Surface Water Quality Monitoring Program

July 2017 to January 2018

Project: Sydney Metro City & Southwest – TSE Works

Document No: SMCSWTSE-JCG-TPW-EM-RPT-097238

DOCUMENT APPROVAL

REVISION	DATE	PREPARED BY	REVIEWED BY	APPROVED BY	REMARKS
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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>
<tr><td>(d)</td><td>Groundwater</td><td>DPI Water</td></tr>
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<tr><td rowspan="10">C10</td><td>Each Construction Monitoring Program must provide:</td><td></td></tr>
<tr><td>(a) details of baseline data available</td><td>Appendix 1 to 10</td></tr>
<tr><td>(b) details of baseline data to be obtained and when;</td><td rowspan="4">Section 3.0</td></tr>
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<tr><td>(f) the location of monitoring;</td><td>Section 3, Figure 1
Section 6.5 and Appendix B of the Construction Soil Water and Groundwater Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002014)</td></tr>
<tr><td>(g) the reporting of monitoring results;</td><td>Section 4.0</td></tr>
<tr><td>(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and</td><td>Section 6.5 of the Construction Soil Water and Groundwater Management Plan (SMCSWTSE-JCG-</td></tr>
</table>

Clause	Detail	Reference
		TPW-EM-PLN-002014)
	(i) any consultation to be undertaken in relation to the monitoring programs.	Section 5.0 Construction Soil Water and Groundwater Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002014)
C12	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 requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 5.0 of the Construction Soil Water and Groundwater Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002014)

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 Plane (CSWGMP): (SMCSWTSE-JCG-TPW-EM-PLN-002014) is to identify potential impacts of the JHCPBG Tunnel Station Excavation (TSE) Works on surface water quality.

The data presented in the SWQMP Report (this report) is submitted in accordance with Condition C9 of the Project Planning Approval, which requires reporting of the results of the TSE Works Water Quality Monitoring Program to the Department of Planning and Environment (DPE), the New South Wales (NSW) Environment Protection Authority (EPA), NSW Department of Primary Industries and the NSW Office of Water

This report will highlight the results of the pre-construction phase of the surface water monitoring program. This will establish the baseline water quality against which operational monitoring data will be compared.

2.0 Background

The Sydney Metro TSE City and Southwest Project (The Project) is located in two catchments – the Sydney Harbour and Paramatta River catchment, and the Cooks River catchment. Within these catchments there are five local watercourses that are located along the project alignment. These local watercourses drain into Middle Harbour, Sydney Harbour and Botany Bay.

The Environmental Impact Statement 1 (EIS 1) identifies that the watercourses near the project corridor are heavily urbanised, with surface water generally collected by developed stormwater networks. Surface water quality along the project alignment is largely influenced by 'point source' water pollution (for example, from stormwater drains) and diffuse water pollution (for example, from urban runoff that does not enter stormwater drains).

No watercourses will be directly impacted or modified by the TSE Works. Wharf modification works will be undertaken at Barangaroo/Darling Harbour and wharf construction will occur at Blues Point.

Treated construction water will be discharged into a number of waterways in accordance with the Project's Environmental Protection License (EPL 20971) including Sydney Harbour, via existing stormwater systems.

As discussed in the CSWGMP, the Water Quality Monitoring Program (this Program) is being implemented to identify potential impacts on water quality resources as well as monitor the effectiveness of the mitigation measures applied as part of the TSE Works.

JHCPBG's focus on water quality management during construction is for prevention of pollution – minimising the risk of polluted, sediment-laden or contaminated water leaving the Premises at all by implementing a comprehensive management and monitoring regime on site. Monitoring will be conducted offsite in the receiving waters, as set out below, to trigger investigation where required and ensure that site processes and procedures are effective. Surface water quality monitoring of the receiving environment prior to construction is highly unlikely to define suitable standards or benchmarks for water quality discharges from the TSE Works given that:

- waterways along the TSE alignment are highly modified due to the urbanised nature of the surrounding area
- the stormwater system collects and transfers water from large urbanised catchment areas. Therefore, there is the potential for contaminants to enter the stormwater systems and subsequently the waterways from many different sources; and
- water quality in urban areas as occurs along the TSE alignment is highly variable and changes in response to prevailing weather patterns and following rainfall

3.0 Methodology

The SWQMP has been developed in accordance with Condition C10 of the Project Planning Approval.

Surface Water Quality is measured at ten locations along the project alignment, shown in Figure 1. Locations are chosen to be representative of water quality and identify any potential impacts of the Project should they occur.

Surface water quality monitoring will be undertaken as follows:

- pre-construction TSE Works – monthly, until commencement of Construction
- TSE Works Construction stage – every three months
- post TSE Works completion – every three months until portion handover

The NSW State Government has endorsed the community's environmental values for water, known as Water Quality Objectives (WQOs) (ANZECC, 2000). The SWQMP methodology for surface water sampling requires that during a sampling event both field measurements and laboratory analytical results are collected. Table 1 details the parameters to be tested when monitoring the waterways. These measures also incorporate the conditions and parameters as stipulated by the TSE Works EPL: No. 20971 Section 3, L2).

This is a precautionary approach. If monitoring results differ from the previous monitoring events by 20%, the Environment Coordinator will within seven days of receiving laboratory results re-test to confirm the results and establish whether TSE Work activities can be linked to the change in test results. Following this investigation additional actions will be completed and documented where required. This process is shown in Figure 2.

In addition to water monitoring, project site inspections are also undertaken at least weekly on each TSE Worksite to identify any works that may impact surrounding waterways.

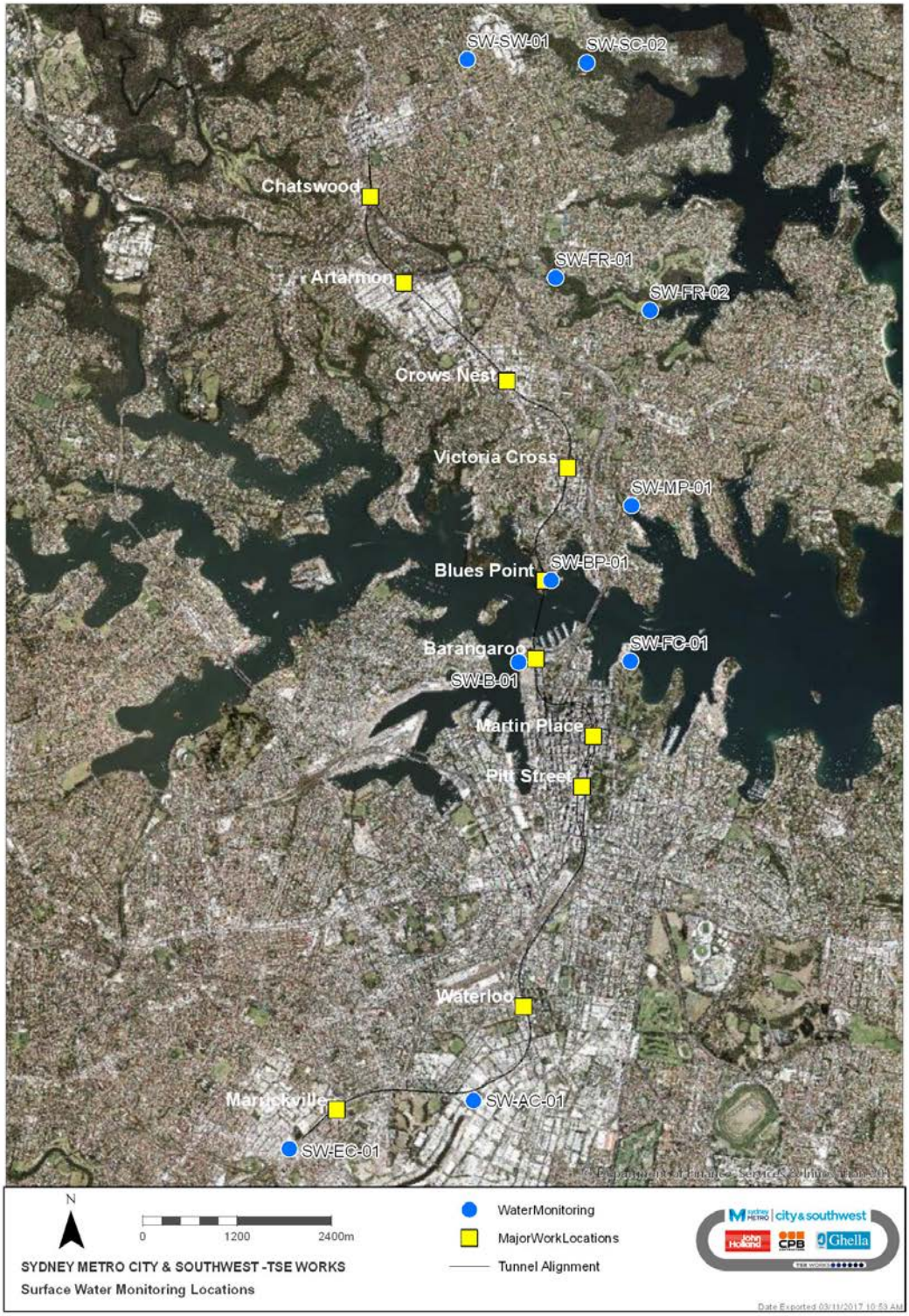

Figure 1: Map of Surface Water Monitoring Location

Table 1- Surface water quality monitoring parameters

Parameter	Sampling Method	Analytical Method	ANZECC[1, 2] Criteria (freshwater)[7]	ANZECC[1, 3] Criteria (marine water)[8]	EPL 20971[9]	Trigger Values	Action
Temperature (°C)	Probe	Field Analysis	>80%ile[4] <20%ile[4]			Results are > than the previous monitoring results by 20%	Environment Coordinators to re-test to confirm results. Environment Coordinator is to undertake an inspection of the TSE Works and propose actions where required Note: There is a delay in receiving the results from grab samples. Environment Coordinator to obtain further grab samples for testing to confirm results. Environment Coordinator to undertake an inspection once results received and establish what activities had been undertaken prior to the tests being undertaken and propose actions where required.
Dissolved Oxygen (% Sat)	Probe	Field Analysis	Lower Limit – 85 Upper Limit - 110	Lower Limit – 90 Upper Limit - 110			
Turbidity (NTU)	Probe	Field Analysis	6-50	0.5-10			
Oil and Grease	Visual analysis, then grab sample if required	Visual Assessment Lab Analysis	-	-	No visible sign of oil and Grease	Visible oil and grease	
Conductivity (µS/cm)[6]	Grab Sample and Probe	Field Analysis Lab Analysis	125-2200	-		Results are > than the previous monitoring results by 20%	
Total Suspended Solids (TSS: mg/L)	Grab Sample	Lab Analysis	-	-	50 mg/L		
Iron (mg/L)			0.3[5]	-			
Manganese (mg/L)			1.7	0.8			

Parameter	Sampling Method	Analytical Method	ANZECC[1, 2] Criteria (freshwater)[7]	ANZECC[1, 3] Criteria (marine water)[8]	EPL 20971[9]	Trigger Values	Action
pH	Grab Sample and Probe	Field Analysis Lab Analysis	Lower Limit – 6.5 Upper Limit – 8.0	Lower Limit – 8.0 Upper Limit – 8.4	6.5 -8.5	Results are > than the previous monitoring results by 0.5	

[1]95% protection level – most commonly applied to ecosystems that could be classified as slightly too moderately disturbed.
[2]ANZECC (2000) guidelines for the protection of freshwater aquatic ecosystems
[3]ANZECC (2000) guidelines for the protection of marine aquatic ecosystems
[4]Default trigger value for each ecosystem-type
[5]There is insufficient data at this stage to derive a reliable value for iron. The current Canadian guideline has been used.
[6]Conductivity will not be tested at monitoring points at Milsons Point, Blues Point, Darling Harbour and Farm Cove
- No data available
[7]Applicable to monitoring locations SW-SC-01, SW-FR-02, SW-EC-01
[8]Applicable to monitoring locations SW-SC-01, SW-FR-02, SW-MP-01, SW-BP-01, SW-B-01, SW-FC-01, SW-AC-01
[9] Where EPL criteria differs from ANZECC Criteria, EPL conditions will be complied with.

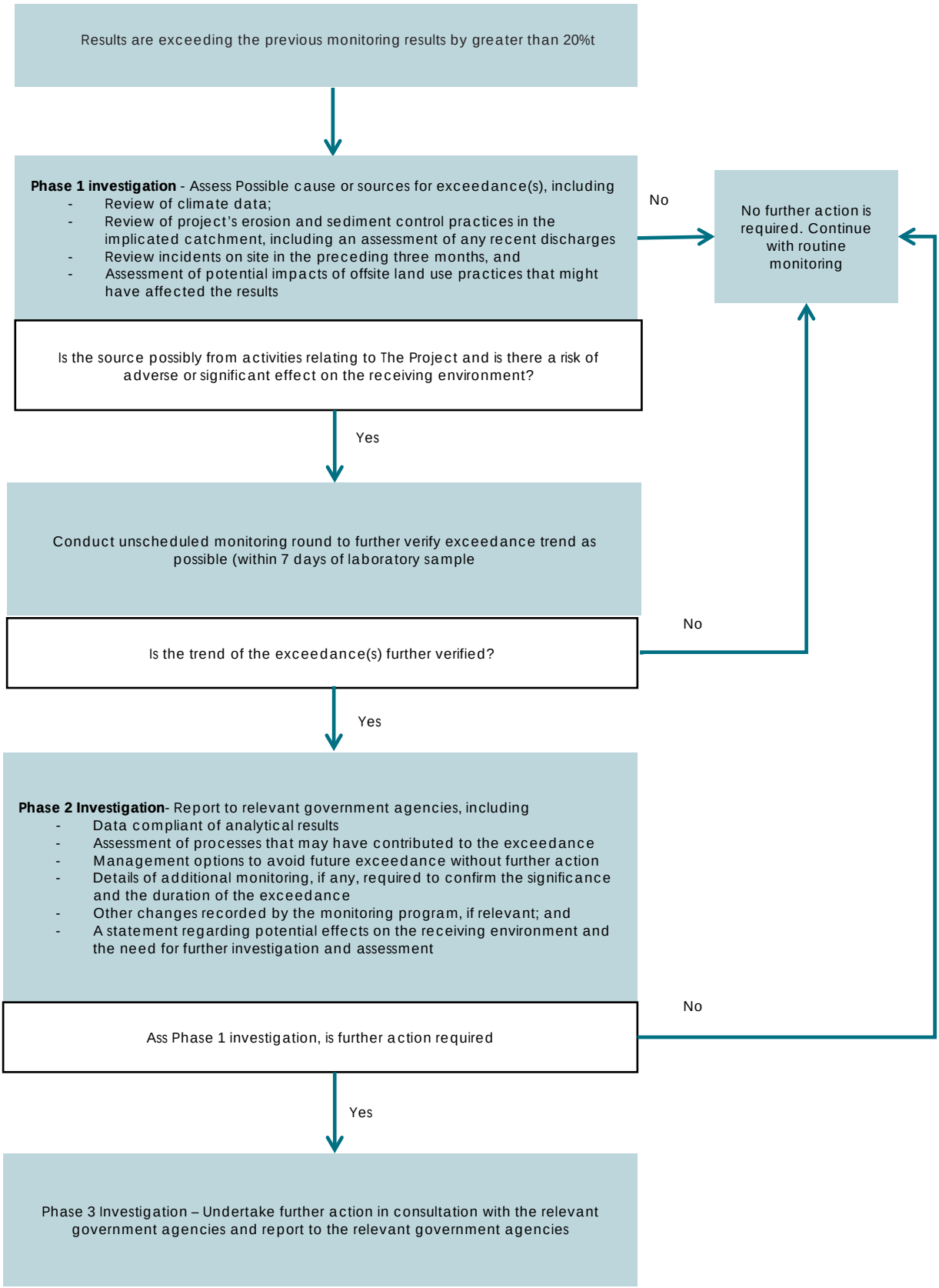

Figure 2: Response action process for exceedances of surface water quality

4.0 Results and Findings

4.1 Overview

Surface water monitoring during the reporting period consisted of the pre-construction baseline monitoring events. The monitoring program during this phase of works consists of sampling at monthly intervals until construction works commence.

Water monitoring results were recorded and the eightieth percentile, minimum, mean and maximum calculated and compared to the appropriate assessment criteria (refer to Table 1).This information will be used to define the baseline criteria of the waterway.

4.2 Scott's Creek/Middle Harbour – Upper Scott's Creek (SW-SC-01)

Scott's Creek catchment receives the surface water runoff from the Chatswood site.

Works being undertaken on the Chatswood site during the reporting period included demolition works undertaken by Delta Group Pty Ltd (Delta) and TSE works including vegetation clearing, contamination and heritage investigations, and site establishment. The Chatswood worksite's erosion and sediment controls including large hardstand areas have been installed in accordance with the NSW Government's Managing Urban Stormwater: Soils and Construction, 2004 (the Blue Book). No discharges occurred from site during the reporting period.

Two sampling locations are monitored within the Scott's Creek catchment.

The Upper Scott's Creek catchment is a completely urbanised catchment, collecting water from the Chatswood CBD which contains residential and light industry. Upper Scotts Creek system is a piped and/or covered stormwater channel for most of the catchment before discharging to an open stormwater trunk channel approximately 400m before the water sampling site. Water from this catchment is classified as freshwater, and is therefore assessed against ANZECC Freshwater criteria shown is Table 1.

Six (6) monitoring events were recorded during the reporting period at Upper Scotts Creek, results of which are shown in Appendix 1. All results were recorded within the assessment criteria with the exception of the following parameters:

Upper Scotts Creek was odorous, turbid and contained visible rubbish and debris during all sampling events. Observed conditions are displayed in Figure 3 and Figure 4, with Figure 4 showing the least turbid for comparison. Creek was slowly flowing in all sampling events.

- The NTU values exceeded the ANZECC Freshwater Criteria parameters on one sampling event (September 2017) when recorded at 58.2. During this event, the creek was noted to be heavily flowing
- Iron levels were also recorded to be above the ANZECC Fresh Water criteria. Laboratory analysis indicated that iron was above the criteria of 0.35 mg/L four (4) of the five (5) water monitoring events.
- Dissolved oxygen levels were below ANZECC Freshwater Criteria for four (4) of the five (5) monitoring events.

Water samples from the Jan-18 reporting period were unavailable as a result of the sampling location, and surrounding creek being marked as *danger* and isolated. Visible foam and

scum (unrelated to the Project) could be seen floating on top of the water, shown in Figure 5. A silt curtain had been installed on each terrace.

Figure 3: Turbid water with visible scum at Upper Scotts Creek (SW-SC-01) on Aug-17

Figure 4: Clear water at Upper Scotts Creek (SW-SC-01) on Oct-17

Figure 5: Murky, turbid water at Upper Scotts Creek (SW-SC-01) on Dec-17

Figure 6: Visible scum within Upper Scotts Creek, with silt curtain installed Jan-18

4.3 Scott's Creek/Middle Harbour – Lower Scott's Creek (SW-SC-02)

The Lower Scotts Creek sampling point is located downstream of Upper Scotts Creek, and received additional runoff from Castle Cove and Middle Cove, before discharging into Fig Tree Cove. The creek system is rock lined or in a disturbed natural creek system. This monitoring location connects to the harbour and therefore is classified as a marine environment and comparable to the ANZECC Marine Water criteria shown in Table 1.

Six (6) water sampling events were undertaken during the reporting period, results are displayed in Appendix 2. Field observations describe the sampling location to be unchanged throughout the sampling period. Water was consistently observed as being clear, slow

flowing, with little to no visible rubbish. Figure 7, Figure 8 and Figure 9 show the creek system throughout the monitoring period. Water quality parameters were recorded within the assessment criteria with the exception of the following parameters:

- The laboratory analysis of pH was recorded below the assessment criteria on all occasions with pH ranging between 7 and 7.8.
- Dissolved oxygen was recorded below the adopted assessment criteria on Aug-17, Sep-17, Nov-17, Dec-17 and Jan-18. These results are consistent with limited flow of the waterway. This is supported by an increase in dissolved oxygen noted during the October reporting period, when there was evidence of a pervious heavy water flow, potentially after the heavy rainfall prior to monitoring.
- Additionally, manganese does not meet the ANZEC criteria for marine environments on one occasion (Oct-17) during which manganese was measured at 0.08 mg/L

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Figure 7:- Lower Scotts Creek (SW-SC-01) on Aug-17

Figure 8: Lower Scotts Creek (SW-SC-01) Oct-17

Figure 9: Lower Scotts Creek (SW-SC-01) on the Dec-17

4.4 Flat Rock Creek/Middle Harbour – Upper Flat Rock Creek (SW-FR-01)

Flat Rock Creek is the receiving waterway for the Artarmon and Crows Nest worksite.

Works on the Artarmon site did not commence during the reporting period.

Crows Nest is currently under demolition and is predominantly covered by existing concrete hardstand. The site is comprised of three distinct sections with local roads along its boundary. Erosion and sediment controls are installed around disturbed areas and the perimeter of the site. Surface water leaves the site passively through erosion and sediment controls. There are no sediment basins or water treatment plants located on site at present.

The Upper Flat Rock Creek catchment area is urbanised with the natural drainage characteristics altered by residential and commercial development. The creek system is rock lined and landscaped.

Six (6) monitoring events were conducted during the reporting period at the Upper Flat Rock Creek sampling location. However, the monitoring location was dry during all sampling

events (refer to Figure 8 and Figure 9). Monitoring events are documented in Appendix 3. As a result, no water samples have been collected.

The sampling site contains infrastructure designed to withstand and allow access during flood, suggesting the presence of water. However, no evidence of recent water flow was observed.

Figure 10: Upper Flat Rock Creek (SW-FR-01) on the Aug-17

Figure 11:- Upper Flat Rock Creek on the Dec-17

4.5 Flat Rock Creek/Middle Harbour – Lower Flat Rock Creek (SW-FR-02)

Lower Flat Rock Creek collects stormwater from the Upper Flat Rock Creek Site and surrounding urban areas. Water from this catchment is piped down to Turks Park before being discharged into Middle Harbour. Sampling is conducted in the marine water at the culvert's discharge and is therefore compared to the ANZECC Marine Water assessment criteria shown in Table 1.

Six (6) monitoring events were conducted during the reporting period at the Lower Flat Rock sampling location, results are shown in Appendix 4.

Water monitoring results are stable between each sampling period. Figure 12, Figure 13 and Figure 14 show the site conditions observed during different sampling events. All results were recorded within the adopted assessment criteria with the exception of the following parameters:

- The laboratory analysis of pH was recorded outside the prescribed range on three occasions in Sep-17, Nov-17 and Dec-17. pH measured at 7.9, 7.8 and 7.9 respectively.
- Dissolved oxygen levels were recorded below the assessment criteria on all sampling occasions.
- NTU and TSS results for the January 2018 period were relatively higher, and above the ANZECC criteria. This was coupled with a low tide and outward flow, which could be seen to be stirring up sediment at the bottom of the culvert.

Figure 12:- Lower Flat Rock Creek (SW-FR-02) on Aug-17

Figure 13: Lower Flat Rock Creek (SW-FR-02) on Sep-17

Figure 14: Lower Flat Rock (SW-FR-02) inOct-17

4.6 Milson Park/ Sydney Harbour (SW-MP-01)

The Milson Park catchment is considered to be urbanised land consisting largely of residential and commercial land uses including the Victoria Cross Sites. Waterways in this catchment have been modified by these processes. The catchment is an open (trunk) channel which discharges into Sydney Harbour. The Waterway is classified as a marine environment, and is therefore compared to the ANZECC Marine assessment criteria shown in Table 1.

Demolition works were undertaken at the Victoria Cross South worksite during the reporting period and have been ongoing since August 2017. The site itself is relatively flat however the surrounding topography falls to the east and to the south of the site. Erosion and sediment controls are installed around the perimeter of the site with passive surface water leaving the site through established erosion sediment controls. Surface water originating from the site discharges to the local stormwater system.

Victoria Cross North experienced no active TSE construction works during the reporting period. Very minor ground disturbances occurred during the geotechnical investigations and utility searches were undertaken.

Six (6) monitoring events were recorded during the reporting period at the Milson Park sampling location, water results are shown in Appendix 5. Monitoring results, specifically electrical conductivity varied significantly between sampling events. Salinity results (both field and laboratory) indicate this location is influenced by tidal movements. As a result, tide and flow direction is be recorded to ensure the correct analysis and comparison is informative and correct.

All results were recorded within the adopted assessment criteria with the exception of the following parameters:

- The laboratory analysis pH was recorded below the assessment criteria on three (3) occasions. These events recorded a pH of 7.9, which is slightly below the lower limit criteria of 8.0.

- Dissolved oxygen levels indicate that the sampling point is within an oxidative environment and were recorded above the assessment criteria on two (2) occasions (Sep-17 and Oct-2017) during the reporting period. High DO readings may be a result of quick and/or rough water flows along the discharge channel.
- The NTU of the water recorded for the Nov-17 and Dec-17 sampling events was above the adopted assessment criteria. The Nov-17 result was particularly high with a measurement of 100 NTU. This was coupled with visible observations of extremely cloudy water flowing down the channel as shown in Figure 17. Cloudy water was also noted during the Dec-17 monitoring event.
- Iron levels were recorded above the assessment criteria in three sampling rounds (Sep-17, Nov-17 and Dec-17). Elevated iron concentrations are likely associated with increased sediment loading noted in the same sampling rounds.

Figure 15: Shallow creek at Milson Park (SW-MP-01) on Sep-17

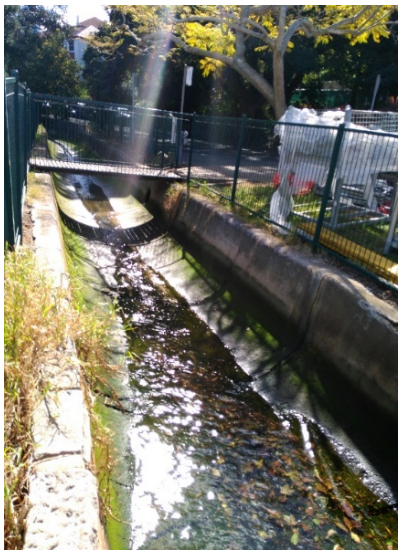

Figure 16: Milson Park (SW-MP-01) on the Oct-17 showing high water level

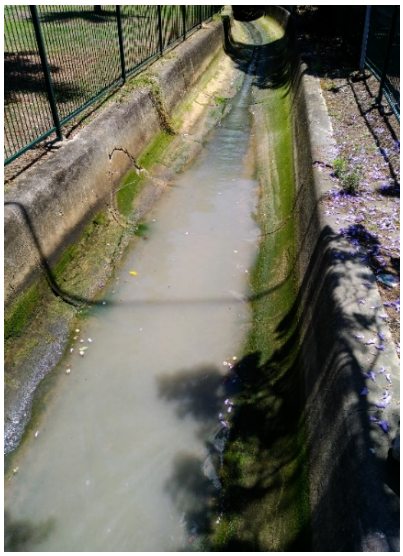

Figure 17: Milky water at Milson Point on Nov-17

4.7 Blues Point/ Sydney Harbour (SW-BP-01)

The Blues Point water monitoring site will receive water directly from the Blues Point Shaft Worksite when work commences, as well the surrounding urban setting and influences from Sydney harbour. Sydney Harbour is a disturbed environment and has been utilised for transport and industry for a significant period. The banks of Sydney Harbour are highly modified and have been straightened and armoured with rock and concrete. The water monitoring site is classified as a marine environment and therefore compared to the ANZECC Marine criteria.

Six (6) monitoring events were undertaken at Blues Point during the reporting period with results shown in Appendix 6. Results were stable and consistent with what would be expected of a marine environment. Figure 18, Figure 19 and Figure 20 show site conditions experienced during the reporting period. All results were recorded within the assessment criteria except for the following parameters:

- The laboratory analysis of pH of the water measured marginally below assessment criteria on one occasion. pH was recorded at 7.9 which falls below the adopted assessment criteria of 8.0.

- The dissolved oxygen levels were also measured to be outside the criteria. Results on Aug-17 (24/08/2017) and Oct-17 (25/10/2017) were above the upper limit of 110 % saturation at 125 and 117% respectively. This is likely associated with environmental conditions (swell, wind etc) rather than an external contaminant source.

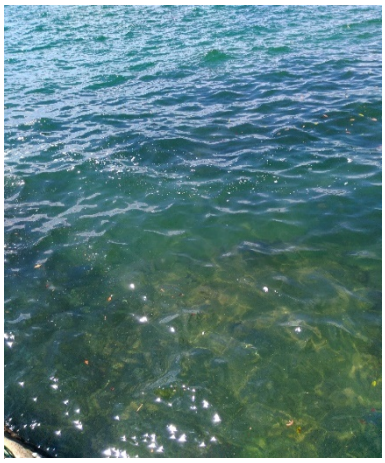

Figure 18: Blues Point (SW-BP-01) on Sep-17

Figure 19: Blues Point (SW_BP-01) on Oct-17

Figure 20: Blues Point (SW-BP-01) on Dec-17

4.8 Barangaroo/Darling Harbour (SW-B-01)

The Barangaroo water monitoring location receives water directly from the Barangaroo Worksite, as well the surrounding urban setting and influences from Sydney harbour. The water monitoring site is in a marine environment and therefore compared to the ANZECC, Marine assessment criteria, detailed in Table 1.

The Barangaroo Worksite is adjacent to the water monitoring location. Works being undertaken on the Barangaroo site during the reporting period were TSE works which included site establishment, amenities installation and minor local area works on Hickson Road to enable necessary traffic switches. The Barangaroo's worksite's erosion and sediment controls, including large hardstand areas, have been installed in accordance with the NSW Government's Managing Urban Stormwater: Soils and Construction, 2004 (the Blue Book). No discharges occurred from site during the reporting period.

Six (6) monitoring events were recorded during the reporting period at the Barangaroo water monitoring site with results displayed in Appendix 8. Little variance was seen between the monitoring results from each sampling round during the reporting period. Figure 21, Figure 22 and Figure 23 shows the site conditions experienced during different monitoring events. All results were typical of a marine environment and were recorded within the assessment criteria with the exception of the following parameters:

- Laboratory analysis of pH was measured marginally below the assessment criteria on one occasion at 7.8.
- The dissolved oxygen levels were also measured to be outside the ANZECC marine assessment criteria of 100% DO saturation. Results on in Sep-17 recorded oxygen saturation of 115.6%. This is likely attributed to environmental conditions such as

swell and wind. 'Choppy' site conditions were documented in field notes during this sampling round. Alternatively, results recorded during the Nov-17 and Jan-18 monitoring periods recorded dissolved oxygen levels that were below the ANZECC criteria (88.7 % and 85% respectively).

Figure 21: Barangaroo (SW-B-01) on Aug-17

Figure 22: Barangaroo (SW-B-01) on Sep-17

Figure 23: Barangaroo (SW-B-01) on Dec-17 showing wavy conditions

4.9 Farm Cover/ Sydney Harbour (SW-FC-01)

The Farm Cove water sampling location receives stormwater from the city, including water from the Martin Place and Pitt Street Work Sites. The Water monitoring site is located within a marine environment and therefore compared to the ANZECC, Marine assessment criteria as documented in Table 1.

Bligh Street Tunnel Support Site (Bligh Street) was a former demolition site. The site is 3m below the road surface level as the building was demolished down to basement level. A water treatment plant was in operation when the site was handed over to TSE (November 2017). Treated water from the WTP is discharged into a licenced discharge point connected to stormwater mains.

The Martin Place North and Pitt Street North sites are currently under demolition. The sites are within an urban environment and bound by roads on all sides. Both sites are relatively flat with little to no fall off site. Erosion and sediment controls are installed around the perimeter of the site with only passive surface water leaving the site through established erosion controls prior to entering the local stormwater system.

Martin Place South and Pitt St South experienced no active TSE works during the reporting period.

Six (6) monitoring events were recorded during the reporting period at the Farm Cove water sampling location with results shown in Appendix 7. Figure 24, Figure 25, and Figure 26 shows the sampling locations at different events. All results were recorded within the assessment criteria with the exception of the following parameters:

- The laboratory analysis of pH was recorded below the adopted assessment criteria on two occasions. pH was recorded at 7.9 and 7.8 during the Oct-17 and Nov-17 sampling events respectively which marginally falls below the adopted assessment criteria of 8.0.

- NTU results during the Jan-18 sampling event were relatively higher than previous results. This was coupled with observation of odours, smelly, and visible brown discharge from outlet, shown in Figure 27.
- Dissolved oxygen levels were also recorded at concentrations above the adopted assessment criteria. Results from Sep-17 were above the upper limit of 110 % oxygen saturation level. It was noted that this was a windy day which could have contributed to the high dissolved oxygen result.

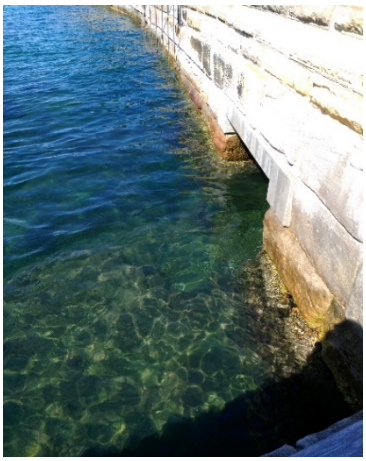

Figure 24: Farm Cove (SW-FC-01) sampling location on Aug-17

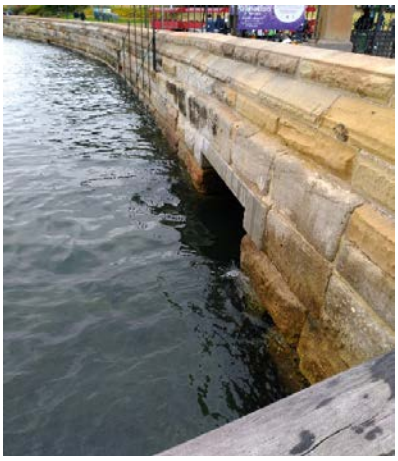

Figure 25: Farm Cove (SW-FC-01) sampling location on Sep-17

Figure 26: High tide at Farm Cove (SW-FC-01) on Dec-17

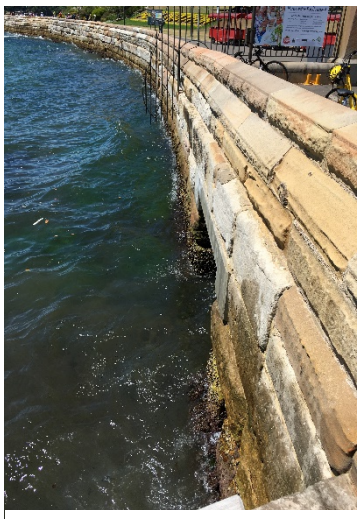

Figure 27: Low tide at Farm Cove SW-FC-01 on Jan-18, showing brown discharge

4.10 Alexandra Canal/ Cooks River (SW-AC-01)

Alexandra Canal sampling sites received water from the surrounding residential and light industry areas, including the Waterloo site. The catchment falls within an urbanised area and the natural drainage characteristics have been altered by straightening waterways and

concreting to improve flowrate. This is an open (trunk) channel which discharges into Cooks River. The sampling location is classified as a freshwater system and measured against the ANZECC, Freshwater criteria.

The Waterloo site was under demolition and has been since August 2017, the site is within an urban environment and bounded by roads on all sides. The site is relatively flat with little to no fall off site, erosion and sediment controls are installed around the perimeter of the site with only passive surface water leaving the through establish erosion controls prior to entering the local stormwater system.

Six (6) monitoring events were recorded between August and December 2017 at the Alexandra Canal sampling site, results are shown in Appendix 9. The canal was noted as being highly disturbed which collects runoff and discharge water from several surrounding businesses, and construction activities including a construction site adjacent to the site. Dewatering was observed on 3 occasions, shown in Figure 28. Visible oil and grease was also seen running down the stream shown in Figure 29.

The flow of the canal was very variable across the different water monitoring events. During the Nov-17 and Dec-17 monitoring events, field samples could not be collected as a result of the fast flow of water, causing the monitoring probe to be washed out of stream. During these events it was not feasible to a collect a scoop sample. The monitoring event of Jan-18 field sample still could not be measured with the monitoring probe, but a grab sample was taken.

All results were recorded within the adopted assessment criteria with the exception of the following parameters:

- pH was recorded above the assessment criteria on one occasion (Oct-17) with a laboratory measurement of 8.3. This is marginally greater than the adopted criteria of 8.0.
- Iron concentrations ranged between 0.23mg/L and 1.3mg/L, of which five sampling events recorded concentrations in excess of the adopted assessment criteria. Elevated iron concentrations are likely a reflection of the industrialised land use of the area as several heavy industries discharge water into the canal.

Figure 28: Adjacent construction site discharging water in Alexandra Canal (SW-EC-01) onAug-17

Figure 29: Visible oil and grease at Alexandra Canal (SW-EC-01) on Sep-17

Figure 30: High water flow, clear at Alexandra Canal on Dec-17

4.11 Eastern Channel/ Cooks River (SW-EC-01)

The Eastern Channel sampling site receives water from stormwater utilities servicing the surrounding residential and light industry land uses. The sampling location is 300 meters south of the Marrickville site. The catchment is highly disturbed and the natural drainage line has been straightened and lined with concrete. This is an open (trunk) channel which discharges into Cooks River. The sampling location is classified as a freshwater system and therefore measured against the ANZECC, Freshwater criteria. The flow of the channel is very variable, shown in Figure 31 and Figure 32.

Works being undertaken on the Marrickville site during the reporting period included demolition works undertaken by Delta Group Pty Ltd (Delta) and TSE works including vegetation clearing, contamination investigations, minor FRP works and installation of the precast shed and footings at the Precast facility. The Marrickville worksite's erosion and sediment controls including large hardstand areas have been installed in accordance with the NSW Government's Managing Urban Stormwater: Soils and Construction, 2004 (the Blue Book). No discharges occurred from site during the reporting period.

Six (6) monitoring events were recorded between August 2017 and January 2018 at the Eastern Channel monitoring site, results are displayed in Appendix 10. All results were recorded within the assessment criteria with the exception of the following parameters;

- Field observation noted the high level of disturbance to the canal. Turbidity readings ranged from 5 – 171 NTU. Odorous and turbid site conditions were identified during sampling events, with visible debris noted on most occasions, as shown in Figure 33. This supports the elevated NTU, and high TSS Levels recorded at this sampling location.
- Dissolved oxygen was recorded at concentrations below the assessment criteria in five (5) monitoring events. These monitoring events were in both low and high water level events and are likely representative of the slow flow rate of the canal.
- Total iron was also recorded in excess of the assessment criteria of 0.35 mg/L on all occasions. During the Dec-17 water monitoring event, total iron was recorded at 3.5 mg/L. Total iron concentrations recorded during the monitoring period are potentially linked to the high sediment yield noted within the water column.

Figure 31: Low/still creek at Eastern Channel (SW-EC-01) on Aug-17

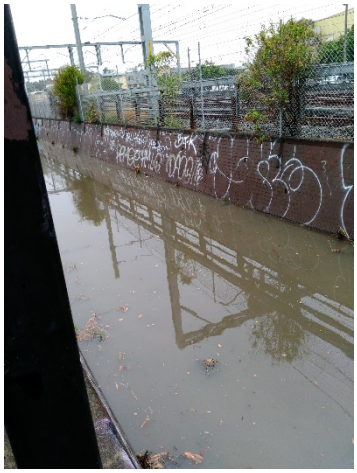

Figure 32: High level creek at Eastern Channel (SW-EC-01) on Oct-17

Figure 33: Eastern Canal (SW-EC-01) showing murky turbid water on Dec-17

Figure 33: Settled water with vegetation at Eastern Canal (SW-EC-01) on Jan-17

5.0 Conclusion

This report summarises the results of the Baseline Surface Water Quality Monitoring Program undertaken between August 2017 and January 2018. This report is required to be submitted to the EPA in accordance with Condition C9 of the Project Planning Approval.

Works being undertaken during this reporting period is classified as Pre-construction TSE Works, and demolition. This monitoring period represents the baseline water quality expected for the project. Future water sampling results will be compared to this report.

Water monitoring was conducted on six (6) occasions between August 2017 to January 2018. The results of the surface water sampling conducted during this monitoring period represent the high level of existing disturbance in the catchment and drainage lines and is reflected within the results of water sampling collected during this sampling period which show high levels of variability.

It should also be noted that the Upper Flat Rock Creek sampling point was dry throughout all sampling rounds. The appropriateness of this sampling location for ongoing monitoring will be assessed accordingly.

Results highlight that the catchment areas have external influences from surrounding residential and industrial sites, as well as other construction sites. It is not possible to identify the exact influence on water quality however JHCPBG's process for testing water prior to discharge off site ensures water quality is within the required parameters.

In addition to the inspections conducted as part of the waterway monitoring program discussed in this Report, JHCPBG conducts daily and weekly environmental inspections of each worksite. The Environment Representative also conducts weekly inspections and any observations are closed out within agreed timeframes. JHCPBG has also engaged a Soil Conservationist (Andrew MacLeod, SECC) to assist in erosion and sediment control planning; inspect the worksites and to provide input on controls.

Water monitoring will continue in accordance with the water monitoring program.

Appendix 1 – Water monitoring results for Upper Scotts Creek (SW-SC-01)

		Units	ANZECC1 Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					3:15:00 PM	3:00:00 PM	3:15:00 PM	2:20:00 PM	3:30:00 PM	4:00:00 PM				
Comment										Site could not be accessed. Isolated by fire department.				
Field	Temp	°C			15.52	19.75	23.63	23.73	21.88		23.7	20.9	23.7	15.5
	pH	pH Units	6.5	8	7.46	7.6	7.51	7.62	7.91		7.7	7.6	7.9	7.5
	Salinity	mS/cm			0.417	0.41	0.627	0.52	0.52		0.5	0.5	0.6	0.4
	Turbidity	NTU	6	50	34	4.3	2.6	10.6	58.2		38.8	21.9	58.2	2.6
	DO	mg/L			6.75	8.7	6	5.4	7.14		7.5	6.8	8.7	5.4
	DO	%	85	110	69.7	98	74.4	61.6	83.5		86.4	77.4	98.0	61.6
	Flow/Tide				Flowing	Flowing	Flowing	Flowing	Heavy Flowing					
Lab	pH	pH Units	6.5	8	7.9	7.9	7.8	7.8	7.7		7.9	7.8	7.9	7.7
	Electrical Conductivity	mS/cm	125	2200	290	460	460	400	210		460.0	364.0	460.0	210.0
	Oil & Grease	LLE			5	5	5	[NT]	5		5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			7	10	15	10	12		12.6	10.8	15.0	7.0
	Iron - Total	mg/L		0.3	0.29	0.45	0.84	0.46	0.84		0.8	0.6	0.8	0.3
	Manganese - Total	mg/L		1.7	0.02	0.02	0.05	0.02	0.03		0.0	0.0	0.1	0.0
Comment					Odorous, visible scum	Odorous	Odorous	N/A	Heavy Flow Visible Scum, Cloudy/Dirty water					
Rainfall (in last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 2 – Water monitoring results for Lower Scotts Creek (SW-SC-02)

		Units	ANZECC1 Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					3:15:00 PM	3:00:00 PM	3:15:00 PM	2:20:00 PM	3:30:00 PM	4:00:00 PM				
Comment														
Field	Temp	oC			14.5	19.75	21.64	22.89	22.12	29.97	22.3	21.8	30.0	14.5
	pH	pH Units	8	8.4	7.27	7.6	7.1	7.06	7.15	7.17	7.3	7.2	7.6	7.1
	Salinity	mS/cm			43.1	36.6	26.1	46.7	42.9	36.2	43.8	38.6	46.7	26.1
	NTU	NTU	0.5	10	1.6	0.6	1.2	3.4	2.1	13.7	2.4	3.8	13.7	0.6
	DO	mg/L			6.52	5.08	8.66	3.2	3.91	4.74	6.9	5.4	8.7	3.2
	DO	%	90	110	78.4	65.2	103	45	51.6	71.8	83.3	69.2	103.0	45.0
	Flow/Tide				outgoing	outgoing	outgoing	Outgoing		outgoing				
Lab	pH	pH Units	8	8.4	7.8	7.8	7.7	7.5	7	7.7	7.8	7.6	7.8	7.0
	Electrical Conductivity	mS/cm			15000	19000	30000	42000	35000	31000	36400.0	28666.7	42000.0	15000.0
	Oil & Grease (LLE)	LLE			5	5	5	5	5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			5	10	11	10	<5	10	10.4	9.2	11.0	5.0
	Iron - Total	mg/L			0.7	0.29	0.55	0.54	0.47	0.52	0.6	0.5	0.7	0.3
	Manganese - Total	mg/L		0.8	0.1	0.02	0.08	0.05	0.06	0.05	0.1	0.1	0.1	0.0
Comment							Evidence of previous heavy flow							
Rainfall (in last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 3 – Water monitoring results for Upper Flat Rock Creek (SW-FR-01)

		Units	ANZECC1 Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time														
Comment					No Water	No Water	No Water	No water	No water	No water				
Field	Temp	oC												
	pH	pH Units	6.5	8										
	Salinity	mS/cm	125	2200										
	NTU	NTU	6	50										
	DO	mg/L												
	DO	%	58	110										
	Flow/Tide													
Lab	pH	pH Units	6.5	8										
	Electrical Conductivity	mS/cm	125	220										
	Oil & Grease (LLE)	LLE												
	Total Suspended Solids	mg/L												
	Iron - Total	mg/L		0.3										
	Manganese - Total	mg/L		1.7										
Comment														
Rainfall (in last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 4 – Water monitoring results for Lower Flat Rock Creek (SW-FR-02)

		Units	ANZECC Criteria 2		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					0.572916667	0.541666667	0.5625	0.5625	1:36PM	0.576388889				
Comment														
Field	Temp	°C			15.32	18.9	22.95	22.63	21.52	27.7	22.7	21.5	27.7	15.3
	pH	pH Units	8	8.4	7.58	7.4	7.64	7.58	7.65	6.98	7.6	7.5	7.7	7.4
	Salinity	mS/cm			49.9	47	49.1	52.9	52.7	46	52.7	49.6	52.9	47.0
	NTU	NTU	0.5	10	0.2	1	0	0	0	13	0.4	2.4	13.0	0.0
	DO	mg/L			6.46	7.24	4.33	3.77	4.45	5.35	6.6	5.3	7.2	3.8
	DO	%	90	110	81.8	96.5	62.4	53.2	62.3	82.2	84.7	73.1	96.5	53.2
	Flow/Tide				Flowing	Flowing	Flowing	Flowing	Flowing	Flowing				
Lab	pH	pH Units	8	8.4	8	7.9	8	7.8	7.9	7.6	8.0	7.9	8.0	7.8
	Electrical Conductivity	mS/cm			45000	49000	52000	49000	45000	46000	49600.0	47666.7	52000.0	45000.0
	Oil & Grease (LLE)	LLE			5	5	5	5	5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			5	10	10	10	<10	19	10.0	10.8	19.0	5.0
	Iron - Total	mg/L			0.1	0.09	0.03	0.05	0.2	0.4	0.1	0.1	0.4	0.0
	Manganese - Total	mg/L		0.8	0.01	0.01	0.01	0.01	0.02	0.02	0.0	0.0	0.0	0.0

Comment				Visible outflowing oil and grease.			Brown, odorous outflow. Very low water level.	
Rainfall (in last 5 days)		0.6	0	28	15.8	21.6	0	

Appendix 5– Water monitoring results for Milsons Park (SW-MP-01)

		Units	ANZECC2 Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					12:30:00 PM	12:15:00 PM	1:06:00 PM	12:46:00 PM	1:15:00 AM	1:50:00 PM				
Comment					Canal was blocked- Sample taken from canal exist									
Field	Temp	oC			15.96	17.83	22.71	22.4	20.7	27.32	22.5	21.2	27.3	16.0
	pH	pH Units	8	8.4	7.67	8	7.86	8.05	7.83	7.17	8.0	7.8	8.1	7.7
	Salinity	mS/cm			49.8	0.5	5.9	10	0.52	3.85	18.0	11.8	49.8	0.5
	NTU	NTU	0.5	10	0.3	3	0.2	100	19	6.2	35.2	21.5	100.0	0.2
	DO	mg/L			7.7	9.5	8.62	7.58	7.1	8.4	8.8	8.2	9.5	7.1
	DO	%	90	110	98.1	134	11.8	90.5	1.005	103	105.3	73.1	134.0	1.0
	Flow/Tide				low	Outgoing	High	Outgoing	Outgoing	Still				
Lab	pH	pH Units	8	8.4	8	7.9	8	7.9	7.9	8.1	8.0	8.0	8.1	7.9
	Electrical Conductivity	mS/cm			49000	380	44000	1100	42000	4600	45000.0	23513.3	49000.0	380.0
	Oil & Grease (LLE)	LLE			5	5	5	5	<5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			7	14	10	100	48	10	58.4	31.5	100.0	7.0
	Iron - Total	mg/L			0.06	0.73	0.2	1.5	0.68	0.27	0.9	0.6	1.5	0.1
	Manganese - Total	mg/L		0.8	0.01	0.03	0.01	0.02	0.04	0.01	0.0	0.0	0.0	0.0
Comment					Clear water	Little water, No connection to bay	Clear water, Visible inwards flow, Visible Debris	Channel down flow is Milky	Channel down flow is Milky	Clear Water				
Rainfall (mm) (last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 6 – Water monitoring results for Blues Point (SW-BP-01)

		Units	ANZECC2 Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					12:00:00 PM	11:30:00 AM	12:17:00 PM	12:30:00 PM	12:49:00 PM	12:30:00 PM				
Comment														
Field	Temp	oC			15.38	18.4	20.83	20.91	20.17	25.21	20.8	20.2	25.2	15.4
	pH	pH Units	8	8.4	7.71	7.6	7.77	7.87	7.88	7.78	7.9	7.8	7.9	7.6
	Salinity	mS/cm			50.9	50	50.1	46.9	53	53.4	51.3	50.7	53.4	46.9
	NTU	NTU	0.5	10	0	0	0	1.2	0	1.1	0.2	0.4	1.2	0.0
	DO	mg/L			10.1	7.56	8.66	7.71	7	6.49	8.9	7.9	10.1	7.0
	DO	%	90	110	125	102	117	104.6	96	98.7	118.6	107.2	125.0	96.0
	Flow/Tide				Outgoing	Outgoing	Incoming	Outgoing	Outgoing	Outgoing				
Lab	pH	pH Units	8	8.4	8.1	8.1	8.1	7.9	8	7.9	8.1	8.0	8.1	7.9
	Electrical Conductivity	mS/cm			51000	52000	53000	49000	50000	52000	52200.0	51166.7	53000.0	49000.0
	Oil & Grease (LLE)	LLE			5	5	5	5	5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			5	10	14	10	10	10	10.8	9.8	14.0	5.0
	Iron - Total	mg/L			0.02	0.06	0.06	0.03	0.04	0.09	0.1	0.1	0.1	0.0
	Manganese - Total	mg/L		0.8	0.01	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.0	0.0
Comment								Clear	Wavy	Wavy				
Rainfall (mm) (last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 7 – Water monitoring results for Farm Cove (SW-FC-01)

		Units	ANZECC2 Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					12:00:00 PM	11:45:00 AM	11:46:00 AM	11:28:00 AM	11:20:00 AM	11:50:00 AM				
Comment														
Field	Temp	oC			15.65	18.42	20.5	20.8	19.6	24.72	20.6	19.9	24.7	15.7
	pH	pH Units	8	8.4	7.63	7.66	7.86	7.8	7.87	7.68	7.9	7.8	7.9	7.6
	Salinity	mS/cm			50.5	50	50.1	53	53.1	50.9	53.0	51.3	53.1	50.0
	NTU	NTU	0.5	10	0.4	0	6.5	0.2	0.4	19	1.6	4.4	19.0	0.0
	DO	mg/L			8.5	9.5	7.86	6.69	7.44	6.3	8.7	7.7	9.5	6.7
	DO	%	90	110	106.2	128	108.5	94.6	101.4	93	112.4	105.3	128.0	94.6
	Flow/Tide				Outgoing	Outgoing	Incoming	Incoming	Outgoing	Outgoing				
Lab	pH	pH Units	8	8.4	8	8	7.9	7.8	8	8	8.0	8.0	8.0	7.8
	Electrical Conductivity	mS/cm			49000	51000	48000	46000	49000	50000	49400.0	48833.3	51000.0	46000.0
	Oil & Grease (LLE)	LLE			5	5	5	5	5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			18	10	10	10	10	14	11.6	12.0	18.0	10.0
	Iron - Total	mg/L			0.04	0.06	0.08	0.05	0.05	0.2	0.1	0.1	0.2	0.0
	Manganese - Total	mg/L		0.8	0.01	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.0	0.0
Comment					Visible outflow		Visible outflow- Dirty Water and Leaves	Visible scum/foam	Bike submerged in Water	Low tide, odours, smelly, and visible brown discharge.				
Rainfall (mm) (last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 8 – Water monitoring results for Barangaroo (SW-B-01)

		Units	ANZECC2 Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					11:15:00 AM	11:00:00 AM	10:47:00 AM	10:35:00 AM	10:31:00 AM	11:15:00 AM				
Comment														
Field	Temp	°C			15.21	18.3	21	21.28	20.83	25.38	21.1	20.3	25.4	15.2
	pH	pH Units	8	8.4	7.59	7.57	7.7	7.67	7.76	7.65	7.7	7.7	7.8	7.6
	Salinity	mS/cm			50.8	50	49.9	53	53.1	53.4	53.0	51.7	53.4	49.9
	NTU	NTU	0.5	10	0	6.2	0	0.5	0	0	1.6	1.1	6.2	0.0
	DO	mg/L			8.41	8	8.32	6.25	6.6	6.21	8.3	7.3	8.4	6.3
	DO	%	90	110	105.2	11.5	115.6	88.7	92.7	85	107.3	83.1	115.6	11.5
	~~Flow/~~Tide				Outgoing	Outgoing	Incoming	Incoming	Incoming	Outgoing				
Lab	pH	pH Units	8	8.4	8	8	8	7.8	8	8	8.0	8.0	8.0	7.8
	Electrical Conductivity	mS/cm			50000	52000	52000	49000	49000	52000	52000.0	50666.7	52000.0	49000.0
	Oil & Grease (LLE)	LLE			5	5	5	5	5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			5	10	12	10	10	10	10.4	9.5	12.0	5.0
	Iron - Total	mg/L			0.02	0.03	0.03	0.04	0.03	0.04	0.0	0.0	0.0	0.0
	Manganese - Total	mg/L		0.8	0.01	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.0	0.0
Comment					Choppy	Choppy	Choppy		Wavy (boat traffic)	Wavy (boat traffic)				
Rainfall (mm) (last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 9 – Water monitoring results for Alexandra Canal (SW-AC-01)

		Units	ANZECC Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					9:30:00 AM	9:00:00 AM	9:00:00 AM	9:00:00 AM	9:00:00 AM	9:00:00 AM				
Comment														
Field	Temp	°C			15.44	19.24	20.99	20.67	21.42	24.32	21.1	20.3	24.3	15.4
	pH	pH Units	6.5	8	7.37	7.25	6.97	6.78	7.3	5.64	7.3	6.9	7.4	6.8
	Salinity	mS/cm	125	2200	0.674	0.554	0.543	0.1	0.47	0.441	0.6	0.5	0.7	0.1
	NTU	NTU	6	50	38.1	27.3	22.9	170	171	5	170.2	72.4	171.0	22.9
	DO	mg/L			10.22	3.6	5.6	6.93	4.42	2.99	7.6	5.6	10.2	3.6
	DO	%	58	110	103.6	39	63.5	74.6	49.6	36.5	80.4	61.1	103.6	39.0
	Flow~~/Tide~~				Low	Low	Low	High	Still	Still				
Lab	pH	pH Units	6.5	8	7.8	7.7	7.6	7.1	7.2	7	7.7	7.4	7.8	7.1
	Electrical Conductivity	mS/cm	125	220	560	590	620	100	470	450	596.0	465.0	620.0	100.0
	Oil & Grease (LLE)	LLE			5	5	5	5	5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			51	32	12	81	42	10	57.0	38.0	81.0	12.0
	Iron - Total	mg/L		0.3	0.58	1.5	2.5	2.6	3.5	0.62	2.8	1.9	3.5	0.6
	Manganese - Total	mg/L		1.7	0.06	0.3	0.3	0.04	0.08	0.09	0.3	0.1	0.3	0.0
Comment					Visible debris, Odorous	Visible rubbish	Evidence of previous heavy flow	Dirty water, rubbish		Settled sediments. Low/no flow. Abundant algae growth. Little water				
Rainfall (mm) (last 5 days)					0.6	0	28	15.8	21.6	0				

Appendix 10 – Water monitoring results for Eastern Channel (SW-EC-01)

		Units	ANZECC Criteria		Monthly Measurements						Statistics			
			Lower Limit	Upper Limit	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	80%ile	mean	max	min
Date					24/08/2017	06/10/2017	25/10/2017	22/11/2017	06/12/2017	30/01/2018				
Time					9:30:00 AM	9:00:00 AM	9:00:00 AM	9:00:00 AM	9:00:00 AM	9:00:00 AM				
Comment														
Field	Temp	°C			15.44	19.24	20.99	20.67	21.42	24.32	21.1	20.3	24.3	15.4
	pH	pH Units	6.5	8	7.37	7.25	6.97	6.78	7.3	5.64	7.3	6.9	7.4	6.8
	Salinity	mS/cm	125	2200	0.674	0.554	0.543	0.1	0.47	0.441	0.6	0.5	0.7	0.1
	NTU	NTU	6	50	38.1	27.3	22.9	170	171	5	170.2	72.4	171.0	22.9
	DO	mg/L			10.22	3.6	5.6	6.93	4.42	2.99	7.6	5.6	10.2	3.6
	DO	%	58	110	103.6	39	63.5	74.6	49.6	36.5	80.4	61.1	103.6	39.0
	~~Flow/Tide~~				Low	Low	Low	High	Still	Still				
Lab	pH	pH Units	6.5	8	7.8	7.7	7.6	7.1	7.2	7	7.7	7.4	7.8	7.1
	Electrical Conductivity	mS/cm	125	220	560	590	620	100	470	450	596.0	465.0	620.0	100.0
	Oil & Grease (LLE)	LLE			5	5	5	5	5	5	5.0	5.0	5.0	5.0
	Total Suspended Solids	mg/L			51	32	12	81	42	10	57.0	38.0	81.0	12.0
	Iron - Total	mg/L		0.3	0.58	1.5	2.5	2.6	3.5	0.62	2.8	1.9	3.5	0.6
	Manganese - Total	mg/L		1.7	0.06	0.3	0.3	0.04	0.08	0.09	0.3	0.1	0.3	0.0
Comment					Visible debris, Odorous	Visible rubbish	Evidence of previous heavy flow	Dirty water, rubbish		Settled sediments. Low/no flow. Abundant algae growth. Little water				
Rainfall (mm) (last 5 days)					0.6	0	28	15.8	21.6	0				