

**PEMBROKE**

**Olive Downs Coking Coal Project**

Additional Information to the  
Environmental Impact Statement

**Section 13**

**Groundwater**

## 13 GROUNDWATER

1. ***Provide an integrated assessment of the potential impacts of the project on Groundwater Dependent Ecosystems (GDE's). This assessment should integrate the findings of the groundwater, surface water and terrestrial and aquatic ecological assessments provided in the draft EIS.***

A detailed assessment of potential impacts on GDEs and wetlands, including those located outside the Project area, is provided in Appendix E. The assessment integrates the findings of the groundwater, surface water and terrestrial and aquatic ecological assessments provided in the draft EIS.

2. ***Provide information that would be included as part of the project's Water Management Plan, including:***

- a) ***Additional baseline water quality data***

Since lodgement of the draft EIS in July 2018 (which included data up to February 2018), Pembroke has continued to collect groundwater quality and level data from the groundwater monitoring network which has been established across the Project area. Groundwater quality sampling events were conducted in April, June, July, August and November 2018. Groundwater bores (standpipes) GW01s, GW02d, GW02s, GW04, GW06s, GW08s, GW12s, GW16s, GW18d, GW18s, GW21d and GW21s (Figure 13-1) were inspected during these sampling events, however bores GW04, GW06s, GW08s and GW16s were dry during these sampling events and therefore no monitoring data was collected. The additional baseline water quality data that was collected from bores which were not dry is provided at the end of this section.

The additional water level monitoring data collected since July 2018 has not indicated any significant change in water levels that would influence the findings presented in the EIS. The standing water levels for monitoring bores GW01s, GW02s, GW02d, GW04, GW08s, GW12s, GW18s, GW18d, GW21s and GW21d are presented in Figure 13-2. The shallow monitoring bores GW04s, GW06s, GW08s and GW16s have remained dry and therefore no monitoring data is presented.

In addition to the above, Section 4.2.4 of the draft EIS outlines the proposed groundwater monitoring that would be further detailed within the Water Management Plan:

*Groundwater quality sampling of existing monitoring bores would continue in order to provide longer term baseline groundwater quality around the Project site, and to detect any changes in groundwater quality during and post-mining. Several bores within the mine footprint would continue to be monitored until they are destroyed as the mine progresses.*

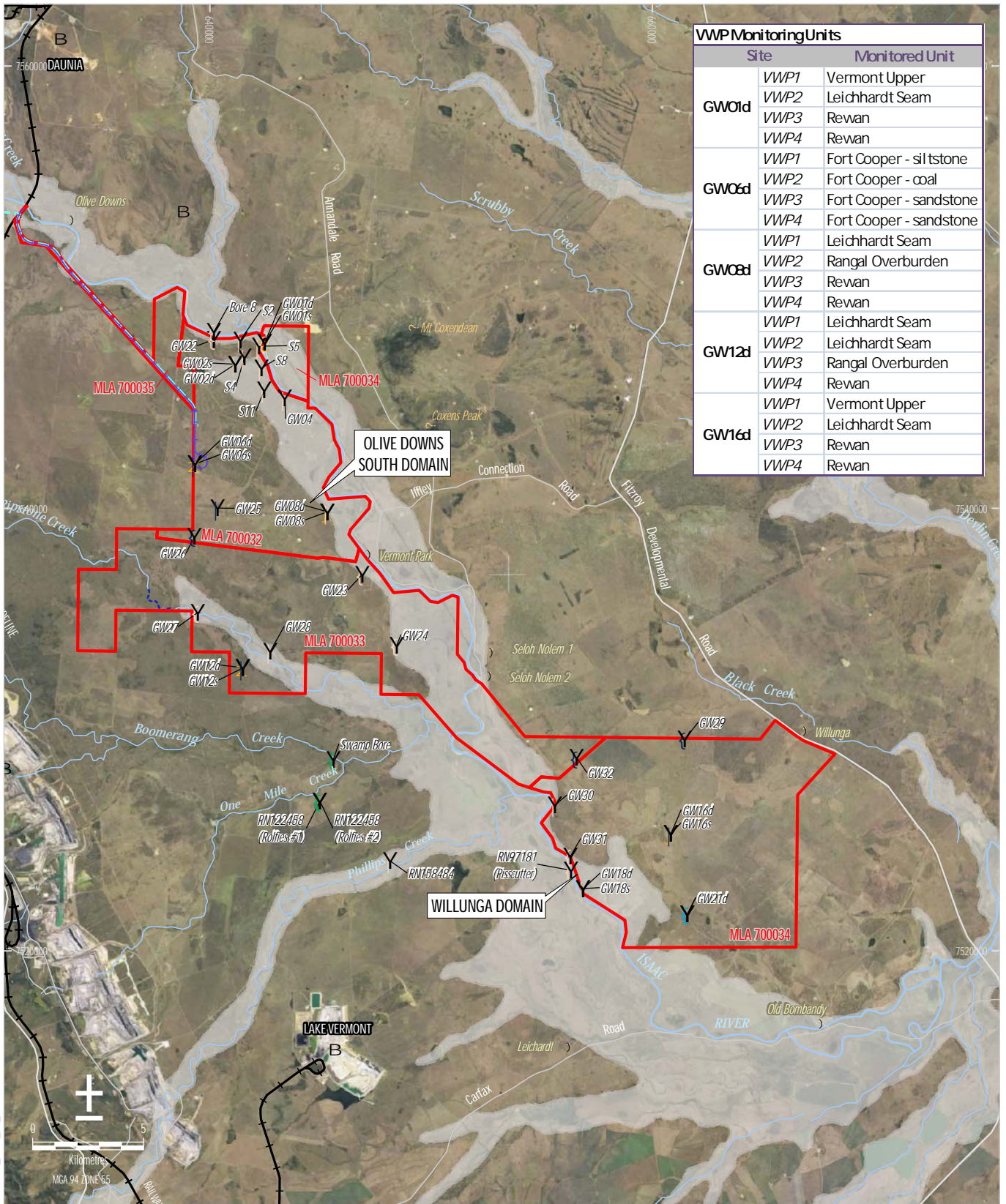
*The existing groundwater monitoring network would be consolidated to remove bores in close proximity to each other (e.g. S6 and S10) and augmented with additional proposed monitoring locations around the pit footprint and proposed coal reject emplacements/ILF cells.*

*Groundwater quality monitoring would continue to be undertaken on a quarterly basis. As part of the full water quality monitoring, in addition to collecting field parameters (EC and pH), water samples would be submitted to a NATA accredited laboratory for analysis of:*

- *physio-chemical indicators (TDS and total suspended solids [TSS]);*
- *major ions (calcium, fluoride, magnesium, potassium, sodium, chloride, sulphate), hardness and ionic balance (total anions/cations);*
- *total alkalinity as CaCO<sub>3</sub>, HCO<sub>3</sub>, CO<sub>3</sub>; and*
- *total and dissolved metals: (Ag, Al, As, B, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Pb, Mn, Mo, Ni, Se, U, V and Zn).*

*Subject to accessibility, quarterly groundwater quality monitoring would also be conducted on privately-owned landholder bores predicted to be impacted by drawdown associated with the Project (Section 4.3).*

WVP Monitoring Units		
Site	Monitored Unit	
GW01d	VWP1	Vermont Upper
	VWP2	Leichhardt Seam
	VWP3	Rewan
	VWP4	Rewan
GW06d	VWP1	Fort Cooper - siltstone
	VWP2	Fort Cooper - coal
	VWP3	Fort Cooper - sandstone
	VWP4	Fort Cooper - sandstone
GW08d	VWP1	Leichhardt Seam
	VWP2	Rangal Overburden
	VWP3	Rewan
	VWP4	Rewan
GW12d	VWP1	Leichhardt Seam
	VWP2	Rangal Overburden
	VWP3	Rewan
	VWP4	Rewan
GW16d	VWP1	Vermont Upper
	VWP2	Leichhardt Seam
	VWP3	Rewan
	VWP4	Rewan



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- LEGEND**
- Mining Lease Application Boundary
  - Railway
  - Dwelling
  - Proposed Rail Spur and Loop
  - Proposed Water Pipeline
  - Proposed Creek Diversion
- Standpipe**
- Compliance and Reference Bore (Monitored Unit)**
- Alluvium
  - Permian
  - Rangal Interburden
  - Regolith
- Reference Bore (Monitored Unit)**
- Alluvium
  - Regolith
  - Vermont Upper

- WVP**
- Compliance and Reference Bore\*
  - Reference Bore\*
- \* Please refer to the "WVP Monitoring Unit" table for the monitored units.

Source: Pembroke (2018), Geoscience Australia - Topographical Data 250K (2006), Department of Natural Resources and Mines (2016)  
 Orthophotography: Google Image (2016)

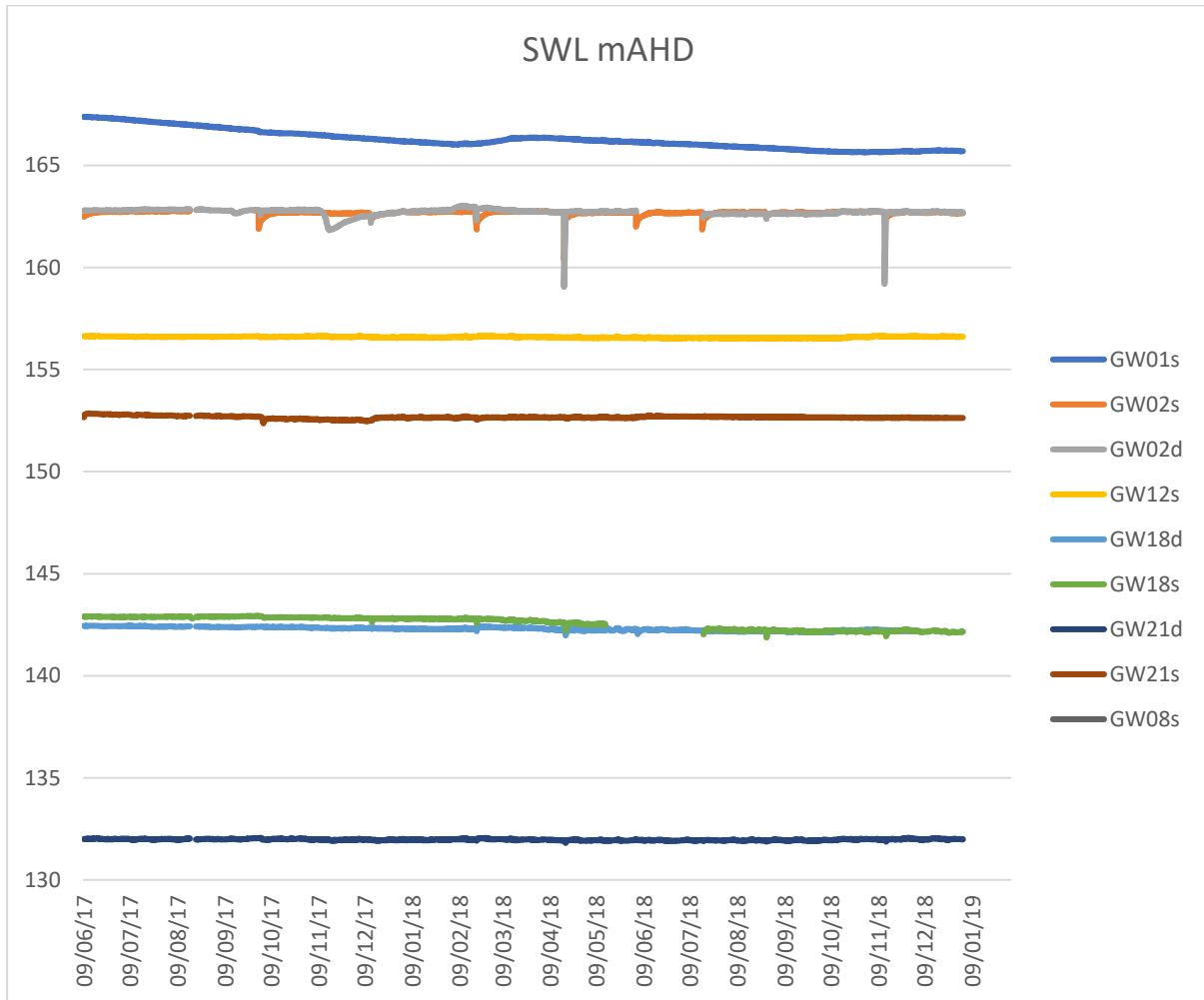


**OLIVE DOWNS COKING COAL PROJECT**  
**Groundwater Monitoring Sites**

Figure 13-1

Note: The quadrant coloured within each symbol indicates whether the bore would be used as a Compliance and Reference Bore or as only a Reference Bore.

**Figure 13-2  
Groundwater Level Monitoring Data**



Further to the above, Table 6-2 of the draft EIS contains the following commitments relevant to the ongoing collection of groundwater quality data that would be detailed within the Water Management Plan:

*Pembroke would prepare an Underground Water Impact Report prior to the commencement of mining in accordance with Chapter 3 of the Water Act.*

...

*Groundwater quality monitoring would continue to be undertaken on a quarterly basis.*

...

*Subject to accessibility, quarterly groundwater quality monitoring would also be conducted on privately-owned landholder bores predicted to be impacted by drawdown associated with the mining operation.*

...

*Each year, an annual review of groundwater quality trends would be conducted by a suitably qualified person. The review would assess the change in groundwater quality over the year, compared to historical trends and impact assessment predictions.*

**b) Recommended receiving waters contaminant trigger investigation levels**

Table E2 of the draft EA has been updated to include proposed Release Contaminant Trigger Investigation Levels. The revised draft Table E-2 is provided in Appendix B and has been reproduced below, as Table 13-1.

**Table 13-1  
Groundwater Quality Triggers and Limits**

Parameter	Contaminant Triggers <sup>1</sup>	Limit Type
pH	7.40-8.03 / 7.1-8.10 (Deep /Shallow) (temporary) <sup>2</sup> 20 <sup>th</sup> percentile of reference (minimum) <sup>3</sup> 80 <sup>th</sup> percentile of reference (maximum) <sup>3</sup>	Range. The median pH value of the most recent eight samples should be within trigger level range.
Electrical Conductivity	16,000 / 8,910 (Deep /Shallow) <sup>4</sup> OR 80 <sup>th</sup> percentile of reference <sup>3</sup> , whichever is higher	<p>Maximum.</p> <p>A trigger for further investigation will be deemed to have occurred when the median (50th percentile) concentration from the most recent eight (8) consecutive samples from a compliance bore exceed the contaminant trigger level.</p>
Aluminium	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 5 mg/L <sup>5</sup> , whichever is higher.	
Arsenic	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.5 mg/L <sup>5</sup> , whichever is higher.	
Boron	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 5 mg/L <sup>5</sup> , whichever is higher.	
Cadmium	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.01 mg/L <sup>5</sup> , whichever is higher.	
Chromium	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 1 mg/L <sup>5</sup> , whichever is higher.	
Copper	80 <sup>th</sup> percentile of reference <sup>2</sup> OR 1 mg/L <sup>5</sup> , whichever is higher	
Mercury	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.002 mg/L <sup>5</sup> , whichever is higher.	
Lead	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.1 mg/L <sup>5</sup> , whichever is higher.	
Molybdenum	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.05 mg/L <sup>5</sup> , whichever is higher.	
Nickel	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 1 mg/L <sup>5</sup> , whichever is higher.	
Selenium	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.02 mg/L <sup>5</sup> , whichever is higher.	
Uranium	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.2 mg/L <sup>5</sup> , whichever is higher.	
Zinc	80 <sup>th</sup> percentile of reference <sup>3</sup> OR 0.317 mg/L/ 0.060 mg/L (shallow/deep) <sup>4</sup> , whichever is higher	

- Triggers will be developed for each main hydrogeological unit.
- Until sufficient baseline data is available, Fitzroy Plan Water Quality Objectives for Zone 34 (deep and shallow groundwater – 80th percentile values) (DEHP 2011) will be used temporarily as trigger values where available. [Department of Environment and Heritage Protection, 2011. Isaac River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Isaac River Sub-basin (including Connors River). State of Queensland, 2011.]
- Trigger values derived from estimates of 20th and 80<sup>th</sup> percentiles based on DSITI (2017) *Using monitoring data to assess groundwater quality and potential environmental impacts*. Version 1. Department of Science, Information Technology and Innovation. Trigger values derived from estimates of 20th or 80th percentiles at a reference site based on a minimum of 18 samples using Department of Environment and Heritage Protection (2009) *Queensland Water Quality Guidelines* methodology (Section 4.3.3). An interim trigger value can be derived from estimates of 20th or 80th percentiles at a reference site based on > 8 but <17 samples using Department of Environment and Heritage Protection (2009) *Queensland Water Quality Guidelines* methodology (Section 4.3.3).
- Isaac River Sub-basin Quality Objectives for Zone 34 (deep and shallow groundwater – 80th percentile values) (DEHP 2011). [Department of Environment and Heritage Protection, 2011. Isaac River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Isaac River Sub-basin (including Connors River). State of Queensland, 2011.]
- Water quality trigger values (low risk) for heavy metals and metalloids in livestock drinking water (ANZECC 2000).
- Reference sites must: (a) have a similar flow regime (b) be from the same bio-geographic and climatic region (c) have similar geology, soil types and topography (d) not be so close to the test sites that any disturbance at the test site also results in a change at the reference site
- All metals and metalloids must be measured as total (unfiltered) and dissolved (<0.45 µm filtered). Contaminant limits for metals and metalloids are only considered to be exceeded if the results for dissolved metal or metalloid exceed the trigger level or contaminant limit.
- The quality characteristics and/or trigger levels in Table E2 may be reviewed if sufficient data is available to adequately demonstrate negligible environmental risk, and it may be determined that a reduced monitoring frequency is appropriate or that certain quality characteristics can be removed from Table E2 by amendment.

**c) Detail of additional groundwater monitoring bores, particularly in the vicinity of wetlands**

Table E1 of the draft EA has been updated to include the locations of the reference and compliance bores proposed for the Project. The revised draft EA is provided in Appendix B. Table E1 has been reproduced below, as Table 13-2.

**Table 13-2  
Groundwater Monitoring Locations and Frequency - Stage 1 Mining Operations**

Monitoring Point	Location		Surface RL (m AHD) <sup>1</sup>	Monitoring Frequency
	Easting	Northing		
<b>Reference Bores<sup>2</sup></b>				
GW22	640193*	7547639*	182.00	Q
GW23	646895*	7537007*	169.09	D/Q
GW24	648450*	7533805*	166.00	D/Q
GW25	640345*	7540008*	185.97	D/Q
GW26	639307*	7538727*	192.71	D/Q
GW27	639465*	7535303*	178.00	D/Q
GW28	642729*	7533536*	172.01	D/Q
RN158484	648152	7524058	160.00	D/Q
GW01s	642481	7547491	180.65	D/Q
GW02s	641152	7546517	179.11	D/Q
GW02d	641141	7546507	179.11	D/Q
GW04	643388	7544973	178.23	D/Q
GW06s	639329	7542005	191.77	D/Q
GW08s	645312	7539839	172.27	D/Q
GW12s	641504	7532788	175.84	D/Q
S11	642455	7545332	178.45	D/Q
S8	642340	7546343	177.84	D/Q
S4	641567	7546845	178.85	D/Q
S5	642239	7547332	179.26	D/Q
S2	641386	7547617	176.97	D/Q
GW01d (VWP1, VWP2, VWP3, VWP4)	642479	7547491	181.58	D
GW06d (VWP1, VWP2, VWP3, VWP4)	639334	7542008	192.86	D
GW08d (VWP1, VWP2, VWP3, VWP4)	645312	7539846	172.18	D
GW12d (VWP1, VWP2, VWP3, VWP4)	641495	7532795	176.89	D
Bore 8 <sup>3</sup>	640186	7547990	188.00	Q
Swamp Bore <sup>3</sup>	645595	7528661	171.00	Q
RN122458 (Rolfies #2) <sup>3</sup>	644971	7526779	174.00	Q
RN122458 (Rolfies #1) <sup>3</sup>	644973	7526776	172.00	Q
<b>Compliance Bores</b>				
GW22	640193*	7547639*	182.00	Q
GW23	646895*	7537007*	169.09	D/Q
GW24	648450*	7533805*	166.00	D/Q
GW26	639307*	7538727*	192.71	D/Q
GW27	639465*	7535303*	178.00	D/Q
GW01s	642481	7547491	180.65	D/Q

**Table 13-2 (Continued)**  
**Groundwater Monitoring Locations and Frequency - Stage 1 Mining Operations**

Monitoring Point	Location		Surface RL (m AHD) <sup>1</sup>	Monitoring Frequency
GW21s	661590	7521656	162.07	D/Q
GW21d	661585	7521655	162.09	D/Q
GW01d (VWP1, VWP2, VWP3, VWP4)	642479	7547491	181.58	D
GW06d (VWP1, VWP2, VWP3, VWP4)	639334	7542008	192.86	D
GW12d (VWP1, VWP2, VWP3, VWP4)	641495	7532795	176.89	D
Bore 8 <sup>3</sup>	640186	7547990	188.00	Q
Swamp Bore <sup>3</sup>	645595	7528661	171.00	Q
RN122458 (Rolfies #2) <sup>3</sup>	644971	7526779	174.00	Q
RN122458 (Rolfies #1) <sup>3</sup>	644973	7526776	172.00	Q

Refer to **Schedule 1 Figure 2** for monitoring locations.

Monitoring is not required where a bore has been removed as a direct result of the mining activity.

\* Approximate location only, to be confirmed.

1. RL must be measured to the nearest 5cm from the top of the bore casing.
2. Reference sites must: (a) have a similar flow regime (b) be from the same bio-geographic and climatic region (c) have similar geology, soil types and topography (d) not be so close to the test sites that any disturbance at the test site also results in a change at the reference site.
3. Subject to landholder access.

D = Daily monitoring frequency using automatic logger.

Q = Quarterly monitoring frequency (i.e. dipped and sampled).

D/Q = Daily monitoring frequency using automatic logger and manually dipped and sampled on a quarterly basis.

Further to this, a description of the GDE and wetland monitoring which Pembroke is proposing is outlined in Appendix E. In summary, Pembroke will prepare and implement a GDE and wetland monitoring program to detect potential impacts on GDEs and wetlands associated with the Project.

The GDE and Wetland Monitoring Program to be implemented by Pembroke within/adjacent riparian vegetation and HES wetlands not proposed to be cleared by the Project (e.g. HES2, HES3, HES5, HES7 and HES8 as shown in Appendix E). This will include monitoring of:

- groundwater depth and quality;
- health of the terrestrial vegetation; and
- surface water quantity and quality.

Selection of GDE monitoring sites will be undertaken in consideration of the GDE mapping tools recommended in Richardson *et al.* (2011) and Emelyanova *et al.* (2017).

**3. If a full EA is sought, specific water quality objectives, release limits and trigger levels must be nominated and supported by sufficient sampling and analysis.**

The draft EA has been updated and is now considered to be a 'full EA'. This includes specific water quality objectives, release limits and trigger levels (as shown in Tables 13-1 and 13-2 above). The proposed groundwater monitoring network has been developed by HydroSimulations and the proposed monitoring program was subject to peer review by Dr Frans Kalf.

Attachment 13-1  
Baseline Groundwater Quality Data  
(April 2018 - November 2018)

Parameter	Date	GW01s	GW02d	GW02s	GW8s	GW12s	GW18d	GW18s	GW21d	GW21s
pH (field)	Nov_18	6.49	7.26	6.55	no data	6.48	6.72	6.98	6.92	7.08
	Aug_18	6.39	7.22	6.53	no data	6.46	7.5	7.08	6.9	7.09
	Jul_18	6.45	7.21	6.53	no data	6.45	7.54	7.06	6.82	6.77
	Jun_18	6.43	7.3	6.62	no data	6.67	7.68	7.08	6.88	7.12
	Apr_18	6.01	7.03	6.36	no data	6.29	7.38	6.9	6.79	7.02
	Jan_18	6.23	7.04	6.4	no data	6.32	6.63	6.81	9.8	7.05
EC (field)	Nov_18	388.6	15,982	41,897	no data	31,182	31,291	13,950	31,083	5,118
	Aug_18	367.5	13,880	42,853	no data	30,494	15,955	12,481	26,727	4,406
	Jul_18	345.3	12,840	39,894	no data	30,449	14,718	8,780	26,610	4,394
	Jun_18	378.3	13,780	39,048	no data	28,031	14,157	6,990	27,776	3,690
	Apr_18	359.1	12,460	33,790	no data	26,020	13,940	4,711	24,240	3,777
	Jan_18	385.9	16,084	42,955	no data	30,447	28,043	13,054	30,125	4,978
Total Dissolved Solids @180°C	Nov_18	172	10,100	41,100	no data	21,000	19,100	6,320	18,200	no data
	Aug_18	173	6,890	29,300	no data	15,700	8,350	6,030	18,000	2,410
	Jul_18	190	7,820	35,600	no data	17,000	12,200	5,050	13,900	2,170
	Jun_18	186	8,350	29,300	no data	18,600	8,460	4,590	16,200	2,740
	Apr_18	186	5,900	18,400	no data	17,700	14,300	2,570	14,600	2,160
	Jan_18	196	9480	35500		18500	16500	7820	15500	2250
Suspended Solids (SS)	Nov_18	<5	<5	721	no data	<5	10	39	18	no data
	Aug_18	<5	14	136	no data	<5	14	366	38	316
	Jul_18	<5	<5	628	no data	16	10	191	21	1,010
	Jun_18	<5	6	19	no data	<5	12	78	14	514
	Apr_18	<5	8	448	no data	<5	13	200	26	1,220
	Jan_18	<5	<5	1570		<5	<5	187	<5	275
Total Hardness as CaCO3	Jan_18	66	1410	10700		3900	5110	3500	5350	489
Hydroxide Alkalinity as CaCO3	Nov_18	<1	<1	<1	no data	<1	<1	<1	<1	no data
	Aug_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Jul_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Jun_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Apr_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Jan_18									
Carbonate Alkalinity as CaCO3	Nov_18	<1	<1	<1	no data	<1	<1	<1	<1	no data
	Aug_18	<1	13	<1	no data	<1	3	<1	<1	50
	Jul_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Jun_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Apr_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Jan_18									
Bicarbonate Alkalinity as CaCO3	Nov_18	93	369	552	no data	660	439	1,680	539	no data
	Aug_18	94	278	390	no data	543	221	1,180	305	266
	Jul_18	90	272	466	no data	573	277	1,640	453	313
	Jun_18	106	319	525	no data	649	267	1,500	520	362
	Apr_18	99	344	513	no data	641	340	1,150	506	376
	Jan_18									
Total Alkalinity as CaCO3	Nov_18	93	369	552	no data	660	439	1,680	539	no data
	Aug_18	94	291	390	no data	543	224	1,180	305	316
	Jul_18	90	272	466	no data	573	277	1,640	453	313
	Jun_18	106	319	525	no data	649	267	1,500	520	362
	Apr_18	99	344	513	no data	641	340	1,150	506	376
	Jan_18									
Sulfate as SO4 - Turbidimetric	Nov_18	7	<1	2,030	no data	1,170	1,200	987	74	no data
	Aug_18	7	4	2,280	no data	910	229	702	233	79
	Jul_18	6	4	1,930	no data	1,240	528	561	266	79
	Jun_18	6	1	1,890	no data	1,270	110	447	289	76
	Apr_18	12	<1	1,760	364	1,220	599	277	271	79



Attachment 13-1  
 Baseline Groundwater Quality Data  
 (April 2018 - November 2018)

Parameter	Date	GW01s	GW02d	GW02s	GW8s	GW12s	GW18d	GW18s	GW21d	GW21s
	Jan_18									
Chloride	Nov_18	40	4,590	11,700	no data	8,140	8,160	3,080	8,410	no data
	Aug_18	41	4,320	11,900	no data	8,410	4,670	2,490	8,720	1,020
	Jul_18	38	4,460	12,200	no data	8,890	6,220	1,720	9,070	1,080
	Jun_18	40	4,340	11,800	no data	8,630	4,460	1,230	8,910	1,070
	Apr_18	40	4,460	12,900	3,280	9,560	6,680	900	9,010	941
	Jan_18									
Calcium	Nov_18	16	415	1,240	no data	429	924	452	932	no data
	Aug_18	15	414	1,330	no data	450	289	405	1,080	88
	Jul_18	13	339	1,190	no data	412	481	303	1,020	79
	Jun_18	16	362	1,060	no data	416	204	220	920	81
	Apr_18	17	375	1,180	108	409	508	150	1,060	80
Magnesium	Nov_18	7	119	1,470	no data	687	908	577	623	no data
	Aug_18	7	123	1,530	no data	713	177	515	804	64
	Jul_18	6	111	1,370	no data	652	446	366	781	58
	Jun_18	7	120	1,410	no data	696	110	271	848	56
	Apr_18	7	122	1,380	173	660	483	178	857	54
Sodium	Nov_18	36	2,400	5,210	no data	4,680	3,540	1,450	3,630	no data
	Aug_18	39	2,420	5,550	no data	5,020	2,800	1,440	3,660	717
	Jul_18	36	2,080	5,180	no data	4,680	2,550	1,170	3,490	654
	Jun_18	42	2,200	5,330	no data	4,800	2,410	867	3,340	630
	Apr_18	40	2,420	4,810	1860	4,640	2,960	609	3,490	591
Potassium	Nov_18	3	13	11	no data	35	11	1	21	no data
	Aug_18	3	14	14	no data	36	11	<1	21	1
	Jul_18	3	12	12	no data	34	10	<1	20	1
	Jun_18	3	13	12	no data	37	8	<1	18	2
	Apr_18	4	15	13	<10	36	11	<1	22	2
Total Hardness as CaCO3	Nov_18	69	1,530	9,150	no data	3,900	6,050	3,500	4,890	no data
	Aug_18	66	1,540	9,740	no data	4,060	1,450	3,130	6,010	483
	Jul_18	57	1,300	8,610	no data	3,710	3,040	2,260	5,760	436
	Jun_18	69	1,400	9,250	no data	3,900	962	1,660	6,460	433
	Apr_18	71	1,440	7,780	982	3,740	3,260	1,110	6,180	422
Aluminium	Nov_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	no data
	Aug_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Jul_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Jun_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Apr_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	0.01	<0.01
Arsenic	Nov_18	<0.001	0.012	<0.010	no data	<0.001	0.001	0.003	0.002	no data
	Aug_18	<0.001	0.009	<0.010	no data	<0.001	0.001	0.004	0.003	0.003
	Jul_18	<0.001	0.006	<0.001	no data	<0.001	0.001	0.004	0.003	0.002
	Jun_18	<0.001	0.006	<0.001	no data	<0.001	<0.001	0.002	0.002	0.002
	Apr_18	<0.001	0.013	<0.001	no data	<0.001	0.001	0.002	0.004	0.003
Beryllium	Nov_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jul_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jun_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Apr_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	Nov_18	0.262	23.8	0.09	no data	0.045	0.186	0.291	10.8	no data
	Aug_18	0.282	20.6	0.096	no data	0.043	3.32	0.448	2.21	0.293
	Jul_18	0.303	19.6	0.113	no data	0.047	3.42	0.381	1.84	0.281
	Jun_18	0.27	17.2	0.108	no data	0.059	5.2	0.292	1.44	0.271
	Apr_18	0.25	23.2	0.122	no data	0.045	0.873	0.204	1.6	0.262
Cadmium	Nov_18	<0.0001	<0.0001	<0.0010	no data	<0.0001	<0.0001	<0.0001	<0.0001	no data
	Aug_18	<0.0001	<0.0001	<0.0010	no data	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jul_18	<0.0001	<0.0001	0.0005	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jun_18	<0.0001	<0.0001	0.0005	no data	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Apr_18	<0.0001	<0.0001	0.0005	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	Nov_18	<0.001	<0.001	<0.010	no data	0.008	<0.001	0.002	<0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	0.01	<0.001	<0.001	0.002	<0.001
	Jul_18	<0.001	<0.001	<0.001	no data	0.009	<0.001	<0.001	0.003	0.002
	Jun_18	<0.001	<0.001	0.001	no data	0.004	<0.001	<0.001	0.002	<0.001
	Apr_18	<0.001	<0.001	<0.001	no data	0.011	<0.001	<0.001	0.007	<0.001

Attachment 13-1  
Baseline Groundwater Quality Data  
(April 2018 - November 2018)

Parameter	Date	GW01s	GW02d	GW02s	GW8s	GW12s	GW18d	GW18s	GW21d	GW21s
Cobalt	Nov_18	<0.001	0.006	<0.010	no data	0.002	<0.001	0.002	<0.001	no data
	Aug_18	<0.001	0.003	<0.010	no data	0.002	<0.001	0.002	<0.001	<0.001
	Jul_18	<0.001	<0.001	0.01	no data	0.002	<0.001	<0.001	<0.001	<0.001
	Jun_18	<0.001	<0.001	0.016	no data	0.004	<0.001	<0.001	<0.001	<0.001
	Apr_18	<0.001	0.007	0.013	no data	0.003	<0.001	0.001	<0.001	<0.001
Copper	Nov_18	0.031	<0.001	1.16	no data	0.287	<0.001	0.005	<0.001	no data
	Aug_18	0.02	0.002	1.16	no data	0.121	<0.001	0.019	<0.001	0.008
	Jul_18	0.151	0.001	1.03	no data	0.325	<0.001	0.019	<0.001	0.009
	Jun_18	0.001	0.005	0.553	no data	1.27	<0.001	0.004	<0.001	0.01
	Apr_18	0.002	0.008	0.742	no data	0.242	0.002	0.011	0.003	0.012
Lead	Nov_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jul_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jun_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Apr_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	Nov_18	0.016	1.67	0.914	no data	0.011	0.199	0.153	4.46	no data
	Aug_18	0.025	2.23	0.948	no data	0.006	0.243	0.098	3.01	0.006
	Jul_18	0.037	2.72	1.04	no data	0.004	0.224	0.042	2.72	0.027
	Jun_18	0.031	2.61	1.43	no data	0.036	0.223	0.032	1.8	0.04
	Apr_18	0.023	2.64	1.22	no data	0.011	0.224	0.039	2.42	0.027
Molybdenum	Nov_18	<0.001	0.004	<0.010	no data	<0.001	0.002	0.003	0.002	no data
	Aug_18	<0.001	0.003	<0.010	no data	<0.001	0.002	0.003	<0.001	<0.001
	Jul_18	<0.001	0.002	<0.001	no data	<0.001	<0.001	0.002	<0.001	<0.001
	Jun_18	<0.001	0.002	<0.001	no data	0.004	<0.001	0.002	<0.001	<0.001
	Apr_18	<0.001	0.003	<0.001	no data	<0.001	0.002	0.001	<0.001	<0.001
Nickel	Nov_18	0.001	0.005	0.018	no data	0.016	0.002	0.011	0.007	no data
	Aug_18	0.002	0.005	0.026	no data	0.021	0.002	0.008	0.01	0.017
	Jul_18	<0.001	0.008	0.024	no data	0.016	0.002	0.005	0.013	0.037
	Jun_18	0.003	0.004	0.029	no data	0.046	0.002	0.007	0.015	0.029
	Apr_18	0.004	0.006	0.03	no data	0.02	0.002	0.006	0.019	0.032
Selenium	Nov_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	no data
	Aug_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	0.01
	Jul_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	0.01
	Jun_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	0.01
	Apr_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	Nov_18	<0.001	<0.001	<0.010	no data	0.001	<0.001	<0.001	<0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jul_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jun_18	<0.001	<0.001	0.001	no data	0.002	<0.001	<0.001	<0.001	<0.001
	Apr_18	<0.001	<0.001	<0.001	no data	0.002	<0.001	<0.001	<0.001	<0.001
Uranium	Nov_18	<0.001	<0.001	0.032	no data	0.009	<0.001	0.071	<0.001	no data
	Aug_18	<0.001	<0.001	0.029	no data	0.009	<0.001	0.063	0.002	0.002
	Jul_18	<0.001	<0.001	0.028	no data	0.009	<0.001	0.048	0.002	0.002
	Jun_18	<0.001	<0.001	0.028	no data	0.009	<0.001	0.037	0.002	0.002
	Apr_18	<0.001	<0.001	0.026	no data	0.01	<0.001	0.023	0.002	0.002
Vanadium	Nov_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	no data
	Aug_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	0.01	<0.01	<0.01
	Jul_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	0.02	<0.01	<0.01
	Jun_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	0.02	<0.01	<0.01
	Apr_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	0.02	<0.01	<0.01
Zinc	Nov_18	<0.005	0.023	<0.050	no data	0.013	<0.005	<0.005	0.011	no data
	Aug_18	<0.005	0.027	<0.050	no data	0.013	<0.005	<0.005	0.006	<0.005
	Jul_18	<0.005	0.037	0.03	no data	0.012	0.006	<0.005	0.008	0.006
	Jun_18	0.006	0.034	0.023	no data	0.06	0.008	<0.005	0.015	0.015
	Apr_18	0.014	0.033	0.024	no data	0.027	0.012	0.007	0.034	<0.005
Boron	Nov_18	0.07	0.25	0.67	no data	1.53	0.29	0.8	0.33	no data
	Aug_18	0.05	0.23	0.63	no data	1.72	0.27	0.8	0.41	1.21
	Jul_18	<0.05	0.21	0.65	no data	1.67	0.24	0.67	0.42	1.26
	Jun_18	0.05	0.23	0.7	no data	1.69	0.26	0.6	0.39	1.13
	Apr_18	0.06	0.19	0.58	no data	1.65	0.31	0.39	0.42	1.11
Iron	Nov_18	<0.05	6.58	<0.10	no data	<0.05	4.8	<0.05	1.44	no data
	Aug_18	<0.05	5.88	<0.50	no data	<0.05	0.35	<0.05	0.54	<0.05

Attachment 13-1  
Baseline Groundwater Quality Data  
(April 2018 - November 2018)

Parameter	Date	GW01s	GW02d	GW02s	GW8s	GW12s	GW18d	GW18s	GW21d	GW21s
	Jul_18	<0.05	4.06	<0.05	no data	<0.05	0.39	<0.05	0.55	<0.05
	Jun_18	<0.05	4.74	<0.05	no data	<0.05	0.27	<0.05	0.42	<0.05
	Apr_18	<0.05	8.94	<0.05	no data	<0.05	2	<0.05	0.35	<0.05
Aluminium	Nov_18	0.01	<0.01	<0.10	no data	0.02	0.02	0.09	<0.01	no data
	Aug_18	0.09	0.1	0.27	no data	0.06	0.08	8.52	1.66	4.77
	Jul_18	0.05	0.01	1.52	no data	0.09	0.02	0.81	0.02	6.56
	Jun_18	0.02	<0.01	0.07	no data	0.02	0.05	0.08	0.02	1.93
	Apr_18	0.03	0.02	0.9	no data	<0.01	0.06	2.48	0.05	12.6
Arsenic	Nov_18	<0.001	0.013	<0.010	no data	<0.001	0.001	0.003	0.002	no data
	Aug_18	<0.001	0.008	<0.010	no data	<0.001	0.001	0.008	0.006	0.004
	Jul_18	<0.001	0.006	0.001	no data	<0.001	0.001	0.004	0.004	0.004
	Jun_18	<0.001	0.007	0.005	no data	0.006	0.005	0.006	0.007	0.005
	Apr_18	<0.001	0.014	0.002	no data	<0.001	0.002	0.004	0.005	0.006
Beryllium	Nov_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jul_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jun_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Apr_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	Nov_18	0.26	26.1	0.1	no data	0.049	0.187	0.294	4.3	no data
	Aug_18	0.327	21.5	0.114	no data	0.043	2.97	1.27	3.69	0.327
	Jul_18	0.269	18.9	0.16	no data	0.044	2.77	0.393	2.27	0.331
	Jun_18	0.261	18.3	0.126	no data	0.094	3.48	0.289	1.7	0.312
	Apr_18	0.234	22.6	0.148	no data	0.04	0.728	0.243	2.38	0.316
Cadmium	Nov_18	<0.0001	<0.0001	<0.0010	no data	<0.0001	<0.0001	<0.0001	<0.0001	no data
	Aug_18	<0.0001	<0.0001	<0.0010	no data	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jul_18	<0.0001	<0.0001	0.0004	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jun_18	<0.0001	<0.0001	0.0005	no data	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
	Apr_18	<0.0001	<0.0001	0.0003	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	Nov_18	<0.001	<0.001	<0.010	no data	0.009	<0.001	0.004	0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	0.012	0.003	0.034	0.01	0.014
	Jul_18	<0.001	<0.001	0.005	no data	0.012	<0.001	0.003	0.004	0.021
	Jun_18	<0.001	<0.001	<0.001	no data	0.006	<0.001	0.002	0.004	0.004
	Apr_18	<0.001	<0.001	0.004	no data	0.012	<0.001	0.01	0.007	0.04
Cobalt	Nov_18	<0.001	0.006	<0.010	no data	0.002	<0.001	0.003	<0.001	no data
	Aug_18	<0.001	0.002	0.012	no data	0.002	<0.001	0.082	0.017	0.006
	Jul_18	<0.001	<0.001	0.016	no data	0.002	<0.001	0.012	<0.001	0.01
	Jun_18	<0.001	<0.001	0.017	no data	0.003	<0.001	0.001	<0.001	0.01
	Apr_18	<0.001	0.006	0.017	no data	0.002	<0.001	0.02	0.002	0.017
Copper	Nov_18	0.033	<0.001	1.28	no data	0.376	<0.001	0.007	<0.001	no data
	Aug_18	0.018	0.01	1.34	no data	0.191	0.072	0.168	0.034	0.031
	Jul_18	0.138	0.005	1.22	no data	0.286	0.002	0.039	<0.001	0.05
	Jun_18	<0.001	0.015	0.575	no data	1.22	0.003	0.004	0.002	0.073
	Apr_18	0.004	0.01	0.821	no data	0.125	0.005	0.033	0.006	0.106
Lead	Nov_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	0.016	0.003	0.002
	Jul_18	<0.001	<0.001	0.002	no data	<0.001	<0.001	0.001	<0.001	0.003
	Jun_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	0.003
	Apr_18	<0.001	0.001	<0.001	no data	<0.001	<0.001	0.003	<0.001	0.006
Manganese	Nov_18	0.018	1.7	1.03	no data	0.016	0.195	0.165	5.25	no data
	Aug_18	0.032	2.92	1.03	no data	0.006	0.25	1.1	3.61	0.115
	Jul_18	0.04	2.61	1.12	no data	0.004	0.208	0.298	2.88	0.225
	Jun_18	0.032	2.52	1.44	no data	0.031	0.215	0.064	2.28	0.243
	Apr_18	0.027	2.4	1.34	no data	0.009	0.216	0.263	2.69	0.355
Molybdenum	Nov_18	<0.001	0.004	<0.010	no data	<0.001	0.002	0.003	0.002	no data
	Aug_18	<0.001	0.003	<0.010	no data	0.002	0.002	0.003	0.001	0.001
	Jul_18	<0.001	0.002	<0.001	no data	<0.001	0.001	0.002	<0.001	<0.001
	Jun_18	<0.001	0.002	<0.001	no data	0.003	0.002	0.002	<0.001	<0.001
	Apr_18	<0.001	0.003	<0.001	no data	<0.001	0.003	0.001	0.002	<0.001
Nickel	Nov_18	0.001	0.006	0.026	no data	0.02	0.002	0.012	0.006	no data
	Aug_18	0.001	0.01	0.022	no data	0.025	0.009	0.051	0.028	0.034
	Jul_18	0.001	0.012	0.035	no data	0.015	0.003	0.01	0.013	0.057
	Jun_18	0.003	0.005	0.03	no data	0.038	0.003	0.008	0.017	0.048

Attachment 13-1  
Baseline Groundwater Quality Data  
(April 2018 - November 2018)

Parameter	Date	GW01s	GW02d	GW02s	GW8s	GW12s	GW18d	GW18s	GW21d	GW21s
	Apr_18	0.005	0.005	0.038	no data	0.018	0.003	0.016	0.022	0.084
Selenium	Nov_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	no data
	Aug_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Jul_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	0.01
	Jun_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Apr_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	Nov_18	<0.001	<0.001	<0.010	no data	<0.001	<0.001	<0.001	<0.001	no data
	Aug_18	<0.001	<0.001	<0.010	no data	0.001	<0.001	<0.001	<0.001	0.002
	Jul_18	<0.001	<0.001	<0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Jun_18	<0.001	<0.001	0.001	no data	<0.001	<0.001	<0.001	<0.001	<0.001
	Apr_18	<0.001	<0.001	0.002	no data	0.001	<0.001	<0.001	<0.001	<0.001
Uranium	Nov_18	<0.001	<0.001	0.034	no data	0.009	<0.001	0.072	0.001	no data
	Aug_18	<0.001	<0.001	0.03	no data	0.009	0.002	0.071	0.017	0.002
	Jul_18	<0.001	<0.001	0.029	no data	0.009	<0.001	0.05	0.002	0.002
	Jun_18	<0.001	<0.001	0.027	no data	0.009	<0.001	0.037	0.002	0.002
	Apr_18	<0.001	<0.001	0.027	no data	0.01	<0.001	0.026	0.002	0.002
Vanadium	Nov_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	<0.01	<0.01	no data
	Aug_18	<0.01	<0.01	<0.10	no data	<0.01	<0.01	0.05	<0.01	0.02
	Jul_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	0.02	<0.01	0.03
	Jun_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	0.01	<0.01	0.02
	Apr_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	0.03	<0.01	0.04
Zinc	Nov_18	<0.005	0.034	<0.052	no data	0.016	<0.005	<0.005	<0.005	no data
	Aug_18	<0.005	0.047	<0.052	no data	0.012	0.015	0.073	0.088	0.021
	Jul_18	<0.005	0.045	0.049	no data	0.011	<0.005	0.008	0.029	0.022
	Jun_18	0.005	0.051	0.024	no data	0.043	0.014	<0.005	0.086	0.03
	Apr_18	0.013	0.043	0.04	no data	0.016	0.02	0.023	0.156	0.036
Boron	Nov_18	0.05	0.23	0.72	no data	1.5	0.3	0.91	0.42	no data
	Aug_18	0.07	0.36	0.67	no data	1.56	0.67	0.98	0.67	1.22
	Jul_18	<0.05	0.22	0.68	no data	1.57	0.25	0.65	0.41	1.27
	Jun_18	<0.05	0.2	0.66	no data	1.64	0.3	0.55	0.48	1.31
	Apr_18	0.05	0.24	0.72	no data	1.69	0.35	0.39	0.42	1.2
Iron	Nov_18	<0.05	7.93	0.19	no data	<0.05	5.34	0.28	3.27	no data
	Aug_18	0.21	5.59	0.69	no data	0.12	1.04	19.8	6.42	6.18
	Jul_18	0.12	4.07	2.81	no data	0.05	0.88	1.74	2.26	8.78
	Jun_18	<0.05	4.84	0.09	no data	0.05	0.55	0.2	2.34	2.45
	Apr_18	0.06	8.46	1.85	no data	<0.05	5.62	5.49	1.65	19.1
Mercury	Nov_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	no data
	Aug_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jul_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jun_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Apr_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury	Nov_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	no data
	Aug_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jul_18	<0.0001	<0.0001	<0.0001	no data	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Jun_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Apr_18	<0.0001	<0.0001	<0.0001	no data	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluoride	Nov_18	<0.1	0.1	0.6	no data	0.4	0.2	0.9	0.3	no data
	Aug_18	<0.1	0.1	0.5	no data	0.4	0.3	0.5	0.1	0.8
	Jul_18	0.1	0.2	0.7	no data	0.4	0.3	1.4	0.2	0.8
	Jun_18	<0.1	0.2	0.6	no data	0.4	0.3	1.2	0.2	0.7
	Apr_18	0.2	<0.1	0.5	no data	0.3	0.2	1	0.1	0.7
Ammonia as N	Nov_18	0.01	4.39	0.17	no data	<0.05	2.64	<0.05	3.87	no data
	Aug_18	<0.01	4.38	<0.05	no data	<0.01	4.69	0.02	2.07	0.02
	Jul_18	<0.01	4.44	<0.05	no data	<0.05	4.32	<0.01	1.89	0.01
	Jun_18	<0.01	4.55	0.06	no data	0.01	4.63	<0.01	1.45	<0.01
	Apr_18	0.01	4.4	0.32	no data	0.02	3.09	0.02	1.77	0.02
Nitrite as N	Nov_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	no data
	Aug_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Jul_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Jun_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
	Apr_18	<0.01	<0.01	<0.01	no data	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	Nov_18	0.1	0.02	0.18	no data	0.05	0.04	0.08	0.02	no data

Attachment 13-1  
Baseline Groundwater Quality Data  
(April 2018 - November 2018)

Parameter	Date	GW01s	GW02d	GW02s	GW8s	GW12s	GW18d	GW18s	GW21d	GW21s
	Aug_18	0.05	<0.01	0.18	no data	0.05	<0.01	0.02	<0.01	3.7
	Jul_18	0.08	<0.01	0.18	no data	0.04	<0.01	0.11	<0.01	2.86
	Jun_18	0.12	<0.01	0.28	no data	0.03	0.03	0.06	0.04	2.76
	Apr_18	0.12	0.01	0.25	no data	0.05	<0.01	0.02	<0.01	2.81
Nitrite + Nitrate as N	Nov_18	0.1	0.02	0.18	no data	0.05	0.04	0.08	0.02	no data
	Aug_18	0.05	<0.01	0.18	no data	0.05	<0.01	0.02	<0.01	3.7
	Jul_18	0.08	<0.01	0.18	no data	0.04	<0.01	0.11	<0.01	2.86
	Jun_18	0.12	<0.01	0.28	no data	0.03	0.03	0.06	0.04	2.76
	Apr_18	0.12	0.01	0.25	no data	0.05	<0.01	0.02	<0.01	2.81
Total Kjeldahl Nitrogen as N	Nov_18	<0.1	5.6	<0.5	no data	<0.5	<5.0	<0.2	3.8	no data
	Aug_18	<0.1	7.6	<0.5	no data	<0.5	4.6	0.6	1.8	0.6
	Jul_18	<0.1	5.9	<0.5	no data	<0.5	4.6	<0.1	2	0.3
	Jun_18	<0.1	8.5	<0.5	no data	<0.5	5.1	0.1	1.6	0.7
	Apr_18	0.2	6.3	<0.5	no data	<0.5	3.2	<0.1	1.5	0.5
Total Nitrogen as N	Nov_18	0.1	5.6	<0.5	no data	<0.5	<5.0	<0.2	3.8	no data
	Aug_18	<0.1	7.6	<0.5	no data	<0.5	4.6	0.6	1.8	4.3
	Jul_18	<0.1	5.9	<0.5	no data	<0.5	4.6	0.1	2	3.2
	Jun_18	0.1	8.5	<0.5	no data	<0.5	5.1	0.2	1.6	3.5
	Apr_18	0.3	6.3	<0.5	no data	<0.5	3.2	<0.1	1.5	3.3
Total Phosphorus as P	Nov_18	<0.01	0.25	<0.05	no data	<0.05	<0.05	0.2	0.2	no data
	Aug_18	0.01	0.07	<0.05	no data	<0.05	0.07	0.81	0.34	0.25
	Jul_18	0.05	0.13	0.1	no data	<0.05	0.05	0.31	0.4	0.25
	Jun_18	<0.01	5.4	0.1	no data	<0.05	0.04	0.36	0.3	0.45
	Apr_18	0.02	0.14	0.12	no data	<0.05	0.05	0.28	0.26	0.25
Reactive Phosphorus as P	Nov_18	<0.01	0.22	0.04	no data	<0.01	<0.01	0.2	0.1	no data
	Aug_18	0.03	0.16	0.03	no data	<0.01	<0.01	0.22	0.12	0.18
	Jul_18	<0.01	0.15	0.04	no data	<0.01	<0.01	0.31	0.4	0.2
	Jun_18	<0.01	0.19	0.04	no data	<0.01	0.03	0.3	0.02	0.28
	Apr_18	<0.01	0.13	0.03	no data	<0.01	<0.01	0.17	0.26	0.2
Total Anions	Nov_18	3.13	137	383	no data	267	264	141	250	no data
	Aug_18	3.18	128	391	no data	267	141	108	257	36.7
	Jul_18	3	131	394	no data	288	192	93	270	38.4
	Jun_18	3.37	129	383	no data	283	133	74	268	39
	Apr_18	3.36	133	411	no data	308	208	54.1	270	35.7
Total Cations	Nov_18	3.02	135	410	no data	282	275	133	256	no data
	Aug_18	3.1	136	434	no data	300	151	125	280	40.9
	Jul_18	2.78	117	398	no data	279	172	96.1	267	37.2
	Jun_18	3.28	124	401	no data	288	124	71	261	36.1
	Apr_18	3.27	134	382	no data	277	194	48.6	276	34.2
Ionic Balance	Nov_18	1.87	0.6	3.33	no data	2.77	2.07	2.87	1.32	no data
	Aug_18	1.32	3.27	5.22	no data	5.88	3.45	7.19	4.26	5.34
	Jul_18	3.63	5.84	0.52	no data	1.66	5.52	1.68	0.55	1.56
	Jun_18	1.4	1.92	2.34	no data	0.86	3.56	2.05	1.19	3.85
	Apr_18	1.35	0.64	3.63	no data	5.19	3.38	5.36	1.08	2.16
C6 - C9 Fraction	Nov_18	<20	<20	<20	no data	<20	<20	<20	<20	no data
	Aug_18	<20	<20	<20	no data	<20	<20	<20	<20	<20
	Jul_18	<20	<20	<20	no data	40	<20	<20	<20	<20
	Jun_18	<20	<20	<20	no data	<20	<20	<20	40	<20
	Apr_18	<20	<20	<20	no data	<20	<20	<20	<20	<20
C10 - C14 Fraction	Nov_18	<50	<50	<50	no data	<50	<50	<50	<50	no data
	Aug_18	<50	<50	<50	no data	<50	<50	<50	<50	<50
	Jul_18	<50	<50	<50	no data	<50	<50	<50	<50	<50
	Jun_18	<50	<50	<50	no data	<50	<50	<50	<50	<50
	Apr_18	<50	<50	<50	no data	<50	<50	<50	<50	<50
C15 - C28 Fraction	Nov_18	<100	<100	<100	no data	<100	<100	<100	<100	no data
	Aug_18	<100	<100	<100	no data	<100	<100	<100	<100	<100
	Jul_18	<100	<100	<100	no data	<100	<100	<100	<100	<100
	Jun_18	<100	<100	<100	no data	<100	<100	<100	<100	<100
	Apr_18	<100	<100	<100	no data	<100	<100	<100	<100	<100
C29 - C36 Fraction	Nov_18	<50	<50	<50	no data	<50	<50	<50	<50	no data



Attachment 13-1  
Baseline Groundwater Quality Data  
(April 2018 - November 2018)

Parameter	Date	GW01s	GW02d	GW02s	GW8s	GW12s	GW18d	GW18s	GW21d	GW21s
meta- & para-Xylene	Nov_18	<2	<2	<2	no data	<2	<2	<2	<2	no data
	Aug_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Jul_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Jun_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Apr_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
ortho-Xylene	Nov_18	<2	<2	<2	no data	<2	<2	<2	<2	no data
	Aug_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Jul_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Jun_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Apr_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
Total Xylenes	Nov_18	<2	<2	<2	no data	<2	<2	<2	<2	no data
	Aug_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Jul_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Jun_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
	Apr_18	<2	<2	<2	no data	<2	<2	<2	<2	<2
Sum of BTEX	Nov_18	<1	<1	<1	no data	<1	<1	<1	<1	no data
	Aug_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Jul_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Jun_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
	Apr_18	<1	<1	<1	no data	<1	<1	<1	<1	<1
Naphthalene	Nov_18	<5	<5	<5	no data	<5	<5	<5	<5	no data
	Aug_18	<5	<5	<5	no data	<5	<5	<5	<5	<5
	Jul_18	<5	<5	<5	no data	<5	<5	<5	<5	<5
	Jun_18	<5	<5	<5	no data	<5	<5	<5	<5	<5
	Apr_18	<5	<5	<5	no data	<5	<5	<5	<5	<5
1,2-Dichloroethane-D4	Nov_18	119	108	114	no data	115	116	110	110	no data
	Aug_18	112	123	121	no data	116	114	109	115	113
	Jul_18	117	77.6	122	no data	120	116	115	99.2	117
	Jun_18	104	102	106	no data	97.3	108	104	89.6	106
	Apr_18	120	112	88.6	no data	82.1	102	107	112	115
Toluene-D8	Nov_18	116	95.8	91.3	no data	103	109	96.7	97	no data
	Aug_18	108	114	117	no data	106	111	101	103	111
	Jul_18	106	80.3	106	no data	107	110	110	112	106
	Jun_18	94.3	83	92	no data	84.6	93	89.7	90.2	93
	Apr_18	102	98.5	83	no data	84.6	120	89.4	114	105
4-Bromofluorobenzene	Nov_18	110	94.7	95.2	no data	95.2	106	99.2	102	no data
	Aug_18	112	123	126	no data	118	114	105	108	112
	Jul_18	112	79.8	111	no data	112	114	114	108	111
	Jun_18	102	95.5	99.9	no data	89.2	99.5	93.4	94.2	99.4
	Apr_18	105	102	92.1	no data	92.3	104	92.8	103	104