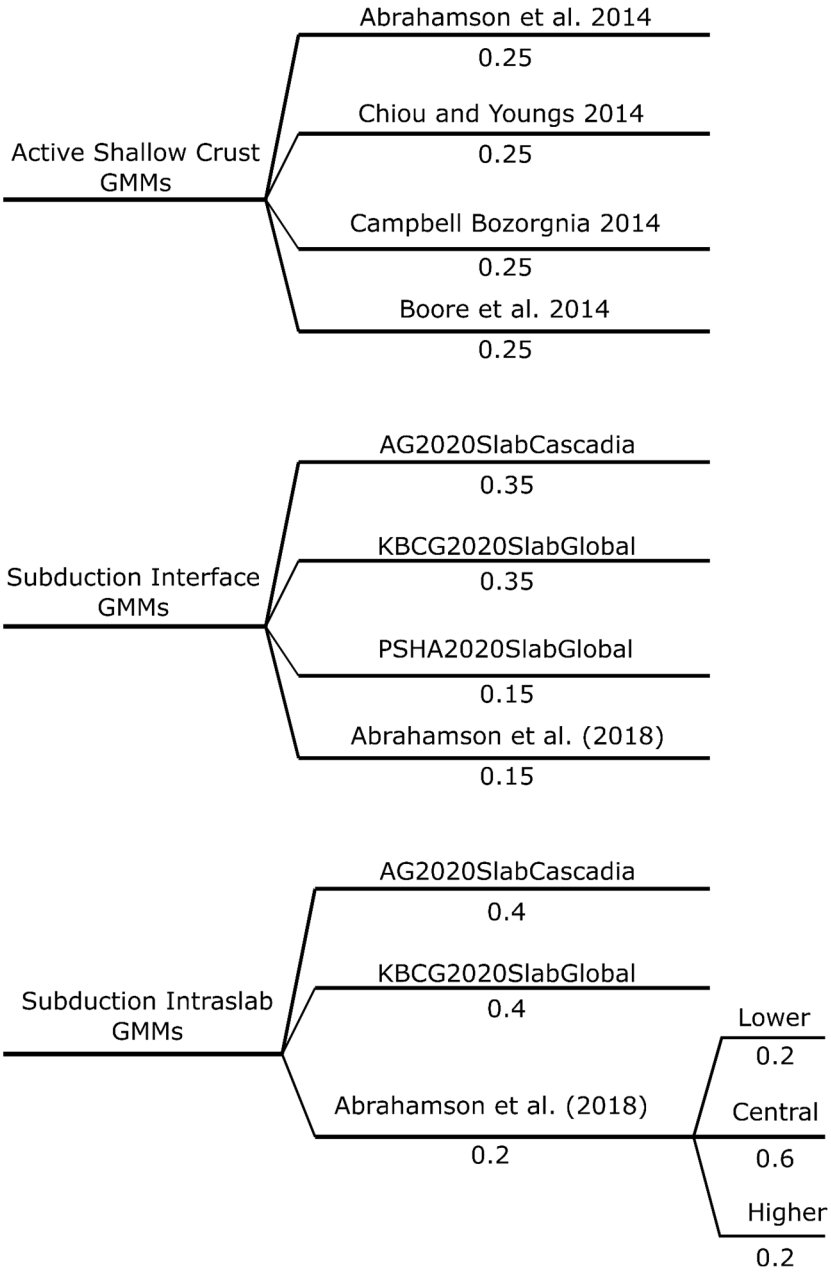

Figure 5 Logic trees for selected ground motion models and their weights for crustal, subduction interface, and subduction in-slab sources

5.3 Validation of Model Implementation

The results of a full CanadaSHM6 model (unmodified) run for the site is compared to results derived from the Seismic Hazard Tool calculator available online (Natural Resources Canada (NRCan) 2020) as the basis to validate our implementation of the CanadaSHM6 source models and GMMs in OpenQuake. Table 8 lists results for the 1/475 and 1/2475 AEPs.

The results from our implementation of CanadaSHM6 in OpenQuake and those available from the seismic hazard tool for the two AEPs are almost identical. The discrepancies in acceleration values in this validation test are negligible and can be attributed to changes in the versions of the OpenQuake software engine. From this validation test, our implementation of CanadaSHM6 is considered valid.

Table 8 also lists the 1/475 AEP and 1/2475 AEP mean hazard results using the site-specific source model developed for the site. The site-specific results are generally lower than CanadaSHM6, although the absolute value of the total hazard and differences in hazard are low. Differences in the results are primarily attributed to the different ground motion model selection and weighting, and the V_{S30} used in this assessment.

Table 8: Accelerations for Validation of Models at 1/475 AEP and 1/2475 AEP

Parameter		Mean acceleration (g)			
AEP	Spectral period (s)	CanadaSHM6 results[1] V_{S30}= 760 m/s	This assessment		
			CanadaSHM6 model[2] V_{S30}= 760 m/s	Site-specific[3] V_{S30}= 760 m/s	Site-specific [4] V_{S30} = 849 m/s
1/475	PGA	0.019	0.018	0.016	0.015
	0.2	0.037	0.036	0.031	0.029
	0.5	0.027	0.027	0.024	0.021
	1.0	0.018	0.018	0.015	0.013
	2.0	0.014	0.013	0.009	0.010
	5.0	0.006	0.006	0.004	0.008
	10.0	0.003	0.003	0.002	0.004
1/2,475	PGA	0.057	0.055	0.051	0.048
	0.2	0.115	0.111	0.107	0.098
	0.5	0.067	0.064	0.061	0.054
	1.0	0.043	0.042	0.043	0.030
	2.0	0.034	0.032	0.035	0.020
	5.0	0.018	0.017	0.011	0.011
	10.0	0.013	0.012	0.006	0.006

Notes:

1. Natural Resources Canada (2020). Obtained using NRCan Seismic Hazard Tool: https://earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/nbc2020-cnb2020-en.php for V_{S30} of 760m/s at site location.
2. Variations between these results and the CanadaSHM6 results are due to minor changes between OpenQuake versions. Results presented in this assessment are from OpenQuake v3.11.4.
3. Variations between these results and the CandaSHM6 published results are due to the source models and weightings developed for this assessment.
4. As per note 3, and the difference in V_{S30}.

6.0 DETERMINISTIC ANALYSIS

The Canadian Dam Association (CDA) guidelines for tailings dams (CDA 2019, Table 3.1) permit the use of a maximum credible earthquake (MCE) for Very High and Extreme consequence facilities. The Mount Polley TSF is located within a relatively tectonically stable continental region in western North America. Major systems or segments of faults with seismogenic potential needed to estimate an MCE within about 400 km of the site are unknown based on our review of readily available information. Consequently, the magnitude-distance pair required to generate discrete, single-valued earthquakes to estimate the site-specific MCE ground motions is not possible for the Mount Polley TSF site. Probabilistically based mean accelerations developed from this assessment, therefore, are recommended for earthquake ground motion analyses at the Mount Polley TSF site.

7.0 SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ANALYSIS RESULTS

Sections below present the site-specific earthquake ground motions for the Mount Polley TSF site. Section 8.0 provides discussion of the results and recommendations. The results presented here are for a V_{s30} of 849 m/s (Appendix B).

The ground motion hazard results from the PSHA are described in three ways:

- Hazard curves that describe the acceleration at a specific spectral period at a range of AEPs. Section 7.1 describes hazard curves for the site.
- Uniform hazard acceleration response spectrum that describes the acceleration for a range of spectral periods at a specific AEP. The response spectrum is “uniform hazard” because each acceleration value has the same AEP. Section 7.2 presents uniform hazard response spectra for the site.
- Magnitude-distance deaggregations that describe the joint probability mass distribution of earthquake-magnitude and source-to-site distance that contribute to the mean hazard at a specific AEP and spectral period. Section 7.3 present magnitude-distance deaggregations for the site.

7.1 Hazard Curves

Hazard curves describe earthquake acceleration values at different AEPs at a given spectral period. Figure 6 shows mean hazard curves for selected spectral periods. The 1/1,000, 1/2,475, 1/5,000, and 1/10,000 AEPs are also shown. The mean hazard curves are the result of summing weighted hazard curves as developed from the logic tree.

Figure 7 shows PGA, 0.5 s, 1.0 s, and 1.5 s spectral period mean hazard curves with 5th, 15th, 50th (median), 85th, and 95th fractiles (median ± 1 and 2 standard deviations). The fractiles reflect the uncertainty in the hazard results as incorporated in the logic trees in this site-specific PSHA. As described in Section 5.2 the b-value and maximum earthquake magnitude uncertainties from the areal source models are not incorporated in the fractile analysis.

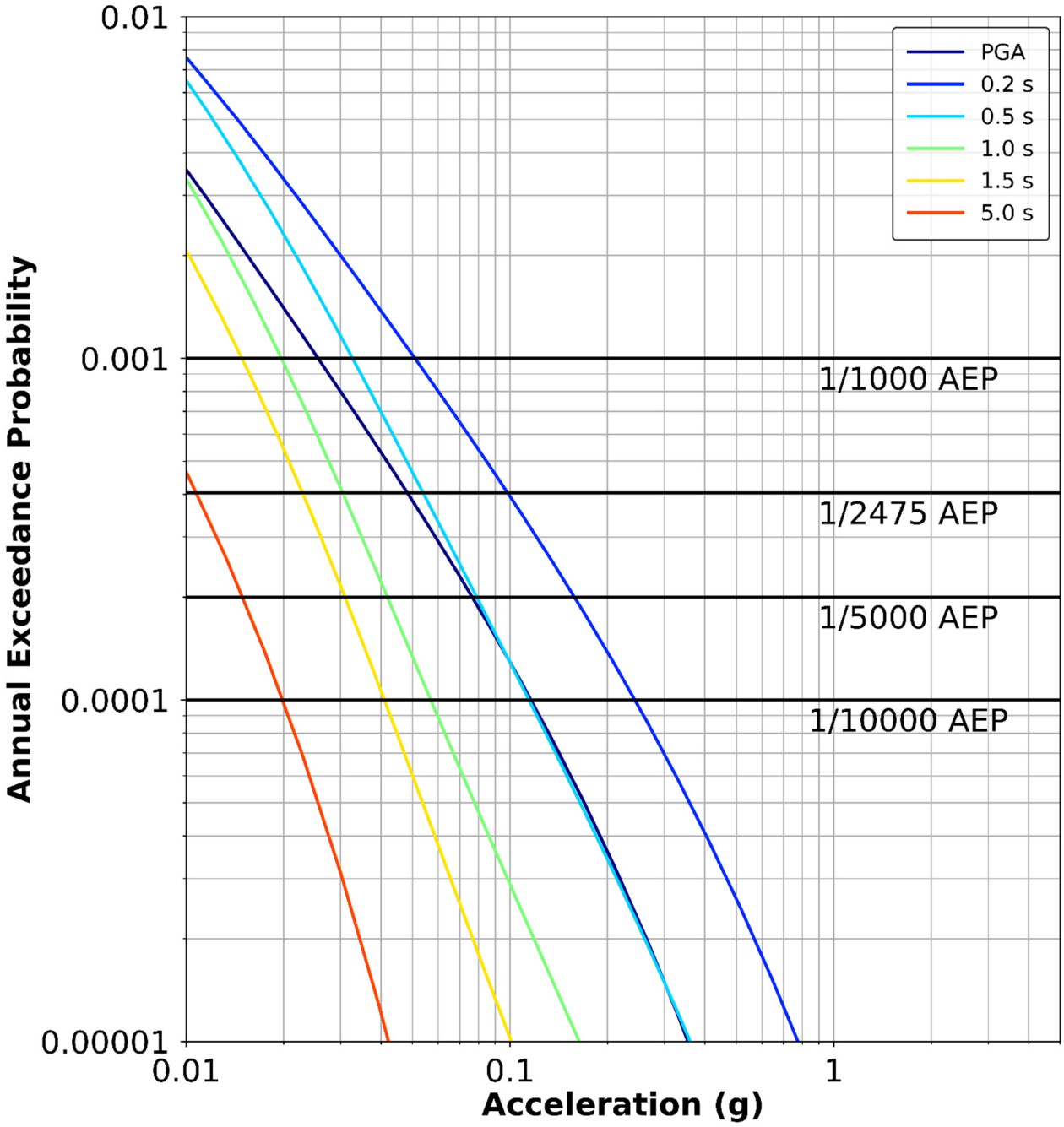

Figure 6: Mean hazard curves for selected spectral periods for top of engineering bedrock ground condition (V_{S30} = 849 m/s)

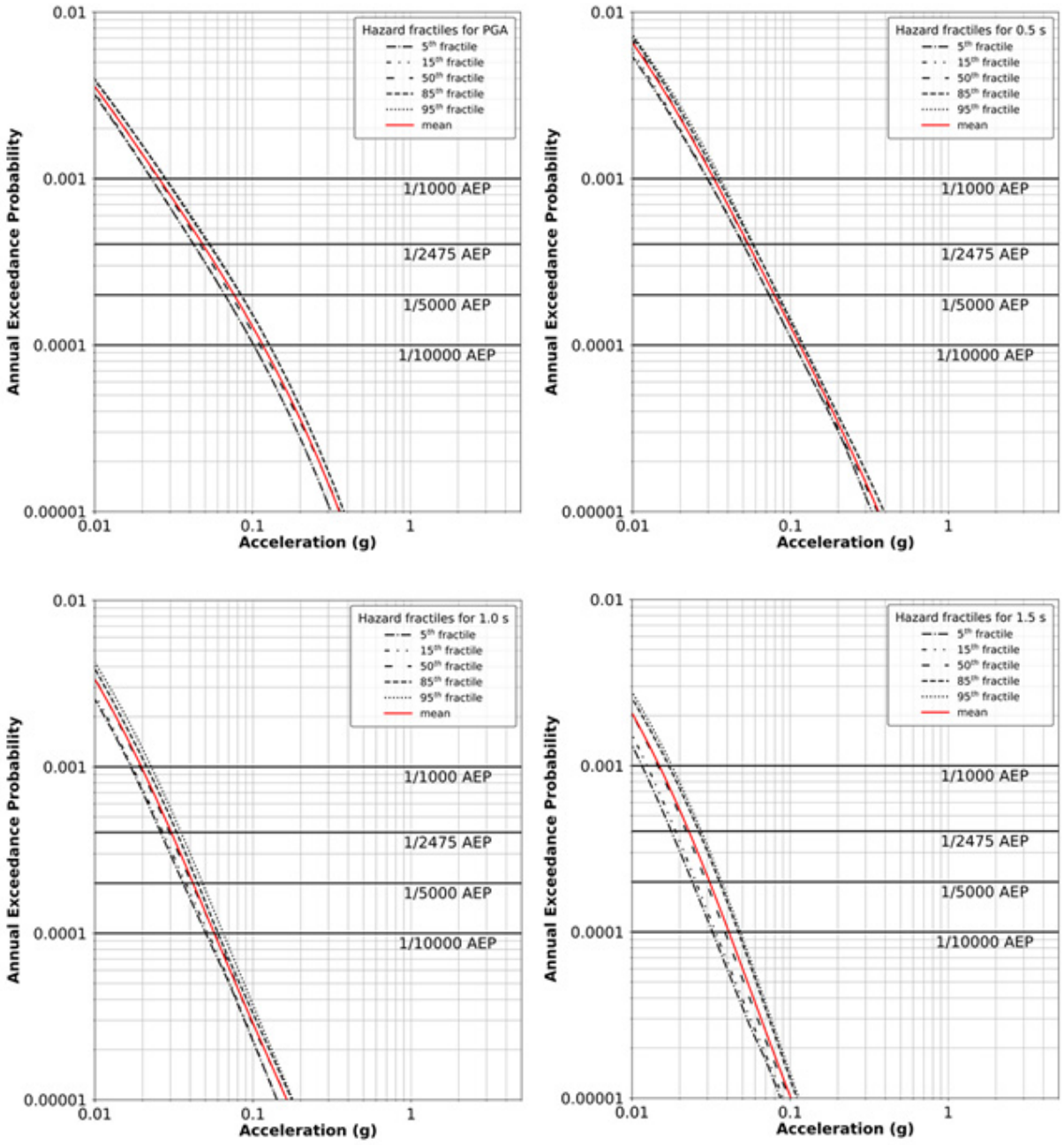

Figure 7: Mean hazard curves, showing 5th, 15th, 50th (median), 85th, and 95th fractiles for PGA (top left), 0.5 s (top right), 1.0 s (bottom left), and 1.5 s (bottom right) spectral periods

7.2 Uniform Hazard Acceleration Response Spectra

Figure 8 shows the mean uniform hazard acceleration response spectra (5%-damped) (UHRS) for the 1/1,000 AEP, 1/2,475 AEP, 1/5,000, and 1/10,000 AEP, respectively. These mean values are for the top of engineering bedrock ground condition (V_{S30} of 849 m/s). Table 9 lists the spectral ordinates for these UHRS.

Figure 9 to Figure 12 show the mean uniform hazard acceleration response spectra (5%-damped) (UHRS) along with the 5th, 15th, 50th (median), 85th, and 95th fractiles for AEPs of 1/1,000, 1/2,475, 1/5,000, and 1/10,000 AEP, respectively. Table 10 to Table 13 list the spectral ordinates for these UHRS for the 1/1,000, 1/2,475, 1/5,000, and 1/10,000 AEP, respectively. These values are for the top of engineering bedrock ground condition with a V_{S30} of 849 m/s.

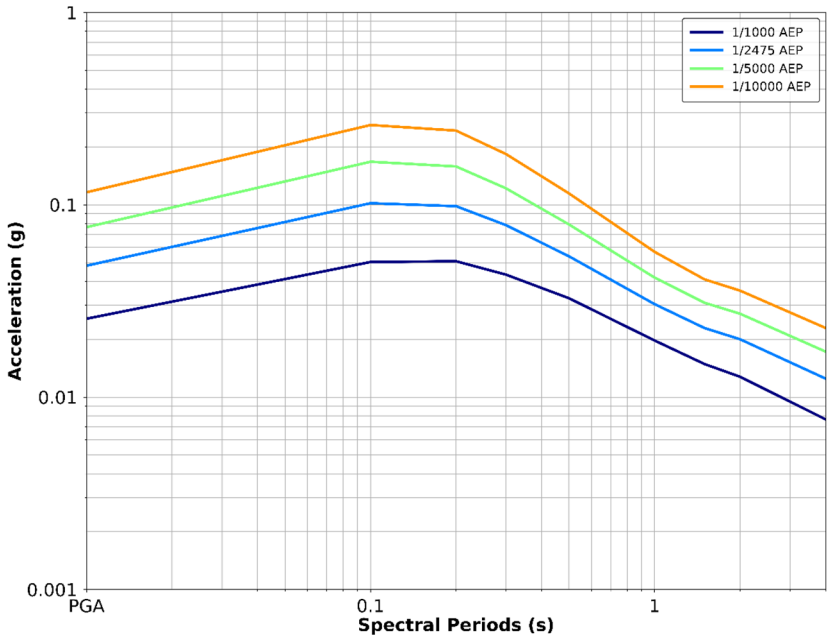

Figure 8: Mean Uniform Hazard Acceleration Response Spectra

Table 9: Uniform Hazard Acceleration Response Spectral Ordinates for Selected AEPs

Special Period (s)	Mean acceleration (g)			
	1/1,000 AEP	1/2,475 AEP	1/5,000 AEP	1/10,000 AEP
PGA	0.026	0.048	0.076	0.116
0.1	0.050	0.102	0.167	0.260
0.2	0.051	0.098	0.158	0.243
0.3	0.043	0.078	0.122	0.183
0.5	0.033	0.054	0.079	0.114
1.0	0.020	0.030	0.042	0.057
1.5	0.015	0.023	0.031	0.041
2.0	0.013	0.020	0.027	0.036
5.0	0.007	0.011	0.015	0.020
10.0	0.003	0.006	0.008	0.011

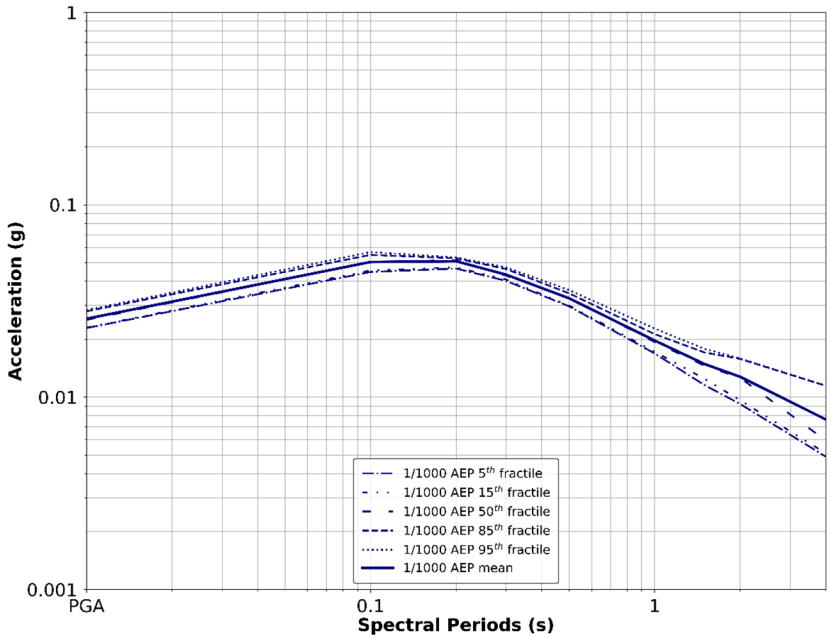

Figure 9: 1/1,000 AEP Mean Uniform Hazard Acceleration Response Spectra and Selected Fractiles

Table 10: Uniform Hazard Acceleration Response Spectral Ordinates for 1/1,000 AEP with Selected Fractiles

Spectral period (s)		Acceleration (g)					
		Mean	Fractile				
			5th	15th	50th (median)	85th	95th
1/1,000AEP	PGA	0.026	0.023	0.023	0.025	0.028	0.028
	0.1	0.050	0.045	0.046	0.050	0.055	0.057
	0.2	0.051	0.047	0.047	0.052	0.053	0.053
	0.3	0.043	0.040	0.041	0.043	0.046	0.047
	0.5	0.033	0.030	0.030	0.033	0.035	0.036
	1.0	0.020	0.017	0.017	0.019	0.021	0.023
	1.5	0.015	0.012	0.012	0.015	0.017	0.018
	2.0	0.013	0.009	0.010	0.013	0.016	0.016
	5.0	0.007	0.004	0.004	0.005	0.010	0.010
	10.0	0.003	0.002	0.002	0.002	0.006	0.006

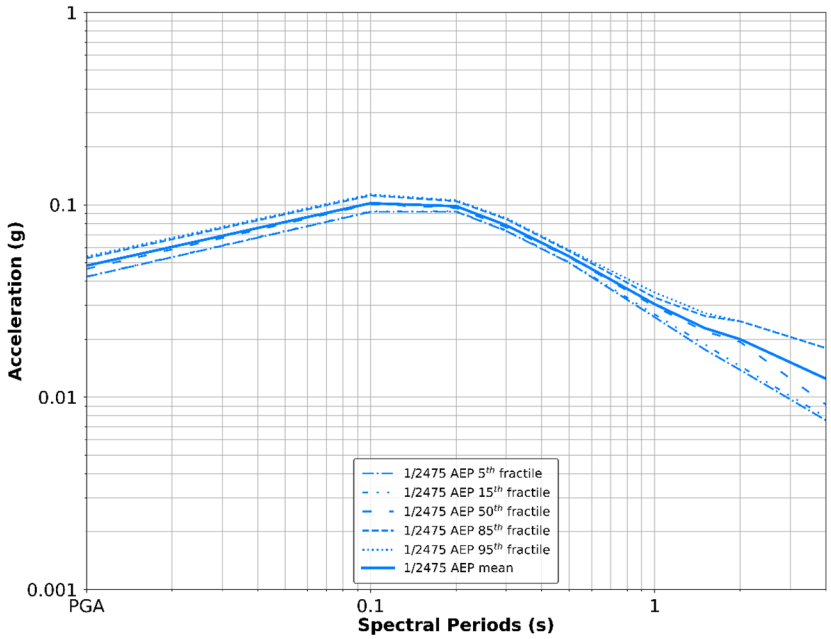

Figure 10: 1/2,475 AEP Mean Uniform Hazard Acceleration Response Spectra and Selected Fractiles

Table 11: Uniform Hazard Acceleration Response Spectral Ordinates for 1/2,475 AEP with Selected Fractiles

Spectral period (s)		Acceleration (g)					
		Mean	Fractile				
			5th	15th	50th (median)	85th	95th
1/2,475 AEP	PGA	0.048	0.042	0.042	0.046	0.053	0.054
	0.1	0.102	0.092	0.092	0.101	0.112	0.113
	0.2	0.098	0.092	0.093	0.096	0.104	0.105
	0.3	0.078	0.073	0.074	0.076	0.084	0.085
	0.5	0.054	0.050	0.050	0.053	0.057	0.058
	1.0	0.030	0.026	0.027	0.030	0.033	0.035
	1.5	0.023	0.018	0.019	0.022	0.026	0.027
	2.0	0.020	0.014	0.014	0.019	0.025	0.025
	5.0	0.011	0.006	0.006	0.007	0.016	0.016
	10.0	0.006	0.003	0.003	0.004	0.009	0.009

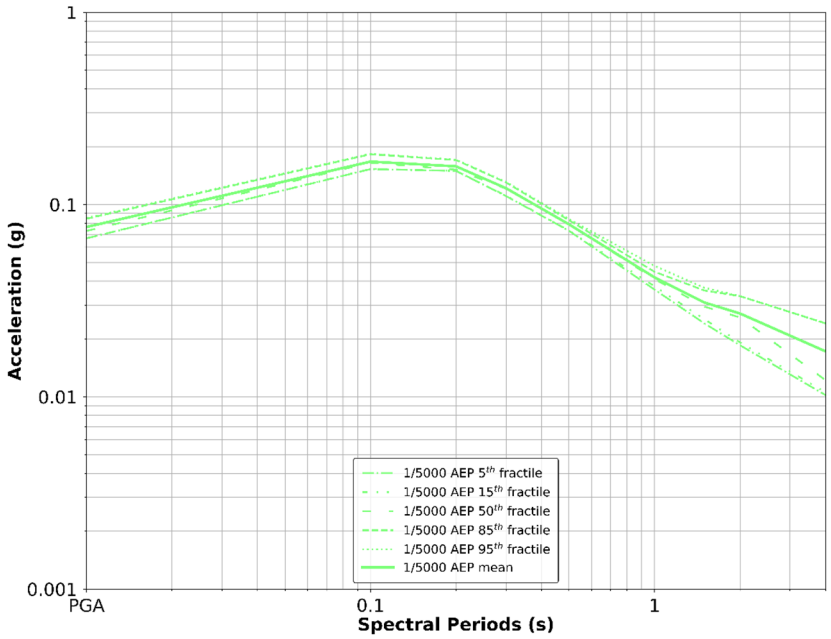

Figure 11: 1/5,000 AEP Mean Uniform Hazard Acceleration Response Spectra and Selected Fractiles

Table 12: Uniform Hazard Acceleration Response Spectral Ordinates for 1/5,000 AEP with Selected Fractiles

Spectral period (s)		Acceleration (g)					
		Mean	Fractile				
			5th	15th	50th (median)	85th	95th
1/5,000 AEP	PGA	0.076	0.067	0.067	0.073	0.084	0.085
	0.1	0.167	0.153	0.153	0.165	0.183	0.184
	0.2	0.158	0.150	0.150	0.152	0.170	0.171
	0.3	0.122	0.111	0.111	0.121	0.130	0.131
	0.5	0.079	0.073	0.073	0.079	0.083	0.084
	1.0	0.042	0.036	0.038	0.041	0.045	0.048
	1.5	0.031	0.024	0.025	0.029	0.036	0.037
	2.0	0.027	0.019	0.019	0.026	0.033	0.033
	5.0	0.015	0.008	0.009	0.010	0.022	0.022
	10.0	0.008	0.004	0.004	0.005	0.012	0.012

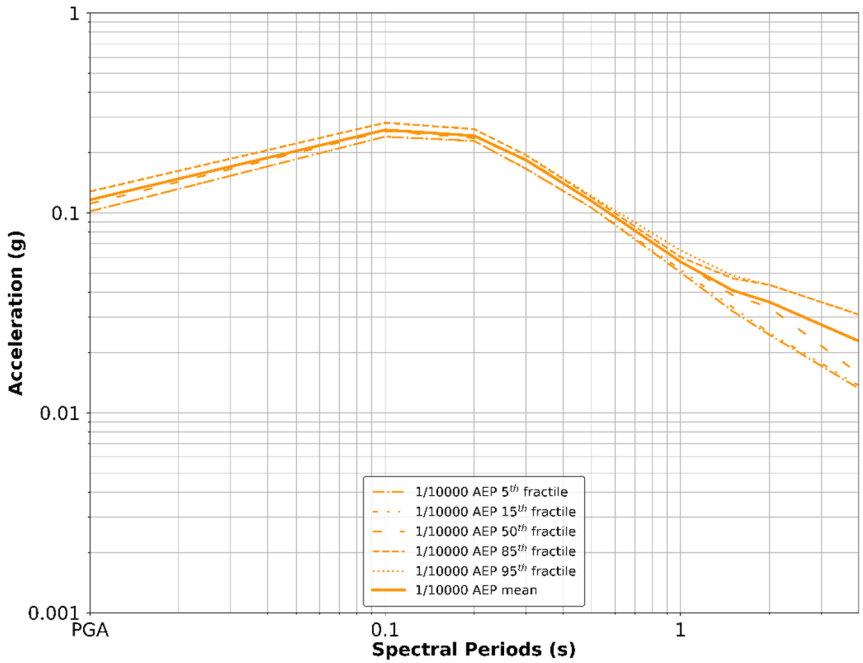

Figure 12: 1/10,000 AEP Mean Uniform Hazard Acceleration Response Spectra and Selected Fractiles

Table 13: Uniform Hazard Acceleration Response Spectral Ordinates for 1/10,000 AEP with selected Fractiles

Spectral period (s)		Acceleration (g)					
		Mean	Fractile				
			5th	15th	50th (median)	85th	95th
1/10,000 AEP	PGA	0.116	0.102	0.102	0.111	0.128	0.128
	0.1	0.260	0.240	0.240	0.256	0.282	0.282
	0.2	0.243	0.229	0.229	0.237	0.262	0.262
	0.3	0.183	0.166	0.166	0.186	0.194	0.194
	0.5	0.114	0.106	0.106	0.115	0.119	0.121
	1.0	0.057	0.050	0.052	0.057	0.060	0.065
	1.5	0.041	0.032	0.034	0.039	0.047	0.048
	2.0	0.036	0.025	0.025	0.034	0.044	0.044
	5.0	0.020	0.011	0.011	0.012	0.028	0.028
	10.0	0.011	0.005	0.005	0.006	0.015	0.015

7.3 Magnitude-distance Deaggregation

Magnitude-distance deaggregation allows identification of earthquake sources that contribute to the total mean hazard at a specified spectral acceleration and AEP. Epsilon (described in Section 3.6) is a parameter of ground-motion uncertainty that further improves the diagnostic capability of magnitude-distance hazard deaggregation. Seismic hazard assessments are concerned with probabilities of exceedance of given ground motions, so the distribution of epsilon greater than zero is important. The magnitude-distance deaggregations are color-coded by epsilon in one-epsilon bins. Selected magnitude-distance deaggregations are plotted in the following figures:

- Figure 13 shows the magnitude-distance deaggregation results of the mean spectral acceleration at PGA, 0.5 s, 1.0 s, and 1.5 s spectral periods for 1/2,475 AEP. This figure represents relative contributions to the total hazard.
- Figure 14 shows the magnitude-distance deaggregation results of the mean spectral acceleration at PGA, 0.5 s, 1.0 s, and 1.5 s spectral periods for 1/10,000 AEP. This figure represents relative contributions to the total hazard.
- Figure 15 shows the magnitude-distance deaggregation results of the mean spectral acceleration at PGA, 0.5 s, 1.0 s, and 1.5 s spectral periods for 1/2,475 AEP. This figure represents relative contribution of the crustal sources located within 400 km of the site.
- Figure 16 shows the magnitude-distance deaggregation results of the mean spectral acceleration at PGA, 0.5 s, 1.0 s, and 1.5 s spectral periods for 1/10,000 AEP. This figure represents relative contribution of the crustal sources located within 400 km of the site.
- Figure 17 shows the magnitude-distance deaggregation results of the mean spectral acceleration at PGA, 0.5 s, 1.0 s, and 1.5 s spectral periods for 1/2,475 AEP. This figure represents relative contribution of the subduction (i.e., interface and in-slab) sources located within 1000 km of the site.
- Figure 18 shows the magnitude-distance deaggregation results of the mean spectral acceleration at PGA, 0.5 s, 1.0 s, and 1.5 s spectral periods for 1/10,000 AEP. This figure represents relative contribution of the subduction (i.e., interface and in-slab) sources located within 1000 km of the site.

The mean and mode of the magnitude-distance joint probability mass distribution is often used for earthquake acceleration time history development. Table 14, Table 15 and Table 16 list the mean, median, and mode of the magnitude, distance, and epsilon values, for the 1/2,475 and 1/10,000 AEPs at PGA, and spectral periods of PGA, 0.5 s, 1.0 s, and 1.5 s, for the total hazard, crustal (within 400 km of the site), and subduction (within 1000 km of the site) sources, respectively.

These results indicate that at AEPs of 1/2,475 and 1/10,000 both crustal earthquakes and subduction interface earthquakes contribute to the total hazard at the Mount Polley TSF site. Subduction earthquakes are the dominant contributor to hazard at periods of about 1 s and longer, while the crustal earthquakes dominate the hazard contributions at the short periods, including at PGA. Appendix A describes how these results were used to develop a representative suite of acceleration time histories suitable for deformation analysis.

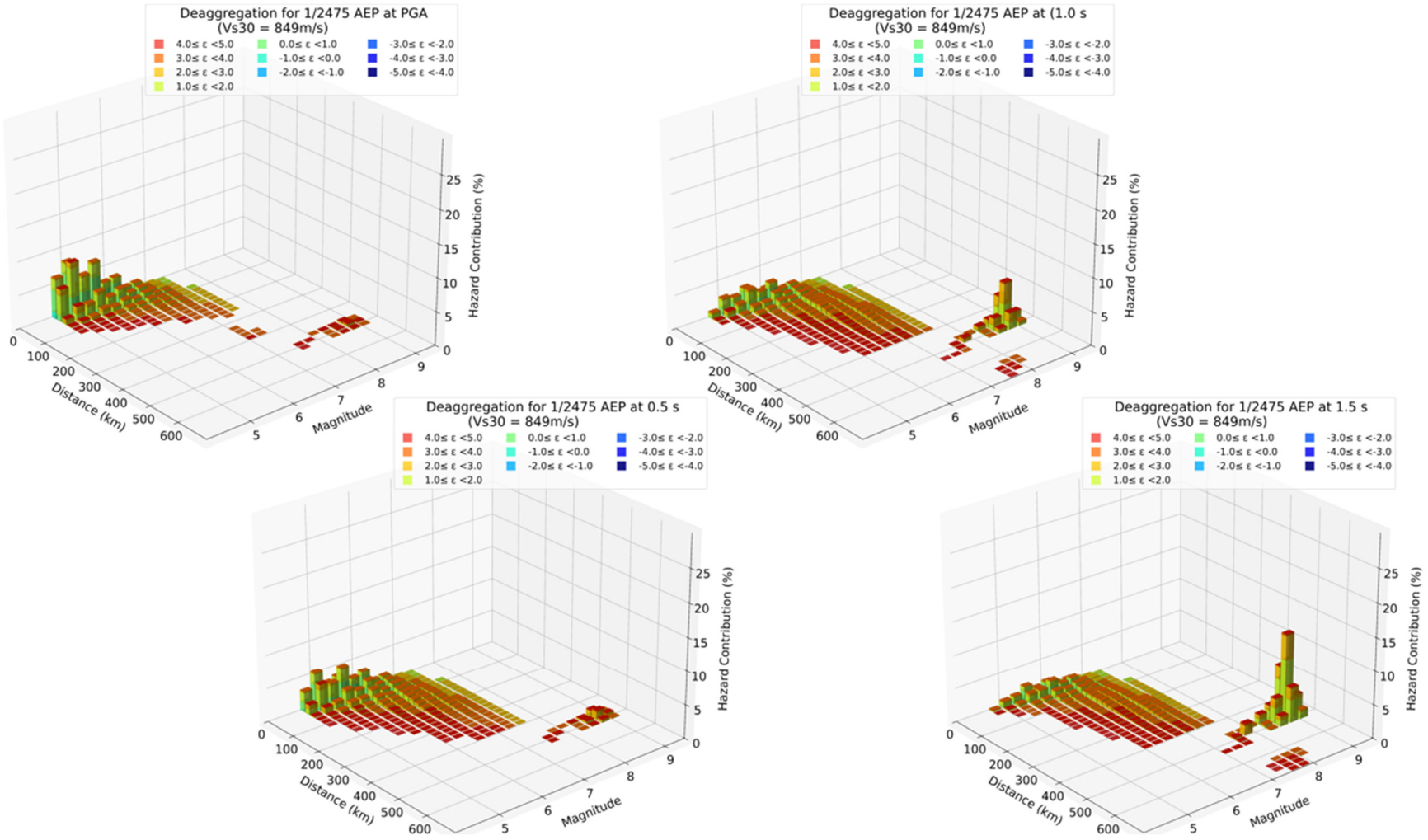

Figure 13: Magnitude-distance deaggregation of the mean PGA (upper left), 0.5 s (lower left), 1.0 s (upper right) and 1.5 s (lower right) spectral periods for the 1/2,475 AEP from full source model, color coded by epsilon in one-epsilon intervals

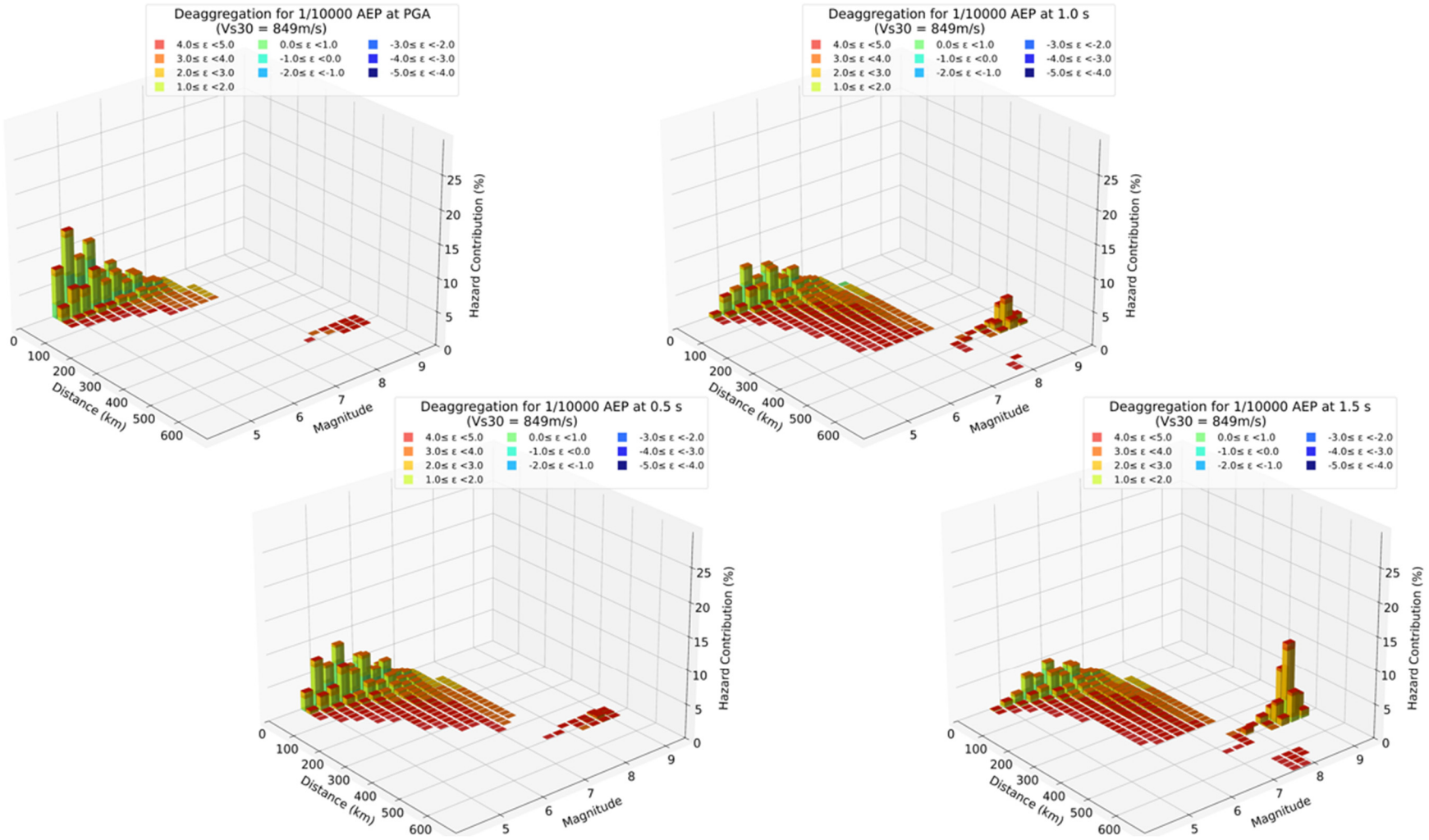

Figure 14: Magnitude-distance deaggregation of the mean PGA (upper left), 0.5 s (lower left), 1.0 s (upper right) and 1.5 s (lower right) spectral periods for the 1/10,000 AEP from full source model, color coded by epsilon in one-epsilon intervals

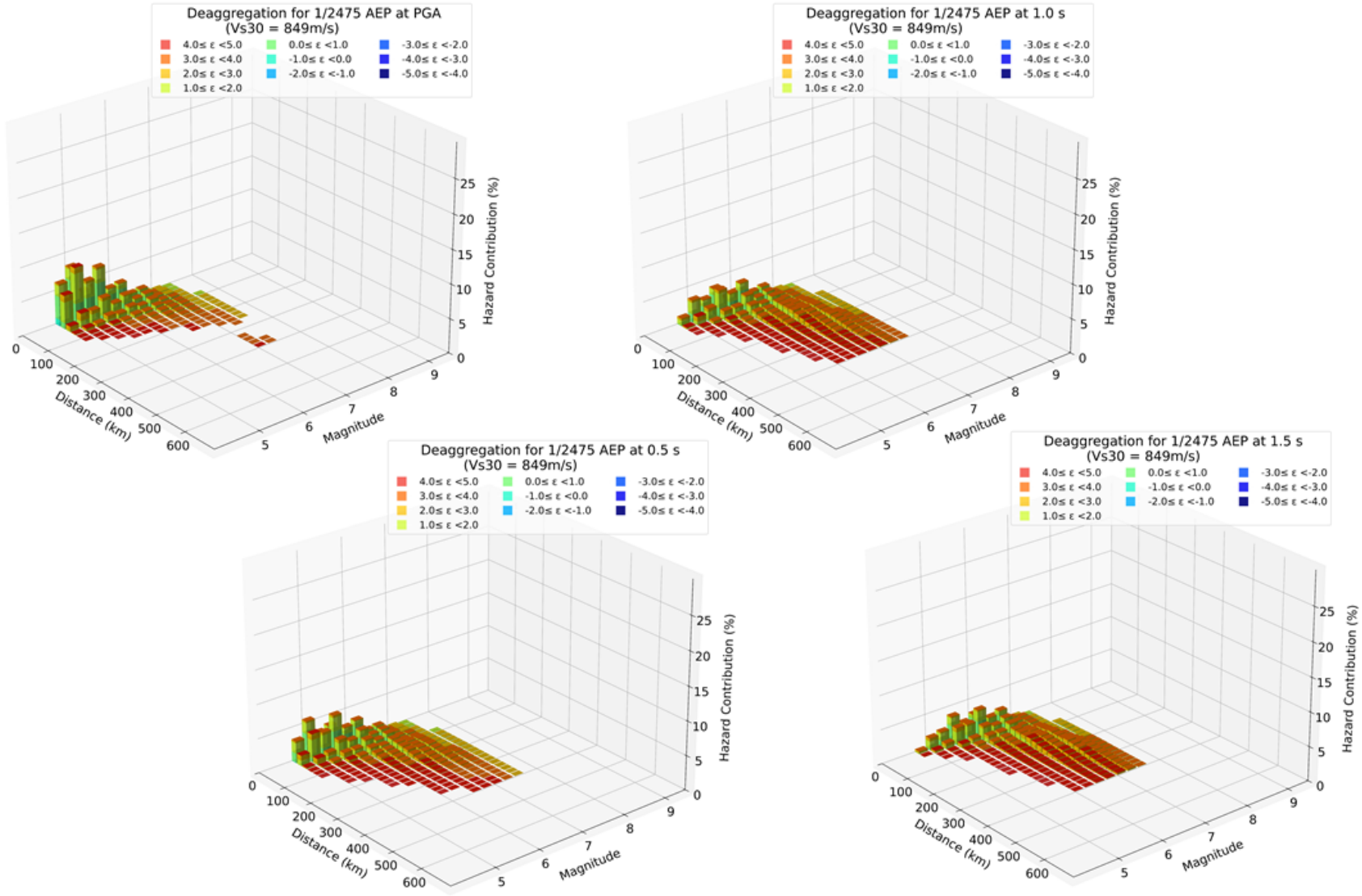

Figure 15: Magnitude-distance deaggregation of the mean PGA (upper left), 0.5 s (lower left), 1.0 s (upper right) and 1.5 s (lower right) spectral periods for the 1/2,475 AEP from crustal sources, color coded by epsilon in one-epsilon intervals

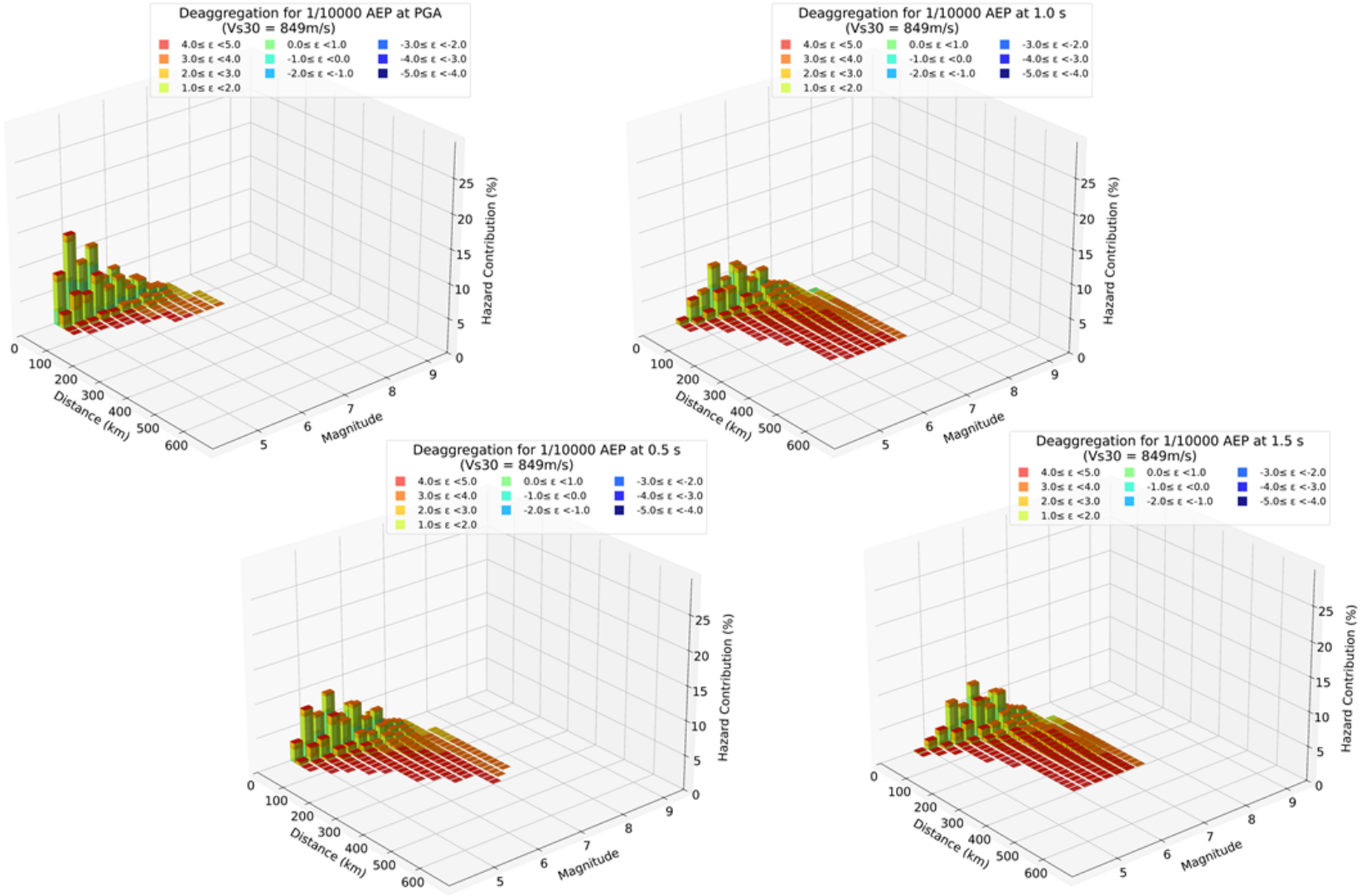

Figure 16: Magnitude-distance deaggregation of the mean PGA (upper left), 0.5 s (lower left), 1.0 s (upper right) and 1.5 s (lower right) spectral periods for the 1/10,000 AEP from crustal sources, color coded by epsilon in one-epsilon intervals

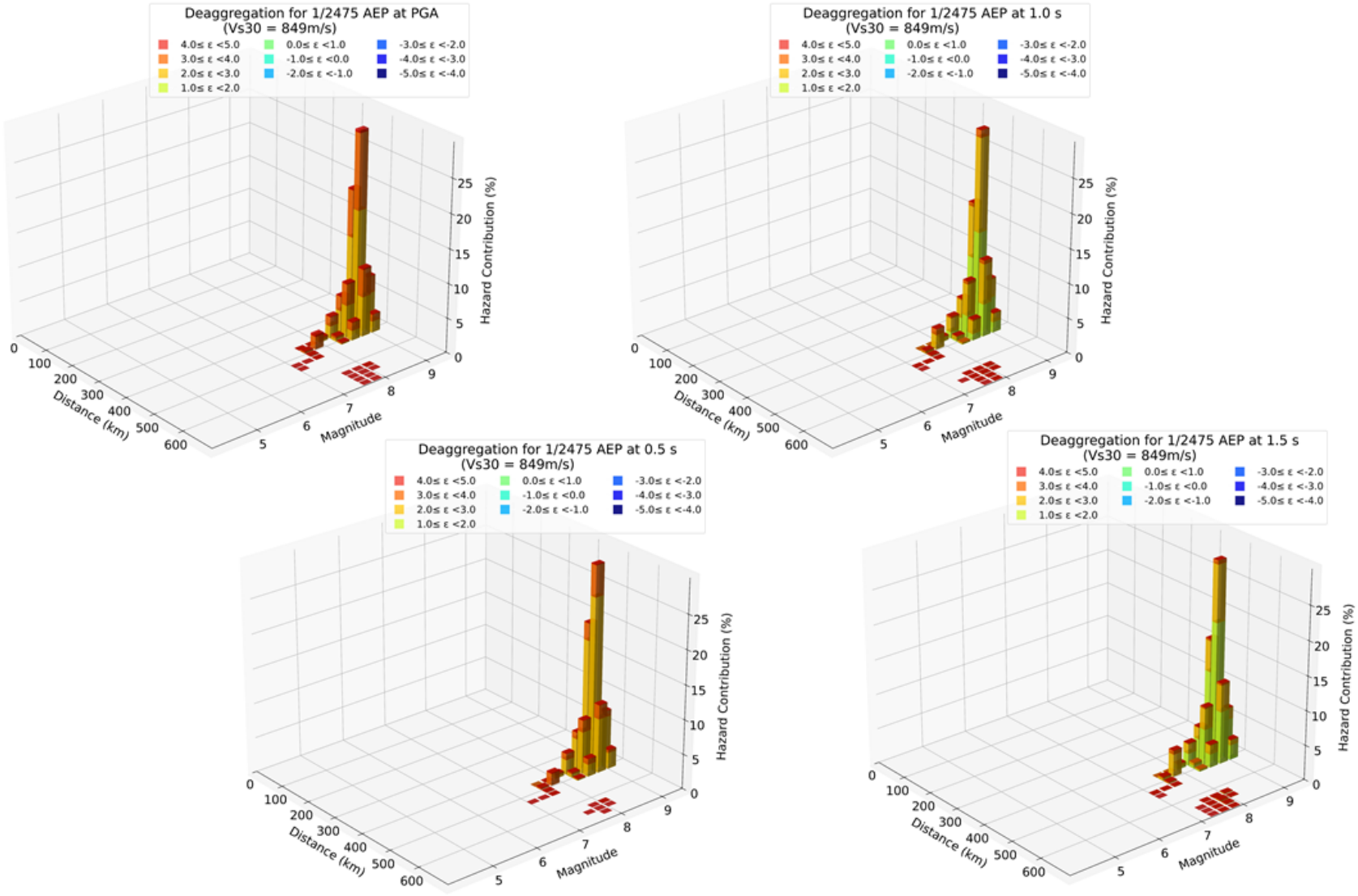

Figure 17: Magnitude-distance deaggregation of the mean PGA (upper left), 0.5 s (lower left), 1.0 s (upper right) and 1.5 s (lower right) spectral periods for the 1/2,475 AEP from subduction sources, color coded by epsilon in one-epsilon intervals

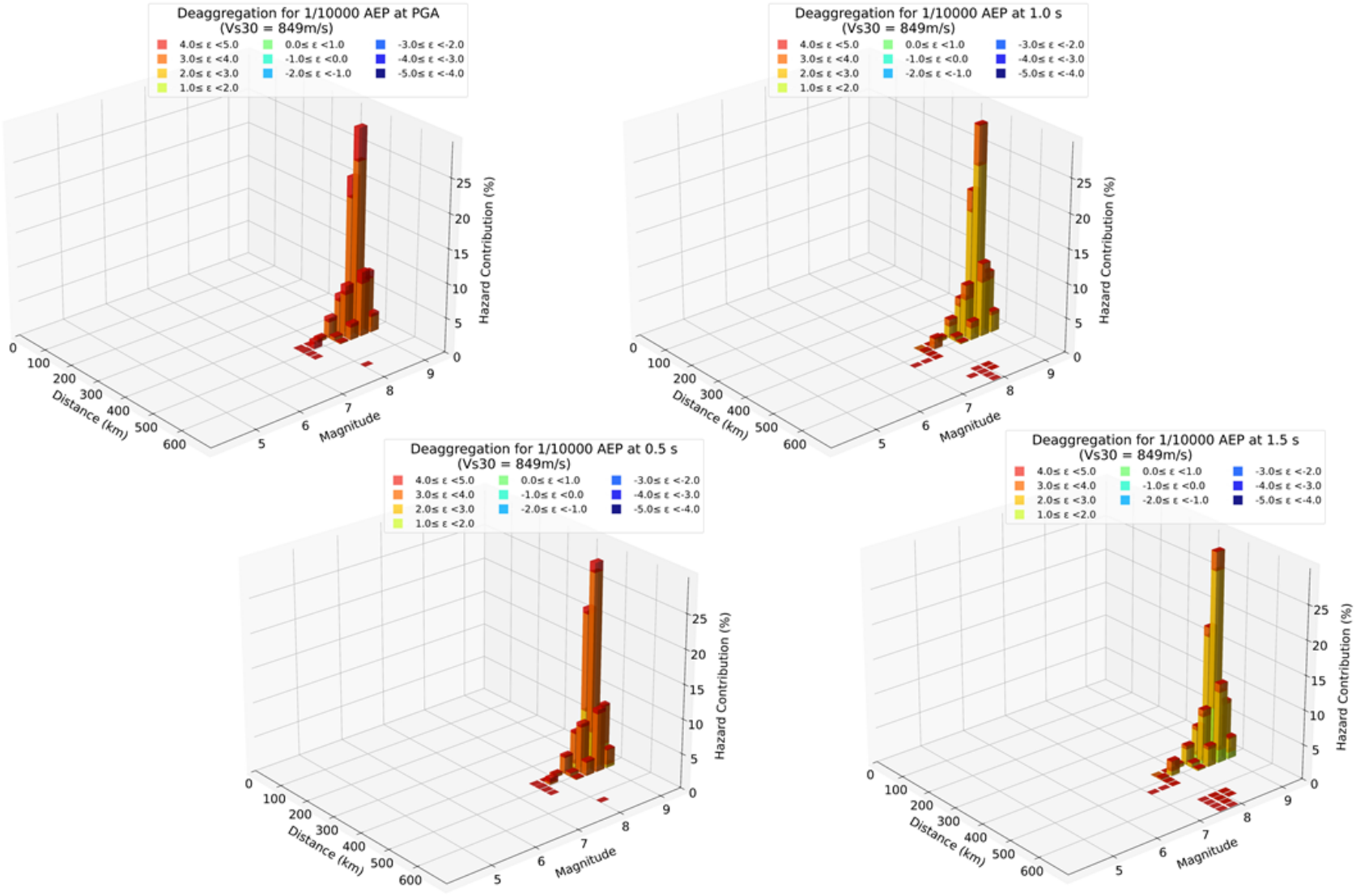

Figure 18: Magnitude-distance deaggregation of the mean PGA (upper left), 0.5 s (lower left), 1.0 s (upper right) and 1.5 s (lower right) spectral periods for the 1/10,000 AEP from subduction sources, color coded by epsilon in one-epsilon intervals

Table 14: Average Distance, Magnitude, and Epsilon for Magnitude-distance Deaggregation for the Total Hazard

AEP	Spectral period (s)	Distance (km)			Magnitude (M_w)			Epsilon[1]		
		Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode
1/2,475	PGA	40 - 60	20 - 40	20 - 40	5.5 - 5.75	5.5 - 5.75	5.0 - 5.25	0.7	0.5	0.5
	0.5	80 - 100	40 - 60	0 - 20	6.0 - 6.25	6.0 - 6.25	5.0 - 5.25	1.0	0.5	0.5
	1.0	180 - 200	100 - 120	480 - 500	6.75 - 7.0	6.5 - 6.75	8.75 - 9.0	1.7	1.5	1.5
	1.5	280 - 300	260 - 280	480 - 500	7.5 - 7.75	7.0 - 7.25	8.75 - 9.0	2.4	2.5	2.5
1/10,000	PGA	20 - 40	0 - 20	0 - 20	5.5 - 5.75	5.5 - 5.75	5.0 - 5.25	0.6	0.5	0.5
	0.5	20 – 40	20 – 40	0 – 20	6.0 – 6.25	6.0 – 6.25	5.5 – 5.75	1.1	1.5	1.5
	1.0	100 – 120	20 – 40	480 – 500	6.5 – 6.75	6.25 – 6.5	8.75 – 9.0	1.0	0.5	0.5
	1.5	220 - 240	100 - 120	480 - 500	7.25 - 7.5	6.75 - 7.0	8.75 - 9.0	2.2	2.5	2.5

Notes:

1. Epsilon values are based on the range of values for the median-distance and median-magnitude.

Table 15: Average Distance, Magnitude, and Epsilon for Magnitude-distance Deaggregation of Crustal Seismic Sources

AEP	Spectral period (s)	Distance (km)			Magnitude (M_w)			Epsilon[1]		
		Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode
1/2,475	PGA	20 - 40	0 - 20	0 - 20	5.5 - 5.75	5.5 - 5.75	5.0 - 5.25	0.6	0.5	0.5
	0.5	60 – 80	40 – 60	0 – 20	6.0 – 6.25	6.0 – 6.25	5.0 – 5.25	1.0	0.5	0.5
	1.0	80 – 100	60 – 80	20 – 40	6.25 – 6.5	6.25 – 6.5	6.0 – 6.25	1.3	1.5	1.5
	1.5	100 – 120	60 – 80	20 – 40	6.5 – 6.75	6.5 – 6.75	6.0 – 6.25	1.3	1.5	1.5
1/10,000	PGA	40 – 60	20 – 40	0 – 20	6.25 – 6.5	6.25 – 6.5	5.5 – 5.75	1.0	0.5	0.5
	0.5	20 – 40	20 – 40	0 – 20	6.0 – 6.25	6.0 – 6.25	5.5 – 5.75	1.1	1.5	1.5
	1.0	40 – 60	20 – 40	0 – 20	6.25 – 6.5	6.25 – 6.5	5.5 – 5.75	1.0	0.5	0.5
	1.5	60 – 80	20 - 40	0 – 20	6.25 – 6.5	6.5 – 6.75	6.0 – 6.25	1.0	0.5	0.5

Notes:

1. Epsilon values are based on the range of values for the median-distance and median-magnitude.

Table 16: Average Distance, Magnitude, and Epsilon for Magnitude-distance Deaggregation of Subduction Seismic Sources

AEP	Spectral period (s)	Distance (km)			Magnitude (M_w)			Epsilon[1]		
		Mean	Median	Mode	Mean	Median	Mode	Mean	Median	Mode
1/2,475	PGA	480 – 500	480 – 500	480 – 500	8.75 – 9.0	8.75 – 9.0	8.75 – 9.0	2.9	2.5	2.5
	0.5	480 – 500	480 – 500	480 – 500	8.75 – 9.0	8.75 – 9.0	8.75 – 9.0	2.7	2.5	2.5
	1.0	480 - 500	480 - 500	480 - 500	8.75 - 9.0	8.75 - 9.0	8.75 - 9.0	2.0	1.5	1.5
	1.5	480 – 500	480 – 500	480 – 500	8.75 – 9.0	8.75 – 9.0	8.75 – 9.0	1.8	1.5	1.5
1/10,000	PGA	480 – 500	480 – 500	480 – 500	8.75 – 9.0	8.75 – 9.0	8.75 – 9.0	3.7	3.5	3.5
	0.5	480 – 500	480 – 500	480 – 500	8.75 – 9.0	8.75 – 9.0	8.75 – 9.0	3.4	3.5	3.5
	1.0	480 – 500	480 – 500	480 – 500	8.75 – 9.0	8.75 – 9.0	8.75 – 9.0	2.7	2.5	2.5
	1.5	480 – 500	480 – 500	480 – 500	8.75 – 9.0	8.75 – 9.0	8.75 – 9.0	2.3	2.5	2.5

Notes:

1. Epsilon values are based on the range of values for the median-distance and median-magnitude.

8.0 SEISMIC HAZARD ANALYSIS: DISCUSSION AND RECOMMENDATIONS

In this section:

- The results of this site-specific seismic hazard assessment are compared to results from the CanadaSHM6
- Earthquake acceleration time history development.

8.1 Comparison of Seismic Hazard Assessment Results to CanadaSHM6

The CanadaSHM6 seismic hazard assessment is not site-specific because it was developed for a national seismic source model and for a series of fixed V_{S30} values. As part of the validation for this assessment (Section 5.3) the CanadaSHM6 results are compared to the results of this assessment at selected AEPs. The results of this site-specific assessment are slightly lower at spectral periods below 2.0 s and slightly higher at spectral periods above 2.0 s. These changes are attributed to the different ground motion model selection and weighting, and V_{S30} used in this assessment.

8.3 Earthquake Acceleration Time History Development

A principal purpose for the site-specific seismic hazard assessment reported here is to support the development of earthquake acceleration time histories. Appendix A presents the data, methods, and results from the development of a suite of 11 two-horizontal-component earthquake acceleration time histories for the Mount Polley TSF site. The 22 EATHs were developed for the site-specific, mean horizontal acceleration response spectrum with an AEP of 1/2,475 years. Electronic files with the developed EATHs were transmitted separately.

9.0 CLOSING

WSP USA appreciates the opportunity to provide WSP Canada with site-specific earthquake hazard assessment for the Mount Polley TSF site. We have applied the best-available science and our understanding of the generally accepted practice in seismic hazard assessment. If you have any questions about the content or use of this report, please contact the undersigned.

Signature Page

WSP USA Inc.

Alan Hull PhD, CEG (CA)
Senior Technical Director

https://wsponlinenam-my.sharepoint.com/personal/tonya_peeler_wsp_com/documents/31404975.000-gal-rev0- mount polley_01022023.docx

10.0 REFERENCES

Abrahamson, N. A., 2006, Seismic Hazard Assessment: Problems with Current Practice and Future Developments, 17.

Abrahamson, N. A., 2009, The state of the practice of seismic hazard analysis: From the good to the bad, EERI Chapter, The University of British Columbia, EERI 2009 Distinguished Lecture.

Abrahamson, N. et al., 2018, Update of the BC Hydro Subduction Ground-Motion Model using the NGA-Subduction Dataset, 2018/02, Pacific earthquake Engineering Research Center (PEER).

Abrahamson, N., and Z. Gülerce, 2020, Regionalized Ground-Motion Models for Subduction Earthquakes Based on the NGA-SUB Database, 237.

Abrahamson, N. A., W. J. Silva, and R. Kamai, 2014, Summary of the ASK14 Ground Motion Relation for Active Crustal Regions, Earthquake Spectra, 30, no. 3, 1025–1055, doi: 10.1193/070913EQS198M.

Allen, T. I., S. Halchuk, J. Adams, and G. A. Weatherill, 2020, Forensic PSHA: Benchmarking Canada's Fifth Generation seismic hazard model using the OpenQuake-engine, Earthquake Spectra, 36, no. 1_suppl, 91–111, doi: 10.1177/8755293019900779.

Beatty, T.W., Orchard, M.J. and Mustard, P.S., 2006, Geology and tectonic history of the Quesnel terrane in the area of Kamloops, British Columbia: In: Colpron, M. and Nelson, J.L., eds., Paleozoic Evolution and Metallogeny of Pericratonic Terranes at the Ancient Pacific Margin of North America, Canadian and Alaskan Cordillera: Geological Association of Canada, Special Paper 45, p. 483-504.

Boore, D. M., J. P. Stewart, E. Seyhan, and G. M. Atkinson, 2014, NGA-West2 Equations for Predicting PGA, PGV, and 5% Damped PSA for Shallow Crustal Earthquakes, Earthquake Spectra, 30, no. 3, 1057–1085, doi: 10.1193/070113EQS184M.

Campbell, K. W., and Y. Bozorgnia, 2014, NGA-West2 Ground Motion Model for the Average Horizontal Components of PGA, PGV, and 5% Damped Linear Acceleration Response Spectra, Earthquake Spectra, 30, no. 3, 1087–1115, doi: 10.1193/062913EQS175M.

Canadian Dam Association (CDA), 2014, Application of Dam Safety Guidelines to Mining Dams, Technical Bulletin, Toronto, Canada.

Chiou, B. S.-J., and R. R. Youngs, 2014, Update of the Chiou and Youngs NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra, Earthquake Spectra, 30, no. 3, 1117–1153, doi: 10.1193/072813EQS219M.

Cornell, C. A., 1968, Engineering seismic risk analysis, Bulletin of the Seismological Society of America, 58, no. 5, 1583–1606, doi: 10.1785/BSSA0580051583.

Dragert, H., R. D. Hyndman, G. C. Rogers, and K. Wang, 1994. Current deformation and the width of the seismogenic zone of the northern Cascadia subduction thrust, Journal of Geophysical Research, 99, 653-668.

GEM, 2022, OpenQuake | Global Earthquake Model Foundation: <https://www.globalquakemodel.org/openquake> (accessed July 1, 2022).

Halchuk, S., T. I. Allen, G. C. Rogers, and J. Adams, 2015, Seismic Hazard Earthquake Epicentre File (SHEEF2010) used in the fifth-generation seismic hazard maps of Canada, 7724, 7724 p.

Hyndman, R.D., and K. Wang, 1995. The rupture zone of Cascadia great earthquakes from current deformation and the thermal regime, Journal of Geophysical Research, 100, no. 22, 133-154.

ICMM, 2019, Global Tailings Standard Draft for Public Consultation: <https://globaltailingsreview.org/wp-content/uploads/2019/11/EN-Global-Tailings-Standard_CONSULTATION-DRAFT.pdf> (accessed January 10, 2022).

Kaklamanos, J., L. G. Baise, and D. M. Boore, 2011, Estimating Unknown Input Parameters when Implementing the NGA Ground-Motion Prediction Equations in Engineering Practice, Earthquake Spectra, 27, no. 4, 1219–1235, doi: 10.1193/1.3650372.

Kolaj, Michal, J. Adams, and S. Halchuk, 2020a, Seismic Hazard in Southeastern Canada: Uncertainty and Controls on Seismic Hazard in a Region of Low-to-Moderate Seismicity, 12.

Kolaj, Michal, J. Adams, and S. Halchuk, 2020b, The 6th Generation Seismic Hazard Model of Canada, 12.

Kolaj, M, S. Halchuk, J. Adams, and T. I. Allen, 2020, Sixth Generation Seismic Hazard Model of Canada: input files to produce values proposed for the 2020 National Building Code of Canada, 8630.

Kuehn, N., Y. Bozorgnia, K. W. Campbell, and N. Gregor, 2020, Partially Non-Ergodic Ground-Motion Model for Subduction Regions using the NGA-Subduction Database, 187.

Mazzotti, S., H. Dragert, J. Henton, M. Schmidt, R. Hyndman, T. James, Y. Lu, and M. Cramer, 2003. Current tectonics of northern Cascadia from a decade of GPS measurements, Journal of Geophysical Research, 108, 2554.

Monger, J.W.H., 1989. Chapter 2. Overview of Cordilleran Geology, in Ricketts, B. D. ed., Western Canada Sedimentary Basin, Canadian Association of Petroleum Geology (Special Paper S30), pp. 9–32.

Monger, J.W.H. and Price, R.A., 1979. Geodynamic evolution of the Canadian Cordillera - Progress and problems: Canadian Journal of Earth Sciences volume 16 (3), p. 770-791.

Natural Resources Canada (NRCan), G. of C., 2020, 2020 National Building Code of Canada Seismic Hazard Tool: <https://earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/nbc2020-cnb2020-en.php> (accessed September 30, 2022).

Nelson, J., and Colpron, M., 2007, Tectonics and metallogeny of the British Columbia, Yukon and Alaskan Cordillera, 1.8 Ga to the present: In: Goodfellow, W.D., ed., Mineral Deposits of Canada: A Synthesis of Major Deposit-Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods: Geological Association of Canada, Mineral Deposits Division, Special Publication No. 5, p. 755-791.

Parker, G. A., J. P. Stewart, D. M. Boore, G. M. Atkinson, and B. Hassani, 2020, NGA-subduction global ground motion models with regional adjustment factors, Earthquake Spectra, 875529302110348, doi: 10.1177/87552930211034889.

Price, R.A. 1994. Cordilleran Tectonics and the Evolution of the Western Canada Sedimentary Basin: In: Geological Atlas of the Western Canada Sedimentary Basin, Chapter 2, Canadian Society of Petroleum Geologists; Editors: G.D. Mossop and I. Shetsen.

Price, R.A. 2000. The Evolution of the Southern Cordilleran Foreland Thrust and Fold Belt and the Kinematics of Cordilleran Orogenesis: In: Conference Proceedings, GeoCanada 2000, Symposium and Field Trip, University of Calgary, Alberta.

Ricketts, B.D., 2008. Cordilleran Sedimentary Basins of Western Canada Record 180 Million Years of Terrane Accretion: K.J. Hsü, Series Editor: Sedimentary Basins of the World, Volume 5, The Sedimentary Basins of the United States and Canada, Andrew D. Miall (Editor). Elsevier, pp. 363 – 394.

Rogers, G. C., J. F. Cassidy, and R. M. Ellis, 1990. The Prince George, British Columbia earthquake of 21 March 1986, Bulletin of the Seismological Society of America, 80, no. 5, 1144-1161.

Si, H., S. Midorikawa, and T. Kishida, 2020, Development of NGA-Sub Ground-Motion Model of 5%-Damped Pseudo-Spectral Acceleration Based on Database for Subduction Earthquakes in Japan, 87.

APPENDIX A

Earthquake Acceleration Time Histories

TECHNICAL MEMORANDUM

DATE February 1, 2023 **Project No.** 31404975.000

TO Andres Torres
WSP Canada Inc.

CC Alan Hull

FROM Mahir Badanagki and Feng Li **EMAIL mahir.badanagki@wsp.com**

EARTHQUAKE ACCELERATION TIME HISTORY DEVELOPMENT FOR MOUNT POLLEY MINE, BRITISH COLUMBIA, CANADA

This technical memorandum (TM) presents a suite of 11 two-horizontal-component earthquake acceleration time histories (EATHs, a.k.a. motions) developed by WSP USA Inc. (WSP USA) for the Mount Polley Mine TSF site in British Columbia, Canada. The 22 EATHs were developed for the target spectrum—the site-specific, mean horizontal acceleration response spectrum with an annual exceedance probability (AEP) of 1/2,475 years as presented in Golder (2022). Electronic files with the developed EATHs were transmitted separately.

1.0 INTRODUCTION

WSP USA developed 11, two-horizontal-component EATHs to support ongoing engineering analyses for the Mount Polley Mine site. WSP USA used the amplitude scaling method to develop the EATHs. The target spectrum is the uniform hazard response spectrum (UHRS) with a 1/2,475 AEP as presented in Golder (2022). The key steps to develop the EATHs were:

- Select seed EATHs that have similar spectral shape to the target spectrum.
- Apply the amplitude scaling method to adjust seed records to match the target spectrum.
- Compare the geometric-mean spectrum of the scaled EATHs to the target spectrum.
- Select a suite of eleven, two-component EATHs suitable for subsequent analyses at the Mount Polley Mine site.
- Prepare this TM to document the approach, procedures, and results.

Figure 1 shows the site-specific mean acceleration response spectrum (i.e., the target spectrum) for an AEP of 1/2,475 as presented in Golder (2022).

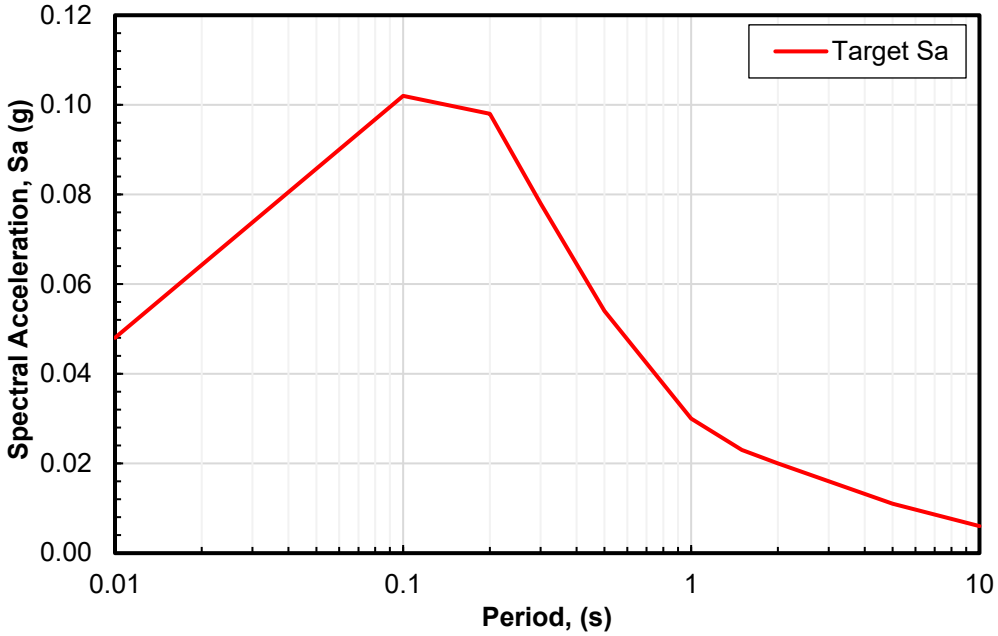

Figure 1: Site-Specific Target Acceleration Response Spectrum for an Annual Exceedance Probability (AEP) of 1/2,475 for Mt Polley TSF Site

2.0 EARTHQUAKE ACCELERATION TIME HISTORY DEVELOPMENT

The following sections describe the EATH selection criteria, process to scale the records, and the resulting EATHs.

2.1 Selection Criteria

WSP USA selected seed EATHs from the Pacific Earthquake Engineering Research Center (PEER) Next Generation Attenuation Phase 2 Project (NGA-West2) strong-motion database. Typical time history selection criteria included earthquake magnitude, source-to-site distance, style of faulting, rupture directivity, and near-surface ground condition at the recording station.

Key EATH selection criteria were:

- Earthquake records should reflect both the near-field moderate-magnitude crustal earthquakes and the far-field subduction interface earthquakes as indicated by the deaggregation analysis. WSP USA judged that eight two-component records from near-field crustal earthquakes and three two-component subduction earthquakes provided a reasonable representation of the 1/2,475 AEP hazard sources.
- Source earthquakes are of moment magnitude (**M**) 5.5 to 6.5 centered at about **M**6.0 that is the preferred modal magnitude in Golder (2022) for crustal motions. The magnitude criterion was relaxed to **M**5.5 to include more seed EATHs. For subduction interface motions, source earthquakes are of **M**8.0 to **M**9.5 centered at **M**9.0.

- Seed EATHs were recorded at stations less than 50 km for the source earthquake for crustal motions and less than 500 km for subduction interface motions.
- Seed EATHs recorded at stations with a V_{S30} (i.e., the time-averaged shear-wave velocity for the top 30 m of earth materials below the ground or reference surface) from 360 to 1500 m/s assuming the site V_{S30} of interest is 849 m/s.
- The shape of the acceleration response spectra of the seed EATHs agrees well with the shape of the target spectrum within the period range of interest of 0.5 to 1.5 seconds, which covers the estimated fundamental period of 1 second for the facility of interest.
- Scaling factors for the seed EATHs are preferred to be between 0.25 and 4.
- No more than two seed EATHs are from the same earthquake.
- No EATHs with velocity pulses were included because the site is more than 10 km away from a known seismically active fault.
- The style-of-faulting criterion was relaxed to include all fault rupture styles.

2.2 Results

The 11 EATHs were selected that meet the selection criteria described above. Figures 2 and 3 show the geometric-mean acceleration response spectrum of the selected and scaled EATHs for crustal and subduction interface motions, respectively, compared with the target response spectrum and 90% and 130% of the target (i.e., -10% and +30% of the target). Typical practice in earthquake geotechnical engineering requires the geometric-mean response spectrum to be within about 90% to 130% of the target response spectrum within the period range of interest (Figure 2).

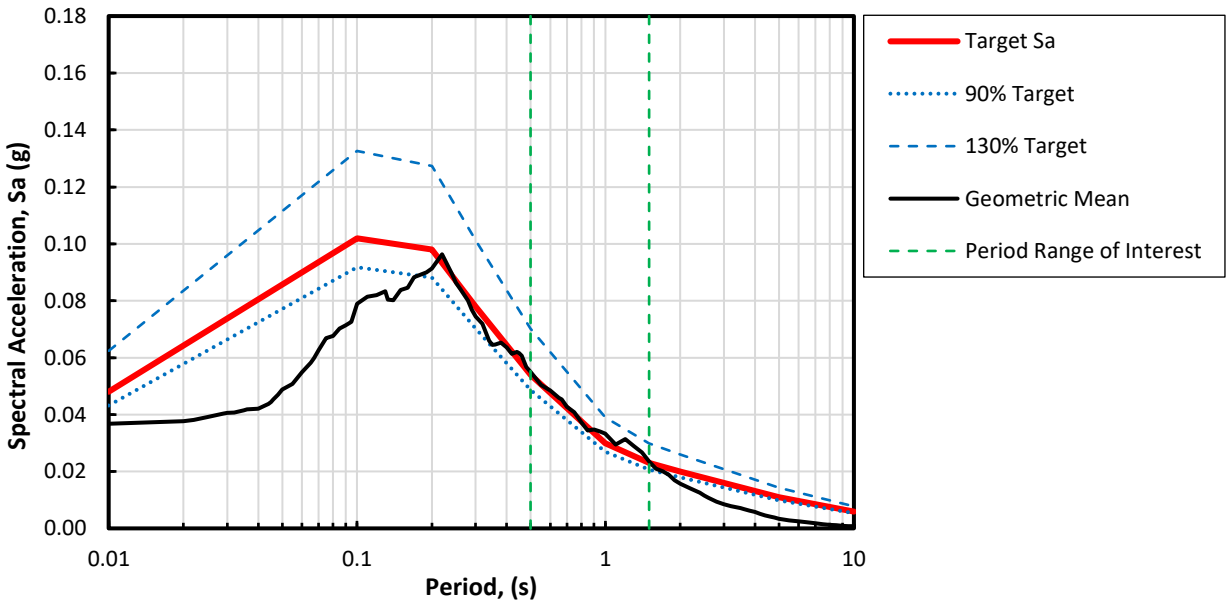

Figure 2: Target Acceleration Response Spectrum and the Geometric-Mean Response Spectrum of Selected and Scaled Crustal Earthquake Acceleration Time Histories

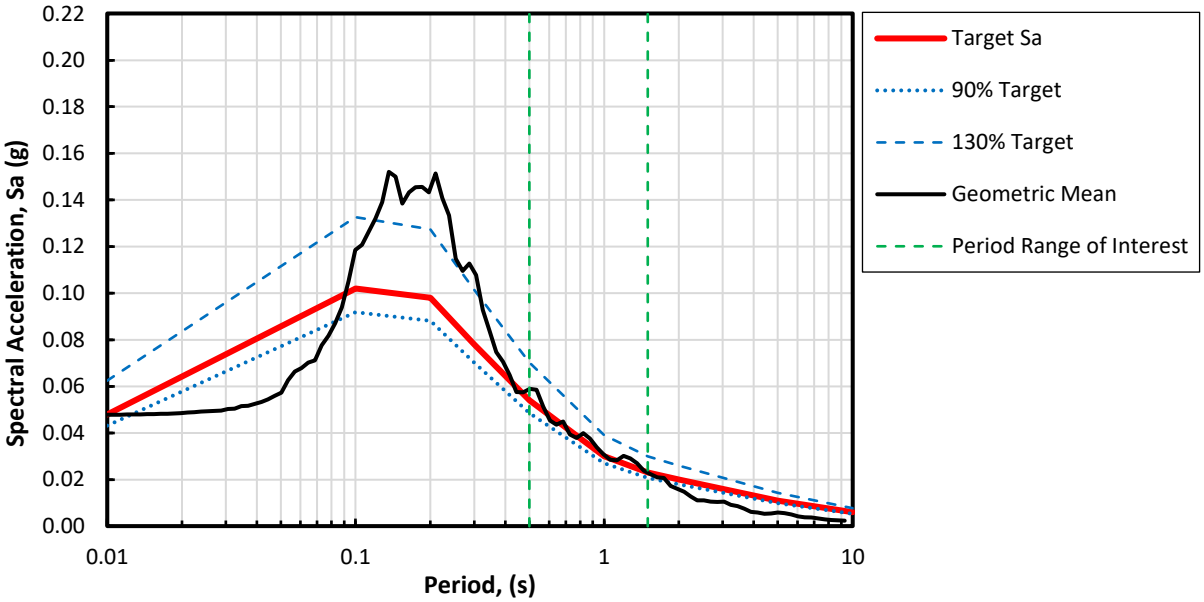

Figure 3: Target Acceleration Response Spectrum and the Geometric-Mean Response Spectrum of Selected and Scaled Interface Earthquake Acceleration Time Histories

Figures 4 and 5 show the response spectra of individual scaled EATHs compared with the target spectrum for both crustal and subduction interface motions. Figures 4 and 5 show that the individual response spectra agree reasonably well with the target. Table 1 lists key parameters of the selected and scaled EATHs.

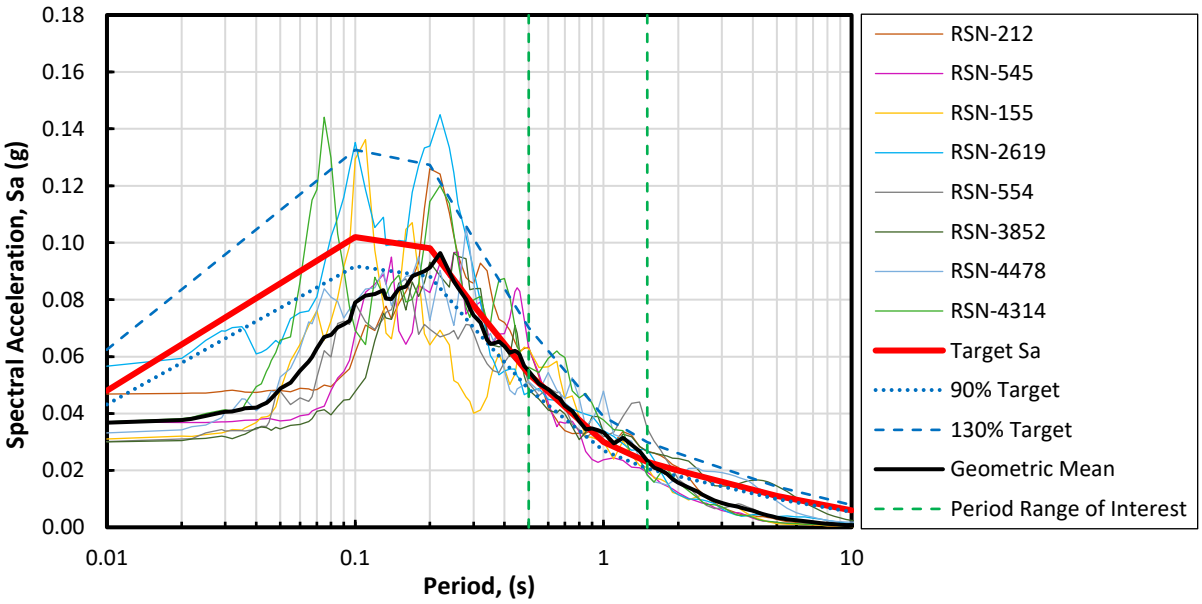

Figure 4: Target Acceleration Response Spectrum and Response Spectra of Individual Crustal Earthquake Acceleration Time Histories

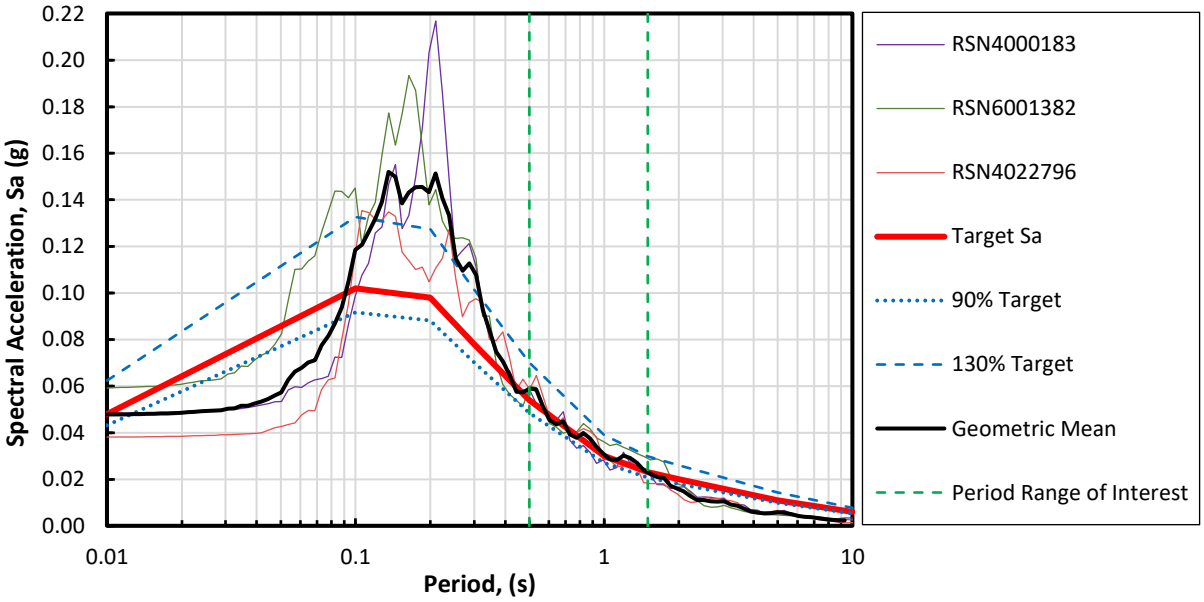

Figure 5: Target Acceleration Response Spectrum and Response Spectra of Individual Subduction Interface Earthquake Acceleration Time Histories

Table 1: Key Parameters of Selected and Scaled Earthquake Acceleration Time Histories

Record Sequence Number (RSN)[a]	Moment Magnitude (M)	Earthquake Name	Year	Station Name	Scale Factor	R_{rup}[b] (km)	R_{jb}[c] (km)	V_{S30}[d] (m/s)	Fault Type	Component	D_{5-75} (s)[e]	D_{5-95} (s)[f]	AI[g] (m/s)	CAV[h] (m/s)
155	5.90	Norcia, Italy	1979	Bevagna	1.10	31	31	401	Normal	NS	10.5	14.6	0.018	1.1
										EW	9.2	14.9	0.013	1.0
212	5.80	Livermore, USA	1980	Del Valle Dam (Toe)	0.25	25	24	403	Strike slip	156	4.8	12.1	0.006	0.6
										246	2.1	7.3	0.013	0.8
357	6.36	Coalinga, USA	1983	Parkfield-Stone Corral	0.30	34	33	565	Reverse	0	4.8	12.2	0.013	1.0
										90	5.4	11.0	0.011	1.0
554	6.19	Chalfant Valley, USA	1986	Long Valley Dam	0.40	21	18	537	Strike slip	0	5.1	11.0	0.010	0.8
										90	7.9	11.9	0.010	0.9
2619	6.20	Chi-Chi, Taiwan	1999	TCU067	0.29	28	28	434	Reverse	N	5.3	6.6	0.009	0.7
										E	5.1	7.1	0.011	0.7
3852	6.20	Chi-Chi, Taiwan	1999	CHY006	0.27	25	25	438	Strike slip	N	5.9	16.7	0.014	1.2
										E	5.7	16.4	0.012	1.1
4314	5.60	Umbria, Italy	1984	Citta Di Castello-Regnano	0.77	41	41	388	Normal	0	7.1	17.7	0.017	1.1
										90	4.9	15.5	0.017	1.1
4478	6.30	L'Aquila, Italy	2009	Lab-Gran Sasso	1.47	11	11	547	Normal	E	7.1	11.5	0.013	1.1
										N	5.6	9.3	0.020	1.2
4000183	9.12	Tohoku	2011	4000183	0.66	104	-	634	Interface	EW	47.3	82.7	0.137	8.6
										NS	47.5	87.5	0.087	6.8
6001382	8.15	Iquique	2014	6000270	0.66	105	-	415	Interface	HLE	28.0	57.4	0.064	4.3
										HLN	21.8	49.5	0.085	4.7
4022796	8.29	Tokachi-oki	2003	4000330	0.70	191	-	386	Interface	EW2	34.7	61.9	0.071	5.3
										NS2	32.9	60.6	0.079	5.4

a. The record sequence number is assigned to individual records in the PEER NGA-West2 database.
b. R_{rup} = closest distance to fault rupture.
c. R_{jb} = closest horizontal distance to the surface projection of the surface fault rupture.
d. V_{s30} = the time-averaged shear-wave velocity for the upper 30 m of earth materials below the ground surface.
e. D_{5-75} = significant duration; the time between 5% and 75% of the cumulative Arias intensity.
f. D_{5-95} = significant duration; the time between 5% and 95% of the cumulative Arias intensity.
g. AI = Arias intensity
h. CAV = cumulative absolute velocity

Earthquake magnitude and source-to-site distance are causal parameters that are indirect measures of the source and travel path characteristics of the selected EATHs. Direct intensity measures, including significant durations (e.g., D_{5-75}), CAV, and AI were compared to predictions from the empirical relations listed in Tables 2 and 3. The predicted intensity measures were calculated for a representative earthquake scenario as listed in Tables 2 and 3. The target scenarios for crustal and subduction interface earthquakes were based on the deaggregation results for the period range of interest from Golder (2022). We used the mode magnitude and mode distance from the deaggregation results.

Table 2: Predicted Intensity Measures from Empirical Relations for a Selected Representative Crustal Earthquake Scenario

Empirical Relation Source	Intensity Measure	Median	16th Percentile	84th Percentile	Closet Distance to Rupture, R_{rup} (km)	Moment Magnitude (M)
Bommer et al. (2009)	D_{5-75}[a] (s)	4	3	7	20	6.0
	D_{5-95}[b] (s)	9	6	15		
Macedo et al. (2021)	CAV[c] (m/s)	1.0	0.7	1.4		
Abrahamson et al. (2016)	AI[d] (m/s)	0.023	0.016	0.034	-	

a. D_{5-75} = significant duration; the time between 5% and 75% of the total energy
b. D_{5-95} = significant duration; the time between 5% and 95% of the total energy
c. CAV = cumulative absolute velocity
d. AI = Arias intensity

Table 3: Predicted Intensity Measures Using Empirical Relations for a Selected Representative Subduction Interface Earthquake Scenario

Empirical Relation	Intensity Measure	Median	16th Percentile	84th Percentile	Closet Distance to Rupture, R_{rup} (km)	Moment Magnitude (M)
Macedo et al. (2019)	CAV[a] (m/s)	6.5	4.9	8.5	450	9
Liu and Macedo (2022)	AI[b] (m/s)	0.12	0.09	0.18		

a. CAV = cumulative absolute velocity
b. AI = Arias intensity

Figures 6 and 7 are comparisons of the intensity measures of the scaled EATHs to the predicted intensity measures. Comparison of the intensity measures of the scaled EATHs to the predicted intensity measures indicates that the D_{5-75}, D_{5-95}, CAV, and AI of the scaled EATHs are generally within the 16th and 84th percentile range of the empirically predicted values. Figures 6 and 7 show that the CAVs of the selected and scaled motions meet the target reasonably well, whereas the AIs are relatively less than the corresponding empirically based targets for both crustal and subduction interface records. It is almost always challenging to meet all four direct measures satisfactorily. For the Mt Polley TSF site, we consider that meeting the CAV criterion is more important than meeting the AI criterion. This is because CAV was observed to correlate better to durations than AI and can potentially be a more efficient intensity measure for predicting ground deformation that depends on the number of shaking cycles above some acceleration threshold (Macedo et al. 2021).

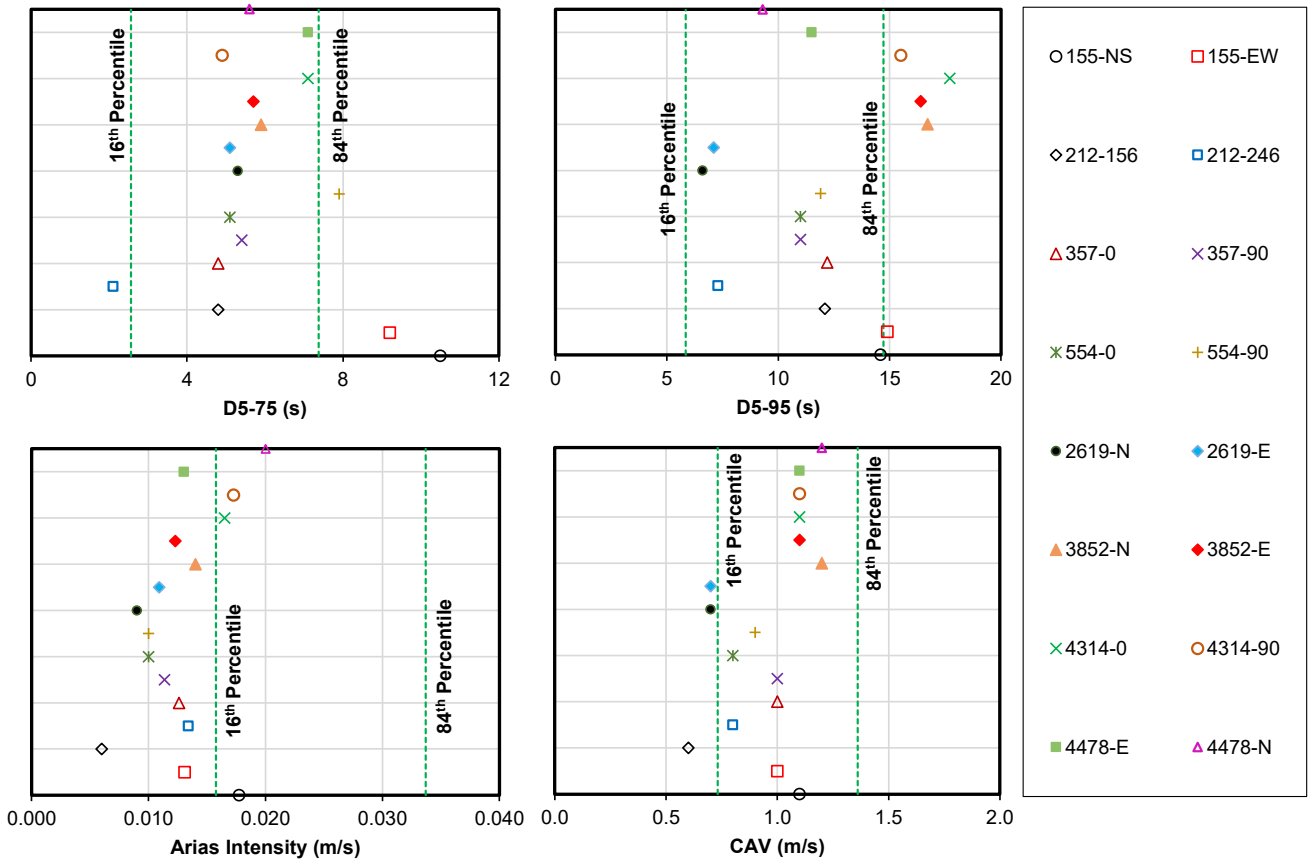

Figure 6: Comparison of Direct Intensity Measures of Selected Scaled Crustal Motions to Predictions Using Empirical Relations for the Mean 1/2,475 AEP Target Spectrum

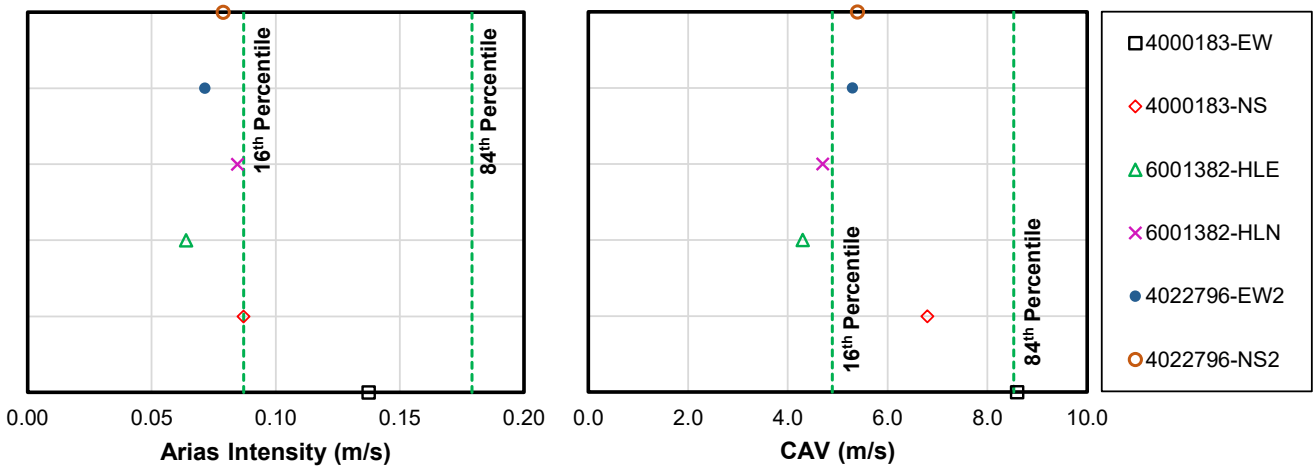

Figure 7: Comparison of Direct Intensity Measures of Selected Scaled Subduction Interface Motions to Predictions Using Empirical Relations for the Mean 1/2,475 AEP Target Spectrum

3.0 LIMITATIONS

Eleven two-horizontal-component EATHs were developed using amplitude scaling to support ongoing engineering analyses for the Mount Polley TSF site in British Columbia, Canada. These EATHs were developed specifically to address the conditions and requirements at the Mount Polley TSF site. They should not be used for other sites or projects without prior review and authorization by WSP USA.

The CAVs of the selected and scaled motions meet the target reasonably well, whereas the AIs are relatively lower than the corresponding target. For this project site, we assumed CAV is better related to the performance of the structure of interest, and hence consider the selected and scaled motions are acceptable. If subsequent analysis shows that this assumption is incorrect, then WSP USA recommends re-evaluation and reselection of the motions, if required.

WSP USA Inc.

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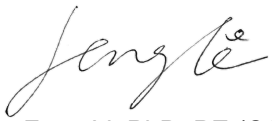

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Attachments: Attachment A – Amplitude Scaling Results for the 22 Individual EATHs for Target Acceleration Response Spectrum

https://wsponlinenam-my.sharepoint.com/personal/tonya_peeler_wsp_com/documents/31404975.000_tm_eaths_rev0.docx

4.0 REFERENCES

Abrahamson C, Shi HJM, and Yang B. 2016. Ground-motion prediction equations for Arias intensity consistent with the NGA-West2 ground-motion models. PEER Report 2016/05, p.57.

Bommer JJ, Stafford PJ, and Alarcón JE. 2009. Empirical equations for the prediction of the significant, bracketed, and uniform duration of earthquake ground motion. Bulletin of the Seismological Society of America, 99(6), pp.3,217–3,233.

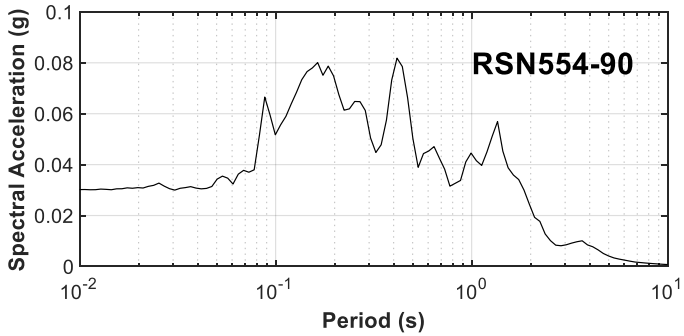
Golder Associates USA Inc. (Golder) 2022. Site-Specific Seismic Hazard Assessment, Mount Polley Mine, British Columbia.

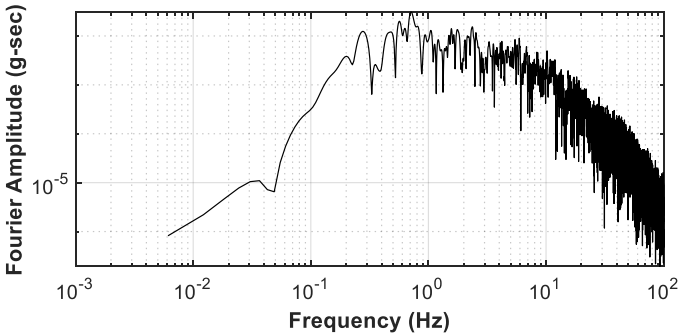
Liu C., Macedo J. 2022. New conditional, scenario-based, and non-conditional cumulative absolute velocity models for subduction tectonic settings. Earthquake Spectra. 38 (1): 615–647.

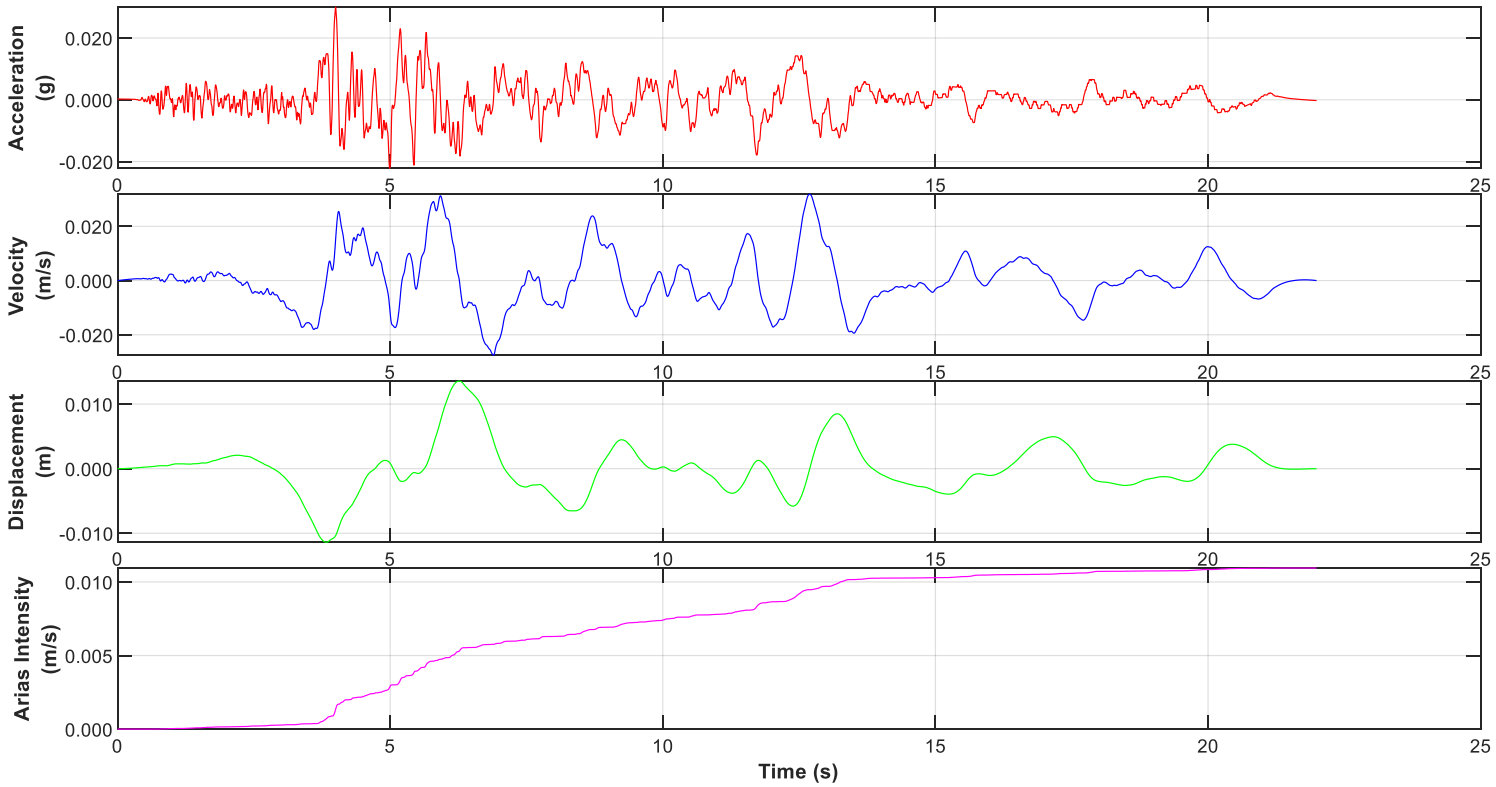
Macedo J., Abrahamson N., Bray J. D. 2019. Arias Intensity Conditional Scaling Ground-Motion Models for Subduction Zones. Bulletin of the Seismological Society of America. 109 (4): 1343–1357.

Macedo J., Abrahamson N., Liu C. 2021. New Scenario-Based Cumulative Absolute Velocity Models for Shallow Crustal Tectonic Settings. Bulletin of the Seismological Society of America; 111 (1): 157–172.

NEHRP (National Earthquake Hazards Reduction Program) Consultants Joint Venture. 2011. Selecting and Scaling Earthquake Ground Motions for Performing Response-History Analyses, National Institute of Standards and Technology (NIST) GCR 11-917-15.







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PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
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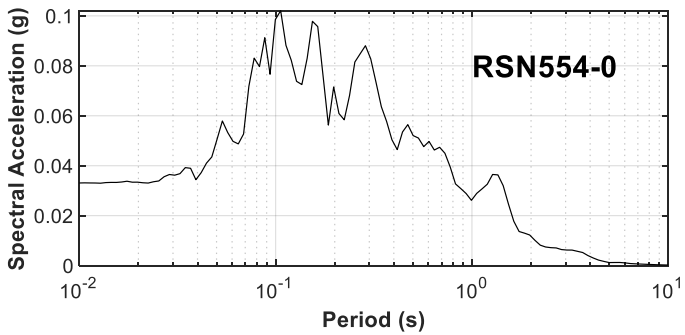

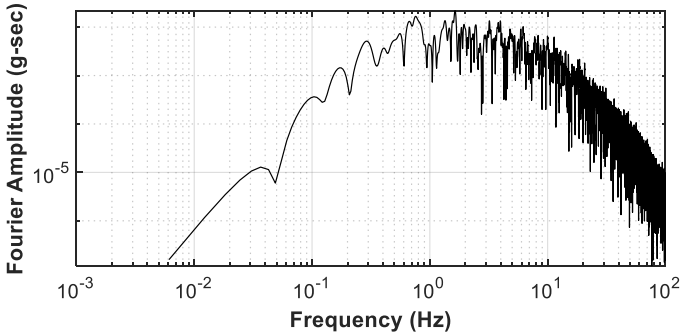

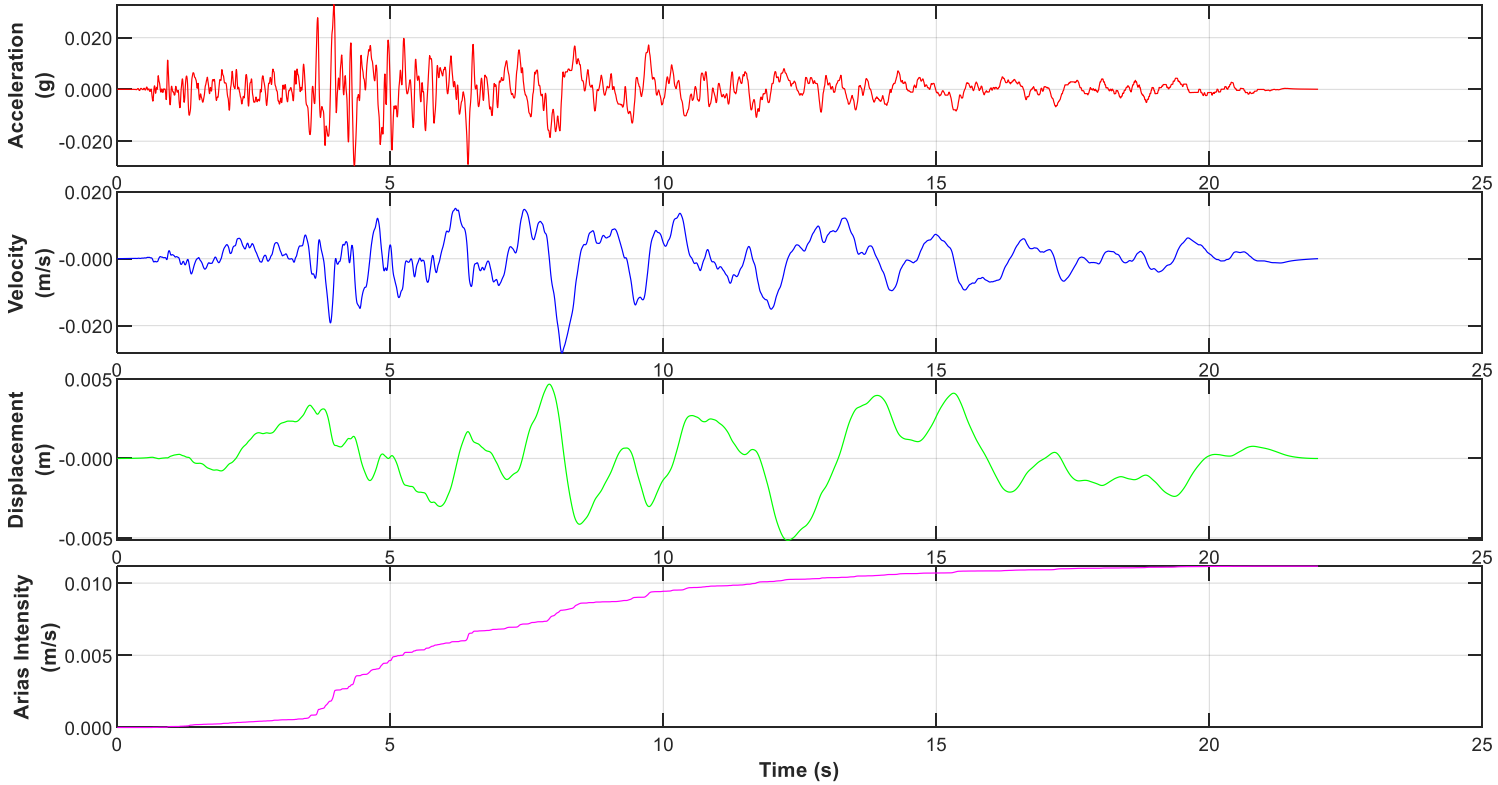

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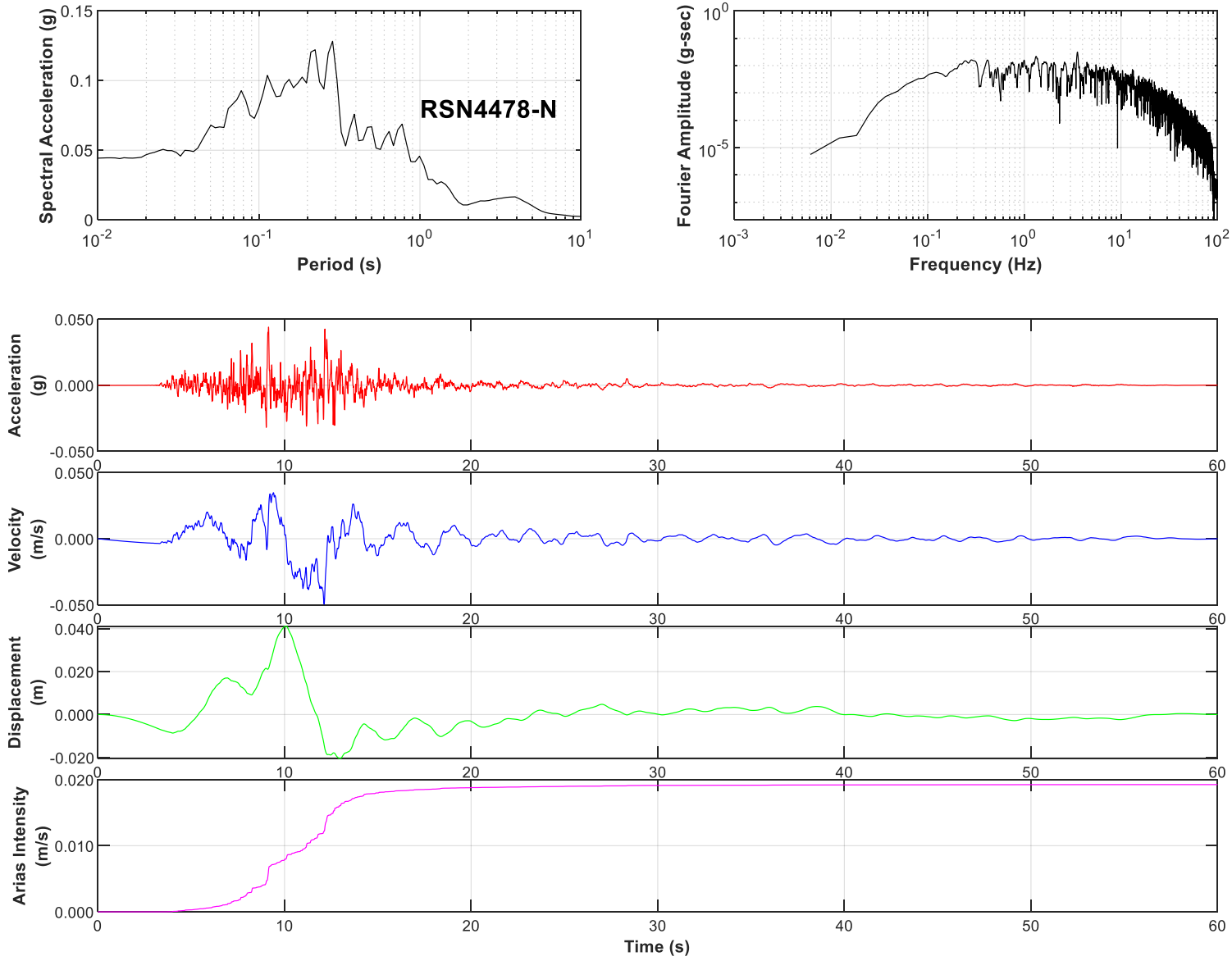

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MT POLLEY MINE, BRITISH COLUMBIA

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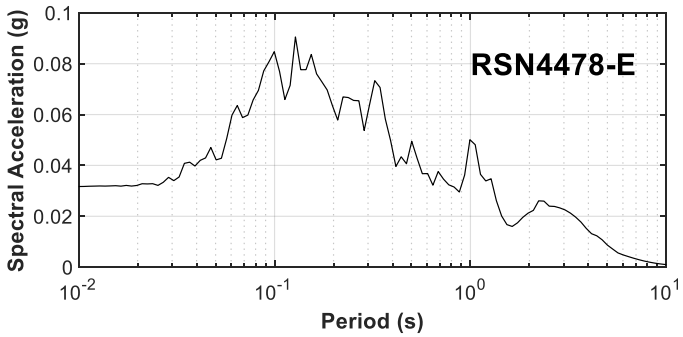

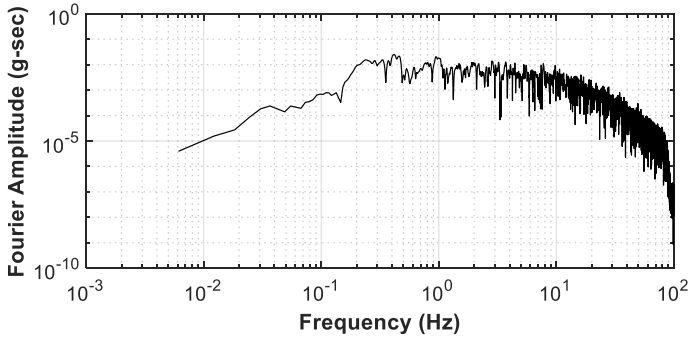

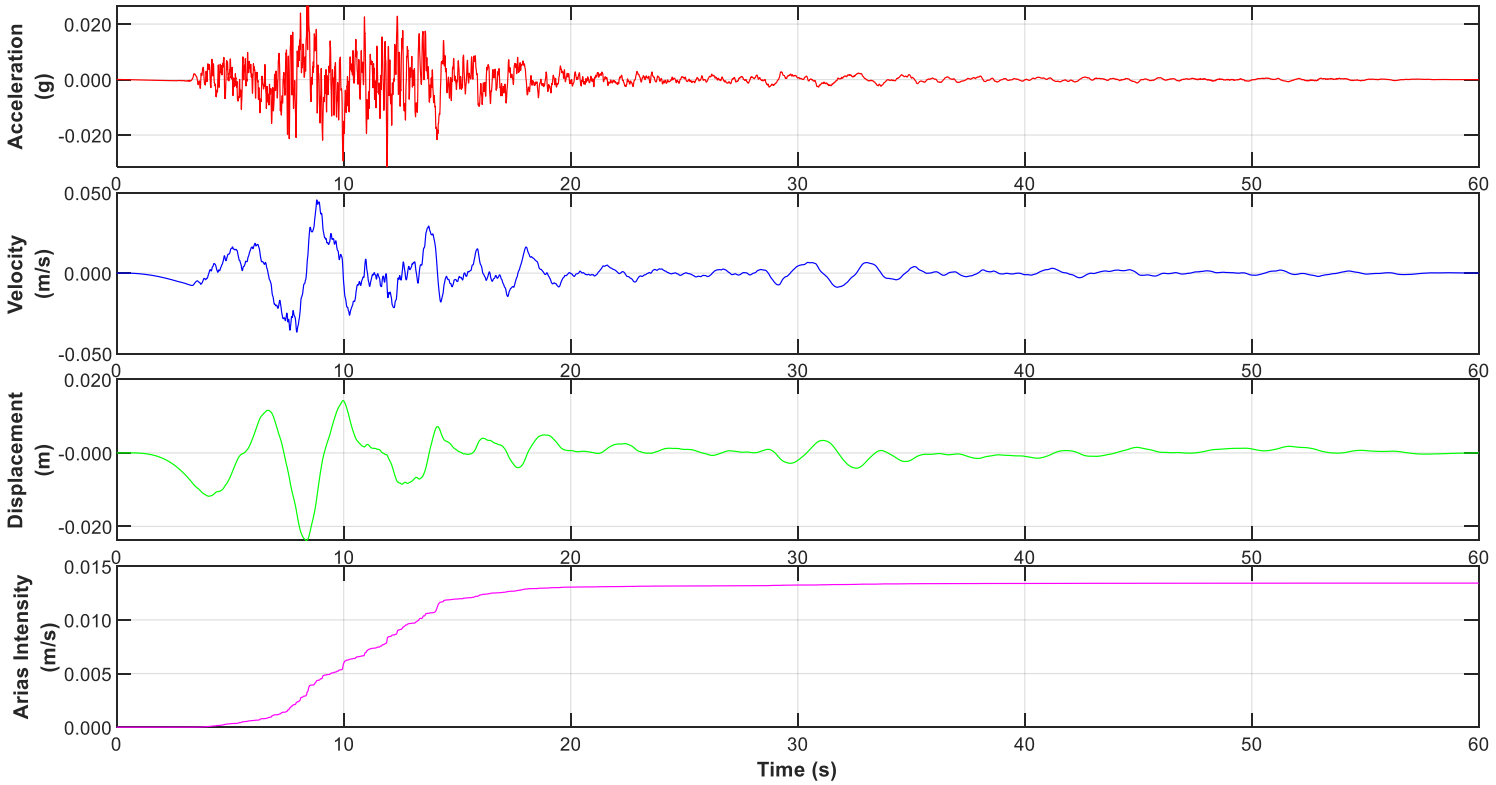

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MT POLLEY MINE, BRITISH COLUMBIA

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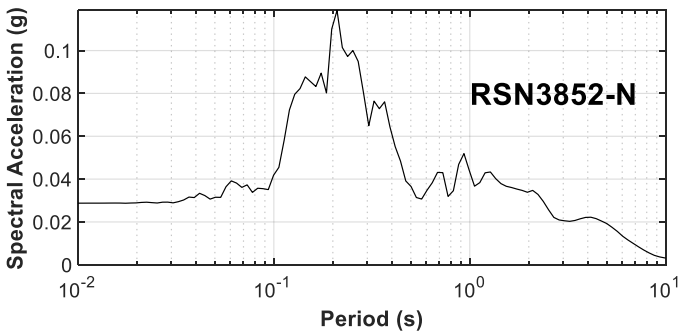

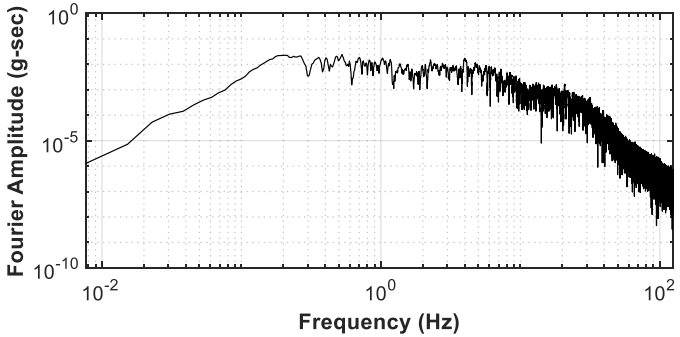

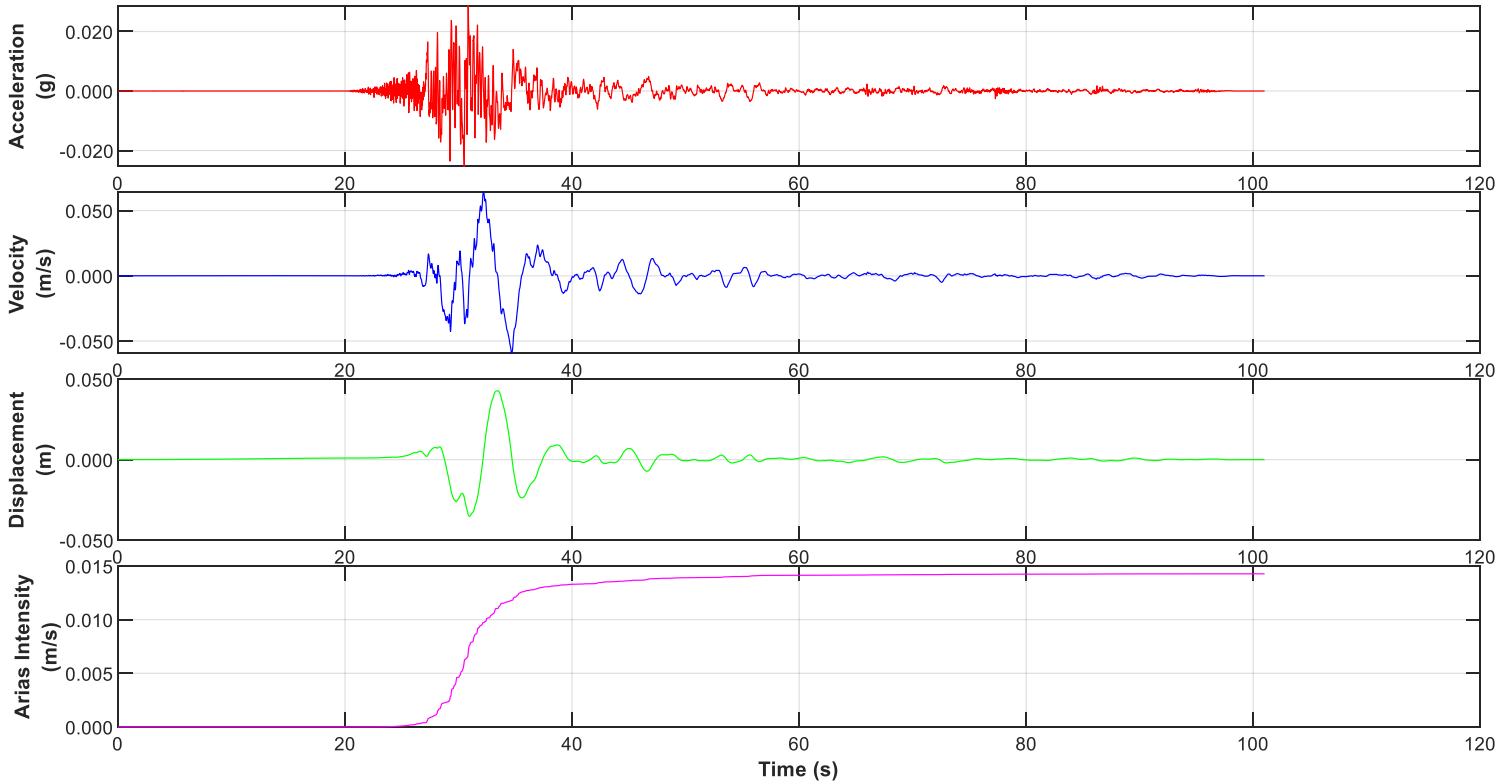

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MT POLLEY MINE, BRITISH COLUMBIA

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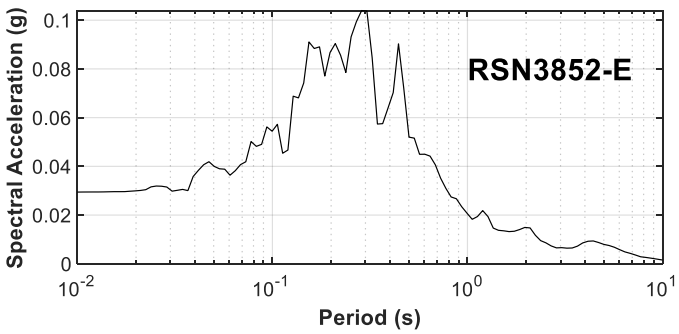

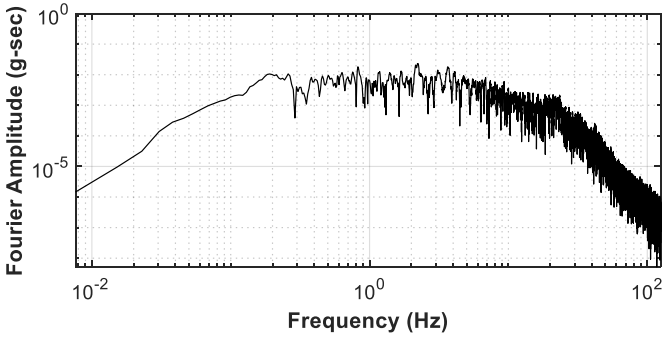

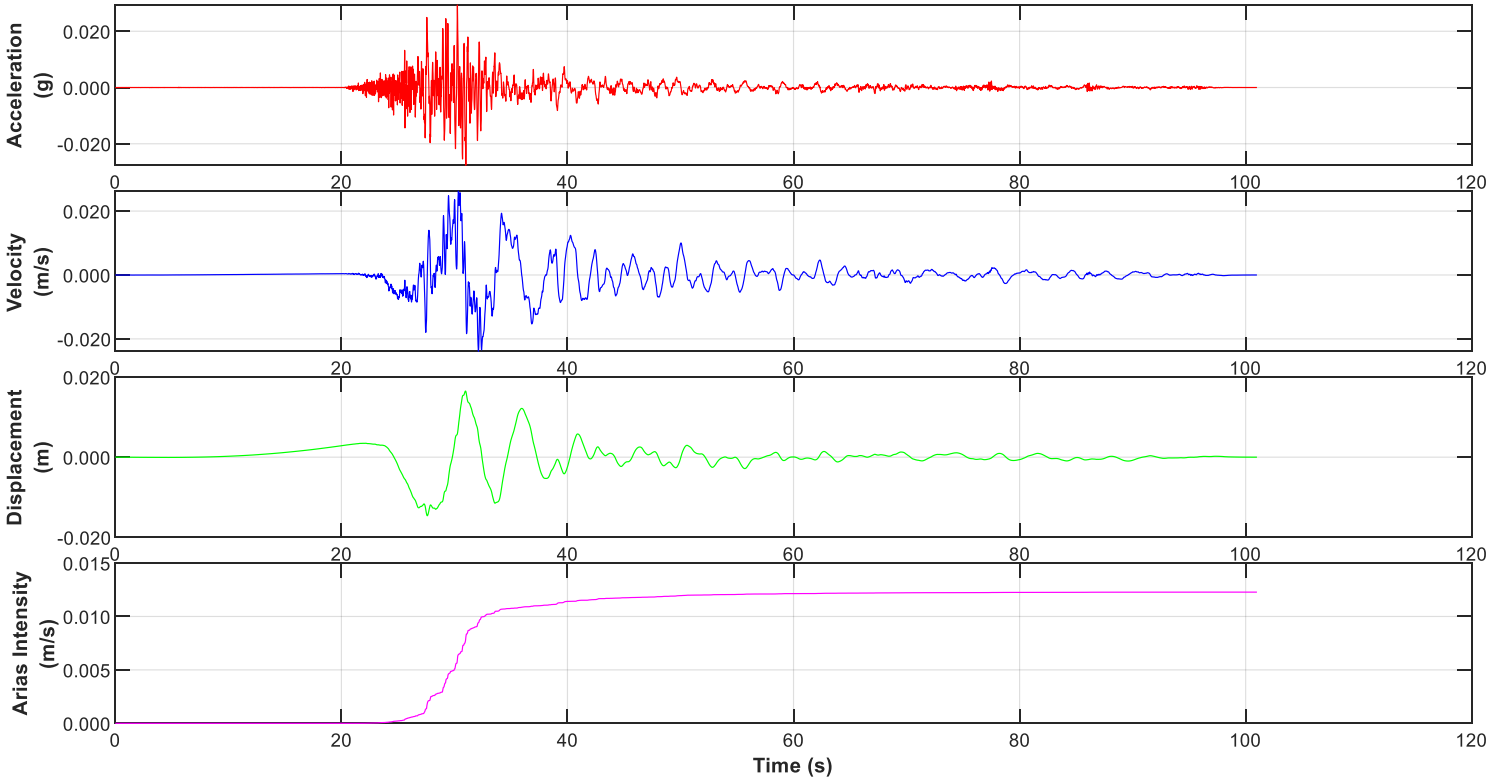

CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN3852-E

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**6**

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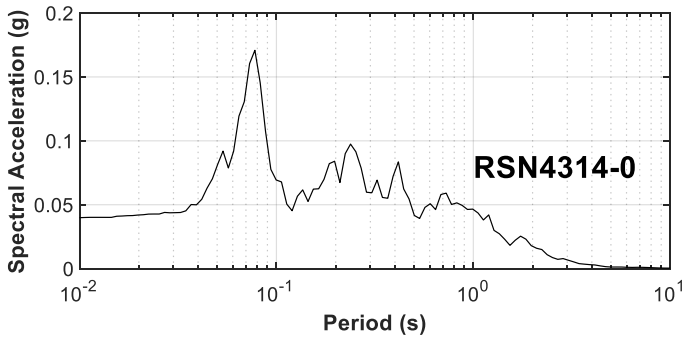

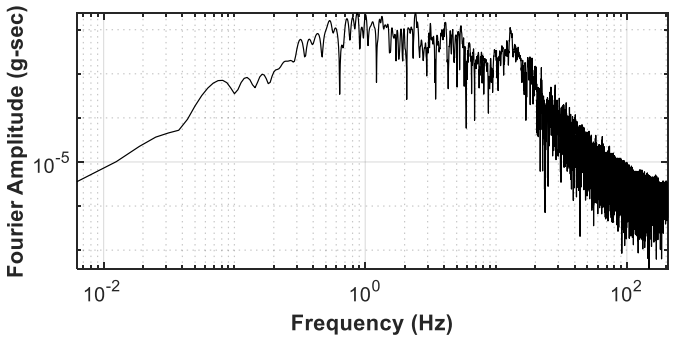

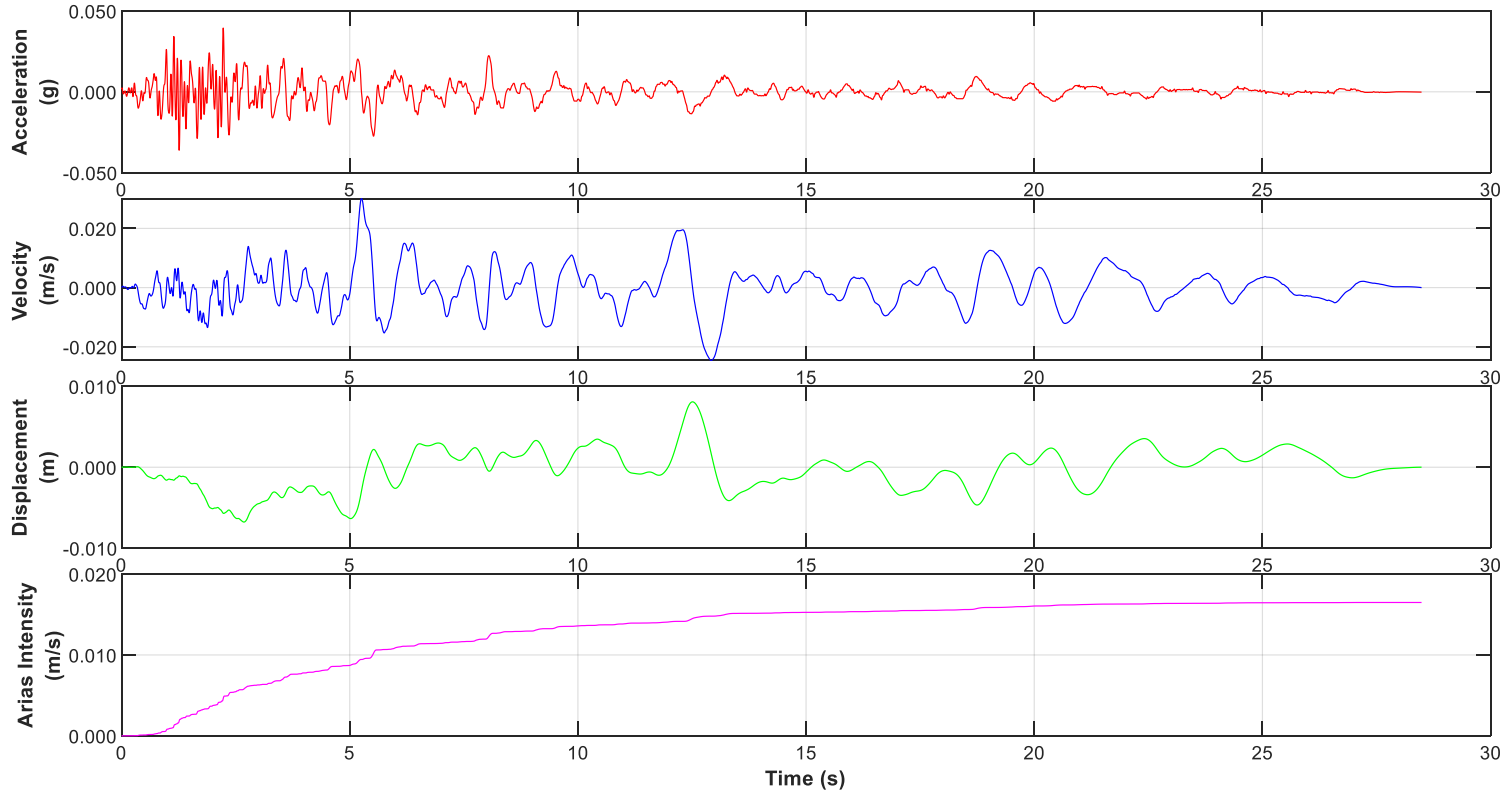

CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN4314-0

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**7**

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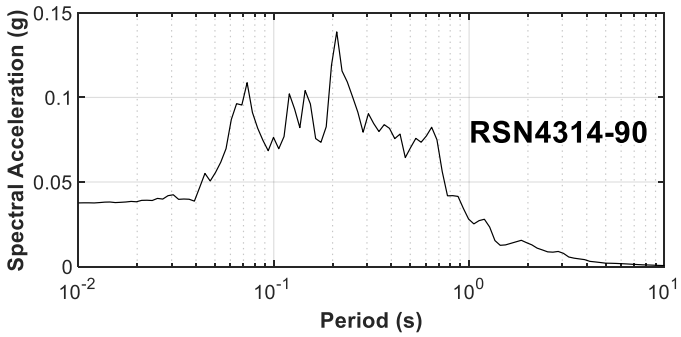
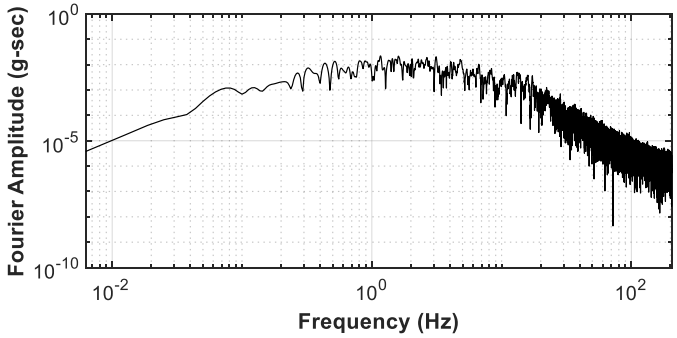
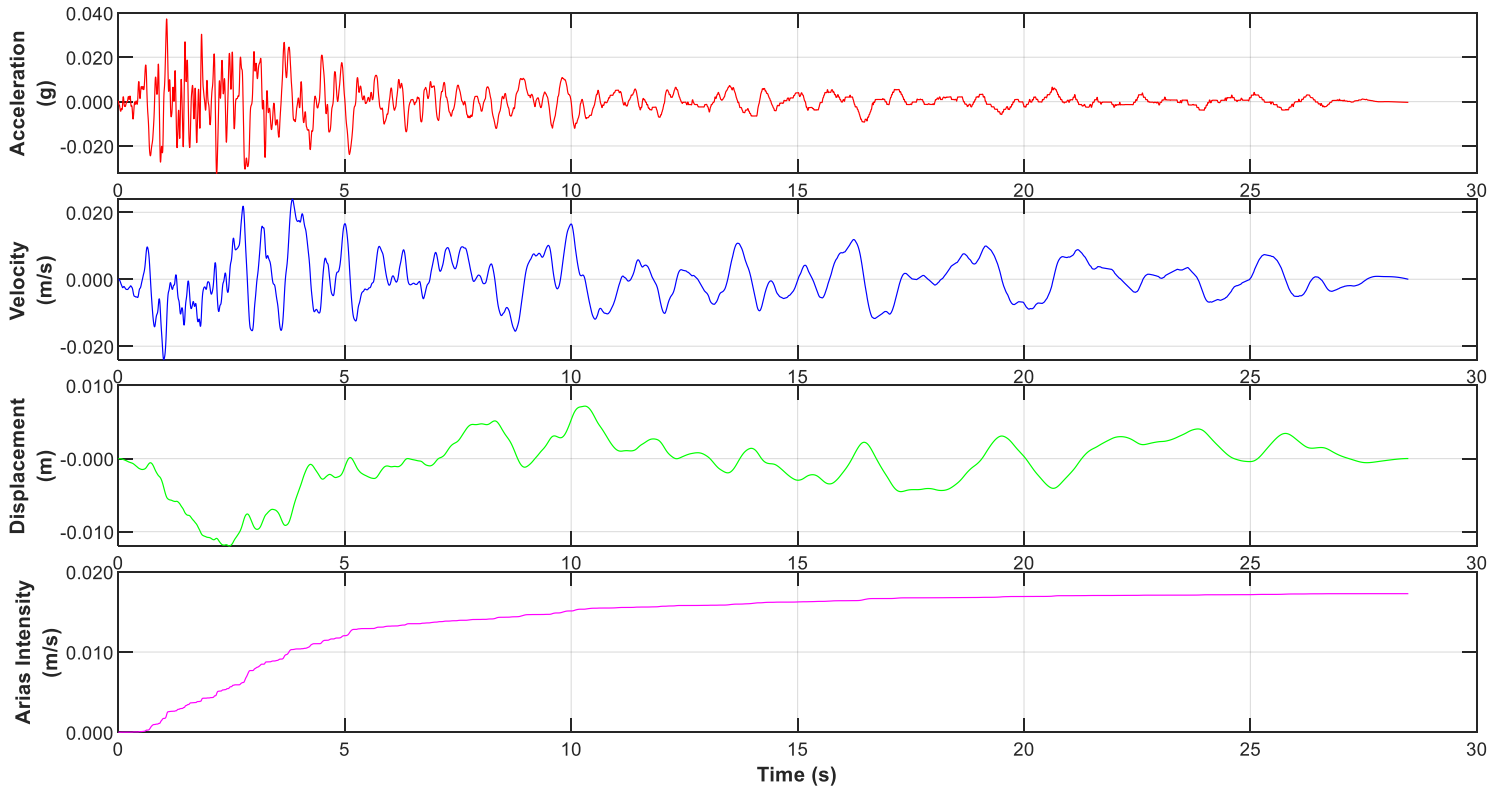






CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

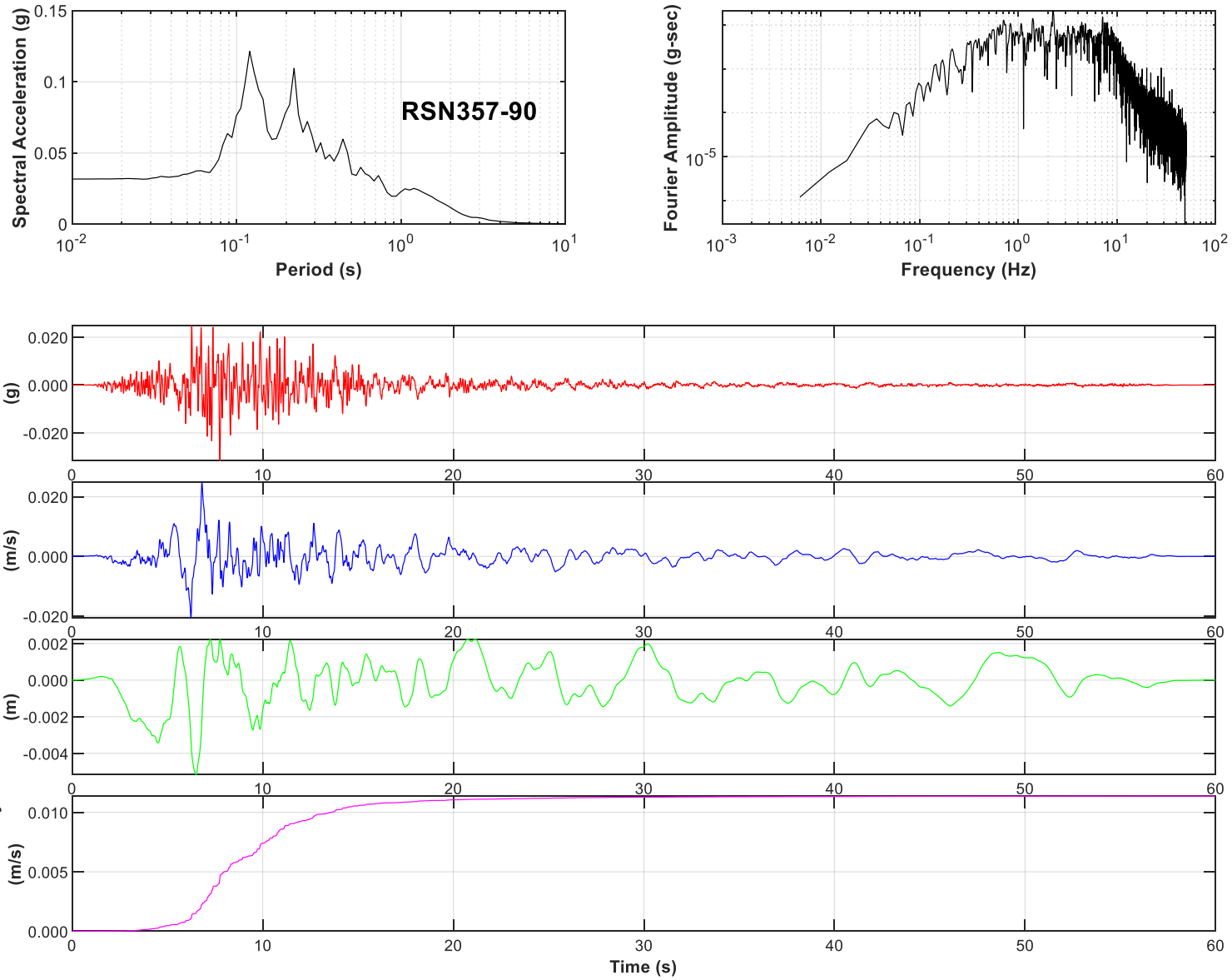
CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN4314-90

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**8**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0



CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN357-90

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**9**

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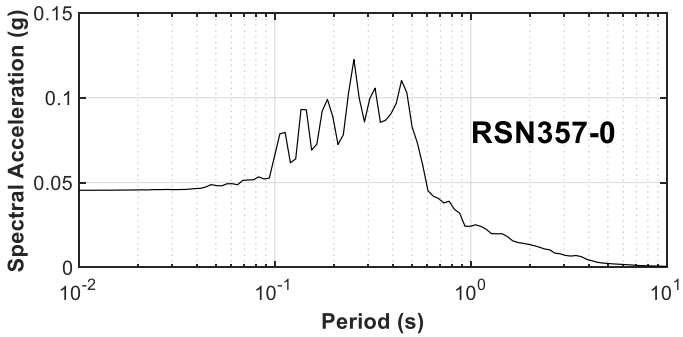
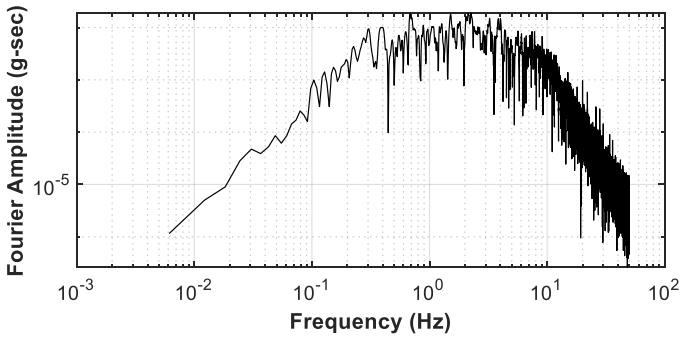
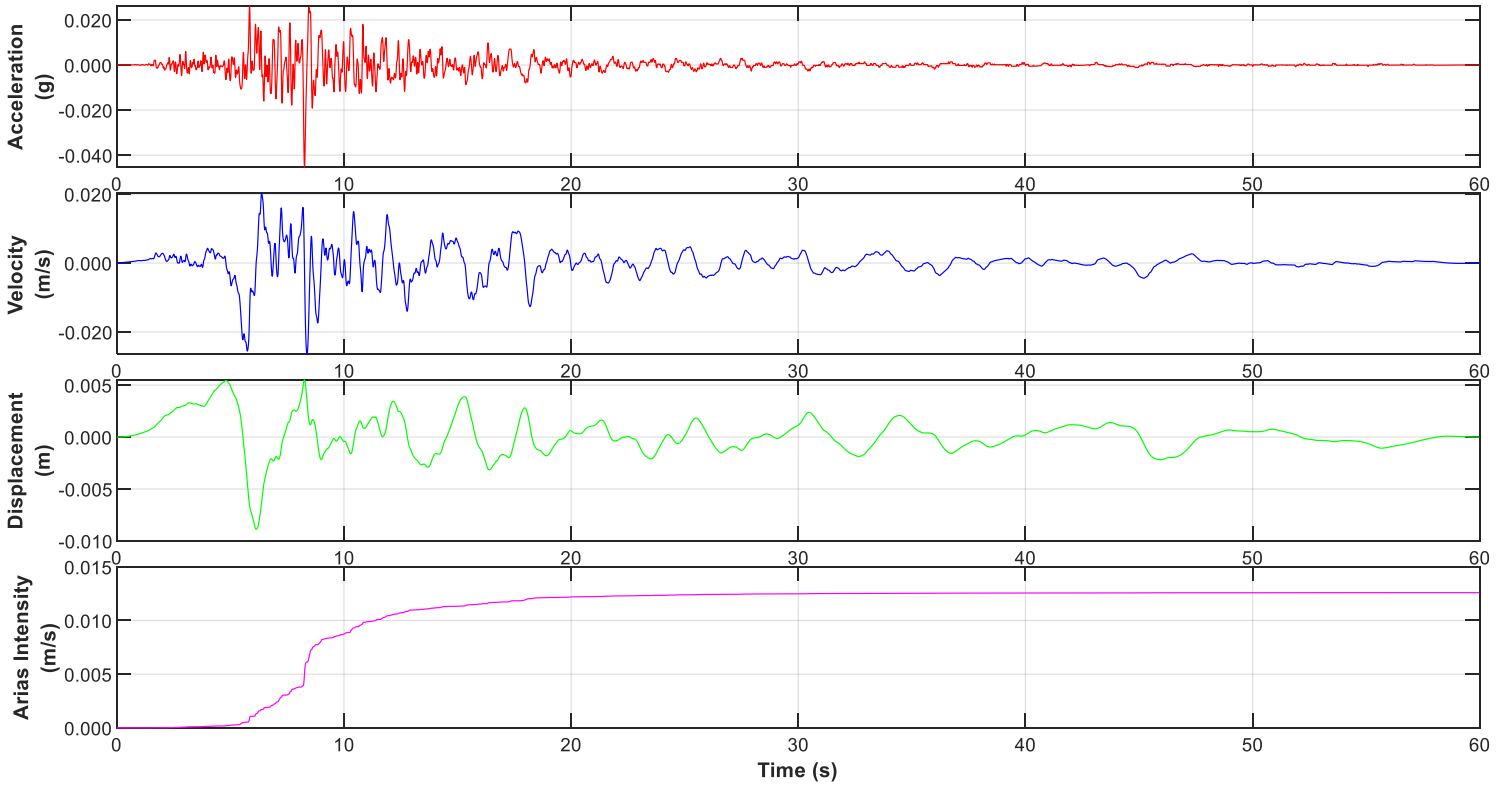






CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

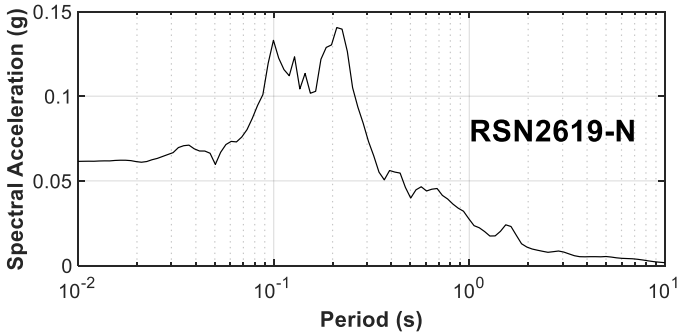
CONSULTANT

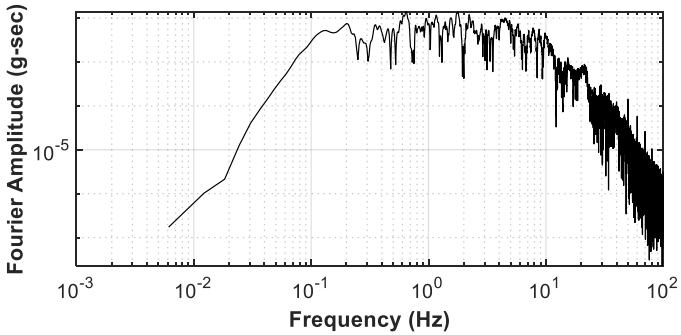
YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

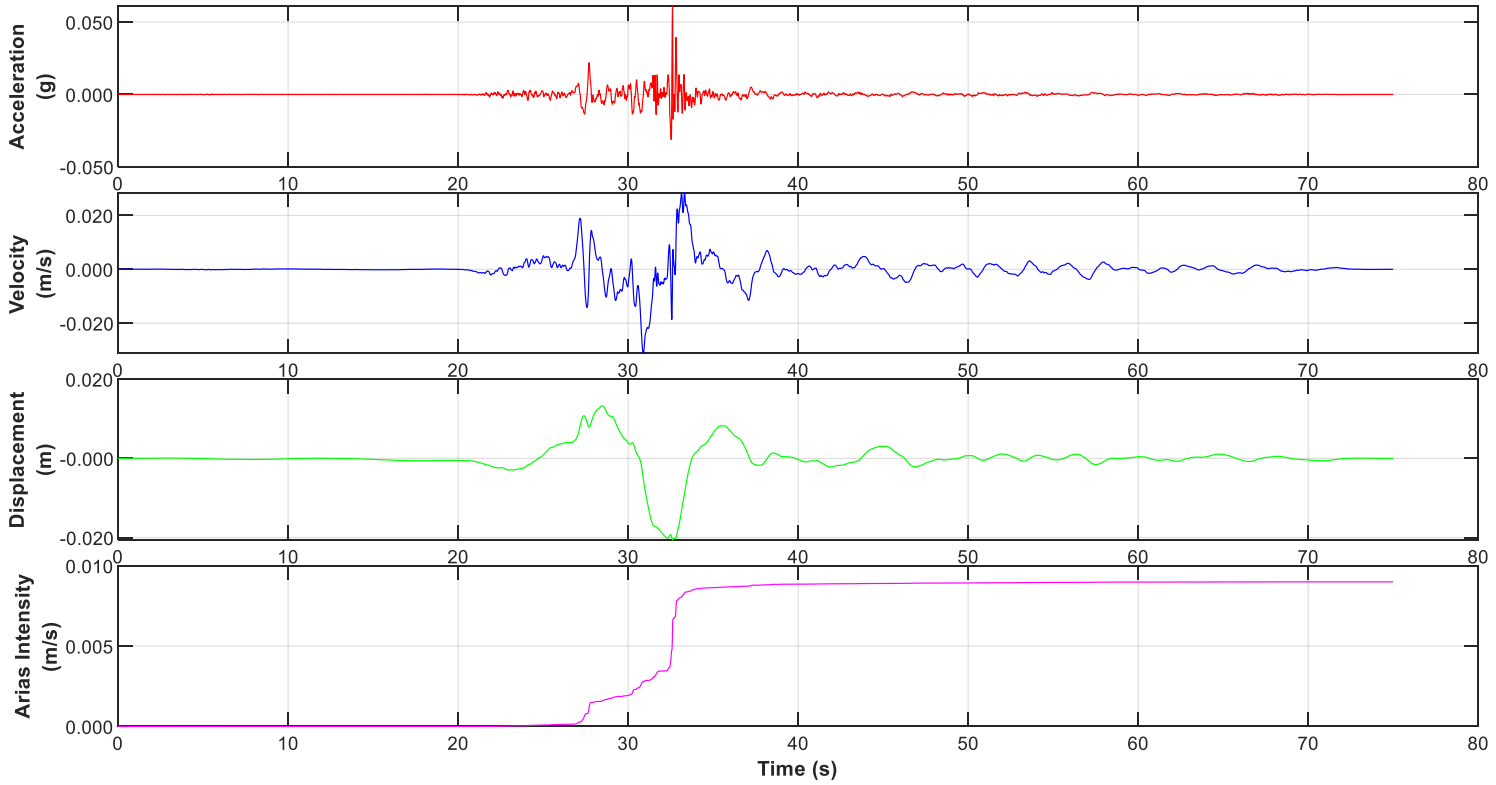
TITLE
AMPLITUDE SCALING RESULTS FOR RSN357-0

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**10**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0







CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

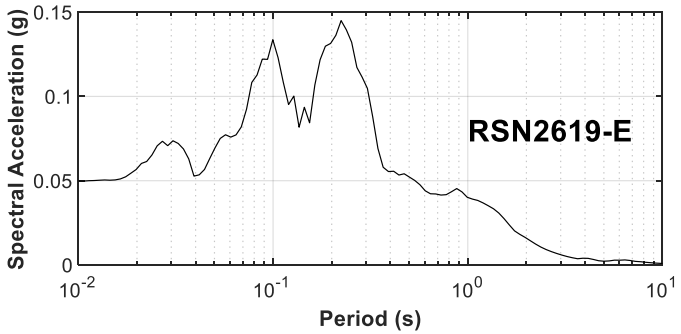
CONSULTANT

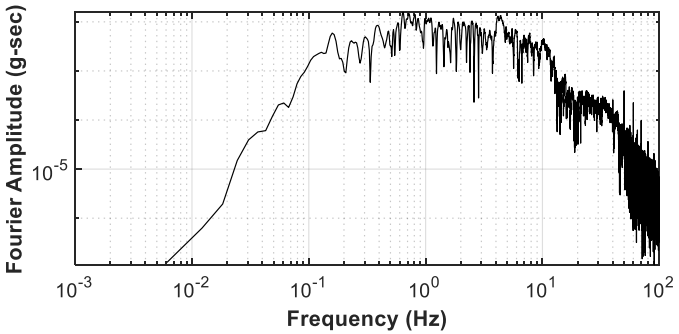
YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

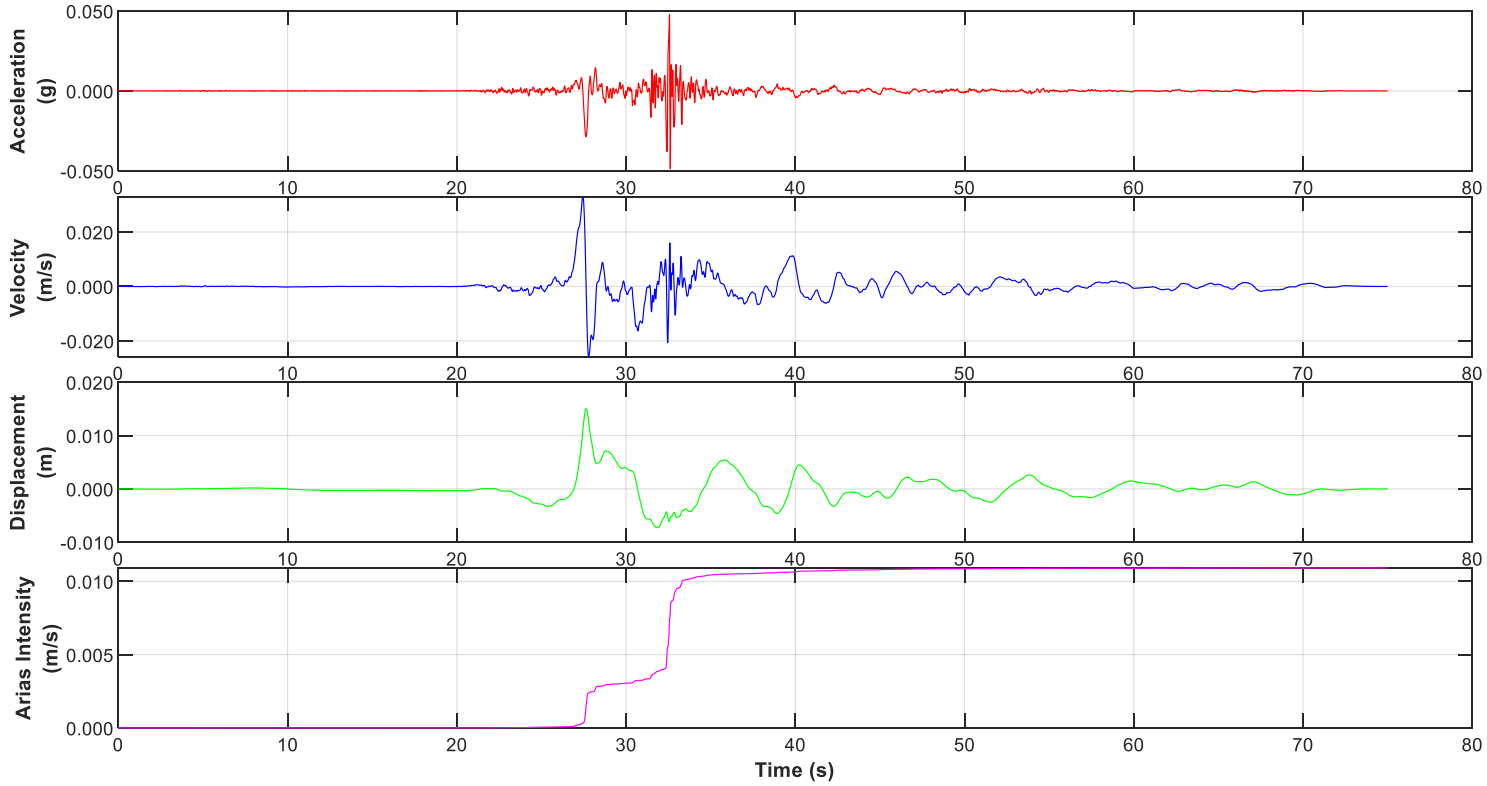
TITLE
AMPLITUDE SCALING RESULTS FOR RSN2619-N

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**11**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0







CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN2619-E

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**12**

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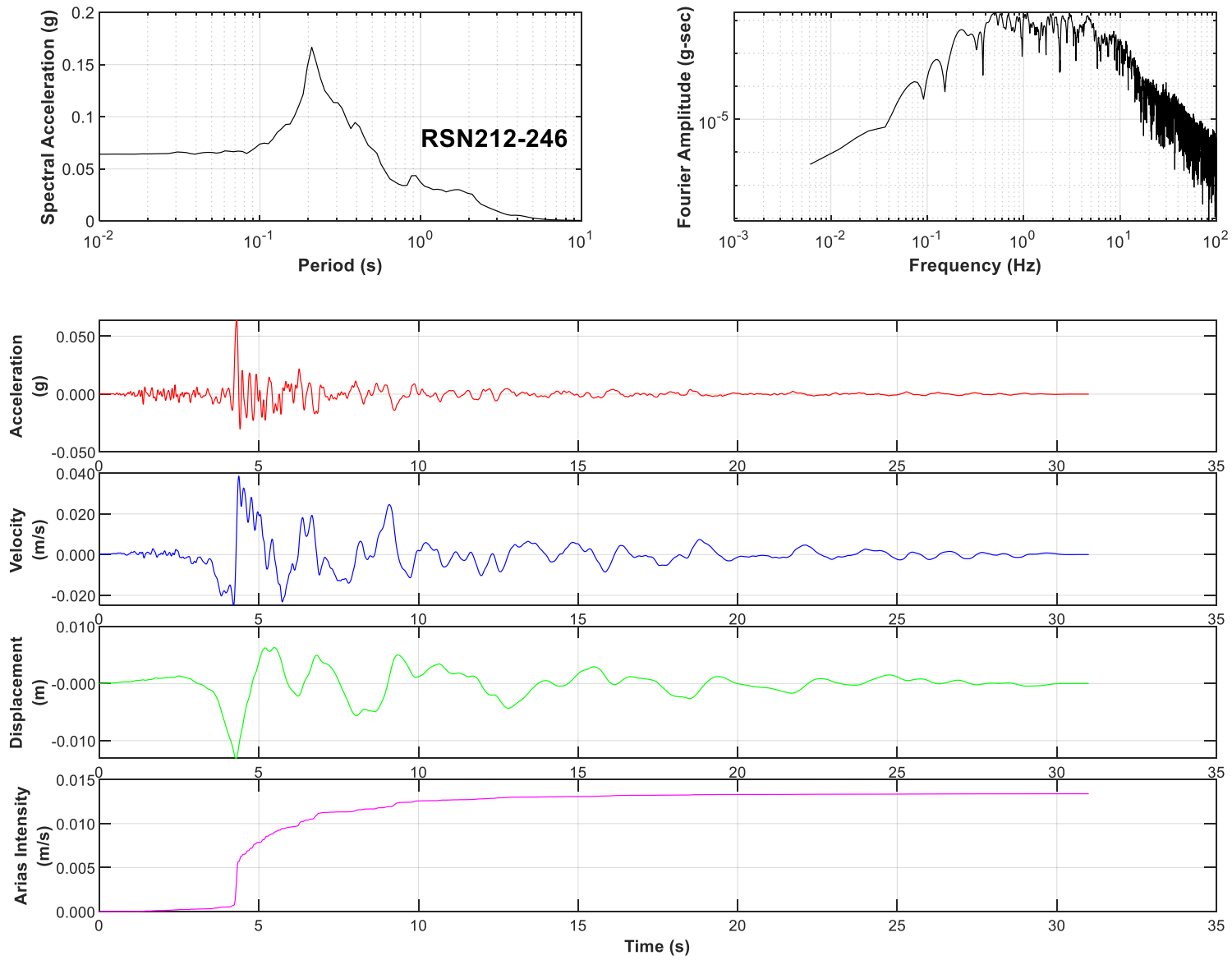


CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

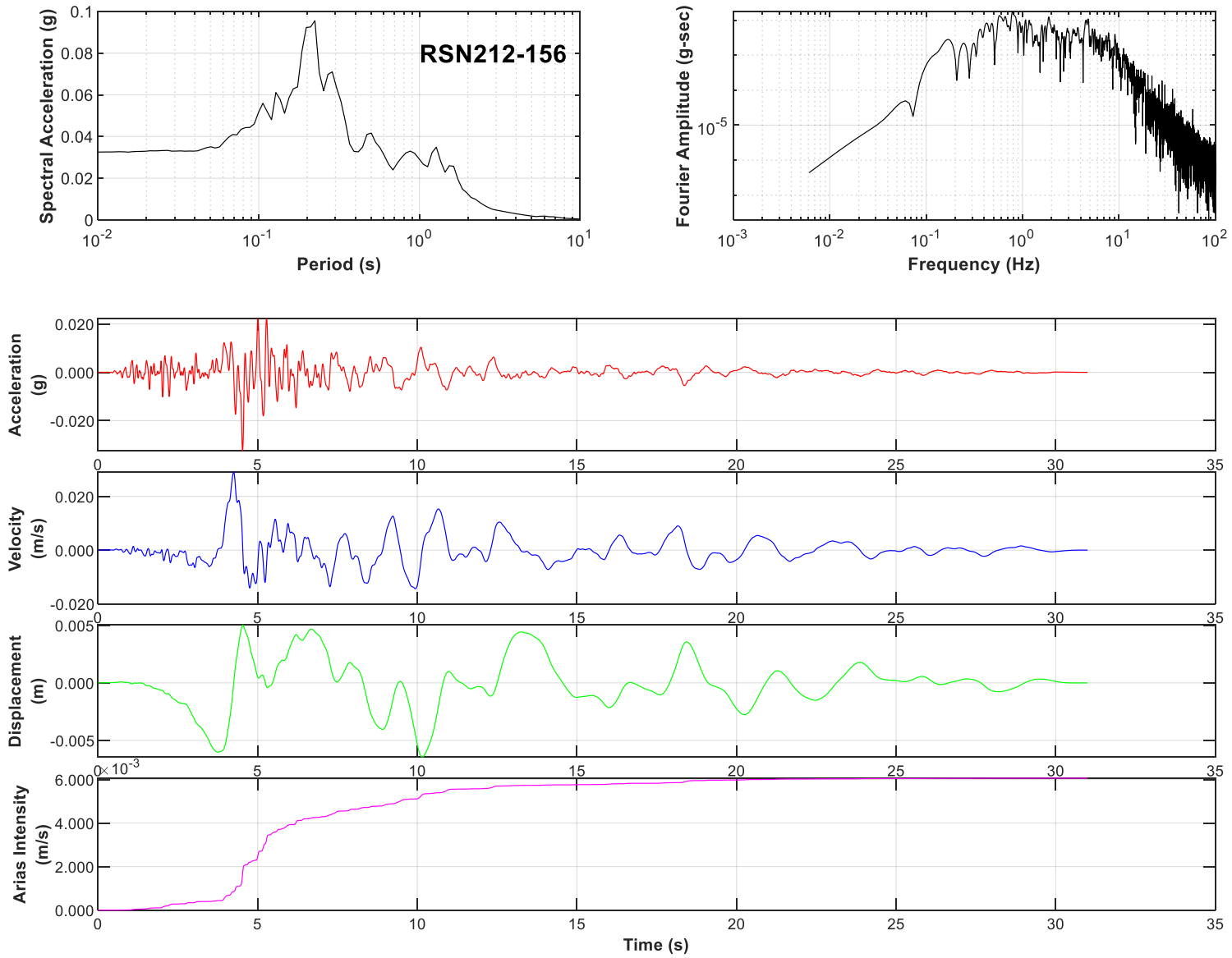
CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN212-246

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**13**

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



CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN212-156

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	300.00	01	14

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
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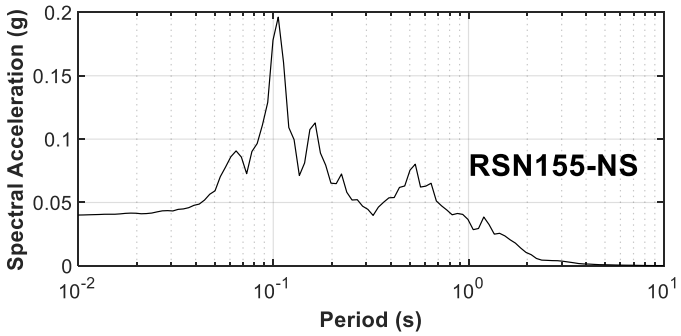

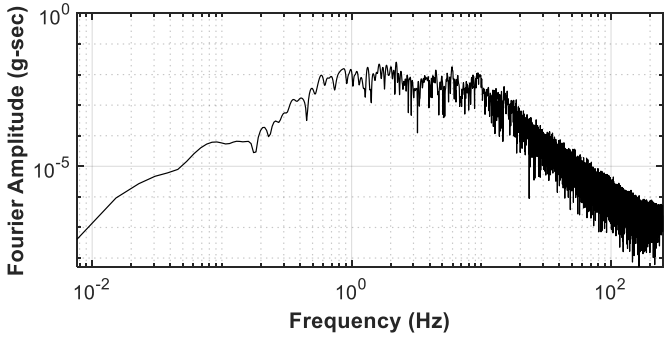

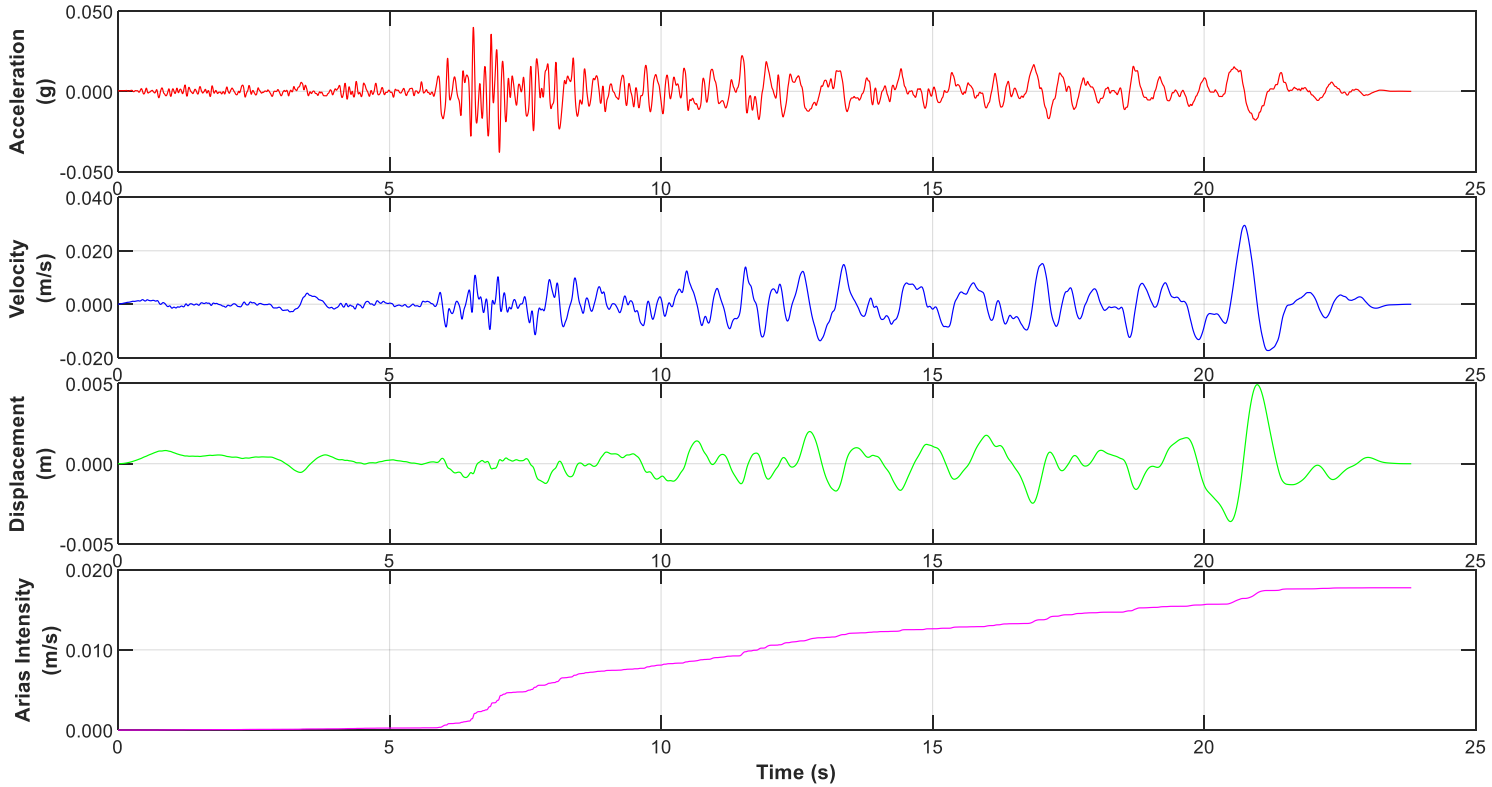

CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN155-NS

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**15**

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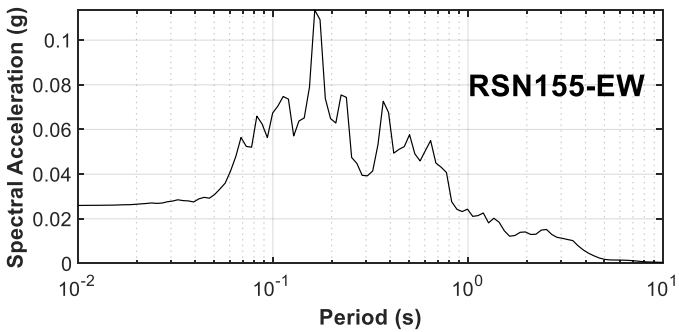

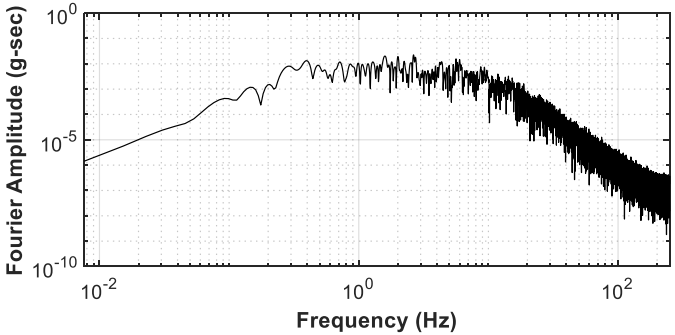

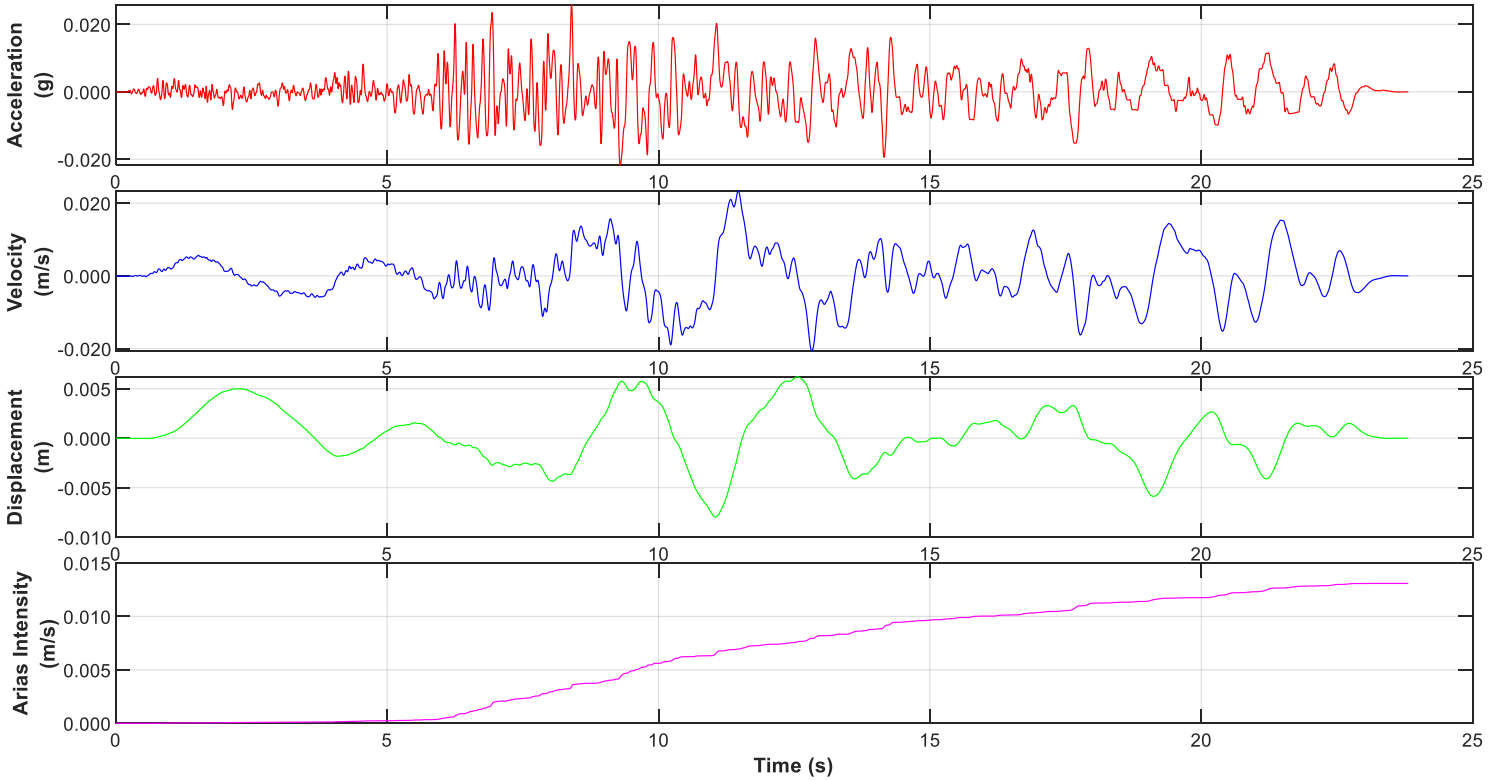

CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN155-EW

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**16**

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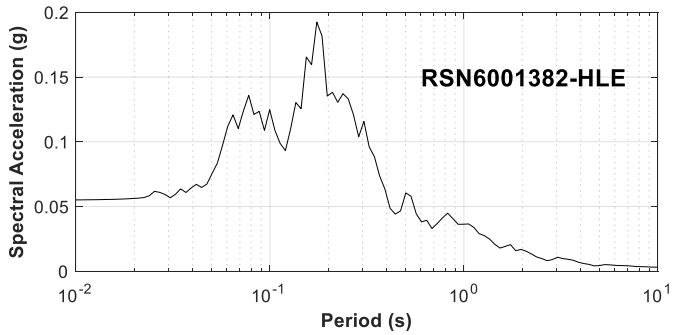

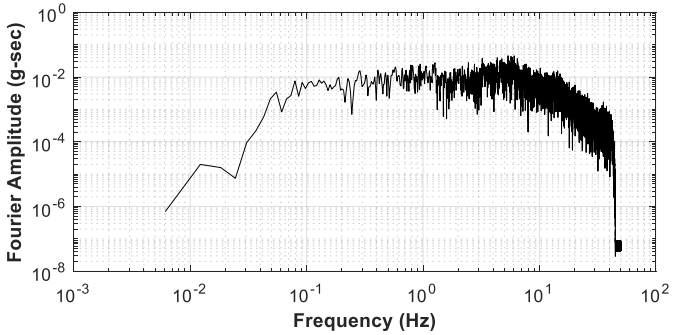

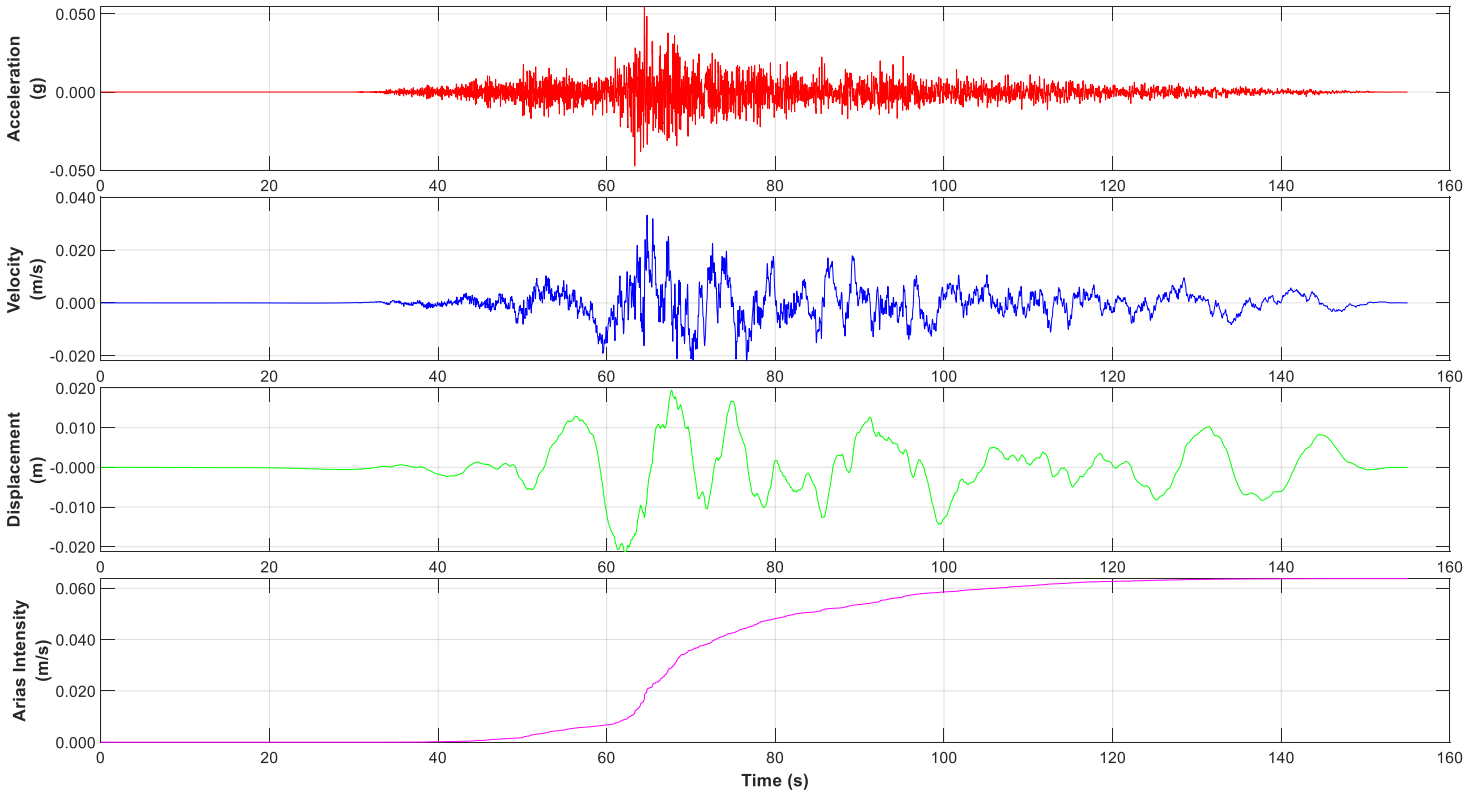

CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN6001382-HLE

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**17**

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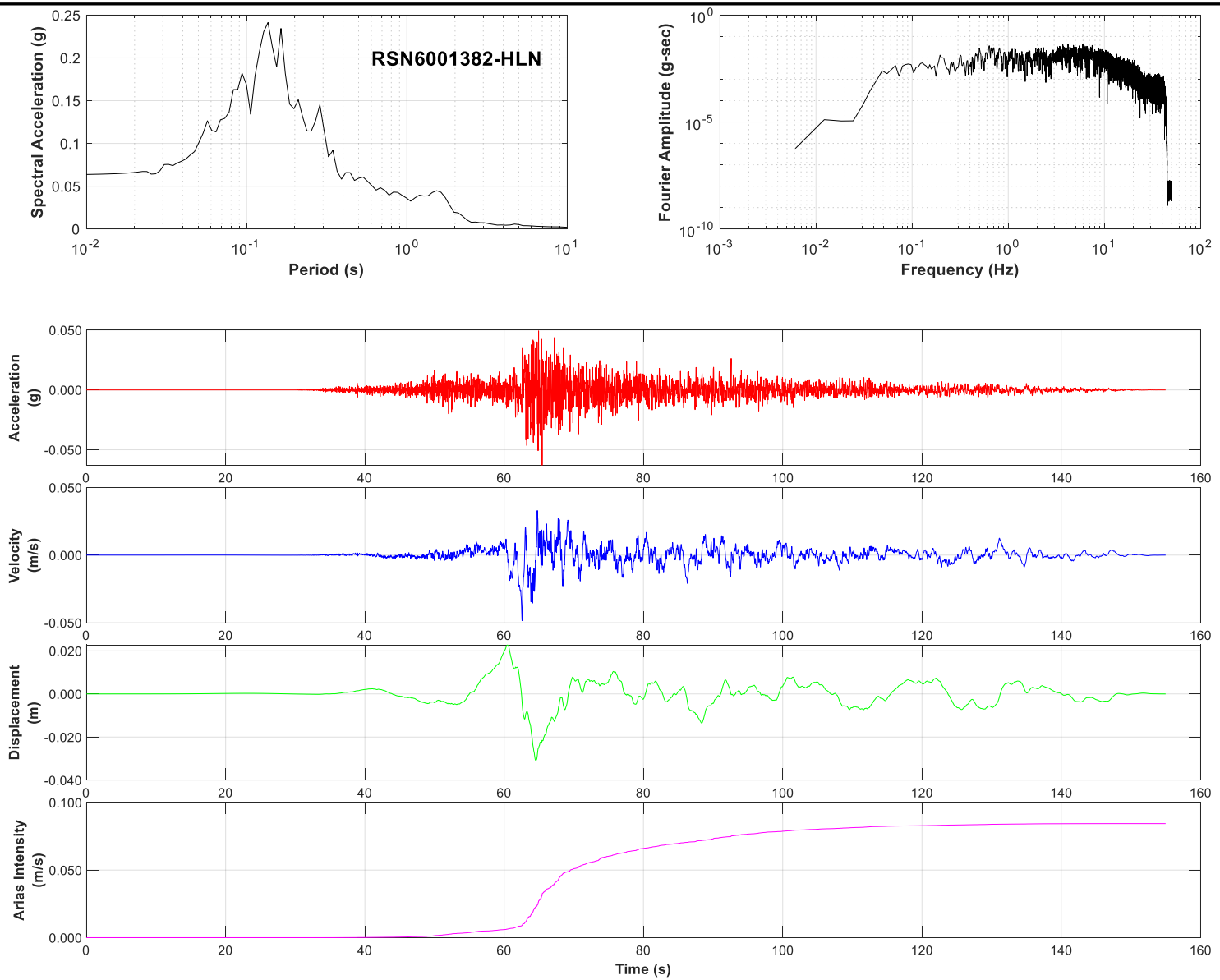


CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

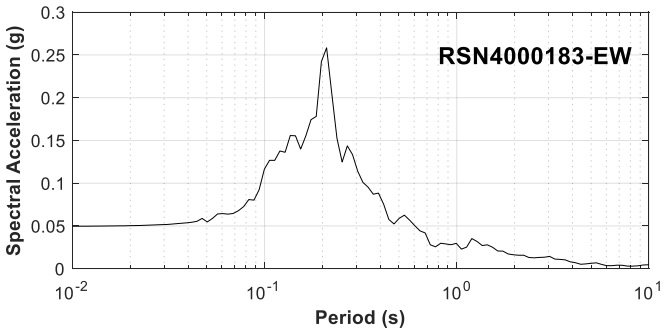
CONSULTANT

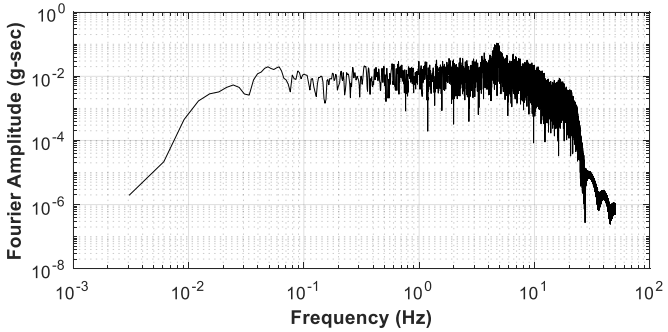
YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

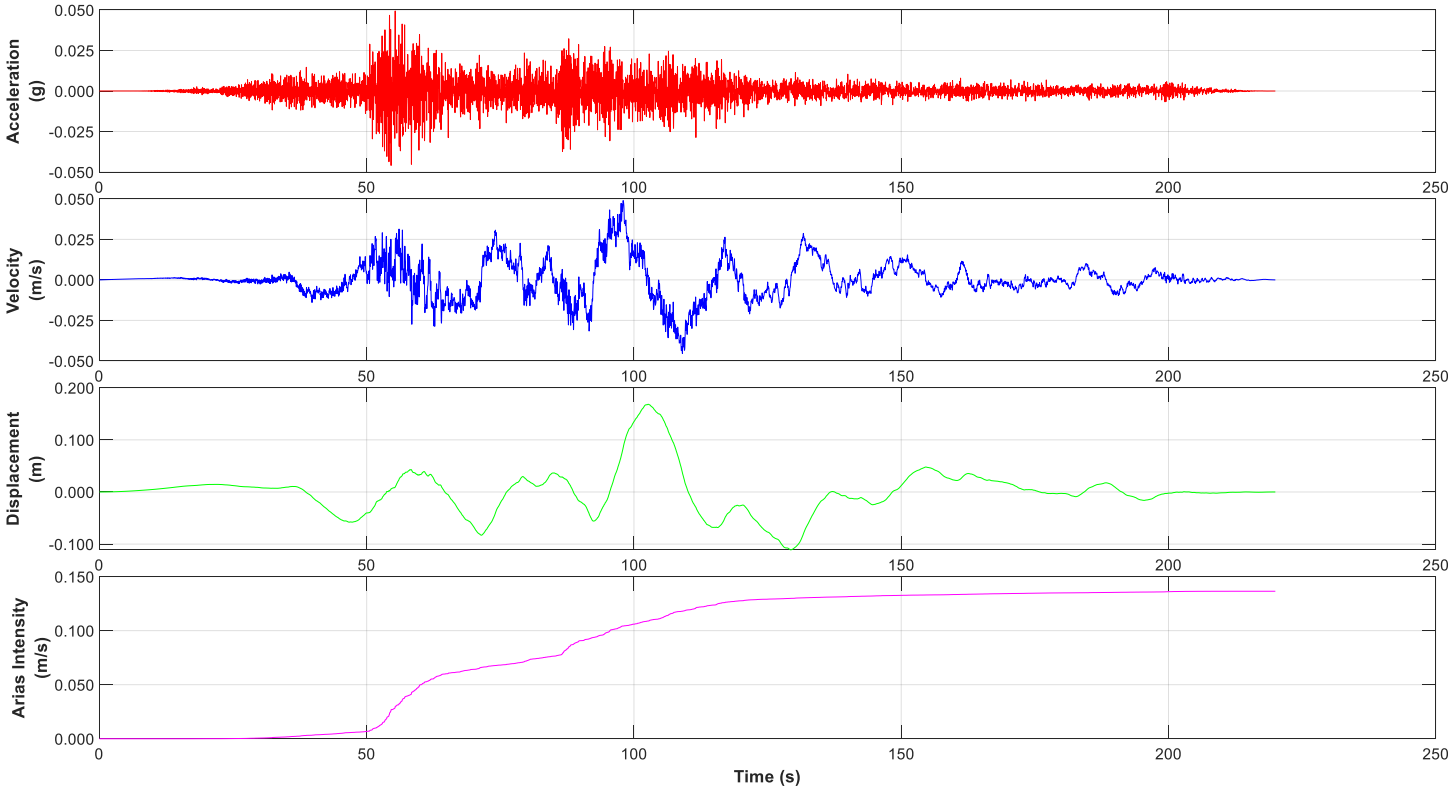
TITLE
AMPLITUDE SCALING RESULTS FOR RSN6001382-HLN

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**18**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0







CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

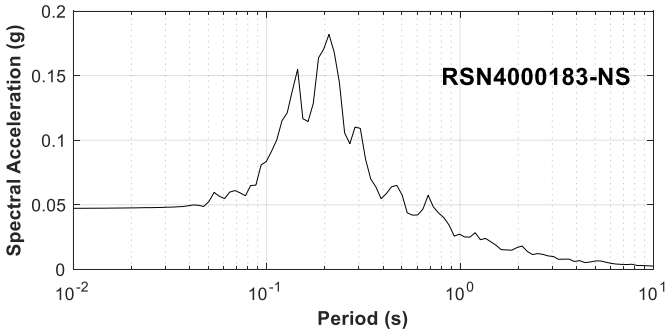
CONSULTANT

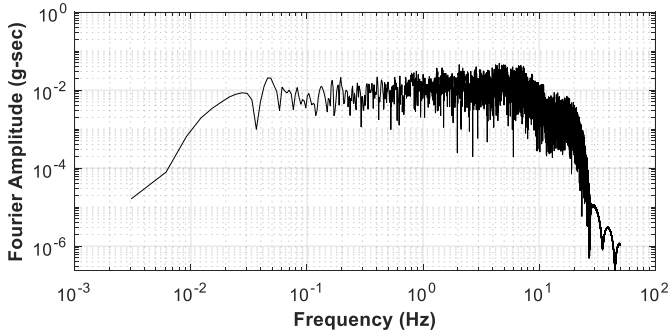
YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

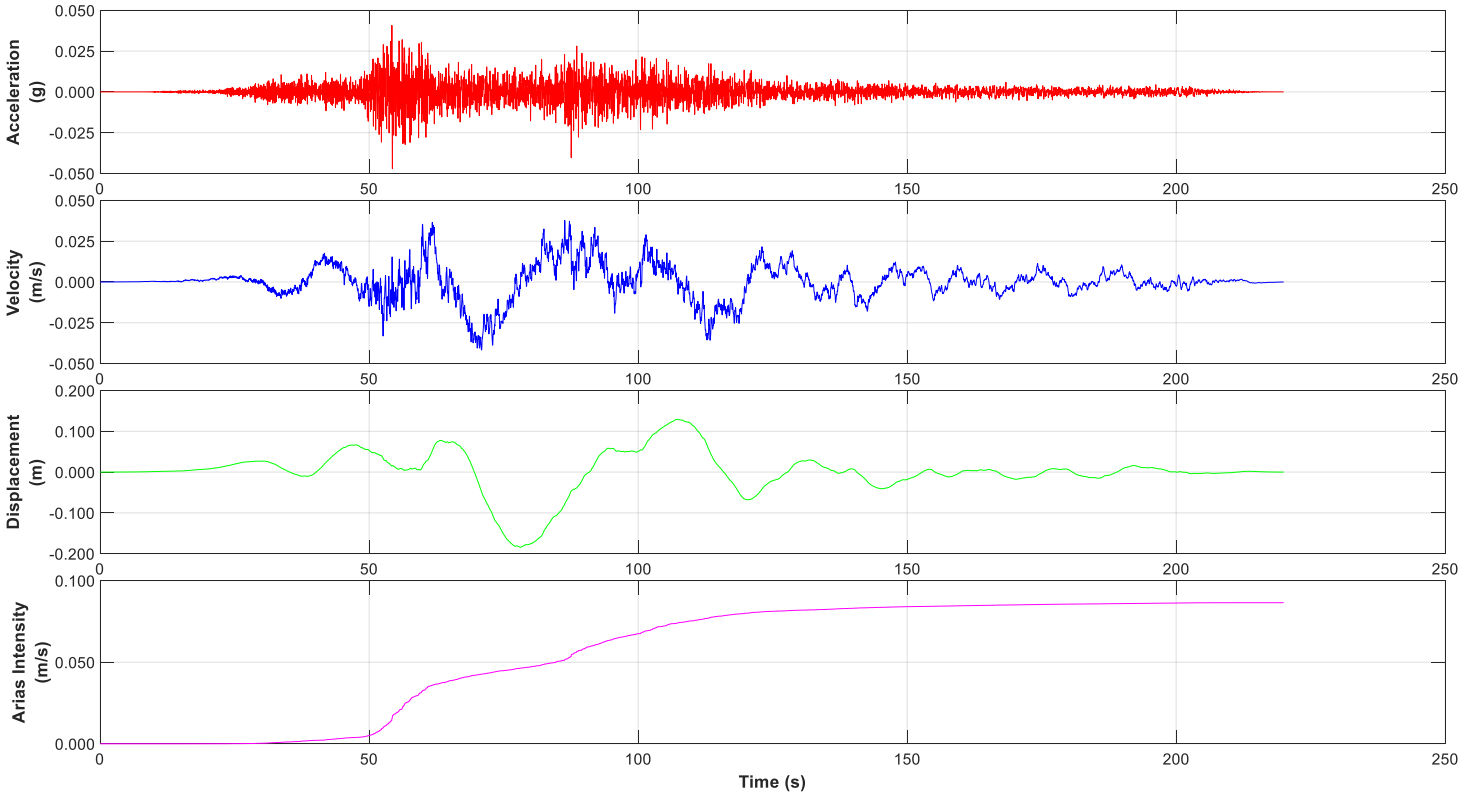
TITLE
AMPLITUDE SCALING RESULTS FOR RSN4000183-EW

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**19**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0







CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN4000183-NS

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**20**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
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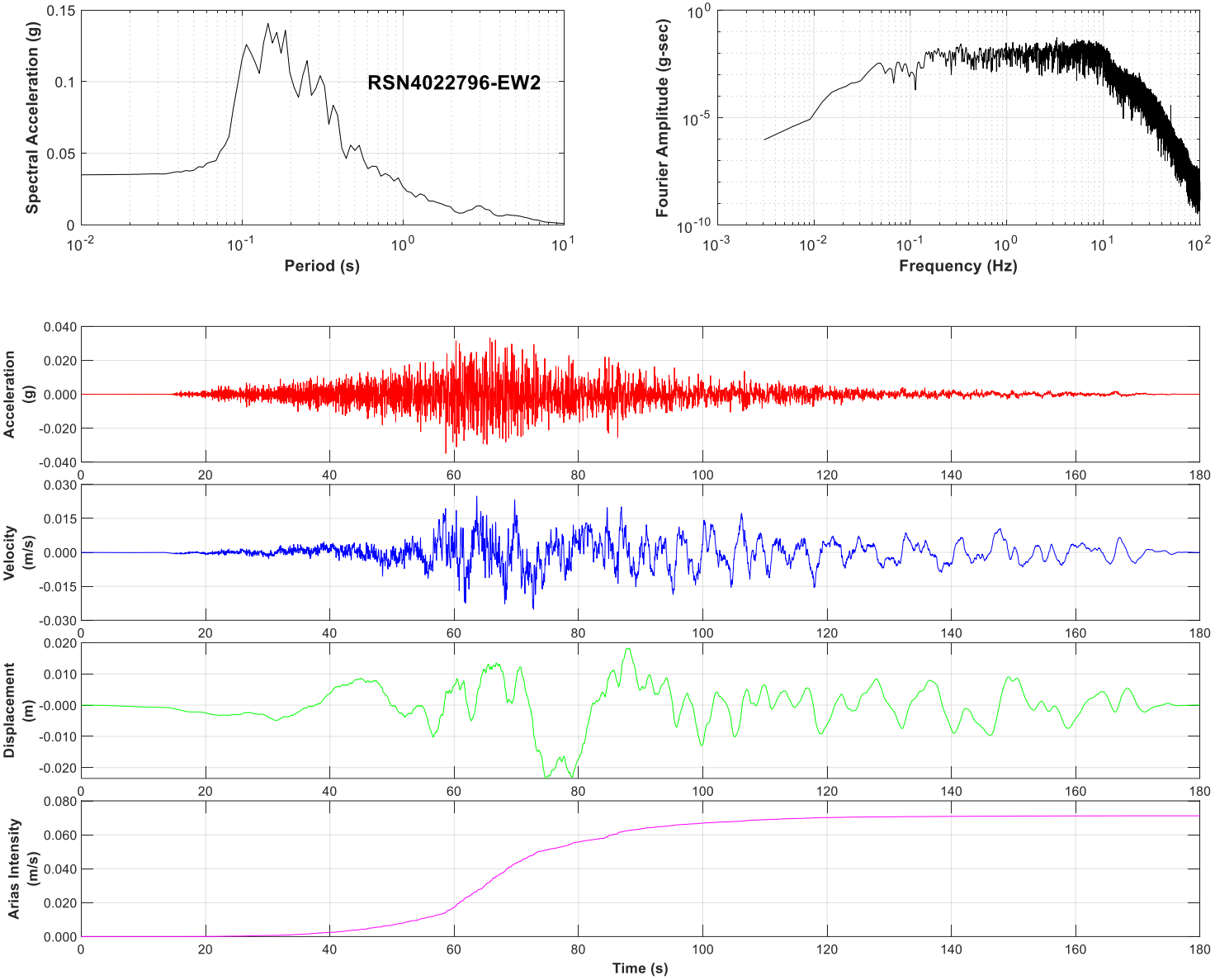

CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN4022796-EW2

PROJECT No.	PHASE	Rev.	FIGURE
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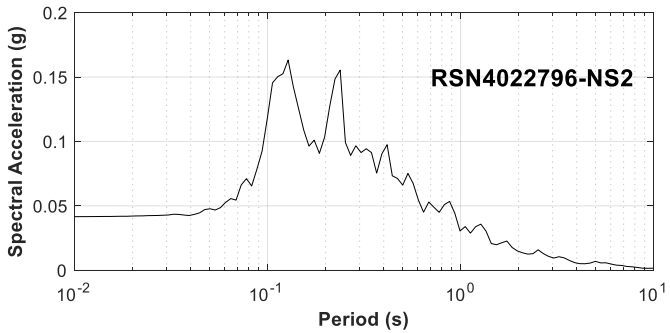

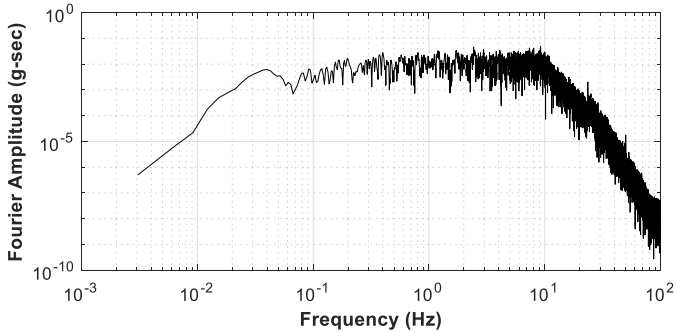

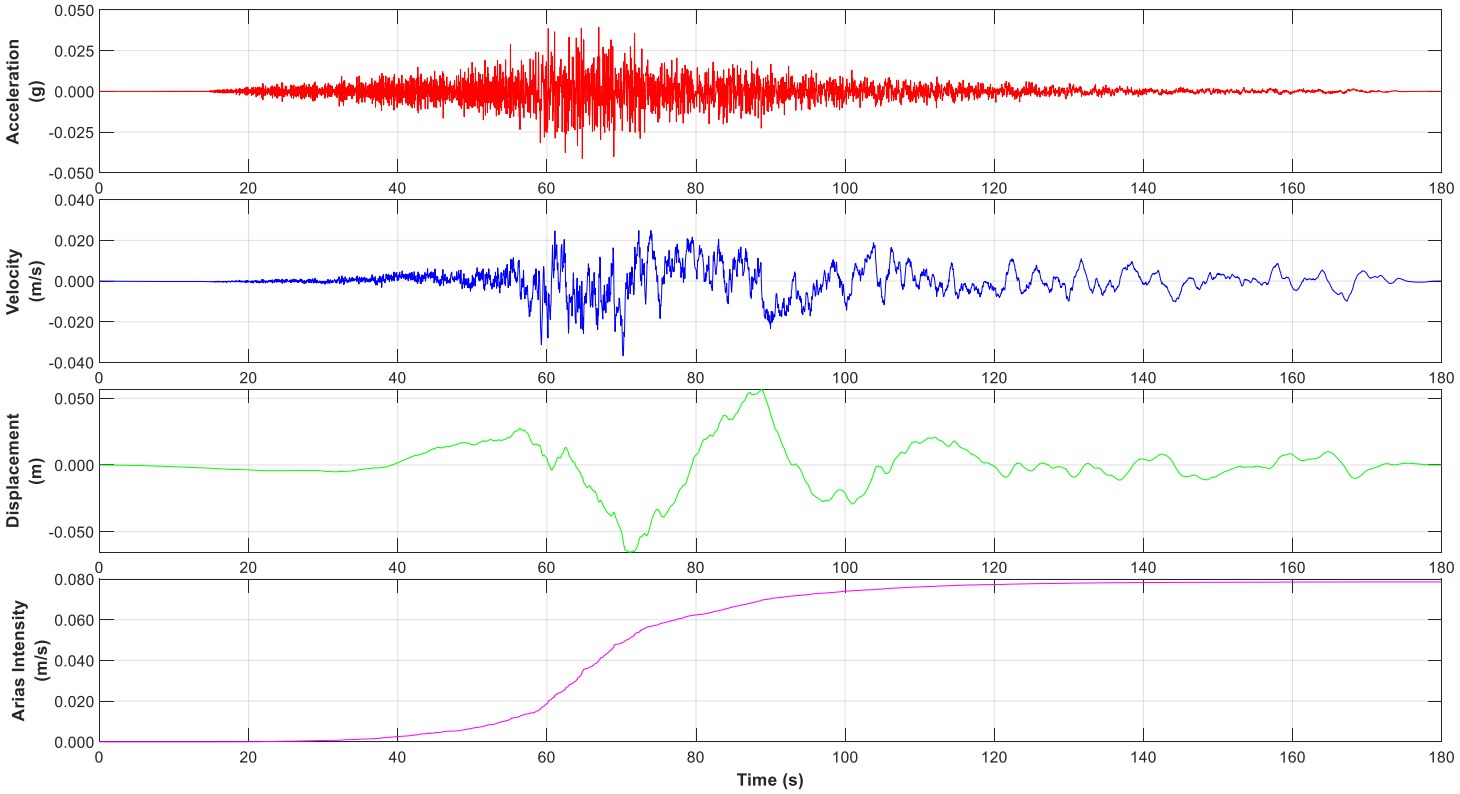

CLIENT
WSP Canada Inc.

PROJECT
SITE-SPECIFIC PROBABILISTIC SEISMIC HAZARD ASSESSMENT
MT POLLEY MINE, BRITISH COLUMBIA

CONSULTANT

YYYY-MM-DD	2022-08-28
PREPARED	MAB
DESIGN	MAB
REVIEW	FL
APPROVED	FL

TITLE
AMPLITUDE SCALING RESULTS FOR RSN4022796-NS2

PROJECT No.	PHASE	Rev.	FIGURE
31404975.000	**300.00**	**01**	**22**

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APPENDIX B

Evaluation of the Time-Average Shear-Wave Velocity

Memorandum

To	Alan Hull
Copy	Erin Todd
From	Matt Harris
Office	Auckland
Date	20 June 2022
File/Ref	6-DY039.00
Subject	Mt Polley VSP Reanalysis and V_{S30} Discussion

Introduction

This memo presents the results of reanalysis of VSP data from three boreholes at the tailings storage facility, Mount Polley Mine, BC Canada. The VSP measurements were originally presented in Technical Memorandum 22514095-040-TM-RevA-51344, dated 10 June 2022.

Approach to Reanalysis

Reanalysis focussed on BH15-10, as this had the deepest penetration, and is the only borehole that penetrated 30 m into material classified as bedrock. A number of approaches were taken to determination of V_{S30} for bedrock, using both the original and revised picks of shear-wave arrivals. The results are presented in Table 1 below, listed in order of reducing confidence. Based on a weighted average these velocities, the V_{S30} for bedrock at BH15-10 is considered to be 849 +/- 33 m/s.

Table 1: Summary of V_{S30} of bedrock from reanalysis of BH15-10 VSP data

Approach to Analysis	V_{S30} from Revised picks (m/s)	V_{S30} from Original picks (m/s)
Revised layer model	857	865
Initial layer model	826	877
Single layer method	852	864
1 m Interval Velocities (defined by 3-point regression)	831	850
1 m Interval Velocities (defined by 5-point regression)	864	890
1 m Interval Velocities (defined by successive arrival times)	820	873

The presented velocities were derived as follows:

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- Revised layer model - the velocity of each layer was calculated based on a linear regression of the vertical component of arrival times within that layer. Assignment of layer boundaries revised during reanalysis, based on slope breaks on a plot of arrival time against depth. V_{S30} calculated as the traveltime-weighted average shear wave velocity from 31.8 m to 61.8 m.
- Initial layer model – As above, without reassignment of layer boundaries.
- Single layer method - An estimate of V_{S30} obtained by assuming a single "layer" over 30 metres from top of bedrock. Based on picks at 31.8 m and 62.5 m depth.
- 1 m Interval Velocities (defined by 3-point regression) - traveltime-weighted average shear wave velocity from 31.8 m to 61.8 m, using 1 m layers with layer velocities derived from a 3-point linear regression of the slope of vertical traveltime data.
- 1 m Interval Velocities (defined by 5-point regression) - traveltime-weighted average shear wave velocity from 31.8 m to 61.8 m, using 1 m layers with layer velocities derived from a 5-point linear regression of the slope of vertical traveltime data.
- 1 m Interval Velocities (defined by successive arrival times) - traveltime-weighted average shear wave velocity from 31.8 m to 61.8 m, using 1 m layers with layer velocities derived from successive shear-wave arrival picks.

The shear-wave arrivals at 31.8 m and 62.5 m in BH15-10 are well defined. These are useful for assessing the travel time of the shear wave through the upper 30 m of material defined as bedrock, using the 'single layer' method of Hunter and Crow (2012). To assess the likely minimum and maximum V_{S30} using this method, both arrivals were picked as early and late as considered reasonable, and results compared. Based on this approach, estimated extreme minimum and maximum V_{S30} for bedrock at this borehole location are 706 m/s and 981 m/s, respectively.

Summary of Results

At borehole BH15-10, which penetrated into bedrock, V_{S30} is considered to be 849 +/- 33 m/s based on reanalysis of available VSP data. Extreme minimum and maximum V_{S30} for bedrock at BH15-10 are estimated at 706 m/s and 981 m/s, respectively.

Borehole BH15-18 only penetrated 6 m into bedrock, though showed good data quality; V_S of the upper bedrock here is considered to be 523 +/- 59 m/s. For comparison, V_S of the upper 6 m of bedrock at BH15-10 is considered to be 643 +/- 51 m/s.

At BH15-06, signal quality is poor, though estimated V_S values for the upper 10 m to 15 m of bedrock were made as roughly 350 m/s to 600 m/s.

Considerations/Data Quality

The data quality is rather variable between the three boreholes, which influences the confidence that can be attributed to each. The signal quality is best at BH15-18, though penetration into bedrock here is only around 6 m.

Signal quality at BH15-10 is considered reasonably good, and worthy of thorough analysis as this borehole penetrates over 30 m into material identified as bedrock.

At BH15-06, signal quality is poor and clear shear-wave arrivals are not able to be identified with confidence at most traces. Any velocities determined here should be treated with caution. Detailed reanalysis of this borehole has not been performed. The high V_S (up to 2820 m/s) initially reported for this borehole seems to be influenced by data quality. Single layer estimates within bedrock suggest V_S values for the upper 10 m to 15 m of bedrock here may be roughly 350 m/s to 600 m/s.

The interpretation of bedrock depths has not been changed. It should be appreciated though that the contrast between bedrock and overlying material at the site is subtle and has been noted as "pretty variable and hard to define".

During the reanalysis, discussed the data and data quality with Rob Luzitano, who performed the initial data analysis. He noted that the boreholes that were used for testing were originally installed in 2015, for use with inclinometers. This meant they were cased with PVC of a suitable diameter, though the approach taken to grouting was unknown. There may therefore be some areas where poor bonding between casing and grout has impacted data quality.

Data was not acquired at every ~1 m (3 foot) interval, as the crew on site were under time pressure during acquisition. At BH15-06 there is 3.5 m below the deepest two recorded intervals. The arrival on the lowest record is indistinct, so additional data here would have been useful.

Particularly high velocities are noted at shallow depth at BH15-06. While not repicked, note that these velocities are based on a small number of ambiguous picks and therefore considered unreliable.

Closure

I trust that this memo meets your needs. If you have any questions regarding the material contained within, please contact the undersigned.

Prepared by:

Matt Harris

Senior Geophysicist

Geophysical Services Limitation Statement

WSP geophysical services are conducted in a manner consistent with the level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions and subject to the time limits, financial and physical constraints applicable to the services.

The inherent uncertainty in geophysical results should be considered during the interpretation process. To help reduce uncertainties in the interpretation, the interpreter will typically make use of prior knowledge and any external complementary datasets, such as existing geologic information, drilling data, the location of underground services, borehole geophysical logs and other geophysical datasets.

References

Golder Associates Ltd. 2022. Bedrock Shear-Wave Velocity Measurements at Three Locations along the Tailings Storage Facility at Mt. Polley Mine, BC. Technical Memorandum (22514095-040-TM-RevA-51344, dated 10 June 2022).

Hunter, J.A. and Crow, H.L. (ed.), 2012. Shear Wave Velocity Measurement Guidelines for Canadian Seismic Site Characterization in Soil and Rock; Geological Survey of Canada, Open File 7078, 227 p. doi:10.4095/291753

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APPENDIX C

Geotechnical Data

Table C1: Summary of Boreholes

Year	Consultant	Borehole ID	Drill Method	General Location Description	Coordinates		Ground Elevation (m)	Azimuth (degrees)	Inclination (degrees)	Completion Depth (m)	Bedrock Depth (m)	Geotechnical Instrumentation																		Record of Borehole Log in Database?	Location on Figure 01?	Location on Figure 02?
												VWP 1				VWP 2				VWP 3				Slope Inclinometer		Shape Accel Array						
					Northing (m)	Easting (m)						Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Collar Elevation (m)	Base Elevation (m)	Sensor Top Elevation (m)	Sensor Base Elevation (m)	SAA ID	Serial No.			
1989	Knight Piesold	MP89-229	Tricone Rotary	Tailings Basin	5,818,999.58	594,945.89	929.10	0	-90	121.92	22.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1989	Knight Piesold	MP89-230	Tricone Rotary	Tailings Basin	5,819,465.36	594,932.62	929.10	0	-90	73.15	19.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1989	Knight Piesold	MP89-231	Tricone Rotary	Corner 1 Embankment	5,819,929.90	595,178.85	927.20	0	-90	121.92	32.00	117.3	809.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
1989	Knight Piesold	MP89-232	Tricone Rotary	Tailings Basin	5,818,944.44	595,471.80	919.40	0	-90	121.9	25.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1989	Knight Piesold	MP89-233	Tricone Rotary	Perimeter Embankment	5,819,358.58	596,015.13	933.90	0	-90	121.9	36.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1989	Knight Piesold	MP89-234	Tricone Rotary	Main Embankment	5,818,369.54	595,625.93	909.30	0	-90	121.9	29.0	82.3	827.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1989	Knight Piesold	MP89-235	Tricone Rotary	South Embankment	5,818,356.15	595,016.85	946.20	0	-90	121.9	4.6	118.9	827.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1989	Knight Piesold	MP89-236	Tricone Rotary	Tailings Basin	5,818,961.71	594,395.20	949.00	0	-90	115.8	7.6	115.8	833.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	R.E. Graham Engineering	96-A1	Solid / Hollow Stem Auger	Main Embankment	5,818,482.71	595,598.14	912.67	0	-90	15.4	-	8.9	903.77	A2-PE2-01	-	2.8	909.87	A2-PE2-02	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	R.E. Graham Engineering	96-B1a	Solid Stem Auger	Main Embankment	5,818,628.27	595,787.88	916.97	0	-90	16.5	-	15.2	901.77	B2-PE2-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	R.E. Graham Engineering	96-B1b	Solid / Hollow Stem Auger	Main Embankment	5,818,627.47	595,790.66	916.99	0	-90	9.1	-	7.4	909.59	B2-PE2-02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	R.E. Graham Engineering	96-C1	Solid / Hollow Stem Auger	Main Embankment	5,818,392.41	595,478.24	915.71	0	-90	15.4	-	8.1	907.61	C2-PE2-01	-	5.1	910.61	C2-PE2-02	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-1A	Air Rotary	Corner 1 Embankment	5,819,939.06	595,415.82	927.89	0	-90	61.3	47.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
1996	Knight Piesold	GW96-1B	Air Rotary	Corner 1 Embankment	5,819,935.22	595,416.16	927.81	0	-90	42.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
1996	Knight Piesold	GW96-2A	Air Rotary	Perimeter Embankment	5,819,449.92	596,065.40	931.42	0	-90	61.6	52.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-2B	Air Rotary	Perimeter Embankment	5,819,447.08	596,074.73	931.42	0	-90	35.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-3A	Air Rotary	Main Embankment	5,818,308.97	595,768.75	912.06	0	-90	54.9	35.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-3B	Air Rotary	Main Embankment	5,818,306.52	595,765.16	912.06	0	-90	20.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-4A	Air Rotary	South Embankment	5,818,164.58	595,147.94	940.56	0	-90	25.0	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-4B	Air Rotary	South Embankment	5,818,162.87	595,151.26	940.46	0	-90	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-5A	Air Rotary	West side of TSF	5,819,626.68	594,330.34	973.55	0	-90	25.5	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-5B	Air Rotary	West side of TSF	5,819,629.64	594,329.79	973.44	0	-90	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	GW96-9	Air Rotary	Main Embankment	5,818,277.14	595,503.89	916.18	0	-90	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	PRW96-1	Solid Stem Auger	Main Embankment	5,818,643.37	595,825.84	919.50	0	-90	22.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	PRW96-2	Solid Stem Auger	Main Embankment	5,818,541.21	595,686.74	913.00	0	-90	16.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	PRW96-3	Solid Stem Auger	Main Embankment	5,818,439.06	595,547.63	915.00	0	-90	9.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1996	Knight Piesold	PRW96-4	Solid Stem Auger	Main Embankment	5,818,356.46	595,443.30	918.00	0	-90	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
1997	Knight Piesold	DH97-BA-F5	-	Borrow Area No. 1	5,818,982.15	595,826.54	-	0	-90	11.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-F8	-	Borrow Area No. 1	5,819,095.63	595,728.43	-	0	-90	15.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-F10	-	Borrow Area No. 1	5,819,173.84	595,662.79	-	0	-90	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-F13	-	Borrow Area No. 1	5,819,286.97	595,562.93	-	0	-90	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-F16	-	Borrow Area No. 1	5,819,399.40	595,465.86	-	0	-90	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-G5	-	Borrow Area No. 1	5,819,014.63	595,862.51	-	0	-90	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-G6	-	Borrow Area No. 1	5,819,052.34	595,831.08	-	0	-90	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-G7	-	Borrow Area No. 1	5,819,091.44	595,797.56	-	0	-90	8.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-G8	-	Borrow Area No. 1	5,819,129.85	595,765.44	-	0	-90	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H5	-	Borrow Area No. 1	5,819,048.15	595,900.92	-	0	-90	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H7	-	Borrow Area No. 1	5,819,125.66	595,834.57	-	0	-90	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H8	-	Borrow Area No. 1	5,819,164.07	595,801.75	-	0	-90	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H10	-	Borrow Area No. 1	5,819,240.18	595,735.41	-	0	-90	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H12	-	Borrow Area No. 1	5,819,316.30	595,669.77	-	0	-90	8.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H13	-	Borrow Area No. 1	5,819,354.01	595,636.95	-	0	-90	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H14	-	Borrow Area No. 1	5,819,391.02	595,605.52	-	0	-90	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H15	-	Borrow Area No. 1	5,819,429.43	595,572.00	-	0	-90	14.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-H16	-	Borrow Area No. 1	5,819,467.14	595,539.18	-	0	-90	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-I5	-	Borrow Area No. 1	5,819,082.36	595,937.93	-	0	-90	14.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-I6	-	Borrow Area No. 1	5,819,120.77	595,905.11	-	0	-90	8.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-I7	-	Borrow Area No. 1	5,819,158.48	595,871.59	-	0	-90	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA-I8	-	Borrow Area No. 1	5,819,195.49	595,838.07	-	0	-90	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1997	Knight Piesold	DH97-BA2-B1	-	Borrow Area No. 2	5,818,204.66	596,430.29	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-B2	-	Borrow Area No. 2	5,818,282.11	596,369.03	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-B3	-	Borrow Area No. 2	5,818,361.29	596,307.18	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-B4	-	Borrow Area No. 2	5,818,439.32	596,245.34	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-B5	-	Borrow Area No. 2	5,818,516.19	596,184.08	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-C1	-	Borrow Area No. 2	5,818,264.19	596,511.21	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-C2	-	Borrow Area No. 2	5,818,341.64	596,449.36	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-C3	-	Borrow Area No. 2	5,818,420.24	596,388.68	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-C4	-	Borrow Area No. 2	5,818,497.69	596,326.83	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-C5	-	Borrow Area No. 2	5,818,575.72	596,265.57	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-D1	-	Borrow Area No. 2	5,818,323.72	596,592.70	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-D2	-	Borrow Area No. 2	5,818,402.33	596,531.43	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-D3	-	Borrow Area No. 2	5,818,480.35	596,471.33	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-D4	-	Borrow Area No. 2	5,818,557.80	596,408.33	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1997	Knight Piesold	DH97-BA2-D5	-	Borrow Area No. 2	5,818,634.67	596,347.64	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-1	-	Borrow Area No. 4	5,819,831.28	594,714.04	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-2	-	Borrow Area No. 4	5,819,891.34	594,728.01	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-3	-	Borrow Area No. 4	5,819,851.53	594,649.10	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-4	-	Borrow Area No. 4	5,819,908.10	594,667.26	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-5 (N)	-	Borrow Area No. 4	5,819,868.99	594,596.03	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-5 (S)	-	Borrow Area No. 4	5,819,914.38	594,463.34	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-6	-	Borrow Area No. 4	5,819,771.22	594,612.09	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-7	-	Borrow Area No. 4	5,819,762.84	594,508.04	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-8	-	Borrow Area No. 4	5,819,841.06	594,477.31	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-10	-	Borrow Area No. 4	5,819,949.99	594,475.22	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-11	-	Borrow Area No. 4	5,819,932.54	594,544.35	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA4-12	-	Borrow Area No. 4	5,819,921.36	594,605.80	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-1	-	Borrow Area No. 2	5,818,539.20	596,423.03	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-2	-	Borrow Area No. 2	5,818,595.26	596,366.97	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-3	-	Borrow Area No. 2	5,818,651.32	596,281.64	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-4	-	Borrow Area No. 2	5,818,606.18	596,309.92	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-5	-	Borrow Area No. 2	5,818,546.65	596,382.85	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-6	-	Borrow Area No. 2	5,818,476.69	596,523.25	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-7	-	Borrow Area No. 2	5,818,518.86	596,497.45	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-8	-	Borrow Area No. 2	5,818,597.65	596,460.06	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-9	-	Borrow Area No. 2	5,818,646.86	596,398.72	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BA2-16	-	Main Embankment	5,818,689.52	596,103.54	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-NO-NAME	-	Main Embankment	5,818,722.76	596,173.49	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	DH98-BL-01	-	South Embankment	5,818,299.01	595,073.01	944.50	0	-90	1.5	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-02	-	Tailings Basin	5,818,490.51	594,933.26	942.00	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-03	-	South Embankment	5,818,377.20	594,800.76	943.00	0	-90	6.7	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-04	-	South Embankment	5,818,495.46	594,531.42	942.20	0	-90	7.6	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-05	-	South Embankment	5,818,478.74	594,688.69	941.80	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-06	-	South Embankment	5,818,506.61	594,727.70	939.50	0	-90	1.2	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-07	-	Tailings Basin	5,818,705.36	594,410.67	943.00	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-08	-	Tailings Basin	5,818,999.58	594,495.47	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-09	-	Tailings Basin	5,819,142.03	594,400.50	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-10	-	Tailings Basin	5,819,411.59	594,364.88	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-11	-	South Embankment	5,818,284.04	595,144.07	946.00	0	-90	2.1	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-12	-	South Embankment	5,818,375.34	595,031.71	948.00	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-13	-	South Embankment	5,818,401.97	594,895.49	945.00	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-14	-	Tailings Basin	5,818,486.39	595,029.77	941.00	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-15	-	Tailings Basin	5,818,631.68	594,861.44	933.00	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-16	-	Tailings Basin	5,818,567.29	594,894.87	936.00	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-17	-	South Embankment	5,818,456.45	594,849.06	942.00	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-18	-	South Embankment	5,818,415.59	594,759.89	942.20	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	DH98-BL-19	-	South Embankment	5,818,477.51	594,599.53	942.20	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1998	Knight Piesold	PRW98-01	-	Main Embankment	-	-	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	PRW98-02	-	Main Embankment	-	-	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	PRW98-03	-	Main Embankment	-	-	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	PRW98-04	-	Main Embankment	-	-	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	PRW98-05	-	Main Embankment	-	-	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	PRW98-06	-	Main Embankment	-	-	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1998	Knight Piesold	PRW98-07	-	Main Embankment	-	-	-	0	-90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
1999	Knight Piesold	BH99-01	-	South Embankment	5,818,482.46	594,754.94	934.00	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-02	-	South Embankment	5,818,474.41	594,729.55	936.00	0	-90	0.6	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-03	-	South Embankment	5,818,502.89	594,694.88	935.50	0	-90	0.6	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-04	-	South Embankment	5,818,510.94	594,670.73	935.50	0	-90	0.9	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-05	-	South Embankment	5,818,520.85	594,653.39	940.00	0	-90	1.2	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-06	-	South Embankment	5,818,543.76	594,609.43	935.80	0	-90	1.8	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-07	-	South Embankment	5,818,551.81	594,576.00	936.00	0	-90	2.4	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-08	-	South Embankment	5,818,567.29	594,518.41	937.50	0	-90	3.7	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-09	-	South Embankment	5,818,554.90	594,499.22	939.50	0	-90	5.8	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-10	-	South Embankment	5,818,553.67	594,432.97	945.00	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-11	-	South Embankment	5,818,523.94	594,462.07	943.00	0	-90	6.7	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-12	-	South Embankment	5,818,315.28	594,919.02	946.50	0	-90	5.5	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-13	-	South Embankment	5,818,362.34	594,899.83	948.00	0	-90	5.5	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-14	-	South Embankment	5,818,395.16	594,888.06	946.50	0	-90	5.2	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-15	-	South Embankment	5,818,470.08	594,759.89	934.50	0	-90	1.8	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-16	-	South Embankment	5,818,440.97	594,885.59	944.00	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-17	-	South Embankment	5,818,479.36	594,871.35	939.50	0	-90	5.8	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-18	-	South Embankment	5,818,505.37	594,851.53	936.50	0	-90	6.1

Table C1: Summary of Boreholes

Year	Consultant	Borehole ID	Drill Method	General Location Description	Coordinates		Ground Elevation (m)	Azimuth (degrees)	Inclination (degrees)	Completion Depth (m)	Bedrock Depth (m)	Geotechnical Instrumentation																		Record of Borehole Log in Database?	Location on Figure 01?	Location on Figure 02?
												VWP 1				VWP 2				VWP 3				Slope Inclinometer		Shape Accel Array						
					Northing (m)	Easting (m)						Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Collar Elevation (m)	Base Elevation (m)	Sensor Top Elevation (m)	Sensor Base Elevation (m)	SAA ID	Serial No.			
1999	Knight Piesold	BH99-27	-	Tailings Basin	5,818,794.53	594,548.13	934.00	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-28	-	Tailings Basin	5,818,746.85	594,467.64	938.00	0	-90	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-29	-	Tailings Basin	5,818,712.79	594,428.63	941.50	0	-90	5.2	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-30	-	South Embankment	5,818,652.12	594,419.34	939.50	0	-90	5.2	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-31	-	South Embankment	5,818,598.25	594,444.73	938.50	0	-90	5.8	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-32	-	Tailings Basin	5,818,681.22	594,518.41	933.10	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-33	-	South Embankment	5,818,640.35	594,511.60	933.50	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-34	-	South Embankment	5,818,591.44	594,506.03	935.50	0	-90	5.2	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-35	-	Tailings Basin	5,818,831.06	594,515.32	393.00	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-36	-	Tailings Basin	5,818,852.73	594,468.26	942.80	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-37	-	Tailings Basin	5,818,804.43	594,504.79	938.50	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-38	-	Tailings Basin	5,818,819.29	594,465.78	942.50	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-39	-	Tailings Basin	5,818,790.81	594,502.93	938.00	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-40	-	Tailings Basin	5,818,795.77	594,457.11	942.40	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-41	-	South Embankment	5,818,263.27	594,902.92	948.50	0	-90	5.8	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-42	-	South Embankment	5,818,326.43	594,963.60	947.20	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-43	-	South Embankment	5,818,357.39	594,950.60	946.80	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	BH99-44	-	South Embankment	5,818,377.82	594,941.93	946.20	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-45	-	South Embankment	5,818,531.74	594,642.13	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-46	-	South Embankment	5,818,545.24	594,659.35	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-47	-	South Embankment	5,818,539.66	594,684.49	-	0	-90	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-48	-	South Embankment	5,818,550.36	594,680.77	-	0	-90	1.2	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-49	-	South Embankment	5,818,547.57	594,697.53	-	0	-90	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-50	-	South Embankment	5,818,540.12	594,713.35	-	0	-90	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-51	-	South Embankment	5,818,514.98	594,689.61	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-52	-	South Embankment	5,818,498.69	594,706.37	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-53	-	South Embankment	5,818,517.78	594,715.22	-	0	-90	1.8	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-54	-	South Embankment	5,818,517.42	594,718.89	-	0	-90	0.6	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-55	-	South Embankment	5,818,501.04	594,738.95	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-56	-	South Embankment	5,818,468.79	594,746.65	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-57	-	South Embankment	5,818,468.22	594,733.52	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-58	-	South Embankment	5,818,459.08	594,772.91	-	0	-90	3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-59	-	South Embankment	5,818,447.66	594,837.13	-	0	-90	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-60	-	South Embankment	-	-	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-61	-	South Embankment	5,818,293.31	595,038.04	-	0	-90	0.6	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-62	-	South Embankment	5,818,314.37	594,988.98	-	0	-90	0.6	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-63	-	South Embankment	5,818,284.69	595,000.00	-	0	-90	1.1	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-64	-	South Embankment	5,818,259.32	595,045.95	-	0	-90	1.3	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-65	-	South Embankment	5,818,253.74	595,081.33	-	0	-90	0.6	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-66	-	South Embankment	5,818,262.06	595,125.14	-	0	-90	0.9	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-67	-	South Embankment	5,818,314.58	595,097.05	-	0	-90	2.7	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-68	-	South Embankment	5,818,354.04	595,040.07	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-69	-	South Embankment	5,818,330.92	595,013.24	-	0	-90	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-70	-	South Embankment	5,818,322.65	595,000.00	-	0	-90	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-71	-	South Embankment	5,818,347.19	594,963.58	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-72	-	South Embankment	5,818,311.23	594,972.71	-	0	-90	0.9	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-73	-	South Embankment	5,818,302.38	594,954.73	-	0	-90	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-74	-	Main Embankment	5,818,795.20	596,109.49	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-75	-	Main Embankment	5,818,804.62	596,093.62	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-76	-	Main Embankment	5,818,783.79	596,059.88	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-77	-	Main Embankment	5,818,758.98	596,072.29	-	0	-90	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-78	-	Main Embankment	5,818,720.78	596,040.04	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-79	-	Main Embankment	5,818,733.43	596,005.59	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-80	-	Main Embankment	5,818,710.22	595,975.87	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-81	-	Main Embankment	5,818,689.05	596,005.59	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-82	-	Main Embankment	5,818,671.54	595,946.97	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-83	-	Main Embankment	5,818,653.22	595,971.39	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-84	-	Main Embankment	5,818,643.45	595,906.66	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-85	-	Main Embankment	5,818,609.25	595,909.10	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-86	-	Main Embankment	5,818,569.55	595,880.40	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-87	-	Main Embankment	5,818,577.49	595,844.97	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-88	-	Main Embankment	5,818,511.53	595,823.60	-	0	-90	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-89	-	Main Embankment	5,818,519.78	595,790.82	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-90	-	Main Embankment	5,818,481.10	595,782.68	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-91	-	Main Embankment	5,818,483.14	595,734.23	-	0	-90	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-92	-	Main Embankment	5,818,448.53	595,744.00	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-93	-	Main Embankment	5,818,376.06	595,655.65	-	0	-90	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-94	-	Main Embankment	5,818,394.38	595,619.82	-	0	-90	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-95	-	Main Embankment	5,818,326.38	595,520.89	-	0	-90	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-96	-	Main Embankment	5,818,308.06	595,540.43	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-97	-	Main Embankment	5,818,275.08	595,482.61	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-98	-	Main Embankment	5,818,349.59	595,597.84	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-99	-	Main Embankment	5,818,354.07	595,565.67	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-100	-	Main Embankment	5,818,260.43	595,437.83	-	0	-90	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-101	-	Main Embankment	5,818,236.81	595,427.24	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-102	-	Main Embankment	5,818,236.81	595,405.66	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-103	-	Main Embankment	5,818,223.78	595,386.12	-	0	-90	2.9	2.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-104	-	Main Embankment	5,818,218.69	595,357.82	-	0	-90	2.2	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-105	-	Main Embankment	5,818,222.36	595,321.79	-	0	-90	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-106	-	Main Embankment	5,818,215.03	595,279.04	-	0	-90	3.4	3.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-107	-	South Embankment	5,818,193.04	595,224.69	-	0	-90	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-108	-	Main Embankment	5,818,175.33	595,307.74	-	0	-90	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-109	-	Main Embankment	5,818,176.55	595,366.98	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-110	-	South Embankment	5,818,226.63	595,172.77	-	0	-90	1.7	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-111	-	Corner 1 Embankment	5,820,012.58	594,936.53	-	0	-90	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-112	-	Corner 1 Embankment	5,820,005.12	595,000.00	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-113	-	Corner 1 Embankment	5,820,016.31	595,026.41	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-114	-	Corner 1 Embankment	5,819,991.81	595,051.29	-	0	-90	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-115	-	Corner 1 Embankment	5,819,962.02	595,077.36	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-116	-	Corner 1 Embankment	5,819,973.66	595,111.81	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-117	-	Corner 1 Embankment	5,819,941.53	595,117.40	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-118	-	Corner 1 Embankment	5,819,947.59	595,147.66	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-119	-	Corner 1 Embankment	5,819,914.07	595,153.71	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-120	-	Corner 1 Embankment	5,819,920.59	595,197.94	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-121	-	Corner 1 Embankment	5,819,878.69	595,204.92	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-122	-	Corner 1 Embankment	5,819,887.07	595,250.08	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-123	-	Corner 1 Embankment	5,819,825.15	595,279.41	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-124	-	Perimeter Embankment	5,819,750.19	595,391.60	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-125	-	Perimeter Embankment	5,819,751.59	595,422.80	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-126	-	Perimeter Embankment	5,819,696.66	595,465.16	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-127	-	Perimeter Embankment	5,819,643.12	595,536.39	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-128	-	Perimeter Embankment	5,819,632.88	595,592.26	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-129	-	Perimeter Embankment	5,819,588.18	595,618.33	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-130	-	Perimeter Embankment	5,819,575.61	595,663.49	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-131	-	Perimeter Embankment	5,819,540.70	595,691.88	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-132	-	Corner 1 Embankment	5,820,016.10	595,044.43	-	0	-90	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-133	-	Corner 1 Embankment	5,819,972.60	594,879.16	-	0	-90	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-134	-	Borrow Area No. 2	5,818,655.79	596,347.62	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-135	-	Borrow Area No. 2	5,818,649.34	596,372.43	-	0	-90	6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-136	-	Borrow Area No. 2	5,818,611.14	596,360.03	930.00	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-137	-	Borrow Area No. 2	5,818,611.14	596,398.72	937.40	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-139	-	Borrow Area No. 2	5,818,701.93	596,364.49	-	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-140	-	Borrow Area No. 2	5,818,729.21	596,468.18	938.50	0	-90	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-141	-	Borrow Area No. 2	5,818,681.59	596,551.52	938.40	0	-90	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-142	-	Borrow Area No. 2	5,818,663.23	596,494.47	938.60	0	-90	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-143	-	Borrow Area No. 2	5,818,661.25	596,601.14	937.80	0	-90	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-144	-	Borrow Area No. 2	5,818,634.95	596,505.88	939.00	0	-90	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-145	-	Borrow Area No. 2	5,818,610.15	596,568.39	938.90	0	-90	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-146	-	Borrow Area No. 2	5,818,600.72	596,517.29	939.50	0	-90	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-147	-	Borrow Area No. 2	5,818,585.84	596,584.76	939.20	0	-90	10.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-148	-	Borrow Area No. 2	5,818,571.95	596,529.20	939.30	0	-90	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-149	-	Borrow Area No. 2	5,818,552.60	596,611.06	939.80	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-150	-	Borrow Area No. 2	5,818,530.27	596,546.07	939.20	0	-90	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-151	-	Borrow Area No. 2	5,818,751.54	596,277.67	937.00	0	-90	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-152	-	Borrow Area No. 2	5,818,772.87	596,309.42	937.20	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-153	-	Borrow Area No. 2	5,818,820.50	596,362.01	938.60	0	-90	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-154	-	Borrow Area No. 2	5,818,869.12	596,415.59	939.00	0	-90	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-155	-	Borrow Area No. 2	5,818,837.86	596,450.82	938.40	0	-90	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-156	-	Borrow Area No. 2	5,818,793.71	596,459.75	938.10	0	-90	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-157	-	Borrow Area No. 2	5,818,726.24	596,509.36	938.40	0	-90	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
1999	Knight Piesold	DH99-158	-	Borrow Area No. 2	5,818,727.23	596,434.44	938.00	0	-90	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2000	Knight Piesold	GW00-1	ODEX	South Embankment	5,818,476.00	594,368.00	939.18	0	-90	21.0	9.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2000	Knight Piesold	GW00-2	ODEX	South Embankment	5,818,337.50	594,651.80	943.40	0	-90	21.6	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2000	Knight Piesold	GW00-3	ODEX	South Embankment	5,818,238.10	594,896.40	943.07	0	-90	24.3	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-01	-	Borrow Area No. 2	5,818,909.31	596,436.65	-	0	-90	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-02	-	Borrow Area No. 2	5,818,880.48	596,450.41	-	0	-90	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N

Table C1: Summary of Boreholes

Year	Consultant	Borehole ID	Drill Method	General Location Description	Coordinates		Ground Elevation (m)	Azimuth (degrees)	Inclination (degrees)	Completion Depth (m)	Bedrock Depth (m)	Geotechnical Instrumentation																		Record of Borehole Log in Database?	Location on Figure 01?	Location on Figure 02?
												VWP 1				VWP 2				VWP 3				Slope Inclinometer		Shape Accel Array						
					Northing (m)	Easting (m)						Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Collar Elevation (m)	Base Elevation (m)	Sensor Top Elevation (m)	Sensor Base Elevation (m)	SAA ID	Serial No.			
2001	Knight Piesold	DH01-06	-	Borrow Area No. 2	5,818,802.56	596,548.57	-	0	-90	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-07	-	Borrow Area No. 2	5,818,842.38	596,534.28	-	0	-90	11.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-08	-	Borrow Area No. 2	5,818,872.80	596,520.00	-	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-09	-	Borrow Area No. 2	5,818,895.56	596,507.03	-	0	-90	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-10	-	Borrow Area No. 2	5,818,913.55	596,536.14	-	0	-90	9.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-11	-	Borrow Area No. 2	5,818,886.83	596,482.96	-	0	-90	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-12	-	Borrow Area No. 2	5,818,920.43	596,491.16	-	0	-90	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-13	-	Borrow Area No. 2	5,818,944.50	596,475.02	-	0	-90	8.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-14	-	Borrow Area No. 2	5,818,788.27	596,580.58	-	0	-90	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-15	-	Borrow Area No. 2	5,818,818.04	596,603.60	-	0	-90	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-16	-	Borrow Area No. 2	5,818,850.84	596,590.37	-	0	-90	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-17	-	Borrow Area No. 2	5,818,863.81	596,554.66	-	0	-90	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-18	-	Borrow Area No. 2	5,818,883.39	596,576.88	-	0	-90	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-19	-	Borrow Area No. 2	5,818,925.72	596,559.68	-	0	-90	7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-20	-	Borrow Area No. 2	5,818,943.97	596,543.81	-	0	-90	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-21	-	Borrow Area No. 2	5,818,964.08	596,515.76	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-22	-	Borrow Area No. 2	5,818,575.68	596,668.95	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-23	-	Borrow Area No. 2	5,818,547.90	596,628.74	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-24	-	Borrow Area No. 2	5,818,521.45	596,599.90	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-25	-	Borrow Area No. 2	5,818,489.43	596,553.07	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-26	-	Borrow Area No. 2	5,818,479.64	596,531.90	-	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-27 (N)	-	Borrow Area No. 2	5,818,615.37	596,751.50	-	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-27 (S)	-	Borrow Area No. 2	5,818,442.69	596,490.26	-	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-28	-	Borrow Area No. 2	5,818,581.50	596,720.02	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-29	-	Borrow Area No. 2	5,818,548.17	596,684.83	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-30	-	Borrow Area No. 2	5,818,511.66	596,650.96	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-31	-	Borrow Area No. 2	5,818,476.47	596,619.48	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-32	-	Borrow Area No. 2	5,818,433.61	596,588.26	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-33	-	Borrow Area No. 2	5,818,383.39	596,525.66	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-34	-	Borrow Area No. 2	5,818,577.80	596,938.03	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-35	-	Borrow Area No. 2	5,818,552.93	596,893.84	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-36	-	Borrow Area No. 2	5,818,529.65	596,848.60	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-37	-	Borrow Area No. 2	5,818,503.72	596,802.30	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-38	-	Borrow Area No. 2	5,818,477.79	596,755.47	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-39	-	Borrow Area No. 2	5,818,455.57	596,709.17	-	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-40	-	Borrow Area No. 2	5,818,436.25	596,666.57	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-41	-	Borrow Area No. 2	5,818,416.41	596,616.04	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-42	-	Borrow Area No. 2	5,818,338.08	596,526.12	-	0	-90	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-43	-	Borrow Area No. 2	5,818,364.43	596,566.80	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-44	-	Borrow Area No. 2	5,818,529.65	596,963.43	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-45	-	Borrow Area No. 2	5,818,517.74	596,918.18	-	0	-90	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-46	-	Borrow Area No. 2	5,818,495.52	596,876.12	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-47	-	Borrow Area No. 2	5,818,473.56	596,831.67	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-48	-	Borrow Area No. 2	5,818,452.39	596,785.63	-	0	-90	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-49	-	Borrow Area No. 2	5,818,428.84	596,737.74	-	0	-90	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-50	-	Borrow Area No. 2	5,818,409.00	596,696.47	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-51	-	Borrow Area No. 2	5,818,373.21	596,636.61	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-52	-	Borrow Area No. 3	5,818,392.63	596,807.67	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-53	-	Borrow Area No. 3	5,818,372.75	596,761.90	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-54	-	Borrow Area No. 3	5,818,351.49	596,717.52	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-55	-	Borrow Area No. 3	5,818,326.98	596,668.51	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-56	-	Borrow Area No. 3	5,818,341.78	596,860.38	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-57	-	Borrow Area No. 3	5,818,326.06	596,806.75	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-58	-	Borrow Area No. 3	5,818,310.80	596,759.59	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-59	-	Borrow Area No. 3	5,818,280.29	596,694.87	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-60	-	Borrow Area No. 3	5,818,283.06	596,584.37	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-61	-	Borrow Area No. 2	5,818,308.95	596,563.57	-	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-62	-	Borrow Area No. 3	5,818,231.28	596,783.17	-	0	-90	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-63	-	Borrow Area No. 3	5,818,132.34	596,828.48	-	0	-90	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-64	-	Borrow Area No. 3	5,818,045.43	596,771.15	-	0	-90	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-65	-	Borrow Area No. 3	5,818,221.11	596,588.07	-	0	-90	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-66	-	Borrow Area No. 2	5,818,252.55	596,506.70	-	0	-90	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	DH01-67	-	-	-	-	-	0	-90	5.2	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-68	-	-	-	-	-	0	-90	2.7	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-69	-	-	-	-	-	0	-90	1.5	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-70	-	-	-	-	-	0	-90	3.0	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-71	-	-	-	-	-	0	-90	1.2	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-72	-	-	-	-	-	0	-90	1.5	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-73	-	-	-	-	-	0	-90	2.7	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-74	-	-	-	-	-	0	-90	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-75	-	-	-	-	-	0	-90	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-76	-	-	-	-	-	0	-90	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-77	-	-	-	-	-	0	-90	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-78	-	-	-	-	-	0	-90	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-79	-	-	-	-	-	0	-90	1.5	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	DH01-80	-	-	-	-	-	0	-90	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	N
2001	Knight Piesold	SI01-01	ODEX	Main Embankment	5,818,464.00	595,667.00	915.70	0	-90	24.4	22.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2001	Knight Piesold	SI01-02	ODEX	Main Embankment	5,818,401.00	595,589.00	917.30	0	-90	30.3	25.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2006	Knight Piesold	SI06-01	Air Rotary	Main Embankment	5,818,399.60	595,649.50	917.10	0	-90	42.2	31.7	-	-	-	-	-	-	-	-	-	-	-	-	917.40	875.10	-	-	-	-	Y	Y	N
2006	Knight Piesold	SI06-02	Air Rotary	Main Embankment	5,818,462.93	595,734.02	917.10	0	-90	34.7	27.2	-	-	-	-	-	-	-	-	-	-	-	-	918.10	886.10	-	-	-	-	Y	Y	N
2006	Knight Piesold	SI06-03	Air Rotary	Main Embankment	5,818,520.66	595,815.07	917.70	0	-90	40.6	36.9	-	-	-	-	-	-	-	-	-	-	-	-	918.70	882.60	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-01	Sonic	Perimeter Embankment	5,819,445.00	595,951.00	935.00	0	-90	19.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-02	Sonic	Perimeter Embankment	5,819,292.00	596,125.00	935.00	0	-90	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-04	Sonic	Perimeter Embankment	5,819,414.00	596,269.00	920.00	0	-90	20.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-06	Sonic	Perimeter Embankment	5,819,131.00	596,297.00	937.00	0	-90	13.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-08	Sonic	Perimeter Embankment	5,819,276.00	596,451.00	918.00	0	-90	17.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-09	Sonic	Perimeter Embankment	5,819,617.00	596,070.00	921.00	0	-90	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-11	Sonic	Perimeter Embankment	5,819,744.00	595,835.00	924.00	0	-90	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-12	Sonic	Perimeter Embankment	5,819,605.00	595,741.00	933.00	0	-90	23.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-14	Sonic	Perimeter Embankment	5,819,739.00	595,544.00	931.00	0	-90	20.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-15	Sonic	Perimeter Embankment	5,819,880.00	595,608.00	925.00	0	-90	20.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2008	Knight Piesold	KP08-16	Sonic	Perimeter Embankment	5,819,663.00	595,778.00	930.00	0	-90	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-01	Sonic	South Embankment	5,818,480.00	594,463.00	941.01	0	-90	11.1	7.0	7.0	934.01	F5	1119797	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-02	Sonic	South Embankment	5,818,343.00	594,786.00	945.09	0	-90	17.4	10.7	7.6	937.49	I5	1119796	10.4	934.69	I6	1119792	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-03	Sonic	Main Embankment	5,818,272.00	595,467.00	927.00	0	-90	23.2	21.3	15.2	911.80	E6	1119794	18.9	908.10	E7	1119801	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-04	Sonic	Main Embankment	5,818,309.00	595,533.00	921.59	0	-90	29.3	25.6	12.5	909.09	C11	1119798	21.0	900.59	C12	1119795	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-05	Sonic	Main Embankment	5,818,410.00	595,605.00	920.60	0	-90	32.3	27.7	12.2	908.40	A16	1119799	16.8	903.80	A17	09-2810	24.4	896.20	A18	09-2808	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-06	Sonic	Main Embankment	5,818,423.00	595,686.00	916.34	0	-90	35.4	31.7	10.7	905.64	A19	09-2811	15.2	901.14	A20	09-2809	22.9	893.44	A21	1119786	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-07	Sonic	Main Embankment	5,818,554.00	595,850.00	919.78	0	-90	43.3	40.0	13.7	906.08	B11	1119793	25.9	893.88	B12	1119791	31.1	888.68	B13	1119785	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-08	Sonic	Main Embankment	5,818,697.00	596,027.00	927.66	0	-90	47.5	44.5	15.2	912.46	K1	1119788	33.8	893.86	K2	1119784	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-09	Sonic	Perimeter Embankment	5,819,415.00	595,928.00	936.59	0	-90	41.7	39.0	19.4	917.19	J1	1119800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2011	AMEC	VW11-10	Sonic	Perimeter Embankment	5,819,783.00	595,410.00	931.80	0	-90	42.4	41.5	18.4	913.40	D6	1119790	24.4	907.40	D7	1119802	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2011	AMEC	VW11-11	Sonic	Corner 1 Embankment	5,820,031.00	594,892.00	940.89	0	-90	23.5	14.9	6.1	934.79	G4	1119789	10.7	930.19	G5	1119787	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2011	AMEC	SI11-01	Sonic	Main Embankment	5,818,353.00	595,527.00	921.08	0	-90	44.8	25.9	-	-	-	-	-	-	-	-	-	-	-	-	921.10	876.30	-	-	-	-	Y	Y	N
2011	AMEC	SI11-02	Sonic	Main Embankment	5,818,716.00	595,998.00	928.27	0	-90	49.4	46.0	-	-	-	-	-	-	-	-	-	-	-	-	928.30	878.90	-	-	-	-	Y	Y	N
2011	AMEC	SI11-04	Sonic	Perimeter Embankment	5,819,780.00	595,408.00	931.93	0	-90	43.3	41.1	-	-	-	-	-	-	-	-	-	-	-	-	931.90	888.60	-	-	-	-	Y	Y	Y
2012	AMEC	SI12-01	ODEX	Perimeter Embankment	5,819,786.00	595,408.00	940.00	0	-90	41.5	40.8	-	-	-	-	-	-	-	-	-	-	-	-	940.00	898.50	-	-	-	-	Y	Y	Y
2012	AMEC	SI12-02	ODEX	Perimeter Embankment	5,819,421.00	595,920.00	940.00	0	-90	42.7	42.1	-	-	-	-	-	-	-	-	-	-	-	-	940.00	897.30	-	-	-	-	Y	Y	N
2014	Thurber	MR14-101	Mud Rotary	Dam Breach Area	5,819,826.00	595,340.00	933.00	0	-90	16.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-102	Mud Rotary	Dam Breach Area	5,819,832.00	595,330.00	932.50	0	-90	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-103	Mud Rotary	Dam Breach Area	5,819,865.00	595,296.00	930.70	0	-90	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	SC14-103	Soil Coring	Dam Breach Area	5,819,967.00	595,292.00	930.80	0	-90	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	SC14-103A	Soil Coring	Dam Breach Area	5,819,868.00	595,290.00	930.90	0	-90	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-104	Mud Rotary	Dam Breach Area	5,819,891.00	595,255.00	931.70	0	-90	12.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-105	Mud Rotary	Dam Breach Area	5,819,914.00	595,228.00	931.70	0	-90	11.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-105A	Mud Rotary	Dam Breach Area	5,819,916.00	595,226.00	931.70	0	-90	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106	Mud Rotary	Dam Breach Area	5,819,997.00	595,148.00	929.40	0	-90	12.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106A	Mud Rotary	Dam Breach Area	5,819,997.00	595,146.00	928.70	0	-90	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106B	Mud Rotary	Dam Breach Area	5,820,001.00	595,139.00	928.50	0	-90	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106C	Mud Rotary	Dam Breach Area	5,820,002.00	595,139.00	928.50	0	-90	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106D	Mud Rotary	Dam Breach Area	5,819,993.00	595,137.00	928.70	0	-90	9.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106E	Mud Rotary	Dam Breach Area	5,819,990.00	595,134.00	929.00	0	-90	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106F	Mud Rotary	Dam Breach Area	5,819,994.00	595,134.00	928.70	0	-90	8.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106G	Mud Rotary	Dam Breach Area	5,819,997.00	595,135.00	928.70	0	-90	8.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106H	Mud Rotary	Dam Breach Area	5,819,998.00	595,135.00	928.60	0	-90	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-106I	Mud Rotary	Dam Breach Area	5,820,001.00	595,135.00	928.60	0	-90	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-107	Mud Rotary	Dam Breach Area	5,820,013.00	595,131.00	928.70	0	-90	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-107A	Mud Rotary	Dam Breach Area	5,820,013.00	595,132.00	928.30	0	-90	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-107B	Mud Rotary	Dam Breach Area	5,820,013.00	595,129.00	928.40	0	-90	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-108	Mud Rotary	Dam Breach Area	5,820,013.00	595,105.00	928.60	0	-90	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-108A	Mud Rotary	Dam Breach Area	5,820,014.00	595,106.00	928.60	0	-90	11.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-109	Mud Rotary	Dam Breach Area	5,820,022.00	595,087.00	929.00

Table C1: Summary of Boreholes

Year	Consultant	Borehole ID	Drill Method	General Location Description	Coordinates		Ground Elevation (m)	Azimuth (degrees)	Inclination (degrees)	Completion Depth (m)	Bedrock Depth (m)	Geotechnical Instrumentation																Record of Borehole Log in Database?	Location on Figure 01?	Location on Figure 02?
												VWP 1				VWP 2				VWP 3				Slope Inclinometer		Shape Accel Array						
					Northing (m)	Easting (m)						Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Installation Depth (m)	Elevation (m)	VWP ID	Serial No.	Collar Elevation (m)	Base Elevation (m)	Sensor Top Elevation (m)	Sensor Base Elevation (m)	SAA ID	Serial No.			
2014	Thurber	MR14-115	Mud Rotary	Dam Breach Area	5,820,007.00	595,076.00	929.00	0	-90	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-116	Mud Rotary	Dam Breach Area	5,819,969.00	595,113.00	930.60	0	-90	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	MR14-116A	Mud Rotary	Dam Breach Area	5,819,969.00	595,112.00	930.60	0	-90	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	RH14-117	ODEX / Mud Rotary	Dam Breach Area	5,819,939.00	595,125.00	932.40	0	-90	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	RH14-117A	ODEX / Mud Rotary	Dam Breach Area	5,819,936.00	595,132.00	932.60	0	-90	13.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	Thurber	RH14-118	ODEX / Mud Rotary	Dam Breach Area	5,819,922.00	595,176.00	937.70	0	-90	18.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-01	Sonic	Dam Breach Area	5,819,871.71	595,247.86	931.35	0	-90	44.5	18.6	43.3	888.05	VWP-A	VW30340	15.8	915.55	VWP-B	VW30342	8.8	922.55	VWP-C	VW30341	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-01A	Sonic	Dam Breach Area	5,819,868.67	595,252.00	931.20	0	-90	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-02	Sonic	Dam Breach Area	5,819,957.08	595,204.00	932.90	0	-90	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-02A	Sonic	Dam Breach Area	5,819,957.44	595,206.55	932.93	0	-90	24.7	16.8	15.2	917.73	VWP-A	VW30347	9.1	923.83	VWP-B	VW30343	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-03	Sonic	Dam Breach Area	5,819,940.73	595,130.30	932.52	0	-90	47.8	22.1	-	-	-	-	-	-	-	-	-	-	-	-	933.30	885.02	930.0	902.6	SAA15-01	62667	Y	N	Y
2014	KCB	SH14-03A	Sonic	Dam Breach Area	5,819,935.11	595,132.33	932.62	0	-90	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	SH14-03B	Sonic	Dam Breach Area	5,819,933.59	595,130.16	932.63	0	-90	20.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	SH14-04	Sonic	Dam Breach Area	5,819,908.34	595,109.12	932.20	0	-90	26.2	24.8	-	-	-	-	-	-	-	-	-	-	-	-	933.10	906.30	-	-	-	-	Y	N	Y
2014	KCB	SH14-05	Sonic	Dam Breach Area	5,819,918.30	595,194.61	937.11	0	-90	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-05A	Sonic	Dam Breach Area	5,819,919.53	595,193.34	937.21	0	-90	29.6	21.5	20.7	916.51	VWP-A	VW30345	15.8	921.41	VWP-B	VW30357	13.7	923.51	VWP-C	VW30356	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-06	Sonic	Dam Breach Area	5,819,917.39	595,179.92	937.46	0	-90	35.7	22.4	-	-	-	-	-	-	-	-	-	-	-	-	938.40	902.06	-	-	-	-	Y	N	Y
2014	KCB	SH14-07	Sonic	Dam Breach Area	5,819,898.72	595,055.32	931.70	0	-90	20.4	14.0	12.2	919.50	VWP-A	VW30355	9.1	922.60	VWP-B	VW30354	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-08	Sonic	Dam Breach Area	5,819,888.90	595,167.20	947.55	0	-90	60.1	42.3	34.7	912.85	VWP-A	VW30350	24.1	923.45	VWP-B	VW30353	22.9	924.65	VWP-C	VW30351	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-08A	Sonic	Dam Breach Area	5,819,887.33	595,169.80	947.61	0	-90	29.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-09	Sonic	Dam Breach Area	5,819,910.99	595,144.50	937.97	0	-90	61.7	28.0	-	-	-	-	-	-	-	-	-	-	-	-	938.90	906.57	-	-	-	-	Y	N	Y
2014	KCB	SH14-10	Sonic	Dam Breach Area	5,819,965.07	595,147.95	932.15	0	-90	26.5	22.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-10A	Sonic	Dam Breach Area	5,819,963.00	595,145.20	930.96	0	-90	17.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	SH14-11	Sonic	Dam Breach Area	5,819,994.51	595,168.10	930.97	0	-90	20.4	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-11A	Sonic	Dam Breach Area	5,819,993.79	595,167.68	930.86	0	-90	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-11B	Sonic	Dam Breach Area	5,819,992.35	595,169.20	931.17	0	-90	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-12	Sonic	Dam Breach Area	5,819,841.69	595,296.54	930.77	0	-90	23.6	20.1	15.2	915.57	VWP-A	VW30344	7.6	923.17	VWP-B	VW30348	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-13	Sonic	Perimeter Embankment	5,819,770.42	595,404.93	933.06	0	-90	32.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-14	Sonic	Dam Breach Area	5,819,936.34	595,095.71	930.12	0	-90	23.6	17.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-15	Sonic	Dam Breach Area	5,819,958.85	595,103.95	930.19	0	-90	23.5	18.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-16	Sonic	Dam Breach Area	5,819,973.26	595,076.47	930.23	0	-90	23.5	14.0	-	-	-	-	-	-	-	-	-	-	-	-	931.30	907.03	929.1	908.7	SAA15-02	62550	Y	N	Y
2014	KCB	SH14-17	Sonic	Dam Breach Area	5,819,997.87	595,090.27	929.57	0	-90	20.4	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-18	Sonic	Dam Breach Area	5,820,024.51	595,016.05	934.76	0	-90	25.0	19.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-19	Sonic	Dam Breach Area	5,820,042.20	594,883.10	942.82	0	-90	20.4	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-20	Sonic	Dam Breach Area	5,819,968.30	594,861.83	969.92	0	-90	54.0	49.3	51.8	918.12	VWP-A	VW30368	39.9	930.02	VWP-B	VW30371	35.1	934.82	VWP-C	VW30373	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-21	Sonic	Dam Breach Area	5,819,759.86	595,303.52	968.91	0	-90	72.4	66.1	56.4	912.51	VWP-A	VW30369	43.6	925.31	VWP-B	VW30372	40.8	928.11	VWP-C	VW30370	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-22	Sonic	Dam Breach Area	5,819,985.00	595,117.70	929.89	0	-90	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	SH14-22A	Sonic	Dam Breach Area	5,819,984.00	595,119.90	929.96	0	-90	23.5	18.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	N	Y
2014	KCB	RH14-03	Mud Rotary	Dam Breach Area	5,819,939.00	595,125.10	932.40	0	-90	13.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	RH14-03A	Mud Rotary	Dam Breach Area	5,819,936.00	595,132.30	932.59	0	-90	12.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	RH14-10	Mud Rotary	Dam Breach Area	5,819,964.65	595,142.43	930.91	0	-90	11.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	RH14-10A	Mud Rotary	Dam Breach Area	5,819,965.51	595,141.18	930.86	0	-90	11.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	RH14-22	Mud Rotary	Dam Breach Area	5,819,981.00	595,126.50	929.78	0	-90	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	RH14-22A	Mud Rotary	Dam Breach Area	5,819,983.00	595,126.00	929.79	0	-90	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	VST14-03	Mud Rotary	Dam Breach Area	5,819,934.14	595,129.01	932.77	0	-90	9.8	-	12.2	920.57	VWP-A	VW30346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	VST14-10	Mud Rotary	Dam Breach Area	5,819,962.22	595,152.14	932.08	0	-90	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	VST14-10A	Mud Rotary	Dam Breach Area	5,819,964.65	595,139.43	930.91	0	-90	11.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2014	KCB	VST14-22	Mud Rotary	Dam Breach Area	5,819,982.71	595,122.56	929.79	0	-90	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	Y
2015	Golder	GA15-01	Sonic	Perimeter Embankment Buttress	5,820,063.30	594,549.30	967.80	0	-90	20.1	-	10.1	957.74	-	VW31559	-	-	-	-	-	-	-	-	969.30	947.67	-	-	-	-	Y	Y	N
2015	Golder	GA15-02	Sonic	Perimeter Embankment Buttress	5,820,049.70	594,727.00	951.70	0	-90	17.1	12.6	12.2	939.51	-	VW31556	-	-	-	-	-	-	-	-	952.80	934.63	-	-	-	-	Y	Y	N
2015	Golder	GA15-03	Sonic	Perimeter Embankment Buttress	5,819,685.96	595,507.54	937.60	0	-90	50.6	47.7	30.5	907.12	VWP-B	VW30361	15.2	922.36	VWP-A	VW30358	-	-	-	-	938.58	887.00	-	-	-	-	Y	Y	N
2015	Golder	GA15-04	Sonic	Perimeter Embankment Buttress	5,819,623.88	595,603.27	937.20	0	-90	53.5	32.3	30.5	906.72	VWP-B	VW30360	15.2	921.96	VWP-A	VW30359	-	-	-	-	937.97	883.70	-	-	-	-	Y	Y	N
2015	Golder	GA15-05	Sonic	Perimeter Embankment Buttress	5,819,552.77	595,704.96	937.50	0	-90	59.8	45.6	32.0	905.50	VWP-B	VW30366	20.0	917.50	VWP-A	VW30365	-	-	-	-	938.46	877.80	-	-	-	-	Y	Y	N
2015	Golder	GA15-06	Sonic	Perimeter Embankment Buttress	5,819,475.88	595,814.30	938.60	0	-90	56.7	40.7	32.0	906.60	VWP-B	VW30363	20.0	918.60	VWP-A	VW30362	-	-	-	-	939.61	881.91	-	-	-	-	Y	Y	N
2015	Golder	GA15-07	Sonic	Perimeter Embankment Buttress	5,819,375.46	595,993.82	935.00	0	-90	44.5	19.7	25.2	909.85	VWP-B	VW31562	16.6	918.39	VWP-A	VW31565	-	-	-	-	936.16	890.50	-	-	-	-	Y	Y	N
2015	Golder	GA15-08	Sonic	Perimeter Embankment Buttress	5,819,255.51	596,082.35	937.00	0	-90	50.6	25.8	31.4	905.61	VWP-B	VW31561	11.6	925.42	VWP-A	VW31560	-	-	-	-	937.70	886.40	-	-	-	-	Y	Y	N
2015	Golder	GA15-09	Sonic	Perimeter Embankment Buttress	5,819,060.02	596,220.56	939.20	0	-90	41.5	22.9	25.3	913.90	VWP-B	VW31567	11.0	928.23	VWP-A	VW31568	-	-	-	-	940.30	897.75	-	-	-	-	Y	Y	N
2015	Golder	GA15-10	Sonic	Main Embankment Buttress	5,818,856.37	596,208.51	938.21	0	-90	74.7	32.0	25.5	912.76	VWP-B	VW31569	11.9	926.32	VWP-A	VW31566	-	-	-	-	939.21	863.54	-	-	-	-	Y	Y	N
2015	Golder	GA15-11	Sonic	Main Embankment Buttress	5,818,767.00	596,270.00	937.00	0	-90	52.7	23.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2015	Golder	GA15-12	Sonic	Main Embankment Buttress	5,818,688.59	595,986.74	928.10	0	-90	50.6	41.4	29.0	899.10	VWP-B	VW30367	18.3	909.80	VWP-A	VW30349	-	-	-	-	929.11	877.50	-	-	-	-	Y	Y	N
2015	Golder	GA15-13	Sonic	Main Embankment Buttress	5,818,594.00	596,056.00	926.10	0	-90	41.5	33.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2015	Golder	GA15-14	Sonic	Main Embankment Buttress	5,818,469.80	595,926.30	913.90	0	-90	21.6	13.4	11.9	902.01	VWP-B	VW31557	6.7	907.19	VWP-A	VW31558	-	-	-	-	915.14	892.26	-	-	-	-	Y	Y	N
2015	Golder	GA15-15	Sonic	Main Embankment Buttress	5,818,460.56	595,693.19	925.00	0	-90	47.5	32.0	25.0	900.00	VWP-B	VW30364	18.0	907.02	VWP-A	VW30352	-	-	-	-	926.00	877.50	-	-	-	-	Y	Y	N
2015	Golder	GA15-16	Sonic	Main Embankment Buttress	5,818,331.00	595,791.00	912.50	0	-90	38.4	21.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2015	Golder	GA15-17	Sonic	Main Embankment Buttress	5,818,260.10	595,584.90	919.05	0	-90	29.3	22.2	20.7	898.35	VWP-B	VW31563	12.8	906.25	VWP-A	VW31564	-	-	-	-	919.93	889.79	-	-	-	-	Y	Y	N
2015	Golder	GA15-18	Sonic	Main Embankment Buttress	5,818,169.50	595,309.60	936.20	0	-90	20.1	12.5	13.4	922.80	VWP-B	1126314	6.1	930.10	VWP-A	1126315	-	-	-	-	937.06	916.08	-	-	-	-	Y	Y	N
2015	Golder	GA15-19	Sonic	South Embankment	5,818,238.20	595,081.10	947.60	0	-90	11.0	6.0	4.6	943.03	-	1126311	-	-	-	-	-	-	-	-	948.35	936.62	-	-	-	-	Y	Y	N
2015	Golder	GA15-20	Sonic	South Embankment	5,818,422.80	594,598.70	944.04	0	-90	9.5	5.4	-	-	-	-	-	-	-	-	-	-	-	-	944.61	934.58	-	-	-	-	Y	Y	N
2015	Golder	GA15-21	Sonic	Main Embankment Buttress	5,818,480.81	595,720.16	-	0	-90	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2015	Golder	VW15-22	Sonic	Corner 1 Embankment	5,819,884.00	595,118.70	950.53	0	-90	-	-	15.0	935.50	-	VW32659	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2015	Golder	VW15-23	Sonic	Corner 1 Embankment	5,819,895.00	595,131.70	951.16	0	-90	-	-	22.5	928.66	-	VW32660	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2015	Golder	VW15-24	Sonic	Corner 1 Embankment	5,819,927.00	595,058.70	950.08	0	-90	-	-	14.9	935.17	-	VW32661	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2015	Golder	VW15-25	Sonic	Corner 1 Embankment	5,819,942.00	595,060.70	951.12	0	-90	-	-	23.3	927.79	-	VW32662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2015	Golder	SI15-26	Sonic	Perimeter Embankment Buttress	5,819,754.00	595,386.50	943.37	0	-90	45.2	42.1	-	-	-	-	-	-	-	-	-	-	-	-	943.75	898.16	-	-	-	-	Y	N	N
2015	Golder	SI15-27	Sonic	Corner 1 Embankment	5,819,858.00	595,163.30	951.09	0	-90	25.0	-	-	-	-	-	-	-	-	-	-	-	-	-	951.49	926.61	-	-	-	-	N	N	N
2015	Golder	SI15-28	Sonic	Corner 1 Embankment	5,819,884.00	595,138.30	951.09	0	-90	26.2	-	-	-	-	-	-	-	-	-	-	-	-	-	952.01	925.55	-	-	-	-	N	N	N
2015	Golder	SI15-29	Sonic	Corner 1 Embankment	5,819,938.00	595,080.00	951.10	0	-90	28.7	-	-	-	-	-	-	-	-	-	-	-	-	-	952.12	923.41	-	-	-	-	N	N	N
2015	Golder	SI15-30	Sonic	Corner 1 Embankment	5,819,942.00	595,045.30	951.02	0	-90	24.7	-	-	-	-	-	-	-	-	-	-	-	-	-	951.28	926.92	-	-	-	-	N	N	N
2016	Golder	GA16-01	Sonic	Corner 1 Embankment Buttress	5,820,084.00	595,032.00	937.20	0	-90	21.3	18.3	15.2	922.00	VWP-B	VW39061	13.4	923.80	VWP-A	VW39064	-	-	-	-	937.80	915.10	-	-	-	-	Y	Y	Y
2016	Golder	GA16-02	Sonic	Corner 1 Embankment Buttress	5,820,128.00	595,095.00	933.00	0	-90	24.4	23.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GA16-03	Sonic	Corner 1 Embankment Buttress	5,820,067.00	595,176.00	932.00	0	-90	24.4	23.2	18.0	914.00	VWP-B	VW39067	12.2	919.80	VWP-A	VW39065	-	-	-	-	932.70	908.00	-	-	-	-	Y	Y	N
2016	Golder	GA16-04	Sonic	Corner 1 Embankment Buttress	5,820,010.00	595,259.00	932.60	0	-90	40.7	40.1	10.2	922.40	-	VW39059	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2016	Golder	GA16-05	Sonic	Corner 1 Embankment Buttress	5,820,062.00	595,305.00	925.40	0	-90	12.2	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2016	Golder	GA16-06	Sonic	Corner 1 Embankment Buttress	5,819,915.00	595,307.00	936.50	0	-90	24.4	22.6	16.8	919.70	-	VW39066	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2016	Golder	GA16-07	Sonic	Corner 1 Embankment Buttress	5,819,964.00	595,348.00	932.30	0	-90	23.0	21.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2016	Golder	GA16-08	Sonic	Corner 1 Embankment Buttress	5,820,015.00	595,378.00	924.30	0	-90	18.3	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2016	Golder	GA16-09	Sonic	Corner 1 Embankment Buttress	5,819,946.00	595,459.00	923.90	0	-90	23.2	22.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2016	Golder	GA16-15	Sonic	South Embankment	5,818,293.00	594,909.00	947.00	0	-90	12.2	10.7	-	-	-	-	-	-	-	-	-	-	-	-	947.80	935.30	-	-	-	-	Y	Y	N
2016	Golder	GA16-16	Sonic	South Embankment	5,818,391.00	594,678.00	944.80	0	-90	12.2	7.0	-	-	-	-	-	-	-	-	-	-	-	-	945.50	933.00	-	-	-	-	Y	Y	N
2016	Golder	GA16-17	Sonic	South Embankment	5,818,270.00	594,793.00	944.40	0	-90	14.6	12.5	10.6	933.80	-	VW39068	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GA16-18	Sonic	Corner 1 Embankment	5,819,891.00	595,118.00	961.00	0	-90	6.6	-	6.5	954.50	-	VW39063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2016	Golder	GA16-19	Sonic	South Embankment	5,818,341.00	594,790.00	945.20	0	-90	12.2	9.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GA16-20	Sonic	Perimeter Embankment	5,819,411.00	595,562.00	961.20	0	-90	31.0	-	30.5	930.70	-	VW39060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2016	Golder	GA16-21	Sonic	Main Embankment	5,818,759.00	595,801.00	964.00	0	-90	37.8	-	37.8	926.20	-	VW39069	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2016	Golder	GA16-22	Sonic	South Embankment	5,818,489.00	594,836.00	962.90	0	-90	24.5	-	24.4	938.50	-	VW39062	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	N	N
2016	Golder	GW16-02A	Sonic	Perimeter Embankment	5,819,731.19	595,831.15	925.10	0	-90	53.6	52.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GW16-02B	Sonic	Perimeter Embankment	5,819,734.31	595,832.84	924.95	0	-90	30.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GW16-03A	Sonic	Main Embankment	5,818,752.04	596,335.81	938.19	0	-90	41.2	31.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GW16-03B	Sonic	Main Embankment	5,818,757.46	596,337.84	938.35	0	-90	30.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GW16-04A	Sonic	Main Embankment	5,818,106.62	595,491.16	922.16	0	-90	16.8	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GW16-04B	Sonic	Main Embankment	5,818,109.50	595,489.47	922.26	0	-90	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GW16-05A	Sonic	South Embankment	5,818,539.05	594,207.62	963.64	0	-90	27.4	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2016	Golder	GW16-05B	Sonic	South Embankment	5,818,541.45	594,206.42	963.91	0	-90	21.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	N
2018	Golder	GA18-01	Sonic	Corner 1 Embankment Buttress	5,820,059.00	595,030.00	940.80	0	-90	29.3	24.4	25.9	914.90	VWP-C	VW48120	18.6	922.20	VWP-B	VW48122	15.8	925.00	VWP-A	VW48121	941.10	913.70	-	-	-	-	Y	Y	Y
2018	Golder	GA18-03	Sonic	Corner 1 Embankment Buttress	5,820,098.00	594,926.00	940.63	0	-90	15.2	9.1	13.1	927.50	VWP-C	VW48117	8.7	931.90	VWP-B	VW48116	7.2	933.40	VWP-A	VW48115	940.90	925.70	-	-	-	-	Y	Y	Y
2018	Golder	GA18-04A	Sonic	Corner 1 Embankment Buttress	5,819,964.00	595,213.00	941.17	0	-90	24.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2018	Golder	GA18-04B	Sonic	Corner 1 Embankment Buttress	5,819,960.00	595,207.00	940.95	0	-90	29.7	25.0	28.6	912.40	VWP-C	VW48123	19.5	921.50	VWP-B	VW48118	18.9	922.10	VWP-A	VW48119	941.30	911.00	-	-	-	-	Y	Y	Y
2021	Golder	GA21-01	Sonic	Perimeter Embankment Buttress	5,819,767.00	595,505.00	931.92	0	-90	53.6	48.0	45.5	886.44	VWP-A	VW139093	26.5	905.44	VWP-B	VW139075	19.5	912.39	VWP-C	VW139057	932.87	878.30	-	-	-	-	Y	Y	N
2021	Golder	GA21-02	Sonic	Perimeter Embankment Buttress	5,819,630.00	595,782.00	930.11	0	-90	75.0	68.9	33.9	896.19	VWP-A	VW139082	27.1	903.04	VWP-B	VW129095	16.4	913.69	VWP-C	VW139086	931.04	855.05	-	-	-	-	Y	Y	N
2021	Golder	GA21-03	Sonic	Perimeter Embankment Buttress	5,819,543.00	595,924.00	930.45	0	-90	52.1	46.9	30.1	900.36	VWP-A	VW139053	25.5	904.93	VWP-B	VW139067	15.8	914.68	VWP-C	VW139097	931.31	879.12	-	-	-	-	Y	Y	N
2021	Golder	GA21-04	Sonic	Corner 1 Embankment Buttress	5,820,064.00	595,303.00	938.38	0	-90	20.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y
2021	Golder	GA21-05	Sonic	Perimeter Embankment Buttress	5,819,157.00	596,148.00	945.52	0	-90	71.9	68.0	52.5	893.00	VWP-A	VW139088	34.9	910.67	VWP-B	VW139089	16.6	928.96	VWP-C	VW139096	946.52	873.42	-	-	-	-	Y	Y	N
2021	Golder	GA21-06	Sonic	Perimeter Embankment Buttress	5,819,115.00	596,282.00	937.98	0	-90	29.3	23.5	13.1	924.86	VWP-A	VW139081	8.0	929.96	VWP-B	VW139076	-	-	-	-	938.82	908.60	-	-	-	-	Y	Y	N
2021	Golder	GA21-07	Sonic	Main Embankment Buttress	5,818,649.00	596,019.00	935.90	0	-90	38.4	-	38.2	897.72	VWP-A	VW139078	28.4	907.52	VWP-B	VW139085	-	-	-	-	-	-	-	-

Table C2: Summary of Test Pits

Year	Consultant	Test Pit ID	Method	General Location Description	Coordinates		Ground Elevation (m)	Completion Depth (m)	Bedrock Encountered? (Y/N)	Record of Test Pit Log in Database?	Test Pit on Figure 01?
					Northing (m)	Easting (m)					
1989	Knight Piesold	TPB-01	CAT 225	Main Embankment	5,818,814.05	595,975.06	-	4.1	N	Y	N
1989	Knight Piesold	TPB-02	CAT 225	Main Embankment	5,819,012.21	596,081.47	-	4.9	N	Y	N
1989	Knight Piesold	TPB-03	CAT 225	Perimeter Embankment	5,819,190.28	596,214.15	-	5.5	N	Y	N
1989	Knight Piesold	TPB-04	CAT 225	Perimeter Embankment	5,819,396.99	596,154.10	-	5.2	N	Y	N
1989	Knight Piesold	TPB-05	CAT 225	Perimeter Embankment	5,819,451.74	595,919.83	-	4.0	N	Y	N
1989	Knight Piesold	TPB-06	CAT 225	Perimeter Embankment	5,819,675.71	595,825.50	-	5.2	N	Y	N
1989	Knight Piesold	TPB-07	CAT 225	Perimeter Embankment	5,819,526.73	595,699.80	-	3.4	N	Y	N
1989	Knight Piesold	TPB-08	CAT 225	Tailings Basin	5,819,369.37	595,609.71	-	4.9	N	Y	N
1989	Knight Piesold	TPB-09	CAT 225	Tailings Basin	5,818,924.19	595,540.23	-	5.2	N	Y	N
1989	Knight Piesold	TPB-10	CAT 225	Main Embankment	5,818,678.26	595,752.76	-	3.7	N	Y	N
1989	Knight Piesold	TPB-11	CAT 225	Main Embankment	5,818,380.54	595,495.64	-	5.2	N	Y	N
1989	Knight Piesold	TPB-12	CAT 225	Main Embankment	5,818,263.28	595,343.37	926.20	4.9	N	Y	N
1989	Knight Piesold	TPB-13	CAT 225	Main Embankment	5,818,465.53	595,629.39	-	4.9	N	Y	N
1989	Knight Piesold	TPB-14	CAT 225	Main Embankment	5,818,323.13	595,714.69	-	4.9	N	Y	N
1989	Knight Piesold	TPB-15	CAT 225	Tailings Basin	5,818,523.04	595,466.33	-	4.9	N	Y	N
1989	Knight Piesold	TPB-16	CAT 225	South Embankment	5,818,549.95	594,423.68	946.00	4.3	N	Y	N
1989	Knight Piesold	TPB-17	CAT 225	Tailings Basin	5,819,774.82	594,762.80	-	4.9	N	Y	N
1989	Knight Piesold	TPB-18	CAT 225	Corner 1 Embankment	5,819,954.10	595,051.75	-	4.9	N	Y	N
1995	Knight Piesold	TP95-16	Hitachi X200	TSF Access Road	5,820,580.00	594,370.00	980.00	6.4	N	Y	N
1995	Knight Piesold	TP95-17	Hitachi X200	TSF Access Road	5,821,110.00	594,230.00	980.00	5.8	N	Y	N
1995	Knight Piesold	TP95-18	Hitachi X200	Tailings / Reclaim Pipeline Route	5,821,100.00	593,285.00	992.00	3.5	N	Y	N
1995	Knight Piesold	TP95-19	Hitachi X200	Tailings / Reclaim Pipeline Route	5,821,600.00	592,980.00	1042.00	6.4	Y	Y	N
1995	Knight Piesold	TP95-26	Hitachi X200	Tailings Basin	5,819,180.00	594,645.00	938.00	6.1	N	Y	N
1995	Knight Piesold	TP95-27	Hitachi X200	Perimeter Embankment	5,819,740.00	595,350.00	930.00	6.2	N	Y	N
1995	Knight Piesold	TP95-28	Hitachi X200	Tailings Basin	5,819,360.00	595,285.00	923.40	6.2	N	Y	N
1995	Knight Piesold	TP95-29	Hitachi X200	Borrow Area No. 2	5,818,745.00	596,270.00	936.00	5.7	N	Y	N
1995	Knight Piesold	TP95-30	Hitachi X200	Borrow Area No. 2	5,818,495.00	596,560.00	938.00	5.5	N	Y	N
1995	Knight Piesold	TP95-31	Hitachi X200	Borrow Area No. 2	5,818,955.00	596,470.00	939.00	5.8	N	Y	N
1995	Knight Piesold	TP95-32	Hitachi X200	Tailings Basin	5,819,140.00	595,780.00	932.00	6.0	N	Y	N
1995	Knight Piesold	TP95-33	Hitachi X200	Tailings Basin	5,818,750.00	594,820.00	932.00	7.7	N	Y	N
1995	Knight Piesold	TP95-34	Hitachi X200	Tailings Basin	5,818,730.00	595,250.00	924.00	6.4	N	Y	N
1995	Knight Piesold	TP95-35	Hitachi X200	Tailings Basin	5,818,690.00	595,535.00	917.00	6.6	N	Y	N
1995	Knight Piesold	TP95-36	Hitachi X200	Tailings Basin	5,818,520.00	595,275.00	924.00	6.3	N	Y	N
1995	Knight Piesold	TP95-37	Hitachi X200	Tailings Basin	5,818,345.00	595,260.00	938.00	3.0	Y	Y	N
1995	Knight Piesold	TP95-38	Hitachi X200	Main Embankment	5,818,460.00	595,485.00	915.00	6.7	N	Y	N
1995	Knight Piesold	TP95-39	Hitachi X200	Main Embankment	5,818,405.00	595,405.00	918.00	7.5	N	Y	N
1995	Knight Piesold	TP95ME-01	Hitachi X200	Main Embankment	5,818,503.74	595,604.67	912.60	2.5	N	Y	N
1995	Knight Piesold	TP95ME-02	Hitachi X200	Main Embankment	5,818,542.46	595,636.73	913.00	3.0	N	Y	N
1995	Knight Piesold	TP95ME-03	Hitachi X200	Main Embankment	5,818,614.44	595,735.34	915.60	3.4	N	Y	N
1995	Knight Piesold	TP95ME-04	Komatsu PC 200 LC	Main Embankment	5,818,505.56	595,641.57	912.40	6.0	N	Y	N
1995	Knight Piesold	TP95ME-05	Komatsu PC 200 LC	Main Embankment	5,818,519.47	595,657.30	912.50	6.5	N	Y	N
1995	Knight Piesold	TP95ME-06	Komatsu PC 200 LC	Main Embankment	5,818,537.62	595,680.29	912.90	6.0	N	Y	N
1995	Knight Piesold	TP95ME-07	Komatsu PC 200 LC	Main Embankment	5,818,550.32	595,696.62	913.20	5.7	N	Y	N
1995	Knight Piesold	TP95ME-08	Komatsu PC 200 LC	Main Embankment	5,818,566.26	595,717.73	913.80	5.8	N	Y	N
1995	Knight Piesold	TP95ME-09	Komatsu PC 200 LC	Main Embankment	5,818,583.32	595,739.05	916.50	6.0	N	Y	N
1995	Knight Piesold	TP95ME-10	Komatsu PC 200 LC	Main Embankment	5,818,459.93	595,584.81	912.40	6.0	N	Y	N
1995	Knight Piesold	TP95ME-11	Komatsu PC 200 LC	Main Embankment	5,818,442.83	595,563.23	912.50	6.2	N	Y	N
1995	Knight Piesold	TP95ME-12	Komatsu PC 200 LC	Main Embankment	5,818,428.58	595,541.24	912.80	6.3	N	Y	N
1995	Knight Piesold	TP95ME-13	Komatsu PC 200 LC	Main Embankment	5,818,409.85	595,520.07	913.40	6.4	N	Y	N
1995	Knight Piesold	TP95ME-14	Komatsu PC 200 LC	Main Embankment	5,818,393.97	595,498.90	914.80	6.2	N	Y	N
1995	Knight Piesold	TP95ME-15	Komatsu PC 200 LC	Main Embankment	5,818,378.91	595,478.14	914.40	6.1	N	Y	N
1995	Knight Piesold	TP95ME-16	Komatsu PC 200 LC	Main Embankment	5,818,359.36	595,457.78	915.40	7.0	N	Y	N
1995	Knight Piesold	TP95ME-17	Komatsu PC 200 LC	Main Embankment	5,818,346.74	595,432.94	916.40	5.7	N	Y	N
1995	Knight Piesold	TP95ME-18	Komatsu PC 200 LC	Main Embankment	5,818,334.53	595,408.11	917.00	6.0	N	Y	N
1995	Knight Piesold	TP95ME-19	Komatsu PC 200 LC	Main Embankment	5,818,325.16	595,387.34	917.80	5.4	N	Y	N
1995	Knight Piesold	TP95ME-20	Komatsu PC 200 LC	Main Embankment	5,818,313.76	595,365.76	918.60	5.7	N	Y	N
1995	Knight Piesold	TP95ME-21	Komatsu PC 200 LC	Main Embankment	5,818,298.70	595,345.41	919.80	3.7	N	Y	N
1995	Knight Piesold	TP95ME-22	Komatsu PC 200 LC	Main Embankment	5,818,376.94	595,417.55	918.00	4.6	N	Y	N
1995	Knight Piesold	TP95ME-23	Komatsu PC 200 LC	Main Embankment	5,818,435.78	595,474.69	915.70	6.3	N	Y	N
1995	Knight Piesold	TP95ME-24	Komatsu PC 200 LC	Main Embankment	5,818,465.63	595,513.91	914.00	6.3	N	Y	N
1995	Knight Piesold	TP95ME-25	Komatsu PC 200 LC	Main Embankment	5,818,394.00	595,573.61	913.70	5.9	N	Y	N
1995	Knight Piesold	TP95ME-26	Komatsu PC 200 LC	Main Embankment	5,818,322.31	595,491.16	915.40	6.4	N	Y	N
1995	Knight Piesold	TP95ME-27	Komatsu PC 200 LC	Main Embankment	5,818,285.26	595,448.82	916.90	6.0	N	Y	N
1995	Knight Piesold	TP95ME-28	Komatsu PC 200 LC	Main Embankment	5,818,257.17	595,413.81	918.00	5.5	N	Y	N
1995	Knight Piesold	TP95ME-29	Komatsu PC 200 LC	Main Embankment	5,818,281.43	595,466.16	917.20	6.7	N	Y	N
1995	Knight Piesold	TP95ME-30	Komatsu PC 200 LC	Main Embankment	5,818,207.09	595,420.73	918.00	5.9	N	Y	N
1995	Knight Piesold	TP95ME-31	Komatsu PC 200 LC	Main Embankment	5,818,257.98	595,493.61	916.20	6.2	N	Y	N
1995	Knight Piesold	TP95ME-32	Komatsu PC 200 LC	Main Embankment	5,818,288.52	595,525.36	914.80	6.2	N	Y	N
1995	Knight Piesold	TP95ME-33	Komatsu PC 200 LC	Main Embankment	5,818,314.98	595,566.49	913.30	6.3	N	Y	N
1995	Knight Piesold	TP95ME-34	Komatsu PC 200 LC	Main Embankment	5,818,345.11	595,612.49	912.20	6.2	N	Y	N
1995	Knight Piesold	TPS19	JD 690D LC	Main Embankment	5,818,411.89	595,724.46	910.80	4.1	N	Y	N
1995	Knight Piesold	TPS20	Komatsu PC 200 LC	Main Embankment	5,818,386.15	595,679.09	911.00	6.4	N	Y	N
1995	Knight Piesold	TPS20.5	Komatsu PC 200 LC	Main Embankment	5,818,329.20	595,685.15	911.20	6.5	N	Y	N
1995	Knight Piesold	TPS21	JD 690D LC	Main Embankment	5,818,276.28	595,682.32	911.20	4.0	N	Y	N
1995	Knight Piesold	TPS21.2	Komatsu PC 200 LC	Main Embankment	5,818,290.02	595,717.46	910.00	6.0	N	Y	N
1995	Knight Piesold	TPS22	JD 690D LC	Main Embankment	5,818,408.36	595,851.97	911.00	4.9	N	Y	N
1996	Knight Piesold	96-1	-	Tailings Basin	5,818,487.41	595,201.48	-	3.9	N	Y	N
1996	Knight Piesold	96-2	-	Tailings Basin	5,818,377.48	595,290.03	-	3.0	N	Y	N
1996	Knight Piesold	96-3	-	Tailings Basin	5,818,422.68	595,245.45	-	2.5	N	Y	N
1996	Knight Piesold	96-4	-	Tailings Basin	5,818,568.10	595,148.49	-	3.9	N	Y	N
1996	Knight Piesold	96-5	-	Tailings Basin	5,818,532.48	595,050.02	-	3.9	N	Y	N
1996	Knight Piesold	96-6	-	Tailings Basin	5,818,401.30	595,026.20	-	6.0	N	Y	N
1996	Knight Piesold	96-7	-	South Embankment	5,818,314.58	595,097.05	-	1.1	Y	Y	N
1996	Knight Piesold	96-8	-	Tailings Basin	5,818,402.52	595,147.12	-	2.5	Y	Y	N
1996	Knight Piesold	96-9	-	Tailings Basin	5,818,332.90	595,232.63	-	2.0	Y	Y	N
1996	Knight Piesold	96-10	-	Tailings Basin	5,818,446.90	595,355.18	-	5.3	N	Y	N
1996	Knight Piesold	96-11	-	Main Embankment	5,818,250.45	595,257.05	-	1.9	Y	Y	N
1996	Knight Piesold	96-12	-	Tailings Basin	5,818,416.77	595,331.56	-	5.6	N	Y	N
1996	Knight Piesold	96-13	-	Tailings Basin	5,818,488.02	595,317.72	-	2.3	N	Y	N
1996	Knight Piesold	96-14	-	Tailings Basin	5,818,519.37	595,350.29	-	4.0	N	Y	N
1996	Knight Piesold	96-15	-	Tailings Basin	5,818,472.75	595,136.13	-	5.0	N	Y	N
1996	Knight Piesold	96-16	-	Tailings Basin	5,818,395.19	595,061.62	-	4.8	N	Y	N
1996	Knight Piesold	96-17	-	Tailings Basin	5,818,506.75	595,254.61	-	6.5	N	Y	N
1996	Knight Piesold	96-18	-	Tailings Basin	5,818,551.94	595,267.64	-	4.5	N	Y	N
1996	Knight Piesold	96-19	-	Tailings Basin	5,818,392.75	595,072.01	-	4.7	Y	Y	N
1996	Knight Piesold	96-20	-	Main Embankment	5,818,586.55	595,307.95	-	7.3	N	Y	N
1996	Knight Piesold	96-21	-	Tailings Basin	5,818,512.04	595,394.67	-	5.7	N	Y	N
1996	Knight Piesold	96-22	-	Tailings Basin	5,818,565.79	595,371.87	-	5.2	N	Y	N
1996	Knight Piesold	96-23	-	Tailings Basin	5,818,586.55	595,407.29	-	2.7	N	Y	N
1996	Knight Piesold	96-24	-	Tailings Basin	5,818,681.23	595,353.10	-	4.3	N	Y	N
1996	Knight Piesold	96-25	-	Tailings Basin	5,818,737.09	595,262.31	-	5.7	N	Y	N
1996	Knight Piesold	96-26	-	Tailings Basin	5,818,709.16	595,307.71	-	3.0	N	Y	N
1996	Knight Piesold	96-27	-	Tailings Basin	5,818,770.61	595,202.26	-	2.3	N	Y	N
1996	Knight Piesold	96-28	-	Tailings Basin	5,818,786.67	595,274.88	-	2.4	N	Y	N
1996	Knight Piesold	96-29	-	Main Embankment	5,818,597.65	595,688.02	-	3.8	N	Y	N

Table C2: Summary of Test Pits

Year	Consultant	Test Pit ID	Method	General Location Description	Coordinates		Ground Elevation (m)	Completion Depth (m)	Bedrock Encountered? (Y/N)	Record of Test Pit Log in Database?	Test Pit on Figure 01?
					Northing (m)	Easting (m)					
1996	Knight Piesold	96-30	-	Tailings Basin	5,818,641.01	595,654.43	-	4.8	N	Y	N
1996	Knight Piesold	96-31	-	Tailings Basin	5,818,614.54	595,613.92	-	4.2	N	Y	N
1996	Knight Piesold	96-32	-	Main Embankment	5,818,569.76	595,645.27	-	3.1	N	Y	N
1996	Knight Piesold	96-33	-	Tailings Basin	5,818,589.71	595,571.58	-	2.5	N	Y	N
1996	Knight Piesold	96-34	-	Tailings Basin	5,818,561.21	595,530.05	-	2.5	N	Y	N
1996	Knight Piesold	96-35	-	Tailings Basin	5,818,588.08	595,500.73	-	2.5	N	Y	N
1996	Knight Piesold	96-36	-	Tailings Basin	5,818,617.39	595,541.04	-	2.1	N	Y	N
1996	Knight Piesold	96-37	-	Main Embankment	5,818,540.44	595,603.74	-	2.3	N	Y	N
1996	Knight Piesold	96-38	-	Main Embankment	5,818,509.91	595,563.03	-	2.3	N	Y	N
1996	Knight Piesold	96-39	-	Main Embankment	5,818,478.56	595,523.94	-	1.9	N	Y	N
1996	Knight Piesold	96-40	-	Tailings Basin	5,818,517.23	595,493.00	-	3.8	N	Y	N
1996	Knight Piesold	96-41	-	Main Embankment	5,818,453.41	595,487.50	-	3.7	N	Y	N
1996	Knight Piesold	96-42	-	Tailings Basin	5,818,490.47	595,482.21	-	4.2	N	Y	N
1996	Knight Piesold	96-43	-	Borrow Area No. 3	5,818,188.95	596,706.31	-	1.2	N	Y	N
1996	Knight Piesold	96-44	-	Borrow Area No. 3	-	-	-	2.2	N	Y	N
1996	Knight Piesold	96-45	-	Borrow Area No. 3	-	-	-	4.2	N	Y	N
1996	Knight Piesold	96-46	-	Borrow Area No. 3	-	-	-	5.3	N	Y	N
1996	Knight Piesold	96-47	-	Borrow Area No. 3	5,818,339.77	596,714.74	-	4.4	N	Y	N
1996	Knight Piesold	96-48	-	Borrow Area No. 3	-	-	-	5.0	N	Y	N
1996	Knight Piesold	96-49	-	Borrow Area No. 3	-	-	-	6.0	N	Y	N
1996	Knight Piesold	96-50	-	Borrow Area No. 3	-	-	-	5.2	N	Y	N
1996	Knight Piesold	96-51	-	Borrow Area No. 3	-	-	-	5.0	N	Y	N
1996	Knight Piesold	96-52	-	Borrow Area No. 3	5,818,268.58	596,786.68	-	4.5	N	Y	N
1996	Knight Piesold	96-53	-	Borrow Area No. 3	5,818,276.76	596,636.36	-	6.0	N	Y	N
1996	Knight Piesold	96-54	-	Borrow Area No. 2	5,818,353.16	596,608.58	-	5.8	N	Y	N
1996	Knight Piesold	96-55	-	Borrow Area No. 2	5,818,432.05	596,562.94	-	5.4	N	Y	N
1996	Knight Piesold	96-56	-	Perimeter Embankment	5,819,723.19	595,881.83	-	8.2	N	Y	N
1996	Knight Piesold	96-57	-	Perimeter Embankment	5,819,760.44	595,906.04	-	6.8	N	Y	N
1996	Knight Piesold	96-58	-	Perimeter Embankment	5,819,659.88	595,839.00	-	7.6	N	Y	N
1996	Knight Piesold	96-59	-	Perimeter Embankment	5,819,697.59	595,910.69	-	7.9	N	Y	N
1996	Knight Piesold	96-60	-	Perimeter Embankment	5,819,671.05	595,929.78	-	5.8	N	Y	N
1996	Knight Piesold	96-61	-	Perimeter Embankment	5,819,749.26	595,856.69	-	7.5	N	Y	N
1996	Knight Piesold	96-62	-	Perimeter Embankment	5,819,762.76	595,822.70	-	6.2	N	Y	N
1996	Knight Piesold	96-63	-	Perimeter Embankment	5,819,779.99	595,797.56	-	6.2	N	Y	N
1996	Knight Piesold	96-64	-	Perimeter Embankment	5,819,818.16	595,765.91	-	6.0	N	Y	N
1996	Knight Piesold	96-65	-	Perimeter Embankment	5,819,813.04	595,730.99	-	4.3	N	Y	N
1996	Knight Piesold	96-66	-	Perimeter Embankment	5,819,705.97	595,847.38	-	5.6	N	Y	N
1996	Knight Piesold	96-67	-	Perimeter Embankment	5,819,694.79	595,874.84	-	6.2	N	Y	N
1996	Knight Piesold	96-68	-	Perimeter Embankment	5,819,727.85	595,909.76	-	6.2	N	Y	N
1996	Knight Piesold	96-69	-	Perimeter Embankment	5,819,751.59	595,888.81	-	5.5	N	Y	N
1996	Knight Piesold	96-70	-	Tailings Basin	5,819,026.81	594,885.13	-	2.7	N	Y	N
1996	Knight Piesold	96-71	-	Tailings Basin	5,819,048.46	594,776.19	-	3.8	N	Y	N
1996	Knight Piesold	96-72	-	Tailings Basin	5,819,051.25	594,740.58	-	0.4	N	Y	N
1996	Knight Piesold	96-73	-	Tailings Basin	5,819,061.03	594,702.87	-	4.2	N	Y	N
1996	Knight Piesold	96-74	-	Tailings Basin	5,819,014.94	594,772.00	-	1.0	N	Y	N
1996	Knight Piesold	96-75	-	Tailings Basin	5,818,985.61	594,767.81	-	3.4	N	Y	N
1996	Knight Piesold	96-76	-	Tailings Basin	5,818,918.36	594,758.04	-	2.9	N	Y	N
1996	Knight Piesold	96-77	-	Tailings Basin	5,818,823.01	594,743.18	-	2.5	N	Y	N
1996	Knight Piesold	96-78	-	Tailings Basin	5,819,142.03	594,767.12	-	2.5	N	Y	N
1996	Knight Piesold	96-79	-	Tailings Basin	5,819,093.85	594,852.31	-	3.5	N	Y	N
1996	Knight Piesold	96-80	-	Tailings Basin	5,819,157.40	594,711.25	-	3.0	N	Y	N
1996	Knight Piesold	96-81	-	Tailings Basin	5,818,962.32	594,833.58	-	3.0	N	Y	N
1996	Knight Piesold	96-82	-	Tailings Basin	5,818,921.46	594,864.53	-	3.0	N	Y	N
1996	Knight Piesold	96-83	-	Tailings Basin	5,818,998.18	594,810.41	-	4.7	N	Y	N
1996	Knight Piesold	96-84	-	Borrow Area No. 1	5,819,082.74	596,016.53	-	5.3	N	Y	N
1996	Knight Piesold	96-85	-	Borrow Area No. 1	5,819,205.27	595,926.75	-	5.3	N	Y	N
1996	Knight Piesold	96-86	-	Borrow Area No. 1	5,819,325.38	595,827.59	-	6.4	N	Y	N
1996	Knight Piesold	96-87	-	Borrow Area No. 1	5,819,434.32	595,725.64	-	2.5	N	Y	N
1996	Knight Piesold	96-88	-	Borrow Area No. 1	5,819,479.71	595,534.30	-	6.5	N	Y	N
1996	Knight Piesold	96-89	-	Borrow Area No. 1	5,819,314.91	595,681.64	-	2.5	N	Y	N
1996	Knight Piesold	96-90	-	Borrow Area No. 1	5,819,240.49	595,834.96	-	2.8	N	Y	N
1996	Knight Piesold	96-91	-	Borrow Area No. 1	5,819,109.60	595,919.07	-	2.5	N	Y	N
1996	Knight Piesold	96-92	-	Borrow Area No. 1	5,819,054.43	595,837.37	-	2.5	N	Y	N
1996	Knight Piesold	96-93	-	Borrow Area No. 1	5,818,710.63	595,744.21	-	5.7	N	Y	N
1996	Knight Piesold	96-94	-	Borrow Area No. 1	5,818,866.23	595,647.07	-	7.0	N	Y	N
1996	Knight Piesold	96-95	-	Borrow Area No. 1	5,818,825.45	595,808.94	-	4.0	N	Y	N
1996	Knight Piesold	96-96	-	Borrow Area No. 1	5,818,738.11	595,789.40	-	4.0	N	Y	N
1996	Knight Piesold	96-97	-	Borrow Area No. 1	5,818,784.32	595,895.26	-	3.3	N	Y	N
1996	Knight Piesold	96-98	-	Borrow Area No. 1	5,818,784.53	595,735.04	-	4.0	N	Y	N
1996	Knight Piesold	96-99	-	Borrow Area No. 1	5,818,872.09	596,030.12	-	6.0	N	Y	N
1996	Knight Piesold	96-100	-	Borrow Area No. 1	5,818,816.90	595,938.01	-	3.8	N	Y	N
1996	Knight Piesold	96-101	-	Borrow Area No. 1	5,819,013.23	595,934.43	-	7.3	N	Y	N
1996	Knight Piesold	96-102	-	Borrow Area No. 1	5,818,944.44	595,859.37	-	7.6	N	Y	N
1996	Knight Piesold	96-103	-	Borrow Area No. 1	5,819,062.81	595,755.66	-	7.5	N	Y	N
1996	Knight Piesold	96-104	-	Borrow Area No. 1	5,819,000.00	595,683.39	-	8.0	N	Y	N
1996	Knight Piesold	96-105	-	Borrow Area No. 1	5,819,129.85	595,831.08	-	6.5	N	Y	N
1996	Knight Piesold	96-106	-	Borrow Area No. 1	5,819,249.26	595,734.02	-	7.6	N	Y	N
1996	Knight Piesold	96-107	-	Borrow Area No. 1	5,819,179.43	595,659.99	-	8.0	N	Y	N
1996	Knight Piesold	96-108	-	Borrow Area No. 1	5,818,857.20	595,878.56	-	6.5	N	Y	N
1996	Knight Piesold	96-109	-	Main Embankment	5,818,273.46	595,519.66	-	3.7	N	Y	N
1996	Knight Piesold	96-110	-	Main Embankment	5,818,246.99	595,463.88	-	4.7	N	Y	N
1996	Knight Piesold	96-111	-	Perimeter Embankment	5,819,480.09	596,067.50	-	5.4	N	Y	N
1996	Knight Piesold	96-112	-	Perimeter Embankment	5,819,206.34	596,208.57	-	6.7	N	Y	N
1996	Knight Piesold	96-113	-	Perimeter Embankment	5,819,659.88	595,977.73	-	5.4	N	Y	N
1996	Knight Piesold	96-114	-	Perimeter Embankment	5,819,644.05	595,893.93	-	5.4	N	Y	N
1996	Knight Piesold	96-115	-	Perimeter Embankment	5,819,692.00	595,944.21	-	5.8	N	Y	N
1996	Knight Piesold	96-116	-	Tailings Basin	5,818,924.89	595,293.02	-	3.0	N	Y	N
1996	Knight Piesold	96-117	-	Tailings Basin	5,818,876.71	595,411.74	-	5.0	N	Y	N
1996	Knight Piesold	96-118	-	Tailings Basin	5,818,764.97	595,474.59	-	4.0	N	Y	N
1996	Knight Piesold	96-119	-	Main Embankment	5,818,482.71	595,598.14	-	5.8	N	Y	N
1996	Knight Piesold	TP96-BA-E4	-	Borrow Area No. 1	5,818,910.92	595,822.35	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-E5	-	Borrow Area No. 1	5,818,949.33	595,788.83	-	5.8	N	Y	N
1996	Knight Piesold	TP96-BA-E6	-	Borrow Area No. 1	5,818,986.34	595,757.41	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-E7	-	Borrow Area No. 1	5,819,025.10	595,724.24	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-E8	-	Borrow Area No. 1	5,819,063.51	595,690.72	-	5.5	N	Y	N
1996	Knight Piesold	TP96-BA-E9	-	Borrow Area No. 1	5,819,101.22	595,657.90	-	6.2	N	Y	N
1996	Knight Piesold	TP96-BA-F4	-	Borrow Area No. 1	5,818,948.63	595,856.57	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-F5	-	Borrow Area No. 1	5,818,982.15	595,825.85	-	6.1	N	Y	N
1996	Knight Piesold	TP96-BA-F6	-	Borrow Area No. 1	5,819,020.21	595,794.07	-	6.1	N	Y	N
1996	Knight Piesold	TP96-BA-F7	-	Borrow Area No. 1	5,819,057.92	595,761.95	-	2.3	N	Y	N
1996	Knight Piesold	TP96-BA-F8	-	Borrow Area No. 1	5,819,095.63	595,728.43	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-F9	-	Borrow Area No. 1	5,819,134.74	595,695.61	-	-	-	N	N
1996	Knight Piesold	TP96-BA-G4	-	Borrow Area No. 1	-	-	-	6.2	N	Y	N
1996	Knight Piesold	TP96-BA-G5	-	Borrow Area No. 1	5,819,014.63	595,862.51	-	6.2	N	Y	N
1996	Knight Piesold	TP96-BA-G6	-	Borrow Area No. 1	5,819,052.34	595,831.08	-	6.0	N	Y	N

Table C2: Summary of Test Pits

Year	Consultant	Test Pit ID	Method	General Location Description	Coordinates		Ground Elevation (m)	Completion Depth (m)	Bedrock Encountered? (Y/N)	Record of Test Pit Log in Database?	Test Pit on Figure 01?
					Northing (m)	Easting (m)					
1996	Knight Piesold	TP96-BA-G7	-	Borrow Area No. 1	5,819,091.44	595,797.56	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-G8	-	Borrow Area No. 1	5,819,129.85	595,765.44	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-G9	-	Borrow Area No. 1	5,819,168.26	595,731.22	-	4.0	N	Y	N
1996	Knight Piesold	TP96-BA-H4	-	Borrow Area No. 1	5,819,007.64	595,933.04	-	6.7	N	Y	N
1996	Knight Piesold	TP96-BA-H5	-	Borrow Area No. 1	5,819,048.15	595,900.92	-	5.6	N	Y	N
1996	Knight Piesold	TP96-BA-H6	-	Borrow Area No. 1	5,819,085.68	595,868.09	-	5.5	N	Y	N
1996	Knight Piesold	TP96-BA-H7	-	Borrow Area No. 1	5,819,125.66	595,834.57	-	6.2	N	Y	N
1996	Knight Piesold	TP96-BA-H8	-	Borrow Area No. 1	5,819,164.07	595,801.75	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-H9	-	Borrow Area No. 1	5,819,201.60	595,768.23	-	6.2	N	Y	N
1996	Knight Piesold	TP96-BA-I4	-	Borrow Area No. 1	5,819,044.48	595,970.75	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-I5	-	Borrow Area No. 1	5,819,082.19	595,937.23	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-I6	-	Borrow Area No. 1	5,819,120.60	595,904.41	-	6.0	N	Y	N
1996	Knight Piesold	TP96-BA-I7	-	Borrow Area No. 1	5,819,158.31	595,870.89	-	6.1	N	Y	N
1996	Knight Piesold	TP96-BA-I8	-	Borrow Area No. 1	5,819,197.41	595,838.07	-	6.1	N	Y	N
1996	Knight Piesold	TP96-BA-I9	-	Borrow Area No. 1	5,819,235.12	595,805.24	-	6.3	N	Y	N
1996	Knight Piesold	PRT-01	-	Main Embankment	5,818,530.77	595,725.27	-	-	-	N	N
1996	Knight Piesold	PRT-02	-	Main Embankment	5,818,413.92	595,565.67	-	-	-	N	N
1996	Knight Piesold	PRT-03	-	Main Embankment	5,818,412.10	595,503.12	-	-	-	N	N
1996	Knight Piesold	PRT-04	-	Main Embankment	5,818,360.11	595,482.59	-	-	-	N	N
1997	Knight Piesold	TP97-BA-F11	-	Borrow Area No. 1	5,819,212.25	595,628.57	-	5.7	N	Y	N
1997	Knight Piesold	TP97-BA-F12	-	Borrow Area No. 1	5,819,249.96	595,596.45	-	5.8	N	Y	N
1997	Knight Piesold	TP97-BA-F14	-	Borrow Area No. 1	5,819,324.68	595,531.50	-	6.0	N	Y	N
1997	Knight Piesold	TP97-BA-F15	-	Borrow Area No. 1	5,819,363.09	595,499.38	-	6.1	N	Y	N
1997	Knight Piesold	TP97-BA-G4	-	Borrow Area No. 1	5,818,977.27	595,894.98	-	5.8	N	Y	N
1997	Knight Piesold	TP97-BA-G10	-	Borrow Area No. 1	5,819,205.27	595,693.51	-	5.9	N	Y	N
1997	Knight Piesold	TP97-BA-G11	-	Borrow Area No. 1	5,819,245.07	595,665.58	-	6.1	N	Y	N
1997	Knight Piesold	TP97-BA-G12	-	Borrow Area No. 1	5,819,283.48	595,632.06	-	5.7	N	Y	N
1997	Knight Piesold	TP97-BA-G13	-	Borrow Area No. 1	5,819,321.89	595,599.94	-	5.8	N	Y	N
1997	Knight Piesold	TP97-BA-G14	-	Borrow Area No. 1	5,819,358.20	595,567.81	-	6.1	N	Y	N
1997	Knight Piesold	TP97-BA-G15	-	Borrow Area No. 1	5,819,395.21	595,535.69	-	6.3	N	Y	N
1997	Knight Piesold	TP97-BA-G16	-	Borrow Area No. 1	5,819,433.62	595,502.17	-	5.7	N	Y	N
1997	Knight Piesold	TP97-BA-H3	-	Borrow Area No. 1	5,818,971.68	595,965.51	-	5.8	N	Y	N
1997	Knight Piesold	TP97-BA-H11	-	Borrow Area No. 1	5,819,277.72	595,703.29	-	5.7	N	Y	N
1997	Knight Piesold	TP97-BA-H12	-	Borrow Area No. 1	-	-	-	5.9	N	Y	N
1997	Knight Piesold	TP97-BA-I10	-	Borrow Area No. 1	5,819,273.53	595,773.12	-	5.9	N	Y	N
1997	Knight Piesold	TP97-BA-I11	-	Borrow Area No. 1	5,819,311.24	595,739.60	-	5.7	N	Y	N
1997	Knight Piesold	TP97-BA-I12	-	Borrow Area No. 1	5,819,351.04	595,706.78	-	3.7	N	Y	N
1997	Knight Piesold	TP97-BA-I13	-	Borrow Area No. 1	5,819,386.66	595,673.96	-	5.5	N	Y	N
1997	Knight Piesold	TP97-BA-I14	-	Borrow Area No. 1	5,819,422.97	595,641.84	-	5.6	N	Y	N
1997	Knight Piesold	TP97-BA-I15	-	Borrow Area No. 1	5,819,462.78	595,609.71	-	5.6	N	Y	N
1997	Knight Piesold	TP97-BA-I16	-	Borrow Area No. 1	5,819,500.48	595,576.89	-	5.7	N	Y	N
1997	Knight Piesold	TP97-BA4-F8	-	Borrow Area No. 4	5,819,693.71	594,514.32	951.08	5.5	N	Y	N
1997	Knight Piesold	TP97-BA4-F9	-	Borrow Area No. 4	5,819,793.57	594,512.23	955.30	5.9	N	Y	N
1997	Knight Piesold	TP97-BA4-G4	-	Borrow Area No. 4	5,819,287.98	594,619.07	939.80	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-G5	-	Borrow Area No. 4	5,819,387.84	594,619.77	941.20	5.7	N	Y	N
1997	Knight Piesold	TP97-BA4-G6	-	Borrow Area No. 4	5,819,490.50	594,614.88	944.60	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-G7	-	Borrow Area No. 4	5,819,590.36	594,612.79	945.36	5.6	N	Y	N
1997	Knight Piesold	TP97-BA4-G8	-	Borrow Area No. 4	5,819,693.71	594,611.39	947.80	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-G9	-	Borrow Area No. 4	5,819,794.27	594,609.29	952.30	5.7	N	Y	N
1997	Knight Piesold	TP97-BA4-H4	-	Borrow Area No. 4	5,819,290.08	594,718.23	937.80	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-H5	-	Borrow Area No. 4	5,819,392.03	594,715.44	939.40	5.0	N	Y	N
1997	Knight Piesold	TP97-BA4-H6	-	Borrow Area No. 4	5,819,491.89	594,714.04	941.30	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-H7	-	Borrow Area No. 4	5,819,591.75	594,711.25	942.80	6.2	N	Y	N
1997	Knight Piesold	TP97-BA4-H8	-	Borrow Area No. 4	5,819,695.11	594,710.55	944.10	5.4	N	Y	N
1997	Knight Piesold	TP97-BA4-H9	-	Borrow Area No. 4	5,819,795.67	594,707.06	947.80	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-I4	-	Borrow Area No. 4	5,819,290.08	594,813.20	936.40	5.1	N	Y	N
1997	Knight Piesold	TP97-BA4-I6	-	Borrow Area No. 4	5,819,493.29	594,811.11	936.90	6.0	N	Y	N
1997	Knight Piesold	TP97-BA4-I7	-	Borrow Area No. 4	5,819,594.55	594,808.32	937.20	5.8	N	Y	N
1997	Knight Piesold	TP97-BA4-I8	-	Borrow Area No. 4	5,819,695.11	594,805.52	939.90	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-I9	-	Borrow Area No. 4	5,819,796.36	594,804.13	942.45	5.3	N	Y	N
1997	Knight Piesold	TP97-BA4-J8	Hitachi EX270	Borrow Area No. 4	5,819,695.80	594,903.99	934.41	5.1	N	Y	N
1997	Knight Piesold	TP97-BA4-J9	Hitachi EX270	Borrow Area No. 4	5,819,799.86	594,901.19	936.66	5.3	N	Y	N
1997	Knight Piesold	TP97-PETP-1	-	Perimeter Embankment	5,819,588.32	595,551.16	-	5.4	N	Y	N
1997	Knight Piesold	TP97-PETP-2	-	Perimeter Embankment	5,819,653.52	595,451.18	-	5.2	N	Y	N
1997	Knight Piesold	TP97-PETP-3	-	Corner 1 Embankment	5,819,796.98	595,281.64	-	5.1	N	Y	N
1997	Knight Piesold	TP97-PETP-4	-	Corner 1 Embankment	5,819,962.17	595,014.30	-	5.0	N	Y	N
1998	Knight Piesold	TP98-BA2-1	-	Borrow Area No. 2	5,818,449.41	596,433.45	-	-	-	N	N
1998	Knight Piesold	TP98-BA2-2	-	Borrow Area No. 2	5,818,548.63	596,463.71	-	-	-	N	N
1998	Knight Piesold	TP98-BA2-3	-	Borrow Area No. 2	5,818,541.68	596,361.52	-	-	-	N	N
1998	Knight Piesold	TP98-BA2-5	-	Borrow Area No. 2	5,818,640.91	596,247.41	-	-	-	N	N
1998	Knight Piesold	PRT98-01	-	Main Embankment	-	-	-	-	-	N	N
1998	Knight Piesold	PRT98-02	-	Main Embankment	-	-	-	-	-	N	N
1998	Knight Piesold	PRT98-03	-	Main Embankment	-	-	-	-	-	N	N
2014	KCB	TP14-01	Komatsu PC 400 LC	Dam Breach Area	5,819,966.80	595,121.70	931.00	-	N	N	N
2014	BGC	BGC-TP-2014	-	Corner 1 Embankment	5,820,252.50	594,927.20	932.14	-	-	N	Y
2023	WSP	TP23-01	CAT 336E Excavator	Downstream of Perimeter Embankment Buttress at Corner 1	5,820,035.00	595,465.00	923.4	5.7	N	Y	N
2023	WSP	TP23-02	CAT 336E Excavator	Downstream of Perimeter Embankment Buttress at Corner 1	5,820,089.00	595,408.00	923.5	6	N	Y	N
2023	WSP	TP23-03	CAT 336E Excavator	Downstream of Perimeter Embankment Buttress at Corner 1	5,820,127.00	595,350.00	924.7	6.5	N	Y	N
2023	WSP	TP23-C5-01	Mechanical Excavation	Perimeter Embankment Abutment	5,820,023.90	594,424.60	967.6	4.2	Y	Y	N
2023	WSP	TP23-C5-02	Mechanical Excavation	Perimeter Embankment Abutment	5,820,013.00	594,385.40	968.4	4.2	Y	Y	N
2023	WSP	TP23-C5-03	Mechanical Excavation	Perimeter Embankment Abutment	5,819,996.10	594,371.30	968.9	4	N	Y	N
2023	WSP	TP23-C5-04	Mechanical Excavation	Perimeter Embankment Abutment	5,819,958.40	594,332.50	972.3	4.2	N	Y	N
2023	WSP	TP23-C5-05	Mechanical Excavation	-	5,819,924.50	594,297.50	976.5	4	N	Y	N
2023	WSP	TP23-C5-06	Mechanical Excavation	-	5,819,944.00	594,252.30	979.2	2.55	Y	Y	N
2023	WSP	TP23-C5-07	Mechanical Excavation	-	5,819,885.60	594,292.80	979.3	4	N	Y	N
2023	WSP	TP23-C5-08	Mechanical Excavation	-	5,819,894.70	594,328.40	974.9	4	N	Y	N
2023	WSP	TP23-C5-17	CAT 336E Excavator	Perimeter Embankment Abutment	5,820,025.00	594,407.00	967.4	3.7	Y	Y	N
2023	WSP	TP23-C5-18	CAT 336E Excavator	Perimeter Embankment Abutment	5,820,008.00	594,350.00	969.3	3.7	N	Y	N
2023	WSP	TP23-C5-19	CAT 336E Excavator	Perimeter Embankment Abutment	5,819,982.00	594,357.00	969.1	4.5	N	Y	N

Table C3: Summary of Cone Penetration Tests

Year	Consultant	CPT Sounding	Method(s)	General Location Description	Coordinates		Ground Elevation (m)	Start Depth (m)	Completion Depth (m)	Intermediate Drill Outs? (Y/N)	Record of CPT in Database?	CPT on Figure 01?	CPT on Figure 02?
					Northing (m)	Easting (m)							
1996	Knight Piesold	CPT96-1	SCPTu	Main Embankment	5,818,475.71	595,586.23	-	0.00	9.70	N	Y	Y	N
1996	Knight Piesold	CPT96-2	CPTu	Main Embankment	5,818,405.37	595,581.55	-	0.00	9.60	N	Y	Y	N
1996	Knight Piesold	CPT96-3	CPTu	Main Embankment	5,818,538.81	595,593.97	-	0.00	10.85	N	Y	Y	N
1996	Knight Piesold	CPT96-4	CPTu	Main Embankment	5,818,478.56	595,515.80	-	0.00	11.50	N	Y	Y	N
1996	Knight Piesold	CPT96-5	CPTu	Main Embankment	5,818,464.00	595,664.61	-	0.00	10.00	N	Y	Y	N
1996	Knight Piesold	PRW96-1	CPT	Main Embankment	-	-	-	0.00	7.65	N	Y	N	N
1996	Knight Piesold	PRW96-2 (4)	CPTu	Main Embankment	-	-	-	0.00	11.80	Y	Y	N	N
1996	Knight Piesold	PRW96-2 (4A)	SCPTu	Main Embankment	-	-	-	7.70	15.85	N	Y	N	N
1996	Knight Piesold	PRW96-3	CPTu	Main Embankment	-	-	-	0.00	8.25	N	Y	N	N
1996	Knight Piesold	PRW96-4	CPTu	Main Embankment	-	-	-	0.00	10.25	N	Y	N	N
2014	The Panel	CPT14-101	CPTu	Dam Breach Area	5,819,824.96	595,337.17	933.02	-	17.13	Y	Y	N	Y
2014	The Panel	CPT14-102	CPTu	Dam Breach Area	5,819,832.38	595,327.32	932.48	-	13.05	N	Y	N	Y
2014	The Panel	RCPT14-103	RCPTu	Dam Breach Area	5,819,863.30	595,298.44	930.58	-	9.43	N	Y	N	Y
2014	The Panel	RCPT14-104	RCPTu	Dam Breach Area	5,819,888.67	595,258.02	931.74	-	12.53	N	Y	N	Y
2014	The Panel	RCPT14-105	RCPTu	Dam Breach Area	5,819,919.38	595,224.14	931.61	0.00	12.28	N	Y	N	Y
2014	The Panel	RCPT14-106	RCPTu	Dam Breach Area	5,819,998.38	595,141.52	928.65	0.00	13.15	N	Y	N	Y
2014	The Panel	RCPT14-107	RCPTu	Dam Breach Area	5,820,013.00	595,126.70	928.41	0.00	14.20	N	Y	N	Y
2014	The Panel	RCPT14-108	RCPTu	Dam Breach Area	5,820,015.85	595,107.30	928.26	0.00	12.75	N	Y	N	Y
2014	The Panel	RCPT14-108B	RCPTu	Dam Breach Area	5,820,014.58	595,106.67	928.44	0.00	15.88	N	Y	N	Y
2014	The Panel	RCPT14-109	RCPTu	Dam Breach Area	5,820,024.43	595,087.57	928.63	0.00	16.15	N	Y	N	Y
2014	The Panel	RCPT14-110	RCPTu	Dam Breach Area	5,820,042.87	595,093.88	928.65	0.00	15.98	N	Y	N	Y
2014	The Panel	RCPT14-111	RCPTu	Dam Breach Area	5,820,044.92	595,116.91	928.41	0.00	14.00	N	Y	N	Y
2014	The Panel	RCPT14-112	RCPTu	Dam Breach Area	5,820,029.00	595,146.40	928.63	0.00	11.70	N	Y	N	Y
2014	The Panel	RCPT14-113	RCPTu	Dam Breach Area	5,820,013.48	595,153.78	929.17	0.00	11.93	N	Y	N	Y
2014	The Panel	RCPT14-114	RCPTu	Dam Breach Area	5,819,979.00	595,062.50	930.61	0.00	1.25	N	Y	N	Y
2014	The Panel	RCPT14-114B	RCPTu	Dam Breach Area	5,819,979.00	595,062.60	930.63	-	14.73	N	Y	N	Y
2014	The Panel	RCPT14-115	RCPTu	Dam Breach Area	5,820,011.00	595,075.90	929.11	0.00	13.00	N	Y	N	Y
2014	KCB	CPT14-01	RSCPTu	Dam Breach Area	5,819,871.83	595,252.96	931.29	2.83	14.68	Y	Y	N	Y
2014	KCB	CPT14-02	RSCPTu	Dam Breach Area	5,819,956.83	595,200.65	933.03	9.48	16.60	Y	Y	N	Y
2014	KCB	CPT14-03	RSCPTu	Dam Breach Area	5,819,937.31	595,129.86	932.47	5.38	20.53	N	Y	N	Y
2014	KCB	CPT14-04	RSCPTu	Dam Breach Area	5,819,912.66	595,105.56	932.27	5.43	17.25	N	Y	N	Y
2014	KCB	CPT14-05	RCPTu	Dam Breach Area	5,819,924.42	595,188.02	937.43	-	5.80	-	N	N	Y
2014	KCB	CPT14-05A	RSCPTu	Dam Breach Area	5,819,924.42	595,188.02	937.43	13.45	17.60	N	Y	N	Y
2014	KCB	CPT14-06	RSCPTu	Dam Breach Area	5,819,920.26	595,177.07	937.76	9.68	20.23	Y	Y	N	Y
2014	KCB	CPT14-06A	RCPTu	Dam Breach Area	5,819,922.37	595,176.22	937.71	10.70	18.10	N	Y	N	Y
2014	KCB	CPT14-07	RSCPTu	Dam Breach Area	5,819,902.21	595,053.58	931.58	6.13	14.18	N	Y	N	Y
2014	KCB	CPT14-08	RSCPTu	Dam Breach Area	5,819,890.40	595,169.41	947.50	21.23	28.88	N	Y	N	Y
2014	KCB	CPT14-10	RCPTu	Dam Breach Area	5,819,967.55	595,151.21	932.24	7.63	16.28	Y	Y	N	N
2014	KCB	CPT14-10A	RSCPTu	Dam Breach Area	5,819,967.55	595,151.21	932.24	-	11.00	-	N	N	Y
2014	KCB	CPT14-11	RSCPTu	Dam Breach Area	5,819,991.32	595,169.95	931.06	5.65	10.63	N	Y	N	Y
2014	KCB	CPT14-13	RSCPTu	Perimeter Embankment	5,819,767.45	595,409.35	933.41	6.73	22.95	Y	Y	N	Y
2014	KCB	CPT14-14	RSCPTu	Dam Breach Area	5,819,937.03	595,100.52	930.45	3.05	13.98	N	Y	N	Y
2014	KCB	CPT14-15	RSCPTu	Dam Breach Area	5,819,960.89	595,100.02	930.20	3.53	18.83	N	Y	N	Y
2014	KCB	CPT14-16	RSCPTu	Dam Breach Area	5,819,976.38	595,078.31	930.28	8.03	12.48	N	Y	N	Y
2014	KCB	CPT14-16A	RSCPTu	Dam Breach Area	5,819,975.79	595,079.20	930.44	2.33	8.98	N	Y	N	Y
2014	KCB	CPT14-17	RSCPTu	Dam Breach Area	5,819,994.09	595,086.97	929.99	3.48	13.95	Y	Y	N	Y
2014	KCB	CPT14-18	RSCPTu	Dam Breach Area	5,820,025.89	595,012.98	934.84	3.85	11.85	N	Y	N	Y
2014	KCB	CPT14-19	RSCPTu	Dam Breach Area	5,820,043.69	594,886.51	942.67	3.38	7.08	Y	Y	N	Y
2014	KCB	CPT14-21	RSCPTu	Perimeter Embankment	5,819,718.00	595,328.74	971.00	0.00	25.55	Y	Y	N	Y
2014	KCB	CPT14-22	RSCPTu	Dam Breach Area	5,819,981.72	595,124.54	929.77	3.93	18.40	N	Y	N	Y
2016	Golder	CPT16-04	CPTu	Corner 1 Embankment Buttress	5,820,009.00	595,265.00	932.80	8.50	15.80	Y	Y	Y	Y
2016	Golder	CPT16-05	CPTu	Corner 1 Embankment Buttress	5,820,060.00	595,310.00	925.50	3.10	7.60	Y	Y	Y	Y
2016	Golder	CPT16-07	CPTu	Corner 1 Embankment Buttress	5,819,961.00	595,352.00	932.40	9.00	14.80	N	Y	Y	Y
2016	Golder	CPT16-08	CPTu	Corner 1 Embankment Buttress	5,820,015.00	595,378.00	924.40	4.10	7.10	N	Y	Y	Y
2016	Golder	CPT16-09	CPTu	Corner 1 Embankment Buttress	5,819,949.00	595,458.00	923.90	2.10	6.50	N	Y	Y	Y
2016	Golder	CPT16-19	CPTu	South Embankment	5,818,341.00	594,791.00	945.20	9.10	9.50	N	Y	Y	N
2016	Golder	CPT16-20	CPTu	Perimeter Embankment (Tailings)	5,819,411.00	595,562.00	961.20	0.70	31.00	N	Y	Y	N
2016	Golder	CPT16-21	CPTu	Main Embankment (Tailings)	5,818,759.00	595,801.00	964.00	0.80	38.40	N	Y	Y	N
2016	Golder	CPT16-22	CPTu	South Embankment (Tailings)	5,818,489.00	594,836.00	962.90	0.70	24.40	N	Y	Y	N
2021	Golder	CPT21-02	SCPTu	Perimeter Embankment Buttress	5,819,628.37	595,780.62	930.07	15.24	26.20	Y	Y	Y	N
2021	Golder	CPT21-03	SCPTu	Perimeter Embankment Buttress	5,819,542.99	595,924.23	930.45	25.30	40.10	Y	Y	Y	N
2021	Golder	CPT21-06	SCPTu	Perimeter Embankment Buttress	5,819,066.04	596,228.13	946.12	30.73	30.91	N	Y	Y	N
2021	Golder	CPT21-07	SCPTu	Main Embankment Buttress	5,818,649.11	596,018.63	935.90	12.50	35.54	Y	Y	Y	N
2021	Golder	CPT21-08	SCPTu	Main Embankment Buttress	5,818,510.30	595,878.28	930.24	18.63	29.89	N	Y	Y	N
2021	Golder	CPT21-09	SCPTu	Main Embankment Buttress	5,818,304.68	595,544.37	930.53	18.53	25.42	Y	Y	Y	N
2023	WSP	CPT23-01	CPT	Perimeter Embankment Crest at Corner 1	5,819,952.00	595,108.00	970.13	47.24	57.35	N	Y	N	Y
2023	WSP	CPT23-02	CPT	Perimeter Embankment Crest at Corner 1	5,819,940.00	595,125.00	969.78	45.80	59.60	Y	Y	N	Y
2023	WSP	CPT23-03	CPT	Perimeter Embankment Slope at Corner 1	5,819,922.00	595,183.00	958.33	33.48	38.68	Y	Y	N	Y

Table C4 (a): Summary of Monitoring Wells

Year	Consultant	Monitoring Well ID	Borehole	General Location Description	Coordinates		Ground Elevation (m)	Collar Elevation (m)	Screen Interval (m)		Screen Interval (mbgs)		Soil Units	Hydraulic Conductivity Tests		Record of MW in Database?	Location on Figure 01?
					Northing (m)	Easting (m)			From	To	From	To		Method	Hydraulic Conductivity (m/s)		
1989	Knight Piesold	MP89-231	MP89-231	Corner 1 Embankment	5,819,929.90	595,178.85	927.20	-	927.20	892.10	0.0	35.1	See Table B4 (b)	Packer Test	See Table C4 (b)	Y	Y
1989	Knight Piesold	MP89-232	MP89-232	Tailings Basin	5,818,944.44	595,471.80	919.40	-	919.40	904.20	0.0	15.2	See Table B4 (b)	Packer Test	See Table C4 (b)	Y	Y
1989	Knight Piesold	MP89-233	MP89-233	Perimeter Embankment	5,819,358.58	596,015.13	933.90	-	933.90	903.40	0.0	30.5	See Table B4 (b)	Packer Test	See Table C4 (b)	Y	Y
1989	Knight Piesold	MP89-234	MP89-234	Main Embankment	5,818,369.54	595,625.93	909.30	-	909.30	869.70	0.0	39.6	See Table B4 (b)	Packer Test	See Table C4 (b)	Y	Y
1989	Knight Piesold	MP89-235	MP89-235	South Embankment	5,818,356.15	595,016.85	946.20	-	946.20	914.20	0.0	32.0	See Table B4 (b)	Packer Test	See Table C4 (b)	Y	Y
1989	Knight Piesold	MP89-236	MP89-236	Tailings Basin	5,818,961.71	594,395.20	949.00	-	949.00	917.00	0.0	32.0	See Table B4 (b)	Packer Test	See Table C4 (b)	Y	Y
1996	Knight Piesold	GW96-1A	GW96-1A	Corner 1 Embankment	5,819,939.06	595,415.82	927.89	928.49	873.49	868.89	54.4	59.0	Bedrock - Volcanic Conglomerate	-	-	Y	Y
1996	Knight Piesold	GW96-1B	GW96-1B	Corner 1 Embankment	5,819,935.22	595,416.16	927.81	928.41	893.71	889.11	34.1	38.7	gravelly SAND *(Glaciofluvial)*	-	-	Y	Y
1996	Knight Piesold	GW96-2A	GW96-2A	Perimeter Embankment	5,819,449.92	596,065.40	931.42	931.92	879.62	876.52	51.8	54.9	Weathered Bedrock - Conglomerate	2022 Solid Slug	3×10^{-6}	Y	Y
1996	Knight Piesold	GW96-2B	GW96-2B	Perimeter Embankment	5,819,447.08	596,074.73	931.42	932.02	900.62	896.02	30.8	35.4	SAND and GRAVEL *(Glaciofluvial?)*	2022 Solid Slug	4×10^{-4}	Y	Y
1996	Knight Piesold	GW96-3A	GW96-3A	Main Embankment	5,818,308.97	595,768.75	912.06	912.56	863.26	859.46	48.8	52.6	Bedrock - Volcanoclastic Conglomerate	-	-	Y	Y
1996	Knight Piesold	GW96-3B	GW96-3B	Main Embankment	5,818,306.52	595,765.16	912.06	912.56	895.16	892.06	16.9	20.0	SAND *(Glaciofluvial)* overlying SAND and SILT *(Basal Till)*	-	-	Y	Y
1996	Knight Piesold	GW96-4A	GW96-4A	South Embankment	5,818,164.58	595,147.94	940.56	941.26	920.46	915.86	20.1	24.7	Bedrock - Volcanoclastic Conglomerate	-	-	Y	Y
1996	Knight Piesold	GW96-4B	GW96-4B	South Embankment	5,818,162.87	595,151.26	940.46	941.16	936.16	933.26	4.3	7.2	SAND, some gravel *(Glaciofluvial?)*	2022 Solid Slug	2×10^{-6}	Y	Y
1996	Knight Piesold	GW96-5A	GW96-5A	West side of TSF	5,819,626.68	594,330.34	973.55	974.15	958.55	954.15	15.0	19.4	Bedrock - Syenite Intrusive	-	-	Y	Y
1996	Knight Piesold	GW96-5B	GW96-5B	West side of TSF	5,819,629.64	594,329.79	973.44	974.04	969.74	966.74	3.7	6.7	sandy SILT *(Ablation Till)*	-	-	Y	Y
1996	Knight Piesold	GW96-9	GW96-9	Main Embankment	5,818,277.14	595,503.89	916.18	916.78	912.18	910.38	4.0	5.8	SAND *(Glaciofluvial)* overlying SILT *(Glaciolacustrine)*	-	-	Y	Y
2000	Knight Piesold	GW00-1A	GW00-1A	South Embankment	5,818,476.10	594,367.95	939.19	940.02	924.25	918.16	14.9	21.0	Bedrock - Volcanic, fractured	-	-	Y	Y
2000	Knight Piesold	GW00-1B	GW00-1B	South Embankment	5,818,475.85	594,371.11	939.20	940.05	934.72	928.62	4.5	10.6	SILT Till with SAND interbed *(Basal Till)*	2022 Solid Slug	3×10^{-6}	Y	Y
2000	Knight Piesold	GW00-2A	GW00-2A	South Embankment	5,818,337.64	594,651.69	943.42	944.17	927.97	921.87	15.5	21.6	Bedrock - Volcanic	-	-	Y	Y
2000	Knight Piesold	GW00-2B	GW00-2B	South Embankment	5,818,336.36	594,657.64	943.43	944.39	935.84	932.79	7.6	10.6	sandy SILT Till overlying Weathered Bedrock	-	-	Y	Y
2000	Knight Piesold	GW00-3A	GW00-3A	South Embankment	5,818,237.66	594,899.91	943.34	944.04	925.14	919.05	18.2	24.3	Weathered Bedrock	-	-	Y	Y
2000	Knight Piesold	GW00-3B	GW00-3B	South Embankment	5,818,238.09	594,896.22	943.06	943.79	935.50	929.40	7.6	13.7	SILT Till with SILT / fine SAND interbed *(Basal Till)*	2022 Solid Slug	8×10^{-7}	Y	Y
2011	AMEC	GW11-2A	GW11-2A	North of TSF	5,821,031.81	594,939.05	934.40	935.15	908.20	905.10	26.2	29.3	Weathered Bedrock	-	-	Y	N
2011	AMEC	GW11-2B	GW11-2B	North of TSF	5,821,029.90	594,937.74	934.47	935.24	923.37	920.27	11.1	14.2	sandy SILT *(Till)* overlying SILT *(Glaciofluvial)*	-	-	Y	N
2014	-	GW14-01	GW14-01	Northwest side of TSF	5,819,742.90	593,765.90	1036.30	-	-	-	-	-	Bedrock	-	-	N	Y
2016	Golder	GW16-2A	GW16-2A	Perimeter Embankment	5,819,731.19	595,831.15	925.10	925.90	876.50	873.50	48.6	51.6	sandy SILTY GRAVEL *(Glaciofluvial)*	Pneumatic	8×10^{-4}	Y	Y
2016	Golder	GW16-2B	GW16-2B	Perimeter Embankment	5,819,734.31	595,832.84	924.95	925.52	897.72	894.72	27.2	30.2	SAND and GRAVEL *(Glaciofluvial)*	Pneumatic	2×10^{-4}	Y	Y
2016	Golder	GW16-3A	GW16-3A	Main Embankment	5,818,752.04	596,335.81	938.19	938.91	900.61	897.61	37.6	40.6	Weathered Bedrock - gravelly sandy SILTY CLAY	Recovery	$<10^{-10}$	Y	Y
2016	Golder	GW16-3B	GW16-3B	Main Embankment	5,818,757.46	596,337.84	938.35	939.00	910.90	907.90	27.4	30.4	SILTY SAND and GRAVEL	Solid Slug	8×10^{-6}	Y	Y
2016	Golder	GW16-4A	GW16-4A	Main Embankment	5,818,106.62	595,491.16	922.16	922.90	908.30	905.30	13.9	16.9	Weathered Bedrock - CLAYEY SILT and SAND	Recovery	1×10^{-7}	Y	Y
2016	Golder	GW16-4B	GW16-4B	Main Embankment	5,818,109.50	595,489.47	922.26	922.97	914.07	913.17	8.2	9.1	SILTY SAND *(Ablation Till)*	Solid Slug	2×10^{-5}	Y	Y
2016	Golder	GW16-5A	GW16-5A	South Embankment	5,818,539.05	594,207.62	963.64	964.29	940.49	937.49	23.2	26.2	Inferred Competent Bedrock	Solid Slug	5×10^{-6}	Y	Y
2016	Golder	GW16-5B	GW16-5B	South Embankment	5,818,541.45	594,206.42	963.91	964.57	947.47	942.87	16.4	21.0	Inferred Competent Bedrock	Recovery	2×10^{-7}	Y	Y
2021	Golder	GW21-06	CPT21-06	Perimeter Embankment Buttress	5,819,066.00	596,228.05	946.12	947.08	912.42	910.87	33.7	35.3	Inferred SAND and GRAVEL *(Basal Till)*	2022 Solid Slug	1×10^{-5}	Y	Y
2021	Golder	GW21-09	GA21-09	Main Embankment Buttress	5,818,304.61	595,544.33	930.53	931.41	914.42	912.85	16.1	17.7	sandy SILTY CLAY / SILT and SAND *(Basal Till)*	2022 Solid Slug	1×10^{-6}	Y	Y
2022	Golder	GW22-01	GA22-01	Corner 1 Embankment Buttress	5,820,058.76	595,034.32	940.84	941.57	920.72	919.20	20.1	21.6	SILTY SAND / gravelly SAND *(Glaciofluvial)*	-	-	Y	Y

Functioning monitoring wells installed around the TSF.

Table C4 (b): Summary of Wireline Packer Test Results (IMC 1990 - Table 4-14)

TABLE 4-14
IMPERIAL METALS CORPORATION
MT. POLLEY PROJECT

TAILINGS AREA B SITE INVESTIGATION
SUMMARY OF WIRELINE PACKER PERMEABILITY TEST RESULTS

Hole No.	Depth Interval (m)	Permeability (cm/s)	Material Description
MP89-231	9 to 12	6.4×10^{-6}	Overburden
	30 to 37	1.6×10^{-6}	Soft Volcanics
	37 to 43	2.9×10^{-7}	Competent Rock
MP89-232	15 to 18	7.7×10^{-6}	Overburden
	32 to 37	3.2×10^{-6}	Fractured Volcanics
	43 to 46	1.0×10^{-5}	Competent Rock
MP89-233	12 to 18	1.1×10^{-5}	Overburden
	30 to 37	2.2×10^{-5}	Soft Rock
	37 to 46	1.6×10^{-5}	Broken Rock
	49 to 55	1.7×10^{-5}	
MP89-234	6 to 12	1.4×10^{-5}	Overburden
	30 to 37	3.2×10^{-7}	Competent Bedrock
	46 to 49	3.3×10^{-6}	Competent Bedrock
MP89-235	6 to 12	5.1×10^{-4}	Heavily Fractured Bedrock at Contact with Overburden
	12 to 18	8.6×10^{-8}	Very Competent Bedrock
	18 to 30	4.0×10^{-7}	Competent Bedrock
	30 to 43	1.1×10^{-5}	Slightly Fractured Bedrock
MP89-236	8 to 12	2.7×10^{-5}	Bedrock
	14 to 24	2.7×10^{-6}	Bedrock
	24 to 37	2.0×10^{-6}	Bedrock
	35 to 46	7.7×10^{-7}	Bedrock

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
1989	Knight Piesold	TPB-01	Main Embankment	Grab	-	-		-		-	Glacial Till	-	13.7	CL	29	19	10	-0.53	CL	-	-	-	-	-	-	3.0	14.0	67.0	16.0	0.002	-
1989	Knight Piesold	TPB-13,14,16	South and Main Embankment	Grab	-	-		-		-	Glacial Till	2.76	25.1	CL/CI	30	16	14	0.65	CL/CI	-	-	-	-	1935	13.3	1.60E-10	1.0	17.0	61.0	21.0	0.002	-
1995	Knight Piesold	TP95-18	Tailings / Reclaim Pipeline Route	Grab	-	1.40		990.60		990.60	Glacial Till	-	13.8	-	27	13	14	0.06	CL	-	-	-	-	2130	10.1	-	38.0	36.0	19.0	7.0	0.002	-
1995	Knight Piesold	TP95-27	Perimeter Embankment	Grab	-	3.80		926.20		926.20	Glacial Till	2.73	11.1	-	22	14	8	-0.36	CL	-	-	-	-	2200	8.0	4.00E-10	19.0	37.0	33.0	11.0	0.002	TX
1995	Knight Piesold	TP95-31	Borrow Area No. 2	Grab	-	2.20		936.80		936.80	Glacial Till	-	11.0	-	22	14	8	-0.38	CL	-	-	-	-	2200	7.6	6.00E-10	41.0	27.0	25.0	7.0	0.002	-
1995	Knight Piesold	TP95-35	Taillings Basin	Grab	-	5.40		911.60		911.60	Glaciolacustrine[1]	2.78	16.5	CL-ML	21	14	7	0.36	CL-ML	-	-	-	-	-	-	7.00E-09	2.0	22.0	65.0	11.0	0.002	-
1995	Knight Piesold	TP95-37	Taillings Basin	Grab	-	1.00		937.00		937.00	Glacial Till	-	18.8	-	27	16	11	0.25	CL	-	-	-	-	-	-	-	14.0	40.0	35.0	11.0	0.002	TX
1995	Knight Piesold	TP95-38	Main Embankment	Grab	-	6.20		908.80		908.80	Glaciolacustrine[1]	2.79	28.4	CI	33	19	14	0.67	CI	-	-	-	-	-	-	3.00E-09	3.0	6.0	73.0	18.0	0.002	-
1995	Knight Piesold	TP95-39	Main Embankment	Grab	-	7.00		911.00		911.00	Glaciolacustrine[1]	2.76	28.5	-	-	-	-	-	-	-	-	-	-	-	-	2.00E-08	0.0	40.0	46.0	14.0	0.002	TX
1996	Knight Piesold	96-45	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-1A	2.40	2.70	-	-	-	Glacial Till	2.74	8.9	-	21	15	6	-1.02	CL-ML	-	-	-	-	-	-	-	46.1	26.6	24.8	2.5	0.002	-
1996	Knight Piesold	96-45	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-1B	3.60	3.90	-	-	-	Glacial Till	2.73	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	32.7	25.4	33.9	8.0	0.002	-
1996	Knight Piesold	96-46	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-2A	0.30	0.60	-	-	-	Glacial Till	2.72	12.8	-	-	-	-	-	-	-	-	2025	10.2	-	-	-	15.7	36.2	39.1	9.0	0.002	-
1996	Knight Piesold	96-46	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-2B	2.00	3.00	-	-	-	Glacial Till	2.73	11.2	-	25	15	10	-0.38	CL	-	-	2083	10.5	-	-	-	21.5	29.0	36.5	13.0	0.002	-
1996	Knight Piesold	96-46	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-2C	2.50	3.10	-	-	-	Glacial Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-46	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-2D	3.60	4.10	-	-	-	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-46	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-2E	5.00	5.30	-	-	-	Glacial Till	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-47	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-3A	1.00	2.00	-	-	-	Glacial Till	2.74	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	21.7	35.0	35.8	7.5	0.002	-
1996	Knight Piesold	96-48	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-4A	0.00	0.70	-	-	-	Glacial Till	-	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-48	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-4B	1.00	2.00	-	-	-	Glacial Till	-	10.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-48	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-4C	2.00	3.00	-	-	-	Glacial Till	2.73	10.5	-	-	-	-	-	-	-	-	2070	10.5	-	-	-	14.8	35.1	44.1	6.0	0.002	-
1996	Knight Piesold	96-48	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-4D	4.00	5.00	-	-	-	Glacial Till	-	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-49	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-5A	2.00	3.00	-	-	-	Glacial Till	2.73	11.0	-	24	15	9	-0.44	CL	-	-	2083	9.5	-	-	-	22.7	30.9	38.9	7.5	0.002	-
1996	Knight Piesold	96-49	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-5B	3.30	3.60	-	-	-	Glacial Till	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-50	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-6A	0.50	1.50	-	-	-	Glacial Till	2.74	11.8	-	-	-	-	-	-	-	-	2000	11.4	-	-	-	11.5	32.1	48.4	8.0	0.002	-
1996	Knight Piesold	96-50	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-6B	2.20	2.70	-	-	-	Glacial Till	-	11.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-50	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-6C	4.40	4.70	-	-	-	Glacial Till	-	10.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-51	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-7A	3.50	4.50	-	-	-	Glacial Till	2.72	9.3	-	-	-	-	-	-	-	-	2168	8.3	-	-	-	18.9	38.8	34.8	7.5	0.002	-
1996	Knight Piesold	96-51	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-7B	4.50	5.00	-	-	-	Glacial Till	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-52	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-8A	0.30	1.00	-	-	-	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-52	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-8B	1.00	2.00	-	-	-	Glacial Till	-	9.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-52	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-8C	2.50	3.00	-	-	-	Glacial Till	-	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-53	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-9A	1.00	2.00	-	-	-	Glacial Till	-	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-53	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-9B	3.00	4.00	-	-	-	Glacial Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-53	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-9C	4.50	4.90	-	-	-	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-53	Borrow Area No. 3	Grab	C/ME(AB)/(ZS,ZB)-9D	6.00	6.30	-	-	-	Glacial Till	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-54	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-10A	0.20	0.50	-	-	-	Glacial Till	-	14.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-54	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-10B	0.50	1.10	-	-	-	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-54	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-10C	2.00	2.40	-	-	-	Glacial Till	2.75	13.2	-	24	15	9	-0.20	CL	-	-	2025	11.3	-	-	-	15.9	34.4	43.4	6.3	0.002	-
1996	Knight Piesold	96-54	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-10D	3.40	3.60	-	-	-	Glacial Till	-	9.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-55	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-11A	0.10	0.40	-	-	-	Glacial Till	-	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-55	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-11B	0.40	0.85	-	-	-	Glacial Till	-	14.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-55	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-11C	0.85	2.00	-	-	-	Glacial Till	-	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-55	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-11D	2.00	3.00	-	-	-	Glacial Till	-	10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-55	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-11E	3.50	3.70	-	-	-	Glacial Till	-	9.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-55	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-11F	4.00	4.20	-	-	-	Glacial Till	-	11.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-55	Borrow Area No. 2	Grab	C/ME(AB)/(ZS,ZB)-11G	5.00	5.40	-	-	-	Glacial Till	-	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-84	Borrow Area No. 1	Grab	C/ME/ZS-34A	0.00	0.25	-	-	-	Glacial Till	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-84	Borrow Area No. 1	Grab	C/ME/ZS-34B	0.25	0.55	-	-	-	Glacial Till	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-84	Borrow Area No. 1	Grab	C/ME/ZS-34C	0.55	2.00	-	-	-	Glacial Till	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-84	Borrow Area No. 1	Grab	C/ME/ZS-34E	4.80	5.10	-	-	-	Glacial Till	-	12.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-84	Borrow Area No. 1	Grab	C/ME/ZS-34F	5.50	5.70	-	-	-	Glacial Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-85	Borrow Area No. 1	Grab	C/ME/ZS-35A	0.00	0.60	-	-	-	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-85	Borrow Area No. 1	Grab	C/ME/ZS-35B	0.60	2.00	-	-	-	Glacial Till	-	9.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-85	Borrow Area No. 1	Grab	C/ME/ZS-35C	3.00		-		-	Glacial Till	2.72	8.6	-	-	-	-	-	-	-	-	-	-	-	-	-	20.2	33.4	38.9	7.5	0.002	-
1996	Knight Piesold	96-85	Borrow Area No. 1	Grab	C/ME/ZS-35D	4.50		-		-	Glacial Till	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-86	Borrow Area No. 1	Grab	C/ME/ZS-36A	0.00	0.25	-	-	-	Glacial Till	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-86	Borrow Area No. 1	Grab	C/ME/ZS-36B	0.25	0.60	-	-	-	Glacial Till	-	14.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-86	Borrow Area No. 1	Grab	C/ME/ZS-36C	0.60	2.00	-	-	-	Glacial Till	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-86	Borrow Area No. 1	Grab	C/ME/ZS-36D	3.10		-		-	Glacial Till	2.75	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	24.0	29.5	37.5	9.0	0.002	-
1996	Knight Piesold	96-86	Borrow Area No. 1	Grab	C/ME/ZS-36E	4.50		-		-	Glacial Till	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-86	Borrow Area No. 1	Grab	C/ME/ZS-36F	6.00		-		-	Glacial Till	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-86	Borrow Area No. 1	Grab	C/ME/ZS-36G	6.30		-		-	Glacial Till	-	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-87	Borrow Area No. 1	Grab	C/ME/ZS-37A	0.00	0.40	-	-	-	Glacial Till	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-87	Borrow Area No. 1	Grab	C/ME/ZS-37B	0.40	1.00	-	-	-	Glacial Till	-	11.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-87	Borrow Area No. 1	Grab	C/ME/ZS-37C	1.00	2.50	-	-	-	Glacial Till	2.72	11.7	-	-	-	-	-	-	-	-	-	-	-	-	-	21.6	34.7	32.7	11.0	0.002	-
1996	Knight Piesold	96-88	Borrow Area No. 1	Grab	C/ME/ZS-38A	0.30	1.10	-	-	-	Glacial Till	-	14.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-88	Borrow Area No. 1	Grab	C/ME/ZS-38B	1.10	2.00	-	-	-	Glacial Till	2.75	10.2	-	-	-	-	-	-	-	-	-	-	-	-	-	21.5	38.5	33.0	7.0	0.002	-
1996	Knight Piesold	96-88	Borrow Area No. 1	Grab	C/ME/ZS-38C	3.70		-		-	Glacial Till	-	8.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-88	Borrow Area No. 1	Grab	C/ME/ZS-38D	5.00	5.80	-	-	-	Glacial Till	-	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-88	Borrow Area No. 1	Grab	C/ME/ZS-38E	6.00		-		-	Glacial Till	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-89	Borrow Area No. 1	Grab	C/ME/ZS-39A	0.25	1.10	-	-	-	Glacial Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-89	Borrow Area No. 1	Grab	C/ME/ZS-39B	1.10	2.50	-	-	-	Glacial Till	-	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-90	Borrow Area No. 1	Grab	C/ME/ZS-40A	0.50	1.20	-	-	-	Glacial Till	-	13.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-90	Borrow Area No. 1	Grab	C/ME/ZS-40B	1.20	2.50	-	-	-	Glacial Till	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-91	Borrow Area No. 1	Grab	C/ME/ZS-41A	0.00	0.60	-	-	-	Glacial Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-91	Borrow Area No. 1	Grab	C/ME/ZS-41B	0.60	2.00	-	-	-	Glacial Till	-	11.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-91	Borrow Area No. 1	Grab	C/ME/ZS-41C	2.50		-		-	Glacial Till	-	9.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-92	Borrow Area No. 1	Grab	C/ME/ZS-42A	0.50	1.20	-	-	-	Glacial Till	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-92	Borrow Area No. 1	Grab	C/ME/ZS-42B	1.20	2.50	-	-	-	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-93	Borrow Area No. 1	Grab	C/ME/ZS-20			-		-	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	8.2	28.6	48.2	15.0	0.002	-
1996	Knight Piesold	96-94	Borrow Area No. 1	Grab	C/ME/ZS-21	-		-		-	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-95	Borrow Area No. 1	Grab	C/ME/ZS--22A	0.50	1.50	-	-	-	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-95	Borrow Area No. 1	Grab	C/ME/ZS-22B	2.50	3.00	-	-	-	Glacial Till	-	16.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-96	Borrow Area No. 1	Grab	C/ME/ZS-23A	0.50	1.50	-	-	-	Glacial Till	2.75	13.6	CL	28	15	13	-0.11	CL	-	-	1990	12.3	-	-	-	11.4	29.1	44.5	15.0	0.002	-
1996	Knight Piesold	96-96	Borrow Area No. 1	Grab	C/ME/ZS-23B	2.50	3.50	-	-	-	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	12.8	33.5	53.7		-	-
1996	Knight Piesold	96-98	Borrow Area No. 1	Grab	C/ME/ZS-24	0.50	1.50	-	-	-	Glacial Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-99	Borrow Area No. 1	Grab	C/ME/ZS-25	4.00	6.00	-	-	-	Glacial Till	-	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	17.6	28.9	53.5		-	-
1996	Knight Piesold	96-99	Borrow Area No. 1	Grab	C/ME/ZS-26B	5.70	7.30	-	-	-	Glacial Till	-	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	33.9	37.8	28.3		-	-
1996	Knight Piesold	96-101	Borrow Area No. 1	Grab	C/ME/ZS-26A	2.00	3.50	-	-	-	Glacial Till	-	15.5	-	-	-	-	-	-	-	-	-	-	-	-	-	3.8	15.2	81.0		-	-
1996	Knight Piesold	96-102	Borrow Area No. 1	Grab	C/ME/ZS-27A	0.50	2.00	-	-	-	Glacial Till	-	11.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-102	Borrow Area No. 1	Grab	C/ME/ZS-27B	2.00	3.00	-	-	-	Glacial Till	2.73	12.1	ML		Non-Plastic		-	ML	-	-	2000	11.2	-	-	-	9.8	37.8	49.4	3.0	0.002	-
1996	Knight Piesold	96-102	Borrow Area No. 1	Grab	C/ME/ZS-27C	3.00	4.00	-	-	-	Glacial Till	-	8.7	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	48.7	39.3		-	-
1996	Knight Piesold	96-102	Borrow Area No. 1	Grab	C/ME/ZS-27D	4.00	6.00	-	-	-	Glacial Till	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	13.9	47.5	38.6		-	-
1996	Knight Piesold	96-102	Borrow Area No. 1	Grab	C/ME/ZS-27E	6.00	7.00	-	-	-	Glacial Till	-	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-103	Borrow Area No. 1	Grab	C/ME/ZS-28A	1.00	3.00	-	-	-	Glacial Till	2.70	11.8	CL-ML	24	17	7	-0.74	CL-ML	-	-	2030	11.0	-	-	-	9.1	39.4	39.5	12.0	0.002	-
1996	Knight Piesold	96-103	Borrow Area No. 1	Grab	C/ME/ZS-28B	3.00	5.00	-	-	-	Glacial Till	-	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-	10.6	34.2	47.2	8.0	0.002	-
1996	Knight Piesold	96-104	Borrow Area No. 1	Grab	C/ME/ZS-29	0.50	1.20	-	-	-	Glacial Till	-	14.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-105	Borrow Area No. 1	Grab	C/ME/ZS-30A	1.00	3.00	-	-	-	Glacial Till	2.73	10.2	-	22	16	6	-0.97	CL-ML	-	-	2090	9.5	-	-	-	17.3	42.7	32.0	8.0	0.002	-
1996	Knight Piesold	96-105	Borrow Area No. 1	Grab	C/ME/ZS-30B	4.00	6.00	-	-	-	Glacial Till	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-106	Borrow Area No. 1	Grab	C/ME/ZS-31A	0.50	2.00	-	-	-	Glacial Till	2.75	12.7	-	20	14	6	-0.22	CL-ML	-	-	2015	11.0	-	-	-	8.4	51.0	32.6	8.0	0.002	-
1996	Knight Piesold	96-106	Borrow Area No. 1	Grab	C/ME/ZS-31B	4.00	6.00	-	-	-	Glacial Till	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-107	Borrow Area No. 1	Grab	C/ME/ZS-32A	0.10	0.60	-	-	-	Glacial Till	-	14.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-107	Borrow Area No. 1	Grab	C/ME/ZS-32B	1.50	2.50	-	-	-	Glacial Till	2.71	13.1	CL	24	13	11	0.01	CL	-	-	2005	10.9	-	-	-	13.1	34.0	41.9	11.0	0.002	-
1996	Knight Piesold	96-107	Borrow Area No. 1	Grab	C/ME/ZS-32C	4.00	5.80	-	-	-	Glacial Till	-	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-108	Borrow Area No. 1	Grab	C/ME/ZS-33A	0.60	1.50	-	-	-	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-108	Borrow Area No. 1	Grab	C/ME/ZS-33B	1.50	2.00	-	-	-	Glacial Till	-	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-108	Borrow Area No. 1	Grab	C/ME/ZS-33D	4.50	6.00	-	-	-	Glacial Till	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-111	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-1A	0.30	0.50	-	-	-	Glacial Till	-	14.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-111	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-1B	0.80	1.00	-	-	-	Glacial Till	-	15.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-111	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-1C	2.00	4.00	-	-	-	Glacial Till	-	10.2	-	-	-	-	-	-	-	-	-	-	-	-	-	29.9	32.6	37.5		-	-
1996	Knight Piesold	96-111	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-1D	5.00	5.40	-	-	-	Glacial Till	-	10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	23.3	34.5	37.2	5.0	0.002	-
1996	Knight Piesold	96-112	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-2A	0.70	1.00	-	-	-	Glacial Till	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-112	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-2B	3.00	3.50	-	-	-	Glacial Till	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	6.6	38.4	55.0		-	-
1996	Knight Piesold	96-113	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-3A	1.00	1.50	-	-	-	Glacial Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-113	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-3B	2.50	3.00	-	-	-	Glacial Till	-	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-	25.0	36.9	35.1	3.0	0.002	-

https://wsponline.sharepoint.com/sites/GLO-10023g/22514095 Deliverables/002_Issued/034-R-51392-Foundation Characterization Report/

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
1996	Knight Piesold	96-114	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-4A	0.70	1.20	-	-	-	Glacial Till	-	14.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	Knight Piesold	96-114	Perimeter Embankment	Grab	C/ME(FB)/(ZS,ZB)-4B	2.50	3.00	-	-	-	Glacial Till	-	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F8	Borrow Area No. 4	Grab	-	0.70		950.38		950.38	Glacial Till	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F8	Borrow Area No. 4	Grab	-	1.40		949.68		949.68	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F8	Borrow Area No. 4	Grab	-	2.20		948.88		948.88	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F8	Borrow Area No. 4	Grab	-	3.40		947.68		947.68	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F8	Borrow Area No. 4	Grab	-	4.90		946.18		946.18	Glacial Till	-	29.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F9	Borrow Area No. 4	Grab	-	1.00		954.30		954.30	Glacial Till	-	17.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F9	Borrow Area No. 4	Grab	-	1.85		953.45		953.45	Glacial Till	-	13.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F9	Borrow Area No. 4	Grab	-	2.10		953.20		953.20	Glacial Till	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F9	Borrow Area No. 4	Grab	-	3.25		952.05		952.05	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F9	Borrow Area No. 4	Grab	-	4.60		950.70		950.70	Glacial Till	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-F9	Borrow Area No. 4	Grab	-	5.00		950.30		950.30	Glacial Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G4	Borrow Area No. 4	Grab	-	0.70		939.10		939.10	Glacial Till	-	17.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G4	Borrow Area No. 4	Grab	-	2.50		937.30		937.30	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G4	Borrow Area No. 4	Grab	-	3.00		936.80		936.80	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G4	Borrow Area No. 4	Grab	-	4.00		935.80		935.80	Glacial Till	-	14.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G5	Borrow Area No. 4	Grab	-	0.50		940.70		940.70	Glacial Till	-	19.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G5	Borrow Area No. 4	Grab	-	1.60		939.60		939.60	Glacial Till	-	13.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G5	Borrow Area No. 4	Grab	-	3.00		938.20		938.20	Glacial Till	-	14.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G5	Borrow Area No. 4	Grab	-	5.40		935.80		935.80	Glacial Till	-	14.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G6	Borrow Area No. 4	Grab	-	1.60		943.00		943.00	Glacial Till	-	16.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G6	Borrow Area No. 4	Grab	-	3.00		941.60		941.60	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G6	Borrow Area No. 4	Grab	-	5.00		939.60		939.60	Glacial Till	-	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G7	Borrow Area No. 4	Grab	-	0.70		944.66		944.66	Glacial Till	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G7	Borrow Area No. 4	Grab	-	2.05		943.31		943.31	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G7	Borrow Area No. 4	Grab	-	3.25		942.11		942.11	Glacial Till	-	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G7	Borrow Area No. 4	Grab	-	4.00		941.36		941.36	Glacial Till	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G7	Borrow Area No. 4	Grab	-	5.20		940.16		940.16	Glacial Till	-	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G8	Borrow Area No. 4	Grab	-	0.70		947.10		947.10	Glacial Till	-	15.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G8	Borrow Area No. 4	Grab	-	1.20		946.60		946.60	Glacial Till	-	14.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G8	Borrow Area No. 4	Grab	-	1.80		946.00		946.00	Glacial Till	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G8	Borrow Area No. 4	Grab	-	3.70		944.10		944.10	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G8	Borrow Area No. 4	Grab	-	5.00		942.80		942.80	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G9	Borrow Area No. 4	Grab	-	0.80		951.50		951.50	Glacial Till	-	20.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G9	Borrow Area No. 4	Grab	-	1.50		950.80		950.80	Glacial Till	-	13.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G9	Borrow Area No. 4	Grab	-	2.20		950.10		950.10	Glacial Till	-	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G9	Borrow Area No. 4	Grab	-	3.10		949.20		949.20	Glacial Till	-	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-G9	Borrow Area No. 4	Grab	-	4.30		948.00		948.00	Glacial Till	-	13.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H4	Borrow Area No. 4	Grab	-	0.50		937.30		937.30	Glacial Till	-	19.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H4	Borrow Area No. 4	Grab	-	1.40		936.40		936.40	Glacial Till	-	15.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H4	Borrow Area No. 4	Grab	-	2.75		935.05		935.05	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H4	Borrow Area No. 4	Grab	-	5.10		932.70		932.70	Glacial Till	-	12.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H5	Borrow Area No. 4	Grab	-	0.50		938.90		938.90	Glacial Till	-	19.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H5	Borrow Area No. 4	Grab	-	1.50		937.90		937.90	Glacial Till	-	14.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H5	Borrow Area No. 4	Grab	-	2.30		937.10		937.10	Glacial Till	-	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H5	Borrow Area No. 4	Grab	-	4.00		935.40		935.40	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H6	Borrow Area No. 4	Grab	-	1.60		939.70		939.70	Glacial Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H6	Borrow Area No. 4	Grab	-	3.40		937.90		937.90	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H6	Borrow Area No. 4	Grab	-	4.20		937.10		937.10	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H6	Borrow Area No. 4	Grab	-	5.30		936.00		936.00	Glacial Till	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H7	Borrow Area No. 4	Grab	-	0.90		941.90		941.90	Glacial Till	-	16.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H7	Borrow Area No. 4	Grab	-	2.05		940.75		940.75	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H7	Borrow Area No. 4	Grab	-	3.00		939.80		939.80	Glacial Till	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H7	Borrow Area No. 4	Grab	-	4.00		938.80		938.80	Glacial Till	-	13.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H7	Borrow Area No. 4	Grab	-	5.00		937.80		937.80	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H8	Borrow Area No. 4	Grab	-	1.00		943.10		943.10	Glacial Till	-	18.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H8	Borrow Area No. 4	Grab	-	1.70		942.40		942.40	Glacial Till	-	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H8	Borrow Area No. 4	Grab	-	2.50		941.60		941.60	Glacial Till	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H8	Borrow Area No. 4	Grab	-	4.60		939.50		939.50	Glacial Till	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H8	Borrow Area No. 4	Grab	-	5.30		938.80		938.80	Glacial Till	-	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H9	Borrow Area No. 4	Grab	-	0.50		947.30		947.30	Glacial Till	-	18.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H9	Borrow Area No. 4	Grab	-	1.60		946.20		946.20	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H9	Borrow Area No. 4	Grab	-	1.90		945.90		945.90	Glacial Till	-	12.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H9	Borrow Area No. 4	Grab	-	3.70		944.10		944.10	Glacial Till	-	8.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-H9	Borrow Area No. 4	Grab	-	4.40		943.40		943.40	Glacial Till	-	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I4	Borrow Area No. 4	Grab	-	1.30		935.10		935.10	Glacial Till	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I4	Borrow Area No. 4	Grab	-	2.30		934.10		934.10	Glacial Till	-	13.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I4	Borrow Area No. 4	Grab	-	3.10		933.30		933.30	Glacial Till	-	14.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I4	Borrow Area No. 4	Grab	-	3.70		932.70		932.70	Glacial Till	-	13.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I6	Borrow Area No. 4	Grab	-	1.00		935.90		935.90	Glacial Till	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I6	Borrow Area No. 4	Grab	-	2.00		934.90		934.90	Glacial Till	-	11.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I6	Borrow Area No. 4	Grab	-	4.40		932.50		932.50	Glacial Till	-	12.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I6	Borrow Area No. 4	Grab	-	4.40		932.50		932.50	Glaciolacustrine	-	19.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I6	Borrow Area No. 4	Grab	-	5.00		931.90		931.90	Glaciolacustrine	-	26.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I7	Borrow Area No. 4	Grab	-	0.70		936.50		936.50	Glacial Till	-	22.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I7	Borrow Area No. 4	Grab	-	1.30		935.90		935.90	Glacial Till	-	15.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I7	Borrow Area No. 4	Grab	-	2.30		934.90		934.90	Glacial Till	-	13.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I7	Borrow Area No. 4	Grab	-	3.20		934.00		934.00	Glacial Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I7	Borrow Area No. 4	Grab	-	4.60		932.60		932.60	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I7	Borrow Area No. 4	Grab	-	5.20		932.00		932.00	Glacial Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I8	Borrow Area No. 4	Grab	-	0.70		939.20		939.20	Glacial Till	-	17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I8	Borrow Area No. 4	Grab	-	2.00		937.90		937.90	Glacial Till	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I8	Borrow Area No. 4	Grab	-	4.50		935.40		935.40	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I9	Borrow Area No. 4	Grab	-	0.50		941.95		941.95	Glacial Till	-	22.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I9	Borrow Area No. 4	Grab	-	1.70		940.75		940.75	Glacial Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I9	Borrow Area No. 4	Grab	-	3.00		939.45		939.45	Glacial Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I9	Borrow Area No. 4	Grab	-	4.30		938.15		938.15	Glacial Till	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-I9	Borrow Area No. 4	Grab	-	5.10		937.35		937.35	Glacial Till	-	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J8	Borrow Area No. 4	Grab	-	1.00		933.41		933.41	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J8	Borrow Area No. 4	Grab	-	1.50		932.91		932.91	Glacial Till	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J8	Borrow Area No. 4	Grab	-	3.40		931.01		931.01	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J8	Borrow Area No. 4	Grab	-	4.50		929.91		929.91	Glacial Till	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J9	Borrow Area No. 4	Grab	-	0.75		935.91		935.91	Glacial Till	-	19.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J9	Borrow Area No. 4	Grab	-	2.00		934.66		934.66	Glacial Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J9	Borrow Area No. 4	Grab	-	3.40		933.26		933.26	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	Knight Piesold	TP97-BA4-J9	Borrow Area No. 4	Grab	-	4.80		931.86		931.86	Glacial Till	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	Knight Piesold	DH98-BA2-6	Borrow Area No. 2	Grab	-	2.29		-		-	Glacial Till	-	10.9	-	23	12	11	-0.10	CL	-	-	-	-	-	-	-	8.4	48.6	30.3	12.7	0.002	-
1998	Knight Piesold	DH98-BA2-9	Borrow Area No. 2	Grab	-	4.27		-		-	Glacial Till	-	14.5	-	23	12	11	0.23	CL	-	-	-	-	-	-	-	23.1	39.1	24.3	13.5	0.002	-
1998	Knight Piesold	DH98-BA2-11	Borrow Area No. 2	Grab	-	3.81		-		-	Glacial Till	-	10.6	-	20	13	7	-0.34	CL-ML	-	-	-	-	-	-	-	13.7	45.9	27.1	13.3	0.002	-
1998	Knight Piesold	DH98-BA2-16	Main Embankment	Grab	-	1.83		-		-	Glacial Till	-	11.8	CL	25	12	13	-0.02	CL	-	-	-	-	-	-	-	13.0	34.9	33.2	18.9	0.002	-
1998	Knight Piesold	DH98-BA4-1	Borrow Area No. 4	Grab	-	2.74		-		-	Glacial Till	-	11.3	CL	21	12	9	-0.08	CL	-	-	-	-	-	-	-	7.3	37.8	41.7	13.2	0.002	-
1998	Knight Piesold	DH98-BA4-6	Borrow Area No. 4	Grab	-	4.27		-		-	Glacial Till	-	11.0	CL	23	12	11	-0.09	CL	-	-	-	-	-	-	-	7.3	36.0	41.6	15.1	0.002	-
1998	Knight Piesold	DH98-BA4-9	Borrow Area No. 4	Grab	-	1.22		-		-	Glacial Till	-	12.4	CL	22	11	11	0.13	CL	-	-	-	-	-	-	-	1.0	42.0	38.6	18.4	0.002	-
1998	Knight Piesold	DH98-BL-04	South Embankment	Grab	-	1.22		940.98		940.98	Glacial Till	-	13.7	CL	24	14	10	-0.03	CL	-	-	-	-	-	-	-	8.5	39.3	33.8	18.4	0.002	-
1998	Knight Piesold	DH98-BL-08	Tailings Basin	Grab	-	3.66		-		-	Glaciolacustrine	-	46.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	Knight Piesold	DH98-BL-10	Tailings Basin	Grab	-	1.37		-		-	Glacial Till	-	14.0	CL	27	16	11	-0.18	CL	-	-	-	-	-	-	-	0.4	41.7	33.6	24.3	0.002	-
1998	Knight Piesold	DH98-BL-12	South Embankment	Grab	-	1.22		946.78		946.78	Glacial Till	-	13.9	CL	27	14	13	-0.01	CL	-	-	-	-	-	-	-	11.7	35.7	30.8	21.8	0.002	-
1999	Knight Piesold	BH99-12	South Embankment	Grab	BH99-12A	2.59	3.05	943.91	943.45	943.68	Glacial Till	-	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	32.3	61.5		-	-
1999	Knight Piesold	BH99-13	South Embankment	Grab	BH99-13A	2.59	3.05	945.41	944.95	945.18	Glacial Till	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	30.9	27.6	33.0	0.002	-
1999	Knight Piesold	BH99-14	South Embankment	Grab	BH99-14A	2.59	3.05	943.91	943.45	943.68	Glacial Till	-	19.8	-	-	-	-	-	-	-	-	-	-	-	-	-	11.5	30.9	57.6		-	-
1999	Knight Piesold	BH99-16	South Embankment	Grab	BH99-16A	2.59	3.05	941.41	940.95	941.18	Glacial Till	-	13.5	-	-	-	-	-	-	-	-	-	-	-	-	-	8.2	33.7	24.3	33.8	0.002	-
1999	Knight Piesold	BH99-16	South Embankment	Grab	BH99-16B	5.64	6.10	938.36	937.90	938.13	Glacial Till	-	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	18.1	26.2	55.7		-	-
1999	Knight Piesold	BH99-16	South Embankment	Grab	BH99-16C	8.69	9.14	935.31	934.86	935.08	Glacial Till	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	15.3	26.4	58.3		-	-
1999	Knight Piesold	BH99-17	South Embankment	Grab	BH99-17A	2.59	3.05	936.91	936.45	936.68	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	31.3	63.7		-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
1999	Knight Piesold	BH99-24	Tailings Basin	Grab	BH99-24A	2.44	2.90	930.56	930.10	930.33	Glaciolacustrine	-	20.9	-	-	-	-	-	-	-	-	-	-	-	-	6.6	15.1	78.3		-	-
1999	Knight Piesold	BH99-27	Tailings Basin	Grab	BH99-27A	5.33	6.10	928.67	927.90	928.29	Glaciolacustrine	-	21.7	-	-	-	-	-	-	-	-	-	-	-	-	1.8	28.9	69.3		-	-
1999	Knight Piesold	BH99-41	South Embankment	Grab	BH99-41A	2.59	3.05	945.91	945.45	945.68	Glacial Till	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	11.1	34.8	54.1		-	-
1999	Knight Piesold	BH99-42	South Embankment	Grab	BH99-42A	2.59	3.05	944.61	944.15	944.38	Glacial Till	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	11.1	30.8	25.8	32.3	0.002	-
1999	Knight Piesold	BH99-42	South Embankment	Grab	BH99-42B	5.64	6.10	941.56	941.10	941.33	Glacial Till	-	15.4	-	-	-	-	-	-	-	-	-	-	-	-	8.5	30.9	60.6		-	-
1999	Knight Piesold	BH99-43	South Embankment	Grab	BH99-43A	2.59	3.05	944.21	943.75	943.98	Glacial Till	-	13.9	-	-	-	-	-	-	-	-	-	-	-	-	5.1	31.6	63.3		-	-
1999	Knight Piesold	BH99-43	South Embankment	Grab	BH99-43B	5.64	6.10	941.16	940.70	940.93	Glacial Till	-	15.3	-	-	-	-	-	-	-	-	-	-	-	-	6.4	29.8	63.8		-	-
1999	Knight Piesold	BH99-44	South Embankment	Grab	BH99-44A	2.59	3.05	943.61	943.15	943.38	Glacial Till	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	14.2	31.0	54.8		-	-
1999	Knight Piesold	BH99-44	South Embankment	Grab	BH99-44B	5.64	6.10	940.56	940.10	940.33	Glacial Till	-	13.2	-	-	-	-	-	-	-	-	-	-	-	-	22.0	26.6	21.8	29.6	0.002	-
2001	Knight Piesold	DH01-01	Borrow Area No. 2	Grab	DH01-01A	3.05		-		-	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	18.9	37.5	43.6		-	-
2001	Knight Piesold	DH01-02	Borrow Area No. 2	Grab	DH01-02A	3.05		-		-	Glacial Till	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	15.9	39.3	25.9	18.9	0.002	-
2001	Knight Piesold	DH01-02	Borrow Area No. 2	Grab	DH01-02B	6.10		-		-	Glacial Till	-	17.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-02	Borrow Area No. 2	Grab	DH01-02C	9.14		-		-	Glacial Till	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-03	Borrow Area No. 2	Grab	DH01-03A	3.05		-		-	Glacial Till	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	16.7	40.6	42.7		-	-
2001	Knight Piesold	DH01-06	Borrow Area No. 2	Grab	DH01-06A	3.05		-		-	Glacial Till	-	10.7	-	-	-	-	-	-	-	-	-	-	-	-	14.7	36.8	48.5		-	-
2001	Knight Piesold	DH01-07	Borrow Area No. 2	Grab	DH01-07B	6.10		-		-	Glacial Till	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	14.2	40.3	28.9	16.6	0.002	-
2001	Knight Piesold	DH01-08	Borrow Area No. 2	Grab	DH01-08C	9.14		-		-	Glacial Till	-	11.2	-	-	-	-	-	-	-	-	-	-	-	-	12.8	38.6	48.6		-	-
2001	Knight Piesold	DH01-09	Borrow Area No. 2	Grab	DH01-09A	3.05		-		-	Glacial Till	-	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-10	Borrow Area No. 2	Grab	DH01-10B	6.10		-		-	Glacial Till	-	12.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-11	Borrow Area No. 2	Grab	DH01-11C	9.14		-		-	Glacial Till	-	11.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-12	Borrow Area No. 2	Grab	DH01-12A	3.05		-		-	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	19.1	41.4	26.3	13.2	0.002	-
2001	Knight Piesold	DH01-12	Borrow Area No. 2	Grab	DH01-12B	6.10		-		-	Glacial Till	-	20.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-13	Borrow Area No. 2	Grab	DH01-13A	3.05		-		-	Glacial Till	-	10.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-14	Borrow Area No. 2	Grab	DH01-14A	3.05		-		-	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-15	Borrow Area No. 2	Grab	DH01-15A	3.05		-		-	Glacial Till	-	8.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-16	Borrow Area No. 2	Grab	DH01-16B	6.10		-		-	Glacial Till	-	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-17	Borrow Area No. 2	Grab	DH01-17A	3.05		-		-	Glacial Till	-	11.0	-	-	-	-	-	-	-	-	-	-	-	-	18.6	36.9	25.0	19.5	0.002	-
2001	Knight Piesold	DH01-18	Borrow Area No. 2	Grab	DH01-18A	3.05		-		-	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-19	Borrow Area No. 2	Grab	DH01-19B	6.10		-		-	Glacial Till	-	11.0	-	-	-	-	-	-	-	-	-	-	-	-	12.0	48.8	39.2		-	-
2001	Knight Piesold	DH01-20	Borrow Area No. 2	Grab	DH01-20A	3.05		-		-	Glacial Till	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	9.7	41.2	49.1		-	-
2001	Knight Piesold	DH01-21	Borrow Area No. 2	Grab	DH01-21B	6.10		-		-	Glacial Till	-	10.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-23	Borrow Area No. 2	Grab	DH01-23A	3.05		-		-	Glacial Till	-	11.3	-	-	-	-	-	-	-	-	-	-	-	-	3.3	46.1	50.6		-	-
2001	Knight Piesold	DH01-24	Borrow Area No. 2	Grab	DH01-24A	3.05		-		-	Glacial Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-25	Borrow Area No. 2	Grab	DH01-25A	3.05		-		-	Glacial Till	-	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-26	Borrow Area No. 2	Grab	DH01-26A	3.05		-		-	Glacial Till	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-26	Borrow Area No. 2	Grab	DH01-26B	6.10		-		-	Glacial Till	-	10.2	-	-	-	-	-	-	-	-	-	-	-	-	6.4	39.4	54.2		-	-
2001	Knight Piesold	DH01-29	Borrow Area No. 2	Grab	DH01-29A	3.05		-		-	Glacial Till	-	8.0	-	-	-	-	-	-	-	-	-	-	-	-	29.7	42.7	27.6		-	-
2001	Knight Piesold	DH01-30	Borrow Area No. 2	Grab	DH01-30A	3.05		-		-	Glacial Till	-	10.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-31	Borrow Area No. 2	Grab	DH01-31A	3.05		-		-	Glacial Till	-	10.7	-	-	-	-	-	-	-	-	-	-	-	-	7.2	39.9	52.9		-	-
2001	Knight Piesold	DH01-32	Borrow Area No. 2	Grab	DH01-32A	3.05		-		-	Glacial Till	-	10.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-33	Borrow Area No. 2	Grab	DH01-33B	6.10		-		-	Glacial Till	-	9.8	-	-	-	-	-	-	-	-	-	-	-	-	13.3	36.3	50.4		-	-
2001	Knight Piesold	DH01-39	Borrow Area No. 2	Grab	DH01-39A	3.05		-		-	Glacial Till	-	8.6	-	-	-	-	-	-	-	-	-	-	-	-	26.0	48.5	25.5		-	-
2001	Knight Piesold	DH01-39	Borrow Area No. 2	Grab	DH01-39B	6.10		-		-	Glacial Till	-	8.4	-	-	-	-	-	-	-	-	-	-	-	-	22.8	46.2	31.0		-	-
2001	Knight Piesold	DH01-40	Borrow Area No. 2	Grab	DH01-40A	3.05		-		-	Glacial Till	-	11.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-41	Borrow Area No. 2	Grab	DH01-41A	3.05		-		-	Glacial Till	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-42	Borrow Area No. 2	Grab	DH01-42A	3.05		-		-	Glacial Till	-	11.5	-	-	-	-	-	-	-	-	-	-	-	-	14.8	38.7	30.3	16.2	0.002	-
2001	Knight Piesold	DH01-43	Borrow Area No. 2	Grab	DH01-43A	3.05		-		-	Glacial Till	-	10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-51	Borrow Area No. 2	Grab	DH01-51A	3.05		-		-	Glacial Till	-	10.3	-	-	-	-	-	-	-	-	-	-	-	-	9.0	39.0	52.0		-	-
2001	Knight Piesold	DH01-59	Borrow Area No. 3	Grab	DH01-59A	3.05		-		-	Glacial Till	-	12.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-60	Borrow Area No. 3	Grab	DH01-60B	6.10		-		-	Glacial Till	-	10.8	-	-	-	-	-	-	-	-	-	-	-	-	11.9	34.6	53.5		-	-
2001	Knight Piesold	DH01-61	Borrow Area No. 2	Grab	DH01-61A	3.05		-		-	Glacial Till	-	11.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-62	Borrow Area No. 3	Grab	DH01-62A	3.05		-		-	Glacial Till	-	10.2	-	-	-	-	-	-	-	-	-	-	-	-	19.6	37.0	43.4		-	-
2001	Knight Piesold	DH01-64	Borrow Area No. 3	Grab	DH01-64A	3.05		-		-	Glacial Till	-	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-65	Borrow Area No. 3	Grab	DH01-65A	3.05		-		-	Glacial Till	-	13.1	-	-	-	-	-	-	-	-	-	-	-	-	8.9	35.9	35.9	19.3	0.002	-
2001	Knight Piesold	DH01-66	Borrow Area No. 2	Grab	DH01-66A	3.05		-		-	Glacial Till	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	Knight Piesold	DH01-67	-	Grab	DH01-67A	3.05		-		-	Glacial Till	-	13.9	-	-	-	-	-	-	-	-	-	-	-	-	0.5	30.5	44.1	24.9	0.002	-
2001	Knight Piesold	DH01-74	-	Grab	DH01-74A	3.05		-		-	Glacial Till	-	14.2	-	-	-	-	-	-	-	-	-	-	-	-	1.7	32.8	65.5		-	-
2001	Knight Piesold	DH01-75	-	Grab	DH01-75A	3.05		-		-	Glacial Till	-	14.6	-	-	-	-	-	-	-	-	-	-	-	-	0.9	30.8	41.4	26.9	0.002	-
2001	Knight Piesold	DH01-77	-	Grab	DH01-77A	3.05		-		-	Glacial Till	-	17.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	Knight Piesold	SI06-01	Main Embankment	Split Spoon	SI06-01-02	10.06		907.04		907.04	-	-	16.0	CL-ML	20	16	4	0.00	CL-ML	-	-	-	-	-	-	0.9	27.5	54.3	17.3	0.002	-
2006	Knight Piesold	SI06-01	Main Embankment	Thin-walled Open Tube	SI06-01-Shelby 1	13.11		903.99		903.99	-	-	30.7	ML	39	26	13	0.36	ML	-	1861	-	-	-	-	0.0	1.2	86.3	12.5	0.002	-
2006	Knight Piesold	SI06-02	Main Embankment	Split Spoon	SI06-02-01	8.53		908.57		908.57	-	-	24.2	CI	44	26	18	-0.10	CI	-	-	-	-	-	-	0.0	1.2	61.3	37.5	0.002	-
2006	Knight Piesold	SI06-02	Main Embankment	Thin-walled Open Tube	SI06-02-Shelby 1	11.73		905.37		905.37	-	-	40.3	CH/MH	53	29	24	0.47	CH/MH	-	-	-	-	-	-	0.0	2.2	45.3	52.5	0.002	Incremental Consolidation
2006	Knight Piesold	SI06-02	Main Embankment	Thin-walled Open Tube	SI06-02-Shelby 2	16.31	16.92	900.79	900.18	900.49	Glacial Till	-	27.3	ML		Non-Plastic		-	ML	-	1583	-	-	-	-	0.0	1.0	96.0	3.0	0.002	-
2006	Knight Piesold	SI06-03	Main Embankment	Split Spoon	SI06-03-02A	8.53		909.17		909.17	-	-	13.6	CL-ML	24	17	7	-0.49	CL-ML	-	-	-	-	-	-	19.0	19.0	48.8	13.2	0.002	-
2006	Knight Piesold	SI06-03	Main Embankment	Split Spoon	SI06-03-02B	8.76		908.94		908.94	-	-	14.4	CL	28	18	10	-0.36	CL	-	-	-	-	-	-	4.3	6.0	66.9	22.8	0.002	-
2006	Knight Piesold	SI06-03	Main Embankment	Split Spoon	SI06-03-04	11.58		906.12		906.12	-	-	23.3	CI	37	24	13	-0.05	CI	-	-	-	-	-	-	1.3	5.6	66.0	27.1	0.002	-
2006	Knight Piesold	SI06-03	Main Embankment	Split Spoon	SI06-03-06	14.63		903.07		903.07	-	-	25.9	CI	42	24	18	0.11	CI	-	-	-	-	-	-	0.0	1.2	68.8	30.0	0.002	-
2006	Knight Piesold	SI06-03	Main Embankment	Split Spoon	SI06-03-08	17.68		900.02		900.02	-	-	23.6	ML		Non-Plastic		-	ML	-	-	-	-	-	-	0.0	1.2	96.3	2.5	0.002	-
2011	AMEC	VW11-01	South Embankment	Grab	G1	1.40		939.61		939.61	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-01	South Embankment	Grab	G2	2.00		939.01		939.01	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	5.0	36.0	45.0	14.0	0.002	-
2011	AMEC	VW11-01	South Embankment	Grab	G3	3.50		937.51		937.51	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-01	South Embankment	Grab	G4	5.90		935.11		935.11	Glacial Till	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-02	South Embankment	Grab	G1	1.60		943.49		943.49	Glacial Till	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-02	South Embankment	Grab	G2	3.10		941.99		941.99	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-02	South Embankment	Grab	G3	6.20		938.89		938.89	Glacial Till	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-02	South Embankment	Grab	G4	8.90		936.19		936.19	Glacial Till	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-02	South Embankment	Grab	G5	10.50		934.59		934.59	Glaciolacustrine	-	17.3	CL	28	20	8	-0.34	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-03	Main Embankment	Grab	G1	13.20		913.80		913.80	Glaciofluvial	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-03	Main Embankment	Grab	G2	15.00		912.00		912.00	Glaciolacustrine	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-03	Main Embankment	Grab	G3	16.60		910.40		910.40	Glaciolacustrine	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-03	Main Embankment	Grab	G4	18.10		908.90		908.90	Glaciofluvial	-	22.2	SM		Non-Plastic		-	ML	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-03	Main Embankment	Grab	G5	19.30		907.70		907.70	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G1	9.20		912.39		912.39	Glacial Till	-	15	-	-	-	-	-	-	-	-	-	-	-	-	6.0	43.0	38.0	13.0	0.002	-
2011	AMEC	VW11-04	Main Embankment	Grab	G2	10.00		911.59		911.59	Glaciolacustrine	-	23.4	CI	44	21	23	0.10	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G3	11.70		909.89		909.89	Glaciolacustrine	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G4	13.80		907.79		907.79	Glaciolacustrine	-	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G5	15.00		906.59		906.59	Glaciolacustrine	-	32.4	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G6	16.60		904.99		904.99	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G7	18.70		902.89		902.89	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	0.0	1.0	65.0	34.0	0.002	-
2011	AMEC	VW11-04	Main Embankment	Grab	G8	21.10		900.49		900.49	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G9	22.70		898.89		898.89	Glacial Till	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-04	Main Embankment	Grab	G10	24.80		896.79		896.79	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G1	10.10		910.50		910.50	Glaciolacustrine	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G2	12.60		908.00		908.00	Glaciolacustrine	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G3	13.70		906.90		906.90	Glaciolacustrine	-	29.8	CI	43	20	23	0.43	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G4	15.30		905.30		905.30	Glaciolacustrine	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G5	16.60		904.00		904.00	Glaciolacustrine	-	24.8	ML	27	24	3	0.27	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G6	19.30		901.30		901.30	Glaciofluvial	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G7	20.50		900.10		900.10	Glacial Till	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G8	25.10		895.50		895.50	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-05	Main Embankment	Grab	G9	27.50		893.10		893.10	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Grab	G1	7.40		908.94		908.94	Glaciolacustrine	-	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C1	8.20		908.14		908.14	Glaciolacustrine	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C1	8.90		907.44		907.44	Glaciolacustrine	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C1	9.40		906.94		906.94	Glaciolacustrine	-	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C2	11.10		905.24		905.24	Glaciolacustrine	-	37.9	CI	48	24	24	0.58	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C2	12.00		904.34		904.34	Glaciolacustrine	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C2	13.10		903.24		903.24	Glaciolacustrine	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C3	13.20		903.14		903.14	Glaciolacustrine	-	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C3	13.90		902.44		902.44	Glaciolacustrine	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C3	14.90		901.44		901.44	Glaciolacustrine	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C4	15.40		900.94		900.94	Glaciofluvial	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C4	16.90		899.44		899.44	Glaciofluvial	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C4	17.30		899.04		899.04	Glaciofluvial	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2011	AMEC	VW11-06	Main Embankment	Core Return	C5	17.70		898.64		898.64	Glaciofluvial	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C5	18.10		898.24		898.24	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Core Return	C5	19.60		896.74		896.74	Glacial Till	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Grab	G2	21.10		895.24		895.24	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Grab	G3	25.10		891.24		891.24	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-06	Main Embankment	Grab	G4	31.20		885.14		885.14	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G1	5.00		914.78		914.78	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G2	8.90		910.88		910.88	Glaciolacustrine	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G3	10.50		909.28		909.28	Glaciolacustrine	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G4	11.70		908.08		908.08	Glaciolacustrine	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G5	13.20		906.58		906.58	Glaciolacustrine	-	26.1	CI	37	24	13	0.16	CI	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G6	16.30		903.48		903.48	Glaciolacustrine	-	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G7	17.80		901.98		901.98	Glaciolacustrine	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G8	20.20		899.58		899.58	Glaciolacustrine	-	26.7	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G9	23.00		896.78		896.78	Glacial Till	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G10	23.40		896.38		896.38	Glacial Till	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G11	25.40		894.38		894.38	Glacial Till	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G12	27.50		892.28		892.28	-[1]	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G13	30.80		888.98		888.98	Glaciolacustrine	-	25.5	CL-ML	27	22	5	0.70	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G14	34.20		885.58		885.58	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G15	35.10		884.68		884.68	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G16	36.70		883.08		883.08	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-07	Main Embankment	Grab	G17	39.10		880.68		880.68	Glacial Till	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G1	1.60		926.06		926.06	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G2	3.10		924.56		924.56	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	8.0	44.0	34.0	14.0	0.002	-
2011	AMEC	VW11-08	Main Embankment	Grab	G3	5.90		921.76		921.76	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G4	7.40		920.26		920.26	Glacial Till	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G5	7.70		919.96		919.96	Glacial Till	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G6	8.50		919.16		919.16	Glaciolacustrine	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Core Return	C1	8.80		918.86		918.86	Glaciolacustrine	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	5.0	73.0	22.0	0.002	-
2011	AMEC	VW11-08	Main Embankment	Grab	G7	9.90		917.76		917.76	Glaciofluvial	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G8	12.30		915.36		915.36	Glaciofluvial	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	68.0	32.0		-	-
2011	AMEC	VW11-08	Main Embankment	Core Return	C2	13.60		914.06		914.06	Glaciolacustrine	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Thin-walled Open Tube	U1	14.00	14.20	913.66	913.46	913.56	Glaciolacustrine	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G9	15.40		912.26		912.26	Glaciofluvial	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	48.0	47.0	5.0	0.002	-
2011	AMEC	VW11-08	Main Embankment	Grab	G10	16.10		911.56		911.56	Glaciofluvial	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G11	16.90		910.76		910.76	Glaciolacustrine	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Thin-walled Open Tube	U2	17.00	17.40	910.66	910.26	910.46	Glaciolacustrine	-	26.4	ML	29	23	6	0.57	ML	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G12	20.00		907.66		907.66	Glaciolacustrine	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Core Return	C3	20.70		906.96		906.96	Glaciolacustrine	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G13	24.50		903.16		903.16	Glaciolacustrine	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Core Return	C4	25.30		902.36		902.36	Glaciolacustrine	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G14	27.60		900.06		900.06	Glaciolacustrine	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G15	28.80		898.86		898.86	Glaciolacustrine	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G16	30.00		897.66		897.66	Glaciolacustrine	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G17	31.90		895.76		895.76	Glaciofluvial	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G18	33.40		894.26		894.26	Glaciofluvial	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G19	34.90		892.76		892.76	Glaciofluvial	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G20	36.40		891.26		891.26	Glaciofluvial	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G21	37.30		890.36		890.36	Glaciofluvial	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G22	38.60		889.06		889.06	Glaciofluvial	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G23	39.20		888.46		888.46	Glaciofluvial	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G24	40.40		887.26		887.26	Glaciofluvial	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-08	Main Embankment	Grab	G25	43.40		884.26		884.26	Glacial Till	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G1	1.50		935.09		935.09	Glacial Till	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G2	3.20		933.39		933.39	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G3	6.60		929.99		929.99	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G4	9.40		927.19		927.19	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G5	12.40		924.19		924.19	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G6	15.40		921.19		921.19	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G7	18.10		918.49		918.49	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G8	19.40		917.19		917.19	Glaciolacustrine	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	11.0	67.0	21.0	0.002	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G9	20.90		915.69		915.69	Glacial Till	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G10	22.40		914.19		914.19	Glacial Till	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G11	24.20		912.39		912.39	Glacial Till	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G12	26.10		910.49		910.49	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G13	27.60		908.99		908.99	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G14	30.60		905.99		905.99	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	6.0	49.0	40.0	5.0	0.002	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G15	33.70		902.89		902.89	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G16	36.70		899.89		899.89	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G17	39.50		897.09		897.09	Weathered Bedrock	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-09	Perimeter Embankment	Grab	G18	40.70		895.89		895.89	Bedrock	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G1	1.70		930.10		930.10	Glacial Till	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G2	2.60		929.20		929.20	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G3	3.10		928.70		928.70	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G4	5.60		926.20		926.20	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G5	9.30		922.50		922.50	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G6	12.30		919.50		919.50	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	8.0	45.0	39.0	8.0	0.002	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G7	15.10		916.70		916.70	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G8	17.00		914.80		914.80	Glaciolacustrine	-	23.0	CI	39	22	17	0.06	CI	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G9	17.40		914.40		914.40	Glaciolacustrine	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.5	99.5		-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G10	18.20		913.60		913.60	Glaciolacustrine	-	24.7	CI	38	23	15	0.11	CI	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G11	19.40		912.40		912.40	Glaciolacustrine	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G12	20.00		911.80		911.80	Glaciolacustrine	-	22.4	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G13	21.20		910.60		910.60	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G14	22.40		909.40		909.40	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G15	23.00		908.80		908.80	Glaciofluvial	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G16	23.90		907.90		907.90	Glaciofluvial	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G17	25.80		906.00		906.00	Glaciofluvial	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G18	27.60		904.20		904.20	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G20	31.50		900.30		900.30	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G21	34.00		897.80		897.80	Glaciofluvial	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G22	35.80		896.00		896.00	Glaciolacustrine	-	20.1	CL	28	18	10	0.21	CL	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G23	37.00		894.80		894.80	Glacial Till	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G24	37.90		893.90		893.90	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G25	41.00		890.80		890.80	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-10	Perimeter Embankment	Grab	G26	41.80		890.00		890.00	Bedrock	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G1	0.20		940.69		940.69	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G2	0.50		940.39		940.39	Glacial Till	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G3	0.80		940.09		940.09	Glacial Till	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G4	1.10		939.79		939.79	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G5	1.70		939.19		939.19	Glacial Till	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G6	2.30		938.59		938.59	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G7	4.40		936.49		936.49	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G8	5.90		934.99		934.99	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G9	7.60		933.29		933.29	Glacial Till	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G10	8.80		932.09		932.09	Upper Glaciolacustrine[2]	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G11	9.50		931.39		931.39	Upper Glaciolacustrine[2]	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G12	9.90		930.99		930.99	Upper Glaciolacustrine[2]	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	8.0	72.0	8.0	0.002	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G13	10.80		930.09		930.09	Upper Glaciolacustrine[2]	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G14	11.40		929.49		929.49	-[1]	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G15	12.40		928.49		928.49	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G16	14.50		926.39		926.39	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G17	16.00		924.89		924.89	Weathered Bedrock	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2011	AMEC	VW11-11	Corner 1 Embankment	Grab	G20	19.70		921.19		921.19	Bedrock	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-01	Main Embankment	Grab	G1	8.40		912.68		912.68	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-01	Main Embankment	Grab	G2	10.70		910.38		910.38	Glaciolacustrine	-	16	-	-	-	-	-	-	-	-	-	-	-	-	1.0	27.0	44.0	28.0	0.002	-
2011	AMEC	SI11-01	Main Embankment	Grab	G3	11.70		909.38		909.38	Glaciolacustrine	-	27.6	CI	34	21	13	0.51	CI	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-01	Main Embankment	Grab	G4	13.10		907.98		907.98	Glaciolacustrine	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-01	Main Embankment	Grab	G5	16.50		904.58		904.58	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-01	Main Embankment	Grab	G6	17.70		903.38		903.38	Glacial Till	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-01	Main Embankment	Grab	G7	19.50		901.58		901.58	Glacial Till	-	8	-	-	-	-	-	-	-	-	-	-	-	-	13.0	46.0	33.0	8.0	0.002	-
2011	AMEC	SI11-01	Main Embankment	Grab	G8	22.30		898.78		898.78	Glacial Till	-	7	-	-	-	-	-	-	-	-	-	-	-	-	39.0	35.0	26.0		-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G1	3.20		925.07		925.07	Glacial Till	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G2	5.30		922.97		922.97	Glacial Till	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G3	6.90		921.37		921.37	Glacial Till	-	10	-	-	-	-	-	-	-	-	-	-	-	-	15.0	38.0	36.0	11.0	0.002	-
2011	AMEC	SI11-02	Main Embankment	Grab	G4	8.40		919.87		919.87	Glacial Till	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G5	9.50		918.77		918.77	Glacial Till	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G6	10.10		918.17		918.17	Glaciolacustrine	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G7	10.60		917.67		917.67	Glaciofluvial	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G8	13.60		914.67		914.67	Glaciolacustrine	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G9	15.10		913.17		913.17	Glaciolacustrine	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G10	16.00		912.27		912.27	Glaciofluvial	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G11	16.50		911.77		911.77	Glaciolacustrine	-	18.4	ML	19	18	1	0.40	ML	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G12	20.20		908.07		908.07	Glaciolacustrine	-	21	-	-	-	-	-	-	-	-	-	-	-	-	0.0	14.0	70.0	16.0	0.002	-
2011	AMEC	SI11-02	Main Embankment	Grab	G13	21.50		906.77		906.77	Glaciolacustrine	-	15.4	CL	25	16	9	-0.07	CL	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G14	24.20		904.07		904.07	Glaciolacustrine	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G15	27.60		900.67		900.67	Glaciolacustrine	-	31.8	CH	57	24	33	0.24	CH	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G16	29.70		898.57		898.57	Glaciolacustrine	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G17	31.30		896.97		896.97	Glaciolacustrine	-	30.4	CI	37	21	16	0.59	CI	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G18	32.80		895.47		895.47	Glaciofluvial	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G19	34.90		893.37		893.37	Glaciofluvial	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G20	36.70		891.57		891.57	Glaciofluvial	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G21	37.60		890.67		890.67	Glaciofluvial	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G22	39.20		889.07		889.07	Glaciofluvial	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G23	40.40		887.87		887.87	Glaciofluvial	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G24	42.20		886.07		886.07	Glaciolacustrine	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G25	44.10		884.17		884.17	Glacial Till	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-02	Main Embankment	Grab	G26	45.00		883.27		883.27	Glacial Till	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-04	Perimeter Embankment	Core Return	C1	18.10		913.83		913.83	Glaciolacustrine	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-04	Perimeter Embankment	Core Return	C1	18.70		913.23		913.23	Glaciolacustrine	-	21	-	-	-	-	-	-	-	-	-	-	-	-	0.0	1.0	65.0	34.0	0.002	-
2011	AMEC	SI11-04	Perimeter Embankment	Core Return	C1	19.80		912.13		912.13	Glaciofluvial	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	AMEC	SI11-04	Perimeter Embankment	Core Return	C2	20.20		911.73		911.73	Glaciofluvial	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-101	Dam Breach Area	Thin-walled Tube	1	5.00		928.00		928.00	Possible Ablation / Moraine Till	-	11.0	SC	23	13	10	-0.20	CL	-	-	-	-	-	-	16.0	39.2	44.8		-	-
2014	Thurber	MR14-101	Dam Breach Area	Thin-walled Tube	2	5.70		927.30		927.30	Possible Ablation / Moraine Till	-	9.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-101	Dam Breach Area	Thin-walled Tube	3	6.40		926.60		926.60	Possible Ablation / Moraine Till	-	12.2	SC	22	13	9	-0.09	CL	-	-	-	-	-	-	16.1	36.8	31.5	15.6	0.002	-
2014	Thurber	MR14-101	Dam Breach Area	Grab	4	7.30		925.70		925.70	Possible Ablation / Moraine Till	-	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-101	Dam Breach Area	Thin-walled Tube	6	15.30		917.70		917.70	Basal Till	-	8.9	SC	22	14	8	-0.64	CL	-	-	-	-	-	-	26.0	35.3	38.7		-	-
2014	Thurber	MR14-101	Dam Breach Area	Thin-walled Tube	7	16.20		916.80		916.80	Basal Till	-	10.9	GC-GM	22	15	7	-0.59	CL-ML	-	-	-	-	-	-	34.0	33.4	32.6		-	-
2014	Thurber	MR14-102	Dam Breach Area	Thin-walled Tube	1	3.30		929.20		929.20	Possible Weathered Ablation / Moraine Till	-	13.0	SC	26	15	11	-0.18	CL	-	-	-	-	-	-	27.6	32.5	27.9	12.0	0.002	-
2014	Thurber	MR14-102	Dam Breach Area	Thin-walled Tube	2	3.90		928.60		928.60	Possible Weathered Ablation / Moraine Till	-	10.9	SC	24	13	11	-0.19	CL	-	-	-	-	-	-	22.6	36.4	29.0	12.0	0.002	-
2014	Thurber	MR14-102	Dam Breach Area	Thin-walled Tube	3	6.70		925.80		925.80	Possible Weathered Ablation / Moraine Till	-	11.9	SC	23	13	10	-0.11	CL	-	-	-	-	-	-	24.0	33.3	42.7		-	-
2014	Thurber	MR14-102	Dam Breach Area	Thin-walled Tube	5	9.40		923.10		923.10	Possible Ablation / Moraine Till	-	15.7	CL	23	13	10	0.27	CL	-	-	-	-	-	-	7.0	33.6	41.4	18.0	0.002	-
2014	Thurber	MR14-102	Dam Breach Area	Thin-walled Tube	6	10.00		922.50		922.50	Possible Ablation / Moraine Till	-	11.5	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-102	Dam Breach Area	Grab	7	10.60		921.90		921.90	Basal Till	-	13.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	1	3.50		927.20		927.20	Possible Ablation / Moraine Till	-	10.2	SC	23	13	10	-0.28	CL	-	-	-	-	-	-	12.0	39.7	31.4	16.9	0.002	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	2	4.90		925.80		925.80	Possible Ablation / Moraine Till	-	11.4	SC	25	14	11	-0.24	CL	-	-	-	-	-	-	21.6	38.4	27.3	12.7	0.002	-
2014	Thurber	MR14-103	Dam Breach Area	Grab	3	5.50		925.20		925.20	Possible Ablation / Moraine Till	-	16.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	5A	7.90		922.80		922.80	Upper Glaciolacustrine[2]	-	15.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	5B	7.90		922.80		922.80	Upper Glaciolacustrine[2]	-	18.4	CL	-	-	-	-	-	-	-	-	-	-	-	3.9	26.4	47.3	22.4	0.002	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	5C	8.00		922.70		922.70	Upper Glaciolacustrine[1]	-	16.9	CL	27	13	14	0.28	CL	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	5D	8.00		922.70		922.70	Upper Glaciolacustrine[1]	-	15.3	CL	33	15	18	0.02	CL	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	5E	8.10		922.60		922.60	Upper Glaciolacustrine[1]	-	14.1	CL	23	13	10	0.11	CL	-	-	-	-	-	-	11.0	34.7	38.9	15.3	0.002	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	5F	8.30		922.40		922.40	Upper Glaciolacustrine[1]	-	25.1	CL	35	17	18	0.45	CL	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	5G	8.30		922.40		922.40	Upper Glaciolacustrine[1]	-	27.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-103	Dam Breach Area	Thin-walled Tube	6	8.60		922.10		922.10	Basal Till	-	12.7	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	SC14-103	Dam Breach Area	Grab	1	2.70		928.10		928.10	Possible Ablation / Moraine Till	-	14.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	SC14-103	Dam Breach Area	Grab	2	3.70		927.10		927.10	Possible Ablation / Moraine Till	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	SC14-103	Dam Breach Area	Grab	3	5.30		925.50		925.50	Possible Ablation / Moraine Till	-	5.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	SC14-103	Dam Breach Area	Grab	4	6.80		924.00		924.00	Possible Ablation / Moraine Till	-	25.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	SC14-103	Dam Breach Area	Grab	5	8.40		922.40		922.40	Possible Ablation / Moraine Till	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-104	Dam Breach Area	Thin-walled Tube	1	3.80		927.90		927.90	Possible Ablation / Moraine Till	-	9.9	SC	22	13	9	-0.34	CL	-	-	-	-	-	-	16.0	36.0	32.0	16.0	0.002	-
2014	Thurber	MR14-104	Dam Breach Area	Thin-walled Tube	2	4.60		927.10		927.10	Possible Ablation / Moraine Till	-	8.9	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-104	Dam Breach Area	Grab	3	5.30		926.40		926.40	Possible Ablation / Moraine Till	-	15.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-104	Dam Breach Area	Thin-walled Tube	4	6.20		925.50		925.50	Possible Ablation / Moraine Till	-	11.9	SC	23	12	11	-0.01	CL	-	-	-	-	-	-	26.3	35.9	24.2	13.6	0.002	-
2014	Thurber	MR14-104	Dam Breach Area	Grab	6	9.10		922.60		922.60	Possible Ablation / Moraine Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-104	Dam Breach Area	Thin-walled Tube	8	11.60		920.10		920.10	Possible Ablation / Moraine Till	-	33.1	CL	41	16	25	0.68	CL	-	-	-	-	-	-	8.9	31.4	24.0	35.7	0.002	-
2014	Thurber	MR14-104	Dam Breach Area	Thin-walled Tube	9	12.40		919.30		919.30	Possible Ablation / Moraine Till	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26.3	35.9	37.8		-	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	2	2.50		929.20		929.20	Possible Fill	-	18.7	OL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	3	3.30		928.40		928.40	Possible Fill	-	14.6	SC	28	15	13	-0.03	CL	-	-	-	-	-	-	15.0	43.6	26.7	14.7	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	4A	3.80		927.90		927.90	Possible Fill	-	13.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	4B	3.90		927.80		927.80	Possible Fill	-	15.5	SC	28	14	14	0.11	CL	-	-	-	-	-	-	10.2	41.3	31.3	17.2	0.002	TX
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	4C	4.10		927.60		927.60	Possible Fill	-	11.7	CL	25	14	11	-0.21	CL	-	-	-	-	-	-	6.3	38.5	37.2	18.0	0.002	OD
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	5	5.10		926.60		926.60	Possible Ablation / Moraine Till	-	13.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-105	Dam Breach Area	Grab	6	6.40		925.30		925.30	Possible Ablation / Moraine Till	-	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	7	7.10		924.60		924.60	Possible Ablation / Moraine Till	-	12.0	SC	23	12	11	0.00	CL	-	-	-	-	-	-	20.7	36.2	29.0	14.1	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	8	8.20		923.50		923.50	Possible Ablation / Moraine Till	-	16.2	SC	22	12	10	0.42	CL	-	-	-	-	-	-	16.5	37.6	30.8	15.1	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	9A	9.20		922.50		922.50	Possible Ablation / Moraine Till	-	14.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	9B	9.20		922.50		922.50	Possible Ablation / Moraine Till	-	21.7	CL	-	-	-	-	-	-	-	-	-	-	-	19.0	11.8	45.4	23.8	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	9C	9.30		922.40		922.40	Upper Glaciolacustrine[2]	-	11.0	GC	25	13	12	-0.17	CL	-	-	-	-	-	-	28.5	28.2	31.0	12.3	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	9D	9.40		922.30		922.30	Upper Glaciolacustrine[2]	-	14.5	CL	25	13	12	0.13	CL	-	-	-	-	-	-	2.3	26.0	52.5	19.3	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	9E	9.50		922.20		922.20	Upper Glaciolacustrine[2]	-	21.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	9F	9.50		922.20		922.20	Upper Glaciolacustrine[2]	-	43.6	CH	54	20	34	0.69	CH	-	-	-	-	-	-	1.9	9.7	34.8	53.6	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	9G	9.70		922.00		922.00	Possible Ablation / Moraine Till	-	17.4	CL	27	13	14	0.31	CL	-	-	-	-	-	-	8.8	30.3	40.8	20.1	0.002	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	10	11.00		920.70		920.70	Possible Ablation / Moraine Till	-	18.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-105	Dam Breach Area	Thin-walled Tube	10	11.20		920.50		920.50	Possible Ablation / Moraine Till	-	12.9	CL	21	13	8	-0.01	CL	-	-	-	-	-	-	5.2	42.5	37.7	14.6	0.002	OD
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	1	3.20		926.20		926.20	Possible Ablation / Moraine Till	-	12.0	SC	25	13	12	-0.08	CL	-	-	-	-	-	-	21.2	34.3	29.8	14.7	0.002	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	2	4.80		924.60		924.60	Possible Ablation / Moraine Till	2.77	12.1	CL	22	12	10	0.01	CL	-	-	-	-	-	-	11.2	36.2	34.2	18.4	0.002	TX
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	3	5.30		924.10		924.10	Possible Ablation / Moraine Till	-	13.9	SC	25	13	12	0.08	CL	-	-	-	-	-	-	14.4	35.9	34.4	15.4	0.002	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	4	6.00		923.40		923.40	Possible Ablation / Moraine Till	-	12.3	GC	23	12	11	0.03	CL	-	-	-	-	-	-	32.8	30.7	25.0	11.5	0.002	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	5	6.80		922.60		922.60	Possible Ablation / Moraine Till	-	13.2	SC	24	12	12	0.10	CL	-	-	-	-	-	-	22.8	40.1	25.3	11.8	0.002	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	6A	8.00		921.40		921.40	Upper Glaciolacustrine[2]	-	-	CH	52	23	29	-	CH	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	6B	8.00		921.40		921.40	Upper Glaciolacustrine[2]	-	35.5	CL	45	21	24	0.60	CL	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	7A	8.70		920.70		920.70	Upper Glaciolacustrine[2]	-	13.4	SC	23	13	10	0.04	CL	-	-	-	-	-	-	22.0	28.3	36.5	13.2	0.002	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	7B	8.90		920.50		920.50	Upper Glaciolacustrine[2]	-	14.8	CL	29	14	15	0.05	CL	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	7C	8.90		920.50		920.50	Basal Till	-	13.3	SC	21	13	8	0.04	CL	-	-	-	-	-	-	11.9	39.4	35.7	13.0	0.002	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	7D	9.00		920.40		920.40	Basal Till	-	16.4	CL	27	13	14	0.24	CL	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	7E	9.10		920.30		920.30	Basal Till	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	10.8	33.9	41.1	14.2	0.002	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	8A	10.40		919.00		919.00	Basal Till	-	20.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106	Dam Breach Area	Thin-walled Tube	8B	10.50		918.90		918.90	Lower Glaciolacustrine[2]	-	23.8	CL	39	24	15	-0.01	CL	-	-	-	-	-	-	0.0	1.7	72.2	26.1	0.002	-
2014	Thurber	MR14-106A	Dam Breach Area	Thin-walled Tube	1A	7.30		921.40		921.40	Possible Ablation / Moraine Till	-	7.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106A	Dam Breach Area	Thin-walled Tube	1B	7.50		921.20		921.20	Upper Glaciolacustrine[2]	-	27.5	CL	45	19	26	0.33	CL	-	-	-	-	-	-	0.0	1.8	52.1	46.1	0.002	-
2014	Thurber	MR14-106A	Dam Breach Area	Thin-walled Tube	1C-T1	7.60		921.10		921.10	Upper Glaciolacustrine[1]	-	43.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106A	Dam Breach Area	Thin-walled Tube	1C-T2	7.60		921.10		921.10	Upper Glaciolacustrine[1]	-	36.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106A	Dam Breach Area	Thin-walled Tube	1C-T3	7.60		921.10		921.10	Upper Glaciolacustrine[1]	-	38.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106A	Dam Breach Area	Thin-walled Tube	1C	7.70		921.00		921.00	Upper Glaciolacustrine[1]	-	35.3	CH	54	23	31	0.40	CH	-	-	-	-	-	-	0.0	0.8	42.8	56.4	0.002	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	Thurber	MR14-106A	Dam Breach Area	Thin-walled Tube	1C-T4	7.70		921.00		921.00	Upper Glaciolacustrine[2]	-	33.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1B-T2	7.30		921.20		921.20	Upper Glaciolacustrine[2]	-	43.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1B-T3	7.30		921.20		921.20	Upper Glaciolacustrine[2]	-	38.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1B	7.40		921.10		921.10	Upper Glaciolacustrine[2]	-	34.6	CH	56	23	33	0.35	CH	-	-	-	-	-	-	-	0.0	1.0	36.6	62.4	0.002	-
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1B	7.50		921.00		921.00	Upper Glaciolacustrine[2]	-	38.6	CH	50	20	30	0.62	CH	-	-	-	-	-	-	-	0.0	0.2	46.9	52.9	0.002	TX
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1C	7.60		920.90		920.90	Upper Glaciolacustrine[2]	2.83	41.2	CH	62	24	38	0.45	CH	-	-	-	-	-	-	-	0.0	0.2	38.6	61.2	0.002	OD
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1C	7.60		920.90		920.90	Upper Glaciolacustrine[2]	-	40.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1D	7.70		920.80		920.80	Upper Glaciolacustrine[2]	-	23.9	CL	31	17	14	0.49	CL	-	-	-	-	-	-	-	0.0	14.3	52.3	33.4	0.002	-
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	1E	7.70		920.80		920.80	Upper Glaciolacustrine[2]	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106C	Dam Breach Area	Thin-walled Tube	2	7.80		920.70		920.70	Upper Glaciolacustrine[2]	-	13.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106D	Dam Breach Area	Thin-walled Tube	2	8.40		920.30		920.30	Upper Glaciolacustrine[2]	-	40.5	CH	54	21	33	0.59	CH	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	2A	7.70		921.30		921.30	Upper Glaciolacustrine[2]	-	33.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	2B	7.90		921.10		921.10	Upper Glaciolacustrine[2]	-	35.2	CL	55	22	33	0.40	CL	-	-	-	-	-	-	-	-	-	-	-	OD
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	2C	8.00		921.00		921.00	Upper Glaciolacustrine[2]	-	35.4	CH	50	21	29	0.50	CH	-	-	-	-	-	-	-	0.0	0.5	48.2	51.3	0.002	TX
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	2C	8.20		920.80		920.80	Upper Glaciolacustrine[2]	-	25.5	CL	42	18	24	0.31	CL	-	-	-	-	-	-	-	0.0	2.9	52.7	44.4	0.002	OD
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	3A	8.30		920.70		920.70	Upper Glaciolacustrine[2]	-	30.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	3B	8.40		920.60		920.60	Upper Glaciolacustrine[2]	2.86	40.1	CH	55	20	35	0.57	CH	-	-	-	-	-	-	-	0.0	1.0	40.6	58.4	0.002	TX
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	3B	8.50		920.50		920.50	Upper Glaciolacustrine[2]	-	40.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	3C	8.80		920.20		920.20	Upper Glaciolacustrine[2]	2.87	40.1	CH	55	22	33	0.55	CH	-	-	-	-	-	-	-	0.0	0.0	42.4	57.6	0.002	TX
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	4A	8.90		920.10		920.10	Upper Glaciolacustrine[2]	-	39.8	CH	57	19	38	0.55	CH	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	4B	9.00		920.00		920.00	Upper Glaciolacustrine[2]	-	48.4	CH	63	22	41	0.64	CH	-	-	-	-	-	-	-	0.0	10.4	26.7	62.9	0.002	OD
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	4C	9.00		920.00		920.00	Upper Glaciolacustrine[2]	-	24.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106E	Dam Breach Area	Thin-walled Tube	4D	9.20		919.80		919.80	Upper Glaciolacustrine[2]	-	24.7	CL	41	22	19	0.14	CL	-	-	-	-	-	-	-	0.0	0.0	64.5	35.5	0.002	OD
2014	Thurber	MR14-106F	Dam Breach Area	Thin-walled Tube	2B	8.00		920.70		920.70	Upper Glaciolacustrine[2]	-	30.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	TX
2014	Thurber	MR14-106F	Dam Breach Area	Thin-walled Tube	2B	8.10		920.60		920.60	Upper Glaciolacustrine[2]	-	37.0	CH	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.1	49.0	50.9	0.002	-
2014	Thurber	MR14-106F	Dam Breach Area	Thin-walled Tube	2B	8.10		920.60		920.60	Upper Glaciolacustrine[2]	-	41.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	TX
2014	Thurber	MR14-106F	Dam Breach Area	Thin-walled Tube	2B	8.30		920.40		920.40	Upper Glaciolacustrine[2]	-	38.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	TX
2014	Thurber	MR14-106F	Dam Breach Area	Thin-walled Tube	3A	8.40		920.30		920.30	Upper Glaciolacustrine[2]	-	27.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106F	Dam Breach Area	Thin-walled Tube	3B	8.50		920.20		920.20	Upper Glaciolacustrine[2]	-	43.4	CH	64	23	41	0.50	CH	-	-	-	-	-	-	-	0.0	6.2	29.3	64.5	0.002	OD
2014	Thurber	MR14-106F	Dam Breach Area	Thin-walled Tube	3C	8.60		920.10		920.10	Upper Glaciolacustrine[2]	-	17.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	15.0	24.1	60.9		-	-
2014	Thurber	MR14-106G	Dam Breach Area	Thin-walled Tube	2B	7.80		920.90		920.90	Upper Glaciolacustrine[2]	-	38.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	TX
2014	Thurber	MR14-106G	Dam Breach Area	Thin-walled Tube	2B-T1	7.80		920.90		920.90	Upper Glaciolacustrine[2]	-	43.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106G	Dam Breach Area	Thin-walled Tube	2B	8.00		920.70		920.70	Upper Glaciolacustrine[2]	-	41.0	CL	40	19	21	1.05	CL	-	-	-	-	-	-	-	0.0	2.5	50.4	47.0	0.002	-
2014	Thurber	MR14-106G	Dam Breach Area	Thin-walled Tube	2B	8.00		920.70		920.70	Upper Glaciolacustrine[2]	-	33.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	TX
2014	Thurber	MR14-106G	Dam Breach Area	Thin-walled Tube	2B	8.00		920.70		920.70	Upper Glaciolacustrine[2]	-	38.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	TX
2014	Thurber	MR14-106G	Dam Breach Area	Thin-walled Tube	2B-T2	8.10		920.60		920.60	Upper Glaciolacustrine[2]	-	38.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-106G	Dam Breach Area	Thin-walled Tube	3A	8.30		920.40		920.40	Upper Glaciolacustrine[2]	-	42.6	CH	57	23	34	0.58	CH	-	-	-	-	-	-	-	0.0	0.5	42.1	57.4	0.002	OD
2014	Thurber	MR14-106H	Dam Breach Area	Thin-walled Tube	1A	7.30		921.30		921.30	Upper Glaciolacustrine[2]	-	34.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-106H	Dam Breach Area	Thin-walled Tube	1B	7.40		921.20		921.20	Upper Glaciolacustrine[2]	-	38.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DS
2014	Thurber	MR14-106H	Dam Breach Area	Thin-walled Tube	1B	7.50		921.10		921.10	Upper Glaciolacustrine[2]	-	40.8	CH	56	20	36	0.58	CH	-	-	-	-	-	-	-	0.0	1.1	36.0	62.9	0.002	OD
2014	Thurber	MR14-106I	Dam Breach Area	Thin-walled Tube	1	7.60		921.00		921.00	Upper Glaciolacustrine[2]	-	34.1	CL	47	21	26	0.50	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	1	2.90		925.80		925.80	Possible Ablation / Moraine Till	-	13.9	SC	24	13	11	0.08	CL	-	-	-	-	-	-	-	27.5	30.3	28.7	13.5	0.002	-
2014	Thurber	MR14-107	Dam Breach Area	Grab	3	4.00		924.70		924.70	Possible Ablation / Moraine Till	-	15.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	4	4.90		923.80		923.80	Possible Ablation / Moraine Till	-	13.6	SC	24	12	12	0.13	CL	-	-	-	-	-	-	-	28.5	31.5	27.5	12.5	0.002	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	5	6.30		922.40		922.40	Possible Ablation / Moraine Till	-	12.8	SC	23	12	11	0.07	CL	-	-	-	-	-	-	-	23.3	36.4	28.4	12.0	0.002	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6	7.30		921.40		921.40	Upper Glaciolacustrine[2]	-	32.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6C	7.10		921.60		921.60	Upper Glaciolacustrine[2]	-	34.8	CL	47	24	23	0.47	CL	-	-	-	-	-	-	-	0.0	0.4	53.3	46.3	0.002	OD
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6C-T1	7.10		921.60		921.60	Upper Glaciolacustrine[2]	-	43.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6C-T2	7.20		921.50		921.50	Upper Glaciolacustrine[2]	-	42.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6C	7.30		921.40		921.40	Upper Glaciolacustrine[2]	-	32.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6C	7.40		921.30		921.30	Upper Glaciolacustrine[2]	-	43.5	CL	45	22	23	0.93	CL	-	-	-	-	-	-	-	0.0	1.9	54.5	43.6	0.002	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6C	7.40		921.30		921.30	Upper Glaciolacustrine[2]	-	32.2	CL/CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-107	Dam Breach Area	Thin-walled Tube	6C	7.40		921.30		921.30	Upper Glaciolacustrine[2]	-	49.9	CL/CH	-	-	-	-	-	-	-	-	-	-	-	-	0.0	2.7	34.1	63.2	0.002	-
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	1A-T1	7.20		921.10		921.10	Upper Glaciolacustrine[2]	-	42.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	1A	7.20		921.10		921.10	Upper Glaciolacustrine[2]	-	42.5	CH	57	23	34	0.57	CH	-	-	-	-	-	-	-	0.0	0.3	42.6	57.2	0.002	-
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	1A-T2	7.30		921.00		921.00	Upper Glaciolacustrine[2]	-	42.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	1B	7.30		921.00		921.00	Upper Glaciolacustrine[2]	-	39.6	CL	46	21	25	0.74	CL	-	-	-	-	-	-	-	0.0	0.0	51.3	48.6	0.002	OD
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	1C	7.40		920.90		920.90	Upper Glaciolacustrine[2]	-	28.1	CL	45	18	27	0.37	CL	-	-	-	-	-	-	-	7.7	25.0	28.6	38.7	0.002	-
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	1D	7.60		920.70		920.70	Basal Till	-	13.9	CL	23	15	8	-0.14	CL	-	-	-	-	-	-	-	18.1	30.8	38.2	12.9	0.002	-
2014	Thurber	MR14-107A	Dam Breach Area	Grab	2	8.70		919.60		919.60	Basal Till	-	16.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-107A	Dam Breach Area	Grab	5	11.00		917.30		917.30	Basal Till	-	18.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	6A	11.50		916.80		916.80	Lower Glaciolacustrine[2]	-	17.3	CL	33	22	11	-0.43	CL	-	-	-	-	-	-	-	8.8	9.8	61.5	19.9	0.002	-
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	6B	11.60		916.70		916.70	Lower Glaciolacustrine[2]	-	22.0	CL	40	25	15	-0.20	CL	-	-	-	-	-	-	-	0.0	0.7	70.4	28.9	0.002	OD
2014	Thurber	MR14-107A	Dam Breach Area	Thin-walled Tube	7	12.00		916.30		916.30	Lower Glaciolacustrine[2]	-	22.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-107B	Dam Breach Area	Thin-walled Tube	1B	6.90		921.50		921.50	Upper Glaciolacustrine[2]	-	32.5	CL	49	20	29	0.43	CL	-	-	-	-	-	-	-	0.0	3.0	44.2	52.8	0.002	OD
2014	Thurber	MR14-107B	Dam Breach Area	Thin-walled Tube	1C	7.10		921.30		921.30	Upper Glaciolacustrine[2]	-	34.1	CH	53	25	28	0.33	CH	-	-	-	-	-	-	-	0.0	0.1	47.9	52.0	0.002	-
2014	Thurber	MR14-108	Dam Breach Area	Thin-walled Tube	1	1.80		926.80		926.80	Possible Ablation / Moraine Till	-	12.8	CL	24	14	10	-0.12	CL	-	-	-	-	-	-	-	14.7	33.7	51.6		-	-
2014	Thurber	MR14-108	Dam Breach Area	Thin-walled Tube	2	3.00		925.60		925.60	Possible Ablation / Moraine Till	-	12.6	SC	24	12	12	0.05	CL	-	-	-	-	-	-	-	25.2	30.7	30.7	13.3	0.002	-
2014	Thurber	MR14-108	Dam Breach Area	Thin-walled Tube	3	3.70		924.90		924.90	Possible Ablation / Moraine Till	-	17.6	SM	-	Non-Plastic	-	-	ML	-	-	-	-	-	-	-	14.8	46.4	38.8		-	-
2014	Thurber	MR14-108	Dam Breach Area	Thin-walled Tube	4	5.80		922.80		922.80	Possible Ablation / Moraine Till	-	17.1	SC	27	12	15	0.34	CL	-	-	-	-	-	-	-	29.1	29.5	25.6	15.7	0.002	-
2014	Thurber	MR14-108	Dam Breach Area	Thin-walled Tube	6	8.00		920.60		920.60	Possible Ablation / Moraine Till	-	17.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-108A	Dam Breach Area	Thin-walled Tube	1	8.60		920.00		920.00	Basal Till	-	19.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-108A	Dam Breach Area	Thin-walled Tube	6	11.60		917.00		917.00	Lower Glaciolacustrine[2]	-	22.5	CL	43	24	19	-0.08	CL	-	-	-	-	-	-	-	0.0	1.0	72.7	26.3	0.002	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	1	1.50		927.50		927.50	Possible Ablation / Moraine Till	-	13.9	CL	26	15	11	-0.10	CL	-	-	-	-	-	-	-	10.4	35.2	54.4		-	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	2	2.70		926.30		926.30	Possible Ablation / Moraine Till	-	13.2	SC	25	14	11	-0.07	CL	-	-	-	-	-	-	-	24.6	31.7	30.2	13.5	0.002	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	3	3.50		925.50		925.50	Possible Ablation / Moraine Till	-	15.3	CL-ML	22	15	7	0.04	CL-ML	-	-	-	-	-	-	-	12.3	35.1	52.6		-	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	4	4.70		924.30		924.30	Possible Ablation / Moraine Till	-	13.0	CL-ML	23	16	7	-0.43	CL-ML	-	-	-	-	-	-	-	13.2	36.0	39.0	11.8	0.002	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	5	6.60		922.40		922.40	Basal Till	-	12.4	GC-GM	25	18	7	-0.80	CL-ML	-	-	-	-	-	-	-	31.5	30.3	30.4	7.9	0.002	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	6A	12.30		916.70		916.70	Basal Till	-	14.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	6B	12.30		916.70		916.70	Basal Till	-	21.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	6B	12.40		916.60		916.60	Basal Till	-	22.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	6B	12.50		916.50		916.50	Basal Till	2.74	13.1	CL/ML	-	-	-	-	-	-	-	-	-	-	-	-	17.6	20.9	48.6	12.9	0.002	-
2014	Thurber	MR14-109	Dam Breach Area	Thin-walled Tube	6B	12.50		916.50		916.50	Basal Till	-	19.9	CL	35	22	13	-0.16	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	1	2.30		926.40		926.40	Possible Ablation / Moraine Till	-	13.7	SC	25	14	11	-0.03	CL	-	-	-	-	-	-	-	22.1	33.3	44.6		-	-
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	2	3.20		925.50		925.50	Possible Ablation / Moraine Till	-	13.1	SC	22	14	8	-0.11	CL	-	-	-	-	-	-	-	19.5	32.5	35.0	13.1	0.002	-
2014	Thurber	MR14-110	Dam Breach Area	Grab	3	4.10		924.60		924.60	Possible Ablation / Moraine Till	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.7	40.6	45.8		-	-
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	4	4.80		923.90		923.90	Possible Ablation / Moraine Till	-	13.0	CL	22	13	9	0.00	CL	-	-	-	-	-	-	-	12.9	32.5	40.5	14.1	0.002	-
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	5	5.70		923.00		923.00	Possible Ablation / Moraine Till	-	31.2	CL-ML	21	15	6	2.70	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	6A	12.20		916.50		916.50	Lower Glaciolacustrine[2]	-	8.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	6B	12.40		916.30		916.30	Lower Glaciolacustrine[2]	-	17.2	CL	36	23	13	-0.45	CL	-	-	-	-	-	-	-	0.0	1.1	74.4	24.5	0.002	OD
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	6C	12.50		916.20		916.20	Lower Glaciolacustrine[2]	-	21.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	6C	12.50		916.20		916.20	Lower Glaciolacustrine[2]	-	22.4	CL/ML	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.2	70.6	29.2	0.002	-
2014	Thurber	MR14-110	Dam Breach Area	Thin-walled Tube	6C	12.50		916.20		916.20	Lower Glaciolacustrine[2]	-	20.8	CL	39	24	15	-0.21	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-111	Dam Breach Area	Thin-walled Tube	1	1.90		926.70		926.70	Possible Ablation / Moraine Till	-	18.2	GC	25	12	13	0.48	CL	-	-	-	-	-	-	-	35.2	29.1	23.3	12.4	0.002	-
2014	Thurber	MR14-111	Dam Breach Area	Grab	2	2.50		926.10		926.10	Possible Ablation / Moraine Till	-	14.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-111	Dam Breach Area	Thin-walled Tube	3A	3.70		924.90		924.90	Possible Ablation / Moraine Till	-	12.1	SC	22	11	11	0.10	CL	-	-	-	-	-	-	-	19.3	36.9	27.8	16.0	0.002	-
2014	Thurber	MR14-111	Dam Breach Area	Thin-walled Tube	3B	3.90		924.70		924.70	Upper Glaciolacustrine[2]	-	20.2	CL	34	13	21	0.34	CL	-	-	-	-	-	-	-	17.3	24.1	26.8	31.8	0.002	-
2014	Thurber	MR14-111	Dam Breach Area	Thin-walled Tube	3C	4.10		924.50		924.50	Upper Glaciolacustrine[2]	-	13.5	CL	22	13	9	0.06	CL	-	-	-	-	-	-	-	12.1	33.8	36.1	18.0	0.002	-
2014	Thurber	MR14-111	Dam Breach Area	Grab	7	4.30		924.30		924.30	Possible Ablation / Moraine Till	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-111	Dam Breach Area	Thin-walled Tube	5A	5.70		922.90		922.90	Possible Ablation / Moraine Till	-	12.9	CL	22	14	8	-0.14	CL	-	-	-	-	-	-	-	12.4	34.6	39.8	13.2	0.002	TX
2014	Thurber	MR14-111	Dam Breach Area	Thin-walled Tube	5B	5.90		922.70		922.70	Possible Ablation / Moraine Till	-	10.8	CL-ML	21	15	6	-0.70	CL-ML	-	-	-	-	-	-	-	11.4	33.9	43.6	11.0	0.002	OD
2014	Thurber	MR14-111	Dam Breach Area	Thin-walled Tube	5B	5.90		922.70		922.70	Possible Ablation / Moraine Till	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-111	Dam Breach Area	Grab	6	9.90		918.70		918.70	Possible Ablation / Moraine Till	-	15.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-111A	Dam Breach Area	Grab	5	4.30		923.80		923.80	Possible Ablation / Moraine Till	-	12.6	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-112	Dam Breach Area	Thin-walled Tube	1	1.70		927.20		927.20	Possible Ablation / Moraine Till	-	11.0	SC	25	13	12	-0.17	CL	-	-	-	-	-	-	-	26.8	32.1	26.6	14.5	0.002	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	Thurber	MR14-112	Dam Breach Area	Grab	3	3.80		925.10		925.10	Possible Ablation / Moraine Till	-	11.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-112	Dam Breach Area	Thin-walled Tube	4A	4.40		924.50		924.50	Possible Ablation / Moraine Till	-	14.4	GC	23	13	10	0.14	CL	-	-	-	-	-	-	-	37.6	27.6	23.5	11.3	0.002	-
2014	Thurber	MR14-112	Dam Breach Area	Thin-walled Tube	4B	4.60		924.30		924.30	Upper Glaciolacustrine[2]	-	32.0	CH	59	21	38	0.29	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-112	Dam Breach Area	Thin-walled Tube	4C	4.80		924.10		924.10	Possible Ablation / Moraine Till	-	16.2	CL	29	13	16	0.20	CL	-	-	-	-	-	-	-	9.1	31.7	38.1	21.1	0.002	-
2014	Thurber	MR14-112	Dam Breach Area	Grab	5	5.60		923.30		923.30	Possible Ablation / Moraine Till	-	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-112	Dam Breach Area	Grab	6	6.50		922.40		922.40	Possible Ablation / Moraine Till	-	17.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	1A	1.30		928.10		928.10	-[1]	-	131.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	1B	1.30		928.10		928.10	Possible Ablation / Moraine Till	-	23.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OD
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	1C	1.40		928.00		928.00	Possible Ablation / Moraine Till	2.78	20.0	CL	27	14	13	0.46	CL	-	-	-	-	-	-	-	6.5	33.0	40.6	19.9	0.002	TX
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	1D	1.60		927.80		927.80	Possible Ablation / Moraine Till	-	17.9	CL	26	13	13	0.38	CL	-	-	-	-	-	-	-	9.8	36.9	36.7	16.6	0.002	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	2	3.90		925.50		925.50	Possible Ablation / Moraine Till	-	12.1	SC	24	13	11	-0.08	CL	-	-	-	-	-	-	-	22.3	30.5	32.7	14.5	0.002	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	3	5.20		924.20		924.20	Possible Ablation / Moraine Till	-	12.8	SC	21	12	9	0.09	CL	-	-	-	-	-	-	-	23.3	29.6	34.1	13.0	0.002	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	4A	6.30		923.10		923.10	Possible Ablation / Moraine Till	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	4A	6.30		923.10		923.10	Possible Ablation / Moraine Till	-	10.8	CL-ML	21	14	7	-0.46	CL-ML	-	-	-	-	-	-	-	3.6	35.9	48.2	12.3	0.002	OD
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	4B	6.50		922.90		922.90	Possible Ablation / Moraine Till	-	11.4	CL-ML	21	14	7	-0.37	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	4B	6.60		922.80		922.80	Possible Ablation / Moraine Till	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	3.6	35.5	48.5	12.3	0.002	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	4B	6.60		922.80		922.80	Possible Ablation / Moraine Till	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	DSS
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	5	7.40		922.00		922.00	Possible Ablation / Moraine Till	-	13.2	CL-ML	20	13	7	0.03	CL-ML	-	-	-	-	-	-	-	8.7	39.8	36.9	14.6	0.002	-
2014	Thurber	MR14-113	Dam Breach Area	Thin-walled Tube	6C	9.40		920.00		920.00	Possible Ablation / Moraine Till	-	18.7	CL	28	17	11	0.15	CL	-	-	-	-	-	-	-	4.6	27.1	50.0	18.3	0.002	OD
2014	Thurber	MR14-114	Dam Breach Area	Thin-walled Tube	2	3.80		926.80		926.80	Possible Ablation / Moraine Till	-	7.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-114	Dam Breach Area	Thin-walled Tube	3	4.80		925.80		925.80	Possible Ablation / Moraine Till	-	11.3	SC	23	12	11	-0.06	CL	-	-	-	-	-	-	-	25.1	32.3	28.4	14.2	0.002	-
2014	Thurber	MR14-114	Dam Breach Area	Thin-walled Tube	5	6.60		924.00		924.00	Possible Ablation / Moraine Till	-	10.8	SC	21	12	9	-0.13	CL	-	-	-	-	-	-	-	26.6	32.0	29.5	11.9	0.002	-
2014	Thurber	MR14-114	Dam Breach Area	Grab	7	9.20		921.40		921.40	Possible Ablation / Moraine Till	-	17.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-115	Dam Breach Area	Grab	2	2.50		926.50		926.50	Possible Ablation / Moraine Till	-	14.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-115	Dam Breach Area	Thin-walled Tube	3	3.80		925.20		925.20	Possible Ablation / Moraine Till	-	11.6	SC	23	12	11	-0.04	CL	-	-	-	-	-	-	-	25.0	31.6	28.0	15.4	0.002	-
2014	Thurber	MR14-115	Dam Breach Area	Thin-walled Tube	4	4.50		924.50		924.50	Possible Ablation / Moraine Till	-	11.3	SC	23	15	8	-0.46	CL	-	-	-	-	-	-	-	18.7	33.7	36.6	11.0	0.002	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	1	0.30		930.30		930.30	Possible Ablation / Moraine Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	2	1.50		929.10		929.10	Possible Ablation / Moraine Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	3	2.10		928.50		928.50	Possible Ablation / Moraine Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	4	2.60		928.00		928.00	Possible Ablation / Moraine Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	5	3.30		927.30		927.30	Possible Ablation / Moraine Till	-	13.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	6	4.00		926.60		926.60	Possible Ablation / Moraine Till	-	11.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	7	4.50		926.10		926.10	Possible Ablation / Moraine Till	-	12.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	8	5.10		925.50		925.50	Possible Ablation / Moraine Till	-	12.4	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	9	5.30		925.30		925.30	Upper Glaciolacustrine[2]	-	30.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	10	5.80		924.80		924.80	Upper Glaciolacustrine[2]	-	31.3	CL	49	21	28	0.37	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	11	6.40		924.20		924.20	Possible Ablation / Moraine Till	-	13.7	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	12	7.00		923.60		923.60	Possible Ablation / Moraine Till	-	15.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	13	7.50		923.10		923.10	Possible Ablation / Moraine Till	-	13.0	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	14	8.20		922.40		922.40	Possible Ablation / Moraine Till	-	13.3	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	15	8.60		922.00		922.00	Possible Ablation / Moraine Till	-	13.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	16	10.60		920.00		920.00	Upper Glaciolacustrine[2]	-	21.5	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	17	10.90		919.70		919.70	Upper Glaciolacustrine[2]	-	37.7	CH	51	20	31	0.57	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	18	11.20		919.40		919.40	Upper Glaciolacustrine[2]	-	38.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	19	11.40		919.20		919.20	Basal Till	-	16.8	CL	25	16	9	0.09	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	20	11.90		918.70		918.70	Lower Glaciolacustrine[2]	-	23.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	21	12.50		918.10		918.10	Lower Glaciolacustrine[2]	-	16.8	CL	23	15	8	0.23	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	22	13.10		917.50		917.50	Lower Glaciolacustrine[2]	-	14.6	CL-ML	22	17	5	-0.48	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	23	13.50		917.10		917.10	Lower Glaciolacustrine[2]	-	14.2	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	24	13.80		916.80		916.80	Lower Glaciolacustrine[2]	-	19.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	25	14.30		916.30		916.30	Lower Glaciolacustrine[2]	-	17.5	CL-ML	23	19	4	-0.38	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	26	14.70		915.90		915.90	Lower Glaciolacustrine[2]	-	12.5	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116	Dam Breach Area	Grab	27	15.00		915.60		915.60	Lower Glaciolacustrine[2]	-	27.1	CL	41	23	18	0.23	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116A	Dam Breach Area	Grab	1	0.30		930.30		930.30	Possible Ablation / Moraine Till	-	13.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116A	Dam Breach Area	Grab	2	0.70		929.90		929.90	Possible Ablation / Moraine Till	-	15.1	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116A	Dam Breach Area	Grab	4	2.10		928.50		928.50	Possible Ablation / Moraine Till	-	13.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	MR14-116A	Dam Breach Area	Grab	5	2.70		927.90		927.90	Possible Ablation / Moraine Till	-	11.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	RH14-118	Dam Breach Area	Grab	2	15.00		922.70		922.70	Possible Ablation / Moraine Till	-	13.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	RH14-118	Dam Breach Area	Grab	3	15.50		922.20		922.20	Possible Ablation / Moraine Till	-	16.6	GC	23	12	11	0.42	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	1	Slice 4		935.16		935.16	Dam Till Core	-	10.1	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	2	Slice 6		933.84		933.84	Dam Till Core	-	12.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	3	Slice 9		935.29		935.29	Dam Till Core	-	11.8	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	4	Slice 14		940.14		940.14	Dam Filter	-	7.1	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	51.4	37.6	11.0		-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	5	Slice 14		936.73		936.73	Dam Till Core	-	10.8	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	7	Slice 18		940.35		940.35	Dam Filter	-	6.8	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	58.3	32.0	9.7		-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	8	Slice 18		933.93		933.93	Fill - Sand	-	15.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	1.0	77.6	21.4		-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	9	Slice 20		937.33		937.33	Dam Till Core	-	8.1	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	50.6	37.5	12.0		-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	10	Slice 20		941.20		941.20	Dam Filter	-	9.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	12.5	32.6	38.5	16.4	0.002	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	11	Slice 24		930.13		930.13	Fill - Gravel	-	11.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	12	Slice 27		930.99		930.99	Dam Till Core	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	13	Slice 27		930.93		930.93	Dam Till Core	-	10.3	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	14 U/S	Slice 31		931.65		931.65	Dam Till Core	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	7.6	38.4	37.8	16.2	0.002	-
2014	Thurber	Remnant Core Excavation	Dam Breach Area	Grab	15 D/S	Slice 31		931.26		931.26	Dam Till Core	-	10.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	18.4	34.3	34.0	13.3	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	1	-	-	-		-	Dam Till Core	-	7.0	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	9.5	38.2	39.7	12.6	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	2	-	-	-		-	Glacial Till	-	8.8	SM/SC	-	-	-	-	-	-	-	-	-	-	-	-	10.2	37.2	34.6	18.0	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	3	-	-	-		-		-	38.8	ML	42	29	13	0.75	ML	-	-	-	-	-	-	-	0.0	0.5	72.6	26.9	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	4	-	-	-		-	Glacial Till	-	9.2	CL/ML	-	-	-	-	-	-	-	-	-	-	-	-	8.0	30.4	43.7	17.9	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	5	-	-	-		-	-	-	10.7	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	0.0	57.9	42.1		-	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	6	-	-	-		-	-	-	1.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	0.0	78.6	21.4		-	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	7	-	-	-		-	Dam Till Core	-	5.5	SC/SM	-	-	-	-	-	-	-	-	-	-	-	-	6.0	37.1	41.4	15.6	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	8	-	-	-		-	-	-	9.3	GP-GM	-	-	-	-	-	-	-	-	-	-	-	-	60.9	27.5	11.6		-	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	9	-	-	-		-	-	-	35.5	ML	39	29	10	0.65	ML	-	-	-	-	-	-	-	0.0	1.5	75.0	23.5	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	10	-	-	-		-		-	15.9	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	0.0	58.4	41.6		-	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	11	-	-	-		-	Glacial Till	-	6.7	SM/SC	-	-	-	-	-	-	-	-	-	-	-	-	13.6	36.0	34.5	15.9	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	12	-	-	-		-	Glacial Till	-	6.9	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	22.1	32.1	31.6	14.2	0.002	-
2014	Thurber	Site Recon	Dam Breach Area	Grab	13	-	-	-		-	Glacial Till	-	4.7	CL/ML	-	-	-	-	-	-	-	-	-	-	-	-	11.4	34.8	39.1	14.6	0.002	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G1	2.23		929.12		929.12	Upper Glacial Till	-	28.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G2	2.59		928.76		928.76	Upper Glacial Till	-	18.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G3	2.68		928.67		928.67	Upper Glacial Till	-	16.7	CL	28	13	15	0.25	CL	-	-	-	-	-	-	-	8.9	38.2	34.4	18.6	0.002	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G4	2.96		928.39		928.39	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G5	3.35		928.00		928.00	Upper Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G6	3.51		927.84		927.84	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G7	3.57		927.78		927.78	Upper Glacial Till	-	12.8	CL	26	12	14	0.06	CL	-	-	-	-	-	-	-	8.7	39.6	32.3	19.4	0.002	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G8	4.09		927.26		927.26	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G9	4.67		926.68		926.68	Upper Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G24	11.46		919.89		919.89	Middle Glacial Till	-	9.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G26	12.07		919.28		919.28	Middle Glacial Till	-	7.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G27	12.50		918.85		918.85	Middle Glacial Till	-	6.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G29	12.71		918.64		918.64	Middle Glacial Till	-	6.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G30	13.11		918.24		918.24	Middle Glacial Till	-	10.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G31	13.50		917.85		917.85	Middle Glacial Till	-	12.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G32	13.90		917.45		917.45	Middle Glacial Till	-	10.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G34	14.24		917.11		917.11	Middle Glacial Till	-	10.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G35	14.66		916.69		916.69	Middle Glacial Till	-	8.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G37	15.12		916.23		916.23	Middle Glacial Till	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G38	15.55		915.80		915.80	Middle Glacial Till	-	4.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G39	15.67		915.68		915.68	Upper Glaciofluvial	-	7.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G40	16.16		915.19		915.19	Upper Glaciofluvial	-	18.2	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G42	16.64		914.71		914.71	Lower Glaciofluvial	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G43	17.07		914.28		914.28	Lower Glacial Till	-	18.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G44	17.22		914.13		914.13	Lower Glacial Till	-	8.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G45	17.83		913.52		913.52	Lower Glacial Till	-	11.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G46	18.38		912.97		912.97	Lower Glacial Till	-	5.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-01	Dam Breach Area	Grab	G48	18.90		912.45		912.45	Weathered Bedrock (Mafic)	-	12.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G50	19.36		911.99		911.99	Weathered Bedrock (Mafic)	-	9.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G51	19.81		911.54		911.54	Weathered Bedrock (Mafic)	-	6.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G52	20.39		910.96		910.96	Weathered Bedrock (Mafic)	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G53	20.94		910.41		910.41	Weathered Bedrock (Mafic)	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G54	21.49		909.86		909.86	Weathered Bedrock (Mafic)	-	6.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G55	21.50		909.85		909.85	Weathered Bedrock (Mafic)	-	14.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G56	21.83		909.52		909.52	Weathered Bedrock (Mafic)	-	14.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G57	22.40		908.95		908.95	Weathered Bedrock (Mafic)	-	9.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G58	22.95		908.40		908.40	Weathered Bedrock (Mafic)	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G60	23.47		907.88		907.88	Weathered Bedrock (Mafic)	-	5.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G61	24.05		907.30		907.30	Weathered Bedrock (Mafic)	-	5.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G62	24.45		906.90		906.90	Weathered Bedrock (Mafic)	-	6.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G63	24.93		906.42		906.42	Weathered Bedrock (Mafic)	-	8.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G65	25.39		905.96		905.96	Weathered Bedrock (Mafic)	-	6.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G66	26.09		905.26		905.26	Weathered Bedrock (Mafic)	-	4.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G67	26.25		905.10		905.10	Weathered Bedrock (Mafic)	-	9.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G69	26.98		904.37		904.37	Weathered Bedrock (Mafic)	-	7.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G70	27.53		903.82		903.82	Weathered Bedrock (Mafic)	-	5.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G71	27.95		903.40		903.40	Weathered Bedrock (Mafic)	-	7.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G72	28.59		902.76		902.76	Weathered Bedrock (Mafic)	-	6.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G74	29.05		902.30		902.30	Weathered Bedrock (Mafic)	-	3.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G75	29.66		901.69		901.69	Weathered Bedrock (Mafic)	-	7.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G77	30.21		901.14		901.14	Weathered Bedrock (Mafic)	-	6.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G78	30.66		900.69		900.69	Weathered Bedrock (Mafic)	-	2.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G79	31.00		900.35		900.35	Weathered Bedrock (Mafic)	-	9.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G80	31.67		899.68		899.68	Weathered Bedrock (Mafic)	-	10.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G81	32.10		899.25		899.25	Weathered Bedrock (Mafic)	-	4.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G82	32.68		898.67		898.67	Weathered Bedrock (Mafic)	-	8.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G83	33.26		898.09		898.09	Weathered Bedrock (Mafic)	-	7.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G84	33.47		897.88		897.88	Weathered Bedrock (Mafic)	-	6.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G86	34.38		896.97		896.97	Weathered Bedrock (Mafic)	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G87	35.08		896.27		896.27	Weathered Bedrock (Mafic)	-	5.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G88	35.82		895.53		895.53	Weathered Bedrock (Mafic)	-	7.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G89	36.58		894.77		894.77	Weathered Bedrock (Mafic)	-	5.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G91	37.31		894.04		894.04	Weathered Bedrock (Mafic)	-	9.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01	Dam Breach Area	Grab	G92	38.07		893.28		893.28	Weathered Bedrock (Mafic)	-	12.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G1	5.12		926.08		926.08	Upper Glacial Till	-	10.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G2	5.64		925.56		925.56	Upper Glacial Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G3	5.64		925.56		925.56	Upper Glacial Till	-	12.0	SC	25	12	13	0.00	CL	-	-	-	-	-	-	-	11.9	38.8	30.7	18.6	0.002	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G4	6.02		925.18		925.18	Upper Glacial Till	-	11.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G5	6.34		924.86		924.86	Upper Glacial Till	-	11.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G6	6.61		924.59		924.59	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G8	7.04		924.16		924.16	Upper Glacial Till	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G9	7.50		923.70		923.70	Upper Glacial Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G10	7.50		923.70		923.70	Upper Glacial Till	-	12.6	CL	22	12	10	0.06	CL	-	-	-	-	-	-	-	9.2	38.4	36.6	15.8	0.002	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G11	7.77		923.43		923.43	Upper Glacial Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G12	8.02		923.18		923.18	Upper Glacial Till	-	17.2	CL	23	14	9	0.36	CL	-	-	-	-	-	-	-	3.9	28.8	48.7	18.6	0.002	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G13	8.14		923.06		923.06	Upper Glacial Till	-	15.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G14	8.38		922.82		922.82	Upper Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G15	8.84		922.36		922.36	Upper Glaciolacustrine	-	13.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G16	8.93		922.27		922.27	Upper Glaciolacustrine	-	37.0	CH	64	20	44	0.39	CH	-	-	-	-	-	-	-	0.1	7.6	35.0	57.3	0.002	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G18	9.05		922.15		922.15	Upper Glaciolacustrine	-	26.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G19	9.69		921.51		921.51	Middle Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G20	10.15		921.05		921.05	Middle Glacial Till	-	15.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G21	10.21		920.99		920.99	Middle Glacial Till	-	10.9	CL	21	13	8	-0.26	CL	-	-	-	-	-	-	-	12.5	36.9	37.0	13.6	0.002	-
2014	KCB	SH14-01A	Dam Breach Area	Grab	G22	10.67		920.53		920.53	Middle Glacial Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02	Dam Breach Area	Grab	G1	4.99		927.91		927.91	Upper Glacial Till	-	25.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02	Dam Breach Area	Grab	G2	5.48		927.42		927.42	Upper Glacial Till	-	15.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02	Dam Breach Area	Grab	G3	7.49		925.41		925.41	Upper Glacial Till	-	13.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G1	4.27		928.66		928.66	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G2	4.57		928.36		928.36	Upper Glacial Till	-	16.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G3	5.18		927.75		927.75	Upper Glacial Till	-	11.2	CL	26	12	14	-0.06	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G4	5.49		927.44		927.44	Upper Glacial Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G5	5.79		927.14		927.14	Upper Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G7	6.40		926.53		926.53	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G8	6.61		926.32		926.32	Upper Glacial Till	-	10.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G9	7.01		925.92		925.92	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G10	7.01		925.92		925.92	Upper Glacial Till	-	11.7	CL	24	12	12	-0.03	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G11	7.35		925.58		925.58	Upper Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G12	7.86		925.07		925.07	Upper Glacial Till	-	10.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G13	8.14		924.79		924.79	Upper Glacial Till	-	11.5	SC	24	11	13	0.04	CL	-	-	-	-	-	-	-	16.5	36.1	29.2	18.3	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G14	8.29		924.64		924.64	Upper Glacial Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G15	8.87		924.06		924.06	Upper Glacial Till	-	11.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G16	9.20		923.73		923.73	Upper Glacial Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G17	9.30		923.63		923.63	Upper Glacial Till	-	12.5	SC	23	11	12	0.13	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G18	9.75		923.18		923.18	Upper Glacial Till	-	11.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G19	10.21		922.72		922.72	Upper Glacial Till	-	12.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G20	10.36		922.57		922.57	Upper Glacial Till	-	10.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G22	10.82		922.11		922.11	Upper Glacial Till	-	26.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G23	11.13		921.80		921.80	Upper Glacial Till	-	21.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G24	11.31		921.62		921.62	Upper Glaciolacustrine	-	33.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G25	11.31		921.62		921.62	Upper Glaciolacustrine	-	36.8	CH	51	19	32	0.56	CH	-	-	-	-	-	-	-	0.3	4.2	46.9	48.5	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G26	11.77		921.16		921.16	Upper Glacial Till	-	12.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G27	12.25		920.68		920.68	Upper Glacial Till	-	13.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G28	12.50		920.43		920.43	Upper Glaciolacustrine	-	31.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G29	12.56		920.37		920.37	Upper Glaciolacustrine	-	28.9	CI	41	18	23	0.47	CI	-	-	-	-	-	-	-	4.5	14.8	41.5	39.2	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G30	12.65		920.28		920.28	Middle Glacial Till	-	16.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G31	13.11		919.82		919.82	Middle Glacial Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G32	13.32		919.61		919.61	Middle Glacial Till	-	9.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G33	13.32		919.61		919.61	Middle Glacial Till	-	8.9	CL	20	14	6	-0.85	CL-ML	-	-	-	-	-	-	-	6.1	42.6	39.3	12.0	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G34	13.90		919.03		919.03	Middle Glacial Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G35	14.17		918.76		918.76	Middle Glacial Till	-	17.5	CL	29	16	13	0.12	CL	-	-	-	-	-	-	-	3.7	18.5	54.1	23.7	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G36	14.33		918.60		918.60	Middle Glacial Till	-	15.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G37	14.78		918.15		918.15	Middle Glacial Till	-	18.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G38	15.09		917.84		917.84	Lower Glaciofluvial	-	20.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G39	15.09		917.84		917.84	Lower Glaciofluvial	-	22.3	ML	-	Non-Plastic		-	ML	-	-	-	-	-	-	-	2.0	11.9	80.6	5.4	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G40	15.39		917.54		917.54	Lower Glaciofluvial	-	14.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G41	15.54		917.39		917.39	Lower Glaciofluvial	-	15.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	0.1	52.6	47.4		-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G42	15.70		917.23		917.23	Lower Glaciofluvial	-	18.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G44	15.88		917.05		917.05	Lower Glaciofluvial	-	23.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G45	16.31		916.62		916.62	Lower Glacial Till	-	17.3	SC	24	14	10	0.33	CL	-	-	-	-	-	-	-	14.0	40.6	30.3	15.0	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G46	16.49		916.44		916.44	Lower Glacial Till	-	15.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G47	16.76		916.17		916.17	Lower Glacial Till	-	15.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G48	19.05		913.88		913.88	Weathered Bedrock (Mafic)	-	16.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G49	19.05		913.88		913.88	Weathered Bedrock (Mafic)	-	17.1	CI	42	23	19	-0.31	CI	-	-	-	-	-	-	-	0.6	38.1	42.3	19.0	0.002	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G50	19.51		913.42		913.42	Weathered Bedrock (Mafic)	-	17.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G51	19.96		912.97		912.97	Weathered Bedrock (Mafic)	-	17.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G52	20.27		912.66		912.66	Weathered Bedrock (Mafic)	-	26.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G54	23.47		909.46		909.46	Weathered Bedrock (Mafic)	-	8.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-02A	Dam Breach Area	Grab	G55	24.38		908.55		908.55	Weathered Bedrock (Mafic)	-	7.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G1	5.18		927.34		927.34	Upper Glacial Till	-	13.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G2	5.79		926.73		926.73	Upper Glacial Till	-	13.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G4	6.25		926.27		926.27	Upper Glacial Till	-	10.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G5	6.65		925.87		925.87	Upper Glacial Till	-	12.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-03	Dam Breach Area	Grab	G6	7.17		925.35		925.35	Upper Glacial Till	-	11.8	SC	24	12	12	-0.02	CL	-	-	-	-	-	-	14.7	35.5	31.8	18.0	0.002	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G7	7.32		925.20		925.20	Upper Glacial Till	-	12.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G8	7.81		924.71		924.71	Upper Glacial Till	-	10.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G9	8.23		924.29		924.29	Upper Glacial Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G11	8.84		923.68		923.68	Upper Glacial Till	-	11.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G12	9.30		923.22		923.22	Upper Glacial Till	-	12.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G13	9.45		923.07		923.07	Upper Glacial Till	-	11.8	SC	24	12	12	-0.02	CL	-	-	-	-	-	-	14.0	39.0	31.1	16.0	0.002	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G14	9.76		922.76		922.76	Upper Glacial Till	-	10.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G16	10.73		921.79		921.79	Upper Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G17	11.07		921.45		921.45	Upper Glaciolacustrine	-	31.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G18	11.10		921.42		921.42	Upper Glaciolacustrine	-	30.6	CI	41	16	25	0.58	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G19	11.34		921.18		921.18	Upper Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G20	11.71		920.81		920.81	Upper Glaciolacustrine	-	32.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G21	11.89		920.63		920.63	Upper Glaciolacustrine	-	35.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G22	11.95		920.57		920.57	Upper Glaciolacustrine	-	24.5	CI	33	14	19	0.55	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G23	12.19		920.33		920.33	Upper Glaciolacustrine	-	21.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G24	12.44		920.08		920.08	Upper Glaciolacustrine	-	25.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G25	12.68		919.84		919.84	Upper Glaciolacustrine	-	37.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G26	12.84		919.68		919.68	Upper Glaciolacustrine	-	33.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G27	13.20		919.32		919.32	Upper Glaciolacustrine	-	37.0	CI	44	17	27	0.74	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G28	13.57		918.95		918.95	Upper Glaciolacustrine	-	18.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G29	13.72		918.80		918.80	Middle Glacial Till	-	12.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G30	14.24		918.28		918.28	Middle Glacial Till	-	10.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G31	14.63		917.89		917.89	Middle Glacial Till	-	20.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G32	15.09		917.43		917.43	Middle Glacial Till	-	22.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G33	15.30		917.22		917.22	Middle Glacial Till	-	20.9	CI	41	22	19	-0.06	CI	-	-	-	-	-	-	0.0	2.7	64.1	33.2	0.002	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G34	15.49		917.03		917.03	Middle Glacial Till	-	22.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G35	15.70		916.82		916.82	Middle Glacial Till	-	21.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G36	16.00		916.52		916.52	Middle Glacial Till	-	21.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G38	16.40		916.12		916.12	Middle Glacial Till	-	21.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G39	16.86		915.66		915.66	Middle Glacial Till	-	22.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G40	17.38		915.14		915.14	Lower Glaciolacustrine	-	26.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G41	17.44		915.08		915.08	Lower Glaciolacustrine	-	26.9	CI	42	21	21	0.28	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G42	17.99		914.53		914.53	Lower Glaciolacustrine	-	26.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G43	18.29		914.23		914.23	Lower Glaciolacustrine	-	27.9	CI	31	20	11	0.72	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G44	18.44		914.08		914.08	Lower Glaciolacustrine	-	27.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G45	18.75		913.77		913.77	Lower Glaciolacustrine	-	27.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G47	19.74		912.78		912.78	Upper Glaciofluvial	-	25.6	ML	27	22	5	0.72	ML	-	-	-	-	-	-	0.0	5.2	80.3	14.5	0.002	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G48	19.60		912.92		912.92	Upper Glaciofluvial	-	26.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G49	20.88		911.64		911.64	Upper Glaciofluvial	-	25.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G50	21.34		911.18		911.18	Upper Glaciofluvial	-	26.3	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G51	22.53		909.99		909.99	Weathered Bedrock (Sedimentary)	-	43.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G52	22.56		909.96		909.96	Weathered Bedrock (Sedimentary)	-	40.5	CH	111	34	77	0.08	CH	-	-	-	-	-	-	0.0	4.8	22.7	72.5	0.002	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G53	22.86		909.66		909.66	Weathered Bedrock (Sedimentary)	-	43.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G54	23.47		909.05		909.05	Weathered Bedrock (Sedimentary)	-	47.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G55	23.78		908.74		908.74	Weathered Bedrock (Sedimentary)	-	50.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G56	23.87		908.65		908.65	Weathered Bedrock (Sedimentary)	-	48.0	CH	88	39	49	0.18	CH	-	-	-	-	-	-	0.8	22.3	31.3	45.6	0.002	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G57	24.39		908.13		908.13	Weathered Bedrock (Sedimentary)	-	45.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G58	25.00		907.52		907.52	Weathered Bedrock (Sedimentary)	-	25.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G59	25.61		906.91		906.91	Weathered Bedrock (Sedimentary)	-	23.4	CH	71	24	47	-0.01	CH	-	-	-	-	-	-	0.9	30.2	27.5	41.4	0.002	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G60	27.43		905.09		905.09	Weathered Bedrock (Sedimentary)	-	47.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03	Dam Breach Area	Grab	G61	28.96		903.56		903.56	Weathered Bedrock (Sedimentary)	-	42.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-03B	Dam Breach Area	Grab	G4	12.14		920.49		920.49	Upper Glaciolacustrine	2.78	31.2	CI	47	20	27	0.41	CI	-	-	-	-	-	-	0.0	1.7	51.3	47.0	0.002	DS
2014	KCB	SH14-03B	Dam Breach Area	Grab	G5	12.45		920.18		920.18	Upper Glaciolacustrine	2.80	46.3	CH	68	25	43	0.50	CH	-	-	-	-	-	-	0.0	4.6	26.5	68.9	0.002	DS
2014	KCB	SH14-04	Dam Breach Area	Grab	G1	0.61		931.59		931.59	Upper Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G2	1.06		931.14		931.14	Upper Glacial Till	-	9.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G3	1.52		930.68		930.68	Upper Glacial Till	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G4	6.55		925.65		925.65	Upper Glacial Till	-	12.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G5	7.01		925.19		925.19	Upper Glacial Till	-	13.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G6	7.16		925.04		925.04	Upper Glacial Till	-	12.5	CL	23	13	10	-0.05	CL	-	-	-	-	-	-	4.4	37.4	40.1	18.1	0.002	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G7	7.46		924.74		924.74	Upper Glacial Till	-	13.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G8	7.62		924.58		924.58	Upper Glacial Till	-	14.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G9	8.04		924.16		924.16	Upper Glacial Till	-	14.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G10	8.56		923.64		923.64	Upper Glacial Till	-	8.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G12	9.29		922.91		922.91	Upper Glacial Till	-	9.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G13	9.66		922.54		922.54	Upper Glacial Till	-	8.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G14	10.12		922.08		922.08	Upper Glacial Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G16	10.82		921.38		921.38	Upper Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G17	11.21		920.99		920.99	Upper Glacial Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G18	11.82		920.38		920.38	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G19	12.01		920.19		920.19	Upper Glacial Till	-	12.1	CL	23	14	9	-0.21	CL	-	-	-	-	-	-	12.8	35.7	38.0	13.5	0.002	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G20	12.46		919.74		919.74	Upper Glacial Till	-	12.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G21	13.04		919.16		919.16	Upper Glacial Till	-	12.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G22	13.59		918.61		918.61	Upper Glacial Till	-	8.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G23	13.65		918.55		918.55	Upper Glaciolacustrine	-	31.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G24	13.65		918.55		918.55	Upper Glaciolacustrine	2.80	38.5	CH	71	22	49	0.34	CH	-	-	-	-	-	-	2.8	8.9	19.8	68.5	0.002	DS
2014	KCB	SH14-04	Dam Breach Area	Grab	G25	13.96		918.24		918.24	Upper Glaciolacustrine	-	38.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G26	14.14		918.06		918.06	Middle Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G27	14.23		917.97		917.97	Middle Glacial Till	-	14.9	CL	27	16	11	-0.10	CL	-	-	-	-	-	-	18.2	22.1	45.9	13.8	0.002	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G28	14.60		917.60		917.60	Middle Glacial Till	-	14.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G30	15.27		916.93		916.93	Lower Glaciolacustrine	-	25.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G31	16.30		915.90		915.90	Upper Glaciofluvial	-	18.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G32	16.46		915.74		915.74	Upper Glaciofluvial	-	21.9	ML	21	19	2	1.45	ML	-	-	-	-	-	-	0.0	32.6	58.1	9.3	0.002	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G33	16.91		915.29		915.29	Upper Glaciofluvial	-	26.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G34	17.37		914.83		914.83	Upper Glaciofluvial	-	25.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G35	18.13		914.07		914.07	Lower Glaciofluvial	-	20.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G36	18.13		914.07		914.07	Lower Glaciofluvial	-	18.4	SM		Non-Plastic		-	ML	-	-	-	-	-	-	2.4	49.4	43.2	5.1	0.002	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G37	18.74		913.46		913.46	Lower Glaciofluvial	-	12.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G38	19.20		913.00		913.00	Lower Glaciofluvial	-	21.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-04	Dam Breach Area	Grab	G39	19.66		912.54		912.54	Lower Glaciofluvial	-	24.5	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G1	3.35		933.86		933.86	Upper Glacial Till	-	16.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G2	3.81		933.40		933.40	Upper Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G3	4.12		933.09		933.09	Upper Glacial Till	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G5	5.70		931.51		931.51	Upper Glacial Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G6	6.16		931.05		931.05	Upper Glacial Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G7	8.48		928.73		928.73	Upper Glacial Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G8	8.78		928.43		928.43	Upper Glacial Till	-	12.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G10	11.19		926.02		926.02	Upper Glacial Till	-	14.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G11	11.68		925.53		925.53	Upper Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G13	12.35		924.86		924.86	Upper Glacial Till	-	9.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G14	12.86		924.35		924.35	Upper Glacial Till	-	7.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G16	13.57		923.64		923.64	Upper Glacial Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G18	14.14		923.07		923.07	Upper Glacial Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G20	14.85		922.36		922.36	Upper Glacial Till	-	13.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G21	15.18		922.03		922.03	Upper Glacial Till	-	14.5	CL	22	12	10	0.25	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G22	15.70		921.51		921.51	Upper Glaciolacustrine	-	29.6	CI	42	15	27	0.54	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G23	15.70		921.51		921.51	Upper Glaciolacustrine	-	34.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G24	16.16		921.05		921.05	Upper Glacial Till	-	13.1	CL	23	12	11	0.10	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G25	16.77		920.44		920.44	Middle Glacial Till	-	11.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G26	17.07		920.14		920.14	Middle Glacial Till	-	7.7	SC	21	14	7	-0.90	CL-ML	-	-	-	-	-	-	10.9	43.1	34.1	12.0	0.002	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G27	17.38		919.83		919.83	Middle Glacial Till	-	8.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G28	17.83		919.38		919.38	Middle Glacial Till	-	7.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G30	18.75		918.46		918.46	Lower Glaciolacustrine	-	20.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G31	18.84		918.37		918.37	Lower Glaciolacustrine	-	18.2	CL	29	17	12	0.10	CL	-	-	-	-	-	-	0.3	17.7	54.0	28.0	0.002	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G32	19.20		918.01		918.01	Lower Glaciolacustrine	-	20.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-05A	Dam Breach Area	Grab	G34	19.51		917.70		917.70	Lower Glaciolacustrine	-	20.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G35	19.81		917.40		917.40	Lower Glaciofluvial	-	4.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G36	20.61		916.60		916.60	Lower Glaciofluvial	-	9.8	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G37	21.28		915.93		915.93	Lower Glaciofluvial	-	12.3	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-05A	Dam Breach Area	Grab	G38	21.49		915.72		915.72	Lower Glaciofluvial	-	12.8	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G1	8.48		928.98		928.98	Upper Glacial Till	-	12.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G3	8.91		928.55		928.55	Upper Glacial Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G4	10.03		927.43		927.43	Upper Glacial Till	-	10.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G5	10.25		927.21		927.21	Upper Glacial Till	-	10.4	SC	24	13	11	-0.24	CL	-	-	-	-	-	-	-	20.8	35.1	29.1	15.0	0.002	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G6	10.40		927.06		927.06	Upper Glacial Till	-	8.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G7	10.73		926.73		926.73	Upper Glacial Till	-	9.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G8	11.34		926.12		926.12	Upper Glacial Till	-	10.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G10	11.95		925.51		925.51	Upper Glacial Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G11	12.32		925.14		925.14	Upper Glacial Till	-	10.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G12	12.56		924.90		924.90	Upper Glacial Till	-	10.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G13	12.99		924.47		924.47	Upper Glacial Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G15	13.36		924.10		924.10	Upper Glacial Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G16	13.84		923.62		923.62	Upper Glacial Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G17	14.42		923.04		923.04	Upper Glacial Till	-	21.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G18	14.67		922.79		922.79	Upper Glacial Till	-	24.7	CL	24	13	11	1.06	CL	-	-	-	-	-	-	-	0.0	21.2	51.3	27.5	0.002	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G19	15.03		922.43		922.43	Upper Glaciolacustrine	-	20.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G20	15.09		922.37		922.37	Upper Glaciolacustrine	-	20.7	CH	21	18	3	0.90	CH	-	-	-	-	-	-	-	0.3	27.0	54.3	18.5	0.002	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G21	15.43		922.03		922.03	Upper Glaciolacustrine	-	26.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G21A	15.79		921.67		921.67	Upper Glaciolacustrine	-	31.0	CH	54	21	33	0.30	CH	-	-	-	-	-	-	-	0.4	1.7	41.9	56.0	0.002	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G22	16.19		921.27		921.27	Upper Glaciolacustrine	-	34.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G24	16.71		920.75		920.75	Middle Glacial Till	-	16.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G25	17.47		919.99		919.99	Middle Glacial Till	-	9.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G26	17.68		919.78		919.78	Middle Glacial Till	-	9.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G27	17.74		919.72		919.72	Middle Glacial Till	-	9.0	CL	22	14	8	-0.63	CL	-	-	-	-	-	-	-	19.0	35.3	33.8	12.0	0.002	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G28	18.08		919.38		919.38	Middle Glacial Till	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G29	18.35		919.11		919.11	Middle Glacial Till	-	8.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G30	18.72		918.74		918.74	Lower Glaciolacustrine	-	12.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G31	19.09		918.37		918.37	Lower Glaciolacustrine	-	16.9	CL	29	14	15	0.19	CL	-	-	-	-	-	-	-	4.8	15.4	57.7	22.0	0.002	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G32	19.60		917.86		917.86	Lower Glaciolacustrine	-	17.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G33	20.88		916.58		916.58	Lower Glaciofluvial	-	11.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-06	Dam Breach Area	Grab	G34	21.49		915.97		915.97	Lower Glaciofluvial	-	10.5	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G1	2.14		929.56		929.56	Tailings	-	20.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G2	2.44		929.26		929.26	Upper Glacial Till	-	14.2	CL	28	13	15	0.08	CL	-	-	-	-	-	-	-	8.7	35.9	36.3	19.2	0.002	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G3	2.75		928.95		928.95	Upper Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G4	3.20		928.50		928.50	Upper Glacial Till	-	10.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G5	3.66		928.04		928.04	Upper Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G7	4.42		927.28		927.28	Upper Glacial Till	-	9.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G8	5.03		926.67		926.67	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G9	5.28		926.42		926.42	Upper Glacial Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G10	5.43		926.27		926.27	Upper Glacial Till	-	9.5	CL	21	12	9	-0.28	CL	-	-	-	-	-	-	-	22.5	34.8	29.6	13.1	0.002	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G11	5.73		925.97		925.97	Upper Glacial Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G12	6.04		925.66		925.66	Upper Glacial Till	-	9.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G14	6.53		925.17		925.17	Upper Glacial Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G15	6.92		924.78		924.78	Upper Glacial Till	-	14.0	CL	29	12	17	0.12	CL	-	-	-	-	-	-	-	10.4	28.3	35.8	25.5	0.002	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G16	7.17		924.53		924.53	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G17	7.81		923.89		923.89	Upper Glacial Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G18	8.33		923.37		923.37	Upper Glacial Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G19A	8.54		923.16		923.16	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G19	8.65		923.05		923.05	Upper Glacial Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G21	9.15		922.55		922.55	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G21A	9.36		922.34		922.34	Upper Glacial Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G22	9.70		922.00		922.00	Upper Glacial Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G23	10.21		921.49		921.49	Upper Glacial Till	-	11.3	CL	22	12	10	-0.07	CL	-	-	-	-	-	-	-	13.7	37.5	33.7	15.1	0.002	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G24	10.46		921.24		921.24	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G25	10.85		920.85		920.85	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G26	11.22		920.48		920.48	Lower Glaciolacustrine	-	23.3	CI	38	19	19	0.23	CI	-	-	-	-	-	-	-	0.0	5.5	60.5	34.0	0.002	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G27	11.37		920.33		920.33	Lower Glaciolacustrine	-	23.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G28	11.74		919.96		919.96	Lower Glaciolacustrine	-	22.5	CI	37	20	17	0.15	CI	-	-	-	-	-	-	-	0.0	3.3	62.0	34.7	0.002	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G29	11.95		919.75		919.75	Lower Glaciolacustrine	-	22.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G30	12.26		919.44		919.44	Lower Glaciofluvial	-	10.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G31	12.90		918.80		918.80	Lower Glacial Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G32	13.14		918.56		918.56	Lower Glacial Till	-	8.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G33	13.51		918.19		918.19	Lower Glacial Till	-	8.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G33A	13.66		918.04		918.04	Lower Glacial Till	-	9.5	SC	24	13	11	-0.32	CL	-	-	-	-	-	-	-	11.9	48.0	27.6	12.5	0.002	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G34	14.48		917.22		917.22	Weathered Bedrock (Volcanic)	-	16.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-07	Dam Breach Area	Grab	G35	16.77		914.93		914.93	Weathered Bedrock (Volcanic)	-	12.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G1	20.22		927.33		927.33	Upper Glacial Till	-	13.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G2	20.37		927.18		927.18	-	-	17.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G2A	21.21		926.34		926.34	-	-	23.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G3	20.90		926.65		926.65	-	-	23.2	CI	34	18	16	0.33	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G4	21.29		926.26		926.26	Upper Glacial Till	-	10.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G5	21.90		925.65		925.65	Upper Glacial Till	-	11.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G6	22.20		925.35		925.35	Upper Glacial Till	-	10.7	SC	25	12	13	-0.10	CL	-	-	-	-	-	-	-	15.3	36.6	31.6	16.5	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G6A	22.35		925.20		925.20	Upper Glacial Till	-	11.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G7	22.81		924.74		924.74	Upper Glacial Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G8	23.42		924.13		924.13	Upper Glacial Till	-	13.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G9	23.88		923.67		923.67	Upper Glacial Till	-	14.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G10	23.88		923.67		923.67	Upper Glaciolacustrine	-	36.4	CH	63	20	43	0.38	CH	-	-	-	-	-	-	-	5.7	10.6	20.9	62.8	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G11	24.18		923.37		923.37	Upper Glacial Till	-	13.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G13	24.79		922.76		922.76	Upper Glacial Till	-	13.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G14	25.25		922.30		922.30	Upper Glacial Till	-	8.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G15	25.40		922.15		922.15	Upper Glacial Till	-	9.2	CL	24	15	9	-0.64	CL	-	-	-	-	-	-	-	8.2	33.4	42.6	15.8	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G16	27.99		919.56		919.56	Middle Glacial Till	-	9.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G17	28.14		919.41		919.41	Middle Glacial Till	-	9.5	CL	23	14	9	-0.50	CL	-	-	-	-	-	-	-	10.8	35.0	39.7	14.5	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G18	28.91		918.64		918.64	Middle Glacial Till	-	9.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G19	28.45		919.10		919.10	Middle Glacial Till	-	10.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G20	29.76		917.79		917.79	Middle Glacial Till	-	9.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G22	30.35		917.20		917.20	Middle Glacial Till	-	6.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G23	30.89		916.66		916.66	Middle Glacial Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G24	31.44		916.11		916.11	Middle Glacial Till	-	7.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G25	31.55		916.00		916.00	Middle Glacial Till	-	7.5	SM	18	14	4	-1.63	ML	-	-	-	-	-	-	-	18.6	55.8	18.6	7.0	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G26	32.16		915.39		915.39	Middle Glacial Till	-	4.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G27	32.65		914.90		914.90	Middle Glacial Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G28	32.92		914.63		914.63	Middle Glacial Till	-	10.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G30	33.68		913.87		913.87	Upper Glaciofluvial	-	11.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G31	34.17		913.38		913.38	Upper Glaciofluvial	-	20.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G32	34.39		913.16		913.16	Upper Glaciofluvial	-	21.0	SP	27	20	7	0.14	CL-ML	-	-	-	-	-	-	-	0.0	6.7	76.3	17.0	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G33	34.81		912.74		912.74	Upper Glaciofluvial	-	24.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G34	35.15		912.40		912.40	Upper Glaciofluvial	-	18.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G35	36.73		910.82		910.82	Lower Glacial Till	-	13.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G36	37.19		910.36		910.36	Lower Glacial Till	-	7.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G37	37.65		909.90		909.90	Lower Glacial Till	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G38	38.10		909.45		909.45	Lower Glacial Till	-	6.6	SM	20	14	6	-1.23	CL-ML	-	-	-	-	-	-	-	21.7	49.6	19.7	9.0	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G39	38.41		909.14		909.14	Lower Glacial Till	-	9.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G41	39.35		908.20		908.20	Lower Glacial Till	-	8.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G42	39.69		907.86		907.86	Lower Glacial Till	-	8.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G43	40.02		907.53		907.53	Lower Glacial Till	-	10.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G44	40.36		907.19		907.19	Lower Glacial Till	-	6.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G45	40.79		906.76		906.76	Lower Glacial Till	-	8.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G46	41.00		906.55		906.55	Lower Glacial Till	-	8.8	CL	29	14	15	-0.35	CL	-	-	-	-	-	-	-	9.0	37.2	36.8	17.0	0.002	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-08	Dam Breach Area	Grab	G47	41.21		906.34		906.34	Lower Glacial Till	-	8.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G48	41.55		906.00		906.00	Lower Glacial Till	-	6.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G49	42.10		905.45		905.45	Lower Glacial Till	-	25.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G51	42.55		905.00		905.00	Weathered Bedrock (Sedimentary)	-	27.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G52	43.10		904.45		904.45	Weathered Bedrock (Sedimentary)	-	25.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G53	43.56		903.99		903.99	Weathered Bedrock (Sedimentary)	-	27.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G54	43.80		903.75		903.75	Weathered Bedrock (Sedimentary)	-	31.6	CH	77	28	49	0.07	CH	-	-	-	-	-	-	-	0.0	10.6	62.3	27.1	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G55	44.23		903.32		903.32	Weathered Bedrock (Sedimentary)	-	29.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G56	44.93		902.62		902.62	Weathered Bedrock (Sedimentary)	-	37.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G57	45.14		902.41		902.41	Weathered Bedrock (Sedimentary)	-	32.5	CH	69	34	35	-0.04	CH	-	-	-	-	-	-	-	0.0	14.6	62.4	23.0	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G58	45.60		901.95		901.95	Weathered Bedrock (Sedimentary)	-	43.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G59	46.27		901.28		901.28	Weathered Bedrock (Sedimentary)	-	41.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G60	46.73		900.82		900.82	Weathered Bedrock (Sedimentary)	-	46.8	CH	150	56	94	-0.10	CH	-	-	-	-	-	-	-	0.0	2.4	37.1	60.5	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G61	46.94		900.61		900.61	Weathered Bedrock (Sedimentary)	-	43.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G62	47.10		900.45		900.45	Weathered Bedrock (Sedimentary)	-	37.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G63	47.40		900.15		900.15	Weathered Bedrock (Sedimentary)	-	46.7	CH	137	37	100	0.10	CH	-	-	-	-	-	-	-	0.0	3.4	40.6	56.0	0.002	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G64	47.96		899.59		899.59	Weathered Bedrock (Sedimentary)	-	44.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G65	48.41		899.14		899.14	Weathered Bedrock (Sedimentary)	-	28.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G66	49.18		898.37		898.37	Weathered Bedrock (Sedimentary)	-	37.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G67	49.63		897.92		897.92	Weathered Bedrock (Sedimentary)	-	38.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G70	51.16		896.39		896.39	Weathered Bedrock (Sedimentary)	-	23.0	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G71	51.77		895.78		895.78	Weathered Bedrock (Sedimentary)	-	34.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G72	52.28		895.27		895.27	Weathered Bedrock (Sedimentary)	-	44.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G73	52.89		894.66		894.66	Weathered Bedrock (Sedimentary)	-	41.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G74	53.50		894.05		894.05	Weathered Bedrock (Sedimentary)	-	25.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G75	54.11		893.44		893.44	Weathered Bedrock (Sedimentary)	-	35.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08	Dam Breach Area	Grab	G76	54.72		892.83		892.83	Weathered Bedrock (Sedimentary)	-	52.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G1	25.06		922.55		922.55	Upper Glacial Till	-	15.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G2	25.40		922.21		922.21	Upper Glacial Till	-	8.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G3	25.77		921.84		921.84	Upper Glacial Till	-	9.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G4	26.10		921.51		921.51	Upper Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G5	26.47		921.14		921.14	Upper Glacial Till	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G5A	26.62		920.99		920.99	Upper Glacial Till	-	11.9	CL	22	12	10	-0.01	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G6	26.71		920.90		920.90	Upper Glaciolacustrine	-	26.2	CH	68	21	47	0.11	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G6A	26.80		920.81		920.81	Upper Glacial Till	-	14.4	CL	29	12	17	0.14	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G7	27.29		920.32		920.32	Upper Glacial Till	-	13.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G8	27.62		919.99		919.99	Middle Glacial Till	-	9.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G9	27.99		919.62		919.62	Middle Glacial Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G10	28.33		919.28		919.28	Middle Glacial Till	-	8.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G11	28.69		918.92		918.92	Middle Glacial Till	-	9.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-08A	Dam Breach Area	Grab	G12	29.03		918.58		918.58	Middle Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G2	10.21		927.76		927.76	Upper Glacial Till	-	21.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G3	10.67		927.30		927.30	Upper Glacial Till	-	15.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G4	11.37		926.60		926.60	Upper Glacial Till	-	13.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G6	11.98		925.99		925.99	Upper Glacial Till	-	11.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G7	12.37		925.60		925.60	Upper Glacial Till	-	12.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G8	12.74		925.23		925.23	Upper Glacial Till	-	8.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G9	13.14		924.83		924.83	Upper Glacial Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G10	13.26		924.71		924.71	Upper Glacial Till	-	10.4	SC	23	11	12	-0.05	CL	-	-	-	-	-	-	-	17.4	40.9	28.6	13.1	0.002	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G11	13.66		924.31		924.31	Upper Glacial Till	-	8.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G12	14.39		923.58		923.58	Upper Glacial Till	-	9.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G13	14.72		923.25		923.25	Upper Glacial Till	-	11.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G15	15.30		922.67		922.67	Upper Glacial Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G16	15.88		922.09		922.09	Upper Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G17	16.25		921.72		921.72	Upper Glacial Till	-	9.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G18	16.64		921.33		921.33	Upper Glacial Till	-	12.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G19	16.82		921.15		921.15	Upper Glacial Till	-	13.7	CL	21	12	9	0.19	CL	-	-	-	-	-	-	-	5.0	40.2	39.6	15.2	0.002	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G20	17.45		920.52		920.52	Upper Glacial Till	-	16.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G21	17.83		920.14		920.14	Upper Glacial Till	-	15.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G22B	18.20		919.77		919.77	Upper Glaciolacustrine	-	27.9	CI	46	17	29	0.38	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G22	18.23		919.74		919.74	Upper Glaciolacustrine	-	29.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G22A	18.35		919.62		919.62	Upper Glaciolacustrine	-	32.0	CI	53	19	34	0.38	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G23	18.84		919.13		919.13	Middle Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G24	19.23		918.74		918.74	Middle Glacial Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G24A	19.35		918.62		918.62	Middle Glacial Till	-	12.9	CL	25	15	10	-0.21	CL	-	-	-	-	-	-	-	5.4	33.0	45.9	15.7	0.002	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G25	19.60		918.37		918.37	Middle Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G26	20.48		917.49		917.49	Middle Glacial Till	-	9.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G27	20.82		917.15		917.15	Middle Glacial Till	-	9.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G28	21.18		916.79		916.79	Middle Glacial Till	-	8.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G29	21.52		916.45		916.45	Middle Glacial Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G30	21.88		916.09		916.09	Middle Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G31	22.22		915.75		915.75	Lower Glaciolacustrine	-	20.1	CI	42	23	19	-0.15	CI	-	-	-	-	-	-	-	0.7	4.9	61.9	32.6	0.002	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G32	22.71		915.26		915.26	Lower Glaciolacustrine	-	21.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G34	23.32		914.65		914.65	Lower Glaciolacustrine	-	25.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G35	23.44		914.53		914.53	Lower Glaciolacustrine	-	24.5	CI	33	20	13	0.35	CI	-	-	-	-	-	-	-	0.0	6.5	73.4	20.1	0.002	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G36	23.77		914.20		914.20	Lower Glaciolacustrine	-	22.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G37	24.96		913.01		913.01	Upper Glaciofluvial	-	23.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G38	25.24		912.73		912.73	Upper Glaciofluvial	-	23.7	ML	26	21	5	0.54	CL-ML	-	-	-	-	-	-	-	0.0	9.9	78.7	11.4	0.002	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G39	25.51		912.46		912.46	Upper Glaciofluvial	-	24.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G40	27.40		910.57		910.57	Upper Glaciofluvial	-	23.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G41	28.44		909.53		909.53	Weathered Bedrock (Sedimentary)	-	22.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G42	29.05		908.92		908.92	Weathered Bedrock (Sedimentary)	-	29.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G43	29.29		908.68		908.68	Weathered Bedrock (Sedimentary)	-	41.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G44	29.96		908.01		908.01	Weathered Bedrock (Sedimentary)	-	41.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G45	30.78		907.19		907.19	Weathered Bedrock (Sedimentary)	-	31.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G46	31.61		906.36		906.36	Weathered Bedrock (Sedimentary)	-	53.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G47	32.22		905.75		905.75	Weathered Bedrock (Sedimentary)	-	49.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G48	32.83		905.14		905.14	Weathered Bedrock (Sedimentary)	-	54.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G49	33.44		904.53		904.53	Weathered Bedrock (Sedimentary)	-	41.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G50	34.05		903.92		903.92	Weathered Bedrock (Sedimentary)	-	54.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G51	54.25		883.72		883.72	Weathered Bedrock (Sedimentary)	-	50.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G52	55.93		882.04		882.04	Weathered Bedrock (Sedimentary)	-	46.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-09	Dam Breach Area	Grab	G53	57.39		880.58		880.58	Weathered Bedrock (Sedimentary)	-	29.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G1	5.03		927.12		927.12	Upper Glacial Till	-	13.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G2	5.58		926.57		926.57	Upper Glacial Till	-	11.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G4	6.34		925.81		925.81	Upper Glacial Till	-	10.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G5	6.95		925.20		925.20	Upper Glacial Till	-	12.7	SC	-	6.95	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G6	7.22		924.93		924.93	Upper Glacial Till	-	11.4	SC	24	12	12	-0.05	CI	-	-	-	-	-	-	-	19.6	33.6	29.8	17.0	0.002	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G7	7.59		924.56		924.56	Upper Glacial Till	-	11.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G8	8.32		923.83		923.83	Upper Glacial Till	-	12.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G10	9.08		923.07		923.07	Upper Glacial Till	-	12.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G11	9.84		922.31		922.31	Upper Glacial Till	-	10.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G12	10.21		921.94		921.94	Upper Glacial Till	-	11.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G13	10.66		921.49		921.49	Upper Glacial Till	-	10.8	SC	23	14	9	-0.36	CL	-	-	-	-	-	-	-	20.5	42.2	22.3	15.0	0.002	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G14	11.16		920.99		920.99	Upper Glaciolacustrine	-	19.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G15	11.28		920.87		920.87	Upper Glaciolacustrine	-	35.0	CH	39	16	23	0.83	CH	-	-	-	-	-	-	-	0.0	1.0	59.6	39.4	0.002	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G16	11.43		920.72		920.72	Upper Glaciolacustrine	-	31.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G17	11.73		920.42		920.42	Upper Glaciolacustrine	-	35.7	CH	60	20	40	0.39	CH	-	-	-	-	-	-	-	0.0	0.9	40.6	58.5	0.002	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G18	11.89		920.26		920.26	Upper Glaciolacustrine	-	42.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G19	12.19		919.96		919.96	Upper Glaciolacustrine	-	30.4	CH	46	16	30	0.48	CH	-	-	-	-	-	-	-	0.0	9.5	44.3	46.2	0.002	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G20	12.34		919.81		919.81	Upper Glaciolacustrine	-	43.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G21	12.50		919.65		919.65	Upper Glaciolacustrine	-	48.7	CH	69	20	49	0.59	CH	-	-	-	-	-	-	-	0.0	1.8	31.5	66.7	0.002	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G22	12.59		919.56		919.56	Upper Glaciolacustrine	-	53.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G23	13.41		918.74		918.74	Middle Glacial Till	-	11.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G24	15.09		917.06		917.06	Lower Glaciolacustrine	-	22.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-10	Dam Breach Area	Grab	G25	15.24		916.91		916.91	Lower Glaciolacustrine	-	15.6	Cl	42	15	27	0.02	Cl	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G26	15.54		916.61		916.61	Lower Glaciolacustrine	-	19.0	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G27	15.85		916.30		916.30	Lower Glaciolacustrine	-	20.7	Cl	31	17	14	0.26	Cl	-	-	-	-	-	-	-	0.0	3.4	72.3	24.3	0.002	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G28	16.00		916.15		916.15	Lower Glaciolacustrine	-	15.7	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G29	16.76		915.39		915.39	Lower Glacial Till	-	18.3	SC	46	16	30	0.08	Cl	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G30	17.07		915.08		915.08	Lower Glacial Till	-	23.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G31	17.22		914.93		914.93	Lower Glacial Till	-	22.9	SC	44	15	29	0.27	Cl	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G32	17.53		914.62		914.62	Lower Glacial Till	-	19.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G33	18.14		914.01		914.01	Lower Glacial Till	-	15.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10	Dam Breach Area	Grab	G35	18.93		913.22		913.22	Lower Glacial Till	-	14.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-10A	Dam Breach Area	Grab	G12	9.73		921.23		921.23	Upper Glacial Till	-	11.5	CL	24	13	11	-0.14	CL	-	-	-	-	-	-	-	17.7	36.1	29.1	17.1	0.002	TXP, TXCU
2014	KCB	SH14-10A	Dam Breach Area	Grab	G10 (Clay Portion)	10.59		920.37		920.37	Upper Glaciolacustrine	-	30.4	Cl	40	18	22	0.56	Cl	-	-	-	-	-	-	-	2.4	7.8	48.3	41.6	0.002	-
2014	KCB	SH14-10A	Dam Breach Area	Grab	G10 (Silt Portion)	10.59		920.37		920.37	Upper Glacial Till	-	30.4	CL	28	14	14	1.17	CL	-	-	-	-	-	-	-	13.9	25.9	35.1	25.1	0.002	TXP, TXCU
2014	KCB	SH14-10A	Dam Breach Area	Grab	G6	11.74		919.22		919.22	Upper Glaciolacustrine	-	34.9	Cl	48	20	28	0.53	Cl	-	-	-	-	-	-	-	0.0	2.7	47.4	49.9	0.002	DS, DSS
2014	KCB	SH14-10A	Dam Breach Area	Grab	G14	13.20		917.76		917.76	Middle Glacial Till	2.76	11.3	SC	20	15	5	-0.74	CL-ML	-	-	-	-	-	-	-	10.3	47.0	31.2	11.5	0.002	TXP, TXCU
2014	KCB	SH14-10A	Dam Breach Area	Grab	G17	15.64		915.32		915.32	Lower Glaciolacustrine	2.75	21.0	Cl	35	19	16	0.13	Cl	-	-	-	-	-	-	-	0.0	3.5	68.5	28.0	0.002	OD, DS
2014	KCB	SH14-11	Dam Breach Area	Grab	GI	2.26		928.71		928.71	Upper Glacial Till	-	23.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G2	3.63		927.34		927.34	Upper Glacial Till	-	12.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G3	3.93		927.04		927.04	Upper Glacial Till	-	11.4	CL	26	16	10	-0.46	CL	-	-	-	-	-	-	-	8.9	37.2	38.2	15.7	0.002	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G4	4.39		926.58		926.58	Upper Glacial Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G5	5.15		925.82		925.82	Upper Glacial Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G6	5.76		925.21		925.21	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G7	6.43		924.54		924.54	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G9	8.66		922.31		922.31	Upper Glacial Till	-	13.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G10	8.81		922.16		922.16	Upper Glacial Till	-	12.9	CL-ML	21	14	7	-0.16	CL-ML	-	-	-	-	-	-	-	10.8	33.9	42.3	13.0	0.002	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G11	9.11		921.86		921.86	Upper Glacial Till	-	9.9	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G12	9.42		921.55		921.55	Upper Glacial Till	-	11.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G14	10.94		920.03		920.03	Middle Glacial Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G15	11.34		919.63		919.63	Middle Glacial Till	-	10.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G17	12.13		918.84		918.84	Lower Glacial Till	-	10.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G18	12.80		918.17		918.17	Lower Glacial Till	-	14.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11	Dam Breach Area	Grab	G19	13.59		917.38		917.38	Lower Glacial Till	-	11.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	14.1	51.5	23.8	10.5	0.002	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G1	1.68		929.49		929.49	Tailings	-	22.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G3	2.72		928.45		928.45	Upper Glacial Till	-	15.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G4	3.20		927.97		927.97	Upper Glacial Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G6	3.97		927.20		927.20	Upper Glacial Till	-	10.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G7	4.61		926.56		926.56	Upper Glacial Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G8	5.25		925.92		925.92	Upper Glacial Till	-	10.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G9	5.58		925.59		925.59	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G10	6.04		925.13		925.13	Upper Glacial Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G12	6.77		924.40		924.40	Upper Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G14	7.23		923.94		923.94	Upper Glacial Till	-	7.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G15	8.33		922.84		922.84	Upper Glacial Till	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G16	8.69		922.48		922.48	Upper Glacial Till	-	11.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G17	9.21		921.96		921.96	Upper Glacial Till	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G18	9.70		921.47		921.47	Middle Glacial Till	-	16.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G18A	9.76		921.41		921.41	Middle Glacial Till	-	15.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	8.6	43.7	47.7		-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G19	10.21		920.96		920.96	Middle Glacial Till	-	13.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G20	10.73		920.44		920.44	Middle Glacial Till	-	11.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G20A	11.25		919.92		919.92	Middle Glacial Till	-	12.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G21	11.40		919.77		919.77	Middle Glacial Till	-	21.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G22	11.65		919.52		919.52	Upper Glaciofluvial	-	10.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G23	12.35		918.82		918.82	Lower Glacial Till	-	11.7	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G24	12.93		918.24		918.24	Lower Glacial Till	-	12.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G25	13.48		917.69		917.69	Lower Glacial Till	-	11.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-11B	Dam Breach Area	Grab	G26	13.96		917.21		917.21	Lower Glacial Till	-	-	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G1	1.25		929.52		929.52	Upper Glacial Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G3	2.59		928.18		928.18	Upper Glacial Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G5	3.05		927.72		927.72	Upper Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G6	3.51		927.26		927.26	Upper Glacial Till	-	8.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G7	3.66		927.11		927.11	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G9	4.57		926.20		926.20	Upper Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G9A	5.27		925.50		925.50	Upper Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G10	5.64		925.13		925.13	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G12	6.28		924.49		924.49	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G13	6.80		923.97		923.97	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G14	7.16		923.61		923.61	Upper Glacial Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G16	8.32		922.45		922.45	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G17	8.69		922.08		922.08	Upper Glacial Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G19	9.85		920.92		920.92	Middle Glacial Till	-	8.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G21	10.73		920.04		920.04	Middle Glacial Till	-	9.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G22	11.37		919.40		919.40	Middle Glacial Till	-	9.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G24	12.13		918.64		918.64	Middle Glacial Till	-	8.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G25	12.74		918.03		918.03	Middle Glacial Till	-	7.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G27	13.50		917.27		917.27	Middle Glacial Till	-	7.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G28	14.39		916.38		916.38	Middle Glacial Till	-	8.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G30	15.18		915.59		915.59	Middle Glacial Till	-	5.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G31	15.54		915.23		915.23	Middle Glacial Till	-	16.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G32	15.91		914.86		914.86	Middle Glacial Till	-	9.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G34	16.95		913.82		913.82	Middle Glacial Till	-	9.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G35	17.71		913.06		913.06	Middle Glacial Till	-	10.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G37	18.68		912.09		912.09	Middle Glacial Till	-	10.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G38	19.23		911.54		911.54	Lower Glacial Till	-	4.7	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-12	Dam Breach Area	Grab	G40	20.09		910.68		910.68	Lower Glacial Till	-	11.3	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G1	2.80		930.26		930.26	Upper Glacial Till	-	13.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G3	3.23		929.83		929.83	Upper Glacial Till	-	13.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G4	3.78		929.28		929.28	Upper Glacial Till	-	10.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G6	4.36		928.70		928.70	Upper Glacial Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G7	4.85		928.21		928.21	Upper Glacial Till	-	12.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G8	5.27		927.79		927.79	Upper Glacial Till	-	8.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	GI0	6.16		926.90		926.90	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G11	7.04		926.02		926.02	Upper Glacial Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G13	7.68		925.38		925.38	Upper Glacial Till	-	9.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G14	8.32		924.74		924.74	Upper Glacial Till	-	10.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G16	9.20		923.86		923.86	Upper Glacial Till	-	8.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G17	9.85		923.21		923.21	Upper Glacial Till	-	10.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G19	10.85		922.21		922.21	Upper Glacial Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G20	11.31		921.75		921.75	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G22	12.34		920.72		920.72	Upper Glacial Till	-	9.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G23	12.50		920.56		920.56	Upper Glacial Till	-	9.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G25	13.87		919.19		919.19	Upper Glacial Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G26	14.45		918.61		918.61	Upper Glacial Till	-	2.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G27	14.78		918.28		918.28	Upper Glacial Till	-	18.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G29	16.03		917.03		917.03	Upper Glacial Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G30	16.79		916.27		916.27	Upper Glacial Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G31	17.07		915.99		915.99	Glaciolacustrine[1]	-	22.4	Cl	42	22	20	0.02	Cl	-	-	-	-	-	-	-	0.0	8.3	56.1	35.6	0.002	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G32	17.83		915.23		915.23	Glaciolacustrine[1]	-	23.3	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G33	18.04		915.02		915.02	Glaciolacustrine[1]	-	25.9	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G34	18.14		914.92		914.92	Glaciolacustrine[1]	-	24.1	Cl	49	22	27	0.08	Cl	-	-	-	-	-	-	-	0.0	1.1	51.6	47.3	0.002	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G35	18.59		914.47		914.47	Upper Glaciofluvial	-	21.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G37	19.96		913.10		913.10	Upper Glaciofluvial	-	20.0	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G40	21.18		911.88		911.88	Lower Glaciofluvial	-	22.1	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G41	21.64		911.42		911.42	Lower Glaciofluvial	-	23.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G43	22.25		910.81		910.81	Lower Glaciofluvial	-	16.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G44	23.01		910.05		910.05	Lower Glaciofluvial	-	7.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-13	Perimeter Embankment	Grab	G45	23.90		909.16		909.16	Lower Glaciofluvial	-	8.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G46	25.24		907.82		907.82	Lower Glaciofluvial	-	19.5	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G48	26.88		906.18		906.18	Lower Glaciofluvial	-	14.1	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G50	27.80		905.26		905.26	Lower Glacial Till	-	6.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G51	28.29		904.77		904.77	Lower Glacial Till	-	7.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G53	29.32		903.74		903.74	Lower Glacial Till	-	5.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G54	29.90		903.16		903.16	Lower Glacial Till	-	16.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G56	30.54		902.52		902.52	Lower Glacial Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G57	30.97		902.09		902.09	Lower Glacial Till	-	13.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G58	31.42		901.64		901.64	Lower Glacial Till	-	8.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-13	Perimeter Embankment	Grab	G60	32.40		900.66		900.66	Lower Glacial Till	-	9.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G3	3.20		926.92		926.92	Upper Glacial Till	-	10.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G4	3.66		926.46		926.46	Upper Glacial Till	-	10.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G5	4.51		925.61		925.61	Upper Glacial Till	-	10.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G6	4.57		925.55		925.55	Upper Glacial Till	-	11.5	SC	25	17	8	-0.69	CL	-	-	-	-	-	-	-	17.6	35.5	33.9	13.0	0.002	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G7	5.30		924.82		924.82	Upper Glacial Till	-	14.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G9	6.13		923.99		923.99	Upper Glacial Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	GI0	6.83		923.29		923.29	Upper Glacial Till	-	9.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	GII	7.77		922.35		922.35	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G12	8.32		921.80		921.80	Upper Glacial Till	-	21.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G13	8.69		921.43		921.43	Upper Glacial Till	-	12.6	CL	23	14	9	-0.16	CL	-	-	-	-	-	-	-	6.7	40.5	36.7	16.1	0.002	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G14	9.02		921.10		921.10	Upper Glacial Till	-	12.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G15	9.91		920.21		920.21	Upper Glaciolacustrine	-	27.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G16	10.00		920.12		920.12	Upper Glaciolacustrine	-	24.9	CI	47	19	28	0.21	CI	-	-	-	-	-	-	-	2.3	17.8	28.7	51.2	0.002	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G18	10.27		919.85		919.85	Upper Glaciolacustrine	-	21.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G19	10.55		919.57		919.57	Middle Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G20	11.37		918.75		918.75	Middle Glacial Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G21	11.73		918.39		918.39	Middle Glacial Till	-	13.2	CL	27	17	10	-0.38	CL	-	-	-	-	-	-	-	8.2	31.9	43.9	16.0	0.002	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G22	12.07		918.05		918.05	Middle Glacial Till	-	12.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G23	12.89		917.23		917.23	Middle Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G24	13.32		916.80		916.80	Lower Glaciolacustrine	-	25.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G25	13.35		916.77		916.77	Lower Glaciolacustrine	-	24.0	CI	33	20	13	0.31	CI	-	-	-	-	-	-	-	0.1	6.9	63.1	29.9	0.002	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G26	14.94		915.18		915.18	Upper Glaciofluvial	-	14.9	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G27	15.09		915.03		915.03	Lower Glaciofluvial	-	7.9	GP	-	-	-	-	-	-	-	-	-	-	-	-	46.8	43.5	9.7	0.0	0.002	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G28	16.15		913.97		913.97	Lower Glacial Till	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G29	17.07		913.05		913.05	Weathered Bedrock (Sedimentary)	-	38.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G30	17.71		912.41		912.41	Weathered Bedrock (Sedimentary)	-	54.9	CH	-	17.71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G31	17.98		912.14		912.14	Weathered Bedrock (Sedimentary)	-	41.0	CH	103	41	62	0.00	CH	-	-	-	-	-	-	-	3.5	30.7	21.4	44.3	0.002	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G32	18.44		911.68		911.68	Weathered Bedrock (Sedimentary)	-	56.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G33	18.68		911.44		911.44	Weathered Bedrock (Sedimentary)	-	54.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G34	19.32		910.80		910.80	Weathered Bedrock (Sedimentary)	-	50.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G35	20.09		910.03		910.03	Weathered Bedrock (Sedimentary)	-	53.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G36	20.94		909.18		909.18	Weathered Bedrock (Sedimentary)	-	47.0	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G37	21.52		908.60		908.60	Weathered Bedrock (Sedimentary)	-	42.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G38	22.04		908.08		908.08	Weathered Bedrock (Sedimentary)	-	41.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G39	23.32		906.80		906.80	Weathered Bedrock (Sedimentary)	-	36.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-14	Dam Breach Area	Grab	G40	23.32		906.80		906.80	Weathered Bedrock (Sedimentary)	-	38.8	CH	116	36	80	0.04	CH	-	-	-	-	-	-	-	0.8	13.0	38.7	47.5	0.002	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G1	2.99		927.20		927.20	Upper Glacial Till	-	13.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G3	3.63		926.56		926.56	Upper Glacial Till	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G5	4.45		925.74		925.74	Upper Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G6	5.27		924.92		924.92	Upper Glacial Till	-	8.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G7	5.88		924.31		924.31	Upper Glacial Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G8	5.91		924.28		924.28	Upper Glacial Till	-	11.7	CL	24	12	12	-0.03	CL	-	-	-	-	-	-	-	12.0	38.1	33.7	16.2	0.002	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G9	6.92		923.27		923.27	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G10	7.56		922.63		922.63	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G12A	8.08		922.11		922.11	Upper Glaciolacustrine	-	29.3	CI	47	20	27	0.34	CI	-	-	-	-	-	-	-	0.5	2.0	48.8	48.7	0.002	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G12	8.35		921.84		921.84	Upper Glaciolacustrine	-	20.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G13	8.63		921.56		921.56	Upper Glacial Till	-	17.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G14	8.99		921.20		921.20	Upper Glacial Till	-	12.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G15	9.17		921.02		921.02	Upper Glacial Till	-	20.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G16	9.45		920.74		920.74	Upper Glaciolacustrine	-	31.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G17A	9.71		920.48		920.48	Upper Glaciolacustrine	-	33.2	CI	40	20	20	0.66	CI	-	-	-	-	-	-	-	0.2	19.0	34.2	46.6	0.002	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G17	9.75		920.44		920.44	Upper Glacial Till	-	15.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G18	10.09		920.10		920.10	Upper Glaciolacustrine	-	33.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G19	10.30		919.89		919.89	Middle Glacial Till	-	18.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G20	10.58		919.61		919.61	Middle Glacial Till	-	16.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G21	10.85		919.34		919.34	Lower Glaciolacustrine	-	24.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G22	11.13		919.06		919.06	Lower Glaciolacustrine	-	23.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G23	11.73		918.46		918.46	Lower Glaciolacustrine	-	24.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G24	11.80		918.39		918.39	Lower Glaciolacustrine	-	25.9	CI	35	20	15	0.39	CI	-	-	-	-	-	-	-	1.4	10.5	61.6	26.5	0.002	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G27	13.14		917.05		917.05	Lower Glaciolacustrine	-	23.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G28	13.56		916.63		916.63	Lower Glaciolacustrine	-	22.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G29	14.42		915.77		915.77	Lower Glaciolacustrine	-	25.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G30	14.48		915.71		915.71	Lower Glaciolacustrine	-	27.5	CI	41	23	18	0.25	CI	-	-	-	-	-	-	-	0.0	3.7	59.5	36.8	0.002	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G30A	14.78		915.41		915.41	Lower Glaciolacustrine	-	29.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G31	15.18		915.01		915.01	Lower Glaciolacustrine	-	26.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G33	16.46		913.73		913.73	Upper Glaciofluvial	-	22.4	CL	29	22	7	0.06	CL	-	-	-	-	-	-	-	2.6	9.9	75.0	12.5	0.002	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G34	16.82		913.37		913.37	Upper Glaciofluvial	-	21.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G35	18.44		911.75		911.75	Weathered Bedrock (Sedimentary)	-	25.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G36	19.96		910.23		910.23	Weathered Bedrock (Sedimentary)	-	27.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G37	21.58		908.61		908.61	Weathered Bedrock (Sedimentary)	-	15.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-15	Dam Breach Area	Grab	G38	23.10		907.09		907.09	Weathered Bedrock (Sedimentary)	-	14.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G1	1.77		928.46		928.46	Upper Glacial Till	-	14.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G2	2.23		928.00		928.00	Upper Glacial Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G4	2.96		927.27		927.27	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G5	3.35		926.88		926.88	Upper Glacial Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G6	3.60		926.63		926.63	Upper Glacial Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G7	4.08		926.15		926.15	Upper Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G8	4.11		926.12		926.12	Upper Glacial Till	-	11.5	CL	25	13	12	-0.13	CL	-	-	-	-	-	-	-	17.8	32.4	34.1	15.8	0.002	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G9	4.75		925.48		925.48	Upper Glacial Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G10	5.27		924.96		924.96	Upper Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G12	5.97		924.26		924.26	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G12A	6.40		923.83		923.83	Upper Glacial Till	-	17.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G13	6.64		923.59		923.59	Upper Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G14	7.16		923.07		923.07	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G16	7.68		922.55		922.55	Middle Glacial Till	-	15.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G17	8.32		921.91		921.91	Middle Glacial Till	-	12.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G18	8.69		921.54		921.54	Middle Glacial Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G19	8.75		921.48		921.48	Middle Glacial Till	-	14.7	CL	27	17	10	-0.23	CL	-	-	-	-	-	-	-	5.0	32.7	43.2	19.0	0.002	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G20	9.33		920.90		920.90	Middle Glacial Till	-	12.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G21	9.85		920.38		920.38	Middle Glacial Till	-	18.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G22	10.45		919.78		919.78	Lower Glaciolacustrine	-	18.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G25	11.77		918.46		918.46	Lower Glaciolacustrine	-	23.6	CI	32	18	14	0.40	CI	-	-	-	-	-	-	-	0.4	6.3	67.3	26.0	0.002	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G26	12.34		917.89		917.89	Lower Glaciolacustrine	-	23.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G27	13.26		916.97		916.97	Lower Glacial Till	-	14.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G28	15.00		915.23		915.23	Weathered Bedrock (Sedimentary)	-	36.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G29	16.25		913.98		913.98	Weathered Bedrock (Sedimentary)	-	26.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G30	18.14		912.09		912.09	Weathered Bedrock (Sedimentary)	-	15.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G31	21.34		908.89		908.89	Weathered Bedrock (Sedimentary)	-	25.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-16	Dam Breach Area	Grab	G32	22.56		907.67		907.67	Weathered Bedrock (Volcanic)	-	31.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G1	2.23		927.34		927.34	Tailings	-	21.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G2	2.62		926.95		926.95	Upper Glacial Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G3	2.68		926.89		926.89	Upper Glacial Till	-	10.7	SC	26	14	12	-0.28	CL	-	-	-	-	-	-	-	16.5	36.4	31.1	16.0	0.002	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G4	3.14		926.43		926.43	Upper Glacial Till	-	11.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G5	3.69		925.88		925.88	Upper Glacial Till	-	10.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-17	Dam Breach Area	Grab	G6	4.33		925.24		925.24	Upper Glacial Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G8	4.60		924.97		924.97	Upper Glacial Till	-	15.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G9	5.30		924.27		924.27	Upper Glacial Till	-	14.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G10	5.45		924.12		924.12	Upper Glacial Till	-	14.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G11	5.88		923.69		923.69	Upper Glaciolacustrine	-	29.7	CH	56	21	35	0.25	CH	-	-	-	-	-	-	-	2.9	12.8	34.3	50.0	0.002	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G12	6.19		923.38		923.38	Middle Glacial Till	-	18.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G13	6.64		922.93		922.93	Middle Glacial Till	-	14.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G14	7.16		922.41		922.41	Middle Glacial Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G15	7.59		921.98		921.98	Middle Glacial Till	-	16.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G16	7.77		921.80		921.80	Middle Glacial Till	-	16.0	CI	34	19	15	-0.20	CI	-	-	-	-	-	-	-	2.9	10.9	62.2	24.0	0.002	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G17	8.32		921.25		921.25	Middle Glacial Till	-	15.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G18	8.69		920.88		920.88	Middle Glacial Till	-	14.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G19	9.24		920.33		920.33	Middle Glacial Till	-	14.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G21	9.85		919.72		919.72	Middle Glacial Till	-	20.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G22	10.21		919.36		919.36	Middle Glacial Till	-	17.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G23	10.70		918.87		918.87	Middle Glacial Till	-	17.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G25	11.40		918.17		918.17	Middle Glacial Till	-	15.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G26	11.80		917.77		917.77	Middle Glacial Till	-	19.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G27	12.22		917.35		917.35	Lower Glaciolacustrine	-	22.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G28	12.83		916.74		916.74	Lower Glaciolacustrine	-	23.3	CI	41	21	20	0.12	CI	-	-	-	-	-	-	-	0.0	1.3	66.7	32.0	0.002	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G29	13.01		916.56		916.56	Lower Glaciolacustrine	-	25.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G31	13.75		915.82		915.82	Upper Glaciofluvial	-	19.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G32	15.70		913.87		913.87	Weathered Bedrock (Mafic)	-	10.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-17	Dam Breach Area	Grab	G33	17.07		912.50		912.50	Weathered Bedrock (Mafic)	-	11.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G1	3.16		931.60		931.60	Dam Till Core	-	11.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G2	4.27		930.49		930.49	Upper Glacial Till	-	17.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G4	5.27		929.49		929.49	Upper Glacial Till	-	14.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G5	5.64		929.12		929.12	Upper Glacial Till	-	15.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G6	5.97		928.79		928.79	Upper Glacial Till	-	13.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G8	6.80		927.96		927.96	Upper Glacial Till	-	10.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G9	7.16		927.60		927.60	Upper Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G10	7.41		927.35		927.35	Upper Glacial Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G12	8.32		926.44		926.44	Upper Glacial Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G13	8.69		926.07		926.07	Upper Glacial Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G14	9.20		925.56		925.56	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G16	9.60		925.16		925.16	Upper Glacial Till	-	15.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G18	10.45		924.31		924.31	Upper Glacial Till	-	9.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G19	10.73		924.03		924.03	Upper Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G20	11.43		923.33		923.33	Upper Glaciofluvial	-	20.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G22	12.65		922.11		922.11	Lower Glaciofluvial	-	21.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G23	13.26		921.50		921.50	Lower Glaciofluvial	-	22.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G25	14.36		920.40		920.40	Lower Glaciofluvial	-	13.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G26	14.69		920.07		920.07	Lower Glaciofluvial	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G27	15.03		919.73		919.73	Lower Glaciofluvial	-	19.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G29	15.94		918.82		918.82	Lower Glacial Till	-	9.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G30	16.28		918.48		918.48	Lower Glacial Till	-	5.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G31	16.61		918.15		918.15	Lower Glacial Till	-	7.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G33	18.14		916.62		916.62	Lower Glacial Till	-	12.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G35	19.05		915.71		915.71	Lower Glacial Till	-	6.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G36	19.81		914.95		914.95	Weathered Bedrock (Sedimentary)	-	30.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G38	21.12		913.64		913.64	Weathered Bedrock (Sedimentary)	-	15.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-18	Dam Breach Area	Grab	G39	24.17		910.59		910.59	Weathered Bedrock (Volcanic)	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G1	2.93		939.89		939.89	Glacial Till	-	16.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G3	3.66		939.16		939.16	Glacial Till	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G4	4.27		938.55		938.55	Glacial Till	-	12.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G5	5.27		937.55		937.55	Glacial Till	-	9.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G6	5.64		937.18		937.18	Glacial Till	-	10.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G7	6.13		936.69		936.69	Glacial Till	-	10.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G9	6.80		936.02		936.02	Glacial Till	-	11.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	GI0	7.41		935.41		935.41	Glacial Till	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G12	8.32		934.50		934.50	Glacial Till	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G13	8.69		934.13		934.13	Glacial Till	-	13.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G14	8.93		933.89		933.89	Glacial Till	-	13.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G16	9.85		932.97		932.97	Glacial Till	-	13.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G17	10.45		932.37		932.37	Glacial Till	-	15.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G18	10.45		932.37		932.37	Glacial Till	-	14.0	CL	28	17	11	-0.27	CL	-	-	-	-	-	-	-	11.9	27.2	47.1	13.7	0.002	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G19	11.40		931.42		931.42	Upper Glaciofluvial	-	14.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G21	12.92		929.90		929.90	Upper Glaciofluvial	-	11.9	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G22	13.47		929.35		929.35	Glacial Till	-	11.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G26	14.36		928.46		928.46	Glacial Till	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G27	14.90		927.92		927.92	Glacial Till	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G29	15.36		927.46		927.46	Glacial Till	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G30	16.15		926.67		926.67	Weathered Bedrock (Volcanic)	-	17.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G31	16.82		926.00		926.00	Weathered Bedrock (Volcanic)	-	18.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G32	18.01		924.81		924.81	Weathered Bedrock (Volcanic)	-	18.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-19	Dam Breach Area	Grab	G33	19.78		923.04		923.04	Weathered Bedrock (Volcanic)	-	22.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G1	10.22		959.70		959.70	Dam Till Core	-	10.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G3	11.32		958.60		958.60	Dam Till Core	-	11.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G4	12.02		957.90		957.90	Dam Till Core	-	10.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G6	12.72		957.20		957.20	Dam Till Core	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G7	13.22		956.70		956.70	Dam Till Core	-	11.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G8	13.52		956.40		956.40	Dam Till Core	-	9.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G9	13.82		956.10		956.10	Dam Till Core	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G10	14.42		955.50		955.50	Dam Till Core	-	8.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G11	15.02		954.90		954.90	Dam Till Core	-	8.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G13	15.92		954.00		954.00	Dam Till Core	-	10.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G14	16.52		953.40		953.40	Dam Till Core	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G16	17.52		952.40		952.40	Dam Till Core	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G17	18.12		951.80		951.80	Dam Till Core	-	14.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G19	19.02		950.90		950.90	Dam Till Core	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G20	19.42		950.50		950.50	Dam Till Core	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G21	20.02		949.90		949.90	Dam Till Core	-	10.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G22	20.52		949.40		949.40	Dam Till Core	-	12.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G23	20.92		949.00		949.00	Dam Till Core	-	12.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G24	21.42		948.50		948.50	Dam Till Core	-	10.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G25	22.12		947.80		947.80	Dam Till Core	-	7.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G26	22.82		947.10		947.10	Dam Till Core	-	8.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G27	23.42		946.50		946.50	Dam Till Core	-	10.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G28	23.82		946.10		946.10	Dam Till Core	-	10.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G29	24.32		945.60		945.60	Dam Till Core	-	10.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G30	25.12		944.80		944.80	Dam Till Core	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G31	25.82		944.10		944.10	Dam Till Core	-	10.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G33	28.02		941.90		941.90	Dam Till Core	-	8.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G35	28.80		941.12		941.12	Glacial Till	-	13.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G37	29.41		940.51		940.51	Glacial Till	-	10.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G38	29.96		939.96		939.96	Glacial Till	-	8.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G39	30.33		939.59		939.59	Glacial Till	-	10.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G41	31.49		938.43		938.43	Glacial Till	-	9.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G42	32.10		937.82		937.82	Glacial Till	-	9.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G44	32.92		937.00		937.00	Glacial Till	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G45	33.22		936.70		936.70	Glacial Till	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G46	33.62		936.30		936.30	Glacial Till	-	10.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G48	34.44		935.48		935.48	Glacial Till	-	12.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G49	34.75		935.17		935.17	Glacial Till	-	12.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G51	35.27		934.65		934.65	Glacial Till	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-20	Dam Breach Area	Grab	G52	35.45		934.47		934.47	Glacial Till	-	12.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G53	36.00		933.92		933.92	Glacial Till	-	13.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G54	36.30		933.62		933.62	Glacial Till	-	13.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G55	36.73		933.19		933.19	Glacial Till	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G57	37.49		932.43		932.43	Glacial Till	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G58	37.80		932.12		932.12	Glacial Till	-	13.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G59	38.25		931.67		931.67	Glacial Till	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G61	39.04		930.88		930.88	Glacial Till	-	12.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G63	39.84		930.08		930.08	Upper Glaciofluvial	-	18.1	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G64	40.78		929.14		929.14	Glacial Till	-	10.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G66	41.42		928.50		928.50	Glacial Till	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G67	42.18		927.74		927.74	Glacial Till	-	11.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G68	42.64		927.28		927.28	Glacial Till	-	8.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G70	43.07		926.85		926.85	Glacial Till	-	12.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G71	43.49		926.43		926.43	Glacial Till	-	13.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G72	44.14		925.78		925.78	Glacial Till	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G73	44.17		925.75		925.75	Glacial Till	-	11.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G75	45.14		924.78		924.78	Glacial Till	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G76	45.45		924.47		924.47	Glacial Till	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G77	45.72		924.20		924.20	Glacial Till	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G79	46.54		923.38		923.38	Glacial Till	-	10.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G80	47.21		922.71		922.71	Glacial Till	-	8.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G82	48.25		921.67		921.67	Glacial Till	-	14.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G84	48.77		921.15		921.15	Glacial Till	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G85	50.02		919.90		919.90	Weathered Bedrock (Volcanic)	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G86	51.88		918.04		918.04	Weathered Bedrock (Volcanic)	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-20	Dam Breach Area	Grab	G87	53.40		916.52		916.52	Weathered Bedrock (Volcanic)	-	16.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G3	32.71		936.20		936.20	Dam Filter	-	13.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G5	33.61		935.30		935.30	Dam Till Core	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G6	34.21		934.70		934.70	Dam Till Core	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G7	34.61		934.30		934.30	Dam Till Core	-	11.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G8	35.11		933.80		933.80	Dam Till Core	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G9	35.71		933.20		933.20	Dam Till Core	-	14.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G10	36.31		932.60		932.60	Dam Till Core	-	12.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G11	37.01		931.90		931.90	Dam Till Core	-	10.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G12	38.21		930.70		930.70	Dam Till Core	-	11.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G13	38.81		930.10		930.10	Dam Till Core	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G18	39.41		929.50		929.50	Dam Till Core	-	14.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G14	39.41		929.50		929.50	Dam Till Core	-	18.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G15	40.18		928.73		928.73	Upper Glacial Till	-	8.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G16	40.85		928.06		928.06	Upper Glacial Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G17	41.18		927.73		927.73	Upper Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G19	41.76		927.15		927.15	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G20	42.07		926.84		926.84	Upper Glacial Till	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G21	42.46		926.45		926.45	Upper Glacial Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G22	42.92		925.99		925.99	Upper Glacial Till	-	9.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G23	43.74		925.17		925.17	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G24	44.20		924.71		924.71	Upper Glacial Till	-	14.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G25	44.69		924.22		924.22	Upper Glacial Till	-	9.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G26	45.15		923.76		923.76	Upper Glacial Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G27	45.48		923.43		923.43	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G28	46.15		922.76		922.76	Upper Glacial Till	-	10.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G29	46.73		922.18		922.18	Upper Glacial Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G30	47.07		921.84		921.84	Upper Glacial Till	-	10.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G31	47.65		921.26		921.26	Middle Glacial Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G32	48.25		920.66		920.66	Middle Glacial Till	-	10.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G33	48.65		920.26		920.26	Middle Glacial Till	-	8.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G34	49.47		919.44		919.44	Middle Glacial Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G35	49.72		919.19		919.19	Middle Glacial Till	-	2.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G36	50.14		918.77		918.77	Middle Glacial Till	-	8.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G37	50.78		918.13		918.13	Middle Glacial Till	-	5.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G38	51.33		917.58		917.58	Middle Glacial Till	-	6.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G39	51.73		917.18		917.18	Middle Glacial Till	-	10.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G40	52.58		916.33		916.33	Middle Glacial Till	-	8.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G42	53.44		915.47		915.47	Middle Glacial Till	-	8.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G43	53.80		915.11		915.11	Middle Glacial Till	-	7.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G44	54.49		914.42		914.42	Middle Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G45	54.59		914.32		914.32	Middle Glacial Till	-	9.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G46	55.36		913.55		913.55	Middle Glacial Till	-	6.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G47	55.81		913.10		913.10	Middle Glacial Till	-	9.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G48	56.12		912.79		912.79	Upper Glaciofluvial	-	9.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G49	56.79		912.12		912.12	Upper Glaciofluvial	-	20.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G50A	57.15		911.76		911.76	Upper Glaciofluvial	-	29.2	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G50	57.43		911.48		911.48	Upper Glaciofluvial	-	13.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G51	57.89		911.02		911.02	Upper Glaciofluvial	-	10.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G52	58.37		910.54		910.54	Lower Glacial Till	-	5.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G53	58.95		909.96		909.96	Lower Glacial Till	-	5.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G54	59.90		909.01		909.01	Lower Glacial Till	-	7.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G55	60.45		908.46		908.46	Lower Glacial Till	-	10.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G56	60.84		908.07		908.07	Lower Glacial Till	-	6.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G57	61.36		907.55		907.55	Lower Glacial Till	-	8.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G58	61.91		907.00		907.00	Lower Glacial Till	-	8.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G59	62.31		906.60		906.60	Lower Glacial Till	-	8.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G60	62.82		906.09		906.09	Lower Glacial Till	-	6.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G61	65.14		903.77		903.77	Lower Glacial Till	-	7.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G62	65.90		903.01		903.01	Lower Glacial Till	-	8.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G64	66.70		902.21		902.21	Weathered Bedrock (Volcanic)	-	11.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G65	67.34		901.57		901.57	Weathered Bedrock (Volcanic)	-	14.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G66	68.22		900.69		900.69	Weathered Bedrock (Volcanic)	-	13.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G67	68.77		900.14		900.14	Weathered Bedrock (Volcanic)	-	12.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G68	69.71		899.20		899.20	Weathered Bedrock (Volcanic)	-	17.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G69	70.20		898.71		898.71	Weathered Bedrock (Volcanic)	-	15.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G70	71.11		897.80		897.80	Weathered Bedrock (Volcanic)	-	13.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-21	Dam Breach Area	Grab	G71	71.72		897.19		897.19	Weathered Bedrock (Volcanic)	-	14.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G1	2.40		927.49		927.49	Tailings	-	22.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G2	2.75		927.14		927.14	Upper Glacial Till	-	13.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G4	3.36		926.53		926.53	Upper Glacial Till	-	8.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G5	4.12		925.77		925.77	Upper Glacial Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G7	5.25		924.64		924.64	Upper Glacial Till	-	9.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G8	5.58		924.31		924.31	Upper Glacial Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G10	6.77		923.12		923.12	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22	Dam Breach Area	Grab	G11	7.11		922.78		922.78	Upper Glacial Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G1	5.25		924.71		924.71	Upper Glacial Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G2	5.58		924.38		924.38	Upper Glacial Till	-	12.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G3	6.04		923.92		923.92	Upper Glacial Till	-	12.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G4	6.16		923.80		923.80	Upper Glacial Till	-	14.2	CL	26	13	13	0.09	CL	-	-	-	-	-	-	-	12.7	36.6	33.9	16.7	0.002	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G5	6.77		923.19		923.19	Upper Glacial Till	-	11.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G6	7.11		922.85		922.85	Upper Glacial Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G8	8.02		921.94		921.94	Upper Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G9	8.45		921.51		921.51	Upper Glacial Till	-	22.4	CL	29	14	15	0.56	CL	-	-	-	-	-	-	-	1.8	15.1	57.0	26.1	0.002	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G10	9.09		920.87		920.87	Upper Glaciolacustrine	-	30.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G11	9.45		920.51		920.51	Upper Glaciolacustrine	-	37.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G12	9.48		920.48		920.48	Upper Glaciolacustrine	-	34.4	CI	46	22	24	0.52	CI	-	-	-	-	-	-	-	0.0	1.0	52.5	46.5	0.002	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G13	10.09		919.87		919.87	Upper Glaciolacustrine	-	30.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G14	10.46		919.50		919.50	Upper Glaciolacustrine	-	42.3	CH	62	26	36	0.45	CH	-	-	-	-	-	-	-	0.4	2.4	30.7	66.5	0.002	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2014	KCB	SH14-22A	Dam Breach Area	Grab	G15	10.86		919.10		919.10	Middle Glacial Till	-	22.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G16	11.37		918.59		918.59	Middle Glacial Till	-	21.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G17	11.40		918.56		918.56	Middle Glacial Till	-	23.7	CI	38	20	18	0.21	CI	-	-	-	-	-	-	-	0.4	2.9	66.7	30.0	0.002	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G18	11.98		917.98		917.98	Middle Glacial Till	-	22.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G19	12.75		917.21		917.21	Middle Glacial Till	-	21.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G20	13.26		916.70		916.70	Lower Glaciolacustrine	-	26.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G22	14.03		915.93		915.93	Lower Glaciolacustrine	-	28.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G23	14.45		915.51		915.51	Lower Glaciolacustrine	-	25.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G23A	14.18		915.78		915.78	Lower Glaciolacustrine	-	28.1	CI	34	23	11	0.46	CI	-	-	-	-	-	-	-	0.0	4.2	72.8	23.0	0.002	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G24	14.85		915.11		915.11	Lower Glaciolacustrine	-	23.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G25	15.40		914.56		914.56	Lower Glaciolacustrine	-	27.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G27	16.37		913.59		913.59	Upper Glaciofluvial	-	25.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G27A	16.25		913.71		913.71	Upper Glaciofluvial	-	21.5	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	0.1	27.5	66.4	6.0	0.002	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G28	17.93		912.03		912.03	Upper Glaciofluvial	-	27.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	SH14-22A	Dam Breach Area	Grab	G29	17.96		912.00		912.00	Upper Glaciofluvial	-	24.8	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	0.6	9.4	80.0	10.0	0.002	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-01	4.22		933.21		933.21	Upper Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-02	5.18		932.25		932.25	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-03	6.10		931.33		931.33	Upper Glacial Till	-	15.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-04	6.93		930.50		930.50	Upper Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-05	7.77		929.66		929.66	Upper Glacial Till	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-06	8.79		928.64		928.64	Upper Glacial Till	-	12.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-07	9.63		927.80		927.80	Upper Glacial Till	-	14.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-08	10.52		926.91		926.91	Upper Glacial Till	-	12.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-09	11.43		926.00		926.00	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-10	12.32		925.11		925.11	Upper Glacial Till	-	14.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	CPT14-05A	Dam Breach Area	Split Spoon	SPT-11	13.23		924.20		924.20	Upper Glacial Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-10A	Dam Breach Area	Split Spoon	SPT-01	3.76		927.15		927.15	Upper Glacial Till	-	11.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-10A	Dam Breach Area	Split Spoon	SPT-02	4.42		926.49		926.49	Upper Glacial Till	-	11.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-10A	Dam Breach Area	Split Spoon	SPT-03	5.22		925.69		925.69	Upper Glacial Till	-	12.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-10A	Dam Breach Area	Split Spoon	SPT-04	6.21		924.70		924.70	Upper Glacial Till	-	13.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-10A	Dam Breach Area	Split Spoon	SPT-05	7.12		923.79		923.79	Upper Glacial Till	-	14.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-10A	Dam Breach Area	Split Spoon	SPT-06	7.99		922.92		922.92	Upper Glacial Till	-	15.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-10A	Dam Breach Area	Split Spoon	SPT-07	8.90		922.01		922.01	Upper Glacial Till	-	14.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-22	Dam Breach Area	Split Spoon	SPT-01	3.10		926.69		926.69	-[1]	-	311.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-22	Dam Breach Area	Split Spoon	SPT-02	3.96		925.83		925.83	Upper Glacial Till	-	13.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-22	Dam Breach Area	Split Spoon	SPT-03	4.88		924.91		924.91	Upper Glacial Till	-	14.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-22	Dam Breach Area	Split Spoon	SPT-04	5.92		923.87		923.87	Upper Glacial Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-22	Dam Breach Area	Split Spoon	SPT-05	6.63		923.16		923.16	Upper Glacial Till	-	15.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	VST14-22	Dam Breach Area	Split Spoon	SPT-06	7.49		922.30		922.30	Upper Glacial Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	RH14-03A	Dam Breach Area	Thin-walled Piston Tube	SS-03	12.19		920.40		920.40	Upper Glaciolacustrine	-	40.2	CI	31	16	15	1.61	CI	-	-	-	-	-	-	-	0.0	16.4	51.6	32.0	0.002	OD, DSS
2014	KCB	RH14-10	Dam Breach Area	Thin-walled Piston Tube	SS-01	10.06		920.85		920.85	Upper Glaciolacustrine	2.79	37.2	CI	44	21	23	0.70	CI	-	-	-	-	-	-	-	0.0	0.7	52.5	46.8	0.002	TXCU, OD, DS, DSS
2014	KCB	RH14-10	Dam Breach Area	Thin-walled Piston Tube	SS-01	10.06		920.85		920.85	Upper Glaciolacustrine	-	37.2	CI	33	15	18	1.23	CI	-	-	-	-	-	-	-	0.0	5.5	55.9	38.6	0.002	-
2014	KCB	RH14-10	Dam Breach Area	Thin-walled Piston Tube	SS-02	10.67		920.24		920.24	Upper Glaciolacustrine	2.75	44.0	CH	59	24	35	0.57	CH	-	-	-	-	-	-	-	0.0	0.4	44.1	55.5	0.002	OD, DSS
2014	KCB	RH14-10	Dam Breach Area	Thin-walled Piston Tube	SS-02	10.67		920.24		920.24	Upper Glaciolacustrine	-	44.0	CH	59	20	39	0.62	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	RH14-10	Dam Breach Area	Thin-walled Piston Tube	SS-02	10.67		920.24		920.24	Upper Glaciolacustrine	-	44.0	CH	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.2	43.9	56.0	0.002	-
2014	KCB	RH14-22	Dam Breach Area	Thin-walled Piston Tube	SS-02	9.29		920.49		920.49	Upper Glaciolacustrine	-	36.9	CI	43	18	25	0.76	CI	-	-	-	-	-	-	-	0.0	1.6	53.5	44.9	0.002	OD, DS, DSS
2014	KCB	RH14-22	Dam Breach Area	Thin-walled Piston Tube	SS-02	9.29		920.49		920.49	Upper Glaciolacustrine	-	36.9	CH	56	23	33	0.42	CH	-	-	-	-	-	-	-	0.0	0.2	43.0	56.8	0.002	TXCU
2014	KCB	RH14-22A	Dam Breach Area	Thin-walled Piston Tube	SS-02	9.30		920.49		920.49	Upper Glaciolacustrine	2.78	35.5	CI	50	20	30	0.52	CI	-	-	-	-	-	-	-	0.0	2.3	40.9	56.8	0.002	OD, DSS
2014	KCB	TP14-01	Dam Breach Area	Block	BS-01	-		-		-	Upper Glacial Till	2.76	10.3	SC	26	14	12	-0.31	CL	-	-	-	-	-	-	-	21.4	34.1	30.0	14.5	0.002	TXP, TXCU, TXE
2014	KCB	TP14-01	Dam Breach Area	Block	BS-02	-		-		-	Upper Glaciolacustrine	2.78	-	CI	32	20	12	-	CI	-	-	-	-	-	-	-	0.0	7.1	55.4	37.5	0.002	TXCU
2014	KCB	TP14-01	Dam Breach Area	Block	BS-02	-		-		-	Upper Glaciolacustrine	2.79	-	CI	40	18	22	-	CI	-	-	-	-	-	-	-	0.0	2.2	52.0	45.8	0.002	OD, DS, DSS
2014	KCB	TP14-01	Dam Breach Area	Block	BS-02	-		-		-	Upper Glaciolacustrine	-	35.2	CH	54	18	36	0.48	CH	-	-	-	-	-	-	-	0.0	3.1	44.9	52.0	0.002	-
2014	KCB	Perimeter Embankment Core	Dam Breach Area	Bulk	TC-01	-		-		-	Dam Till Core	2.76	10.7	SC	23	13	10	-0.23	CL	-	-	2006	10.6	-	-	-	17.7	36.7	35.2	10.5	0.002	TXP, TXCU
2014	KCB	Perimeter Embankment Core	Dam Breach Area	Bulk	TC-01	-		-		-	Dam Till Core	2.76	11.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	KCB	Perimeter Embankment Core	Dam Breach Area	Bulk	TC-02	-		-		-	Dam Till Core	2.76	10.8	CL	26	15	11	-0.38	CL	-	-	1977	12.5	-	-	-	11.1	34.1	37.7	17.0	0.002	TXP, TXCU
2014	KCB	Toe Bulge	Dam Breach Area	Bulk	-	-		-		-	Upper Glacial Till	-	-	CL	28	14	14	-	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	Golder	-	-	Thin-walled Tube	1-Top	4.00		-		-	Glaciofluvial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	80.8	16.5		-	TXCU
2014	Golder	-	-	Thin-walled Tube	1-Bottom	4.00		-		-	Glaciolacustrine	-	15.9	CL-ML	25	18	7	-0.30	CL-ML	-	-	-	-	-	-	-	3.2	16.0	62.8	18.0	0.002	DSS
2014	Golder	-	-	Thin-walled Tube	2-Top	4.00		-		-	Glaciofluvial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	82.1	16.3		-	TXCU
2014	Golder	-	-	Thin-walled Tube	2-Bottom	4.00		-		-	Glaciolacustrine	2.70	21.5	CI	32	20	12	0.13	CI	-	-	-	-	-	-	-	0.0	8.1	64.9	27.0	0.002	DSS
2014	Golder	-	-	Thin-walled Tube	3-Top	4.00		-		-	Glaciofluvial	2.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	79.3	18.1		-	TXCU
2014	Golder	-	-	Thin-walled Tube	4-Bottom	4.00		-		-	Glaciolacustrine	2.77	25.8	CI	35	18	17	0.46	CI	-	-	-	-	-	-	-	0.3	11.5	48.2	40.0	0.002	DSS, CRS
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	1	7.20	7.50	960.60	960.30	960.45	Topsoil	-	15.1	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	2	7.80	8.00	960.00	959.80	959.90	Topsoil / Glacial Till	-	146.4	ML/SM/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	3	8.20	8.50	959.60	959.30	959.45	Glacial Till	-	13.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	4	9.20	9.50	958.60	958.30	958.45	Glacial Till	-	12.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	5	10.20	10.50	957.60	957.30	957.45	Glacial Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	6	11.20	11.50	956.60	956.30	956.45	Glacial Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	6B	11.70	12.00	956.10	955.80	955.95	Glacial Till	-	13.1	CL	21	12	9	0.12	CL	-	-	-	-	-	-	-	13	37	50		-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	7	12.20	12.50	955.60	955.30	955.45	Glacial Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	8	13.20	13.50	954.60	954.30	954.45	Glacial Till	-	10.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	9	14.20	14.50	953.60	953.30	953.45	Glacial Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	10	15.50	15.70	952.30	952.10	952.20	Glacial Till	-	8.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	11	16.70	17.00	951.10	950.80	950.95	Glacial Till	-	8.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	12	17.50	17.80	950.30	950.00	950.15	Glacial Till	-	11.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	13	18.50	18.80	949.30	949.00	949.15	Glacial Till	-	4.8	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-01	Perimeter Embankment Buttress	Grab	14	19.30	19.60	948.50	948.20	948.35	Glacial Till	-	5.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	1	1.80	2.10	949.90	949.60	949.75	Glacial Till	-	14.0	CL-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	2	2.80	3.10	948.90	948.60	948.75	Glacial Till	-	12.4	CL-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	3	3.70	4.10	948.00	947.60	947.80	Glacial Till	-	11.3	CL-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	3B	4.20	4.50	947.50	947.20	947.35	Glacial Till	-	11.1	CL-SC	25	14	11	-0.26	CL	-	-	-	-	-	-	-	18	37	45		-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	4	4.90	5.20	946.80	946.50	946.65	Glacial Till	-	12.5	CL-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	5	6.30	6.60	945.40	945.10	945.25	Glacial Till	-	13.2	CL-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	6	7.20	7.50	944.50	944.20	944.35	Glaciofluvial	-	8.5	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	7	8.60	8.90	943.10	942.80	942.95	Glacial Till	-	11.0	CI-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	8	10.60	10.90	941.10	940.80	940.95	Glacial Till	-	10.8	CI-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	9	11.60	11.90	940.10	939.80	939.95	Glacial Till	-	10.5	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	9B	12.00	12.30	939.70	939.40	939.55	Glacial Till	-	16.1	CL/SC	29	20	9	-0.43	CL	-	-	-	-	-	-	-	14	33	53		-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	10	12.60	12.90	939.10	938.80	938.95	Weathered Bedrock	-	9.0	CL/SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	11	13.60	13.90	938.10	937.80	937.95	Weathered Bedrock	-	4.8	CL/SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	12	14.60	14.90	937.10	936.80	936.95	Weathered Bedrock	-	16.0	CL/SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	13	15.60	15.90	936.10	935.80	935.95	Weathered Bedrock	-	16.0	CL/SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-02	Perimeter Embankment Buttress	Grab	14	16.60	16.90	935.10	934.80	934.95	Weathered Bedrock	-	16.5	CL/SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	1	2.10	2.40	935.50	935.20	935.35	Fill	-	6.5	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	2	3.00	3.30	934.60	934.30	934.45	Fill	-	8.7	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	3	3.90	4.20	933.70	933.40	933.55	Fill	-	12.8	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	4	4.50	4.80	933.10	932.80	932.95	Fill	-	9.1	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	5	5.40	5.70	932.20	931.90	932.05	Glacial Till	-	9.6	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	6	6.30	6.60	931.30	931.00	931.15	Glacial Till	-	10.4	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	7	7.20	7.50	930.40	930.10	930.25	Glacial Till	-	11.3	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	8	8.10	8.40	929.50	929.20	929.35	Glacial Till	-	9.9	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	9	9.30	9.60	928.30	928.00	928.15	Glacial Till	-	10.1	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	10	10.20	10.50	927.40	927.10	927.25	Glacial Till	-	8.9	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	50	11.30	11.60	926.30	926.00	926.15	Glacial Till	-	11.6	SC/CI	22	14	8	-0.30	CL	-	-	-	-	-	-	-	20	34	46		-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	11	11.60	11.80	926.00	925.80	925.90	Glacial Till	-	10.8	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	12	12.30	12.60	925.30	925.00	925.15	Glacial Till	-	9.8	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	13	13.20	13.50	924.40	924.10	924.25	Glacial Till	-	10.2	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	14	14.40	14.70	923.20	922.90	923.05	Glacial Till	-	9.1	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	15	15.60	15.90	922.00	921.70	921.85	Glacial Till	-	9.5	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	16	16.50	16.80	921.10	920.80	920.95	Glacial Till	-	10.3	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	17	17.40	17.70	920.20	919.90	920.05	Glacial Till	-	12.2	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	18	18.30	18.60	919.30	919.00	919.15	Glacial Till	-	10.7	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	19	19.50	19.80	918.10	917.80	917.95	Glacial Till	-	10.2	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	20	20.40	20.70	917.20	916.90	917.05	Glacial Till	-	9.0	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	21	21.60	21.90	916.00	915.70	915.85	Glacial Till	-	8.6	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	22	22.50	22.80	915.10	914.80	914.95	Glacial Till	-	8.2	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	23	23.70	24.00	913.90	913.60	913.75	Glacial Till	-	10.7	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	24	24.60	24.90	913.00	912.70	912.85	Glacial Till	-	10.3	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	25	25.50	25.80	912.10	911.80	911.95	Glacial Till	-	12.3	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	26	26.02	27.00	911.58	910.60	911.09	Glaciofluvial	-	21.4	ML/SM		Non-Plastic		-	ML	-	-	-	-	-	-	0	36	64		17	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	26	26.02	27.00	911.58	910.60	911.09	Glaciofluvial	-	22.3	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	27	27.30	27.60	910.30	910.00	910.15	Glaciofluvial	-	20.5	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	28	28.20	29.00	909.40	908.60	909.00	Glaciofluvial	-	22.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	28	28.50	28.80	909.10	908.80	908.95	Glaciofluvial	-	15.1	ML		Non-Plastic		-	ML	-	-	-	-	-	-	1	3	96		-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	29	29.40	29.70	908.20	907.90	908.05	Glaciofluvial	-	27.3	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	30	30.30	30.60	907.30	907.00	907.15	Glaciofluvial	-	17.0	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	31	31.50	31.80	906.10	905.80	905.95	Glaciofluvial	-	5.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	32	32.70	33.00	904.90	904.60	904.75	Glacial Till	-	17.1	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	33	33.90	34.20	903.70	903.40	903.55	Glacial Till	-	9.9	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	34	34.80	35.10	902.80	902.50	902.65	Glacial Till	-	6.8	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	35	35.70	36.00	901.90	901.60	901.75	Glaciofluvial	-	17.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	36	36.60	36.90	901.00	900.70	900.85	Glaciofluvial	-	8.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	37	37.80	38.10	899.80	899.50	899.65	Glaciofluvial	-	18.5	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	38	38.70	39.00	898.90	898.60	898.75	Glaciofluvial	-	16.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	39	39.60	39.90	898.00	897.70	897.85	Glacial Till	-	8.1	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	40	40.80	41.20	896.80	896.40	896.60	Glacial Till	-	6.1	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	41	41.80	42.10	895.80	895.50	895.65	Glacial Till	-	9.7	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	42	43.00	43.30	894.60	894.30	894.45	Glacial Till	-	6.4	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	43	44.20	44.50	893.40	893.10	893.25	Glacial Till	-	9.6	SM-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	44	45.10	45.40	892.50	892.20	892.35	Glacial Till	-	8.6	SM-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	45	46.00	46.30	891.60	891.30	891.45	Glacial Till	-	7.9	SM-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	46	47.20	47.50	890.40	890.10	890.25	Glacial Till	-	8.3	SM-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	47	48.10	48.40	889.50	889.20	889.35	Weathered Bedrock	-	15.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	48	49.00	49.30	888.60	888.30	888.45	Weathered Bedrock	-	14.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-03	Perimeter Embankment Buttress	Grab	49	50.20	50.50	887.40	887.10	887.25	Weathered Bedrock	-	6.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	1	0.30	0.60	936.90	936.60	936.75	Fill	-	6.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	2	1.20	1.50	936.00	935.70	935.85	Fill	-	5.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	3	2.10	2.40	935.10	934.80	934.95	Fill	-	4.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	4	3.00	3.30	934.20	933.90	934.05	Fill	-	14.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	5	3.90	4.20	933.30	933.00	933.15	Glacial Till	-	15.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	6	5.40	5.70	931.80	931.50	931.65	Glacial Till	-	10.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	7	6.30	6.60	930.90	930.60	930.75	Glacial Till	-	10.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	8	7.20	7.50	930.00	929.70	929.85	Glacial Till	-	9.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	9	8.40	8.70	928.80	928.50	928.65	Glacial Till	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	10	9.30	9.60	927.90	927.60	927.75	Glacial Till	-	8.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	11	10.50	10.80	926.70	926.40	926.55	Glacial Till	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	12	11.40	11.70	925.80	925.50	925.65	Glacial Till	-	8.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	13	12.60	12.90	924.60	924.30	924.45	Glacial Till	-	12.4	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	14	13.50	13.80	923.70	923.40	923.55	Glacial Till	-	12.1	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	55B	14.00	14.40	923.20	922.80	923.00	Glacial Till	-	10.2	SM/ML		Non-Plastic		-	ML	-	-	-	-	-	-	13	39	48		-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	15	14.40	14.70	922.80	922.50	922.65	Glacial Till	-	10.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	16	15.30	15.60	921.90	921.60	921.75	Glacial Till	-	11.0	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	17	16.50	16.80	920.70	920.40	920.55	Glacial Till	-	9.7	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	18	17.40	17.70	919.80	919.50	919.65	Glacial Till	-	6.9	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	19	18.30	18.60	918.90	918.60	918.75	Glacial Till	-	11.2	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	20	19.20	19.50	918.00	917.70	917.85	Glacial Till	-	9.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	21	20.40	20.70	916.80	916.50	916.65	Glacial Till	-	12.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	22	21.30	21.60	915.90	915.60	915.75	Glacial Till	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	23	22.20	22.50	915.00	914.70	914.85	Glacial Till	-	6.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	24	23.70	24.00	913.50	913.20	913.35	Glacial Till	-	9.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	25	24.60	24.90	912.60	912.30	912.45	Glacial Till	-	7.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	26	25.50	25.80	911.70	911.40	911.55	Glacial Till	-	9.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	27	26.40	26.70	910.80	910.50	910.65	Glacial Till	-	12.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	56B	26.70	27.20	910.50	910.00	910.25	Glacial Till	-	10.0	SM		Non-Plastic		-	ML	-	-	-	-	-	-	22	61	17		-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	28	27.30	27.60	909.90	909.60	909.75	Glaciofluvial	-	16.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	29	28.20	28.50	909.00	908.70	908.85	Glaciofluvial	-	18.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	30	29.40	29.70	907.80	907.50	907.65	Glaciofluvial	-	17.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	31	30.30	30.60	906.90	906.60	906.75	Glaciofluvial	-	4.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	32	31.50	31.80	905.70	905.40	905.55	Glaciofluvial	-	19.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	33	32.40	32.70	904.80	904.50	904.65	Bedrock	-	14.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	34	33.30	33.60	903.90	903.60	903.75	Bedrock	-	6.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	35	34.20	34.50	903.00	902.70	902.85	Bedrock	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	36	35.10	35.40	902.10	901.80	901.95	Bedrock	-	6.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	37	36.00	36.30	901.20	900.90	901.05	Bedrock	-	5.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	38	36.60	36.90	900.60	900.30	900.45	Bedrock	-	5.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	39	37.50	37.80	899.70	899.40	899.55	Bedrock	-	9.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	40	38.70	39.00	898.50	898.20	898.35	Bedrock	-	5.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	41	39.90	40.20	897.30	897.00	897.15	Bedrock	-	7.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	42	40.80	41.10	896.40	896.10	896.25	Bedrock	-	5.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	57B	41.50	41.80	895.70	895.40	895.55	Bedrock	-	7.3	GM		Non-Plastic		-	ML	-	-	-	-	-	-	49	34	17		-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	43	42.00	42.30	895.20	894.90	895.05	Bedrock	-	8.3	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	44	42.90	43.20	894.30	894.00	894.15	Bedrock	-	6.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	45	43.80	44.10	893.40	893.10	893.25	Bedrock	-	14.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	46	44.70	45.00	892.50	892.20	892.35	Bedrock	-	11.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	47	45.90	46.20	891.30	891.00	891.15	Bedrock	-	16.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	48	46.80	47.10	890.40	890.10	890.25	Bedrock	-	21.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	49	48.00	48.30	889.20	888.90	889.05	Bedrock	-	5.7	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	50	49.20	49.50	888.00	887.70	887.85	Bedrock	-	5.5	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	51	50.10	50.40	887.10	886.80	886.95	Bedrock	-	8.9	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	52	51.00	51.30	886.20	885.90	886.05	Bedrock	-	7.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	53	51.90	52.20	885.30	885.00	885.15	Bedrock	-	6.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-04	Perimeter Embankment Buttress	Grab	54	52.80	53.10	884.40	884.10	884.25	Bedrock	-	7.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	1	0.90	1.20	936.60	936.30	936.45	Fill	-	6.9	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	2	2.70	3.00	934.80	934.50	934.65	Glacial Till	-	13.9	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	3	3.90	4.20	933.60	933.30	933.45	Glacial Till	-	13.1	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	50B	4.20	4.70	933.30	932.80	933.05	Glacial Till	-	8.0	SM/ML	22	14	8	-0.75	CL	-	-	-	-	-	-	9	50	41		-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	4	5.10	5.40	932.40	932.10	932.25	Glacial Till	-	10.0	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	5	6.30	6.60	931.20	930.90	931.05	Glacial Till	-	9.4	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	6	7.30	7.60	930.20	929.90	930.05	Glacial Till	-	10.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	7	8.40	8.70	929.10	928.80	928.95	Glacial Till	-	10.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	8	9.50	9.80	928.00	927.70	927.85	Glacial Till	-	9.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	9	10.20	10.50	927.30	927.00	927.15	Glacial Till	-	9.8	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	10	11.00	11.30	926.50	926.20	926.35	Glacial Till	-	9.9	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	11	12.30	12.60	925.20	924.90	925.05	Glacial Till	-	10.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	12	13.70	14.00	923.80	923.50	923.65	Glacial Till	-	10.2	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	13	14.80	15.10	922.70	922.40	922.55	Glacial Till	-	9.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	14	16.40	16.70	921.10	920.80	920.95	Glacial Till	-	9.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	15	16.70	17.00	920.80	920.50	920.65	Glacial Till	-	8.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	16	17.60	17.90	919.90	919.60	919.75	Glacial Till	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	17	18.20	18.50	919.30	919.00	919.15	Glacial Till	-	7.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	18	18.80	19.10	918.70	918.40	918.55	Glacial Till	-	7.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	19	20.30	20.60	917.20	916.90	917.05	Glacial Till	-	10.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	57	20.40	20.70	917.10	916.80	916.95	Glacial Till	-	19.0	CL-ML	25	19	6	0.00	CL-ML	-	-	-	-	-	-	4	29	67		-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	20	21.20	21.50	916.30	916.00	916.15	Glacial Till	-	8.9	SC/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	51B	22.10	22.40	915.40	915.10	915.25	Glacial Till	-	8.3	SC/ML		Non-Plastic		-	ML	-	-	-	-	-	-	18	35	47		-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	21	22.40	22.70	915.10	914.80	914.95	Glacial Till	-	10.8	SC/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	58	23.20	23.50	914.30	914.00	914.15	...[1]	-	19.3	CI	39	20	19	-0.04	CI	-	-	-	-	-	-	5	34	61		-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	22	24.20	24.50	913.30	913.00	913.15	Glaciofluvial	-	12.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	23	24.80	25.10	912.70	912.40	912.55	Glaciofluvial	-	7.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	24	25.40	25.70	912.10	911.80	911.95	Glaciofluvial	-	15.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	25	26.60	26.90	910.90	910.60	910.75	Glaciofluvial	-	16.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	52B	27.20	27.50	910.30	910.00	910.15	-	-	12.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	8	29	58	5	0.002	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	26	27.50	27.80	910.00	909.70	909.85	Glacial Till	-	8.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	27	28.40	28.70	909.10	908.80	908.95	Glacial Till	-	8.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	28	31.10	31.40	906.40	906.10	906.25	Glacial Till	-	8.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	29	32.00	32.30	905.50	905.20	905.35	Glacial Till	-	5.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	30	32.90	33.20	904.60	904.30	904.45	Glaciofluvial	-	16.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	53B	33.20	33.90	904.30	903.60	903.95	Glaciofluvial	-	14.2	SM	-	Non-Plastic	-	-	ML	-	-	-	-	-	-	-	6	55	36	3	0.002	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	31	33.90	34.20	903.60	903.30	903.45	Glaciofluvial	-	18.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	100	34.60	34.90	902.90	902.60	902.75	Glaciolacustrine	-	10.2	CI	42	25	17	-0.87	CI	-	-	-	-	-	-	-	0	4	58	38	0.002	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	32	34.70	35.00	902.80	902.50	902.65	Glaciolacustrine	-	30.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	33	35.60	35.90	901.90	901.60	901.75	Glaciofluvial	-	18.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	34	36.70	37.00	900.80	900.50	900.65	Glaciofluvial	-	23.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	35	37.70	38.00	899.80	899.50	899.65	Glaciofluvial	-	25.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	54B	38.00	38.70	899.50	898.80	899.15	Glaciofluvial	-	26.9	ML	25	20	5	1.38	CL-ML	-	-	-	-	-	-	-	0	19	81		-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	36	38.70	39.00	898.80	898.50	898.65	Glaciofluvial	-	23.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	37	40.30	40.60	897.20	896.90	897.05	Glaciofluvial	-	22.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	38	41.30	41.60	896.20	895.90	896.05	Glaciofluvial	-	17.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	39	42.50	42.80	895.00	894.70	894.85	Glacial Till	-	15.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	40	43.20	43.50	894.30	894.00	894.15	Glaciofluvial	-	20.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	41	44.00	44.30	893.50	893.20	893.35	Glaciofluvial	-	19.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	42	45.20	45.50	892.30	892.00	892.15	Glacial Till	-	24.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	43	46.30	46.60	891.20	890.90	891.05	Weathered Bedrock	-	22.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	44	47.60	47.90	889.90	889.60	889.75	Weathered Bedrock	-	7.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	45	48.50	48.80	889.00	888.70	888.85	Weathered Bedrock	-	4.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	46	49.70	50.00	887.80	887.50	887.65	Weathered Bedrock	-	5.6	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	47	50.30	50.60	887.20	886.90	887.05	Weathered Bedrock	-	6.6	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	48	50.90	51.20	886.60	886.30	886.45	Weathered Bedrock	-	11.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	49	51.80	52.10	885.70	885.40	885.55	Weathered Bedrock	-	12.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	50	53.00	53.30	884.50	884.20	884.35	Weathered Bedrock	-	16.2	GC/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	51	53.90	54.20	883.60	883.30	883.45	Weathered Bedrock	-	13.0	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	52	55.10	55.40	882.40	882.10	882.25	Weathered Bedrock	-	11.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	53	56.00	56.30	881.50	881.20	881.35	Weathered Bedrock	-	14.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	54	56.90	57.20	880.60	880.30	880.45	Weathered Bedrock	-	15.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	55	58.40	58.70	879.10	878.80	878.95	Weathered Bedrock	-	14.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-05	Perimeter Embankment Buttress	Grab	56	59.30	59.60	878.20	877.90	878.05	Weathered Bedrock	-	3.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	1	1.37	1.68	937.23	936.92	937.08	Fill	-	5.4	GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	2	4.42	4.72	934.18	933.88	934.03	Glacial Till	-	9.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	3	5.18	5.49	933.42	933.11	933.27	Glacial Till	-	13.0	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	4	6.25	6.55	932.35	932.05	932.20	Glacial Till	-	11.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	50	6.40	7.30	932.20	931.30	931.75	Glacial Till	-	7.3	GC	24	13	11	-0.52	CL	-	-	-	-	-	-	-	45	28	27		-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	5	7.32	7.62	931.28	930.98	931.13	Glacial Till	-	12.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	6	8.23	8.53	930.37	930.07	930.22	Glacial Till	-	11.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	7	9.45	9.75	929.15	928.85	929.00	Glacial Till	-	9.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	8	10.52	10.82	928.08	927.78	927.93	Glacial Till	-	8.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	51	10.70	11.60	927.90	927.00	927.45	Glacial Till	-	7.8	GC	22	13	9	-0.58	CL	-	-	-	-	-	-	-	43	25	32		-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	9	11.58	11.89	927.02	926.71	926.87	Glacial Till	-	10.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	10	12.50	12.80	926.10	925.80	925.95	Glacial Till	-	8.3	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	11	13.41	13.72	925.19	924.88	925.04	Glacial Till	-	8.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	12	14.63	14.94	923.97	923.66	923.82	Glacial Till	-	8.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	52	14.90	15.80	923.70	922.80	923.25	Glaciofluvial	-	7.3	SM	-	Non-Plastic	-	-	ML	-	-	-	-	-	-	-	26	37	37		-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	13	15.85	16.15	922.75	922.45	922.60	Glacial Till	-	6.7	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	14	16.46	16.76	922.14	921.84	921.99	Glacial Till	-	7.8	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	15	17.68	17.98	920.92	920.62	920.77	Glacial Till	-	9.7	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	16	18.59	18.90	920.01	919.70	919.86	Glacial Till	-	10.4	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	53	18.60	19.50	920.00	919.10	919.55	Glacial Till	-	9.5	SC/CI	20	15	5	-1.10	CL-ML	-	-	-	-	-	-	-	21	34	45		-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	17	19.51	19.81	919.09	918.79	918.94	Glacial Till	-	9.6	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	18	20.73	21.03	917.87	917.57	917.72	Glacial Till	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	19	21.64	21.95	916.96	916.65	916.81	Glacial Till	-	7.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	20	22.56	22.86	916.04	915.74	915.89	Glacial Till	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	21	23.47	23.77	915.13	914.83	914.98	Glacial Till	-	13.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	22	24.99	25.30	913.61	913.30	913.46	Glacial Till	-	13.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	23	25.91	26.21	912.69	912.39	912.54	Glacial Till	-	13.3	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	54	26.20	26.80	912.40	911.80	912.10	Glacial Till	-	-	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	24	26.82	27.13	911.78	911.47	911.63	Glacial Till	-	11.9	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	14	38	48		-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	25	27.74	28.04	910.86	910.56	910.71	Glacial Till	-	9.7	SC/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	26	28.96	29.26	909.64	909.34	909.49	Glaciolacustrine	-	23.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	27	29.87	30.18	908.73	908.42	908.58	Glaciolacustrine	-	28.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	28	30.78	31.09	907.82	907.51	907.67	Glaciolacustrine	-	27.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	Run 11	29.60	30.80	909.00	907.80	908.40	Glaciolacustrine	-	27.8	CI	36	21	15	0.45	CI	-	-	-	-	-	-	-	0	0	70	30	0.002	Incremental Consolidation
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	Run 11	30.30	30.30	908.30	908.30	908.30	Glaciolacustrine	-	26.7	CI	47	22	25	0.19	CI	-	-	-	-	-	-	-	0	0	56	44	0.002	Incremental Consolidation
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	Run 11	31.10	31.30	907.50	907.40	907.45	Glaciolacustrine	-	26.5	CI	49	26	23	0.02	CI	-	-	-	-	-	-	-	-	-	-	-	-	Incremental Consolidation
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	Run 11	31.30	31.30	907.30	907.30	907.30	Glaciolacustrine	-	24.1	CI	38	24	14	0.01	CI	-	-	-	-	-	-	-	0	2	69	29	0.002	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	29	31.70	32.00	906.90	906.60	906.75	Glacial Till	-	8.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	30	32.61	32.92	905.99	905.68	905.84	Glacial Till	-	9.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	31	34.14	34.44	904.46	904.16	904.31	Glaciolacustrine	-	27.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	55	34.44	35.36	904.16	903.24	903.70	Glaciolacustrine	-	25.9	CH	59	23	36	0.08	CH	-	-	-	-	-	-	-	0	9	91		-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	32	34.75	35.05	903.85	903.55	903.70	Glaciolacustrine	-	29.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	100	34.90	35.20	903.70	903.40	903.55	Glaciolacustrine	-	2.4	CH	57	25	32	-0.71	CH	-	-	-	-	-	-	-	0	0	29	71	0.002	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	101	35.60	35.90	903.00	902.70	902.85	Glaciolacustrine	-	20.4	CH	57	23	34	-0.08	CH	-	-	-	-	-	-	-	0	1	33	66	0.002	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	33	35.66	35.97	902.94	902.63	902.79	Glaciolacustrine	-	32.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	34	36.58	36.88	902.02	901.72	901.87	Glaciofluvial	-	19.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	35	37.49	37.80	901.11	900.80	900.96	Glaciofluvial	-	21.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	36	38.40	38.71	900.20	899.89	900.05	Glacial Till	-	12.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	37	39.78	40.08	898.82	898.52	898.67	Glacial Till	-	7.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	38	40.84	41.15	897.76	897.45	897.61	Weathered Bedrock	-	13.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	39	41.45	41.76	897.15	896.84	897.00	Weathered Bedrock	-	14.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	40	42.37	42.67	896.23	895.93	896.08	Weathered Bedrock	-	13.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	41	43.59	43.89	895.01	894.71	894.86	Weathered Bedrock	-	13.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	42	44.81	45.11	893.79	893.49	893.64	Weathered Bedrock	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	43	46.02	46.33	892.58	892.27	892.43	Weathered Bedrock	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	44	51.21	51.51	887.39	887.09	887.24	Weathered Bedrock	-	11.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	45	52.12	52.43	886.48	886.17	886.33	Weathered Bedrock	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	46	53.04	53.34	885.56	885.26	885.41	Weathered Bedrock	-	15.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	47	54.25	54.56	884.35	884.04	884.20	Weathered Bedrock	-	13.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	48	55.32	55.63	883.28	882.97	883.13	Weathered Bedrock	-	20.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-06	Perimeter Embankment Buttress	Grab	49	56.24	56.54	882.36	882.06	882.21	Weathered Bedrock	-	18.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	1	0.30	0.60	934.70	934.40	934.55	Glacial Till	-	16.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	2	1.20	1.50	933.80	933.50	933.65	Glacial Till	-	6.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	3	2.10	2.40	932.90	932.60	932.75	Glacial Till	-	10.3	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	4	3.00	3.30	932.00	931.70	931.85	Glacial Till	-	7.6	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	12	3.30	3.90	931.70	931.10	931.40	Glacial Till	-	12.1	SC/CL	22	12	10	0.01	CL	-	-	-	-	-	-	-	26	34	40		-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	5	4.20	4.50	930.80	930.50	930.65	Glacial Till	-	10.9	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	6	5.10	5.40	929.90	929.60	929.75	Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	6B	5.70	5.80	929.30	929.20	929.25	Glacial Till	-	-	CL	22	12	10	-	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	7	6.30	6.60	928.70	928.40	928.55	Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	8	7.50	7.80	927.50	927.20	927.35	Glacial Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	9	8.70	9.00	926.30	926.00	926.15	Glaciofluvial	-	8.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	10	9.60	9.90	925.40	925.10	925.25	Glacial Till	-	11.5	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	10B	9.90	10.20	925.10	924.80	924.95	Glacial Till	-	8.0	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	10C	10.20	10.50	924.80	924.50	924.65	Glacial Till	-	8.4	SC/CL	23	15	8	-0.83	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	10C	10.20	10.50	924.80	924.50	924.65	Glacial Till	-	-	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	15	36	49		-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	11	10.50	10.80	924.50	924.20	924.35	Glacial Till	-	9.4	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	11B	11.60	11.90	923.40	923.10	923.25	Glaciofluvial	-	7.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	12B	12.10	12.40	922.90	922.60	922.75	Glacial Till	-	11.0	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	13	13.10	13.40	921.90	921.60	921.75	Glacial Till	-	12.0	ML/SM	-	-	-	-	-	-	-	-	-	-	-	16	45	39		-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	13B	13.40	13.70	921.60	921.30	921.45	Glacial Till	-	8.1	ML/SM	19	14	5	-1.18	CL-ML	-	-	-	-	-	-	-	12	31	57		-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	14	14.10	14.40	920.90	920.60	920.75	Glacial Till	-	14.8	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	15	15.10	15.40	919.90	919.60	919.75	Glacial Till	-	15.9	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	16	16.10	16.40	918.90	918.60	918.75	Glacial Till	-	11.9	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	17B	17.40	17.70	917.60	917.30	917.45	Glacial Till	-	16.1	CL	26	17	9	-0.10	CL	-	-	-	-	-	-	-	2	19	79		-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	17	17.10	17.40	917.90	917.60	917.75	Glacial Till	-	13.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	18	18.10	18.40	916.90	916.60	916.75	Glacial Till	-	9.3	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	19	19.10	19.40	915.90	915.60	915.75	Glacial Till	-	3.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	20	19.80	20.10	915.20	914.90	915.05	Bedrock	-	4.2	GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	20B	20.40	20.70	914.60	914.30	914.45	Bedrock	-	-	GW	-	-	-	-	-	-	-	-	-	-	-	-	57	37	6		-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	21	21.10	21.40	913.90	913.60	913.75	Bedrock	-	6.4	GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	22	22.10	22.40	912.90	912.60	912.75	Bedrock	-	10.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	23	23.10	23.40	911.90	911.60	911.75	Bedrock	-	9.9	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	24	24.15	24.45	910.85	910.55	910.70	Bedrock	-	6.3	GM-GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	25	25.10	25.40	909.90	909.60	909.75	Bedrock	-	7.0	GM-GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	26	25.90	26.21	909.10	908.79	908.95	Bedrock	-	15.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	27	26.21	26.50	908.79	908.50	908.65	Bedrock	-	14.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	27B	26.50	26.80	908.50	908.20	908.35	Bedrock	-	15.2	SM		Non-Plastic		-	ML	-	-	-	-	-	-	-	12	60	28		-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	28	27.10	27.40	907.90	907.60	907.75	Bedrock	-	16.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	29	28.00	28.30	907.00	906.70	906.85	Bedrock	-	6.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	30	29.10	29.40	905.90	905.60	905.75	Bedrock	-	5.8	SP/GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	31	30.15	30.45	904.85	904.55	904.70	Bedrock	-	10.0	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	32	31.10	31.40	903.90	903.60	903.75	Bedrock	-	6.6	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	33	32.10	32.40	902.90	902.60	902.75	Bedrock	-	10.8	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	34	33.10	33.30	901.90	901.70	901.80	Bedrock	-	13.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	35	34.05	34.35	900.95	900.65	900.80	Bedrock	-	6.5	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	36	35.00	35.30	900.00	899.70	899.85	Bedrock	-	8.4	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	37	36.15	36.45	898.85	898.55	898.70	Bedrock	-	9.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	38	37.15	37.35	897.85	897.65	897.75	Weathered Bedrock	-	4.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	39	38.10	38.40	896.90	896.60	896.75	Weathered Bedrock	-	4.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	40	38.90	39.15	896.10	895.85	895.98	Weathered Bedrock	-	8.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	41	40.35	40.60	894.65	894.40	894.53	Weathered Bedrock	-	2.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	42	41.85	42.10	893.15	892.90	893.03	Weathered Bedrock	-	4.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-07	Perimeter Embankment Buttress	Grab	43	44.10	44.40	890.90	890.60	890.75	Weathered Bedrock	-	2.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	1	1.50	1.80	935.50	935.20	935.35	Glacial Till	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	2B	2.40	2.70	934.60	934.30	934.45	Glacial Till	-	11.3	CL	23	13	10	-0.17	CL	-	-	-	-	-	-	-	9	38	53		-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	2	2.70	3.00	934.30	934.00	934.15	Glacial Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	3	3.60	3.90	933.40	933.10	933.25	Glacial Till	-	14.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	4	4.50	4.80	932.50	932.20	932.35	Glacial Till	-	9.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	5	5.40	5.70	931.60	931.30	931.45	Glacial Till	-	14.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	6	6.30	6.60	930.70	930.40	930.55	Glacial Till	-	5.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	6B	6.60	6.90	930.40	930.10	930.25	Glacial Till	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	28	56	16		-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	7	7.50	7.80	929.50	929.20	929.35	Glacial Till	-	4.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	8B	8.40	8.70	928.60	928.30	928.45	-	-	7.3	SM	18	14	4	-1.68	CL-ML	-	-	-	-	-	-	-	6	63	31		-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	8	8.70	9.00	928.30	928.00	928.15	-	-	8.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	9	9.90	10.20	927.10	926.80	926.95	-	-	3.8	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	10	11.10	11.40	925.90	925.60	925.75	-	-	11.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	11	12.30	12.60	924.70	924.40	924.55	-	-	6.8	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	12	13.50	13.80	923.50	923.20	923.35	-	-	2.3	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	13	14.40	14.70	922.60	922.30	922.45	Glaciofluvial	-	7.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	14	15.30	15.60	921.70	921.40	921.55	Glaciofluvial	-	5.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	15	16.20	16.50	920.80	920.50	920.65	Glaciofluvial	-	6.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	16	17.40	17.70	919.60	919.30	919.45	Glaciofluvial	-	12.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	17	18.30	18.60	918.70	918.40	918.55	Glaciofluvial	-	4.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	18	19.20	19.50	917.80	917.50	917.65	Glaciofluvial	-	13.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	19	20.40	20.70	916.60	916.30	916.45	Glaciofluvial	-	10.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	20	21.30	21.60	915.70	915.40	915.55	-	-	2.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	21	22.20	22.50	914.80	914.50	914.65	-	-	15.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	22	23.40	23.70	913.60	913.30	913.45	Glacial Till	-	5.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	23B	24.00	24.30	913.00	912.70	912.85	Glacial Till	-	7.6	SC/CL	24	15	9	-0.82	CL	-	-	-	-	-	-	-	16	41	43		-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	23	24.30	24.60	912.70	912.40	912.55	Glacial Till	-	6.4	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	24	25.20	25.50	911.80	911.50	911.65	Glacial Till	-	15.7	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	24B	25.50	25.80	911.50	911.20	911.35	-	-	-	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	12	40	48		-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	25	26.40	26.70	910.60	910.30	910.45	Bedrock	-	10.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	26	27.30	27.60	909.70	909.40	909.55	Bedrock	-	5.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	27	28.20	28.50	908.80	908.50	908.65	Bedrock	-	6.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	28	29.40	29.70	907.60	907.30	907.45	Bedrock	-	11.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	29	30.30	30.60	906.70	906.40	906.55	Bedrock	-	16.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	30	31.20	31.50	905.80	905.50	905.65	Bedrock	-	11.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	31	32.40	32.70	904.60	904.30	904.45	Bedrock	-	12.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	32	33.30	33.60	903.70	903.40	903.55	Bedrock	-	11.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	33	34.20	34.50	902.80	902.50	902.65	Bedrock	-	9.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	34	35.10	35.40	901.90	901.60	901.75	Bedrock	-	9.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	35	36.10	36.40	900.90	900.60	900.75	Bedrock	-	12.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	36	37.20	37.50	899.80	899.50	899.65	Bedrock	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	37	38.10	38.40	898.90	898.60	898.75	Bedrock	-	10.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	38	38.70	39.00	898.30	898.00	898.15	Bedrock	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	39	39.60	39.90	897.40	897.10	897.25	Bedrock	-	9.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	40	40.50	40.80	896.50	896.20	896.35	Bedrock	-	7.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	41	41.40	41.70	895.60	895.30	895.45	Bedrock	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	42	42.60	42.90	894.40	894.10	894.25	Bedrock	-	9.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	43	43.50	43.80	893.50	893.20	893.35	Bedrock	-	8.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	44	44.40	44.70	892.60	892.30	892.45	Bedrock	-	5.9	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	45	45.30	45.60	891.70	891.40	891.55	Bedrock	-	10.1	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	46	46.20	46.50	890.80	890.50	890.65	Bedrock	-	10.2	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	47	47.10	47.40	889.90	889.60	889.75	Bedrock	-	11.2	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	48	48.30	48.60	888.70	888.40	888.55	Bedrock	-	14.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	49	49.20	49.50	887.80	887.50	887.65	Bedrock	-	10.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-08	Perimeter Embankment Buttress	Grab	50	50.30	50.60	886.70	886.40	886.55	Bedrock	-	9.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	1	0.90	1.20	938.30	938.00	938.15	-	-	17.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	2	2.10	2.40	937.10	936.80	936.95	-	-	9.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	3	3.00	3.30	936.20	935.90	936.05	-	-	9.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	4B	3.90	4.20	935.30	935.00	935.15	-	-	10.2	CL	23	14	9	-0.42	CL	-	-	-	-	-	-	-	7	35	58		-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	4	4.20	4.50	935.00	934.70	934.85	-	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	5	5.40	5.70	933.80	933.50	933.65	-	-	14.8	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	5B	5.70	6.00	933.50	933.20	933.35	-	-	15.9	ML/SM	21	15	6	0.15	CL-ML	-	-	-	-	-	-	-	5	35	60		-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	6	6.30	6.60	932.90	932.60	932.75	-	-	13.0	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	7	7.20	7.50	932.00	931.70	931.85	-	-	8.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	8	8.40	8.70	930.80	930.50	930.65	-	-	9.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	9	9.30	9.60	929.90	929.60	929.75	-	-	11.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	10	10.20	10.50	929.00	928.70	928.85	-	-	5.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	11	11.10	11.40	928.10	927.80	927.95	-	-	17.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	12	12.30	12.60	926.90	926.60	926.75	-	-	5.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	13	13.20	13.50	926.00	925.70	925.85	-	-	3.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	14	14.40	14.70	924.80	924.50	924.65	-	-	10.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	15	15.30	15.60	923.90	923.60	923.75	-	-	4.6	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	16	16.20	16.50	923.00	922.70	922.85	-	-	4.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	17	17.40	17.70	921.80	921.50	921.65	-	-	8.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	18	18.60	18.90	920.60	920.30	920.45	-	-	7.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	19	19.50	19.80	919.70	919.40	919.55	-	-	4.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	20	20.40	20.70	918.80	918.50	918.65	-	-	4.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	21	21.30	21.60	917.90	917.60	917.75	-	-	5.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	22	22.50	22.80	916.70	916.40	916.55	-	-	5.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	23	23.40	23.70	915.80	915.50	915.65	Bedrock	-	20.2	CI/CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	100	24.00	24.30	915.20	914.90	915.05	Bedrock	-	18.0	CI/CH	38	16	22	0.09	CI	-	-	-	-	-	-	0	22	46	32	0.002	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	24	24.30	24.60	914.90	914.60	914.75	Bedrock	-	22.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	25	25.50	25.80	913.70	913.40	913.55	Bedrock	-	15.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	26	26.40	26.70	912.80	912.50	912.65	Bedrock	-	16.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	27	27.30	27.60	911.90	911.60	911.75	Bedrock	-	7.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	28	28.50	28.80	910.70	910.40	910.55	Bedrock	-	13.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	29	29.40	29.70	909.80	909.50	909.65	Bedrock	-	14.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	30	30.30	30.60	908.90	908.60	908.75	Bedrock	-	9.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	31	31.50	31.80	907.70	907.40	907.55	Bedrock	-	7.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	32	32.40	32.70	906.80	906.50	906.65	Bedrock	-	12.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	33	33.30	33.60	905.90	905.60	905.75	Bedrock	-	11.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	34	34.50	34.80	904.70	904.40	904.55	Bedrock	-	18.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	35	35.40	35.70	903.80	903.50	903.65	Weathered Bedrock	-	13.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	36	36.30	36.60	902.90	902.60	902.75	Weathered Bedrock	-	11.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	37	37.50	37.80	901.70	901.40	901.55	Weathered Bedrock	-	4.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	38	38.70	39.00	900.50	900.20	900.35	Weathered Bedrock	-	23.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	39	39.60	39.90	899.60	899.30	899.45	Weathered Bedrock	-	17.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-09	Perimeter Embankment Buttress	Grab	40	40.50	40.80	898.70	898.40	898.55	Weathered Bedrock	-	6.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	1	1.80	2.10	936.41	936.11	936.26	Glacial Till	-	13.8	CI/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	2	2.70	3.00	935.51	935.21	935.36	Glacial Till	-	13.0	CI/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	3	3.00	3.30	935.21	934.91	935.06	Glacial Till	-	11.9	CI/SC	26	15	11	-0.28	CL	-	-	-	-	-	-	14	38	48		-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	4	3.90	4.20	934.31	934.01	934.16	Glacial Till	-	9.7	CI/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	6	6.30	6.60	931.91	931.61	931.76	Glacial Till	-	9.5	CI/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	8	8.10	8.40	930.11	929.81	929.96	Glaciofluvial	-	13.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	9	9.30	9.60	928.91	928.61	928.76	Glaciofluvial	-	18.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	10	10.20	10.50	928.01	927.71	927.86	Glaciofluvial	-	16.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	10B	10.50	10.80	927.71	927.41	927.56	Glaciofluvial	-	18.3	ML		Non-Plastic		-	ML	-	-	-	-	-	-	0	11	85	4	0.002	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	11	11.10	11.40	927.11	926.81	926.96	Glaciofluvial	-	20.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	100	11.90	12.20	926.31	926.01	926.16	Glaciolacustrine[1]	-	18.6	ML	38	23	15	-0.29	CI	-	-	-	-	-	-	0	4	64	32	0.002	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	12	12.30	12.60	925.91	925.61	925.76	Glaciofluvial	-	24.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	13	13.20	13.50	925.01	924.71	924.86	Glaciofluvial	-	5.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	14	14.10	14.40	924.11	923.81	923.96	Glaciofluvial	-	3.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	15	15.00	15.30	923.21	922.91	923.06	Glaciofluvial	-	13.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	16	15.90	16.20	922.31	922.01	922.16	Glaciofluvial	-	7.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	17	17.10	17.40	921.11	920.81	920.96	Glacial Till	-	15.9	GC/SC	25	15	10	0.09	CL	-	-	-	-	-	-	39	35	26		-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	18	18.60	18.90	919.61	919.31	919.46	Glacial Till	-	10.1	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	19	19.50	19.80	918.71	918.41	918.56	Glacial Till	-	8.2	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	20	20.10	20.40	918.11	917.81	917.96	Glacial Till	-	16.9	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	21	21.00	21.30	917.21	916.91	917.06	Glacial Till	-	10.2	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	22	22.20	22.50	916.01	915.71	915.86	Glacial Till	-	11.9	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	23	23.10	23.40	915.11	914.81	914.96	Glacial Till	-	20.1	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	24	24.00	24.30	914.21	913.91	914.06	Glacial Till	-	18.0	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	25	24.90	25.20	913.31	913.01	913.16	Glacial Till	-	13.5	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	26	26.10	26.40	912.11	911.81	911.96	Glacial Till	-	9.6	GC/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	27	27.30	27.60	910.91	910.61	910.76	Glacial Till	-	7.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	27B	27.60	27.90	910.61	910.31	910.46	Glacial Till	-	9.1	SM		Non-Plastic		-	ML	-	-	-	-	-	-	13	61	26		-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	28	28.50	28.80	909.71	909.41	909.56	Glacial Till	-	10.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	29	29.40	29.70	908.81	908.51	908.66	Glacial Till	-	17.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	30	30.60	30.90	907.61	907.31	907.46	Glacial Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	31	31.50	31.80	906.71	906.41	906.56	Glacial Till	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	32	32.40	32.70	905.81	905.51	905.66	Weathered Bedrock	-	22.2	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	32B	33.30	33.60	904.91	904.61	904.76	Weathered Bedrock	-	14.6	CL-CI	26	15	11	-0.04	CL	-	-	-	-	-	-	16	34	50		-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	33	33.60	33.90	904.61	904.31	904.46	Weathered Bedrock	-	12.1	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	34	34.50	34.80	903.71	903.41	903.56	Weathered Bedrock	-	15.5	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	42B	42.60	42.90	895.61	895.31	895.46	Weathered Bedrock	-	11.3	CL-CI	31	16	15	-0.31	CI	-	-	-	-	-	-	19	25	56		-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	54B	54.90	55.20	883.31	883.01	883.16	Weathered Bedrock	-	10.9	SM/GM		Non-Plastic		-	ML	-	-	-	-	-	-	39	48	13		-	-
2015	Golder	GA15-10	Main Embankment Buttress	Grab	56B	57.30	57.60	880.91	880.61	880.76	Weathered Bedrock	-	10.1	ML/SM	23	16	7	-0.84	CL	-	-	-	-	-	-	28	35	37		-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	1	1.00	1.30	936.00	935.70	935.85	Glacial Till	-	12.8	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	2	2.00	2.30	935.00	934.70	934.85	Glacial Till	-	13.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	3	3.00	3.30	934.00	933.70	933.85	Glacial Till	-	13.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	3B	3.60	3.90	933.40	933.10	933.25	Glacial Till	-	11.6	CL/SC	25	13	12	-0.12	CL	-	-	-	-	-	-	25	30	45		-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	4	4.05	4.35	932.95	932.65	932.80	Glacial Till	-	11.5	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	5	5.00	5.30	932.00	931.70	931.85	Glacial Till	-	12.2	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	5B	5.70	6.00	931.30	931.00	931.15	Glacial Till	-	11.8	GC/CL	25	15	10	-0.32	CL	-	-	-	-	-	-	31	21	33	15	0.002	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	6	6.00	6.30	931.00	930.70	930.85	Glacial Till	-	14.8	GC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	7	7.00	7.30	930.00	929.70	929.85	Glaciofluvial	-	10.6	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	8	8.00	8.30	929.00	928.70	928.85	Glaciofluvial	-	12.3	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	9	9.00	9.30	928.00	927.70	927.85	Glaciofluvial	-	8.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	10	10.00	10.30	927.00	926.70	926.85	Glaciofluvial	-	12.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	11	11.10	11.40	925.90	925.60	925.75	Glaciofluvial	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	12	12.00	12.30	925.00	924.70	924.85	Glaciofluvial	-	11.7	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	13	13.00	13.30	924.00	923.70	923.85	Glaciofluvial	-	3.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	13B	13.30	13.60	923.70	923.40	923.55	Glaciofluvial	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	0	85	15		-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	14	14.10	14.40	922.90	922.60	922.75	Glaciofluvial	-	23.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	15	15.00	15.30	922.00	921.70	921.85	Glaciofluvial	-	21.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	16	15.60	15.90	921.40	921.10	921.25	Glaciolacustrine	-	22.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	17	16.30	16.60	920.70	920.40	920.55	Glaciolacustrine	-	24.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	17B	16.60	16.85	920.40	920.15	920.28	Glaciolacustrine	-	27.4	CL-ML	36	27	9	0.04	ML-OL	-	-	-	-	-	-	0	1	84	15	0.002	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	18	17.10	17.40	919.90	919.60	919.75	Glacial Till	-	18.1	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	19	17.80	18.10	919.20	918.90	919.05	Glacial Till	-	19.0	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	20	19.10	19.40	917.90	917.60	917.75	Glacial Till	-	4.5	SM/GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	21	20.20	20.50	916.80	916.50	916.65	Glacial Till	-	11.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	22	21.00	21.30	916.00	915.70	915.85	Glacial Till	-	7.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	23	22.10	22.40	914.90	914.60	914.75	Glacial Till	-	8.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	24	22.80	23.10	914.20	913.90	914.05	Glacial Till	-	5.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	25	23.20	23.50	913.80	913.50	913.65	Weathered Bedrock	-	12.4	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	26	24.20	24.50	912.80	912.50	912.65	Weathered Bedrock	-	12.1	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	27	25.20	25.50	911.80	911.50	911.65	Weathered Bedrock	-	13.5	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	27B	25.50	25.80	911.50	911.20	911.35	Weathered Bedrock	-	13.3	CL/SC	30	16	14	-0.19	CL/CI	-	-	-	-	-	-	14	27	59		-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	28	26.20	26.50	910.80	910.50	910.65	Weathered Bedrock	-	16.4	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	29	27.10	27.40	909.90	909.60	909.75	Weathered Bedrock	-	16.1	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	30	28.20	28.50	908.80	908.50	908.65	Weathered Bedrock	-	16.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	31	29.10	29.50	907.90	907.50	907.70	Weathered Bedrock	-	14.6	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	32	30.20	30.50	906.80	906.50	906.65	Weathered Bedrock	-	6.2	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	33	31.20	31.50	905.80	905.50	905.65	Weathered Bedrock	-	6.5	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	34	32.10	32.40	904.90	904.60	904.75	Weathered Bedrock	-	12.4	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	35	33.00	33.30	904.00	903.70	903.85	Weathered Bedrock	-	12.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	36	34.20	34.50	902.80	902.50	902.65	Weathered Bedrock	-	5.8	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	37	35.20	35.50	901.80	901.50	901.65	Weathered Bedrock	-	8.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	38	36.20	36.50	900.80	900.50	900.65	Weathered Bedrock	-	8.9	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	39	37.20	37.50	899.80	899.50	899.65	Weathered Bedrock	-	9.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	40	38.10	38.40	898.90	898.60	898.75	Weathered Bedrock	-	10.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	41	38.80	39.10	898.20	897.90	898.05	Weathered Bedrock	-	14.8	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	42	39.80	40.10	897.20	896.90	897.05	Weathered Bedrock	-	7.4	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	43	40.80	41.10	896.20	895.90	896.05	Weathered Bedrock	-	6.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	44	41.80	42.10	895.20	894.90	895.05	Weathered Bedrock	-	10.9	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	45	42.70	43.00	894.30	894.00	894.15	Weathered Bedrock	-	5.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	46	43.80	44.10	893.20	892.90	893.05	Weathered Bedrock	-	5.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	47	45.80	46.10	891.20	890.90	891.05	Weathered Bedrock	-	11.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	48	48.00	48.30	889.00	888.70	888.85	Weathered Bedrock	-	9.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	49	48.90	49.20	888.10	887.80	887.95	Weathered Bedrock	-	12.8	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	50	49.20	49.50	887.80	887.50	887.65	Weathered Bedrock	-	9.5	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	51	50.00	50.30	887.00	886.70	886.85	Weathered Bedrock	-	7.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	52	51.00	51.30	886.00	885.70	885.85	Weathered Bedrock	-	6.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-11	Main Embankment Buttress	Grab	53	52.10	52.40	884.90	884.60	884.75	Weathered Bedrock	-	7.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2015	Golder	GA15-12	Main Embankment Buttress	Grab	1	1.80	2.10	926.30	926.00	926.15	Glacial Till	-	16.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	2	3.00	3.30	925.10	924.80	924.95	Glacial Till	-	11.5	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	3	4.20	4.50	923.90	923.60	923.75	Glacial Till	-	12.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	4	5.40	5.70	922.70	922.40	922.55	-	-	357.4	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	5	6.30	6.60	921.80	921.50	921.65	Glacial Till	-	15.0	SM/ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	26	27		47	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	6	6.60	6.90	921.50	921.20	921.35	Glacial Till	-	11.9	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	7	7.20	7.50	920.90	920.60	920.75	Glacial Till	-	11.3	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	8	8.40	8.70	919.70	919.40	919.55	Glacial Till	-	14.3	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	9	9.30	9.60	918.80	918.50	918.65	Glacial Till	-	11.6	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	10	10.20	10.50	917.90	917.60	917.75	Glacial Till	-	11.2	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	11	11.40	11.70	916.70	916.40	916.55	Glaciofluvial	-	13.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	12	12.60	12.90	915.50	915.20	915.35	Glaciofluvial	-	20.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	13	13.50	13.80	914.60	914.30	914.45	Glaciofluvial	-	21.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	14	14.40	14.70	913.70	913.40	913.55	Glaciofluvial	-	20.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	15	15.30	15.60	912.80	912.50	912.65	Glaciofluvial	-	21.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	15B	15.60	15.90	912.50	912.20	912.35	Glaciofluvial	-	21.0	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	27		73	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	16	16.20	16.50	911.90	911.60	911.75	Glaciofluvial	-	24.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	17	17.40	17.70	910.70	910.40	910.55	Glaciolacustrine	-	21.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	18	18.60	18.90	909.50	909.20	909.35	Glaciolacustrine	-	21.6	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	19	19.05	19.35	909.05	908.75	908.90	Glaciolacustrine	-	23.4	CL-CI	29	21	8	0.30	CL	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	20	19.50	19.80	908.60	908.30	908.45	Glaciolacustrine	-	19.4	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	21	20.40	20.70	907.70	907.40	907.55	Glaciolacustrine	-	19.5	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	Run 8	20.60	20.85	907.50	907.25	907.38	Glaciolacustrine	-	18.8	CL-CI	31	17	14	0.13	CI	-	-	-	-	-	-	-	0	11	52	37	0.002	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	22	21.60	21.90	906.50	906.20	906.35	Glaciolacustrine	-	21.4	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	23	22.50	22.80	905.60	905.30	905.45	Glaciolacustrine	-	22.7	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	24	25.50	25.80	902.60	902.30	902.45	Glaciolacustrine	-	26.5	CL-CI	31	19	12	0.63	CI	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	Run 10	26.50	26.60	901.60	901.50	901.55	Glaciolacustrine	-	32.7	CI	45	28	17	0.28	ML-OL	-	-	-	-	-	-	-	0	0	66	34	0.002	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	Run 10	26.60	28.70	901.50	899.40	900.45	Glaciolacustrine	-	24.9	CI	39	24	15	0.06	CI	-	-	-	-	-	-	-	0	2	76	22	0.002	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	25	26.70	27.00	901.40	901.10	901.25	Glaciolacustrine	-	31.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	27	28.50	28.80	899.60	899.30	899.45	Glaciolacustrine	-	28.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	28	29.40	29.70	898.70	898.40	898.55	Glaciolacustrine	-	28.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	29	30.60	30.90	897.50	897.20	897.35	Glaciolacustrine	-	30.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	100	30.90	31.10	897.20	897.00	897.10	Glaciofluvial	-	22.8	ML	30	23	7	-0.03	ML	-	-	-	-	-	-	-	0	11	71	18	0.002	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	30	31.50	31.80	896.60	896.30	896.45	Glaciofluvial	-	29.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	31	32.70	33.00	895.40	895.10	895.25	Glaciofluvial	-	18.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	32	33.90	34.20	894.20	893.90	894.05	Glaciofluvial	-	17.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	32B	34.20	34.50	893.90	893.60	893.75	Glaciofluvial	-	15.1	SM		Non-Plastic		-	ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	33	34.80	35.10	893.30	893.00	893.15	Glaciofluvial	-	21.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	34	35.70	36.00	892.40	892.10	892.25	Glaciofluvial	-	17.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	35	36.90	37.20	891.20	890.90	891.05	Glaciofluvial	-	25.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	36	37.80	38.10	890.30	890.00	890.15	Glaciofluvial	-	14.3	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	37	38.70	39.00	889.40	889.10	889.25	Glaciofluvial	-	9.5	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	38	39.60	39.90	888.50	888.20	888.35	Glacial Till	-	17.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	39	40.50	40.80	887.60	887.30	887.45	Glacial Till	-	9.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	40	41.70	42.00	886.40	886.10	886.25	Weathered Bedrock	-	14.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	41	42.90	43.20	885.20	884.90	885.05	Weathered Bedrock	-	2.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	42	43.80	44.10	884.30	884.00	884.15	Weathered Bedrock	-	2.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	43	44.70	45.00	883.40	883.10	883.25	Weathered Bedrock	-	6.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	44	45.60	45.90	882.50	882.20	882.35	Weathered Bedrock	-	6.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	45	46.50	46.80	881.60	881.30	881.45	Weathered Bedrock	-	7.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	46	47.70	48.00	880.40	880.10	880.25	Weathered Bedrock	-	20.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	47	48.90	49.20	879.20	878.90	879.05	Weathered Bedrock	-	18.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12	Main Embankment Buttress	Grab	48	49.80	50.10	878.30	878.00	878.15	Weathered Bedrock	-	6.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-12B	Main Embankment Buttress	Grab	1	18.00	18.10	910.10	910.00	910.05	Glaciolacustrine	-	23.2	CL	27	18	9	0.58	CL	-	-	-	-	-	-	-	0	7	73	20	0.002	-
2015	Golder	GA15-12B	Main Embankment Buttress	Grab	2	21.50	22.10	906.60	906.00	906.30	Glaciolacustrine	2.71	19.9	CI	36	19	17	0.05	CI	-	-	-	-	-	-	-	0	7	54	39	0.002	DSS, CRS, Incremental Consolidation
2015	Golder	GA15-12B	Main Embankment Buttress	Grab	3	26.80	27.40	901.30	900.70	901.00	Glaciolacustrine	2.77	36.6	CI	47	25	22	0.53	CI	-	-	-	-	-	-	-	0	3	57	40	0.002	DSS, CRS
2015	Golder	GA15-13	Main Embankment Buttress	Grab	1	0.70	1.00	925.40	925.10	925.25	Glacial Till	-	17.4	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	2	1.70	2.00	924.40	924.10	924.25	Glacial Till	-	11.8	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	3	2.70	3.00	923.40	923.10	923.25	Glacial Till	-	14.0	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	3B	3.00	3.30	923.10	922.80	922.95	Glacial Till	-	14.3	CL-CI	30	14	16	0.02	CL/CI	-	-	-	-	-	-	-	15	31		54	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	4	3.80	4.10	922.30	922.00	922.15	Glacial Till	-	14.0	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	5	5.20	5.50	920.90	920.60	920.75	Glaciolacustrine[1]	-	26.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	5B	5.70	6.00	920.40	920.10	920.25	Glaciolacustrine[1]	-	24.8	CI	37	16	21	0.42	CI	-	-	-	-	-	-	-	0	19	50	31	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	6	6.30	6.60	919.80	919.50	919.65	Glacial Till	-	20.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	7	7.20	7.50	918.90	918.60	918.75	Glacial Till	-	12.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	8	8.20	8.50	917.90	917.60	917.75	Glacial Till	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	9	9.20	9.50	916.90	916.60	916.75	Glacial Till	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	10	10.20	10.50	915.90	915.60	915.75	Glaciofluvial	-	17.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	10B	10.50	10.80	915.60	915.30	915.45	Glaciofluvial	-	16.1	SM		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	60		40	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	11	11.20	11.50	914.90	914.60	914.75	Glaciofluvial	-	22.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	12	12.20	12.50	913.90	913.60	913.75	Glaciofluvial	-	23.6	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	13	13.60	13.90	912.50	912.20	912.35	Glaciofluvial	-	19.5	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	100	14.60	14.90	911.50	911.20	911.35	Glaciofluvial	-	17.9	CL	28	20	8	-0.26	CL	-	-	-	-	-	-	-	0	5	76	19	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	14	14.80	15.10	911.30	911.00	911.15	Glaciofluvial	-	21.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	15	15.70	16.00	910.40	910.10	910.25	Glaciofluvial	-	19.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	15B	16.10	16.40	910.00	909.70	909.85	Glaciofluvial	-	17.4	CL	27	16	11	0.13	CL	-	-	-	-	-	-	-	0	6	82	12	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	16	16.80	17.10	909.30	909.00	909.15	Glaciofluvial	-	17.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	101	17.10	17.30	909.00	908.80	908.90	Glaciofluvial	-	12.7	ML	21	15	6	-0.38	CL-ML	-	-	-	-	-	-	-	0	21	60	19	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	17	18.20	18.50	907.90	907.60	907.75	Glaciofluvial	-	17.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	18	19.20	19.50	906.90	906.60	906.75	Glaciolacustrine	-	19.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	18B	19.50	19.80	906.60	906.30	906.45	Glaciolacustrine	-	18.8	ML	22	15	7	0.54	CL	-	-	-	-	-	-	-	0	19	70	11	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	19	20.20	20.50	905.90	905.60	905.75	Glaciolacustrine	-	20.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	20	21.20	21.50	904.90	904.60	904.75	Glaciolacustrine	-	29.5	CI-CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	20b	21.60	21.90	904.50	904.20	904.35	Glaciolacustrine	-	30.2	CI-CH	49	23	26	0.28	CI	-	-	-	-	-	-	-	0	0	60	40	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	21	22.30	22.60	903.80	903.50	903.65	Glaciolacustrine	-	25.4	CI-CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	22	23.30	23.60	902.80	902.50	902.65	-[1]	-	34.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	23	24.30	24.60	901.80	901.50	901.65	Glaciolacustrine	-	33.1	CI-CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	23b	24.60	24.90	901.50	901.20	901.35	Glaciolacustrine	-	31.4	CI-CH	48	22	26	0.36	CI	-	-	-	-	-	-	-	0	9	59	32	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	24	25.30	25.60	900.80	900.50	900.65	Glaciofluvial	-	20.0	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	102	26.20	26.40	899.90	899.70	899.80	Glaciolacustrine	-	13.3	CL	44	20	24	-0.28	CI	-	-	-	-	-	-	-	0	6	53	41	0.002	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	25	26.40	26.70	899.70	899.40	899.55	Glaciolacustrine	-	31.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	26	27.70	28.00	898.40	898.10	898.25	Glaciofluvial	-	19.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	26B	28.20	28.50	897.90	897.60	897.75	Glaciofluvial	-	19.2	SM		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	70		30	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	27	28.70	29.00	897.40	897.10	897.25	Glaciofluvial	-	20.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	28	29.70	30.00	896.40	896.10	896.25	Glaciofluvial	-	17.0	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	29	31.20	31.50	894.90	894.60	894.75	Glacial Till	-	9.1	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	30	32.20	32.50	893.90	893.60	893.75	Glacial Till	-	18.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	31	33.00	33.30	893.10	892.80	892.95	Glacial Till	-	18.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	32	34.00	34.30	892.10	891.80	891.95	Weathered Bedrock	-	6.2	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	33	35.00	35.30	891.10	890.80	890.95	Weathered Bedrock	-	6.8	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	34	35.70	36.00	890.40	890.10	890.25	Weathered Bedrock	-	12.7	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	35	36.70	37.00	889.40	889.10	889.25	Weathered Bedrock	-	12.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	36	37.70	38.00	888.40	888.10	888.25	Weathered Bedrock	-	11.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	37	38.70	39.00	887.40	887.10	887.25	Weathered Bedrock	-	16.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	38	39.70	40.00	886.40	886.10	886.25	Weathered Bedrock	-	11.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-13	Main Embankment Buttress	Grab	39	40.70	41.00	885.40	885.10	885.25	Weathered Bedrock	-	4.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	1	0.60	0.90	913.30	913.00	913.15	Glacial Till	-	14.7	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	2	1.60	1.90	912.30	912.00	912.15	Glacial Till	-	13.1	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	3	2.60	2.90	911.30	911.00	911.15	Glacial Till	-	12.8	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	3B	3.00	3.30	910.90	910.60	910.75	Glacial Till	-	12.0	CL/SC	23	14	9	-0.22	CL	-	-	-	-	-	-	-	12	37		51	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	4	3.60	3.90	910.30	910.00	910.15	Glaciofluvial	-	13.2	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	5	4.60	4.90	909.30	909.00	909.15	Glaciofluvial	-	17.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	6	5.60	5.90	908.30	908.00	908.15	Glaciolacustrine	-	16.9	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	7	6.60	6.90	907.30	907.00	907.15	Glaciolacustrine	-	22.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	7B	6.90	7.20	907.00	906.70	906.85	Glaciolacustrine	-	22.9	CI	34	20	14	0.21	CI	-	-	-	-	-	-	-	0	1	75	24	0.002	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2015	Golder	GA15-14	Main Embankment Buttress	Grab	8	7.90	8.20	906.00	905.70	905.85	Glaciolacustrine	-	33.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	9	8.70	9.00	905.20	904.90	905.05	Glaciolacustrine	-	31.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	9B	9.00	9.30	904.90	904.60	904.75	Glaciolacustrine	-	29.2	CI	39	20	19	0.48	CI	-	-	-	-	-	-	-	0	3	84	13	0.002	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	10	9.90	10.20	904.00	903.70	903.85	Glaciofluvial	-	30.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	10B	10.20	10.50	903.70	903.40	903.55	Glaciofluvial	-	24.6	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	0	99	1	0.002	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	11	10.90	11.20	903.00	902.70	902.85	Glaciofluvial	-	30.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	12	12.60	12.90	901.30	901.00	901.15	Glaciofluvial	-	17.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	13	14.00	14.30	899.90	899.60	899.75	Weathered Bedrock	-	8.4	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	14	15.00	15.30	898.90	898.60	898.75	Weathered Bedrock	-	8.4	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	15	16.10	16.40	897.80	897.50	897.65	Weathered Bedrock	-	2.8	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	16	17.10	17.40	896.80	896.50	896.65	Weathered Bedrock	-	14.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	17	18.10	18.40	895.80	895.50	895.65	Weathered Bedrock	-	8.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	18	19.10	19.40	894.80	894.50	894.65	Weathered Bedrock	-	8.9	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	19	20.10	20.40	893.80	893.50	893.65	Weathered Bedrock	-	11.6	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-14	Main Embankment Buttress	Grab	20	21.10	21.40	892.80	892.50	892.65	Weathered Bedrock	-	1.8	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	1	0.90	1.20	924.10	923.80	923.95	Fill	-	2.8	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	2	5.40	5.70	919.60	919.30	919.45	Fill	-	9.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	3	6.60	6.90	918.40	918.10	918.25	Fill	-	6.0	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	4	7.50	7.80	917.50	917.20	917.35	Fill	-	6.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	5	9.30	9.60	915.70	915.40	915.55	Fill	-	3.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	6	10.20	10.50	914.80	914.50	914.65	Fill	-	6.8	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	7	11.40	11.70	913.60	913.30	913.45	Fill	-	3.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	8	12.60	12.90	912.40	912.10	912.25	Fill	-	5.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	9	14.70	15.00	910.30	910.00	910.15	Glacial Till	-	21.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	9B	15.30	15.60	909.70	909.40	909.55	Glacial Till	-	16.0	CL	23	13	10	0.30	CL	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	10	15.90	16.20	909.10	908.80	908.95	Glacial Till	-	16.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	11	16.80	17.10	908.20	907.90	908.05	Glaciolacustrine	-	16.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	12	19.20	19.50	905.80	905.50	905.65	Glaciolacustrine	-	26.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	Run 7	19.70	19.80	905.30	905.20	905.25	Glaciolacustrine	-	29.9	CI	44	27	17	0.17	ML-OL	-	-	-	-	-	-	-	0	1	61	38	0.002	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	13	20.40	20.70	904.60	904.30	904.45	Glaciolacustrine	-	29.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	Run 8	21.50	21.60	903.50	903.40	903.45	Glaciofluvial	-	24.3	ML	27	25	2	-0.35	ML	-	-	-	-	-	-	-	2	0	90	8	0.002	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	14	21.60	21.90	903.40	903.10	903.25	Glaciolacustrine	-	30.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	14B	21.90	22.20	903.10	902.80	902.95	Glaciolacustrine	-	28.5	CI	42	19	23	0.41	CI	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	15	22.50	22.80	902.50	902.20	902.35	Glaciolacustrine	-	26.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	16	23.70	24.00	901.30	901.00	901.15	Glaciofluvial	-	26.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	17	24.60	24.90	900.40	900.10	900.25	Glaciofluvial	-	27.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	17B	24.90	25.20	900.10	899.80	899.95	Glaciofluvial	-	21.7	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	18	25.50	25.80	899.50	899.20	899.35	Glaciofluvial	-	23.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	19	26.70	27.00	898.30	898.00	898.15	Glaciofluvial	-	20.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	20	27.60	27.90	897.40	897.10	897.25	Glacial Till	-	10.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	21	28.50	28.80	896.50	896.20	896.35	Glacial Till	-	13.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	22	29.70	30.00	895.30	895.00	895.15	Glacial Till	-	12.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	23	30.60	30.90	894.40	894.10	894.25	Glacial Till	-	8.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	24	39.00	39.30	886.00	885.70	885.85	Weathered Bedrock	-	12.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	25	41.10	41.40	883.90	883.60	883.75	Weathered Bedrock	-	3.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	26	42.00	42.30	883.00	882.70	882.85	Weathered Bedrock	-	10.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	27	43.50	43.80	881.50	881.20	881.35	Weathered Bedrock	-	12.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	28	44.70	45.00	880.30	880.00	880.15	Weathered Bedrock	-	13.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	29	45.60	45.90	879.40	879.10	879.25	Weathered Bedrock	-	16.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15	Main Embankment Buttress	Grab	30	46.80	47.10	878.20	877.90	878.05	Weathered Bedrock	-	16.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-15B	Main Embankment Buttress	Thin-walled Piston Tube	1	17.02	17.45	907.98	907.55	907.77	Glaciolacustrine	-	24.4	CI	39	20	19	0.23	CI	-	-	-	-	-	-	-	0	1	69	30	0.002	DSS
2015	Golder	GA15-15B	Main Embankment Buttress	Thin-walled Piston Tube	1	17.02	17.45	907.98	907.55	907.77	Glaciolacustrine	-	27.4	CI	40	23	17	0.26	CI	-	-	-	-	-	-	-	1	0	67	32	0.002	Incremental Consolidation
2015	Golder	GA15-15B	Main Embankment Buttress	Thin-walled Piston Tube	2 (300 DSS)	18.54	18.92	906.46	906.08	906.27	Glaciolacustrine	-	28.8	CI	47	20	27	0.33	CI	-	-	-	-	-	-	-	0	1	56	43	0.002	DSS
2015	Golder	GA15-15B	Main Embankment Buttress	Thin-walled Piston Tube	2 (600 DSS)	18.54	18.92	906.46	906.08	906.27	Glaciolacustrine	-	26.6	CI	43	19	24	0.32	CI	-	-	-	-	-	-	-	0	1	56	43	0.002	DSS
2015	Golder	GA15-15B	Main Embankment Buttress	Thin-walled Piston Tube	2 (CRS)	18.54	18.92	906.46	906.08	906.27	Glaciolacustrine	-	27.0	CI	40	22	18	0.28	CI	-	-	-	-	-	-	-	0	2	60	38	0.002	CRS
2015	Golder	GA15-16	Main Embankment Buttress	Grab	1	0.90	1.20	911.60	911.30	911.45	Fill	-	11.5	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	2	2.30	2.60	910.20	909.90	910.05	Glaciofluvial	-	20.2	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	2B	2.70	3.00	909.80	909.50	909.65	[1]	-	17.0	CL-CI	30	17	13	0.00	CL/CI	-	-	-	-	-	-	-	7	21	72		-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	3	3.30	3.60	909.20	908.90	909.05	Glaciofluvial	-	12.2	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	4	4.30	4.60	908.20	907.90	908.05	Glaciofluvial	-	14.0	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	5	5.00	5.30	907.50	907.20	907.35	Glaciolacustrine	-	19.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	5B	5.30	5.70	907.20	906.80	907.00	Glaciolacustrine	-	24.3	CL	30	17	13	0.56	CL	-	-	-	-	-	-	-	0	10	58	32	0.002	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	6	6.00	6.30	906.50	906.20	906.35	Glaciolacustrine	-	24.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	7	6.90	7.20	905.60	905.30	905.45	Glaciolacustrine	-	29.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	7B	7.20	7.50	905.30	905.00	905.15	Glaciolacustrine	-	29.8	CI	40	22	18	0.43	CI	-	-	-	-	-	-	-	0	2	61	37	0.002	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	8	7.65	7.95	904.85	904.55	904.70	Glaciolacustrine	-	31.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	9	8.25	8.60	904.25	903.90	904.08	Glaciolacustrine	-	33.4	CI-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	9B	8.70	9.00	903.80	903.50	903.65	Glaciolacustrine	-	30.9	CI-ML	35	24	11	0.63	CI	-	-	-	-	-	-	-	0	0	79	21	0.002	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	10	9.00	9.30	903.50	903.20	903.35	Glaciolacustrine	-	29.4	CI-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	11	10.10	10.35	902.40	902.15	902.28	Glaciofluvial	-	29.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	11B	10.50	10.80	902.00	901.70	901.85	Glaciofluvial	-	27.8	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	0	95	5	0.002	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	12	11.30	11.60	901.20	900.90	901.05	Glaciofluvial	-	26.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	13	12.60	12.90	899.90	899.60	899.75	Glaciofluvial	-	24.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	14	13.60	13.90	898.90	898.60	898.75	Glaciofluvial	-	22.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	15	14.60	14.90	897.90	897.60	897.75	Glaciofluvial	-	21.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	16	15.60	15.90	896.90	896.60	896.75	Glacial Till	-	16.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	17	16.60	16.95	895.90	895.55	895.73	Glacial Till	-	15.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	18	17.30	17.60	895.20	894.90	895.05	Glacial Till	-	20.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	19	17.80	18.00	894.70	894.50	894.60	Glacial Till	-	7.1	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	20	19.10	19.30	893.40	893.20	893.30	Glacial Till	-	15.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	21	19.80	20.10	892.70	892.40	892.55	Glacial Till	-	8.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	22	20.40	20.70	892.10	891.80	891.95	Glacial Till	-	23.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	23	21.30	21.60	891.20	890.90	891.05	Glacial Till	-	16.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	24	21.90	22.20	890.60	890.30	890.45	Weathered Bedrock	-	8.9	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	25	23.15	23.45	889.35	889.05	889.20	Weathered Bedrock	-	8.3	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	26	24.20	24.50	888.30	888.00	888.15	Weathered Bedrock	-	8.6	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	27	25.25	25.60	887.25	886.90	887.08	Weathered Bedrock	-	8.6	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	28	26.20	26.50	886.30	886.00	886.15	Weathered Bedrock	-	9.3	SW/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	29	27.30	27.60	885.20	884.90	885.05	Weathered Bedrock	-	11.4	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	31	29.30	29.55	883.20	882.95	883.08	Weathered Bedrock	-	8.5	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	33	31.10	31.40	881.40	881.10	881.25	Weathered Bedrock	-	13.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	34	32.00	32.30	880.50	880.20	880.35	Weathered Bedrock	-	12.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	35	32.70	33.00	879.80	879.50	879.65	Weathered Bedrock	-	12.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	36	33.70	34.00	878.80	878.50	878.65	Weathered Bedrock	-	17.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	37	35.00	35.30	877.50	877.20	877.35	Weathered Bedrock	-	23.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	38	35.50	35.80	877.00	876.70	876.85	Weathered Bedrock	-	24.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	39	36.50	36.80	876.00	875.70	875.85	Weathered Bedrock	-	12.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-16	Main Embankment Buttress	Grab	40	38.10	38.40	874.40	874.10	874.25	Weathered Bedrock	-	16.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	1	6.30	6.60	912.75	912.45	912.60	Glacial Till	-	14.5	ML-SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	1B	6.60	6.90	912.45	912.15	912.30	Glaciofluvial	-	12.4	CL-CI	29	15	14	-0.19	CL	-	-	-	-	-	-	-	4	31	65		-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	2	7.30	7.60	911.75	911.45	911.60	Glaciofluvial	-	20.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	3	8.30	8.60	910.75	910.45	910.60	Glaciofluvial	-	20.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	3B	8.80	9.10	910.25	909.95	910.10	Glaciofluvial	-	14.6	SM		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	71	29		-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	4	9.30	9.60	909.75	909.45	909.60	Glaciofluvial	-	19.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	5	10.60	10.90	908.45	908.15	908.30	Glaciolacustrine	-	31.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	6	11.60	11.90	907.45	907.15	907.30	Glaciolacustrine	-	30.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	100	12.40	12.60	906.65	906.45	906.55	Glaciolacustrine	-	25.6	CI	28	23	5	0.52	ML	-	-	-	-	-	-	-	0	1	92	7	0.002	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	7	12.70	13.00	906.35	906.05	906.20	Glaciofluvial	-	29.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	7B	13.00	13.30	906.05	905.75	905.90	Glaciofluvial	-	25.7	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	0	98	2	0.002	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	8	13.70	14.00	905.35	905.05	905.20	Glaciofluvial	-	28.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	9	14.70	15.00	904.35	904.05	904.20	Glaciofluvial / Till	-	28.0	ML/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	9B	15.15	15.45	903.90	903.60	903.75	Glacial Till	-	7.5	SM	18	15	3	-2.50	ML	-	-	-	-	-	-	-	27	42	31		-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	10	15.70	16.00	903.35	903.05	903.20	Glacial Till	-	8.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	11	16.70	17.00	902.35	902.05	902.20	Glaciofluvial	-	18.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	12	17.70	18.00	901.35	901.05	901.20	Glaciofluvial	-	17.3	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2015	Golder	GA15-17	Main Embankment Buttress	Grab	13	18.70	19.00	900.35	900.05	900.20	Glacial Till	-	14.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	14	19.70	20.00	899.35	899.05	899.20	Glacial Till	-	15.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	15	20.70	21.00	898.35	898.05	898.20	Glacial Till	-	21.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	15B	21.00	21.30	898.05	897.75	897.90	Glacial Till	-	21.1	CL	28	21	7	0.01	CL	-	-	-	-	-	-	-	2	5	93		-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	16	21.70	22.00	897.35	897.05	897.20	Glacial Till	-	14.0	SW-GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	17	22.70	23.00	896.35	896.05	896.20	Weathered Bedrock	-	8.9	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	18	23.70	24.00	895.35	895.05	895.20	Weathered Bedrock	-	9.4	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	19	24.70	25.00	894.35	894.05	894.20	Weathered Bedrock	-	8.7	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	20	25.50	25.80	893.55	893.25	893.40	Weathered Bedrock	-	7.2	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-17	Main Embankment Buttress	Grab	21	26.60	26.90	892.45	892.15	892.30	Weathered Bedrock	-	16.8	SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	1	1.80	2.10	934.40	934.10	934.25	Glacial Till	-	16.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	2	2.80	3.10	933.40	933.10	933.25	Glaciofluvial	-	12.5	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	3B	3.60	3.80	932.60	932.40	932.50	Glaciofluvial	-	11.6	CL/SC	27	13	14	-0.10	CL	-	-	-	-	-	-	-	0	37	63		-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	3	3.80	4.10	932.40	932.10	932.25	Glaciofluvial	-	12.2	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	4	4.80	5.10	931.40	931.10	931.25	Glaciofluvial	-	13.6	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	5	5.80	6.10	930.40	930.10	930.25	Glaciofluvial	-	14.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	6B	6.50	6.80	929.70	929.40	929.55	Glaciofluvial	-	13.5	CL/SC	28	14	14	-0.04	CL	-	-	-	-	-	-	-	4	35	61		-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	6	6.80	7.10	929.40	929.10	929.25	Glaciofluvial	-	13.3	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	100	7.30	7.50	928.90	928.70	928.80	Glaciofluvial	-	9.5	CL	25	14	11	-0.41	CL	-	-	-	-	-	-	-	0	30	49	21	0.002	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	7	7.90	8.20	928.30	928.00	928.15	Glacial Till	-	14.2	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	8	8.80	9.10	927.40	927.10	927.25	Glacial Till	-	11.4	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	8b	9.10	9.40	927.10	926.80	926.95	Glacial Till	-	10.7	SC/CL	21	12	9	-0.14	CL	-	-	-	-	-	-	-	5	47	48		-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	9	9.80	10.10	926.40	926.10	926.25	Glacial Till	-	11.0	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	10	10.80	11.10	925.40	925.10	925.25	Glacial Till	-	10.5	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	11	11.80	12.10	924.40	924.10	924.25	Glacial Till	-	9.4	SC/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	12	12.90	13.20	923.30	923.00	923.15	Weathered Bedrock	-	18.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	13	13.80	13.90	922.40	922.30	922.35	Weathered Bedrock	-	14.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	14	14.40	14.70	921.80	921.50	921.65	Weathered Bedrock	-	14.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	15	15.50	15.80	920.70	920.40	920.55	Weathered Bedrock	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	16	16.40	16.70	919.80	919.50	919.65	Weathered Bedrock	-	13.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-18	Main Embankment Buttress	Grab	17	17.40	17.70	918.80	918.50	918.65	Weathered Bedrock	-	6.2	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-19	South Embankment	Grab	1	2.50	2.80	945.10	944.80	944.95	Glacial Till	-	16.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-19	South Embankment	Grab	1B	3.00	3.30	944.60	944.30	944.45	Glacial Till	-	13.6	CL	26	14	12	-0.03	CL	-	-	-	-	-	-	-	3	35	62		-	-
2015	Golder	GA15-19	South Embankment	Grab	2	3.50	3.80	944.10	943.80	943.95	Glacial Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-19	South Embankment	Grab	3	4.50	4.80	943.10	942.80	942.95	Glacial Till	-	11.3	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-19	South Embankment	Grab	3B	5.10	5.40	942.50	942.20	942.35	Glacial Till	-	12.3	SM/ML	21	14	7	-0.24	CL-ML	-	-	-	-	-	-	-	8	43	49		-	-
2015	Golder	GA15-19	South Embankment	Grab	4	5.50	5.80	942.10	941.80	941.95	Glacial Till	-	11.2	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-19	South Embankment	Grab	5	6.80	7.10	940.80	940.50	940.65	Weathered Bedrock	-	8.0	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-19	South Embankment	Grab	6	7.80	8.10	939.80	939.50	939.65	Weathered Bedrock	-	6.6	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-20	South Embankment	Grab	1	1.50	1.80	942.54	942.24	942.39	Glacial Till	-	14.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-20	South Embankment	Grab	1B	1.80	2.10	942.24	941.94	942.09	Glacial Till	-	17.4	CL	28	15	13	0.18	CL	-	-	-	-	-	-	-	1	19	80		-	-
2015	Golder	GA15-20	South Embankment	Grab	2	2.50	2.80	941.54	941.24	941.39	Glacial Till	-	12.2	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-20	South Embankment	Grab	2b	3.00	3.30	941.04	940.74	940.89	Glacial Till	-	11.9	CL/SC	26	14	12	-0.18	CL	-	-	-	-	-	-	-	12	39	49		-	-
2015	Golder	GA15-20	South Embankment	Grab	3	3.70	4.00	940.34	940.04	940.19	Glacial Till	-	15.0	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-20	South Embankment	Grab	4	4.60	4.90	939.44	939.14	939.29	Glacial Till	-	12.8	CL/SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-20	South Embankment	Grab	4b	4.90	4.95	939.14	939.09	939.12	Glacial Till	-	13.5	CL/SC	27	14	13	-0.04	CL	-	-	-	-	-	-	-	11	44	45		-	-
2015	Golder	GA15-20	South Embankment	Grab	5	6.10	6.40	937.94	937.64	937.79	Weathered Bedrock	-	4.6	CL/SC/GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	1	5.18	5.48	907.32	907.02	907.17	Glaciolacustrine	-	30.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	2	5.48	6.10	907.02	906.40	906.71	Glaciolacustrine	-	28.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	2	5.48	6.10	907.02	906.40	906.71	Glaciolacustrine	-	42.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	3	6.10	6.70	906.40	905.80	906.10	Glaciolacustrine	-	31.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	3	6.10	6.70	906.40	905.80	906.10	Glaciolacustrine	-	25.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	5 (CRS)	7.39		905.11		905.11	Glaciolacustrine	2.76	39.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	0	1	77	22	0.002	CRS
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	5 (2000 kPa)	7.48		905.02		905.02	Glaciolacustrine	2.72	26.4	CI	34	19	15	0.49	CI	-	-	-	-	-	-	-	0	0	83	17	0.002	DSS
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	5 (800 kPa)	7.53		904.97		904.97	Glaciolacustrine	2.65	30.9	CI	47	22	25	0.36	CI	-	-	-	-	-	-	-	0	0	68	32	0.002	DSS
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	5 (400 kPa)	7.62		904.88		904.88	Glaciolacustrine	2.80	22.1	CI	39	19	20	0.16	CI	-	-	-	-	-	-	-	0	1	86	13	0.002	DSS
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	6	7.90	8.50	904.60	904.00	904.30	Glaciolacustrine	-	31.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	6	7.90	8.50	904.60	904.00	904.30	Glaciolacustrine	-	30.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Golder	GA15-21	Main Embankment Buttress	Thin-walled Piston Tube	9 (CIU)	9.75	10.36	902.75	902.14	902.45	Glaciofluvial	2.78	27.1	ML	24	21	3	2.03	ML	-	-	-	-	-	-	-	0	27	64	9	0.002	TXCU
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	1	9.14	9.30	928.06	927.90	927.98	Till Like	-	13.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	2	9.75	9.91	927.45	927.29	927.37	Till Like	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	3	10.52	10.67	926.68	926.53	926.61	Till Like	-	10.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	4	11.20	11.35	926.00	925.85	925.93	Till Like	-	9.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	5	11.89	12.04	925.31	925.16	925.24	Till Like	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	6	12.57	12.73	924.63	924.47	924.55	Till Like	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	7	13.26	13.41	923.94	923.79	923.87	Till Like	-	12.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	8	13.94	14.10	923.26	923.10	923.18	Till Like	-	13.0	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	9	14.78	14.94	922.42	922.26	922.34	-	-	13.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	10	15.47	15.62	921.73	921.58	921.66	-	-	18.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	11	16.15	16.31	921.05	920.89	920.97	Till Like	-	12.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	12	16.84	16.99	920.36	920.21	920.29	Till Like	-	12.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	13	17.53	17.68	919.67	919.52	919.60	Till Like	-	22.3	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	14	18.14	18.29	919.06	918.91	918.99	Till Like	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	15	18.90	19.05	918.30	918.15	918.23	Weathered Bedrock	-	13.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	16	19.58	19.74	917.62	917.46	917.54	Weathered Bedrock	-	10.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	17	20.27	20.42	916.93	916.78	916.86	Weathered Bedrock	-	15.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-01	Corner 1 Embankment Buttress	Grab	18	20.96	21.11	916.24	916.09	916.17	Weathered Bedrock	-	7.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	1	3.05	3.20	929.95	929.80	929.88	-	-	40.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	2	3.73	3.89	929.27	929.11	929.19	-	-	19.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	3	4.27	4.42	928.73	928.58	928.66	-	-	12.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	4	4.95	5.11	928.05	927.89	927.97	Till Like	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	5	5.64	5.79	927.36	927.21	927.29	Till Like	-	10.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	6	6.32	6.48	926.68	926.52	926.60	-	-	11.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	7	7.01	7.16	925.99	925.84	925.92	Till Like	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	8	7.70	7.85	925.30	925.15	925.23	Till Like	-	13.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	9	8.46	8.61	924.54	924.39	924.47	Till Like	-	9.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	10	9.07	9.14	923.93	923.86	923.90	-	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	11	9.69	9.83	923.31	923.17	923.24	-	-	10.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	12	10.36	10.52	922.64	922.48	922.56	-	-	8.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	13	11.05	11.20	921.95	921.80	921.88	-	-	9.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	14	11.73	11.89	921.27	921.11	921.19	-	-	9.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	15	12.42	12.57	920.58	920.43	920.51	-	-	10.1	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	16	13.11	13.26	919.89	919.74	919.82	-	-	15.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	17	13.79	13.94	919.21	919.06	919.14	-	-	21.5	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	18	14.48	14.63	918.52	918.37	918.45	-	-	12.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	19	15.24	15.39	917.76	917.61	917.69	Till Like	-	15.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	20	15.93	16.08	917.07	916.92	917.00	Lower Glaciolacustrine[2]	-	22.9	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	21	16.61	16.76	916.39	916.24	916.32	Lower Glaciolacustrine[2]	-	23.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	22	17.30	17.45	915.70	915.55	915.63	Lower Glaciolacustrine[2]	-	22.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	23	17.98	18.14	915.02	914.86	914.94	Lower Glaciolacustrine[2]	-	23.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	24	18.67	18.82	914.33	914.18	914.26	Lower Glaciolacustrine[2]	-	29.4	CL-ML	25	20	5	1.88	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	25	19.35	19.51	913.65	913.49	913.57	-	-	18.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	26	20.27	20.42	912.73	912.58	912.66	-	-	21.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	27	21.11	21.26	911.89	911.74	911.82	-	-	16.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	28	21.49	21.64	911.51	911.36	911.44	-	-	24.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	29	22.17	22.33	910.83	910.67	910.75	-	-	9.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	30	22.86	23.01	910.14	909.99	910.07	-	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-02	Corner 1 Embankment Buttress	Grab	31	23.55	23.70	909.45	909.30	909.38	Weathered Bedrock	-	6.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	1	3.66	3.81	928.34	928.19	928.27	Till Like	-	22.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	2	4.27	4.42	927.73	927.58	927.66	Till Like	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	3	4.88	5.03	927.12	926.97	927.05	Till Like	-	9.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	4	5.49	5.64	926.51	926.36	926.44	Till Like	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	5	6.10	6.25	925.90	925.75	925.83	Till Like	-	13.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	6	6.71	6.86	925.29	925.14	925.22	Till Like	-	11.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	7	7.32	7.47	924.68	924.53	924.61	Till Like	-	12.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	8	7.92	8.08	924.08	923.92	924.00	Till Like	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	9	8.53	8.69	923.47	923.31	923.39	Till Like	-	9.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	10	9.14	9.30	922.86	922.70	922.78	Till Like	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	11	9.75	9.91	922.25	922.09	922.17	Till Like	-	11.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	12	10.36	10.52	921.64	921.48	921.56	Till Like	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	13	10.97	11.13	921.03	920.87	920.95	Till Like	-	8.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	14	11.58	11.73	920.42	920.27	920.35	Till Like	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	15	12.19	12.34	919.81	919.66	919.74	Till Like	-	11.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	16	12.80	12.95	919.20	919.05	919.13	Till Like	-	17.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	17	13.41	13.56	918.59	918.44	918.52	Till Like	-	12.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	18	14.02	14.17	917.98	917.83	917.91	-	-	16.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	19	14.63	14.78	917.37	917.22	917.30	Till Like	-	10.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	20	15.85	16.00	916.15	916.00	916.08	Till Like	-	11.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	21	16.46	16.61	915.54	915.39	915.47	Till Like	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	22	17.07	17.22	914.93	914.78	914.86	Till Like	-	9.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	23	17.68	17.83	914.32	914.17	914.25	Till Like	-	8.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	24	18.29	18.44	913.71	913.56	913.64	Till Like	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	25	18.90	19.05	913.10	912.95	913.03	Till Like	-	8.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	26	19.51	19.66	912.49	912.34	912.42	Till Like	-	6.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	27	20.12	20.27	911.88	911.73	911.81	Till Like	-	7.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	28	20.73	20.88	911.27	911.12	911.20	Till Like	-	10.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	29	21.34	21.49	910.66	910.51	910.59	Till Like	-	10.3	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	30	21.95	22.10	910.05	909.90	909.98	Till Like	-	21.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	31	22.56	22.71	909.44	909.29	909.37	Till Like	-	8.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-03	Corner 1 Embankment Buttress	Grab	32	23.16	23.32	908.84	908.68	908.76	Weathered Bedrock	-	8.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	1	0.61	0.76	931.99	931.84	931.92	Fill	-	4.2	SP-GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	2	2.13	2.29	930.47	930.31	930.39	Fill	-	4.8	SP-GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	3	4.88	5.03	927.72	927.57	927.65	Till Like	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	4	5.64	5.79	926.96	926.81	926.89	Till Like	-	11.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	5	6.55	6.71	926.05	925.89	925.97	Till Like	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	6	7.16	7.32	925.44	925.28	925.36	Till Like	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	7	7.77	7.92	924.83	924.68	924.76	Till Like	-	12.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	8	8.38	8.53	924.22	924.07	924.15	-[1]	-	3.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	9	8.99	9.14	923.61	923.46	923.54	Upper Glaciolacustrine[2]	-	10.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	10	9.60	9.75	923.00	922.85	922.93	Upper Glaciolacustrine[2]	-	18.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	11	10.21	10.36	922.39	922.24	922.32	Upper Glaciolacustrine[2]	-	15.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Thin-walled Piston Tube	12B	10.62	10.92	921.98	921.68	921.83	Upper Glaciolacustrine[2]	-	11.1	CH	25	13	12	-0.16	CL	-	-	-	-	-	-	-	17.4	32.6	29.0	21.0	0.002	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Thin-walled Piston Tube	12	10.70	11.00	921.90	921.60	921.75	Upper Glaciolacustrine[2]	-	31.6	CH	57	28	29	0.12	CH	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	13	11.43	11.58	921.17	921.02	921.10	Upper Glaciolacustrine[2]	-	17.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	14	12.04	12.19	920.56	920.41	920.49	Upper Glaciolacustrine[2]	-	9.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	15	12.80	12.95	919.80	919.65	919.73	-	-	13.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	16	13.49	13.64	919.11	918.96	919.04	-	-	13.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	17	14.17	14.33	918.43	918.27	918.35	-	-	12.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	18	14.86	15.01	917.74	917.59	917.67	-	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	19	15.54	15.70	917.06	916.90	916.98	-	-	14.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	20	16.23	16.38	916.37	916.22	916.30	-	-	11.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	21	16.92	17.07	915.68	915.53	915.61	-	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	22	18.44	18.59	914.16	914.01	914.09	Till Like	-	9.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	23	19.13	19.28	913.47	913.32	913.40	Till Like	-	12.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	24	19.81	19.96	912.79	912.64	912.72	Till Like	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	25	20.50	20.65	912.10	911.95	912.03	Till Like	-	9.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	26	21.34	21.49	911.26	911.11	911.19	Lower Glaciolacustrine[2]	-	23.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	26B	21.49	22.02	911.11	910.58	910.85	Lower Glaciolacustrine[2]	-	23.3	CL	51	23	28	0.01	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	27	22.02	22.17	910.58	910.43	910.51	Lower Glaciolacustrine[2]	-	15.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	28	22.71	22.86	909.89	909.74	909.82	Till Like	-	16.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	29	23.39	23.55	909.21	909.05	909.13	Till Like	-	15.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	30	24.08	24.23	908.52	908.37	908.45	Till Like	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	31	24.77	24.92	907.83	907.68	907.76	Till Like	-	14.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	32	25.45	25.60	907.15	907.00	907.08	Till Like	-	12.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	33	26.14	26.29	906.46	906.31	906.39	Till Like	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	34	26.82	26.97	905.78	905.63	905.71	Till Like	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	35	27.51	27.66	905.09	904.94	905.02	Till Like	-	19.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	36	28.19	28.35	904.41	904.25	904.33	-	-	8.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	37	28.88	29.03	903.72	903.57	903.65	-	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	38	29.57	29.72	903.03	902.88	902.96	-	-	11.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	39	30.25	30.40	902.35	902.20	902.28	-	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	40	31.09	31.24	901.51	901.36	901.44	-	-	14.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	41	31.78	31.93	900.82	900.67	900.75	-	-	6.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	42	32.46	32.61	900.14	899.99	900.07	-	-	6.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	43	33.15	33.30	899.45	899.30	899.38	-	-	9.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	44	33.83	33.99	898.77	898.61	898.69	-	-	16.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	45	34.52	34.67	898.08	897.93	898.01	-	-	5.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	46	35.20	35.36	897.40	897.24	897.32	-	-	12.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	47	35.89	36.04	896.71	896.56	896.64	-	-	5.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	48	36.58	36.73	896.02	895.87	895.95	-	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	49	37.26	37.41	895.34	895.19	895.27	-	-	9.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	50	37.95	38.10	894.65	894.50	894.58	-	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	51	38.63	38.79	893.97	893.81	893.89	-	-	5.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	52	39.32	39.47	893.28	893.13	893.21	-	-	7.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	53	40.01	40.16	892.59	892.44	892.52	Weathered Bedrock	-	15.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-04	Corner 1 Embankment Buttress	Grab	54	40.54	40.69	892.06	891.91	891.99	Weathered Bedrock	-	2.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	1	0.30	0.46	925.10	924.94	925.02	Till Like	-	11.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	2	0.91	1.07	924.49	924.33	924.41	Till Like	-	9.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	3	1.52	1.68	923.88	923.72	923.80	Till Like	-	10.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	4	2.13	2.29	923.27	923.11	923.19	Till Like	-	10.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	5	2.74	2.90	922.66	922.50	922.58	Till Like	-	11.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	6	3.35	3.51	922.05	921.89	921.97	Upper Glaciolacustrine[2]	-	13.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Thin-walled Piston Tube	7	3.80	4.10	921.60	921.30	921.45	Upper Glaciolacustrine[2]	-	16.3	CL	37	15	22	0.06	CI	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Thin-walled Piston Tube	7B	3.80	4.10	921.60	921.30	921.45	Upper Glaciolacustrine[2]	-	13.6	CL	26	13	13	0.05	CL	-	-	-	-	-	-	-	23.0	28.9	27.1	21.0	0.002	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	8	4.57	4.72	920.83	920.68	920.76	Upper Glaciolacustrine[2]	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	9	5.18	5.33	920.22	920.07	920.15	Upper Glaciolacustrine[2]	-	21.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	10	5.79	5.94	919.61	919.46	919.54	Till Like	-	10.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	11	6.40	6.55	919.00	918.85	918.93	Till Like	-	5.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	12	7.01	7.16	918.39	918.24	918.32	Till Like	-	10.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	13	7.62	7.77	917.78	917.63	917.71	Till Like	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-05	Corner 1 Embankment Buttress	Grab	14	8.23	8.38	917.17	917.02	917.10	Weathered Bedrock	-	8.5	CL-CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	1	9.14	9.30	927.36	927.20	927.28	-	-	8.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	2	9.75	9.91	926.75	926.59	926.67	-	-	10.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	3	10.36	10.52	926.14	925.98	926.06	-	-	13.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	4	10.97	11.13	925.53	925.37	925.45	-	-	11.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	5	11.58	11.73	924.92	924.77	924.85	-	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	6	12.19	12.34	924.31	924.16	924.24	-	-	10.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	7	12.80	12.95	923.70	923.55	923.63	Till Like	-	9.1	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	8	13.41	13.56	923.09	922.94	923.02	Till Like	-	9.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	9	14.02	14.17	922.48	922.33	922.41	Till Like	-	12.3	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	10	14.63	14.78	921.87	921.72	921.80	Till Like	-	12.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	11	15.24	15.39	921.26	921.11	921.19	Till Like	-	13.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	12	15.85	16.00	920.65	920.50	920.58	Till Like	-	9.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	13	16.46	16.61	920.04	919.89	919.97	-	-	16.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	14	17.07	17.22	919.43	919.28	919.36	Till Like	-	20.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	15	17.68	17.83	918.82	918.67	918.75	Till Like	-	11.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	16	18.29	18.44	918.21	918.06	918.14	Till Like	-	8.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	17	18.90	19.05	917.60	917.45	917.53	Till Like	-	10.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	18	19.51	19.66	916.99	916.84	916.92	Till Like	-	9.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	19	20.12	20.27	916.38	916.23	916.31	Till Like	-	10.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	20	20.73	20.88	915.77	915.62	915.70	-	-	19.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	21	21.34	21.49	915.16	915.01	915.09	-	-	11.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	22	21.95	22.10	914.55	914.40	914.48	Till Like	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-06	Corner 1 Embankment Buttress	Grab	23	22.56	22.71	913.94	913.79	913.87	Weathered Bedrock	-	8.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	1	4.11	4.27	928.19	928.03	928.11	Till Like	-	14.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	2	4.80	4.95	927.50	927.35	927.43	Till Like	-	13.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	3	5.49	5.64	926.81	926.66	926.74	Till Like	-	14.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	4	6.17	6.32	926.13	925.98	926.06	Till Like	-	13.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	5	6.86	7.01	925.44	925.29	925.37	Till Like	-	14.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	6	7.54	7.70	924.76	924.60	924.68	Till Like	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Thin-walled Piston Tube	8	8.70	9.00	923.60	923.30	923.45	Upper Glaciolacustrine[2]	-	32.4	CL	39	22	17	0.61	CI	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	9	9.60	9.75	922.70	922.55	922.63	-	-	13.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	10	10.29	10.44	922.01	921.86	921.94	-	-	17.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	11	10.97	11.13	921.33	921.17	921.25	-	-	13.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	12	11.66	11.81	920.64	920.49	920.57	-	-	13.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	13	12.34	12.50	919.96	919.80	919.88	-	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	14	13.03	13.18	919.27	919.12	919.20	-	-	12.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	15	13.72	13.87	918.58	918.43	918.51	-	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	16	14.40	14.55	917.90	917.75	917.83	-	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	17	15.09	15.24	917.21	917.06	917.14	-	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	18	15.77	15.93	916.53	916.37	916.45	-	-	10.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	19	16.46	16.61	915.84	915.69	915.77	-	-	10.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	20	17.15	17.30	915.15	915.00	915.08	-	-	9.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	21	17.83	17.98	914.47	914.32	914.40	-	-	13.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	22	18.52	18.67	913.78	913.63	913.71	-	-	15.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	23	19.20	19.35	913.10	912.95	913.03	-	-	8.2	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	24	19.89	20.04	912.41	912.26	912.34	-	-	8.0	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	25	20.57	20.73	911.73	911.57	911.65	-	-	8.6	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	26	21.26	21.34	911.04	910.96	911.00	-	-	7.3	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-07	Corner 1 Embankment Buttress	Grab	27	21.49	21.64	910.81	910.66	910.74	Weathered Bedrock	-	18.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	1	0.30	0.46	924.00	923.84	923.92	Till Like	-	15.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	2	0.91	1.07	923.39	923.23	923.31	Till Like	-	12.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	3	1.52	1.68	922.78	922.62	922.70	Till Like	-	13.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	4	2.13	2.29	922.17	922.01	922.09	Till Like	-	10.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	5	2.74	2.90	921.56	921.40	921.48	Till Like	-	11.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	6	3.35	3.96	920.95	920.34	920.65	Upper Glaciolacustrine[2]	-	19.3	CL	41	18	23	0.06	CI	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	7	3.96	4.11	920.34	920.19	920.27	Upper Glaciolacustrine[2]	-	23.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	8	4.57	4.72	919.73	919.58	919.66	Till Like	-	12.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	9	5.18	5.33	919.12	918.97	919.05	Till Like	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	10	5.79	5.94	918.51	918.36	918.44	Till Like	-	11.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	11	6.40	6.55	917.90	917.75	917.83	Till Like	-	12.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	12	7.01	7.16	917.29	917.14	917.22	Till Like	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	13	7.62	7.77	916.68	916.53	916.61	Till Like	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	14	8.23	8.38	916.07	915.92	916.00	Till Like	-	9.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	15	8.84	8.99	915.46	915.31	915.39	Till Like	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	16	9.45	9.60	914.85	914.70	914.78	Till Like	-	9.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	17	10.06	10.21	914.24	914.09	914.17	Till Like	-	9.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	18	10.67	10.82	913.63	913.48	913.56	Till Like	-	7.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	19	11.28	11.43	913.02	912.87	912.95	Till Like	-	8.2	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	20	11.89	12.04	912.41	912.26	912.34	Till Like	-	9.7	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	21	12.50	12.65	911.80	911.65	911.73	Till Like	-	11.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	22	13.11	13.26	911.19	911.04	911.12	Till Like	-	9.3	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	23	13.72	13.87	910.58	910.43	910.51	Till Like	-	9.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	24	14.33	14.48	909.97	909.82	909.90	Till Like	-	6.9	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	25	14.94	15.09	909.36	909.21	909.29	Till Like	-	9.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	26	15.54	15.70	908.76	908.60	908.68	Weathered Bedrock	-	6.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	27	16.15	16.31	908.15	907.99	908.07	Weathered Bedrock	-	6.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	28	16.76	16.92	907.54	907.38	907.46	Weathered Bedrock	-	6.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	29	17.37	17.53	906.93	906.77	906.85	Weathered Bedrock	-	8.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-08	Corner 1 Embankment Buttress	Grab	30	17.98	18.14	906.32	906.16	906.24	Weathered Bedrock	-	6.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	1	0.30	0.46	923.60	923.44	923.52	Till Like	-	14.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	2	0.91	1.07	922.99	922.83	922.91	Till Like	-	11.3	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	3	1.52	1.68	922.38	922.22	922.30	Till Like	-	12.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	4	2.13	2.29	921.77	921.61	921.69	Till Like	-	13.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	5	2.74	2.90	921.16	921.00	921.08	-[1]	-	25.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Thin-walled Piston Tube	6	3.35	4.00	920.55	919.90	920.23	Upper Glaciolacustrine[2]	-	30.6	CL	33	19	14	0.83	CI	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Thin-walled Piston Tube	6B	3.35	4.00	920.55	919.90	920.23	Upper Glaciolacustrine[2]	2.75	23.1	CL	36	15	21	0.39	CI	-	-	-	-	-	-	-	5.0	22.5	35.5	37.0	0.002	CRS
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	7	4.10	4.40	919.80	919.50	919.65	Upper Glaciolacustrine[2]	-	29.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	8	4.57	4.72	919.33	919.18	919.26	Upper Glaciolacustrine[2]	-	34.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	9	5.18	5.33	918.72	918.57	918.65	Till Like	-	12.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	10	5.79	5.94	918.11	917.96	918.04	Till Like	-	9.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	11	6.40	6.55	917.50	917.35	917.43	Till Like	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	12	7.01	7.16	916.89	916.74	916.82	Till Like	-	8.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	13	7.62	7.77	916.28	916.13	916.21	Till Like	-	5.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	14	8.23	8.38	915.67	915.52	915.60	Till Like	-	8.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	15	8.84	8.99	915.06	914.91	914.99	Till Like	-	7.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	16	9.45	9.60	914.45	914.30	914.38	Till Like	-	12.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	17	10.06	10.21	913.84	913.69	913.77	Till Like	-	11.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	18	10.67	10.82	913.23	913.08	913.16	Till Like	-	9.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	19	11.28	11.43	912.62	912.47	912.55	Till Like	-	6.7	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	20	11.89	12.04	912.01	911.86	911.94	Till Like	-	6.0	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	21	12.50	12.65	911.40	911.25	911.33	Till Like	-	5.3	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	22	13.11	13.26	910.79	910.64	910.72	Till Like	-	7.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	23	13.72	13.87	910.18	910.03	910.11	Till Like	-	9.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	24	14.33	14.48	909.57	909.42	909.50	Till Like	-	4.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	25	14.94	15.09	908.96	908.81	908.89	Till Like	-	5.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	26	15.54	15.70	908.36	908.20	908.28	Till Like	-	5.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	27	16.15	16.31	907.75	907.59	907.67	Till Like	-	6.2	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	28	16.76	16.92	907.14	906.98	907.06	Till Like	-	6.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	29	17.37	17.53	906.53	906.37	906.45	-	-	9.3	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	30	17.98	18.14	905.92	905.76	905.84	-	-	8.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	31	18.59	18.75	905.31	905.15	905.23	-	-	10.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	32	19.20	19.35	904.70	904.55	904.63	-	-	9.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	33	19.81	19.96	904.09	903.94	904.02	-	-	6.1	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	34	20.42	20.57	903.48	903.33	903.41	-	-	6.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	35	21.03	21.18	902.87	902.72	902.80	-	-	7.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-09	Corner 1 Embankment Buttress	Grab	36	21.64	21.79	902.26	902.11	902.19	-	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	1	3.05	3.20	943.95	943.80	943.88	Till Like	-	18.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	2	3.66	3.81	943.34	943.19	943.27	Till Like	-	12.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	3	4.27	4.42	942.73	942.58	942.66	Till Like	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	4	4.88	5.03	942.12	941.97	942.05	Till Like	-	11.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	5	5.49	5.64	941.51	941.36	941.44	Till Like	-	14.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	6	6.10	6.25	940.90	940.75	940.83	Till Like	-	10.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	7	6.71	6.86	940.29	940.14	940.22	Till Like	-	11.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	8	7.32	7.47	939.68	939.53	939.61	Till Like	-	13.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	9	7.92	8.08	939.08	938.92	939.00	Till Like	-	11.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-15	South Embankment	Grab	10	8.53	8.69	938.47	938.31	938.39	Till Like	-	19.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	1	0.61	0.76	944.19	944.04	944.12	Till Like	-	14.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	2	1.22	1.37	943.58	943.43	943.51	Till Like	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	3	1.83	1.98	942.97	942.82	942.90	Till Like	-	11.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	4	2.44	2.59	942.36	942.21	942.29	Till Like	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2016	Golder	GA16-16	South Embankment	Grab	5	3.05	3.20	941.75	941.60	941.68	Till Like	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	6	3.66	3.81	941.14	940.99	941.07	Till Like	-	13.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	7	4.27	4.42	940.53	940.38	940.46	Till Like	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	8	4.88	5.03	939.92	939.77	939.85	Till Like	-	17.5	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	9	5.49	5.64	939.31	939.16	939.24	Till Like	-	18.9	CL-ML	23	15	8	0.49	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	10	6.10	6.25	938.70	938.55	938.63	Till Like	-	14.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-16	South Embankment	Grab	11	6.71	6.86	938.09	937.94	938.02	Till Like	-	15.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	1	0.91	1.07	943.49	943.33	943.41	Till Like	-	8.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	2	1.52	1.68	942.88	942.72	942.80	Till Like	-	11.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	3	2.13	2.29	942.27	942.11	942.19	Till Like	-	12.0	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	4	2.74	2.90	941.66	941.50	941.58	Till Like	-	16.0	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	5	3.35	3.51	941.05	940.89	940.97	Till Like	-	12.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	6	3.96	4.11	940.44	940.29	940.37	Till Like	-	12.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	7	4.57	4.72	939.83	939.68	939.76	Till Like	-	14.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	8	5.18	5.33	939.22	939.07	939.15	Till Like	-	12.7	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	9	5.79	5.94	938.61	938.46	938.54	Till Like	-	12.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	10	6.40	6.55	938.00	937.85	937.93	Till Like	-	14.5	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	11	7.01	7.16	937.39	937.24	937.32	Till Like	-	13.0	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	12	7.62	7.77	936.78	936.63	936.71	Till Like	-	15.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	13	8.23	8.38	936.17	936.02	936.10	Till Like	-	13.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	14	8.84	8.99	935.56	935.41	935.49	Till Like	-	15.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	15	9.45	9.60	934.95	934.80	934.88	Till Like	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	16	10.06	10.21	934.34	934.19	934.27	Till Like	-	8.1	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	17	10.67	10.82	933.73	933.58	933.66	Till Like	-	11.4	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-17	South Embankment	Grab	18	11.28	11.43	933.12	932.97	933.05	Glaciolacustrine[1]	-	19.8	ML-SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	1	0.30	0.46	944.90	944.74	944.82	-	-	21.0	OH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	2	0.91	1.07	944.29	944.13	944.21	Till Like	-	11.4	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	3	1.52	1.68	943.68	943.52	943.60	Till Like	-	14.1	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	4	2.13	2.29	943.07	942.91	942.99	Till Like	-	12.3	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	5	2.74	2.90	942.46	942.30	942.38	Till Like	-	12.6	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	6	3.35	3.51	941.85	941.69	941.77	Till Like	-	19.9	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	7	3.96	4.11	941.24	941.09	941.17	Till Like	-	13.5	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	8	4.57	4.72	940.63	940.48	940.56	Till Like	-	10.1	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	9	5.18	5.33	940.02	939.87	939.95	Till Like	-	12.2	SP-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	10	5.79	5.94	939.41	939.26	939.34	Till Like	-	12.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	11	6.40	6.55	938.80	938.65	938.73	Till Like	-	12.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	12	7.01	7.16	938.19	938.04	938.12	Till Like	-	7.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	13	7.62	7.77	937.58	937.43	937.51	Till Like	-	6.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	14	8.23	8.38	936.97	936.82	936.90	Till Like	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	15	8.84	8.99	936.36	936.21	936.29	Till Like	-	11.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Golder	GA16-19	South Embankment	Grab	16	9.14	9.45	936.06	935.75	935.91	Glaciolacustrine[1]	-	15.6	ML	26	19	7	-0.49	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	1	0.39		940.41		940.41	Fill	-	12.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	2	0.82		939.98		939.98	Fill	-	16.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	3	1.26		939.54		939.54	Fill	-	10.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	4	1.69		939.11		939.11	Fill	-	13.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	5	2.13		938.67		938.67	Fill	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	6	2.56		938.24		938.24	Fill	-	15.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	7	3.00		937.80		937.80	Fill	-	15.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	8	3.44		937.36		937.36	Fill	-	18.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	9	3.87		936.93		936.93	Fill	-	9.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	10	4.31		936.49		936.49	Fill	-	6.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	11	4.74		936.06		936.06	Fill	-	9.7	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	12	5.18		935.62		935.62	Fill	-	8.7	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	13	5.61		935.19		935.19	Fill	-	10.7	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	14	6.05		934.75		934.75	Fill	-	7.7	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	15	6.56		934.24		934.24	Fill	-	9.2	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	16	7.07		933.73		933.73	Fill	-	7.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	17	7.58		933.23		933.23	Fill	-	4.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	18	8.08		932.72		932.72	Fill	-	7.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	19	8.59		932.21		932.21	Fill	-	6.7	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	20	9.10		931.70		931.70	Fill	-	7.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	21	9.61		931.19		931.19	Fill	-	7.2	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	22	10.12		930.68		930.68	Fill	-	9.1	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	23	10.63		930.18		930.18	Fill	-	11.1	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	24	11.13		929.67		929.67	-	-	16.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	25	11.64		929.16		929.16	-	-	15.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	26	12.15		928.65		928.65	-	-	14.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	27	12.91		927.89		927.89	-	-	11.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	28	13.68		927.13		927.13	-	-	9.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	29	14.44		926.36		926.36	-	-	11.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	30	15.00		925.80		925.80	-	-	11.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	31	15.50		925.30		925.30	-	-	13.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	32	16.00		924.80		924.80	-	-	12.0	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	33	16.50		924.30		924.30	-	-	10.0	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	34	17.00		923.80		923.80	-	-	20.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	35	17.50		923.30		923.30	-	-	22.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	36	18.00		922.80		922.80	-	-	19.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	37	18.50		922.30		922.30	-	-	14.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	38	19.00		921.80		921.80	-	-	16.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	39	19.50		921.30		921.30	-	-	16.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	40	20.00		920.80		920.80	-	-	11.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	41	20.50		920.30		920.30	-	-	11.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	42	21.00		919.80		919.80	-	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	43	21.50		919.30		919.30	-	-	12.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	44	22.00		918.80		918.80	-	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	45	22.50		918.30		918.30	-	-	17.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	46	23.00		917.80		917.80	Weathered Bedrock	-	12.3	GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	47	23.50		917.30		917.30	Weathered Bedrock	-	15.4	GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	48	24.00		916.80		916.80	Weathered Bedrock	-	11.9	GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	49	24.50		916.30		916.30	Weathered Bedrock	-	13.6	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	50	25.00		915.80		915.80	Weathered Bedrock	-	16.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	51	25.50		915.30		915.30	Inferred Bedrock	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	52	26.00		914.80		914.80	Inferred Bedrock	-	15.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	53	26.50		914.30		914.30	Inferred Bedrock	-	13.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	54	27.00		913.80		913.80	Inferred Bedrock	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	55	27.50		913.30		913.30	Inferred Bedrock	-	12.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	56	28.00		912.80		912.80	Inferred Bedrock	-	8.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-01	Corner 1 Embankment Buttress	Grab	57	28.50		912.30		912.30	Inferred Bedrock	-	16.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	1	0.50		940.13		940.13	Fill	-	9.6	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	2	1.00		939.63		939.63	Fill	-	10.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	3	1.50		939.13		939.13	Fill	-	8.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	4	2.00		938.63		938.63	Fill	-	9.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	5	2.50		938.13		938.13	Fill	-	5.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	6	3.00		937.63		937.63	Till Like	-	3.8	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	7	3.50		937.13		937.13	Till Like	-	17.7	MH/CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	8	4.00		936.63		936.63	Till Like	-	12.3	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	9	4.50		936.13		936.13	-	-	11.6	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	10	5.00		935.63		935.63	-	-	11.8	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	11	5.50		935.13		935.13	-	-	13.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	12	5.90		934.73		934.73	Upper Glaciolacustrine[1]	-	13.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	31	6.10		934.53		934.53	Upper Glaciolacustrine[1]	-	20.1	CI	34	19	15	0.07	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	13	6.50		934.13		934.13	Upper Glaciolacustrine[1]	-	18.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	14	7.00		933.63		933.63	Upper Glaciolacustrine[1]	-	18.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	15	7.50		933.13		933.13	-	-	17.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	16	8.00		932.63		932.63	-	-	24.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	17	8.50		932.13		932.13	-	-	15.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	18	9.00		931.63		931.63	-	-	11.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	19	9.50		931.13		931.13	Till Like	-	13.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	20	10.00		930.63		930.63	Till Like	-	11.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	21	10.50		930.13		930.13	Till Like	-	8.8	CI/SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	22	11.00		929.63		929.63	Till Like	-	9.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	23	11.50		929.13		929.13	Till Like	-	4.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	24	11.94		928.69		928.69	Weathered Bedrock	-	5.7	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	25	12.19		928.44		928.44	-	-	10.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	26	13.00		927.63		927.63	Weathered Bedrock	-	2.2	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	27	13.50		927.13		927.13	Weathered Bedrock	-	2.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	28	14.27		926.36		926.36	-	-	17.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	29	14.65		925.98		925.98	Weathered Bedrock	-	3.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-03	Corner 1 Embankment Buttress	Grab	30	15.00		925.63		925.63	Weathered Bedrock	-	3.2	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	1	0.49		940.68		940.68	Fill	-	19.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	2	1.01		940.16		940.16	Fill	-	20.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	3	1.49		939.68		939.68	Fill	-	17.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	4	1.98		939.19		939.19	Fill	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	5	2.50		938.67		938.67	Fill	-	7.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	6	2.99		938.18		938.18	Fill	-	15.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	7	3.51		937.66		937.66	Fill	-	14.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	8	3.99		937.18		937.18	Fill	-	8.8	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	9	6.49		934.68		934.68	Fill	-	6.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	10	7.01		934.16		934.16	Fill	-	6.2	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	11	7.50		933.67		933.67	Fill	-	3.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	12	9.69		931.48		931.48	Fill	-	7.8	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	13	10.00		931.17		931.17	Fill	-	5.1	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	14	10.49		930.68		930.68	Fill	-	5.4	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	15	11.00		930.17		930.17	Fill	-	6.8	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	16	11.49		929.68		929.68	Fill	-	6.2	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	17	12.01		929.16		929.16	Fill	-	6.7	GM/GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	18	12.50		928.67		928.67	-	-	6.9	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	19	14.63		926.54		926.54	-	-	14.4	GP/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	20	15.00		926.17		926.17	-	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	21	15.37		925.80		925.80	-	-	16.6	SC/CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	22	18.50		922.67		922.67	-	-	11.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	23	18.99		922.18		922.18	-	-	11.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	24	20.48		920.69		920.69	-	-	15.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	25	21.00		920.17		920.17	-	-	20.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	26	21.01		920.16		920.16	-	-	19.3	CL	24	14	10	0.53	CL	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	27	21.49		919.68		919.68	-	-	17.1	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	28	22.01		919.16		919.16	-	-	13.4	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	29	22.49		918.68		918.68	Till Like	-	20.2	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	30	22.98		918.19		918.19	Till Like	-	9.5	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	31	23.50		917.67		917.67	-	-	23.5	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04A	Corner 1 Embankment Buttress	Grab	32	23.99		917.18		917.18	-	-	26.5	SM/ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	1	12.68		928.27		928.27	Topsoil	-	207.1	OL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	2	13.20		927.75		927.75	-	-	44.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	3	13.69		927.26		927.26	Till Like	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	4	14.20		926.75		926.75	Till Like	-	10.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	5	14.69		926.26		926.26	Till Like	-	9.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	6	15.18		925.77		925.77	Till Like	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	7	15.70		925.25		925.25	-	-	10.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	8	16.18		924.77		924.77	-	-	10.0	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	9	16.70		924.25		924.25	-	-	11.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	10	17.19		923.76		923.76	-	-	10.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	11	17.68		923.27		923.27	-	-	11.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	12	18.20		922.75		922.75	-	-	11.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	13	18.79		922.16		922.16	Upper Glaciolacustrine[2]	-	32.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	20	18.87		922.09		922.09	Upper Glaciolacustrine[2]	-	36.6	CI	47	17	30	0.65	CI	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	14	19.25		921.70		921.70	Upper Glaciolacustrine[1]	-	34.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	19	19.40		921.55		921.55	Upper Glaciolacustrine[2]	-	36.7	CH	41	19	22	0.80	CI	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	15	19.66		921.29		921.29	Upper Glaciolacustrine[2]	-	18.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	16	19.91		921.04		921.04	Upper Glaciolacustrine[1]	-	36.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	17	20.47		920.48		920.48	-	-	14.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	21	20.68		920.28		920.28	Upper Glaciolacustrine[2]	-	19.9	CI	31	15	16	0.31	CI	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	18	20.87		920.08		920.08	-	-	20.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	22	21.82		919.13		919.13	Till Like	-	10.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	23	22.34		918.61		918.61	Till Like	-	8.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	24	22.83		918.12		918.12	Till Like	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	25	23.35		917.60		917.60	-	-	11.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	26	23.84		917.11		917.11	-	-	20.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	27	24.32		916.63		916.63	Till Like	-	24.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	28	24.84		916.11		916.11	Till Like	-	13.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	29	25.33		915.62		915.62	Till Like	-	16.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	30	25.85		915.10		915.10	Weathered Bedrock	-	14.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	31	26.33		914.62		914.62	Weathered Bedrock	-	10.0	GP-GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	32	26.82		914.13		914.13	Weathered Bedrock	-	13.4	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	33	27.34		913.61		913.61	Weathered Bedrock	-	7.0	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	34	27.83		913.12		913.12	Weathered Bedrock	-	4.9	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	35	28.32		912.63		912.63	Weathered Bedrock	-	5.7	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	36	28.83		912.12		912.12	Weathered Bedrock	-	9.7	CI/GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	37	29.32		911.63		911.63	Weathered Bedrock	-	8.0	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Golder	GA18-04B	Corner 1 Embankment Buttress	Grab	38	29.72		911.23		911.23	Weathered Bedrock	-	4.5	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	1	1.22		930.70		930.70	Basal Till	-	12.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	1	1.52	1.83	930.40	930.09	930.25	Basal Till	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	14.1	40.3	31.8	13.8	0.002	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	2	1.83		930.09		930.09	Basal Till	-	11.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	3	2.13		929.79		929.79	Basal Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	4	2.74		929.18		929.18	Basal Till	-	9.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	5	3.35		928.57		928.57	Basal Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	6	3.96		927.96		927.96	Basal Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	2	3.96	4.27	927.96	927.65	927.81	Basal Till	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	15.1	40.2	31.0	13.7	0.002	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	7	4.57		927.35		927.35	Basal Till	-	12.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	8	5.18		926.74		926.74	Basal Till	-	10.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	9	5.79		926.13		926.13	Basal Till	-	9.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	10	6.40		925.52		925.52	Basal Till	-	7.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	11	7.01		924.91		924.91	Basal Till	-	8.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	12	7.62		924.30		924.30	Basal Till	-	8.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	13	8.23		923.69		923.69	Basal Till	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	14	8.84		923.08		923.08	Basal Till	-	8.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	15	9.45		922.47		922.47	Basal Till	-	8.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	16	10.06		921.86		921.86	Basal Till	-	7.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	17	10.67		921.25		921.25	Basal Till	-	8.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	18	11.28		920.64		920.64	Basal Till	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	19	11.89		920.03		920.03	Basal Till	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	20	12.50		919.42		919.42	Basal Till	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	21	13.11		918.81		918.81	Basal Till	-	7.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	22	13.72		918.20		918.20	Basal Till	-	7.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	23	14.33		917.59		917.59	Basal Till	-	7.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	24	14.94		916.98		916.98	Basal Till	-	8.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	25	15.54		916.38		916.38	Basal Till	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	6	15.85	16.15	916.07	915.77	915.92	Basal Till	-	8.9	CL	22	11	11	-0.19	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	26	16.15		915.77		915.77	Basal Till	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	27	16.76		915.16		915.16	Basal Till	-	8.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	28	17.37		914.55		914.55	Basal Till	-	8.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	29	17.98		913.94		913.94	Basal Till	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	30	18.59		913.33		913.33	Basal Till	-	7.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	31	19.20		912.72		912.72	Basal Till	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	8	19.39	19.69	912.53	912.23	912.38	Glaciolacustrine	-	17.0	CL	27	17	10	0.00	CL	-	-	-	-	-	-	-	0.3	8.1	91.6		-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	32	19.51		912.41		912.41	Glaciolacustrine	-	17.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	33	19.81		912.11		912.11	Basal Till	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	34	20.42		911.50		911.50	Basal Till	-	17.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	10	20.51	21.18	911.41	910.74	911.08	Glaciolacustrine[1]	-	22.0	CI	33	21	12	0.08	CI	-	-	-	-	-	-	-	0	2.8	97.2		-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	35	21.03		910.89		910.89	Cl	-	21.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	36	21.64		910.28		910.28	Glaciofluvial	-	13.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	37	22.25		909.67		909.67	Glaciofluvial	-	15.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	38	22.86		909.06		909.06	Basal Till	-	10.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	39	23.47		908.45		908.45	Glaciofluvial	-	10.8	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	13	23.77	24.08	908.15	907.84	908.00	Glaciofluvial	-	-	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	40.0	49.0	11.0		-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	40	24.08		907.84		907.84	Glaciofluvial	-	11.3	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	41	24.69		907.23		907.23	Glaciofluvial	-	10.9	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	42	25.30		906.62		906.62	Glaciofluvial	-	11.7	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	43	25.91		906.01		906.01	Glaciofluvial	-	18.6	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	44	26.52		905.40		905.40	Glaciofluvial	-	17.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	45	27.13		904.79		904.79	Glaciofluvial	-	17.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	46	27.74		904.18		904.18	Basal Till	-	10.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	47	28.35		903.57		903.57	Basal Till	-	9.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	48	28.96		902.96		902.96	-	-	17.2	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	49	29.57		902.35		902.35	-	-	12.5	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	50	30.18		901.74		901.74	Basal Till	-	7.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	51	30.78		901.14		901.14	Basal Till	-	6.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	52	31.39		900.53		900.53	Basal Till	-	6.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	53	32.00		899.92		899.92	Basal Till	-	6.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	54	32.61		899.31		899.31	Basal Till	-	5.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	55	33.22		898.70		898.70	Basal Till	-	4.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	56	33.83		898.09		898.09	Basal Till	-	10.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	57	34.44		897.48		897.48	Basal Till	-	10.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	18	34.75	35.36	897.17	896.56	896.87	Basal Till	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	8.6	50.9	32.8	7.7	0.002	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	58	35.05		896.87		896.87	Basal Till	-	9.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	59	35.66		896.26		896.26	Basal Till	-	6.9	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	60	36.27		895.65		895.65	Basal Till	-	7.2	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	61	36.88		895.04		895.04	Basal Till	-	4.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	62	37.49		894.43		894.43	Basal Till	-	7.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	63	38.10		893.82		893.82	Basal Till	-	4.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	64	38.71		893.21		893.21	Basal Till	-	4.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	65	39.32		892.60		892.60	Basal Till	-	5.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	66	39.93		891.99		891.99	Glaciofluvial	-	7.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	67	40.54		891.38		891.38	Glaciofluvial	-	14.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	68	41.15		890.77		890.77	Basal Till	-	7.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	69	41.76		890.16		890.16	-	-	13.4	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	70	42.37		889.55		889.55	-	-	16.7	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	22	42.37	42.67	889.55	889.25	889.40	-	-	16.9	CL/CI	30	17	13	-0.01	CL/CI	-	-	-	-	-	-	-	1.2	7.7	91.1		-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	71	42.98		888.94		888.94		-	10.9	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	72	43.59		888.33		888.33	-	-	15.3	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	73	44.20		887.72		887.72	-	-	16.4	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	74	44.81		887.11		887.11	Glaciofluvial	-	19.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	75	45.42		886.50		886.50	Glaciofluvial	-	16.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	76	46.02		885.90		885.90	Glaciofluvial	-	18.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	77	46.63		885.29		885.29	Basal Till	-	12.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Grab	25	46.94	47.24	884.98	884.68	884.83	Basal Till	-	12.7	CL	26	16	10	-0.33	CL	-	-	-	-	-	-	-	0.6	14.1	85.3		-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	78	47.24		884.68		884.68	Basal Till	-	13.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	79	47.85		884.07		884.07	Basal Till	-	9.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	80	48.46		883.46		883.46	Bedrock	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	81	49.07		882.85		882.85	Bedrock	-	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	82	49.68		882.24		882.24	Bedrock	-	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-01	Perimeter Embankment Buttress	Chunk	83	50.29		881.63		881.63	Bedrock	-	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	1	1.22		928.89		928.89	Basal Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	2	1.83		928.28		928.28	Basal Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	1	1.98	2.29	928.13	927.82	927.98	-	-	16.4	CL	26	14	12	0.20	CL	-	-	-	-	-	-	-	6.0	30.1	63.9		-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	3	2.13		927.98		927.98	-	-	15.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Thin-walled Open Tube	TO5	2.13	3.66	927.98	926.45	927.22	Basal Till	-	-	SC	-	-	-	-	-	2151	2365	-	-	-	-	-	11.6	39.3	35.7	13.4	0.002	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	4	2.74		927.37		927.37	Basal Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	5	3.35		926.76		926.76	Basal Till	-	10.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	6	3.96		926.15		926.15	Glaciofluvial	-	9.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	7	4.57		925.54		925.54	Glaciofluvial	-	5.3	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	8	5.18		924.93		924.93	-	-	3.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	3	5.49	5.79	924.62	924.32	924.47	-	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	22.7	43.2	27.7	6.4	0.002	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	9	5.79		924.32		924.32	-	-	3.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	10	6.40		923.71		923.71	-	-	5.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	11	7.01		923.10		923.10	-	-	5.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	4	7.32	7.62	922.79	922.49	922.64	-	-	5.5	ML	-	Non-Plastic	-	-	ML	-	-	-	-	-	-	-	0	30.6	69.4		-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	12	7.62		922.49		922.49	-	-	5.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	13	8.23		921.88		921.88	-	-	25.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	14	8.84		921.27		921.27	-	-	5.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	15	9.45		920.66		920.66	-	-	5.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	16	10.06		920.05		920.05	-	-	4.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	17	10.67		919.44		919.44	-	-	9.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	18	11.28		918.83		918.83	-	-	21.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	19	11.89		918.22		918.22	-	-	6.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	20	12.50		917.61		917.61	-	-	4.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	21	13.11		917.00		917.00	-	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	22	13.72		916.39		916.39	-	-	15.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	23	14.33		915.78		915.78	-	-	19.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	24	14.94		915.17		915.17	-	-	22.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	25	15.54		914.57		914.57	-	-	17.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	26	16.15		913.96		913.96	-	-	10.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	9	16.15	16.46	913.96	913.65	913.81	Glaciolacustrine	-	19.0	CL	27	17	10	0.20	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	27	16.76		913.35		913.35	Glaciolacustrine	-	16.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	28	17.37		912.74		912.74	Glaciofluvial	-	19.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	29	17.98		912.13		912.13	Glaciofluvial	-	14.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	30	18.59		911.52		911.52	Glaciofluvial	-	14.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	31	19.20		910.91		910.91	Glaciofluvial	-	15.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	11	19.51	19.81	910.60	910.30	910.45	-	-	17.7	CL	27	18	9	-0.03	CL	-	-	-	-	-	-	-	0	5.6	94.4		-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	32	19.81		910.30		910.30	-	-	18.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	33	20.42		909.69		909.69	Glaciofluvial	-	15.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	34	21.03		909.08		909.08	Glaciofluvial	-	14.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	35	21.64		908.47		908.47	-	-	16.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	36	22.25		907.86		907.86	-	-	13.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	37	22.86		907.25		907.25	Glaciofluvial	-	23.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	38	23.47		906.64		906.64	Glaciofluvial	-	19.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	39	24.08		906.03		906.03	Glaciofluvial	-	23.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	40	24.69		905.42		905.42	Glaciofluvial	-	21.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	41	25.30		904.81		904.81	Glaciofluvial	-	20.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	42	25.91		904.20		904.20	Glaciofluvial	-	15.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Thin-walled Open Tube	TO3	26.21	27.13	903.90	902.98	903.44	Glaciofluvial	-	-	ML	-	-	-	-	-	1826	2262	-	-	-	-	-	0.2	35.3	58.4	6.1	0.002	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	43	26.52		903.59		903.59	Glaciofluvial	-	19.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	44	27.13		902.98		902.98	Glaciofluvial	-	21.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	15	27.31	27.40	902.80	902.71	902.76	Glaciolacustrine	-	33.9	CI	40	23	17	0.64	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	45	27.37		902.74		902.74	Glaciolacustrine	-	34.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	46	27.74		902.37		902.37	Glaciofluvial	-	23.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	47	28.35		901.76		901.76	Glaciofluvial	-	24.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	48	28.96		901.15		901.15	Glaciofluvial	-	22.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	17	29.44	29.54	900.67	900.57	900.62	Glaciolacustrine	-	36.8	CI	34	22	12	1.23	CI	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	49	29.50		900.61		900.61	Glaciolacustrine	-	36.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	50	29.57		900.54		900.54	Glaciofluvial	-	33.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	51	30.18		899.93		899.93	Glaciofluvial	-	25.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	52	30.78		899.33		899.33	Glaciofluvial	-	22.6	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	53	31.39		898.72		898.72	Glaciofluvial	-	22.7	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	54	32.00		898.11		898.11	Glaciofluvial	-	20.2	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	55	32.61		897.50		897.50	Glaciofluvial	-	8.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	56	33.22		896.89		896.89	Glaciofluvial	-	9.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	19	33.22	33.53	896.89	896.58	896.74	Glaciofluvial	-	-	SP	-	-	-	-	-	-	-	-	-	-	-	34.3	61.6	4.1		-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	57	33.83		896.28		896.28	Glaciofluvial	-	13.4	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	58	34.44		895.67		895.67	Glaciofluvial	-	11.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	59	35.05		895.06		895.06	Glaciofluvial	-	11.1	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	60	35.66		894.45		894.45	Glaciofluvial	-	9.1	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	61	36.27		893.84		893.84	Glaciofluvial	-	5.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	62	36.88		893.23		893.23	Glaciofluvial	-	14.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	63	37.49		892.62		892.62	Glaciofluvial	-	18.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	64	38.10		892.01		892.01	Glaciofluvial	-	16.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	65	38.71		891.40		891.40	Glaciofluvial	-	16.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	66	39.32		890.79		890.79	Glaciofluvial	-	14.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	67	39.93		890.18		890.18	Glaciofluvial	-	19.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	68	40.54		889.57		889.57	Glaciofluvial	-	18.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	69	41.15		888.96		888.96	Glaciofluvial	-	16.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	70	41.76		888.35		888.35	Basal Till	-	8.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	71	42.37		887.74		887.74	Basal Till	-	7.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	72	42.98		887.13		887.13	Basal Till	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	73	43.59		886.52		886.52	Basal Till	-	8.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	74	44.20		885.91		885.91	Basal Till	-	5.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	75	44.81		885.30		885.30	Basal Till	-	10.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	76	45.42		884.69		884.69	Basal Till	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	77	46.02		884.09		884.09	Basal Till	-	8.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	78	46.63		883.48		883.48	Glaciofluvial	-	19.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	24	47.09	47.34	883.02	882.77	882.90	Basal Till	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	23.3	35.5	25.3	15.9	0.002	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	79	47.24		882.87		882.87	Basal Till	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	80	47.85		882.26		882.26	Glaciofluvial	-	12.6	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	81	48.46		881.65		881.65	Glaciofluvial	-	23.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	82	49.07		881.04		881.04	Glaciofluvial	-	19.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	83	49.65		880.46		880.46	Glaciolacustrine	-	19.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	84	49.83		880.28		880.28	Glaciofluvial	-	7.1	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	85	50.29		879.82		879.82	Glaciofluvial	-	12.8	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	86	50.90		879.21		879.21	Glaciofluvial	-	18.8	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	87	51.51		878.60		878.60	Glaciofluvial	-	18.8	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	88	52.12		877.99		877.99	Glaciofluvial	-	8.0	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	89	52.73		877.38		877.38	Glaciofluvial	-	7.0	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	90	53.34		876.77		876.77	Glaciofluvial	-	9.8	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	91	53.95		876.16		876.16	Glaciofluvial	-	10.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	92	54.56		875.55		875.55	Glaciofluvial	-	9.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	27	54.56	54.86	875.55	875.25	875.40	Glaciofluvial	-	10.6	SM		Non-Plastic		-	ML	-	-	-	-	-	-	36.6	46.2	17.2		-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	93	55.17		874.94		874.94	Glaciofluvial	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	94	55.78		874.33		874.33	Glaciolacustrine	-	16.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	29	56.08	56.39	874.03	873.72	873.88	Glaciolacustrine	-	19.0	CI	35	22	13	-0.23	CI	-	-	-	-	-	-	0	1.7	98.3		-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	95	56.39		873.72		873.72	Glaciolacustrine	-	19.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	96	57.00		873.11		873.11	Glaciolacustrine	-	24.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	97	57.61		872.50		872.50	Glaciolacustrine	-	22.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	98	58.22		871.89		871.89	Glaciolacustrine	-	21.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	99	58.83		871.28		871.28	Glaciolacustrine	-	21.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	100	59.44		870.67		870.67	Glaciolacustrine	-	22.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	101	60.05		870.06		870.06	Glaciolacustrine	-	23.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	32	60.35	60.66	869.76	869.45	869.61	Glaciolacustrine	-	24.8	CI	38	22	16	0.18	CI	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	102	60.66		869.45		869.45	Glaciolacustrine	-	21.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	103	61.26		868.85		868.85	Glaciolacustrine	-	27.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	104	61.87		868.24		868.24	Glaciolacustrine	-	20.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Grab	33	62.18	62.48	867.93	867.63	867.78	Glaciolacustrine	-	18.1	CI	31	20	11	-0.17	CI	-	-	-	-	-	-	0	2.2	97.8		-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	105	62.48		867.63		867.63	Glaciolacustrine	-	19.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	106	63.09		867.02		867.02	Glaciolacustrine	-	24.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	107	63.70		866.41		866.41	Glaciofluvial	-	27.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	108	64.31		865.80		865.80	Glaciofluvial	-	22.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	109	64.92		865.19		865.19	-	-	15.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	110	65.53		864.58		864.58	Glaciofluvial	-	20.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	111	66.14		863.97		863.97	Basal Till	-	16.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	112	66.75		863.36		863.36	Basal Till	-	15.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	113	67.36		862.75		862.75	Basal Till	-	12.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	114	67.97		862.14		862.14	Basal Till	-	15.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	115	68.58		861.53		861.53	Basal Till	-	16.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	116	69.19		860.92		860.92	-	-	15.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	117	69.80		860.31		860.31	-	-	15.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	118	70.41		859.70		859.70	Bedrock	-	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	119	71.02		859.09		859.09	Bedrock	-	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-02	Perimeter Embankment Buttress	Chunk	120	71.63		858.48		858.48	Bedrock	-	9.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	1	5.18		925.27		925.27	Ablation Till	-	12.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	2	5.79		924.66		924.66	Ablation Till	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	3	6.40		924.05		924.05	Ablation Till	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	4	7.01		923.44		923.44	Ablation Till	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	2	7.01	7.32	923.44	923.13	923.29	Ablation Till	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	16.7	43.6	31.5	8.2	0.002	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	5	7.62		922.83		922.83	Ablation Till	-	9.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	6	8.23		922.22		922.22	Ablation Till	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	7	8.84		921.61		921.61	Ablation Till	-	12.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	8	9.45		921.00		921.00	Ablation Till	-	8.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	9	10.06		920.39		920.39	Ablation Till	-	11.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	4	10.36	10.67	920.09	919.78	919.94	Ablation Till	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	25.0	34.8	30.3	9.9	0.002	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	10	10.67		919.78		919.78	Ablation Till	-	10.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	11	11.28		919.17		919.17	Ablation Till	-	12.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	12	11.89		918.56		918.56	Ablation Till	-	11.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	13	12.50		917.95		917.95	Ablation Till	-	10.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	14	13.11		917.34		917.34	Ablation Till	-	10.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	15	13.72		916.73		916.73	Ablation Till	-	11.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	16	14.33		916.12		916.12	Ablation Till	-	11.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	17	14.94		915.51		915.51	Ablation Till	-	12.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	18	15.54		914.91		914.91	Ablation Till	-	12.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	19	16.15		914.30		914.30	Ablation Till	-	12.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	20	16.76		913.69		913.69	Ablation Till	-	12.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	21	17.37		913.08		913.08	Ablation Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	22	17.98		912.47		912.47	Ablation Till	-	11.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	23	18.59		911.86		911.86	Ablation Till	-	12.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	24	19.20		911.25		911.25	Ablation Till	-	11.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	25	19.81		910.64		910.64	Ablation Till	-	11.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	26	20.42		910.03		910.03	Ablation Till	-	12.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	27	21.03		909.42		909.42	Ablation Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	28	21.64		908.81		908.81	Ablation Till	-	11.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	29	22.25		908.20		908.20	Ablation Till	-	10.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	30	22.86		907.59		907.59	Ablation Till	-	12.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	12	23.17	23.47	907.28	906.98	907.13	Glaciolacustrine	-	21.1	Cl	45	22	23	-0.04	Cl	-	-	-	-	-	-	-	5.6	7.9	86.5		-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	31	23.47		906.98		906.98	Basal Till	-	9.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	32	24.08		906.37		906.37	Glaciolacustrine	-	23.7	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	13	24.38	24.69	906.07	905.76	905.92	Glaciolacustrine	-	24.3	Cl	37	22	15	0.15	Cl	-	-	-	-	-	-	-	0	2.3	97.7		-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	33	24.69		905.76		905.76	Glaciolacustrine	-	22.9	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Thin-walled Open Tube	TO2	24.69	24.99	905.76	905.46	905.61	Glaciolacustrine	-	22.1	Cl		Non-Plastic		-	ML	-	-	-	-	-	-	-	0	17.4	65.6	17.0	0.002	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Thin-walled Open Tube	TO2-CRS	24.69	24.99	905.76	905.46	905.61	Glaciolacustrine	-	24.3	Cl	33	20	13	0.33	Cl	-	-	-	-	-	-	-	0	1.3	71.3	27.4	0.002	CRS
2021	Golder	GA21-03	Perimeter Embankment Buttress	Thin-walled Open Tube	TO3	24.99	25.60	905.46	904.85	905.16	Glaciolacustrine	-	22.8	Cl	32	19	13	0.29	Cl	-	-	-	-	-	-	-	0	3.7	77.3	19.0	0.002	Incremental Consolidation
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	34	25.30		905.15		905.15	Glaciolacustrine	-	23.2	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	14	25.60	25.91	904.85	904.54	904.70	Glaciolacustrine	-	20.5	CL/CI	30	20	10	0.05	CL/CI	-	-	-	-	-	-	-	0	10.5	89.5		-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Thin-walled Open Tube	TO4-CRS	25.60	26.21	904.85	904.24	904.55	Glaciolacustrine	-	19.8	CL/CI	37	22	15	-0.15	Cl	1682	2014	-	-	-	-	-	0	1.8	65.6	32.6	0.002	DSS, CRS
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	35	25.91		904.54		904.54	Glaciolacustrine	-	22.7	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	36	26.52		903.93		903.93	Glaciofluvial	-	10.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	37	27.13		903.32		903.32	Glaciofluvial	-	16.8	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	38	27.74		902.71		902.71	Glaciofluvial	-	21.3	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	39	28.35		902.10		902.10	Glaciofluvial	-	21.4	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	40	28.96		901.49		901.49	Glaciofluvial	-	19.5	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	41	30.18		900.27		900.27	Glaciofluvial	-	6.1	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	42	30.78		899.67		899.67	Glaciofluvial	-	10.8	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	43	31.39		899.06		899.06	Glaciofluvial	-	7.2	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	44	32.00		898.45		898.45	Glaciofluvial	-	8.5	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	45	32.61		897.84		897.84	Glaciolacustrine	-	18.7	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	46	33.22		897.23		897.23	Glaciolacustrine	-	17.1	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	19	33.22	33.53	897.23	896.92	897.08	Glaciolacustrine	-	17.2	Cl	37	20	17	-0.16	Cl	-	-	-	-	-	-	-	0	2.0	98.0		-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Thin-walled Open Tube	TO5-DSS	33.22	33.83	897.23	896.62	896.93	Glaciolacustrine	-	21.2	Cl	50	22	28	-0.03	Cl/CH	-	-	-	-	-	-	-	2.5	8.0	43.7	45.8	0.002	DSS, CRS, Incremental Consolidation
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	47	33.83		896.62		896.62	Glaciolacustrine	-	19.8	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	48	34.44		896.01		896.01	Glaciolacustrine	-	22.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	20	34.44	34.75	896.01	895.70	895.86	Glaciolacustrine	-	25.7	CH	68	24	44	0.04	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	49	35.05		895.40		895.40	Glaciolacustrine	-	16.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	50	35.66		894.79		894.79	-	-	10.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	51	36.27		894.18		894.18	-	-	10.5	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	21	36.58	36.88	893.87	893.57	893.72	-	-	16.8	CL-ML	20	15	5	0.36	CL-ML	-	-	-	-	-	-	-	1.7	25.6	72.7		-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	52	36.88		893.57		893.57	-	-	17.7	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	53	37.49		892.96		892.96	-	-	25.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	22	37.80	38.10	892.65	892.35	892.50	Glaciofluvial	-	21.1	ML		Non-Plastic		-	ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	54	38.10		892.35		892.35	Glaciofluvial	-	21.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	55	38.71		891.74		891.74	Glaciofluvial	-	22.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	56	39.32		891.13		891.13	Glaciolacustrine	-	24.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	57	39.93		890.52		890.52	Glaciolacustrine	-	25.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	23	39.93	40.23	890.52	890.22	890.37	Glaciolacustrine	-	23.5	CL	29	15	14	0.61	CL	-	-	-	-	-	-	-	0	3.8	96.2		-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	58	40.54		889.91		889.91	Glaciolacustrine	-	25.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	59	41.15		889.30		889.30	Glaciolacustrine	-	22.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	60	41.76		888.69		888.69	Glaciofluvial	-	19.9	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	61	42.37		888.08		888.08	Glaciofluvial	-	10.0	GW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	62	42.98		887.47		887.47	Basal Till	-	8.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	63	43.59		886.86		886.86	Basal Till	-	9.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	25	43.59	43.89	886.86	886.56	886.71	Basal Till	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	20.6	35.4	34.6	9.4	0.002	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	64	44.20		886.25		886.25	Basal Till	-	14.0	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	65	44.81		885.64		885.64	Basal Till	-	19.5	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Grab	26	45.11	45.42	885.34	885.03	885.19	Basal Till	-	17.9	CL-ML	23	16	7	0.27	CL-ML	-	-	-	-	-	-	-	1.4	26.7	71.9		-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	67	46.02		884.43		884.43	Basal Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	68	46.63		883.82		883.82	Basal Till	-	8.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-03	Perimeter Embankment Buttress	Chunk	69	47.24		883.21		883.21	Weathered Bedrock	-	18.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	1	14.33		924.05		924.05	Ablation Till	-	13.0	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	2	14.94		923.44		923.44	Ablation Till	-	12.2	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	3	15.54		922.84		922.84	Ablation Till	-	12.9	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	4	16.15		922.23		922.23	Ablation Till	-	12.4	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	5	16.76		921.62		921.62	Ablation Till	-	10.6	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	6	17.37		921.01		921.01	Ablation Till	-	14.2	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Grab	4	17.53	17.68	920.85	920.70	920.78	Upper Glaciolacustrine[2]	-	18.2	Cl	32	14	18	0.23	Cl	-	-	-	-	-	-	-	2.0	20.1	77.9		-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	7	17.68		920.70		920.70	Upper Glaciolacustrine[2]	-	20.8	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Thin-walled Open Tube	TO1	17.68	18.29	920.70	920.09	920.40	Upper Glaciolacustrine[2]	-	20.5	Cl	47	19	28	0.05	Cl	-	-	-	-	-	-	-	32.3	9.5	22.1	36.1	0.002	Cyclic DSS
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Chunk	8	19.05		919.33		919.33	Basal Till	-	17.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Thin-walled Open Tube	TO3	19.20	20.12	919.18	918.26	918.72	Basal Till	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	14.8	39.7	33.2	12.3	0.002	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Thin-walled Open Tube	TO4	20.12	20.73	918.26	917.65	917.96	Basal Till	-	-	SC	-	-	-	-	-	2063	2320	-	-	-	-	-	21.1	34.5	31.0	13.4	0.002	-
2021	Golder	GA21-04	Corner 1 Embankment Buttress	Thin-walled Open Tube	TO5	20.73	20.88	917.65	917.50	917.58	Basal Till	-	-	SC	-	-	-	-	-	1982	2250	-	-	-	-	-	14.9	39.2	32.7	13.2	0.002	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	1	7.01		938.51		938.51	Ablation Till	-	5.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	2	7.62		937.90		937.90	Ablation Till	-	16.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	3	8.23		937.29		937.29	Ablation Till	-	11.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	1	8.23	8.53	937.29	936.99	937.14	Ablation Till	-	-	SC	-	-	-	-	-	-	-	-	-	-	-	-	17.4	41.7	28.7	12.2	0.002	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	4	8.84		936.68		936.68	Ablation Till	-	10.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	2	9.02	9.08	936.50	936.44	936.47	Glaciolacustrine	-	17.5	Cl	31	15	16	0.16	CI	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	5	9.05		936.47		936.47	Glaciolacustrine	-	16.0	Cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	6	9.45		936.07		936.07	Ablation Till	-	11.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	7	10.06		935.46		935.46	Ablation Till	-	10.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	8	10.67		934.85		934.85	Ablation Till	-	11.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	9	11.28		934.24		934.24	Ablation Till	-	16.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	10	11.58		933.94		933.94	Ablation Till	-	16.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	11	12.50		933.02		933.02	Ablation Till	-	15.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	12	13.11		932.41		932.41	Ablation Till	-	15.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	13	13.72		931.80		931.80	Ablation Till	-	14.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	14	14.33		931.19		931.19	Ablation Till	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	15	14.94		930.58		930.58	Glaciofluvial	-	5.2	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	16	15.54		929.98		929.98	Glaciofluvial	-	3.4	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	17	16.15		929.37		929.37	Glaciofluvial	-	9.0	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	18	16.76		928.76		928.76	Glaciofluvial	-	9.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	19	17.98		927.54		927.54	Glaciofluvial	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	20	18.59		926.93		926.93	Glaciofluvial	-	5.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	21	19.20		926.32		926.32	Glaciofluvial	-	3.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	22	19.81		925.71		925.71	Basal Till	-	3.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	23	20.42		925.10		925.10	Glaciofluvial	-	7.4	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	24	21.03		924.49		924.49	Glaciofluvial	-	2.4	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	25	21.64		923.88		923.88	Glaciofluvial	-	2.2	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	26	22.25		923.27		923.27	Basal Till	-	2.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	27	22.86		922.66		922.66	Basal Till	-	2.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	28	23.47		922.05		922.05	-	-	6.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	29	24.08		921.44		921.44	-	-	3.3	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	30	24.69		920.83		920.83	-	-	3.0	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	31	25.30		920.22		920.22	-	-	3.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	32	25.91		919.61		919.61	Basal Till	-	2.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	33	26.82		918.70		918.70	Basal Till	-	11.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	34	27.74		917.78		917.78	Glaciofluvial	-	2.7	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	35	28.35		917.17		917.17	Glaciofluvial	-	3.1	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	11	28.65	28.96	916.87	916.56	916.72	Basal Till	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	-	7.5	44.7	41.8	6.0	0.002	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	36	28.96		916.56		916.56	Basal Till	-	12.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	37	29.57		915.95		915.95	Glaciofluvial	-	9.6	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	38	30.18		915.34		915.34	Glaciofluvial	-	13.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	39	30.78		914.74		914.74	Basal Till	-	10.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	40	31.39		914.13		914.13	Basal Till	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	41	32.00		913.52		913.52	Basal Till	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	42	32.61		912.91		912.91	Basal Till	-	15.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	43	33.22		912.30		912.30	Basal Till	-	14.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	44	33.83		911.69		911.69	Basal Till	-	14.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	45	34.44		911.08		911.08	Basal Till	-	16.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	16	34.75	35.05	910.77	910.47	910.62	Glaciolacustrine	-	15.3	CL	29	17	12	-0.14	CL	-	-	-	-	-	-	1.2	24.8	74.0		-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	46	35.05		910.47		910.47	Glaciolacustrine	-	17.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	47	35.66		909.86		909.86	Basal Till	-	14.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	48	36.27		909.25		909.25	Basal Till	-	18.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	49	36.88		908.64		908.64	Basal Till	-	14.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	50	37.49		908.03		908.03	Basal Till	-	18.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	51	38.10		907.42		907.42	Basal Till	-	17.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	52	38.71		906.81		906.81	Basal Till	-	14.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	53	39.32		906.20		906.20	Basal Till	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	54	39.93		905.59		905.59	Basal Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	55	40.54		904.98		904.98	Basal Till	-	13.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	19	40.54	40.84	904.98	904.68	904.83	-	-	15.0	CL	29	15	14	0.00	CL	-	-	-	-	-	-	2.0	16.5	81.5		-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	56	41.15		904.37		904.37	-	-	14.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	57	41.76		903.76		903.76	Basal Till	-	10.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	58	42.37		903.15		903.15	Basal Till	-	8.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	59	42.98		902.54		902.54	Basal Till	-	12.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	20	42.98	43.28	902.54	902.24	902.39	Basal Till	-	9.3	CL	27	14	13	-0.36	CL	-	-	-	-	-	-	0	39.0	61.0		-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	60	43.59		901.93		901.93	Basal Till	-	8.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	61	44.20		901.32		901.32	Basal Till	-	7.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	62	44.81		900.71		900.71	Basal Till	-	9.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	63	45.42		900.10		900.10	Basal Till	-	7.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	64	46.02		899.50		899.50	Basal Till	-	6.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	65	46.63		898.89		898.89	Basal Till	-	3.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	66	47.24		898.28		898.28	Basal Till	-	10.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	67	47.85		897.67		897.67	Basal Till	-	13.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	68	48.46		897.06		897.06	Basal Till	-	7.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	69	49.07		896.45		896.45	Basal Till	-	5.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	70	49.68		895.84		895.84	Basal Till	-	5.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	71	50.29		895.23		895.23	Basal Till	-	5.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	72	50.90		894.62		894.62	Basal Till	-	10.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	73	51.51		894.01		894.01	Basal Till	-	12.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	74	52.12		893.40		893.40	Basal Till	-	12.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	27	52.43	52.73	893.09	892.79	892.94	Glaciolacustrine	-	10.6	CL	26	15	11	-0.40	CL	-	-	-	-	-	-	4.4	35.6	60.0		-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	75	52.73		892.79		892.79	Glaciolacustrine	-	14.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	76	53.34		892.18		892.18	Glaciolacustrine	-	15.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	77	53.95		891.57		891.57	Basal Till	-	15.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	78	54.56		890.96		890.96	Basal Till	-	17.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	79	55.17		890.35		890.35	Basal Till	-	17.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	80	55.78		889.74		889.74	Basal Till	-	16.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	81	57.00		888.52		888.52	Basal Till	-	12.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Grab	30	57.30	57.61	888.22	887.91	888.07	Glaciolacustrine	-	12.7	CL	25	15	10	-0.23	CL	-	-	-	-	-	-	7.2	27.1	65.7		-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	82	57.61		887.91		887.91	Glaciolacustrine	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	83	58.22		887.30		887.30	Basal Till	-	5.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	84	58.83		886.69		886.69	Basal Till	-	15.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	85	60.05		885.47		885.47	Glaciofluvial	-	10.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	86	60.66		884.86		884.86	Glaciofluvial	-	18.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	87	61.26		884.26		884.26	Glaciofluvial	-	13.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	88	63.09		882.43		882.43	Basal Till	-	14.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	89	63.70		881.82		881.82	Basal Till	-	13.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	90	64.31		881.21		881.21	Basal Till	-	12.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	91	64.92		880.60		880.60	Basal Till	-	6.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	92	65.68		879.84		879.84	Basal Till	-	12.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	93	66.14		879.38		879.38	Basal Till	-	10.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	94	66.75		878.77		878.77	Basal Till	-	11.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	95	67.36		878.16		878.16	Basal Till	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	96	67.97		877.55		877.55	Basal Till	-	12.6	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-05	Perimeter Embankment Buttress	Chunk	97	68.58		876.94		876.94	Bedrock	-	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	1	0.30		937.68		937.68	Basal Till	-	12.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	2	0.91		937.07		937.07	Basal Till	-	12.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	3	1.52		936.46		936.46	Basal Till	-	10.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	4	2.13		935.85		935.85	Basal Till	-	10.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Grab	1	2.44	2.74	935.54	935.24	935.39	Basal Till	-	-	ML	-	-	-	-	-	-	-	-	-	-	-	5.3	36.4	42.8	15.5	0.002	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	5	2.74		935.24		935.24	Basal Till	-	12.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	6	3.35		934.63		934.63	Basal Till	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	7	3.96		934.02		934.02	Basal Till	-	10.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	8	4.57		933.41		933.41	Basal Till	-	9.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	9	5.18		932.80		932.80	Basal Till	-	6.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	10	5.79		932.19		932.19	Basal Till	-	6.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	11	6.40		931.58		931.58	Basal Till	-	4.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Grab	2	6.40	6.71	931.58	931.27	931.43	Basal Till	-	-	SM	-	-	-	-	-	-	-	-	-	-	-	32.4	43.9	18.4	5.3	0.002	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	12	7.01		930.97		930.97	Basal Till	-	5.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	13	7.62		930.36		930.36	Glaciofluvial	-	17.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Grab	3	7.77	7.93	930.21	930.05	930.13	Glaciolacustrine	-	20.5	CI	32	20	12	0.04	CI	-	-	-	-	-	-	0.8	14.7	84.5		-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	14	8.23		929.75		929.75	Glaciofluvial	-	16.6	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	15	8.84		929.14		929.14	Glaciofluvial	-	5.4	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	16	9.45		928.53		928.53	Glaciofluvial	-	4.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	17	10.06		927.92		927.92	Basal Till	-	6.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	18	10.67		927.31		927.31	Basal Till	-	4.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	19	11.28		926.70		926.70	Glaciofluvial	-	17.8	SW-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	20	11.89		926.09		926.09	Basal Till	-	4.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	21	12.50		925.48		925.48	Glaciofluvial	-	3.4	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Grab	6	12.80	13.11	925.18	924.87	925.03	Glaciofluvial	-		SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	44.3	44.8	8.6	2.3	0.002	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	22	13.11		924.87		924.87	Glaciofluvial	-	3.5	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	23	14.33		923.65		923.65	Basal Till	-	9.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	24	14.94		923.04		923.04	Basal Till	-	7.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	25	15.54		922.44		922.44	Basal Till	-	7.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	26	16.15		921.83		921.83	Glaciofluvial	-	9.0	SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	27	16.76		921.22		921.22	Basal Till	-	3.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Grab	8	16.76	17.07	921.22	920.91	921.07	Basal Till	-		GM	-	-	-	-	-	-	-	-	-	-	-	-	38.1	35.5	20.4	6.0	0.002	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	28	17.37		920.61		920.61	Basal Till	-	5.0	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	29	17.98		920.00		920.00	Basal Till	-	5.5	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	30	18.59		919.39		919.39	Basal Till	-	4.6	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	31	19.20		918.78		918.78	Basal Till	-	5.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	32	19.81		918.17		918.17	Basal Till	-	3.2	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	33	20.42		917.56		917.56	Basal Till	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	34	21.03		916.95		916.95	Basal Till	-	7.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	35	21.64		916.34		916.34	Basal Till	-	8.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	36	22.25		915.73		915.73	Basal Till	-	9.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-06	Perimeter Embankment Buttress	Chunk	37	22.86		915.12		915.12	Basal Till	-	11.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	1	11.28		924.62		924.62	Basal Till	-	14.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	2	11.89		924.01		924.01	Basal Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Grab	1	11.89	12.19	924.01	923.71	923.86	Basal Till	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	12.1	33.8	36.8	17.3	0.002	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	3	12.50		923.40		923.40	Basal Till	-	13.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	4	13.11		922.79		922.79	Basal Till	-	15.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	5	13.72		922.18		922.18	Glaciolacustrine	-	22.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Grab	2	13.72	14.02	922.18	921.88	922.03	Glaciolacustrine	-	27.8	CI	47	18	29	0.34	CI	-	-	-	-	-	-	4.9	16.6	78.5		-	-
2021	Golder	GA21-07	Main Embankment Buttress	Thin-walled Open Tube	TO1	13.72	14.17	922.18	921.73	921.96	Glaciolacustrine	-	29.2	CI	45	22	23	0.31	CI	-	-	-	-	-	-	1.5	12.1	46.1	40.3	0.002	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	6	14.33		921.57		921.57	Basal Till	-	28.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	7	14.94		920.96		920.96	Basal Till	-	11.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	8	15.54		920.36		920.36	Basal Till	-	13.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	9	16.15		919.75		919.75	Glaciofluvial	-	13.8	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	10	16.76		919.14		919.14	Basal Till	-	11.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	11	17.37		918.53		918.53	Basal Till	-	12.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	12	17.98		917.92		917.92	Basal Till	-	12.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	13	18.59		917.31		917.31	Basal Till	-	12.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	14	19.20		916.70		916.70	Basal Till	-	9.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	15	19.81		916.09		916.09	Glaciofluvial	-	19.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	16	20.42		915.48		915.48	Glaciofluvial	-	21.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	17	21.03		914.87		914.87	Glaciofluvial	-	26.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	18	21.64		914.26		914.26	Glaciofluvial	-	25.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	19	22.25		913.65		913.65	Glaciolacustrine	-	24.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	20	22.86		913.04		913.04	Glaciolacustrine	-	22.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Grab	9	22.86	23.17	913.04	912.73	912.89	Glaciolacustrine	-	23.9	CL	27	18	9	0.66	CL	-	-	-	-	-	-	-	0	15.6	84.4		-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	21	23.47		912.43		912.43	Glaciolacustrine	-	24.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	22	24.08		911.82		911.82	Glaciofluvial	-	22.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	23	24.69		911.21		911.21	Glaciolacustrine	-	19.3	MH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	24	25.30		910.60		910.60	-	-	19.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Grab	11	25.30	25.60	910.60	910.30	910.45	-	-	19.3	CL	28	18	10	0.13	CL	-	-	-	-	-	-	-	0	5.2	94.8		-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	25	25.91		909.99		909.99	-	-	22.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	26	26.52		909.38		909.38	Glaciofluvial	-	19.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	27	27.13		908.77		908.77	Glaciofluvial	-	21.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	28	27.74		908.16		908.16	Glaciofluvial	-	21.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	29	28.35		907.55		907.55	Glaciofluvial	-	19.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	30	28.96		906.94		906.94	-	-	18.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	31	29.57		906.33		906.33	-	-	21.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	32	30.18		905.72		905.72	-	-	28.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	33	30.78		905.12		905.12	-	-	30.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	34	31.39		904.51		904.51	-	-	33.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	35	32.00		903.90		903.90	-	-	34.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	36	32.61		903.29		903.29	Glaciolacustrine	-	32.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Thin-walled Open Tube	TO3	32.92	33.53	902.98	902.37	902.68	Glaciolacustrine	-	22.2	CH	41	22	19	0.01	CI	1353	1587	-	-	-	-	-	0	0.6	66.8	32.6	0.002	-
2021	Golder	GA21-07	Main Embankment Buttress	Thin-walled Open Tube	TO3-DSS	32.92	33.53	902.98	902.37	902.68	Glaciolacustrine	-	28.2	CH	33	18	15	0.68	CI	-	-	-	-	-	-	-	0	1.1	70.3	28.6	0.002	DSS, CRS
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	37	33.22		902.68		902.68	Glaciolacustrine	-	30.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	38	33.83		902.07		902.07	Glaciolacustrine	-	30.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Grab	15	33.83	34.14	902.07	901.76	901.92	Glaciolacustrine	-	28.7	CH	61	22	39	0.17	CH	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Thin-walled Open Tube	TO4	33.83	34.14	902.07	901.76	901.92	Glaciolacustrine	-	33.8	CH	43	20	23	0.60	CI	-	-	-	-	-	-	-	0	2.0	61.7	36.3	0.002	CRS, Incremental Consolidation
2021	Golder	GA21-07	Main Embankment Buttress	Thin-walled Open Tube	TO5	34.14	34.75	901.76	901.15	901.46	Glaciolacustrine	-	30.5	CH	53	23	30	0.25	CH	1559	2014	-	-	-	-	0	1.7	50.3	48.0	0.002	Incremental Consolidation
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	39	34.44		901.46		901.46	Glaciolacustrine	-	23.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	40	35.05		900.85		900.85	Glaciolacustrine	-	37.6	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	41	35.66		900.24		900.24	Glaciolacustrine	-	29.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	42	36.27		899.63		899.63	Glaciofluvial	-	25.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	43	36.88		899.02		899.02	Glaciolacustrine	-	31.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	44	37.49		898.41		898.41	-	-	29.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-07	Main Embankment Buttress	Chunk	45	38.10		897.80		897.80	Glaciofluvial	-	23.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	1	17.37		912.87		912.87	Ablation Till	-	15.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Grab	1	17.37	17.68	912.87	912.56	912.72	Ablation Till	-	-	ML	-	-	-	-	-	-	-	-	-	-	-	-	13.4	35.4	38.9	12.3	0.002	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	2	17.98		912.26		912.26	Ablation Till	-	17.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	3	18.59		911.65		911.65	Glaciofluvial	-	12.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	4	19.20		911.04		911.04	-	-	8.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	5	19.81		910.43		910.43	-	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	6	20.42		909.82		909.82	Glaciofluvial	-	19.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	7	21.03		909.21		909.21	Glaciofluvial	-	24.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	8	21.64		908.60		908.60	Glaciolacustrine	-	25.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	9	22.25		907.99		907.99	Glaciolacustrine	-	22.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Grab	4	22.71	22.86	907.53	907.38	907.46	Glaciolacustrine	-	21.3	CI	36	19	17	0.14	CI	-	-	-	-	-	-	-	0	5.5	94.5		-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	10	22.86		907.38		907.38	Glaciolacustrine	-	17.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	11	23.47		906.77		906.77	Glaciolacustrine	-	21.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Thin-walled Open Tube	TO3	23.53	23.68	906.71	906.56	906.64	Glaciolacustrine	-	27.4	CI	43	23	20	0.22	CI	-	-	-	-	-	-	-	0	5.0	59.4	35.6	0.002	DSS, CRS, Incremental Consolidation
2021	Golder	GA21-08	Main Embankment Buttress	Grab	5	23.77	23.93	906.47	906.31	906.39	Glaciolacustrine	-	34.7	CI	48	27	21	0.37	CI	-	-	-	-	-	-	-	0	0.5	99.5		-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	12	24.08		906.16		906.16	Glaciolacustrine	-	22.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	13	24.69		905.55		905.55	Glaciolacustrine	-	18.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Thin-walled Open Tube	TO5-DSS	24.69	25.30	905.55	904.94	905.25	Glaciolacustrine	-	27.4	CI	44	23	21	0.21	CI	1599	2027	-	-	-	-	-	0	0.3	54.8	44.9	0.002	DSS, Cyclic DSS
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	14	25.30		904.94		904.94	Glaciolacustrine	-	10.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	15	25.91		904.33		904.33	Glaciolacustrine	-	17.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Grab	6	26.06	26.21	904.18	904.03	904.11	Glaciolacustrine	-	30.0	CI	47	23	24	0.29	CI	-	-	-	-	-	-	-	0	3.1	96.9		-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	16	26.52		903.72		903.72	Glaciolacustrine	-	17.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	17	27.13		903.11		903.11	Glaciolacustrine	-	14.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Grab	7	27.43	27.74	902.81	902.50	902.66	Glaciolacustrine	-	-	CI	-	-	-	-	-	-	-	-	-	-	-	-	0	0.2	55.6	44.2	0.002	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	18	27.74		902.50		902.50	Glaciolacustrine	-	20.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	19	28.35		901.89		901.89	Glaciolacustrine	-	9.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	20	28.96		901.28		901.28	Glaciolacustrine	-	6.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Grab	8	28.96	29.26	901.28	900.98	901.13	Glaciolacustrine	-	29.8	CI	41	22	19	0.41	CI	-	-	-	-	-	-	-	0	0.2	99.8		-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	21	29.57		900.67		900.67	Glaciofluvial	-	6.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	22	30.18		900.06		900.06	Glaciofluvial	-	9.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	23	30.78		899.46		899.46	Glaciofluvial	-	6.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	24	31.39		898.85		898.85	Glaciofluvial	-	7.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	25	32.00		898.24		898.24	Glaciofluvial	-	25.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	26	32.61		897.63		897.63	Glaciofluvial	-	17.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	27	33.22		897.02		897.02	Basal Till	-	12.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	28	33.83		896.41		896.41	Basal Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	29	34.44		895.80		895.80	Basal Till	-	9.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-08	Main Embankment Buttress	Grab	10	34.75	35.05	895.49	895.19	895.34	-	-	-	CL	-	-	-	-	-	-	-	-	-	-	-	-	6.0	41.9	33.2	18.9	0.002	-
2021	Golder	GA21-08	Main Embankment Buttress	Chunk	30	35.05		895.19		895.19	Basal Till	-	14.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	1	14.33		916.20		916.20	Basal Till	-	12.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	2	14.94		915.59		915.59	Basal Till	-	17.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	3	15.54		914.99		914.99	Basal Till	-	9.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	4	16.15		914.38		914.38	Basal Till	-	14.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	5	16.76		913.77		913.77	Basal Till	-	13.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	6	17.37		913.16		913.16	Basal Till	-	5.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	7	17.98		912.55		912.55	Basal Till	-	6.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Grab	3	18.90	19.05	911.63	911.48	911.56	Glaciolacustrine	-	17.1	CI	32	16	16	0.07	CI	-	-	-	-	-	-	-	0	25.4	74.6		-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	8	18.59		911.94		911.94	Basal Till	-	5.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	9	19.20		911.33		911.33	Glaciolacustrine	-	16.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	10	19.81		910.72		910.72	Glaciofluvial	-	22.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	11	20.12		910.41		910.41	Glaciofluvial	-	14.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	12	21.64		908.89		908.89	Glaciolacustrine	-	24.0	CL/CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Thin-walled Open Tube	TO2	21.64	22.25	908.89	908.28	908.59	Glaciolacustrine	-	29.6	CL/CH	28	20	8	1.20	CL	-	-	-	-	-	-	-	0	0.8	82.8	16.4	0.002	-
2021	Golder	GA21-09	Main Embankment Buttress	Thin-walled Open Tube	TO2-CRS	21.64	22.25	908.89	908.28	908.59	Glaciolacustrine	-	33.2	CL/CH	56	25	31	0.26	CH	-	-	-	-	-	-	-	0	0.2	50.5	49.3	0.002	CRS, Incremental Consolidation
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	13	22.86		907.67		907.67	Glaciofluvial	-	14.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	14	23.47		907.06		907.06	Glaciofluvial	-	15.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	15	24.08		906.45		906.45	Glaciofluvial	-	25.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Grab	7	24.38	24.69	906.15	905.84	906.00	Glaciofluvial	-	24.9	ML	-	Non-Plastic	-	-	ML	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	16	24.69		905.84		905.84	Glaciofluvial	-	25.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	17	25.30		905.23		905.23	Glaciofluvial	-	27.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	18	25.91		904.62		904.62	Basal Till	-	16.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	19	26.52		904.01		904.01	Basal Till	-	10.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	20	27.13		903.40		903.40	Basal Till	-	14.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Grab	8	27.43	27.74	903.10	902.79	902.95	Basal Till	-	-	ML	-	-	-	-	-	-	-	-	-	-	-	-	11.3	25.9	54.0	8.8	0.002	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	21	27.74		902.79		902.79	Basal Till	-	14.7	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	22	28.35		902.18		902.18	Basal Till	-	14.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	23	28.96		901.57		901.57	Basal Till	-	14.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	24	29.57		900.96		900.96	Basal Till	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	25	30.18		900.35		900.35	Basal Till	-	11.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	26	30.78		899.75		899.75	Glaciofluvial	-	7.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	27	31.39		899.14		899.14	Glaciofluvial	-	22.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Grab	9	31.70	32.00	898.83	898.53	898.68	Glaciolacustrine	-	25.7	CL/CI	30	20	10	0.57	CL/CI	-	-	-	-	-	-	-	0	5.1	94.9		-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	28	32.00		898.53		898.53	Glaciolacustrine	-	26.5	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	29	32.61		897.92		897.92	Basal Till	-	8.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	30	33.22		897.31		897.31	Basal Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	31	33.83		896.70		896.70	Basal Till	-	10.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	32	34.44		896.09		896.09	Glaciofluvial	-	13.8	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-09	Main Embankment Buttress	Chunk	33	35.05		895.48		895.48	Glaciofluvial	-	12.5	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	1	3.35		938.49		938.49	Fill	-	18.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	2	3.96		937.88		937.88	Fill	-	15.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	3	4.57		937.27		937.27	Fill	-	15.6	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	4	14.33		927.51		927.51	Ablation Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	5	14.94		926.90		926.90	Ablation Till	-	9.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	6	15.54		926.30		926.30	Ablation Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	7	16.15		925.69		925.69	Ablation Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	8	16.76		925.08		925.08	Ablation Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	9	17.37		924.47		924.47	Ablation Till	-	13.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	10	17.98		923.86		923.86	Ablation Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	11	18.59		923.25		923.25	Ablation Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	12	19.20		922.64		922.64	Ablation Till	-	12.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	13	19.81		922.03		922.03	Ablation Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	14	21.03		920.81		920.81	Ablation Till	-	13.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	15	21.64		920.20		920.20	Ablation Till	-	12.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	16	22.25		919.59		919.59	Ablation Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	17	23.01		918.83		918.83	Ablation Till	-	12.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	18	23.47		918.37		918.37	Ablation Till	-	13.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	19	24.08		917.76		917.76	Ablation Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-10	Corner 1 Embankment Buttress	Chunk	20	24.69		917.15		917.15	Ablation Till	-	10.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	1	0.61		930.20		930.20	Ablation Till	-	15.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	2	1.22		929.59		929.59	Ablation Till	-	12.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	3	1.83		928.98		928.98	Ablation Till	-	13.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	4	2.44		928.37		928.37	Ablation Till	-	11.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	5	3.05		927.76		927.76	Ablation Till	-	10.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	6	3.66		927.15		927.15	Ablation Till	-	10.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	7	4.27		926.54		926.54	Ablation Till	-	10.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	8	4.72		926.09		926.09	Ablation Till	-	11.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	9	5.49		925.32		925.32	Ablation Till	-	10.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	10	6.10		924.71		924.71	Ablation Till	-	11.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	11	6.71		924.10		924.10	Ablation Till	-	9.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	12	7.32		923.49		923.49	Ablation Till	-	10.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	13	7.92		922.89		922.89	Ablation Till	-	11.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	14	8.38		922.43		922.43	Glaciofluvial	-	6.9	SP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	15	9.14		921.67		921.67	Ablation Till	-	10.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	16	9.75		921.06		921.06	Ablation Till	-	19.8	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	17	10.21		920.60		920.60	Ablation Till	-	15.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	18	10.97		919.84		919.84	Ablation Till	-	11.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	19	11.43		919.38		919.38	Glaciolacustrine	-	20.1	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	20	11.73		919.08		919.08	Glaciolacustrine	-	20.6	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	21	12.50		918.31		918.31	Glaciolacustrine	-	22.9	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Thin-walled Open Tube	TO2-CRS	12.65	12.83	918.16	917.98	918.07	Glaciolacustrine	-	20.7	ML/CL	25	16	9	0.52	CL	-	-	-	-	-	-	-	0	10.8	73.7	15.5	0.002	CRS
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	22	12.83		917.98		917.98	Glaciolacustrine	-	22.4	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Grab	15	13.41	13.65	917.40	917.16	917.28	Glaciolacustrine	-	18.8	ML/CL	28	17	11	0.16	CL	-	-	-	-	-	-	-	3.1	11.6	65.6	19.7	0.002	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	23	13.56		917.25		917.25	Glaciolacustrine	-	19.5	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	24	14.17		916.64		916.64	Glaciolacustrine	-	19.9	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Thin-walled Open Tube	TO9-CRS	16.00	16.23	914.81	914.58	914.70	Glaciolacustrine	-	20.7	ML/CL	20	16	4	1.18	CL-ML	-	-	-	-	-	-	-	0.8	16.4	70.6	12.2	0.002	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Grab	16	16.64	16.76	914.17	914.05	914.11	Glaciolacustrine	-	17.1	ML/CL	22	18	4	-0.23	CL-ML	-	-	-	-	-	-	-	0.9	12.9	77.5	8.7	0.002	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	25	16.73		914.08		914.08	Glaciolacustrine	-	17.3	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Thin-walled Open Tube	TO11-CRS	16.76	17.14	914.05	913.67	913.86	Glaciolacustrine	-	18.1	ML/CL	23	16	7	0.30	CL-ML	-	-	-	-	-	-	-	0.5	11.5	80.5	7.5	0.002	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	26	17.47		913.34		913.34	Glaciolacustrine	-	15.9	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	27	18.07		912.74		912.74	Glaciolacustrine	-	19.5	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	28	18.75		912.06		912.06	Ablation Till	-	11.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	29	19.35		911.46		911.46	Ablation Till	-	9.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	30	19.96		910.85		910.85	Ablation Till	-	9.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	31	20.57		910.24		910.24	Glaciolacustrine	-	16.7	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Grab	20	20.73	21.03	910.08	909.78	909.93	Glaciolacustrine	-	19.2	ML/CL	24	15	9	0.47	CL	-	-	-	-	-	-	-	4.3	18.4	62.9	14.4	0.002	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	32	21.18		909.63		909.63	Glaciolacustrine	-	18.1	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	33	21.79		909.02		909.02	Glaciolacustrine	-	24.1	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	34	22.40		908.41		908.41	Glaciolacustrine	-	16.0	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	35	23.01		907.80		907.80	Glaciolacustrine	-	11.6	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	36	23.62		907.19		907.19	Glaciolacustrine	-	12.1	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Grab	24	23.93	24.23	906.88	906.58	906.73	Glaciolacustrine	-	17.2	ML/CL	19	17	2	0.10	ML	-	-	-	-	-	-	-	4.0	20.7	68.7	6.6	0.002	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	37	24.23		906.58		906.58	Glaciolacustrine	-	19.1	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	38	24.84		905.97		905.97	Glaciolacustrine	-	20.2	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	39	25.45		905.36		905.36	Glaciolacustrine	-	9.2	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	40	26.06		904.75		904.75	Glaciolacustrine	-	13.2	ML/CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	41	26.67		904.14		904.14	Glaciofluvial	-	14.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	42	27.28		903.53		903.53	Glaciofluvial	-	9.2	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2021	Golder	GA21-11	Perimeter Embankment Buttress	Chunk	43	27.89		902.92		902.92	Glaciofluvial	-	8.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	1	0.46		940.38		940.38	Tailings	-	7.8	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	2	2.29		938.55		938.55	Tailings	-	18.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	3	3.51		937.33		937.33	Tailings	-	18.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	4	5.03		935.81		935.81	Rockfill	-	8.6	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Grab	6	11.28	11.58	929.56	929.26	929.41	Glacial Till	-	16.8	CL	27	15	12	0.15	CL	-	-	-	-	-	-	-	8.6	37.1	34.3	20.0	0.002	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	5	11.43		929.41		929.41	Glacial Till	-	17.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	6	12.04		928.80		928.80	Glacial Till	-	17.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	7	12.65		928.19		928.19	Glacial Till	-	13.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	8	13.11		927.73		927.73	Glacial Till	-	9.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	9	13.87		926.97		926.97	Glacial Till	-	9.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	10	14.33		926.51		926.51	Glacial Till	-	9.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Grab	10	14.93	15.24	925.91	925.60	925.76	Glacial Till	-	9.3	SC	22	13	9	-0.41	CL	-	-	-	-	-	-	-	14.0	37.2	29.7	19.1	0.002	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	11	15.09		925.75		925.75	Glacial Till	-	9.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	12	15.54		925.30		925.30	Glacial Till	-	10.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	13	16.31		924.53		924.53	Glacial Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Grab	12	17.07	17.37	923.77	923.47	923.62	-	-	17.9	CL-ML	20	16	4	0.48	CL-ML	-	-	-	-	-	-	-	0.1	12.7	16.2	71.0	0.002	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	14	17.22		923.62		923.62	-	-	18.3	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Grab	13	17.98	18.29	922.86	922.55	922.71	-	-	24.3	CL-ML	26	20	6	0.72	CL-ML	-	-	-	-	-	-	-	0.2	3.0	89.2	7.6	0.002	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	15	18.14		922.70		922.70	-	-	24.9	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	16	18.59		922.25		922.25	-	-	24.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	17	19.32		921.52		921.52	-	-	18.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	18	19.66		921.18		921.18	-	-	13.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	19	20.27		920.57		920.57	-	-	16.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Grab	17	20.73	21.03	920.11	919.81	919.96	Glaciofluvial	-	15.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	71.4	24.3	2.5	0.002	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	20	20.88		919.96		919.96	Glaciofluvial	-	19.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	21	21.22		919.62		919.62	-	-	11.0	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	22	22.10		918.74		918.74	-	-	13.7	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	23	22.40		918.44		918.44	Glacial Till	-	16.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	24	23.32		917.52		917.52	Weathered Bedrock	-	11.2	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2022	Golder	GA22-01	Corner 1 Embankment Buttress	Chunk	25	23.93		916.91		916.91	Weathered Bedrock	-	6.4	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	1	37.19		932.70		932.70	Fill	-	8.9	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	2	37.80		932.09		932.09	Fill	-	4.1	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	3	38.40		931.49		931.49	Fill	-	5.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	4	39.62		930.27		930.27	Fill	-	8.0	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	5	40.23		929.66		929.66	Fill	-	9.6	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	6	40.84		929.05		929.05	Fill	-	4.9	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	7	41.45		928.44		928.44	Fill	-	3.4	GW-GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	8	42.06		927.83		927.83	Fill	-	9.2	GW-GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	9	42.67		927.22		927.22	Ablation Till	-	7.3	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	10	43.28		926.61		926.61	Ablation Till	-	10.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	11	43.89		926.00		926.00	Ablation Till	-	11.1	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	12	44.50		925.39		925.39	Ablation Till	-	10.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	13	45.11		924.78		924.78	Ablation Till	-	7.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	14	45.72		924.17		924.17	Ablation Till	-	11.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	15	46.33		923.56		923.56	Ablation Till	-	9.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	16	46.94		922.95		922.95	Ablation Till	-	10.1	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Grab	6	47.50	47.90	922.39	921.99	922.19	-	-	14.4	CL-ML	20	13	7	0.20	CL-ML	-	-	-	-	-	-	-	4.3	43.3	35.8	16.6	0.002	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	17	47.55		922.34		922.34	Ablation Till	-	11.1	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	18	49.53		920.36		920.36	Upper Glaciolacustrine	-	16.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Thin-walled Open Tube	4	49.90	50.50	919.99	919.39	919.69	Upper Glaciolacustrine	-	29.6	CH	49	18	31	0.37	CI	-	-	-	-	-	-	-	0	2.8	43.7	53.5	0.002	XRD, CRS Vert, CRS Horiz
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	19	49.99		919.90		919.90	Upper Glaciolacustrine	-	18.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Grab	8	50.30	50.60	919.59	919.29	919.44	Upper Glaciolacustrine	-	28.1	CH	51	22	29	0.21	CH	-	-	-	-	-	-	-	0	6.4	46.1	47.5	0.002	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	20	50.52		919.37		919.37	Upper Glaciolacustrine	-	30.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	21	51.21		918.68		918.68	Basal Till	-	13.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	22	51.82		918.07		918.07	Lower Glaciolacustrine	-	11.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Grab	9	52.10	52.40	917.79	917.49	917.64	Lower Glaciolacustrine	-	22.0	CI	36	21	15	0.07	CI	-	-	-	-	-	-	-	0	1	65.2	33.8	0.002	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	23	52.43		917.46		917.46	Lower Glaciolacustrine	-	14.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	24	53.04		916.85		916.85	Lower Glaciolacustrine	-	13.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	25	53.64		916.25		916.25	Basal Till	-	8.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	26	54.25		915.64		915.64	Lower Glaciolacustrine	-	13.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	27	54.86		915.03		915.03	Lower Glaciolacustrine	-	16.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	28	55.47		914.42		914.42	Glaciofluvial	-	12.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	29	56.08		913.81		913.81	Lower Glaciolacustrine	-	13.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	30	56.69		913.20		913.20	Basal Till	-	14.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-01	Perimeter Embankment Crest at Corner 1	Chunk	31	57.30		912.59		912.59	Weathered Bedrock	-	15.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	1	42.52		927.24		927.24	Ablation Till	-	10.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	2	43.13		926.63		926.63	Ablation Till	-	11.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	3	43.74		926.02		926.02	Ablation Till	-	11.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	4	44.35		925.41		925.41	Ablation Till	-	10.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	5	44.96		924.80		924.80	Ablation Till	-	10.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	6	45.57		924.19		924.19	Ablation Till	-	12.0	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	7	46.18		923.58		923.58	Ablation Till	-	12.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	8	46.79		922.97		922.97	Ablation Till	-	11.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	9	47.40		922.36		922.36	Ablation Till	-	10.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	10	47.70		922.06		922.06	-	-	11.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	11	48.01		921.75		921.75	Glaciolacustrine	-	23.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	12	48.62		921.14		921.14	Ablation Till	-	9.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	13	49.23		920.53		920.53	Ablation Till	-	8.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	14	49.99		919.77		919.77	Upper Glaciolacustrine	-	18.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Thin-walled Open Tube	2	50.00	50.40	919.76	919.36	919.56	Upper Glaciolacustrine	-	33.2	CH	56	26	30	0.24	CH	-	-	-	-	-	-	-	0.0	1.5	42.9	55.6	0.002	DSS, XRD
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	15	50.17		919.59		919.59	Upper Glaciolacustrine	-	27.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	16	50.44		919.32		919.32	Basal Till	-	11.5	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	17	51.36		918.40		918.40	Basal Till	-	6.6	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	18	52.12		917.64		917.64	Lower Glaciolacustrine	-	15.6	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	19	52.88		916.88		916.88	Lower Glaciolacustrine	-	14.0	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	6	53.30	53.60	916.46	916.16	916.31	Lower Glaciolacustrine	-	19.1	CL-CI	30	20	10	-0.09	CL-CI	-	-	-	-	-	-	-	0.0	0.7	75.9	23.4	0.002	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	20	53.49		916.27		916.27	Lower Glaciolacustrine	-	13.4	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	21	54.10		915.66		915.66	Lower Glaciolacustrine	-	18.2	CL/CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	22	54.71		915.05		915.05	Lower Glaciolacustrine	-	19.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	23	55.32		914.44		914.44	Lower Glaciolacustrine	-	15.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	24	55.93		913.83		913.83	Glaciofluvial	-	16.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	25	56.54		913.22		913.22	Glaciofluvial	-	15.9	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	26	57.15		912.61		912.61	Glaciofluvial	-	17.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	27	57.76		912.00		912.00	Glaciofluvial	-	14.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	28	58.37		911.39		911.39	Glaciofluvial	-	12.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	29	58.98		910.78		910.78	Glaciofluvial	-	18.3	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-02	Perimeter Embankment Crest at Corner 1	Chunk	30	59.59		910.17		910.17	Glaciofluvial	-	20.1	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	1	29.70		928.54		928.54	Ablation Till	-	13.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	2	30.30		927.94		927.94	Ablation Till	-	11.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	3	30.90		927.34		927.34	Ablation Till	-	9.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	4	31.50		926.74		926.74	Ablation Till	-	9.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	5	32.20		926.04		926.04	Ablation Till	-	10.3	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	6	32.80		925.44		925.44	Ablation Till	-	10.0	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	7	33.40		924.84		924.84	Ablation Till	-	10.3	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	8	34.00		924.24		924.24	Ablation Till	-	10.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	9	34.60		923.64		923.64	Ablation Till	-	11.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	10	35.20		923.04		923.04	Upper Glaciolacustrine	-	14.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	11	36.30		921.94		921.94	Upper Glaciolacustrine	-	19.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	12	37.00		921.24		921.24	Upper Glaciolacustrine	-	12.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	13	37.60		920.64		920.64	Upper Glaciolacustrine	-	15.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	14	38.30		919.94		919.94	Basal Till	-	9.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	15	38.90		919.34		919.34	Basal Till	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	16	39.50		918.74		918.74	Basal Till	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	17	40.10		918.14		918.14	Basal Till	-	10.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	18	40.70		917.54		917.54	Lower Glaciolacustrine	-	20.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	19	41.30		916.94		916.94	Basal Till	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	20	41.90		916.34		916.34	Basal Till	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-03	Perimeter Embankment Slope at Corner 1	Chunk	21	42.50		915.74		915.74	Basal Till	-	8.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	1	14.70		926.59		926.59	Ablation Till	-	11.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	2	15.30		925.99		925.99	Ablation Till	-	10.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	3	15.90		925.39		925.39	Ablation Till	-	11.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	4	16.50		924.79		924.79	Ablation Till	-	11.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	5	17.10		924.19		924.19	Ablation Till	-	11.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	6	17.70		923.59		923.59	Ablation Till	-	8.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	7	18.30		922.99		922.99	Ablation Till	-	10.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	8	19.00		922.29		922.29	Ablation Till	-	8.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	9	19.60		921.69		921.69	Upper Glaciolacustrine	-	9.2	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Grab	7	19.86	20.17	921.43	921.12	921.28	Upper Glaciolacustrine	-	14.1	CL-ML	17	13	4	0.28	CL-ML	-	-	-	-	-	-	-	3.9	31.5	49.5	15.1	0.002	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Grab	8	20.17	20.47	921.12	920.82	920.97	Upper Glaciolacustrine	-	14.9	CL	22	14	8	0.11	CL	-	-	-	-	-	-	-	7.1	26.1	50.3	16.5	0.002	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	10	20.20		921.09		921.09	Upper Glaciolacustrine	-	14.9	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	11	20.80		920.49		920.49	Till	-	13.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	12	21.40		919.89		919.89	Till	-	9.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	13	22.00		919.29		919.29	Glaciofluvial	-	13.1	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	14	22.60		918.69		918.69	Glaciofluvial	-	21.2	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	15	23.20		918.09		918.09	Glaciofluvial	-	25.1	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	16	23.80		917.49		917.49	Glaciofluvial	-	20.4	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-05	Perimeter Embankment Buttress at Corner 1	Chunk	17	24.40		916.89		916.89	Till	-	8.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	1	14.72		926.79		926.79	Ablation Till	-	11.8	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	2	15.33		926.18		926.18	Ablation Till	-	10.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	3	15.94		925.57		925.57	Ablation Till	-	11.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	4	16.55		924.96		924.96	Ablation Till	-	11.9	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Thin-walled Open Tube	1-CRS	16.64	20.22	924.87	921.29	923.08	Upper Glaciolacustrine	-	43.4	CH	68	23	45	0.45	CH	-	-	-	-	-	-	-	0.0	6.2	24.6	69.2	0.002	CRS, XRD
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Thin-walled Open Tube	1-DSS	16.64	20.22	924.87	921.29	923.08	Upper Glaciolacustrine	-	-	CH	-	-	-	-	-	-	-	-	-	-	-	-	0.0	1.1	38.7	60.2	0.002	DSS (2 tests), XRD
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	5	17.16		924.35		924.35	Ablation Till	-	14.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	6	17.77		923.74		923.74	Ablation Till	-	21.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	7	18.38		923.13		923.13	Ablation Till	-	34.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	8	18.99		922.52		922.52	Ablation Till	-	21.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	9	19.60		921.91		921.91	Upper Glaciolacustrine	-	49.2	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	10	19.90		921.61		921.61	Upper Glaciolacustrine	-	45.5	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	11	20.21		921.30		921.30	Upper Glaciolacustrine	-	46.7	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	12	20.82		920.69		920.69	Till	-	16.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	13	21.43		920.08		920.08	Till	-	14.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	14	22.04		919.47		919.47	Till	-	20.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Grab	14	22.05	22.35	919.46	919.16	919.31	Lower Glaciolacustrine[2]	-	11.8	CL	25	15	10	-0.32	CL	-	-	-	-	-	-	-	21.0	21.0	35.4	22.6	0.002	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	15	22.65		918.86		918.86	Lower Glaciolacustrine[2]	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	16	23.26		918.25		918.25	Glaciofluvial	-	13.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Grab	17	23.57	23.88	917.94	917.63	917.79	Basal Till	-	12.5	SC	25	15	10	-0.25	CL	-	-	-	-	-	-	-	23.4	33.8	42.8		-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	17	23.87		917.64		917.64	Basal Till	-	17.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	18	24.48		917.03		917.03	Basal Till	-	19.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	19	25.09		916.42		916.42	Basal Till	-	12.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	20	25.69		915.82		915.82	Basal Till	-	14.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	21	26.30		915.21		915.21	Basal Till	-	14.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	22	26.91		914.60		914.60	Basal Till	-	19.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	23	27.52		913.99		913.99	Glaciofluvial	-	27.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	24	28.13		913.38		913.38	Glaciofluvial	-	21.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	25	28.74		912.77		912.77	Basal Till	-	15.6	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	26	29.35		912.16		912.16	Basal Till	-	13.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	27	29.96		911.55		911.55	Basal Till	-	15.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	28	30.57		910.94		910.94	Basal Till	-	20.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-07	Perimeter Embankment Buttress at Corner 1	Chunk	29	31.18		910.33		910.33	Basal Till	-	21.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	1	14.60		927.19		927.19	Ablation Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	2	15.20		926.59		926.59	Ablation Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	3	15.80		925.99		925.99	Ablation Till	-	12.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	4	16.50		925.29		925.29	Ablation Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Grab	1	16.56	16.86	925.23	924.93	925.08	Ablation Till	-	11.2	CL	22	13	9	-0.20	CL	-	-	-	-	-	-	-	14.0	31.4	38.4	16.2	0.002	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	5	17.10		924.69		924.69	Ablation Till	-	12.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	6	17.80		923.99		923.99	Ablation Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	7	18.40		923.39		923.39	Ablation Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	8	19.00		922.79		922.79	Ablation Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	9	19.60		922.19		922.19	Ablation Till	-	9.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	10	20.80		920.99		920.99	Ablation Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	11	21.40		920.39		920.39	Ablation Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	12	22.00		919.79		919.79	Ablation Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Grab	4	22.66	22.96	919.13	918.83	918.98	Ablation Till	-	8.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	16.6	33.4	50.0		-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	13	22.70		919.09		919.09	Ablation Till	-	9.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	14	23.30		918.49		918.49	Ablation Till	-	9.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	15	23.90		917.89		917.89	Ablation Till	-	12.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	16	26.30		915.49		915.49	-	-	15.6	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	17	26.90		914.89		914.89	Ablation Till	-	14.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	18	27.50		914.29		914.29	Ablation Till	-	14.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	19	28.10		913.69		913.69	Ablation Till	-	10.6	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	20	28.70		913.09		913.09	Ablation Till	-	11.0	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-08	Perimeter Embankment Buttress at Corner 1	Chunk	21	29.80		911.99		911.99	Till	-	9.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	1	14.70		926.88		926.88	Ablation Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	2	15.30		926.28		926.28	Ablation Till	-	9.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	3	15.90		925.68		925.68	Ablation Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	4	16.50		925.08		925.08	Ablation Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	5	17.10		924.48		924.48	Ablation Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	6	17.70		923.88		923.88	Ablation Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	7	18.30		923.28		923.28	Ablation Till	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	8	19.00		922.58		922.58	Ablation Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	9	19.60		921.98		921.98	Ablation Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	10	20.20		921.38		921.38	Ablation Till	-	12.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	11	20.80		920.78		920.78	Ablation Till	-	8.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	12	21.40		920.18		920.18	Ablation Till	-	11.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	13	22.00		919.58		919.58	Ablation Till	-	10.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	14	22.60		918.98		918.98	Ablation Till	-	9.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	15	23.20		918.38		918.38	Till	-	9.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Grab	8	23.52	23.72	918.06	917.86	917.96	Till	-	9.2	SC	21	13	8	-0.48	CL	-	-	-	-	-	-	-	16.6	36.4	34.3	12.7	0.002	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	16	23.80		917.78		917.78	Till	-	11.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	17	24.40		917.18		917.18	Till	-	8.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	18	25.10		916.48		916.48	Till	-	9.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	19	25.70		915.88		915.88	Till	-	9.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	20	26.30		915.28		915.28	Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	21	26.90		914.68		914.68	Till	-	11.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	22	27.50		914.08		914.08	Till	-	8.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	23	28.10		913.48		913.48	Till	-	9.3	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	24	28.70		912.88		912.88	Till	-	9.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-09	Perimeter Embankment Buttress at Corner 1	Chunk	25	29.30		912.28		912.28	Till	-	10.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	1	16.25		925.51		925.51	Ablation Till	-	10.3	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	2	16.86		924.90		924.90	Ablation Till	-	10.6	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	3	17.17		924.59		924.59	Upper Glaciolacustrine	-	29.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	4	17.47		924.29		924.29	Upper Glaciolacustrine	-	35.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Grab	3	17.47	17.78	924.29	923.98	924.14	Upper Glaciolacustrine	-	39.9	CH	61	29	32	0.34	CH	-	-	-	-	-	-	-	0.0	0.7	37.7	61.6	0.002	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	5	18.08		923.68		923.68	Upper Glaciolacustrine	-	14.1	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	6	18.69		923.07		923.07	Till	-	12.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	7	19.30		922.46		922.46	Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	8	20.22		921.54		921.54	Till	-	9.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	9	20.83		920.93		920.93	Upper Glaciolacustrine	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Grab	13	20.83	21.13	920.93	920.63	920.78	Upper Glaciolacustrine	-	14.8	CL	25	15	10	-0.02	CL	-	-	-	-	-	-	-	9.9	16.8	52.1	21.2	0.002	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	10	21.13		920.63		920.63	Upper Glaciolacustrine	-	17.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	11	21.44		920.32		920.32	Till	-	14.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Grab	15	21.74	22.05	920.02	919.71	919.87	Lower Glaciolacustrine[1]	-	16.8	CL	29	16	13	0.06	CL	-	-	-	-	-	-	-	3.5	11.8	59.3	25.4	0.002	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	12	22.05		919.71		919.71	Lower Glaciolacustrine[1]	-	23.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	13	22.66		919.10		919.10	Till	-	12.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	14	23.27		918.49		918.49	Till	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	15	23.87		917.89		917.89	Till	-	9.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	16	24.48		917.28		917.28	Till	-	9.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	17	25.09		916.67		916.67	Till	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	18	25.70		916.06		916.06	Till	-	10.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	19	26.31		915.45		915.45	Till	-	9.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	20	26.92		914.84		914.84	Till	-	10.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-10	Perimeter Embankment Buttress at Corner 1	Chunk	21	27.53		914.23		914.23	Till	-	10.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	1	0.71		923.95		923.95	-	-	18.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	2	1.32		923.34		923.34	-	-	16.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	3	1.93		922.73		922.73	Till	-	15.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	4	2.54		922.12		922.12	Till	-	10.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	5	3.45		921.21		921.21	Till	-	15.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	4	3.45	3.76	921.21	920.90	921.06	Till	-	11.0	SC	25	14	11	-0.27	CL	-	-	-	-	-	-	-	28.3	27.2	44.5		-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	6	4.06		920.60		920.60	Till	-	11.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	7	4.67		919.99		919.99	Till	-	11.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	8	5.28		919.38		919.38	Till	-	12.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	9	5.89		918.77		918.77	Till	-	10.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	10	6.50		918.16		918.16	Till	-	9.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	11	7.11		917.55		917.55	Till	-	11.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	12	7.72		916.94		916.94	Till	-	11.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	13	8.33		916.33		916.33	Till	-	10.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	14	8.94		915.72		915.72	Till	-	11.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	15	9.55		915.11		915.11	Till	-	11.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	16	10.16		914.50		914.50	Till	-	9.4	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	17	10.77		913.89		913.89	Till	-	9.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	18	12.60		912.06		912.06	Till	-	13.0	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	9	12.60	12.90	912.06	911.76	911.91	Till	-	11.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	13.0	39.2	47.8		-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	19	13.21		911.45		911.45	Till	-	12.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	20	13.82		910.84		910.84	Till	-	12.2	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	21	14.43		910.23		910.23	Till	-	10.1	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	22	15.04		909.62		909.62	Till	-	11.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	23	15.65		909.01		909.01	Till	-	13.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	24	16.25		908.41		908.41	Till	-	13.7	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	25	16.86		907.80		907.80	Till	-	10.8	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	26	17.47		907.19		907.19	Till	-	12.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	27	18.08		906.58		906.58	Till	-	9.9	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	28	18.69		905.97		905.97	Till	-	14.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	29	19.30		905.36		905.36	Till	-	13.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	30	19.91		904.75		904.75	Till	-	12.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	31	20.52		904.14		904.14	Till	-	13.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	32	21.13		903.53		903.53	Till	-	13.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	33	21.74		902.92		902.92	Till	-	13.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	34	22.35		902.31		902.31	Till	-	7.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	35	22.96		901.70		901.70	Till	-	8.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	36	23.57		901.09		901.09	Till	-	8.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	37	24.18		900.48		900.48	Till	-	5.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	38	24.79		899.87		899.87	Till	-	12.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	39	25.40		899.26		899.26	Till	-	9.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	40	26.01		898.65		898.65	Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	41	26.62		898.04		898.04	Till	-	9.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	42	27.23		897.43		897.43	Till	-	15.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	43	27.84		896.82		896.82	Till	-	11.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	44	28.45		896.21		896.21	Till	-	8.5	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	2A&2S	28.75	29.06	895.91	895.60	895.76	Till	-	11.7	CL	26	14	12	-0.19	CL	-	-	-	-	-	-	1.8	21.1	56.5	20.6	0.002	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	45	29.06		895.60		895.60	Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	46	29.67		894.99		894.99	Glaciofluvial	-	11.1	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	47	30.28		894.38		894.38	Glaciofluvial	-	9.2	SP-SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	48	30.89		893.77		893.77	Basal Till	-	9.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	49	31.49		893.17		893.17	Basal Till	-	7.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-13	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	50	32.10		892.56		892.56	Weathered Bedrock	-	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	1	1.04		922.37		922.37	Till	-	15.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	2	1.35		922.06		922.06	Till	-	14.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	3	1.96		921.45		921.45	Till	-	9.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	4	2.57		920.84		920.84	Till	-	11.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	5	2.87		920.54		920.54	Till	-	13.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	2&2A	2.87	3.18	920.54	920.23	920.39	Upper Glaciolacustrine[2]	-	12.8	CL	26	14	12	-0.10	CL	-	-	-	-	-	-	4.3	33.8	43.1	18.8	0.002	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	6	3.18		920.23		920.23	Upper Glaciolacustrine[2]	-	13.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	7	3.78		919.63		919.63	Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	5	4.09	4.40	919.32	919.01	919.17	Till	-	12.1	CL	24	15	9	-0.32	CL	-	-	-	-	-	-	17.6	26.0	39.0	17.4	0.002	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	8	4.39		919.02		919.02	Till	-	11.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	9	5.00		918.41		918.41	Till	-	11.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	10	5.61		917.80		917.80	Till	-	10.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	11	6.22		917.19		917.19	Till	-	7.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	12	6.83		916.58		916.58	Till	-	8.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	13	7.44		915.97		915.97	Till	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	14	8.05		915.36		915.36	Till	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	15	8.66		914.75		914.75	Till	-	8.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	16	9.27		914.14		914.14	Till	-	9.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	17	9.88		913.53		913.53	Till	-	7.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	18	10.49		912.92		912.92	-	-	8.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	19	11.10		912.31		912.31	Till	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	20	11.71		911.70		911.70	Till	-	18.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	21	12.32		911.09		911.09	Till	-	13.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	22	12.93		910.48		910.48	Till	-	12.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	23	13.54		909.87		909.87	Till	-	7.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	24	14.15		909.26		909.26	Till	-	12.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	25	14.76		908.65		908.65	Till	-	10.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	26	15.37		908.04		908.04	Glaciofluvial	-	11.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	27	15.98		907.43		907.43	Till	-	9.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	28	18.42		904.99		904.99	Till	-	10.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	29	19.02		904.39		904.39	Till	-	8.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	30	21.77		901.64		901.64	Till	-	11.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	31	22.38		901.03		901.03	Till	-	11.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	32	22.99		900.42		900.42	Till	-	11.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	33	23.60		899.81		899.81	Till	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	34	24.21		899.20		899.20	Till	-	11.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	35	24.82		898.59		898.59	Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	36	25.43		897.98		897.98	Till	-	11.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	37	26.04		897.37		897.37	Till	-	10.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	38	26.64		896.77		896.77	Till	-	9.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	39	27.25		896.16		896.16	Till	-	9.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	40	30.61		892.80		892.80	Till	-	10.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	41	31.22		892.19		892.19	Till	-	14.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	42	31.83		891.58		891.58	Till	-	10.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	43	32.44		890.97		890.97	Glaciofluvial	-	18.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	44	33.05		890.36		890.36	Glaciofluvial	-	13.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	45	33.66		889.75		889.75	Glaciofluvial	-	17.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	46	34.26		889.15		889.15	Glaciofluvial	-	16.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	47	34.87		888.54		888.54	Glaciofluvial	-	10.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	48	35.48		887.93		887.93	Glaciofluvial	-	9.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	49	36.09		887.32		887.32	Glaciofluvial	-	14.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	50	36.70		886.71		886.71	Glaciofluvial	-	12.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	51	37.31		886.10		886.10	Glaciofluvial	-	12.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	52	37.80		885.61		885.61	Glaciofluvial	-	12.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	53	38.40		885.01		885.01	Glaciofluvial	-	13.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	54	39.01		884.40		884.40	Glaciofluvial	-	12.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	55	39.62		883.79		883.79	Glaciofluvial	-	12.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	56	39.93		883.48		883.48	Glaciofluvial	-	13.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	57	40.23		883.18		883.18	Glaciofluvial	-	14.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	58	40.54		882.87		882.87	Glaciofluvial	-	19.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	59	40.84		882.57		882.57	Glaciofluvial	-	16.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	60	41.15		882.26		882.26	Glaciofluvial	-	18.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	61	41.45		881.96		881.96	Glaciofluvial	-	16.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	62	41.76		881.65		881.65	Glaciofluvial	-	17.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	63	42.06		881.35		881.35	Glaciofluvial	-	17.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	64	42.98		880.43		880.43	Glaciofluvial	-	17.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	65	43.59		879.82		879.82	Glaciofluvial	-	18.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	66	43.89		879.52		879.52	Glaciofluvial	-	16.7	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	67	44.20		879.21		879.21	Glaciofluvial	-	17.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	68	44.50		878.91		878.91	Glaciofluvial	-	18.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	69	44.81		878.60		878.60	Glaciofluvial	-	20.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	70	45.11		878.30		878.30	Glaciofluvial	-	13.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	71	45.42		877.99		877.99	Glaciofluvial	-	17.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	40	45.80	46.03	877.61	877.38	877.50	Glaciolacustrine	-	20.7	CL	27	14	13	0.52	CL	-	-	-	-	-	-	2.7	8.2	57.4	31.7	0.002	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	72	46.02		877.39		877.39	Glaciolacustrine	-	22.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	73	46.33		877.08		877.08	Glaciofluvial	-	12.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	74	46.94		876.47		876.47	Glaciolacustrine	-	22.4	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-14	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	75	47.55		875.86		875.86	Glaciolacustrine	-	22.3	CH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	1	0.84		923.54		923.54	-	-	15.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	2	1.45		922.93		922.93	-	-	12.0	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	3	2.36		922.02		922.02	-	-	11.5	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	4	2.97		921.41		921.41	-	-	11.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	5	3.58		920.80		920.80	-	-	12.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	6	4.19		920.19		920.19	-	-	14.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	7	4.80		919.58		919.58	-	-	10.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	5	5.11	5.41	919.27	918.97	919.12	Upper Glaciolacustrine[2]	-	13.8	CL	25	14	11	-0.02	CL	-	-	-	-	-	-	7.7	29.2	42.5	20.6	0.002	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	8	5.41		918.97		918.97	Upper Glaciolacustrine[2]	-	15.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	9	6.02		918.36		918.36	Till	-	9.7	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	10	6.63		917.75		917.75	Till	-	11.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	11	7.24		917.14		917.14	Till	-	8.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	12	7.85		916.53		916.53	Till	-	8.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	13	8.46		915.92		915.92	Till	-	7.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C5: Summary of Index Test Results

Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m³)	Wet Density (kg/m³)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m³)	Optimum Water Content (%)	Maximum Dry Density (kg/m³)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	14	9.07		915.31		915.31	Till	-	8.5	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	15	9.68		914.70		914.70	Till	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	16	10.29		914.09		914.09	Till	-	8.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	17	10.90		913.48		913.48	Glaciofluvial	-	12.9	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	18	11.51		912.87		912.87	Glaciofluvial	-	12.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	19	12.12		912.26		912.26	Glaciofluvial	-	7.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	20	12.73		911.65		911.65	Till	-	8.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	21	13.34		911.04		911.04	Till	-	5.2	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	22	13.94		910.44		910.44	Till	-	6.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	23	14.55		909.83		909.83	Till	-	6.4	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	24	15.77		908.61		908.61	Till	-	10.3	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	25	16.38		908.00		908.00	Till	-	5.6	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	26	16.99		907.39		907.39	Till	-	6.8	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-15	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	27	17.91		906.47		906.47	Till	-	8.1	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	1	0.61		927.68		927.68	-	-	12.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	2	1.22		927.07		927.07	-	-	13.6	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	3	1.83		926.46		926.46	-	-	12.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	4	2.44		925.85		925.85	-	-	11.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	5	3.05		925.24		925.24	-	-	10.4	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	6	3.66		924.63		924.63	-	-	10.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	7	4.27		924.02		924.02	-	-	9.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	8	4.88		923.41		923.41	-	-	9.9	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	9	5.49		922.80		922.80	-	-	18.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	6	5.50	5.80	922.79	922.49	922.64	-	-	21.6	CL-ML	20	16	4	1.40	CL-ML	-	-	-	-	-	-	-	1.5	13.8	84.7		-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	10	6.10		922.19		922.19	-	-	20.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	11	6.71		921.58		921.58	-	-	16.9	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	12	7.32		920.97		920.97	-	-	19.8	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	7	7.90	8.20	920.39	920.09	920.24	-	-	17.6	CL-ML	21	17	4	0.15	CL-ML	-	-	-	-	-	-	-	0.0	8.3	91.7		-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	13	7.92		920.37		920.37	-	-	16.6	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	8	8.50	8.80	919.79	919.49	919.64	Lower Glaciolacustrine[2]	-	17.3	CL-ML	25	18	7	-0.10	CL-ML	-	-	-	-	-	-	-	0.0	2.4	74.1	23.5	0.002	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	14	8.53		919.76		919.76	Lower Glaciolacustrine[2]	-	18.1	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	15	9.14		919.15		919.15	Lower Glaciolacustrine[2]	-	28.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	16	9.75		918.54		918.54	Lower Glaciolacustrine[2]	-	23.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	9	10.10	10.40	918.19	917.89	918.04	Lower Glaciolacustrine[2]	-	27.9	CI	31	20	11	0.72	CI	-	-	-	-	-	-	-	0.0	0.6	62.3	37.1	0.002	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	17	10.36		917.93		917.93	Lower Glaciolacustrine[2]	-	22.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	18	10.97		917.32		917.32	Lower Glaciolacustrine[2]	-	30.3	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	19	11.58		916.71		916.71	-	-	24.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	10	11.60	11.90	916.69	916.39	916.54	-	-	28.1	CL	28	19	9	1.01	CL	-	-	-	-	-	-	-	0.0	2.6	71.6	25.8	0.002	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	20	12.19		916.10		916.10	-	-	17.0	SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	21	12.80		915.49		915.49	-	-	26.0	ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	12	13.10	13.40	915.19	914.89	915.04	-	-	25.5	ML	24	21	3	1.50	ML	-	-	-	-	-	-	-	0.0	7.4	78.8	13.8	0.002	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	22	13.41		914.88		914.88	-	-	15.2	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	23	14.02		914.27		914.27	-	-	15.7	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	24	14.63		913.66		913.66	-	-	16.4	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	25	15.24		913.05		913.05	-	-	13.5	SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	26	15.85		912.44		912.44	-	-	9.8	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	27	16.46		911.83		911.83	-	-	8.9	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	28	17.07		911.22		911.22	-	-	9.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	15	17.10	17.40	911.19	910.89	911.04	-	-	9.3	CI	34	15	19	-0.30	CI	-	-	-	-	-	-	-	19.8	26.4	53.8		-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	29	17.68		910.61		910.61	-	-	9.1	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	30	18.29		910.00		910.00	-	-	11.2	CI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	31	18.90		909.39		909.39	Bedrock	-	10.0	GP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	32	19.51		908.78		908.78	Bedrock	-	8.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	33	20.12		908.17		908.17	Bedrock	-	3.8	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	34	20.73		907.56		907.56	Bedrock	-	10.9	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	35	21.34		906.95		906.95	Bedrock	-	8.8	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	36	21.95		906.34		906.34	Bedrock	-	10.4	GC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	37	22.56		905.73		905.73	Bedrock	-	2.4	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	GA23-16	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	38	23.16		905.13		905.13	Bedrock	-	2.1	GM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	1	0.50	0.80	922.90	922.60	922.75	Till	-	17.6	CL-ML	21	14	7	0.51	CL-ML	-	-	-	-	-	-	-	7.1	42.1	50.8		-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	1	0.50		922.90		922.90	Till	-	18.5	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	2	1.00		922.40		922.40	Till	-	17.3	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	3	1.50		921.90		921.90	Till	-	15.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	4	2.00		921.40		921.40	Till	-	14.0	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	3	2.00	2.30	921.40	921.10	921.25	Till	-	12.1	CL	25	15	10	-0.29	CL	-	-	-	-	-	-	-	20.3	29.4	50.3		-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	5	2.50		920.90		920.90	Till	-	13.2	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	6	3.00		920.40		920.40	Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	7	3.50		919.90		919.90	Till	-	13.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	5	3.70	4.00	919.70	919.40	919.55	Till	-	12.4	CL	23	14	9	-0.18	CL	-	-	-	-	-	-	-	3.2	23.8	73.0		-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	8	4.00		919.40		919.40	Till	-	12.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	9	4.50		918.90		918.90	Till	-	12.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	10	5.00		918.40		918.40	Till	-	11.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-01	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	11	5.50		917.90		917.90	Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	1	0.50	0.80	923.00	922.70	922.85	Till	-	15.2	CL/CI	30	17	13	-0.14	CL/CI	-	-	-	-	-	-	-	18.0	28.3	53.7		-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	1	0.50		923.00		923.00	Till	-	16.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	2	1.00		922.50		922.50	Till	-	15.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	3	1.50		922.00		922.00	Till	-	15.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	4	2.00		921.50		921.50	Till	-	11.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	5	2.50		921.00		921.00	Till	-	11.7	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	6	3.00		920.50		920.50	Till	-	13.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	7	3.50		920.00		920.00	Till	-	8.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	8	4.00		919.50		919.50	Till	-	12.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	5	4.20	4.50	919.30	919.00	919.15	Till	-	12.8	CL	27	14	13	-0.09	CL	-	-	-	-	-	-	-	6.5	34.8	58.7		-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	9	4.50		919.00		919.00	Till	-	11.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	10	5.00		918.50		918.50	Till	-	13.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	11	5.50		918.00		918.00	Till	-	12.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-02	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	12	6.00		917.50		917.50	Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	1	1.20		923.50		923.50	-	-	18.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	2	1.50		923.20		923.20	Till	-	17.2	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	1	1.50	1.80	923.20	922.90	923.05	Till	-	18.3	CL-ML	23	16	7	0.33	CL-ML	-	-	-	-	-	-	-	0.0	31.8	68.2		-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	3	2.00		922.70		922.70	Till	-	17.0	CL-ML	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	4	2.50		922.20		922.20	Till	-	11.4	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	5	3.00		921.70		921.70	Till	-	12.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	3	3.00	3.30	921.70	921.40	921.55	Till	-	12.0	CL	27	15	12	-0.25	CL	-	-	-	-	-	-	-	8.6	36.8	54.6		-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	6	3.50		921.20		921.20	Till	-	11.3	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	7	4.00		920.70		920.70	Till	-	9.1	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	8	4.50		920.20		920.20	Till	-	9.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	9	5.00		919.70		919.70	Till	-	10.6	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Grab	5	5.00	5.30	919.70	919.40	919.55	Till	-	9.8	CL	22	13	9	-0.36	CL	-	-	-	-	-	-	-	8.5	36.5	55.0		-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	10	5.50		919.20		919.20	Till	-	10.8	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	11	6.00		918.70		918.70	Till	-	10.9	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-03	Downstream of Perimeter Embankment Buttress at Corner 1	Chunk	12	6.50		918.20		918.20	Till	-	10.5	CL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-C5-01	Perimeter Embankment Abutment	Grab	1	-	-	965.80		965.80	Till	-	15.4	CL	25	11	14	0.31	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-C5-02	Perimeter Embankment Abutment	Grab	1	-	-	966.90		966.90	Till	-	12.1	CL	24	11	13	0.08	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-C5-03	Perimeter Embankment Abutment	Grab	1	-	-	967.90		967.90	Till	-	12.1	CL	22	9	13	0.24	CL	-	-	-	-	-	-	-	-	-	-	-	-	-
2023	WSP	TP23-C5-04	Perimeter Embankment Abutment	Grab	1	0.70	4.20	971.60	968.10	969.85	Till	-	11.4	CL	23	14	9	-0.29	CL	-	-	-	-	-	-	-	6.2	32.8	45.2	15.8	0.002	-
2023	WSP	TP23-C5-05	Perimeter Embankment Abutment	Grab	1	0.50	4.00	976.00	972.50	974.25	Till	-	13.8	CL	24	14	10	-0.02	CL	-	-	-	-	-	-	-	2.7	32.4	48.5	16.4	0.002	-
2023	WSP	TP23-C5-06	Perimeter Embankment Abutment	Grab	1	0.00	2.50	979.20	976.70	977.95	Till	-	13.4	CL	25	15	10	-0.16	CL	-	-	-	-	-	-	-	9.3	30.1	43.4	17.2	0.002	-
2023	WSP	TP23-C5-07	Perimeter Embankment Abutment	Grab	1	0.50	4.00	978.80	975.30	977.05	Till	-	12.9	CL	23	15	8	-0.26	CL	-	-	-	-	-	-	-	3.3	33.9	47.6	15.2	0.002	-
2023	WSP	TP23-C5-08	Perimeter Embankment Abutment	Grab	1	1.00	4.00	973.90	970.90	972.40	Till	-	14.8	CL	26	14	12	0.07	CL	-	-	-	-	-	-	-	1.3	32.1	44.7	21.9	0.002	-
2023	WSP	TP23-C5-17	Perimeter Embankment Abutment	Grab	4	-	-	964.40		964.40	Till	-	12.8	CL	26	12	14	0.06	CL	-	-	-	-	-	-	-	2.5	40.5	57.0		-	-
2023	WSP	TP23-C5-18	Perimeter Embankment Abutment	Grab	1 (QA)	-	-	968.90		968.90	Till	-	16.6	CL	22	13	9	0.40	CL	-	-	-	-	-	-	-	1.8	32.1	66.1		-	-
2023	WSP	TP23-C5-18	Perimeter Embankment Abutment	Grab	1	-	-	968.90		968.90	Till	-	16.9	CL	26	14	12	0.24	CL	-	-	-	-	-	-	-	1.9	33.9	64.2		-	-
2023	WSP	TP23-C5-19	Perimeter Embankment Abutment	Grab	1 (QA)	-	-	968.10		968.10	Till	-	13.2	CL	24	13	11	0.02	CL	-	-	-	-	-	-	-	7.5	31.3	61.2		-	-

Table C5: Summary of Index Test Results

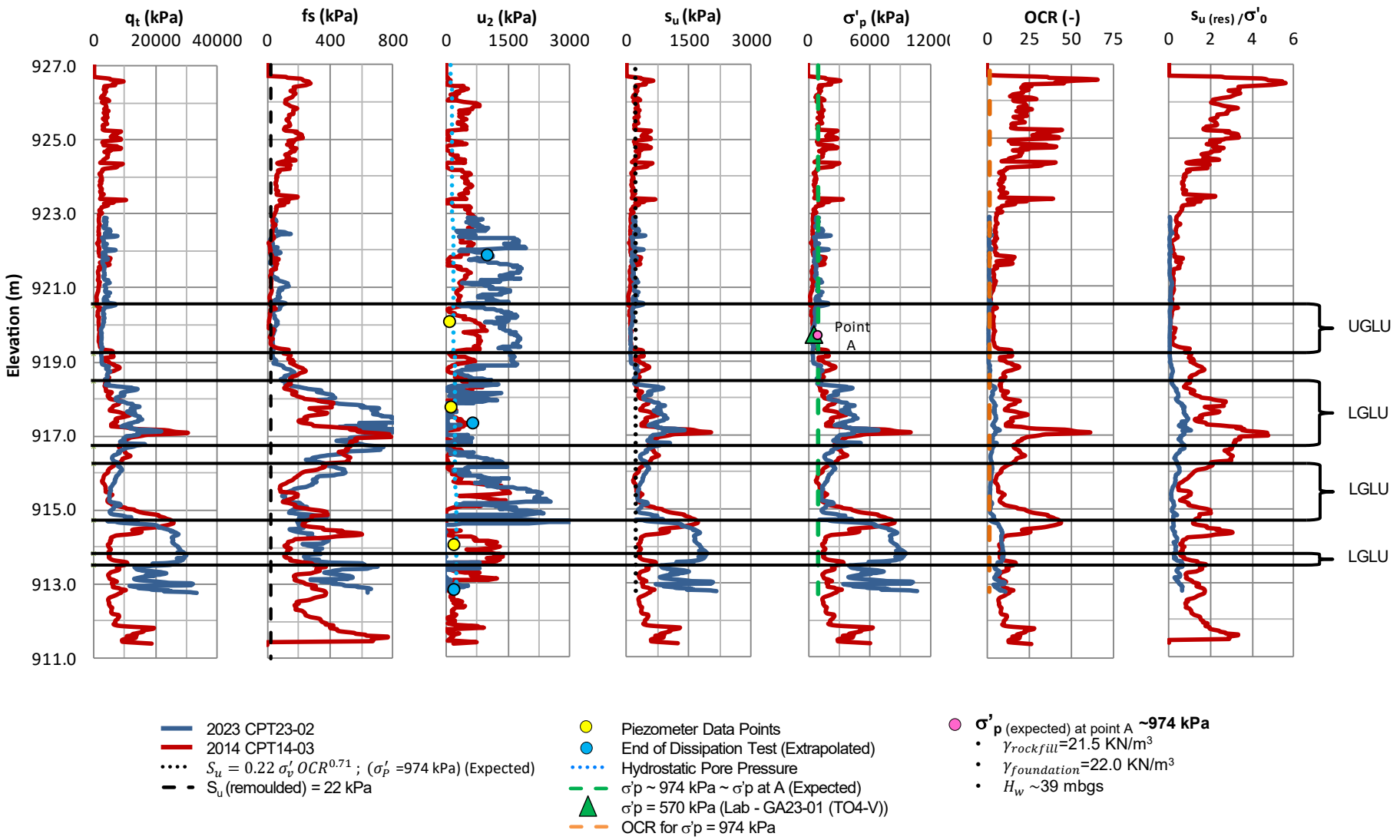
Year	Consultant	Borehole / Test Pit ID	General Location Description	Sample Type	Sample No.	Depth (m)		Elevation (m)			Soil Unit	Specific Gravity	Water Content (%)	Unified Soil Classification System (USCS)	Atterberg Limits				Atterberg Classification	Dry Density (kg/m^3)	Wet Density (kg/m^3)	Standard Proctor		Modified Proctor		Hydraulic Conductivity (m/s)	Particle Size Distribution					Advanced Testing Completed
						From	To	From	To	Mid-Point					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)				Maximum Dry Density (kg/m^3)	Optimum Water Content (%)	Maximum Dry Density (kg/m^3)	Optimum Water Content (%)		Gravel (%)	Sand (%)	Fines (%)		Clay Threshold (< mm)	
																												Silt (%)	Clay (%)		
2023	WSP	TP23-CS-19	Perimeter Embankment Abutment	Grab	1	-	-	968.10		968.10	Till	-	13.6	CL	26	14	12	-0.03	CL	-	-	-	-	-	-	-	3.6	37.8	58.6		-	-
2023	WSP	TP23-CS-19	Perimeter Embankment Abutment	Grab	3	-	-	965.90		965.90	Till	-	13.2	CL	25	12	13	0.09	CL	-	-	-	-	-	-	-	2.5	38.4	59.1		-	-

1. Soil unit was redefined from original description based on further assessment.
2. Soil unit was redefined from glaciolacustrine to either upper glaciolacustrine or lower glaciolacustrine.

APPENDIX D

2023 CPT Data and Interpretation

https://golderassociates.sharepoint.com/sites/10023g/50000_TSF_ENGINEERING/Forms/AllItems.aspx?csf=1&web=1&e=nYBCs9&ovuser=3d234255%2De20f%2D4205%2D88a5%2D9658a402999b%2Cscott%2Ecoombs%40wsp%2Ecom&OR=Teams%2DHL&CT=1661378880663&clickparams=eyJBcHBOYW1lIjoiVGVhbXMtRGVza3RvcCIsIkFwcFZlcnNpb24iOiIyNy8yMjA3MzEwMTAwNSIsIkhhc0ZlZGVyYXRlZFVzZXIiOnRydWV9&cid=9dc739fa%2De3f1%2D4631%2Dabbf%2Dce95a81677b4&RootFolder=%2Fsites%2F10023g%2F50000%5FTSF%5FENGINEERING%2F51300%5FUltimate%5FDesign%2F51331%5F2021%20Site%20Investigation%2FCPT%2FCPTu%20Interpretation&FolderCTID=0x012000ECCF7810C0D4C94D91E590ED93C22946



REFERENCES/NOTES

1. q_t = Tip Resistance
2. fs = Sleeve Friction
3. u_2 = Pore Pressure
4. s_u = Undrained Shear Strength
5. σ'_p = Preconsolidation Stress
6. OCR = Overconsolidation Ratio
7. σ'_v = Vertical Effective Stress
8. σ_v = Total Vertical Stress
9. GLU = Glaciolacustrine Unit
10. $s_u = (q_t-\sigma_v)/15$
11. $\sigma'_p = 0.33(q_t-\sigma_v)$
12. OCR = σ'_p/σ'_v

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-24
PREPARED	E. Dina
DESIGNED	A. Bayoumi
REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
CPT DATA AND INTERPRETATION
CPT23-01

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	**51300**	**51392**	**1**	**D-1**

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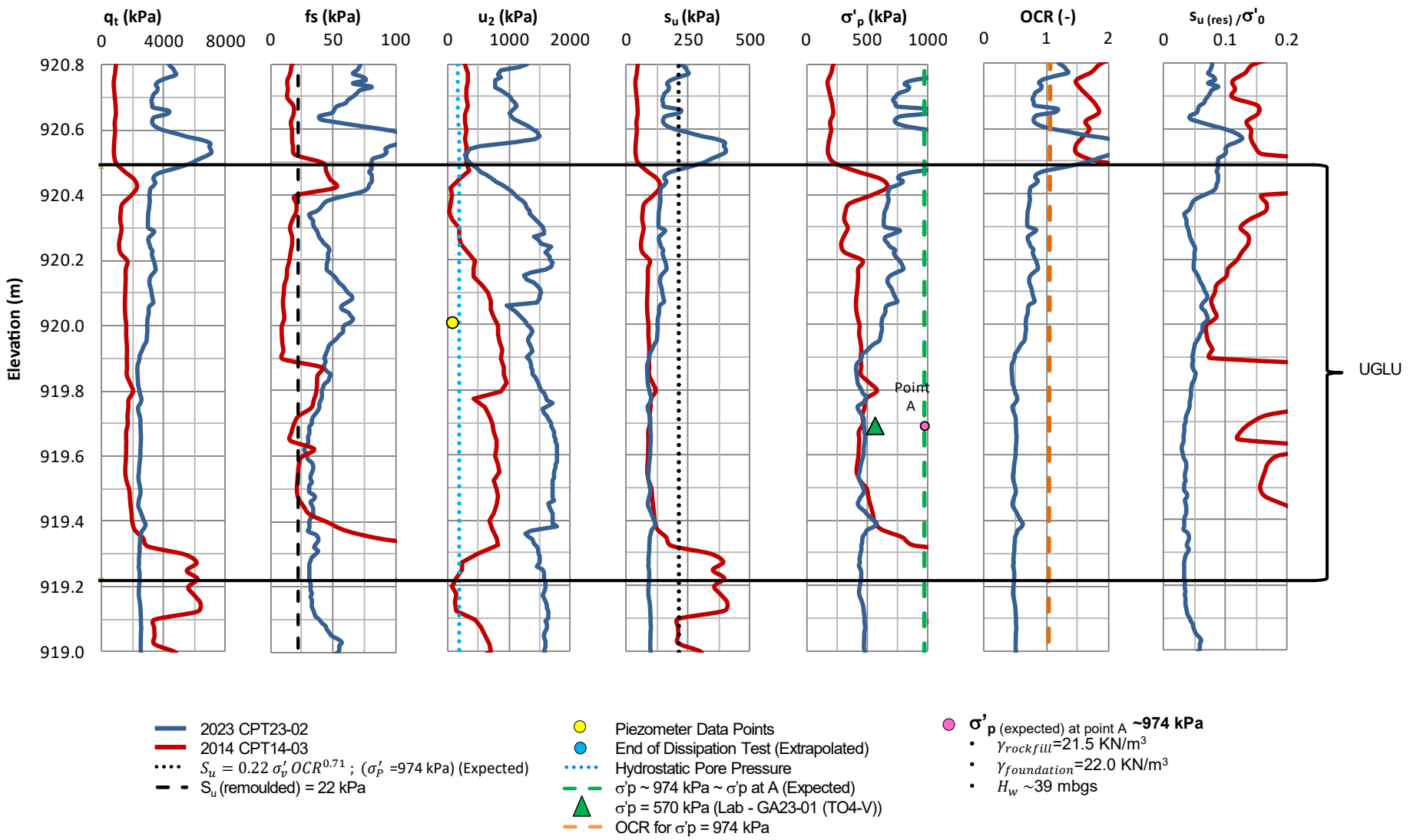

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REVIEWED	A. Bayoumi
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PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
CPT DATA AND INTERPRETATION
CPT23-01- Zoomed Profile

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	51300	51392	1	D-2

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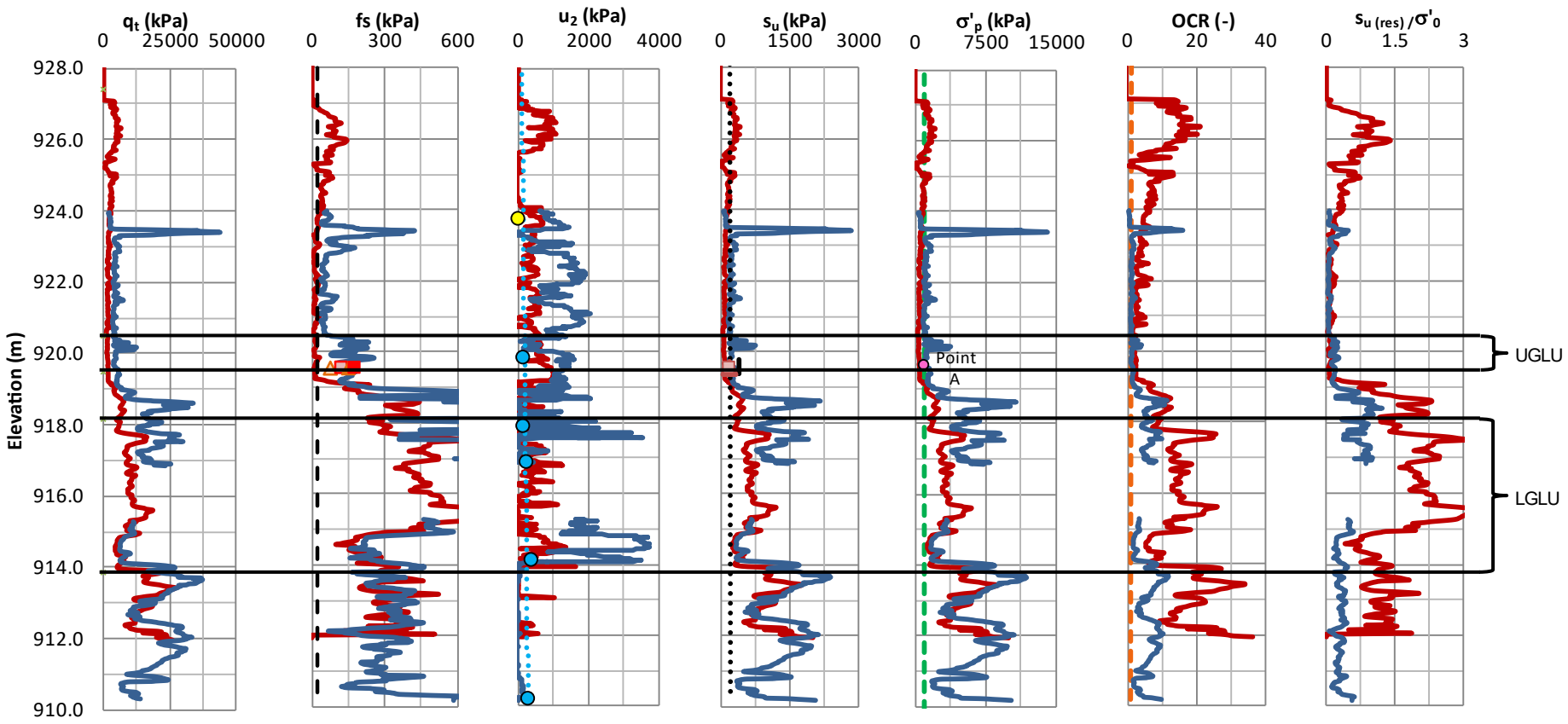

- 2023 CPT23-02
- 2014 CPT14-03
- $S_u = 0.22\,\sigma'_v\,OCR^{0.71}$; (σ'_P =950 kPa) (Expected)
- S_u (remoulded) = 22 kPa
- Shelby Tube GA23-02 (TO2)

- Piezometer Data Points
- End of Dissipation Test (Extrapolated)
- Hydrostatic Pore Pressure
- σ'p ~ 950 kPa ~ σ'p at A (Expected)
- OCR for σ'p = 950 kPa

- Lab Data – Monotonic Test- γ ~ 100%
- Lab Data – Monotonic Test – γ ~ 20%
- Lab Data – Post-Reconsolidation Monotonic Test– γ ~ 20%
- Lab Data – Post-Reconsolidation Monotonic Test– γ ~ 100%
- Lab Data – Monotonic Test
- Lab Data – Post-Reconsolidation Monotonic Test

- **σ'p** (expected) at point A **~950 kPa**
  - $\gamma_{rockfill}$=21.5 KN/m^3
  - $\gamma_{foundation}$=22.0 KN/m^3
  - H_w ~37 mbgs

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YYYY-MM-DD	2025-01-24
PREPARED	E. Dina
DESIGNED	A. Bayoumi
REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
CPT DATA AND INTERPRETATION
CPT23-02

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	**51300**	**51392**	**1**	**D-3**

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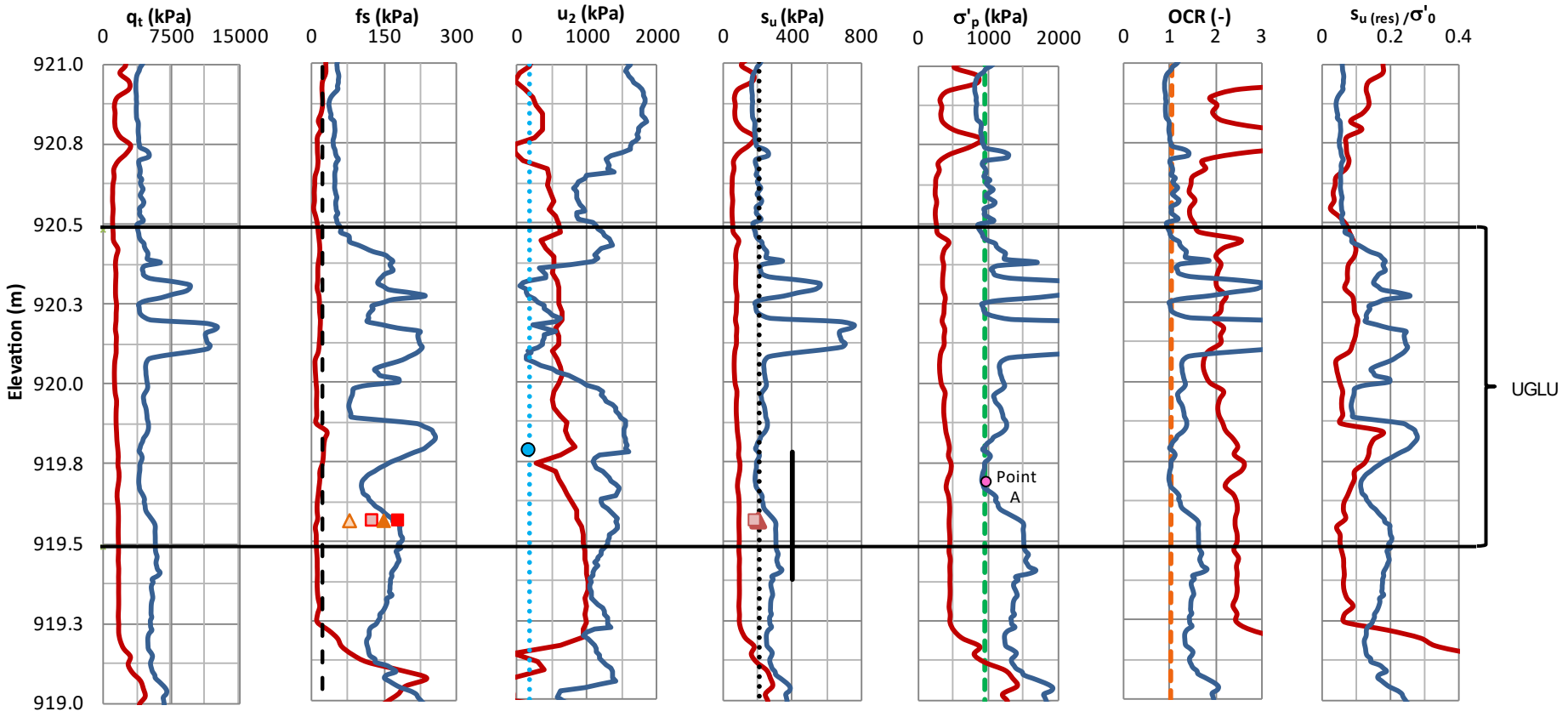

- 2023 CPT23-02
- 2014 CPT14-03
- $S_u = 0.22\,\sigma'_v\,OCR^{0.71}$; (σ'_P =950 kPa) (Expected)
- S_u (remoulded) = 22 kPa
- Shelby Tube GA23-02 (TO2)

- Piezometer Data Points
- End of Dissipation Test (Extrapolated)
- Hydrostatic Pore Pressure
- σ'p ~ 950 kPa ~ σ'p at A (Expected)
- OCR for σ'p = 950 kPa

- Lab Data – Monotonic Test- γ ~ 100%
- Lab Data – Monotonic Test – γ ~ 20%
- Lab Data – Post-Reconsolidation Monotonic Test– γ ~ 20%
- Lab Data – Post-Reconsolidation Monotonic Test– γ ~ 100%
- Lab Data – Monotonic Test
- Lab Data – Post-Reconsolidation Monotonic Test

- **σ'p (expected) at point A ~950 kPa**
- $\gamma_{rockfill}$=21.5 KN/m^3
- $\gamma_{foundation}$=22.0 KN/m^3
- H_w ~37 mbgs

REFERENCES/NOTES

1. q_t = Tip Resistance
2. fs = Sleeve Friction
3. u_2 = Pore Pressure
4. s_u = Undrained Shear Strength
5. σ'_p = Preconsolidation Stress
6. OCR = Overconsolidation Ratio
7. σ'_v = Vertical Effective Stress
8. σ_v = Total Vertical Stress
9. GLU = Glaciolacustrine Unit
10. $s_u = (q_t-\sigma_v)/15$
11. $\sigma'_p = 0.33(q_t-\sigma_v)$
12. $OCR = \sigma'_p/\sigma'_v$

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2025-01-24
PREPARED	E. Dina
DESIGNED	A. Bayoumi
REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
CPT DATA AND INTERPRETATION
CPT23-02- Zoomed Profile

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	51300	51392	1	D-4

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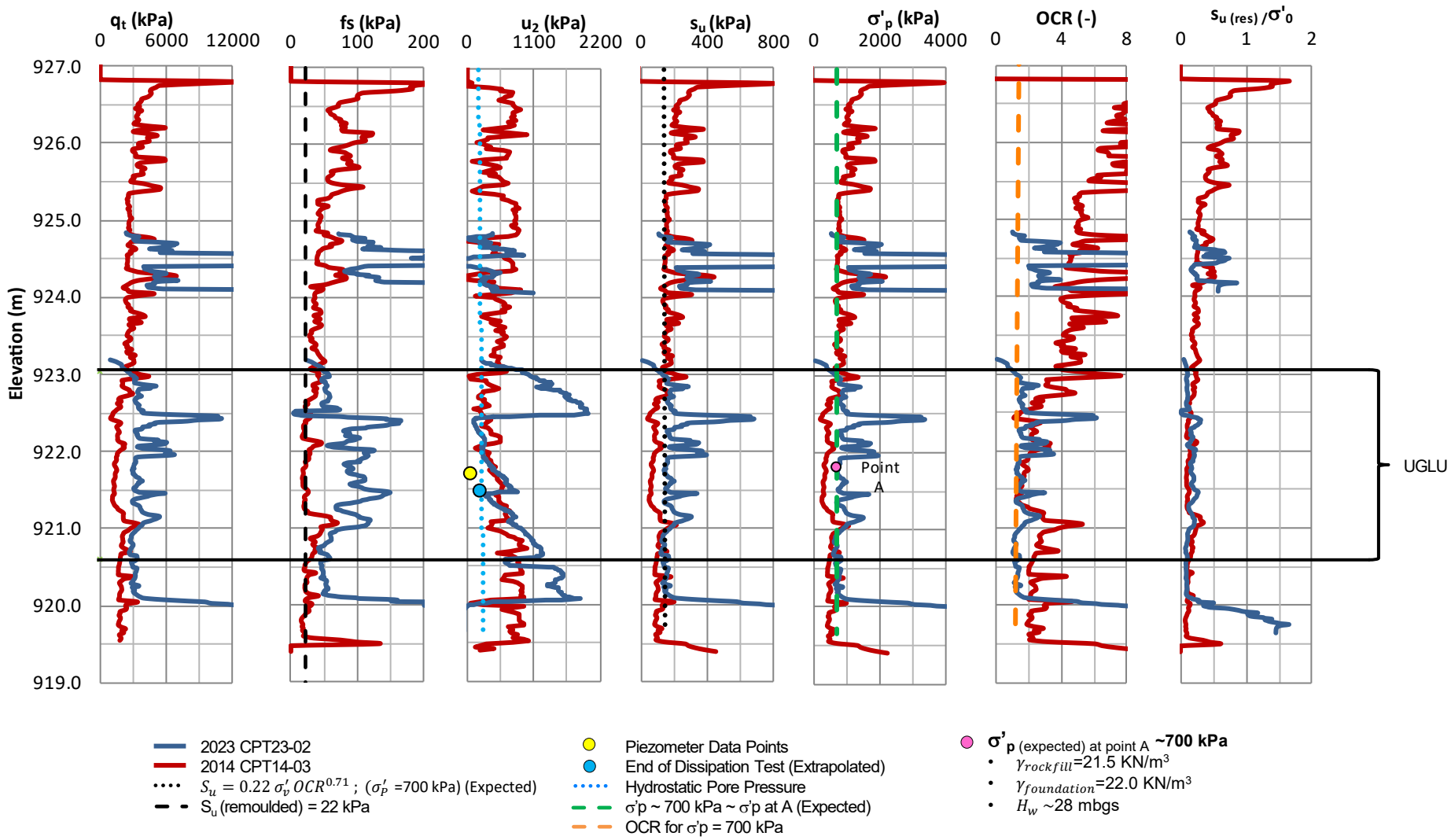

REFERENCES/NOTES

1. q_t = Tip Resistance
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3. u_2 = Pore Pressure
4. s_u = Undrained Shear Strength
5. σ'_p = Preconsolidation Stress
6. OCR = Overconsolidation Ratio
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8. σ_v = Total Vertical Stress
9. GLU = Glaciolacustrine Unit
10. $s_u = (q_t-\sigma_v)/15$
11. $\sigma'_p = 0.33(q_t-\sigma_v)$
12. OCR = σ'_p/σ'_v

CLIENT
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YYYY-MM-DD	2025-01-24
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REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
CPT DATA AND INTERPRETATION
CPT23-03

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	**51300**	**51392**	**1**	**D-5**

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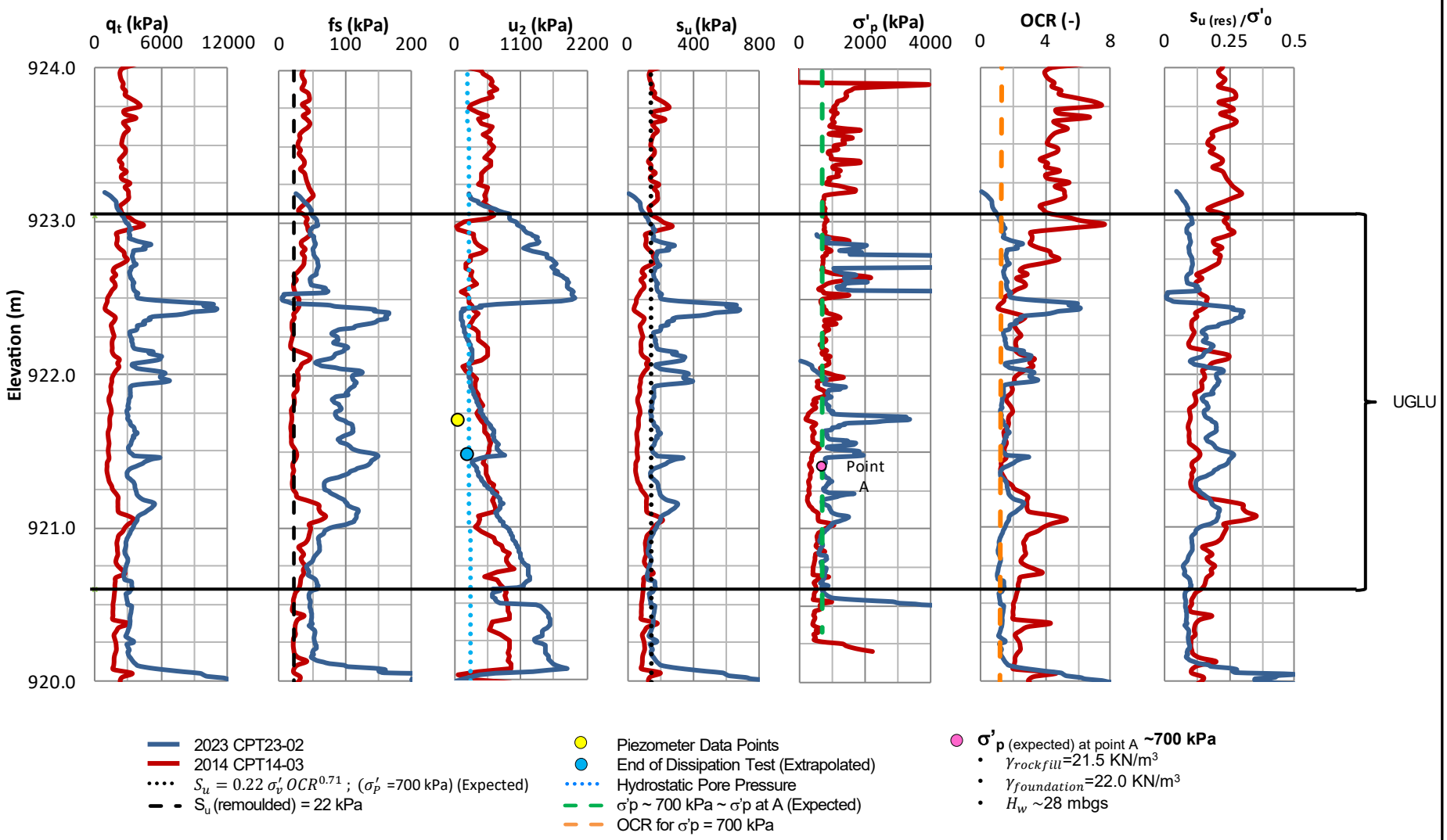

REFERENCES/NOTES

1. q_t = Tip Resistance
2. fs = Sleeve Friction
3. u_2 = Pore Pressure
4. s_u = Undrained Shear Strength
5. σ'_p = Preconsolidation Stress
6. OCR = Overconsolidation Ratio
7. σ'_v = Vertical Effective Stress
8. σ_v = Total Vertical Stress
9. GLU = Glaciolacustrine Unit
10. $s_u = (q_t-\sigma_v)/15$
11. $\sigma'_p = 0.33(q_t-\sigma_v)$
12. OCR = σ'_p/σ'_v

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YYYY-MM-DD	2025-01-24
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REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
CPT DATA AND INTERPRETATION
CPT23-03- Zoomed Profile

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	51300	51392	1	D-6

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CPT	Elevation (m)	t_{50} (s)	Estimated Hydraulic Conductivity (cm/s)	Lithology
CPT23-01	921.81	2846.90	4.8×10^{-8}	Gravelly sandy silty clay, medium plasticity (ablation till)
CPT23-01	917.26	654.87	3.0×10^{-7}	Silty clay, medium plasticity, trace sand, trace gravel, laminated (lower glaciolacustrine)
CPT23-01	912.78	185.59	1.5×10^{-6}	Bedrock, highly to completely weathered
CPT23-02	919.78	474.24	4.5×10^{-7}	Clay, high plasticity, some sand, trace gravel, varved (upper glaciolacustrine)
CPT23-02	917.84	279.67	8.8×10^{-7}	Silty clay, low to medium plasticity, trace sand, trace gravel, faintly laminated (lower glaciolacustrine)
CPT23-02	916.85	245.60	1.0×10^{-6}	Silty clay, low to medium plasticity, trace sand, trace gravel, faintly laminated (lower glaciolacustrine)
CPT23-02	914.09	29.01	1.5×10^{-5}	Silty clay, medium plasticity, trace sand, trace gravel, laminated (lower glaciolacustrine)
CPT23-02	910.18	122.63	2.5×10^{-6}	Bedrock, highly to completely weathered
CPT23-03	921.47	79.57	4.2×10^{-6}	Silty clay, medium plasticity, some sand, trace gravel, laminated (upper glaciolacustrine)

REFERENCES/NOTES

1. Hydraulic conductivity estimates based on Parez & Fauriel (1988).

$$k_h\,(cm/s) \approx \left(\frac{1}{251 * t_{50}(sec)}\right)^{1.25}$$

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
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YYYY-MM-DD	2025-01-24
PREPARED	E. Dina
DESIGNED	A. Bayoumi
REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
CPT DATA AND INTERPRETATION
ESTIMATED HYDRAULIC CONDUCTIVITY FROM DISSIPATION TESTS

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	51300	51392	1	D-7

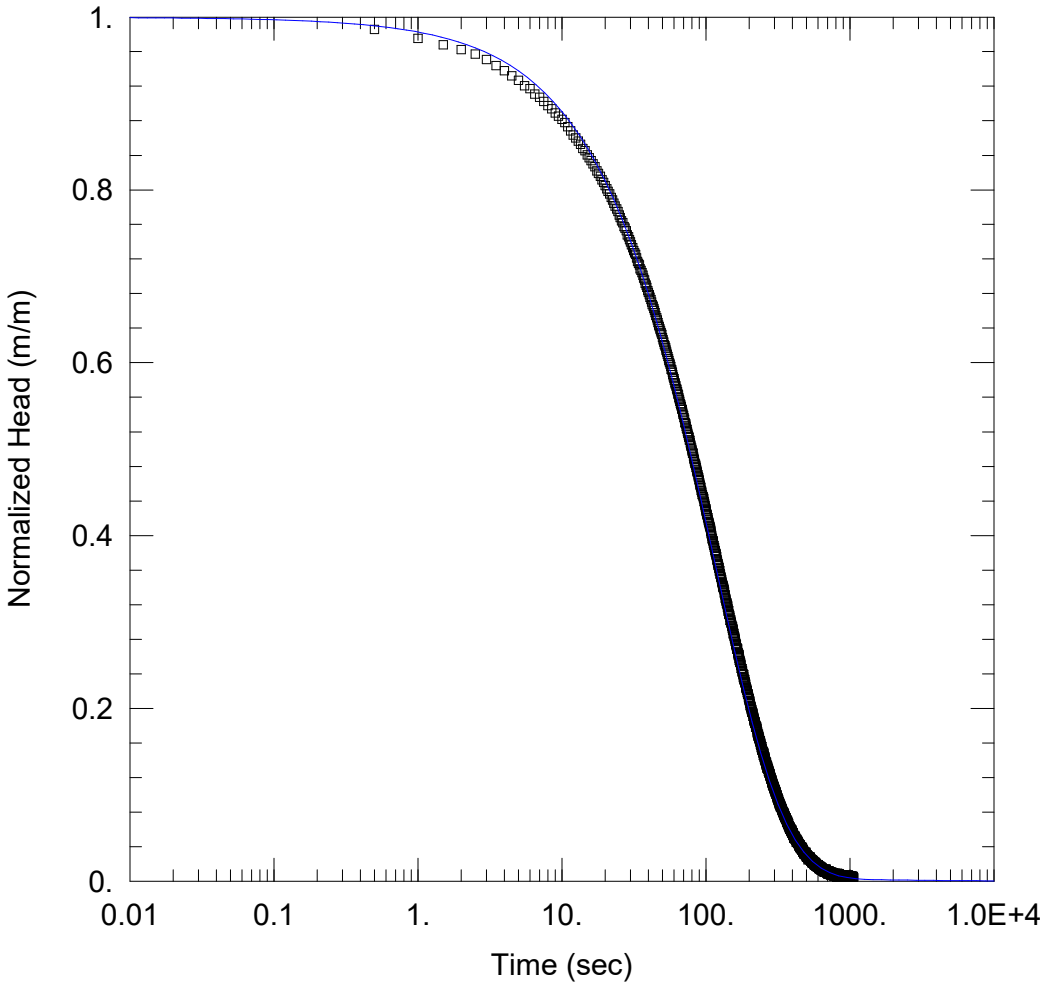
APPENDIX E

Well Test Results and Nearest Registered Water Wells and Mapped Aquifers

Well Location Data					GW Levels			Screened Interval					Single Well Response Test Results		
Easting	Northing	Well No.	Ground Surface Elevation (m)	TOC Elevation (m)	Date	Water Level (mbtoc)	Water Level (m)	Top (mbgs)	Bottom (mbgs)	Top (m)	Bottom (m)	HS unit	Method	Number of Tests Analyzed	K (m/s)
594371.11	5818475.85	GW00-1B	939.20	940.05	02-Jun-22	1.34	938.71	4.5	10.6	934.7	928.6	SILT Till with SAND interbed (Basal Till)	Solid Slug and Bailer	5	3E-06
594896.22	5818238.09	GW00-3B	943.06	943.79	02-Jun-22	3.80	939.98	7.6	13.7	935.5	929.4	SILT Till with SILT/f.SAND interbed (Basal Till)	Solid Slug	2	8E-07
596065.40	5819449.92	GW96-2A	931.42	931.92	01-Jun-22	30.80	901.13	51.8	54.9	879.6	876.5	Weathered Bedrock - conglomerate	Solid Slug	2	3E-06
596074.73	5819447.08	GW96-2B	931.42	932.02	01-Jun-22	17.21	914.81	30.8	35.4	900.6	896.0	SAND and GRAVEL *(Glaciofluvial?)*	Solid Slug and Bailer	8	4E-04
595151.26	5818162.87	GW96-4B	940.46	941.16	01-Jun-22	1.91	939.25	4.3	7.2	936.2	933.3	SAND and GRAVEL *(Glaciofluvial?)*	Solid Slug	6	2E-06
596228.05	5819066.00	GW21-06	946.12	947.08	31-Mar-22	30.24	916.84	33.7	35.3	912.4	910.9	Unknown Overburden	Solid Slug	2	1E-05
595544.37	5818304.68	GW21-09	930.53	931.44	31-Mar-22	16.91	914.53	16.1	17.7	914.4	912.9	Silty CLAY / SILT and SAND (Basal Till)	Solid Slug	2	1E-06

* indicates this elevation was calculated from stickup, not directly surveyed

[1] this is the reccommended method to start with, but ideally tests should be conducted with both the small and large slu



WELL TEST ANALYSIS

Data Set: C:\...\GW96-2A_1b_GH.aqt
Date: 06/16/22 Time: 15:41:04

PROJECT INFORMATION

Company: Golder
Client: Mount Polley Mine
Project: 22514095
Test Well: GW00-1B
Test Date: June 4, 2022

AQUIFER DATA

Saturated Thickness: 24.96 m

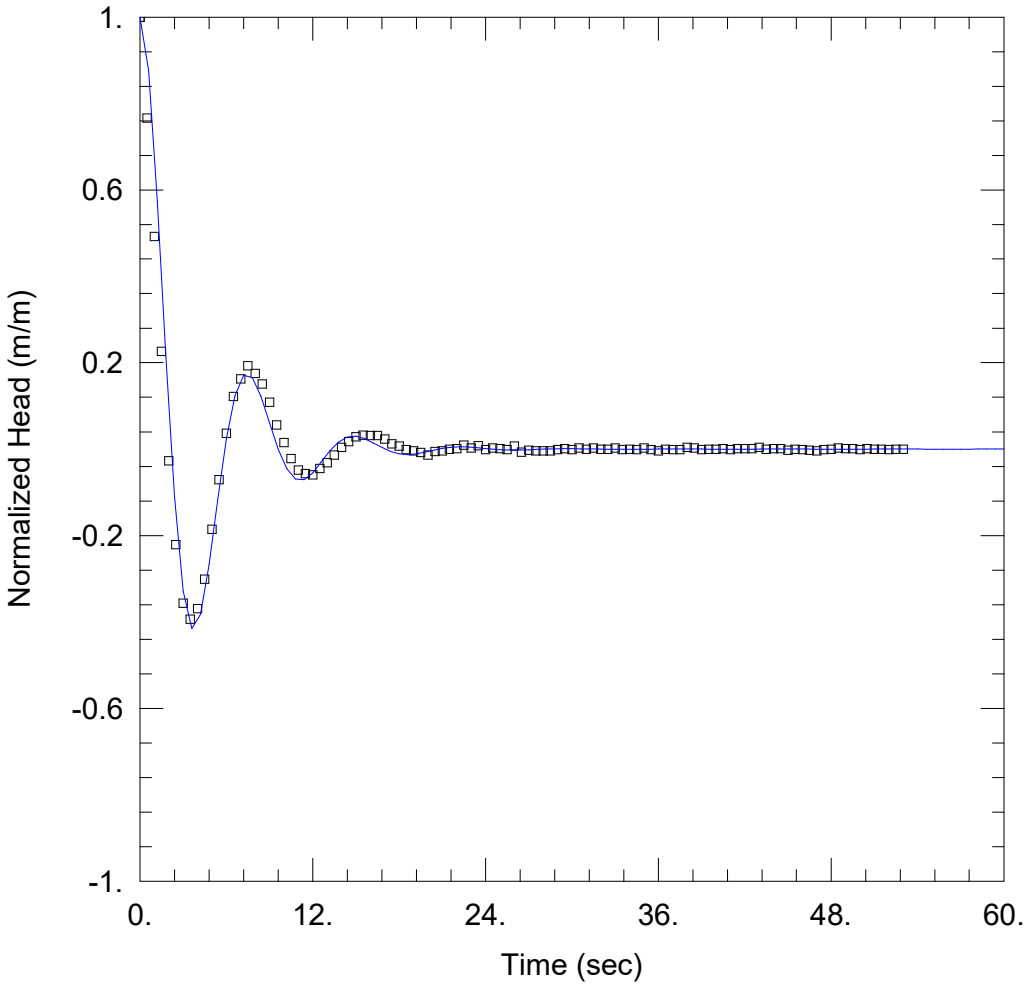
WELL DATA (GW96-2A)

Initial Displacement: 0.4507 m
Total Well Penetration Depth: 24.96 m
Casing Radius: 0.026 m
Static Water Column Height: 24.96 m
Screen Length: 4.3 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 2.7E-6 m/sec
Kz/Kr = 1.
Ss = 9.6E-6 m^{-1}



WELL TEST ANALYSIS

Data Set: C:\...\GW96-2B_1b_GH.aqt
Date: 06/16/22 Time: 15:50:31

PROJECT INFORMATION

Company: Golder
Client: Mount Polley Mine
Project: 22514095
Test Well: GW00-1B
Test Date: June 4, 2022

AQUIFER DATA

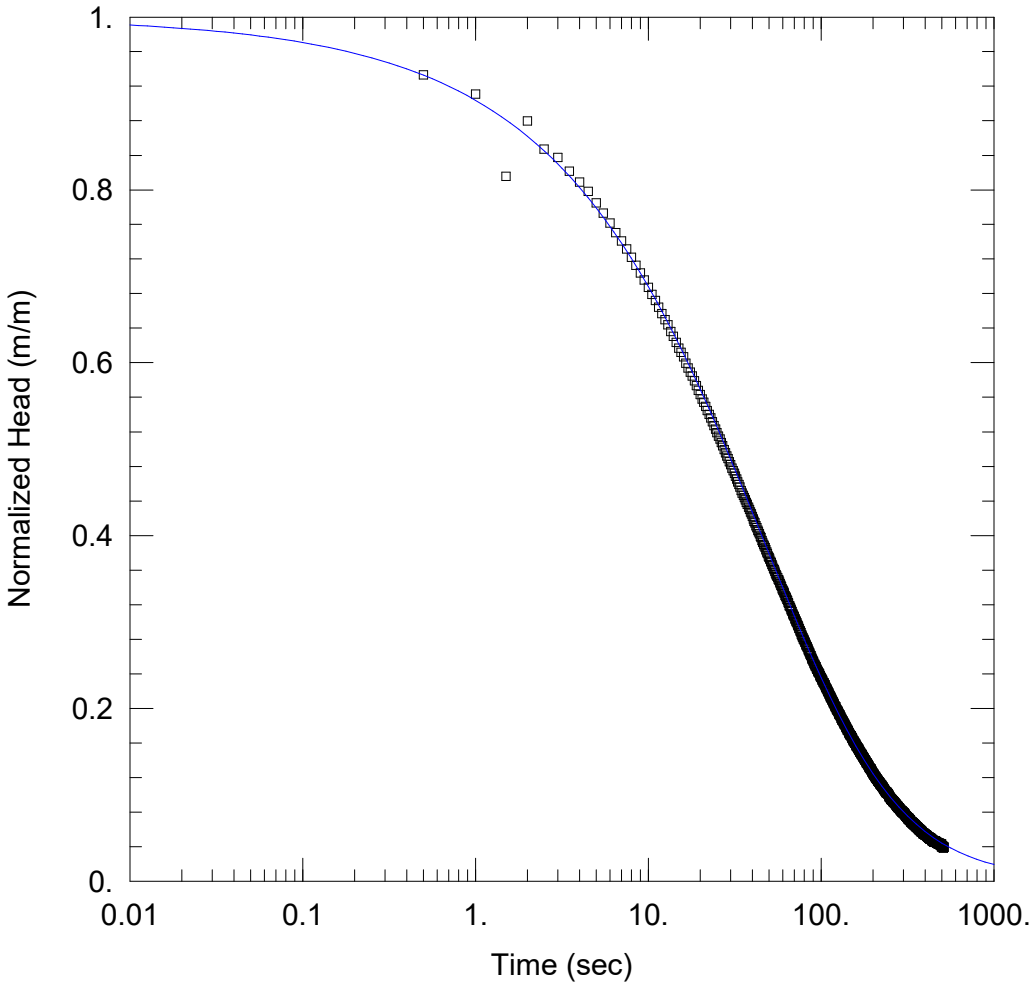
Saturated Thickness: 19.15 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (GW96-2B)

Initial Displacement: 0.0737 m
Total Well Penetration Depth: 19.15 m
Casing Radius: 0.026 m
Static Water Column Height: 19.15 m
Screen Length: 6. m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Springer-Gelhar
K = 0.00039 m/sec
Le = 12.71 m



WELL TEST ANALYSIS

Data Set: C:\...\GW96-4B_2a_GH.aqt
Date: 06/16/22 Time: 16:36:10

PROJECT INFORMATION

Company: Golder
Client: Mount Polley Mine
Project: 22514095
Test Well: GW00-1B
Test Date: June 4, 2022

AQUIFER DATA

Saturated Thickness: 6.27 m

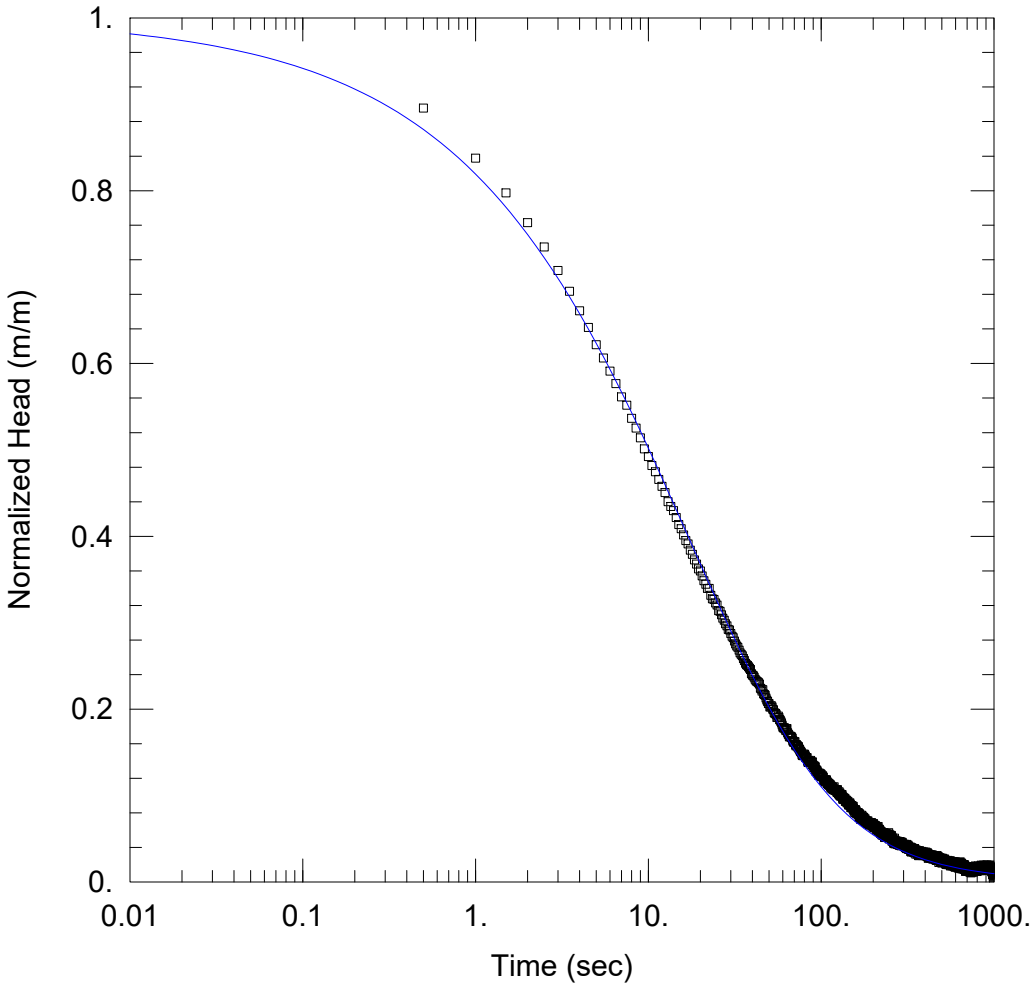
WELL DATA (GW96-4B)

Initial Displacement: 0.4043 m
Total Well Penetration Depth: 6.27 m
Casing Radius: 0.026 m
Static Water Column Height: 6.27 m
Screen Length: 4.6 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 2.0E-6 m/sec
Kz/Kr = 1.
Ss = 0.0031 m^{-1}



WELL TEST ANALYSIS

Data Set: C:\...\GW00-1B_1b_GH.aqt
Date: 06/15/22 Time: 11:00:00

PROJECT INFORMATION

Company: Golder
Client: Mount Polley Mine
Project: 22514095
Test Well: GW00-1B
Test Date: June 4, 2022

AQUIFER DATA

Saturated Thickness: 9.39 m

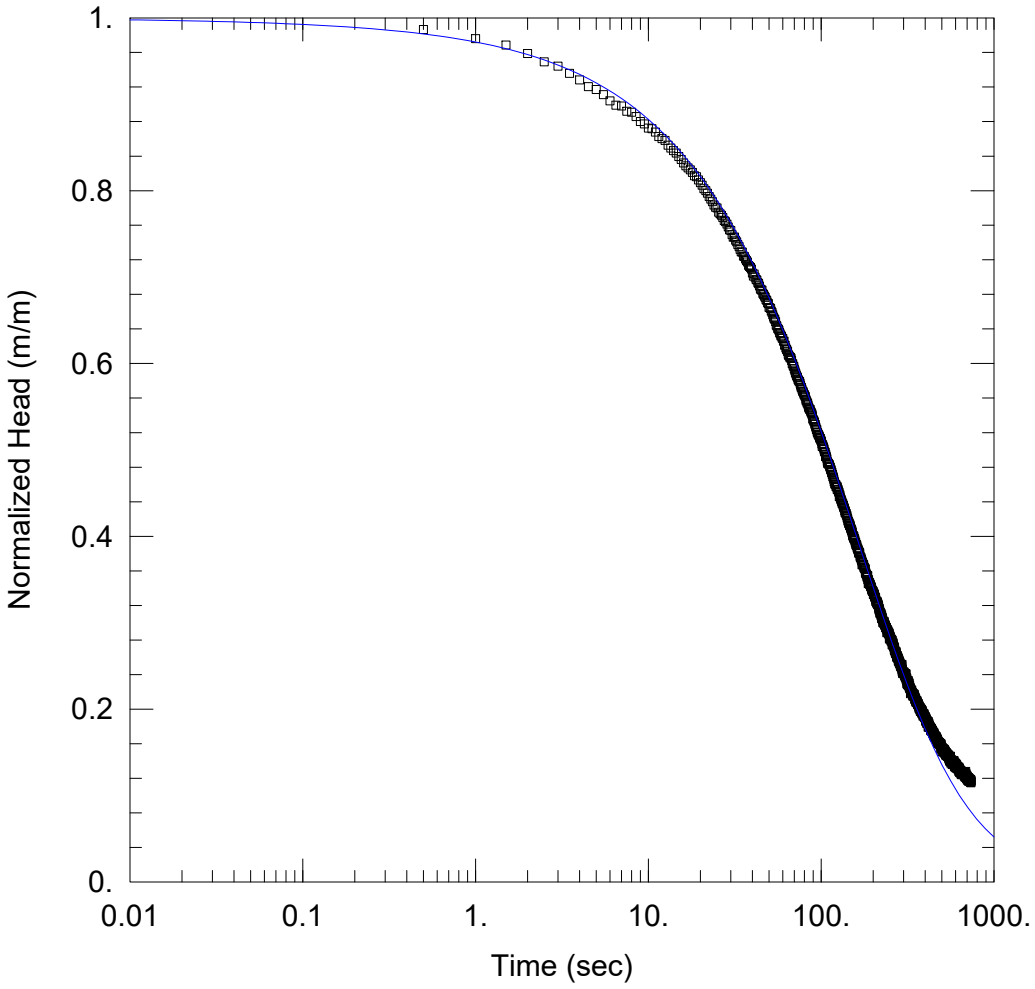
WELL DATA (GW00-1b)

Initial Displacement: 0.1245 m
Total Well Penetration Depth: 9.39 m
Casing Radius: 0.025 m
Static Water Column Height: 9.39 m
Screen Length: 6.1 m
Well Radius: 0.051 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 2.7E-6 m/sec
Kz/Kr = 1.
Ss = 0.01 m^{-1}



WELL TEST ANALYSIS

Data Set: C:\...\GW00-3B_1b_GH.aqt
Date: 06/15/22 Time: 11:33:34

PROJECT INFORMATION

Company: Golder
Client: Mount Polley Mine
Project: 22514095
Test Well: GW00-1B
Test Date: June 4, 2022

AQUIFER DATA

Saturated Thickness: 9.92 m

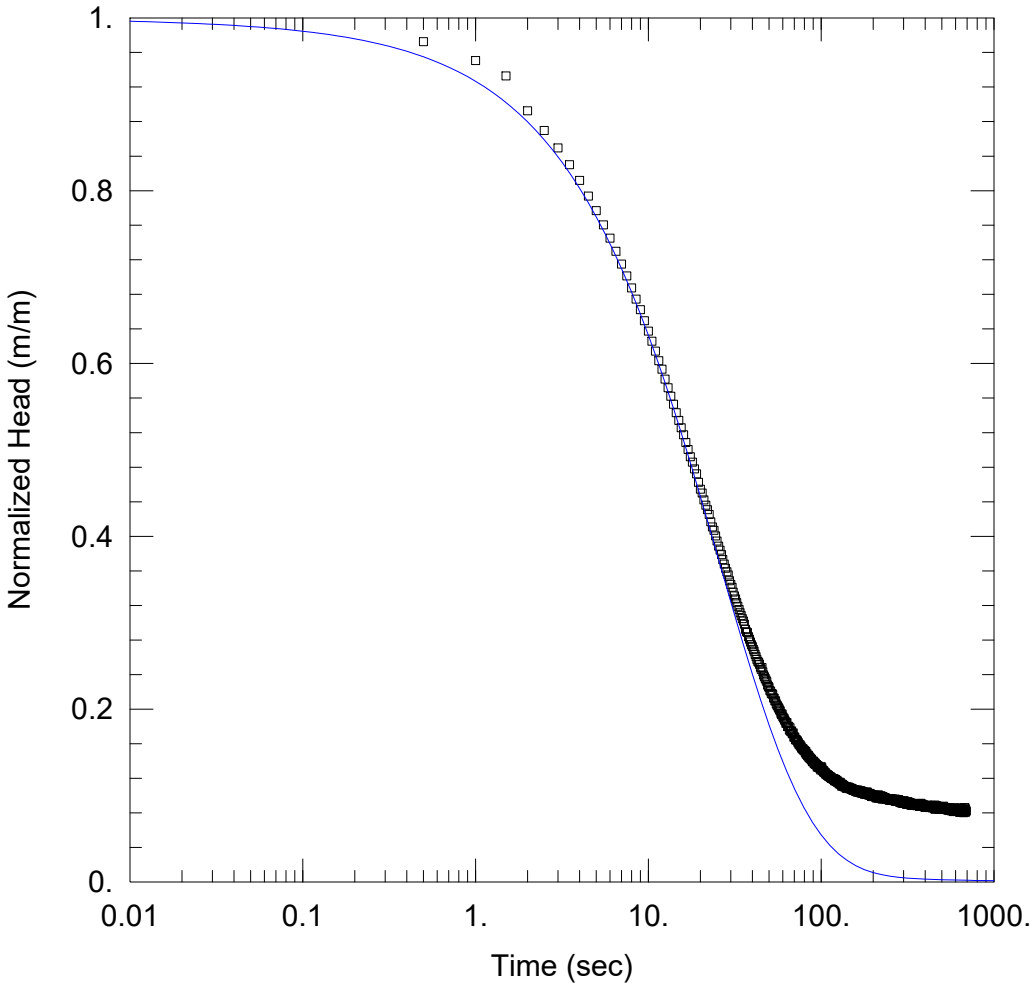
WELL DATA (GW00-3b)

Initial Displacement: 0.4201 m
Total Well Penetration Depth: 9.92 m
Casing Radius: 0.025 m
Static Water Column Height: 9.92 m
Screen Length: 6.1 m
Well Radius: 0.051 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 7.5E-7 m/sec
Kz/Kr = 1.
Ss = 0.0005 m^{-1}



WELL TEST ANALYSIS

Data Set: C:\...\MW21-06_1b_GH.aqt
Date: 06/16/22 Time: 14:59:29

PROJECT INFORMATION

Company: Golder
Client: Mount Polley Mine
Project: 22514095
Test Well: GW00-1B
Test Date: June 4, 2022

AQUIFER DATA

Saturated Thickness: 6. m

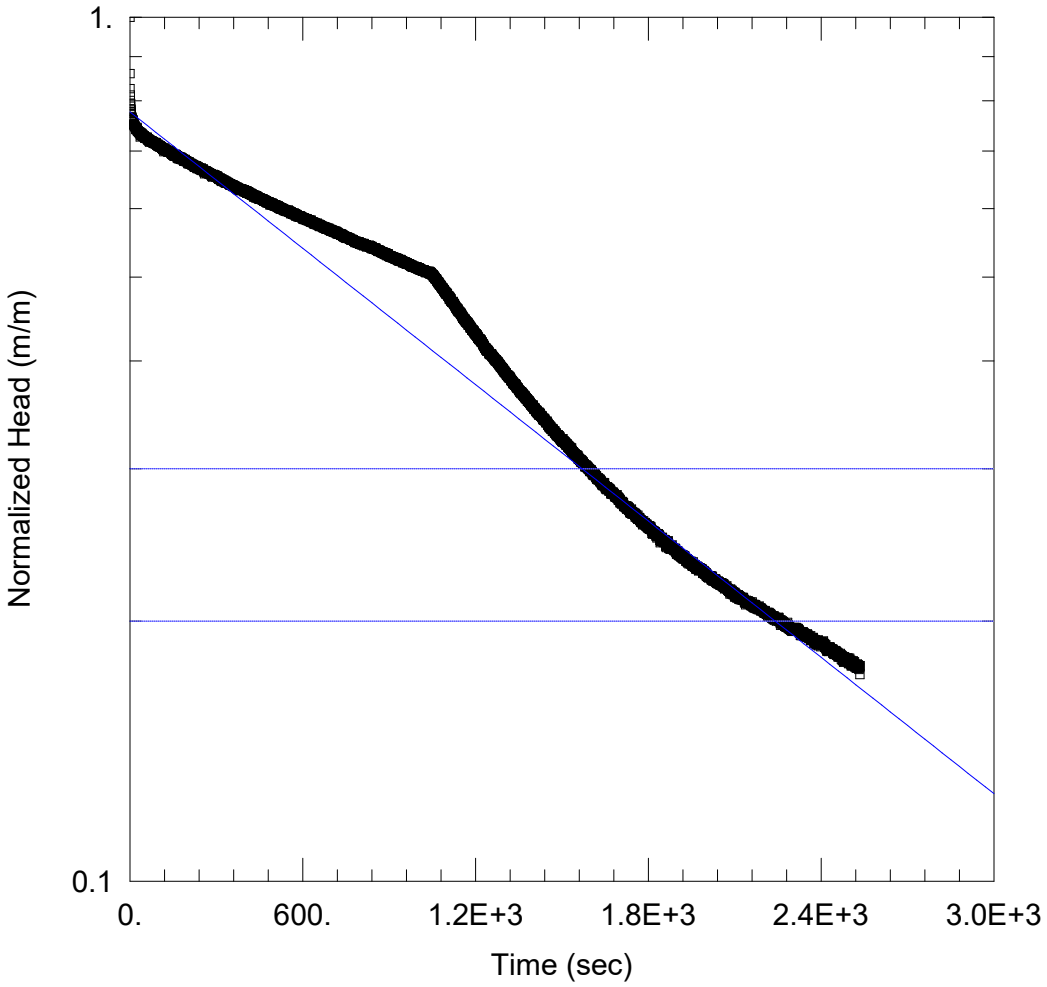
WELL DATA (MW21-06)

Initial Displacement: 0.4292 m
Total Well Penetration Depth: 6.05 m
Casing Radius: 0.025 m
Static Water Column Height: 6. m
Screen Length: 1.6 m
Well Radius: 0.076 m

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 2.2E-5 m/sec
Kz/Kr = 1.
Ss = 0.0003 m^{-1}



WELL TEST ANALYSIS

Data Set: C:\...\MW21-09_1_GH.aqt
Date: 07/06/22 Time: 09:55:25

PROJECT INFORMATION

Company: Golder
Client: Mount Polley Mine
Project: 22514095
Test Well: GW00-1B
Test Date: June 4, 2022

AQUIFER DATA

Saturated Thickness: 1.7 m Anisotropy Ratio (Kz/Kr): 1.

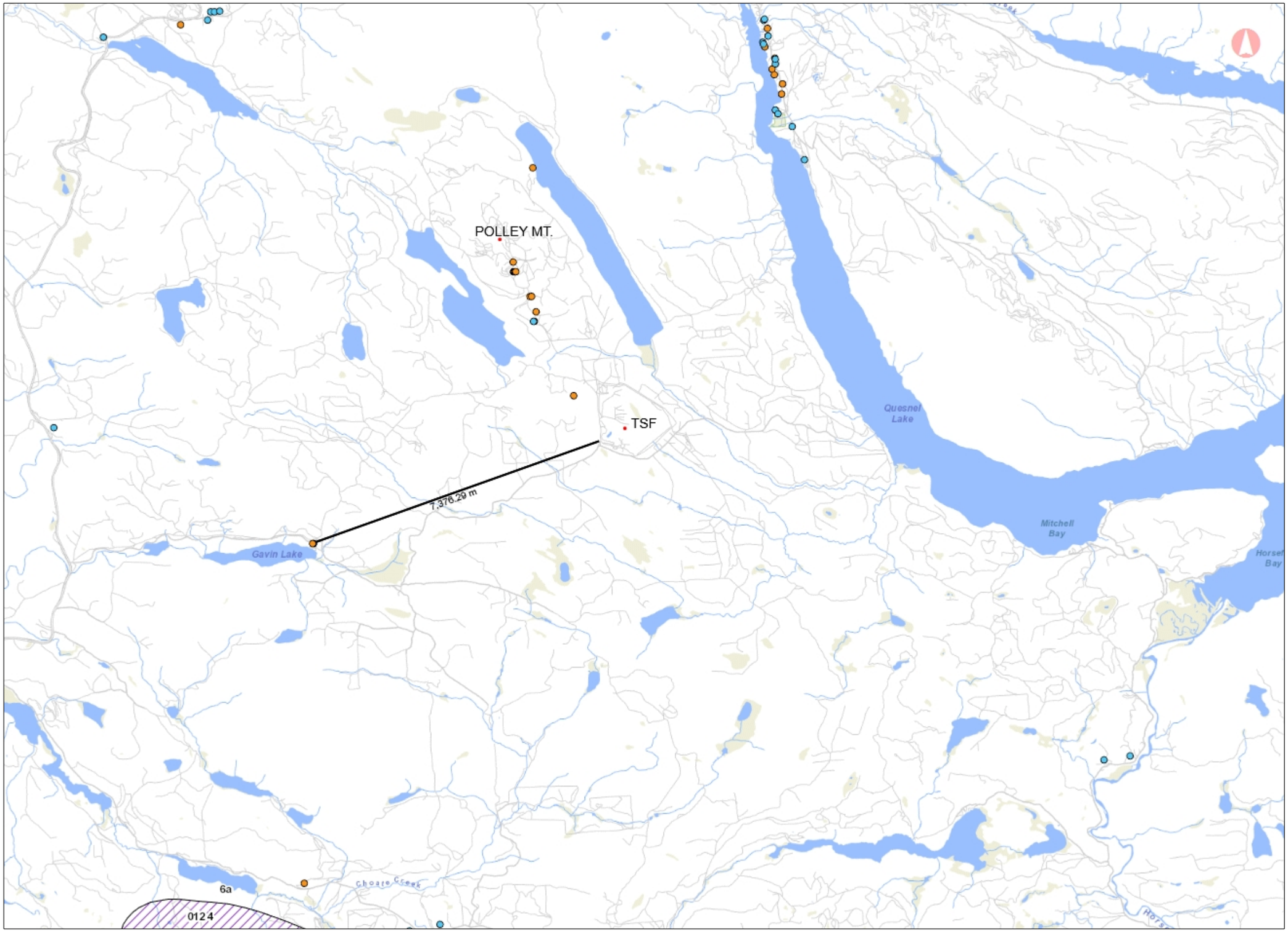
WELL DATA (MW21-09)

Initial Displacement: 0.353 m
Total Well Penetration Depth: 1.73 m
Casing Radius: 0.025 m
Static Water Column Height: 1.7 m
Screen Length: 1.6 m
Well Radius: 0.076 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 9.5E-7 m/sec y0 = 0.2742 m



BRITISH COLUMBIA

iMapBC Mapping

Legend

- Water Wells - Private Dome:
- Water Wells - Licensed/Unli
  - WELL_LICENCE_GENERAL_S
  - Licensed
  - Unlicensed
- Aquifers - Subtype - BC - Cc
  - AQUIFER_SUBTYPE_CODE
  - 1a
  - 1b
  - 1c
  - 2
  - 3
  - 4a
  - 4b
  - 4c
  - 5a
  - 5b
  - 6a
  - 6b
  - UNK
- Aquifers - Vulnerability - BC
  - VULNERABILITY_CODE
  - Bedrock High Vulnerability
  - Bedrock Moderate Vulnerability
  - Bedrock Low Vulnerability
  - Unconsolidated High Vulnerabili
  - Unconsolidated Moderate Vulne

0 1.83 3.7 km

1: 90,000

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Datum:	NAD83
Projection:	NAD_1983_BC_Environment_Albers

Key Map of British Columbia

APPENDIX F

Soil Grain Size Analyses for K

Sample Location	Sample No.	Depth (m)	Lithology	Soil Descripton	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Other (%)	Bulk Density	K (m/s) Estimate from HydrogeoSieve	
											K (m/s)	K Estimation Method Details
GA21-01	GS1	1.52 - 1.83	Ablation Till	gravelly CLAYEY SAND and SILTY CLAY	13.8	31.8	40.3	14.1	0.0	NA	1E-07	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-01	GS2	3.96 - 4.27	Ablation Till	gravelly CLAYEY SAND and SILTY CLAY	13.7	31.0	40.2	15.1	0.0	NA	1E-07	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-01	GS18	34.75 - 35.36	Basal Till	gravelly sandy SILT	7.7	32.8	50.9	8.6	0.0	NA	2E-06	Estimation from Krumbein and Monk. The geometric mean seems too low
GA21-02	GS3	5.49 - 5.79	Ablation Till	gravelly sandy SILT	6.4	27.7	43.2	22.7	0.0	NA	1E-06	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-02	GS24	47.09 - 47.34	Basal Till	sandy CLAYEY SILT	15.9	25.3	35.5	23.3	0.0	NA	1E-07	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-03	GS2	7.01 - 7.32	Ablation Till	sandy gravelly SILT	8.2	31.5	43.6	16.7	0.0	NA	4E-07	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-03	GS4	10.36 - 10.67	Ablation Till	sandy gravelly SILT	9.9	30.3	34.8	25.0	0.0	NA	2E-06	Estimation from Krumbein and Monk. The geometric mean seems too low
GA21-03	GS25	43.59 - 43.89	Basal Till	sandy gravelly SILTY CLAY	9.4	34.6	35.4	20.6	0.0	NA	1E-06	Estimation from Krumbein and Monk. The geometric mean seems too low
GA21-05	GS1	8.23 - 8.53	Ablation Till	sandy SILTY CLAY	12.2	28.7	41.7	17.4	0.0	NA	2E-07	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-05	GS11	28.65 - 28.96	Basal Till	SILT	6.0	41.8	44.7	7.5	0.0	NA	3E-07	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-06	GS1	2.44 - 2.74	Ablation Till	gravelly sandy SILT	15.5	42.8	36.4	5.3	0.0	NA	2E-08	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)
GA21-06	GS2	6.40 - 6.71	Ablation Till	gravelly SILTY SAND	5.3	18.4	43.9	32.4	0.0	NA	1E-06	Geometric mean of applicable methods (Terzaghi, Sauerbrei, Kozeny-Carmen, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-06	GS6	12.80 - 13.11	Glaciofluvial	gravelly SAND	2.3	8.6	44.8	44.3	0.0	NA	3E-05	Geometric mean of applicable methods (Terzaghi, Sauerbrei, Zamarin, Barr, Alyamani and Sen) too low, use 10 times higher (i.e., use 3E-4 m/s)
GA21-06	GS8	16.76 - 17.07	Basal Till	gravelly sandy SILT	6.0	20.4	35.5	38.1	0.0	NA	1E-06	Geometric mean of applicable methods (Terzaghi, Sauerbrei, Kozeny-Carmen, Zamarin, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-07	GS1	11.89 - 12.19	Ablation Till	sandy SILTY CLAY	17.3	36.8	33.8	12.1	0.0	NA	2E-08	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)
GA21-08	GS1	17.37 - 17.68	Ablation Till	sandy SILT	12.3	38.9	35.4	13.4	0.0	NA	9E-08	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-08	GS7	27.43 - 27.74	Glaciolacustrine	SILTY CLAY	44.2	55.6	0.2	0.0	0.0	NA	3E-10	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)
GA21-08	GS10	34.75 - 35.05	Basal Till	sandy SILTY CLAY	18.9	33.2	41.9	6.0	0.0	NA	4E-08	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen, Krumbein and Monk)
GA21-09	GS8	27.43 - 27.74	Basal Till	sandy SILT	8.8	54.0	25.9	11.3	0.0	NA	6E-08	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)
GA21-11	GS15	13.41 - 13.65	Glaciolacustrine	SILTY CLAY	19.7	65.6	11.6	3.1	0.0	NA	4E-09	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)
GA21-11	GS16	16.64 - 16.76	Glaciolacustrine	SILTY CLAY	8.7	77.5	12.9	0.9	0.0	NA	2E-08	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)
GA21-11	GS20	20.73 - 21.03	Glaciolacustrine	sandy SILTY CLAY	14.4	62.9	18.4	4.3	0.0	NA	9E-09	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)
GA21-11	GS24	23.93 - 24.23	Glaciolacustrine	sandy SILTY CLAY	6.6	68.7	20.7	4.0	0.0	NA	7E-08	Geometric mean of applicable methods (Sauerbrei, Barr, Alyamani and Sen)

APPENDIX G

X-Ray Diffraction Results

QUANTITATIVE PHASE ANALYSIS AND CLAY SPECIATION OF FOUR POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

Project: ***CA-GLD-23590671/51600.51641***

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Reference number: 24-0065-COM-WSPB

February 21, 2024

METHOD

For quantitative analysis, the samples were reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone XRD Mill (Retsch GmbH, Germany) for 10 minutes. Continuous-scan X-ray powder-diffraction (XRD) data were collected over a range of 4-80°2θ with CoKα radiation on a Bruker D8 Advance Bragg-Brentano diffractometer equipped with a 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye-XE-T detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA.

For the clay speciation and identification, 1 g splits of the samples were taken for separation. Whole samples were placed in a 40 mL distilled water solution with a deflocculant and dispersed by sonication with an ultrasonic probe. The suspensions were centrifuged at 1400 r.c.f for 10 minutes to remove bulk minerals. The remaining clay suspension was decanted and vacuum filtered. The purified clay was smeared onto glass plates to create an (00*l)* orientated mount. X-ray powder-diffraction data were taken from 4-25 °2θ on the smear mounts in multiple steps. The purified clay fraction was measured by XRD, then placed in a glycol vapor chamber at 70 °C for 4 hours, then measured by XRD again to check for swelling clays. The sample was then heated to 400 °C for 1 hour, then measured by XRD, then heated again to 550 °C for 1 hour and measured by XRD to check for characteristic decomposition of certain clay species. High angle scans of randomly orientated clay fractions are taken as needed.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Bruker. X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1-4.

Some of the analyte(s) present were poorly crystalline clays. To fit these analytes, empirical models for poorly crystalline clays have been calibrated against reference clays from the Source Clays Project or the Pacific Museum of Earth at UBC using the PONKCS method (Scarlett and Madsen, Powder Diffr., Vol. 21, No. 4, December 2006).

The low angle scans of the purified clay and subsequent glycol and heat treatments are shown in Figures 5-8. The high sensitivity identification of clays was attained by a sequence of methods described by Moore and Reynolds (Moore, Duane Milton, and Robert C. Reynolds Jr. *X-ray Diffraction and the Identification and Analysis of Clay Minerals*. Oxford University Press (OUP), 1989). The methods used here are broadly in line with what is described more succinctly by Poppe *et al.* for the US geological survey (https://pubs.usgs.gov/of/2001/of01-041/index.htm). A brief explanation of the qualitative clay speciation interpretation is given in Table 2.

Table 1. Results of quantitative phase analysis (wt.%), clay species that swell when exposed to ethylene glycol are indicated.

Phase	**Ideal Formula**	**Swelling Clay**	**1-GA21-03 GS-12**	**2-GA23-07B T01**	**3-GA23-02 T02**	**4-GA21-08C T05**
Actinolite	$Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$		0.9	0.5	0.7	1.2
Anatase	TiO_2		0.2 (?)			
Calcite	$CaCO_3$		3.7	6.7	5.9	1.3
Clinochlore	$(Mg,Al)_6(Si,Al)_4O_{10}(OH)_8$	no	10.0	12.2	7.9	9.9
Diopside	$CaMgSi_2O_6$				2.3	1.5
Dolomite	$CaMg(CO_3)_2$		1.1	1.0	1.1	1.1
Hematite	α-Fe_2O_3			0.8	0.7	0.7
Illite – Smectite (mixed layer)	$\sim K_{0.65}Al_{2.0}(Al_{0.65}Si_{3.35}O_{10})(OH)_2$ – $(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$	yes	4.7	4.5	2.8	0.9
Illite-Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	no	27.9	25.7	19.9	16.8
Kaolinite	$Al_2Si_2O_5(OH)_4$	no	2.2	2.6	1.7	2.0
K-Feldspar (orthoclase)	$KAlSi_3O_8$		3.1	3.9	4.5	6.4
Laumontite	$CaAl_2Si_4O_{12} \cdot 4H_2O$			1.4	1.0	0.7
Magnetite	$Fe^{2+}Fe^{3+}{}_2O_4$		0.5 (?)		0.4 (?)	
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$	yes	5.3	9.6	4.8	13.5
Plagioclase (albite, anorthite)	$NaAlSi_3O_8$ – $CaAl_2Si_2O_8$		13.5	12.7	17.4	21.0
Quartz	SiO_2		26.4	18.2	28.4	22.3
Rutile	TiO_2		0.7 (?)	0.6 (?)	0.4 (?)	0.5 (?)
Total			**100**	**100**	**100**	**100**

Table 2: An explanation of the characteristic behaviour of each clay species identified during chemical and heat treatments. Identification given by Detected (D) and Not Detected (N/D). Swelling is indicated if a clay swells under exposure to ethylene glycol.

Identified Clay Phase	**Identification**	**Swelling**	**1-GA21-03 GS-12**	**2-GA23-07B T01**	**3-GA23-02 T02**	**4-GA21-08C T05**
Chlorite (clinochlore)	Sharp peaks at 14Å and 7Å	No	D	D	D	D
Illite – Smectite (mixed layer)	Broad peak at 12.5Å, swells to <17Å	Yes	D	D	D	D
Mica (illite-muscovite)	Sharp peak at 10Å, unchanged	No	D	D	D	D
Kaolinite	Peak at 7Å destroyed at 550ºC and Rietveld analysis	No	D	D	D	D
Dioctahedral Smectite (montmorillonite)	Broad peak at 14Å swells to 17Å	Yes	D	D	D	D

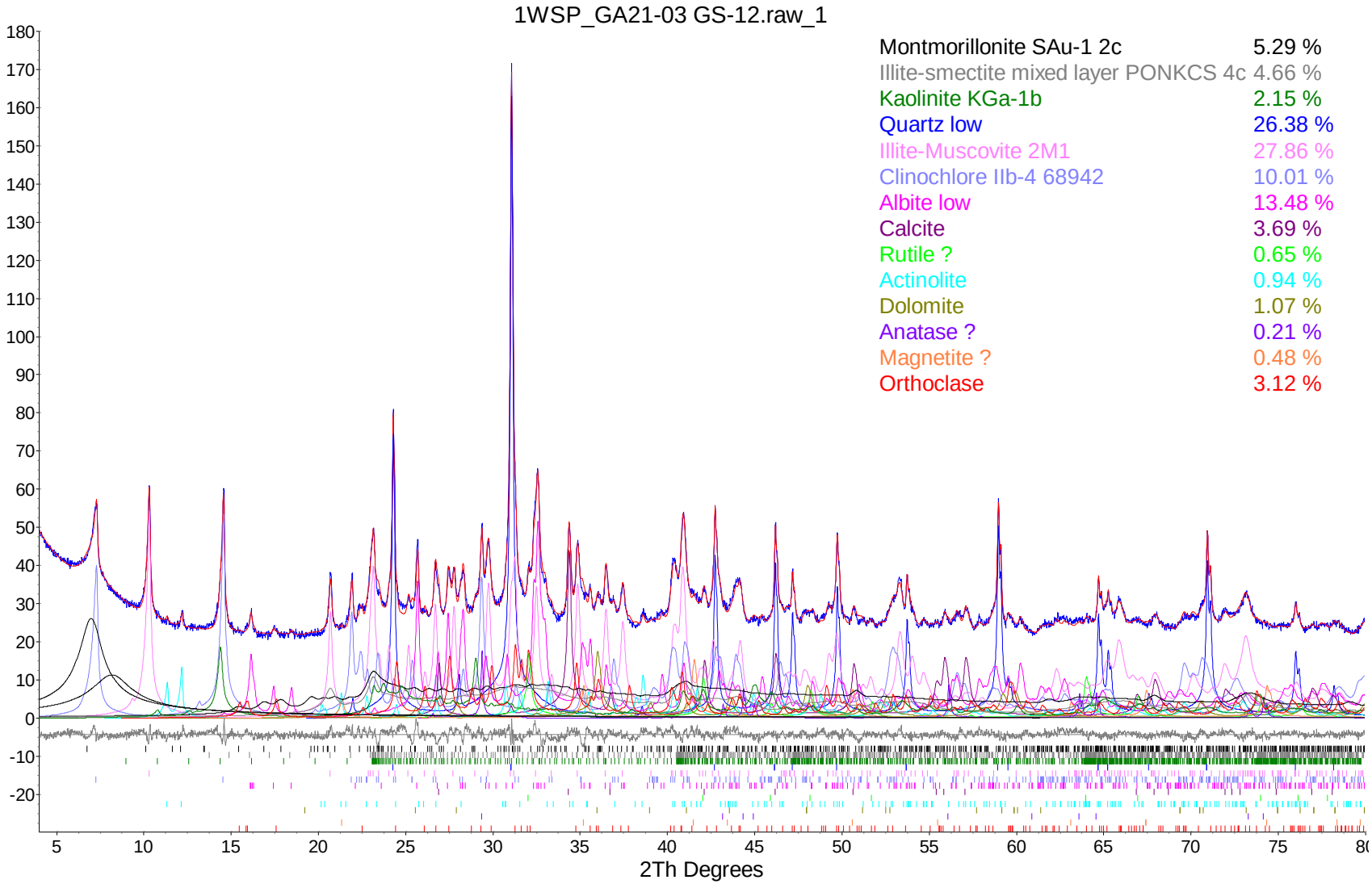

Figure 1. Rietveld refinement plot of sample **1 – GA21-03 GS-12** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.)

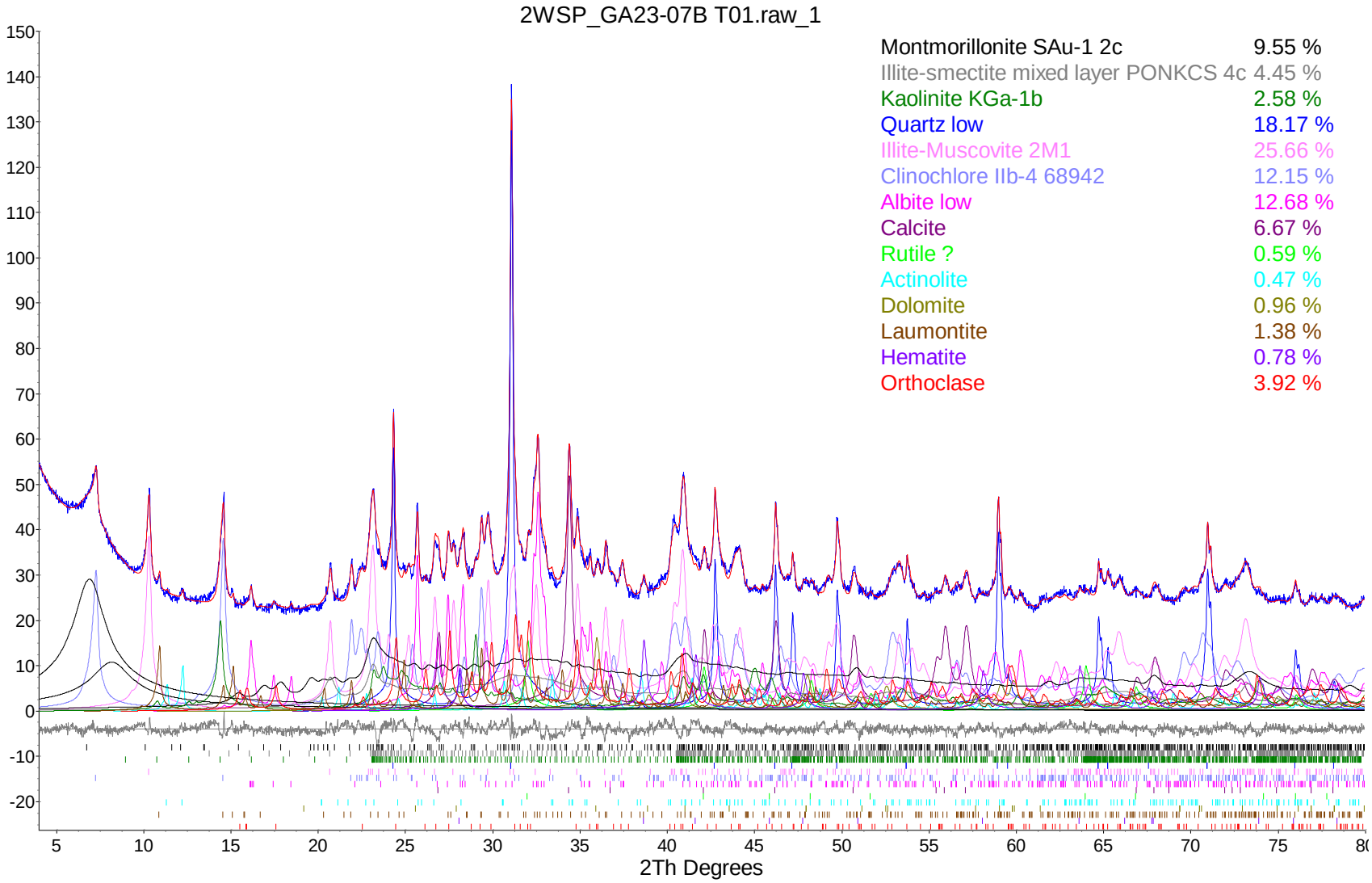

Figure 2. Rietveld refinement plot of sample **2- GA23-07B T01** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.)

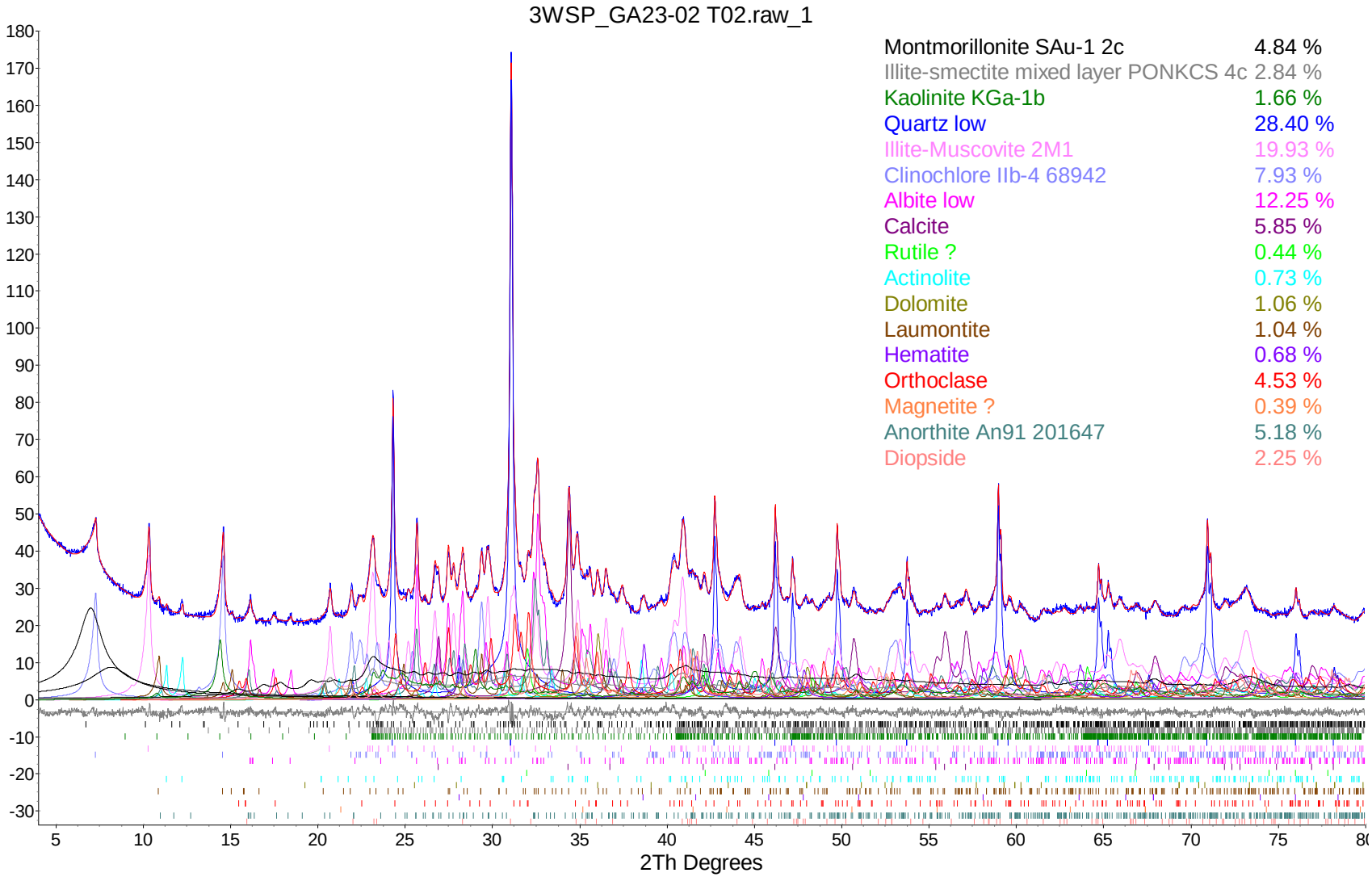

Figure 3. Rietveld refinement plot of sample **3- GA23-02 T02** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections. Coloured lines are individual diffraction patterns of all phases)

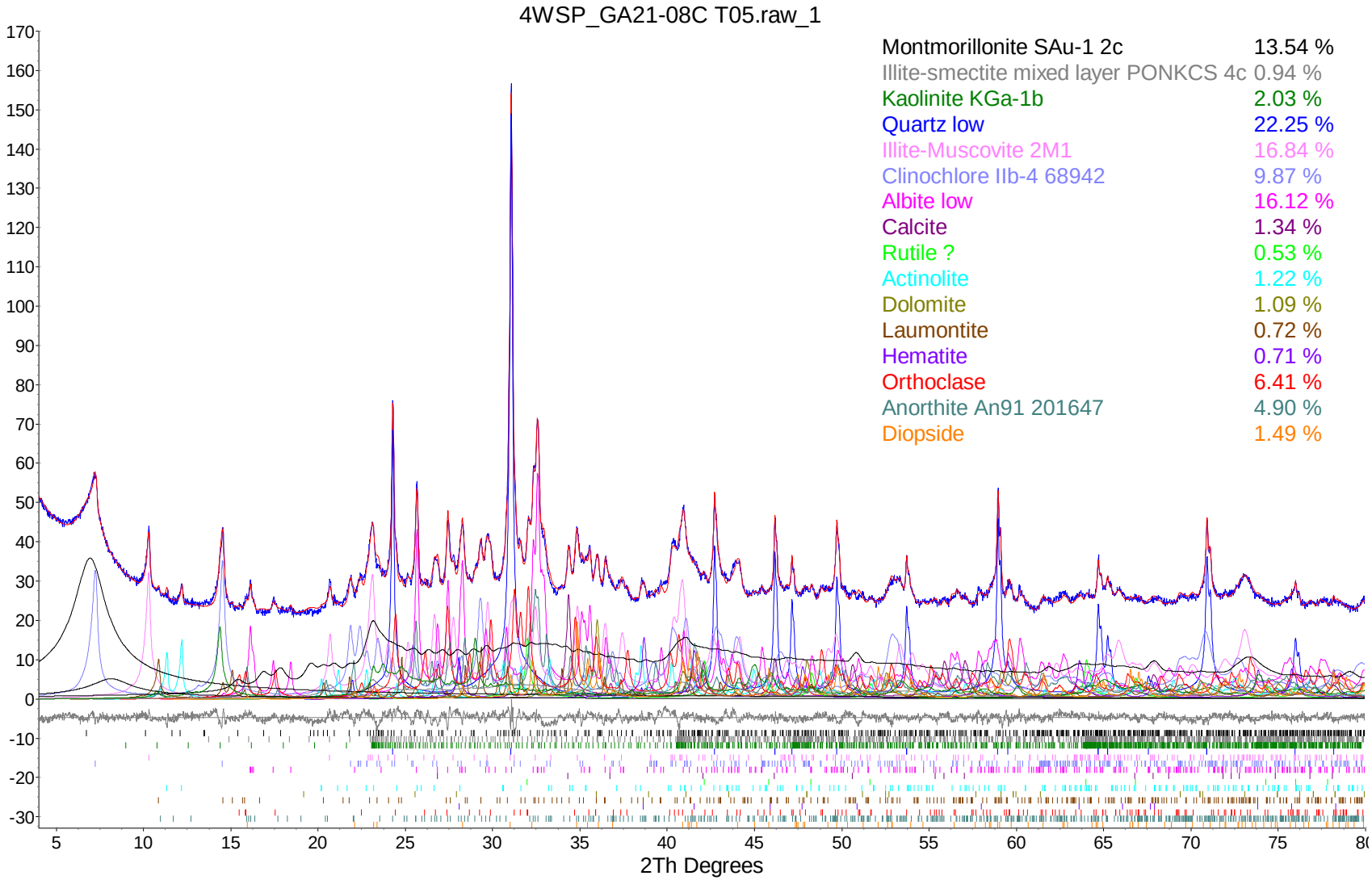

Figure 4. Rietveld refinement plot of sample **4 – GA21-08C T05** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections. Coloured lines are individual diffraction patterns of all phases.)

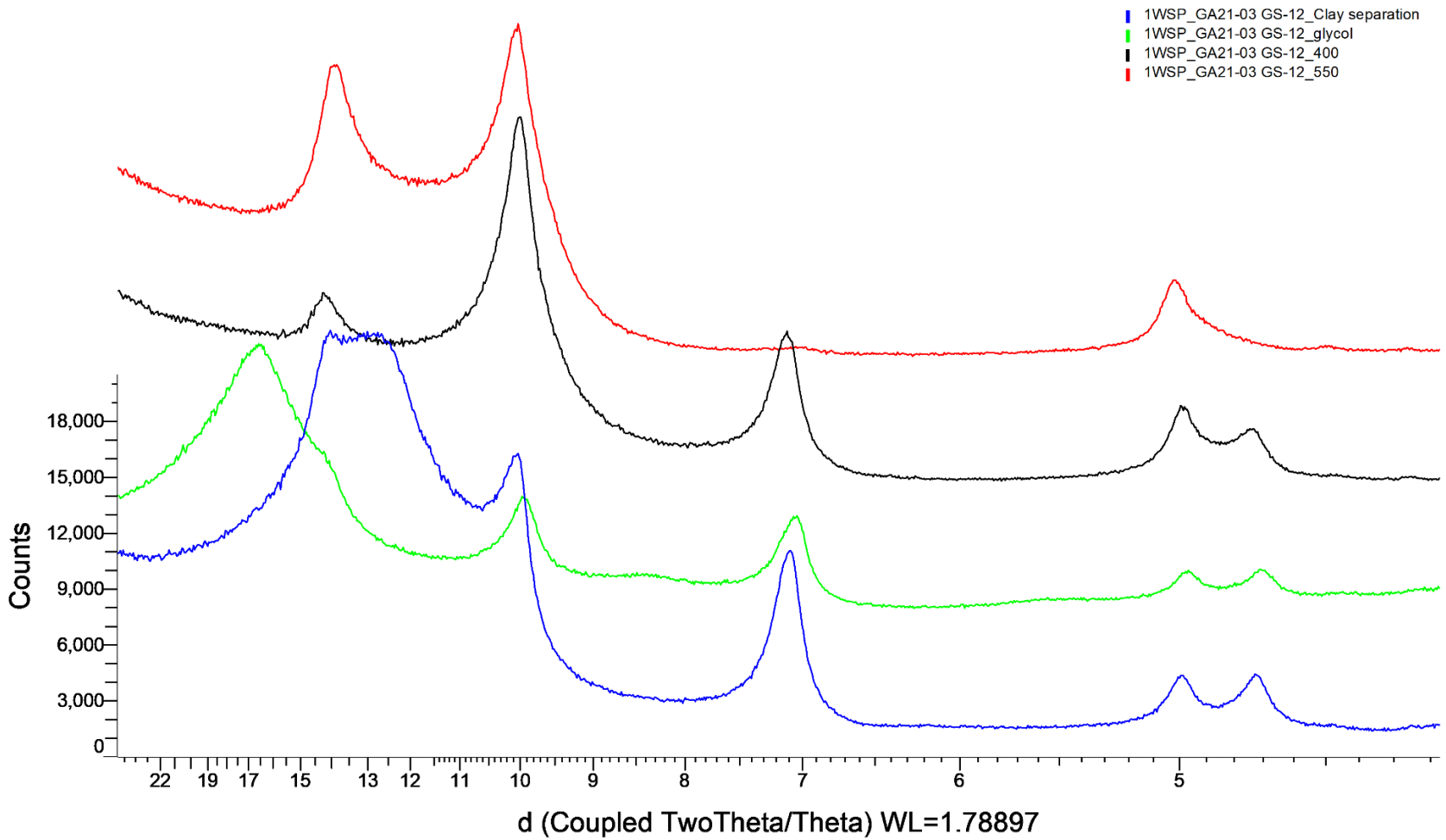

Figure 5: Powder diffraction data plots taken on the purified clay fraction of sample **1- GA21-03 GS-12**. Data patterns are offset in the y-axis for viewing ease. From bottom to top these patterns are; the untreated purified clay, the clay after glycol absorption in a vapor chamber, the clay after being heated to 400 ºC, and the clay after being heated to 550 ºC.

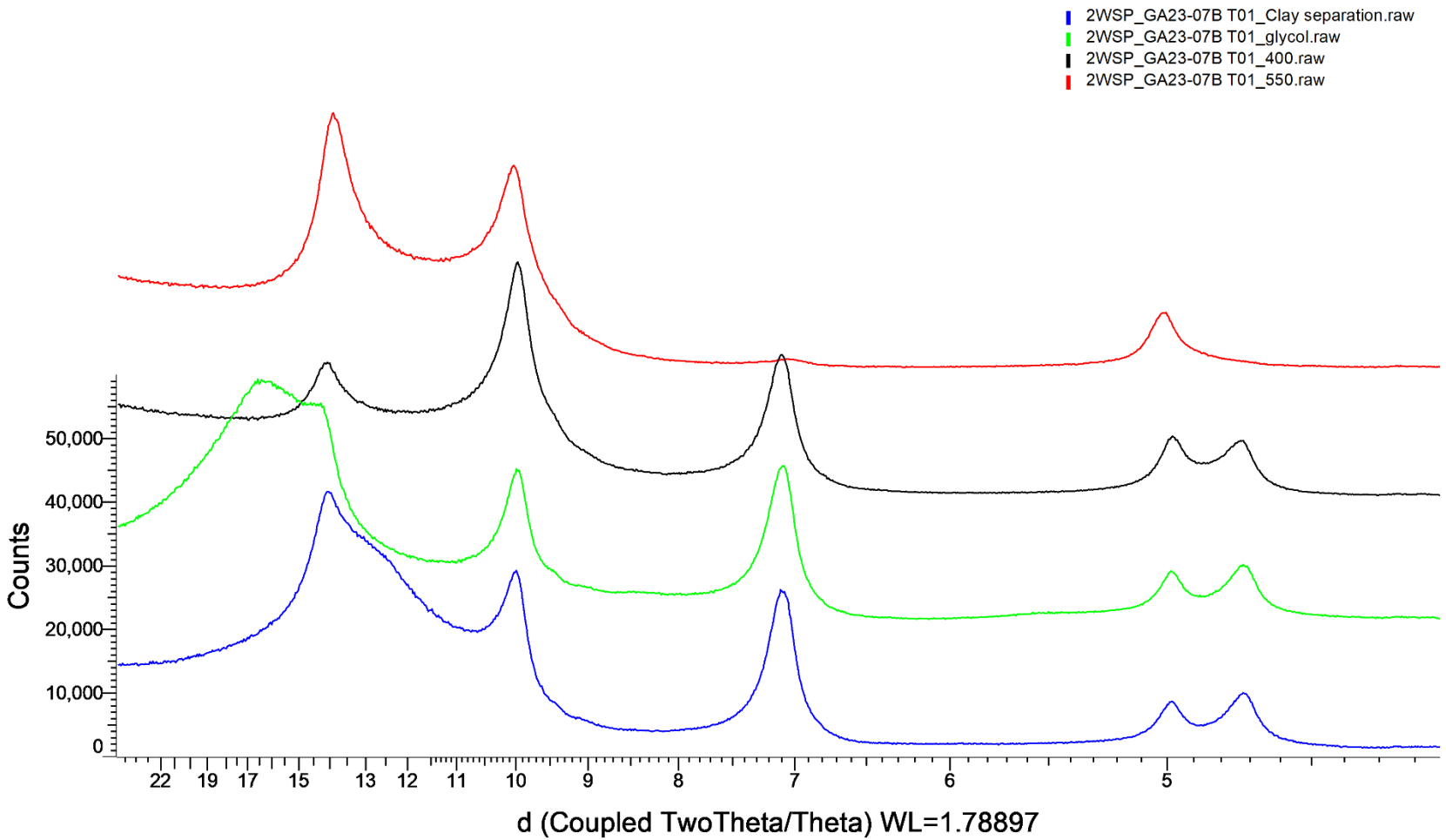

Figure 6: Powder diffraction data plots taken on the purified clay fraction of sample **2- GA23-07B T01**. Data patterns are offset in the y-axis for viewing ease. From bottom to top these patterns are; the untreated purified clay, the clay after glycol absorption in a vapor chamber, the clay after being heated to 400 ºC, and the clay after being heated to 550 ºC.

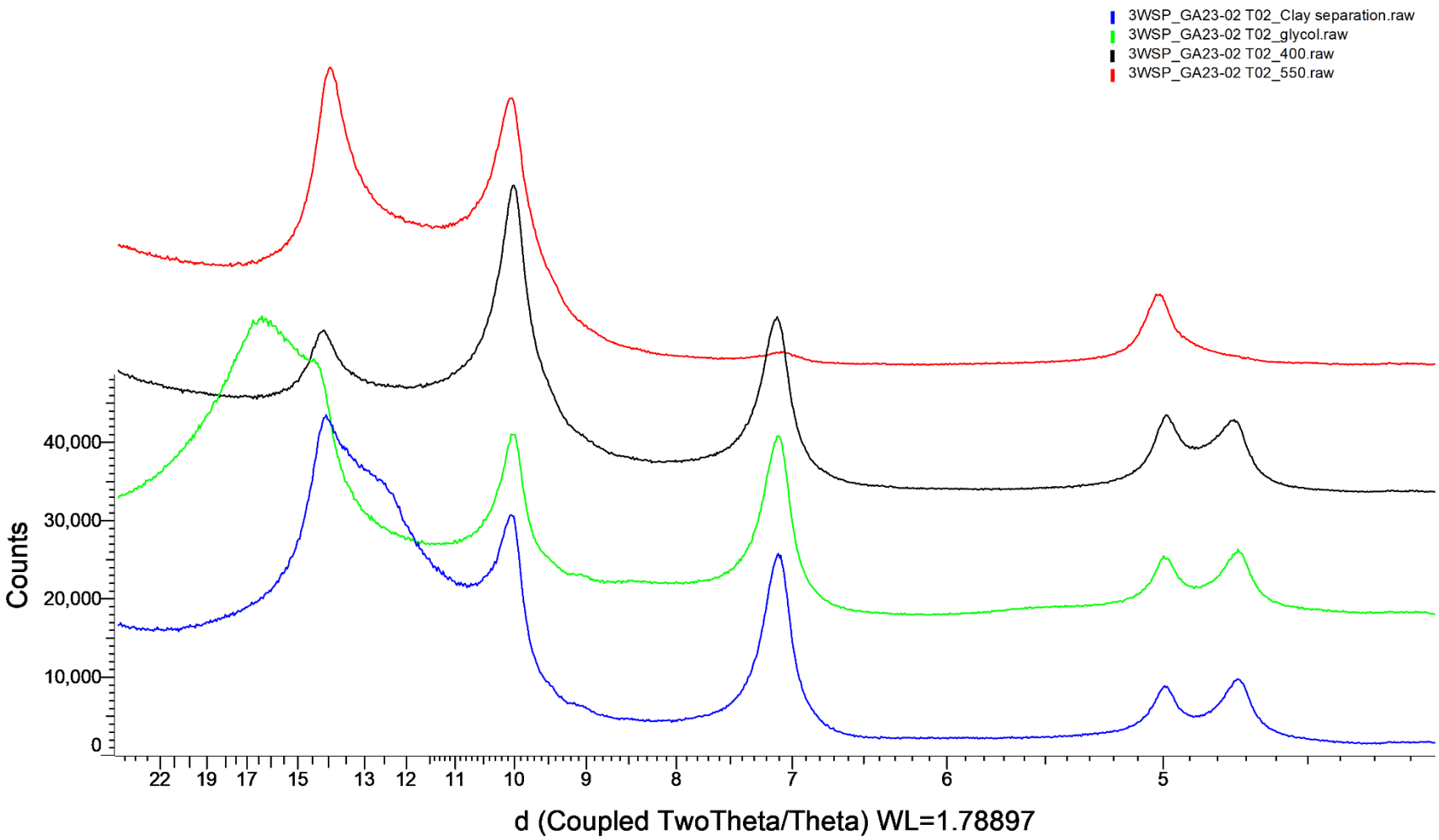

Figure 7: Powder diffraction data plots taken on the purified clay fraction of sample **3- GA23-02 T02**. Data patterns are offset in the y-axis for viewing ease. From bottom to top these patterns are; the untreated purified clay, the clay after glycol absorption in a vapor chamber, the clay after being heated to 400 ºC, and the clay after being heated to 550 ºC.

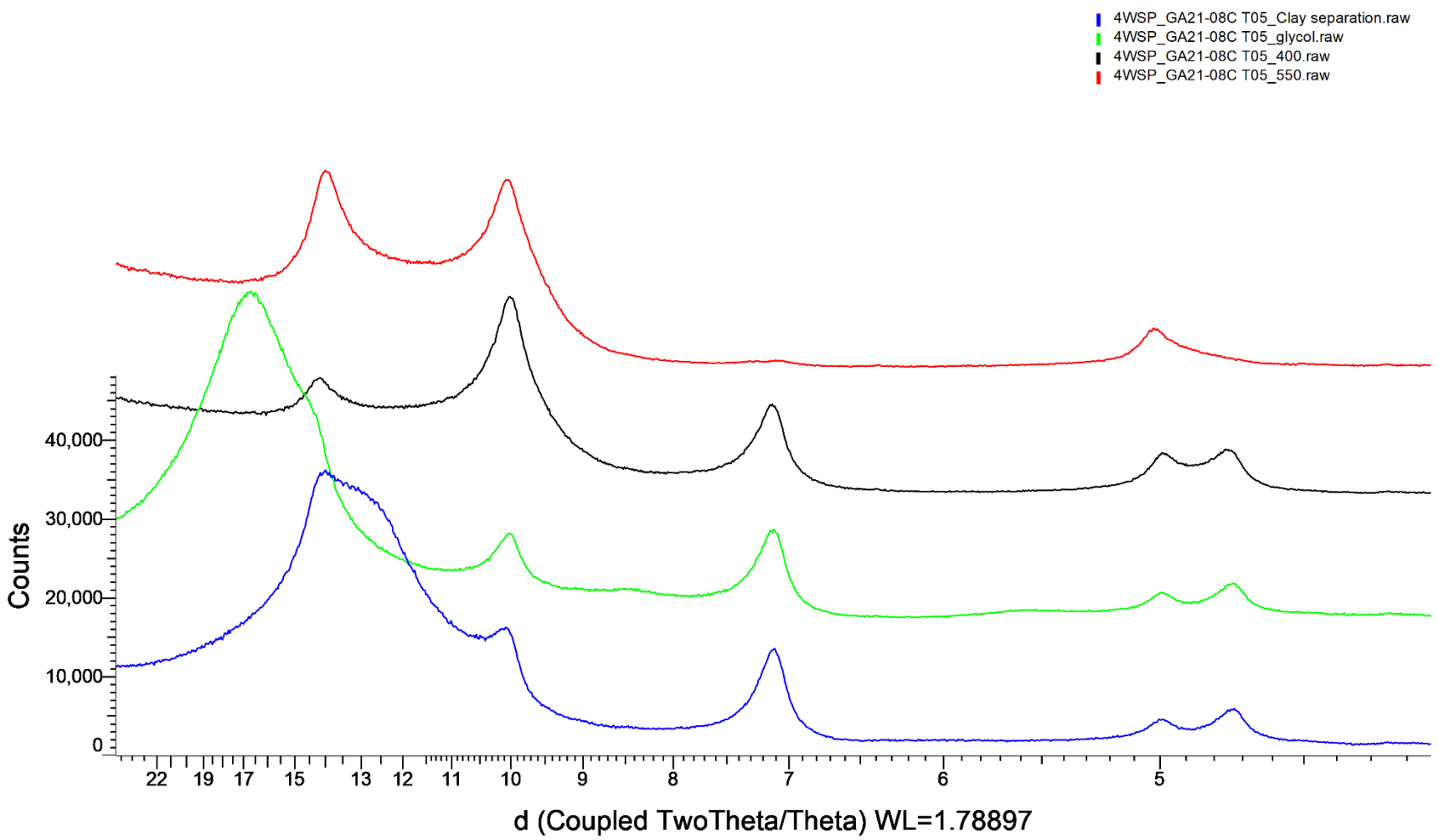

Figure 8: Powder diffraction data plots taken on the purified clay fraction of sample **4- GA21-08C T05**. Data patterns are offset in the y-axis for viewing ease. From bottom to top these patterns are; the untreated purified clay, the clay after glycol absorption in a vapor chamber, the clay after being heated to 400 ºC, and the clay after being heated to 550 ºC.

QUANTITATIVE PHASE ANALYSIS AND CLAY SPECIATION OF ONE POWDER SAMPLE USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

Project: ***23590671***

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Reference number: 24-0135-COM-WSPB

March 25, 2024

METHOD

For quantitative analysis, the sample was reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone XRD Mill (Retsch GmbH, Germany) for 10 minutes. Continuous-scan X-ray powder-diffraction (XRD) data were collected over a range of 4-80°2θ with CoKα radiation on a Bruker D8 Advance Bragg-Brentano diffractometer equipped with a 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye-XE-T detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA.

For the clay speciation and identification, a 1 g split of the sample was taken for separation. The sample was placed in a 40 mL distilled water solution with a deflocculant and dispersed by sonication with an ultrasonic probe. The suspension was centrifuged at 1400 r.c.f for 10 minutes to remove bulk minerals. The remaining clay suspension was decanted and vacuum filtered. The purified clay was smeared onto a glass plate to create an (00*l)* orientated mount. X-ray powder-diffraction data were taken from 4-25 °2θ on the smear mount in multiple steps. The purified clay fraction was measured by XRD, then placed in a glycol vapor chamber at 70 °C for 4 hours, then measured by XRD again to check for swelling clays. The sample was then heated to 400 °C for 1 hour, then measured by XRD, then heated again to 550 °C for 1 hour and measured by XRD to check for characteristic decomposition of certain clay species. High angle scans of randomly orientated clay fractions are taken as needed.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Bruker. X-ray powder-diffraction data of the sample was refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plot is shown in Figure 1.

Some of the analyte(s) present were poorly crystalline clays. To fit these analytes, empirical models for poorly crystalline clays have been calibrated against reference clays from the Source Clays Project or the Pacific Museum of Earth at UBC using the PONKCS method (Scarlett and Madsen, Powder Diffr., Vol. 21, No. 4, December 2006).

The low angle scans of the purified clay and subsequent glycol and heat treatments are shown in Figure 2. The high sensitivity identification of clays was attained by a sequence of methods described by Moore and Reynolds (Moore, Duane Milton, and Robert C. Reynolds Jr. *X-ray Diffraction and the Identification and Analysis of Clay Minerals*. Oxford University Press (OUP), 1989). The methods used here are broadly in line with what is described more succinctly by Poppe *et al.* for the US geological survey (https://pubs.usgs.gov/of/2001/of01-041/index.htm). A brief explanation of the qualitative clay speciation interpretation is given in Table 2.

Table 1. Results of quantitative phase analysis (wt.%), clay species that swell when exposed to ethylene glycol are indicated.

Phase	**Ideal Formula**	**Swelling Clay**	**GA23-01 (T04) 49.9m-50.5m**
Actinolite	$Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$		0.8
Calcite	$CaCO_3$		6.8
Clinochlore	$(Mg,Al)_6(Si,Al)_4O_{10}(OH)_8$	no	10.6
Diopside	$CaMgSi_2O_6$		1.6 (?)
Dolomite	$CaMg(CO_3)_2$		1.0
Illite – Smectite (mixed layer)	$\sim K_{0.65}Al_{2.0}(Al_{0.65}Si_{3.35}O_{10})(OH)_2$ – $(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$	yes	2.9
Illite-Muscovite 2M1	$KAl_2(AlSi_3O_{10})(OH)_2$	no	23.8
Kaolinite	$Al_2Si_2O_5(OH)_4$	no	2.0
K-Feldspar (orthoclase)	$KAlSi_3O_8$		4.1
Laumontite	$CaAl_2Si_4O_{12} \cdot 4H_2O$		1.2
Magnetite	$Fe^{2+}Fe^{3+}{}_2O_4$		0.4 (?)
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot nH_2O$	yes	7.2
Plagioclase (albite)	$NaAlSi_3O_8$ – $CaAl_2Si_2O_8$		14.9
Quartz	SiO_2		21.9
Rutile	TiO_2		0.9 (?)
Total			**100**

Table 2: An explanation of the characteristic behaviour of each clay species identified during chemical and heat treatments. Identification given by Detected (D) and Not Detected (N/D). Swelling is indicated if a clay swells under exposure to ethylene glycol.

Identified Clay Phase	**Identification**	**Swelling**	**GA23-01 (T04) 49.9m-50.5m**
Chlorite (clinochlore)	Sharp peaks at 14Å and 7Å	No	D
Illite – Smectite (mixed layer)	Broad peak at 12.5Å, swells to <17Å	Yes	D
Mica (illite-muscovite)	Sharp peak at 10Å, unchanged	No	D
Kaolinite	Peak at 7Å destroyed at 550ºC and Rietveld analysis	No	D
Dioctahedral Smectite (montmorillonite)	Broad peak at 14Å swells to 17Å	Yes	D

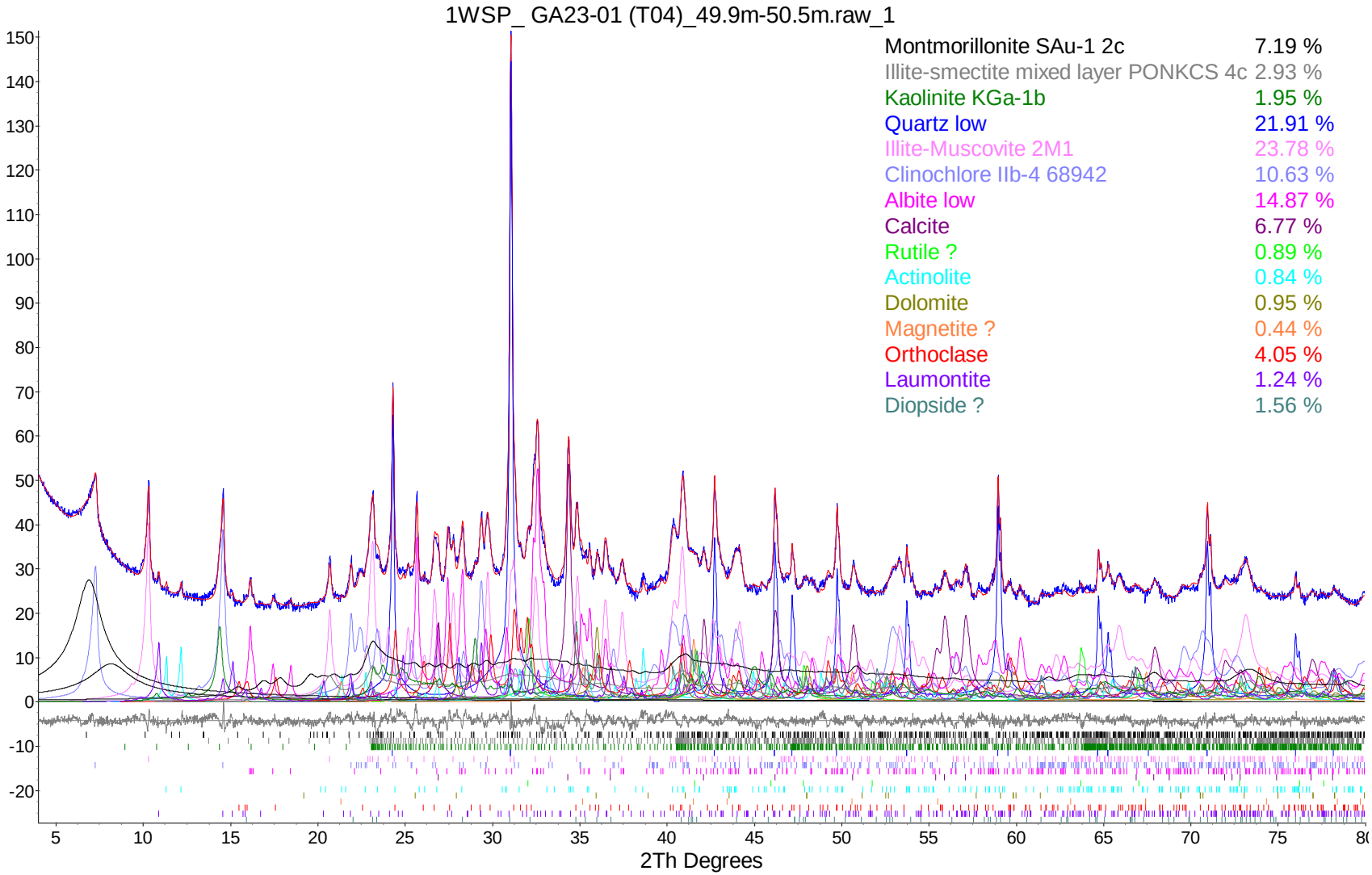

Figure 1. Rietveld refinement plot of sample **GA23-01 (T04) 49.9m-50.5m** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.)

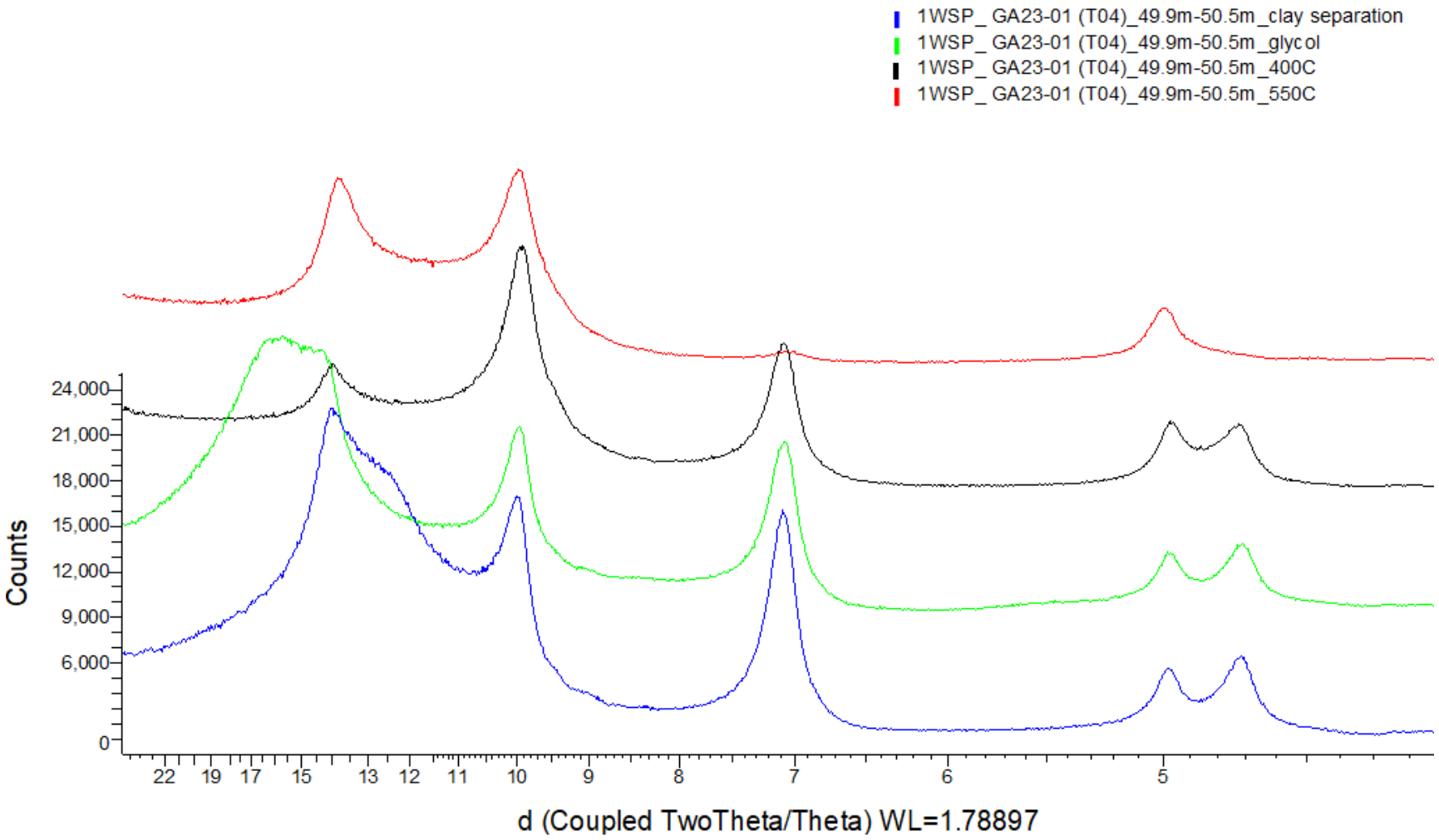

Figure 2: Powder diffraction data plots taken on the purified clay fraction of sample **GA23-01 (T04) 49.9m-50.5m**. Data patterns are offset in the y-axis for viewing ease. From bottom to top these patterns are; the untreated purified clay, the clay after glycol absorption in a vapor chamber, the clay after being heated to 400 ºC, and the clay after being heated to 550 ºC.

https://golderassociates.sharepoint.com/sites/10023g/50000_TSF_ENGINEERING/Forms/AllItems.aspx?csf=1&web=1&e=nYBCs9&ovuser=3d234255%2De20f%2D4205%2D88a5%2D9658a402999b%2Cscott%2Ecoombs%40wsp%2Ecom&OR=Teams%2DHL&CT=1661378880663&clickparams=eyJBcHBOYW1lIjoiVGVhbXMtRGVza3RvcCIsIkFwcFZlcnNpb24iOiIyNy8yMjA3MzEwMTAwNSIsIkhhc0ZlZGVyYXRlZFVzZXIiOnRydW
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Borehole Location	Borehole	Source	Clay Species (wt%)					
			Illite-Smectite (mixed layer)	Illite-Muscovite 2M1	Kaolinite	Montmorillonite	Smectite	Clinochlore
Main Embankment	GA21-08C (TO5)	WSP (2024a)	0.9	16.8	2	13.5	-	9.9
Perimeter Embankment	GA21-03 (GS-12)	WSP (2024a)	4.7	27.9	2.2	5.3	-	10
	SH14-01A (G16)	KCB (2015c)	-	20.3	-	-	9	12.8
Perimeter Embankment at Corner 1	GA23-07 (TO1)	WSP (2024a)	4.5	25.7	2.6	9.6	-	12.2
	GA23-02 (TO2)		2.8	19.9	1.7	4.8	-	7.9
	GA23-01 (TO4)		2.9	23.8	2	7.2	-	10.6
	SH14-03 (G24)	KCB (2015c)	-	18.8	2.5	-	9	13.1
	SH14-04 (G24)		-	23.1	4.4	-	11	12.1
	SH14-22A (G12)		-	18.6	2.1	-	9	11.6
	SH14-10 (G17)		-	19.5	-	-	5	16.2
	SH14-10 (G21)		-	19.6	-	-	5	12.6
	SH14-02A (G29)		-	22.2	-	-	8	10.4
	SH14-02A (G25)		-	18.7	-	-	9	12.1

a) wt.%: weight percentage.

REFERENCES/NOTES

1. WSP samples were tested for illite-muscovite 2M1 and clinochlore while KCB samples were tested for illite/muscovite with an unspecified muscovite polytype and chlorite, respectively. The KCB results are listed under illite-muscovite 2M1 and clinochlore in the table for ease of comparison.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

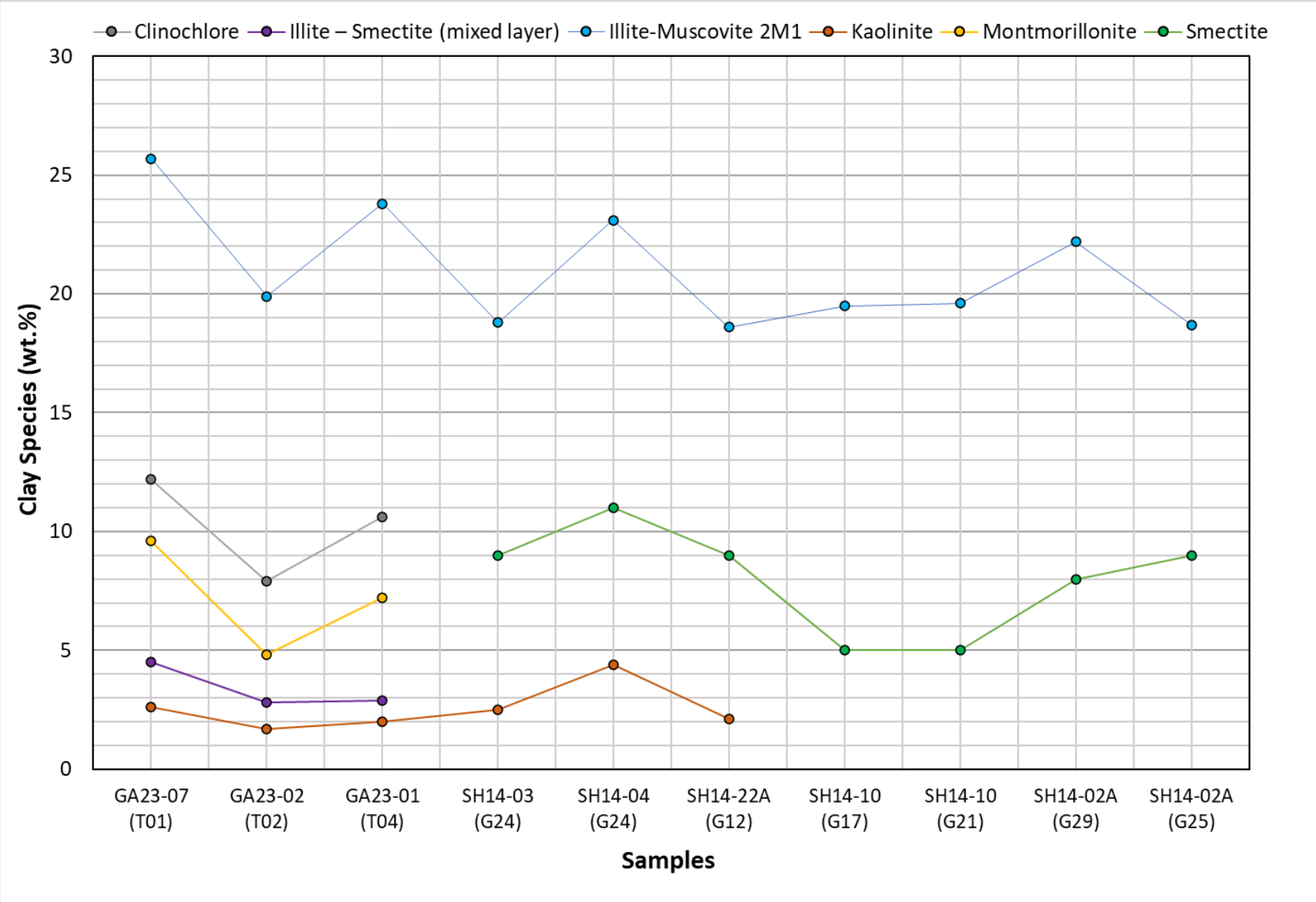
YYYY-MM-DD	2024-12-18
PREPARED	E. Dina
DESIGNED	E. Dina
REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
QUANTITATIVE PHASE ANALYSIS AND CLAY SPECIATION RESULTS – SUMMARY OF SELECT MINERALS

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	**51300**	**51392**	**1**	**G-1**

https://golderassociates.sharepoint.com/sites/10023g/50000_TSF_ENGINEERING/Forms/AllItems.aspx?csf=1&web=1&e=nYBCs9&ovuser=3d234255%2De20f%2D4205%2D88a5%2D9658a402999b%2Cscott%2Ecoombs%40wsp%2Ecom&OR=Teams%2DHL&CT=1661378880663&clickparams=eyJBcHBOYW1lIjoiVGVhbXMtRGVza3RvcCIsIkFwcFZlcnNpb24iOiIyNy8yMjA3MzEwMTAwNSIsIkhhc0ZlZGVyYXRlZFVzZXIiOnRydWV9&cid=9dc739fa%2De3f1%2D4631%2Dabbf%2Dce95a81677b4&RootFolder=%2Fsites%2F10023g%2F50000%5FTSF%5FENGINEERING%2F51300%5FUltimate%5FDesign%2F51331%5F2021%20Site%20Investigation%2FCPT%2FCPTu%20Interpretation&FolderCTID=0x012000ECCF7810C0D4C94D91E590ED93C22946



REFERENCES/NOTES

1. WSP samples were tested for illite-muscovite 2M1 and clinochlore while KCB samples were tested for illite/muscovite with an unspecified muscovite polytype and chlorite, respectively. The KCB results are listed under illite-muscovite 2M1 and clinochlore in the table for ease of comparison.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
wsp

YYYY-MM-DD	2024-12-18
PREPARED	E. Dina
DESIGNED	E. Dina
REVIEWED	A. Bayoumi
APPROVED	G. Pizarro-Sala

PROJECT
MOUNT POLLEY MINE
TAILINGS STORAGE FACILITY
FOUNDATION CHARACTERIZATION REPORT

TITLE
QUANTITATIVE PHASE ANALYSIS AND CLAY SPECIATION RESULTS - SUMMARY OF SELECT MINERALS AT CORNER 1

PROJECT NO.	PHASE	TASK	REV.	FIGURE
22514095	**51300**	**51392**	**1**	**G-2**

APPENDIX H

Assurance Statements

APPENDIX A-1: DESIGN ENGINEER'S SITE CHARACTERIZATION ASSURANCE STATEMENT

To: The Owner(s) Date: February 6, 2025

Name: Mount Polley Mining Corporation

Address: PO Box 12, Likely, BC, V0L 1N0

For the dam:

UTM (Location): Zone IOU; Easting 595,768; Northing 5,818,548

Located at (Description): near Likely, BC

Name of dam or description: Mount Polley Tailings Storage Facility

Provincial dam number: Permit M-200

Dam function: Tailings Storage

Current *project stage* is:

Check one

☐ Feasibility design
☐ Detailed design
▪ Construction/operations

The undersigned hereby gives assurance that he/she is a qualified APEGBC-registered professional and is a professional engineer and is the **Design Engineer** for the dam project identified above.

I have signed, sealed, and dated the attached dam site characterization report in accordance with the *APEGBC Professional Practice Guidelines – Site Characterization for Dam Foundations in BC*. The report must be read in conjunction with this Assurance Statement.

In preparing the dam site characterization report, I have completed the following activities:

(Check the applicable items)

Completed by the Design Engineer	Activity
X	Collected and reviewed available and relevant background information, documentation, and data
X	Visited the site and reviewed the conditions in the field that may be relevant for site characterization
X	Developed and executed a site characterization program that provides information to support the design of the dam, subject to the qualifications noted
X	Reviewed previous site characterization studies and data and updated the dam site characterization assessment report to include all data and, where appropriate, revised interpretations of data
X	Assessed potential areas of risk identified during site characterization programs to date and, as far as is practical, addressed the risks
X	Evaluated the level of complexity of the site and documented how it was assessed and supported by the site characterization program(s)
X	Reviewed and accepted all assurance statements submitted by the supporting registered professionals (SRPs)
X	Prepared a data record report
X	Prepared the dam site characterization report, which interprets the site conditions

In preparing the dam site characterization report, I have completed the following activities or reviewed and accepted such activities completed by a supporting registered professional (SRP):

(Check the applicable items)

Completed by the Design Engineer	Completed by the SRP, and reviewed and accepted by the Design Engineer	Activity
	X	Assessed the surficial and bedrock geological models to confirm that they adequately support the understanding of the spatial variability of the geotechnical properties of the foundation materials
X		Carried out sufficient in situ and laboratory testing to quantify the geotechnical properties of the foundation materials
X		Assessed the strength properties of the foundation materials with consideration of stress state and response to loadings
	X	Assessed the hydrogeological properties of the foundation materials with consideration of potential hydraulic gradients, artesian pressures, and seepage flow paths
	X	Assessed the seismotectonic conditions to provide a basis for the seismic hazard analysis of the dam
X	X	Evaluated the level of complexity of the site and documented how it was assessed and supported by the site characterization program(s)
X		Reviewed and accepted all assurance statements submitted by the supporting registered professionals (SRPs)
X	X	Prepared a data record report
X	X	Prepared the dam site characterization report, which interprets the site conditions

I hereby give my assurance that based on the attached dam site characterization report, at this point in time:

Check one

- [x] The dam site characterization report is reasonably comprehensive and supports the design of the dam.
- [ ] The dam site characterization report is not sufficiently comprehensive to support the design of the dam, in that the dam site characterization report identifies areas of potential concern that require additional investigation as set out in section(s) _____ of the attached dam site characterization report

Name: (print) Germán Pizarro

Signature: _____ Date: February 6, 2025

Address: 840 Howe Street, #1000, Vancouver, BC, V6Z 2M1

(Affix professional seal here)

Telephone: 604 787 2166

Email: german.pizarro@wsp.com

2025-02-06

(If the APEGBC professional is a member of a firm, complete the following)

I am a member of the firm WSP Canada Inc.

(Print name of firm)

and I sign this letter on behalf of the firm.

APPENDIX A-2: SUPPORTING REGISTERED PROFESSIONAL'S ASSURANCE STATEMENT OF PROFESSIONAL SERVICES

To: The Design Engineer Date: 6 February 2025

Name: Connie Romano

Address: WSP Canada Inc

840 Howe Street, #1000, Vancouver BC, V6Z 2M1, Canada

For the dam:

UTM (Location): Zone: IOU; Easting 595768.72 m; Northing 5818548.36 m

Located at (Description): near Likely, British Columbia

Name of dam or description: TSF Embankment

Dam function: tailings storage

Owned by: Mount Polley Mining Corporation (MPMC)

Current project stage is:

Check one

☐ Feasibility design
☐ Detailed design
☒ Construction/operations

This is to advise that the undersigned is a **supporting registered professional** (SRP) retained by MPMC to carry out supporting professional services for the dam.

I undertook supporting professional services in the following:

(Check applicable sections)

☐ Bedrock/structural geology
☐ Surficial geology
☐ Geotechnical investigations
☒ Hydrogeology
☐ Seismotectonic investigations
☐ Other

The undersigned hereby gives assurance that the

hydrogeological and geochemical assessment

and the documents prepared by this supporting registered professional for the project have been carried out in a manner that meets the intent of the applicable APEGBC guidelines and good professional practice.

These professional services are described, and the results of them reported on in the documents prepared by me, or under my direct supervision, which bear my professional seal.

(With respect to field reviews, initial the following statements, as applicable. Leave blank those that are not applicable.)

_____ Field review(s) are not applicable

_____ Field review(s) are applicable:

_____ I have performed field review(s) for the services identified above. (field review: 30 May 2022 to 1 June 2022)

_____ Field review(s) have been performed by_____.

I confirm that I have communicated and liaised as required with the appropriate APEGBC professionals for the purposes of my services.

I hereby give my assurance that I am an APEGBC-registered professional.

Name: (print) Connie Romano

Signature: _____ Date: 6 February 2025

Address: WSP Canada Inc.

840 Howe St. #1000, Vancouver BC, V6Z 2M1

Telephone:

Email: connie.romano@wsp.com

(If the APEGBC professional is a member of a firm, complete the following)

I am a member of the firm WSP Canada Inc.

(Print name of firm)

and I sign this letter on behalf of the firm.

APPENDIX A-2: SUPPORTING REGISTERED PROFESSIONAL'S ASSURANCE STATEMENT OF PROFESSIONAL SERVICES

To: The Design Engineer Date: 06 February 2025

Name: Jeffrey Fillipone, PhD, PGeo (BC)

Address: WSP Canada Inc

WSP Canada Inc. 301-3600 Uptown Blvd. Victoria, BC V8Z 0B9

For the dam:

UTM (Location): Zone: UTM Zone 10, Easting 595768.72 m; Northing 5818548.36 m

Located at (Description): Near Likely, British Columbia

Name of dam or description: TSF Embankment

Dam function: Tailings storage

Owned by: Mount Polley Mining Corporation (MPMC)

Current project stage is:

Check one

☐ Feasibility design
☐ Detailed design
☒ Construction/operations

This is to advise that the undersigned is a **supporting registered professional** (SRP) retained by MMPC to carry out supporting professional services for the dam.

I undertook supporting professional services in the following:

(Check applicable sections)

☒ Bedrock/structural geology
☒ Surficial geology
☐ Geotechnical investigations
Hydrogeology
☒ Seismotectonic investigations
☐ Other

The undersigned hereby gives assurance that the surficial geology, bedrock geology, seismotectonics and the documents prepared by this supporting registered professional for the project have been carried out in a manner that meets the intent of the applicable APEGBC guidelines and good professional practice.

These professional services are described, and the results of them reported on in the documents prepared by me, or under my direct supervision, which bear my professional seal.

(With respect to field reviews, initial the following statements, as applicable. Leave blank those that are not applicable.)

_____ Field review(s) are not applicable

_____ Field review(s) are applicable:

__X__ I have performed field review(s) for the services identified above. field reviews: 30 May 2022 to 1 June 2022))

_____ Field review(s) have been performed by _____.

I confirm that I have communicated and liaised as required with the appropriate APEGBC professionals for the purposes of my services.

I hereby give my assurance that I am an APEGBC-registered professional.

Name: (print) Jeffrey Fillipone

Signature: Date: 06 February 2025

Address: WSP Canada Inc.
301-3600 Uptown Blvd., Victoria, BC V8Z 0B9, Canada

Telephone: 250-419-4917

Email: Jeff.fillipone@wsp.com

(If the APEGBC professional is a member of a firm, complete the following)

I am a member of the firm. WSP Canada Inc
(Print name of firm)

and I sign this letter on behalf of the firm.

wsp.com

APPENDIX 3-4: 2024 SITE WIDE WATER BALANCE MODEL UPDATE AND CALIBRATION

TECHNICAL MEMORANDUM

DATE March 21, 2025 **Reference No.** CA0020527.4505-011-TM-Rev0-31141

TO Matt O'Leary
Mount Polley Mining Corporation

FROM Stella Cheng, Theoclea Swiech, and Curtis VanWerkhoven **EMAIL stella.cheng@wsp.com; theoclea.swiech@wsp.com; curtis.vanwerkhoven@wsp.com**

2024 SITE WIDE WATER BALANCE MODEL UPDATE AND CALIBRATION – MOUNT POLLEY MINE

1.0 INTRODUCTION

Mount Polley Mining Corporation (MPMC) retained WSP Canada Inc. (WSP) to provide water balance modelling services to update and calibrate the Site Wide Water Balance Model (SWWBM) in support of MPMC's 2024 Annual Report. This exercise is a requirement of Section 4.2.1 (f) of MPMC's Discharge Permit 11678, issued under the *Environmental Management Act* and most recently amended through a Consent Order on December 31, 2020, (BC ENV 2020).

The SWWBM was developed using GoldSim™, a highly graphical software package for carrying out dynamic, probabilistic simulations to support decision-making (GoldSim 2018). GoldSim™ is frequently used to evaluate water management alternatives, perform sensitivity analyses, and conduct mass balance simulations.

The SWWBM was developed as part of the Mount Polley Mine Resumed Operations and Closure Water Management Plan Permit Amendment Application and Technical Assessment Report (Golder 2016a) to model water management across the site (e.g., runoff, water transfers, and storage). The details of the SWWBM were first presented in the Mount Polley Mine Water Balance report (Golder 2016b).

On May 26, 2019, Mount Polley Mine (the Mine) entered a care and maintenance phase. On June 1, 2022, the Mine resumed operations under the current EMA Permit 11678. Mining and tailings deposition occurred throughout 2024.

WSP updated the SWWBM in March 2024 to calibrate water volumes, water levels and discharges in the Tailings Storage Facility (TSF) for the period from January 1, 2023 to December 31, 2023 (WSP 2024a). An updated Water Balance Report was presented in 2023 (WSP 2023a) as part of the Water Management Plan for the Springer Expansion Life-of-Mine update (WSP 2023b).

This technical memorandum describes updates to the SWWBM to reflect site conditions in 2024, and calibration to measured water levels in the TSF for the period from January 1, 2024, to December 31, 2024. A summary of the model updates, the assumptions made in the calibration process, a discussion of the calibration results, and the end-of-year water balance for the Mine, are included in this document.

2.0 SITE WIDE WATER BALANCE MODEL UPDATE

2.1 Data Received

MPMC provided WSP with measured data from site (MPMC 2025a), including the following:

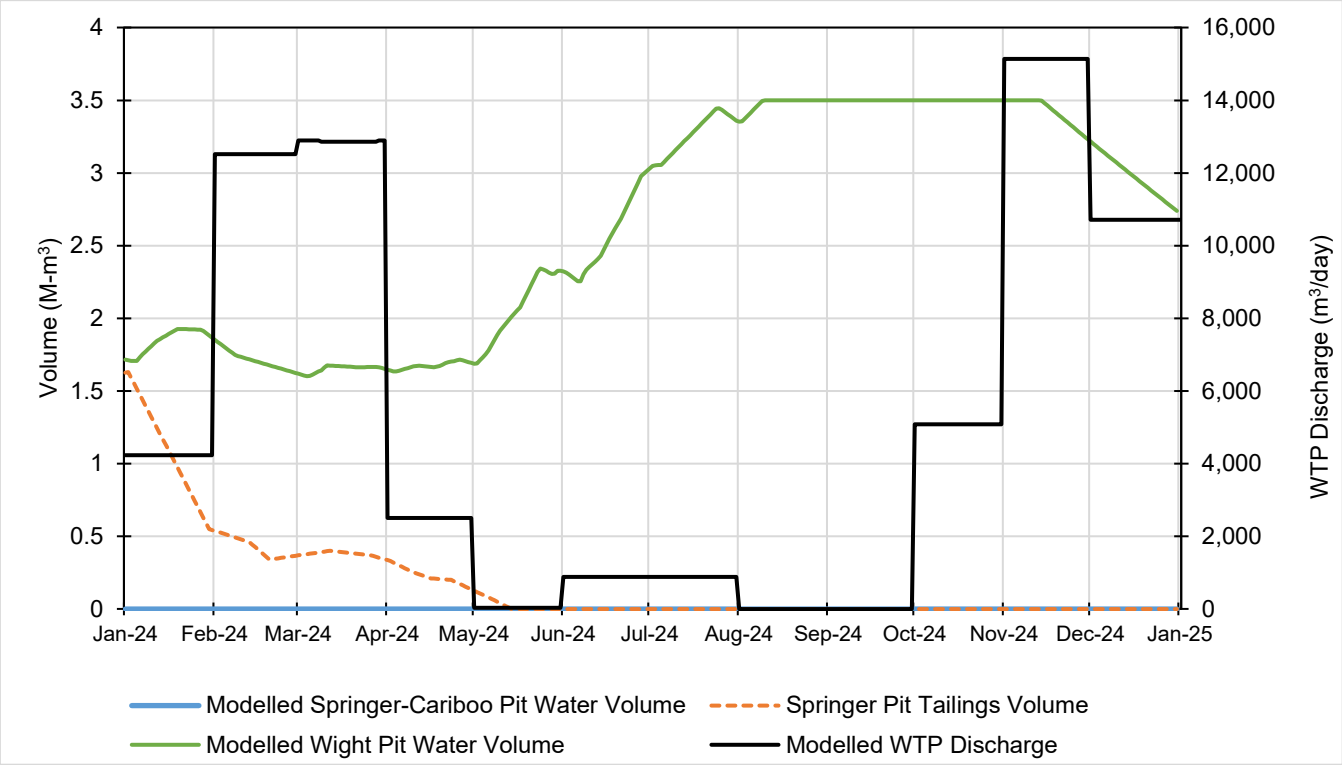
- "Snow Pack 2024.xlsx" Periodic snowpack measurements (snow water equivalent [SWE]).
- "TSF Water Balance Jan 24, 2023 v3.xlsx" Periodic Springer Pit, Cariboo Pit and Wight Pit water level measurements in 2024 (m, mine grid).
- "2024 all weather station data.xlsx" 2024 climate data from site – including rainfall (mm), daily temperature (ºC) and evaporation (mm).
- "HMI WTP 2024 Total.xlsx" Monthly discharge of treated water (m^3) through the water treatment plant (WTP).
- "Weekly TSF Reports.pdf" TSF reclaim pond water level measurements (m, tailings grid), Springer Pit remaining tailings (M-m^3), and measured flows from Cariboo Booster to Mill throughout 2024.
- "2024 Monthly Tailings Tonnage.xlsx" Tailings deposited in the TSF throughout 2024 (tonnes).

2.2 Summary of Model Updates

Through discussions with MPMC, the SWWBM was updated to reflect site water management operations for the period of January 1, 2024 to December 31, 2024. The model updates were as follows:

- Tailings discharge from the ore processing plant to the TSF throughout 2024.
- Process plant inflows come not only from the TSF but also from Cariboo Booster, Wight Pit, and NEZ Dump. Recorded inflows from Cariboo Booster are used as direct input in the calibration model, as these flows were more case-specific (MPMC 2025b) rather than assigning a fixed flow capacity in the SWWBM.
- After meeting the Process Plant's water demand, water from the TSF Booster and NEZ Booster Sump is transferred to SERDS ditch and Wight Pit, respectively.
- Starting in 2024, Springer-Cariboo Pit is now modelled as a single combined pit instead of two separate pits.
- The discharge to the environment through the WTP was updated. The volume of WTP discharge saw a significant decline in mid-2024 due to the WTP being offline from April 9, 2024 to October 17, 2024, (MPMC 2025a). Monthly discharge volumes through the WTP are shown on Figure 1.
- Water from Wight Pit was transferred to the WTP via Long Ditch for treatment and discharge and to the Process Plant via NEZ Booster Sump in 2024. A time series plot of the modelled total water volume in Wight Pit is shown in Figure 1.
- Springer-Cariboo Pit was actively dewatered throughout 2024, resulting in low or no accumulated water in the pit sump. A time series plot of the modeled total water volume in Springer-Cariboo Pit is shown in Figure 1.

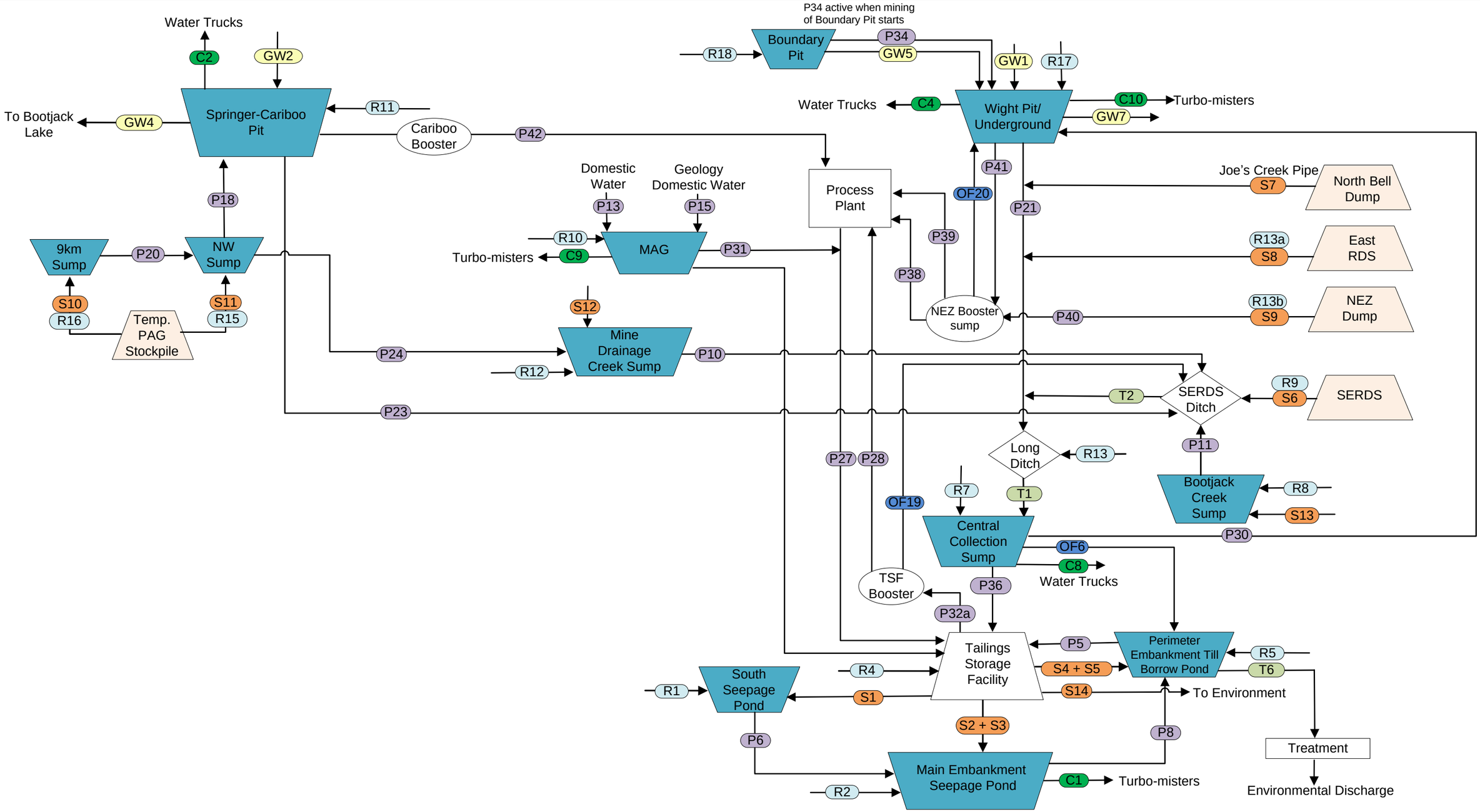
Additional details related to the use of available surveys are provided in the following section. The SWWBM flow diagram has been updated to reflect the flow paths between the facilities for 2024, as illustrated in Figure 2.



Note: The primary y-axis unit (M-m^3) denotes millions of cubic meters.

Stored water volume = surface water volume + voids water volume

Figure 1: Springer-Cariboo, Wight Pits Modelled Volumes and WTP Discharge Modelled Flow Rate



Runoff (R)
Seepage Flow (S)
Water consumption (C)
Pumped Flows (P)
Groundwater Flows (GW)
Transfer Flows (T)
Flow Path

Note:
(a) Evaporation and Direct Precipitation are modelled for all ponds, but are not shown on this diagram.
(b) Flow quantity may fluctuate based on the year/phase of the model.

wsp

CLIENT: Mount Polley Mining Corporation

DRAWN: SC
DATE: 11 March 2025
CHECKED: TS
DATE: 11 March 2025
SCALE: Not to Scale
PROJECT No: CA0047730.8440/31141

TITLE

Site Wide Water Balance Operational Phase Flow Diagram

FIGURE No: 2
REV No: 0

2.3 Site Surveys

2.3.1 TSF

Topographic surveys of the TSF were conducted by MPMC on October 30, 2023. A bathymetric survey within the TSF was conducted on August 25, 2023. The storage-elevation curve in 2023 was developed using the combined bathymetry and topography, and it is used in the SWWBM to infer the TSF free water volume from measured water level data, recognizing that the surfaces described are a triangulation of a bathymetry survey (tailings surface under water) and a topographic survey (tailings surface above water). The triangulation of survey points near the transition between water and land, as well as the use of different dates for the Topographic and Bathymetric Surveys, introduce uncertainty into the resulting storage-elevation curves. However, the accuracy is considered acceptable for the required resolution of the model results.

A new bathymetry survey within the TSF was conducted on July 15, 2024. Storage-elevation curve was linearly developed based on two points from the survey (MPMC 2024c), with an adjustment to raise the surface by 0.69 m (WSP 2024b):

- Water storage on July 15, 2024 at 965.53 m is 758,514 m^3.
- Total water capacity at 968.89 m is 6,996,630 m^3.

Projected storage-elevation curves were used to model the facilities with linear interpolation throughout 2024. The period before July 15, 2024, was modeled using linear interpolation between the 2023 stage-storage curve and the July 15, 2024 stage-storage curve. Storage-elevation curves for the TSF up to a dam crest elevation of 974 m developed from the July 15, 2024 TSF survey were used in support of the free water volumes projection affected by tailings deposition after the survey date.

2.3.2 Springer – Cariboo Pit

A bathymetric and topographic survey of Springer-Cariboo Pit was conducted by MPMC on January 25, 2024, indicating that the Springer and Cariboo pits were divided up to the saddle level (approximate elevation of 964 m), and then combined from that level upward. Based on the recorded pit elevation data from MPMC (MPMC 2024a) and the fact that the Springer Pit was completely dewatered as of April 18, 2023, (MPMC 2024b), the Springer Pit and Cariboo Pit were considered as separate reservoirs for modeling purposes in 2023. Storage-elevation curves for Springer Pit and Cariboo Pit were generated individually to infer the free water volumes within the pits from measured water level data in the SWWBM.

Springer Pit storage-elevation curves based on the bathymetric and topographic survey on November 7, 2019, were used in the model until April 18, 2023. These were then projected to the Springer Pit storage-elevation curve based on the January 25, 2024, survey. Projected storage-elevation curves were used to model the facilities with linear interpolation between dates until January 25, 2024. The storage curve based on the January 2024 survey was used up until June 30, 2024.Tailings were excavated during the calibration period, it is assumed that the excavation is reflected in the survey data. Figure 1 shows a time series plot of Springer Pit remaining tailings volume.

Cariboo Pit storage-elevation curves (dated January 30, 2023, refer to MPMC 2023) were used until the end of 2022. These were then projected to the Cariboo Pit storage-elevation curve based on the January 25, 2024, survey. Projected storage-elevation curves were used to model the facilities with a daily linear interpolation between dates, between dates until January 25, 2024. The storage curve based on the January 2024 survey was used up until June 30, 2024.

Springer-Cariboo Pit has been modelled as one single pit starting July 1, 2024. The Springer-Cariboo Pit storage- elevation curves (dated July 23, 2024; MPMC 2024d) were provided by MPMC.

2.3.3 Wight Pit

Wight Pit storage-elevation curves (dated September 6, 2024; MPMC 2024e) were provided by MPMC. The curves include underground workings and pore space assumptions. Measured water level data from MPMC were used to infer the water volumes in the pit based on the storage-elevation curves provided in 2024.

3.0 MODEL CALIBRATION

3.1 Overview

The SWWBM was calibrated by adjusting outflows of the reservoirs and comparing modelled water levels to measured water levels recorded at the TSF. The TSF temporarily retains high runoff inflows experienced during freshet and storm events. The resulting modelled water levels in the TSF and Wight Pit are the balance of site-wide inflows and outflows, including pumping to and from the pits and the booster station, which are temporary storage locations for surplus water on site.

An input climate dataset was generated (Section 3.2) and seasonal runoff coefficients were used during freshet (Section 3.3) to represent measured site runoff conditions (i.e., reduction in measured snowpack depth) in 2024 and to facilitate the calibration.

3.2 Climate Data

A climate dataset at the Mine for 2024 was generated and used to represent site climatic conditions for the calibration.

The dataset shown in Table 1 consisted of the following:

- January through December rainfall data from MPMC.
- Freshet (March through April) snowmelt as determined from decreases in snowpack SWE depth recorded at the Mine.

The SWWBM's rainfall data for 2024 was derived from the average readings of tipping rain gauges at Station 1 and Station 2. However, for August and September, only Station 2's data was used due to missing data at Station 1, which had only 7 recorded daily readings in August and 15 in September.

WSP conducted QA/QC modifications on the local climate station data, identifying invalid entries in the evaporation data received from MPMC, including negative evaporation values. Upon reviewing the evaporation data, WSP observed that evaporation was rarely 0 mm. Additionally, the absolute values of the negative readings were very close to those on the dates immediately before and after the negative ones. Therefore, the absolute values were used for the negative entries during the climate analysis.

Table 1: 2024 Monthly Climate Data Used in SWWBM

Month	Rainfall (mm)	Snowmelt (mm)	Evaporation (mm)
January	29.4	0	12.1
February	3.5	40.8	18.8
March	4.4	45.0	44.8
April	15.5	0	63.9
May	110.5	0	68.3
June	88.0	0	112.5
July	50.3	0	89.2
August	25.0	0	66.7
September	74.4	0	41.6
October	72.4	0	21.0
November	21.6	0	12.0
December	44.8	0	10.0
2024 Annual	**539.8**	**85.8**	**560.7**

3.3 Runoff Coefficients

Runoff coefficients in the SWWMB are adjustable loss parameters that translate precipitation, snowmelt, and ground conditions into estimates of modelled runoff. Historical SWWBM calibrations supported the delineation of runoff coefficients into two distinct seasonal climate periods:

- Freshet (March to June; inclusive) – Highest runoff coefficients to represent expected higher soil moisture content, and therefore greater runoff.
- General (January to February; inclusive and July to December; inclusive) – Mid range coefficients to represent soil moisture contents for intermittent runoff events. A 30% increase to the general coefficients is applied to the subsequent month if the previous month had a cumulative rainfall plus snowmelt depth greater than 50 mm.

The seasonal runoff coefficients defined for the catchment types remained unchanged from those used in the 2022 SWWBM calibration and are listed in Table 2.

Table 2: Seasonal Runoff Coefficients

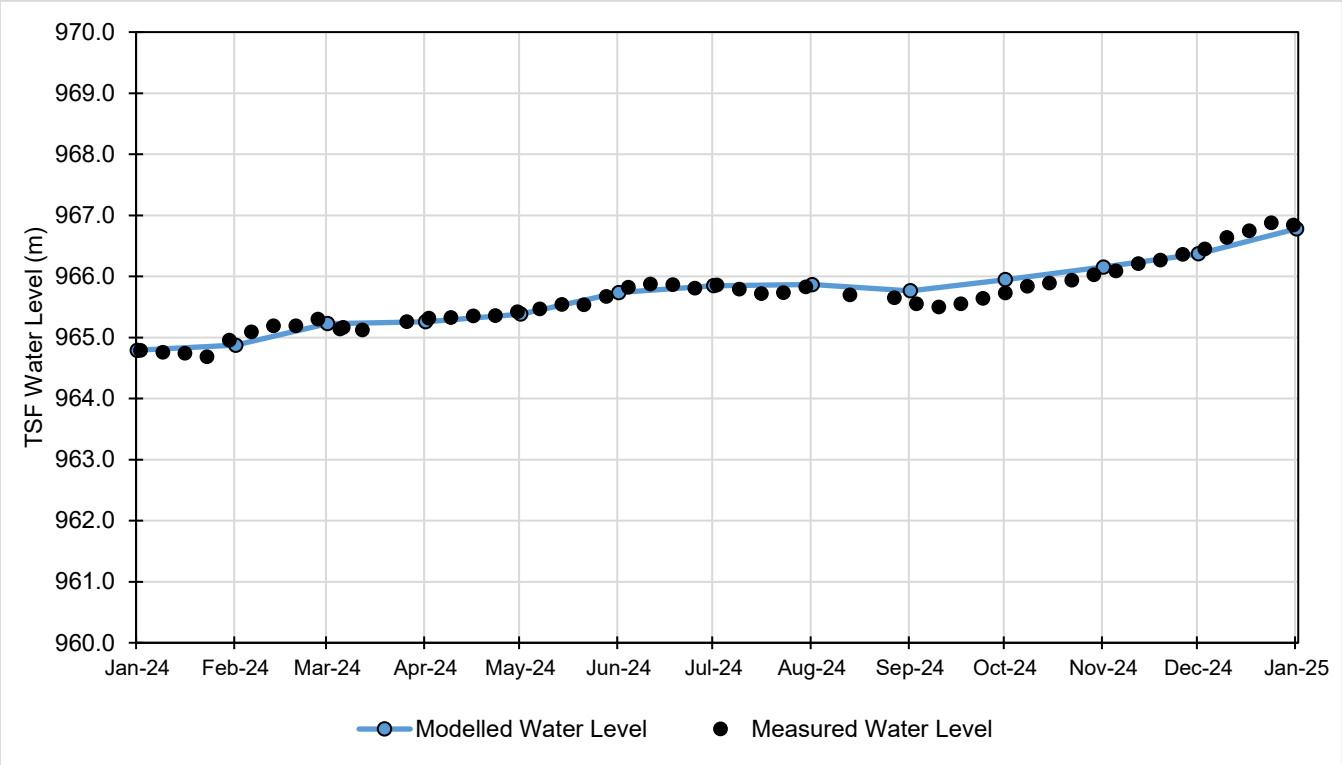
Catchment Type	General	Freshet
Exposed tailings	0.6	0.9
Disturbed areas	0.3	0.9
Rock disposal site areas	0.1	0.6
Open pits	0.75	0.9
Undisturbed catchments	0.4	0.42
Haul roads and access roads	0.15	0.9
Mill site area	0.1	0.1

Source: Golder 2020

4.0 CALIBRATION RESULTS

4.1 TSF

Figure 3 shows the modelled and measured water levels within the TSF for the 2024 calibration period. The modeled water levels were estimated from the modeled volume estimated using the storage-elevation storage curves. The average absolute difference between modelled and measured water levels is approximately 0.08 m, which is considered acceptable for the purposes of the calibration exercise. The difference in the water levels modelled compared to measured on December 31, 2024, was 0.06 m.

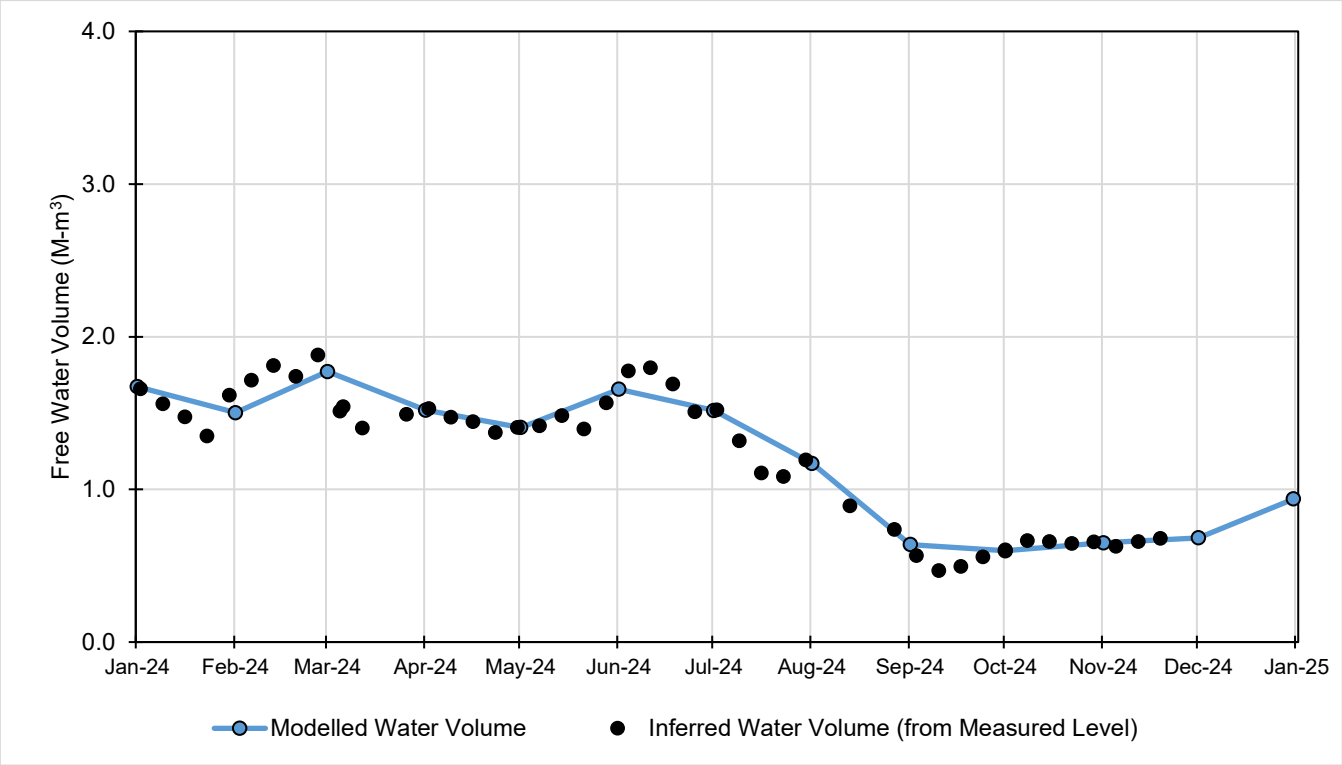


Note: Last measured water level occurred on December 31, 2024.

Figure 3: Water Levels in the TSF

Figure 4 shows the modelled free water volume in the TSF along with the inferred free water volume from measured water levels. The measured water levels were converted to a water volume using the storage elevation curves described in Section 2.3.

Figure 3 and Figure 4 indicate that the model is reasonably calibrated and there is general alignment between measured and modelled free water levels, as well as between the inferred and modelled free water volumes in the TSF.



Note: Last measured water level occurred on December 31, 2024. The y-axis unit (M-m^3) denotes million cubic meters.

Figure 4: Free Water Volume in the TSF

4.2 Wight Pit

Figure 5 shows the modelled and measured water levels within the Wight Pit for the 2024 calibration period. The modelled water levels were estimated from the modelled volume using the storage-elevation curves. The average difference between modelled and measured water levels is approximately 5.2 m.

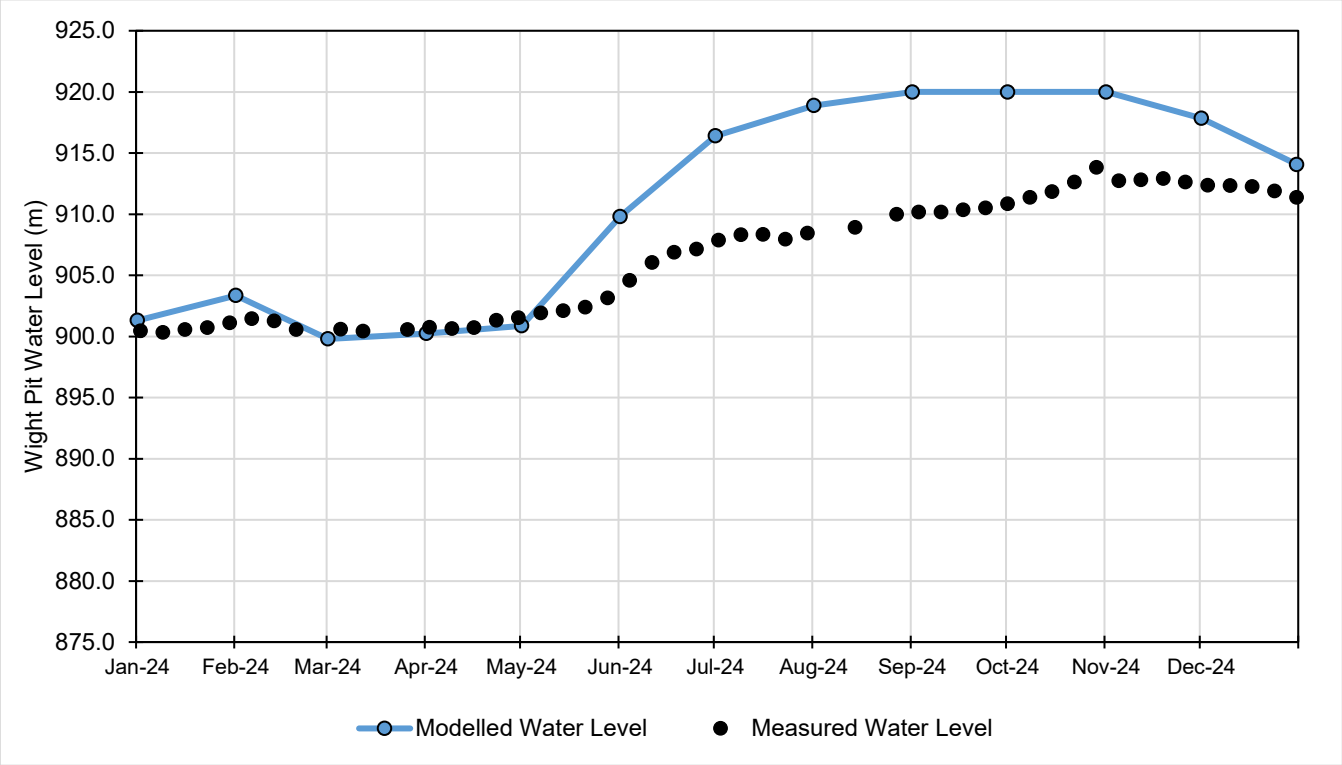


Figure 5: Wight Pit Water Level

Figure 6 shows the modelled water volume in the Wight Pit along with the inferred free water volume from measured water levels. The measured water levels were converted to an inferred water volume using the storage elevation curves described in Section 2.3.

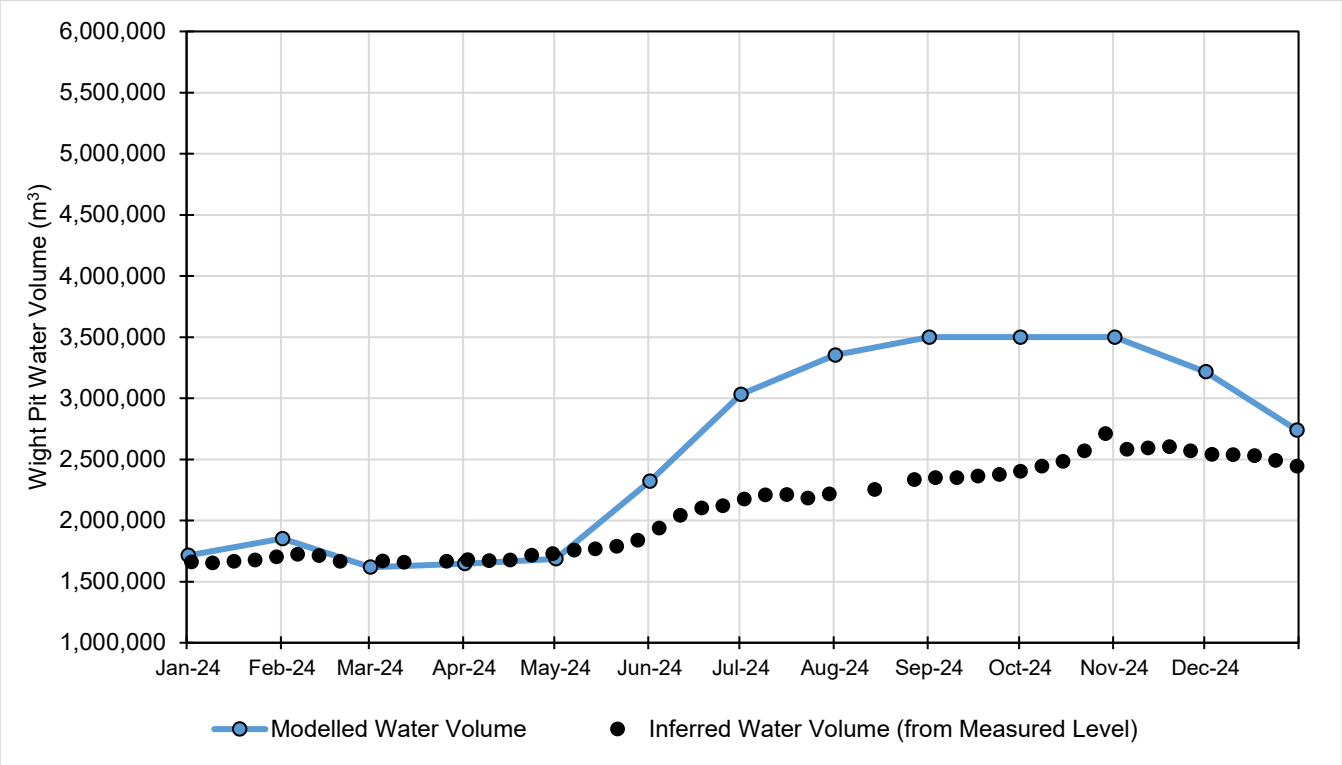


Figure 6: Wight Pit Water Volume

4.3 Differences between Modelled and Measured Values

Differences between modelled and measured values may have several explanations:

- Variability in runoff coefficient throughout the year.
- Uncertainties in the climate data, e.g.,
  - Data gaps exist from on-site climate station data collection (evaporation, precipitation) and data infill assumptions are made, as described in Section 3.2.
  - Snowpack surveys can miss intermittent snowmelt if conducted infrequently and the use of composite datasets may over or under-estimate actual conditions.
- Uncertainties in the TSF bathymetric survey (e.g., the transition between exposed tailings surface [i.e., beach] and free water can be complex).
- Uncertainties associated with the tie-in of the October 30, 2023 TSF storage curve with the July 15, 2024 TSF storage curve.
- Potential inaccuracies in water level measurements.
- Potential inaccuracies and/or missing WTP discharge data.
- Potential differences between modeled water transfer rates and actual transfers on site.
- Potential inaccuracies regarding the inflows and outflows of groundwater to the pits, in particular the Wight Pit.

The modeled results from the SWWBM calibration reasonably approximate long-term site conditions and trends, particularly at the TSF, supporting its suitability for water management planning, subject to further assessment and calibration as recommended.

5.0 END-OF-YEAR WATER BALANCE

Table 3 presents End of Year (EoY) modelled site water balance from 2017 through 2024 (Results for 2017 to 2023 are from WSP 2024a). The modelled total water on site is the net storage of free water volume (total water) on site as of December 31, 2024, including the TSF, pits, sumps, and ponds. The annual net inflow represents direct precipitation, runoff, groundwater inflows, subtracting evaporation and groundwater outflows.

Table 3: EoY Modelled Site Water Balance Volume

Date	Total Water on Site[(a)(b)] (M-m^3)	Annual Water Net Inflow[(c)] (M-m^3)
December 31, 2017	6.0	4.6
December 31, 2018	3.9	5.3
December 31, 2019	3.8	6.4
December 31, 2020	8.2	9.5
December 31, 2021	7.5	6.1
December 31, 2022	6.0	6.4
December 31 ,2023	4.0	5.6
December 31, 2024	4.7	5.0

(a) End of year sum of water in TSF, pits, sumps, and ponds.

(b) Includes Wight Pit stored water volume.

(c) Net Inflows = Direct Precipitation + Runoff + Groundwater Inflow (including baseflows) - Evaporation - Groundwater Outflow (for calendar year).

6.0 RECOMMENDATIONS

Based on the results of the 2024 SWWBM calibration, the following recommendations are provided to support continuous improvement of the water balance modelling for the Project:

- Increase the frequency of periodic snowpack measurements in the spring and fall seasons to generate more representative snowmelt data (e.g., in case mid-season snowmelt occurs outside of the freshet period).
- Record both snowfall and rainfall data measurements in the winter to produce more representative climate data (only rainfall and snowpack is recorded currently).
- Conduct QAQC on climate data from the local station and comparison to regional data to improve accuracy.
- Review historical pan evaporation data from the local climate stations in relation to regional values and assess the need for updates in future SWWBM calibration periods.
- Conduct both topographic and bathymetric surveys in spring and fall annually to achieve a more precise TSF storage curve progression.

- Review and validate available flow data on site to supplement the calibration of the SWWBM.
- Conduct an interim Q4 2025 model calibration, calibrating to freshet 2025 and allowing sufficient time to address data gaps, refine assumptions, and incorporate water management updates.
- Refine the runoff coefficients as part of future model updates.
- Implement flow measurements at a location where only (or almost only) natural runoff is produced.

7.0 CLOSURE

This technical memorandum summarizes the SWWBM calibration and end-of-year water balance for the model run period January 1, 2024, to December 31, 2024, (inclusive). The reader is referred to the Study Limitations section, which follows the text and forms an integral part of this memorandum.

We trust that this technical memorandum satisfies your current requirements. Please contact the undersigned should you have any questions.

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https://wsponline.sharepoint.com/sites/gld-10023g/2025 deliverables1/ca0047730.8440 deliverables/002_issued/011-tm-31141-2024 site wide wb model calibration/rev0/ca0047730.8440-011-tm-rev0-31141-2024 wb calibration 21mar_25.docx

REFERENCES

BC ENV. 2020. British Columbia Ministry of Environment and Climate Change Strategy. Effluent Discharge Permit 11678. Issued to Mount Polley Mining Corporation on February 1, 2020 and Amended December 31, 2020.

Golder (Golder Associates Ltd.). 2016a. Mount Polley Mine Long Term Water Management Plan Permit Amendment Application under the Environmental Management Act: Technical Assessment Report. Prepared for Mount Polley Mining Corporation. No. 1411734-162-R-Rev0-16000. October 17, 2016.

Golder. 2016b. Operations and Closure Mount Polley Mine Water Balance Model. Prepared for Mount Polley Mining Corporation. No. 1411734-167-R-Rev0-16000. October 17, 2016.

Golder. 2020. Mount Polley Mine. Water Management Plan (Mine Operations). Prepared for Mount Polley Mining Corporation. Ref No.19133363-066-R-Rev0-31550. November 27, 2020.

GoldSim (GoldSim Technology Group). 2018. GoldSim User's Guide Version 12.1, Issaquah, WA. June 2018.

MPMC (Mount Polley Mining Corporation). 2023. Mount Polley 2022 Annual Calibration Data. Files sent via electronic transfer. January 30, 2023.

MPMC. 2024a. Mount Polley 2023 Annual Calibration Data. Files sent via electronic transfer. February 9, 2025.

MPMC. 2024b. Mount Polley - RFI - 2023 Water Balance Calibration – Springer Pit Dewatering Information. Matt O'Leary. Emailed on January 15, 2024.

MPMC. 2024c. 240715 – TSF. Email from Dylan Taylor, Civil E.I.T., from Celtic Engineering Ltd. August 26, 2024.

MPMC. 2024d. Springer-Cariboo Stage Storage Curve. 2024 07 23 LOM Main Zone Pit Fill Curve – Ryan Brown.xlsx. Received via Email from Don Parsons, Chief Compliance Office from Imperial Metals. September 5, 2024.

MPMC. 2024e. Wight Pit Storage Curve. 220223 WP Fill Curve-IM-D-53.xlsx. Received from Mathieu O'Leary via email dated September 6, 2024.

MPMC. 2025a. Mount Polley 2024 Annual Calibration Data. Files sent via electronic transfer. January 21, 2025.

MPMC. 2025b. Mount Polley Weekly TSF & Water Management Systems Status. Files sent weekly via email from David Buxton-Gray.

WSP (WSP Canada Inc.). 2023a. Mount Polley Mine Water Balance Model – Springer Expansion Life-of-Mine. Prepared for Mount Polley Mining Corporation. No. 23590671-084-TM-Rev0-31182. December 4, 2023.

WSP. 2023b. Mount Polley Mine Water Management Plan – Springer Expansion Life-of-Mine. Prepared for Mount Polley Mining Corporation. No. 23590671-091-TM-Rev0-31191. December 4, 2023.

WSP. 2024a. Mount Polley Mine 2023 Site Wide Water Balance Model Update and Calibration. Prepared for Mount Polley Mining Corporation. No. CA0020527.4505-026-TM-Rev0-31141. March 21, 2024.

WSP. 2024b. July TSF survey and bathy. Email from Tyler Klassen, Lead Designer, dated September 5, 2024.

STUDY LIMITATIONS

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