PENTIUM
WATER

CAR DUMPER 2

September 2023 Groundwater Monitoring Event

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1. INTRODUCTION

Pentium Water (Pentium) was engaged by Hanroy Iron Ore Pty Ltd (Hanroy) to complete a groundwater monitoring event (GME) at monitoring wells located in the Car Dumper 2 (CD2) Project Area. This report provides the methodology and analytical results for the GME completed in September 2023.

1.1. PROJECT BACKGROUND

Roy Hill Infrastructure Pty Ltd (RHI), a wholly owned subsidiary of Hancock Prospecting Pty Ltd (HPPL), currently operates the Roy Hill iron ore port facility in Port Hedland, Western Australia (WA). RHI is intending to expand their landside port facility which includes construction of a second car dumper (CD2) (Figure 1).

A total of seven (7) groundwater monitoring wells (BH01-A, BH01-B, BH02, BH03-A, BH03-B, BH04-A, BH04-B) were installed at the CD2 Project Area between February and April 2023 to enable groundwater monitoring (inclusive of sampling and analysis) for the purpose of characterising groundwater and aquifer conditions. (WEPL, 2023). The monitoring well locations are shown in Figure 2. It is noted that the WEPL (2023) reports prefaced each bore with the designation 'ATU'; however, this has not been applied herein.

The first GME was undertaken in April 2023 and included collection of field measurements, depth to water measurements and groundwater sampling for laboratory analysis. Laboratory analysis comprised the following:

- Targeted volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs) to assess general groundwater quality
- Metals
- Acidification indicator parameters
- Salinity.

1.2. OBJECTIVE

The objective of the GME was to collect data to supplement the April 2023 GME (WEPL, 2023).

1.3. SCOPE OF WORK

The following scope of work was completed:

- Collection of stabilisation field chemistry parameters during well purging
- Gauging depth to water levels
- Collection of groundwater samples via low-flow sampling methodology for analysis at a National Association of Testing Authorities (NATA)-certified laboratory
- Data analysis and reporting.

2. GROUNDWATER MONITORING EVENT

The GME was completed on the 12 and 13 September 2023 at monitoring wells BH01-A, BH01-B, BH02, BH03-A, BH03-B, BH04-A, and BH04-B (Figure 1). The methodology employed and field and laboratory results are detailed in the following sections.

2.1. METHODOLOGY

2.1.1. DEPTH TO WATER MEASUREMENTS

Depth to water at each monitoring well was measured prior to sample collection. The water level was measured using an interface meter referencing a marked point made as part of the April 2023 GME (WEPL, 2023).

2.1.2. PURGING

Groundwater stabilisation parameters were measured during purging using a YSI ProDSS multi-parameter meter with flow cell. Drawdown was monitored and did not exceed 0.1 m. Purging continued until stabilisation of water quality parameters was achieved over 3 consecutive measurement periods (at 5-minute intervals). The field parameters measured included:

- pH: ±0.1 pH units
- Electric conductivity (EC): ± 5%
- Redox (reduction / oxidation potential): ± 10%
- Dissolved oxygen (DO): ± 10%
- Temperature in Celsius(C): ± 0.2 degrees
- Turbidity.

2.1.3. SAMPLING

2.1.3.1. SAMPLE COLLECTION

Sampling was completed using a portable low flow 45-millimetre (mm) bladder pump (QED Sample Pro) and collected directly from the low-density polyethylene tubing into laboratory supplied pre-preserved sample containers. Samples for dissolved metals analysis were field filtered using an inline 45 micrometres (µm) disposable filter. Upon collection, the groundwater sample bottles were sealed and placed in a chilled esky for storage and shipping to ALS Laboratory, a NATA accredited laboratory.

2.1.3.2. SAMPLE ANALYSIS

Groundwater samples were analysed for the following:

- Targeted volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs) to assess general groundwater quality
- Metals
- Acid sulphate soil indicator parameters
- Salinity

3. RESULTS

3.1. DEPTH TO WATER MEASUREMENTS

The depth to water measurements, collected prior to sampling, along with those reported as part of the April 2023 (WEPL, 2023) groundwater monitoring event are provided in Table 1.

A review of the April 2023 and September 2023 results indicate the following:

- Depth to water from ground level ranged between 2.2 and 3.07 metres above Australian Height Datum (m AHD)
- The measured depth to water levels (potentiometric surface) in the deep levels ('A' series) were in the same range as those obtained from the shallow wells ('B') series (water table). The potentiometric surface at BH02 was also recorded in the same range as the shallow wells. This indicates positive vertical hydraulic gradient.
- Depth-to-water measurements are not synoptic as they were collected over the span of two days.

Table 1: Pre-Sample Depth to Water Measurements

Well ID	Easting	Northing	Ground Level (m AHD)[1]	Well Casing Height above Ground Level (m)[2, 3]	Well Screen Interval (m)[1]		April 2023 GME[1]			Sept 2023		
					Top of Screen (m from ground level)	Base of Screen (m from ground level)	DTW (m bTOC)	DTW (m bgl)	DTW (m ADH at ground level)	DTW (m bTOC)	DTW (m bgl)	DTW (m ADH at ground level)
Shallow Wells												
BH01-B	659782	7749712	3.12	0.66	3	6	0.95	0.29	**2.83**	1.55	0.89	**2.23**
BH03-B	659847	7749787	3.3	0.71	2	5	1.2	0.49	**2.81**	1.62	0.91	**2.39**
BH04-B	659870	7749721	6.3	0.73	3	6	4.14	3.41	**2.89**	4.58	3.58	**2.72**
Deep Wells												
BH01-A	659782	7749712	3.12	0.70	10	16	0.75	0.05	**3.07**	1.55	0.85	**2.27**
BH03-A	659847	7749787	3.3	0.81	12	18	1.2	0.39	**2.91**	1.75	0.94	**2.36**
BH04-A[4]	659870	7749721	6.3	0.68	9	15	4.08	3.4	**2.9**	4.75	4.07	**2.23**
Cross Aquifer[5]												
BH02	659810	7749762	3.58	0.69	1.5	25	1.48	0.79	**2.79**	1.98	1.38	**2.2**

Notes:
[1] Information obtained from Western Environmental report (WEPL, 2023)
[2] Information derived from Western Environmental Report (WEPL, 2023).
[3] Represents the distance between ground level and the top of the well casing (TOC) in metres.
[4] This bore was installed on the operational side which is elevated by approximately 3 metres of fill material.
[5] Well is screened across both the shallow and deeper units targeted by the other monitoring bores
m AHD indicates metres above Australian Height Datum
m bgl indicates metres below ground level
m bTOC indicates metres below top of well casing

3.2. FIELD MEASUREMENTS

Field measurements collected during purging and prior to sampling are detailed in **Appendix A**. The results presented in Figure 2 are those obtained following stabilisation. Variances in stabilisation parameters for BH04-B were observed; notably a lower electrical conductivity measurement, higher turbidity, and with the redox being negative (reduced state).

Except for the redox values, the results gathered in this sampling event were similar to those obtained as part of the April 2023 groundwater monitoring event (WEPL, 2023). Original data sheets were checked, and the Redox data for the September 2023 event presented in this report is confirmed as the data from the field readings of the YSI meter.

Sampling continued for significantly longer in the second set of sampling events, with stabilisation from the groundwater taking significantly longer than previous sampling, so insufficient pumping time is not a factor.

Calibration of the meter was undertaken on the meter prior to arrival onsite, and as all other values are in accordance with previous readings it is not believed to be a calibration error, but this can't be completely ruled out.

It is not known if there is some other factor impacting the Redox values with their variation compared to WEPL recorded data in April 2023 so it is recommended this should be further investigated with the next monitoring event.

Table 2: Field Stabilisation Measurements

Well ID	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
Shallow Wells							
BH01-B	Clear	29.7	7.47	111,059	149.4	1.48	9.43
BH03-B	Clear	29.5	7.33	96,305	65.1	0.16	8.16
BH04-B	Cloudy/light brown	31.2	7.5	36,578	-54.15	0.29	40.1
Deep Wells							
BH01-A	Clear	30.9	7.41	116,891	102.9	1.33	2.58
BH03-A	Clear	30.4	7.24	111,411	169.3	1.45	19.42
BH04-A	Clear	32.1	7.27	111,919	15.7	0.18	1.71
Cross Aquifer							
BH02	Clear	28.5	7.06	135,980	12.2	0.26	12.82

3.3. LABORATORY ANALYTICAL RESULTS

The laboratory analytical results were assessed with key consideration given to the following and discussed in further detail in this section:

- Salinity
- Groundwater buffering capacity against acidification.

Full laboratory result tabulation is provided in **Appendix B**. Laboratory documentation is provided in **Appendix C**.

It is noted that total recoverable hydrocarbons (TRH) and toluene were detected in groundwater samples collected from monitoring bores BH02-A and BH02-B as part of the April 2023 monitoring event. Analytical results for these parameters in groundwater samples collected from these monitoring wells as part of the September 2023 monitoring event recorded TRH and toluene concentrations below the laboratory detection limit.

There were no notable outliers across the September 2023 groundwater analytical results, apart from BH04-B. The variances in the results were noted in relation to salinity, and chloride and

sulphate values. This appears consistent with the April 2023 results indicating that positioning of the well screen and location of the well may have bearing on this trend.

Overall, the September 2023 analytical data was generally consistent with the April 2023 groundwater results.

3.3.1. GROUNDWATER SALINITY

Seawater is defined as having a chloride: sulphate ratio of ~0.14 ±0.2 (Nature, 2015; Kroopnick, 1977). As shown in Table 3, the Cl:SO_4 mass ratio for the groundwater samples ranged between 0.12 and 0.14 indicating seawater (excluding BH04-B that had a ratio of 0.06).

Hypersaline water has a total dissolved solid (TDS) value greater than 35,000 milligrams per litre (mg/L). TDS in the groundwater samples collected ranged between 64,100 and 103,000 mg/L (excluding BH04-B) indicating hypersaline groundwater. BH04-B had a TDS value of 20,200 mg/L.

Table 3: Groundwater Analytical Summary – Salinity

Analyte	Unit	BH0-2	BH01-B	BH03-B	BH04-B	BH01-A	BH03-A	BH04-A
Sulphate (SO_4)	mg/L	6120	4,650	4,320	1,890	5,010	5,000	4,920
Chloride (Cl)	mg/L	43,500	36,100	29,100	10,200	38,300	36,500	34,700
Cl: SO_4 ratio	NA	0.14	0.12	0.12	0.06	0.13	0.14	0.14
EC	µS/cm	124,000	99,000	87,100	31,400	102,000	98,800	94,800
TDS	mg/L	103,000	77,000	64,100	20,200	79,600	75,300	72,600

3.3.2. BUFFERING CAPACITY INDICATORS

The *Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes Guideline* DWER guidance material (DWER, 2015) provides indicators for assessing the buffering capacity of groundwater. These indicators are summarised in Table 4.

Table 4: Groundwater Buffering Capacity

Class	Designation	Alkalinity	pH	Description
1	Very high alkalinity	>180 mg/L	>6.5	Generally adequate to maintain acceptable pH level in the future
2	High alkalinity	60-80 mg/L	>6	Generally adequate to maintain acceptable pH level in the future
3	Moderate alkalinity	30-60 mg/L	5.5-7.5	Inadequate to maintain stable, acceptable pH level in areas vulnerable acidification
4	Low alkalinity	10-30 mg/L	5-6	Inadequate to maintain stable, acceptable pH level
5	Very low alkalinity	<10 mg/L	<6	Unacceptable pH level under all circumstances

A summary of groundwater analytical results is provided in Table 5 and indicates the following:

- pH ranges from 7.33 to 7.76
- Total alkalinity ranges between 106 and 274 mg/L
- Total acidity ranges between 22 and 45 mg/L.

An assessment of the results against the groundwater buffering capacity criteria indicates that groundwater meets Class 1, with a designation of 'very high alkalinity'.

Table 5: Groundwater Analytical Summary – pH, Alkalinity and Acidity Indicators

Analyte	Unit	BH0-2	BH01-B	BH03-B	BH04-B	BH01-A	BH03-A	BH04-A
pH	pH Unit	7.33	7.53	7.61	7.76	7.47	7.49	7.5
Total Alkalinity	mg/L	121	106	174	274	117	130	122
Total Acidity	mg/L	45	28	33	22	36	35	33

4. CONCLUSION

An assessment of the results indicates that groundwater in the CD2 Project area is hypersaline seawater that is pH neutral, and highly alkaline with significant buffering capacity.

Low levels of TRH and toluene were detected in groundwater samples collected from monitoring bores ATU-BH02-A and ATU-BH02-B as part of the April 2023 monitoring event. Analytical results for these parameters in groundwater samples collected from these monitoring wells as part of the September 2023 monitoring event recorded TRH and toluene concentrations below the laboratory detection limit.

There were no notable outliers across the September 2023 groundwater analytical results, apart from ATU-BH04-B. The variances in the results were noted in relation to salinity, and chloride and sulphate values. This appears consistent with the April 2023 results indicating that positioning of the well screen and location of the well may have bearing on this trend.

The September 2023 analytical data was generally consistent with the April 2023 groundwater results.

5. REFERENCES

DWER (2015). Identification and investigation of acid sulphate soils and acidic landscapes. Department of Water and Environmental Regulation, June 2015.

Kroopnick, Peter (1977) The CO4: CL Ration in Ocean Rainwater, Pacific Science Vol. 31, No.1, p 91-106, 1977

Nature (2015), Impact of climate changes during the last 5 million years on groundwater in basement aquifers, Nature, 22 September 2015

WEPL (2023). Car Dumper Hydrogeological Investigation: Groundwater Assessment Factual Memorandum, P22.268-RPT-GME-0, Western Environmental Pty Ltd, August 2023.

Appendix A – Field Stabilisation Measurements

BH01-A
Date of sample: 12/09/2023
Depth of sample: 12 m

Time	Elapsed time (min)	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
15:15	0	Clear	30.9	7.61	117154	135.3	2.22	4.11
15:16	1	Clear	30.9	7.5	117034	130.1	1.88	3.15
15:21	6	Clear	30.9	7.43	116823	111.9	1.38	7.75
15:26	11	Clear	30.9	7.41	116883	103.7	1.36	2.65
15:31	16	Clear	30.9	7.41	116891	102.9	1.33	2.58
Variance (last 3 readings)				+/- 0.02	+/- 0.03%			

BH01-B
Date of sample: 12/09/2023
Depth of sample: 5 m

Time	Elapsed time (min)	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
15:52	0	Clear	29.9	7.51	112055	113.7	1.96	32.32
15:54	2	Clear	29.8	7.48	111542	117.3	1.58	38.3
15:57	5	Clear	29.7	7.47	111402	124.2	1.50	28.2
16:02	10	Clear	29.7	7.47	111251	134.2	1.46	16.6
16:07	15	Clear	29.7	7.47	111047	143.2	1.45	10.61
16:12	20	Clear	29.6	7.47	111004	147.1	1.46	10.11
16:17	25	Clear	29.7	7.47	111059	149.4	1.48	9.43
Variance (last 3 readings)				+/- 0.00	+/- 0.02%			

BH02
Date of sample: 13/09/2023
Depth of sample: 22 m

Time	Elapsed time (min)	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
7:10	0	Clear	22.9	7.42	80847	18	2.71	5.61
7:11	1	Clear	24.6	7.35	89980	21.9	2.28	6.14
7:15	5	Clear	26.1	7.10	112790	9.7	1.13	13.62
7:20	10	Clear	27.3	7.01	132881	20.1	0.61	8.43
7:25	15	Clear	27.8	7.01	132987	18.4	0.52	8.51
7:30	20	Clear	28.1	7.03	134989	17.1	0.34	8.9
7:35	25	Clear	28.2	7.04	135316	15.4	0.31	10.68
7:40	30	Clear	28.4	7.05	135779	11.4	0.28	12.21
7:45	35	Clear	28.5	7.06	135980	12.2	0.26	12.82
Variance (last 3 readings)				+/- 0.02	+/- 0.3%			

BH03 A
Date of sample: 12/09/2023
Depth of sample: 15 m

Time	Elapsed time (min)	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
13:20	0	Cloudy/white	32.1	7.46	116101	139.3	2.42	150.31
13:21	1	Cloudy/white	31.6	7.33	115208	147.5	2.28	193.5
13:25	5	Cloudy/white	31.2	7.26	114178	161.4	2.02	157.34
13:30	10	Clearer/white	30.9	7.24	112966	177.3	1.91	73.4
13:35	15	Clearer/white	30.8	7.24	112714	189.2	1.88	48.92
13:40	20	Clear	30.5	7.25	111885	189.7	1.75	45.03
13:45	25	Clear	30.4	7.24	111485	176.3	1.5	27.72
13:50	30	Clear	30.4	7.24	111411	169.3	1.45	19.42
Variance (last 3 readings)				+/- 0.01	+/- 0.3%			

BH03 B
Date of sample: 12/09/2023
Depth of sample: 4.5 m

Time	Elapsed time (min)	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
14:13	0	Clear	29.8	7.62	94200	164.2	0.81	32.3
14:14	1	Clear	29.5	7.48	94603	161.3	0.38	30.68
14:18	5	Clear	29.5	7.38	95722	147.4	0.19	18.12
14:23	10	Clear	29.5	7.34	96239	111.1	0.14	12
14:28	15	Clear	29.5	7.34	96304	80.7	0.14	7.25
14:33	20	Clear	29.5	7.33	96305	65.1	0.16	8.16
Variance (last 3 readings)				+/- 0.01	+/- 0.04%			

BH04 A
Date of sample: 12/09/2023
Depth of sample: 12 m

Time	Elapsed time (min)	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
10:30	0	Clear	32.4	7.15	97842	175.4	0.63	3.2
10:31	1	Clear	32.4	7.16	97988	159.6	0.49	2.51
10:34	4	Clear	32.4	7.19	111928	117.0	0.39	2.35
10:37	7	Clear	32.4	7.20	111974	72.9	0.35	2.41
10:40	10	Clear	32.4	7.21	111861	51.3	0.29	2.28
10:45	15	Clear	32.4	7.24	112372	29.6	0.25	2.22
10:50	20	Clear	32.4	7.25	112321	26.3	0.22	2.30
10:55	25	Clear	32.4	7.26	112576	15.9	0.21	2.05
11:00	30	Clear	32.1	7.27	111880	13.8	4.18	1.70
11:05	35	Clear	32.1	7.27	111919	15.7	0.18	1.71
Variance (last 3 readings)				+/- 0.01	+/- 0.4%			

BH04 B
Date of sample: 12/09/2023
Depth of sample: 5.5 m

Time	Elapsed time (min)	Colour/ Appearance	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	Redox (mV)	Dissolved Oxygen (ppm)	Turbidity (NTU)
11:55	0	Cloudy/light brown	33.7	8.03	37200	121.9	2.15	182.6
11:58	3	Cloudy/light brown	31.8	7.82	35669	128.9	0.73	135.6
12:00	5	Cloudy/light brown	31.4	7.6	35617	98.6	0.52	176.3
12:05	10	Cloudy/light brown	31.2	7.5	37043	-55.15	0.31	46.8
12:10	15	Cloudy/light brown	31.2	7.5	36578	-54.15	0.29	40.1
Variance (last 3 readings)				+/- 0.1	+/- 2%			

Appendix B – Laboratory Results

Analyte grouping/Analyte	CAS Number	Unit	Limit of reporting	BH01A	BH01B	BH02	BH03A	BH03B	BH04A	BH04B
pH Value		pH Unit	0.01	7.47	7.53	7.33	7.49	7.61	7.5	7.76
Electrical Conductivity @ 25°C		µS/cm	1	102000	99000	124000	98800	87100	94800	31400
Total Dissolved Solids @180°C		mg/L	10	79600	77000	103000	75300	64100	72600	20200
Salinity		g/kg	0.01	74.2	71.8	93.9	71.6	61.7	68.2	19.5
Hydroxide Alkalinity as CaCO3	DMO-210-001	mg/L	1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	mg/L	1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	mg/L	1	117	106	121	130	174	122	274
Total Alkalinity as CaCO3		mg/L	1	117	106	121	130	174	122	274
Acidity as CaCO3		mg/L	1	36	28	45	35	33	33	22
Sulfate as SO4 - Turbidimetric	14808-79-8	mg/L	1	5010	4650	6120	5000	4320	4920	1890
Chloride	16887-00-6	mg/L	1	38300	36100	43500	36500	29100	34700	10200
Calcium	7440-70-2	mg/L	1	806	743	1080	696	666	662	258
Magnesium	7439-95-4	mg/L	1	2560	2390	3270	2350	2100	2250	539
Sodium	7440-23-5	mg/L	1	22800	22100	28500	22200	18800	21200	6460
Potassium	7/09/7440	mg/L	1	824	794	1020	818	678	815	236
Aluminium	7429-90-5	mg/L	0.01	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.05
Arsenic	7440-38-2	mg/L	0.001	0.01	0.012	<0.020	0.01	<0.010	0.01	0.007
Cadmium	7440-43-9	mg/L	0.0001	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010	<0.0005
Chromium	7440-47-3	mg/L	0.001	<0.010	0.015	<0.020	<0.010	<0.010	<0.010	<0.005
Copper	7440-50-8	mg/L	0.001	<0.010	<0.010	0.026	<0.010	<0.010	<0.010	<0.005
Lead	7439-92-1	mg/L	0.001	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.005
Manganese	7439-96-5	mg/L	0.001	0.06	<0.010	2.38	0.037	0.341	0.833	1.22
Nickel	7440-02-0	mg/L	0.001	0.012	<0.010	<0.020	<0.010	0.014	<0.010	0.011
Selenium	7782-49-2	mg/L	0.01	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.05
Zinc	7440-66-6	mg/L	0.005	<0.050	<0.050	<0.100	<0.050	<0.050	<0.050	<0.025
Iron	7439-89-6	mg/L	0.05	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50	<0.25
Mercury	7439-97-6	mg/L	0.0001	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0001
Nitrite + Nitrate as N		mg/L	0.01	0.15	2.41	<0.01	0.03	3.86	0.02	0.02
Total Kjeldahl Nitrogen as N		mg/L	0.1	0.7	0.7	0.5	<0.5	1.8	0.6	1.1
Total Nitrogen as N		mg/L	0.1	0.8	3.1	0.5	<0.5	5.7	0.6	1.1
Total Phosphorus as P		mg/L	0.01	0.05	<0.05	0.08	0.13	<0.05	0.08	0.12
Total Anions		meq/L	0.01	1190	1120	1360	1140	914	1080	332
Total Cations		meq/L	0.01	1260	1220	1590	1210	1040	1160	344
Ionic Balance		%	0.01	3.13	4.2	7.87	3.33	6.49	3.45	1.73

Metals filtered

	Analyte grouping/Analyte	CAS Number	Unit	Limit of reporting	BH01A	BH01B	BH02	BH03A	BH03B	BH04A	BH04B
	Dissolved Oxygen		mg/L	0.1	6.3	6.2	4.2	5.6	5.7	5	3.2
Total petroleum hydrocarbons (TPH)	C6 - C9 Fraction		µg/L	20	<20	<20	<20	<20	<20	<20	<20
	C10 - C14 Fraction		µg/L	50	<50	<50	<50	<50	<50	<50	<50
	C15 - C28 Fraction		µg/L	100	<100	<100	<100	<100	<100	<100	<100
	C29 - C36 Fraction		µg/L	50	<50	<50	<50	<50	<50	<50	<50
	C10 - C36 Fraction (sum)		µg/L	50	<50	<50	<50	<50	<50	<50	<50
Total recoverable hydrocarbons (TRH)	C6 - C10 Fraction	C6_C10	µg/L	20	<20	<20	<20	<20	<20	<20	<20
	C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	µg/L	20	<20	<20	<20	<20	<20	<20	<20
	>C10 - C16 Fraction		µg/L	100	<100	<100	<100	<100	<100	<100	<100
	>C16 - C34 Fraction		µg/L	100	<100	<100	<100	<100	<100	<100	<100
	>C34 - C40 Fraction		µg/L	100	<100	<100	<100	<100	<100	<100	<100
	>C10 - C40 Fraction (sum)		µg/L	100	<100	<100	<100	<100	<100	<100	<100
	>C10 - C16 Fraction minus Naphthalene (F2)		µg/L	100	<100	<100	<100	<100	<100	<100	<100
BTEX	Benzene	71-43-2	µg/L	1	<1	<1	<1	<1	<1	<1	<1
	Toluene	108-88-3	µg/L	2	<2	<2	<2	<2	<2	<2	<2
	Ethylbenzene	100-41-4	µg/L	2	<2	<2	<2	<2	<2	<2	<2
	meta- & para-Xylene	108-38-3 106-42-3	µg/L	2	<2	<2	<2	<2	<2	<2	<2
	ortho-Xylene	95-47-6	µg/L	2	<2	<2	<2	<2	<2	<2	<2
	Total Xylenes		µg/L	2	<2	<2	<2	<2	<2	<2	<2
	Sum of BTEX		µg/L	1	<1	<1	<1	<1	<1	<1	<1
TPH(V)/BTEX Surrogates	Naphthalene	91-20-3	µg/L	5	<5	<5	<5	<5	<5	<5	<5
	1.2-Dichloroethane-D4	17060-07-0	%	2	123	120	116	116	110	111	112
	Toluene-D8	2037-26-5	%	2	105	96.5	99	97.4	97.7	104	101
	4-Bromofluorobenzene	460-00-4	%	2	108	102	104	98.5	98.4	104	106

Appendix C – Laboratory Documentation

QUALITY CONTROL REPORT

Work Order	: **EP2312712**	Page	: 1 of 9
Client	: **CASH SALES PERTH**	Laboratory	: Environmental Division Perth
Contact	: Rob Swift	Contact	: Customer Services EP
Address	: Level 1, 640 Murray St West Perth 6005	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: PW011723 HanRoy Iron Ore Projects Pty Ltd	Date Samples Received	: 14-Sep-2023
Order number	: ----	Date Analysis Commenced	: 14-Sep-2023
C-O-C number	: ----	Issue Date	: 29-Sep-2023
Sampler	: Greg van Blomestein		
Site	: ----		
Quote number	: EP23CASHWA0052		
No. of samples received	: 7		
No. of samples analysed	: 7		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA005P: pH by PC Titrator (QC Lot: 5307381)									
EP2312712-005	BH03B	EA005-P: pH Value	----	0.01	pH Unit	7.61	7.62	0.1	0% - 20%
EP2312721-008	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	5.41	5.49	1.5	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 5307380)									
EP2312700-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	765	762	0.4	0% - 20%
EP2312712-005	BH03B	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	87100	86600	0.6	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 5303263)									
EP2312595-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1320	1290	1.8	0% - 20%
EP2312676-004	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1370	1320	3.5	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 5307379)									
EP2312700-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	135	150	10.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	135	150	10.1	0% - 20%
EP2312712-005	BH03B	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	174	173	0.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	174	173	0.8	0% - 20%
ED038A: Acidity (QC Lot: 5308165)									
EP2312712-001	BH01A	ED038: Acidity as CaCO3	----	1	mg/L	36	34	4.0	0% - 20%
EP2312754-002	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	26	32	19.6	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5298906)									
EP2312633-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	78	73	7.6	0% - 20%
EP2312702-010	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	702	799	13.0	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED045G: Chloride by Discrete Analyser (QC Lot: 5298907)									
EP2312633-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	534	537	0.6	0% - 20%
EP2312702-010	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1050	1070	1.5	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 5307704)									
EP2312754-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	6	6	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	15	14	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	108	105	2.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
EP2312712-001	BH01A	ED093F: Calcium	7440-70-2	1	mg/L	806	823	2.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2560	2560	0.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	22800	23100	1.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	824	837	1.6	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5307702)									
EP2312712-001	BH01A	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0010	<0.0010	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.010	0.011	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.010	<0.010	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.060	0.060	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.012	0.011	14.4	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.10	<0.10	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.10	<0.10	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.50	<0.50	0.0	No Limit
EP2312563-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.155	0.158	1.7	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.384	0.389	1.3	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.011	0.012	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.22	0.24	7.0	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	31.4	32.2	2.4	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 5307703)									
EP2312712-003	BH02	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0005	0.0	No Limit
EP2312756-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0005	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5298970)									
EP2312641-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	36.8	38.0	3.1	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5298970) - continued									
EP2312480-009	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5300009)									
EP2312593-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.4	0.0	No Limit
EP2312699-007	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.0	1.3	32.4	0% - 50%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5300011)									
EP2312712-003	BH02	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.5	0.6	0.0	No Limit
EP2312754-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.2	1.2	0.0	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5300010)									
EP2312712-003	BH02	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.08	0.16	59.0	No Limit
EP2312754-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.05	0.04	0.0	No Limit
EP025: Oxygen - Dissolved (DO) (QC Lot: 5299103)									
EP2312712-001	BH01A	EP025: Dissolved Oxygen	----	0.1	mg/L	6.3	6.2	0.0	0% - 20%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5299603)									
EP2312707-002	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5299827)									
EP2312707-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP2312726-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5299603)									
EP2312707-002	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5299827)									
EP2312707-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP2312726-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5299827)									
EP2312707-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2312726-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 5299827) - continued									
EP2312726-002	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 5307381)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA010P: Conductivity by PC Titrator (QCLot: 5307380)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	24800 µS/cm	97.8	92.1	105
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5303263)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	97.4	94.7	109
				<10	1000 mg/L	98.8	94.7	109
ED037P: Alkalinity by PC Titrator (QCLot: 5307379)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	116	85.1	126
				<1	200 mg/L	104	90.5	111
ED038A: Acidity (QCLot: 5308165)								
ED038: Acidity as CaCO3	----	----	mg/L	----	20 mg/L	107	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5298906)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	94.5	89.9	112
				<1	500 mg/L	106	89.9	112
ED045G: Chloride by Discrete Analyser (QCLot: 5298907)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	88.6	113
				<1	1000 mg/L	103	88.6	113
ED093F: Dissolved Major Cations (QCLot: 5307704)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	86.5	117
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.3	88.4	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	101	91.4	113
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	99.3	84.6	108
EG020F: Dissolved Metals by ICP-MS (QCLot: 5307702)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	100	90.2	111
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.4	89.7	108

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5307702) - continued								
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.8	87.3	107
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	92.8	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.3	89.4	106
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	97.0	87.6	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.7	87.2	108
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	91.1	83.8	102
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	101	89.5	112
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	95.4	89.9	120
EG035F: Dissolved Mercury by FIMS (QCLot: 5307703)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	103	85.6	120
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5298970)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	97.8	90.5	110
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5300009)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	88.0	80.0	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5300011)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	87.7	80.0	115
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5300010)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	108	70.0	110
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5299603)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	682 µg/L	87.6	39.3	103
EP071: C15 - C28 Fraction	----	100	µg/L	<100	686 µg/L	73.9	47.2	122
EP071: C29 - C36 Fraction	----	50	µg/L	<50	514 µg/L	109	42.5	119
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5299827)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	94.3	73.6	113
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5299603)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	692 µg/L	71.7	47.0	100
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	860 µg/L	97.6	46.2	116
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	322 µg/L	89.9	24.7	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5299827)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	95.3	73.9	115
EP080: BTEXN (QCLot: 5299827)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	94.6	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	95.3	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	90.8	84.4	113

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP080: BTEXN (QCLot: 5299827) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	93.5	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	94.4	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	96.4	77.0	118

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5298906)							
EP2312633-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	125	70.4	130
ED045G: Chloride by Discrete Analyser (QCLot: 5298907)							
EP2312633-011	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	104	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5307702)							
EP2312563-002	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	102	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	100	70.0	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	98.7	70.0	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	97.4	70.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	95.5	70.0	130
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	# Not Determined	70.0	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	99.3	70.0	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	98.7	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5307703)							
EP2312712-002	BH01B	EG035F: Mercury	7439-97-6	0.01 mg/L	94.4	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5298970)							
EP2312480-009	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	85.9	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5300009)							
EP2312593-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	85.5	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5300011)							
EP2312712-004	BH03A	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	95.2	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5300010)							
EP2312712-004	BH03A	EK067G: Total Phosphorus as P	----	5 mg/L	95.0	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5299603)							
EP2312707-001	Anonymous	EP071: C10 - C14 Fraction	----	341 µg/L	91.8	44.5	122
		EP071: C15 - C28 Fraction	----	343 µg/L	83.5	55.1	143
		EP071: C29 - C36 Fraction	----	257 µg/L	125	53.6	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5299827)							
EP2312707-002	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	97.7	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5299603)							
EP2312707-001	Anonymous	EP071: >C10 - C16 Fraction	----	346 µg/L	75.3	44.5	122
		EP071: >C16 - C34 Fraction	----	430 µg/L	113	55.1	143
		EP071: >C34 - C40 Fraction	----	161 µg/L	117	53.6	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5299827)							
EP2312707-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	101	77.0	137
EP080: BTEXN (QCLot: 5299827)							
EP2312707-002	Anonymous	EP080: Benzene	71-43-2	20 µg/L	102	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	104	73.5	126

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2312712**	Page	: 1 of 9
Client	: **CASH SALES PERTH**	Laboratory	: Environmental Division Perth
Contact	: Rob Swift	Telephone	: +61-8-9406 1301
Project	: PW011723 HanRoy Iron Ore Projects Pty Ltd	Date Samples Received	: 14-Sep-2023
Site	: ----	Issue Date	: 29-Sep-2023
Sampler	: Greg van Blomestein	No. of samples received	: 7
Order number	: ----	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG020F: Dissolved Metals by ICP-MS	EP2312563--002	Anonymous	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
BH01A,	BH01B,	----	----	----	20-Sep-2023	12-Sep-2023	**8**
BH02,	BH03A,						
BH03B,	BH04A,						
BH04B							
EP025: Oxygen - Dissolved (DO)							
Clear Plastic Bottle - Natural							
BH01A,	BH01B,	----	----	----	14-Sep-2023	12-Sep-2023	**2**
BH02,	BH03A,						
BH03B,	BH04A,						
BH04B							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	1	16	6.25	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✓ = Within holding time.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	----	----	----	**20-Sep-2023**	12-Sep-2023	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	----	----	----	**20-Sep-2023**	10-Oct-2023	✓
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	----	----	----	**18-Sep-2023**	19-Sep-2023	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	----	----	----	**20-Sep-2023**	26-Sep-2023	✓
ED038A: Acidity							
Clear Plastic Bottle - Natural (ED038)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	----	----	----	**21-Sep-2023**	26-Sep-2023	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	----	----	----	**21-Sep-2023**	10-Oct-2023	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	----	----	----	**21-Sep-2023**	10-Oct-2023	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (ED093F)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**----**	----	----	**19-Sep-2023**	10-Oct-2023	✓
EG020F: Dissolved Metals by ICP-MS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**----**	----	----	**19-Sep-2023**	10-Mar-2024	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**----**	----	----	**19-Sep-2023**	10-Oct-2023	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**----**	----	----	**19-Sep-2023**	10-Oct-2023	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**20-Sep-2023**	10-Oct-2023	✓	**20-Sep-2023**	10-Oct-2023	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**20-Sep-2023**	10-Oct-2023	✓	**20-Sep-2023**	10-Oct-2023	✓
EP025: Oxygen - Dissolved (DO)							
Clear Plastic Bottle - Natural (EP025)							
BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**----**	----	----	**14-Sep-2023**	12-Sep-2023	×

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**15-Sep-2023**	19-Sep-2023	✓	**20-Sep-2023**	25-Oct-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH01A	**12-Sep-2023**	**15-Sep-2023**	26-Sep-2023	✓	**15-Sep-2023**	26-Sep-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**15-Sep-2023**	26-Sep-2023	✓	**16-Sep-2023**	26-Sep-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) BH01A, BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**15-Sep-2023**	19-Sep-2023	✓	**20-Sep-2023**	25-Oct-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH01A	**12-Sep-2023**	**15-Sep-2023**	26-Sep-2023	✓	**15-Sep-2023**	26-Sep-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**15-Sep-2023**	26-Sep-2023	✓	**16-Sep-2023**	26-Sep-2023	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) BH01A	**12-Sep-2023**	**15-Sep-2023**	26-Sep-2023	✓	**15-Sep-2023**	26-Sep-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) BH01B, BH02, BH03A, BH03B, BH04A, BH04B	**12-Sep-2023**	**15-Sep-2023**	26-Sep-2023	✓	**16-Sep-2023**	26-Sep-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oxygen - Dissolved	EP025	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by Auto Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by Auto Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by Auto Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Salinity	EA020-EC-P	WATER	In house: Referenced to APHA 2520B. Calculation from Electrical conductivity. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Acidity as Calcium Carbonate	ED038	WATER	In house: Referenced to APHA 2310 B Acidity is determined by manual titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).

Analytical Methods	Method	Matrix	Method Descriptions
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Oxygen - Dissolved	EP025	WATER	In house: Referenced to APHA 4500-O G. Dissolved Oxygen Probe. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

CERTIFICATE OF ANALYSIS

Work Order	: **EP2312712**	Page	: 1 of 9
Client	: **CASH SALES PERTH**	Laboratory	: Environmental Division Perth
Contact	: Rob Swift	Contact	: Customer Services EP
Address	: Level 1, 640 Murray St West Perth 6005	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	PW011723 HanRoy Iron Ore Projects Pty Ltd	Date Samples Received	14-Sep-2023 11:45
Order number	: ----	Date Analysis Commenced	: 14-Sep-2023
C-O-C number	: ----	Issue Date	: 29-Sep-2023 09:43
Sampler	: Greg van Blomestein		
Site	: ----		
Quote number	EP23CASHWA0052		
No. of samples received	: 7		
No. of samples analysed	7		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EK061G/EK067G (TKN/TP): LOR for samples EP2312712-002, -004 and -005 raised due to the high amount of TDS present.
- EG035: LOR raised for samples EP2312712 -001 to -006 due to possible matrix interference.
- EG020: Metals LOR for samples EP2312712 -001 to -007 raised due to high TDS content.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH01A	BH01B	BH02	BH03A	BH03B
			Sampling date / time	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00
Compound	CAS Number	LOR	Unit	EP2312712-001	EP2312712-002	EP2312712-003	EP2312712-004	EP2312712-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.47	7.53	7.33	7.49	7.61
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	102000	99000	124000	98800	87100
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	79600	77000	103000	75300	64100
EA020EC: Salinity								
Salinity	----	0.01	g/kg	74.2	71.8	93.9	71.6	61.7
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	117	106	121	130	174
Total Alkalinity as CaCO3	----	1	mg/L	117	106	121	130	174
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	36	28	45	35	33
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5010	4650	6120	5000	4320
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	38300	36100	43500	36500	29100
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	806	743	1080	696	666
Magnesium	7439-95-4	1	mg/L	2560	2390	3270	2350	2100
Sodium	7440-23-5	1	mg/L	22800	22100	28500	22200	18800
Potassium	7440-09-7	1	mg/L	824	794	1020	818	678
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.10	<0.10	<0.20	<0.10	<0.10
Arsenic	7440-38-2	0.001	mg/L	0.010	0.012	<0.020	0.010	<0.010
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010
Chromium	7440-47-3	0.001	mg/L	<0.010	0.015	<0.020	<0.010	<0.010
Copper	7440-50-8	0.001	mg/L	<0.010	<0.010	0.026	<0.010	<0.010
Nickel	7440-02-0	0.001	mg/L	0.012	<0.010	<0.020	<0.010	0.014
Lead	7439-92-1	0.001	mg/L	<0.010	<0.010	<0.020	<0.010	<0.010
Selenium	7782-49-2	0.01	mg/L	<0.10	<0.10	<0.20	<0.10	<0.10
Zinc	7440-66-6	0.005	mg/L	<0.050	<0.050	<0.100	<0.050	<0.050

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH01A	BH01B	BH02	BH03A	BH03B
			Sampling date / time	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00
Compound	CAS Number	LOR	Unit	EP2312712-001	EP2312712-002	EP2312712-003	EP2312712-004	EP2312712-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Manganese	7439-96-5	0.001	mg/L	**0.060**	<0.010	**2.38**	**0.037**	**0.341**
Iron	7439-89-6	0.05	mg/L	<0.50	<0.50	<1.00	<0.50	<0.50
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.15**	**2.41**	<0.01	**0.03**	**3.86**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.7**	**0.7**	**0.5**	<0.5	**1.8**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.8**	**3.1**	**0.5**	<0.5	**5.7**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.05**	<0.05	**0.08**	**0.13**	<0.05
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**1190**	**1120**	**1360**	**1140**	**914**
ø Total Cations	----	0.01	meq/L	**1260**	**1220**	**1590**	**1210**	**1040**
ø Ionic Balance	----	0.01	%	**3.13**	**4.20**	**7.87**	**3.33**	**6.49**
EP025: Oxygen - Dissolved (DO)								
Dissolved Oxygen	----	0.1	mg/L	**6.3**	**6.2**	**4.2**	**5.6**	**5.7**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH01A	BH01B	BH02	BH03A	BH03B
			Sampling date / time	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00
Compound	CAS Number	LOR	Unit	EP2312712-001	EP2312712-002	EP2312712-003	EP2312712-004	EP2312712-005
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	123	120	116	116	110
Toluene-D8	2037-26-5	2	%	105	96.5	99.0	97.4	97.7
4-Bromofluorobenzene	460-00-4	2	%	108	102	104	98.5	98.4

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH04A	BH04B	----	----	----
			Sampling date / time	12-Sep-2023 00:00	12-Sep-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EP2312712-006	EP2312712-007	--------	--------	--------
				Result	Result	---	---	---
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.50**	**7.76**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**94800**	**31400**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**72600**	**20200**	----	----	----
EA020EC: Salinity								
Salinity	----	0.01	g/kg	**68.2**	**19.5**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**122**	**274**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**122**	**274**	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**33**	**22**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**4920**	**1890**	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**34700**	**10200**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**662**	**258**	----	----	----
Magnesium	7439-95-4	1	mg/L	**2250**	**539**	----	----	----
Sodium	7440-23-5	1	mg/L	**21200**	**6460**	----	----	----
Potassium	7440-09-7	1	mg/L	**815**	**236**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.10	<0.05	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.010**	**0.007**	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0010	<0.0005	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.010	<0.005	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.010	<0.005	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.010	**0.011**	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.010	<0.005	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.10	<0.05	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.050	<0.025	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH04A	BH04B	----	----	----
			Sampling date / time	12-Sep-2023 00:00	12-Sep-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EP2312712-006	EP2312712-007	--------	--------	--------
				Result	Result	---	---	---
EG020F: Dissolved Metals by ICP-MS - Continued								
Manganese	7439-96-5	0.001	mg/L	**0.833**	**1.22**	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.50	<0.25	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0002	<0.0001	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.02**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.6**	**1.1**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.6**	**1.1**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.08**	**0.12**	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**1080**	**332**	----	----	----
ø Total Cations	----	0.01	meq/L	**1160**	**344**	----	----	----
ø Ionic Balance	----	0.01	%	**3.45**	**1.73**	----	----	----
EP025: Oxygen - Dissolved (DO)								
Dissolved Oxygen	----	0.1	mg/L	**5.0**	**3.2**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH04A	BH04B	----	----	----
				Sampling date / time	12-Sep-2023 00:00	12-Sep-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EP2312712-006	EP2312712-007	--------	--------	--------
					Result	Result	---	---	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L		<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		111	112	----	----	----
Toluene-D8	2037-26-5	2	%		104	101	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		104	106	----	----	----

Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Appendix D – Figures

Figure 1: CD2 Project Area

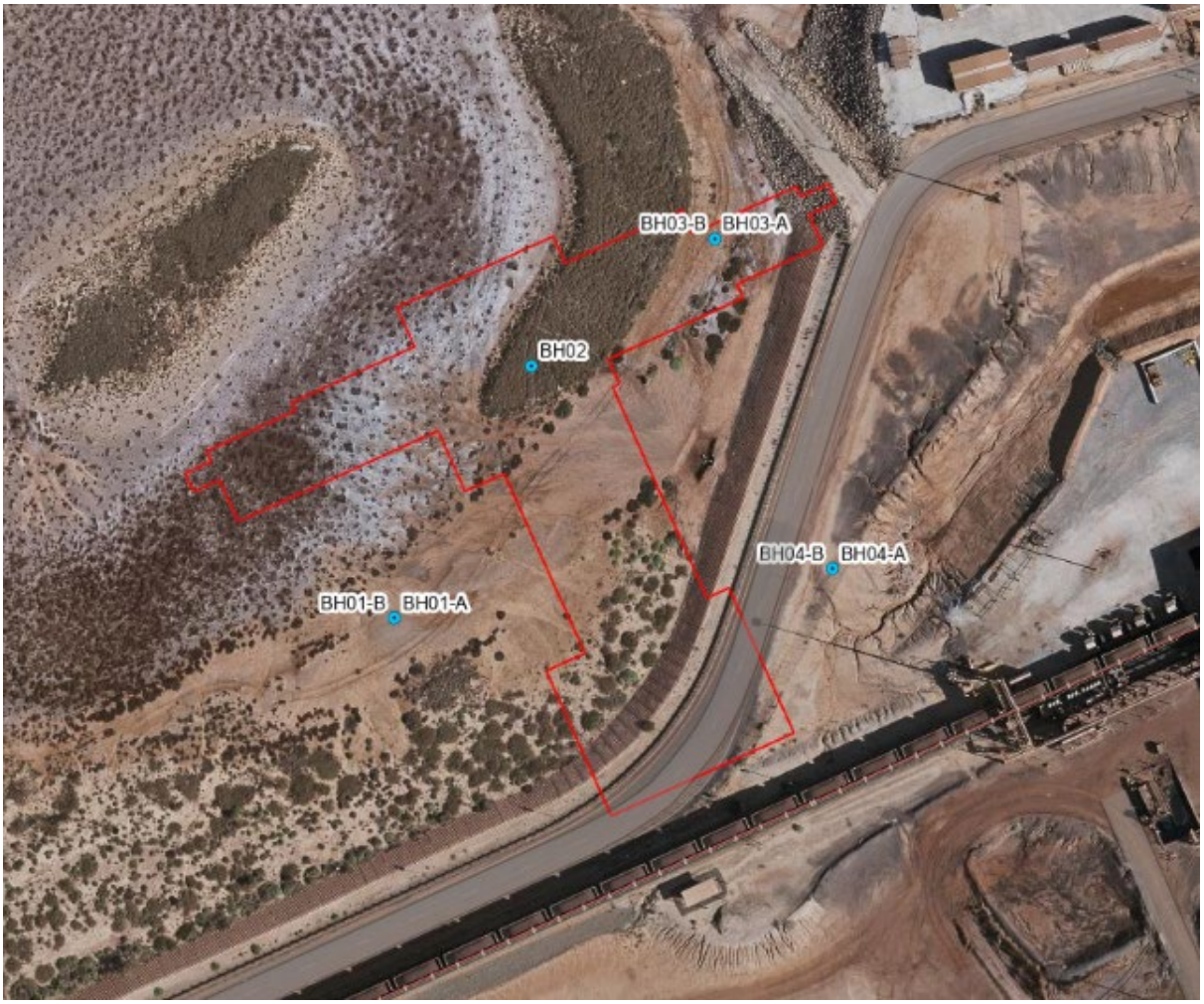

Figure 2: Monitoring Well Locations