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ATTENTION: Teck Coal Limited

REFERENCE: **Evaluation of Groundwater as a Potential Stressor to Westslope Cutthroat Trout in the Harmer and Grave Creek Watersheds**

READER'S NOTE

Background

The Elk Valley (Qukin ʔamaʔkis) is located in the southeast corner of British Columbia (BC), Canada. “Ktunaxa people have occupied Qukin ʔamaʔkis for over 10,000 years. The value and significance of ʔa·kxamis ʼqapi qapsin (All Living Things) to the Ktunaxa Nation and in Qukin ʔamaʔkis must not be understated” (text provided by the Ktunaxa Nation Council [KNC]).

The Elk Valley contains the main stem of the Elk River, and one of the tributaries to the Elk River is Grave Creek. Grave Creek has tributaries of its own, including Harmer Creek. Harmer and Grave Creeks are upstream of a waterfall on Grave Creek, and they are home to isolated, genetically pure Westslope Cutthroat Trout (WCT; Oncorhynchus clarkii lewisi). This fish species is iconic, highly valued in the area and of special concern under federal and provincial legislation and policy.

In the Grave Creek watershed[1], the disturbance from logging, roads and other development is limited. The mine property belonging to Teck Coal Limited's Elkview Operations includes an area in the southwest of the Harmer Creek subwatershed. These operations influence Harmer Creek through its tributary Dry Creek, and they influence Grave Creek below its confluence with Harmer Creek (Harmer Creek Evaluation of Cause, 2022)[2]. Westslope Cutthroat Trout populations in both Harmer and Grave Creeks are part of Teck Coal's monitoring program.

The Evaluation of Cause Process

The Process Was Initiated

Teck Coal undertakes aquatic monitoring programs in the Elk Valley, including fish population monitoring. Using data collected as part of Teck Coal's monitoring program, Cope & Cope (2020) reported low abundance of juvenile WCT in 2019, which appeared to be due to recruitment failure in Harmer Creek. Teck Coal initiated an Evaluation of Cause — a process to evaluate and report on what may have contributed to the apparent recruitment failure. Data were analyzed from annual monitoring programs in the Harmer and Grave Creek population areas[3] from 2017 to 2021 (Thorley et al. 2022; Chapter 4, Evaluation of Cause), and several patterns related to recruitment[4] were identified:

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[1] Including Grave and Harmer Creeks and their tributaries.

[2] Harmer Creek Evaluation of Cause Team. (2023). Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population. Report prepared for Teck Coal Limited.

[3] Grave Creek population area" includes Grave Creek upstream of the waterfall at river kilometer (rkm) 2.1 and Harmer Creek below Harmer Sedimentation Pond. "Harmer Creek population area" includes Harmer Creek and its tributaries (including Dry Creek) from Harmer Sedimentation Pond and upstream.

[4] Recruitment refers to the addition of new individuals to a population through reproduction.

- Reduced Recruitment[5] occurred during the 2017, 2018 and 2019 spawn years[6] in the Harmer Creek population and in the 2018 spawn year in the Grave Creek population.
- The magnitude of Reduced Recruitment in the Harmer Creek population in the 2018 spawn year was significant enough to constitute Recruitment Failure[7].
- Recruitment was Above Replacement[8] for the 2020 spawn year in both the Harmer and Grave Creek populations.

The recruitment patterns from 2017, 2018 and 2019 in Harmer Creek are collectively referred to as Reduced Recruitment in this report. To the extent that there are specific nuances within 2017-2019 recruitment patterns that correlate with individual years, such as the 2018 Recruitment Failure, these are referenced as appropriate.

How the Evaluation of Cause Was Approached

When the Evaluation of Cause was initiated, an Evaluation of Cause Team (the Team) was established. It was composed of Subject Matter Experts (SMEs) who evaluated stressors with the potential to impact the WCT population. Further details about the Team are provided in the Evaluation of Cause report (Harmer Creek Evaluation of Cause Team, 2023).

During the Evaluation of Cause process, the Team had regularly scheduled meetings with representatives of the KNC and various agencies (the participants). These meetings included discussions about the overarching question that would be evaluated and about technical issues, such as identifying potential stressors, natural and anthropogenic, which had the potential to impact recruitment in the Harmer Creek WCT population. This was an iterative process driven

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[5] For the purposes of the Evaluation of Cause, Reduced Recruitment is defined as a probability of > 50% that annual recruitment is <100% of that required for population replacement (See Chapter 4, Evaluation of Cause, Harmer Creek Evaluation of Cause Team 2023).

[6] The spawn year is the year a fish egg was deposited, and fry emerged.

[7] For the purposes of the Evaluation of Cause, Recruitment Failure is defined as a probability of > 50% that annual recruitment is <10% of that required for population replacement (See Chapter 4, Evaluation of Cause, Harmer Creek Evaluation of Cause Team 2023).

[8] For the purposes of the Evaluation of Cause, Above Replacement is defined as a probability of > 50% that annual recruitment is >100% of that required for population replacement (See Chapter 4, Evaluation of Cause, Harmer Creek Evaluation of Cause Team 2023).

largely by the Team's evolving understanding of key parameters of the WCT population, such as abundance, density, size, condition and patterns of recruitment over time. Once the approach was finalized and the data were compiled, SMEs presented methods and draft results for informal input from participants. Subject Matter Experts then revised their work to address feedback and, subsequently, participants reviewed and commented on the reports. Finally, results of the analysis of the population monitoring data and potential stressor assessments were integrated to determine the relative contribution of each potential stressor to the Reduced Recruitment in the Harmer Creek population.

The Overarching Question the Team Investigated

The Team investigated the overarching question identified for the Evaluation of Cause, which was:

> **What potential stressors can explain changes in the Harmer Creek Westslope Cutthroat Trout population over time, specifically with respect to Reduced Recruitment?**

The Team developed a systematic and objective approach to investigate the potential stressors that could have contributed to the Reduced Recruitment in the Harmer Creek population. This approach is illustrated in the figure that follows the list of deliverables, below. The approach included evaluating patterns and trends, over time, in data from fish monitoring and potential stressors within the Harmer Creek population area and comparing them with patterns and trends in the nearby Grave Creek population area, which was used as a reference. The SMEs used currently available data to investigate causal effect pathways for the stressors and to determine if the stressors were present at a magnitude and for a duration sufficient to have adversely impacted the WCT. The results of this investigation are provided in two types of deliverables:

1. Individual Subject Matter Expert reports (such as the one that follows this Note). Potential stressors were evaluated by SMEs and their co-authors using the available data. These evaluations were documented in a series of reports that describe spatial and temporal patterns associated with the potential stressors, and they focus on the period

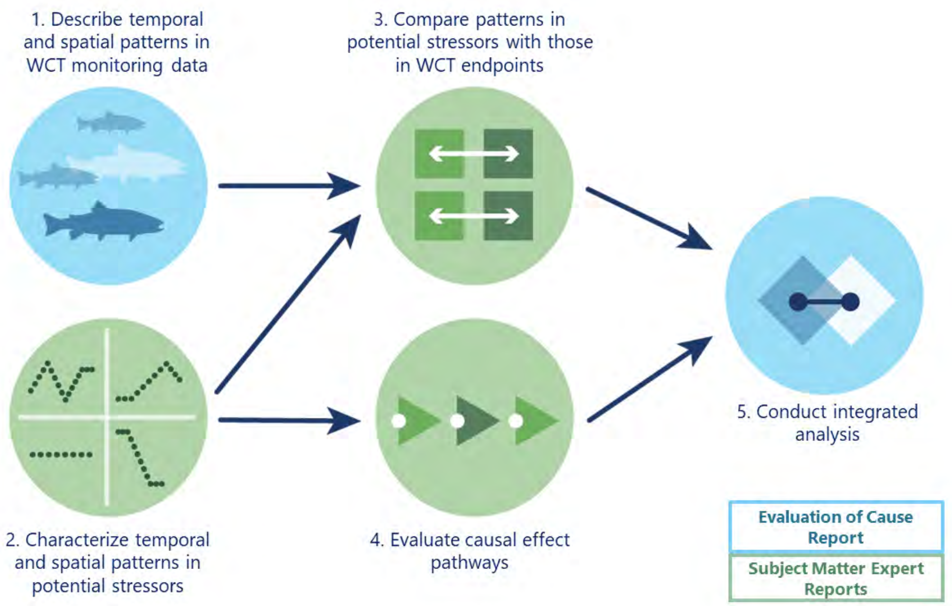
of Reduced Recruitment, including the Recruitment Failure of the 2018 spawn year where appropriate. The reports describe if and to what extent potential stressors may explain the Reduced Recruitment.

The full list of Subject Matter Expert reports follows at the end of this Reader's Note.

2. The Evaluation of Cause report. The SME reports provided the foundation for the Evaluation of Cause report, which was prepared by a subset of the Team and included input from SMEs.

   The Evaluation of Cause report:

a. Provides readers with context for the SME reports and describes Harmer and Grave Creeks, the Grave Creek watershed, the history of development in the area and the natural history of WCT in these creeks.
b. Presents fish monitoring data, which characterize the Harmer Creek and Grave Creek populations over time.
c. Uses an integrated approach to assess the role of each potential stressor in contributing to Reduced Recruitment in the Harmer Creek population area.



Conceptual approach to the Evaluation of Cause for the Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout population.

Participation, Engagement, & Transparency

To support transparency, the Team engaged frequently with participants throughout the Evaluation of Cause process. Participants in the Evaluation of Cause process, through various committees, included:

- Ktunaxa Nation Council;
- BC Ministry of Forests;
- BC Ministry of Land, Water and Resource Stewardship;
- BC Ministry Environment & Climate Change Strategy;
- Ministry of Energy, Mines and Low Carbon Innovation; and
- Environmental Assessment Office.

Citations for Evaluation of Cause Team Reports

Focus	Citation
Harmer Creek Evaluation of Cause report	Harmer Creek Evaluation of Cause Team. (2023). *Evaluation of Cause - Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population*. Report prepared for Teck Coal Limited.
Calcite	Hocking, M. A., Cloutier, R. N., Braga, J., & Hatfield, T. (2022). *Subject Matter Expert Report: Calcite. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population*. Report prepared for Teck Coal Limited. Prepared by Ecofish Research Ltd.
Dissolved oxygen	Abell, J., Yu, X., Braga, J., & Hatfield, T. (2022). *Subject Matter Expert Report: Dissolved Oxygen. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population*. Report prepared for Teck Coal Limited. Prepared by Ecofish Research Ltd.
Energetic Status	Thorley, J.L. & Branton, M.A. (2023) *Subject Matter Expert Report: Energetic Status at the Onset of Winter Based on Fork Length and Wet Weight. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population*. Report prepared for Teck Coal Limited. Prepared by Poisson Consulting Ltd and Branton Environmental Consulting.
Food availability	Wiebe, A., Orr, P., & Ings, J. (2022). *Subject Matter Expert Report: Food Availability. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population*. Report prepared for Teck Coal Limited. Prepared by Minnow Environmental Inc.

Focus	Citation
Groundwater	Canham, E., & Duchek, S. (2022). *Evaluation of Groundwater as a Potential Stressor to Westslope Cutthroat Trout in the Harmer and Grave Creek Watersheds.* Memo prepared for Teck Coal Limited. Prepared by SNC-Lavalin Inc.
Habitat availability (instream flow)	Wright, N., Little, P., & Hatfield, T. (2022). *Subject Matter Expert Report: Streamflow and Inferred Habitat Availability. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population*. Report prepared for Teck Coal Limited. Prepared by Ecofish Research Ltd.
Sediment quality	Wiebe, A., Orr, P., & Ings, J. (2022). Subject Matter Expert Report: Sediment Quality. *Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population.* Report prepared for Teck Coal Limited. Prepared by Minnow Environmental Inc.
Selenium	de Bruyn, A., Bollinger, T., & Luoma, S. (2022). *Subject Matter Expert Report: Selenium. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population.* Report prepared for Teck Coal Limited. Prepared by ADEPT Environmental Sciences Ltd, TKB Ecosystem Health Services, and SNL PhD, LLC.
Mall population size	Thorley, J. L., Hussein, N., Amish, S. J. (2022). *Subject Matter Expert Report: Small Population Size. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population.* Report prepared for Teck Coal Limited. Prepared by Poisson Consulting and Conservation Genomics Consulting, LLC.
Telemetry analysis	Akaoka, K., & Hatfield, T. (2022). *Harmer and Grave Creeks Telemetry Movement Analysis.* Memo prepared for Teck Coal Limited. Prepared by Ecofish Research Ltd.

Focus	Citation
Total suspended solids	Durston, D., & Hatfield, T. (2022). *Subject Matter Expert Report: Total Suspended Solids. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population.* Report prepared for Teck Coal Limited. Prepared by Ecofish Research Ltd.
Water quality	Warner, K., & Lancaster, S. (2022). *Subject Matter Expert Report: Surface Water Quality. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population.* Report prepared for Teck Coal Limited. Prepared by WSP-Golder.
Water temperature and ice	Hocking, M., Whelan, C. & Hatfield, T. (2022). *Subject Matter Expert Report: Water Temperature and Ice. Evaluation of Cause – Reduced Recruitment in the Harmer Creek Westslope Cutthroat Trout Population.* Report prepared for Teck Coal Limited. Prepared by Ecofish Research Ltd.

1 Introduction

Teck Coal undertakes aquatic monitoring programs in the Elk Valley, including fish population monitoring. Using data collected from 2017 to 2019 in Harmer and Grave Creeks, Cope & Cope (2020) reported low abundance of juvenile Westslope Cutthroat Trout (WCT; *Oncorhynchus clarkii lewisi*), which indicated apparent recruitment failure in Harmer Creek. Teck Coal initiated an Evaluation of Cause — a process to evaluate and report on what may have contributed to the apparent recruitment failure. Data were analyzed from annual monitoring programs in the Harmer and Grave Creek population areas[9] from 2017 to 2021 (Thorley et al. 2022; Chapter 4, Evaluation of Cause), and several patterns related to recruitment[10] were identified:

- *Reduced Recruitment*[11] occurred during the 2017, 2018, and 2019 spawn years[12] in the Harmer Creek population and in the 2018 spawn year in the Grave Creek population.
- The magnitude of Reduced Recruitment in the Harmer Creek population in the 2018 spawn year was significant enough to constitute *Recruitment Failure*[13].
- Recruitment was *Above Replacement*[14] for the 2020 spawn year in both the Harmer and Grave Creek populations.

The recruitment patterns from 2017, 2018, and 2019 in Harmer Creek are collectively referred to as Reduced Recruitment in this report. To the extent that there are specific nuances within 2017 to 2019 recruitment patterns that correlate with individual years, such as the 2018 Recruitment Failure, these are referenced as appropriate.

The Evaluation of Cause Project Team investigated one overarching question:

What potential stressors can explain changes in the Harmer Creek Westslope Cutthroat Trout population over time, specifically with respect to patterns of Reduced Recruitment?

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[9] "Grave Creek population area" includes Grave Creek upstream of the waterfall and Harmer Creek below Harmer Sedimentation Pond. "Harmer Creek population area" includes Harmer Creek and its tributaries (including Dry Creek) from Harmer Sedimentation Pond and upstream.

[10] Recruitment refers to the addition of new individuals to a population through reproduction.

[11] For the purposes of the Evaluation of Cause, Reduced Recruitment is defined as a probability of >50% that annual recruitment was <100% of that required for population replacement (See Chapter 4, Evaluation of Cause, Harmer Creek Evaluation of Cause Team, 2023).

[12] The spawn year is the year a fish egg was deposited and fry emerged.

[13] For the purposes of the Evaluation of Cause, Recruitment Failure is defined as a probability of >50% that annual recruitment is <10% of that required for population replacement (See Chapter 4 Evaluation of Cause, Harmer Creek Evaluation of Cause Team, 2023).

[14] For the purposes of the Evaluation of Cause, recruitment Above Replacement is defined as a probability of >50% that annual recruitment is >100% of that required for population replacement (See Chapter 4 Evaluation of Cause, Harmer Creek Evaluation of Cause Team, 2023).

To investigate this question, the Team evaluated trends in WCT population parameters, including size, condition, and recruitment, and in the potential stressors[15] that could impact these parameters. They evaluated the trends in WCT population parameters based on monitoring data collected from 2017 to 2021 (reported in Thorley et al., 2022 and Chapter 4, Harmer Creek Evaluation of Cause Team, 2023). The Grave Creek population area was used as a reference area for this evaluation.

The approach for analyzing potential stressors for the Evaluation of Cause was to (1) characterize trends in each stressor for the Harmer and Grave Creek populations, (2) compare the trends between the two population areas, (3) identify any changes in Harmer Creek during the period of Reduced Recruitment, including the 2018 Recruitment Failure of the 2018 spawn year where appropriate, and (4) evaluate how each stressor trended relative to the fish population parameters. The Team then identified mechanisms by which the potential stressors could impact WCT and determined if the stressors were present at a sufficient magnitude and duration to have an adverse effect on WCT during the period of Reduced Recruitment. Together, these analyses were used in the Evaluation of Cause report to support conclusions about the relative contribution of each potential stressor to the Reduced Recruitment observed in the Harmer Creek population area.

This document is one of a series of SME reports that support the integrated Harmer Creek Westslope Cutthroat Trout Evaluation of Cause (Harmer Creek Evaluation of Cause Team, 2023). For more information, see the preceding Reader's Note.

1.1 Scope of Work

At the request of Teck Coal Limited (Teck Coal), SNC-Lavalin Inc. (SNC-Lavalin) has prepared this letter addressing the potential for hydrogeological stressors in relation to the Evaluation of Cause (EoC) of the recruitment failures in the population of Westslope Cutthroat Trout (WCT) in Harmer and Grave Creeks in spawning years 2018 and 2019. Specifically, this assessment is evaluating whether inferred groundwater chemistry or levels could have been stressors to WCT in Harmer and Grave Creeks. Harmer Creek is the dominant tributary of Grave Creek and Dry Creek is a tributary of Harmer Creek. This letter presents:

- A characterization of the physical and chemical hydrogeology based on available data;
- A conceptual site model (CSM) for groundwater-surface water interactions in the Harmer and Grave Creek watersheds; and
- An evaluation of the potential for groundwater to act as a separate stressor on WCT habitat in Harmer and Grave Creeks.

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[15] The Evaluation of Cause process was initiated early in 2021 with currently available data. Although the process continued through mid-2022, data collected in 2021 were not included in the Evaluation of Cause because most stressor reports were already complete. Exceptions were made for the 2021 fish monitoring data and (1) selenium data because the selenium report was not complete and substantive new datasets were available, and (2) water temperature data for 2021 in the temperature report because a new sampling location was added in upper Grave Creek that contributed to our understanding of the Grave Creek population area.

2 Available Data

The study area for this assessment is defined as the Harmer Creek watershed, the Dry Creek watershed, and the area of the Grave Creek watershed shown on Drawing 1. Twelve wells are present in the study area (Drawing 1). Table A summarizes relevant details for the wells and borehole logs are provided as Attachment A. The Dry Creek (DC) series wells have only been sampled once; therefore, their results are considered preliminary.

Table A: Monitoring Well Installation Details, Monitoring Program, and Frequency

Well ID	Installation Date	Program	Monitoring Frequency	Data Available	Well Type	Well Depth (mbgs)
EV_GV3gw	October 2013	RGMP/EVO SSGMP	Quarterly	2014-2021	2-inch monitoring well	24.4
EV_GV3gws	August 2020	EVO SSGMP	Quarterly	2020-2021	2-inch monitoring well	9.2
EV_MW_GV4A	August 2020	RGMP Background	Quarterly	2020-2021	2-inch monitoring well	15.7
EV_MW_GV4B	August 2020	RGMP Background	Quarterly	2020-2021	2-inch monitoring well	5.8
EV_MW_DC1	Q1 2021	Dry Creek Study	Quarterly	2021	3-inch diameter monitoring well	33.53
EV_MW_DC2	Q1 2021	Dry Creek Study	Quarterly	2021	4-inch diameter monitoring well	54.42
EV_MW_DC3	Q1 2021	Dry Creek Study	Quarterly	2021	3-inch diameter monitoring well	13.72
EV_MW_DC4	Q1 2021	Dry Creek Study	Quarterly	2021	3-inch diameter monitoring well	13.72
EV_MW_DC5	Q1 2021	Dry Creek Study	Quarterly	2021	3-inch diameter monitoring well	6.09
EV_MW_DC6	Q1 2021	Dry Creek Study	Quarterly	2021	4-inch diameter monitoring well	31.95
EV_MW_DC7	Q1 2021	Dry Creek Study	Quarterly	2021	3-inch diameter monitoring well	10.70
EV_PW_DC1	Q1 2021	Dry Creek Study	Quarterly	2021	10-inch diameter pumping well	29.80

Available surface water data includes water level and water quality data for the EVO Harmer Creek Compliance Point (EV_HC1), located in Harmer Creek immediately downstream of Harmer Dam and EV_DC1 at the outlet of the Dry Creek Sedimentation Pond (Drawing 1).

In addition to these data, flow and load accretion studies were conducted on Harmer Creek by SNC-Lavalin (SNC-Lavalin, 2020a), Lorax Environmental (Lorax, 2019), SRK Consulting Inc. (SRK, 2019), and Golder (2021b). Complimented by the generalized conceptual understanding of groundwater systems in tributaries as outlined in the 2020 Regional Groundwater Monitoring Program Update (SNC-Lavalin, 2020b), these flow and load accretion studies informed much of what is presented in this assessment due to the limited amount of groundwater data available. The SRK study was conducted during low flow conditions (October 2018), the Lorax study was conducted during low flow conditions (October 2019), the SNC-Lavalin studies were conducted during both high (May 2020) and low (October 2020) flow conditions, and the Golder studies were conducted during both high (July 2020 and June 2021) and low (October 2019) flow conditions.

In addition to the flow and load accretion studies, Golder (Golder, 2015) conducted numerical modeling for the Baldy Ridge Extension project environmental assessment, relevant results of which are also presented in this report.

3 Site Setting and Geology

The Harmer Creek, Grave Creek, and Dry Creek watersheds are located east of Teck Coal’s Elkview Operation (EVO). EVO Dry Creek Spoils are present in the EVO Dry Creek catchment which is within the upper region of the Harmer Creek watershed. Drawing 1 shows Harmer Creek and its watershed, Grave Creek, and Dry Creek and the monitoring locations used for this study. Dry Creek drains into Harmer Creek approximately 2.7 km from the Harmer Creek headwaters, and Harmer Creek drains into Grave Creek, which ultimately drains into the Elk River. The valleys that the creeks are situated in are relatively deeply incised and surficial deposits are limited in the valley bottom as shown in Drawing 1.

Monitoring wells EV_GV3gw, EV_GV3gwS, and EV_MW_GV4A/B provide lithology information for the Grave Creek valley bottom, downgradient of the confluence between Harmer and Grave creeks. Based on these boreholes, the lithology in this area is as follows:

- A mixture of sandy gravel/gravelly sand, sand, gravel, and silty gravel throughout the boreholes to maximum depth of 24.4 metres below ground surface (mbgs) at EV_GV3gw; and
- Sandstone bedrock was encountered at 13.4 mbgs at EV_MW_GV4A and was greater than 24.2 mbgs (EV_GV3gw), 12.2 mbgs (EV_GV3gwS), and 6.1 mbgs (EV_MW_GV4B) in the other boreholes.

In the area of the Dry Creek Sedimentation Pond, the lithology is based on monitoring wells EV_MW_DC1, EV_MW_DC2, EV_MW_DC3, EV_MW_DC4, EV_MW_DC5, EV_MW_DC6, and EV_MW_DC7, and pumping well EV_PW_DC1 and consists of the following:

- Fill to depths ranging from 1.52 mbgs to 6.10 mbgs;
- The fill is either directly overlying limestone bedrock or overlying silt and gravel/silty gravel which is overlying silty clay and sandy/silty gravel, all of which is inferred to be till; and
- Limestone bedrock at depths ranging from 5.33 mbgs (EV_MW_DC5 and EV_MW_DC6) to 31.09 mbgs (EV_MW_DC1 and EV_MW_DC2).

4 Physical Hydrogeology

A hydrograph showing groundwater elevations at EV_MW_GV4A/B, EV_GV3gw/gws, surface water levels at EV_HC1 and EV_DC1, and precipitation at Sparwood is presented as Figure 1. No water was withdrawn from Harmer or Grave Creeks during the time for which data has been assessed for this study. Groundwater elevations at monitoring well EV_GV3gw fluctuate seasonally, increasing with the spring freshet; elevations and fluctuations during the period of interest are like previous years. There are insufficient data to comment on the other wells.

Vertical hydraulic gradients in 2020 were downward at both EV_GV3gwS/EV-GV3gw (0.18 m/m and 0.18 m/m) and EV_GV4A/B (0.05 m/m and 0.14 m/m) in Q3 and Q4, respectively. Data are only available for EV_GV3gwS and EV_GV4A/B for Q3 and Q4 2020.

Near Dry Creek Sedimentation Pond, the vertical hydraulic gradient between wells EV_MW_DC5 and EV_MW_DC6 was slightly upward (0.06 m/m) in March 2021; these wells are installed in the shallow fill and deeper limestone, respectively. This is an approximation as these wells are not immediately adjacent to each other; they are roughly 13 m apart. At wells EV_MW_DC7, EV_PW_DC1, EV_MW_DC1, and EV_MW_DC2, the vertical hydraulic gradient was slightly upward (0.01 m/m) between the shallow well (EV_MW_DC7) and intermediate well (EV_PW_DC1), and downward (0.02 m/m to 0.24 m/m) between the intermediate wells (EV_PW_DC1 and EV_MW_DC1) and the deep well (EV_MW_DC2).

Horizontal groundwater flow direction in the vicinity of the pond is generally inferred to be to the north (i.e., down-valley flow) and east from the upland area to the west (Drawing 2); however, there is some localized flow to the northeast upgradient of the pond (see more detailed information in Golder, 2021b). Most groundwater flow is interpreted to be in the shallow overburden; however, some groundwater is interpreted to occur in the bedrock (Golder, 2021b). Horizontal hydraulic conductivities were calculated for the Dry Creek wells based on slug tests and constant rate pumping tests; results are summarized in Table B (Golder, 2021a; Golder, 2021b). Horizontal groundwater flow velocity was estimated using the following equation:

$$V = Ki/n$$

Where:

V = horizontal seepage velocity (m/s);

K = horizontal hydraulic conductivity (m/s);

i = horizontal hydraulic gradient (m/m); and

n = effective porosity (0.1 used for bedrock and 0.3 used for overburden; Freeze and Cherry, 1979).

Horizontal hydraulic gradients were calculated using March 2021 groundwater elevations in Golder (2021b); the average horizontal hydraulic gradient in bedrock was 0.041 m/m and 0.35 m/m in the overburden. Using these gradients, along with the geomean of the horizontal hydraulic conductivities provided in Golder (2021b), the horizontal groundwater flow velocity in the bulk bedrock mass is estimated to be 8.2 m/year. In the overburden, the horizontal groundwater flow velocity was estimated to be 731 m/year. Additional details regarding the groundwater flow regime around Dry Creek Sedimentation Pond is provided in Golder (2021b).

Table B: Horizontal Hydraulic Conductivities in Dry Creek Wells

Well ID	Screened Lithology	Type of Test	Horizontal Hydraulic Conductivity (m/s)
EV_MW_DC1	Sandy Gravel	Slug Test	1×10^{-5}
EV_MW_DC2	Limestone and Siltstone (Bedrock)	Constant Rate Pumping Test	$4 \times 10^{-7(1)}$ (Bulk)
EV_MW_DC3	Silty/Clayey Gravel	Slug Test	$4 \times 10^{-6(2)}$
EV_MW_DC4	Silty/Clayey Gravel	Slug Test	6×10^{-6}
EV_MW_DC5	Gravel (Fill)	Slug Test	1×10^{-4}
EV_MW_DC6	Limestone (Bedrock)	Constant Rate Pumping Test	$1 \times 10^{-6(1)}$ (Bulk)
EV_MW_DC7	Silty Gravel	Slug Test	3×10^{-5}
EV_PW_DC1	Sandy Gravel	Constant Rate Pumping Test	1×10^{-5}

Notes: (1) – Geometric mean of estimated hydraulic conductivity during pumping test, i.e., drawdown, recovery, and late time recovery; (2) – Slug test results provided two matchable curves, the geometric mean of hydraulic conductivity estimates has been provided (Golder 2021a).

5 Chemical Hydrogeology

Key indicator parameters, referred to as "constituents of interest" (CI), include non-Order Constituents (non-OC), which have been identified as part of the 2020 RGMP Update Background Assessment, as well as Order Constituents (OC) identified in Teck Coal's *Environmental Management Act*[16] (EMA) Permit (SNC-Lavalin, 2020b). The OC are selenium, cadmium, sulphate, and nitrate.

The concentrations of the OC over time in the samples collected from the groundwater monitoring wells and from surface water monitoring locations are shown on Figures 2, 3, and 4. Dissolved selenium to sulphate (as sulphur [S]) ratios are shown on Figures 5 and 6. Based on studies completed by SRK in the Elk River Valley, Se:SO4 (S) ratios of approximately 5×10^{-4} or higher are an indicator that the water is influenced by mining (SRK, 2018a; SRK, 2018b). Attachment B presents Mann-Kendall trend analyses for EV_GV3gw; there were insufficient groundwater quality data available to do Mann-Kendall analyses on the other wells. Mann-Kendall analyses indicate nitrate concentrations are decreasing, and sulphate and dissolved selenium are stable.

Surface water OC concentrations below Harmer Dam and prior to the confluence with Grave Creek (EV_HC1) fluctuate seasonally and are typically lower during freshet, which is consistent with the effect of dilution on constituent concentrations in a freshet dominated regime. OC concentrations at the Dry Creek Sedimentation Pond outlet (EV_DC1) are higher than those measured in Harmer Creek and fluctuate similarly. Fluctuations and ranges of concentrations are similar between 2018 and 2020 as previous years. No surface water data are available along Harmer Creek between EV_DC1 and EV_HC1; however, given OC concentrations behave similarly at the two locations, it is expected that concentration ranges would be between EV_DC1 and EV_HC1 and would have the same seasonal patterns.

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[16] *Environmental Management Act* (EMA), B.C. Reg. 179/2021 / effective July 7, 2021.

Dissolved selenium to sulphate (as S) ratios at EV_DC1 are indicative of water quality that is influenced by mining (Figure 6), which is expected given that the Dry Creek Sedimentation Pond is located downstream of waste rock (Drawing 1). At EV_HC1, the ratios are indicative of a mixture of water that is influenced by mining, originating from Dry Creek Sedimentation Pond, and natural waters originating from the creeks that flow into Harmer Creek as it flows north.

Concentrations of dissolved selenium and nitrate-nitrogen in groundwater at EV_GV3gw are lower than at EV_HC1, while sulphate is similar (Figures 2, 3, and 4). Concentrations of OC at EV_GV3gw exhibited little variation compared to Harmer Creek. Concentration ranges and fluctuations were similar in the period of interest (i.e., April 1, 2018 to October 31, 2020) compared to previous years. A shallow well EV_GV3gwS (screened 7.7 mbgs to 9.2 mbgs) was installed in August 2020 to complement EV_GV3gw, as well as a nested well pair (EV_GV4A/B) upstream along Grave Creek to obtain a better understanding of groundwater-surface interaction upgradient of the confluence with Harmer Creek. Concentrations of sulphate and nitrate in samples from wells EV_GV3gwS and EV_GV4A/B are lower than at EV_GV3gw; dissolved selenium concentrations are generally similar except at EV_GV4A, although one of the samples was slightly higher. Groundwater samples from monitoring wells EV_MW_GV4A/B, and EV_GV3gw/gwS have dissolved selenium to sulphate (as S) ratios, which is indicative of natural non-contact water, (Figure 5).

Monitoring wells EV_MW_DC2, EV_MW_DC3, EV_MW_DC4, EV_MW_DC5, EV_MW_DC6, EV_MW_DC7, and production well EV_PW_DC1 are near the Dry Creek spoil and the dissolved selenium to sulphate ratios are indicative of the influence in mine contact water, based on March 2021 results (Figure 5). Monitoring well EV_MW_DC1 is also located near Dry Creek Sedimentation Pond; however, ratios at this well did not clearly indicate influence from waste spoils. The lowest selenium and sulphate concentrations were in a shallow overburden well (EV_MW_DC1) north of the pond. The highest selenium and sulphate concentrations were in wells EV_MW_DC5 and EV_MW_DC6 south of the pond; EV_MW_DC5 is a shallow overburden well and EV_MW_DC6 is a deeper bedrock well. The overburden wells generally had higher concentrations of selenium and sulphate. Results from sampling in May 2021 are presented by Golder (2021b) and indicate lower OC concentrations compared to the March 2021 results (Attachment F).

Due to monitoring wells, except for EV_GVgw, being installed in 2021 there is limited groundwater chemistry data available; therefore, potential changes in chemistry due to seasonality or other factors (e.g., mine water management) are not yet known.

Concentrations of OC, especially sulphate and selenium, in the interstices of the creek substrate in this gaining reach are of interest for overwintering WCT. There are no measurements of water quality in the interstices of the creek substrate and there are not enough data to calculate the concentrations of sulphate and selenium; however, Table C summarizes the groundwater concentrations of sulphate and selenium from March 12, 2021, at the wells near Dry Creek which are located 100 m upstream of the confluence.

To provide context for the groundwater concentrations of nitrate, sulphate, and selenium, results are compared to the British Columbia Water Quality Guidelines for Freshwater Aquatic Life (BCWQG FAL; ENV 2021) and the calculated Level 1 and Level 2 benchmarks for the protection of aquatic life in the Elk Valley (Teck 2014). Table C also includes nitrate concentrations as some results exceeded the BCWQG FAL. Cadmium is not included in Table C as all results were below both the BCWQG and the Level 1 and

Level 2 benchmarks. May 2021 results (Golder, 2021b; Attachment F) were lower than the results presented in Table C.

Table C: March 12, 2021 Groundwater Concentrations

Well ID / Guideline / Benchmark	Approximate Screen Interval (mbgs)	Nitrate (mg/L)	Sulphate (mg/L)	Total Selenium (µg/L)
BCWQG FAL – Long Term Chronic WQG	*NA*	*3.0*	*429*[a]	*2*
BCWQG FAL – Short Term Acute WQG	*NA*	*32.8*	*NA*	*NA*
Level 1 - 10% critical effect size benchmark for fish	*NA*	*16*[b]	*381*[c]	*70*[d]
Level 2 - 20% critical effect size benchmark for fish	*NA*	*21*[b]	*530*[c]	*187*[d]
EV_MW_DC1	24.00-30.00	0.0234	102	9.84
EV_MW_DC2	35.88-52.75	1.24	314	***74.7***
EV_MW_DC3	9.00-10.50	3.36	**787**	***181***
EV_MW_DC4	8.50-10.00	2.62	**703**	***148***
EV_MW_DC5	3.70-5.20	3.59	**805**	***176***
EV_MW_DC6	16.62-31.95	3.69	**830**	***180***
EV_MW_DC7	9.20-10.70	2.89	**621**	***134***
EV_PW_DC1	17.50-29.70	2.74	**716**	***129***

Notes: a – depends on hardness as $CaCO_3$, groundwater hardness ranged from 318 mg/L to 1,300 mg/L, 429 mg/L applies to water considered very hard (181-250 mg/L), guidelines for water with hardness greater than 250 mg/L must be determined on a site-specific basis; b – representative species is Rainbow trout (*Onchorhynkus mykiss*), test type was 39-day embryo-alevin development completed using augmented site water; c – benchmark is for most sensitive species (Rainbow trout) in waters with hardness ≥250mg/L as $CaCO_3$, test type was 28-day embryo-alevin development; d – benchmark is for WCT reproduction in the Upper Fording River; NA – not applicable; grey shading – exceeds BCWQG FAL long term chronic WQG; ***bold italic*** – exceeds Level 1 benchmark; **bold underline** – exceeds Level 2 benchmark.

Two wells (EV_MW_DC5 and EV_MW_DC6) had nitrate results above the BCWQG FAL long-term chronic WQG and none exceeded the Level 1 or 2 benchmarks. For comparison, nitrate concentrations in surface water in Dry Creek Sedimentation Pond ranged between 1.91 and 4.84 mg/L, with a median of 3.31 mg/L for the period of April 1, 2018, to October 31, 2020.

All sulphate results were above the BCWQG FAL long-term chronic WQG of 429 mg/L, and both the Level 1 (381 mg/L) and Level 2 (530 mg/L) benchmarks, except for EV_MW_DC1 and EV_MW_DC2. For comparison, sulphate concentrations in surface water in Dry Creek Sedimentation Pond for the period of April 1, 2018, to October 31, 2020, ranged between 350 and 930 mg/L with a median of 750 mg/L.

All selenium results were above the BCWQG FAL long-term chronic WQG, and all wells except EV_MW_DC1 had selenium concentrations above the Level 1 reproductive benchmark of 70 mg/L. Some results approached the Level 2 benchmark of 187 mg/L. For comparison, selenium concentrations in surface water in Dry Creek Sedimentation Pond ranged between 79.4 and 224 µg/L, with a median of 168 µg/L for the period of April 1, 2018, to October 31, 2020.

As shown in Table B, the shallower wells generally had higher concentrations of nitrate, sulphate, and selenium. Teck will continue to monitor the Dry Creek wells quarterly for at least one year and is conducting additional investigations to better understand the groundwater flow regime around the Dry Creek Sedimentation Pond. Warner and de Bruyn (2022) provide additional details on the concentrations of nitrate, sulphate, and selenium in surface water.

6 Conceptual Site Model

A hydrogeological CSM is a written or pictorial representation of the physical and chemical hydrogeological parameters and processes in a system or site. In this assessment, a hydrogeological CSM is being presented to illustrate the groundwater-surface water interactions in the Harmer and Grave Creek watersheds.

Drawing 3 presents a block diagram illustrating the key features of the CSM for groundwater-surface water interactions in the Harmer Creek and Grave Creek watersheds. Groundwater data in the Harmer Creek watershed is limited to one round of sampling and monitoring at the wells installed in Q1 2021 near Dry Creek Sedimentation Pond. Therefore, the CSM is based largely on the flow and load accretion studies (Lorax, 2019; SNC-Lavalin, 2020a; SRK, 2019; Golder, 2021b). The Lorax study monitoring stations and reaches investigated in the 2020 SNC-Lavalin study are shown on Drawing 1. Relevant tables, figures, and drawings from each of the studies are included as Attachments C (Lorax), D (SNC-Lavalin), E (SRK), and F (Golder).

Groundwater flow is interpreted to generally follow topography from the Harmer Creek valley bottom towards the Grave Creek valley bottom then into the Elk River valley bottom. The surficial aquifers are limited in extent; and therefore, a separate groundwater flow system is not expected (Golder, 2015). The lithology encountered at the Dry Creek wells was fill at ground surface to a maximum depth of 6.10 mbgs, overlying silty/clayey gravel and silty clay, overlying limestone which was encountered at depths ranging from 5.33 mbgs (EV_MW_DC5) to 31.09 mbgs (EV_MW_DC2). These results confirm the aquifers are of limited lateral extent with a relatively thick vertical extent (up to a maximum thickness of 12 m at wells EV_MW_DC1 and EV_MW_DC2 and 11 m at EV_PW_DC1; Attachment A). The unconsolidated lithologies, i.e., till, silty gravel, and silty clay identified suggest relatively low permeability which would inhibit groundwater flow. Attachment C is a schematic from the 2019 Lorax flow accretion study illustrating the field survey measurements. In this study, two losing reaches and one gaining reach were identified along Harmer Creek. One losing reach was near the confluence with Balzy Creek and one was just upstream of the inlet to the Harmer Creek Sedimentation Pond; the gaining reach is near the confluence of Dry and Harmer Creeks (Drawing 1). The losing reach near Balzy Creek is associated with alluvial deposits and a widening of the Harmer Creek channel; the flow decreased 33 L/s (-22%) in this location. Near the Harmer Creek Sedimentation Pond inlet, the flow reduction was 63 L/s (-30%) and is likely a result of the extensive beaver dam complex located just upstream of the Harmer Creek Sedimentation Pond inlet, which is classified as an alluvial deposit. The stream flow lost to the underlying aquifer is re-introduced to the stream near EV_HC1. In this study, it was also found that selenium and nitrate behave conservatively in Harmer Creek, (i.e., there is no evidence for attenuation of these parameters but also no increases from groundwater). Figures 5 and 6 show dissolved selenium to sulphate (as S) ratios for the Lorax study; Harmer Creek upstream of Dry Creek plotted as natural non-contact water, Dry Creek plotted as being mine influenced, and locations along Harmer Creek plotted as a mixture between these two sources.

The gaining reach identified by Lorax (2019) was between stations “Harmer u/s Dry” just upstream of the confluence of Dry Creek and Harmer Creek, and “Harmer d/s Dry” approximately 200 m downstream of the confluence (Drawing 1). In this reach, 35 L/s of flow was not accounted for and is interpreted to be the result of groundwater influx into the creek. Golder (2021) identified the same gaining reach (Attachment F).

The 2020 flow and load accretion studies conducted in May and August 2020 (SNC-Lavalin, 2020a) found Harmer Creek was stable from approximately 600 m upstream of Harmer Creek Sedimentation Pond to 2,200 m downstream of the pond, at which point there is a 1,000 m gaining reach, after which point the creek is stable again until it discharges to the Elk River. Relevant tables, and figures and drawings from this study, are included as Attachment D. Flows from Grave Creek were consistently stable from its confluence with Harmer Creek to the mouth of the Elk River.

The 2018 SRK study indicated that flows arriving from Harmer Creek and Dry Creek and downstream of the Grave/Harmer confluence were all comparable relative to the catchment size. Sulphate, nitrate, and selenium loading was derived mainly from Dry Creek and the loads persisted downstream to Grave Creek at the confluence with the Elk River. These results are generally in agreement with the findings of the Lorax and SNC-Lavalin studies.

6.1 CSM Summary

Mine-related constituents are present in the water quality samples collected from the wells installed near the Dry Creek Sedimentation Pond, a slight upward vertical gradient was present in March 2021 between the intermediate and shallow wells EV_MW_DC7/EV_PW_DC1, and a gaining reach was identified near the confluence of Dry and Harmer creeks. Some groundwater transport of selenium and other OC into Harmer Creek near Dry Creek appears to be occurring, but the flow accretion studies do not suggest this is increasing the concentration of selenium or other OC in Harmer Creek. The source of elevated selenium in the groundwater near Dry Creek and the potential for groundwater input to Harmer Creek is under investigation by Teck.

7 Conclusion

Studies conducted on flow and loading in Harmer and Grave Creeks in 2019 and 2020 (Lorax, 2019; SNC-Lavalin, 2020a) indicate that water quality and flow volumes in these creeks have limited influence from the groundwater; and as such, the groundwater is not believed to be a stressor to the WCT. Losing and gaining reaches were identified in Harmer Creek. The flow lost in the losing reaches is re-introduced to the creek downstream, prior to the confluence with Grave Creek. The gaining reach starts just upstream of the confluence of Dry Creek and Harmer Creek and goes until approximately 200 m downstream of the confluence of Dry and Harmer Creeks. At present, no additional groundwater related work is recommended specific to this assessment since groundwater quality and levels in the wells near

Dry Creek will continue to be monitored for at least one year and monitoring wells near the Harmer Creek Sedimentation Pond will continue to be monitored and reported on in their respective programs.

8 References

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Golder Associates. 2021a. Teck Coal Elkview Operations Dry Creek Groundwater Bypass Study. 2021 Field Program Summary and Results. Report submitted to Teck Coal Limited. August 18, 2021.

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SNC-Lavalin Inc. 2020b. 2020 Regional Groundwater Monitoring Program Update. Report prepared for Teck Coal Limited, dated December 4, 2020.

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Thorley, J. L., Kortello, A. K., & Robinson, M. 2021 Grave and Harmer Creek Westslope Cutthroat Trout Population Monitoring, 2020. A Poisson Consulting report prepared by Poisson Consulting, Grylloblatta and Lotic Environmental for Teck Coal Ltd., Sparwood, BC.

Thorley, J. L., Kortello, A. K., Brooks, J. & M. Robinson. 2022. Grave and Harmer Creek Westslope Cutthroat Trout Population Monitoring 2021. A Poisson Consulting, Grylloblatta and Lotic Environmental report prepared for Teck Coal Ltd., Sparwood, BC.

Warner, K, & de Bruyn, A. 2022. Subject Matter Expert Report: Water Quality. Evaluation of Cause – Recruitment Failure in the Harmer Creek Westslope Cutthroat Trout Population. Report prepared for Teck Coal Limited. Prepared by Golder Associates Ltd.

9 Notice to Reader

This report has been prepared and the work referred to in this report has been undertaken by SNC-Lavalin Inc. (SNC-Lavalin) for the exclusive use of Teck Coal Limited, who has been party to the development of the scope of work and understands its limitations. The methodology, findings, conclusions, and recommendations in this report are based solely upon the scope of work and subject to the time and budgetary considerations described in the proposal and/or contract pursuant to which this report was issued. Any use, reliance on, or decision made by a third party based on this report is the sole responsibility of such third party. SNC-Lavalin accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

The findings, conclusions, and recommendations in this report (i) have been developed in a manner consistent with the level of skill normally exercised by professionals currently practicing under similar conditions in the area, and (ii) reflect SNC-Lavalin's best judgment based on information available at the time of preparation of this report. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our original contract and included in this report. The findings and conclusions contained in this report are valid only as of the date of this report and may be based, in part, upon information provided by others. If any of the information is inaccurate, new information is discovered, site conditions change, or standards are amended, modifications to this report may be necessary. The results of this assessment should in no way be construed as a warranty that the subject site is free from any and all environmental impact.

Any soil and rock descriptions in this report and associated logs have been made with the intent of providing general information on the subsurface conditions of the site. This information should not be used as geotechnical data for any purpose unless specifically addressed in the text of this report. Groundwater conditions described in this report refer only to those observed at the location and time of observation noted in the report.

This report must be read as a whole, as sections taken out of context may be misleading. If discrepancies occur between the preliminary (draft) and final version of this report, it is the final version that takes precedence. Nothing in this report is intended to constitute or provide a legal opinion.

The contents of this report are confidential and proprietary. Other than by Branton Environmental, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of Branton Environmental and SNC-Lavalin.

10 Closure

We trust this letter meets your current requirements and greatly appreciate the opportunity to assist Teck Coal with this project. If you have any questions, please contact Emma Canham or Sheila Duchek.

Prepared By:	Reviewed By:
Emma Canham, MSc, P.Geo. Project Hydrogeologist *Environment Practice* **Engineering Services Canada**	Sheila Duchek, MSc, P.Geo. Service Manager, Hydrogeology and Earth Sciences *Environment Practice* **Engineering Services Canada**

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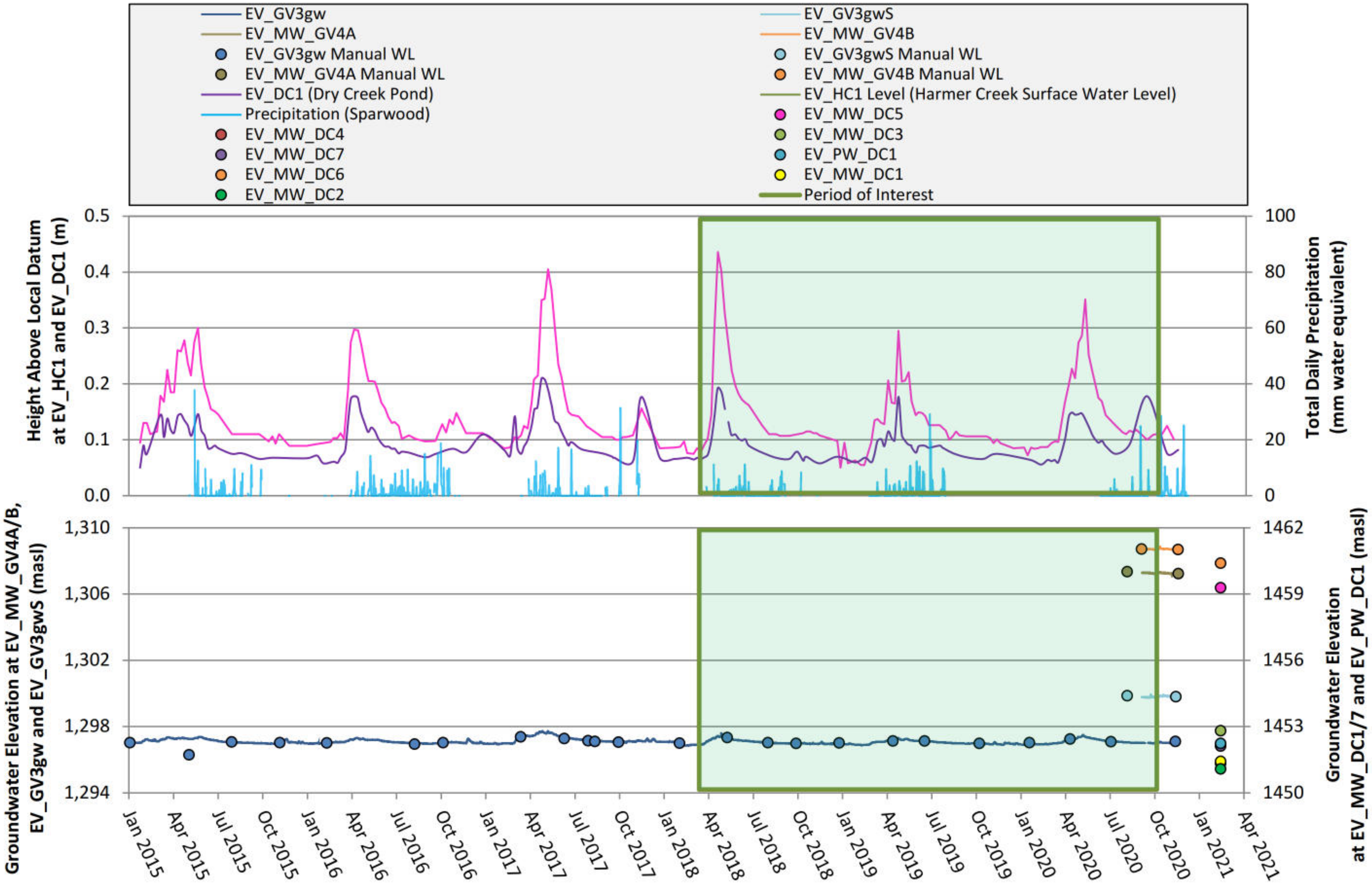
Figures

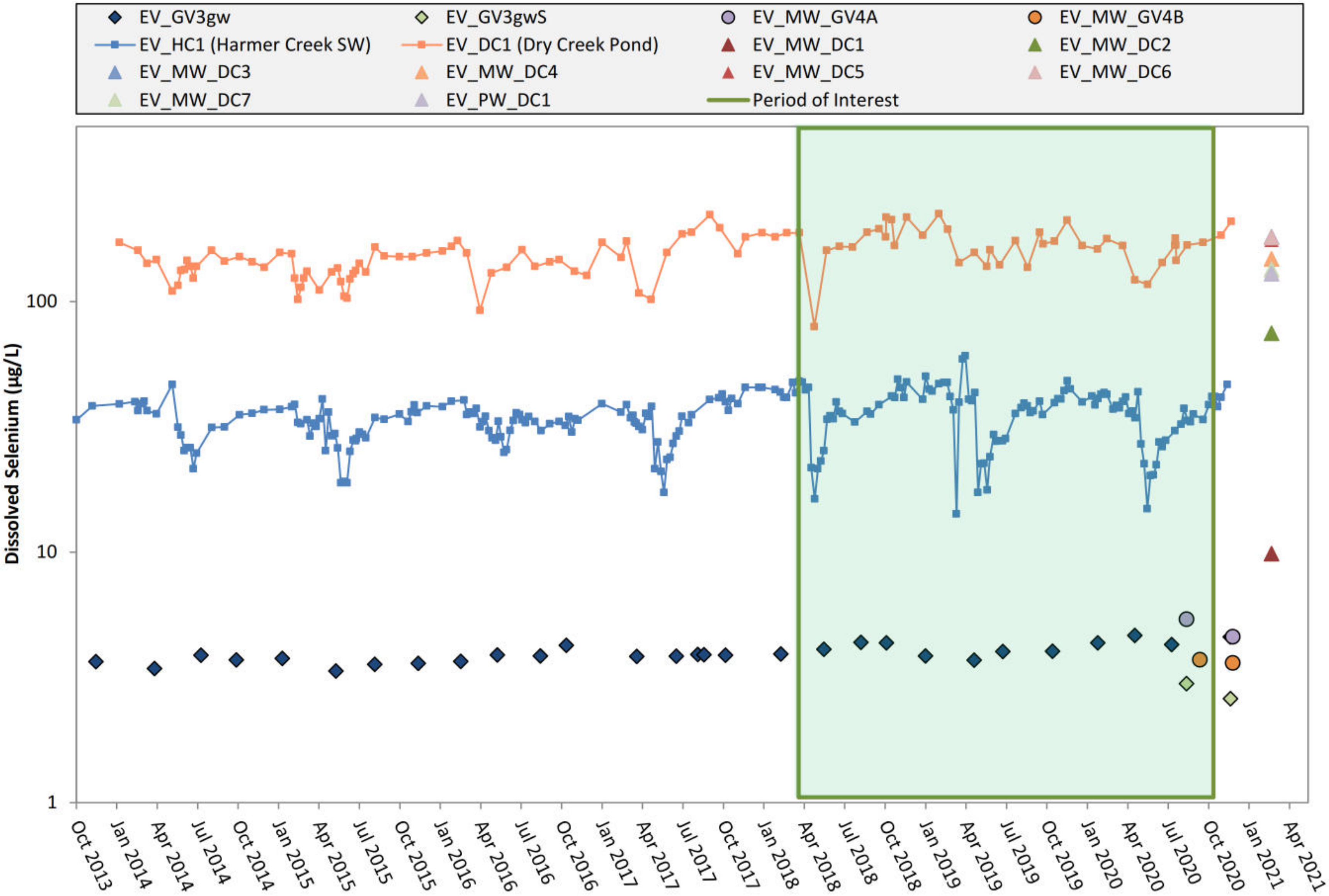
1: Grave Creek and Harmer Creek Watersheds – Hydrograph
2: Grave Creek and Harmer Creek Watersheds – Dissolved Selenium Concentrations
3: Grave Creek and Harmer Creek Watersheds – Sulphate Concentrations
4: Grave Creek and Harmer Creek Watersheds – Nitrate-N Concentrations
5: Grave Creek and Harmer Creek Watersheds – Groundwater Se:SO4 (S) Ratios
6: Grave Creek and Harmer Creek Watersheds – Surface Water Se:SO4 (S) Ratios

Figure 1: Grave Creek and Harmer Creek Watersheds - Hydrograph



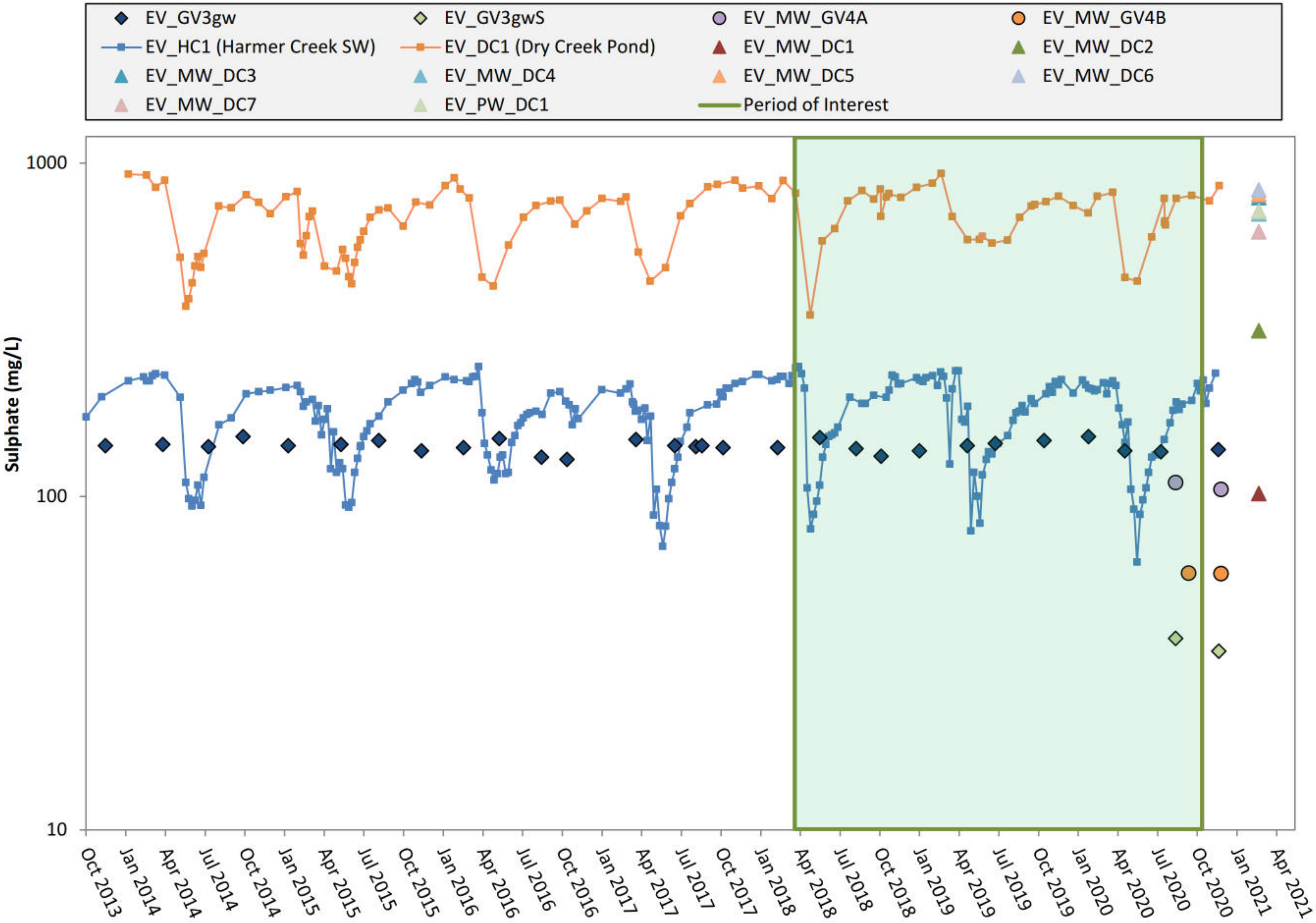
Notes: Data was removed where suspected datalogger removal occured. EV_HC1 Level is plotted as height above location datum. Continuous water level water has been compensated using barologger at EV_MW_SPR1B. EV_DC1 rating curve data from 2018-05-29 to 2020-12-10.

Figure 2: Grave Creek and Harmer Creek Watersheds - Dissolved Selenium Concentrations



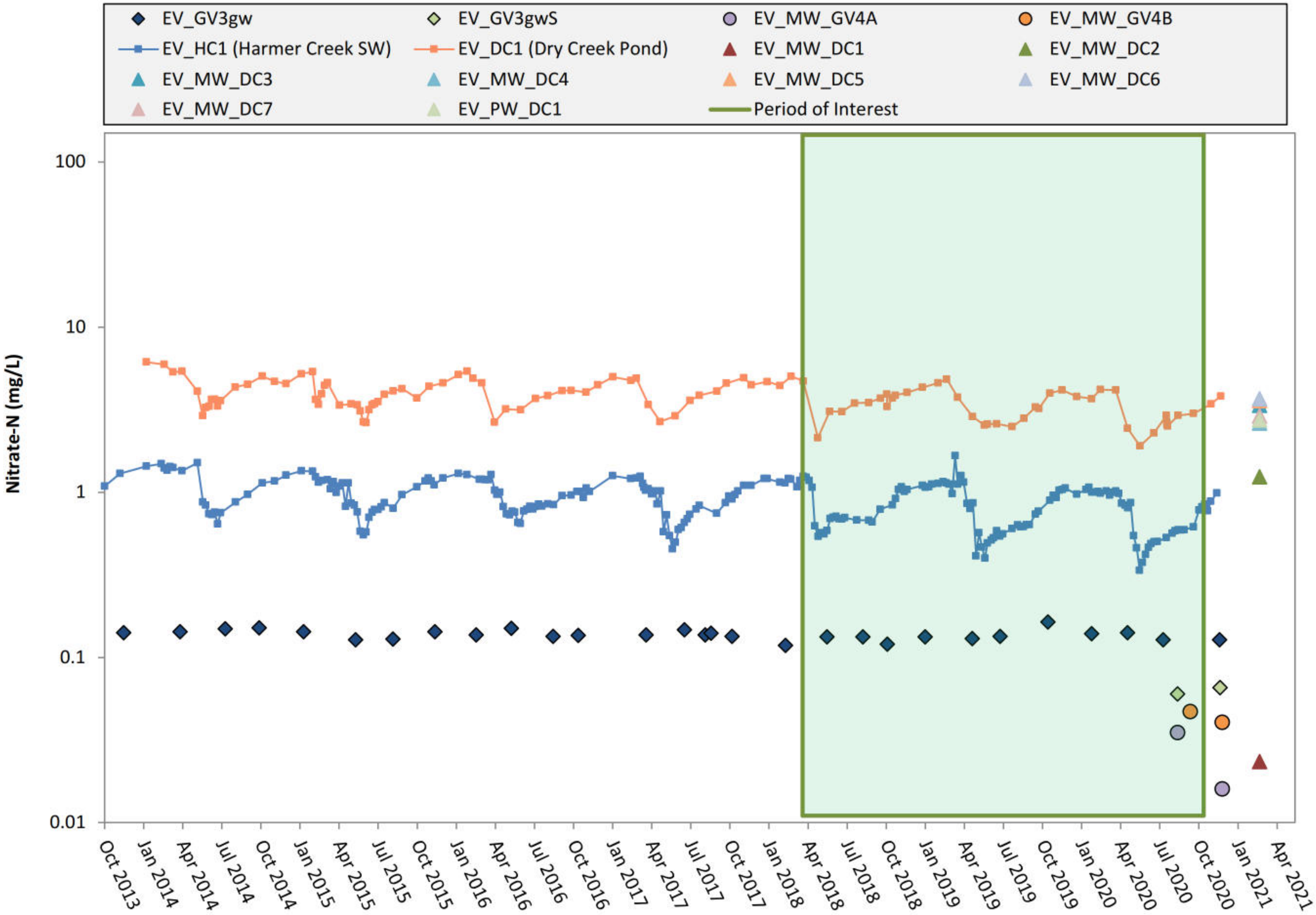
Notes: Logarithmic scale has been applied on distribution of concentrations relative to applicable screening criteria.

Figure 3: Grave Creek and Harmer Creek Watersheds - Sulphate Concentrations



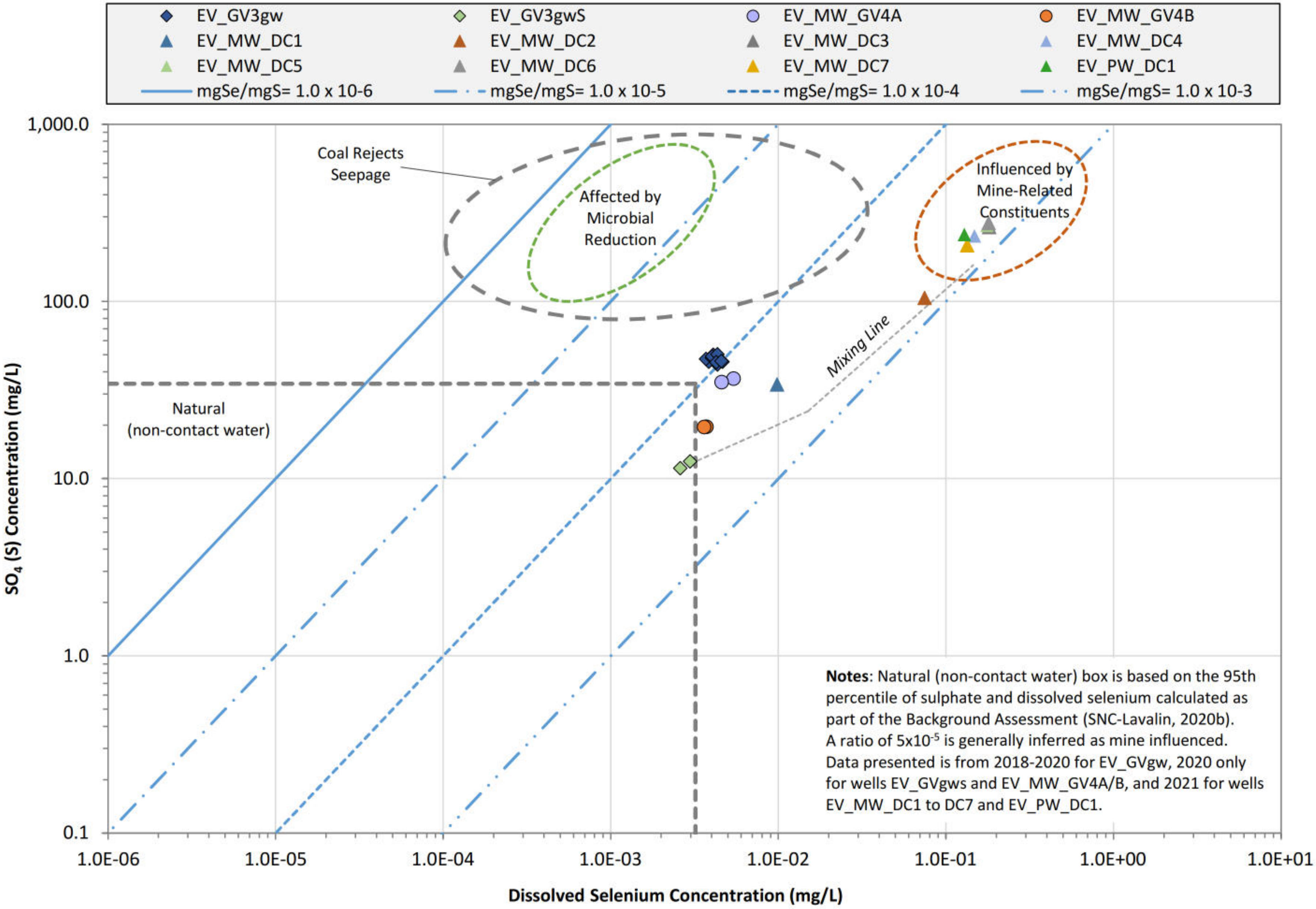
Notes: Logarithmic scale has been applied on distribution of concentrations relative to applicable screening criteria.

Figure 4: Grave Creek and Harmer Creek Watersheds - Nitrate-N Concentrations



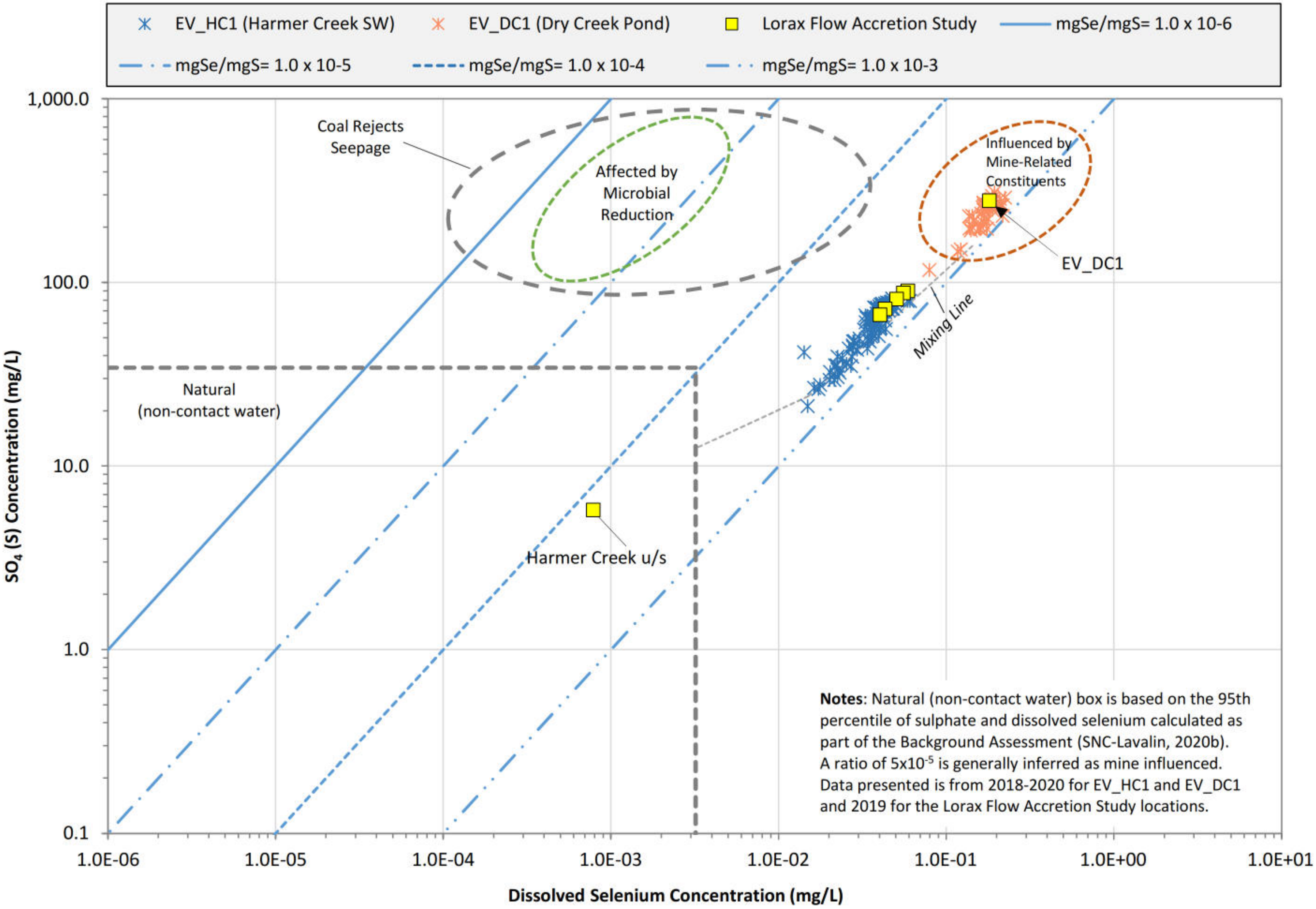
Notes: Logarithmic scale has been applied on distribution of concentrations relative to applicable screening criteria.

Figure 5: Grave Creek and Harmer Creek Watersheds - Groundwater Se:SO4 (S) Ratios



Notes: Natural (non-contact water) box is based on the 95th percentile of sulphate and dissolved selenium calculated as part of the Background Assessment (SNC-Lavalin, 2020b). A ratio of $5x10^{-5}$ is generally inferred as mine influenced. Data presented is from 2018-2020 for EV_GVgw, 2020 only for wells EV_GVgws and EV_MW_GV4A/B, and 2021 for wells EV_MW_DC1 to DC7 and EV_PW_DC1.

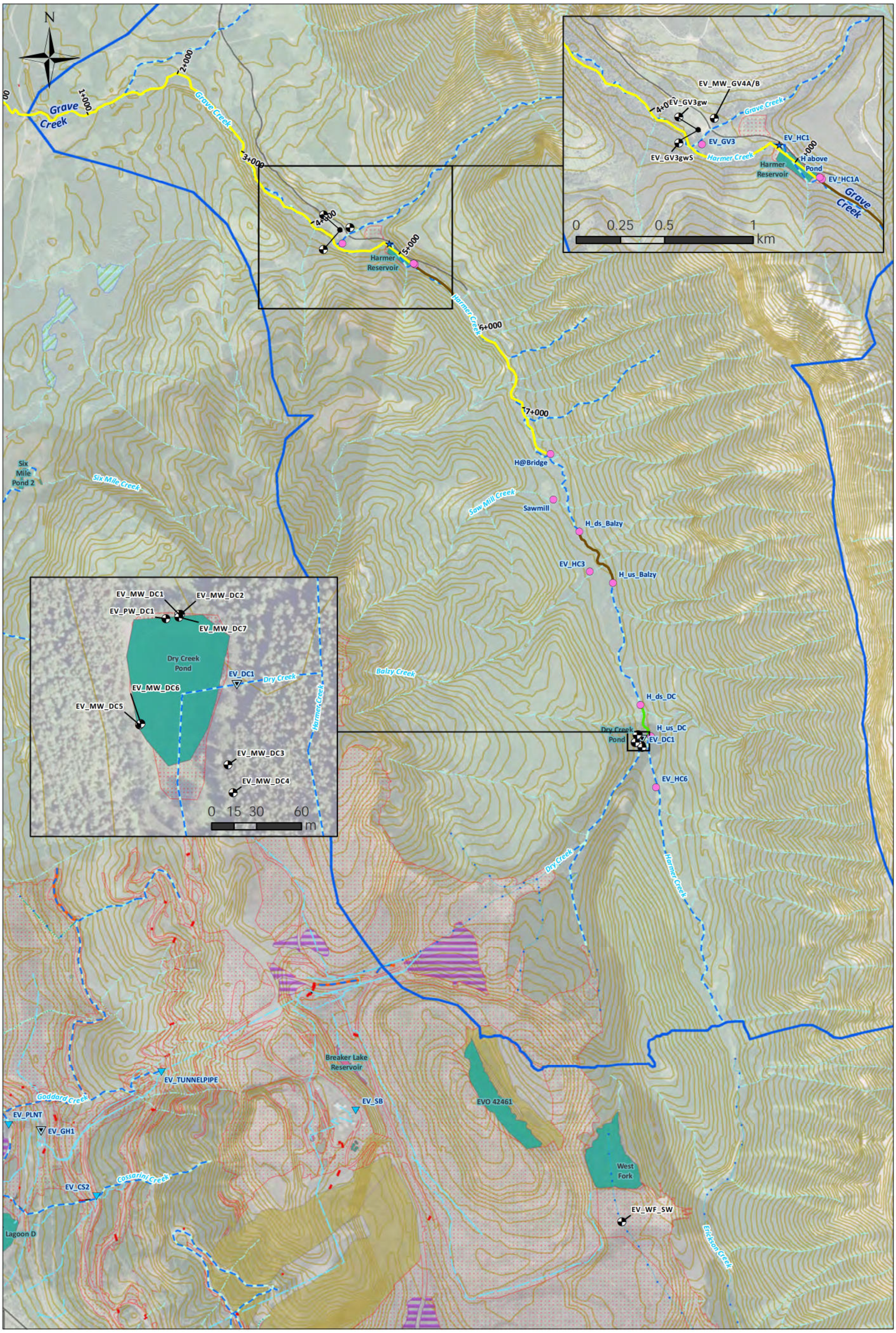
Figure 6: Grave Creek and Harmer Creek Watersheds - Surface Water Se:SO4 (S) Ratios



Notes: Natural (non-contact water) box is based on the 95th percentile of sulphate and dissolved selenium calculated as part of the Background Assessment (SNC-Lavalin, 2020b). A ratio of $5x10^{-5}$ is generally inferred as mine influenced. Data presented is from 2018-2020 for EV_HC1 and EV_DC1 and 2019 for the Lorax Flow Accretion Study locations.

Drawings

- 672386-1 – Harmer Creek Watershed Monitoring Locations
- 672386-2 – Groundwater Elevations in Harmer Creek Watershed – Dry Creek Pond
- 672386-3 – Block Diagram 3D Conceptual Hydrogeology and Transport Pathways of Order Constituents at EVO – Grave Creek/Harmer Creek



Legend

Groundwater Stations[4]
◐ Monitoring

Surface Water Stations
★ Compliance Point
▽ Authorized Discharge
▼ Monitoring
● Lorax Flow Accretion Study Locations

Site Features
Secondary Road
Gaining reach identified by Lorax
Losing reach identified by Lorax
SNC Study Area
TRIM Contour Lines (20m)
Tailings/Settling Pond
Reservoir
Pit
Stockpiles
Waste Dump (Spoils)
Harmer, Grave, and Dry Creek Watersheds

Water Features
Intermittent + Indefinite Stream
Stream + Stream Ditch
Subsurface
Culvert
Ditch
Rock Drain
Water Pipeline
River Bed
Wetted Area/Wetland (Based on 1:35000 Scale)

Notes:
1. Original in colour.
2. Numerical scale reflects full-size print. Print scaling will distort this scale, however scale bar will remain accurate.
3. Intended for illustration purposes, accuracy has not been verified for construction or navigation purposes.
4. Locations of overlapping wells have been adjusted for clarity.

References:
1. Information provided by Teck Coal Limited.
2. TRIM contours (20m interval) obtained from Government of BC Rest Service https://maps.gov.bc.ca/arcgis/rest/services/mpcm/bcgwpub/MapServer
3.Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 0.2 0.4 0.8 1.2 1.6 2 km

PROJECT LOCATION:
Elk Valley, BC

CLIENT NAME:
Teck Coal Limited

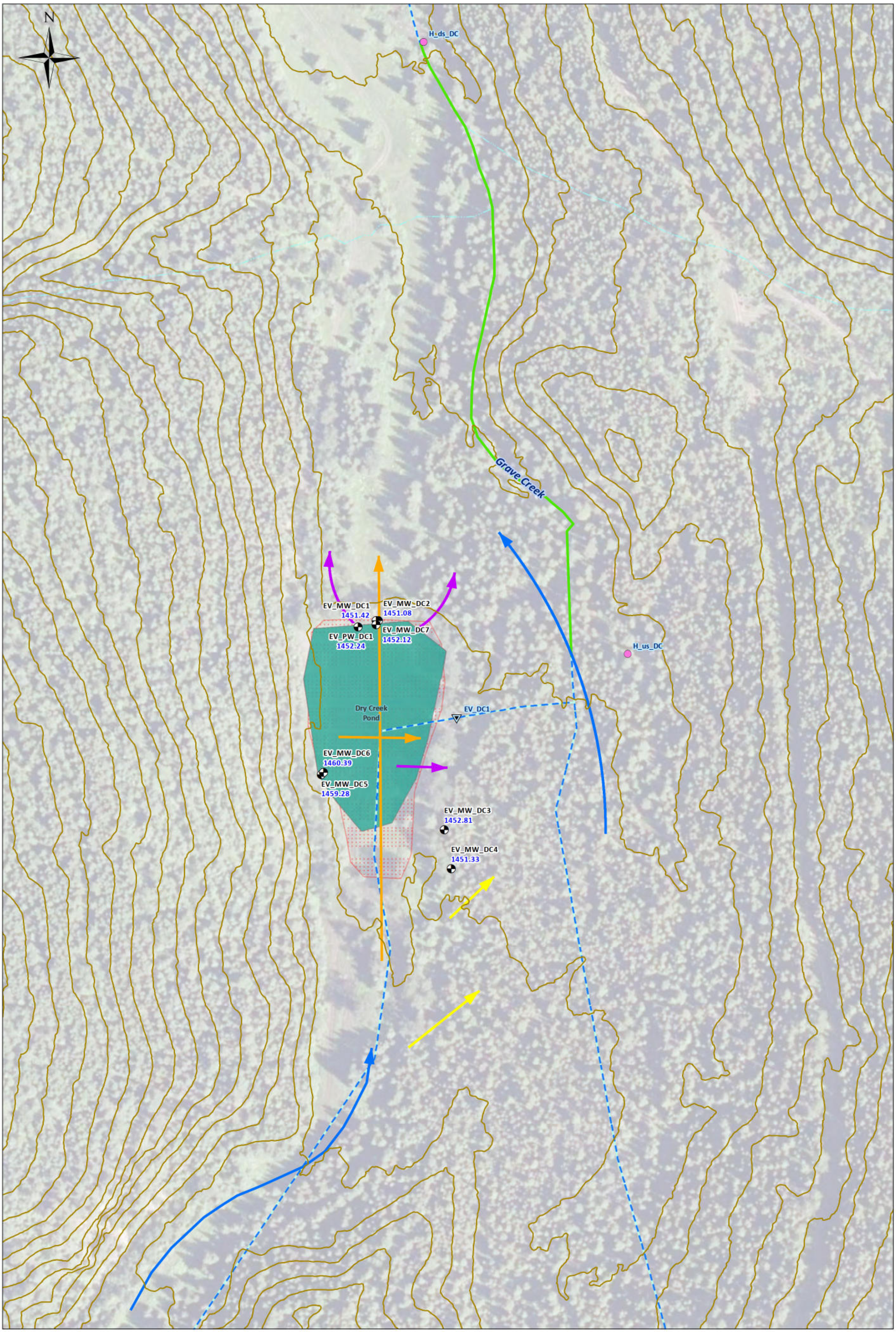
SNC·LAVALIN

Harmer Creek Watershed Monitoring Locations

CHK'D: EC
BY: CW
DATE: 2022-11-09 SCALE: 1:35,000
COORD SYS: NAD 1983 UTM Zone 11N
Ref Num:
DRAWING 1

Project Path: \\Sli2606\projects\Current Projects\Teck Coal Ltd\SPO\672386

MXD Path: \\Sli4395\projects\Current Projects\Teck Coal Ltd\GISCAD\GIS\Map Series\672386 - \2021 Harmer Grave Memo\672386-1-HC_WatershedMonLoc.mxd



Legend

- ◐ Groundwater Monitoring Stations
- ▽ Authorized Discharge
- ● Lorax Flow Accretion Study Locations
- — Topographic Contour (5m)
- — Gaining reach identified by Lorax
- ‐ ‐ Intermittent + Indefinite Stream
- ‐ ‐ Stream + Stream Ditch
- 🟩 Tailings/Settling Pond
- ▨ Waste Dump (Spoils)

Groundwater Flow Direction[3]

- ➤ Potential GW Flow within valley fill sub-parallel to the stream
- ➤ Potential GW flow toward east
- ➤ Potential GW flow within valley fill bypassing the sedimentary pond
- ➤ Potential seepage pathways from Dry Creek sediment pond

Notes:
1. Original in colour.
2. Numerical scale reflects full-size print. Print scaling will distort this scale, however scale bar will remain accurate.
3. Intended for illustration purposes, accuracy has not been verified for construction or navigation purposes.

References:
1. Information provided by Teck Coal Limited.
2. TRIM contours (20m interval) obtained from Government of BC Rest Service https://maps.gov.bc.ca/arcgis/rest/services/mpcm/bcgwpub/MapServer
3. Golder Associates Ltd. 2021. Dry Creek Project: Conceptual Groundwater Model and Bypass Estimations, Teck Coal Elkview Operations. Report submitted to Teck Coal Limited, dated December 2, 2021.

0 25 50 100
Meters

PROJECT LOCATION:
Elk Valley, BC

CLIENT NAME:
Teck Coal Limited

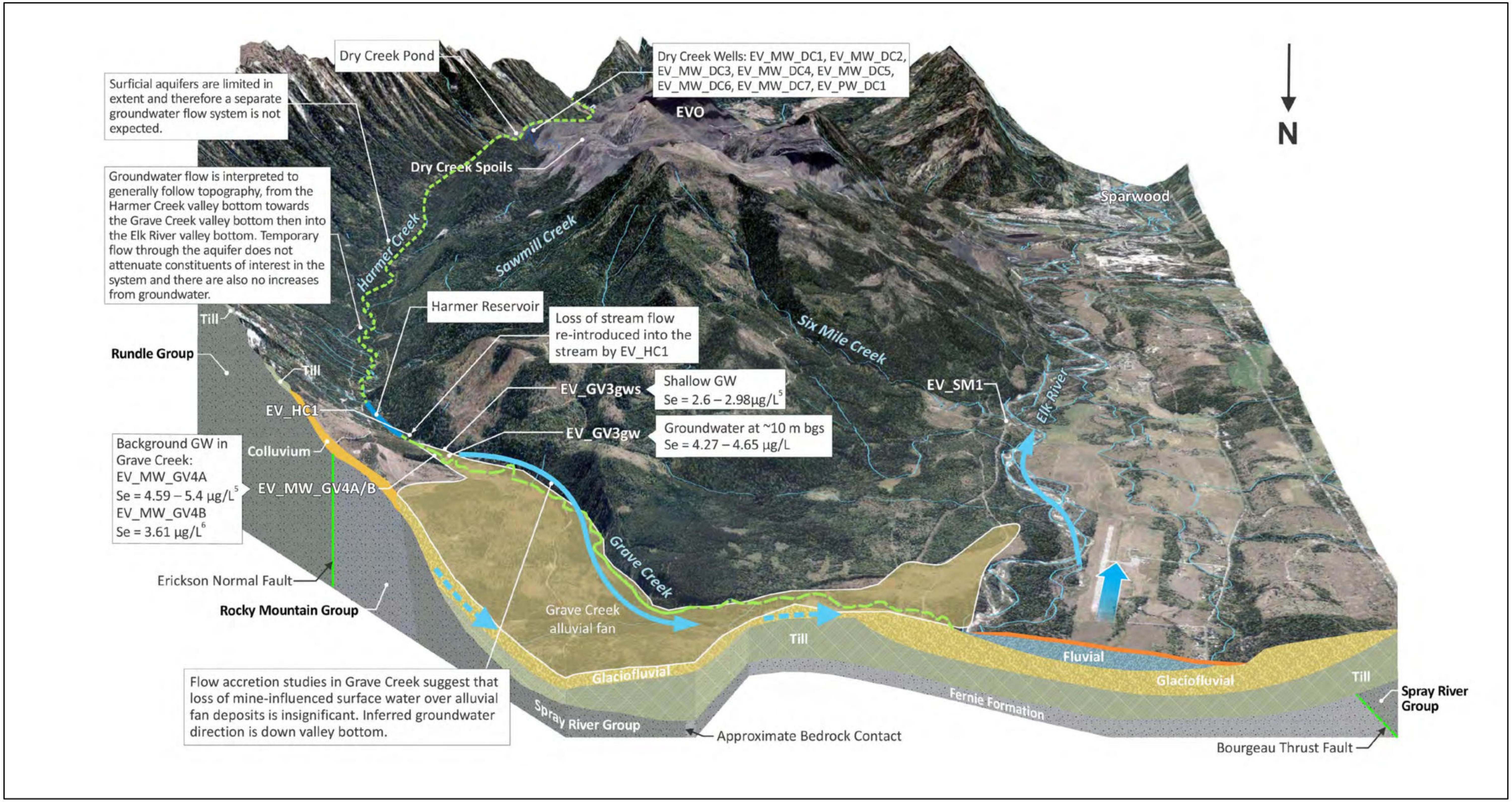
SNC·LAVALIN

Groundwater Elevations in Harmer Creek Watershed - Dry Creek Pond

CHK'D: EC
BY: CW
DATE: 2022-11-09
SCALE: 1:1,800
COORD SYS: NAD 1983 UTM Zone 11N
Ref Num:
DRAWING 2

Project Path: \\Sli2606\projects\Current Projects\Teck Coal Ltd\SPO\672386

MXD Path: \\Sli4395\projects\Current Projects\Teck Coal Ltd\GIS\CAD\GIS\Map Series\672386 - 2021 Harmer Grave Memo\672386-2-GWElev_Concentrations.mxd



Dry Creek Wells: EV_MW_DC1, EV_MW_DC2, EV_MW_DC3, EV_MW_DC4, EV_MW_DC5, EV_MW_DC6, EV_MW_DC7, EV_PW_DC1

Surficial aquifers are limited in extent and therefore a separate groundwater flow system is not expected.

Groundwater flow is interpreted to generally follow topography, from the Harmer Creek valley bottom towards the Grave Creek valley bottom then into the Elk River valley bottom. Temporary flow through the aquifer does not attenuate constituents of interest in the system and there are also no increases from groundwater.

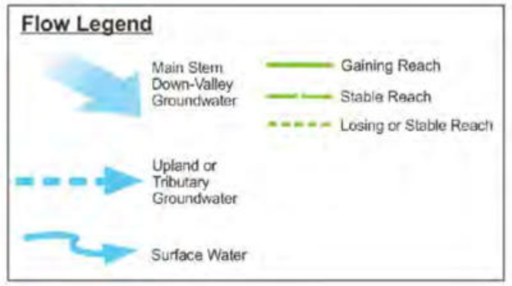
Loss of stream flow re-introduced into the stream by EV_HC1

Shallow GW
Se = 2.6 – 2.98µg/L[5]

Groundwater at ~10 m bgs
Se = 4.27 – 4.65 µg/L

Background GW in Grave Creek:
EV_MW_GV4A
Se = 4.59 – 5.4 µg/L[5]
EV_MW_GV4B
Se = 3.61 µg/L[6]

Flow accretion studies in Grave Creek suggest that loss of mine-influenced surface water over alluvial fan deposits is insignificant. Inferred groundwater direction is down valley bottom.



REFERENCES:

1. Graphics from Brick Tudor Studios, LLC.
2. Geology derived from Monahan, 2000, BC Government.
3. Lorax Environmental. 2019. EVO Dry Creek and Harmer Creek Local Flow and Water Quality Investigation. Report prepared for Teck Coal Limited. Dated June 4, 2019.
4. SNC-Lavalin Inc. 2020. Grave Creek and Line Creek Flow Accretion Studies, Summer and Fall 2020. Technical Memorandum prepared for Teck Coal Limited, dated November 5, 2020.

NOTES:
1. Original in colour.
2. All concentrations shown are for 2020 minimum and maximum unless otherwise stated.
3. Subsurface geology is not to scale.
4. Vertical exaggeration 2x for topographic profile.
5. Range at EV_MW-GV4A and EV_GV3gwS based on two sampling events in 2020.
6. Only one sampling event at EV_MW-GV4B in 2020.

CLIENT:
Teck Coal Limited

PROJECT LOCATION:
Elk Valley, BC

SNC·LAVALIN

Block Diagram Showing 3D Conceptual Hydrogeology and Transport Pathways of Order Constituents at EVO - Grave Creek/Harmer Creek

BY: CW
SCALE:
DATE: 2022-11-09
REF No: DRAWING 3
CHK'D: EC
Proj Coord Sys:

MXD Path: \\Sli2606\projects\Current Projects\Teck Coal Ltd\GISCAD\GIS\Map Series\672386 -\2021 Harmer Grave Memo\672386-2-BlockDiagram.mxd

Project Path: \\Sli2606\projects\Current Projects\Teck Coal Ltd\GISCAD\Exports\635544_SSGMP_RGMP_AnnualReport_2020

Attachment A

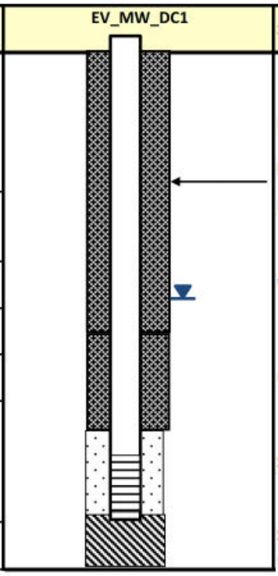
Borehole Logs

EV_MW_DC1 Borehole Log and As-Built Diagram

TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

Hole ID	From	To	Thickness	Grain size	Description	Lithology
EV_MW_DC1		1.52	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, dry, loose	FILL
EV_MW_DC1	1.52	4.57	3.05	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, moist, loose	
EV_MW_DC1	4.57	6.10	1.53	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, wet/saturated, loose. Water at 4.4 mGL.	
EV_MW_DC1	6.10	7.62	1.52	vc	(ML) CLAYEY SILT AND (GM) GRAVEL. Low plasticity, light grey – brown, some sand very fine grained; gravel, coarse to very coarse grained, subangular to rounded, brown, wet.	SILT & GRAVEL
EV_MW_DC1	7.62	10.67	3.05	gr	(GM) CLAYEY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, wet/saturated, loose.	CLAYEY GRAVEL
EV_MW_DC1	10.67	11.43	0.76	vf-f	(ML) CLAYEY SILT. With very fine grained sand, trace gravel, grey, low plasticity, wet, loose	CLAYEY SILT
EV_MW_DC1	11.43	18.29	6.86	clay	(CL) SILTY CLAY. High plasticity, W<PL, some silt, greyish brown, firm to soft, some silt and sand lenses, trace gravel, moist (TILL). Drilling slow.	SILTY CLAY
EV_MW_DC1	18.29	31.09	12.80	gr	(GP) SANDY GRAVEL. Coarse to very coarse grained, subangular to rounded, dark grey and brown, some sand fine to coarse grained, trace silt and clay, wet/saturated, loose. (Gravel consist of limestone, siltstone, sandstone, quartz, shale). Continuous blow of water during rod change and drilling. Sand heaving observed at ~24 m and continued.	SANDY GRAVEL
EV_MW_DC1	31.09	33.53	2.44	-	LIMESTONE (bedrock), grey, hard, effervesces strongly with HCL (there appear no weathered or fractured bedrock in the 2 .44 m bedrock section)	LIMESTONE

EV_MW_DC1



Stick up 0.74 m

Borehole Dia: 142 mm (Odex drilling)

Bentonite Chips: Surface to 10.0 m

Blank: 0.0 to 24.0 m, Sch 40, 68 mm ID, 78 mm OD

Water Level: 8.41 mGL (12 March 2021)

Upper Bentonite Seal: 10. 0 to 20.35 mGL

Sand (10/20 Filter Sand): 20.35 to 30.26 mGL

Screen: 24.0 to 30.0 m, Sch 40, 10-Slot, 68 mm ID, 78 mm OD

Lower Bentonite seal: 30.26 mGL

Total Depth: 33.53 mGL

Total Depth: 33.53 mGL

Top of Bedrock: 31.09 mGL

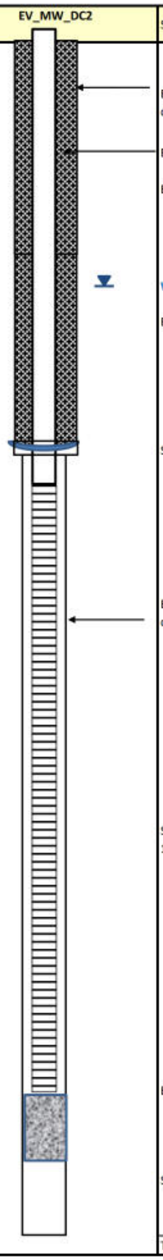
EV_MW_DC2 Borehole Log and As-Built Diagram

TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

Hole ID	Run no	From	To	Thickness	Grain size	Natural Fractures	Description	Lithology
EV_MW_DC2			1.52	1.52	gr	-	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, dry, loose	FILL
EV_MW_DC2		1.52	4.57	3.05	gr	-	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, moist, loose	
EV_MW_DC2		4.57	6.10	1.53	gr	-	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet/saturated, loose. Water at 4.4 mGL.	
EV_MW_DC2		6.10	7.62	1.52	vc	-	(ML) CLAYEY SILT AND (GM) GRAVEL . Low plasticity, light grey – brown, some sand, very fine grained; gravel, coarse to very coarse grained, subangular to rounded, brown, wet.	SILT & GRAVEL
EV_MW_DC2		7.62	10.67	3.05	gr	-	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, with some clay low plasticity, wet/saturated, loose.	SILTY GRAVEL
EV_MW_DC2		10.67	11.43	0.76	vf-f	-	(ML) CLAYEY SILT. With very fine grained sand, some gravel, grey, low plasticity, wet, loose	CLAYEY SILT
EV_MW_DC2		11.43	18.29	6.86	clay	-	(CL) SILTY CLAY. High plasticity, W<PL, some silt, greyish brown, firm to soft, some silt and sand lenses, gravel, moist (TILL). Drilling slow.	SILTY CLAY
EV_MW_DC2		18.29	31.09	12.80	gr	-	(GP) SANDY GRAVEL. Coarse to very coarse grained, subangular to rounded, dark grey and brown, some sand fine to coarse grained, trace silt and clay, wet/saturated, loose. (Gravel consist of limestone, siltstone, sandstone, quartz, shale). Continuous blow of water during rod change and drilling.	SANDY GRAVEL
EV_MW_DC2		31.09	35.36	4.27	-	-	LIMESTONE (bedrock), grey, weathered and fractured (Odex casing goes in easily), effervesces strongly with HCL.	WEATHERED TRANSITION ZONE
EV_MW_DC2		35.36	36.47	1.11	-	-	LIMESTONE (bedrock), grey, competent, effervesces strongly with HCL	
EV_MW_DC2	1	36.47	37.92	1.45	**CORING POINT 36.47 mGL**	36.47 - 37.22	LIMESTONE (bedrock), grey, weathered and fractured, hard, traces of calcite -some veins on larger chunks, effervesces with HCL, weathered faces and rounded edges (Recovery 50%, RQD 0%)	LIMESTONE
EV_MW_DC2	2	37.92	39.42	1.50	-	37.92-38.67, 38.98	LIMESTONE (bedrock), grey, crystalline in fractures, weathered and fractured, hard, calcite veins, effervesces with HCL (Recovery 100%, RQD 53%)	
EV_MW_DC2	3	39.42	40.92	1.50	-	39.6, 39.98, 40.12	LIMESTONE (bedrock), grey, some fractures , hard, calcite veins various orientations, effervesces with HCL (Recovery 100%, RQD 91%)	LIMESTONE
EV_MW_DC2	4	40.92	42.42	1.50	-	41.8, 42.32	LIMESTONE (bedrock), grey, more mechanical fractures, hard, calcite veins, effervesces with HCL, , some black calcareous, organic matter inside fracture at 42.32 m, reacts with HCl but leaves black streaks as acid drains (Recovery 100%, RQD 95%)	LIMESTONE
EV_MW_DC2	5	42.42	43.92	1.50	-	42.65-42.92, 42.97, 43.23, 42.30,43.42, 43.62, 43.82	LIMESTONE (bedrock), grey, fractured in most part , hard, calcite veins, effervesces with HCL, inside fractures is crystalline with calcite (Recovery 100%, RQD 70%)	LIMESTONE
EV_MW_DC2	6	43.92	45.42	1.50	-	43.97, 44.02,44.52, 44.63, 44.84, 45.12-45.42	LIMESTONE (bedrock), dark grey, fractured in most part , hard, calcite veins, effervesces with HCL, inside fractures is crystalline with calcite, 43.92-43.97 mGL some vuggy porosity - with some infilled with calcite. (Recovery 100%, RQD 61%)	LIMESTONE
EV_MW_DC2	7	45.42	46.92	1.50	-	45.58-46.13, 46.84	LIMESTONE (bedrock), grey, fractured in most part , hard, calcite veins, effervesces with HCL (Recovery 100%, RQD 59%)	LIMESTONE
EV_MW_DC2	8	46.92	48.42	1.50	-	47, 47.07-47.25	LIMESTONE (bedrock), grey, fractured in most part , hard, calcite veins, effervesces with HCL, inside fractures vary from weathered to crystalline. Trace vuggy porosity at bottom of run. (Recovery 100%, RQD 71%)	LIMESTONE
EV_MW_DC2	9	48.42	49.92	1.50	-	48.58, 48.64, 49.46	LIMESTONE (bedrock), grey, fractured, hard, calcite veins, effervesces with HCL, 48.97 mGL appears brecciated with cementation of clasts, contact at 49.46 mGL CALCAREOUS SILTSTONE, dark grey, calcite veins, fine sediment, smoother feel to fractures, small coal seam at 49.48 mGL (Recovery 100%, RQD 97%)	LIMESTONE
EV_MW_DC2	10	49.92	51.42	1.50	-	50.02, 50.47	CALCAREOUS SILTSTONE (bedrock), dark grey, fractured, hard, calcite veins, effervesces with HCL, highly weathered at 50.47 mGL (Recovery 100%, RQD 98%)	SILTSTONE
EV_MW_DC2	11	51.42	52.92	1.50	-	52.62	CALCAREOUS SILTSTONE (bedrock), dark grey. Contact at 51.43, Argillaceous Limestone (bedrock), grey to dark grey, fractured, more crystalline than the siltstone, hard, calcite veins, effervesces with HCL (Recovery 100%, RQD 98%)	SILTSTONE
EV_MW_DC2	12	52.92	54.42	1.50	-	52.99, 53.28-53.32, 53.47,53.67, 53.74, 54.04-54.06, 54.27-54.42	CALCAREOUS SILTSTONE (52.92-52.97), dark grey, fissile, reacts with HCL (only a 5 cm lens). LIMESTONE (52.97-54.42) (bedrock), grey, competent, fractured in most part, hard, calcite veins, effervesces with HCL, light grey weathered cementation zone 53.29-53.45 mGL, reacts with HCL. 52.97 mGL has trace argillaceous limestone. Light grey cementation zone at 54.04 to 54.06 mGL. (Recovery 100%, RQD 77%)	LIMESTONE

Total Depth: 54.42 mGL

Top of Bedrock: 31.09 mGL



Stick up 0.75 m

Borehole Dia: 168 mm Surface to 36.47 mGL (Odex drilling)

Bentonite Chips: Surface to 8.0 m

Blank: 0.0 to 35.88 m, Sch 40, 101 mm ID, 114 mm OD

Water Level: 8.56 mGL (12 March 2021)

Bentonite Pellets (Seal): 8.0 to 34.88 mGL

Shale Trap at 34.88 mGL

Borehole Dia: 128 mm 36.47 to 54.42 mGL (ODEX coring)

Screen: 35.88 to 52.75 mGL, 20 Slot, Sch 40, 101 mm ID, 114 mm OD

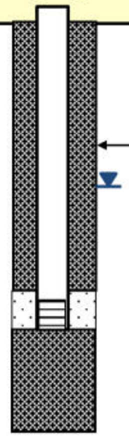
Bottom of screen: 52.75 mGL

Slough: 52.75 to 54.42 mGL

Total Drilled Depth: 54.42 mGL

EV_MW_DC3 Borehole Log and As-Built Diagram

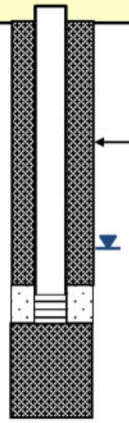
TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

Hole ID	From	To	Thickness	Grain size	Description	Lithology	EV_MW_DC3	Stick up 0.91 m
EV_MW_DC3		1.52	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, moist to wet at the bottom, loose (~FILL)	FILL		
EV_MW_DC3	1.52	3.05	1.53	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet, loose. Water at 2.4 mGL.	SILTY GRAVEL		Borehole Dia: 142 mm (Odex Drilling)
EV_MW_DC3	3.05	4.57	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet/saturated, loose.			Bentonite Chips: Surface to 4.0 mGL
EV_MW_DC3	4.57	6.10	1.53	vc	(ML)SAND AND (GM) GRAVEL . light grey – brown, sand, medium to coarse grained, gravel, coarse to very coarse grained, subangular to rounded, brown, wet.	SAND & GRAVEL		**Water Level: 4.77 mGL (12 March 2021)**
EV_MW_DC3	6.10	7.62	1.52	clay	(SM) CLAYEY SILT. Low plasticity, W~PL, some silt, greyish brown, soft, some sand lenses, gravel, wet (TILL).	CLAYEY SILT		Sand (10/20 Filter Sand): 4.0 to 11.0 mGL
EV_MW_DC3	7.62	11.13	3.51	gr	(GC) Clayey and silty GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, wet, loose, some clay, low plasticity, soft to firm, wet.	GRAVEL (Silty/clayey)		Screen: 9.0 to 10.5 m, Sch 40, 10-Slot, 68 mm ID, 78 mm OD
EV_MW_DC3	11.13	12.50	1.37	-	LIMESTONE (bedrock), greyish brown, weathered and fractured, hard, effervesces strongly with HCL	LIMESTONE		
EV_MW_DC3	12.50	13.72	1.22	-	LIMESTONE (bedrock), grey, hard, effervesces strongly with HCL			Lower Bentonite Seal: 11.0 to 13.73 mGL
								Total Depth: 13.72 mGL

Total Depth: 13.72 mGL
Top of Bedrock: 11.13 mGL

EV_MW_DC4 Borehole Log and As-Built Diagram

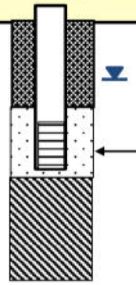
TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

Hole ID	From	To	Thickness	Grain size	Description	Lithology	EV_MW_DC4	Stick up 0.9 m
EV_MW_DC4		1.52	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, moist to wet at the bottom, loose (FILL)	FILL		
EV_MW_DC4	1.52	3.05	1.53	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, moist, loose.	SILTY GRAVEL		Borehole Dia: 142 mm (Odex Drilling)
EV_MW_DC4	3.05	4.57	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet, loose. Water at 4.3 mGL.			Bentonite Chips: Surface to 4.5 mGL
EV_MW_DC4	4.57	6.10	1.53	vc	(SP) SAND AND (GM) GRAVEL . light grey – brown, sand, medium to coarse grained, gravel, coarse to very coarse grained, subangular to rounded, brown, wet/saturated.	SAND & GRAVEL		
EV_MW_DC4	6.10	9.14	3.04	sand	(SM) SILTY SAND and Gravel. Some clay, Low plasticity, W~PL, some silt, greyish brown, soft, wet.	SILTY SAND & GRAVEL		**Water Level: 7.15 mGL (12 March 2021)**
EV_MW_DC4	9.14	10.82	1.68	gr	(GC/GM) Clayey and silty GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, wet, loose, some clay, low plasticity, soft to firm, wet.	GRAVEL (Silty/Clayey)		Sand (10/20 Filter Sand): 4.5 to 10.5 mGL
EV_MW_DC4	10.82	11.56	0.74	-	LIMESTONE (bedrock), greyish brown, weathered and fractured, hard, effervesces strongly with HCL	LIMESTONE		Screen: 8.5 to 10.0 mGL, Sch 40, 10-Slot, 68 mm ID, 78 mm OD
EV_MW_DC4	11.56	13.72	2.16	-	LIMESTONE (bedrock), grey, hard, effervesces strongly with HCL			Lower Bentonite Seal: 10.5 to 13.73 mGL
								Total Depth: 13.72 mGL

Total Depth: 13.72 mGL
Top of Bedrock: 10.82 mGL

EV_MW_DC5 Borehole Log and As-Built Diagram

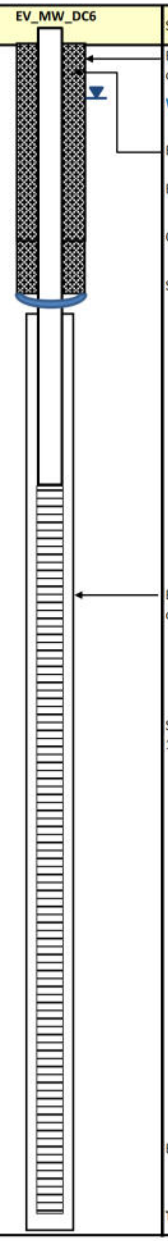
TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

Hole ID	From	To	Thickness	Grain size	Description	Lithology	EV_MW_DC5	Stick up 0.85 m
EV_MW_DC5		1.52	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, dry, loose (FILL)	FILL		Borehole Dia: 142 mm (Odex Drilling) **Water Level: 2.17 mGL (12 March 2021)**
EV_MW_DC5	1.52	2.29	0.77	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, moist, loose (FILL)			Bentonite Chips: Surface to 2.23 m Blank: 0.0 to 3.7 m, Sch 40, 68 mm ID, 78 mm OD
EV_MW_DC5	2.29	5.33	3.04	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet/saturated, loose. Water at 2.43 mGL mGL. (FILL)			Screen: 3.7 to 5.2 m, Sch 40, 10-Slot, 68 mm ID, 78 mm OD
EV_MW_DC5	5.33	5.64	0.31	-	LIMESTONE (bedrock), grey, weathered, fractured, effervesces strongly with HCL	LIMESTONE		Sand (10/20 Filter Sand): 2.23 to 5.25 mGL
EV_MW_DC5	5.64	6.09	0.45	-	LIMESTONE (bedrock), grey, hard, competent, effervesces strongly with HCL			Lower Bentonite seal: 6.04 to 5.25 mGL
								Total Depth: 6.09 mGL

Total Depth: 6.09 mGL
Top of Bedrock: 5.33 mGL

EV_MW_DC6 Borehole Log and As-Built Diagram

TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

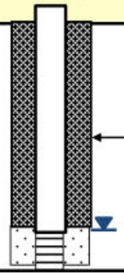
Hole ID	Run no	From	To	Thickness	Grain size	Natural Fractures	Description	Lithology	EV_MW_DC6	Stick up 0.81 m
EV_MW_DC6	-		1.52	1.52	gr	-	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, dry, loose (FILL)	FILL		Borehole Dia: 168 mm Surface to 12.1 mGL (Odex drilling)
EV_MW_DC6	-	1.52	2.29	0.77	gr	-	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, moist, loose (FILL)			Water Level: 0.955 mGL (12 March 2021)
EV_MW_DC6	-	2.29	5.33	3.04	gr	-	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet/saturated, loose. Water at 2.43 mGL. (FILL)			Bentonite Chips: Surface to 2.0 mGL
EV_MW_DC6	-	5.33	10.97	5.64	-	-	LIMESTONE (bedrock), grey, weathered, fractured, effervesces strongly with HCL	LIMESTONE		Blank: 0.0 to 16.62 mGL, Sch 40, 101 mm ID, 114 mm OD
EV_MW_DC6	-	10.97	12.10	1.13	-	-	LIMESTONE (bedrock), grey, hard, fractured, competent, effervesces strongly with HCL			Coated Bentonite Pellet Seal: 2.0 to 12.1 mGL
EV_MW_DC6	1	12.10	12.45	0.35	**CORING POINT 12.1 mGL**		LIMESTONE (bedrock), grey, weathered and fractured, hard, calcite veins, effervesces with HCL, presence of silt coating on core (Recovery 100%; RQD 0%)	LIMESTONE		Shale Trap at 12.1 mGL
EV_MW_DC6	2	12.45	13.95	1.50	-	12.86, 13.33-13.53	LIMESTONE (bedrock), grey, fractured through out, hard, calcite veins with various orientation, effervesces with HCL, NF zone shows weathering inside fracture (Recovery 100%, RQD 85%)	LIMESTONE		
EV_MW_DC6	3	13.95	15.45	1.50	-	14.33-14.70	LIMESTONE (bedrock), light grey, competent, fractured, hard, calcite veins with various orientation, effervesces with HCL, NF zone has evidence of re-mineralization of gypsum (Recovery 100%, RQD 75%)	LIMESTONE		
EV_MW_DC6	4	15.45	16.95	1.50	-	None	LIMESTONE (bedrock), light grey, fractured at 0.25 m intervals (all mechanical), hard, calcite veins with various orientation, effervesces with HCL, joint at 16.75 mGL, Limestone, grey, competent, hard, calcite veins, fossiliferous (Recovery 100%, RQD 100%)	LIMESTONE		
EV_MW_DC6	5	16.95	18.45	1.50	-	16.95-17.07, 17.23, 17.35, 17.61, 17.69, 17.89, 18.01	LIMESTONE (bedrock), grey to light grey, fractured - some fractures are noticed along core but core does not split, hard, calcite veins various orientation, effervesces with HCL, fossiliferous ends at 17.05 mGL (Recovery 100%, RQD 68%)	LIMESTONE		
EV_MW_DC6	6	18.45	19.95	1.50	-	19.4-19.55,19.65	LIMESTONE (bedrock), dark grey, fractured in most part , hard, calcite veins, effervesces with HCL (Recovery 100%, RQD 87%)	LIMESTONE		Borehole Dia: 128 mm from 12.1 to 31.95 mGL (Odex coring)
EV_MW_DC6	7	19.95	21.45	1.50	-	20.33-20.58, 20.85, 20.96, 21.25	LIMESTONE (bedrock), grey, fractured in most part , evidence of weathering in fractured surfaces, hard, calcite veins, various direction, cubic calcite crystals in fracture, effervesces with HCL (Recovery 100%, RQD 71%)	LIMESTONE		
EV_MW_DC6	8	21.45	22.95	1.50	-	21.61 - 22.11, 22.5-22.95	LIMESTONE (bedrock), grey, competent, highly fractured , hard, calcite veins various directions, effervesces with HCL, large vertical fracture along calcite vein from 21.96-22.50 mGL (Recovery 100%, RQD 27%)	LIMESTONE		Screen: 16.62 to 31.95 mGL (5 x 3 m), 20 Slot, Sch 40, 101 mm ID, 114 mm OD
EV_MW_DC6	9	22.95	24.45	1.50	-	2.95-23.45, 23.61, 24-24.37	LIMESTONE (bedrock), light grey to grey, weathered and heavily fractured, calcareous mudstone at 23.85-24.0 mGL, calcite veins various orientations, effervesces with HCL, collapsed structures with interbedded mudstones from 23.55-23.60 mGL, heavily fracture/pulverized zone 24.0-24.37 mGL some gypsum in this zone (Recovery 100%, RQD 35%)	LIMESTONE		
EV_MW_DC6	10	24.45	25.95	1.50	-	25.05, 25.3-25.39, 25.55, 25.65-25.95	LIMESTONE (bedrock), grey, heavily fractured, fractures indicate weathering and calcite crystals, hard, calcite veins various orientation, effervesces with HCL (Recovery 100%, RQD 57%)	LIMESTONE		
EV_MW_DC6	11	25.95	27.45	1.50	-	25.95-26.55, 26.8, 26.99, 27.12, 27.27	LIMESTONE (bedrock), light grey, competent, fractured, hard, calcite veins various orientation, effervesces with HCL, 25.95-26.55 mGL heavily fractured - natural shows weathering and calcite crystallization. 26.8 mGL collapsed zone with some interbedded mudstone (Recovery 100%, RQD 57%)	LIMESTONE		
EV_MW_DC6	12	27.45	28.95	1.50	-	27.85, 28.05, 28.25, 28.55, 28.89-28.95	LIMESTONE (bedrock), grey, competent, fractured in most part, hard, calcite veins various orientation, effervesces with HCL, heavily weathered brown limestone zone at 26.99-27.03 mGL, some brecciated clasts within - still effervesces with HCL (Recovery 100%, RQD 75%)	LIMESTONE		
EV_MW_DC6	13	28.95	30.45	1.50	-	28.95-29.39, 29.47, 29.57,	LIMESTONE (bedrock), grey, fractured in most part, hard, calcite veins, effervesces with HCL, 29.02-29.07 mGL mudstone, soft, calcareous, weathered, very fine grain, reacts with HCL. 29.20-29.27 mGL brecciated limestone, clasts cemented in place, reacts with HCL. Bottom of run is very crystalline (Recovery 100%, RQD 58%)	LIMESTONE		Bottom of screen: 31.95 mGL
EV_MW_DC6	14	30.45	31.95	1.50	-	30.63, 30.8, 31.10, 31.38	LIMESTONE (bedrock), grey, fractured in most part, hard, calcite veins, effervesces with HCL (Recovery 100%, RQD 64%)	LIMESTONE		**Total Drilled Depth: 31.95 mGL**

Total Depth: 31.95 mGL

Top of Bedrock: 5.33 mGL

EV_MW_DC7 Borehole Log and As-Built Diagram

TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

Hole ID	From	To	Thickness	Grain size	Description	Lithology	EV_MW_DC7	Stick up 0.78 m.
EV_MW_DC7		1.52	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, dry, loose	FILL		**Water Level: 7.68 mGL (12 March 2021)**
EV_MW_DC7	1.52	4.57	3.05	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, moist, loose			Borehole Dia: 142 mm (Odex drilling)
EV_MW_DC7	4.57	6.10	1.53	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, wet, loose.			Bentonite Pellets (Seal): Surface to 7.6 m
EV_MW_DC7	6.10	7.62	1.52	vc	(ML) CLAYEY SILT AND (GM) GRAVEL . Low plasticity, light grey – brown, some sand, very fine grained; gravel, coarse to very coarse grained, subangular to rounded, brown, wet/saturated. Water at 6.5 mGL.	SILT & GRAVEL		Screen: 9.2 to 10.7 m, Sch 40, 10-Slot, 68 mm ID, 78 mm OD
EV_MW_DC7	7.62	10.70	3.08	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet/saturated, loose.	SILTY GRAVEL		Sand (10/20 Filter Sand): 7.6 to 10.7 mGL

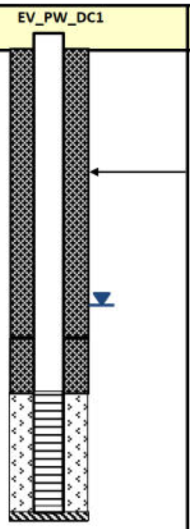
Total Depth: 10.70 mGL

Top of Bedrock: 31.09 mGL as observed in EV-MW_DC1

EV_PW_DC1 Borehole Log and As-Built Diagram

TECK COAL EVO SRF P3 DRY CREEK - Groundwater Field Program

Hole ID	From	To	Thickness	Grain size	Description	Lithology
EV_PW_DC1		1.52	1.52	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, dry, loose	FILL
EV_PW_DC1	1.52	4.57	3.05	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, trace clay, low plasticity, moist, loose	
EV_PW_DC1	4.57	6.10	1.53	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet/saturated, loose. Water observed at 4.4 mGL.	
EV_PW_DC1	6.10	7.62	1.52	vc	(ML) CLAYEY SILT AND (GM) GRAVEL . Low plasticity, light grey – brown, some sand, very fine grained; gravel, coarse to very coarse grained, subangular to rounded, brown, wet.	SILT & GRAVEL
EV_PW_DC1	7.62	10.67	3.05	gr	(GM) SILTY GRAVEL. Coarse to very coarse grained, subangular to rounded, brown, some clay, low plasticity, wet/saturated, loose.	SILTY GRAVEL
EV_PW_DC1	10.67	11.43	0.76	vf-f	(ML) CLAYEY SILT. With very fine grained sand, some gravel, grey, low plasticity, wet, loose	CLAYEY SILT
EV_PW_DC1	11.43	18.00	6.57	clay	(CL) SILTY CLAY. High plasticity, W<PL, some silt, greyish brown, firm to soft, some silt and sand lenses, some gravel, moist (TILL). Drilling slow.	SILTY CLAY
EV_PW_DC1	18.00	29.70	11.70	gr	(GP) SANDY GRAVEL. Coarse to very coarse grained, subangular to rounded, dark grey and brown, some sand, fine to coarse grained, trace silt and clay, wet/saturated, loose. (Gravel consist of limestone, siltstone, sandstone, quartz, shale). Continuous blow of water during rod change and drilling. Sand heaving observed at ~24 m and continued.	SANDY GRAVEL
EV_PW_DC1	29.70	29.80	0.10	-	LIMESTONE (bedrock), grey, weathered/fractured, effervesces strongly with HCL	LIMESTONE



Stick up 0.90 m

Borehole Dia: 323.85 mm (DR Drilling)

Bentonite Chips: Surface to 14.0 mGL

Blank: 0.0 to 17.5 m, mild steel, 258.4 mm ID, 274.72 mm OD

Water Level: 7.38 mGL (12 March 2021)

Bentonite Pellets (Seal): 14.0 to 17.0 mGL

Screen: 17.5.0 to 29.7 m, stainless steel, 10-Slot, 258.4 mm ID, 274.72 mm OD (Natural pack around the screen at 17 to 29.7 mGL))

Thin layer (0.1 m) of Bentonite pellets at the bottom

Total Depth: 29.8 mGL

Total Depth: 29.80 mGL
Top of Bedrock: 29.70 mGL

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GV3gw

SHEET 1 OF 3

LOCATION: See Location Plan

N: 5522255 E: 656580

BORING DATE: October 23, 2013

DATUM: UTM Zone 11 (Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	Ground Surface	400.51					Stick-up =0.91 m
		SANDY GRAVEL, fine-grained, sub-angular to angular, moderately graded, dry, very loose	0.00					
1.52		SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, dry, very loose	398.98 1.52					
2.90		SANDY GRAVEL, fine-grained, sub-angular to angular, moderately graded, dry, very loose	397.61 2.90					
4.57		SAND, some gravel, localized thin zones of gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose	395.94 4.57					Bentonite Chips
10								15 Nov 2013 ∇

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q- ● rem V. ⊕ U- O: 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp ⊢—○W—⊣ Wl: 10 20 30 40

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: RT

CHECKED: CD

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GV3gw

SHEET 2 OF 3

LOCATION: See Location Plan

N: 5522255 E: 656580

BORING DATE: October 23, 2013

DATUM: UTM Zone 11
(Nad 83)

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80 SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - O 20 40 60 80	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} WATER CONTENT PERCENT Wp ⊢—O W—⊣ Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	SAND, some gravel, localized thin zones of gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose *(continued)*									
11											
12											
13		SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose		387.55 12.95							
14		GRAVEL, fine-grained, sub-rounded to sub-angular, well graded, moist, very loose		385.88 14.63							
15											Bentonite Chips
16		SAND, some gravel, fine to coarse-grained, sub-rounded to sub-angular, moderately graded, moist, very loose		384.35 16.15							
17		GRAVEL, some silt, fine-grained, sub-rounded to sub-angular, poorly graded, moist, very loose		382.98 17.53							
18											
19		SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose		381.46 19.05							
20											

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

DATA ENTRY: IPG

PROJECT No.: 12.1349.0013

RECORD OF BOREHOLE: EV_GV3gw

SHEET 3 OF 3

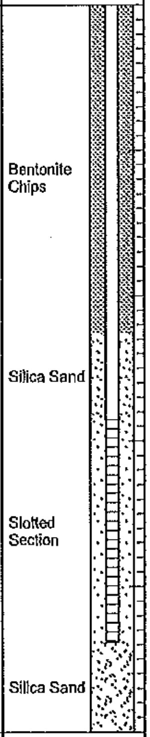
LOCATION: See Location Plan

BORING DATE: October 23, 2013

DATUM: UTM Zone 11 (Nad 83)

N: 5522255 E: 656580

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80 SHEAR STRENGTH Cu, kPa 20 40 60 80 nat V. + Q- ● rem V. ⊕ U- O	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} WATER CONTENT PERCENT Wp ⊢—O^W—⊣ Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
20	Sonic 127 mm (ID) Casing 152.4 mm (OD) JR Drilling	SILTY GRAVEL, fine-grained, sub-rounded to sub-angular, poorly graded, wet, very loose *(continued)*	379.63 20.88							
21		SILTY GRAVEL, fine and coarse-grained, sub-angular to angular, poorly graded, wet, very loose								Bentonite Chips
22										Silica Sand
23										Slotted Section
24										Silica Sand
25		End of BOREHOLE. NOTES: Standpipe installed to 24.4 m upon well completion. Groundwater level measured at 9.9 mbgs on November 15, 2013.	375.51 25.00							
26										
27										
28										
29										
30										



DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RT
CHECKED: CD

BOREHOLE - EXPANDED ADD. LAB TESTING 12.1349.0013 BH LOGS.GPJ CALGARY.GDT 4/8/14

FINAL

SNC·LAVALIN

Client
Teck Coal Limited

Location
Regional Groundwater Monitoring

Borehole No. : EV_BH_GV3gwS

PAGE 1 OF 2

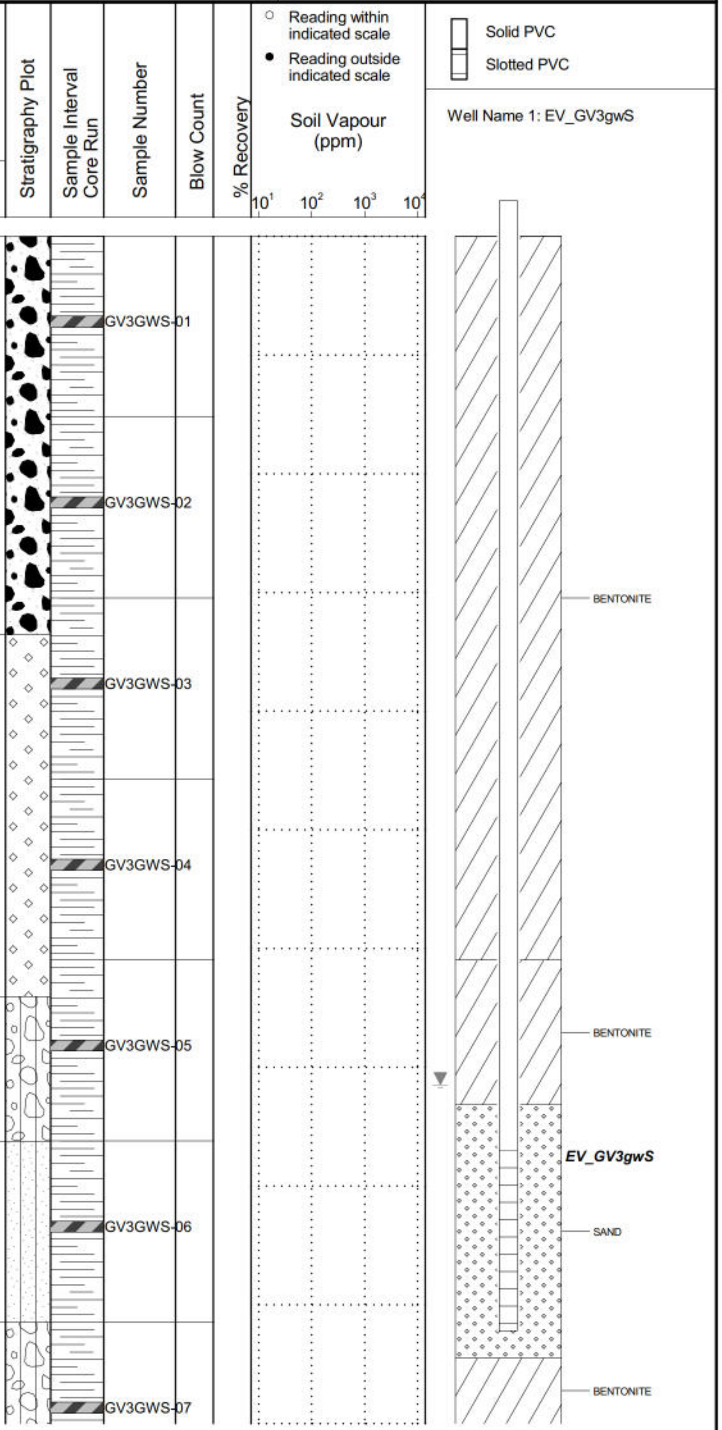
Drilling Contractor	Owen's Drilling	Date Monitored	2020 08 31	Project Number:	631283
Drilling Method	Odex	Ground Surface Elev. (m)	1307.011	Borehole Logged By:	MTB
Borehole Dia. (m)	0.13	Top of Casing Elev. (m)	1307.883	Date Drilled:	2020 08 10
Pipe/Slotted Pipe Dia. (m)	0.05/0.05	Northing: 5522259.297	Easting: 656580.106	Log Typed By:	AS

Depth in Metres

Drilling Legend
▨ Sample Interval
☐ Odex

Water/NAPL Levels
▼ Water Level 1
▽ Water Level 2
◆ NAPL
◇ NAPL

Soil Description



0 SANDY GRAVEL, fine to coarse gravel, subangular, fine to coarse grained sand, containing cobbles, well graded, grey, loose, dry.
At 0.3 m - organics.

1

2 At 2.1 m - damp, brown.

3 GRAVELLY SAND, fine to coarse grained sand, fine to coarse gravel, subangular to subrounded, well graded, brown, loose, moist.

4

5 Below 4.9 m - gravel, fine, some silt.

6 At 5.9 m - wet.

SILTY GRAVEL, fine to coarse, subangular to angular, some sand, fine to coarse, brown, medium dense, damp.

7

SILTY SAND, fine to coarse grained, some gravel, fine, subangular to angualar, well graded, brown, medium dense, wet.

8

9 SILTY GRAVEL, fine to coarse, angular to subangular, some sand, fine to coarse, brown, medium dense, wet.

10

NOTES
Bolded sample denotes sample analyzed.
* Denotes blind field duplicate.

QA/QC: LLH 2020 10 19 Print Date:2020-12-02

FINAL

SNC·LAVALIN

Client
Teck Coal Limited

Location
Regional Groundwater Monitoring

Borehole No. : EV_BH_GV3gwS

PAGE 2 OF 2

Drilling Contractor	Owen's Drilling	Date Monitored	2020 08 31	Project Number:	631283
Drilling Method	Odex	Ground Surface Elev. (m)	1307.011	Borehole Logged By:	MTB
Borehole Dia. (m)	0.13	Top of Casing Elev. (m)	1307.883	Date Drilled:	2020 08 10
Pipe/Slotted Pipe Dia. (m)	0.05/0.05	Northing: 5522259.297	Easting: 656580.106	Log Typed By:	AS

Drilling Legend
▨ Sample Interval
☐ Odex

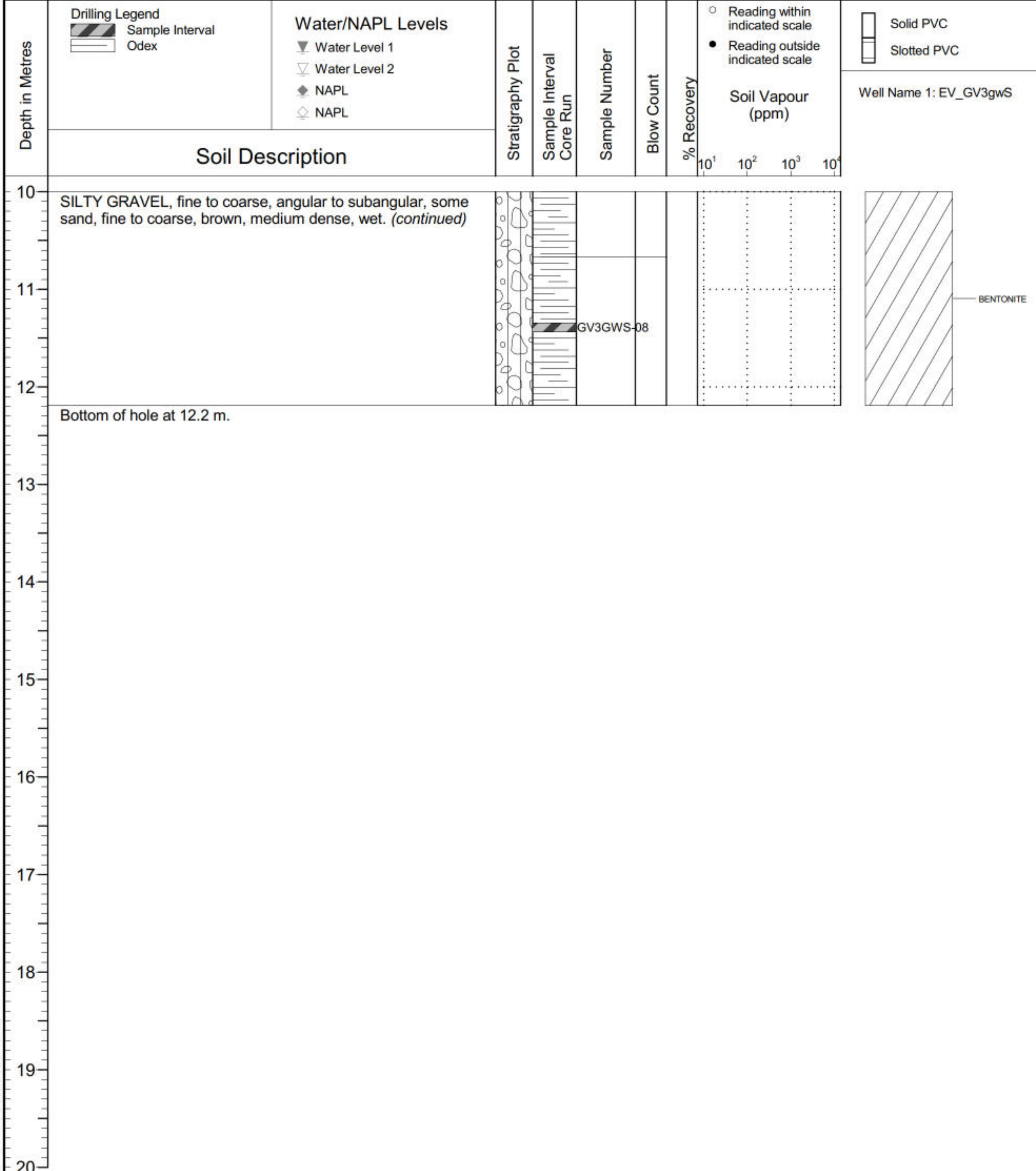
Water/NAPL Levels
▼ Water Level 1
▽ Water Level 2
◆ NAPL
◇ NAPL

○ Reading within indicated scale
● Reading outside indicated scale

☐ Solid PVC
☐ Slotted PVC

Well Name 1: EV_GV3gwS

Depth in Metres	Soil Description	Stratigraphy Plot	Sample Interval Core Run	Sample Number	Blow Count	% Recovery	Soil Vapour (ppm)
10	SILTY GRAVEL, fine to coarse, angular to subangular, some sand, fine to coarse, brown, medium dense, wet. *(continued)*			GV3GWS-08			
12.2	Bottom of hole at 12.2 m.						



NOTES
Bolded sample denotes sample analyzed.
* Denotes blind field duplicate.

QA/QC: LLH 2020 10 19 Print Date:2020-12-02

FINAL

SNC·LAVALIN	Client **Teck Coal Limited**	**Borehole No. : EV_BH_GV4A**
	Location **Regional Groundwater Monitoring**	PAGE 1 OF 2

Drilling Contractor	Owen's Drilling	Date Monitored	2020 08 31	Project Number:	631283
Drilling Method	Odex	Ground Surface Elev. (m)	1310.661	Borehole Logged By:	MTB
Borehole Dia. (m)	0.13	Top of Casing Elev. (m)	1311.532	Date Drilled:	2020 08 09
Pipe/Slotted Pipe Dia. (m)	0.05/0.05	Northing: 5522317.465	Easting: 656664.666	Log Typed By:	AS

Drilling Legend
▨ Sample Interval
☐ Odex

Water/NAPL Levels
▼ Water Level 1
▽ Water Level 2
◆ NAPL
◇ NAPL

○ Reading within indicated scale
● Reading outside indicated scale

Soil Vapour (ppm)

☐ Solid PVC
☐ Slotted PVC

Well Name 1: EV_MW_GV4A

Depth in Metres

Soil Description

SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, subangular, some silt, well graded, brown, loose, moist, organics.

At 1.07 m - wet.

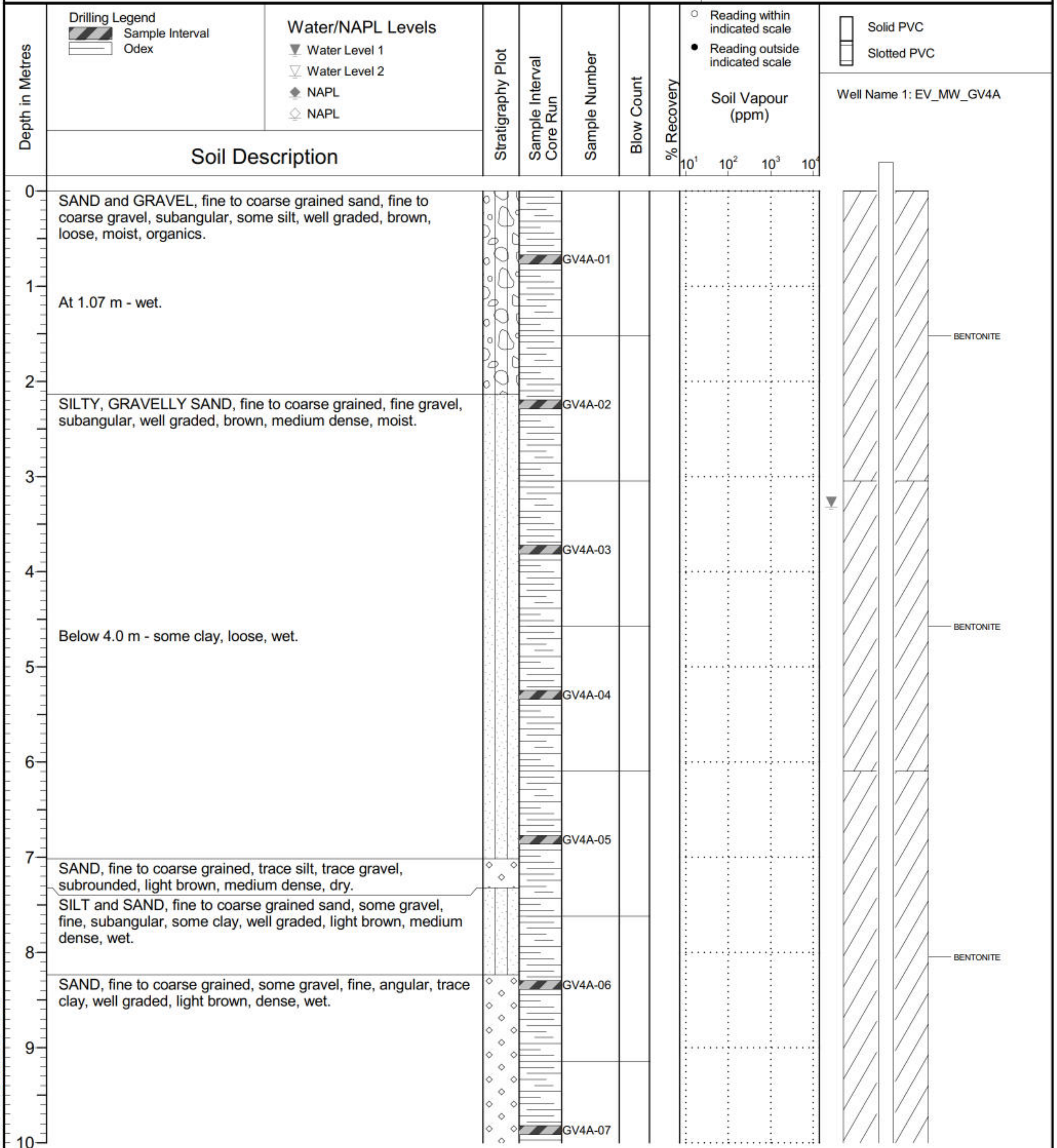
SILTY, GRAVELLY SAND, fine to coarse grained, fine gravel, subangular, well graded, brown, medium dense, moist.

Below 4.0 m - some clay, loose, wet.

SAND, fine to coarse grained, trace silt, trace gravel, subrounded, light brown, medium dense, dry.

SILT and SAND, fine to coarse grained sand, some gravel, fine, subangular, some clay, well graded, light brown, medium dense, wet.

SAND, fine to coarse grained, some gravel, fine, angular, trace clay, well graded, light brown, dense, wet.



NOTES
Bolded sample denotes sample analyzed.
* Denotes blind field duplicate.

QA/QC: LLH 2020 10 19 Print Date:2020-12-02

FINAL

SNC·LAVALIN

Client
Teck Coal Limited

Location
Regional Groundwater Monitoring

Borehole No. : EV_BH_GV4A

Drilling Contractor	Owen's Drilling	Date Monitored	2020 08 31	Project Number:	631283
Drilling Method	Odex	Ground Surface Elev. (m)	1310.661	Borehole Logged By:	MTB
Borehole Dia. (m)	0.13	Top of Casing Elev. (m)	1311.532	Date Drilled:	2020 08 09
Pipe/Slotted Pipe Dia. (m)	0.05/0.05	Northing: 5522317.465	Easting: 656664.666	Log Typed By:	AS

Drilling Legend
▨ Sample Interval
▭ Odex

Water/NAPL Levels
▼ Water Level 1
▽ Water Level 2
◆ NAPL
◇ NAPL

○ Reading within indicated scale
● Reading outside indicated scale

▯ Solid PVC
▯ Slotted PVC

Well Name 1: EV_MW_GV4A

Depth in Metres | Soil Description | Stratigraphy Plot | Sample Interval Core Run | Sample Number | Blow Count | % Recovery | Soil Vapour (ppm)

SAND, fine to coarse grained, some gravel, fine, angular, trace clay, well graded, light brown, dense, wet. *(continued)*

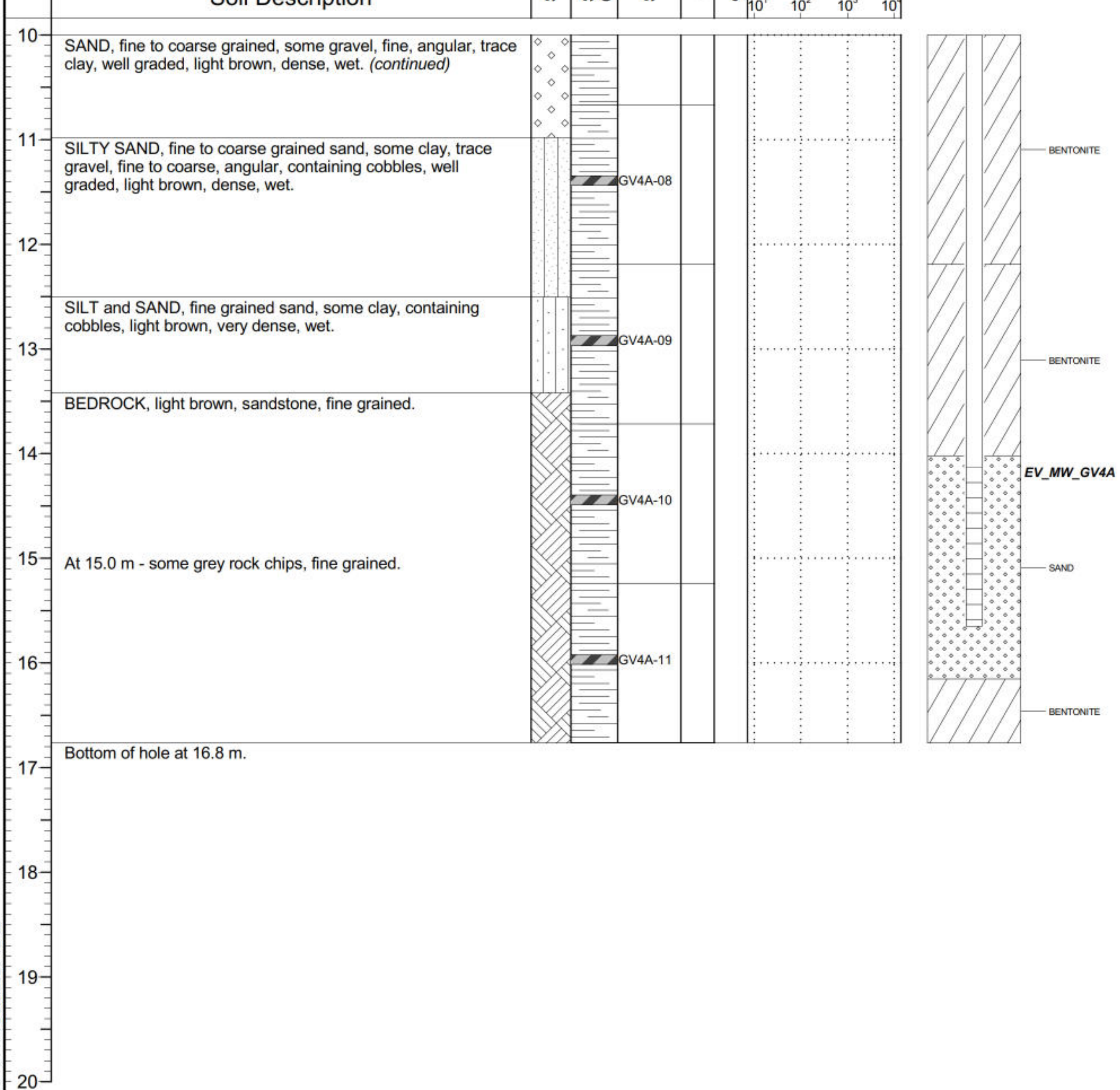
SILTY SAND, fine to coarse grained sand, some clay, trace gravel, fine to coarse, angular, containing cobbles, well graded, light brown, dense, wet.

SILT and SAND, fine grained sand, some clay, containing cobbles, light brown, very dense, wet.

BEDROCK, light brown, sandstone, fine grained.

At 15.0 m - some grey rock chips, fine grained.

Bottom of hole at 16.8 m.



NOTES
Bolded sample denotes sample analyzed.
* Denotes blind field duplicate.

QA/QC: LLH 2020 10 19 Print Date:2020-12-02

FINAL

SNC·LAVALIN

Client
Teck Coal Limited

Location
Regional Groundwater Monitoring

Borehole No. : EV_BH_GV4B

PAGE 1 OF 1

Drilling Contractor	Owen's Drilling	Date Monitored	2020 09 30	Project Number:	631283
Drilling Method	Odex	Ground Surface Elev. (m)	1310.636	Borehole Logged By:	MTB
Borehole Dia. (m)	0.13	Top of Casing Elev. (m)	1311.661	Date Drilled:	2020 08 10
Pipe/Slotted Pipe Dia. (m)	0.05/0.05	Northing: 5522318.467	Easting: 656662.164	Log Typed By:	AS

Drilling Legend
▨ Sample Interval
▭ Odex

Water/NAPL Levels
▼ Water Level 1
▽ Water Level 2
◆ NAPL
◇ NAPL

Depth in Metres

Soil Description

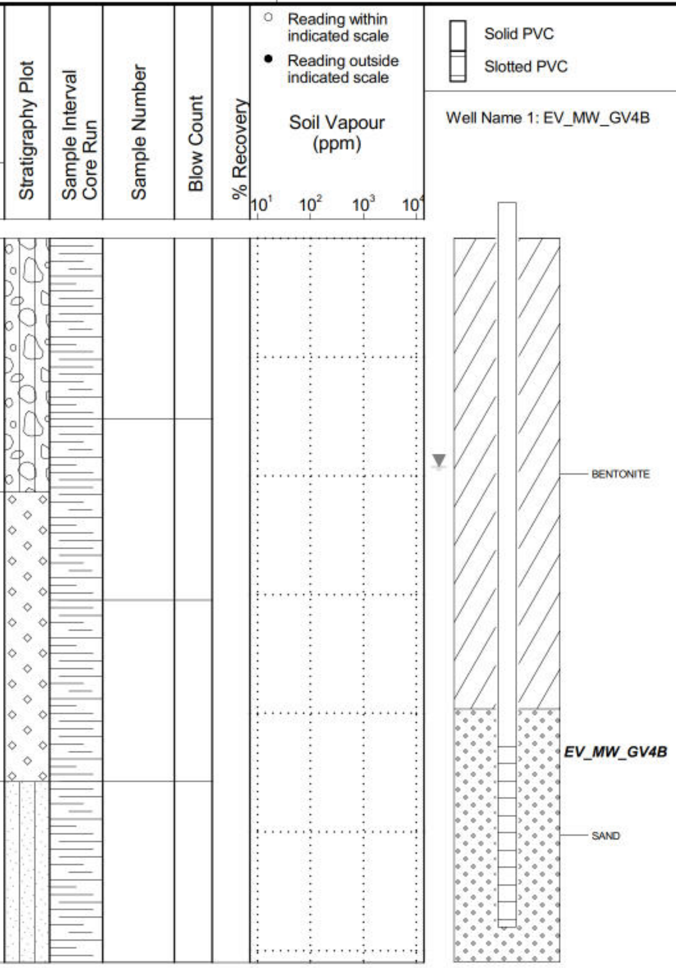
0 SAND and GRAVEL, fine to coarse grained sand, fine to coarse gravel, subangular, some silt, well graded, brown, loose.

1 At 1.07 m - wet.

2 GRAVELLY SAND, fine to coarse grained, fine gravel, subangular, well graded, brown, medium dense, moist.

4.6 SILTY, GRAVELLY SAND, fine to coarse grained sand, fine to coarse gravel, subangular, some clay, well graded, brown, loose, wet.

6.1 Bottom of hole at 6.1 m.



NOTES

QA/QC: LLH 2020 10 19 Print Date:2020-12-02

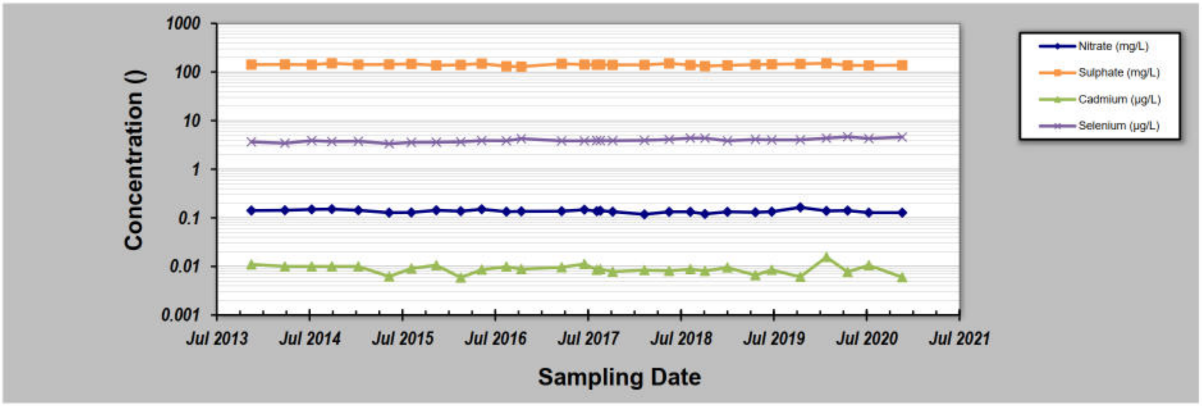
Attachment B

Mann-Kendall Trend Analyses

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 09-Feb-21
Facility Name: Teck Coal Regional Groundwater - EVO
Conducted By: MBS
Job ID: 671557
Location EV_GV3gw

Sampling Event	Sampling Date	EV_GV3GW CONCENTRATION						
	Parameter (units)	Nitrate (mg/L)	Sulphate (mg/L)	Cadmium (µg/L)	Selenium (µg/L)			
1	15-Nov-13	0.141	142	0.011	3.65			
2	28-Mar-14	0.143	143	0.01	3.43			
3	12-Jul-14	0.149	141	0.01	3.87			
4	30-Sep-14	0.151	151	0.01	3.71			
5	13-Jan-15	0.143	142	0.01	3.76			
6	15-May-15	0.128	143	0.0062	3.35			
7	11-Aug-15	0.129	147	0.0091	3.56			
8	18-Nov-15	0.143	137	0.0106	3.59			
9	23-Feb-16	0.137	140	0.0059	3.66			
10	16-May-16	0.15	149	0.0086	3.88			
11	22-Aug-16	0.134	131	0.0099	3.85			
12	20-Oct-16	0.136	129	0.0088	4.24			
13	29-Mar-17	0.137	148	0.0096	3.83			
14	27-Jun-17	0.147	142	0.0112	3.84			
15	15-Aug-17	0.137	141	0.0085	3.9			
16	29-Aug-17	0.14	142	0.0088	3.89			
17	17-Oct-17	0.134	140	0.0078	3.87			
18	20-Feb-18	0.118	140	0.0084	3.92			
19	29-May-18	0.133	150	0.0081	4.09			
20	21-Aug-18	0.133	139	0.0088	4.36			
21	18-Oct-18	0.12	132	0.0081	4.34			
22	15-Jan-19	0.133	137	0.0095	3.85			
23	6-May-19	0.13	142	0.0066	4.1			
24	10-Jul-19	0.134	144	0.0085	4.01			
25	31-Oct-19	0.164	147	0.0061	4.02			
26	11-Feb-20	0.139	151	0.0156	4.34			
27	5-May-20	0.141	137	0.0077	4.65			
28	28-Jul-20	0.128	136	0.0106	4.27			
29	8-Dec-20	0.128	138	0.006	4.58			
30								
	Coefficient of Variation:	0.07	0.04	0.22	0.08			
	Mann-Kendall Statistic (S):	-118	-60	-128	267			
	Confidence Factor:	98.6%	86.4%	99.2%	>99.9%			
	Concentration Trend:	Decreasing	Stable	Decreasing	Increasing			



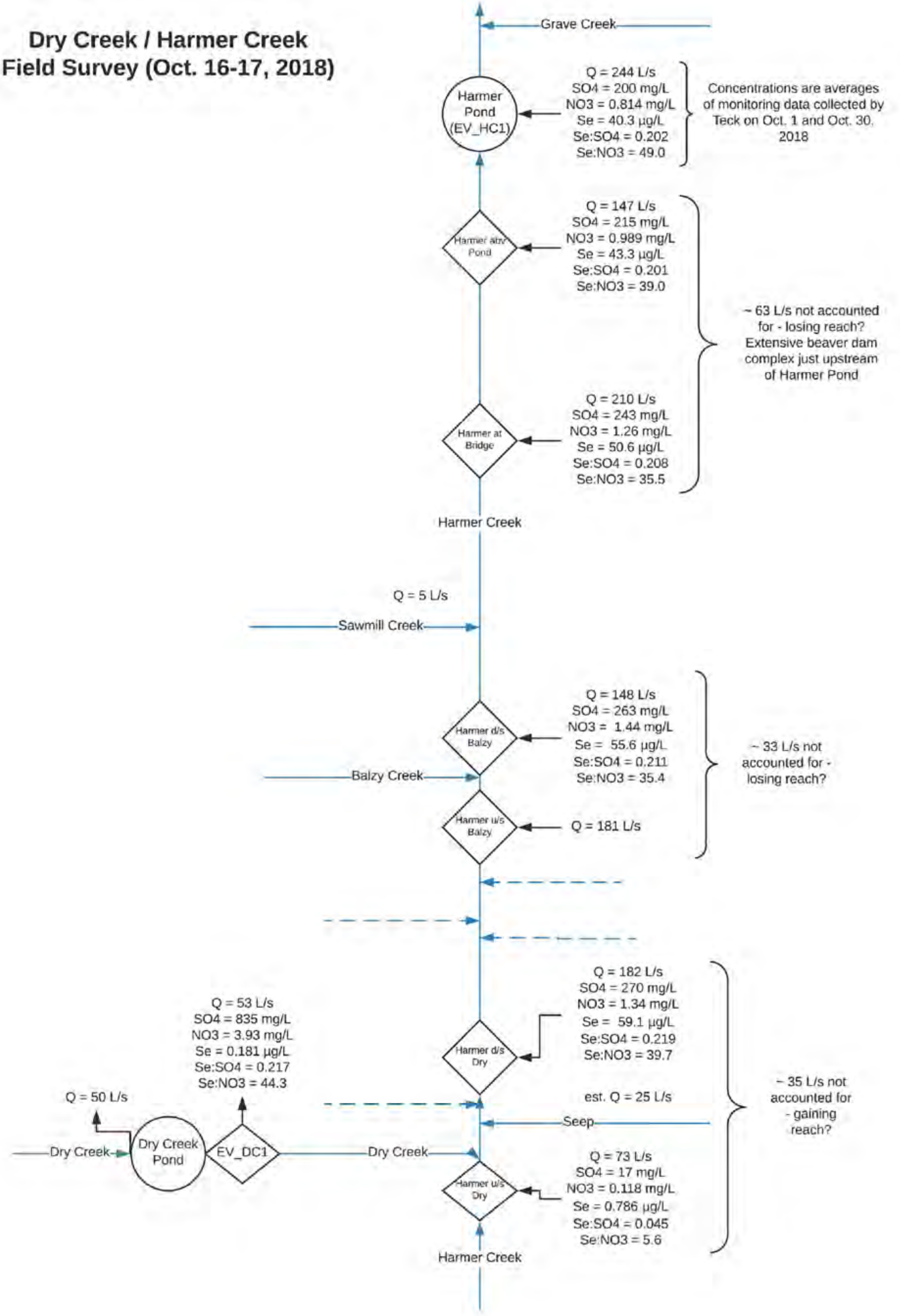
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

Attachment C

Lorax Flow Accretion Study Field Measurements

Dry Creek / Harmer Creek Field Survey (Oct. 16-17, 2018)



		CLIENT:	*PROJECT:* **EVO Dry Creek and Harmer Creek Local Flow and Water Quality Investigation**
		LORAX ENVIRONMENTAL	*TITLE:* Schematic Illustrating October Field Survey Measurements in Harmer Creek Watershed
			PROJECT #: A513-1 — *FIGURE:* 4-2

P:\@Drafting\Harmer-Dry\Drafting Figures\MXD\Flow Diagram_20190212.mxd

Attachment D

SNC-Lavalin Flow Accretion Study Tables, Drawings, and Figures

Table D: Spring Flow Accretion Study – Grave Creek Data Summary Table

Stream	Reach	Site #	SWQ Sample Name	UTM Z11		Date (MM/DD) (2020)	Time	Discharge (L/s)	Method	Temperature (°C)	pH	Specific Conductance (µS/cm)	DO (mg/L)	ORP (mV)	Reach Type*	Notes
				Easting (m)	Northing (m)											
Grave Creek	Main	GCm.0226	RG_FLA_GV1	653545	5523411	05/11	10:25	3468	Dye-Tracer	3	8.12	525.6	11.7	208.8	No further downstream measurement	
Grave Creek	Main	GCm.0226	-	653545	5523411	05/12	7:20	3384	Dye-Tracer	-	-	-	-	-	No further downstream measurement	Duplicate measurement on May 12, 2020
Grave Creek	Main	GCm.0977	RG_FLA_GV2	654193	5523365	05/11	12:10	3533	Dye-Tracer	3.1	8.23	525.5	11.6	127.8	Stable - Equilibrium Channel Morphology	
Grave Creek	Main	GCm.1291	RG_FLA_GV3	654463	5523505	05/11	13:55	3537	Dye-Tracer	3.4	8.3	521.7	11.3	123.8	Stable - Equilibrium Channel Morphology	
Tributary	Tributary	GCt.1400	-	654590	5523616	05/11	16:20	18	Estimate	-	-	-	-	-	-	Tributary entering on right side downstream of GCm.1458
Grave Creek	Main	GCm.1458	RG_FLA_GV4	654601	5523596	05/11	14:45	3546	Dye-Tracer	3.4	8.33	518.3	11.3	115.2	Stable - Equilibrium Channel Morphology	
Tributary	Tributary	GCt.1636	-	654760	5523611	05/11	16:30	5	Estimate	-	-	-	-	-	-	Tributary entering on right side downstream of GCm.2357
Grave Creek	Main	GCm.2357	RG_FLA_GV5	655302	5523537	05/12	9:10	3263	Dye-Tracer	2.6	8.2	534.2	11.2	241.8	Gaining – Partially Confined Valley Corridor	
Grave Creek	Main	GCm.3300	RG_FLA_GV6	655760	5522780	05/12	12:00	3330	Dye-Tracer	3.9	8.34	532.4	10.8	120.8	Stable - Partially Confined Valley Corridor	
Grave Creek	Main	GCm.3595	RG_FLA_GV7	655992	5522596	05/12	13:10	3331	Dye-Tracer	3.8	8.3	532.0	10.9	113.3	Stable - Partially Confined Valley Corridor	
Seep	Seep	GCp.3830	-	656191	5522501	05/12	14:35	3	Estimate	-	-	-	-	-	Seep	Seep entering on right side downstream of GCm.4025
Grave Creek	Main	GCm.4025	RG_FLA_GV8	656310	5522335	05/12	15:00	3241	Dye-Tracer	3.6	8.27	379.6	10.8	104.0	Stable - Partially Confined Valley Corridor	
Grave Creek	Main	GCm.4025	-	656310	5522335	05/13	7:45	3268	Dye-Tracer	-	-	-	-	-	Stable - Partially Confined Valley Corridor	Duplicate measurement on May 13, 2020
Grave Creek	Main	GCm.4333	RG_FLA_GV9	656612	5522192	05/13	10:20	1017	Dye-Tracer	2.2	8.23	287.1	11.4	208.0	Confined Valley Corridor	Upstream of confluence with Harmer Creek
Harmer Creek	Tributary	HAt.4608	RG_FLA_HM1	656790	5522100	05/13	11:25	2247	Dye-Tracer	4.2	8.29	637.0	10.7	159.0	Stable - Equilibrium Channel Morphology	
Seep	Seep	HAp.5396	-	657446	5521842	05/13	13:45	4	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5403
Harmer Creek	Tributary	HAt.5403	RG_FLA_HM2	657445	5521825	05/13	13:15	2170	Dye-Tracer	4.6	8.27	647.2	10.5	113.2	-	Harmer Creek Pond downstream

Table D (Cont'd): Spring Flow Accretion Study – Grave Creek Data Summary Table

Stream	Reach	Site #	SWQ Sample Name	UTM Z11		Date (MM/DD) (2020)	Time	Discharge (L/s)	Method	Temperature (°C)	pH	Specific Conductance (µS/cm)	DO (mg/L)	ORP (mV)	Reach Type*	Notes
				Easting (m)	Northing (m)											
Seep	Seep	HAp.5579	-	657595	5521739	05/13	14:55	3	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5828
Seep	Seep	HAp.5586	-	657598	5521732	05/13	14:55	3	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5828
Seep	Seep	HAp.5621	-	657615	5521703	05/13	14:50	2	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5828
Harmer Creek	Tributary	HAt.5828	RG_FLA_HM3	657747	5521545	05/13	14:40	2157	Dye-Tracer	5.2	8.28	645.0	10.3	119.1	Stable - Equilibrium Channel Morphology	

*For reach type descriptions, see Table G: Geomorphic Planform Classification. The classification of the reach describes the features between the site location and the next measured location downstream.

Table E: Fall Flow Accretion Study – Grave Creek Data Summary Table

Stream	Reach	Site #	SWQ Sample Name	UTM Z11		Date (MM/DD) (2020)	Time	Discharge (L/s)	Method	Temperature (°C)	pH	Specific Conductance (µS/cm)	DO (mg/L)	ORP (mV)	Reach Type*	Notes
				Easting (m)	Northing (m)											
Grave Creek	Main	GCm.0226	RG_FLA_GV1	653545	5523411	10/05	10:47	349	Salt-Tracer	5.7	8.29	621	11.4	224.8	No further downstream measurement	
Grave Creek	Main	GCm.0977	RG_FLA_GV2	654193	5523365	10/05	11:49	344	Salt-Tracer	6	8.45	618	11.3	189.2	Stable - Equilibrium Channel Morphology	
Grave Creek	Main	GCm.1291	RG_FLA_GV3	654463	5523505	10/05	13:08	339	Salt-Tracer	6.8	8.46	616	11.0	170.7	Stable - Equilibrium Channel Morphology	
Tributary	Tributary	GCt.1400	-	654590	5523616	10/05	14:53	2.4	Estimate	-	-	-	-	-	-	Tributary entering on right side downstream of GCm.1458
Grave Creek	Main	GCm.1458	RG_FLA_GV4	654601	5523596	10/05	13:56	354	Salt-Tracer	7.1	8.5	616	10.9	151.5	Stable - Equilibrium Channel Morphology	
Tributary	Tributary	GCt.1636	-	654760	5523611	10/05	13:40	0.5	Estimate	-	-	-	-	-	-	Tributary entering on right side downstream of GCm.2357
Grave Creek	Main	GCm.2357	-	655302	5523537	10/05	15:48	326	Salt-Tracer	-	-	-	-	-	Gaining – Partially Confined Valley Corridor	
Grave Creek	Main	GCm.2357	RG_FLA_GV5	655302	5523537	10/06	9:01	340	Salt-Tracer	6.8	8.27	627	10.6	206.5	Gaining – Partially Confined Valley Corridor	Duplicate measurement on October 6, 2020
Grave Creek	Main	GCm.3300	RG_FLA_GV6	655760	5522780	10/06	11:29	335	Salt-Tracer	7.2	8.39	619	10.7	75.2	Stable - Partially Confined Valley Corridor	
Grave Creek	Main	GCm.3595	RG_FLA_GV7	655992	5522596	10/06	12:28	337	Salt-Tracer	7.2	8.39	620	10.6	103.3	Stable - Partially Confined Valley Corridor	
Seep	Seep	GCp.3630	-	656023	5522591	10/06	12:34	0.8	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of GCm.4025
Seep	Seep	GCp.3740	-	656104	5522538	10/06	11:01	0.2	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of GCm.4025
Seep	Seep	GCp.3765	-	656123	5522500	10/06	13:43	2.0	Estimate	-	-	-	-	-	-	Seep entering on left side downstream of GCm.4025
Grave Creek	Main	GCm.4025	RG_FLA_GV8	656310	5522335	10/06	14:00	338	Salt-Tracer	7.3	8.39	618	10.6	123.5	Stable - Partially Confined Valley Corridor	
Grave Creek	Main	GCm.4333	RG_FLA_GV9	656612	5522192	10/06	14:54	69	Salt-Tracer	7.3	8.32	359.1	10.5	120.5	Confined Valley Corridor	Upstream of confluence with Harmer Creek
Harmer Creek	Tributary	HAt.4608	-	656790	5522100	10/06	16:05	251	Salt-Tracer	-	-	-	-	-	Stable - Equilibrium Channel Morphology	Duplicate measurement on October 7, 2020
Harmer Creek	Tributary	HAt.4608	RG_FLA_HM1	656790	5522100	10/07	9:05	253	Salt-Tracer	7	8.32	679	10.4	211.1	Stable - Equilibrium Channel Morphology	
Seep	Seep	HAp.5396	-	657446	5521842	10/07	10:16	1.0	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5403
Harmer Creek	Tributary	HAt.5403	RG_FLA_HM2	657445	5521825	10/07	10:40	253	Salt-Tracer	6.3	8.42	683	10.8	173.9	-	Harmer Creek Pond downstream

Table E (Cont'd): Fall Flow Accretion Study – Grave Creek Data Summary Table

Stream	Reach	Site #	SWQ Sample Name	UTM Z11		Date (MM/DD) (2020)	Time	Discharge (L/s)	Method	Temperature (°C)	pH	Specific Conductance (µS/cm)	DO (mg/L)	ORP (mV)	Reach Type*	Notes
				Easting (m)	Northing (m)											
Seep	Seep	HAp.5579	-	657595	5521739	10/07	11:13	0.3	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5828
Seep	Seep	HAp.5586	-	657598	5521732	10/07	11:14	0.5	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5828
Seep	Seep	HAp.5621	-	657615	5521703	10/07	11:16	0.5	Estimate	-	-	-	-	-	-	Seep entering on right side downstream of HAt.5828
Harmer Creek	Tributary	HAt.5828	RG_FLA_HM3	657747	5521545	10/07	11:44	244	Salt-Tracer	6.8	8.49	684	10.8	150.7	Stable - Equilibrium Channel Morphology	

*For reach type descriptions, see Table G: Geomorphic Planform Classification. The classification of the reach describes the features between the site location and the next measured location downstream.

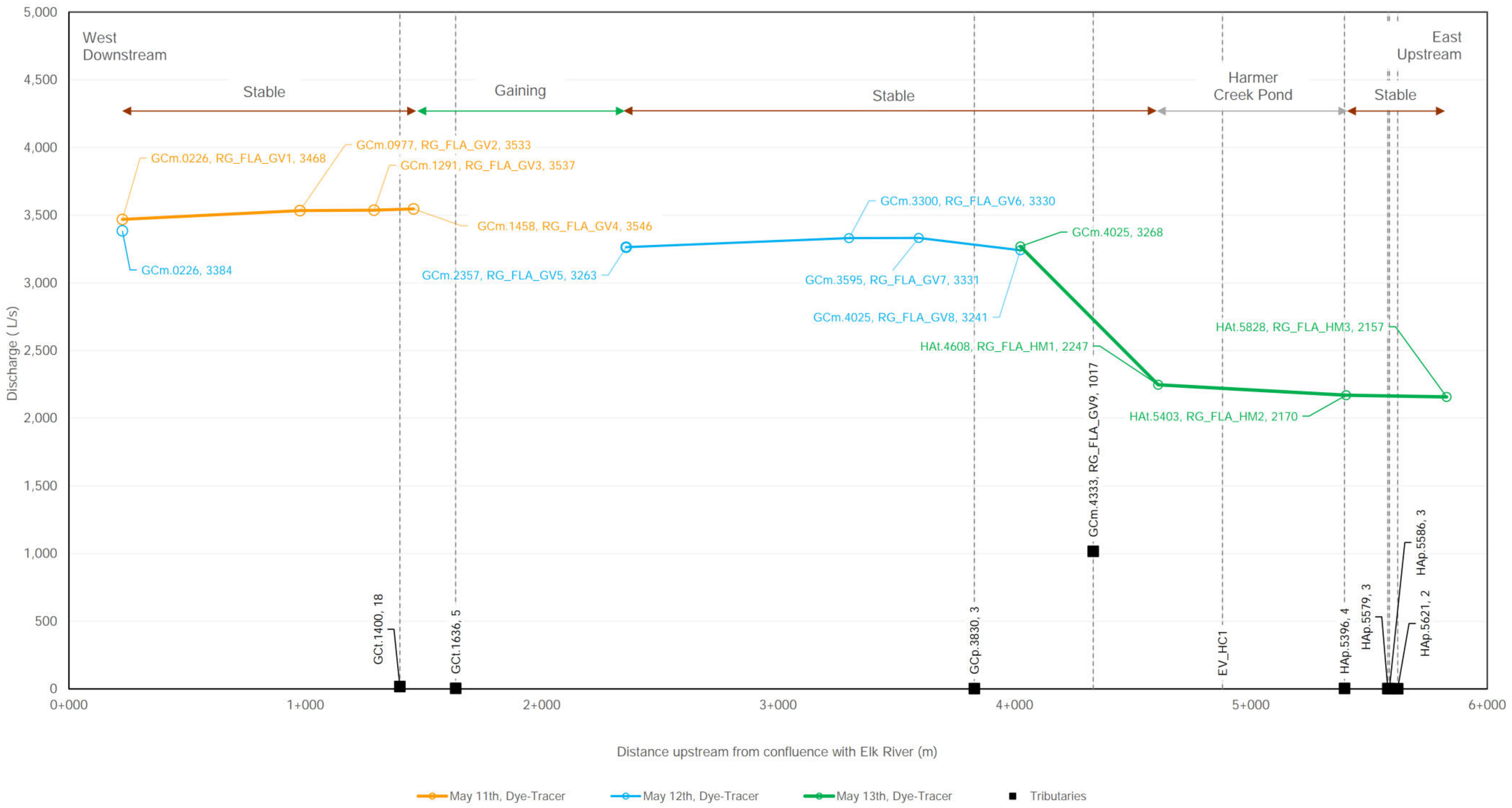


Figure A: Spring Flow Accretion Study – All Grave Creek and Grave Creek tributary measurements (May 2020)

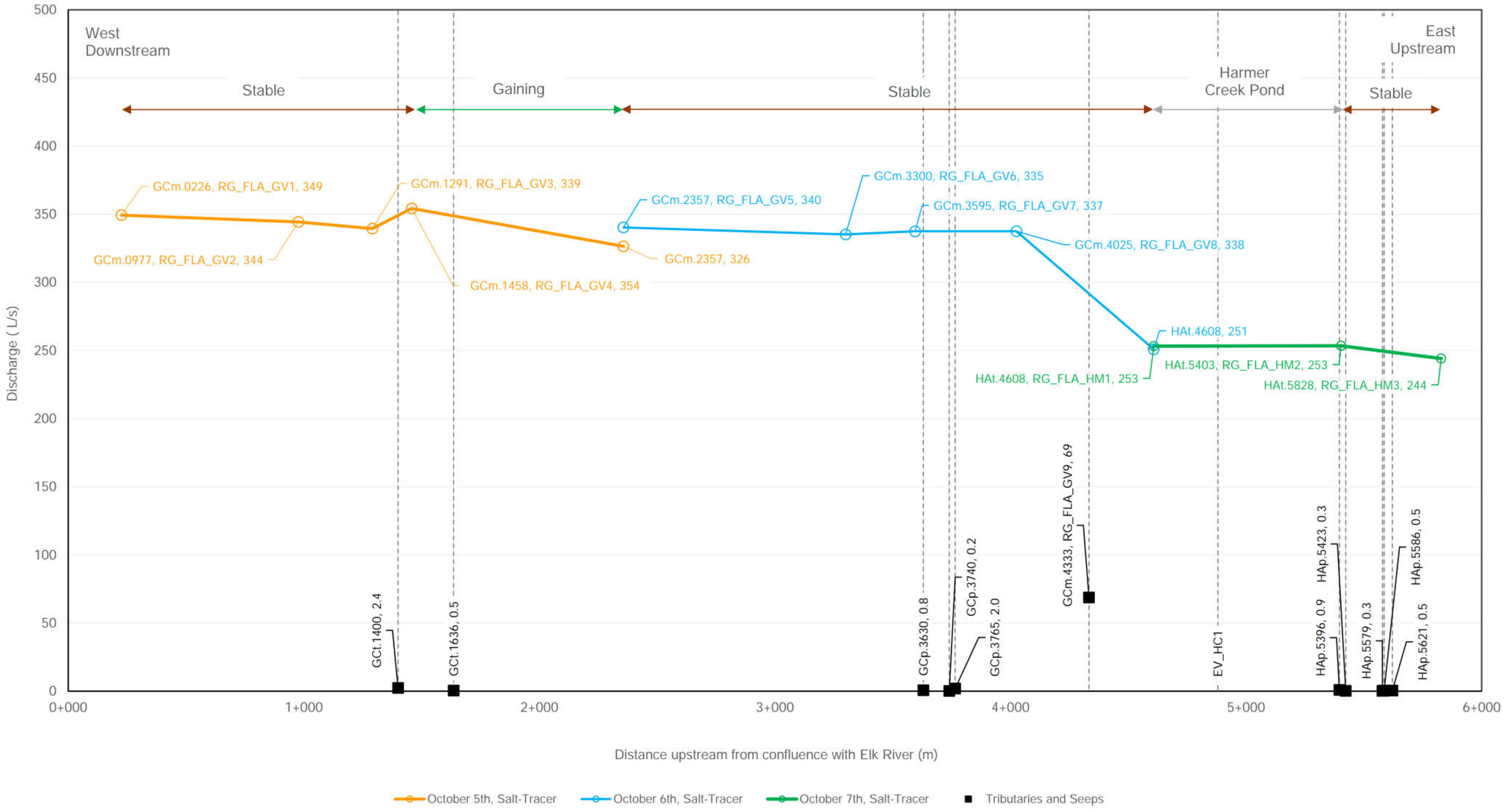
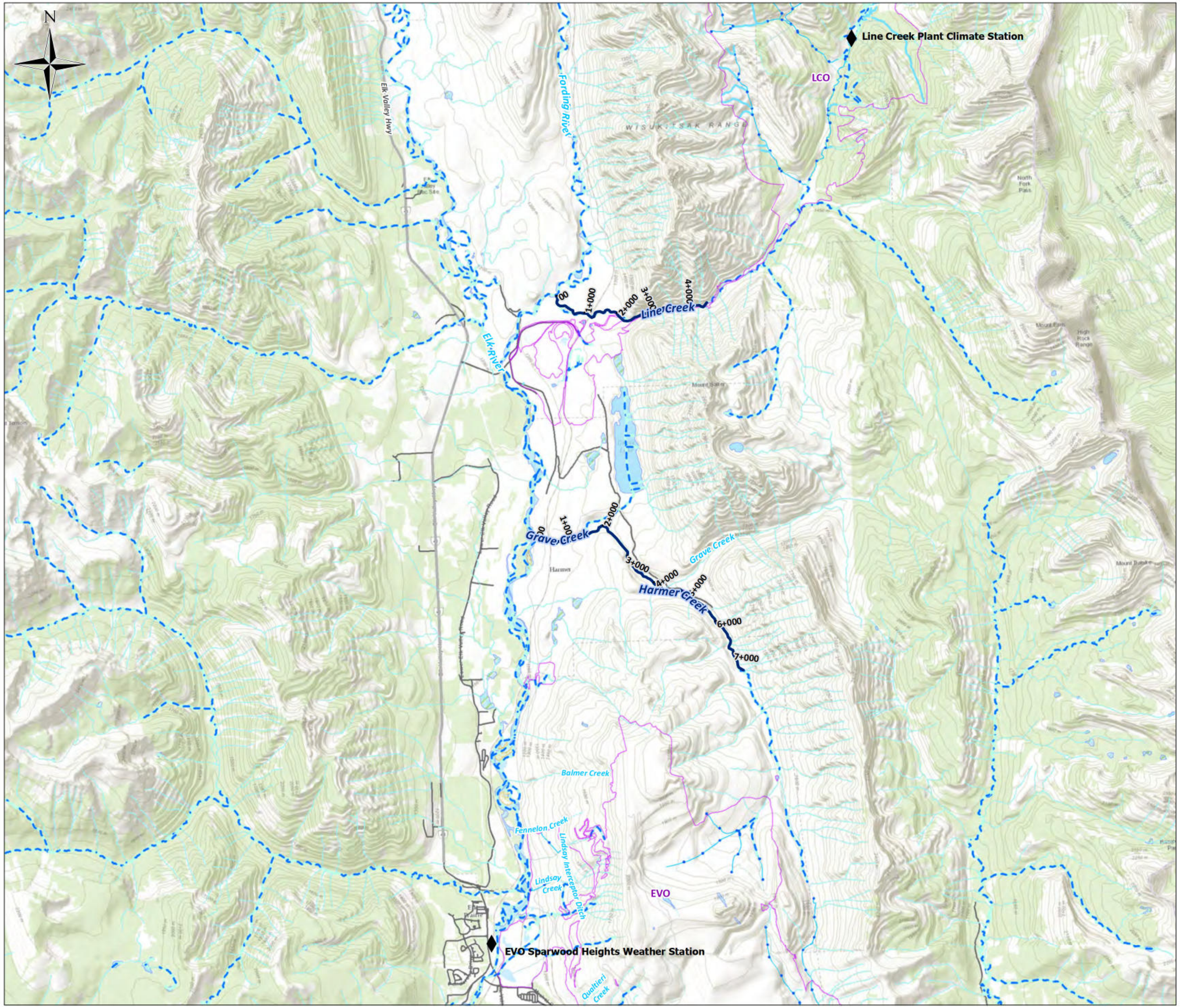


Figure B: Fall Flow Accretion Study – All Grave Creek and Grave Creek tributary measurements (October 2020)



Legend

▬	Line/Grave Creek Chainage
☐	Mine Permitted Areas
┈	Intermittent Stream
╌	Stream Ditch
─	Stream
┄	Subsurface
▬	Highway
─	Secondary Road
▨	Island
🟦	Lake
🟦	River Bed
▨	Wetland

NOTES:
1. Original in colour.
2. Numerical scale reflects full-size print. Print scaling will distort this scale; however, scale bar will remain accurate.
3. Intended for illustration purposes. Accuracy has not been verified for construction or navigation

REFERENCES:
1. Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

REVISIONS:
0 - CW - 2020-10-05 - DRAFT - BR
1 - AO - 2020-12-03 - FINAL CW

0 1,050 2,100 4,200 6,300 8,400 Meters

CLIENT:
Fording River Operations, BC

PROJECT LOCATION:
Teck Coal Ltd

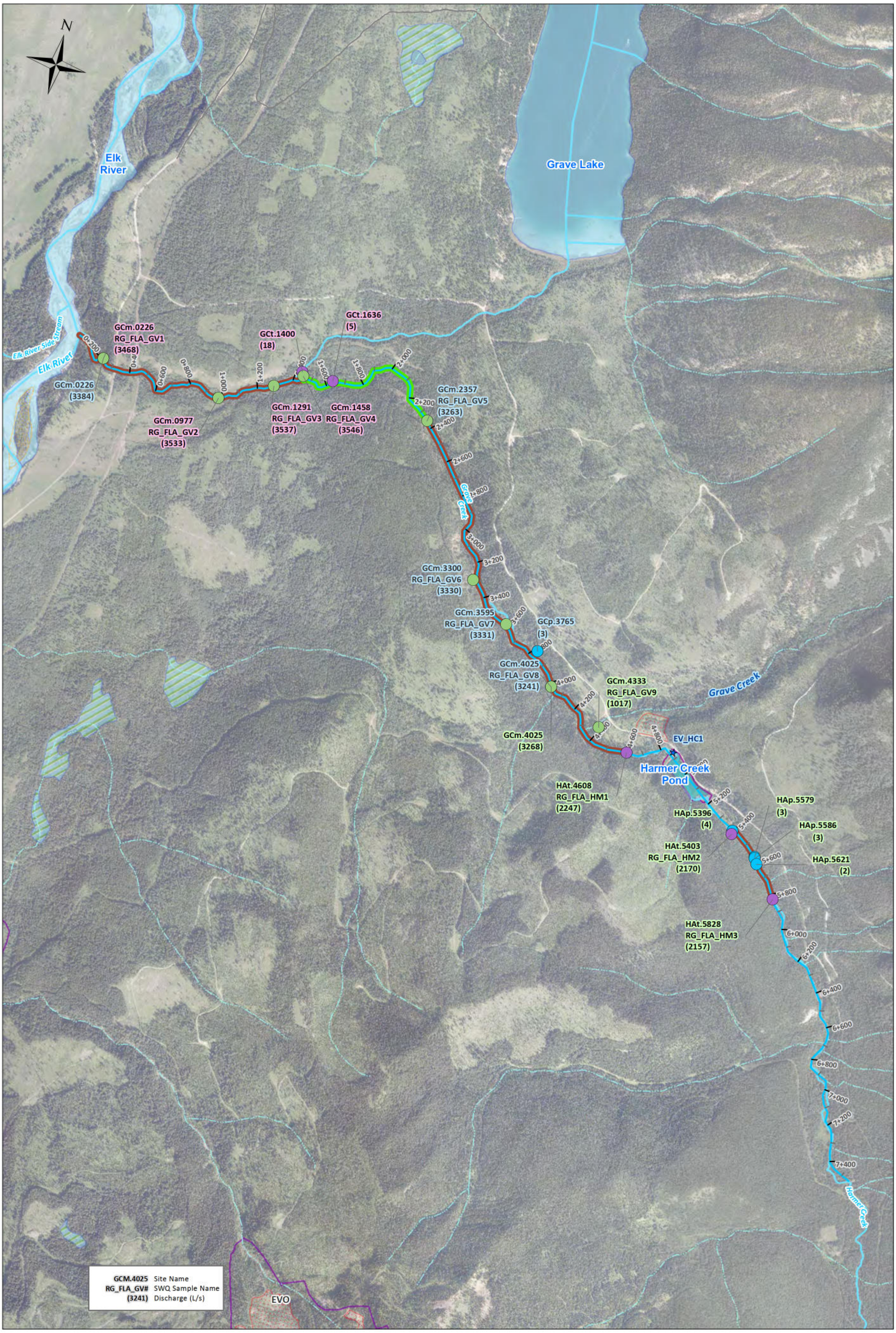
SNC·LAVALIN

Study Areas

BY: CW | SCALE: 1:100,000 | DATE: 2020/12/03 | REF No: | REV: 0
CHK'D: BR | Proj Coord Sys: NAD 1983 UTM Zone 11N | **Drawing 400**

MXD Path: P:\Current Projects\Teck Coal Ltd\GISCAD\GIS\Map Series\658004_GHO_Hydrogeo\Drawing 400 - Grave and Line Creek Location Plan1.mxd

Project Path: \\Sli2606\projects\Current Projects\Teck Coal Ltd\GISCAD\Exports\FLOW



Sample Location
- ● Main
- ● Tributary
- ● Seep

Surface Water Stations
- ★ Compliance Point

Site Features
- — Road
- ▨ Tailings/Settling Pond
- ☐ EVO
- ▨ Waste Dump (Spoils)

Water Features
- ┈ Intermittent Stream
- — Stream
- ▨ Island
- ▨ Lake
- ▨ River Bed
- ▨ Wetland
- ▬ Gaining
- ▬ No Change

GAm.**** Flow Measured and/or Sampled on May 11, 2020
GAm.**** Flow Measured and/or Sampled on May 12, 2020
GAm.**** Flow Measured and/or Sampled on May 13, 2020

Notes:
1. Original in colour.
2. Numerical scale reflects full-size print. Print scaling will distort this scale, however scale bar will remain accurate.
3. Intended for illustration purposes, accuracy has not been verified for construction or navigation purposes.
4. All flow measurements are in L/s.

References:
1. Imagery provided by Teck Coal Ltd. 2019

Revisions:
0 - CW - 2020-10-05 - DRAFT - BR
1 - AO - 2020-12-03 - FINAL CW

0 125 250 500 750 1,000 Meters

PROJECT LOCATION: Greenhills Operations, BC

CLIENT NAME: Teck Coal Limited.

SNC·LAVALIN

2020 Grave Creek Flow Locations and Measurements - May 2020

CHK'D: BR	DATE: 2020/12/03	SCALE: 1:20,000	Ref Num: REV: 0
BY: CW	COORD SYS: NAD 1983 UTM Zone 11N		Drawing 401

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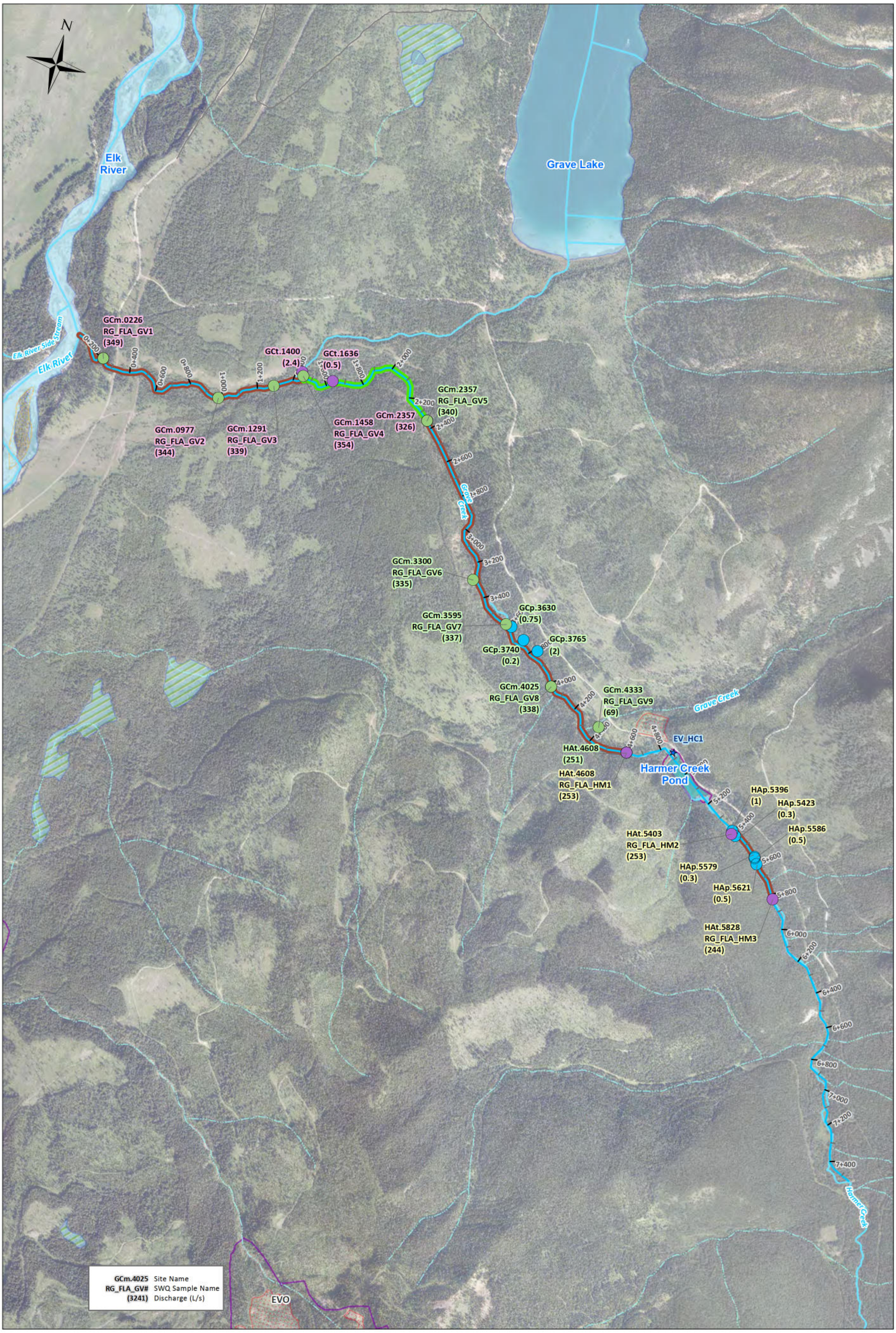

Sampling Location

- 🟢 Main
- 🟣 Tributary
- 🔵 Seep

Surface Water Stations

- ★ Compliance Point

Site Features

- — Road
- ▬ Tailings/Settling Pond
- ▭ EVO
- ▨ Waste Dump (Spoils)

Water Features

- ┈ Intermittent Stream
- — Stream
- ▨ Island
- ▭ Lake
- ▭ River Bed
- ▨ Wetland
- 🟩 Gaining
- 🟫 No Change

GAm.**** Flow Measured and/or Sampled on Oct 5, 2020

GAm.**** Flow Measured and/or Sampled on Oct 6, 2020

GAm.**** Flow Measured and/or Sampled on Oct 7, 2020

Notes:
1. Original in colour.
2. Numerical scale reflects full-size print. Print scaling will distort this scale, however scale bar will remain accurate.
3. Intended for illustration purposes, accuracy has not been verified for construction or navigation purposes.
4. All flow measurements are in L/s.

References:
1. Imagery provided by Teck Coal Ltd. 2019

Revisions:
0 - CW - 2020-10-05 - DRAFT - BR
1 - AO - 2020-12-03 - FINAL CW

0 125 250 500 750 1,000 Meters

PROJECT LOCATION:
Greenhills Operations, BC

CLIENT NAME:
Teck Coal Limited.

SNC·LAVALIN

2020 Grave Creek Flow Locations and Measurements - Oct 2020

CHK'D: BR
BY: CW
DATE: 2020/12/03 SCALE: 1:20,000
COORD SYS: NAD 1983 UTM Zone 11N
Ref Num: REV: 0
Drawing 402

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Project Path: \\Sli2606\projects\Current Projects\Teck Coal Ltd\GISCAD\Exports\FLOW

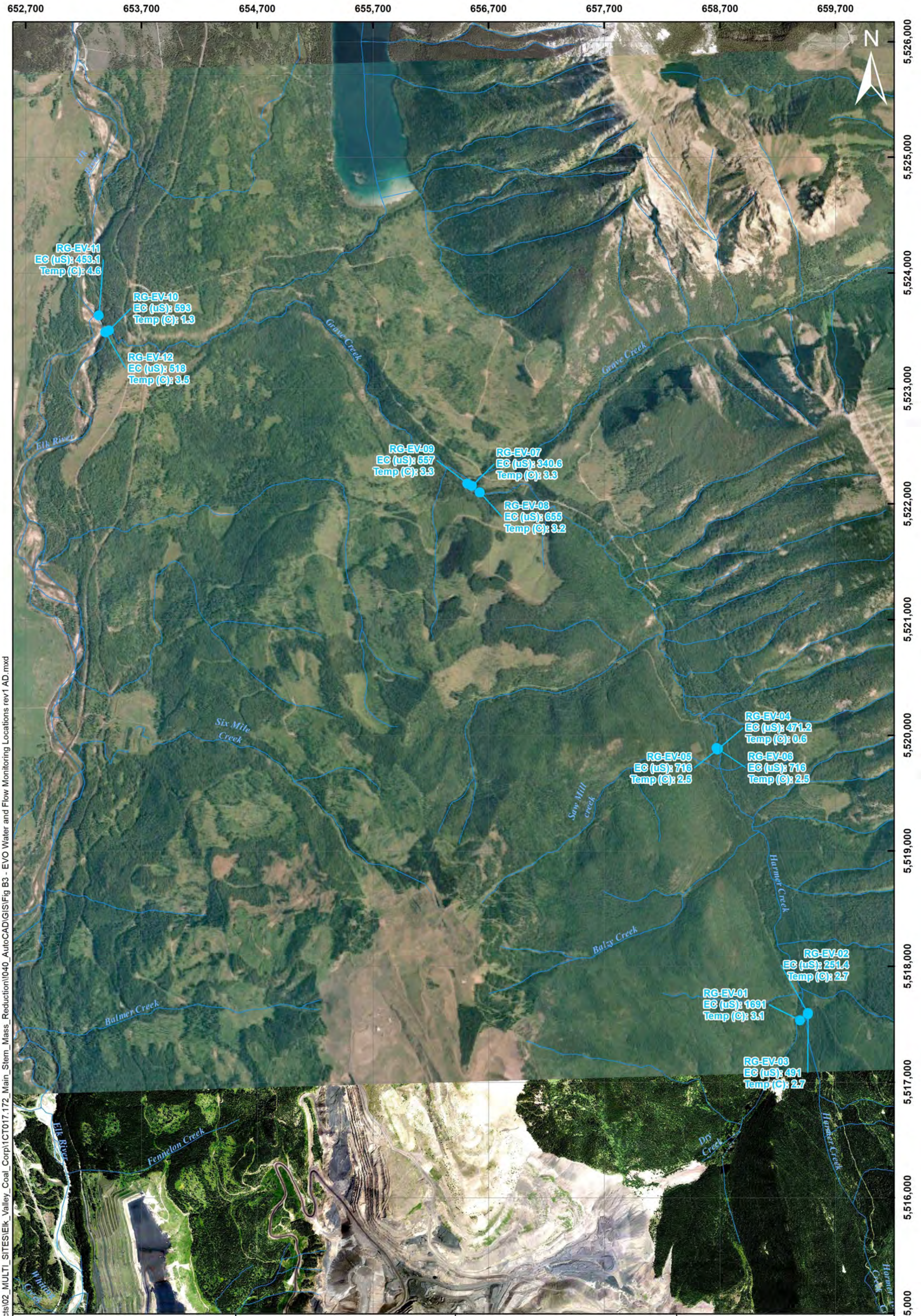
Attachment E

SRK Load Accretion Study Table, Drawing, and Figure

Table 11. Flow and Water Chemistry in Harmer Creek/Grave Creek

Client Sample ID	Location Description	Flow	Temperature	NO_3	SO_4	Cd	Se
		m^3/s		mg-N/L	mg/L	mg/L	mg/L
RG-EV-01	Dry us/ Harmer	0.054	3.1	3.7	800	0.000028	0.16
RG-EV-02	Harmer u/s of Dry	0.066	2.7	0.091	17	<0.000005	0.00061
RG-EV-03	Harmer d/s of Dry	0.12	2.7	1.1	240	0.0000085	0.021
RG-EV-04	Sawmill u/s Grave	0.0039	0.6	<0.005	60	0.000016	0.0012
RG-EV-05	Harmer u/s of Sawmill	0.18	2.5	1.1	240	0.000018	0.043
RG-EV-06	Harmer d/s of Sawmill	0.18	2.5	1.1	240	0.000016	0.048
RG-EV-07	Grave u/s Harmer	0.067	3.3	0.047	29	0.0000087	0.0021
RG-EV-08	Harmer u/s of Grave	0.24	3.2	0.77	200	0.000012	0.034
RG-EV-09	Grave d/s of Harmer	0.28	3.3	0.53	140	0.000011	0.023
RG-EV-10	Grave u/s Elk	0.39	1.3	0.55	160	0.000009	0.025
RG-EV-11	Elk u/s of Grave	10	4.6	2.8	80	0.0000092	0.014
RG-EV-12	Elk d/s of Grave	-	3.5	1.6	120	0.0000077	0.021

Source:
\\srk.ad\dfs\na\van\Projects\02_MULTI_SITES\Elk_Valley_Coal_Corp\1CT017.172_Main_Stem_Mass_Reduction\400_Data_Analysis\SW_Sinks\[LoadLoss_1CT017172_SJD_R0.xlsx]



0 0.4 0.8 Kilometers

srk consulting

Teck

Job No: 1CT017.172

Filename: Fig B3 - EVO Water and Flow Monitoring Locations rev1 AD

Elk Valley

Main Stem Mass Reduction

Hypothesis 3
EVO Water and Flow Monitoring Locations

Date: May 2019

Approved: SJD

Figure: B3

\\srk.ad\dfs\na\van\Projects\02_MULTI_SITES\Elk_Valley_Coal_Corp\1CT017.172_Main_Stem_Mass_Reduction\!040_AutoCAD\GIS\Fig B3 - EVO Water and Flow Monitoring Locations rev1 AD.mxd

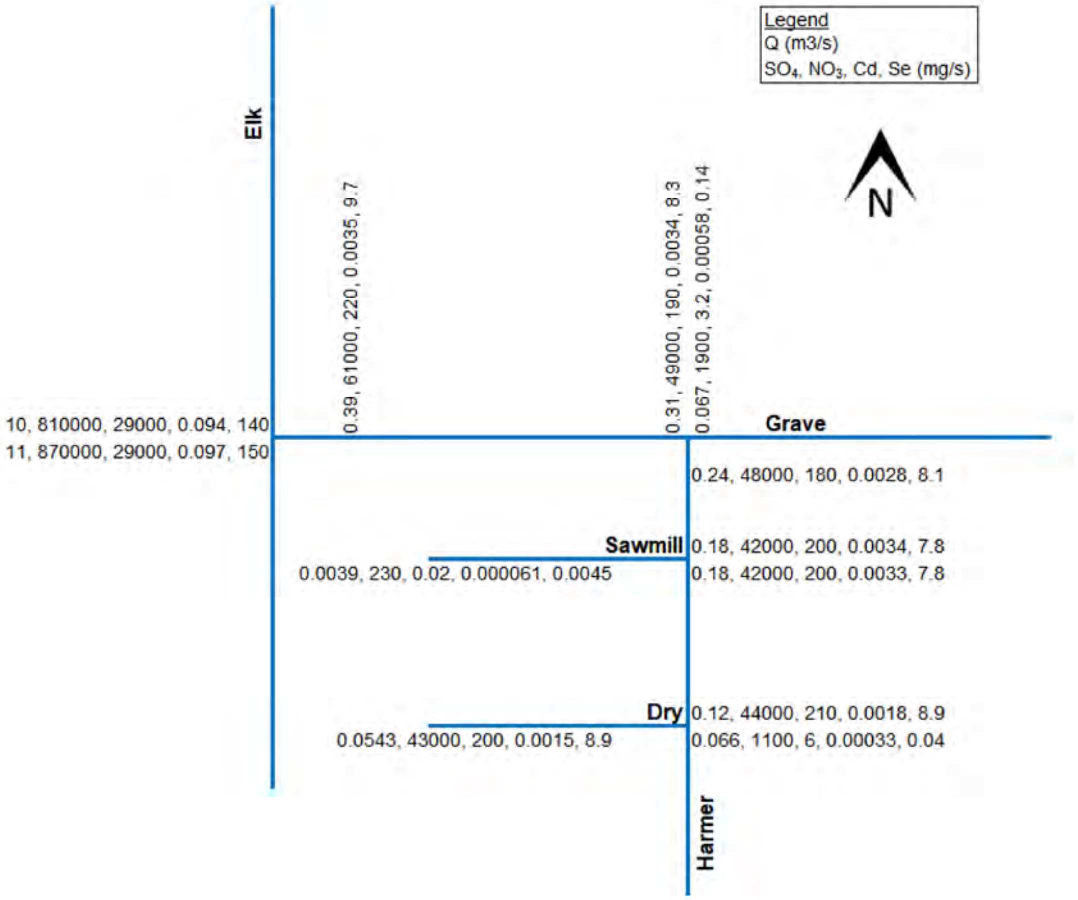


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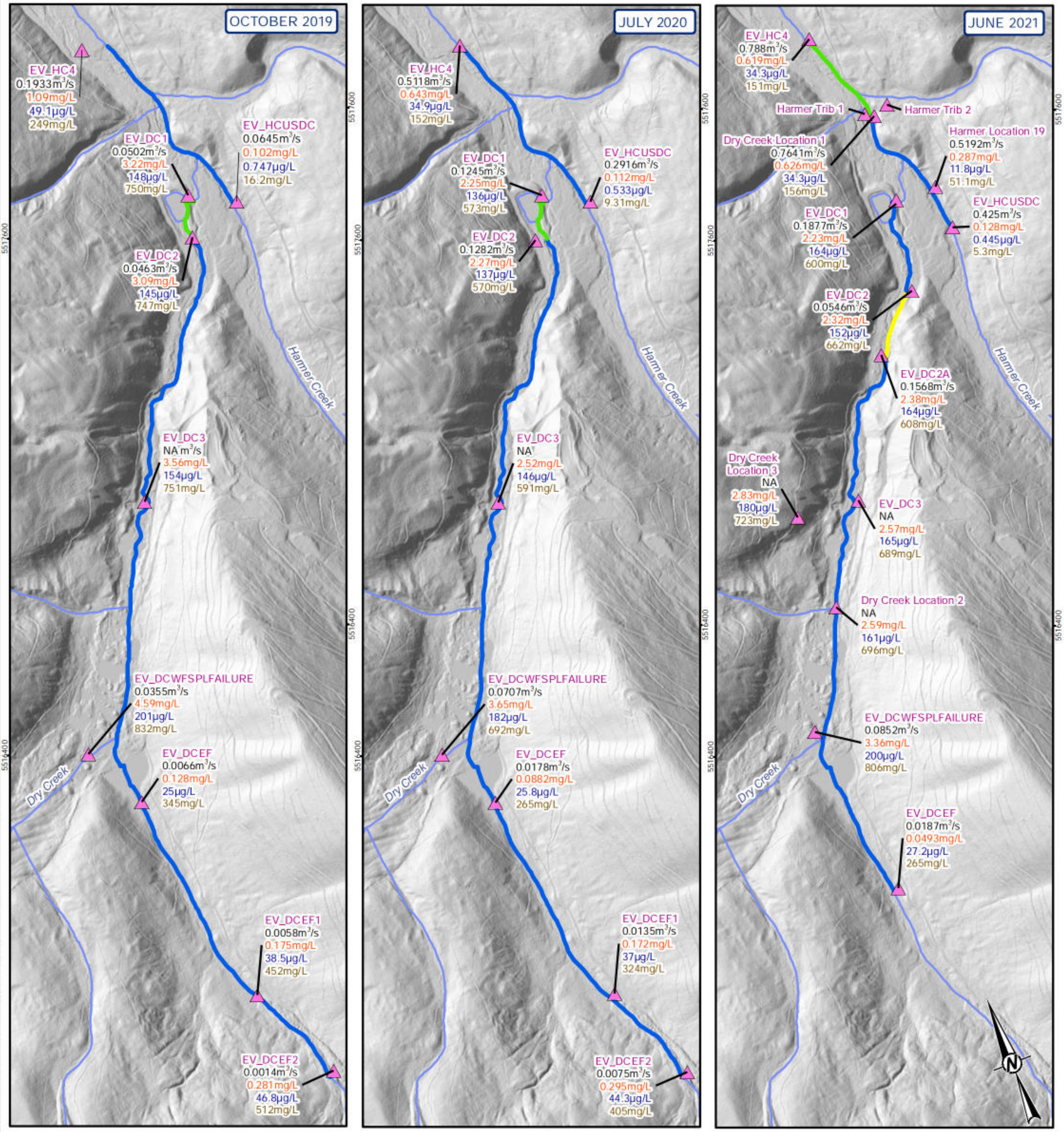
Figure 29. Schematic of Load Balance in Harmer Creek/Grave Creek.

Attachment F

Golder Flow Accretion Figure and Groundwater Quality Results



LEGEND

WATERCOURSE	
▲	SURFACE DISCHARGE MEASUREMENT POINT
	0.084 DISCHARGE m³/s

CONCENTRATION RESULT LABELS

NITRATE (mg/L)
SELENIUM (T-µg/L)
SULPHATE (mg/L)

FLOW ACCRETION RESULTS

🟦	GAINING REACH (INFLOW >10% OF UPSTREAM DISCHARGE)
🟩	NEUTRAL REACH (CHANGE < 10% OF UPSTREAM DISCHARGE)
🟨	LOSING REACH (OUTFLOW >10% OF UPSTREAM DISCHARGE)

0 250 500
1:14,000 METRES

NOTES / REFERENCES
1. FLOW ACCRETION DATA OBTAINED FROM THE KWL DRY CREEK FLOW ACCRETION STUDIES NOVEMBER 2019 - 2265-066-300 , JULY 2020 - 2628.076-300 AND JULY 2021 - 2628.091.
2. HYDROGRAPHY AND AERIAL/HILLSHADE (2020) OBTAINED FROM TECK COAL LIMITED.
3. NA = NOT AVAILABLE AS FLOW COULD NOT BE ACCURATELY MEASURED DUE TO THE BRAIDED NATURE OF THE CREEK.
4. THE CO-ORDINATES FOR THE DATA COLLECTION POINTS ARE CONSISTENT WITH THE SOURCE MATERIAL WITH THE EXCEPTION OF JUNE 2021 (& EV_HCF JULY 2020) WHERE SOME POINTS HAVE BEEN SLIGHTLY SHIFTED SO AS TO FALL ON THE CREEK.
PROJECTION: UTM ZONE 11 DATUM: NAD 83

CLIENT
TECK COAL LIMITED

PROJECT
EVO SRF PHASE 3 GROUNDWATER CONCEPTUAL MODEL

TITLE
FLOW ACCRETION - DRY CREEK

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-30
DESIGNED	TG
PREPARED	VMB
REVIEWED	GM
APPROVED	RM

PROJECT NO.	PHASE	REV.	FIGURE
20448959		0	6

Table 1: Summary of Physical Hydraulic Properties and CI Water Quality Results

Well ID	Well Installation Target	Screened Lithology	Screened Interval (mGL)	Type of Testing Completed	Hydraulic Conductivity (m/s)	Groundwater Elevation (masl)	Nitrate (as N) (mg/L)	Sulphate (mg/L)	Total Selenium (µg/L)	Sampling Date
EV_MW_DC1	Deep Overburden	Sandy Gravel	24 – 30	Slug Testing	1×10^{-5}	1451.42	0.0234	102	9.84	March 12, 2021
						1453.73	0.467	217	0.023	May 27, 2021
EV_MW_DC2	Bedrock	Limestone & Siltstone (Bedrock)	35.9 – 52.8	Constant Rate Pumping Test	4×10^{-7} (1) (Bulk)	1451.08	1.24	314	74.7	March 12, 2021
						1454.13	0.352	101	0.013	May 28, 2021
EV_MW_DC3	Fine Grained Unit	Silty/Clayey Gravel	9.0 – 10.5	Slug Testing	4×10^{-6} (2)	1452.81	3.36	787	181	March 12, 2021
						1453.9	1.64	489	0.114	May 26, 2021
EV_MW_DC4	Fine Grained Unit	Silty/Clayey Gravel	8.5 – 13.7	Slug Testing	6×10^{-6}	1450.31	2.62	703	148	March 12, 2021
						1452.04	1.70	501	0.109	May 26, 2021
EV_MW_DC5	Fill	Gravel (Fill)	3.7 – 5.2	Slug Testing	1×10^{-4}	1458.57	3.59	805	176	March 12, 2021
						1458.57	1.10	271	0.066	May 29, 2021
EV_MW_DC6	Bedrock	Limestone (Bedrock)	16.6 – 32.0	Constant Rate Pumping Test	1×10^{-6} (1) (Bulk)	1459.69	3.69	830	180	March 12, 2021
						1460.77*	1.11	268	0.067	May 28, 2021
EV_MW_DC7	Shallow Overburden	Silty Gravel	9.2 – 10.7	Slug Testing	3×10^{-5}	1452.12	2.89	621	134	March 12, 2021
						1452.53	1.13	406	0.058	May 28, 2021
EV_PW_DC1	Deep Overburden	Sandy Gravel	17.5 – 29.7	Constant Rate Pumping Test	1×10^{-5}	1452.24	2.74	716	129	March 12, 2021
						1453.58	-	-	-	May 28, 2021
BH20-1D	Bedrock	Bedrock	12 – 15.1	-	-	1456.67	n/a	n/a	n/a	March 12, 2021
EV_DC1	Surface Water Sampling Location			-	-	-	2.25	575	136	March 12, 2021
Water Level at the Pond	-			-	-	1457.6 (3)	-	-	-	March 12, 2021

Note(s): mGL = meters below ground levels; m/s = metres per second; masl = metres above sea level, mg/L = milligrams per litre; µg/L = micrograms per litre, n/a = not available

1) Geometric mean of estimated hydraulic conductivity during constant rate pumping test (i.e., drawdown, recovery and late time recovery).

2) Slug test results provided two matchable curves, a geometric mean of two hydraulic conductivity estimates has been provided (Golder 2021a).

3) The Dry Creek Sediment Pond level was measured at the top of the ice which is believed to be representative of the Pond decant elevation.