Appendix 9-B

2018 Hydrogeological Field Data Report

NWP Coal Canada Ltd

2018 Hydrogeological Field Data Report
Crown Mountain Project, BC

Prepared for

NWP Coal Canada Limited

Prepared by

srk consulting

SRK Consulting (Canada) Inc.
1CN028.002
January 2019

2018 Hydrogeological Field Data Report
Crown Mountain Project, BC

January 2019

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Executive Summary

SRK Consulting (Canada) Inc. was contracted by NWP Coal Canada Limited (NWP) to provide hydrogeological services in support of the feasibility study and permitting for the Crown Mountain Project, BC. A hydrogeological field Investigation was completed by SRK between September and November 2018 at Crown Mountain to collect data in support of the project. Field methods and results are summarized in this data report. This report is intended to be a summary of the field activities. Only a brief discussion regarding the site stratigraphy and water levels is provided.

The field investigation consisted of drilling and installation of 16 single monitoring wells, three nested monitoring wells and one pumping well at 12 locations. Hydraulic testing, well development, water quality sampling and water level surveys were completed on the newly installed wells.

The general characteristics of geological materials included colluvial material with low permeability and densely compacted fine grained till layers over bedrock occurring at higher elevations on West Alexander Creek and relatively permeable fluvial materials overlying tills and glaciofluvial sands and gravels occurring at lower elevations in the lateral valleys and in the Alexander Creek valley. Glaciolacustrine deposits of relatively low permeability, very fine sands, silts and clays that were also observed on the southern side of the Alexander Creek valley, are believed to be overlying bedrock.

Based on data collected on 26 October 2018, groundwater levels reflect ground topography, ranging from 1465 m asl in low elevation areas up to 1968 m asl in higher elevations. Data showing seasonal variations in groundwater levels and groundwater flow directions are not yet available.

A total of 26 water quality samples were collected by SRK/OKC from October 12 to November 7, 2018. SRK also conducted a seepage survey between September 12 and October 26, 2018, while between October 1and October 4, 2018, Swiftwater carried out a flow survey on West Alexander and East Alexander Creek.

The hydrogeological field program was completed as required. SRK recommends that all of the new monitoring wells completed during the 2018 hydrogeological investigation, and historical monitoring wells, be routinely monitored to supplement the existing groundwater quality dataset.

At a minimum, the following routine monitoring should be conducted:

- Complete well development for those that did not have sufficient water for development (GW6-BR, GW7-B, GW-MP1-BR, GW12-OB, GW-MD1 and GW-PP2);
- Quarterly water level monitoring in all existing and new monitoring wells and data download of all the pressure transducers (newly and pre-installed ones);
- Quarterly water quality sampling in all existing and newly installed monitoring wells.

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List of Abbreviations

ags	Above Ground Surface
BGC	BGC Engineering Inc
BPC	Bear's Paw Contracting
bgs	Below Ground Surface
btop	Below Top of Pipe
CD	Constant Discharge
Dillon	Dillon Consulting Ltd
Geotech	Geotech Drilling Services Ltd
GW	Groundwater
L	Litre
m	metre
na	Not Available
ns	Not Sampled
O'Kane	O'Kane Consultants
OKC	O'Kane Consultants
OR	Over Range
ppm	Part Per Million
Swiftwater	Swiftwater Consulting
SP	Seepage Point
TOC	Top of Casing (PVC pipe)
USgpm	US Gallons Per Minute
USCS	Universal Soil Classification System

1 Introduction

1.1 Scope of Report

SRK Consulting (Canada) Inc. was contracted by NWP Coal Canada Limited (NWP) to provide hydrogeological services in support of the feasibility study and permitting for the Crown Mountain Project, BC. This hydrogeological field data report is intended to summarize the field work done by SRK between September and November 2018. This report provides only a preliminary interpretation of encountered geological and groundwater conditions; a comprehensive interpretation of collected data will be provided in a Groundwater Baseline Study Report.

1.2 Objectives

The objectives of SRK 2018 Groundwater (GW) field investigation included the following:

1. Characterize hydrogeological conditions across site:
   (a) Identify key hydrostratigraphic units;
   (b) Estimate hydraulic properties of overburden and bedrock;
   (c) Collect data to quantify groundwater flow and quality;
   (d) Collect data to assess groundwater interaction with surface water;
   (e) Identify areas of groundwater seepage.
2. Establishment of a network for groundwater monitoring to support project engineering, permitting and operations.

1.3 Scope of Work

The scope of work for this hydrogeological field investigation included the following activities:

- Drilling program, including:
  - Drilling and installation of three nested (deep and shallow in same borehole) and 13 single (“paired”, deep an shallow side-by-side) monitoring wells with a Sonic drill rig;
  - Installation of three single monitoring wells in selected geotechnical boreholes drilled by Stantec;
  - Installation of one pumping well in a geotechnical borehole drilled by Stantec.
- Preparation and testing of monitoring wells, including:
  - Well development and collection of initial water quality sampling/lab analysis;
  - Hydraulic testing (slug and pumping tests);
  - Water level monitoring;

  - Seepage survey.

- Field Coordination with Swiftwater Consultant (Swiftwater) to conduct a targeted flow survey on Alexander Creek and West Alexander Creek
- Field Coordination with O'Kane Consultants (OKC) to conduct a second comprehensive well development and water quality sampling

1.4 Modifications from Planned Scope

A number of changes to the original scope of work occurred based on field observations:

- The original proposal included only single installations at each location (a deep and shallow monitoring well set 1.5 m apart from each other). Three boreholes were changed to have nested completions (multiple standpipes in an individual hole) due to time constrains caused by overlapping drill rig schedule for Stantec's geotechnical investigation, unexpected field conditions (a flowing artesian borehole) and a field determination to obtain higher detail vertical hydraulic pressure profiles.
- All the deep boreholes were planned to be advanced 3 -10 m into bedrock. Given the limited drill rig capabilities (50 m max drilling depth), some of the wells in the Alexander Creek valley never intercepted bedrock.
- Initial findings at GW9 suggested that bedrock was deeper than expected. Consequently, the original GW8 location (200 m south of GW9) was removed from the program and substituted with one of Stantec's geotechnical boreholes (BH18-MP1). SRK drilled and installed a nested monitoring well (GW-MP1-OB/BR) 10 m away from BH18-MP1 and then supervised the installation of pumping well GW-MP1-PW inside the BH18-MP1 borehole.
- The original proposal accounted for a dual shift drilling program (night and day), with SRK and OKC field staff sharing rig supervision. Because a night shift drill crew was not available, no drilling was completed during nights. SRK conducted all drilling supervision and OKC was contracted to complete well development and groundwater sampling at the end of the program.
- Packer testing was initially planned in two selected boreholes part of NWP's 2018 geotechnical exploration program. Due to poor ground conditions and unavailability of packer equipment when planned holes could have been tested, the task was not completed.

Table 1-1 presents a summary of the major changes to the original scope of work.

Table 1-1: Changes from Original Scope of Work

Well ID	Screen Target	Total Depth (m) Expected	Well ID	Screened Zone	Total Depth (m bgs)	Note
GW1-BR	Bedrock contact/WBR	50	GW1-A	Overburden	27.4	Bedrock not tagged, flowing artesian - well installed above confining unit (clay), nested well installation
GW1-OB	Overburden	25	GW1-B	Overburden	9.0	
GW3-BR	Bedrock contact/WBR	50	GW3-A / GW3-B	Overburden	44.5 / 24.1	Bedrock not tagged, installed 3 wells at this location: a shallow, an intemediate and a deep well for better vertical profile, nested well installation (A and C)
GW3-OB	Overburden	25	GW3-C	Overburden	11.9	
GW4-BR	Bedrock contact/WBR	50	GW4-BR	Bedrock contact	35.1	Bedrock not tagged, flowing artesian - well installed above confining unit (clay)
GW4-OB	Overburden	25	GW4-OB	Overburden	13.7	
GW6-BR	Bedrock contact/WBR	25	GW6-BR	Bedrock contact	14.3	Bedrock shallower than expected
GW6-OB	Overburden	15	GW6-OB	Overburden	5.5	
GW7-BR	Bedrock contact/WBR	35	GW7-A	Overburden	32.9	
GW7-OB	Overburden	15	GW7-B	Overburden	13.6	
GW8-BR	Bedrock	50	GW-MP1-BR	Bedrock contact	31.1	GW8 location substituted by GW-MP1 (Stantec's geotech investigation location), nested well installation
GW8-OB	Overburden	15	GW-MP1-OB	Overburden	10.4	
GW9-BR	Bedrock	50	GW9-BR	Bedrock contact	42.7	
GW9-OB	Overburden	15	GW9-OB	Overburden	24.1	
GW12-BR	Bedrock contact	25	GW12-BR	Bedrock contact	15.2	Bedrock shallower than expected
GW12-OB	Overburden	10	GW12-OB	Overburden	7.6	
GW14-BR	Bedrock contact	25	GW14-BR	Bedrock contact	22.6	
GW14-OB	Overburden	15	GW14-OB	Overburden	15.2	
GW16	Bedrock contact	25	na	na	na	Not appoved
Stantec Geotech Investigation						
BH18-PP2	Bedrock contact	based on geotech	GW-PP2	Bedrock contact	7	
BH18-MD1	Bedrock contact	based on geotech	GW-MD1	Bedrock contact	4.9	
BH18-MD2	Bedrock contact	based on geotech	GW-MD2	Bedrock contact	20.1	
BH18-MP1	Bedrock contact	based on geotech	GW-MP1-PW	Overburden	10.8	Installed 102 mm (4") pumping well
NWP 2018 Geotech Exploration Program						
CM18-22	No screen	based on geotech	na	na	as planned	Packers were not available to conduct hydraulic testing at targeted depths
CM18-28	No screen	based on geotech	na	na	as planned	

1.5 Report Organization

The remainder of this report comprises the following technical sections:

- **Section 2 – Field Methods** describes methods used;
- **Section 3 – Results** provides field program results and data;
- **Section 4 – Field Data Summary** provides a brief interpretation of the stratigraphy and the groundwater flow at Crown Mountain;
- **Sections 5** – Conclusions & Recommendations summarize SRK "going forward" plan and provides recommendations for continuing groundwater monitoring on site.

2 Field Methods

2.1 Overview

The 2018 hydrogeological field investigation incorporated five major components:

1. Sonic drilling program and well installation;
2. Well development and sampling for groundwater quality;
3. Hydraulic testing and water level measurements;
4. Targeted surface water flow survey to support interpretation of groundwater – surface water interactions;
5. Seepage mapping.

2.2 Sonic Drilling and Well Completion

SRK determined suitable borehole locations based on future mine development (i.e. open pits, mine dumps, etc.). The monitoring well placement was envisioned with the goal of collecting upstream and downstream data of each mine feature as well as having background data. During mine permitting process, the final borehole locations were then approved with the Notice of Work (NoW) under the Mines Act.

Boreholes completed during the September – October 2018 drilling investigation were advanced using a track mounted Fraste DR242 drill rig equipped with a Sonic system operated by Geotech Drilling Services Ltd. (Geotech). The rig was also equipped with a dual wall coring barrel for bedrock advancement.

As part of SRK hydrogeological investigation, a total of 17 boreholes were advanced between 12 September and 27 October 2018 at 9 different locations. At 8 of these locations, a deep borehole (15 m to 47 m) and a shallow borehole (6 m to 24 m), were drilled 1.5 m apart. Four additional boreholes, originally part of Stantec geotechnical investigation, were incorporated into SRK investigation (i.e. SRK supervised completion as monitoring wells – GW-MP1-PW, GW-MD1, GW-

MD2 and GW-PP2). At one location (GW-MP1) only a deep hole was advanced 10 m away from BH-MP1 (Stantec Geotech borehole).

All deep boreholes were drilled to about 3 - 10 m into bedrock, where available, or to maximum rig drilling capability (50 m). The drill core was logged, photographed and placed into labelled core boxes (see Photo log – Appendix E).

Soil samples were logged for colour, texture, grain size and moisture content. Natural soils were classified using the Unified Soil Classification System (USCS). Select soil samples were collected from few boreholes for QA/QC purposes and for estimation of hydraulic conductivity of mixed or fine-grained texture not screened/slug tested. Samples are currently on hold.

A total of 22 monitoring wells and 1 pumping well were installed at site. Monitoring wells GW1-A/B, GW3-A/C, and GW-MP1-OB/BR were installed within the same borehole ("nested wells"). For the nested wells, the original borehole (152 mm or 6-inch outer diameter) was reamed over with a 178 mm (7 inch) Sonic drill casing to the depth of the bottom of the upper well. All the other boreholes were completed as single well installations. All 22 monitoring wells were completed with flush-threaded 51 mm (2 inch) diameter Schedule 40 polyvinyl chloride (PVC) pipe with #10 slot screen sections (0.25 mm or 0.010-inch aperture width) and capped at the base with either a slip cap or threaded cap.

One borehole (BH-MP1), part of Stantec geotechnical investigation, was completed as a pumping well (GW-MP1-PW). The original borehole (152 mm or 6-inch outer diameter) was reamed over with a 178 mm (7 inch) Sonic drill casing to the depth of the bottom of the selected screen location. The inner steel casing was pulled while the hole was backfilled with bentonite chips. The pumping well was then installed in the outer steel casing with flush-threaded 102 mm (4 inch) diameter Schedule 40 PVC pipe with #20 slot screen sections (0.50 mm or 0.020-inch aperture width) and capped at the base with a slip cap.

After a well string was assembled and lowered into the borehole, standard bagged 10/20 filter sand was used to backfill the annulus between the well and the borehole. A small amount of sand was placed in the annulus before the steel casing was pulled up to expose a section of screen and allow the sand to fill the void between the screen and the borehole wall. This process was repeated until the entire screen section was exposed. The filter pack was placed approximately 0.5 to 1m above the top of the screen section in all wells. To prevent any aquifer cross-contamination and/or surface infiltration, a bentonite seal using 0.5 m of bentonite pellets was placed in the well annulus above the filter pack, followed by bentonite chips up to ground surface. Monitoring wells were completed at surface with a protective casing around them. The name of each well was written on the inside and outside of each monument.

Surveyed monitoring well coordinates and elevations (ground and top of PVC pipe) were provided by NWP.

2.3 Well Development and Sampling

Methods of well development of monitoring wells and pumping wells differed and are discussed separately below.

2.3.1 Development of Monitoring Wells

Following installation, monitoring wells were developed by SRK and/or OKC staff using a hydrolift inertial pump. The hydrolift was mounted to the monitoring well protective casing and a mechanical drive repeatedly lifted and lowered a clean Waterra tubing-foot valve assembly into the well to pump water to surface. Monitoring wells were purged until water quality parameters stabilized (pH, conductivity, temperature), water was clear and a target minimum of three well volumes was purged. All monitoring wells were considered sufficiently developed, except for GW4-OB and GW7-OB which had little water and a slow recharge rate, and GW12-OB which was dry.

2.3.2 Development of Pumping Well

Upon completion, the pumping well was developed using air lifting technique. The field equipment consisted of an air compressor and a 25 mm (1 inch) diameter dropped PVC pipe. A constant air flow was injected at the bottom of the well for 15 hours. Development time depended on the screen length and visual turbidity of the production water. Conductivity, pH, temperature and visual turbidity were recorded until completion of well development.

2.3.3 Groundwater Sampling

An initial water quality survey was completed in the newly installed monitoring wells following development. Sampling was completed by SRK/OKC field staff from 12 October to 7 November 2018 using:

1. 50 mm (2 inch) Geotech SS Geosub submersible pump with low flow controller and clean Waterra tubing;
2. 25 mm (1 inch) bladder pump and clean 6 mm (1/4 inch) HDPE tubing; and
3. 1 L hydrosleeve.

Water quality samples were collected immediately following well development once the static water level had recovered. The submersible pump was installed just above the screened area where the bladder pump was installed in the middle of the screen area. The purging rate was the lowest achievable by the pump (low flow sampling) to maintain a constant water level (where possible). Water levels were monitored using an electric water level probe. During purging at each monitoring well, a handheld YSI 556 multiparameter probe and an Orbeco TM-2511 turbidity meter were used to measure the following parameters in groundwater discharge:

- pH;
- Temperature;
- Electrical conductivity (EC);

- Oxidation/reduction potential (ORP); and
- Dissolved oxygen (DO).

A groundwater sample was collected after successive readings of EC, ORP and DO were within ±10% of the respective previous readings and, when water levels were stabilized, indicators of sampling formation water. Below is the analytical schedule:

- Physical Parameters;
- Anions and Nutrients;
- Dissolved and Total Metals; and
- PAHs.

Two samples were also collected during the pumping test at GW-MP1-PW: one after five hours of pumping and one after 10 hours of pumping (before pump shut off).

Groundwater samples were collected in pre-washed bottles provided by ALS Laboratories. Samples collected for dissolved metals were field-filtered using 45 µm in-line filters (or 45 µm filters-syringe sets) and field-acidified with the appropriate preservative. All sample bottles were labeled with the well ID, collection date and time, and the requested analytes. Samples were kept below 4 degrees Celsius until delivery to ALS Laboratories in Burnaby, BC for analysis. Three blind duplicate samples were collected by filling the primary and duplicate sample containers simultaneously.

2.4 Hydraulic Testing and Water Level Measurements

2.4.1 Hydraulic Testing

Single Well Response Tests

Single well response (slug) tests were conducted at all the newly installed monitoring wells to estimate the hydraulic conductivity of the aquifer sediments in proximity of the well screens. The slug tests were completed by SRK staff from 23 September to 27 October 2018.

A slug test provides an estimate of the hydraulic conductivity of aquifer material in the immediate vicinity of the monitoring well. To conduct a slug test, a near instantaneous change in the static water level in a piezometer is induced by introducing (falling head test) or removing (rising head test) a solid object of known dimensions and volume. Both rising and falling head tests were performed using a solid PVC slug of 32 mm outer diameter and 0.91 m length. Multiple slug tests were conducted at each piezometer to assess the consistency of the results. The water level changes in the piezometer were recorded at 0.25, 0.5, 1 or 5 second intervals (depending on expected well response) using a pressure transducer with onboard data logger (Solinst Levelogger) and subsequently downloaded for analysis.

Wells that were noticed to have a slow recharge rate during development were tested differently: a recovery test was performed. The well was pumped dry (with Waterra tubing-footvalve assembly)

and left to recharge overnight. The water level changes were recorded using a pressure transducer with on board data logger.

Pumping Test

A pumping test was performed by SRK and Bear's Paw Contracting (BPC) staff in pumping well GW-MP1-PW on 11 October 2018 to establish the hydraulic properties of the well and the surrounding aquifer. The test included a 2-hour step test followed by a 10-hour constant discharge (CD) test. Pre-test water levels were recorded prior to the beginning of the test at the pumping well (GW-MP1-PW) and monitoring well GW-MP1-OB, located 10 meters from the pumping well.

Pumping was conducted using a 76 mm (3 inch) diameter Grundfos 10SQE05-160 submersible pump rated for 0.7 to 3.4 m^3/hour (3-15 USgpm). Flow was controlled by adjusting a manual valve on the discharge line. Water from GW-MP1-PW was discharged into a trench approximately 20 meters from the test well through a 16 mm (5/8 inch) diameter HDPE tubing.

Water level measurements were made with Solinst Leveloggers (downhole pressure transducers and thermistors with onboard data logging) and manual measurements. A Solinst Barologger was also installed to record barometric pressure. All the loggers were programmed to record at 1-minute intervals. Aquifer drawdown was also monitored manually throughout the test period at the pumping well and at monitoring well GW-MP1-OB using an electric water level probe.

The step test was performed to determine well yield and efficiency, and included 2 steps at different flow rates:

- Step 1: 1 hour at 0.4 m^3/hour;
- Step 2: 1 hour at 0.6 m^3/hour.

The pumping test was conducted immediately following the step test. The pumping test ran for 10-hours at an average pumping rate of 0.8 m^3/hour. Some variation in pumping rate was required to maintain a steady pumping rate.

At the end of the pumping test, water levels were recorded until water levels had recovered to at least 90% of static levels within the pumping well and monitoring well.

2.4.2 Water Level Survey

A water level survey was completed by SRK/OKC staff on 26 October 2018. Both newly installed and the pre-existing wells were surveyed at that time. The depth to water at all the wells was measured using an electric water level probe. The depth measurements were consistently recorded from the mark on top of the PVC standpipe.

2.4.3 Long Term Groundwater monitoring

Six Solinst Leveloggers and one Barologger were installed in selected monitoring wells to monitor long term water levels. All pressure transducers were set to record water pressure (m) every hour. Depth to water was recorded using an electric water level probe at each location prior to the installation of the pressure transducer.

2.5 Flow Survey

Between 1 October and 4 October 2018, Swiftwater carried out a flow survey on West Alexander and East Alexander Creek. Objective of this study was to understand any groundwater – surface water interaction and to characterize flow losses and gains throughout Alexander Creek, East Alexander Creek, and West Alexander Creek.

2.6 Seepage Survey

Between 12 September and 26 October 2018, SRK field staff conducted a reconnaissance seep survey in order to better understand localized groundwater discharge zones. The survey consisted of a site walkaround and the recording of any visual water flow observed coming out of the ground. Information recorded included:

- GPS coordinates;
- Flow rate of seepage/spring;
- Description with photographic record.

3 Results

This section presents results of the field program.

3.1 Monitoring Well Completion Details

Table 3-1 summarizes monitoring well completion details. Detailed borehole logs are included in Appendix A (SRK) and B (Stantec). Figure 1 shows the locations of all the wells installed during the 2018 field hydrogeological investigation.

One of the deep boreholes (GW1) was abandoned because flowing artesian conditions complicated the monitoring well installation. The hole was plugged with a grouting mixture of cement and bentonite.

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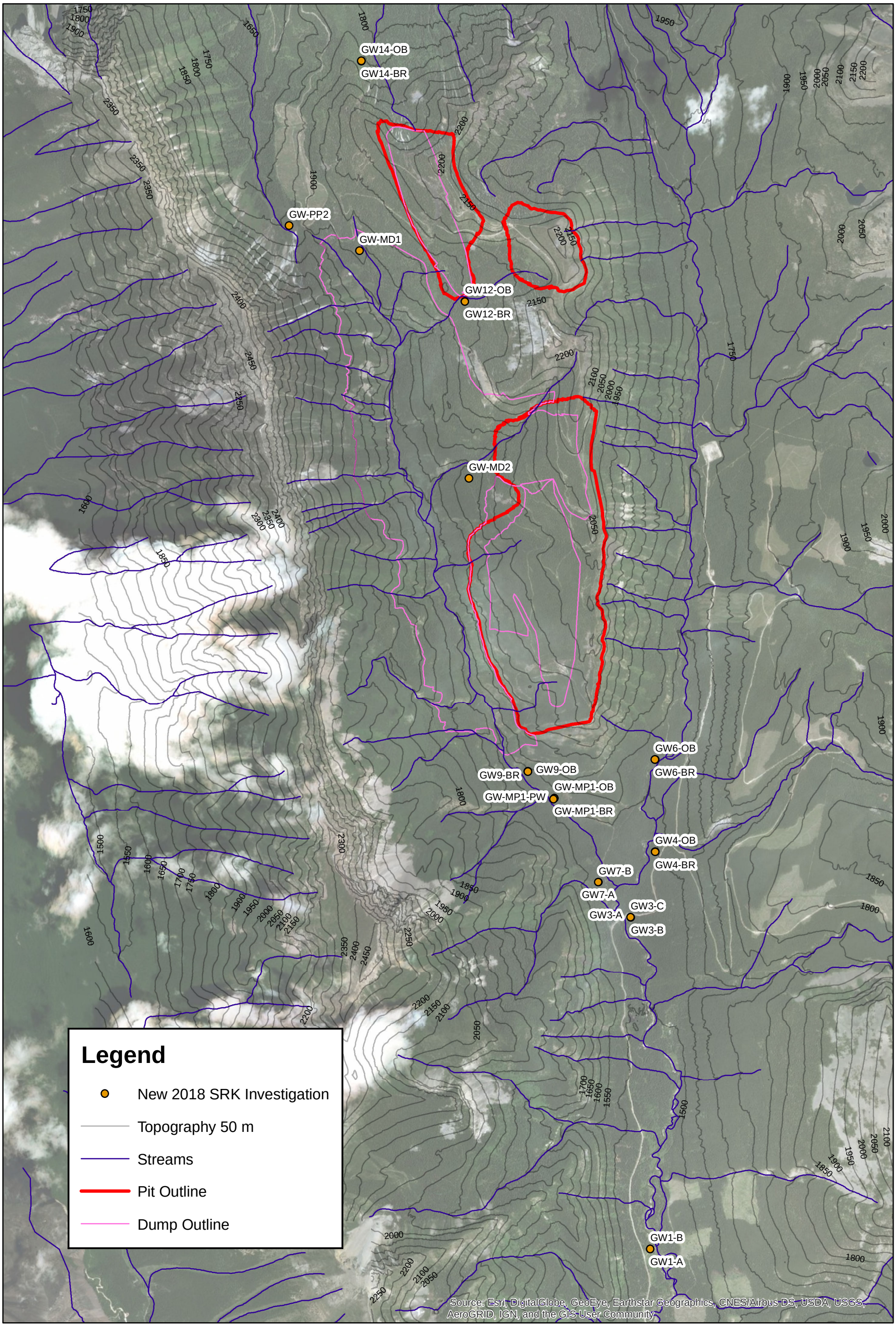

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NWP Coal Canada Ltd

As-built - 2018 GW Well Locations

Job No: 1CN028.002

Filename: Figure 1_Locations_rev00

Crown Mountain -
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Table 3-1: Monitoring Well Completion Details

Monitoring Well ID	Easting UTM	Northing UTM	DH Diameter (mm)	MW Diameter (mm)	Borehole Depth (m bgs)	ScreenTop (m bgs)	Screen Bottom (m bgs)	Midpoint Scrn Depth (m bgs)	Screen Length (m)	Screen Slot Size -	Elevation (m)	TOC Elevation (m masl)	PVC Stickup (m ags)	Midpoint Screen Elev. Elevation (masl)	Screen Geology	Date Completed
GW1-A	664415.5	5512946.9	140	51	27.4	24.4	27.4	25.9	3.0	0.010	1466.67	1467.47	0.790	1440.76	Sand, silty, fine	10/15/2018
GW1-B	664415.4	5512946.9	178	51	27.4	5.9	9.0	7.5	3.0	0.010	1466.67	1467.52	0.820	1459.20	Sand	10/15/2018
GW3-A	664250.4	5515733.7	140	51	47.2	41.5	44.5	43.0	3.0	0.010	1515.95	1517.11	1.180	1472.98	Gravel and cobbles, sand	10/24/2018
GW3-B	664251.6	5515733.2	140	51	24.4	21.0	24.1	22.6	3.0	0.010	1515.96	1516.83	0.840	1493.40	Cobbles, gravel and sand	10/25/2018
GW3-C	664250.3	5515733.8	178	51	47.2	8.8	11.9	10.4	3.0	0.010	1515.95	1517.15	1.225	1505.59	Sand and gravel, cobbley	10/24/2018
GW4-OB	664455.6	5516284.9	140	51	13.7	10.7	13.7	12.2	3.0	0.010	1546.81	1547.84	1.025	1534.62	Sand and gravel, silt	10/23/2018
GW4-BR	664455.6	5516283.4	140	51	36.6	32.0	35.1	33.5	3.0	0.010	1546.69	1547.79	0.980	1513.16	Bedrock (Sandstone)	10/22/2018
GW6-OB	664454.7	5517060.3	140	51	6.1	2.4	5.5	4.0	3.0	0.010	1562.76	1563.68	0.915	1558.80	Sand&Gravel	9/25/2018
GW6-BR	664453.7	5517059.2	140	51	15.2	11.3	14.3	12.8	3.0	0.010	1562.70	1563.65	0.955	1549.89	Bedrock (Sandstone)	9/25/2018
GW7-A	663978.6	5516029.7	140	51	36.6	29.9	32.9	31.4	3.0	0.010	1532.40	1533.15	0.870	1501.00	Cobbles and sand, sand	10/16/2018
GW7-B	663980.2	5516029.3	140	51	14.5	10.5	13.6	12.0	3.0	0.010	1532.36	1533.26	1.020	1520.32	Sand and gravel, silty	10/17/2018
GW-MP1-OB	663608.5	5516735.5	178	51	32.0	7.3	10.4	8.8	3.0	0.010	1554.45	1555.32	0.870	1545.61	Gravel, sandy with clay	9/22/2018
GW-MP1-BR	663608.5	5516735.5	140	51	32.0	28.0	31.1	29.6	3.0	0.010	1554.45	1555.29	0.840	1524.88	Bedrock (Mudstone)	9/22/2018
GW-MP1-PW	663601.8	5516727.3	178	102	32.0	7.8	10.8	9.3	3.0	0.020	1554.33	1555.33	1.005	1545.03	Gravel, sandy with silt/clay	9/24/2018
GW9-OB	663385.1	5516959.7	140	51	24.4	21.0	24.1	22.6	3.0	0.010	1592.19	1592.99	0.805	1569.63	Clayey Sand and Gravel/Clay	9/20/2018
GW9-BR	663386.4	5516959.0	140	51	42.7	39.6	42.7	41.1	3.0	0.010	1592.00	1592.91	0.910	1550.85	Sand/Fractured Bedrock	9/19/2018
GW12-OB	662858.0	5520907.9	140	51	10.6	4.6	7.6	6.1	3.0	0.010	1983.52	1984.44	0.925	1977.42	Sand&Gravel/Fractured Bedrock	9/15/2018
GW12-BR	662857.2	5520907.1	140	51	15.2	13.7	15.2	14.5	1.5	0.010	1983.53	1984.45	0.920	1969.08	Bedrock (Sandstone)	9/16/2018
GW14-OB	661986.3	5522929.1	140	51	16.8	12.2	15.2	13.7	3.0	0.010	1865.55	1866.37	0.820	1851.83	Sand&Gravel/Fractured Bedrock	9/14/2018
GW14-BR	661986.0	5522930.9	140	51	22.6	19.5	22.6	21.0	3.0	0.010	1865.61	1866.52	0.905	1844.58	Bedrock (Mudstone)	9/13/2018
GW-MD1	661971.9	5521336.1	140	51	6.1	1.8	4.9	3.4	3.0	0.010	1916.23	1917.17	0.935	1912.88	Bedrock (Sandstone)	9/28/2018
GW-MD2	662891.4	5519422.1	140	51	21.3	17.1	20.1	18.6	3.0	0.010	1827.58	1828.36	0.780	1808.99	Silt/Gravel/Fractured Bedrock	9/27/2018
GW-PP2	661379.6	5521545.3	140	51	7.9	5.5	7.0	6.2	1.5	0.010	1870.56	1871.47	0.905	1864.31	Bedrock (Sandstone)	9/29/2018

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Crown Mountain\1CN028.002_Ground Water Assessment\!080_Deliverables\1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 1-1 Scope of Work

3.2 Well Development and sampling results

Monitoring well and pumping well development results are summarized in Table 3-2 amd Table 3-3 (respectively).

Table 3-4 shows a summary of the groundwater samples collected at site. O'Kane field report is attached in Appendix C.

3.3 Hydraulic testing and water level results

Table 3-5 reports a summary of the hydraulic tests conducted in the monitoring wells.

Table 3-6 shows the results of the water level survey (depths to water and geodetic water level elevations). Figure 2 shows the geodetic water level elevations.

Figure 3 shows locations of monitoring wells selected for the long-term monitoring. A list of monitoring wells that were equipped, for the long-term monitoring, with a pressure transducer (and relative serial number) is presented in Table 3-7.

3.4 Flow survey results

Swiftwater flow survey report is attached in Appendix D.

3.5 Seepage Survey results

A detailed seepage survey summary is presented in Table 3-8. Figure 4 shows locations of seepage points.

1852.64 GW14-OB
1852.46 GW14-BR
2096.17 CM12-01
GW-PP2 1865.62
nm CM11-11
GW-MD1 1913.00
1988.51 CM13-06
dry GW12-OB
GW12-BR 1968.39
GW-MD2 1821.79
dry CM13-20
nm CM13-25
1571.84 GW9-OB
1573.28 GW9-BR
1560.02 GW6-OB
1559.34 GW6-BR
1546.77 GW-MP1-OB
1542.01 GW-MP1-BR
1547.18 GW-MP1-PW
1535.41 GW4-OB
1529.03 GW4-BR
1511.09 GW7-A
1518.31 GW7-B
1509.30 GW3-A
1509.30 GW3-B
1509.24 GW3-C
1464.95 GW1-A
1465.65 GW1-B

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- New 2018 SRK Investigation
- Previous Investigation
- 1511.09 GW Elevation (m asl)
- Streams
- Pit Outline
- Dump Outline
- Topography 50 m

srk consulting

NWP Coal Canada Ltd

Groundwater Levels, 26 October 2018

Job No: 1CN028.002

Filename: Figure 2_October WL_rev00

Crown Mountain -
2018 Hydrogeological Field Data Report

Date: 2019-01-18

Approved: AM

Figure: 2

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CM12-01
CM11-11
CM13-06
GW12-BR
CM13-20
CM13-25
GW6-OB
GW-MP1-OB
GW-MP1-BR
GW3-C
GW1-B

Legend

- 2018 SRK Locations Equipped with Pressure Transducer
- Previous Locations Equipped with Pressure Transducer
- Topography 50 m
- Streams
- Pit Outline
- Dump Outline

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Long Term Monitoring Locations

Job No: 1CN028.002

Filename: Figure 3_Long Term Monitoring Locations_rev00

Crown Mountain -
2018 Hydrogeological Field Data Report

Date:	Approved:	Figure:
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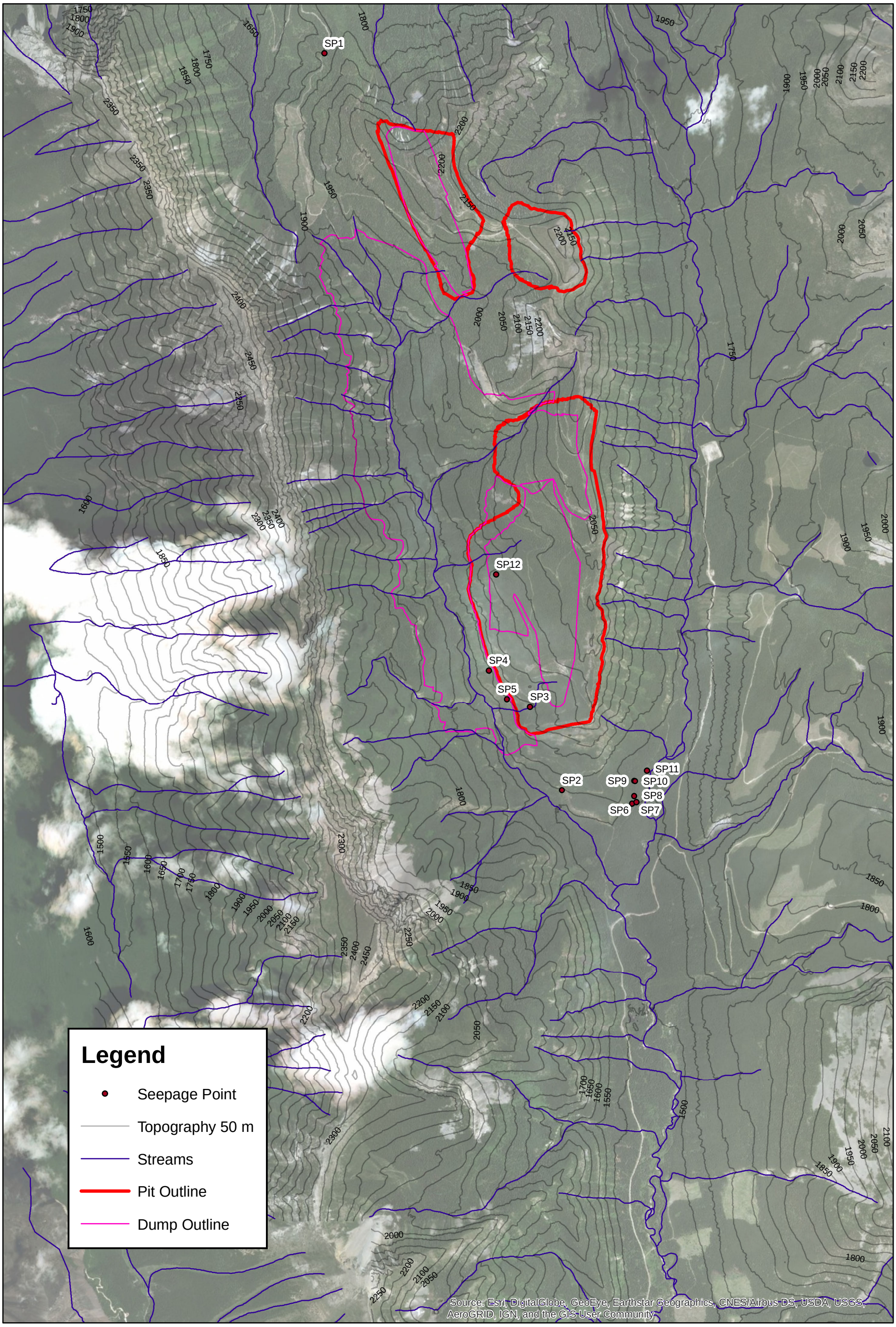
Z:\01_SITES\Crown Mountain\040_AutoCAD\Figures for report\2018 Field Investigation Summary Report\Figure 3_Long Term Monitoring Locations_rev00.mxd



Z:\01_SITES\Crown Mountain\040_AutoCAD\Figures for report\2018 Field Investigation Summary Report\Figure 4_Seepage Points Locations_rev00.mxd

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Seepage Point Locations

Job No: 1CN028.002

Filename: Figure 4_Seepage Points Locations_rev00

Crown Mountain -
2018 Hydrogeological Field Data Report

Date:	Approved:	Figure:
2019-01-18	AM	4

Table 3-2: Monitoring Well Development Results

Monitoring Well	Volume Purged	Development	Developer	Date	Field pH	Field EC	TDS	Turbidity	Observation
ID	(L)	-	-	-	-	(µS/cm)	(ppm)	(NTU)	
GW1-A	671	Hydrolift	SRK/OKC	11/3/2018	7.82	454.5	295.52	201	Turbid
GW1-B	300	Hydrolift	SRK	10/16/2018	na	na	na	53	Clear
GW3-A	1,100	Hydrolift	SRK/OKC	11/3/2018	8.24	337.7	219.5	37.9	Clear
GW3-B	950	Hydrolift	SRK	10/25/2018	na	na	na	40	Clear
GW3-C	400	Hydrolift	SRK	10/27/2018	na	na	na	17	Clear
GW4-OB	66	Hydrolift/Bailer	SRK/OKC	11/3/2018	8.12	404.1	268.57	15.4	Clear
GW4-BR	569	Hydrolift	SRK/OKC	11/3/2018	8.27	723.4	470.19	40	Clear
GW6-OB	750	Hydrolift	SRK/OKC	11/6/2018	7.68	505.4	351.5	5	Clear
GW6-BR	81	Hydrolift/Bailer	SRK/OKC	11/6/2018	7.71	1574.3	1017.86	OR	Turbid, silty grey
GW7-A	1,050	Hydrolift	SRK/OKC	11/3/2018	8.1	312.4	203.09	56	Clear
GW7-B	10	Bailer	SRK/OKC	11/3/2018	na	na	na	na	Muddy, sandy brown
GW-MP1-OB	500	Hydrolift	SRK	9/22/2018	na	na	na	40.2	Clear
GW-MP1-BR	340	Hydrolift	SRK	9/28/2018	na	na	na	OR	black
GW9-OB	360	Hydrolift	SRK	9/24/2018	na	na	na	39.3	Clear
GW9-BR	800	Hydrolift	SRK	9/21/2018	na	na	na	42	Clear
GW12-OB	dry	na	ns	na	na	na	na	na	na
GW12-BR	4	Bailer	SRK/OKC	10/31/2018	8.1	372	241.78	OR	Muddy, sandy brown
GW14-OB	1,220	Hydrolift	SRK/OKC	10/31/2018	7.44	328.7	213.78	26.9	Clear
GW14-BR	1,220	Hydrolift	SRK/OKC	10/30/2018	7.91	417	271.05	35.2	Clear
GW-MD1	13	Bailer	OKC	11/1/2018	na	na	na	OR	Muddy
GW-MD2	900	Hydrolift	SRK/OKC	11/1/2018	8.13	302	196.9	34	Clear
GW-PP2	20	Hand	OKC	11/1/2018	8.1	372	241.78	OR	Muddy

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Crown Mountain\1CN028.002_Ground Water Assessment\!080_Deliverables\1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 1-1 Scope of Work

Table 3-3: Pumping Well Development Results

Monitoring Well	Volume Purged	Airlift Yeald	Date Completed	Field pH	Field EC	TDS	Turbidity	Observation
ID	(L)	USgpm	-	-	(µS/cm)	(ppm)	(NTU)	
GW-MP1-PW	6,000	2	9/26/2018	na	na	na	90	1 tsp of sediments

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Crown Mountain\1CN028.002_Ground Water Assessment\!080_Deliverables\1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 3-3 PW Development

Notes:

L – Liter

Usgpm – US galons per minute

Ppm – Part per Million

NA – not available

Table 3-4: Groundwater Quality Summary

Monitoring Well ID	Sampling Method	Sampler	Date Sampled
GW1-A	Bladder Pump	OKC	11/4/2018
GW1-B	Bladder Pump	OKC	11/2/2018
GW3-A	Bladder Pump	OKC	11/5/2018
GW3-B	Bladder Pump	OKC	11/4/2018
GW3-C	Bladder Pump	OKC	11/4/2018
GW4-OB	Hydrasleeve	OKC	11/4/2018
GW4-BR	Bladder Pump	OKC	11/4/2018
GW6-OB	2" Submersible Pump	SRK	9/27/2018
GW6-BR	2" Submersible Pump	SRK	10/2/2018
GW7-A	Bladder Pump	OKC	11/5/2018
GW7-B	Hydrasleeve	OKC	11/5/2018
GW-MP1-OB	2" Submersible Pump	SRK	9/27/2018
GW-MP1-BR	2" Submersible Pump	SRK	10/2/2018
GW9-OB	2" Submersible Pump	SRK	9/27/2018
GW9-BR	2" Submersible Pump	SRK	10/2/2018
GW12-OB	ns	ns	ns
GW12-BR	ns	ns	ns
GW14-OB*	Bladder Pump/Bailer	OKC	10/31/2018
GW14-BR*	Bladder Pump	OKC	11/1/2018
GW-MD1	ns	ns	ns
GW-MD2	Bladder Pump	OKC	11/2/2018
GW-PP2	ns	ns	ns

\\srk.ad\dfs\na\van\Projects\01_SITES\Crown Mountain\1CN028.002_Ground Water Assessment\!080_Deliverables\1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 3-4 MW Sampling

Table 3-5:Slug test Summary

Well ID	Screened Depth Interval m bgs		Screened Geology	Test Type	Date Completed
GW1-A	24.4	27.4	Sand, silty, fine	Slug test	10/20/2018
GW1-B	5.9	9.0	Sand	Slug test	10/18/2018
GW3-A	41.5	44.5	Gravel and cobbles, sand	Slug test	10/27/2018
GW3-B	21.0	24.1	Cobbles, gravel and sand	Slug test	10/27/2018
GW3-C	8.8	11.9	Sand and gravel, cobbley	Slug test	10/27/2018
GW4-OB	10.7	13.7	Sand and gravel, silt	Recovery Test	10/27/2018
GW4-BR	32.0	35.1	Bedrock (Sandstone)	Slug test	10/27/2018
GW6-OB	2.4	5.5	Sand&Gravel	Slug test	9/26/2018
GW6-BR	11.3	14.3	Bedrock (Sandstone)	Recovery Test	9/28/2018
GW7-A	29.9	32.9	Cobbles and sand, sand	Slug test	10/18/2018
GW7-B	10.5	13.6	Sand and gravel, silty	Recovery Test	10/20/2018
GW-MP1-OB	7.3	10.4	Gravel, sandy with clay	Slug test	9/24/2018
GW-MP1-BR	28.0	31.1	Bedrock (Mudstone)	Recovery Test	9/27/2018
GW9-OB	21.0	24.1	Clayey Sand and Gravel/Clay	Slug test	9/23/2018
GW9-BR	39.6	42.7	Sand/Fractured Bedrock	Slug test	9/23/2018
GW12-OB	4.6	7.6	Sand&Gravel/Fractured Bedrock	na	na
GW12-BR	13.7	15.2	Bedrock (Sandstone)	Recovery Test	9/29/2018
GW14-OB	12.2	15.2	Sand&Gravel/Fractured Bedrock	Slug test	9/23/2018
GW14-BR	19.5	22.6	Bedrock (Mudstone)	Slug test	9/23/2018
GW-MD1	1.8	4.9	Bedrock (Sandstone)	Slug test	10/26/2018
GW-MD2	17.1	20.1	Silt/Gravel/Fractured Bedrock	Slug test	10/26/2018
GW-PP2	5.5	7.0	Bedrock (Sandstone)	Slug test	10/26/2018

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Crown Mountain\1CN028.002_Ground Water Assessment\!080_Deliverables\1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 3-4 MW Sampling

Table 3-6: Water Level survey (26 October 2018)

ID	Easting	Northing	TOC Elevation (m amsl)	PVC Stickup (m ags)	Total depth (m btop)	Screened Depth Interval (m bgs)		GW Level Observations	
								26-Oct-18	
								DTW (m btop)	Elevation (m amsl)
GW1-A	664416	5512947	1467.47	0.790	27.900	24.38	27.43	2.525	1464.95
GW1-B	664415	5512947	1467.52	0.820	9.830	5.94	8.99	1.877	1465.65
GW3-A	664250	5515734	1517.11	1.180	45.440	41.45	44.50	7.808	1509.30
GW3-B	664252	5515733	1516.83	0.840	24.905	21.03	24.08	7.523	1509.30
GW3-C	664250	5515734	1517.15	1.225	13.000	8.84	11.89	7.911	1509.24
GW4-OB	664456	5516285	1547.84	1.025	14.720	10.67	13.72	12.426	1535.41
GW4-BR	664456	5516283.4	1547.79	0.980	35.920	32.00	35.05	18.757	1529.03
GW6-OB	664455	5517060	1563.68	0.915	6.340	2.44	5.49	3.651	1560.02
GW6-BR	664454	5517059	1563.65	0.955	14.965	11.28	14.33	4.309	1559.34
GW7-A	663979	5516030	1533.15	0.870	33.860	29.87	32.92	22.055	1511.09
GW7-B	663980	5516029	1533.26	1.020	15.445	10.52	13.56	14.947	1518.31
GW-MP1-OB	663609	5516735	1555.32	0.870	11.120	7.32	10.36	8.554	1546.77
GW-MP1-BR	663609	5516735	1555.29	0.840	31.380	28.04	31.09	13.284	1542.01
GW-MP1-PW	663602	5516727	1555.33	1.005	11.650	7.77	10.82	8.152	1547.18
GW9-OB	663385	5516960	1592.99	0.805	25.450	21.03	24.08	21.153	1571.84
GW9-BR	663386	5516959	1592.91	0.910	43.695	39.62	42.67	19.630	1573.28
GW12-OB	662858	5520908	1984.44	0.925	8.500	4.57	7.62	dry	dry
GW12-BR	662857	5520907	1984.45	0.920	16.100	13.70	15.20	16.069	1968.39
GW14-OB	661986	5522929	1866.37	0.820	15.015	12.19	15.24	13.728	1852.64
GW14-BR	661986	5522931	1866.52	0.905	23.500	19.51	22.56	14.053	1852.46
GW-MD1	661972	5521336	1917.17	0.935	5.530	1.83	4.88	4.169	1913.00
GW-MD2	662891	5519422	1828.36	0.780	20.270	17.07	20.12	6.570	1821.79
GW-PP2	661380	5521545	1871.47	0.905	8.117	5.49	7.01	5.850	1865.62
Historical Monitoring Wells									
CM11-11	662704	5521503	2088.00	na	125.020	120.00	123.00	nm	nm
CM12-01	662429	5522037	2143.00	na	124.170	118.50	124.50	46.832	2096.17
CM13-06	662823	5521114	1998.00	na	35.470	31.70	34.70	9.493	1988.51
CM13-20	663264	5518426	1877.00	na	23.840	20.80	23.80	dry	dry
CM13-25	663769	5517924	1938.00	na	90.120	87.10	90.10	nm	nm

Source: 1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 3-6 Water Level

Notes:
m – metres
GW – Monitoring Well (Groundwater Program)
btop - Below Top of Pipe
ags – Above Ground Survace
TOC – Top of Casing (PVC Pipe)
amsl – Above Mean Sea Level
nm – not measured
na – not available

Table 3-7: Long Term Monitoring Summary

Monitoring Well	DTW	Pressure Transducer Depth	Pressure transducer Serial # (Solinst)	Note
ID	m btop	m btop	-	
GW1-B	1.89	6	2092789	
GW3-C	7.91	12	2092928	
GW6-OB	3.37	8	2089975	
GW-MP1-OB	8.27	13	2092796	Barologger installed in casing (Serial # 2092763)
GW-MP1-BR	15.72	18	2092776	
GW12-BR	15.87	15	2092933	

Source:\\srk.ad\dfs\na\van\Projects\01_SITES\Crown Mountain\1CN028.002_Ground Water Assessment\!080_Deliverables\1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 3-6 Water Level

Notes:

DTW – Depth to Water

m – Meters

GW – Monitoring Well (Groundwater Program)

btop – Below Top of Pipe

Table 3-8: Seepage Survey Summary

Seepage Point	Easting	Northing	Estimated Flow	Note	Date
ID	UTM	UTM	(L/min)		
SP1	661676.0	5522992.8	< 1	Small seep near GW14	9/14/2018
SP2	663672.2	5516800.9	< 1	Small seep above MP1, on road	9/24/2018
SP3	663404.6	5517502.7	< 1	Small seepage on branch C km 105-106	9/27/2018
SP4	663059.0	5517806.0	15	Potential Spring 3-4 m below	10/20/2018
SP5	663211.8	5517564.7	0.5	Small seep	10/20/2018
SP6	664261.4	5516688.6	< 1	Small seep, marsh area	10/27/2018
SP7	664297.8	5516702.0	8	Little Creek	10/27/2018
SP8	664281.0	5516753.8	8	Little Creek	10/27/2018
SP9	664280.8	5516879.5	8	Little Creek	10/27/2018
SP10	664288.1	5516877.5	8	Possible spring	10/27/2018
SP11	664387.7	5516966.2	8	Water seepage, little creek	10/27/2018
SP12	663119.6	5518614.5	< 1	Small seep below pad CM-22	10/27/2018

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Crown Mountain\1CN028.002_Ground Water Assessment\!080_Deliverables\1CN028.002.500 2018 Hydrogeology Field Data Report\!020_Tables\[2018_Hydrogeological_Field_Data Tables_1CN028-200_Draft_Rev0_AM.xlsx]Table 3-6 Water Level

Notes:

m – meters

SP – Seepage Point

L - Litre

4 Field Data Summary

4.1 Overview

This hydrogeological field data report was intended to summarize the field work done by SRK during September – November 2018 at Crown Mountain. The following section briefly describes key findings of the investigation however, most of the data analysis, the conceptual model and the supporting groundwater modeling, will be presented later on in a more comprehensive Baseline Study Report that will fully support the EA for the feasibility study of the proposed mine.

4.2 Stratigraphy

The sediments encountered during drilling are mostly consistent with the geological history in the area as described by BGC (2017): glacial sediment from the most recent glacial episode (Fraser Glaciation) and weathered bedrock reworked by gravity and water to redistribute them as colluvium and fluvial sediments. Streams and rivers have graded to the present-day river level of the Elk River, downcutting into glacial deposits and bedrock creating gullies, terraces, benches and steep-sided scarps. Glaciofluvial terraces, glaciolacustrine deposits and till blankets are located along the lower slopes of the site. Alluvial fans have formed at the mouths of the major creeks. Colluvium is present on many of the steep slopes in the study area and is usually mapped near bedrock outcrops (BGC, 2017).

General description of the stratigraphic units is provided below:

COLLUVIUM (12 - 20 m thick): Observed on the higher slopes of the West Alexander valley (GW7 and GW9) and consisted typically of loose to medium dense material with 5 to 20% fines ranging from a brown to greyish brown color. Coarse grains often sands and gravels with angular to rounded edges. Colluvium contains cemented till lenses.

FLUVIAL MATERIALS (0 - 13 m thick): Observed in the valley of the West Alexander, East Alexander and Alexander Creek (GW1, GW3, GW4, GW6 and GW-MP1) consisting of layers of gravels, sands and silty sands. Possible confusion with glaciofluvial deposits where separation by till is not possible.

GLACIOLFLUVIAL SEDIMENTS (up to 35 m thick): The Fraser outwash glaciation resulted in the glaciolfluvial sediments within the Alexander Creek valley. In general, the sediments are mostly loose clean subangular to rounded sands and gravels but include also silty and clayey layers. Glaciolfluvial sediments are deep, overlaid by fluvial material and till blankets and range from dark grey to black. Observed at GW3, GW4 and GW7.

GLACIOLACUSTRINE DEPOSITS (0 - 38 m thick): Layers of dark grey very fine poorly-graded sand transitioning to a high plastic clay were found in many of two boreholes in West Alexander and Alexander Creek valley (GW1 and GW7) at around 30 m depth. Field observation suggest glaciolacustrine may act as aquiclude giving way to artesian conditions in the underlying aquifer.

TILL DEPOSITS (10 - 20 m thick): The till/morainal deposit was identified in field as being a dense basal till overlying bedrock on the higher slopes of the West Alexander valley and overlying colluvium or glaciofluvial deposits lower in the valleys and consisting of silt with coarser grains (sands and gravels) and typically dark grey to black in color. Observed at GW4, GW9, GW12 and GW14. Hard cemented layers of till act as aquiclude, confining underlying units and creating perched water tables on top of them.

BEDROCK: Dark grey to black mudstone and sandstone, fine-grained and varying from platy to blocky texture, weak to moderate in strength. The presence of quartz infill was notices at GW4. Depth to bedrock in the lateral West and East Alexander Creek valleys mostly ranged from 6 to 40 m bgs. Bedrock depth in the lower West Alexander and in Alexander Creek valley could not be tagged because of deeper than expected ground conditions (drilling rig depth capability maximized).

4.3 Groundwater Flow

Figure 2 presents the groundwater elevation map based on static groundwater level measurements made on 26 October 2018. The groundwater elevation map shows groundwater elevations site ranging between 1465 m asl (GW1) and 1968 m asl (GW12).

Variations in groundwater levels and groundwater flow directions are currently unknown; however, it is expected that water levels will be affected by freshet and rainfall events while groundwater flow directions will be likely affected by topography.

5 Conclusion

5.1 Field Investigation

The 2018 hydrogeological field investigation at Crown Mountain was conducted from September to November 2018 in support of the feasibility study and permitting for the proposed mine. The investigation consisted of drilling and installation of 16 single, 3 nested monitoring wells and 1 pumping well, at 12 locations, and subsequent hydraulic testing, water quality sampling and water level surveys on the newly installed wells.

This report is intended to be a summary of the field activities. A brief discussion regarding the site stratigraphy and water levels is reported below.

5.1.1 Stratigraphy

In general, colluvial material with low permeability and densely compacted fine grained till layers over bedrock were observed at higher elevations on West Alexander Creek and relative permeable fluvial materials overlying tills and glaciofluvial sands and gravels dominated at lower elevations in the lateral valleys and in the Alexander Creek valley. Glaciolacustrine deposits of relative low permeability, very fine sands, silts and clays were also observed on the southern side of the Alexander Creek valley, are believed to be overlying bedrock.

5.1.2 Water levels

Based on data collected on 26 October 2018, groundwater levels ranged from 1465 m asl and 1968 m asl. Variations in groundwater levels and groundwater flow directions are currently unknown.

A detailed description of what is SRK's "going forward" plan, starting from the field data collected during the 2018 hydrogeological field investigation is summarized in the next paragraph.

5.2 Going Forward

Starting from the field data collected during the 2018 hydrogeological field investigation, SRK is planning to:

1. Complete data reduction.
2. Compile all the available data (SRK, Stantec, NWP, Dillon).
3. Create/update the Conceptual Site Model that will include stratigraphy (from boreholes, test pits and terrain mapping), hydraulic conductivities (from slug tests and pumping test), hydrology, groundwater quality, recharge data, seepage data and water balance.
4. Build a groundwater numerical model to assess baseline and mining (operational and end of mine) conditions and to propose mitigations.
5. Conduct an Effects Assessment as part of the EA.

6 Recommendations

SRK recommends that all of the new monitoring wells completed during the 2018 hydrogeological investigation along with the existing ones be routinely monitored as part of the EA for the proposed mine at Crown Mountain.

At a minimum, the following routine monitoring should be conducted:

- Complete well development for those that did not have sufficient water for development (GW6-BR, GW7-B, GW-MP1-BR, GW12-OB, GW-MD1 and GW-PP2);
- Quarterly water level monitoring in all existing and new monitoring wells and data download of all the pressure transducer (newly and pre-installed ones);
- Quarterly water quality sampling in all existing and newly installed monitoring wells

SRK recommends that the quarterly monitoring be conducted by O'Kane starting in February 2019.

This report, 2018 Hydrogeological Field Data Report, Crown Mountain, BC, was prepared by

Alberto Marengo GIT,
Consultant (Hydrogeology)

and reviewed by

Dan Mackie PGeo,
Principal Consultant (Hydrogeology)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

7 References

BGC, 2017. Draft Crown Mountain Project Terrain Stability and Geohazards Mapping. Report prepared for Keefer Ecological Services, December 21, 2017.

Appendix A – SRK Borehole Logs

Borehole Number: **GW1-A/B**
Location: **Alexander Road km 88**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **27.40**
Depth to Rock(m): **na**

Start Date: **10/14/2018**
End Date: **10/15/2018**

Borehole Coordinates: **E: 664,415.4 (m) N: 5,512,947 (m)** Ground Elevation (m): **1,466.672**

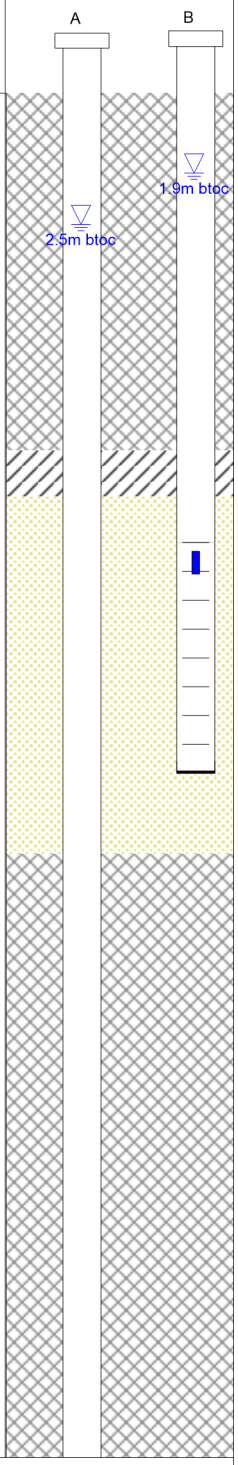
Collar Dip (deg): **90** Depth to Water (m): **1.735 (A), 1.057 (B)** Casing Stickup (m): **0.79 (A), 0.82 (B)**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy
0	1468						
0–4	1468–1464		GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some sand, trace silt, loose, wet, brown, subrounded.		Fluvial	
4–5	1464–1462		SW	Well Graded Sand (SW) - few gravel, trace cobble, loose, saturated, dark brown.			
5–6	1462–1460		GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some cobble, loose, saturated, dark brown, subangular to subrounded.			
6–7	1460–1460		ML	Sandy Silt (ML) - some clay, soft, saturated, dark brown, no dilatancy, non-plastic, noncohesive.			
7–8	1460–1458		GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some cobble, few silt, loose, saturated, brown, subangular to subrounded.			
8–9	1458–1458		SW	Well Graded Sand (SW) - Sand is Fine to Medium, trace silt, soft, saturated, very dark grayish brown.			
9–10	1458–1456		SM	Silty Sand (SM) - Sand is Fine to Medium, , soft, saturated, very dark grayish brown.			
10–11	1456–1456		ML	Sandy Silt (ML) - soft, saturated, very dark grayish brown, no dilatancy, low plasticity, noncohesive.			Aquifer
11–12	1456–1454		SM	Silty Sand (SM) - Sand is Fine to Medium, , soft, saturated, very dark grayish brown, no dilatancy, low plasticity, noncohesive.			
12–14	1454–1452		SW	Well Graded Sand (SW) - Sand is Fine to Medium, trace silt, soft, saturated, very dark grayish brown.			
14–15	1452–1452		SM	Silty Sand (SM) - Sand is Fine to Medium, trace clay, soft, saturated, very dark grayish brown, no dilatancy, low plasticity, noncohesive.			
15–17	1452–1450		ML	Sandy Silt (ML) - very dense, saturated, gray, no dilatancy, low plasticity, noncohesive.			
17–18	1450			Silty Sand (SM) - Sand is Fine to Medium, trace clay, dense,			

INSTALLATION



Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW1-A/B**
Location: **Alexander Road km 88**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **27.40**
Depth to Rock(m): **na**

Start Date: **10/14/2018**
End Date: **10/15/2018**

Borehole Coordinates: **E: 664,415.4 (m) N: 5,512,947 (m)** Ground Elevation (m): **1,466.672**

Collar Dip (deg): **90** Depth to Water (m): **1.735 (A), 1.057 (B)** Casing Stickup (m): **0.79 (A), 0.82 (B)**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
			SM	saturated, gray, no dilatancy, low plasticity, noncohesive.		Glaciolacustrine		
19	1448		SP	Poorly Graded Sand (SP) - Sand is Fine, trace silt, soft, saturated, gray.				
20			SM	Silty Sand (SM) - Sand is Fine, some clay, very dense, saturated, gray, no dilatancy, non-plastic, noncohesive.				
21	1446							
22								
23	1444		ML	Sandy Silt (ML) - some clay, soft, saturated, very dark grayish brown, no dilatancy, low plasticity, noncohesive.				
24								
25	1442		SM	Silty Sand (SM) - Sand is Fine, very dense, saturated, gray, no dilatancy, low plasticity, noncohesive.				
26								
27	1440							

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW1**
Location: **Alexander Road km 88**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **51.80**
Depth to Rock(m): **49.10**

Start Date: **10/11/2018**
End Date: **10/12/2018**

Borehole Coordinates: **E: 664,415 (m)** **N: 5,512,937 (m)** Ground Elevation (m): **1,466.672**

Collar Dip (deg): **90** Depth to Water (m): **na** Casing Stickup (m): **na**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1468							
1	1466		GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, trace silt, trace cobble, loose, wet, brown.		Fluvial		
3	1464		SW	Well Graded Sand (SW) - trace gravel, trace silt, loose, saturated, brown.				
5	1462		SM	Silty Sand (SM) - Sand is Medium to Coarse, some cobble, soft, saturated, brown, no dilatancy, non-plastic, noncohesive.				
6			ML	Gravelly Silt (ML) - trace clay, stiff, saturated, strong brown, no dilatancy, low plasticity, noncohesive.				
7	1460		SM	Silty Sand (SM) - Sand is Fine, trace clay, dense, saturated, dark grayish brown, no dilatancy, low plasticity, noncohesive.				
9	1458		SP	Poorly Graded Sand (SP) - Sand is Fine, trace silt, dense, saturated, gray. Siltier from 9.1 m to 9.8 m.	Siltier from 9.1 m to 9.8 m			
11	1456		CL	Sandy Lean Clay (CL) - some silt, soft, saturated, gray, slow dilatancy, medium plasticity, cohesive.				
13	1454		SP	Poorly Graded Sand (SP) - Sand is Fine, trace silt, dense, saturated, gray.				
15	1452		ML	Sandy Silt (ML) - stiff, saturated, gray, no dilatancy, medium plasticity, cohesive.			Aquifer	
17	1450							
18								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW1**
Location: **Alexander Road km 88**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **51.80**
Depth to Rock(m): **49.10**

Start Date: **10/11/2018**
End Date: **10/12/2018**

Borehole Coordinates: **E: 664,415 (m)** **N: 5,512,937 (m)** Ground Elevation (m): **1,466.672**

Collar Dip (deg): **90** Depth to Water (m): **na** Casing Stickup (m): **na**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
19	1448		CH	Fat Clay with Sand (CH) - some silt, soft, saturated, gray, slow dilatancy, high plasticity, cohesive.		Glaciolacustrine		
20								
21	1446							
22								
23	1444							
24			ML	Sandy Silt (ML) - some clay, stiff, saturated, dark grayish brown, no dilatancy, low plasticity, cohesive.				
25	1442							
26								
27	1440							
28			SP	Poorly Graded Sand (SP) - Sand is Fine, trace silt, medium dense, saturated, dark grayish brown.				
29	1438							
30								
31	1436							
32								
33	1434							
34								
35	1432							
36								
37	1430		CH	Fat Clay (CH) - some silt, trace sand, soft, saturated, gray, slow dilatancy, high plasticity, cohesive. Less silt content from 33.5 m to 36.6	Less silt content from 33.5 m to 36.6 m, from 39.0m to 39.6 m,			

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW1**
Location: **Alexander Road km 88**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **51.80**
Depth to Rock(m): **49.10**

Start Date: **10/11/2018**
End Date: **10/12/2018**

Borehole Coordinates: **E: 664,415 (m)** **N: 5,512,937 (m)** Ground Elevation (m): **1,466.672**

Collar Dip (deg): **90** Depth to Water (m): **na** Casing Stickup (m): **na**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
38	1428			m, from 39.0m to 39.6 m, from 44.2 m to 45.7 m.	from 44.2 m to 45.7 m		Aquiclude	
39								
40	1426							
41								
42	1424							
43								
44	1422		SC	Clayey Sand (SC) - Sand is Fine, some silt, trace gravel, medium dense, saturated, dark grayish brown, no dilatancy, non-plastic, noncohesive, rounded.				
45								
46	1420		CH	Sandy Fat Clay (CH) - some silt, trace gravel, soft, saturated, dark grayish brown, slow dilatancy, medium plasticity, cohesive, rounded.				
47								
48	1418							
49								
50	1416		Bedrock	Possible Bedrock (Coal), no recovery - soft, saturated, black.		No Recovery	Confined Aquifer	
51								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW3-A/C**
Location: **Alexander Road km 90**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **47.24**
Depth to Rock(m): **na**

Start Date: **10/23/2018**
End Date: **10/24/2018**

Borehole Coordinates: **E: 664,250.3 (m) N: 5,515,734 (m)** Ground Elevation (m): **1,515.952**

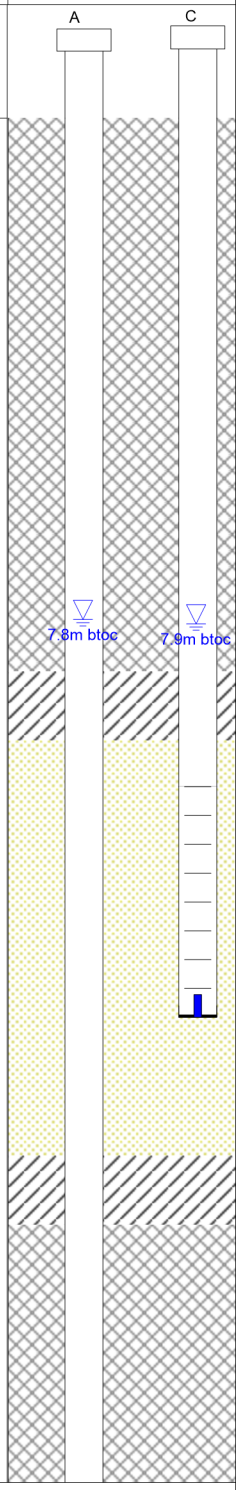
Collar Dip (deg): **90** Depth to Water (m): **6.628 (A), 6.686 (C)** Casing Stickup (m): **1.18 (A), 1.225 (C)**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy
0	1516						
1			SW	Well Graded Sand with Gravel (SW) - some silt, few cobble, medium dense, moist to wet, dark brown, subrounded to rounded. Cobbley and coarser from 6.1 m, silty from 9.1 m.	Cobbley and coarser from 6.1 m, silty from 9.1 m. Saturated from 6.1 m	Fluvial	
2	1514						
3							
4	1512						
5							
6	1510						
7							
8	1508						
9							
10	1506						
11							
12	1504						
13							
14	1502		SM	Silty Sand with Gravel (SM) - Sand is Medium to Coarse, , trace clay, medium dense, saturated, very dark grayish brown, no dilatancy, non-plastic, noncohesive, subrounded to rounded, poorly graded.			
15							
16	1500						
17			ML	Sandy Silt with Gravel (ML) - few clay, stiff, saturated, very dark grayish brown, no dilatancy, low plasticity, noncohesive, rounded,			
18	1498						

INSTALLATION



Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW3-A/C**
Location: **Alexander Road km 90**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **47.24**
Depth to Rock(m): **na**

Start Date: **10/23/2018**
End Date: **10/24/2018**

Borehole Coordinates: **E: 664,250.3 (m) N: 5,515,734 (m)** Ground Elevation (m): **1,515.952**

Collar Dip (deg): **90** Depth to Water (m): **6.628 (A), 6.686 (C)** Casing Stickup (m): **1.18 (A), 1.225 (C)**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
				well graded.				
19			SM	Silty Sand with Gravel (SM) - Sand is Well graded, some cobble, trace clay, medium dense, saturated, very dark grayish brown, no dilatancy, non-plastic, noncohesive, angular to subangular, well graded.				
20	1496							
21								
22	1494		SM	Silty Sand with Gravel (SM) - Sand is Coarse, some clay, trace cobble, dense, saturated, very dark grayish brown, no dilatancy, non-plastic, noncohesive, angular to subangular, poorly graded. Some fine green sand at 24.1 m, Cobbley and boulders from 24.4 m.	Some fine green sand at 24.1 m, Cobbley and boulders from 24.4 m		Aquifer	
23								
24	1492							
25								
26	1490							
27								
28	1488		SP-SM	Poorly Graded Sand with Silt (SP-SM) - Sand is Coarse, , loose, saturated, very dark grayish brown.		Glacioflu vial		
			GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, loose, saturated, dark brown, angular to subangular.				
29			SM	Silty Sand with Gravel (SM) - Sand is Well graded, little cobble, dense, saturated, very dark grayish brown, no dilatancy, non-plastic, noncohesive, subangular to subrounded, well graded.				
30	1486							
31								
32	1484		GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some cobble, medium dense, saturated, very dark grayish brown, subangular to subrounded, poorly graded.				
33								
34	1482		SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - some cobble, loose, saturated, very dark grayish brown, subrounded to rounded.				
35			SW	Well Graded Sand (SW) - little gravel, trace cobble, loose, saturated, very dark grayish brown, rounded.				
36	1480							
37				Sandy Silt (ML) - some gravel, stiff,				

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW3-A/C**
Location: **Alexander Road km 90**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **47.24**
Depth to Rock(m): **na**

Start Date: **10/23/2018**
End Date: **10/24/2018**

Borehole Coordinates: **E: 664,250.3 (m) N: 5,515,734 (m)** Ground Elevation (m): **1,515.952**

Collar Dip (deg): **90** Depth to Water (m): **6.628 (A), 6.686 (C)** Casing Stickup (m): **1.18 (A), 1.225 (C)**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
38	1478		ML	saturated, gray, no dilatancy, low plasticity, cohesive, rounded, poorly graded.				
39			SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - some clay, trace cobble, dense, saturated, gray, subangular to subrounded, well graded.				
40	1476		ML	Sandy Silt with Gravel (ML) - some clay, trace cobble, hard, dry, brown, no dilatancy, non-plastic, noncohesive, angular, poorly graded, laminated, columnar. TILL (cemented).	TILL (cemented)			
41								
42	1474		GW-GM	Well Graded Gravel with Silt and Sand (GW-GM) - some cobble, trace boulder, loose, saturated, very dark grayish brown, subangular to subrounded, well graded.				
43								
44	1472							
45			SP	Poorly Graded Sand with Gravel (SP) - Sand is Coarse, some cobble, trace silt, medium dense, saturated, very dark grayish brown, subangular to subrounded.				
46	1470							
47								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW3-B**
Location: **Alexander Road km 90**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **24.38**
Depth to Rock(m): **na**

Start Date: **10/21/2018**
End Date: **10/21/2018**

Borehole Coordinates: **E: 664,251.6 (m) N: 5,515,733 (m)** Ground Elevation (m): **1,515.957**

Collar Dip (deg): **90** Depth to Water (m): **6.683** Casing Stickup (m): **0.84**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1516							
1								
2	1514							
3								
4	1512							
5								
6	1510							
7			SM	Silty Sand with Gravel (SM) - trace cobble, loose, saturated, brown, subrounded to rounded, well graded. Boulder at 4.6 m, Cobbley and Coarse from 6.1 m.	Boulder at 4.6 m, Cobbley and Coarse from 6.1 m. Saturated from 6.1 m	Fluvial	Aquifer	7.5m btoc
8	1508							
9								
10	1506							
11								
12	1504							
13								
14	1502		ML	Sandy Silt with Gravel (ML) - trace cobble, medium stiff, saturated, dark brown, no dilatancy, low plasticity, noncohesive, subrounded, well graded.				
15								
16	1500		SM	Silty Sand (SM) - few gravel, trace clay, loose, saturated, very dark grayish brown, subrounded, well				
17								
18	1498							

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW3-B**
Location: **Alexander Road km 90**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **24.38**
Depth to Rock(m): **na**

Start Date: **10/21/2018**
End Date: **10/21/2018**

Borehole Coordinates: **E: 664,251.6 (m) N: 5,515,733 (m)** Ground Elevation (m): **1,515.957**

Collar Dip (deg): **90** Depth to Water (m): **6.683** Casing Stickup (m): **0.84**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
19				graded.		Glacioflu vial		
20	1496		ML	Sandy Silt (ML) - little gravel, soft, saturated, gray, no dilatancy, low plasticity, noncohesive, angular, well graded.				
21			GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, little cobble, few silt, dense, saturated, dark brown, subangular.				
22	1494							
23			SM	Silty Sand with Gravel (SM) - some gravel, dense, saturated, dark brown, subangular, well graded.				
24	1492							

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW4-BR**
Location: **Alexander Road km 91.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **36.58**
Depth to Rock(m): **31.70**

Start Date: **10/21/2018**
End Date: **10/22/2018**

Borehole Coordinates: **E: 664,455.6 (m) N: 5,516,283 (m)** Ground Elevation (m): **1,546.686**

Collar Dip (deg): **90** Depth to Water (m): **17.78** Casing Stickup (m): **0.98**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1548							
1	1546		SW	Well Graded Sand with Gravel (SW) - little cobble, trace silt, loose, dry, brown, subrounded to rounded. Cobbley from 3.0 m to 7.6 m.	Cobbley from 3.0 m to 7.6 m	Fluvial	Perched Aquifer	
2								
3	1544							
4								
5	1542							
6								
7	1540		SW	Well Graded Sand with Gravel (SW) - trace silt, trace cobble, loose, moist to wet, brown, subrounded to rounded, well graded.	Orange staining at 11.6 m			
8								
9	1538							
10								
11	1536							
12								
13	1534		ML	Gravelly Silt with Sand (ML) - trace clay, trace cobble, hard, moist, dark brown, no dilatancy, non-plastic, noncohesive, rounded, poorly graded.				
14								
15	1532							
16			ML	Sandy Silt (ML) - little gravel, hard, moist, dark gray, no dilatancy, non-plastic, noncohesive, angular, poorly graded, laminated. TILL (cemented).	TILL (cemented)			
17	1530		SM		Silt from 16.5 m to 16.8 m	Morain/Till	Aquiclude	19m btoc
18				Silty Sand with Gravel (SM) - few clay, trace cobble, hard, wet, dark brown, rounded, well graded. Silt				

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW4-BR**
Location: **Alexander Road km 91.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **36.58**
Depth to Rock(m): **31.70**

Start Date: **10/21/2018**
End Date: **10/22/2018**

Borehole Coordinates: **E: 664,455.6 (m) N: 5,516,283 (m)** Ground Elevation (m): **1,546.686**

Collar Dip (deg): **90** Depth to Water (m): **17.78** Casing Stickup (m): **0.98**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
19	1528		ML	from 16.5 m to 16.8 m. Gravelly Silt with Sand (ML) - few cobble, hard, wet, dark brown, no dilatancy, low plasticity, noncohesive, subrounded, poorly graded.				
20								
21	1526		ML	Sandy Silt with Gravel (ML) - few clay, trace cobble, hard, moist to wet, dark grayish brown, no dilatancy, non-plastic, noncohesive, subangular to subrounded, poorly graded.				
22								
23	1524							
24			GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some cobble, trace silt, dense, saturated, reddish brown, subangular to subrounded.		Glaciofluvial	Confined Aquifer	
25	1522							
26								
27	1520							
28								
29	1518		ML	Gravelly Silt with Sand (ML) - hard, wet, dark grayish brown, no dilatancy, non-plastic, noncohesive, subrounded to rounded, poorly graded.				
30			GP	Poorly Graded Gravel with Sand (GP) - some cobble, few clay, hard, saturated, brown, rounded.				
31	1516							
32			Bedrock	Bedrock (Sandstone), fractured, gray	Some clay and sand intrusion	Bedrock		
33	1514							
34								
35	1512							
36								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW4-OB**
Location: **Alexander Road km 91.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **13.72**
Depth to Rock(m): **na**

Start Date: **10/22/2018**
End Date: **10/22/2018**

Borehole Coordinates: **E: 664,455.6 (m) N: 5,516,285 (m)** Ground Elevation (m): **1,546.807**

Collar Dip (deg): **90** Depth to Water (m): **11.4** Casing Stickup (m): **1.025**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1547							
1			SW-SM	Well Graded Sand with Silt and Gravel (SW-SM) - little cobble, trace boulder, loose, moist to wet, light reddish brown, subrounded to rounded.		Fluvial	Perched Aquifer	
2	1545							
3								
4	1543							
5								
6	1541							
7								
8	1539							
9								
10	1537							
11								
12	1535		ML	Gravelly Silt with Sand (ML) - little clay, stiff, wet, dark grayish brown, no dilatancy, low plasticity, noncohesive, rounded, poorly graded.		Morain/Till	Aquiclude	
13								

12m btoc

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW6-BR**
Location: **Branch C km 109**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **15.24**
Depth to Rock(m): **6.10**

Start Date: **9/24/2018**
End Date: **9/25/2018**

Borehole Coordinates: **E: 664,453.7 (m) N: 5,517,059 (m)** Ground Elevation (m): **1,562.696**

Collar Dip (deg): **90** Depth to Water (m): **3.354** Casing Stickup (m): **0.955**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1563		SM	Silty Sand with Gravel (SM) - dense, dry, dark brown, subangular, poorly graded.		Fluvial	Aquifer	4.3m btoc
1								
2	1561		ML	Sandy Silt (ML) - some clay, trace gravel, medium stiff, dry, dark grayish brown, no dilatancy, medium plasticity, noncohesive.				
3								
4	1559		OL/OH	Sandy Organic Soil (OL/OH) - trace clay, soft, dry, gray, no dilatancy, low plasticity, noncohesive.				
			SM	Silty Sand (SM) - trace cobble, loose, saturated, gray.				
5			GW	Well Graded Gravel with Sand (GW) - some cobble, loose, saturated, gray.				
6	1557		SP	Poorly Graded Sand (SP) - trace gravel, some cobble, dense, saturated, dark grayish brown, subangular to subrounded.				
7								
8	1555							
9								
10	1553		Bedrock	Bedrock (Sandstone), fractured, dark gray	Competent from 13.7 m	Bedrock		
11								
12	1551							
13								
14	1549							
15								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW6-OB**
Location: **Branch C km 109**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **6.10**
Depth to Rock(m): **na**

Start Date: **9/25/2018**
End Date: **9/25/2018**

Borehole Coordinates: **E: 664,454.7 (m) N: 5,517,060 (m)** Ground Elevation (m): **1,562.76**

Collar Dip (deg): **90** Depth to Water (m): **2.736** Casing Stickup (m): **0.915**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1562.4		SM	Silty Sand with Gravel (SM) - Sand is Medium to Coarse, trace clay, soft, dry, dark brown, subangular to subrounded.		Fluvial	Aquifer	3.7m btoc
1								
2	1560.4		ML	Sandy Silt (ML) - some clay, few organics, soft, wet, gray, no dilatancy, non-plastic, noncohesive.				
3								
4	1558.4		SP	Poorly Graded Sand with Gravel (SP) - Sand is Fine to Medium, trace cobble, dense, saturated, gray, subangular to subrounded.				
5								
6			ML	Sandy Silt (ML) - soft, saturated, dark grayish brown, no dilatancy, non-plastic, noncohesive.		Bedrock		
			Bedrock	Bedrock (Sandstone), fractured				

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW7-A**
Location: **Alexander Road km 91**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **36.60**
Depth to Rock(m): **na**

Start Date: **10/15/2018**
End Date: **10/16/2018**

Borehole Coordinates: **E: 663,978.6 (m) N: 5,516,030 (m)** Ground Elevation (m): **1,532.395**

Collar Dip (deg): **90** Depth to Water (m): **21.18** Casing Stickup (m): **0.87**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1532		SC	Clayey Sand (SC) - Sand is Fine, some silt, trace gravel, dense, dry, brown, angular to subangular.		Colluvium	Perched Aquifer	
1			SC	Clayey Sand with Gravel (SC) - Sand is Fine, trace cobble, hard, dry, brown, angular to subangular, poorly graded.	Cemented			
2	1530		SP-SC	Poorly Graded Sand with Clay and Gravel (SP-SC) - Sand is Medium to Coarse, trace cobble, stiff, dry, brown, angular to subangular.	Some orange staining			
3								
4	1528		CL	Sandy Lean Clay with Gravel (CL) - trace silt, hard, moist, brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded.	Hard to drill			
5								
6			ML	Gravelly Silt with Sand (ML) - trace clay, hard, moist, gray, no dilatancy, low plasticity, noncohesive, angular to subangular.				
7	1526		CL	Gravelly Lean Clay with Sand (CL) - trace silt, hard, moist, dark grayish brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded.	Hard to drill			
8								
9	1524							
10								
11	1522		GW-GM	Well Graded Gravel with Silt and Sand (GW-GM) - trace clay, trace cobble, soft, wet, dark brown, angular.				
12								
13	1520		CL	Gravelly Lean Clay with Sand (CL) - some silt, stiff, wet, brown, no dilatancy, medium plasticity, noncohesive, angular, poorly graded.		Morain/Till	Aquiclude	
14								
15	1518		ML	Gravelly Silt with Sand (ML) - some clay, some cobble, hard, dry, brown, no dilatancy, non-plastic, noncohesive, angular to subangular, poorly graded.	TILL (Cemented)			
16								
17	1516							
18								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW7-A**
Location: **Alexander Road km 91**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **36.60**
Depth to Rock(m): **na**

Start Date: **10/15/2018**
End Date: **10/16/2018**

Borehole Coordinates: **E: 663,978.6 (m) N: 5,516,030 (m)** Ground Elevation (m): **1,532.395**

Collar Dip (deg): **90** Depth to Water (m): **21.18** Casing Stickup (m): **0.87**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
19	1514		CL	Gravelly Lean Clay with Sand (CL) - trace silt, hard, wet, dark brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded.				
20			ML	Gravelly Silt with Sand (ML) - some clay, hard, moist, dark grayish brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded.	TILL (Cemented)			
21	1512							
22			SM	Silty Sand with Gravel (SM) - some cobble, trace clay, loose, saturated, dark grayish brown, angular, well graded.				22m btoc
23	1510							
24								
25	1508							
26			GM	Silty Gravel with Sand (GM) - trace cobble, trace clay, loose, saturated, dark brown, angular to subangular, well graded.	Orange staining from 26.5 m to 26.8 m	Glacioflu vial	Confin ed Aquifer	
27	1506							
28								
29	1504							
30			SP	Poorly Graded Sand with Gravel (SP) - Sand is Coarse, trace silt, loose, saturated, dark brown, angular to subangular.				
31	1502							
32			SP-SM	Poorly Graded Sand with Silt (SP-SM) - Sand is Fine to Medium, trace gravel, dense, saturated, dark grayish brown, subrounded to rounded.				
33	1500							
34			ML	Sandy Silt with Gravel (ML) - stiff, saturated, dark gray, no dilatancy, low plasticity, noncohesive, rounded, poorly graded.				
	1498		SM	Silty Sand (SM) - Sand is Fine to Medium, , dense, saturated, dark grayish brown, poorly graded.				
35			CH	Sandy Fat Clay (CH) - soft, saturated, dark grayish brown, slow dilatancy, high plasticity, cohesive.		Glaciolac ustrine	Aquiclu de	
36	1496							

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW7-B**
Location: **Alexander Road km 91**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **14.48**
Depth to Rock(m): **na**

Start Date: **10/16/2018**
End Date: **10/17/2018**

Borehole Coordinates: **E: 663,980.2 (m) N: 5,516,029 (m)** Ground Elevation (m): **1,532.358**

Collar Dip (deg): **90** Depth to Water (m): **13.93** Casing Stickup (m): **1.02**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
	1533							
0			SC	Clayey Sand with Gravel (SC) - Sand is Fine, some silt, trace organics, medium dense, dry, dark brown.		Colluvium	Perched Aquifer	
1	1531							
2			ML	Sandy Silt with Gravel (ML) - hard, dry to moist, dark brown, laminated. Cemented.	Cemented. Some Orange Staining			
3								
	1529		SC	Clayey Sand (SC) - Sand is Fine to Medium, some silt, trace gravel, medium dense, moist, dark brown.				
4								
			CL	Sandy Lean Clay with Gravel (CL) - trace silt, stiff, moist, dark brown, no dilatancy, low plasticity, cohesive, angular to subangular, poorly graded.				
5								
	1527		ML	Gravelly Silt with Sand (ML) - some clay, very stiff, moist, dark grayish brown, no dilatancy, low plasticity, noncohesive, angular to subangular, poorly graded.				
6								
			SC	Clayey Sand with Gravel (SC) - trace silt, medium dense, moist, dark brown, subangular.				
7								
	1525							
8								
			ML	Gravelly Silt (ML) - few cobble, trace sand, hard, moist, gray, no dilatancy, low plasticity, cohesive, angular, poorly graded.				
9								
	1523							
10								
			GM	Silty Gravel with Sand (GM) - Gravel is Fine to Medium, some cobble, trace clay, loose, wet, dark brown, subangular, poorly graded.				
11								
	1521							
12								
13								
	1519							
			ML	Gravelly Silt with Sand (ML) - some cobble, hard, moist, dark grayish brown, no dilatancy, low plasticity, cohesive, angular, poorly graded.	TILL (cemented)	Morain/Till	Aquiclude	
14			GP-GM	Poorly Graded Gravel with Silt and Sand (GP-GM) - Gravel is Coarse, some cobble, loose, saturated, brown, angular to subangular.				15m btoc

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW9-BR**
Location: **Branch C km 108**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **42.67**
Depth to Rock(m): **40.54**

Start Date: **9/17/2018**
End Date: **9/19/2018**

Borehole Coordinates: **E: 663,386.4 (m) N: 5,516,959 (m)** Ground Elevation (m): **1,591.997**

Collar Dip (deg): **90** Depth to Water (m): **18.72** Casing Stickup (m): **0.91**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1592		SP-SM	Poorly Graded Sand with Silt and Gravel (SP-SM) - Sand is Fine, trace cobble, trace clay, loose, dry, brown, angular to subangular.		Morain/Till	Unsaturated zone	
1								
2	1590		Boulder/Cobbles	Boulder/Cobbles				
3								
4	1588		SP-SM	Poorly Graded Sand with Silt and Gravel (SP-SM) - Sand is Fine, some cobble, medium dense, dry, dark brown, low plasticity, angular to subangular.				
5			GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some cobble, some boulder, loose, moist, dark brown, angular to subangular.				
6	1586							
7								
8	1584							
9			SC	Clayey Sand with Gravel (SC) - Sand is Fine, trace cobble, dense, dry, dark brown, angular to subangular.				
10	1582		ML	Sandy Silt with Gravel (ML) - little clay, hard, dry, dark brown, no dilatancy, low plasticity, cohesive, angular to subangular, poorly graded, laminated. TILL (cemented).	TILL (cemented)			
11								
12	1580		SC	Clayey Sand with Gravel (SC) - Sand is Fine to Medium, some silt, dense, dry, dark brown, low plasticity, angular to subangular.				
13			GM	Silty Gravel with Sand (GM) - Gravel is medium, , loose, dry, dark brown, subrounded, poorly graded.				
14	1578		CL	Gravelly Lean Clay with Sand (CL) - some silt, very stiff, dry, dark brown, non-plastic, angular, poorly graded.				
15								
16	1576							
17			SM	Silty Sand (SM) - Sand is Fine, some clay, trace cobble, dense, dry, dark brown, angular to subangular, poorly graded.				
18	1574							

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW9-BR**
Location: **Branch C km 108**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **42.67**
Depth to Rock(m): **40.54**

Start Date: **9/17/2018**
End Date: **9/19/2018**

Borehole Coordinates: **E: 663,386.4 (m) N: 5,516,959 (m)** Ground Elevation (m): **1,591.997**

Collar Dip (deg): **90** Depth to Water (m): **18.72** Casing Stickup (m): **0.91**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
19			CL	Sandy Lean Clay with Gravel (CL) - some silt, hard, dry, dark brown, low plasticity, angular, poorly graded, laminated. TILL (cemented).	TILL (cemented)			20m btoc
20	1572							
21			GC	Clayey Gravel with Sand (GC) - Gravel is Coarse, dense, wet, dark grayish brown, low plasticity, angular, poorly graded.		Colluvium	Confined Aquifer	
22	1570							
23			ML	Sandy Silt with Gravel (ML) - some clay, hard, dry, gray, no dilatancy, low plasticity, cohesive, angular to subangular, laminated. Cemented.	Cemented			
24	1568		CL	Sandy Lean Clay with Gravel (CL) - stiff, moist, gray, no dilatancy, low plasticity, cohesive, angular to subangular, poorly graded.				
25								
26	1566	SA1	SC	Clayey Sand with Gravel (SC) - trace silt, loose, wet, dark grayish brown, angular to subangular, poorly graded.				
27								
28	1564		CL	Sandy Lean Clay with Gravel (CL) - trace cobble, stiff, wet, dark grayish brown, no dilatancy, low plasticity, cohesive, angular to subangular.				
29			ML	Sandy Silt (ML) - some clay, trace gravel, hard, dry to moist, brown, no dilatancy, low plasticity, cohesive, angular, poorly graded, laminated. TILL (cemented).	TILL (cemented)			
30	1562							
31		SA2	SC	Clayey Sand with Gravel (SC) - Sand is Coarse, trace cobble, dense, saturated, dark grayish brown, low plasticity, angular to subangular, poorly graded.				
32	1560		CL	Sandy Lean Clay with Gravel (CL) - , stiff, saturated, dark grayish brown, low plasticity, cohesive, angular to subangular.				
33			ML	Sandy Silt (ML) - trace gravel, hard, dry to moist, dark gray, no dilatancy, low plasticity, cohesive, angular to subangular, poorly graded. TILL (cemented).	TILL (cemented)			
34	1558		CL	Sandy Lean Clay (CL) - some silt, trace gravel, hard, dry to moist, dark gray, no dilatancy, low plasticity, cohesive, angular to subangular, poorly graded.	Cemented from 34.7 m to 35.1 m			
35								
36	1556	SA3	SC	Clayey Sand with Gravel (SC) -				
37								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW9-BR**
Location: **Branch C km 108**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **42.67**
Depth to Rock(m): **40.54**

Start Date: **9/17/2018**
End Date: **9/19/2018**

Borehole Coordinates: **E: 663,386.4 (m) N: 5,516,959 (m)** Ground Elevation (m): **1,591.997**

Collar Dip (deg): **90** Depth to Water (m): **18.72** Casing Stickup (m): **0.91**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
38	1554		CL	dense, saturated, dark grayish brown, angular to subangular, poorly graded. Sandy Lean Clay with Gravel (CL) - very stiff, wet, dark grayish brown, no dilatancy, low plasticity, cohesive, angular, poorly graded.	Dry, cemented from 39.3 m to 39.6 m			
39								
40	1552		SP	Poorly Graded Sand with Gravel (SP) - Sand is Coarse, trace clay, loose, saturated, dark grayish brown, angular.				
41			Bedrock	Bedrock (Mudstone), fractured. Some sand and clay intrusions		Bedrock		
42	1550							

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW9-OB**
Location: **Branch C km 108**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **24.40**
Depth to Rock(m): **na**

Start Date: **9/19/2018**
End Date: **9/20/2018**

Borehole Coordinates: **E: 663,385.1 (m) N: 5,516,960 (m)** Ground Elevation (m): **1,592.186**

Collar Dip (deg): **90** Depth to Water (m): **20.35** Casing Stickup (m): **0.805**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1592		SM	Silty Sand with Gravel (SM) - Sand is Fine, trace cobble, loose, dry, brown, angular to subangular, poorly graded.		Morain/Till	Unsaturated zone	
3	1588		GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some cobble, some boulder, medium dense, dry, brown, angular to subangular.				
7	1584		SC	Clayey Sand with Gravel (SC) - few cobble, trace boulder, dense, dry, dark brown, angular to subangular, poorly graded.	Boulder from 6.7 m to 7.3 m			
11	1580	SA1	GC	Clayey Gravel with Sand (GC) - Gravel is Medium to Coarse, few cobble, dense, dry to moist, dark brown, angular, poorly graded.				
15	1576	SA2	CL	Sandy Lean Clay with Gravel (CL) - some silt, stiff, dry to moist, dark grayish brown, no dilatancy, low plasticity, cohesive, rounded, poorly graded.				
16	1576		SC	Clayey Sand with Gravel (SC) - Sand is Fine to Medium, few cobble, dense, moist, dark brown, angular, poorly graded.				
18								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW9-OB**
Location: **Branch C km 108**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **24.40**
Depth to Rock(m): **na**

Start Date: **9/19/2018**
End Date: **9/20/2018**

Borehole Coordinates: **E: 663,385.1 (m) N: 5,516,960 (m)** Ground Elevation (m): **1,592.186**

Collar Dip (deg): **90** Depth to Water (m): **20.35** Casing Stickup (m): **0.805**

LITHOLOGY: ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy
19	1574		ML	Sandy Silt with Gravel (ML) - some clay, trace cobble, hard, dry, dark grayish brown, no dilatancy, low plasticity, cohesive, angular, poorly graded. TILL (cemented).	TILL (cemented)		
20	1572						
21							
22		SA3	SC	Clayey Sand with Gravel (SC) - Sand is Fine, some silt, trace cobble, dense, saturated, dark grayish brown, angular, poorly graded.		Colluvium	Confined Aquifer
23	1570		CL	Gravelly Lean Clay with Sand (CL) - some silt, hard, dry, dark grayish brown, no dilatancy, low plasticity, cohesive, angular, well graded. TILL (cemented).	TILL (cemented)		
24	1568						

INSTALLATION: 21m btoc

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW12-BR**
Location: **Branch C Spur 1**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **15.20**
Depth to Rock(m): **7.01**

Start Date: **9/16/2018**
End Date: **9/16/2018**

Borehole Coordinates: **E: 662,857.2 (m) N: 5,520,907 (m)** Ground Elevation (m): **1,983.534**

Collar Dip (deg): **90** Depth to Water (m): **15.15** Casing Stickup (m): **0.92**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1984		CL	Gravelly Lean Clay (CL) - trace sand, hard, dry, dark brown, no dilatancy, medium plasticity, cohesive, angular, poorly graded.	Hard to drill, some orange staining	Morain/Till	Aquifer	
3	1980		ML	Sandy Silt (ML) - trace gravel, stiff, dry, black, no dilatancy, non-plastic, cohesive.				
			CL	Sandy Lean Clay with Gravel (CL) - hard, dry, black, no dilatancy, low plasticity, cohesive, angular, poorly graded.				
			SM	Silty Sand with Gravel (SM) - Sand is Fine, dense, dry, brown, angular to subangular, poorly graded.	TILL (cemented). Hard to drill			
5	1978		ML	Gravelly Silt with Sand (ML) - hard, dry, brown, no dilatancy, low plasticity, cohesive, angular, poorly graded, laminated. TILL (cemented).				
			CL	Gravelly Lean Clay (CL) - some silt, trace sand, hard, dry, brown, no dilatancy, low plasticity, cohesive, angular, poorly graded.				
7	1976		SM	Silty Sand with Gravel (SM) - Sand is Fine, trace boulder, medium dense, dry, very pale brown, angular to subangular, poorly graded.				
9	1974		Bedrock	Bedrock (Mudstone), fractured, gray to black		Bedrock		
12	1972		Bedrock	Coal				
13	1970		Bedrock	Bedrock (Sandstone), fine grained, fractured. Orange intrusions	Orange intrusions			
15								16m btoc

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW12-OB**
Location: **Branch C Spur 1**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **10.60**
Depth to Rock(m): **6.71**

Start Date: **9/15/2018**
End Date: **9/16/2018**

Borehole Coordinates: **E: 662,858 (m)** **N: 5,520,908 (m)** Ground Elevation (m): **1,983.515**

Collar Dip (deg): **90** Depth to Water (m): **dry** Casing Stickup (m): **0.925**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1984		SM	Silty Sand (SM) - Sand is Fine, trace gravel, loose, dry, dark brown, angular, poorly graded.	Some orange stainings	Morain/Till	Aquifer	
1			CL	Sandy Lean Clay (CL) - some silt, trace gravel, stiff, dry, dark brown, no dilatancy, low plasticity, cohesive, angular, poorly graded.				
2	1982		CL	Sandy Lean Clay (CL) - some silt, trace gravel, soft, dry, dark brown, no dilatancy, medium plasticity, cohesive, angular, poorly graded.				
3			ML	Sandy Silt (ML) - trace clay, hard, dry, very pale brown, no dilatancy, non-plastic, cohesive, poorly graded. TILL (cemented).	TILL (cemented)			
4	1980		SC	Clayey Sand with Gravel (SC) - Sand is Coarse, some silt, dense, dry, brown, angular to subangular, poorly graded.				
5			CL	Sandy Lean Clay (CL) - trace gravel, hard, dry, brown, no dilatancy, non-plastic, noncohesive, subangular, poorly graded.				
6	1978		GC	Clayey Gravel with Sand (GC) - Gravel is Coarse, , dense, dry, brown, angular to subangular, poorly graded.				
7			Bedrock	Bedrock (Mudstone), fractured, black		Bedrock		
8	1976							
9								
10	1974							

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW14-BR**
Location: **Brach C km 92.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **22.56**
Depth to Rock(m): **16.15**

Start Date: **9/13/2018**
End Date: **9/13/2018**

Borehole Coordinates: **E: 661,986 (m)** **N: 5,522,931 (m)** Ground Elevation (m): **1,865.611**

Collar Dip (deg): **90** Depth to Water (m): **13.15** Casing Stickup (m): **0.905**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
0	1866							
1			SP	Poorly Graded Sand with Gravel (SP) - Sand is Fine, trace silt, loose, dry, dark brown, angular to subangular.				
2	1864		ML	Sandy Silt (ML) - trace clay, few gravel, stiff, dry, dark brown, no dilatancy, low plasticity, noncohesive, angular to subangular, poorly graded.				
3			SM	Silty Sand with Gravel (SM) - Sand is Medium to Coarse, , loose, dry, dark brown, angular to subangular, poorly graded.				
4	1862		CL	Gravelly Lean Clay (CL) - trace silt, trace boulder, very stiff, dry, dark brown, no dilatancy, low plasticity, noncohesive, subangular, poorly graded.				
5								
6	1860							
7			SM	Silty Sand with Gravel (SM) - Sand is Fine, trace boulder, hard, dry, dark brown, angular, poorly graded. TILL (cemented).	TILL (cemented)	Morain/Till		
8	1858							
9			CL	Gravelly Lean Clay (CL) - trace sand, hard, dry, dark brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded.				
10	1856		ML		TILL (cemented)			
11			SM	Sandy Silt (ML) - trace gravel, hard, dry, dark brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded. TILL (cemented).	TILL (cemented)		Aquifer	
12	1854		ML	Silty Sand with Gravel (SM) - Sand is Fine, , hard, moist to wet, dark brown, angular to subangular, poorly graded. TILL (cemented). Sandy Silt (ML) - trace gravel, hard, moist to wet, brown, no dilatancy, non-plastic, noncohesive, angular to subangular, poorly graded. TILL (cemented).	TILL (cemented)			
13								
14	1852							
15								
16	1850		GP	Poorly Graded Gravel with Sand (GP) - Gravel is Coarse, some cobble, hard, saturated, dark grayish brown, angular, poorly graded. Possible weathered bedrock.	Possible weathered bedrock			
17								
18	1848							

14m btoc

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW14-BR**
Location: **Brach C km 92.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **22.56**
Depth to Rock(m): **16.15**

Start Date: **9/13/2018**
End Date: **9/13/2018**

Borehole Coordinates: **E: 661,986 (m)** **N: 5,522,931 (m)** Ground Elevation (m): **1,865.611**

Collar Dip (deg): **90** Depth to Water (m): **13.15** Casing Stickup (m): **0.905**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
19	1846		Bedrock	Bedrock (Mudstone), fractured, black. Competent from 18.7 m. Coal from 16.2 m to 16.3 m		Bedrock		
20								
21	1844							
22								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW14-OB**
Location: **Brach C km 92.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **16.76**
Depth to Rock(m): **15.24**

Start Date: **9/14/2018**
End Date: **9/14/2018**

Borehole Coordinates: **E: 661,986.3 (m) N: 5,522,929 (m)** Ground Elevation (m): **1,865.55**

Collar Dip (deg): **90** Depth to Water (m): **12.91** Casing Stickup (m): **0.82**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy
0	1866						
0–1	1865–1864		SM	Silty Sand (SM) - Sand is Fine, trace gravel, loose, dry, dark brown, angular to subangular, poorly graded.		Morain/Till	Aquifer
1–2	1864–1862		ML	Sandy Silt (ML) - some clay, trace gravel, hard, dry, dark brown, no dilatancy, low plasticity, cohesive, angular, poorly graded.			
2–4	1862–1860		SM	Silty Sand with Gravel (SM) - Sand is Medium to Coarse, , dense, dry, dark brown, angular to subangular, poorly graded.			
4–6	1860–1858		ML	Sandy Silt with Gravel (ML) - trace clay, hard, dry, dark brown, no dilatancy, low plasticity, cohesive, angular, poorly graded.			
6–7	1858		SC	Clayey Sand with Gravel (SC) - Sand is Medium to Coarse, , medium dense, dry to moist, dark brown, angular to subangular, poorly graded.			
7–8	1858		CL		TILL (cemented)		
8–10	1858–1856		ML	Sandy Lean Clay with Gravel (CL) - very stiff, dry, dark grayish brown, no dilatancy, low plasticity, noncohesive, angular to subangular, poorly graded. TILL (cemented). Sandy Silt with Gravel (ML) - trace boulder, hard, dry, dark brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded. TILL (cemented).	TILL (cemented)		
10–12	1856–1854						
12–13	1854–1852		CL	Sandy Lean Clay with Gravel (CL) - hard, dry, dark brown, no dilatancy, low plasticity, noncohesive, angular, poorly graded.			
13–14	1852		ML	Sandy Silt with Gravel (ML) - trace boulder, hard, dry to moist, dark brown, no dilatancy, non-plastic, noncohesive, angular, poorly graded.			
14–15	1852–1850		SM	Silty Sand with Gravel (SM) - Sand is Fine to Medium, loose, saturated, dark brown, angular to subangular, poorly graded.			
15–16	1850		Bedrock	Bedrock (Mudstone), fractured, black		Bedrock	

INSTALLATION

14m btoc

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW-MP1-OB/BR**
Location: **Branch C km 107.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **32.00**
Depth to Rock(m): **26.52**

Start Date: **9/20/2018**
End Date: **9/22/2018**

Borehole Coordinates: **E: 663,608.5 (m) N: 5,516,735 (m)** Ground Elevation (m): **1,554.45**

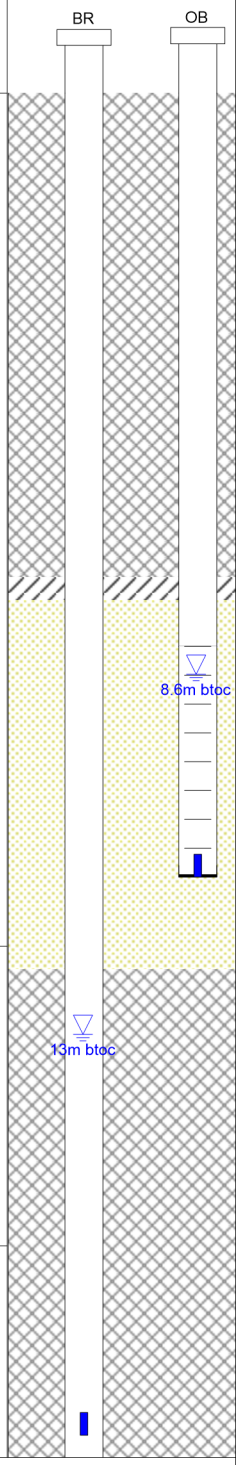
Collar Dip (deg): **90** Depth to Water (m): **7.684 (OB), 12.444 (BR)** Casing Stickup (m): **0.87 (OB), 0.84 (BR)**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy
0	1554		SM	Silty Sand with Gravel (SM) - Sand is Fine, trace cobble, trace organics, loose, dry, brown, angular to subangular, poorly graded.		Fluvial	Perched Aquifer
1			ML	Sandy Silt (ML) - some clay, trace gravel, stiff, dry, dark grayish brown, non-plastic, rounded, poorly graded.			
2	1552						
3			SC	Clayey Sand with Gravel (SC) - Sand is Fine to Medium , few cobble, dense, saturated, dark gray, angular to subangular, poorly graded.			
4	1550						
5							
6			SC	Clayey Sand (SC) - Sand is Fine, dense, saturated, dark brown, angular to subangular.			
	1548		SM	Silty Sand (SM) - trace gravel, dense, saturated, dark gray, rounded, well graded.			
7							
8							
	1546						
9		SA1	GP-GC	Poorly Graded Gravel with Clay and Sand (GP-GC) - Gravel is Medium to Coarse, some cobble, dense, saturated, dark gray, angular to subangular.			
10							
	1544						
11							
12			ML	Gravelly Silt with Sand (ML) - some clay, hard, dry, dark grayish brown, rounded, poorly graded, laminated. TILL (cemented).	TILL (cemented)	Morain/Till	Aquiclude
	1542		CL	Gravelly Lean Clay with Sand (CL) - few boulder, very stiff, wet, dark grayish brown, no dilatancy, low plasticity.			
13							
14			ML	Sandy Silt with Gravel (ML) - hard, dry, dark grayish brown, non-plastic, poorly graded, laminated. TILL (cemented).	TILL (cemented)		
	1540						
15							
16			SC	Clayey Sand with Gravel (SC) - Sand is Medium to Coarse, few cobble, dense, wet, dark grayish brown.			
	1538						
17							
18				Gravelly Silt with Sand (ML) - some			

INSTALLATION



Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Borehole Number: **GW-MP1-OB/BR**
Location: **Branch C km 107.5**

srk consulting

NWP Coal Canada Ltd

Project No.: **1CN028.002**
Client: **NWP Coal Canada**
Project: **2018 Hydrogeological Field Investigation**

Drilling Contractor: **Geotech Drilling**
Drilling Equipment: **Sonic**
Logged By: **AM**

Final Depth(m): **32.00**
Depth to Rock(m): **26.52**

Start Date: **9/20/2018**
End Date: **9/22/2018**

Borehole Coordinates: **E: 663,608.5 (m) N: 5,516,735 (m)** Ground Elevation (m): **1,554.45**

Collar Dip (deg): **90** Depth to Water (m): **7.684 (OB), 12.444 (BR)** Casing Stickup (m): **0.87 (OB), 0.84 (BR)**

LITHOLOGY

ICE, Organics, Peat, Clay, Sandy Silt, Sand, Gravel, Boulder/Cobbles, Bedrock, Silty Sand, Poorly-graded Sand, Well-graded Sand, Well-graded Gravel, Poorly-graded Gravel

Depth (m)	Elevation (masl)	Sample	USCS	Lithology Description	Drilling Notes	Stratigraphic Unit	Hydrostratigraphy	INSTALLATION
19	1536		ML / CL	clay, some cobble, hard, dry, dark gray, low plasticity, subrounded to rounded, poorly graded, laminated. TILL (cemented).	TILL (cemented)	Colluvium	Confined Aquifer	
20			CL	Gravelly Lean Clay with Sand (CL) - stiff, wet, dark gray, no dilatancy, low plasticity, angular, poorly graded.				
21	1534		ML	Gravelly Silt (ML) - some clay, trace sand, hard, dry, dark gray, low plasticity, angular to subangular, poorly graded, laminated. TILL (cemented).	TILL (cemented)			
22			CL / ML	Gravelly Lean Clay with Sand (CL) - stiff, wet, dark gray, no dilatancy, low plasticity, angular, poorly graded.				
23	1532		ML	Gravelly Silt (ML) - some clay, trace sand, hard, dry, dark gray, low plasticity, angular to subangular, poorly graded, laminated.				
24			CL	Gravelly Lean Clay with Sand (CL) - stiff, wet, dark gray, no dilatancy, low plasticity, angular, poorly graded.				
25	1530							
26								
27	1528		Bedrock	Bedrock (Mudstone), fractured to competent, black. Some coal from 26.8 m to 29 m		Bedrock		
28								
29	1526							
30								
31	1524							
32								

Installation Legend

Bentonite Chips, Coated Pellets, Sand, Cave, 2" PVC, 4" PVC, 2" Screen (10 Slot), 4" Screen (20 Slot), Monument, Pressure Transducer, Grout, End Cap

Appendix B – Stantec Borehole Logs

Drill Hole BH18-MD1 (GW-MD1)

NWP Coal CANADA LIMITED

Stantec

Project No:	129500035	Drill Type:	Sonic
Project:	2018 Crown Mountain Exploration	Drilling Contractor:	Geotech Drilling
Client:	NWP Coal	Hole Size (mm):	152.4 (6" Casing)
Easting/Northing (NAD 83):	661972/ 5521336 (GPS as-built)	Logged By:	K.Anderson
Ground Elevation (masl):	n/a	Reviewed By:	O. Kosarewicz
Date Drilled:	September 29, 2018	PVC Stick-up:	3.297 ft.a.g.s/ 0.935 m.a.g.s
		Depth to Water (ft):	13.678, October 26, 2018

DEPTH (ft)	ELEVATION (ft)	SYMBOL	MATERIAL DESCRIPTION	Standard Penetration Test N Value 25 50 75 / Shear Strength (Tsf) 30 60 90	Atterberg Limits Moisture Content (%) 10 20 30	SAMPLE ID	SAMPLE	Rec. (%)	INSTRUMENT
			CLAY and SILT, some fine to coarse grained gravel, low to medium plasticity, very stiff, dark to medium brown, musty odor, dry.	R		9849		70	
5			SANDSTONE, highly fractured, some siltstone, fine grained, medium to dark grey, trace quartz veins. …(4 - 4.4 ft) SILTSTONE, some very fine grained sand, light brownish grey, laminated.						
10			SANDSTONE, fine grained, dark grey.						
15									
20			…(18.6 - 19 ft) Possible fault, highly fractured zone with clay, crushed sandstone, angular.						

End of borehole at 20.0 ft
SRK designed and installed well at this location.

Grab Sample		SPT Split Spoon Sample		Bentonite Chips	
Shelby Tube Sample		Vane Shear Strength		Coated Pellets	Caved material
SPT Blow Counts	A/B/C	Natural Moisture Content		Filter Sand	
SPT (N) Value		Atterberg Limits	PL LL	2" PVC Screen (10 Slot)	

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Drill Hole BH18-MD2 (GW-MD2)

NWP Coal CANADA LIMITED

Stantec

Project No:	129500035	Drill Type:	Sonic
Project:	2018 Crown Mountain Exploration	Drilling Contractor:	Geotech Drilling
Client:	NWP Coal	Hole Size (mm):	152.4 (6" Casing)
Easting/Northing (NAD 83):	662891/ 5519422 (GPS as-built)	Logged By:	K.Anderson
Ground Elevation (masl):	n/a	Reviewed By:	O. Kosarewicz
Date Drilled:	September 27, 2018	PVC Stick-up:	2.559 ft.a.g.s/ 0.780 m.a.g.s
		Depth to Water (ft):	21.555, October 26, 2018

DEPTH (ft)	ELEVATION (ft)	SYMBOL	MATERIAL DESCRIPTION	Standard Penetration Test N Value (25, 50, 75) / Shear Strength (Tsf) (30, 60, 90)	Atterberg Limits Moisture Content (%) (10, 20, 30)	SAMPLE ID	SAMPLE	Rec. (%)	INSTRUMENT
0			SILTY CLAY (CL), trace fine to coarse grained gravel, medium plasticity, soft, medium orange brown, moist.	8				85	
5			… low plasticity, soft to firm, medium brown, wet to saturated.	60		9842		40	
			SILTY SAND (SM), medium to coarse grained, some fine to coarse grained gravel, well graded, compact, max particle size 70 mm, saturated.						
10			SILT (ML), some gravel, non-plastic, soft, greyish brown, moist.	17		9887		30	
15			…moist to wet	38		9841		50	
20			SILT (ML), some clay, trace gravel, low plasticity, soft to firm, greyish brown, moist.	48		9888		50	
			CLAYEY SILT (ML), trace fine grained gravel, low plasticity, soft to firm, greyish brown, moist.						
25			SILTY CLAY (CL), trace to some fine to coarse grained gravel, low plasticity, firm, greyish brown, wet.						
30			SILT (ML), some clay, some fine to coarse grained gravel, non-plastic, hard, moist.						

Grab Sample	▣	SPT Split Spoon Sample	⊠	Bentonite Chips	■
Shelby Tube Sample	■	Vane Shear Strength	✚	Coated Pellets	⊠
SPT Blow Counts	A/B/C	Natural Moisture Content	✕	Filter Sand	⁘
SPT (N) Value	●	Atterberg Limits	PL ⊖ LL	2" PVC Screen (10 Slot)	▥

Continued Next Page

Caved material ▩

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Drill Hole BH18-MD2 (GW-MD2)

Client: NWP Coal

Project: 2018 Crown Mountain Exploration Project No: 129500035 Page No. 2 of 3

DEPTH (ft)	ELEVATION (ft)	SYMBOL	MATERIAL DESCRIPTION	Standard Penetration Test N Value (25 50 75) / Shear Strength (Tsf) (30 60 90)	Atterberg Limits Moisture Content (%) (10 20 30)	SAMPLE ID	SAMPLE	Rec. (%)	INSTRUMENT
			GRAVEL to COBBLES (GP), poorly graded, very loose, max particle size 100 mm, greyish brown, moist, sandstone.	79		9890			
35			SILTY CLAY (CL), some fine to coarse grained gravel, low plasticity, hard, orange brown to black, some oxidation, moist.						
				64		9843		55	
			CLAYEY SILT (ML), some fine to coarse grained gravel, low plasticity, orange brown, oxidized, sandstone clasts.						
40			CLAYEY SILT (ML), fine grained orange sand, some fine grained gravel, low to medium plasticity, orange brown.	25		9844		110	
			SANDSTONE, fine grained, poorly graded, hard, light grey, dry, powered, possibly a boulder.						
45			CLAYEY SILT (ML), some fine grained sand, low plasticity, very stiff, light brown, damp, laminated.	54		9891		70	
			SANDSTONE BOULDER, fine grained, light grey to orange brown, oxidized, crushed.						
			SILTY CLAY (CL), trace fine grained to coarse grained gravel, low to medium plasticity, soft to firm, dark greyish brown, moist to wet.						
50			CLAYEY SILT (ML), some fine to coarse grained gravel, low plasticity to non-plastic, hard, dark brown, moist, light yellowish brown clay bands.	69		9845		75	
			SANDSTONE, fine grained, light yellowish grey, crushed.						
55			SILT (ML), trace fine grained brown sand, trace coarse grained gravel, max particle size 50 mm, very stiff to hard, dark grey with brown sandstone clasts, damp.	R		9892		40	
			SILTY CLAY TILL (CL), some fine to coarse grained sand, some gravel, some cobbles, max particle size 90 mm, dark greyish brown, moist to wet.						
60			SANDSTONE, BEDROCK, coarse grained, light to medium grey, minor laminations when visible, highly broken.	R					
65									

Grab Sample | SPT Split Spoon Sample | Bentonite Chips | *Continued Next Page*

Shelby Tube Sample | Vane Shear Strength | Coated Pellets | Caved material

SPT Blow Counts A/B/C | Natural Moisture Content | Filter Sand

SPT (N) Value | Atterberg Limits (PL — LL) | 2" PVC Screen (10 Slot)

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Drill Hole BH18-MD2 (GW-MD2)

Client: NWP Coal

Project: 2018 Crown Mountain Exploration Project No: 129500035 Page No. 3 of 3

DEPTH (ft)	ELEVATION (ft)	SYMBOL	MATERIAL DESCRIPTION	Standard Penetration Test N Value 25 50 75 / Shear Strength (Tsf) 30 60 90	Atterberg Limits Moisture Content (%) 10 20 30	SAMPLE ID	SAMPLE	Rec. (%)	INSTRUMENT
70			SANDSTONE, BEDROCK, coarse grained, light to medium grey, minor laminations when visible, highly broken. *(continued)*						

End of borehole at 70.0 ft

SRK designed and installed well at this location.

Grab Sample		SPT Split Spoon Sample		Bentonite Chips	
Shelby Tube Sample		Vane Shear Strength		Coated Pellets	Caved material
SPT Blow Counts	A/B/C	Natural Moisture Content		Filter Sand	
SPT (N) Value		Atterberg Limits	PL LL	2" PVC Screen (10 Slot)	

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

NWP Coal CANADA LIMITED Drill Hole BH18-MP1 (GW-MP1-PW)

Stantec

Project No:	129500035	Drill Type:	Sonic
Project:	2018 Crown Mountain Exploration	Drilling Contractor:	Geotech Drilling
Client:	NWP Coal	Hole Size (mm):	152.4 (6" Casing)
Easting/Northing (NAD 83):	663602/ 5516727 (GPS as-built)	Logged By:	J.Hebert
Ground Elevation (masl):	1555.3	Reviewed By:	O. Kosarewicz
Date Drilled:	September 22, 2018	PVC Stick-up:	3.28 ft.a.g.s/ 1.005 m.a.g.s
		Depth to Water (ft):	26.745, October 26, 2018

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	Standard Penetration Test N Value / Shear Strength (Tsf)	Atterberg Limits / Moisture Content (%)	SAMPLE ID	SAMPLE	Rec. (%)	INSTRUMENT
0	5100	SILT with ROCK FRAGMENTS (FILL), beige to grey, damp to wet.	11		1		55	
		…grey, subangular to angular rock fragments, wet.						
		ORGANICS (TOPSOIL), some silt with gravel, angular to sub-angular gravel, dry to damp, brown to beige.						
5		Friable SILT with rock fragments (TILL), beige, white to rusty staining along bands, damp to moist.						
		…(5 - 5.5 ft) wet.	23		2		50	
	5095	…becoming mostly silt.						
10		…(9.5 - 10 ft) rusty staining.						
		CLAYEY SILT TILL (ML), interbedded with gravel to cobble size rock fragments (4 inches), grey to beige, wet.	11		3		50	
	5090							
15		SILTY CLAY TILL (CL), some sand, low to medium plasticity, wet, grey (in split spoon).	5		4		50	
		…(17 - 20 ft) gravel and cobble size rock fragments.						
	5085							
20		CLAYEY SILT TILL (ML), low plasticity, grey, wet.	40		5		50	
		…(22 - 22.5 ft) wet clay.						
	5080	… 4 inch rock fragment, white, weathered.						
25		SILTY CLAY TILL (CL), low plasticity, wet, grey.						
		CLAYEY SILT TILL (ML), low plasticity, grey, wet.	41		6		67	
	5075							
30								

Standard Penetration Test N Value: 25 50 75
Shear Strength (Tsf): 30 60 90
Atterberg Limits / Moisture Content (%): 10 20 30

Grab Sample		SPT Split Spoon Sample		Bentonite Chips	
Shelby Tube Sample		Vane Shear Strength		Coated Pellets	
SPT Blow Counts	A/B/C	Natural Moisture Content	×	Filter Sand	
SPT (N) Value	●	Atterberg Limits	PL — ○ LL	4" PVC Screen (20 Slot)	

Continued Next Page

Caved material

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Drill Hole BH18-MP1 (GW-MP1-PW)

Client: NWP Coal

Project: 2018 Crown Mountain Exploration Project No: 129500035 Page No. 2 of 4

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	Standard Penetration Test N Value (25 50 75) / Shear Strength (Tsf) (30 60 90)	Atterberg Limits Moisture Content (%) (10 20 30)	SAMPLE ID	SAMPLE	Rec. (%)
35	5070	CLAYEY SILT TILL (ML), low plasticity, grey, wet. *(continued)* … rusty stains at top of split spoon. Grey pulverized rock at top of run with very wet silt and clay.	23		7		32
40	5065	SILT TILL (ML) with black angular rock fragments cemented in bands, wet to moist, light grey to grey.	18		8		42
45	5060	SILT TILL (ML) with gravel and angular cobble pieces, grey to brown, wet, orange stains. …(43 - 45 ft) decrease in rock pieces, increase in clay.	51		9		60
50	5055	…(45 - 47 ft) less angular rock pieces, grey, wet. …(47 - 48 ft) very wet. …(48 - 50 ft) saturated to wet, rock fragments have rusty stains.	26		10		55
55	5050	SILT TILL (ML) with rock fragments, trace clay, moist, light brown.	19		11		13
60	5045	…(55 - 56 ft) cobble and angular gravel, very little cementing.	38		12		75
65	5040	…(62 - 65 ft) gravel and cobbles cemented with silt, moist to wet.	54		13		75
			53				

INSTRUMENT

Continued Next Page

Grab Sample		SPT Split Spoon Sample		Bentonite Chips	
Shelby Tube Sample		Vane Shear Strength		Coated Pellets	
SPT Blow Counts	A/B/C	Natural Moisture Content		Filter Sand	
SPT (N) Value		Atterberg Limits	PL — LL	4" PVC Screen (20 Slot)	

Caved material

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Drill Hole BH18-MP1 (GW-MP1-PW)

Client: NWP Coal
Project: 2018 Crown Mountain Exploration Project No: 129500035 Page No. 3 of 4

DEPTH (ft)	ELEVATION (ft)	SYMBOL	MATERIAL DESCRIPTION	Standard Penetration Test N Value 25 50 75 / Shear Strength (Tsf) 30 60 90	Atterberg Limits Moisture Content (%) 10 20 30	SAMPLE ID	SAMPLE	Rec. (%)	INSTRUMENT
			SILT TILL (ML) with cobble size rock fragments, dark grey, wet. *(continued)*			14		46	
	5035								
			…(69 - 70 ft) light grey.						
70			…(70 ft) top of run 6 inches of wet rock fragments and silt, 5 inch rock piece.		R	15		17	
	5030								
			…(74 - 74.5 ft) pulverized rock, light grey to dark grey, dry.						
75			(75 - 76.3 ft) cobbles with fine grained wet fraction, light brown, very wet.						
			SILT TILL (ML) with cobbles, brown, moist to wet.						
	5025								
80			…(80 - 82 ft) loose, grey, wet.						
			…(82 ft) fragments (1 - 4 inches), grey, moist.						
	5020								
85			…(85 - 85.5 ft) very wet. …(85.5 ft) cobbles (1 - 2 inches), loose, dark grey, wet.						
	5015								
			…(88 - 91 ft) dark grey, moist.						
90			…(91 ft) very densely packed TILL, dark grey, damp.						
	5010		…(92 ft) becoming moist.						
95			…(95 - 98 ft) wet, more angular rock.						
	5005								
			BEDROCK, SANDSTONE, dark grey, core is broken in discs, wet, some fine fractured fraction.						
100									

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Grab Sample		SPT Split Spoon Sample		Bentonite Chips	
Shelby Tube Sample		Vane Shear Strength		Coated Pellets	
SPT Blow Counts	A/B/C	Natural Moisture Content		Filter Sand	
SPT (N) Value		Atterberg Limits	PL LL	4" PVC Screen (20 Slot)	

Continued Next Page

Caved material

Drill Hole BH18-MP1 (GW-MP1-PW)

Client: NWP Coal

Project: 2018 Crown Mountain Exploration Project No: 129500035 Page No. 4 of 4

DEPTH (ft)	ELEVATION (ft)	SYMBOL	MATERIAL DESCRIPTION	Standard Penetration Test N Value 25 50 75 / Shear Strength (Tsf) 30 60 90	Atterberg Limits Moisture Content (%) 10 20 30	SAMPLE ID	SAMPLE	Rec. (%)	INSTRUMENT
	5000		BEDROCK, SANDSTONE, dark grey, core is broken in discs, wet, some fine fractured fraction. *(continued)*						
105			End of borehole at 105.0 ft SRK designed and installed well at this location.						

WELL DH LOG W/LEGEND GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Grab Sample		SPT Split Spoon Sample		Bentonite Chips	
Shelby Tube Sample		Vane Shear Strength		Coated Pellets	Caved material
SPT Blow Counts	A/B/C	Natural Moisture Content		Filter Sand	
SPT (N) Value		Atterberg Limits	PL LL	4" PVC Screen (20 Slot)	

Drill Hole BH18-PP2 (GW-PP2)

NWP Coal CANADA LIMITED

Stantec

Project No:	129500035	Drill Type:	Sonic
Project:	2018 Crown Mountain Exploration	Drilling Contractor:	Geotech Drilling
Client:	NWP Coal	Hole Size (mm):	152.4 (6" Casing)
Easting/Northing (NAD 83):	661380/ 5521545 (GPS as-built)	Logged By:	K.Anderson
Ground Elevation (masl):	n/a	Reviewed By:	O. Kosarewicz
Date Drilled:	September 29, 2018	PVC Stick-up:	2.99 ft.a.g.s/ 0.905 m.a.g.s
		Depth to Water (ft):	19.193, October 26, 2018

DEPTH (ft)	MATERIAL DESCRIPTION	Standard Penetration Test N Value (25, 50, 75) / Shear Strength (Tsf) (30, 60, 90)	Atterberg Limits / Moisture Content (%) (10, 20, 30)	SAMPLE ID	SAMPLE	Rec. (%)
0	SILTY CLAY (OL), low plasticity, soft, orangy brown, musty odor, moist, possibly not in situ, disturbed due to pad building.	13		1	SS	65
	SILT (OL), non-plastic, soft, dark brown, dry, organics.			9854	GB	
	SILT (OL), trace fine to coarse grained gravel, soft, light orange to brown, dry, organics.			9855	GB	
	SAND (SP), fine grained, trace fine to coarse grained gravel, poorly graded, loose, max particle size 30 mm, light brown to redish brown, moist.			9856 9857 9858	GB GB GB	
5	SILT (ML), some clay, trace fine grained sand, soft, dark brown to redish brown, moist. …(4 - 4.25 ft) CLAY, medium to high plasticity, reddish brown.	9		9859	SS	
	CLAY (CL), medium to high plasticity, soft, light brownish grey, moist.			9860	GB	
10	CLAY (CL), some fine to coarse grained gravel, medium plasticity, soft, light grey, moist.	5		9881	SS	85
	SANDY SILT (ML), some fine to coarse grained gravel, non-plastic, wet.			9882	GB	
15	CLAY (CL), some rounded gravel, low plasticity, dark grey to black, possibly a till.	5		9883	SS	70
				9884	GB	
	BEDROCK, SANDSTONE, fine grained, light grey, pulverised (sonic drill, no double barrel).					
20	BEDROCK, SANDSTONE, fine grained, trace clay, light grey, trace calcite and siderite veining.			9885	GB	
25						

End of borehole at 26.0 ft
SRK designed and installed well at this location.

INSTRUMENT

Grab Sample		SPT Split Spoon Sample		Bentonite Chips	
Shelby Tube Sample		Vane Shear Strength		Coated Pellets	
SPT Blow Counts	A/B/C	Natural Moisture Content		Filter Sand	
SPT (N) Value		Atterberg Limits	PL — LL	2" PVC Screen (10 Slot)	

Caved material

WELL DH LOG W/LEGEND AND GB-SCALED GEOTECH 2017 CONUMA.GPJ NORWEST CORP.GDT 12/10/18

Appendix C – O'Kane Field Report

O'Kane Consultants

Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

O'Kane Consultants Inc.
905C Industrial Road 2
Cranbrook, BC V1C 4C9
Canada
www.okc-sk.com

Memorandum

To: Art Palm – CEO, NWP Coal

From: Jesse Liberty-Dallas, Field Technician

Our ref: 982-03

Date: November 14, 2018

Re: **NWP Coal Crown Mountain – October to November 2018 Ground Water Sampling**

Crown Mountain ground water sampling and development occurred from October 29th to November 7th by OKC personnel Jesse Liberty-Dallas and Graham Hay. Samples were shipped to ALS Calgary throughout the week and were analysed for PAH, routine chemistry, and total / dissolved metals / nutrients. In total 15 wells were visited for development and 12 wells were sampled out of the 23 new wells. The program was stopped prior to completion of development and sampling. Currently there are wells outstanding, as well as data downloads from the Solinst level loggers installed by SRK.

Crown was accessed both from the North West and the South East entrances. The side by side was required every day to reach the new wells. Two-hour check-ins were done by inReach to Tyler Birkham (OKC). Wet heavy snow with white out conditions occurred on Thursday (Nov 1) to Monday (Nov 5) on the peak of Crown and OKC had moved into the valley to continue development / sampling. It is unknown if access to the peak is possible via side by side.

Development of the wells occurred using Waterra tubing and a Hydrolift as well as bailing by hand until the turbidity was below 40 NTU. Field parameters were recorded initially and every 50L purged on high recharge wells.

Water samples were collected using a low flow 1-inch bladder and on GW 04B, using two 1-L Hydrasleeves. The Hydrasleeves were lowered to the center of the screen interval and retrieved. Due to the volume required for the sample bottles two Hydrasleeves were used and some mixing did occur in the routine, dissolved metals and dissolved nutrient bottles.

Below is a table summarizing the work done during OKC's visit to Crown Mountain.

Table 1: Status of Crown Mountain Wells, November 2018

Well ID:	Development Volume (L)	Further Development Required	Sampled	Comment
GW1-A	171	N	Y	Cleared up after draining dry
GW1-B	0	N	Y	Developed by SRK
GW3-A	250	N	Y	
GW3-B	0	N	Y	Developed by SRK
GW3-C	0	N	Y	Developed by SRK
GW4-BR	169	N	Y	
GW4-OB	26	N	Y	Used hydrolift and bailer
GW6-BR	36	Y	N	Still turbid, used hydrolift and a bailer
GW6-OB	150	N	N	
GW7-A	250	N	Y	
GW7-B	0.3	Y	Y	Unable to retrieve full sample, due to low volume
GW9-BR	0	N	N	Developed by SRK
GW9-OB	0	N	N	Developed by SRK
GW12-BR	0.05	Y	N	Low volume
GW12-OB	0	Y	N	Dry
GW14-BR	400	N	Y	
GW14-OB	620	N	Y	
GW-MD1	13	Y	N	Hand bailed, still muddy
GW-MD2	400	N	Y	
GW-MP1-BR	0	Y	N	Black water and slow recharge
GW-MP1-OB	0	N	N	Developed by SRK
GW-MP1-PW	0	N	N	No sampling required
GW-PP2	20	Y	N	Hand pumped with Waterra, still muddy

GW-06-BR, the 09 series and MP1-OB are ready to be sampled with no further development while GW-MD1, MP1-BR, PP2, 06-OB require development. GW7-B, 12-BR and OB have very little volumes and will require development when water levels rise.

We trust information provided in this memorandum is satisfactory for your requirements. Please do not hesitate to contact me at 587-220-3943 or JLiberty-Dallas@okc-sk.com should you have any questions or comments.

Appendix D – Swiftwater Flow Report

SWIFTWATER
CONSULTING

November 9th, 2018

Office 8766
200-375 Water St
Vancouver, BC
V6B 0M9
+1-778-952-3569

Project Code: 1-18
Document Number: 18-00001-R0

Attn: Daniel Mackie - Principal Consultant (Hydrogeology)

SRK Consulting Ltd.
22nd Floor, 1066 West Hastings Street,
Vancouver, BC
V6E 3X2
Canada

RE: CROWN MOUNTAIN PROJECT, ALEXANDER CREEK STREAMFLOWS

Dear Daniel,

A site visit to the Crown Mountain Project was completed by Swiftwater Consulting Ltd. (Swiftwater) from October 1st to October 4th, 2018. The field team consisted of August Ustare (Associate) and Keyhan Babaee (Junior Field Technician). Details of the visit, including data summaries and preliminary interpretation of results, are included in this letter.

Objectives

The principal objective of the field visit was to characterize flow losses and gains throughout Alexander Creek, East Alexander Creek, and West Alexander Creek. The primary task required to achieve this objective was to complete detailed measurements of streamflow at the locations proposed by SRK Consulting Ltd. (SRK) and shown on Figure 1.

The following activities were also completed to further reduce uncertainty:

- Discharge was measured at the project hydrometric monitoring station, located at SW1.5,
- A continuous water level sensor was installed at SW1.5 for the duration of the field campaign, and
- Visual observation and estimates of streamflow in tributaries of West Alexander Creek, East Alexander Creek, and Alexander Creek

There were specific requirements for maximizing the value of the low streamflow survey, including:

- Timing the visit to coincide with low summer streamflows, and
- Ensuring relatively static streamflows persisted throughout the survey.

Field Visit Overview

The following is a day-by-day breakdown of the field activities.

October 1, 2018

The team arrived in Sparwood in the late afternoon and completed a site safety induction. General logistics were discussed with Alberto Marengo (SRK), and instrumentation was prepared for the following day.

October 2nd, 2018 – East Alexander Creek

The team aimed to complete discharge measurements along the East Alexander Tributary.

A PT2X submersible pressure transducer was installed at SW1.5, approximately 950 m downstream of the confluence of East Alexander and West Alexander Creeks'. Water level and temperature were logged at 5-minute increments for the duration of the measurement campaign. Moving upstream, access to East Alexander Creek was blocked by a locked gate at the first bridge over the West Alexander Creek, and so the team was required to hike 4.7 kilometers upstream to SW8. Snowfall in recent days had resulted in challenging conditions and the team did not arrive at SW8 until mid-morning.

Between 10:28 to 11:20, discharge was measured at SW8. Measured discharge was 48 L/s, with an Uncertainty of 5.8%. A photo of the SW8 measurement section is included in Plate 1Error! Reference source not found.. Moving downstream along the channel, two small tributaries on the right bank were crossed. These tributaries were expected to original from the same channel upstream and were estimated to contribute a combined 5 and 9 L/s to the East Alexander Creek.

Between 12:21 and 13:00, a discharge measurement was completed at SW7.8. Measured Discharge was 54 L/s, with an uncertainty of 6.3%. A photo of SW7.8 is included in Plate 2. The change in discharge between SW8 and SW7.8 (6 L/s) is consistent with the estimated tributary flow contributions.

The team continued hiking downstream, but due to time constraints were required to walk adjacent and parallel to the stream. Although every effort was made to keep the creek in view at all times, but it may be that some tributaries were missed. Regardless, numerous flow-related features were observed, many of them dry, including small braided sections of East Alexander, and several dry tributaries. Total travel time downstream from SW7.8 to SW7.1 was approximately two hours. SW7.1 is located 1.71 km upstream of the confluence and the team arrived in the early-afternoon. A discharge measurement was completed between 15:06 and 15:54. Measured discharge was 318 L/s, with an uncertainty of 3.2%. A photo of SW7.1 is included in Plate 3.

The team moved farther downstream and, between 16:44 and 16:54, measured discharge on East Alexander Creek, immediately downstream of the bridge crossing. Measured Discharge was 216 L/s, with an uncertainty of 5.1%. Photos of the measurement section are shown on Plate 4. The reduction in discharge between SW7.1 and EAST may be attributed to flow losses to ground in the area around the confluence of the West Alexander and East Alexander Creeks', and/or natural changes in stream discharge that were occurring during the measurement period. However, the former is expected to be the more likely cause of flow losses. Any natural changes in streamflow observed during the measurement period would have resulted in an expectation of flow increases, as shown on Figure 2.

It was confirmed that the stream alignment shown in Figure 1 is no longer accurate. There is some evidence that the stream follows this pathway under higher flow conditions, but on October 2nd, less than 1 L/s was observed to be flowing in this channel. Thus, rather than make the sharp right bend toward West Alexander

upstream of the road crossing, the majority stream continues under the crossing and flows another 300 m before it meets West Alexander Creek.

October 3rd, 2018 – West Alexander Creek

Stage had increased overnight but had returned to its previous level by morning. The team aimed to complete all discharge measurements along the West Alexander Tributary. Following a drive to the headwaters of West Alexander Creek, the team commenced hiking downstream from GW12 (Groundwater Well). The first kilometer of West Alexander Creek was extremely difficult to traverse, not only because of the large amounts of snow that had accumulated over the preceding days, but also because the catchment slope was very high. Arriving at SW6.6, the team observed no visible flow conditions in the small, ill-defined channel. There was also no audible evidence of any flow at this location. Moving farther downstream, a small trickle was heard at SW6.5, and it was expected that this flow was <1 L/s. At SW6.4, located 200 m downstream of SW6.5 (and 70 m lower in elevation), flow was visually estimated to be 5 L/s. SW6 is located a short distance downstream, and the total elevation change over the 500 m from SW6.6 to SW6 was -170 m.

The team continued moving downstream on West Alexander and arrived at SW5.9, shown on Plate 5, measuring discharge between 11:09 and 11:30. Measured discharge was 7 L/s, with an uncertainty of 12.5%. Approximately 60 m downstream, a relatively large right bank tributary was observed to be contributing 2-3 L/s to West Alexander Creek. A second right bank tributary less than 20 m farther was dry. It is speculated that given the terrain, these two tributaries may originate from the same upstream sub-catchment, with the second tributary possibly only flowing during higher flows. A farther 300 m and 500 m downstream were two right bank tributaries merging with West Alexander Creek. However, both tributaries were dry, with no visible surface flow.

The team continued downstream and arrived at SW5.1, shown on Plate 6, measuring discharge between 12:17 and 12:42. Measured discharge was 11 L/s, with an uncertainty of 3%. 500 m farther downstream, an additional flow of 3-5 L/s was observed from a right bank tributary. 200 m downstream of this tributary, the team arrived at SW4.5, shown on Plate 7, and measured discharge between 13:36 and 13:54. Measured discharge was 15 L/s, with an uncertainty of 11.9%. There is significant avalanche terrain covering the right bank tributaries of West Alexander Creek upstream of SW4.5. Much of the terrain appears to be heavily altered due to avalanche pathways and stripped of vegetation. This is likely to effect tributary inflows to West Alexander Creek.

Moving downstream, the team observed three tributaries a short distance from SW4.5: a trickle observed from a right bank tributary, a dry channel from the left bank, and another right bank tributary contributing less than 1 L/s.

No other tributaries were observed for another 1.3 km, as they team made their way downstream. However, after this, and for approximately 1.4 km, down to SW4, a total of six tributaries were observed; four flowing in from the left bank, and two flowing in from the right bank. Moving downstream, flow from these tributaries totaled approximately 15 L/s. At SW4, flow was estimated at 16:44 over a horizontal natural log weir. The weir was 3 m across, had an average depth of approximately 5 cm, and an average velocity of 0.2 m/s. Total flow was estimated to be 30 L/s.

The team was then required to make their way back to the truck in order to exit the site. Throughout the course of the day, stage at SW1.5 had fallen by 1 cm, as shown on Figure 2.

October 4th, 2018 – East Alexander Creek and Alexander Creek

Stage had increased overnight to its previous level Stage overnight had increased slightly, as shown on Figure 2. The objective of this day was to complete the remaining work and return to Vancouver. The team arrived at SW3, shown on Plate 8, and measured discharge between 6:47 and 7:10. Measured discharge was 28 L/s, with an uncertainty of 2.9%. This discharge is generally consistent with the discharge observed on the previous day at SW4 but, given the additional catchment area and the slight increase in stage, does suggest that this area may be of a losing reach.

Moving downstream a dry left bank tributary was observed, and the team arrived at SW1.9, shown on Plate 9, measuring discharge between 8:11 and 9:01. SW1.9 is in East Alexander Creek, immediately upstream of the East Alexander and West Alexander confluence. Measured discharge was 184 L/s, with an uncertainty of 4.7%. It was noted that discharge in the West Alexander at the confluence were negligibly different to flows measured at SW3. It was also noted that the much larger East Alexander Creek flow was resulting in approximately 10 m of backwatering up West Alexander Creek.

The team arrived at SW1.5, and measured discharge between 9:34 and 10:25. Measured discharge was 170 L/s, with an uncertainty of 2.1%. The reduction in flow despite the contributions of both East and West Alexander Creeks, suggests that the intervening terrain is a losing reach.

The team packed the equipment and continued on to Calgary, and the return flight to Vancouver.

Discussion

Despite the challenges encountered in traversing the project site and the complications related to changing stage and melting snow, the data collected indicates that the lower reaches of West Alexander Creek and East Alexander Creek are losing reaches, with measurable reductions in flow occurring from about SW4 (West Alexander) and SW7.1 (East Alexander). Flow losses continue down to SW1.5 and may persist beyond this point. The region of flow losses in West Alexander seem to roughly correspond to a significant change in channel slope, which occurs at about SW4, as shown on Figure 5.

There was no evidence found of flows going completely to ground in either East Alexander or West Alexander Creeks', and no evidence of any significant springs, excepting perhaps in the upper reaches of West Alexander Creek, where the channel gradient was high, and flows occurred through pronounced bedrock outcroppings. However, deeper snow conditions in this area meant that though the team were able to identify relatively large changes in flow over a relatively short distance, a specific location where a spring may occur was not discernible.

There is almost an order of magnitude difference in flows between West Alexander and East Alexander Creek, with East Alexander being far more significant and contributing between 80% and 90% of the combined flows downstream of the confluence (184 L/s versus 28 L/s). This flow ratio will likely not persist under all flow conditions.

The smaller flows measured in West Alexander Creek may result in higher uncertainty in the magnitude of flow losses due to the larger impact of ambient changes, such as melting snow. However, given the relatively

small changes in stage at SW1.5, and the relatively large changes in flow throughout the West Alexander, the effect of flow losses would remain.

Changes in groundwater elevation have not been investigated at this time.

Recommendations

Should additional data collection be required to further refine flow losses, it is recommended that efforts be put into characterizing flow changes from SW4 (West Alexander) and SW7.1 (East Alexander) downstream to, and then well beyond SW1.5. The timing of these types of site visits is critical to ensuring that optimum conditions are met.

Closing

We trust that this summary satisfies your requirements, but should you have any questions or concerns, please do not hesitate to contact the undersigned.

SWIFTWATER CONSULTING LTD.

<Original signed by>

Cameron McCarthy
M.A.Sc., P.Eng., P.Geo., A.Sc.T.
Principal Water Resource Engineer

Table 1. Location Details

Location	Easting	Northing	Date - Time	Discharge L/s	Uncertainty %	Distance km	Comments
East Alexander Creek							
SW8	664815	5519596	Oct 2nd, 10:28 – 11:20	48	5.1	4.62	
SW7.8	664777	5519542	Oct 2nd, 12:21 – 13:00	54	6.3	4.55	
SW7.1	664349	5516650	Oct 2nd, 15:06 – 15:47	318	3.2	1.38	
EAST	664355	5515744	Oct 2nd, 16:44 – 16:54	216	5.1	0.3	
SW1.9	664384	5515478	Oct 4th, 8:11 – 9:01	184	4.7	0	
West Alexander Creek							
SW6.6	662710	5520782	Oct 3rd, 9:02	0	-	6.98	Visual Estimate
SW6.5	662677	5520753	Oct 3rd, 9:11	1	-	6.81	Visual Estimate
SW6.4	662536	5520670	Oct 3rd, 10:17	5	-	6.61	Visual Estimate
SW5.9	662325	5520585	Oct 3rd, 11:09 – 11:30	7	12.5	6.53	
SW5.1	662232	5519903	Oct 3rd, 12:17 – 12:42	11	3.8	5.8	
SW4.5	662479	5519327	Oct 3rd, 13:36 – 13:54	15	11.9	5.09	
SW4	663249	5516994	Oct 3rd, 16:42	30	25	2.3	
SW3	664011	5516173	Oct 4th, 6:48 – 7:10	28	2.9	1	
SW2.1	664323	5515471	Oct 4th, 8:19	28	-	0	Same Flow as SW3
Alexander Creek							
SW1.9	664384	5515478	Oct 4th, 8:11 – 9:01	184	4.7		
SW1.5	664359	5514654	Oct 4th, 9:34 – 10:25	169	2.1		

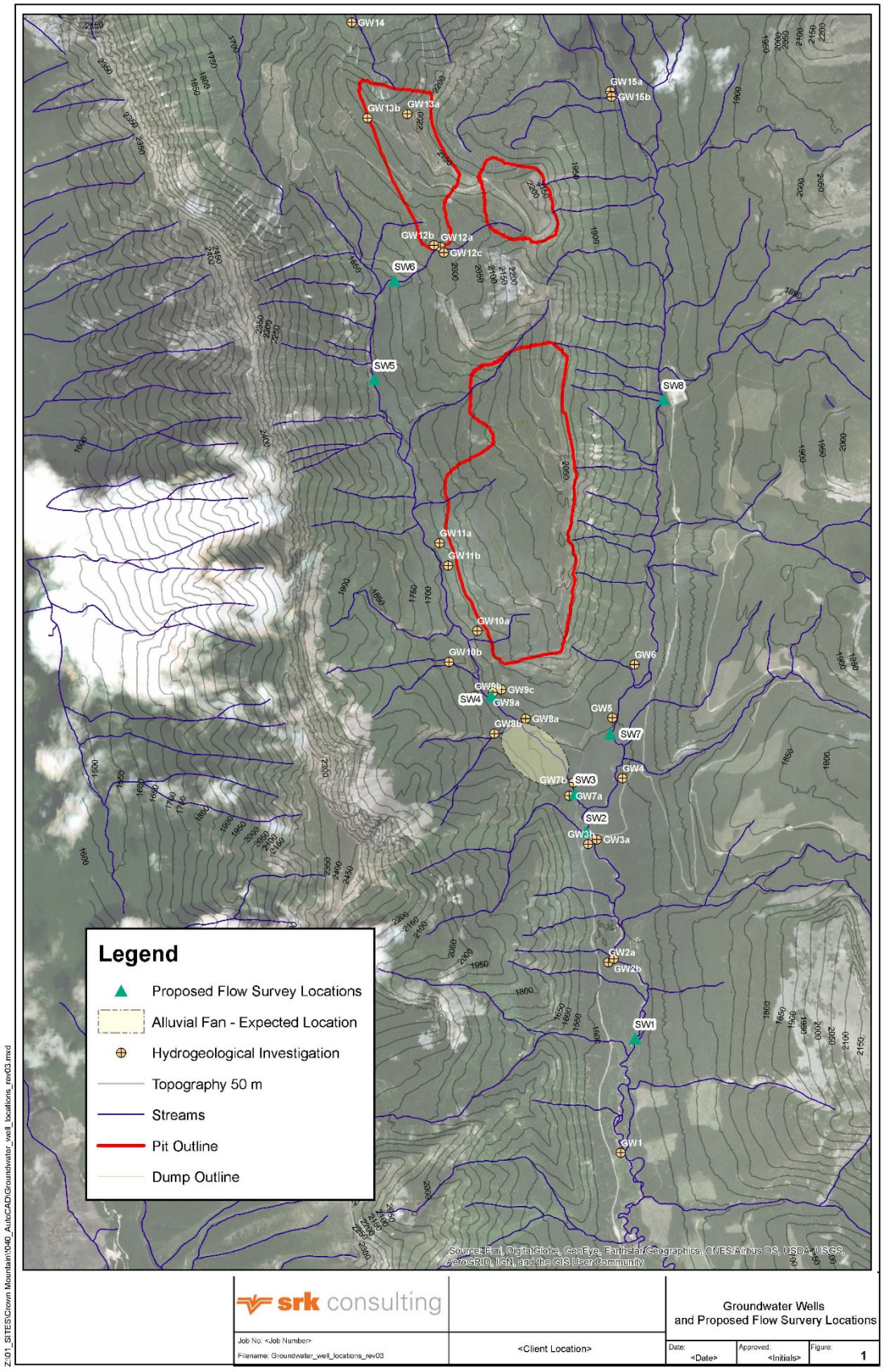


Figure 1. Proposed Measurement Locations (SRK)

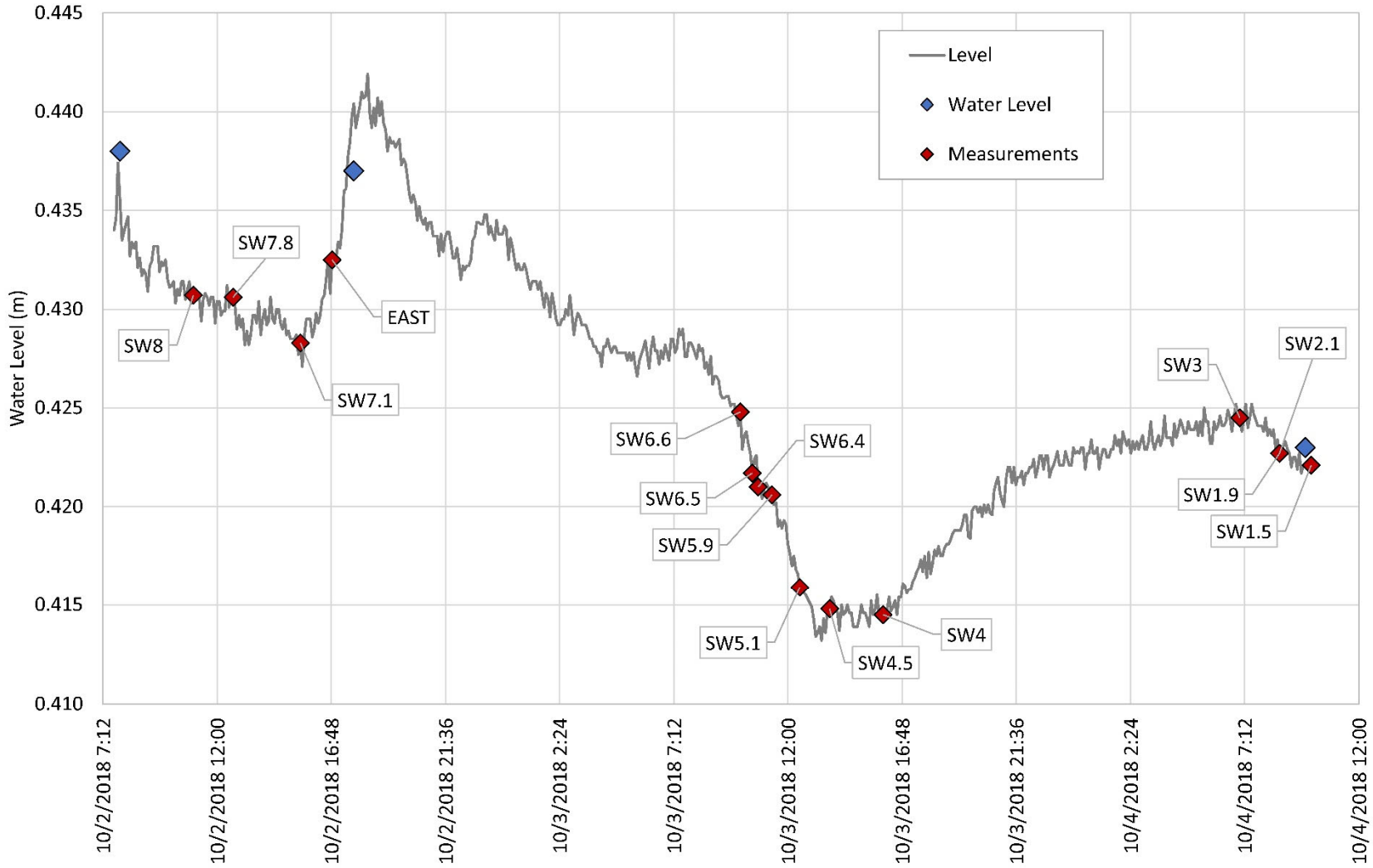


Figure 2. Continuous stage recorded at SW1.5. The total range of stage change at SW1.5 throughout the measurements was <2 cm (0.414 m to 0.433 m).

Figure 3. East Alexander Creek Measurement Nodes

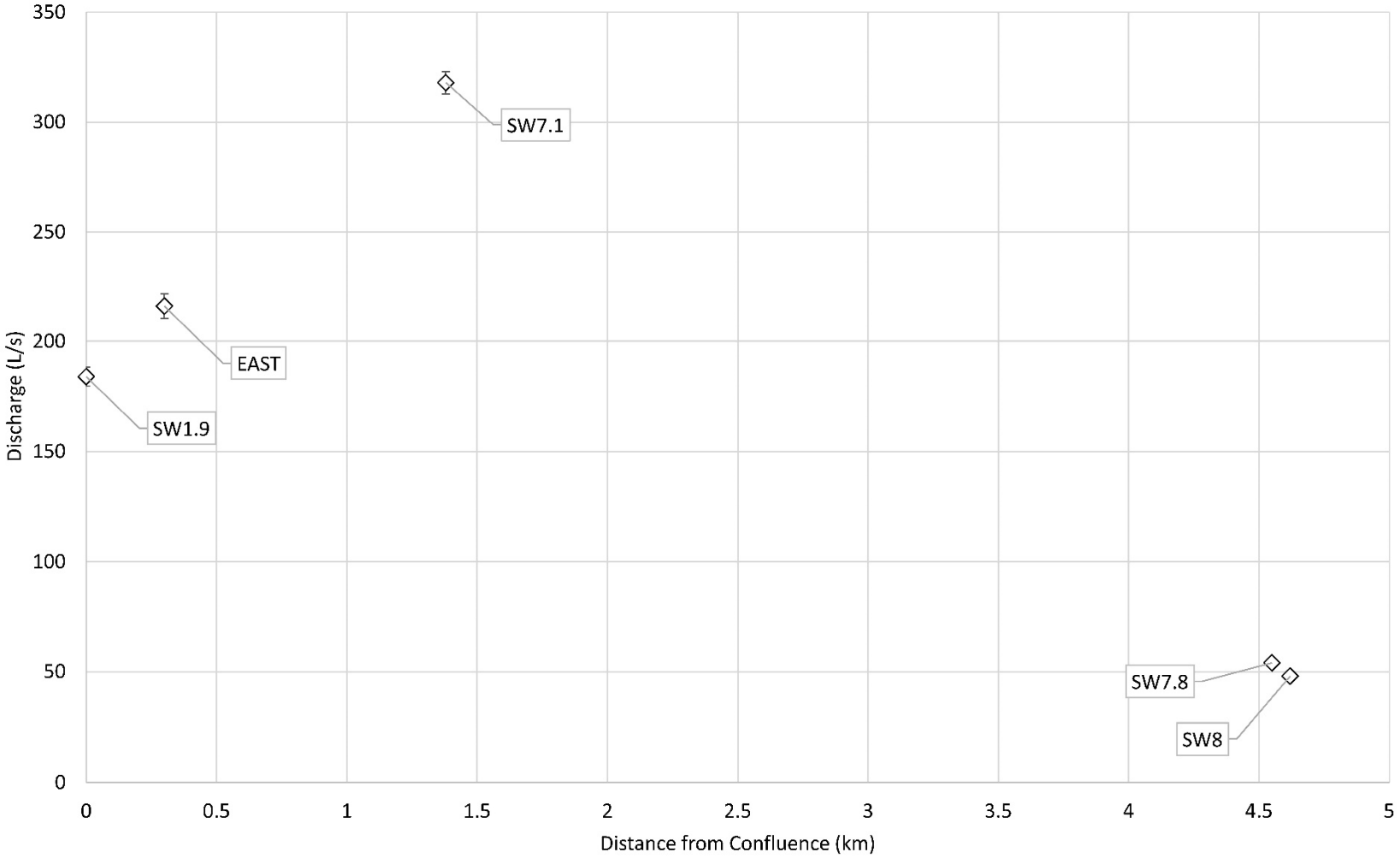


Figure 4. East Alexander Creek Discharge[1]

[1] Error bars shown relate to the calculated error from the current meter or visual estimates of uncertainty

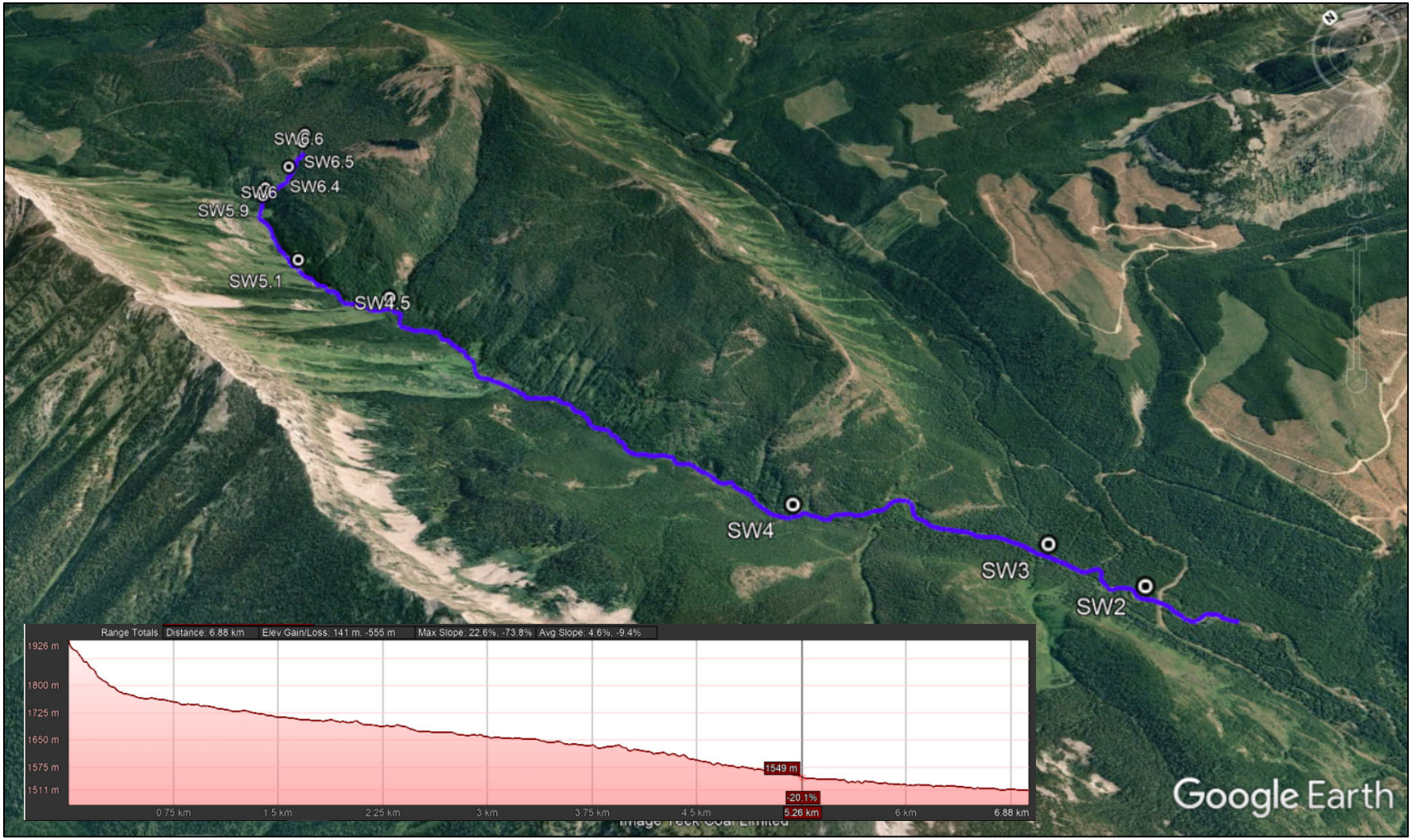


Figure 5. West Alexander Creek Measurement Nodes

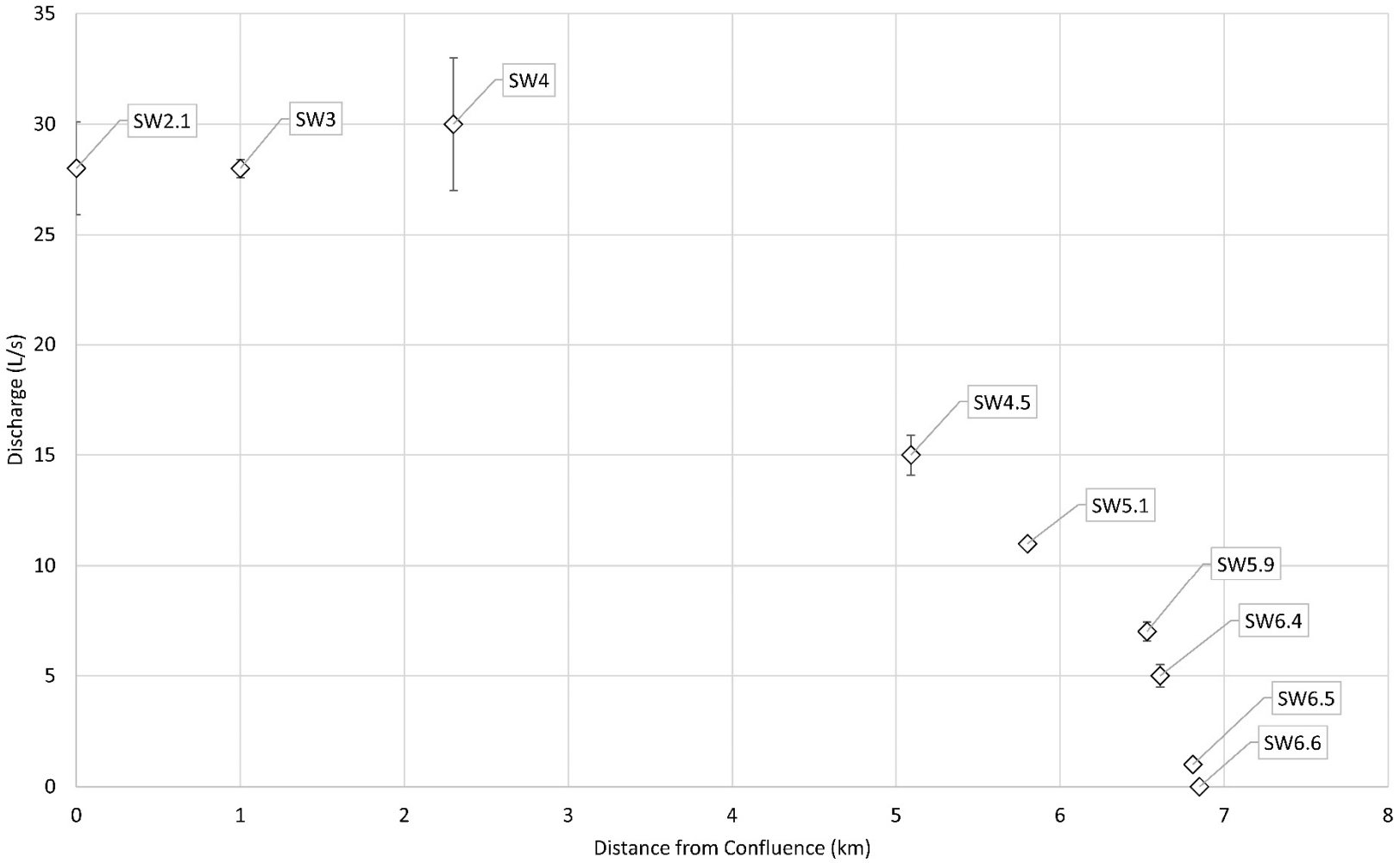


Figure 6. West Alexander Creek Discharge[1]

[1] Error bars shown relate to the calculated error from the current meter or visual estimates of uncertainty

Plate 1. SW8 Discharge Measurement Section (Photo Taken October 2nd, 11:30 AM)

Plate 2. SW7.8 Discharge Measurement Section (Photo Taken October 22nd, 11:50 AM)

Plate 3. SW7.1 Discharge Measurement Section (Photo Taken October 22nd, 4:00 PM)

Plate 4. East Alexander Creek downstream of the Bridge Crossing (Photo Taken October 2nd, 16:59)

Plate 5. SW5.9 Discharge Measurement Section (Photo taken October 3rd, 11:34 AM)

Plate 6. SW5.1 Discharge Measurement Section (Photo taken October 3rd, 12:47 PM)

Plate 7. SW4.5 Discharge Measurement Section (Photo taken October 3rd, 1:48 PM)

Plate 8. SW3 Discharge Measurement Section (Photo taken October 4th, 7:00)

Plate 9. SW1.9, Discharge Measurement Section (Photo taken October 4th, 8:40)

Appendix E – Photo Log

Crown Mountain – GW1

0m-48.8m

GW1 – 0m-6.1m

GW1_0m-3.0m_01A

GW1_0m-3.0m_01B

GW1_3.0m-6.1m_02A

GW1_3.0m-6.1m_02B

GW1_3.0m-6.1m_02C

GW1 – 6.1m-12.2m

GW1_6.1m-9.1m_03A

GW1_6.1m-9.1m_03B

GW1_6.1m-9.1m_03C

GW1_9.1m-12.2m_04A

GW1_9.1m-12.2m_04C

GW1_9.1m-12.2m_04B

GW1 – 12.2m-18.3m

GW1_12.2m-15.2m_05A

GW1_12.2m-15.2m_05B

GW1_12.2m-15.2m_05C

GW1_15.2m-18.3m_06A

GW1_15.2m-18.3m_06B

GW1_15.2m-18.3m_06C

GW1- 18.3m-24.4m

GW1_18.3m-21.3m_07A

GW1_18.3m-21.3m_07B

GW1_18.3m-21.3m_07C

GW1_21.3m-24.4m_08A

GW1_21.3m-24.4m_08B

GW1_21.3m-24.4m_08C

GW1 – 24.4m-30.5m

GW1_24.4m-27.4m_09A

GW1_24.4m-27.4m_09B

GW1_24.4m-27.4m_09C

GW1_27.4m-30.5m_10A

GW1_27.4m-30.5m_10B

GW1_27.4m-30.5m_10C

GW1 – 30.5m-36.6m

GW1_30.5m-33.5m_11A

GW1_30.5m-33.5m_11B

GW1_30.5m-33.5m_11C

GW1_33.5m-36.6m_12A

GW1_33.5m-36.6m_12B

GW1_33.5m-36.6m_12C

GW1 – 36.6m-42.7m

GW1_36.6m-39.6m_13A

GW1_36.6m-39.6m_13B

GW1_36.6m-39.6m_13C

GW1_39.6m-42.7m_14A

GW1_39.6m-42.7m_14B

GW1_39.6m-42.7m_14C

GW1 – 42.7m-48.8m

GW1_42.7m-45.7m_15A

GW1_42.7m-45.7m_15B

GW1_45.7m-48.8m_16A

GW1_45.7m-48.8m_16B

GW1_45.7m-48.8m_16C

Crown Mountain - GW1-A/B

0m-27.4m

GW1-A/B – 0m-6.1m

GW1-A_B_0m-3m_01A

GW1-A_B_0m-3m_01B

GW1-A_B_3.0m-6.1m_02A

GW1-A_B_3.0m-6.1m_02B

GW1-A_B_3.0-6.1._02C

GW1-A/B – 6.1m-12.2m

GW1-A_B_6.1m-9.1m_03A

GW1-A_B_6.1m-9.1m_03B

GW1-A_B_6.1m-9.1m_03C

GW1-A_B_9.1m-12.2m_04A

GW1-A_B_9.1m-12.2m_04B

GW1-A_B_9.1m-12.2m_04C

GW1-A/B – 12.2m-18.3m

GW1-A_B_12.2m-15.2m_05A

GW1-A_B_12.2m-15.2m_05B

GW1-A_B_12.2m-15.2m_05C

GW1-A_B_15.2m-18.3m_06A

GW1-A_B_15.2m-18.3m_06B

GW1-A_B_15.2m-18.3m_06C

GW1-A/B – 18.3m-24.4m

GW1-A_B_18.3m-21.3m_07A

GW1-A_B_18.3m-21.3m_07B

GW1-A_B_18.3m-21.3m_07C

GW1-A_B_21.3m-24.4m_08A

GW1-A_B_21.3m-24.4m_08B

GW1-A_B_21.3m-24.4m_08C

GW1-A/B – 24.4m-27.4m

GW1-A_B_24.4m-27.4m_09A

GW1-A_B_24.4m-27.4m_09B

GW1-A_B_24.4m-27.4m_09C

Crown Mountain - GW3-A/C

0m-47.2m

GW3-A/C – 0m–6.1m

GW3-A_C_0m-3.0m_01A

GW3-A_C_0m-3.0m_01B

GW3-A_C_0m-3.0m_01C

GW3-A_C_3.0m-6.1m_02A

GW3-A_C_3.0m-6.1m_02B

GW3-A_C_3m-6.1m_02C

GW3-A/C – 6.1m-12.2m

GW3-A_C_6.1m-9.1m_03A

GW3-A_C_6.1m-9.1m_03B

GW3-A_C_6.1m-9.1m_03C

GW3-A_C_9.1m-12.2m_04A

GW3-A_C_9.1m-12.2m_04B

GW3-A_C_9.1m-12.2m_04C

GW3-A/C – 12.2m-18.3m

GW3-A_C_12.2m-15.2m_05A

GW3-A_C_12.2m-15.2m_05B

GW3-A_C_12.2m-15.2m_05C

GW3-A_C_15.2m-18.3m_06A

GW3-A_C_15.2m-18.3m_06B

GW3-A_C_15.2m-18.3m_06C

GW3-A/C – 18.3m-24.4m

GW3-A_C_18.3m-21.3m_07A

GW3-A_C_18.3m-21.3m_07B

GW3-A_C_18.3m-21.3m_07C

GW3-A_C_21.3m-24.4m_08A

GW3-A_C_21.3m-24.4m_08B

GW3-A_C_21.3m-24.4m_08C

GW3-A/C – 24.4m-30.5m

GW3-A_C_24.4m-27.4m_09A

GW3-A_C_24.4m-27.4m_09B

GW3-A_C_24.4m-27.4m_09C

GW3-A_C_27.4m-30.5m_10A

GW3-A_C_27.4m-30.5m_10B

GW3-A_C_27.4m-30.5m_10C

GW3-A/C – 30.5m – 36.6m

GW3-A_C_30.5m-33.5m_11A

GW3-A_C_30.5m-33.5m_11B

GW3-A_C_30.5m-33.5m_11C

GW3-A_C_33.5m-36.6m_12A

GW3-A_C_33.5m-36.6m_12B

GW3-A_C_33.5m-36.6m_12C

GW3-A/C – 39.6m-44.2m

GW3-A_C_39.6m-41.1m_14A

GW3-A_C_39.6m-41.1m_14B

GW3-A_C_39.6m-41.1m_14C

GW3-A_C_41.1m-44.2m_15A

GW3-A_C_41.1m-44.2m_15B

GW3-A_C_41.1m-44.2m_15C

GW-A/C – 44.2m-47.2m

GW3-A_C_44.2m-47.2m_16A

GW3-A_C_44.2m-47.2m_16B

GW3-A_C_44.2m-47.2m_16C

Crown Mountain - GW3-B

0m-24.4m

GW3-B – 0m-3.0m

GW3-B_0m-3.0m_01A

GW3-B_0m-3.0m_01B

GW3-B_0m-3.0m_01C

GW3-B_3.0m-6.1m_02A

GW3-B_3.0m-6.1m_02B

GW3-B_3.0m-6.1m_02C

GW3-B – 6.1m-12.2m

GW3-B_6.1m-9.1m_03A

GW3-B_6.1m-9.1m_03B

GW3-B_6.1m-9.1m_03C

GW3-B_9.1m-12.2m_04A

GW3-B_9.1m-12.2m_04B

GW3-B_9.1m-12.2m_04C

GW3-B – 12.2m-18.3m

GW3-B_12.2-15.2_05A

GW3-B_12.2-15.2_05B

GW3-B_12.2-15.2_05C

GW3-B_15.2-18.3_06A

GW3-B_15.2-18.3_06B

GW3-B_15.2-18.3_06C

GW3-B – 18.3m-24.4m

GW3-B_18.3-21.3_07A

GW3-B_18.3-21.3_07B

GW3-B_18.3-21.3_07C

GW3-B_21.3-24.4_08A

GW3-B_21.3-24.4_08B

GW3-B_21.3-24.4_08C

Crown Mountain – GW4-BR

0m-36.6m

GW4-BR – 0m-3.0m

GW4-BR_0m-1.5m_1A

GW4-BR_1.5m-3.0m_2A

GW4-BR_1.5m-3.0m_2B

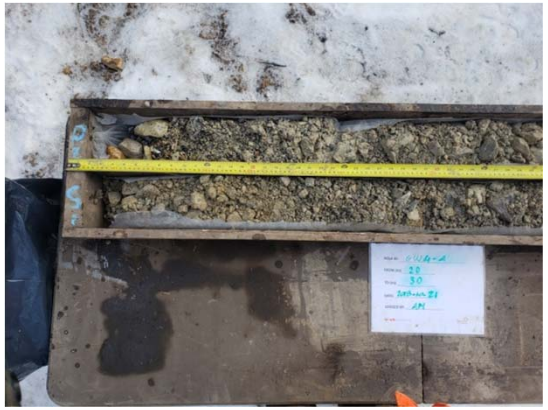
GW4-BR_1.5m-3.0m_2C

GW4-BR – 3.0m-9.1m

GW4-BR_3.0m-6.1m_3A

GW4-BR_3.0m-6.1m_3B

GW4-BR_3.0m-6.1m_3C



GW4-BR_6.1m-9.1m_4A

GW4-BR_6.1m-9.1m_4B

GW4-BR_6.1m-9.1m_4C

GW4-BR – 9.1m-18.3m

GW4-BR_9.1m-12.2m_5A

GW4-BR_9.1m-12.2m_5B

GW4-BR_9.1m-12.2m_5C

GW4-BR_12.2m-15.2m_6A

GW4-BR_15.2m-18.3m_7A

GW4-BR_15.2m-18.3m_7B

GW4-BR – 18.3m-23.2m

GW4-BR_18.3m-21.3m_8A

GW4-BR_18.3m-21.3m_8B

GW4-BR_18.3m-21.3m_8C

GW4-BR_21.3m-23.2m_9A

GW4-BR_21.3m-23.2m_9C

GW4-BR_21.3m-23.2m_9B

GW4-BR – 23.2m-29.0m

GW4-BR_23.2m-25.9m_10A

GW4-BR_23.2m-25.9m_10B

GW4-BR_25.9m-29.0m_11A

GW4-BR_25.9m-29.0m_11B

GW4-BR_25.9m-29.0m_11C

GW4-BR – 29.0m-31.7m

GW4-BR_29.0m-30.5m_12A

GW4-BR_29.0m-30.5m_12B

GW4-BR_29.0m-30.5m_12C

GW4-BR_30.5m-31.7m_13A

GW4-BR_30.5m-31.7m_13B

GW4-BR_30.5m-31.7m_13C

GW4-BR – 31.7m-36.6m

GW4-BR_31.7m-33.5m_14A

GW4-BR_31.7m-33.5m_14B

GW4-BR_31.7m-33.5m_14C

GW4-BR_33.5m-36.6m_15A

GW4-BR_33.5m-36.6m_15B

GW4-BR_33.5m-36.6m_15C

Crown Mountain - GW4-OB

0m-13.7m

GW4-OB – 0m-3.0m

GW4-OB_0m-1.5m_01A

GW4-OB_0m-1.5m_01B

GW4-OB_1.5m-3.0m_02A

GW4-OB_1.5m-3.0m_02B

GW4-OB_1.5m-3.0m_02C

GW4-OB – 3.0m-9.1m

GW4-OB_3.0m-6.1m_03A

GW4-OB_3.0m-6.1m_03B

GW4-OB_3.0m-6.1m_03C

GW4-OB_6.1m-9.1m_04A

GW4-OB_6.1m-9.1m_04B

GW4-OB_6.1m-9.1m_04C

GW4-OB – 9.1m-13.7m

GW4-OB_9.1m-12.2m_05A

GW4-OB_9.1m-12.2m_05B

GW4-OB_9.1m-12.2m_05C

GW4-OB_12.2m-13.7m_06A

GW4-OB_12.2m-13.7m_06B

GW4-OB_12.2m-13.7m_06C

Crown Mountain - GW6-BR

0m-15.2m

GW6-BR – 0m-4.3m

GW6-BR_0m-3.0m_01A

GW6-BR_0m-3.0m_01B

GW6-BR_0m-3.0m_01C

GW6-BR_3.0m-4.3m_02A

GW6-BR_3.0m-4.3m_02B

GW6-BR_3.0m-4.3m_02C

GW6-BR – 4.3m-7.6m

GW6-BR_4.3m-4.9m_03A

GW6-BR_4.9m-7.6m_04A

GW6-BR – 7.6m-12.2m

GW6-BR_7.6m-10.7m_05A

GW6-BR_7.6m-10.7m_05B

GW6-BR_7.6m-10.7m_05C

GW6-BR_10.7m-12.2m_06A

GW6-BR_10.7m-12.2m_06B

GW6-BR_10.7m-12.2m_06C

GW6-BR - 12.2m-15.2m

GW6-BR_12.2m-15.2m_07A

GW6-BR_12.2m-15.2m_07B

GW6-BR_12.2m-15.2m_07C

Crown Mountain - GW6-PB

0m-6.1m

GW6-OB – 0m-3.7m

GW6-OB_0m-3.0m_01A

GW6-OB_3.0m-3.7m_02A

GW6-OB_3.0m-3.7m_02B

GW6-OB_3.0m-3.7m_02C

GW6-OB – 3.7m-6.1m

GW6-OB_3.7m-6.1m_03A

Crown Mountain - GW7-A

0m-36.6m

GW7-A – 0m-6.1m

GW7-A_0m-3.0m_01A

GW7-A_0m-3.0m_01B

GW7-A_0m-3.0m_01C

GW7-A_3.0m-6.1m_02A

GW7-A_3.0m-6.1m_02B

GW7-A_3.0m-6.1m_02C

GW7-A – 6.1m-12.2m

GW7-A_6.1m-9.1m_03A

GW7-A_6.1m-9.1m_03B

GW7-A_6.1m-9.1m_03C

GW7-A_9.1m-12.2m_04A

GW7-A_9.1m-12.2m_04B

GW7-A_9.1m-12.2m_04C

GW7-A – 12.2m-18.3m

GW7-A_12.2m-15.2m_05A

GW7-A_12.2m-15.2m_05B

GW7-A_12.2m-15.2m_05C

GW7-A_15.2m-18.3m_06A

GW7-A_15.2m-18.3m_06B

GW7-A_15.2m-18.3m_06C

GW7-A – 18.3m-24.4m

GW7-A_18.3m-21.3m_07A

GW7-A_18.3m-21.3m_07B

GW7-A_18.3m-21.3m_07C

GW7-A_21.3m-24.4m_08A

GW7-A_21.3m-24.4m_08B

GW7-A_21.3m-24.4m_08C

GW7-A – 24.4m-30.5m

GW7-A_24.4m-27.4m_09A

GW7-A_24.4m-27.4m_09B

GW7-A_24.4m-27.4m_09C

GW7-A_27.4m-30.5m_10A

GW7-A_27.4m-30.5m_10B

GW7-A_27.4m-30.5m_10C

GW7-A – 30.5-36.6m

GW7-A_30.5m-33.5m_11A

GW7-A_30.5m-33.5m_11B

GW7-A_30.5m-33.5m_11C

GW7-A_33.5m-36.6m_12A

GW7-A_33.5m-36.6m_12B

GW7-A_33.5m-36.6m_12C

Crown Mountain – GW7-B

0m-14.5m

GW7-B – 0m-6.1m

GW7-B_0m-3.0m_01A

GW7-B_0m-3.0m_01B

GW7-B_0m-3.0m_01C

GW7-B_3.0m-6.1m_02A

GW7-B_3.0m-6.1m_02B

GW7-B_3.0m-6.1m_02C

GW7-B – 6.1m-12.2m

GW7-B_6.1m-9.1m_03A

GW7-B_6.1m-9.1m_03B

GW7-B_6.1m-9.1m_03C

GW7-B_9.1m-12.2m_04A

GW7-B_9.1m-12.2m_04B

GW7-B_9.1m-12.2m_04C

GW7-B - 9.1m-13.7m

GW7-B_9.1m-12.2m_04A

GW7-B_9.1m-12.2m_04B

GW7-B_9.1m-12.2m_04C

GW7-B_12.2m-13.7m_05A

GW7-B_12.2m-13.7m_05B

GW7-B_12.2m-13.7m_05C

GW7-B – 13.7m-14.5m

GW7-B_13.7m-14.5m_06A

GW7-B_13.7m-14.5m_06B

GW7-B_13.7m-14.5m_06C

Crown Mountain - GW9-BR

0m-42.7m

GW9-BR – 0m-6.1m

GW9-BR_0m-3.0m_01A

GW9-BR_0m-3.0m_01B

GW9-BR_0m-3.0m_01C

GW9-BR_3.0m-6.1m_02A

GW9-BR_3m-6.1m_02B

GW9-BR_3m-6.1m_02C

GW9-BR – 6.1m-12.2m

GW9-BR_6.1m-9.1m_03A

GW9-BR_6.1m-9.1m_03B

GW9-BR_6.1m-9.1m_03C

GW9-BR_9.1m-12.2m_04A

GW9-BR_9.1m-12.2m_04B

GW9-BR_9.1m-12.2m_04C

GW9-BR – 12.2m-18.3m

GW9-BR_12.2m-15.2m_05A

GW9-BR_12.2m-15.2m_05B

GW9-BR_12.2m-15.2m_05C

GW9-BR_15.2m-18.3m_06A

GW9-BR_15.2m-18.3m_06B

GW9-BR_15.2m-18.3m_06C

GW9-BR – 18.3m-24.4m

GW9-BR_18.3m-21.3m_07A

GW9-BR_18.3m-21.3m_07B

GW9-BR_18.3m-21.3m_07C

GW9-BR_21.3m-24.4m_08A

GW9-BR_21.3m-24.4m_08B

GW9-BR_21.3m-24.4m_08C

GW9-BR – 24.4m-30.5m

GW9-BR_24.4m-27.4m_09A

GW9-BR_24.4m-27.4m_09B

GW9-BR_24.4m-27.4m_09C

GW9-BR_27.4m-30.5m_10A

GW9-BR_27.4m-30.5m_10B

GW9-BR_27.4m-30.5m_10C

GW9-BR – 30.5m-36.6m

GW9-BR_30.5m-33.5m_11A

GW9-BR_30.5m-33.5m_11B

GW9-BR_30.5m-33.5m_11C

GW9-BR_33.5m-36.6m_12A

GW9-BR_33.5m-36.6m_12B

GW9-BR_33.5m-36.6m_12C

GW9-BR – 36.6m-41.5m

GW9-BR_36.6m-39.6m_13A

GW9-BR_36.6m-39.6m_13B

GW9-BR_36.6m-39.6m_13C

GW9-BR_39.6m-41.5m_14A

GW9-BR_39.6m-41.5m_14B

GW9-BR_39.6m-41.5m_14C

GW9-BR – 41.5m-42.7m

GW9-BR_41.5m-42.7m_15A

GW9-BR_41.5m-42.7m_15B

GW9-BR_41.5m-42.7m_15C

Crown Mountain - GW9-OB

0m-24.4m

GW9-OB – 0m-6.1m

GW9-OB_0m-3.0m_01A

GW9-OB_0m-3.0m_01B

GW9-OB_0m-3.0m_01C

GW9-OB_3.0m-6.1m_02A

GW9-OB_3.0m-6.1m_02B

GW9-OB_3.0m-6.1m_02C

GW9-OB – 6.1m-12.2m

GW9-OB_6.1m-9.1m_03A

GW9-OB_6.1m-9.1m_03B

GW9-OB_6.1m-9.1m_03C

GW9-OB_9.1m-12.2m_04A

GW9-OB_9.1m-12.2m_04B

GW9-OB_9.1m-12.2m_04C

GW9-OB – 12.2m-18.3m

GW9-OB_12.2m-15.2m_05A

GW9-OB_12.2m-15.2m_05B

GW9-OB_12.2m-15.2m_05C

GW9-OB_15.2m-18.3m_06A

GW9-OB_15.2m-18.3m_06B

GW9-OB_15.2m-18.3m_06C

GW9-OB – 18.3m-24.4m

GW9-OB_18.3m-21.3m_07A

GW9-OB_18.3m-21.3m_07B

GW9-OB_18.3m-21.3m_07C

GW9-OB_21.3m-24.4m_08A

GW9-OB_21.3m-24.4m_08B

GW9-OB_21.3m-24.4m_08C

Crown Mountain - GW12-BR

0m-15.2m

GW12-BR – 0m-4.6m

GW12-BR_0m-3.0m_01A

GW12-BR_0m-3.0m_01B

GW12-BR_0m-3.0m_01C

GW12-BR_3.0m-4.6m_02A

GW12-BR_3.0m-4.6m_02B

GW12-BR_3.0m-4.6m_02C

GW12-BR – 4.6m-9.1m

GW12-BR_4.6m-7.0m_03A

GW12-BR_4.6m-7.0m_03B

GW12-BR_4.6m-7.0m_03C

GW12-BR_7.0m-9.1m_04A

GW12-BR_7.0m-9.1m_04B

GW12-BR_7.0m-9.1m_04C

GW12-BR – 9.1m-13.7m

GW12-BR_9.1m-10.7m_05A

GW12-BR_9.1m-10.7m_05B

GW12-BR_9.1m-10.7m_05C

GW12-BR_10.7m-13.7m_06A

GW12-BR_10.7m-13.7m_06B

GW12-BR_10.7m-13.7m_06C

GW12-BR – 13.7m-15.2m

GW12-BR_13.7m-15.2m_07A

GW12-BR_13.7m-15.2m_07B

GW12-BR_13.7m-15.2m_07C

Crown Mountain - GW12-OB

0m-10.7m

GW12-OB – 0m-3.7m

GW12-OB_0m-1.8m_01A

GW12-OB_0m-1.8m_01B

GW12-OB_0m-1.8m_01C

GW12-OB_1.8m-3.7m_02A

GW12-OB_1.8m-3.7m_02B

GW12-OB_1.8m-3.7m_02C

GW12-OB – 3.7m-9.1m

GW12-OB_3.7m-6.1m_03A

GW12-OB_3.7m-6.1m_03B

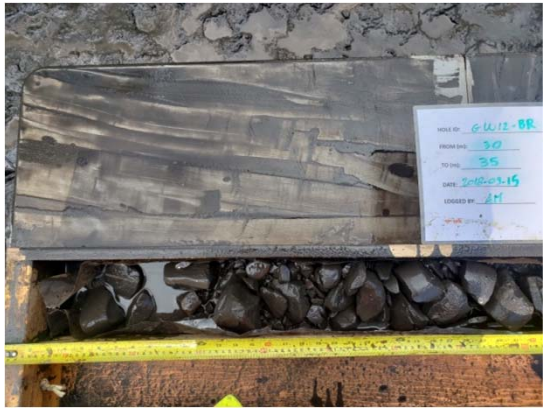
GW12-OB_3.7m-6.1m_03C

GW12-OB_6.1m-9.1m_04A

GW12-OB_6.1m-9.1m_04B

GW12-OB_6.1m-9.1m_04C

GW12-OB – 9.1m-10.7m



GW12-OB_9.1m-10.7m_05A

GW12-OB_9.1m-10.7m_05B

GW12-OB_9.1m-10.7m_05C

Crown Mountain – GW14-BR

0m-22.6m

GW14-BR – 0m-6.1m

GW14-BR_0m-3.0m_01A

GW14-BR_0m-3.0m_01B

GW14-BR_0m-3.0m_01C

GW14-BR_3.0m-6.1m_2A

GW14-BR_3.0m-6.1m_2B

GW14-BR_3.0m-6.1m_2C

GW14-BR – 6.1m-10.1m

GW14-BR_6.1m-9.1m_3A

GW14-BR_6.1m-9.1m_3B

GW14-BR_6.1m-9.1m_3C

GW14-BR_9.1m-10.1m_4A

GW14-BR_9.1m-10.1m_4B

GW14-BR_9.1m-10.1m_4C

GW14-BR – 10.1m-15.2m

GW14-BR_10.1m-12.2m_5A

GW14-BR_10.1m-12.2m_5B

GW14-BR_10.1m-12.2m_6A

GW14-BR_12.2m-15.2m_5C

GW14-BR_12.2m-15.2m_6B

GW14-BR_12.2m-15.2m_6C

GW14-BR – 15.2m-18.3m

GW14-BR_15.2m-16.2m_7A

GW14-BR_15.2m-16.2m_7B

GW14-BR_15.2m-16.2m_7C

GW14-BR_16.2m-18.3m_8A

GW14-BR_16.2m-18.3m_8B

GW14-BR_16.2m-18.3m_9A

GW14-BR – 18.3m-22.6m

GW14-BR_18.3m-21.3m_8C

GW14-BR_18.3m-21.3m_9B

GW14-BR_18.3m-21.3m_9C

GW14-BR_21.3m-22.6m_10A

GW14-BR_21.3m-22.6m_10B

GW14-BR_21.3m-22.6m_10C

Crown Mountain - GW14-OB

0m-16.8m

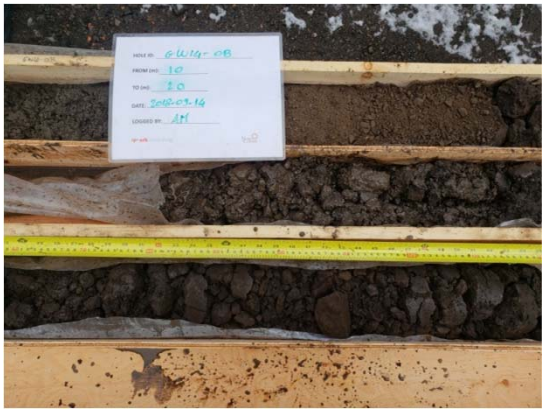
GW14-OB – 0m-6.1m

GW14-OB_0m-3.0m_01A

GW14-OB_0m-3.0m_01B

GW14-OB_0m-3.0m_01C

GW14-OB_3.0m-6.1m_02A



GW14-OB_3.0m-6.1m_02B

GW14-OB_3.0m-6.1m_02C

GW14-OB – 6.1m-10.7m

GW14-OB_6.1m-9.1m_03A

GW14-OB_6.1m-9.1m_03B

GW14-OB_6.1m-9.1m_03C

GW14-OB_9.1m-10.7m_04A

GW14-OB_9.1m-10.7m_04B

GW14-OB_9.1m-10.7m_04C

GW14-OB – 10.7m-14.3m

GW14-OB_10.7m-13.7m_05A

GW14-OB_10.7m-13.7m_05B

GW14-OB_13.7m-14.3m_06A

GW14-OB_13.7m-14.3m_06B

GW14-OB_13.7m-14.3m_06C

GW14-OB – 14.3m-16.8m

GW14-OB_14.3m-16.8m_07A

GW14-OB_14.3m-16.8m_07B

GW14-OB_14.3m-16.8m_07C

Crown Mountain - GW-MP1

0m-32.0m

GW-MP1 – 0m-6.1m

GW-MP1_0m-3.0m_01A

GW-MP1_0m-3.0m_01B

GW-MP1_0m-3.0m_01C

GW-MP1_3.0m-6.1m_02A

GW-MP1_3.0m-6.1m_02B

GW-MP1_3.0m-6.1m_02C

GW-MP1 – 6.1m-12.2m

GW-MP1_6.1m-9.1m_03A

GW-MP1_6.1m-9.1m_03B

GW-MP1_6.1m-9.1m_03C

GW-MP1_9.1m-12.2m_04A

GW-MP1_9.1m-12.2m_04B

GW-MP1_9.1m-12.2m_04C

GW-MP1 – 12.2m-18.3m

GW-MP1_12.2m-15.2m_05A

GW-MP1_12.2m-15.2m_05B

GW-MP1_12.2m-15.2m_05C

GW-MP1_15.2m-18.3m_06A

GW-MP1_15.2m-18.3m_06B

GW-MP1_15.2m-18.3m_06C

GW-MP1 -18.3m-24.4m

GW-MP1_18.3m-21.3m_07A

GW-MP1_18.3m-21.3m_07B

GW-MP1_18.3m-21.3m_07C

GW-MP1_21.3m-24.4m_08A

GW-MP1_21.3m-24.4m_08B

GW-MP1_21.3m-24.4m_08C

GW-MP1 – 24.4m-29.0m

GW-MP1_24.4m-26.8m_09A

GW-MP1_24.4m-26.8m_09B

GW-MP1_24.4m-26.8m_09C

GW-MP1_26.8m-29.0m_10A

GW-MP1_26.8m-29.0m_10B

GW-MP1_26.8m-29.0m_10C

GW-MP1 – 29.0m–32.0m

GW-MP1_29.0m-32.0m_11A

GW-MP1_29.0m-32.0m_11B

GW-MP1_29.0m-32.0m_11C