



Ground Doctor Pty Ltd

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14 February 2020

Hy-tec Industries Pty Ltd
Austen Quarry
391 Jenolan Caves Road
Hartley NSW 2790
Craig.Mcdonald@adbri.com.au

Attention: Mr Craig McDonald

Dear Craig,

**RE: JANUARY 2020 GROUNDWATER MONITORING RESULTS,
AUSTEN QUARRY, HARTLEY, NSW**

Ground Doctor was engaged by Hy-tec Industries Pty Ltd (Hy-tec) to undertake the January 2020 round of baseline groundwater monitoring at the Austen Quarry, 391 Jenolan Caves Road, Hartley, NSW (the site).

1 Background Information

The Stage 2 Expansion of the Austen Quarry was approved on 15 July 2015 (development application SSD-6084). An updated site specific Water Management Plan (WMP) (Groundwork Plus, 2017) was developed as required by the conditions of consent for development. The WMP included provisions for managing both surface water and groundwater impacts at the site. The revised WMP was approved in late 2017.

The WMP required the establishment of groundwater monitoring bores at three locations around the periphery of the open pit, establishment of water level data loggers in each bore and collection of four rounds of baseline groundwater quality over two years following establishment of the monitoring bores.

The monitoring bores were established in December 2017. Ground Doctor conducted the first round of baseline monitoring in early January 2018. Water level loggers were installed into the monitoring bores at the completion of the January 2018 monitoring round. Subsequent monitoring was conducted in June 2018, January 2019 and July 2019.

2 Objectives

The objectives of the work undertaken was to complete the fifth round (January 2020) of baseline groundwater monitoring in accordance with the WMP. The WMP stipulated that baseline monitoring would occur at six monthly intervals for a period of 2 years. The January 2020 monitoring round was conducted approximately 2 years after the initial monitoring round and as such is the final round of baseline groundwater monitoring.

3 Monitoring Bore Locations

The monitoring bore locations are shown on *Figure 1 of Attachment A*. Monitoring bore coordinates and details are summarised in *Table 1*. *Table 1* also presents a summary of the monitoring bore construction details.

Table 1: Monitoring Bore Construction Details

Bore ID	Easting	Northing	Approx. Surface Elevation (AHD)	Depth to Bottom (btc)	Screened Intervals (bgl)	Stickup (agl)
MB01S	235245	6281077	700m	7.42m	3.7-6.7m	0.8m
MB01D	235259	6281098	700m	29.30m	20-23m 26-28.5m	0.8m
MB02	235915	6280398	710m	29.10m	10.5-13.5m 22.5-28.5m	0.6m
MB03	236419	6281786	690m	25.31m	18.5-24.5m	0.4m

Eastings and northings are MGA Zone 56.

btc = below top of casing

bgl = below ground level

agl = above ground level

4 Groundwater Sampling Methodology

Each monitoring bore was gauged using an electronic dip meter prior to any disturbance of the water column. Bores were gauged on the afternoon of 6 January 2020. The depth to water was measured from the top of casing at each bore. MB03 was installed into a dry hole and the hole was found to be dry at the time of gauging.

The water level logger was removed from each borehole following gauging. Data stored within the water level loggers were downloaded on 7 January 2020. The water level loggers were reinstated in each monitoring bore following sampling on the morning of 7 January 2020.

Deep bores were purged dry using a bore specific disposable bailer. The deep bores were bailed dry on 6 January 2020. The bores were allowed to recover for a period of approximately 18 hours prior to sample collection. The bailer was lowered gently into the deep bores to collect samples that were free of suspended sediment. After samples had been collected additional water was bailed from the deep bores to allow measurement of field water quality parameters.

The shallow bore (MB01S) was purged dry after approximately 6L of water had been removed. MB01S recovered quickly and was sampled approximately 10 minutes after it was bailed dry. Water quality parameters were measured at the time of sampling.

A water sample was collected from standing water in the pit floor on 7 January 2020. An unpreserved sample bottle was filled directly from ponded water in the pit sump. This bottle was then used to fill preserved sample bottles and samples requiring field filtering. Once sampling was complete field water quality parameters were measured. The water quality meter was placed in the pond and allowed to equilibrate for a period of approximately 10 minutes. The field water quality parameters were then recorded.

Water quality parameters could not be measured in Yorkeys Creek adjacent to MB01S during the January 2020 monitoring round as it was dry. This location does not form part of the monitoring requirements outlined in the WMP.

Water quality measurements were made using a YSI water quality meter hired from Airmet Scientific. The meter was calibrated prior to dispatch. A calibration record for the water quality meter is presented as *Attachment C*.

Water samples were collected into laboratory supplied bottles, each marked with the appropriate identification. Sample bottles were appropriately preserved where necessary. The samples for dissolved metals analysis were filtered in the field using disposable 45µm filters. The sampler wore disposable nitrile gloves at all times during sampling to minimise potential for cross contamination. Samples were placed into an esky with ice immediately after collection. Ice was replenished as required to ensure samples remained cool whilst in storage.

Water samples were dispatched to Envirolab (Sydney) on the afternoon of 7 January 2020. An overnight courier service was used to minimise transit time. Samples were received by Envirolab on the morning of 8 January 2020.

Groundwater samples collected from each monitoring bore were analysed for major cations, major anions, nutrients and dissolved metals as specified in Table 37 of the WMP (Groundwork Plus, 2017). The water samples collected from the pit were analysed for major cations, major anions, nutrients, dissolved metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs) as specified in Table 37 of the WMP (Groundwork Plus, 2017).

5 Field Observations

Field observations were recorded on bore sampling forms, which are presented as *Attachment B*. Depth to water results and measured field parameters at the time of sampling are presented in *Table 2* with data collected during the three previous monitoring rounds.

Table 2: Summary of Field Observations – All Monitoring Rounds

Bore ID	Date	DTW (m btc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
MB01S	Jan-18	4.63m	15.9	6.08	575	6.27	-11.6
	Jun-18	4.48m	16.5	5.41	343	7.41	94
	Jan-19	4.42m	15.7	3.95	495	7.29	122
	Jul-19	4.36m	15.7	4.37	465	7.52	97
	Jan-20	5.63m	15.4	2.47	623	7.88	48
MB01D	Jan-18	5.49m	16.7	2.64	1170	7.02	-22
	Jun-18	1.94m	14.7	1.56	779	7.44	85
	Jan-19	2.08m	17.3	1.41	931	7.58	95
	Jul-19	4.55m	15.4	5.68	666	7.36	89
	Jan-20	4.10m	15.9	2.80	999	8.15	3
MB02	Jan-18	17.43m	16.4	3.73	1210	7.03	-5
	Jun-18	17.54m	12.9	5.08	927	7.32	130
	Jan-19	17.74m	16.3	1.77	1180	7.27	127
	Jul-19	17.82m	13.8	4.10	1083	7.39	139
	Jan-20	17.92m	15.4	2.54	1418	7.39	116
MB03	Jan-18	Dry	-	-	-	-	-
	Jun-18	Dry	-	-	-	-	-
	Jan-19	Dry	-	-	-	-	-
	Jul-19	Dry	-	-	-	-	-
	Jan-20	Dry	-	-	-	-	-
Pit Water	Jan-18	-	21.9	4.30	820	7.00	8
	Jun-18	-	7.6	6.97	357	7.01	119
	Jan-19	-	25.2	5.30	794	8.20	91
	Jul-19	-	7.9	9.50	536	8.33	129
	Jan-20	-	19.4	3.17	1015	7.82	110
Yorkeys Creek	Jan-18	-	-	-	-	-	-
	Jun-18	-	6.7	12.25	353	7.93	104
	Jan-19	-	21.3	2.31	469	7.53	93
	Jul-19	-	3.5	9.64	314	8.64	57
	Jan-20	Creek Dry	-	-	-	-	-

6 Analytical Results

The certificate of analysis for water samples is presented as *Attachment E*.

A summary of analytical data is presented in *Table F1* of *Attachment F*. The summary table presents January 2018, June 2018, January 2019, July 2019 and January 2020 baseline groundwater quality against preliminary triggers outlined in the WMP (Groundwork Plus, 2017).

Five rounds of data have been collected from the site to date with the aim of establishing a baseline.

Exceedances of preliminary triggers across all monitoring rounds were as follows:

- The reported zinc concentration in the water sample collected from “MB01S” exceeded the ANZECC (2000) threshold for 95% protection of fresh water aquatic ecosystems in the January 2018 monitoring round.
- The reported zinc concentration in the water sample collected from “MB02” exceeded the ANZECC (2000) threshold for 95% protection of fresh water aquatic ecosystems in the January 2020 monitoring round.
- The reported zinc concentration in the water sample collected from the “Pit” exceeded the ANZECC (2000) threshold for 95% protection of fresh water aquatic ecosystems in the January 2018, June 2018 and January 2020 monitoring rounds.
- The report manganese concentration in the sample collected from the “Pit” exceeded the Australian Drinking Water (2011) and ANZECC (2000) threshold for 95% protection of fresh water aquatic ecosystems in the January 2018 monitoring round.
- The report manganese concentration in the water sample collected from “MB01D” exceeded the Australian Drinking Water (2011) threshold in the June 2018 monitoring round.
- The reported cadmium concentration in the water sample collected from the “Pit” exceeded the ANZECC (2000) threshold for 95% protection of fresh water aquatic ecosystems and/or the Australian Drinking Water (2011) threshold in the January 2018, June 2018 and January 2020 monitoring rounds.
- The reported nickel concentration in the water sample collected from the “MB01D” exceeded the ANZECC (2000) threshold for 95% protection of fresh water aquatic ecosystems in the January 2018 monitoring round.
- The reported copper concentrations in the water sample collected from “MW01S”, “MW01D” and the “Pit” exceeded the ANZECC (2000) threshold for 95% protection of fresh water aquatic ecosystems in the January 2020 monitoring round.

The purpose of the baseline monitoring undertaken was to obtain site specific water quality data that can be used to develop site specific triggers. Five rounds of baseline data have provided a spread of results that can be used as a baseline against which any future impacts (if any) can be compared.

7 Water Level Logger Data

All water level loggers were set to record water level at 6 hour intervals commencing 12am on 12 January 2018. The water level data loggers were not vented. A barologger was deployed to record air pressure at the same recording interval to allow water level logger readings to be corrected to account for changes in air pressure.

Water level data loggers installed in MB01S, MB01D and MB02, and the barometric pressure logger installed at MB03, were downloaded on 7 January 2020.

The raw data was corrected for changes in air pressure using the barometric pressure data. The manual water level measurement collected at the time the loggers were removed from each borehole were used to convert the water level logger data to a depth to water relative to the top of the PVC bore casing.

At the completion of the monitoring round the water level loggers were redeployed in their respective boreholes.

Corrected water level data is presented graphically as *Attachment D*.

7.1 MB01S

The water level in MB01S was relatively consistent over the first 21 months of the baseline monitoring period (January 2018 to July 2019) with variation between approximately 4.2m below top of casing and 4.9m below top of casing. Over the last three months of the monitoring period (October 2019 to January 2020) the water level in MB01S fell by over 1m. The observed decreasing water level at MB01S was most likely associated with drought conditions in the second half of 2019 which resulted in drying of Yorkeys Creek. There was no water within Yorkeys Creek during the January 2020 monitoring round.

Variation in standing water level within MB01S is inferred to be primarily related to water level changes in the adjacent Yorkeys Creek.

7.2 MB01D

The water level within MB01D stayed below the water level logger for a period of approximately 1 week after each groundwater monitoring event and took approximately 3 weeks to return to the pre-sampling level following each monitoring round. The slow recovery was due to the relatively low permeability of the fractured rock aquifer.

Once groundwater levels had re-established in MB01D post July 2019 sampling the depth to water varied between 1.7m to 4.4m below top of casing, with a decreasing trend over the monitoring period.

The reason for variation in MB01D is not well understood but should become more apparent with the collection of longer term water level data. It is possible that water level changes at MB01D are partly related to accumulation of water within the base of the Quarry during periods of wet weather, and subsequent dewatering of the excavation.

Relative elevation data is not available for the monitoring bore network. MB01S and MB01D are located approximately 20m apart. The top of casing at MB01D is estimated to be at least 1m above the top of casing at MB01S. The standing water level within MB01D is generally higher than that in MB01S. This indicates an upward gradient with potential for groundwater intersected from the deeper bore to discharge into Yorkeys Creek. The water level at MB01D was higher than the water level within MB01S at all times during the monitoring period, indicating the upward gradient was maintained. The relatively steep decline in water levels at MB01S may in part be related to falling water levels at depth. However, the dataset to date indicates that groundwater inflow is likely to be an insignificant contribution to water within Yorkeys Creek, which would be reliant overland flow from the upgradient catchment. This inference is supported by a lack of correlation of water levels within MB01S and MB01D during the July 2019 and January 2020 period. Water levels within MB01D were at their lowest during this period without appearing to have had a significant affect on water levels within MB01S.

7.3 MB02

The drawdown effects of purging and sampling are evident in the water level data for MB02 for approximately 48hours after each monitoring event. Stabilised water level readings for MB02 are relatively uniform, with a minor decreasing trend across the 24 month monitoring period from approximately 17.4m to 17.9m below top of casing. The overall decreasing trend over the 24 month monitoring period is attributed to the relatively dry climatic conditions.

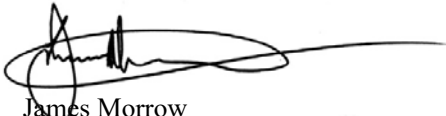
8 Conclusions and Recommendations

Baseline groundwater monitoring was undertaken on a six-monthly basis for a two year period after the establishment of groundwater monitoring bores, as specified by the WMP (Groundwork Plus, 2017). The data has been collated and can be used to develop site specific triggers for any future groundwater impact assessment.

Water level loggers have been used to collect groundwater level data during the two year monitoring period and will collect water level data for the foreseeable future. Ongoing water level monitoring is recommended on a six-monthly basis. Water level logger data should be collected and reported on a six-monthly basis.

If you have any questions regarding the works outlined in this report please contact the undersigned on 0407 875 302.

Kind Regards



James Morrow
Environmental Engineer
Ground Doctor Pty Ltd

2018-GD001-L4

Attachment A – Figure

Attachment B – Groundwater Sampling Forms

Attachment C – Water Quality Meter Calibration Record

Attachment D – Groundwater Level Charts

Attachment E – Laboratory Certificate of Analysis

Attachment F – Analytical Results Summary Table

9 References

- ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Trigger values for 95% protection of fresh water ecosystems.
- Groundwork Plus (2017), “*Austen Quarry Water Management Plan*”, Report Number 1517_610_002_RPTO_Water Management Plan_V8, 10 October 2017

Attachment A

Figure



1:9,028
0 100 200m



Ground Doctor Pty Ltd

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PO Box 6278
22 Tamworth Street
Dubbo NSW 2830

Project Name: Groundwater Monitoring Bore Installation and July 2019 Groundwater Monitoring Round

Project Number: 2018-GD001

Figure 1

Groundwater Monitoring Bore Locations

Attachment B

Groundwater Sampling Forms



**Austen Quarry
Groundwater Monitoring Form**

Monitoring Bore ID:	MB01S
Date:	6 and 7 January 2020

Depth to Water:	5.63m
Depth to Bottom:	7.42m
Saturated Well Depth:	1.8m
Well Volume:	4L (Saturated Well Depth x 2L)

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
6L	15.4	2.47	623	7.88	48

Description of Works / Observations:
Bore bailed dry after approximately 6L removed.
Groundwater was turbid (grey-brown) during purging.
Groundwater was allowed to settle before sampling to minimise turbidity in samples.



**Austen Quarry
Groundwater Monitoring Form**

Monitoring Bore ID:	MB01D
Date:	6 and 7 January 2020

Depth to Water:	4.10m
Depth to Bottom:	29.3m
Saturated Well Depth:	25.2m
Well Volume:	50L

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
56L	15.9	2.8	999	8.15	3

Description of Works / Observations:
Well bailed dry after 56L removed (approximate well volume)
Water was clear and colourless at commencement and became turbid grey-brown during purging.
Well allowed to recover overnight.
Water sampled was clear and colourless (low turbidity).



**Austen Quarry
Groundwater Monitoring Form**

Monitoring Bore ID:	MB02
Date:	6 and 7 January 2020

Depth to Water:	17.92m
Depth to Bottom:	29.10m
Saturated Well Depth:	11.2m
Well Volume:	22L

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
30L	15.4	2.54	1418	7.39	116

Description of Works / Observations:
Well bailed dry after 30L removed.
Water was turbid grey during purging, becoming siltier with increased drawdown.
Well allowed to recover overnight.
Water sampled was clear and colourless (low turbidity).



**Austen Quarry
Groundwater Monitoring Form**

Monitoring Bore ID:	MB03
Date:	6 and 7 January 2020

Depth to Water:	Well Dry
Depth to Bottom:	25.31m
Saturated Well Depth:	NA
Well Volume:	NA

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
NA					

Description of Works / Observations:
Well was dry.



**Austen Quarry
Groundwater Monitoring Form**

Monitoring Bore ID:	Pit Sump
Date:	07-Jan-20

Depth to Water:	NA
Depth to Bottom:	NA
Saturated Well Depth:	NA
Well Volume:	NA

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
NA	19.4	3.17	1015	7.82	110

Description of Works / Observations:
Water in pit sump was clear and colourless.
No hydrocarbon sheen visible on surface of pit water.
No unnatural odour noted in sampled water.



**Austen Quarry
Groundwater Monitoring Form**

Monitoring Bore ID:	Yorkeys Creek
Date:	07-Jan-20

Depth to Water:	NA
Depth to Bottom:	NA
Saturated Well Depth:	NA
Well Volume:	NA

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
NA	-	-	-	-	-

Description of Works / Observations:
Yorkeys Creek was dry during the monitoring event.

Attachment C

Water Quality Meter Calibration Form



Air-Met Scientific Pty Ltd
1300 137 067

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **18J104331**

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		324189	pH 9.43
2. pH 7.00		pH 7.00		320613	pH 6.73
3. pH 4.00		pH 4.00		330734	pH 3.95
4. mV		231.8mV		338782/337308	230.3mV
5. EC		2.76mS		333787	2.76mS
6. D.O		0.00ppm		329994	0.01ppm
7. Temp		21.5°C		MultiTherm	20.4°C

Calibrated by: Sarah Lian

Calibration date: 17/12/2019

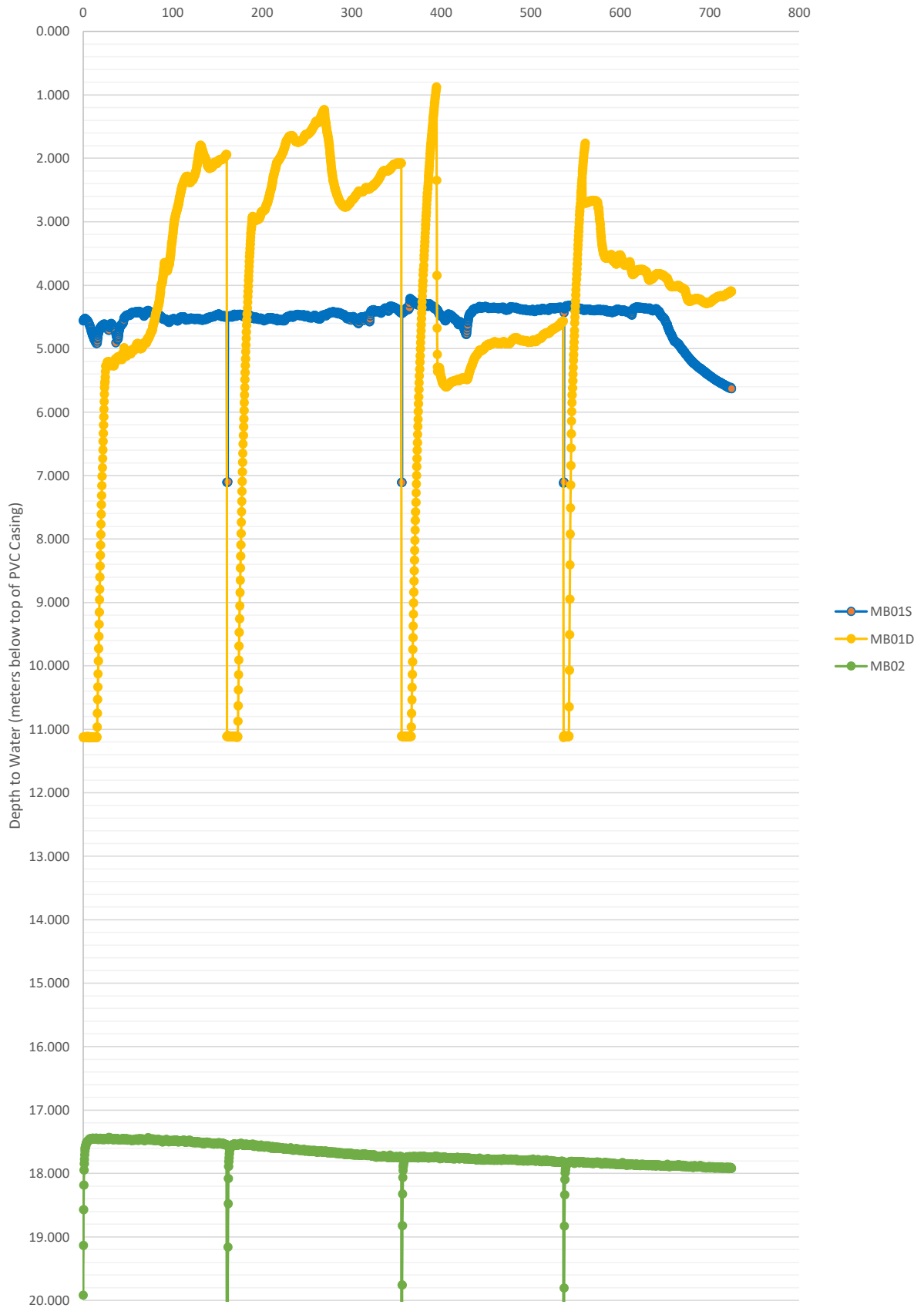
Next calibration due: 16/01/2020

Attachment D

Groundwater Level Chart

Depth to Water vs Time

Time (Days commencing 12 January 2018)



Attachment E

Laboratory Certificate of Analysis

SAMPLE RECEIPT ADVICE

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow

Sample Login Details

Your reference	Hytec Austen Quarry Baseline Groundwater Monitorin
Envirolab Reference	233998
Date Sample Received	08/01/2020
Date Instructions Received	08/01/2020
Date Results Expected to be Reported	15/01/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	5 WATER
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.3
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie

Phone: 02 9910 6200
Fax: 02 9910 6201
Email: ahie@envirolab.com.au

Jacinta Hurst

Phone: 02 9910 6200
Fax: 02 9910 6201
Email: jhurst@envirolab.com.au

Analysis Underway, details on the following page:



Sample ID	VTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHsin Water	Calcium - Dissolved	Potassium - Dissolved	Sodium - Dissolved	Magnesium - Dissolved	Hydroxide Alkalinity (OH-) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulphate, SO4	Chloride, Cl	Ionic Balance	All metals in water-dissolved	Metals in Water - Dissolved	Total Dissolved Solids(grav)	Ammonia as N in water	Nitrate as N in water	Nitrite as N in water
MB01S				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MB01D				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MB02				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DUPE				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.



CERTIFICATE OF ANALYSIS 233998

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow
Address	PO Box 6278, Dubbo, NSW, 2830

Sample Details

Your Reference	<u>Hytec Austen Quarry Baseline Groundwater Monitorin</u>
Number of Samples	5 WATER
Date samples received	08/01/2020
Date completed instructions received	08/01/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	15/01/2020
Date of Issue	15/01/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By

Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Senior Chemist
Loren Bardwell, Senior Chemist
Priya Samarawickrama, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

vTRH(C6-C10)/BTEXN in Water		
Our Reference		233998-4
Your Reference	UNITS	Pit
Date Sampled		07/01/2020
Type of sample		WATER
Date extracted	-	09/01/2020
Date analysed	-	09/01/2020
TRH C ₆ - C ₉	µg/L	<10
TRH C ₆ - C ₁₀	µg/L	<10
TRH C ₆ - C ₁₀ less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	107
Surrogate toluene-d8	%	99
Surrogate 4-BFB	%	100

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

svTRH (C10-C40) in Water		
Our Reference		233998-4
Your Reference	UNITS	Pit
Date Sampled		07/01/2020
Type of sample		WATER
Date extracted	-	09/01/2020
Date analysed	-	10/01/2020
TRH C ₁₀ - C ₁₄	µg/L	<50
TRH C ₁₅ - C ₂₈	µg/L	<100
TRH C ₂₉ - C ₃₆	µg/L	<100
TRH >C ₁₀ - C ₁₆	µg/L	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50
TRH >C ₁₆ - C ₃₄	µg/L	<100
TRH >C ₃₄ - C ₄₀	µg/L	<100
Surrogate o-Terphenyl	%	80

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

PAHs in Water		
Our Reference		233998-4
Your Reference	UNITS	Pit
Date Sampled		07/01/2020
Type of sample		WATER
Date extracted	-	09/01/2020
Date analysed	-	15/01/2020
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	<1
Pyrene	µg/L	<1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j+k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Benzo(a)pyrene TEQ	µg/L	<5
Total +ve PAH's	µg/L	NIL (+)VE
Surrogate <i>p</i> -Terphenyl-d14	%	92

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

Ion Balance						
Our Reference		233998-1	233998-2	233998-3	233998-4	233998-5
Your Reference	UNITS	MB01S	MB01D	MB02	Pit	DUPE
Date Sampled		07/01/2020	07/01/2020	07/01/2020	07/01/2020	07/01/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date prepared	-	08/01/2020	08/01/2020	08/01/2020	08/01/2020	08/01/2020
Date analysed	-	08/01/2020	08/01/2020	08/01/2020	08/01/2020	08/01/2020
Calcium - Dissolved	mg/L	76	160	80	92	74
Potassium - Dissolved	mg/L	1.6	0.9	2.2	6.2	1.6
Sodium - Dissolved	mg/L	23	38	180	35	22
Magnesium - Dissolved	mg/L	13	15	35	60	13
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	220	320	520	300	230
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	220	320	520	300	230
Sulphate, SO ₄	mg/L	21	210	140	230	22
Chloride, Cl	mg/L	47	22	91	25	48
Ionic Balance	%	-2.0	-3.0	-4.0	-1.0	-5.0

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

All metals in water-dissolved						
Our Reference		233998-1	233998-2	233998-3	233998-4	233998-5
Your Reference	UNITS	MB01S	MB01D	MB02	Pit	DUPE
Date Sampled		07/01/2020	07/01/2020	07/01/2020	07/01/2020	07/01/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date prepared	-	09/01/2020	09/01/2020	09/01/2020	09/01/2020	09/01/2020
Date analysed	-	09/01/2020	09/01/2020	09/01/2020	09/01/2020	09/01/2020
Aluminium-Dissolved	µg/L	<10	<10	<10	<10	<10
Arsenic-Dissolved	µg/L	2	4	3	<1	2
Boron-Dissolved	µg/L	20	360	250	<20	20
Barium-Dissolved	µg/L	10	41	93	46	9
Beryllium-Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	0.3	<0.1
Cobalt-Dissolved	µg/L	<1	1	<1	<1	<1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	2	2	1	2	<1
Iron-Dissolved	µg/L	11	170	<10	<10	<10
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese-Dissolved	µg/L	130	390	54	120	140
Molybdenum-Dissolved	µg/L	<1	3	2	15	<1
Nickel-Dissolved	µg/L	<1	2	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	2	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1
Silver-Dissolved	µg/L	<1	<1	<1	<1	<1
Strontium-Dissolved	µg/L	250	910	3,200	440	260
Titanium-Dissolved	µg/L	<1	<1	<1	<1	<1
Vanadium-Dissolved	µg/L	<1	2	2	<1	<1
Zinc-Dissolved	µg/L	7	7	14	23	2

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

Metals in Water - Dissolved						
Our Reference		233998-1	233998-2	233998-3	233998-4	233998-5
Your Reference	UNITS	MB01S	MB01D	MB02	Pit	DUPE
Date Sampled		07/01/2020	07/01/2020	07/01/2020	07/01/2020	07/01/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date digested	-	15/01/2020	15/01/2020	15/01/2020	15/01/2020	15/01/2020
Date analysed	-	15/01/2020	15/01/2020	15/01/2020	15/01/2020	15/01/2020
Silicon*- Dissolved	mg/L	9.2	34	11	8.6	9.3

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

Miscellaneous Inorganics						
Our Reference		233998-1	233998-2	233998-3	233998-4	233998-5
Your Reference	UNITS	MB01S	MB01D	MB02	Pit	DUPE
Date Sampled		07/01/2020	07/01/2020	07/01/2020	07/01/2020	07/01/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date prepared	-	08/01/2020	08/01/2020	08/01/2020	08/01/2020	08/01/2020
Date analysed	-	08/01/2020	08/01/2020	08/01/2020	08/01/2020	08/01/2020
Total Dissolved Solids (grav)	mg/L	250	670	840	640	270
Ammonia as N in water	mg/L	0.007	0.028	0.061	0.087	0.007
Nitrate as N in water	mg/L	<0.005	<0.005	0.02	0.14	0.007
Nitrite as N in water	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 10% ie total anions = total cations +/-10%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			09/01/2020	[NT]	[NT]	[NT]	[NT]	09/01/2020	[NT]
Date analysed	-			09/01/2020	[NT]	[NT]	[NT]	[NT]	09/01/2020	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	103	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	103	[NT]
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	101	[NT]
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-016	104	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate toluene-d8	%		Org-016	98	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate 4-BFB	%		Org-016	99	[NT]	[NT]	[NT]	[NT]	100	[NT]

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/01/2020	[NT]	[NT]	[NT]	[NT]	09/01/2020	[NT]
Date analysed	-			10/01/2020	[NT]	[NT]	[NT]	[NT]	10/01/2020	[NT]
TRH C ₁₀ - C ₁₄	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH C ₁₅ - C ₂₈	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH C ₂₉ - C ₃₆	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	107	[NT]
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	111	[NT]
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	107	[NT]
Surrogate o-Terphenyl	%		Org-003	75	[NT]	[NT]	[NT]	[NT]	100	[NT]

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

QUALITY CONTROL: PAHs in Water				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/01/2020	[NT]	[NT]	[NT]	[NT]	09/01/2020	[NT]
Date analysed	-			15/01/2020	[NT]	[NT]	[NT]	[NT]	15/01/2020	[NT]
Naphthalene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	120	[NT]
Acenaphthylene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Phenanthrene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Anthracene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Pyrene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzo(a)anthracene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-012/017	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-012/017	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	127	[NT]	[NT]	[NT]	[NT]	91	[NT]

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	233998-2
Date prepared	-			08/01/2020	1	08/01/2020	08/01/2020		08/01/2020	08/01/2020
Date analysed	-			08/01/2020	1	08/01/2020	08/01/2020		08/01/2020	08/01/2020
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	76	76	0	106	#
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1.6	1.6	0	104	102
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	23	23	0	102	91
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	13	13	0	107	105
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	220	220	0	[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	1	220	220	0	102	[NT]
Sulphate, SO ₄	mg/L	1	Inorg-081	<1	1	21	22	5	112	83
Chloride, Cl	mg/L	1	Inorg-081	<1	1	47	48	2	106	81
Ionic Balance	%		Inorg-040	[NT]	1	-2.0	-3.0	-40	[NT]	[NT]

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

QUALITY CONTROL: All metals in water-dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	233998-2
Date prepared	-			09/01/2020	1	09/01/2020	09/01/2020		09/01/2020	09/01/2020
Date analysed	-			09/01/2020	1	09/01/2020	09/01/2020		09/01/2020	09/01/2020
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	<10	<10	0	104	103
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	96	99
Boron-Dissolved	µg/L	20	Metals-022	<20	1	20	20	0	101	#
Barium-Dissolved	µg/L	1	Metals-022	<1	1	10	10	0	94	94
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	93	95
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	94	97
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	105	94
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	101	95
Copper-Dissolved	µg/L	1	Metals-022	<1	1	2	1	67	105	92
Iron-Dissolved	µg/L	10	Metals-022	<10	1	11	<10	10	106	#
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	106	103
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	130	140	7	97	#
Molybdenum-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	98	103
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	100	88
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	103	98
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	102	119
Silver-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	103	83
Strontium-Dissolved	µg/L	1	Metals-022	<1	1	250	260	4	97	#
Titanium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	102	105
Vanadium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	100	98
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	7	7	0	95	95

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

QUALITY CONTROL: Metals in Water - Dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	233998-4
Date digested	-			15/01/2020	3	15/01/2020	15/01/2020		15/01/2020	15/01/2020
Date analysed	-			15/01/2020	3	15/01/2020	15/01/2020		15/01/2020	15/01/2020
Silicon*- Dissolved	mg/L	0.2	Metals-020	<0.2	3	11	11	0	108	104

Client Reference: Hytec Austen Quarry Baseline Groundwater Monitorin

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	233998-2
Date prepared	-			08/01/2020	1	08/01/2020	08/01/2020		08/01/2020	08/01/2020
Date analysed	-			08/01/2020	1	08/01/2020	08/01/2020		08/01/2020	08/01/2020
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	250	[NT]		89	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.007	0.007	0	104	98
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	106	107
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	102	104

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

All metals in water-dissolved - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Ion Balance - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY - Client

Client: Ground Doctor Pty Ltd	Client Project Name / Number / Site etc (ie report title):	Phone: E-mail: Contact:
Contact person: James Morrow ph: 0407 875 302	Hytec Austen Quarry Baseline Groundwater Monitoring	
Project Mgr: James Morrow	PO No.:	
Sampler: James Morrow	Envirolab Quote No. :	
Address: Austen Quarry, 391 Jenolan Caves Road, Hartley, NSW	Standard TAT	
Phone: -- Mob: 0407875302	Or choose: standard / same day / 1 day / 2 day / 3 day	
Fax: --	<i>Note: Inform lab in advance if urgent turnaround is required - surcharge applies</i>	
Email:	Lab comments:	

Sample information					Tests Required										Comments				
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Hy-tec Suite (see table below)	TRH, BTEX, PAHs													Provide as much information about the sample as you can
1	MB01S	-	07-Jan-20	Water	x														Envirolab Services 12 Ashley St Charswood NSW 2067 Ph: (02) 9910 6200 Job No: 233998 Date Received: 08/01/20 Time Received: 11:05 Received by: M7 Temp (Cool/Ambient): 7.3 Cooling: Ice pack Security: Intact/Broken/None
2	MB01D	-	07-Jan-20	Water	x														
3	MB02	-	07-Jan-20	Water	x														
4	Pit	-	07-Jan-20	Water	x	x													
5	DUPE	-	07-Jan-20	Water	x														

Relinquished by (company): James Morrow	Received by (company): ES	Lab use only:
Print Name: James Morrow	Print Name: Ming Yan To	Samples Received: Cool or Ambient (circle one)
Date & Time: 3/7/19 1400	Date & Time: 08/01/20 11:05	Temperature Received at: 7.3 (if applicable)
Signature: JRM	Signature: M7	Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book Page No: 1 of 1

233998

HYTEC Groundwater Suite

Analyte Group	Analyte
Dissolved Solids	Total Dissolved Solids
Major Cations	Magnesium Calcium Sodium Potassium
Major Anions	Sulphate Chloride Hydroxide as CaCO ₃ Carbonate as CaCO ₃ Bicarbonate as CaCO ₃
Heavy Metals (Dissolved)	Aluminium Arsenic Boron Barium Beryllium Cadmium Chromium Cobalt Copper Iron Lead Manganese Mercury Molybdenum Nickel Selenium Silicon Silver Strontium Titanium Vanadium Zinc
Nutrients	Ammonia Nitrate Nitrite

Attachment F

Analytical Results Summary Table

Table F1
Baseline Analytical Data Summary - January 2018 to January 2020

	ANZECC DGV 2018 (Fresh)	Aust. Drinking Water 2011	10/01/2018	22/06/2018	03/01/19	03/07/19	07/01/20	10/01/2018	22/06/2018	03/01/19	03/07/19	07/01/20	10/01/2018	22/06/2018	03/01/19	03/07/19	07/01/20	10/01/2018	22/06/2018	03/01/19	03/07/19	07/01/20	Units			
			MB01S	MB01S	MB01S	MB01S	MB01S	MB01D	MB01D	MB01D	MB01D	MB01D	MB01D	MB02	MB02	MB02	MB02	PIT	PIT	PIT	PIT	PIT	PIT			
Major Cations (mg/L)	Calcium	-	-	66	74	68	75	76	144	150	140	130	160	52	71	73	81	80	71	49	64	62	92	mg/L		
	Magnesium	-	-	14	13	13	14	13	16	15	14	12	15	24	31	33	35	35	45	26	44	51	60	mg/L		
	Sodium	-	-	23	22	18	19	23	95	59	48	41	38	200	190	170	190	180	26	25	20	24	35	mg/L		
	Potassium	-	-	1	1	1.5	1.7	1.6	3	1	1.4	1.2	0.9	2	2	2.2	2.3	2.2	4	3	4.7	4.6	6.2	mg/L		
	Sulphate	-	-	22	23	25	18	21	259	248	200	95	210	120	127	130	130	140	183	98	220	210	230	mg/L		
Major Anions (mg/L)	Chloride	-	-	43	44	51	40	47	58	23	26	32	22	68	78	89	82	91	9	10	13	18	25	mg/L		
	Hydroxide as CaCO3	-	-	<1	<1	<5	<5	<5	<1	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	<5	<5	mg/L		
	Carbonate as CaCO3	-	-	<1	<1	<5	<5	<5	<1	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	<5	<5	mg/L		
	Bicarbonate as CaCO3	-	-	216	232	230	230	220	307	335	350	290	320	476	520	530	520	520	181	201	170	170	300	mg/L		
	Aluminium	0.055	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	mg/L		
Heavy Metals (Dissolved) (mg/L)	Arsenic	0.013	0.01	0.003	0.001	0.002	0.001	0.002	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.003	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	mg/L		
	Barium	-	2	0.015	0.013	0.011	0.008	0.01	0.08	0.055	0.061	0.052	0.041	0.065	0.085	0.097	0.088	0.093	0.032	0.029	0.071	0.029	0.046	mg/L		
	Beryllium	-	0.06	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	mg/L		
	Boron	0.37	4	<0.05	<0.05	<0.02	<0.02	0.02	0.33	0.32	0.36	0.27	0.36	0.32	0.27	0.25	0.23	0.25	<0.05	<0.05	<0.02	<0.02	<0.02	mg/L		
	Cadmium	0.0002	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.0019	0.0001	<0.0001	0.0003	mg/L
	Chromium	0.001	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	mg/L	
	Cobalt	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.003	0.002	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	mg/L	
	Copper	0.0014	2	0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	mg/L	
	Iron	-	-	<0.05	<0.05	<0.01	<0.01	0.011	<0.05	<0.05	0.014	<0.010	0.17	<0.05	<0.05	<0.01	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	mg/L	
	Lead	0.0034	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	mg/L	
	Manganese	1.9	0.5	0.123	0.153	0.085	0.093	0.13	0.353	0.53	0.5	0.15	0.39	0.038	0.046	0.085	0.062	0.054	2	0.188	<0.005	<0.005	0.12	0.12	mg/L	
	Mercury	0.6	0.001	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.05	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.05	mg/L	
	Molybdenum	-	0.05	0.002	<0.001	0.001	0.001	<0.001	0.03	0.004	0.008	0.004	0.003	0.009	0.002	0.003	0.002	0.004	<0.001	0.011	0.009	0.011	0.009	0.015	mg/L	
	Nickel	0.011	0.02	0.001	<0.001	<0.001	<0.001	<0.001	0.018	0.003	0.006	0.004	0.002	0.003	0.002	<0.001	<0.001	<0.001	0.008	0.001	<0.001	<0.001	<0.001	<0.001	mg/L	
	Selenium	0.005	0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	mg/L	
	Silver	0.00005	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	mg/L	
	Strontium	-	-	0.208	0.245	0.27	0.2	0.25	0.897	0.99	0.82	0.91	2.36	3.01	3.3	3.2	0.298	0.231	0.33	0.26	0.44	0.44	0.44	0.44	mg/L	
	Titanium	-	-	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	mg/L	
	Vanadium	-	-	<0.01	<0.01	<0.001	<0.001	<0.001	<0.01	<0.01	0.003	0.02	0.002	<0.01	<0.01	0.003	0.002	0.002	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	mg/L	
	Zinc	0.008	-	0.03	<0.005	0.005	0.002	0.007	<0.005	0.006	0.004	0.005	0.007	<0.005	<0.005	0.007	0.007	0.014	0.443	0.16	0.006	0.006	0.023	0.023	mg/L	
Silicon (mg/L)	-	-	9.15	10.1	8.9	9.5	9.2	24.4	31.6	37	29	34	9.6	11.3	11	11	11	15.2	19.4	5.1	3.8	8.6	8.6	mg/L		
Nutrients (mg/L)	Nitrate*	10 (as N)	50 (as NO3)	0.05	<0.01	0.01	<0.005	<0.005	0.08	<0.01	0.01	<0.005	<0.005	<0.01	<0.01	0.007	0.008	0.02	4.45	0.48	1.4	0.3	0.14	mg/L		
	Nitrite	None	-	<0.01	<0.01	<0.005	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	0.01	<0.01	0.012	<0.005	<0.005	mg/L		
	Ammonia	0.9	-	0.03	0.05	<0.005	<0.005	0.007	0.03	0.02	<0.005	0.005	0.028	<0.01	0.08	0.048	0.062	0.061	0.4	0.05	<0.005	<0.005	0.087	mg/L		
	TRH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<EQL	<EQL	<EQL	<EQL	<EQL	<EQL	ug/L	
Hydrocarbons (ug/L)	Benzene	950	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	<1	<1	<1	ug/L		
	Toluene	-	800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<1	<1	<1	ug/L		
	Ethylbenzene	-	300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<1	<1	<1	ug/L		
	Xylene	200	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<3	<3	<3	ug/L		
	Naphthalene	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<1	<1	<1	ug/L		
	Benzo(a)pyrene	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<1	<1	<1	ug/L		