Bi - Annual Surface Water Monitoring Report

June 2021 to December 2021

Project: Sydney Metro City & Southwest – TSE Works

Document No: SMCSWTSE-JCG-TPW-EM-RPT-097504

DOCUMENT APPROVAL

REVISION	DATE	PREPARED BY	REVIEWED BY	APPROVED BY	REMARKS
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		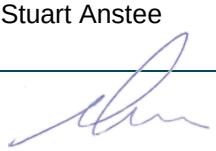	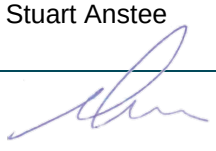	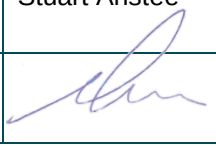	

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Compliance matrix

<table>
<tr><th>Clause</th><th>Detail</th><th>Reference</th></tr>
<tr><td>C9</td><td>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each Construction Monitoring program to compare actual performance of construction of the CSSI against predicted performance.
<table>
<tr><th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr>
<tr><td>(c)</td><td>Water Quality</td><td>EPA and Relevant Council(s)</td></tr>
</table></td><td>This report</td></tr>
<tr><td rowspan="11">C10</td><td>Each Construction Monitoring Program must provide:</td><td></td></tr>
<tr><td>(a) details of baseline data available</td><td>Appendix B</td></tr>
<tr><td>(b) details of baseline data to be obtained and when;</td><td rowspan="4">Section 7.0</td></tr>
<tr><td>(c) details of all monitoring of the project to be undertaken;</td></tr>
<tr><td>(d) the parameters of the project to be monitored;</td></tr>
<tr><td>(e) the frequency of monitoring to be undertaken;</td></tr>
<tr><td>(f) the location of monitoring;</td><td>Section 6.0, Figure 4</td></tr>
<tr><td>(g) the reporting of monitoring results;</td><td>Appendix B</td></tr>
<tr><td>(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and</td><td>Section 6.6 of the Construction Soil Water and Groundwater Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002014)</td></tr>
<tr><td>(i) any consultation to be undertaken in relation to the monitoring programs.</td><td>Figure 1</td></tr>
<tr><td>C12</td><td>The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C9 of this approval and must include, to the written satisfaction of the Secretary, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information</td><td>Figure 1</td></tr>
</table>

Clause	Detail	Reference
	requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program	This report
E107	The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with.	Section 2.3 noting an EPL is in force and provides specific requirements for the Project

1.0 Introduction

The purpose of the Surface Water Quality Monitoring Program (SWQMP) (detailed in Section 6.1 of the Construction Soil, Water and Groundwater Management Plan (CSWGMP): (SMCSWTSE-JCG-TPW-EM-PLN-002014) is to identify potential impacts of the JHCPBG Tunnel Station Excavation (TSE) Works on water quality in local receiving waters.

The data presented in the SWQMP Report (this report) is submitted in accordance with Condition C16 of the Project Planning Approval, which requires reporting of the results of the TSE Works Water Quality Monitoring Program to the Department of Planning, Infrastructure and Environment (DPIE), the New South Wales (NSW) Environment Protection Authority (EPA), the NSW Natural Resource Access Regulator (NRAR) and relevant councils.

This report will highlight the results from the construction phase of the surface water monitoring program and compare these results against established baseline water quality targets developed during pre-construction monitoring.

2.0 Compliance

2.1 Approvals

The NSW DPIE's list of Secretary's Environmental Assessment Requirements (SEARs) for the project requires the assessment of groundwater and surface water quality impacts to reference the relevant public health and environmental water quality criteria, including those specified in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC 2000 guidelines), applicable regional, local or site-specific guidelines and any licensing requirements.

2.2 ANZECC (2000) Guidelines and Surface Water Monitoring Parameters

The ANZECC guidelines provide specific assessment criteria and water quality guideline values that aim to protect and manage water resources whilst maintaining economic and social development.

The ANZECC guidelines for marine and freshwater specific to south-east Australian lowland rivers and NSW coastal rivers have been used throughout this report, in accordance with the SEARs, to inform ongoing assessments of potential impacts on water quality.

The guidelines have been developed based on ecotoxicity data for a wide range of species in Australia and New Zealand, however they are not site specific and do not consider the local environment including local influences on water quality. An exceedance of an ANZECC guideline value is common and can be a result of a range of factors, including local hydrogeological conditions. As a result the ANZECC guidelines recommend the implementation of a risk-based approach to determine actual environmental risk.

To address this, a trigger response plan has been developed (Figure 1) and implemented in the event of surface water sampling results exceeding the 80th percentile of the baseline values. The following items will be reviewed as part of an exceedance investigation.

- Climate data, specifically rainfall records for the period leading up to and including the sampling event
- Activities at nearby Project sites including any water discharges.
- Erosion and sediment control practices on sites discharging into the specific catchment

- Incidents at nearby Project sites in the preceding three months, and
- Potential non-Project related activities in the catchment that might have affected the results

The results of the investigation may result in further actions including additional monitoring, modifications to site practices or regulatory reporting as detailed in Figure 1.

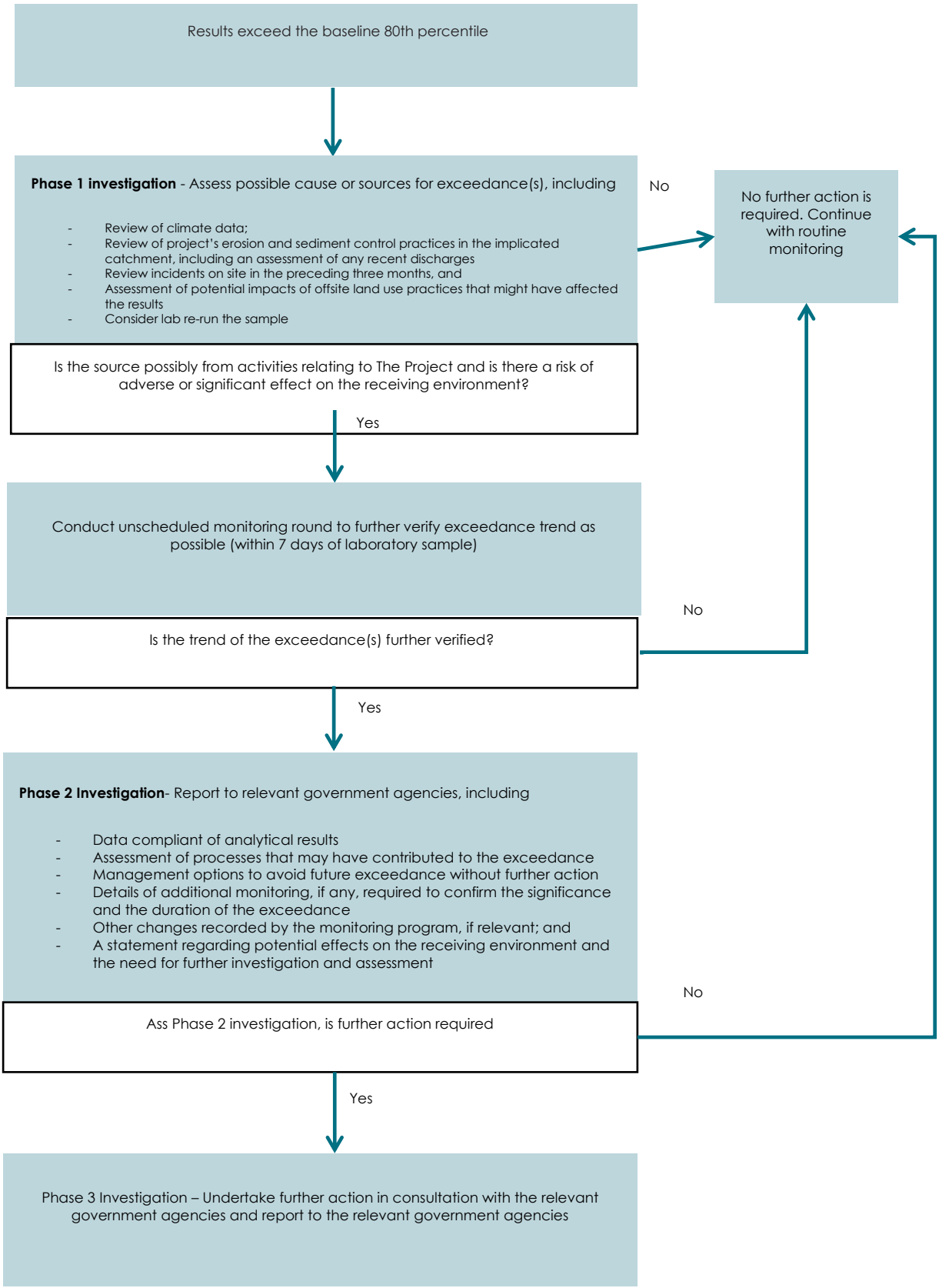

Figure 1 – Response Action Process for exceedances of Surface Water Quality

2.3 NSW Water Quality Objectives

The NSW Water Quality Objectives (WQOs) (NSW Government 2014) are the agreed environmental values and long-term goals for NSW surface waters and are to be considered when assessing and managing the likely impact of activities on waterways.

The environmental values for the project are the protection of:

1. Aquatic ecosystems;
2. Visual amenity
3. Secondary contact recreation (e.g. boating)
4. Primary contact recreation (e.g. swimming) in the longer term (10 year) and
5. For upper tributaries only, protection of aquatic foods (cooked).

'Aquatic ecosystems' is the primary environmental value of the project as the watercourses within the sub-catchments, intercepted by the project, support downstream aquatic ecosystems.

There may be 'secondary contact recreation' and / or 'primary contact recreation' in parts of the downstream surface water catchments within the project area. However, the objective of protection of aquatic ecosystems will also protect these additional environmental values since aquatic ecosystems are generally more sensitive to changes to the aquatic environment.

The WQOs are consistent with the agreed national framework for assessing water quality, set out in the ANZECC guidelines. While the WQOs provide environmental values for NSW waters, the ANZECC guidelines provide the technical guidance to assess the water quality needed to protect those values.

3.0 Site Characterisation

3.1 Rainfall

The Bureau of Meteorology (BoM) Sydney Observatory Hill weather station (BoM site ID 066062) is located approximately 200 metres from the Barangaroo Worksite, at the centre of the TSE Works alignment.

The average yearly rainfall is 1213.4mm (based on records from 1858 – 2021). Autumn and winter have been identified as the wettest months in Sydney with on average the highest rainfall received in June (133.1mm). Spring is on average the driest season with September receiving the least rainfall (68.1mm).

Weather data (including rainfall) is collected using data from the Sydney Observatory Hill weather station, accessed via the Bureau of Meteorology website (http://www.bom.gov.au). Figure 2 depicts the total monthly rainfall for the monitoring period against the long-term average for the same months.

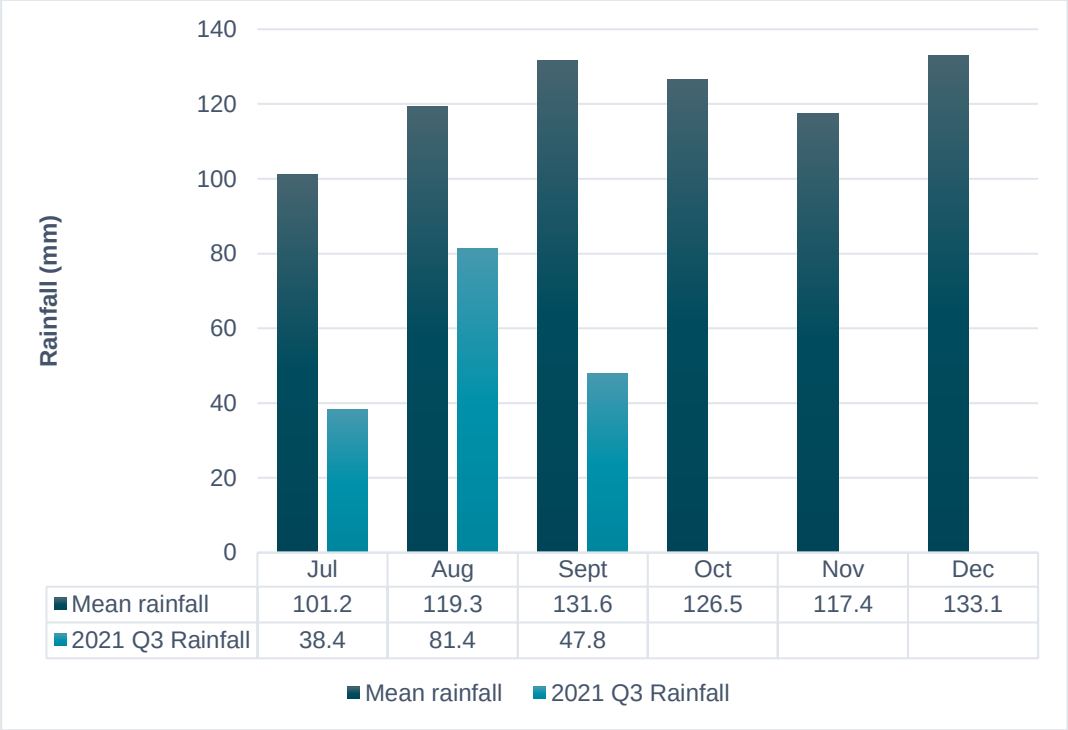

Figure 1 Monthly mean rainfall compared to 2021 monthly total rainfall

During this reporting period, lower than average rainfall was recorded in July (38.4mm), August (81.4mm) and September (47.8mm) compared with the historic average. The lowest rainfall volume was recorded in July where only 38.4mm of rain was recorded compared to a historic mean of 101.2mm. Sampling events were undertaken in September (Q3).

3.2 Surface Hydrology

The project is located within the Sydney Harbour/Parramatta River catchment and the Cooks River catchment. Within these two catchments there are five local watercourses that are located along the tunnel and station excavation (TSE) works alignment, which drain into Middle Harbour, Sydney Harbour or Botany Bay (Figure 3).

Figure 3: Surface water catchments and watercourses (Source: Figure 21-1 of the Sydney Metro City & Southwest EIS)

The sub-catchments are well established urban catchments with predominantly residential and/or commercial/industrial land use. Watercourses near the TSE Works are heavily urbanised and surface water is generally captured by developed stormwater networks. Treated construction water is discharged into a number of waterways, including into Sydney Harbour, via existing stormwater systems or directly into Sydney Harbour (Table 1).

Table 1 Drainage Catchments

Catchment Area	Relevant TSE Works element	Surface water sub-catchment area	Receiving water
Sydney Harbour and Parramatta River	Chatswood northern dive site	Scotts Creek and Flat Rock Creek	Middle Harbour
	Artarmon substation	Flat Rock Creek	
	Crows Nest	Flat Rock Creek tributary	
	Victoria Cross Station	Milsons Park	Sydney Harbour
	Blues Point temporary site	N/A	
	Barangaroo Station	N/A	
	Martin Place Station	City area	
	Pitt Street Station	City area	
Cooks River	Waterloo Station	Alexandra Canal	Botany Bay (via Cooks River)
	Marrickville southern dive	Marrickville Valley	

Geologically, the project area is located within the Sydney Basin. The recognised hydrogeological units within the project area are shown in Table 2.

Table 2 Hydrogeological Units within the project area

Hydrogeological Unit	Aquifer Type	Properties
Unconsolidated sediments (fill, alluvium, marine sediments)	Unconfined aquifer	Partially saturated
Ashfield Shale (Wianamatta Group)	Leaky aquifer	Mostly saturated
Hawkesbury Sandstone (including Mittagong Formation transitional unit)	Unconfined/semi-confined aquifer	Mostly saturated

The extent of development within the catchments and watercourses was assessed within the EIS. Waterways were determined to be affected by poor water quality and changed flow regime. The waterways have been greatly modified, with creek systems extensively channelised or hard edged with concrete. Wetlands have been destroyed or degraded and, where natural remnants of vegetation exist, they are often affected by weeds and rubbish.

Based on the assessment in the EIS and the Pre-Construction Surface Water Quality Monitoring Programme, ecosystem disturbance for each discharge location has been determined and included in Table 3.

4.0 Project Progress

The project tunnels were largely constructed within the Ashfield Shale and the Hawkesbury Sandstone, and constructed below the water table. The Hawkesbury Sandstone is the main water bearing groundwater system in the region and is primarily an unconfined aquifer but is semi-confined where it is overlain by the Ashfield Shale and alluvium, where present. All tunnelling works for the project were completed in March 2020.

During the construction phase of the project, water from construction process activities (including piling, drilling, concreting and tunnelling works), surface water on site and tunnel groundwater inflows is treated and discharged from the project water treatment plants (WTP). Treated discharge water is the primary source of discharge into the receiving environment (i.e. waterways and the harbours) and has been managed via eight WTPs at peak construction (Table 3).

Current activities on the Project during the reporting period include the construction of the Station Box at Barangaroo which has involved some dewatering. Works at the Barangaroo Site are expected to be completed the end of October 2021, as such this will be the final bi-annual surface water monitoring report completed for the project.

Table 3 Water treatment plant details

WTP	WTP Status during reporting period.	Discharge Location	Receiving Environment	Level of ecosystem disturbance at discharge location	Groundwater system present at site
Chatswood	Inactive. Site handed over to follow on contractors.	Local stormwater system	Scott's Creek, Castle Cove, Middle Harbour	Moderate to highly disturbed	Ashfield Shale, Hawkesbury Sandstone
Crows Nest	Inactive. Site handed over to follow on contractors.	Local stormwater system	Flat Rock Creek, Long Bay, Middle Harbour	Moderately to highly disturbed	Hawkesbury Sandstone, minor Ashfield Shale
Victoria Cross	Inactive. Site handed over to follow on contractors.	Local stormwater system	Milson Park, Sydney Harbour	Highly disturbed	Hawkesbury Sandstone
Barangaroo	Active	Direct to Sydney Harbour	Sydney Harbour	Highly disturbed	Hawkesbury Sandstone
Martin Place	Inactive. Site handed over to follow on contractors.	Local stormwater system	Sydney Harbour	Highly disturbed	Hawkesbury Sandstone
Pitt Street	Inactive. Site handed over to	Local stormwater system	Sydney Harbour	Highly disturbed	Hawkesbury Sandstone

WTP	WTP Status during reporting period.	Discharge Location	Receiving Environment	Level of ecosystem disturbance at discharge location	Groundwater system present at site
	follow on contractors.				
Waterloo	Inactive. Site handed over to follow on contractors.	Local stormwater system	Alexandra Canal, Cooks River, Botany Bay	Highly disturbed	Ashfield Shale, Hawkesbury Sandstone
Marrickville	Inactive. Site handed over to follow on contractors.	Local stormwater system	Eastern Canal, Cooks River, Botany Bay	Highly disturbed	Ashfield Shale, minor Hawkesbury Sandstone

4.1 Water Treatment Plant (WTP) Discharge

The Environmental Protection Licence for the project (EPL 20971) states that for each monitoring/discharge point, the discharged water must comply with the criteria specified in Condition L2.8 (see Table 4).

Table 4 WTP Discharge Criteria (EPL 20971 Condition L2.8)

Analyte	Unit	Discharge Criteria
pH	pH units	6.5 – 8.5
Total suspended solids	Milligrams per litre	50
Oil and grease	Visible	Not visible

Water captured in the station box, as well as the site surface is captured and pumped to the WTPs. All WTPs active during the reporting period worked via a process of coagulation, flocculation and clarification with media and carbon filtration on the Barangaroo WTP for additional treatment.

For the period June 2021 to December 2021, WTPs were operational at Barangaroo for the first three months of the reporting period. The Chatswood and Waterloo WTPs were handed onto follow on contractors on 01/08/2020, Martin Place WTP was handed over 11/12/2020 and the Victoria Cross WTP was decommissioned on 21/07/2020 and subsequently moved to Barangaroo and commissioned for ongoing use for the remainder of the project.

5.0 Water Monitoring Assessment Framework

5.1 Water Quality Trigger Values

The NSW State Government has endorsed the community's environmental values for water, known as Water Quality Objectives (WQOs) (ANZECC, 2000). The Soil and Water Quality

Management Plan methodology for surface water sampling requires that during a sampling event both field measurements and laboratory analytical results are collected.

Table 5 details the parameters to be tested when monitoring the waterways and includes those required under EPL 20971.

A precautionary approach has been adopted for the surface water quality monitoring. Results collected in the current monitoring round are compared against the 80th percentile baseline data presented in Table 6. If results are greater than the baseline data 80th percentile, further investigation is undertaken including:

- Analysis of weather conditions
- Review of construction works being undertaken onsite at the time of sampling
- Re-sampling within 7 days of reviewing results where a link is established to TSE works.

Further details of the investigation are presented in Figure 1. Note that due to construction works occurring onsite at Marrickville and in the surrounding area, sampling point SW-EC-03 was added to the surface water sampling regime to replace SW-EC-01. Therefore no baseline data is available for this sample point.

Table 5 Surface water quality monitoring parameters

Parameter	Sampling Method	Analytical Method	ANZECC, Trigger Values (Lowland River)[3]	ANZECC, Trigger Values (Estuarine Water)[4]	EPL 20971[5]	Trigger Value
Dissolved Oxygen (% Sat)	Probe	Field Analysis	85% - 110%	-	-	Baseline 20th Percentile[8]
Turbidity (NTU)	Probe	Field Analysis	6 NTU-50 NTU	0.5 NTU–10 NTU	-	Baseline 80th Percentile
Oil and Grease	Visual / Grab Sample	Visual / Lab	-	-	No visible Oil and Grease	Baseline 80th Percentile
Conductivity (mS/cm)[2]	Grab Sample and Probe	Field / Lab	0.125mS/cm - 2.2mS/cm	-	-	Baseline 80th Percentile
Total Suspended Solids (mg/L)	Grab Sample	Lab Analysis	-	-	50 mg/L	Baseline 80th Percentile
Iron (mg/L)	Grab Sample	Lab Analysis	0.3 mg/L[1]	-	-	Baseline 80th Percentile
Manganese (mg/L)	Grab Sample	Lab Analysis	1.9 mg/L[6]	0.08mg/L[7]		Baseline 80th Percentile

pH	Grab Sample and Probe	Field / Lab	6.5 – 8.0	7.0 – 8.5	6.5 - 8.5	Baseline 80th Percentile

[1] Taken from ANZECC 2020 draft guidelines.
[2] Conductivity trigger values not applicable to estuarine or marine sampling points due to the naturally high salinity of the receiving water.
[3] Applicable to monitoring locations SW-SC-01, SW-FR-02, SW-EC-01, SW-AC-01
[4] Applicable to monitoring locations SW-SC-02, SW-FR-02, SW-MP-01, SW-BP-01, SW-B-01, SW-FC-01, SW-AC-01, SW-EC-03
[5] Where EPL criteria differs from ANZECC Criteria, EPL conditions will be complied with.
[6] Manganese toxicant value for 95% species protection in a fresh water environment
[7] Default ANZECC trigger value for Manganese in marine environment
[8] 20th percentile used for the DO trigger value as a decrease of DO is perceived to be more representative of environmental degradation

Table 6 Baseline 80th Percentile Parameters

LOCATION	PH[1]	ELECTRICAL CONDUCTIVITY[1] (MS/CM)	TSS	TURBIDITY (NTU)	DO (MG/L)[2]	DO %[2]	FE (MG/L)	MN (MG/L)	OIL AND GREASE (MG/L)
SW-SC-01	7.7/7.9	0.50/0.46	12.6	38.8	5.9	68.1	0.8	0.03	5.0
SW-SC-02	7.3/7.8	43.8/36.4	10.4	2.4	3.9	51.6	0.6	0.10	5.0
SW-MP-01	7.7/8.0	18.0/45.0	58.4	35.3	7.6	98.1	0.9	0.03	5.0
SW-BP-01	7.9/8.1	51.3/52.2	10.8	0.2	7.0	98.7	0.1	0.008	5.0
SW-FC-01	7.9/8.0	53.0/49.4	11.6	1.6	6.7	94.6	0.1	0.008	5.0
SW-B-01	7.7/8.0	53.0/52.0	10.4	1.6	6.3	88.7	0.03	0.008	5.0
SW-AC-01	7.3/8.0	0.6/0.6	10.0	14.9	7.3	96.0	0.9	0.03	5.0
SW-EC-01	7.7/7.7	0.6/0.6	57.0	170.2	3.6	39.0	2.8	0.3	5.0
SW-EC-03[3]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] Field test/Laboratory test

[2] 20th Percentile adopted

[3] No baseline data available for sampling point SW-EC-03

6.0 Monitoring Program

6.1 Surface Water Monitoring Sites

Surface Water Quality was measured at one location (SW-B-01) along the project alignment during this reporting period, shown in Figure 4. Locations were chosen to be representative of water quality and identify any potential impacts of the Project should they occur. Details of the field observations are presented in Appendix A.

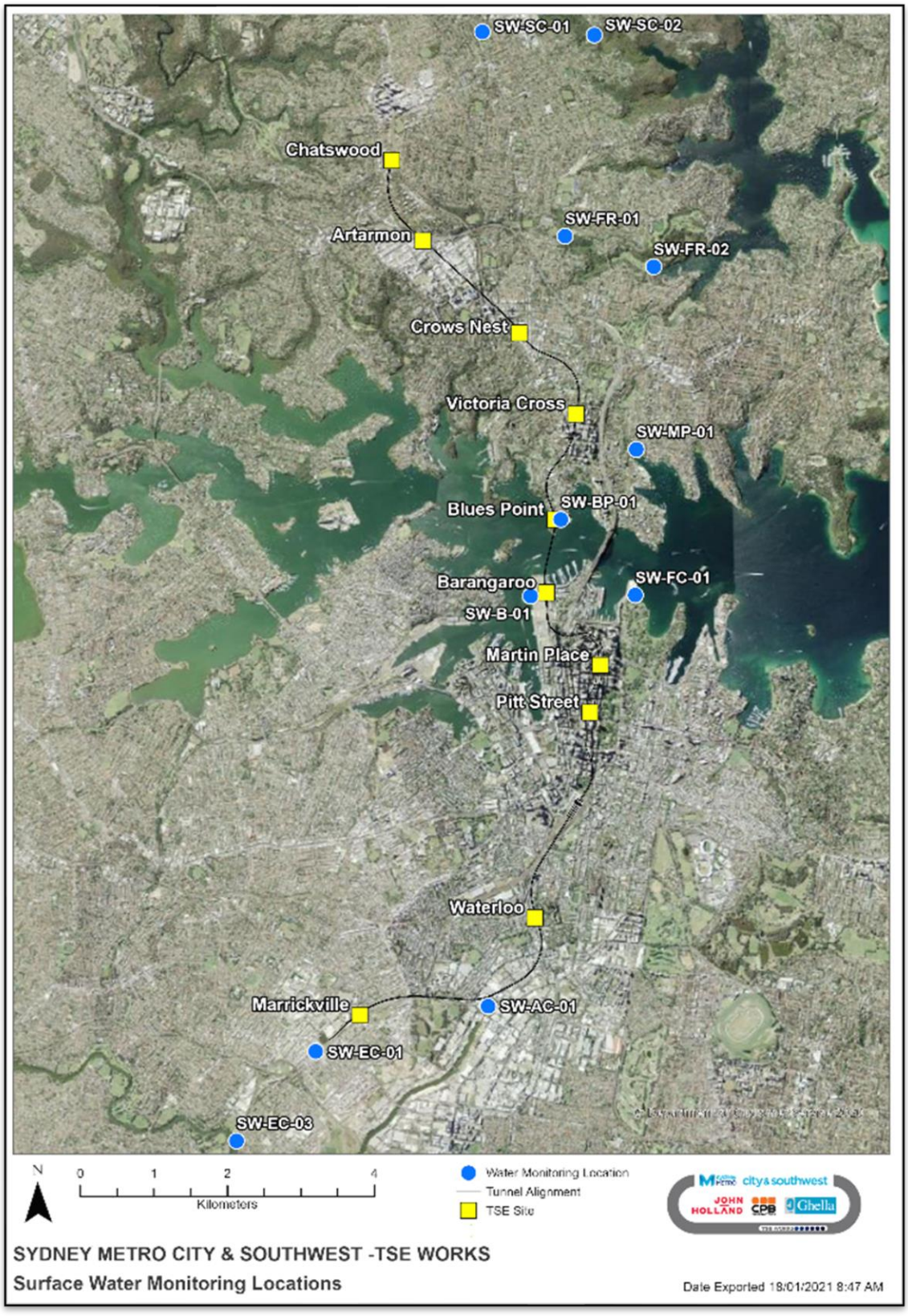

Figure 4: Surface Water Monitoring Locations

6.2 Surface Water Quality Sampling

Surface water sampling was undertaken in accordance with the Soil and Water Management Plan at the following frequencies:

- Quarterly (general sampling rounds);
- Up to four wet weather sampling events within a 12 month period (when at least 38.8mm of rain is received in the catchment in any 5 day period). No wet weather samples were taken during this reporting period.

Grab samples were collected manually from the sampling locations and analysed at a NATA accredited laboratory. Samples were collected into sampling bottles and jars provided by the laboratory.

All samples were clearly labelled and stored in a refrigerated container prior to dispatch under the chain of custody procedures.

Sampling equipment was rinsed well between samples and on return to the lab at the end of each sampling trip. De-ionised and tap water was available for washing equipment in the field. Monitoring probes were not submerged in water showing signs of hydrocarbon contamination (oil slick etc). None of the sampling points displayed such characteristics during the sampling rounds.

6.2.1 In-situ measurements

Field water quality parameters including temperature, electric conductivity (EC) and pH were measured at each sampling location using a multi-probe field water quality meter. Other observations including odour and colour were recorded on the field sheets.

The multi-probe field water quality meter was field calibrated at the start and completion of each day of water quality sampling. Calibration records (field and laboratory) are maintained on JHCPBG's ORIS system.

6.2.2 QA/QC Procedures

Quality Assurance / Quality Control (QA/QC) samples are collected to ensure the quality of the investigation procedures and sampling program. QA/QC samples provide analytical information that may be used to investigate irregular results.

QA/QC sampling is undertaken in accordance with AS 5667.1:1998. Only NATA registered laboratories are used to undertake analysis.

7.0 Surface Water Quality Results

7.1 Baseline 80th Percentile Water Quality Results

Pre-construction surface water quality testing was carried out monthly from August 2017 to January 2018 to determine baseline water quality prior to discharge from construction works. Water monitoring results were recorded and the 80th percentile maximum calculated to define the baseline criteria of the waterway. It should be noted that a reduced metals suite of Iron and Manganese were selected for analysis during the pre-construction monitoring program. This was determined based on the level of risk associated with the known groundwater quality in the Project area. As such these parameters only have been assessed throughout the construction phase of the monitoring program.

7.2 Surface Water Quality Results June 2021 to December 2021

The surface water quality results collected from the June to December 2021 monitoring period are presented in Appendix B alongside the baseline 80th percentile results for each catchment area.

Sampling events consisted of one quarterly sample on the 30th September 2021 (Q3) for Barangaroo only.

Field results are based on the readings from the Horiba water quality meter taken at the time of monitoring, samples were also collected simultaneously and submitted for analysis at a NATA accredited laboratory.

Where sampling results (either field or laboratory) were found to be outside the baseline 80th percentile trigger values, an assessment of the results against ANZECC trigger values was carried out and if required additional review undertaken.

Tables 7 to 10 present the sampling results which exceeded both baseline 80th percentile and ANZECC trigger values.

7.2.1 **pH**

Table 7: Surface Water pH exceedances of the Baseline 80th Percentile and ANZECC Trigger Values.

LOCATION	SAMPLING ROUND	FIELD RECORDED VALUE	FIELD 80TH PERCENTILE BASELINE DATA	LABORATORY RECORDED VALUE	LABORATORY 80TH PERCENTILE BASELINE DATA	ANZECC TRIGGER VALUE	WTP DISCHARGE
N/A[1]	Q3	**8.6**	7.7	8.1	8.0	8.5	7.2

At location SW-B-01 the field reading for pH exceeded both the 80%ile value and the upper ANZECC trigger value. Laboratory results however were compliant with the ANZECC criteria but marginally above the laboratory 80%ile value. Discharge from the water treatment plant sampled at the same time were compliant with both ANZECC criteria and the 80%ile value.

Based upon the laboratory results and water treatment plant sampling results, it was concluded that slightly elevated pH readings were not representative of environmental impact on the basis that they were compliant with ANZECC criteria and are likely due to environmental factors not project discharge.

7.2.2 Turbidity and Total Suspended Solids

Table 8: Surface Water Turbidity/TSS exceedances of the Baseline 80th Percentile and ANZECC Trigger Values.

LOCATION	SAMPLING ROUND	FIELD RECORDED VALUE (NTU)	FIELD 80TH PERCENTILE BASELINE DATA (NTU)	LABORATORY RECORDED VALUE (TSS)	LABORATORY 80TH PERCENTILE BASELINE DATA (TSS)	ANZECC TRIGGER VALUE (NTU)	WTP DISCHARGE (TSS)
SW-B-01	Q3	0.9	1.6	5.1	10.4	0.5-10	5

There were no exceedances of either baseline 80th percentile or ANZECC trigger values recorded during the reporting period

7.2.3 Iron and Manganese

Table 9: Surface Water Iron and Manganese exceedances of the Baseline 80th Percentile Values.

LOCATION	SAMPLING ROUND	FE (MG/L) RECORDED VALUE	FE (MG/L) 80TH PERCENTILE BASELINE DATA	MN (MG/L) RECORDED VALUE	MN (MG/L) 80TH PERCENTILE BASELINE DATA	ANZECC TRIGGER VALUE (FE/MN)	WTP DISCHARGE
SW-B-01	Q3	0.05	0.03	0.012	0.01	-/0.08	-

There were no exceedances recorded of the 80th percentile and ANZECC assessment criteria recorded in surface water samples collected during the monitoring period.

Iron in the sample collected from SW-B-01 marginally exceeded the 80%ile value but was well below the draft ANZECC discharge criteria of 0.3mg/L. Iron in the sample collected from the water treatment plant was also well below the draft ANZECC discharge criteria.

Manganese in the sample collected from SW-B-01 marginally exceeded the 80%ile value but was well below the ANZECC discharge criteria of 0.08mg/L. Manganese in the sample collected from the water treatment plant was also well below the draft ANZECC discharge criteria.

7.2.4 Oil and Grease

Oil and grease was not detected above the laboratory reporting limit during the reporting period.

7.2.5 Electrical Conductivity

Table 10: Surface Water Electrical Conductivity exceedances of the Baseline 80th Percentile and ANZECC Trigger Values

LOCATION	SAMPLING ROUND	EC (MS/CM) RECORDED VALUE	EC (MS/CM) 80TH PERCENTILE BASELINE DATA	LABORATORY RECORDED VALUE	LABORATORY 80TH PERCENTILE BASELINE DATA	ANZECC TRIGGER VALUE	WTP DISCHARGE
N/A[1]	-	-	-	-	-	-	-

1. There were no exceedances of both baseline 80th percentile and ANZECC trigger values recorded during the reporting period

As SW-B-01 is located in estuarine/marine waters, there were no exceedances of both ANZECC trigger values and Baseline 80th percentile criteria during this reporting period.

7.2.6 Dissolved Oxygen

There were no occasions during the reporting period where results were recorded at concentrations lower than both the 20th percentile and ANZECC criteria.

8.0 Conclusions

Water monitoring was conducted on one occasion during the monitoring period in accordance with the Surface Water Monitoring Program. In general, water quality results have been found to be influenced by external factors within the catchment and surrounding areas including industrial and construction discharges which are not associated with the JHCPBG works.

Sampling of discharge water from the WTPs found levels to be in accordance with the assessment requirements and no exceedances of water quality are attributed to the TSE works.

9.0 Appendices

Appendix A – Field Sheets

Horiba Control Unit Serial#	00AFV1XV	Horiba Probe Serial#	X9500VU5
Date Last Serviced	30/6/20	Last Calibrated (Internally)	19/2/21
Date of Monitoring	30/9/21	Persons	S. Austee
Reason for Monitoring	Quarterly Monitoring ☑	Post Rain ☐	Other:

Location	Time	Temp (°C)	pH	EC (ms/cm)	Turbidity (NTU)	DO (mg/L)	DO (%)	Comment
SW-1-01	10.07	20.01	8.6	49.2	0.9	5.39	73.9	CLEAR, ODOURLESS, MID-TIDE

Date/Time of Handover to Lab	~ 4.30pm

Appendix B – Sampling Results

		Field						Lab						
	Analyte	Temp	pH	Electrical Conductivity	Turbidity	DO	DO	pH	Electrical Conductivity	Oil & Grease (LLE)	Total Suspended Solids	Iron - Total	Manganese - Total	Flow/Tide
Monitoring Parameters	Units	oC	pH Units	mS/cm)	NTU	mg/L	%	pH Units	mS/cm)	(LLE)	mg/L	mg/L	mg/L	
	Estuarine (LL)		**7.0**		**0.5**			**7.0**						
	Esturaine (UL)		**8.5**		**10.0**			**8.5**					**0.08**	
	EPL 20971 (LL)		**6.5**					**6.5**						
	EPL 20971 (UL)		**8.5**					**8.5**			**50.0**			
	Baseline 80%ile	N/A	7.7	53.0	1.6	*N/A*	*N/A*	8.0	52.0	5.0	10.4	0.03	0.01	
	Baseline 20%ile	*N/A*	*N/A*	*N/A*	*N/A*	*6.3*	*88.7*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	
	Standard Dev	3.3	0.7	1.9	1.7	1.1	15.5	0.1	1.2	0.0	4.9	0.1	0.1	
	Max Value	25.4	9.3	54.8	6.2	9.2	119.1	8.1	52.0	5.0	22.0	0.3	0.3	
	Min Value	14.2	6.0	48.3	0.0	5.0	63.3	7.8	49.0	5.0	5.0	0.0	0.0	
Baseline dataset	24/08/2017	15.2	7.6	50.8	0.0	8.4	105.2	8.0	50.0	5.0	5.0	*0.02*	0.01	Outgoing
	06/10/2017	18.3	7.6	50.0	*6.2*	8.0	115.0	8.0	52.0	5.0	10.0	*0.03*	0.01	Outgoing
	25/10/2017	21.0	7.7	49.9	0.0	8.3	115.6	8.0	52.0	5.0	*12.0*	*0.03*	0.01	Incoming
	22/11/2017	21.3	7.7	53.0	0.5	6.3	*88.7*	7.8	49.0	5.0	10.0	*0.04*	0.01	Incoming
	06/12/2017	20.8	7.8	53.1	0.0	6.6	92.7	8.0	49.0	5.0	10.0	*0.03*	0.01	Incoming
	30/01/2018	25.4	7.7	53.4	0.0	6.2	*85.0*	8.0	52.0	5.0	10.0	*0.04*	0.01	Outgoing
2018 Q1	29/03/2018	23.4	8.2	53.1	*2.4*	7.4	109.5	*8.1*	50.0	5.0	*22.0*	*0.03*	0.01	Outgoing tide
2018 Q2	31/05/2018	17.1	8.1	53.2	0.1	5.0	*63.3*	7.8	.	<5	<5	*0.05*	<0.01	
Post Rainfall	07/06/2018	15.8	8.0	51.5	0.4	7.1	90.4	8.0	50.0	<5	<5	<0.01	0.04	Low tide
2018 Q3	22/08/2018	14.2	**9.3**	54.8	0.0	7.4	93.8	8.0	.	<5	<5	*0.04*	<0.01	Clear odourless, calm
Post Rainfall	08/10/2018	17.3	8.1	48.3	0.5	9.2	119.1	8.0	.	<5	<5	*0.27*	<0.02	Outgoing
2018 PR WTP - BN	08/10/2018	.	.	.	.	.	.	8.0	.	<5	5.0	*0.10*	0.30	Barangaroo WTP
2018 Q4	22/11/2018	20.6	**6.0**	49.5	0.0	7.9	109.0	8.0	52.0	<5	<5	*0.04*	<0.01	
2019 Q1	22/03/2019	23.58	**5.88**	46.8	0.5	5.61	*79.2*	8	49	< 10	3.4	< 0.05	< 0.005	High tide, moderate swell. pH probe faulty
2019 Q2	31/05/2019	17.71	8.14	54.1	0	7.12	95.6	8	51	*15*	*14*	< 0.05	< 0.005	Low tide, clear
Post Rainfall	26/06/2019	16.47	8.09	46.6	0	8.3	98.9	8	*53*	*17*	*40*	< 0.25	< 0.025	Clear, odourless
2019 Q3	09/08/2019	15.21	**9.07**	45.5	0.3	14.7	180.4	**2.5**	*57*	*17*	*11*	< 0.05	< 0.005	Low tide, no debris
Post Rainfall	30/08/2019	14.44	7.85	47.3	0.4	8.46	103	7.8	52	< 10	*12*	< 0.05	< 0.005	Clear water, odourless, high tide
2019 Q4	11/10/2019	18.13	7.91	40.6	*2.2*	6.31	*82.1*	*8.1*	*54*	*23*	4.9	< 0.05	< 0.005	Clear, high tide
Post Rainfall	11/02/2020	24.33	7.72	17.3	*20.8*	8.41	108.3	7.6	15	< 10	*38*	*0.45*	*0.016*	Brown, slight turbid, high tide
2020 PR WTP - BN	10/02/2020	.	.	.	*2.5*	.	.	7	3.9	*15*	*19*	*0.4*	*0.22*	Barangaroo WTP
2020 Q1	12/03/2020	21.56	8.33	36.7	*6.6*	9.1	117.5	6.9	49	<10	<5	*0.06*	0.007	
2020 Q1 WTP - BN	12/03/2020	.	.	.	.	.	.	6.6	.	<10	2.2	<0.05	<0.005	Barangaroo WTP
2020 Q2	19/06/2020	15.46	8.34	45.8	*3.3*	9.25	113	7.8	44	< 10	*26*	< 0.05	0.005	Lowtide, clear, odourless
2020 Q2 WTP - BN	19/06/2020	.	.	.	.	.	.	7.1	25	<10	*11*	*1*	**0.64**	Barangaroo WTP
Post Rainfall	17/07/2020	14.66	8.01	52.6	*12.2*	6.47	*81.4*	7.9	47	< 10	**400.0**	< 0.05	< 0.005	Clear, odourless, lowtide
2020 PR WTP - BN	17/07/2020	.	.	.	.	.	.	7.6	31	<10	**120.0**	*1.3*	**4.60**	Barangaroo WTP (not discharging)
2020 PR WTP - BN	30/07/2020	.	.	.	.	.	.	7.7	.	<10	*17*	*1.2*	**2.80**	Barangaroo WTP
2020 Q3	25/09/2020	17.54	8.08	51.3	*4.4*	10.2	134.5	7.9	50	< 10	8.2	< 0.05	< 0.005	Clear, odourless, high tide
2020 Q3 WTP - BN	25/09/2020	.	.	.	.	.	.	8.0	.	< 10	*42*	*0.73*	**0.32**	Barangaroo WTP
2020 Q4	20/11/2020	21.06	8.15	50.1	0	8.99	125.8	8.0	50	< 10	*31*	< 0.05	< 0.005	Clear, odourless high tide, WTP not discharging
2020 Q4 WTP - BN	20/11/2020	.	.	.	.	.	.	.	.	.	.	.	.	Barangaroo WTP (not discharging)
2021 Q1	19/02/2021	24.32	8.02	52.4	12.4	6.45	81.5	8.0	*58*	<10	*12*	<0.05	0.008	
2021 Q1 WTP - BN	19/02/2021	.	.	.	.	.	.	7.4	16	<10	*48*	*0.07*	**0.35**	
Post Rainfall	19/03/2021	24.21	7.97	17.9	28.6	8.39	107.5	7.7	41	<10	**160.0**	<0.05	<0.005	Large rainfall event
2021 Q2	07/05/2021	20.49	7.79	37.4	1.5	8.34	110	8.3	51	<10	*16*	<0.05	0.005	high tide, clear, odourless
2021 Q2 WTP - BN	07/05/2021	.	.	.	.	.	.	7.6	6.5	<10	3.8	*0.61*	**0.14**	Barangaroo WTP
2021 Q3	30/09/2021	20.01	**8.6**	49.2	0.9	5.39	73.9	8.1	51	<10	5.1	0.05	0.012	Clear, odourless, mid-tide
2021 Q3 WTP - BN	30/09/2021	.	.	.	.	.	.	7.2	28	<10	5	0.16	1.5	