NSW GOVERNMENT

Transport for NSW

Western Harbour Tunnel and Warringah Freeway Upgrade

Appendix E – Groundwater memorandum

SEPTEMBER 2020

Jacobs

Memorandum

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Subject	Environmental Impact Statement; Groundwater assessment	**Project Name**	Western Harbour Tunnel and Warringah Freeway Upgrade
Attention	Jamie Crawford (Arcadis)	**Project No.**	IA146500
From	Pride Mangeya and Ben Rotter (Jacobs)		
Date	28 August 2020		

1. Purpose

This memorandum provides a response to issues raised by the NSW Environment Protection Authority and the Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator in relation to Appendix N (Technical working paper: Groundwater) of the environmental impact statement (EIS).

2. Reporting consistency and quality

2.1 Issue raised

Appendix N (Groundwater) does not satisfactorily addresses SEAR 1j, under 10. Water-Quality which states:
"The Proponent must identify proposed monitoring locations, monitoring frequency and indicators of surface and groundwater quality"
Table 5-10 and Figure 4-2 in Appendix N (Groundwater) of the EIS identify eight groundwater monitoring bores near the proposed infrastructure alignment have been used to sample groundwater quality since November 2017. However, these results differ from those shown in Appendix D of Appendix N, which provides the full analytical results (monthly samples) in that:
• Monitoring has not been done at regular intervals
• Maximum of six sampling rounds were conducted since the bores were constructed in November 2017.
The EPA also requests that all historic monthly data collected to date (sampling after April 2018 up until 2020) should be made available, updated and reported on.

2.2 Response

2.2.1 Proposed monitoring

Transport for NSW is committed to developing a groundwater monitoring program to support the construction and operation phases of the project (refer to environmental management measure (EMM) SG20 at Table D2-1 of this submissions report).

The locations and frequency of monitoring proposed for each potential impact of the project on groundwater as identified by the environmental impact statement, and for groundwater in general, are listed in Table 2.1.

Details of surface water monitoring locations are provided in Appendix O (Technical working paper: Surface water quality and hydrology).

Table 2.1 Potential impacts and proposed groundwater quality monitoring

Potential impact	Environmental impact statement assessment	Proposed monitoring
Activation of acid sulfate soils	Up to nine metres of drawdown at Rozelle Rail Yards and three metres of drawdown at Birchgrove Park (cumulative impact during operation). Acid sulfate soils could be activated if present, reducing the beneficial use of the aquifer	The monitoring program currently being carried out at the Rozelle Rail Yards by the M4-M5 Link is sufficient in addressing project requirements for the initial phases of the project. Any need for extension of monitoring beyond the M4-M5 Link program will be reviewed by an appropriately qualified person three months prior to the planned completion of the M4-M5 Link monitoring. The review of need will be based on the impacts due to tunnelling associated with the Western Harbour Tunnel. The project will also install one piezometer at Birchgrove Park. This piezometer will be screened in sediments near the shoreline. Frequency of the monitoring at Birchgrove Park would be monthly for a period of up to six months prior to construction (for baseline data), monthly during construction and monthly for a period of 12 months post construction. Monitoring at the Birchgrove Park site would record groundwater level and quality (pH to be measured at a minimum).
Migration of potential contaminants groundwater	High risk of the presence of contaminated groundwater at Rozelle Rail Yards and Waverton Park, with groundwater level drawdown of up to nine and two metres at these locations respectively (cumulative impact	With exception of the ventilation tunnels, the civil works and resulting groundwater drawdown in proximity to the Rozelle Rail Yards is primarily attributed to the M4-M5 Link.

Potential impact	Environmental impact statement assessment	Proposed monitoring
	during operation). Migration of contaminated groundwater could reduce the beneficial use of the aquifer. Other areas of environmental interest for contamination are not classified as high risk.	The M4-M5 Link's approval requirements and groundwater monitoring program at the Rozelle Rail Yard should be sufficient in meeting the project's monitoring requirements. Notwithstanding, an appropriately qualified person will assess the need for additional monitoring requirements, including the testing of analytes detailed in Table 2-2 below, at the Rozelle Rail Yards for the project during detailed design. The assessment of need will be based on impacts due to tunnelling associated with the Western Harbour Tunnel. At Waverton Park, piezometers will be installed and screened within the contaminated horizon, as well as the horizon below the contaminated horizon (in bedrock). Frequency of monitoring at Waverton Park will be monthly for a period up to six months prior to construction (for baseline data), monthly during construction and monthly for a period of 12 months post construction. Monitoring at Waverton Park will record groundwater level and the water quality analytes listed in Table 2.2.
Saline intrusion from bay waters	Modelling predicts that migration of the saline interface is negligible to minor. Impacts to other groundwater users and groundwater dependent ecosystems are not expected. However, the beneficial use of the aquifer could be impacted.	One piezometer will be installed within Birchgrove Park and one piezometer would be installed on Balls Head Drive (where tunnel is very deep) and within 40 metres of the tunnel alignment. Piezometers will be screened in the shallow sandstone. Monitoring will be for groundwater levels and electrical conductivity (at a minimum).

Potential impact	Environmental impact statement assessment	Proposed monitoring
		Frequency will be monthly for a period up to six months prior to construction (for baseline data), monthly during construction and monthly for a period of 12 months post construction.
Existing groundwater users	Reduced/loss of supply at private groundwater supply bores due to groundwater level drawdown of up to four metres at bore GW109209, and two metres at bores GW108991 and GW107764 (cumulative impact during operation).	If existing private groundwater supply bores GW109209, GW108991 and GW107764 are found to be viable, monitoring of groundwater levels and electrical conductivity in these bores will be carried out prior to construction to provide a baseline for assessing potential drawdown impacts during construction.
General	Potential changes to groundwater quality due to presence of tunnel.	Continued groundwater monitoring at the existing monitoring locations prior to, during and post construction will be carried out at a monthly frequency for groundwater levels and the groundwater quality analytes listed in Table 2.2 (subject to ongoing access availablity). Monitoring will occur for six months prior to construction and for one year post-construction. Review of the monitoring results will be carried out at the end of the pre-construction and post-construction monitoring periods. The quality and quantity of groundwater inflows into tunnels during construction, and into tunnels next to Sydney Harbour and beneath high-risk sites for contamination during operation (i.e. adjacent to Rozelle Rail Yards and Waverton Park) will be monitored. The quantity and quality of the treated wastewater discharges from the construction wastewater treatment plants, and from the Rozelle

Potential impact	Environmental impact statement assessment	Proposed monitoring
		wastewater treatment plant during operation will be monitored.

2.2.2 Summary of groundwater quality monitoring for the project

The complete set of monitoring results were not available during preparation of the EIS. These results have now been included in the complete dataset attached to this memorandum.

The groundwater quality data used in the environmental impact statement was sourced from reports compiled for the monitoring carried out by AECOM and Golder Douglas Partners JV between November 2017 and February 2019.

Table 5-11 contained in Appendix N (Technical working paper: Groundwater) provided the results from AECOM monitoring rounds 1 to 7 and Golder Douglas Partners monitoring rounds 1 to 6. Results for Golder Douglas Partners JV monitoring rounds 7 and 8 were not available during preparation of the EIS. Water quality results from the more recent monitoring rounds 7 and 8 do not differ significantly from the results of previous monitoring rounds. As a result, revised groundwater modelling was considered unnecessary.

Detailed monitoring results and statistical summaries of monitoring results, for each analyte, are provided in Attachment A of this memorandum. This is an updated version of Appendix D – Groundwater quality results contained in Appendix N (Technical working paper: Groundwater).
The data provided in the revised Appendix D includes all monitoring data collected subsequent to April 2018.

Note that not all bores were monitored during each monitoring round, and some early monitoring rounds report very limited water quality (if any) results.

The data from the complete set of reports shows that monitoring has been carried out at nine monitoring piezometers. Seven monitoring rounds were carried out by AECOM and eight monitoring rounds were carried out by Golder Douglas Partners JV between November 2017 and February 2019.

The locations of the monitoring piezometers are shown in Figure 2.1. Figure 2.1 is an updated version of Figure 4-2 contained in Appendix N (Technical working paper: Groundwater), showing the additional monitoring location at piezometer B209, and reflecting the fact that water quality sampling has been carried out at piezometers B112P, B150P and B208.

Results for piezometer B209 were not previously available, as access to monitor at this location had not been granted.

Piezometers B112P and B150P are monitoring locations that were installed subsequent to initial locations. These additional piezometers were reportedly installed (immediately adjacent to existing piezometers) due to issues with groundwater quality at the existing piezometers B112 and B150.

Proposed groundwater quality monitoring as described in Table 2.1 would include the suite of analytes listed in Table 2.2.

Table 2.3 provides a summary of the groundwater quality sampling carried out to date for the analytes shown in Table 2.2. Table 2.3 is an updated version of Table 5-11 contained in Appendix N (Technical working paper: Groundwater). The updated table includes the results of Golder Douglas Partners monitoring rounds 7 and 8 not previously available and not previously included in Table 5-11 of Appendix N.

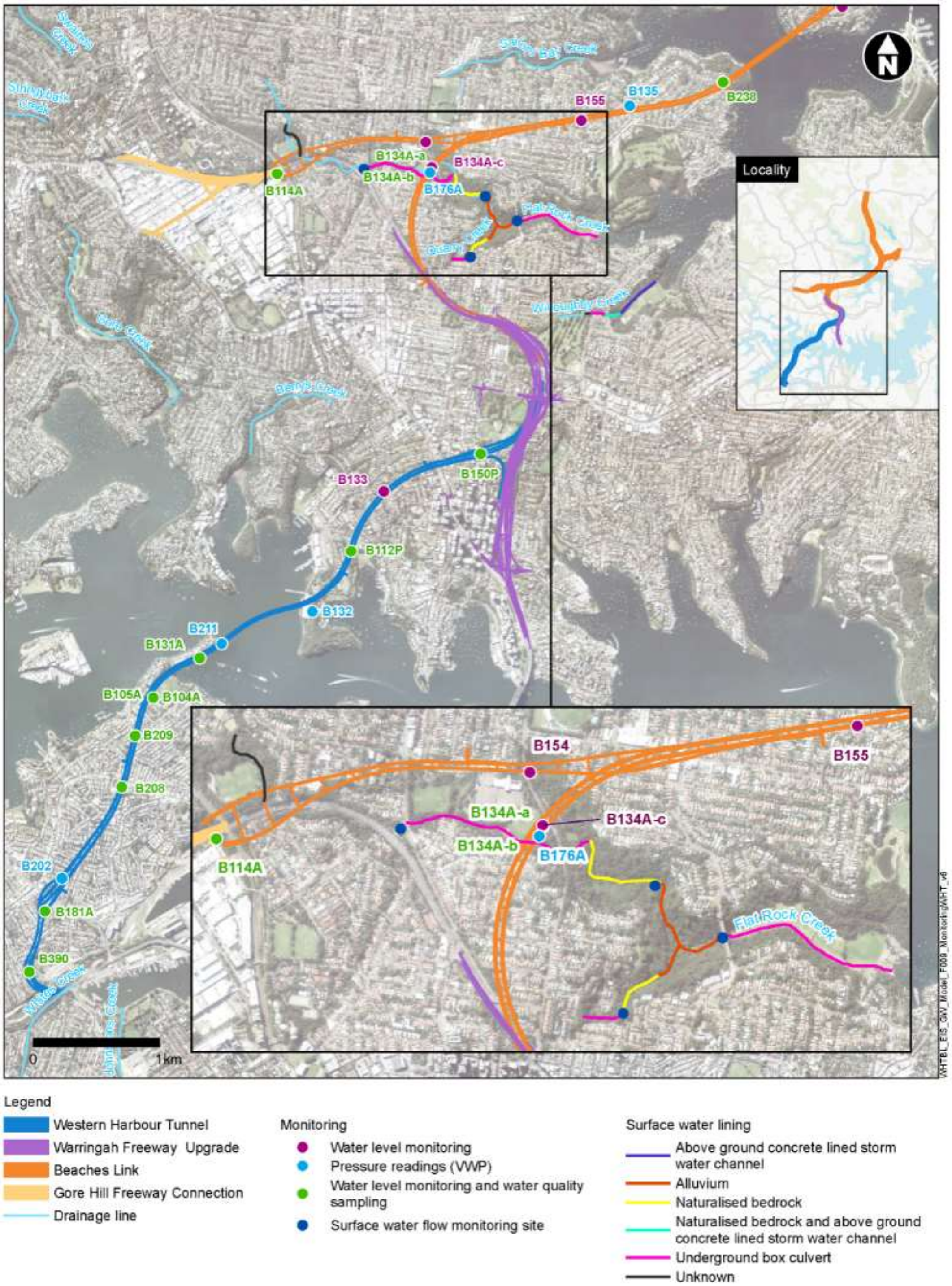


Figure 2.1 Groundwater and surface water monitoring sites (updated Figure 4-2 of Appendix N (Technical working paper: Groundwater))

Table 2.2 Groundwater quality analytes.

Category	Suite of analytes	
Physico-chemical parameters (laboratory)	Electrical conductivity (EC) pH	Total dissolved solids (TDS)
Major ions	Bicarbonate Calcium Carbonate Chloride	Fluoride Phosphorus Potassium Sulfate
Dissolved metals and minor / trace elements	Arsenic Barium Boron Cadmium Chromium Cobalt Copper	Iron Lead Manganese Mercury Nickel Zinc
Nutrients	Ammonia Nitrate Nitrite	Reactive and total phosphorus Total Kjeldhal nitrogen Total nitrogen
Hydrocarbons	Monocyclic aromatic hydrocarbons (MAH) Polycyclic aromatic hydrocarbons (PAH)	Total petroleum hydrocarbons (TPH)

Table 2.3 Groundwater quality sampling (updated Table 5-10 of Appendix N (Technical working paper: Groundwater))

Bore ID	Location (refer to Figure 2.1)	Monitored formation	Previous number of samples	Updated number of samples	Comments
B104A	Birchgrove	Hawkesbury Sandstone	5	7	Metals results considered unreliable due to high pH[1]
B105A	Birchgrove	Hawkesbury Sandstone	5	8	Complete results
B112P	Waverton	Hawkesbury Sandstone	8	10	Complete results
B131A	Birchgrove	Hawkesbury Sandstone	5	8	Complete results
B150P	North Sydney	Hawkesbury Sandstone	7	8	Complete results
B181A	Rozelle	Hawkesbury Sandstone	6	8	Complete results
B208	Balmain	Hawkesbury Sandstone	5	6	Metals results considered unreliable due to high pH[1]
B209	Birchgrove	Hawkesbury Sandstone	0	2	Complete results
B390	Rozelle	Hawkesbury Sandstone	7	8	Complete results

[1]Bores with pH > 8.5 are considered likely to have been impacted by an alkaline source, most likely grout contamination during installation.

3. Geological cross sections and long sections

3.1 Issue raised

For the purpose of both groundwater flow and groundwater modelling, DPIE-Water requires a series of detailed geological cross sections and long sections of [the] underground tunnel, these include:
** Schematic sections should reflect the detailed geology as recorded in the geological drillhole logs, relative position of the investigation drillholes, water table intersections, plus the proposed tunnel*

**Emphasis on the locations where the tunnel rises to the surface, has connections to immersed tunnel sections, or intersects zones of high concentration of discontinuities.*

3.2 Response

Transport for NSW will have ongoing discussions with the Department of Planning, Industry and Environment regarding the requirement for geological cross sections and long sections, during which Transport for NSW will present these to the Department of Planning, Industry and Environment (Water) and the Natural Resources Access Regulator during the assessment period. Transport for NSW would continue to engage with Department of Planning, Industry and Environment regarding this issue.

4. Schematics of the hydrogeological conceptual model

4.1 Issue raised

Provide DPIE-Water schematic of the hydrogeological conceptual model for:

** The Western Harbour Tunnel; Rozelle to Birchgrove and Balls Head to Warringah Freeway sections*

** These must include the geology units, known geological structures, proposed Western Harbour tunnel alignment, relevant monitoring bores and their relative depths, with groundwater levels.*

4.2 Response

Schematics of the conceptual hydrogeological model are presented in Attachment B of this memorandum. Figures provided in Attachment B are as follows:

- Figure B1 – Map showing location of hydrogeological section lines
- Figure B2 – Hydrogeological section along line A-A'
- Figure B3 – Hydrogeological section along line B-B'
- Figure B4 – Hydrogeological section along line C-C'
- Figure B5 – Hydrogeological section along line D-D'.

The following sections provide a summary of the key aspects of the conceptual hydrogeological model relating to the south model, which includes the Rozelle to Birchgrove cross-section. Further details of the conceptual hydrogeological model are provided in Section 2 of Appendix N (Technical working paper: Groundwater).

4.2.1 Overview of geology

The geology along the project alignment consists mainly of Hawkesbury Sandstone. Ashfield Shale is present along the project alignment at ridgelines and outcrops in the area from Willoughby to Neutral Bay. Fill deposits occur along the alignment at Birchgrove and Waverton Park. Marine sediments occur on the harbour floor, overlying the Hawkesbury Sandstone.

4.2.2 Hydraulic conductivity-depth relationship in Hawkesbury Sandstone

Project-specific geotechnical investigations including packer testing (hydraulic testing) were carried out at bores to estimate hydraulic conductivity. Figure 4.1, is a revised version of Figure 2-9 in Appendix F of Appendix N (Technical working paper: Groundwater). Figure 4.1 shows the results of packer test estimates for Hawkesbury Sandstone hydraulic conductivity plotted against depth below ground level at four bores along the project alignment south of Sydney Harbour between Rozelle and Birchgrove (B202, B209, B104A, B149). For comparison, Figure 4.1 also shows the geometric mean of hydraulic conductivity values obtained from packer tests carried out at bores in the Hawkesbury Sandstone across the Sydney Basin by Tammetta and Hawkes (2009)[1].

Data from the regional analysis (Tammetta and Hawkes, 2009) indicates a clear trend of decreasing hydraulic conductivity with depth below ground level. Results presented in Figure 4.1 for four bores along the project alignment between Rozelle and Birchgrove (B202, B209, B104A, B149) are highly variable but do indicate an upper limit to hydraulic conductivity that decreases with depth.

The estimated hydraulic conductivity values at bores along the project alignment between Rozelle and Birchgrove show some consistency with the regional assessment by Tammetta and Hawkes (2009), although the values are generally below the regional average.

The trend of decreasing hydraulic conductivity with depth was also inferred from observations from drill-core samples (for project-specific geotechnical investigation bores drilled along the project alignment) which showed a decrease in fracture spacing and degree of weathering with depth.

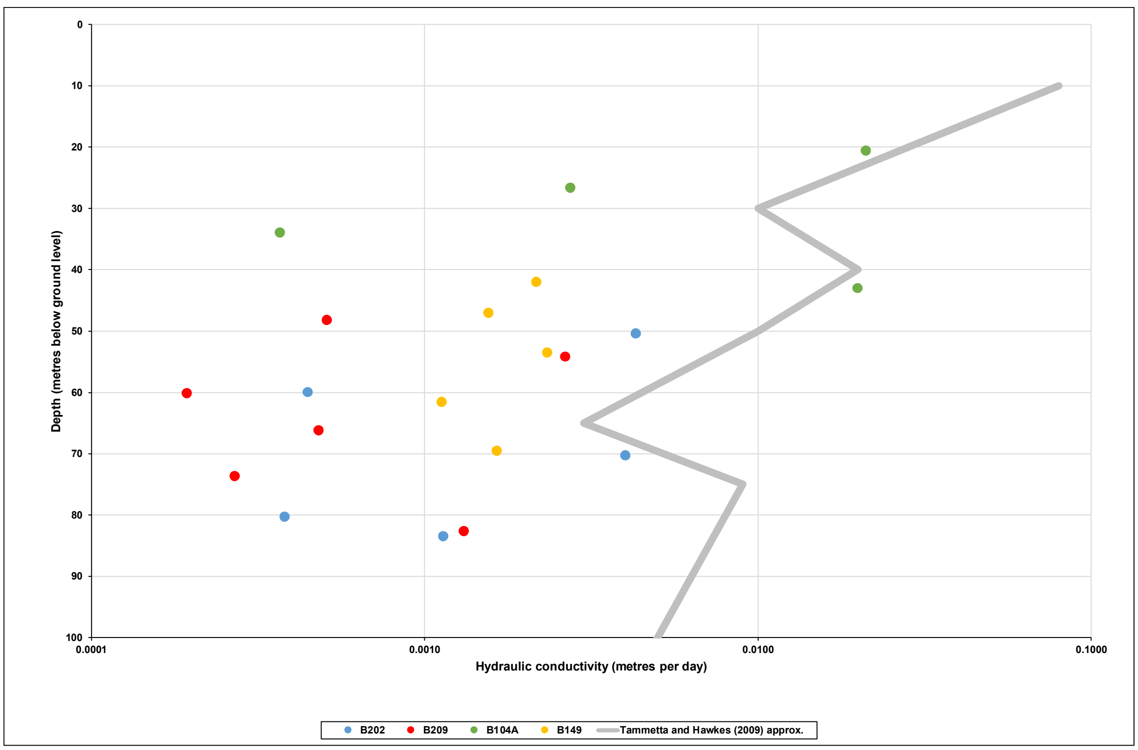


Figure 4.1Hydraulic conductivity versus depth at bores along tunnel alignment.

[1] Tammetta, P., and Hawkes, G. (2009), Analysis of aquifer tests in Mesozoic sandstones in western Sydney, Australia, IAH NSW, Groundwater in the Sydney Basin Symposium, Sydney, NSW, Australia, 4-5 Aug. 2009, W.A. Milne-Home (Ed)

4.2.3 Hydrogeological units assigned to Hawkesbury Sandstone

Based on the observed decrease in hydraulic conductivity with depth described in Section 4.2.2, the Hawkesbury Sandstone was divided into hydrogeological units. The units are described in Table 4.1 and shown in the hydrogeological sections in Attachment B. Although the naming convention used for the hydrogeological units refers to weathering characteristics, the division of the Hawkesbury Sandstone into the four hydrogeological units also considers other characteristics such as drill-core observations on fracture spacing and rock strength classification.

Table 4.1 Hydrogeological units in the Hawkesbury Sandstone.

Hydrogeological unit	Depth interval[1] (metres below ground level)	Horizontal hydraulic conductivity [2] (metres per day)
Weathered sandstone	0 to 10	1.4×10^{-1}
Moderately weathered sandstone	10 to 70	2.0×10^{-2}
Slightly weathered sandstone	70 to 85	4.3×10^{-3}
Unweathered sandstone	>85	1.3×10^{-3}

[1]Average depth interval based on depth at deepest part along project alignment.

[2]Initial hydraulic conductivity estimates which were subsequently adjusted during model calibration.

The initial horizontal hydraulic conductivity values assigned to the hydrogeological units were generally based on the maximum project-specific hydraulic conductivity values estimated from land-based packer (hydraulic) testing at similar depths. Marine-based packer tests were excluded from the hydraulic conductivity-depth analysis for the reasons provided in Section 4.2.4.

There were no project-specific packer test results for depths less than 10 metres that could be used to assign hydraulic conductivity values for the Weathered sandstone hydrogeologic unit in the conceptual hydrogeological model. Therefore, the initial hydraulic conductivity of 1.4×10^{-1} metres/day assigned to the Weathered sandstone was based on the following:

- Projection of the hydraulic conductivity geometric mean line based on basin-wide testing (Figure 4.1) indicates that the average hydraulic conductivity up to a depth of 10 metres ranges from 8×10^{-2} to 2×10^{-1} metres/day. The initial hydraulic conductivity value applied to the Weathered sandstone hydrogeological unit in the conceptual hydrogeological model is within this range.

- The initial hydraulic conductivity assigned to the Weathered sandstone in the conceptual hydrogeological model is similar to the hydraulic conductivity assigned in the calibrated model for the adjacent M4-M5 Link project for Weathered sandstone occurring at similar depths (HydroSimulations, 2017)[2].

[2] HydroSimulations (2017), Westconnex M4-M5 Link.Groundwater Modelling Report, Annexure H – Groundwater modelling report, August 2017.

4.2.4 High permeability zone adjacent to harbour

Areas of enhanced permeability on the project alignment are inferred to occur immediately adjacent to and underlying the harbour as shown in Figure B2 and Figure B4 of Attachment B. This is to be expected as it is assumed that the underlying structural control has resulted in the palaeo-drainages in which the harbour is now located. The influence of structure on permeability in the harbour is also supported by the order of magnitude increase of mean hydraulic conductivities associated with the sub-harbour lithologies compared to lithologies located at a distance from the harbour as described in Appendix F of Appendix N (Technical working paper: Groundwater) (Section 2.5.4.3.1) and shown in Figure B2 and Figure B4 in Attachment B of this memorandum. The high permeability zone was assigned a hydraulic conductivity one order of magnitude higher than bulk rock hydraulic conductivity in the conceptual hydrogeological model.

A tanked (undrained) tunnel system fully lined with a waterproof membrane will be installed to a distance of approximately 130 metres from the harbour crossing (north and south of the harbour) to control potential high inflows. A tanked (undrained) tunnel system, rather than a drained tunnel system design, was selected for the project because it avoids the requirement for ongoing draining and dewatering and therefore reduces groundwater drawdown.

4.2.5 Hydraulic conductivity of dykes

A dolerite dyke, commonly referred to as the “Great Sydney Dyke” was intercepted in bore B202 at depths between 92.5 and 95.15 metres below ground level. The hydraulic conductivity estimated from packer testing of the zone including the dyke was low (less than 9×10^{-5} m/day). It is common for dykes to have lower hydraulic conductivity when competent or weathered to clay.

Packer test results for bore B202 showed that the hydraulic conductivity of the sandstone surrounding the dyke was also low (refer to Figure B2 in Attachment B). This suggests that the emplacement of the dyke has not resulted in enhanced permeability in the area surrounding the sandstone.

In summary, there was no evidence from the packer test results for bore B202 to suggest that the hydraulic conductivity for the dyke was significantly different from the hydraulic conductivity of the surrounding bulk rock. Therefore, for the purposes of impact assessment, the inferred dyke zones along the project alignment were assigned the same hydraulic conductivity as the surrounding bulk rock.

Attachment A

Water quality results for Western Harbour Tunnel and Warringah Freeway Upgrade project

Water quality results (updated version of Appendix D – Groundwater quality results contained in Appendix N (Technical working paper: Groundwater))

							Location_Code	B104A	B104A	B104A	B104A	B104A	B104A	B104A	B105A	B105A	B105A	B105A	B105A	B105A	B105A	B105A	B112P	B112P	B112P	B112P	B112P	B112P	B112P	B112P	B112P	B112P	B131A
							Monitoring_Zone	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Yurrulbin Park	Berrys Bay	Berrys Bay	Berrys Bay	Berrys Bay	Berrys Bay	Berrys Bay	Berrys Bay	Berrys Bay	Berrys Bay	Berrys Bay	Yurrulbin Park
							Sampled_Date_Time	2/11/2017	7/12/2017	10/01/2018	6/02/2018	7/03/2018	13/06/2018	7/11/2018	1/11/2017	15/11/2017	6/12/2017	10/01/2018	6/02/2018	7/03/2018	13/06/2018	24/10/2018	15/03/2018	12/04/2018	11/05/2018	14/06/2018	18/07/2018	18/07/2018	21/09/2018	21/09/2018	13/11/2018	8/02/2019	1/11/2017
Chem_Group	ChemName	output unit	EQL	Superseded ADWG 2015 Health	ANZECC 2000 FW 95%	ANZECC 2000 MW 95%	NHMRC 2008 Recreational Water Quality/ Aesthetics																										
Resistivity (Saturated Paste)	Resistivity at 25°C	ohm cm	1					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	505	606	474	641	-	-	-	-	-	-	-
Metals	Arsenic (Filtered)	µg/L	1	10			100[#1]	2	1	1	<1	1	<1	<1	2	2	4	8	8	7	4	6	4	19	5	17	4	5	16	16	12	12	<10
	Barium (Filtered)	µg/L	1	2000			20000[#1]	624	445	493	486	363	348	213	173	175	182	182	189	186	168	173	177	131	178	114	180	180	193	184	175	-	77
	Boron (Filtered)	µg/L	50	4000	370		40000[#1]	<50	70	<50	<50	<50	<50	<50	140	140	130	120	120	120	120	120	<50	90	70	70	80	80	80	80	60	-	1050
	Cadmium (Filtered)	µg/L	0.1	2	0.2	5.5	20[#1]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1
	Chromium (III+VI) (Filtered)	µg/L	1					9	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	1	<1	<1	<1	<1	<1	<1	<10
	Cobalt (Filtered)	µg/L	1			1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	14	3	21	2	19	18	14	14	13	-	25
	Copper (Filtered)	µg/L	1	2000	1.4	1.3	20000[#1]	3	2	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	3	4	7	<1	<1	<1	<1	<1	<1	<10
	Iron (Filtered)	µg/L	50					<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	230	100	540	260	330	1080	80	1190	1220	2110	2050	1910	-	398,000
	Lead (Filtered)	µg/L	1	10	3.4	4.4	100[#1]	<1	4	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10
	Magnesium (Filtered)	µg/L	1000					<1000	<1000	<1000	<1000	<1000	<1000	<1000	38,000	55,000	51,000	55,000	53,000	54,000	52,000	53,000	44,000	30,000	43,000	27,000	-	44,000	-	41,000	42,000	46,000	856,000
	Manganese (Filtered)	µg/L	1	500	1900		5000[#1]	<1	<1	<1	<1	<1	<1	<1	360	378	422	439	422	450	400	401	287	229	386	245	425	414	498	470	475	-	10,100
	Mercury (Filtered)	µg/L	0.1	1	0.6	0.4	10[#1]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel (Filtered)	µg/L	1	20	11	70	200[#1]	10	9	9	8	7	6	5	1	<1	<1	<1	<1	<1	<1	<1	13	11	33	25	30	30	13	12	11	10	<10
	Zinc (Filtered)	µg/L	5		8	15		11	9	<5	<5	<5	<5	10	<5	<5	<5	<5	<5	<5	13	<5	14	<5	11	22	<5	<5	<5	<5	<5	6	<50
Inorganics	Carbonate Alkalinity as CaCO3	mg/L	1					74	148	109	89	71	66	88	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Soluble Bicarb as CaCO3*	mg/L	1					-	-	-	-	-	<1	<1	85	-	-	-	-	-	229	227	417	336	415	328	-	349	-	340	330	405	67
	Alkalinity (Hydroxide) as CaCO3	mg/L	1					1050	412	516	606	658	635	438	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Alkalinity (total) as CaCO3	mg/L	1					1130	561	626	695	729	701	526	85	179	160	195	206	260	229	227	417	336	415	328	-	349	-	340	330	405	67
	Ammonia	mg/L	0.01		0.9	0.91		1.11	1.09	1.32	1.34	1.23	-	-	-	0.6	0.51	0.49	0.54	0.44	-	-	0.03	-	-	-	-	-	-	-	-	-	-
	Ammonia as N	mg/L	0.01					-	-	-	-	-	0.96	0.73	0.67	-	-	-	-	-	0.44	0.44	0.03	0.09	0.11	0.03	-	0.15	-	0.18	0.2	0.2	1.56
	Anions Total	meq/L	0.01					32.4	17.9	19.8	21.6	21.1	18.7	14.7	20.4	31.4	29.9	31.3	31.1	30.2	27.8	28	22.6	16.7	21.5	17.6	-	18.5	-	19.4	20.1	21.4	417
	Bicarbonate Alkalinity as CaCO3	mg/L	1					<1	<1	<1	<1	<1	-	-	-	179	160	195	206	260	-	-	417	-	-	-	-	-	-	-	-	-	-
	Calcium (Filtered)	mg/L	1					154	152	174	183	174	205	148	63	110	107	120	122	136	128	140	122	78	119	73	-	127	-	119	118	131	821
	Cations Total	meq/L	0.01					30	20.2	22.3	21.8	19.2	18.5	13	19	30.4	27.8	28.5	28.1	27.1	26	25.3	20.5	16.1	19.9	15.3	-	20.5	-	19.4	19.3	21.2	386
	Chloride	mg/L	1					81	62	73	76	72	78	86	551	825	803	812	796	693	671	692	447	297	418	326	-	356	-	397	434	427	13,300
	Electrical conductivity (lab)	uS/cm	1					5230	2520	3450	3050	3650	3140	2800	2230	3340	3080	3210	3140	2970	2710	2880	1980	1650	2110	1560	-	1900	-	2000	2250	2090	39,200
	Fluoride	mg/L	0.1	1.5			15[#1]	0.6	0.4	0.5	0.6	0.4	0.4	0.3	0.2	0.3	0.3	0.3	0.4	0.2	0.3	0.2	0.4	0.4	0.3	0.5	-	-	-	-	-	-	0.2
	Ionic Balance	%	0.01					3.83	6.12	5.9	0.35	4.77	0.53	6.2	3.68	1.6	3.62	4.6	5.15	5.42	3.28	4.99	4.87	1.78	3.74	6.9	-	5.13	-	0.11	2.13	0.32	3.81
	Kjeldahl Nitrogen Total	mg/L	0.1					2.4	1.1	1.9	1.6	1.3	1.2	0.8	0.8	1	0.8	1.1	0.6	0.4	0.4	0.5	<0.1	0.1	0.2	0.6	-	2.4	-	0.4	0.2	0.3	1.7
	Nitrate & Nitrite (as N)	mg/L	0.01					-	-	-	-	-	0.03	0.01	-	-	-	-	-	-	0.02	0.02	<0.01	-	-	-	-	-	-	-	-	-	-
	Nitrate (as N)	mg/L	0.01	11.29[#2]	0.1581[#3]		112.9[#4]	<0.01	0.01	0.06	0.04	0.02	0.03	<0.01	<0.01	0.02	0.13	<0.01	0.03	0.02	0.02	0.02	<0.01	<0.01	0.02	0.52	-	0.04	-	0.01	0.03	0.02	<0.01
	Nitrite (as N)	mg/L	0.01	0.91[#5]			9.1[#6]	0.12	0.07	<0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.05	<0.01	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	<0.01
	Nitrogen (Total Oxidised)	mg/L	0.01					0.04	0.08	0.06	0.04	0.03	-	-	<0.01	0.02	0.13	<0.01	0.03	0.02	-	-	<0.01	-	0.02	0.52	-	0.04	-	0.01	0.03	-	<0.01
	Nitrogen (Total)	mg/L	0.01					2.4	1.2	2	1.6	1.3	1.2	0.8	0.8	1	0.9	1.1	0.6	0.4	0.4	0.5	<0.1	0.04 - 0.1	0.02 - 0.2	0.52 - 1.1	-	0.04 - 2.4	-	0.01 - 0.4	0.2	0.02 - 0.3	1.7
	Phosphorus	mg/L	0.01					0.03	0.08	0.03	<0.01	0.01	<0.01	0.09	0.01	0.11	0.09	0.12	0.06	0.05	0.04	0.05	<0.01	0.03	0.04	0.12	-	0.08	-	0.12	0.05	0.02	0.07
	Potassium (Filtered)	mg/L	1					67	35	35	32	25	20	14	30	39	32	29	27	18	19	16	7	13	8	18	-	8	-	7	7	8	80
	Reactive Phosphorus as P	mg/L	0.01					<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	0.07	-	<0.01	-	<0.01	0.02	<0.01	<0.01
	Sodium (Filtered)	mg/L	1					473	270	293	272	226	179	121	274	447	401	397	389	355	342	312	245	216	236	207	-	238	-	228	224	246	5780
	Sulfate as SO4 - Turbidimetric (Filtered)	mg/L	1					360	237	253	269	215	121	86	152	221	194	215	218	264	206	189	82	76	68	89	-	72	-	66	61	59	1930
	Total Dissolved Solids	mg/L	10					-	1280	1250	1570	991	1680	878	1140	2100	2050	1750	1760	1790	1640	1640	1240	931	1140	914	-	986	-	988	1200	1270	26,900
	Total Dissolved Solids (Filtered)	mg/L	10					1640	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physiochemical parameters	pH (lab)	pH Units	0.01					12	11.7	11.9	11.9	12	12	11.9	7.94	7.91	8.01	8.03	7.96	7.81	7.6	7.84	7.4	7.89	7.44	7.96	-	7.54	-	7.71	8.14	7.65	6.07
TRH - NEPM 2013 Fractions	TRH >C6 - C10	µg/L	20					<20	20	30	30	<20	<20	<20	<20	<20	<20	30	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	60
	TRH >C10 - C16	µg/L	100					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	130
	TRH >C16 - C34	µg/L	100					<100	580	130	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	570
	TRH >C34 - C40	µg/L	100					<100	180	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	TRH >C10 - C40 (Sum of total)	µg/L	100					<100	760	130	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	700
	TRH >C6 - C10 less BTEX (F1)	µg/L	20					<20	20	20	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
	TRH >C10 - C16 less Naphthalene (F2)	µg/L	100					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	130
TPH - NEPM 1999 Fractions	TPH C6 - C9	µg/L	20					<20	30	50	30	<20	<20	<20	<20	<20	<20	40	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	60
	TPH C10 - C14	µg/L	50					<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	80
	TPH C15 - C28	µg/L	100					<100	440	130	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	580
	TPH C29-C36	µg/L	50					<50	240	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
	TPH C10 - C36 (Sum of total)	µg/L	50					<50	680	130	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	660
BTEXN	Benzene	µg/L	1	1	950	700	10[#1]	<1	<1	<1	<1	<1	<1	<1	<1	<1	2	2	2	2	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	37
	Ethylbenzene	µg/L	2	300			3000[#1]	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Naphthalene	µg/L	1		16	70		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<1	<5	<1	<1	<1	<1
	Toluene	µg/L	2	800			8000[#1]	<2	<2	10	9	6	3	3	<2	<2	<2	22	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	11
	Total BTEX	mg/L	0.001					<0.001	<0.001	0.01	0.009	0.006	0.003	0.003	<0.001	<0.001	0.002	0.024	0.002	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.05
	Xylene (m & p)	µg/L	2					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2
	Xylene (o)	µg/L	2		350			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Xylene Total	µg/L	2	600			6000[#1]	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2
PAHs	Benzo[b+j]fluoranthene	mg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	<0.001
	Acenaphthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Acenaphthylene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Benz(a)anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Benzo(a)pyrene TEQ (zero)	µg/L	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	-	-	-	-	-	-	-	-	-	-
	Benzo(a) pyrene	µg/L	0.5	0.01			0.1[#1]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	<0.5	<0.5	<0.5	<0.5
	Benzo(a)pyrene TEQ (lower bound)*	µg/L	0.5					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	<0.5	<0.5	<0.5	-
	Benzo(b,j+k)fluoranthene	µg/L	2					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Benzo(a)pyrene TEQ (upper bound)*	mg/L	0.005					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Benzo(g,h,i)perylene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Benzo(k)fluoranthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Chrysene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Dibenz(a,h)anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Fluoranthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Fluorene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Indeno(1,2,3-c,d)pyrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Phenanthrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	Pyrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	-	<1	<1	<1	<1
	PAHs (Sum of total)	µg/L	0.5	0.01				<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	<0.5	<0.5	<0.5	<0.5
Halogenated Benzenes	Hexachlorobenzene	µg/L	0.5					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EPA 448 Classification of Wastes	Polycyclic aromatic hydrocarbons EPA448	µg/L	0.5					-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
EPA 621 Classification of Wastes	PAHs (EPA VIC Total)	µg/L	0.5					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-

Env Stds Comments
#1:Drinking water guideline multiplied by 10
#2:Converted from Nitrate as NO3 (50 mg/L)
#3:Converted from Nitrate as NO3 (700ug/L)
#4:Converted from Nitrate as NO3 (50 mg/L) and multiplied by 10 from drinking water guidelines
#5:Converted from Nitrite as NO2 (3 mg/L)
#6:Converted from Nitrite as NO2 (3 mg/L) and multiplied by 10 from drinking water guidelines

Water quality results (updated version of Appendix D – Groundwater quality results contained in Appendix N (Technical working paper: Groundwater))

Chem_Group	ChemName	output unit	EQL	Superseded ADWG 2015 Health	ANZECC 2000 FW 95%	ANZECC 2000 MW 95%	NHMRC 2008 Recreational Water Quality/ Aesthetics	B131A Yurrulbin Park 15/11/2017	B131A Yurrulbin Park 6/12/2017	B131A Yurrulbin Park 10/01/2018	B131A Yurrulbin Park 6/02/2018	B131A Yurrulbin Park 7/03/2018	B131A Yurrulbin Park 13/06/2018	B131A Yurrulbin Park 24/10/2018
Resistivity (Saturated Paste)	Resistivity at 25°C	ohm cm	1					-	-	-	-	-	-	-
Metals	Arsenic (Filtered)	µg/L	1	10			100[#1]	<1	1	2	1	2	1	<10
	Barium (Filtered)	µg/L	1	2000			20000[#1]	130	119	81	97	92	86	90
	Boron (Filtered)	µg/L	50	4000	370		40000[#1]	930	1050	950	890	730	660	820
	Cadmium (Filtered)	µg/L	0.1	2	0.2	5.5	20[#1]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1
	Chromium (III+VI) (Filtered)	µg/L	1					<1	<1	<1	<1	<1	<1	<10
	Cobalt (Filtered)	µg/L	1			1		15	3	1	3	2	<1	<10
	Copper (Filtered)	µg/L	1	2000	1.4	1.3	20000[#1]	<1	<1	<1	1	<1	<1	<10
	Iron (Filtered)	µg/L	50					417,000	479,000	432,000	506,000	349,000	536,000	513,000
	Lead (Filtered)	µg/L	1	10	3.4	4.4	100[#1]	<1	<1	<1	<1	<1	<1	<10
	Magnesium (Filtered)	µg/L	1000					939,000	905,000	952,000	940,000	752,000	924,000	1.01E6
	Manganese (Filtered)	µg/L	1	500	1900		5000[#1]	12,600	11,700	12,300	12,300	10,200	12,800	13,300
	Mercury (Filtered)	µg/L	0.1	1	0.6	0.4	10[#1]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel (Filtered)	µg/L	1	20	11	70	200[#1]	2	<1	<1	<1	2	<1	<10
	Zinc (Filtered)	µg/L	5		8	15		14	<5	<5	34	7	<5	<50
Inorganics	Carbonate Alkalinity as CaCO3	mg/L	1					<1	<1	<1	<1	<1	<1	<1
	Soluble Bicarb as CaCO3*	mg/L	1					-	-	-	-	-	109	46
	Alkalinity (Hydroxide) as CaCO3	mg/L	1					<1	<1	<1	<1	<1	<1	<1
	Alkalinity (total) as CaCO3	mg/L	1					96	144	25	54	76	109	46
	Ammonia	mg/L	0.01		0.9	0.91		1.55	<0.5	0.52	<0.5	1.5	-	-
	Ammonia as N	mg/L	0.01					-	-	-	-	-	2.3	1.28
	Anions Total	meq/L	0.01					357	379	379	363	364	339	358
	Bicarbonate Alkalinity as CaCO3	mg/L	1					96	144	25	54	76	-	-
	Calcium (Filtered)	mg/L	1					1010	957	970	970	813	953	1010
	Cations Total	meq/L	0.01					380	363	375	367	333	345	386
	Chloride	mg/L	1					11,500	12,300	12,300	11,700	11,700	11,000	11,700
	Electrical conductivity (lab)	uS/cm	1					36,900	36,200	37,100	35,200	36,800	27,600	36,400
	Fluoride	mg/L	0.1	1.5			15[#1]	0.2	0.3	0.2	0.2	0.1	<0.1	-
	Ionic Balance	%	0.01					3.11	2.15	0.51	0.6	4.49	0.85	3.71
	Kjeldahl Nitrogen Total	mg/L	0.1					4.2	1	1.2	1.8	2.1	2.4	1.2
	Nitrate & Nitrite (as N)	mg/L	0.01					-	-	-	-	-	<0.1	0.02
	Nitrate (as N)	mg/L	0.01	11.29[#2]	0.1581[#3]		112.9[#4]	<0.1	<0.1	0.14	<0.05	<0.25	<0.1	0.02
	Nitrite (as N)	mg/L	0.01	0.91[#5]			9.1[#6]	<0.1	<0.1	<0.01	<0.05	<0.25	<0.1	<0.01
	Nitrogen (Total Oxidised)	mg/L	0.01					<0.1	<0.1	0.14	<0.05	<0.25	-	-
	Nitrogen (Total)	mg/L	0.01					4.2	1	1.3	1.8	2.1	2.4	1.2
	Phosphorus	mg/L	0.01					1.22	<0.1	0.12	<0.1	0.15	<0.05	<0.05
	Potassium (Filtered)	mg/L	1					97	77	82	75	63	66	77
	Reactive Phosphorus as P	mg/L	0.01					<0.05	<0.1	<0.01	<0.05	<0.01	<0.1	<0.01
	Sodium (Filtered)	mg/L	1					5740	5490	5670	5510	4830	5050	5750
	Sulfate as SO4 - Turbidimetric (Filtered)	mg/L	1					1470	1400	1530	1530	1570	1280	1300
	Total Dissolved Solids	mg/L	10					29,500	31,800	26,900	29,600	25,600	27,500	25,200
	Total Dissolved Solids (Filtered)	mg/L	10					-	-	-	-	-	-	-
Physiochemical parameters	pH (lab)	pH Units	0.01					6.33	6.41	5.74	5.75	5.82	6.16	5.69
TRH - NEPM 2013 Fractions	TRH >C6 - C10	µg/L	20					550	580	330	30	20	<20	<20
	TRH >C10 - C16	µg/L	100					110	160	130	<100	<100	<100	<100
	TRH >C16 - C34	µg/L	100					130	170	150	<100	<100	<100	<100
	TRH >C34 - C40	µg/L	100					<100	<100	<100	<100	<100	<100	<100
	TRH >C10 - C40 (Sum of total)	µg/L	100					240	330	280	<100	<100	<100	<100
	TRH >C6 - C10 less BTEX (F1)	µg/L	20					120	190	110	<20	<20	<20	<20
	TRH >C10 - C16 less Naphthalene (F2)	µg/L	100					110	160	130	<100	<100	<100	<100
TPH - NEPM 1999 Fractions	TPH C6 - C9	µg/L	20					540	580	350	30	20	<20	<20
	TPH C10 - C14	µg/L	50					100	150	100	90	<50	<50	<50
	TPH C15 - C28	µg/L	100					150	150	160	<100	<100	<100	<100
	TPH C29-C36	µg/L	50					<50	<50	<50	<50	<50	<50	<50
	TPH C10 - C36 (Sum of total)	µg/L	50					250	300	260	90	<50	<50	<50
BTEXN	Benzene	µg/L	1	1	950	700	10[#1]	10	28	29	24	19	8	10
	Ethylbenzene	µg/L	2	300			3000[#1]	<2	<5	<2	<2	<2	<2	<2
	Naphthalene	µg/L	1		16	70		<1	<1	<1	<1	<1	<1	<1
	Toluene	µg/L	2	800			8000[#1]	422	365	194	<2	<2	<2	<2
	Total BTEX	mg/L	0.001					0.432	0.393	0.223	0.024	0.019	0.008	0.01
	Xylene (m & p)	µg/L	2					<2	<5	<2	<2	<2	<2	<2
	Xylene (o)	µg/L	2		350			<2	<5	<2	<2	<2	<2	<2
	Xylene Total	µg/L	2	600			6000[#1]	<2	<5	<2	<2	<2	<2	<2
PAHs	Benzo[b+j]fluoranthene	mg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Acenaphthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Acenaphthylene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Benz(a)anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Benzo(a)pyrene TEQ (zero)	µg/L	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	-	-
	Benzo(a) pyrene	µg/L	0.5	0.01			0.1[#1]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(a)pyrene TEQ (lower bound)*	µg/L	0.5					-	-	-	-	-	-	-
	Benzo(b,j+k)fluoranthene	µg/L	2					-	-	-	-	-	-	-
	Benzo(a)pyrene TEQ (upper bound)*	mg/L	0.005					-	-	-	-	-	-	-
	Benzo(g,h,i)perylene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Benzo(k)fluoranthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Chrysene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Dibenz(a,h)anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Fluoranthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Fluorene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Indeno(1,2,3-c,d)pyrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Phenanthrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	Pyrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1
	PAHs (Sum of total)	µg/L	0.5	0.01				<0.5	-	-	-	-	<0.5	<0.5
Halogenated Benzenes	Hexachlorobenzene	µg/L	0.5					-	-	-	-	-	-	-
EPA 448 Classification of Wastes	Polycylic aromatic hydrocarbons EPA448	µg/L	0.5					-	<0.5	<0.5	<0.5	<0.5	-	-
EPA 621 Classification of Wastes	PAHs (EPA VIC Total)	µg/L	0.5					-	-	-	-	-	-	-

ChemName	B150P Berrys Bay 6/04/2018	B150P Berrys Bay 26/04/2018	B150P Berrys Bay 29/05/2018	B150P Berrys Bay 28/06/2018	B150P Berrys Bay 18/07/2018	B150P Berrys Bay 21/09/2018	B150P Berrys Bay 13/11/2018	B150P Berrys Bay 8/02/2019
Resistivity at 25°C	-	-	-	-	-	-	-	-
Arsenic (Filtered)	<1	-	<1	2	<1	<1	<1	<1
Barium (Filtered)	118	-	-	159	117	100	105	-
Boron (Filtered)	160	-	-	60	450	790	920	-
Cadmium (Filtered)	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium (III+VI) (Filtered)	<1	-	1	1	<1	<1	<1	1
Cobalt (Filtered)	9	-	-	9	4	<1	<1	-
Copper (Filtered)	<1	-	<1	<1	<1	<1	<1	<1
Iron (Filtered)	4490	-	-	20,400	8230	3600	4070	-
Lead (Filtered)	<1	-	<1	<1	<1	<1	<1	<1
Magnesium (Filtered)	4000	5000	5000	6000	5000	-	5000	5000
Manganese (Filtered)	457	-	-	648	482	440	454	-
Mercury (Filtered)	<0.1	-	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1
Nickel (Filtered)	24	-	33	8	4	1	2	2
Zinc (Filtered)	16	-	<5	<5	<5	2	<5	9
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1	-	<1	<1
Soluble Bicarb as CaCO3*	44	64	76	94	87	-	100	125
Alkalinity (Hydroxide) as CaCO3	<1	<1	<1	<1	<1	-	<1	<1
Alkalinity (total) as CaCO3	44	64	76	94	87	-	100	125
Ammonia	0.04	-	-	-	-	-	-	-
Ammonia as N	0.04	0.02	<0.01	0.11	0.06	-	0.02	0.03
Anions Total	3.09	3.73	3.71	3.96	4.02	-	4.27	4.21
Bicarbonate Alkalinity as CaCO3	44	-	-	-	-	-	-	-
Calcium (Filtered)	6	7	8	4	7	-	9	8
Cations Total	3.42	3.68	3.99	4.16	3.73	-	4.42	4.32
Chloride	48	61	57	57	63	-	60	60
Electrical conductivity (lab)	392	458	422	419	446	-	452	419
Fluoride	-	-	-	-	-	-	-	-
Ionic Balance	5.12	0.61	3.69	2.42	3.73	-	1.65	1.32
Kjeldahl Nitrogen Total	<0.1	0.3	0.3	0.2	0.2	-	0.3	0.5
Nitrate & Nitrite (as N)	0.02	-	-	-	-	-	-	-
Nitrate (as N)	0.02	<0.01	<0.01	<0.01	0.01	-	0.04	0.02
Nitrite (as N)	<0.01	<0.01	<0.01	0.01	<0.01	-	<0.01	<0.01
Nitrogen (Total Oxidised)	0.02	<0.01	<0.01	<0.01	0.01	-	0.04	-
Nitrogen (Total)	<0.1	<0.01 - 0.3	<0.01 - 0.3	<0.01 - 0.2	0.01 - 0.2	-	0.3	0.02 - 0.5
Phosphorus	0.02	0.03	0.04	0.01	0.04	-	0.05	0.11
Potassium (Filtered)	2	2	2	1	2	-	3	3
Reactive Phosphorus as P	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.03
Sodium (Filtered)	63	66	72	54	67	-	80	79
Sulfate as SO4 - Turbidimetric (Filtered)	41	35	28	23	24	-	28	1
Total Dissolved Solids	200	224	220	289	260	-	240	265
Total Dissolved Solids (Filtered)	-	-	-	-	-	-	-	-
pH (lab)	6.9	6.69	6.79	6.66	6.58	-	8.01	7.21
TRH >C6 - C10	<20	<20	<20	<20	<20	<10	<20	<20
TRH >C10 - C16	<100	<100	<100	<100	<100	<50	<100	<100
TRH >C16 - C34	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C34 - C40	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C10 - C40 (Sum of total)	<100	<100	<100	<100	<100	-	<100	<100
TRH >C6 - C10 less BTEX (F1)	<20	<20	<20	<20	<20	<10	<20	<20
TRH >C10 - C16 less Naphthalene (F2)	<100	<100	<100	<100	<100	<50	<100	<100
TPH C6 - C9	<20	<20	20	<20	<20	<10	<20	<20
TPH C10 - C14	<50	<50	<50	<50	<50	<50	<50	<50
TPH C15 - C28	<100	<100	<100	<100	<100	<100	<100	<100
TPH C29-C36	<50	<50	<50	<50	<50	<100	<50	<50
TPH C10 - C36 (Sum of total)	<50	<50	<50	<50	<50	-	<50	<50
Benzene	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	<2	<2	<2	<2	<2	<2	<2	<2
Naphthalene	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	<2	3	3	<2	<2	2	<2	<2
Total BTEX	<0.001	0.003	0.003	<0.001	<0.001	-	<0.001	<0.001
Xylene (m & p)	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	<2	<2	<2	<2	<2	<1	<2	<2
Xylene Total	<2	<2	<2	<2	<2	-	<2	<2
Benzo[b+j]fluoranthene	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001
Acenaphthene	<1	<1	<1	<1	<1	-	<1	<1
Acenaphthylene	<1	<1	<1	<1	<1	-	<1	<1
Anthracene	<1	<1	<1	<1	<1	-	<1	<1
Benz(a)anthracene	<1	<1	<1	<1	<1	-	<1	<1
Benzo(a)pyrene TEQ (zero)	<0.5	-	-	-	-	-	-	-
Benzo(a) pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
Benzo(a)pyrene TEQ (lower bound)*	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
Benzo(b,j+k)fluoranthene	-	-	-	-	-	-	-	-
Benzo(a)pyrene TEQ (upper bound)*	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	<1	<1	<1	<1	<1	-	<1	<1
Benzo(k)fluoranthene	<1	<1	<1	<1	<1	-	<1	<1
Chrysene	<1	<1	<1	<1	<1	-	<1	<1
Dibenz(a,h)anthracene	<1	<1	<1	<1	<1	-	<1	<1
Fluoranthene	<1	<1	<1	<1	<1	-	<1	<1
Fluorene	<1	<1	<1	<1	<1	-	<1	<1
Indeno(1,2,3-c,d)pyrene	<1	<1	<1	<1	<1	-	<1	<1
Phenanthrene	<1	<1	<1	<1	<1	-	<1	<1
Pyrene	<1	<1	<1	<1	<1	-	<1	<1
PAHs (Sum of total)	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
Hexachlorobenzene	-	-	-	-	-	-	-	-
Polycylic aromatic hydrocarbons EPA448	-	-	-	-	-	-	-	-
PAHs (EPA VIC Total)	-	-	-	-	-	-	-	-

ChemName	B181A Rozelle Rail Yards 2/11/2017	B181A Rozelle Rail Yards 15/11/2017	B181A Rozelle Rail Yards 6/12/2017	B181A Rozelle Rail Yards 10/01/2018	B181A Rozelle Rail Yards 6/02/2018	B181A Rozelle Rail Yards 7/03/2018	B181A Rozelle Rail Yards 13/06/2018	B181A Rozelle Rail Yards 24/10/2018	B208 Victoria Road 10/01/2018
Resistivity at 25°C	-	-	-	-	-	-	-	-	-
Arsenic (Filtered)	1	<1	<1	<1	<1	<1	<1	<1	1
Barium (Filtered)	71	37	66	66	73	54	56	61	92
Boron (Filtered)	110	140	130	130	120	130	150	130	<50
Cadmium (Filtered)	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.1	<0.1
Chromium (III+VI) (Filtered)	<1	<1	<1	<1	<1	2	3	<1	6
Cobalt (Filtered)	2	1	1	1	1	1	<1	<1	<1
Copper (Filtered)	16	9	7	5	4	3	6	5	<1
Iron (Filtered)	<50	<50	<50	<50	<50	180	<50	<50	<50
Lead (Filtered)	2	2	3	3	2	<1	4	3	<1
Magnesium (Filtered)	6000	7000	7000	8000	7000	5000	8000	7000	<1000
Manganese (Filtered)	45	35	35	33	31	19	27	27	<1
Mercury (Filtered)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel (Filtered)	4	1	2	2	2	<1	1	2	<1
Zinc (Filtered)	264	253	293	242	241	171	193	260	<5
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1	<1	<1	<1	57
Soluble Bicarb as CaCO3*	-	-	-	-	-	-	<1	<1	-
Alkalinity (Hydroxide) as CaCO3	<1	<1	<1	<1	<1	<1	<1	<1	147
Alkalinity (total) as CaCO3	2	<1	<1	<1	<1	7	<1	<1	204
Ammonia	0.01	0.02	<0.01	<0.01	0.01	<0.01	-	-	0.47
Ammonia as N	-	-	-	-	-	-	0.01	<0.01	-
Anions Total	3.62	3.27	3.23	3.44	3.56	3.09	2.92	2.9	6.01
Bicarbonate Alkalinity as CaCO3	2	<1	<1	<1	<1	7	-	-	<1
Calcium (Filtered)	16	18	22	26	24	26	22	17	58
Cations Total	3.38	3.47	3.63	3.94	3.62	3.15	3.97	3.07	6.71
Chloride	59	54	54	54	50	41	48	49	59
Electrical conductivity (lab)	487	458	473	504	433	409	390	420	1140
Fluoride	0.2	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.6
Ionic Balance	3.46	2.97	5.8	6.74	0.84	0.96	15.3	2.89	5.47
Kjeldahl Nitrogen Total	1.7	1	0.7	1.2	0.5	0.5	1.1	0.6	0.8
Nitrate & Nitrite (as N)	-	-	-	-	-	-	4.96	5.02	-
Nitrate (as N)	6.64	6.28	5.87	5.43	5.83	4.48	4.96	5.02	0.07
Nitrite (as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised)	6.64	6.28	5.87	5.43	5.83	4.48	-	-	0.07
Nitrogen (Total)	8.3	7.3	6.6	6.6	6.3	5	6.1	5.6	0.9
Phosphorus	0.34	0.09	0.14	0.37	0.06	0.06	0.55	0.12	0.04
Potassium (Filtered)	5	5	5	6	6	7	5	5	30
Reactive Phosphorus as P	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
Sodium (Filtered)	45	43	42	42	39	29	48	35	70
Sulfate as SO4 - Turbidimetric (Filtered)	92	84	82	92	83	71	75	73	13
Total Dissolved Solids	-	318	296	280	316	256	230	210	494
Total Dissolved Solids (Filtered)	361	-	-	-	-	-	-	-	-
pH (lab)	5.82	4.15	4.42	4.18	4.59	6.14	4.62	4.49	11.4
TRH >C6 - C10	<20	<20	20	20	<20	<20	<20	<20	30
TRH >C10 - C16	<100	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C16 - C34	160	<100	<100	<100	<100	<100	<100	<100	220
TRH >C34 - C40	<100	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C10 - C40 (Sum of total)	160	<100	<100	<100	<100	<100	<100	<100	220
TRH >C6 - C10 less BTEX (F1)	<20	<20	20	20	<20	<20	<20	<20	20
TRH >C10 - C16 less Naphthalene (F2)	<100	<100	<100	<100	<100	<100	<100	<100	<100
TPH C6 - C9	<20	<20	20	20	<20	<20	<20	<20	40
TPH C10 - C14	<50	<50	<50	<50	<50	<50	<50	<50	<50
TPH C15 - C28	130	<100	<100	<100	<100	<100	<100	<100	200
TPH C29-C36	<50	<50	<50	<50	<50	<50	<50	<50	<50
TPH C10 - C36 (Sum of total)	130	<50	<50	<50	<50	<50	<50	<50	200
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	<2	<2	<2	<2	<2	<2	<2	<2	<2
Naphthalene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	<2	<2	<2	<2	<2	<2	<2	<2	10
Total BTEX	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01
Xylene (m & p)	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene (o)	<2	<2	<2	<2	<2	<2	<2	<2	<2
Xylene Total	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo[b+j]fluoranthene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Acenaphthene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benz(a)anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene TEQ (zero)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5
Benzo(a) pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (lower bound)*	-	-	-	-	-	-	-	-	-
Benzo(b,j+k)fluoranthene	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene TEQ (upper bound)*	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(k)fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chrysene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibenz(a,h)anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoranthene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluorene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenanthrene	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pyrene	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAHs (Sum of total)	<0.5	<0.5	-	-	-	-	<0.5	<0.5	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	<0.5
Polycylic aromatic hydrocarbons EPA448	-	-	<0.5	<0.5	<0.5	<0.5	-	-	<0.5
PAHs (EPA VIC Total)	-	-	-	-	-	-	-	-	-

Env Stds Comments
#1:Drinking water guideline multiplied by 10
#2:Converted from Nitrate as NO3 (50 mg/L)
#3:Converted from Nitrate as NO3 (700ug/L)
#4:Converted from Nitrate as NO3 (50 mg/L) and multiplied by 10 from drinking water guidelines
#5:Converted from Nitrite as NO2 (3 mg/L)
#6:Converted from Nitrite as NO2 (3 mg/L) and multiplied by 10 from drinking water guidelines

Water quality results (updated version of Appendix D – Groundwater quality results contained in Appendix N (Technical working paper: Groundwater))

							Location_Code	B208	B208	B208	B208	B208A	B208A	B209	B209	B390	B390	B390	B390	B390	B390	B390	B390
							Monitoring_Zone	Victoria Road	Victoria Road	Victoria Road	Victoria Road	Victoria Road	Victoria Road	Yurrulbin Park	Yurrulbin Park	Rozelle Rail Yards	Rozelle Rail Yards	Rozelle Rail Yards	Rozelle Rail Yards	Rozelle Rail Yards	Rozelle Rail Yards	Rozelle Rail Yards	Rozelle Rail Yards
							Sampled_Date_Time	6/02/2018	7/03/2018	13/06/2018	24/10/2018	15/11/2017	6/12/2017	15/06/2018	24/10/2018	9/02/2018	15/03/2018	12/04/2018	11/05/2018	11/05/2018	14/06/2018	18/07/2018	7/11/2018
Chem_Group	ChemName	output unit	EQL	Superseded ADWG 2015 Health	ANZECC 2000 FW 95%	ANZECC 2000 MW 95%	NHMRC 2008 Recreational Water Quality/ Aesthetics																
Resistivity (Saturated Paste)	Resistivity at 25°C	ohm cm	1					-	-	-	-	-	-	-	-	1560	1680	1520	-	1550	1660	-	-
Metals	Arsenic (Filtered)	µg/L	1	10			100[#1]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
	Barium (Filtered)	µg/L	1	2000			20000[#1]	78	69	39	73	185	129	343	160	134	132	144	130	127	108	133	-
	Boron (Filtered)	µg/L	50	4000	370		40000[#1]	<50	<50	<50	<50	<50	<50	<50	<50	250	200	220	210	140	500	140	-
	Cadmium (Filtered)	µg/L	0.1	2	0.2	5.5	20[#1]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Chromium (III+VI) (Filtered)	µg/L	1					<1	<1	8	2	70	32	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Cobalt (Filtered)	µg/L	1			1		<1	<1	<1	<1	<1	<1	<1	<1	13	13	13	12	12	10	12	-
	Copper (Filtered)	µg/L	1	2000	1.4	1.3	20000[#1]	<1	<1	3	2	2	1	<1	<1	<1	<1	<1	<1	2	5	<1	<1
	Iron (Filtered)	µg/L	50					<50	<50	<50	<50	<50	<50	<50	<50	15,600	24,400	29,000	25,000	26,500	12,200	31,500	-
	Lead (Filtered)	µg/L	1	10	3.4	4.4	100[#1]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Magnesium (Filtered)	µg/L	1000					<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	13,000	11,000	13,000	13,000	14,000	12,000	13,000	14,000
	Manganese (Filtered)	µg/L	1	500	1900		5000[#1]	<1	<1	1	<1	<1	<1	<1	<1	832	794	852	860	747	674	828	-
	Mercury (Filtered)	µg/L	0.1	1	0.6	0.4	10[#1]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1
	Nickel (Filtered)	µg/L	1	20	11	70	200[#1]	2	2	1	1	<1	<1	2	<1	19	14	15	12	15	13	18	16
	Zinc (Filtered)	µg/L	5		8	15		6	6	8	<5	7	6	<5	<5	65	<5	6	8	<5	11	<5	<5
Inorganics	Carbonate Alkalinity as CaCO3	mg/L	1					47	46	37	49	59	42	314	52	<1	<1	<1	-	<1	<1	<1	<1
	Soluble Bicarb as CaCO3*	mg/L	1					-	-	<1	11	-	-	<1	<1	54	75	69	72	71	75	83	36
	Alkalinity (Hydroxide) as CaCO3	mg/L	1					130	87	72	<1	643	294	273	133	<1	<1	<1	<5	<1	<1	<1	<1
	Alkalinity (total) as CaCO3	mg/L	1					176	133	110	60	702	336	586	185	54	75	69	72	71	75	83	36
	Ammonia	mg/L	0.01		0.9	0.91		0.51	0.47	-	-	0.51	0.38	-	-	<0.01	<0.01	-	<0.005	-	-	-	-
	Ammonia as N	mg/L	0.01					-	-	0.07	0.24	-	-	0.11	0.05	<0.01	<0.01	0.24	-	0.24	0.15	0.16	0.64
	Anions Total	meq/L	0.01					5.84	4.98	2.7	3.54	15.9	8.77	14.8	7.03	5.84	6.39	6.13	-	6.13	6.08	5.83	5.89
	Bicarbonate Alkalinity as CaCO3	mg/L	1					<1	<1	-	-	<1	<1	-	-	-	75	-	-	-	-	-	-
	Calcium (Filtered)	mg/L	1					34	26	37	18	192	84	200	84	6	4	4	3.2	4	4	4	4
	Cations Total	meq/L	0.01					5.91	4.89	2.73	3.35	13.8	8.82	12.2	6.44	6.02	5.89	6.47	-	5.54	5.8	6.45	4.88
	Chloride	mg/L	1					64	64	15	66	60	64	74	71	143	147	142	120	142	141	128	165
	Electrical conductivity (lab)	uS/cm	1					676	622	312	466	2660	1760	1960	1230	642	597	657	630	646	602	671	633
	Fluoride	mg/L	0.1	1.5			15[#1]	0.9	0.5	<0.1	0.5	0.4	0.5	<0.1	<0.1	0.1	0.2	<0.1	<0.1	0.1	0.2	-	-
	Ionic Balance	%	0.01					0.58	0.92	-	2.68	7.14	0.28	9.63	4.37	1.52	4.07	2.66	-1	5.12	2.4	5.02	9.38
	Kjeldahl Nitrogen Total	mg/L	0.1					0.6	0.5	0.4	0.4	0.7	0.6	2.3	<0.1	0.1	5	0.3	-	0.3	0.3	0.4	0.8
	Nitrate & Nitrite (as N)	mg/L	0.01					-	-	0.07	0.02	-	-	0.02	<0.01	-	<0.01	-	-	-	-	-	-
	Nitrate (as N)	mg/L	0.01	11.29[#2]	0.1581[#3]		112.9[#4]	0.02	0.02	0.06	0.02	<0.01	0.07	0.02	<0.01	0.03	<0.01	0.04	<0.005	0.43	0.04	0.04	<0.01
	Nitrite (as N)	mg/L	0.01	0.91[#5]			9.1[#6]	<0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.005	<0.01	<0.01	0.08	0.02
	Nitrogen (Total Oxidised)	mg/L	0.01					0.02	0.02	-	-	0.01	0.07	-	-	0.03	<0.01	-	-	0.43	0.04	0.12	0.01
	Nitrogen (Total)	mg/L	0.01					0.6	0.5	0.5	0.4	0.7	0.7	2.3	<0.1	0.1	5	0.04 - 0.3	0.1	0.43 - 0.7	0.04 - 0.3	0.12 - 0.5	0.01 - 0.8
	Phosphorus	mg/L	0.01					0.01	0.01	0.02	0.02	0.02	<0.01	0.85	<0.01	<0.01	1	<0.01	<0.05	<0.01	<0.01	0.01	<0.01
	Potassium (Filtered)	mg/L	1					44	30	4	11	40	55	4	3	1	4	3	2.6	2	10	2	2
	Reactive Phosphorus as P	mg/L	0.01					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01
	Sodium (Filtered)	mg/L	1					71	65	18	50	74	74	49	50	87	78	82	90	95	85	79	80
	Sulfate as SO4 - Turbidimetric (Filtered)	mg/L	1					25	25	4	23	11	12	49	64	35	36	36	-	34	29	27	25
	Total Dissolved Solids	mg/L	10					455	328	126	276	654	614	695	394	322	340	376	360	356	312	343	388
	Total Dissolved Solids (Filtered)	mg/L	10					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physiochemical parameters	pH (lab)	pH Units	0.01					11	11	11	10.2	11.9	11.8	11.9	11.5	6.05	6.2	6.24	6	6.2	6.91	6.32	6.44
TRH - NEPM 2013 Fractions	TRH >C6 - C10	µg/L	20					40	40	<20	<20	<20	30	<20	<20	<20	<20	<20	<10	<20	<20	<20	<20
	TRH >C10 - C16	µg/L	100					<100	<100	<100	<100	<100	<100	<100	<100	<100	150	<100	<50	<100	<100	<100	<100
	TRH >C16 - C34	µg/L	100					260	<100	<100	<100	270	150	310	<100	610	630	200	440	450	<100	<100	<100
	TRH >C34 - C40	µg/L	100					<100	<100	<100	<100	150	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	TRH >C10 - C40 (Sum of total)	µg/L	100					260	<100	<100	<100	420	150	310	<100	610	780	200	-	450	<100	<100	<100
	TRH >C6 - C10 less BTEX (F1)	µg/L	20					20	30	<20	<20	<20	30	<20	<20	<20	<20	<20	<10	<20	<20	<20	<20
	TRH >C10 - C16 less Naphthalene (F2)	µg/L	100					<100	<100	<100	<100	<100	<100	<100	<100	<100	150	<100	<50	<100	<100	<100	<100
TPH - NEPM 1999 Fractions	TPH C6 - C9	µg/L	20					40	30	<20	<20	<20	30	<20	<20	<20	<20	<20	<10	<20	<20	<20	<20
	TPH C10 - C14	µg/L	50					<50	<50	<50	<50	<50	60	<50	<50	<50	120	<50	<50	<50	<50	<50	<50
	TPH C15 - C28	µg/L	100					220	<100	<100	<100	190	130	290	<100	520	640	240	410	440	<100	<100	<100
	TPH C29-C36	µg/L	50					<50	<50	<50	<50	140	<50	110	<50	<50	<50	<50	<100	<50	<50	<50	<50
	TPH C10 - C36 (Sum of total)	µg/L	50					220	<50	<50	<50	330	190	400	<50	520	760	240	-	440	<50	<50	<50
BTEXN	Benzene	µg/L	1	1	950	700	10[#1]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Ethylbenzene	µg/L	2	300			3000[#1]	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	<2	<2	<2	<2
	Naphthalene	µg/L	1		16	70		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Toluene	µg/L	2	800			8000[#1]	15	12	<2	6	<2	<2	<2	<2	<2	<2	<2	<1	<2	<2	<2	<2
	Total BTEX	mg/L	0.001					0.015	0.012	<0.001	0.006	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001
	Xylene (m & p)	µg/L	2					<2	<2	<2	<2	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Xylene (o)	µg/L	2		350			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<1	<2	<2	<2	<2
	Xylene Total	µg/L	2	600			6000[#1]	<2	<2	<2	<2	2	<2	<2	<2	<2	<2	<2	-	<2	<2	<2	<2
PAHs	Benzo[b+j]fluoranthene	mg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001
	Acenaphthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Acenaphthylene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Benz(a)anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Benzo(a)pyrene TEQ (zero)	µg/L	0.5					<0.5	<0.5	-	-	<0.5	<0.5	-	-	-	<0.5	-	-	-	-	-	-
	Benzo(a) pyrene	µg/L	0.5	0.01			0.1[#1]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	Benzo(a)pyrene TEQ (lower bound)*	µg/L	0.5					-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
	Benzo(b,j+k)fluoranthene	µg/L	2					-	-	-	-	-	-	-	-	-	-	-	<2	-	-	-	-
	Benzo(a)pyrene TEQ (upper bound)*	mg/L	0.005					-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-
	Benzo(g,h,i)perylene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Benzo(k)fluoranthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	<1	<1
	Chrysene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Dibenz(a,h)anthracene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Fluoranthene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Fluorene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Indeno(1,2,3-c,d)pyrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Phenanthrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Pyrene	µg/L	1					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	PAHs (Sum of total)	µg/L	0.5	0.01				-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
Halogenated Benzenes	Hexachlorobenzene	µg/L	0.5					<0.5	<0.5	<0.5	<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-
EPA 448 Classification of Wastes	Polycylic aromatic hydrocarbons EPA448	µg/L	0.5					<0.5	<0.5	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-
EPA 621 Classification of Wastes	PAHs (EPA VIC Total)	µg/L	0.5					-	-	-	-	-	-	-	-	-	<0.5	-	-	-	-	-	-

Env Stds Comments
#1:Drinking water guideline multiplied by 10
#2:Converted from Nitrate as NO3 (50 mg/L)
#3:Converted from Nitrate as NO3 (700ug/L)
#4:Converted from Nitrate as NO3 (50 mg/L) and multiplied by 10 from drinking water guidelines
#5:Converted from Nitrite as NO2 (3 mg/L)
#6:Converted from Nitrite as NO2 (3 mg/L) and multiplied by 10 from drinking water guidelines

Water quality Yurulbin Point zone (B209, B104A, B105A and B131A)

Chem_Group	ChemName	output unit	EQL	Superseded ADWG 2015 Health	ANZECC 2000 FW 95%	ANZECC 2000 MW 95%	NHMRC 2008 Recreational Water Quality/ Aesthetics	Statistical Summary Number of Results	Minimum Concentration	Maximum Concentration	Median Concentration
Metals	Arsenic (Filtered)	µg/L	1	10			100[#1]	25	<1	<10	2
	Barium (Filtered)	µg/L	1	2000			20000[#1]	25	77	624	175
	Boron (Filtered)	µg/L	50	4000	370		40000[#1]	25	<50	1050	120
	Cadmium (Filtered)	µg/L	0.1	2	0.2	5.5	20[#1]	25	<0.1	<1	0.05
	Chromium (III+VI) (Filtered)	µg/L	1					25	<1	<10	0.5
	Cobalt (Filtered)	µg/L	1			1		25	<1	25	0.5
	Copper (Filtered)	µg/L	1	2000	1.4	1.3	20000[#1]	25	<1	<10	0.5
	Iron (Filtered)	µg/L	50					25	<50	536000	25
	Lead (Filtered)	µg/L	1	10	3.4	4.4	100[#1]	25	<1	<10	0.5
	Magnesium (Filtered)	µg/L	1000					25	1.01	952000	52000
	Manganese (Filtered)	µg/L	1	500	1900		5000[#1]	25	<1	13300	401
	Mercury (Filtered)	µg/L	0.1	1	0.6	0.4	10[#1]	25	<0.1	<0.1	0.05
	Nickel (Filtered)	µg/L	1	20	11	70	200[#1]	25	<1	10	1
	Zinc (Filtered)	µg/L	5		8	15		25	<5	<50	2.5
Inorganics	Carbonate Alkalinity as CaCO3	mg/L	1					25	<1	314	0.5
	Soluble Bicarb as CaCO3*	mg/L	1					10	<1	229	56.5
	Alkalinity (Hydroxide) as CaCO3	mg/L	1					25	<1	1050	0.5
	Alkalinity (total) as CaCO3	mg/L	1					25	25	1130	195
	Ammonia	mg/L	0.01		0.9	0.91		15	0.44	1.55	0.6
	Ammonia as N	mg/L	0.01					10	0.05	2.3	0.7
	Anions Total	meq/L	0.01					25	7.03	417	30.2
	Bicarbonate Alkalinity as CaCO3	mg/L	1					15	<1	260	76
	Calcium (Filtered)	mg/L	1					25	63	1010	174
	Cations Total	meq/L	0.01					25	6.44	386	27.8
	Chloride	mg/L	1					25	62	13300	693
	Electrical conductivity (lab)	uS/cm	1					25	1230	39200	3210
	Fluoride	mg/L	0.1	1.5			15[#1]	25	<0.1	0.6	0.3
	Ionic Balance	%	0.01					25	0.35	9.63	3.81
	Kjeldahl Nitrogen Total	mg/L	0.1					25	<0.1	4.2	1.2
	Nitrate & Nitrite (as N)	mg/L	0.01					8	<0.01	<0.1	0.02
	Nitrate (as N)	mg/L	0.01	11.29[#2]	0.1581[#3]		112.9[#4]	25	<0.01	<0.25	0.02
	Nitrite (as N)	mg/L	0.01	0.91[#5]			9.1[#6]	25	<0.01	<0.25	0.005
	Nitrogen (Total Oxidised)	mg/L	0.01					17	<0.01	<0.25	0.04
	Nitrogen (Total)	mg/L	0.1					25	<0.1	4.2	1.2
	Phosphorus	mg/L	0.01					25	<0.01	1.22	0.05
	Potassium (Filtered)	mg/L	1					25	3	97	32
	Reactive Phosphorus as P	mg/L	0.01					25	<0.01	<0.1	0.005
	Sodium (Filtered)	mg/L	1					25	49	5780	389
	Sulfate as SO4 - Turbidimetric (Filtered)	mg/L	1					25	49	1930	237
	Total Dissolved Solids	mg/L	10					24	394	31800	1755
	Total Dissolved Solids (Filtered)	mg/L	10					1	1640	1640	1640
Physiochemical parameters	pH (lab)	pH Units	0.01					25	5.69	12	7.94
TRH - NEPM 2013 Fractions	TRH >C6 - C10	µg/L	20					25	<20	580	10
	TRH >C10 - C16	µg/L	100					25	<100	160	50
	TRH >C16 - C34	µg/L	100					25	<100	580	50
	TRH >C34 - C40	µg/L	100					25	<100	180	50
	TRH >C10 - C40 (Sum of total)	µg/L	100					25	<100	760	50
	TRH >C6 - C10 less BTEX (F1)	µg/L	20					25	<20	190	10
	TRH >C10 - C16 less Naphthalene (F2)	µg/L	100					25	<100	160	50
TPH - NEPM 1999 Fractions	TPH C6 - C9	µg/L	20					25	<20	580	10
	TPH C10 - C14	µg/L	50					25	<50	150	25
	TPH C15 - C28	µg/L	100					25	<100	580	50
	TPH C29-C36	µg/L	50					25	<50	240	25
	TPH C10 - C36 (Sum of total)	µg/L	50					25	<50	680	25
BTEXN	Benzene	µg/L	1	1	950	700	10[#1]	25	<1	37	2
	Ethylbenzene	µg/L	2	300			3000[#1]	25	<2	<5	1
	Naphthalene	µg/L	1		16	70		25	<1	<1	0.5
	Toluene	µg/L	2	800			8000[#1]	25	<2	422	1
	Total BTEX	mg/L	0.001					25	<0.001	0.432	0.003
	Xylene (m & p)	µg/L	2					25	<2	<5	1
	Xylene (o)	µg/L	2		350			25	<2	<5	1
	Xylene Total	µg/L	2	600			6000[#1]	25	<2	<5	1
PAHs	Benzo[b+j]fluoranthene	mg/L	0.001					25	<0.001	<0.001	0.0005
	Acenaphthene	µg/L	1					25	<1	<1	0.5
	Acenaphthylene	µg/L	1					25	<1	<1	0.5
	Anthracene	µg/L	1					25	<1	<1	0.5
	Benz(a)anthracene	µg/L	1					25	<1	<1	0.5
	Benzo(a)pyrene TEQ (zero)	µg/L	0.5					15	<0.5	<0.5	0.25
	Benzo(a) pyrene	µg/L	0.5	0.01			0.1[#1]	25	<0.5	<0.5	0.25
	Benzo(g,h,i)perylene	µg/L	1					25	<1	<1	0.5
	Benzo(k)fluoranthene	µg/L	1					25	<1	<1	0.5
	Chrysene	µg/L	1					25	<1	<1	0.5
	Dibenz(a,h)anthracene	µg/L	1					25	<1	<1	0.5
	Fluoranthene	µg/L	1					25	<1	<1	0.5
	Fluorene	µg/L	1					25	<1	<1	0.5
	Indeno(1,2,3-c,d)pyrene	µg/L	1					25	<1	<1	0.5
	Phenanthrene	µg/L	1					25	<1	<1	0.5
	Pyrene	µg/L	1					25	<1	<1	0.5
	PAHs (Sum of total)	µg/L	0.5	0.01				13	<0.5	<0.5	0.25
EPA 448 Classification of Wastes	Polycyclic aromatic hydrocarbons EPA448	µg/L	0.5					12	<0.5	<0.5	0.25

Env Stds Comments
#1:Drinking water guideline multiplied by 10
#2:Converted from Nitrate as NO3 (50 mg/L)
#3:Converted from Nitrate as NO3 (700ug/L)
#4:Converted from Nitrate as NO3 (50 mg/L) and multiplied by 10 from drinking water guidelines
#5:Converted from Nitrite as NO2 (3 mg/L)
#6:Converted from Nitrite as NO2 (3 mg/L) and multiplied by 10 from drinking water guidelines

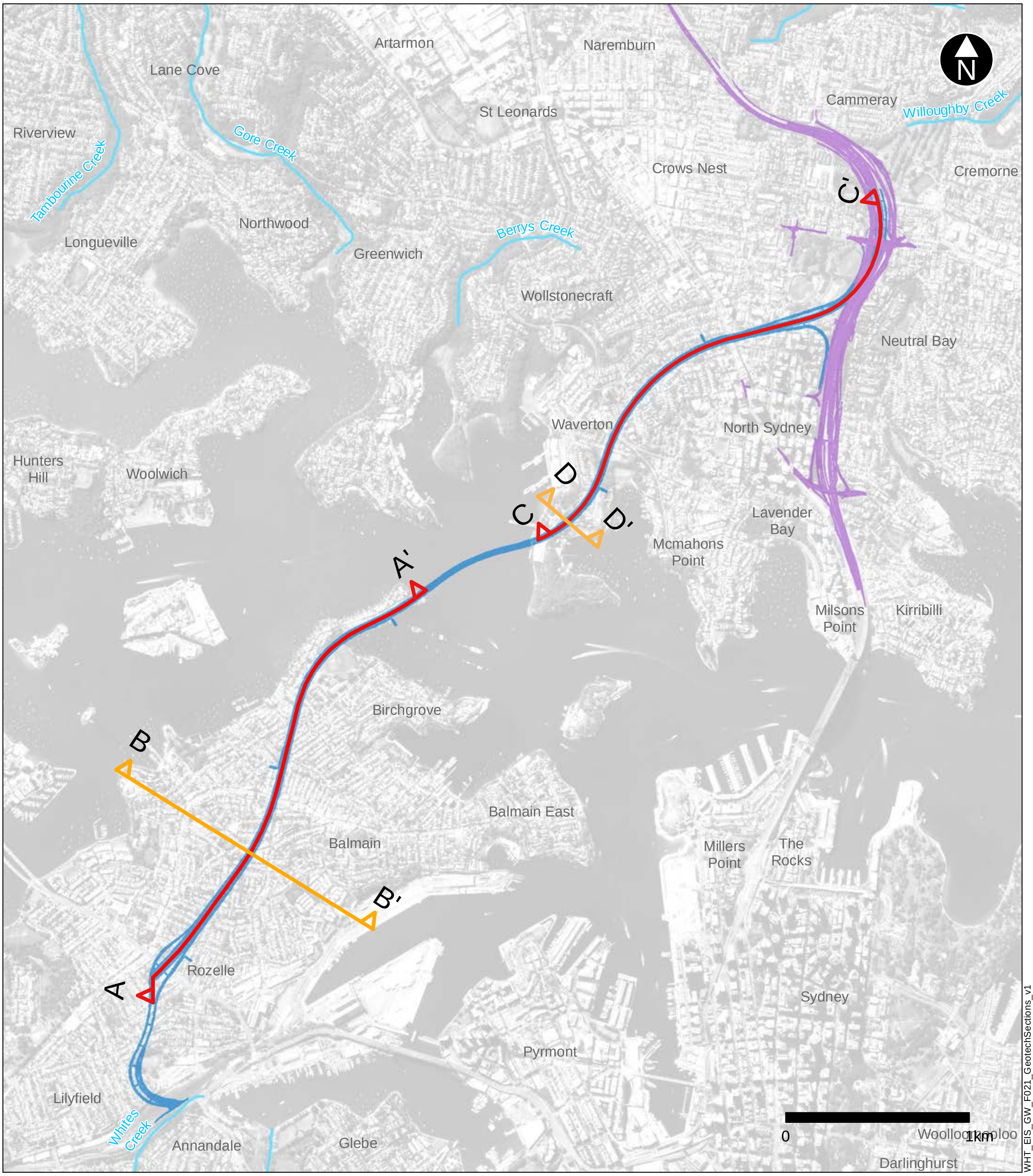
Water quality Yurulbin Point zone (B209, B104A, B105A and B131A)

Chem_Group	ChemName	output unit	EQL	Superseded ADWG 2015 Health	ANZECC 2000 FW 95%	ANZECC 2000 MW 95%	NHMRC 2008 Recreational Water Quality/ Aesthetics	Number of Guideline Exceedances
Metals	Arsenic (Filtered)	µg/L	1	10			100[#1]	0
	Barium (Filtered)	µg/L	1	2000			20000[#1]	0
	Boron (Filtered)	µg/L	50	4000	370		40000[#1]	8
	Cadmium (Filtered)	µg/L	0.1	2	0.2	5.5	20[#1]	2
	Chromium (III+VI) (Filtered)	µg/L	1					0
	Cobalt (Filtered)	µg/L	1			1		7
	Copper (Filtered)	µg/L	1	2000	1.4	1.3	20000[#1]	4
	Iron (Filtered)	µg/L	50					25
	Lead (Filtered)	µg/L	1	10	3.4	4.4	100[#1]	3
	Magnesium (Filtered)	µg/L	1000					0
	Manganese (Filtered)	µg/L	1	500	1900		5000[#1]	8
	Mercury (Filtered)	µg/L	0.1	1	0.6	0.4	10[#1]	0
	Nickel (Filtered)	µg/L	1	20	11	70	200[#1]	0
	Zinc (Filtered)	µg/L	5		8	15		8
Inorganics	Carbonate Alkalinity as CaCO3	mg/L	1					0
	Soluble Bicarb as CaCO3*	mg/L	1					0
	Alkalinity (Hydroxide) as CaCO3	mg/L	1					0
	Alkalinity (total) as CaCO3	mg/L	1					0
	Ammonia	mg/L	0.01		0.9	0.91		7
	Ammonia as N	mg/L	0.01					0
	Anions Total	meq/L	0.01					0
	Bicarbonate Alkalinity as CaCO3	mg/L	1					0
	Calcium (Filtered)	mg/L	1					0
	Cations Total	meq/L	0.01					0
	Chloride	mg/L	1					25
	Electrical conductivity (lab)	uS/cm	1					0
	Fluoride	mg/L	0.1	1.5			15[#1]	0
	Ionic Balance	%	0.01					0
	Kjeldahl Nitrogen Total	mg/L	0.1					0
	Nitrate & Nitrite (as N)	mg/L	0.01					0
	Nitrate (as N)	mg/L	0.01	11.29[#2]	0.1581[#3]		112.9[#4]	1
	Nitrite (as N)	mg/L	0.01	0.91[#5]			9.1[#6]	0
	Nitrogen (Total Oxidised)	mg/L	0.01					0
	Nitrogen (Total)	mg/L	0.1					0
	Phosphorus	mg/L	0.01					0
	Potassium (Filtered)	mg/L	1					0
	Reactive Phosphorus as P	mg/L	0.01					0
	Sodium (Filtered)	mg/L	1					25
	Sulfate as SO4 - Turbidimetric (Filtered)	mg/L	1					0
	Total Dissolved Solids	mg/L	10					24
	Total Dissolved Solids (Filtered)	mg/L	10					1
Physiochemical parameters	pH (lab)	pH Units	0.01					25
TRH - NEPM 2013 Fractions	TRH >C6 - C10	µg/L	20					0
	TRH >C10 - C16	µg/L	100					0
	TRH >C16 - C34	µg/L	100					0
	TRH >C34 - C40	µg/L	100					0
	TRH >C10 - C40 (Sum of total)	µg/L	100					0
	TRH >C6 - C10 less BTEX (F1)	µg/L	20					0
	TRH >C10 - C16 less Naphthalene (F2)	µg/L	100					0
TPH - NEPM 1999 Fractions	TPH C6 - C9	µg/L	20					0
	TPH C10 - C14	µg/L	50					0
	TPH C15 - C28	µg/L	100					0
	TPH C29-C36	µg/L	50					0
	TPH C10 - C36 (Sum of total)	µg/L	50					0
BTEXN	Benzene	µg/L	1	1	950	700	10[#1]	13
	Ethylbenzene	µg/L	2	300			3000[#1]	0
	Naphthalene	µg/L	1		16	70		0
	Toluene	µg/L	2	800			8000[#1]	0
	Total BTEX	mg/L	0.001					0
	Xylene (m & p)	µg/L	2					0
	Xylene (o)	µg/L	2		350			0
	Xylene Total	µg/L	2	600			6000[#1]	0
PAHs	Benzo[b+j]fluoranthene	mg/L	0.001					0
	Acenaphthene	µg/L	1					0
	Acenaphthylene	µg/L	1					0
	Anthracene	µg/L	1					0
	Benz(a)anthracene	µg/L	1					0
	Benzo(a)pyrene TEQ (zero)	µg/L	0.5					0
	Benzo(a) pyrene	µg/L	0.5	0.01			0.1[#1]	25
	Benzo(g,h,i)perylene	µg/L	1					0
	Benzo(k)fluoranthene	µg/L	1					0
	Chrysene	µg/L	1					0
	Dibenz(a,h)anthracene	µg/L	1					0
	Fluoranthene	µg/L	1					0
	Fluorene	µg/L	1					0
	Indeno(1,2,3-c,d)pyrene	µg/L	1					0
	Phenanthrene	µg/L	1					0
	Pyrene	µg/L	1					0
	PAHs (Sum of total)	µg/L	0.5	0.01				13
EPA 448 Classification of Wastes	Polycylic aromatic hydrocarbons EPA448	µg/L	0.5					0

Env Stds Comments
#1:Drinking water guideline multiplied by 10
#2:Converted from Nitrate as NO3 (50 mg/L)
#3:Converted from Nitrate as NO3 (700ug/L)
#4:Converted from Nitrate as NO3 (50 mg/L) and multiplied by 10 from drinking water guidelines
#5:Converted from Nitrite as NO2 (3 mg/L)
#6:Converted from Nitrite as NO2 (3 mg/L) and multiplied by 10 from drinking water guidelines

Attachment B

Schematics of conceptual hydrogeological model



Legend

Western Harbour Tunnel

Warringah Freeway Upgrade

Figure B1 - Map showing location of section lines

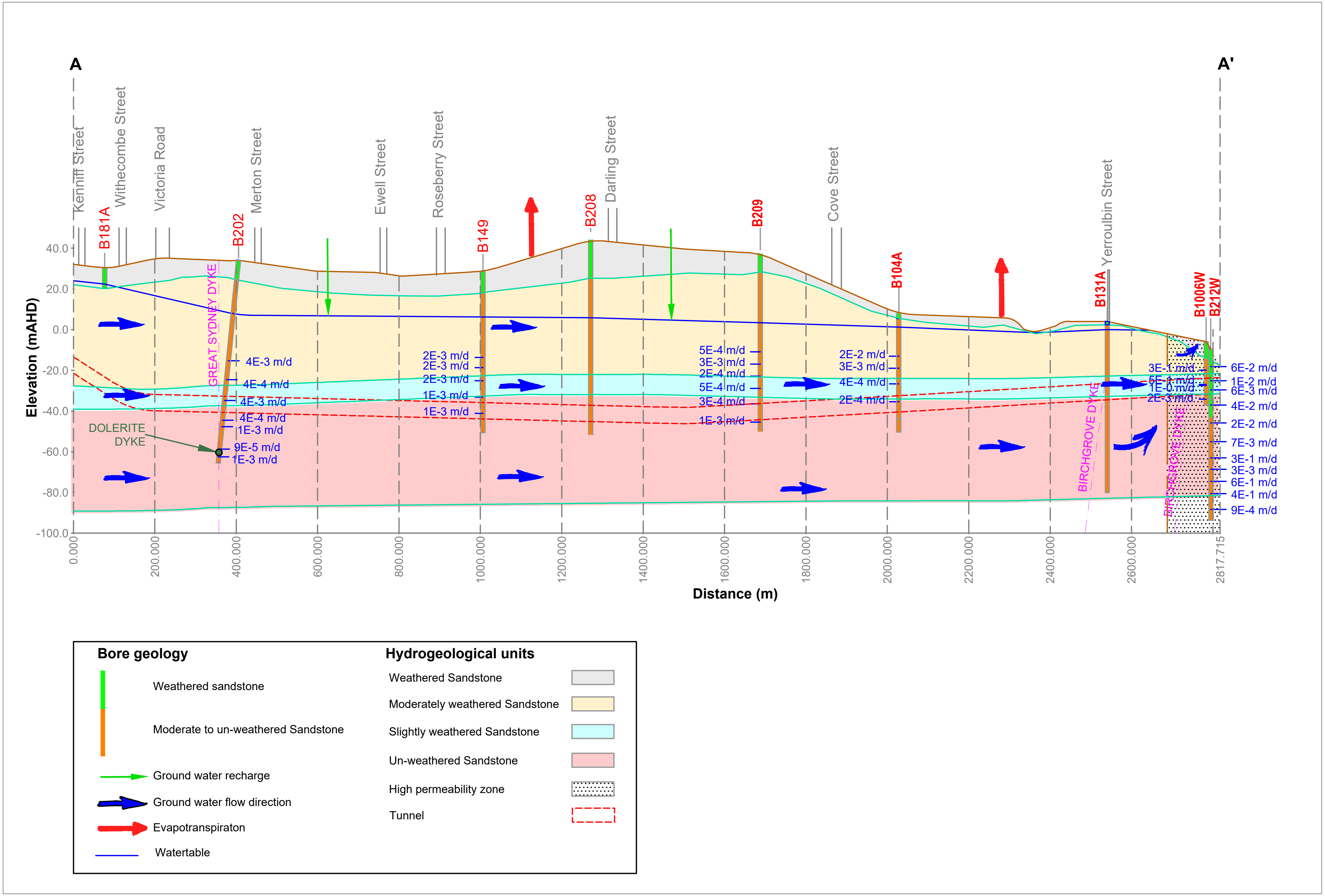


Figure B2 - Hydrogeological section AA'

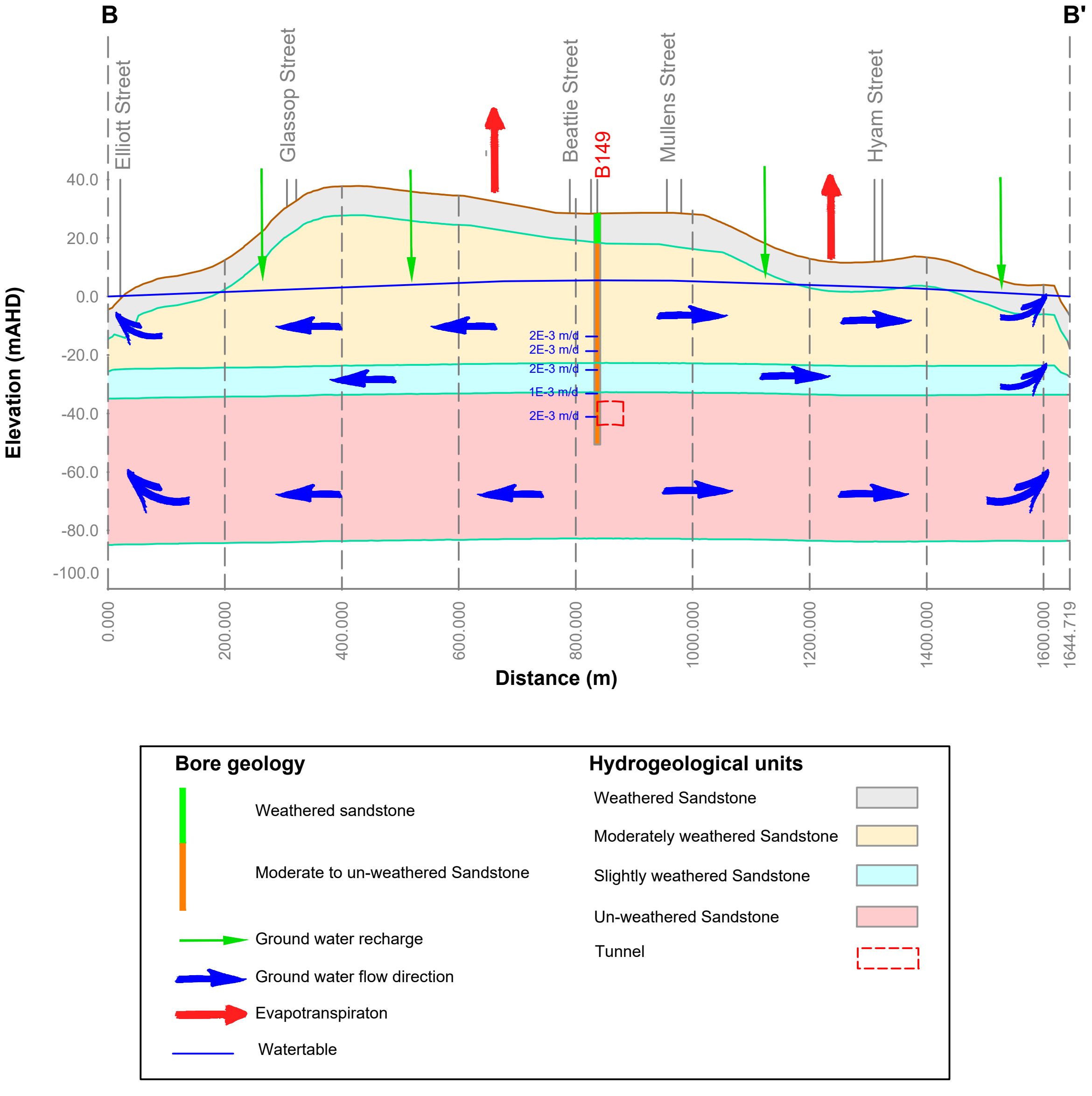


Figure B3 - Hydrogeological section BB'

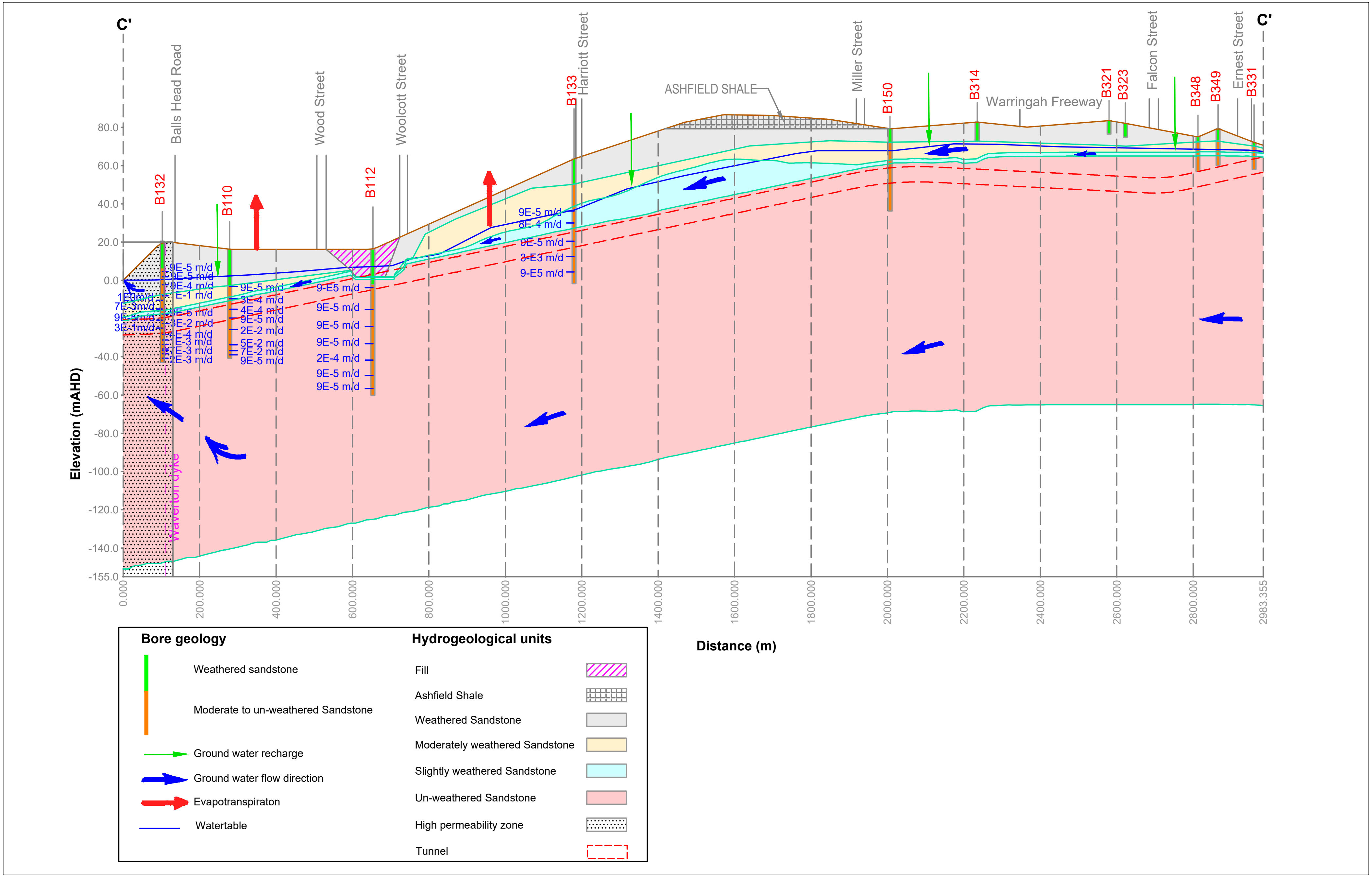


Figure B4 - Hydrogeological section CC'

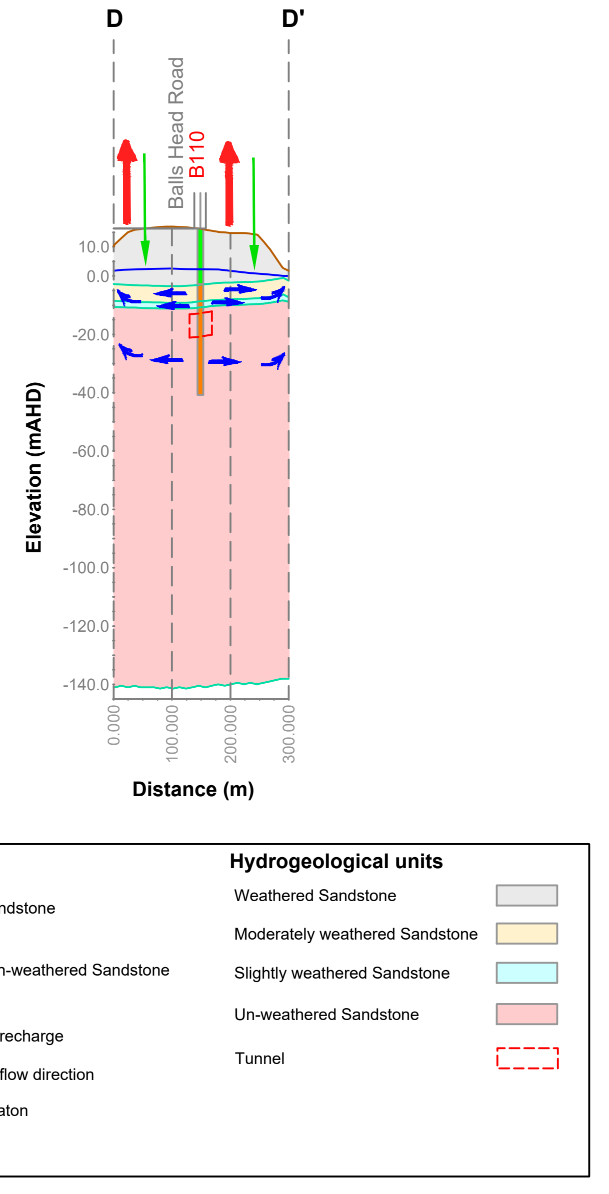


Figure B5 - Hydrogeological Section DD'