

Boundary Creek and Big Swamp Remediation and Environmental Protection Plan

Barwon Water

Soil sampling and well completion report

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Executive Summary

In response to the reduction of baseflow to Boundary Creek associated with the operation of the Barwon Downs borefield, and the subsequent drying of acid sulfate soils in Yeodene (Big) Swamp, Barwon Water received a Section 78 Ministerial Notice pursuant to Section 78 of the Water Act (1989), directing the corporation to develop and implement a Remediation Plan for the Boundary Creek and Big Swamp environments.

This report presents the findings of a soil sampling and groundwater monitoring investigation, which is one of a number of assessments aimed at informing the remediation plan.

The program collected a total of 181 soil samples across 17 sites via a combination of push tube and rotary auger drilling. Lithological logs indicate the presence of silts, clays and discrete sands and in the upper 6 m of the soil profile throughout Yeodene Swamp. This is consistent with the occurrence of alluvial deposits. Logs also indicate a relatively high organic matter content within the soil profile.

A total of 16 wells were constructed and were fitted with Solinst groundwater level loggers along with one barometric pressure logger. Groundwater levels varied between 1.4 and -0.10 m bgl (above ground surface) throughout the swamp and tended to be closer to the surface (<0.5 m bgl) in the lower reaches of the swamp and deeper (~1 m bgl) in the upstream reaches of the swamp.

Slug tests were undertaken at each of the 17 newly installed wells. Hydraulic conductivities ranged from 0.02 to 1.8 m/day, with an average conductivity of 0.50 m/day and a standard deviation of 0.62 m/day. This is broadly consistent with the range in hydraulic conductivities expected for unconsolidated silts (Domenico and Schwartz, 1990).

Organic carbon content was analysed and classified according to Huang et al., (2009). Accordingly, 26% of soil samples collected were classified as mineral soils, 24% as mineral soils with organics, 43% as organic soils and 8% as peat. This indicates that while the majority of soil samples are classified as organic soils or soils with organics, only a small proportion are technically classified as peat.

Sulfate concentrations in soils ranged from 0.9 mg/L to 5,100 mg/L with an average concentration of 284 mg/L. The average concentration of sulfate in soil samples (taken at 0.5 m depth intervals) increased from 165 mg/L at 0.5 m to 686 mg/L at 1.0 m depth. Concentrations below this subsequently declined to an average of between 130 and 160 mg/L to 6.0 m depth.

Of the 181 samples analysed, 180 exceed the 0.03 %S net acidity concentration limit for characterisation as acid sulfate soils. Acid neutralising capacity was below detection in all samples. This indicates that within the soils sampled, there is no capacity to neutralise any of the existing acid present, or any potential acidity that may be released upon further oxidation.

Concentrations of existing acidity tend to decline with depth. The average concentration throughout all cores was >0.5 %S in the upper 2.0 meters of the soil profile, 0.25 %S at 4.0 meters depth and 0.13 %S below 4.5 m depth. This is consistent with oxidation of sulfides and subsequent acidification during drying in the upper soil profile.

Significant concentrations of potential acidity (sulfide) exist in soils collected from the subsurface of the swamp. The average potential acidity increased from 0.12 %S in the top 0.5 m of the soil profile to 3.6 %S at 1.5 m depth. Average concentrations variably declined from 3.6 %S at 1.5 m depth to 1.3 %S below 4.5 m depth. The results indicate that significant stores of potential acidity remain throughout the lower soil profile of the swamp, and that future drying and oxidation of these soils may result in acid generation.



1. Introduction

1.1 Background

The Yeodene (Big) Swamp is located on Boundary Creek and contains acid sulfate soils (ASS) that have dried out, resulting in the release of acidic water to the lower reaches of Boundary Creek and ultimately, the Barwon River.

A report commissioned by Barwon Water titled "Barwon Downs Hydrogeological Studies 2016-17: numerical model calibration and historical impacts" (Jacobs, 2018a), found that the operation of the Barwon Downs borefield over the past 30 years is responsible for two thirds of the reduction of groundwater base flow into boundary Creek.

A subsequent study, titled the "Yeodene Swamp Study" (Jacobs, 2018b) concluded that baseflow reduction, combined with the inability to deliver supplementary flows to the swamp has led to the drying of ASS in Yeodene Swamp.

In response to the above, Barwon Water received a Section 78 Ministerial Notice pursuant to Section 78 of the Water Act 1989, directing the corporation to develop and implement a Remediation Plan for the Boundary Creek and Big Swamp environments.

Furthermore, Barwon Water are required to undertake appropriate hydrogeological, hydrological and geochemical assessments necessary to inform and support the development of the Remediation Plan. To refine this, a series of data gaps were assessed and prioritised by Rivers and Wetlands (Baldwin, 2018) in consultation with the Boundary Creek Remediation Working Group, Barwon Water, Jacobs and other independent experts including Professor Richard Bush and Dr Vanessa Wong.

This report presents the findings of a soil sampling and groundwater monitoring investigation, which represents one of a number of assessments aimed at informing the remediation plan and aims to close out the below questions which have been raised. Potential data gaps that could be informed by this study include:

Question 4: Is there a hydraulic connection between Big Swamp and the Lower Tertiary Aquifer?

Question 5: Are there preferential surface or subsurface flow paths in Big Swamp?

Question 6: How much actual and potential acidity is currently stored in Big Swamp?

Question 7: How much sulfate remains in the sediment profile in the swamp?

Question 8: How much bioavailable carbon is currently stored in Big Swamp that can be used to promote biogeochemical processes?

Question 13: How extensive is fire damage to the peat in Big Swamp?



1.2 Scope of work

Jacobs were engaged by Barwon Water to design and undertake a field program.

The program includes:

- Technical advice during the borehole drilling and construction of up to 18 wells throughout Yeodene Swamp;
- Collection of soil samples for the purpose of hydrogeological and geochemical characterisation;
- Aquifer permeability testing (by slug testing) at the well locations for hydrogeological characterisation;
- Deployment of loggers for ongoing monitoring of groundwater levels; and
- Survey of new wells and existing features throughout the swamp.

This report summarises the outcomes of the field program. This report is intended to be essentially a factual report and does not provide extensive analysis and interpretation of the results. This is expected to be provided through later reports issued by Barwon Water, following further analysis.



2. Site investigation

2.1 Borehole drilling and soil sample collection

During the development of the soil sampling and well installation program, eighteen potential sites were proposed for investigation. Of these, 17 sites were safely accessible. BH13 could not be accessed safely due to the presence of dense vegetation and uneven surfaces. Investigations of the remaining sites took place between April and May 2019. Borehole drilling was undertaken by Go Dill Pty Ltd under supervision of a Jacobs hydrogeologist. Borehole logging, sample collection and handling was independently verified by a representative from Monash University. A brief summary of the drilling/sampling program is as follows:

2.1.1 Track mounted drilling

BH01, BH04, BH05, BH06, BH07, BH08, BH09, BH10, BH11, BH14, BH15, BH16 and BH17 were drilled using a Geoprobe track mounded drilling rig.

Collection of soil samples at these sites occurred via 60 mm diameter plastic lined push tubes to 4.5 m below ground level (m bgl) or until refusal. Holes were subsequently advanced to 6.0 m depth using 203 mm diameter hollow stem auger. The hollow stem augers increased the diameter of the borehole to 203 mm.

Using this method, undisturbed soil cores were returned to 4.5 m bgl and disturbed samples were returned between 4.5 and 6.0 m bgl.

2.1.2 Hand held sampling

BH02, BH03, BH12 and BH18 were sampled using a hand-held petrol driven 60 mm diameter push tube sampler due to access restrictions. These locations were sampled to 3.6 m bgl or refusal. The returned samples were undisturbed.

2.1.3 Sample handling

A total of 181 Soil samples were taken from a range of depths. Samples were described and handled according to Sullivan et. al (2018). These were sealed in ASS polyethylene zip lock bags provided by ALS laboratories and placed on ice in coolers in the field. Samples were transferred to a portable freezer upon return from the field on the day of collection. Samples were subsequently sent to Monash University for laboratory analysis and were received in a frozen condition.

A summary of the borehole drilling is shown below in Table 2-1, borehole locations are shown in Figure 2-1. Borehole lithology logs are shown in Appendix A.

Bore ID	Date Drilling		Coordinates ¹		Surface elevation	Borehole diameter	Termination depth	
	Drillea	Μετησα	Easting	Northing	(m AHD)	(mm)	m bgl ³	m AHD⁴
BH01	17/04/2019	GeoProbe	735858.9	5743834.9	141.9	203	6	135.9
BH02	7/05/2019	Hand	735838.9	5743863.1	141.8	60	3.6	138.1
BH03	7/05/2019	Hand	735853.3	5743889.0	141.7	60	3.6	137.7
BH04	23/04/2019	GeoProbe	735682.3	5743890.3	143.4	203	6	137.4
BH05	18/04/2019	GeoProbe	735686.9	5743921.0	143.1	203	6	137.1
BH06	18/04/2019	GeoProbe	735712.2	5743922.107	142.9	203	6	136.9

Table 2-1 Summary of borehole drilling



Bore ID	Date	Drilling	Coordinates ¹		Surface elevation	Borehole diameter	Termination depth	
	Drillea	Μετησα	Easting	Northing	(m AHD)	(mm)	m bgl ³	m AHD ⁴
BH07	17/04/2019	GeoProbe	735721.7	5743948.325	142.5	203	6	136.5
BH08	25/04/2019	GeoProbe	735607.0	5743908.6	144.6	203	6	138.6
BH09	24/04/2019	GeoProbe	735609.7	5743944.4	144.4	203	6	138.4
BH10	24/04/2019	GeoProbe	735622.3	5743966.9	144.3	203	6	138.3
BH11	8/05/2019	GeoProbe	735469.3	5743898.1	147.1	203	6	141.1
BH12	9/05/2019	Hand	735438.0	5743952.7	147.2	60	3.4	143.8
BH14	25/04/2019	GeoProbe	735360.8	5743853.1	147.7	203	6	141.7
BH15	26/04/2019	GeoProbe	735330.5	5743870.0	147.4	203	6	141.4
BH16	7/05/2019	GeoProbe	735300.1	5743903.5	148.0	203	6	142.0
BH17	6/05/2019	GeoProbe	735266.8	5743903.0	148.1	203	5.9	142.2
BH18 ² (YS05)	23/03/2019	Hand	735276	5743824	148.7	60	3.6	145.1

Note:

1. Datum MGA94 zone 54 - survey to an accuracy of ± 0.030 m

2. BH18 coordinates were taken via handled GPS and to an accuracy of ± 3.0 m

3. m bgl – metres below ground level

4. AHD – Australian Height Datum

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Figure 2-1 borehole location



2.2 Groundwater well construction

Table 2-2 below provides a summary of the construction details of the groundwater monitoring wells that were installed between April and May 2019 in the drilled boreholes. It is noted that a well was not installed at BH18 as a previously installed well (YS05) was already present at this location from earlier investigations (Jacobs, 2017).

Monitoring wells were constructed by sequentially joining threaded casing and screen lengths and lowering them down the drilled borehole to termination depth. Monitoring bores BH02, BH03 and BH12 were constructed with 26 mm class 18 uPVC casing with 1.5 m long screens slotted at a 0.3 mm aperture. A sump was not installed on these shallower wells to ensure the watertable was intersected.

The remaining wells were constructed using 50 mm diameter class 18 uPVC casing. Screens were 3.0 m long and slotted at a 0.4 mm aperture. All 50 mm diameter wells had 1.0 m sumps installed below the screen interval in case of sediment build up.

Gravel pack (8/16 Sibelco gravel) was free poured into the annulus between the well casing and drilled borehole to provide a filter pack around the screened section. Bentonite chips were subsequently free poured on top of the gravel pack to form a seal to the surface and to prevent grout or cement from seeping into the gravel pack.

During construction of BH02 and BH03, well screens were pushed past the bottom of the drilled borehole and into the underlaying sediments. Therefore, the bottom of the screened interval for both these wells does not have filter pack around it and is surrounded by natural formation. This represents the bottom 0.1 m of BH02 and the bottom 0.4 m of BH03. At BH06, BH08 and BH14, slight hole collapse occurred between drilling and construction. This occurred around the bottom of the sump and did not prevent any gravel pack from encasing the screen interval of these wells.

Constructed well casings were finished approximately 0.70 m above ground level and encased in yellow steel monument cover that were finished approximately 0.80 above ground level. BH02 and BH03 were installed with a 1.1 m high casing and 1.25 m high monument cover due to increased risk of surface water inundation at these locations. Due to the height of some well casings, the installed monument casing could not close entirely at some wells. All wells were named on the inside cap of the monument using a permanent marker.

A summary of well construction details are shown below in Table 2-2 and correspond to the borehole locations listed in Table 2-1. Further well construction details are summarised in the following appendices:

- Well construction and lithology logs are shown in Appendix A
- Push tube photographs are shown in Appendix B
- Well completion photographs are shown in Appendix C
- Well completion reports are detailed in Appendix D
- Well construction licenses are listed in Appendix E

Table 2-2 monitoring well installation details

Well ID	BCL	Stickup (m)	Constructed bore diameter (mm)	Total construction depth (m bgl)	Screen from (m bgl)	Screen to (m bgl)
BH01	WRK112869	0.60	50	6	2.0	5.0
BH02	WRK112870	1.16	26	3.7	2.2	3.7
BH03	WRK112871	1.20	26	4	2.5	4.0
BH04	WRK112872	0.82	50	6	2.0	5.0

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Well ID	BCL	Stickup (m)	Constructed bore diameter (mm)	Total construction depth (m bgl)	Screen from (m bgl)	Screen to (m bgl)
BH05	WRK112873	0.79	50	6	2.0	5.0
BH06	WRK112874	0.68	50	6	1.9	4.9
BH07	WRK112875	0.55	50	6	2.0	5.0
BH08	WRK112876	0.67	50	6	1.9	4.9
BH09	WRK112877	0.68	50	6	2.0	5.0
BH10	WRK112878	0.69	50	6	2.0	5.0
BH11	WRK112879	0.63	50	6	2.0	5.0
BH12	WRK112880	0.71	26	3.4	1.9	3.4
BH14	WRK112882	0.64	50	6	2.0	5.0
BH15	WRK112883	0.66	50	6	2.0	5.0
BH16	WRK112884	0.81	50	6	2.0	5.0
BH17	WRK112885	0.66	50	5.9	1.9	4.9
YS05	N/A	0.82	50	3.00	1.50	3.00

2.3 Well development

Groundwater wells were developed between the 23rd and 24th May 2019 via surging and purging of the screened interval using both airlift and bail methods. Wells were developed in order to remove introduced products, improve near well permeability, reduce entry loss, reduce entry of suspended solids and increase well efficiency. Accordingly, all wells were developed according to the minimum construction reequipments for water bores in Australia (NUDLC, 2012).

All wells were developed by removing standing water from the casing via airlift purging and/or bailing. During airlifting, polyethylene tubing was gradually lowered down-hole with a continuous flow of air supplied by a compressor and standing water in the well was displaced by air and brought to the surface. Water was then allowed to flow through high pressure polyethylene piping secured to top of the well and was collected to monitor water quality. The tubing was continuously lowered down the well until the bottom was reached and the well was purged of water. If yields from the well were adequate, the tubing was left in the well to provide a continues flow of water from the aquifer to the surface for periods of time ranging from 30 minutes to 1 hour. If yields were low, wells were allowed to recover for a period before development continued. Go Dill Pty Ltd undertook the development, supervised on site by a Jacobs hydrogeologist.

Field water quality was recorded during development using a calibrated YSI water quality probe. Development was undertaken until a minimum of ten well volumes of water had been removed or until insufficient water was being produced. Wells with 50 mm casing diameter were developed via airlift on 23rd May. The remaining wells developed were developed by bailer due to wet conditions limiting access by vehicle and air compressor on 24th of May. All 26 mm diameter wells were bail purged. Table 2-3 summarises the development of the wells.



Table 2-3 Details of well development

Well ID	Date	Time	Cumulative volume (L)	Electrical conductivity (uS/cm	рН	Temperature (deg C)	Reduction Oxidation Potential (mV)	Dissolved Oxygen (mg/L)	Purge method
		10:00	25	574	6.18	19.8	72.4	1.65	
		10:02	40	602	5.95	13.7	65.8	3.99	
		10:06	60	594	5.88	13.2	75.9	1.63	
		10:07	80	607	5.84	12.7	78.9	6.42	
BH01	23/05/2019	10:15	90	600	5.75	12.3	89.7	10.3	Airlift
_		10:20	100	821	5.53	11.7	99.4	9.16	
		10:25	125	930	4.9	11.4	135.1	9.34	
		10:30	150	979	4.51	11.7	154	9.61	
		10:35	175	1007	4.37	11.5	168	9.41	
		2:20	1	682	6.01	14	71	5.8	
		2:30	2	658	6.18	14.1	40	2.07	
BH02	24/05/2019	2:40	3	627	6.27	14.3	47.8	1.55	Bail
		2:50	4	580	6.26	14.6	68	2.59	
		3:00	5	602	6.32	14.2	71	4.09	
		1:30	1	636	5.18	12.7	164	3.56	
		1:35	2	556	5.68	12.8	91	2.41	
		1:41	3	536	5.85	13.5	83	0.2	
BH03	24/05/2019	1:50	4	538	5.94	13.4	69	1.02	Bail
		1:55	5	538	6.01	13.5	71	2.31	-
		2:00	6	544	6.06	13.7	64	3	
		2:10	7	545	6.1	13.8	54	3.4	
		11:21	25	2960	4.02	14.7	198	9.44	
		11:25	50	2922	4.03	14.6	198	8.7	
	00/05/0040	11:30	75	2965	4.02	14.2	200	8.74	A :
BH04	23/05/2019	11:35	100	3021	4.01	13.6	202	9.57	AIIIII
		11:40	125	3013	4.01	13.6	203	8.33	
		11:50	150	3059	4.01	13.4	205	8.9	
		14:10	25	536	5.97	13.4	77.4	9.09	
BH05	23/05/2019	14:15	50	506	5.88	13.3	88.2	8.47	Airlift
		14:35	75	515	5.61	11.7	111	8.5	
		12:10	25	791	4.89	13.6	170	6.64	
BH06	23/05/2019	12:30	50	790	5.11	13.2	154	6.01	Airlift
		12:50	75	808	5.16	11.5	38	8.44	
		13:10	20	620	5.46	13.8	138	3.5	
BH07	23/05/2019	13:21	45	565	6.18	12.4	100	9.98	Airlift
		13:50	75	538	6.22	10.4	92	9.54	
вцое	22/05/2010	4:30	25	5500	3.73	15.4	207	7.73	Airlift
БПОО	23/03/2019	4:45	27	6184	3.6	12.2	228	9.5	Anni
		7:42	40	6782	3.57	15.3	219	5.42	
BH08	24/05/2019	8:00	55	6711	3.54	15.1	247	3.19	Bail
		8:10	60	6621	3.53	14.9	207	9.11	
BLIOO	22/05/2010	3:10	25	3581	4.14	14.7	187	8.56	Airlift
БПОЭ	23/03/2019	3:50	50	3787	3.83	13.7	217	8.3	Amm
	22/05/2040	3:55	25	944	4.74	13.6	184	6.27	٨: ١: ٤٠
	23/03/2019	4:20	50	797	5.24	12.8	142.5	6.44	Amilt
		8:20	12	3332	2.6	14	410	3.92	
	24/05/2010	8:30	25	3247	2.59	14.6	415	3.48	Airlift
	24/05/2019	8:40	40	3300	2.71	14.6	396	0.03	
		8:45	50	3248	2.68	14.8	399	0	



		9:00	65	3372	2.67	14.6	398	3.71	
		9:10	1	1846	2.78	13.2	367	4.1	
DUIAO	04/05/0040	9:20	2	1833	2.83	13.1	357	5.02	A :-1:61
BH12	24/05/2019	9:30	4	1861	2.82	12.9	347	5.49	Airlift
		9:45	6	1887	2.77	13	359	6.06	
		12:35	25	5125	3.02	16.2	317	2.33	
		12:40	30	4547	3.52	16.7	366	2.01	
BH14	24/05/2019	12:50	50	4356	3.6	16.6	259	1.51	Bail
		13:00	60	4387	3.61	16.5	250	1.77	
		13:10	75	4437	3.6	16.5	247	1.95	
		12:00	25	1530	3.43	14.4	304	1.06	
BH15 24/0	04/05/0040	12:10	40	1583	3.38	14.5	395	3.07	Dell
	24/05/2019	12:15	50	1560	3.31	14.4	293	1.44	Ball
		12:30	75	1582	3.46	14.5	291	2.81	

2.4 Groundwater levels and logger installation

A total of 17 groundwater level loggers and one barometric logger was installed throughout the newly constructed wells and YS05.

Groundwater levels were recorded using an electronic water level tape before a Solinst level logger was deployed into the monitoring well on a stainless steel cable. All loggers were set to hang approximately 1 m above the bottom of the well, with 2 to 5 metres of water column above. One barometric logger was installed in BH01. All loggers were set to one hour recording intervals to measure short term fluctuations in water level. The loggers have a maximum of 40,000 memory points equating to 4.5 years of continues logging without downloading and or resetting. It is recommended that the logging frequency is revised following the first 12 months of monitoring to preserve logger batter and memory.

Table 2-4 below summarises the logger installation including measured water levels at time of deployment.

Well ID	Date	Time	Logger serial	Groundwater level at deployment		
			number	m bgl	m AHD	
BH01	12/06/2019	7:53	0022105721	0.17	141.69	
BH01 (Barro)	12/06/2019	8:00	0012104949	-	-	
BH02	12/06/2019	7:55	0022105724	-0.08	141.83	
BH03	12/06/2019	7:58	0022105709	-0.10	141.84	
BH04	12/06/2019	9:13	0022105726	0.33	143.03	
BH05	12/06/2019	9:15	0022105727	0.69	142.40	
BH06	12/06/2019	9:18	0022105725	0.86	142.04	
BH07	12/06/2019	9:20	0022105706	0.05	142.45	
BH08	12/06/2019	10:08	0022105698	0.86	143.76	
BH09	12/06/2019	10:10	0022105718	1.22	143.14	
BH10	12/06/2019	10:13	0022105711	1.13	143.18	
BH11	12/06/2019	10:15	0022105716	1.23	145.86	

Table 2-4 level logger installation summary



Well ID	Date Time		Logger serial	Groundwater level at deployment		
			number	m bgl	m AHD	
BH12	12/06/2019	10:17	0022105699	1.22	145.98	
BH14	12/06/2019	11:09	0022105689	1.40	146.26	
BH15	12/06/2019	11:11	0022105722	0.31	147.11	
BH16	12/06/2019	11:13	0022105732	0.63	147.36	
BH17	12/06/2019	11:15	0022105691	1.17	146.94	
YS05	06/08/2019	11:00	ТВС	0.44	148.28	

Note:

1. BH02 and BH03 groundwater level was measured to be above ground level and is denoted by a negative sign.

2.5 Survey

Elevation, and co-ordinates were recorded at the installed groundwater monitoring wells. In addition, to better characterise the location of key features within the swamp, elevation and co-ordinates were collected from 13 locations within the fire trench, and 10 locations along downstream drainage paths of the swamp. This was undertaken by a Jacobs surveyor on the 10th and 12th June 2019. All surveyed points were cross referenced to control Elliminyt PM78 and recorded to an accuracy of ±0.030m. Each survey point for the fire trench and tributary is shown in Table 2-5 and Table 2-6 respectively. Points are also shown spatially in Figure 2-2.

Table 2-5 Survey point locations along fire trench

Point ID	Easting	Northing	Elevation (m AHD)
999	735091.2	5743688.6	150.7
1000	735123.0	5743696.5	150.3
1001	735178.3	5743711.8	149.2
1002	735218.0	5743721.1	149.9
1003	735292.6	5743756.7	150.6
1004	735349.3	5743791.5	148.8
1012	735464.3	5743835.3	148.6
1020	735605.3	5743884.4	145.7
1021	735664.3	5743875.3	144.6
1022	735683.4	5743864.6	144.5
1029	735733.8	5743849.6	143.1
1030	735805.8	5743802.6	142.0
1032	735875.5	5743805.2	141.6

Soil sampling and well completion report





Figure 2-2 Location of survey points at wells installed, fire trench and drainage line



Point ID	Easting	Northing	Elevation (m AHD)
2000	735930.6	5743942.4	140.4
2001	735930.3	5743941.7	140.9
2002	735926.0	5743926.3	141.0
2003	735923.521	5743916.736	140.7
2005	735920.6	5743904.8	140.8
2006	735917.0	5743893.0	140.8
2007	735911.0	5743874.9	140.7
2008	735913.1	5743875.7	141.4
2009	735922.6	5743908.0	141.2
2010	735930.3	5743941.4	141.0
2011	735930.7	5743942.5	140.8

Table 2-6 Survey point locations along outflow tributary

2.6 Spoil management

During the investigation, excavated ASS waste material was exposed to the atmosphere, presumably resulting in some oxidation. As such, the exposed waste material was deposited in accordance with an environmental management plan to a depth of >0.5 m below the ground surface and buried under topsoil.

To limit oxidation, soil material excavated from depth was managed in the following way:

- The duration of waste material exposure at the surface prior to disposal to the subsurface was limited
- Clay dominated material was placed on top of coarser grained material as a natural oxygen barrier

While is it presumed that some oxidation did occur, there was no notable discoloration or iron hydroxide staining noticed on exposed material, suggesting this was limited. Figure 2-3 below illustrates the disposal.



Figure 2-3 Spoil management procedure



3. Results of investigation

3.1 Lithological logs

The location of boreholes is shown in Figure 2-1 and lithological logs in Appendix A.

Lithological logs indicate that clays and silts are the dominant lithology's throughout the swamp, although small discrete intervals of sands do occur. Small intervals of burnt peat were identified in the upper 0.5 m of some soil cores, most dominantly at BH17 and BH18 (see question 13 section 1.1).

Figure 3-1 below shows the lithology at boreholes both spatially and vertically using Leapfrog geological modelling software. A vertical exaggeration of 10x has been applied. This illustrates that boreholes located towards the upper reaches of the swamp (BH11, BH14, BH15 and BH16) tend to be clay dominated, while boreholes at the lower reaches of the swamp at (BH1, BH2, BH3 and BH7) tend to be silt dominated. Small lenses of coarse sand are evident at BH04, BH08, BH11, BH12, BH14, BH16 and BH17.

These results are consistent with the dominance of quaternary alluvial sediments in the upper 6 m of the stratigraphic profile in the swamp. The dominance of clay and limited presence of sand through the cores may limit connection between the LTA and the swamp (see question 4 in 1.1), however this is somewhat speculative and likely to be better resolved thorough water balance assessments that will be undertaken in subsequent studies.



Figure 3-1 Leapfrog geological model showing the primary constituents of SILT (grey), CLAY (light yellow) and SAND (orange) throughout the bore logs

3.2 Aquifer Permeability testing

Slug testing of groundwater monitoring was completed between 11th and 13th June 2019. Testing was undertaken using a solid PVC slug to displace water in the well and a groundwater level logger was deployed in each well to record the change in groundwater head in real time and viewed on a laptop. Viewing the change in water column height in the well in real time allowed for visualisation that the test was complete before a subsequent test was undertaken. A minimum of one test was undertaken at each well with multiple tests occurring at wells which recovered faster.

Change in water level data recorded during the tests was processed using the Aqtesolv software package to estimate hydraulic conductivity (K) for the screened section of the aquifer at each well. The determination of a K value for each test was undertaken using a visual match on a log-log displacement/time curve using the Bouwer and Rice (1976) analytical solution for unconfined aquifers method. A hydraulic conductivity anisotropy ratio (K_{vertical}/K_{horizontal}) of 0.2 was assumed as is consistent for alluvium (Todd, 1980). While lower values may be appropriate for clay dominated sediments, analysis was not sensitive to this parameter with a K_v/K_h value of



0.01 yielding an average increase in the overall K value of only 9%. An aquifer thickness of 10 m was used in all analysis. Where multiple tests occurred, an average of the resulting estimates of K was used to give an overall estimate of hydraulic conductivity for the tested intervals. The curve fitting undertaken as part of this analysis is included in Appendix F and a summary of the results presented in Table 3-1.

Hydraulic conductivities ranged from 0.02 to 1.8 m/day, with an average conductivity of 0.50 m/day and a standard deviation of 0.62 m/day. This is broadly consistent with the range in hydraulic conductivities expected for unconsolidated silts (Domenico and Schwartz, 1990).

A broad range in hydraulic conductivities is observed through the swamp. Elevated hydraulic conductivities were observed at BH06, BH09, BH10, BH11, BH12 and BH16. These are predominantly located through the centre of the swamp. This may suggest greater groundwater flow rates at these locations. However, neither lithological logs nor slug tests suggest the occurrence of a pervasive unit of elevated permeability that promotes subsurface flow (see question 5 in section 1.1). Additionally, there does not appear to be a consistent trend between the dominant lithology at each given well and the hydraulic conductivity (Table 3-1), which makes the inference of such trends difficult to assert.

Further to the above, the dominance of clays and silts suggest that groundwater flow will be dominantly horizontal. As discussed above, an anisotropy ratio of 0.2 has been assumed for the below analysis, as is consistent with the range of 0.1 - 0.5 assumed for alluvium by Todd (1980), however this could be as low as 0.01 in clays, which reinforces that subsurface flow through the swamp will be dominantly horizontal.

Bore ID	Effective Screened	Dominant lithology in Sreen	Slug test type (Falling /Rising	Estimated hydra (m/day)	aulic conductivity (k)
	Interval (m bgl) ¹		head)	Test Result	Final estimate for well
			Falling head	0.27	
	15 60		Rising head	0.22	0.22
DITOT	1.5 - 0.0		Falling head	0.16	0.22
			Rising head	0.22	
BH02	10.25		Falling head	0.03	0.11
DI 102	1.9 - 3.5	SIITY CLAY	Falling head	0.18	0.11
BH03	15 26		Falling head	0.03	0.03
DI 103	1.5 - 5.0		Falling head	0.03	0.03
BH04	16-60	Silty CLAV	Falling head	0.09	0.00
БП04	1.0 - 0.0		Rising head	0.09	0.09
			Falling head	0.05	
BH05	1.5 – 6.0	- 6.0 Silty CLAY	Rising head	0.06	0.06
			Rising head	0.06	
			Falling head	1.35	
BHOS	15 50	5.9 Silty CLAV	Rising head	1.12	1.51
DI 100	1.5 - 5.9		Falling head	1.18	1.51
			Rising head	2.41	
	15 60		Falling head	0.02	0.02
DITOT	1.5 - 0.0		Rising head	0.01	0.02
BH08	1.5 – 5.9	Silty CLAY / Silty SAND	Rising head	0.10	0.10
			Falling head	1.34	
BHO0	15 60	Silty CLAV	Rising head	1.26	1 31
DI 109	1.5 - 0.0		Falling head	1.34	1.51
			Rising head	1.30	
			Rising head	0.83	
	16 60	Silty CLAY / Clayov SILT	Rising head	1.60	1 20
	1.0 - 0.0	Siny CLAT / Clayey SILT	Falling head	1.14	1.30
			Rising head	1.64	

Table 3-1 Results of slug testing of groundwater wells



Bore ID	Effective Screened	Dominant lithology in Sreen	Slug test type (Falling /Rising	Estimated hydra (m/day)	ulic conductivity (k)	
	Interval (m bgl) ¹		head)	Test Result	Final estimate for well	
DUI44	45.00	CLAY	Falling head	0.35	0.05	
БПІІ	1.5 - 6.0	CLAY	Rising head	0.35	0.35	
BH12	0.7 – 3.5 ¹	Sandy CLAY	Rising head	0.82	0.82	
		Clayey SILT, CLAY,	Rising head	0.14	0.12	
BH14	1.5 - 5.5	SAND	Rising head	0.13	0.13	
DLI45	15 60		Falling head	0.12	0.16	
БПІЭ	1.5 – 6.0	SIITY CLAY	Rising head	0.20	0.16	
DLI16	12 60	Sandy CLAY	Rising head	1.72	1 70	
БПІО	1.3 - 6.0	Sandy CLAY	Rising head	1.85	1.79	
DLI47	14 50	Sondy CLAV	Falling head	0.06	0.05	
DH17	1.4 - 5.9	Sanuy CLAY	Falling head	0.04	0.05	

Notes:

2. Well screen was unsaturated

3.3 Groundwater levels

Depth to groundwater was measured in all 16 newly installed wells in June 2019. YS05 in was measured in July 2019.

The groundwater levels recorded as part of investigations have been summarised in Table 3-2 below. Groundwater levels varied between 1.4 and -0.10 m bgl. Groundwater levels labelled with a negative m bgl value indicate artesian conditions. These were recorded at BH02 and BH03 in the lower reaches of the swamp.

These data have been used in conjunction with a digital terrain model to generate a potentiometric groundwater surface and depth to groundwater map for the monitoring period (Figure 3-2). This illustrates a steep hydraulic gradient towards the swamp from the north and a gentler hydraulic gradient towards the swamp from the south. The hydraulic gradient through the swamp trends to the east in a broadly similar direction to the flow path of Boundary Creek.

Depth to watertable mapping indicates groundwater levels near to the surface (<0.5 m bgl) in the lower reaches of the swamp near (BH02) and through the north west portion of the swamp.

W	Dete	Groundwater level				
	Date	m bgl	m AHD			
BH01	12/06/2019	0.17	141.69			
BH02	12/06/2019	-0.08	141.83			
BH03	12/06/2019	-0.10	141.84			
BH04	12/06/2019	0.33	143.03			
BH05	12/06/2019	0.69	142.40			
BH06	12/06/2019	0.86	142.04			
BH07	12/06/2019	0.05	142.45			
BH08	12/06/2019	0.86	143.76			

Table 3-2 Summary of groundwater levels (m bgl) and groundwater elevation (m AHD) recorded

^{1.} Effective screen is length of gravel pack of well.



W	Dete	Groundwater level				
	Date	m bgl	m AHD			
BH09	12/06/2019	1.22	143.14			
BH10	12/06/2019	1.13	143.18			
BH11	12/06/2019	1.23	145.86			
BH12	12/06/2019	1.22	145.98			
BH14	12/06/2019	1.40	146.26			
BH15	12/06/2019	0.31	147.11			
BH16	12/06/2019	0.63	147.36			
BH17	12/06/2019	1.17	146.94			





Date Publi

Figure 3-2 Depth to water table and groundwater elevation at wells and as interpreted throughout Big Swamp from the well data-June 2019



3.4 Static geochemical test work

Soil samples were collected at various depths at all boreholes across Big Swamp. The soils were analysed for a number of geochemical properties. This section provides a preliminary assessment of the general trends in geochemistry observed both spatially and with depth through the swamp. A detailed geochemical assessment is in preparation by Monash University. The general parameters discussed here include organic carbon, sulfate and acidity (in its various forms). These results have been detailed in Appendix G.

3.4.1 Organic carbon content

Analysis of the organic matter (OM) and organic carbon (OC) content of soils was undertaken by Monash University Laboratories via the loss on ignition (LOI) method. A total of 181 samples were analysed via this method with the results summarised in Table 3-3 below.

These results indicate that the soils throughout the swamp are predominated by those with a high organic carbon content. This is consistent with core logs (Appendix A) which indicate the presence of organic material, organic odour and peat layers throughout the soil profile.

While there are a number of guidelines available which classify organic soils according to their organic carbon content, mineral fraction, clay content and texture, we have adopted a limit of >30% OC for the classification of peat in accordance with Huang et al., (2009). This limit is based on a combination of experimental work, literature review and evaluation of currently existing classification systems (e.g. Inisheva, 2006; Isbell, 2002).

Accordingly, 26% of soil samples collected are classified as mineral soils, 24% as mineral soils with organics, 43% as organic soils and 8% as peat. To summarise, while the majority of soil samples are classified as organic soils or soils with organics, only a small proportion are technically consistent with peat.

These results provide a starting point to answering research question 8 (see section 1.1), in that the soils throughout the swamp contain significant concentrations of organic carbon. However, the bio-availability of this carbon and its capacity to promote processes such as sulfate reduction remain unquantified. This is likely to be further resolved in parallel studies being undertaken by Monash University.

Organic Carbon (%)	No. of samples	% of samples	Classification
<3	46	26%	Mineral soils
3 - 15	43	24%	Mineral soils with organics
15 - 30	77	43%	Organic soils
>30	15	8%	Peat

Table 3-3 Summary of organic C content of soils via LOI analysis

3.4.2 Sulfate

Sulfate was extracted from each of the 181 sediment samples using a 20 ml milli-Q water extraction at Monash University Laboratories. The concentration of sulfate in the resulting extracts ranged from 0.9 mg/L to 5,100 mg/L with an average concentration of 284 mg/L.

Trends in sulfate concentrations with depth are illustrated in Figure 3-3. The average concentration increases from 165 mg/L at 0.5 m to 686 mg/L at 1.0 m depth before gradually declining to an average of 160 mg/L at 3.0 m. Average concentrations below 3.0 m depth vary between 160 and 130 mg/L.

Given the nature of the site and the presence of acid sulfate soils, these results are consistent with oxidation of sulfides in the upper soil profile and the subsequent release of sulfuric acid. Similar trends in existing acidity would be expected throughout the soil profile if this is the case and are discussed in further detail below.





Figure 3-3 Average, 25th and 75th percentile (shown as error bars) of sulfate with depth (aggregate from 0.5 m intervals)

3.4.3 Acidity

A summary of the potential and existing acidity within each soil core has been prepared in Appendix G. General trends in potential and existing acidity with depth have been summarised in Figure 3-4. A full report and laboratory certificates regarding static chemistry results is in preparation by Monash University. For the purpose of this report, the results are briefly summarised below and the key findings are as follows:

- Acid neutralising capacity (ANC) was below detection in all samples analysed. This indicates that within
 the soils samples, there is no capacity to neutralise any of the existing acid present, or any potential
 acidity that may be released upon further oxidation.
- High concentrations of net acidity are present throughout the majority of samples collected from the swamp. Of the 181 samples collected, 180 exceed the criteria of 0.03 %S for classification as acid sulfate soils (EPA, 2009).
- Concentrations of existing acidity tends to decline with depth. Figure 3-4 shows a decline in the average concentration of acidity from >0.5 %S in the upper 2.0 meters of the soil profile, to 0.25 %S at 4.0 meters depth and 0.13 %S below 4.5 m depth. These trends are consistent sulfate concentrations and provide further support for the occurrence of sulfide oxidation in the upper portion of the soil profile.
- Significant concentrations of potential acidity (sulfide) exist in soils collected from the subsurface of the swamp. Figure 3-4 shows an increase in the average potential acidity from 0.12 %S in the top 0.5 m of the soil profile to 3.6 %S at 1.5 m depth. Average concentrations variably decline from 3.6 %S at 1.5 m depth to 1.3 %S below 4.5 m depth. The results indicate that significant stores of potential acidity remain throughout the soil profile of the swamp, and that future drying and oxidation of these soils may result in acid generation.



Average sulfide concentrations peaked between 1.5-2.0 m below the ground surface. This could be
related to the formation contemporary sulfides as a result of the infiltration of ferrous, sulfate rich
leachate from the upper profile as it is subject to reducing conditions below the water table. However,
there is significant variability in the concentration of sulfides at depth and as such, this could be an
artefact of heterogeneity at the site.



Figure 3-4 Average, 25th and 75th percentile (show as error bars) of existing and potential acidity with depth (aggregate from 0.5 m intervals)

In addition to trends throughout soil profiles discussed above, spatial trends were also assessed using subsurface 3D geological modelling software Leapfrog Works (Leapfrog). This has been used to show the 3D spatial distribution of the boreholes with respect to existing and potential acidity in Yeodene Swamp. A radial basis function linear interpolation was applied to the numerical borehole data to create two 3D numerical heat map models showing the 3D spatial distribution of potential and existing acidity within the swamp.

The models were bound by the topography and a horizontal elevation of 135.8 m AHD (the lowest elevation of coring at BH01). Ellipsoid ratios of 9, 9 and 1 were applied for the maximum, intermediate and minimum directions of the model (x, y and z) respectively. This yields a greater emphasis on the horizontal plane of the models rather than the vertical plain for both models. This was undertaken to allow for the numerical value at a specific borehole and depth to have a greater effect horizontally where no data was available. The purpose of these models is to allow discussion of spatial trends in acidity to be discussed and not the full quantification of acid stores.

Figure 3-5 and Figure 3-6 show a horizontal slice with a slight dip at approximate depths at 0 - 2 m bgl for existing acidity and 2 - 6 m bgl for potential acidity. Figure 3-5 illustrates that the highest concentrations of existing acidity tend to occur throughout the upstream areas of the swamp at BH18, BH14, BH12 and BH11. In these boreholes, concentrations of existing acidity exceed 2.0 %S in the upper 2.0 m of the soil profile (approximately double the average concentration for this interval through the swamp).



Similarly, concentrations of potential acidity tend to be higher in the same general area, with concentrations exceeding 10 %S at BH18, BH15 and BH14. However, similar concentrations were also observed through the through the downstream portion of the swamp at discrete intervals in BH4, BH5, BH6, BH8, BH9 and BH10.

Conversely, throughout the central area of the swamp (at BH11 and BH12), only one sample was collected with a concentration of potential acidity exceeding 1 %S. The average concentration across samples from BH11 and BH12 was 0.58 %S, compared to the average concentration of potential acidity of 6.2 %S at BH18. While this illustrates the reduction in potential acidity that are observed through the central portion of the swamp, it should be noted that such concentrations are still ~20 times greater than the net acidity limit for classification of ASS.

Given this, it can be concluded that regardless of specific location within the swamp, significant stores of potential acidity are likely to exist that should be taken into account when considering management strategies.



Figure 3-5 Existing acidity heat map sliced at 0 – 2 m depth



Figure 3-6 Potential acidity heat map sliced at 2 - 6 m depth



4. Summary and conclusions

4.1 Summary

This report details the outcomes of a field program involving soil sample collection at 17 sites for subsequent static geochemical analysis of acid suflate soils, the construction of 17 well at these sites, the deployment of groundwater level loggers in each well, aquifer permeability testing at each site and groundwater level monitoring. The outcomes of the field program can be summarised as follows.

4.1.1 Lithological logs and soil sample collection

A total of 181 soil samples were collected across 17 sites via a combination of push tube and rotary auger drilling. Each core was logged, photographed and samples were collected and handled in accordance with Sullivan et al. (2018) during transfer to Monash University for static geochemical analysis.

Lithological logs indicate the presence of silts, clays and discrete sands and in the upper 6 m of the soil profile throughout Yeodene Swamp. This is consistent with the occurrence of alluvial deposits. Logs also indicate a relatively high organic matter content within the soil profile.

4.1.2 Well construction and logger installation

A total of 16 wells were constructed. Of these, 13 were constructed to a depth of \sim 6 m bgl with 50 mm uPVC using a drilling rig. An additional 3 wells were constructed by hand to depths of 3 to 4 m bgl with 26 mm uPVC. Wells were finished with a stick up of \sim 0.70 m and a steel lockable standpipe.

Solinst groundwater level loggers were deployed in each well to a depth approximately 1 m above the well's total depth. Loggers were set to record levels at a 1 hr frequency. A total of 17 groundwater loggers were deployed including 16 at the newly installed wells and one in a previously installed well (BH18 previously termed YS05 in the Yeodene Swamp Study – Jacobs, 2018b). One Barometric level logger was also installed at BH01.

4.1.3 Aquifer permeability testing

Slug tests were undertaken at each of the 17 newly installed wells. Hydraulic conductivities ranged from 0.02 to 1.8 m/day, with an average conductivity of 0.50 m/day and a standard deviation of 0.62 m/day. This is broadly consistent with the range in hydraulic conductivities expected for unconsolidated silts (Domenico and Schwartz, 1990).

4.1.4 Groundwater levels

Groundwater levels varied between 1.4 and -0.10 m bgl (negative sign denotes groundwater levels above ground surface – artesian conditions). Depth to watertable mapping indicates groundwater levels near to the surface (<0.5 m bgl) in the lower reaches of the swamp (near BH02) and through the north west portion of the swamp.

4.1.5 Static geochemical test work

181 samples were analysed for organic carbon content and classified according to Huang et al., (2009). Accordingly, 26% of soil samples collected were classified as mineral soils, 24% as mineral soils with organics, 43% as organic soils and 8% as peat. In summary, while most soil samples are classified as organic soils or soils with organics, only a small proportion are technically classified as peat.

Sulfate concentrations ranged from 0.9 mg/L to 5,100 mg/L with an average concentration of 284 mg/L. The average concentration of sulfate in soil samples at 0.5 m intervals increased from 165 mg/L at 0.5 m to 686 mg/L at 1.0 m depth. Concentrations below this subsequently declined to an average of between 130 and 160 mg/L to 6.0 m depth.



Of the 181 samples analysed, 180 exceed the 0.03 %S net acidity concentration limit for characterisation as acid sulfate soils. Acid neutralising capacity was below detection in all samples. This indicates that within the soils sampled, there is no capacity to neutralise any of the existing acid present, or any potential acidity that may be released upon further oxidation.

Concentrations of existing acidity tend to decline with depth. The average concentration of throughout all cores was >0.5 %S in the upper 2.0 meters of the soil profile, 0.25 %S at 4.0 meters depth and 0.13 %S below 4.5 m depth.

Significant concentrations of potential acidity (sulfide) exist in soils collected from the subsurface of the swamp. The average potential acidity increased from 0.12 %S in the top 0.5 m of the soil profile to 3.6 %S at 1.5 m depth. Average concentrations variably declined from 3.6 %S at 1.5 m depth to 1.3 %S below 4.5 m depth. The results indicate that significant stores of potential acidity remain throughout the soil profile of the swamp, and that future drying and oxidation of these soils may result in acid generation.

4.2 Conclusions

Within the context of the Boundary Creek and Big Swamp Remediation and Environmental Protection Plan, a number of conclusions can be drawdown from the above investigations which have the capacity to answer or inform research questions that have remained unresolved to date. The conclusions and relevant research questions have been listed below:

4.2.1 Question 4: Is there a hydraulic connection between Big Swamp and the Lower Tertiary Aquifer?

The dominance of clays and silts and limited occurrence of sand through the cores suggests that connection between the LTA and the swamp may be limited. Further, the shallow groundwater levels are not indicative of significant drawdown at the swamp. However, the results presented here are not conclusive and are likely to be better resolved through water balance assessments that will be undertaken in other studies.

4.2.2 Question 5: Are there preferential surface or subsurface flow paths in Big Swamp?

Elevated hydraulic conductivities were observed at BH06, BH09, BH10, BH11, BH12 and BH16. These are predominantly located through the centre of the swamp and may suggest higher groundwater flow rates through these areas. However, neither lithological logs nor slug tests suggest the occurrence of a pervasive unit of elevated permeability that promotes subsurface flow. Given the alluvial nature of sediments through the swamp and the dominance of clay and silt, it is likely that groundwater flow will be dominantly horizontal.

4.2.3 Question 6: How much actual and potential acidity is currently stored in Big Swamp?

The static geochemical test work presented within this report provides sufficient data to quantify the amount of existing and potential acidity within the swamp. While full quantification is beyond the scope of this report, further interrogation of the data and refinement of the models in section 3.4.2 could be used for this purpose.

4.2.4 Question 7: How much sulfate remains in the sediment profile in the swamp?

Results indicate average sulfate concentrations of >400 mg/L in the upper 2 m of the soil profile throughout the swamp. Trends in sulfate concentrations with depth are similar to those given by existing acidity vs depth. This suggests that the products of sulfide oxidation (including sulfate) have been retained in the soil profile to some degree. The capacity for these to react and generate alkalinity under different conditions is being assessed separately by Monash University.



4.2.5 Question 8: How much bioavailable carbon is currently stored in Big Swamp that can be used to promote biogeochemical processes?

The static geochemical results presented within this report provide an indication of the organic carbon content, which was found to be >15% in greater than half of all samples collected. The bioavailability of this carbon has not been assessed as part of this study.

4.2.6 Question 13: How extensive is fire damage to the peat in Big Swamp?

Charring and the occurrence of burnt material within soil profiles was limited to the upper 0.5 m of the soil profiles in cores taken towards the western portion of the swamp. However as discussed in section 3.4, peat layers did not dominate the soil profile.



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Todd, D.K., 1980. Groundwater Hydrology, 2nd ed., John Wiley & Sons, New York, 535p.



Appendix A. Borehole logs and groundwater monitoring well construction details



Contractor: GoDill Easting: 735838.9 Elevation: 1 Plant: Petrol driven and sampler Northing: 5743863.1 Datum: Logged by: NU Checked by: Grid: MGA94 Zone 54 Inclination: -1 DRILLING MATERIAL SUBSTANCE IN DRILLING MATERIAL SUBSTANCE IN assisting: E E E E Inclination: -1 assisting: E E E E E E Inclination: -1 assisting: E E E E E E Inclination: -1 assisting: E E E E E E E E a	41.75 Started: 07/05/2019 Finished: 07/05/2019 Orientation: STALLATION DETAILS D Type Stick Up & RL Tip Depth & 102 Standpipe 1.16 m 142.9 m 3.70 m 138.05 11/06/2019 Concrete 26 mm diameter class 18 PVC casing
RILLING MATERIAL SUBSTANCE IN 1000/0 10/0 <td< th=""><th>STALLATION DETAILS</th></td<>	STALLATION DETAILS
Updays Image: Second strate Image: Second strate Image: Second str	D Type Stick Up & RL Tip Depth & 102 Standpipe 1.16 m 142.9 m 3.70 m 138.01
B000000000000000000000000000000000000	11/06/2019 60 mm diameter borehole Concrete 26 mm diameter class 18 PVC casing
139 - - - - - - - -<	Bentonite chips Bild filter grain size sand Class 18 PVC 0.3 mm machine slotted screen Hole collapse Cuttings

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ject:		Yeod	ene Sv	vamp ASS field invest	gation					Page	e: 1 of 1
ent: ontract ant:	tor:	Barw GoDi Geop	on Wa ill probe	ter	Location: Easting: Northing:	Yedodene Swam 735682.3 5743890.3	DElevation: Datum:	143.37		Proje Started: Finished:	24/04/2019 24/04/2019
gged	by:	NU	c	Checked by: GH	Grid:	MGA94 Zone 54	Inclination	n: -90°		Orientation:	
RILLING	G		MAT	ERIAL SUBSTANCE				INSTALLA	ATION DETA	ILS	
Water	RL (m)	Depth (m)	Graphic Log		Description of Str	ata		ID BH4	Type Standpipe	Stick Up 0.82 m 144	& RL Tip Depth & .19 m 6.00 m 137.37
11/06/2019	143 - 142 - 141 -	- - - - - - - - - - - - - - - - - - -	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Clayey SILT: red with wh abundant roots/rootlets a Clayey SILT: dark brown poor cohesion, crumbly, Silty CLAY: moderate to cohesive, abundant deca	ite mottles, dry, firm nd decaying organic to black with some y some roots ow plasticity, dark b ying organic materia	to hard grains, no cohe matter /ellow brown mottles, n rown to black, moist, so	ioist, loose	2.00 m		- C	11/06/2019 oncrete 0 mm diameter class 3 PVC casing entonite chips
	140 -	- 3 		Clayey SAND with some sand, no organic matter Silty CLAY with trace san no organic matter	silt: low plasticity, w	et, soft, cohesive, medi plasticity, medium grey,	wet, soft,			C m sa	lass 18 PVC 0.4 mm achine slotted screen 16 filter grain size and
-	139 -	-		stiff, fine to medium grain	noderate to high pla led sand	isucity, dank grey, most	, sun to very	5.00 m			
	138 -	-								e s'	' or 203mm diameter orehole lass 18 PVC sump
	-	-		Hole Terminated at 6.00	m				<u> </u>	4	
				DRILLING					GROUNDWAT	ER SYMBOLS	

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			V								Dama	
ojeci ient:	[:		Barw	ion Wat	ter	Location:	Yedodene Swam	ρ			Page Proje	ect No: IS288600
Contra Plant: .ogge	acto ed b	or: y:	GoD Geoj NU	rill probe C	Checked by: GH	Easting: Northing: Grid:	735686.9 5743921.0 MGA94 Zone 54	Elevation: Datum: Inclinatior	143.08 n: -90°		Started: Finished: Orientation:	18/04/2019 18/04/2019
RILLI	ING			MAT	ERIAL SUBSTANCE				INSTALLA	TION DETAI	LS	
Support	water	RL (m)	Depth (m)	Graphic Log		Description of St	rata		ID BH5	Type Standpipe	Stick Up 0.80 m 143	& RL Tip Depth & F 3.88 m 6.00 m 137.08
11/06/2014 0		143 -	- - - - 1 -		Sandy SILT with some cla granular sand texture, roc Silty CLAY: low to moder firm, some organic matter Clayey SILT: low plasticity inclusions (peat)	ay: orange red to ye titets abundant ate plasticity, dark b , dark brown, wet,	llow brown, dry, loose h rown with red mottles, r soft, cohesive, some fib	n moist		BH5	 ↓ ↓	entonite chips
	1	141 -	- - 2 -		soft to firm, some organic	material, find sand	ae plasticity, dark brow	n, moist,	2.00 m		50 11	0 mm diameter class 8 PVC casing ' or 203 mm diameter orehole
	1	140 -	- - 3 -		Clayey SILT with trace of find sand	sand: low plasticity,	dark brown, wet, soft, (cohesive,			c m	lass 18 PVC 0.4 mm achine slotted screen
	1	139 -	- - 4 -	$\begin{array}{c} \times & \times & \times \\ \times & \times & \times & \times \\ \times & \times & \times &$	Silty CLAY: low plasticity, cohesive	dark grey with som	e yellow brown mottles	, wet, soft,			8/ sz	/16 filter grain size and
	1	138 -	- - 5 -						<u>5.00 m</u>		c	lass 18 PVC sump
			- - 6 - -		Hole Terminated at 6.00 r	n						
			L	<u> </u>	DRILLING PT - Push Tube AD/T - Auguer drilling with t	c-but			<u> </u>	GROUNDWATI	ER SYMBOLS	el (during drilling)

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	C	(B	S Pie	zometer	Installat	ion De	etails			BH09
oject: ent:		Yeod Barw	lene Swa on Wate	amp ASS field inves er	stigation Location:	Yedodene Swam		Page: 1 of 1 Project No: IS28860			
Contractor: Plant: Logged by:		GoD Geop NU	rill probe Cl	hecked by: GH	Easting: Northing: Grid:	735609.7 5743944.4 MGA94 Zone 54	Elevation Datum: Inclinatio	: 144.36 n: -90°		Started: Finished: Orientation:	24/04/2019 24/04/2019
RILLING			MATE	RIAL SUBSTANCE				INSTALL	ATION DETA	LS	
Support Water	RL (m)	Depth (m)	Graphic Log	ROCk (texture altera	Description of Str TYPE : Colour, Grain , fabric, mineral compo tion, cementation, maj	rata size, Structure ssition, hardness or defect type)		ID BH	Type Standpipe	Stick Up 0.68 m 145	& RL Tip Depth & F .04 m 6.00 m 138.36
14	44 –	_	× × × × × × × × × × × × × ×	SILT with trace sand: ro decaying organic mate	ed to red brown, dry, le rial	oose, poor cohesion, fi	nd sand,		8 5 8 2 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4 Ci	oncrete
11/06/2019	43 -	- 1	× × × × × × × × × × × × × × × × × × ×	Clayey SILT with trace	sand: dark brown, mo	ist, loose, poor cohesio	on, friable			Be	entonite chips 11/06/2019
14	42 -	- 2 	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Silty CLAY: moderate to abundant organics	o low plasticity, mediu o low plasticity, mediu	m brown to grey, mois m brown to grey, mois	t, firm, t, firm to stiff,	2.00 m		50 18 • bc	9 mm diameter class 9 PVC casing or 203 mm diameter rehole
14	41 –	- 3 -		Silty CLAY: low to mod increasing concentratic	erate plasticity, mediu n of organics but varia high plasticity, mediu	m brown to grey, wet, : able m grey with yellow bro	soft to firm,			City	ass 18 PVC 0.4 mm achine slotted screen
12	40 -	- 4		Moist, very stiff	e plasticity, medium gr	rey to yellow mottles, w	iet, firm			8/ sa	16 filter grain size Ind
12	39 -	- 5 						<u>5.00 m</u>		ci	ass 18 PVC sump
		- 6		Hole Terminated at 6.0	0 m					<u>bartel</u>	
				DRILLING PT - Push Tube AD/T - Auguer drilling w	th tc-but			= Water	GROUNDWAT	ER SYMBOLS	I (during drilling)

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J	A		OE	S		Ε	ng	jineerin	g Log - B	orehole	e				BH18	
Proje Clier	ect: nt:	Ye Ba	eodene S arwon Wa	wamp ater	ASS	field in	vesti	gation Location:	Yedodene Swam	Page: 1 of 1 Project No: IS288600						
Contractor: Plant: Logged by:		: G G : N	oDrill eoprobe U	Checke	ed by:	GH		Easting: Northing: Grid:	735276.0 5743824.0 MGA94 Zone 54	Elevation: Datum: Inclination:	148.72 -90°			Started:08/05/2Finished:08/05/2Orientation:	19 19	
DR	ILLING	INFO	RMATION	1		MAT	ERIA	L SUBSTANCE								
Method & Support	Penetration	Groundwater Levels	Samples & SPT Data	RL (m)	Depth (m)	Graphic Log	Classification Symbol		Material Description	on		Moisture	Consistency Relative Density	Field Test D & Other Obsen	Pata /ations	
A					_	× × ×	SW- SC	Sandy SILT: orang	ge-red with black browr	n mottles, dry, loose	e, some	D	L	ALLUVIUM 0.00: Within burnt area		
				148 -	- - - - 1		СН	Silty CLAY: low to mottles, moist, so	moderate plasticity, bla ft, cohesive	ack brown with son	ne	М		0.20: Organic odour		
					-		сн	Silty CLAY: low to orange red mottle	moderate plasticity, bla s, wet, soft, some piece	ack brown with son es of char	ne					
- Ld	PT			147 -	-2-			Silty CLAY with tra wet, soft, find sand	ace sand: moderate to I d	ow plasticity dark g	grey,	10/	s	1.60: Organic odour		
			146 -					daughe de biek alegdieite.	and und and me	- diu una	v			- - -		
					-3		сн	size sand	derate to high plasticity,	grey, wet, son, me	aium					
				145 -	- - - - 4 -			Hole Terminated a	at 3.20 m							
				144 -	- - - 5 -											
				143 -	- - - 6 -											
				142 -	- - -7 -										-	
				141 -	- 8										-	
				140 -	-9 -										-	
METHC HA AS AD/A AD/T WB RR AH C	D & SUPP Hand Auger Auger Auger - Washboi Rock Rol Air Hamn Casing	ORT ger V-bit TC-bit re ller her	PENETRATION No resistance ranging to refusal	139 - I GR0 ⊻ ⊻	DUNDWA = Wate (static) = Wate (during - = Wate	TER r level drilling) r inflow r outflow	D B SPT U E W	SAMPLES & Fil Disturbed Sample N S Bulk Sample HW SPT Sample RW Undisturbed Sample HP H Enviro Sample HV H Water Sample (P: F	ELD TESTS PT blows per 300mm SPT penetration by hammer weig SPT penetration by rod weight Hand Penetrometer Hand Vane Shear Peak Su R: Residual Su)	MOISTURE D = Dry M = Moist W = Wet Wp = Plastic Lir W = Liquid Lirm	mit VD	DEN Very Lo Loose Medium Dense Very De	SITY (N- pose n Dense ense	value) CONSISTEN 0-4 VS Very Soft 4-10 S Soft 10-30 F Firm 30-50 St Stiff 50-100 VSt Very Stiff H Hard	CY (Su) (N-value) < 12 kPa {0-2} 12 - 25 {2-4} 25 - 50 {4-8} 50 - 100 {8-15} 100 - 200 {15-30} > 200 kPa {>30	

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Appendix B. Push tube photographs



Appendix B. Push tube photographs



BH01, 0 to 4.5 m



BH02, 0 to 3.6 m



BH03, 0 to 3.7 m



BH04, 0 to 4.5 m





BH06, 0 to 4.5 m





BH07, 0 to 4.5 m



BH08, 0 to 4.5 m



BH09, 0 to 4.5 m



BH10, 0 to 4.5 m



BH11, 0 to 4.5 m



BH14, 0 to 4.5 m



BH15, 0 to 4.5 m



BH16, 0 to 4.5 m



BH17, 0 to 4.5 m



BH18, 0 to 3.4 m



Appendix C. Well completion photographs



Appendix C. Well completion photographs



BH01








































































Appendix D. Well completion reports

6		R	ORE	w			989 M		ЭT		LICENC	CE TO COI	NSTRUC		E 0 7	4	BH
Souther Rural Wa	n si ter T	RW COP	Y - to South	em Ru	ral Water v	vithin 2	8 days	of complet	tion of	bore.		F	leport of	n site 1	2 3		1 5
Managing Water. Serving Commu	nities. G	PS CO	-ORDS:	E	7 3 5	2 9 9	9 N	5 7 4	39	0 2	Drilled Bo		earpoin	t 🗌 Well o	r Shaft		ragline
	Z	ONE: 54	4 / 55 plicable	GD	A 94/AD	Q66							OFFICI	E USE ONL	. Y	新聞	
Bore Owner Barw	on Wa	ater	phoable								BORE	NUMBER					
Site Address 25 POS	SSUM R	IDGE RC	DAD, YEC	DENE,	, VIC 3249	(Boun	dary C	reek - Big S	Swamp)	BORE L	JSES		ti -			
Date 07 0 Commenced	95 201	9 Date Con	e npleted	07 05	5 2019 /	Tot Dej	al pth	6		(m)	GMA				ZONE	с. 	
Was Bore Decommis	ssioned	? Y/N	N		If Yes, St	ate Me	thod										
1. DRILLING AND W	VATER	INTERS	ECTION	DETAI		EDEE	OTION	IC (while a	leille e			Anton Ann					
Method	From	То	Bit di	am F	From	To	Te	st Sta	tic E	Est yiel	d Draw	Casing a	t Depth	at Ec at 25	i C	Lithol	ogy
	(m)	(m)	(mn)	(m)	(m)	Met	hod Level	(m)	l/sec	down (m)	test (m)	test (r	n) (µS/cm	<u>1)</u>		
Hollow Stem Auger	0	0	200		-				-	-	-		1	-			
		-	-	-	-		-				-				_		
	CREEK		SLOTS	(91)	OPEN HO		н)		-			1	-		10 A	6 0840	2051 AK1
GENERAL	JOILE	10 (00)	CAS	NG	OFERING			SCREENS	S / SL	OTS					OF	FICE	USE
ýpe CA SC SL OH	From (m)	To (m)	Inner (m	diam (m)	Outer diam (mm)	Mate	erial	Inner diam (mm)	Outer (m	r diam nm)	Material	Aperture (mm)	Filter Y / N	Trade Nam	ie	_ithol	ogy
	6	5	50		60	C18 เ	JPVC	26	3	2	C18 uPVC	0.3	N				
	5	2	2	6	32	C18 เ	JPVC	50	60	0	C18 uPVC	0.4	Ν	10	- 1 ⁻¹		
	2	+0.7	5		60	C18 เ	JPVC					1					
	1											1	1		1961		
			Udin			12.								1			
100 x 100 steel n	nonum	ent co	vor							N	ELL HEAD	FITTINGS	Casi		Bullo	ose /	
OPMENT (0) DE	NTONIT						A.V/=1	(0)		2					<u> </u>	, dr	
Aaterial		From	To	Cemer	t Water	S	ieal / F	Packer	Ou	uter dia	m /	Artificial Gr	avel Pac	king	Gra	vel si	ze
	G	(m) 6	(m)	(bags)	(inces)		typ		Ors	seal (m	m)	Gra	r placem avity	ent	mesn pa		3 (mm) 4
	H	15	0.8		-	Me	dium	Chins			-		avity		1.2		-
	ΗF	0.0	0.0	4	10	IVIC	ulum	Chips	-						_		
	吕는	0.8	0	4	40	-		-		*							
			_		-		_		-							_	_
Method	Yield	Dra	w Pu	nping	Recover	y Fina	al Stati	c Ec at 25	C	р Г	Material	SLOG			From (m)	To (m)
Hand bailing	I/sec	aown	(m) 1im 45	e (min)	Time (mi		_evel	926	1)		Clay, silty,	red/orang	e		0	().1
. DRILLER'S PUMP	ING TE	ST				1 0.1		pH 4.3	}		Silt, sandy	, black/bro	own		0.1	(J.5
Method Stati	ic Y	field P	umping	Draw	Pump	ing R	ecove	TY Ec at 25	C		Sand, claye	ey with silt,	orange/	/brown grey	0.5		 2
Lever		Sec Lt	ever (m)	1) 11000	ing nine (i		ine (m	μο/οι	<u>"</u>		Clay, sand	y, grey			2		 6
IF NOT A DRILLE	DBORE	-	1		-	_					Clav. sand	I. Drk arev			4		6
Туре	Length	Width	Diam	Lining	g Material	F	From	To									
	((1))	(iii)	(11)				(iii)	(11)	-								
SAMPLES						1		1									
Have material sample	s been t	taken?	Yes 🗹	No 🗖	ŀ	fYes	From	.0(r	n)								
Have water samples t	been tak	ien?	Yes 🗹	No 🗖			To.	(r	n)								
Samples taken by: Bo DISINFECTION	re Owne	er 🖬 Di		Project	t Geologis				-								
Was the Bore Disinfed	cted?		Yes 🛛	No 🖸		17											
If yes, state method of	disinfec	ction:	Chlorine Other pl	Washe	d 🖸 Ste	am Cle	aned (ב									
riller's Name Ben Ou	ughton		ouler, ple	1000 54		. Drille	ar's Lic	ence No	1049								
vriller's Signature						Date	05	/ 06	1 201	19							
lame of Plant Operato	r				-1	-	Prin	t and S	ian								
									· ·						1.		

BORE COMPLETION REPORT BORE COMPLETION					WA	TER A	CT 1	989				LICEN	CE TO CO	NSTRUC			714	10	BH
Method From Total State State <th< th=""><th>Souther</th><th>n _{se}</th><th>BC W COPY</th><th></th><th>CON</th><th>IPLE</th><th>TIO</th><th>NF</th><th>REPOR</th><th>RT</th><th></th><th></th><th>W</th><th>ORKS N</th><th></th><th></th><th><u></u></th><th>1.1</th><th></th></th<>	Souther	n _{se}	BC W COPY		CON	IPLE	TIO	NF	REPOR	RT			W	ORKS N			<u></u>	1.1	
CASHEG 14 CONTENT Conten Content Content <	Managing Water. Serving Commun	To To	be sent to	o Southern	Rural	Water w	ithin 28	days	of complet	a of b	ore.	1	F	leport o	nsite 1⊡	2	3	4[5[
Convert Detailed Detailed Detailed Default Bit Month Watter Orr do 2018 Didd Gene Uses Gene Uses Bit Month Watter Orr do 2018 Didd Gene Uses Gene Uses Bit Month Over Text Net Sector No Didd Gene Uses Gene Uses DelLUNG ADV WATER INTERSECTION DETAILS Didd of the drilling, measurements taken from natural aufface. DEFTOCE USE Method From 10 200 Image: Sector Net Text Net Sector Net Net Sector Net Sector Net Net Sector Net Sector N		G	PS CO-C	ORDS:	E	<u>3 3 2</u>	- * *	<u>'</u> N	51714	3 3 1	0 2	Drilled Bo	ore 🖆 Spr	earpoin	t 🗌 Well o	r Shaf	tL	Drag	gline
Bite Addresse 25 POSSUM MEDE RADU, VEODERLE, VEO 2349 (Boundary Creek - Big Swartp). DATE: USES GMA ZONE Bath OT 0.5 2016 0.6 0.0 Depth (m) Vea Boro Docommissionad7 / V I N If Yea, State Method Image: Comparison of Y V I N Image: Comparison of Y V	Bore Owner Barwo	on Wa	DNE: 54 ete as appli ter	/ 50 icable	GDA delete a	94/AD as applica	ble					BORE	NUMBER	OFFICI		<u>y</u> 			
Date 07 05 2010 Open Park Complexity Total GMA ZONE Via Bore Decommissioned? Y/N N If Yes, State Method (m) Mathematical State OFFICE USE DBILLING ATO: WATTER INTERSECTION DETAILS Different Internet INTERSECTION State State Different Internet Inte	Site Address 25 POS	SUM RI	DGE ROA	D, YEODE	ENE, V	IC 3249	(Bound	dary C	reek - Big S	Swamp)		BORE	JSES						
Vas Bore Decommissioned? Y / N N If Yes, State Method . DRULING AND WATTEN INTERSECTION DETAILS Depth at East 25 cl OFFICE USE Method From To Bit dam From To Depth at East 25 cl OFFICE USE Method From To Bit dam From To Depth at East 25 cl Ultrocky Iolion Stem Auger 0 6 200 Intel Method Depth at East 25 cl Ultrocky Iolion Stem Auger 0 6 200 Perfect use Depth at East 25 cl Ultrocky Iolion Stem Auger 0 6 500 600 Cnu wvc 26 32 Cl 8 u/vc 0.3 N Iolion	Date 07 0 Commenced	5 2019	Date Comp	07 Dieted	05	2019	Tota Dep	al oth	6	(I	m)	GMA				ZON	IE		•••••
DelLINA AND WATER INTERSECTION DETAILS OFFICE USE DILLING TCHNINDUE WEEL INTERSECTION DETAILS DETILING TCHNING Desk of a basin a basin from network surface) OFFICE USE Method From from from from from from from from f	Was Bore Decommis	sioned	Y/N	Ν	lf	Yes, Sta	ate Met	thod							2				
DRILLING TECHNIQUE WATER INTERSECTIONS (while diffing, measurements taken from natural surface) OFFICE USE Method From To Batimeric Section Sectin Section Sectin Sectin Section Secti	1. DRILLING AND W	ATER I	NTERSEC	CTION DE	TAILS											Differen			
Initiation Initiat	DRILLING TECHNIC	QUE	То	Dit diam	WAT	ER INT	ERSEC	TION	IS (while d	Irilling,	mea	surements	taken fro	m natur	al surface)	C	DFFIC	CE L	JSE
Indux Stem Auger 0 6 200 Image: Stem Auger 0 1 <t< td=""><td>Metriod</td><td>(m)</td><td>(m)</td><td>(mm)</td><td>(m</td><td>)</td><td>(m)</td><td>Met</td><td>hod Level</td><td>(m)</td><td>l/sec</td><td>down (m</td><td>) test (m)</td><td>test (r</td><td>n) (µS/cm</td><td>1)</td><td>- un</td><td>0106</td><td>Ъ</td></t<>	Metriod	(m)	(m)	(mm)	(m)	(m)	Met	hod Level	(m)	l/sec	down (m) test (m)	test (r	n) (µS/cm	1)	- un	0106	Ъ
CASINGS (CA) SCREENS (SC) SLOTS (SL) OPEN HOLE (OH) GENERAL CASING SCREENS / SLOTS SCREENS / SLOTS grow S.S. OH From (m) Trade flam Outer clam Material Aperus Filer OFFICE USE grow S.S. OH From (m) Trade flam Outer clam Material Aperus Filer Trade flam Uthology grow S.S. OH From (m) Trade flam Outer clam Material Aperus Filer Trade flam Uthology grow S.S. OH From (m) So (So (G) Classing N Ithous	Hollow Stem Auger	0	6	200											1		建設		Super-
L. CASINGS (CA) SCREENS (SC) SLOTS (SL) OPEN HOLE (OH) GENERAL CASING CASING CASING CASING CASING OPFICE USE general (mm) (mm) (mm) Trade Name Fire OPFICE USE general (mm) (mm) (mm) Material Material Material Apartum Fire Fire OPFICE USE Utilioiday general 5 2 26 32 C18 uPVC 0.4 N Image Image<				16-11	111				211										
CASINGS (CA) SCREENS (SC) SLOTS (SL) OPEN HOLE (OH) SCREENS / SLOTS OFFICE USE CASINGS (CA) SCREENS (SC) SLOTS (SL) OPEN HOLE (OH) SCREENS / SLOTS Approximately and the state of	1		1	1						The s								Statute -	
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ype St. ofl Fire Tade Name Lithology	GENERAL			CASING	G				SCREENS	S / SLO	TS						OFFIC	εı	JSE
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Holkow Stam Auger 0 6 200 1 2 2	Method	From (m)	To (m)	Bit dia	n Fr	rom m)	To (m)	Te	st Stat	tic Es	t yield /sec	d Draw	Casing a test (m)	t Depth test (n	at Ec at 25	C	Litho	logy
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INAL BORE DEVELOPMENT Method Yield Draw Pumping Recovery Final Static Ecat 25 C 4and bailing 3 l/min 45 0.75 926 ORILLER'S PUMPING TEST DHILE'S long Method Static Yield Pumping Recovery Ecat 25 C Level (m) Visec Draw Pumping Recovery Ecat 25 C J. DRILLER'S PUMPING TEST D/H 6.1 Siti, sandy, black/brown 0.1 0.5 Automatic Level (m) down (m) Time (min) (u.S/cm) Said (u.S/cm) 0.1 0.5 J. IF NOT A DRILLED BORE Transform To To Clay, sand, prey 2 6 Type Length Width Diam Ining Material From To Clay, sand, Drk grey 4 6 Samples been taken? Yes D No D If Yes From 0. (m) (m) Clay, sand, Drk grey 4 6 Disinfector Chlorine Washed D Stam Cleaned D (m) - - - Mas the Bore Disinfector? Yes D										1		1						
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Aand bailing 3 l/min 45 0.75 926 DRILLER'S PUMPING TEST pH 6.1 Method Static Yield Pumping Draw Pumping Recovery Ec at 25 C I. IF NOT A DRILLED BORE Image: the main of th	Method	Yield Vsec	Dra	w Pur	ping (min)	Recovery Time (min	Fina	al Static	c Ec at 25 (uS/cm	C	N	Material				From	(m)	To (m)
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Method Static Yield Pumping Draw Pumping Recovery Ec at 25 C Sand, clayey with silt, orange/brown grey 0.5 2 A I <td>. DRILLER'S PUMP</td> <td>ING TE</td> <td>ST</td> <td></td> <td>•</td> <td></td> <td></td> <td></td> <td>pH 6.1</td> <td></td> <td></td> <td>Silt, sandy,</td> <td>black/bro</td> <td>own</td> <td></td> <td>0.1</td> <td></td> <td>0.5</td>	. DRILLER'S PUMP	ING TE	ST		•				pH 6.1			Silt, sandy,	black/bro	own		0.1		0.5
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. IF NOT A DRILLED BORE Type Length Width Diam Lining Material From To (m) (m) (m) (m) (m) To (m) . SAMPLES Have material samples been taken? Yes I No I If Yes From .0(m) Have water samples been taken? Yes I No I If Yes From .0(m) Samples taken by: Bore Owner I Driller I Project Geologist I Image: Clay, sand, Drk grey 4 6 . DISINFECTION	20101					1			1 10 20	-	****	Clay, sand	y, grey			2		6
Type Length Width Diam Lining Material From To (m) (m) (m) (m) (m) To . SAMPLES Have material samples been taken? Yes No Have water samples been taken? Yes No If Yes From .0. (m) Have water samples been taken? Yes No . DISINFECTION Was the Bore Disinfected? Yes No Print and Sign	. IF NOT A DRILLEI	DBORE					_			_		Clay, sand	, Drk grev			4		6
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. DISINFECTION Was the Bore Disinfected? Yes □ No ☑ If yes, state method of disinfection: Chlorine Washed □ Steam Cleaned □ Other, please specify: Other, please specify: riller's Name Ben Oughton Driller's Licence No. 1049 riller's Signature Date 05 , 06 Print and Sign	Samples taken by: Bo	re Owne	er 🖸 Dr	iller 🛛 🛛 F	roject	Geologist												
Was the Bore Disinfected? Yes V No V If yes, state method of disinfection: Chlorine Washed C Steam Cleaned C Other, please specify:	DISINFECTION	100.04					3			-					* ₁			
Driller's Name Ben Oughton Driller's Licence No. 1049 Date 05 / 06 / 2019 Date Print and Sign	Was the Bore Disinfed If yes, state method of	ted? disinfec	tion: (Yes L N Chlorine V Other, plea	lo 🖬 Vashec ase spe	I 🗆 Stea	um Clea	aned C	2									
riller's Signature	riller's Name Ben Ou	ughton					Drille	er's Lic	ence No	1049								
lame of Plant Operator	riller's Signature						Date	05	, 06	1 2019								
	lame of Plant Operato	r						Prin	t and S	ian								

				WA	TER A	CT 1	989				LICEN	CE TO CO	NSTRUC	ст г		1.1	-1-	-	BH
Souther	n _{se}	BC W COPY	DRE (CON	IPLE	TIC	N I	REPOR	RT			W	ORKS N	10. L	WILIE	10		<u> 0</u> 1	
Wanaging Water. Serving Commu	ter To	be sent t	o Souther	n Rura	Waterw	vithin 2	8 days	of complet	ion c	of bore.	1	F	Report o	n site	e 1⊻	2	3	4	5
	GI	PS CO-	ORDS:	E[/	13 15 1.	2 9 3	<u> </u>	[3]/]4]	3 8	1012	Drilled B	ore 🖆 Sp	rearpoin	t	Well or	Shaf	tL	Dra	gline
Bore Owner Barw	on Wa	DNE: 54 ete as app ter	/ 30 licable	delete	as applica	ble					BORE	NUMBER	OFFICI						
Site Address 25 POS	SSUM RI	DGE ROA	AD, YEOD	ENE, \	/IC 3249	(Boun	dary C	creek - Big S	wam	np)	BORE	USES							
Date 07 0 Commenced	5 2019 /	Date Com	07 pleted	05	2019	Tot De	al pth …	6		(m)	GMA			••••	•••••	ZON	IE		
Nas Bore Decommis	ssioned?	Y/N		ETAIL	f Yes, Sti S	ate Me	thod				-								
DRILLING TECHNI	QUE	-	1	WA	TER INT	ERSE	CTION	NS (while d	Irillir	ıg, mea	surements	taken fro	m natur	al s	urface)		DFFI	CE I	USE
Method	From (m)	To (m)	Bit dian (mm)	n Fre	om n)	To (m)	Te Met	est Stat hod Level	tic (m)	Est. yie I/sec	ld Draw down (m	Casing a test (m)	test (r	at E	Ec at 25 (µS/cm)	C	Lith	olo	gy
-Iollow Stem Auger	0	6	200										1722						ALC: NO.
																		1.12	
GENERAL	SCREEN	s (SC)	CASIN	G G	PEN HO	LE (O	H)	SCREENS	s/s	LOTS				-		190	OFFIC	EI	USE
ype CA SC SL OH	From (m)	To (m)	Inner di (mm)	am Ou	ıter diam (mm)	Mate	erial	Inner diam (mm)	Out (er diam mm)	Material	Aperture (mm)	Filter Y / N	Tra	de Name	•	Lith	oloç	ЭУ
	6	5	50	_	60	C18 เ	JPVC	26	_	32	C18 uPVC	0.3	N						
	5	2	26	-	32	C18 เ	JPVC	50		60	C18 uPVC	0.4	N	. 5		· 1			
	2	+0.7	50	-	60	C18 เ	JPVC					1		-	_				10
		200		-		-	_					1.21	1						
						1					_								
. CÊMENT (C) BE ^{faterial} C B S P	NTONIT G	E (B) SI From (m)	To Ci (m) (I	PAC ement bags)	KERS (P Water (litres)) GR/	AVEL Seal / F	(G) Packer De	0	Duter dia f seal (m	am 1m)	Artificial Gr Method o	ravel Pac f placem	king ent		G nesh	ravel pass	size	€ (mm)
		6	1.5					01.1				Gra	avity	~	-	1	.2 - 2	2.4	
	님님	1.5	0.8	-	40	Me	aium	Chips	-									_	
	H	0.8	0	4	40			-							-				
		ENT		-	-	0	-	200	-			100			_			_	
Nethod	Yield	Drav		oing	Recover	Fina	al Stati	Ec at 25	C	ĺ	Material	3100				From	n (m)	T	o (m)
land bailing	3 I/min		45		rinne (rinn	0.1	75	926	<i>"</i>		Clay, silty	red/orang	ge			0		0.	1
DRILLER'S PUMP	ING TES	т						pH 4.	01		Silt, sand	/, black/br	own			0.1		0.	5
Method Stati Level	c Yi (m) I/s	eld Pu sec Lev	mping /el (m) do	Draw wn (m	Pumpi Time (n	ng R nin) Ti	ecove me (m	ry Ec at 25 in) (µS/cm))		Sand, clay	ey with silt	, orange/	/brov	vn grey	0.5		2	
											Clay, san	dy, grey				2		6	
IF NOT A DRILLE	BORE	Width	Diam	ining	Matorial		From	То	-		Clay, san	d, Drk grey	y 			4		6	
ype	(m)	(m)	(m)	Junig	viatorial	1	(m)	(m)	4										
SAMDI ES							_		_										
lave material sample	s been ta	aken? Y	es 🛛 N		lf	Yes	From	0 (n 6 (n	n)										
Samples taken by: Bo	re Owne	r 🗋 Dril		roject (Geologist		.0.									••••••			
DISINFECTION				-		19			-	ľ				·					
was the Bore Disinfed f yes, state method of	ted? disinfect	Y tion: C C	hlorine W	ashed se spe	C Stea	am Cle	aned (2											
riller's Name Ben Ou	ighton					Drille	er's Lic	cence No	104	9									
riller's Signature						Date	05	/ 06	1 2	019									
ame of Plant Operato	r						Prin	t and S	ign										

				WAT	ER A	CT 1	989				LICE	ICE TO CO	NSTRU			410	BH
Souther	n _{sr}	BO RW COPY -	REC	OM	PLE	TIO	DN F	REPOF	RT			V	VORKS			410	
Managing Water. Serving Commu	ter To	be sent to	Southern	Rural	Nater w	ithin 2	8 days	of complet		f bore.	1		Report o	on site 1 ⊻	2 3	4	
1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	G	PS CO-O	RDS:	E	3 5 4	<u>5 8 </u> 8	9 N	5/7 4	3 9	01012	Drilled E	Bore 스 Sp	rearpoir	nt 🗌 Well o	r Shaft	Dra	agline
Bore Owner Barw	Zo on Wa	ONE: 54 / lete as applie ter	cable	GDA 9 delete a	94/AD s applica	0466 ble					BORE	NUMBER	OFFIC		<u>Y</u>		
Site Address 25 POS	SSUM R	IDGE ROA	D, YEODI	ENE, V	IC 3249	(Bound	dary C	reek - Big S	Swam	np)	BORE	USES					
Date 07 0 Commenced	5 2019	9 Date Comp	07 leted	05	2019	Tot Dep	al pth	6		(m)	GMA.			 	ZONE		
Was Bore Decommis	ssioned	? Y/N	N	If Y	Yes. Sta	ate Me	thod							2			
1. DRILLING AND W	ATER I	NTERSEC	TION DE	TAILS													
DRILLING TECHNI	QUE	-		WAT	ER INT	ERSE	CTION	IS (while d	rillin	ig, mea	surement	s taken fro	om natu	ral surface)	OF	FICE	USE
Method	From (m)	To (m)	Bit diam (mm)	From (m)	n	To (m)	Tes	st Stat	ic (m)	Est yie l/sec	down (n) Casing a	at Depth	m) (µS/cn	5 C L	itholo	gy
Hollow Stem Auger	0	6	200						. /			1		u u			
		1	200	12-5		-		-			-	-					
				1	-		-					-					
		-	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1					_						1.0		法基金	ALC: N
2. CASINGS (CA) S	SCREEN	is (SC) s	LOTS (SI	L) OP	EN HO	LE (OI	H) T	CODEENIS	10	OTO					OF		LICE
TVDE	From	То	Inner dia	m Oute	er diam	Mate	erial	Inner diam	Out	er diam	Material	Aperture	Filter	Trade Nam		itholo	av
CA SC SL OH	(m)	(m)	(mm)	()	nm)			(mm)	(mm)	materia	(mm)	Y/N				55
	6	5	50		60	C18 u	JPVC	26	3	32	C18 uPVC	0.3	N				
	5	2	26		32	C18 u	JVP	50	6	60	C18 uPVC	0.4	N	de la	· 1 1		
	2	+0.7	50		60	C18 u	JVP				-						
													1			11.1	
					-				15							No a	
					1	-							Cas	lina –	Bullno	se /	
100 x 100 steel n	nonum	ent cove	er								VELL HEA	DELLING	S Sho	eY/N	1dca	pY/	NY
3. CÉMENT (C) BE	NTONIT	E (B) SE	ALS (S)	PACK	ERS (P	GR/	AVEL	(G)								÷	
Material C B S P	G	From (m)	To Cer (m) (ba	ment ags)	Water (litres)	S	eal / P	acker e	of	Duter di	am nm)	Artificial G Method c	ravel Pac	nent	Grav mesh pa	el size ssing	e (mm)
		6 1	.5									Gr	avity		1.2	- 2.	4
		1.5 0	.8		=	Mec	dium	Chips									
	E L	0.8	0	4	40												
	吕는	0.0							-			-					
							-		-	_		125.125					_
Method	Yield	Draw	Pumpi	ing R	ecovery	Fina	al Statio	Ec at 25	C	[9. DRILLE	R'S LOG			From (n	N T	(m)
Line of the Stine of	l/sec	down (r	n) Time (r	nin) Ti	me (min		evel	(μS/cm)		Clay, s	ilty, red/	orange)	0	0	1
Hand bailing	3 i/min	_	45		_	0.1	/5	0H 5 6	1		Silt sa	ndv bla	rk/hro	Nn	01		15
Method Stati		ield Pum	ping D	raw	Pumpi		ecover	y Ec at 25	c		Sond old	vov with oil	bit bit bit	/brown grov	0.1		
Level	(m) 1/s	sec Leve	el (m) dov	vn (m)	Time (n	nin) Tir	me (mi	n) (µS/cm)				, orange	biowingley	0.5		
						-	_	-			Clay, s	andy, gr	ey		2	6	
6. IF NOT A DRILLE	BORE		iom I I	ning M	atorial		rom	1 70	-		Clay, s	and, Drk	grey		4	6	j
ishe	(m)	(m)	(m)	ning wi	aterial		(m)	(m)	_								
	1				_												
7. SAMPLES									_	i							
Have material sample Have water samples t	s been ta been take	aken? Ye en? Ye	es ☑ No es ☑ No		lf	Yes	From To	0(n 6(n	1) 1)								
Samples taken by: Bo	re Owne	r 🛛 Drille	er 🛛 Pro	oject Ge	eologist												
B. DISINFECTION	1.15				_	3			-	Î				· .			
Was the Bore Disinfed	ted?	tion: Ch		ehod C) Stor	m Clev	anod	1									
in yes, state method of	alainiec	Ot	her, please	e speci	fy:			-		ŀ							
Driller's Name Ben Ou	ighton					Drille	er's Lic	ence No1	049	9							
Driller's Signature						Date	05	/ 06	1 20	019							
Name of Plant Operato	r						Prin	t and S	Sia	n							
									3							1	

				WAT	ER A	CT 1	989				LICE	ICE TO CO	NSTRU			410	BH
Souther	n _{sr}	BO RW COPY -	REC	OM	PLE	TIO	DN F	REPOF	RT			V	ORKS N	10. [W] L]			
Managing Water. Serving Commun	ter to nities.	be sent to	Southern	Rural	Nater w	ithin 2	8 days	of complet		f bore.	1		Report o	n site 1 ⊻	2 3	4	
	G	PS CO-O	RDS:	E	3 5 2	51818	9 N	5/74	3 9	002	Drilled E	Bore 스 Sp	rearpoir	nt 🗌 Well o	r Shaft	Dra	gline
Bore Owner Barw	Z0 ₀n On Wa	ONE: 54 / lete as appli ter	b6 cable	GDA s delete a	94/AD s applica	066 ble					BORE	NUMBER	OFFIC		Y		
Site Address 25 POS	SSUM R	IDGE ROA	D, YEODI	ENE, V	IC 3249	(Boun	dary C	reek - Big S	Swan	np)	BORE	USES					
Date 07 0 Commenced	95 2019 /	9 Date Comp	07 leted	05	2019	Tot Dep	al pth	6		(m)	GMA.			 	ZONE		
Was Bore Decommis	ssioned	? Y/N	Ν	lf '	Yes. Sta	ate Me	thod							2			
1. DRILLING AND W	VATER I	NTERSEC	TION DE	TAILS													
DRILLING TECHNI	QUE	-		WAT	ER INT	ERSE	CTION	IS (while d	Irillin	ig, mea	surement	s taken fro	m natu	ral surface)	OF	FICE	USE
Method	From (m)	To (m)	Bit diam (mm)	Fror (m)	n	To (m)	Te: Meth	st Stat	ic (m)	Est yie l/sec	down (n) Casing a	test (m) (µS/cn	5 C L	itholo	gy
Hollow Stem Auger	0	6	200			<u>, ,</u>							1				
		1	2	12-5		-		-			-	-	-				
				1	-	-	-					-					
		-	100 A 17 18					_						-		· · · · ·	
2. CASINGS (CA) S	SCREEN	IS (SC) S	LOTS (S	L) OP	EN HO	LE (OI	H)	0005510		0.000							
GENERAL	From	То	CASING	n Oute	er diam	Mate	erial	SCREENS	Out	LOIS er diam	Material	Aperture	Filter	Trade Nam	OF	ICE U	
CA SC SL OH	(m)	(m)	(mm)	(nm)	Ivitate	and a	(mm)	(mm)	wateria	(mm)	Y/N	Trade Nan			37
	6	5	50		60	C18 เ	JPVC	26		32	C18 uPVC	0.3	N				
	5	2	26	1	32	C18 เ	JVQ	50	6	60	C18 uPVC	0.4	N	A	$-i^{2}$		
	2	+0.7	50		60	C18 เ	JPVC										
			1										1000		194		
				1	-				15			1				10	
	-			-	-	-							Cas	ing	Bulloo	SP /	
100 x 100 steel n	nonum	ent cove	er		•					-	VELL HEA	D FITTING	S Sho	eY/N	ndca	pY/	NY
3. CEMENT (C) BE	NTONIT	E (B) SE	ALS (S)	PACK	ERS (P	GR/	AVEL	(G)			- A						
Material	G	From	To Cer	ment	Water	S	eal / P	acker	C	Duter di	am am)	Artificial G	ravel Pac	cking	Grav	el size	e (mm)
		6 1	5	agoj	(111 03)		typ	6	0	i seai (ii		Gr	avity		1 2	- 2	4
	H	15 0	.0	-	-	Mod	lium	Chine					avity		1.2		-
	님는	1.5 0	0	1	40	IVIEC	Jum	Chips	-						_		
		0.8		4	40	-				•		-					
				-		0											
4. FINAL BORE DEV	ELOPM	Draw	Pumpi		ecoven	Fina	al Statio	Ec at 25	C	ſ	9. DRILLE	R'S LOG			1	1 -	
incurca	l/sec	down (r	n) Time (r	nin) Ti	me (min) L	evel	(μS/cm	1)		Clove	ilty rod/	orongo		From (n		o (m) 1
Hand bailing	3 l/min		45	_		0.7	75	926						, 		0.	. I.
5. DRILLER'S PUMP	ING TES	ST Pur	ping D	raw	Pumpi		ecover	PFC at 25	C		Siit, Sa	nuy, bia	SK/DIO	/VII		0	.5
Level	(m) 1/s	sec Leve	el (m) dov	vn (m)	Time (m	nin) Ti	me (mi	n) (µS/cm))		Sand, cla	yey with sil	, orange	/brown grey	0.5	2	
											Clay, s	andy, gr	ey		2	6	
6. IF NOT A DRILLED	BORE					-		1	_		Clay, s	and, Drk	grey		4	6	
Туре	Length (m)	Width D (m)	iam Li m)	ning M	aterial	F	From (m)	To (m)		İ							
		1				1				ŀ							
7. SAMPLES						1		-	_								
Have material sample	s been ta	aken? Ye	s 🗹 No	۵	lf	Yes	From	0(m	n)								
Have water samples b	been take	en? Ye	s 🖸 No				To.	.o(n	n)								
Samples taken by: Bo B. DISINFECTION	re Owne	r 🖬 Drille	er 🖬 Pro	oject Ge	eologist	<u>د</u>			_								
Was the Bore Disinfect	cted?	Ye	s 🛛 No				-										
If yes, state method of	disinfec	tion: Ch	lorine Wa	shed C	Stea	m Cle	aned C	ב									
		Ot	her, pleas	e speci	fy:												
Driller's Name Ben Ou	ighton					Drille	er's Lic	ence No1	049	9							
Driller's Signature						Date	05		120								
Name of Plant Operato	r					1	Prin	t and S	Sig	n i							aanninaaq

6		B	ORF	W			989 N F		ЭТ		LICENC	E TO CO	NSTRUC		E 0	7 4	0 9
Souther Rural Wa	n si ter te	RW COPY	to Southe	m Rura	al Water w	vithin 28	3 days	of complet	ion of l	bore.		F	leport o	n site 1	2	3	4 🗌 5
Managing Water. Serving Commu	nities. G	PS CO-	ORDS:	E 7	3 5 2	2 9 9	N	5 7 4	3 9	0 2	Drilled Bo		earpoin	t Well o	or Shaft		Dragline
	Z	ONE: 54	1/55	GD/	A 94/AD	066							OFFIC	E USE ON	LY		
Bore Owner Barw	on Wa	iter		ucieu							BOREN	IUMBER					
Site Address 25 POS	SSUM R	IDGE RO	AD, YEOI	DENE,	VIC 3249	(Bound	dary C	reek - Big S	wamp))	BORE L	ISES					
Date 07 0 Commenced	5 201	9 Date Com	0 Ipleted	7 05	2019	Tota Dep	al oth	6		(m)	GMA				Z ON	E	
Was Bore Decommis	ssioned	? Y/N	N		lf Yes, Sta	ate Me	thod										
DRILLING AND W	ATER	NTERSE	ECTION D	ETAIL	S	EDGE	TION	C (utbile d	rilling	-	ouromonto	takan fra	m natur		1986	DEEIC	EURE
Method	From	То	Bit dia	n Fr	om	To	Te	st Stat	ic E	st yiel	d Draw	Casing a	t Depth	at Ec at 2	5 C	Lithe	blogy
	(m)	(m)	(mm)	(m)	(m)	Meth	nod Level	(m)	l/sec	down (m)	test (m)	test (r	n) (µS/cı	<u>n)</u>		
Hollow Stem Auger	0	0	200			-			-		-	-	-	-			
		-		-			-	-	-								
			01.070					_	-				1		翻		ALL ALL
GENERAL	SCREEP	is (SC)	CASIN	SL) (DPEN HO	LE (OF	1) 	SCREENS	:/SI	OTS					6	FEIC	FUSE
ype CA SC SL OH	From (m)	To (m)	Inner c	iam O	uter diam (mm)	Mate	rial	Inner diam (mm)	Outer (m	diam m)	Material	Aperture (mm)	Filter Y / N	Trade Nar	ne	Litho	logy
	6	5	50		60	C18 u	PVC	26	32	2	C18 uPVC	0.3	N				
	5	2	26		32	C18 u	PVC	50	60	C	C18 uPVC	0.4	Ν	1.	- x <u>t</u>		
	2	+0.7	50		60	C18 u	PVC		1						Contraction of the		
												1. 21			100		
			Jan			1.			1								
100 x 100 steel m		ont on				-				W	ELL HEAD	FITTINGS	Casi	ing [Bull	nose	
Aterial C B S P	G	E (B) S From (m)	To ((m)	PAC ement bags)	KERS (P Water (litres)) GR/	eal / F	(G) Packer e	Ou of s	iter dia seal (m	m A m)	Artificial Gr Method of	avel Pac f placem	king ent	Gr mesh	ravel s passir	iize 1g (mm)
		6	1.5									Gra	avity		1.	2 - 2	4
		1.5	0.8			Mee	dium	Chips									
		0.8	0	4	40							_					
											- A						
FINAL BORE DEV	ELOPM	ENT		ning	Baaayan	. L Fino	Ctati	En at 25		9	DRILLER'	S LOG			-		
vietriou	l/sec	down	(m) Time	(min)	Time (mir) L	evel	(μS/cm))	4	Material				From	(m)	To (m)
Hand bailing	3 l/min		45		102	0.7	75	926			Clay, slity,	red/orang	e		0		0.1
DRILLER'S PUMP	ING TE	ST	mping	Draw	Pumpi		ecover	pH 6.2	C		Silt, sandy	, black/bro	own		0.1		0.5
Level	(m) 1/	sec Le	evel (m) d	own (m) Time (n	nin) Tir	ne (mi	n) (µS/cm)		Sand, claye	ey with silt,	orange	brown grey	/ 0.5		2
							_	-			Clay, sand	y, grey			2		6
IF NOT A DRILLE	BORE	Width	Diam	Lining	Matorial	F	rom	То	1		Clay, sand	, Drk grey	/ 		4		6
Type	(m)	(m)	(m)	Lining	Wateria		(m)	(m)	_								
	1				_			1									
SAMPLES					14	Van	France	0 4									
⊓ave material sample Have water samples t	s been t been tak	aken? en?	res⊎l N Yes⊡l N		п	res	To.		n)								
Samples taken by: Bo	re Owne	er 🖸 Dr	iller 🛛 🛛 F	roject	Geologist												
B DISINFECTION	tod?				_	3		-						1			
If yes, state method of	disinfec	tion: C	Chlorine V Other, plea	lashec ise spe	I 🗋 Stea	am Clea	aned C	כ									
riller's Name Ben Ou	ighton					Drille	r's Lic	ence No	049								
riller's Signature						Date	05	/ 06	/ 201	9							
lame of Plant Operato	r						Prin	t and S	ign								

6		BC		WA	TER A		989 N I		ЭТ		LICENC	E TO CO	NSTRU		E 0	7 4	0	BH 9 7
Souther Bural Wat	n se	W COPY	- o Souther	n Rural	Water w	/ithin 28	davs	of complet	ion of be	ore.		F	leport o	n site 1	2	3	4]5
Managing Water. Serving Commun	nities. Gl	PS CO-0	ORDS:	E 7	3 5 2	2 9 9	N	5 7 4	3 9 0	2	Drilled Bo	re Sn	earnoin		or Sha	нП	Dra	aline
	Z	DNE: 54	/ 55	GDA	94/AD	066					Brilled Be		OFFIC		LY	North North		
Bore Owner Barw	on Wa	ete as appl ter	licable	delete	as applica	ble					BORE	IUMBER						
Site Address 25 POS	SUM RI	DGE ROA	AD, YEOD	ENE, V	IC 3249	(Bound	lary C	reek - Big S	wamp)		BOREL	ISES						
Date 07 0 Commenced	5 2019	Date Com	07 pleted	05	2019	Tota Dep	al oth	6	(r	n)	GMA				zor	٩Ε		
Was Bore Decommis	ssioned	Y/N	N	lf	Yes, Sta	ate Met	thod							2				
1. DRILLING AND W	ATER I	NTERSE	CTION D	ETAILS	3													
DRILLING TECHNI	QUE	To	Dit diam	WAT	TER INT	ERSEC	NOIT	IS (while d	in Fa	meas	surements	taken fro	m natur	al surface		OFFIC	CE L	JSE
Mediod	(m)	(m)	(mm)	(m	v)	(m)	Met	hod Level	(m) L	/sec	down (m)	test (m)	test (r	n) (µS/cr	n)	ш	UIUE	IY
Hollow Stem Auger	0	6	200			1	1									設定は		
																	AND S	
	1		1	11.2					i in (ii					1			10 10 10 10 10 10 10 10 10 10 10 10 10 1	
2. CASINGS (CA) S	CREEN	S (SC)	SLOTS (S	SL) OI	PEN HO	LE (OH	ł)	0.000										
GENERAL		1	CASIN	G				SCREENS	S / SLO	TS				Laure and		OFFIC	EL	ISE
CA SC SL OH	From (m)	To (m)	Inner di (mm)	amOu	ter diam (mm)	Mate	rial	Inner diam (mm)	Outer c (mm	liam)	Material	Aperture (mm)	Filter Y / N	Trade Nar	ne	Lith	olog	Ŋ
	6	5	50		60	C18 ul	PVC	26	32	0	C18 uPVC	0.3	Ν	<u></u>				0.5
	5	2	26		32	C18 ul	PVC	50	60	0	C18 uPVC	0.4	Ν	1.	. 1	t		
	2	+0.7	50		60	C18 ul	PVC											
										-		-			-	1.1		
	-			1	-				1	-					- 2			
			1	_		-	-		4	-	an atrati		Cas	ing	Bui	Inoso	1	
B. CÉMENT (C) BE Material C B S P Image: Comparison of the second s	G I	E (B) SE From (m) 6	To Ce (m) (th) 1.5 (th)	PACK ement bags)	KERS (P Water (litres)) GRA Se	al / F	(G) Packer De	Oute of se	er dia al (mi	m / m)	Artificial Gr Method o Gra	avel Pac f placem avity	king ent	G mesh 1	ravel passi .2 -	size ing (i 2.4	mm)
		1.5	0.8			Med	dium	Chips										
		0.8	0	4	40													
									0		1							
. FINAL BORE DEV	ELOPM	ENT							_	9	DRILLER'	SLOG						
Method	Yield I/sec	Drav down (m) Time	oing F (min) T	Recovery Time (min	/ Final	l Stati evel	c Ec at 25 (µS/cm	C	1	Material	_			From	n (m)	Тс) (m)
Hand bailing	3 l/min		45		02	0.7	5	926			Clay, silty,	red/orang	e		0		0.1	
DRILLER'S PUMP	ING TES	ат						pH 3.5	3		Silt, sandy	, black/bro	own		0.1		0.5	5
Method Stati	c Yi (m) I/s	eld Pui sec Lev	mping [/el (m) do	Draw wn (m)	Pumpi Time (n	ng Re nin) Tin	ecove ne (mi	ry Ec at 25 in) (μS/cm	C		Sand, claye	ey with silt,	orange	/brown grey	0.5		2	
											Clay, sand	y, grey			2		6	
. IF NOT A DRILLED	BORE										Clay, sand	, Drk grey	/		4		6	
Туре	Length	Width I	Diam L (m)	lining N	Aaterial	Fi	rom (m)	To (m)										
					_													
. SAMPLES																		
Have material sample Have water samples b	s been ta been take	aken? Y en? Y	es ☑ No es ☑ No		lf	Yes I	From To	0(n (n	n) n)									
Samples taken by: Bo	re Owne	r 🖬 Dril	ler 🖵 Pr	oject G	ieologist			-	_									
Was the Bore Disinfec	ted?	Y	es 🖬 No					-										
If yes, state method of	disinfec	tion: C O	hlorine W	ashed se spec	Stea	am Clea	aned (ב										
oriller's Name Ben Ou	ighton					Drille	r's Lic	ence No	049						-			
riller's Signature						Date	05	/ 06	1 2019									
lame of Plant Operato	r					- I	Prin	t and S	ign									

-		-		WA	TER A	CT 1	989		-		LICE	NCE TO C	ONSTRU	JCT		1017	4	BH9
Souther	n _{sr}	W COPY -	REC		IPLE	: HC	NN F	EPOP	41				WORKS	No.				
Managing Water. Serving Commun	Ter To	be sent to	Southen	Rural	Water w	ithin 2	8 days	of complet	ion o	f bore.	1		нероп	on s	nte IU J	2Ц3 г	Ц" Г	ᆡᅂ니ᅧ
	GI		RDS:	EL	04/00				010	1012	Drilled	Bore ഥ S	prearpo	int	Well or	Shaft		ragline
Bore Owner Barw	on Wa	DNE: 54 / ete as applie ter	cable	delete a	94/AD as applica	ble					BOR	NUMBE	OFFI R					
Site Address 25 POS	SSUM RI	DGE ROA	D, YEOD	ENE, \	/IC 3249	(Boun	dary Cr	reek - Big S	Swan	np)	BOR	USES						
Date 07 0 Commenced	5 2019	Date Comp	07 leted	05	2019	Tot Dej	tal pth	6		(m)	GMA					ZONE		
Was Bore Decommis	ssioned?	Y/N	N	lf	Yes, Sta	ate Me	thod								2			
1. DRILLING AND W	ATER I	NTERSEC	TION DE	TAILS														
DRILLING TECHNI	QUE	To	Dit diam	WAT	TER INT	ERSE	CTION	S (while d	rillin	ig, mea	suremen	s taken f	rom nat	ural	surface)	OF	FICE	USE
Method	(m)	(m)	(mm)	(m	m)	(m)	Meth	od Level	ic (m)	I/sec	down (m) test (i	n) test	(m)	ec at 25 (μS/cm)			ogy
Hollow Stem Auger	0	6	200															
			16-1	110						3		1						
1			1							1					1			
2. CASINGS (CA)	CREEN	S (SC) S	LOTS (S	L) OF	PEN HO	LE (O	H)					-				N217		
GENERAL			CASING	a _				SCREENS	5/S	LOTS						OF	FICE	USE
Type CA SC SL OH	From (m)	To (m)	Inner dia (mm)	am Out	ter diam (mm)	Mate	erial	Inner diam (mm)	Out (er diam mm)	Material	Apertur (mm)	e Filter		ade Name	e L	ithol	ogy
	6	5	50		60	C18 เ	JPVC	26		32	C18 uPV	0.3	N	1				
	5	2	26		32	C18 u	JPVC	50	(60	C18 uPV	0.4	N		5			
	2	+0.7	50	-	60	C18 เ	JPVC					1	1	1				
	-			-			-				1		1	+	_			
	-		-	-					1	-			-	-			124-13 1373 2	201 (22) 201 (23)
	-			_		-	-		1		13.000					Dullas		
100 x 100 steel n	nonum	ent cove	er								NELL HEA	D FITTIN	GS Sh	ioe \	(/N	ndca	p Y	/NY
3. CÉMENT (C) BE	NTONIT	E (B) SE	ALS (S)	PACK	ERS (P	GR	AVEL (G)										
Material C B S P	G	From (m)	To Ce m) (b	ment	Water (litres)	S	Seal / Pa	acker	0	Duter dia f seal (n	am nm)	Artificial Method	Gravel Pa	nckin	g	Grav	el siz	ze a (mm)
nnnn		6 1	.5		(500			ood (i		G	ravity			1.2	- 2	.4
	급는	15 0	8		=	Med	dium	Chips						-	-	-		
	H		0	1	40	Wiet		Unpu	-									
	HP	5.0		-	-0				-		-	-						
			_	_			_		-					_			_	
Method	Yield	Draw	Pump	ing F	Recovery	Fina	al Static	Ec at 25	C	ſ	9. DRILLE Material	R'S LOG				From (r	n)	To (m)
Hand bailing	I/sec	down (r	n) Time (min) T	ime (mir			(μS/cm)		Clav, s	iltv. red	/orang	е		0	().1
			45		-	0.	/5	0H38	_		Silt sa	ndv bla	ack/bro	wn		01		0.5
Method Stati	c Yi	eld Purr	ping E	Iraw	Pumpi	ng R	ecover	y Ec at 25	С		Sand cla	vev with s	ilt orang	e/brc	wn arev	0.5		2
Level	(m) 1/s	sec Leve	el (m) do	wn (m)	Time (n	nin) Ti	me (mir	n) (µS/cm)			andu c			win grey	0.0		£
			_			-	-		_		Clay, s	anuy, g				2		2
Type	Length	Width D	iam L	ining N	laterial	F	From	То	٦		Ciay, s	anu, D	k grey			4		C
	(m)	(m) (m)				(m)	(m)	-									
					_			1										
7. SAMPLES	e boon tr	kon? Vo			lf	Yes	From	0 (m	1									
Have water samples t	been take	en? Ye				,	To	6(n	1)									
Samples taken by: Bo	re Owne	r 🖸 Drille	er 🛛 Pr	oject G	ieologist													
8. DISINFECTION	tod ⁰		. D. N-			3			7					,	•			
If yes, state method of	disinfect	tion: Ch	lorine Wa	ashed [Stea	m Cle	aned 🗆	1		ľ								
		Ot	her, pleas	e spec	ify:					ł								
Driller's Name Ben Ou	ighton					Drille	er's Lice	ence No. 1	049	9							-	
Driller's Signature						Date	, 05	/ 06	120	019								
Name of Plant Operato	r						Prin	t and S	Sig	n i							na ain.	

Method Provide Model Second and a series is a solution. Method with a series is a solution. Provide it is a series is a solution. Density of the series is a solution. <thdensity a="" is="" of="" series="" solution.<="" solutis="" th="" the=""> <</thdensity>	Souther	n _{si}	BO BW COPY -	REC	WATE OMP	R AC	Г 1989 Ю О	REPOI	RT		LICENC	E TO CO W	NSTRUO ORKS N		E 0 7	4	BH10
CONS CAL	Managing Water. Serving Commun	ter To	be sent to	Southern	Rural Wa	ter with	in 28 day	s of complet	tion of bo	ore.		F	leport o	nsite 1 ⊻	2	3	4 🗌 5
Construction Construction<		G	PS CO-C	RDS:			9 9 1 9 N		21210	<u></u>	Drilled Bo	ore 🖆 Spr	earpoin	t 🗌 Well o	r Shaft		ragline
Site Address 2P POSSUM RDGE ROAD. YEODENE, VE 3240(Boundary Creak - Big Swamy) Date Office 2019 Display of 100 Display of 100 <td>Bore Owner Barw</td> <td>کر on Wa</td> <td>ONE: 54 . lete as appli ter</td> <td>cable d</td> <td>GDA 94 lelete as aj</td> <td>/ADO</td> <td>56</td> <td></td> <td></td> <td></td> <td>BOREN</td> <td>IUMBER</td> <td>OFFIC</td> <td>E USE ONL</td> <td><u>.</u> </td> <td></td> <td></td>	Bore Owner Barw	کر on Wa	ONE: 54 . lete as appli ter	cable d	GDA 94 lelete as aj	/ADO	56				BOREN	IUMBER	OFFIC	E USE ONL	<u>.</u> 		
Date Of 52 Zord Total Ome Commanced / / N N If Yes, State Method (m) CMA Zorder Zorder <td< td=""><td>Site Address 25 POS</td><td>SSUM R</td><td>IDGE ROA</td><td>D, YEODE</td><td>NE, VIC</td><td>3249(B</td><td>oundary</td><td>Creek - Big S</td><td>Swamp)</td><td></td><td>BOREL</td><td>ISES</td><td></td><td></td><td></td><td></td><td></td></td<>	Site Address 25 POS	SSUM R	IDGE ROA	D, YEODE	NE, VIC	3249(B	oundary	Creek - Big S	Swamp)		BOREL	ISES					
Commenced Completed Form No If Yes, State Method Meas Bore Decommissioned? V/N N If Yes, State Method OPFICE USE DRILLING ADD VATER INTERSECTIONS OPERALS Data Internet Method OPFICE USE OPFICE USE DMILING TECHNIQUE WATER INTERSECTIONS (while drilling, Level (m) East (m) Ea	Date 07 0	5 201	9 Date	07	05 20	19	Total	6			GMA					<u>.</u>	
Web Exp Decommissioned? Y / N N If Yes State Method t. DRLING RAW WATER INTERSECTION DETAILS WATER INTERSECTION DETAILS OFFICE LISE Method From To Bit dam From To OFFICE LISE Method From To Bit dam From To OFFICE LISE Method From To Bit dam From To OFFICE LISE Method From To Bit dam From To OFFICE LISE Method From To Bit dam From To OFFICE LISE Link Concerns Scotesns / stores Scotesns / stores OFFICE LISE Utriology Vir To From To Scotesns / stores OFFICE LISE Vir Scotesns / stores Scotesns / stores OFFICE LISE Utriology Vir Scotesns / stores Scotesns / stores OFFICE LISE Utriology Vir Scotesns / stores Scotesns / stores Scotesns / stores OFFICE LISE <t< th=""><th>Commenced ////</th><th></th><th>Comp</th><th>leted</th><th>/</th><th></th><th>Depth</th><th></th><th> (n</th><th>n)</th><th>GWA</th><th></th><th>NGLS UND</th><th></th><th></th><th></th><th></th></t<>	Commenced ////		Comp	leted	/		Depth		(n	n)	GWA		NGLS UND				
DRILLING AND WATER INTERSECTIONS (Sub Park INTERSECTIONS (while drilling, measurements taken from natural surface). OPFICE USE DRILLING TECHNORUE WATER INTERSECTIONS (while drilling, measurements taken from natural surface). OPFICE USE Method From To Bit diam To Diam	Was Bore Decommis	ssioned	? Y/N	N	If Ye	s, State	Method	· ·····									
DRILLING TECHNIQUE WATER INTERSECTIONS (while dilling, measurements taken from structure) OFFICE USE Method (m) (1. DRILLING AND W	ATER I	NTERSEC	TION DE	TAILS										124-22	23.7-10	New York
Initial of the set of	DRILLING TECHNI	QUE	То	Dit diam	WATER	INTER	SECTIO	NS (while c	Irilling,	meas	surements	taken fro	m natu	al surface)	0	FFIC	EUSE
Hollow Stem Auger 0 6 200 1	Mediod	(m)	(m)	(mm)	(m)	(m) Me	thod Level	(m) L	/sec	down (m)	test (m)	test (n) (µS/cm	<u>n)</u>	Luic	logy
Law of the Born Derived Control Scheener Contro Scheener Control Sch	Hollow Stem Auger	0	6	200										1	ALC: N		
Acting (CA) SCREENS (SC) SCREENS / SLOTS CASIMG GENERAL CASIMG CASIMG SCREENS / SLOTS OFFICE USE GENERAL CASIMG CASIMG SCREENS / SLOTS OFFICE USE GENERAL Fmin Image data Image data Material Image data Material Image data Material Image data Material Material Material Material Material Image data Image data<						1								1			
2. ASINGS (CA) SCREENS (SC) SLOTS (SL) OPEN HOLE (OH) CASING SCREENS / SLOTS GENERAL CASING SCREENS / SLOTS CA From Tomer diam Outer diam Material Inner diam Outer diam Material Aperture VI Inter diam Outer diam Material Aperture VI Inter diam Outer diam Material Inner diam Outer diam Material Aperture VI Inter diam Outer diam Material Inner diam Outer diam Material Aperture VI Inter diam Outer diam Material Inner diam Outer diam Material Aperture VI Inter diam Outer diam Material Inner diam Outer diam Inner diam Inne					121				111								
GENERAL (1) CASING SCREENS / SLOTS OFFICE USE (mm)	2. CASINGS (CA)	CREEN	IS (SC) S	LOTS (SL	OPEN	HOLE	(OH)					1			SE17	Sectores.	in the second
Type Bit Material International (mm) Material International (mm) Material M	GENERAL			CASING	<u>,</u>		(9.9	SCREENS	S / SLO	TS					0	FFIC	EUSE
Image: Construction Image: Construction <thimage: construction<="" th=""> Image: Construction</thimage:>	Type CA SC SI OH	From (m)	To	Inner diar	n Outer o	diam N	Material	Inner diam	Outer c	diam	Material	Aperture	Filter	Trade Nam	10	Litho	logy
Image: Section of the section of th		6	5	50	60) (18 uPVC	26	32	,	C18 uPVC	0.3	N	0			
Image: State Stat		5	2	26	30		18 uPVC	50	60		C18 uPVC	0.4	N	A.			
Image: State state samples been taken? Yes No No <t< td=""><td></td><td>2</td><td>+0.7</td><td>50</td><td>60</td><td></td><td></td><td>00</td><td>00</td><td></td><td></td><td>0.4</td><td>14</td><td></td><td></td><td></td><td></td></t<>		2	+0.7	50	60			00	00			0.4	14				
Image: State of the state		2	+0.7	- 50					-	-							
Image: state of the state		1	-		1			·		-			_		_		
WELL HEAD FITTINGS Calering Shoe Y/N Infulliose / / N													-				
Image: Signature 1.5 0.8 0 4 40 Image: Signature Image	Aaterial	G	From (m) 6 1	To Cer (m) (ba	nent Wa lgs) (liti	s (P) ater res)	Seal / ty	Packer pe	Oute of se	er dia al (m	m / m)	Artificial Gr Method of Gra	avel Pac f placem avity	king ent	Gra mesh p 1.2	avel s assin 2 - 2	ize g (mm) 2.4
Image: second			1.5 ().8		IN	lediun	n Chips		_	_						
A. FINAL BORE DEVELOPMENT Method Vield Draw Pumping Recovery Final Static E at 25 C (u.\$/cm) Hand bailing 3 l/min 45 0.75 926 DRILLER'S PUMPING TEST pH 5.2 Method Static Yield Pumping Prow (m) Time (min) Time (min) Method Static Yield Pumping Prow (m) Time (min) Galaxies Method Static Yield Pumping Recovery Ec at 25 C Clay, saity, red/orange 0 0.1 Method Static Yield Pumping Recovery Ec at 25 C Clay, saidy, black/brown 0.1 0.5 Method Level (m) Mom (m) Time (min) fme (min) fme (min) fme (min) 0.5 2 Clay, saidy, grey 2 6 Clay, sandy, grey 2 6 Samples taken by: Bore Owner Driller Project Geologist 2			0.8	0 4	1 4	0				•		_					
A. FINAL BORE DEVELOPMENT Method Yield Used down (m) Pumping Time (min) Recovery Time (min) Final Static Level (u,S/cm) Dext (u,S/cm) Material Material From (m) To (m) A. DRILLER'S PUMPING TEST pH 5.2 Method Static Level (m) Yield Usec Pumping Level (m) Recovery films (min) Eat 25 C (u,S/cm) Material From (m) To (m) Method Static Level (m) Yield Level (m) Draw down (m) Pumping Time (min) Recovery (u,S/cm) Eat 25 C Sand, clayey with silt, orange/brown grey 0.5 2 Method Langth Width Diam Lining Material From (m) To (m) To (m) Clay, sandy, grey 2 6 SAMPLES Samples been taken? Yes (Do (D) If Yes From (D) (m) (m) (m) (m) Samples taken by: Bore Owner (D) Driller (D) Project Geologist (D) Driller's Leonce No. 1049 Other, please specify Diate Office (20) Oil Final And Sign Have of Plant Operator Print and Sign Driller's Leonce No. 1049 Diate Distrop (20) Diate Distrop											- () A						
Waterial Yield down (m) Time (min) Time (min)<	. FINAL BORE DEV	ELOPM	ENT	Dumpi	Da Doo		Final Sta	tio Eo at 25		9	DRILLER'	S LOG			-	-	
Hand bailing 3 I/min 45 0.75 926 DRILLER'S PUMPING TEST pH 5.2 Method Static Yield Pumping Draw Pumping Recovery Ec at 25 C Level (m) I/sec Level (m) down (m) Time (min) (u.S/cm) 0.1 0.5 . IF NOT A DRILLED BORE Time (min) Time (min) Time (min) (u.S/cm) 0.1 0.5 . IF NOT A DRILLED BORE Time (min) Time (min) To Clay, sandy, black/brown grey 0.5 2 . Length Width Diam Lining Material From To Clay, sandy, grey 2 6 . SAMPLES Have material samples been taken? Yes O No O If Yes From O DISINFECTION Was the Boro Disinfected? Yes O No O Driller's Licence No. 1049 	Wethod	l/sec	down (r	n) Time (n	nin) Time	(min)	Level	μS/cm	1)	1	Material				From	<u>(m)</u>	To (m)
DRILLER'S PUMPING TEST pH 5.2 Method Static Yield Pumping Draw Pumping Recovery Ec at 25 C Method Level (m) U/sec Level (m) down (m) Time (min) (µ/s/cm) Stift, Sandy, Diack/Drown 0.1 0.5 2 Level (m) U/sec Level (m) down (m) Time (min) (µ/s/cm) Clay, sandy, Diack/Drown 0.5 2 Linon A DRILLED BORE Ining Material From To Clay, sandy, Drk grey 2 6 SMPLES Ining Material From .0 (m) (m) m 1	Hand bailing	3 l/min		45	2110		0.75	926			Clay, slit	y, rea/o	range		0		0.1
Interviewer (m) Draw (m) Time (min) Time (min) Ear 20 C Image: Interviewer (m) Interviewer (m) Image: Int	. DRILLER'S PUMP	ING TES	ST Due	ning D		mping	Baaaw	pH 5.2			Silt, san	dy, blac	K/Drov	vn	0.1		0.5
A. FROT A DRILLED BORE Type Length Width Diam Lining Material From To Type Length Width Diam Lining Material From To . SAMPLES Have material samples been taken? Yes Q No Q If Yes From .0 (m) Have water samples been taken? Yes Q No Q To .6 (m) Samples taken by: Bore Owner D Driller D Project Geologist Q Image: Clay, sandy, grey 2 6 JSINFECTION Was the Bore Disinfected? Yes Q No Q To .6 (m) Yes, state method of disinfection: Chlorine Washed Q Steam Cleaned Q Image: Clay, sandy, grey 2 6 Iller's Name Ben Oughton Driller's Licence No. 1049 Image: Clay of the cl	Level	c Y (m) I/:	sec Lev	el (m) dow	n (m) Tin	ne (min)	Time (n	nin) (µS/cm	1)		Sand, claye	ey with silt,	orange	/brown grey	0.5		2
A. IF NOT A DRILLED BORE Type Length Width Diam Lining Material From To (m) (m) (m) (m) (m) To . SAMPLES Have material samples been taken? Yes 🖉 No 🗋 If Yes From .0(m) (m) (m) (m) Have water samples been taken? Yes 🖉 No 🗋 To6(m) (m) (m) Samples taken by: Bore Owner 🗋 Driller 📄 Project Geologist 🖾 (m) (m) . DISINFECTION Was the Bore Disinfected? Yes 🗋 No 🖾 (m) Was the Bore Disinfected? Yes 🗋 No 🖄 Driller's Licence No. 1049 (m) riller's Name Ben Oughton Driller's Licence No. 1049 (m) riller's Signature Date 05 , 06 , 2019 (m) ame of Plant Operator Print and Sign (m) (m)											Clay, sa	ndy, gre	∋y		2		6
iype Length Width Diam Lining Material From To (m) (m) (m) (m) (m) SAMPLES Have material samples been taken? Yes I No I If Yes From 0(m) Have water samples been taken? Yes No I If Yes From 0(m) Samples taken by: Bore Owner D Driller Project Geologist I DisinFECTION Was the Bore Disinfected? Yes No I If Yes Claned I Other, please specify:	. IF NOT A DRILLED	BORE					_		-		Clay, sa	nd, Drk	grey		4		6
SAMPLES Have material samples been taken? Yes I No I If Yes From 0(m) Have water samples been taken? Yes No I To6(m) Samples taken by: Bore Owner Driller Project Geologist I DISINFECTION Was the Bore Disinfected? Yes No I Steam Cleaned I Other, please specify: riller's Name Ben Oughton Driller's Licence No. 1049 riller's Signature ame of Plant Operator	Туре	Length (m)	Width D (m))iam Lir (m)	ning Mate	rial	From (m)	To (m)	1								
SAMPLES Have material samples been taken? Yes No If Yes Have water samples been taken? Yes No To6(m) Samples taken by: Bore Owner Driller Project Geologist DisinFECTION Was the Bore Disinfected? Yes No Steam Cleaned Other, please specify: Diller's Name Ben Oughton riller's Signature ame of Plant Operator		1															
Have material samples been taken? Yes No L If Yes From 0 (m) Have water samples been taken? Yes No L To 6 (m) Samples taken by: Bore Owner Diller Project Geologist 2 DISINFECTION Was the Bore Disinfected? Yes No 2 'f yes, state method of disinfection: Chlorine Washed Steam Cleaned C Other, please specify: riller's Name Ben Oughton riller's Signature Date 05 / 06 / 2019 ame of Plant Operator Print and Sign	. SAMPLES														1		
Samples taken by: Bore Owner in Driller in Project Geologist in A. DISINFECTION Was the Bore Disinfected? Yes in No in the Yes in No in the Yes, state method of disinfection: Chlorine Washed in Steam Cleaned in Other, please specify: Tiller's Name Ben Oughton Tiller's Signature Date 05 / 06 / 2019 Tiller's Signature Tiller's Signature Determine Of Plant Operator	Have material sample Have water samples b	s been tak	aken? Ye en? Ye	es ☑ No es ☑ No		lf Ye	es From To) <u> 6 (</u> r	n) n)								
Was the Bore Disinfected? Yes No 2 If yes, state method of disinfection: Chlorine Washed Steam Cleaned C Other, please specify: Driller's Licence No. 1049 riller's Signature Date 05 / 06 / 2019 ame of Plant Operator Print and Sign	B. DISINFECTION	le Owne		er u Pro	Ject Geol	ogist 🗳	4	-	_								
If yes, state method of disinfection: Chlorine Washed Carl Steam Cleaned Carl Other, please specify:	Was the Bore Disinfec	ted?	Ye	s 🛛 No	2												
riller's Name Ben Oughton Driller's Licence No. 1049 riller's Signature Date Doi: 1049 Date	If yes, state method of	disinfec	tion: Ch Ot	nlorine Was her, please	shed 🗅 specify:	Steam	Cleaned	0									
riller's Signature Date D5 06 2019 ame of Plant Operator Print and Sign	Driller's Name Ben Ou	ighton		, p		r	Driller's Li	cence No.	1049								
ame of Plant Operator	Driller's Signature						Date	5 , 06	/ 2019								
	Name of Plant Operato	r					Pri	nt and S	Sian								

Souther	n "	BC	RE C	WATE OMP	R AC	T 1989	REPOI	ЯT		LICENC	E TO CO W	NSTRUC		E 0 7	4	BH11 0 9 7
Rural Water	ter To	be sent to	Southern	Rural Wa	ter with	nin 28 day	s of complet	ion of bo	ore.	1.5	F	leport o	n site 1 ⊻	2 🗌 :	3	4 🗌 5
Malaging fraid. Out ing Commu	G	PS CO-C	RDS:	E[/]3]	5 2	9 9 N	574	3 9 0	02	Drilled Bo	ore 🗹 Spr	earpoin	t 🗌 Well o	r Shaft	D	ragline
Bore Owner Barwo	Z de on Wa	ONE: 54 . lete as appli iter	cable	GDA 94 felete as a	/ADO	6 6				BOREN	IUMBER	OFFIC	E USE ONL	Y ::		
Site Address 25 POS	SSUM R	IDGE ROA	.D, YEODE	NE, VIC	3249(B	Boundary	Creek - Big S	Swamp)		BODEL	1050					
Date 07 0	5 201	o Date	07	05 20		Total	e	ini		BUREL	1959				1	
Commenced /	5 201	···· Comp	leted	//		Depth -	0	(n	n)	GMA				ZONE		1999 - 1999 -
Was Bore Decommis	ssioned	2 Y/N	N	If Ye	s. State	Method							7			
1. DRILLING AND W	ATER I	NTERSEC	TION DE	TAILS												
DRILLING TECHNI	QUE	4		WATER	INTER	RSECTIO	NS (while c	Irilling, r	meas	surements	taken fro	m natur	al surface)	0	FFIC	EUSE
Method	From (m)	To (m)	Bit diam	From (m)	To	D T	est Stat	(m) Est	t yiel	d Draw	Casing a	t Depth	at Ec at 25	C	Litho	logy
Hollow Stem Auger	0	6	200	(11)				(11) 1/	300	down(iii)	test (iii)	tearti		<u>y</u>		
Thenew etchin rager			200	1	-			-	-			-	-	-		24년 (11) . (11) (11) (11) (11) (11) (11) (11) (11)
		-		-	-		-			-			_	-		
			(111.4								
2. CASINGS (CA) S	CREEN	IS (SC) S	LOTS (SL) OPEN	HOLE	E (OH)										
GENERAL		1	CASING	1			SCREENS	S / SLO	TS			-	1	0	FIC	USE
CA SC SL OH	From (m)	To (m)	Inner diar (mm)	n Outer o (mn	diam n)	Material	Inner diam (mm)	Outer d (mm	liam)	Material	Aperture (mm)	Filter Y / N	Trade Nam	e	Litho	logy
	6	5	50	60		C18 uPVC	26	32		C18 uPVC	0.3	Ν				
	5	2	26	32		C18 uPVC	50	60		C18 uPVC	04	N	A.,	_		
	2	107	50	60	-			00	-		0.4					
	2	+0.7	50	0					_			-				
			1	1							10.01	1		2012) 101		
			1												the set	
400 x 400 steel m				-					M		FITTINGS	Cas	ing	Bulin	ose /	
TOO X TOO SLEET II	Ionun		51						2			Sno	e Y/N		арү	
3. CÉMENT (C) BE	NTONIT	E(B) SE	ALS (S)	PACKER	S (P)	GRAVEL	- (G)					1.5		-		-
C B S P	G	(m)	(m) (ba	nent vva igs) (liti	res)	Seal /	Packer pe	of sea	er dia al (m	m / m)	Method of	avel Pac f placem	ent	Gra mesh p	assin	.g (mm)
	~	6 1	.5		-11					41-	Gra	avity		1.2	2 - 2	2.4
	ΠĽ	1.5 0	.8		N	/lediun	n Chips									
	HF			1 1				-	-							
	님는	0.0		+ 4						-	_					
					1.00				_				1			
. FINAL BORE DEV	ELOPM	ENT	Dumpi	Da Daa	ovon (Final Sta	tio Eo at 25		9	. DRILLER'	S LOG			1		
Wethod	l/sec	down (r	n) Time (n	nin) Time	(min)	Level	μS/cm	1)	14	Material				From	(m)	To (m)
Hand bailing	3 l/min		45	1	- 1	0.75	926			Clay, silt	y, red/o	range		0		0.1
. DRILLER'S PUMP	ING TE	ST					pH 2.6			Silt, san	dy, blac	k/brov	vn	0.1		0.5
Method Stati	C Y	ield Pun sec Lev	nping Dr el (m) dow	raw Pu m (m) Tin	umping ne (min	Recove	ery Ec at 25 nin) (µS/cm	C		Sand, claye	ey with silt,	orange	/brown grey	0.5		2
								-		Clay, sa	ndy, gre	Эy		2		6
	BORE			_		-	1			Clay sa	nd Drk	arev		4		6
Type	Length	Width D	iam Lir	ning Mate	rial	From	То			Oldy, Sd		grey				0
	(m)	(m)	(m)		-	(m)	(m)									
					-		-									
. SAMPLES			12.000				0	-								
Have material sample	s been t	aken? Ye	No		If Ye	es From	۱(r 6 /-	n)								
nave water samples to Samples taken by Ro	re Owne	en Ye er Di Drill	er D Pro	Lect Geol	ogist 🖂		/ .									
DISINFECTION				001 0601		N. 10		-								
Was the Bore Disinfec	ted?	Ye	s 🛛 No													
If yes, state method of	disinfec	tion: Ch	lorine Was	shed 🗅	Steam	Cleaned	D									
		Ot	her, please	specify:												
viller's Name Ben Ou	ighton					Driller's Li	icence No	1049								
)riller's Signature						Date	5 , 06	1 2019								
ame of Plant Operato	r					Pri	nt and S	Sian								
									1.1							

DORE CONPLETION REPORT WORKS No Support Stranging Water. Serving Communities. Serving Communities. Report on Serving Communities. Managing Water. Serving Communities. GPS CO-ORDS: E 7 3 5 2 9 9 N 5 7 4 3 9 0 2 Drilled Bore Drille	site 1 / : 	2 🗌 3 [Shaft 🗌	4 [] 4
Managing Water. Serving Communities. GPS CO-ORDS: E 7 3 5 7 4 3 0 2 Managing Water. Serving Communities. GPS CO-ORDS: E 7 3 5 7 4 3 0 2 Drilled Bore Sprearpoint ZONE: 54 / 55 delete as applicable GDA 94/ADQ666 delete as applicable GDA 94/ADQ666 OFFICE BORE NUMBER Image: Communities. Image: Communities. Image: Communities. OFFICE Image: Communities. Image: Communit	Well or] Dragline
ZONE: 54 / 55 GDA 94/ADQr66 OFFICE Bore Owner. Barwon Water GDA 94/ADQr66 OFFICE Site Address 25 POSSUM RIDGE ROAD, YEODENE, VIC 3249 (Boundary Creek - Big Swamp) Date 07 05 2019 Date 07 05 2019 Date 07 05 2019 Total 6 Commenced ////// Completed ///// Completed (m)		Ghait	J Diagini
delete as applicable delete as applicable BORE NUMBER Bore Owner Barwon Water Bore Owner Bore NUMBER Site Address 25 POSSUM RIDGE ROAD, YEODENE, VIC 3249 (Boundary Creek - Big Swamp) Bore USES Date 07 05 2019 Total 6 Commenced ////////////////////////////////////		1000	
Site Address 25 POSSUM RIDGE ROAD, YEODENE, VIC 3249 (Boundary Creek - Big Swamp) Date 07 05 2019 Date 07 05 2019 Total 6 Commenced / / Depth (m) BORE USES GMA	PARTICIPATION AND ADDRESS INCOME.		
Date 07 05 2019 Date 07 05 2019 Total 6 Commenced / / / Completed / / Depth (m)			
		ZONE.	
Man Para Decommission of N / N	1		
1. DRILLING AND WATER INTERSECTION DETAILS			
DRILLING TECHNIQUE WATER INTERSECTIONS (while drilling, measurements taken from natural	I surface)	OFF	FICE USE
Method From To Bit diam From To Test Static Est yield Draw Casing at Depth at (m) (m) (m) (m) (m) Method Level (m) 1/sec down (m) test (m) test (m)	t Ec at 25 ((uS/cm)	L	ithology
Hollow Stem Auger 0 6 200	(µO/ OIII)		
		125	
			1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
CASINGS (CA) SCREENS (SC) SLOTS (SL) OPEN HOLE (OH)		OFF	
ype Co Ri Oli from To Inner diam Outer diam Material Inner diam Outer diam Material Aperture Filter T	Trade Name	Li	thology
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			
Image: Construction Image: Construction	à,		
			불미르
Interial From To Cement Water Seal / Packer Outer diam Artificial Gravel Packir C B S P G (m) (m) (bags) (litres) type of seal (mm) Method of placemer	ng nt m	Grav	el size ssing (mm
		1.2	- 2.4
	-		
FINAL BORE DEVELOPMENT 9. DRILLER'S LOG Method Yield Draw Pumping Recovery Final Static Ec at 25 C Metorial		From Im	To (m
I/sec down (m) Time (min) Time (min) Level (μS/cm)		0	0.1
Tand bailing 3 I/min 45 0.75 926 Silt sandy black/brown		0 1	0.5
Method Static Yield Pumping Draw Pumping Recovery Ec at 25 C Sand clavery with silt grange/bu	rown grov	0.5	0.0
Level (m) I/sec Level (m) down (m) Time (min) Time (min) (μS/cm)	Town grey	0.5	2
		2	0
Type Length Width Diam Lining Material From To Clay, sand, Drk grey		4	6
(m) (m) (m)			
SAMPLES			
Have water samples been taken? Yes 🗹 No 🖵 To			
Samples taken by: Bore Owner D Driller D Project Geologist D			
Vas the Bore Disinfected? Yes No 2	`		
f yes, state method of disinfection: Chlorine Washed C Steam Cleaned C			
riller's Name Ben Oughton Driller's Licence No. 1049			
riller's Signature			

6		D		W		CT 1	989		T		LICEN	CE TO CO	NSTRUC		F 0 7	4	BH1
Souther Bural Wat	n se	W COPY	JRE					TEPUI		f have		VV F	ORKS N	n site 1		<u>зП</u>	4ΠF
Managing Water. Serving Commun	nities.	PS CO-	ORDS:	F 7	7 3 5	2 9 9	9 N	5 7 4	3 9	0 2							
	Z	ONE: 54	/ 55	GD	A 94/AD	066					Drilled B	ore 🗆 op	OFFICI		Y		ragime
Bore Owner Barwo	on Wa	ete as app ter	licable	delet	e as applica	able					BORE	NUMBER					
Site Address 25 POS	SUM RI	DGE RO	AD, YEO	DENE,	VIC 3249	(Boun	dary C	reek - Big S	Swam	p)	BORE	USES					
Date 07 0 Commenced	5 2019	Date Com	pleted	07 05	2019	Tot Dep	al pth	6		(m)	GMA		••••••		ZON	<u>с</u>	
Was Bore Decommis	ssioned	Y/N	N		If Yes, St	ate Me	thod							1			
I. DRILLING AND W	ATER I	NTERSE	CTION I	DETAIL	s										- I man		
DRILLING TECHNI	QUE	To	Dit dia	W	ATER INT	ERSE	CTION	IS (while c	Irillin	g, mea	surements	taken fro	m natur	al surface	0	FFIC	EUSE
Method	(m)	(m)	(mm) ((m)	(m)	Met	hod Level	(m)	I/sec	down (m	test (m)	test (r	n) (μS/cn	n)	Linc	logy
Hollow Stem Auger	0	6	200	1.12								1000			and a second		語言
			L C	1				21									
			1														
. CASINGS (CA)	CREEN	S (SC)	SLOTS	(SL)	OPEN HO	LE (O	H)					1	4		NEW L	and set to	(Section 4
GENERAL			CASI	NG				SCREENS	S/SI	LOTS					0	FFIC	E USE
ype CA SC SL OH	From (m)	To (m)	Inner ((mr	diam C n)	uter diam (mm)	Mate	erial	Inner diam (mm)	Oute (r	er diam mm)	Material	Aperture (mm)	Filter Y / N	Trade Nan	10	Litho	logy
	6	5	50		60	C18 u	uPVC	26	3	32	C18 uPVC	0.3	Ν	a			
	5	2	26	;	32	C18 เ	JPVC	50	6	60	C18 uPVC	0.4	Ν	A.	. <i>x</i> t		
	2	+0.7	50		60	C18 L	JPVC								and a state		
7000		1													10		
					-	1			1							200	
			-	_			-				Labor Fritzel		Casi		Bullr		
laterial C B S P	G I	From (m) 6	To ((m) 1.5	Cemen (bags)	t Water (litres)	S	ieal / F typ	Packer De	O of	uter dia seal (m	am im)	Artificial Gr Method o Gra	ravel Pac f placem avity	king ent	Gra mesh p 1.	avel s bassin 2 - 2	ize ig (mm) .4
	ΠĽ	1.5	0.8			Me	dium	Chips							1		
	ΠĒ	0.8	0	4	40												
	F											-		-			
FINAL BORE DEV	ELOPM	ENT		-	-	L	-		-			100				_	
Method	Yield	Drav		nping	Recover	y Fina	al Stati	c Ec at 25	C	Ĺ	Material	0 LOU			From	(m)	To (m)
land bailing	3 I/min	down	45	s (min)	Time (rim	0.7	75	926	<u> </u>	ſ	Clay, silty	red/orang	je		0		0.1
DRILLER'S PUMP	ING TES	ST						pH 3.	6		Silt, sandy	, black/br	own		0.1		0.5
Method Stati	c Yi	eld Pu	mping	Draw	Pumpi	ing R	ecove	ry Ec at 25	C		Sand, clay	ey with silt	, orange/	/brown grey	0.5		2
Level	(11) 1/2	Sec Le	ver(in) ic		iy inne (i		ine (in		<u> </u>	.,	Clay, san	dy, grey			2		6
IF NOT A DRILLED	BORE				-		-	1	-	i.	Clav. san	d. Drk arev	/		4		6
Гуре	Length	Width	Diam	Lining	Material	F	rom	То				.,	, 				
	<u>(m)</u>	(m)	(m)	-		-	(m)	(m)	-								
SAMPLES		-				-		1		.,							
lave material samples	s been tak	aken?)			ĥ	Yes	From	0 (r 6 (r	n) n)								
Samples taken by: Bo	re Owne	r 🖸 Dri		Project	Geologis	t 🗹			"								
DISINFECTION						9			_					* ₁			
Was the Bore Disinfec f yes, state method of	ted? disinfec	tion: C	res II I Chlorine \	No 🖸 Washed	d 🖸 Stea	am Cle	aned (2									
rillara Nama Ran Ou	ahton		Julier, pie	ase sp	eony:	D-10		onos N-	1040	, .							
riller's Name Den Ou	igni Q(1					Data	915 LIC 05	, 06	, 20)19							
ame of Plant Operator	r						Dei										
						5	L IU	rand S	iyn						1.1		

Souther	n _{sr}	BC		WAT OM	IPLE		989 N I	REPOR	RT		LICENO	CE TO CO W	NSTRUC	CT Io. WLI	<u>E 0 7</u>	7 4	E	3H15 9 7
Managing Water. Serving Commun	ler to nities.	be sent to	o Southern DRDS:	E 7	Water w 3 5 2	2 9 9		5 7 4	3 9	0 2	Drillod Br			tonice te tonice te	∠	ы П	4 L	
	ZC	ONE: 54	/ 55 icable	GDA S	94/AD		-						OFFIC		Y			
Bore Owner Barw	on Wa	ter									BORE	NUMBER						
Site Address 25 POS	SSUM RII	DGE ROA	D, YEODE	ENE, VI	C 3249	(Bound	lary C	reek - Big S	wamp	<u>)</u>	BORE	JSES						
Date 07 0 Commenced	5 2019	Date Comp	07 pleted	/ 05	2019	Tota Dep	al oth …	6		(m)	GMA	•••••			. ZON	E		
Was Bore Decommis	ssioned?	Y/N	N	lf '	Yes, Sta	ate Me	thod											
1. DRILLING AND W	ATER I	TERSEC	CTION DE	TAILS								_			Lance			
DRILLING TECHNI	QUE	То	Dit diam	WAT	ERINT	ERSEC	IOIT	NS (while d	in I r	g, mea	surements	taken fro	m natur	al surface)	C)FFIC	にし	JSE
Method	(m)	(m)	(mm)	(m)	"	(m)	Met	hod Level	(m)	l/sec	down (m) test (m)	test (r	n) (µS/cm	1)	- Liui	Diog	ly
Hollow Stem Auger	0	6	200		1													
				-		-	-	-			-			_				
											-						100	14
2. CASINGS (CA)	SCREEN	S (SC)	SLOTS (S	L) OP	EN HO	LE (OF	1)	0000000		070					1000	10000000	STOCK!	107
TVDE	From	То	Inner dia	am Oute	er diam	Mate	rial	Inner diam	Outer	r diam	Material	Aperture	Filter	Trade Nam	e	Lith	oloa	ISE
CASC SLOH	(m)	(m)	(mm)	(mm)	C10	DVC	(mm)	(m)	nm)		(mm)	Y/N	1	_		т Т	
	5	2	26	-	00 32	C18 u		50	5	0		0.3		- - A.				
	2	2	50	-	52 60	C10 u	DVC	50	0			0.4			- / [
	2	+0.7	50	-	60	CIOU	FVC		-	-						175 182 0 4 182		
				-			-		1	-					_	<u>12</u> 12	100	
	-			_					1					_		14		1311
100 x 100 steel n	nonum	ent cov	er		•					v	VELL HEAD	FITTINGS	Sho	eY/N	_ reulii	cap	Ý/1	NΥ
3. CÊMENT (C) BE	NTONITI	E (B) SE	ALS (S)	PACK	ERS (P	GR/	VEL	(G)							2.2			
Material C B S P	G	rom (m)	To Ce (m) (b	ment ags)	Water (litres)	S	eal / F	Packer De	OL of s	uter dia seal (m	im i im)	Artificial Gr Method of	avel Pac f placem	king ent	Gr mesh	avel passi	size ng (mm)
	~	6	1.5									Gra	avity		1.	2 - 2	2.4	
		1.5	0.8			Med	dium	Chips										
		0.8	0	4	40													
					I (17)				1									
4. FINAL BORE DEV	ELOPM	ENT								9	. DRILLER	SLOG						
Method	Yield I/sec	Draw down (i	m) Time (ing R min) Ti	ecovery me (min	/ Fina	l Stati evel	ic Ec at 25 (μS/cm	C	F	Material				From	(m)	То) (m)
Hand bailing	3 l/min		45		04.1	0.7	'5	926			Clay, silty,	red/orang	le		0		0.1	
5. DRILLER'S PUMP	ING TES	T				1.2		pH 3.4	6		Silt, sandy	, black/bro	own		0.1		0.5	5
Method Stati	c Yi (m) I/s	eld Pur ec Lev	nping L rel (m) dov	vn (m)	Pumpli Time (rr	ng Re nin) Tin	ne (m	ry Ec at 25 in) (μS/cm	C))		Sand, claye	ey with silt	orange	brown grey	0.5		2	
											Clay, sand	ly, grey			2		6	
6. IF NOT A DRILLED	BORE	140-00-1 -				1 -		1 -	_		Clay, sand	l, Drk grey	/		4		6	
Туре	Length (m)	(m)	Diam L (m)	ining M	aterial	F	rom (m)	10 (m)										
7. SAMPLES							_	0	-									
Have material sample Have water samples b	s been ta been take	nken? Yo n? Yo	es 🗹 No es 🗹 No		IT	Yes	To		n) n)									
Samples taken by: Bo B. DISINFECTION	re Ownei	Drill	ler 🖵 Pr	oject Ge	eologist		-		_									
Was the Bore Disinfec If yes, state method of	ted? disinfect	Ye ion: Cl	es 🖬 No hIorine Wa	D Ished C) Stea	um Clea	aned (2										
		0	ther, pleas	e speci	fy:													
Driller's Name Ben Ou	ighton					Drille	r's Lic	cence No	201	19								
Driller's Signature	3					Date			120									
wame of Plant Operato	r					S	Prin	t and S	ign									

	•	B	ORF		ATER A		989 N F	REPOI	RT		LICE		ONSTRU VOBKS I	CT No.	WLE	0	7 4	0	3H1
Rural Wa	n sf ter to	W COPY	to South	em Rur	al Water v	vithin 2	8 days	of complet	tion o	f bore.			Report o	on si	ite 1	2	3	4	5
Managing Water. Serving Commun	nities. G	PS CO-	ORDS:	E	3 5	2 9 9	N [5 7 4	39	0 2	Drilled		orearpoir	nt	Well or	Shaf	τD	Dra	gline
Bore Owner Barw	Z(del on Wa	ONE: 54 lete as app ter	/ 55 blicable	GD. delet	A 94/AD e as applica	Qi66 ible					BORI	NUMBER	OFFIC	EU	SE ONL'	r 			
Site Address 25 POS	SUM RI	DGE RO	AD, YEO	DENE,	VIC 3249	(Bound	dary C	reek - Big S	Swam	ip)	BOB								
Date 07 0	5 2019	Date	(07 05	2019	Tot	al	6			GMA	. 0313					IE		
Commenced /////		Com	pleted			Dep	pth …			(m)	199629413		/Mass (03)		ACCHARGES	104293		1948	NH COM
Was Bore Decommis	ssioned	? Y/N	N		If Yes, St	ate Me	thod												
1. DRILLING AND W	ATER I	NTERSE	CTION	DETAIL	S	EDEE	OTION	IC (while a	1-1111-			la delven fr		und a		1933	OFF	201	ICE
Method	From	То	Bit dia	m Fi	rom	To	Te	st Stat	tic	Est yie	ld Drav	Casing	at Dept	h at	Ec at 25	C	Litt		<u>ју</u>
	(m)	(m)	(mm) ((m)	(m)	Met	hod Level	(m)	l/sec	down	m) test (m) test ((m)	(µS/cm)				
Hollow Stem Auger	0	6	200	-	_			-						-		-			
								_										No.	
	1		1	n pina							_				1.1			Sec. 2	
. CASINGS (CA)	CREEN	S (SC)	SLOTS	(SL) (OPEN HO	LE (OF	H)												
GENERAL	-		CASI	NG				SCREENS	S/S	LOTS		1	1	1-			OFFIC	EL	JSE
ype CA SC SL OH	From (m)	(m)	Inner (mr	n)	(mm)	Mate	erial	Inner diam (mm)	Out (er diam mm)	Material	Aperture (mm)	Y / N	Ira	ade Nam	Ð	Lith	JOIC	ſY
	6	5	50		60	C18 u	IPVC	26		32	C18 uPV	0.3	N						0.6
	5	2	26	;	32	C18 u	IPVC	50	(60	C18 uPV	0.4	N	.1	a	- 13			
	2	+0.7	50		60	C18 u	PVC					1							
	-		-	-									1	1		-	94		
	-	-	-	-			-		17			-	-	-				100	8
		-	1		-	1.000			1		1.1.1.2.7.			1		Dut		1	
faterial CBSP	G I	From (m) 6	To (m) 1.5	Cemen (bags)	t Water (litres)	S	eal / F typ	Packer De	o	Duter dia f seal (n	am nm)	Artificial G Method	aravel Pac of placen ravity	cking nent	9	G nesh 1	ravel passi .2 -	size ng (2.4	mm)
	ΠĒ	1.5	0.8			Me	dium	Chips											
	۳F	0.8	0	4	40														
	H	0.0	-								-			-		-			
		ENT		-		0	-		-										_
Method	Yield	Drav	v Pur	nping	Recover	Fina	al Stati	c Ec at 25	C	ſ	Material	H'S LUG				From	1 (m)	Tr) (m)
land bailing	3 l/min	down	(m) 11m	e (min)	Time (mir		evei	(µS/Cff	1)	Ĩ	Clay, silt	y, red/oran	ge			0		0.1	1
DBILLER'S PLIMP		ST.				1 0.1		pH 4.1		ŀ	Silt, san	dy, black/b	rown			0.1		0.	5
Method Stati	c Yi	eld Pu	mping	Draw	Pumpi	ng R	ecove	ry Ec at 25	C		Sand. cla	vev with si	t. orange	e/bro	wn arev	0.5		2	
Level	(m) 1/s	sec Le	vel (m) c	iown (n	n) Time (n		me (mi	in) (μS/cm	<u>v</u>		Clav sa	ndv arev	.,			2		6	
					1				_			nd Drk ar				-			
Type	Length	Width	Diam	Lining	Material	F	rom	То	1		Clay, Sa	nu, Dik gie	÷y			4		0	
	(m)	(m)	(m)			-	(m)	(m)	-										
SAMPI ES							_												
- SAMPLES lave material sample	s been tak	aken?			lf	Yes	From . To .	0 (r 6 (r	n) n)										
Samples taken by: Bo	re Owne	r 🗖 Dri	iller 🛛	Project	Geologist		57												
DISINFECTION						4			_										
Was the Bore Disinfec f yes, state method of	ted? disinfec	tion: C	Yes 🔲 🛛 Chlorine \ Other ple	No 🖸 Washed	d 🖸 Stea	am Clea	aned (2											
riller's Name Ben Ou	ighton			200 op		Drille	ar's Lie	ence No	104	9									
riller's Signature	ana ang ang ang ang ang ang ang ang ang					Date	05	/ 06	1 20	019									
lame of Plant Operato	r						Prin	t and C	ian										
								cunu O	' ' 9''										

Souther	n _{sr}	BC W COPY	PRE C	WAT OM	ER A PLE	CT 1	989 N	REPOI	RT		LICEN	CE TO CO W	NSTRUC	. WL	E 0 7	4	BH1
Managing Water. Serving Commun	ter To	be sent f	o Southerr	Rural V	Vater w	vithin 2	8 days	5 7 4	3 S	of bore.	1	F	Report or	nsite 1⊡	2[];	3 -	4 🗌 5
Bara Owner Barw	Z(del on Wa	ONE: 54	/ 55 licable	GDA 9	4/AD applica	Qi66 ble	_ 14				BORE		OFFICE		r Shaft		
Site Address 25 POS	SUM RI	DGE ROA	AD, YEODE	NE, VIC	3249	(Bound	dary C	Creek - Big S	Swan	 np)	BODE						
Date 07 0 Commenced	5 2019	Date Com	07 pleted	05	2019	Tot Dep	al pth	6		(m)	GMA.				L ZONI	<u> </u>	
Was Bore Decommis	ssioned?	Y/N		If Y	'es, Sta	ate Me	thod							1			
DRILLING TECHNI	QUE	1	104	WATE	RINT	ERSE	CTION	NS (while c	Irillin	ng, mea	surement	s taken fro	m natur	al surface)	0	FFIC	E USE
Method	From (m)	10 (m)	Bit diam (mm)	(m)		10 (m)	Met	hod Level	tic (m)	Est yie I/sec	down (n	Casing a test (m)	test (n	at Ec at 25 n) (µS/cm	1) 1)	Litho	logy
Hollow Stem Auger	0	6	200								_						
										1				1 3.0			
2. CASINGS (CA) S	CREEN	S (SC)	SLOTS (S	L) OPI	EN HO	LE (OI	H)										
GENERAL Type CA SC SL OH	From (m)	To	CASING Inner dia (mm)	i m Oute	r diam	Mate	erial	SCREENS Inner diam (mm)	Out	LOTS er diam	Material	Aperture (mm)	Filter	Trade Nam	OI Ie	FICI Litho	E USE logy
	6	5	50		50	C18 เ	JPVC	26		32	C18 uPVC	0.3	N				
	5	2	26		32	C18 เ	JPVC	50	ie:	60	C18 uPVC	0.4	N	A.			
	2	+0.7	50		50	C18 เ	uPVC				-						
		1													1		
								-	1								
				-		-	-					EITTING	Casi	ng	Bulin	ose /	
3. CÊMENT (C) BE Material C B S P		E (B) SI	To Ce	PACKE	RS (P) Vater litres)) GR/ S	AVEL Seal / F	(G) Packer	(Duter dia	am 1m)	Artificial Gr Method o	ravel Paci	king	Gra	avel s	ize
		6	1.5									Gra	avity		1.2	2 - 2	.4
		1.5	0.8			Me	dium	Chips									
		0.8	0	4	40						-	_					
				1								ration					
A. FINAL BORE DEV Method	ELOPMI Yield	Drav	v Pump	ing Re	covery	/ Fina	al Stati	ic Ec at 25	C	ſ	9. DRILLEF	'S LOG			From	(m)	To (m)
	l/sec	down	(m) Time (i	nin) Tir	ne (min) L	evel	(μS/cm	1)		Clay, silty	, red/orand	le		0	,	0.1
			45		-	0.1	/5	0H 3 7	_		Silt. sand	v. black/br	own		0.1		0.5
Method Stati	c Yi	eld Pu	mping D	raw	Pumpi	ng R	ecove	ry Ec at 25	C		Sand, clay	vev with silt	. orange/	brown arev	0.5		2
Level	(m) 1/s	ec Lev	/el (m) dov	vn (m)	ime (n	וו (חור	me (m	in) (µS/cm	<u>v</u>		Clav. san	dv. arev	,		2		6
	BORE			-			-	1	-		Clay san	d Drk arev			4		6
Type	Length (m)	Width (m)	Diam Li (m)	ning Ma	terial	F	From (m)	To (m)			Ciay, San		y 				0
. SAMPLES Have material sample	s been ta	iken? Y	es 🛛 No	0	lf	Yes	From	0(r	n)								
nave water samples to Samples taken by: Bo	re Owne	r 🗋 Dril	ler D Pro	oject Ge	ologist		10		"							·····	
Was the Bore Disinfect If yes, state method of	ted? disinfect	Y ion: C C	es D No hlorine Wa	I shed I e specif	Stea	am Clea	aned	-									
Driller's Name Ben Ou	ighton					Drille	er's Lic	cence No	104	9							
)riller's Signature						Date	05	/ 06	1.2	019							
lame of Plant Operato	r					-	Prin	t and S	ign								



Appendix E. Well construction Licence

Works Licence ID:

WLE074097

Printed on: 28 Mar 2019 1:14:01 pm

COPY OF RECORD IN THE VICTORIAN WATER REGISTER LICENCE TO CONSTRUCT WORKS

under Section 67 of the Water Act 1989

The information in this copy of record is as recorded at the time of printing. Current information should be obtained by a search of the register. The State of Victoria does not warrant the accuracy or completeness of this information and accepts no responsibility for any subsequent release, publication or reproduction of this information.

This licence does not remove the need to apply for any authorisation or permission necessary under any other Act of Parliament with respect to anything authorised by the works licence.

Water used under this licence is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.

This licence is not to be interpreted as an endorsement of the design and/or construction of any works (including dams). The Authority does not accept any responsibility or liability for any suits or actions arising from injury, loss, damage or death to person or property which may arise from the maintenance, existence or use of the works.

Each person named as a licence holder is responsible for ensuring all the conditions of this licence are complied with.

This licence authorises its holders to construct the described works, subject to the conditions.

Licence Holder(s)

BARWON WATER of 44 LONSDALE STREET SOUTH GEELONG VIC 3220

Licence Contact Details

BARWON WATER

44 LONSDALE STREET

SOUTH GEELONG VIC 3220

Licence Details

Expiry date Status Authority Name of waterway or aquifer Water system 28 Mar 2020 Active Southern Rural Water NA for construct/decommission Unincorporated (GMU)

Summary of Licensed Works

The details in this section are a summary only. They are subject to the conditions specified in this licence.

Works ID	Works type	Use of water
WRK112869	Bore	Observation
WRK112870	Bore	Observation
WRK112871	Bore	Observation
WRK112872	Bore	Observation
WRK112873	Bore	Observation
WRK112874	Bore	Observation
WRK112875	Bore	Observation
WRK112876	Bore	Observation
WRK112877	Bore	Observation
WRK112878	Bore	Observation
WRK112879	Bore	Observation
WRK112880	Bore	Observation
WRK112881	Bore	Observation
WRK112882	Bore	Observation
WRK112883	Bore	Observation
WRK112884	Bore	Observation
WRK112885	Bore	Observation
WRK112886	Bore	Observation

Description of Licensed Works

WORKS ID WRK112869		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location		
Easting	Northing	Zone MGA
735802.078	5743839.275	Zone 54
Land description Volume 4177 Folio 273 CA 115A Parish of Yeo		
Property address		
25 POSSUM RIDGE ROAI	D, YEODENE, VIC 3249	
Description of Licensed W	orks	

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	60.000 metres

Easting	Northing
735842.659	5743828.521

Zone MGA Zone 54

Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112871		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location		
Easting	Northing	Zone MGA

5743898.978

Land description

735740.577

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112872		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location <i>Easting</i> 735830.248	<i>Northing</i> 5743889.117	<i>Zone MGA</i> Zone 54
Land description Volume 4177 Folio 273 CA 115A Parish of Yeo		

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112873

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	60.000 metres

Works location

Easting	Northing	Zone MGA
735725.600	5743876.597	Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112874		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location		
Easting	Northing	Zone MGA
735761.978	5743931.093	Zone 54
Land description		
Volume 4177 Folio 273		
CA 115A Parish of Yeo		
Property address		

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	60.000 metres

Easting	Northing
735618.190	5743916.251

Zone MGA Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112876		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location		
Easting	Northing	Zone MGA
735634.810	5743953.576	Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112877		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location		
Easting	Northing	Zone MGA
735432.908	5743914.204	Zone 54
Land description Volume 4177 Folio 273 CA 115A Parish of Yeo		

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112878

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	60.000 metres

Works location

Easting	Northing	Zone MGA
735427.588	5743953.473	Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112879		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location		
Easting	Northing	Zone MGA
735426.652	5744001.564	Zone 54
Land description Volume 4177 Folio 273		
CA 115A Parish of Yeo		
Property address		

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	60.000 metres

Easting	
735372.904	

Northing 5743845.708

Zone MGA Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112881		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location		
Easting	Northing	Zone MGA
735333.053	5743873.448	Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112882		
Works type	Bore	
Works subtype	Drilled bore	
Proposed maximum depth	60.000 metres	
Works location <i>Easting</i> 735302.808	<i>Northing</i> 5743891.766	Zone MGA Zone 54
Land description Volume 4177 Folio 273 CA 115A Parish of Yeo		

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112883

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	60.000 metres

Works location

Easting	Northing	Zone MGA
735253.750	5743914.896	Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID WRK112884					
Works type	Bore				
Works subtype	Drilled bore				
Proposed maximum depth	60.000 metres				
Works location					
Easting	Northing Zone MG				
735303.069	Zone 54				
Land description					
Volume 4177 Folio 273					
CA 115A Parish of Yeo					
Property address					

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

Works type	Bore
Works subtype	Drilled bore
Proposed maximum depth	60.000 metres

Easting	Northing
735752.298	5743915.492

Zone MGA Zone 54

Land description

Volume 4177 Folio 273 CA 115A Parish of Yeo

Property address

25 POSSUM RIDGE ROAD, YEODENE, VIC 3249

Description of Licensed Works

WORKS ID	WRK112886						
Works type	e	Bore					
Works subt	type	Drille	ed bore				
Proposed n	naximum dept	h 60.00	60.000 metres				
Works locatio	n						
Easting		1	Northing		Zone MGA		
735643.222	2	4	5743986.2	250	Zone 54		
Volume 41 CA 115A F Property addu 25 POSSU	77 Folio 273 Parish of Yeo ress M RIDGE RC	DAD, YEO	DENE, V	'IC 3249			
Related Instru	iments						
Related entitlements Nil							
Related water-use entities Nil							
Application H	listory						
Reference	Туре	Stati	лS	Lodged date	Approved date	Recorded date	
WLI610021	Issue	App	roved	28 Mar 2019	28 Mar 2019		

Conditions

Licence WLE074097 is subject to the following conditions:

Siting and construction

- 1 The bore(s) must be drilled at the location specified in the application approved by the Authority.
- 2 If after drilling the bore is considered unsatisfactory a replacement bore may be drilled on the land specified in the licence.

Preventing pollution

- 3 All earthworks must be carried out, and all drilling fluids and waters produced during construction and development must be disposed of, in ways that avoid contaminating native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.
- 4 Construction must stop immediately if the Authority reasonably believes that fuel, lubricant, drilling fluid, soil or water produced during construction and development is at risk of being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.
- 5 The licence holder must construct and maintain bund walls, in accordance with the timeframe, specifications, guidelines or standards prescribed by the Authority, to prevent fuel, lubricant, drilling fluid, soil or water produced during construction and development from being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people's property.

Construction standards

6 The bore(s) must be constructed, and where relevant decommissioned, in accordance with the Minimum Construction Requirements for Water Bores in Australia, Edition 3 or its successor.

Drilling licence and supervision requirements

- 7 The bore(s) must be constructed by, or under the direct supervision of, a driller licensed under the Water Act 1989 and endorsed as a Class 1, 2, or 3 driller, with appropriate endorsements.
- 8 If artesian pressure is expected or encountered, then a driller licensed under the Water Act 1989, and endorsed as a class 3 driller, must install casing in the bore(s) to a suitable depth, and in a suitable manner, to prevent its outbreak. A suitable valve must also be fitted to the bore.

Bore completion report

9 A Bore Completion Report must be submitted to the Authority within 28 working days of the bore(s) being completed.

Protecting water resources

- 10 No more than 18 bore(s) may be brought to final development under this licence.
- 11 At the completion of drilling and before the drilling rig leaves the site, all but 18 bore(s) must be decommissioned so as to eliminate physical hazards, conserve aquifer yield, prevent groundwater contamination and prevent the intermingling of desirable and undesirable waters.
- 12 The bore(s) must be located at least 30 metres from any authority's channel, reserve or easement unless authorised by the Authority.

Protecting water quality

- 13 Drilling must not exceed the maximum depth.
- 14 The bore(s) must be constructed so as to prevent aquifer contamination caused by vertical flow outside the casing.
- 15 If two or more aquifers are encountered, the bore(s) must be constructed to ensure that an impervious seal is made and maintained between each aquifer to prevent aquifer connection through vertical flow outside the casing; under no circumstances are two or more aquifers to be screened within the one bore or in any other manner to allow connection between them.
- 16 Boreheads must be constructed, to ensure that no flood water, surface runoff or potential

subsurface contaminated soakage can enter the bore or bore annulus.

Protecting other water users

- 17 The diameter of the drill casing must not exceed 130 millimetres.
- 18 The bore(s) must be constructed so that water levels in the bore(s) can be measured by an airline, a piezometer or a method approved in writing by the Authority.

Fees and charges

19 The licence holder must, when requested by the Authority, pay all fees, costs and other charges under the Water Act 1989 in respect of this licence.

END OF COPY OF RECORD



Appendix F. Aquifer permeability test results














































































Appendix G. Laboratory results


















