CONFIDENTIAL

REPORT

Western Ridge – Crusher Study Area Baseline Assessment

PFAS and TRH Groundwater Baseline Assessment

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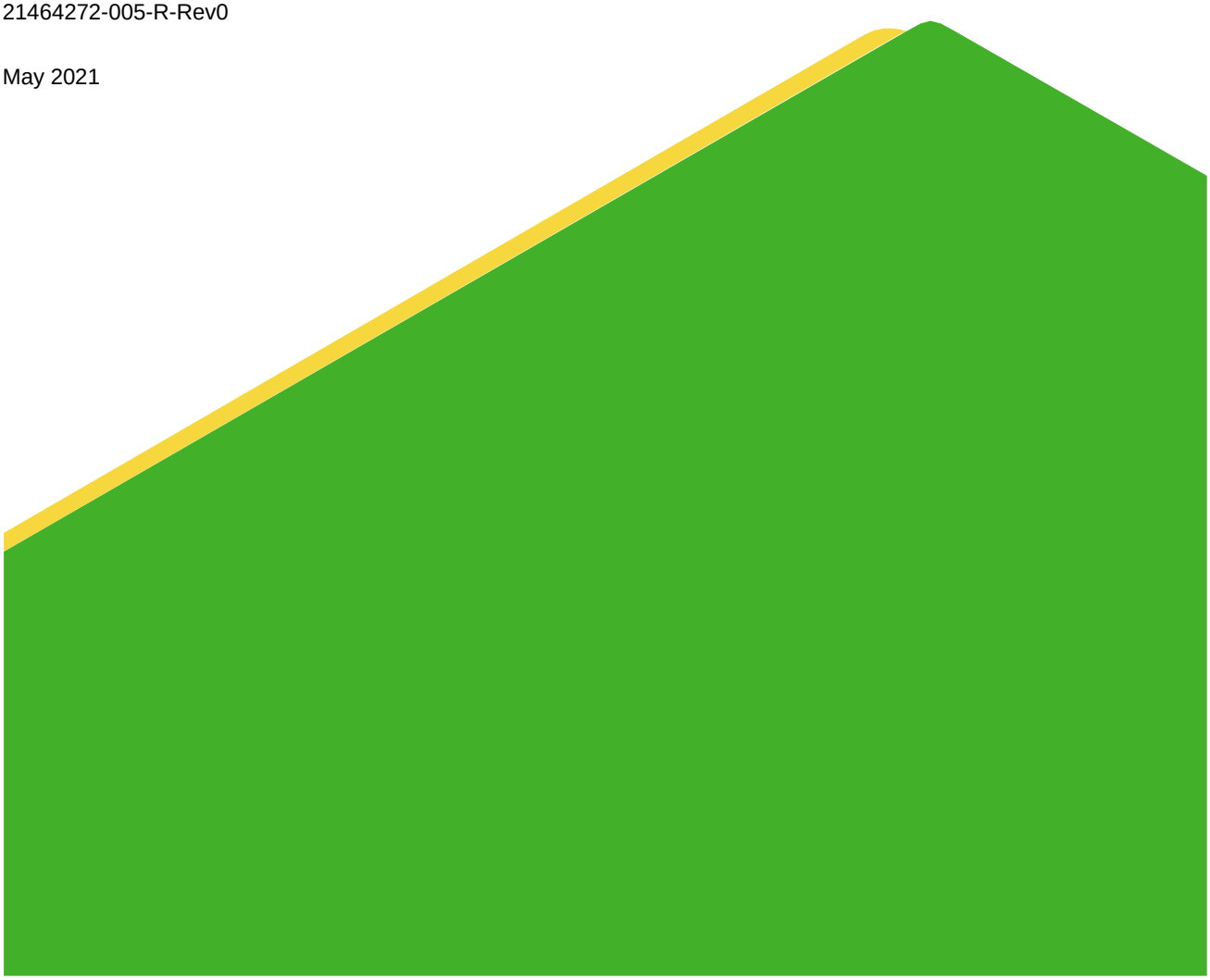

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1.0 INTRODUCTION

BHP Billiton Iron Ore Pty Ltd (BHP) engaged Golder Associates Pty Ltd (Golder) to conduct a groundwater baseline assessment of per- and poly-fluoroalkyl substances (PFAS) and total recoverable hydrocarbons (TRH) at the Western Ridge exploration area (the site). For this baseline assessment purposes, Western Ridge site is divided into three zones: the Western Ridge Crusher Study (WRCS), the Eastern Syncline, and Afghan Springs. This report presents the baseline findings for the WRCS area (the study area) conducted in April 2021. The baseline assessment for the Eastern Syncline and the Afghan Springs areas are provided under separate covers.

The location plan is presented in Figure 1 and a site plan is presented in Figure 2.

2.0 BACKGROUND

BHP intends to develop the Western Ridge for active mining. The site is located west of the Mount Whaleback mine site where PFAS and TRH contamination have been identified within the groundwater. Therefore, BHP requires a baseline assessment of PFAS and TRH concentrations in the groundwater at the Western Ridge prior to development for mining.

3.0 OBJECTIVES

The objective of the baseline assessment was as follows:

- To evaluate the concentrations of PFAS and TRH in the groundwater at the site to establish a baseline, using the existing bores at the site.

This baseline assessment is not to meet environmental assessment requirements as set out in the Department of Water and Environmental Regulation (DWER) Contaminated Sites Guidelines and the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (ASC NEPM). However, the methodologies applied for this assessment are generally consistent with the above guidelines.

This report presents the findings of the baseline assessment for the WRCS area only.

4.0 SCOPE OF WORKS

The scope of works conducted at the study area included the following:

- Obtain groundwater samples using Hydrasleeve® from nine existing groundwater monitoring wells:
  - HWSR0014M
  - HWSR0019M
  - HWSR0020M
  - HWSR0021M
  - HXAN0002M
  - WSR0296M
  - WSR0299M
  - WSR0597M
  - WSR1193RM
- Submit groundwater samples to NATA-accredited environmental testing laboratories for PFAS (to meet the 99% species protection criteria) and TRH analyses.
- Preparation of a factual report (this report) to present baseline PFAS and TRH contamination at the WRCS area.

5.0 SITE OVERVIEW

The site overview information below has been obtained through a desktop review, including from the BHP 'Western Ridge and OB29/30/35 Detailed Hydrogeological Assessment' (BHP, 2020). Additional information obtained during the site visit has also been included. This section covers the bigger Western Ridge exploration area and not specifically focus on the WRCS area.

5.1 Site Identification

The Western Ridge exploration area is located approximately 2 km southwest of the Mount Whaleback mine site, both of which are owned and operated by BHP. These mine sites are located approximately 5 to 7 km west of the Newman Township and approximately 1200 km north-east of Perth, in the Pilbara region of Western Australia. The WRCS area is located in the western portion of the Western Ridge exploration area, as presented in Figure 1 and displayed in more detail on Figure 2.

The site identification details are summarised in Table 1 below.

Table 1: Site Identification

Item	Description	
Site Location	Approximately 5 to 7 km west of Newman	
Allotment/DP	Lot 101 on Deposited Plan 220388 and Crown Land	
Local Government Authority	Shire of East Pilbara	
Zoning	Rural	
Previous Land Use	Rural	
Proposed Land Use	Mining tenement	
WRCS Boundary Coordinates	*Easting (m)*	*Northing (m)*
	766300.5441	7412151.856
	766191.8121	7410776.535
	765957.9788	7409508.813
	766053.3028	7407932.114
	764937.4409	7407955.016
	764891.7837	7407349.476
	761014.8316	7407422.014
	761064.1658	7409851.799
	762412.2678	7410822.888

5.2 Site Description

The topography of the Western Ridge is undulating with raised elevation to the north (Bill's Hill and Mount Helen) running east to west and raised elevation to the south (Silver Knight) as displayed in Figure 1.

The WRCS area is predominantly covered by native vegetation with unsealed roads and drill pads from past and current exploration activities throughout the area. Some observed access tracks and areas of drill related clearing have been rehabilitated.

It is important to note that the Western Ridge site is located within a Priority 1 drinking water catchment area (DoW, 2014), which has the fundamental water quality objective of risk avoidance to protect the drinking water source.

5.3 Climate

The Newman Airport weather station (007176) is the nearest weather station to the site and is located approximately 12 km away from the site. The data indicated the mean maximum temperature range is from 22.9°C (July) to 39.1°C (December) and the mean minimum temperature range is from 6.4°C (July) to 25.0°C (January). The mean annual rainfall is 332.6 mm, with the highest mean rainfall during February (71.0 mm) and the lowest during September (3.9 mm). January and February were recorded as the wettest months, with higher mean rainfall data than the remaining months.

The Pilbara climate and subsequent rainfall is typically dominated by the influence of subtropical highs located to the south of the Pilbara. During summer (November to April) the high-pressure cell moves further south, resulting in the Pilbara receiving approximately 70% of its annual precipitation during these summer months. Annual precipitation figures for these zones are much less than the annual potential evaporation (BHP, 2020).

The Pilbara is characterised by high local evaporation rates and a generally low soil infiltration capacity. This results in recharge occurring exclusively during major rainfall events (15-25 mm/d). The closest station that records evaporation is the Wittenoom BoM station, located approximately 190 km north-west of Newman. Annual average evaporation for Wittenoom is 3,142 mm/year, which exceeds annual rainfall by as much as 2,800 mm/year.

5.4 Hydrogeological Setting

5.4.1 Geology

The geological conditions in the region can be summarised as:

- The Silver Knight and Eastern Syncline are mainly hosted by the upper Marra Mamba members, but mineralisation of the overlying Wittenoom and underlying Jeerinah formations can also be seen in the orebodies.
- Bill's Hill and Mount Helen orebodies are hosted in the mineralised Brockman Iron Formation. The orebody aquifer is usually well delineated by the extent of the high-grade ore (assumed high permeability), with a halo of lower grade ore (assumed moderate permeability) around it.

5.4.2 Topography and Surface Water Drainage

The site is located within the Whaleback Creek catchment. The main drainage features are the Whaleback Creek, and its southern tributary which drains the Western Ridge area (referred to as Southern Creek). The Whaleback Creek drains into the Fortescue River, upstream of Ethel Gorge. The Gorge is located downstream (north) of Ophthalmia Dam at the confluence of Homestead, Shovelanna, and Warrawandu Creeks, which merge within the Fortescue River and flow through the Ophthalmia Range in a northerly direction (BHP, 2020).

5.4.3 Aquifer

There are two main aquifer types (BHP, 2020):

1) The regional aquifers; which generally comprise weathered dolomite of the Paraburdoo Member of the Wittenoom Formation, which occurs in sub-crop along the Whaleback and Southern Creek valleys.

2) The orebody aquifers; which comprise the mineralised Brockman Iron Formation that make up the Bill's Hill and Mount Helen orebodies and the mineralised Marra Mamba that make up Silver Knight and Eastern Syncline orebodies.

5.5 Groundwater Abstraction

Groundwater abstraction at the Western Ridge is currently regulated through the RiWI Act 5C License to Take Water GWL170659(3) which allows the annual abstraction of 45,000 kL/a to be used for exploration drilling operations as well as dust suppression for earthworks and construction purposes only (BHP, 2020).

In order to achieve progressive dewatering to allow mining below the water table, BHP is seeking to amend the 5C licence in the near future.

6.0 PREVIOUS LAND USE

Golder is of the understanding that the area has no known previous land use except for exploration activities and hydrogeological drilling purposes. This is supported by the available historical aerial photographs of the site (see Figures 3A – 3D), which did not indicate any major historical activities or infrastructures at the site.

Based on *pers comm. Andrew Cottrell (BHP hydrogeologist), April 2021*, the Afghan Springs pools were historically used for stock water purposes. There were previously some infrastructures in the area for keeping cattle, i.e., water tanks. Andrew also indicated that there has been a creek diversion, approximately 12 to 24 months ago, which can also be seen on the historical aerial photographs. He indicated that there is no known potentially contaminating activities or events reported at the Western Ridge site.

Golder considers that exploration and hydrogeological assessment activities have the potential to introduce contamination. However, the impacts are likely to be minimal and with groundwater levels considerably deep, contamination impacts to groundwater from site activities on and above ground are considered to be unlikely. It is important to note that the use of additives during drilling (i.e., drilling muds and/or glue for the PVC casing installation of the bores) may result in cross-contamination to the groundwater samples collected and give false positives with regards to PFAS and TRH in groundwater.

7.0 ANALYTICAL SCHEDULE

Groundwater samples collected were analysed for PFAS, which comprised the 28 PFAS suite with appropriate limit of reporting (LOR) for comparison against the 99% species protection level. In addition, groundwater samples were also analysed for TRH and benzene, toluene, ethylbenzene, xylenes, and naphthalene (BTEXN) analyses.

8.0 ASSESSMENT CRITERIA

A summary of the relevant groundwater assessment criteria is provided in Table 2.

Table 2: Groundwater Assessment Criteria

Potential Receptor	TRH, BTEXN	PFAS/PFOA
Human Health	ASC NEPM HSL-D* DER (2014) Drinking Water Health Value**	PFAS National Environmental Management Plan (NEMP) 2.0 (2020) Human Health guideline values: - Drinking water quality guideline value**, and - Recreational water quality guideline value*
Ecological	ANZG (2018) Fresh Water 95%*	PFAS NEMP 2.0 (2020) Ecological water quality guideline values: - Freshwater 99% species protection – high conservation value system*, and - Freshwater 95% species protection – slightly to moderately disturbed system*

Note: * Assessment criteria was selected based on the current and the intent future land use for the site. 99% species protection level for PFAS has also been adopted to account for potential bioaccumulation.

** Assessment criteria was selected as the site is located within a Priority 1 drinking water catchment area.

9.0 GROUNDWATER SAMPLING METHODOLOGY

The groundwater sampling was undertaken between 13 and 16 April 2021 by two Golder field personnel.

Groundwater samples were collected from nine existing groundwater wells within the WRCS area. Groundwater wells WSR1270RM, WSR1241RM, WSR1153RM, WSR0663RM, WSR1248RM, WSR1150RM were dry and WSR1139RM could not be located and therefore these wells could not be sampled. The nine wells which were sampled, HWSR0014M, HWSR0019M, HWSR0020M, HWSR0021M, WSR0296M, WSR0299M, WSR0597M, WSR1193RM, and HXAN0002M were selected to assess the area laterally. While this baseline assessment is limited by the availability of existing bores, Golder considers that the locations of the bores selected are sufficient to provide a 'snapshot' of PFAS and TRH concentrations in groundwater at the site, which is the intention of this baseline assessment. Groundwater well construction logs are provided in Appendix A.

The groundwater monitoring wells were sampled using HDPE Hydrasleeves® (Super/SkinnySleeve). Prior to sampling, an electronic water level meter (BHP supplied 1550T2 BHP 200 m) was used to determine assess the standing water level (SWL). The SWL measurements are displayed in Appendix B.

In general, the HDPE Hydrasleeves® were set to target the well screen, at approximately 3 to 5 m below the groundwater level. For monitoring wells with well screen deeper than the groundwater level, the HDPE Hydrasleeves® were set at approximately 1 m below the top of the screen level. The HDPE Hydrasleeves® were then left for at least a 24-hour period except at HXAN0002M which was left for at least 23 hours to allow the groundwater, within the well column, to stabilise. The HDPE Hydrasleeves® were then retrieved and the groundwater transferred directly into laboratory supplied bottles using Hydrasleeves® straws.

Groundwater field parameters (pH, reduction-oxygen potential (redox), conductivity, temperature, and dissolved oxygen (DO)) were measured using a calibrated YSI water quality meter (19L1002399) by placing the probes into a small aliquot of retrieved groundwater which was poured from the Hydrasleeves® into a container for measurement. Field groundwater monitoring sheets are provided in Appendix B. The YSI calibration certificate and daily bump checks are provided in Appendix C.

New nitrile gloves were worn while preparing the HDPE Hydrasleeves® for deployment and during retrieval. Samples were placed in laboratory supplied eskies and cooled with bags of ice (ice bricks were not used). Between each location, the water level meter was decontaminated with a Liquinox/water solution and deionised water, to reduce the potential of cross contamination.

Groundwater samples were dispatched under chain-of custody (CoC) procedures to ALS (primary laboratory) and Eurofins (secondary laboratory) which are both NATA-accredited laboratories. The CoCs and laboratory certificates are included in Appendix D.

9.1 Sampling Quality Assurance and Quality Control (QA/QC)

The following quality assurance control measures were undertaken during the sampling program:

- Field duplicate or triplicate samples were collected at a minimum rate of 20% (10% duplicates and 10% triplicates).
- Primary and duplicate samples were submitted to NATA-accredited laboratory ALS Environmental. Triplicate samples collected were submitted to an alternate NATA-accredited laboratory Eurofins.
- Water samples were collected whilst wearing a new pair of disposable nitrile gloves for each sample.
- Samples collected were placed in laboratory-supplied bottles appropriate for the relevant analyte.
- No rinsate samples were collected as no non-dedicated sampling equipment was used.

- Trip blanks were submitted for analysis at a rate of one per esky.
- Samples collected in the field were placed in an esky with ice in bags (no ice bricks were used) and delivered to the NATA accredited laboratories for analysis.

9.2 PFAS Sampling Considerations

Due to the widespread use of PFAS compounds in everyday items, the following considerations were implemented by field staff prior and during the collection of samples as per guidance provided by Department of Water and Environmental Regulation (DWER) *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances* (2017):

1) No new clothing, or clothing with rain or waterproof coatings/treated fabric.
2) No food or snack containers wrapped with non-compliant materials.
3) No Teflon® containing or coated field equipment.
4) No Teflon® lined lids on the laboratory supplied sample bottle.
5) No Decon or detergent decontamination solutions. Liquinox® was used for decontaminating equipment.
6) No ice bricks for sample storage.
7) No PFAS containing sun cream.

10.0 RESULTS

10.1 Groundwater Levels and Field Parameters

Groundwater monitoring wells were gauged using an electronic water level meter prior to sampling and groundwater parameters obtained from a sample aliquot using a YSI water quality meter. The depth to groundwater and bore installation details are summarised in Table 3 and the groundwater field parameters recorded of the sampled wells are presented in Table 4.

Table 3: Summary of Groundwater Levels (April 2021) and Borehole Details

Well ID	Depth to Groundwater (m btoc)	Top of PVC Pipe Survey Level (m AHD)	Groundwater Level (m AHD)	Top of Screened Interval (m AHD)	Base of Screened Interval (m AHD)	Drilled/ Installation Date
HWSR0014M	151.77	667.43	515.66	492.50	480.50	October 2020
HWSR0019M	49.35	632.36	583.01	571.52	478.52	October 2020
HWSR0020M	27.93	630.71	602.78	617.93	527.93	October 2020
WSR0296M	117.40	625.26	507.86	523.72	427.72	November 2015
WSR0299M	112.11	621.51	509.40	521.13	437.13	November 2015
WSR0597M	135.37	651.68	516.31	518.70	470.70	May 2016
WSR0663RM	Dry	608.54	-	523.86	517.86	May 2016
WSR1139RM	n/a	634.52	-	572.77	530.77	November 2016
WSR1150RM	Dry	649.23	-	545.78	527.78	November 2016
WSR1153RM	Dry	641.27	-	528.91	504.91	November 2016
WSR1193RM	67.55	636.44	568.89	572.69	548.69	November 2016
WSR1270RM	Dry	606.69	-	521.89	503.89	November 2016
WSR1241RM	Dry	618.37	-	533.35	515.35	December 2016
WSR1248RM	Dry	615.05	-	542.16	524.16	November 2016

Well ID	Depth to Groundwater (m btoc)	Top of PVC Pipe Survey Level (m AHD)	Groundwater Level (m AHD)	Top of Screened Interval (m AHD)	Base of Screened Interval (m AHD)	Drilled/ Installation Date
HWSR0021M	107.91	615.99	508.08	472.63	388.63	March/ April 2021
HXAN0002M	76.70	624.56	547.86	563.63	473.63	February 2021

Notes: n/a = not accessible/could not locate
m btoc = metre below top of casing
m bgl = metre below ground level

It is noted that the water level is above the screen interval for some wells (i.e., HWSR0014M and HWSR0019M). While having the well screen lower than the groundwater level is not ideal, given there is no known previous land use with the exception for exploration and hydrogeological assessment activities, light non-aqueous phase liquid (LNAPL) impacts in groundwater are not expected. Additionally, groundwater level is considerably deep (down to 151 m btoc at HWSR0014M) and subsequently contamination impacts in groundwater from the minimalistic nature of the site activities are unlikely. Therefore, these selected wells are considered to be suitable for the baseline assessment purposes; however, for future environmental and contaminated sites assessment works, Golder recommends the installation of groundwater monitoring wells that meet the requirements as set out in the DWER and NEPM guidelines.

Table 4: Summary of Groundwater Field Parameters – April 2021

Well ID	pH	Temperature (°C)	Redox (mV)	DO (%)	Specific Conductivity (µS/cm at 25°C)	Notes
HWSR0014M	7.15	24.9	164.3	3.76	545	Sample was clear, no odour/sheen, low turbidity.
HWSR0019M	7.47	29.2	-70.0	1.20	3022	Sample was clear, no odour/sheen, low turbidity
HWSR0020M	8.11	27.6	-332.6	0.28	1540	Sample was clear, no sheen, low turbidity
WSR0296M	7.56	29.5	-16.7	2.22	983	Sample was clear, rotten egg odour, no sheen, low turbidity
WSR0299M	7.50	31.2	-1.6	1.85	513	Sample was clear, no odour/sheen, low turbidity
WSR0597M	7.18	25.8	105.9	3.83	1194	Sample was cloudy grey, no odour/sheen, medium turbidity
WSR1193RM	7.42	28.1	-155.1	1.22	1422	Sample was cloudy brown, no odour/sheen, medium turbidity
HWSR0021M	7.27	30.5	17.6	3.24	961	Sample was cloudy brown, no odour, high turbidity
HXAN0002M	7.79	26.7	-205.0	0.66	892	Sample was clear, rotten egg odour, no sheen, low turbidity

10.2 Analytical Results

The following section summaries the laboratory analytical results. The results are presented in Tables A and B at the end of this report and the laboratory reports are displayed in Appendix D.

10.2.1 PFAS

PFAS was detected above laboratory LOR in one groundwater well, HXAN0002M. At the other locations sampled, PFAS was not detected above the LOR.

Concentrations above laboratory LORs are summarised in Table 5 below. No exceedance of adopted assessment criteria (where available) was reported.

Table 5: PFAS Concentration above LOR

Analytes	Concentrations (µg/L)
HXAN0002M	
6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	0.002
Sum of PFAS	0.002

10.2.2 TRH

TRH was detected above laboratory LOR within samples obtained from four locations HWSR0014M, HWSR0019M, HWSR0020M, and HXAN0002M. Toluene was also reported at two locations (HWSR0020M at and HXAN0002M). TRH C_6-C_{10} F1 was reported at HWSR0014M and HWSR0019M, but from the presence of compounds other than BTEX. Reported concentrations did not exceed relevant screening criteria and are summarised in Table 6.

Table 6: TRH Concentrations above LOR (mg/L)

Well ID	TRH C_6-C_{10} F1	TRH >C_{10}-C_{16} F2	TRH >C_{16}-C_{34} F3	TRH >C_{34}-C_{40} F4	Toluene
HWSR0014M	0.17	<0.1	<0.1	<0.1	<0.002
HWSR0019M	0.15	<0.1	0.13	<0.1	<0.002
HWSR0020M	0.54	<0.1	0.11	<0.1	0.007
HXAN0002M	0.4	<0.1	<0.1	<0.1	0.007

10.2.3 Summary

While there is no known previous land use (except for exploration activities and hydrogeological drilling purposes), the results from this groundwater baseline assessment indicated that there are detections of PFAS, TRH, and toluene in groundwater at the site. It is noted that PFAS and TRH contamination have been reported within the groundwater at the Mount Whaleback mine site, located 2 km east of the site; however, Golder does not consider for these reported concentrations at the Western Ridge site to be related to those contaminations at the Mount Whaleback mine site.

It is considered likely that the reported PFAS, TRH, and toluene concentrations are related to the drilling additives that were used during drilling and installation of the groundwater wells (i.e., drilling muds and/or glue for the PVC casing installation). This consideration is supported by the following:

- Sarah Stegena (BHP) indicated that the groundwater wells recently installed have not been developed. Given the low yield of the groundwater wells, it is likely that the additives used during drilling and installation are still present within the groundwater. These wells were drilled using reverse circulation (RC) drilling methodology and PVC casing were glued and screwed and were hung from the top of the bore to the correct depth in the drill hole with no annulus backfill.
- The reported contamination appeared only at the recently installed groundwater wells except for HWSR0021M, as also shown in the results from the Afghan Springs area within the Western Ridge site (Golder, 2021). Groundwater wells that were installed over a year ago were not reported with any detectable concentrations of PFAS, TRH and toluene above laboratory LOR. HWSR0021M was recently installed in March/April 2021 and is understood to have been drilled as a production bore. Visual observation of this borehole on site indicates it to be potentially a different construction to the monitoring wells and may explain why TRH and PFAS were not detected at this location despite it being a newer well.

- The chromatographs did not show the typical unresolved complex mixture (UCM) associated with refined petroleum hydrocarbon (diesel, petrol) impacts, which are the typical hydrocarbon contamination identified at a mine site, including at Mount Whaleback. Chromatographs are included as Appendix E.
- Given the depth to groundwater at the site is relatively deep (>25 m bgl), it is unlikely for volatile compounds (i.e., toluene and TRH C_6-C_{10}) to leach to the groundwater from contamination events at surface.

Nevertheless, no exceedance of adopted assessment criteria was reported for any contaminants analysed as part of this groundwater baseline assessment.

11.0 QUALITY ASSURANCE/QUALITY CONTROL

The quality assurance/quality control (QA/QC) procedures adopted during this project are based on the ASC NEPM, DER 2014 guidelines (DER 2014), *AS 4482.1 – 2005* (Standards Australia 2005), *AS 4482.2 – 1999* (Standards Australia 1999), and PFAS NEMP (HEPA, 2020).

QA involves all the actions, procedures, checks, and decisions undertaken to ensure the representativeness and integrity of samples and accuracy and reliability of analytical results (ASC NEPM). QC involves protocols to monitor and measure the effectiveness of QA procedures.

The precision of the results for each analyte between the primary sample and the field duplicate/triplicate is determined by calculating the RPD. A quantitative measure of the accuracy of the analytical results reported is made by calculating the RPDs in accordance with the procedure described in AS 4482.1 – 2005 using the below calculation.

$$\%\text{RPD} = \left|\frac{A-B}{A+B}\right| \text{ x } 200$$

For the purposes of this assessment and in accordance with guidance in the NEPM 2013, an RPD less than or equal to 30% represents good correlation between laboratory results. Where the RPD is greater than 30% and the analytical results are less than five times the LOR, the precision and accuracy are also considered acceptable because the accuracy of laboratory analyses decreases as concentrations approach the LOR.

11.1 Fieldwork Program

RPD results are presented in Table C and trip blank results are presented in Table D at the end of this report. Field QA/QC procedures and compliance during the assessment are summarised in Table 7.

Table 7: Summary of Field QA/QC Compliance

QA/QC Element	Requirement	Requirement Adhered to?	Information/ Data Acceptable?
Equipment calibration	Where relevant, all field equipment is to be calibrated by the equipment supplier and certification provided	Yes (Appendix C)	Yes
Sampling methods	All sampling methods outlined in the methodology must be adhered to.	Yes	Yes
Record keeping	Detailed records of field activities were maintained with the use of daily record sheets, and quality control sample registers.	Yes	Yes
Chain of custody documentation	The CoC documentation was completed for each batch of samples, identifying the names of the samplers, the type of sample, the collection date and the analyses performed.	Yes	Yes
Sample labelling	Samples were properly labelled, showing reference number, sample ID, date of collection and sampler.	Yes	Yes

QA/QC Element	Requirement	Requirement Adhered to?	Information/ Data Acceptable?
Sample containers	Samples were collected in appropriate laboratory-supplied containers with suitable preservation methods (where required).	Yes	Yes
Sample storage and transport	Samples were stored in a chilled, insulated container immediately after sampling and delivered to the laboratory with CoC documentation.	Yes	Yes (See Note 1)
Analysis of trip blanks	No contamination of trip blanks reported.	Yes	Yes
Decontamination	Reusable field equipment (i.e., water level meter) were appropriately decontaminated using potable water and Liquinox® solution between each sampling location.	Yes	Yes
Duplicate samples	Duplicate and triplicate samples were collected for analysis by the primary and secondary laboratories, respectively (at a frequency of at least one pair per 10 samples).	Yes	Yes
	Relative percent difference (RPD) assessment to adhere to the following protocols: ■ 1-5 × laboratory LOR: no limit; ■ >5 × laboratory LOR: 0-30%.	Yes	Yes (See Note 2)

Notes: 1. Samples were all sent in an insulated container (esky) on ice. However, the ideal temperature could not be maintained throughout transport and elevated temperature inside the esky was noted upon receipt by the laboratory. The temperature of samples on arrival at the laboratory was reported at 21.9°C. This elevated temperature was associated with the remote nature of the site and the heat experienced by the site conditions in the Pilbara, which may affect the results.

2. Three RPDs were reported above 30% for results>5 × laboratory LOR. These RPD breaches are for TRH C_6-C_9 and TRH C_6-C_{10} F1 and TRH C_6-C_{10} less BTEX F1 between primary and triplicate samples collected at HWSR0019M. Higher triplicate results have been adopted in Table B to be conservative. All primary and triplicate results for these analytes are below the assessment criteria and therefore these RPD breaches are not considered to affect the outcome of the investigation.

11.2 Laboratory Quality Data Assessment

All samples were submitted to NATA-accredited laboratories in Perth for laboratory analysis. Laboratory QA/QC analysis were reviewed to assess data integrity and confirm reliability of the analytical data. Laboratory QA/QC analysis results were compared to laboratory acceptance criteria.

11.2.1 Holding Time

No analysis holding time outliers were reported.

11.2.2 Laboratory Control Spike

No laboratory control outliers were reported.

11.2.3 Surrogates

No surrogate recovery outliers were reported.

11.2.4 Matrix Spikes

No matrix spike outliers were reported.

11.2.5 Duplicates

No duplicate outliers were reported.

11.2.6 Method Blanks

No method blank value outliers were reported.

11.2.7 Laboratory QC Sample Frequency

Laboratory QC samples frequency outliers were reported for laboratory duplicates for PFAS analysis. Only one laboratory duplicate sample was analysed out of 14 primary samples (7.14%), which did not meet the 10% target. Note that samples not collected by Golder were included in the frequency rate calculation. The one laboratory duplicate analysed was collected by Golder and the 10% target criteria would have been met if no other non-Golder samples included in the frequency rate calculation. Matrix spike frequency outliers for PFAS and TRH – semi volatile fraction were reported as no samples were analysed (0.00%) of an expected 5% target.

As stated in Section 11.2.5, no duplicate outliers were reported in this duplicate sample; therefore, these laboratory QC sample frequency outliers are not considered to have significant impact on the overall data quality or outcome of the investigation.

11.3 Summary

A review of the field and laboratory QA/QC data and procedures confirms an acceptable level of compliance with the general requirements and DQOs. As such, there is an acceptable level of confidence in the data upon which the conclusions in this report have been made.

12.0 CONCLUSIONS AND RECOMMENDATIONS

12.1 Conclusions

The following conclusions are drawn from the data obtained during the baseline assessment:

- The results from this groundwater baseline assessment indicated that there are detections of PFAS, TRH, and toluene in groundwater at the site. It is considered likely that the reported PFAS, TRH, and toluene concentrations are related to the drilling additives that were used during drilling and installation of the groundwater wells (i.e., drilling muds and/or glue for the PVC casing installation).
- The reported contamination appeared only at the recently installed groundwater wells. Groundwater wells that were installed over a year ago were not reported with any detectable concentrations of PFAS, TRH, and toluene above laboratory LOR.
- No exceedance of adopted assessment criteria was reported for any contaminants analysed as part of this groundwater baseline assessment.

12.2 Recommendations

It is considered that the site is suitable to be developed for active mining from contaminated sites perspective.

It is recommended to develop and resample groundwater wells with PFAS, TRH, and toluene detections to confirm the presence of these contaminants prior to development.

13.0 IMPORTANT INFORMATION

Your attention is drawn to the document titled – “Important Information Relating to this Report”, which is included in Appendix F of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder has under the contract between it and its client.

14.0 CLOSING

Should you have any queries concerning this report, please do not hesitate to contact the under-signed.

15.0 REFERENCES

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Signature Page

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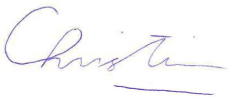

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Table A: Western Ridge – WRCS
Groundwater PFAS Analytical Results

				Per- and polyfluoroalkyl substances (PFAS)																													
				Perfluorodecane sulfonic acid (PFDS)	N-Methyl PFO sulfonamidoethanol (MeFOSE)	N-methyl-PFO sulfonamidoacetic acid (MeFOSAA)	Perfluorooctanoic Acid (PFOA)	Perfluorooctane sulfonic acid (PFOS)	Perfluorohexane sulfonic acid (PFHxS)	Sum of PFHxS and PFOS (lab reported)	Sum of WA DER PFAS (n=10)	Sum of PFASs (n=28 - Lab Reported)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorodecanoic acid (PFDA)	Perfluoropentanoic acid (PFPeA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorododecanoic acid (PFDoDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorobutane sulfonic acid (PFBS)	4:2 Fluorotelomer sulfonic acid (4:2 FTSA)	6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	10:2 Fluorotelomer sulfonic acid (10:2 FTSA)	N-Ethyl PFO sulfonamide (EtFOSA)	N-Ethyl PFO sulfonamidoethanol (EtFOSE)	N-Methyl PFO sulfonamide (MeFOSA)	Perfluorooctane sulfonamide (FOSA)	N-ethyl-PFO sulfonamidoacetic acid (EtFOSAA)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR				0.0005	0.001	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005
PFAS NEMP 2.0 2020 95% Eco Fresh Water							220	0.13																									
PFAS NEMP 2.0 2020 99% Eco Fresh Water							19	0.00023																									
PFAS NEMP 2.0 2020 Drinking Water							0.56	0.07	0.07	0.07																							
PFAS NEMP 2.0 2020 Recreational Water							10	2	2	2																							
Site ID	**Location**	**Sampled Date**	**Lab Report**																															
WRCS	HWSR0014M	16/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	HWSR0019M	15/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	HWSR0020M	15/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	HWSR0021M	15/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	HXAN0002M	16/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	0.002	0.002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	WSR0296RM	15/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	WSR0299RM	15/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	WSR0597RM	16/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
WRCS	WSR1193RM	15/04/2021	EP2104244	<0.0005	<0.001	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005

Table B: Western Ridge – WRCS
Groundwater Organic Analytical Results

				MAH						PAH	Total Recoverable Hydrocarbons											
				Benzene	Toluene	Ethylbenzene	Xylenes (m & p)	Xylene (o)	Xylenes (Sum of total) (Lab Reported)	Total BTEX	Naphthalene	TRH C_6-C_9 Fraction	TRH C_{10}-C_{14} Fraction	TRH C_{15}-C_{28} Fraction	TRH C_{29}-C_{36} Fraction	TRH+C_{10}-C_{36} (Sum of total) (Lab Reported)	TRH+C_{10}-C_{40} (Sum of total) (Lab Reported)	TRH C_6-C_{10} Fraction F1	TRH C_6-C_{10} Fraction Less BTEX F1	TRH >C_{10}-C_{16} Fraction F2	TRH >C_{10}-C_{16} Fraction Less Naphthalene F2	TRH >C_{16}-C_{34} Fraction F3	TRH >C_{34}-C_{40} Fraction F4
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR				0.001	0.002	0.002	0.002	0.002	0.002	0.001	0.005	0.02	0.05	0.1	0.05	0.05	0.1	0.02	0.02	0.1	0.1	0.1	0.1
DER (2014) Drinking Water Health Value				0.001	0.8	0.3			0.6														
ANZG (2018) Freshwater 95%				0.95				0.35			0.016												
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand																							
2-4m				5	NL	NL			NL		NL								6		NL		
4-8m				5	NL	NL			NL		NL								6		NL		
>8m				5	NL	NL			NL		NL								7		NL		
Site ID	**Location**	**Sampled Date**	**Lab Report**																				
Western Ridge Crusher Study - 21464272	HWSR0014M	16/04/2021	EP2104244	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	0.18	<0.05	<0.1	<0.05	<0.05	<0.1	0.17	0.17	<0.1	<0.1	<0.1	<0.1
Western Ridge Crusher Study - 21464272	HWSR0019M	15/04/2021	EP2104244	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	0.31*	<0.05	0.12	<0.05	0.12	0.13	0.33*	0.33*	<0.1	<0.1	0.13	<0.1
Western Ridge Crusher Study - 21464272	HWSR0020M	15/04/2021	EP2104244	<0.001	0.007	<0.002	<0.002	<0.002	<0.002	0.007	<0.005	0.6	0.11	0.12	<0.05	0.23	0.11	0.54	0.53	<0.1	<0.1	0.11	<0.1
Western Ridge Crusher Study - 21464272	HWSR0021M	15/04/2021	EP2104244	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
Western Ridge Crusher Study - 21464272	HXAN0002M	16/04/2021	EP2104244	<0.001	0.007	<0.002	<0.002	<0.002	<0.002	0.007	<0.005	0.44	0.09	<0.1	<0.05	0.09	<0.1	0.4	0.39	<0.1	<0.1	<0.1	<0.1
Western Ridge Crusher Study - 21464272	WSR0296RM	15/04/2021	EP2104244	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
Western Ridge Crusher Study - 21464272	WSR0299RM	15/04/2021	EP2104244	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
Western Ridge Crusher Study - 21464272	WSR0597RM	16/04/2021	EP2104244	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1
Western Ridge Crusher Study - 21464272	WSR1193RM	15/04/2021	EP2104244	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1

Note: NL indicates the HSL is not limiting

* Higher triplicate concentrations are adopted to be conservative

RPD ≥30% and one or more values ≥5 × LOR
RPD ≥30% and both values <5 × LOR
RPD ≥30% due to differing LORs

Chemical Group	Chemical Name	Units	LOR	Lab Report Number	EP2104244	EP2104244	RPD		EP2104244	789525	RPD
				Field ID	HWSR0020M	FD01			HWSR0019M	HWSR0019/59150421	
				Sample Type	Primary	Duplicate			Primary	Triplicate	
				Sampled Date/Time	############	############			############	4/15/2021 12:00	
Per- and polyfluoroalkyl substances (PFAS)	Perfluorodecane sulfonic acid (PFDS)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	N-Methyl PFO sulfonamidoethanol (MeFOSE)	µg/L	0.001 : 0.005 (Interlab)		<0.001	<0.001	<30		<0.001	<0.005	<30
	N-methyl-PFO sulfonamidoacetic acid (MeFOSAA)	µg/L	0.0005 : 0.005 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.005	<30
	Perfluorooctanoic Acid (PFOA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0002 : 0.001 (Interlab)		<0.0002	<0.0002	<30		<0.0002	<0.001	<30
	Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Sum of PFHxS and PFOS (lab reported)	µg/L	0.0002 : 0.001 (Interlab)		<0.0002	<0.0002	<30		<0.0002	<0.001	<30
	Sum of WA DER PFAS (n=10)	µg/L	0.0002 : 0.005 (Interlab)		<0.0002	<0.0002	<30		<0.0002	<0.005	<30
	Sum of PFASs (n=28 - Lab Reported)	µg/L	0.0002 : 0.005 (Interlab)		<0.0002	<0.0002	<30		<0.0002	<0.005	<30
	Perfluorobutanoic acid (PFBA)	µg/L	0.002 : 0.005 (Interlab)		<0.002	<0.002	<30		<0.002	<0.005	<30
	Perfluorohexanoic acid (PFHxA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluorodecanoic acid (PFDA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluoropentanoic acid (PFPeA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluorononanoic acid (PFNA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluorotridecanoic acid (PFTrDA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluorododecanoic acid (PFDoDA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluoroundecanoic acid (PFUnDA)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005 : 0.001 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.001	<30
	4:2 Fluorotelomer sulfonic acid (4:2 FTSA)	µg/L	0.001		<0.001	<0.001	<30		<0.001	<0.001	<30
	6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	µg/L	0.001 : 0.005 (Interlab)		<0.001	<0.001	<30		<0.001	<0.005	<30
	8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	µg/L	0.001		<0.001	<0.001	<30		<0.001	<0.001	<30
	10:2 Fluorotelomer sulfonic acid (10:2 FTSA)	µg/L	0.001		<0.001	<0.001	<30		<0.001	<0.001	<30
	N-Ethyl PFO sulfonamide (EtFOSA)	µg/L	0.001 : 0.005 (Interlab)		<0.001	<0.001	<30		<0.001	<0.005	<30
	N-Ethyl PFO sulfonamidoethanol (EtFOSE)	µg/L	0.001 : 0.005 (Interlab)		<0.001	<0.001	<30		<0.001	<0.005	<30
	N-Methyl PFO sulfonamide (MeFOSA)	µg/L	0.001 : 0.005 (Interlab)		<0.001	<0.001	<30		<0.001	<0.005	<30
	Perfluorooctane sulfonamide (FOSA)	µg/L	0.0005 : 0.005 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.005	<30
	N-ethyl-PFO sulfonamidoacetic acid (EtFOSAA)	µg/L	0.0005 : 0.005 (Interlab)		<0.0005	<0.0005	<30		<0.0005	<0.005	<30
MAH	Benzene	mg/L	0.001		<0.001	<0.001	<30		<0.001	N/A	-
	Toluene	mg/L	0.002		0.007	0.008	13		<0.002	N/A	-
	Ethylbenzene	mg/L	0.002		<0.002	<0.002	<30		<0.002	N/A	-
	Xylenes (m & p)	mg/L	0.002		<0.002	<0.002	<30		<0.002	N/A	-
	Xylene (o)	mg/L	0.002		<0.002	<0.002	<30		<0.002	N/A	-
	Xylenes (Sum of total) (Lab Reported)	mg/L	0.002		<0.002	<0.002	<30		<0.002	N/A	-
	Total BTEX	mg/L	0.001		0.007	0.008	13		<0.001	N/A	-
PAH	Naphthalene	mg/L	0.005 : 0.01 (Interlab)		<0.005	<0.005	<30		<0.005	<0.01	<30
Total Recoverable Hydrocarbons	TRH C_6-C_9 Fraction	mg/L	0.02		0.6	0.78	26		0.17	0.31	58
	TRH C_{10}-C_{14} Fraction	mg/L	0.05		0.11	<0.05	126		<0.05	0.26	165
	TRH C_{15}-C_{28} Fraction	mg/L	0.1		0.12	<0.1	82		0.12	<0.1	82
	TRH C_{29}-C_{36} Fraction	mg/L	0.05 : 0.1 (Interlab)		<0.05	<0.05	<30		<0.05	<0.1	<30
	TRH+C_{10}-C_{36} (Sum of total) (Lab Reported)	mg/L	0.05 : 0.1 (Interlab)		0.23	<0.05	161		0.12	0.26	74
	TRH+C_{10}-C_{40} (Sum of total) (Lab Reported)	mg/L	0.1		0.11	<0.1	75		0.13	<0.1	89
	TRH C_6-C_{10} Fraction F1	mg/L	0.02		0.54	0.71	27		0.15	0.33	75
	TRH C_6-C_{10} Fraction Less BTEX F1	mg/L	0.02		0.53	0.7	28		0.15	0.33	75
	TRH >C_{10}-C_{16} Fraction F2	mg/L	0.1 : 0.05 (Interlab)		<0.1	<0.1	<30		<0.1	<0.05	<30
	TRH >C_{10}-C_{16} Fraction Less Naphthalene F2	mg/L	0.1 : 0.05 (Interlab)		<0.1	<0.1	<30		<0.1	<0.05	<30
	TRH >C_{16}-C_{34} Fraction F3	mg/L	0.1		0.11	<0.1	75		0.13	<0.1	89
	TRH >C_{34}-C_{40} Fraction F4	mg/L	0.1		<0.1	<0.1	<30		<0.1	<0.1	<30

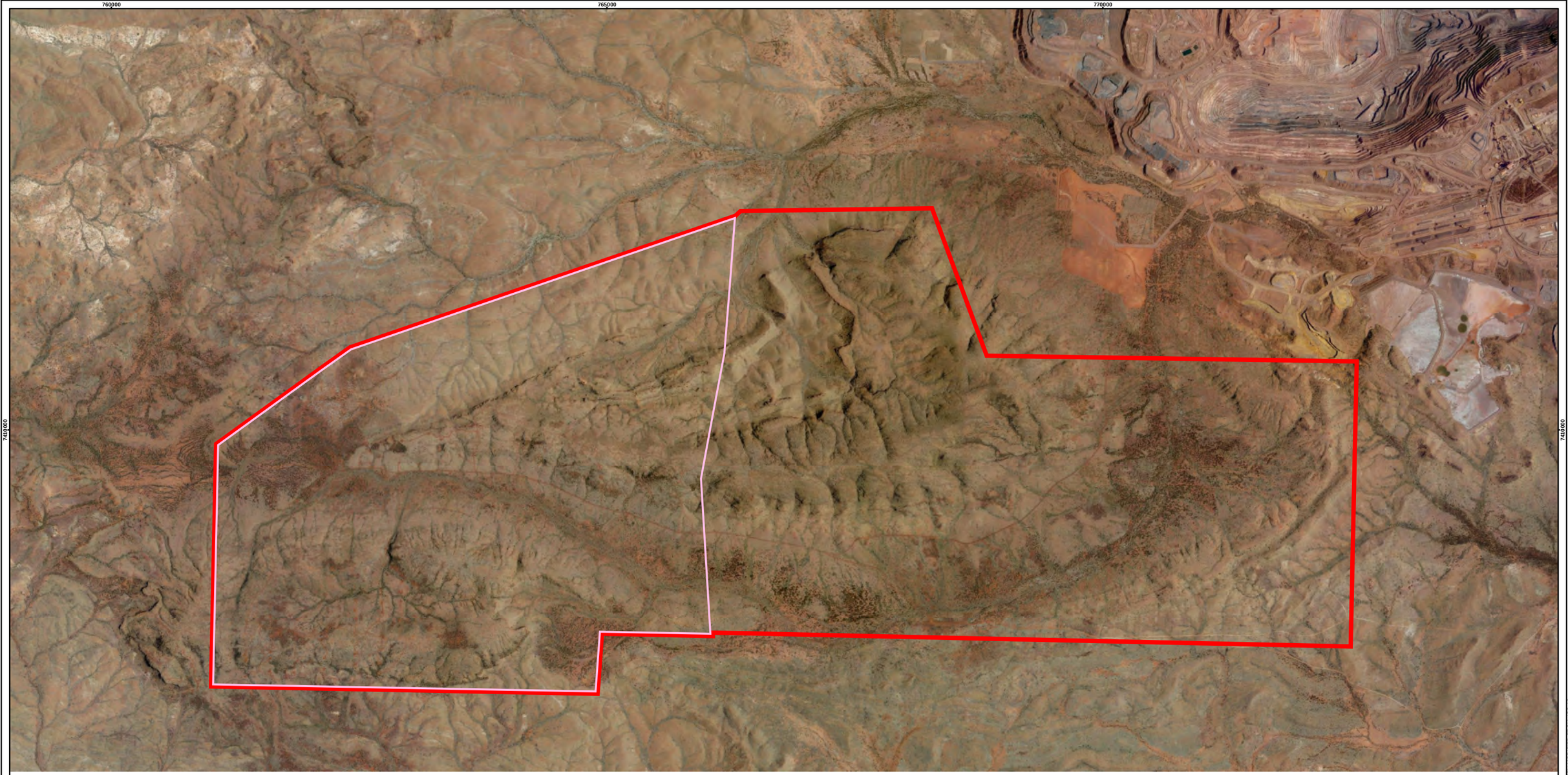
Note: N/A = Not Analysed

Lab Report Number	EP2104244	EP2104244
Field ID	TB319	TBW325
Sampled Date/Time	4/16/2021 15:00	4/16/2021 15:00
Sample Type	Trip Blank	Trip Blank

Chemical Group	Chemical Name	Units	LOR		
MAH	Benzene	mg/L	0.001	<0.001	
	Toluene	mg/L	0.002	<0.002	
	Ethylbenzene	mg/L	0.002	<0.002	
	Xylenes (m & p)	mg/L	0.002	<0.002	
	Xylene (o)	mg/L	0.002	<0.002	
	Xylenes (Sum of total) (Lab Reported)	mg/L	0.002	<0.002	
	Total BTEX	mg/L	0.001	<0.001	
PAH	Naphthalene	mg/L	0.005	<0.005	
Total Recoverable Hydrocarbons	TRH C_6-C_9 Fraction	mg/L	0.02	<0.02	
	TRH C_6-C_{10} Fraction F1	mg/L	0.02	<0.02	
	TRH C_6-C_{10} Fraction Less BTEX F1	mg/L	0.02	<0.02	
Per- and polyfluoroalkyl substances (PFAS)	Perfluorodecane sulfonic acid (PFDS)	µg/L	0.0005		<0.0005
	N-Methyl PFO sulfonamidoethanol (MeFOSE)	µg/L	0.001		<0.001
	N-methyl-PFO sulfonamidoacetic acid (MeFOSAA)	µg/L	0.0005		<0.0005
	Perfluorooctanoic Acid (PFOA)	µg/L	0.0005		<0.0005
	Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0002		<0.0002
	Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005		<0.0005
	Sum of PFHxS and PFOS (lab reported)	µg/L	0.0002		<0.0002
	Sum of WA DER PFAS (n=10)	µg/L	0.0002		<0.0002
	Sum of PFASs (n=28 - Lab Reported)	µg/L	0.0002		<0.0002
	Perfluorobutanoic acid (PFBA)	µg/L	0.002		<0.002
	Perfluorohexanoic acid (PFHxA)	µg/L	0.0005		<0.0005
	Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005		<0.0005
	Perfluorodecanoic acid (PFDA)	µg/L	0.0005		<0.0005
	Perfluoropentanoic acid (PFPeA)	µg/L	0.0005		<0.0005
	Perfluorononanoic acid (PFNA)	µg/L	0.0005		<0.0005
	Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.0005		<0.0005
	Perfluorotridecanoic acid (PFTrDA)	µg/L	0.0005		<0.0005
	Perfluorododecanoic acid (PFDoDA)	µg/L	0.0005		<0.0005
	Perfluoroundecanoic acid (PFUnDA)	µg/L	0.0005		<0.0005
	Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.0005		<0.0005
	Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.0005		<0.0005
	Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005		<0.0005
	4:2 Fluorotelomer sulfonic acid (4:2 FTSA)	µg/L	0.001		<0.001
	6:2 Fluorotelomer sulfonic acid (6:2 FTSA)	µg/L	0.001		<0.001
	8:2 Fluorotelomer sulfonic acid (8:2 FTSA)	µg/L	0.001		<0.001
	10:2 Fluorotelomer sulfonic acid (10:2 FTSA)	µg/L	0.001		<0.001
	N-Ethyl PFO sulfonamide (EtFOSA)	µg/L	0.001		<0.001
	N-Ethyl PFO sulfonamidoethanol (EtFOSE)	µg/L	0.001		<0.001
	N-Methyl PFO sulfonamide (MeFOSA)	µg/L	0.001		<0.001
	Perfluorooctane sulfonamide (FOSA)	µg/L	0.0005		<0.0005
	N-ethyl-PFO sulfonamidoacetic acid (EtFOSAA)	µg/L	0.0005		<0.0005

760000 765000 770000

7410000



760000 765000 770000

LEGEND

- WESTERN RIDGE STUDY AREA
- WESTERN RIDGE CRUSHER STUDY (WRCS)

KEY MAP

0 20 40
Kilometres

NEWMAN

0 800 1,600
1:40,000 METRES

NOTE(S)
1. COORDINATE SYSTEM: GDA 1994 MGA ZONE 50

REFERENCE(S)
1. AERIAL IMAGERY SOURCED FROM © WESTERN AUSTRALIAN LAND INFORMATION AUTHORITY TRADING AS LANDGATE (2018)

CLIENT
BHP

PROJECT
PFAS BASELINE ASSESSMENT - WRCS

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-05-03
DESIGNED	PW
PREPARED	AM
REVIEWED	& %
APPROVED	& %

TITLE
HISTORICAL IMAGERY - 2014

PROJECT NO.	CONTROL	REV.	FIGURE
21464272	00 -R		3D

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3
0 25mm

PATH: B:\BHP_Bill\on\P\tara\99_PROJECTS\21464272_WaterQuality\02_PRODUCTION\MXD\003-R\21464272-003-R-F003-RevA_WRCS.mxd PRINTED ON: 2021-05-03 AT 4:09:00 PM

APPENDIX A

Well Construction Logs

APPENDIX B

Field Sheets

APPENDIX C

Calibration Certificates

APPENDIX D

Laboratory Certificates

APPENDIX E

Chromatographs

APPENDIX F

Important Information

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