Annual Quartz Mining Licence Report for 2019

Property: Sä Dena Hes Mine

Permit# : QML-0004

Company: Sä Dena Hes Operating Corporation c/o Teck Resources Limited

Prepared By: Gerry Murdoch, Project Manager, Reclamation
Michelle Unger B.Sc., Manager Environmental Performance

Issued Date: March 30, 2020

Executive Summary

The Annual Reclamation Report for 2019 for the Sä Dena Hes (SDH) mine site was prepared by Teck Resources Limited on behalf of Sä Dena Hes Mining Corporation, as required in accordance with Yukon Quartz Mining License QML-0004. This annual report describes the progress of closure and reclamation related activities at the Sä Dena Hes Mine in 2019.

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly-owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

Permanent closure and decommissioning activities commenced in 2013 and were completed in 2015. Reclamation activities conducted at the site includes applying a simple cover, using natural glacial till materials, to most mine disturbed areas limiting the release of contaminants to the air, water and land. Surface contouring and vegetation have been completed for protection against water erosion. A revegetation program was implemented once the cover system was finished in 2015.

In 2019, samples from all of the required water quality monitoring stations met the standards in water use licence QZ16-051 for all water quality parameters. Water quality monitoring was also conducted under the Adaptive Management Plan (AMP) as part of the Water Licence. Although there were a few specific performance threshold exceedances, review of available water quality data, and information from subsequent sampling events, no additional actions were deemed necessary.

Revegetation monitoring was conducted for the fourth year. Willow and Alder were the most successful species in terms of vigour and growth. Many Poplar plants however were increasing in size and branching out. The overall survival rate continues to be high: greater than 70% in 10 of the 14 plots. The survival rate at the other 4 plots ranged from 48.6% to 69.5%.

Physical work conducted at the site in 2019 included placing a 30cm till cap on 1,384 m^2 in the mill area as it was considered insufficient and identified in the 2018 Revegetation Report. Regular maintenance was conducted on the main access road culverts, including the installation of one new overflow culvert. The old pump shack on Camp Creek was removed.

Table of Contents

LIST OF APPENDED REPORTS

1. Sä Dena Hes – 2019 Annual Report Yukon Water Licenses QZ16-051 dated March 2020, prepared by Ensero Solutions
2. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, dated October 2019, prepared by Laberge Environmental Services

1.0 Introduction

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly-owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

Teck submitted notice to begin "Permanent Closure" to the Ministry of Energy, Mines and Resources (EMR) on February 17, 2012. The Detailed Decommissioning and Reclamation Plan (DDRP) (Teck 2012, 2013) was revised to plan for permanent closure. Permanent closure and decommissioning activities were carried out in 2014 and in 2015. A final DDRP was submitted in August 2015 (Teck, 2015) to account for amendments issued in 2014 and 2015. In 2015 Teck amended the Quartz Mining License (QML-0004), which expires on December 31, 2040. The current status of the site is Permanent Closure and Reclamation.

The objectives of the decommissioning and reclamation plan are to ensure the:

- Protection of public health and safety;
- Implementation of environmental protection measures that minimize adverse environment impacts;
- Ensuring land use commensurate with surrounding lands;
- Post closure monitoring of the site to assess effectiveness of closure measures for the long term.

Reclamation activities conducted at the site includes applying a simple cover, using natural glacial till materials, to most mine disturbed areas limiting the release of contaminants to the air, water and land. Surface contouring and vegetation have been completed for protection against water erosion. A revegetation program was implemented once the cover system was finished in 2015.

The Yukon Water Board regulates water management of the mine site. Water Use Licence QZ16-051 addressing permanent closure came into effect on April 1, 2017.

2.0 2019 Decommissioning and Reclamation Activities

The QML and Water Use Licence both require post-reclamation environmental monitoring, physical/geotechnical inspections, and maintenance of constructed/engineered structures to be completed under the *Environmental Monitoring, Surveillance and Reporting Plan* (EMSRP, 2017) and Adaptive Management Plan (AMP, 2018).

The following summarizes the activities with details further discussed within the subsequent sections:

- Surface Water and Groundwater Quality Monitoring/Sampling
  - Bi-monthly/quarterly surface water and groundwater monitoring and sampling was conducted from January to December as per the Water Use Licence QZ16-051. Access to some of the locations are conducted using helicopter/snowmobiles in the winter months and an all-terrain vehicle in the snow free months.

- Terrestrial Monitoring
  - The 2019 re-vegetation assessment was completed in July to assess the 2015 site planting program.
- Physical/geotechnical inspections
  - Spring and fall routine site inspection of physical/geotechnical features was completed by Teck and the site caretaker.
  - The annual 2019 Dam Safety Inspection (DSI) was completed by the engineer of record in September. As per the QML-0004, the Dam Safety Inspection report was submitted on Dec. 6, 2019.
  - Survey completed on the North Dam settlement gauges in July.
- Maintenance of constructed/engineered structures or access road
  - Beaver dam in the North Creek channel was removed in September.
  - A new overflow culvert was installed at 1km of access road
  - Clean debris from access road culverts.
  - Repair Jewelbox portal drain pipe
  - Demolish old pump shack, back fill culvert casing.
  - A 30cm till cap was placed on 1,384 m^2 in the mill area which was identified in 2018 with insufficient cover.

3.0 2020 Decommissioning and Reclamation Activities

There are no planned physical activities in 2020 other than monitoring the reclaimed areas and completing maintenance of any areas that may be identified following freshet.

The post closure monitoring as outlined in the EMSRP and AMP will be conducted in 2020 as per the Water Licence issued in April 2017.

4.0 Effectiveness of the Remediation Measures

All the physical remediation and revegetation activities were completed in 2015. Based on the current monitoring programs, the remediation measures appear to be effective.

5.0 Map showing the status of all decommissioning and reclamation activities

All the physical remediation and revegetation activities were completed in 2015. In the 2015 Annual Report, several drawings were included within the AMEC 2015 As-built report. Due to the limited physical work and revegetation completed in 2019 there are no updated maps included within this report.

6.0 Inspection of Engineered structures

The 2019 geotechnical inspection of the structures and features associated with the Tailings Management Area at SDH completed by SRK on September 9 & 10, 2019. The inspection report *Sä Dena Hes Mine, Yukon Territory 2019 Dam Safety Inspection, dated December 2019,* (SRK, 2019) submitted to EMR on December 6, 2019.

The report presents SRK's observations of the following structures and features, identifies any deficiencies and provides recommendations where appropriate:

- The North Dam;
- The decommissioned North Creek Dyke and Second Crossing;
- The relocated Camp Creek Channel;
- The North Channel and South Channel;
- The Sediment Retaining Structure (SRS);
- The Burnick Portals (1200 and 1300) and Waste Rock Dumps;
- The Jewelbox and Main Zone Waste Rock Dump and Portal areas.

The South and Reclaim Dams including the tailings were decommissioned in 2014. The Camp Creek Diversion and Exit Chute were decommissioned in 2015. The North Creek Dyke and spillway including a second crossing culvert system on North Creek downstream below the dyke were decommissioned in 2015.

The North Dam remains as an earthen embankment that retains the stored tailings. A variable depth till cover was placed over the tailings in 2014 as a growth medium and to control the migration of windblown tailings. No resloping of the downstream dam face was needed.

The SRS is an approximately 5 m high berm that was formed during the decommissioning and removal of the South Dam. The berm was designed to retain sediment in runoff from the till tailings cover and incorporates a riprap lined spillway. The spillway has capacity for the 1 in 1000-year flood event.

The Burnick 1200 and 1300 Portals were capped in 2015 with locally available waste rock and graded with a gently sloped face to provide long term stability. The crests of the associated waste rock dumps were recontoured to provide added stability. No resloping of the downstream face of the dumps was required.

In summary, based on the 2019 inspection all the geotechnical structures are stable and are functioning in accordance with the closure design parameters. There were no changes to the structures in 2019.

The 2019 Dam Safety Inspection Deficiencies:

- North Creek Channel - 2019-01 Beaver Dam at inlet channel – Remove beaver dam channel – Completed September 5, 2019 - Closed

7.0 Results of Studies and Monitoring Programs

7.1 Water Licence Monitoring

The water quality standards and monitoring requirements are managed under Water Licence QZ16-051 Effective Date April 1, 2017 with the expiry date of December 31, 2040.

The licence describes the water quality monitoring program for post closure monitoring, which is the applicable program for the current status of the SDH (Permanent Closure and Reclamation). The water quality program outlines the sampling sites, frequency and required water quality parameters.

As required by Licence QZ16-051, water quality data is reported quarterly to the Yukon Territory Water Board. The 2019 monitoring results are discussed in the annual report prepared by Alexco Environmental Group entitled *Sä Dena Hes – 2019 Annual Report Yukon Water Licence QZ16-051 dated March 2020* (Ensero, 2020). The report provides a detailed analysis of data and is included as Attachment 1. Surface and groundwater water quality monitoring conducted under the AMP are also included in the water licence monitoring requirements. The AMP describes a means of interpreting data to indicate if water quality is changing from conditions observed over the past 20 years. The plan also describes when and how changes in water quality require a response.

In 2019, samples from all the required water quality monitoring stations met the standards in licence QZ16-051 for all water quality parameters, however, exceedances of the AMP thresholds did occur. Based on the review of available water quality data, and information from subsequent sampling events, no additional actions were deemed necessary.

7.2 Vegetation Monitoring

In 2015, a total 27,000 plugs were planted of *Salix alaxensis, S. bebbiana, S. barclayi, S. planifolia* and *Populus balsamifera* were installed in several discrete areas throughout the reclaim, south pond, north pond and mill areas. The remaining open areas of these sites were planted with approximately 70,000 alder (*Alnus viridis crispa*) plugs. The alder were planted at a much lower density than the other tree species.

Revegetation monitoring was conducted in 2019 by Laberge Environmental Services. The detailed results of the monitoring are included in the attached report entitled *"Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2019"* dated October 2019 (Laberge, 2019). In summary, 14 permanent tree-monitoring plots were established and monitored from July 23th to July 25th, 2019. Overall the survival rate was high with greater than 70% in 10 of the 14 plots. The survival rate at the other 4 plots ranged from 48.6% to 69.5%.

In 2015, grass was hand seeded at an application rate of 44 kg/ha, in various areas throughout the mine site. A low elevation seed mix was used on the reclaimed roads and the lower borrow pit. A high elevation seed mix was used at the Burnick and Jewel Box waste rock zones. Seven grass monitoring plots were established. Overall the grass growth was gradually increasing in all plots since the assessment in 2019, with a significant increase in the plots on Jewelbox.

.

Photograph 1: Reclaimed North Tailings Pond

8.0 Invasive Plants

Similar to 2018, the most common invasive species was Hawksbeard (*Leucantbenum vulgara*) and was generally found sporadically along the road sides within the study area and has increased near monitoring plot VMP-9 at the landfill site (Laberge 2019). As in 2018 individual white sweetclover plants (*Melilotus alba)* were identified near the boneyard site again in 2019 and were removed from site and disposed appropriately.

9.0 Spills and Accidents

There were no reportable spills or accidents in 2019.

10.0 Wildlife Incidents and Other Accidents

There were no direct wildlife incidents or other accidents reported in 2019 other than notable activity of beavers plugging road culverts along the main access road and North Creek Cannel.

11.0 Site Improvements to address Sediment and Erosion

There were no signs of major erosion in any of the capped areas in 2019. Some minor erosion had occurred in 2018 where surface water is collecting and forming into small streams. The capping material contains a component of larger stones that are self-armoring the small steams and reducing the overall erosion. The small streams were reassessed in 2019 and no noticeable additional erosion has occurred.

12.0 Closing

I trust this reports meets the requirements under Part 5, Section 11.4 of QML-0004. Please contact Gerry Murdoch at 250-427-8408 gerry.murdoch@teck.com if you have any questions regarding this report.

Gerry Murdoch
Project Manager
Teck Legacy Properties

13.0 References

Alexco. (2018). *Sa Dena Hes Mine - Post-Reclamation Adaptive Management Plan, dated February 12, 2018.*

Ensero. (2020). *Sä Dena Hes – 2019 Annual Report Yukon Water Licence QZ16-051 dated March 2020.*

Laberge. (2019). *Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, October 2019 prepared by Laberge Environmental Services.*

SRK. (2019). *Sä Dena Hes Mine, Yukon Territory, 2019 Dam Safety Inspection, dated December 2019, prepared by SRK Consulting (Canada) Inc.*

Teck. (2017). *Sa Dena Hes Mine – Environmental Monitoring, Surveillance and Reporting Plan, June 28, 2017.*

Teck. (2018). *Water Licence #QZ16-051 – Sa Dena Hes Mine – Submission of Revised Adaptive Management Plan, dated March 7, 2018.*

APPENDED REPORTS

1. Sä Dena Hes – 2019 Annual Report Yukon Water Licenses QZ16-051 dated March 2020, prepared by Ensero Solutions
2. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, dated October 2019, prepared by Laberge Environmental Services

SÄ DENA HES

2019 ANNUAL REPORT YUKON WATER LICENCE QZ16-051

March 2020

Prepared for:

YUKON WATER BOARD

ENSERO solutions
Unit 3 151 Industrial Road
Whitehorse, YT Y1A 2V3
T. (867) 668-6463
www.ensero.com

March 22, 2020

Yukon Water Board
attn.: Chairperson
Y106-419 Range Road
Whitehorse, YT

Dear Chairperson:

Regarding: 2019 ANNUAL REPORT YUKON WATER LICENCE QZ16-051

On behalf of Sä Dena Hes Operating Corporation c/o Teck Resources Limited and in accordance with Water Use Licence QZ16-051 Part H Clause 65 please find attached the required report for 2019 for the Sä Dena Hes Mine.

If you have any questions regarding this report, please contact the undersigned at (867) 668-6463.

Sincerely,
ENSERO solutions

Emilie Bouchard

Emilie Bouchard, M.Sc. P.Chem. Environnemental Scientist

DISTRIBUTION LIST

# of copies	Company/Agency name
1	Teck Resources Limited
1	Yukon Water Board

ENSERO SOLUTIONS

Report prepared by:

Marie Ducharme, B.Sc., Adv. Dipl. G.I.S.
GIS and Environmental Data Manager

Report reviewed by:

Emilie Bouchard, M.Sc. P.Chem
Environmental Scientist

Report reviewed by: D

Andrew Gault, M. Chem, Ph.D.
Environmental Chemist

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

The Sä Dena Hes (SDH) property is the site of a former lead-zinc mine that operated from 1991 to 1992. The property is located 45 km north of Watson Lake (Figure 2-1) in the Yukon Territory and is owned by the Sä Dena Hes Mining Corporation (SDHOC) which is a joint venture between Teck Resources Limited (Teck) and Pan-Pacific Metal Mining Corp., a wholly-owned subsidiary of Korea Zinc. Teck is the operator under the joint venture agreement for the site.

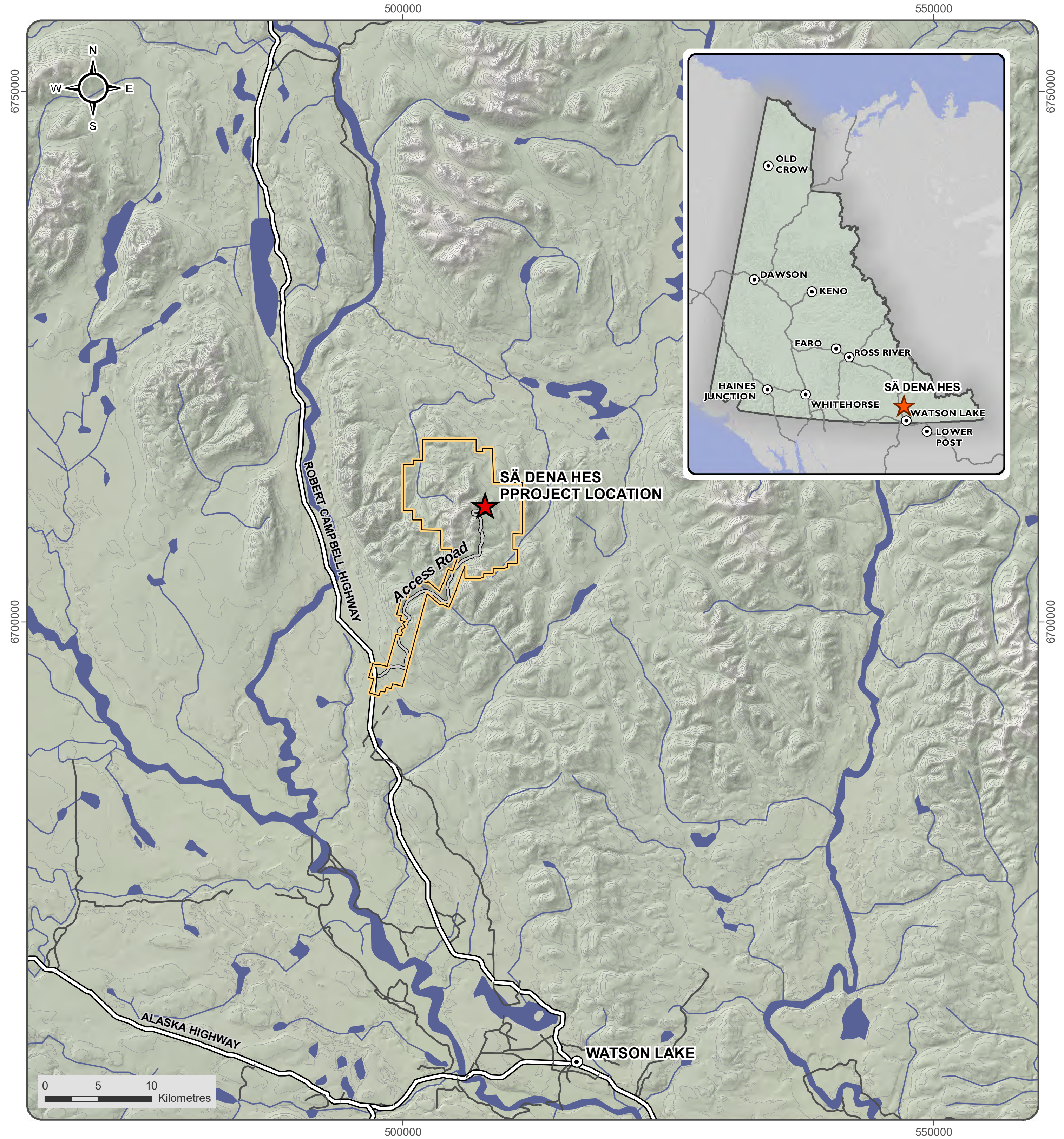
The Yukon Waterboard regulates water management of mine sites within Yukon Territory with site-specific Water Use Licences. Water Use Licence QZ16-051 (Appendix A), addressing permanent closure came into effect on April 1, 2017. A requirement of QZ16-051 is that annual reports addressing the terms of the licence be submitted to the Water Board. Ensero Solutions (Ensero), was retained by Teck to prepare the 2019 report.

2 CLOSURE STATUS

The SDHOC c/o Teck submitted notice to begin "Permanent Closure" to the Ministry of Energy, Mines and Natural Gas on February 17, 2012. The Detailed Decommissioning and Reclamation Plan (DDRP) (Teck 2012, 2013) was revised to plan for permanent closure. Permanent closure and decommissioning activities were carried out in 2014 and in 2015. A final DDRP was submitted in August 2015 (Teck, 2015) to account for amendments issued in 2014 and 2015. In 2015, Teck amended the Quartz Mining Licence (QML-0004), which expires on December 31, 2040. The current status of the site is Permanent Closure and Reclamation.

Reclamation activities at SDH were completed in 2015 and all reclamation activities have been documented in the aforementioned submissions.

Environmental Monitoring and Adaptive Management Planning are part of a comprehensive system of identifying and managing potential adverse effects through the post-reclamation phase of the SDH Mine. Post-reclamation environmental monitoring, physical/geotechnical inspections, and maintenance of constructed/engineered structures will be undertaken at the site in the post-closure period as described in the Environmental Monitoring, Surveillance and Reporting Plan (EMSRP, 2017) and WUL QZ16-051.



Project Location	Quartz Claim Boundary	Primary road
Community	Waterbody	Secondary Road
	Watercourse	Access Road
		Topographic Contour (200ft)

SÄ DENA HES

FIGURE 2-1

PROJECT LOCATION

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
Datum: NAD 83; Projection: UTM Zone 9N

Teck

MARCH 2020

D:\Project\AllProjects\Sa_Dena_Hess\GIS\Maps\01-Overview_Maps\Project_Overview\Project_Overview_ltr_20200305.mxd (
Last edited by: amatlashevska; 2020-03-05/13:56 PM)

3 WATER QUALITY MONITORING

The Water Quality Monitoring Program is a key monitoring program for the post-reclamation condition of the SDH mine site. The water monitoring program includes monitoring of the mine discharge sources, downstream stations which are potentially influenced by mine discharge (compliance stations), and downstream reference stations which are not influenced by mine discharge.

3.1 2019 WATER QUALITY MONITORING PROGRAMS AND REPORTING REQUIREMENTS

3.1.1 Water Use Licence QZ16-051

Schedule A Parts 1 and 2 of Licence QZ16-051 (Appendix A) outline the surface and groundwater water quality monitoring sites, sampling schedule, and analytical program. Furthermore, Part 2 defines which surface water quality stations are compliance points, discharge sources, and additional surface water stations. Figure 3-1 shows the locations of the surface and groundwater water monitoring stations. Figure 3-2 shows the conceptual loading for the discharge source conceptual flow paths.

Under the current water licence ten surface water monitoring stations are sampled bi-monthly. Stations MH-11 (Upper False Canyon Creek), MH-12 (East Fork of Tributary E), and MH-15 (West Fork of Tributary E) are compliance points and are monitored against the receiving water quality standards of the WUL.

The following mine discharge source monitoring stations are part of the monitoring program but do not have specific water quality standards under the WUL:

- MH-02 (North Dam seepage);
- MH-22 (Burnick 1200 Portal discharge); and
- SDH-S2[1] (1380 Portal discharge as seep in the downslope waste rock dump).

[1] In the past (2001 to 2014), the Main Zone 1380 Portal (MH-25) monitored the discharge. It can no longer be sampled since it was decommissioned during closure. SDH-S2 is sampled instead of MH-25, as it receives drainage from the 1380 Portal. It is present as a seep in the waste rock downslope of the portal.

Additional surface water monitoring stations located downstream of the mine site are also part of the monitoring program in order to detect potential changes to baseline water quality. These comprise:

- MH-13 (False Canyon Creek 10 km downstream of the former reclaim pond);
- MH-04 (Camp Creek headwaters above former reclaim pond);
- MH-29 (Access Creek upstream of Camp Creek); and
- MH-30 (unnamed tributary upstream of False Creek Canyon).

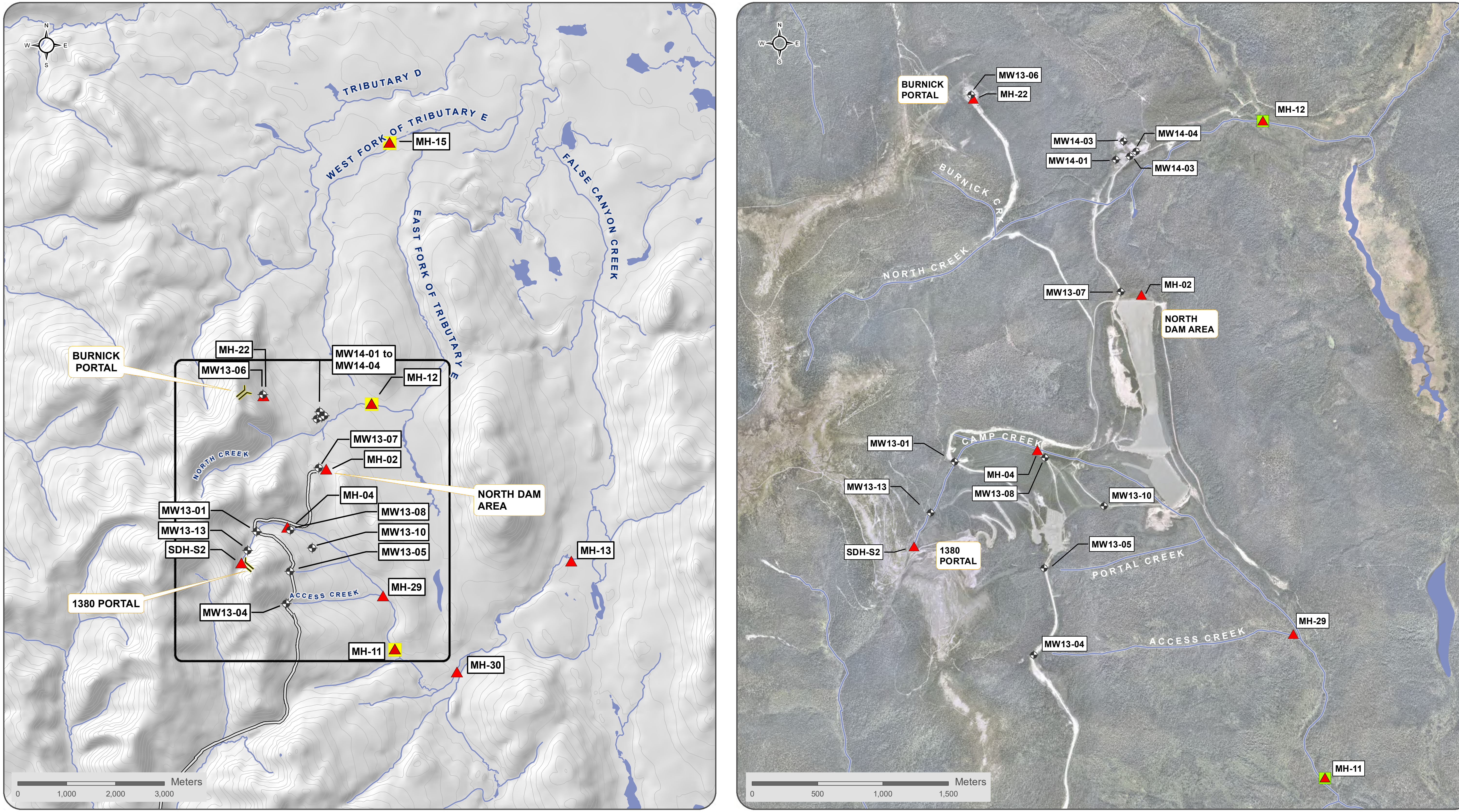
In this report, the water quality measured at these collection points may be compared to the generic Canadian Council of Ministers of the Environment water quality guidelines (CCME) for the protection of aquatic life or the British Columbia Water Quality guidelines for the protection of aquatic life (BCMOE) for reference purposes only.

There are three post-reclamation groundwater monitoring programs as part of the EMSRP: the first is designed to monitoring downgradient of mine-influenced loading sources, the second is designed to monitor areas were soil contamination has been identified, and the third is to monitor the landfill area.

The groundwater stations are visited and sampled on a quarterly basis. The mine source groundwater monitoring stations include three stations within the expected groundwater flow path of the 1380 Portal (MW13-01, MW13-08, and MW13-13) and one within the expected flow path of the Burnick 1200 Portal (MW13-06). Monitoring at these groundwater monitoring wells began in 2013.

The landfill groundwater monitoring wells are MW14-01, MW14-02, MW14-03, and MW14-04. Monitoring of these wells was initiated in mid-2016.

The contaminated sites groundwater monitoring stations include MW13-04, MW13-05, MW13-07, and MW13-10. MW13-04 and MW13-05 are located along the Main Access Road and downgradient from the Mill site and Jewelbox Pit. MW13-07 is located downstream of the North Dam and reclaimed tailings impoundment area. MW13-10 is located northeast and downgradient from the Mill site. Monitoring of these stations began in 2013.



ENSERO solutions

National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Map Projection: UTM Zone 9N

This drawing has been prepared for the use of Ensero Solution's client and may not be used, reproduced or relied upon by third parties, except as agreed by Ensero Solutions and its client, as required by law or for use of governmental reviewing agencies. Ensero Solutions accepts no responsibility, and denies any liability whatsoever, to any party that modifies this drawing without Ensero Solutions express written consent.

- Portal
- Receiving Surface Water Quality Station
- Surface Water Quality Station
- Goundwater Monitoring Well
- Watercourse
- Waterbody
- Access Road
- Contour

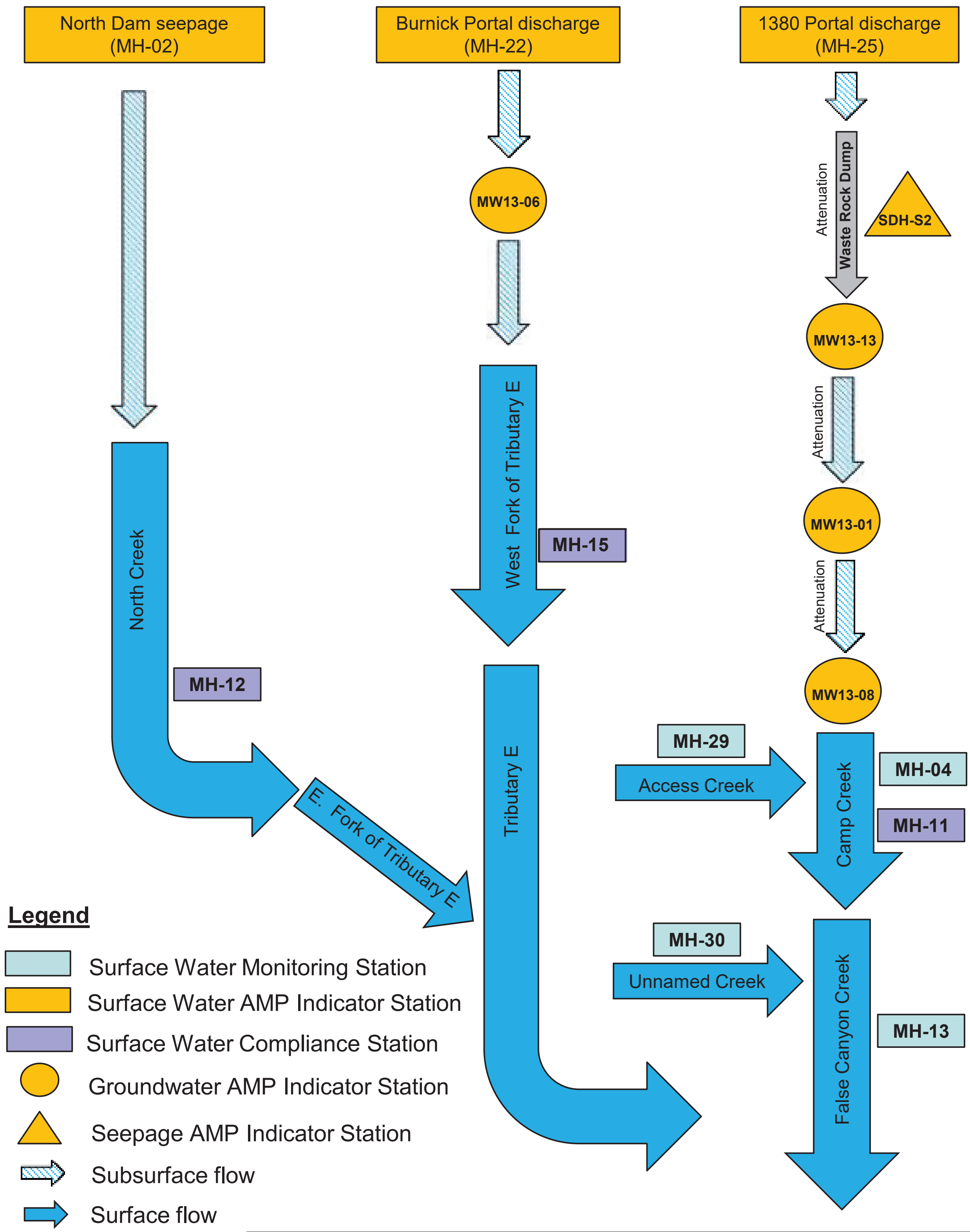
Teck

SÄ DENA HES
2019 ANNUAL REPORT

FIGURE 3-1
MONITORING STATIONS LOCATIONS

MARCH 2020

D:\Project\AllProjects\Sa_Dena_Hess\GIS\Maps\01-Overview_Maps\WQ_Stations\BOTH\Post-Reclamation\Post_Rec_WQ_MonitoringProgram_20200324.mxd
(*Last edited by: mducharme;3/24/2020/11:06 AM*)



srk consulting	Teck	Sä Dena Hes
		FIGURE 3-2 CONCEPTUAL LOADING DIAGRAM
Job No: 1CT008.043 Filename: AdaptiveManagementPlanFigures_1CT008.043_Rev01_LMC_LNB.pptx	Sä Dena Hes	Date: Sept 26, 2014 / Approved: LNB / Figure: 4-2

The 2019 monitoring schedule was designed to meet the requirement of the Water Use Licence (WUL) QZ16-051, which came into effect on April 1, 2017. Table 3-1 shows the sampling effort for 2019 by month for the surface water quality stations sampled bi-monthly, and by quarter for the groundwater monitoring stations.

Table 3-1: Surface Water Samples Collected Per Quarter

	Feb	Apr	Jun	Aug	Oct	Dec	Total Samples 2019
MH-02	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	6
MH-04	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	6
MH-11	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	6
MH-12	Sampled	- [1]	Sampled	Sampled	Sampled	Sampled	5
MH-13	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	6
MH-15	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	6
MH-22	- [1]	- [1]	Sampled	Sampled	Sampled	Sampled	4
MH-29	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	6
MH-30	Sampled	Sampled	Sampled	Sampled	Sampled	Sampled	6
SDH-S2	- [3]	- [2]	Sampled	- [2]	- [2]	- [3]	1

1. Dry
2. Water inaccessible (under waste rock)
3. Site Inaccessible

Table 3-2: Groundwater Samples Collected per Quarter

	Q1 (Feb)	Q2 (Jun)	Q3 (Aug)	Q4 (Oct)	Total Samples 2019
MW13-01	Sampled	Sampled	Sampled	Sampled	4
MW13-04	- [1]	Sampled	Sampled	Sampled	3
MW13-05	- [1]	Sampled	- [1]	- [1]	1
MW13-06	Sampled	Sampled	Sampled	Sampled	4
MW13-07	Sampled	Sampled	Sampled	Sampled	4
MW13-08	Sampled	Sampled	Sampled	Sampled	4
MW13-10	Sampled	Sampled	Sampled	Sampled	4
MW13-13	- [2]	Sampled	Sampled	Sampled	3
MW14-01	- [1]	Sampled	Sampled	- [1]	2
MW14-02	- [1]	- [1]	- [1]	- [1]	0
MW14-03	- [1]	- [1]	- [1]	- [1]	0
MW14-04	- [1]	- [1]	Sampled	- [1]	1

1. *Dry*
2. *Insufficient water volume to sample*

3.1.2 Adaptive Management Plan

The Water Use Licence QZ16-051 requires submission of an updated Adaptive Management Plan (AMP) to the Yukon Water Board. Water licence QZ16-051 requires that the annual report include a detailed assessment of the parameters being measured at AMP indicator stations and identification of any additional indicator parameters that should be incorporated into the AMP. The AMP (Appendix B) was prepared by Alexco Environmental Group and submitted in June 2017 (Alexco, 2017) and revised in February 2018 due to transcription errors detected in 2017 (Alexco, 2018 and Teck, 2018).

The AMP is a critical component for evaluating and responding to emerging or changing conditions on site. The AMP describes a means of interpreting data to indicate if water quality is changing from conditions observed over the past 20 years. The plan also describes when and how changes in water quality necessitate a response. The AMP outlines the conceptual geochemical model and associated risks and identifies monitoring stations, specific indicators, and associated numerical water quality specific performance thresholds. If a specific performance threshold is exceeded, the AMP outlines required responses.

Receiving environment surface water quality, mine source water, and groundwater quantity and quality are the AMP components that have been identified as having the potential for unexpected conditions during the post-reclamation period for which the DDRP may not provide adequate mitigation against potential effects to the environment or human health and safety. Any activities carried out at the site under the DDRP or the AMP are included in the Annual Report, as well as any updates to the AMP.

The objective of the mine source flow path AMP monitoring program is to detect changes from existing conditions that may have the potential to adversely affect receiving aquatic environments. Water quality is monitored to observe any potential changes indicative of loading from the North Dam, Burnick Portal, and 1380 Portal. The mine source AMP indicator stations include the North Dam Seepage (MH-02), Burnick 1200 Portal Discharge (MH-22), and the 1380 Portal drainage present as a seep in the downgradient waste rock dump (SDH-S2).

The specific indicators used to detect changes from existing conditions are cadmium, lead, zinc, and sulphate. Stations MH-02 and MH-22 have specific performance thresholds for sulphate and total cadmium, lead, and zinc. Stations MH-11, MH-12, and MH-15 have specific performance thresholds for sulphate, and both total and dissolved cadmium, lead, and zinc. Stations SDH-S2, MW13-01, MW13-08, and MW13-13 have specific performance thresholds for sulphate and dissolved cadmium, lead, and zinc. Station MW13-06 has specific performance thresholds for dissolved cadmium, lead, and zinc. AMP specific indicators and performance thresholds are described further in Appendix B.

All the stations monitored under the AMP are included in the water licence monitoring requirements. Instances where the AMP was triggered in 2019 are presented in Section 4.4 for each of the three mine sources, landfill groundwater monitoring, and contaminated sites groundwater monitoring.

3.1.3 Water Quality Trends

Clause 65a of licence QZ16-051 states that any variances from baseline conditions or from the previous year's data should be discussed. This section of the report compares the 2019 data to the long-term trends for selected parameters and stations.

Parameters included in the discussion were selected based on the following rationale:

- pH, sulphate, and total alkalinity as indicators of acid rock drainage, sulphide oxidation, and buffering capacity;
- Hardness as it is used to calculate some WUL QZ16-051 water quality standards (e.g., cadmium, copper, lead, nickel, zinc, and sulphate) as well as some AMP thresholds
- Cadmium[2] as it historically exceeded the licence standard at MH-25 between 2001 and 2014, before it was decommissioned. MH-25 can no longer be monitored, therefore, SDH-S2 has been monitored instead. Although the most recently updated Canadian generic water quality guideline applies to dissolved cadmium (BCMOE), the total cadmium data are also presented since it has a longer data record.

3.2 METHODOLOGY

At each of the surface water monitoring stations, samples were collected for analysis of general chemical parameters, total and dissolved metals, and nutrients. Samples for dissolved metals samples were filtered in the field using 0.45 µm disposable filterware. Samples for total and dissolved metals were preserved in the field with laboratory supplied nitric acid. Samples for nutrients were collected and preserved with laboratory-supplied sulphuric acid.

At each groundwater well, samples were collected for analysis of general chemical parameters, dissolved metals, and nutrients, when enough water was encountered in the monitoring wells. Samples taken from the landfill monitoring wells are also analyzed for hydrocarbons (BTEX, LEPH, HEPH, VPH, PAH). Samples for dissolved metals samples were filtered in the field using 0.45 µm disposable filterware. Samples for dissolved metals were preserved in the field with nitric acid. Samples for nutrients were preserved with sulphuric acid.

[2] Cadmium analytical detection limits have decreased over time. Detection limits were higher and more variable before 2005. A few samples had concentrations at 0.002 and 0.003 mg/L prior to 2005. These were not entered as below detection limits in the database but are likely within the range of analytical error of instrumentation. Since 2005, detection limits have been as low as 0.00001 mg/L but occasionally have been higher (0.0001 mg/L) due to matrix effects. The varying limits confound interpretation of long-term trends for stations that have lower cadmium levels (e.g. MH-04 and MH-11).

In-situ water pH, conductivity, oxidation – reduction potential (ORP), and temperature were measured and recorded at each surface water station and groundwater monitoring well. Water and substrate appearance (colour, turbidity) was also noted for surface water stations and purge volumes and groundwater levels were noted for groundwater wells.

All samples were stored in coolers with freezer packs to remain cold (4°C), but not frozen, during sampling at site and during transport to ALS Environmental in Vancouver for all the sampling events. ALS Environmental is certified with the Canadian Association for Environmental Analytical Laboratories (CAEAL).

3.3 QUALITY ASSURANCE

Quality assurance/quality control measures implemented as part of this program generally consisted of:

- Collection, handling, storage, and chemical analysis in accordance with "Standard Methods for Examination of Water and Wastewater" and Alexco Environmental Group protocols; and
- Establishment of Data Quality Objectives and documentation of sample variability due to natural variability and analytical variability.

The Relative Percent Difference (RPD) is used to determine variability. The RPD is the difference between the sample result and replicate result, divided by the average of the sample result and replicate result. This number is then multiplied by 100 and the outcome is the RPD. The RPD is not considered further where one or both results being compared are less than the practical quantitation limit (PQL). The PQL is five times the Method Detection Limit (MDL) and is defined as the minimum concentration that can be measured within specified limits of precision and accuracy. A constituent with results below the PQL means that the constituent being analyzed is not present in a sufficient amount to be reliably quantified. Typically, as parameters approach their detection limit, high variability is more likely to occur. Where applicable, the RPD of <25% can be used as a benchmark whereby an RPD greater than 25% warrants further comment or consideration.

3.3.1.1 Analytical Variability

Laboratory duplicates were used to measure laboratory analytical variability. Results of quality assurance analysis are included in Appendix C within the laboratory reports. All laboratory duplicates met the lab quality control limit of 20% relative percent difference (RPD) for all parameters tested. ALS Environmental also ran analyses on matrix spikes, spiked blanks, and method blanks with internal Data Quality Objectives achieved for all samples ensuring data precision and accuracy.

3.3.1.2 Field Variability

During the monitoring program field replicates were collected to measure field variability between simultaneous grab samples. A total of 12 field replicates were collected in 2019. The parameters with RPD values greater than 25% that met the PQL are shown in Table 3-3. The RPD range (28% to 37%) is relatively limited and reflects natural variation of the concentration of these parameters at each station rather than laboratory or sampling error.

Table 3-3: Parameters with RPD values greater than 25% and met the PQL

Site	Date	Parameter with value greater than 25% that met the PQL	RPD
MW13-13	22/Oct/2019	Dissolved Aluminium	32%
MW13-13	22/Oct/2019	Dissolved Copper	37%
MH-11	09/Jul/2019	Dissolved Lead	37%
MW13-01	25/Feb/2019	Dissolved Manganese	28%
MH-11	23/Oct/2019	Dissolved Selenium	30%

3.3.1.3 Field and Travel Blanks

Additional field quality control samples include field blanks and trip blanks, where de-ionized water is handled, processed, and analyzed in the same manner as the site water samples. Blanks can provide an indication of sample contamination occurring in the field (field blank) or laboratory (method blanks) and at any point in between (trip blanks). Concentrations of parameters should not be detectable, though a PQL of two-times the reportable detection limit allows for slight "noise" around the detection limit.

A field blank is processed by taking de-ionized water (analyte free media) to the sample station, opening it and exposing it to ambient air and 'collecting' it in the sample bottles. These samples are treated the same as the actual water samples, preserved and filtered as necessary, and their analysis can provide an indication of contamination that may be affecting the actual samples. Six field blanks were analyzed in 2019 for the February, April June, August, October and December sampling events; the field blank data are provided in Appendix C. Only one parameter was detected above the PQL of two-times the reported detection limit for the field blanks. The field blank collected in June 2019 returned a total lead concentration of 0.000157 mg/L, approximately three-fold higher than the reported detection limit of 0.00005 mg/L.

Trip blanks (sample of de-ionized water) are supplied and prepared by the lab and are intended to accompany the sample bottles provided by the lab for the monitoring program. The trip blank travels with the sample bottles to the sample stations and is returned unopened back to the lab with the collected samples. The purpose of the trip blank is to identify any potential contamination (e.g. cross contamination from other samples or ambient air conditions) to which the samples may be exposed. Eight trip blanks were analyzed in 2019 for the February, March, April, June (2), August, October and December sampling events. The results of the Trip Blanks are presented in the laboratory certificates of analysis provided in Appendix C. Four trip blanks returned results that were more than twice the reported detection limit (Table 3-4: Trip Blanks Results Greater than Twice the RDL and Meet PQL).

Table 3-4: Trip Blanks Results Greater than Twice the RDL and Meet PQL

Sampling Date	Analyte	Units	Result	Reported Detection Limit	Ratio of Result/Reported Detection Limit
07/Jun/2019	Cr-W-D	mg/L	0.00048	0.0001	4.8
25/Apr/2019	Cr-W-T	mg/L	0.00021	0.0001	2.1
25/Oct/2019	NH3-W	mg/L	0.0164	0.005	3.3
05/Dec/2019	NH3-W	mg/L	0.0333	0.005	6.7

3.4 RESULTS AND DISCUSSION

The following sections discuss the three mine source flow paths and the two groundwater programs. Each section addresses all three elements required by the WUL:

- WUL exceedances;
- AMP triggers and responses (when applicable); and
- Long-term water quality trends.

All the results from the 2019 monitoring are available in Appendix D.

3.4.1 North Dam Seepage

During operations, tailings were discharged to the North Tailings Impoundment. Currently, there is no ponded water behind the North Tailings Dam. The tailings are saturated within a metre of the surface. Seepage from the toe of the North Dam was routinely monitored at MH-02 as required by the existing WUL QZ16-051. The seepage at MH-02 is tailings porewater that mixes with groundwater from the valley sides and runoff from the North Dam face (SRK 2000).

Seepage from the North Tailings Dam flows throughout the entire year. Flow at MH-02 is highest during freshet and lowest during the winter. The seepage flows above ground for a short distance from the North Dam before infiltrating into the ground. It then flows as groundwater before eventually discharging to North Creek and the headwaters of the East Fork of Tributary E. From the East Fork of Tributary E, the water flows to Tributary E and then to False Canyon Creek. The monitoring stations and conceptual flow path are shown in Figure 3-1 and Figure 3-2. MH-12 is a receiving water quality collection point and located downstream of the tailings on North Creek.

3.4.1.1 WUL

None of the six surface water samples taken at the receiving water collection point on North Creek (MH-12) in 2019 exceeded the receiving water quality standard prescribed by the water license.

In April 2018, MH-12 exceeded the receiving water quality standard for total selenium. The total selenium concentration was 0.0026 mg/L, which marginally exceeded the standard of 0.002 mg/L. None of the other five surface water samples taken at MH-12 in 2018, nor the five samples taken in 2019 exceeded the receiving water standards prescribed by the WUL.

3.4.1.2 AMP

This section discusses the comparison of AMP water quality data to the specific performance thresholds for the North Dam Seepage mine source flow path. The objective of the AMP for the North Dam seepage is to detect any deterioration in water quality in the tailings dam seepage and manage and mitigate these changes before any effects are observed in the downstream receiving surface waters. AMP monitoring locations include tailings seepage monitoring at MH-02 located at the toe of the dam and surface water monitoring station MH-12 in North Creek.

Monitoring MH-02 would detect any changes in water quality to the loading source. Downstream of this station, tailings seepage flows as groundwater. Any potential change in surface water quality in the receiving waters would therefore be a function of groundwater reactive transport.

3.4.1.2.1 MH-02 Total Lead, August 2019

In August 2019, the sample collected at the North Dam Seepage (MH-02) exceeded the AMP mine source water quality Specific Thresholds 1 and 2 (ST1 and ST2, respectively). The sample returned a concentration of 0.0165 mg/L for total lead, above both ST1 (0.006 mg/L) and ST2 (0.007 mg/L). This AMP exceedance was not reported in the third quarter compliance report; it was detected later when summarizing the results for the 2019 annual report. The dissolved lead concentration (0.0013 mg/L) was below ST1 and an order of magnitude lower than the total lead level, indicating that lead was primarily associated with particulates, consistent with the field observations that the sampling location was cloudy owing to heavy rain at the time of sampling.

Figure 3-3 shows the total lead concentrations of the tailings' seepage (MH-02) since 2015. Since 2015, five samples have contained total lead concentrations that exceeded the AMP ST1 and ST2 levels. In 2019, the two samples taken at MH-02 after the AMP exceedance had much lower total lead concentrations, more in alignment with the historical data of two-times the reported detection limit. Combined with the much lower dissolved lead concentration (Figure 3-3), this suggests that the elevated total lead observed for the August 2019 sampling event was not indicative of an ongoing deterioration in local water quality.

When an exceedance occurs in a mine source sample the AMP requires the evaluation of the water quality of the receiving environment. In this instance the receiving water quality is monitored at the East Fork of Tributary E (MH-12). The WUL water quality standard for total lead at MH-12 is calculated using hardness and the total suspended solids (TSS) content (Appendix A). If the TSS is at or above 4 mg/L, the standard applies to the dissolved lead concentration of the sample. Conversely, if the TSS is below 4 mg/L, the standard applies to the total fraction of the metal. In 2019, the TSS was below 4 mg/L for all six samples except for the June sample which returned a TSS of 5.5 mg/L. Therefore, in 2019, the WUL guideline for lead applied to the total fraction for all samples except for the June sample. The total and dissolved lead concentration for samples collected at MH-12 in 2019 and since 2015 are shown in Table 3-5 and Figure 3-4, respectively. All samples collected at MH-12 in 2019 were well below the WUL guideline for lead.

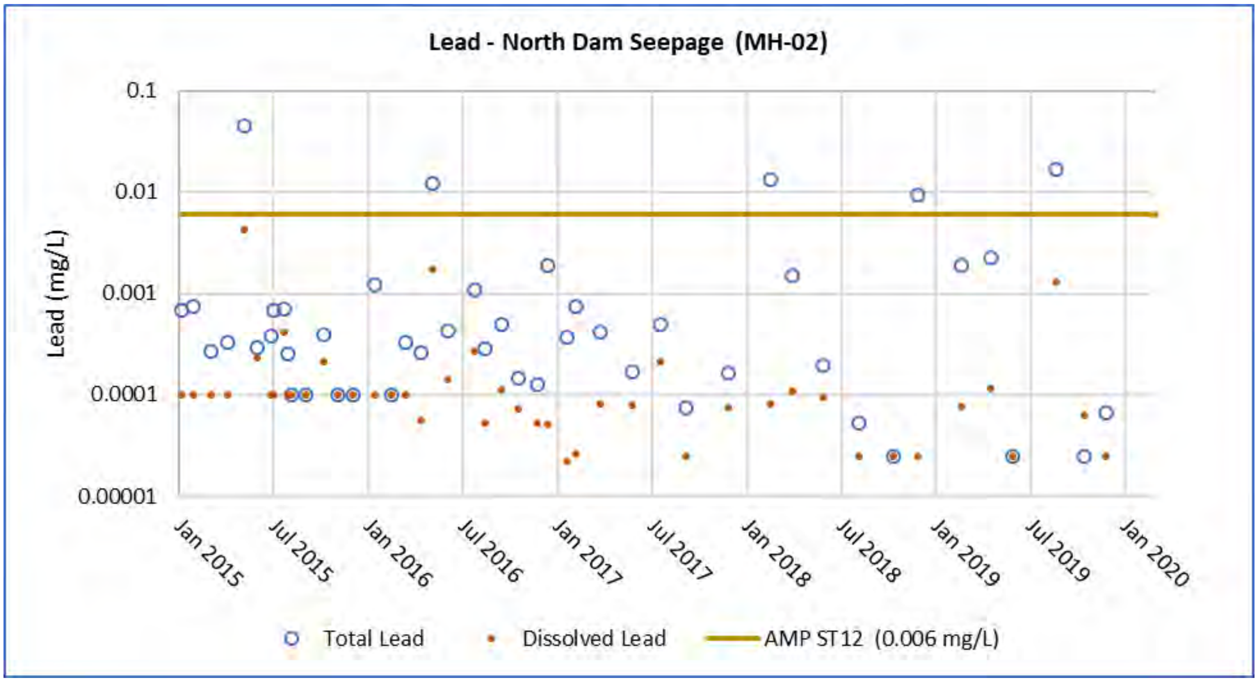


Figure 3-3: Total and Dissolved Lead Concentrations in North Dam Seepage (MH-02)

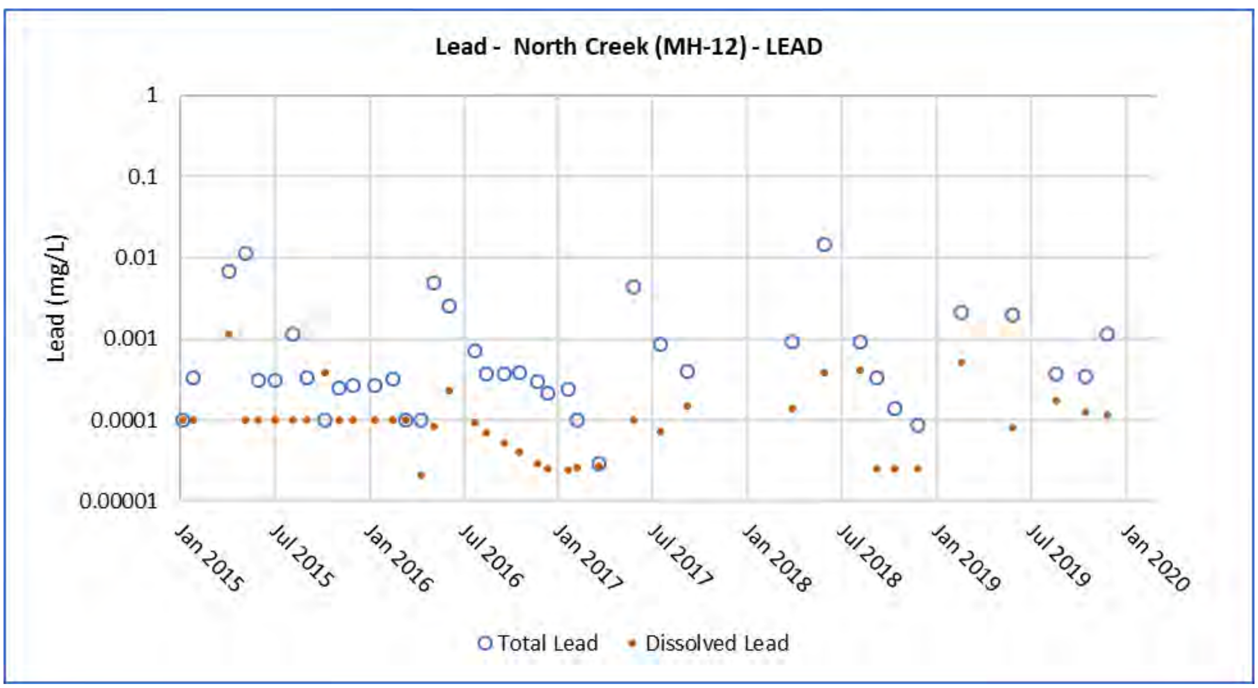


Figure 3-4: Total and Dissolved Lead Concentrations in North Creek (MH-12)

Table 3-5: Lead Concentration, TSS and WUL Guidelines for MH-12 in 2019

Date	TSS	WUL Standard	Total Lead	Dissolved Lead
	mg/L	mg/L	mg/L	mg/L
25/Feb/2019	1.6	0.00994	**0.00214**	0.000515
03/Jun/2019	5.5	0.00815	0.00197	**0.000079**
26/Aug/2019	<1	0.00990	**0.000365**	0.000172
23/Oct/2019	<1	0.00961	**0.000343**	0.000123
03/Dec/2019	3.2	0.0105	**0.00113**	0.000116
Bold text indicates which fraction (dissolved or total) the WUL applies				

In addition to the receiving environment surface water site, dissolved lead concentrations have been stable downstream of the North Dam seepage at groundwater monitoring station MW13-07 (Figure 3-5). This well is monitored for water quality and is subject to scrutiny under the AMP. The dissolved lead guideline for MW13-07 is based on the YCSR guideline (0.11 mg/L at the hardness observed at MW13-07); dissolved lead levels have been below the YCSR guideline over the past 5 years of monitoring (Figure 3-5). Furthermore, lead concentrations observed in 2019 at MW13-07 were consistent with the historical data and do not show any indication of a deterioration in water quality (Figure 3-5).

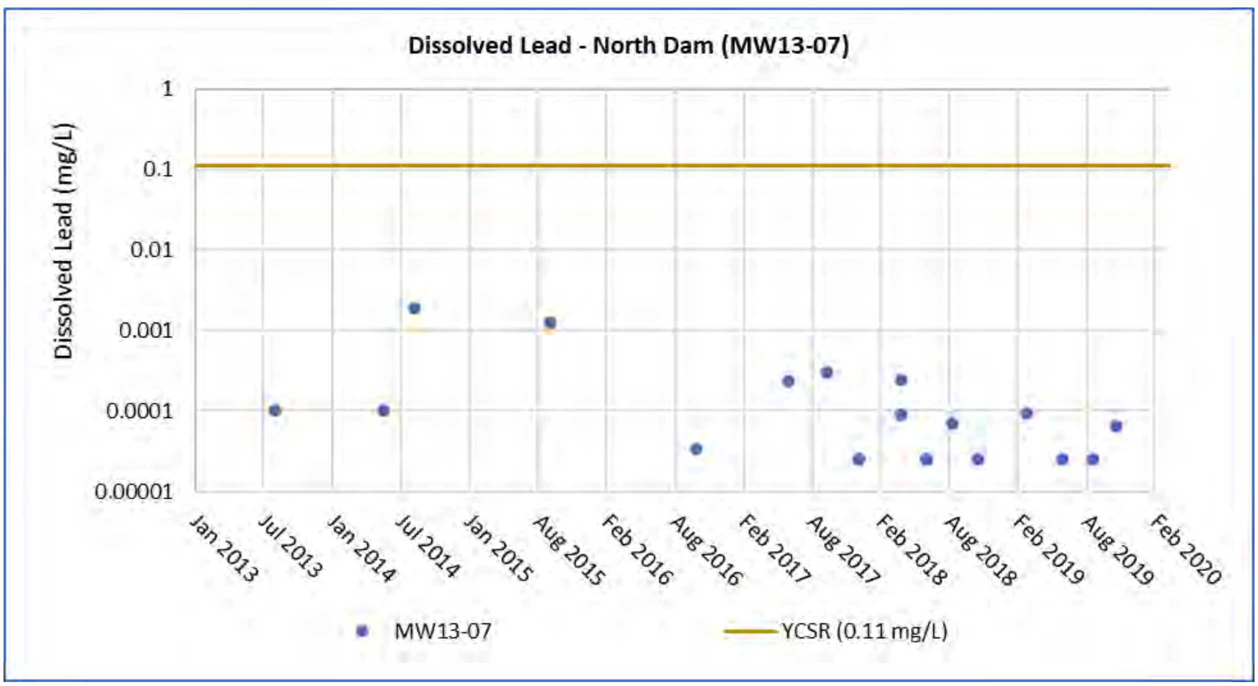


Figure 3-5: Dissolved Lead Concentrations in North Dam Monitoring Well MW13-07

3.4.1.3 Water Quality Trends

Plots showing historical and current surface and groundwater constituent concentrations are available in Appendix E. Samples collected in the North Dam seepage MH-02 had pH levels ranging from 7.2 to 8.2, with a 2019 annual average of 7.6, which is consistent with the five-year historical average of 7.6. The pH for the receiving environment monitoring station MH-12 ranged between 7.8 and 8.6 with an annual average of 8.1, which is identical to the historical average. Downstream at MW13-07, the pH had an annual average of 7.3, identical to the five-year average.

Alkalinity at MH-02 was as high as 450 mg/L in the 1990s but has since decreased to the 250 mg/L range and had an average of 256 mg/L in 2019. Alkalinity at MH-12 in 2019 averaged at 177 mg/L which is in line with the five-year average of 189 mg/L. Alkalinity at MW13-07 averaged at 231 mg/L in 2019, in line with the five-year alkalinity levels (227 mg/L).

Sulphate concentrations at the North Dam seepage (MH-02) have remained stable at approximately 300 mg/L since 2002, with an average concentration of 280 mg/L in 2019. At the receiving water monitoring station (MH-12), sulphate concentrations were considerably lower, with historical averages typically ranging from 9 to 22 mg/L. In 2019, MH-12 had stable sulphate concentrations ranging from 11 to 13 mg/L. Sulphate MW13-07 averaged at 36 mg/L in 2019, in line with the five-year alkalinity levels (45 mg/L).

North Dam Seepage (MH-02) total hardness has historically ranged between 178 mg/L and 716 mg/L, with a five-year average of 560. In 2019 the North Dam seepage had an average dissolved hardness of 478 mg/L. The receiving environment monitoring location MH-12 had a hardness annual average of 179 mg/L, which is comparable to the historical five-year average of 209 mg/L. The 2019 hardness average at MW13-07 was 227 mg/L, comparable to the five-year average of 241 mg/L.

Cadmium concentrations at the North Dam seepage (MH-02) and downstream at MH-12 were stable, with annual averages for total cadmium of 0.00004 and 0.00006 mg/L respectively, a slight decrease from the five-year historical average of 0.001 mg/L.

Total zinc concentrations at the North Dam seepage (MH-02) appear to be declining, with an annual average concentration of 0.016 mg/L, a decrease when compared to the 2018 annual average of 0.04 mg/L and the five-year historical average of 0.06 mg/L. Downstream at the receiving environment monitoring station (MH-12) the annual total zinc average (0.007 mg/L) was also lower than the five-year historical average (0.017 mg/L) and well below the WUL guideline of 0.56 mg/L. A substantial zinc (dissolved) concentration decrease was observed at MW13-07 with 2019 average concentrations of 0.0017 mg/L as compared to the five-year average of 0.03 mg/L.

Total lead varied considerably at MH-02 in 2019 ranging from below the reported detection limit of 0.0005 mg/L to 0.0165 mg/L (August 2019 sample which exceeded the ST2 AMP threshold; Section 3.4.1.2.1; Figure 3-3). The total lead annual median was 0.00096 mg/L in 2019, which is comparable to the annual median observed in2018 (0.00085 mg/) . For MH-12, the 2019 total lead annual average of 0.001 mg/L was within the 2013-2018 annual averages range of 0.0009 to 0.003 mg/L. The groundwater samples taken at MW13-07 in 2019 returned dissolved lead concentrations averaging at 0.00005 mg/L, lower than the 2013-2018 average (0.00191 mg/). Overall, no increasing trend in total lead was observed at any of the surface and groundwater monitoring stations within the North Dam catchment.

3.4.2 Burnick Portal Discharge

The objective of the AMP for the Burnick Portal discharge is to detect any deterioration in water quality in the drainage flowing from the Burnick Portal and downgradient surface water. AMP monitoring locations include the Burnick portal drainage (MH-22), groundwater monitoring well MW13-06 adjacent to and downgradient of the Burnick portal, and surface water monitoring station MH-15 in the West Fork of Tributary E. The monitoring stations and conceptual flow path are shown in Figure 3-1 and Figure 3-2.

3.4.2.1 WUL

None of the six surface water samples taken at the receiving water collection point in West Fork of Tributary E (MH-15) in 2019 exceeded the receiving water quality standard prescribed by the water license.

Water level monitoring of the mine source groundwater monitoring wells is required under water licence QZ16-051. Water levels at MW13-06 have remained relatively constant throughout 2019 and previous years (Table 3-6). There are no water quality standards for this well outlined in the current water licence; however, AMP thresholds are defined for this well.

Table 3-6: Burnick Portal Groundwater Levels

Well ID	2019				2019 Average	2018 Average	2017 Average	Historical Average [1]
	Feb	Jun	Aug	Oct				
	Masl [2]	masl	masl	masl	masl	masl	masl	masl
MW13-06	1180.3	1181.5	1181.1	1180.6	1180.9	1180.8	1180.1	1181.3

[1] Overall average (without 2019 data)
[2] masl denotes metres above sea level

3.4.2.2 AMP

3.4.2.2.1 MW13-06 Sulphate

The sulphate AMP ST1 for the mine source groundwater wells is triggered when three consecutive monitoring events or four of the last six monitoring events show progressively increasing concentrations of sulphate, dissolved cadmium, lead, or zinc. Mine source groundwater monitoring well MW13-06 met the AMP ST1 for sulphate in in June, August, and October 2019 with consecutive monitoring results that returned progressively increasing sulphate concentrations. (Table 3-6)

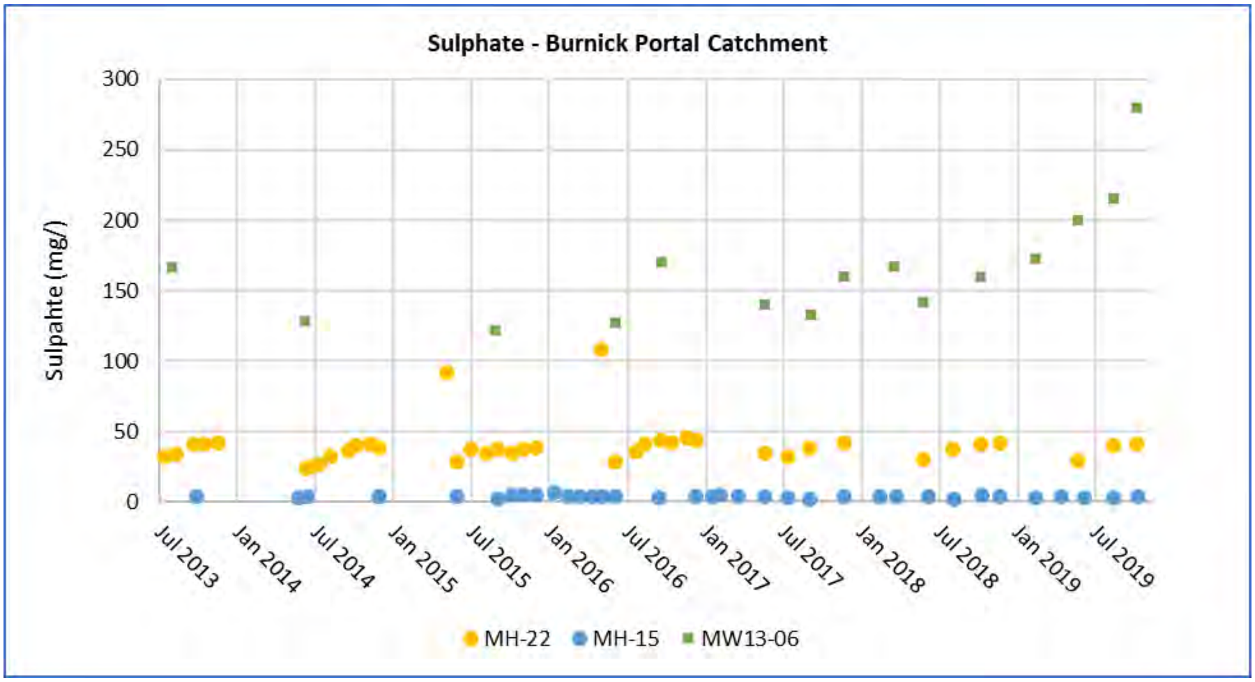


Figure 3-6: Sulphate Concentrations at Stations MH-22, MH-15, and MW13-06

As per the AMP, an evaluation of upstream and downstream water quality was conducted. The closest water quality monitoring location upstream is at the Burnick Portal (MH-22). MH-15, on the West Fork of Tributary E, is the downstream receiving water monitoring station.

Sulphate concentrations upstream at station MH-22 (29.4 mg/L in June 2019) were below the historical average (39.5 mg/L) and shown to be stable. Downstream, at station MH-15, sulphate concentrations were also stable, and sulphate concentrations in June 2019 (3.18 mg/L) and April 2019 (4.09 mg/L) were below the historical average of 4.19 mg/L. There is a seasonal trend in the sulphate levels measured at MH-22 with gradual increase seen yearly starting in the early summer and increasing until December (Table 3-6).

Long term trends show that the sulphate concentrations at surface water stations (i.e., MH-15 and MH-22) in the Burnick portal catchment have been stable since monitoring began in 2013. An increasing trend in sulphate levels is evident for the samples collected at MW13-06 (Table 3-6). Sulphate does not have a numerical specific threshold under the AMP. Instead, the AMP requires that sulphate concentrations at the source station (MH-22) are lower than those present in the well (MW13-06). Both the source and receiving water sampling locations show stable levels of sulphate that were three to four times lower than those present in samples collected from MW13-06 (Table 3-6). As such, the increasing sulphate levels observed in MW13-06 have not affected the surface receiving environment and do not appear to be related to the Burnick portal discharge (MH-22). Changes in the sulphate concentrations measured at MW13-06 will continue to be evaluated in 2020.

3.4.2.2.2 MW13-06 Dissolved Zinc

Downstream of the Burnick Portal, the Mine Source groundwater monitoring well MW13-06 triggered the AMP ST1 for dissolved zinc in October 2019 with four of the last six monitoring events that exhibited an increase in concentration (0.070 to 0.11 mg/L) (Figure 3-7). Despite the slight increase, all concentrations were well below the ST2 threshold of 0.5 mg/L in 2019.

Total and dissolved zinc concentrations upstream at MH-22 were stable within their seasonal bounds and well below the AMP ST2 (2.7 mg/L) (Table 3-8). Similarly, total and dissolved zinc levels at the downstream sampling location MH-15 were also stable (Table 3-9) with total zinc typically below the detection limit (0.003 mg/L) and well below the AMP ST2 threshold (2.7 mg/L).

Additionally, the dissolved zinc concentration observed in the October 2019 sampling event for station MW13-06 (0.11 mg/L) is comparable with the range observed in previous years (e.g., 0.070 to 0.11 mg/L between May 2017 and October 2018), suggesting the recent results from this monitoring station were unremarkable. Therefore, the slight increase in dissolved zinc levels observed at MW13-06 were not considered significant.

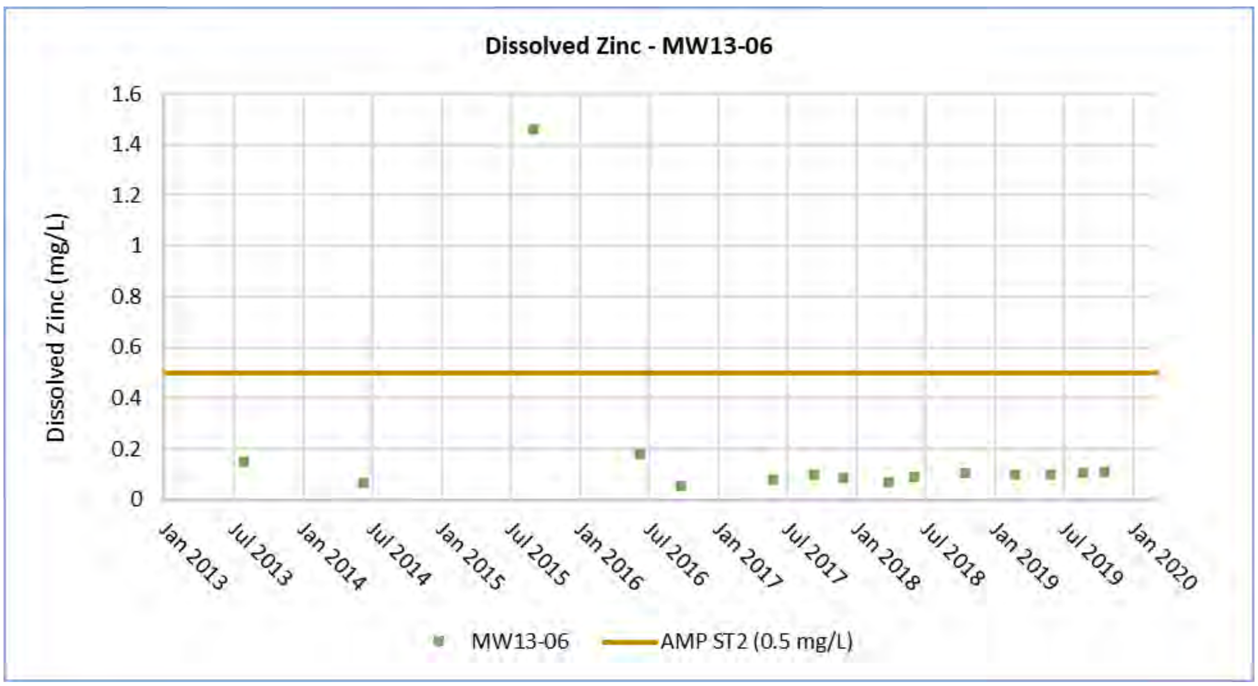


Figure 3-7: Dissolved Zinc Concentrations at Station MW13-06

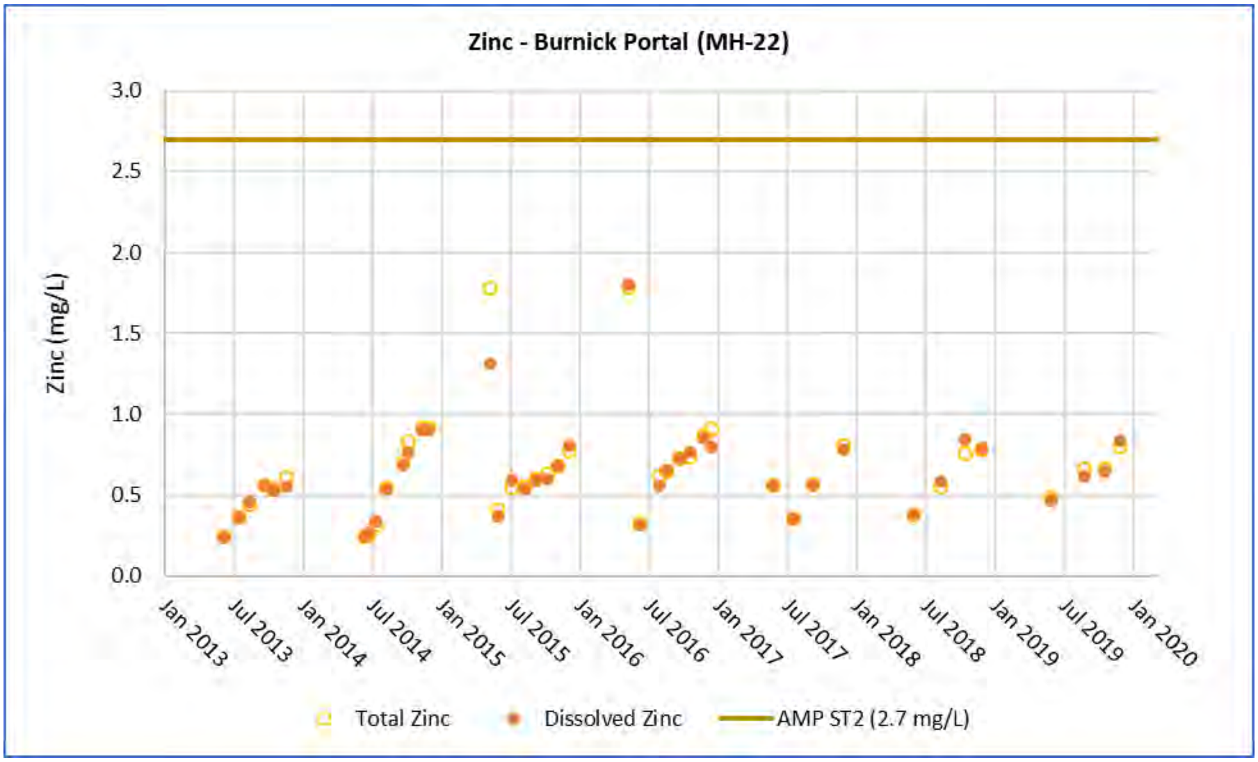


Figure 3-8 Zinc Concentrations Burnick Portal (MH-22)

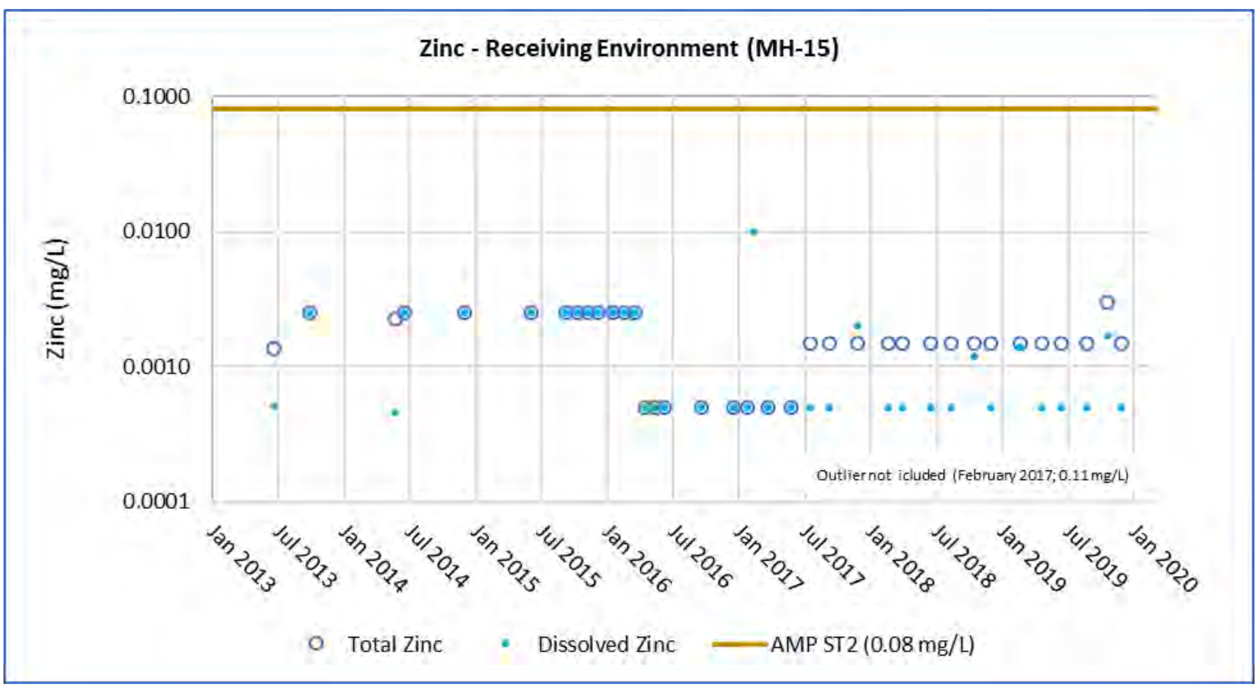


Figure 3-9: Zinc Concentrations Burnick Portal Receiving Environment (MH-15)

3.4.2.3 Water Quality Trends

Long term pH trends have been stable for all stations in the Burnick Portal catchment since 1997. The pH for the mine source station (MH-22) ranged from 7.3 to 8.7 with an average of 7.8, slightly lower than the 2013-2018 average of 8.1. At the receiving environment monitoring station MH-15, pH ranged between 7.6 and 8.3, with an annual average of 7.9, in agreement with the five-year historical average of 8.0. Samples collected from the groundwater station downgradient of the portal (MW13-06) were circumneutral (2019 annual average pH of 7.0), which is consistent with historical results (five-year average of 6.9). Plots showing historical and current surface and groundwater constituents are available in Appendix E.

Alkalinity in the Burnick 1200 Portal discharge (MH-22) has consistently been around 100 mg/L. Total alkalinity concentrations were within historical ranges in 2019 with an annual alkalinity of 112 mg/L. At the receiving environmental station (MH-15) total alkalinity levels have remained stable with a 2019 annual average of 204 mg/L compared to the five-year average of 198 mg/L. The monitoring well in the Burnick portal discharge flow path (MW13-06) had a yearly average total alkalinity of 191 mg/L comparable to the 2013-2018 average of 202 mg/L.

In 2019, MH-22 and MH-15 sulphate concentrations were stable and displayed the historical seasonal trend of increasing sulphate concentrations from winter to spring, as discussed in Section 4.4.2.2.1. The annual averages for MH-22 and MH-15 (38 and 3.5 mg/L, respectively) are comparable to the five-year averages (40 and 4.1 mg/L, respectively). Sulphate levels have been increasing steadily at MW13-06 (Table 3-6) with concentrations increasing for every sampling session between June 2018 (142 mg/L) and October 2019 (280 mg/L), triggering the AMP on three consecutive occasions. The October 2019 sample returned a sulphate concentration that was 1.7-fold higher than the historical average of 165 mg/L. Changes in the sulphate concentrations measured at MW13-06 will continue to be evaluated in 2020.

Hardness levels have been stable at the monitoring stations in the Burnick portal catchment. Total hardness at MH-22 varied between 145 and 165 mg/L in 2019, with an average of 153 mg/L keeping with the long-term trend (historical average of 144 mg /L). Similarly, total hardness at MH-15 has been stable with a yearly average of 202 mg/L, comparable to the five-year average of 198 mg/L. The 2019 average dissolved hardness at MW13-06 was of 360 mg/L, somewhat elevated as compared to the historical average of 244 mg/L.

Total cadmium concentrations at the 1200 Burnick Portal (MH-22) ranged from 0.0033 to 0.0043 mg/L in 2019. Total cadmium concentrations at MH-22 have slowly increased since the early 1990s and the trend continues with a 2019 yearly average of 0.038 mg/L as compared to the 1993 average of 0.007 mg/L. Total cadmium concentration at MH-15 have remained constant with yearly averages between 0.00001 to 0.00002 mg/L since 2013. Cadmium concentrations at MW13-06 averaged at 0.000017 mg/L in 2019, significantly lower than the five-year average of 0.00021 mg/L.

The total zinc annual averages for MH-22 and MH-15 (0.7 and 0.002 mg/L, respectively) are comparable to the five-year averages (0.7 and 0.005 mg/L, respectively). Dissolved zinc triggered the AMP in the third quarter of 2019 at MW13-06 (discussed in Section 3.4.2.2.2). This slight increase in dissolved zinc levels observed at MW13-06 was not considered significant.

3.4.3 1380 Portal Discharge

The objective of the AMP for the 1380 Portal drainage is to detect any deterioration in the portal drainage water quality within the waste rock dump and monitor for the potential loss of attenuation capacity of the soils upstream of Camp Creek. AMP monitoring locations include the seepage monitoring at station SDH-S2 within the Main Zone waste rock dump, groundwater monitoring at MW13-01, MW13-08, and MW13-13 located downgradient of SDH-S2 and upstream of Camp Creek, and the receiving water surface water monitoring at MH-11 in upper False Canyon Creek.

The three groundwater monitoring stations downstream of the 1380 and Burnick portals are sampled quarterly. Station MW13-01 is located downgradient of 1380 portal in the 1380 Gully. Stations MW13-08 and MW13-13 are also projected to be along the groundwater flow path of 1380 Portal drainage. The monitoring stations and conceptual flow path are shown in Figure 3-1 and Figure 3-2.

3.4.3.1 WUL

None of the six surface water samples taken at the receiving water collection point in Upper False Creek Canyon (MH-11) during 2019 exceeded the receiving water standards prescribed by the water license.

Water level monitoring of the mine source groundwater monitoring wells is required under water licence QZ16-051. Water levels in the all three mine source monitoring wells have remained relatively constant throughout 2019 and previous years (Table 3-7). There are no water quality standards for these stations outlined in the current water licence; however, there are AMP thresholds for these stations.

Table 3-7: 1380 Portal Discharge Groundwater Levels

Well ID	Individual 2019				2019 Avg	2018 Avg	2017 Avg	Historical Average [1]
	Feb	Jun	Aug	Oct				
	masl [2]	masl	masl	masl	masl	masl	masl	masl
MW13-13	1244.4	1248.0	1248.9	1245.7	1246.8	1247.0	1245.4	1247.1
MW13-01	1180.3	1181.5	1181.1	1180.6	1180.9	1180.8	1180.4	1180.9
MW13-08	1130.7	1133.7	1131.9	1131.5	1131.9	1132.0	1131.4	1132.2

[1] *Overall average (without 2019 data)*
[2] *masl denotes metres above sea level*

3.4.3.2 AMP

During the third and fourth quarters of 2019, there was a consistent yet marginal increase of both dissolved cadmium and zinc concentrations in samples collected from monitoring wells MW13-01 and MW13-13. At MW13-08, sulphate triggered the AMP on three different instances, and dissolved zinc in one instance. These AMP triggers are discussed below.

3.4.3.2.1 MW13-08 – Sulphate

In 2019, sulphate triggered the AMP ST1 at MW13-08 for sulphate twice in 2019 due to slight but constant increases in concentrations. Sulphate concentrations have a seasonal variation at MW13-08, increasing at the end of the summer until late winter then decreasing in summer (Figure 3-10). Aside from this seasonality, no other trends were observed in sulphate concentrations at MW13-08 (Figure 3-10); the MW13-08 sulphate concentrations observed in 2019 were within the range of concentrations seen historically (9.6 to 18 mg/L), and well below the AMP ST2 threshold of 55 mg/L. Similarly, no increasing trend in sulphate concentrations was observed at the upgradient groundwater monitoring stations MW13-01 and MW13-13 (Figure 3-10). Furthermore, no change on sulphate concentrations were noted in the surface water stations located in the 1380 portal catchment (Figure 3-11). Overall, this suggests that the AMP ST1 event was related to natural variation in sulphate concentrations rather than an increasing trend.

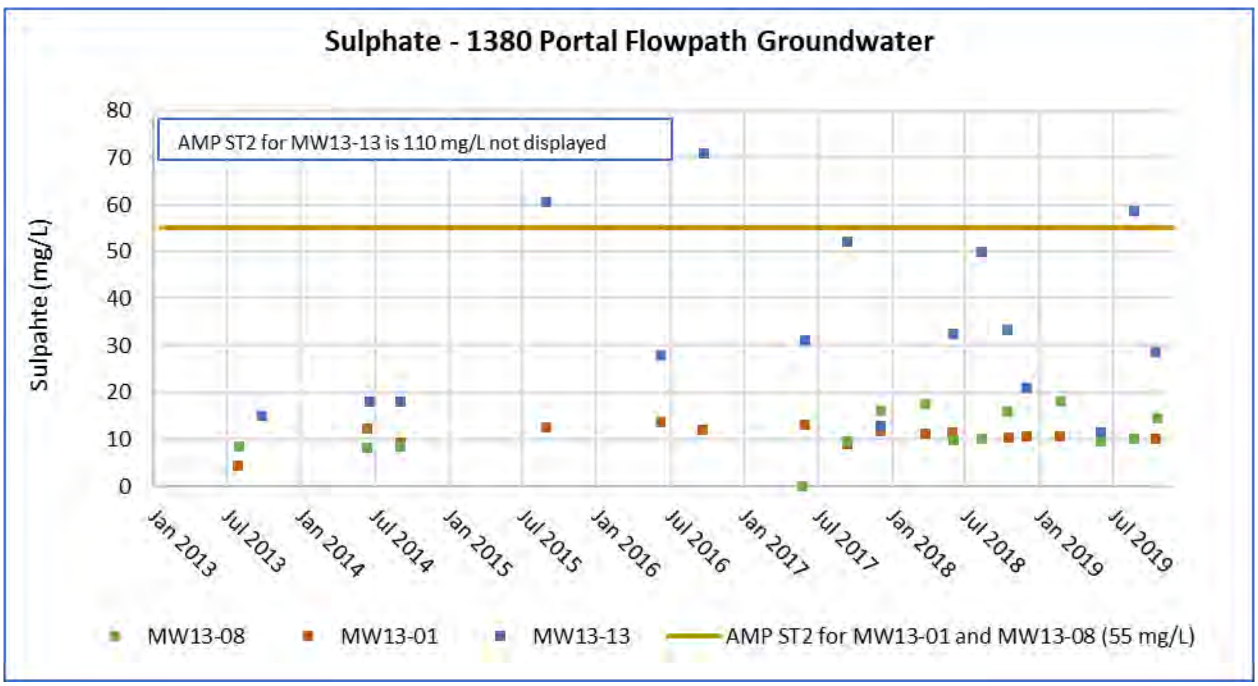


Figure 3-10: Sulphate Concentrations at MW13-01, MW13-08 and MW13-13

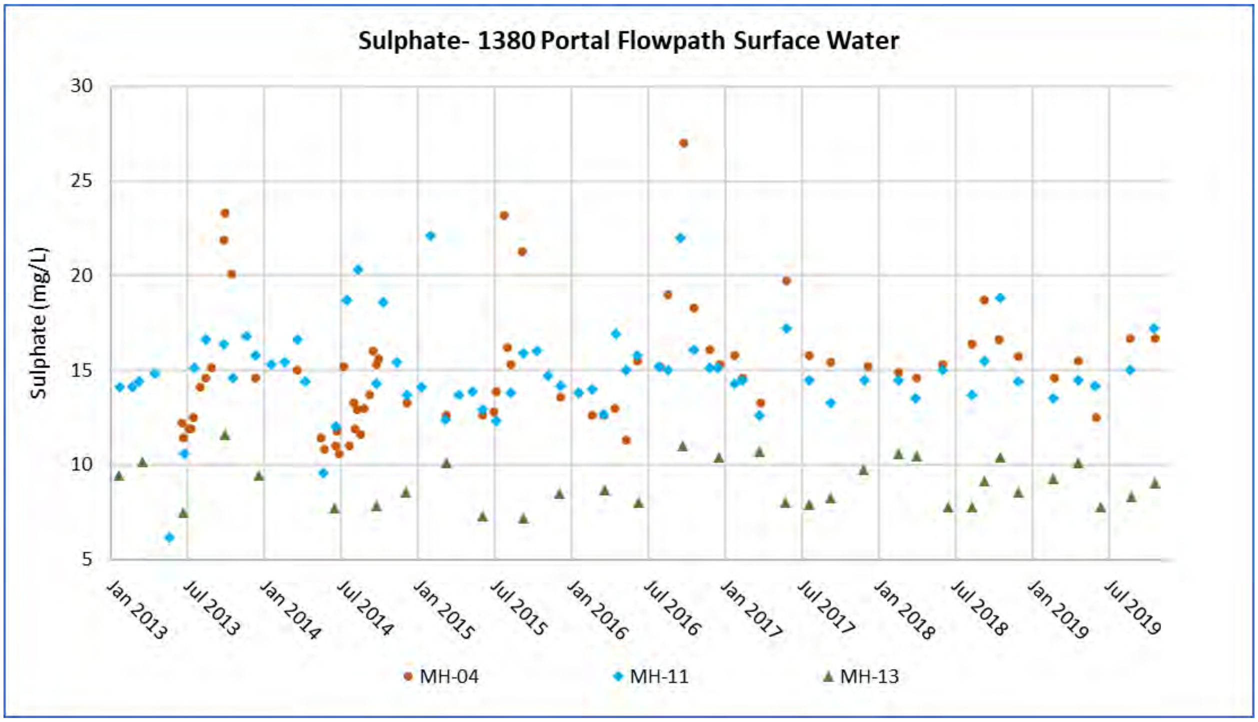


Figure 3-11: Sulphate Concentrations at MH-11, MH-04 and MH-13

3.4.3.2.2 Dissolved Zinc

The wells along the flow path downstream of the 1380 portal (MW13-01, MW13-08 and MW13-13) were installed to monitor the groundwater water quality and the potential loss of attenuation capacity in the mine source flow path.

At MW13-13, the concentrations of dissolved zinc gradually increased from 0.01 to 0.12 mg/L from December 2018 to August 2019, triggering the AMP ST1 in the third quarter of 2019 (for three consecutive result of increasing concentrations). Similarly, dissolved zinc concentrations at MW13-01 increased from February to November 2019, going from a concentration of 0.017 to 0.035 mg/L triggering the AMP in the third and fourth quarter of 2019. Despite these increases, the higher ranges seen in 2019 were within their historical seasonal variation observed in these waters (Figure 3-12) and well below the AMP ST2 threshold of 0.5 mg/L which applies to all three wells in the 1380 portal flow path.

Downstream at MW13-08 a small increase in dissolved zinc triggered the AMP during the second quarter of 2019, when dissolved zinc concentrations increased over three consecutive monitoring results, with values ranging from below the detection limit (<0.001 mg/L) in October 2018, increasing to 0.0013 mg/L in February 2019 reaching 0.0018 mg/L in the June 2019 sample. The duplicate collected in February returned a dissolved zinc concentration of 0.0013 mg/L, lower than its counterpart (0.0018 mg/L). The concentrations were either below or marginally above the detection limit (0.001 mg/L) and were therefore not considered significant.

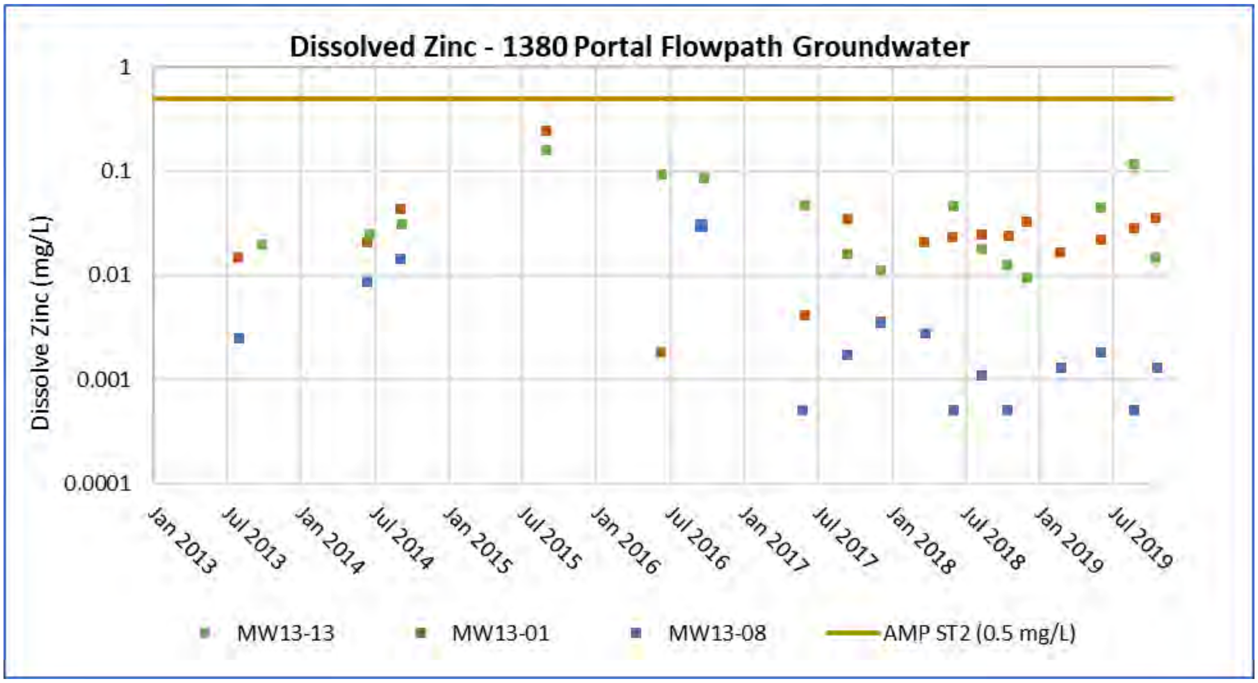


Figure 3-12: Dissolved Zinc Concentrations at MW13-01, MW13-08 and MW13-13

The mine source (SDH-S2) seep is sampled infrequently as it is often inaccessible or dry and the paucity of samples limit the detection of trends; however, the receiving environment surface water monitoring station on Camp Creek (MH-11), downgradient of well MW13-08, did not exhibit similar increases in dissolved zinc concentrations (Figure 3-13) and were well below the WUL guideline. Moreover, zinc concentrations were stable at the two additional surface water monitoring stations MH-13 and MH-04 in the 1380 portal flow path (Figure 3-13). At MH-11, dissolved zinc has steadily and gradually decreased with yearly average of 0.009 mg/L in 2013 and 2014 to stabilize at 0.004 mg/L in 2017-2019.

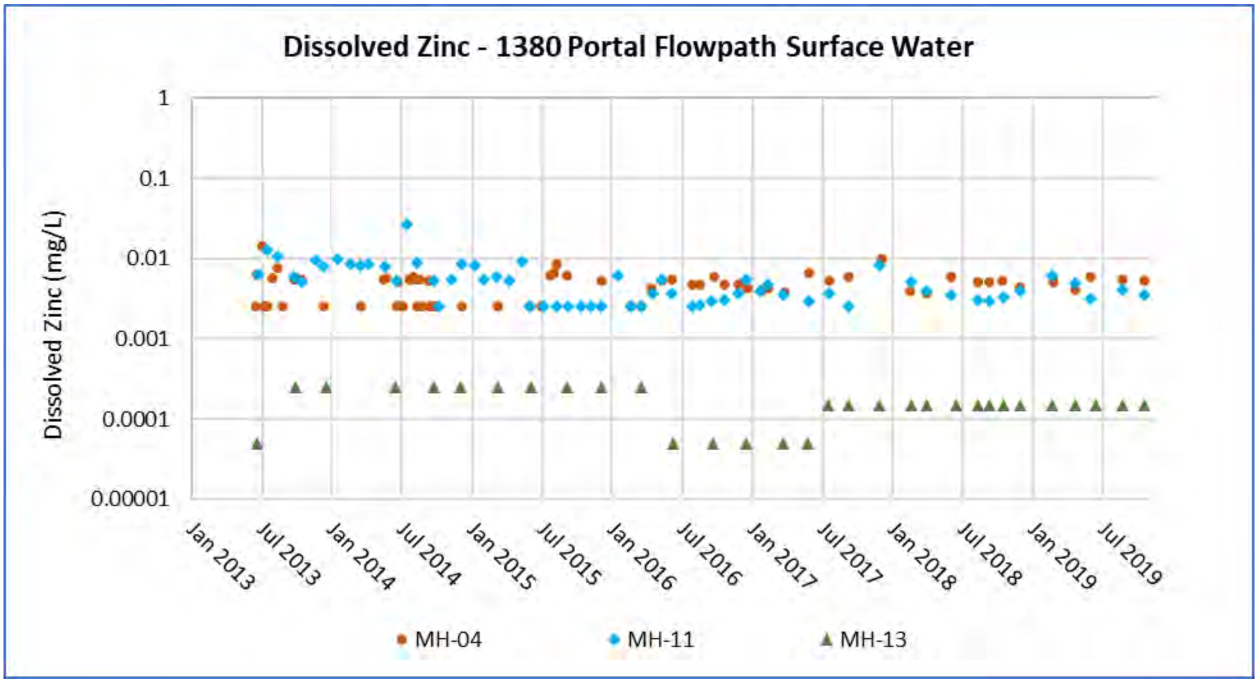


Figure 3-13: Dissolved Zinc Concentrations at MH-11, MH-04 and MH-13

Despite the gradual increase in the dissolved zinc concentrations at MW13-13 and MW13-01 in 2019, AMP ST1 events were related to natural seasonal variation in zinc concentrations rather than an increasing trend. Regardless, dissolved zinc should be monitored to detect any increases in the portal 1380 flow path.

3.4.3.2.3 Dissolved Cadmium

Dissolved cadmium also triggered the AMP ST1 at MW13-13 and MW13-01 on three different occasions in 2019. Dissolved cadmium concentrations gradually increased from 0.0005 mg/L in December 2018 to 0.0038 mg/L in August 2019, while concentrations increased from 0.00051 to 0.00092 mg/L from February to October 2019 at MW13-01. Despite the increase, in both cases, the highest results noted in 2019 were within the seasonal range observed in these waters and the increases were comparable to increases observed in the previous years (Figure 3-14). Moreover, the cadmium levels were all well below the AMP thresholds.

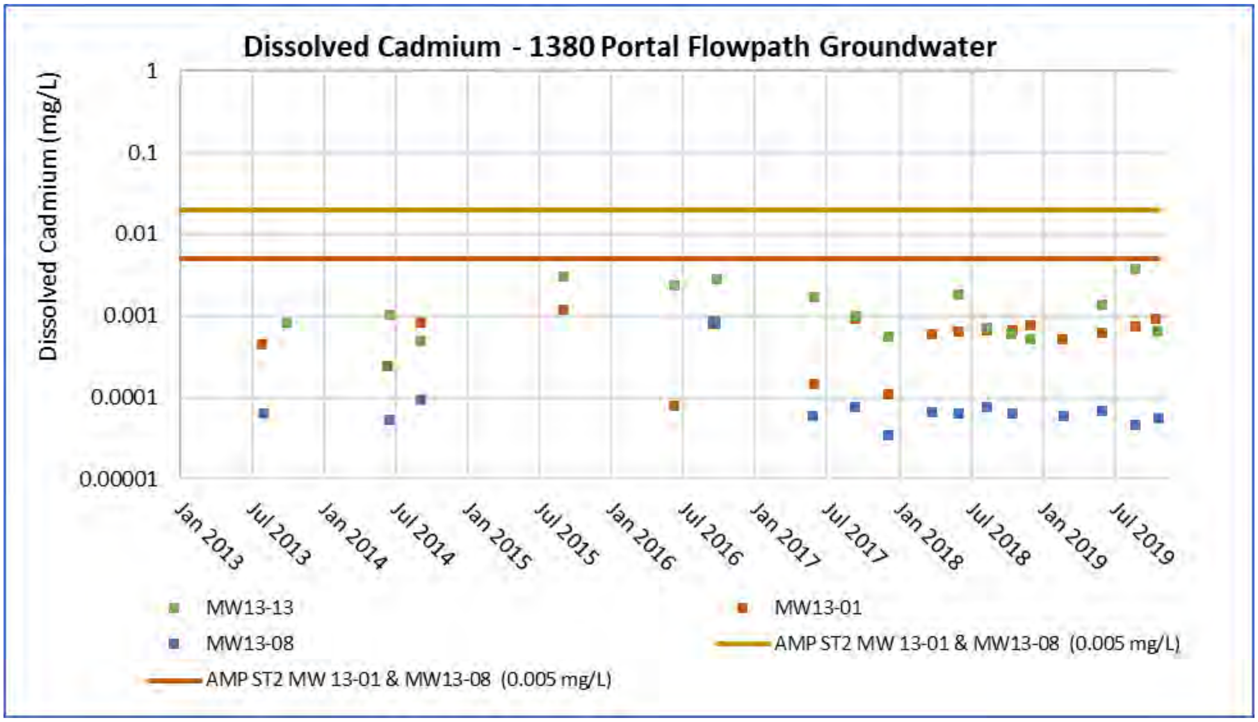


Figure 3-14: Dissolved Cadmium at MW13-01, MW13-08 and MW13-13

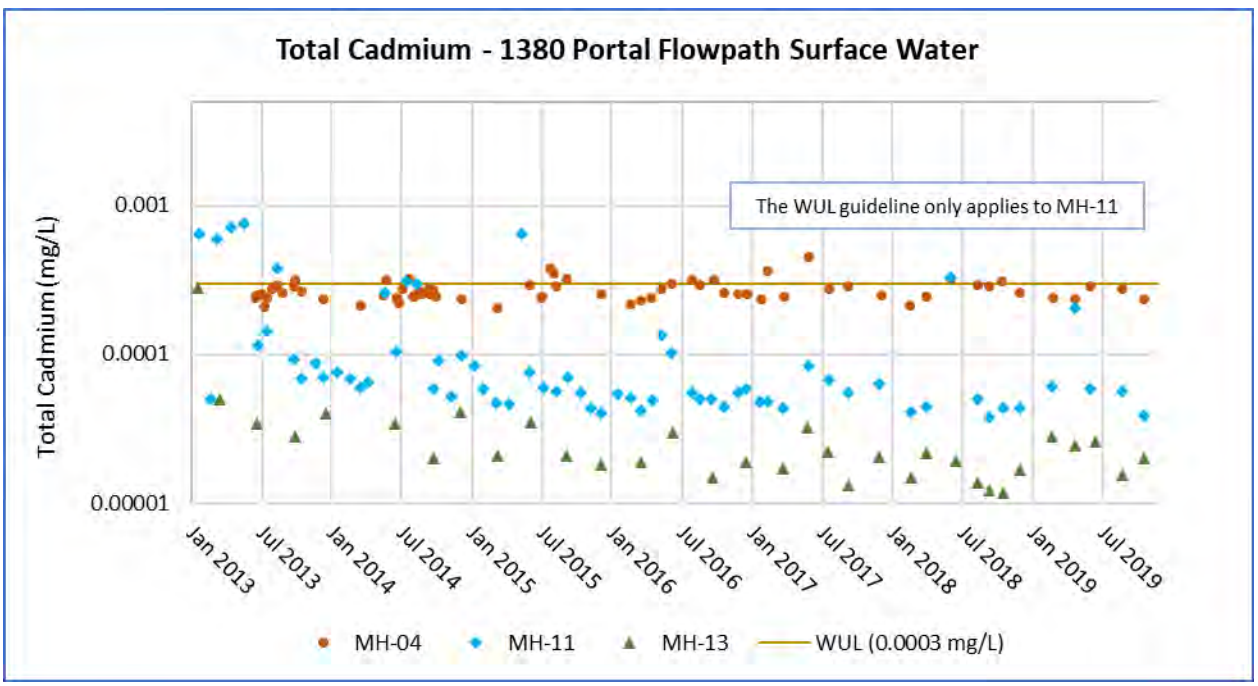


Figure 3-15: Total Cadmium Concentration at MH-11, MH-04 and MH-13

Cadmium concentrations at the surface water monitoring location downstream were stable (Figure 3-15). The yearly average cadmium concentrations at the receiving environment monitoring station has remained constant at 0.0004 mg/L for the past four years and levels are well below the WUL guideline. Given the stable cadmium concentrations observed over the period of record, it appears that natural attenuation of cadmium continues to operate along the 1380 portal flow path and the activation of the AMP appears to be indicative of the seasonal trend and the sensitivity of the AMP trigger.

3.4.3.3 Water Quality Trends

Long term pH trends have been stable for all three surface water stations and three groundwater stations downstream of the 1380 Portal. The receiving surface water monitoring stations (MH-04, MH-11, and MH-13) also had circumneutral pH with a range between 7.2 and 8.5. The WUL receiving environment monitoring station (MH-11) had an annual average pH of 7.9 in 2019, comparable to the five-year average of 8.1. The average monitoring well pH was circumneutral (7.5), ranging from 6.9 to 8.2, consistent with previous results. Plots showing historical and current surface and groundwater concentrations are available in Appendix E. The single sample collected at SDH-S2 returned a pH of 7.1, which is comparable to the average pH of 7.6 recorded at the 1380 portal discharge (MH-25) between 2001 and 2014.

The 1380 Portal discharge (SDH-S2) has generally had low alkalinity around 50 mg/L since monitoring began at this location, consistent with concentrations historically observed at MH-25 (average of 37.4 mg/L). The single sample collected in 2019 at the SDH-S2 had an alkalinity of 109 mg/L. In 2019, all the groundwater stations downstream of the 1380 Portal had alkalinity concentrations comparable to those of previous years. At the Lower Camp Creek surface water quality monitoring locations, total alkalinity concentrations were within historical ranges in 2019 with annual average alkalinity of 159, 211, and 201 mg/L at stations MH-04, MH-11, and MH-15, respectively. Groundwater alkalinity has also remained stable in 2019 as compared to previous years. MW13-13 had an average total alkalinity of 97 mg/L in 2019 compared to yearly average of 99.7 and 95.2 mg/L in 2018 and 2017 respectively. MW13-08 had a 2019 yearly average of 282 mg/L alkalinity as compared to the 2013-2018 average of 251 mg/L. Similarly, MW13-01 had a 2019 annual average of 156 mg/L, which is comparable with the five-year average of 135 mg/L.

Sulphate concentrations triggered the AMP ST1 in 2019 at MW13-08, but the gradual increase that activated the AMP trigger is considered to be due to a seasonal trend rather than a long term trend; sulphate levels are discussed in detail in Section 3.4.3.2.1. Sulphate concentrations at 1380 Portal discharge (SDH-S2) have been around 200 mg/L since monitoring began in 2013 at this station and were consistent with historical concentrations at MH-25 averaging 221 mg/L. The WUL mandated receiving water monitoring station below the 1380 portal (MH-11) has a very stable sulphate level with the 2019 annual average equivalent to the five-year average (15 mg/L).

Historical dissolved hardness levels were generally between 165 and 211 mg/L at all surface water stations in this catchment. In 2019, hardness remained stable at all surface water monitoring stations with annual averages between 160 and 205 mg/L. Dissolved hardness has also been very stable over the years of monitoring at the three wells, with annual averages being comparable to historical averages. MW13-13 had an average dissolved hardness of 123 mg/L in 2019 compared to a historic average of 127 mg/L. Similarly, MW13-08 had a 2019 annual dissolved hardness of 293 mg/L as compared to a historical average of 278 mg/L. MW13-01 was also stable in 2019, with an annual average of 153 mg/L compared to a historical average of 159 mg/L.

3.4.4 Landfill Groundwater Monitoring

Waste from the demolition of the Mill was placed in the existing landfill in 2015. The landfill is located near the former North Creek pump house. The landfill contains waste produced during operations and demolition debris from the Mill Site, former camp and office buildings, and miscellaneous debris from the site. The objective of the AMP for the landfill is to detect if there is an increase in the water level such that the landfill would be submerged or detect a change in water quality that might imply that landfill materials are leaching metals or are a source of hydrocarbons. Monitoring of these stations was initiated in mid-2016.

3.4.4.1 AMP

AMP monitoring locations include MW14-02, MW14-03, MW14-04, which would detect any changes in water quality and level close to the source. MW14-01 is a background monitoring station for the landfill that is part of the EMSRP. In addition to physical parameters and dissolved metals, samples collected at these groundwater monitoring stations are also analyzed for hydrocarbons to assess potential mobilization and transport from the landfill.

The water quality results are compared to Schedule 3 of the Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Yukon Government, 2002). There were no exceedances of the YCSR water quality guidelines in 2019, nor of any of the AMP specific thresholds.

Quarterly water level monitoring in the landfill groundwater monitoring wells is required under the WUL and the AMP. Individual and average water levels are shown in Table 3-8. Wells MW14-02 and MW14-03 were dry throughout 2019, which is consistent with previous years.

Well MW14-01 was dry in the first and second quarters of 2019. Levels measured in the third and fourth quarters of 2019 were consistent with those observed in previous years. MW14-01 had an average level of 1014.8 masl in 2019, compared to a historical average of 1017.3 masl.

At the MW14-04 monitoring well the 2019 water levels were consistent with those of previous years. There was little water present in MW14-04 during all four sampling events and the well was slow to recharge after purging. The 2019 annual average water level at MW14-04 (1017.8 masl) was consistent with the historical average (1018.9 masl).

The water levels at all stations were lower than 3.5 m from the base of the landfill; none of the AMP specific thresholds were triggered.

Table 3-8: Portal Discharge Groundwater Levels

Well Water Levels								
Well ID	2019				2019 Average	2018 Average	2017 Average	Historical Average [1]
	Feb	Jun	Aug	Oct				
	masl [2]	masl	masl	masl	masl	masl	masl	masl
MW14-01	Dry	Dry	1015.015	1014.65	1014.8	1,015.1	1,015.0	1,017.3
MW14-02	Dry	Dry	Dry	Dry	Dry	Dry	1,018.5	1,019.0
MW14-03	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1,031.9
MW14-04	Dry	1017.65	1017.8	1017.885	1017.8	1,017.9	Dry	1,018.9

1 Overall average (without 2019 data)
2 masl denotes metres above sea level

3.4.4.2 Water Quality Trends

Due to the small dataset associated with the landfill groundwater monitoring program (two samples collected at MW14-01 and one at MW14-04 in 2019), water quality trends are difficult to discern. Plots showing historical and current groundwater concentrations are available in Appendix E.

Only one field pH measurement was collected at MW14-01. The pH of 7.4 is comparable to the five-year average of 7.0. Sulphate concentrations have seemingly decreased at MW14-01 with a range of 3.5 to 3.6 mg/L compared to the historical average of 10 mg/L. The single sample collected at MW14-04 returned a sulphate concentration of 3.8 mg/L, indicating a decrease as compared to the historical average of 8.7 mg/L.

Hardness levels were also stable in 2019 as compared to the historical averages. MW14-01 had a 2019 average of 219 mg/L as compared to the historical average of 223 mg/L, and the single sample collected at MW14-04 had a hardness of 162 mg/L as compared a historical average of 172 mg/L.

3.4.5 Contaminated Sites Groundwater Monitoring

An environmental assessment of the site, conducted between 2011 and 2014, found petroleum hydrocarbon in soil that exceeded the YCSR guidelines in the vicinity of maintenance shops and fuel storage tanks. Similarly, metal concentrations exceeded YCSR guidelines in soils associated with the mine primary activity areas (i.e., sediment ponds, tailings facilities, waste rock piles) and processing areas (i.e., mill area). The hydrogeological assessment conducted indicated that groundwater quality has not been impacted by the identified hydrocarbons or metals soil contamination, and a remediation plan was executed.

The monitoring plan includes three groundwater wells around the site designed to monitor areas downgradient of where soil contamination has been identified as part of the Contaminated Site Assessment process:

- MW13-05 (Jewelbox/Main Zone);

- MW13-10 (Mill Site); and
- MW13-07 (Tailings Impoundment Area).

MW13-04 is also monitored for the same parameters as the site assessment wells and is considered to reflect baseline conditions. MW13-04 and MW13-05 are located along the main access road and downstream of the mill site, MW13-07 is located just downstream the North Dam and tailings pond area, and MW13-10 is located northeast and downstream of the mill site (Figure 3-1).

Water quality results are compared to Schedule 3 of the Yukon Contaminated Sites Regulation (YCSR) Water Quality Guideline for the protection of Freshwater Aquatic Life (Yukon Government, 2002). Comparison to YCSR water quality guidelines is not a requirement of the water licence but is included in water quality reporting for reference. There were no exceedances of the YCSR water quality guidelines in 2019.

3.4.5.1 AMP

The objective of the AMP for the general CSR groundwater wells is to detect a change in water quality that might imply that a metals or hydrocarbons plume is spreading from historical sources near the mill site or tailings pond area. AMP monitoring sites include MW13-10 (Mill Site), MW13-07 (Tailings Pond Area), and MW13-05 (Jewelbox/Main Zone) which are located to detect any changes in water quality and level close to the source.

The thresholds for groundwater quality are based on the Yukon contaminated sites regulations (YCSR) for the protection of aquatic life. The groundwater quality threshold parameters are hydrocarbons and dissolved cadmium, lead and zinc. All samples taken from the AMP monitoring wells in 2018 were below the YCSR guidelines and no AMP triggers were activated.

Water level monitoring of these wells is required under water licence QZ16-051 and water levels at four groundwater monitoring stations have remained constant historically and throughout 2019. Table 3-9 provides the well water levels and yearly averages for each station visited in 2019. Water levels were consistent with historical water levels, with 2019 averages being comparable with historical annual averages.

Table 3-9: Contaminated Sites Groundwater levels

Well Water Levels (masl)								
Well ID	2019				2019 Average	2018 Average	2017 Average	Historical Average [1]
	Feb	Jun	Aug	Oct				
	masl	masl	masl	masl	masl	masl	masl	masl
MW13-04	Dry	1,192.4	1,181.3	1,180.7	1,184.8	1,183.7	1,180.2	1,184.0
MW13-05	Dry	1,193.8	Dry	Dry	1,193.8	1,192.2	1,190.2	1,191.5
MW13-07	1,093.19	1,094.63	1,093.81	1,093.62	1,093.8	1,093.8	1,093.4	1,094.2
MW13-10	1,115.18	1,117.46	1,115.65	1,115.56	1,116.0	1,016.0	1,115.5	1,115.8

[1] Overall average (without 2019 data)
[2] masl denotes metres above sea level

3.4.5.2 Water Quality Trends

The historical record for these wells is limited and consists of ten to sixteen data points for each well, from 2013 to 2019, with the most frequent sampling occurring from 2017 onward. The paucity of data limits the identification and interpretation of long-term trends in the dataset. Plots showing historical and current concentrations of samples collected in these monitoring wells are available in Appendix E.

The pH measured at all four wells was circumneutral, ranging from 7.2 to 7.8, consistent with historical data. Sulphate concentrations have remained relatively stable at all four of the groundwater monitoring locations with a minimum of 4.7 mg/L at station MW13-04 and a maximum of 48 mg/L at MW13-05.

Alkalinity has also been stable at approximately 220 mg/L for stations MW13-07 and MW13-10 and at approximately 130 mg/L at stations MW13-04 and MW13-05. Hardness has remained stable for all monitoring wells with 2019 averages near historical (2013-2018) averages.

The YCSR dissolved cadmium guideline is hardness dependent and has a range of 0.0005 mg/L to 0.0006 mg/L for MW13-04 and a value of 0.0006 mg/L for the other three wells. The highest 2019 concentrations of dissolved cadmium were recorded at the background well MW13-04 (0.0005 mg/L) in September 2016, October 2018, June 2019, and October 2019. All the contaminated sites groundwater monitoring stations (MW13-05, MW13-07, and MW13-10) had dissolved cadmium concentrations below the ST2 of 0.000045 mg/L.

The dissolved lead YCSR guideline is hardness dependent, with a guideline of 0.06 mg/L for MW13-04 and MW13-05 and 0.11 mg/L for MW13-07 and MW13-10. The annual average dissolved lead for MW13-04 was 0.00056 mg/L, a slight increase from the 2013-2018 average of 0.00047 mg/L. At MW13-05 an increase in dissolved lead was observed with an 2019 average of 0.00014 mg/L as compared to the five-year of 0.000052 mg/L. A similar increase was observed at MW13-07 with the annual average of 0.000052 mg/L being almost five times greater then the historical average (0.000015 mg/L). Concentrations of dissolved lead were constant at MW13-10 with levels in 2019 averaging at 0.00015 mg/L as compared to the five-year average of 0.00011 mg/L. Despite the increases at some wells, none of the 2019 samples taken at MW13-05, MW13-07 and MW13-10 came close to exceeding the AMP ST2.

The dissolved zinc YCSR guideline is hardness dependent, with a guideline of 0.9 mg/L for MW13-04 and MW13-05 and 1.65 mg/L for MW13-078 and MW13-10. The highest level was recorded at the background monitoring well (MW13-04) in June 2019 at 0.02 mg/L. Most dissolved zinc levels measured at MW13-05, MW13-07, and MW13-10 were one order of magnitude below the lowest threshold (ST2) (0.675 mg/L for MW13-05 and 1.24 mg/L for MW13-07 and MW13-10), with yearly averages of 0.018, 0.0017 and 0.0019 mg/L, respectively. The 2019 averages indicate slight decreases in zinc concentration at MW13-07 (2019 average of 0.0017 mg/L as compared to the 2013-2018 average of 0.031 mg/L) and MW13-10 (2019 average of 0.0019 mg/L as compared to the historical average of 0.0089 mg/L) and an increase at MW13-05 (2019 average of 0.018 mg/L as compared to the historical average of 0.003 mg/L). MW13-04 had stable concentrations with an annual average of 0.016 mg/L and a five-year average of 0.010 mg/L.

4 SURFACE WATER HYDROLOGY

The surface hydrology of the SDH site was first characterized in 1990 during the permitting stage of the mine (SRK 1990). An update was prepared in 1999 to support the 2000 Decommissioning and Reclamation Plan (Teck 2000). A further update was prepared in 2005 to incorporate site climate and flow data that had been collected over a four-year period from 2000 to 2004. In 2013, another set of updated flow measurement were made for key water sampling locations. The results of the 2013 work were discussed in the 2013 annual water licence report (SRK 2014a).

The most recent hydrology update was generated in 2014. This updated hydrological information was used in SDH's water and load balance model for predicting post-closure surface water quality. A memorandum (SRK 2014b) detailing this update was submitted on September 16, 2014. The following sections provide a summary of the hydrology data collected at the site in 2019.

4.1 METHODOLOGY

As part of the SDH water monitoring program, measurements or field estimates of creek discharge were conducted. Flows during open water were measured using an electromagnetic flow meter and the United States Geological Survey mid-section method. A Marsh-McBirney Flowmate velocity meter were used for open water flow measurements. During the winter months, flows are measured using the salt-dilution gauging method. The dilution gauging procedure method deposits a known amount of salt into the stream and measures the concentration downstream overtime. For MH-22 and MH-02 where a pipe is discharging, the bucket fill method is utilized. A known quantity bucket is filled, and the time is recorded. The process is repeated five times and the average is taken. The measurement period covers the time it takes for the conductivity to respond to the tracer and return to background. The method used at each site for measuring discharge are shown in Table 4-1.

Table 4-1: Hydrology Methods for 2019 sampling events

Site	February	April	June	August	October	December
MH-02	- [2]	- [2]	BF	BF	BF	BF
MH-04	DG	DG	M	M	DG	DG
MH-11	- [2]	DG	M	M	DG	DG
MH-12	- [2]	- [2]	M	M	DG	DG
MH-13	DG	DG	M	M	DG	DG
MH-15	DG	DG	M	M	DG	DG
MH-22	- [2]	- [2]	BF	BF	BF	BF
MH-29	- [2]	- [2]	M	M	M	DG
MH-30	- [1]	- [1]	- [1]	- [1]	- [1]	- [1]

M= Marsh McBirney Flo-Mate
DG=Dilution Gauging
BF= Bucket-fill
[1] Site has been flooded by beaver activity, unable to conduct flow measurements.
[2] No discharge measurement collected due to low or no flow conditions

4.2 RESULTS

Results of the 2019 flow monitoring are presented below in (Table 4-2) as well as in Appendix D. No flows were conducted at MH-30 in 2019 due to flooding at the site from beaver activity. Efforts were made to try and find a more suitable channel; however, efforts were unsuccessful. Some sites had no flow measurements collected during the February and April sampling events, due to low or no flows at those sites.

Table 4-2: Discharge results for 2019 (m^3/s)

Site	February	April	June	August	October	December
MH-02	- [2]	- [2]	0.0003	0.0012	0.0001	0.0001
MH-04	0.0046	0.0040	0.0434	0.0185	0.0112	0.0081
MH-11	- [1]	0.0140	0.1827	0.0661	0.0318	0.0130
MH-12	- [1]	- [1]	0.0551	0.0222	0.0044	0.0119
MH-13	0.0472	0.0663	0.7358	0.1392	0.1323	0.1600
MH-15	0.0394	0.0466	0.1373	0.0694	0.0655	0.0132
MH-22	- [2]	- [2]	0.0027	0.0011	0.0005	0.0003
MH-29	- [2]	- [2]	0.0445	0.0117	0.0066	0.0055
MH-30	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]

[1] Frozen to ground, or very low flow
[2] Pipe frozen
[3] Flooded due to beaver activity

5 PHYSICAL AND GEOTECHNICAL MONITORING

Part G Clauses 44 to 48 of Licence QZ16-051 outlines the physical monitoring program of constructed and engineered structures remaining at the site. Monitoring of earthworks was conducted in 2019 as per the OMS Manual (SRK, 2015) and the Post-Closure Geotechnical Monitoring Plan (SRK, 2014c). Piezometer levels in the North Dam were measured monthly to monitor the phreatic surface within the dam. Piezometric levels in North Dam were reviewed on a regular basis by both Teck and SRK. They are included in the annual geotechnical inspection report provided in Appendix G. The seasonal fluctuations recorded in 2019 in the piezometers are generally consistent with those in previous years and below the maximum safe levels are within acceptable tolerance limits (SRK, 2019).

A formal geotechnical inspection of the structures and features associated with the Tailings Management Area (TMA) as well as other geotechnical structures was also conducted by SRK on (September 9 and 10, 2019). The dam safety inspection report is provided in Appendix G. The report presents SRK's observations of the following structures and features:

- The North Dam;
- The decommissioned North Creek Dyke and Second Crossing;
- The relocated Camp Creek Channel;
- The North Channel and South Channel;
- The Sediment Retaining Structure (SRS);
- The Burnick Portals (1200 and 1300) and waste rock dumps; and
- The Jewelbox and Main Zone Waste Rock Dump Areas.

In summary, all the geotechnical structures are stable and are functioning in accordance with the closure design parameters. There were no changes to the structures in 2019.

- There was one recommendation identified in 2019. North Creek Channel – 2019-01 Beaver Dam at inlet to channel – Remove beaver dam channel – Completed September 5, 2019- Closed

In addition to the geotechnical inspection, monitoring and maintenance of the roadways is required as part of the QZ16-051. In 2019, maintenance included removing debris from the road culverts and the installation of one new overflow culvert. Physical work conducted at the site in 2019 included placing a 30cm till cap on 1,384 m2 in the mill area as the area was identified in 2018 with insufficient cover. The old pump shack on Camp Creek was removed.

6 SPILL CONTINGENCY PLAN REVIEW

No spills or unauthorized discharges occurred in 2019. The Spill Contingency Plan was updated on March 26, 2018 to reflect current activities and contacts at the site. The Spill Contingency Plan reviewed in March 2020 and no revisions are required.

7 SUMMARY

Decommissioning activities were completed in 2015 and the site is now in permanent closure. Details of the 2015 decommissioning work are provided in AMEC's 2015 Reclamation Activities and As-Built Report, which were submitted by Teck in November 2015. The current water licence QZ16-051 addressing permanent closure came into effect on April 1, 2017.

No freshwater from the on-site water wells was withdrawn for industrial or domestic purposes in 2019. No water was discharged by pumping. The Reclaim Pond Dam has been removed and reclaimed. Water from the South Tailings Pond now freely drains to the downstream environment when water levels reach the level of the South Retaining Structure spillway invert.

In 2019, samples from all the required water quality monitoring stations met the standards in licence QZ16-051 for all water quality parameters, however, exceedances of the AMP thresholds did occur in 2019 and are discussed in Section 4.4. Based on the review of available water quality data, and information from subsequent sampling events, no additional actions were deemed necessary.

Work at SDH in 2019 included:

- Monitoring of surface and groundwater quality;
- The annual physical and geotechnical inspection and associated earthworks monitoring including monitoring piezometers on the North Dam, which did not uncover any unusual circumstances;
- Road maintenance included removing debris from the road culverts and the installation of one new overflow culvert; and
- Physical work included the 30cm till cap on 1,384 m^2 in the mill area area which was identified in 2018 with insufficient cover. The old pump shack on Camp Creek was also removed.

8 REFERENCES

Alexco 2017. Sä Dena Hes Mine, Post-Reclamation Adaptive Management Plan. Report prepared for Sä Dena Hes Operating Corporation C/O Teck Resources Limited by Alexco Environmental Group, June 28, 2017.

Alexco 2018. Sä Dena Hes Mine, Post-Reclamation Adaptive Management Plan. Revised report prepared for Sä Dena Hes Operating Corporation C/O Teck Resources Limited by Alexco Environmental Group, February 12, 2018.

AMEC 2015. 2015 Sä Dena Hes Mine, Reclamation Activities and As-Built Report. Report prepared for Sä Dena Hes Operating Corporation C/O Teck Resources Limited by AMEC, submitted November 2015

Laberge Environmental Services, 2018. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mine Site. Report prepared for Sä Dena Hes Operating Corporation C/O Teck Resources Limited by Laberge Environmental Services, October. 2018

Steffan, Robertson, and Kirsten (Canada) Inc (SRK). 1990. Mt. Hundere Development Initial Environmental Evaluation. Report prepared for Curragh Resources. May 1990.

SRK Consulting (Canada) Inc. (SRK). 2000. 2000 Geochemical Studies. Sä Dena Hes Mine. November 2000.

SRK 2014a. Sä Dena Hes 2013 Annual Report Water Licence QZ99-045. Report Prepared for Teck Resources Limited by SRK Consulting (Canada) Inc. March 2014.

SRK 2014b. Sä Dena Hes Hydrology Update. Memorandum prepared for Teck Resources Limited by SRK Consulting (Canada) Inc. September 2014.

SRK 2014c. Proposed Post Reclamation Geotechnical Monitoring Program. Memorandum prepared for Teck Resources Limited by SRK Consulting (Canada) Inc. September 2014.

SRK Consulting (Canada) Inc., (2015). 2015 Operation, Maintenance and Surveillance Manual for the Tailings Management Area at Sä Dena Hes Mine. Report prepared for Teck Resources Limited. 1CT008.055. October 2015.

SRK 2019, Sä Dena Hes Mine, Yukon Territory, 2019 Dam Safety Inspection. Report Prepared for Teck Resources Limited by SRK Consulting (Canada) Inc. December 2019.

Teck 2000. Detailed Decommissioning and Reclamation Plan. Report prepared by Teck Resources Limited. 2000.

Teck 2018. Water Licence #QZ16-051 – Sa Dena Hes Mine – Submission of Revised Adaptive Management Plan. Letter from Teck to Yukon Water Board, dated March 7, 2018.

Yukon Government 2002. Environment Act Contaminated Sites Regulation. August 2002.

APPENDIX A

WATER USE LICENCE QZ16-051

YUKON WATER BOARD

Pursuant to the *Waters Act* and *Waters Regulation*, the Yukon Water Board hereby grants a Type B water licence for a quartz mining undertaking to:

Sä Dena Hes Operating Corp.
c/o Teck Resources Limited
3300-550 Burrard Street
Vancouver, BC V6C 0B3

LICENCE NUMBER:	QZ16-051		
LICENCE TYPE:	B	**UNDERTAKING:**	QUARTZ
WATER MANAGEMENT AREA:	01 Liard		
LOCATION:	Upper False Canyon Creek and tributaries of False Canyon Creek, Sä Dena Hes Mine Site		
MAP CO-ORDINATES:	Max Latitude: 60° 42' 21" N Max Longitude: 129° 11' 38" W Min Latitude: 60° 18' 31" N Max Longitude: 128° 34' 08" W		
PURPOSE:	To store/alter flow of water associated with maintenance and decommissioning activities and to deposit a waste to water.		
EFFECTIVE DATE:	April 1, 2017		
EXPIRY DATE:	December 31, 2040		

This licence shall be subject to the restrictions and conditions contained herein and to the restrictions and conditions contained in the *Waters Act* and the *Waters Regulation* made thereunder.

Dated this 30 day of

March, 2017

Witness

Approved by:

Chairperson
YUKON WATER BOARD

PART A - DEFINITIONS

"Act" means *Waters Act* and any amendments thereto.

"Adaptive Management Plan" means the *Sä Dena Hes Mine Post-Relcamation Adaptive Management Plan* submitted as part of the Application and included in the Register QZ16-051 as part of exhibit 1.16, and any subsequent revisions.

"Application" means Application QZ16-051, including any additional submissions and/or revisions submitted to the Yukon Water Board by the Licensee, up to the date of the Board's decision.

"Board" means the Yukon Water Board.

"Dam Safety Guidelines" means the most current version of the Dam Safety Guidelines issued by the Canadian Dam Association.

"Detailed Decommissioning and Reclamation Plan" or "DDRP" means the *Detailed Decommissioning and Reclamation Plan* that was submitted as part of the Application and included in Register QZ16-051 as exhibit 1.3 and any subsequent revisions.

"Environmental Monitoring, Surveillance and Reporting Plan" or "EMSRP" means the *Environmental Monitoring, Surveillance and Reporting Plan* submitted as part of the Application and included in Register QZ16-051 as Exhibit 1.24, and any subsequent revisions.

"Freshwater Intake end-of Pipe Fish Screen Guideline" means the most current version of the *Freshwater Intake end-of Pipe Fish Screen Guideline* issued by the Department of Fisheries and Oceans.

"Inspector" means any person designated as an Inspector under the Act.

"Natural Boundary" means the visible high water mark of any lake, river, stream or other body of water where the presence and action of water is so common and usual and so long continued as to mark upon the soil of the bed of the lake, river, stream or other body of water a character distinct from that of the banks thereof, both in respect to vegetation and in respect to the nature of the soil itself. In addition, the best estimates of the edge of dormant or old side channels and marsh areas are considered to be Natural Boundaries.

"Non-Acid Generating and Non-Metal Leaching" means rock with a paste pH $\geq$ 5.0, a Neutralizing Potential: Acid Generation Potential Ratio (NPR) $\geq$ 3:1 and a sulphur content of $<$ 0.3%.

"Post-Closure Geotechnical Monitoring Plan" means *Proposed Post Reclamation Geotechnical Monitoring Program* that was submitted as part of the Application and included in Register QZ16-051 as Appendix D in exhibit 1.24, and any subsequent revisions.

"Regulation" means the *Waters Regulation* made under the Act.

"Spill Contingency Plan" means the *Spill Contingency Plan* that was submitted as part of the Application and included in Register QZ16-051 as exhibit 1.28, and any subsequent revisions.

"Waste" means any substance as defined in the Act.

"Watercourse" means a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches.

"Wetted Perimeter" means the horizontal extent of the present water level while the work is taking place.

PART B – WATER USE AND DEPOSIT OF WASTE

1. The Licensee is hereby authorized to
    a) deposit Waste in the form of;
        i. water from Burnick 1200, via sub-surface flow, to tributaries of False Canyon Creek; and
        ii. water from 1380 Portal, via sub-surface flow, to Upper False Canyon Creek.
        iii. seepage from North dam to Tributary E False Canyon Creek;
        iv. seepage and runoff from the south sediment retaining structure to Upper False Canyon Creek;
        v. collected runoff from the Jewelbox Hill dumps to Upper False Canyon Creek;
        vi. collected runoff from the North Hill dumps to tributaries of False Canyon Creek;
    b) Store and/or alter flow of water associated with the south sediment retention structure;
    c) carry out ongoing site monitoring and maintenance, including culvert maintenance and replacement; and
    d) decommission and reclaim the site road and access road, including culvert removal and bank stabilization,

    as described in the Application, and subject to the conditions of this licence. Where there is a discrepancy between the Application and this licence, the conditions of this licence shall prevail.

PART C – DESIGN AND CONSTRUCTION

2. The Licensee shall submit to the Board final detailed design construction drawings, specifications and quality assurance/quality control procedures for the construction of any works associated with the implementation of the DDRP.

3. The design of all structures and facilities associated with the project shall be carried out using sound engineering practices and shall be completed and sealed by a Professional Engineer licenced to practice in Yukon.

4. The final detailed design construction drawings, specifications and quality assurance/quality control procedures submitted to the Board shall be consistent with the designs in the DDRP.

5. At least ten days prior to the proposed date of commencement of construction of any structure or facility, the Licensee shall submit to the Board a written notification, together with a detailed construction schedule and the name and contact number(s) of the construction superintendent.

6. Where site conditions require minor modification to the designs submitted to the Board, the Licensee shall notify the Board, at least 10 days in advance, of the details of the modifications or variations from final detailed designs, specifications and quality assurance/quality control procedures previously submitted to the Board, provide a detailed construction schedule and the name and contact number(s) of the construction superintendent. The notice shall be in writing and include an explanation of the reasons for the change and an assessment of the potential impact on the performance of the works. The notice shall be sealed by a Professional Engineer licensed to practice in Yukon.

7. As-constructed (record) drawings and construction reports for all structures and facilities shall be submitted to the Board within ninety days of the completion of construction. Each submission shall be sealed by a Professional Engineer licenced to practice in Yukon.

PART D –OPERATING CONDITIONS

8. During the term of this licence, the Licensee shall maintain all works in good order in accordance with sound engineering and environmental practices.

9. The Licensee shall maintain the main access road from June through September in a manner such that heavy equipment can be taken to the site until the site has stabilized.

10. The Licensee shall maintain facilities and structures and undertake all monitoring in accordance with the requirements of this Licence.

11. When conducting any instream works, creek flow must be diverted around the work areas.

12. Where fish are present, the Licensee shall salvage all fish prior to de-watering any work area.

13. All works associated with the undertaking shall be maintained in good repair.

14. Construction and/or maintenance equipment shall be mechanically sound and free of leaks.

15. The tracks and/or wheels of heavy equipment are prohibited from entering the Wetted Perimeter of any Watercourse.

16. Granular bedding and backfill material shall consist of non-frozen material.

17. Except as authorized by this licence, no Waste shall enter any Watercourse as a result of any activities carried out by the Licensee.

18. All disturbed ground surfaces shall be stabilized in such a manner so as to prevent erosion and surface runoff.

Water Pumps

19. All water pumps shall be contained within an impermeable liner/structure that has the capacity to contain 110% of the maximum combined volumetric capacity of the fuel, lubricants and coolants within the engine of the water pump.

20. The Licensee shall provide barriers consisting of fish guards, screens, coverings or nets on all water intakes that are consistent with *Freshwater Intake end-of Pipe Fish Screen Guideline.*

21. The Licensee shall cease pumping or decanting and take remedial action if there is alteration to the bed or bank of the water channel as a result of pumping.

Rip-rap

22. Rip-rap shall be hard, dense, angular, Non-Acid Generating and Non-Metal Leaching quarry stone or boulders, free of seams, cracks, structural defects and contaminants, freeze-thaw resistant, non-slaking and free of fine-grained materials including silt and sand. Rip-rap gradation will conform to the specifications provided in the Application in Register QZ16-051 exhibit 1.15.

Geotextile

23. Specifications of the geotextile material shall comply with those described in the Application in Register QZ16-051 exhibit 1.2.

Culvert Removal

24. When removing culverts, the following procedures shall be followed:

    a) schedule removal of culverts so as to avoid concentrations of fish if such concentrations exist;

b) install or construct non-erodible cofferdams, silt barriers or other suitable methods to control siltation downstream of the work area;

c) reshape site to conform to grade of adjacent stream bank following removal of the culvert;

d) use rip-rap or other suitable methods, if required, to stabilize the bank at the work site; and

e) remove all silt controls following completion of work and ensure the grade of the drainage course is restored.

25. Culvert placement, removal and channel excavation shall be done in the dry, with the exception of connecting the existing channel to the diversion channel.

Spills and Unauthorized Discharges

26. Where a spill or an unauthorized discharge occurs, that is of a reportable quantity under the Yukon Spills Regulations, the Licensee shall immediately contact the 24-hour Yukon Spill Report number, (867) 667-7244 and implement the Spill Contingency Plan. A detailed written report on any such event including, but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to the Board not later than 10 days after the occurrence.

27. The Licensee shall apply the relevant procedures in the Spill Contingency Plan. The Licensee shall review the Spill Contingency Plan annually and shall provide a summary of that review, including any revisions to the plan, as a component of the annual report.

28. The Licensee shall maintain a log book of all spill or unauthorized discharge occurrences, including spills that are less than the reportable quantities under the Yukon Spills Regulations. The log book shall be made available at the request of an Inspector. The log book shall include, but not necessarily be limited to:

a) the date and time of the spill or unauthorized discharge occurrence;

b) the substance spilt or discharged;

c) the approximate amount spilt or discharged;

d) the location of the spill;

e) the distance between the spill or discharge and the nearest Watercourse; and

f) remedial measures taken to contain and clean-up the spill area or to cease the unauthorized discharge.

29. The Licensee shall include a summary of all spills or unauthorized discharges that occurred during the year reported, as part of the annual report.

30. All personnel shall be trained in procedures to be followed and the equipment to be used in

the containment of a spill.

31. Prior to the commencement of construction, the Licensee shall update the Spill Contingency Plan and provide the updated plan to the Board.

32. The Spill Contingency Plan shall be posted on site for the duration of the works.

Fuel Transfer and Refueling

33. Fuel, lubricants, hydraulic fluids, coolants and similar substances, with the exception with liquid associated with the water pump engine, shall be transferred a minimum of 30 metres from the Natural Boundary of any Watercourse, in such a way that said substances are not deposited in or allowed to be deposited in waters.

34. Water pumps may be refuelled within the Natural Boundary of any Watercourse. Refueling activities shall adhere to the following:
    a) no refueling shall be conducted within the Wetted Perimeter of any Watercourse;
    b) the fuel transfer shall be visually and continually monitored;
    c) fuel transfer nozzles shall be operated manually and will not be locked in the open position;
    d) spill kits, including absorbent pads shall be maintained in close proximity to the stationary equipment during refuelling operations;
    e) fuel transfers shall be conducted with an operator at each end of the transfer hose;
    f) shall only be conducted during daylight hours; and
    g) fuel transfer equipment components such as pumps, hoses and nozzles shall be visually checked for leaks or damage prior to each refuelling operation.

PART E – PLANS AND STUDIES

EMSRP Update

35. The Licensee shall submit an updated EMSRP to the Board within 90 days of the effective date of this licence. The updated plan shall include, but not be limited to:
    a) The terms and conditions of this licence;
    b) An updated groundwater monitoring program that includes the following:
        i. Quarterly monitoring of the groundwater wells in Schedule A;
        ii. Quarterly reporting of site water monitoring data; and
        iii. Addition of dissolved oxygen and oxidation-reduction potential as field parameters for the groundwater program.

Adaptive Management Plan

36. The Licensee shall submit an updated Adaptive Management Plan to the Board within 90 days of the effective date of this licence. The updated plan shall include, but not be limited to:

    a) the terms and conditions of this licence;
    b) the addition of sulphate to the AMP for mine source flow path water quality and receiving environment surface water quality components of the AMP;
    c) the addition of specific numerical thresholds for the mine source groundwater quality AMP based on scientifically derived thresholds that are proactive and protective of the receiving environment; and
    d) as part of the annual reporting on the AMP, a detailed assessment of the full suite of paramaters being measured at AMP indicators stations and identification of any additional indicator parameters that should be incorporated into the AMP.

Groundwater-Surface Water Interaction Study

37. Within 90 days of the effective date of this licence, the Licensee shall submit to the Board a plan for the assessment of groundwater-surface water interactions at the site including, but not limited to:

    a) a review of all monitoring results from all wells on site;
    b) predictions of groundwater-surface water interactions; and
    c) verification of existing site information including rationale supporting location of receiving water monitoring stations.

38. The Licensee shall carryout the assessment according the plan and submit report documenting the results of the program and any recommendations stemming from the study on or before March 31, 2019.

39. Subject to any required assessments, authorizations or approvals, the Licensee shall implement all plans required by this section of this licence.

PART F –RECEIVING WATER QUALITY STANDARDS

40. All results of grab sample analysis for MH-11, MH-12 and MH-15 shall meet the following receiving water quality standards.

Parameter	Maximum Concentration in a Grab Sample
Aluminum, dissolved	if pH $\geq$ 6.5 = 0.05 mg/L if pH < 6.5 = e[1.6−3.327(median pH)+0.402(median pH)^2]
Antimony, total	9 µg/L

Parameter	**Maximum Concentration in a Grab Sample**
Arsenic, total	5 µg/L
Beryllium, total	0.13 µg/L
Cadmium, dissolved	$= e^{[0.736 \times \ln(hardnesss) - 4.943]}$ in µg/L
Chromium VI, total	1 µg/L
Cobalt, total	4 µg/L
Copper, total[1]	if hardness ≤ 50 mg/L = 2 µg/L if hardness >50 mg/L = 0.04 x (hardness)
Iron, total[2]	1 mg/L
Lead, total[3]	**MH-12/ MH-15** (µg/L) $= \{3.31 + e^{[1.273 \ln(hardness) - 4.704]}\}$ **MH-11** (µg/L) $= 1.928 \times \{3.31 + e^{[1.273 \ln(hardness) - 4.704]}\}$
Molybdenum, total	0.073 mg/L
Nickel, total	if hardness ≤ 60 mg/L or unknown = 25 µg/L if hardness > 60 mg/L and ≤ 180 mg/L = $[e^{\{0.76[\ln(hardness)]+1.06\}}]$ µg/L if hardness > 180 mg/L= 150 µg/L
Selenium, total	2 µg/L
Silver, total	0.25 µg/L
Sulphate, total	if hardness ≤ 30 mg/L =128 mg/L if hardness > 30 mg/L and ≤ 75 mg/L =218 mg/L if hardness > 75 mg/L and ≤ 180 mg/L =309 mg/L if hardness > 180 mg/L =429 mg/L
Thallium, total	0.8 µg/L
Zinc, total[3]	**MH-12 / MH-15** if hardness ≤ 90 mg/L = 7.5 µg/L if hardness > 90 mg/L $= [7.5 + 0.75(hardness - 90)]$ µg/L **MH-11** if hardness ≤ 90 mg/L = 18.75 µg/L if hardness > 90 mg/L = 2.5 x $[7.5 + 0.75(hardness - 90)]$µg/L

Hardness is measured in mg/L $CaCO_3$ at monitoring station

[1] Standard for Copper during month of May is 4 µg/L if hardness ≤ 50 mg/L or 0.08 x [hardness] if hardness > 50 mg/L

[2] Standard for Iron during month of May is 3.9 mg/L

[3] Apply to dissolved fraction when TSS is 4 mg/L or higher

PART G - MONITORING AND SURVEILLANCE

41. The Licensee shall comply with the water quality monitoring program and surveillance network program as outlined in the EMSRP and in accordance with Schedule A of this licence and shall submit the data that is compiled as a result of these programs and studies as a component of the required annual reports.

42. Laboratory analyses shall be performed by a laboratory accredited under the International Organization for Standardization ISO/IEC 17025:2005 standard and the accreditation must include the actual tests being performed by the laboratory.

43. Monitoring and sampling shall be carried out in accordance with the procedures and standards described in:

    a) Guidance Document for the Sampling and Analysis of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/5), Minerals and Metals Division, Environment Canada;

    b) Guidance Document for Flow Measurement of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/4), Minerals and Metals Division, Environment Canada;

    c) Standard Guide for Sampling Ground-Water Monitoring Wells, ASTM D4448-01, ASTM International, PA, USA.

Physical Monitoring Program

44. The Licensee shall comply with the physical monitoring program as outlined in the EMSRP and Schedule B of this licence and shall submit the data that is compiled as a result of these programs and studies as a component of the required annual reports.

45. All earthworks and water retaining structures including, but not limited to, open pits, waste dumps, ditches, dams, dykes, weirs and appurtenances shall be inspected by a Professional Engineer licenced to practice in Yukon as per the Post-Closure Geotechnical Monitoring Plan. The results of the inspection, including all problems identified, remedial measures proposed, and remedial measures implemented, shall be compiled in a report that shall be submitted to the Board as part of the annual report.

46. The Licensee shall complete a dam safety review for all water retaining structures, including but not limited to dams, dykes, weirs and appurtenances at least once every ten years, with the first review to be completed no later than 2026. The review shall be conducted in accordance with the most recent Dam Safety Guidelines published by the Canadian Dam Association.

47. Details of any maintenance, inspection and/or surveillance activities undertaken in the previous year in relation to dam safety shall be included in the annual report.

48. The North tailings dam shall be monitored by the use of instrumentation as required by the Engineer of Record in the Post-Closure Geotechnical Monitoring Plan to ensure long term stability.

Fisheries Monitoring Program

49. A fisheries monitoring program shall be conducted in accordance to Schedule A-Part 3 of this licence and the EMSRP. The sample locations shall be marked in the field in a manner that ensures that replicate surveys can be made.

50. The Licensee shall survey sites MH-13, and MH-30 beginning in 2018, to confirm:

    a) a generalized stream bed and substrate characterization and to identify changes since the previous sampling, and

b) through generally accepted methodology, a catch per unit effort and the general implications of any changes observed as compared to prior sampling periods.

51. The results of the fisheries monitoring program shall be included in the Annual Report.

Benthic Invertebrate Monitoring

52. Benthic invertebrate monitoring shall be conducted in accordance with Schedule A-Part 3 of this licence and the EMSRP beginning in 2018.

53. The Licensee shall collect representative samples in accordance to the Canadian Aquatic Biomonitoring Network (CABIN) Field Manual for wadeable streams, and accepted preservation, enumerative and identification procedures.

54. Sample collection, identification, enumeration and data interpretation shall be performed by an individual having qualifications, expertise and experience in the subject.

55. Water sampling shall be conducted at each of the collection sites during the sample period per Schedule A.

56. Results of the benthic invertebrate monitoring and the water sampling and analysis shall be included in the Annual Report.

Sediment Monitoring

57. Sediment monitoring shall be conducted in accordance with Schedule A-Part 3 of this licence and the EMSRP.

58. The timing of the sediment monitoring shall coincide with the benthic invertebrate monitoring program. Triplicate samples shall be collected at each of the five sites indicated in the benthic invertebrate monitoring program.

59. All data collection shall be conducted in accordance to a nationally recognized sampling protocol (e.g. CCME Protocols Manual for Water Quality Sampling in Canada, 2011). The results shall be included in the Annual Report.

PART H – GENERAL CONDITIONS

60. The Licensee shall ensure a copy of this Licence is maintained at the site during operations at all times.

Other Laws

61. No condition of the water use licence limits the applicability of any statutory authority.

62. All construction or installation of works authorized by this licence shall occur on property that the Licensee has the right to enter upon and use for that purpose.

Non-Compliance

63. In the event that the Licensee fails to comply with any provision or condition of this licence, the Board may, subject to the Act, cancel the licence.

Correspondence

64. Where any direction, notice, order or report under this licence is required to be in writing, it shall be given:

a) To the Licensee, if delivered, or mailed by registered mail, to the address identified on page 1 of this licence, and shall be deemed to have been given to the Licensee on the day it was delivered, or 7 days after the day it was mailed, as the case may be; or

b) To the Board, if delivered, faxed or mailed by registered mail, to the following address:

Yukon Water Board
Suite 106, 419 Range Road
Whitehorse YT Y1A 3V1

Fax#: (867) 456-3890

and shall be deemed to have been given to the Board on the day it was delivered or faxed, or 7 days after the day it was mailed, as the case may be.

c) The Board or the Licensee may, by notice in writing, change its address for delivery.

Annual Reports

65. The Licensee shall submit annual reports to the Board on or before March 31 of the year following the year reported. The report shall include the information required by the Regulation including, but not necessarily limited to:

a) summaries of all data generated as a result of the monitoring requirements of this licence, including analysis and interpretation by a qualified individual or firm and a discussion of any variances from baseline conditions or from previous years' data;

b) a detailed record of any major post-reclamation maintenance work carried out on the waste dumps, diversion works, roads or any other aspect on the property that may have an impact on water;

c) documentation of any activities carried out at the site including those carried out under the requirements of the DDRP or Adaptive Management Plan;

d) reporting on the Adaptive Management Plan; and

e) an identification of any recommendations from the physical monitoring program, or from the most recent dam inspections or safety reviews, that were either not implemented, or that did not comply with the schedule proposed in the report, or in the review, including an explanation of why the recommendations was not implemented.

Quarterly Reports

66. Unless otherwise specified in this licence, the Licensee shall forward to the Board a copy of all data collected as part of the monitoring programs of this licence no more than 30 days after the conclusion of each quarterly sampling event in which that data was collected.

Reports

67. The Licensee shall provide to the Board one unbound, single-sided, paper copy of all reports required by this licence. All reports must be reproducible by standard photocopier.

68. The Licensee shall upload electronic copies of all reports required by this licence to the Yukon Water Board's online licensing registry, Waterline. Electronic copies shall be submitted in one of the following formats: MS Word, MS Excel, or Adobe .pdf format.

69. All water quality, water quantity and water level data shall also be submitted in Excel format. Water quality results must be uploaded to Waterline in the format outlined in the most recent version of Yukon's "Laboratory Data Submission Standards for Water Quality". This guide is available on the Yukon Water Board website.

SCHEDULE A – PART 1
SURVEILLANCE MONITORING SITES

Station ID	Station Description	Coordinates	
		Northing	Easting
MH-11	Camp Creek located 2 km downstream of the Reclaim Pond (Upper False Canyon Creek)	6707788	509460
MH-12	East Fork of Tributary E – of False Canyon Creek, approximately 2 km downstream of the north tailings dam	6712755	509688
MH-02	North Dam seepage	6711477	508060
MH-22	Burnick 1200 Portal discharge	6712946	506767
SDH-S2	Drainage from the 1380 Portal, present as a seep in the downslope waste rock dump	6709558	506325
MH-13	False Canyon Creek main channel located 10 km downstream of the mine site	6709113	512541
MH-04	Located near the Camp Creek headwaters above the former Reclaim Pond	6710292	507267
MH-15	West Fork of Tributary E	6718408	510041
MH-29	Access Creek Upstream of Camp Creek	6708895	509146
MH-30	Unnamed Tributary Upstream of False Canyon Creek	6707568	510985
MW13-01	Jewelbox/Main Zone – in 1380 Gully, downgradient of 1380 Portal.	6710202	506635
MW13-04	Main Access Road	6708729	507240
MW13-05	Main Access Road – south of the Mill Site on the Main Access Road.	6709392	507318
MW13-06	Burnick 1200 Portal	6713001	506761
MW13-07	North Dam – north of the North Dam and tailings pond area.	6711502	507904
MW13-10	Mill site - northeast of the Mill Site	6709866	507774
MW13-08	Downgradient of 1380 Portal	6710234	507325
MW13-13	Downgradient of 1380 Portal	6709814	506452
MW14-01	In proximity to the landfill.	6712303	507861
MW14-02	In proximity to the landfill.	6712330	507967
MW14-03	In proximity to the landfill.	6712442	507922
MW14-04	In proximity to the landfill.	6712365	508005

SCHEDULE A – PART 2
WATER MONITORING SURVEILLANCE PROGRAM

Station Category	Station ID	Flow	Water Level	Field Measurements		External Analytical Suite	
				Frequency	Parameters	Frequency	Analytical Suite
Compliance Point	MH-11	BM		BM	C	BM	A
	MH-12	BM		BM	C	BM	A
	MH-15	BM		BM	C	BM	A
Discharge Source	MH-02	BM		BM	C	BM	A
	MH-22	BM		BM	C	BM	A
	SDH-S2	BM		BM	C	BM	A
Additional Surface Water Stations	MH-13	BM		BM	C	BM	A
	MH-04	BM		BM	C	BM	A
	MH-29	BM		BM	C	BM	A
	MH-30	BM		BM	C	BM	A
Groundwater	MW13-01		Q	Q	D	Q	B
	MW13-04		Q	Q	D	Q	B,H
	MW13-05		Q	Q	D	Q	B,H
	MW13-06		Q	Q	D	Q	B
	MW13-07		Q	Q	D	Q	B,H
	MW13-10		Q	Q	D	Q	B,H
	MW13-08		Q	Q	D	Q	B
	MW13-13		Q	Q	D	Q	B
	MW14-01		Q	Q	D	Q	B,H
	MW14-02		Q	Q	D	Q	B,H
	MW14-03		Q	Q	D	Q	B,H
	MW14-04		Q	Q	D	Q	B,H

BM: Bi-monthly; S/F: Spring and Fall (freshet and low flow periods); Q:Quarterly (to include freshet and low flow periods

C: pH, specific conductance, water temperature

D: pH, specific conductance, water temperature, dissolved oxygen, ORP

A: pH, specific conductance, total alkalinity, TSS, TDS, total and dissolved metals, total ammonia-N, nitrate-N, nitrite-N, dissolved sulphate, hardness

B: pH, specific conductance, total alkalinity, dissolved metals, total ammonia-N, nitrate-N, nitrite-N, dissolved sulphate, hardness

H: hydrocarbons including BTEX, LEPH, HEPH, VPH, PAH

SCHEDULE A – PART 3
AQUATIC RESOURCES MONITORING PROGRAM

Station ID	Benthics/ Sediments	Fisheries
MH-11	BA-LFF	
MH-12	BA-LFF	
MH-13	BA-LFF	BA-LFF
MH-04	BA-LFF	
MH-29	BA-LFF	
MH-30	BA-LFF	BA-LFF

BA-LFF: Every two years during the low flow period (August or September)

Benthics: field collection and laboratory taxonomy using CABIN wadeable stream protocol.
Sediment: metals, total organic carbon and particle size
Fisheries: population and fish size

SCHEDULE B – PHYSICAL MONITORING

Inspection of Relevant Mine Components

Year	Frequency
2017- 2026	Annually
2027-2040	Years 2031, 2036, 2040

APPENDIX B

ADAPTIVE MANAGEMENT PLAN

ALEXCO
ENVIRONMENTAL
GROUP

Sä Dena Hes Mine

Post-Reclamation Adaptive Management Plan

12/02/2018

Prepared for:

SÄ DENA HES OPERATING CORPORATION C/O TECK RESOURCES LIMITED

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1 OVERVIEW

The Sä Dena Hes (SDH) mine is a lead/zinc mine located 45 km north of Watson Lake in southeastern Yukon within the Traditional Territory of the Kaska First Nation, specifically Liard First Nation (LFN). The SDH mine was constructed in 1991 and operated between August 1991 and December 1992 by Curragh Resources Inc. under Water Licence IN90-002 pursuant to the *Northern Inland Waters Act*. Approximately 700,000 tonnes of ore were mined and processed onsite during the 16-month operation of the mine. The mine has not been in operation since that time.

After 14 years in Temporary Closure, on January 26, 2012, Teck Resources Limited (Teck), on behalf of the Sä Dena Hes Operating Corporation (SDHOC), informed YG of its intention to enter the SDH mine into permanent closure and begin to implement the approved Detailed Decommissioning and Reclamation Plan (DDRP) on January 29, 2013. The decommissioning, closure and reclamation activities to permanently close the SDH mine was conducted from 2013 to 2015 in accordance with the licensed and approved DDRP.

During the 25-year post-reclamation phase, Teck proposes:

- To continue to deposit a waste from the discharges of the Main Zone 1380 Portal, the Burnick 1200 Portal and seepage from the Tailings Management Facility;
- To maintain and replace (if necessary) culverts and crossings on the Main Access Road and Site Access Road; and
- To store/alter water flow (to maintain dry construction conditions) for removal of culverts and back stabilization during decommissioning of the Main Access Road and Site Access Road.

This Adaptive Management Plan (AMP) is a tool used to address uncertainty or conditions in water quality beyond those anticipated in post-reclamation. AMPs outline a range of possible but unexpected outcomes and the responses that will be undertaken to curb possible negative impacts associated with these unexpected situations.

There are several very prescriptive and detailed management plans required for both operational control and regulatory approval for the post-reclamation period. Teck has developed a number of operational management plans which describe the management and response actions for expected conditions at the site. These plans currently include:

- Detailed Decommissioning and Reclamation Plan (Teck, 2015); and,
- Environmental Monitoring, Surveillance, Reporting Plan - EMSRP (Teck, 2017).

This AMP provides a framework for responses to conditions beyond those expected and identified in these decision-based management plans. Consequently, this AMP addresses a limited range of components related to water quality. It is expected that the AMP will be reviewed and revised as the closure measures are evaluated over time. The AMP has also been updated to reflect the conditions described in Water Use License, QZ16-051, which came into effect April 1, 2017.

1.2 ADAPTIVE MANAGEMENT PLANNING

Adaptive management is an approach to environmental management that is appropriate when a mitigation measure may not function as intended or when broad-scale environmental change is possible. Adaptive management plans are precautionary in nature, and provide a level of security in long term environmental planning. Adaptive management plans also allow for the inclusion of improved science into mitigation measures as they are continually revised.

Adaptive management has been evolving since its emergence in the 1970s. Adaptive approaches include an ability to incorporate knowledge into the management plan as the knowledge is gleaned and circumstances change (Eberhard, et al., 2009). Eberhard, et al., described the categories of knowledge that may trigger changes to water quality management plans; system understanding, measuring progress, and anticipating changes. These categories allow for the inclusion of knowledge and adaptation of management to changed conditions. Embedding adaptation into environmental plans involves thinking about how the results of monitoring will change management actions. Adaptive management plans are a way to accept uncertainties and build a structured framework to respond to changing conditions.

Adaptive management constructs a flexible path with actions to take when specific triggers occur. AMPs are a formalization of a plan for performance monitoring and project re-evaluation in the future. The general structure of adaptive management can be described by the following steps:

1. Identify risk triggers associated with vulnerabilities or uncertainties;
2. Quantify impacts and uncertainties;
3. Develop a monitoring network to understand variability and detect changes in water quality;
3. Evaluate strategies and define implementation path that allows for multiple options at specific triggers;
4. Monitor the performance and critical variables in the system; and
5. Implement or re-evaluate strategies when triggers are reached.

While the nomenclature used in AMPs varies, the steps listed above are representative of typical AMP processes. Within AMPs, triggers provide decision points in a stepwise decision-making framework that identifies how and when management action should be taken. A key characteristic of adaptive management is monitoring, which is used to document and track the status of the system of interest and to adjust management policies in an iterative process. Adaptive management is a rigorous method for addressing uncertainties in natural systems to meet performance objectives.

1.3 ADAPTIVE MANAGEMENT PLAN OBJECTIVES

This document identifies areas of uncertainty within the operational phase of Permanent Closure at Sä Dena Hes Mine and provides an AMP framework for each. The AMP describes monitoring commitments, thresholds, triggers and responses to underperforming elements or emerging risks for water quality. The steps laid out in the AMP framework are proactive, and describe progressively intensifying actions taken before adverse environmental impacts are observed.

Response planning, and results for anticipated, known and/or planned events are contained within site management plans. This AMP provides a framework for responding to a range of future events that are uncertain such as the loss of attenuation capacity, increased rates of metal release or other events that can result in the exceedance of the site water quality objectives.

AMPs do not prescribe specific responses to range of events, which is a function of Management plans. AMPs are designed to expand from monitoring data and must be flexible to do this. It is difficult to predict the specific environmental conditions that may arise which require a response from management and, therefore, the AMP does not provide specific detailed descriptions of responses to a situation. The AMP provides a range of possible responses to use as a guide to respond to specific environmental conditions encountered. Management should use the information provided in the AMP and undertake the appropriate response.

1.4 ADAPTIVE MANAGEMENT PLAN APPROACH

In addition to the conclusions drawn from monitoring, the approach presented in this AMP follows the Environment Canada Environmental Code of Practice for Metal Mines, Section 4.1.17 on Adaptive Management, which states that:

Mine owners/operators should use adaptive management methods to revise and refine the environmental management strategy. Adaptive management should consider a wide range of factors, including:

- results of environmental audits or other evaluation activities;
- results of environmental monitoring;
- results of monitoring of the performance or condition of environmental infrastructure, such as containment structures, water management systems or treatment facilities;
- technological developments; and
- changing environmental conditions. (Environment Canada, 2009)

In addition to the guidance provided by the Environmental Code of Practice for Metal Mines, the AMP meets the Yukon Government's Protocol for the Contaminated Sites Regulation under the Environment Act Protocol 13: Adaptive Management.

1.4.1 AMP FRAMEWORK

This AMP is laid out using a common element approach to consistently implement the AMP protocol as illustrated in Figure 1-1. The common elements are:

1. Description of the site water quality components and associated risk narratives:

- *Description* and understanding of the component leads to risk narrative and specific performance thresholds.
- *Risk Narrative* describes the possible environmental impacts and environmental conditions to water quality that implementation of the AMP will prevent.

2. Monitoring site water quality:

- *Specific Indicators* are the environmental or physical parameters to be monitored and assessed. Specific indicators are measurable or observable, and are indicative of changes from the designed or expected condition, such as select water chemistry parameters and groundwater levels.
- *Monitoring Requirements* describes the monitoring regime for the component including frequency, type of data required, and interpretation of results. The monitoring sites and schedule for the entire SDH mine site during reclamation and closure are already set out in the Environmental Monitoring, Surveillance, Reporting Plan (Teck, 2017). The AMP identifies specific monitoring sites described in the EMSRP that would identify potential changes and uses those sites and monitoring schedule to prompt an appropriate response. One of the possible actions that can come out of the AMP if triggered is to examine the water quality results from appropriate additional monitoring sites described in EMSRP, or to request additional sampling beyond those in the EMSRP.
- *Specific Performance Thresholds* define the conditions, in terms of specific indicators, when action is triggered. Performance thresholds are specific to each AMP component and are staged to accommodate levels of concern and a diversity of actions. To the extent possible, specific performance thresholds will include early warning thresholds.

3. Responding to unexpected conditions of the component:

- *Specific Responses* are staged according to specific performance thresholds and describe the actions to be implemented if those thresholds are crossed.

  The actions to be implemented are the following:

  a) Notification – notify the appropriate parities based on which component and level of specific performance threshold is exceeded.
  b) Review – verification of data appropriate to the level of specific threshold exceeded.
  c) Evaluation – an investigation into the cause of the exceedance appropriate to the level of the specific threshold exceeded. Can include trend analysis, resampling, or a more thorough investigation into root causes.

d) Action – an appropriate response based on the level of the specific threshold exceeded.

4. Annual Reporting and Review:

Annual Reporting would include the rationale for modifying the AMP if site conditions were to change. The AMP should be modified whenever monitoring data demonstrate a sustained deviation from previous trends in the data, the monitoring plan is revised and/or the best available conventional technology or practice to characterize or mitigate the water quality becomes available. The annual review will include a review of the relevant monitored data and AMP elements. Updates, amendments, performance thresholds crossed, and trigger(s) activated will be provided to the appropriate governmental organizations as required and will be part of the annual report.

In year 10 of the EMSRP monitoring schedule, data will be reviewed to evaluate if data variability and trends have been adequately characterized to reduce the monitoring frequency. The AMP will be reviewed and potentially revised such that the AMP is consistent with the proposed monitoring schedule from year 11 and onwards.

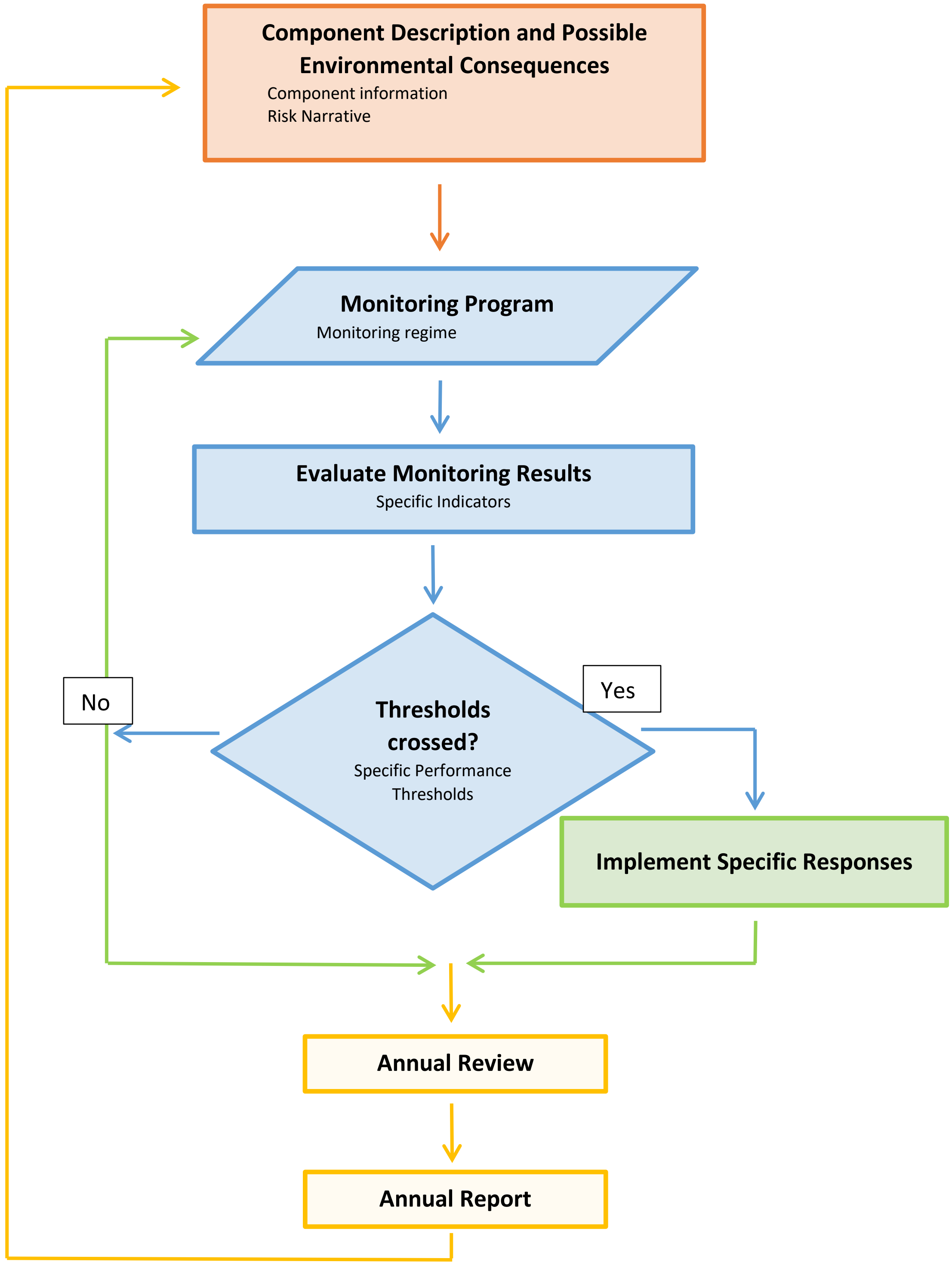


Figure 1-1: Sequential Components of the AMP (Adapted from AECOM 2010).

1.4.2 SITE SPECIFIC LOADING

This AMP was developed to protect water quality in the receiving water (Camp Creek, Tributary E, and False Canyon Creek) downgradient of the site.

This AMP does not consider physical stability or waste covers as mine components requiring AMP triggers and thresholds as the purpose of an AMP is to provide a management framework for facilities and performance that have a relatively high degree of uncertainty. The physical stability of the covers and the engineered geotechnical facilities will be monitored and maintained during post-reclamation according to the *Geotechnical Monitoring Program* (SRK, 2014b), and the *Environmental Monitoring, Surveillance, and Reporting Plan* (Teck, 2017). If during regular monitoring and maintenance further issues are identified they will be dealt with under these two plans. These plans also account for additional inspections that can be triggered by extraordinary circumstances such as after a significant storm or seismic event.

1.5 DESCRIPTION OF AMP LOADING SOURCES AND FLOW PATHS

There are three loading sources (North Dam Seepage, Burnick Portal and 1380 Portal) at SDH. Loadings from these sources infiltrate into the ground near their sources. Loading from the sources would then travel along groundwater flowpaths to surface water features. Constituent loading from the sources has not been observed in the receiving water and the mass loadings have been inferred to be attenuated. This section, adapted from the *Draft Adaptive Management Plan, Sä Dena Hes Mine* (SRK, 2014a) describes each loading source, the geochemical conceptual model and the drainage flow path.

1.5.1 NORTH DAM SEEPAGE

During operations, tailings were discharged to the North Tailings Dam. Currently, there is no ponded water behind the North Tailings Dam. The tailings are saturated within a meter of the surface. Seepage from the toe of the North Dam is routinely monitored at MH-02 as required by the existing WUL QZ15-082 (previously QZ99-045). The seepage at MH-02 is tailings porewater that mixes with groundwater from the valley sides and runoff from the North Dam face (SRK 2000). The seepage quality at MH-02 is routinely in compliance for all WUL parameters.

Seepage from the North Tailings Dam flows throughout the entire year. Flow at MH-02 is highest during freshet and lowest during the winter. The seepage flows above ground for a short distance from the North Dam before infiltrating into the ground. It then flows as groundwater before eventually discharging to North Creek and the headwaters of the East Fork of Tributary E. From the East Fork of Tributary E, the water flows to Tributary E and then to False Canyon Creek. The flow path is shown in Figure 1-2, Figure 1-3, and Figure 1-4.

Metal attenuation along this pathway has not been evaluated. The flowpath between the point of infiltration and discharge to surface water is shorter than the flowpaths at the Burnick Portal and 1380 Portal. For the purposes of the post-reclamation water quality predictions, it was conservatively assumed that the entire constituent load from the seepage discharges to North Creek above MH-12 and that there was no attenuation of metals by the soil (SRK 2014a).

1.5.1.1 *Specific Issues*

The objective of the AMP for the North Dam seepage is to detect any deterioration in water quality in the tailings dam seepage and manage and mitigate these changes before any effects are observed in the downstream receiving surface waters. AMP monitoring locations include tailings seepage monitoring at MH-02 located at the toe of the dam and surface water monitoring station MH-12 in North Creek.

Monitoring MH-02 would detect any changes in water quality close to the loading source. Downstream of this station, tailings seepage flows as groundwater. Any potential change in surface water quality in the receiving waters would therefore be a function of groundwater reactive transport. Any water quality changes are expected to be slow and would be detected by monitoring over multiple years.

1.5.2 Burnick Portal Discharge

The Burnick Portal is located 3 km from the former SDH mill site and was constructed to access the Burnick Zone ore body. There are two portals (1200 and 1300) at the Burnick Zone. The lower portal previously discharged continuously and has been routinely monitored during temporary closure at MH-22 as part of WUL QZ15-082 (previously QZ99-045). Now discharge from MH-22 is ephemeral (June to November). The discharge water quality exceeds the WUL limits for zinc during low flow months.

MH-22 discharge flows through a buried culvert, cascades over the crest of the Burnick waste rock dump, and then infiltrates under the waste rock dump. It then flows downgradient to the east-northeast as groundwater to the headwaters of the West Fork of Tributary E, which is more than 1.5 km downgradient of the portal, as shown on Figure 1-2, Figure 1-3, and Figure 1-4. The headwaters of the West Fork of Tributary E are marshy and channeled surface flow is intermittent. Surface water flows to the east-northeast from the West Fork of Tributary E into Tributary E at MH-15 and then to False Canyon Creek. There is currently no evidence of the zinc load from the Burnick Portal in Tributary E or False Canyon Creek (SRK 2005). SRK (2000) concluded zinc is attenuated through extensive contact with the soils between the Burnick Portal and the West Fork of Tributary E.

Column experiments using discharge from the Burnick Portal and downstream soils were used to evaluate the attenuation mechanism (SRK 2007). The test work concluded that downgradient soils have the potential to significantly attenuate zinc concentrations at the levels observed in the discharge for much longer than 200 years. Column tests showed the attenuation capacity was not exhausted and no secondary minerals were formed. The studies confirmed that zinc is passively removed by contact with downgradient soils.

Because the zinc attenuation mechanism has more than 200 years of capacity, the attenuation capacity of the soils is considered to last for the duration of the licenced post-reclamation period.

1.5.2.1 *Specific Issues*

The objective of the AMP for the Burnick Portal discharge is to detect any deterioration in water quality in the drainage flowing from the Burnick Portal and downgradient surface water. AMP monitoring locations include the Burnick portal drainage (MH-22), groundwater monitoring well MW13-06 adjacent to and downgradient of the

Burnick portal and surface water monitoring station MH-15 in the West Fork of Tributary E. The sampling locations and flow path are shown on Figure 1-2 , Figure 1-3, Figure 1-4.

Monitoring at MH-22 and MW13-06 would detect any changes in water quality in the portal drainage. Downstream of these stations, the drainage flows as groundwater. Any potential change in surface water quality in the receiving waters would be a function of reactive transport along the groundwater flowpath. Any changes are expected occur slowly and would be detected by monitoring over time.

1.5.3 1380 PORTAL DISCHARGE

The Main Zone Pit is a box cut located in the headwaters of Camp Creek. The 1380 Portal is located at the south end of the cut. In June 1999, drainage from the portal was observed. The drainage is monitored at MH-25 as part of WUL QZ99-045. MH-25 was sampled for the first time in 1999 to support the closure plan and was found to contain 41 mg/L dissolved zinc. The 1380 Portal was decommissioned in 2014 resulting in the portal drainage (and station MH-25) becoming inaccessible. Currently seepage within the downstream waste rock sump is the closest water quality sample to the 1380 portal drainage and is opportunistically sampled at station SDH-S2[1].

Drainage from the 1380 Portal is ephemeral (June to October) and consistently exceeded the previous WUL QZ99-045 (now QZ15-082) limits for zinc and cadmium and less frequently for lead. The zinc is leached from oxidizing exposed rock and talus around the portal area, which contain sphalerite. The source water is likely shallow groundwater with minor contributions from Jewelbox Pit (SRK 2000).

In 2000, MH-25 was monitored continuously for two months to assess variations in flow and chemistry. SRK (2000) reported that the drainage from the Main Zone pit portal contained elevated zinc, cadmium, and lead concentrations. Flow was estimated at 1 L/s. Flow decreased following freshet, but constituent concentrations were relatively constant. The constituent load associated with this flow was not detected in Camp Creek or False Canyon Creek at any time during the summer, suggesting attenuation along the flow path.

The 1380 Portal drainage flows through the marble Main Zone waste rock dump immediately downstream of the portal. Flow within the waste rock dump is audible but difficult to locate and/or access, resulting in infrequent monitoring. The dissolution of the marble attenuates zinc, cadmium, and lead by precipitation of metal carbonates. This attenuation mechanism of drainage from MH-25 is considered to last in perpetuity. Station SDH-S2 located within the waste rock below the 1380 Portal characterizes concentrations after attenuation by the waste rock. MH-25 and SDH-S2 have similar sulphate levels, but the zinc concentration is approximately four times lower at SDH-S2 than at MH-25, the level of cadmium is approximately five times lower, and the level of lead is approximately 1.5 times lower. Geochemical modelling indicates that that precipitation of zinc, cadmium, and lead carbonates is the probable attenuation mechanism resulting from the interaction of MH-25 drainage with marble waste rock (Day and Bowles 2005).

[1] The dump in its entirety is surveyed monthly for seepage. Samples are collected opportunistically at locations other than SDH-S2 when observed and accessible. Data are screened and reported as SDH-S2 if results are comparable.

After passing through the waste rock dump, the 1380 Portal drainage is further attenuated downstream as groundwater flows through the soils along the flow path to Camp Creek. There may eventually be a loss of attenuation capacity in the soils. The groundwater flow discharges to surface as a spring near the headwaters of Camp Creek. The length of the flow path from the 1380 Portal to the spring near the headwaters of Camp Creek is approximately 900 m. The spring is relatively large and is located where the southern fork of Camp Creek originates which mixes about 100 m downstream with water from a second groundwater spring on the southwestern flank of Mt. Hundere. Camp Creek flows to the south and is a tributary to False Canyon Creek, as shown on Figure 1-2 and Figure 1-3.

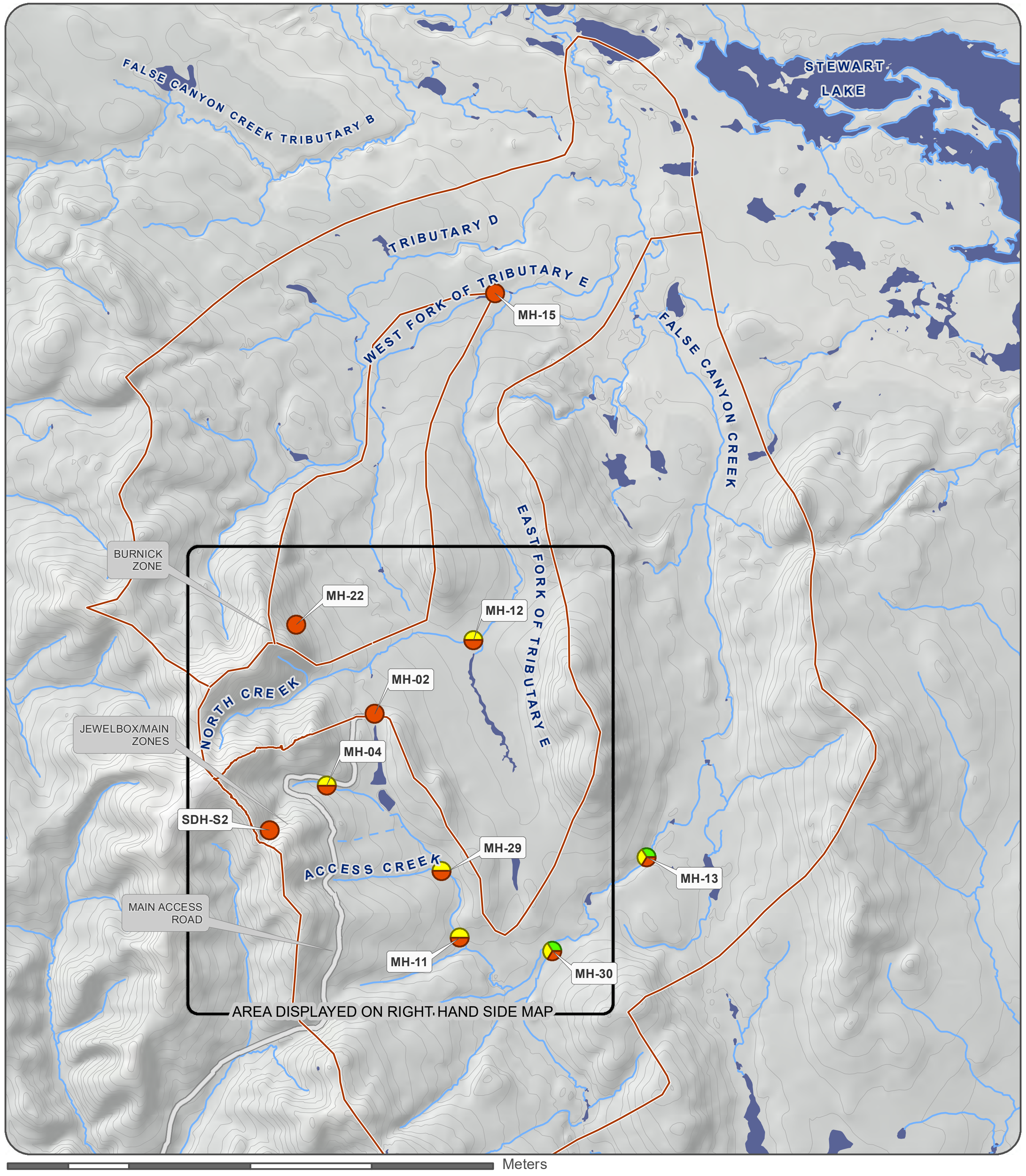
1.5.3.1 *Specific Issues*

The objective of the AMP for the 1380 Portal drainage is to detect any deterioration in the portal drainage water quality within the waste rock dump and monitor for the potential loss of attenuation capacity of the soils upstream of Camp Creek. AMP monitoring locations include:

- Seepage monitoring at station SDH-S2[1] within the Main Zone waste rock dump,
- Groundwater monitoring at MW13-01, MW13-08, and MW13-13 located downgradient of SDH-S2 and upstream of Camp Creek, and
- Surface water monitoring at MH-11 upper False Canyon Creek.

All the locations are shown on Figure 1-2, Figure 1-3, and Figure 1-4.

Any potential change in surface water quality in the receiving waters would be a function of reactive transport along the groundwater flowpath. Any changes are expected to be slow and would be detected by monitoring over time.



National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Map Projection: UTM Zone 9N

Post-Reclamation Monitoring Stations

- Fisheries Monitoring
- Benthos/Sediment Monitoring
- Surface Water Quality Monitoring

Catchments Boundaries

Teck

ACCESS

SÄ DENA HES MINE

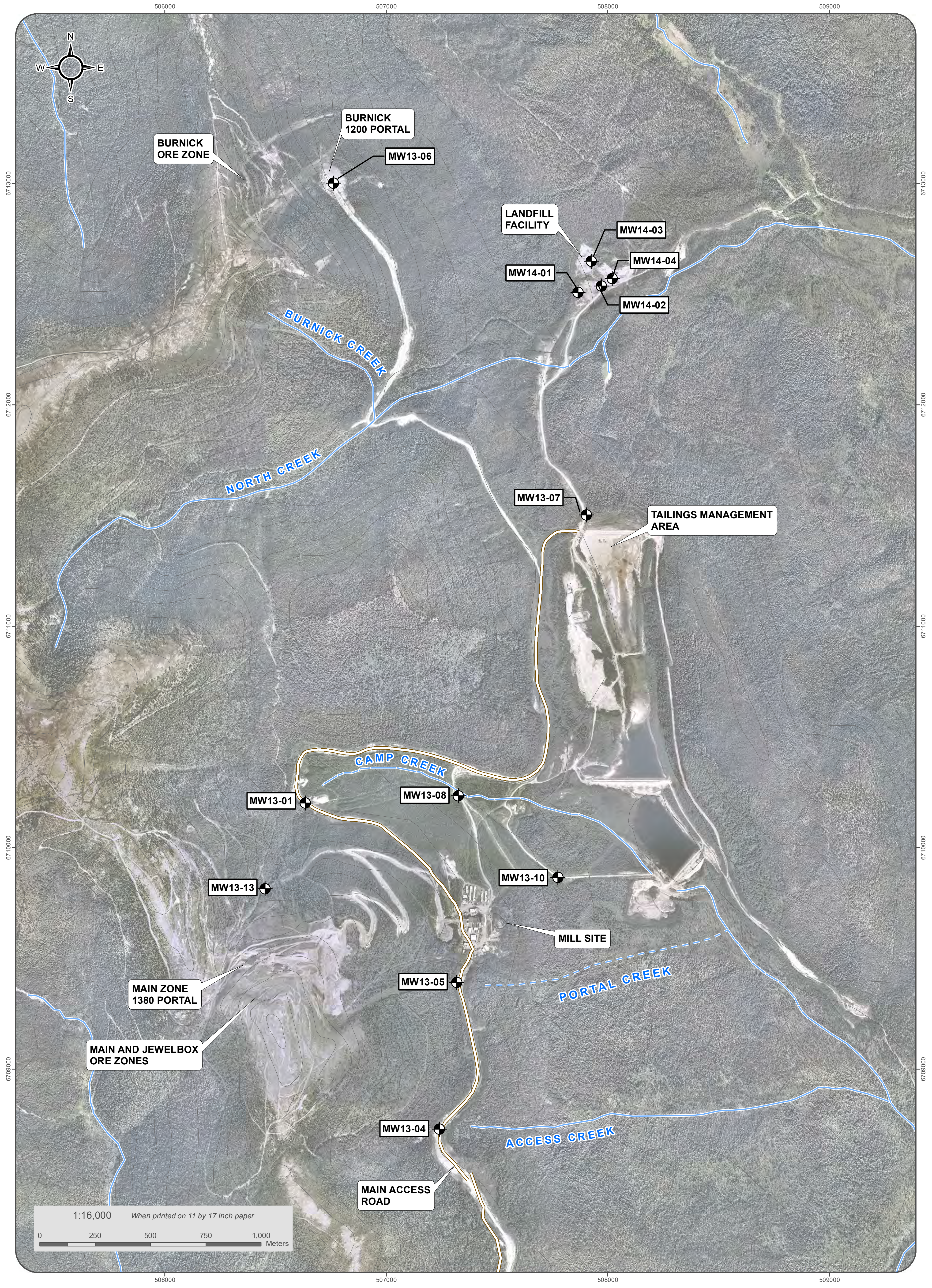
POST- RECLAMATION PHASE WATER LICENSE APPLICATION

FIGURE 1-2

POST-RECLAMATION SURFACE WATER MONITORING STATIONS

JULY 2015

I:\Sa_Dena_Hess\GIS\Maps\02-Permitting\04-Closure WUL 2015\Fig-5-1_Post_Reclamation_MonitoringProgram_20150708.mxd (*Last edited by: mducharme;7/8/2015/14:09 PM*)



Monitoring Well

Perrenial Stream

Ephemeral Stream

Access Road

Contour

SÄ DENA HES MINE
ADAPTIVE MANAGEMENT PLAN

FIGURE 1-3
POST-RECLAMATION GROUNDWATER MONITORING WELL LOCATIONS

APRIL 2017

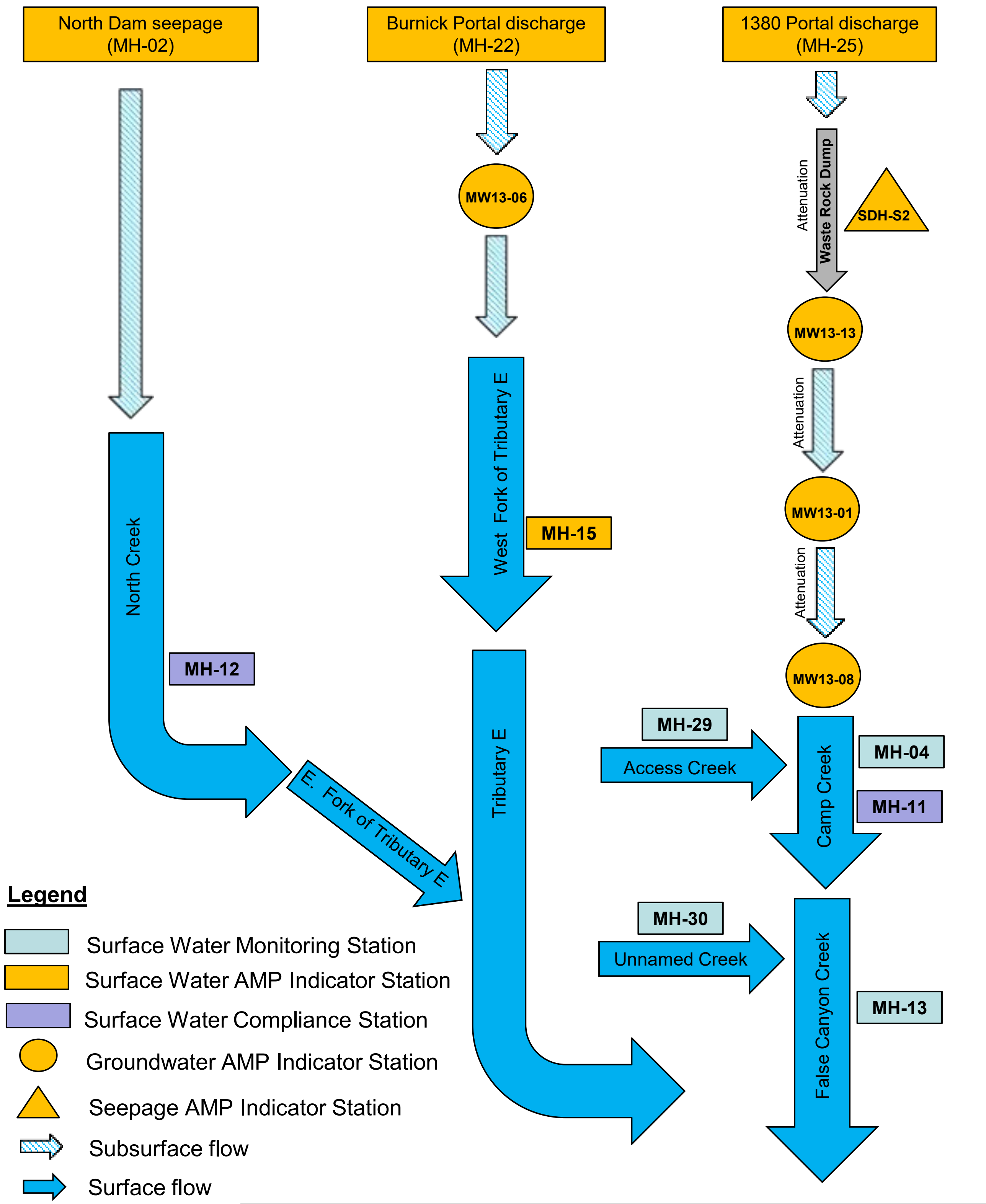
Aerial Imagery Captures in 2012 (Pre-decomissioning and reclamation)

AEG

Datum: NAD 83; Projection: UTM Zone 9N

Teck

D:\Project\AllProjects\Sa_Dena_Hess\GIS\Maps\01-Overview_Maps\WQ_Stations\GW\ClosureMonitoringWells_20170427.mxd
(*Last edited by: amatlashevska;27/04/2017/11:00 AM*)



srk consulting | Teck | Adaptive Management Plan
Conceptual Loading Diagram

Job No: 1CT008.043
Filename: AdaptiveManagementPlanFigures_1CT008.043_Rev01_LMC_LNB.pptx

Sä Dena Hes

Date: Sept 26, 2014 | Approved: LNB | Figure: 1-4

1.6 DESCRIPTION OF AMP LANDFILL COMPONENT AND FLOW PATHS

Waste from the demolition of the Mill was placed in the existing landfill in 2015. The landfill is located near the former North Creek pump house. The landfill contains waste produced during operations and demolition debris from the Mill Site, former camp and office buildings, and miscellaneous debris from the site. The direction of groundwater flow inferred from the potentiometric gradient is east across the site and ultimately discharges along North Creek (Golder, 2015b). Investigation in the vicinity of the landfill found that the groundwater is within a shallow, unconfined aquifer that is composed primarily of unconsolidated sand with silt, gravel, and cobbles (Golder, 2015b). Data collected in September, 2015 estimate the groundwater velocity across the landfill to be approximately 60 m/year, such that groundwater would discharge to North Creek after a two to three-year period (Golder, 2015b).

The groundwater table around the landfill has been generally greater than three meters below the base of the landfill. SDHOC Waste Management Permit (#81-020) for the landfill requires that the base of the landfill cells remain a minimum of three (3) meters higher than observed water table elevations. Water quality is also being monitored around the landfill to detect if any buried materials are leaching metals or are a source of hydrocarbons.

1.6.1 SPECIFIC ISSUES

The objective of the AMP for the Landfill is to detect if there is an increase in the water level such that the landfill would be submerged or detect a change in water quality that might imply that landfill materials are leaching metals or are a source of hydrocarbons. AMP monitoring locations include MW14-02, MW14-03, MW14-04, which would detect any changes in water quality and level close to the source. MW14-01 is a background monitoring station for the landfill that is part of the EMSRP. Any changes in water quality downgradient are expected to be slow and would be detected by monitoring over time.

1.7 DESCRIPTION OF AMP CONTAMINATED SITE GROUNDWATER COMPONENTS AND FLOW PATHS

An environmental assessment was completed by Golder between 2011 and 2014, and identified areas of the site as having concentrations of petroleum hydrocarbons and metals in soil in excess of the Yukon Contaminated Site Regulation (CSR) standards. A conceptual groundwater model for the site, from data collected in September 2015, estimated groundwater flow velocity through the overburden to be 80 m/year from the Mill Site to Camp Creek. The distance between these sites is ~ 800 m so that any contamination that originated at the Mill Site would arrive at Camp Creek within 10 years. The Mill site has been in place for greater than 20 years so it is likely that if any contamination had reached groundwater it would have already been detected.

1.7.1 SPECIFIC ISSUES

The objective of the AMP for the general CSR groundwater wells is to detect a change in water quality that might imply that metals or hydrocarbons plume is spreading from historical sources near the mill site or tailings pond area. AMP monitoring locations include MW13-10 (Mill Site), MW13-07 (Tailings Pond Area), and Jewelbox (13-05) it would which would detect any changes in water quality and level close to the source. Any changes in water quality downgradient are expected to be slow and would be detected by monitoring over time.

Ultimately, overburden groundwater from these sites would discharge into Camp Creek (MH-11) and North Creek (MH-12).

2. AMP FOR MINE SOURCE FLOWPATH WATER QUALITY

2.1 MINE SOURCE WATER QUALITY

The AMP for the mine source water quality component has been adapted from the Draft Adaptive Management Plan, Sä Dena Hes Mine (SRK, 2014). The geochemical conceptual model and flow paths for each mine loading source are described in Section 1.5.

2.1.1 DESCRIPTION

Water quality monitoring has been conducted as a condition of the current WUL since 1991. As part of the WUL mine related source load water quality is monitored at:

- North Tailings Dam Seepage (MH-02);
- Burnick Portal (MH-22); and
- 1380 Portal (SDH-S2[2] as MH-25 has been decommissioned).

Water from these sources infiltrates to groundwater near the source and then migrates downgradient to areas of groundwater discharge. Monthly and quarterly water quality monitoring results currently meet the permit limits in the WUL at the receiving environment stations.

Water quality will be monitored after reclamation to observe any potential changes indicative of loading from the North Dam, Burnick Portal and 1380 Portal. The monitoring schedule for the source monitoring sites is presented in Table 2-1.

Table 2-1: Mine Source Water Monitoring Schedule

Stations	Monitoring Frequency [3]
MH-02, MH-22, and SDH-S2	Every 2 Months

[2] As discussed in Section 1.5.3, constituent concentrations in the 1380 Portal drainage at SDH-S2 are lower because of attenuation within the waste rock pile

[3] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

2.1.2 RISK NARRATIVE

The objective of the AMP is to detect changes from existing conditions and ensure that mine source water quality does not negatively affect receiving aquatic environments. As described in Section 1.5 and shown on Figure 1-2 and Figure 1-3, mine source water does not report to the surface water compliance points (MH-11 and MH-12) directly, but goes to ground and is naturally attenuated upstream of these points. However, an increase in constituent loading from one of the three mine site sources (MH-02, MH-22, and SDH-S2) may result in potential deterioration in water quality at the downgradient surface water monitoring stations (MH-11, MH-12, and MH-15). As such, monitoring the water quality at these loadings sources could provide an early indication for the framework discussed in Section 2.2.

2.1.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

Indicators, specific performance thresholds and responses specific to source water quality and the monitoring program are provided in Table 2-2. The source concentrations (MH-02, MH-22, and SDH-S2) have been relatively stable over the observed period (temporary closure through to current), such that increases of 25% or 50% above the above the maximum observed concentrations would indicate a change worth investigating. However, the contaminant load model suggests that increases in the order of 25% to 50% over the maximum observed concentration at these sources would not likely result in exceedances of site water quality limits downstream. As such, these increase thresholds are considered appropriate indicators for the mine source water quality. Additionally, one of the evaluation responses to Specific Threshold 2 in the Mine Source AMP is to evaluate if the data show an upward trend.

In addition, the AMP for Mine Source Flow Path Water Quality is designed to monitor the potential loss of attenuation capacity downgradient of the mine sources and not the changes in source loads. If source concentrations double or even increase by an order of magnitude, there may still be sufficient attenuation capacity to prevent an exceedance of downstream water quality limits. It is better to monitor for changes along the flowpath not at the source. The rate at which concentrations change downstream is a function of the travel time, dispersion, mixing with other groundwater sources, and the loss of attenuation capacity. The potential increase in downstream concentrations that may occur in response to the increase in source concentrations would occur over years, well within the temporal resolution of the monitoring program. Evaluating changes in concentrations over time (e.g., trend analysis) is an evaluation aspect of the groundwater flowpath AMP and is designed to monitor the potential impact of these changes on downstream water quality.

Table 2-2: Specific Indicators, Performance Thresholds and Responses for Mine Source Water Quality

<table>
<tr><th>Specific Indicators</th><th>Specific Performance Thresholds</th><th>Specific Responses</th></tr>
<tr>
<td>Concentrations, in mg/L at stations MH-02, MH-22 and SDH-S2 of:
Cadmium
Lead
Zinc
Sulphate</td>
<td>Specific Threshold 1 (ST1)

The specific threshold for these constituents is an increase of more than 25% above the maximum observed concentrations. The numerical thresholds are:
<table>
<tr><th>Parameter</th><th>MH-02</th><th>MH-22</th><th>Parameter</th><th>SDH-S2</th></tr>
<tr><td>Total Zn</td><td>0.40</td><td>2.3</td><td>Dissolved Zn</td><td>15.3</td></tr>
<tr><td>Total Cd</td><td>0.014</td><td>0.011</td><td>Dissolved Cd</td><td>0.13</td></tr>
<tr><td>Total Pb</td><td>0.006</td><td>0.05</td><td>Dissolved Pb</td><td>0.51</td></tr>
<tr><td>SO_4</td><td>600</td><td>134</td><td>SO_4</td><td>290</td></tr>
</table>
Units are mg/L.</td>
<td>Notification
Teck Representative/Environmental Monitor.
Include in scheduled annual reporting.
Review
Follow QA/QC investigative protocol:
Review laboratory QA/QC report
Validate original result, and re-run lab sample if a laboratory error is suspected
Evaluation
Compare with appropriate mine source flow path groundwater wells (MW13-13 and MW13-01, or MW13-06) and with the appropriate receiving environment water quality results (MH-11, MH-12, or MH-15).
Action
During next scheduled sampling event collect a duplicate sample at monitoring site that exceeded ST1.</td>
</tr>
<tr>
<td>Concentrations, in mg/L at stations MH-02, MH-22 and SDH-S2 of:
Cadmium
Lead
Zinc
Sulphate</td>
<td>Specific Threshold 2 (ST2)

The specific threshold for these constituents is an increase of more than 50% above the maximum observed concentrations. The numerical thresholds are:
<table>
<tr><th>Parameter</th><th>MH-02</th><th>MH-22</th><th>Parameter</th><th>SDH-S2</th></tr>
<tr><td>Total Zn</td><td>0.48</td><td>2.7</td><td>Dissolved Zn</td><td>18.3</td></tr>
<tr><td>Total Cd</td><td>0.016</td><td>0.013</td><td>Dissolved Cd</td><td>0.15</td></tr>
<tr><td>Total Pb</td><td>0.007</td><td>0.06</td><td>Dissolved Pb</td><td>0.61</td></tr>
<tr><td>SO_4</td><td>720</td><td>161</td><td>SO_4</td><td>348</td></tr>
</table>
Units are mg/L.</td>
<td>Notification
Teck Representative/Environmental Monitor.
Include in scheduled annual reporting.
Review
Follow QA/QC investigative protocol:
Validate original result, or re-run lab sample if a laboratory error is indicated
Evaluation
Compare with appropriate mine source flow path groundwater wells (MW13-13 and MW13-01, or MW13-06) and with the appropriate receiving environment water quality results (MH-11, MH-12, or MH-15).
Qualified professional reviews all monitoring data, conducts trend analysis, determines if action is required based on risk narrative, and develops recommendations.
Action
Conduct recommendations as warranted by qualified professional, if it is determined that there could be an impact downgradient at the compliance points, which could include:
Increased monitoring frequency, and
Expanding monitoring network.
Depending on the findings of the investigation, the water quality model may be revised to re-evaluate potential changes to downstream water quality.</td>
</tr>
</table>

2.2 GROUNDWATER QUALITY

2.2.1 DESCRIPTION

Several groundwater wells were installed along some of the mine source flows paths to be able to monitor the flow paths of the mine sources when they go to ground. In the case of the 1380 discharge the wells also monitor attenuation capacity (MW13-13, MW13-08, and MW13-01).

The long term groundwater monitoring plan for the mine loading source discharge wells is provided in Table 2-3, and is discussed in the Sa Dena Hes Environmental Monitoring, Surveillance and Report Plan (Teck, 2017).

Table 2-3: Groundwater Monitoring Schedule

Stations	Monitoring Frequency [4]
Mine Loading Source Discharge Wells (MW13-01, MW13-06, MW13-08 & MW13-13)	Quarterly

2.2.2 RISK NARRATIVE

If mine source water quality has deteriorated significantly or has breached or exhausted the attenuation occurring onsite then adverse effects may occur at the receiving environment (MH-11, MH-12, and MH-15). The mine loading source discharge wells (MW13-01, MW13-06, MW13-08, and MW13-13) are along the flow paths from the mine loading sources to the receiving environment and may provide an indication of this potential.

2.2.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

Groundwater chemistry data, collected since the monitoring wells were installed in 2013, show constituent concentrations have varied by more than an order of magnitude in individual wells without effecting downgradient surface water quality. Concentrations in several wells increased an order of magnitude and then decreased an order of magnitude by the next sampling event. As such the most effective thresholds for these groundwater wells is assessing if the concentration increases are consistent and sustained. This first threshold for groundwater chemistry at these wells, which would act as a warning for any potential effect on receiving surface waters, is if three consecutive monitoring events or four of the last six monitoring events show progressively increasing concentrations (ST1). The next threshold (ST2) would be a single exceedance of the concentrations provided in Table 2-4, which are calculated to provide a conservative warning. These concentration limits are based on estimates of the groundwater concentration that could result in an exceedance site water quality limits downstream and anticipated attenuation capacity.

The final threshold (ST3) is a sustained increase in concentration over 3 sampling events that has resulted in a concentration increase greater than the ST2 concentrations. Where ST2 is a single, potentially anomalous

[4] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

exceedance of the Table 2-4 concentrations with no forewarning of an increasing trend, as has occurred previously, ST3 is an exceedance of the Table 2-4 concentrations combined with an upward trend in concentrations. The upward trend combined with the exceedance of numeric criteria is cause for greater response than just an exceedance of the two lower thresholds.

Progressively increasing concentrations means each concentration is greater than the subsequent measurement. Changes in groundwater concentrations along the flow path between sources and the receiving water occur slowly because the travel time between the source and receiving water is on the order of years. Furthermore, over twenty years of monitoring data show the sources have not affected surface water quality. As such, assessing changes in concentrations (e.g., increasing trends) over the time scale of groundwater transport (i.e., years) is an appropriate indicator of a risk to downstream water quality. The method to analyze data trends will be selected based on the statistical characteristics of the data and will follow regulatory guidance for conducting trend analysis.

The indicators, performance thresholds and responses specific to groundwater quality, and the monitoring program are provided in Table 2-5.

Table 2-4. Specific Threshold 2 Groundwater Concentrations

	Catchment			
	Camp Creek			West Fork of Tributary E
Parameter	MW13-01	MW13-08	MW13-13	MW13-06
Zn-D	0.5	0.5	0.5	0.5
Cd-D	0.005	0.005	0.02	0.001
Pb-D	0.035	0.035	0.035	0.015
Sulphate	55	55	110	No concentration threshold. The source (MH-22) concentration is less than well (MW13-06) concentration.

*Units are mg/L.

Table 2-5: Specific Indicators, Performance Thresholds and Responses for Mine Source Groundwater Quality

Specific Indicators	Specific Performance Thresholds	Specific Responses
List 1 monitoring wells Aqueous concentrations of parameters for monitoring wells: MW13-01, MW13-06, MW13-08, and MW13-13.	**Specific Threshold 1 (ST1)** (for D-Cd, D-Pb, D-Zn, and SO_4) 3 consecutive monitoring results with progressively increasing concentrations **or** 4 of the last 6 monitoring events show progressively increasing concentrations.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Compare with upstream and receiving environment water quality results. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 (ST2) (for D-Cd, D-Pb, D-Zn, and SO_4) Single exceedance of the calculated ST2 concentrations provided in Table 2-4.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the groundwater data by a qualified professional and appropriate recommendations to be developed o Any review must consider the risk narrative (i.e. impact on surface water compliance point MH-11, MH-12, or MH-15) **Action** • Resample within 6 months (if not already part of the monitoring schedule) and appropriate upgradient and downgradient sample sites along the flowpath to evaluate if concentrations remain elevated
	Specific Threshold 3 (ST3) (for D-Cd, D-Pb, D-Zn, and SO_4) A sustained increase in concentration over 3 sampling events that has resulted in a concentration increase greater than the ST2 levels.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified person compares new results with mine source loading results. If comparison indicates that mine loadings are responsible for exceedance, and validation confirms results, then: o Develop investigation plan o Trend analysis and water balance model used to predict if an exceedance of the guideline at the site compliance points downgradient with one year • Resample within 6 months (if not already part of the monitoring schedule) and appropriate upgradient and downgradient sample sites along the flowpath to evaluate if concentrations remain elevated **Action** • Follow recommendations arising from review undertaken by qualified professional, which could include: o Increased monitoring frequency o Begin the development of mitigation alternatives to maintain effluent water quality objectives below effluent quality standards if the water and load balance model results indicate sustained exceedances of water quality objectives. **Examples of Potential Mitigation Actions** If model indicates potential for sustained exceedances of effluent standards at MH-11 or MH-12, then potential mitigation measures could include: • Groundwater extraction and treatment • Source Control, including mine pool treatment

2.3 RECEIVING ENVIRONMENT SURFACE WATER QUALITY

2.3.1 DESCRIPTION

The monitoring points where the AMP for receiving environment water quality is applicable are MH-11, MH-12, and MH-15. The AMP for these monitoring points is the final management component of the protection of the receiving environment (Camp Creek, North Creek, and ultimately False Canyon Creek) from the impact of mine sources. The monitoring for MH-11, MH-12, and MH-15 is outlined in the Environmental Monitoring, Surveillance and Reporting Plan (Teck, 2017), as well provided in Table 2-6.

There are three mine site drainage source loads: 1380 Portal, the Burnick Portal, and seepage from the North Dam of the tailings impoundment. Discharge from both the 1380 Portal and Burnick Portal flow through the downgradient waste rock dumps, after which the flow infiltrates into the ground and is naturally attenuated. Groundwater from these sources ultimately discharges to False Canyon Creek. There will be no on site water collection or treatment during the post-reclamation time period. Only neutral mine water will be naturally discharged during this time.

Table 2-6: Receiving Surface Water Monitoring Schedule

Stations	Monitoring Frequency[5]
MH-11,MH-12, and MH-15	Every 2 Months

[5] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

2.3.2 RISK NARRATIVE

There are two different surface water receiving environment risks associated with the reclamation and closure of the mine site:

- An increase in metal contaminant loading from mine sources and reporting to the compliance points would mean a potential negative impact on the receiving environment; and

- An increase in suspended solids due to erosion and sedimentation from the reclaimed mine site could negatively effect the aquatic receiving environment in the years immediately following the completion of closure activities.

2.3.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS, AND RESPONSES

The applicable water quality guidelines were adopted from the most recently updated guidelines between CCME and BC MOE as the permit limits for most constituents. In the case of lead and zinc, alternative methods were used to develop permit limits for MH-11, MH-12, and MH-15 (Azimuth, 2016). The indicator parameters selected for the receiving environment AMP are dissolved cadmium, total and dissolved lead, and total and dissolved zinc with the corresponding proposed effluent quality standards provided for these parameters in Table 2-7. Table 2-8 provides the adaptive management framework to monitoring and response to concentrations of key metal contaminants reporting to the site receiving environment.

Zinc, cadmium, and lead have been shown to be attenuated along the groundwater flowpath from the source areas to the receiving environment. As previously mentioned, the purpose of the adaptive management plan is to monitor the change in the attenuation capacity along the groundwater flowpath. Although sulphate is another constituent associated with the mine source areas, sulphate is not attenuated along the groundwater flowpath and is not included as an indicator parameter within the receiving environment.

Table 2-7: Surface Water AMP Specific Thresholds

Parameters, water	UNITS	WUL Effluent Quality Standards	Specific Threshold 1 (ST1)	Specific Threshold 2 (ST2)
Cadmium, Dissolved				
$Cd = e^{[0.736*\ln(hardness) - 4.943]}$	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Lead[1]				
Site MH-12 and MH-15, use $Pb_{MH-12} = 3.31 + e^{[1.273*\ln(hardness) - 4.704]}$	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Site MH-11, use $Pb_{MH-11} = 1.928*(3.31 + e^{[1.273*\ln(hardness) - 4.704]})$	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Zinc[1]				
Site MH-12 and MH-15, Hardness ≥ 90 use, Zn = 7.5 + 0.75*(hardness – 90)	µg/L	Calculated	75% of Calculated	90% of Calculated EQS
Site MH-11, Hardness ≥ 90 use, Zn = 7.5 + 1.875*(hardness – 90)	µg/L	Calculated	75% of Calculated EQS	90% of Calculated EQS
Sulphate				
Hardness: >75 and ≤ 180 mg/L	mg/L	309	278	232
Hardness: >180 mg/L	mg/L	429	386	322

* Where standards are hardness based. The unit is µg $CaCO_3$/L, unless otherwise specified

[1]When TSS is >4, apply standard to dissolved fraction, otherwise apply to total fraction.

Table 2-9 provides the AMP for erosion and sedimentation potential related to reclamation activities at the site. The highest likelihood of this effect is in the years immediately following the completion of the reclamation activities. As such, the TSS AMP applies only during Year 1 to Year 4 of the post-closure schedule, which coincides with the period of more frequent monitoring so that Teck can respond to any excursions from expected conditions.

The TSS AMP thresholds are based on CCME TSS guidelines. The background used to calculate the site specific guideline is determined by the reference monitoring site, MH-30. A synoptic sampling result from MH-30 sets the guideline for the indicator sites MH-11, MH-12, and MH-15 for that monitoring event. The thresholds are steps up to the guideline level.

Table 2-8: Specific Indicators, Performance Thresholds and Responses for Receiving Environment Surface Water Quality, related to Risk from Metal Contaminant Loading

Specific Indicators	Specific Performance Thresholds	Specific Responses
(for D-Cd, T-Pb & D-Pb, T-Zn & D-Zn, and SO_4) • Aqueous concentrations at surface water monitoring stations MH-11, MH-12, and MH-15. See Table 2-6 for specific threshold values.	**Specific Threshold 1** Exceedance of 75% of the concentration of the standards in Table 2.11 at MH-11, MH-12, or MH-15.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report, validate original result, or re-run lab sample if a laboratory error is indicated **Evaluation** • Compare with upstream monitoring stations. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 Table 2.6 Greater than 75% of the concentration of the standards for two (2) consecutive sampling events (scheduled or resample) OR greater than 90% of the standards for a single event at MH11, MH-12, or MH-15.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified professional compares results with appropriate upgradient samples along the mine source loading flow path. o Evaluate causes for load contributions and develop investigation plan o Trend analysis is conducted by a qualified person to evaluate if there is a trend and if it is likely to result in an exceedance of effluent standards within a one-year period. **Action** • Implement investigation plan, including at a minimum: o Re-sample the site that triggered ST2 within 6 months (if not already scheduled), and also sample the appropriate mine source flow path monitoring sites (i.e., a synoptic event of MH-11, M13-01, MW13-13, and SDH-S2, OR MH-12 and MH-02). o Site investigation of candidate load contributions. • Review results of investigation and prepare recommendations if appropriate, based on risk narrative
	Specific Threshold 3 Table 2.6 Greater than 90% of the concentration of the standards for two (2) consecutive sampling events (scheduled or resample) OR a single exceedance of the standards at MH11, MH-12, or MH-15.	**Notification** • Same as Specific Threshold 1, • plus, notification of YG Inspector if a single exceedance of a standard **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified professional compares results with appropriate up gradient samples along the mine south loading flow path. If comparison indicates that mine loadings are responsible for exceedance, and lab validation confirms results, then: o Evaluate causes for load contributions and develop investigation plan o Trend analysis is conducted by a qualified person to determine if upward trend is likely to increase passed the effluent standards more than once in a one-year period. **Action** • Conduct recommendations as put forward by the qualified professional • Re-sample the site that triggered ST2 with 6 months (if not already scheduled), and also sample the appropriate mine source flow path monitoring sites (i.e. a synoptic event of MH-11, M13-01, MW13-13, and SDH-S2, OR MH-12 and MH-02).
	Specific Threshold 4 Table 2.6 Two (2) consecutive exceedances (scheduled or resample) of the effluent standards in Table 2.6 at MH11, MH-12, or MH-15, where evaluation confirmed mine loading was responsible for the first exceedance.	**Notification** • Same as Specific Threshold 3 • Plus, Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • A qualified professional compares results with appropriate upgradient samples along the mine south loading flow path. If comparison indicates that mine loadings are responsible for exceedance, and lab validation confirms results, then: o Evaluate causes for load contributions and develop investigation plan o Trend analysis is conducted by a qualified person. **Action** • Conduct recommendations as put forward by the qualified professional, may include impact study or an aquatic survey • Actions will continue until specific threshold values are no longer exceeded, such as those listed in Potential Mitigation Actions. **Examples of Potential Mitigation Actions** • Mitigation measures could include groundwater extraction and treatment and permeable reactive barriers, source control such as mine pool treatment, and/or passive treatment alternatives such as bioreactors or constructed wetland treatment systems.

Table 2-9: Specific Indicators, Performance Thresholds and Responses for Receiving Environment Surface Water Quality, related to Risk from Erosion

Specific Indicators	Specific Performance Thresholds	Specific Responses
Total Suspended Solids at stations MH-11, MH-12, and MH-15 Applies to the first 4 years of post-closure monitoring (Years 1 to 4).	**Specific Threshold 1** MH-30 TSS mg/L + 10 mg/L	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Review monitoring data upstream of compliance point that exceeded the ST1. **Action** • Collect duplicate at site that exceeded the ST1 during the next scheduled monitoring event.
	Specific Threshold 2 MH-30 TSS result + 20 mg/L	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • Evaluation from ST1, and resample the station that exceeded ST2 within 10 days of getting original lab result (if not already scheduled), collect duplicate TSS sample at the site that exceeded the ST2 (if the original lab result was validated) **Action** • Inspect mine site catchment upgradient of compliance site that exceeded – look for signs of erosion and sedimentation from reclamation activities and conduct necessary maintenance as required.
	Specific Threshold 3 MH-30 TSS result + 25 mg/L	**Notification** • Same as Specific Threshold 1 • Plus, notification of YG Inspector and Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • Evaluation from ST1 and ST2 **Action** • Inspect mine site catchment upgradient of compliance site that exceeded – look for signs of erosion and sedimentation from reclamation activities and conduct necessary maintenance as required. • Have qualified professional assess stability of reclaimed mine site for long term trend of erosion or sedimentation from mine site and provide recommendations to mitigate issues. • Implement recommendations from qualified professional until TSS has dropped below the ST1 Threshold. These may include runoff control, additional revegetation, soil stabilization with natural or synthetic materials, and/or aggressive sediment control if runoff and erosion control measures are not effective enough

3. AMP FOR LANDFILL AND GENERAL SITE WATER QUALITY

3.1 LANDFILL GROUNDWATER MONITORING

3.1.1 DESCRIPTION

The landfill contains waste produced during operations and demolition debris from the Mill Site, former camp and office buildings, and miscellaneous debris from the site. The purpose of post-closure monitoring is to monitor the water levels and quality around the landfill to detect if any changes occur over time. The AMP is used to provide responses if water levels in the landfill monitoring wells (MW14-02, MW14-03, and MW-14-04) get too high around the landfill or the water quality in those same wells indicates metal leaching or a hydrocarbon plume is coming from the facility. The EMSRP provides the monitoring schedule for these wells, but is also summarized in Table 3-1.

Table 3-1: Landfill Monitoring Schedule

Stations	Monitoring Frequency [6]
Landfill Wells (MW14-01, MW14-02, MW14-03, & MW-14-04)	Quarterly

3.1.2 RISK NARRATIVE

The risk if metals or hydrocarbons are detected leaching from the landfill is that they would flow through the shallow groundwater system and would ultimately enter North Creek and could potentially be an adverse impact on the receiving environment water quality (MH-12). Additionally, if water levels should rise within 3.0 meters of the base of the landfill, the landfill would be out of compliance of the landfill permit.

3.1.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

The thresholds for groundwater quality are based on the Yukon Contaminated Sites Regulations for the protection of aquatic life. The groundwater quality threshold parameters are hydrocarbons and dissolved Cadmium, Lead and Zinc. Indicators, performance thresholds and responses specific to groundwater quality and quantity, which are detailed in Table 3-2 and Table 3-3.

The groundwater table around the landfill has been generally greater than three meters below the base of the landfill. SDHOC Waste Management Permit (#81-020) for the landfill requires that the base of the landfill cells remain a minimum of three (3) meters higher than observed water table elevations. Water quality is also being monitored around the landfill to detect if any buried materials are leaching metals or are a source of hydrocarbons.

[6] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

The AMP Table describing the specific indicators, thresholds, and responses for landfill water quality is Table 3-4, and the AMP for the landfill water levels is Table 3-5.

Table 3-2: Groundwater Metals Concentrations

Parameters, water	UNITS	SCHEDULE 3 - GENERIC NUMERICAL WATER STANDARDS - AQUATIC LIFE (AW)	90% (ST2)	75% (ST1)
Cadmium Dissolved *				
Cadmium Hardness < 30	µg/L	0.1	0.09	0.075
Cadmium Hardness = 30 - < 90	µg/L	0.3	0.27	0.225
Cadmium Hardness = 90 - < 150	µg/L	0.5	0.45	0.375
Cadmium Hardness = 150 - < 210	µg/L	0.6	0.54	0.45
Lead Dissolved*				
Lead Hardness < 50	µg/L	40	36	30
Lead Hardness = 50 - < 100	µg/L	50	45	37.5
Lead Hardness = 100 - < 200	µg/L	60	54	45
Lead Hardness = 200 - < 300	µg/L	110	99	82.5
Lead Hardness ≥ 300	µg/L	160	144	120
Zinc Dissolved *				
Zinc Hardness < 90	µg/L	75	67.5	56.25
Zinc Hardness = 90 - < 100	µg/L	150	135	112.5
Zinc Hardness = 100 - < 200	µg/L	900	810	675
Zinc Hardness = 2000 - < 300	µg/L	1,650	1485	1237.5
Zinc Hardness = 300 - < 400	µg/L	2,400	2160	1800
Yukon Contaminated Sites Regulation Standards are for the protection of FRESHWATER aquatic life, based on 2002 version. These guidelines should be updated as new versions are issued by Yukon Environment.				

Table 3-3: Groundwater Hydrocarbon Concentrations

	UNITS	SCHEDULE 3 - GENERIC NUMERICAL WATER STANDARDS - AQUATIC LIFE (AW)	90% (ST2)	75% (ST1)
Volatiles – Water				
VPHs (VHs6-10 minus BTEX)	µg/L	1,500	1,350	1,125
Benzene	µg/L	4,000	3,600	3,000
Toluene	µg/L	390	351	293
Ethylbenzene	µg/L	2,000	1,800	1,500
Polycyclic Aromatic Hydrocarbons – Water				
Acenaphthene	µg/L	60	54	45
Acridine	µg/L	0.5	0.45	0.38
Anthracene	µg/L	1	0.9	0.75
Benzo(a)anthracene	µg/L	1	0.9	0.75
Benzo(a)pyrene	µg/L	0.1	0.09	0.08
Fluoranthene	µg/L	2	1.8	1.5
Fluorene	µg/L	120	108	90
Naphthalene	µg/L	10	9	7.5
Phenanthrene	µg/L	3	2.7	2.25
Pyrene	µg/L	0.2	0.18	0.15
Quinoline	µg/L	34	30.6	25.5
Extractable Petroleum Hydrocarbons - Water				
LEPHs (C10-C19 less PAH)	µg/L	500	450	375
EPH (C10-C19)	µg/L	5,000	4,500	3,750

Yukon Contaminated Sites Regulation Standards are for the protection of FRESHWATER aquatic life, based on 2002 version. These guidelines should be updated as new versions are issued by Yukon Environment.

Table 3-4: Specific Indicators, Performance Thresholds and Responses for Landfill Groundwater Quality

Specific Indicators	Specific Performance Thresholds	Specific Responses
Aqueous concentrations of parameters described in Table 3-2 and Table 3-3 for monitoring wells: MW14-02, -03, and -04	**Specific Threshold 1** • Exceedance of 75% of the guideline concentrations provided in Table 3-2 and Table 3-3 in 2 consecutive samples collected from any of the indicator wells.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Compare results with past results with all landfill wells monitored. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 • Exceedance of 90% of the guideline concentrations provided in Table 3-2 and Table 3-3 in 2 consecutive samples collected (scheduled or re-sampled) from any of the indicator wells.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the landfill groundwater data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. o Evaluate causes for load contributions and develop investigation plan **Action** • Follow recommendations arising from review undertaken by qualified professional. • Resample appropriate wells within 6 months (unless monitoring schedule calls for sampling within the period already); collect duplicate samples at the indicator wells that exceeded ST2, and sample surface water monitoring station MH-12 for metals and hydrocarbons. • Review all newly collected sample data within two weeks of receiving the results.
	Specific Threshold 3 • Exceedance of the guideline concentrations provided in Table 3-2 and Table 3-3 collected during a single sampling event (scheduled or re-sampled) collected from any of the indicator wells.	**Notification** • Same as Specific Threshold 1 • Plus, Inspector and Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the landfill groundwater data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. o Data review is conducted by a qualified person to determine if exceedance is an anomaly or a trend that will continue and need to be addressed. **Action** • Follow recommendations arising from review undertaken by qualified professional.

Table 3-5: Specific Indicators, Performance Thresholds and Responses for Landfill Groundwater Elevation

Specific Indicators	Specific Performance Thresholds	Specific Responses
Groundwater elevation below landfill determined by monitoring wells: MW14-02, -03, and -04	**Specific Threshold 1** • Water table measurements are **within 3.5 m** of the base of the landfill for 2 sampling event at one or both of the indicator wells.	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Confirm groundwater level data: validate original result. **Evaluation** • Compare groundwater elevations to base of landfill and nearby well in regular EMSRP **Action** • Collect additional water levels with 6 months (if not already scheduled) of ST1 being exceeded, at all 4 landfill wells, not just the indicator wells.
	Specific Threshold 2 • Water table measurements are **within 3.5 m** of the base of the landfill for 3 consecutive sampling events (scheduled or re-sampled) at all of the indicator wells.	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the groundwater elevation data and trend analysis by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. **Action** • Collect additional water levels with 6 months (if not already scheduled) of the ST2 being exceeded, at all 4 landfill wells (MW14-01,02,03, and 04). • Install a water level datalogger within one of the indicator wells to collect continuous water level data. • Follow recommendations of qualified professional.
	Specific Threshold 3 • Water table measurements are **within 3.0 m** of the base of the landfill for 1 sampling event (scheduled or re-sampled) at all of the indicator wells.	**Notification** • Same as Specific Threshold 1 • Inspector and Liard First Nation **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the all of groundwater elevation data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. • Investigation into root cause of elevated groundwater levels and if they will continue to remain elevated. **Action** • Review remedial options proposed by qualified professional with regulators and LFN and develop implementation plan and schedule. **Examples of Mitigation Actions** • Construction of additional drainage features, placement of lower permeability cover material to further reduce surface infiltration in the vicinity of the landfill.

3.2 CSR GROUNDWATER MONITORING

3.2.1 DESCRIPTION

Between 2011 and 2014, Golder conducted an environmental site assessment of the site, which found petroleum hydrocarbon and metal concentrations in soil that exceeded the Yukon Contaminated Site Regulations at the vicinity of maintenance shops and fuel storage tanks, and metals associated with the mine primary activity areas (i.e., sediment ponds, tailings facilities, waste rock piles) and processing areas (i.e., mill area). The hydrogeological assessment conducted has indicated that groundwater quality has not been impacted by the identified hydrocarbons or metals soil contamination. The remediation plan for the hydrocarbon and metal impacted areas was to cover the areas with fill material to reduce the pathway and exposure to ecological receptors[7].

The EMSRP includes three groundwater wells around the site designed to monitor areas downgradient of where soil contamination has been identified as part of the Contaminated Site Assessment process MW13-05, MW13-10, and MW13-07 as described in Table 3-6. MW13-04 is considered a background conditions well and is monitored for the same parameters as the site assessment wells.

Table 3-6: Groundwater Monitoring Schedule

Stations	Monitoring Frequency [8]
MW13-04, MW13-05, MW13-10, & MW13-07	Quarterly

3.2.2 RISK NARRATIVE

If a hydrocarbon plume or metal leaching was detected in one of the indicator wells for the Tailings Reclaim Pond Site (MW13-07), Mill site (MW13-10), or the Jewelbox (13-05) it would eventually flow into Camp Creek or North Creek, ultimately, impacting surface water quality prior to compliance sites MH-11 and MH-12.

3.2.3 SPECIFIC INDICATORS, PERFORMANCE THRESHOLDS AND RESPONSES

The thresholds for groundwater quality are based on the Yukon contaminated sites regulations for the protection of aquatic life. The groundwater quality threshold parameters are hydrocarbons, and dissolved cadmium, lead and zinc, which are detailed in Table 3-2 and Table 3-3. Indicators, performance thresholds and responses specific to groundwater quality and quantity, and the monitoring program are provided below in Table 3-7.

As discussed in Section 1.7, the estimated groundwater flow velocity through the overburden is approximately 80 m/year from the Mill Site to Camp Creek. The distance between these sites is approximately 800 m so that any contamination that originated at the Mill Site would arrive at Camp Creek within 10 years. The Mill site has been in place for greater than 20 years. If contamination had migrated along the groundwater flowpath without attenuation, it would have already been detected in surface water. The proposed sampling frequency provides sufficient time to identify and react, as necessary, when AMP thresholds are triggered.

---

[7] Although most of the metal impacted areas were covered, a few areas were not covered due to very steep terrain limiting access.

[8] The frequency presented reflects the current water license conditions, which are not intended to remain at this frequency for the duration of the licence. A reduced frequency may be proposed in the future and the water licence subsequently amended.

Table 3-7: Specific Indicators, Performance Thresholds and Responses for General Site Groundwater Quality

Specific Indicators	Specific Performance Thresholds	Specific Responses
Aqueous concentrations of parameters described in Table 3-2 and 3-3 in monitoring wells: MW13-05, MW13-07 & MW13-10.	**Specific Threshold 1** • Exceedance of 75% of the guideline concentrations provided in Table 3-2 and 3-3 in two (2) consecutive samples collected from the indicator wells	**Notification** • Teck Representative/Environmental Monitor • Include in scheduled annual reporting **Review** • Review laboratory QA/QC report: validate original result or re-run sample in lab if error is indicated. **Evaluation** • Review groundwater data trends for all stations to assess for potential systematic contamination due to sampling. **Action** • During next scheduled sampling event conduct a duplicate at monitoring site that exceeded ST1.
	Specific Threshold 2 • Exceedance of 90% of the guideline concentrations provided Table 3-2 and 3-3 in two (2) consecutive collected (scheduled or re-sampled) from the indicator wells	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the appropriate general site condition groundwater well data and a qualified professional conducts a trend analysis in order to develop appropriate recommendations, which must consider the risk narrative. o Evaluate causes for load contributions and develop investigation plan **Action** • Follow recommendations arising from review undertaken by qualified professional. • Resample appropriate wells within 6 months (unless monitoring schedule calls for sampling within the period already) collect duplicate samples at the indicator wells that exceeded ST2.
	Specific Threshold 3 • Exceedance of the guideline concentrations provided in Table 3-2 and 3-3 collected during a single sampling event (scheduled or re-sampled) from the indicator wells	**Notification** • Same as Specific Threshold 1 **Review** • Same as Specific Threshold 1 **Evaluation** • A review of the relevant groundwater data by a qualified professional and appropriate recommendations to be developed, which must consider the risk narrative. o Trend analysis is conducted by a qualified person to determine if exceedance is an anomaly or a trend that will continue and needs to be addressed. o anomaly or a trend that will continue and need to be addressed. **Action** • Follow recommendations arising from review undertaken by qualified professional.

4. REPORTING

The reporting associated with AMP will part of the annual Quartz Mining License and Water Use Licence report and will include:

- Summary of monitoring data collected as part of the AMP;
- Trend analysis in water quality in at compliance points MH-11, MH12- and MH-15;
- Trend analysis in mine source water quality stations;
- Trend analysis for groundwater quantity and quality;
- A detailed assessment of the full suite of parameters being measured at AMP indicators stations;
- Identification of any additional indicator parameters that should be incorporated into the AMP;
- Summary of any thresholds exceeded and any activities undertaken in relation the AMP; and
- Proposed updates and revisions to the AMP.

5. REFERENCES

AECOM, 2010. *Tom Valley Final Adaptive Management Plan*.

Azimuth Consulting Group, 2016. *Sä Dena Hes - Proposed Permit Limits for the Water Use Licence Application*. Technical Memorandum dated June 20, 2016.

Canadian Environmental Assessment Agency, 2013. *Operational Policy Statement - Adaptive Management Measures under the Canadian Environmental Assessment Act*. Retrieved from http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=50139251-1. 13 September 2013

Day, S. and R. Bowles. 2005. *Atypical and typical zinc geochemistry in a carbonate setting, Sä Dena Hes Mine, Yukon Territory, Canada*. Geochemistry: Exploration, Environment, Analysis, Vol. 5 2005, pp. 255–266.

Eberhard, R., Robinson, C. J., Waterhouse, J., Parslow, J., Hart, B., Grayson, R., & Taylor, B., 2009. *Adaptive Management for Water Quality Planning - From Theory to Practice.* Marine and Freshwater Research, 60, 1189-1195.

Environment Canada, 2009. *Environmental Code of Practice for Metal Mines*. Ottawa.

Golder Associates, 2015a. *Adaptive Management Planning - Long Term Groundwater Monitoring, Sä Dena Hes Mine*. Prepared for Teck Resources. 27 November 2015.

Golder Associates, 2015b. *Long Term Groundwater Monitoring, Sä Dena Hes Mine, Yukon Territory*. Prepared for Teck Resources. 8 July 2015.

Government of Yukon, 2000. *Environment Act: Contaminated Sites Regulations.* O.I.C. 2002/171 Environment Yukon.

SRK Consulting (Canada) Inc. (SRK). 2000. *2000 Geochemical Studies*. Sä Dena Hes Mine. November.

SRK. 2005. *Sä Dena Hes Mine Water Quality and Loading Re-Assessment.* January.

SRK Consulting, 2014. Draft Adaptive Management Plan, Sä Dena Hes Mine. Prepared for Teck Resources.

SRK Consulting, 2014b. *Proposed Post Reclamation Geotechnical Monitoring Program Memo*. Prepared for Teck Resources.

Teck Resources Limited, 2017. *Sä Dena Hes Mine Environmental Monitoring, Reporting, and Surveillance Plan*.

Teck Resources Limited, 2015. *Sä Dena Hes Mine Detailed Decommisioning & Reclmation Plan.* August 2015.

APPENDIX C

LAB REPORTS

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 28-FEB-19
Report Date: 11-MAR-19 17:10 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2238412

Project P.O. #: Teck PO-9615
Job Reference: TECK-18-1
C of C Numbers: 1 of 2, 2 of 2
Legal Site Desc:

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238412-1	L2238412-2	L2238412-3	L2238412-4	L2238412-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-FEB-19	27-FEB-19	25-FEB-19	25-FEB-19	25-FEB-19
	Sampled Time	11:05	15:45	12:50	13:30	14:30
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	357	319	418	407	1130
	Hardness (as CaCO3) (mg/L)	178	160	219	209	612
	pH (pH)	8.14	8.17	7.96	7.77	7.47
	Total Suspended Solids (mg/L)	1.6	<1.0	<1.0	1.8	15.0
	Total Dissolved Solids (mg/L)	210	199	251	236	824
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	177	155	212	215	302
	Ammonia, Total (as N) (mg/L)	0.0167	<0.0050	0.0058	<0.0050	0.0155
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	DLDS <0.25
	Chloride (Cl) (mg/L)	2.46	<0.50	<0.50	<0.50	DLDS <2.5
	Fluoride (F) (mg/L)	0.121	0.151	0.091	0.043	DLDS <0.10
	Nitrate (as N) (mg/L)	0.137	0.245	0.0987	0.0135	DLDS <0.025
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	DLDS <0.0050
	Sulfate (SO4) (mg/L)	12.0	14.6	13.5	4.82	344
Total Metals	Aluminum (Al)-Total (mg/L)	0.0154	0.0183	0.0100	0.0080	0.0272
	Antimony (Sb)-Total (mg/L)	0.00028	0.00014	0.00013	0.00012	0.00011
	Arsenic (As)-Total (mg/L)	0.00096	0.00043	0.00043	0.00036	0.00094
	Barium (Ba)-Total (mg/L)	0.0785	0.0239	0.0739	0.0566	0.0592
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000118	0.000237	0.0000605	0.0000615	0.0000696
	Calcium (Ca)-Total (mg/L)	64.6	62.0	76.3	74.3	218
	Chromium (Cr)-Total (mg/L)	0.00044	0.00021	<0.00010	0.00023	0.00019
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00079
	Copper (Cu)-Total (mg/L)	0.00225	<0.00050	<0.00050	0.00053	0.00078
	Iron (Fe)-Total (mg/L)	0.043	0.025	0.061	0.035	0.284
	Lead (Pb)-Total (mg/L)	0.00214	0.000378	0.000277	0.000112	0.00187
	Lithium (Li)-Total (mg/L)	0.0013	0.0013	0.0015	0.0011	0.0010
	Magnesium (Mg)-Total (mg/L)	6.63	3.19	8.99	7.59	18.0
	Manganese (Mn)-Total (mg/L)	0.00505	0.00072	0.0136	0.00667	0.733
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00138	0.000732	0.000749	0.000338	0.000201
	Nickel (Ni)-Total (mg/L)	0.00051	<0.00050	<0.00050	<0.00050	0.00065
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.59	0.38	0.51	0.31	1.50
	Selenium (Se)-Total (mg/L)	0.000942	0.000925	0.000528	0.000313	0.000064
	Silicon (Si)-Total (mg/L)	3.97	3.31	3.84	4.08	4.75

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238412-6	L2238412-7	L2238412-8	L2238412-9	L2238412-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-FEB-19	26-FEB-19	26-FEB-19	26-FEB-19	27-FEB-19
	Sampled Time	10:55	12:10	09:50	10:00	15:30
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	413	383	381	367	<2.0
	Hardness (as CaCO3) (mg/L)	230	198	199	223	<0.50
	pH (pH)	8.00	7.64	8.10	8.10	5.41
	Total Suspended Solids (mg/L)	<1.0	6.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	236	218	223	215	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	211	198	204	202	<1.0
	Ammonia, Total (as N) (mg/L)	0.0080	0.0456	0.0156	0.0158	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	2.27	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.058	0.056	0.091	0.086	<0.020
	Nitrate (as N) (mg/L)	0.120	0.0693	0.0945	0.0922	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	9.28	5.25	3.41	3.28	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0057	0.0280	0.0113	0.0108	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00011	0.00019	0.00012	0.00013	<0.00010
	Arsenic (As)-Total (mg/L)	0.00031	0.00060	0.00039	0.00043	<0.00010
	Barium (Ba)-Total (mg/L)	0.160	0.255	0.197	0.198	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000282	0.0000812	0.0000179	0.0000173	<0.0000050
	Calcium (Ca)-Total (mg/L)	62.6	51.7	62.5	63.3	<0.050
	Chromium (Cr)-Total (mg/L)	0.00015	0.00051	0.00011	0.00013	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00017	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00063	0.00219	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.143	0.705	0.253	0.280	<0.010
	Lead (Pb)-Total (mg/L)	0.000142	0.00610	0.000582	0.000570	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0011	0.0011	<0.0010
	Magnesium (Mg)-Total (mg/L)	15.2	16.5	11.8	12.6	<0.10
	Manganese (Mn)-Total (mg/L)	0.00742	0.0459	0.0177	0.0205	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00108	0.00145	0.00201	0.00205	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00119	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.44	0.49	0.42	0.43	<0.10
	Selenium (Se)-Total (mg/L)	0.000681	0.000608	0.000697	0.000662	<0.000050
	Silicon (Si)-Total (mg/L)	3.37	3.42	4.09	4.08	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2238412-11				
		Description	Water				
		Sampled Date					
		Sampled Time					
		Client ID	TRIP BLANK				
Grouping	**Analyte**						
WATER							
Physical Tests	Conductivity (uS/cm)		<2.0				
	Hardness (as CaCO3) (mg/L)		HTC <0.50				
	pH (pH)		5.42				
	Total Suspended Solids (mg/L)		<1.0				
	Total Dissolved Solids (mg/L)		<10				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		<1.0				
	Ammonia, Total (as N) (mg/L)		<0.0050				
	Bromide (Br) (mg/L)		<0.050				
	Chloride (Cl) (mg/L)		<0.50				
	Fluoride (F) (mg/L)		<0.020				
	Nitrate (as N) (mg/L)		<0.0050				
	Nitrite (as N) (mg/L)		<0.0010				
	Sulfate (SO4) (mg/L)		<0.30				
Total Metals	Aluminum (Al)-Total (mg/L)		<0.0030				
	Antimony (Sb)-Total (mg/L)		<0.00010				
	Arsenic (As)-Total (mg/L)		<0.00010				
	Barium (Ba)-Total (mg/L)		<0.00010				
	Beryllium (Be)-Total (mg/L)		<0.000020				
	Bismuth (Bi)-Total (mg/L)		<0.000050				
	Boron (B)-Total (mg/L)		<0.010				
	Cadmium (Cd)-Total (mg/L)		<0.0000050				
	Calcium (Ca)-Total (mg/L)		<0.050				
	Chromium (Cr)-Total (mg/L)		<0.00010				
	Cobalt (Co)-Total (mg/L)		<0.00010				
	Copper (Cu)-Total (mg/L)		<0.00050				
	Iron (Fe)-Total (mg/L)		<0.010				
	Lead (Pb)-Total (mg/L)		<0.000050				
	Lithium (Li)-Total (mg/L)		<0.0010				
	Magnesium (Mg)-Total (mg/L)		<0.10				
	Manganese (Mn)-Total (mg/L)		<0.00010				
	Mercury (Hg)-Total (mg/L)		<0.0000050				
	Molybdenum (Mo)-Total (mg/L)		<0.000050				
	Nickel (Ni)-Total (mg/L)		<0.00050				
	Phosphorus (P)-Total (mg/L)		<0.050				
	Potassium (K)-Total (mg/L)		<0.10				
	Selenium (Se)-Total (mg/L)		<0.000050				
	Silicon (Si)-Total (mg/L)		<0.10				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238412-1	L2238412-2	L2238412-3	L2238412-4	L2238412-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-FEB-19	27-FEB-19	25-FEB-19	25-FEB-19	25-FEB-19
	Sampled Time	11:05	15:45	12:50	13:30	14:30
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	2.47	0.877	1.41	1.15	10.3
	Strontium (Sr)-Total (mg/L)	0.224	0.198	0.267	0.243	0.646
	Sulfur (S)-Total (mg/L)	4.39	5.45	4.90	2.31	122
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	DLM <0.00060	DLM <0.00090	<0.00030	<0.00030	0.00091
	Uranium (U)-Total (mg/L)	0.00114	0.000970	0.00131	0.000801	0.00179
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0206	0.0057	0.0069	<0.0030	0.0429
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0037	0.0017	0.0018	0.0025	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00027	0.00012	0.00012	0.00011	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00071	0.00037	0.00038	0.00037	0.00028
	Barium (Ba)-Dissolved (mg/L)	0.0797	0.0231	0.0791	0.0568	0.0580
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000110	0.000215	0.0000465	0.0000506	0.0000298
	Calcium (Ca)-Dissolved (mg/L)	59.9	58.4	72.3	70.0	213
	Chromium (Cr)-Dissolved (mg/L)	0.00045	0.00017	<0.00010	0.00016	0.00022
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00067
	Copper (Cu)-Dissolved (mg/L)	DTC 0.00331	<0.00020	0.00047	0.00041	0.00039
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.025	0.022	0.047
	Lead (Pb)-Dissolved (mg/L)	0.000515	0.000067	0.000183	<0.000050	0.000076
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0014	0.0017	0.0011	0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.83	3.42	9.24	8.33	19.3
	Manganese (Mn)-Dissolved (mg/L)	0.00285	0.00022	0.0114	0.00567	0.632
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00140	0.000741	0.000829	0.000358	0.000203
	Nickel (Ni)-Dissolved (mg/L)	0.00068	<0.00050	<0.00050	<0.00050	0.00082
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.77	0.38	0.51	0.32	1.63
	Selenium (Se)-Dissolved (mg/L)	0.000864	0.000853	0.000601	0.000361	0.000060
	Silicon (Si)-Dissolved (mg/L)	4.06	3.29	3.89	4.05	4.68

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2238412-6	L2238412-7	L2238412-8	L2238412-9	L2238412-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-FEB-19	26-FEB-19	26-FEB-19	26-FEB-19	27-FEB-19
	Sampled Time	10:55	12:10	09:50	10:00	15:30
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	0.000028	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.10	2.16	1.06	1.08	<0.050
	Strontium (Sr)-Total (mg/L)	0.200	0.125	0.174	0.187	<0.00020
	Sulfur (S)-Total (mg/L)	3.61	2.25	1.44	1.44	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	0.00014	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00086	0.00039	0.00033	<0.00030
	Uranium (U)-Total (mg/L)	0.00167	0.00183	0.000929	0.000941	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0060	0.0138	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0018	0.0015	0.0013	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00010	<0.00010	0.00011	0.00013	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00022	0.00022	0.00022	0.00022	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.174	0.238	0.204	0.219	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000212	0.0000451	0.0000177	0.0000119	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	63.7	48.9	58.1	66.0	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00016	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00014	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00052	0.00091	<0.00020	0.00043	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.013	0.116	0.032	0.021	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000094	0.000105	0.000061	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0012	<0.0010	0.0012	0.0013	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	17.2	18.5	13.2	14.3	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00581	0.0426	0.00955	0.0103	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00118	0.00185	0.00206	0.00226	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00066	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.47	0.58	0.45	0.50	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.000702	0.000611	0.000673	0.000708	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.56	3.41	4.21	4.50	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238412-11				
	Description	Water				
	Sampled Date					
	Sampled Time					
	Client ID	TRIP BLANK				
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	<0.050				
	Strontium (Sr)-Total (mg/L)	<0.00020				
	Sulfur (S)-Total (mg/L)	<0.50				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Uranium (U)-Total (mg/L)	<0.000010				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location					
	Dissolved Metals Filtration Location					
	Aluminum (Al)-Dissolved (mg/L)					
	Antimony (Sb)-Dissolved (mg/L)					
	Arsenic (As)-Dissolved (mg/L)					
	Barium (Ba)-Dissolved (mg/L)					
	Beryllium (Be)-Dissolved (mg/L)					
	Bismuth (Bi)-Dissolved (mg/L)					
	Boron (B)-Dissolved (mg/L)					
	Cadmium (Cd)-Dissolved (mg/L)					
	Calcium (Ca)-Dissolved (mg/L)					
	Chromium (Cr)-Dissolved (mg/L)					
	Cobalt (Co)-Dissolved (mg/L)					
	Copper (Cu)-Dissolved (mg/L)					
	Iron (Fe)-Dissolved (mg/L)					
	Lead (Pb)-Dissolved (mg/L)					
	Lithium (Li)-Dissolved (mg/L)					
	Magnesium (Mg)-Dissolved (mg/L)					
	Manganese (Mn)-Dissolved (mg/L)					
	Mercury (Hg)-Dissolved (mg/L)					
	Molybdenum (Mo)-Dissolved (mg/L)					
	Nickel (Ni)-Dissolved (mg/L)					
	Phosphorus (P)-Dissolved (mg/L)					
	Potassium (K)-Dissolved (mg/L)					
	Selenium (Se)-Dissolved (mg/L)					
	Silicon (Si)-Dissolved (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2238412-1	L2238412-2	L2238412-3	L2238412-4	L2238412-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	25-FEB-19	27-FEB-19	25-FEB-19	25-FEB-19	25-FEB-19
		Sampled Time	11:05	15:45	12:50	13:30	14:30
		Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**						
WATER							
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)		2.79	0.923	1.48	1.29	10.8
	Strontium (Sr)-Dissolved (mg/L)		0.227	0.211	0.283	0.260	0.669
	Sulfur (S)-Dissolved (mg/L)		4.29	4.97	4.70	1.80	114
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)		0.00114	0.000994	0.00135	0.000820	0.00190
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)		0.0240	0.0051	0.0062	0.0026	0.0395
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)		0.00044	0.00021	<0.00010	0.00023	0.00019
	Hexavalent Chromium (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238412-6	L2238412-7	L2238412-8	L2238412-9	L2238412-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-FEB-19	26-FEB-19	26-FEB-19	26-FEB-19	27-FEB-19
	Sampled Time	10:55	12:10	09:50	10:00	15:30
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.25	2.95 DTC	1.16	1.45	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.218	0.127	0.183	0.199	<0.00020
	Sulfur (S)-Dissolved (mg/L)	3.80	2.14	1.33	1.49	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00183	0.00185	0.000947	0.00102	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0049	0.0083	0.0014	0.0014	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00015	0.00051	0.00011	0.00013	<0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238412-11
	Description	Water
	Sampled Date	
	Sampled Time	
	Client ID	TRIP BLANK
Grouping	**Analyte**	
WATER		
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	
	Sodium (Na)-Dissolved (mg/L)	
	Strontium (Sr)-Dissolved (mg/L)	
	Sulfur (S)-Dissolved (mg/L)	
	Thallium (Tl)-Dissolved (mg/L)	
	Tin (Sn)-Dissolved (mg/L)	
	Titanium (Ti)-Dissolved (mg/L)	
	Uranium (U)-Dissolved (mg/L)	
	Vanadium (V)-Dissolved (mg/L)	
	Zinc (Zn)-Dissolved (mg/L)	
	Zirconium (Zr)-Dissolved (mg/L)	
Speciated Metals	Chromium (III)-Total (mg/L)	
	Hexavalent Chromium (mg/L)	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2238412-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2238412-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2238412-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2238412-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2238412-1, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2238412-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2238412-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2238412-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2238412-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

ALS Test Code	Matrix	Test Description	Method Reference**
CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

Reference Information

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	**Laboratory Location**

Reference Information

ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 2   2 of 2

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2238412-COFC

COC Number: 15 -

Report To — Contact and company name below will appear on the final report

Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
Company address below will appear on the final report	
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☐ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax amacphail@accessconsulting.ca,mducharme@acc
Email 2 Michelle.unger@teck.com
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax Michelle.unger@teck.com
Email 2 roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q62635
Job #: TECK-18-1
PO / AFE: Teck PO-9615
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Can Dang Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)	Number of Containers
	MH-12 (LP)	25-Feb-19	11:05	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	27-Feb-19	15:45	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	25-Feb-19	12:50	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	25-Feb-19	13:30	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	25-Feb-19	14:30	Water	R	R	R	R	R	R	R	8
	MH-13 (LP)	26-Feb-19	10:55	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	26-Feb-19	12:10	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	26-Feb-19	9:50	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	26-Feb-19	10:00	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	27-Feb-19	15:30	Water	R	R	R	R	R	R	R	7
	MH-22 (LP)			Water	R	R	R	R	R	R	R	8
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R	8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☑

INITIAL COOLER TEMPERATURES °C: 10 8° 9°
FINAL COOLER TEMPERATURES °C: 8 (of 5)

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 28/2/2019	Time: 17:30	Received by:	Date: Feb 28/19	Time: 12:46	Received by: HK	Date: 3/1	Time: 12:15p

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION   WHITE - LABORATORY COPY   YELLOW - CLIENT COPY   OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2238412-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☐ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	amacphail@accessconsulting.ca,mducharme@acc
Email 2	Michelle.unger@teck.com
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]	☑ Standard TAT if received by 3 pm - business days - no surcharges apply	
PRIORITY (Business Days)	4 day [P4] ☐	
	3 day [P3] ☐	
	2 day [P2] ☐	
EMERGENCY	1 Business day [E1] ☐	
	Same Day, Weekend or Statutory holiday [E0] ☐	
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm	

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
PO / AFE:	Teck PO-9615
LSD:	
ALS Lab Work Order # (lab use only)	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Can Dang	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	Trip Blank (LQTB)			Water	R	R	R	R	R	R		7

Drinking Water (DW) Samples[1] (client use)	
Are samples taken from a Regulated DW System?	☐ YES ☐ NO
Are samples for human drinking water use?	☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐ No ☐
Ice Packs ☑	Ice Cubes ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated ☑			
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C	8 (0.5)

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Andrew MacPhail	Date: 28/2/19	Time: 13:30	Received by:	Date:	Time:	Received by: LAA	Date: 3/1	Time: 12:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 28-FEB-19
Report Date: 11-MAR-19 17:21 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2238424

Project P.O. #: TECK PO9516
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Comments: For the sample, "MW-GW", the specific bottles for BTEX, LEPH/HEPH, VPH and PAH analysis were not received. Therefore, these analyses were not performed on this sample.

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2238424-1	L2238424-2	L2238424-3	L2238424-4	L2238424-5
	Sample ID	L2238424-1	L2238424-2	L2238424-3	L2238424-4	L2238424-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	25-FEB-19	27-FEB-19	27-FEB-19	27-FEB-19	25-FEB-19
	Sampled Time	15:05	11:30	13:40	15:20	13:02
	Client ID	MW13-01	MW13-06	MW13-07	MW13-08	MW13-10
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	323	685	502	656	450
	Hardness (as CaCO3) (mg/L)	163	324	234	353	230
	pH (pH)	7.62	7.02	7.64	7.54	7.83
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	158	184	230	348	207
	Ammonia, Total (as N) (mg/L)	0.0053	0.0142	0.164	0.0129	0.0147
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	0.71	<0.50	<0.50
	Fluoride (F) (mg/L)	0.338	0.586	0.370	0.046	0.055
	Nitrate (as N) (mg/L)	0.377	<0.0050	<0.0050	0.0832	0.532
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0012	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	10.6	173	42.5	18.1	35.1
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0032	0.0013	0.0036	0.0026	0.0027
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00011	<0.00010	0.00017	0.00012
	Arsenic (As)-Dissolved (mg/L)	0.00043	0.0501	0.00266	0.00022	0.00105
	Barium (Ba)-Dissolved (mg/L)	0.0213	0.0241	0.0271	0.265	0.00767
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.013	0.024	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000511	DLM <0.000040	0.0000075	0.0000590	0.0000165
	Calcium (Ca)-Dissolved (mg/L)	58.4	117	66.7	118	78.4
	Chromium (Cr)-Dissolved (mg/L)	0.00025	0.00017	0.00019	0.00024	0.00046
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00265	0.00055	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00020	0.00021	0.00031	0.00034	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.721	2.10	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000974	<0.000050	0.000094	<0.000050	0.000093
	Lithium (Li)-Dissolved (mg/L)	0.0018	0.0086	0.0083	0.0022	0.0016
	Magnesium (Mg)-Dissolved (mg/L)	4.21	8.01	16.5	13.8	8.31
	Manganese (Mn)-Dissolved (mg/L)	0.00106	0.342	0.990	0.00023	0.00016
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000739	0.0394	0.00374	0.000727	0.00183
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.0295	0.00207	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	0.156	0.085	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.61	2.05	3.30	0.79	1.08
	Selenium (Se)-Dissolved (mg/L)	0.00125	<0.000050	<0.000050	0.000939	0.00151
	Silicon (Si)-Dissolved (mg/L)	3.46	15.6	7.22	4.25	3.91

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238424-6				
	Description	Groundwater				
	Sampled Date	25-FEB-19				
	Sampled Time	15:15				
	Client ID	MW-GW				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	323				
	Hardness (as CaCO3) (mg/L)	165				
	pH (pH)	7.79				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	158				
	Ammonia, Total (as N) (mg/L)	0.0059				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.358				
	Nitrate (as N) (mg/L)	0.374				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	10.7				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0015				
	Antimony (Sb)-Dissolved (mg/L)	0.00014				
	Arsenic (As)-Dissolved (mg/L)	0.00044				
	Barium (Ba)-Dissolved (mg/L)	0.0210				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.000498				
	Calcium (Ca)-Dissolved (mg/L)	59.0				
	Chromium (Cr)-Dissolved (mg/L)	0.00024				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.000848				
	Lithium (Li)-Dissolved (mg/L)	0.0017				
	Magnesium (Mg)-Dissolved (mg/L)	4.23				
	Manganese (Mn)-Dissolved (mg/L)	0.00141				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000709				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.62				
	Selenium (Se)-Dissolved (mg/L)	0.00133				
	Silicon (Si)-Dissolved (mg/L)	3.39				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2238424-1 Groundwater 25-FEB-19 15:05 MW13-01	L2238424-2 Groundwater 27-FEB-19 11:30 MW13-06	L2238424-3 Groundwater 27-FEB-19 13:40 MW13-07	L2238424-4 Groundwater 27-FEB-19 15:20 MW13-08	L2238424-5 Groundwater 25-FEB-19 13:02 MW13-10
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.35	15.8	13.8	1.33	1.94
	Strontium (Sr)-Dissolved (mg/L)	0.187	0.417	0.479	0.414	0.359
	Sulfur (S)-Dissolved (mg/L)	3.92	59.4	14.3	6.57	11.8
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	0.000011	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00017	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00100	0.0140	0.00691	0.00213	0.00293
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0168	0.101	0.0027	0.0013	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)			<0.00050		<0.00050
	Ethylbenzene (mg/L)			<0.00050		<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)			<0.00050		<0.00050
	Styrene (mg/L)			<0.00050		<0.00050
	Toluene (mg/L)			<0.00045		<0.00045
	ortho-Xylene (mg/L)			<0.00050		<0.00050
	meta- & para-Xylene (mg/L)			<0.00050		<0.00050
	Xylenes (mg/L)			<0.00075		<0.00075
	Surrogate: 4-Bromofluorobenzene (SS) (%)			101.9		103.0
	Surrogate: 1,4-Difluorobenzene (SS) (%)			94.4		93.8
Hydrocarbons	EPH10-19 (mg/L)			<0.25		<0.25
	EPH19-32 (mg/L)			<0.25		<0.25
	LEPH (mg/L)			<0.25		<0.25
	HEPH (mg/L)			<0.25		<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)			<0.10		<0.10
	VPH (C6-C10) (mg/L)			<0.10		<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)			82.2		77.9
	Surrogate: 3,4-Dichlorotoluene (SS) (%)			84.8		SURR-ND 55.9
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)			<0.000010		<0.000010
	Acenaphthylene (mg/L)			<0.000010		<0.000010
	Acridine (mg/L)			<0.000010		<0.000010
	Anthracene (mg/L)			<0.000010		<0.000010
	Benz(a)anthracene (mg/L)			<0.000010		<0.000010
	Benzo(a)pyrene (mg/L)			<0.0000050		<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238424-6
	Description	Groundwater
	Sampled Date	25-FEB-19
	Sampled Time	15:15
	Client ID	MW-GW
Grouping	**Analyte**	
WATER		
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.12
	Strontium (Sr)-Dissolved (mg/L)	0.188
	Sulfur (S)-Dissolved (mg/L)	3.75
	Thallium (Tl)-Dissolved (mg/L)	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00100
	Vanadium (V)-Dissolved (mg/L)	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0177
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030
Volatile Organic Compounds	Benzene (mg/L)	
	Ethylbenzene (mg/L)	
	Methyl t-butyl ether (MTBE) (mg/L)	
	Styrene (mg/L)	
	Toluene (mg/L)	
	ortho-Xylene (mg/L)	
	meta- & para-Xylene (mg/L)	
	Xylenes (mg/L)	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	
Hydrocarbons	EPH10-19 (mg/L)	
	EPH19-32 (mg/L)	
	LEPH (mg/L)	
	HEPH (mg/L)	
	Volatile Hydrocarbons (VH6-10) (mg/L)	
	VPH (C6-C10) (mg/L)	
	Surrogate: 2-Bromobenzotrifluoride (%)	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	
	Acenaphthylene (mg/L)	
	Acridine (mg/L)	
	Anthracene (mg/L)	
	Benz(a)anthracene (mg/L)	
	Benzo(a)pyrene (mg/L)	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2238424-1	L2238424-2	L2238424-3	L2238424-4	L2238424-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	25-FEB-19	27-FEB-19	27-FEB-19	27-FEB-19	25-FEB-19
	Sampled Time	15:05	11:30	13:40	15:20	13:02
	Client ID	MW13-01	MW13-06	MW13-07	MW13-08	MW13-10
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)			<0.000010		<0.000010
	Benzo(b+j+k)fluoranthene (mg/L)			<0.000015		<0.000015
	Benzo(g,h,i)perylene (mg/L)			<0.000010		<0.000010
	Benzo(k)fluoranthene (mg/L)			<0.000010		<0.000010
	Chrysene (mg/L)			<0.000010		<0.000010
	Dibenz(a,h)anthracene (mg/L)			<0.0000050		<0.0000050
	Fluoranthene (mg/L)			<0.000010		<0.000010
	Fluorene (mg/L)			<0.000010		<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)			<0.000010		<0.000010
	1-Methylnaphthalene (mg/L)			<0.000050		<0.000050
	2-Methylnaphthalene (mg/L)			<0.000050		<0.000050
	Naphthalene (mg/L)			0.000054		<0.000050
	Phenanthrene (mg/L)			<0.000020		<0.000020
	Pyrene (mg/L)			<0.000010		<0.000010
	Quinoline (mg/L)			<0.000050		<0.000050
	Surrogate: Acridine d9 (%)			103.5		85.0
	Surrogate: Chrysene d12 (%)			98.6		100.6
	Surrogate: Naphthalene d8 (%)			84.5		86.3
	Surrogate: Phenanthrene d10 (%)			104.6		103.9

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2238424-6				
	Sample ID	L2238424-6				
	Description	Groundwater				
	Sampled Date	25-FEB-19				
	Sampled Time	15:15				
	Client ID	MW-GW				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2238424-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

Reference Information

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 1

Reference Information

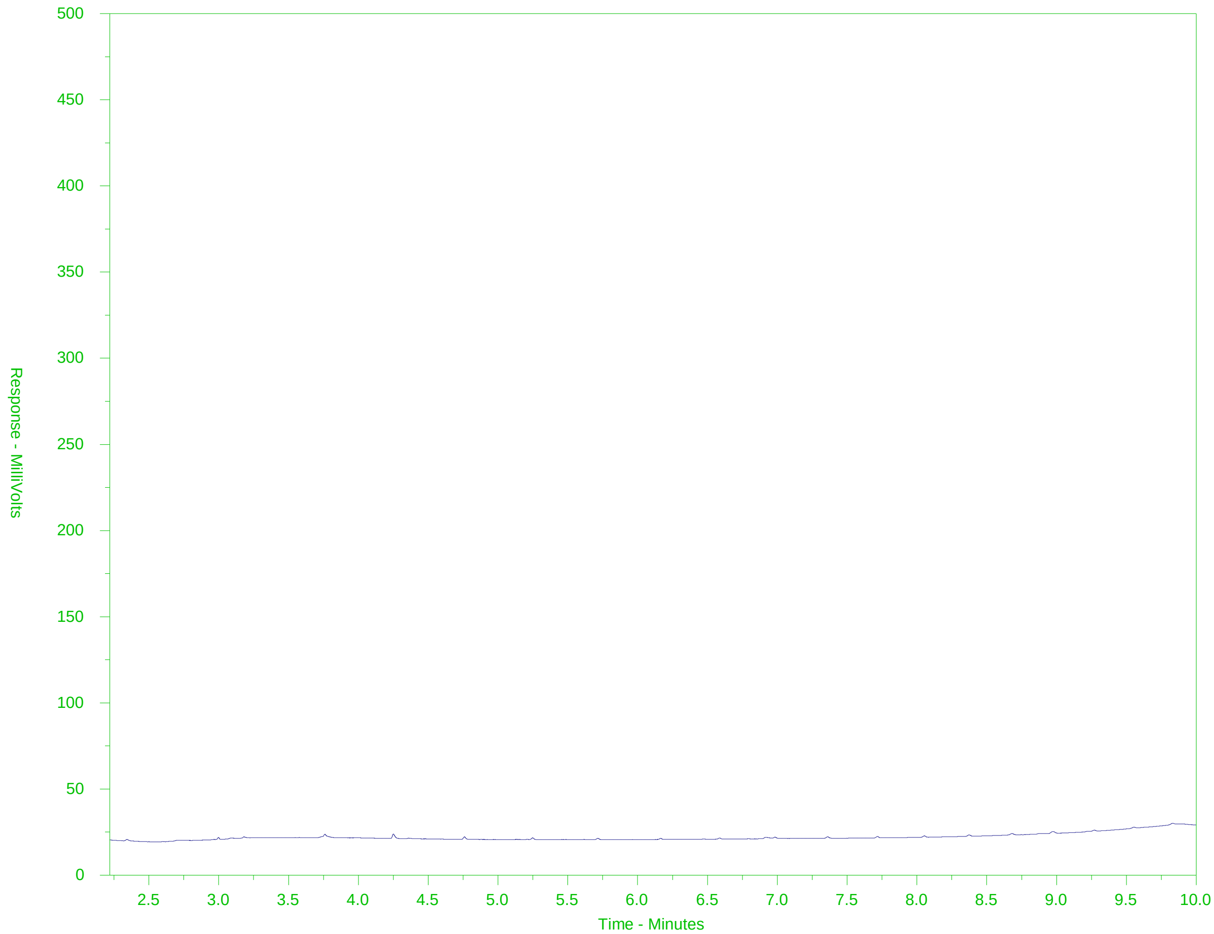
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2238424-3
Client Sample ID: MW13-07



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

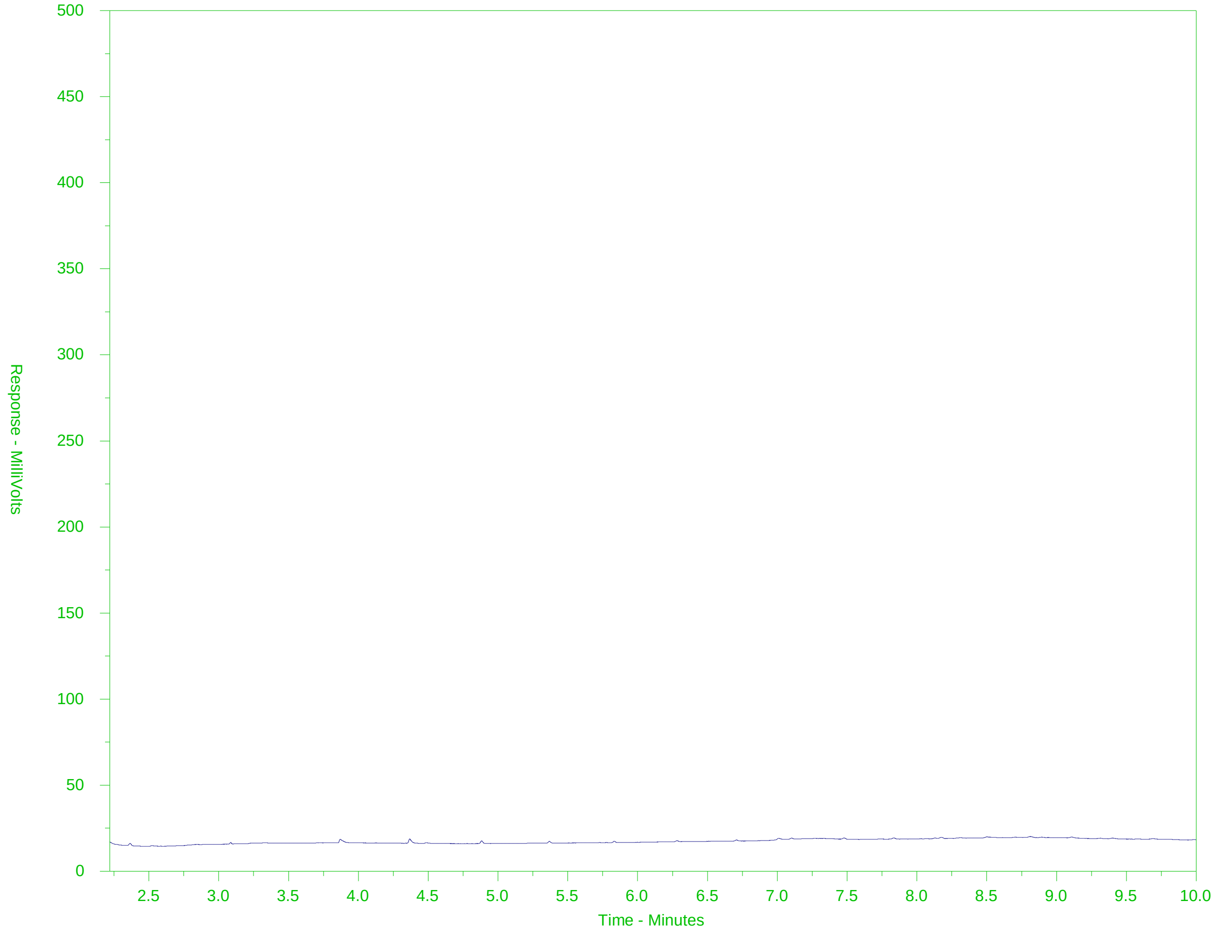
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2238424-5
Client Sample ID: MW13-10



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chain of Custody / Ana
Canada Toll Free:
www.alsglo

L2238424-COFC

COC #

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1:	amacphail@accessconsulting.ca, mducharme@a	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2:	michelle.unger@teck.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3:		Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	TECK-18-01	
Company:		PO / AFE:	TECK PO9516	
Contact:		LSD:		
Address:				
Phone:		Quote #:	Q62635	
Lab Work Order # (lab use only)		ALS Contact:	Can Dang	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg (F/P)	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia (P)	BTEX, LEPH, HEPH (P)	VPH, PAH (P)									Number of Containers
	MW13-01 (LP)	25-Feb-19	15:05	Groundwater	X	X	X	X											
	~~MW13-04 (LP)~~			Groundwater	X	X	X	X	X	X									
	~~MW13-05 (LP)~~			Groundwater	X	X	X	X	X	X									
	MW13-06 (LP)	27-Feb--19	11:30	Groundwater	X	X	X	X											
	MW13-07 (LP)	27-Feb-19	13:40	Groundwater	X	X	X	X	X	X									
	MW13-08 (LP)	27-Feb-19	15:20	Groundwater	X	X	X	X											
	MW13-10 (LP)	25-Feb-19	13:02	Groundwater	X	X	X	X	X	X									
	~~MW13-13 (LP)~~			Groundwater	X	X	X	X											
	~~MW14-01 (LP)~~			Groundwater	X	X	X	X	X	X									
	~~MW14-02 (LP)~~			Groundwater	X	X	X	X	X	X									
	~~MW14-03 (LP)~~			Groundwater	X	X	X	X	X	X									
	~~MW14-04 (LP)~~			Groundwater	X	X	X	X	X	X									
	MW-GW (LQR)	25-Feb-19	15:15	Groundwater	X	X	X	X	X	X									

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Andrew MacPhail	Date (dd-mmm-yy) 28-Feb-19	Time (hh-mm) 13:30	Received by:	Date: Feb 28/19	Time: 12:46	Temperature: 10/3/9 °C	Verified by: HA	Date: 3/1	Time: 12:15P	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

8 (of 5)

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 29-APR-19
Report Date: 06-MAY-19 14:44 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2264244

Project P.O. #: Teck PO-9615
Job Reference: TECK-18-1
C of C Numbers: 1 of 2, 2 of 2
Legal Site Desc:

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2264244-1	L2264244-2	L2264244-3	L2264244-4	L2264244-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-APR-19	25-APR-19	25-APR-19	25-APR-19	26-APR-19
	Sampled Time	15:30	10:45	11:40	12:50	10:20
	Client ID	MH-04	MH-11	MH-29	MH-02	MH-13
WATER						
Physical Tests	Conductivity (uS/cm)	319	415	401	1070	387
	Hardness (as CaCO3) (mg/L)	173	230	217	608	211
	pH (pH)	8.40	8.39	8.36	8.12	8.38
	Total Suspended Solids (mg/L)	<1.0	1.3	<1.0	37.9	1.7
	Total Dissolved Solids (mg/L)	192	249	248	820	227
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	167	230	236	304	219
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0254	<0.0050	0.0100	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.25 DLDS	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<2.5 DLDS	<0.50
	Fluoride (F) (mg/L)	0.163	0.092	0.056	<0.10 DLDS	0.074
	Nitrate (as N) (mg/L)	0.232	0.0856	0.0199	<0.025 DLDS	0.101
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0050 DLDS	<0.0010
	Sulfate (SO4) (mg/L)	15.5	14.5	4.95	348	10.1
Total Metals	Aluminum (Al)-Total (mg/L)	0.0044	0.173	0.0085	0.0221	0.0040
	Antimony (Sb)-Total (mg/L)	0.00012	0.00021	0.00011	<0.00010	0.00011
	Arsenic (As)-Total (mg/L)	0.00038	0.00090	0.00037	0.00158	0.00042
	Barium (Ba)-Total (mg/L)	0.0246	0.0830	0.0605	0.0563	0.168
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000233	0.000205	0.0000429	0.0000595	0.0000243
	Calcium (Ca)-Total (mg/L)	60.9	74.3	72.7	220	58.8
	Chromium (Cr)-Total (mg/L)	0.00015	0.00038	0.00023	<0.00010	0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00019	<0.00010	0.00091	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00080	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.483	0.017	0.682	0.382
	Lead (Pb)-Total (mg/L)	0.000156	0.00422	<0.000050	0.00227	0.000055
	Lithium (Li)-Total (mg/L)	0.0014	0.0018	0.0012	0.0011	0.0011
	Magnesium (Mg)-Total (mg/L)	3.29	9.41	8.66	18.9	15.5
	Manganese (Mn)-Total (mg/L)	0.00047	0.0581	0.00439	0.927	0.00829
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000746	0.000824	0.000405	0.000274	0.00116
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00053	<0.00050	0.00060	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.37	0.73	0.37	1.86	0.55
	Selenium (Se)-Total (mg/L)	0.000992	0.000572	0.000293	0.000091	0.000629
	Silicon (Si)-Total (mg/L)	3.21	4.12	4.16	5.19	3.32

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2264244-6	L2264244-7	L2264244-8	L2264244-9	L2264244-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-APR-19	26-APR-19	25-APR-19	25-APR-19	25-APR-19
	Sampled Time	09:20	11:20	13:00	10:35	
	Client ID	MH-30	MH-15	MH-SW	MH-FB	TRIP BLANK
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	333	359	1070	<2.0	<2.0
	Hardness (as CaCO3) (mg/L)	180	198	622	<0.50	
	pH (pH)	8.29	8.37	8.10	5.48	5.42
	Total Suspended Solids (mg/L)	2.8	1.3	65.5	<1.0	<1.0
	Total Dissolved Solids (mg/L)	187	212	785	<10	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	195	211	310	<1.0	<1.0
	Ammonia, Total (as N) (mg/L)	0.0319	0.0064	0.0081	<0.0050	RRV 0.015
	Bromide (Br) (mg/L)	<0.050	<0.050	DLDS <0.25	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	DLDS <2.5	<0.50	<0.50
	Fluoride (F) (mg/L)	0.059	0.102	DLDS <0.10	<0.020	<0.020
	Nitrate (as N) (mg/L)	0.0694	0.0697	DLDS <0.025	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	DLDS <0.0050	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	5.91	4.09	346	<0.30	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0195	0.0064	0.0390	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00011	0.00012	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00039	0.00039	0.00239	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	0.237	0.198	0.0631	<0.00010	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000435	0.0000071	0.0000821	<0.0000050	<0.0000050
	Calcium (Ca)-Total (mg/L)	46.5	58.3	218	<0.050	<0.050
	Chromium (Cr)-Total (mg/L)	0.00013	0.00028	0.00032	RRV 0.00017	RRV 0.00021
	Cobalt (Co)-Total (mg/L)	0.00014	<0.00010	0.00104	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	1.05	0.207	0.885	<0.010	<0.010
	Lead (Pb)-Total (mg/L)	0.000103	<0.000050	0.00264	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0012	0.0011	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	16.6	12.9	19.0	<0.10	<0.10
	Manganese (Mn)-Total (mg/L)	0.0386	0.0112	1.03	<0.00010	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00151	0.00206	0.000238	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00060	<0.00050	0.00066	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.64	0.57	1.80	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	0.000593	0.000670	0.000051	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	3.28	3.84	5.09	<0.10	<0.10

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2264244-1	L2264244-2	L2264244-3	L2264244-4	L2264244-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-APR-19	25-APR-19	25-APR-19	25-APR-19	26-APR-19
	Sampled Time	15:30	10:45	11:40	12:50	10:20
	Client ID	MH-04	MH-11	MH-29	MH-02	MH-13
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.867	1.49	1.14	10.6	1.02
	Strontium (Sr)-Total (mg/L)	0.222	0.299	0.282	0.674	0.208
	Sulfur (S)-Total (mg/L)	5.33	5.48	1.78	126	3.89
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00467	<0.00030	DLM <0.00060	<0.00030
	Uranium (U)-Total (mg/L)	0.00104	0.00153	0.000982	0.00190	0.00182
	Vanadium (V)-Total (mg/L)	<0.00050	0.00053	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0039	0.0177	<0.0030	0.0267	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0017	0.0017	0.0020	<0.0010	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00017	0.00011	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00040	0.00042	0.00041	0.00060	0.00034
	Barium (Ba)-Dissolved (mg/L)	0.0245	0.0783	0.0612	0.0558	0.160
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000221	0.0000436	0.0000409	0.0000270	0.0000120
	Calcium (Ca)-Dissolved (mg/L)	63.4	76.2	72.4	213	59.1
	Chromium (Cr)-Dissolved (mg/L)	0.00013	0.00018	<0.00010	0.00025	0.00016
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00077	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00047	0.00025	<0.00020	0.00022
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.023	0.011	0.265	0.085
	Lead (Pb)-Dissolved (mg/L)	0.000075	0.000140	<0.000050	0.000114	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0016	0.0017	0.0013	0.0011	0.0012
	Magnesium (Mg)-Dissolved (mg/L)	3.56	9.70	8.73	18.5	15.3
	Manganese (Mn)-Dissolved (mg/L)	0.00019	0.00624	0.00399	0.634	0.00546
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000744	0.000811	0.000400	0.000247	0.00119
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.40	0.74	0.38	1.79	0.55
	Selenium (Se)-Dissolved (mg/L)	0.000958	0.000642	0.000354	0.000099	0.000778
	Silicon (Si)-Dissolved (mg/L)	3.44	3.99	4.19	5.03	3.39

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte					
	Sample ID	L2264244-6	L2264244-7	L2264244-8	L2264244-9	L2264244-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-APR-19	26-APR-19	25-APR-19	25-APR-19	25-APR-19
	Sampled Time	09:20	11:20	13:00	10:35	
	Client ID	MH-30	MH-15	MH-SW	MH-FB	TRIP BLANK
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.828	1.03	10.6	<0.050	<0.050
	Strontium (Sr)-Total (mg/L)	0.122	0.185	0.691	<0.00020	<0.00020
	Sulfur (S)-Total (mg/L)	2.20	1.38	130	<0.50	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00060 DLM	<0.00030	<0.00090 DLM	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00178	0.00104	0.00192	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0319	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0017	0.0018	<0.0010	<0.0010	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00012	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00026	0.00033	0.00064	<0.00010	
	Barium (Ba)-Dissolved (mg/L)	0.234	0.199	0.0569	<0.00010	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	0.0000307	0.0000079	0.0000254	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	45.3	58.2	218	<0.050	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00017	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	0.00012	<0.00010	0.00076	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	0.00028	<0.00020	<0.00020	<0.00020	
	Iron (Fe)-Dissolved (mg/L)	0.396	0.075	0.259	<0.010	
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	0.000107	<0.000050	
	Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0012	0.0011	<0.0010	
	Magnesium (Mg)-Dissolved (mg/L)	16.2	12.8	18.5	<0.10	
	Manganese (Mn)-Dissolved (mg/L)	0.0360	0.00678	0.647	<0.00010	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.00158	0.00215	0.000252	<0.000050	
	Nickel (Ni)-Dissolved (mg/L)	0.00052	<0.00050	<0.00050	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.63	0.60	1.80	<0.10	
	Selenium (Se)-Dissolved (mg/L)	0.000622	0.000752	0.000089	<0.000050	
	Silicon (Si)-Dissolved (mg/L)	3.28	3.90	4.96	<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2264244-1	L2264244-2	L2264244-3	L2264244-4	L2264244-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	25-APR-19	25-APR-19	25-APR-19	25-APR-19	26-APR-19
	Sampled Time	15:30	10:45	11:40	12:50	10:20
	Client ID	MH-04	MH-11	MH-29	MH-02	MH-13
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.946	1.56	1.14	10.0	0.986
	Strontium (Sr)-Dissolved (mg/L)	0.223	0.297	0.273	0.701	0.207
	Sulfur (S)-Dissolved (mg/L)	5.48	5.32	1.70	122	3.56
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00101	0.00149	0.000962	0.00198	0.00178
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0041	0.0049	<0.0010	0.0212	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00015	0.00038	0.00023	<0.00010	0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2264244-6	L2264244-7	L2264244-8	L2264244-9	L2264244-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-APR-19	26-APR-19	25-APR-19	25-APR-19	25-APR-19
	Sampled Time	09:20	11:20	13:00	10:35	
	Client ID	MH-30	MH-15	MH-SW	MH-FB	TRIP BLANK
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	0.836	1.04	9.83	<0.050	
	Strontium (Sr)-Dissolved (mg/L)	0.123	0.188	0.694	<0.00020	
	Sulfur (S)-Dissolved (mg/L)	2.13	1.41	122	<0.50	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)	0.00178	0.00107	0.00199	<0.000010	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	0.0012	<0.0010	0.0212	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	
Speciated Metals	Chromium (III)-Total (mg/L)	0.00013	0.00028	0.00032	0.00017	
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2264244-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2264244-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2264244-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2264244-1, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2264244-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2264244-10, -2, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2264244-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2264244-10, -2, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2264244-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2264244-10, -2, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L2264244-10, -2, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2264244-1, -10, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2264244-10, -2, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 2	2 of 2

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2264244-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: mducharme@accessconsulting.ca

Email 2: Michelle.unger@teck.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Michelle.unger@teck.com

Email 2: roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q62635

Job #: TECK-18-1

PO / AFE: Teck PO-9615

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#

Major/Minor Code: | Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Can Dang | Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)	Number of Containers
	MH-12 (LP)			Water								
	MH-04 (LP) ✓	25-Apr-19	15:30	Water	R	R	R	R	R	R	R	7
	MH-11 (LP)	25-Apr-19	10:45	Water	R	R	R	R	R	R	R	7
	MH-29 (LP) ✓	25-Apr-19	11:40	Water	R	R	R	R	R	R	R	7
	MH-02 (LP) ✓	25-Apr-19	12:50	Water	R	R	R	R	R	R	R	7
	MH-13 (LP) ✓	26-Apr-19	10:20	Water	R	R	R	R	R	R	R	7
	MH-30 (LP) ✓	26-Apr-19	9:20	Water	R	R	R	R	R	R	R	7
	MH-15 (LP) ✓	26-Apr-19	11:20	Water	R	R	R	R	R	R	R	7
	MH-SW (LQR) ✓	25-Apr-19	13:00	Water	R	R	R	R	R	R	R	7
	MH-FB (LQFB) ✓	25-Apr-19	10:35	Water	R	R	R	R	R	R	R	7
	MH-22 (LP)											
	SDH-S2 (LP)											

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 7.0

FINAL COOLER TEMPERATURES °C: 6° (cab at 3)

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Alex Zhang	Date: Apr 29	Time: 8:00	Received by: EF	Date: 29 Apr 2019	Time: 10:10	Received by:	Date: Apr 30	Time: 11:14am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2264244-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☐ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax amacphail@accessconsulting.ca,mducharme@acc
Email 2 Michelle.unger@teck.com
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax Michelle.unger@teck.com
Email 2 roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
PO / AFE:	Teck PO-9615
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: Can Dang | Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	Trip Blank (LQTB)			Water	R	R	R	R	R	R		7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 7.0
FINAL COOLER TEMPERATURES °C: 6° (avg of 3)

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Alex Z	Date: Apr 29	Time: 8:00	Received by: EF	Date: 29 Apr 2019	Time: 10:10	Received by:	Date: Apr. 30	Time: 11:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY — OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 07-JUN-19
Report Date: 10-JUL-19 17:07 (MT)
Version: FINAL REV. 2

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2287546

Project P.O. #: TECK PO9516
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Comments: ADDITIONAL 04-JUL-19 13:10

10-JUL-2019 Revision 2: This revision replaces and supersedes previous revision of this report. This revision includes the followings:
- modified Fluoride, Nitrate and Sulfate data for the samples, L2287546-6 and -7;
- additional analysis performed on the samples L2287546-10 and -11.

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-1	L2287546-2	L2287546-3	L2287546-4	L2287546-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	05-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	05-JUN-19
	Sampled Time	18:30	16:00	14:15	12:30	15:20
	Client ID	MW13-01	MW13-04	MW13-05	MW13-06	MW13-07
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	294	253	340	696	449
	Hardness (as CaCO3) (mg/L)	149	132	169	349	218
	pH (pH)	8.07	8.19	8.17	7.94	8.23
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	151	133	132	188	227
	Ammonia, Total (as N) (mg/L)	0.0186	0.0063	0.0131	0.0142	0.148
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.345	0.068	0.064	0.529	0.336
	Nitrate (as N) (mg/L)	0.398	0.369	1.53	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0024	<0.0010
	Sulfate (SO4) (mg/L)	11.1	5.26	47.4	200	32.6
Total Metals	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-6	L2287546-7	L2287546-8	L2287546-9	L2287546-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Water
	Sampled Date	06-JUN-19	06-JUN-19	05-JUN-19	06-JUN-19	06-JUN-19
	Sampled Time	10:50	12:00	10:15	11:20	10:15
	Client ID	MW13-08	MW13-10	MW13-13	MW-GW	MH-SW
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	429	413	195	425	293
	Hardness (as CaCO3) (mg/L)	243	232	96.2	256	162
	pH (pH)	8.06	8.07	8.03	8.04	8.40
	Total Suspended Solids (mg/L)					1.5
	Total Dissolved Solids (mg/L)					186
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	236	199	92.1	242	145
	Ammonia, Total (as N) (mg/L)	0.0300	0.0056	0.0170	0.0309	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.056	0.054	0.092	0.055	0.118
	Nitrate (as N) (mg/L)	0.237	0.560	0.182	0.241	0.231
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	9.57	30.6	11.5	9.69	12.4
Total Metals	Aluminum (Al)-Total (mg/L)					0.0131
	Antimony (Sb)-Total (mg/L)					0.00012
	Arsenic (As)-Total (mg/L)					0.00045
	Barium (Ba)-Total (mg/L)					0.0203
	Beryllium (Be)-Total (mg/L)					<0.000020
	Bismuth (Bi)-Total (mg/L)					<0.000050
	Boron (B)-Total (mg/L)					<0.010
	Cadmium (Cd)-Total (mg/L)					0.000272
	Calcium (Ca)-Total (mg/L)					56.6
	Chromium (Cr)-Total (mg/L)					0.00019
	Cobalt (Co)-Total (mg/L)					<0.00010
	Copper (Cu)-Total (mg/L)					<0.00050
	Iron (Fe)-Total (mg/L)					0.025
	Lead (Pb)-Total (mg/L)					0.000507
	Lithium (Li)-Total (mg/L)					0.0013
	Magnesium (Mg)-Total (mg/L)					2.83
	Manganese (Mn)-Total (mg/L)					0.00091
	Mercury (Hg)-Total (mg/L)					<0.0000050
	Molybdenum (Mo)-Total (mg/L)					0.000602
	Nickel (Ni)-Total (mg/L)					<0.00050
	Phosphorus (P)-Total (mg/L)					<0.050
	Potassium (K)-Total (mg/L)					0.44
	Selenium (Se)-Total (mg/L)					0.000567
	Silicon (Si)-Total (mg/L)					3.18

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-11				
	Description	Water				
	Sampled Date	04-JUN-19				
	Sampled Time	11:50				
	Client ID	MH-29				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	317				
	Hardness (as CaCO3) (mg/L)	179				
	pH (pH)	8.45				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	191				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	176				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	0.048				
	Nitrate (as N) (mg/L)	0.135				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	4.00				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0123				
	Antimony (Sb)-Total (mg/L)	0.00020				
	Arsenic (As)-Total (mg/L)	0.00080				
	Barium (Ba)-Total (mg/L)	0.0404				
	Beryllium (Be)-Total (mg/L)	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	0.0000445				
	Calcium (Ca)-Total (mg/L)	60.0				
	Chromium (Cr)-Total (mg/L)	0.00011				
	Cobalt (Co)-Total (mg/L)	<0.00010				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	0.021				
	Lead (Pb)-Total (mg/L)	0.000069				
	Lithium (Li)-Total (mg/L)	0.0013				
	Magnesium (Mg)-Total (mg/L)	4.45				
	Manganese (Mn)-Total (mg/L)	0.00396				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.000607				
	Nickel (Ni)-Total (mg/L)	<0.00050				
	Phosphorus (P)-Total (mg/L)	<0.050				
	Potassium (K)-Total (mg/L)	0.38				
	Selenium (Se)-Total (mg/L)	0.000804				
	Silicon (Si)-Total (mg/L)	3.87				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2287546-1	L2287546-2	L2287546-3	L2287546-4	L2287546-5
	Sample ID	L2287546-1	L2287546-2	L2287546-3	L2287546-4	L2287546-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	05-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	05-JUN-19
	Sampled Time	18:30	16:00	14:15	12:30	15:20
	Client ID	MW13-01	MW13-04	MW13-05	MW13-06	MW13-07
WATER						
Total Metals	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0028	0.0034	0.0025	0.0014	0.0020
	Antimony (Sb)-Dissolved (mg/L)	0.00021	0.00029	0.00034	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00039	0.00076	0.00053	0.0420	0.00213
	Barium (Ba)-Dissolved (mg/L)	0.0213	0.0378	0.0598	0.0251	0.0266
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.013	0.022
	Cadmium (Cd)-Dissolved (mg/L)	0.000619	0.000471	0.0000702	DLM <0.000020	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	53.2	47.9	61.4	124	61.4
	Chromium (Cr)-Dissolved (mg/L)	0.00023	0.00033	0.00040	<0.00010	0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00212	0.00033
	Copper (Cu)-Dissolved (mg/L)	0.00043	0.00081	0.00233	<0.00020	0.00021
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.709	2.10
	Lead (Pb)-Dissolved (mg/L)	0.000769	0.000451	0.000143	0.000081	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0019	0.0017	0.0017	0.0087	0.0087
	Magnesium (Mg)-Dissolved (mg/L)	3.88	2.99	3.82	9.61	15.8
	Manganese (Mn)-Dissolved (mg/L)	0.00229	0.00071	0.00092	0.293	0.691
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000755	0.000550	0.000619	0.0319	0.00302
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.0305	0.00086
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	0.154	0.088
	Potassium (K)-Dissolved (mg/L)	0.63	0.48	0.61	2.02	2.91
	Selenium (Se)-Dissolved (mg/L)	0.00121	0.00110	0.00256	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.82	4.16	4.95	16.7	8.12

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-6	L2287546-7	L2287546-8	L2287546-9	L2287546-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Water
	Sampled Date	06-JUN-19	06-JUN-19	05-JUN-19	06-JUN-19	06-JUN-19
	Sampled Time	10:50	12:00	10:15	11:20	10:15
	Client ID	MW13-08	MW13-10	MW13-13	MW-GW	MH-SW
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)					<0.000010
	Sodium (Na)-Total (mg/L)					0.788
	Strontium (Sr)-Total (mg/L)					0.190
	Sulfur (S)-Total (mg/L)					4.78
	Thallium (Tl)-Total (mg/L)					<0.000010
	Tin (Sn)-Total (mg/L)					<0.00010
	Titanium (Ti)-Total (mg/L)					0.00042
	Uranium (U)-Total (mg/L)					0.000769
	Vanadium (V)-Total (mg/L)					<0.00050
	Zinc (Zn)-Total (mg/L)					0.0058
	Zirconium (Zr)-Total (mg/L)					<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0046	0.0016	0.0169	0.0011	0.0017
	Antimony (Sb)-Dissolved (mg/L)	0.00014	0.00012	0.00012	0.00014	0.00013
	Arsenic (As)-Dissolved (mg/L)	0.00029	0.00108	0.00062	0.00028	0.00036
	Barium (Ba)-Dissolved (mg/L)	0.138	0.0103	0.0108	0.148	0.0189
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000684	0.0000224	0.00139	0.0000583	0.000246
	Calcium (Ca)-Dissolved (mg/L)	82.9	78.7	35.9	87.1	59.8
	Chromium (Cr)-Dissolved (mg/L)	0.00038	0.00045	0.00013	0.00045	0.00012
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00058	0.00026	0.00145	<0.00020	0.00026
	Iron (Fe)-Dissolved (mg/L)	0.020	<0.010	0.025	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000088	0.000103	0.00166	<0.000050	0.000160
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0016	<0.0010	0.0013	0.0012
	Magnesium (Mg)-Dissolved (mg/L)	8.77	8.53	1.56	9.32	3.16
	Manganese (Mn)-Dissolved (mg/L)	0.00050	0.00027	0.00069	0.00010	0.00018
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000795	0.00169	0.000174	0.000820	0.000599
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.65	1.07	0.51	0.63	0.43
	Selenium (Se)-Dissolved (mg/L)	0.00126	0.00159	0.000515	0.00110	0.000609
	Silicon (Si)-Dissolved (mg/L)	4.25	4.32	2.07	4.19	3.00

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-11				
	Description	Water				
	Sampled Date	04-JUN-19				
	Sampled Time	11:50				
	Client ID	MH-29				
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	0.729				
	Strontium (Sr)-Total (mg/L)	0.190				
	Sulfur (S)-Total (mg/L)	1.94				
	Thallium (Tl)-Total (mg/L)	<0.000010				
	Tin (Sn)-Total (mg/L)	<0.00010				
	Titanium (Ti)-Total (mg/L)	<0.00030				
	Uranium (U)-Total (mg/L)	0.000723				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	<0.0030				
	Zirconium (Zr)-Total (mg/L)	<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0032				
	Antimony (Sb)-Dissolved (mg/L)	0.00020				
	Arsenic (As)-Dissolved (mg/L)	0.00075				
	Barium (Ba)-Dissolved (mg/L)	0.0384				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000301				
	Calcium (Ca)-Dissolved (mg/L)	63.3				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00027				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0013				
	Magnesium (Mg)-Dissolved (mg/L)	4.97				
	Manganese (Mn)-Dissolved (mg/L)	0.00135				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000609				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.37				
	Selenium (Se)-Dissolved (mg/L)	0.000757				
	Silicon (Si)-Dissolved (mg/L)	3.57				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-1	L2287546-2	L2287546-3	L2287546-4	L2287546-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	05-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	05-JUN-19
	Sampled Time	18:30	16:00	14:15	12:30	15:20
	Client ID	MW13-01	MW13-04	MW13-05	MW13-06	MW13-07
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.789	0.619	0.909	12.4	7.42
	Strontium (Sr)-Dissolved (mg/L)	0.169	0.112	0.183	0.484	0.442
	Sulfur (S)-Dissolved (mg/L)	4.33	2.27	16.6	73.1	12.4
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000012	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00101	0.000645	0.000872	0.0116	0.00629
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0221	0.0196	0.0181	0.0984	0.0013
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)		<0.00050	<0.00050		<0.00050
	Ethylbenzene (mg/L)		<0.00050	<0.00050		<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050	<0.00050		<0.00050
	Styrene (mg/L)		<0.00050	<0.00050		<0.00050
	Toluene (mg/L)		<0.00045	<0.00045		<0.00045
	ortho-Xylene (mg/L)		<0.00050	<0.00050		<0.00050
	meta- & para-Xylene (mg/L)		<0.00050	<0.00050		<0.00050
	Xylenes (mg/L)		<0.00075	<0.00075		<0.00075
	Surrogate: 4-Bromofluorobenzene (SS) (%)		90.8	94.1		88.3
	Surrogate: 1,4-Difluorobenzene (SS) (%)		104.1	98.9		100.3
Hydrocarbons	EPH10-19 (mg/L)		<0.25	<0.25		<0.25
	EPH19-32 (mg/L)		<0.25	<0.25		<0.25
	LEPH (mg/L)		<0.25	<0.25		<0.25
	HEPH (mg/L)		<0.25	<0.25		<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.10		<0.10
	VPH (C6-C10) (mg/L)		<0.10	<0.10		<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)		89.4	95.8		89.7
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		86.4	100.7		93.4
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)		<0.000010	<0.000010		<0.000010
	Acenaphthylene (mg/L)		<0.000010	<0.000010		<0.000010
	Acridine (mg/L)		<0.000010	<0.000010		<0.000010
	Anthracene (mg/L)		<0.000010	<0.000010		<0.000010
	Benz(a)anthracene (mg/L)		<0.000010	<0.000010		<0.000010
	Benzo(a)pyrene (mg/L)		<0.0000050	<0.0000050		<0.0000050
	Benzo(b&j)fluoranthene (mg/L)		<0.000010	<0.000010		<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-6	L2287546-7	L2287546-8	L2287546-9	L2287546-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Water
	Sampled Date	06-JUN-19	06-JUN-19	05-JUN-19	06-JUN-19	06-JUN-19
	Sampled Time	10:50	12:00	10:15	11:20	10:15
	Client ID	MW13-08	MW13-10	MW13-13	MW-GW	MH-SW
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.12	1.87	0.539	1.20	0.769
	Strontium (Sr)-Dissolved (mg/L)	0.268	0.335	0.0656	0.278	0.214
	Sulfur (S)-Dissolved (mg/L)	4.17	11.5	4.37	3.65	4.29
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	DLM <0.00060	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00147	0.00258	0.000256	0.00146	0.000757
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0018	0.0019	0.0443	0.0010	0.0063
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)		<0.00050		<0.00050	
	Ethylbenzene (mg/L)		<0.00050		<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050		<0.00050	
	Styrene (mg/L)		<0.00050		<0.00050	
	Toluene (mg/L)		<0.00045		RRV 0.00059	
	ortho-Xylene (mg/L)		<0.00050		<0.00050	
	meta- & para-Xylene (mg/L)		<0.00050		<0.00050	
	Xylenes (mg/L)		<0.00075		<0.00075	
	Surrogate: 4-Bromofluorobenzene (SS) (%)		93.8		93.6	
	Surrogate: 1,4-Difluorobenzene (SS) (%)		105.7		101.8	
Hydrocarbons	EPH10-19 (mg/L)		<0.25		<0.25	
	EPH19-32 (mg/L)		<0.25		<0.25	
	LEPH (mg/L)		<0.25		<0.25	
	HEPH (mg/L)		<0.25		<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10		<0.10	
	VPH (C6-C10) (mg/L)		<0.10		<0.10	
	Surrogate: 2-Bromobenzotrifluoride (%)		93.6		91.6	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		81.7		99.5	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)		<0.000010		<0.000010	
	Acenaphthylene (mg/L)		<0.000010		<0.000010	
	Acridine (mg/L)		<0.000010		<0.000010	
	Anthracene (mg/L)		<0.000010		<0.000010	
	Benz(a)anthracene (mg/L)		<0.000010		<0.000010	
	Benzo(a)pyrene (mg/L)		<0.0000050		<0.0000050	
	Benzo(b&j)fluoranthene (mg/L)		<0.000010		<0.000010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2287546-11				
		Description	Water				
		Sampled Date	04-JUN-19				
		Sampled Time	11:50				
		Client ID	MH-29				
Grouping	**Analyte**						
WATER							
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)		<0.000010				
	Sodium (Na)-Dissolved (mg/L)		0.721				
	Strontium (Sr)-Dissolved (mg/L)		0.215				
	Sulfur (S)-Dissolved (mg/L)		1.46				
	Thallium (Tl)-Dissolved (mg/L)		<0.000010				
	Tin (Sn)-Dissolved (mg/L)		<0.00010				
	Titanium (Ti)-Dissolved (mg/L)		<0.00030				
	Uranium (U)-Dissolved (mg/L)		0.000773				
	Vanadium (V)-Dissolved (mg/L)		<0.00050				
	Zinc (Zn)-Dissolved (mg/L)		<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030				
Volatile Organic Compounds	Benzene (mg/L)						
	Ethylbenzene (mg/L)						
	Methyl t-butyl ether (MTBE) (mg/L)						
	Styrene (mg/L)						
	Toluene (mg/L)						
	ortho-Xylene (mg/L)						
	meta- & para-Xylene (mg/L)						
	Xylenes (mg/L)						
	Surrogate: 4-Bromofluorobenzene (SS) (%)						
	Surrogate: 1,4-Difluorobenzene (SS) (%)						
Hydrocarbons	EPH10-19 (mg/L)						
	EPH19-32 (mg/L)						
	LEPH (mg/L)						
	HEPH (mg/L)						
	Volatile Hydrocarbons (VH6-10) (mg/L)						
	VPH (C6-C10) (mg/L)						
	Surrogate: 2-Bromobenzotrifluoride (%)						
	Surrogate: 3,4-Dichlorotoluene (SS) (%)						
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)						
	Acenaphthylene (mg/L)						
	Acridine (mg/L)						
	Anthracene (mg/L)						
	Benz(a)anthracene (mg/L)						
	Benzo(a)pyrene (mg/L)						
	Benzo(b&j)fluoranthene (mg/L)						

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-1	L2287546-2	L2287546-3	L2287546-4	L2287546-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	05-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	05-JUN-19
	Sampled Time	18:30	16:00	14:15	12:30	15:20
	Client ID	MW13-01	MW13-04	MW13-05	MW13-06	MW13-07
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b+j+k)fluoranthene (mg/L)		<0.000015	<0.000015		<0.000015
	Benzo(g,h,i)perylene (mg/L)		<0.000010	<0.000010		<0.000010
	Benzo(k)fluoranthene (mg/L)		<0.000010	<0.000010		<0.000010
	Chrysene (mg/L)		<0.000010	<0.000010		<0.000010
	Dibenz(a,h)anthracene (mg/L)		<0.0000050	<0.0000050		<0.0000050
	Fluoranthene (mg/L)		<0.000010	<0.000010		<0.000010
	Fluorene (mg/L)		<0.000010	<0.000010		<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010	<0.000010		<0.000010
	1-Methylnaphthalene (mg/L)		<0.000050	<0.000050		<0.000050
	2-Methylnaphthalene (mg/L)		<0.000050	<0.000050		<0.000050
	Naphthalene (mg/L)		<0.000050	<0.000050		<0.000050
	Phenanthrene (mg/L)		<0.000020	<0.000020		<0.000020
	Pyrene (mg/L)		<0.000010	<0.000010		<0.000010
	Quinoline (mg/L)		<0.000050	<0.000050		<0.000050
	Surrogate: Acridine d9 (%)		127.3	123.3		96.3
	Surrogate: Chrysene d12 (%)		122.7	117.9		100.3
	Surrogate: Naphthalene d8 (%)		85.6	88.4		91.7
	Surrogate: Phenanthrene d10 (%)		108.7	107.8		100.2

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-6	L2287546-7	L2287546-8	L2287546-9	L2287546-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Water
	Sampled Date	06-JUN-19	06-JUN-19	05-JUN-19	06-JUN-19	06-JUN-19
	Sampled Time	10:50	12:00	10:15	11:20	10:15
	Client ID	MW13-08	MW13-10	MW13-13	MW-GW	MH-SW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b+j+k)fluoranthene (mg/L)		<0.000015		<0.000015	
	Benzo(g,h,i)perylene (mg/L)		<0.000010		<0.000010	
	Benzo(k)fluoranthene (mg/L)		<0.000010		<0.000010	
	Chrysene (mg/L)		<0.000010		<0.000010	
	Dibenz(a,h)anthracene (mg/L)		<0.0000050		<0.0000050	
	Fluoranthene (mg/L)		<0.000010		<0.000010	
	Fluorene (mg/L)		<0.000010		<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010		<0.000010	
	1-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
	2-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
	Naphthalene (mg/L)		<0.000050		<0.000050	
	Phenanthrene (mg/L)		<0.000020		<0.000020	
	Pyrene (mg/L)		<0.000010		<0.000010	
	Quinoline (mg/L)		<0.000050		<0.000050	
	Surrogate: Acridine d9 (%)		103.6		77.3	
	Surrogate: Chrysene d12 (%)		107.4		97.6	
	Surrogate: Naphthalene d8 (%)		99.8		89.1	
	Surrogate: Phenanthrene d10 (%)		108.2		97.6	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287546-11				
	Description	Water				
	Sampled Date	04-JUN-19				
	Sampled Time	11:50				
	Client ID	MH-29				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Potassium (K)-Dissolved	B	L2287546-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2287546-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2287546-10, -11
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2287546-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2287546-8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2287546-10, -11
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2287546-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2287546-8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2287546-10, -11
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2287546-10, -11
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2287546-10, -11
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2287546-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2287546-8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2287546-10, -11
Matrix Spike	Zinc (Zn)-Dissolved	MS-B	L2287546-8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2287546-10, -11
Matrix Spike	Calcium (Ca)-Total	MS-B	L2287546-10, -11
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2287546-10, -11
Matrix Spike	Strontium (Sr)-Total	MS-B	L2287546-10, -11

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

Reference Information

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

Reference Information

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	**Laboratory Location**
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

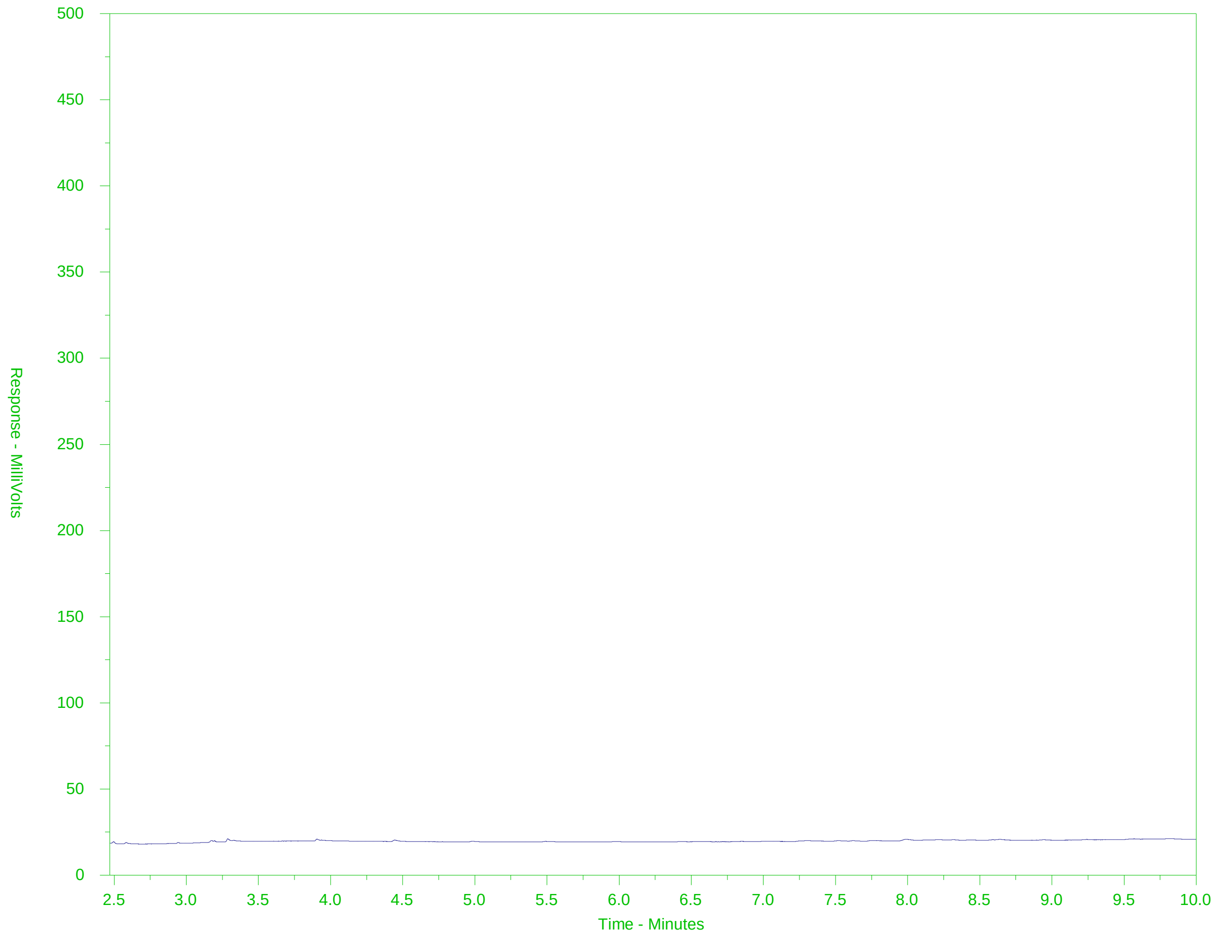
1 of 1

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287546-2
Client Sample ID: MW13-04



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

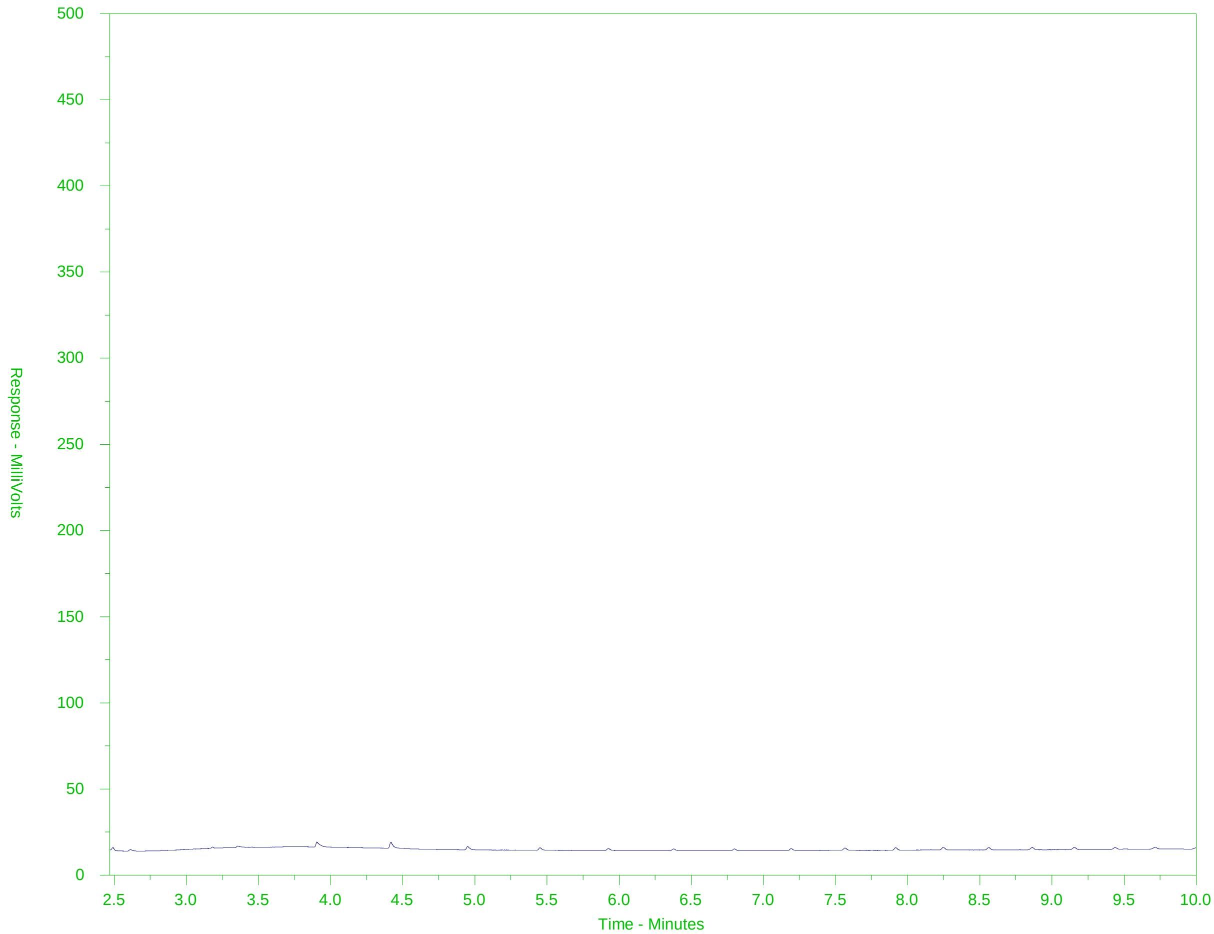
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287546-3
Client Sample ID: MW13-05



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

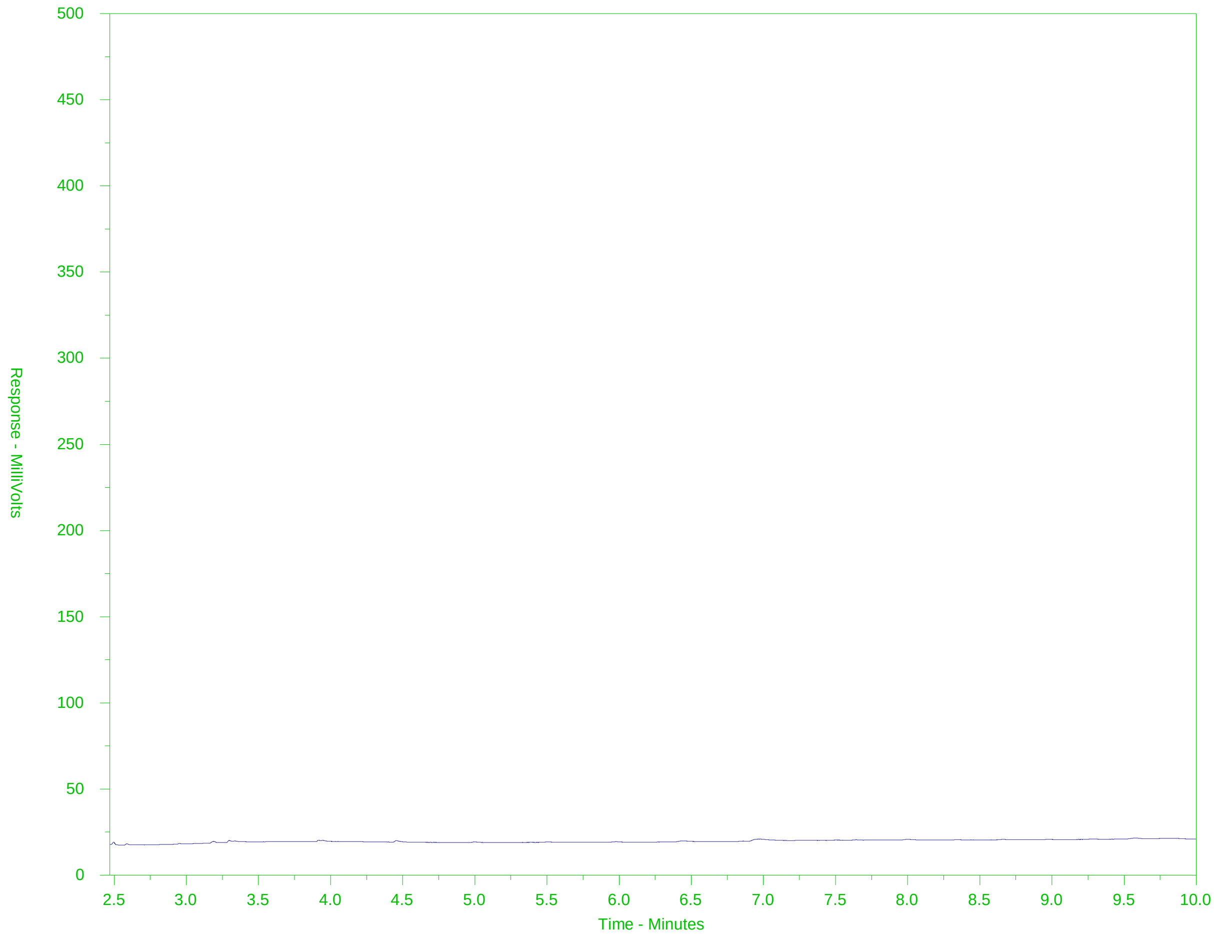
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

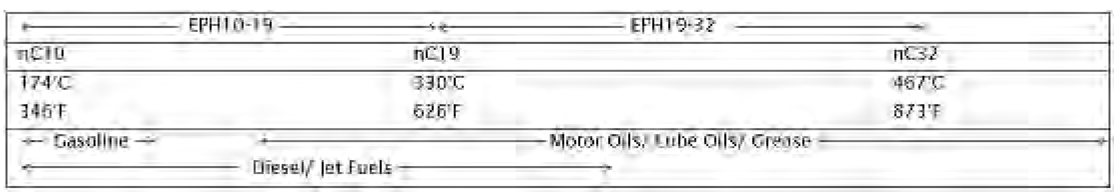
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287546-5
Client Sample ID: MW13-07





The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

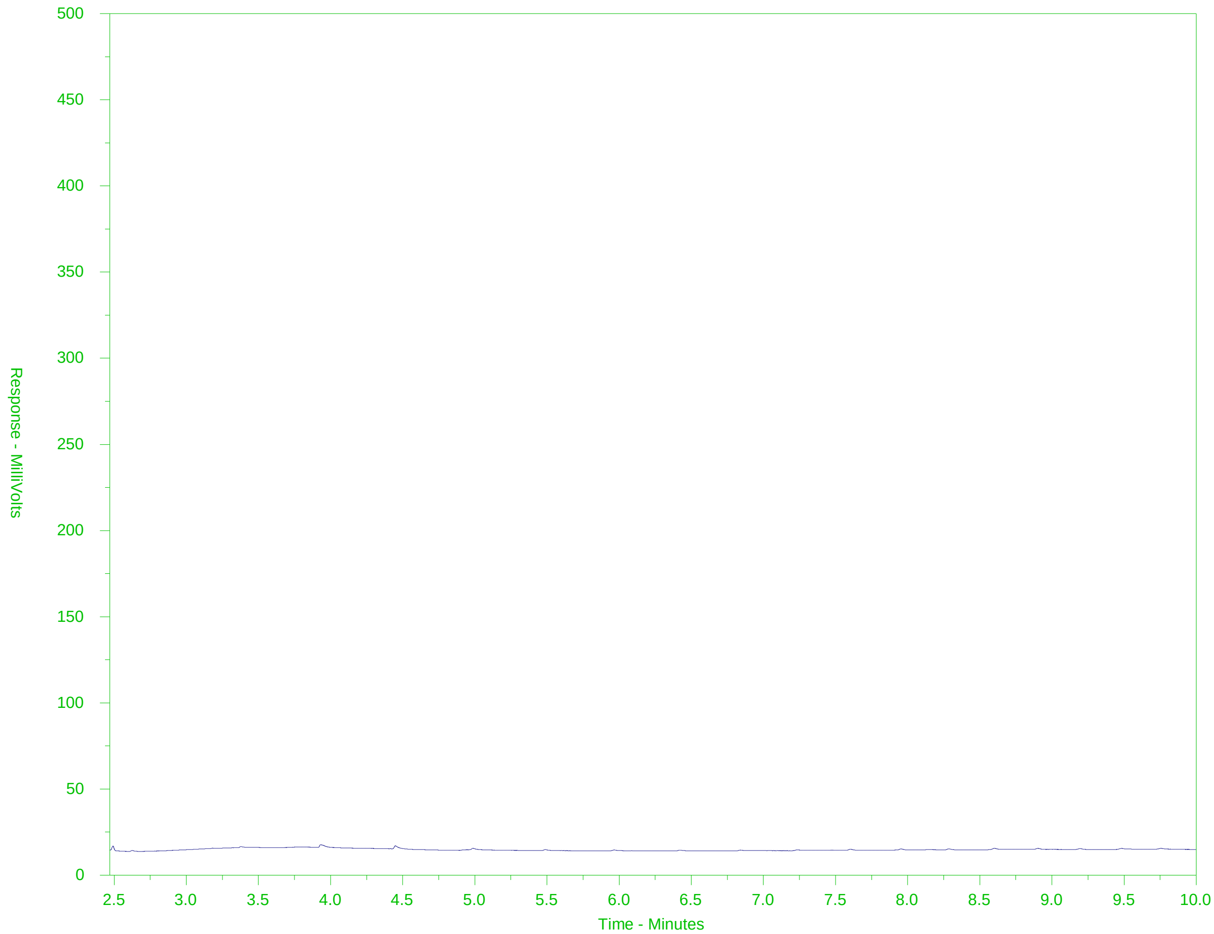
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

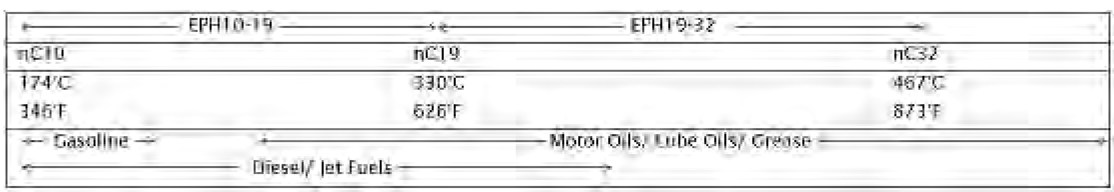
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287546-7
Client Sample ID: MW13-10





The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

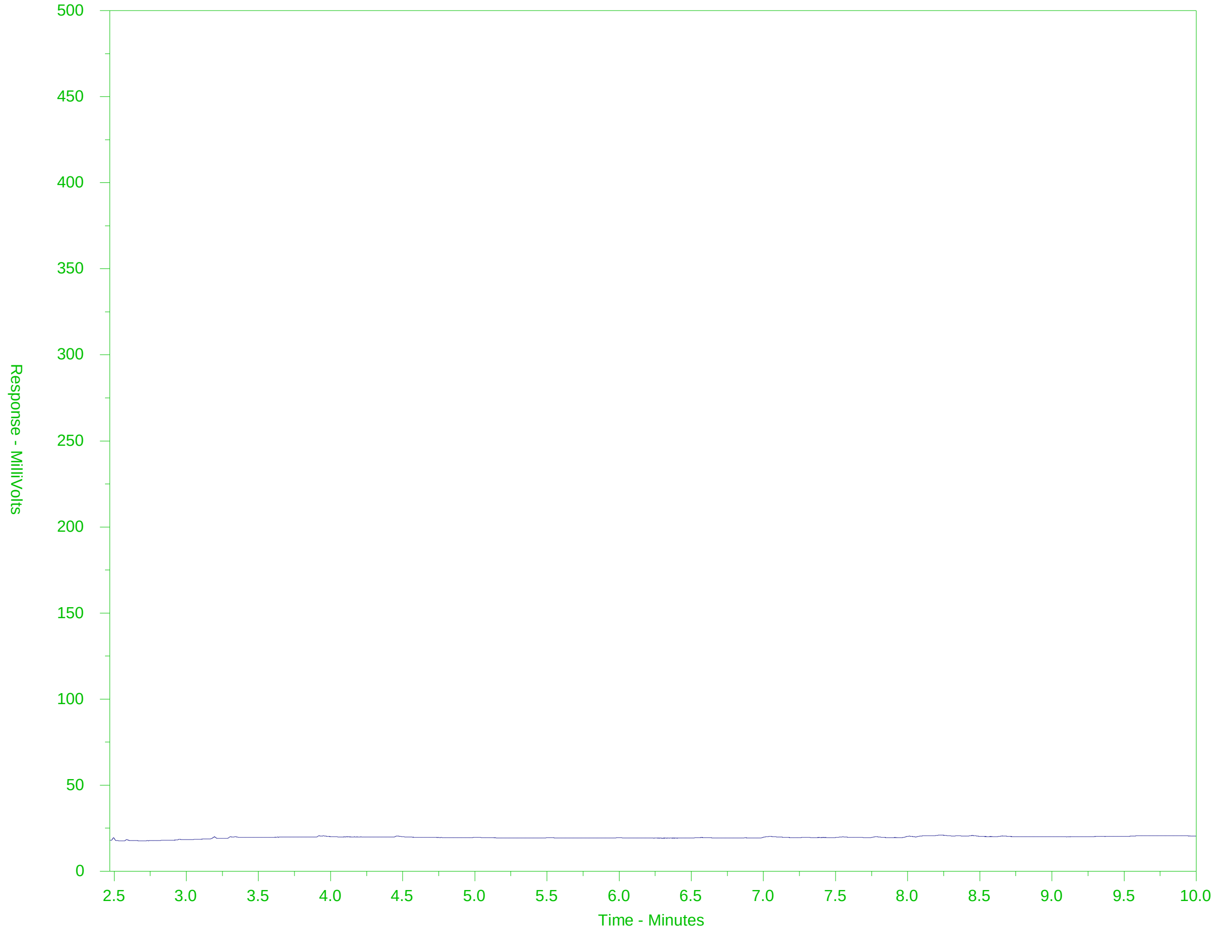
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287546-9
Client Sample ID: MW-GW



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chain of Custody / Analy
Canada Toll Free: 1
www.alsglob

L2287546-COFC

OC #

Report To		**Report Format / Distribution**		**Service Requested** (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1:	mducharme@accessconsulting.ca	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2:	michelle.unger@teck.com	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax:	Email 3:	ebouchard@alexcoenv.com	
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**		
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	TECK-18-01	
Company:		PO / AFE:	TECK PO9516	
Contact:		LSD:		
Address:				
Phone:		Quote #:	Q62635	
Lab Work Order # (lab use only)		**ALS Contact:**	Can Dang	**Sampler:**

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg (F/P)	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia (P)	BTEX, LEPH, HEPH (P)	VPH, PAH (P)	Number of Containers
	MW13-01 (LP)	05-Jun-19	18:30	Groundwater	X	X	X	X			
	MW13-04 (LP)	04-Jun-19	16:00	Groundwater	X	X	X	X	X	X	
	MW13-05 (LP)	04-Jun-19	14:15	Groundwater	X	X	X	X	X	X	
	MW13-06 (LP)	04-Jun-19	12:30	Groundwater	X	X	X	X			
	MW13-07 (LP)	05-Jun-19	15:20	Groundwater	X	X	X	X	X	X	
	MW13-08 (LP)	06-Jun-19	10:50	Groundwater	X	X	X	X			
	MW13-10 (LP)	06-Jun-19	12:00	Groundwater	X	X	X	X	X	X	
	MW13-13 (LP)	05-Jun-19	10:15	Groundwater	X	X	X	X			
				Groundwater							
				Groundwater							
				Groundwater							
				Groundwater							
	MW-GW (LQR)	06-Jun-19	11:20	Groundwater	X	X	X	X	X	X	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Emilie Bouchard	Date (dd-mmm-yy) 7-Jun-19	Time (hh-mm)	Received by: CL	Date: Jun 7/19	Time: 10:13	Temperature: 6.9 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 20.00 Front

BC JUN - 8 2019 4:55 7°C

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 07-JUN-19
Report Date: 17-JUL-19 18:15 (MT)
Version: FINAL REV. 2

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2287565
Project P.O. #: 9516
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Comments:
17-JUL-2019 Revision 2: This revision replaces and supersedes all previous report. Fluoride, Nitrate and Sulfate data for the sample, L2287565-5, has been modified.

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2287565-1	L2287565-2	L2287565-3	L2287565-4	L2287565-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	03-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	05-JUN-19
	Sampled Time	16:00	12:45	13:25	18:10	11:30
	Client ID	MH-12	MH-22	MH-02	SDH-S2	MH-11
WATER						
Physical Tests	Conductivity (uS/cm)	261	255	844	507	336
	Hardness (as CaCO3) (mg/L)	139	124	487	227	190
	pH (pH)	8.22	7.99	8.07	7.77	8.39
	Total Suspended Solids (mg/L)	5.5	<1.0	<1.0	202	7.1
	Total Dissolved Solids (mg/L)	157	169	677	382	206
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	138	97.9	201	109	168
	Ammonia, Total (as N) (mg/L)	0.0064	<0.0050	<0.0050	<0.0050	0.0056
	Bromide (Br) (mg/L)	<0.050	<1.0 DLDS	<0.25 DLDS	<0.25 DLDS	<0.050
	Chloride (Cl) (mg/L)	1.54	<10 DLDS	<2.5 DLDS	<2.5 DLDS	<0.50
	Fluoride (F) (mg/L)	0.230	1.03	<0.10 DLDS	0.13	0.082
	Nitrate (as N) (mg/L)	0.0112	0.17	<0.025 DLDS	0.509	0.191
	Nitrite (as N) (mg/L)	<0.0010	<0.020 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0010
	Sulfate (SO4) (mg/L)	13.0	29.4	281	210	14.2
Total Metals	Aluminum (Al)-Total (mg/L)	0.0522	<0.0030	<0.0030	2.62	0.0152
	Antimony (Sb)-Total (mg/L)	0.00023	0.00257	<0.00010	0.00311	0.00019
	Arsenic (As)-Total (mg/L)	0.00104	0.00425	0.00030	0.00838	0.00059
	Barium (Ba)-Total (mg/L)	0.0600	0.0129	0.0466	0.0562	0.0524
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	0.00056	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.00192	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.050 DLA	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000533	0.00326	0.0000055	0.139	0.0000581
	Calcium (Ca)-Total (mg/L)	51.7	45.9	187	174	68.2
	Chromium (Cr)-Total (mg/L)	0.00039	0.00019	<0.00010	0.00382	0.00016
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	0.00041	0.00533	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.0122	<0.00050
	Iron (Fe)-Total (mg/L)	0.085	<0.010	0.011	5.65	0.037
	Lead (Pb)-Total (mg/L)	0.00197	0.000315	<0.000050	23.3	0.000410
	Lithium (Li)-Total (mg/L)	0.0013	0.0052	0.0011	0.0055	0.0014
	Magnesium (Mg)-Total (mg/L)	4.78	6.18	14.8	6.16	5.94
	Manganese (Mn)-Total (mg/L)	0.00856	0.00236	0.0292	0.559	0.00523
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00119	0.0108	0.000339	0.00200	0.000840
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00476	<0.00050	0.0191	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	0.26	<0.050
	Potassium (K)-Total (mg/L)	0.45	0.49	1.90	0.87	0.47
	Selenium (Se)-Total (mg/L)	0.000624	0.0111	0.000091	0.00559	0.000719
	Silicon (Si)-Total (mg/L)	3.79	4.49	4.16	7.51	3.51

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287565-6	L2287565-7			
	Description	Water	Water			
	Sampled Date	06-JUN-19				
	Sampled Time	09:50				
	Client ID	MH-04	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	279	<2.0			
	Hardness (as CaCO3) (mg/L)	149	<0.50			
	pH (pH)	8.41	5.43			
	Total Suspended Solids (mg/L)	2.7	<1.0			
	Total Dissolved Solids (mg/L)	181	<10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	146	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	0.124	<0.020			
	Nitrate (as N) (mg/L)	0.235	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	12.5	<0.30			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0098	<0.0030			
	Antimony (Sb)-Total (mg/L)	0.00014	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00040	<0.00010			
	Barium (Ba)-Total (mg/L)	0.0198	<0.00010			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.000286	<0.0000050			
	Calcium (Ca)-Total (mg/L)	59.9	<0.050			
	Chromium (Cr)-Total (mg/L)	0.00022	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	0.013	<0.010			
	Lead (Pb)-Total (mg/L)	0.000527	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0013	<0.0010			
	Magnesium (Mg)-Total (mg/L)	2.86	<0.10			
	Manganese (Mn)-Total (mg/L)	0.00082	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000588	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.39	<0.10			
	Selenium (Se)-Total (mg/L)	0.000668	<0.000050			
	Silicon (Si)-Total (mg/L)	3.04	<0.10			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287565-1	L2287565-2	L2287565-3	L2287565-4	L2287565-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	03-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	05-JUN-19
	Sampled Time	16:00	12:45	13:25	18:10	11:30
	Client ID	MH-12	MH-22	MH-02	SDH-S2	MH-11
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.00290	<0.000010
	Sodium (Na)-Total (mg/L)	0.819	0.824	8.69	0.52	0.904
	Strontium (Sr)-Total (mg/L)	0.188	0.224	0.601	0.207	0.234
	Sulfur (S)-Total (mg/L)	2.66	11.9	99.5	71.1	4.95
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000014	<0.000010	0.000174	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	DLA <0.00050	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00164	<0.00030	<0.00030	0.0598	<0.00030
	Uranium (U)-Total (mg/L)	0.000745	0.00292	0.00145	0.000978	0.00104
	Vanadium (V)-Total (mg/L)	0.00054	<0.00050	<0.00050	0.0104	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0045	0.478	0.0032	21.2	0.0047
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	DLA <0.0010	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0023	0.0013	0.0023	<0.0010	0.0036
	Antimony (Sb)-Dissolved (mg/L)	0.00023	0.00248	<0.00010	0.00021	0.00021
	Arsenic (As)-Dissolved (mg/L)	0.00095	0.00424	0.00030	<0.00010	0.00058
	Barium (Ba)-Dissolved (mg/L)	0.0590	0.0123	0.0439	0.0217	0.0504
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000256	0.00307	<0.0000050	0.0944	0.0000401
	Calcium (Ca)-Dissolved (mg/L)	47.8	40.0	171	85.7	66.4
	Chromium (Cr)-Dissolved (mg/L)	0.00018	0.00019	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00041	0.00036	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00022	<0.00020	<0.00020	<0.00020	0.00027
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	0.014
	Lead (Pb)-Dissolved (mg/L)	0.000079	0.000246	<0.000050	0.0524	0.000110
	Lithium (Li)-Dissolved (mg/L)	0.0013	0.0048	0.0011	0.0013	0.0014
	Magnesium (Mg)-Dissolved (mg/L)	4.78	5.83	14.5	3.23	6.00
	Manganese (Mn)-Dissolved (mg/L)	0.00047	0.00220	0.0288	0.00314	0.00226
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00134	0.0107	0.000331	0.000650	0.000836
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00477	<0.00050	0.00127	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.47	0.50	2.01	0.78	0.48
	Selenium (Se)-Dissolved (mg/L)	0.000654	0.0112	0.000084	0.00444	0.000895
	Silicon (Si)-Dissolved (mg/L)	3.97	4.66	4.58	2.34	3.60

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287565-6	L2287565-7			
	Description	Water	Water			
	Sampled Date	06-JUN-19				
	Sampled Time	09:50				
	Client ID	MH-04	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.766	<0.050			
	Strontium (Sr)-Total (mg/L)	0.197	<0.00020			
	Sulfur (S)-Total (mg/L)	4.43	<0.50			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	0.00038	<0.00030			
	Uranium (U)-Total (mg/L)	0.000746	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0059	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0015	<0.0010			
	Antimony (Sb)-Dissolved (mg/L)	0.00013	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.00036	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.0198	<0.00010			
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	0.000259	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	54.5	<0.050			
	Chromium (Cr)-Dissolved (mg/L)	0.00015	RRV 0.00048			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000168	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0012	<0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	3.11	<0.10			
	Manganese (Mn)-Dissolved (mg/L)	0.00018	<0.00010			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000604	<0.000050			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050			
	Potassium (K)-Dissolved (mg/L)	0.43	<0.10			
	Selenium (Se)-Dissolved (mg/L)	0.000711	<0.000050			
	Silicon (Si)-Dissolved (mg/L)	3.17	<0.050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287565-1	L2287565-2	L2287565-3	L2287565-4	L2287565-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	03-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	05-JUN-19
	Sampled Time	16:00	12:45	13:25	18:10	11:30
	Client ID	MH-12	MH-22	MH-02	SDH-S2	MH-11
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.890	0.829	8.76	0.475	0.913
	Strontium (Sr)-Dissolved (mg/L)	0.186	0.212	0.576	0.111	0.228
	Sulfur (S)-Dissolved (mg/L)	2.45	12.1	103	72.4	5.30
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	0.000014	<0.000010	0.000022	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000728	0.00294	0.00151	0.000273	0.00115
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0011	0.466	0.0033	12.0	0.0032
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287565-6	L2287565-7			
	Description	Water	Water			
	Sampled Date	06-JUN-19				
	Sampled Time	09:50				
	Client ID	MH-04	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	0.804	<0.050			
	Strontium (Sr)-Dissolved (mg/L)	0.207	<0.00020			
	Sulfur (S)-Dissolved (mg/L)	4.59	<0.50			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Dissolved (mg/L)	0.000790	<0.000010			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0059	0.0016 RRV			
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Selenium (Se)-Total	MB-LOR	L2287565-7
Laboratory Control Sample	Iron (Fe)-Total	MES	L2287565-7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Zinc (Zn)-Dissolved	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Aluminum (Al)-Total	MS-B	L2287565-7
Matrix Spike	Barium (Ba)-Total	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2287565-7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2287565-7
Matrix Spike	Iron (Fe)-Total	MS-B	L2287565-7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2287565-7
Matrix Spike	Manganese (Mn)-Total	MS-B	L2287565-7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Total	MS-B	L2287565-7
Matrix Spike	Sulfur (S)-Total	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Titanium (Ti)-Total	MS-B	L2287565-7
Matrix Spike	Ammonia, Total (as N)	MS-B	L2287565-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

Reference Information

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 1

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Chain of Custody / Analytica
Canada Toll Free: 1 80
www.alsglobal.c

L2287565-COFC

COC #

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	TECK Metals Ltd	☑ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Michelle Unger	☑ PDF ☑ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	601 Knightton Road	Email 1:	ebouchard@alexcoenv.com	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Kimberly, BC	Email 2:	mducharme@accessconsulting.ca	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	250-427-8422 Fax: 867-633-4882	Email 3:	michelle.unger@teck.com	Analysis Request
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	TECK-18-01	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:		
Lab Work Order # (lab use only)		ALS Contact:	Jesse McCord	Sampler: Emilie Bouchard

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg	Dissolved Metals (low level)	General (pH, SPC, alkalinity,	Ammonia, Nitrate, Nitrite	TSS, TDS	Number of Containers
–	MH-12	03-Jun-19	16:00	Water	x	x	x	x	x	6
–	MH-22	04-Jun-19	12:45	Water	x	x	x	x	x	6
–	MH-02	04-Jun-19	13:25	Water	x	x	x	x	x	6
–	SDH-S2	04-Jun-19	18:10	Water	x	x	x	x	x	6
–	MH-11	05-Jun-19	11:30	Water	x	x	x	x	x	6
–	MH-04	06-Jun-19	9:50	Water	x	x	x	x	x	6
–	Trip Blank	N/A	N/A	Water	x	x	x	x	x	6

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Emilie Bouchard	Date (dd-mmm-yy) 7-Jun-19	Time (hh-mm)	Received by: CL	Date: June 7/2019	Time: 10:13	Temperature: 6.9 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

GENF 18.01 Front

BC JUN - 8 2019 11:55 8°C

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 20-JUN-19
Report Date: 03-JUL-19 10:40 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2295674

Project P.O. #: Teck PO-9516
Job Reference: TECK-18-1
C of C Numbers: 1 of1
Legal Site Desc:

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2295674-1	L2295674-2	L2295674-3	L2295674-4
	Description	Water	Water	Water	Water
	Sampled Date	19-JUN-19	19-JUN-19	19-JUN-19	19-JUN-19
	Sampled Time	14:50	17:15	18:15	15:20
	Client ID	MH-15	MH-13	MH-30	MH-FB
Grouping	**Analyte**				
WATER					
Physical Tests	Conductivity (uS/cm)	306	274	187	<2.0
	Hardness (as CaCO3) (mg/L)	177	161	108	<0.50
	pH (pH)	8.38	8.35	8.17	5.35
	Total Suspended Solids (mg/L)	5.4	2.5	1.2	<1.0
	Total Dissolved Solids (mg/L)	176	159	99	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	183	157	106	<1.0
	Ammonia, Total (as N) (mg/L)	0.0060	<0.0050	0.0056	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.101	0.061	0.052	<0.020
	Nitrate (as N) (mg/L)	0.0063	0.0344	0.0110	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	3.18	7.77	3.97	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0248	0.0336	0.0212	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00013	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00053	0.00054	0.00021	<0.00010
	Barium (Ba)-Total (mg/L)	0.167	0.109	0.130	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000214	0.0000258	0.0000223	<0.0000050
	Calcium (Ca)-Total (mg/L)	48.5	43.1	25.1	<0.050
	Chromium (Cr)-Total (mg/L)	0.00011	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00058	0.00083	<0.00050
	Iron (Fe)-Total (mg/L)	0.320	0.216	0.163	<0.010
	Lead (Pb)-Total (mg/L)	0.000119	0.000177	0.000060	RRV 0.000157
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	12.4	10.1	9.20	<0.10
	Manganese (Mn)-Total (mg/L)	0.0282	0.0137	0.00602	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00189	0.000843	0.000890	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	0.00068	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.46	0.33	0.29	<0.10
	Selenium (Se)-Total (mg/L)	0.000387	0.000486	0.000464	<0.000050
	Silicon (Si)-Total (mg/L)	3.50	3.09	2.58	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2295674-1	L2295674-2	L2295674-3	L2295674-4	
		Description	Water	Water	Water	Water	
		Sampled Date	19-JUN-19	19-JUN-19	19-JUN-19	19-JUN-19	
		Sampled Time	14:50	17:15	18:15	15:20	
		Client ID	MH-15	MH-13	MH-30	MH-FB	
Grouping	**Analyte**						
WATER							
Total Metals	Silver (Ag)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)		1.08	0.861	0.623	<0.050	
	Strontium (Sr)-Total (mg/L)		0.154	0.159	0.0734	<0.00020	
	Sulfur (S)-Total (mg/L)		1.34	3.22	1.55	<0.50	
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)		0.00043	<0.00060	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)		0.000668	0.000937	0.000594	<0.000010	
	Vanadium (V)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)		<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)		0.0018	0.0043	0.0068	0.0012 RRV	
	Antimony (Sb)-Dissolved (mg/L)		0.00010	0.00013	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)		0.00031	0.00042	0.00018	<0.00010	
	Barium (Ba)-Dissolved (mg/L)		0.172	0.100	0.118	0.00026 RRV	
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	0.0000158	0.0000143	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)		50.8	48.5	27.9	<0.050	
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)		<0.00020	0.00043	0.00077	0.00035 RRV	
	Iron (Fe)-Dissolved (mg/L)		0.060	0.090	0.101	<0.010	
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Dissolved (mg/L)		0.0012	0.0011	<0.0010	<0.0010	
	Magnesium (Mg)-Dissolved (mg/L)		12.1	9.78	9.19	<0.10	
	Manganese (Mn)-Dissolved (mg/L)		0.00691	0.00502	0.00539	<0.00010	
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)		0.00200	0.000925	0.000946	<0.000050	
	Nickel (Ni)-Dissolved (mg/L)		<0.00050	<0.00050	0.00060	<0.00050	
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)		0.35	0.30	0.26	<0.10	
	Selenium (Se)-Dissolved (mg/L)		0.000431	0.000568	0.000432	<0.000050	
	Silicon (Si)-Dissolved (mg/L)		3.30	2.92	2.53	<0.050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2295674-1	L2295674-2	L2295674-3	L2295674-4
	Description	Water	Water	Water	Water
	Sampled Date	19-JUN-19	19-JUN-19	19-JUN-19	19-JUN-19
	Sampled Time	14:50	17:15	18:15	15:20
	Client ID	MH-15	MH-13	MH-30	MH-FB
Grouping	**Analyte**				
WATER					
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.865	0.765	0.557	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.171	0.175	0.0832	<0.00020
	Sulfur (S)-Dissolved (mg/L)	1.37	2.68	1.63	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000707	0.000944	0.000631	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00011	<0.00010	<0.00010	<0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Molybdenum (Mo)-Dissolved	DUP-H	L2295674-4
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2295674-4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2295674-4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2295674-4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2295674-4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2295674-4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2295674-4
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Barium (Ba)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Boron (B)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Lithium (Li)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Nickel (Ni)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Sulfur (S)-Total	MS-B	L2295674-1, -2, -3, -4
Matrix Spike	Uranium (U)-Total	MS-B	L2295674-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

Reference Information

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

Reference Information

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of1

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2295674-COFC

COC Number:

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knighton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: mducharme@accessconsulting.ca

Email 2: mmioska@alexcoenv.com

Email 3: ebouchard@alexcoenv.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Michelle.unger@teck.com

Email 2: roxanne.menear@teck.com

...ll E&P TATs with your AM - surcharges will apply

...TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q62635

Job #: TECK-18-1

PO / AFE: Teck PO-9516

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#

Major/Minor Code: | Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Can Dang

Sampler: Emilie Bouchard

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation	Number of Containers
					P	F/P		P	P		P	
	MH-15 (LP)	19-Jun-19	14:50	Water	R	R	R	R	R	R	R	8
	MH-13 (LP)	19-Jun-19	17:15	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	19-Jun-19	18:15	Water	R	R	R	R	R	R	R	8
	MH-FB (LP)	19-Jun-19	15:20	Water	R	R	R	R	R	R	R	8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☑

INITIAL COOLER TEMPERATURES °C: 11

FINAL COOLER TEMPERATURES °C: 8

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Emilie Bouchard	Date: June 20, 2019	Time:	Received by:	Date: June 20/19.	Time: 11:40	Received by: HA	Date: 6/21	Time: 1135

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 30-AUG-19
Report Date: 17-SEP-19 17:35 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2339331
Project P.O. #: Teck PO-9516
Job Reference:
C of C Numbers: 1 of 2, 2 of 2
Legal Site Desc:

Comments: ADDITIONAL 12-SEP-19 18:02

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-1	L2339331-2	L2339331-3	L2339331-4	L2339331-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-19	27-AUG-19	28-AUG-19	28-AUG-19	27-AUG-19
	Sampled Time	15:00	13:30	13:50	14:15	12:20
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	321	302	368	340	603
	Hardness (as CaCO3) (mg/L)	168	156	201	187	308
	Hardness (from Totals) (mg/L)	177	161	205	194	328
	pH (pH)	8.47	8.37	8.41	8.42	8.30
	Total Suspended Solids (mg/L)	<1.0	3.5	1.2	<1.0	8.7
	Total Dissolved Solids (mg/L)	192	189	221	205	440
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	189	158	214	197	184
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	DLDS <0.25
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	DLDS <2.5
	Fluoride (F) (mg/L)	0.112	0.143	0.082	0.050	DLDS <0.10
	Nitrate (as N) (mg/L)	0.0166	0.184	0.0605	0.0221	DLDS <0.025
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	DLDS <0.0050
	Sulfate (SO4) (mg/L)	11.3	16.7	15.0	3.14	149
Total Metals	Aluminum (Al)-Total (mg/L)	0.0073	0.0156	0.0107	0.0070	0.213
	Antimony (Sb)-Total (mg/L)	0.00023	0.00013	0.00015	0.00016	0.00017
	Arsenic (As)-Total (mg/L)	0.00085	0.00037	0.00062	0.00067	0.00070
	Barium (Ba)-Total (mg/L)	0.0766	0.0219	0.0639	0.0507	0.0323
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000431	0.000273	0.0000557	0.0000559	0.0000723
	Calcium (Ca)-Total (mg/L)	60.6	59.6	68.7	67.9	114
	Chromium (Cr)-Total (mg/L)	0.00023	0.00018	<0.00010	0.00010	0.00048
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00063
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00056	<0.00050	0.00107
	Iron (Fe)-Total (mg/L)	0.011	0.026	0.069	0.015	0.373
	Lead (Pb)-Total (mg/L)	0.000365	0.000809	0.000345	0.000051	0.0165
	Lithium (Li)-Total (mg/L)	0.0014	0.0014	0.0015	0.0013	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.26	3.00	8.21	5.92	10.7
	Manganese (Mn)-Total (mg/L)	0.00116	0.00162	0.00847	0.00316	0.0425
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00127	0.000652	0.00111	0.000638	0.000371
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.44	0.40	0.44	0.26	1.77
	Selenium (Se)-Total (mg/L)	0.000791	0.00100	0.000591	0.000353	0.000266

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-6	L2339331-7	L2339331-8	L2339331-9	L2339331-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	29-AUG-19	29-AUG-19	29-AUG-19	28-AUG-19	28-AUG-19
	Sampled Time	11:30	10:30	12:45	13:40	14:40
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	352	277	349	301	<2.0
	Hardness (as CaCO3) (mg/L)	196	157	194	158	<0.50
	Hardness (from Totals) (mg/L)	206	151	193	153	<0.50
	pH (pH)	8.45	8.24	8.44	8.39	5.56
	Total Suspended Solids (mg/L)	<1.0	1.2	1.3	2.0	<1.0
	Total Dissolved Solids (mg/L)	213	160	202	195	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	204	172	196	160	<1.0
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.062	0.053	0.097	0.142	<0.020
	Nitrate (as N) (mg/L)	0.0063	<0.0050	<0.0050	0.182	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	8.33	4.00	2.72	16.6	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0060	0.0057	0.0044	0.0201	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00012	<0.00010	0.00011	0.00013	<0.00010
	Arsenic (As)-Total (mg/L)	0.00051	0.00034	0.00040	0.00037	<0.00010
	Barium (Ba)-Total (mg/L)	0.162	0.217	0.187	0.0223	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000156	0.0000197	0.0000104	0.000313	<0.0000050
	Calcium (Ca)-Total (mg/L)	60.5	38.4	55.9	56.0	<0.050
	Chromium (Cr)-Total (mg/L)	0.00010	0.00011	<0.00010	0.00021	0.00012 RRV
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.163	0.375	0.126	0.028	<0.010
	Lead (Pb)-Total (mg/L)	0.000072	<0.000050	<0.000050	0.000882	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0012	0.0014	<0.0010
	Magnesium (Mg)-Total (mg/L)	13.3	13.3	12.9	3.28	<0.10
	Manganese (Mn)-Total (mg/L)	0.00608	0.0181	0.0106	0.00205	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00108	0.00123	0.00171	0.000640	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00066	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.40	0.34	0.39	0.43	<0.10
	Selenium (Se)-Total (mg/L)	0.000512	0.000378	0.000390	0.000802	<0.000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-11	L2339331-12			
	Description	Water	Water			
	Sampled Date	28-AUG-19	23-AUG-19			
	Sampled Time	10:55				
	Client ID	MH-22	TRIP BLANK (LQTB)			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	294	<2.0			
	Hardness (as CaCO3) (mg/L)	153	<0.50 HTC			
	Hardness (from Totals) (mg/L)	148	<0.50			
	pH (pH)	8.20	5.49			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	186	<10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	113	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	1.22	<0.020			
	Nitrate (as N) (mg/L)	0.138	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	40.8	<0.30			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030			
	Antimony (Sb)-Total (mg/L)	0.00244	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00433	<0.00010			
	Barium (Ba)-Total (mg/L)	0.0152	<0.00010			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.00372	<0.0000050			
	Calcium (Ca)-Total (mg/L)	47.9	<0.050			
	Chromium (Cr)-Total (mg/L)	0.00019	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	0.000304	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0054	<0.0010			
	Magnesium (Mg)-Total (mg/L)	6.79	<0.10			
	Manganese (Mn)-Total (mg/L)	0.00050	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.00810	<0.000050			
	Nickel (Ni)-Total (mg/L)	0.00343	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.57	<0.10			
	Selenium (Se)-Total (mg/L)	0.0140	<0.000050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2339331-1	L2339331-2	L2339331-3	L2339331-4	L2339331-5
	Sample ID	L2339331-1	L2339331-2	L2339331-3	L2339331-4	L2339331-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-19	27-AUG-19	28-AUG-19	28-AUG-19	27-AUG-19
	Sampled Time	15:00	13:30	13:50	14:15	12:20
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	4.04	3.01	3.58	3.67	3.25
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	0.000016
	Sodium (Na)-Total (mg/L)	1.00	0.759	1.17	0.952	7.87
	Strontium (Sr)-Total (mg/L)	0.232	0.199	0.271	0.234	0.379
	Sulfur (S)-Total (mg/L)	4.33	5.91	6.02	1.53	56.7
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00040	DLM <0.00060	<0.00030	0.00434
	Uranium (U)-Total (mg/L)	0.000910	0.000880	0.00103	0.000647	0.000867
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00077
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0067	0.0044	<0.0030	0.0174
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0026	0.0020	0.0028	0.0027	0.0084
	Antimony (Sb)-Dissolved (mg/L)	0.00021	0.00013	0.00015	0.00016	0.00014
	Arsenic (As)-Dissolved (mg/L)	0.00078	0.00035	0.00054	0.00067	0.00033
	Barium (Ba)-Dissolved (mg/L)	0.0735	0.0224	0.0626	0.0493	0.0273
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000420	0.000299	0.0000459	0.0000479	0.0000155
	Calcium (Ca)-Dissolved (mg/L)	57.1	56.9	66.5	64.6	107
	Chromium (Cr)-Dissolved (mg/L)	0.00022	0.00019	0.00011	0.00011	0.00013
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00029
	Copper (Cu)-Dissolved (mg/L)	0.00021	0.00029	0.00037	0.00041	0.00045
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.038	<0.010	0.029
	Lead (Pb)-Dissolved (mg/L)	0.000172	0.000165	0.000094	<0.000050	0.00130
	Lithium (Li)-Dissolved (mg/L)	0.0016	0.0015	0.0017	0.0015	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.14	3.27	8.36	6.21	10.2
	Manganese (Mn)-Dissolved (mg/L)	0.00061	0.00050	0.00459	0.00154	0.0280
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00128	0.000682	0.00101	0.000621	0.000441
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.44	0.44	0.44	0.27	1.73
	Selenium (Se)-Dissolved (mg/L)	0.000680	0.000827	0.000636	0.000437	0.000319

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-6	L2339331-7	L2339331-8	L2339331-9	L2339331-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	29-AUG-19	29-AUG-19	29-AUG-19	28-AUG-19	28-AUG-19
	Sampled Time	11:30	10:30	12:45	13:40	14:40
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	3.11	2.51	3.34	3.46	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.970	0.683	0.985	0.868	<0.050
	Strontium (Sr)-Total (mg/L)	0.210	0.115	0.174	0.193	<0.00020
	Sulfur (S)-Total (mg/L)	3.57	1.79	1.19	6.60	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00040	<0.00030
	Uranium (U)-Total (mg/L)	0.00130	0.00101	0.000653	0.000792	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	0.0073	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0018	0.0022	0.0016	0.0025	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00011	<0.00010	<0.00010	0.00013	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00041	0.00029	0.00035	0.00036	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.144	0.194	0.176	0.0229	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000109	0.0000144	<0.0000050	0.000308	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	56.0	40.5	54.8	57.8	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00021	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00028	0.00026	<0.00020	0.00026	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.078	0.239	0.073	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.000169	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0012	<0.0010	0.0012	0.0015	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	13.5	13.6	14.0	3.24	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00325	0.0184	0.00616	0.00046	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00101	0.00124	0.00174	0.000697	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00054	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.38	0.34	0.38	0.44	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.000488	0.000419	0.000375	0.000900	<0.000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-11	L2339331-12			
	Description	Water	Water			
	Sampled Date	28-AUG-19	23-AUG-19			
	Sampled Time	10:55				
	Client ID	MH-22	TRIP BLANK (LQTB)			
Grouping	**Analyte**					
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	4.87	<0.10			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.914	<0.050			
	Strontium (Sr)-Total (mg/L)	0.234	<0.00020			
	Sulfur (S)-Total (mg/L)	15.4	<0.50			
	Thallium (Tl)-Total (mg/L)	0.000018	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.00359	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.661	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	<0.0010				
	Antimony (Sb)-Dissolved (mg/L)	0.00238				
	Arsenic (As)-Dissolved (mg/L)	0.00423				
	Barium (Ba)-Dissolved (mg/L)	0.0154				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.00379				
	Calcium (Ca)-Dissolved (mg/L)	49.9				
	Chromium (Cr)-Dissolved (mg/L)	0.00014				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.000255				
	Lithium (Li)-Dissolved (mg/L)	0.0060				
	Magnesium (Mg)-Dissolved (mg/L)	6.84				
	Manganese (Mn)-Dissolved (mg/L)	0.00037				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00867				
	Nickel (Ni)-Dissolved (mg/L)	0.00338				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.59				
	Selenium (Se)-Dissolved (mg/L)	0.0133				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-1	L2339331-2	L2339331-3	L2339331-4	L2339331-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	26-AUG-19	27-AUG-19	28-AUG-19	28-AUG-19	27-AUG-19
	Sampled Time	15:00	13:30	13:50	14:15	12:20
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	4.15	3.31	3.64	3.83	3.07
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.08	0.874	1.29	1.01	7.77
	Strontium (Sr)-Dissolved (mg/L)	0.217	0.207	0.264	0.234	0.375
	Sulfur (S)-Dissolved (mg/L)	3.98	5.95	5.42	1.21	52.3
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	0.00063
	Uranium (U)-Dissolved (mg/L)	0.000996	0.000838	0.00110	0.000686	0.000913
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	DTMF 0.0165	0.0055	0.0041	0.0010	0.0031
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00023	0.00018	<0.00010	0.00010	0.00048
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-6	L2339331-7	L2339331-8	L2339331-9	L2339331-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	29-AUG-19	29-AUG-19	29-AUG-19	28-AUG-19	28-AUG-19
	Sampled Time	11:30	10:30	12:45	13:40	14:40
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	3.22	2.72	3.65	3.25	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.01	0.714	1.07	1.03	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.209	0.113	0.179	0.210	<0.00020
	Sulfur (S)-Dissolved (mg/L)	3.05	1.47	1.20	5.90	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00134	0.00102	0.000734	0.000840	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013	<0.0010	<0.0010	0.0054	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00010	0.00011	<0.00010	0.00021	0.00012
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339331-11	L2339331-12			
	Description	Water	Water			
	Sampled Date	28-AUG-19	23-AUG-19			
	Sampled Time	10:55				
	Client ID	MH-22	TRIP BLANK (LQTB)			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	4.70				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.906				
	Strontium (Sr)-Dissolved (mg/L)	0.241				
	Sulfur (S)-Dissolved (mg/L)	13.3				
	Thallium (Tl)-Dissolved (mg/L)	0.000018				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.00368				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.617				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Speciated Metals	Chromium (III)-Total (mg/L)	0.00019				
	Hexavalent Chromium (mg/L)	<0.00050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Titanium (Ti)-Total	DUP-H	L2339331-10
Duplicate	Zirconium (Zr)-Total	DUP-H	L2339331-10
Method Blank	Sodium (Na)-Total	MB-LOR	L2339331-2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2339331-1, -10, -11, -2, -3, -4, -5, -6, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2339331-1, -10, -11, -2, -3, -4, -5, -6, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2339331-1, -10, -11, -2, -3, -4, -5, -6, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2339331-1, -10, -11, -2, -3, -4, -5, -6, -8, -9
Matrix Spike	Aluminum (Al)-Total	MS-B	L2339331-2
Matrix Spike	Barium (Ba)-Total	MS-B	L2339331-12
Matrix Spike	Barium (Ba)-Total	MS-B	L2339331-7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2339331-1, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Total	MS-B	L2339331-2
Matrix Spike	Cadmium (Cd)-Total	MS-B	L2339331-2
Matrix Spike	Calcium (Ca)-Total	MS-B	L2339331-12
Matrix Spike	Calcium (Ca)-Total	MS-B	L2339331-7, -8
Matrix Spike	Calcium (Ca)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2339331-1, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L2339331-2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2339331-12
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2339331-7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2339331-1, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2339331-2
Matrix Spike	Manganese (Mn)-Total	MS-B	L2339331-2
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Potassium (K)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Selenium (Se)-Total	MS-B	L2339331-12
Matrix Spike	Silicon (Si)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2339331-12
Matrix Spike	Sodium (Na)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L2339331-1, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Total	MS-B	L2339331-2
Matrix Spike	Strontium (Sr)-Total	MS-B	L2339331-12
Matrix Spike	Strontium (Sr)-Total	MS-B	L2339331-7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2339331-1, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L2339331-2
Matrix Spike	Sulfur (S)-Total	MS-B	L2339331-12
Matrix Spike	Sulfur (S)-Total	MS-B	L2339331-10, -11, -9
Matrix Spike	Sulfur (S)-Total	MS-B	L2339331-2
Matrix Spike	Zinc (Zn)-Total	MS-B	L2339331-2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.

Reference Information

MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED	Water	Chromium, Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Reference Information

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

VIC100-T-HARDNESS-VA	Water	Hardness from Total Metals	APHA 2340B

Custom Calculation for Hardness. Client is requesting when Total Metals are run, only Total metals are used for hardness calculation.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 2 2 of 2

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2339331-COFC

COC Number:

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knighton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	
Contact:	

Report Format / Distribution

Select Report Format:
Quality Control (QC) Report with Report
Select Distribution:
Email 1 or Fax mducharme@accessconsulting.ca
Email 2 mmioska@alexcoenv.com
Email 3 michelle.unger@teck.com

Invoice Distribution

Select Invoice Distribution:
Email 1 or Fax Michelle.unger@teck.com
Email 2 roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]

EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
PO / AFE:	Teck PO-9516
LSD:	
ALS Lab Work Order # (lab use only)	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Can Dang	Sampler: EB

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)						Number of Containers
	MH-12 (LP)	26-Aug-19	15:00	Water	R	R	R	R	R	R	R						8
	MH-04 (LP)	27-Aug-19	13:30	Water	R	R	R	R	R	R	R						8
	MH-11 (LP)	28-Aug-19	13:50	Water	R	R	R	R	R	R	R						8
	MH-29 (LP)	28-Aug-19	14:15	Water	R	R	R	R	R	R	R						8
	MH-02 (LP)	27-Aug-19	12:20	Water	R	R	R	R	R	R	R						8
	MH-13 (LP)	29-Aug-19	11:30	Water	R	R	R	R	R	R	R						8
	MH-30 (LP)	29-Aug-19	10:30	Water	R	R	R	R	R	R	R						8
	MH-15 (LP)	29-Aug-19	12:45	Water	R	R	R	R	R	R	R						8
	MH-SW (LQR)	28-Aug-19	13:40	Water	R	R	R	R	R	R	R						8
	MH-FB (LQFB)	28-Aug-19	14:40	Water	R	R	R	R	R	R	R						7
	MH-22 (LP)	28-Aug-19	10:55	Water	R	R	R	R	R	R	R						8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 7 / 8 / 7 / 9 / 8 / 8

FINAL COOLER TEMPERATURES °C: 8Au

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Emilie Bouchard	Date: 2019-08-30	Time:	Received by:	Date: Aug 30/19	Time: 13:00	Received by: SP	Date: 8/31/19	Time: 1245pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2339331-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	
Contact:	

Project Information

ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
PO / AFE:	Teck PO-9516
LSD:	
ALS Lab Work Order # (lab use only)	

Report Format / Distribution

Select Report Format:
Quality Control (QC) Report with Report

Select Distribution:

Email 1 or Fax	mducharme@alexcoenv.com
Email 2	mmloska@alexcoenv.com
Email 3	michelle.unger@teck.com

Invoice Distribution

Select Invoice Distribution:

Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Can Dang	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]

EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation						Number of Containers
					P	F/P		P	P		P						
	Trip Blank (LQTB)	23-08-19		Water	R	R	R	R	R	R							7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☒ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	8 Aug

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Emilie Bouchard	Date: 2019-08-30	Time:	Received by:	Date:	Time:	Received by: SP	Date: 8/31/19	Time: 1245pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION   WHITE - LABORATORY COPY   YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 30-AUG-19
Report Date: 12-SEP-19 17:51 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2339357

Project P.O. #: 9516
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2339357-1	L2339357-2	L2339357-3	L2339357-4	L2339357-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	27-AUG-19	28-AUG-19	28-AUG-19	27-AUG-19	27-AUG-19
	Sampled Time	16:35	09:20	12:20	11:35	14:30
	Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
WATER						
Physical Tests	Conductivity (uS/cm)	296	297	743	473	450
	Hardness (as CaCO3) (mg/L)	150	142	375	223	273
	Hardness (from Totals)	150	142	375	223	273
	pH (pH)	8.36	8.37	8.32	8.45	8.02
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	156	193	221	231	242
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0175	0.0172	0.164	0.0056
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.25 DLDS	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<2.5 DLDS	<0.50	<0.50
	Fluoride (F) (mg/L)	0.378	0.052	0.52	0.347	0.045
	Nitrate (as N) (mg/L)	0.354	0.618	<0.025 DLDS	<0.0050	0.332
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0050 DLDS	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	10.2	4.78	215	35.6	10.0
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0013	0.0019	0.0018	0.0024	0.0085
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00025	0.00010	<0.00010	0.00016
	Arsenic (As)-Dissolved (mg/L)	0.00028	0.00071	0.0477	0.00308	0.00022
	Barium (Ba)-Dissolved (mg/L)	0.0219	0.0506	0.0273	0.0265	0.175
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.015	0.022	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.000748	0.000432	0.0000089	<0.0000050	0.0000468
	Calcium (Ca)-Dissolved (mg/L)	54.3	51.0	134	62.4	93.2
	Chromium (Cr)-Dissolved (mg/L)	0.00021	0.00027	<0.00010	<0.00010	0.00040
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00245	0.00036	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00020	0.00039	<0.00020	<0.00020	0.00040
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.657	2.22	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000774	0.000536	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0015	0.0015	0.0088	0.0086	0.0019
	Magnesium (Mg)-Dissolved (mg/L)	3.52	3.47	9.93	16.4	9.93
	Manganese (Mn)-Dissolved (mg/L)	0.00153	0.00017	0.311	0.750	0.00036
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000717	0.000646	0.0359	0.00319	0.000608
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.0325	0.00052	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	0.164	0.098	<0.050
	Potassium (K)-Dissolved (mg/L)	0.65	0.42	2.19	2.92	0.64
	Selenium (Se)-Dissolved (mg/L)	0.00123	0.00105	<0.000050	<0.000050	0.00127

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339357-6	L2339357-7	L2339357-8	L2339357-9	L2339357-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	27-AUG-19	28-AUG-19	27-AUG-19	26-AUG-19	27-AUG-19
	Sampled Time	15:30	17:00	09:55	15:45	14:40
	Client ID	MW13-10	MW13-13	MW14-01	MW14-04	MW-GW
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	414	293	401	317	442
	Hardness (as CaCO3) (mg/L)	239	144	223	163	282
	Hardness (from Totals)	239	144	223	163	282
	pH (pH)	8.12	8.12	8.41	8.29	7.99
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	210	87.5	284	191	266
	Ammonia, Total (as N) (mg/L)	0.0142	0.0132	0.0220		<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	1.16	<0.50
	Fluoride (F) (mg/L)	0.055	0.137	0.090	0.070	0.044
	Nitrate (as N) (mg/L)	0.521	0.746	0.226	0.0735	0.323
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0012	0.0011	<0.0010
	Sulfate (SO4) (mg/L)	34.4	58.7	3.57	3.82	10.0
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0020	0.0109	0.0058	0.0150	0.0039
	Antimony (Sb)-Dissolved (mg/L)	0.00013	0.00013	0.00020	0.00029	0.00015
	Arsenic (As)-Dissolved (mg/L)	0.00115	0.00044	0.00029	0.00080	0.00021
	Barium (Ba)-Dissolved (mg/L)	0.00857	0.0184	0.117	0.132	0.192
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000187	0.00378	0.0000362	0.0000666	0.0000588
	Calcium (Ca)-Dissolved (mg/L)	81.9	54.5	71.7	53.6	96.8
	Chromium (Cr)-Dissolved (mg/L)	0.00040	<0.00010	0.00061	0.00037	0.00037
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00066	0.00084	0.00073	0.0143	0.00027
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.014	<0.010	0.024	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000146	0.00115	0.000085	0.00164	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0018	0.0012	<0.0010	0.0019	0.0020
	Magnesium (Mg)-Dissolved (mg/L)	8.46	2.01	10.8	7.17	9.74
	Manganese (Mn)-Dissolved (mg/L)	0.00038	0.00047	0.00098	0.00341	0.00015
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00200	0.000249	0.00226	0.00562	0.000541
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00185	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	1.17	0.63	0.71	2.20	0.64
	Selenium (Se)-Dissolved (mg/L)	0.00159	0.00135	0.00100	0.000125	0.00133

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339357-11					
	Description	Groundwater					
	Sampled Date	28-AUG-19					
	Sampled Time	12:30					
	Client ID	MW-00					
Grouping	**Analyte**						
WATER							
Physical Tests	Conductivity (uS/cm)	742					
	Hardness (as CaCO3) (mg/L)	352					
	Hardness (from Totals)	352					
	pH (pH)	8.36					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	233					
	Ammonia, Total (as N) (mg/L)	0.0193					
	Bromide (Br) (mg/L)	DLDS <0.25					
	Chloride (Cl) (mg/L)	DLDS <2.5					
	Fluoride (F) (mg/L)	0.61					
	Nitrate (as N) (mg/L)	DLDS <0.025					
	Nitrite (as N) (mg/L)	DLDS <0.0050					
	Sulfate (SO4) (mg/L)	218					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD					
	Dissolved Metals Filtration Location	FIELD					
	Aluminum (Al)-Dissolved (mg/L)	0.0015					
	Antimony (Sb)-Dissolved (mg/L)	0.00011					
	Arsenic (As)-Dissolved (mg/L)	0.0467					
	Barium (Ba)-Dissolved (mg/L)	0.0256					
	Beryllium (Be)-Dissolved (mg/L)	<0.000020					
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050					
	Boron (B)-Dissolved (mg/L)	0.012					
	Cadmium (Cd)-Dissolved (mg/L)	DLM <0.000030					
	Calcium (Ca)-Dissolved (mg/L)	125					
	Chromium (Cr)-Dissolved (mg/L)	<0.00010					
	Cobalt (Co)-Dissolved (mg/L)	0.00242					
	Copper (Cu)-Dissolved (mg/L)	<0.00020					
	Iron (Fe)-Dissolved (mg/L)	0.617					
	Lead (Pb)-Dissolved (mg/L)	<0.000050					
	Lithium (Li)-Dissolved (mg/L)	0.0080					
	Magnesium (Mg)-Dissolved (mg/L)	9.51					
	Manganese (Mn)-Dissolved (mg/L)	0.294					
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050					
	Molybdenum (Mo)-Dissolved (mg/L)	0.0346					
	Nickel (Ni)-Dissolved (mg/L)	0.0308					
	Phosphorus (P)-Dissolved (mg/L)	0.157					
	Potassium (K)-Dissolved (mg/L)	2.01					
	Selenium (Se)-Dissolved (mg/L)	<0.000050					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339357-1	L2339357-2	L2339357-3	L2339357-4	L2339357-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	27-AUG-19	28-AUG-19	28-AUG-19	27-AUG-19	27-AUG-19
	Sampled Time	16:35	09:20	12:20	11:35	14:30
	Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	3.32	3.83	15.5	7.69	3.84
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.769	0.888	13.1	9.14	1.00
	Strontium (Sr)-Dissolved (mg/L)	0.166	0.131	0.536	0.462	0.331
	Sulfur (S)-Dissolved (mg/L)	3.51	1.66	75.8	12.6	3.86
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	0.000014	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000912	0.000657	0.0122	0.00678	0.00147
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0281	0.0117	0.105	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)		<0.00050		<0.00050	
	Ethylbenzene (mg/L)		<0.00050		<0.00050	
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050		<0.00050	
	Styrene (mg/L)		<0.00050		<0.00050	
	Toluene (mg/L)		<0.00045		<0.00045	
	ortho-Xylene (mg/L)		<0.00050		<0.00050	
	meta- & para-Xylene (mg/L)		<0.00050		<0.00050	
	Xylenes (mg/L)		<0.00075		<0.00075	
	Surrogate: 4-Bromofluorobenzene (SS) (%)		92.0		90.2	
	Surrogate: 1,4-Difluorobenzene (SS) (%)		92.5		92.4	
Hydrocarbons	EPH10-19 (mg/L)		<0.25		<0.25	
	EPH19-32 (mg/L)		<0.25		<0.25	
	LEPH (mg/L)		<0.25		<0.25	
	HEPH (mg/L)		<0.25		<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10		<0.10	
	VPH (C6-C10) (mg/L)		<0.10		<0.10	
	Surrogate: 2-Bromobenzotrifluoride (%)		97.4		95.7	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		98.5		105.2	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)		<0.000010		<0.000010	
	Acenaphthylene (mg/L)		<0.000010		<0.000010	
	Acridine (mg/L)		<0.000010		<0.000010	
	Anthracene (mg/L)		<0.000010		<0.000010	
	Benz(a)anthracene (mg/L)		<0.000010		<0.000010	
	Benzo(a)pyrene (mg/L)		<0.0000050		<0.0000050	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2339357-6 Groundwater 27-AUG-19 15:30 MW13-10	L2339357-7 Groundwater 28-AUG-19 17:00 MW13-13	L2339357-8 Groundwater 27-AUG-19 09:55 MW14-01	L2339357-9 Groundwater 26-AUG-19 15:45 MW14-04	L2339357-10 Groundwater 27-AUG-19 14:40 MW-GW
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	3.99	2.06	4.59	3.80	3.94
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	2.00	0.700	1.39	2.84	0.986
	Strontium (Sr)-Dissolved (mg/L)	0.394	0.0945	0.250	0.217	0.340
	Sulfur (S)-Dissolved (mg/L)	11.7	19.2	1.34	1.54	3.83
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	0.00035	<0.00030	0.00098	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00308	0.000374	0.000659	0.000504	0.00145
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0020	0.117	0.0013	0.0101	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)	<0.00050		<0.00050		<0.00050
	Ethylbenzene (mg/L)	<0.00050		<0.00050		<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050		<0.00050		<0.00050
	Styrene (mg/L)	<0.00050		<0.00050		<0.00050
	Toluene (mg/L)	<0.00045		<0.00045		<0.00045
	ortho-Xylene (mg/L)	<0.00050		<0.00050		<0.00050
	meta- & para-Xylene (mg/L)	<0.00050		<0.00050		<0.00050
	Xylenes (mg/L)	<0.00075		<0.00075		<0.00075
	Surrogate: 4-Bromofluorobenzene (SS) (%)	94.6		92.9		91.5
	Surrogate: 1,4-Difluorobenzene (SS) (%)	86.0		91.4		90.6
Hydrocarbons	EPH10-19 (mg/L)	<0.25		<0.25		<0.25
	EPH19-32 (mg/L)	<0.25		<0.25		<0.25
	LEPH (mg/L)	<0.25		<0.25		<0.25
	HEPH (mg/L)	<0.25		<0.25		<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10		<0.10		<0.10
	VPH (C6-C10) (mg/L)	<0.10		<0.10		<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)	94.4		94.9		96.0
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	103.3		111.8		105.9
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010		<0.000010		<0.000010
	Acenaphthylene (mg/L)	<0.000010		<0.000010		<0.000010
	Acridine (mg/L)	<0.000010		<0.000010		<0.000010
	Anthracene (mg/L)	<0.000010		<0.000010		<0.000010
	Benz(a)anthracene (mg/L)	<0.000010		<0.000010		<0.000010
	Benzo(a)pyrene (mg/L)	<0.0000050		<0.0000050		<0.0000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339357-11				
	Description	Groundwater				
	Sampled Date	28-AUG-19				
	Sampled Time	12:30				
	Client ID	MW-00				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	15.4				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	12.5				
	Strontium (Sr)-Dissolved (mg/L)	0.495				
	Sulfur (S)-Dissolved (mg/L)	77.4				
	Thallium (Tl)-Dissolved (mg/L)	0.000012				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.0124				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0964				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00045				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	85.7				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	92.4				
Hydrocarbons	EPH10-19 (mg/L)	<0.25				
	EPH19-32 (mg/L)	<0.25				
	LEPH (mg/L)	<0.25				
	HEPH (mg/L)	<0.25				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
	VPH (C6-C10) (mg/L)	<0.10				
	Surrogate: 2-Bromobenzotrifluoride (%)	91.3				
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	103.0				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000010				
	Acenaphthylene (mg/L)	<0.000010				
	Acridine (mg/L)	<0.000010				
	Anthracene (mg/L)	<0.000010				
	Benz(a)anthracene (mg/L)	<0.000010				
	Benzo(a)pyrene (mg/L)	<0.0000050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339357-1	L2339357-2	L2339357-3	L2339357-4	L2339357-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	27-AUG-19	28-AUG-19	28-AUG-19	27-AUG-19	27-AUG-19
	Sampled Time	16:35	09:20	12:20	11:35	14:30
	Client ID	MW13-01	MW13-04	MW13-06	MW13-07	MW13-08
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)		<0.000010		<0.000010	
	Benzo(b+j+k)fluoranthene (mg/L)		<0.000015		<0.000015	
	Benzo(g,h,i)perylene (mg/L)		<0.000010		<0.000010	
	Benzo(k)fluoranthene (mg/L)		<0.000010		<0.000010	
	Chrysene (mg/L)		<0.000010		<0.000010	
	Dibenz(a,h)anthracene (mg/L)		<0.0000050		<0.0000050	
	Fluoranthene (mg/L)		<0.000010		<0.000010	
	Fluorene (mg/L)		<0.000010		<0.000010	
	Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010		<0.000010	
	1-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
	2-Methylnaphthalene (mg/L)		<0.000050		<0.000050	
	Naphthalene (mg/L)		<0.000050		<0.000050	
	Phenanthrene (mg/L)		<0.000020		<0.000020	
	Pyrene (mg/L)		<0.000010		<0.000010	
	Quinoline (mg/L)		<0.000050		<0.000050	
	Surrogate: Acridine d9 (%)		96.6		105.0	
	Surrogate: Chrysene d12 (%)		104.5		105.5	
	Surrogate: Naphthalene d8 (%)		104.5		100.4	
	Surrogate: Phenanthrene d10 (%)		107.2		106.5	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339357-6	L2339357-7	L2339357-8	L2339357-9	L2339357-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	27-AUG-19	28-AUG-19	27-AUG-19	26-AUG-19	27-AUG-19
	Sampled Time	15:30	17:00	09:55	15:45	14:40
	Client ID	MW13-10	MW13-13	MW14-01	MW14-04	MW-GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015		<0.000015		<0.000015
	Benzo(g,h,i)perylene (mg/L)	<0.000010		<0.000010		<0.000010
	Benzo(k)fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Chrysene (mg/L)	<0.000010		<0.000010		<0.000010
	Dibenz(a,h)anthracene (mg/L)	<0.0000050		<0.0000050		<0.0000050
	Fluoranthene (mg/L)	<0.000010		<0.000010		<0.000010
	Fluorene (mg/L)	<0.000010		<0.000010		<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010		<0.000010		<0.000010
	1-Methylnaphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	2-Methylnaphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	Naphthalene (mg/L)	<0.000050		<0.000050		<0.000050
	Phenanthrene (mg/L)	<0.000020		<0.000020		<0.000020
	Pyrene (mg/L)	<0.000010		<0.000010		<0.000010
	Quinoline (mg/L)	<0.000050		<0.000050		<0.000050
	Surrogate: Acridine d9 (%)	97.8		98.3		99.1
	Surrogate: Chrysene d12 (%)	101.3		101.6		98.0
	Surrogate: Naphthalene d8 (%)	99.5		102.7		97.0
	Surrogate: Phenanthrene d10 (%)	104.7		107.0		103.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2339357-11				
	Description	Groundwater				
	Sampled Date	28-AUG-19				
	Sampled Time	12:30				
	Client ID	MW-00				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(b&j)fluoranthene (mg/L)	<0.000010				
	Benzo(b+j+k)fluoranthene (mg/L)	<0.000015				
	Benzo(g,h,i)perylene (mg/L)	<0.000010				
	Benzo(k)fluoranthene (mg/L)	<0.000010				
	Chrysene (mg/L)	<0.000010				
	Dibenz(a,h)anthracene (mg/L)	<0.0000050				
	Fluoranthene (mg/L)	<0.000010				
	Fluorene (mg/L)	<0.000010				
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000010				
	1-Methylnaphthalene (mg/L)	<0.000050				
	2-Methylnaphthalene (mg/L)	<0.000050				
	Naphthalene (mg/L)	<0.000050				
	Phenanthrene (mg/L)	<0.000020				
	Pyrene (mg/L)	<0.000010				
	Quinoline (mg/L)	<0.000050				
	Surrogate: Acridine d9 (%)	107.1				
	Surrogate: Chrysene d12 (%)	106.4				
	Surrogate: Naphthalene d8 (%)	103.8				
	Surrogate: Phenanthrene d10 (%)	109.9				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2339357-11, -2, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2339357-11, -2, -4
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2339357-11, -2, -4
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2339357-1, -10, -3, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

Reference Information

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA | Water | Dissolved Metals in Water by CRC ICPMS | APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA | Water | Ammonia in Water by Fluorescence | J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA | Water | Nitrite in Water by IC (Low Level) | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA | Water | Nitrate in Water by IC (Low Level) | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PAH-ME-MS-VA | Water | PAHs in Water | EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA | Water | pH by Meter (Automated) | APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA | Water | Sulfate in Water by IC | EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA | Water | VH in Water by Headspace GCFID | BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA | Water | VH Surrogates for Waters | BC Env. Lab Manual (VH in Solids)

VIC100-T-HARDNESS-VA | Water | Hardness from Total Metals | APHA 2340B

Custom Calculation for Hardness. Client is requesting when Total Metals are run, only Total metals are used for hardness calculation.

VOC7-HSMS-VA | Water | BTEX/MTBE/Styrene by Headspace GCMS | EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA | Water | VOC7 and/or VOC Surrogates for Waters | EPA 5035A/5021A/8260C

VPH-CALC-VA | Water | VPH is VH minus select aromatics | BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA | Water | Sum of Xylene Isomer Concentrations | CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Reference Information

Chain of Custody Numbers:

1 of 1

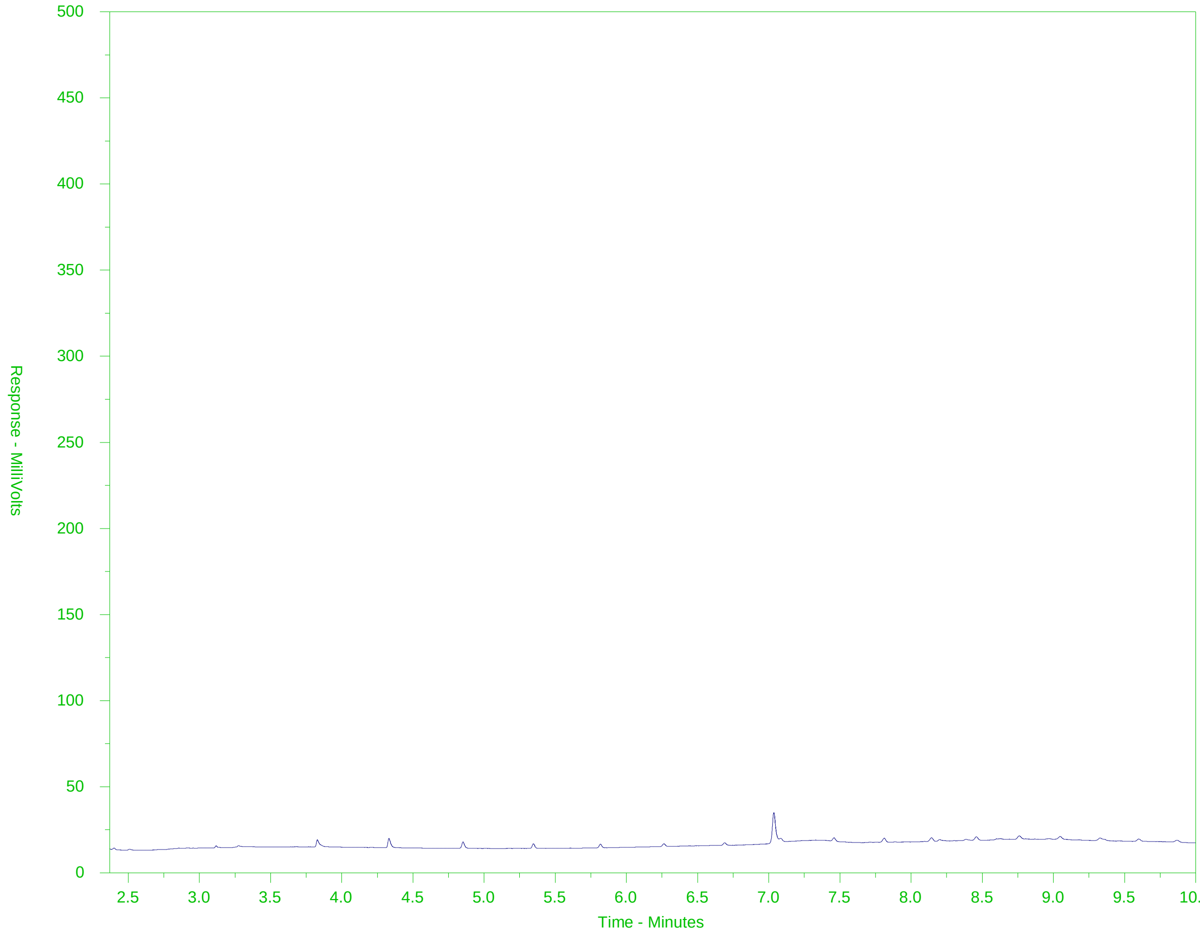
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2339357-2
Client Sample ID: MW13-04



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

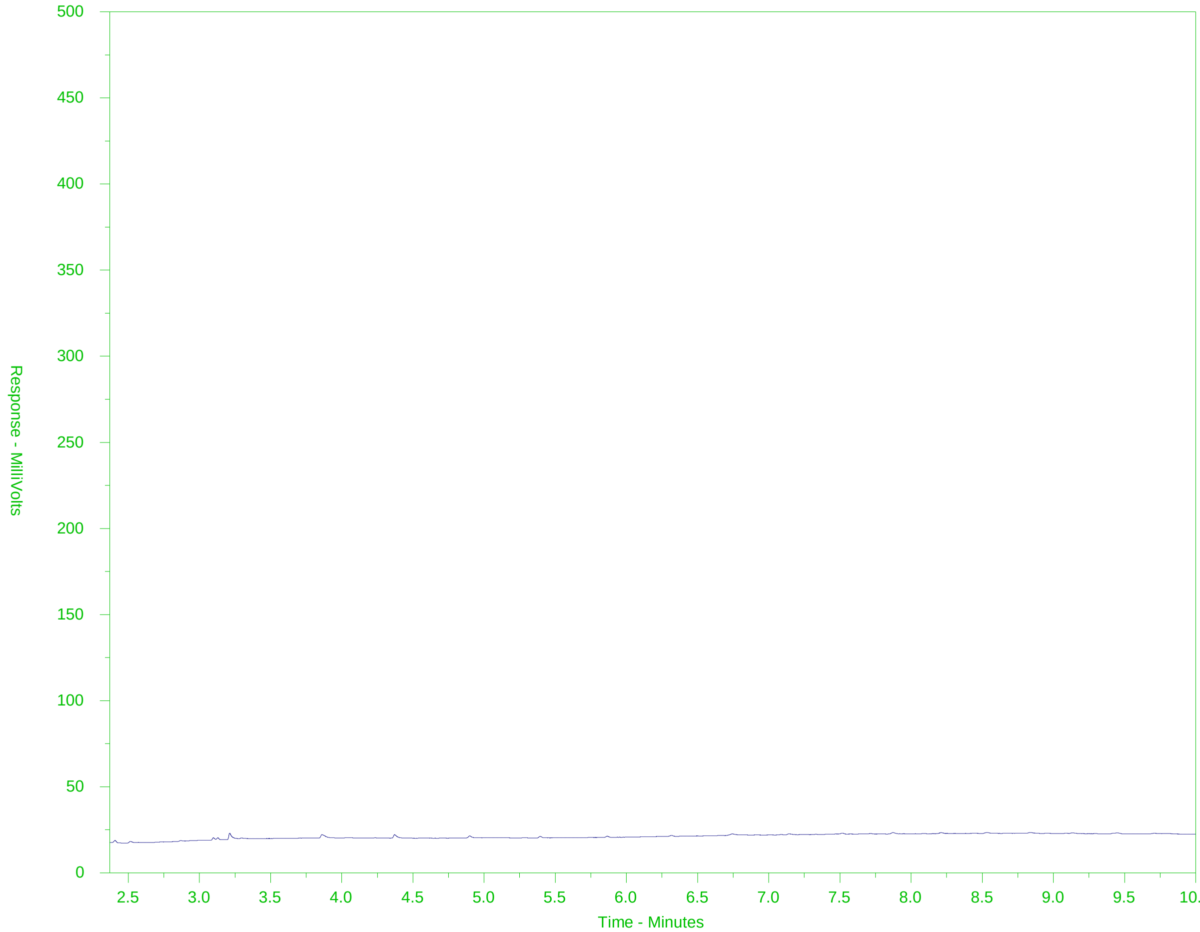
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2339357-4
Client Sample ID: MW13-07



EPH10-19	EPH19-32	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
Gasoline	Motor Oils/ Lube Oils/ Grease	
Diesel/ Jet Fuels		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

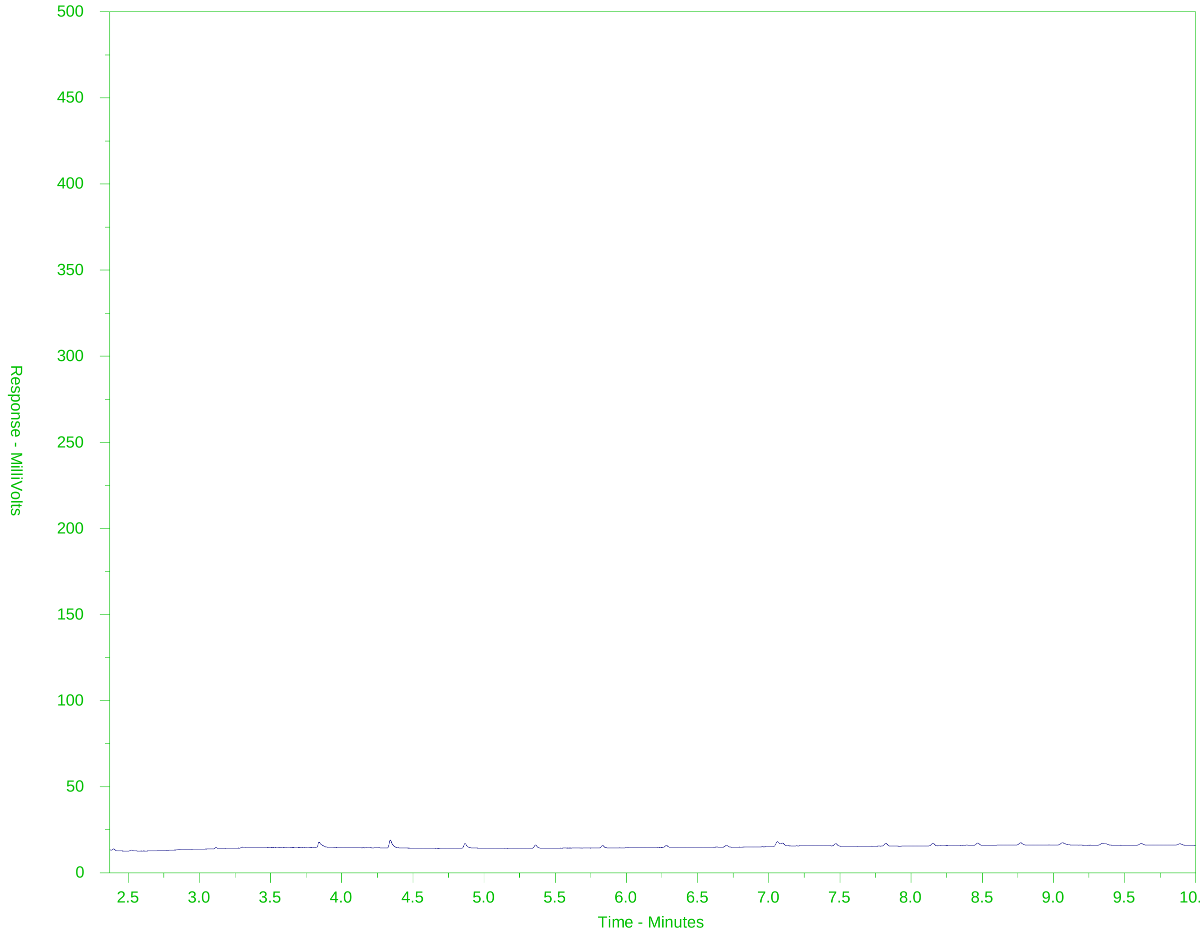
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2339357-6
Client Sample ID: MW13-10



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

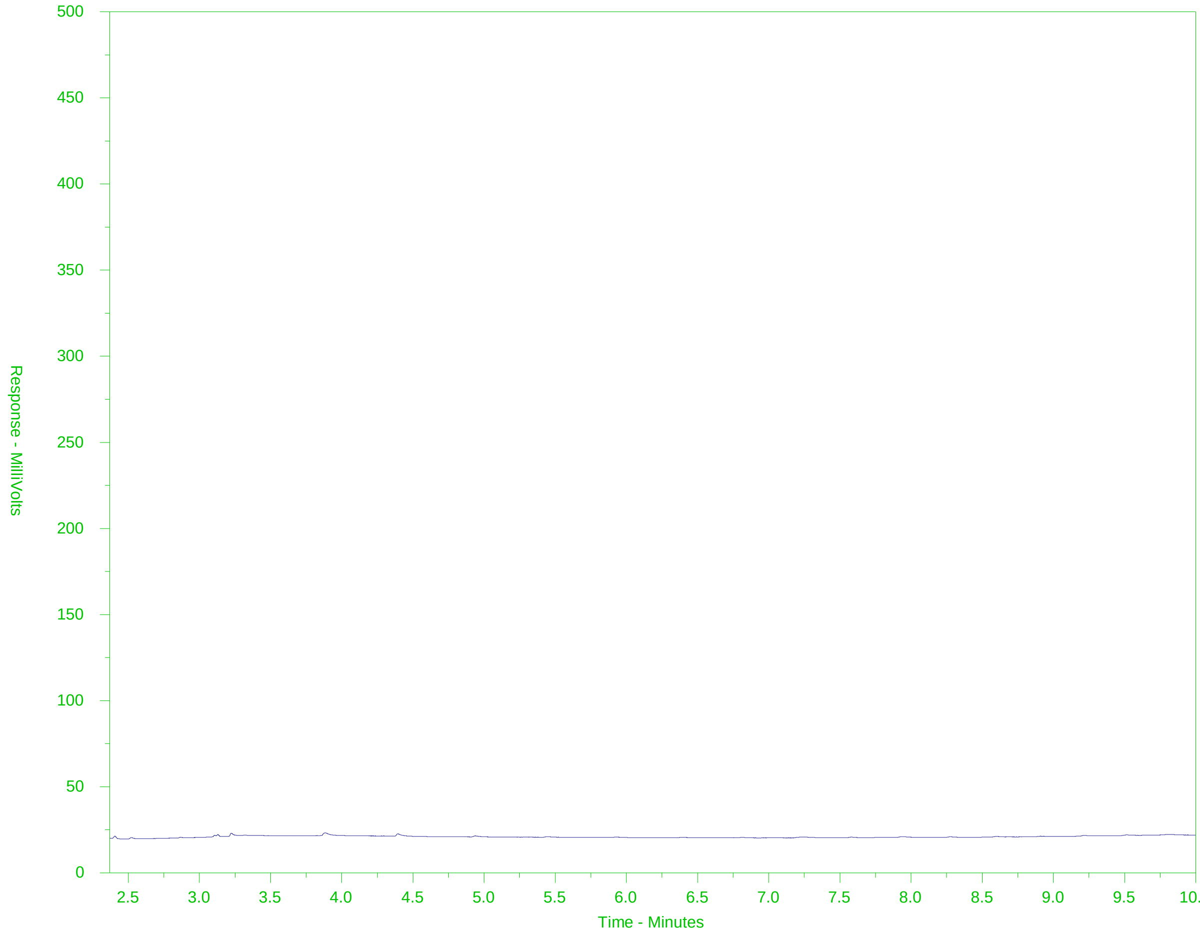
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2339357-8
Client Sample ID: MW14-01



EPH10-19		EPH19-32
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
Gasoline	Motor Oils/ Lube Oils/ Grease	
Diesel/ Jet Fuels		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

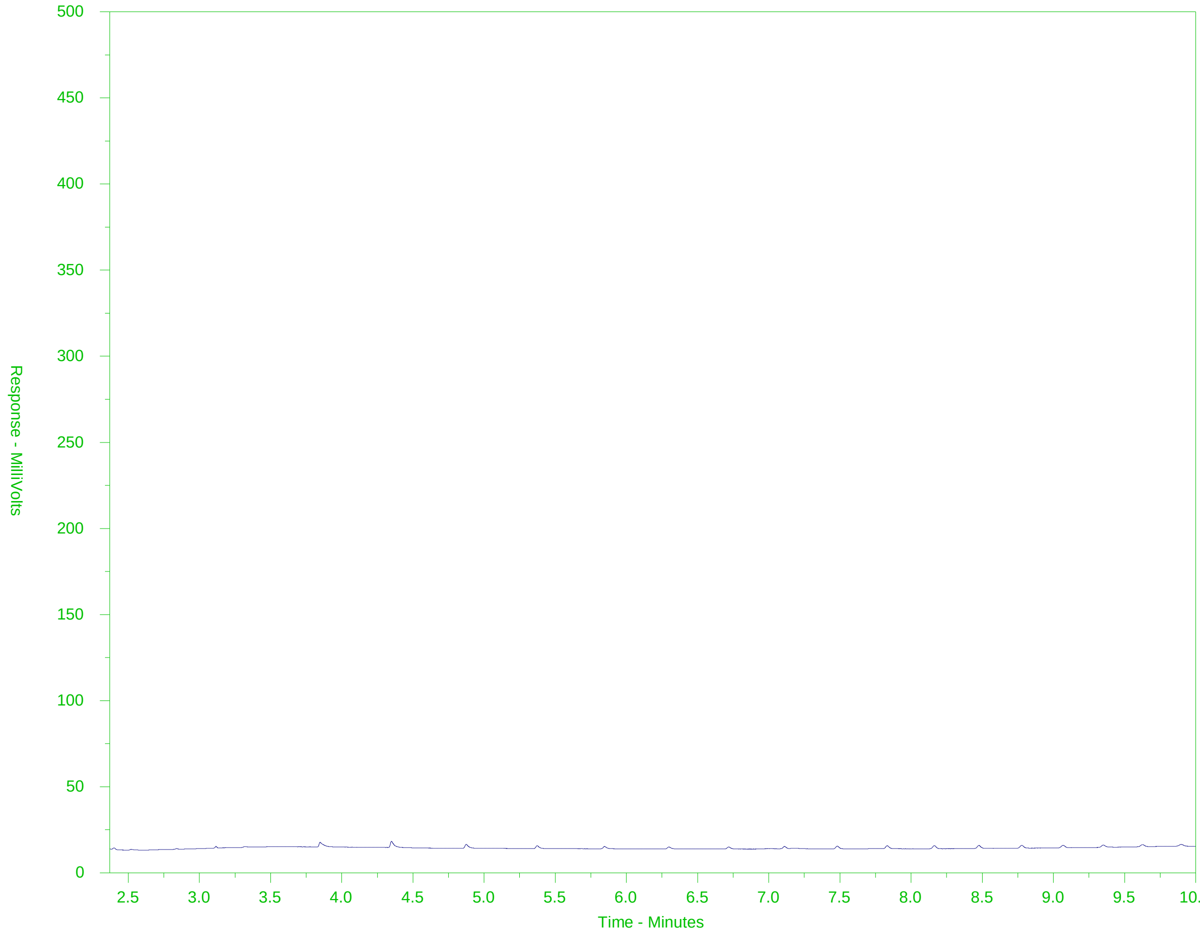
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2339357-10
Client Sample ID: MW-GW



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

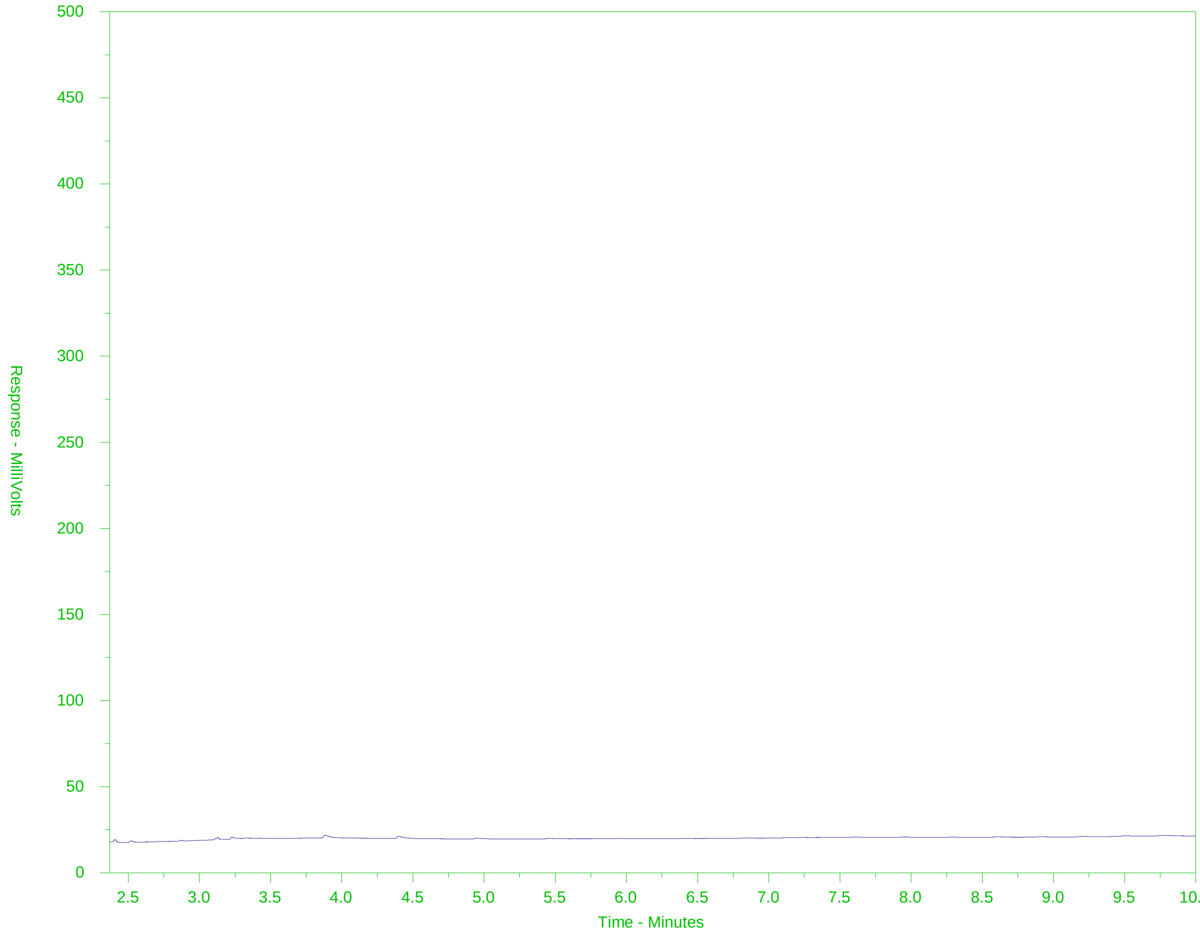
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2339357-11
Client Sample ID: MW-00



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

L2339357-COFC

Chain of Custody / Analytical Reque

Canada Toll Free: 1 800 668 98

www.alsglobal.com

ALS Environmental

Report To		Report Format / Distribution	
Company:	TECK Metals Ltd	☑ Standard ☐ Other	
Contact:	Michelle Unger	☑ PDF ☑ Excel ☑ Digital ☐ Fax	
Address:	601 Knightton Road	Email 1:	mducharme@accessconsulting.ca
	Kimberly, BC	Email 2:	michelle.unger@teck.com
Phone:	250-427-8422 Fax:	Email 3:	mmioska@alexcoenv.com
Invoice To	Same as Report ? ☑ Yes ☐ No	**Client / Project Information**	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #:	TECK-18-01
Company:		PO / AFE:	TECK PO9516
Contact:		LSD:	
Address:			
Phone:		Quote #:	Q62635
Lab Work Order # (lab use only)		ALS Contact:	Can Dang
		Sampler:	

Service Requested (Rush for routine analysis subject to availability)

- ◉ Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg (F/P)	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia (P)	BTEX, LEPH, HEPH (P)	VPH, PAH (P)	Number of Containers
	MW13-01 (LP)	27-Aug-19	16:35	Groundwater	X	X	X	X			4
	MW13-04 (LP)	28-Aug-19	9:20	Groundwater	X	X	X	X	X	X	8
	MW13-06 (LP)	28-Aug-19	12:20	Groundwater	X	X	X	X			4
	MW13-07 (LP)	27-Aug-19	11:35	Groundwater	X	X	X	X	X	X	8
	MW13-08 (LP)	27-Aug-19	14:30	Groundwater	X	X	X	X			4
	MW13-10 (LP)	27-Aug-19	15:30	Groundwater	X	X	X	X	X	X	8
	MW13-13 (LP)	28-Aug-19	17:00	Groundwater	X	X	X	X			4
	MW14-01 (LP)	27-Aug-19	9:55	Groundwater	X	X	X	X	X	X	8
	MW14-04 (LP)	26-Aug-19	15:45	Groundwater	X	X					2
	MW-GW (LQR)	27-Aug-19	14:40	Groundwater	X	X	X	X	X	X	8
	MW-00	28-Aug-19	12:30	Groundwater	x	x	x	x	x	x	8

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Emilie Bouchard	Date (dd-mmm-yy) 19-Aug-30	Time (hh-mm)	Received by:	Date: Aug 30/19.	Time: 13:00	Temperature: 7/3/7 °C	Verified by: SP	Date: 8/31/19	Time: 1245PM	Observations: Yes / No ? If Yes add SIF

9/8/8° 8°C Avg

GENF 20.00 Front

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 28-OCT-19
Report Date: 08-NOV-19 18:41 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2373028
Project P.O. #: Teck PO-9516
Job Reference: TECK-18-1
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2373028-1	L2373028-2	L2373028-3	L2373028-4	L2373028-5
	Sample ID	L2373028-1	L2373028-2	L2373028-3	L2373028-4	L2373028-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-OCT-19	25-OCT-19	23-OCT-19	23-OCT-19	22-OCT-19
	Sampled Time	14:00	14:00	12:00	12:45	16:50
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	333	314	393	345	935
	Hardness (from Totals) (mg/L)	171	158	208	182	522
	pH (pH)	8.33	8.28	8.32	8.31	8.21
	Total Suspended Solids (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Total Dissolved Solids (mg/L)	204	178	271	209	672
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	200	169	223	213	272
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0148	<0.0050	0.0052	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	DLDS <0.25
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	DLDS <2.5
	Fluoride (F) (mg/L)	0.109	0.151	0.089	0.049	DLDS <0.10
	Nitrate (as N) (mg/L)	0.0593	0.238	0.134	0.113	DLDS <0.025
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	DLDS <0.0050
	Sulfate (SO4) (mg/L)	12.2	16.7	17.2	4.85	276
Total Metals	Aluminum (Al)-Total (mg/L)	0.0155	0.0062	0.0058	0.0057	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00020	0.00013	0.00012	0.00016	<0.00010
	Arsenic (As)-Total (mg/L)	0.00072	0.00037	0.00049	0.00064	0.00024
	Barium (Ba)-Total (mg/L)	0.0673	0.0197	0.0563	0.0417	0.0290
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000362	0.000234	0.0000388	0.0000346	<0.0000050
	Calcium (Ca)-Total (mg/L)	57.9	57.9	69.4	62.9	179
	Chromium (Cr)-Total (mg/L)	0.00022	0.00022	0.00013	0.00014	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00050
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.019	<0.010	0.046	0.015	<0.010
	Lead (Pb)-Total (mg/L)	0.000343	0.000205	0.000136	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0014	0.0015	0.0016	0.0013	<0.0010
	Magnesium (Mg)-Total (mg/L)	6.42	3.35	8.50	6.10	18.5
	Manganese (Mn)-Total (mg/L)	0.00085	0.00059	0.00862	0.00336	0.0114
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00122	0.000678	0.000971	0.000635	0.000233
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.47	0.40	0.45	0.27	1.51
	Selenium (Se)-Total (mg/L)	0.000754	0.000885	0.000723	0.000597	0.000097
	Silicon (Si)-Total (mg/L)	4.22	3.28	3.90	3.94	5.31

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373028-6	L2373028-7	L2373028-8	L2373028-9	L2373028-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	24-OCT-19	24-OCT-19	24-OCT-19	23-OCT-19	25-OCT-19
	Sampled Time	13:00	12:00	14:00	12:30	19:00
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	378	303	369	395	<2.0
	Hardness (from Totals) (mg/L)	200	163	199	204	<0.50
	pH (pH)	8.32	8.15	8.34	8.34	5.37
	Total Suspended Solids (mg/L)	<1.0	5.8	1.3	<1.0	<1.0
	Total Dissolved Solids (mg/L)	214	188	228	237	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	206	171	206	239	<1.0
	Ammonia, Total (as N) (mg/L)	0.0083	0.0197	0.0053	0.0056	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.062	0.091	0.094	0.054	<0.020
	Nitrate (as N) (mg/L)	0.0395	0.133	0.0288	0.0259	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	9.04	17.1	3.85	4.74	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0074	0.0780	0.0100	0.0119	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00010	0.00010	0.00016	0.00013	<0.00010
	Arsenic (As)-Total (mg/L)	0.00031	0.00052	0.00036	0.00050	<0.00010
	Barium (Ba)-Total (mg/L)	0.129	0.193	0.158	0.0597	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000201	0.0000471	0.0000584	0.0000397	<0.0000050
	Calcium (Ca)-Total (mg/L)	55.7	40.7	56.3	67.3	<0.050
	Chromium (Cr)-Total (mg/L)	0.00014	0.00023	0.00014	0.00011	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00023	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	0.00074	0.00072	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.126	1.11	0.207	0.060	<0.010
	Lead (Pb)-Total (mg/L)	0.000064	0.000249	0.000117	0.000242	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	<0.0010	0.0012	0.0016	<0.0010
	Magnesium (Mg)-Total (mg/L)	14.9	15.0	14.1	8.64	<0.10
	Manganese (Mn)-Total (mg/L)	0.00695	0.0532	0.0202	0.0102	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00108	0.00120	0.00170	0.00101	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00069	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.41	0.35	0.38	0.47	<0.10
	Selenium (Se)-Total (mg/L)	0.000457	0.000435	0.000500	0.000713	<0.000050
	Silicon (Si)-Total (mg/L)	3.36	3.21	4.00	3.96	<0.10

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373028-11	L2373028-12			
	Description	Water	Water			
	Sampled Date	22-OCT-19				
	Sampled Time	15:40				
	Client ID	MH-22	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	300	<2.0			
	Hardness (from Totals) (mg/L)	145	<0.50			
	pH (pH)	8.13	5.32			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	188	<10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	115	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0164 RRV			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	1.25	<0.020			
	Nitrate (as N) (mg/L)	0.141	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	41.0	<0.30			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030			
	Antimony (Sb)-Total (mg/L)	0.00240	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00389	<0.00010			
	Barium (Ba)-Total (mg/L)	0.0147	<0.00010			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.00383	<0.0000050			
	Calcium (Ca)-Total (mg/L)	47.1	<0.050			
	Chromium (Cr)-Total (mg/L)	0.00017	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	0.000310	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0060	<0.0010			
	Magnesium (Mg)-Total (mg/L)	6.68	<0.10			
	Manganese (Mn)-Total (mg/L)	0.00018	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.00837	<0.000050			
	Nickel (Ni)-Total (mg/L)	0.00357	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.57	<0.10			
	Selenium (Se)-Total (mg/L)	0.0136	<0.000050			
	Silicon (Si)-Total (mg/L)	4.63	<0.10			

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2373028-1	L2373028-2	L2373028-3	L2373028-4	L2373028-5
	Sample ID	L2373028-1	L2373028-2	L2373028-3	L2373028-4	L2373028-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-OCT-19	25-OCT-19	23-OCT-19	23-OCT-19	22-OCT-19
	Sampled Time	14:00	14:00	12:00	12:45	16:50
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.07	0.885	1.19	0.952	9.86
	Strontium (Sr)-Total (mg/L)	0.219	0.208	0.268	0.221	0.601
	Sulfur (S)-Total (mg/L)	4.62	6.08	6.51	1.95	107
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00034	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.000999	0.000888	0.00119	0.000691	0.00177
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0055	0.0040	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0027	0.0014	0.0017	0.0020	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00022	0.00014	0.00013	0.00016	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00076	0.00040	0.00048	0.00066	0.00028
	Barium (Ba)-Dissolved (mg/L)	0.0713	0.0211	0.0615	0.0447	0.0314
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000444	0.000254	0.0000361	0.0000379	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	60.6	60.3	65.1	65.0	181
	Chromium (Cr)-Dissolved (mg/L)	0.00021	0.00020	0.00010	0.00011	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00042
	Copper (Cu)-Dissolved (mg/L)	0.00031	<0.00020	0.00023	0.00028	<0.00020
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.019	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000123	0.000095	<0.000050	<0.000050	0.000063
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0015	0.0015	0.0013	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	5.85	3.17	7.81	5.76	17.3
	Manganese (Mn)-Dissolved (mg/L)	0.00045	0.00043	0.00671	0.00221	0.0105
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00133	0.000694	0.000782	0.000701	0.000252
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.48	0.42	0.47	0.28	1.59
	Selenium (Se)-Dissolved (mg/L)	0.000846	0.000872	0.000663	0.000623	0.000076
	Silicon (Si)-Dissolved (mg/L)	4.12	3.35	3.95	3.90	4.98

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373028-6	L2373028-7	L2373028-8	L2373028-9	L2373028-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	24-OCT-19	24-OCT-19	24-OCT-19	23-OCT-19	25-OCT-19
	Sampled Time	13:00	12:00	14:00	12:30	19:00
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.05	0.768	1.15	1.22	<0.050
	Strontium (Sr)-Total (mg/L)	0.206	0.115	0.178	0.275	<0.00020
	Sulfur (S)-Total (mg/L)	3.58	2.00	1.65	6.44	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	0.00015	<0.00010	0.00021	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.0018 DLM	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00141	0.00140	0.000864	0.00129	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0032	0.0030	0.0043	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0011	0.0018	0.0013	0.0015	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	0.00010	<0.00010	0.00010	0.00011	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00024	0.00025	0.00024	0.00042	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.132	0.181	0.163	0.0615	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000198	0.0000337	0.0000083	0.0000404	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	56.8	41.0	60.3	74.5	<0.050
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00062	0.00040	<0.00020	0.00038	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.019	0.256	0.043	0.020	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0011	<0.0010	0.0011	0.0016	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	13.9	14.2	13.2	8.42	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00455	0.0319	0.00654	0.00682	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00109	0.00127	0.00161	0.000771	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.42	0.38	0.34	0.45	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.000578	0.000392	0.000506	0.000489	<0.000050
	Silicon (Si)-Dissolved (mg/L)	3.35	3.01	3.92	3.86	<0.050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373028-11	L2373028-12			
	Description	Water	Water			
	Sampled Date	22-OCT-19				
	Sampled Time	15:40				
	Client ID	MH-22	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Total Metals	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.888	<0.050			
	Strontium (Sr)-Total (mg/L)	0.239	<0.00020			
	Sulfur (S)-Total (mg/L)	14.5	<0.50			
	Thallium (Tl)-Total (mg/L)	0.000018	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.00374	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.664	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	<0.0010				
	Antimony (Sb)-Dissolved (mg/L)	0.00228				
	Arsenic (As)-Dissolved (mg/L)	0.00362				
	Barium (Ba)-Dissolved (mg/L)	0.0157				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.00377				
	Calcium (Ca)-Dissolved (mg/L)	53.5				
	Chromium (Cr)-Dissolved (mg/L)	0.00015				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.000278				
	Lithium (Li)-Dissolved (mg/L)	0.0060				
	Magnesium (Mg)-Dissolved (mg/L)	6.83				
	Manganese (Mn)-Dissolved (mg/L)	0.00017				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00767				
	Nickel (Ni)-Dissolved (mg/L)	0.00347				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.59				
	Selenium (Se)-Dissolved (mg/L)	0.0126				
	Silicon (Si)-Dissolved (mg/L)	4.60				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373028-1	L2373028-2	L2373028-3	L2373028-4	L2373028-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	23-OCT-19	25-OCT-19	23-OCT-19	23-OCT-19	22-OCT-19
	Sampled Time	14:00	14:00	12:00	12:45	16:50
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.03	0.848	1.14	0.926	9.46
	Strontium (Sr)-Dissolved (mg/L)	0.217	0.211	0.251	0.223	0.595
	Sulfur (S)-Dissolved (mg/L)	4.05	5.64	6.42	1.76	91.2
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000991	0.000883	0.00111	0.000699	0.00180
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0016	0.0052	0.0035	<0.0010	0.0026
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00040	0.00022	0.00013	0.00014	<0.00010
	Hexavalent Chromium (mg/L)	0.00070	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373028-6	L2373028-7	L2373028-8	L2373028-9	L2373028-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	24-OCT-19	24-OCT-19	24-OCT-19	23-OCT-19	25-OCT-19
	Sampled Time	13:00	12:00	14:00	12:30	19:00
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.01	0.751	0.998	1.11	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.202	0.119	0.175	0.258	<0.00020
	Sulfur (S)-Dissolved (mg/L)	3.35	1.66	1.65	5.74	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00144	0.00129	0.000860	0.00127	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0015	0.0017	0.0017	0.0036	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00014	0.00023	0.00014	0.00011	<0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373028-11	L2373028-12			
	Description	Water	Water			
	Sampled Date	22-OCT-19				
	Sampled Time	15:40				
	Client ID	MH-22	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.843				
	Strontium (Sr)-Dissolved (mg/L)	0.232				
	Sulfur (S)-Dissolved (mg/L)	12.9				
	Thallium (Tl)-Dissolved (mg/L)	0.000022				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.00373				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.649				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Speciated Metals	Chromium (III)-Total (mg/L)	0.00017	<0.00010			
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Chromium (Cr)-Total	B	L2373028-2
Method Blank	Manganese (Mn)-Total	B	L2373028-2
Method Blank	Nickel (Ni)-Total	B	L2373028-2
Laboratory Control Sample	Sulfur (S)-Dissolved	MES	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2373028-10, -11, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2373028-10, -11, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2373028-10, -11, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2373028-10, -11, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2373028-1, -2, -3, -4, -5, -6, -7
Matrix Spike	Barium (Ba)-Total	MS-B	L2373028-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2373028-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2373028-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2373028-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-WR	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-WR	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED	Water	Total Trivalent Chromium in Water	CALCULATION

Reference Information

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED Water Chromium, Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WR Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-WR Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-WR Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-WR Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

Reference Information

VIC100-T-HARDNESS-VA	Water	Hardness from Total Metals	APHA 2340B

Custom Calculation for Hardness. Client is requesting when Total Metals are run, only Total metals are used for hardness calculation.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2373028-COFC

COC Number:

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To ☒ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: mducharme@accessconsulting.ca

Email 2: mmioska@alexcoenv.com

Email 3: Michelle.unger@teck.com

Invoice Distribution

Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Michelle.unger@teck.com

Email 2: roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
PO / AFE:	Teck PO-9516
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: Can Dang **Sampler:** EB

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)	Number of Containers
	MH-12 (LP)	23-Oct-19	14:00	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	25-Oct-19	14:00	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	23-Oct-19	12:00	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	23-Oct-19	12:45	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	22-Oct-19	16:50	Water	R	R	R	R	R	R	R	8
	MH-13 (LP)	24-Oct-19	13:00	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	24-Oct-19	12:00	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	24-Oct-19	14:00	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	23-Oct-19	12:30	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	25-Oct-19	19:00	Water	R	R	R	R	R	R	R	7
	MH-22 (LP)	22-Oct-19	15:40	Water	R	R	R	R	R	R	R	8
	Trip Blank (LQTB)			Water	R	R	R	R	R	R	R	7

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☒ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C: 12.3, 12.4, 8.4

FINAL COOLER TEMPERATURES °C: 3, 4, 4, 6 C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Emilie Bouchard	Date: 28-Oct-19.	Time:	Received by:	Date: Oct 28 2019	Time: 2:00PM	Received by:	Date: 31 Oct 19	Time: 11:35 PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 28-OCT-19
Report Date: 06-NOV-19 16:12 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2373302

Project P.O. #: TECK PO9516
Job Reference: TECK-18-01
C of C Numbers: 1 of 1
Legal Site Desc:

Comments: For the sample, ALS identify as L2373302-10, the specific bottle for ammonia analysis was not received. Therefore, ammonia analysis was not performed on this sample.

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373302-1	L2373302-2	L2373302-3	L2373302-4	L2373302-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	21-OCT-19	21-OCT-19	22-OCT-19	22-OCT-19	25-OCT-19
	Sampled Time	18:00	16:15	12:00	15:15	13:00
	Client ID	MW13-01	MW13-04	MW13-00	MW13-06	MW13-07
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	295	281	252	779	450
	Hardness (as CaCO3) (mg/L)	155	164	130	392	231
	Hardness (from Totals)	155	164	130	392	231
	pH (pH)	7.78	8.10	8.01	7.64	7.96
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	159	161	109	171	237
	Ammonia, Total (as N) (mg/L)	0.0219	0.0247	0.0195	0.0185	0.150
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	DLDS <0.25	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	DLDS <2.5	<0.50
	Fluoride (F) (mg/L)	0.396	0.058	0.156	0.54	0.348
	Nitrate (as N) (mg/L)	0.409	0.663	0.909	DLDS <0.025	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0024	DLDS <0.0050	<0.0010
	Sulfate (SO4) (mg/L)	10.0	4.71	29.6	280	33.4
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0022	0.0029	0.0150	0.0019	0.0034
	Antimony (Sb)-Dissolved (mg/L)	0.00011	0.00032	0.00014	0.00014	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00029	0.00085	0.00049	0.0217	0.00259
	Barium (Ba)-Dissolved (mg/L)	0.0217	0.0477	0.0120	0.0279	0.0282
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.012	0.024
	Cadmium (Cd)-Dissolved (mg/L)	0.000919	0.000489	0.000648	DLM <0.000060	DLM <0.000010
	Calcium (Ca)-Dissolved (mg/L)	55.9	59.3	48.6	138	65.3
	Chromium (Cr)-Dissolved (mg/L)	0.00021	0.00034	0.00027	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	0.00224	0.00036
	Copper (Cu)-Dissolved (mg/L)	0.00032	0.00223	0.00116	0.00042	0.00033
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.017	0.416	2.17
	Lead (Pb)-Dissolved (mg/L)	0.00148	0.000699	0.000730	<0.000050	0.000064
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0016	<0.0010	0.0076	0.0081
	Magnesium (Mg)-Dissolved (mg/L)	3.80	3.91	2.04	11.2	16.5
	Manganese (Mn)-Dissolved (mg/L)	0.00039	0.00091	0.00054	0.275	0.778
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000493	0.000639	0.000418	0.0299	0.00302
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.0353	0.00086
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	0.143	0.125
	Potassium (K)-Dissolved (mg/L)	0.66	0.78	0.78	2.23	3.23
	Selenium (Se)-Dissolved (mg/L)	0.00126	0.00109	0.000708	0.000163	<0.000050

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373302-6	L2373302-7	L2373302-8	L2373302-9	L2373302-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	25-OCT-19	23-OCT-19	22-OCT-19	23-OCT-19	23-OCT-19
	Sampled Time	13:50	10:45	11:30	15:00	14:40
	Client ID	MW13-08	MW13-10	MW13-13	MW14-01	MW14-04
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	529	435	252	391	
	Hardness (as CaCO3) (mg/L)	306	241	130	214	161
	Hardness (from Totals)	306	241	130	214	
	pH (pH)	8.09	8.10	8.05	8.01	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	302	215	110	225	
	Ammonia, Total (as N) (mg/L)	0.0487	0.0220	0.0122	0.0441	
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	
	Chloride (Cl) (mg/L)	<0.50	0.64	<0.50	<0.50	
	Fluoride (F) (mg/L)	0.051	0.063	0.151	0.105	
	Nitrate (as N) (mg/L)	0.491	0.535	0.914	0.213	
	Nitrite (as N) (mg/L)	<0.0010	0.0042	0.0017	<0.0010	
	Sulfate (SO4) (mg/L)	14.6	35.3	28.7	3.49	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0012	0.0018	0.0109	0.0058	0.0029
	Antimony (Sb)-Dissolved (mg/L)	0.00016	0.00015	0.00017	0.00017	0.00032
	Arsenic (As)-Dissolved (mg/L)	0.00016	0.00110	0.00049	0.00025	0.00066
	Barium (Ba)-Dissolved (mg/L)	0.214	0.00805	0.0124	0.116	0.120
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000558	0.0000284	0.000644	0.0000287	0.0000519
	Calcium (Ca)-Dissolved (mg/L)	106	82.1	48.5	67.5	52.6
	Chromium (Cr)-Dissolved (mg/L)	0.00045	0.00047	0.00020	0.00067	0.00029
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00034	0.00217	0.00168	0.00073	0.00183
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.014	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000252	0.000673	0.000062	0.000085
	Lithium (Li)-Dissolved (mg/L)	0.0019	0.0016	<0.0010	<0.0010	0.0017
	Magnesium (Mg)-Dissolved (mg/L)	10.2	8.80	2.06	11.0	7.16
	Manganese (Mn)-Dissolved (mg/L)	0.00022	0.00054	0.00059	0.00051	0.00547
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000507	0.00178	0.000401	0.00209	0.00501
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.66	1.24	0.85	0.62	1.35
	Selenium (Se)-Dissolved (mg/L)	0.00146	0.00156	0.000713	0.00101	0.000215

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2373302-11				
		Description	Groundwater				
		Sampled Date	21-OCT-19				
		Sampled Time	18:30				
		Client ID	MW-GW				
Grouping	**Analyte**						
WATER							
Physical Tests	Conductivity (uS/cm)		299				
	Hardness (as CaCO3) (mg/L)		154				
	Hardness (from Totals)		154				
	pH (pH)		7.85				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		163				
	Ammonia, Total (as N) (mg/L)		0.0245				
	Bromide (Br) (mg/L)		<0.050				
	Chloride (Cl) (mg/L)		<0.50				
	Fluoride (F) (mg/L)		0.397				
	Nitrate (as N) (mg/L)		0.400				
	Nitrite (as N) (mg/L)		<0.0010				
	Sulfate (SO4) (mg/L)		9.79				
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD				
	Dissolved Metals Filtration Location		FIELD				
	Aluminum (Al)-Dissolved (mg/L)		0.0018				
	Antimony (Sb)-Dissolved (mg/L)		0.00011				
	Arsenic (As)-Dissolved (mg/L)		0.00028				
	Barium (Ba)-Dissolved (mg/L)		0.0226				
	Beryllium (Be)-Dissolved (mg/L)		<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050				
	Boron (B)-Dissolved (mg/L)		<0.010				
	Cadmium (Cd)-Dissolved (mg/L)		0.000948				
	Calcium (Ca)-Dissolved (mg/L)		55.5				
	Chromium (Cr)-Dissolved (mg/L)		0.00026				
	Cobalt (Co)-Dissolved (mg/L)		<0.00010				
	Copper (Cu)-Dissolved (mg/L)		0.00020				
	Iron (Fe)-Dissolved (mg/L)		<0.010				
	Lead (Pb)-Dissolved (mg/L)		0.00152				
	Lithium (Li)-Dissolved (mg/L)		0.0012				
	Magnesium (Mg)-Dissolved (mg/L)		3.68				
	Manganese (Mn)-Dissolved (mg/L)		0.00044				
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)		0.000491				
	Nickel (Ni)-Dissolved (mg/L)		<0.00050				
	Phosphorus (P)-Dissolved (mg/L)		<0.050				
	Potassium (K)-Dissolved (mg/L)		0.65				
	Selenium (Se)-Dissolved (mg/L)		0.00125				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		L2373302-1	L2373302-2	L2373302-3	L2373302-4	L2373302-5
	Sample ID	L2373302-1	L2373302-2	L2373302-3	L2373302-4	L2373302-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	21-OCT-19	21-OCT-19	22-OCT-19	22-OCT-19	25-OCT-19
	Sampled Time	18:00	16:15	12:00	15:15	13:00
	Client ID	MW13-01	MW13-04	MW13-00	MW13-06	MW13-07
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	3.38	4.01	2.61	14.3	7.63
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.747	1.02	0.702	12.8	8.93
	Strontium (Sr)-Dissolved (mg/L)	0.146	0.144	0.0774	0.553	0.433
	Sulfur (S)-Dissolved (mg/L)	3.63	1.55	9.34	92.4	11.6
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	0.00043	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000719	0.000719	0.000609	0.0100	0.00617
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0354	0.0173	0.0157	0.110	0.0021
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)		<0.00050			<0.00050
	Ethylbenzene (mg/L)		<0.00050			<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050			<0.00050
	Styrene (mg/L)		<0.00050			<0.00050
	Toluene (mg/L)		<0.00045			<0.00045
	ortho-Xylene (mg/L)		<0.00050			<0.00050
	meta- & para-Xylene (mg/L)		<0.00050			<0.00050
	Xylenes (mg/L)		<0.00075			<0.00075
	Surrogate: 4-Bromofluorobenzene (SS) (%)		83.4			78.9
	Surrogate: 1,4-Difluorobenzene (SS) (%)		94.8			103.1
Hydrocarbons	EPH10-19 (mg/L)		<0.25			<0.25
	EPH19-32 (mg/L)		0.31			<0.25
	LEPH (mg/L)		<0.25			<0.25
	HEPH (mg/L)		0.31			<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10			<0.10
	VPH (C6-C10) (mg/L)		<0.10			<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)		91.9			99.2
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		97.6			SURR-ND 66.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)		<0.000010			<0.000010
	Acenaphthylene (mg/L)		<0.000010			<0.000010
	Acridine (mg/L)		<0.000010			<0.000010
	Anthracene (mg/L)		<0.000010			<0.000010
	Benz(a)anthracene (mg/L)		<0.000010			<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2373302-6	L2373302-7	L2373302-8	L2373302-9	L2373302-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	25-OCT-19	23-OCT-19	22-OCT-19	23-OCT-19	23-OCT-19
	Sampled Time	13:50	10:45	11:30	15:00	14:40
	Client ID	MW13-08	MW13-10	MW13-13	MW14-01	MW14-04
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	3.97	3.92	2.53	4.57	3.72
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.04	2.11	0.747	1.29	2.06
	Strontium (Sr)-Dissolved (mg/L)	0.328	0.327	0.0776	0.222	0.191
	Sulfur (S)-Dissolved (mg/L)	4.91	11.4	9.37	1.39	1.21
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00010	0.00021	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00146	0.00295	0.000604	0.000638	0.000440
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0013	0.0033	0.0150	0.0024	0.0027
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)		<0.00050		<0.00050	<0.00050
	Ethylbenzene (mg/L)		<0.00050		<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)		<0.00050		<0.00050	<0.00050
	Styrene (mg/L)		<0.00050		<0.00050	<0.00050
	Toluene (mg/L)		<0.00045		<0.00045	<0.00045
	ortho-Xylene (mg/L)		<0.00050		<0.00050	<0.00050
	meta- & para-Xylene (mg/L)		<0.00050		<0.00050	<0.00050
	Xylenes (mg/L)		<0.00075		<0.00075	<0.00075
	Surrogate: 4-Bromofluorobenzene (SS) (%)		82.7		82.3	82.4
	Surrogate: 1,4-Difluorobenzene (SS) (%)		103.3		105.5	100.3
Hydrocarbons	EPH10-19 (mg/L)		<0.25		<0.25	<0.25
	EPH19-32 (mg/L)		<0.25		<0.25	<0.25
	LEPH (mg/L)		<0.25		<0.25	<0.25
	HEPH (mg/L)		<0.25		<0.25	<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10		<0.10	<0.10
	VPH (C6-C10) (mg/L)		<0.10		<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)		93.3		114.2	108.0
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		98.2		84.7	100.9
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)		<0.000010		<0.000010	<0.000010
	Acenaphthylene (mg/L)		<0.000010		<0.000010	<0.000010
	Acridine (mg/L)		<0.000010		<0.000010	<0.000010
	Anthracene (mg/L)		<0.000010		<0.000010	<0.000010
	Benz(a)anthracene (mg/L)		<0.000010		<0.000010	<0.000010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373302-11				
	Description	Groundwater				
	Sampled Date	21-OCT-19				
	Sampled Time	18:30				
	Client ID	MW-GW				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	3.33				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.751				
	Strontium (Sr)-Dissolved (mg/L)	0.139				
	Sulfur (S)-Dissolved (mg/L)	3.37				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000756				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0363				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					
	Xylenes (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	EPH10-19 (mg/L)					
	EPH19-32 (mg/L)					
	LEPH (mg/L)					
	HEPH (mg/L)					
	Volatile Hydrocarbons (VH6-10) (mg/L)					
	VPH (C6-C10) (mg/L)					
	Surrogate: 2-Bromobenzotrifluoride (%)					
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)					
	Acenaphthylene (mg/L)					
	Acridine (mg/L)					
	Anthracene (mg/L)					
	Benz(a)anthracene (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373302-1	L2373302-2	L2373302-3	L2373302-4	L2373302-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	21-OCT-19	21-OCT-19	22-OCT-19	22-OCT-19	25-OCT-19
	Sampled Time	18:00	16:15	12:00	15:15	13:00
	Client ID	MW13-01	MW13-04	MW13-00	MW13-06	MW13-07
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)		<0.0000050			<0.0000050
	Benzo(b&j)fluoranthene (mg/L)		<0.000010			<0.000010
	Benzo(b+j+k)fluoranthene (mg/L)		<0.000015			<0.000015
	Benzo(g,h,i)perylene (mg/L)		<0.000010			<0.000010
	Benzo(k)fluoranthene (mg/L)		<0.000010			<0.000010
	Chrysene (mg/L)		<0.000010			<0.000010
	Dibenz(a,h)anthracene (mg/L)		<0.0000050			<0.0000050
	Fluoranthene (mg/L)		<0.000010			<0.000010
	Fluorene (mg/L)		<0.000010			<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010			<0.000010
	1-Methylnaphthalene (mg/L)		<0.000050			<0.000050
	2-Methylnaphthalene (mg/L)		<0.000050			<0.000050
	Naphthalene (mg/L)		<0.000050			<0.000050
	Phenanthrene (mg/L)		<0.000020			<0.000020
	Pyrene (mg/L)		<0.000010			<0.000010
	Quinoline (mg/L)		<0.000050			<0.000050
	Surrogate: Acridine d9 (%)		78.2			98.4
	Surrogate: Chrysene d12 (%)		102.6			113.9
	Surrogate: Naphthalene d8 (%)		91.6			103.8
	Surrogate: Phenanthrene d10 (%)		95.7			107.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373302-6	L2373302-7	L2373302-8	L2373302-9	L2373302-10
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	25-OCT-19	23-OCT-19	22-OCT-19	23-OCT-19	23-OCT-19
	Sampled Time	13:50	10:45	11:30	15:00	14:40
	Client ID	MW13-08	MW13-10	MW13-13	MW14-01	MW14-04
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)		<0.0000050		<0.0000050	<0.0000050
	Benzo(b&j)fluoranthene (mg/L)		<0.000010		<0.000010	<0.000010
	Benzo(b+j+k)fluoranthene (mg/L)		<0.000015		<0.000015	<0.000015
	Benzo(g,h,i)perylene (mg/L)		<0.000010		<0.000010	<0.000010
	Benzo(k)fluoranthene (mg/L)		<0.000010		<0.000010	<0.000010
	Chrysene (mg/L)		<0.000010		<0.000010	<0.000010
	Dibenz(a,h)anthracene (mg/L)		<0.0000050		<0.0000050	<0.0000050
	Fluoranthene (mg/L)		<0.000010		<0.000010	<0.000010
	Fluorene (mg/L)		<0.000010		<0.000010	<0.000010
	Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000010		<0.000010	<0.000010
	1-Methylnaphthalene (mg/L)		<0.000050		<0.000050	<0.000050
	2-Methylnaphthalene (mg/L)		0.000056		<0.000050	<0.000050
	Naphthalene (mg/L)		<0.000050		<0.000050	<0.000050
	Phenanthrene (mg/L)		<0.000020		<0.000020	<0.000020
	Pyrene (mg/L)		<0.000010		<0.000010	<0.000010
	Quinoline (mg/L)		<0.000050		<0.000050	<0.000050
	Surrogate: Acridine d9 (%)		86.2		77.4	74.3
	Surrogate: Chrysene d12 (%)		109.5		119.6	95.8
	Surrogate: Naphthalene d8 (%)		98.4		109.8	88.1
	Surrogate: Phenanthrene d10 (%)		103.4		114.5	98.2

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2373302-11				
	Description	Groundwater				
	Sampled Date	21-OCT-19				
	Sampled Time	18:30				
	Client ID	MW-GW				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Benzo(a)pyrene (mg/L)					
	Benzo(b&j)fluoranthene (mg/L)					
	Benzo(b+j+k)fluoranthene (mg/L)					
	Benzo(g,h,i)perylene (mg/L)					
	Benzo(k)fluoranthene (mg/L)					
	Chrysene (mg/L)					
	Dibenz(a,h)anthracene (mg/L)					
	Fluoranthene (mg/L)					
	Fluorene (mg/L)					
	Indeno(1,2,3-c,d)pyrene (mg/L)					
	1-Methylnaphthalene (mg/L)					
	2-Methylnaphthalene (mg/L)					
	Naphthalene (mg/L)					
	Phenanthrene (mg/L)					
	Pyrene (mg/L)					
	Quinoline (mg/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BR-L-IC-N-WR	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-WR	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

F-IC-N-WR	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-WR	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-WR	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-WR	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VIC100-T-HARDNESS-VA	Water	Hardness from Total Metals	APHA 2340B

Custom Calculation for Hardness. Client is requesting when Total Metals are run, only Total metals are used for hardness calculation.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 1

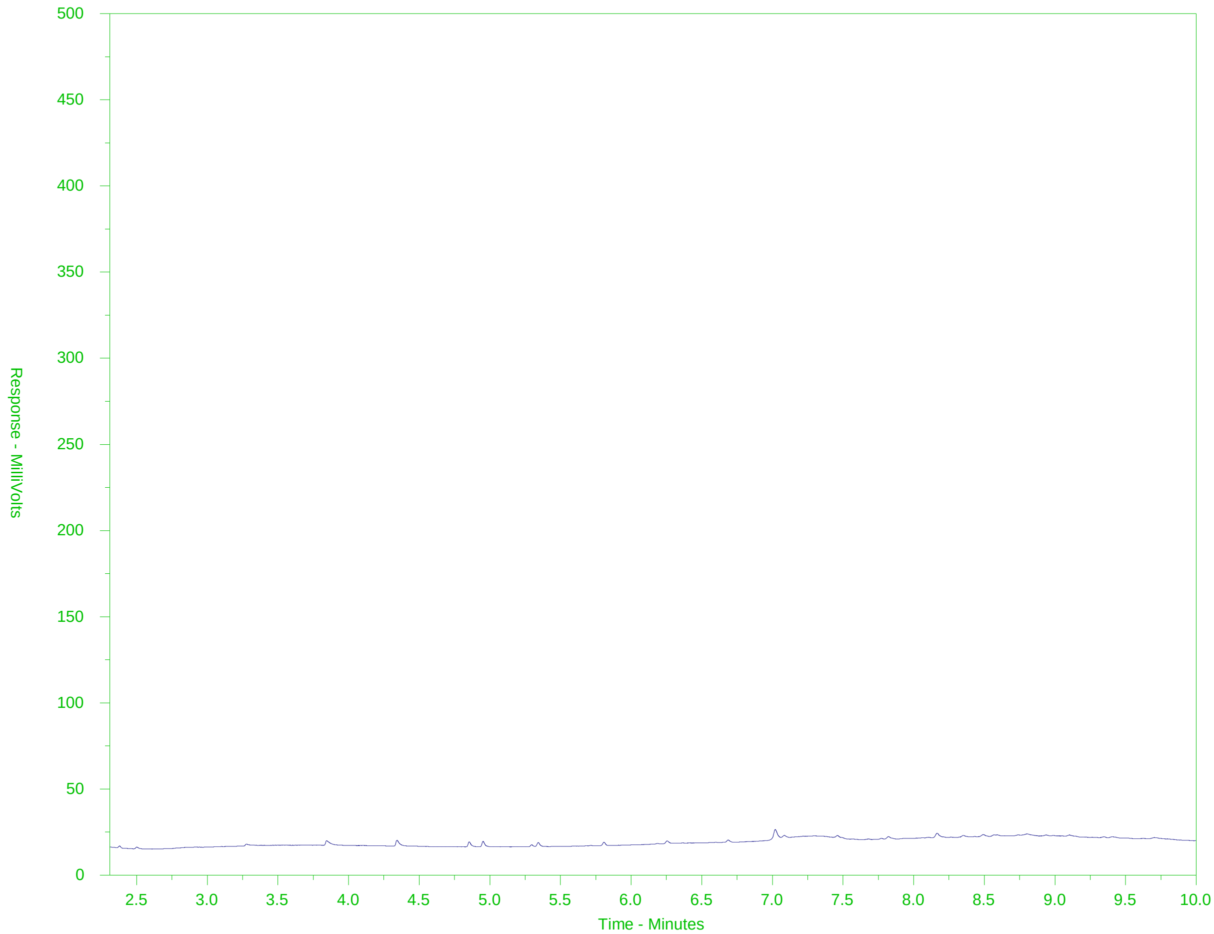
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2373302-2
Client Sample ID: MW13-04



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

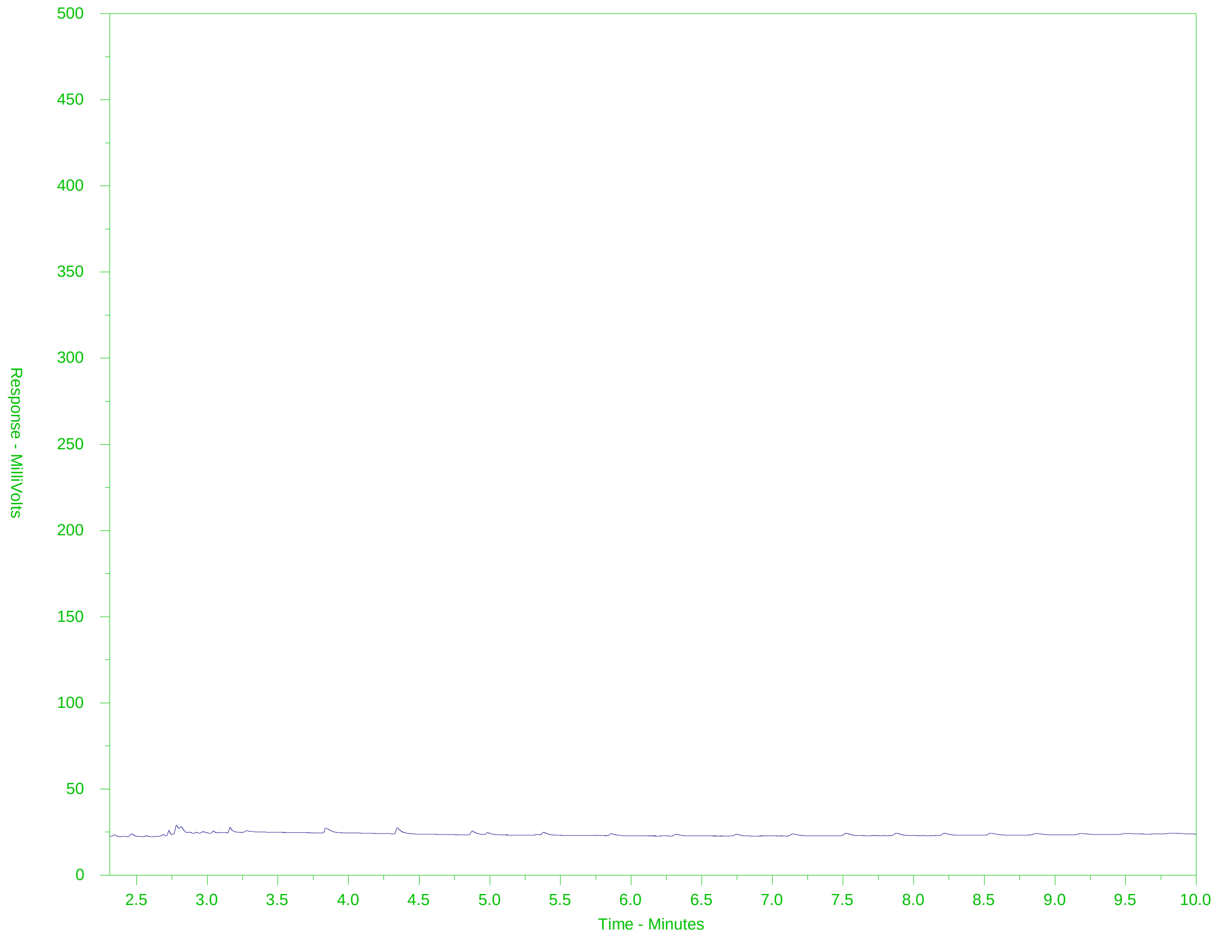
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2373302-5
Client Sample ID: MW13-07



EPH10-19		EPH19-32
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
Gasoline	Motor Oils/ Lube Oils/ Grease	
Diesel/ Jet Fuels		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

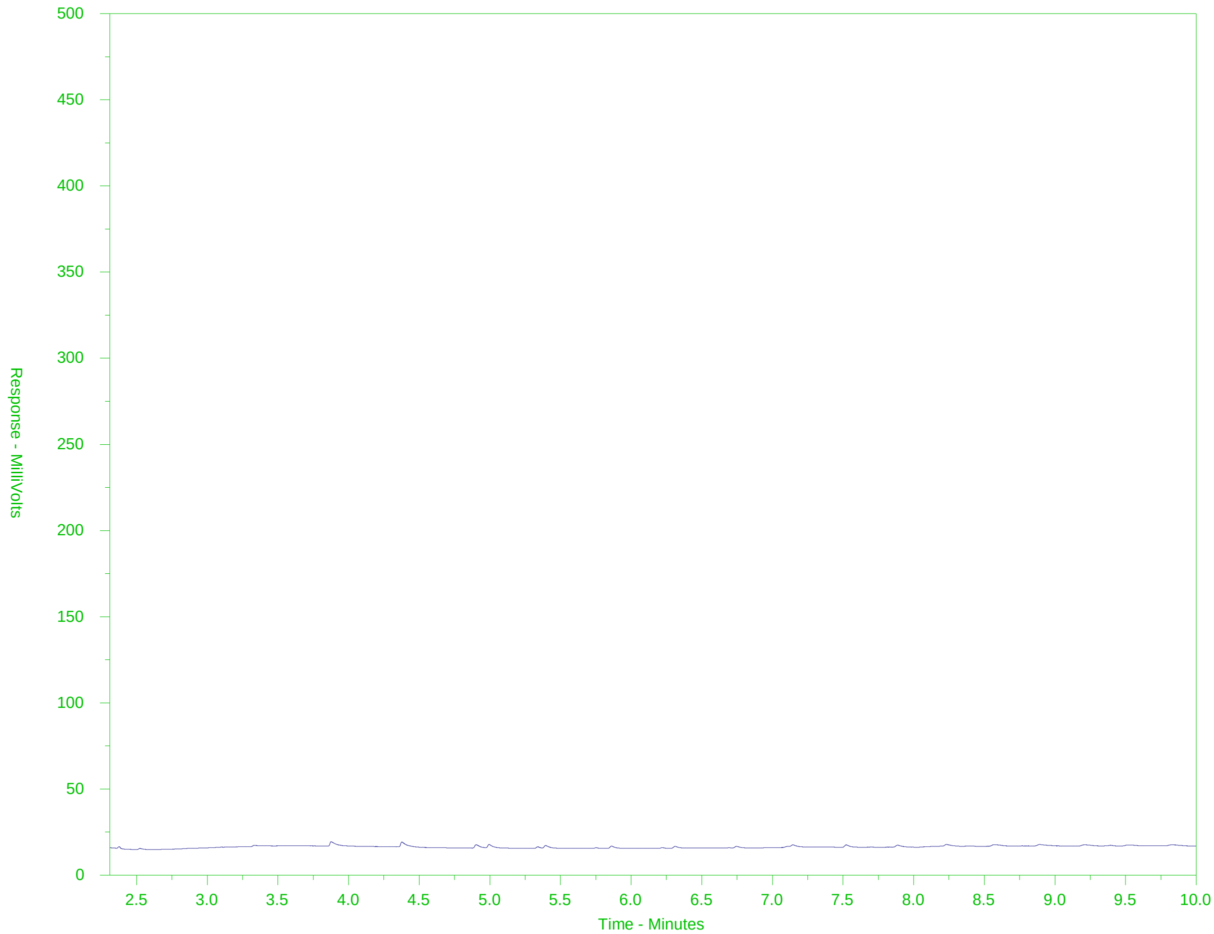
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2373302-7
Client Sample ID: MW13-10



EPH10-19		EPH19-32
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
Gasoline	Motor Oils/ Lube Oils/ Grease	
Diesel/ Jet Fuels		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

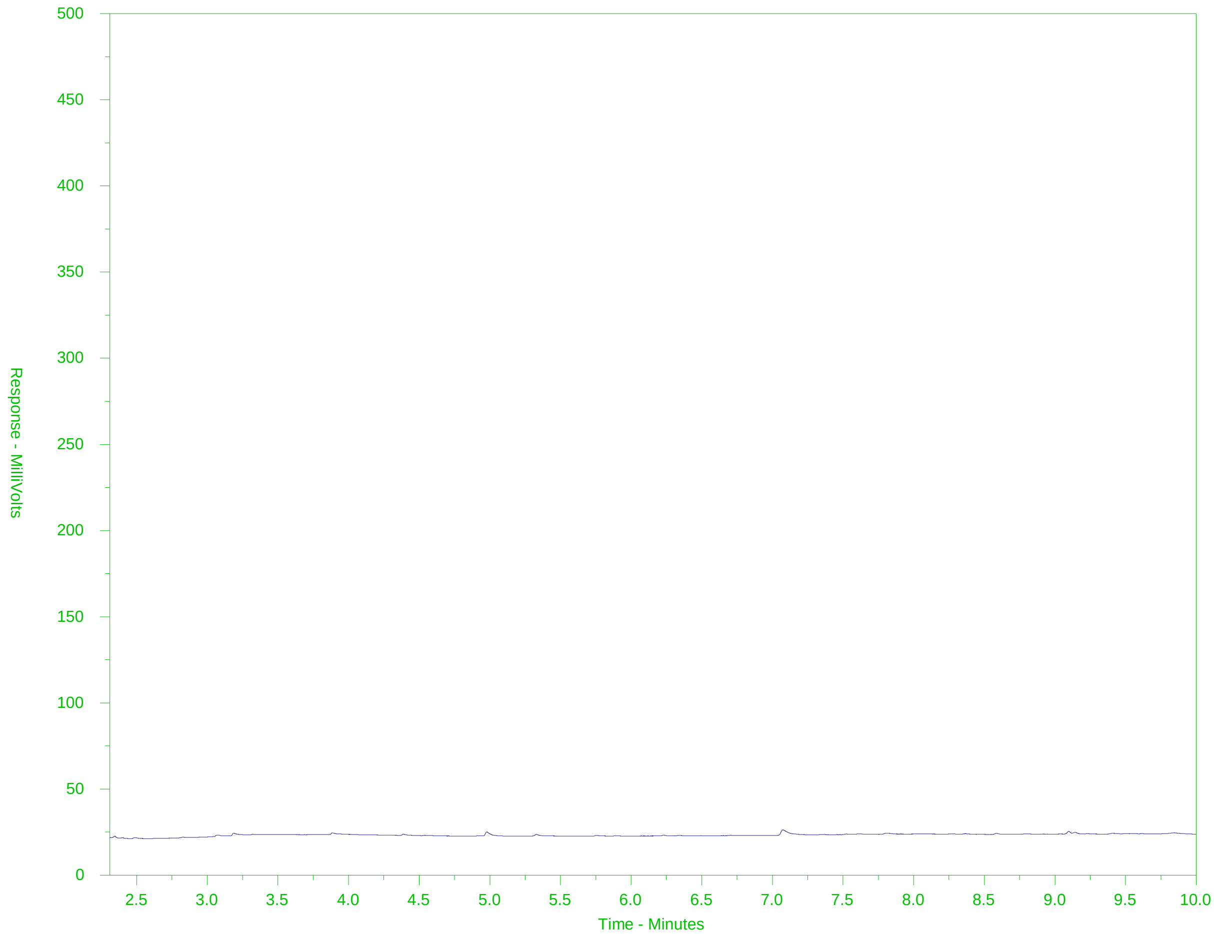
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

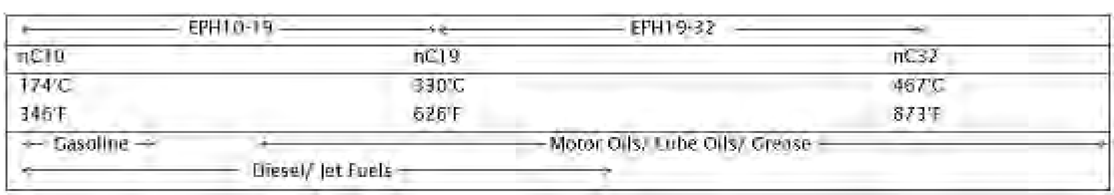
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2373302-9
Client Sample ID: MW14-01





The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

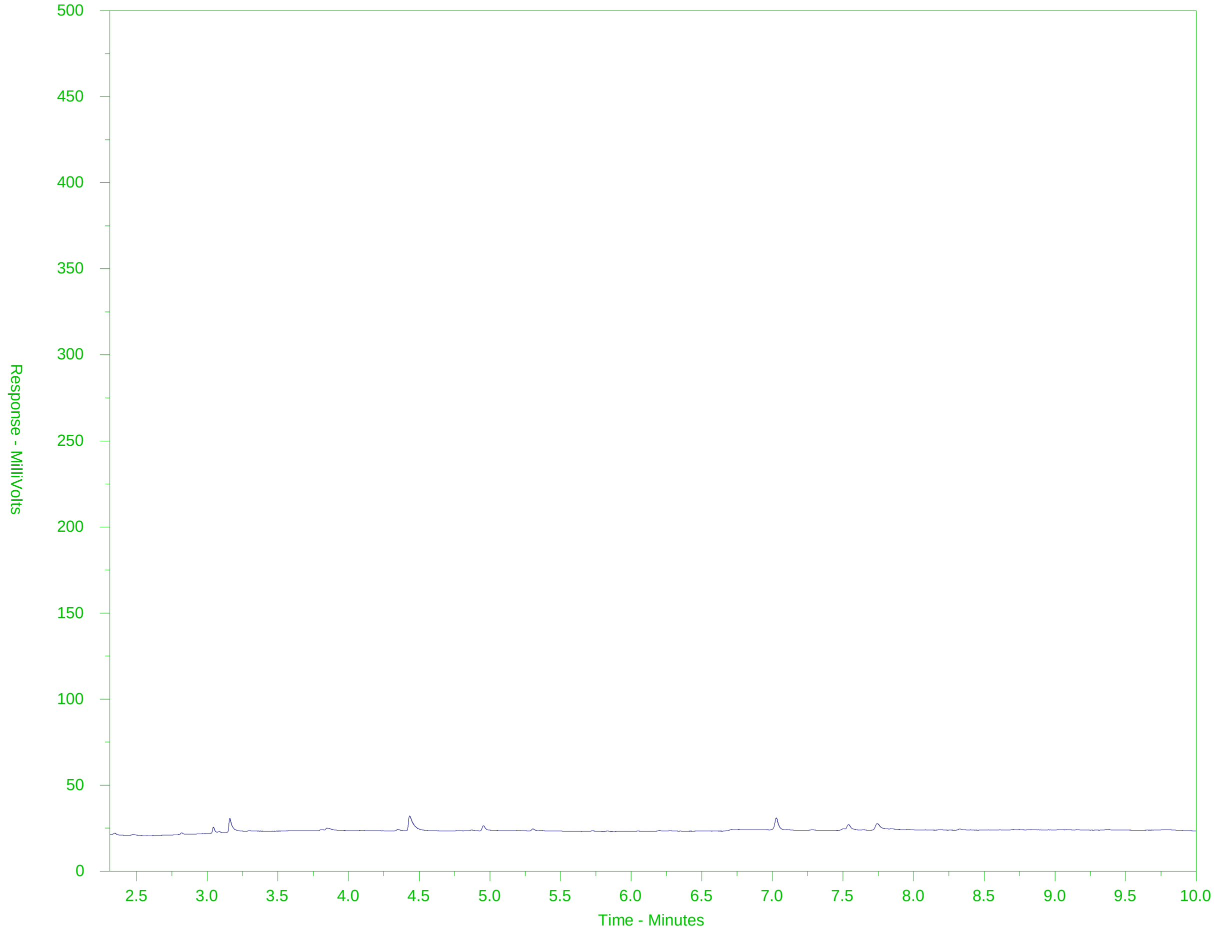
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2373302-10
Client Sample ID: MW14-04



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chain of Custody / Analyt
Canada Toll Free: 1
www.alsgloba

L2373302-COFC

OC #

Report To	
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Address:	601 Knightton Road
	Kimberly, BC
Phone:	250-427-8422 Fax:
Invoice To	Same as Report ? ☒ Yes ☐ No
Hardcopy of Invoice with Report?	☐ Yes ☒ No
Company:	
Contact:	
Address:	
Phone:	
Lab Work Order # (lab use only)	

Report Format / Distribution	
☒ Standard ☐ Other	
☒ PDF ☒ Excel ☒ Digital ☐ Fax	
Email 1:	mducharme@accessconsulting.ca
Email 2:	michelle.unger@teck.com
Email 3:	mmioska@alexcoenv.com
Client / Project Information	
Job #:	TECK-18-01
PO / AFE:	TECK PO9516
LSD:	
Quote #:	Q62635
ALS Contact:	Can Dang
Sampler:	

Service Requested (Rush for routine analysis subject to availability)

- ● Regular (Standard Turnaround Times - Business Days)
- ○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
- ○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
- ○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	pH, SPC, alkalinity, hardness	dissolved metals low level +Hg (F/P)	Anions (nitrate, nitrite, sulphate, Cl, F, Br)	Ammonia (P)	BTEX, LEPH, HEPH (P)	VPH, PAH (P)									Number of Containers
	MW13-01 (LP)	21-Oct-19	18:00	Groundwater	X	X	X	X											4
	MW13-04 (LP)	21-Oct-19	16:15	Groundwater	X	X	X	X	X	X									8
	MW13-00 (LQR)	22-Oct-19	12:00	Groundwater	X	X	X	X											4
	MW13-06 (LP)	22-Oct-19	15:15	Groundwater	X	X	X	X											4
	MW13-07 (LP)	25-Oct-19	13:00	Groundwater	X	X	X	X	X	X									
	MW13-08 (LP)	25-Oct-19	13:50	Groundwater	X	X	X	X											
	MW13-10 (LP)	23-Oct-19	10:45	Groundwater	X	X	X	X	X	X									8
	MW13-13 (LP)	22-Oct-19	11:30	Groundwater	X	X	X	X											4
	MW14-01 (LP)	23-Oct-19	15:00	Groundwater	X	X	X	X	X	X									8
	MW14-04 (LP)	23-Oct-19	14:40	Groundwater		X		X	X	X									6
	MW-GW (LQR)	21-Oct-19	18:30	Groundwater	X	X	X	X											4

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Yukon EQWin and ACC200 digital formats. General A: pH, EC, TSS (low) **General B:** pH, EC, TSS (low), anions-all
General C: pH, EC, TSS (low), anions-all, ion balance, alkalinity **General D:** pH, EC, TSS (low), SO4, ion balance, alkalinity **General E:** pH, EC, TSS (low), SO4, ion balance

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Emilie Bouchard	Date (dd-mmm-yy) 28-Oct-19	Time (hh-mm)	Received by:	Date: Oct 28	Time: 2:00PM	Temperature: 13.4 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

12.2
8.1

TC 30 Oct 19 11:50 AM

3.2, 4.4, 5.6°C

GENF 20.00 Front

TECK METALS LTD.
ATTN: Michelle Unger
601 Knightton Road
KIMBERLEY BC V1A 3E1

Date Received: 06-DEC-19
Report Date: 19-DEC-19 15:04 (MT)
Version: FINAL

Client Phone: 250-427-8404

Certificate of Analysis

Lab Work Order #: L2393003

Project P.O. #: Teck PO-9516
Job Reference: TECK-18-1
C of C Numbers: 1 of 2, 2 of 2
Legal Site Desc:

Can Dang
Senior Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2393003-1	L2393003-2	L2393003-3	L2393003-4	L2393003-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	03-DEC-19	05-DEC-19	03-DEC-19	03-DEC-19	02-DEC-19
	Sampled Time	15:55	10:45	13:10	14:00	15:22
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	325	310	394	349	955
	Hardness (as CaCO3) (mg/L)	173	163	184	178	539
	Hardness (from Totals) (mg/L)	189	175	224	200	586
	pH (pH)	8.23	8.22	8.25	8.22	8.11
	Total Suspended Solids (mg/L)	3.2	5.1	9.4	3.3	4.0
	Total Dissolved Solids (mg/L)	225	185	249	215	701
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	182	157	221	193	277
	Ammonia, Total (as N) (mg/L)	0.0060	<0.0050	<0.0050	<0.0050	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	DLDS <0.25
	Chloride (Cl) (mg/L)	0.77	<0.50	<0.50	<0.50	DLDS <2.5
	Fluoride (F) (mg/L)	0.112	0.158	0.096	0.056	DLDS <0.10
	Nitrate (as N) (mg/L)	0.0983	0.233	0.141	0.111	DLDS <0.025
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	DLDS <0.0050
	Sulfate (SO4) (mg/L)	11.1	15.2	15.3	4.61	286
Total Metals	Aluminum (Al)-Total (mg/L)	0.0364	0.0310	0.0361	0.0280	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00023	0.00015	0.00015	0.00017	<0.00010
	Arsenic (As)-Total (mg/L)	0.00124	0.00044	0.00061	0.00073	0.00034
	Barium (Ba)-Total (mg/L)	0.0751	0.0233	0.0658	0.0454	0.0326
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000549	0.000301	0.0000544	0.0000651	0.0000058
	Calcium (Ca)-Total (mg/L)	64.8	64.4	75.1	69.7	203
	Chromium (Cr)-Total (mg/L)	0.00121	0.00023	0.00017	0.00013	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00052
	Copper (Cu)-Total (mg/L)	0.00052	<0.00050	<0.00050	0.00065	<0.00050
	Iron (Fe)-Total (mg/L)	0.055	0.046	0.125	0.052	0.056
	Lead (Pb)-Total (mg/L)	0.00113	0.00158	0.000884	0.000197	0.000066
	Lithium (Li)-Total (mg/L)	0.0015	0.0017	0.0018	0.0015	0.0010
	Magnesium (Mg)-Total (mg/L)	6.70	3.46	8.82	6.19	19.1
	Manganese (Mn)-Total (mg/L)	0.00457	0.00342	0.0200	0.00982	0.0234
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00156	0.00102	0.00100	0.00160	0.000323
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.46	0.43	0.46	0.28	1.30
	Selenium (Se)-Total (mg/L)	0.000832	0.000925	0.000708	0.000578	0.000073

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2393003-6	L2393003-7	L2393003-8	L2393003-9	L2393003-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-DEC-19	04-DEC-19	04-DEC-19	04-DEC-19	04-DEC-19
	Sampled Time	12:00	10:45	13:44	14:00	12:15
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	380	406	366	368	<2.0
	Hardness (as CaCO3) (mg/L)	213	226	199	205	<0.50
	Hardness (from Totals) (mg/L)	231	248	215	216	<0.50
	pH (pH)	8.23	8.15	8.21	8.22	5.56
	Total Suspended Solids (mg/L)	2.0	3.5	<1.0	1.2	<1.0
	Total Dissolved Solids (mg/L)	213	229	213	207	<10
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	209	226	226	229	<1.0
	Ammonia, Total (as N) (mg/L)	0.0057	0.0129	<0.0050	0.0074	<0.0050
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.82	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.063	0.067	0.092	0.091	<0.020
	Nitrate (as N) (mg/L)	0.0708	0.0368	0.0433	0.0438	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	8.71	5.99	3.80	3.78	<0.30
Total Metals	Aluminum (Al)-Total (mg/L)	0.0131	0.0080	0.0034	0.0032	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00010	0.00010	0.00013	0.00012	<0.00010
	Arsenic (As)-Total (mg/L)	0.00035	0.00045	0.00030	0.00029	<0.00010
	Barium (Ba)-Total (mg/L)	0.153	0.273	0.179	0.179	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000152	0.0000319	0.0000065	0.0000069	<0.0000050
	Calcium (Ca)-Total (mg/L)	66.1	62.2	63.0	62.7	<0.050
	Chromium (Cr)-Total (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00016	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	0.00053	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	0.179	0.811	0.134	0.129	<0.010
	Lead (Pb)-Total (mg/L)	0.000067	0.000158	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)	0.0013	0.0010	0.0013	0.0013	<0.0010
	Magnesium (Mg)-Total (mg/L)	15.9	22.5	13.9	14.3	<0.10
	Manganese (Mn)-Total (mg/L)	0.0123	0.0519	0.0114	0.0109	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00185	0.00350	0.00201	0.00207	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.41	0.90	0.41	0.41	<0.10
	Selenium (Se)-Total (mg/L)	0.000589	0.000627	0.000551	0.000547	<0.000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2393003-11	L2393003-12			
	Description	Water	Water			
	Sampled Date	03-DEC-19	05-DEC-19			
	Sampled Time	11:56	12:00			
	Client ID	MH-22	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	303	<2.0			
	Hardness (as CaCO3) (mg/L)	159	<0.50 HTC			
	Hardness (from Totals) (mg/L)	165	<0.50			
	pH (pH)	7.92	5.48			
	Total Suspended Solids (mg/L)	<1.0	<1.0			
	Total Dissolved Solids (mg/L)	184	<10			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	121	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0333 RRV			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	1.29	<0.020			
	Nitrate (as N) (mg/L)	0.135	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	41.9	<0.30			
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	<0.0030			
	Antimony (Sb)-Total (mg/L)	0.00258	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00381	<0.00010			
	Barium (Ba)-Total (mg/L)	0.0160	<0.00010			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.00434	<0.0000050			
	Calcium (Ca)-Total (mg/L)	54.1	<0.050			
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	0.000350	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0063	<0.0010			
	Magnesium (Mg)-Total (mg/L)	7.12	<0.10			
	Manganese (Mn)-Total (mg/L)	0.00014	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.00891	<0.000050			
	Nickel (Ni)-Total (mg/L)	0.00348	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050			
	Potassium (K)-Total (mg/L)	0.62	<0.10			
	Selenium (Se)-Total (mg/L)	0.0153	<0.000050			

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2393003-1	L2393003-2	L2393003-3	L2393003-4	L2393003-5
	Sample ID	L2393003-1	L2393003-2	L2393003-3	L2393003-4	L2393003-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	03-DEC-19	05-DEC-19	03-DEC-19	03-DEC-19	02-DEC-19
	Sampled Time	15:55	10:45	13:10	14:00	15:22
	Client ID	MH-12	MH-04	MH-11	MH-29	MH-02
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	4.53	3.51	4.15	4.22	5.31
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.45	0.896	1.23	0.991	9.82
	Strontium (Sr)-Total (mg/L)	0.237	0.229	0.291	0.239	0.659
	Sulfur (S)-Total (mg/L)	4.68	5.54	5.88	2.24	103
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	0.00024	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00126	0.00087	0.00099	<0.00090 DLM	<0.00030
	Uranium (U)-Total (mg/L)	0.00114	0.00104	0.00136	0.000787	0.00216
	Vanadium (V)-Total (mg/L)	0.00075	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	0.0046	0.0079	0.0061	<0.0030	0.0034
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0018	0.0014	0.0011	0.0015	0.0013
	Antimony (Sb)-Dissolved (mg/L)	0.00021	0.00013	0.00012	0.00015	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00072	0.00037	0.00043	0.00058	0.00023
	Barium (Ba)-Dissolved (mg/L)	0.0734	0.0225	0.0557	0.0436	0.0319
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000454	0.000244	0.0000292	0.0000356	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	58.3	59.6	61.0	61.4	185
	Chromium (Cr)-Dissolved (mg/L)	0.00016	0.00016	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00050
	Copper (Cu)-Dissolved (mg/L)	0.00030	0.00043	0.00034	0.00041	0.00021
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	0.017	<0.010	0.011
	Lead (Pb)-Dissolved (mg/L)	0.000116	0.000082	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0014	0.0015	0.0014	0.0013	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	6.73	3.54	7.72	5.90	18.7
	Manganese (Mn)-Dissolved (mg/L)	0.00033	0.00031	0.00576	0.00248	0.00665
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00138	0.000792	0.000838	0.000850	0.000240
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.42	0.39	0.38	0.24	1.20
	Selenium (Se)-Dissolved (mg/L)	0.000906	0.000875	0.000625	0.000638	0.000060

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2393003-6	L2393003-7	L2393003-8	L2393003-9	L2393003-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-DEC-19	04-DEC-19	04-DEC-19	04-DEC-19	04-DEC-19
	Sampled Time	12:00	10:45	13:44	14:00	12:15
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	3.81	4.86	4.34	4.43	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	1.06	1.60	1.11	1.13	<0.050
	Strontium (Sr)-Total (mg/L)	0.227	0.169	0.190	0.190	<0.00020
	Sulfur (S)-Total (mg/L)	3.90	2.81	1.97	1.92	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	0.00159	0.00213	0.000950	0.000924	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0178	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0010	0.0011	<0.0010	0.0013	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00011	0.00012	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00022	0.00027	0.00022	0.00024	<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.147	0.266	0.181	0.187	<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000082	0.0000210	<0.0000050	0.0000059	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	59.1	54.5	56.3	58.5	<0.050
	Chromium (Cr)-Dissolved (mg/L)	0.00014	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00015	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00029	0.00052	0.00028	0.00022	RRV 0.00025
	Iron (Fe)-Dissolved (mg/L)	0.027	0.119	0.043	0.048	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0011	<0.0010	0.0012	0.0012	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	15.9	22.0	14.3	14.2	<0.10
	Manganese (Mn)-Dissolved (mg/L)	0.00537	0.0471	0.00773	0.00780	RRV 0.00014
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00132	0.00325	0.00188	0.00190	RRV 0.000081
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00064	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.38	0.79	0.38	0.37	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.000612	0.000584	0.000652	0.000614	<0.000050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2393003-11	L2393003-12			
	Description	Water	Water			
	Sampled Date	03-DEC-19	05-DEC-19			
	Sampled Time	11:56	12:00			
	Client ID	MH-22	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Total Metals	Silicon (Si)-Total (mg/L)	4.71	<0.10			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	0.892	<0.050			
	Strontium (Sr)-Total (mg/L)	0.251	<0.00020			
	Sulfur (S)-Total (mg/L)	15.0	<0.50			
	Thallium (Tl)-Total (mg/L)	0.000019	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.00403	<0.000010			
	Vanadium (V)-Total (mg/L)	0.00052	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.797	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	<0.0010				
	Antimony (Sb)-Dissolved (mg/L)	0.00259				
	Arsenic (As)-Dissolved (mg/L)	0.00390				
	Barium (Ba)-Dissolved (mg/L)	0.0170				
	Beryllium (Be)-Dissolved (mg/L)	<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.00456				
	Calcium (Ca)-Dissolved (mg/L)	51.1				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00027				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.000334				
	Lithium (Li)-Dissolved (mg/L)	0.0063				
	Magnesium (Mg)-Dissolved (mg/L)	7.60				
	Manganese (Mn)-Dissolved (mg/L)	0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00896				
	Nickel (Ni)-Dissolved (mg/L)	0.00385				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.62				
	Selenium (Se)-Dissolved (mg/L)	0.0154				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID		L2393003-1	L2393003-2	L2393003-3	L2393003-4	L2393003-5
Description		Water	Water	Water	Water	Water
Sampled Date		03-DEC-19	05-DEC-19	03-DEC-19	03-DEC-19	02-DEC-19
Sampled Time		15:55	10:45	13:10	14:00	15:22
Client ID		MH-12	MH-04	MH-11	MH-29	MH-02
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	4.34	3.56	3.52	4.01	5.17
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.59	0.903	1.11	0.933	9.65
	Strontium (Sr)-Dissolved (mg/L)	0.219	0.204	0.236	0.212	0.601
	Sulfur (S)-Dissolved (mg/L)	4.64	6.22	4.93	1.84	110
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00102	0.000958	0.00115	0.000715	0.00198
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0025	0.0051	0.0033	<0.0010	0.0031
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	0.00121	0.00023	0.00017	0.00013	<0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2393003-6	L2393003-7	L2393003-8	L2393003-9	L2393003-10
	Description	Water	Water	Water	Water	Water
	Sampled Date	04-DEC-19	04-DEC-19	04-DEC-19	04-DEC-19	04-DEC-19
	Sampled Time	12:00	10:45	13:44	14:00	12:15
	Client ID	MH-13	MH-30	MH-15	MH-SW	MH-FB
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	3.73	4.69	4.41	4.47	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	1.07	1.51	1.12	1.12	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.202	0.154	0.176	0.181	<0.00020
	Sulfur (S)-Dissolved (mg/L)	3.57	2.70	1.72	1.68	<0.50
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00012	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00149	0.00192	0.000871	0.000872	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0011	0.0125	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Hexavalent Chromium (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2393003-11	L2393003-12			
	Description	Water	Water			
	Sampled Date	03-DEC-19	05-DEC-19			
	Sampled Time	11:56	12:00			
	Client ID	MH-22	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	5.03				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	0.953				
	Strontium (Sr)-Dissolved (mg/L)	0.244				
	Sulfur (S)-Dissolved (mg/L)	16.2				
	Thallium (Tl)-Dissolved (mg/L)	0.000016				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.00396				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.836				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Speciated Metals	Chromium (III)-Total (mg/L)	<0.00010				
	Hexavalent Chromium (mg/L)	<0.00050				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Magnesium (Mg)-Dissolved	B	L2393003-10
Matrix Spike	Mercury (Hg)-Total	MS-B	L2393003-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2393003-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2393003-10
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2393003-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2393003-10
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L2393003-10
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2393003-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2393003-10
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L2393003-10
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2393003-10
Matrix Spike	Selenium (Se)-Dissolved	MS-B	L2393003-10
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2393003-10
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2393003-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2393003-10
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2393003-10
Matrix Spike	Barium (Ba)-Total	MS-B	L2393003-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L2393003-10
Matrix Spike	Calcium (Ca)-Total	MS-B	L2393003-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L2393003-10
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2393003-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2393003-10
Matrix Spike	Potassium (K)-Total	MS-B	L2393003-10
Matrix Spike	Sodium (Na)-Total	MS-B	L2393003-10
Matrix Spike	Strontium (Sr)-Total	MS-B	L2393003-1, -10, -11, -12, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L2393003-10

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-WR	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-WR	Water	Chloride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CR-CR3-TOT-CALC-ED Water Total Trivalent Chromium in Water CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the total hexavalent chromium (Cr(VI)) results.The Limit of Reporting for Chromium (III) varies as a function of the test results.

CR-CR6-ED Water Chromium, Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WR Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-WR Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-WR Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-WR Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

VIC100-T-HARDNESS-VA	Water	Hardness from Total Metals	APHA 2340B

Custom Calculation for Hardness. Client is requesting when Total Metals are run, only Total metals are used for hardness calculation.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 of 2   2 of 2

GLOSSARY OF REPORT TERMS
Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2393003-COFC

COC Number:

Report To	Contact and company name below will appear on the final report
Company:	TECK Metals Ltd
Contact:	Michelle Unger
Phone:	250-4278422
	Company address below will appear on the final report
Street:	601 Knightton Road
City/Province:	Kimberly, BC
Postal Code:	V1A 3E1
Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	
Quality Control (QC) Report with Report	
Select Distribution:	
Email 1 or Fax	mducharme@accessconsulting.ca
Email 2	mmioska@alexcoenv.com
Email 3	ebouchard@alexcoenv.com
Invoice Distribution	
Select Invoice Distribution:	
Email 1 or Fax	Michelle.unger@teck.com
Email 2	roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]			
PRIORITY (Business Days)	4 day [P4] 3 day [P3] 2 day [P2]	EMERGENCY	1 Business day [E1] Same Day, Weekend or Statutory holiday [E0]
Date and Time Required for all E&P TATs:		dd-mmm-yy hh:mm	

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information	
ALS Account # / Quote #:	Q62635
Job #:	TECK-18-1
PO / AFE:	Teck PO-9516
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: Can Dang | Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg (P)	Dissolved Metals (low level) +Hg (F/P)	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br) (P)	Ammonia (P)	TDS, TSS(low)	Chromium Speciation (P)	Number of Containers
	MH-12 (LP)	3-Dec-19	15:55	Water	R	R	R	R	R	R	R	8
	MH-04 (LP)	5-Dec-19	10:45	Water	R	R	R	R	R	R	R	8
	MH-11 (LP)	3-Dec-19	13:10	Water	R	R	R	R	R	R	R	8
	MH-29 (LP)	3-Dec-19	14:00	Water	R	R	R	R	R	R	R	8
	MH-02 (LP)	2-Dec-19	15:22	Water	R	R	R	R	R	R	R	8
	MH-13 (LP)	4-Dec-19	12:00	Water	R	R	R	R	R	R	R	8
	MH-30 (LP)	4-Dec-19	10:45	Water	R	R	R	R	R	R	R	8
	MH-15 (LP)	4-Dec-19	13:44	Water	R	R	R	R	R	R	R	8
	MH-SW (LQR)	4-Dec-19	14:00	Water	R	R	R	R	R	R	R	8
	MH-FB (LQFB)	4-Dec-19	12:15	Water	R	R	R	R	R	R	R	7
	MH-22 (LP)	3-Dec-19	11:56	Water	R	R	R	R	R	R	R	8
	SDH-S2 (LP)			Water	R	R	R	R	R	R	R	8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

Are samples for human drinking water use?

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐		SIF Observations	Yes ☐	No ☐
Ice Packs ☒	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated ☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C
5.7			5,6,6°C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Charlotte Rentmeister	Date: 6 dec 2019	Time:	Received by:	Date: Dec 6	Time: 11:30	Received by:	Date: 7 Dec 19	Time: 1:00 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2393003-COFC

COC Number: 15 -

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	
Company:	TECK Metals Ltd	Select Report Format:	
Contact:	Michelle Unger	Quality Control (QC) Report with Report	
Phone:	250-4278422		
	Company address below will appear on the final report	Select Distribution:	
Street:	601 Knightton Road	Email 1 or Fax	mducharme@alexcoenv.com
City/Province:	Kimberly, BC	Email 2	mmioska@alexcoenv.com
Postal Code:	V1A 3E1	Email 3	ebouchard@alexcoenv.com
Invoice To	Same as Report To	Invoice Distribution	
	Copy of Invoice with Report	Select Invoice Distribution:	
Company:		Email 1 or Fax	Michelle.unger@teck.com
Contact:		Email 2	roxanne.menear@teck.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]

PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]

EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q62635	AFE/Cost Center:	PO#
Job #:	TECK-18-1	Major/Minor Code:	Routing Code:
PO / AFE:	Teck PO-9516	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: Can Dang	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (low level) + Hg	Dissolved Metals (low level) +Hg	pH, SPC, alkalinity, hardness	Anions(Nitrate, Nitrite, Sulphate, Cl, F, Br)	Ammonia	TDS, TSS(low)	Chromium Speciation						Number of Containers
					P	F/P		P	P		P						
	Trip Blank (LQTB)	5-Dec-19	12:00	Water	R	R	R	R	R	R							7

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System?	
Are samples for human drinking water use?	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
6.4			5	6	6°C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Charlotte Rentmeister	Date: 6 dec 2019	Time:	Received by: 75	Date: Dec 6	Time: 11:30	Received by: JG	Date: 7 Dec 19	Time: 1:05 AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an **Authorized DW COC form.**

APPENDIX D

2019 WATER QUALITY RESULTS

		MW13-06				MW13-13				MW13-01			
		Burwick 1200 Portal				Downgradient of 1380 Portal				Jewelbox/Main Zone - in 1360 Gully, downgradient of 1380 Portal			
		27/Feb/19	4/Jun/19	28/Aug/19	22/Oct/19	27/Feb/19	5/Jun/19	28/Aug/19	22/Oct/19	25/Feb/19	5/Jun/19	27/Aug/19	21/Oct/19
Ground Water Elevation	masl	1179.1	1184.2	1181.2	1180.7	1244.4	1248.0	1248.9	1245.7	1180.3	1181.5	1181.1	1180.6
Temperature - Field	C	2.7	4	5.9	1.8		0.2	2.8	2.5	1.2	2.8	3.5	1
pH - Field	pH	7.61	6.71	6.75	7.04		7.44	7.6	8.24	7.68	6.93	7.17	7.41
pH - Lab	pH	7.02	7.94	8.32	7.64		8.03	8.12	8.05	7.62	8.07	8.36	7.78
Hardness (Dissolved, CaCO3)	mg/L	324	349	375	392		96.2	144	130	163	149	150	155
Conductivity - Field	µS/cm	740.1	642.6	728.6	786.9		213.5	283.7	266.6	358	309.3	289.5	293.1
Conductivity - Lab	µS/cm	685	696	743	779		195	293	252	323	294	296	295
Ammonia Nitrogen	mg/L	0.0142	0.0142	0.0172	0.0185		0.0170	0.0132	0.0122	0.0053	0.0186	<0.0050	0.0219
NO2-W	mg/L	<0.0010	0.0024	<0.0050	<0.0050		<0.0010	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L	<0.0050	<0.0050	<0.025	<0.025		0.182	0.746	0.914	0.377	0.398	0.354	0.409
Sulphate	mg/L	173	200	215	280		11.5	58.7	28.7	10.6	11.1	10.2	10.0
Fluoride	mg/L	0.586	0.529	0.52	0.54		0.092	0.137	0.151	0.338	0.345	0.378	0.396
Chloride	mg/L	<0.50	<0.50	<2.5	<2.5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromide	mg/L	<0.050	<0.050	<0.25	<0.25		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L	1.26	17.58	1.23	2.96		12.69	11.02	10.26	7.1	16.45	9.11	7.91
Dissolved Oxygen	%	10.9	156.7	10	21.4		101.6	81.6	76.4	57.2	140.7	68.6	55.8
Redox	mV	7.9	58.4	2.9	159.4		173.3	116.4	229.7	138.9	140.5	110.8	308.9
Alkalinity (CaCO3)	mg/L	184	188	221	171		92.1	87.5	110	158	151	156	159
Dissolved Arsenic	mg/L	0.0501	0.0420	0.0477	0.0217		0.00062	0.00044	0.00049	0.00043	0.00039	0.00028	0.00029
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L	0.0013	0.0014	0.0018	0.0019		0.0169	0.0109	0.0109	0.0032	0.0028	0.0013	0.0022
Dissolved Barium	mg/L	0.0241	0.0251	0.0273	0.0279		0.0108	0.0184	0.0124	0.0213	0.0213	0.0219	0.0217
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	Not enough water in well to sample.	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L	0.013	0.013	0.015	0.012		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L	117	124	134	138		35.9	54.5	48.5	58.4	53.2	54.3	55.9
Dissolved Cadmium	mg/L	<0.000040	<0.000020	0.0000089	<0.000060		0.00139	0.00378	0.000644	0.000511	0.000619	0.000748	0.000919
Dissolved Cobalt	mg/L	0.00265	0.00212	0.00245	0.00224		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L	0.00017	<0.00010	<0.00010	<0.00010		0.00013	<0.00010	0.00020	0.00025	0.00023	0.00021	0.00021
Dissolved Copper	mg/L	0.00021	<0.00020	<0.00020	0.00042		0.00145	0.00084	0.00168	0.00020		0.00020	0.00032
Dissolved Iron	mg/L	0.721	0.709	0.657	0.416		0.025	0.014	0.014	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L	2.05	2.02	2.19	2.23		0.51	0.63	0.85	0.61	0.63	0.65	0.66
Dissolved Lithium	mg/L	0.0086	0.0087	0.0088	0.0076		<0.0010	0.0012	<0.0010	0.0018	0.0019	0.0015	0.0011
Dissolved Magnesium	mg/L	8.01	9.61	9.93	11.2		1.56	2.01	2.06	4.21	3.88	3.52	3.80
Dissolved Manganese	mg/L	0.342	0.293	0.311	0.275		0.00069	0.00047	0.00059	0.00106	0.00229	0.00153	0.00039
Dissolved Molybdenum	mg/L	0.0394	0.0319	0.0359	0.0299		0.000174	0.000249	0.000401	0.000739	0.000755	0.000717	0.000493
Dissolved Sodium	mg/L	15.8	12.4	13.1	12.8		0.539	0.700	0.747	1.35	0.789	0.769	0.747
Dissolved Nickel	mg/L	0.0295	0.0305	0.0325	0.0353		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	<0.000050	0.000081	<0.000050	<0.000050		0.00166	0.00115	0.000673	0.000974	0.000769	0.000774	0.00148
Dissolved Phosphorus	mg/L	0.156	0.154	0.164	0.143		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L	0.00011	<0.00010	0.00010	0.00014		0.00012	0.00013	0.00017	0.00013	0.00021	0.00013	0.00011
Dissolved Sulphur	mg/L	59.4	73.1	75.8	92.4		4.37	19.2	9.37	3.92	4.33	3.51	3.63
Dissolved Selenium	mg/L	<0.000050	<0.000050	<0.000050	0.000163		0.000515	0.00135	0.000713	0.00125	0.00121	0.00123	0.00126

		MW13-06				MW13-13				MW13-01			
		Burwick 1200 Portal				Downgradient of 1380 Portal				Jewelbox/Main Zone - in 1360 Gully, downgradient of 1380 Portal			
		27/Feb/19	4/Jun/19	28/Aug/19	22/Oct/19	27/Feb/19	5/Jun/19	28/Aug/19	22/Oct/19	25/Feb/19	5/Jun/19	27/Aug/19	21/Oct/19
Dissolved Silicon	mg/L	15.6	16.7	15.5	14.3	Not enough water in well to sample	2.07	2.06	2.53	3.46	3.82	3.32	3.38
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	0.00021	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L	0.417	0.484	0.536	0.553		0.0656	0.0945	0.0776	0.187	0.169	0.166	0.146
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030		<0.00060	0.00035	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L	0.000011	0.000012	0.000014	0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L	0.0140	0.0116	0.0122	0.0100		0.000256	0.000374	0.000604	0.00100	0.00101	0.000912	0.000719
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	0.101	0.0984	0.105	0.110		0.0443	0.117	0.0150	0.0168	0.0221	0.0281	0.0354
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Acenaphthene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Acenaphthylene	mg/L												
Acridine	mg/L												
Anthracene	mg/L												
Benz(a)anthracene	mg/L												
Benzene	mg/L												
Benzo(a)pyrene	mg/L												
2-Methylnaphthalene	mg/L												
Benzo(b,j)fluoranthene	mg/L												
Benzo(g,h,i)perylene	mg/L												
VPH (C6-C10)	mg/L												
Benzo(k)fluoranthene	mg/L												
Methyl t-butyl ether	mg/L												
Xylenes, total	mg/L												
1-Methylnaphthalene	mg/L												
Dibenz(a,h)anthracene	mg/L												
HEPH	mg/L												
Fluorene	mg/L												
Fluoranthene	mg/L												
Ethylbenzene	mg/L												
EPH19-32	mg/L												
Chrysene	mg/L												
EPH10-19	mg/L												
Pyrene	mg/L												
Volatile Hydroc (VH6-10)	mg/L												
Toluene	mg/L												
Quinoline	mg/L												
LEPH	mg/L												
Phenanthrene	mg/L												
ortho-Xylene	mg/L												
Naphthalene	mg/L												
Methyl t-butyl ether	mg/L												
meta- & para-Xylene	mg/L												
Styrene	mg/L												
Indeno(1,2,3-c,d)pyrene	mg/L												

		MW13-08				MW14-01				MW14-02			
		Downgradient of 1380 Portal				In proximity of the landfill				In proximity of the landfill			
		27/Feb/19	6/Jun/19	27/Aug/19	25/Oct/19	25/Feb/19	3/Jun/19	27/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19
Ground Water Elevation	masl	1130.7	1133.7	1131.9	1131.5			1015.0	1014.7				
Temperature - Field	C	0.5	2.2	2.8	2.4			4.2					
pH - Field	pH	7.37	7.23	7.21	7.29			7.41					
pH - Lab	pH	7.54	8.06	8.02	8.09			8.41	8.01				
Hardness (Dissolved, CaCO3)	mg/L	353	243	273	306			223	214				
Conductivity - Field	µS/cm	674.3	472.8	510.6	540			409.2					
Conductivity - Lab	µS/cm	656	429	450	529			401	391				
Ammonia Nitrogen	mg/L	0.0129	0.0300	0.0056	0.0487			0.0220	0.0441				
NO2-W	mg/L	<0.0010	<0.0010	<0.0010	<0.0010			0.0012	<0.0010				
NO3-W	mg/L	0.0832	<0.0050	0.332	0.491			0.226	0.213				
Sulphate	mg/L	18.1	9.57	10.0	14.6			3.57	3.49				
Fluoride	mg/L	0.046	0.332	0.045	0.051			0.090	0.105				
Chloride	mg/L	<0.50	<0.50	<0.50	<0.50			<0.50	<0.50				
Bromide	mg/L	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050				
Dissolved Oxygen	mg/L	3.69	22.63	7.76	5.85			7.05					
Dissolved Oxygen	%	28.8	188.3	57.4	42.9			54.1					
Redox	mV	10.6	159.5	96.5	225.5			113.6					
Alkalinity (CaCO3)	mg/L	348	236	242	302			284	225				
Dissolved Arsenic	mg/L	0.00022	0.00029	0.00022	0.00016			0.00029	0.00025				
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010				
Dissolved Aluminium	mg/L	0.0026	0.0046	0.0085	0.0012			0.0058	0.0058				
Dissolved Barium	mg/L	0.265	0.138	0.175	0.214	Dry	Dry	0.117	0.116	Dry	Dry at 16.17m	Dry	Dry at 16.170m
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020			<0.000020	<0.000020				
Dissolved Boron	mg/L	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010				
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050				
Dissolved Calcium	mg/L	118	82.9	93.2	106			71.7	67.5				
Dissolved Cadmium	mg/L	0.0000590	0.0000684	0.0000468	0.0000558			0.0000362	0.0000287				
Dissolved Cobalt	mg/L	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010				
Dissolved Chromium	mg/L	0.00024	0.00038	0.00040	0.00045			0.00061	0.00067				
Dissolved Copper	mg/L	0.00034	0.00058	0.00040	0.00034			0.00073	0.00073				
Dissolved Iron	mg/L	<0.010	0.020	<0.010	<0.010			<0.010	<0.010				
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050	<0.0000050				
Dissolved Potassium	mg/L	0.79	0.65	0.64	0.66			0.71	0.62				
Dissolved Lithium	mg/L	0.0022	0.0014	0.0019	0.0019			<0.0010	<0.0010				
Dissolved Magnesium	mg/L	13.8	8.77	9.93	10.2			10.8	11.0				
Dissolved Manganese	mg/L	0.00023	0.00050	0.00036	0.00022			0.00098	0.00051				
Dissolved Molybdenum	mg/L	0.000727	0.000795	0.000608	0.000507			0.00226	0.00209				
Dissolved Sodium	mg/L	1.33	1.12	1.00	1.04			1.39	1.29				
Dissolved Nickel	mg/L	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050				
Dissolved Lead	mg/L	<0.000050	0.000088	<0.000050	<0.000050			0.000085	0.000062				
Dissolved Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050				
Dissolved Antimony	mg/L	0.00017	0.00014	0.00016	0.00016			0.00020	0.00017				
Dissolved Sulphur	mg/L	6.57	4.17	3.86	4.91			1.34	1.39				
Dissolved Selenium	mg/L	0.000939	0.00126	0.00127	0.00146			0.00100	0.00101				

		MW13-08				MW14-01				MW14-02			
		Downgradient of 1380 Portal				In proximity of the landfill				In proximity of the landfill			
		27/Feb/19	6/Jun/19	27/Aug/19	25/Oct/19	25/Feb/19	3/Jun/19	27/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19
Dissolved Silicon	mg/L	4.25	4.25	3.84	3.97			4.59	4.57				
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010				
Dissolved Strontium	mg/L	0.414	0.268	0.331	0.328			0.250	0.222				
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030	<0.00030				
Dissolved Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010				
Dissolved Uranium	mg/L	0.00213	0.00147	0.00147	0.00146			0.000659	0.000638				
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050				
Dissolved Zinc	mg/L	0.0013	0.0018	<0.0010	0.0013			0.0013	0.0024				
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030	<0.00030				
Acenaphthene	mg/L							<0.000010	<0.000010				
Acenaphthylene	mg/L							<0.000010	<0.000010				
Acridine	mg/L							<0.000010	<0.000010				
Anthracene	mg/L							<0.000010	<0.000010				
Benz(a)anthracene	mg/L							<0.000010	<0.000010				
Benzene	mg/L							<0.00050	<0.00050				
Benzo(a)pyrene	mg/L							<0.0000050	<0.0000050				
2-Methylnaphthalene	mg/L							<0.000050	<0.000050				
Benzo(b,j)fluoranthene	mg/L							<0.000010	<0.000010				
Benzo(g,h,i)perylene	mg/L							<0.000010	<0.000010				
VPH (C6-C10)	mg/L							<0.10	<0.10				
Benzo(k)fluoranthene	mg/L							<0.000010	<0.000010				
Methyl t-butyl ether	mg/L					Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
Xylenes, total	mg/L							<0.00075	<0.00075				
1-Methylnaphthalene	mg/L							<0.000050	<0.000050				
Dibenz(a,h)anthracene	mg/L							<0.0000050	<0.0000050				
HEPH	mg/L							<0.25	<0.25				
Fluorene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable			<0.000010	<0.000010				
Fluoranthene	mg/L							<0.000010	<0.000010				
Ethylbenzene	mg/L							<0.00050	<0.00050				
EPH19-32	mg/L							<0.25	<0.25				
Chrysene	mg/L							<0.000010	<0.000010				
EPH10-19	mg/L							<0.25	<0.25				
Pyrene	mg/L							<0.000010	<0.000010				
Volatile Hydroc (VH6-10)	mg/L							<0.10	<0.10				
Toluene	mg/L							<0.00045	<0.00045				
Quinoline	mg/L							<0.000050	<0.000050				
LEPH	mg/L							<0.25	<0.25				
Phenanthrene	mg/L							<0.000020	<0.000020				
ortho-Xylene	mg/L							<0.00050	<0.00050				
Naphthalene	mg/L							<0.000050	<0.000050				
Methyl t-butyl ether	mg/L												
meta- & para-Xylene	mg/L							<0.00050	<0.00050				
Styrene	mg/L							<0.00050	<0.00050				
Indeno(1,2,3-c,d)pyrene	mg/L							<0.000010	<0.000010				

		MW14-03				MW14-04				MW13-04			
		In proximity of the landfill				In proximity of the landfill				Main Access Road			
		25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	4/Jun/19	28/Aug/19	21/Oct/19
Ground Water Elevation	masl						1017.7	1017.8	1017.9		1192.4	1181.3	1180.7
Temperature - Field	C										1.2	2.1	1.5
pH - Field	pH										7.53	7.54	7.83
pH - Lab	pH							8.29			8.19	8.37	8.10
Hardness (Dissolved, CaCO3)	mg/L							163	161		132	142	164
Conductivity - Field	µS/cm										269.5	298.9	295.9
Conductivity - Lab	µS/cm							317			253	297	281
Ammonia Nitrogen	mg/L										0.0063	0.0175	0.0247
NO2-W	mg/L							0.0011			<0.0010	<0.0010	<0.0010
NO3-W	mg/L							0.0735			0.369	0.618	0.663
Sulphate	mg/L							3.82			5.26	4.78	4.71
Fluoride	mg/L							0.070			0.068	0.052	0.058
Chloride	mg/L							1.16			<0.50	<0.50	<0.50
Bromide	mg/L							<0.050			<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L										12.52	8.93	8.17
Dissolved Oxygen	%										102.6	68.2	58.6
Redox	mV										170.2	104.3	264.7
Alkalinity (CaCO3)	mg/L							191			133	193	161
Dissolved Arsenic	mg/L							0.00080	0.00066		0.00076	0.00071	0.00085
Dissolved Silver	mg/L							<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L							0.0150	0.0029		0.0034	0.0019	0.0029
Dissolved Barium	mg/L	Dry	Dry at 7.5m	Dry	Dry	Dry	Water collection not possible	0.132	0.120	Dry	0.0378	0.0506	0.0477
Dissolved Beryllium	mg/L							<0.000020	<0.000020		<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L							<0.010	<0.010		<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L							<0.000050	<0.000050		<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L							53.6	52.6		47.9	51.0	59.3
Dissolved Cadmium	mg/L							0.0000666	0.0000519		0.000471	0.000432	0.000489
Dissolved Cobalt	mg/L							<0.00010	<0.00010		<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L							0.00037	0.00029		0.00033	0.00027	0.00034
Dissolved Copper	mg/L							0.0143	0.00183		0.00081	0.00039	0.00223
Dissolved Iron	mg/L							0.024	<0.010		<0.010	<0.010	<0.010
Dissolved Mercury	mg/L							<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L							2.20	1.35		0.48	0.42	0.78
Dissolved Lithium	mg/L							0.0019	0.0017		0.0017	0.0015	0.0016
Dissolved Magnesium	mg/L							7.17	7.16		2.99	3.47	3.91
Dissolved Manganese	mg/L							0.00341	0.00547		0.00071	0.00017	0.00091
Dissolved Molybdenum	mg/L							0.00562	0.00501		0.000550	0.000646	0.000639
Dissolved Sodium	mg/L							2.84	2.06		0.619	0.888	1.02
Dissolved Nickel	mg/L							0.00185	<0.00050		<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L							0.00164	0.000085		0.000451	0.000536	0.000699
Dissolved Phosphorus	mg/L							<0.050	<0.050		<0.050	<0.050	<0.050
Dissolved Antimony	mg/L							0.00029	0.00032		0.00029	0.00025	0.00032
Dissolved Sulphur	mg/L							1.54	1.21		2.27	1.66	1.55
Dissolved Selenium	mg/L							0.000125	0.000215		0.00110	0.00105	0.00109

		MW14-03				MW14-04				MW13-04			
		In proximity of the landfill				In proximity of the landfill				Main Access Road			
		25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	4/Jun/19	28/Aug/19	21/Oct/19
Dissolved Silicon	mg/L							3.80	3.72		4.16	3.83	4.01
Dissolved Tin	mg/L							<0.00010	<0.00010		<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L							0.217	0.191		0.112	0.131	0.144
Dissolved Titanium	mg/L							0.00098	<0.00030		<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L							<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L							0.000504	0.000440		0.000645	0.000657	0.000719
Dissolved Vanadium	mg/L							<0.00050	<0.00050		<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L							0.0101	0.0027		0.0196	0.0117	0.0173
Dissolved Zirconium	mg/L							<0.00030	<0.00030		<0.00030	<0.00030	<0.00030
Acenaphthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Acridine	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Anthracene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Benzene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Benzo(a)pyrene	mg/L								<0.0000050		<0.0000050	<0.0000050	<0.0000050
2-Methylnaphthalene	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
Benzo(b,j)fluoranthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
VPH (C6-C10)	mg/L								<0.10		<0.10	<0.10	<0.10
Benzo(k)fluoranthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Methyl t-butyl ether	mg/L	Dry	Dry	Dry	Dry	Dry	Water collection not possible		<0.00050	Dry	<0.00050	<0.00050	<0.00050
Xylenes, total	mg/L								<0.00075		<0.00075	<0.00075	<0.00075
1-Methylnaphthalene	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
Dibenz(a,h)anthracene	mg/L								<0.0000050		<0.0000050	<0.0000050	<0.0000050
HEPH	mg/L							Insufficent Water for complete analysis	<0.25		<0.25	<0.25	0.31
Fluorene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Fluoranthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Ethylbenzene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
EPH19-32	mg/L								<0.25		<0.25	<0.25	0.31
Chrysene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
EPH10-19	mg/L								<0.25		<0.25	<0.25	<0.25
Pyrene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Volatile Hydroc (VH6-10)	mg/L								<0.10		<0.10	<0.10	<0.10
Toluene	mg/L								<0.00045		<0.00045	<0.00045	<0.00045
Quinoline	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
LEPH	mg/L								<0.25		<0.25	<0.25	<0.25
Phenanthrene	mg/L								<0.000020		<0.000020	<0.000020	<0.000020
ortho-Xylene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Naphthalene	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
Methyl t-butyl ether	mg/L												
meta- & para-Xylene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Styrene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Indeno(1,2,3-c,d)pyrene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010

		MW13-05				MW13-07				MW13-10			
		Main Access Road - south of the Mill Site on the Main Access Road				North Dam - north of the North Dam and Tailings Pond Area				Mill Site - northeast of the Mill Site			
		25/Feb/19	4/Jun/19	27/Aug/19	21/Oct/19	27/Feb/19	5/Jun/19	27/Aug/19	25/Oct/19	26/Feb/19	6/Jun/19	27/Aug/19	23/Oct/19
Ground Water Elevation	masl	Dry	1193.8	Dry	Dry	1093.2	1094.6	1093.8	1093.6	1115.2	1117.5	1115.7	1115.6
Temperature - Field	C		0.8			3	3.7	4	3.3	1.6	1.8	2.6	2.1
pH - Field	pH		7.6			7.48	7.22	7.26	7.57	7.55	7.35	7.39	7.58
pH - Lab	pH		8.17			7.64	8.23	8.45	7.96	7.83	8.07	8.12	8.10
Hardness (Dissolved, CaCO3)	mg/L		169			234	218	223	231	230	232	239	241
Conductivity - Field	µS/cm		370.7			506	492.7	470.9	460.9	549.2	459.3	436.8	438.7
Conductivity - Lab	µS/cm		340			502	449	473	450	450	413	414	435
Ammonia Nitrogen	mg/L		0.0131			0.164	0.148	0.164	0.150	0.0147	0.0056	0.0142	0.0220
NO2-W	mg/L		<0.0010			0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0042
NO3-W	mg/L		1.53			<0.0050	<0.0050	<0.0050	<0.0050	0.532	0.243	0.521	0.535
Sulphate	mg/L		47.4			42.5	32.6	35.6	33.4	35.1	9.68	34.4	35.3
Fluoride	mg/L		0.064			0.370	0.336	0.347	0.348	0.055	0.055	0.055	0.063
Chloride	mg/L		<0.50			0.71	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.64
Bromide	mg/L		<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L					1.84	21.89	0.27	1.16	6.5	17.11	7.46	7.77
Dissolved Oxygen	%		97.1			15.7	189.4	2.1	8.4	52.8	141.3	54.9	56.6
Redox	mV		150.6			-105.2	-81.8	-131.7	-95	145.8	163.8	97.9	215.2
Alkalinity (CaCO3)	mg/L		132			230	227	231	237	207	199	210	215
Dissolved Arsenic	mg/L		0.00053			0.00266	0.00213	0.00308	0.00259	0.00105	0.00108	0.00115	0.00110
Dissolved Silver	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L		0.0025			0.0036	0.0020	0.0024	0.0034	0.0027	0.0016	0.0020	0.0018
Dissolved Barium	mg/L		0.0598			0.0271	0.0266	0.0265	0.0282	0.00767	0.0103	0.00857	0.00805
Dissolved Beryllium	mg/L		<0.000020			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L		<0.010			0.024	0.022	0.022	0.024	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L		61.4			66.7	61.4	62.4	65.3	78.4	78.7	81.9	82.1
Dissolved Cadmium	mg/L		0.0000702			0.0000075	<0.0000050	<0.0000050	<0.000010	0.0000165	0.0000224	0.0000187	0.0000284
Dissolved Cobalt	mg/L		<0.00010			0.00055	0.00033	0.00036	0.00036	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L		0.00040			0.00019	0.00010	<0.00010	<0.00010	0.00046	0.00045	0.00040	0.00047
Dissolved Copper	mg/L		0.00233			0.00031	0.00021	<0.00020	0.00033	<0.00020	0.00026	0.00066	0.00217
Dissolved Iron	mg/L		<0.010			2.10	2.10	2.22	2.17	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L		<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L		0.61			3.30	2.91	2.92	3.23	1.08	1.07	1.17	1.24
Dissolved Lithium	mg/L		0.0017			0.0083	0.0087	0.0086	0.0081	0.0016	0.0016	0.0018	0.0016
Dissolved Magnesium	mg/L		3.82			16.5	15.8	16.4	16.5	8.31	8.53	8.46	8.80
Dissolved Manganese	mg/L		0.00092			0.990	0.691	0.750	0.778	0.00016	0.00027	0.00038	0.00054
Dissolved Molybdenum	mg/L		0.000619			0.00374	0.00302	0.00319	0.00302	0.00183	0.00169	0.00200	0.00178
Dissolved Sodium	mg/L		0.909			13.8	7.42	9.14	8.93	1.94	1.87	2.00	2.11
Dissolved Nickel	mg/L		<0.00050			0.00207	0.00086	0.00052	0.00086	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L		0.000143			0.000094	<0.000050	<0.000050	0.000064	0.000093	0.000103	0.000146	0.000252
Dissolved Phosphorus	mg/L		<0.050			0.085	0.088	0.098	0.125	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L		0.00034			<0.00010	<0.00010	<0.00010	<0.00010	0.00012	0.00012	0.00013	0.00015
Dissolved Sulphur	mg/L		16.6			14.3	12.4	12.6	11.6	11.8	11.5	11.7	11.4
Dissolved Selenium	mg/L		0.00256			<0.000050	<0.000050	<0.000050	<0.000050	0.00151	0.00159	0.00159	0.00156

		MW13-05				MW13-07				MW13-10			
		Main Access Road - south of the Mill Site on the Main Access Road				North Dam - north of the North Dam and Tailings Pond Area				Mill Site - northeast of the Mill Site			
		25/Feb/19	4/Jun/19	27/Aug/19	21/Oct/19	27/Feb/19	5/Jun/19	27/Aug/19	25/Oct/19	26/Feb/19	6/Jun/19	27/Aug/19	23/Oct/19
Dissolved Silicon	mg/L		4.95			7.22	8.12	7.69	7.63	3.91	4.32	3.99	3.92
Dissolved Tin	mg/L		<0.00010			0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010
Dissolved Strontium	mg/L		0.183			0.479	0.442	0.462	0.433	0.359	0.335	0.394	0.327
Dissolved Titanium	mg/L		<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L		0.000872			0.00691	0.00629	0.00678	0.00617	0.00293	0.00258	0.00308	0.00295
Dissolved Vanadium	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L		0.0181			0.0027	0.0013	<0.0010	0.0021	<0.0010	0.0019	0.0020	0.0033
Dissolved Zirconium	mg/L		<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Acenaphthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Benzo(a)pyrene	mg/L		<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
2-Methylnaphthalene	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000056
Benzo(b,j)fluoranthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
VPH (C6-C10)	mg/L		<0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(k)fluoranthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Methyl t-butyl ether	mg/L	Dry	<0.00050	Dry	Dry	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes, total	mg/L		<0.00075			<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
1-Methylnaphthalene	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dibenz(a,h)anthracene	mg/L		<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
HEPH	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Fluorene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluoranthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Ethylbenzene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
EPH19-32	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Chrysene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
EPH10-19	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Pyrene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Volatile Hydroc (VH6-10)	mg/L		<0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Toluene	mg/L		<0.00045			<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Quinoline	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
LEPH	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Phenanthrene	mg/L		<0.000020			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
ortho-Xylene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Naphthalene	mg/L		<0.000050			0.000054	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Methyl t-butyl ether	mg/L												
meta- & para-Xylene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Indeno(1,2,3-c,d)pyrene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

		MH-11						MH-12					
		Camp Creek located 2km downstream of the Reclaim Pond (Upper False Creek Canyon).						East fork of Tributary E — of false Canyon approximately 2 km downstream north tailings dam					
		25-Feb-19	25-Apr-19	5-Jun-19	28-Aug-19	23-Oct-19	3-Dec-19	25-Feb-19	24-Apr-19	3-Jun-19	26-Aug-19	23-Oct-19	3-Dec-19
Total Hardness	mg/L				205	208	224				177	171	189
Hardness (Dissolved, CaCO3)	mg/L	219	230	190	201		184	178		139	168		173
Temperature - Field	C	0	0	1.8	5.4	-0.1	-0.1	0.1		3.1	5.6	-0.1	-0.1
pH - Field	pH	7.58	7.19	7.89	7.88	8.23	8.43	7.67		7.71	7.84	8.4	8.61
pH - Lab	pH	7.96	8.39	8.39	8.41	8.32	8.25	8.14		8.22	8.47	8.33	8.23
Conductivity - Field	µS/cm	218	420	352.9	360.4	388.2	273.2	406.2		280.9	306.9	323.3	293.2
Conductivity - Lab	µS/cm	418	415	336	368	393	394	357		261	321	333	325
Total Dissolved Solids	mg/L	251	249	206	221	271	249	210		157	192	204	225
Total Suspended Solids	mg/L	<1.0	1.3	7.1	1.2	<1.0	9.4	1.6		5.5	<1.0	<1.0	3.2
Discharge	L/min		840	10960	3970	1910	780			3310	1330	260	714
Ammonia Nitrogen	mg/L	0.0058	0.0254	0.0056	<0.0050	<0.0050	<0.0050	0.0167		0.0064	<0.0050	<0.0050	0.0060
NO2-W	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L	0.0987	0.0856	<0.0050	0.0605	0.134	0.141	0.137		0.0112	0.0166	0.0593	0.0983
Sulphate	mg/L	13.5	14.5	14.2	15.0	17.2	15.3	12.0		13.0	11.3	12.2	11.1
Fluoride	mg/L	0.091	0.092	<0.020	0.082	0.089	0.096	0.121		0.230	0.112	0.109	0.112
Chloride	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.46		1.54	<0.50	<0.50	0.77
Bromide	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L	9.43	10.17	11.66	11.07	10.16	10.5	9.49		15.07	9	12.72	12.86
Dissolved Oxygen (Percent)	%	72.1	70	94.8	87.6	69.3	72.2	72.5		127.5	71.6	86.8	87.9
Redox	mV	130.8	160.6	171.6	93.8	258.1	176.6	106		157	140	269.3	229
Alkalinity (CaCO3)	mg/L	212	230	168	214	223	221	177		138	189	200	182
Total Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L	0.0100	0.173	0.0152	0.0107	0.0058	0.0361	0.0154		0.0522	0.0073	0.0155	0.0364
Total Arsenic	mg/L	0.00043	0.00090	0.00059	0.00062	0.00049	0.00061	0.00096	Augered to ground. No water found. Unable to sample	0.00104	0.00085	0.00072	0.00124
Total Barium	mg/L	0.0739	0.0830	0.0524	0.0639	0.0563	0.0658	0.0785		0.0600	0.0766	0.0673	0.0751
Total Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L	76.3	74.3	68.2	68.7	69.4	75.1	64.6		51.7	60.6	57.9	64.8
Total Cadmium	mg/L	0.0000605	0.000205	0.0000581	0.0000557	0.0000388	0.0000544	0.000118		0.0000533	0.0000431	0.0000362	0.0000549
Total Cobalt	mg/L	<0.00010	0.00019	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L	<0.00010	0.00038		<0.00010	0.00013	0.00017	0.00044			0.00023	<0.00040	0.00121
Total Chromium	mg/L	<0.00010	0.00038	0.00016	<0.00010	0.00013	0.00017	0.00044		0.00039	0.00023	0.00022	0.00121
Total Chromium VI	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	0.00070	<0.00050
Total Copper	mg/L	<0.00050	0.00080	<0.00050	0.00056	<0.00050	<0.00050	0.00225		<0.00050	<0.00050	<0.00050	0.00052
Total Iron	mg/L	0.061	0.483	0.037	0.069	0.046	0.125	0.043		0.085	0.011	0.019	0.055
Total Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L	0.51	0.73	0.47	0.44	0.45	0.46	0.59		0.45	0.44	0.47	0.46
Total Lithium	mg/L	0.0015	0.0018	0.0014	0.0015	0.0016	0.0018	0.0013		0.0013	0.0014	0.0014	0.0015
Total Magnesium	mg/L	8.99	9.41	5.94	8.21	8.50	8.82	6.63		4.78	6.26	6.42	6.70
Total Manganese	mg/L	0.0136	0.0581	0.00523	0.00847	0.00862	0.0200	0.00505		0.00856	0.00116	0.00085	0.00457
Total Molybdenum	mg/L	0.000749	0.000824	0.000840	0.00111	0.000971	0.00100	0.00138		0.00119	0.00127	0.00122	0.00156
Total Sodium	mg/L	1.41	1.49	0.904	1.17	1.19	1.23	2.47		0.819	1.00	1.07	1.45
Total Nickel	mg/L	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	0.00051		<0.00050	<0.00050	<0.00050	<0.00050
Total Lead	mg/L	0.000277	0.00422	0.000410	0.000345	0.000136	0.000884	0.00214		0.00197	0.000365	0.000343	0.00113
Total Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.00013	0.00021	0.00019	0.00015	0.00012	0.00015	0.00028		0.00023	0.00023	0.00020	0.00023
Total Selenium	mg/L	0.000528	0.000572	0.000719	0.000591	0.000723	0.000708	0.000942		0.000624	0.000791	0.000754	0.000832

		MH-11						MH-12					
		Camp Creek located 2km downstream of the Reclaim Pond (Upper False Creek Canyon).						East fork of Tributary E — of false Canyon approximately 2 km downstream north tailings dam					
		25-Feb-19	25-Apr-19	5-Jun-19	28-Aug-19	23-Oct-19	3-Dec-19	25-Feb-19	24-Apr-19	3-Jun-19	26-Aug-19	23-Oct-19	3-Dec-19
Total Silicon	mg/L	3.84	4.12	3.51	3.58	3.90	4.15	3.97		3.79	4.04	4.22	4.53
Total Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Total Strontium	mg/L	0.267	0.299	0.234	0.271	0.268	0.291	0.224		0.188	0.232	0.219	0.237
Total Sulphur	mg/L	4.90	5.48	4.95	6.02	6.51	5.88	4.39		2.66	4.33	4.62	4.68
Total Titanium	mg/L	<0.00030	0.00467	<0.00030	<0.00060	<0.00030	0.00099	<0.00060		0.00164	<0.00030	0.00034	0.00126
Total Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L	0.00131	0.00153	0.00104	0.00103	0.00119	0.00136	0.00114		0.000745	0.000910	0.000999	0.00114
Total Vanadium	mg/L	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		0.00054	<0.00050	<0.00050	0.00075
Total Zinc	mg/L	0.0069	0.0177	0.0047	0.0044	0.0040	0.0061	0.0206		0.0045	<0.0030	<0.0030	0.0046
Total Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L	0.00038	0.00042	0.00058	0.00054	0.00048	0.00043	0.00071		0.00095	0.00078	0.00076	0.00072
Dissolved Aluminium	mg/L	0.0018	0.0017	0.0036	0.0028	0.0017	0.0011	0.0037		0.0023	0.0026	0.0027	0.0018
Dissolved Barium	mg/L	0.0791	0.0783	0.0504	0.0626	0.0615	0.0557	0.0797		0.0590	0.0735	0.0713	0.0734
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020		<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L	72.3	76.2	66.4	66.5	65.1	61.0	59.9		47.8	57.1	60.6	58.3
Dissolved Cadmium	mg/L	0.0000465	0.0000436	0.0000401	0.0000459	0.0000361	0.0000292	0.000110		0.0000256	0.0000420	0.0000444	0.0000454
Dissolved Cobalt	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L	<0.00010	0.00018	<0.00010	0.00011	0.00010	<0.00010	0.00045		0.00018	0.00022	0.00021	0.00016
Dissolved Copper	mg/L	0.00047	0.00047	0.00027	0.00037	0.00023	0.00034	0.00331	Augered to ground.	0.00022	0.00021	0.00031	0.00030
Dissolved Iron	mg/L	0.025	0.023	0.014	0.038	0.019	0.017	<0.010	No water found.	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	Unable to sample	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L	0.51	0.74	0.48	0.44	0.47	0.38	0.77		0.47	0.44	0.48	0.42
Dissolved Lithium	mg/L	0.0017	0.0017	0.0014	0.0017	0.0015	0.0014	0.0014		0.0013	0.0016	0.0014	0.0014
Dissolved Magnesium	mg/L	9.24	9.70	6.00	8.36	7.81	7.72	6.83		4.78	6.14	5.85	6.73
Dissolved Manganese	mg/L	0.0114	0.00624	0.00226	0.00459	0.00671	0.00576	0.00285		0.00047	0.00061	0.00045	0.00033
Dissolved Molybdenum	mg/L	0.000829	0.000811	0.000836	0.00101	0.000782	0.000838	0.00140		0.00134	0.00128	0.00133	0.00138
Dissolved Sodium	mg/L	1.48	1.56	0.913	1.29	1.14	1.11	2.79		0.890	1.08	1.03	1.59
Dissolved Nickel	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00068		<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	0.000183	0.000140	0.000110	0.000094	<0.000050	<0.000050	0.000515		0.000079	0.000172	0.000123	0.000116
Dissolved Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L	0.00012	0.00017	0.00021	0.00015	0.00013	0.00012	0.00027		0.00023	0.00021	0.00022	0.00021
Dissolved Sulphur	mg/L	4.70	5.32	5.30	5.42	6.42	4.93	4.29		2.45	3.98	4.05	4.64
Dissolved Selenium	mg/L	0.000601	0.000642	0.000895	0.000636	0.000663	0.000625	0.000864		0.000654	0.000680	0.000846	0.000906
Dissolved Silicon	mg/L	3.89	3.99	3.60	3.64	3.95	3.52	4.06		3.97	4.15	4.12	4.34
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L	0.283	0.297	0.228	0.264	0.251	0.236	0.227		0.186	0.217	0.217	0.219
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L	0.00135	0.00149	0.00115	0.00110	0.00111	0.00115	0.00114		0.000728	0.000996	0.000991	0.00102
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	0.0062	0.0049	0.0032	0.0041	0.0035	0.0033	0.0240		0.0011	0.0165	0.0016	0.0025
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030

		MH-15						MH-02					
		Trib E, West Fork, u/s of Trib E East Fork						Tailings North Dam Seepage					
		26-Feb-19	26-Apr-19	19-Jun-19	29-Aug-19	24-Oct-19	4-Dec-19	25-Feb-19	25-Apr-19	4-Jun-19	27-Aug-19	22-Oct-19	2-Dec-19
Total Hardness	mg/L				193	199	215				328	522	586
Hardness (Dissolved, CaCO3)	mg/L	199	198	177	194		199	612	608	487	308		539
Temperature - Field	C	0	0.3	8.1	6.3	0	-0.1	0	0	9.6	7.5	0.2	0
pH - Field	pH	7.75	7.64	7.55	7.92	8.21	8.3	7.42	7.17	7.45	7.6	7.82	8.22
pH - Lab	pH	8.10	8.37	8.38	8.44	8.34	8.21	7.47	8.12	8.07	8.30	8.21	8.11
Conductivity - Field	µS/cm	382.6	362.5	286.1	344.6	360.1	216.7	562.2	1040	922	600.3	928.3	947.8
Conductivity - Lab	µS/cm	381	359	306	349	369	366	1130	1070	844	603	935	955
Total Dissolved Solids	mg/L	223	212	176	202	228	213	824	820	677	440	672	701
Total Suspended Solids	mg/L	<1.0	1.3	5.4	1.3	1.3	<1.0	15.0	37.9	<1.0	8.7	<1.0	4.0
Discharge	L/min	2360	2800	8238	4160	3930	792			20	72	6	6
Ammonia Nitrogen	mg/L	0.0156	0.0064	0.0060	<0.0050	0.0053	<0.0050	0.0155	0.0100	<0.0050	<0.0050	<0.0050	<0.0050
NO2-W	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
NO3-W	mg/L	0.0945	0.0697	0.0063	<0.0050	0.0288	0.0433	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Sulphate	mg/L	3.41	4.09	3.18	2.72	3.85	3.80	344	348	281	149	276	286
Fluoride	mg/L	0.091	0.102	0.101	0.097	0.094	0.092	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Chloride	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Bromide	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Dissolved Oxygen	mg/L	10.82	10.4	10.7	10.61	11.51	13.89	8.01	7.1	11.25	9.03	10.01	13.82
Dissolved Oxygen (Percent)	%	81.1	71.9	90.7	85.9	78.4	94.4	61.8	48.9	113.1	75.5	69.8	94.6
Redox	mV	80	105.2	116.6	114.9	260.9	222.3	158.9	21.1	128	6.6	249.5	148.6
Alkalinity (CaCO3)	mg/L	204	211	183	196	206	226	302	304	201	184	272	277
Total Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000016	<0.000010	<0.000010
Total Aluminum	mg/L	0.0113	0.0064	0.0248	0.0044	0.0100	0.0034	0.0272	0.0221	<0.0030	0.213	<0.0030	<0.0030
Total Arsenic	mg/L	0.00039	0.00039	0.00053	0.00040	0.00036	0.00030	0.00094	0.00158	0.00030	0.00070	0.00024	0.00034
Total Barium	mg/L	0.197	0.198	0.167	0.187	0.158	0.179	0.0592	0.0563	0.0466	0.0323	0.0290	0.0326
Total Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L	62.5	58.3	48.5	55.9	56.3	63.0	218	220	187	114	179	203
Total Cadmium	mg/L	0.0000179	0.0000071	0.0000214	0.0000104	0.0000584	0.0000065	0.0000696	0.0000595	0.0000055	0.0000723	<0.0000050	0.0000058
Total Cobalt	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00079	0.00091	0.00041	0.00063	0.00050	0.00052
Total Chromium III	mg/L	0.00011	0.00028	0.00011	<0.00010	0.00014	<0.00010	0.00019	<0.00010		0.00048	<0.00010	<0.00010
Total Chromium	mg/L	0.00011	0.00028	0.00011	<0.00010	0.00014	<0.00010	0.00019	<0.00010	<0.00010	0.00048	<0.00010	<0.00010
Total Chromium VI	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050
Total Copper	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00078	<0.00050	<0.00050	0.00107	<0.00050	<0.00050
Total Iron	mg/L	0.253	0.207	0.320	0.126	0.207	0.134	0.284	0.682	0.011	0.373	<0.010	0.056
Total Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L	0.42	0.57	0.46	0.39	0.38	0.41	1.50	1.86	1.90	1.77	1.51	1.30
Total Lithium	mg/L	0.0011	0.0012	0.0011	0.0012	0.0012	0.0013	0.0010	0.0011	0.0011	<0.0010	<0.0010	0.0010
Total Magnesium	mg/L	11.8	12.9	12.4	12.9	14.1	13.9	18.0	18.9	14.8	10.7	18.5	19.1
Total Manganese	mg/L	0.0177	0.0112	0.0282	0.0106	0.0202	0.0114	0.733	0.927	0.0292	0.0425	0.0114	0.0234
Total Molybdenum	mg/L	0.00201	0.00206	0.00189	0.00171	0.00170	0.00201	0.000201	0.000274	0.000339	0.000371	0.000233	0.000323
Total Sodium	mg/L	1.06	1.03	1.08	0.985	1.15	1.11	10.3	10.6	8.69	7.87	9.86	9.82
Total Nickel	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00065	0.00060	<0.00050	<0.00050	<0.00050	<0.00050
Total Lead	mg/L	0.000582	<0.000050	0.000119	<0.000050	0.000117	<0.000050	0.00187	0.00227	<0.000050	0.0165	<0.000050	0.000066
Total Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.00012	0.00012	<0.00010	0.00011	0.00016	0.00013	0.00011	<0.00010	<0.00010	0.00017	<0.00010	<0.00010
Total Selenium	mg/L	0.000697	0.000670	0.000387	0.000390	0.000500	0.000551	0.000064	0.000091	0.000091	0.000266	0.000097	0.000073

		MH-15						MH-02					
		Trib E, West Fork, u/s of Trib E East Fork						Tailings North Dam Seepage					
		26-Feb-19	26-Apr-19	19-Jun-19	29-Aug-19	24-Oct-19	4-Dec-19	25-Feb-19	25-Apr-19	4-Jun-19	27-Aug-19	22-Oct-19	2-Dec-19
Total Silicon	mg/L	4.09	3.84	3.50	3.34	4.00	4.34	4.75	5.19	4.16	3.25	5.31	5.31
Total Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00021	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Strontium	mg/L	0.174	0.185	0.154	0.174	0.178	0.190	0.646	0.674	0.601	0.379	0.601	0.659
Total Sulphur	mg/L	1.44	1.38	1.34	1.19	1.65	1.97	122	126	99.5	56.7	107	103
Total Titanium	mg/L	0.00039	<0.00030	0.00043	<0.00030	<0.00030	<0.00030	0.00091	<0.00060	<0.00030	0.00434	<0.00030	<0.00030
Total Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L	0.000929	0.00104	0.000668	0.000653	0.000864	0.000950	0.00179	0.00190	0.00145	0.000867	0.00177	0.00216
Total Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00077	<0.00050	<0.00050
Total Zinc	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	<0.0030	0.0429	0.0267	0.0032	0.0174	<0.0030	0.0034
Total Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L	0.00022	0.00033	0.00031	0.00035	0.00024	0.00022	0.00028	0.00060	0.00030	0.00033	0.00028	0.00023
Dissolved Aluminium	mg/L	0.0015	0.0018	0.0018	0.0016	0.0013	<0.0010	<0.0010	<0.0010	0.0023	0.0084	<0.0010	0.0013
Dissolved Barium	mg/L	0.204	0.199	0.172	0.176	0.163	0.181	0.0580	0.0558	0.0439	0.0273	0.0314	0.0319
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L	58.1	58.2	50.8	54.8	60.3	56.3	213	213	171	107	181	185
Dissolved Cadmium	mg/L	0.0000177	0.0000079	<0.0000050	<0.0000050	0.0000083	<0.0000050	0.0000298	0.0000270	<0.0000050	0.0000155	<0.0000050	<0.0000050
Dissolved Cobalt	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00067	0.00077	0.00041	0.00029	0.00042	0.00050
Dissolved Chromium	mg/L	<0.00010	0.00017	<0.00010	<0.00010	<0.00010	<0.00010	0.00022	0.00025	<0.00010	0.00013	<0.00010	<0.00010
Dissolved Copper	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00028	0.00039	<0.00020	<0.00020	0.00045	<0.00020	0.00021
Dissolved Iron	mg/L	0.032	0.075	0.060	0.073	0.043	0.043	0.047	0.265	<0.010	0.029	<0.010	0.011
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L	0.45	0.60	0.35	0.38	0.34	0.38	1.63	1.79	2.01	1.73	1.59	1.20
Dissolved Lithium	mg/L	0.0012	0.0012	0.0012	0.0012	0.0011	0.0012	0.0010	0.0011	0.0011	<0.0010	<0.0010	<0.0010
Dissolved Magnesium	mg/L	13.2	12.8	12.1	14.0	13.2	14.3	19.3	18.5	14.5	10.2	17.3	18.7
Dissolved Manganese	mg/L	0.00955	0.00678	0.00691	0.00616	0.00654	0.00773	0.632	0.634	0.0288	0.0280	0.0105	0.00665
Dissolved Molybdenum	mg/L	0.00206	0.00215	0.00200	0.00174	0.00161	0.00188	0.000203	0.000247	0.000331	0.000441	0.000252	0.000240
Dissolved Sodium	mg/L	1.16	1.04	0.865	1.07	0.998	1.12	10.8	10.0	8.76	7.77	9.46	9.65
Dissolved Nickel	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00082	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	0.000105	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000076	0.000114	<0.000050	0.00130	0.000063	<0.000050
Dissolved Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L	0.00011	0.00012	0.00010	<0.00010	0.00010	0.00011	<0.00010	<0.00010	<0.00010	0.00014	<0.00010	<0.00010
Dissolved Sulphur	mg/L	1.33	1.41	1.37	1.20	1.65	1.72	114	122	103	52.3	91.2	110
Dissolved Selenium	mg/L	0.000673	0.000752	0.000431	0.000375	0.000506	0.000652	0.000060	0.000099	0.000084	0.000319	0.000076	0.000060
Dissolved Silicon	mg/L	4.21	3.90	3.30	3.65	3.92	4.41	4.68	5.03	4.58	3.07	4.98	5.17
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L	0.183	0.188	0.171	0.179	0.175	0.176	0.669	0.701	0.576	0.375	0.595	0.601
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00063	<0.00030	<0.00030
Dissolved Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L	0.000947	0.00107	0.000707	0.000734	0.000860	0.000871	0.00190	0.00198	0.00151	0.000913	0.00180	0.00198
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	0.0014	<0.0010	<0.0010	<0.0010	0.0017	<0.0010	0.0395	0.0212	0.0033	0.0031	0.0026	0.0031
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

		MH-04						MH-13					
		Alternate site - Lower Camp Creek, immediately above West Interceptor - only when no discharge from MH-3						False Creek Canyon, 10 km d/s of Reclaim Pond					
		27-Feb-19	25-Apr-19	6-Jun-19	27-Aug-19	25-Oct-19	5-Dec-19	26-Feb-19	26-Apr-19	19-Jun-19	29-Aug-19	24-Oct-19	4-Dec-19
Total Hardness	mg/L				161	158	175				206	200	231
Hardness (Dissolved, CaCO3)	mg/L	160	173	149	156		163	230	211	161	196		213
Temperature - Field	C	0.2	0.4	1	3.3	0.8	0.3	0.1	0	6.4	5.7	0.1	-0.1
pH - Field	pH	8.23	7.79	7.75	7.92	8.36	8.18	7.72	7.57	7.85	7.94	8.2	8.49
pH - Lab	pH	8.17	8.40	8.41	8.37	8.28	8.22	8.00	8.38	8.35	8.45	8.32	8.23
Conductivity - Field	µS/cm	322.2	321.3	287.2	297.1	303.1	256.7	414.8	370.4	253.6	346.8	369.5	335.4
Conductivity - Lab	µS/cm	319	319	279	302	314	310	413	387	274	352	378	380
Total Dissolved Solids	mg/L	199	192	181	189	178	185	236	227	159	213	214	213
Total Suspended Solids	mg/L	<1.0	<1.0	2.7	3.5	<1.0	5.1	<1.0	1.7	2.5	<1.0	<1.0	2.0
Discharge	L/min	280	200	2600	1110	666	490	2830	3980	44150	8352	7938	9600
Ammonia Nitrogen	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0148	<0.0050	0.0080	<0.0050	<0.0050	<0.0050	0.0083	0.0057
NO2-W	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L	0.245	0.232	0.235	0.184	0.238	0.233	0.120	0.101	0.0344	0.0063	0.0395	0.0708
Sulphate	mg/L	14.6	15.5	12.5	16.7	16.7	15.2	9.28	10.1	7.77	8.33	9.04	8.71
Fluoride	mg/L	0.151	0.163	0.124	0.143	0.151	0.158	0.058	0.074	0.061	0.062	0.062	0.063
Chloride	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromide	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L	10.49	10.04	16.29	11.76	15.01	12.94	11.28	10.29	9.3	12.38	11.3	9.98
Dissolved Oxygen (Percent)	%	82.2	69.4	131.5	88.2	105.1	84.4	71.7	70.3	75.5	98.8	77.9	68.1
Redox	mV	31.9	148.3	152	60.3	226.1	122.1	126.1	97.9	115.2	109.8	236.6	182
Alkalinity (CaCO3)	mg/L	155	167	146	158	169	157	211	219	157	204	206	209
Total Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L	0.0183	0.0044	0.0098	0.0156	0.0062	0.0310	0.0057	0.0040	0.0336	0.0060	0.0074	0.0131
Total Arsenic	mg/L	0.00043	0.00038	0.00040	0.00037	0.00037	0.00044	0.00031	0.00042	0.00054	0.00051	0.00031	0.00035
Total Barium	mg/L	0.0239	0.0246	0.0198	0.0219	0.0197	0.0233	0.160	0.168	0.109	0.162	0.129	0.153
Total Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L	62.0	60.9	59.9	59.6	57.9	64.4	62.6	58.8	43.1	60.5	55.7	66.1
Total Cadmium	mg/L	0.000237	0.000233	0.000286	0.000273	0.000234	0.000301	0.0000282	0.0000243	0.0000258	0.0000156	0.0000201	0.0000152
Total Cobalt	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L	0.00021	0.00015		0.00018	0.00022	0.00023	0.00015	0.00010	<0.00010	0.00010	0.00014	<0.00010
Total Chromium	mg/L	0.00021	0.00015	0.00022	0.00018	0.00022	0.00023	0.00015	0.00010	<0.00010	0.00010	0.00014	<0.00010
Total Chromium VI	mg/L	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Copper	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00063	<0.00050	0.00058	<0.00050	0.00074	<0.00050
Total Iron	mg/L	0.025	<0.010	0.013	0.026	<0.010	0.046	0.143	0.382	0.216	0.163	0.126	0.179
Total Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L	0.38	0.37	0.39	0.40	0.40	0.43	0.44	0.55	0.33	0.40	0.41	0.41
Total Lithium	mg/L	0.0013	0.0014	0.0013	0.0014	0.0015	0.0017	0.0011	0.0011	<0.0010	0.0011	0.0011	0.0013
Total Magnesium	mg/L	3.19	3.29	2.86	3.00	3.35	3.46	15.2	15.5	10.1	13.3	14.9	15.9
Total Manganese	mg/L	0.00072	0.00047	0.00082	0.00162	0.00059	0.00342	0.00742	0.00829	0.0137	0.00608	0.00695	0.0123
Total Molybdenum	mg/L	0.000732	0.000746	0.000588	0.000652	0.000678	0.00102	0.00108	0.00116	0.000843	0.00108	0.00108	0.00185
Total Sodium	mg/L	0.877	0.867	0.766	0.759	0.885	0.896	1.10	1.02	0.861	0.970	1.05	1.06
Total Nickel	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Lead	mg/L	0.000378	0.000156	0.000527	0.000809	0.000205	0.00158	0.000142	0.000055	0.000177	0.000072	0.000064	0.000067
Total Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L	0.00014	0.00012	0.00014	0.00013	0.00013	0.00015	0.00011	0.00011	0.00013	0.00012	0.00010	0.00010
Total Selenium	mg/L	0.000925	0.000992	0.000668	0.00100	0.000885	0.000925	0.000681	0.000629	0.000486	0.000512	0.000457	0.000589

		MH-04						MH-13					
		Alternate site - Lower Camp Creek, immediately above West Interceptor - only when no discharge from MH-3						False Creek Canyon, 10 km d/s of Reclaim Pond					
		27-Feb-19	25-Apr-19	6-Jun-19	27-Aug-19	25-Oct-19	5-Dec-19	26-Feb-19	26-Apr-19	19-Jun-19	29-Aug-19	24-Oct-19	4-Dec-19
Total Silicon	mg/L	3.31	3.21	3.04	3.01	3.28	3.51	3.37	3.32	3.09	3.11	3.36	3.81
Total Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	<0.00010
Total Strontium	mg/L	0.198	0.222	0.197	0.199	0.208	0.229	0.200	0.208	0.159	0.210	0.206	0.227
Total Sulphur	mg/L	5.45	5.33	4.43	5.91	6.08	5.54	3.61	3.89	3.22	3.57	3.58	3.90
Total Titanium	mg/L	<0.00090	<0.00030	0.00038	0.00040	<0.00030	0.00087	<0.00030	<0.00030	<0.00060	<0.00030	<0.00030	<0.00030
Total Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L	0.000970	0.00104	0.000746	0.000880	0.000888	0.00104	0.00167	0.00182	0.000937	0.00130	0.00141	0.00159
Total Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Zinc	mg/L	0.0057	0.0039	0.0059	0.0067	0.0055	0.0079	0.0060	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Total Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L	0.00037	0.00040	0.00036	0.00035	0.00040	0.00037	0.00022	0.00034	0.00042	0.00041	0.00024	0.00022
Dissolved Aluminium	mg/L	0.0017	0.0017	0.0015	0.0020	0.0014	0.0014	0.0013	<0.0010	0.0043	0.0018	0.0011	0.0010
Dissolved Barium	mg/L	0.0231	0.0245	0.0198	0.0224	0.0211	0.0225	0.174	0.160	0.100	0.144	0.132	0.147
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L	58.4	63.4	54.5	56.9	60.3	59.6	63.7	59.1	48.5	56.0	56.8	59.1
Dissolved Cadmium	mg/L	0.000215	0.000221	0.000259	0.000299	0.000254	0.000244	0.0000212	0.0000120	0.0000158	0.0000109	0.0000198	0.0000082
Dissolved Cobalt	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L	0.00017	0.00013	0.00015	0.00019	0.00020	0.00016	<0.00010	0.00016	<0.00010	<0.00010	<0.00010	0.00014
Dissolved Copper	mg/L	<0.00020	<0.00020	<0.00020	0.00029	<0.00020	0.00043	0.00052	0.00022	0.00043	0.00028	0.00062	0.00029
Dissolved Iron	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	0.085	0.090	0.078	0.019	0.027
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L	0.38	0.40	0.43	0.44	0.42	0.39	0.47	0.55	0.30	0.38	0.42	0.38
Dissolved Lithium	mg/L	0.0014	0.0016	0.0012	0.0015	0.0015	0.0015	0.0012	0.0012	0.0011	0.0012	0.0011	0.0011
Dissolved Magnesium	mg/L	3.42	3.56	3.11	3.27	3.17	3.54	17.2	15.3	9.78	13.5	13.9	15.9
Dissolved Manganese	mg/L	0.00022	0.00019	0.00018	0.00050	0.00043	0.00031	0.00581	0.00546	0.00502	0.00325	0.00455	0.00537
Dissolved Molybdenum	mg/L	0.000741	0.000744	0.000604	0.000682	0.000694	0.000792	0.00118	0.00119	0.000925	0.00101	0.00109	0.00132
Dissolved Sodium	mg/L	0.923	0.946	0.804	0.874	0.848	0.903	1.25	0.986	0.765	1.01	1.01	1.07
Dissolved Nickel	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	0.000067	0.000075	0.000168	0.000165	0.000095	0.000082	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L	0.00012	0.00013	0.00013	0.00013	0.00014	0.00013	0.00010	<0.00010	0.00013	0.00011	0.00010	<0.00010
Dissolved Sulphur	mg/L	4.97	5.48	4.59	5.95	5.64	6.22	3.80	3.56	2.68	3.05	3.35	3.57
Dissolved Selenium	mg/L	0.000853	0.000958	0.000711	0.000827	0.000872	0.000875	0.000702	0.000778	0.000568	0.000488	0.000578	0.000612
Dissolved Silicon	mg/L	3.29	3.44	3.17	3.31	3.35	3.56	3.56	3.39	2.92	3.22	3.35	3.73
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L	0.211	0.223	0.207	0.207	0.211	0.204	0.218	0.207	0.175	0.209	0.202	0.202
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L	0.000994	0.00101	0.000790	0.000838	0.000883	0.000958	0.00183	0.00178	0.000944	0.00134	0.00144	0.00149
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	0.0051	0.0041	0.0059	0.0055	0.0052	0.0051	0.0049	<0.0010	<0.0010	0.0013	0.0015	0.0011
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

		MH-22						MH-29					
		Burnick 1200 Portal discharge						Access Cr, u/s of Camp Cr					
		27-Feb-19	24-Apr-19	4-Jun-19	28-Aug-19	22-Oct-19	3-Dec-19	25-Feb-19	25-Apr-19	4-Jun-19	28-Aug-19	23-Oct-19	3-Dec-19
Total Hardness	mg/L	No water found at pipe, no sample taken	No flow from pipe. Unable to collect sample		148	145	165				194	182	200
Hardness (Dissolved, CaCO3)	mg/L			124	153		159	209	217	179	187		178
Temperature - Field	C			2.6	2.3	1.4	3.2	0	0		4.7	-0.1	-0.1
pH - Field	pH			7.37	7.25	7.97	8.74	7.66	7.11		7.88	8.26	8.45
pH - Lab	pH			7.99	8.20	8.13	7.92	7.77	8.36	8.45	8.42	8.31	8.22
Conductivity - Field	µS/cm			269.5	295.2	290.7	286.3	174.8	409.6		336.8	339.7	331.7
Conductivity - Lab	µS/cm			255	294	300	303	407	401	317	340	345	349
Total Dissolved Solids	mg/L			169	186	188	184	236	248	191	205	209	215
Total Suspended Solids	mg/L			<1.0	<1.0	<1.0	<1.0	1.8	<1.0	<1.0	<1.0	<1.0	3.3
Discharge	L/min			160	66	30	20			2670	702	400	330
Ammonia Nitrogen	mg/L			<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0052	<0.0050
NO2-W	mg/L			<0.020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L			0.17	0.138	0.141	0.135	0.0135	0.0199	0.135	0.0221	0.113	0.111
Sulphate	mg/L			29.4	40.8	41.0	41.9	4.82	4.95	4.00	3.14	4.85	4.61
Fluoride	mg/L			1.03	1.22	1.25	1.29	0.043	0.056	0.048	0.050	0.049	0.056
Chloride	mg/L			<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromide	mg/L			<1.0	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L			12.66	11.27	10.54	10.81	6.86	9.91		11.04	9.69	10
Dissolved Oxygen (Percent)	%			108.2	82.7	75.2	81	52.6	67.9		85.9	66.3	74.9
Redox	mV			111.2	21.9	186.7	102.9	130	120.6		96.3	248.4	197.5
Alkalinity (CaCO3)	mg/L			97.9	113	115	121	215	236	176	197	213	193
Total Silver	mg/L			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Aluminum	mg/L			<0.0030	<0.0030	<0.0030	<0.0030	0.0080	0.0085	0.0123	0.0070	0.0057	0.0280
Total Arsenic	mg/L			0.00425	0.00433	0.00389	0.00381	0.00036	0.00037	0.00080	0.00067	0.00064	0.00073
Total Barium	mg/L			0.0129	0.0152	0.0147	0.0160	0.0566	0.0605	0.0404	0.0507	0.0417	0.0454
Total Beryllium	mg/L			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Total Bismuth	mg/L			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Total Boron	mg/L			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Calcium	mg/L			45.9	47.9	47.1	54.1	74.3	72.7	60.0	67.9	62.9	69.7
Total Cadmium	mg/L			0.00326	0.00372	0.00383	0.00434	0.0000615	0.0000429	0.0000445	0.0000559	0.0000346	0.0000651
Total Cobalt	mg/L			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Chromium III	mg/L				0.00019	0.00017	<0.00010	0.00023	0.00023	~	0.00010	0.00014	0.00013
Total Chromium	mg/L			0.00019	0.00019	0.00017	<0.00010	0.00023	0.00023	0.00011	0.00010	0.00014	0.00013
Total Chromium VI	mg/L				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050
Total Copper	mg/L			<0.00050	<0.00050	<0.00050	<0.00050	0.00053	<0.00050	<0.00050	<0.00050	<0.00050	0.00065
Total Iron	mg/L			<0.010	<0.010	<0.010	<0.010	0.035	0.017	0.021	0.015	0.015	0.052
Total Mercury	mg/L			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Total Potassium	mg/L			0.49	0.57	0.57	0.62	0.31	0.37	0.38	0.26	0.27	0.28
Total Lithium	mg/L			0.0052	0.0054	0.0060	0.0063	0.0011	0.0012	0.0013	0.0013	0.0013	0.0015
Total Magnesium	mg/L			6.18	6.79	6.68	7.12	7.59	8.66	4.45	5.92	6.10	6.19
Total Manganese	mg/L			0.00236	0.00050	0.00018	0.00014	0.00667	0.00439	0.00396	0.00316	0.00336	0.00982
Total Molybdenum	mg/L			0.0108	0.00810	0.00837	0.00891	0.000338	0.000405	0.000607	0.000638	0.000635	0.00160
Total Sodium	mg/L			0.824	0.914	0.888	0.892	1.15	1.14	0.729	0.952	0.952	0.991
Total Nickel	mg/L			0.00476	0.00343	0.00357	0.00348	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Lead	mg/L			0.000315	0.000304	0.000310	0.000350	0.000112	<0.000050	0.000069	0.000051	<0.000050	0.000197
Total Phosphorus	mg/L			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Total Antimony	mg/L			0.00257	0.00244	0.00240	0.00258	0.00012	0.00011	0.00020	0.00016	0.00016	0.00017
Total Selenium	mg/L			0.0111	0.0140	0.0136	0.0153	0.000313	0.000293	0.000804	0.000353	0.000597	0.000578

		MH-22						MH-29					
		Burnick 1200 Portal discharge						Access Cr, u/s of Camp Cr					
		27-Feb-19	24-Apr-19	4-Jun-19	28-Aug-19	22-Oct-19	3-Dec-19	25-Feb-19	25-Apr-19	4-Jun-19	28-Aug-19	23-Oct-19	3-Dec-19
Total Silicon	mg/L	No water found at pipe, no sample taken	No flow from pipe. Unable to collect sample	4.49	4.87	4.63	4.71	4.08	4.16	3.87	3.67	3.94	4.22
Total Tin	mg/L			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00024
Total Strontium	mg/L			0.224	0.234	0.239	0.251	0.243	0.282	0.190	0.234	0.221	0.239
Total Sulphur	mg/L			11.9	15.4	14.5	15.0	2.31	1.78	1.94	1.53	1.95	2.24
Total Titanium	mg/L			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00090
Total Thallium	mg/L			0.000014	0.000018	0.000018	0.000019	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Total Uranium	mg/L			0.00292	0.00359	0.00374	0.00403	0.000801	0.000982	0.000723	0.000647	0.000691	0.000787
Total Vanadium	mg/L			<0.00050	<0.00050	<0.00050	0.00052	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Zinc	mg/L			0.478	0.661	0.664	0.797	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Total Zirconium	mg/L			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Silver	mg/L			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Arsenic	mg/L			0.00424	0.00423	0.00362	0.00390	0.00037	0.00041	0.00075	0.00067	0.00066	0.00058
Dissolved Aluminium	mg/L			0.0013	<0.0010	<0.0010	<0.0010	0.0025	0.0020	0.0032	0.0027	0.0020	0.0015
Dissolved Barium	mg/L			0.0123	0.0154	0.0157	0.0170	0.0568	0.0612	0.0384	0.0493	0.0447	0.0436
Dissolved Beryllium	mg/L			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron -	mg/L			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L			40.0	49.9	53.5	51.1	70.0	72.4	63.3	64.6	65.0	61.4
Dissolved Cadmium	mg/L			0.00307	0.00379	0.00377	0.00456	0.0000506	0.0000409	0.0000301	0.0000479	0.0000379	0.0000356
Dissolved Cobalt	mg/L			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L			0.00019	0.00014	0.00015	<0.00010	0.00016	<0.00010	<0.00010	0.00011	0.00011	<0.00010
Dissolved Copper	mg/L			<0.00020	<0.00020	<0.00020	0.00027	0.00041	0.00025	0.00027	0.00041	0.00028	0.00041
Dissolved Iron	mg/L			<0.010	<0.010	<0.010	<0.010	0.022	0.011	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L			0.50	0.59	0.59	0.62	0.32	0.38	0.37	0.27	0.28	0.24
Dissolved Lithium	mg/L			0.0048	0.0060	0.0060	0.0063	0.0011	0.0013	0.0013	0.0015	0.0013	0.0013
Dissolved Magnesium	mg/L			5.83	6.84	6.83	7.60	8.33	8.73	4.97	6.21	5.76	5.90
Dissolved Manganese	mg/L			0.00220	0.00037	0.00017	0.00010	0.00567	0.00399	0.00135	0.00154	0.00221	0.00248
Dissolved Molybdenum	mg/L			0.0107	0.00867	0.00767	0.00896	0.000358	0.000400	0.000609	0.000621	0.000701	0.000850
Dissolved Sodium	mg/L			0.829	0.906	0.843	0.953	1.29	1.14	0.721	1.01	0.926	0.933
Dissolved Nickel	mg/L			0.00477	0.00338	0.00347	0.00385	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L			0.000246	0.000255	0.000278	0.000334	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Phosphorus	mg/L			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L			0.00248	0.00238	0.00228	0.00259	0.00011	0.00011	0.00020	0.00016	0.00016	0.00015
Dissolved Sulphur	mg/L			12.1	13.3	12.9	16.2	1.80	1.70	1.46	1.21	1.76	1.84
Dissolved Selenium	mg/L			0.0112	0.0133	0.0126	0.0154	0.000361	0.000354	0.000757	0.000437	0.000623	0.000638
Dissolved Silicon	mg/L			4.66	4.70	4.60	5.03	4.05	4.19	3.57	3.83	3.90	4.01
Dissolved Tin	mg/L			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L			0.212	0.241	0.232	0.244	0.260	0.273	0.215	0.234	0.223	0.212
Dissolved Titanium	mg/L			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L			0.000014	0.000018	0.000022	0.000016	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L			0.00294	0.00368	0.00373	0.00396	0.000820	0.000962	0.000773	0.000686	0.000699	0.000715
Dissolved Vanadium	mg/L			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L			0.466	0.617	0.649	0.836	0.0026	<0.0010	<0.0010	0.0010	<0.0010	<0.0010
Dissolved Zirconium	mg/L			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

		MH-30						SDH-S2					
		Unnamed tributary to False Canyon Creek, approximately 3 km d/s of MH-11						Waste rock below Main Zone					
		26-Feb-19	26-Apr-19	19-Jun-19	29-Aug-19	24-Oct-19	4-Dec-19	26-Apr-19	26-Feb-19	4-Jun-19	29-Aug-19	22-Oct-19	22-Oct-19
Total Hardness	mg/L				151	163	248	No visible seep seen from the air and site conditions unsafe for landing.	Site Inaccessible		Water Inaccessible	Water Inaccessible	Site Inaccessible
Hardness (Dissolved, CaCO3)	mg/L	198	180	108	157		226			227			
Temperature - Field	C	0.9	0.2	6.8	6.4	0.2	0.4			1.2			
pH - Field	pH	7.49	6.91	7.7	7.59	7.74	8.3			7.13			
pH - Lab	pH	7.64	8.29	8.17	8.24	8.15	8.15			7.77			
Conductivity - Field	µS/cm	378.4	344.3	170.2	274	300.6	329			552.9			
Conductivity - Lab	µS/cm	383	333	187	277	303	406			507			
Total Dissolved Solids	mg/L	218	187	99	160	188	229			382			
Total Suspended Solids	mg/L	6.0	2.8	1.2	1.2	5.8	3.5			202			
Discharge	L/min												
Ammonia Nitrogen	mg/L	0.0456	0.0319	0.0056	<0.0050	0.0197	0.0129			<0.0050			
NO2-W	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			<0.0050			
NO3-W	mg/L	0.0693	0.0694	0.0110	<0.0050	0.133	0.0368			0.509			
Sulphate	mg/L	5.25	5.91	3.97	4.00	17.1	5.99			210			
Fluoride	mg/L	0.056	0.059	0.052	0.053	0.091	0.067			0.13			
Chloride	mg/L	2.27	<0.50	<0.50	<0.50	<0.50	0.82			<2.5			
Bromide	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.25			
Dissolved Oxygen	mg/L	7.51	9.75	8.56	7.41	11.74	9.37			12.79			
Dissolved Oxygen (Percent)	%	58.6	60.4	70.2	60.1	80.9	64.8			106.9			
Redox	mV	102.2	64.7	116.1	100.7	181.5	68.3			172.7			
Alkalinity (CaCO3)	mg/L	198	195	106	172	171	226			109			
Total Silver	mg/L	0.000028	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			0.00290			
Total Aluminum	mg/L	0.0280	0.0195	0.0212	0.0057	0.0780	0.0080			2.62			
Total Arsenic	mg/L	0.00060	0.00039	0.00021	0.00034	0.00052	0.00045			0.00838			
Total Barium	mg/L	0.255	0.237	0.130	0.217	0.193	0.273			0.0562			
Total Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020			0.00056			
Total Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			0.00192			
Total Boron	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			<0.050			
Total Calcium	mg/L	51.7	46.5	25.1	38.4	40.7	62.2			174			
Total Cadmium	mg/L	0.0000812	0.0000435	0.0000223	0.0000197	0.0000471	0.0000319			0.139			
Total Cobalt	mg/L	0.00017	0.00014	<0.00010	<0.00010	0.00023	0.00016			0.00533			
Total Chromium III	mg/L	0.00051	0.00013	<0.00010	0.00011	0.00023	0.00011						
Total Chromium	mg/L	0.00051	0.00013	<0.00010	0.00011	0.00023	0.00011			0.00382			
Total Chromium VI	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050						
Total Copper	mg/L	0.00219	<0.00050	0.00083	<0.00050	0.00072	0.00053			0.0122			
Total Iron	mg/L	0.705	1.05	0.163	0.375	1.11	0.811			5.65			
Total Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050			
Total Potassium	mg/L	0.49	0.64	0.29	0.34	0.35	0.90			0.87			
Total Lithium	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010			0.0055			
Total Magnesium	mg/L	16.5	16.6	9.20	13.3	15.0	22.5			6.16			
Total Manganese	mg/L	0.0459	0.0386	0.00602	0.0181	0.0532	0.0519			0.559			
Total Molybdenum	mg/L	0.00145	0.00151	0.000890	0.00123	0.00120	0.00350			0.00200			
Total Sodium	mg/L	2.16	0.828	0.623	0.683	0.768	1.60			0.52			
Total Nickel	mg/L	0.00119	0.00060	0.00068	0.00066	0.00069	<0.00050			0.0191			
Total Lead	mg/L	0.00610	0.000103	0.000060	<0.000050	0.000249	0.000158			23.3			
Total Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			0.26			
Total Antimony	mg/L	0.00019	0.00011	<0.00010	<0.00010	0.00010	0.00010			0.00311			
Total Selenium	mg/L	0.000608	0.000593	0.000464	0.000378	0.000435	0.000627			0.00559			

		MH-30						SDH-S2					
		Unnamed tributary to False Canyon Creek, approximately 3 km d/s of MH-11						Waste rock below Main Zone					
		26-Feb-19	26-Apr-19	19-Jun-19	29-Aug-19	24-Oct-19	4-Dec-19	26-Apr-19	26-Feb-19	4-Jun-19	29-Aug-19	22-Oct-19	22-Oct-19
Total Silicon	mg/L	3.42	3.28	2.58	2.51	3.21	4.86	No visible seep seen from the air and site conditions unsafe for landing.	Site Inaccessible	7.51	Water Inaccessible	Water Inaccessible	Site Inaccessible
Total Tin	mg/L	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00050			
Total Strontium	mg/L	0.125	0.122	0.0734	0.115	0.115	0.169			0.207			
Total Sulphur	mg/L	2.25	2.20	1.55	1.79	2.00	2.81			71.1			
Total Titanium	mg/L	0.00086	<0.00060	<0.00030	<0.00030	<0.0018	<0.00030			0.0598			
Total Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			0.000174			
Total Uranium	mg/L	0.00183	0.00178	0.000594	0.00101	0.00140	0.00213			0.000978			
Total Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050			0.0104			
Total Zinc	mg/L	0.0138	<0.0030	<0.0030	<0.0030	0.0032	0.0178			21.2			
Total Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030			<0.0010			
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010			
Dissolved Arsenic	mg/L	0.00022	0.00026	0.00018	0.00029	0.00025	0.00027			<0.00010			
Dissolved Aluminium	mg/L	0.0018	0.0017	0.0068	0.0022	0.0018	0.0011			<0.0010			
Dissolved Barium	mg/L	0.238	0.234	0.118	0.194	0.181	0.266			0.0217			
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020			<0.000020			
Dissolved Boron -	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			<0.010			
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050			
Dissolved Calcium	mg/L	48.9	45.3	27.9	40.5	41.0	54.5			85.7			
Dissolved Cadmium	mg/L	0.0000451	0.0000307	0.0000143	0.0000144	0.0000337	0.0000210			0.0944			
Dissolved Cobalt	mg/L	0.00014	0.00012	<0.00010	<0.00010	0.00011	0.00015			0.00036			
Dissolved Chromium	mg/L	0.00016	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010			
Dissolved Copper	mg/L	0.00091	0.00028	0.00077	0.00026	0.00040	0.00052			<0.00020			
Dissolved Iron	mg/L	0.116	0.396	0.101	0.239	0.256	0.119			<0.010			
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050			
Dissolved Potassium	mg/L	0.58	0.63	0.26	0.34	0.38	0.79			0.78			
Dissolved Lithium	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			0.0013			
Dissolved Magnesium	mg/L	18.5	16.2	9.19	13.6	14.2	22.0			3.23			
Dissolved Manganese	mg/L	0.0426	0.0360	0.00539	0.0184	0.0319	0.0471			0.00314			
Dissolved Molybdenum	mg/L	0.00185	0.00158	0.000946	0.00124	0.00127	0.00325			0.000650			
Dissolved Sodium	mg/L	2.95	0.836	0.557	0.714	0.751	1.51			0.475			
Dissolved Nickel	mg/L	0.00066	0.00052	0.00060	0.00054	<0.00050	0.00064			0.00127			
Dissolved Lead	mg/L	0.000094	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			0.0524			
Dissolved Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			<0.050			
Dissolved Antimony	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			0.00021			
Dissolved Sulphur	mg/L	2.14	2.13	1.63	1.47	1.66	2.70			72.4			
Dissolved Selenium	mg/L	0.000611	0.000622	0.000432	0.000419	0.000392	0.000584			0.00444			
Dissolved Silicon	mg/L	3.41	3.28	2.53	2.72	3.01	4.69			2.34			
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010			
Dissolved Strontium	mg/L	0.127	0.123	0.0832	0.113	0.119	0.154			0.111			
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030			
Dissolved Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010			0.000022			
Dissolved Uranium	mg/L	0.00185	0.00178	0.000631	0.00102	0.00129	0.00192			0.000273			
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050			
Dissolved Zinc	mg/L	0.0083	0.0012	0.0010	<0.0010	0.0017	0.0125			12.0			
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030			<0.00030			

		MW13-06				MW13-13				MW13-01			
		Burwick 1200 Portal				Downgradient of 1380 Portal				Jewelbox/Main Zone - in 1360 Gully, downgradient of 1380 Portal			
		27/Feb/19	4/Jun/19	28/Aug/19	22/Oct/19	27/Feb/19	5/Jun/19	28/Aug/19	22/Oct/19	25/Feb/19	5/Jun/19	27/Aug/19	21/Oct/19
Ground Water Elevation	masl	1179.1	1184.2	1181.2	1180.7	1244.4	1248.0	1248.9	1245.7	1180.3	1181.5	1181.1	1180.6
Temperature - Field	C	2.7	4	5.9	1.8		0.2	2.8	2.5	1.2	2.8	3.5	1
pH - Field	pH	7.61	6.71	6.75	7.04		7.44	7.6	8.24	7.68	6.93	7.17	7.41
pH - Lab	pH	7.02	7.94	8.32	7.64		8.03	8.12	8.05	7.62	8.07	8.36	7.78
Hardness (Dissolved, CaCO3)	mg/L	324	349	375	392		96.2	144	130	163	149	150	155
Conductivity - Field	µS/cm	740.1	642.6	728.6	786.9		213.5	283.7	266.6	358	309.3	289.5	293.1
Conductivity - Lab	µS/cm	685	696	743	779		195	293	252	323	294	296	295
Ammonia Nitrogen	mg/L	0.0142	0.0142	0.0172	0.0185		0.0170	0.0132	0.0122	0.0053	0.0186	<0.0050	0.0219
NO2-W	mg/L	<0.0010	0.0024	<0.0050	<0.0050		<0.0010	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010
NO3-W	mg/L	<0.0050	<0.0050	<0.025	<0.025		0.182	0.746	0.914	0.377	0.398	0.354	0.409
Sulphate	mg/L	173	200	215	280		11.5	58.7	28.7	10.6	11.1	10.2	10.0
Fluoride	mg/L	0.586	0.529	0.52	0.54		0.092	0.137	0.151	0.338	0.345	0.378	0.396
Chloride	mg/L	<0.50	<0.50	<2.5	<2.5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Bromide	mg/L	<0.050	<0.050	<0.25	<0.25		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L	1.26	17.58	1.23	2.96		12.69	11.02	10.26	7.1	16.45	9.11	7.91
Dissolved Oxygen	%	10.9	156.7	10	21.4		101.6	81.6	76.4	57.2	140.7	68.6	55.8
Redox	mV	7.9	58.4	2.9	159.4		173.3	116.4	229.7	138.9	140.5	110.8	308.9
Alkalinity (CaCO3)	mg/L	184	188	221	171		92.1	87.5	110	158	151	156	159
Dissolved Arsenic	mg/L	0.0501	0.0420	0.0477	0.0217		0.00062	0.00044	0.00049	0.00043	0.00039	0.00028	0.00029
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L	0.0013	0.0014	0.0018	0.0019		0.0169	0.0109	0.0109	0.0032	0.0028	0.0013	0.0022
Dissolved Barium	mg/L	0.0241	0.0251	0.0273	0.0279		0.0108	0.0184	0.0124	0.0213	0.0213	0.0219	0.0217
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	Not enough water in well to sample.	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L	0.013	0.013	0.015	0.012		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L	117	124	134	138		35.9	54.5	48.5	58.4	53.2	54.3	55.9
Dissolved Cadmium	mg/L	<0.000040	<0.000020	0.0000089	<0.000060		0.00139	0.00378	0.000644	0.000511	0.000619	0.000748	0.000919
Dissolved Cobalt	mg/L	0.00265	0.00212	0.00245	0.00224		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L	0.00017	<0.00010	<0.00010	<0.00010		0.00013	<0.00010	0.00020	0.00025	0.00023	0.00021	0.00021
Dissolved Copper	mg/L	0.00021	<0.00020	<0.00020	0.00042		0.00145	0.00084	0.00168	0.00020		0.00020	0.00032
Dissolved Iron	mg/L	0.721	0.709	0.657	0.416		0.025	0.014	0.014	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L	2.05	2.02	2.19	2.23		0.51	0.63	0.85	0.61	0.63	0.65	0.66
Dissolved Lithium	mg/L	0.0086	0.0087	0.0088	0.0076		<0.0010	0.0012	<0.0010	0.0018	0.0019	0.0015	0.0011
Dissolved Magnesium	mg/L	8.01	9.61	9.93	11.2		1.56	2.01	2.06	4.21	3.88	3.52	3.80
Dissolved Manganese	mg/L	0.342	0.293	0.311	0.275		0.00069	0.00047	0.00059	0.00106	0.00229	0.00153	0.00039
Dissolved Molybdenum	mg/L	0.0394	0.0319	0.0359	0.0299		0.000174	0.000249	0.000401	0.000739	0.000755	0.000717	0.000493
Dissolved Sodium	mg/L	15.8	12.4	13.1	12.8		0.539	0.700	0.747	1.35	0.789	0.769	0.747
Dissolved Nickel	mg/L	0.0295	0.0305	0.0325	0.0353		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L	<0.000050	0.000081	<0.000050	<0.000050		0.00166	0.00115	0.000673	0.000974	0.000769	0.000774	0.00148
Dissolved Phosphorus	mg/L	0.156	0.154	0.164	0.143		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L	0.00011	<0.00010	0.00010	0.00014		0.00012	0.00013	0.00017	0.00013	0.00021	0.00013	0.00011
Dissolved Sulphur	mg/L	59.4	73.1	75.8	92.4		4.37	19.2	9.37	3.92	4.33	3.51	3.63
Dissolved Selenium	mg/L	<0.000050	<0.000050	<0.000050	0.000163		0.000515	0.00135	0.000713	0.00125	0.00121	0.00123	0.00126

		MW13-06				MW13-13				MW13-01			
		Burwick 1200 Portal				Downgradient of 1380 Portal				Jewelbox/Main Zone - in 1360 Gully, downgradient of 1380 Portal			
		27/Feb/19	4/Jun/19	28/Aug/19	22/Oct/19	27/Feb/19	5/Jun/19	28/Aug/19	22/Oct/19	25/Feb/19	5/Jun/19	27/Aug/19	21/Oct/19
Dissolved Silicon	mg/L	15.6	16.7	15.5	14.3		2.07	2.06	2.53	3.46	3.82	3.32	3.38
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	0.00021	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L	0.417	0.484	0.536	0.553		0.0656	0.0945	0.0776	0.187	0.169	0.166	0.146
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030		<0.00060	0.00035	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L	0.000011	0.000012	0.000014	0.000010	Not enough water in well to sample	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L	0.0140	0.0116	0.0122	0.0100		0.000256	0.000374	0.000604	0.00100	0.00101	0.000912	0.000719
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L	0.101	0.0984	0.105	0.110		0.0443	0.117	0.0150	0.0168	0.0221	0.0281	0.0354
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Acenaphthene	mg/L												
Acenaphthylene	mg/L												
Acridine	mg/L												
Anthracene	mg/L												
Benz(a)anthracene	mg/L												
Benzene	mg/L												
Benzo(a)pyrene	mg/L												
2-Methylnaphthalene	mg/L												
Benzo(b,j)fluoranthene	mg/L												
Benzo(g,h,i)perylene	mg/L												
VPH (C6-C10)	mg/L												
Benzo(k)fluoranthene	mg/L												
Methyl t-butyl ether	mg/L												
Xylenes, total	mg/L												
1-Methylnaphthalene	mg/L												
Dibenz(a,h)anthracene	mg/L												
HEPH	mg/L												
Fluorene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Fluoranthene	mg/L												
Ethylbenzene	mg/L												
EPH19-32	mg/L												
Chrysene	mg/L												
EPH10-19	mg/L												
Pyrene	mg/L												
Volatile Hydroc (VH6-10)	mg/L												
Toluene	mg/L												
Quinoline	mg/L												
LEPH	mg/L												
Phenanthrene	mg/L												
ortho-Xylene	mg/L												
Naphthalene	mg/L												
Methyl t-butyl ether	mg/L												
meta- & para-Xylene	mg/L												
Styrene	mg/L												
Indeno(1,2,3-c,d)pyrene	mg/L												

		MW13-08				MW14-01				MW14-02			
		Downgradient of 1380 Portal				In proximity of the landfill				In proximity of the landfill			
		27/Feb/19	6/Jun/19	27/Aug/19	25/Oct/19	25/Feb/19	3/Jun/19	27/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19
Ground Water Elevation	masl	1130.7	1133.7	1131.9	1131.5			1015.0	1014.7				
Temperature - Field	C	0.5	2.2	2.8	2.4			4.2					
pH - Field	pH	7.37	7.23	7.21	7.29			7.41					
pH - Lab	pH	7.54	8.06	8.02	8.09			8.41	8.01				
Hardness (Dissolved, CaCO3)	mg/L	353	243	273	306			223	214				
Conductivity - Field	µS/cm	674.3	472.8	510.6	540			409.2					
Conductivity - Lab	µS/cm	656	429	450	529			401	391				
Ammonia Nitrogen	mg/L	0.0129	0.0300	0.0056	0.0487			0.0220	0.0441				
NO2-W	mg/L	<0.0010	<0.0010	<0.0010	<0.0010			0.0012	<0.0010				
NO3-W	mg/L	0.0832	<0.0050	0.332	0.491			0.226	0.213				
Sulphate	mg/L	18.1	9.57	10.0	14.6			3.57	3.49				
Fluoride	mg/L	0.046	0.332	0.045	0.051			0.090	0.105				
Chloride	mg/L	<0.50	<0.50	<0.50	<0.50			<0.50	<0.50				
Bromide	mg/L	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050				
Dissolved Oxygen	mg/L	3.69	22.63	7.76	5.85			7.05					
Dissolved Oxygen	%	28.8	188.3	57.4	42.9			54.1					
Redox	mV	10.6	159.5	96.5	225.5			113.6					
Alkalinity (CaCO3)	mg/L	348	236	242	302			284	225				
Dissolved Arsenic	mg/L	0.00022	0.00029	0.00022	0.00016			0.00029	0.00025				
Dissolved Silver	mg/L	<0.000010	<0.000010	<0.000010	<0.000010			<0.000010	<0.000010				
Dissolved Aluminium	mg/L	0.0026	0.0046	0.0085	0.0012			0.0058	0.0058				
Dissolved Barium	mg/L	0.265	0.138	0.175	0.214	Dry	Dry	0.117	0.116	Dry	Dry at 16.17m	Dry	Dry at 16.170m
Dissolved Beryllium	mg/L	<0.000020	<0.000020	<0.000020	<0.000020			<0.000020	<0.000020				
Dissolved Boron	mg/L	<0.010	<0.010	<0.010	<0.010			<0.010	<0.010				
Dissolved Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050			<0.000050	<0.000050				
Dissolved Calcium	mg/L	118	82.9	93.2	106			71.7	67.5				
Dissolved Cadmium	mg/L	0.0000590	0.0000684	0.0000468	0.0000558			0.0000362	0.0000287				
Dissolved Cobalt	mg/L	<0.00010	<0.00010	<0.00010	<0.00010			<0.00010	<0.00010				
Dissolved Chromium	mg/L	0.00024	0.00038	0.00040	0.00045			0.00061	0.00067				
Dissolved Copper	mg/L	0.00034	0.00058	0.00040	0.00034			0.00073	0.00073				
Dissolved Iron	mg/L	<0.010	0.020	<0.010	<0.010			<0.010	<0.010				
Dissolved Mercury	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050			<0.0000050	<0.0000050				
Dissolved Potassium	mg/L	0.79	0.65	0.64	0.66			0.71	0.62				
Dissolved Lithium	mg/L	0.0022	0.0014	0.0019	0.0019			<0.0010	<0.0010				
Dissolved Magnesium	mg/L	13.8	8.77	9.93	10.2			10.8	11.0				
Dissolved Manganese	mg/L	0.00023	0.00050	0.00036	0.00022			0.00098	0.00051				
Dissolved Molybdenum	mg/L	0.000727	0.000795	0.000608	0.000507			0.00226	0.00209				
Dissolved Sodium	mg/L	1.33	1.12	1.00	1.04			1.39	1.29				
Dissolved Nickel	mg/L	<0.00050	<0.00050	<0.00050	<0.00050			<0.00050	<0.00050				
Dissolved Lead	mg/L	<0.000050	0.000088	<0.000050	<0.000050			0.000085	0.000062				
Dissolved Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050			<0.050	<0.050				
Dissolved Antimony	mg/L	0.00017	0.00014	0.00016	0.00016			0.00020	0.00017				
Dissolved Sulphur	mg/L	6.57	4.17	3.86	4.91			1.34	1.39				
Dissolved Selenium	mg/L	0.000939	0.00126	0.00127	0.00146			0.00100	0.00101				

		MW13-08				MW14-01				MW14-02			
		Downgradient of 1380 Portal				In proximity of the landfill				In proximity of the landfill			
		27/Feb/19	6/Jun/19	27/Aug/19	25/Oct/19	25/Feb/19	3/Jun/19	27/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19
Dissolved Silicon	mg/L	4.25	4.25	3.84	3.97	Dry	Dry	4.59	4.57	Dry	Dry	Dry	Dry
Dissolved Tin	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	Dry	Dry	<0.00010	<0.00010	Dry	Dry	Dry	Dry
Dissolved Strontium	mg/L	0.414	0.268	0.331	0.328	Dry	Dry	0.250	0.222	Dry	Dry	Dry	Dry
Dissolved Titanium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	Dry	Dry	<0.00030	<0.00030	Dry	Dry	Dry	Dry
Dissolved Thallium	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Dissolved Uranium	mg/L	0.00213	0.00147	0.00147	0.00146	Dry	Dry	0.000659	0.000638	Dry	Dry	Dry	Dry
Dissolved Vanadium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
Dissolved Zinc	mg/L	0.0013	0.0018	<0.0010	0.0013	Dry	Dry	0.0013	0.0024	Dry	Dry	Dry	Dry
Dissolved Zirconium	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	Dry	Dry	<0.00030	<0.00030	Dry	Dry	Dry	Dry
Acenaphthene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Acenaphthylene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Acridine	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Anthracene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Benz(a)anthracene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Benzene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
Benzo(a)pyrene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.0000050	<0.0000050	Dry	Dry	Dry	Dry
2-Methylnaphthalene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000050	<0.000050	Dry	Dry	Dry	Dry
Benzo(b,j)fluoranthene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Benzo(g,h,i)perylene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
VPH (C6-C10)	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.10	<0.10	Dry	Dry	Dry	Dry
Benzo(k)fluoranthene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Methyl t-butyl ether	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
Xylenes, total	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00075	<0.00075	Dry	Dry	Dry	Dry
1-Methylnaphthalene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000050	<0.000050	Dry	Dry	Dry	Dry
Dibenz(a,h)anthracene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.0000050	<0.0000050	Dry	Dry	Dry	Dry
HEPH	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.25	<0.25	Dry	Dry	Dry	Dry
Fluorene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Fluoranthene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Ethylbenzene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
EPH19-32	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.25	<0.25	Dry	Dry	Dry	Dry
Chrysene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
EPH10-19	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.25	<0.25	Dry	Dry	Dry	Dry
Pyrene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry
Volatile Hydroc (VH6-10)	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.10	<0.10	Dry	Dry	Dry	Dry
Toluene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00045	<0.00045	Dry	Dry	Dry	Dry
Quinoline	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000050	<0.000050	Dry	Dry	Dry	Dry
LEPH	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.25	<0.25	Dry	Dry	Dry	Dry
Phenanthrene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000020	<0.000020	Dry	Dry	Dry	Dry
ortho-Xylene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
Naphthalene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000050	<0.000050	Dry	Dry	Dry	Dry
Methyl t-butyl ether	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry			Dry	Dry	Dry	Dry
meta- & para-Xylene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
Styrene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.00050	<0.00050	Dry	Dry	Dry	Dry
Indeno(1,2,3-c,d)pyrene	mg/L	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Dry	Dry	<0.000010	<0.000010	Dry	Dry	Dry	Dry

		MW14-03				MW14-04				MW13-04			
		In proximity of the landfill				In proximity of the landfill				Main Access Road			
		25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	4/Jun/19	28/Aug/19	21/Oct/19
Ground Water Elevation	masl						1017.7	1017.8	1017.9		1192.4	1181.3	1180.7
Temperature - Field	C										1.2	2.1	1.5
pH - Field	pH										7.53	7.54	7.83
pH - Lab	pH							8.29			8.19	8.37	8.10
Hardness (Dissolved, CaCO3)	mg/L							163	161		132	142	164
Conductivity - Field	µS/cm										269.5	298.9	295.9
Conductivity - Lab	µS/cm							317			253	297	281
Ammonia Nitrogen	mg/L										0.0063	0.0175	0.0247
NO2-W	mg/L							0.0011			<0.0010	<0.0010	<0.0010
NO3-W	mg/L							0.0735			0.369	0.618	0.663
Sulphate	mg/L							3.82			5.26	4.78	4.71
Fluoride	mg/L							0.070			0.068	0.052	0.058
Chloride	mg/L							1.16			<0.50	<0.50	<0.50
Bromide	mg/L							<0.050			<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L										12.52	8.93	8.17
Dissolved Oxygen	%										102.6	68.2	58.6
Redox	mV										170.2	104.3	264.7
Alkalinity (CaCO3)	mg/L							191			133	193	161
Dissolved Arsenic	mg/L							0.00080	0.00066		0.00076	0.00071	0.00085
Dissolved Silver	mg/L							<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L							0.0150	0.0029		0.0034	0.0019	0.0029
Dissolved Barium	mg/L	Dry	Dry at 7.5m	Dry	Dry	Dry	Water collection not possible	0.132	0.120	Dry	0.0378	0.0506	0.0477
Dissolved Beryllium	mg/L							<0.000020	<0.000020		<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L							<0.010	<0.010		<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L							<0.000050	<0.000050		<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L							53.6	52.6		47.9	51.0	59.3
Dissolved Cadmium	mg/L							0.0000666	0.0000519		0.000471	0.000432	0.000489
Dissolved Cobalt	mg/L							<0.00010	<0.00010		<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L							0.00037	0.00029		0.00033	0.00027	0.00034
Dissolved Copper	mg/L							0.0143	0.00183		0.00081	0.00039	0.00223
Dissolved Iron	mg/L							0.024	<0.010		<0.010	<0.010	<0.010
Dissolved Mercury	mg/L							<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L							2.20	1.35		0.48	0.42	0.78
Dissolved Lithium	mg/L							0.0019	0.0017		0.0017	0.0015	0.0016
Dissolved Magnesium	mg/L							7.17	7.16		2.99	3.47	3.91
Dissolved Manganese	mg/L							0.00341	0.00547		0.00071	0.00017	0.00091
Dissolved Molybdenum	mg/L							0.00562	0.00501		0.000550	0.000646	0.000639
Dissolved Sodium	mg/L							2.84	2.06		0.619	0.888	1.02
Dissolved Nickel	mg/L							0.00185	<0.00050		<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L							0.00164	0.000085		0.000451	0.000536	0.000699
Dissolved Phosphorus	mg/L							<0.050	<0.050		<0.050	<0.050	<0.050
Dissolved Antimony	mg/L							0.00029	0.00032		0.00029	0.00025	0.00032
Dissolved Sulphur	mg/L							1.54	1.21		2.27	1.66	1.55
Dissolved Selenium	mg/L							0.000125	0.000215		0.00110	0.00105	0.00109

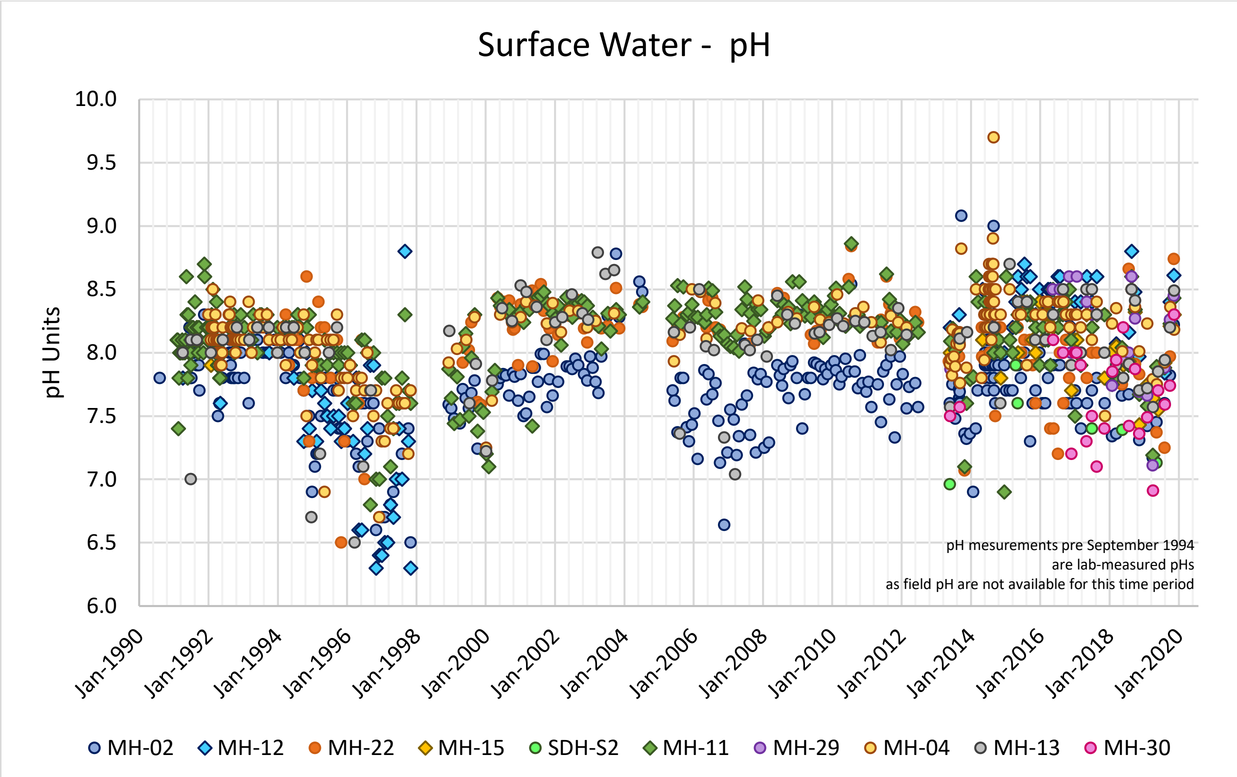
		MW14-03				MW14-04				MW13-04			
		In proximity of the landfill				In proximity of the landfill				Main Access Road			
		25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	3/Jun/19	26/Aug/19	23/Oct/19	25/Feb/19	4/Jun/19	28/Aug/19	21/Oct/19
Dissolved Silicon	mg/L							3.80	3.72		4.16	3.83	4.01
Dissolved Tin	mg/L							<0.00010	<0.00010		<0.00010	<0.00010	<0.00010
Dissolved Strontium	mg/L							0.217	0.191		0.112	0.131	0.144
Dissolved Titanium	mg/L							0.00098	<0.00030		<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L							<0.000010	<0.000010		<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L							0.000504	0.000440		0.000645	0.000657	0.000719
Dissolved Vanadium	mg/L							<0.00050	<0.00050		<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L							0.0101	0.0027		0.0196	0.0117	0.0173
Dissolved Zirconium	mg/L							<0.00030	<0.00030		<0.00030	<0.00030	<0.00030
Acenaphthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Acridine	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Anthracene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Benzene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Benzo(a)pyrene	mg/L								<0.0000050		<0.0000050	<0.0000050	<0.0000050
2-Methylnaphthalene	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
Benzo(b,j)fluoranthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
VPH (C6-C10)	mg/L								<0.10		<0.10	<0.10	<0.10
Benzo(k)fluoranthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Methyl t-butyl ether	mg/L	Dry	Dry	Dry	Dry	Dry	Water collection not possible		<0.00050	Dry	<0.00050	<0.00050	<0.00050
Xylenes, total	mg/L								<0.00075		<0.00075	<0.00075	<0.00075
1-Methylnaphthalene	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
Dibenz(a,h)anthracene	mg/L								<0.0000050		<0.0000050	<0.0000050	<0.0000050
HEPH	mg/L							Insufficent Water for complete analysis	<0.25		<0.25	<0.25	0.31
Fluorene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Fluoranthene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Ethylbenzene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
EPH19-32	mg/L								<0.25		<0.25	<0.25	0.31
Chrysene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
EPH10-19	mg/L								<0.25		<0.25	<0.25	<0.25
Pyrene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010
Volatile Hydroc (VH6-10)	mg/L								<0.10		<0.10	<0.10	<0.10
Toluene	mg/L								<0.00045		<0.00045	<0.00045	<0.00045
Quinoline	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
LEPH	mg/L								<0.25		<0.25	<0.25	<0.25
Phenanthrene	mg/L								<0.000020		<0.000020	<0.000020	<0.000020
ortho-Xylene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Naphthalene	mg/L								<0.000050		<0.000050	<0.000050	<0.000050
Methyl t-butyl ether	mg/L												
meta- & para-Xylene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Styrene	mg/L								<0.00050		<0.00050	<0.00050	<0.00050
Indeno(1,2,3-c,d)pyrene	mg/L								<0.000010		<0.000010	<0.000010	<0.000010

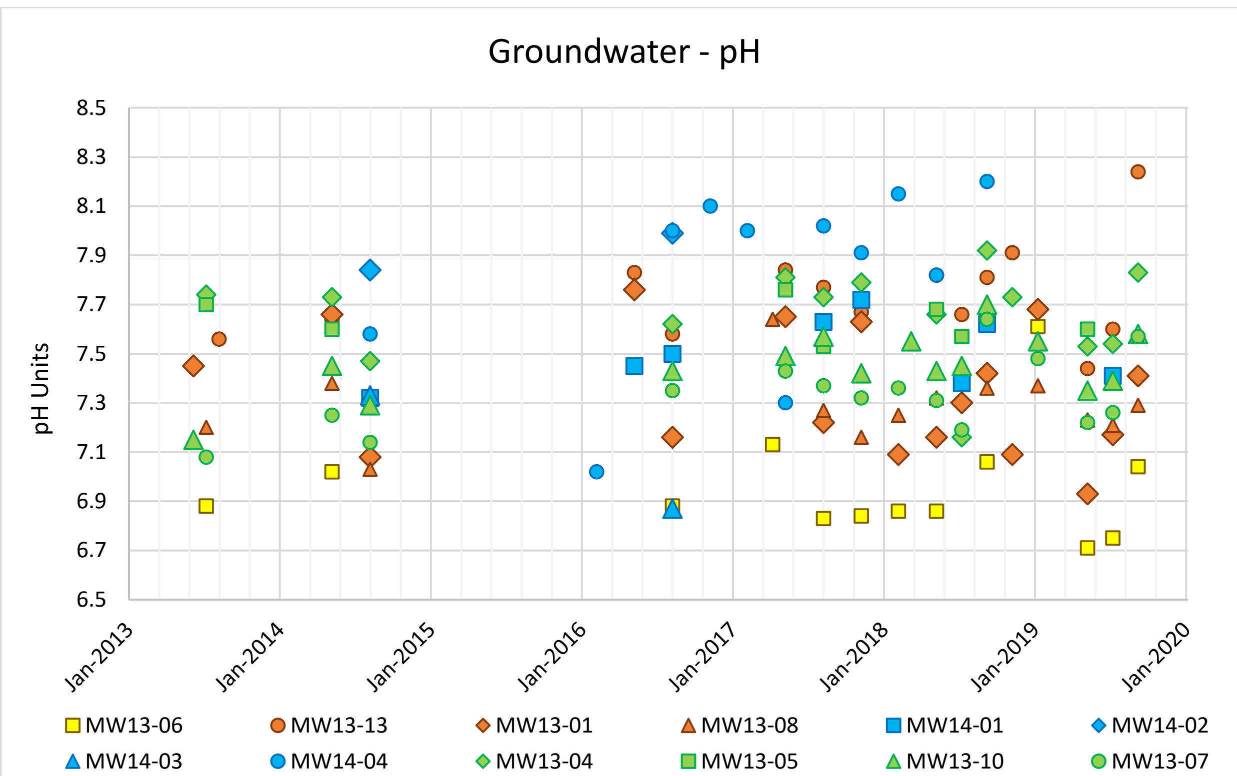
		MW13-05				MW13-07				MW13-10			
		Main Access Road - south of the Mill Site on the Main Access Road				North Dam - north of the North Dam and Tailings Pond Area				Mill Site - northeast of the Mill Site			
		25/Feb/19	4/Jun/19	27/Aug/19	21/Oct/19	27/Feb/19	5/Jun/19	27/Aug/19	25/Oct/19	26/Feb/19	6/Jun/19	27/Aug/19	23/Oct/19
Ground Water Elevation	masl		1193.8			1093.2	1094.6	1093.8	1093.6	1115.2	1117.5	1115.7	1115.6
Temperature - Field	C		0.8			3	3.7	4	3.3	1.6	1.8	2.6	2.1
pH - Field	pH		7.6			7.48	7.22	7.26	7.57	7.55	7.35	7.39	7.58
pH - Lab	pH		8.17			7.64	8.23	8.45	7.96	7.83	8.07	8.12	8.10
Hardness (Dissolved, CaCO3)	mg/L		169			234	218	223	231	230	232	239	241
Conductivity - Field	µS/cm		370.7			506	492.7	470.9	460.9	549.2	459.3	436.8	438.7
Conductivity - Lab	µS/cm		340			502	449	473	450	450	413	414	435
Ammonia Nitrogen	mg/L		0.0131			0.164	0.148	0.164	0.150	0.0147	0.0056	0.0142	0.0220
NO2-W	mg/L		<0.0010			0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0042
NO3-W	mg/L		1.53			<0.0050	<0.0050	<0.0050	<0.0050	0.532	0.243	0.521	0.535
Sulphate	mg/L		47.4			42.5	32.6	35.6	33.4	35.1	9.68	34.4	35.3
Fluoride	mg/L		0.064			0.370	0.336	0.347	0.348	0.055	0.055	0.055	0.063
Chloride	mg/L		<0.50			0.71	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.64
Bromide	mg/L		<0.050			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Oxygen	mg/L					1.84	21.89	0.27	1.16	6.5	17.11	7.46	7.77
Dissolved Oxygen	%		97.1			15.7	189.4	2.1	8.4	52.8	141.3	54.9	56.6
Redox	mV		150.6			-105.2	-81.8	-131.7	-95	145.8	163.8	97.9	215.2
Alkalinity (CaCO3)	mg/L		132			230	227	231	237	207	199	210	215
Dissolved Arsenic	mg/L		0.00053			0.00266	0.00213	0.00308	0.00259	0.00105	0.00108	0.00115	0.00110
Dissolved Silver	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Aluminium	mg/L		0.0025			0.0036	0.0020	0.0024	0.0034	0.0027	0.0016	0.0020	0.0018
Dissolved Barium	mg/L	Dry	0.0598	Dry	Dry	0.0271	0.0266	0.0265	0.0282	0.00767	0.0103	0.00857	0.00805
Dissolved Beryllium	mg/L		<0.000020			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Dissolved Boron	mg/L		<0.010			0.024	0.022	0.022	0.024	<0.010	<0.010	<0.010	<0.010
Dissolved Bismuth	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Calcium	mg/L		61.4			66.7	61.4	62.4	65.3	78.4	78.7	81.9	82.1
Dissolved Cadmium	mg/L		0.0000702			0.0000075	<0.0000050	<0.0000050	<0.000010	0.0000165	0.0000224	0.0000187	0.0000284
Dissolved Cobalt	mg/L		<0.00010			0.00055	0.00033	0.00036	0.00036	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Chromium	mg/L		0.00040			0.00019	0.00010	<0.00010	<0.00010	0.00046	0.00045	0.00040	0.00047
Dissolved Copper	mg/L		0.00233			0.00031	0.00021	<0.00020	0.00033	<0.00020	0.00026	0.00066	0.00217
Dissolved Iron	mg/L		<0.010			2.10	2.10	2.22	2.17	<0.010	<0.010	<0.010	<0.010
Dissolved Mercury	mg/L		<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Dissolved Potassium	mg/L		0.61			3.30	2.91	2.92	3.23	1.08	1.07	1.17	1.24
Dissolved Lithium	mg/L		0.0017			0.0083	0.0087	0.0086	0.0081	0.0016	0.0016	0.0018	0.0016
Dissolved Magnesium	mg/L		3.82			16.5	15.8	16.4	16.5	8.31	8.53	8.46	8.80
Dissolved Manganese	mg/L		0.00092			0.990	0.691	0.750	0.778	0.00016	0.00027	0.00038	0.00054
Dissolved Molybdenum	mg/L		0.000619			0.00374	0.00302	0.00319	0.00302	0.00183	0.00169	0.00200	0.00178
Dissolved Sodium	mg/L		0.909			13.8	7.42	9.14	8.93	1.94	1.87	2.00	2.11
Dissolved Nickel	mg/L		<0.00050			0.00207	0.00086	0.00052	0.00086	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Lead	mg/L		0.000143			0.000094	<0.000050	<0.000050	0.000064	0.000093	0.000103	0.000146	0.000252
Dissolved Phosphorus	mg/L		<0.050			0.085	0.088	0.098	0.125	<0.050	<0.050	<0.050	<0.050
Dissolved Antimony	mg/L		0.00034			<0.00010	<0.00010	<0.00010	<0.00010	0.00012	0.00012	0.00013	0.00015
Dissolved Sulphur	mg/L		16.6			14.3	12.4	12.6	11.6	11.8	11.5	11.7	11.4
Dissolved Selenium	mg/L		0.00256			<0.000050	<0.000050	<0.000050	<0.000050	0.00151	0.00159	0.00159	0.00156

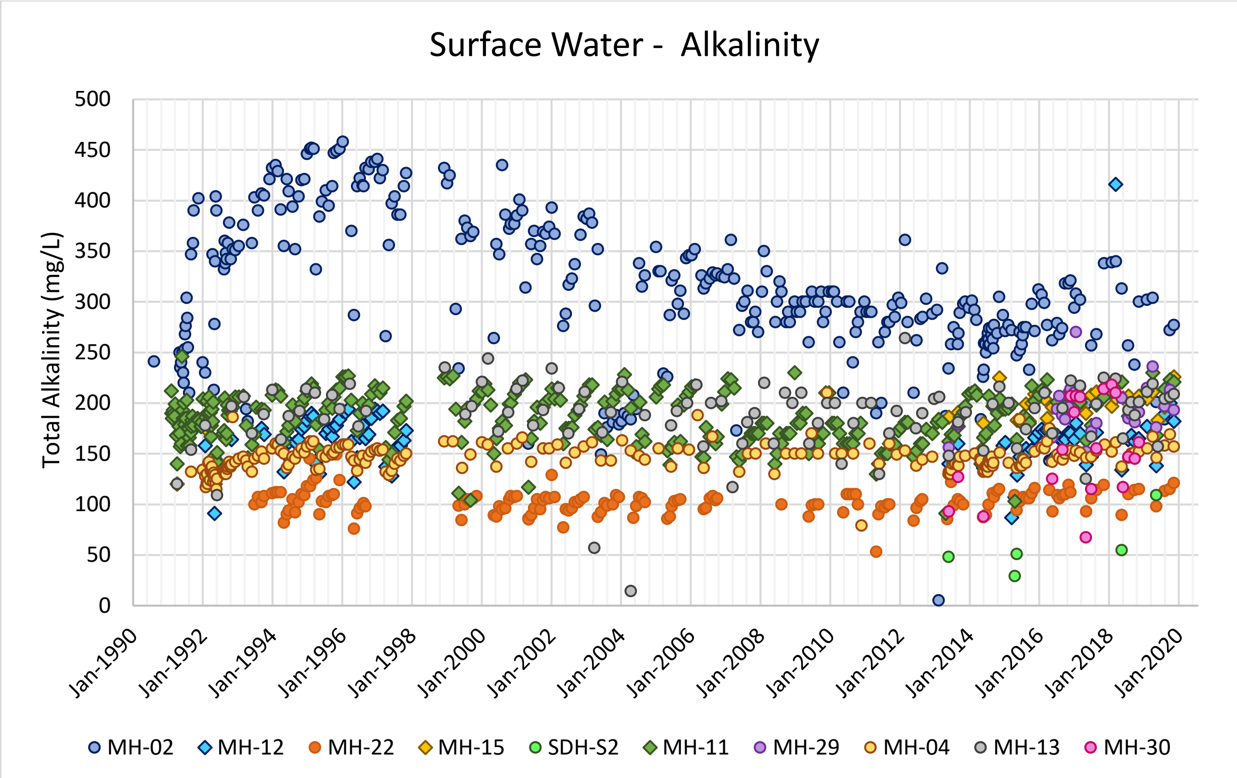
		MW13-05				MW13-07				MW13-10			
		Main Access Road - south of the Mill Site on the Main Access Road				North Dam - north of the North Dam and Tailings Pond Area				Mill Site - northeast of the Mill Site			
		25/Feb/19	4/Jun/19	27/Aug/19	21/Oct/19	27/Feb/19	5/Jun/19	27/Aug/19	25/Oct/19	26/Feb/19	6/Jun/19	27/Aug/19	23/Oct/19
Dissolved Silicon	mg/L		4.95			7.22	8.12	7.69	7.63	3.91	4.32	3.99	3.92
Dissolved Tin	mg/L		<0.00010			0.00017	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010
Dissolved Strontium	mg/L		0.183			0.479	0.442	0.462	0.433	0.359	0.335	0.394	0.327
Dissolved Titanium	mg/L		<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Thallium	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Uranium	mg/L		0.000872			0.00691	0.00629	0.00678	0.00617	0.00293	0.00258	0.00308	0.00295
Dissolved Vanadium	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Zinc	mg/L		0.0181			0.0027	0.0013	<0.0010	0.0021	<0.0010	0.0019	0.0020	0.0033
Dissolved Zirconium	mg/L		<0.00030			<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Acenaphthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Benzo(a)pyrene	mg/L		<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
2-Methylnaphthalene	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000056
Benzo(b,j)fluoranthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
VPH (C6-C10)	mg/L		<0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(k)fluoranthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Methyl t-butyl ether	mg/L	Dry	<0.00050	Dry	Dry	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Xylenes, total	mg/L		<0.00075			<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
1-Methylnaphthalene	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dibenz(a,h)anthracene	mg/L		<0.0000050			<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
HEPH	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Fluorene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluoranthene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Ethylbenzene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
EPH19-32	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Chrysene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
EPH10-19	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Pyrene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Volatile Hydroc (VH6-10)	mg/L		<0.10			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Toluene	mg/L		<0.00045			<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Quinoline	mg/L		<0.000050			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
LEPH	mg/L		<0.25			<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Phenanthrene	mg/L		<0.000020			<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
ortho-Xylene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Naphthalene	mg/L		<0.000050			0.000054	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Methyl t-butyl ether	mg/L												
meta- & para-Xylene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Styrene	mg/L		<0.00050			<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Indeno(1,2,3-c,d)pyrene	mg/L		<0.000010			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

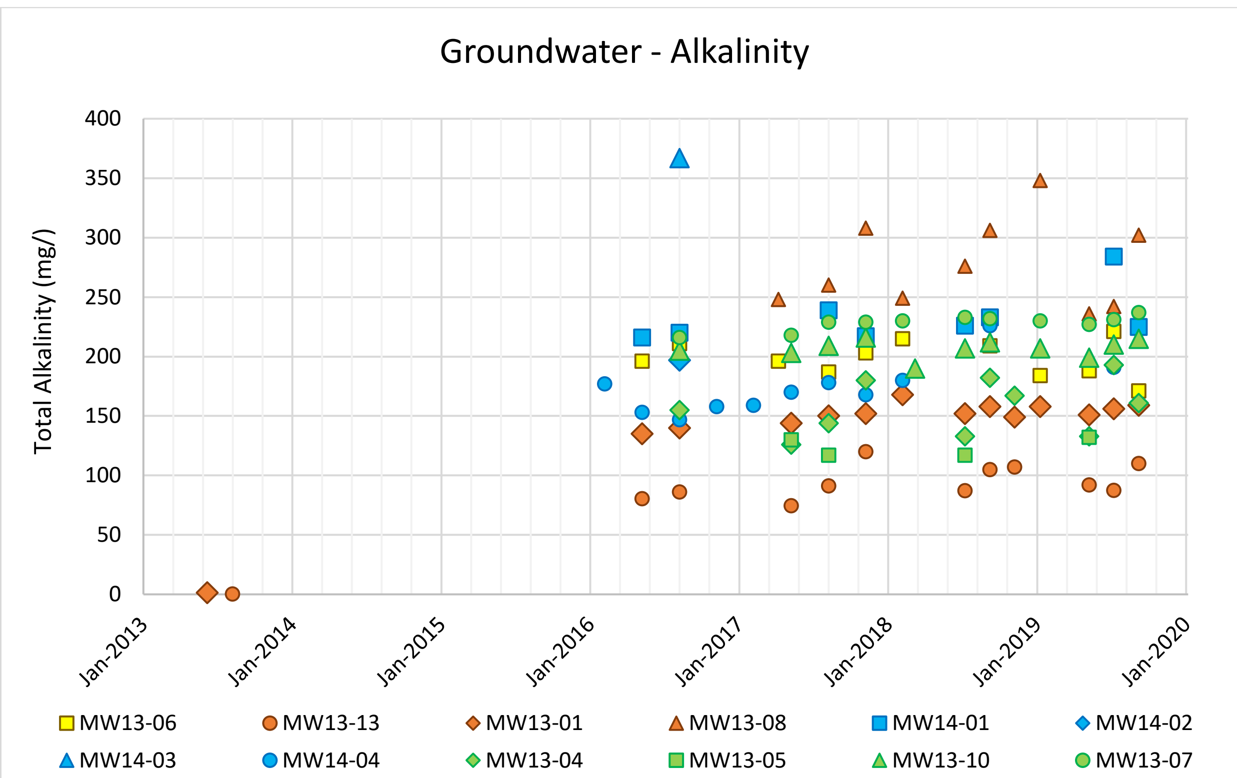
APPENDIX E

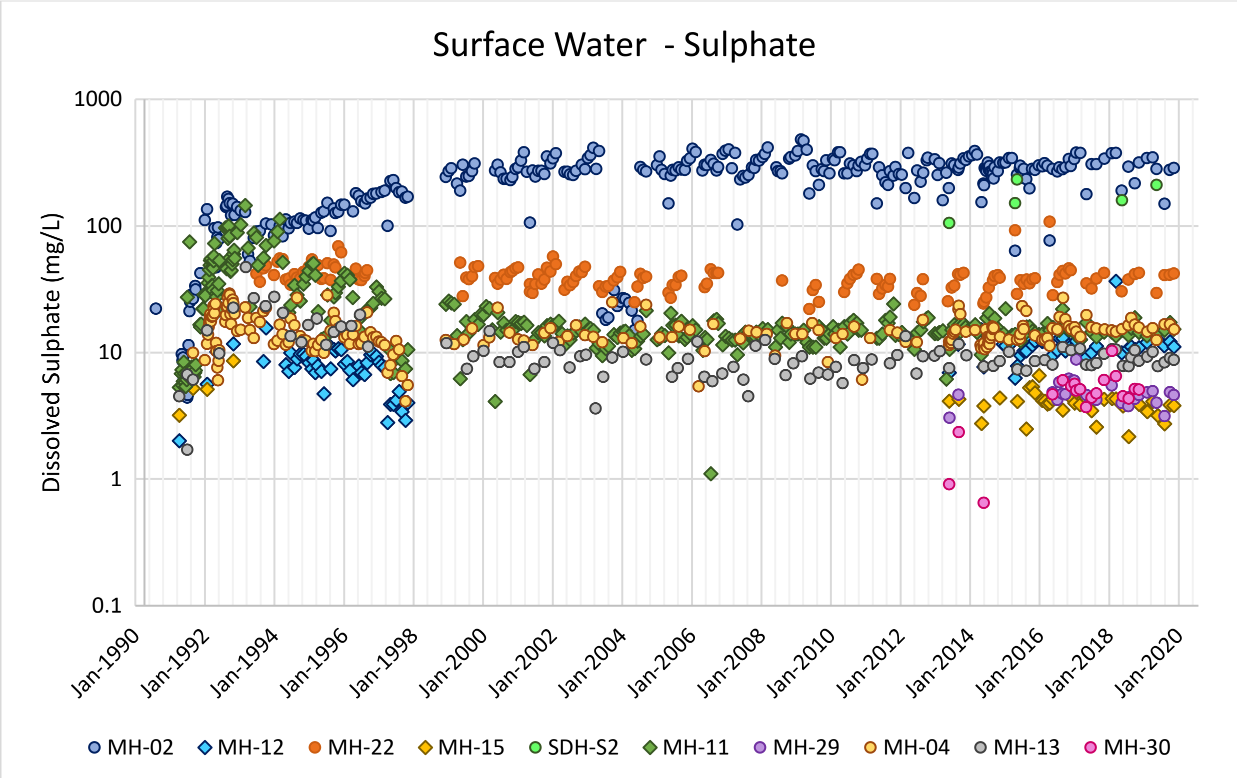
WATER QUALITY PLOTS

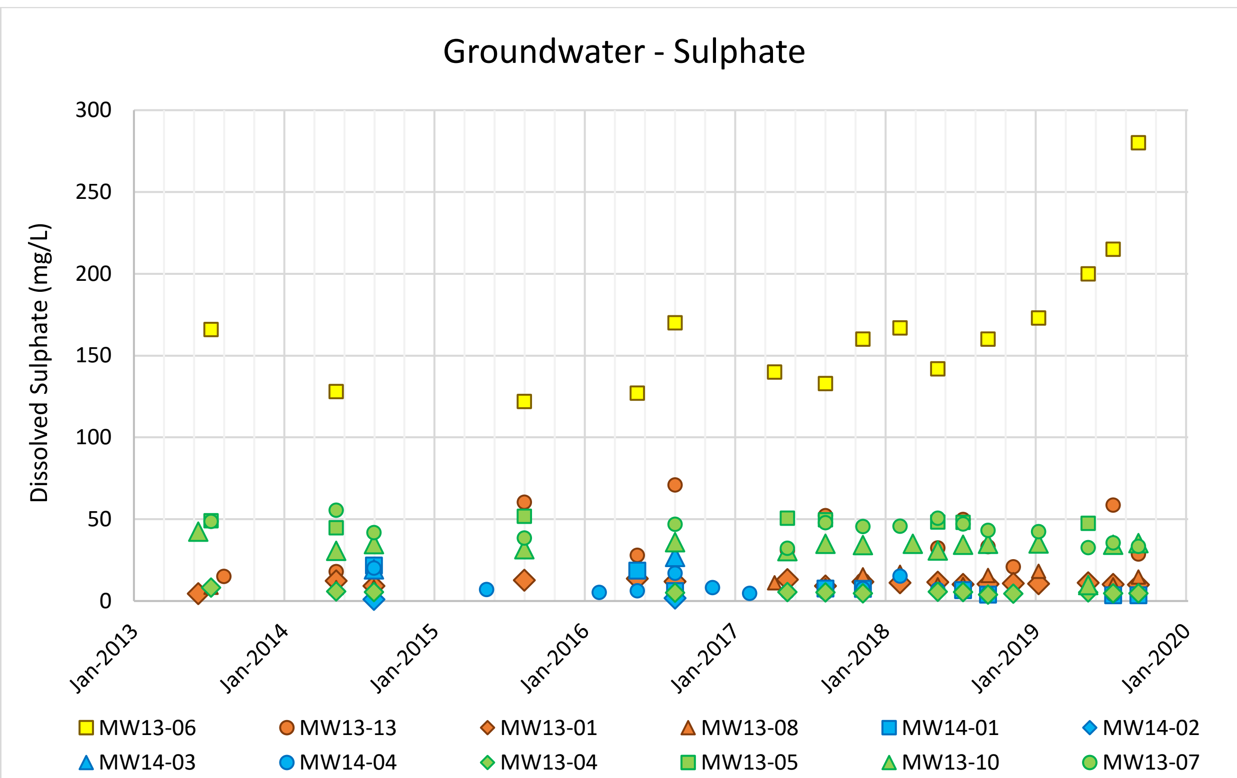

Surface Water - pH
pH Units
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
pH mesurements pre September 1994
are lab-measured pHs
as field pH are not available for this time period
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

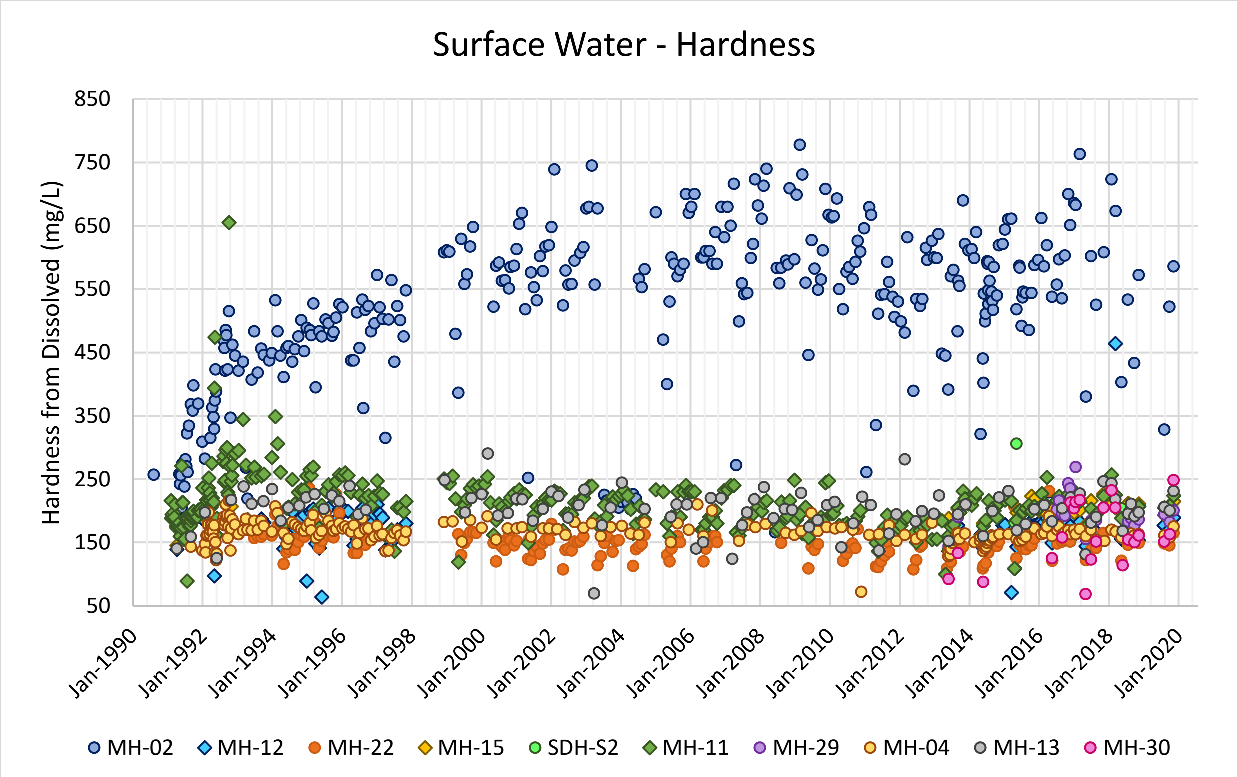

Groundwater - pH
pH Units
8.5
8.3
8.1
7.9
7.7
7.5
7.3
7.1
6.9
6.7
6.5
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

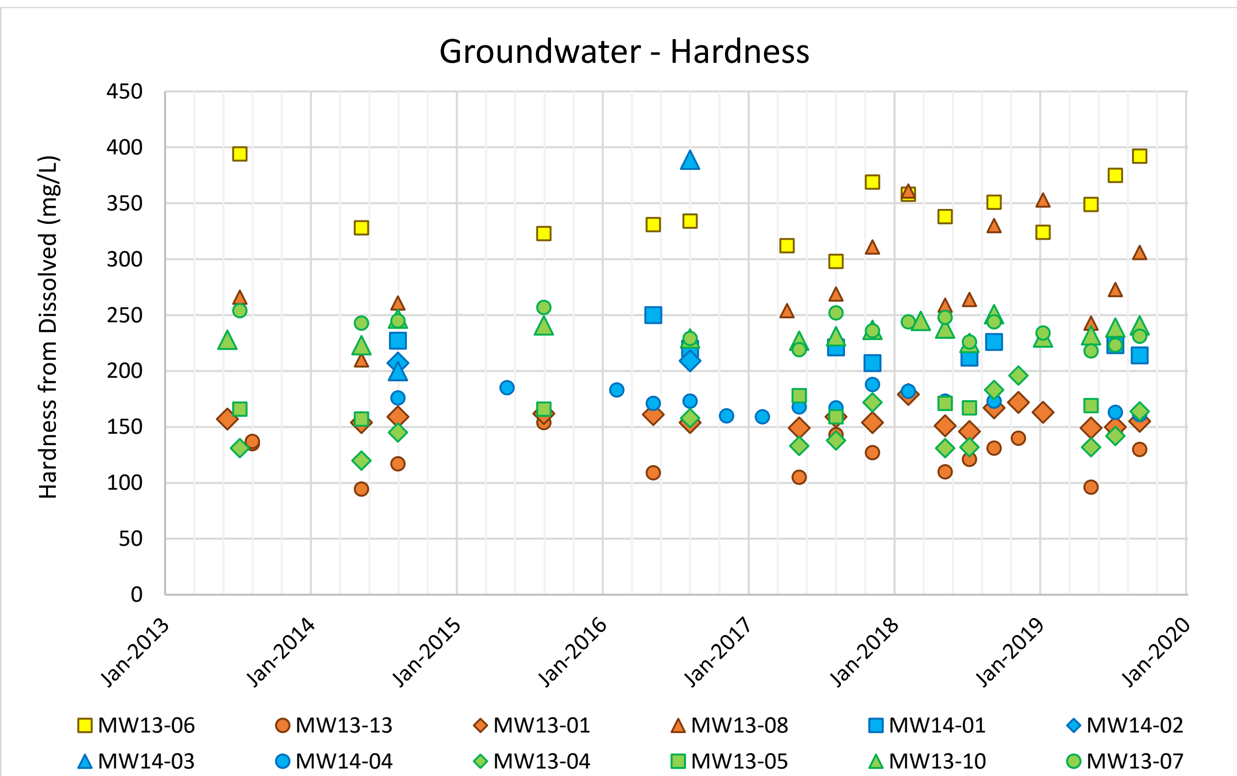

Surface Water - Alkalinity
Total Alkalinity (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

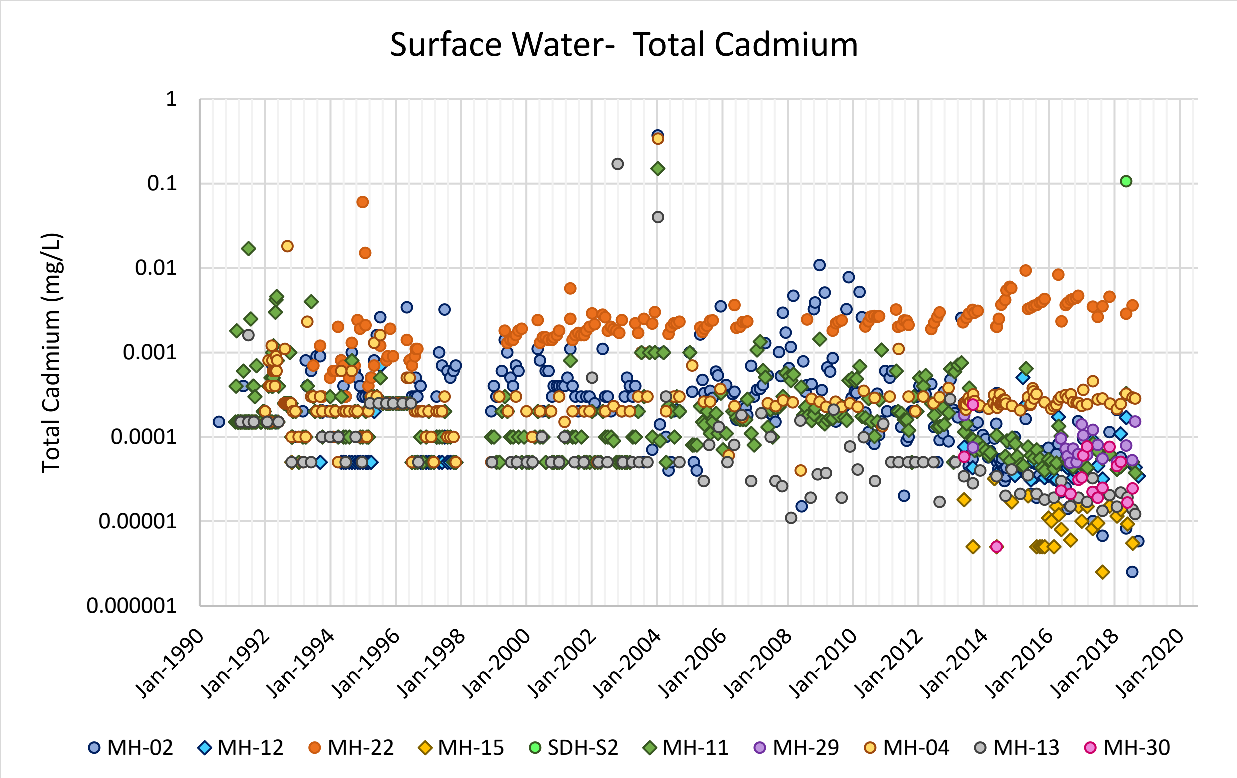

Groundwater - Alkalinity
Total Alkalinity (mg/)
400
350
300
250
200
150
100
50
0
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

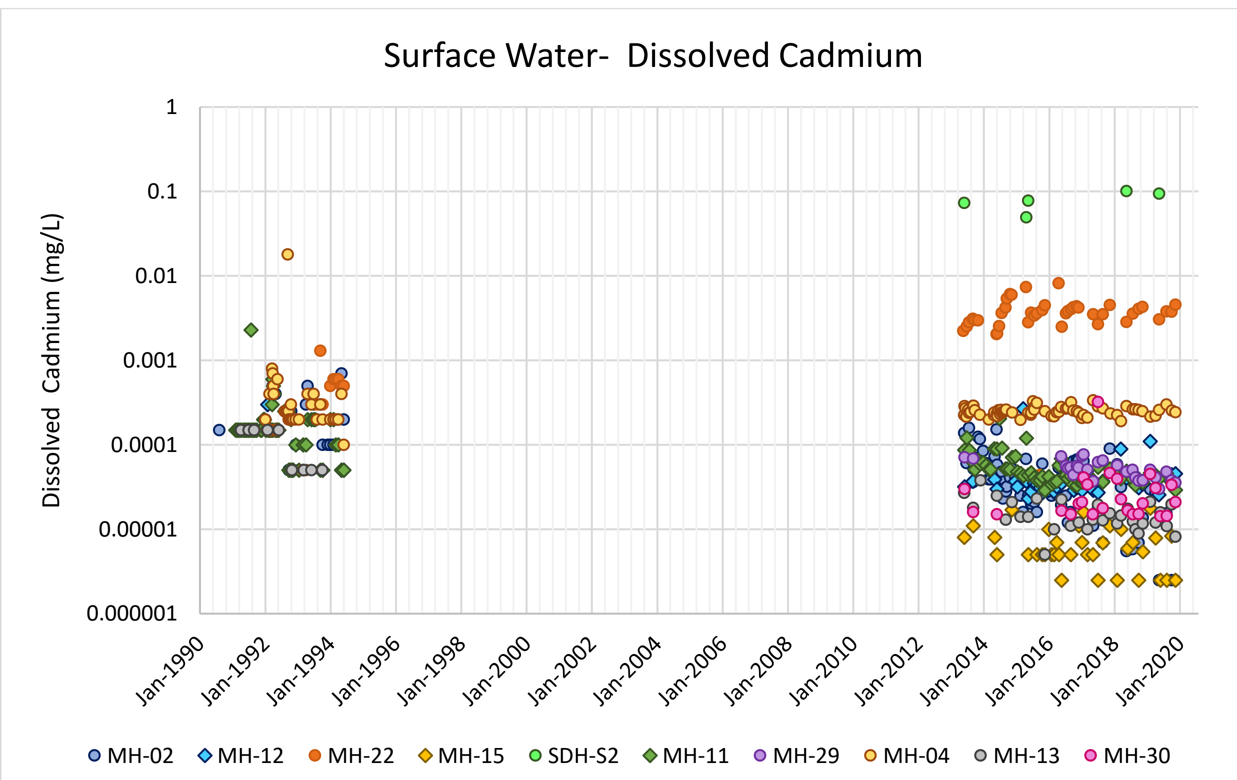

Surface Water - Sulphate
Dissolved Sulphate (mg/L)
1000
100
10
1
0.1
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

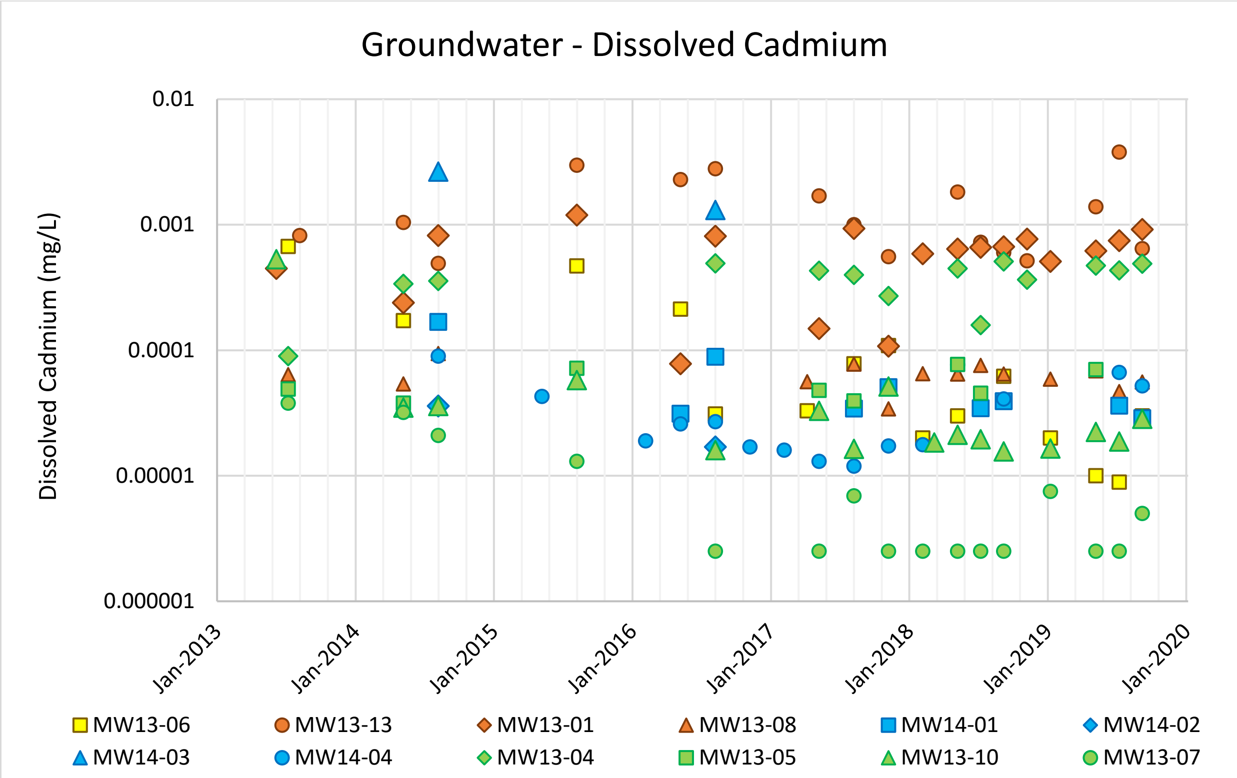

Groundwater - Sulphate
Dissolved Sulphate (mg/L)
300
250
200
150
100
50
0
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

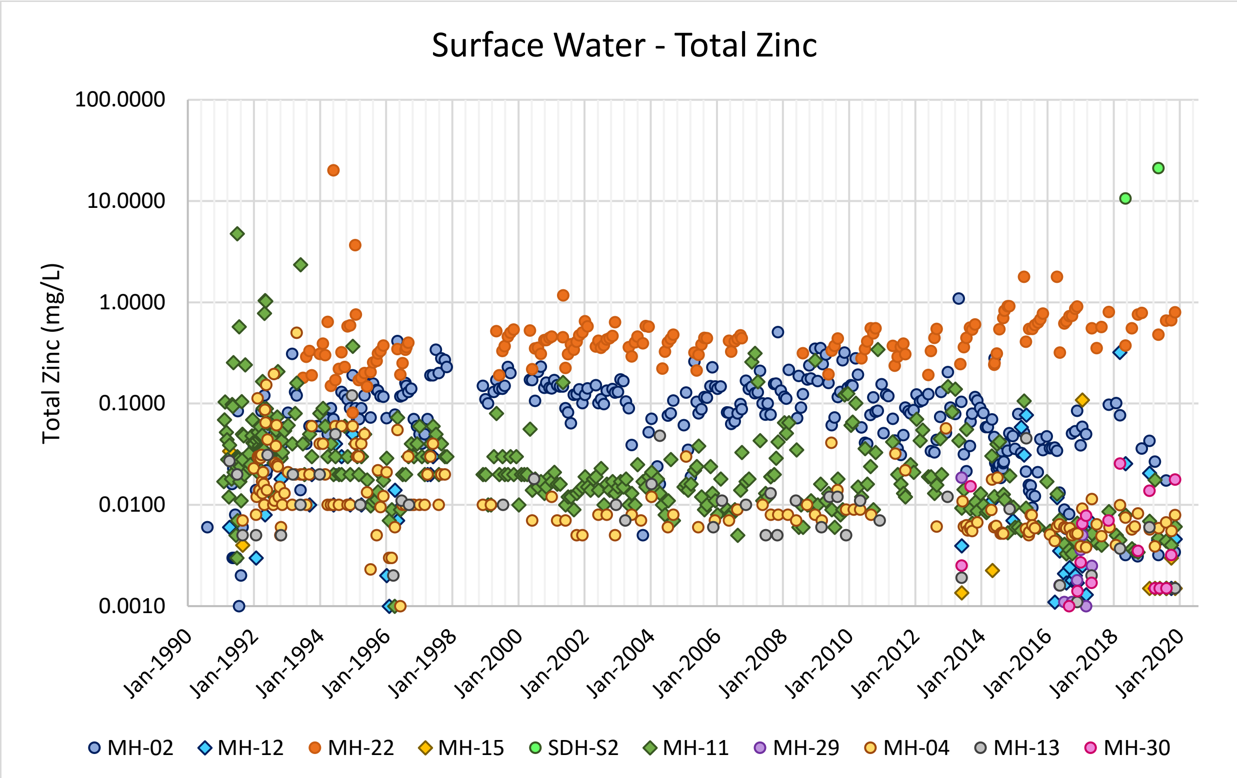

Surface Water - Hardness
Hardness from Dissolved (mg/L)
850
750
650
550
450
350
250
150
50
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

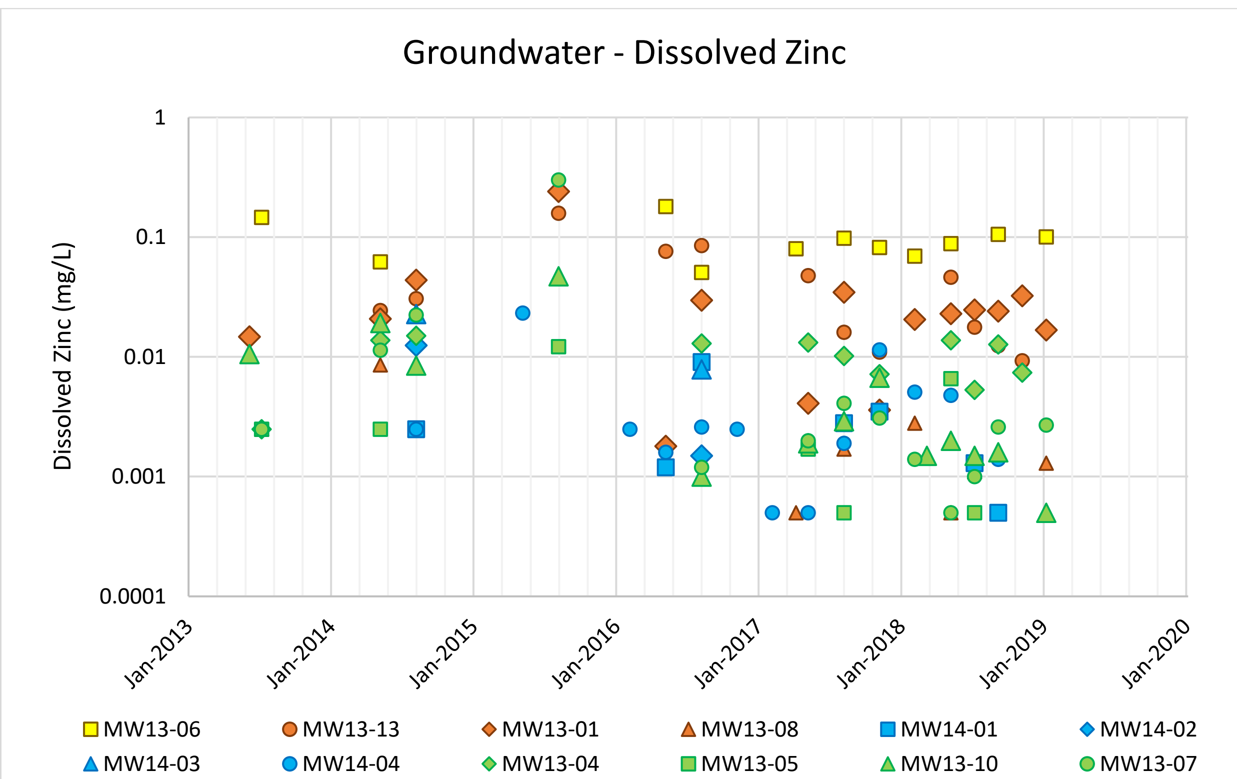

Groundwater - Hardness
Hardness from Dissolved (mg/L)
450
400
350
300
250
200
150
100
50
0
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

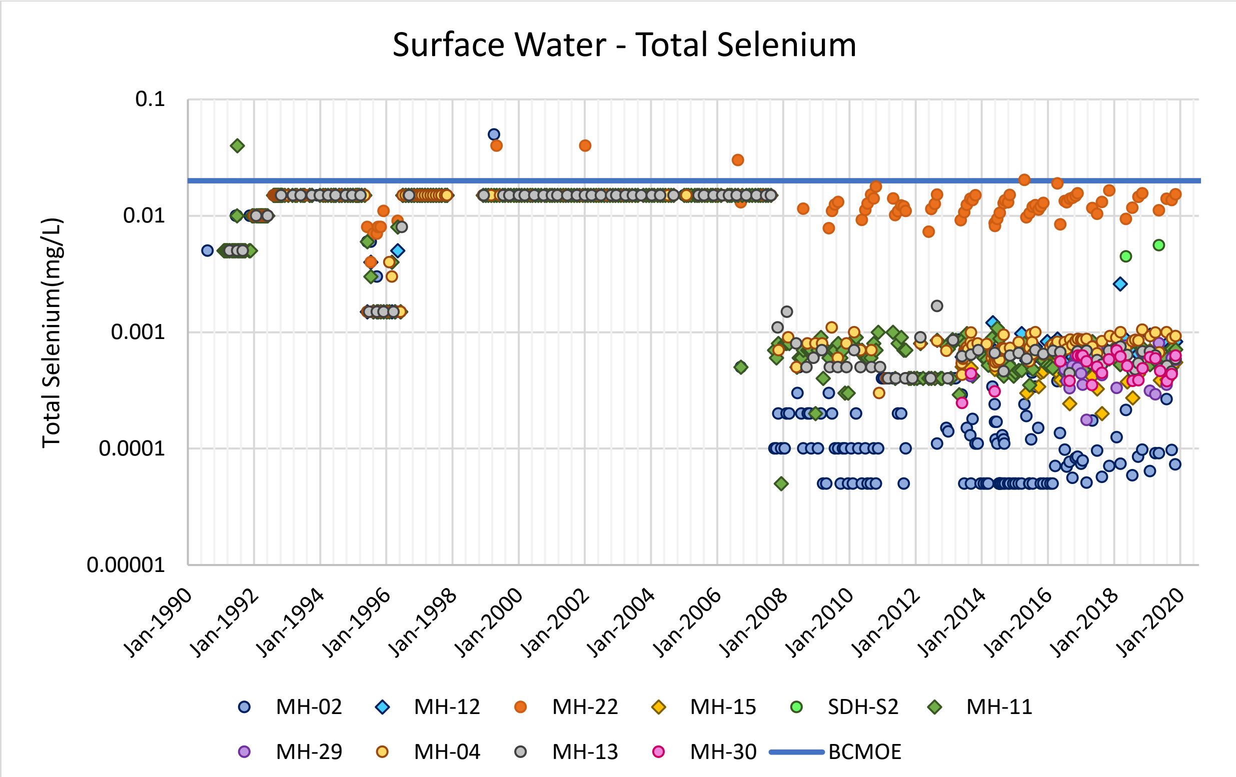

Surface Water- Total Cadmium
Total Cadmium (mg/L)
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

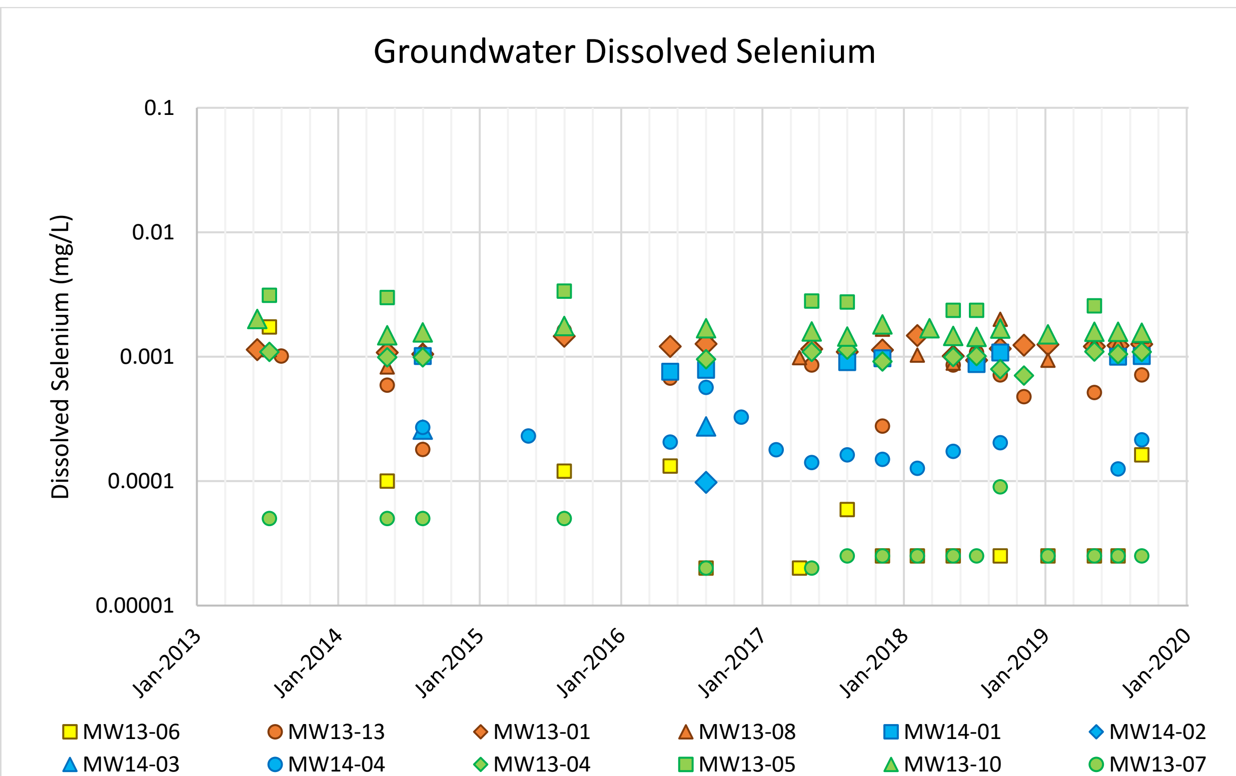

Surface Water- Dissolved Cadmium
Dissolved Cadmium (mg/L)
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30

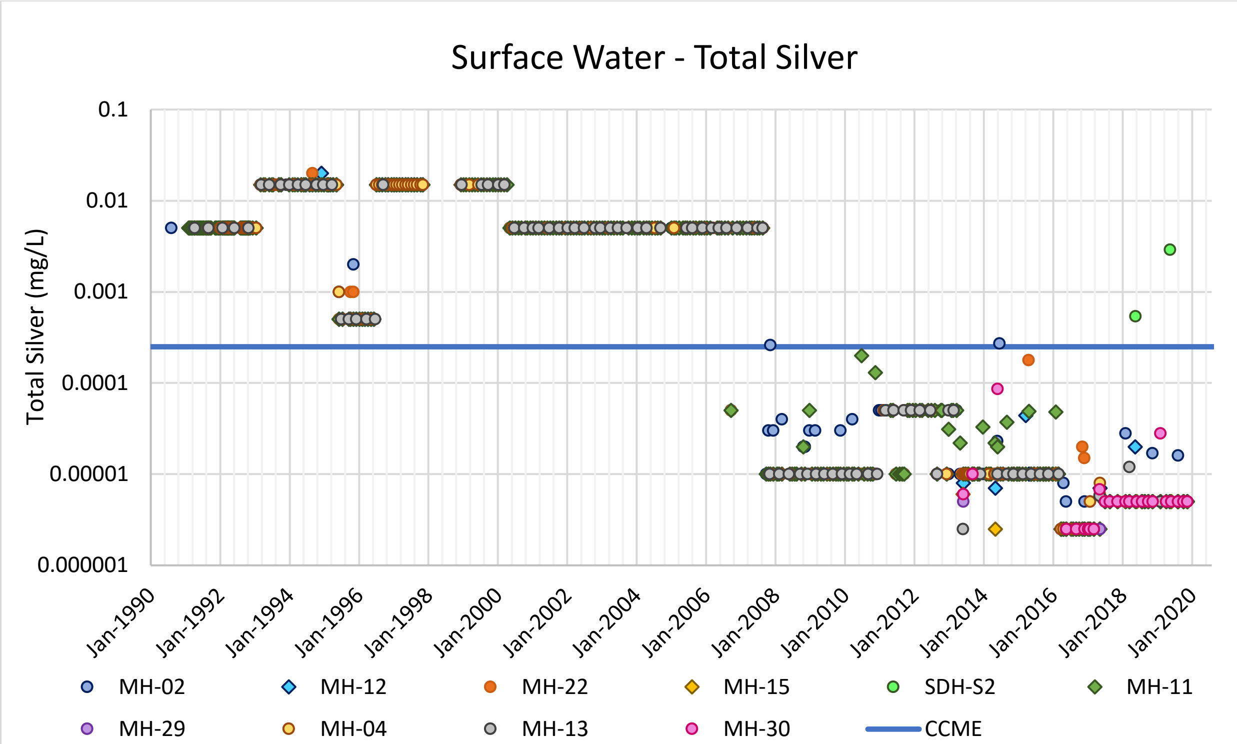

Groundwater - Dissolved Cadmium
Dissolved Cadmium (mg/L)
0.01
0.001
0.0001
0.00001
0.000001
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

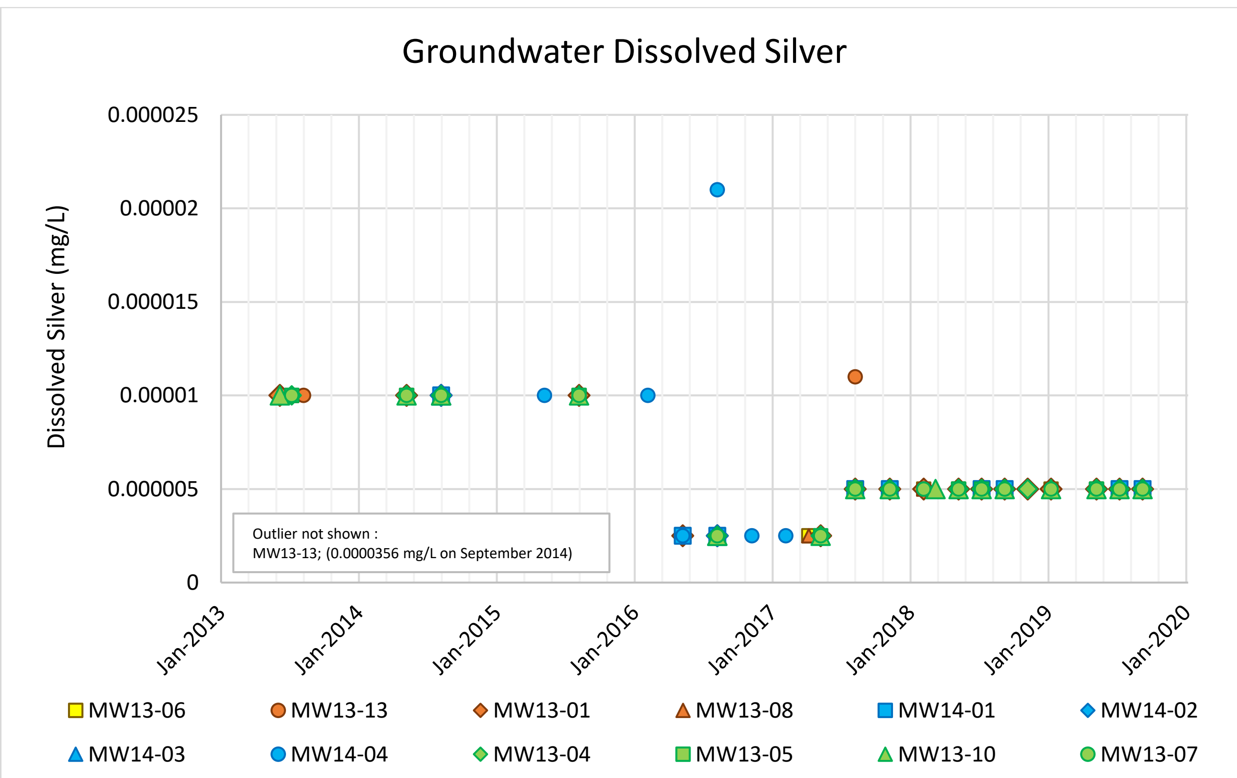

Surface Water - Total Zinc
Total Zinc (mg/L)
100.0000
10.0000
1.0000
0.1000
0.0100
0.0010
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30


Groundwater - Dissolved Zinc
Dissolved Zinc (mg/L)
1
0.1
0.01
0.001
0.0001
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07


Surface Water - Total Selenium
Total Selenium(mg/L)
0.1
0.01
0.001
0.0001
0.00001
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30
BCMOE


Groundwater Dissolved Selenium
Dissolved Selenium (mg/L)
0.1
0.01
0.001
0.0001
0.00001
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07


Surface Water - Total Silver
Total Silver (mg/L)
0.1
0.01
0.001
0.0001
0.00001
0.000001
Jan-1990
Jan-1992
Jan-1994
Jan-1996
Jan-1998
Jan-2000
Jan-2002
Jan-2004
Jan-2006
Jan-2008
Jan-2010
Jan-2012
Jan-2014
Jan-2016
Jan-2018
Jan-2020
MH-02
MH-12
MH-22
MH-15
SDH-S2
MH-11
MH-29
MH-04
MH-13
MH-30
CCME


Groundwater Dissolved Silver
Dissolved Silver (mg/L)
0.000025
0.00002
0.000015
0.00001
0.000005
0
Outlier not shown :
MW13-13; (0.0000356 mg/L on September 2014)
Jan-2013
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Jan-2019
Jan-2020
MW13-06
MW13-13
MW13-01
MW13-08
MW14-01
MW14-02
MW14-03
MW14-04
MW13-04
MW13-05
MW13-10
MW13-07

Appendix F

2019 Dam Safety Inspection

Teck

Sä Dena Hes Mine, Yukon Territory 2019 Dam Safety Inspection

Prepared for

Teck Resources Limited

Prepared by

srk consulting

SRK Consulting (Canada) Inc.
December 2019

Sä Dena Hes Mine, Yukon Territory
2019 Dam Safety Inspection

December 2019

Prepared for

Mr. Gerry Murdoch, Legacy Properties
Teck Resources Limited
601 Knighton Road
Kimberley, BC V1A 3E1
Canada

Tel: +1 250 427 8408
Web: www.teck.com

Prepared by

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2
Canada

Tel: +1 604 681 4196
Web: www.srk.com

Project No: 1CT008.072

File Name: SDH_2019_TSF_DSI_1CT008-072_20191203_FNL_pmh.docx

srk consulting

Executive Summary

This report presents the results of the 2019 Annual Dam Safety Inspection (DSI) of the structures and features associated with the Tailings Management Area (TMA) that forms part of the closed Sä Dena Hes mine located near Watson Lake, Yukon. The only remaining tailings retaining embankment at the closed site is the North Dam. A small dike referred to as the Sediment Retaining Structure (SRS) was also retained after closure of the site to collect any sediment that would be generated from the till cap that was placed over the exposed tailings. Other structures included in the DSI scope are a series of newly constructed (2014) riprapped lined diversion channels and the reclaimed waste rock dumps at the location of the closed portals adjacent to the Main, Jewelbox and Burnick ore zones.

The inspection was completed by Mr. Peter Healey PEng., an associate of SRK Consulting (Canada) Inc., on September 9 and 10, 2019 while accompanied by Gerry Murdoch (Teck), Morgan Lypka (Teck), Peter Mikes (SRK) and Jeff Basarich (Teck). Mr. Healey is the Engineer of Record (EoR) for the site and has been completing the annual dam inspections since 1992.

The work was completed in accordance with Teck's Tailings and Water Retaining Structures (TWRS) guideline and policy (2019) and the Yukon Territory Sä Dena Hes Water Licence issued April 2017 (QZ16-051).

Summary of Facility Description

The original TMA consisted of three earth structures, which were referred to as the North Dam, the South Dam and the Reclaim Dam. The North and South dams, which impounded the tailings, were constructed between July 1990 and October 1991. The starter dams for both structures were built to a height of about 13 metres.

In addition to the North and South Dams, a Reclaim Dam was built to detain supernatant water decanted from the tailings pond. The mine operation involved recycling of the detained water to the mill, with a controlled discharge when required into the adjacent Camp Creek from April to October each year.

Operations at Sä Dena Hes mine, which commenced in July 1991, were suspended in December 1992 due to low lead and zinc prices. Decommissioning of the site began in 2014 and was completed in 2015.

Structures that currently remain on the site include the North Dam and the Sediment Retaining Structure (SRS). The SRS is a 7 m high dike which impounds a small pond.

Summary of Key Hazards

As a required component of a DSI, the following key hazards at the site were identified and the consequences of different hypothetical failure modes of the North Dam and the SRS were assessed:

- runoff from extreme precipitation events,

- seismic events,
- ice build up and debris in the SRS spillway,
- flow capacity of the SRS spillway, and
- potential for liquefaction of the tailings.

The key hypothetical failure modes assessed included:

- Dam Overtopping,
- Piping, and
- Slope Stability.

The assessment concluded that the North Dam and the SRS Dike are in good condition, meet current expectations and fall within acceptable guidelines for stability. None of the above hypothetical failure modes are of a concern to manifest themselves.

Summary of Consequence Classifications

Consequence classification is not related to the likelihood of a failure, but rather the potential impact resulting from a hypothetical failure if it did occur. The last Dam Safety Review (DSR) was carried out by AMEC Foster Wheeler (AMECFW) (now the WOOD Group) in 2015. Based on this review, the CDA Dam Consequence Classification (DCC) of the North Dam was changed from “Low” to “Significant” and the DCC for the SRS remained as “Low”. The change for the North Dam was based on an issue raised by AMECFW noting that there was a potential for liquefaction of the tailings if the dam were to fail and that during a flood event there was a potential for overtopping of the dam. The Consequence Classification of the Sediment Retaining Structure was assessed during the DSI and remains “Low”.

It is SRK’s opinion that the Dam Consequence Classification (DCC) of “Significant” for the North Dam is overly conservative and should remain as “Low. The next DSR is scheduled for 2020 and the DCC for the North Dam should be reviewed at that time.

Summary of Key Observations

North Dam

The North Dam is in good condition and shows no signs of deformation or abnormal settling. The downstream slope of the dam shows no signs of surficial movement or erosion nor is there any sign of bulging at the downstream toe.

The piezometers and settlement gauges on the North Dam are in good condition and continue to function as designed. The seasonal fluctuations recorded in the latter part of 2018 and in the spring and summer of 2019 in the piezometers are consistent with those observed in previous years.

The readings taken of the settlement gauges in the North Dam indicate that there has been no unexpected settlement of the embankment over the 24-year period that readings have been taken, with settlement readings varying to a maximum of 51 mm (or less than 1% of the total height of the dam) from the initial readings taken in 1993. In the last three years, settlement readings have fluctuated no more than 1 mm.

Sediment Retaining Structure

The SRS is in good physical condition and the spillway is functioning in accordance within design parameters.

North Creek

Beaver activity was again evident at the inlet to the channel with the construction of a beaver dam. The dam raises the water level of the pond behind the structure and increases the risk of a rapid release of water that could result in erosion of the riprap protection in the channel. The beaver dam was removed in 2019. Best Practice dictates that beaver dams be removed when identified during the routine inspections. However, there are no downstream structures that are at risk in the event that the beaver dam was to release water.

Summary of Significant Changes

There are no significant changes to the stability of either the North Dam or the SRS since their construction in 1991 and 2014, respectively.

Summary of Review of OMS and EPRP Manuals

The Operation, Maintenance and Surveillance (OMS) Manual was originally prepared by SRK in 2015. The manual was reviewed as part of this 2019 DSI.

Recent changes (2019) to the OMS manual are provided in Section 5.6. The changes focus on (i) updates to site climate data; (ii) updates to the Sä Dena Hes peak ground acceleration (PGA) levels; (iii) subsequent changes to the design criteria for the North Dam and the SRS dike related to the PGA changes; (v) Piezometer maintenance (vi) Addition of trigger levels in the North Dam piezometers and settlement gauges.

The current Emergency Preparedness and Response Plan (EPRP) was prepared by SRK in 2015. Teck is currently updating the requirements for ERPs at all legacy sites. The EPRP for the Sä Dena Hes will be updated once these guidelines have been finalized.

Summary Table of Deficiencies and Non-Conformances

There are no outstanding deficiencies or non-conformances from the 2018 or earlier DSI’s. A list of deficiencies or non conformances noted from the 2019 dam safety inspection are summarized below:

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulatory or OMS Reference	Recommended Action	Priority (Teck 2019)	Recommended Deadline/ Status
North Creek Channel	2019-1	Beaver Dam at inlet to channel		Remove beaver dam in channel	3	Before end of 2019 Completed September 5, 2019 Closed

General Description of Priority Rankings[1]

Priority	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant regulatory concern.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact or significant regulatory action; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks. This typically includes ongoing construction items within the appropriate construction cycle.

[1] Based on the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (2016 revision).

Table of Contents

List of Figures

List of Tables

Appendices

List of Abbreviations

AEP	Annual Exceedance Probability
AMECFW	AMEC Foster Wheeler
CDA	Canadian Dam Association
CSP	Corrugated Steel Pipe
DCC	Dam Consequence Classification
DDRP	Detailed Decommissioning Reclamation Plan
DSI	Dam Safety inspection
DSR	Dam Safety review
ECCC	Environment Climate Change Canada
EoR	Engineer of Record
EPRP	Emergency Preparedness and Response Plan
FoS	Factor of Safety
HSRC	Health, Safety and Reclamation Code
IDF	Inflow Flood Design
KCB	Klohn Crippen Berger
OMS	Operation, Maintenance, Surveillance
PGA	Peak Ground Acceleration
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
SRS	Sediment Retaining Structure
TMA	Tailings Management Area
TWRS	Tailings and Water Retaining Structures

1 Introduction

1.1 Purpose, Scope of Work, and Methodology

This report presents the results of the 2019 Annual Dam Safety Inspection (DSI) of the structures and features associated with the Tailings Management Area (TMA) that forms part of the closed Sä Dena Hes mine located near Watson Lake, Yukon. The current Yukon Water Licence (QZ16-051) and Teck's Guideline for Tailings and Water Retaining Structures (Teck 2019). The work was authorized by Mr. Gerry Murdoch, Teck Resources Limited (Teck) on behalf of the Sä Dena Hes Operating Corp.

Mr. Peter Healey PEng, an associate of SRK Consulting (Canada) Inc., completed the site inspection on September 10 and 11, 2019 while accompanied by Gerry Murdoch (Teck), Morgan Lypka (Teck), Peter Mikes (SRK) and Jeff Basarich (Teck). Mr. Healey is the Engineer of Record (EoR) for the site and has been completing the annual dam inspections since 1992.

The scope of the work consisted of:

- A visual inspection of the physical condition of the following structures and features to identify any deficiencies and non-conformances:
  - The North Tailings Dam
  - The North Creek channel that was reclaimed following decommissioning of the North Creek Dike and Second Crossing of North Creek
  - The relocated Camp Creek drainage channel
  - The North and South drainage Channels
  - The Sediment Retaining Structure (SRS)
  - The Burnick, Main and Jewelbox Waste Rock Dump areas
- A review of the Operation, Maintenance and Surveillance Manual (OMS) and Emergency Preparedness and Response Plan (EPRP) for the TMA
- A review of the Dam Consequence Classifications
- A review of the routine site inspection forms provided by Teck
- A review of the piezometer and settlement records of the North Dam provided by Teck
- A review of the 2015 Dam Safety Review (DSR) carried out by AMEC Foster Wheeler (AMECFW), now the WOOD Group

It should be noted that all elevations referenced in this report are based on a datum that was established during a LiDAR survey carried out in 2012. The original site datum used to design and build the structures in the early 90's was about 2 m lower than the 2012 datum. All previous inspection reports, prior to 2014, used the 1990 datum.

1.2 Regulatory Requirements and Guidelines

This DSI addresses the performance of the TMA, the associated water management infrastructure including the Jewelbox and Main Zone open pits, and the Jewelbox, Main Zone and Burnick waste rock dumps. The work was completed in accordance with the following regulatory requirements and guidelines, which in combination, fall within Teck's internal requirements included in Teck's Tailings and Water Retaining Structures (TWRS) guideline and policy (2019):

- Canadian Dam Association (CDA) Dam Safety Guidelines 2007 (2013 Edition)
- Canadian Dam Association (CDA) Application of Dam Safety Guidelines to Mining Dams. Technical Bulletin, 2014
- The Yukon Territory Sä Dena Hes Water Licence (QZ99-045). New Licence issued April 2017 (QZ16-051)
- The Yukon Territory Sä Dena Hes Quartz Mining Licence (QML-0004)

While the DSI is focused on the TMA, the waste rock dumps are included in the DSI in accordance with Clause 45 of the current Water Licence (QZ16-051).

1.3 Facility Description

1.3.1 Overview

This section provides a description of the components remaining at the mine site after the TMA was decommissioned in 2014 and 2015. A map showing the overall mine site is provided on Figure 1. A general arrangement map of the TMA is provided in Figure 2.

1.3.2 North Dam

The North Dam is approximately 15 m high with a crest elevation of 1,100 m, a crest length of about 260 m, and a crest width of 10 m. A site plan and section through the dam are shown in Figures 3 and 4. The North Dam for this report is considered a mining dam as it is a barrier constructed for the retention of tailings (CDA 2014).

Most of the tailings lie within the northern half of the TMA above the original cofferdam, which has since been removed. The tailings behind the North Dam were capped with a till cover in 2014. The cover was graded flush with the crest of the dam and graded south toward the SRS. A few small low lying areas remain within the cover that seasonally collect water, but overall the North Dam has not retained water since the mine decommissioning was completed. Given the cover grades away from the dam crest, the dam would only need to retain ponded water under extreme conditions as discussed below.

In 2016, SRK carried out a hydrological study (SRK 2017) to assess the likelihood of overtopping of the North Dam in the event of a design flood event. The results indicated that during an extreme case, such as the Probable Maximum Flood (PMF), the North Dam crest is not overtopped. Although the backwater effect arising from a blockage scenario in the central channel does result in an increased flood extent, with ponded water reaching within a few centimetres of the dam crest, an overtopping scenario is not reached. The maximum depth of water would vary from 0.5 m in the central channel to less than 0.1 m adjacent to the upstream crest of the dam. The model predicted that during the peak of the event, water would only be lapping up against the dam for about 12 hours before it dissipates. The minimum freeboard adjacent to the low point along the upstream edge of the crest at the peak of the event varied from 5 to 8 cm.

1.3.3 Sediment Retaining Structure (SRS)

The SRS was constructed by leaving in place a low-profile dike composed of the former South Dam toe material. The structure is considered temporary and Teck plans to remove the structure in the future. The primary function of the SRS is to retain any sediment that may be transported from the till cover over time. There is very little evidence that sediment has accumulated in the pond.

The dike is approximately 80 m in length and has a crest width of 4 m at an approximate elevation of 1,087.7 m. The upstream face of the SRS was graded to 2H:1V and the downstream face was graded to 2.5H:1V. While the SRS is only about 7 m high, for this report it is also considered a mining dam as it is a barrier constructed for the retention of ponded water (CDA 2014). The depth of water behind the structure is a maximum of about 1.7 m.

An emergency spillway was constructed through the dike to accommodate the 1 in 1000-year Inflow Design Flood (IDF) event (5.4m^3/s) and to convey runoff from the upstream catchment to the South Drainage Channel. The as-built spillway and drainage channel geometries are presented in Figures 5 and 6. The spillway channel invert elevation is 1,085.7 m and has a length of 33.3 m.

1.3.4 Water Management Infrastructure

Overview

Three drainage channels were built as part of the 2014 TMA decommissioning (see Figure 7). The longest of the three was constructed through the former Reclaim Dam and the pond area to route Camp Creek flows along its historical alignment. The other two drainages (the North Channel and the South Channel) were constructed to direct runoff from the covered tailings areas to the new Camp Creek Drainage Channel. There is also a drainage channel located down the middle of the cover that directs runoff from the tailings cover at the northern end of the TMA.

South Drainage Channel

The South Drainage Channel was constructed from the SRS spillway through the former South Dam and connects with the Camp Creek Drainage Channel. The channel length is about 230 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile (see Figure 8). The channel is designed for the 1 in 1000-year IDF. Upstream and downstream side slopes are 2:1 (H:V). Average grade of the channel is 0.04.

Camp Creek Drainage Channel

The Camp Creek Drainage Channel was constructed through the former Reclaim Dam and pond area to route Camp Creek flows along its historical alignment (see Figure 8). The channel length is about 940 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile (see Figure 8). The channel is designed for the 1 in 1000-year IDF. Upstream and downstream side slopes are 2:1 (H:V). Average grade of the channel is 0.05.

North Drainage Channel

The North Drainage Channel was constructed along the east side of the former South Pond to convey water from the North Tailings Area to the SRS. Conveyed water is detained in the SRS to allow for sediments to deposit before the water is discharged into Camp Creek (see Figure 9). The channel length is about 300 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile. The channel is designed for the 1 in 1000-year (IDF). Upstream and downstream side slopes are 2:1 (H:V). Average grade of the channel is 0.03.

North Creek

During operation of the mine, a dike was built over the North Creek as a water storage facility for the mill. The dike (see Figure 1 for location) was decommissioned in 2015 and a riprapped channel was built through the old dike to convey the flow along North Creek to False Canyon Creek. A similar channel was also built downstream to convey the North Creek flow through a decommissioned access road.

1.3.5 Tailings Cover

The soil cover over the tailings discussed previously varies up to 2.2 m in thickness. It covers all the exposed deposited tailings, specifically in the North Tailings Area and the tailings deposited in South Pond area. The cover was constructed of excavated dam fill material. It provides an effective means of controlling wind erosion of tailings and a growth medium over the tailings for revegetation. The cover was sloped away from the crest of the North Dam in a southerly direction towards the SRS. Water is no longer impounded behind the dam. A shallow swale was constructed down the middle of the cover to direct surface runoff on the cover to the SRS.

The total covered area of the TMA is 155,081 m^2. The reclaimed North Tailings Area is 87,745 m^2, the reclaimed South Pond including the grassy area is 28,444 m^2, and the reclaimed Reclaim Pond is 38,892 m^2.

1.3.6 Waste Rock Dumps

During operation of the mine, waste rock dumps were developed at each of the main portals, associated with the Main Zone, the Jewelbox Zone and the Burnick Zone ore bodies. At closure, the portals were closed off with waste rock, and the dumps were resloped to direct runoff away from the openings and to provide more stable conditions.

1.4 Background Information and History

The original TMA, which extended from the North Dam to the South Dam covered an area of approximately 0.205 sq. km (Figure 2). During the operating life of the mine, approximately 700,000 tonnes of tailings were deposited into the impoundment, primarily at the northern end. The North and South dams, which impounded the tailings, were constructed between July 1990 and October 1991. The starter dams for both structures were built to a height of about 13 metres. Between the two dams, at the location of a topographic saddle, was a 2 m high cofferdam, which had a gated culvert to control the flow of water and tailings from the northern half of the impoundment to the southern half.

In addition to the North and South Dams, a Reclaim Dam was built to detain supernatant water. A decant tower, in the South Tailings Pond, was used to discharge the supernatant water in the tailings pond into the Reclaim Pond through a 0.5 m diameter corrugated steel decant pipe (CSP). The mine operation involved recycling of the detained water to the mill with a controlled discharge, when required, into the adjacent Camp Creek from April to October each year.

An open channel emergency spillway was located at the west side of the Reclaim Pond. This spillway was designed to accommodate the design flood event from the TMA catchment only. Flow through this spillway was directed to the primary spillway system, which was part of the Camp Creek diversion channel constructed along the west side of the Reclaim Pond. This primary spillway consisted of two 1,200 mm diameter CSP culverts and was designed to accommodate the 1 in 200-year Inflow Design Flood (IDF). Camp Creek was diverted into the diversion channel and discharged through the two culverts into a riprap lined exit chute.

An emergency spillway was also located in the west abutment of the South Dam and was designed to accommodate the 200-year IDF. The spillway consisted of two 900 mm diameter CSP culverts. The discharge from the spillway entered the Reclaim Pond downstream via an unlined channel.

Two additional surface water diversions, the east and west interceptor ditches, were located on both sides of the TMA to intercept surface runoff from upslope of the TMA.

In March of 1992, the previous operators, Curragh Resources, built a rockfill buttress along the toe of the Reclaim dam to provide extra protection against sloughing and erosion of the toe due to seepage.

In September 1992, work commenced on a 2-metre raise of the South Dam to El. 1098. Work on the extension was shut down on October 14, 1992 because of construction difficulties experienced due to sub-zero temperatures.

Operations at Sä Dena Hes mine, which commenced in July 1991, were suspended in December 1992 due to low lead and zinc prices.

During the care and maintenance period after the mine shut down in 1992, water was released from the tailings pond to the Reclaim Pond seasonally by way of syphons to maintain a safe operating level. Water was discharged from the Reclaim Pond to Camp Creek in accordance with the limits imposed by the Water License.

In 2003, Teck Cominco installed an HDPE pipeline through one of the spillway culverts as a siphon to facilitate the transfer of water from the South Tailings Pond.

With the 2014 decommissioning work, the TMA was significantly modified. The Reclaim Dam was completely removed, and the final excavated surface of the Reclaim Dam was graded to blend into the surrounded topography.

In 2014, most of the South Dam was removed to form the Sediment Retaining Structure (SRS). The decant tower and the pipe were decommissioned and removed to the on-site landfill. The South Dam overflow spillway was decommissioned by removing the two 900 mm diameter culverts that were disposed of at the landfill. Similarly, to the decommissioning of the Reclaim Dam, the dam footprint was excavated to original ground (with exception of the SRS) and blended into the surrounded topography.

The Camp Creek Diversion Channel, exit chute, and culverts were decommissioned in 2015. The interceptor ditches were decommissioned in 2015.

Many of the access roads at the site have been decommissioned and access to the decommissioned Main Zone, Jewelbox and Burnick areas are via all-terrain vehicle or helicopter.

2 Maintenance and Surveillance during 2018 to 2019

After the 1992 shutdown of the mine, it never reopened, and no more tailings were deposited into the TMA. Information on the decommissioning of the mine is provided in Section 1.4.

Teck conducts on-going maintenance and surveillance of the TMA and the water management infrastructure at the site including the access road from the Robert Campbell Highway. Any trees or vegetation on the downstream slope of North Dam that do not conform to the guidelines in the Sä Dena Hes OMS manual are trimmed or removed. Seepage at the toe of the North Dam is monitored monthly with sampling of water quality and measurement of flow. During the monthly inspections by the sampling team, an inspection of the North Dam and the SRS spillway is made to check for any blockages or subsidence.

3 Climate Data and Water Balance during 2018 to 2019

3.1 Review and Summary of Climate Data

This section presents the current climate data for the site. As there is no weather station at the site, the data from selected local meteorological stations was used to determine the mean annual precipitation and evaporation for the site. Below reference is made to a detailed climate characterization study that was carried out by SRK (SRK, 2017) to determine mean annual total precipitation for the Project site in absence of any site-specific data.

3.1.1 Mean Annual Precipitation

A regional and regression analysis was performed using the nearby meteorological stations from Environment and Climate Change Canada (ECCC). The data was compiled in R Studio Software, generating the mean annual precipitation (MAP) for each station. Table 3-1 presents the station locations relative to the site, as well as their respective MAP estimate. Correction for under-catch in the precipitation measurements is prepared daily by ECCC for many, but not all meteorological stations, as noted in Table 3-2.

Table 3-1: Selected Meteorological Stations Associated with the Project Site (1960 to 2016)

Station ID	Station Name	Longitude [deg]	Latitude [deg]	Elevation [m]	Dist. from Site [km]	MAP [mm]	Years of Info [yrs]	Under-Catch Factor Available
2101200	Watson Lake A	-128.82	60.12	687.4	46.66	424.0	74	YES
2101135	Tuchitua	-129.22	60.93	723.9	47.90	493.6	40	YES
2100FCG	Hour Lake	-129.13	61.18	890.0	72.93	544.8	28	NO
2101081	Swift River	-131.18	60.00	891.2	141.74	564.7	37	YES
1191440	Cassiar	-129.83	59.28	1077.5	150.35	728.2	36	YES
1197530	Smith River A	-126.43	59.90	673.0	151.68	466.9	25	NO
2203922	Tungsten	-128.25	61.95	1143.0	160.38	637.0	22	NO
2101100	Teslin A	-132.74	60.17	705.0	217.87	332.9	56	YES
1192340	Dease Lake	-130.01	58.43	806.6	243.67	419.9	61	YES
1195250	Muncho Lake	-125.77	58.93	836.5	248.96	508.1	40	NO
2100200	Carcross	-134.70	60.17	660.0	324.42	248.4	60	NO
1208202	Todagin Ranch	-130.07	57.60	899.0	334.45	419.4	18	NO
2100460	Drury Creek	-134.39	62.20	609.0	348.27	372.9	35	YES

Source:
file:///Z:\01_SITES\Sa_Dena_Hes\1CT008.061_2016_DSR_Studies\Task%20100_Hydrology\R_Analysis\Hydrology\Precipitation_Hydrology_at_Sa_Dena_Hes.docx

The regression analysis predicted a MAP for the site of 646 mm based on an elevation of 1080 masl. Monthly average precipitation for the site is summarized in Table 3-2 based on the site MAP of 646 mm and the monthly distribution from the Cassiar station (SRK 2017).

Table 3-2: Monthly Average Precipitation for the Site

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Site	58.1	49.1	39.4	23.9	33.6	47.8	60.7	63.3	71.7	75.6	58.8	64.6	646

3.1.2 2018 Analysis

An estimate of the 2018 MAP for the site was computed and used to estimate the 2018 Water Discharge Volumes at the SRS spillway.

The Watson Lake A station was used as the reference station as it is the most representative station close to the site that is currently active. Total precipitation recorded at Watson Lake A in 2018 was reported as 222 mm by ECCC. Using the undercatch correction factor of 1.13 (SRK 2017), total corrected annual precipitation for 2018 at Watson Lake was 250 mm.

A ratio of Watson Lake MAP vs. calculated Site MAP was applied to convert the 2018 Watson Lake airport precipitation to a representative MAP for the Site. Based on the corrected undercatch MAP for Watson Lake of 479.3 mm, the adjustment factor for the site is 1.42, which equates to an approximate annual precipitation of 355.6 mm in 2018 at the site as shown in Table 3-3.

Table 3-3: 2018 Monthly Precipitation for the Site (based on 2018 Watson Lake Data)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2018/Annual
Site	51.3	13.8	32.1	14.9	10.6	51.5	30.5	20.9	24.1	67.4	25.7	12.8	355.6

3.1.3 Evaporation

The network of evaporation stations is sparse in the Yukon and northern British Columbia. Potential evapotranspiration was calculated using the Morton (1983) methodology, utilising meteorological parameters measured at the nearby Watson Lake weather station, with solar radiation data obtained from the Whitehorse Airport station. Using this method, the annual lake evaporation rate was estimated to be 483 mm as shown in Table 3-4. Due to the limited variability of lake evaporation from year to year, the average annual values are applied in the annual water balance.

Table 3-4: Mean Monthly Lake Evaporation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Morton-Shallow Lake [mm]	10.4	8.4	18.2	41.4	75.5	96.9	99.5	71.6	33.4	11.0	7.2	9.7	483.2

Source:://Z:\01_SITES\Sa_Dena_Hes\1CT008.057_2016_Geotech_Inspection\!080_Deliverables\1CT008.057_Report\010_Text\2016_SDH_GeotInsp_Report_1CT008-057_20170404_pmh.docx

3.2 Review and Summary of Water Balance

The TMA at Sä Dena Hes has been decommissioned and there are no active ponds other than the small sediment pond at the SRS. The SRS pond has a maximum surface area of about 1600 m^2 during the freshet high flow period. An emergency overflow spillway was also built through the SRS to accommodate the 1 in 1000-year flood event. The catchment area for the SRS spillway is 1.33 km^2 as shown on Figure 10.

A simplified mean annual average water balance calculation for the catchment above the SRS dike is summarized below, based on data compiled for the recent SRK hydrological study (SRK 2017) and the following assumptions:

- Inflow from the surrounding hillside catchment (1.17 km^2) based on 60% of the MAP;
- Inflow from the tailings till cover (0.16 km^2) based on 50% of the MAP;
- Direct precipitation input to the SRS pond based on 100% of the MAP; and
- Outflow from the SRS pond based on annual pond evaporation (483 mm) and seepage losses (estimated at 0.5 l/s).

The average annual water balance from the SRS Pond is the following:

- MAR from the hillside catchment above the SRS = 453,500 m^3
- MAP on the sediment pond surface = 1034 m^3
- MAR on the tailings cover material = 50,388 m^3
- Total Annual Inflow: 504,900 m^3
- Total Outflow (seepage and pond evaporation): 16,540 m^3
- Net Annual Volume (over spillway): 488,370 m^3

Using the estimated 2018 MAP for the site, the 2018 annual water balance is summarized below:

- MAR from the hillside catchment above the SRS = 249,631 m^3
- MAP on the sediment pond surface = 569 m^3
- MAR on the tailings cover material = 27,737 m^3
- Total Annual Inflow: 277,937 m^3
- Total Outflow (seepage and pond evaporation): 16,540 m^3
- Net Annual Discharge Volume (over spillway): 261,396 m^3

3.3 Freeboard and Storage

3.3.1 North Dam

The 2016 hydrological studies completed by SRK (SRK 2016a) estimated that during an “extreme worst case” Probable Maximum Precipitation (PMP) event with none of the existing drainage features such as water diversions functioning, there would still be a freeboard above the maximum ponded water of between 5 to 8 cm.

3.3.2 SRS

The SRS dike has a 1 m freeboard above the 1 in 1000 year flood event to the crest of the Dike.

3.4 Water Discharge Volumes

The current water licence does not have provision for regulating the volume of water discharging over the SRS spillway. However, with reference to the above water balance, the estimated annual water discharge volume through the SRS spillway for 2018 was 261,396 cubic metres.

3.5 Water Discharge Quality

The surface water quality discharging from the TMA is currently monitored annually under the Yukon Water Licence QZ16-051. The groundwater quality is currently monitored under the same licence. The results of the surface and groundwater quality sampling for 2019 were not available at the time this report was prepared. However, a review of the 2018 results compiled in the 2018 annual report was carried out by SRK. In 2018, samples from all the required water quality monitoring stations were collected and analysed. The results demonstrated that all the surface and groundwater stations met the standards provided in the water licence QZ16-051. It is the opinion of SRK that the current site water quality does not impact the structural integrity or factors of safety associated with stability of the North Dam or the SRS dike. Furthermore, it is the opinion of SRK that the water quality does not impact the performance of the water management structures.

4 Site Observations

4.1 Visual Observations

The weather during the DSI on September 10 and 11, 2019 was sunny and warm. Routine inspections of the TMA are made by Jeff Basarich twice a year in the spring (June 10, 2019) and the fall (October 5, 2019). Observations made by Mr. Basarich were reviewed by SRK

No safety concerns related to the North Dam and the SRS were identified during review of the photos and reports prepared by the Mr Basarich.

4.1.1 North Dam

A site plan and a section of the North Dam are presented on Figures 3 and 4.

The crest of the North Dam looking west is shown in Photo 1 (Appendix A). The dam is in good condition and shows no signs of deformation or abnormal settling. The downstream slope of the dam (Photo 2) shows no signs of surficial movement or erosion nor is there any sign of bulging at the downstream toe. While there are a few shrubs and small trees on the slope, no excessive vegetation growth beyond the guidelines in OMS was noted.

The piezometers and settlement gauges (Photos 3 and 4) on the North Dam are in good condition and continue to function as designed. Orange coloured piezometer caps provide visible identification for the monitoring team.

Along the downstream toe of the North Dam there is an 80 m long seepage zone. Seepage from this zone is collected at a monitoring station referred to as MH-02 and is a combination of groundwater discharge from the surrounding hillsides to the west and minimal seepage flow from the impoundment. The monitoring station consists of a 6-inch diameter steel pipe (Photo 5) embedded in sandbags. A section of the seepage zone along the toe is shown in Photo 6.

4.1.2 Till Tailings Cover

The till tailings cover has an overall gentle downslope gradient away from the North Dam. Photo 7 shows a view looking north of the drainage swale located down the middle of the tailings cover at the north end of the TMA. This swale was constructed to assist in directing runoff away from the crest of the North Dam. The swale was clear of any debris or vegetation and although there was evidence that water has flowed in the swale, at the time of the inspection it was dry except for one pool of water. Photo 8 shows a view of the swale at the location of the original cofferdam.

As planned, vegetation is slowly developing over the entire area of the cover as shown in Photo 11.

4.1.3 North Creek

A riprapped channel conveys the North Creek over the original location of the decommissioned North Creek Dike. It was noted during the Spring routine inspection that at the inlet of the channel, beavers had again built a dam which restricted the flow. The dam raises the water level of the pond nominally and could potentially increases the risk of a rapid release of water which could result in erosion of the riprap protection in the channel. However, there are no downstream structures that are at risk if the beaver dam were to release water. The dam was removed just after completion of this DSI. Best Practice dictates that beaver dams be removed when identified during the routine inspections.

About 150 metres east downstream of the above channel is a second riprapped channel that was reclaimed following the removal of two culverts as part of the site reclamation in 2015. The channel is stable and requires no remediation.

4.1.4 Sediment Retaining Structure

The Sediment Retaining Structure (SRS) was built during the decommissioning of the South Dam between 2014 and 2015. Figures 5 and 6 provide a site plan and sections of the SRS.

The North drainage channel upstream of the SRS (Photo 12) remains in stable condition with no noticeable subsidence.

The rock cofferdam and the sedimentation pond are functioning well. The sedimentation pond was clear at the time of our inspection with no evidence of any silt buildup (Photos 13 and 14).

The emergency spillway at the SRS is stable and has no safety concerns (Photo 15). The plunge pool shown in Photo 16 provides adequate capacity to accommodate any high flows over the spillway. Seepage from the hillside area to the east of the structure is still evident along the downstream toe of the SRS (Photo 17). A small active boil (Photo 18) that has been noted in previous inspections was still present. This boil is a remnant of pore pressures that were evident during and after the construction of the South Dam which prompted the construction of a toe buttress. The pore pressures were a result of the hydraulic gradient across the dam due to the stored water in behind the embankment. The pore pressures were accentuated by the sand and gravel zones in the foundation soils below the dam. Since the removal of the South Dam, the pore pressures have significantly reduced, but the small head of water due to the retained pond behind the SRS dike is the likely source of the small boil.

4.1.5 Drainage Channels

The riprapped drainage channels (the North channel, the Camp Creek channel and the South channel) were constructed during the TMA decommissioning in 2014. Figure 7 provides a plan view of the three channels. SRK inspected each of the channels for any signs of major subsidence and movement of the riprap erosion protection.

Photo 19 shows the Camp Creek channel looking north and Photo 20 shows the South channel. No movement of the riprap or subsidence was evident in any of these channels.

Photos 21 and 22 show location of the Camp Creek channel at the lower reach (also location of the original Reclaim Dam) and the upper reach of the Camp Creek channel.

Photo 23 show the confluence of the Camp Creek drainage channel and the original Camp Creek.

4.1.6 Burnick and Jewelbox Waste Rock Dumps

SRK inspected the resloped Main Zone and Jewelbox waste dumps (Photo 24) shown in Figure 12. It was noted that at the northeast end of the JewelBox dump, there was evidence of some erosion (Photo 25). SRK had recommended in the 2018 DSI that additional monitoring pins be installed to monitor any deepening of the gully over time. It was noted during this inspection that the gully had not deepened and there was no impact on the stability of the dump.

Two to three shallow openings were observed in the pit wall at the Main Zone area. These openings may have been caused by internal subsidence but currently do not pose a safety concern.

SRK also inspected the Burnick waste dumps at the locations of the reclaimed 1200 and 1300 portals respectively as shown in Figure 11. During the site decommissioning in 2014, the dumps were recontoured to provide added long-term stability. No further subsidence of the slopes was noted.

Minor settlement of the fill that was placed over the 1200 portal was noted during the 2017 and 2018 inspection. Minor cracking in the fill caused by the expected settlement of the fill was observed this year. No action is required.

4.2 Instrumentation Review

4.2.1 Water Levels

The water levels in the North Dam piezometers are recorded monthly and the results are reviewed by the EoR after each monitoring session. Figure B1 in Appendix B provides a plot of seasonal water levels from 2011 for Piezometers NDW-1A, 2A, 3A and 4A compared to the maximum safe levels established for the North Dam (as listed in the OMS Manual).

The piezometers are in good condition and continue to function as designed. The seasonal fluctuations recorded in latter part of 2018 and most of 2019 in the piezometers are consistent with those in previous years and are within acceptable tolerance limits. There was an anomaly in one set of readings taken on February 25, 2019 which indicated that the water levels in Piezometers 1A and 2A were about 1 m higher than expected. A second set of readings were subsequently taken on March 28, 2019 including a check on the depths to the bottom of the piezometer drill holes. The results confirmed that the February 25 readings were an anomaly as the subsequent readings were in line with expected patterns.

The peak levels recorded in June 2019 are plotted on the dam section shown on Figure 4.

In the new water license, which was issued April 2017, piezometer levels are required to be measured bi-monthly.

4.2.2 Deformation/Settlement

The readings taken of the settlement gauges in the North Dam indicate that there has been no unexpected settlement of the embankment over the 25-year period that readings have been taken.

Teck has been surveying the settlement gauges on the North Dam since 1993. Results are shown on Table 4-1. The results are elevations taken from the top of the steel pins that were set within the crest of the dam during construction. The last set of readings taken using the 1990 datum was completed in 2010. A recent set of readings was completed in 2017 based on the 2012 datum. The readings are consistent with those observed in previous years, with settlement readings varying to a maximum of 51 mm (or less than 1% of the total height of the dam) from the initial readings taken in 1993. The recorded settlements are considered normal deformation for a small earthen dam and would not compromise the structural integrity of the dam. In the last 3 years, the settlement changes have been less than 1 mm.

Table 4-1: Summary of Elevations taken at the top of the North Dam Settlement Gauges

Date	NDS3 (m)	NDS1 (m)	NDS2 (m)
August/93	1098.639	1098.501	1098.613
July/94	1098.637	1098.502	1098.589
August/95	1098.690	1098.545	1098.663
July/96	1098.637	1098.493	1098.609
August/97	1098.637	1098.496	1098.618
October/98	1098.627	1098.482	NA
October/02	1098.619	1098.481	1098.607
June/05	1098.637	1098.479	1098.587
June/06	1098.63	1098.45	1098.57
August/07	1098.786	1098.454	1098.489
June/08	1098.626	1098.482	1098.597
June/09	1098.625	1098.469	1098.587
June/10	1098.59	1098.47	1098.60
August/14	1100.572	1100.412	1100.524
September/15	1100.548	1100.391	1100.512
2016	1100.572	1100.425	1100.547
2017	1100.573	1100.427	1100.547
2018	1100.571	1100.426	1100.546
2019	1100.57	1100.427	1100.547

Note: 2014 to 2019 readings are based on the 2012 datum.

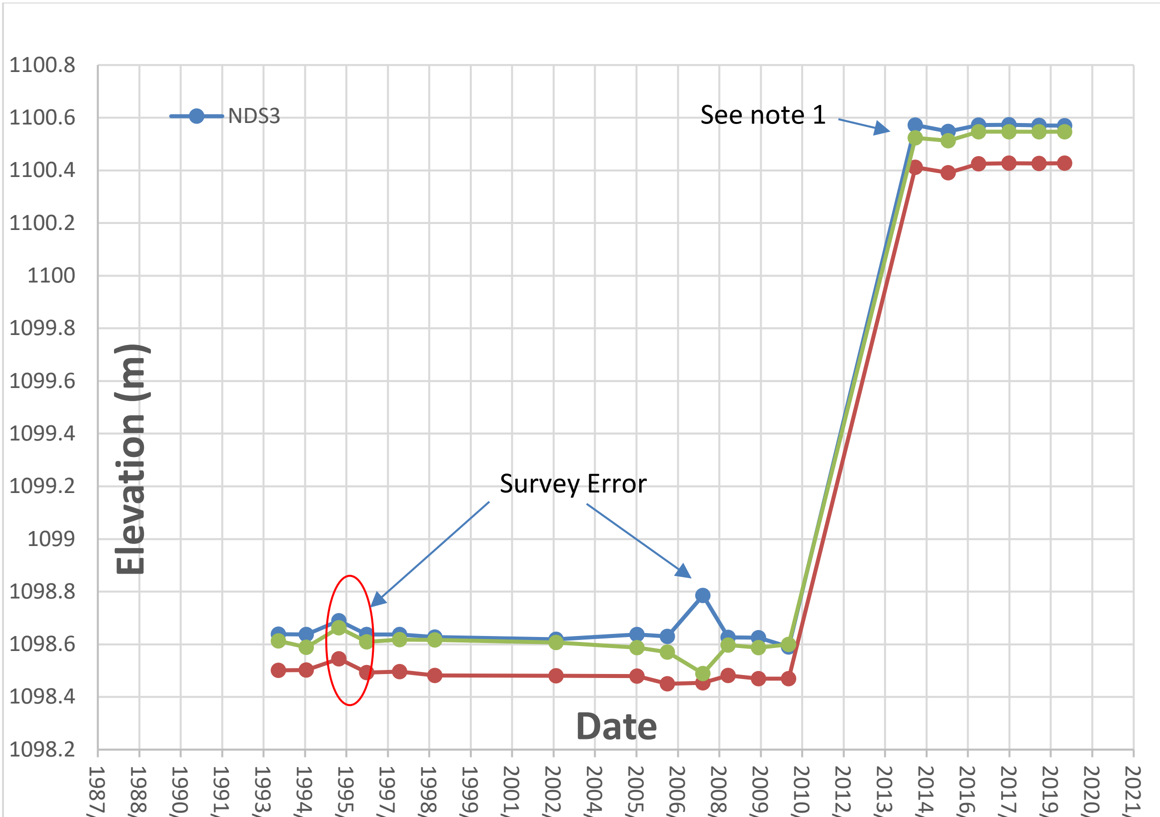


Figure 13: North Dam Settlements

Note 1: Survey Datum was changed in 2012

Figure 13 presents a graphical depiction of the settlement of the crest of the dam over time. The readings taken from 1992 to 2010 were based on the 1990 datum. The 2014 to 2019 readings were based on the 2012 datum. The results shown for 1995 and 2008 are erroneous due to survey error. Furthermore, some of the results indicate an increase in elevation. Those numbers were attributed to the inaccuracy of the survey equipment used and were consequently ignored. In general, as shown by Figure 13 above, settlement of the North Dam is performing as expected.

Given the above results and the long-term trend, settlement readings would continue to 2020 with no further readings taken beyond that point.

4.3 Photographs

A photographic log was taken during the site inspection. Photos are provided in Appendix A and are referenced in Section 4.1.

4.4 Pond and Discharge Water Quality

The Sediment pond at the SRS is the only pond associated with the TMA. Water quality in the pond was monitored as MH-01 under previous Water Licence QZ16-080 which expired on March 31, 2017. The results of the water sampling carried out for the pond under the QZ16-080 water licence met the standards in the water licence. Under the current water licence QZ016-051, water quality in the sediment pond is not required to be monitored. It is the opinion of SRK that the results would not impact the structural integrity of the North Dam or the SRS dike.

4.5 Site Inspection Forms

Every year, in accordance with the site Water Licence, the OMS manual and the EPRP, a routine inspection of the TMA is completed twice a year in the spring and the fall by Jeff Basarich.

4.6 Facility Data Sheets

Facility data sheets for the North Dam and the SRS dike are provided in Appendix C.

5 Dam Safety Assessment

5.1 Design Basis Review

5.1.1 North Dam

The original design of the starter dam for the North Dam required a crest elevation of 1,100 m with an ultimate dam design crest elevation of 1,106 m. However, this ultimate design crest elevation was modified in subsequent revisions to the mine plan to El. 1,104 m. A summary of the design criteria for the North Dam is provided in Table 5-1. The design criteria were also updated to reflect changes in the CDA 2014 Technical Bulletin, Dam Consequence Classification.

Table 5-1: Design Criteria of the North Dam (Updated)

Design Crest Elevation (Ultimate)	Not applicable
Starter Dam Crest (Existing)	1,100 m
Top of Till Core Elevation (Ultimate)	Not applicable
Maximum Operating Tailings Level (ultimate)	Not applicable
Maximum Operating Pond Level (Ultimate)	Not applicable
Spillway Invert Elevation	No emergency spillway in dam
Design Operating Freeboard	Not applicable
Design Seepage (SRK/AMCL, 2000)	35-50 L/min
Tailings Storage Capacity (Ultimate)	Not applicable
Dam Consequence Classification (2015 DSR)	Significant
Target Earthquake Level (CDA, 2014) (Passive care) Seismic Event	1 in 2475 year (PGA = 0.152g) NBC SHC 2015
Target FOS (CDA, 2014)	1.5 (static); 1.0 (pseudo-static)
Target Flood Levels (CDA, 2014)	1/3 between the 1,000-year event and the PMF

Source:://Z:\01_SITES\Sa_Dena_Hes\1CT008.057_2016_Geotech_Inspection\!080_Deliverables\1CT008.057_Report\010_Text\2016_SDH_GeotInsp_Report_1CT008-057_20170404_pmh.docx

5.1.2 Sediment Retaining Structure

The SRS spillway was designed to accommodate the 1 in 1000-year design flood. The SRS currently has a “Low” Consequence Classification. CDA (2014) recommends that the inflow design flood (IDF) for a low consequence dam class that is expected to remain in Construction, Operation & Transition Phase would be the 1 in 100-year event as referenced in Table 3-2 of the CDA 2014 Technical Bulletin. However, as the SRS will be in a “Closure-Passive Care Phase” for an extended period under infrequent surveillance, the IDF for the spillway was raised to the next highest dam classification level, the 1 in 1000-year event as referenced in Table 4-1 of the CDA 2014 Technical Bulletin.

Similarly, the target PGA for the SRS is 0.146 g.

A summary of the design criteria for the SRS is provided in Table 5-2 below.

Table 5-2: Design Criteria for the SRS

Original Design Crest Elevation	El. 1086.7 m
As Built Crest Elevation	El. 1087.7 m
Original Design Spillway Invert Elevation	El. 1085.0 m
As Built Spillway Invert Elevation	El. 1085.7 m
Crest Length	80 m
Design Operating Freeboard	1 m
As Built Operating Freeboard	1 m
Dam Consequence Classification	Low
Operating Pond Level	El. 1085 m
Target Earthquake Level (CDA 2014) (Passive Care)	1 in 1000 years (PGA = 0.082g) NBC SHC 2015
Target FOS (CDA 2014)	1.5 (static); 1.0 (pseudo-static)
Target Flood Levels (CDA 2014) (Passive Care)	1 in 1000 years

5.2 Hazards and Hypothetical Failure Modes Review

As a permanently closed site, structures at Sä Dena Hes mine site that have the potential to endanger human life or create environmental damage were either removed or upgraded to enhance long-term physical stability. This section of the DSI reviews the hazards that have been identified for the North Dam and the SRS and provides an assessment of the safety of these structures relative to the potential failure modes listed in the CDA (2014) Technical Bulletin.

Key hazards identified for the North Dam and SRS include runoff from extreme precipitation events, seismic events, ice buildup and debris in the SRS spillway, potential for liquefaction of the tailings and flow capacity of the SRS spillway. The following sections assess the potential failure modes for each structure.

5.2.1 Dam Overtopping

The hydrological studies completed by SRK in 2016 (SRK 2016a) concluded that there is no risk of overtopping of the North Dam even in an “extreme worst case” Probable Maximum

Precipitation (PMP) event with none of the existing drainage features such as water diversions functioning.

The spillway in the SRS is designed to accommodate the 1 in 1000-year IDF which meets the CDA 2014 target levels for flood hazards for “low” Dam Consequence Classification dams in the closure-passive care phase.

5.2.2 Internal Erosion

North Dam

The North Dam was built as a tailings retaining structure designed to allow seepage through the dam. The dam has three zones: an upstream low permeability compacted zone of silty till, a semi pervious compacted central zone of sandy till and a compacted outer downstream shell of pervious sand and gravel. Underlying the dam is a native sandy, gravelly silt (till). There are no indicators of fines being washed through to dam, although there is some seepage evident at the downstream toe. This seepage is mixed in with historical spring activity that was noted during the construction of the dam and the annual dam inspections. The tailings placed up against the upstream face of the dam have significantly reduced the seepage loss since initial construction. Piezometric levels in the dam and in the foundation have varied seasonally since the mine shut down in 1992 and lower levels are expected over time as the till cap consolidates.

The hydraulic gradient across the North Dam is in the range of 0.1 to 0.2. The dam material consists of a mixture of silty till to sandy till which is estimated to have a critical hydraulic gradient ranging from 1 to 13. This means the potential for internal erosion is very low to low.

SRS

The pond behind the SRS has a maximum depth of about 1.5 m and the overall hydraulic gradient through the structure is low and corresponds to no piping potential. The seepage through the dike is barely measurable. There is one small boil that has been noted at the downstream toe of the SRS dike, but no loss of fines detected.

5.2.3 Slope Stability

Table 5-3 outlines the minimum factor of safety (FoS) values for mining dams based on the guidelines in the CDA 2014 technical Bulletin.

Table 5-3: Target Levels for Earthquake Hazards/Factor of Safety, 2014 CDA Guidelines

Dam Rating	Care Type[1]	Event	AEP	Minimum Static FoS	Minimum Pseudo-Static FoS
Low	Transition	1 in 100 year	0.01	1.5	1.0
Low	Passive Care	1 in 1000 year	0.001	1.5	1.0
Significant	Transition	1 in 1000 year	0.001	1.5	1.0
Significant	Passive Care	1 in 2475 year	0.0004	1.5	1.0

Notes:
1. Active care assumes regular dam safety reviews, continual dam performance monitoring and the ability to respond to emergencies immediately. Passive care assumes no maintenance or monitoring occurs post-closure.

As the site is expected to remain in the Closure Passive Care phase for an extended period and as there is infrequent surveillance, the passive care targets have been adopted.

North Dam

As discussed above, the North Dam is composed of compacted fill with a pervious downstream shell. The downstream slope is 2.5H:1V. Several stability analyses have been performed on this dam in the last 2 years.

In 2015, SRK completed a stability analysis of the North Dam to supplement a third-party review of the Dam Consequence Category for the dam.

The results of the stability analyses completed on the North Dam, which are shown in Table 5-4, show that the structure exceeds minimum FoS requirements for long-term static and pseudo-static stability for closed dams under passive care classified as having a “Significant” consequence of failure.

Table 5-4: Stability Analysis Results

Case	FoS
Long Term Static	1.6
Pseudo-Static (1 in 100 year)	1.5
Pseudo-Static (1 in 1000 year)	1.3
Pseudo-Static (1 in 2475 year)	1.2

In the above slope stability analysis, the seismic acceleration used in the calculation was one-half of the full Peak Ground Acceleration (PGA) or 0.20 g. The application of the entire PGA value in the direction of failure is extremely conservative and represents the absolute worst-case scenario.

In 2016, SRK completed an updated post-liquefaction stability analysis of the North Dam. The stability analysis was completed to assess the stability of the North Dam following an earthquake event and assuming liquefaction of the tailings impounded by the dam during the seismic event.

The stability analysis concluded that tailings play no role in dam stability as the critical failure surface runs through the dam, which is constructed of compacted fill.

Based on the above analyses and the current water levels (maximums), the North Dam is stable under both static and seismic assessments.

It should also be noted that in March 2019, SRK completed a review of the Qualitative Performance Objections (QPO) for the North Dam. The review involved the development of threshold criteria for water levels within the piezometers and for dam crest settlement. These criteria have been incorporated into the updated OMS manual as discussed in section 5.6. The pseudo-static stability analysis completed for this study was based on the 2015 National Building

Code Seismic hazard calculator (NBC SHC) which lists the 1 in 2475 PGA as 0.14g compared to the PGA of 0.2g used in the previous analysis referenced above.

SRS

SRK also completed a stability analysis of the current configuration of the dike under both static and pseudo-static conditions. The dike has a maximum height of about 7 m and upstream and downstream slopes of 2H:1V slope and 2.5H:1V respectively. The maximum depth of the pond behind the dike is about 1.7 m.

The seismic calculation was completed using a full horizontal loading of 0.15 g (2010 NBC SHC), which was based on the target level for earthquake hazards suggested by CDA 2014 guidelines for a low consequence class dam in the passive care phase. The results of the analysis indicated both the static and pseudo-static FoSs' exceeded the target values in Table 5-3 above. It is also noted that the PGA based on the 2015 NBC SHC is now 0.08g almost 50% less than the 2010 values.

5.2.4 Surface Erosion

North Dam

SRK completed a study in 2016 to assess the erosion potential of the material on the downstream face. The study concluded that existing sand and gravel material exposed on the downstream face is adequate to withstand the runoff from the 200-year, 24-hour rainfall event without any significant erosion.

SRS

GeoJute fabric protection on the downstream face of the SRS is in good condition and provides adequate protection against surface erosion.

5.3 Review of Downstream and Upstream Conditions

5.3.1 Downstream Conditions (South)

No changes were noted downstream or south of the TMA. The original exit chute shows no sign of increased seepage since Camp Creek was redirected back into the original Camp Creek channel. The vegetation is slowly taking hold. There were no new dwellings or changes in land use noted.

5.3.2 Upstream Conditions (North)

The North Dam is located near an original catchment divide so all conditions are predominantly downstream. An inspection of the conditions north of the North Dam was carried out and no changes were noted. Similarly, to the area south of the TMA, no new dwellings or changes to land use were noted.

5.4 Dam Classification Review

The first assessment of the Dam Consequence Classification (DCC) of potential failure of the dams and spillways associated with the TMA was completed by SRK for the 2000 Detailed Decommissioning Reclamation Plan (DDRP). The assessment was completed in accordance with the guidelines presented in the “Mine Reclamation in the Northwest Territory and the Yukon” (INAC 1992) and focused on the failure of the South Dam spillway and the failure of the North Dam. The failure of South Dam and the Reclaim Dam was not considered since they would be removed upon closure. The study concluded that the failure of the North Dam and the South Dam spillway would not pose a significant risk to public health and safety; there would be no loss of life expected, no damage to buildings and no loss to roads. The design criteria established for the design of the South Dam spillway and the stability of the North Dam was therefore based on the 1 in 1000-year IDF and the PGA for the 1 in 1000 seismic event, respectively. No dam breach or inundation studies were carried out.

As part of the 2003 Dam Safety Review (DSR) completed by Klohn Crippen Berger (KCB), a screening level assessment of the DCC for the TMA was carried out so that the appropriate design criteria could be established for the DSR. The assessment was carried out in accordance with the 1999 CDA Dam Safety Guidelines and included a dam breach inundation analysis. The study concluded that all three dams (North, South and Reclaim) would be classified as Low Consequence facilities.

In 2010, a second DSR was carried out by Golder Associates, who also completed a screening level assessment so that design criteria could be established for the 2010 DSR. The assessment was completed in accordance with the CDA 2007 Dam Safety Guidelines and included a conceptual dam breach and inundation study. Overall the assessment concluded that all three dams would be in the “significant” consequence class due to the potentially significant incremental losses on False Creek and Frances River.

Given the 2014 decommissioning activities associated with the TMA, SRK completed a dam breach and inundation study for the SRS dike and the North Dam. The assessment concluded that by applying the CDA (2014) generalized guidelines shown in Table 5-5, incremental losses from a breach of the North Dam and SRS dike would place the structures in the “Low” Consequence class. The attribution of that class to the North Dam and the SRS is based on the following consequence criteria:

- There is no population at risk downstream of the facility or near the dam or in the expected path of any water releases;
- No loss of human life would be expected from the failure;
- No local or regional infrastructure or services would be impacted by a failure; and
- There would be minimal short-term loss and no long-term loss.

Table 5-5: CDA (2014) Dam Classification in Terms of Consequences of Failure

Dam Class	Population at Risk [note 1]	Incremental Losses		
		Loss of Life [note 2]	Environmental and Cultural Values	Infrastructure and Economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss or marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of i*mportant* fish or wildlife habitat. Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very high	Permanent	100 or fewer	Significant loss or deterioration or *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances)
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affection critical infrastructure or services (e.g., hospital, major industrial complex, major storage facilities for dangerous substances)

Note 1. Definitions for population at risk:

None – There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary- People are only temporarily in the dam-breach inundation zone (e.g. seasonal cottage use, passing though on transportation routes, participating in recreational activities).

Permanent- The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

Note 2. Definitions for population at risk:

Unspecified- The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example might not be higher if the temporary population is not likely to be present during the flood season.

The last DSR was carried out by AMECFW in 2015 and based on this review, the CDA Dam Consequence Classification of the North Dam was changed from “Low” to “Significant”. The change was based on an issue raised by AMECFW noting that there was a potential for liquefaction of the tailings if the dam were to fail and that during a flood event there was a potential for overtopping of the dam. Because of this classification change, the IDF for the North Dam under passive care was changed to 1/3 between the 1,000-year event and the PMF and the design earthquake event was changed from the 1 in 1,000-year event to the 1 in 2,475-year event, respectively (based on passive care guidelines in CDA 2014).

As discussed in Section 5.2, there is no risk of overtopping of the North Dam even in an “extreme worst case” Probable Maximum Precipitation (PMP) event (SRK 2016a) and the recent stability analysis completed by SRK concluded liquefied tailings play no role in dam stability as the critical failure surface runs through the dam, which is constructed of compacted fill.

It is SRK's opinion that the Dam Consequence Classification (DCC) of "Significant" for the North Dam is overly conservative and should remain as "Low". The next DSR is scheduled for 2020 and the DCC for the North Dam should be reviewed at that time

5.5 Physical and Operational Performance

As the mine is currently closed in passive care, operational performance is not applicable. The North Dam is currently stable and does not retain any water. There are no signs of any instability on the crest or the downstream slope. The SRS dike is also stable with no indication of cracks along the crest or sloughing on the upstream and downstream slopes.

The spillway shows no sign of movement of the riprap or instability. It is functioning in accordance with the design parameters.

5.6 Operations, Maintenance and Surveillance (OMS) Manual Review

The current OMS Manual was prepared by SRK in 2015 and was updated in February 2018. The manual was reviewed as part of this 2019 DSI.

A list of changes to the 2015 OMS manual are provided below:

February 2018 changes:

1. Section 1.1 *The SRS and the North Dam are in a "passive" care phase of closure with some surveillance and monitoring. Design criteria for both structures are governed by the target levels for flood and earthquake hazards based on the passive care phase of closure*.

2. Section 2.1 *Details in the Key Roles and Responsibility Table 1 have been updated including key contact information.*

3. Section 2.2 *Org Chart Figure 6 has been updated*.

4. Section 3.3.4 *Dam Consequence Category. Added discussion on the DCC for the North Dam and added reference to a scheduled Risk Assessment in Dec 2018. Frequency of DSR's for the SDH TMA.*

5. Section 5.2 *Added comment about a review of the Dam Consequence Category for the North Dam and the frequency of DSR's for the site.*

6. Section 5.3.2 *Added comment about Piezometer caps and labels*.

7. Section 6.1 *Added comment about the frequency of Routine maintenance inspections (Fall and Spring).*

8. Section 6.5.2 *Added requirement to remove Beaver dams as soon as they are identified during routine inspections.*

9. Section 6.5.6 *Added comments about erosion monitoring pins at the toe of the Jewelbox Waste Rock dump.*

October 2019 Changes:

1. *Section 3.4.7 The 2018 monthly precipitation estimates for the site in table 13 were updated based on 2018 Watson Lake data.*

2. *Section 3.3.3 Target Earthquake PGA for the SRS in Table 5 was reduced from 0.15 g to 0.08 g based on the 2015 NBC SHC.*

3. *Section 3.3.4 Target Earthquake PGA for the North Dam in Table 7 was reduced from 0.2 g to 0.14 g based on the 2015 NBC SHC.*

4. *Section 3.4.9 PGA's for the Sä Dena Hes site were updated based on the 2015 NBC SHC.*

5. *Section 5.3.2 New tables were added to this section providing trigger levels for North Dam Piezometers and settlement gauges.*

5.7 Emergency Preparedness and Response Plan (EPRP) Review

The current EPRP was prepared by SRK in 2015. The manual was reviewed as part of the 2018 DSI.

A list of changes to the EPRP is provided below:

1. Section 2.1 *Details in the Key Roles and Responsibility Table 1 have been updated including key contact information.*

2. Section 2.2 *Org Chart Figure 6 has been updated*.

Teck is currently updating the requirements for EPRs at all legacy sites. The ERP for the Sä Dena Hes will be updated once these guidelines have been finalized.

6 Summary and Recommendations

6.1 Summary of Construction and Operations Activities

The site is currently closed and there are no construction or operation activities.

6.2 Summary of Climate and Water Balance

The MAP for the site is 646 mm based on a recent regional and regression analysis performed by SRK using the nearby meteorological stations from Environment and Climate Change Canada (ECCC). An estimate of the 2018 annual precipitation was calculated to be 356 mm based on the 2018 annual precipitation recorded at the Watson Lake airport.

The mean annual lake evaporation for the site remains unchanged at the estimated 483 mm.

6.3 Summary of Performance

Per previous inspections, the North Dam is currently stable and does not retain any water. There are no signs of any instability on the crest or the downstream slope. The vegetation on the till cover is slowly taking hold and the drainage channel in the middle of the cover is functioning as designed.

The SRS dike is also stable with no indication of cracks along the crest or sloughing on the upstream and downstream slopes.

The spillway shows no signs of movement of the riprap or instability. It is functioning in accordance with the design parameters

6.4 Summary of Changes to Facility or Upstream or Downstream Conditions

There were no significant changes noted of the North Dam or the SRS dike. Similarly, there were no changes to the upstream and downstream conditions to the north and south of the North Dam.

6.5 Consequence Classification

The consequence of failure category for North Dam and the SRS Dike is currently “significant” and “low” respectively. It is SRK’s opinion that the Dam Consequence Classification (DCC) of “Significant” for the North Dam is overly conservative and should remain as “Low”. The next DSR is scheduled for 2020 and the DCC for the North Dam should be reviewed at that time

6.6 Table of Deficiencies and Non Conformances

SRK has completed the 2019 DSI of Sä Dena Hes mine, TMA and water management infrastructure and concluded that the North Dam, the SRS, the diversion channels and the waste rock dumps are in good condition, and there was no evidence of any dam safety issues or concerns.

Table 6-1 provides a summary of deficiencies and non conformances noted during the 2019 dam safety inspection (DSI). There are no outstanding deficiencies or non-conformances from the 2018 or earlier DSI’s.

Table 6-1: Summary of Deficiencies and Non-Conformances

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulatory or OMS Reference	Recommended Action	Priority (Teck 2019)	Recommended Deadline/ Status
North Creek Channel	2019-1	Beaver Dam at inlet to channel		Remove beaver dam in channel	3	Before end of 2019 Completed September 5, 2019 Closed

General Description of Priority Rankings[2]

Priority	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant regulatory concern.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact or significant regulatory action; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks. This typically includes ongoing construction items within the appropriate construction cycle.

[2] Based on the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia (2016 revision).

This final report, 2019 Sä Dena Hes Annual Dam Safety Inspection, was prepared by SRK Consulting (Canada) Inc.

This signature has been scanned.
The author has given permission for its use in this particular document.
The original signature is held on file.

Peter Healey, PEng
Associate

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

7 References

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited. 2016. Sä Dena Hes Mine, Tailings Management Facility 2051 Dam Safety Review. Report prepared for Teck Resources Limited. TE133102.5000. February 2016.

Canadian Dam Association (CDA). 2013 Edition. Dam Safety Guidelines 2007

Canadian Dam Association (CDA). 2014. Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams, April 2014.

Canadian Dam Association (CDA). 2016. Technical Bulletin Dam Safety Reviews.

INAC 1992, Mine Site Reclamation Guidelines for Northwest Territories, 1992

MEMPR 2013, Guidelines for Annual Dam Safety Inspection Reports (August 2013)

Morton, F.I. 1983. "Operation Estimated of Areal Evapotranspiration and their significance to the science and practice of hydrology." *Journal of Hydrology* 66: 1-76

SRK Consulting (Canada) Inc., 2015a. 2015 Operation, Maintenance and Surveillance Manual for the Tailings Management Area at Sä Dena Hes Mine. Report prepared for Teck Resources Limited. 1CT008.055. October 2015.

SRK Consulting (Canada) Inc., 2015b. 2015 Geotechnical Inspection, Tailings Management facility, SDH, YT, November 2015.

SRK Consulting (Canada) Inc., 2016a. Dam Safety Review Technical Studies, Sä Dena Hes Mine.

SRK Consulting (Canada) Inc., 2016b. 2016 Dam Safety Inspection, Tailings Management Area SDH, YT, November 2016.

SRK Consulting (Canada) Inc. 2017a. Baseline Hydrology at Sä Dena Hes. December 2017.

SRK Consulting (Canada) Inc., 2017b. 2017 Dam Safety Inspection, Tailings Management Area SDH, YT, December 2017.

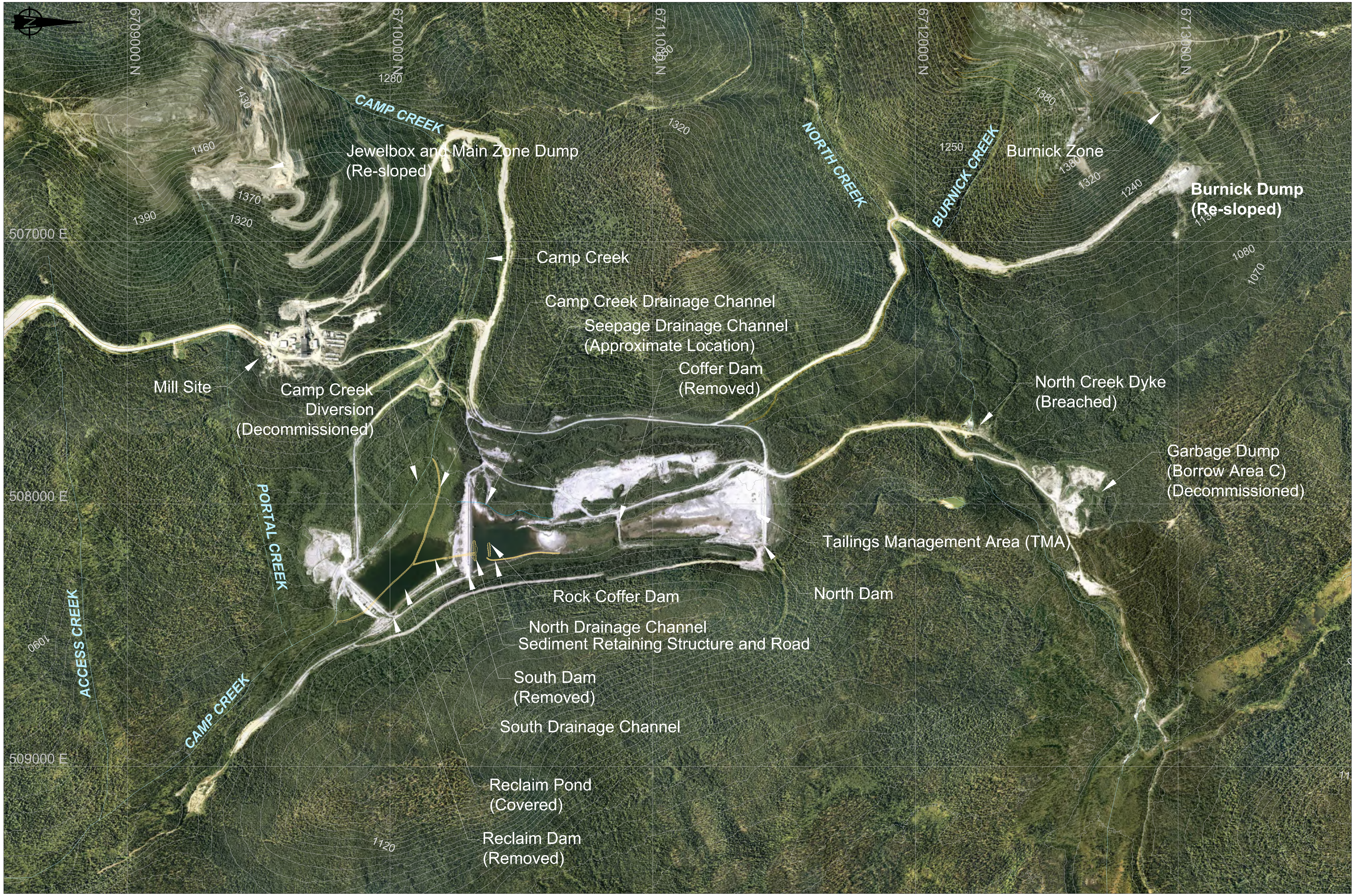
SRK Consulting (Canada) Inc., 2018. 2018 Dam Safety Inspection, Tailings Management Area SDH, YT, November 2018

SRK Consulting (Canada) Inc., 2019 Qualitative Performance Objectives, North Dam, SDH, YT, March 2019

Teck Resources Limited, 2019. Guideline for Tailings and Water Retaining Structures, January 2019.

Yukon Territory Water Board Water License QZ99-045 for SDH mine (YTWB 2002), and its amendments (YTWB 2005 and YTWB 2010)

Figures



NOTES

1. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey. Coordinate system is UTM NAD 83CSRS zone 9V.
2. Orthographic photo depicts pre-decommissioned surface.

0 100 200 300 400 500

Scale in Metres

CONTOUR INTERVAL=10m

srk consulting

Teck

2019 Dam Safety Inspection

Vicinity Map

SRK JOB NO.: 1CT008.072

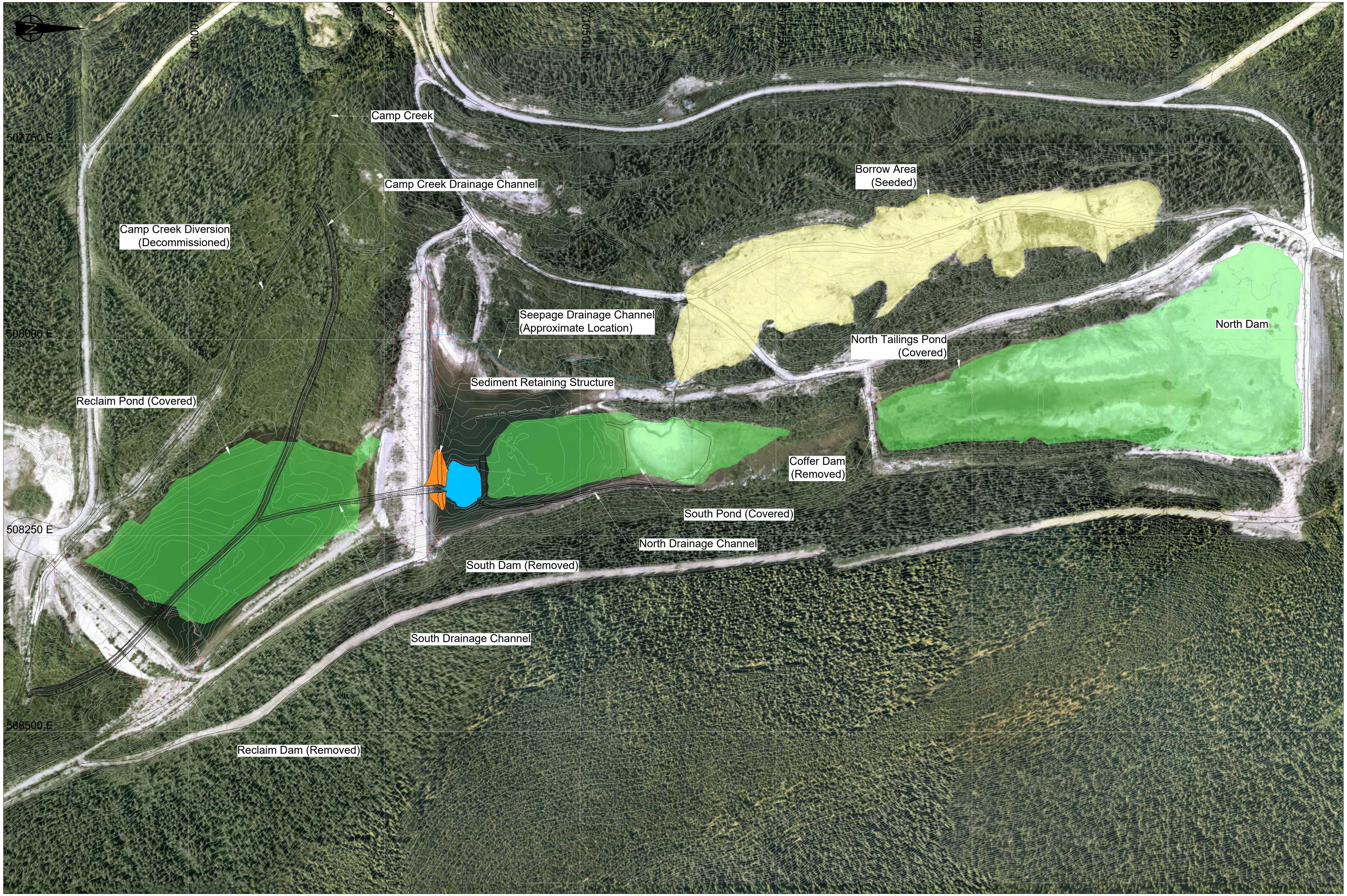
FILE NAME: 1CT008_072_fig_01 - Vicinity Map.dwg

Sä Dena Hes Project

DATE: September 2019

APPROVED: PH

FIGURE: 1



LEGEND

- Major Contour (5m interval)
- Minor Contour (1m interval)
- Edge of Road
- Design Edge of Road
- Camp Creek Drainage Channel
- Dam Excavation Extent
- Sedimentation Pond
- Capped Areas
- Seeded Area

NOTES

1. Preconstruction topographical contour data was obtained from McElhanney and is based on August 15, 2012 LiDAR Survey.
2. As-built survey data was collected by Yukon Engineering Services and Amec Foster Wheeler.
3. Coordinate system is UTM NAD 83 CSRS Zone 9V.
4. Tailings characterization work conducted by Golder and Associates determined the location of capping at the South Pond and Reclaim Pond areas.

0m 50 100 150 200

srk consulting

Teck

2019 Dam Safety Inspection

TMA General Arrangement Map

SRK JOB NO.: 1CT008.072

FILE NAME: 1CT008_072_fig_02 - General Arrangement.dwg

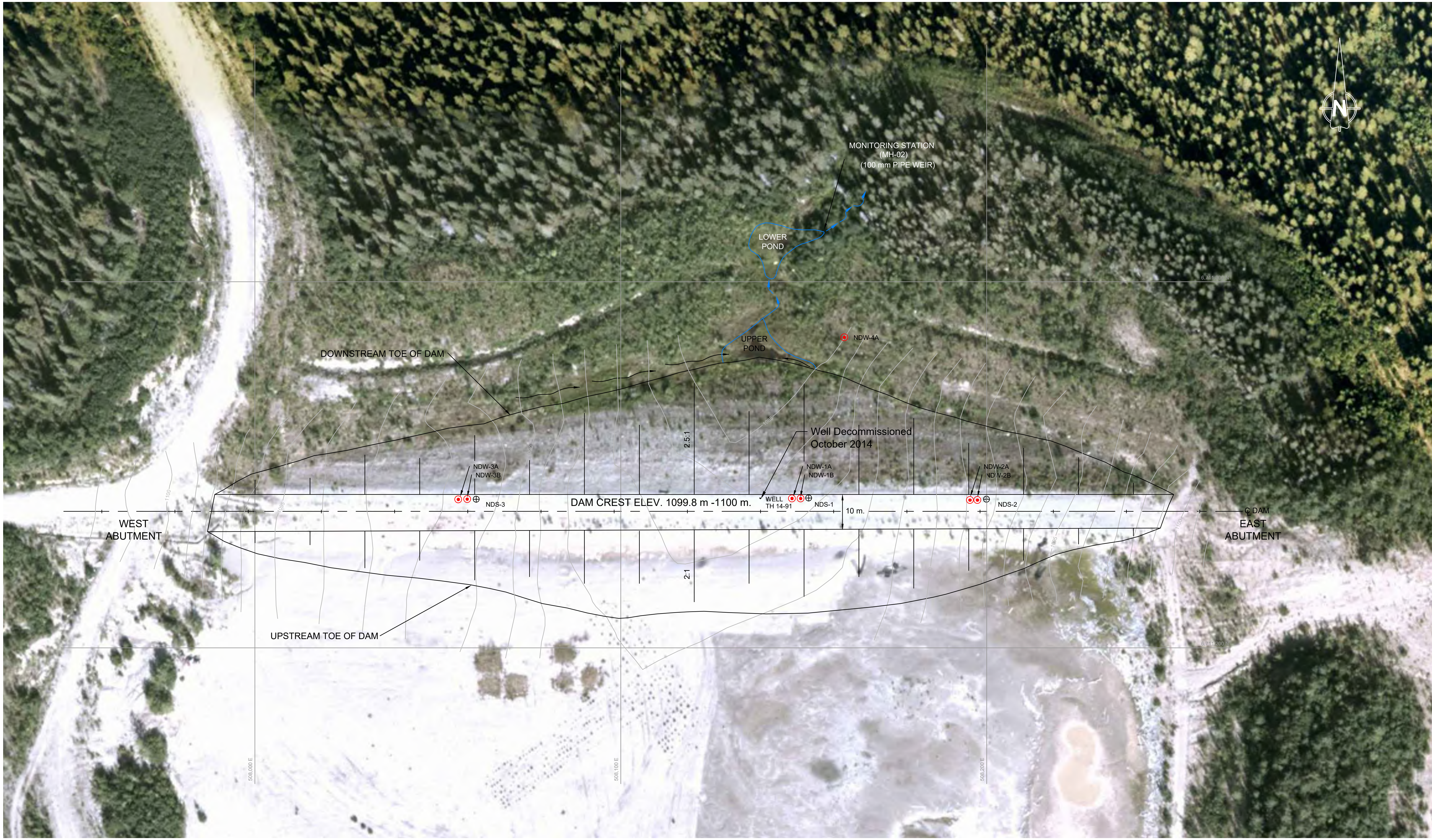
Sä Dena Hes Project

DATE: September 2019

APPROVED: PMH

FIGURE: 2

\\srk.ad\dfs\na\ssk\Projects\01_SITES\Sa_Dena_Hes\1CT008.072_2019 DSI\040_AutoCAD_GIS\1CT008_072_fig_02 - General Arrangement.dwg



KEY

NDW-1 ⊙	PIEZOMETERS INSTALLED (NOV., 1991)
NDS-1 ⊕	SETTLEMENT GAUGE INSTALLED (NOV., 1991)
⟶	SEEPAGE

NOTES:

1. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey and October 2013 YES Survey. Coordinate system is UTM NAD 83CSRS zone 9V.

srk consulting

Teck

SRK JOB NO.: 1CT008.072

FILE NAME: 1CT008_072_fig_03 – North Dam–plan.dwg

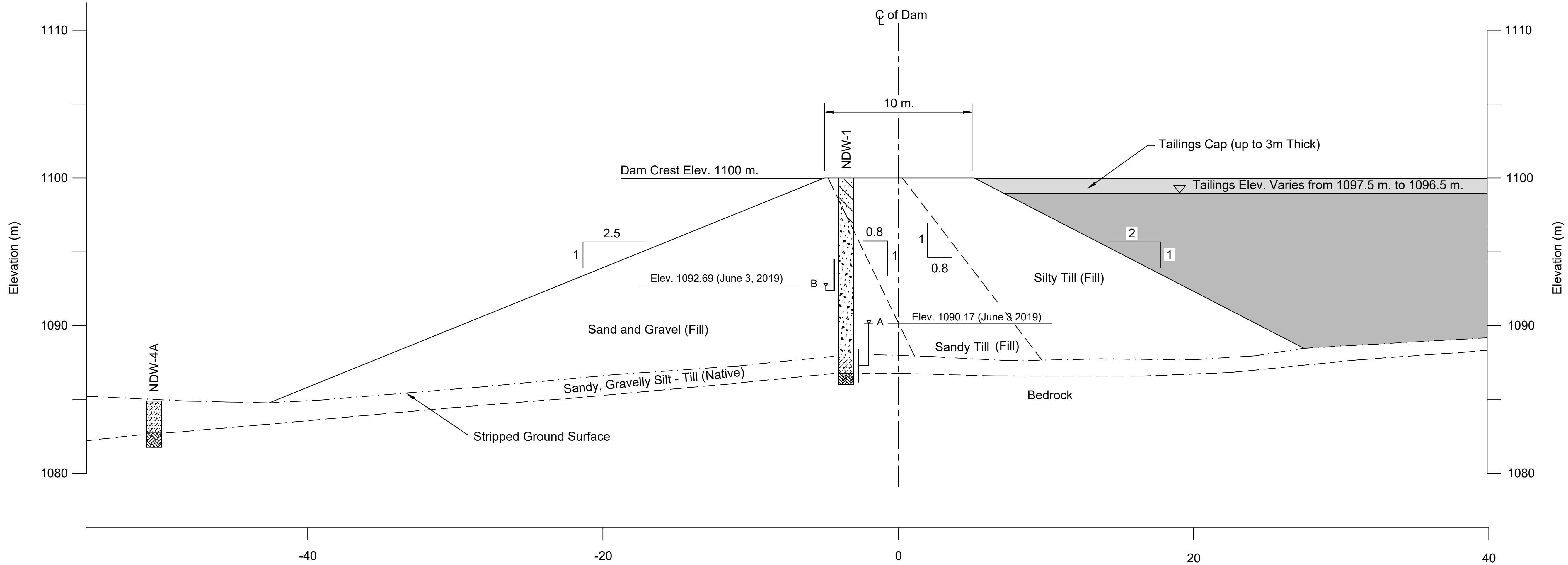
Sa Dena Hes Project

2019 Dam Safety Inspection

North Dam
Site Plan

DATE:	APPROVED:	FIGURE:
September 2019	P.M.H.	3

\\srk.ad\dfs\na\ssk\Projects\01_SITES\Sa_Dena_Hes\1CT008.072_2019 DSI\!040_AutoCAD_GIS\1CT008_072_fig_03 - North Dam-plan.dwg



Date	Piezometer	Borehole depth (mBTOC)	Piezometer Interval (mBTOC)	Soil Type	Top of Casing Elev. (mamsl)	Ground Elevation (mamsl)	Water Reading (mBTOC)	Top of water (mamsl)	Depth to Bottom (mBTOC)	Bottom of hole (mamsl)	Piezometer Interval (mamsl)
3-Jun-19	NDW-1A	14.44	12.34-14.44	Bedrock	1100.74	1100.00	10.57	1090.17	14.48	1086.26	1086.3-1088.4
3-Jun-19	NDW-1B	8.30	6.2-8.3	Sandy Till	1100.70	1100.00	8.015	1092.69	8.05	1092.65	1092.4-1094.5

LEGEND

- Sandy Till (Fill)
- Silty Till (Fill)
- Sand & Gravel(Fill)
- Silty Sand (Till)
- Gravelly Silty Sand (Till)
- Sand & Gravel (Native)
- Bedrock
- Piezometric Head for Filter Zone Indicated
- Tailings
- Tailings Cap

NOTES

1. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey. Coordinate system is UTM NAD 83CSRS zone 9V.

0m 3 6 9 12

srk consulting

SRK JOB NO.: 1CT008.072

FILE NAME: 1CT008_072_fig_04 - North Dam-XS.dwg

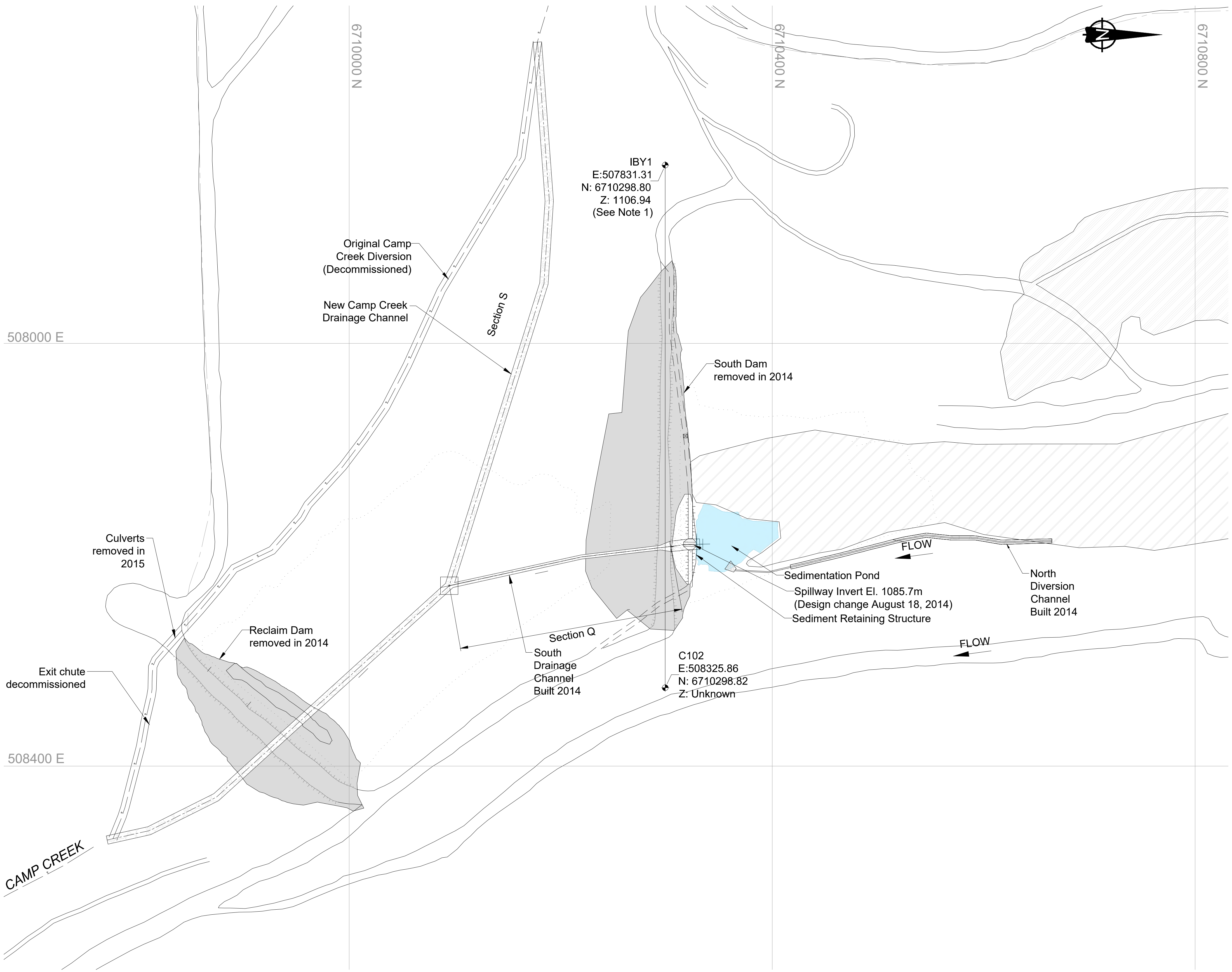
Teck

Sä Dena Hes Project

2019 Dam Safety Inspection

North Dam
Section 0+400

DATE: September 2019 | APPROVED: PMH | FIGURE: 4



LEGEND

- Covered Tailings
- Removed Dams
- Sedimentation Pond
- Minor Contours (1m interval)
- Major Contours (5m interval)
- Camp Creek
- Drainage Channel

NOTES

1. This Benchmark datum is currently used to monitor settlement gauges on the dam and was used as the benchmark in construction of the dam. The elevation has been adjusted from 1103.54m to the current LiDAR Survey elevation.

0 20 40 60 80 100
Scale in Metres

srk consulting

Teck

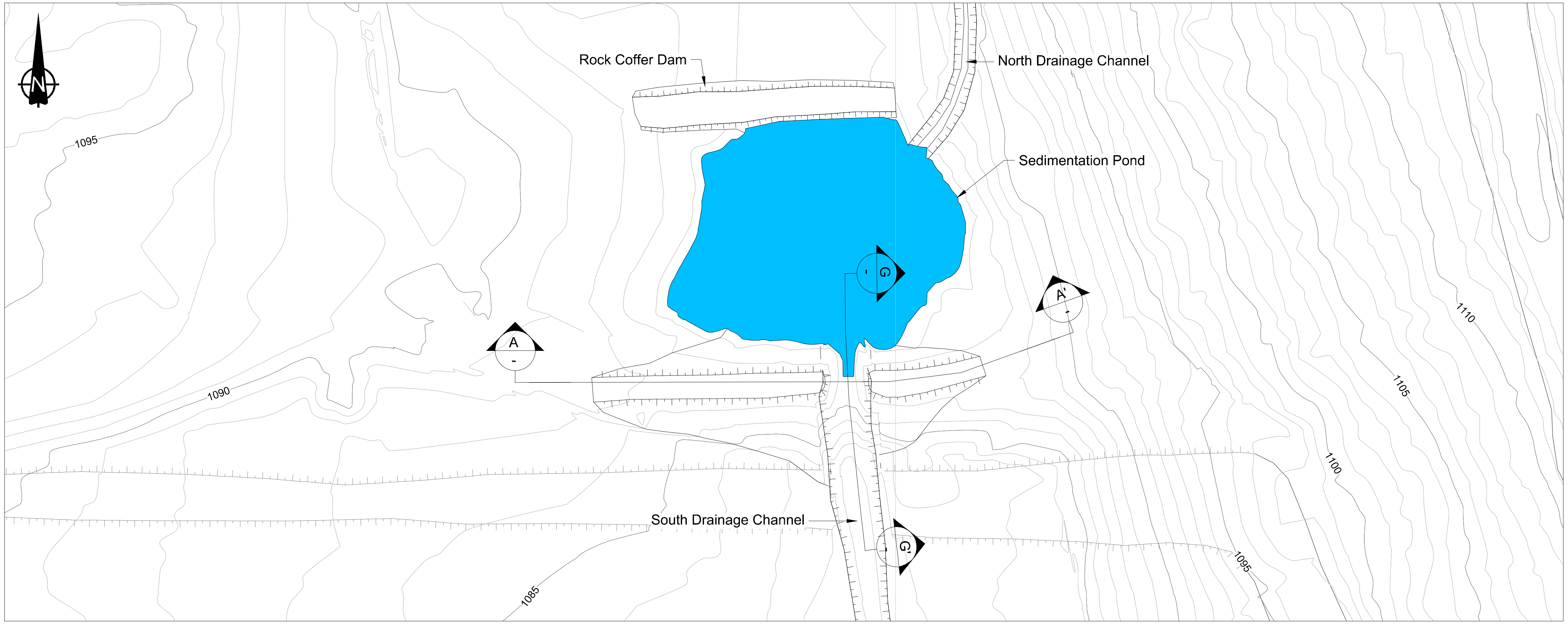
Sä Dena Hes Project

2019 Dam Safety Inspection

Sediment Retaining Structure
Location Map

SRK JOB NO.:	1CT008.072
FILE NAME:	1CT008_072_fig_05 – TMF.dwg

DATE:	APPROVED:	FIGURE:
September 2018	PMH	5



Plan

0m 10 20 30 40

LEGEND

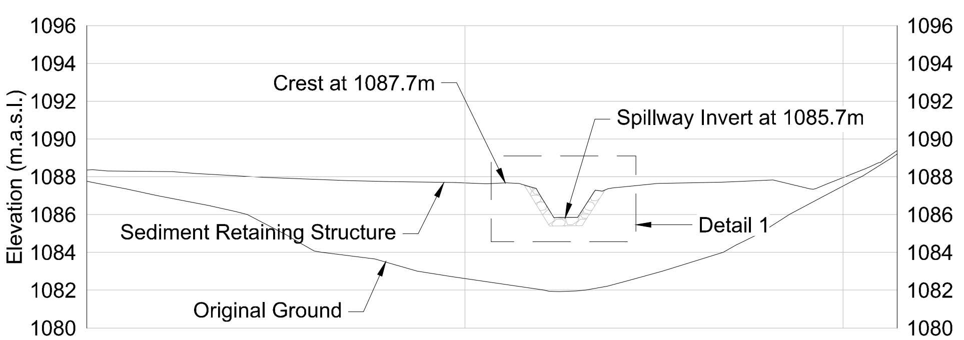
- Major Contour (5m)
- Minor Contour (1m)
- Dam Crest
- Dam Toe
- Edge of Road
- Sediment Pond

PROFILE AND DETAIL LEGEND

- Original Ground
- Non-woven Geotextile
- Riprap

NOTES

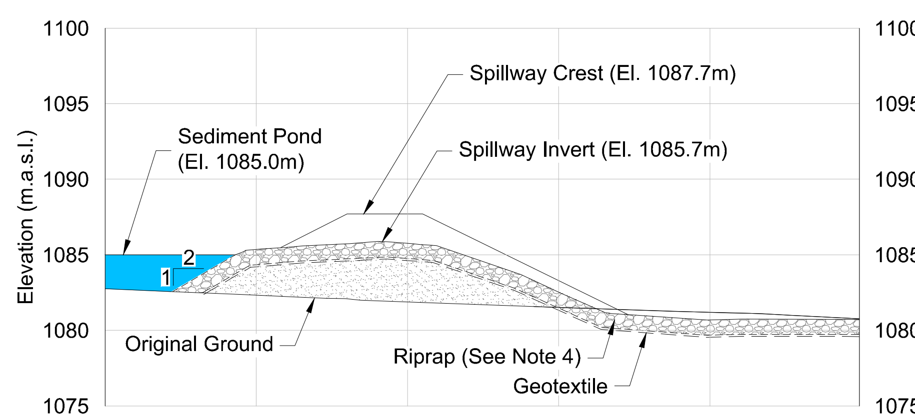
1. Excavated dam fill material was used to cap tailings. The final excavated surface was graded to promote drainage and blended topography into adjacent natural topography.
2. Rip rap from downstream toe buttress was salvaged and reused during channel construction.
3. The decant tower was demolished down to the foundation. Steel reinforced concrete was deposited in the onsite landfill located in Borrow Area C. The remaining concrete foundation was covered with dam fill material and graded to blend into topography.
4. Design extents of rip rap and geotextile, as no as-built survey.



A - Profile A-A'

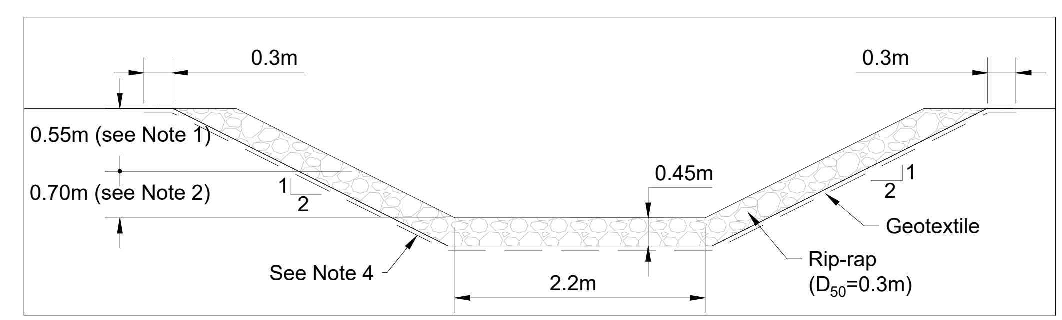
0m 10 20 30 40 Horizontal

0m 4 8 12 16 Vertical



G - Section G-G'

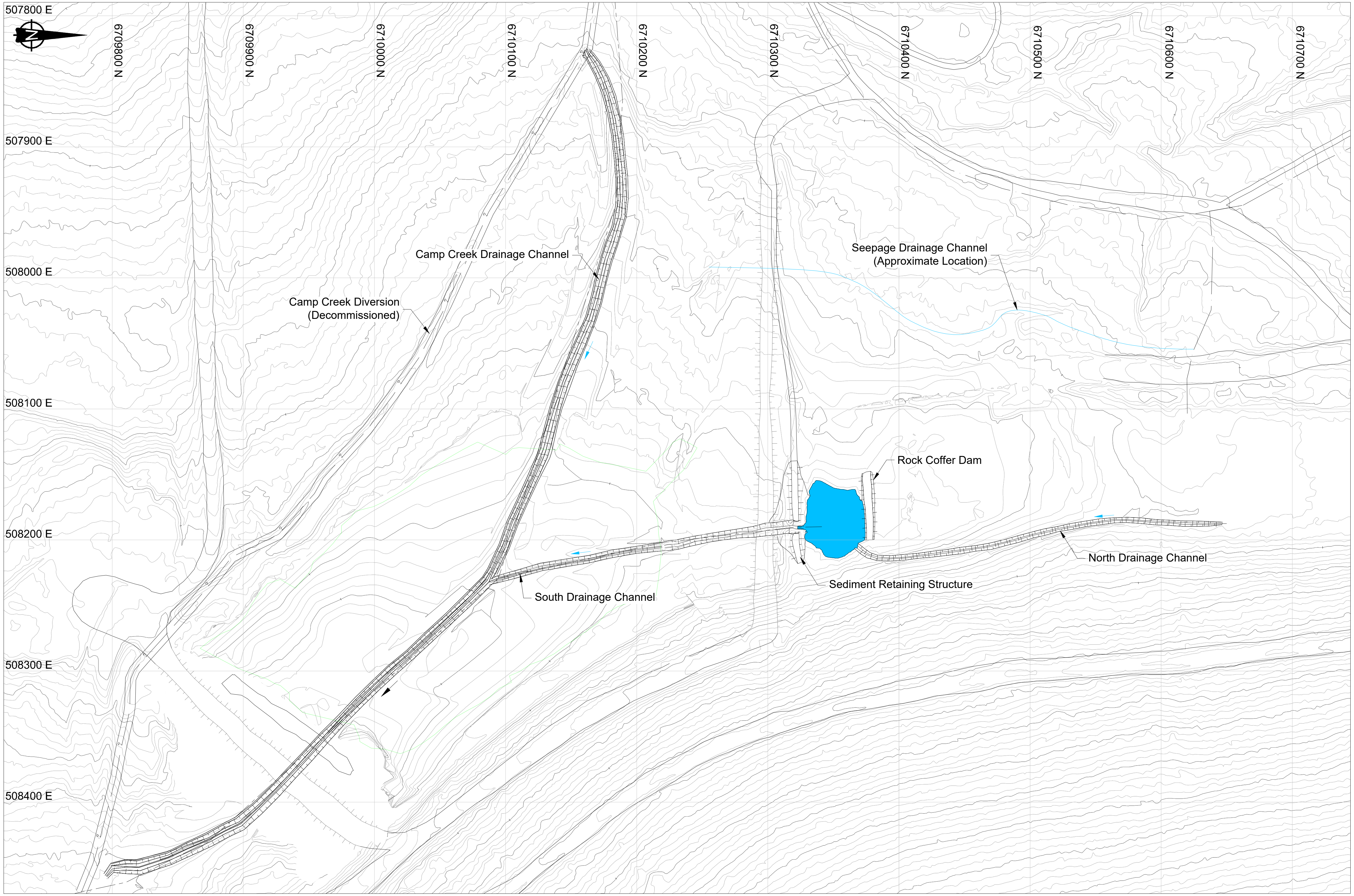
0m 5 10 15 20



1 - Detail 1 - Design Spillway Typical Section

N.T.S.

srk consulting	Teck	2019 Dam Safety Investigation
		Sediment Retaining Structure Plan and Profile
SRK JOB NO.: 1CT008.072	Sä Dena Hes Project	DATE: September 2019
FILE NAME: 1CT008_072_fig_06 - Sediment Retaining Struct.dwg		APPROVED: PMH
		DRAWING: 6



LEGEND

- Major Contour (5m)
- Minor Contour (1m)
- Dam Crest
- Dam Toe
- Edge of Road
- Direction of Flow
- Sediment Pond

NOTES

1. As-built Camp Creek Drainage Channel upstream and downstream tie-in locations and North Drainage Channel alignments were modified from the design by Amec foster wheeler, with consultation from SRK and Teck, based on field conditions.

0m 30 60 90 120

srk consulting

Teck

2019 Dam Safety Investigation

Drainage Channel Plan

SRK JOB NO.: 1CT008.072

FILE NAME: 1CT008_072_fig_07 - Drainage Channel.dwg

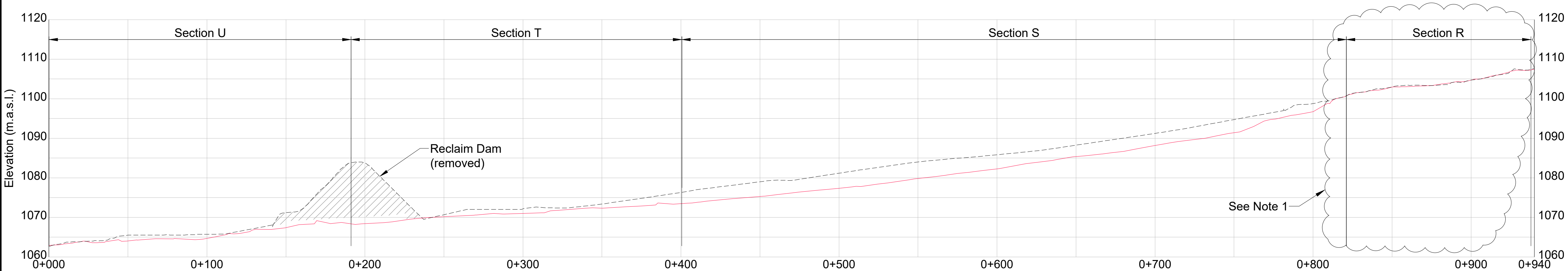
Sä Dena Hes Project

DATE: September 2019

APPROVED: PMH

DRAWING: 7

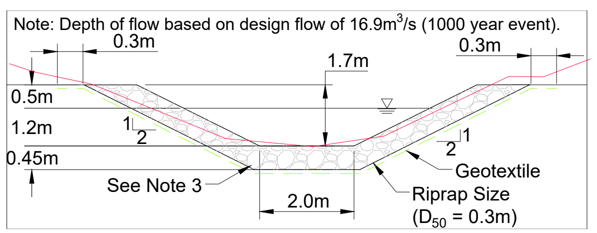
\\srk.ad\dfs\na\sk\Projects\01_SITES\Sa_Dena_Hes\1CT008.072_2019 DSI\040_AutoCAD_GIS\1CT008_072_fig_07 - Drainage Channel.dwg



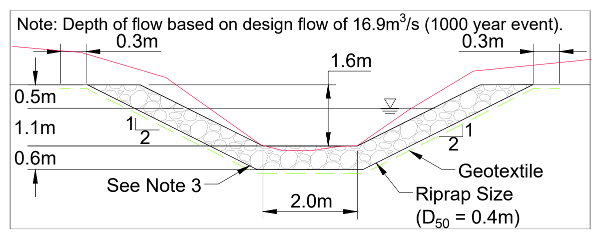
W 09 **Profile W - W'**
Camp Creek Channel

Horizontal: 0 10 20 30 40 50 Scale in Metres

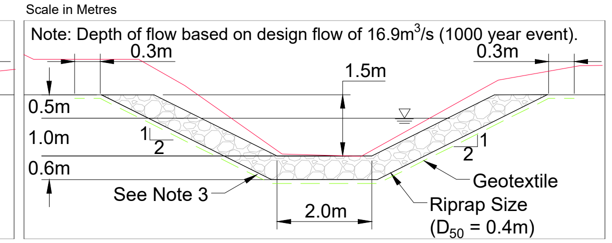
Vertical: 0 5 10 15 20 25 Scale in Metres



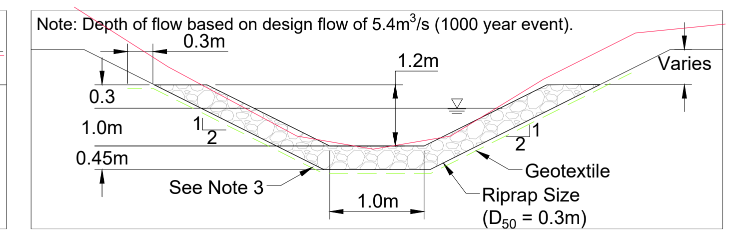
U 09 **DESIGN SECTION U- U'**
Camp Creek Drainage Channel
N.T.S.



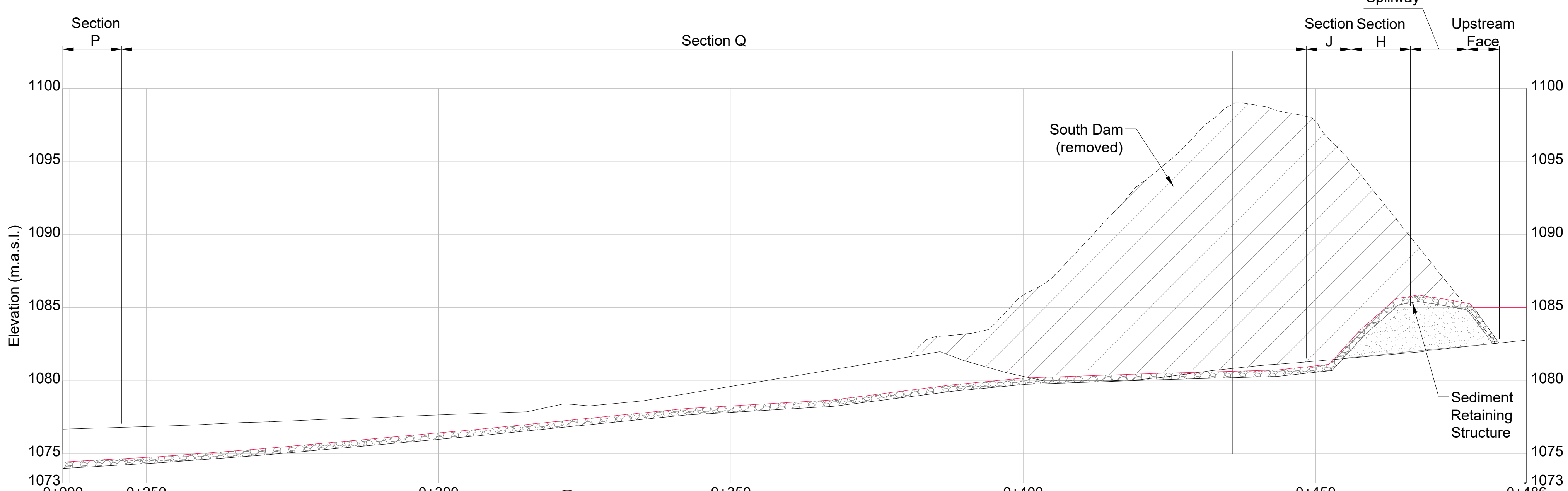
T 09 **DESIGN SECTION T- T'**
Camp Creek Drainage Channel
N.T.S.



S 09 **DESIGN SECTION S - S'**
Camp Creek Drainage Channel
N.T.S.



Q 09 **DESIGN SECTION Q - Q'**
South Drainage Channel
N.T.S.



V 09 **Profile V - V'**
South Drainage Channel

Horizontal: 0 5 10 15 20 25 Scale in Metres

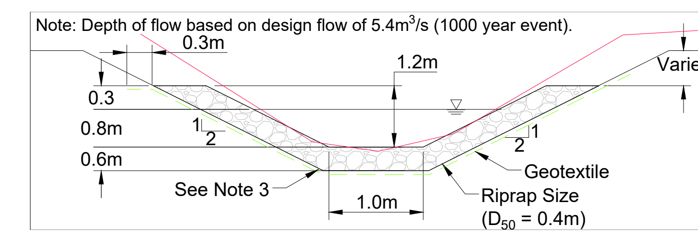
Vertical: 0 2 4 6 8 10 Scale in Metres

LEGEND

- Top of Drainage Channel Profile
- Pre-existing Ground
- Pre-Construction Ground
- Sediment Retaining Structure
- Non-woven Geotextile
- Material to be removed
- Rip Rap
- Till (left in place from Original Dam)
- As-built Surface

NOTES

1. Based on field conditions Section R was removed from the design and the upstream tie-in location was modified.
2. Design extents of rip rap and geotextile, as no as-built survey.



P 09 **DESIGN SECTION P - P'**
South Dam Drainage Channel
N.T.S.

Design Drainage Channel Riprap Volume Summary Table

Location	D_{50} (m)	Armoring Depth (m)	Volume (m^3)
Section U	0.3	0.45	993
Section T	0.4	0.6	1409
Section S	0.4	0.6	2875
Section P	0.4	0.6	52

AS-BUILT EXCAVATED RIPRAP QUANTITIES USED FOR CHANNEL CONSTRUCTION

Material	Units	Quantity	Notes
Riprap developed from the Quarry	m^3	5,492	Volume tracked by Amec Foster Wheeler
Riprap salvaged from Toe Buttresses	m^3	3,592	Volume tracked by Amec Foster Wheeler

srk consulting | Teck | 2019 Dam Safety Inspection

DRAWING TITLE: Drainage Channel Sections

SRK JOB NO: 1CT008.072

FILE NAME: 1CT008_072_fig_08-09-AB_Asbuilt.dwg

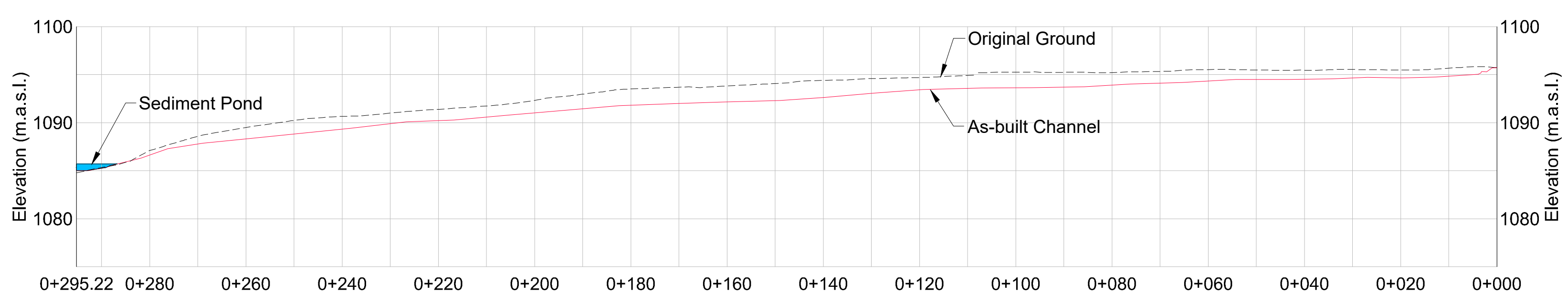
Sä Dena Hes Project

DATE: September 2019 | APPROVED: PMH | FIGURE NO. 8

\\srk.ad\dfs\na\ssk\Projects\01_SITES\Sa_Dena_Hes\1CT008.072_2019 DSI\040_AutoCAD_GIS\1CT008_072_fig_08-09-AB_Asbuilt.dwg

PLAN

0 5 10 15 20 25
Scale in Metres



ND
-
Profile ND - ND'
2x Vertical Exaggeration

Horizontal: 0 5 10 15 20 25
Scale in Metres
Vertical: 0 2.5 5 7.5 10 12.5
Scale in Metres

NOTES

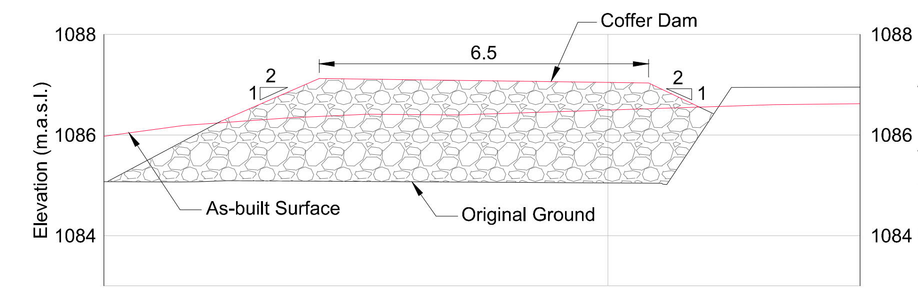
1. Based on field conditions the North Drainage Channel was realigned to avoid constructing the channel through deposited tailings.
2. Based on field conditions a Rock Cofferdam was constructed to retain soft tailings from sliding into the sediment retention pond during cover construction.
3. The decant tower was demolished down to the foundation. Steel reinforced concrete was deposited in the onsite landfill located in Borrow Area C. The remaining concrete foundation was covered with dam fill material and graded to blend into topography.
4. Design extents of rip rap and geotextile, as no as-built survey.

Design North Tailings Drainage Channel Riprap Volume Summary Table:

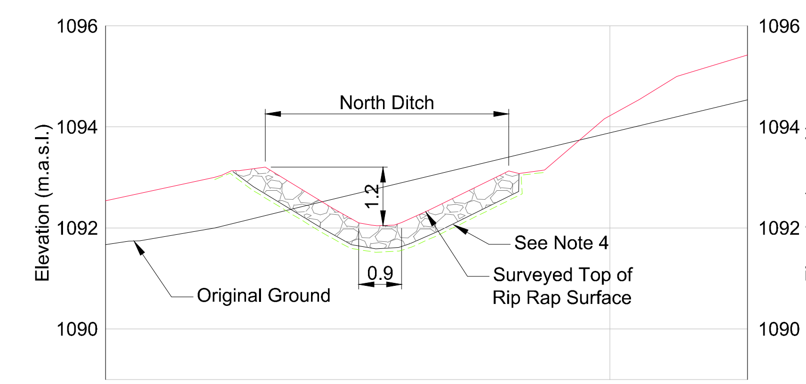
Location	D_{50} (m)	Armoring Depth (m)	Volume (m^3)
Y	0.3	0.45	638
Discharge Area	0.3	0.45	25

LEGEND

- Major Contours (5m)
- Minor Contours (1m)
- Edge of Road
- Tailings Pipeline
- Existing Ground (Profile)
- Non-woven Geotextile
- Covered Tailings (Proposed in Design)
- Rip Rap
- Sediment Pond (As-built)
- As-built Toe
- As-built Crest
- As-built Extent of Excavation / Fill



Z
-
Section Z - Z'
0 1 2 3 4 5
Scale in Metres



Y
-
Section Y - Y'
0 1 2 3 4 5
Scale in Metres

srk consulting

SRK JOB NO: 1CT008.072

FILE NAME: 1CT008_072_fig_08-09-AB_Asbuilt.dwg

Teck

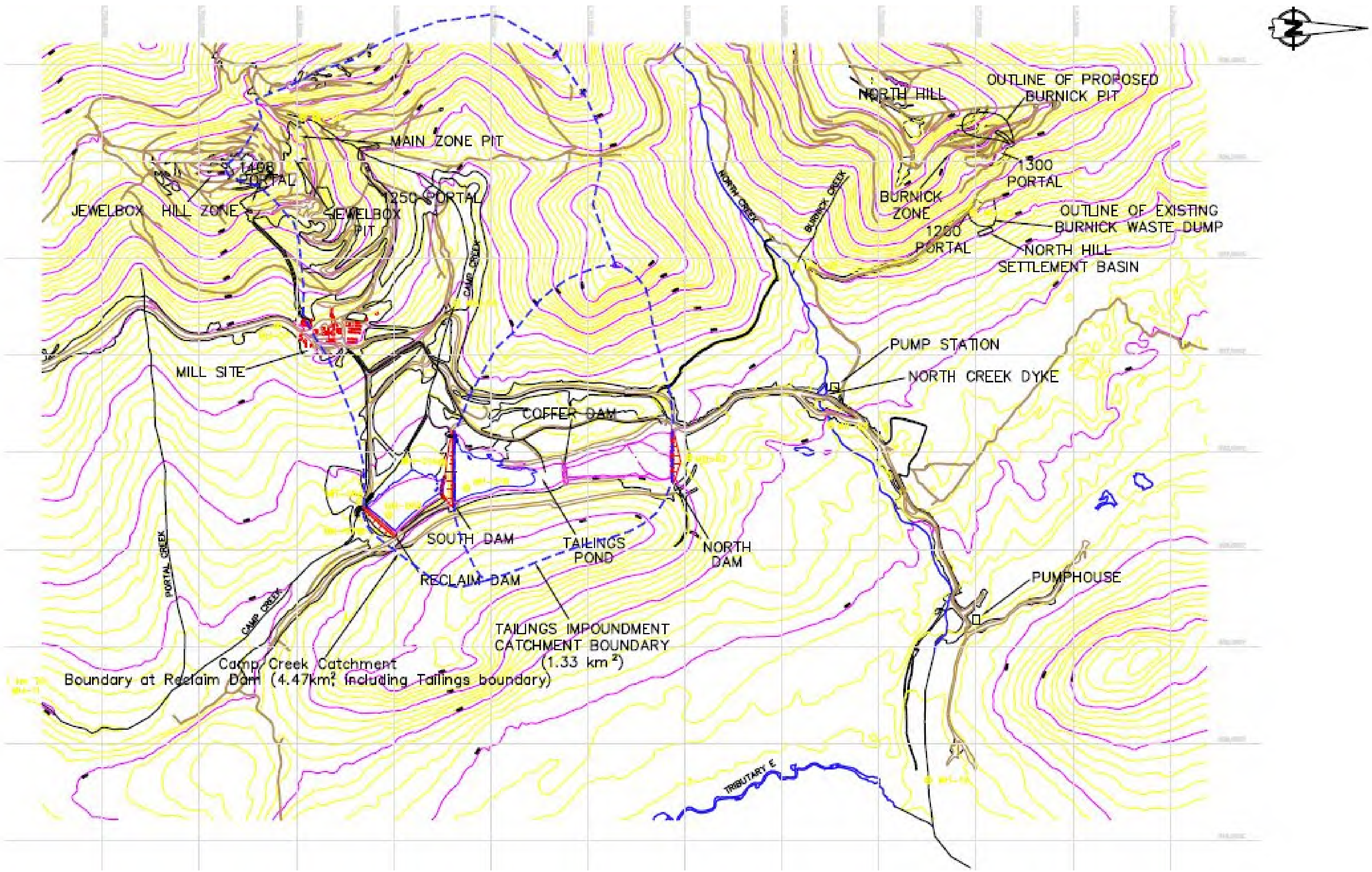
Sä Dena Hes Project

2019 Dam Safety Inspection

DRAWING TITLE:

North Drainage Channel
Plan, Profile and Section

DATE:	APPROVED:	FIGURE NO.
September 2019	PMH	9



srk consulting

Teck

Job No: 1CT008.072

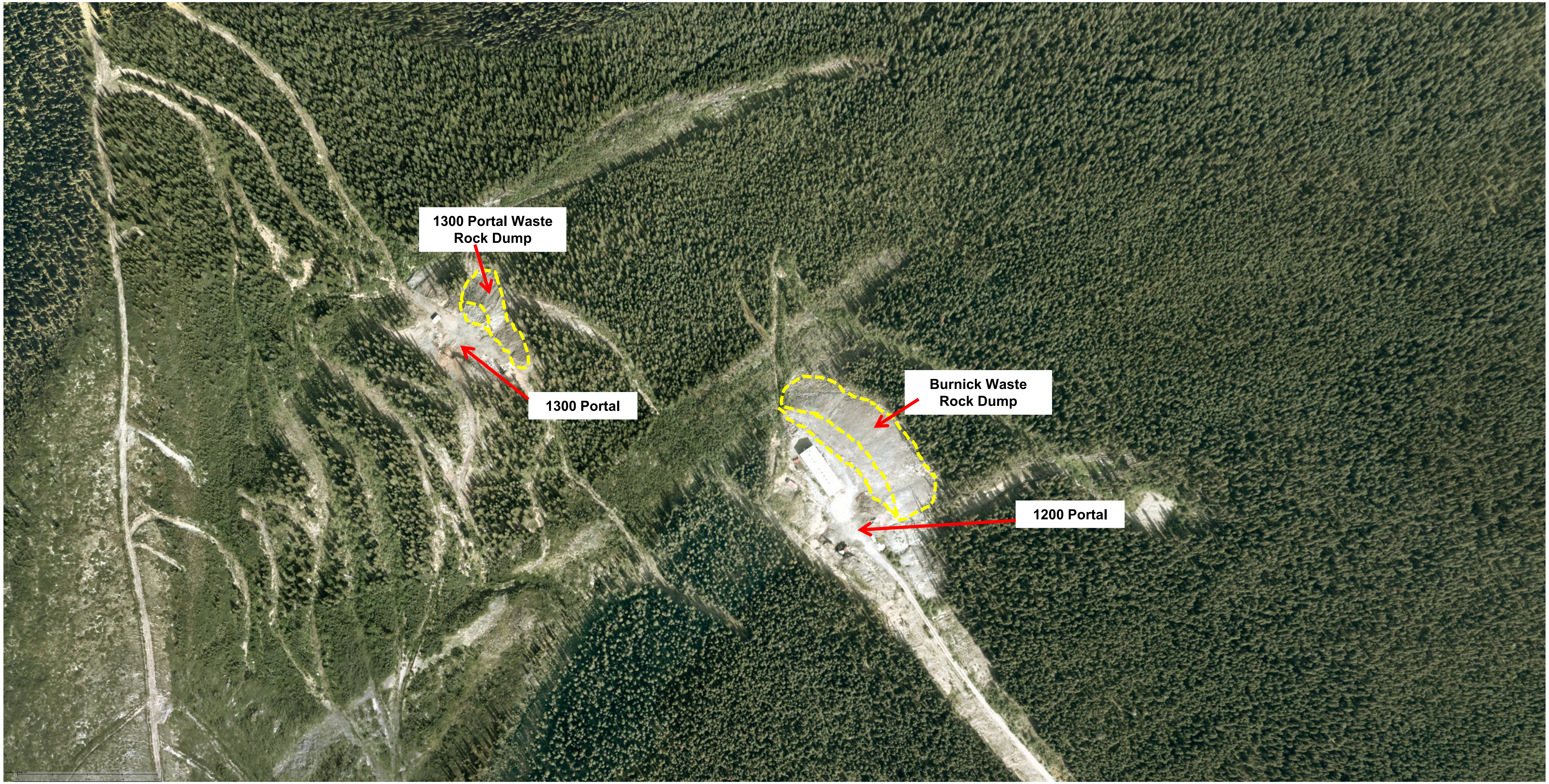
Filename: 1CT008_072_fig_10 - CatchmentMap.pptx

Sä Dena Hes Project

2019 Dam Safety Inspection

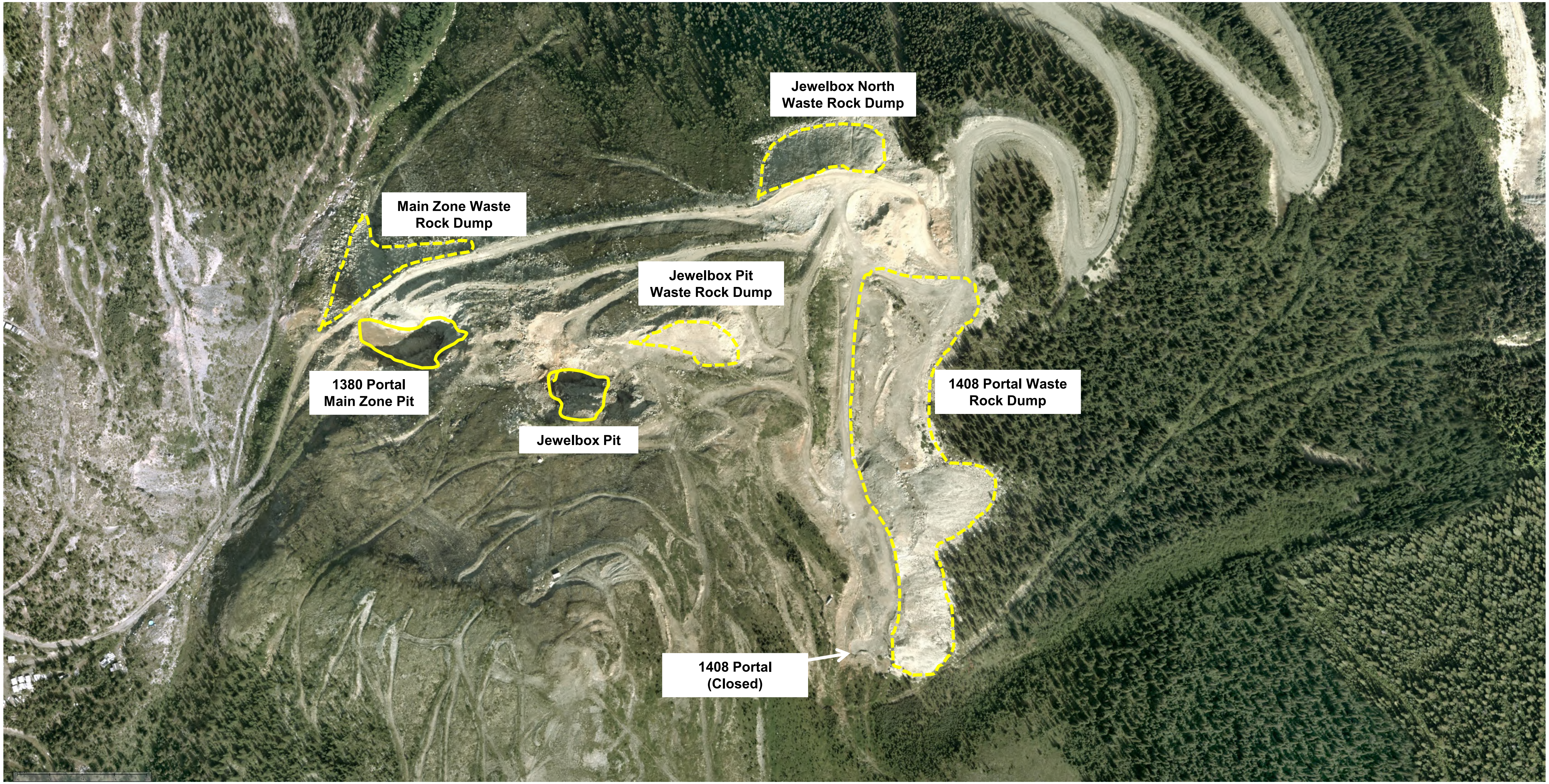
Catchment Areas

Date:	Approved:	Figure:
September 2019	PH	10



\\van-srv0.van.na.srk.ad\01_SITES\Sa_Dena_Hes\1CT008.053_2015 Geotechnical Inspection\040_AutoCAD\Powerpoint Figures

srk consulting	Teck	2019 Dam Safety Inspection
		Burnick Zone Plan View
Job No: 1CT008.072 Filename: 1CT008_072_fig_11 - Burnick Zone.pptx	Sä Dena Hes	Date: September 2019 | Approved: PMH | Figure: 11



\\van-srv0.van.na.srk.ad\01_SITES\Sa_Dena_Hes\1CT008.053_2015 Geotechnical Investigation\040_AutoCAD\Powerpoint Figures

srk consulting	Teck	2019 Dam Safety Inspection
		Main Zone and Jewelbox Zone Plan View
Job No: 1CT008.072 Filename: 1CT008_072_fig_12 - Main Zone and JB Zone.pptx	Sä Dena Hes	Date: September 2019 · Approved: PMH · Figure: 12

Appendix A – Photo Log

Photo 1: North Dam Crest looking west

Photo 2: Downstream slope of the North Dam looking east

Photo 3: Typical North Dam Piezometer

Photo 4: Typical Settlement Gauge.

Photo 5: MH-02 Flow Gauge

Photo 6: Seepage at toe of North Dam, mainly due to hillside springs

Photo 9: View looking north of drainage swale on tailings till cover

Photo 10: View of the southern end of the tailings till cover at location of original cofferdam

Photo 11: Vegetation on tailings cover looking north

Photo 12: View south at the SRS pond in background with North Diversion on the left

Photo 13: SRS and the rock cofferdam

Photo 14: Rock Cofferdam above SRS looking west

Photo 15: View looking north (upstream) of the SRS emergency spillway

Photo 16: Plunge pool below SRS spillway

Photo 17: View of the rock protection along the downstream toe of the SRS on east side

Photo 18: small boils at toe of SRS. Due mainly to local spring activity.

Photo 19: View west along the Camp Creek Drainage Channel

Photo 20: View north at the SRS dike and the south drainage channel

Photo 21: View east over the location of the original Reclaim Dam (removed)

Photo 22: View downstream of the Camp Creek drainage channel

Photo 23: Confluence of the Camp Creek Drainage channel and the original Camp Creek

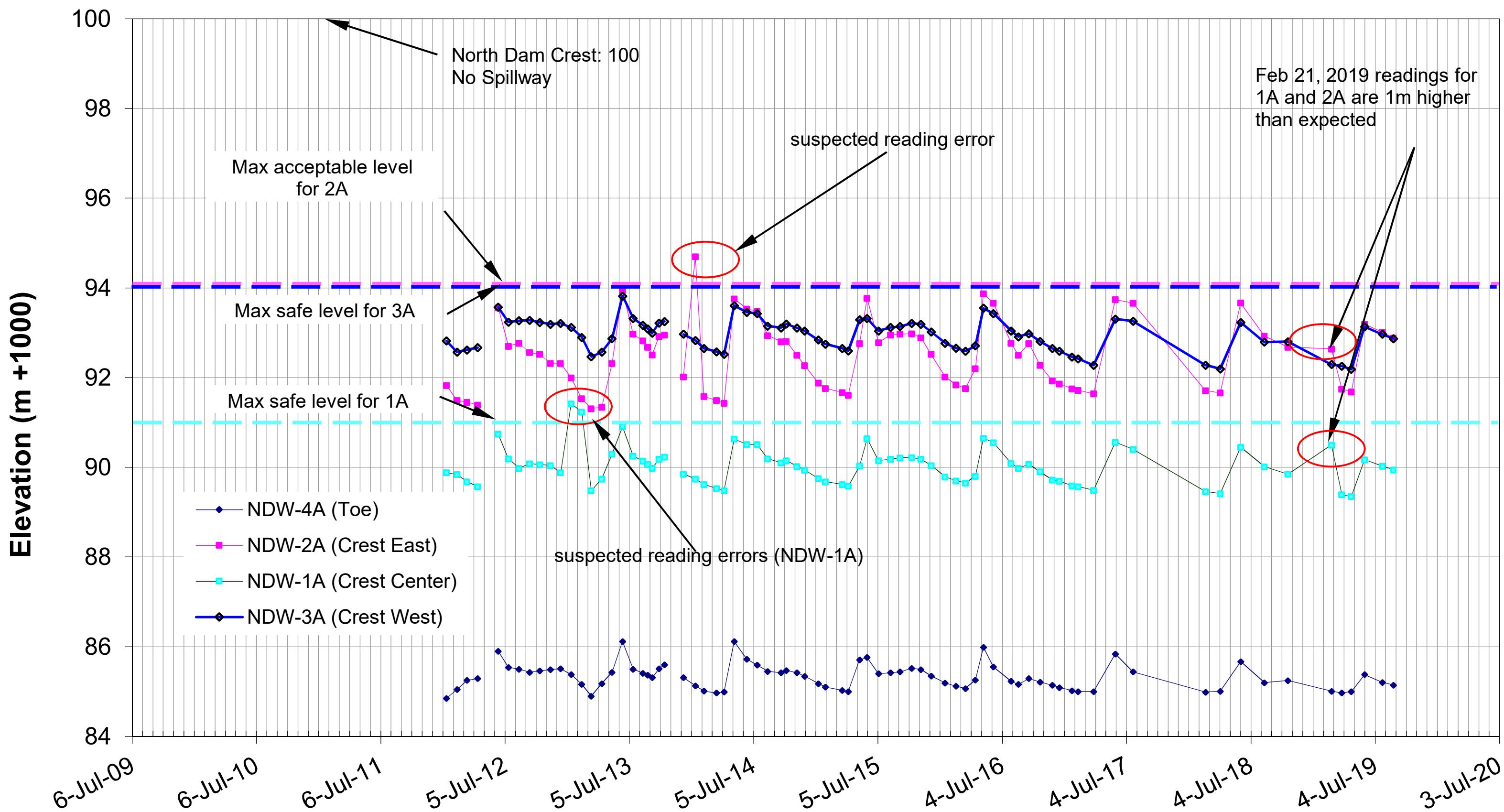
Photo 24: Regraded slopes of Jewelbox waste rock dump

Photo 25: Erosion gully at toe of Jewelbox Waste rock dump

Photo 26: Pit wall above the 1380 Portal at the Main Zone

Photo 27 Burnick waste rock dump at 1200 level

Appendix B – Piezometric Levels



\\van-svr0\Projects\01_SITES\Sa_Dena_Hes\1CT008.072_2019_Dam Safety Inspection\

srk consulting	Teck	2019 Dam Safety Inspection
Job No: 1CT008.072	Sa Dena Hes Mine	North Dam Piezometric Levels vs. Time
File: NDMPiezolevels_1CT008 072_PMH_20191009		Date: October 9, 2018 · Approved: PMH · Figure: B1

Appendix C – Facility Data Sheet

Appendix C

Facility Data Sheet

North Dam and SRS Dyke

Physical Description

North Dam	
Dam Type	Earth Dam, Single Stage, three zones
Maximum Dam Height	15m
Dam Crest Width	10m
Impoundment Area	0.16 km^2
Volume of Tailings	400,000 m^3
Reservoir Capacity	NA
Consequence Classification	Significant, Passive care
Inflow Design Flood (IDF)	1/3 between the 1,000-year event and the PMF
Design Earthquake	1: 2475- year event
Spillway Capacity	NA
Catchment Area	NA till cover slopes (drains) to south towards SRS
Access to Dam	Vehicles via roads or helicopter in winter
SRS Dyke	
Dam Type	Earth Dam, Single Stage, one zone
Maximum Dam Height	5m
Dam Crest Width	4m
Impoundment Area	Pond area is 1600m^2
Volume of Tailings	400,000 m^3
Reservoir Capacity	800 m^3
Consequence Classification	Low, Passive care
Inflow Design Flood (IDF)	1,000-year event
Design Earthquake	1,000-year event
Spillway Capacity	5.4m^3/s
Catchment Area	1.33 sq km
Access to Dam	Vehicles via roads or helicopter in winter

REVEGETATION MONITORING AT THE RECLAIMED SÄ DENA HES MINE SITE, 2019

The reclaimed north tailings pond

For

Teck Resources Ltd
Sä Dena Hes Operating Corporation

Submitted by

Laberge Environmental Services

October 2019

Laberge
ENVIRONMENTAL SERVICES
P.O. Box 21072
Whitehorse, Y.T.
Y1A 6P7

Office Phone: 867-668-6838
Cell Phone: 867-334-9921
Fax: 867-667-6956

LETTER OF TRANSMITTAL

Michelle Unger
Manager, Environmental Compliance
Teck Resources Limited
Bag 2000,
Kimberley, BC
V1A 3E1

Dear Michelle:

Re: **Revegetation Monitoring at the Reclaimed Sä Dena Hes Mine Site, 2019**

This report provides the results for Year Four monitoring of the grass seeded areas and the tree planted areas at the reclaimed Sä Dena Hes mine site. Overall to date, the revegetation programs are proving very successful. An invasive plant assessment of the site was also undertaken.

Should you have any questions or comments on the report, please do not hesitate to contact the undersigned.

Sincerely,

Original signed by:

Bonnie Burns
Laberge Environmental Services

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 BACKGROUND

On behalf of Sä Dena Hes Mining Corporation, Teck Resources Limited (Teck) initiated permanent closure of the Sä Dena Hes Mine in September of 2013. Decommissioning and reclamation activities were undertaken in 2013, 2014 and 2015.

Willow, poplar and alder seeds were collected from the Sä Dena Hes area in 2014.Plugs were grown off-site over winter and planted in 2015 on the tailings management area (TMA), mill site and the landfill site. The waste rock zones at Jewel Box and Burnick were contoured and then seeded with various grass species in 2015. The TMA was seeded in September 2016. Seeding was delayed in the TMA to give the 2015 tree plantings one year with less grass competition.

Teck retained Laberge Environmental Services (Laberge) to monitor these revegetated areas in the summer of 2019 and to conduct an invasive plant assessment while on site.

2.0 REVEGETATION MONITORING

The revegetation program at Sä Dena Hes continues to be successful in Year Four. The majority of planted species display continued growth and vigor, and grass cover has increased at Burnick Waste Rock Dump and on the reclaimed roads. Vascular plant diversity is increasing as more native plants establish the site. An inventory list of all the plant species identified at the plots is provided in Appendix A. Photographs of each site are presented in Appendix B.

2.1 Tree/Shrub Planted Areas

Details on the methodology of the seed collections, planting of plugs and plot establishment are provided in a previously submitted report by Laberge (2015). The purpose of the willow and poplar planting was to provide some biodiversity over the tailings management area, but not create a major attractant for moose browse. Approximately 27,000 plugs consisting of *Salix alaxensis, S. bebbiana, S. barclayi, S. planifolia* and *Populus balsamifera* were installed in several discrete areas throughout the reclaim pond, south pond, north pond and mill areas. The remaining open areas of these sites were planted with approximately 70,000 alder (*Alnus viridis* subsp. *crispa*) plugs. The alder were planted at a much lower density than the other tree species.

Fourteen permanent monitoring plots, eight planted with willows and poplar and six planted with alder, were established in 2015 (Table 1, Figure 1). Plots VMP-1 to VMP-8 were planted at a higher density than the alder plots, VMP-9 to VMP-14. The plots represented each of the areas planted except for the boneyard. Only a small area was planted with alder here as the majority of the boneyard has naturally revegetated over the years with willows, poplar, some alder and forbs. The growth in this planted area was also assessed in 2019.

The fourteen plots were monitored from July 23th to 25th, 2019. Table 2 summarizes the assessment of the fourth year of growth of the planted tree plugs at each of the plots. Photographs were taken of each site and selected photos are presented in Appendix B. All photos will be archived and maintained for comparison purposes over time.

Willows species are not yet producing catkins and could not be positively identified to species. A total of four willow species were initially planted; *Salix alaxensis, S. bebbiana, S. barclayi and S. planifolia*. The presence of volunteer species within the plots was also noted.

With few exceptions, all tree species were healthy and continuing to grow well with the alders exhibiting the most robust and vigorous growth in 2019.

TABLE 1 LOCATION OF TREE MONITORING PLOTS

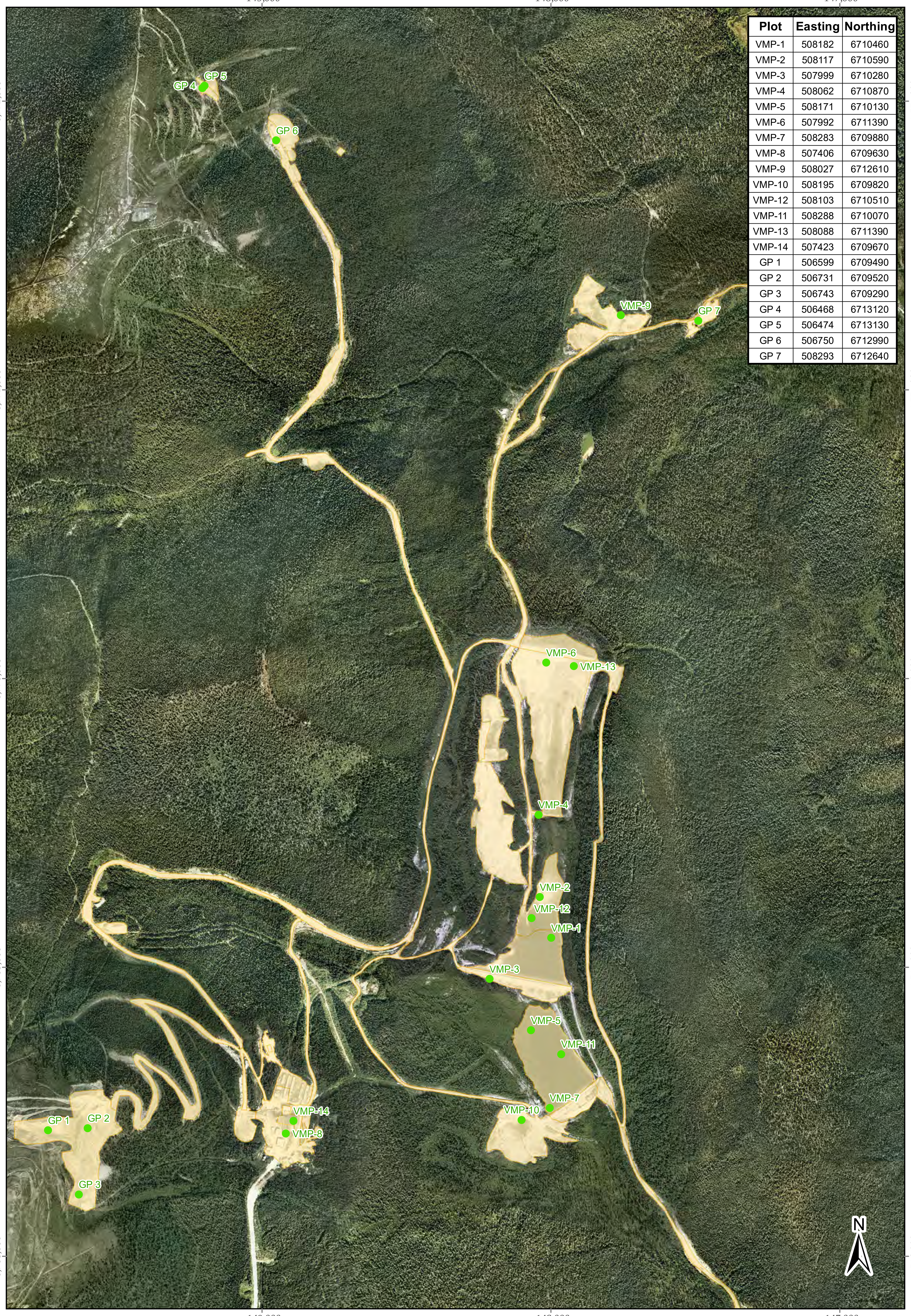
Plot #	Easting NAD 83	Northing Zone 9V	Elevation (m)	Tree Type	General Location
VMP-1	508182	6710456	1072	willow/poplar	south pond area
VMP-2	508117	6710587	1084.2	willow/poplar	south pond area
VMP-3	507999	6710278	1085.4	willow/poplar	south pond area
VMP-4	508062	6710865	1090.9	willow/poplar	north pond area
VMP-5	508171	6710130	1072.9	willow/poplar	reclaim pond area
VMP-6	507992	6711385	1072.3	willow/poplar	north dam area
VMP-7	508283	6709879	1075.3	willow/poplar	reclaim pond area
VMP-8	507406	6709627	1149.4	willow/poplar	mill site
VMP-9	508027	6712609	1009.2	alder	landfill
VMP 10	508195	6709820	1078.1	alder	Borrow pit G
VMP 11	508288	6710068	1070.2	alder	reclaim pond area
VMP-12	508106	6710513	1069	alder	south pond area
VMP 13	508088	6711391	1088.4	alder	north pond area
VMP-14	507423	6709674	1186.9	alder	mill site

General observations were made in the planted area of the boneyard on July 24th, 2019. The planted alder were healthy and robust. Many other species were growing in the assessed area: Salix spp, poplar, grasses, (including fescues, spike trisetum, bluejoint, wheatgrass, alpine bluegrass and tickle grass,) fleabane, currant, cinquefoil, sandwort, elegant hawksbeard, dandelion, dwarf fireweed, lupine, foxtail, fireweed, willowherb, horsetail, raspberry, yellow avens, alsike clover, conifer seedlings and mustards. Two invasive species, white sweet clover and narrowleaf hawksbeard, were also growing in the boneyard. The sweet clover was again removed for the third consecutive year.

To further assess the growth, heights of randomly selected trees, (which covered the range of plants per plot) were measured (Table 3).

Review of these tables shows that growth and biodiversity has increased in the majority of the plots since last assessed in July 2018. Most trees have grown considerably taller over the past year. The tallest tree measured in 2019 occurred at VMP-5 where a poplar with a height of 1.95 m was recorded. Vascular plant diversity has increased due to the establishment of several more native species into the plots.

Overall, tree growth appeared healthy and robust. Conversely, plants continued to do poorly at VMP-8 on the mill site where mortality increased, and growth was stressed. As identified through observations and an intensive sampling program in 2018, the contamination of the soil was confirmed (Laberge, 2018b). On September 22nd, 2019, a till cover was applied to the affected area and seeded by hand with seeds collected from various areas of the SDH site (Photo #28). Species applied included alder, dwarf fireweed, wheatgrass and yarrow.



Plot	Easting	Northing
VMP-1	508182	6710460
VMP-2	508117	6710590
VMP-3	507999	6710280
VMP-4	508062	6710870
VMP-5	508171	6710130
VMP-6	507992	6711390
VMP-7	508283	6709880
VMP-8	507406	6709630
VMP-9	508027	6712610
VMP-10	508195	6709820
VMP-12	508103	6710510
VMP-11	508288	6710070
VMP-13	508088	6711390
VMP-14	507423	6709670
GP 1	506599	6709490
GP 2	506731	6709520
GP 3	506743	6709290
GP 4	506468	6713120
GP 5	506474	6713130
GP 6	506750	6712990
GP 7	508293	6712640

Teck

Sa Dena Hes Vegetation Monitoring Plots

Veg Monitoring
Reclaimed Areas

*** Aerial photography was obtained from McElhanney from August 15, 2012 LiDAR survey and represents the site prior to reclamation.

0 100 200 Meters

1:12,000

DATE:	MINE OPERATION:
3/14/2017	Sa Dena Hes
DRAWN BY:	COORDINATE SYSTEM:
goulton	NAD 1983 UTM Zone 11N

Document Path: \\teckcominco\CGO\Groups\TCGIS\Data\Operations\LegacyProperties\Sa Dena Hes\2016 Veg Plots\SDH_2016_Veg_Monitoring_11x17.mxd

TABLE 2 YEAR FOUR MONITORING OF TREE PLOTS, JULY 2019

	Site	Date Established	# of plugs planted	Date Assessed	# of live trees	Survival Rate (%)	Tree Species	Other Species	Comments	Invasive Species
Willow / Poplar	VMP-1	6/24/2015	42	7/25/2019	36	85.7	willow	4 volunteer alder, volunteer poplar, altai fescue, tufted fescue, wheatgrass, alsike clover, lupine - some with seed pods, cushion moss.	plants appear healthy, willows bushing out, lots of leaf litter, goose scat in plot	alsike clover
	VMP-2	6/26/2015	59	7/25/2019	41	69.5	36 poplar 5 willow	several volunteer willow and poplar, foxtail, wheatgrass, fescue, alpine bluegrass, sandwort, Epilobium, fir fleabane, cinquefoil, moss, unknown forb	plants are looking a lot healthier than previously, more leaves, etc	none
	VMP-3	6/27/2015	60	7/24/2019	61	101.7	56 willow 5 poplar	4 volunteer alder, volunteer willows, tall bluegrass, foxtail, fescue, fir, cushion moss, dwarf fireweed, ticklegrass,	grasses do not appear to be doing well, willow growth appears stagnant, lots of mosquitoes	none
	VMP-4	6/29/2015	24	7/24/2019	17	70.8	willow	19 volunteer willow, 13 volunteer poplar, 71 volunteer alder, wheatgrass, alpine bluegrass, alfalfa, ticklegrass, fleabane, Epilobium, spike trisetum, fireweed, dwarf fireweed, fir, fescue	amazing infill of alders, increased biodiversity, alfalfa appears to be increasing in numbers and size	alfalfa
	VMP-5	6/29/2015	24	7/25/2019	22	91.7	14 willow 8 poplar	Many volunteer willow and poplar, altai fescue, alpine bluegrass, Epilobium, fir, fireweed, cushion moss, dwarf fireweed, mushroom, fleabane, volunteer alder, grass of parnasuss, equisetum	all plants are very healthy although some insect damage on one willow, willows and poplars are becoming more bushy and taller	none
	VMP-6	6/30/2015	50	7/23/2019	46	92.0	25 poplar 21 willow	10 volunteer willow, wolunteer alder, wheatgrass, fescue, spike trisetum, spruce, lupine, fir, fireweed, cushion moss	most willows are feltleaf, wheatgrass is dominant grass, increased growth of trees	none
	VMP-7	7/1/2015	67	7/25/2019	63	94.0	62 poplar 1 willow	volunteer willow, poplar and alder, fir, wheatgrass, fescue, cushion moss, alsike colver, alpine bluegrass, fleabane, dwarf fireweed, dandelion, grass of parnassus, equistem, siberian yarrow, mushrooms, alkai fescue	osprey with young still occupying nest, plants are healthy, lots of biodiveristy	alsike clover hawksbeard
	VMP-8*	8/27/2015	37	7/23/2019	18	48.6	18 poplar	fir seedlings, alpine bluegrass, spike trisetum, small plant of aster family, fescue, wheatgrass	3 obvious dead trees, remaining trees unhealthy and many only have a few leaves near the base	none
Alder	VMP-9	8/23/2015	12	7/23/2018	13	108.3	alder	volunteer willow, glaucous wheatgrass, spike trisetum, alpine bluegrass, tall bluegrass, slender wheatgrass, ticklegrass, fescue, fireweed, alpine Astragalus, polygonmun, dandeliion, pussytoes, lupine, groundsel, fir seedling, Epilobium	4 alders in the plot have seed cones, many native plants colonizing plot and area	many hawksbeard, alsike clover
	VMP-10	8/25/2015	15	7/25/2019	10	66.7	alder	fir, crepis, dwarf fireweed in flower, fireweed, volunteer willow, poplar, and alder, fleabane, alpine bluegrass, cushion moss, sandwort	osprey and young still at nest, alder are healthy and growing	immature hawksbeard - removed
	VMP-11	8/25/2015	12	7/25/2019	14	116.7	alder	volunteer poplar and willow, wheatgrass, alpine bluegrass, dwarf fireweed, altai fescue, dandelion, foxtail, fir, Epilobium	2 of the alder plants have seed cones, extra alder are due to the bushing out of alder and exact location of plug is hard to determine	none
	VMP-12	8/27/2015	15	7/24/2019	12	80.0	alder	volunteer willows and alder, fescue, ticklegrass, wheatgrass, Epilobium, unknown forbs	alders appear healthy, some plants have seed cones outside of plot	none
	VMP-13	8/27/2015	7	7/23/2019	8	114.3	alder	1 volunteer alder, quite a few volunteer willow - small, fescue, alpine bluegrass, wheatgrass, dwarf fireweed, spruce, sandwort,volunteer poplar	robust growth of plants	none
	VMP-14	8/27/2015	10	7/23/2019	7	70.0	alder	fir seedling, polygonum, volunteer willow and alder, 2 species of bluegrass, spike trisetum, alkali grass, dwarf fireweed, ticklegrass, sandwort, dandelion, shepherd's purse, raspberry, alpine astragulus, fireweed, cushion moss, Epilobium, cinquefoil		alsike clover 1 hawksbeard - removed

* The original Plot VMP 8 that was planted on June 30, 2015, was inadvertently removed during site prep for alders and reestablished on August 27, 2015

TABLE 3 HEIGHTS OF PLANTED TREE SPECIES, JULY 2019		
Site	**Species Planted**	**Random Heights (cm)**
VMP-1	Willow	40,43,16, 18.5, 27
VMP-2	Poplar	21.5, 54.5, 30, 39.5, 13
	Willow	32.5, 18, 20.5, 15, 10
VMP-3	Poplar	103, 40 (dead tip), 17, 24, 11
	Willow	55, 29, 59.5, 36, 18
VMP-4	Alder	24, 40.5, 8, 26.5, 54.5 (volunteer)
	Willow	37, 29.5, 34, 42, 22
VMP-5	Poplar	195.5, 157.5, 122, 127, 80.5
	Willow	100, 72, 59.5, 88.5, 39
VMP-6	Poplar	107, 138, 46, 84, 95
	Willow	47, 36, 35, 94, 65
VMP-7	Poplar	174, 141, 129.5, 69, 41
	Willow	36
VMP-8	Poplar	18.5, 24, includes dead tip: 25, 27, 29.5
VMP-9	Alder	114, 68, 118, 108.5, 93
VMP-10	Alder	73, 61.5, 95, 55.5, 98
VMP-11	Alder	80, 44, 104, 98, 102.5
VMP-12	Alder	122, 90, 50, 43, 82
VMP-13	Alder	81, 70, 79, 63, 44
VMP-14	Alder	102, 73, 31.5, 77.5, 11 - looks to be from a plug

2.2 Grass Seeded Areas

Grass was hand seeded at an application rate of 44 kg/ha, in various areas throughout the mine site in 2015. The low elevation seed mix (Table 4) was used on the reclaimed roads and the lower borrow pit. The high elevation seed mix (Table 5) was used at the Burnick and Jewel Box waste rock zones.

TABLE 4 LOW ELEVATION SEED MIX AND AMOUNTS			
Common Name	**Scientific Name**	**Weight %**	**Composition %**
Violet Wheatgrass	*Agropyron violaceum*	47	13
Northern Fescue	*Festuca altaica*	24	18
Glacier Alpine Bluegrass	*Poa alpina*	11	37
Sheep fescue	*Festuca ovina*	18	32

TABLE 5 HIGH ELEVATION SEED MIX AND AMOUNTS			
Common Name	**Scientific Name**	**Weight %**	**Composition %**
Violet Wheatgrass	*Agropyron violaceum*	45	12

TABLE 5	HIGH ELEVATION SEED MIX AND AMOUNTS		
Rocky Mountain Fescue	*Festuca saximontana*	15	17
Chariot Hard Fescue	*Festuca brevipila*	15	21
Tufted Hairgrass	*Deschampsia caespitosa*	14	14
Glacier Alpine Bluegrass	*Poa alpina*	10	23
Spike Trisetum	*Trisetum spicatum*	1	13

No plots were established on the reclaimed roads but general observations were made. It appears that some sections were seeded at a high application rate. This may impede the natural colonization of local species from the seed sources of the nearby forest.

The methodology of the establishment of the seven grass plots is detailed in a previously submitted report by Laberge (2017). Table 6 below describes the location of each of these plots.

TABLE 6 LOCATIONS OF GRASS MONITORING PLOTS

Plot #	NAD 83, Zone 9V		Elevation (m)	General Location
	Easting	Northing		
GP-1	506599	6709489	1416.4	Jewel Box waste rock zone
GP-2	506731	6709521	1388.7	Jewel Box waste rock zone
GP-3	506743	6709291	1409.7	Jewel Box waste rock zone
GP-4	506468	6713116	1287.2	Burnick 1300 waste rock zone
GP-5	506474	6713125	1288.4	Burnick 1300 waste rock zone
GP-6	506750	6712985	1211.6	Burnick 1200 waste rock zone
GP-7	508293	6712639	1002.2	Gravel Pit area past Landfill

Grass growth had visibly increased at all plots on Jewel Box and many were flowering (Photos #19 to 21). However, similar to 2016, 2017 and 2018, no grasses were present in plot GP-4 and it appears that the upper section of Burnick 1300 was missed during the seeding process. The lower portion did contain some stressed grass and Plot GP-5 was assessed.

Mature grasses were growing in most plots and were identified to genus or species. The results of the monitoring of the grass plots are presented in Table 7.

The high elevation sites have steep slopes and evidence of erosion in the form of minor rilling was observed at the plots on Jewel Box in the past, however there were no signs of increased erosion in 2019. No signs of erosion were present at the other plots. There was only one plot in a low elevation site, GP-7, in an old borrow pit area near the landfill area. Of the grass plots, this was the only one with the presence of an invasive species, narrowleaf hawksbeard.

Grasses within the plots were measured to assess growth (Table 7). Density, height and the number of mature grasses increased in 2019 with the exception of the plots on Burnick 1300.

TABLE 7 YEAR FOUR DATA FOR THE GRASS MONITORING PLOTS, JULY 23 and 24, 2019

Grass Plot #	% Cover	Planted Grass Species	Random Heights (cm)	Other Species Present	Invasive Species	Signs of Erosion	Comments
GP-1	25	Two species of Fescue, Wheatgrass, Alpine Bluegrass	Fescue: 42, 37, 48 alpine bluegrass: 24.5, 23.5 Wheatgrass: 26.5	small volunteer willows	none	none	grasses appear healthy and growing, 80 to 90% are flowering
GP-2	10	Two species of Fescue, Wheatgrass, Alpine Bluegrass, Spike trisetum	Fescue: 32.5. Alpine Bluegrass: 4, 35 Wheatgrass: 3.5, Spike trisetum: 19	mustard, pussytoes, very small willow and a small felt leaf willow	none	none new, just old scarring	obvious increase in growth from last year, many grasses in inflorescence, some bare areas.
GP-3	10	Fescue, Wheatgrass, Alpine Bluegrass	Fescue: 37, 30, 30.5. Alpine Bluegrass: 4. Wheatgrass: 16.5, 30.5, 17	fir seedling	none	old eroded rills, plants growing in them	Fescue is dominant grass. Lots of alpine bluegrass but appear to be dying back.
GP-4	0	none	none	a few fir seedlings	none	none	This plot appears to not have been seeded in the past
GP-5	<1	Fescue	Fescue: 3, 2, 2, 1.5, 2.5	a few fir seedlings, a bit of moss	none	none	few blades of stressed grass
GP-6	<1	Fescue, Alpine Bluegrass	Fescue: 9, 4, 30.5, 6, 10	conifer seedlings	none	none	Fescue dominant, one plant in flower, some leaf litter
GP-7	15	Fescue, Alpine Bluegrass, Wheatgrass, ticklegrass		Willows, yarrow, aribis, fleabane, conifer seedling, sandwort, pussytoes, dandelion	several Hawksbeard, alsike clover	none	some mature grasses, grasses appear a bit stressed. Fescue is dominant grass

2.3 Transect

In July 2017, a line transect (TP-1) was set up in the north pond area as a method to determine the success, growth and community structure of the tree planted area where grass had been seeded the following year. The methodology, adapted from EMAN Terrestrial Vegetation Monitoring Protocols Section III (Environment Canada, 1999), is detailed in the report submitted by Laberge (2018[a]). The locations and observations within each 1 m^2 plot were noted (Table 8).

Plant coverage had increased in some plots. Leaf litter from previous years' growth was evident in a few of the plots. Volunteer tree seedlings were documented in several of the plots. Alpine bluegrass appeared to be dying back in some areas. This was also evident at the plots planted on Jewel Box. It is not known why this is resulting since alpine bluegrass is tolerant to alpine and subalpine zones, is long lived, and is tolerant to low nutrient and acidic conditions (Matheus and Omtzigt, 2013). It is not a strong competitor, however this did not seem to be the issue at the assessed sites. It grows poorly in wet conditions and perhaps there was more rain than usual at the SDH site in 2019. There is no weather station at site nor is there an on-site caretaker so this hypothesis could not be confirmed.

TABLE 8 LINE TRANSECT IN NORTH POND AREA, TP-1, JULY 24, 2019					
Plot #	Zone 9V, NAD 83		% Cover	Species	Comments
	Easting	Northing			
Base stake	508119	6711103			
Q-1	508110	6711102	2	Wheatgrass, Fescue, Alpine Bluegrass	1 mature fescue, Alpine Bluegrass are barely alive
Q-2	508102	6711100	20	1 alder; 50 cm, wheatgrass, fescue, volunteer willow	small plants but healthy, alder healthy and growing, one mature fescue and 1 wheatgrass
Q-3	508099	6711102	2	Alpine bluegrass, fescue, wheatgrass	none mature
Q-4	508092	6711101	4	ticklegrass in flower, 5 volunteer willow, 3 volunteer poplar, 2 species of Epilobium, 2 spruce seedling, moss, sandwort	increasing biodiversity
Q-5	508088	6711101	7	Fescue, alpine bluegrass, alkali grass, 11 volunteer willow-2 species, 3 volunteer poplar, fireweed, Epilobium different species of bluegrass, cushion moss	1 willow - quite large (see Photo) Fescue and alkali grass mature, some standing water
Q-6	508082	6711101	20	Alpine Bluegrass, Fescue, Wheatgrass, 2 small volunteer willows, fleabane, Epilobium	Alpine bluegrass appears to be struggling, other grasses are mature.
Q-7	508077	6711100	5	Alpine bluegrass, fescue, alkaligrass, 10 volunteer willow, 5 volunteer poplar, spruce seedling, fireweed, dwarf fireweed, cushion moss	spruce seedling is growing - branches
Q-8	508069	6711100	25	Alpine bluegrass, fescue, wheatgrass, 1 alder - 73cm, 1 volunteer feltleaf willow - 34cm, and 7 small willows, fleabane.	Several mature Alpine Bluegrass
Q-9	508060	6711099	1	fir seedling, 1 small volunteer willow, fescue, wheatgrass, alpine bluegrass, fireweed	
Q-10	508054	6711099	2	Fescue, wheatgrass, alpine bluegrass, cushion moss, spruce	The alpine bluegrass appears to be dying back.
End stake	508049	6711098			

3.0 INVASIVE SPECIES ASSESSMENT

Observations regarding the presence of invasive plants were conducted throughout the monitoring program. Invasive species were noted and locations of larger populations were documented with a hand-held GPS.

The population of Oxeye Daisy (*Leucanthemum vulgare*) that was observed south of the gate at Kilometer 23 in 2016 was eradicated when this area was prepared and seeded with the low elevation grass mixture in the fall of 2016. As with the years since then, no Oxeye Daisy was observed in 2019.

Similar to the past assessments, the most common invasive species was *Crepis tectorum*, (narrowleaf hawksbeard) and was generally found sporadically along the roadsides within the study area. Hawksbeard is an annual plant of the sunflower family and was introduced from Europe as a contaminant in seed mixes. Hawksbeard is commonly found in cultivated fields and disturbed areas. The population that was documented near the monitoring plot VMP-9 at the landfill site, had increased in 2019. Due to the shade intolerance characteristic of this plant, it will gradually die out when the alder trees increase in size. Similarly, there was a population of hawksbeard east of plot VMP-1 as identified in 2018. The small population of hawksbeard that was previously documented at WP#96 was absent in 2019. Hawksbeard was also observed within some of the monitoring plots (see Tables 2 and 7). Although another in-depth roadside survey was not completed on the access road in 2019, it was noted that the population of white sweet clover now only grows along the first 100m of the access road off the Robert Campbell Highway. The decrease is likely due to the encroachment of bushes and trees along the road crowding and shading out the clover.

Small white sweetclover plants (*Melilotus alba)* were identified near the boneyard site where plants had been removed in 2017 and 2018. These were again immediately removed from the site and disposed of appropriately. Table 11 summarizes all observations.

TABLE 9 OBSERVATIONS OF INVASIVE PLANTS IN THE STUDY AREA, 2019

Waypoint or Plot #	NAD 83 Zone 9V		General Location	Invasive Species	Action
	Easting	Northing			
VMP-1	508182	6710456	south pond area	1 alsike clover	
VMP-1 area	---	---	east of VMP-1 (see Photo #27)	population of hawksbeard	
VMP-4	508062	6710865	outside of plot, north pond area	alfalfa	
WP#22	507848	6711377	Boneyard	several small white clover plants and hawksbeard	clover removed
VMP-7	508283	6709879	reclaim pond area - outside of plot	alsike clover and hawksbeard	
VMP-9	508027	6712609	landfill	many hawksbeard and alsike clover	
VMP-10	508195	6709820	borrow pit G	1 small hawksbeard	removed
VMP-14	507423	6709674	north pond area	alsike clover and hawksbeard	removed
GP-7	508293	6712639	small borrow pit	several hawksbeard and alsike clover	
WP #114	508016	6712629	near VMP-9, near forest	hawksbeard	

4.0 SUMMARY

The fourth year of monitoring the planted tree plugs showed that willow and alder were the most successful species in terms of vigor and growth. Many poplar plants however were increasing in size and branching out. The overall survival rate continues to be high; greater than 70% in 10 of the 14 plots. The survival rate at the other plots ranged from 48.6% to 69.5%.

Several alder within the plots and throughout the study area were producing cones in July 2019 and in all likelihood would have produced seeds in the fall (Photo #15). There was no evidence yet of catkin development on any willows or poplars.

Grass growth had significantly increased at the plots on Jewel Box.

Crepis tectorum (narrowleaf hawksbeard) was the most common invasive species at the site. This species is widespread in the Yukon and readily invades disturbed areas. Currently no management is necessary but observations will continue to be made.

5.0 RECOMMENDATIONS

In Year 5, 2020, assessments should be conducted consistent with methods in 2019, but with the addition of determining the rooting depth of the various species in the plots. It is suggested that tissue samples of each type of vegetation be collected from the plots and analyzed for metal uptake. A reference plot will need to be established to compare concentrations with uptake in the natural forest.

The monitoring program can then be reduced to once every five years.

6.0 REFERENCES

Environment Canada. 1999. EMAN Terrestrial Vegetation Monitoring Protocols, Report #9, Section III Ground Vegetation Biodiversity Monitoring Protocols.

Laberge Environmental Services. 2015. Tree Planting at the Reclaimed Sä Dena Hes Mining Site, 2015. Prepared for Teck Resources Ltd.

Laberge Environmental Services. 2017. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2016. Prepared for Teck Resources Ltd.

Laberge Environmental Services. 2018a. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2017. Prepared for Teck Resources Ltd.

Laberge Environmental Services. 2018b. Revegetation Monitoring at the Reclaimed Sä Dena Hes Mining Site, 2018. Prepared for Teck Resources Ltd.

Matheus, P.E. and C.M. Omtzigt, 2013. Yukon Revegetation Manual, Practical Approaches and Methods. Whitehorse, Yukon. 182 pages. ISBN 978-0-9919499-0-8.

APPENDIX A

INVENTORY LIST OF ALL PLANTS INDENTIFIED IN THE PLOTS, 2019

Sa Dena Hes – Species present in revegetation plots – July 22-26, 2019

Trees

Abies lasiocarpa	Subalpine fir
Picea glauca	White spruce
Populus balsamifera	Balsam poplar

Shrubs

Alnus viridis subsp. *crispa*	Green alder
Ribes sp.	Currant
Rubus idaeus	Red raspberry
Salix glauca	Grey-leaved willow
Salix spp.	Willows
Vaccinium uliginosum	Bog blueberry

Forbs

Achillea alpina subsp. *multiflora*	Siberian yarrow
Achillea millefolium	Yarrow
Antennaria sp.	Pussy toes
Arabis sp.	Rockcress
Aremisia norvegica	Mountain sagewort
Askellia elegans	Elegant hawksbeard
Astragalus alpinus	Alpine astragalus
Brassicaceae family	Mustard
Capsella bursa-pastoris	Shepherd’s purse
Cerastium beeringianum	Bering sea chickweed
Epilobium hornemanni	Hornemann willow-herb
Erigeron acris	Bitter Fleabane
Lupinus arcticus	Arctic lupine
Luzula parviflora	Small-flowered wood-rush
Minuartia sp.	Stitchwort
Parnassia sp.	Grass of parnasuss
Polygonum sp.	Buckwheat
Potentilla sp.	Cinquefoil
Senecio sp.	Groundsel

Graminoids

Agrostis scabra	Ticklegrass
Calamagrostis canadensis	Bluejoint reedgrass
Elymus glaucous	Blue wild rye
Elymus sp.	Wheatgrass
Festuca altaica	Altai fescue
Festuca saximontana	Rocky mountain fescue
Hordeum jubatum	Foxtail barley
Phleum alpinum	Alpine timothy
Poa alpina	Alpine bluegrass
Poa arctica	Arctic bluegrass

Poa pratensis?	Kentucky bluegrass
Puccinellia sp.	Alkali grass
Trisetum spicatum	Spike trisetum

Ferns and Allies

Equisetum sp.	Horsetail

Mosses and lichens

Bryophyta	Cushion moss

Invasive species

Crepis tectorum	Narrow-leaved hawksbeard
Medicago sativa	Alfalfa
Melilotus albus	White sweetclover
Taraxacum sp.	Dandelion
Trifolium hybridum	Alsike clover

APPENDIX B

PHOTOGRAPHS, JULY 2019

Photo #1: VMP-1

Photo #2: VMP-2, trees appear much healthier this year.

Photo #3: VMP-3

Photo #4: Healthy growth at VMP-4

Photo #5: Trees continues to increase at VMP-5

Photo #6: Mushrooms at VMP-5

Photo #7: Increased growth at VMP-6

Photo #8: VMP-7

Photo #9: Unhealthy stressed growth at VMP-8

Photo #10: Robust alder growth at VMP-9

Photo #11: Increased alder growth at VMP-10

Photo #12: Subalpine fir seedlings sheltered by rocks at VMP-10

Photo #13: VMP-11

Photo #14: Healthy growth at VMP-12

Photo #15: Seed cones on one of the alder at VMP-12

Photo #16: Robust alder growth at VMP-13

Photo #17: VMP-14

Photo #18: Alders continue to grow at the Boneyard

Photo #19: GP-1, increased grass growth.

Photo #22: Minimal growth at GP-5

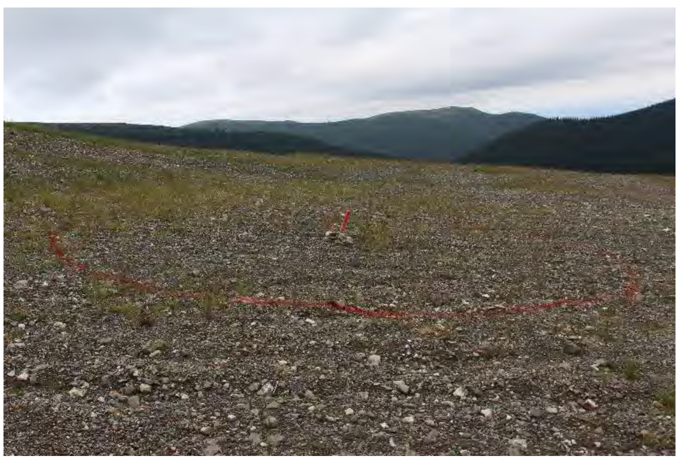


Photo #20: Mature grasses growing within plot GP-2

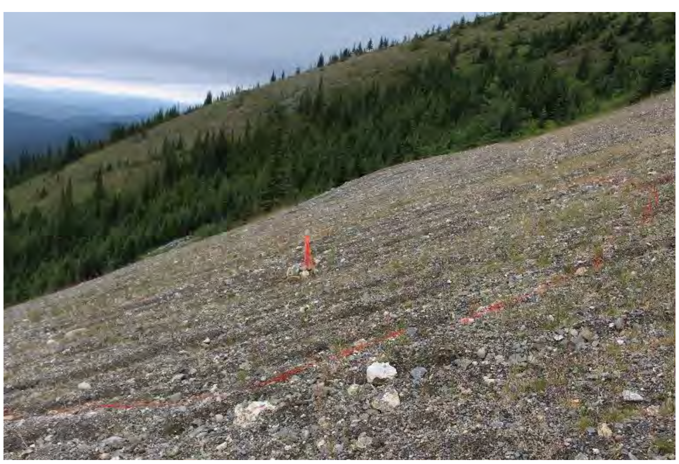


Photo #21: GP-3

Photo #23: A few grasses growing at GP-6

Photo #24: GP-7

Photo #25: Healthy alder in Plot Q-2 in Transect

Photo # 26: Volunteer willows growing in Plot Q-4

Photo #27: Hawksbeard growing east of VMP-1

Photo #28: The area at VMP-8 after the till cover has been applied and seeded, September 2019.