Ground Doctor Pty Ltd

ABN: 32 160 178 656

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8 March 2018

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

Attention: Mr Rod Welsh

Dear Rod,

RE: GROUNDWATER MONITORING BORE INSTALLATION AND JANUARY 2018 GROUNDWATER MONITORING RESULTS, AUSTEN QUARRY, HARTLEY, NSW

Ground Doctor was engaged by Hy-tec Industries Pty Ltd (Hy-tec) to assist with the establishment of groundwater monitoring bores and to assist with the first round of 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 a two year period following establishment of the monitoring bores.

Hy-tec engaged Ground Doctor to assist with the establishment of the monitoring bore network and to assist with the first round of water quality monitoring. This report outlines the work undertaken and presents the results of the first groundwater monitoring round.

2 Objectives

The objectives of the work undertaken were to:

- Establish a groundwater monitoring bore network in compliance with the WMP;
- Establish water level data loggers in each newly installed monitoring bore;
- Complete the first round of groundwater monitoring in accordance with the WMP.

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*.

The selected monitoring bore locations were within the approximate locations shown in *Figure 6* of the WMP (Groundwork Plus, 2017). The periphery of the open pit (or proposed extent of the open pit) is predominantly steep and inaccessible to conventional vehicles. The monitoring bore locations were determined primarily based on accessibility to drilling equipment. It was necessary to ensure that the borehole could be installed safely and that the monitoring bores could be safely accessed during future monitoring events.

4 Monitoring Bore Installation

Monitoring bore installation work was undertaken 18-19 December 2017.

Boreholes were drilled by Premier Drill and Blast using air rotary (top hammer) drilling methods. Boreholes were drilled with an 89mm diameter drill bit.

Drilling work was supervised by Ground Doctor's Environmental Engineer, Mr James Morrow. Drill cuttings were observed and logged in the field with particular attention paid to the presence of weak zones in rock and moisture content of drill cuttings. Boreholes were drilled to a maximum depth of 28.5m below ground level or a minimum of 670m AHD.

Where evidence of potential water bearing features was encountered the hole was left undisturbed for a period of approximately 15 minutes at the next rod change to assess whether the borehole was making water. In most boreholes, water was not made during drilling and the presence of water bearing strata was determined by small moisture changes in the drill cuttings.

Once the boreholes reached the maximum or targeted depth the drill rods were removed. Bore casing was arranged at the surface and the lowered into the borehole.

Boreholes were constructed of 50mm ID screw fit Class 18 uPVC screen (1mm aperture) and blank casing. In each borehole screened sections were placed adjacent to water bearing strata (or suspected water bearing strata) as well as at the base of each borehole.

The borehole annulus adjacent to each screen was gravel packed using 3-5mm rounded river gravel. The borehole annulus was filled with slow acting bentonite pellets above the uppermost screened interval to seal the annulus and prevent short circuiting of surface water into the bore screen. Bore casing was left with an approximate 0.5-1m stickup above surrounding ground level.

A steel stickup monument was concreted around the top of each bore casing.

Monitoring bore construction logs are presented as *Attachment B*. Bore construction details are summarised in *Table 1*.

At MB01 field observations indicated the presence of groundwater in weathered material in the upper 5m of the subsurface, as well as water in the underlying fractured bedrock. A shallow (6.7m deep) bore and a deep (28.5m deep) bore were installed at MB01 and the bores were referred to as MB01S (shallow) and MB01D (deep). The WMP stipulated that nested wells be considered where multiple groundwater sources were likely to be present.

Each monitoring bore was developed after installation. Deeper bores (MB01D, and MB02) were bailed dry using a bore specific disposable bailer. The shallow bore (MB01S) was screened in relatively permeable near surface aquifer and was developed by bailing approximately 60L after installation.

Four boreholes were drilled within a 200m radius of MB03. The first three boreholes were advanced to a depth of 28.5m below ground level. Drill cuttings were dry throughout each borehole. Holes were left open for approximately 1 hour after drilling and did not make water. A fourth borehole was drilled to a depth of approximately 24.5m. Moist cuttings were encountered approximately 18-20m below ground level but the hole did not make water. Bore casing and screen was installed into the dry hole, which had extended beyond the targeted depth of 670m AHD.

Table 1: Monitoring Bore Construction Details

Bore ID	Easting	Northing	Approx. Surface Elevation (AHD)	Depth to Bottom (btc)	Screened Intervals (bgl)	Stickup (agl)	Depth to Water (btc)
MB01S	235245	6281077	700m	7.42m	3.7-6.7m	0.8m	4.63m
MB01D	235259	6281098	700m	29.30m	20-23m 26-28.5m	0.8m	5.49m
MB02	235915	6280398	710m	29.10m	10.5-13.5m 22.5-28.5m	0.6m	17.43m
MB03	236419	6281786	690m	25.31m	18.5-24.5m	0.4m	Dry

Eastings and northings are MGA Zone 56.
btc = below top of casing
bgl = below ground level
agl = above ground level

5 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 10 January 2018. 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.

Observations made during installation works indicated that the deep bores intersected very low yielding fractured rock. The estimated bore yield indicated that sampling via continuous pumping (even using low flow methods) was not appropriate for the deeper bores.

Deep bores were purged dry using a bore specific disposable bailer. The deep bores were purged on 10 January 2018. The wells 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 by bailing more than 3 well volumes. Water samples were collected from MB01S after purging. Water quality parameters were measured regularly during purging of MB01S to assess the effectiveness of purging.

A water sample was collected from a sump in the pit floor on 10 January 2018. An unpreserved sample bottle was filled directly from the ponded water in the 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 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 ALS Lithgow laboratory on the afternoon of 11 January 2018. It is understood that the samples were forwarded to the ALS Sydney laboratory for analysis.

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).

6 Field Observations

Field observations were recorded on bore sampling forms, which are presented as *Attachment D.* Depth to water results and measured field parameters at the time of sampling are presented in *Table 2*.

Table 2: Summary of Field Observations

Bore ID	DTW (btc)	Temp (^{o}C)	DO (ppm)	EC (µS/cm)	pH	ORP (mV)
MB01S	4.63m	15.9	6.08	575	6.27	-11.6
MB01D	5.49m	16.7	2.64	1170	7.02	-22
MB02	17.43m	16.4	3.73	1210	7.03	-5
MB03	Dry	-	-	-	-	-
Pit Water	-	21.9	4.3	820	7	8

MB03 was dry at the time of sampling. Groundwater samples collected from MB01D and MB02 were clear and colourless and free of significant suspended sediment. Water sampled from MB01S was mildly turbid due to disturbance of fines during well purging.

Water within the pit sump was clear and colourless and free of surface sheen and unnatural odour.

7 Analytical Results

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

8 Water Level Logger Installation

Water level data loggers were installed in MB01S, MB01D and MB02 at the completion of groundwater sampling. MB03 was dry at the time of monitoring so it was not necessary to install a logger in this borehole.

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.

Data loggers were suspended from the underside of the plastic well cap using stainless steel cable and stainless steel wire rope grips. The data loggers used at the site had an ideal working range of 0-10m. At MB01S the logger was suspended approximately 0.5m from the bottom of the bore casing (approximately 2.5m below the standing water level). At MB01D and MB02 the loggers was suspended approximately 5m below the standing water levels.

The barologger was suspended approximately 1m below the top of casing within MB03.

Water level logger installation details are summarised in *Table 3*.

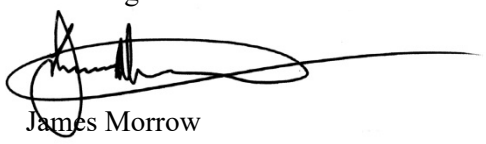
Table 3: Water Level Logger Heights

Bore ID	Depth to Water (m btc)	Depth to Bottom (m btc)	Logger Depth (m btc)
MB01S	4.63m	7.42m	7.0m
MB01D	5.49m	29.30m	11.0m
MB02	17.43m	16.4	23.0m
MB03	Dry	25.31m	1.0m (barologger)

m btc = metres below top of casing.

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-L1

Attachment A – Figure

Attachment B – Monitoring Bore Construction Logs

Attachment C – Water Quality Meter Calibration Record

Attachment D – Groundwater Sampling Forms

Attachment E – Laboratory Certificate of Analysis

9 References

- Groundwork Plus (2017), "*Austen Quarry Water Management Plan*", Report Number 1517_610_002_RPTO_Water Management Plan_V8, 10 October 2017

Attachment A

Figure

Ground Doctor Pty Ltd

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Dubbo NSW 2830

Project Name:	Groundwater Monitoring Bore Installation and January 2018 Groundwater Monitoring Round
Project Number:	2018-GD001

Figure 1

Groundwater Monitoring Bore Locations

Attachment B

Monitoring Bore Construction Logs

Borehole ID: MB01D

Project No.: 2018-GD001

Project Name: Austen Quarry Groundwater Monitoring

Client: Hy-tec Industries Pty Ltd

Site Address: 391 Jenolan Caves Road, Hartley, NSW

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				0.8m Stickup Steel Monument
		Silty Sand: Gey-brown, silt and fine sand, moist.	1.0				
		Weathered Rhyolite: Grey-brown, dry. Soft layer 4-5m bgl. Cutting damp but hole did not make water during drilling.	5.0				Annulus Filled with Drill Cuttings (0.3-10m bgl)
		Rhyolite: Grey, dry, hard. Water strike in soft layer 21-22m. Hole made water at rod change.					50mm ID Screw Fit Class 18 uPVC Blank Casing (-1-20m bgl)
							Bentonite Seal (10-19m bgl)
							Gravel Pack (3-5mm) Rounded River Gravel (19-28.5m bgl)
							50mm ID Screw Fit Class 18 uPVC Machine Slotted Screen (20-23m bgl)
							50mm ID Screw Fit Class 18 uPVC Blank Casing (23-26m bgl)
							50mm ID Screw Fit Class 18 uPVC Machine Slotted Screen (26-28.5m bgl)
			28.5				50mm ID Class 18 PVC End Cap (28.5m)
		End of Hole at 28.5m in Rhyolite.					

Drilled By: Premier Drill and Blast

Drill Method: Air Rotary (Top Hammer)

Drill Date: 19 December 2017

Hole Size: 89mm

Datum:

Sheet: 1 of 1

Borehole ID: MB01S

Project No.: 2018-GD001

Project Name: Austen Quarry Groundwater Monitoring

Client: Hy-tec Industries Pty Ltd

Site Address: 391 Jenolan Caves Road, Hartley, NSW

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				0.7m Stickup Steel Monument
		Silty Sand: Gey-brown, silt and fine sand, moist.	1.0				Bentonite Seal (0.3-2m bgl)
		Weathered Rhyolite: Grey-brown, dry. Soft layer 4-5m bgl. Water strike during drilling.	5.0				50mm ID Screw Fit Class 18 uPVC Blank Casing (-1-3.7m bgl)
		Rhyolite: Grey, dry, hard. Water strike in soft layer 21-22m. Hole made water at rod change.	6.7				Gravel Pack (3-5mm) Rounded River Gravel (2-6.7m bgl)
		End of Hole at 6.7m in Rhyolite.					50mm ID Screw Fit Class 18 uPVC Machine Slotted Screen (3.7-6.7m bgl)
							50mm ID Class 18 PVC End Cap (6.7m)

-2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Drilled By: Premier Drill and Blast

Drill Method: Air Rotary (Top Hammer)

Drill Date: 19 December 2017

Hole Size: 89mm

Datum:

Sheet: 1 of 1

Borehole ID: MB02

Project No.: 2018-GD001

Project Name: Austen Quarry Groundwater Monitoring

Client: Hy-tec Industries Pty Ltd

Site Address: 391 Jenolan Caves Road, Hartley, NSW

Ground Doctor Pty Ltd

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
		Ground Surface	0.0				0.6m Stickup Steel Monument
		Silty Sand: Brown, silt and fine sand, moist.	1.0				Bentonite Seal (0.3-3m bgl)
		Rhyolite: Light brown, red and white, dry. Possible moisture at top of granite (approx 8m). Hole did not make water.					50mm ID Screw Fit Class 18 uPVC Blank Casing (-1-10.5m bgl)
			8.0				
		Granite: Grey Brown, Hard, Dry.					50mm ID Screw Fit Class 18 uPVC Machine Slotted Screen (10.5-13.5m bgl)
			13.0				
		Rhyolite: Bluey Grey, dry, hard. Weak layer 22-24m. Moisture in cuttings but hole did not make water in 15 minutes at rod change.					50mm ID Screw Fit Class 18 uPVC Blank Casing (13.5-22.5m bgl)
							Gravel Pack (3-5mm) Rounded River Gravel (3-28.5m bgl)
							50mm ID Screw Fit Class 18 uPVC Machine Slotted Screen (22.5-28.5m bgl)
			28.5				
		End of Hole at 28.5m in Rhyolite.					50mm ID Class 18 PVC End Cap (28.5m)

Drilled By: Premier Drill and Blast

Drill Method: Air Rotary (Top Hammer)

Drill Date: 18 December 2017

Hole Size: 89mm

Datum:

Sheet: 1 of 1

Borehole ID: MB03

Project No.: 2018-GD001

Project Name: Austen Quarry Groundwater Monitoring

Client: Hy-tec Industries Pty Ltd

Site Address: 391 Jenolan Caves Road, Hartley, NSW

Ground Doctor Pty Ltd

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SUBSURFACE PROFILE				SAMPLE		CONSTRUCTION	
Depth (m)	Symbol	Description	Depth/Elev.	Sample ID	PID / Odour	Well Diagram	Materials Used
-2							
-1		Ground Surface	0.0				0.8m Stickup Steel Monument
0		**Weathered Granite:** Orange- brown, clayey sand and gravel, fine sand to medium gravel, dry.					
1							
2							
3							Bentonite Seal (0.3-5m bgl)
4			4.0				
5		**Granite:** Grey Brown, Hard, Dry.					
6		Weathered layer18-20m with moist cuttings. Hole did not make water.					50mm ID Screw Fit Class 18 uPVC Blank Casing (-1-18.5m bgl)
7							
8							
9							
10							
11							
12							
13							Gravel Pack (3-5mm) Rounded River Gravel (5-24.5m bgl)
14							
15							
16							
17							
18							
19							
20							
21							
22							50mm ID Screw Fit Class 18 uPVC Machine Slotted Screen (18.5-24.5m bgl)
23							
24			24.5				
25		**End of Hole at 24.5m in Granite.**					50mm ID Class 18 PVC End Cap (24.5m)
26							
27							
28							
29							
30							
31							
32							

Drilled By: Premier Drill and Blast

Drill Method: Air Rotary (Top Hammer)

Drill Date: 19 December 2017

Hole Size: 89mm

Datum:

Sheet: 1 of 1

Attachment C

Water Quality Meter Calibration Record

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **11K101271**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

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		309865	pH 9.87
2. pH 7.00		pH 7.00		307928	pH 6.95
3. pH 4.00		pH 4.00		307927	pH 4.06
4. mV		231.8mV		311901/300322	231.8mV
5. EC		2.76mS		306341	2.75mS
6. D.O		0.00 ppm		5253	0.01ppm
7. Temp		21.0°C		MultiTherm	20.7°C

Calibrated by: Michelle C Wagner **Michelle Wagner**

Calibration date: **02/01/2018**

Next calibration due: **01/07/2018**

Attachment D

Groundwater Sampling Forms

Austen Quarry
Groundwater Monitoring Form

Monitoring Bore ID:	MB01S
Date:	10-Jan-18

Depth to Water:	4.63m
Depth to Bottom:	7.42m
Saturated Well Depth:	2.79m
Well Volume:	5.6L (Saturated Well Depth x 2L)

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
5L	16.4	3.25	591	6.56	-10.3
10L	16	3.66	585	6.56	3.9
15L	16	0.01	581	6.3	12.7
20L	16	0.08	576	6.17	25
25L	15.9	6.08	575	6.27	-11.6

Description of Works / Observations:
Good water inflow.
Well bailed continuously to remove 25L and was then sampled.
Groundwater was turbid (grey-brown) during purging.
Groundwater was allowed to settle before sampling to minimise turbidy in samples.

Austen Quarry
Groundwater Monitoring Form

Monitoring Bore ID:	MB01D
Date:	10 and 11 January 2018

Depth to Water:	5.49m
Depth to Bottom:	29.3m
Saturated Well Depth:	23.81L
Well Volume:	47.6L

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
60L	16.7	2.64	1170	7.02	-22

Description of Works / Observations:
Well bailed dry after 60L removed (well volume plus annulus volume)
Water was turbid grey-brown during purging, becoming siltier with increased drawdown.
Well allowed to recover overnight.
Water sampled was clear and colourless (low turbidy).

Austen Quarry
Groundwater Monitoring Form

Monitoring Bore ID:	MB02
Date:	10 and 11 January 2018

Depth to Water:	17.43m
Depth to Bottom:	29.10m
Saturated Well Depth:	11.67m
Well Volume:	23.3L

Field Parameters:

Purge Volume (L)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	ORP (mV)
30L	16.4	3.73	1210	7.03	-5

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

Austen Quarry
Groundwater Monitoring Form

Monitoring Bore ID:	MB03
Date:	10-Jan-18

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:	10-Jan-18

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	21.9	4.3	820	7	8

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.

Attachment E

Laboratory Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1801825**	Page	: 1 of 7
Client	: **HY-TEC INDUSTRIES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MARK TAYLOR	Contact	: Customer Services ES
Address	: 664 OLD GYMPIE RD NARANGBA QLD, AUSTRALIA 4504	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hytec Austen Quarry Baseline Groundwater Monitoring	Date Samples Received	: 12-Jan-2018 08:30
Order number	: ----	Date Analysis Commenced	: 12-Jan-2018
C-O-C number	: ----	Issue Date	: 22-Jan-2018 11:43
Sampler	: MARK TAYLOR		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 5		
No. of samples analysed	: 5		

ilac-MRA NATA
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. 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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 Contact 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.

- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB01S	MB01D	MB02	PIT	DUPA
			Client sampling date / time	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00
Compound	CAS Number	LOR	Unit	ES1801825-001	ES1801825-002	ES1801825-003	ES1801825-004	ES1801825-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.81	7.90	7.97	7.59	7.60
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	556	1090	1190	786	784
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	376	750	722	640	634
EA075: Redox Potential								
Redox Potential	----	0.1	mV	74.0	61.0	59.0	57.0	57.0
pH Redox	----	0.01	pH Unit	7.35	7.40	7.46	7.01	6.92
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	216	307	476	181	183
Total Alkalinity as CaCO3	----	1	mg/L	216	307	476	181	183
ED040F: Dissolved Major Anions								
Silicon	7440-21-3	0.05	mg/L	9.15	24.4	9.60	15.2	15.1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	22	259	120	183	211
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	43	58	68	9	10
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	66	144	52	71	71
Magnesium	7439-95-4	1	mg/L	14	16	24	45	44
Sodium	7440-23-5	1	mg/L	23	95	200	26	25
Potassium	7440-09-7	1	mg/L	1	3	2	4	5
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	7440-38-2	0.001	mg/L	0.003	0.005	0.004	<0.001	<0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.015	0.080	0.065	0.032	0.032
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	0.0088	0.0086
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L	<0.001	0.002	<0.001	0.003	0.004
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MB01S	MB01D	MB02	PIT	DUPA
			Client sampling date / time	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00
Compound	CAS Number	LOR	Unit	ES1801825-001	ES1801825-002	ES1801825-003	ES1801825-004	ES1801825-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Manganese	7439-96-5	0.001	mg/L	**0.123**	**0.353**	**0.038**	**2.00**	**2.03**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.030**	**0.009**	**0.004**	**0.004**
Nickel	7440-02-0	0.001	mg/L	**0.001**	**0.018**	**0.003**	**0.008**	**0.007**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**0.208**	**0.897**	**2.36**	**0.298**	**0.295**
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.030**	<0.005	<0.005	**0.443**	**0.442**
Boron	7440-42-8	0.05	mg/L	<0.05	**0.33**	**0.32**	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.03**	**0.03**	<0.01	**0.40**	**0.41**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	**0.01**	**0.01**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.05**	**0.08**	<0.01	**4.45**	**4.45**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.05**	**0.08**	<0.01	**4.46**	**4.46**
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**5.99**	**13.2**	**13.9**	**7.68**	**8.33**
Total Cations	----	0.01	meq/L	**5.47**	**12.7**	**13.3**	**8.48**	**8.38**
Ionic Balance	----	0.01	%	**4.49**	**1.74**	**2.22**	**4.95**	**0.29**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	----	----	----	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	----	----	----	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	----	----	----	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	----	----	----	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	----	----	----	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	----	----	----	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	----	----	----	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	----	----	----	<1.0	<1.0

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB01S	MB01D	MB02	PIT	DUPA
				Client sampling date / time	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00
Compound	CAS Number	LOR	Unit		ES1801825-001	ES1801825-002	ES1801825-003	ES1801825-004	ES1801825-005
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benz(a)anthracene	56-55-3	1.0	µg/L		----	----	----	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L		----	----	----	<1.0	<1.0
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		----	----	----	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		----	----	----	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L		----	----	----	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		----	----	----	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		----	----	----	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		----	----	----	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		----	----	----	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		----	----	----	<0.5	<0.5
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
^ >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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MB01S	MB01D	MB02	PIT	DUPA
				Client sampling date / time	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00	10-Jan-2018 00:00
Compound	CAS Number	LOR	Unit		ES1801825-001	ES1801825-002	ES1801825-003	ES1801825-004	ES1801825-005
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		----	----	----	**23.9**	**22.4**
2-Chlorophenol-D4	93951-73-6	1.0	%		----	----	----	**55.6**	**55.0**
2.4.6-Tribromophenol	118-79-6	1.0	%		----	----	----	**50.1**	**37.9**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		----	----	----	**77.7**	**77.3**
Anthracene-d10	1719-06-8	1.0	%		----	----	----	**96.5**	**92.2**
4-Terphenyl-d14	1718-51-0	1.0	%		----	----	----	**91.1**	**84.1**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		----	----	----	**119**	**120**
Toluene-D8	2037-26-5	2	%		----	----	----	**121**	**121**
4-Bromofluorobenzene	460-00-4	2	%		----	----	----	**106**	**111**

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1801825**	Page	: 1 of 9
Client	: **HY-TEC INDUSTRIES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MARK TAYLOR	Contact	: Customer Services ES
Address	: 664 OLD GYMPIE RD NARANGBA QLD, AUSTRALIA 4504	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Hytec Austen Quarry Baseline Groundwater Monitoring	Date Samples Received	: 12-Jan-2018
Order number	: ----	Date Analysis Commenced	: 12-Jan-2018
C-O-C number	: ----	Issue Date	: 22-Jan-2018
Sampler	: MARK TAYLOR		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 5		
No. of samples analysed	: 5		

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. 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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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

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	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 1367702)									
ES1801653-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.04	6.36	5.16	0% - 20%
ES1801835-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.42	6.38	0.625	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1367700)									
ES1801516-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1210	1210	0.246	0% - 20%
ES1801835-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1140	1140	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 1370909)									
EP1801189-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	530	617	15.3	0% - 20%
ES1801903-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	14500	12900	11.6	0% - 20%
EA075: Redox Potential (QC Lot: 1369498)									
ES1801825-001	MB01S	EA075: Redox Potential	----	0.1	mV	74.0	67.0	9.93	0% - 20%
		EA075: pH Redox	----	0.01	pH Unit	7.35	7.26	1.23	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1367703)									
ES1801809-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	54	53	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	54	53	0.00	0% - 20%
ES1801835-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	79	80	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	79	80	0.00	0% - 20%
ED040F: Dissolved Major Anions (QC Lot: 1367251)									
EW1800133-004	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	2.16	2.18	1.05	0% - 20%
ES1801756-001	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	2.79	2.82	0.952	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1367254)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1367254) - continued									
ES1801825-002	MB01D	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	259	258	0.570	0% - 20%
ES1801776-020	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	382	425	10.6	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 1367253)									
ES1801825-002	MB01D	ED045G: Chloride	16887-00-6	1	mg/L	58	58	0.00	0% - 20%
ES1801776-020	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	629	686	8.65	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1374061)									
ES1801764-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	16	16	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	9	8	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	12	12	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	3	3	0.00	No Limit
ES1801825-004	PIT	ED093F: Calcium	7440-70-2	1	mg/L	71	69	3.73	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	45	40	10.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	26	26	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	5	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1374056)									
ES1801653-001	Anonymous	EG020B-F: Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.014	0.014	0.00	0% - 50%
		EG020B-F: Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	0.00	No Limit
ES1801825-004	PIT	EG020B-F: Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020B-F: Strontium	7440-24-6	0.001	mg/L	0.298	0.280	6.15	0% - 20%
		EG020B-F: Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1374060)									
ES1801764-005	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.032	0.032	0.00	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.008	0.009	0.00	No Limit
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.020	0.021	0.00	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.02	0.02	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1374060) - continued									
ES1801825-004	PIT	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0088	0.0080	8.86	0% - 20%
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.032	0.030	6.54	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	2.00	2.04	1.94	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	0.004	0.003	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.008	0.007	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.443	0.415	6.61	0% - 20%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1374057)									
ES1801728-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1801825-001	MB01S	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1374484)									
ES1801653-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.00	No Limit
ES1801883-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.01	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1367252)									
ES1801825-002	MB01D	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
ES1801776-020	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	18.6	20.5	9.87	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1374485)									
ES1801653-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.06	0.06	0.00	No Limit
ES1801883-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	2.40	2.41	0.00	0% - 20%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1368463)									
EP1801189-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1801840-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1368463)									
EP1801189-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1801840-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1368463)									
EP1801189-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 1368463) - continued									
EP1801189-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1801840-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (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 Spike (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 (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA010P: Conductivity by PC Titrator (QCLot: 1367700)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	106	95	113
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 1370909)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	102	87	109
				<10	293 mg/L	100	66	126
EA075: Redox Potential (QCLot: 1369498)								
EA075: Redox Potential	----	----	mV	----	234 mV	97.9	96	106
				----	300 mV	99.3	97	105
				----	86 mV	107	97	115
ED037P: Alkalinity by PC Titrator (QCLot: 1367703)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	101	81	111
				----	50 mg/L	115	70	130
ED040F: Dissolved Major Anions (QCLot: 1367251)								
ED040F: Silicon	7440-21-3	0.05	mg/L	<0.05	5 mg/L	119	91	123
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1367254)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	82	122
ED045G: Chloride by Discrete Analyser (QCLot: 1367253)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	81	127
				<1	1000 mg/L	116	81	127
ED093F: Dissolved Major Cations (QCLot: 1374061)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	90.4	80	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.3	90	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.9	82	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.0	85	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 1374056)								
EG020B-F: Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
EG020B-F: Strontium	7440-24-6	0.001	mg/L	<0.001	0.1 mg/L	104	81	113
EG020B-F: Titanium	7440-32-6	0.01	mg/L	<0.01	0.1 mg/L	97.0	77	119
EG020F: Dissolved Metals by ICP-MS (QCLot: 1374060)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	97.4	80	116
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	103	85	114
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	86.8	85	115
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	103	82	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	103	84	110

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1374060) - continued								
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	87.0	85	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	95.7	82	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.9	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.8	83	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	89.4	82	110
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	99.9	79	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	98.8	82	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	102	85	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	90.2	83	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.8	81	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	107	85	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	90.6	82	112
EG035F: Dissolved Mercury by FIMS (QCLot: 1374057)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	89.1	83	105
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1374484)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	105	90	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1367252)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	98.0	82	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1374485)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	105	91	113
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1368247)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	69.6	50	94
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	75.5	64	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	69.0	62	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	74.6	64	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	68.6	63	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	79.0	64	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	72.1	64	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	77.9	63	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	74.6	64	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	69.7	63	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	81.3	62	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	80.5	63	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	75.4	63	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	69.1	60	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	67.1	61	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	68.7	59	118

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1368248)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	84.2	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	91.5	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	90.3	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1368463)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	81.3	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1368248)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	87.0	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	95.8	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	94.5	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1368463)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	83.3	75	127
EP080: BTEXN (QCLot: 1368463)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	86.5	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	92.6	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	93.9	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	92.7	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	93.7	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	105	70	120

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	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1367254)							
ES1801776-020	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 1367253)							
ES1801776-020	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	118	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1374060)							
ES1801764-004	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	105	70	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	125	70	130
		EG020A-F: Barium	7440-39-3	1 mg/L	105	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	105	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1374060) - continued							
ES1801764-004	Anonymous	EG020A-F: Chromium	7440-47-3	1 mg/L	112	70	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	123	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	113	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	97.5	70	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	122	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	102	70	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	116	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	98.5	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1374057)							
ES1801653-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	107	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1374484)							
ES1801653-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	92.9	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1367252)							
ES1801776-020	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	# Not Determined	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1374485)							
ES1801653-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	107	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1368463)							
EP1801189-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	114	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1368463)							
EP1801189-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	109	70	130
EP080: BTEXN (QCLot: 1368463)							
EP1801189-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	111	70	130
		EP080: Toluene	108-88-3	25 µg/L	98.7	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	104	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	106	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	102	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	102	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1801825**	Page	: 1 of 9
Client	: **HY-TEC INDUSTRIES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MARK TAYLOR	Telephone	: +61-2-8784 8555
Project	: Hytec Austen Quarry Baseline Groundwater Monitoring	Date Samples Received	: 12-Jan-2018
Site	: ----	Issue Date	: 22-Jan-2018
Sampler	: MARK TAYLOR	No. of samples received	: 5
Order number	: ----	No. of samples analysed	: 5

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							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES1801776--020	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK057G: Nitrite as N by Discrete Analyser	ES1801776--020	Anonymous	**Nitrite as N**	14797-65-0	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			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
MB01S, MB01D, MB02, PIT, DUPA	----	----	----	13-Jan-2018	10-Jan-2018	**3**
EA075: Redox Potential						
Clear Plastic Bottle - Natural						
MB01S, MB01D, MB02, PIT, DUPA	----	----	----	15-Jan-2018	10-Jan-2018	**5**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	18	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	18	0.00	5.00	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.

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)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**13-Jan-2018**	10-Jan-2018	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**13-Jan-2018**	07-Feb-2018	✓
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**16-Jan-2018**	17-Jan-2018	✓
EA075: Redox Potential							
Clear Plastic Bottle - Natural (EA075)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**15-Jan-2018**	10-Jan-2018	×
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**13-Jan-2018**	24-Jan-2018	✓
ED040F: Dissolved Major Anions							
Clear Plastic Bottle - Natural (ED040F)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**15-Jan-2018**	07-Feb-2018	✓

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
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**12-Jan-2018**	07-Feb-2018	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**12-Jan-2018**	07-Feb-2018	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
MB01D, MB02	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	17-Jan-2018	✓
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
MB01S, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	07-Feb-2018	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Natural (EG020B-F)							
MB01D, MB02	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	09-Jul-2018	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020B-F)							
MB01S, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	09-Jul-2018	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Natural (EG035F)							
MB01D, MB02	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	07-Feb-2018	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
MB01S, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	07-Feb-2018	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	07-Feb-2018	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**12-Jan-2018**	12-Jan-2018	✓

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
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MB01S, MB01D, MB02, PIT, DUPA	**10-Jan-2018**	**----**	----	----	**17-Jan-2018**	07-Feb-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
PIT, DUPA	**10-Jan-2018**	**15-Jan-2018**	17-Jan-2018	✓	**18-Jan-2018**	24-Feb-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
PIT, DUPA	**10-Jan-2018**	**15-Jan-2018**	17-Jan-2018	✓	**18-Jan-2018**	24-Feb-2018	✓
Clear glass VOC vial - HCl (EP080)							
PIT, DUPA	**10-Jan-2018**	**15-Jan-2018**	24-Jan-2018	✓	**15-Jan-2018**	24-Jan-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
PIT, DUPA	**10-Jan-2018**	**15-Jan-2018**	17-Jan-2018	✓	**18-Jan-2018**	24-Feb-2018	✓
Clear glass VOC vial - HCl (EP080)							
PIT, DUPA	**10-Jan-2018**	**15-Jan-2018**	24-Jan-2018	✓	**15-Jan-2018**	24-Jan-2018	✓
EP080: BTEXN							
Clear glass VOC vial - HCl (EP080)							
PIT, DUPA	**10-Jan-2018**	**15-Jan-2018**	24-Jan-2018	✓	**15-Jan-2018**	24-Jan-2018	✓

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)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	14	**14.29**	**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
Dissolved Metals by ICP-MS - Suite B	EG020B-F	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Dissolved	ED040F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Redox Potential	EA075	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	18	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**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
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Dissolved	ED040F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Redox Potential	EA075	3	5	**60.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**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)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**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
Dissolved Metals by ICP-MS - Suite B	EG020B-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Dissolved	ED040F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	14	**7.14**	**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	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	6	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	18	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**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 PC 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 (2013) Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM (2013) 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 (2013) Schedule B(3)
Redox Potential	EA075	WATER	In house: Ion selective electrode
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Major Anions - Dissolved	ED040F	WATER	In house: Referenced to APHA 3120. The 0.45µm filtered samples are determined by ICP/AES for Sulfur and/or Silcon content and reported as Sulfate and/or Silica after conversion by gravimetric factor.
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 (2013) 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 librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
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 (2013) 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 (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) 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.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite B	EG020B-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 AS 3550, 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 (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
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 (2013) 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 (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A 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 (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B 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 (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) 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 sparging.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1801825**

Client	: **HY-TEC INDUSTRIES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MARK TAYLOR	Contact	: Customer Services ES
Address	: 664 OLD GYMPIE RD NARANGBA QLD, AUSTRALIA 4504	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: mark.taylor@hy-tec.com.au	E-mail	: ALSEnviro.Sydney@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: Hytec Austen Quarry Baseline Groundwater Monitoring	Page	: 1 of 3
Order number	: ----	Quote number	: EB2017HYTIND0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: MARK TAYLOR		

Dates

Date Samples Received	: 12-Jan-2018 08:30	Issue Date	: 12-Jan-2018
Client Requested Due Date	: 22-Jan-2018	Scheduled Reporting Date	: **22-Jan-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 14.4' C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 5 / 5

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Due to appropriately preserved container not being supplied for dissolved metals for samples #2, #3, the analysis will be conduct from the natural bottle provided.**
- **Temperature has been requested on the COC, however this is a field test and therefore cannot be analysed in the laboratory.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Dissolved Mercury by FIMS : EG035F		
MB01D	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
MB02	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals by ICP-MS - Suite A : EG020A-F		
MB01D	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
MB02	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals by ICP-MS - Suite B : EG020B-F		
MB01D	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
MB02	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA010P Conductivity (PC)	WATER - ED040F Dissolved Major Anions	WATER - EG020F Dissolved Metals by ICPMS	WATER - EG035F Dissolved Mercury by FIMS	WATER - EK055G Ammonia as N By Discrete Analyser	WATER - NT-01 & 02 Ca, Mg, Na, K, Cl, SO4, Alkalinity	WATER - NT-04 Nitrite and Nitrate
ES1801825-001	10-Jan-2018 00:00	MB01S	✓	✓	✓	✓	✓	✓	✓
ES1801825-002	10-Jan-2018 00:00	MB01D	✓	✓	✓	✓	✓	✓	✓
ES1801825-003	10-Jan-2018 00:00	MB02	✓	✓	✓	✓	✓	✓	✓
ES1801825-004	10-Jan-2018 00:00	PIT	✓	✓	✓	✓	✓	✓	✓
ES1801825-005	10-Jan-2018 00:00	DUPA	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PC)	WATER - EA015H Total Dissolved Solids - High Level	WATER - EA075 Redox Potential	WATER - W-07 TRH/BTEX/N/PAH
ES1801825-001	10-Jan-2018 00:00	MB01S	✓	✓	✓	
ES1801825-002	10-Jan-2018 00:00	MB01D	✓	✓	✓	
ES1801825-003	10-Jan-2018 00:00	MB02	✓	✓	✓	
ES1801825-004	10-Jan-2018 00:00	PIT	✓	✓	✓	✓
ES1801825-005	10-Jan-2018 00:00	DUPA	✓	✓	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

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

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation

EA005-P: pH by PC Titrator							
DUPA	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
MB01D	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
MB01S	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
MB02	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
PIT	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
EA075: Redox Potential							
DUPA	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
MB01D	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
MB01S	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
MB02	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----
PIT	Clear Plastic Bottle - Natural	----	10-Jan-2018	12-Jan-2018	✘	----	----

Requested Deliverables

MARK TAYLOR

- *AU Certificate of Analysis - NATA (COA)	Email	mark.taylor@hy-tec.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mark.taylor@hy-tec.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mark.taylor@hy-tec.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mark.taylor@hy-tec.com.au
- A4 - AU Tax Invoice (INV)	Email	mark.taylor@hy-tec.com.au
- Chain of Custody (CoC) (COC)	Email	mark.taylor@hy-tec.com.au
- EDI Format - ENMRG (ENMRG)	Email	mark.taylor@hy-tec.com.au
- EDI Format - XTab (XTAB)	Email	mark.taylor@hy-tec.com.au

CHAIN OF CUSTODY - Client

Client: Hy-Tec	**Client Project Name / Number / Site etc (ie report title):** Hytec Austen Quarry Baseline Groundwater Monitoring	**ALS** 277-289 Smithpark Road, Smithfield, NSW
Contact person: Mark Taylor	**PO No.:**	**Phone:** 02 87848555
Project Mgr: Mark Taylor	**Envirolab Quote No. :**	**E-mail:**
Sampler: Mark Taylor	**Standard TAT**	**Contact:**
Address: Austen Quarry, 391 Jenolan Caves Road, Hartley, NSW	**Or choose:** standard / same day / 1 day / 2 day / 3 day	
Phone: -- **Mob:** 0428855447	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax: --	**Lab comments:**	
Email:		

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	-	10-Jan-18	Water	x										
2	MB01D	-	11-Jan-18	Water	x										
3	MB02	-	11-Jan-18	Water	x										
4	Pit	-	10-Jan-18	Water	x	x									
5	DUPA	-	10-Jan-18	Water	x	x									

HT

Environmental Division Sydney
Work Order Reference
ES1801825

Telephone : + 61-2-8784 8555

Relinquished by (company):	**Hytec**	**Received by (company):** J.Greally ALS	***Lab use only:***
Print Name:	**Mark Taylor**	**Print Name:** Jessie	**Samples Received: Cool or Ambient (circle one)**
Date & Time:	11/01/2018	**Date & Time:** 12/01/18 08:30	**Temperature Received at:** **(if applicable)**
Signature:	**MT**	**Signature:**	**Transported by: Hand delivered / courier**

White - Lab copy / Blue - Client copy / Pink - Retain in Book

ES1801825

HYTEC Groundwater Suite

Analyte Group	Analyte
Physical Parameters (measure in field)	EC, pH, Eh, Temperature
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