

December 22, 2017
Project Number: AWS170073

David Browne
ERIAS Group
22B Beulah Road
Norwood SA 5067

Dear David

RE: Mt Bonnie and Iron Blow groundwater investigation update

CDM Smith Australia Pty Ltd (CDM Smith) was engaged by ERIAS Group (ERIAS) to undertake field hydrogeological investigations for the Mt Bonnie and Iron Blow deposits of the Hayes Creek Project (Figure 1). The field program consisted of drilling and bore construction, aquifer testing and collection of water samples for water quality analysis. The following letter provides a brief status report of the recently completed field program. A report will be prepared in early January 2018, which will present an analysis of the results.

Drilling and bore construction

A total of 16 drillholes were drilled in the vicinity of the Mt Bonnie deposit (Figure 2). Drilling commenced on 12-Oct-17 and was completed on 31-Oct-17. Eleven of the Mt Bonnie drillholes were constructed as monitoring bores with 50 mm diameter PVC casing, two drillholes were constructed as test bores with 150 mm diameter PVC casing, and one drillhole was abandoned. The first attempt at HCT-2 (designated as HCT-2x) was abandoned due to driller error in selecting appropriately sized PVC casing for the bore, resulting in casing being lost in the drillhole.

A total of seven drillholes were drilled in the vicinity of the Iron Blow deposit (Figure 3). Five drillholes were constructed as monitoring bores with 50 mm diameter PVC casing and two drillholes were abandoned. The first attempt at HCM-19 (designated as HCM-19x) and HCM-18 were abandoned due to ground conditions (i.e. hole collapsing on hammer and/or large inflows of groundwater).

Appendix A provides a summary of the completed drillholes and bores at the Mt Bonnie and Iron Blow deposits. The composite bore logs for the completed bores are presented in Appendix B.

Aquifer testing

Slug testing was completed on all 11 Mt Bonnie monitoring bores. The tests consisted of rapidly lowering a 2 m 'slug' below the standing water level and recording the water level response using a submerged pressure transducer. Analysis of the test results provides an estimate of the hydraulic conductivity of the strata directly adjacent to the bore.

Airlift recovery tests were completed on the two Mt Bonnie test bores and five of the Iron Blow drillholes. The tests consisted of airlifting the drillholes at a constant rate for a set period of time (typically one hour), then recording the water level response to airlifting using a submerged pressure transducer. The logger data was corrupted for the airlift

recovery test undertaken at HCM-21 due to an error with the logger software. However, data are available for all other tests. The tests provide estimates of the hydraulic conductivity of the strata surrounding the bore. Furthermore, estimates of aquifer storage properties can be calculated for HCT-1 and HCT-2 because water levels of nearby monitoring bores were recorded throughout the tests.

A summary of which bores and drillholes were aquifer tested (and which type of test was conducted) is presented in Appendix A.

Water quality

Water quality samples were collected from 18 bores and five surface water sites (Figure 2 and 3). Samples were analysed for field parameters (recorded using a calibrated portable multi-meter), major ions and metals. A duplicate sample was collected at HCT-1 for QA/QC. Appendix C presents a summary of the sampling sites and the laboratory results.

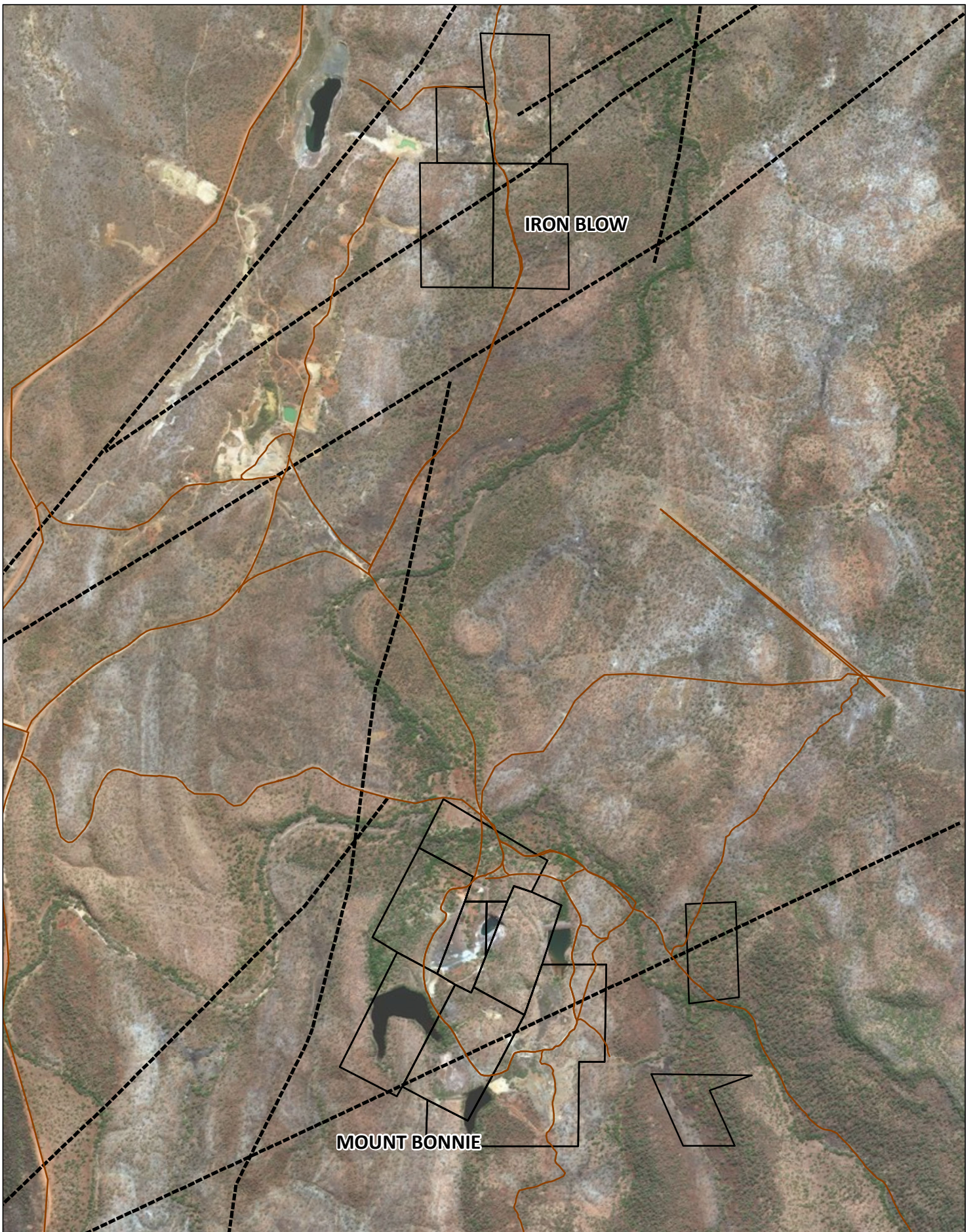
A draft report presenting an analysis of the results from the field program is currently being prepared, and a draft will be submitted to ERIAS in early January 2018. If you have any questions about the information in this letter, please do not hesitate to contact M Short or A. Hoare.

Sincerely

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cc: Kate Holder, Andy Bennett, Kate Pearce



0 0.2 0.4
Kilometers

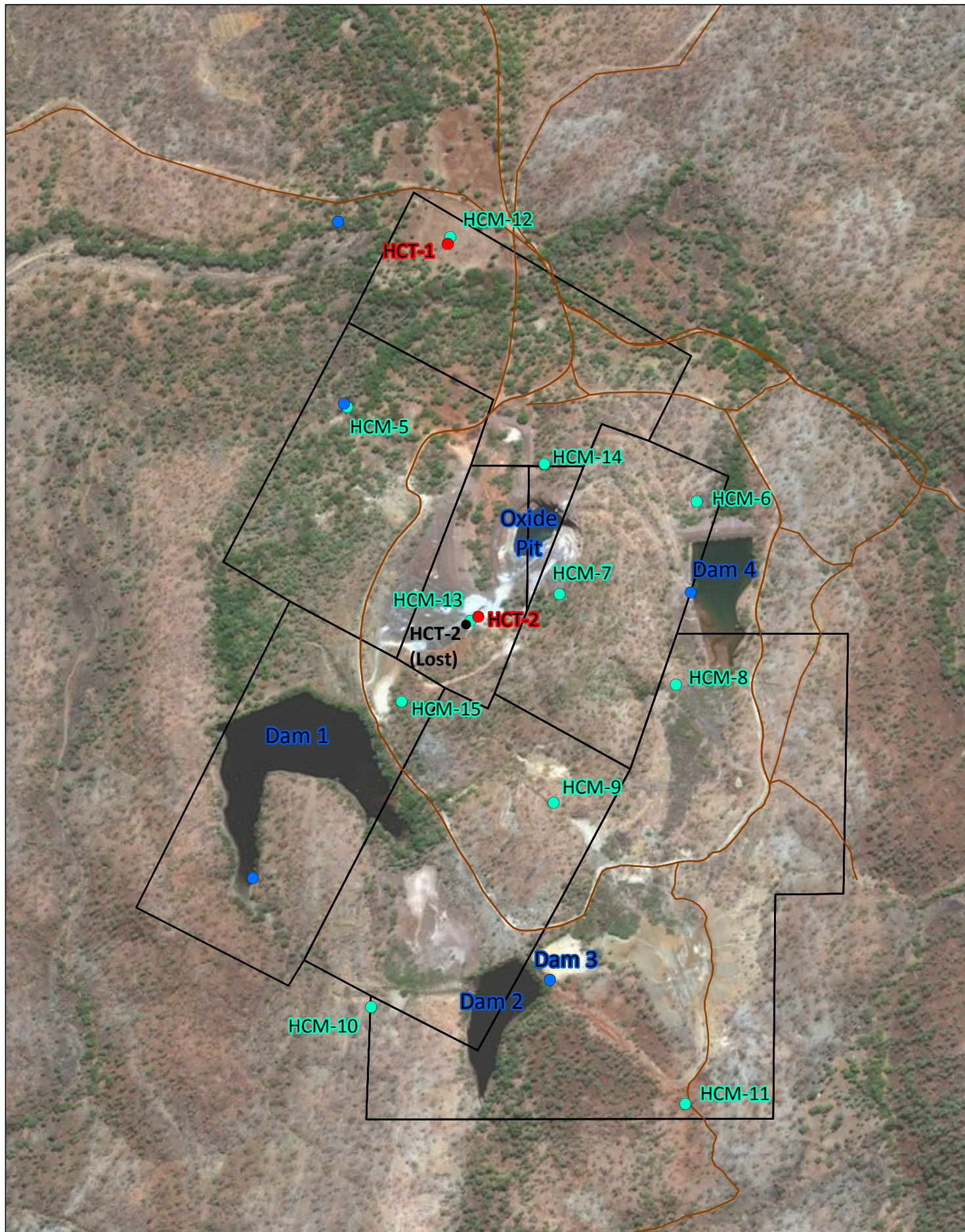
Legend

- Tracks
- Major Structures
- PNX mining lease (approx.)

Scale @ A4 1:20,000
Date: 21/12/17
Drawn: KH

Figure 1
Hayes Creek Project Area
Locality Plan

**CDM
Smith**



0 0.05 0.1
Kilometers

Scale @ A4 1:7,500
Date: 21/12/17
Drawn: MShort

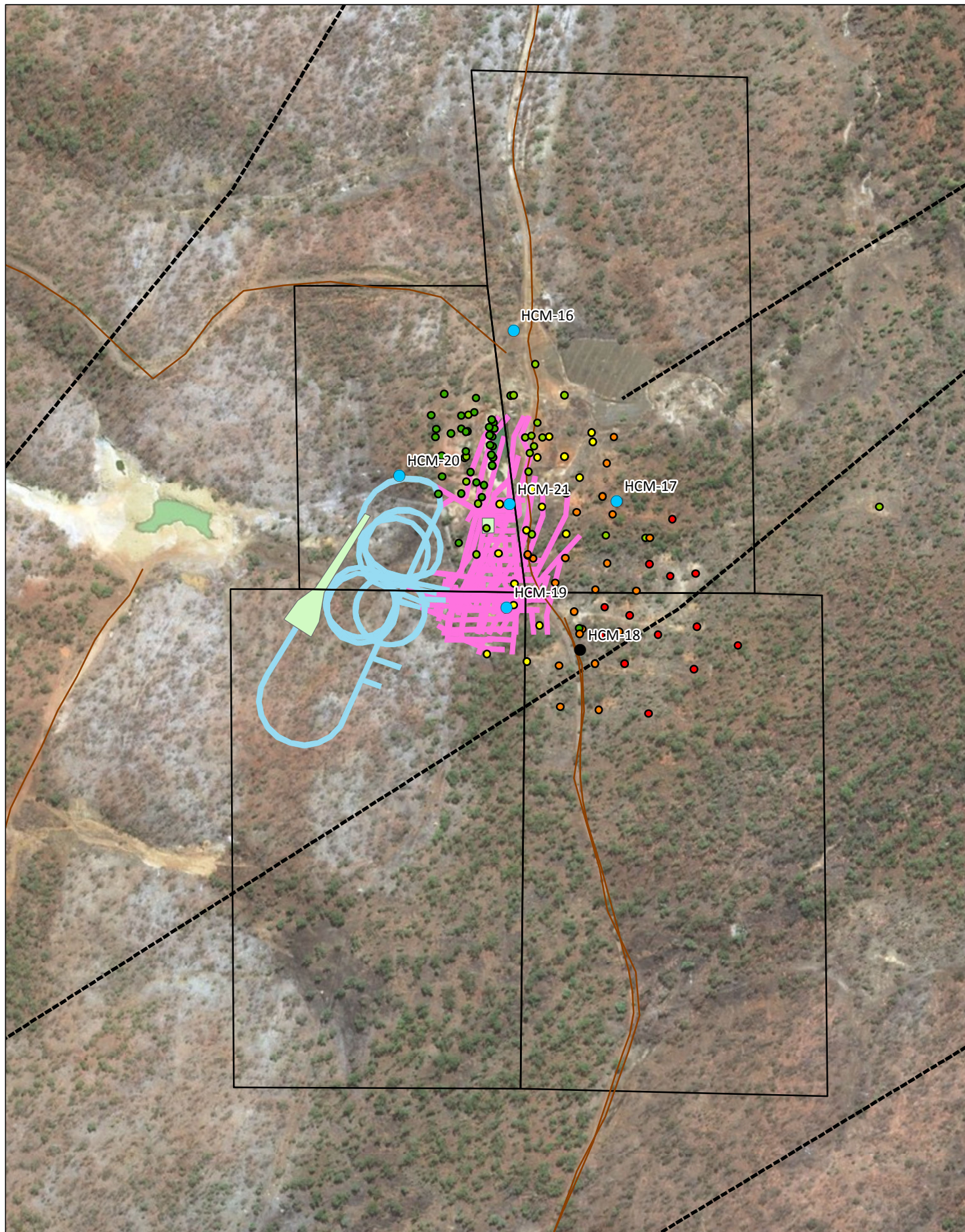
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- Abandoned bore
- Monitoring bore
- Surface water sample
- Test bore
- Tracks
- PNX mining lease (approx.)

Figure 2

Mount Bonnie Groundwater
Investigation Locality Plan

**CDM
Smith**



0 0.05 0.1
Kilometers

Scale @ A4 1:5,000
Date: 21/12/17
Drawn: KH

Legend

— Tracks

--- Major Structures

Iron Blow Bore Status

● Abandoned

● Monitoring

PNX Drill holes - depth

● 1.0 - 58.0

● 58.0 - 126.0

● 126.0 - 210.2

● 210.2 - 329.8

● 329.8 - 501.2

■ Vent Portal

■ Decline

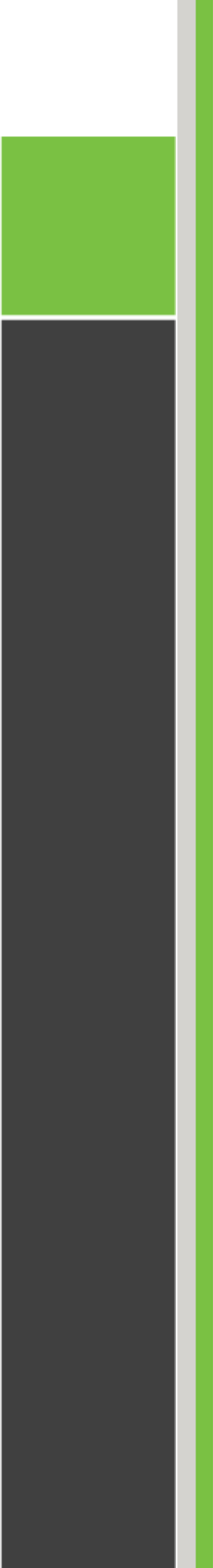
■ Level/Development

□ PNX mining lease (approx.)

Figure 3

Iron Blow Groundwater
Investigation Locality Plan

**CDM
Smith**



Appendix A Drilling and construction summary

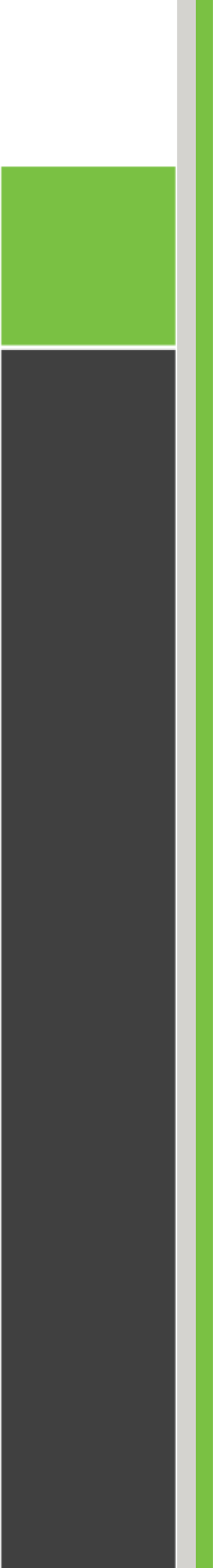
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Table A1 Summary details of Mt Bonnie drillholes and bores

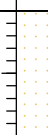
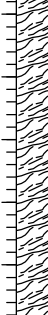
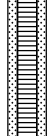
Hole ID	HCT-1	HCT-2	HCT-2x	HCM-5	HCM-6	HCM-7	HCM-8	HCM-9	HCM-10	HCM-11	HCM-12	HCM-13	HCM-14	HCM-15
Hole Status	Test	Test	Abandoned	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Drilled Depth (m)	25	79	-	18	36	58	30	49	42	42	25	67	72	55
Easting	776006	776052	776034	775854	776382	776175	776351	776166	775890	776365	776010	776040	776152	775936
Northing	8501784	8501221	8501209	8501538	8501395	8501255	8501118	8500940	8500631	8500485	850775	8501215	8501452	8501093
Elevation (mAHD)	130	82	87	18	134	173	154	164	152	164	130	148	147	144
Drilling Start Date	30/10/17	28/10/17	30/10/17	12/10/17	15/10/17	21/10/17	16/10/17	18/10/17	19/10/17	17/10/17	13/10/17	22/10/17	24/10/17	23/10/17
Drilling End Date	31/10/17	29/10/17	30/10/17	12/10/17	15/10/17	21/10/17	17/10/17	18/10/17	19/10/17	18/10/07	14/10/17	22/10/17	25/10/17	23/10/17
Hole Diameter (mm)	254	254	-	133	133	133	133	133	133	133	133	133	133	133
Casing Diameter (mm)	150	150	-	50	50	50	50	50	50	50	50	50	50	50
Cased Depth (m)	25	55	-	18	36	58	30	49	42	42	24.3	55	60.5	46
Casing Stickup (m)	1.17	0.95	0.05	0.98	0.84	0.93	0.91	0.87	0.96	0.86	0.8	0.96	0.76	0.93
Blank Casing (m)	0-13	0-37	-	0-12	0-18	0-52	0-18	0-43	0-18	0-36	0-6.3	0-43	0-39.5	0-19
Slotted Interval (m)	13-25	37-55	-	Dec-18	18-36	52-58	18-30	43-49	18-42	36-42	6.3-24.3	43-55	39.5-60.5	19-46
Open Hole Interval (m)	N/A	37-79	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	24.3-25	55-67	60.5-72	46-55
SWL (mbgl)	3.09	17.61	-	1.36	8.76	39.38	10.34	20.53	9.16	17.34	2.92	17.62	18.04	7.52
Field EC (µS/cm)	440	241	-	318	292	411	2180	2142	427	796	431	279	504	632
Field Temp. (°C)	28.8	31.4	-	30.4	30.1	32.3	32.8	31.4	32.4	32.0	29.3	32.3	31.2	32.8
Field pH	7.85	7.1	-	7.56	7.24	8.02	7.64	7.43	7.57	7.49	7.28	7.57	6.15	7.46
Airlift Yield (L/s)	1.5	0.6	-	0.1	10.2	1.0	3.4	0.5	12.5	7.0	4	0.6	2.2	4.5
Slug test completed	N	N	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Airlift recovery Test completed	Y	Y	-	N	N	N	N	N	N	N	N	N	N	N
Water Samples collected	Y	Y	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

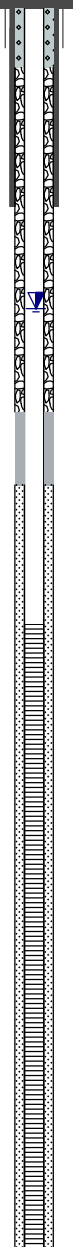
Table A2 Summary details of Iron Blow drillholes and bores

Hole ID	HCM-16	HCM-17	HCM-18	HCM-19x	HCM-19	HCM-20	HCM-21
Hole Status	Monitor	Monitor	Abandoned	Abandoned	Monitor	Monitor	Monitor
Drilled Depth (m)	100	120	24	30	100	114	100
Easting	776145	776249	776212	776138	776138	776030	776141
Northing	8504691	8504519	8504369	8504412	8504412	8504545	8504516
Elevation (mAHD)	121	118	121	122	122	130	120
Drilling Start Date	9/12/17	5/12/17	8/12/17	4/12/17	7/12/17	3/12/17	1/12/17
Drilling End Date	10/12/17	7/12/17	8/12/17	5/12/17	8/12/17	5/12/17	3/12/17
Hole Diameter (mm)	133	133	152	133	133	133	133
Casing Diameter (mm)	50	50	-	-	50	50	50
Cased Depth (m)	16	36	6	-	9.5	10	36
Casing Stickup (m)	0.96	-	N/A	-	1.06	-	-
Blank Casing (m)	N/A	0-24	N/A	-	N/A	N/A	0-24
Slotted Interval (m)	0-16	24-36	N/A	-	0-9.5	0-10	24-36
Open Hole Interval (m)	16-100	36-120	N/A	-	9.5-100	10-114	36-100
SWL (mbgl)	8.25	4.22	N/A	-	5.40	7.36	4.22
Field EC ($\mu\text{S}/\text{cm}$)	155	1519	199	-	633	191	180
Field Temp. ($^{\circ}\text{C}$)	30.4	31.1	32.0	-	31.4	32.9	30.3
Field pH	6.39	7.77	6.96	-	7.56	7.45	6.4
Airlift Yield (L/s)	3.6	10.0	1.3	-	3.5	3.5	6.7
Slug test completed	N	N	N	-	N	N	N
Airlift recovery Test completed	Y	Y	N	-	Y	Y	Y
Water Samples collected	Y	Y	N	-	Y	Y	Y



Appendix B Composite bore logs

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCM-5					
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073				Total Depth (m bgl): 18					
				Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a					
				Location: Mt Bonnie				Surface Elevation (m AHD): 130					
				Client: PNX Metals				Static Water Level					
				Drilled By: Geo Drilling				Date: 25/10/2017 Depth (mbRP): 2.26					
				Drilling Method: Air Hammer				Projection: GDA94 Z52					
				Bore Diameter: 5.25"				Easting: 775854 Northing: 8501538					
				Date Started: 12/10/2017				Date Completed: 12/10/2017					
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.					
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"		0		Quaternary Sediments Grey brown quartz and siltstone						Stick up 0.98m		0-1m cement seal
					Mount Bonnie Formation Greywacke with fine siltstone inclusions								0-6m 6" PVC pre-collar
Air Hammer	5.25"		10		Mount Bonnie Formation Dark grey siltstone with greywacke incusions. Some chert @8-9m								1-7.8m backfill
					Mount Bonnie Formation Dark grey siltstone, greywacke and shale								0-12m 50mm Cl.18 PVC production casing
						12	34.6	0.1	469	7.01	First water strike @ 12m		7.8-9.5m bentonite seal
													9.5-18m gravel pack (3-6mm)
													12-18m 50mm Cl.18 PVC slotted casing (0.5mm aperture)
							34.2	0.1	193	7.23			EOH @ 18m
								LOGGED BY: SAO				DATE: 30/10/2017	
								CHECKED BY				DATE:	

		COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-6								
 CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000		Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 5.25" Date Started: 15/10/2017		Total Depth (m bgl): 36 Well Permit Number: n/a Surface Elevation (m AHD): 134 Static Water Level Date: 25/10/2017 Depth (m bRP): 9.77 Projection: GDA94 Z52 Easting: 776382 Northing: 8501395 Date Completed: 16/10/2017								
DRILLING INFO.		GEOLOGICAL DESCRIPTION		FIELD RECORDS / CONSTRUCTION INFO.								
METHOD	BIT LOG (inches) PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"	0		Quaternary Sediments Cream sandstone. Fine to medium grained Mount Bonnie Formation Grey/brown sandstone and mudstone Mount Bonnie Formation Grey/purple sandstone with iron staining Mount Bonnie Formation Khaki/grey sandstone. Fine grained						Stick up 0.84m		0-2m cement seal 0-6m 6" PVC pre-collar 2-11.9m backfill 0-18m 50mm Cl.18 PVC production casing 11.9-14m bentonite seal 14-36m gravel pack (3-6mm)
Air Hammer	5.25"	1.10		Mount Bonnie Formation Grey/pink sandstone with clay and minor quartz	16	24.7	0.5	285	6.67	First water strike @ 16 m		
		20		Mount Bonnie Formation Khaki/grey sandstone and mudstone. Quartz vein @ 19-20m	21	33.9	0.5	288	6.77			
					21	31.7	2.9	294	6.85			
						31.6	3.9	294	6.82			
				Mount Bonnie Formation Dark grey, graphitic shale with sandstone	27	30.2	7.0	301	6.89			
						30.7	7.7	302	6.83			
						31.1	4.4	301	6.87			
						31.3	4.4	300	6.89			
						30.6	4.4	301	6.89			18-36m 50mm Cl.18 PVC slotted casing (0.5mm aperture)
						31.7	4.4	299	6.87			
						31.1	10.2	302	6.90			EOH @ 36m
LOGGED BY: SAO DATE: 30/10/2017 CHECKED BY: DATE:												

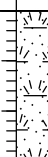
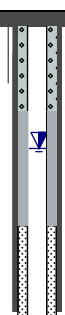
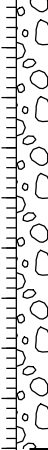
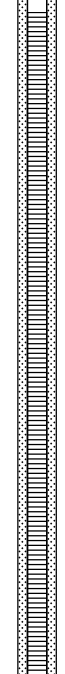
				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-7									
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073				Total Depth (m bgl): 58							
				Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a							
				Location: Mt Bonnie				Surface Elevation (m AHD): 173							
				Client: PNX Metals				Static Water Level							
				Drilled By: Geo Drilling				Date: 25/10/2017 Depth (mbRP): 40.23							
				Drilling Method: Air Hammer				Projection: GDA94 Z52							
				Bore Diameter: 5.25"				Easting: 776175 Northing: 8501255							
				Date Started: 21/10/2017				Date Completed: 21/10/2017							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION		
Air Hammer	7.75"		0		Mount Bonnie Formation Dark grey siltstone/greywacke with dull red bands occasionally. Some iron-stained fractures.						Stick up 0.93m		0-1m cement seal		
			0.33		Mount Bonnie Formation As above. More blocky with obvious oxidised and iron-stained fracture surfaces.								0-6m 6" PVC pre-collar		
Air Hammer	5.25"		10		Mount Bonnie Formation Weathered mineralised zone. Hematitic and Goethitic clay and siltstone. Quartz vein at 20-21m.								0-52m 50mm Cl.18 PVC production casing		
			0.35		Mount Bonnie Formation Soft carbonate alteration with foliation of the above lithology. Some iron staining in fractures.								1-46.5m backfill		
			0.86		Mount Bonnie Formation Dark grey siltstone/greywacke. Slightly coarser grained than at shallower depths.										
			1.00		Mount Bonnie Formation Grey-green soft siltstone. Quartz vein @ 45-46m. Some minor hard dark grey bands throughout (1-2 m in thickness)										
			0.75		Mount Bonnie Formation Dark grey, hard, cherty siltstone/talc. Quartz vein @ 56-57m (all quartz in cuttings)										
			30										46.5-48.9m bentonite seal		
0.33			48.9-58m gravel pack (3-6mm)												
0.32			52-58m 50mm Cl.18 PVC slotted casing (0.5mm aperture)												
0.43			EOH @ 58m												
			50												
0.30															
0.38															
						55	41.8	0.4	311	6.93	First water strike @ 55m				
						32.8	1.0	402	7.92						
						LOGGED BY: MS				DATE: 30/10/2017					
						CHECKED BY				DATE:					

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-8							
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number:AWS170073 Project Name:Hayes Creek Project Water Studies Location:Mt Bonnie Client:PNX Metals Drilled By:Geo Drilling Drilling Method:Air Hammer Bore Diameter:5.25" Date Started:17/10/2017				Total Depth (m bgl):30 Well Permit Number:n/a Surface Elevation (m AHD):154 Static Water Level Date: 25/10/2017 Depth (mbRP): 11.17 Projection:GDA94 Z52 Easting:776351 Northing:8501118 Date Completed:17/10/2017					
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.					
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
↑ Air Hammer	↑ 7.75"		0		Mount Bonnie Formation Khaki brown sandstone (fine-grained) with iron stained fractures and minor quartz veins. Transition zone between weathered and fresh rock						Stick up 0.91m		0-1m cement seal
			0.54										0-6m 6" PVC pre-collar
			10										1-8.5m backfill
			0.55										8.5-10m bentonite seal
					Mount Bonnie Formation Grey and brown sandstone and mudstone. Slightly weathered. Stained fracture surfaces	18					First water strike @ 18m		0-18m 50mm Cl.18 PVC production casing
↑ Air Hammer	↑ 5.25"		0.46										10-30m gravel pack (3-6mm)
			20		Mount Bonnie Formation Fresh grey mudstone with iron-stained fractures								18-30m 50mm Cl.18 PVC slotted casing (0.5mm aperture)
			0.26			31.9	0.5	2533	6.78				
						33.1	1.2	2573	7.29				
			0.26			24	32.2	3.4	2553	7.52			
							32.9	n/a	1651	7.70			
													EOH @ 30m
			0.26										
						LOGGED BY: SAO		DATE: 30/10/2017					
						CHECKED BY		DATE:					

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-9							
 CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 5.25" Date Started: 18/10/2017		Total Depth (m bgl): 49 Well Permit Number: n/a Surface Elevation (m AHD): 164 Static Water Level Date: 25/10/2017 Depth (m bRP): 20.97 Projection: GDA94 Z52 Easting: 776166 Northing: 8500940 Date Completed: 18/10/2017							
DRILLING INFO.				GEOLOGICAL DESCRIPTION		FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"		0		No Sample								0-1m cement seal
Air Hammer	5.25"		10		Mount Bonnie Formation Grey/brown weathered mudstone with iron stained fractures								0-6m 6" PVC pre-collar
			20		Mount Bonnie Formation Brown/grey weathered mudstone, iron-rich with stained fracture surfaces								1-38m backfill
			30		Mount Bonnie Formation Green/grey mudstone (reduced)								0-43m 50mm Cl.18 PVC production casing
			40		Mount Bonnie Formation Weathered mudstone with pale-tan/brown clay								38-39.5m bentonite seal
			41		Mount Bonnie Formation Grey/light-grey mudstone with iron-stained fracture surfaces	41	37.5	<0.5	1792	6.70	First water strike @ 41m		39.5-49m gravel pack (3-6mm)
		0.50	49				37.5	<0.5	1791	7.06			43-49m 50mm Cl.18 PVC slotted casing (0.5mm aperture) EOH @ 49m
							38.3	0.5	1758	7.30			
						LOGGED BY: SAO		DATE: 30/10/2017					
						CHECKED BY		DATE:					

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCM-10						
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073				Total Depth (m bgl): 42						
				Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a						
				Location: Mt Bonnie				Surface Elevation (m AHD): 152						
				Client: PNX Metals				Static Water Level						
				Drilled By: Geo Drilling				Date: 25/10/2017 Depth (mbRP): 9.83						
				Drilling Method: Air Hammer				Projection: GDA94 Z52						
				Bore Diameter: 5.25"				Easting: 775890 Northing: 8500631						
				Date Started: 19/10/2017				Date Completed: 19/10/2017						
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.						
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION	
Air Hammer	7.75"		0		Mount Bonnie Formation Khaki and pink sugary sandstone with minor mudstone. Iron-stained fracture surfaces						Stick up 0.96m		0-1m cement seal	
			0.35		Mount Bonnie Formation Weathered grey and brown mudstone and sandstone with clay. Iron-stained fracture surfaces.								0-6m 6" PVC pre-collar	
Air Hammer	5.25"		10		Mount Bonnie Formation Grey graphitic mudstone with weak lamination and minor sandstone.	17					First water strike @ 17m		1-11.7m backfill	
			0.71											0-18m 50mm Cl.18 PVC production casing
			20											11.7-13.5m bentonite seal
			0.52											13.5-42m gravel pack (3-6mm)
			0.39											
			30											
			0.35											
			31											
			0.33											
			40											

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-11									
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073				Total Depth (m bgl): 42							
				Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a							
				Location: Mt Bonnie				Surface Elevation (m AHD): 164							
				Client: PNX Metals				Static Water Level							
				Drilled By: Geo Drilling				Date: 25/10/2017 Depth (mbRP): 18.13							
				Drilling Method: Air Hammer				Projection: GDA94 Z52							
				Bore Diameter: 5.25"				Easting: 776365 Northing: 8500485							
				Date Started: 17/10/2017				Date Completed: 18/10/2017							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION		
Air Hammer	7.75"		0		Quaternary Sediments Dark tan, fine-grained sandstone						Stick up 0.86m		1m cement seal		
			Mount Bonnie Formation Grey/green mudstone with weak sericite alteration. Iron-staining on fracture surfaces								0-6m 6" PVC pre-collar				
Air Hammer	5.25"		0.32		Mount Bonnie Formation Bedded grey mustone with chert and silicious bands	22	37.3	<0.5	586		First water strike @ 22m		0-36m 50mm Cl.18 PVC production casing		
			0.24											1-29.5m backfill	
Air Hammer			0.39		Mount Bonnie Formation Grey, fine-grained sandstone with minor quartz veining.		32.1	1.0	736				29.5-31.5m bentonite seal		
			0.86												31.5-42m gravel pack (3-6mm)
Air Hammer			0.86				33.0	0.8	729				36-42m 50mm Cl.18 PVC slotted casing (0.5mm aperture)		
			0.86												EOH @ 42m
								LOGGED BY: SAO				DATE: 30/10/2017			
								CHECKED BY				DATE:			

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCM-12					
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 5.25" Date Started: 13/10/2017				Total Depth (m bgl): 25 Well Permit Number: n/a Surface Elevation (m AHD): 130 Static Water Level Date: 25/10/2017 Depth (mbRP): 3.55 Projection: GDA94 Z52 Easting: 776010 Northing: 8501795 Date Completed: 14/10/2017					
				DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.	
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"	0.64	0		Topsoil Red/brown silt and clay	7					Stick up 0.80m		0-2m cement seal 0-6m 6" PVC pre-collar
			Alluvial sediments Orange/brown sandstone and clay with minor quartz		2-4.3m bentonite seal								
Air Hammer	5.25"	0.55	10		Alluvial sediments Grey/brown mudstone and minor sandstone with iron-stained fractures. Weak sericite alteration @ 12m						First water strike @ 7m		0-6.3m 50mm Cl.18 PVC production casing
			Alluvial sediments Shale with minor graphitic alteration. Minor quartz veining		4.3-24.3m gravel pack (3-6mm)								
			Alluvial sediments Grey mudstone with minor sandstone. Minor pyrite veining		6.3-24.3m 50mm Cl.18 PVC slotted casing (0.5mm aperture)								
			20								24.3-25m fallback EOH @ 25m		
						32.9	2.0	571	7.04				
						30.7	2.0	611	7.52				
						31.6	2.0	608	6.11				
						31.2	2.0	611	6.16				
								LOGGED BY: SAO				DATE: 30/10/2017	
								CHECKED BY				DATE:	

					COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-13							
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000					Project Number: AWS170073				Total Depth (m bgl): 67					
					Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a					
					Location: Mt Bonnie				Surface Elevation (m AHD): 148					
					Client: PNX Metals				Static Water Level					
					Drilled By: Geo Drilling				Date: 27/10/2017 Depth (mbRP): 18.60					
					Drilling Method: Air Hammer				Projection: GDA94 Z52					
					Bore Diameter: 5.25"				Easting: 776040 Northing: 8501215					
					Date Started: 22/10/2017				Date Completed: 22/10/2017					
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.						
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION	
Air Hammer	7.75"		0		Waste Rock Highly-weathered, leached mudstone/greywacke						Stick up 0.96m		0-1m cement seal	
			0.46		Mount Bonnie Formation Clayey zone. Mottled with some quartz and weathered mudstone cuttings								0-6m 6" PVC pre-collar	
Air Hammer			10		Mount Bonnie Formation Highly-weathered mudstone with minor goethitic clay.								0-43m 50mm Cl.18 PVC production casing	
			0.75		Mount Bonnie Formation Slightly-weathered mudstone/siltstone. Iron-stained fracture surfaces.								1-38.5m backfill	
Air Hammer			20		Mount Bonnie Formation Fresh dark grey siltstone. No iron-stained fractures	21.5	37.1	<0.10	97	6.58	First water strike @ 21.5m		38.5-40m bentonite seal	
			0.35		Mount Bonnie Formation As above with minor pyrite on fracture surfaces. Fracture zone/quartz vein @ 47-48m. Pyrite dominant @53-54m, 57-58m.	33							40.5-55.5m gravel pack (3-6mm)	
Air Hammer			30										43-55m 50mm Cl.18 PVC slotted casing (0.5mm aperture)	
			0.19										55.5-56m bentonite plug	
Air Hammer			40										56-67m backfill	
			0.22											
Air Hammer			50											
			0.20											
Air Hammer			60											
			0.46											
Air Hammer			75		Gerowie Tuff Soft, light grey-green talc.									
			0.75											
													EOH @ 67m	
						LOGGED BY: MS				DATE: 30/10/2017				
						CHECKED BY				DATE:				

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCM-14								
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 5.25" Date Started: 24/10/2017				Total Depth (m bgl): 72 Well Permit Number: n/a Surface Elevation (m AHD): 147 Static Water Level Date: 26/10/2017 Depth (mbRP): 18.76 Projection: GDA94 Z52 Easting: 776152 Northing: 8501452 Date Completed: 25/10/2017								
				DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.				
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION			
Air Hammer	7.75"		0		Mount Bonnie Formation Highly-weathered mudstone with mottled clay and silt						Stick up 0.76m		0-1m cement seal			
			Mount Bonnie Formation Grey-purple, highly-weathered mudstone		0-6m 6" PVC pre-collar											
Air Hammer	5.25"		0.46		Mount Bonnie Formation Slightly weathered grey mudstone. Iron-stained fractures throughout. Deep weathering profile	35		<0.1			First water strike @ 35m		1-33.5m backfill			
			10										0-39.5m 50mm Cl.18 PVC production casing			
			0.50													
			0.46													
			20													
			0.50													
			30													
			0.67													
			1.00													
			40											Mount Bonnie Formation Khaki clay with leached mudstone. Mostly fine cuttings		
				Mount Bonnie Formation Highly-fractured zone. Grey mudstone with iron-stained fractures.												
				Mount Bonnie Formation Fresher grey mudstone with no iron-stained fractures	29.3	0.45	121	7.13				35.5-61m gravel pack (3-6mm)				
				Mount Bonnie Formation As above but with a greenish sercite alteration. Soft ground.	33.2	0.45	123	6.31								
				Mount Bonnie Formation Hard dark grey/black mudstone. Quartz and pyrite vein @ 52-54m.								39.5-60.5m 50mm Cl.18 PVC slotted casing (0.5mm aperture)				
					32.8	2.17	304	5.69								
								</								

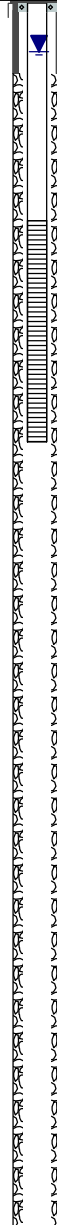
				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCM-15					
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073				Total Depth (m bgl): 55					
				Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a					
				Location: Mt Bonnie				Surface Elevation (m AHD): 144					
				Client: PNX Metals				Static Water Level					
				Drilled By: Geo Drilling				Date: 25/10/2017 Depth (mbRP): 7.47					
				Drilling Method: Air Hammer				Projection: GDA94 Z52					
				Bore Diameter: 5.25"				Easting: 775936 Northing: 8501093					
				Date Started: 23/10/2017				Date Completed: 23/10/2017					
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.					
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"		0		Mount Bonnie Formation Colluvium-top soil. Brittle leached mudstone chips						Stick up 0.93m		1m cement seal
		0.46			Mount Bonnie Formation Fractured grey mudstone/greywacke. Iron-staining on fracture surfaces							0-6m 6" PVC pre-collar	
Air Hammer	5.25"		10										1-13m backfill
		0.60										0-19m 50mm Cl.18 PVC production casing	
		0.86					16	<0.5			First water strike @ 16m		13-15.7m bentonite seal
		0.67			Mount Bonnie Formation As above but with pyrite on fracture surfaces. No obvious highly-fractured interval.	23	32.9	0.45	478	6.60			15.7-46.5m gravel pack (3-6mm)
		0.60				27	30.2	4.45	535	7.03			19-46m 50mm Cl.18 PVC slotted casing (0.5mm aperture)
		0.40					28.9	4.45	551	6.83			
		0.38			Gerowie Tuff Grey mudstone/siltstone with soft soapy texture (talc)		30.5	4.45	565	6.93			46.5-47m bentonite plug
		0.50					30.4	>6	600	7.53			47-55m backfill
		0.16			Gerowie Tuff Dark grey/black shaly mudstone		31.5	>6	604	7.54			EOH @ 55m
								LOGGED BY: MS DATE: 30/10/2017					
								CHECKED BY DATE:					

		COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCM-16						
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000		Project Number:AWS170073 Project Name:Hayes Creek Project Water Studies Location: Mt Bonnie Client:PNX Metals Drilled By:Geo Drilling Drilling Method:Air Hammer Bore Diameter:7.75", 5.25" Date Started:9/12/2017 Total Depth (m bgl):100 Well Permit Number:n/a Surface Elevation (m AHD):121 Static Water Level Date: 10/12/2017 Depth (mbRP): 8.25 Projection:GDA94 Z52 Easting:776145 Northing:8504691 Date Completed:10/12/2017										
DRILLING INFO.		GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.						
METHOD	BIT LOG (inches) PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"	0		Extremley weathered siltstone, red/brown, Quartz present								0 - 1m
		0.75		Very weathered Siltstone, with clay inclusions grey/brown/white								Cement seal
		10		Weathered siltstone, some clay inclusions, grey brown white								0 - 6m 6" PVC pre-collar
		0.86		Weathered Claystone, very brittle, browm/cream	15							0 - 16m
		1.09		Fresh Siltstone dark grey, ocasional pyrite								50mm CL.18 PVC slotted casing (0.5mm aperture)
		0.71				30.5	2.67	154.2	6.06			
		1.14				30.5	2.98	131.7	6.28			16 - 100m
		0.47				30	3.33	125.2	6.49			Open hole (blocked)
		0.46				29.6	2.85	138.4	6.56			
		0.40		Fresh mudstone, very dark grey, ocasional bands of carbonacious mudstone, pyrite common		30.1	3.64	140.3	6.48			
		0.25				29.9	3.6	137.1	6.45			
		0.31		Fresh Siltstone , very dark grey, pyrite and quartz abundant		30.3	2.85	143.3	6.32			
		0.31				31	3.44	144.6	6.22			
		0.25				31.6	3.7	145.6	6.4			
		0.24		Fresh Mudstone, very dark grey, small quarts veins common throughout, pyrite present		31	3.27	148.9	6.35			
		0.23		Fresh Siltstone, dark grey frequent quartz veins, pyrite present.		31.3	2.96	149.9	6.45			
		0.17				32.1	3.2	189.3	6.4			
		0.21				32	1.95	195.8	6.2			
		0.16				31.5	2.8	172.5	6.4			
						LOGGED BY: MS		DATE: 20/12/2017				
						CHECKED BY		DATE:				

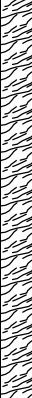
				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-17									
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073				Total Depth (m bgl): 120							
				Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a							
				Location: Mt Bonnie				Surface Elevation (m AHD): 118							
				Client: PNX Metals				Static Water Level							
				Drilled By: Geo Drilling				Date: 7/12/2017 Depth (mbRP): 4.22							
				Drilling Method: Air Hammer				Projection: GDA94 Z52							
				Bore Diameter: 7.75", 5.25"				Easting: 776249 Northing: 8504519							
				Date Started: 5/12/2017				Date Completed: 7/12/2017							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION		
Air Hammer	7.75"		0		Top Soil Top soil - Red/orange clay/silt with poorly-sorted silica gravel (1-4 mm)	24							0 - 1m Cement seal		
		0.86	10		Highly-weathered and leached gravels with red/orange clay/silt Highly-weathered grey mudstone and siltstone gravel with iron-staining in light grey clay (60-70%) Highly-weathered grey mudstone and siltstone with no iron-staining in a very light grey clay (80-90%).								0 - 6m 6" PVC pre-collar 0 - 24m 50mm CL.18 PVC production casing 24 - 36m 50mm CL.18 PVC slotted casing (0.5mm aperture)		
Air Hammer	5.25"		20		Moderately-weathered grey siltstone (grading to sandstone texture) with very minor pyrite on fractures. Carbonaceous (graphite in discharge water) between 33-35m.		32	3.5	450	6.3					
		0.75	30				29.9	4	453	6.45					
		1.00	40				31.3	5	457	6.49					
		1.20	50		Soft grey, fine-grained sandstone Dark grey, fine-grained sandstone. Fractured and blocky cuttings. Interbedded with minor dark grey siltstone. Some rare quartz veining		29.5	5	445	6.57					
		1.20	60				29.8	5.5	454	6.75					
		0.43	70		As above - quartz veining becoming more common		30.4	6.5	575	6.95					
		0.40	80				30.2	6.5	739	7.3					
		0.46	90		As above - less siltstone interbedding		30.5	7	1000	7.32					
		0.46	100				30.6	7.5	1109	7.18					
		0.43	110				30.7	7.5	1071	7.15					
		0.30	120		As above - no visible silstone (entirely sandstone)		30.9	7.5	1090	7.34					
		0.27					30.8	7.5	1120	7.4					
		0.25					31.2	8	1239	7.51					
		0.21					31.2	8	1301	7.33					
		0.17					31.2	8	1418	7.48					
		0.17					31.1	8	1585	7.81					
						LOGGED BY: MS		DATE: 20/12/2017							
						CHECKED BY		DATE:							

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCM-19					
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 7.75", 5.25" Date Started: 7/12/2017				Total Depth (m bgl): 100 Well Permit Number: n/a Surface Elevation (m AHD): 122 Static Water Level Date: 8/12/2017 Depth (mbRP): 5.4 Projection: GDA94 Z52 Easting: 776138 Northing: 8504412 Date Completed: 8/12/2017					
				DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.	
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"		0		Top Soil Top soil. Red/orange silt and clay with poorly-sorted mixed (silica, mudstone) gravel. Highly-weathered tan, leached mudstone/siltstone/sandstone with tan clay (60%) Highly-weathered grey siltstone and sandstone in brown clay with iron-stained fracture surfaces	15							0 - 1m Cement seal 0 - 6m 6" PVC pre-collar 0 - 9.5m 50mm CL.18 PVC slotted casing (0.5mm aperture)
			0.86				31.7	1.2	193	7.71			
			10				31.4	1.1	238	7.78			
			0.75										
			0.86										
			20										
			0.67										
			30										
			0.86				30.3	1.5	228	7.82			
			0.67										
			40										
			0.67				31.3	2.5	223	7.81			
			50										
			0.30				30.4	3.2	214	7.81			
			60										
			0.43				30.2	3.2	204	7.96			
			70										
			0.35				30.6	3.2	248	7.87			
			80										
			0.40				31.3	3.5	354	7.91			
			90										
			0.32				31	3.5	409	7.98			
			100				30.7	3.5	469	7.93			
							30.9	3.5	446	7.95			
							31.3	4.1	455	7.98			
							30.6	3.36	533	7.23			
							30.5	2.98	622	7.57			
								LOGGED BY: MS				DATE: 20/12/2017	
								CHECKED BY				DATE:	

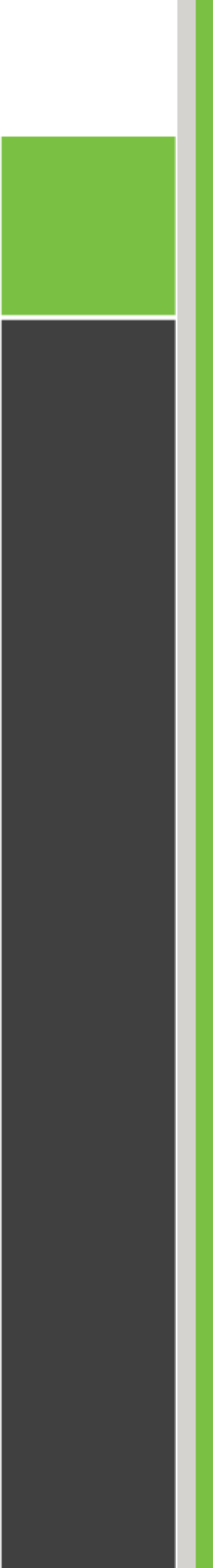
		COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-20								
 CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000		Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 7.75", 5.25" Date Started: 3/12/2017		Total Depth (m bgl): 114 Well Permit Number: n/a Surface Elevation (m AHD): 130 Static Water Level Date: 4/12/2017 Depth (mBRP): 7.36 Projection: GDA94 Z52 Easting: 776030 Northing: 8504545 Date Completed: 5/12/2017								
DRILLING INFO.		GEOLOGICAL DESCRIPTION		FIELD RECORDS / CONSTRUCTION INFO.								
METHOD	BIT LOG (inches) PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	7.75"	0		Highly-weathered siltstone/mudstone in a red/orange matrix (60%). Very broken ground.								0 - 1m Cement seal
		0.75		As above but clay/silt increasing to 90-95% (white clay)								0 - 6m 6" PVC pre-collar
		1.50		White/grey clay (negligible rock fragments)								0 - 10m 50mm CL.18 PVC slotted casing (0.5mm aperture)
		1.50		White/grey clay with moderately weathered siltstone and fine-grained sandstone. Sulfides present								
		1.50		As above. Clay content increases to 90%								
		1.50		As above. Clay decreases to 50%	18		<0.1					
		1.50		Moderately weathered grey siltstone with minor pyrite veining		35.1	1.5	171	7.15			
		1.50		Slightly-weathered grey sandstone interbedded with dark grey siltstone. Pyrite veining throughout. Quartz vein @ 26-27 m. Clayey zone @ 30-31 m.		32.3	2.5	273	6.93			
		0.50		Fresh black, foliated siltstone. Pyrite on fractures (only occasional)		30.3	2	220	7.07			
		0.40		As above. No pyrite and interbedded with minor khaki chert layers		31.7	2.5	291	7.4			
		0.43		Fresh dark grey/black siltstone. Very minor pyrite veining throughout. Major pyrite vein @ 40-41 m. Major quartz vein @ 48-49 m		31.5	2	343	7.81			
		0.35				31.3	2.5	303	7.4			
		0.24				31.7	3.5	533	7.63			
		0.29		As above but very silicified and cherty texture		31.3	3.5	416	7.85			
		0.24				31.7	3	550	7.94			
		0.30		Layer of lighter coloured (tan/grey) chert/siltstone		31.8	3	440	8.21			
		0.18		Fresh dark grey to black siltstone. Foliation present. Minor pyrite (no veining but crystals in rock matrix) throughout. Quartz vein @ 80-81 m.		31.3	3	406	8.56			
		0.17		As above. Pyrite veining also present		32	3	413	8.07			
		0.13				32.5	3	470	8.32			
		0.11		Increase in pyrite veining and some quartz veining. Major quartz veins @ 100-101 m and 109-110 m.		32.3	3	497	7.87			
		0.14				33.2	3	805	7.95			
		0.07				32.9	3	191	7.45			
		0.08										
						LOGGED BY: MS		DATE: 20/12/2017				
						CHECKED BY		DATE:				

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: HCM-21									
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 7.75", 5.25" Date Started: 1/12/2017				Total Depth (m bgl): 100 Well Permit Number: n/a Surface Elevation (m AHD): 120 Static Water Level Date: 2/12/2017 Depth (mbRP): 3.77 Projection: GDA94 Z52 Easting: 776141 Northing: 8504516 Date Completed: 3/12/2017							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION		
Air Hammer	7.75"		0		Broken, highly-weathered and leached grey mudstone. In a matrix of red/orange silt and clay								0 - 1m Cement seal 0 - 6m 6" PVC pre-collar 0 - 24m 50mm CL.18 PVC production casing		
	5.25"		1.20		Broken and highly-weathered grey mudstone. Iron-stained fractures (orange and red)										
			0.86		As above but includes a high proportion of clay (40-50%)								24 - 36m 50mm CL.18 PVC slotted casing (0.5mm aperture)		
			0.86		Moderately weathered dark grey mudstone. Orange iron-staining on fractures	20	<0.5								
			2.00		Fresh, dark grey mudstone. No iron-staining. Pyrite veining		38.1	0.6	146	6.74					
			1.00		Fresh dark grey mudstone interbedded with khaki/grey fine-grained sandstone (50%)		28.9	0.8	120	6.63					
			0.55		As above but sandstone content decreased (10-20%)		29.3	1.2	120	6.74					
			0.50				29.3	1.2	120	6.74					
			0.40		Fresh dark grey/black mudstone. Pyrite veining throughout		30.1	3	137	6.44					
			0.30				30.4	5.5	143	6.23					
			0.24				29.9	6.7	138	5.97					
			0.20				29.9	6.3	143	5.99					
			0.16				30.1	6.3	150	6.2					
			0.13				30.5	6.3	150	6.34					
			0.15				30.2	5.5	161	6.36					
			0.10				30.4	5.5	186	6.49					
			0.08		As above with minor quartz veining with pyrite		30.3	6	188	6.47					
			0.07		As above with quartz veining increasing		30.5	6	158	6.47					
			0.07				30.3	6.2	180	6.4					
								LOGGED BY: MS				DATE: 19/12/2017			
								CHECKED BY				DATE:			

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCT-1						
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Advance Casing & Air Hammer Bore Diameter: 10" Date Started: 30/10/2017				Total Depth (m bgl): 25 Well Permit Number: n/a Surface Elevation (m AHD): 130 Static Water Level Date: 1/11/2017 Depth (mbRP): 4.26 Projection: GDA94 Z52 Easting: 776006 Northing: 8501784 Date Completed: 31/10/2017						
				DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.		
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION	
Air Hammer	12"		0		Topsoil Red/brown silt and clay with minor quartz sand and gravel	14	<0.1		379	7.35	Stick up 1.17m		0-8m cement seal	
					Alluvial Sediments Leached, light grey mudstone gravel (angular to sub-rounded) with red/brown silt and clay.								0-10m 10" PVC pre-collar	
Air Hammer	10"		0.47		Alluvial Sediments Highly-weathered, large (5-30mm), angular to sub-rounded grey mudstone gravel and cobbles with tan silt and clay. Poorly-sorted, medium silicate sand occurs throughout.						First water strike @ 14m		8-9m bentonite seal	
					Alluvial Sediments Moderately-weathered grey mudstone gravel with iron-stained surfaces - transported fragments of basement. Poorly-sorted, medium silicate sand occurs throughout.								0-13m 150mm Cl.9 PVC production casing	
			0.38			28.8	1.2	403	7.26				9-25m gravel pack (3-6mm)	
					Alluvial Sediments Grey mudstone gravel, cobbles and boulder fragments with pyrite veining - transported fragments of basement. Polished and rounded surfaces evident - likely to be fragments of larger pebbles, cobbles or boulders. Very large cuttings (2-6cm). Poorly-sorted, medium silicate sand occurs throughout.								13-25m 150mm Cl.9 PVC hand slotted casing (1.5mm aperture)	
			0.60			29.3	1.2	403	7.26				EOH @ 25m	
			0.38											
						LOGGED BY: MS		DATE: 30/10/2017						
						CHECKED BY		DATE:						

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCT-2 (lost)					
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073				Total Depth (m bgl): 55					
				Project Name: Hayes Creek Project Water Studies				Well Permit Number: n/a					
				Location: Mt Bonnie				Surface Elevation (m AHD): 148					
				Client: PNX Metals				Static Water Level					
				Drilled By: Geo Drilling				Date: 28/10/2017 Depth (mbRP): 18.52					
				Drilling Method: Air Hammer				Projection: GDA94 Z52					
				Bore Diameter: 7.75"				Easting: 776034 Northing: 8501209					
				Date Started: 26/10/2017				Date Completed: 27/10/2017					
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.					
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	10"		0		Waste Rock Red/brown silt with angular fragments of highly-weathered grey mudstone						Hole lost due to casing getting stuck at 24m		0-6m 9" PVC pre-collar
			Waste Rock White clay with angular fragments of highly-weathered and leached grey mudstone										
Air Hammer	7.75"		0.50		Mount Bonnie Formation Leached and weathered khaki/brown mudstone	18	<0.1						12m of fallen 6" PVC left in hole at approximately 12-24m
			0.50										
			0.22										
			0.15										
0.21		20	Mount Bonnie Formation Weathered grey mudstone with iron-stained fracture surfaces	29.5	<0.5						0-55m backfill		
0.21		30	Mount Bonnie Formation Fresh grey mudstone with pyrite on fracture surfaces	35.2	0.45	130	6.67						
0.21		40		33.2	0.79	191	6.72						
0.17		50		32.1	5.64	272	6.78						
0.17				32.5	5.64	260	6.78						
		0.30			Gerowie Tuff Transition to Gerowie Tuff. Soft green/grey talc with some quartz @ 49-51m	33.1	5.64	258	6.79				EOH @ 55m
								LOGGED BY: MS DATE: 30/10/2017					
								CHECKED BY DATE:					

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: HCT-2					
CDM Smith CDM Smith Australia Pty Ltd Level 2, 238 Angas St Adelaide, SA, 5000				Project Number: AWS170073 Project Name: Hayes Creek Project Water Studies Location: Mt Bonnie Client: PNX Metals Drilled By: Geo Drilling Drilling Method: Air Hammer Bore Diameter: 10" Date Started: 28/10/2017				Total Depth (m bgl): 79 Well Permit Number: n/a Surface Elevation (m AHD): 148 Static Water Level Date: 30/10/2017 Depth (mbRP): 17.72 Projection: GDA94 Z52 Easting: 776052 Northing: 8501221 Date Completed: 29/10/2017					
				DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.	
METHOD	BIT LOG (inches)	PENETRATION RATE (m/minute)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	TEMP (degrees C)	AIRLIFT YIELD (L/s)	EC (µS/cm)	pH	COMMENTS	WELL CONSTRUCTION	WELL DESCRIPTION
Air Hammer	12"		0		Waste Rock No sample						Stick up 0.95m		0-1m cement seal
			0.46		Waste Rock Red/brown silt with angular fragments of weathered grey mudstone.								0-6m 10" steel pre-collar
Air Hammer	10"		10		Mount Bonnie Formation Weathered grey mudstone with iron-stained fracture surfaces						First water strike @ 28m		0-37m 150mm Cl.9 PVC production casing
			0.32										1-30m backfill
Air Hammer			20		Mount Bonnie Formation Fresh dark grey mudstone with pyrite on fracture surfaces. Pyrite dominant @ 45-47m	28	33.6	<0.1	197	6.98			30-32 bentonite seal
			0.43										
Air Hammer	10"		30			33.2	0.1	216	6.31				32-55m gravel pack (3-6mm)
			0.46										
Air Hammer			40			31.5	0.3	243	6.26				37-55m 150mm Cl.9 PVC hand slotted casing (1.5mm aperture)
			0.50										
Air Hammer	5.25"		50		Mount Bonnie Formation Transition to Gerowie Tuff. Soft green/grey talc with some quartz and hard sections	32.5	0.6	242	6.76				55-79m backfill
			0.86										
Air Hammer			60		Gerowie Tuff Soft waxy green/grey talc. Very soft drilling. Minor chert bands throughout	32.7	0.6	236	7.00				EOH @ 79m
			0.86										
Air Hammer	5.25"		70			33.2	0.6	232	7.00				EOH @ 79m
			0.67										
Air Hammer			80			33.4	0.6	235	7.16				EOH @ 79m
			1.00										
Air Hammer			90			33.1	0.6	239	7.24				EOH @ 79m
			1.20										
LOGGED BY: MS DATE: 30/10/2017 CHECKED BY DATE:													



Appendix C Water quality results

Table C1 **Water quality sampling summary**

Sample ID	Type	Deposit area	Date	Easting	Northing	Notes
HCM-5	Groundwater	Mt Bonnie	31-Oct-17	775854	8501538	Sampled at the end of airlift development
HCM-6			1-Nov-17	776382	8501395	
HCM-7			31-Oct-17	776175	8501255	
HCM-8			31-Oct-17	776351	8501118	
HCM-9			1-Nov-17	776166	8500940	
HCM-10			1-Nov-17	775890	8500631	
HCM-11			1-Nov-17	776365	8500485	
HCM-12			29-Oct-17	776010	8501795	
HCM-13			31-Oct-17	776040	8501215	
HCM-14			1-Nov-17	776152	8501452	
HCM-15			31-Oct-17	775936	8501093	
HCM-16			Iron Blow	10-Dec-17	776145	
HCM-17		6-Dec-17		776249	8504519	
HCM-19		8-Dec-17		776138	8504412	
HCM-20		4-Dec-17		776030	8504545	
HCM-21		3-Dec-17		776141	8504516	
HCT-1		Mt Bonnie	31-Oct-17	776006	8501784	
HCT-1 (dup)			31-Oct-17	776052	8501221	
HCT-2			29-Oct-17	776034	8501209	
Dam 1		Surface water		11-Oct-17	775711	
Dam 3	11-Oct-17			776160	8500672	
Dam 4	11-Oct-17			776373	8501258	
HCM-5 area	11-Oct-17			775849	8501543	Black water with organic odour
Margaret River	11-Oct-17			775840	8501818	Pool of water with mosquito larvae (low flow)

Table C2 Field water quality parameters

Sample ID	Temperature (°C)	pH	Electrical conductivity (µS/cm)	Dissolved oxygen (mg/L)	Dissolved oxygen (% saturation)	Redox potential (mV)	Temperature (°C)
HCM-5	30.4	7.56	318	Not measured. Parameters relating to oxygen (dissolved oxygen and redox potential) are not representative of <i>in situ</i> groundwater because samples were collected at the end of airlift development.			
HCM-6	30.1	7.24	292				
HCM-7	32.3	8.02	411				
HCM-8	32.8	7.64	2180				
HCM-9	31.4	7.43	2142				
HCM-10	32.4	7.57	427				
HCM-11	32.0	7.49	796				
HCM-12	29.3	7.28	431				
HCM-13	32.3	7.57	279				
HCM-14	31.2	6.15	504				
HCM-15	32.8	7.46	631				
HCM-16	31.4	6.39	155				
HCM-17	31.3	7.77	1519				
HCM-19	30.4	7.56	633				
HCM-20	30.7	7.65	210				
HCM-21	30.1	6.46	215				
HCT-1	28.8	7.85	440				
HCT-1 (dup)	28.8	7.85	440				
HCT-2	31.4	7.10	241				
Dam 1	33.0	6.03	165	4.06	57.0	204	4.06
Dam 3	34.8	5.20	242	2.17	31.3	208.5	2.17
Dam 4	32.8	3.79	330	3.91	58.1	301.9	3.91
HCM-5 area	31.5	6.22	222	0.05	0.7	-13.6	0.05
Margaret River	29.9	6.78	219	1.33	17.6	130.4	1.33

Table C3 Alkalinity, acidity and hardness concentrations (all as mg/L as CaCO₃)

Sample ID	CO ₃ ²⁻	HCO ₃ ⁻	OH ⁻	Total alkalinity	Total Hardness	Total acidity
HCM-5	<1	133	<1	133	129	<1
HCM-6	<1	30	<1	30	108	2
HCM-7	<1	196	<1	196	163	<1
HCM-8	<1	241	<1	241	1060	<1
HCM-9	<1	150	<1	150	1240	1
HCM-10	<1	212	<1	212	162	<1
HCM-11	<1	237	<1	237	403	<1
HCM-12	<1	191	<1	191	196	<1
HCM-13	<1	125	<1	125	125	2
HCM-14	<1	10	<1	10	170	47
HCM-15	<1	255	<1	255	296	<1
HCM-16	<1	12	<1	12	44	5
HCM-17	<1	141	<1	141	730	6
HCM-19	<1	101	<1	101	271	4
HCM-20	<1	37	<1	37	46	2
HCM-21	<1	28	<1	28	66	10
HCT-1	<1	182	<1	182	193	<1
HCT-1 (dup)	<1	180	<1	180	200	<1
HCT-2	<1	118	<1	118	105	<1
Dam 1	<1	18	<1	18	43	3
Dam 3	<1	4	<1	4	56	8
Dam 4	<1	<1	<1	<1	64	34
HCM-5 area	<1	68	<1	68	50	14
Margaret River	<1	86	<1	86	61	6



Table C4 Lab pH and major ions (all as mg/L, except HCO₃⁻ which is in mg/L as CaCO₃)

Sample ID	pH	TDS	Ca	Mg	Na	K	Cl ⁻	SO ₄ ²⁻	F ⁻	HCO ₃ ⁻	Si
HCM-5	7.82	254	12	24	16	2	3	41	<0.1	133	21.0
HCM-6	7.55	356	12	19	13	2	1	110	<0.1	30	19.1
HCM-7	8.29	245	6	36	26	2	18	13	<0.1	196	16.4
HCM-8	8.11	1910	151	167	172	5	44	1200	<0.1	241	20.2
HCM-9	8.10	1990	209	174	80	8	50	1150	<0.1	150	27.1
HCM-10	8.01	250	22	26	31	2	2	28	<0.1	212	19.6
HCM-11	8.02	569	74	53	21	3	12	258	<0.1	237	26.8
HCM-12	8.01	316	24	33	19	4	4	68	<0.1	191	22.7
HCM-13	7.85	194	9	25	8	2	5	21	<0.1	125	15.2
HCM-14	6.22	372	22	28	17	4	10	231	<0.1	10	12.4
HCM-15	7.97	448	46	44	22	3	10	112	<0.1	255	28.1
HCM-16	7.02	269	3	9	6	3	<1	37	0.6	12	13.4
HCM-17	7.91	1310	134	118	48	5	3	748	0.1	141	16.4
HCM-19	7.86	466	36	44	16	3	2	217	0.8	101	15.4
HCM-20	7.60	-	4	17	18	2	1	86	1.2	37	5.24
HCM-21	7.11	165	10	10	4	2	<1	65	0.7	28	13.6
HCT-1	8.24	326	23	33	18	3	4	69	<0.1	182	24.2
HCT-1 (dup)	8.23	324	24	34	19	3	4	69	<0.1	180	23.5
HCT-2	7.90	159	4	23	8	3	5	14	<0.1	118	12.4
Dam 1	7.00	104	4	8	10	2	2	41	0.2	18	4.8
Dam 3	5.96	222	6	10	4	9	3	91	0.1	4	3.3
Dam 4	3.59	181	6	12	3	3	<1	116	0.2	<1	3.0
HCM-5 area	6.82	129	5	9	2	13	3	<10	0.1	68	6.2
Margaret River	7.26	127	8	10	7	4	8	6	0.2	86	11.6

Table C5 Dissolved (filtered) metal concentrations (all as µg/L)

Sample ID	Ag	Al	As	B	Ba	Be	Cd	Cr	Co	Cu	Fe	Hg	Pb	Mn	Mo	Ni	Sb	Se	Sn	Sr	Th	U	Zn
HCM-5	<1	<10	747	<50	7	<1	<0.1	<1	<1	<1	140	<0.1	<1	267	<1	2	<1	<10	<1	12	<1	<1	<5
HCM-6	<1	<10	9	<50	9	<1	<0.1	<1	<1	<1	60	<0.1	<1	295	2	<1	<1	<10	<1	80	<1	<1	<5
HCM-7	<1	20	4	<50	20	<1	<0.1	<1	<1	<1	<50	<0.1	<1	198	<1	<1	2	<10	<1	78	<1	<1	19
HCM-8	<1	<10	4	<50	20	<1	<0.1	<1	<1	<1	<50	<0.1	<1	206	<1	<1	<1	<10	<1	76	<1	<1	8
HCM-9	<1	<10	<1	<50	11	<1	<0.1	<1	<1	<1	<50	<0.1	<1	92	<1	<1	4	<10	<1	44	<1	4	5
HCM-10	<1	30	314	<50	17	<1	<0.1	<1	1	<1	<50	<0.1	<1	4	<1	<1	2	<10	<1	18	<1	<1	<5
HCM-11	<1	<10	69	<50	12	<1	<0.1	<1	4	<1	<50	<0.1	<1	604	<1	1	1	<10	<1	89	<1	<1	12
HCM-12	<1	<10	1210	<50	22	<1	12.6	<1	4	4	<50	<0.1	<1	815	<1	5	<1	<10	<1	28	<1	<1	<5
HCM-13	<1	<10	2	<50	18	<1	<0.1	<1	1030	<1	140	<0.1	<1	565	2	2	49	<10	<1	303	<1	<1	640
HCM-14	<1	<10	2	<50	9	<1	<0.1	<1	38	<1	12400	<0.1	<1	79	<1	<1	<1	<10	<1	30	<1	<1	12800
HCM-15	<1	<10	2	<50	104	<1	6.5	<1	15	<1	<50	<0.1	<1	5360	<1	14	6	<10	<1	76	<1	<1	<5
HCM-16	<1	20	222	<50	1	<1	18.4	<1	3	4	<50	<0.1	<1	383	3	3	4	<10	<1	9	<1	<	1910
HCM-17	-	<10	18	960	<1	26	<0.1	<1	4	<1	1	1580	35	4	<10	<1	<1	351	34	<1	2	<1	1380
HCM-19	<1	70	913	<50	16	<1	3.9	<1	4	<1	660	<0.1	<1	562	19	6	22	<10	<1	55	<1	<1	109
HCM-20	-	90	7	5	<1	8	<0.1	<1	<1	<1	<50	69	29	3	<10	<1	<1	8	10	<1	<1	<1	<50
HCM-21	-	<10	73	1680	<1	27	52.4	<1	5	<1	3	792	4	7	<10	<1	<1	10	3360	<1	<1	<1	2160
HCT-1	<1	40	8	<50	20	<1	<0.1	<1	10	<1	<50	<0.1	<1	1240	4	<1	<1	<10	<1	122	<1	<1	<5
HCT-1 (dup)	<1	40	3	<50	17	<1	<0.1	<1	2	<1	<50	<0.1	<1	320	1	<1	<1	<10	<1	67	<1	<1	<5
HCT-2	<1	<10	4	<50	8	<1	<0.1	<1	26	<1	190	<0.1	<1	140	5	3	32	<10	<1	399	<1	<1	122
Dam 1	<1	10	30	<50	11	<1	<0.1	<1	1	2	<50	<0.1	<1	16	<1	<1	<1	<10	<1	16	<1	<1	<5
Dam 3	1	110	135	<50	66	<1	26.2	<1	23	257	1360	1.3	32	7400	<1	9	2	<10	<1	28	<1	<1	2360
Dam 4	<1	2440	18	<50	35	<1	8.3	<1	38	254	380	<0.1	22	5990	<1	45	<1	<10	<1	7	<1	<1	648
HCM-5 area	<1	40	6	<50	62	<1	<0.1	<1	3	1	1510	<0.1	<1	1330	<1	<1	<1	<10	<1	35	<1	<1	7
Margaret River	<1	30	9	<50	74	<1	<0.1	<1	4	<1	2170	<0.1	<1	2030	<1	<1	<1	<10	<1	38	<1	<1	<5