CONSTRUCTION MONITORING REPORT

November 2022 to April 2023

Sydney Metro City & Southwest

Package 5 & 6

Customer: Sydney Metro

Document Preparation and Control	Document Review
Brae Haddock – Environmental Advisor	Geraldine Figueira – Environmental and Sustainability Advisor
Document Approval	**Signature**
Amy Williams – Environment & Sustainability Manager	

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Downer		**Sydney Metro**	

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Compliance Matrix

Condition	Requirement	Compliance
MCoA C14	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, 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 Construction Monitoring Report

Introduction

This Construction Monitoring Report has been prepared in accordance with Condition C14 of Critical State Significant Infrastructure Planning Approval 8256. It contains the results of Noise and Vibration Monitoring Program and the Water Quality Monitoring Programs, conducted as part of the station upgrades and Metro Services Building (MSB) construction at:

- Dulwich Hill (Package 5)
- Hurlstone Park (Package 6)
- Campsie (Package 5)
- Belmore (Package 6)
- Wiley Park (Package 6)
- Punchbowl (Package 5)

This report details the results of the noise, vibration and surface water monitoring conducted for a period of six (6) months of construction of Package 5 and Package 6 of the Sydney Metro Southwest Project. Construction of these packages commenced on 21 April 2021 and this report details the results of the monitoring undertaken from 8 November 2022 to 7 April 2023. Previous monitoring results for the project have been covered in separate Construction Monitoring Reports.

Submission Requirements

In accordance with condition the Ministers Conditions of Approval (MCoA) C14, Construction Monitoring Report will be submitted to the following agencies for information:

- Inner West Council;
- City of Canterbury Bankstown; and
- DPE.

The Independent Environmental Representative for DPE will review the report prior to submission.

Surface Water Monitoring

The project sites are located within the rail corridor on the T3 Bankstown line between Dulwich Hill and Punchbowl, New South Wales (NSW). The project sites form part of the overall Cooks River catchment with water from the area discharging into the Cooks River via local stormwater drainage or overland flow. The catchment area is highly urbanised with mixed residential, commercial and industrial properties.

The closest Project worksite to an existing watercourse is the Wiley Park Station services building, which is located approximately 100m from an unnamed concrete-lined channel, which forms the upper reaches

of Coxs Creek and is identified as a first-order stream within the Cooks River Catchment. Water quality is measured on an ongoing basis for the wider Cooks River catchment by the NSW Department of Planning & Environment (DPE) as part of the Beachwatch programme. The monitoring point is at Kyeemagh Baths at the mouth of the Cooks River in Port Botany. Water quality within the Cooks River catchment is influenced by stormwater, fertilisers, industrial discharges and sewage contamination. Objectives for water quality management during construction are:

- Minimise pollution of surface water through appropriate erosion and sediment control;
- Maintain existing water quality of surrounding surface watercourses.

The water quality monitoring program, in accordance with Table 13 of the SWMP, is to be undertaken quarterly in response to wet weather events (four wet weather events - >20mm of rain per 24 hours - per year), and also including dry weather sampling. Additional surface water monitoring is undertaken during construction to monitor the effectiveness of measures for managing soil and water impacts implemented. It must be conducted for the duration of construction or unless otherwise agreed to by Downer, Sydney Metro and the Independent Environmental Representative for DPE. Details of the Water Quality Monitoring Program and the mitigation measures to reduce the impact of the construction activities are contained within the Soil and Water Management Plans listed below:

- Southwest Metro – Dulwich Hill, Campsie and Punchbowl Station Upgrades Soil and Water Management Plan. This document can be accessed via the Downer Sydney Metro Environment Documents website.
https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Dulwich_Hill__Campsie_and_Punchbowl_CEMP_Rev07_2.pdf

- Southwest Metro – Hurlstone Park, Belmore and Wile Park Station Upgrades Soil and Water Management Plan. This document can be accessed on the Downer Sydney Metro Environment Documents website:
https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Hurlstone_Park_Belmore_WileyP_CEMP_Rev07_2.pdf

RESULTS - SURFACE WATER MONITORING

In accordance with Table 21.4 of the EIS, Vol. 1B, the water quality trigger values relevant for the project are the following:

Indicator	Criteria (lowland rivers)
Total phosphorus	50 ug/L
Total nitrogen	500 ug/L
Chlorophyll-a	5 ug/L
Turbidity	6-50 NTU
Salinity (electrical conductivity)	125-2,200 uS/cm
Dissolved oxygen (per cent saturation)	85-110 %
pH	6.5-8.5

A summary of the Surface Water Monitoring Results is contained within the table below. The complete Surface Water Monitoring Reports are contained within Appendixes 1-4. Bold red text indicates initial criteria exceedances.

Parameter	25/11/2022			22/02/2023			
	WP1 (upstream)	WP2 (downstream)	WP2-DP1[1] (downstream)	WP1 (upstream)	WP2 (downstream)	WP2-DP1[2] (downstream)	WP2-DP2[2] (downstream)
Monitoring Event	Dry weather event (mid-construction)			Wet weather event (mid-construction)			
Water Depth (m)	0.05	0.05	0.005	0.2 – 0.3	0.2 – 0.3	0.008	0.01 – 0.02
pH	8.14	8.41	**9.19**	7.50	7.63	**9.32**	7.33
Electrical Conductivity (µS/cm)	941.0	874.0	659.0	693.0	685.0	808.0	548.0
Dissolved Oxygen (mg/L)	6.55	6.44	6.40	6.45	6.50	4.25	4.89
Dissolved Oxygen (%)	**78.8**	**78.4**	**78.6**	92.2	92.1	**50.7**	**55.8**
SHE[1] Redox Potential (mV)	361.0	372.5	315.0	**118.1**	147.8	**103.5**	138.3
Total Suspended Solids (TSS) (mg/L)	<5	<5	<5	9.6	12.0	5.8	270.0
Turbidity (NTU)	1.3	1.4	2.2	11.0	14.0	3.8	**290.0**
Total phosphorus (mg/L)	**0.14**	**0.14**	**0.09**	**0.15**	**0.11**	**0.05**	**0.16**
Total nitrogen (mg/L)	**0.9**	**1.1**	**1.5**	**3.2**	**3.3**	**4.7**	**1.8**
Chlorophyll-a (mg/L)	< 0.005	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.002
Condition	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Light brown and medium turbidity
Oil and Grease (mg/L)	<10	11	<10	<10	<10	<10	<10

Note to Table:

[1] Inspected two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) and sampled one (1) additional nominated downstream discharge point (WP2-DP1) on 25 November 2022. No sampling work was undertaken at the downstream discharge point – WP2-DP2 due to lack of flow contribution.

[2] Inspected and sampled two (2) additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) on 22 February 2023.

Figure 1: WP1 and WP2 location map. Please note that only WP1-DP1 and WP2-DP1 are Downer's discharge points.

For reference, the previous monitoring events at these locations yielded the results below[1]:

[1] Discussion of these results are included in Construction Monitoring Report 2 (November 2021 to April 2022), Package 5 - SMCSWSW5-DEW-WEC-EMREP- 001412 and Package 6 - SMCSWSW6-DEW-WEC-EMREP- 01300.

Parameter	24/05/2022			04/07/2022				21/07/2022				25/08/2022		
	WP1 (upstream)	WP2 (downstream)	WP2-DP1[1] (downstream)	WP1 (upstream)	WP2 (downstream)	WP2-DP1[2] (downstream)	WP2-DP2[2] (downstream)	WP1 (upstream)	WP2 (downstream)	WP2-DP1[2] (downstream)	WP2-DP2[2] (downstream)	WP1 (upstream)	WP2 (downstream)	WP2-DP1[3] (downstream)
Monitoring Event	Wet weather event (mid-construction)			Wet weather event (mid-construction)				Wet weather event (additional pH investigation)				Dry weather event (additional pH investigation)		
Water Depth (m)	0.20	0.25	0.25	0.45	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.25	0.25	0.35
pH	6.82	**9.02**	**10.49**	6.87	6.92	**10.81**	7.29	7.71	7.93	**9.76**	8.48	7.16	9.02	**10.71**
Electrical Conductivity (µS/cm)	590.0	556.4	502.36	296.3	330.5	400.6	375.5	**61.0**	**108.2**	**84.1**	**90.6**	805.0	861.0	773.0
Dissolved Oxygen (mg/L)	8.10	8.05	6.22	22.98	8.95	7.63	10.61	7.52	7.13	6.28	6.42	13.50	10.32	**4.06**
Dissolved Oxygen (%)	85.3	**83.2**	**64.4**	**73.6**	**71.3**	**61.8**	**67.7**	**221.8**	86.4	**73.6**	102.6	124.1	101.0	**40.8**
SHE[1] Redox Potential (mV)	281.7	256.4	175.6	303.7	314	236.6	197.8	422.4	373.5	358.8	370.2	295.2	252.4	230.1
Total Suspended Solids (TSS) (mg/L)	<5	<5	23	11	9	42	26	Not Tested	Not Tested	Not Tested	Not Tested	<5	<5	<5
Turbidity (NTU)	14.0	16.0	18.0	9.4	11.0	14.0	22.0	Not Tested	Not Tested	Not Tested	Not Tested	3.9	3.8	1.2
Total phosphorus (mg/L)	**0.16**	**0.14**	**0.04**	**0.06**	**0.06**	**0.04**	**0.14**	Not Tested	Not Tested	Not Tested	Not Tested	**0.31**	**0.35**	**0.11**
Total nitrogen (mg/L)	**2.5**	**1.8**	**3.1**	**0.48**	**0.57**	**3.1**	**1.68**	Not Tested	Not Tested	Not Tested	Not Tested	**2.1**	**1.2**	**4.6**
Chlorophyll-a (mg/L)	**< 0.01**	**< 0.01**	**< 0.01**	**0.036**	< 0.002	< 0.002	< 0.002	Not Tested	Not Tested	Not Tested	Not Tested	< 0.002	< 0.002	< 0.002
Condition	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity	Clear, Low Turbidity
Oil and Grease (mg/L)	<10	<10	<10	<10	<10	<10	<10	Not Tested	Not Tested	Not Tested	Not Tested	<10	19	13

Mid-Construction Quarterly Dry-Weather Event – 25/11/2022

The sampling event was considered as a mid-construction dry-weather event based on the rainfall data recorded by the nearby weather station:

- Canterbury Racecourse AWS station (ID: 066194): approximately 4.6 km from the site with the rainfall data recorded 0 mm over the last 24 hours prior to the field sampling.

All four (4) nominated monitoring locations were inspected (WP1, WP2, WP2-DP1 and WP2-DP2) on 25 November 2022. Three (3) surface water monitoring locations (WP1, WP2 and WP2-DP1) were sampled. WP2-DP2 was not sampled due to the dry condition with no contribution to the water body was observed during the time of sampling. Minor flow contribution at the time of sampling was observed immediately downstream / north of at WP1 (discharge point WP2-DP1). Refer to **Figure 1** for approximate location of WP2-DP1.

Results for the mid-construction dry-weather event sampled on 25 November 2022 generally showed monitored parameters were within the adopted threshold criteria, with the exception of dissolved oxygen, total nitrogen, total phosphorous, and pH:

- **Dissolved oxygen** saturation measured at all three locations (WP1, WP2 and WP2-DP1) were outside the adopted criteria range. This is not considered to be a significant issue based on the baseline comparison indicating the dissolved oxygen saturation measured from this mid-construction dry-weather event are closer to the adopted thresholds than the pre-construction event.
- **Total nitrogen** measured at all three locations (WP1, WP2 and WP2-DP1) were above the adopted criterion range with the analytical results of 0.9 mg/L at WP1, 1.1 mg/L at WP2 and 1.5 mg/L at WP2-DP1. Overall, this is not considered to be a significant issue based on the baseline comparison indicating the total nitrogen measured from this mid-construction dry-weather event are closer to the adopted thresholds than the pre-construction event.
- **Phosphorous** measured at all three locations (WP1, WP2 and WP2-DP1) were above the adopted criteria with analytical results of 0.14 mg/L at WP1, 0.14 mg/L at WP2, and 0.09 mg/L at WP2-DP1. Overall, this is not considered to be a significant issue based on the baseline comparison indicating the phosphorous measured from this mid-construction dry-weather event were similar to the pre-construction event.
- **pH** measured at WP1 and WP2 were within the adopted criterion range, whereas pH measured at WP2-DP1 (9.19) was above the adopted criterion range (i.e. 6.5 – 8.5).

Results between upstream and downstream samples collected during the mid-construction dry-weather event were comparable, with the exception of:

- **Oil and Grease** results reported for the downstream sample location (WP2: 11 mg/L) was slightly higher than the upstream sample location (WP1: <10 mg/L). However, it is not considered this is a significant issue and this is not considered likely to be a result of the construction activities undertaken based on:
  - Oil and Grease concentration reported for the downstream sample (WP2: 29 mg/L) collected during pre-construction baseline monitoring event undertaken on 10 March 2021.
  - No visible oil sheen observed from any of the downstream monitoring location (WP2).

- **Total nitrogen** result at the downstream eastern discharge point (WP2-DP1: 1.5 mg/L) and downstream sample location (WP2: 1.1 mg/L) were slightly higher than the upstream sampling point (WP1: 0.9 mg/L). However, it is not considered this is a significant issue and this is not considered likely to be a result of the construction activities undertaken because:
  - It is known that there is an off-site flow contribution to the eastern downstream discharge point (WP2-DP1) from the urban run-off drainage system at Shadforth Street. It is known that high level of total nitrogen (i.e. an order of magnitude higher than the WP2-DP1 results) was previously identified from this off-site flow contribution.
- **pH** results at downstream eastern discharge point sample (WP2-DP1: 9.19) and downstream sample point (WP2: 8.41) were higher than the results measured at the upstream sample location (WP1: 8.14). As such, flow from the downstream eastern discharge point (WP2-DP1) was highly likely to contribute to the higher pH measured in the downstream water body.

One sampling event during the pre-construction period (baseline event) was undertaken on 10 March 2021. This event has been used for comparison of mid-construction monitoring events under similar conditions (i.e. not triggering the wet-weather event criteria). It should be noted that the baseline water quality monitoring represents a single sampling event and may not be representative of the range of water quality within the channel prior to construction starting.

Further details of this investigation works are provided in Appendix 1 of this report.

Wet weather event (mid-construction): 22/02/2023

The sampling event was considered as a mid-construction wet-weather event based on the rainfall data recorded by the nearby weather station:

- Canterbury Racecourse AWS station (ID: 066194): approximately 4.6 km from the site with the rainfall data recorded 90.8mm (i.e., above the 20 mm threshold) over the last 24 hours prior to the field sampling.

All four (4) nominated monitoring locations were inspected and sampled (WP1, WP2, WP2-DP1 and WP2-DP2) on 22 February 2023. At the time of sampling, WP2-DP2 (downstream western discharge point) contained high flowing water and one discharge point (WP1-DP1) was observed immediately downstream / north of WP1 (upstream of work area) with low flow contribution. Refer to **Figure 1** for approximate location of WP1-DP1.

The results of the monitoring event indicated that:

- Concentrations of Chlorophyll-a were reported below the laboratory detection limit and adopted assessment criteria at all sample locations. It is noted that due to insufficient volume of the sample being available for analysis by the laboratory (Eurofins), the LOR of this analyte was raised from 2 µg/L to 10 µg/L which is above the adopted assessment criteria. This non-compliance has been communicated with the laboratory (Eurofins) and will be avoided for future monitoring work; Overall, this issue is not considered to be a significant issue based no Chlorophyll-a exceedance to the adopted assessment criteria was historically detected from previous mid-construction wet weather monitoring events with similar water quality being visually as well as analytically observed between this round of monitoring undertaken on 24 May 2022 and previous monitoring events;
- Concentrations of Oil and Grease were reported below laboratory detection limit at all sample locations;

- TSS concentrations were reported with concentration of 9.6mg/L at WP1 (upstream),12mg/L at WP2 (downstream), 5.8mg/L at WP2-DP1 (downstream eastern discharge point) and 270mg/L at WP2-DP2 (downstream western discharge point).

Results for the mid-construction quarterly wet-weather event sampled on 22 February 2023 generally were within the adopted screening criteria, with the exception of:

- **pH** measured at upstream (WP1: 7.50) was within the adopted criterion range, whereas downstream eastern discharge point (WP2-DP1: 9.32) was above the adopted criterion range (i.e., 6.5 – 8.5); the pH at downstream sample (WP2:7.63) and downstream western discharge point (WP2-DP2:7.33) were within the adopted criterion range;
- **Dissolved oxygen** saturation measured at upstream point (WP1: 92.2%) and downstream (WP2: 92.1%) were within the adopted assessment criterion, but downstream eastern discharge point (WP2-DP1: 50.7%) and downstream western discharge point (WP2-DP2: 55.8%) were below the adopted criterion range (i.e., 85% - 110%). This is not considered to be a significant issue based on:
  - Dissolved oxygen saturation measured at WP2-DP1 was within the historical range measured at WP2 and close to the lower limit of historical range measured at WP1 (52.9 to 98.7%).
  - Dissolved oxygen saturation measured at WP2-DP2 was within the historical ranges measured at WP1 and WP2.
- **Total phosphorous** reported for each of the four locations (WP1, WP2, WP2-DP1 and WP2-DP2) were above the adopted criteria. However, this is not considered to be a significant issue based on:
  - The total phosphorus result at WP1 (0.15 mg/L) was within the historical range obtained from previous mid-construction wet-weather events, which historically fluctuated between below the laboratory detection limit to 0.23 mg/L.
  - The total phosphorus result at WP2 (0.11 mg/L) was within the historical range obtained from previous mid-construction wet-weather events, which historically fluctuated between below the laboratory detection limit to 0.28 mg/L.
  - The total phosphorus result at WP2-DP1 (0.05 mg/L) is slightly higher than the two historically results (both 0.04 mg/L) obtained from WP2-DP1 for wet-weather events. Furthermore, the total phosphorus result at WP2-DP1 is with the historical range measured at WP1 and WP2.
  - The total phosphorus result at WP2-DP2 (0.16 mg/L) is slightly higher than the historically results (both 0.14 mg/L) obtained from WP2-DP2 for wet-weather event. Furthermore, the total phosphorus result at WP2-DP1 is within the historical range measured at WP1 and WP2.
- **Total nitrogen** results at upstream sample (WP1: 3.2 mg/L), downstream sample (WP2: 3.3 mg/L), downstream eastern discharge point (WP2-DP1: 4.7 mg/L) and downstream western discharge point (WP2-DP-2: 1.8mg/L) were above the adopted assessment criteria (i.e., 0.35 mg/L). Overall, these exceedances in total nitrogen concentration are not considered to be a significant issue based on that the total nitrogen results were within the range obtained from previous mid-construction wet-weather sampling events.
- **Turbidity** was reported with concentration of 11 NTU at WP1 (upstream), 14 NTU at WP2

(downstream) and 3.8 NTU WP2-DP1 (downstream eastern discharge point), readings below adopted assessment criteria. WP2-DP1 (downstream eastern discharge point) exceeding the limit with a concentration of 290 NTU. However, this is not considered to be a significant issue based on:

- The stormwater discharged from WP2-DP2 discharge point was not from the Wiley Park Station Upgrade worksite.
- The increased level of turbidity was potentially caused by the disturbance of sediment in the WP2-DP2 discharge point by the light rain and wind during sampling.

The comparison of the mid-construction wet-weather event conducted on 22 February 2023 to the eight previous wet-weather sampling events showed no significant difference. Based on comparison to the adopted assessment criteria, comparison with eight previous mid-construction wet-weather events, and comparison of the upstream WP1, downstream WP2, downstream eastern discharge point WP2-DP1 and downstream western discharge point WP2-DP2 results, the results reported for the 22 February 2023 sampling event are generally not considered to reflect an adverse impact to water quality due to construction activities at the subject site except for pH.

Further details of this investigation works are provided in Appendix 2 of this report.

Discussion - Surface Water Monitoring

The monitored parameters were either within the adopted assessment screening criteria or considered insignificant for the exceedances (oil and grease, total nitrogen, total phosphorous and dissolved oxygen saturation) based on the comparison with the pre-construction baseline monitoring results. However, pH measured at the downstream discharge point WP2-DP1 were outside the assessment criteria range of 6.5 to 8.5 and were considered significant that require further investigation of the upstream area regarding the potential source(s).

The following recommendations regarding the elevated pH identified at WP1-DP2 and the two upstream flow contributions (temporary surface water erosion and sediment control trenches and platform 1 drainage system) have been offered:

- Temporary surface water erosion and sediment control trenches: prior to rainfall events, it is recommended to install a non-permeable physical barrier (e.g. black plastic sheeting) in the drainage trench path surrounding the construction footprint of the OSD tank. This would prevent surface water from coming into direct contact with the stabilised sand/cement mixture used to backfill the area.
- Removal of soil/sediment materials from the Platform 1 drainage system: the identified alkaline soil /sediment should be removed from the Platform 1 drainage system after construction has been completed within Platform 1 in general accordance with the following steps:
  - Excavating of any excessive soil/sediment materials from the Platform 1 drainage system including aco drain and connecting underground drainage pipe to the extent practicable.
  - Flushing of the soil/sediment materials that remain within the Platform 1 drainage system including aco drain and connecting underground drainage pipe following the excavation work outlined in the previous bullet point.

  - Following the flushing work, the two drainage pits located near the downstream end of aco drain should be checked and any soil/sediment materials should be removed by excavation.

- Completion of a validation test: following the removal and cleaning work of the Platform 1 drainage system, a validation test is recommended to check the effectiveness of the mitigation works undertaken by applying tap water at the start / upstream of the Platform 1 drainage system and measuring pH using a calibrated water quality meter at multiple downstream locations along the aco drain and associated drainage system.

Downer conducts regular inspections of the environmental controls, including sediment and erosion controls at Wiley Park to ensure that all sediments and erosion controls are in place, well maintained and functioning correctly. These inspections are conducted by the Project Team and Environmental Team. This proactive approach ensures that environmental controls are functioning properly rather than reactively inspecting the worksite following monitoring and reporting.

Noise and vibration

The area surrounding the project sites contains a variety of land-use types and receivers, including residential, commercial, industrial and sensitive non-residential receivers. These land-uses are mixed within the identified noise catchments, although in general there are clusters of industrial and commercial areas surrounding stations, primarily residential areas between stations. The area surrounding the project sites are affected by rail noise and vibration. The majority of works will occur within the rail corridor, on the station platforms and buildings and within the Metro Services Building Areas, works will mainly occur adjacent to residential properties.

Noise and vibration monitoring must be carried out for the duration of Construction. The predominant reason for monitoring noise and vibration associated with the construction works is to ensure compliance with modelled results for noisy works and to ensure compliance with modelled results and the project's Conditions of Approval(s) and Noise and Vibration Management Plan (NVMP). Modelling undertaken prior to noisy construction activities assesses if Respite Offers (RO) and Alternate Accommodation (AA) are required to be provided to sensitive receivers that are impacted by noise from works conducted outside of standard working hours.

Other reasons to conduct noise and vibration monitoring include:

- In response to noise or vibration complaints;
- If requested by Sydney Metro, the ER, DPE or EPA;
- To augment baseline noise levels, if the noise environment at a receiver is considered to be different from the noise logger locations used for the EIS;
- To validate predicted noise levels associated with each works scenario assessed in the CNVIS, at the commencement of works and new construction activities or location;
- To confirm baseline vibration levels currently experienced at heritage-listed structures and at any vibration-sensitive equipment;
- Where vibration levels are predicted to exceed the vibration screening level, attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure, in accordance with Revised Environmental Mitigation Measure (REMM) NVC12; and
- As part of a plant noise audit.

The methodology and rationale for conducting noise and vibration monitoring is contained within the relevant Noise and Vibration Monitoring Plans, being:

- Southwest Metro – Dulwich Hill, Campsie and Punchbowl Station Upgrades Noise and Vibration Management Plan. This document can be accessed via the Downer Sydney Metro Environment Documents website,

  https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Dulwich_Hill__Campsie_and_Punchbowl_Station_NVMP_Rev07.pdf

- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Noise and Vibration Management Plan. This document can be accessed via the Downer Sydney Metro Environment Documents website,

  https://www.downergroup.com/Content/cms/Documents/Sydney_Metro_package_5_6/Hurlstone_Park__Belmore_and_Wiley_Park_Station_NVMP_Rev07.pdf

RESULTS – NOISE MONITORING

The table below contains a summary of the noise monitoring results. The complete reports are provided in Appendices 3 to 7.

Assessment Point	Measured Plant	Predicted noise level dB(A)	Measured noise level		Above predicted noise level	Comments
			$L_{Aeq(15min)}$	L_{Amax}		
14/11/2022	**TL927-1-33F01 Campsie Station Electrical Works Report (r1) – APPENDIX 3**					
13-15 Anglo Road, Campsie	EWP & power hand tools 14.11.2022 10:09pm – 10:24pm	50 (T: Predicted LAeq, 15min for Typical activities)	55	70	Yes	The measured $L_{Aeq, 15min}$ is higher than the predicted noise level. However, this can be attributed to heavy road/foot/rail traffic nearby 13-15 Anglo Road. All construction activities on site were inaudible due to the heavy road/foot/rail traffic. Loud noise events were due to traffic pass bys and activities at nearby residential properties.
04/02/2023	**TL927-1-34F01 2023 WE32 Noise Monitoring Report (r2) – APPENDIX 4**					
57a Ewart Street, Dulwich Hill	Vacuum Truck, Telehandler and Delivery Truck 04.02.2023 12:05pm – 12:20pm	92 (H: Predicted LAeq, 15min for High impact activities)	67	84	No	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The predicted noise level also included multiple construction activities occurring concurrently, which included High impact activity (D/E/N) – Barrier, Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
67-69 Ewart Street, Dulwich Hill	Vacuum Truck, Telehandler and Delivery Truck 04.02.2023 12:25pm – 12:40pm	92 (H: Predicted LAeq, 15min for High impact activities)	70	80	No	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The predicted noise level also included multiple construction activities occurring concurrently, which included High impact activity (D/E/N) – Barrier, Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.

71 Ewart Street, Dulwich Hill	Vacuum Truck and Telehandler 04.02.2023 12:43pm – 12:58pm	95 (H: Predicted LAeq, 15min for High impact activities)	59	79	No	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The predicted noise level also included multiple construction activities occurring concurrently, which included High impact activity (D/E/N) – Barrier, Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
5 Railway Street, Hurlstone Park	Hand tools and Telehandler 04.02.2023 1:07pm – 1:22pm	83 (T: Predicted LAeq, 15min for Typical activities)	59	77	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 20m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
2 Hopetoun Street, Hurlstone Park	Hand tools, delivery truck and excavator with bucket attachment 04.02.2023 1:28pm – 1:43pm	83 (T: Predicted LAeq, 15min for Typical activities)	56	76	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 26m away. In the prediction model, the distance between the closest work area and the most affected facade is 15m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.

105 Duntroon Street, Hurlstone Park	Hand tools, delivery truck and excavator with bucket attachment 04.02.2023 1:46pm – 2:01pm	85 (T: Predicted LAeq, 15min for Typical activities)	67	81	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 9m away. In the prediction model, the distance between the closest work area and the most affected facade is 2m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
2 Wilfred Ave, Campsie	Hand tools, delivery truck and excavator with bucket attachment 04.02.2023 2:33pm – 2:48pm	69 (T: Predicted LAeq, 15min for Typical activities)	59	81	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 24m away. In the prediction model, the distance between the closest work area and the most affected facade is 10m. • It was noted that the measured works were intermittent.
3 Wilfred Ave, Campsie	Hand tools, delivery truck and excavator with bucket attachment 04.02.2023 2:48pm – 3:03pm	69 (T: Predicted LAeq, 15min for Typical activities)	56	76	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 25m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • It was noted that the measured works were intermittent.
13-15 Anglo Road, Campsie	Mobile crane and excavator with bucket attachment 04.02.2023 3:10pm – 3:25pm	79 (T: Predicted LAeq, 15min for Typical activities)	61	88	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver. • It was noted that the mobile crane was only idling during the measurement period

30 Redman Pde, Belmore	Hand tool works at site compound was not audible at this monitoring location. 04.02.2023 3:42pm – 3:57pm	67 (T: Predicted LAeq, 15min for Typical activities)	61	80	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • The closest work area to this monitoring location was 105m away (at Belmore Station site compound). • The hand tool works were not audible at this monitoring location.
26 Redman Pde, Belmore	Hand tool works at site compound was not audible at this monitoring location. 04.02.2023 4:00pm – 4:15pm	68 (T: Predicted LAeq, 15min for Typical activities)	59	89	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • The closest work area to this monitoring location was 80m away (at Belmore Station site compound). • The hand tool works were not audible at this monitoring location.
1b Acadia Street, Belmore	Powered Hand Tools 04.02.2023 4:25pm – 4:40pm	69 (T: Predicted LAeq, 15min for Typical activities)	49	78	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 26m away. In the prediction model, the distance between the closest work area and the most affected facade is 14m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
1/1 Cornelia Street, Wiley Park	Hand tools, mobile crane and excavator with bucket attachment 04.02.2023 5:02pm – 5:17pm	83 (T: Predicted LAeq, 15min for Typical activities)	57	68	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 35m away. In the prediction model, the distance between the closest work area and the most affected facade is 1m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.

2/1 Cornelia Street, Wiley Park	Mobile crane 04.02.2023 5:23pm – 5:38pm	83 (T: Predicted LAeq, 15min for Typical activities)	54	72	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 73m away. In the prediction model, the distance between the closest work area and the most affected facade is 1m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
2 Shadforth Street, Wiley Park	Hi-rail excavator with bucket attachment, Handtools, and EWP 04.02.2023 5:48pm – 6:03pm	82 (T: Predicted LAeq, 15min for Typical activities)	52	69	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 28m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
41 Urunga Pde, Punchbowl	Vacuum truck 04.02.2023 6:22pm – 6:37pm	60 (T: Predicted LAeq, 15min for Typical activities)	67	72	Yes	Measured $L_{Aeq, 15min}$ is above predicted noise level. Note that in the prediction model, the typical activity was assessed with a temporary noise screen installed. However, this was not observed during the noise measurement.
25 Urunga Pde, Punchbowl	No construction work was observed during the monitoring period. 04.02.2023 6:42pm – 6:57pm	N/A	59	84	N/A	No construction work was observed during the monitoring period.

Assessment Point	Measured Plant	Predicted noise level dB(A)	Measured noise level		Above predicted noise level	Comments
			$L_{Aeq(15min)}$	L_{Amax}		
08/02/2023	**TL927-1-35F01 2023 WK32 Noise Monitoring Report (r1) – APPENDIX 5**					
20 Redman Parade, Belmore	Power hand tools, Light tower 08.02.2023 11:16pm – 11:31pm	54 (T: Predicted LAeq, 15min for Typical activities)	49	68	No	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. Notably, the 100T mobile crane was not operating during this measurement period. • It was noted that the measured works were intermittent.
19 Redman Parade, Belmore	100T mobile crane, lighting tower 08.02.2023 11:43pm – 11:58pm	56 (T: Predicted LAeq, 15min for Typical activities)	50	65	No	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The 100T mobile crane did not operate continuously under high load. Crane operation was a mixture of idling, slewing, and lifting. • It was noted that the measured works were intermittent.
18 Redman Parade, Belmore	100T mobile crane, lighting tower 09.02.2023 12:00am – 12:15am	54 (T: Predicted LAeq, 15min for Typical activities)	51	69	No	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The 100T mobile crane did not operate continuously under high load. Crane operation was a mixture of idling, slewing, and lifting. • It was noted that the measured works were intermittent.
13-15 Anglo Road, Campsie	Truck crane, rattle gun 09.02.2023 12:53am – 1:08am	79 (H: Predicted LAeq, 15min for High impact activities)	58	77	No	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 75m away. In the prediction model, the distance between the closest work area and the most affected facade is 10m. • The truck crane was not operating under significant load during the measurement period. • The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver. • It was noted that the measured works were intermittent.

5-9 London Street, Campsie	Rattle gun, hand tools, truck crane 09.02.2023 1:15am – 1:30am	66 (T: Predicted LAeq, 15min for Typical activities)	53	70	No	The measured $L_{Aeq,\ 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 135m away. In the prediction model, the distance between the closest work area and the most affected facade is 40m. • The truck crane was not operating under significant load during the measurement period. • It was noted that the measured works were intermittent.
20/02/2023	**TL927-1-37F01 Campsie Station Noise Monitoring Report (r1) – APPENDIX 6**					
201 Beamish Street, Campsie	Angle grinder 20.02.2023 10:00pm – 10:15pm	45 (For predicted plant of Hand tools (no impact), EWP, small forklift, welding)	72	94	Yes	The contribution from the angle grinder works $L_{Aeq,\ 15min}$ is above the predicted noise level. This can be attributed to: • Louder equipment operated during the measurement compared to the modelled plant and equipment. The observations below were made during the measurement: • The noise environment was dominated by road/pedestrian/rail traffic. • Angle grinder works were only audible when there was no road traffic. • Angle grinder works were intermittent.
13-15 Anglo Road, Campsie	Angle grinder 20.02.2023 10:18pm – 10:33pm	45 (For predicted plant of Hand tools (no impact), EWP, small forklift, welding)	56	72	Yes	The contribution from the angle grinder works $L_{Aeq,\ 15min}$ is above the predicted noise level. This can be attributed to: • Louder equipment operated during the measurement compared to the modelled plant and equipment. The observations below were made during the measurement: • The noise environment was dominated by road /rail traffic. • Angle grinder works were only audible when there was no road traffic. • Angle grinder works were intermittent.
23/03/2023	**TL927-038F01 Belmore Station Noise Monitoring Report (r1) – APPENDIX 7**					
1 Acacia Street, Belmore	EWP & Handtools 23.03.2023 10:07pm – 10:22pm	45	44	N/A	No	The measured $L_{Aeq,\ 15min}$ is below the predicted noise level.
26 Redman Parade, Belmore	EWP & Handtools 23.03.2023 10:30pm – 10:45pm	45	52 (42)	N/A	No	The measured $L_{Aeq,\ 15min}$ is above the predicted noise level. However, the construction noise was inaudible at this monitoring location. Given that the construction noise was inaudible at this monitoring location, the contribution from the construction works can be assumed to be 10 dB below the measured $L_{Aeq,\ 15min}$. As a result, the contribution from the construction works can be calculated to be 42 dB(A), which is below the predicted noise level of 45 dB(A).

RESULTS – VIBRATION MONITORING

The sections below contain a summary of the vibration monitoring results. The complete reports are provided in Appendix 8. The established criteria for cosmetic damage in the Sydney Metro Construction Noise and Vibration Statement is as follows:

- Reinforced or framed structures: 25.0 mm/s;
- Unreinforced or light framed structures: 7.5 mm/s;
- Heritage structures (structurally sound): 7.5 mm/s; and
- Heritage structures (structurally unsound): 2.5 mm/s.

Also, in accordance with the Hurlstone Park Station Vibration Monitoring Plan developed in consultation with the Project consulting structural engineers (Appendix 14), the established vibration limits for the affected garage structure at a residential property on Commons Street are shown below:

- Greater than or equal to 4 mm/s (cosmetic damage is possible);
- Greater than or equal to 8 mm/s (cosmetic damage becoming more likely).

During the reporting period, vibration monitoring was undertaken at the following locations:

	Date	Location
1	16/02/2023 – 17/02/2023 & 17/04/2023	Garage structure at 3A Commons Street, Hurlstone Park

1 – 3A Commons Street, Hurlstone Park (16/02/2023 – 17/04/2023)

The results of the unattended vibration measurements for the neighbouring garage structure at 3A Commons Street, Hurlstone Park are presented below:

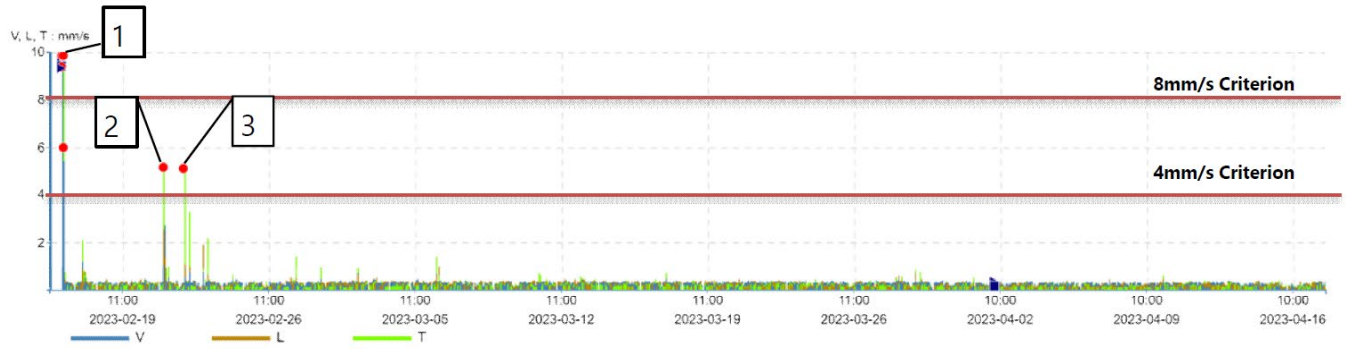

Figure 2 – Unattended vibration monitoring results for 3A Commons Street between 16/02/2023 – 17/04/2023

In accordance with the Hurlstone Park Station Vibration Monitoring Plan, the vibration levels produced from the vibration intensive works in the vicinity of the affected garage structure were below 4 mm/s as shown in Figure 2. Note that there were three events that resulted in an instantaneous vibration level of above 4 mm/s, however this event was not caused by the nearby construction activities, as justified in table below.

Exceedance ID	Date and Time	Cause of exceedance
1	16.02.2023 12:29pm	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	21.02.2023 07:12am	At this time, it was confirmed by the Project team no construction works were occurring near the monitor. An extraneous event such as a worker inadvertently bumping the monitor was likely the cause of the exceedance. Therefore, the exceedance was deemed not construction related.
3	22.02.2023 08:19am	At this time, it was confirmed by the Project team no construction works were occurring near the monitor. An extraneous event such as a worker inadvertently bumping the monitor was likely the cause of the exceedance. Therefore, the exceedance was deemed not construction related.

Discussion – Noise and Vibration Monitoring

The results of the noise measurements were typically below or consistent with the predicted noise levels for the works. There were four (4) instances where the results of the noise measurements were above the predicted noise levels. One measurement that exceeded the predicted noise level was related to extraneous road traffic noise rather than measured noise levels of construction activities conducted at Campsie Station. Second exceedance was related to having no temporary noise screen installed which was included in the model at Punchbowl Station. Third and fourth exceedances were related to louder equipment (angle grinder) operating during the measurement compared to the modelled plant and equipment at Campsie Station.

Noise monitoring results demonstrated that the provision of construction noise mitigation measures was appropriate.

The results of the unattended vibration measurements were typically below the established vibration screening criterion presented in the CNVS. There were three events that resulted in an instantaneous vibration level above screening criterion that were investigated and found to be unrelated construction activities. The results of the attended vibration measurements show that the measured vibration levels produced by the compacting works were below the established vibration screening criteria for cosmetic damage. Therefore, the risk of cosmetic damage was assessed as low.

It should also be noted that Downer conducts regular inspection of the environmental controls, including noise and vibration mitigation measures, across all work sites. These inspections are conducted by the Project Team and the Environmental Team. This proactive approach ensures that environmental controls are functioning properly rather than reactively inspecting the worksite following monitoring and reporting.

Appendix 1 – Surface Water Monitoring Report - 304100142_R012_SWM_WileyPark_Rev0

Surface Water Monitoring Report - Wiley Park Station

Syn-Construction Quarterly Dry-Weather Event (25 Nov 2022)

28 February 2023

Prepared for:

Downer EDI Works Pty Ltd

Prepared by:

Stantec Australia

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Prepared by _____
(signature)

Chong Zeng

Reviewed by _____
(signature)

Mike Jorgensen

Approved by _____
(signature)

Mike Jorgensen

Revision	Description	Author		Quality Check		Independent Review	
RevA	Draft	Chong Zeng	16/12/2022	Mike Jorgensen	16/12/2022	N/A	N/A
Rev0	Final	Chong Zeng	28/02/2023	Mike Jorgensen	28/02/2023	Clare Madigan	28/02/2023

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Abbreviations

MSB	Metro Services Building
SWMP	Soil and Water Management Plan
DO	Dissolved oxygen
EC	Electrical conductivity
pH	Potential of hydrogen
ORP	Oxidation-reduction potential
NATA	National Association of Testing Authorities, Australia
QA/QC	Quality assurance/quality control
TSS	Total Suspended Solids
CoA	Conditions of Approval
DQO	Data Quality Objective
DQIs	Data Quality Indicators
RPD	Relative Percentage Difference
LORs	limits of reporting
CoC	Chain-of-Custody

Glossary

NTU	Nephelometric Turbidity Units
µS/cm	MicroSiemens per Centimeter
µg/L	Microgram per Liter

1.0 INTRODUCTION

1.1 BACKGROUND

Stantec Australia Pty Ltd ("Stantec" – former Cardno) was commissioned by Downer EDI Works Pty Ltd ("Downer EDI") to undertake monitoring and reporting of surface water quality of the unnamed channel near the Wiley Park Station Upgrade worksite. The proposed upgrade includes the upgrade of the main station and installation of the Metro Services Building (MSB).

Surface water quality of the channel near the Wiley Park Upgrade Site is to be monitored as per the requirements summarised in the **Table 1-2**, which is excerpted from the Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Soil and Water Management Plan (SWMP). The monitoring program was prepared to meet the requirements outlined in The Sydney Metro City and Southwest – Sydenham to Bankstown Upgrade Conditions of Approval SSi-8256, specifically Condition 8 to Condition 10. The sampling locations (WP1 – Upstream and WP2 – Downstream) of the water quality monitoring are shown on **Figure GS004** in **Appendix A**. In order to establish a more robust dataset of how the downstream discharge from the worksite affects the water quality, Downer EDI requested two additional sampling locations at the downstream discharge points (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) of the water quality monitoring since May 2022. This additional sampling at the downstream discharge points is subject to the flow contribution at the time of each monitoring event. Refer to **Figure GS004** in **Appendix A** for approximate locations of the sampling locations.

The closest Project worksite to an existing watercourse is the Wiley Park Station services building, which is located approximately 100 m from an unnamed concrete-lined channel, which forms the upper reaches of Coxs Creek and is identified as a first-order stream.

For the purpose of establishing baseline water quality data within the first-order stream at Wiley Park, water quality monitoring was intended to be undertaken for a period prior to construction of the Wiley Park services building as outlined in the Table 13 of the SWMP. At a minimum, one dry-weather sample and one wet weather sample (weather permitting) were intended to be collected during the pre-construction period. The frequency of pre-construction water quality monitoring within this channel was subject to water being present within the structure. However, during the baseline monitoring period no wet-weather event was able to be captured prior to commencement of construction. A dry-weather baseline monitoring event was undertaken on 10 March 2021.

This report presents the findings from the fourteenth surface water monitoring event, which was undertaken by Stantec on 25 November 2022. The event undertaken was a syn-construction quarterly dry-weather event. **Table 1-1** below summarised the surface water monitoring events undertaken to date by Stantec.

Table 1-1 Summary of Surface Water Monitoring Event Undertaken to Date

Date of Monitoring	Type of Event	Report Reference
10 March 2021	Pre-construction Dry Baseline	4NE30187_R001_SWM_WileyPark_Rev0
20 March 2021	Construction Wet Weather	4NE30187_R001_SWM_WileyPark_Rev0
5 May 2021	Construction Wet Weather	4NE30187_R002_SWM_WileyPark_Rev0
1 July 2021	Construction Dry Weather	NE30161_R003_SWM_WileyPark_Rev0
30 September 2021	Construction Dry Weather	NE30161_R004_SWM_WileyPark_Rev0
12 November 2021	Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
26 November 2021	Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
9 and 10 February 2022	Construction Dry Weather	NE30161_R006_SWM_WileyPark_Rev0
23 February 2022	Construction Wet Weather	NE30161_R007_SWM_WileyPark_Rev0
9 March 2022	Construction Wet Weather	NE30161_R008_SWM_WileyPark_Rev0
24 May 2022	Construction Wet Weather	NE30161_R009_SWM_WileyPark_Rev0
4 and 21 July 2022	Construction Wet Weather	NE30161_R010_SWM_WileyPark_Rev0
25 August 2022	Construction Dry Weather	NE30161_R011_SWM_WileyPark_Rev0
25 November 2022	Construction Dry Weather	NE30161_R012_SWM_WileyPark_Rev0

1.2 PURPOSE AND OBJECTIVE

The purpose of the surface water monitoring works is to monitor and record surface water quality within the unnamed channel in accordance with the monitoring program as outlined in the Site's SWMP. The objective of the works is to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel. The evaluation entailed comparing water quality of samples collected upstream of the worksite discharge points with water quality downstream of the discharge points.

1.3 SCOPE OF WORKS

Stantec undertook the following tasks during the surface water monitoring event:

- Inspected and sampled the two nominated surface water sampling locations (WP1 – Upstream and WP2 – Downstream) on 25 November 2022 as a syn-construction quarterly dry-weather monitoring event.
- Inspected two additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) and sampled on additional nominated downstream discharge points location (WP2-DP1) on 25 November 2022 as part of syn-construction quarterly dry-weather monitoring event. No sampling work was undertaken at the downstream discharge point – WP2-DP2 due to dry condition.
- Recorded field parameters (measured using a calibrated water quality meter) and noted observations of the water bodies during sampling. Field parameters measured included:
  - Dissolved oxygen (DO).
  - Electrical conductivity (EC).
  - Potential of hydrogen (pH).

  - Oxidation-reduction potential (ORP).
  - Temperature.
- Collected three primary surface water samples from WP1, WP2 and WP2-DP1, one intra-lab duplicate sample and one inter-lab duplicate sample per sampling event for submission to a laboratory accredited by the National Association of Testing Authorities, Australia (NATA) for the requested analytical testing of primary and additional quality assurance/quality control (QA/QC) samples. Samples were submitted for analysis of:
  - Oil & Grease.
  - Total Suspended Solids (TSS).
  - Nutrients (Total Phosphorous, Total Nitrogen).
  - Turbidity.
  - Chlorophyll-a.
- Reviewed the analytical and field data and prepared this report.

Details of the monitoring program are shown below in the **Table 1-2**, which is excerpted from the Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades SWMP.

Table 1-2 Wiley Park Water Quality Monitoring Program

Wiley Park Water Quality Monitoring Program	
Waterway	Sydney Water Cooks River Channel (first-order stream)
Indicative inspection and / or monitoring points	WP1 – upstream
	WP2 – downstream
	WP2-DP1- downstream eastern discharge point
	WP2-DP2 – downstream western discharge point
Interaction with project works	Channel near the Wiley Park service building site
Pre-construction works	Monthly for parameters detailed in Table 11 of the site's SWMP (including at least one dry-weather round of sampling). One wet-weather event, if possible, for the parameters detailed in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.
During construction of the Wiley Park services building	Quarterly for parameters detailed in Table 11 of the site's SWMP (including during dry weather). Four wet-weather events per year for the parameters in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.

2.0 GUIDELINES AND LEGISLATION

There are a range of Guidelines and Legislation and Conditions of Approval (CoA) that are applicable to the surface water monitoring program that are summarised below.

The CoA applicable to this job include:

- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018.

The State and Federal legislation and policy and guidelines that apply to the program include:

- Environmental Planning and Assessment Act 1979 (EP&A Act).
- Contaminated Land Management Act 1997.
- Protection of the Environment Operations Act 1997 (POEO Act).
- Water Management Act 2000 Water Management (General) Regulation 2018.

Additional guidelines and standards to the management of soil and water include:

- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book').
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book').
- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines').
- ANZECC (2018). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines').
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').

3.0 MONITORING AND INSPECTION LOCATIONS

Details of the inspection and / or monitoring locations are provided in **Table 3-1**. The locations are provided in **Appendix A**. Representative photographs are presented in **Appendix B**.

Table 3-1 Surface Water Monitoring Location Details

Sample Location	Latitude	Longitude	Description
WP1 (up-stream)	-33.924014	151.065315	Immediately south of the Boulevarde and east of 118 the Boulevarde.
WP2 (down-stream)	-33.923339	151.064970	Immediately north of the Urunga Parade and west of 4 Urunga Parade.
WP2-DP1 (downstream eastern discharge point)	-33.923543	151.065058	Immediately south of the Urunga Parade, east side of the channel, approximately 20 m south of WP2.
WP2-DP2 (downstream western discharge point)	-33.923529	151.065048	Immediately south of the Urunga Parade, west side of the channel, approximately 20 m south / upstream of WP2.

4.0 QUALITY MANAGEMENT

The Data Quality Objective (DQO) process is used to establish a systematic planning approach to setting the type, quantity and quality of data required for making decisions based on the environmental condition of the project area. The DQO process involves the seven steps detailed in **Table 4-1**.

Table 4-1 Data Quality Objectives

DQO	Description
Step 1 State the Problem	Construction work may adversely impact the local surface water quality within the unnamed channel near the site.
Step 2 Identify the Decisions	Are there any impacts to surface water quality from construction activities at the site?
Step 3 Identify Inputs to the Decision	The primary inputs to the decisions described above are: • Assessment of surface water quality of the unnamed channel within proximity to Wiley Park service building site per the requirements outlined in the site's SWMP, with samples collected from two locations (upstream and downstream of the site); • Laboratory analysis of surface water samples for relevant parameters; • Assessment of the suitability of the analytical data obtained, against the Data Quality Indicators (DQIs); • Assessment of the analytical results against applicable guideline criteria; and • Aesthetic observations of surface water bodies, including odours, sheen and condition, if encountered.
Step 4 Define the Study Boundaries	The lateral extent of the study area is the channel near the Wiley Park service building site. The temporal boundaries of the study comprises the duration of the monitoring program, including pre-construction monitoring, construction phase, and post-construction monitoring as required.
Step 5 Develop a Decision Rule	The decision rules for the water quality monitoring sampling events included: • Were primary and QA/QC samples analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses? • Did the field and laboratory QA/QC results indicate that the data set was reliable and representative of the water quality with Relative Percentage Difference (RPD) values of 30% or less? • Were the laboratory limits of reporting (LORs) below the applicable guideline criteria for the analysed parameters? • Were guideline criteria sourced from endorsed guidelines? • Were surface water aesthetic characteristics evaluated including odours and sheen? • Were the monitoring results obtained from the downstream sample collected during construction phase greater than the upstream sample collected during the same monitoring event? If so, then the adverse impact to the quality of water in the unnamed channel is considered to have potentially occurred.
Step 6 Specify Limits on Decision Error	In accordance with the relevant guidelines as endorsed under the Contaminated Land Management Act 1997. Specific limits for this project are in accordance with the appropriate guidance made or endorsed by state and national regulations, appropriate indicators of data quality, and standard procedures for field sampling and handling. This step also examines the certainty of conclusive statements based on the available new Site data collected. This should include the following points to quantify tolerable limits:

DQO	Description
	• A decision can be made based on a certainty assumption of 95% confidence in any given data set (excluding asbestos). A limit on the decision error will be 5% that a conclusive statement may be a false positive or false negative. A decision error in the context of the decision rule presented above would lead to either underestimation or overestimation of the risk level associated with a particular sampling area. Decision errors may include: • Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the Site. To address this, minimum numbers of samples are proposed to be collected from each media. As such, there may be limitations in the data if aspects of the sampling plan cannot be implemented. Some examples of this scenario include but not limited to: – Proposed samples are not collected due to lack of water flow or access being restricted to a given location. • Limitations in ability to acquire useful and representative information from the data collected. The data are proposed to be collected from multiple locations and sample media. • Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed: – Field staff to follow a standard procedure when undertaking samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, collection of representative samples and use of appropriate sample containers and preservation methods. – Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis. – Laboratories to report quality assurance/ quality control data for comparison with the DQIs established for the project
Step 7 Optimise the Design for Obtaining Data	To achieve the DQOs and DQIs, the following sampling procedures were implemented to optimise the design for obtaining data: • Surface water samples was collected from upstream and downstream sampling locations, as available due to access and water level; • Surface water samples was collected from two (2) discharge points between upstream and downstream, as available due to access and water level; • Surface water parameters were selected based on project monitoring requirements provided to Stantec; • Samples were collected by suitably qualified and experienced environmental scientists; • Samples were collected and preserved in accordance with relevant standards/guidelines; and • Field and laboratory QA/QC procedures were adopted and reviewed to indicate the reliability of the results obtained.

4.1 DATA QUALITY INDICATORS

The following DQIs have been adopted for the project. The DQIs outlined in **Table 4-2** assist with decisions regarding the usefulness of the data obtained, including the quality of the laboratory data.

Table 4-2 Summary of Data Quality Indicators

Data Quality Indicator	Frequency	Data Acceptance Criteria
Completeness		
Field documentation correct	All samples	The work was documented in accordance with Stantec SOPs
Suitably qualified and experience sampler	All samples	Person deemed competent by Stantec collecting and logging samples

Data Quality Indicator	Frequency	Data Acceptance Criteria
Appropriate lab methods and limits of reporting (LORs)	All samples	Samples were analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses.
Chain of custodies (COCs) completed appropriately	All samples	The work was documented in accordance with Stantec SOPs
Sample holding times complied with	All samples	The samples were extracted and analysed within holding times specified by the project NATA-accredited laboratory
Proposed/critical locations sampled	-	Proposed/critical locations sampled
Comparability		
Consistent standard operating procedures for collection of each sample. Samples should be collected, preserved and handled in a consistent manner	All samples	All works undertaken in accordance with Stantec SOPs
Experienced sampler	All samples	Person deemed competent by Stantec collecting and logging samples
Climatic conditions (temp, rain etc) recorded and influence on samples quantified (if required)	All samples	Climatic conditions documented in field sheets
Consistent analytical methods, laboratories and units	All samples	Sample analysis to be in accordance with NATA-approved methods
Representativeness		
Sampling appropriate for media and analytes (appropriate collection, handling and storage)	All samples	Sample analysis to be in accordance with NATA-approved methods
Samples homogenous	All samples	All works undertaken in accordance with Stantec SOPs
Detection of laboratory artefacts, e.g. contamination blanks	-	Laboratory artefacts assessed and impact on results determined
Samples extracted and analysed within holding times	All samples	The samples were extracted and analysed within holding times specified by the laboratory
Precision		
Blind duplicates (intra-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD result less than 10 × LOR
Split duplicates (inter-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No Limit RPD result less than 10 × LOR
Laboratory duplicates	1 per 20 samples	Results greater than 10 x LOR:less than or equal to 30% RPD Results less than 10 x LOR: No limit on RPD
Accuracy (Bias)		
Surrogate spikes	All organic samples	50-150%
Matrix spikes	1 per 20 samples	70-130%
Laboratory control samples	1 per 20 samples	70-130%

Data Quality Indicator	Frequency	Data Acceptance Criteria
Method blanks	1 per 20 samples	Less than LOR

The DQOs and DQIs for the project were met during the monitoring events. Discussion of the Quality Control / Quality Assurance assessment is provided in **Appendix E**.

5.0 FIELD INVESTIGATION

The scope and method of the surface water monitoring is summarised in **Table 5-1**.

Table 5-1 Investigation Activity Summary

Activity	Details
Dates of Fieldwork	25 November 2022
Surface Water Inspection and Monitoring	All four nominated locations outlined in **Section 3.0** were inspected during the course of the field work undertaken on 25 November 2022 with three nominated locations monitored including WP1 – upstream, WP2 – downstream, WP2-DP1 – downstream eastern discharge point. No monitoring was undertaken at WP2-DP2 (downstream western discharge point) due to the dry condition at WP2-DP2 at the time of fieldwork undertaken. Stantec undertook the inspection and/or monitoring per the following procedures: Surface water body inspection - The general site condition was inspected prior to commencement of field works for signs of any site activities that may have altered the surface water contamination status or require modifications to the field or laboratory works program. Each nominated location was inspected for indicators of contamination and the presence as well as the flow of surface water. This information is recorded on the field sheets presented in **Appendix C**. Surface water sampling – Subject to the flow contribution at each nominated location during the field work undertaken, field parameters and visual/olfactory observations were recorded prior to sampling at each nominated location. Physico-chemical parameters including pH, electrical conductivity (EC), dissolved oxygen (DO), reduction-oxidation potential (redox), and temperature were measured using a calibrated water quality meter. Surface water samples were collected either directly into the sampling bottle or directly from the telescopic scoop. Once field parameters were recorded, the surface water samples were transferred to appropriately preserved sample containers provided by the laboratories. Field observations, and parameters are presented in **Appendix C**. Surface water samples were placed into an Esky containing ice and maintained at or below 4°C whilst onsite and in transit to the NATA-accredited laboratories for the targeted analyses.
Surface Water Analysis	Surface water samples from the monitoring event were submitted under standard chain-of-custody (CoC) procedures to NATA-accredited Eurofins Environment Testing Australia analysis of the parameters as follows: • Oil & Grease; • Total Suspended Solids (TSS); • Nutrients (Total Phosphorous, Total Nitrogen); • Turbidity; and • Chlorophyll-a. Tabulated laboratory results are presented in Appendix D. The Data QA /QC program and data quality review including calibration certificates is presented in Appendix E. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and CoC documentation are included in Appendix F.
Decontamination	In the event of reusable sampling or monitoring equipment (telescopic scoop, water quality meter) was used decontamination was undertaken. Decontaminated between locations using a standard bucket wash. Equipment was washed in phosphate-free detergent (Liquinox) and rinsed in laboratory supplied rinsate water.

6.0 SURFACE WATER ASSESSMENT CRITERIA

The assessment criteria for surface water analytical and field data were adopted from Table 11 of the site's SWMP. The criteria for selected parameters are provided in **Table 6-1** below. ANZECC guideline criteria are included in the table for reference.

Table 6-1 Water Quality Monitoring Parameters and Adopted Criteria at Wiley Park

Parameter	ANZECC Criteria – Freshwater[1]	Proposed Trigger Values	Proposed Actions
Temperature (°C)	>80% ile; <20% ile	Downstream results are greater than upstream results in rainfall events up to and including the significant event threshold of greater than 20 mm in 24 hours. Downstream results are greater than upstream results during dry-weather sampling.	Environment Manager (or delegate) to re-test to confirm results and undertake an inspection of the adjacent works and propose actions where required.
Dissolved Oxygen (DO)	Lower limit – 85% Upper limit -110%		
Turbidity (NTU)	6-50 NTU		
Oil and grease	-		
pH	Lower limit – 6.5 Upper limit – 8.5		
Salinity (as EC)	125 – 2200 µS/cm		
Total Suspended Solids (TSS)	-		
Total Phosphorus as P	25 µg/L		
Total Nitrogen as N	350 µg/L		
Chlorophyll-a	3 µg/L		

Note to Table

1 ANZECC guideline criteria are included for reference. It is noted that for dry weather events baseline testing comparison will indicate whether this existing water quality within the channel meet ANZECC guidelines, prior to construction of the services building. For wet weather events where no baseline data is available a direct comparison to upstream and downstream results is undertaken. Sydney Metro's Principal Contractor will comply with Section 120 of the Protection of the Environment Operations Act 1997.

7.0 SUMMARY OF RESULTS

7.1 SUMMARY OF FIELD OBSERVATIONS

All four nominated monitoring locations were inspected (WP1, WP2, WP2-DP1 and WP2-DP2) on 25 November 2022. Three surface water sampling locations (WP1, WP2 and WP2-DP1) were able to be monitored and sampled whereas the WP2-DP2 sampling location was not able to be monitored and sampled due to the dry condition during the time of fieldwork undertaken on 25 November 2022. Photos of each nominated location are included in **Appendix B**. The following observations were made:

7.1.1 Syn-Construction Quarterly Dry-Weather Event – 25 November 2022

- The sampling event was undertaken on 25 November 2022 during a dry-weather event with 0 mm precipitation over the last 24 hours prior to the field sampling (rainfall data was obtained from the closest Bureau of Meteorology weather station, i.e. Canterbury Racecourse AWS – BOM Station ID: 066194). Refer to **Appendix C** for a copy of the weather recordings obtained from the Bureau of Meteorology website (http://www.bom.gov.au/);
- Observation of water body:
  - WP 1 (upstream of work area) contained low flowing clear water with low turbidity. No visible oil sheen observed from the water surface. The estimated depth of the water body was 0.05 m.
  - WP 2 (downstream of work area) contained low flowing clear water with low turbidity. No visible oil sheen observed from the water surface. The estimated depth of the water body was 0.05 m.
  - WP2-DP1 (downstream eastern discharge point) contained very low flowing clear water with low turbidity. The estimated depth of the water body was 0.005 m. The estimated flow contribution from WP2-DP1 into the main water channel is 5%.
  - WP2-DP2 (downstream western discharge point) was dry. No contribution to the water body was observed during the time of sampling.
- Additional observation:
  - One discharge point (WP1-DP1) was observed immediately downstream / north of WP1. No flow contribution was observed at the time of sampling. Refer to **Appendix A** for approximate location of WP1-DP1. Refer to **Appendix B** for a detailed photo.

7.2 FIELD PARAMETERS

The parameters from each location sampled are presented in **Table 7-1**.

Table 7-1 Laboratory Physico-chemical Parameters and Field Observations – 25 November 2022

Location ID / Field Perimeter	WP1 (upstream)	WP2 (downstream)	WP2-DP1 (downstream eastern discharge point)
Water Depth (m)	0.05	0.05	0.005
Estimated Flow Rate	low	low	very low

Location ID / Field Perimeter	WP1 (upstream)	WP2 (downstream)	WP2-DP1 (downstream eastern discharge point)
Temperature (oC)	26.7	24.9	28.6
pH	8.14	8.41	9.19
Electrical Conductivity (µS/cm)	941	874	659
Dissolved Oxygen (mg/L)	6.55	6.44	6.40
Dissolved Oxygen (%)	78.8	78.4	78.6
Oxidation-Reduction Potential (mV)	157.6	167.5	113.2
SHE[1] Redox Potential (mV)	361.0[2]	372.5	315.0
Condition	Clear Low turbidity	Clear Low turbidity	Clear Low turbidity

Note to Table

1 SHE – Standard Hydrogen Electrode

2 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP).

7.3 SURFACE WATER ANALYTICAL RESULTS

Laboratory analytical results for the surface water samples collected are presented in **Appendix D**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Appendix F**.

7.3.1 Syn-construction Dry-Weather Event – 25 November 2022

The analytical results of the monitoring event indicate that:

- Concentrations of Chlorophyll-a were reported below adopted assessment criteria at all sample locations;
- Concentrations of Oil and Grease were reported:
  - WP1: <10 mg/L.
  - WP2: 11 mg/L.
  - WP2-DP1: <10 mg/L.
- Concentrations of nutrients (total nitrogen and the total phosphorous) were reported:
  - Total nitrogen:
    - WP1: 0.9 mg/L.
    - WP2: 1.1 mg/L.
    - WP2-DP1: 1.5 mg/L.
  - Total phosphorous:
    - WP1: 0.14 mg/L.
    - WP2: 0.14 mg/L.
    - WP2-DP1: 0.09 mg/L.

- TSS were reported below the laboratory detection limit (<5 mg/L).
- Turbidity was reported:
  - WP1: 1.3 NTU.
  - WP2: 1.4 NTU.
  - WP2-DP1: 2.2 NTU.

7.3.2 Baseline Results Comparison

One sampling event during the pre-construction period (baseline event) was undertaken on 10 March 2021. This event has been used for comparison of syn-construction monitoring events under similar conditions (i.e. not triggering the wet-weather event criteria). It should be noted that the baseline water quality monitoring represents a single sampling event and may not be representative of the range of water quality within the channel prior to construction starting.

The parameters from each location sampled are presented in **Table 7-2** compared with the baseline pre-construction event undertaken on 10 March 2021. Overall, conditions are similar in the pre-construction results and the syn-construction sampling event on 25 November 2022. These baseline conditions have been taken into account in the interpretation below. It is noted that due to the scope of work assigned to Stantec by the time of baseline monitoring event, no sampling or monitoring work was undertaken at the downstream discharging points (WP2-DP1 and WP2-DP2) for comparison.

Table 7-2 Comparison of current sampling results to baseline results.

Location ID	Assessment Criteria	WP1 (upstream) Baseline Results 10 March 2021	WP1 (upstream) 25 November 2022	WP2 (downstream) Baseline Results 10 March 2021	WP2 (downstream) 25 November 2022
Temperature (oC)	N/A	21.3	26.7	21.1	24.9
pH	6.5 - 8.5	7.90	8.14	7.61	8.41
Electrical Conductivity (µS/cm)	>125 – 2,200	543	941	363	874
Dissolved Oxygen (%)	85% - 110%	63	78.8	45.9	78.4
Oxidation-Reduction Potential (mV)	N/A	140.7	157.6	181.0	167.5
SHE[1] Redox Potential (mV)	N/A	348.13[2]	361.03[2]	388.43[2]	372.53[2]
Chlorophyll a (µg/L)	>3	<5	<2	<5	<2
Oil and Grease (mg/L)	Comparison	<10	<10	29	11
Nitrogen (Total) (mg/L)	>0.35	2.5	0.9	1.68	1.1
Phosphorus (mg/L)	>0.025	0.34	0.14	0.12	0.14
TSS (mg/L)	N/A	<1	<5	<1	<5
Turbidity (NTU)	>6 - 50	2.9	1.3	<1	1.4

Note to Table

1 SHE – Standard Hydrogen Electrode

2 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP).

Highlighted cell with the bold font indicates exceedance of the adopted assessment criteria.

7.4 RESULTS DISCUSSION

7.4.1 Comparison to ANZG 2018 / ANZECC 2000 Criteria

Results for the syn-construction dry-weather event sampled on 25 November 2022 generally showed monitored parameters were within the adopted threshold criteria, with the exception of dissolved oxygen, total nitrogen, total phosphorous, and pH:

- Dissolved oxygen saturation measured at all three locations (WP1, WP2 and WP2-DP1) were outside the adopted criteria range. This is not considered to be a significant issue based on the comparison outlined in **Section 7.3.2** indicating the dissolved oxygen saturation measured from this syn-construction dry-weather event are closer to the adopted thresholds than the pre-construction event.
- Total nitrogen measured at all three locations (WP1, WP2 and WP2-DP1) were above the adopted criterion range with the analytical results of 0.9 mg/L, 1.1 mg/L and 1.5 mg/L for WP1, WP2, and WP2-DP1 respectively. Overall, this is not considered to be a significant issue based on the comparison outlined in **Section 7.3.2** indicating the total nitrogen measured from this syn-construction dry-weather event are closer to the adopted thresholds than the pre-construction event.
- Phosphorous measured at all three locations (WP1, WP2 and WP2-DP1) were above the adopted criteria with analytical results of 0.14 mg/L, 0.14 mg/L, and 0.09 mg/L for WP1, WP2, and WP2-DP1 respectively. Overall, this is not considered to be a significant issue based on the comparison outlined in **Section 7.3.2** indicating the phosphorous measured from this syn-construction dry-weather event were similar to the pre-construction event.
- pH measured at WP1 and WP2 were within the adopted criterion range, whereas pH measured at WP2-DP1 (9.19) was above the adopted criterion range (i.e. 6.5 – 8.5).

7.4.2 Comparison of Upstream and Downstream Results

Results between upstream and downstream samples collected during the syn-construction dry-weather event were comparable, with the exception of:

- Chlorophyll-a result for the downstream eastern discharge point sample location (WP2-DP1: 0.0023 mg/L) was slightly higher than the upstream sample location (WP1: <0.002 mg/L). However, it is not considered this is a significant issue based on:
  - Chlorophyll-a result for the downstream sample location WP2 was below the detection limit (WP2: <0.002 mg/L).
  - Chlorophyll-a result for the downstream eastern discharge point sample location (WP2-DP1) was within the ANZG 2018 / ANZECC 2000 Criteria (i.e., <0.003 mg/L).
- Oil and Grease results reported for the downstream sample location (WP2: 11 mg/L) was slightly higher than the upstream sample location (WP1: <10 mg/L). However, it is not considered this is a significant issue and this is not considered likely to be a result of the construction activities undertaken based on:
  - Oil and Grease concentration reported for the downstream sample (WP2: 29 mg/L) collected during pre-construction baseline monitoring event undertaken on 10 March 2021.

  - No visible oil sheen observed from the downstream monitoring location (WP2). Refer to **Appendix B** for photos of the surface water condition at the downstream monitoring location.
- Total nitrogen result at the downstream eastern discharge point (WP2-DP1: 1.5 mg/L) and downstream sample location (WP2: 1.1 mg/L) were slightly higher than the upstream sampling point (WP1: 0.9 mg/L). However, it is not considered this is a significant issue and this is not considered likely to be a result of the construction activities undertaken because:
  - It is known that there is an off-site flow contribution to the eastern downstream discharge point (WP2-DP1) from the urban run-off drainage system at Shadforth Street. It is known that high level of total nitrogen (i.e. an order of magnitude higher than the WP2-DP1 results) was previously identified from this off-site flow contribution. This off-site source with elevated nitrogen concentration was documented in the following report:
    - Cardno now Stantec (2022a) *Source Investigation for Algal Growth Observed within the V-Drain near Shadforth Street*. Date: 2 September 2022. Revision: RevA. Report reference: 304100142_TM01_V-Drain Algal Growth_RevA.
- Turbidity result at the downstream eastern discharge point (WP2-DP1: 2.2 NTU) and downstream sample location (WP2: 1.4 NTU) were slightly higher than the upstream sampling point (WP1: 1.3 NTU). However, it is not considered this is a significant issue based on:
  - Turbidity results for all three sampling locations (WP1, WP2, WP2-DP1) measured were within the ANZG 2018 / ANZECC 2000 Criteria.
- The pH results at downstream eastern discharge point sample (WP2-DP1: 9.19) and downstream sample point (WP2: 8.41) were higher than the results measured at the upstream sample location (WP1: 8.14). As such, flow from the downstream eastern discharge point (WP2-DP1) was highly likely to contribute to the higher pH measured in the downstream water body. Additional investigation works to identify the potential source(s) of this elevated pH measured to the upstream area of WP2-DP1 were undertaken and documented in the following reports:
  - Cardno now Stantec (2022b) *Surface Water Monitoring Report – Wiley Park Station*. Date: 15 September 2022. Revision: Rev0. Report reference: 304100142_R010_SWM_WileyPark_Rev0.
  - Cardno now Stantec (2022c) *Additional pH Source Investigation within the Platform 1 Drainage System at Wiley Park Station*. Date: 9 November 2022. Revision: Rev0. Report reference: 304100142_TM02_Add_pH_Inv_P1_Rev0.

Two potential sources identified in these reports were based on the additional investigation works undertaken:

- Stabilising sand / cement mix backfill surrounding On-Site Detention Tank (OSD): As noted by Downer EDI, stabilising sand with cement as per the Metro T2M design was used as backfill materials around the OSD, which is considered likely to be a source of this elevated pH identified within the surface water in the soil trenches which forms part of the upstream flow contribution of WP2-DP1.
- Alkaline soil / sediment within the Platform 1 drainage system: The alkaline soil / sediment identified within the Platform 1 drainage system considered likely to be the main source of the elevated pH measured from the surface water collected within the Platform 1 drainage system which forms part of the upstream flow contribution of WP2-DP1.

8.0 CONCLUSION

Stantec was engaged to undertake surface water monitoring of the unnamed channel west of Wiley Park Station in accordance with the SWMP for the project. The objective of the works was to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel that receives in part stormwater from the construction area.

This report presents monitoring data of a syn-construction dry-weather event on 25 November 2022. Based on the investigation results obtained, following conclusions are made:

- ANZG 2018 / ANZECC 2000 comparison and assessment: during this syn-construction dry-weather monitoring event, monitored parameters were either within the adopted ANZG 2018 / ANZECC 2000 screening criteria or considered insignificant for the exceedances (total nitrogen, total phosphorous and dissolved oxygen saturation) based on the comparison with the pre-construction baseline monitoring results. However, pH measured at the downstream eastern discharge point WP2-DP1 (9.19) was outside the assessment criteria range of 6.5 to 8.5.
- Upstream and downstream comparison and assessment: during this syn-construction dry-weather monitoring event, the results of downstream sample point WP2, downstream discharge point (WP2-DP1) and upstream sample point WP1 were either comparable or considered insignificant / unlikely a result from the construction activities within Wiley Park worksite for the increases at downstream sample point / downstream discharge points (Chlorophyll-a, oil and grease, total nitrogen and turbidity) based on the review of site plan, comparison with the pre-construction baseline monitoring results, and adopted ANZG 2018 / ANZECC 2000 criteria. However, the elevated pH measured at the downstream eastern discharge point WP2-DP1 was considered a result of the construction activities within Wiley Park worksite based on the findings outlined in Cardno now Stantec (2022b and 2022c).

8.1 RECOMMENDATIONS

Based on the findings outlined in Cardno now Stantec (2022b and 2022c), recommendations regarding the elevated pH identified at WP1-DP2 and the two upstream flow contributions (platform 1 drainage system and temporary surface water erosion and sediment control trenches) are made as follows:

- Temporary surface water erosion and sediment control trenches: prior to rainfall events, it is recommended that installation of a impermeable physical barrier (e.g. black plastic sheeting) within the drainage trench path surrounding the construction footprint of the OSD tank. This would prevent surface water from coming into direct contact with the stabilised sand / cement mixture used to backfill the area.
- Platform 1 drainage system:
  - Removal of soil / sediment materials from the Platform 1 drainage system: the identified alkaline soil / sediment should be removed from the Platform 1 drainage system after construction has been completed within the Platform 1 in general accordance with the following steps:
    - Excavation of any excessive soil / sediment materials from the Platform 1 drainage system including aco drain and connecting underground drainage pipe to the extent practicable.

  - Flushing of the soil / sediment materials that remain within the Platform 1 drainage system including aco drain and connecting underground drainage pipe following the excavation work outlined in the previous bullet point.
  - Following the flushing work, the two drainage pits located near the downstream end of aco drain should be checked and any soil / sediment materials should be removed by excavation.
- Validation test: following the removal and cleaning work of the Platform 1 drainage system, a validation test is recommended to check the effectiveness of the mitigation works undertaken by applying tap water at the start / upstream of the Platform 1 drainage system and measuring pH using a calibrated water quality meter at multiple downstream locations along the aco drain and associated drainage system.

9.0 REFERENCES

- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines').
- ANZECC (2000). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines').
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').
- Contaminated Land Management Act 1997.
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book').
- Environmental Planning and Assessment Act 1979 (EP&A Act).
- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book').
- Protection of the Environment Operations Act 1997 (POEO Act).
- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades – Soil and Water Management Plan, dated 16th February 2021.
- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018.
- Water Management Act 2000 Water Management (General) Regulation 2018.

10.0 LIMITATIONS

This assessment has been undertaken in general accordance with the current industry standards for a surface water monitoring report for the purpose and objectives and scope identified in this report. The agreed scope of this assessment has been limited for the current purposes of the Client. The assessment may not identify contamination occurring in all areas of the site, or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained. This Document has been provided by Stantec subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Stantec's proposal and Section 1 of this report and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of Stantec's services are as described in Stantec's proposal, and are subject to restrictions and limitations. Stantec did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Stantec in regards to it.
- Conditions may exist which were undetectable given the limited nature of the enquiry Stantec was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Stantec's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Stantec to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.
- Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Stantec for incomplete or inaccurate data supplied by others.
- Stantec may have retained sub consultants affiliated with Stantec to provide services for the benefit of Stantec. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Stantec's affiliated companies, and their employees, officers and directors.

This assessment report is not any of the following:

- A Site Audit Report or Site Audit Statement (SAR/SAS) as defined under the Contaminated Land Management Act, 1997 or an assessment sufficient for an Environmental Auditor to be able to conclude a SAR/SAS.
- A geotechnical report and the bore logs/test pit logs may not be sufficient for geotechnical advice.
- An assessment of surface water contaminants potentially arising from other sites or sources nearby.
- A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land

Appendix A FIGURES

Downer
Relationships creating success

Surface Water Monitoring

WILEY PARK STATION

Legend

- Monitoring Location
- Discharging Points
- Watercourse (NSW SS)
- Cadastre (NSW SS, 2022)

FIGURE GS004

1:500 Scale at A3

m
0 5 10 15 20

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-08-30 | Project:304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-004-SurfaceWater.mxd 01
Aerial imagery supplied by MetroMap (June 2022)

Appendix B PHOTOGRAPHS

Photograph 1. Condition observed from sampling location of WP1 during the monitoring event – 25 November 2022.

Photograph 2. No stormwater in-flow observed from the discharge point WP1-DP1 which was located within the rail corridor and immediately downstream / north from WP1 during the monitoring event – 25 November 2022.

Photograph 3. Condition observed from sampling location of WP2 during the monitoring event – 25 November 2022.

Photograph 4. Minor stormwater in-flow observed from the downstream discharge point WP2-DP1 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – 25 November 2022.

Photograph 5. No stormwater in-flow observed from the downstream discharge point WP2-DP2 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – 25 November 2022.

Appendix C FIELD DOCUMENTS

Surface Water Sampling Field Record

Site / Project:	Wiley Park SWM		Sampling Point:
Client:	Downer		Job No. 304500142
Person Sampling:	Jiaqi Zhou		Initials: JZ
Site Details			
Sampling Equipment – Directly into bottle / Water Scoop / Van Dorn Sampler / Other:			Date: 25.11.2022
Observations on Site: Last Rain Event / Recent Storms / Releases / Other : Dry weather			

Sample Details, Observations, GPS Coordinates & Field Physiochemical Measurements
(if possible, record parameters once stable)

Sample ID	WP1	WP2	WP2-DP1	WP2-DP2	
Start Time:	11:35	12:40	13:25		
Easting	/	/	/		
Northing	/	/	/		
Sample Depth (m)	0-0.05	0-0.05	0-0.05		
Water Body Depth (m)	0.05	0.05	0.015		
Location – Onsite/Offsite /Inlet/Outlet/ Middle	Upstream	Downstream	Upstream discharging point		
Flow Rate None/ Low / Med / High	Low	Low	Low		
DO (mg/L)	6.55	6.44	6.40		
DO (%)	78.8	78.4	78.6		
EC (µS/Cm)	941	874	659		
pH	8.14	8.41	9.19		
Eh ORP (mV)	157.6	167.5	113.2		
Temp (°C)	26.7	24.9	28.6		
Water Colour	Clear	Clear	Clear		
Turbidity Low / Med / High	Low	Low	Low		
Observations / Notes	Upstream DP no contribution Dry.		With approx. 5% contribution	downstream DP2 no contribution, Dry.	

Sample Container & Preservation Data

Number of sample containers:			No surface water contribute to the headwall. running in the site surface drainage trench. no water		
Container Volume					
Container Type					
Preservation			DP1 water from headwall only.		
Sample Number (for Lab ID):		QA100 a			
QC Dup Sample No.:		QA200			

Checklist:

- **Ice**
- **Photos (water body and samples)**
- **Cal certificate**
- **Call Chong if data go crazy or observed contamination on site**
- **Weather records**
- **COC**
  - **QA200 sample needs to be sent to ALS**
  - **Chlorophyll a from 5 ug/L to 2 ug/L)**

WP 2

With :0.6m
Depth : 0.05m
Flow : 1

$0.6 \times 0.05 \times 1 = 0.03$

WP2 -DP1

Width : 0.6m
Depth : 0.005m
Flow : 0.5

$0.6 \times 0.05 \times 0.5 = 0.0015$

$\frac{0.0015}{0.03} = 5\%$.

WAMSCIENTIFIC
Your water and air monitoring equipment specialists

Certificate of Service and Calibration
Water Quality Meter
YSI Professional Plus

Company Name	WAM Scientific
Office Address	26 Bungarra Crescent, Chipping Norton NSW 2170
Phone Number	+61 405 241 484
Contact Name	William Pak
Instrument	YSI Professional Plus Water Quality Meter w/ 1m Quatro Cable
Serial Number	21C100012
Client Name	Chong Zeng/Jiaqi Zhou (Stantec Australia)
Project Number	304500142
Comments	-

Instrument Check

Item	Test	Test Passed	Comments
2 x Alkaline C-size Batteries	Klein Tools MM300 Multimeter	✓	Both batteries reading above 2.9V
Battery Saver Function	Operation	✓	Automatically turns off after 60 minutes if idle
Unit Display	Operation	✓	Screen visible, no damage
Keypad	Operation	✓	Responsive, no damage
Connection Port and Cable	Condition/Check	✓	Clean, no damage
Monitor Housing	Condition/Check	✓	No damage
Firmware	Version	✓	4.0.0
pH Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
pH millivolts for pH 7.00	Calibration	✓	pH 7.00 calibration range between 0 mV ± 50 mV
pH millivolts for pH 4.00	Calibration	✓	pH 4 mV range +165 to +180 from 7 buffer mV value
pH slope	Calibration	✓	Range between 55 to 60 mV/pH (ideal value 59 mV)
Response time < 90 seconds	Calibration	✓	Responds to correct value within 90 seconds
ORP Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
ORP Reading	Calibration	✓	Within ± 80 mV of reference Zobell Reading
Response time < 90 seconds	Calibration	✓	Responds to correct value within 90 seconds
Conductivity/Temp Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
Conductivity Cell	Calibration	✓	Conductivity cell constant 5.0 ± 1.0 in GLP file
Clean Sensor Readings	Calibration	✓	Clean sensor reads less than 3 uS/cm in dry air
Dissolved Oxygen Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
DO Cap	Condition/Calibration	✓	1.25 mil PE membrane (yellow membrane)
DO Sensor in Use	Condition	✓	Polarographic DO sensor
DO Sensor Value	Calibration	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA

Instrument Readings

Parameter	Standard Used	Reference No.	Calibration Value	Observed	Actual	Units
Temperature	Centre 370 Thermometer	Room Temp.	19.8	19.7	19.8	°C
pH	pH 4.00	386466	4.01	4.00	4.01	pH
pH	pH 7.00	387329	7.00	7.00	7.00	pH
Conductivity	2760 µs/cm at 25°C	388521	2760	2759	2760	µs/cm
ORP (Ref. check only)	Zobell A & B	380835/382785	238.8	242.5	238.8	mV
Zero Dissolved O_2	$NaSO_3$ in Distilled H_2O	389912	0.0	-0.8	0.0	%
100% Dissolved O_2	100% Air Saturated H_2O	Fresh Air	100.0	108.1	100.0	%

Declaration

WAM Scientific certifies that the above instrument was successfully tested according to manufacturer's standards and all necessary checks were conducted to ensure the instrument was fully operational prior to dispatch. The calibration data supplied was obtained in accordance with manufacturer's specifications using solutions of known values.

Calibrated By	William Pak
Calibration Date	22/11/2022
Calibration Due	22/05/2023

WAMSCIENTIFIC
Your water and air monitoring equipment specialists

WAM Scientific:
26 Bungarra Crescent
CHIPPING NORTON NSW 2170
T: +61 405 241 484 | +61 424 198 667
E: rentals@wamscientific.com.au
E: accounts@wamscientific.com.au

Latest Weather Observations for Canterbury

IDN60801

Issued at 11:02 pm EDT Friday 25 November 2022 (issued every 10 minutes, with the page automatically refreshed every 10 minutes)

About weather observations | Map of weather stations | Latest weather observations for NSW | Other Formats

Station Details ID: 066194 Name: CANTERBURY RACECOURSE AWS Lat: -33.91 Lon: 151.11 Height: 3.0 m

Data from the previous 72 hours. | See also: Recent months at Canterbury

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
25/11:00pm	18.7	18.4	15.4	81	1.9	SSE	11	17	6	9	-	-	0.0
25/10:30pm	18.7	18.4	15.4	81	1.9	S	11	17	6	9	-	-	0.0
25/10:00pm	18.7	18.5	15.6	82	1.8	SSE	11	17	6	9	-	-	0.0
25/09:30pm	19.1	19.3	15.8	81	2.0	SE	9	15	5	8	-	-	0.0
25/09:00pm	19.2	18.2	15.5	79	2.2	SE	15	20	8	11	-	-	0.0
25/08:30pm	19.0	18.9	14.9	77	2.4	SE	9	13	5	7	-	-	0.0
25/08:00pm	19.1	18.1	14.6	75	2.6	ESE	13	19	7	10	-	-	0.0
25/07:30pm	19.7	19.1	14.7	73	2.9	ESE	11	19	6	10	-	-	0.0
25/07:00pm	20.5	19.4	14.2	67	3.7	ESE	13	17	7	9	-	-	0.0
25/06:30pm	21.0	19.6	14.4	66	3.9	E	15	22	8	12	-	-	0.0
25/06:00pm	21.7	20.0	14.6	64	4.2	ESE	17	22	9	12	-	-	0.0
25/05:30pm	21.3	18.8	14.2	64	4.1	SE	20	30	11	16	-	-	0.0
25/05:00pm	21.7	19.3	14.4	63	4.3	SE	20	30	11	16	-	-	0.0
25/04:30pm	21.5	18.9	13.7	61	4.5	ESE	20	28	11	15	-	-	0.0
25/04:00pm	23.0	20.3	13.5	55	5.5	ESE	20	30	11	16	-	-	0.0
25/03:30pm	24.0	21.5	14.1	54	5.8	ESE	20	30	11	16	-	-	0.0
25/03:00pm	23.8	21.4	13.9	54	5.8	ESE	19	28	10	15	-	-	0.0
25/02:30pm	23.7	21.6	15.2	59	5.1	ESE	20	33	11	18	-	-	0.0
25/02:00pm	23.9	21.8	15.1	58	5.3	E	20	32	11	17	-	-	0.0
25/01:30pm	24.3	22.1	15.0	56	5.6	ESE	20	32	11	17	-	-	0.0
25/01:00pm	24.3	22.4	15.2	57	5.5	E	19	28	10	15	-	-	0.0
25/12:30pm	23.6	22.5	15.4	60	4.9	ENE	15	24	8	13	-	-	0.0
25/12:00pm	23.8	20.2	14.2	55	5.7	ESE	26	37	14	20	-	-	0.0
25/11:55am	24.8	22.8	15.4	56	5.7	SE	20	37	11	20	-	-	0.0
25/11:30am	23.9	22.7	10.2	42	7.5	SSW	7	19	4	10	-	-	0.0
25/11:00am	23.9	22.2	9.9	41	7.7	W	9	19	5	10	-	-	0.0
25/10:30am	22.9	22.4	11.9	50	6.2	E	6	13	3	7	-	-	0.0
25/10:00am	22.5	22.6	14.4	60	4.8	NNW	7	17	4	9	-	-	0.0
25/09:30am	21.7	21.4	13.3	59	4.8	NNW	7	15	4	8	-	-	0.0
25/09:00am	20.5	20.1	14.2	67	3.7	NNW	9	13	5	7	-	-	0.0
25/08:30am	19.8	18.9	13.7	68	3.5	NW	11	19	6	10	-	-	0.0
25/08:00am	19.7	20.0	14.9	74	2.8	N	7	13	4	7	-	-	0.0
25/07:30am	18.6	18.9	15.1	80	2.0	NW	7	11	4	6	-	-	0.0
25/07:00am	17.7	18.4	15.7	88	1.2	N	6	9	3	5	-	-	0.0
25/06:30am	15.4	17.2	15.4	100	0.0	CALM	0	0	0	0	-	-	0.0
25/06:00am	14.3	15.7	14.3	100	0.0	CALM	0	0	0	0	-	-	0.0
25/05:30am	14.4	15.7	14.2	99	0.1	CALM	0	0	0	0	-	-	0.0
25/05:00am	14.7	16.0	14.2	97	0.3	CALM	0	0	0	0	-	-	0.0
25/04:30am	15.3	16.8	14.7	96	0.3	CALM	0	0	0	0	-	-	0.0
25/04:00am	15.4	16.7	14.1	92	0.7	CALM	0	0	0	0	-	-	0.0
25/03:30am	16.1	17.4	14.1	88	1.1	CALM	0	0	0	0	-	-	0.0
25/03:00am	17.3	18.2	14.0	81	1.9	NNE	2	6	1	3	-	-	0.0
25/02:30am	17.8	17.9	13.9	78	2.2	NNE	6	9	3	5	-	-	0.0
25/02:00am	18.2	18.7	13.9	76	2.5	N	4	11	2	6	-	-	0.0
25/01:30am	18.1	17.9	14.8	81	1.9	NNE	9	13	5	7	-	-	0.0
25/01:00am	18.2	17.7	14.9	81	1.9	NNE	11	17	6	9	-	-	0.0

25/12:30am	18.4	18.2	14.7	79	2.1	NNE	9	15	5	8	-	-	0.0
25/12:00am	18.3	18.5	14.6	79	2.1	ENE	7	13	4	7	-	-	0.0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
24/11:30pm	18.2	18.2	15.3	83	1.7	ESE	9	13	5	7	-	-	0.0
24/11:00pm	18.7	18.5	14.8	78	2.3	ENE	9	15	5	8	-	-	0.0
24/10:30pm	18.7	18.3	14.2	75	2.6	NE	9	17	5	9	-	-	0.0
24/10:00pm	18.5	17.8	14.2	76	2.5	ENE	11	17	6	9	-	-	0.0
24/09:30pm	18.7	18.4	14.4	76	2.5	NE	9	17	5	9	-	-	0.0
24/09:00pm	18.5	17.3	14.0	75	2.6	ENE	13	19	7	10	-	-	0.0
24/08:30pm	18.7	17.9	14.0	74	2.7	NE	11	20	6	11	-	-	0.0
24/08:00pm	18.9	17.7	14.0	73	2.8	ENE	13	20	7	11	-	-	0.0
24/07:30pm	19.0	16.9	13.6	71	3.1	ENE	17	26	9	14	-	-	0.0
24/07:00pm	19.5	16.8	13.4	68	3.5	E	20	32	11	17	-	-	0.0
24/06:30pm	20.0	17.0	13.7	67	3.6	E	22	32	12	17	-	-	0.0
24/06:00pm	20.4	17.3	13.4	64	4.0	E	22	35	12	19	-	-	0.0
24/05:30pm	21.5	18.8	13.4	60	4.7	E	20	32	11	17	-	-	0.0
24/05:00pm	22.0	19.2	13.1	57	5.1	E	20	30	11	16	-	-	0.0
24/04:30pm	22.4	18.7	12.6	54	5.6	ESE	24	35	13	19	-	-	0.0
24/04:00pm	22.7	19.4	11.7	49	6.2	ESE	20	30	11	16	-	-	0.0
24/03:30pm	22.9	19.1	11.3	48	6.5	ESE	22	32	12	17	-	-	0.0
24/03:00pm	23.2	19.2	10.3	44	7.1	SE	22	33	12	18	-	-	0.0
24/02:30pm	23.0	19.3	10.1	44	7.0	SE	20	35	11	19	-	-	0.0
24/02:00pm	23.2	19.3	9.6	42	7.4	SE	20	33	11	18	-	-	0.0
24/01:30pm	23.8	20.6	9.8	41	7.6	SE	17	28	9	15	-	-	0.0
24/01:00pm	23.6	20.5	10.3	43	7.3	SE	17	26	9	14	-	-	0.0
24/12:30pm	23.5	20.9	10.6	44	7.1	SSE	15	26	8	14	-	-	0.0
24/12:00pm	24.1	20.9	6.8	33	9.0	W	13	26	7	14	-	-	0.0
24/11:30am	23.5	20.7	8.4	38	8.0	SW	13	28	7	15	-	-	0.0
24/11:00am	22.8	19.9	8.1	39	7.7	SW	13	22	7	12	-	-	0.0
24/10:30am	22.0	18.4	6.7	37	7.8	WSW	15	26	8	14	-	-	0.0
24/10:00am	21.6	18.1	7.1	39	7.4	WSW	15	26	8	14	-	-	0.0
24/09:30am	21.0	17.7	8.0	43	6.8	SW	15	28	8	15	-	-	0.0
24/09:00am	20.4	16.9	7.4	43	6.7	SW	15	26	8	14	-	-	0.0
24/08:30am	20.2	17.7	8.2	46	6.2	SW	11	19	6	10	-	-	0.0
24/08:00am	19.2	16.1	8.8	51	5.4	SW	15	19	8	10	-	-	0.0
24/07:30am	18.0	16.7	11.3	65	3.6	WSW	9	15	5	8	-	-	0.0
24/07:00am	16.2	16.0	13.7	85	1.4	WNW	7	11	4	6	-	-	0.0
24/06:30am	14.3	14.1	13.0	92	0.7	WNW	6	9	3	5	-	-	0.0
24/06:00am	14.0	14.5	12.9	93	0.6	WNW	2	7	1	4	-	-	0.0
24/05:30am	13.7	13.5	13.1	96	0.3	W	6	7	3	4	-	-	0.0
24/05:00am	13.0	13.8	12.5	97	0.3	CALM	0	0	0	0	-	-	0.0
24/04:30am	13.3	14.1	12.5	95	0.4	CALM	0	0	0	0	-	-	0.0
24/04:00am	14.2	15.2	13.2	94	0.6	CALM	0	0	0	0	-	-	0.0
24/03:30am	14.7	15.1	13.6	93	0.6	SSW	4	7	2	4	-	-	0.0
24/03:00am	14.2	15.1	12.9	92	0.7	CALM	0	6	0	3	-	-	0.0
24/02:30am	14.6	15.5	13.0	90	0.9	CALM	0	0	0	0	-	-	0.0
24/02:00am	15.8	16.6	12.7	82	1.7	CALM	0	0	0	0	-	-	0.0
24/01:30am	17.3	17.0	12.8	75	2.5	SSE	6	9	3	5	-	-	0.0
24/01:00am	17.6	17.4	13.5	77	2.3	SSE	7	13	4	7	-	-	0.0
24/12:30am	18.0	17.8	13.7	76	2.4	SSE	7	13	4	7	-	-	0.0
24/12:00am	18.1	17.2	13.6	75	2.6	SSE	11	19	6	10	-	-	0.0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
23/11:30pm	18.4	17.1	13.7	74	2.7	SSE	13	19	7	10	-	-	0.0
23/11:00pm	19.1	17.4	13.5	70	3.2	SE	15	30	8	16	-	-	0.0
23/10:30pm	18.6	18.1	10.9	61	4.2	S	4	11	2	6	-	-	0.0
23/10:00pm	18.4	18.6	10.5	60	4.2	CALM	0	0	0	0	-	-	0.0

23/09:30pm	18.0	17.3	9.9	59	4.3	ESE	4	9	2	5	-	-	0.0
23/09:00pm	19.8	18.9	9.4	51	5.5	NE	4	11	2	6	-	-	0.0
23/08:30pm	20.1	18.9	9.7	51	5.6	NE	6	9	3	5	-	-	0.0
23/08:00pm	20.9	19.6	9.8	49	6.0	E	7	11	4	6	-	-	0.0
23/07:30pm	23.9	20.9	6.2	32	9.1	SW	11	17	6	9	-	-	0.0
23/07:00pm	25.0	21.6	5.7	29	9.9	WSW	13	24	7	13	-	-	0.0
23/06:30pm	26.0	21.4	5.6	27	10.5	WSW	19	32	10	17	-	-	0.0
23/06:00pm	26.5	21.8	6.0	27	10.6	WSW	20	32	11	17	-	-	0.0
23/05:30pm	27.1	23.1	6.5	27	10.8	WSW	17	30	9	16	-	-	0.0
23/05:00pm	27.1	22.6	6.0	26	11.0	W	19	30	10	16	-	-	0.0
23/04:30pm	27.2	23.0	8.1	30	10.3	WSW	20	35	11	19	-	-	0.0
23/04:00pm	27.2	23.3	8.6	31	10.1	SW	19	30	10	16	-	-	0.0
23/03:30pm	26.8	23.1	7.8	30	10.2	SW	17	35	9	19	-	-	0.0
23/03:00pm	26.1	23.2	9.5	35	9.1	SW	15	30	8	16	-	-	0.0
23/02:30pm	25.6	21.6	6.8	30	9.8	SW	17	35	9	19	-	-	0.0
23/02:00pm	25.3	21.1	8.3	34	9.1	W	20	37	11	20	-	-	0.0
23/01:30pm	24.8	20.3	7.0	32	9.3	WSW	20	33	11	18	-	-	0.0
23/01:00pm	24.1	20.1	8.1	36	8.5	W	19	28	10	15	-	-	0.0
23/12:30pm	23.2	18.8	7.3	36	8.3	SW	20	37	11	20	-	-	0.0
23/12:00pm	23.0	17.4	7.1	36	8.2	W	26	39	14	21	-	-	0.0
23/11:57am	23.1	17.1	7.2	36	8.2	W	28	46	15	25	-	-	0.0
23/11:30am	22.3	17.5	7.3	38	7.8	WSW	22	39	12	21	-	-	0.0
23/11:02am	22.0	16.0	7.0	38	7.7	WSW	28	46	15	25	-	-	0.0
23/11:00am	22.1	15.7	7.1	38	7.7	WSW	30	46	16	25	-	-	0.0
23/10:39am	21.7	15.6	6.8	38	7.6	SW	28	46	15	25	-	-	0.0
23/10:30am	21.5	16.7	7.3	40	7.3	SW	22	41	12	22	-	-	0.0
23/10:00am	20.9	15.6	6.8	40	7.2	WSW	24	37	13	20	-	-	0.0
23/09:30am	19.8	15.4	7.2	44	6.4	W	20	32	11	17	-	-	0.0
23/09:00am	18.8	13.0	6.3	44	6.2	W	26	39	14	21	-	-	0.0
23/08:30am	17.9	12.8	5.8	45	5.9	W	22	39	12	21	-	-	0.0
23/08:00am	17.5	12.9	5.4	45	5.8	W	19	28	10	15	-	-	0.0
23/07:30am	16.6	11.7	5.3	47	5.4	WNW	20	28	11	15	-	-	0.0
23/07:00am	15.5	12.8	5.4	51	4.8	WNW	9	17	5	9	-	-	0.0
23/06:30am	13.5	10.8	5.7	59	3.7	NW	9	15	5	8	-	-	0.0
23/06:00am	13.0	10.1	4.9	58	3.7	NNW	9	17	5	9	-	-	0.0
23/05:30am	13.1	10.2	4.8	57	3.8	NNW	9	15	5	8	-	-	0.0
23/05:00am	13.7	10.4	4.6	54	4.2	NW	11	19	6	10	-	-	0.0
23/04:30am	14.9	10.8	4.6	50	4.8	WNW	15	24	8	13	-	-	0.0
23/04:00am	14.2	10.9	4.5	52	4.5	W	11	20	6	11	-	-	0.0
23/03:30am	14.4	11.4	4.1	50	4.7	NW	9	17	5	9	-	-	0.0
23/03:00am	14.2	11.2	4.2	51	4.6	NW	9	17	5	9	-	-	0.0
23/02:30am	13.7	11.3	4.3	53	4.3	NW	6	13	3	7	-	-	0.0
23/02:00am	13.5	11.1	5.2	57	3.9	NW	7	11	4	6	-	-	0.0
23/01:30am	11.2	9.9	5.9	70	2.5	WNW	2	9	1	5	-	-	0.0
23/01:00am	12.6	10.3	4.8	59	3.6	W	6	7	3	4	-	-	0.0
23/12:30am	13.1	10.7	4.5	56	3.9	NW	6	9	3	5	-	-	0.0
23/12:00am	15.3	12.8	3.8	46	5.3	NW	6	9	3	5	-	-	0.0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/11:30pm	15.8	11.9	3.6	44	5.6	WNW	13	20	7	11	-	-	0.0

Other formats

Comma delimited format used in spreadsheet applications
http://www.bom.gov.au/fwo/IDN60801/IDN60801.94766.axf

JavaScript Object Notation format (JSON) in row-major order
http://www.bom.gov.au/fwo/IDN60801/IDN60801.94766.json

Data quality

Most of these data are generated automatically and are frequently updated. Quality checks on data are not normally performed. It is possible for incorrect values to appear. Refer to information at About Latest Weather Observations and please check the disclaimer before using these data.

WARNINGS

WATER | CLIMATE | ENVIRONMENT

Tropical Cyclones
Tsunami Warning Centre
Agriculture - Water and the Land
Marine & Ocean
UV & Sun Protection
Rainfall & River Conditions

 Radar
 Sat
 Maps

Rainfall Forecasts
Seasonal Outlooks
Climate Variability & Change
Climate Data Online
Seasonal Streamflow Forecasts
Water Storage

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Indigenous Weather Knowledge
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Students and Teachers

Appendix D LABORATORY SUMMARY TABLES

				TPH	Inorganics				Field Physio-Chemical			
			Chlorophyll a	Oil and Grease	Nitrogen (Total as N)	Phosphorus (Total as P)	TSS	Turbidity	pH - Field	Temprature	Electrical Conductivity	Dissolved Oxygen
			mg/L	mg/L	mg/L	µg/L	mg/L	NTU	Units	°C	uS/cm	%Sat
EQL			0.002	10	0.2	10	5	1	0.01	0.1	0.1	0.1
ANZECC Criteria - Freshwater			**0.003**	**-**	**0.35**	**25**	**-**	**<6-50**	**6.5-8.5**	**-**	**125-2200**	**85% - 110%**
Lab Report Number	**Field ID**	**Date**										
944702	**WP1**	**25/11/2022**	<0.002	<10	**0.9**	**140**	<5	1.3	8.14	26.7	941	**78.8**
944702	**WP2**	**25/11/2022**	<0.002	11	**1.1**	**140**	<5	1.4	8.41	24.9	874	**78.4**
944702	**WP2-DP1**	**25/11/2022**	0.0023	<10	**1.5**	**90**	<5	2.2	**9.19**	28.6	659	**78.6**
944702	**QA100**	**25/11/2022**	Not Test	<10	**1**	**130**	<5	1.3	Not Test	Not Test	Not Test	Not Test
ES2242847	**QA200**	**25/11/2022**	Not Test	<5	**1.4**	**210**	6	3.7	Not Test	Not Test	Not Test	Not Test
Maximum Concentration			0.0023	11	**1.5**	**210**	6	3.70				

Appendix E QUALITY ASSURANCE/QUALITY CONTRAL

Quality Assurance/Quality Control (QA/QC) procedures were implemented to ensure the precision accuracy, representativeness, completeness and comparability of all data gathered. The QA/QC procedures included:

- Equipment calibration to ensure field measurements obtained are accurate
- Equipment decontamination to prevent cross contamination
- Use of appropriate measures (i.e. gloves) to prevent cross contamination
- Appropriate sample identification
- Correct sample preservation
- Sample transport with Chain of Custody (COC) documentation
- Laboratory analysis in accordance with NATA accredited methods.

Table E1 details the QA/QC procedures and sample collection details undertaken through the surface water elements of the investigation. Copies of all the COCs, along with the Sample Receipt Notifications (SRNs), Interpretive QA/QC Reports are provided in Appendix F.

Table E1 Field QA/QC Method Validation

Requirement	Yes / No	Comments
Equipment decontamination	Yes	In the event of involving reusable equipment. Decontamination of sampling equipment (water quality meter, telescopic water scoop etc.) was undertaken by washing with phosphate free detergent (Liquinox) followed by a rinse with potable water.
Sample collection	Yes	Samples were collected using disposable nitrile gloves via telescopic water scoop. A clean pair of gloves was used for each new sample being collected to limit the possibility of cross-contamination.
QA/QC sample collection	Yes	One (1) surface water duplicate and one (1) surface water triplicate sample were collected for intra and inter-lab QA/QC purposes to monitor the quality of the field practices for sample collection. Stantec based the investigation around a rate of one duplicate and triplicate sample per sampling event, as the requirement for duplicate and triplicate sample collection.
Sample identification	Yes	All samples were marked with a unique identifier including project number, sample location, and date.
Sample preservation	Yes	Samples were placed in a chilled ice box with ice for storage and transport to the laboratory.
COC documentation	Yes	A COC form was completed by Stantec detailing sample identification, collection date, sampler and laboratory analysis required. The COC form was signed off and returned to Stantec by the laboratory staff upon receipt of all the samples. COC forms and Sample Receipt Notification (SRN) are provided in Appendix F. The SRN indicates that the samples were received at the laboratory intact and chilled and within the required holding times.
NATA accredited methods	Yes	The NATA accredited Eurofins mgt and ALS Analysed the samples in accordance with NATA accredited methods. Analytical methods used are indicated in the stamped laboratory results provided in Appendix F.
Laboratory Internal QC	Yes	All Data Quality Objectives were met by the laboratories.

Table E2 Field QA/QC Collection Summary

Environmental Media	Date	Primary	Duplicate	Triplicate
Surface Water	25/11/2022	WP2	QA100	QA200

Relative Percentage Difference Determination

Laboratory results for duplicate and triplicate samples are assessed using a determination of the Relative Percentage Difference (RPD). Where a primary sample and a duplicate sample are compared, the RPD provides an indication of the reproducibility of the results, which incorporates the sampling method. Where a primary sample and a split sample are compared, the RPD provides an indication of the accuracy of the primary laboratory results as compared to the secondary laboratory result.

The calculation used to determine the RPD is:

$$RPD = \frac{(Co - Cs)}{\left(\frac{Co + Cs}{2}\right)} x100$$

Where:

Co = Concentration of the original sample

Cs = Concentration of the duplicate sample

In calculating the RPD values the following protocols were adopted:

- Where both concentrations are above laboratory reporting limits the RPD formula is used;
- Where both concentrations are below the laboratory reporting limits, no RPD is calculated; and
- Where one or both sample concentrations are reported to be less than ten times (<10x) the laboratory reporting limit, the RPD is calculated but is not assessed against the adopted criterion.

In accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013, Stantec adopts an RPD acceptance criterion up to 30% of the mean concentration of the analyte. It should be noted that variations might be higher for organic analysis, due to the volatile nature of the components, and for low concentrations of analytes.

The adopted criterion will not apply to RPDs where one of both concentrations are less than 10 times the reporting limit, as this criterion would otherwise overestimate the significance of minor variations in concentrations at or near the laboratory reporting limit. Large RPDs returned for low concentrations of analytes near the reporting limit is not as indicative of a significant difference in the results as a small RPD is for larger concentrations.

This approach is employed by NATA-accredited laboratories when assessing internal duplicate sample RPDs. This approach acknowledges that concentrations at or around the reporting limit are too low for an accurate evaluation of the significance of the RPD.

This approach has been adopted when assessing the relevance (compliance) of RPDs during this investigation. RPDs will be calculated for sample sets where one or both concentrations are less than 10 times the reporting limit for discussion purposes, but will not be assessed as a pass or fail in relation to the criterion.

The RPD results for duplicate samples are presented in this appendix. Although two (2) RPD values (total phosphate and turbidity) were reported to be above the accepted 30% RPD criteria (refer to the

RPD table attached below), the breaches in RPDs are not considered to alter the overall outcome of the assessment. It can be concluded that the analytical data can be relied upon for the purposes of this factual report.

Laboratory QC and QCI Report Summary

The laboratories selected for undertaking the analysis (Eurofins mgt and ALS) are NATA-accredited for the analysis required, and undertook certain QA/QC requirements to demonstrate the suitability of the data that is obtained. The laboratory is required to undertake and report internal laboratory Quality Control (QC) procedures for all chemical analysis undertaken. The QC testing is required to include:

- Laboratory duplicate sample analysis at the rate of one duplicate analysis per ten samples
- Method blank at the rate of one method blank analysis per 20 samples
- Laboratory control sample at the rate of one laboratory control sample analysis per 20 samples
- Spike recovery analysis at the rate of one spike recovery analysis per 20 samples.

Compliance with the laboratory QA/QC requirements and non-conformance details are discussed in the internal Laboratory QA/QC reports included with the certificates of analysis in Appendix F. Laboratory QA/QC requirements were within acceptance limits.

Stantec concludes that the data reported by the NATA-accredited Eurofins mgt and ALS as presented in this report is suitable for interpretative purposes and to make conclusions/recommendations regarding water quality.

		Lab Report Number	944702			944702	ES2242847		
		Field ID	WP2	QA100		WP2	QA200		
		Matrix Type	Water	Water		Water	Water		
		Date	25/11/2022	25/11/2022	RPD	25/11/2022	25/11/2022	RPD	
	Unit	EQL							
NA									
Phosphate total (as P)	**MG/L**	0.01	0.14	0.13	7	0.14	0.21	**40**	
Chlorophyll a	**µg/L**	2	<2			<2			
TPH									
Oil and Grease	**mg/L**	5	11	<10	10	11	<5	NA	
Inorganics									
Kjeldahl Nitrogen Total	**µg/L**	100					1,200		
Nitrate & Nitrite (as N)	**µg/L**	10					250		
Nitrogen (Total)	**µg/L**	100	1,100	1,000	10	1,100	1,400	24	
TSS	**µg/L**	5,000	<5,000	<5,000	NA	<5,000	6,000	NA	
Turbidity	**NTU**	0.1	1.4	1.3	7	1.4	3.7	**90**	

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**

****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**

*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

Appendix F LABORATORY REPORTS

Cardno
Shaping the Future

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zheng	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	JZ	Turnaround Requirements:	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	Lab:	ALS | 277-289 Woodpark Rd, Smithfield NSW 2164
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample information						Analysis Required												Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix		TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							
QA200		4	ICE	25/11/2022	Water		1	1	1	1	1							

HT

Environmental Division
Sydney
Work Order Reference
ES2242847

Telephone : +61-2-8784 8555

Relinquished by:	Jiaqi Zhou	Received by:		Relinquished by:		Received by:	Jack / ALS	Relinquished by:
(name / company)	Cardno ACT/NSW Pty Ltd	(name / company)		(name / company		(name / company)		(name / company)
Date & Time:	25/11/2022	Date & Time:		Date & Time:		Date & Time:	25/11/22 1735	Date & Time:
Signature:	JZ	Signature:		Signature:		Signature:	JC	Signature:
Received by:		Relinquished by:		Received by:		Relinquished by:		*Lab use:*
(name / company)		(name / company)		(name / company		(name / company)		Samples Received: Cool or Ambient (circle one)
Date & Time:		Date & Time:		Date & Time:		Date & Time:		Temperature Received at: (if applicable)
Signature:		Signature:		Signature:		Signature:		Transported by: Hand delivered / courier

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2242847**

Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jiaqi.zhou@cardno.com.au	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Page	: 1 of 2
Order number	: ----	Quote number	: EP2022MWHAUS0030 (EN/024/)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: JIAQI ZHOU		

Dates

Date Samples Received	: 25-Nov-2022 17:35	Issue Date	: 25-Nov-2022
Client Requested Due Date	: 05-Dec-2022	Scheduled Reporting Date	: **05-Dec-2022**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 10.3'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA025H Suspended Solids - Standard Level	WATER - EA045 Turbidity	WATER - EP020 Oil & Grease (O&G)	WATER - NT-11 Total Nitrogen and Total Phosphorus
ES2242847-001	25-Nov-2022 00:00	QA200	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS ADDRESS		
- A4 - AU Tax Invoice (INV)	Email	sapinvoices@stantec.com
CHONG ZENG		
- *AU Certificate of Analysis - NATA (COA)	Email	chong.zeng@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	chong.zeng@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	chong.zeng@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	chong.zeng@cardno.com.au
- A4 - AU Tax Invoice (INV)	Email	chong.zeng@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	chong.zeng@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	chong.zeng@cardno.com.au
- EDI Format - XTab (XTAB)	Email	chong.zeng@cardno.com.au
CONTAM NSW		
- *AU Certificate of Analysis - NATA (COA)	Email	contamnsw@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	contamnsw@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	contamnsw@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	contamnsw@cardno.com.au
- A4 - AU Tax Invoice (INV)	Email	contamnsw@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	contamnsw@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	contamnsw@cardno.com.au
- EDI Format - XTab (XTAB)	Email	contamnsw@cardno.com.au
JIAQI ZHOU		
- *AU Certificate of Analysis - NATA (COA)	Email	jiaqi.zhou@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jiaqi.zhou@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jiaqi.zhou@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jiaqi.zhou@cardno.com.au
- A4 - AU Tax Invoice (INV)	Email	jiaqi.zhou@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	jiaqi.zhou@cardno.com.au
- EDI Format - XTab (XTAB)	Email	jiaqi.zhou@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2242847**	Page	: 1 of 2
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 25-Nov-2022 17:35
Order number	: ----	Date Analysis Commenced	: 26-Nov-2022
C-O-C number	: ----	Issue Date	: 02-Dec-2022 18:24
Sampler	: JIAQI ZHOU		
Site	: ----		
Quote number	: EN/024/		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QA200**	**----**	**----**	**----**	**----**
			Sampling date / time	25-Nov-2022 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2242847-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**6**	**----**	**----**	**----**	**----**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**3.7**	**----**	**----**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.25**	**----**	**----**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.2**	**----**	**----**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.4**	**----**	**----**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.21**	**----**	**----**	**----**	**----**
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	**----**	**----**	**----**	**----**

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2242847**	Page	: 1 of 3
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 25-Nov-2022
Order number	: ----	Date Analysis Commenced	: 26-Nov-2022
C-O-C number	: ----	Issue Date	: 02-Dec-2022
Sampler	: JIAQI ZHOU		
Site	: ----		
Quote number	: EN/024/		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4736763)									
ES2242847-001	QA200	EA025H: Suspended Solids (SS)	----	5	mg/L	6	6	0.0	No Limit
ES2242925-003	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	249	263	5.5	0% - 20%
EA045: Turbidity (QC Lot: 4728527)									
ES2242762-032	Anonymous	EA045: Turbidity	----	0.1	NTU	32.3	31.8	1.6	0% - 20%
--------		EA045: Turbidity	----	0.1	NTU	----	6.0	5.1	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4736977)									
ES2242847-001	QA200	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.25	0.25	0.0	0% - 20%
ES2242951-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.35	0.36	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4736973)									
ES2242847-001	QA200	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.2	1.2	0.0	0% - 50%
ES2242857-010	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.5	1.0	68.9	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4736974)									
ES2242847-001	QA200	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.21	0.20	5.0	0% - 20%
ES2242857-010	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.10	0.12	20.7	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4736763)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	102	83.0	129
				<5	1000 mg/L	95.1	82.0	110
				<5	987 mg/L	87.4	83.0	118
EA045: Turbidity (QCLot: 4728527)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	97.8	91.0	105
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4736977)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4736973)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	92.1	69.0	101
				<0.1	1 mg/L	94.9	70.0	118
				<0.1	5 mg/L	95.6	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4736974)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	97.6	71.3	126
				<0.01	0.442 mg/L	101	71.3	126
				<0.01	1 mg/L	106	71.3	126
EP020: Oil and Grease (O&G) (QCLot: 4739495)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	112	81.0	121

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4736977)							
ES2242847-001	QA200	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	102	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4736973)							
ES2242857-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	100	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4736974)							
ES2242857-001	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	109	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2242847**	Page	: 1 of 4
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Telephone	: +61-2-8784 8555
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 25-Nov-2022
Site	: ----	Issue Date	: 02-Dec-2022
Sampler	: JIAQI ZHOU	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
QA200	**25-Nov-2022**	**----**	----	----	**30-Nov-2022**	02-Dec-2022	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
QA200	**25-Nov-2022**	**----**	----	----	**26-Nov-2022**	27-Nov-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
QA200	**25-Nov-2022**	**----**	----	----	**30-Nov-2022**	23-Dec-2022	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
QA200	**25-Nov-2022**	**30-Nov-2022**	23-Dec-2022	✓	**30-Nov-2022**	23-Dec-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
QA200	**25-Nov-2022**	**30-Nov-2022**	23-Dec-2022	✓	**30-Nov-2022**	23-Dec-2022	✓
EP020: Oil and Grease (O&G)							
Miscellaneous Sulfuric Preserved - glass (EP020)							
QA200	**25-Nov-2022**	**----**	----	----	**01-Dec-2022**	23-Dec-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Cardno
Shaping the Future

944702

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zheng	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	JZ	Turnaround Requirements:	5 Days TAT
Email Address (results and Invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	Lab:	Eurofins |
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample information						Analysis Required												Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	Chlorophyll-a (LOR Required - 2 ug/L)	TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							
WP1		6	ICE	25/11/2022	Water	1	1	1	1	1	1							Please reduce the detection limit of Chlorophyll a from 5 ug/L to 2 ug/L
WP2		6	ICE		Water	1	1	1	1	1	1							
WP2-DP1		6	ICE		Water	1	1	1	1	1	1							
QA100		4	ICE		Water		1	1	1	1	1							

Relinquished by: (name / company)	Jiaqi Zhou Cardno ACT/NSW Pty Ltd	Received by: (name / company)		Relinquished by: (name / company		Received by: (name / company)		Relinquished by: (name / company)	
Date & Time:	11/25/2022	Date & Time:	5:15	Date & Time:		Date & Time:		Date & Time:	
Signature:	JZ	Signature:		Signature:		Signature:		Signature:	
Received by: (name / company)		Relinquished by: (name / company)		Received by: (name / company		Relinquished by: (name / company)		*Lab use:* Samples Received: Cool or Ambient (circle one)	
Date & Time:		Date & Time:		Date & Time:		Date & Time:		Temperature Received at: 9.7 (if applicable)	
Signature:		Signature:		Signature:		Signature:		Transported by: Hand delivered / courier	

eurofins | Environment Testing

www.eurofins.com.au EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Tel: +61 2 4968 8448
NATA# 1261 Site# 25079

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 45 51
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Sample Receipt Advice

Company name:	Stantec Australia Pty Ltd (NSW/ACT)
Contact name:	Jiaqi Zhou
Project name:	DOWNER SYDNEY METRO STATIONS - WILEY PARK
Project ID:	NE30161
Turnaround time:	5 Day
Date/Time received	Nov 25, 2022 5:15 PM
Eurofins reference	944702

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Hannah Mawbey on phone : or by email: HannahMawbey@eurofins.com

Results will be delivered electronically via email to Jiaqi Zhou - jiaqi.zhou@cardno.com.au.

Note: A copy of these results will also be delivered to the general Stantec Australia Pty Ltd (NSW/ACT) email address.

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Tel: +61 2 4968 8448
NATA# 1261 Site# 25079

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 45 51
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Order No.:
Report #: 944702
Phone:
Fax:

Received: Nov 25, 2022 5:15 PM
Due: Dec 2, 2022
Priority: 5 Day
Contact Name: Jiaqi Zhou

Project Name: DOWNER SYDNEY METRO STATIONS - WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Nitrogen (as N)	Total Suspended Solids Dried at 103 °C to 105 °C	Turbidity
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X		X		
Sydney Laboratory - NATA # 1261 Site # 18217								X		X	X
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	Nov 25, 2022		Water	S22-No0063011	X	X	X	X	X	X
2	WP2	Nov 25, 2022		Water	S22-No0063012	X	X	X	X	X	X
3	WP2-DP1	Nov 25, 2022		Water	S22-No0063013	X	X	X	X	X	X
4	QA100	Nov 25, 2022		Water	S22-No0063014		X	X	X	X	X
Test Counts						3	4	4	4	4	4

Stantec Australia Pty Ltd
Level 22, 570 Bourke Street
Melbourne
VIC 3000

Attention: **Jiaqi Zhou**

Report **944702-W**
Project name DOWNER SYDNEY METRO STATIONS - WILEY PARK
Project ID NE30161
Received Date Nov 25, 2022

Client Sample ID			**WP1**	**WP2**	**WP2-DP1**	**QA100**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**S22-No0063011**	**S22-No0063012**	**S22-No0063013**	**S22-No0063014**
Date Sampled			**Nov 25, 2022**	**Nov 25, 2022**	**Nov 25, 2022**	**Nov 25, 2022**
Test/Reference	LOR	Unit				
Chlorophyll a	2	ug/L	< 2	< 2	2.3	-
Oil & Grease (HEM)	10	mg/L	< 10	11	< 10	< 10
Phosphate total (as P)	0.01	mg/L	0.14	0.14	0.09	0.13
Total Nitrogen (as N)	0.2	mg/L	0.9	1.1	1.5	1.0
Total Suspended Solids Dried at 103 °C to 105 °C	5	mg/L	< 5	< 5	< 5	< 5
Turbidity	1	NTU	1.3	1.4	2.2	1.3

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chlorophyll a	Melbourne	Nov 29, 2022	28 Days
- Method: LTM-INO-4340 Chlorophyll a in Waters			
Oil & Grease (HEM)	Melbourne	Nov 29, 2022	28 Days
- Method: LTM-INO-4380 Oil and Grease (APHA 5520B)			
Phosphate total (as P)	Sydney	Nov 30, 2022	28 Days
- Method: E052 Total Phosphate (as P)			
Total Nitrogen (as N)	Melbourne	Nov 29, 2022	7 Days
- Method: LTM-INO-4040 Phosphate and Nitrogen in waters			
Total Suspended Solids Dried at 103 °C to 105 °C	Sydney	Nov 30, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	Nov 30, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Tel: +61 2 4968 8448
NATA# 1261 Site# 25079

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

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NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 45 51
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Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Nitrogen (as N)	Total Suspended Solids Dried at 103 °C to 105 °C	Turbidity
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X		X		
Sydney Laboratory - NATA # 1261 Site # 18217								X		X	X
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	Nov 25, 2022		Water	S22-No0063011	X	X	X	X	X	X
2	WP2	Nov 25, 2022		Water	S22-No0063012	X	X	X	X	X	X
3	WP2-DP1	Nov 25, 2022		Water	S22-No0063013	X	X	X	X	X	X
4	QA100	Nov 25, 2022		Water	S22-No0063014		X	X	X	X	X
Test Counts						3	4	4	4	4	4

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Oil & Grease (HEM)	mg/L	< 10			10	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	mg/L	< 5			5	Pass	
Turbidity	NTU	< 1			1	Pass	
LCS - % Recovery							
Oil & Grease (HEM)	%	86			70-130	Pass	
Phosphate total (as P)	%	101			70-130	Pass	
Total Nitrogen (as N)	%	120			70-130	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	%	94			70-130	Pass	
Turbidity	%	86			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103 °C to 105 °C	N22-No0071479	NCP	%	89			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chlorophyll a	S22-No0066186	NCP	ug/L	< 5	< 5	<1	30%	Pass	
Oil & Grease (HEM)	M22-No0059908	NCP	mg/L	56	49	13	30%	Pass	
Total Nitrogen (as N)	B22-No0060413	NCP	mg/L	0.6	0.6	<1	30%	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	N22-No0071479	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Turbidity	S22-No0063011	CP	NTU	1.3	1.4	9.5	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Phosphate total (as P)	S22-No0063014	CP	mg/L	0.13	0.13	4.6	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Bonnie Pu	Analytical Services Manager
Dilani Samarakoon	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Inorganic
Roopesh Rangarajan	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Appendix 2 – Surface Water Monitoring Report - 304100142_R013_SWM_WileyPark_Rev0

Surface Water Monitoring Report - Wiley Park Station

Syn-Construction Quarterly Wet-Weather Event (22 February 2023)

24 March 2023

Prepared for:

Downer EDI Works Pty Ltd

Prepared by:

Stantec Australia

Revision	Description	Author		Quality Check		Independent Review	
RevA	Draft	Jiaqi Zhou	24/3/2023	Mike Jorgensen	24/3/2023	N/A	N/A

Prepared by _____
(signature)

Jiaqi Zhou

Reviewed by _____
(signature)

Mike Jorgensen

Approved by _____
(signature)

Mike Jorgensen

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LIST OF TABLES

LIST OF APPENDICES

Abbreviations

MSB	Metro Services Building
SWMP	Soil and Water Management Plan
DO	Dissolved oxygen
EC	Electrical conductivity
pH	Potential of hydrogen
ORP	Oxidation-reduction potential
NATA	National Association of Testing Authorities, Australia
QA/QC	Quality assurance/quality control
TSS	Total Suspended Solids
CoA	Conditions of Approval
DQO	Data Quality Objective
DQIs	Data Quality Indicators
RPD	Relative Percentage Difference
LORs	limits of reporting
CoC	Chain-of-Custody

Glossary

NTU	Nephelometric Turbidity Units
µS/cm	MicroSiemens per Centimeter
µg/L	Microgram per Liter

1.0 INTRODUCTION

1.1 BACKGROUND

Stantec Australia Pty Ltd ("Stantec" – formerly Cardno) was commissioned by Downer EDI Works Pty Ltd ("Downer EDI") to undertake monitoring and reporting of surface water quality of the unnamed channel near the Wiley Park Station Upgrade worksite. The proposed upgrade includes the upgrade of the main station and installation of the Metro Services Building (MSB).

Surface water quality of the channel near the Wiley Park Upgrade Site is to be monitored as per the requirements summarised in the **Table 1-2**, which is excerpted from the Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades Soil and Water Management Plan (SWMP). The monitoring program was prepared to meet the requirements outlined in The Sydney Metro City and Southwest – Sydenham to Bankstown Upgrade Conditions of Approval SSi-8256, specifically Condition 8 to Condition 10. The sampling locations (WP1 – Upstream and WP2 – Downstream) of the water quality monitoring are shown on **Figure GS004** in **Appendix A**. In order to establish a more robust dataset of how the downstream discharge from the worksite affects the water quality, Downer EDI requested two additional sampling locations at the downstream discharge points (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) of the water quality monitoring since May 2022. This additional sampling at the downstream discharge points is subject to the flow contribution at the time of each monitoring event. Refer to **Figure GS004** in **Appendix A** for approximate locations of the sampling locations.

The closest Project worksite to an existing watercourse is the Wiley Park Station services building, which is located approximately 100 m from an unnamed concrete-lined channel, which forms the upper reaches of Coxs Creek and is identified as a first-order stream.

For the purpose of establishing baseline water quality data within the first-order stream at Wiley Park, water quality monitoring was intended to be undertaken for a period prior to construction of the Wiley Park services building as outlined in the Table 13 of the SWMP. At a minimum, one dry-weather sample and one wet weather sample (weather permitting) were intended to be collected during the pre-construction period. The frequency of pre-construction water quality monitoring within this channel was subject to water being present within the structure. However, during the baseline monitoring period no wet-weather event was able to be captured prior to commencement of construction. A dry-weather baseline monitoring event was undertaken on 10 March 2021.

This report presents the findings from the fifteenth surface water monitoring event, which was undertaken by Stantec on 22 February 2023. The event undertaken was a syn-construction quarterly wet-weather event. **Table 1-1** below summarises the surface water monitoring events undertaken to date by Stantec.

Table 1-1 Summary of Surface Water Monitoring Event Undertaken to Date

Date of Monitoring	Type of Event	Report Reference
10 March 2021	Pre-construction Dry Baseline	4NE30187_R001_SWM_WileyPark_Rev0
20 March 2021	Construction Wet Weather	4NE30187_R001_SWM_WileyPark_Rev0
5 May 2021	Construction Wet Weather	4NE30187_R002_SWM_WileyPark_Rev0
1 July 2021	Construction Dry Weather	NE30161_R003_SWM_WileyPark_Rev0
30 September 2021	Construction Dry Weather	NE30161_R004_SWM_WileyPark_Rev0
12 November 2021	Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
26 November 2021	Construction Wet Weather	NE30161_R005_SWM_WileyPark_Rev0
9 and 10 February 2022	Construction Dry Weather	NE30161_R006_SWM_WileyPark_Rev0
23 February 2022	Construction Wet Weather	NE30161_R007_SWM_WileyPark_Rev0
9 March 2022	Construction Wet Weather	NE30161_R008_SWM_WileyPark_Rev0
24 May 2022	Construction Wet Weather	NE30161_R009_SWM_WileyPark_Rev0
4 and 21 July 2022	Construction Wet Weather	NE30161_R010_SWM_WileyPark_Rev0
25 August 2022	Construction Dry Weather	NE30161_R011_SWM_WileyPark_Rev0
25 November 2022	Construction Dry Weather	NE30161_R012_SWM_WileyPark_Rev0
22 February 2023	Construction Wet Weather	NE30161_R013_SWM_WileyPark_RevA

1.2 PURPOSE AND OBJECTIVE

The purpose of the surface water monitoring works is to monitor and record surface water quality within the unnamed channel in accordance with the monitoring program as outlined in the Site's SWMP. The objective of the works is to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel. The evaluation entailed comparing water quality of samples collected upstream of the worksite discharge points with water quality downstream of the discharge points.

1.3 SCOPE OF WORKS

Stantec undertook the following tasks during the surface water monitoring event:

- Inspected and sampled the two nominated surface water sampling locations (WP1 – Upstream and WP2 – Downstream) on 22 February 2023 as a syn-construction quarterly wet-weather monitoring event.
- Inspected and sampled two additional nominated downstream discharge points locations (WP2-DP1 – downstream eastern discharge point and WP2-DP2 – downstream western discharge point) on 22 February 2023 as part of syn-construction quarterly wet-weather monitoring event.
- Recorded field parameters (measured using a calibrated water quality meter) and noted observations of the water bodies during sampling. Field parameters measured included:
  - Dissolved oxygen (DO).
  - Electrical conductivity (EC).
  - Potential of hydrogen (pH).
  - Oxidation-reduction potential (ORP).

  - Temperature.
- Collected four primary surface water samples from WP1, WP2, WP2-DP1 and WP2-DP2, one intra-lab duplicate sample and one inter-lab duplicate sample per sampling event for submission to a laboratory accredited by the National Association of Testing Authorities, Australia (NATA) for the requested analytical testing of primary and additional quality assurance/quality control (QA/QC) samples. Samples were submitted for analysis of:
  - Oil & Grease.
  - Total Suspended Solids (TSS).
  - Nutrients (Total Phosphorous, Total Nitrogen).
  - Turbidity.
  - Chlorophyll-a.
- Reviewed the analytical and field data and prepared this report.

Details of the monitoring program are shown below in the **Table 1-2**, which is excerpted from the Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades SWMP.

Table 1-2 Wiley Park Water Quality Monitoring Program

Wiley Park Water Quality Monitoring Program	
Waterway	Sydney Water Cooks River Channel (first-order stream)
Indicative inspection and / or monitoring points	WP1 – upstream
	WP2 – downstream
	WP2-DP1- downstream eastern discharge point
	WP2-DP2 – downstream western discharge point
Interaction with project works	Channel near the Wiley Park service building site
Pre-construction works	Monthly for parameters detailed in Table 11 of the site's SWMP (including at least one dry-weather round of sampling). Refer to **Table 7-2** for the detailed field and laboratory analysed parameters. One wet-weather event, if possible, for the parameters detailed in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.
During construction of the Wiley Park services building	Quarterly for parameters detailed in Table 11 of the site's SWMP (including during dry weather). Four wet-weather events per year for the parameters in Table 11, subject to event occurrence, safe conditions for monitoring and access being available to conduct monitoring. Note: A wet-weather event is when the receiving area has received greater than 20 mm of rain in 24 hours. The sampling was undertaken immediately during construction hours and if it is safe to do so.

2.0 GUIDELINES AND LEGISLATION

There are a range of Guidelines and Legislation and Conditions of Approval (CoA) that are applicable to the surface water monitoring program that are summarised below.

The CoA applicable to this job include:

- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018.

The State and Federal legislation and policy and guidelines that apply to the program include:

- Environmental Planning and Assessment Act 1979 (EP&A Act).
- Contaminated Land Management Act 1997.
- Protection of the Environment Operations Act 1997 (POEO Act).
- Water Management Act 2000 Water Management (General) Regulation 2018.

Additional guidelines and standards to the management of soil and water include:

- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book').
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book').
- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines').
- ANZECC (2018). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines').
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').

3.0 MONITORING AND INSPECTION LOCATIONS

The monitoring locations are presented on **Figure 3-1** (refer to **Appendix A** for a full-size figure).

Figure 3-1 Monitoring Locations

Details of the inspection and / or monitoring locations are provided in **Table 3-1**. Representative photographs are presented in **Appendix B**.

Table 3-1 Surface Water Monitoring Location Details

Sample Location	Latitude	Longitude	Description
WP1 (up-stream)	-33.924014	151.065315	Immediately south of the Boulevarde and east of 118 The Boulevarde.
WP2 (down-stream)	-33.923339	151.064970	Immediately north of the Urunga Parade and west of 4 Urunga Parade.
WP2-DP1 (downstream eastern discharge point)	-33.923543	151.065058	Immediately south of the Urunga Parade, east side of the channel, approximately 20 m south of WP2.
WP2-DP2 (downstream western discharge point)	-33.923529	151.065048	Immediately south of the Urunga Parade, west side of the channel, approximately 20 m south / upstream of WP2.

4.0 QUALITY MANAGEMENT

The Data Quality Objective (DQO) process is used to establish a systematic planning approach to setting the type, quantity and quality of data required for making decisions based on the environmental condition of the project area. The DQO process involves the seven steps detailed in **Table 4-1**.

Table 4-1 Data Quality Objectives

DQO	Description
Step 1 State the Problem	Construction work may adversely impact the local surface water quality within the unnamed channel near the site.
Step 2 Identify the Decisions	Are there any impacts to surface water quality from construction activities at the site?
Step 3 Identify Inputs to the Decision	The primary inputs to the decisions described above are: • Assessment of surface water quality of the unnamed channel within proximity to Wiley Park service building site per the requirements outlined in the site's SWMP, with samples collected from two locations (upstream and downstream of the site); • Laboratory analysis of surface water samples for relevant parameters; • Assessment of the suitability of the analytical data obtained, against the Data Quality Indicators (DQIs); • Assessment of the analytical results against applicable guideline criteria; and • Aesthetic observations of surface water bodies, including odours, sheen and condition, if encountered.
Step 4 Define the Study Boundaries	The lateral extent of the study area is the channel near the Wiley Park service building site. The temporal boundaries of the study comprise the duration of the monitoring program, including pre-construction monitoring, construction phase, and post-construction monitoring as required.
Step 5 Develop a Decision Rule	The decision rules for the water quality monitoring sampling events included: • Were primary and QA/QC samples analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses? • Did the field and laboratory QA/QC results indicate that the data set was reliable and representative of the water quality with Relative Percentage Difference (RPD) values of 30% or less? • Were the laboratory limits of reporting (LORs) below the applicable guideline criteria for the analysed parameters? • Were guideline criteria sourced from endorsed guidelines? • Were surface water aesthetic characteristics evaluated including odours and sheen? • Were the monitoring results obtained from the downstream sample collected during construction phase greater than the upstream sample collected during the same monitoring event? If so, then the adverse impact to the quality of water in the unnamed channel is considered to have potentially occurred.
Step 6 Specify Limits on Decision Error	In accordance with the relevant guidelines as endorsed under the Contaminated Land Management Act 1997. Specific limits for this project are in accordance with the appropriate guidance made or endorsed by state and national regulations, appropriate indicators of data quality, and standard procedures for field sampling and handling.

DQO	Description
	This step also examines the certainty of conclusive statements based on the available new Site data collected. This should include the following points to quantify tolerable limits: • A decision can be made based on a certainty assumption of 95% confidence in any given data set (excluding asbestos). A limit on the decision error will be 5% that a conclusive statement may be a false positive or false negative. A decision error in the context of the decision rule presented above would lead to either underestimation or overestimation of the risk level associated with a particular sampling area. Decision errors may include: • Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the Site. To address this, minimum numbers of samples are proposed to be collected from each media. As such, there may be limitations in the data if aspects of the sampling plan cannot be implemented. Some examples of this scenario include but not limited to: – Proposed samples are not collected due to lack of water flow or access being restricted to a given location. • Limitations in ability to acquire useful and representative information from the data collected. The data are proposed to be collected from multiple locations and sample media. • Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed: – Field staff to follow a standard procedure when undertaking samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, collection of representative samples and use of appropriate sample containers and preservation methods. – Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis. – Laboratories to report quality assurance/ quality control data for comparison with the DQIs established for the project
Step 7 Optimise the Design for Obtaining Data	To achieve the DQOs and DQIs, the following sampling procedures were implemented to optimise the design for obtaining data: • Surface water samples was collected from upstream and downstream sampling locations, as available due to access and water level; • Surface water samples was collected from two (2) discharge points between upstream and downstream, as available due to access and water level; • Surface water parameters were selected based on project monitoring requirements provided to Stantec; • Samples were collected by suitably qualified and experienced environmental scientists; • Samples were collected and preserved in accordance with relevant standards/guidelines; and • Field and laboratory QA/QC procedures were adopted and reviewed to indicate the reliability of the results obtained.

4.1 DATA QUALITY INDICATORS

The following DQIs have been adopted for the project. The DQIs outlined in **Table 4-2** assist with decisions regarding the usefulness of the data obtained, including the quality of the laboratory data.

Table 4-2 Summary of Data Quality Indicators

Data Quality Indicator	Frequency	Data Acceptance Criteria
Completeness		
Field documentation correct	All samples	The work was documented in accordance with Stantec SOPs

Data Quality Indicator	Frequency	Data Acceptance Criteria
Suitably qualified and experience sampler	All samples	Person deemed competent by Stantec collecting and logging samples
Appropriate lab methods and limits of reporting (LORs)	All samples	Samples were analysed using methods endorsed by relevant regulatory guidelines at laboratories NATA-accredited for the requested analyses.
Chain of custodies (COCs) completed appropriately	All samples	The work was documented in accordance with Stantec SOPs
Sample holding times complied with	All samples	The samples were extracted and analysed within holding times specified by the project NATA-accredited laboratory
Proposed/critical locations sampled	-	Proposed/critical locations sampled
Comparability		
Consistent standard operating procedures for collection of each sample. Samples should be collected, preserved and handled in a consistent manner	All samples	All works undertaken in accordance with Stantec SOPs
Experienced sampler	All samples	Person deemed competent by Stantec collecting and logging samples
Climatic conditions (temp, rain etc.) recorded and influence on samples quantified (if required)	All samples	Climatic conditions documented in field sheets
Consistent analytical methods, laboratories and units	All samples	Sample analysis to be in accordance with NATA-approved methods
Representativeness		
Sampling appropriate for media and analytes (appropriate collection, handling and storage)	All samples	Sample analysis to be in accordance with NATA-approved methods
Samples homogenous	All samples	All works undertaken in accordance with Stantec SOPs
Detection of laboratory artefacts, e.g., contamination blanks	-	Laboratory artefacts assessed and impact on results determined
Samples extracted and analysed within holding times	All samples	The samples were extracted and analysed within holding times specified by the laboratory
Precision		
Blind duplicates (intra-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No RPD Limit when results are less than 10 × LOR
Split duplicates (inter-laboratory duplicates)	1 per 20 samples	Less than or equal to 30% RPD No RPD Limit when results are less than 10 × LOR
Laboratory duplicates	1 per 20 samples	Results greater than 10 x LOR: less than or equal to 30% RPD Results less than 10 x LOR: No limit on RPD
Accuracy (Bias)		

Data Quality Indicator	Frequency	Data Acceptance Criteria
Surrogate spikes	All organic samples	50-150%
Matrix spikes	1 per 20 samples	70-130%
Laboratory control samples	1 per 20 samples	70-130%
Method blanks	1 per 20 samples	Less than LOR

The DQOs and DQIs for the project were met during the monitoring events. Discussion of the Quality Control / Quality Assurance assessment is provided in **Appendix E**.

5.0 FIELD INVESTIGATION

The scope and method of the surface water monitoring is summarised in **Table 5-1**.

Table 5-1 Investigation Activity Summary

Activity	Details
Dates of Fieldwork	22 February 2022
Surface Water Inspection and Monitoring	All four nominated locations (i.e., WP1 – upstream, WP2 – downstream, WP2-DP1 – downstream eastern discharge point, and WP2-DP2 – downstream western discharge point) outlined in **Section 3.0** were inspected and monitored during field work undertaken on 22 February 2022. Stantec undertook the inspection and/or monitoring per the following procedures: Surface water body inspection - The general site condition was inspected prior to commencement of field works to confirm that it was safe to collect the samples and for signs of any site activities that may have altered the surface water contamination status or require modifications to the field or laboratory works program. Each nominated location was inspected for indicators of contamination and the presence as well as the flow of surface water. This information is recorded on the field sheets presented in **Appendix C**. Surface water sampling – Subject to the flow contribution at each nominated location during the field work undertaken, field parameters and visual/olfactory observations were recorded prior to sampling at each nominated location. Physico-chemical parameters including pH, EC, DO, ORP, and temperature were measured using a calibrated water quality meter. Surface water samples were collected either directly into the sampling bottle or directly from the telescopic scoop. Once field parameters were recorded, the surface water samples were transferred to appropriately preserved sample containers provided by the laboratories. Field observations, and parameters are presented in **Appendix C**. Surface water samples were placed into an Esky containing ice and maintained at or below 4°C whilst onsite and in transit to the NATA-accredited laboratories for the targeted analyses.
Surface Water Analysis	Surface water samples from the monitoring event were submitted under standard chain-of-custody (CoC) procedures to NATA-accredited Eurofins Environment Testing Australia analysis of the parameters as follows: • Oil & Grease; • Total Suspended Solids (TSS); • Nutrients (Total Phosphorous, Total Nitrogen); • Turbidity; and • Chlorophyll-a. Tabulated laboratory results are presented in **Appendix D**. The Data QA /QC program and data quality review including calibration certificates is presented in **Appendix E**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and CoC documentation are included in **Appendix F**.
Decontamination	In the event of reusable sampling or monitoring equipment (telescopic scoop, water quality meter) was used decontamination was undertaken. Decontaminated between locations using a standard bucket wash. Equipment was washed in phosphate-free detergent (Liquinox) and rinsed in laboratory supplied rinsate water.

6.0 SURFACE WATER ASSESSMENT CRITERIA

The assessment criteria for surface water analytical and field data were adopted from Table 11 of the site's SWMP. The criteria for selected parameters are provided in **Table 6-1** below. ANZECC guideline criteria are included in the table for reference.

Table 6-1 Water Quality Monitoring Parameters and Adopted Criteria at Wiley Park

Parameter	ANZECC Criteria – Freshwater[1]	Proposed Trigger Values	Proposed Actions
Temperature (°C)	>80% ile; <20% ile	Downstream results are greater than upstream results in rainfall events up to and including the significant event threshold of greater than 20 mm in 24 hours. Downstream results are greater than upstream results during dry-weather sampling.	Environment Manager (or delegate) to re-test to confirm results and undertake an inspection of the adjacent works and propose actions where required.
Dissolved Oxygen (DO)	Lower limit – 85% Upper limit -110%		
Turbidity (NTU)	6 - 50 NTU		
Oil and grease	-		
pH	Lower limit – 6.5 Upper limit – 8.5		
Salinity (as EC)	125 – 2200 µS/cm		
Total Suspended Solids (TSS)	-		
Total Phosphorus as P	25 µg/L		
Total Nitrogen as N	350 µg/L		
Chlorophyll-a	3 µg/L		

Note to Table

1 ANZECC guideline criteria are included for reference. It is noted that for dry weather events baseline testing comparison will indicate whether this existing water quality within the channel meet ANZECC guidelines, prior to construction of the services building. For wet weather events where no baseline data is available a direct comparison to upstream and downstream results is undertaken. Sydney Metro's Principal Contractor will comply with Section 120 of the Protection of the Environment Operations Act 1997.

7.0 SUMMARY OF RESULTS

7.1 SUMMARY OF FIELD OBSERVATIONS

All four nominated monitoring locations (WP1, WP2, WP2-DP1 and WP2-DP2) were inspected, monitored, and sampled on 22 February 2023. Photos of each nominated location are included in **Appendix B**. The following observations were made:

7.1.1 Syn-Construction Quarterly Wet-Weather Event – 22 February 2023

- The sampling event was undertaken on 22 February 2023 during a wet-weather event with 90.8 mm precipitation over the last 24 hours prior to the field sampling (rainfall data was obtained from the closest Bureau of Meteorology weather station, i.e., Canterbury Racecourse AWS – BOM Station ID: 066194). Refer to **Appendix C** for a copy of the weather recordings obtained from the Bureau of Meteorology website (http://www.bom.gov.au/);
- Observation of water body:
  - WP 1 (upstream of work area) contained medium to high flowing clear water with low turbidity. No visible oil sheen observed from the water surface. The estimated depth of the water body was 0.2 m to 0.3 m.
  - WP 2 (downstream of work area) contained high flowing clear water with low turbidity. No visible oil sheen observed on the water surface. The estimated depth of the water body was 0.2 m to 0.3 m.
  - WP2-DP1 (downstream eastern discharge point) contained high flowing clear water with low turbidity. The estimated depth of the water body was 0.008 m. The estimated flow contribution from WP2-DP1 into the main water channel is 2% (Refer to **Appendix C** for the calculation of the estimated flow contribution from WP2-DP1 into the main water channel).
  - WP2-DP2 (downstream western discharge point) contained high flowing water. The estimated depth of the water body was 0.02 m. The estimated flow contribution from WP2-DP2 into the main water channel is 3% (Refer to **Appendix C** for the calculation of the estimated flow contribution from WP2-DP2 into the main water channel). It is noted that prior to the sampling at WP2-DP2, no rain was observed and the stormwater at WP2-DP2 was clear with low turbidity. However, at the time of sampling at WP2-DP2, light rain and wind was observed and the stormwater at WP2-DP2 was light brown with medium turbidity. Refer to **Appendix B** for detailed photos.
- Additional observation:
  - One discharge point (WP1-DP1) was observed immediately downstream / north of WP1. Minor flow contribution was observed at the time of sampling. The estimated flow contribution from WP1-DP1 into the main water channel is 0.2% (Refer to **Appendix C** for the calculation of the estimated flow contribution from WP1-DP1 into the main water channel). Refer to **Appendix A** for approximate location of WP1-DP1. Refer to **Appendix B** for a detailed photo.

7.2 FIELD PARAMETERS

The parameters from each location sampled are presented in **Table 7-1**.

Table 7-1 Field Physico-chemical Parameters and Field Observations – 22 February 2023

Location ID / Field Perimeter	WP1 (upstream)	WP2 (downstream)	WP2-DP1 (downstream eastern discharge point)	WP2-DP1 (downstream western discharge point)
Water Depth (m)	0.2 to 0.3	0.2 to 0.3	0.008	0.01 to 0.02
Estimated Flow Rate	Medium to high	High	High	High
Temperature (°C)	21.8	21.9	21.8	21.8
pH	7.50	7.63	9.32	7.33
Electrical Conductivity (µS/cm)	693	685	808	548
Dissolved Oxygen (mg/L)	6.45	6.50	4.25	4.89
Dissolved Oxygen (%)	92.2	92.1	50.7	55.8
Oxidation-Reduction Potential (mV)	118.1	147.8	103.5	138.3
SHE[1] Redox Potential (mV)	324.9[2]	354.6[2]	310.3[2]	345.1[2]
Condition	Clear and low turbidity	Clear and low turbidity	Clear and low turbidity	• Prior to sampling: Clear and low turbidity • At the time of sampling: light brown and medium turbidity

Note to Table

1 SHE – Standard Hydrogen Electrode

2 Water quality meter utilised on the day of monitoring contains Ag/AgCl reference electrode with 3.5 M KCl filling solution. As such, SHE was calculated based on Table 1 of US EPA document: SESDPROC-113-R2, Field Measurement of Oxidation-Reduction Potential (ORP).

7.3 SURFACE WATER ANALYTICAL RESULTS

Laboratory analytical results for the surface water samples collected are presented in **Appendix D**. Copies of the original laboratory reports, NATA-stamped laboratory certificates, and Chain of Custody documentation are included in **Appendix F**.

7.3.1 Syn-construction Quarterly Wet-Weather Event – 22 February 2023

The analytical results of the monitoring event indicate that:

- Concentrations of Chlorophyll-a were reported below the laboratory detection limit (<2 µg/L) at all sample locations;
- Concentrations of Oil and Grease were reported below the laboratory detection limit (<10 mg/L) at all sample locations;
- Concentrations of nutrients (total nitrogen and the total phosphorous) were reported:
  - Total nitrogen:
    - WP1: 3.2 mg/L.
    - WP2: 3.3 mg/L.
    - WP2-DP1: 4.7 mg/L.
    - WP2-DP2: 1.8 mg/L
  - Total phosphorous:
    - WP1: 0.15 mg/L.
    - WP2: 0.11 mg/L.
    - WP2-DP1: 0.05 mg/L.
    - WP2-DP1: 0.16 mg/L.
- TSS were reported:
  - WP1: 9.6 mg/L.
  - WP2: 12.0 mg/L.
  - WP2-DP1: 5.8 mg/L.
  - WP2-DP2: 270.0 mg/L.
- Turbidity was reported:
  - WP1: 11.0 NTU.
  - WP2: 14.0 NTU.
  - WP2-DP1: 3.8 NTU.
  - WP2-DP1: 290.0 NTU.

7.3.2 Baseline Results Comparison

One sampling event during the pre-construction period (baseline event) was undertaken on 10 March 2021 which was during dry conditions. It should be noted that wet-weather or storm-event pre-construction sampling events were not able to be conducted because of the lack of rainfall. The monitoring results of the baseline event (10 March 2021) has not been used for comparison with the monitoring results under this report because the conditions encountered were different (i.e., non-trigger for wet-weather event criteria). However, eight previous mid-construction wet weather sampling events were used to compare and check if there is any evidence of potential adverse impact to water quality caused by the construction activities.

Table 7-2 summarises the range and average numbers of each parameter from upstream and downstream in the previous eight wet-weather events between 20 March 2021 and 4 July 2022.

Table 7-2 Comparison of latest wet condition sampling event to previous wet condition sampling events

Monitoring Event		Previous Wet-Weather Events - Range				Previous Wet-Weather Events - Average				22 February 2023			
Location ID	Assessment Criteria	WP1	WP2	WP2-DP1[7]	WP2-DP2[2]	WP1	WP2	WP2-DP1[7]	WP2-DP2[2]	WP1	WP2	WP2-DP1	WP2-DP2
Temperature (ºC)	N/A[1]	15.9 - 22.6	15.9 -23.4	16 - 17.4	16	19.1	19.1	16.7	16.0	21.8	21.9	21.8	21.8
pH	6.5 - 8.5	**6.07** - 8.10	6.92 - **9.02**	**10.49** - **10.81**	7.29	7.38	7.81	10.7	7.29	7.50	7.63	**9.32**	7.33
EC (µS/cm)	125 – 2,200	230 - **2,500**	**92.9** - 659	400.6 - 502.3	375.5	673.5	399.6	451.5	375.5	693	685	808	548
DO (%)	85% - 110%	**52.9** - 98.7	**43.2** - 101.9	**61.8** -**64.4**	**67.7**	**69.9**	**69.4**	**63.1**	**67.7**	92.2	92.1	**50.7**	**55.8**
Chlorophyll a (µg/L)	3	<LOR[3] – 3.6	<LOR[3] - 2.7	<LOR[4]	<2	2[5]	2[5]	<LOR[4]	<2	<2	<2	<2	<2
Oil and Grease (mg/L)	Comparison	<10 - 10	<10	<10	<10	6[5]	<10	<10	<10	<10	<10	<10	<10
Nitrogen (Total) (mg/L)	0.35	**0.48** - **5**	**0.57** - **2.8**	**3.1**	**1.68**	**2.3**	**1.9**	**3.1**	**1.68**	**3.2**	**3.3**	**4.7**	**1.8**
Phosphorus Total (as P) (mg/L)	0.025	<LOR[6] - **0.23**	<LOR[6] -**0.28**	**0.04**	**0.14**	**0.17**	**0.15**	**0.04**	**0.14**	**0.15**	**0.11**	**0.05**	**0.16**
TSS (mg/L)	N/A[1]	<5 - 18	<5 - 47	23 - 42	26	10.8	15.8	32.5	26	9.6	12	5.8	270
Turbidity (NTU)	6 - 50	4.3 - 37	11 - 28	14 - 18	22	18.9	18.4	16	22	11	14	3.8	**290**

Note to Table

1 Not Applicable

2 For the wet-weather event, only one historical water sample was collected from WP2-DP2 on 4 July 2022.

3 Laboratory limit of reporting (LOR). For wet-weather event conducted on 20 March and 5 March 2021, the LOR of Chlorophyll a was used as 5 ug/L, and for wet-weather events conducted on 12 November, 26 November 2021, 23 February, 9 March and 4 July 2022, LOR of Chlorophyll a was used as 2 ug/L and for wet-weather event conducted on 24 May 2022, the LOR of Chlorophyll a was used as 10 ug/L.

4 Laboratory limit of reporting (LOR). For the wet-weather events, historical water samples from WP2-DP1 were only collected during on 24 May and 4 July 2022. 20 March and 5 March 2021 which the LOR of Chlorophyll a was used as 10 ug/L and 2 ug/L respectively.

5 Half of the value of the laboratory limit of reporting (LOR) was used for calculation of average when below detection limit reported.

6 Laboratory limit of reporting (LOR). Due to the laboratory matrix interference, the LOR of phosphate total (as P) in the wet-weather event conducted on 20 March 2021 was raised to 0.5 mg/L. The LOR of phosphate total (as P) in the rest wet-weather events was 0.01 mg/L.

7 For the wet-weather events, only two historical water samples was collected from WP2-DP2 on 24 May and 4 July 2022 respectively.

Highlighted cells indicate an exceedance of the applicable assessment criteria.

7.4 RESULTS DISCUSSION

7.4.1 Comparison to ANZG 2018 / ANZECC 2000 Criteria

Results for the syn-construction quarterly wet-weather event sampled on 22 February 2023 generally showed monitored parameters were within the adopted threshold criteria, with the exception of dissolved oxygen, total nitrogen, total phosphorous, turbidity, and pH:

- pH measured at WP1, WP2 and WP2-DP2 were within the adopted criterion range, whereas the pH value of 9.32 measured at WP2-DP1 (downstream eastern discharge point sample) was above the adopted criterion range (i.e., 6.5 – 8.5), which is consistent with the previous monitoring results obtained on 24 May and 4 July 2022 under similar weather conditions.
- Dissolved oxygen saturation measured at WP1 upstream and WP2 downstream sampling points were within the adopted criteria range (85% - 110%), whereas WP2-DP1 downstream eastern discharge point (50.7%) and WP2-DP2 downstream western discharge point (55.8%) were below the adopted criteria range. This is not considered to be a significant issue based on:
  - Dissolved oxygen saturation measured at WP2-DP1 was within the historical range measured at WP2 and close to the lower limit of historical range measured at WP1 (52.9 to 98.7%).
  - Dissolved oxygen saturation measured at WP2-DP2 was within the historical ranges measured at WP1 and WP2.
- Total nitrogen reported for each of the four locations (WP1, WP2, WP2-DP1 and WP2-DP2) were above the adopted criterion range. However, this is not considered to be a significant issue based on:
  - The total nitrogen result at WP1 (3.2 mg/L) was within the historical range obtained from previous mid-construction wet-weather events, which were ranged from 0.48 to 5.0 mg/L.
  - The total nitrogen result at WP2 (3.3 mg/L) was slightly over the historical range reported for samples collected during previous mid-construction wet-weather sampling events, which ranged between 0.57 mg/L and 2.8 mg/L.
  - The total nitrogen result at WP2-DP1 (4.7 mg/L) was within the historical range measured at WP1, which was reported with concentrations between 0.48 mg/L and 5 mg/L. Furthermore, the high level of total nitrogen is not considered likely to be a result of the construction activities undertaken based on:
    - Results from previous sampling (Cardno now Stantec, 2022a) noted that there is an off-site flow contribution to the eastern downstream discharge point (WP2-DP1) from the urban run-off drainage system at Shadforth Street. Results from this previous sampling indicated that a higher concentration of total nitrogen (i.e., an order of magnitude higher than the WP2-DP1 results) was present in the surface water coming from this off-site source. This off-site source with elevated nitrogen concentration was documented in the following report:
      - Cardno now Stantec (2022a) Source Investigation for Algal Growth Observed within the V-Drain near Shadforth Street. Date: 2 September 2022. Revision: RevA. Report reference: 304100142_TM01_V-Drain Algal Growth_RevA.
  - The total nitrogen result at WP2-DP2 (1.8 mg/L) was closer to the guideline criterion of 0.35 mg/L compared to the results reported for the samples collected at WP1, WP2 and WP2-DP1.
- Total Phosphorous reported for each of the four locations (WP1, WP2, WP2-DP1 and WP2-DP2) were above the adopted criteria. However, this is not considered to be a significant issue based on:

  - The total phosphorus result at WP1 (0.15 mg/L) was within the historical range obtained from previous mid-construction wet-weather events, which historically fluctuated between below the laboratory detection limit to 0.23 mg/L.
  - The total phosphorus result at WP2 (0.11 mg/L) was within the historical range obtained from previous mid-construction wet-weather events, which historically fluctuated between below the laboratory detection limit to 0.28 mg/L.
  - The total phosphorus result at WP2-DP1 (0.05 mg/L) is slightly higher than the two historically results (both 0.04 mg/L) obtained from WP2-DP1 for wet-weather events. Furthermore, the total phosphorus result at WP2-DP1 is with the historical range measured at WP1 and WP2.
  - The total phosphorus result at WP2-DP2 (0.16 mg/L) is slightly higher than the historically results (both 0.14 mg/L) obtained from WP2-DP2 for wet-weather event. Furthermore, the total phosphorus result at WP2-DP1 is within the historical range measured at WP1 and WP2.
- Turbidity measured at WP1, WP2 and WP2-DP1 were within the adopted criterion range (6 – 50 NTU), whereas turbidity measured at WP2-DP2 downstream western discharge point (290 NTU) was above the adopted criterion range. However, this is not considered to be a significant issue based on:
  - The stormwater discharged from WP2-DP2 discharge point was not from the Wiley Park Station Upgrade worksite.
  - The increased level of turbidity was potentially caused by the disturbance of sediment in the WP2-DP2 discharge point by the light rain and wind during sampling. Refer to **Appendix B** for detailed field note and **Appendix C** for detailed photos.

7.4.2 Comparison of Upstream and Downstream Results

Results between upstream and downstream samples collected during the syn-construction quarterly wet-weather event were comparable, with the exception of:

- The pH measurement at WP2-DP1 downstream eastern discharge point sample (9.32) was higher than the results measured at WP1 upstream sample location (7.50) while the pH measurement at WP2-DP2 downstream western discharge point sample (7.33) was lower than the pH measured at WP1 upstream sample location. As such, flow from the downstream eastern discharge point (WP2-DP1) was highly likely to contribute to the higher pH measured in the downstream water body. Additional investigation works to identify the potential source(s) of this elevated pH measured at the upstream area of WP2-DP1 were undertaken and documented in the following reports:
  - Cardno now Stantec (2022b) *Surface Water Monitoring Report – Wiley Park Station*. Date: 15 September 2022. Revision: Rev0. Report reference: 304100142_R010_SWM_WileyPark_Rev0.
  - Cardno now Stantec (2022c) *Additional pH Source Investigation within the Platform 1 Drainage System at Wiley Park Station*. Date: 9 November 2022. Revision: Rev0. Report reference: 304100142_TM02_Add_pH_Inv_P1_Rev0.

Two potential sources identified in these reports were based on the additional investigation works undertaken:

- Stabilised sand / cement mix backfill surrounding the On-Site Detention Tank (OSD): As noted by Downer EDI, stabilised sand with cement as per the Metro T2M design was used as backfill

materials around the OSD. The cement-stabilised sand is considered to be a source of this elevated pH that was measured in the surface water that was flowing in the soil trenches next to the OSD and that comprised part of the discharge sampled at WP2-DP1.

- Alkaline soil / sediment within the Platform 1 drainage system: The alkaline soil / sediment identified within the Platform 1 drainage system is considered likely to be the main source of the elevated pH measured in the surface water collected within the Platform 1 drainage system, which comprises part of the upstream flow contribution at WP2-DP1.
- Total nitrogen result at WP2-DP1 downstream eastern discharge point (4.7 mg/L) was higher than the WP1 upstream sampling point (3.2 mg/L). However, it is not considered this is a significant issue based on:
  - Total nitrogen result at the WP2 downstream (3.3 mg/L) is slightly higher than WP1 upstream (3.2 mg/L).
  - The reported concentration of total nitrogen is not considered likely to be a result of the construction activities undertaken based on:
    - Results from previous sampling (Cardno now Stantec, 2022a) noted that there is an off-site flow contribution to the eastern downstream discharge point (WP2-DP1) from the urban run-off drainage system at Shadforth Street. Results from this previous sampling indicated that a higher concentration of total nitrogen (i.e., an order of magnitude higher than the WP2-DP1 results) was present in the surface water coming from this off-site source.
- Total suspended solids at WP2-DP2 downstream western discharge point (270 mg/L) was significantly higher than the WP1 upstream sampling point (9.6 mg/L) whereas total suspended solids result at WP2-DP1 downstream eastern discharge point (5.8 mg/L) was significantly lower than the WP1 upstream sampling point. However, it is not considered a significant issue based on:
  - The stormwater discharged from WP2-DP2 discharge point was not from the Wiley Park Station Upgrade worksite.
  - The increased level of total suspended solids was potentially caused by the disturbance of sediment in the WP2-DP2 discharge point by the light rain and wind at the time of sampling. Refer to **Appendix B** for detailed field note and **Appendix C** for detailed photos.
- Turbidity result at WP2-DP2 downstream western discharge point (290 NTU) was significantly higher than the WP1 upstream sampling point (11 mg/L) whereas turbidity result at WP2-DP1 downstream eastern discharge point (3.8 mg/L) was significantly lower than the WP1 upstream sampling point. However, it is not considered a significant issue based on:
  - The stormwater discharged from WP2-DP2 discharge point was not from the Wiley Park Station Upgrade worksite.
  - The increased level of turbidity was potentially caused by the disturbance of sediment in the WP2-DP2 discharge point by the light rain and wind at the time of sampling. Refer to **Appendix B** for detailed field note and **Appendix C** for detailed photos.

8.0 CONCLUSION

Stantec was engaged to undertake surface water monitoring of the unnamed channel west of Wiley Park Station in accordance with the SWMP for the project. The objective of the works was to evaluate whether construction activities are impacting water quality downstream of the project footprint in the unnamed channel that receives in part stormwater from the construction area.

This report presents monitoring data of a syn-construction quarterly wet-weather event on 22 February 2023. Based on the investigation results obtained, following conclusions are made:

- ANZG 2018 / ANZECC 2000 comparison and assessment:
  - During this syn-construction quarterly wet-weather monitoring event, monitored parameters were either within the adopted ANZG 2018 / ANZECC 2000 screening criteria or the exceedances are considered insignificant for dissolved oxygen saturation, total nitrogen, total phosphorous, and turbidity based on the review of historical wet-weather monitoring events results.
  - However, high pH that exceeded the ANZG 2018 / ANZECC 2000 guideline value was measured at the downstream discharge point WP2-DP1.
- Upstream and downstream comparison and assessment:
  - During this wet-weather monitoring event, the results for the samples collected at the downstream sampling point WP2, downstream discharge points (WP2-DP1 and WP2-DP2), and upstream sampling point WP1 were either comparable or the differences in concentrations were considered either insignificant or unlikely a result from the construction activities within Wiley Park worksite.
  - However, the elevated pH measured at the downstream discharge point WP2-DP1 was considered a result of the construction activities within Wiley Park worksite based on the findings outlined in Cardno now Stantec (2022b and 2022c).

8.1 RECOMMENDATIONS

Based on the findings outlined in Cardno now Stantec (2022b and 2022c), recommendations regarding the elevated pH identified at WP1-DP2 and the two flow contributions (platform 1 drainage system and temporary surface water erosion and sediment control trenches) are made as follows:

- Temporary surface water erosion and sediment control trenches: prior to rainfall events, it is recommended that installation of an impermeable physical barrier (e.g., black plastic sheeting) within the drainage trench path surrounding the construction footprint of the OSD tank. This would prevent surface water from coming into direct contact with the stabilised sand / cement mixture used to backfill the area.
- Platform 1 drainage system:
  - Removal of soil / sediment materials from the Platform 1 drainage system: the identified alkaline soil / sediment should be removed from the Platform 1 drainage system after construction has been completed within the Platform 1 in general accordance with the following steps:
    - Excavation of any excessive soil / sediment materials from the Platform 1 drainage system including aco drain and connecting underground drainage pipe to the extent practicable.
    - Flushing of the soil / sediment materials that remain within the Platform 1 drainage system including aco drain and connecting underground drainage pipe following the excavation work outlined in the previous bullet point.
    - Following the flushing work, the two drainage pits located near the downstream end of aco drain should be checked and any soil / sediment materials should be removed by excavation.

- Validation test: following the removal and cleaning work of the Platform 1 drainage system, a validation test is recommended to check the effectiveness of the mitigation works undertaken by applying tap water at the start / upstream of the Platform 1 drainage system and measuring pH using a calibrated water quality meter at multiple downstream locations along the aco drain and associated drainage system.

9.0 REFERENCES

- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZECC Guidelines').
- ANZECC (2000). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the 'ANZECC Guidelines').
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (known as 'ANZG Guidelines').
- Contaminated Land Management Act 1997.
- Cardno now Stantec (2022a). Source Investigation for Algal Growth Observed within the V-Drain near Shadforth Street, dated 2 September 2022.
- Cardno now Stantec (2022b). Surface Water Monitoring Report – Wiley Park Station, dated 15 September 2022.
- Cardno now Stantec (2022c). Additional pH Source Investigation within the Platform 1 Drainage System at Wiley Park Station, date: 9 November 2022.
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book').
- Environmental Planning and Assessment Act 1979 (EP&A Act).
- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book').
- Protection of the Environment Operations Act 1997 (POEO Act).
- Southwest Metro – Hurlstone Park, Belmore and Wiley Park Station Upgrades – Soil and Water Management Plan, dated 16 February 2021.
- The Sydney Metro City and Southwest - Sydenham to Bankstown Upgrade Conditions of Approval SSI-8256, determined 12 December 2018.
- Water Management Act 2000 Water Management (General) Regulation 2018.

10.0 LIMITATIONS

This assessment has been undertaken in general accordance with the current industry standards for a surface water monitoring report for the purpose and objectives and scope identified in this report. The agreed scope of this assessment has been limited for the current purposes of the Client. The assessment may not identify contamination occurring in all areas of the site, or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained. This Document has been provided by Stantec subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Stantec's proposal and Section 1 of this report and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of Stantec's services are as described in Stantec's proposal, and are subject to restrictions and limitations. Stantec did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Stantec in regards to it.
- Conditions may exist which were undetectable given the limited nature of the enquiry Stantec was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Stantec's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Stantec to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.
- Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Stantec for incomplete or inaccurate data supplied by others.
- Stantec may have retained sub consultants affiliated with Stantec to provide services for the benefit of Stantec. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Stantec's affiliated companies, and their employees, officers and directors.

This assessment report is not any of the following:

- A Site Audit Report or Site Audit Statement (SAR/SAS) as defined under the Contaminated Land Management Act, 1997 or an assessment sufficient for an Environmental Auditor to be able to conclude a SAR/SAS.
- A geotechnical report and the bore logs/test pit logs may not be sufficient for geotechnical advice.
- An assessment of surface water contaminants potentially arising from other sites or sources nearby.
- A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land

Appendix A FIGURES

Downer
Relationships creating success

Surface Water Monitoring

WILEY PARK STATION

Legend

- Monitoring Location
- Discharging Points
- Watercourse (NSW SS)
- Cadastre (NSW SS, 2022)

FIGURE GS004

1:500 Scale at A3

m
0 5 10 15 20

N

Cardno now Stantec

Map Produced by Stantec Australia Pty Ltd (WNE)
Date: 2022-08-30 | Project:304500142
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30161-GS-004-SurfaceWater.mxd 01
Aerial imagery supplied by MetroMap (June 2022)

Appendix B PHOTOGRAPHS

Photograph 1. Condition observed from sampling location of WP1 during the monitoring event – 22 February 2023.

Photograph 2. Low stormwater in-flow observed from the discharge point WP1-DP1 which was located within the rail corridor and immediately downstream / north from WP1 during the monitoring event – 22 February 2023.

Photograph 3. Condition observed from sampling location of WP2 during the monitoring event – 22 February 2023.

Photograph 4. High flow stormwater observed from the downstream discharge point WP2-DP1 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – 22 February 2023.

Photograph 5. High flow stormwater observed from the downstream discharge point WP2-DP1 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – 22 February 2023.

Photograph 6. High flow stormwater observed from the downstream discharge point WP2-DP2 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – approximately 1:30 pm 22 February 2023 (before sampling).

Photograph 7. High flow stormwater observed from the downstream discharge point WP2-DP2 which were located within the rail corridor and immediately upstream / south from WP2 during the monitoring event – approximately 2:30 pm 22 February 2023 (at the time of sampling).

Appendix C FIELD DOCUMENTS

14/2/23

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument **YSI Quatro Pro Plus**
Serial No. **09K100887**

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00		389384	pH 7.04
2. pH 4.00		pH 4.00		389384	pH 4.01
3. mV		234.94mV		395557/395763	234.9mV
4. EC		2.76mS		396172	2761mS
5. D.O		0.00%		12110	-0.2%
6. Temp		22.3°C		MultiTherm	23.3°C

Calibrated by: **Lauren Soutar**

Calibration date: **14/02/2023**

Next calibration due: **16/03/2023**

Surface Water Sampling Field Record

Site / Project:	Wiley Park SWM				**Sampling Point:**
Client:	Downer				Job No. 304500142
Person Sampling:	Jiaqi Zhou				Initials: JZ
Site Details					
Sampling Equipment – Directly into bottle / Water Scoop / Van Dorn Sampler / Other:					Date: 22.02.2023
Observations on Site: Last Rain Event / Recent Storms / Releases / Other :					
Sample Details, Observations, GPS Coordinates & Field Physiochemical Measurements (if possible, record parameters once stable)					
Sample ID	WP1	WP2	WP2 - DP1	~~WP2-DP1~~ WP2-DP2	
Start Time:	12:45pm	1:30pm	2:00pm	2:30pm	
Easting	/	/	/	/	
Northing	/	/	/	/	
Sample Depth (m)	~~0 - 0.1~~	0 - 0.1	0 - ~~0.05~~ 0.008	0 - ~~0.05~~ 0.02	
Water Body Depth (m)	~~0.2-0.3~~	0.2 - 0.3	0.008	~~0.05~~ 0.01 - 0.02	
Location – Onsite/Offsite /Inlet/Outlet/ Middle	Upstream	Downstream	Downstream discharge point (East)	Downstream discharge point (west)	
Flow Rate None/ Low / Med / High	Med to Hig	Hig	Hig	Hig	
DO (mg/L)	6.45	6.50	4.25	4.89	
DO (%)	92.2	92.1	50.7	55.8	
spc EC (µS/Cm)	693	685	808	548	
pH	7.50	7.63	9.32	7.33	
ORP (mV)	118.1	147.8	103.5	138.3	
Temp (°C)	21.8	21.9	21.8	21.8	
Water Colour	clear	clear	clear	light brown	
Turbidity Low / Med / High	Low	Low	low	Med	
Observations / Notes	upstream DP minor contribution flow - low <1%		WP2-DP1 contributed approx ~~6%~~ 2%	WP2-DP2 contributed approx ~~3%~~ 5%	
Sample Container & Preservation Data					
Number of sample containers:	6	6	6	6	
Container Volume			Observation: Turbidity of WP2-DP2 was low at around 1:30 pm with no rain. At the time of sampling of WP2-DP2 at around 2:30pm, the turbidity was medium under light raining. This could be caused by ~~the disturb of the sediment in the WP2-DP2 by the~~ rain.		
Container Type					
Preservation					
Sample Number (for Lab ID):		QA100			
QC Dup Sample No.:		QA200			

Checklist:

- **Ice**
- **Photos (water body and samples)**
- **Cal certificate**
- [redacted]
- **Weather records**
- **COC**
  - **QA200 sample needs to be sent to ALS**
  - **Chlorophyll a from 5 ug/L to 2 ug/L)**

WP2

Width : 1 m

Depth : 0.25 m

Flow : 1 (unit)

$1 \times 0.25 \times 1 = 0.25$

WP2-DP1

Width : 0.6 m

Depth : 0.01

Flow : 0.8 (unit)

$0.6 \times 0.01 \times 0.8 = 0.0048$

$\frac{WP2-DP1}{WP2} = \frac{0.0048}{0.25} = 1.92\%$

$\approx 2\%$

WP2 - DP2

(2 discharge points)

Width : 0.2+0.2=0.4

Depth : 0.02

Flow : 0.8 (Unit)

$0.4 \times 0.02 \times 0.8 = 0.064$

$\frac{WP2-DP2}{WP2} = \frac{0.064}{0.25} = 25.6\%$

$\approx 3\%$

WP1 - DP1

Width : 0.4m

Depth : 0.005

Flow : 0.2 (Unit)

$0.4 \times 0.005 \times 0.2 = 0.0004$

$\frac{WP1-DP1}{WP2} = \frac{0.0004}{0.25} = 0.16\%$

$\approx 0.2\%$

Australian Government
Bureau of Meteorology

Latest Weather Observations for Canterbury

IDN60801

Issued at 10:03 am EDT Wednesday 22 February 2023 (issued every 10 minutes, with the page automatically refreshed every 10 minutes)

Station Details **ID:** 066194 **Name:** CANTERBURY RACECOURSE AWS **Lat:** -33.91 **Lon:** 151.11 **Height:** 3.0 m

Data from the previous 72 hours. | See also: Recent months at Canterbury

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/10:00am	21.6	18.1	13.5	60	4.7	SE	24	35	13	19	-	-	0.0
22/09:30am	21.7	18.2	14.6	64	4.2	SE	26	39	14	21	-	-	0.0
22/09:00am	21.3	17.7	15.2	68	3.6	SE	28	43	15	23	-	-	90.8
22/08:37am	20.7	16.9	14.8	69	3.5	SE	28	50	15	27	-	-	90.8
22/08:30am	21.3	18.0	14.9	67	3.8	SE	26	43	14	23	-	-	90.8
22/08:00am	21.5	17.7	14.6	65	4.0	SE	28	44	15	24	-	-	90.8
22/07:30am	21.1	17.7	15.9	72	3.1	SE	28	46	15	25	-	-	90.8
22/07:16am	21.2	17.5	15.1	68	3.6	SE	28	48	15	26	-	-	90.8
22/07:00am	21.1	18.0	14.5	66	3.9	SE	24	39	13	21	-	-	90.8
22/06:30am	20.9	16.6	14.5	67	3.7	SE	30	43	16	23	-	-	90.8
22/06:00am	20.7	17.7	15.9	74	2.9	SE	26	43	14	23	-	-	90.8
22/05:48am	20.7	17.7	16.9	79	2.3	SE	28	46	15	25	-	-	90.8
22/05:30am	20.2	18.3	15.8	76	2.6	SE	20	33	11	18	-	-	90.8
22/05:07am	19.6	16.2	15.7	78	2.3	SE	28	46	15	25	-	-	90.8
22/05:00am	19.3	15.0	16.0	81	2.0	SE	33	46	18	25	-	-	90.8
22/04:37am	20.0	16.8	18.1	89	1.2	SSE	32	52	17	28	-	-	90.8
22/04:36am	19.9	17.5	18.2	90	1.1	SSE	28	48	15	26	-	-	90.8
22/04:30am	19.9	18.1	18.7	93	0.7	SSE	26	41	14	22	-	-	90.8
22/04:09am	19.4	17.2	18.7	96	0.4	SSE	28	50	15	27	-	-	90.2
22/04:00am	19.6	18.2	18.9	96	0.4	SSE	24	37	13	20	-	-	89.4
22/03:48am	19.9	18.7	18.4	91	0.9	SSE	22	41	12	22	-	-	88.2
22/03:45am	20.1	18.4	18.2	89	1.2	SSE	24	43	13	23	-	-	88.0
22/03:33am	20.1	18.7	18.8	92	0.8	SSE	24	48	13	26	-	-	87.8
22/03:30am	20.2	18.4	18.7	91	0.9	SSE	26	48	14	26	-	-	87.8
22/03:00am	21.0	18.5	18.0	83	1.9	SSE	28	46	15	25	-	-	87.6
22/02:38am	21.1	18.8	18.5	85	1.6	SSE	28	46	15	25	-	-	87.6
22/02:30am	20.8	19.4	18.7	88	1.3	SSE	24	46	13	25	-	-	87.6
22/02:26am	20.7	19.3	18.8	89	1.2	SSE	24	46	13	25	-	-	87.6
22/02:10am	20.6	19.7	19.1	91	0.9	SSE	22	39	12	21	-	-	86.6
22/02:03am	20.6	19.8	19.3	92	0.8	SSE	22	32	12	17	-	-	85.8
22/02:00am	20.7	20.0	19.4	92	0.8	SSE	22	32	12	17	-	-	85.6

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
22/01:30am	20.3	20.9	20.3	100	0.0	SE	17	26	9	14	-	-	82.2
22/01:00am	20.2	17.8	20.0	99	0.1	SSE	32	50	17	27	-	-	61.8
22/12:56am	20.3	18.6	19.8	97	0.3	SE	28	50	15	27	-	-	59.6
22/12:53am	20.8	20.2	20.5	98	0.2	SE	24	44	13	24	-	-	59.0
22/12:40am	20.9	21.3	20.9	100	0.0	ESE	20	30	11	16	-	-	58.2
22/12:30am	20.8	21.7	20.8	100	0.0	ESE	17	24	9	13	-	-	58.0
22/12:15am	20.9	21.3	20.6	98	0.2	SE	19	30	10	16	-	-	56.6
22/12:08am	20.8	21.5	20.5	98	0.2	SE	17	28	9	15	-	-	55.4
22/12:00am	20.8	21.0	20.6	99	0.1	SE	20	32	11	17	-	-	55.0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
21/11:30pm	20.5	21.1	20.3	99	0.1	SE	17	24	9	13	-	-	45.8
21/11:00pm	20.8	20.6	19.8	94	0.6	SE	20	32	11	17	-	-	41.2
21/10:59pm	20.8	20.5	19.6	93	0.8	SE	20	32	11	17	-	-	41.0
21/10:57pm	20.9	20.9	19.7	93	0.8	SE	19	32	10	17	-	-	40.8
21/10:40pm	20.9	20.1	20.1	95	0.5	SE	24	39	13	21	-	-	40.6
21/10:30pm	21.1	21.1	20.1	94	0.6	SE	20	30	11	16	-	-	40.2
21/10:24pm	21.1	22.0	20.8	98	0.2	SSE	17	28	9	15	-	-	40.2
21/10:00pm	20.9	21.4	20.9	100	0.0	SSE	19	33	10	18	-	-	40.0
21/09:30pm	20.7	21.0	20.7	100	0.0	S	20	43	11	23	-	-	39.4
21/09:00pm	20.5	20.7	20.5	100	0.0	S	20	32	11	17	-	-	36.0
21/08:30pm	20.9	21.4	20.9	100	0.0	SSE	19	35	10	19	-	-	30.8
21/08:00pm	21.0	20.5	20.8	99	0.1	SSE	24	39	13	21	-	-	20.2
21/07:30pm	21.2	21.8	21.0	99	0.1	S	19	37	10	20	-	-	15.0
21/07:00pm	21.3	21.2	20.8	97	0.3	SSW	22	44	12	24	-	-	7.2
21/06:44pm	22.3	21.1	20.8	91	1.0	S	28	44	15	24	-	-	1.0
21/06:30pm	23.8	23.9	20.3	81	2.3	S	20	33	11	18	-	-	0.0
21/06:00pm	25.4	25.4	20.2	73	3.4	SSE	20	28	11	15	-	-	0.0
21/05:30pm	25.8	25.0	20.1	71	3.7	SE	24	32	13	17	-	-	0.0
21/05:00pm	25.8	24.4	19.7	69	3.9	SE	26	35	14	19	-	-	0.0
21/04:30pm	26.8	26.8	18.9	62	5.1	ESE	17	24	9	13	-	-	0.0
21/04:00pm	28.1	27.2	18.2	55	6.3	E	20	30	11	16	-	-	0.0
21/03:30pm	28.3	27.1	17.5	52	6.8	E	20	28	11	15	-	-	0.0
21/03:00pm	28.6	27.3	18.1	53	6.7	E	22	32	12	17	-	-	0.0
21/02:30pm	28.4	28.2	18.5	55	6.3	ENE	17	26	9	14	-	-	0.0
21/02:00pm	28.7	27.7	17.6	51	7.0	ENE	19	26	10	14	-	-	0.0
21/01:30pm	28.6	28.0	18.4	54	6.5	ENE	19	24	10	13	-	-	0.0
21/01:00pm	28.6	28.0	17.5	51	7.0	ENE	17	24	9	13	-	-	0.0
21/12:30pm	28.7	28.1	16.6	48	7.5	E	15	24	8	13	-	-	0.0
21/12:00pm	28.8	30.0	18.3	53	6.7	E	9	20	5	11	-	-	0.0
21/11:30am	28.6	29.4	18.1	53	6.7	ESE	11	19	6	10	-	-	0.0
21/11:00am	27.1	28.9	17.3	55	6.1	NE	4	9	2	5	-	-	0.0
21/10:30am	27.1	28.6	18.1	58	5.7	N	7	15	4	8	-	-	0.0
21/10:00am	26.4	27.9	17.5	58	5.6	N	6	11	3	6	-	-	0.0
21/09:30am	26.6	28.8	19.2	64	4.8	ENE	6	13	3	7	-	-	0.0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
21/09:00am	24.8	28.2	20.1	75	3.0	ESE	2	7	1	4	-	-	0.0
21/08:30am	24.5	28.3	21.0	81	2.3	ESE	2	9	1	5	-	-	0.0
21/08:00am	23.0	27.9	23.0	100	0.0	ESE	2	9	1	5	-	-	0.0
21/07:30am	20.5	24.5	20.5	100	0.0	CALM	0	0	0	0	-	-	0.0
21/07:09am	19.7	23.3	19.7	100	0.0	CALM	0	0	0	0	-	-	0.0
21/07:00am	19.7	23.3	19.7	100	0.0	CALM	0	0	0	0	-	-	0.0
21/06:41am	19.3	22.7	19.3	100	0.0	CALM	0	0	0	0	-	-	0.0
21/06:30am	19.2	22.5	19.2	100	0.0	CALM	0	0	0	0	-	-	0.0
21/06:00am	19.1	22.4	19.1	100	0.0	CALM	0	0	0	0	-	-	0.0
21/05:42am	18.8	22.0	18.8	100	0.0	CALM	0	0	0	0	-	-	0.0
21/05:30am	18.6	21.7	18.6	100	0.0	CALM	0	0	0	0	-	-	0.0
21/05:00am	19.9	23.6	19.9	100	0.0	CALM	0	0	0	0	-	-	0.0
21/04:30am	19.8	23.4	19.8	100	0.0	CALM	0	0	0	0	-	-	0.0
21/04:00am	19.8	23.3	19.6	99	0.1	CALM	0	6	0	3	-	-	0.0
21/03:30am	20.1	23.8	19.9	99	0.1	CALM	0	0	0	0	-	-	0.0
21/03:00am	20.0	23.3	19.2	95	0.5	CALM	0	0	0	0	-	-	0.0
21/02:30am	20.6	24.2	19.8	95	0.5	CALM	0	0	0	0	-	-	0.0
21/02:00am	20.5	23.8	19.0	91	0.9	CALM	0	0	0	0	-	-	0.0
21/01:30am	21.0	24.4	19.3	90	1.1	CALM	0	0	0	0	-	-	0.0
21/01:00am	21.5	24.8	19.1	86	1.5	CALM	0	0	0	0	-	-	0.0
21/12:30am	22.7	25.0	19.5	82	2.0	N	6	9	3	5	-	-	0.0
21/12:00am	23.3	24.8	19.7	80	2.3	NNE	11	20	6	11	-	-	0.0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
20/11:30pm	23.4	23.9	19.3	78	2.6	NE	15	22	8	12	-	-	0.0
20/11:00pm	23.6	23.8	19.3	77	2.7	NE	17	28	9	15	-	-	0.0
20/10:30pm	23.8	24.6	19.1	75	3.0	NE	13	24	7	13	-	-	0.0
20/10:00pm	23.9	24.4	19.2	75	3.0	NE	15	28	8	15	-	-	0.0
20/09:30pm	24.1	24.6	19.2	74	3.1	NE	15	24	8	13	-	-	0.0
20/09:00pm	24.1	24.6	19.2	74	3.1	NE	15	28	8	15	-	-	0.0
20/08:30pm	24.3	25.0	18.9	72	3.4	NE	13	26	7	14	-	-	0.0
20/08:00pm	24.7	24.7	18.9	70	3.7	NNE	17	30	9	16	-	-	0.0
20/07:30pm	25.1	25.5	19.0	69	3.9	NE	15	22	8	12	-	-	0.0
20/07:00pm	26.0	25.5	18.7	64	4.7	NE	19	28	10	15	-	-	0.0
20/06:30pm	26.7	26.4	19.1	63	4.9	NE	19	32	10	17	-	-	0.0
20/06:00pm	27.0	26.3	18.6	60	5.4	NE	20	35	11	19	-	-	0.0
20/05:30pm	27.7	27.2	19.0	59	5.6	ENE	20	35	11	19	-	-	0.0
20/05:00pm	28.0	26.4	18.4	56	6.1	ENE	24	35	13	19	-	-	0.0
20/04:30pm	28.3	27.4	19.0	57	6.0	NE	22	35	12	19	-	-	0.0
20/04:00pm	28.5	27.5	18.9	56	6.2	ENE	22	33	12	18	-	-	0.0
20/03:30pm	28.7	28.1	20.4	60	5.5	ENE	24	41	13	22	-	-	0.0
20/03:00pm	28.2	28.1	20.0	61	5.4	ENE	20	30	11	16	-	-	0.0
20/02:30pm	28.9	29.1	21.4	64	5.0	ENE	22	32	12	17	-	-	0.0
20/02:00pm	29.3	31.1	21.8	64	5.0	NE	15	24	8	13	-	-	0.0
20/01:30pm	28.7	29.4	20.4	60	5.5	ENE	17	22	9	12	-	-	0.0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
20/01:00pm	28.6	30.0	21.1	64	5.0	E	15	26	8	14	-	-	0.0
20/12:30pm	28.9	30.8	20.6	61	5.5	NE	11	17	6	9	-	-	0.0
20/12:00pm	28.8	31.7	21.1	63	5.1	N	7	13	4	7	-	-	0.0
20/11:30am	27.7	29.9	20.5	65	4.7	N	9	19	5	10	-	-	0.0
20/11:00am	27.0	28.8	20.3	66	4.4	N	11	19	6	10	-	-	0.0
20/10:30am	26.1	28.1	20.7	72	3.5	N	11	17	6	9	-	-	0.0
20/10:00am	24.6	26.2	19.9	75	3.0	NNW	11	19	6	10	-	-	0.0
20/09:30am	24.4	25.8	20.3	78	2.7	N	13	20	7	11	-	-	0.0
20/09:00am	23.9	25.9	20.0	79	2.5	N	9	17	5	9	-	-	0.2
20/08:30am	23.5	25.4	20.6	84	1.9	N	11	17	6	9	-	-	0.2
20/08:00am	22.8	26.6	21.6	93	0.8	N	4	7	2	4	-	-	0.2
20/07:30am	21.6	26.1	21.6	100	0.0	CALM	0	0	0	0	-	-	0.2
20/07:00am	21.1	25.4	21.1	100	0.0	CALM	0	0	0	0	-	-	0.2
20/06:30am	20.7	24.8	20.7	100	0.0	CALM	0	0	0	0	-	-	0.2
20/06:00am	20.2	24.0	20.2	100	0.0	CALM	0	0	0	0	-	-	0.2
20/05:30am	19.8	23.4	19.8	100	0.0	CALM	0	0	0	0	-	-	0.2
20/05:23am	19.9	23.6	19.9	100	0.0	CALM	0	0	0	0	-	-	0.2
20/05:00am	19.6	23.1	19.6	100	0.0	CALM	0	0	0	0	-	-	0.2
20/04:30am	20.0	23.7	20.0	100	0.0	CALM	0	0	0	0	-	-	0.2
20/04:00am	20.0	23.7	20.0	100	0.0	CALM	0	0	0	0	-	-	0.2
20/03:46am	19.7	23.3	19.7	100	0.0	CALM	0	0	0	0	-	-	0.2
20/03:44am	20.6	24.6	20.6	100	0.0	CALM	0	0	0	0	-	-	0.2
20/03:30am	20.4	23.8	20.2	99	0.1	NE	2	6	1	3	-	-	0.2
20/03:24am	19.9	23.3	19.4	97	0.3	CALM	0	0	0	0	-	-	0.2
20/03:00am	20.6	24.4	20.1	97	0.3	CALM	0	0	0	0	-	-	0.2
20/02:30am	20.9	24.8	20.4	97	0.3	CALM	0	2	0	1	-	-	0.2
20/02:00am	21.2	25.3	20.7	97	0.3	CALM	0	0	0	0	-	-	0.2
20/01:30am	21.0	24.9	20.3	96	0.4	CALM	0	0	0	0	-	-	0.2
20/01:00am	21.1	24.9	20.1	94	0.6	CALM	0	0	0	0	-	-	0.2
20/12:30am	21.7	25.7	20.5	93	0.8	CALM	0	0	0	0	-	-	0.2
20/12:00am	22.2	25.4	19.7	86	1.6	E	2	7	1	4	-	-	0.2

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
19/11:30pm	22.8	25.4	20.1	85	1.7	E	6	11	3	6	-	-	0.2
19/11:00pm	22.8	25.2	20.1	85	1.7	E	7	11	4	6	-	-	0.2
19/10:30pm	22.6	24.9	19.9	85	1.7	ENE	7	9	4	5	-	-	0.2
19/10:00pm	22.7	24.6	19.7	83	1.9	E	9	11	5	6	-	-	0.2
19/09:30pm	22.9	24.9	19.9	83	1.9	E	9	11	5	6	-	-	0.2
19/09:00pm	23.3	24.9	19.9	81	2.2	E	11	15	6	8	-	-	0.2
19/08:30pm	23.6	24.8	19.9	80	2.4	ESE	13	17	7	9	-	-	0.2
19/08:00pm	23.7	24.9	19.8	79	2.5	E	13	17	7	9	-	-	0.2
19/07:30pm	24.3	25.6	20.2	78	2.7	ESE	13	22	7	12	-	-	0.2
19/07:00pm	25.0	25.7	19.6	72	3.5	SE	15	24	8	13	-	-	0.2
19/06:30pm	25.5	25.7	19.4	69	3.9	ESE	17	24	9	13	-	-	0.2
19/06:00pm	26.0	26.4	19.9	69	4.0	SE	17	24	9	13	-	-	0.2

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
19/05:30pm	26.0	26.5	20.1	70	3.8	SE	17	22	9	12	-	-	0.2
19/05:00pm	26.3	26.9	20.2	69	4.0	SE	17	26	9	14	-	-	0.2
19/04:30pm	26.4	26.8	19.8	67	4.3	SE	17	22	9	12	-	-	0.2
19/04:00pm	26.6	27.1	20.0	67	4.3	SSE	17	24	9	13	-	-	0.2
19/03:30pm	26.3	26.7	20.6	71	3.7	SE	19	26	10	14	-	-	0.2
19/03:00pm	26.2	26.5	20.3	70	3.9	SE	19	28	10	15	-	-	0.2
19/02:30pm	26.0	26.1	19.9	69	4.0	SE	19	30	10	16	-	-	0.2
19/02:00pm	26.0	26.6	20.3	71	3.7	ESE	17	28	9	15	-	-	0.0
19/01:30pm	26.3	27.4	19.7	67	4.3	SE	13	22	7	12	-	-	0.0
19/01:00pm	25.7	26.8	19.6	69	3.9	SSE	13	24	7	13	-	-	0.0
19/12:30pm	25.5	26.0	19.2	68	4.0	SSE	15	24	8	13	-	-	0.0
19/12:00pm	25.1	25.4	18.8	68	4.0	SSE	15	24	8	13	-	-	0.0
19/11:30am	24.9	25.1	18.6	68	4.0	SSE	15	22	8	12	-	-	0.0
19/11:00am	24.7	24.5	18.4	68	4.0	SSE	17	24	9	13	-	-	0.0
19/10:30am	24.9	25.0	18.4	67	4.1	S	15	22	8	12	-	-	0.0

This page was created at **10:07 on Wednesday 22 February 2023 (AEDT)**

Appendix D LABORATORY SUMMARY TABLES

				TPH	Inorganics				Field Physio-Chemical			
			Chlorophyll a	Oil and Grease	Nitrogen (Total as N)	Phosphorus (Total as P)	TSS	Turbidity	pH	°C Temprature	Electrical Conductivity	Dissolved Oxygen
			mg/L	mg/L	mg/L	µg/L	mg/L	NTU	Units	°C	uS/cm	%Sat
EQL			0.002	10	0.2	10	5	1	0.01	0.1	0.1	0.1
ANZECC Criteria - Freshwater			**0.003**	**-**	**0.35**	**25**	**-**	**<6-50**	**6.5-8.5**	**-**	**125-2200**	**85% - 110%**
Lab Report Number	**Field ID**	**Date**										
966513	**WP1**	**22/02/2023**	<0.002	<10	**3.2**	**150**	9.6	11.0	7.50	21.8	693	92.2
966513	**WP2**	**22/02/2023**	<0.002	<10	**3.3**	**110**	12.0	14.0	7.63	21.9	685	92.1
966513	**WP2-DP1**	**22/02/2023**	<0.002	<10	**4.7**	**50**	5.8	3.8	**9.32**	21.8	808	**50.7**
966513	**WP2-DP2**	**22/02/2023**	<0.002	<10	**1.8**	**160**	270.0	**290.0**	7.33	21.8	548	**55.8**
966513	**QA100**	**22/02/2023**	Not Tested	<10	**3.1**	**110**	12.0	14.0	Not Tested	Not Tested	Not Tested	Not Tested
ES2305945	**QA200**	**22/02/2023**	Not Tested	<5	**3.1**	**130**	12.0	16.3	Not Tested	Not Tested	Not Tested	Not Tested
Maximum Concentration			<0.002	<10	**4.7**	**160**	270	**290.0**	**9.32**	21.9	808.0	**92.2**

Appendix E QUALITY ASSURANCE/QUALITY CONTRAL

Stantec

RPD Table

Project Number: 304500142
Site Identification: Wiley Park Station
Report Title: Surface Water Monitoring

					TPH	Inorganics				
				Chlorophyll a	Oil and Grease	Nitrate & Nitrite (as N)	Phosphate total (as P)	TSS	Turbidity
				mg/L	mg/L	mg/L	µg/L	mg/L	NTU
EQL				0.002	10	0.2	10	5	1
Lab Report Number	Field ID	Matrix Type	Date						
966513	WP2	water	22/02/2023	<0.002	<10	3.2	150	9.6	11.0
	QA100	water	22/02/2023	Not Tested	<10	3.1	110	12.0	14.0
RPD				NA	NA	3	**31**	22	24
966513	WP2	water	22/02/2023	<0.002	<10	3.2	150	9.6	11.0
ES2305945	QA200	water	22/02/2023	Not Tested	<5	3.1	130	12.0	16.3
RPD				NA	NA	3	14	22	**39**

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**
NA - Not Applicable

Quality Assurance/Quality Control (QA/QC) procedures were implemented to ensure the precision accuracy, representativeness, completeness and comparability of all data gathered. The QA/QC procedures included:

- Equipment calibration to ensure field measurements obtained are accurate
- Equipment decontamination to prevent cross contamination
- Use of appropriate measures (i.e. gloves) to prevent cross contamination
- Appropriate sample identification
- Correct sample preservation
- Sample transport with Chain of Custody (COC) documentation
- Laboratory analysis in accordance with NATA accredited methods.

Table E1 details the QA/QC procedures and sample collection details undertaken through the surface water elements of the investigation. Copies of all the COCs, along with the Sample Receipt Notifications (SRNs), Interpretive QA/QC Reports are provided in Appendix F.

Table E1 Field QA/QC Method Validation

Requirement	Yes / No	Comments
Equipment decontamination	Yes	In the event of involving reusable equipment. Decontamination of sampling equipment (water quality meter, telescopic water scoop etc.) was undertaken by washing with phosphate free detergent (Liquinox) followed by a rinse with potable water.
Sample collection	Yes	Samples were collected using disposable nitrile gloves via telescopic water scoop. A clean pair of gloves was used for each new sample being collected to limit the possibility of cross-contamination.
QA/QC sample collection	Yes	One (1) surface water duplicate and one (1) surface water triplicate sample were collected for intra and inter-lab QA/QC purposes to monitor the quality of the field practices for sample collection. Stantec based the investigation around a rate of one duplicate and triplicate sample per sampling event, as the requirement for duplicate and triplicate sample collection.
Sample identification	Yes	All samples were marked with a unique identifier including project number, sample location, and date.
Sample preservation	Yes	Samples were placed in a chilled ice box with ice for storage and transport to the laboratory.
COC documentation	Yes	A COC form was completed by Stantec detailing sample identification, collection date, sampler and laboratory analysis required. The COC form was signed off and returned to Stantec by the laboratory staff upon receipt of all the samples. COC forms and Sample Receipt Notification (SRN) are provided in Appendix F. The SRN indicates that the samples were received at the laboratory intact and chilled and within the required holding times.
NATA accredited methods	Yes	The NATA accredited Eurofins mgt and ALS Analysed the samples in accordance with NATA accredited methods. Analytical methods used are indicated in the stamped laboratory results provided in **Appendix F**.
Laboratory Internal QC	Yes	All Data Quality Objectives were met by the laboratories.

Table E2 Field QA/QC Collection Summary

Environmental Media	Date	Primary	Duplicate	Triplicate
Surface Water	22/02/2023	WP2	QA100	QA200

Relative Percentage Difference Determination

Laboratory results for duplicate and triplicate samples are assessed using a determination of the Relative Percentage Difference (RPD). Where a primary sample and a duplicate sample are compared, the RPD provides an indication of the reproducibility of the results, which incorporates the sampling method. Where a primary sample and a split sample are compared, the RPD provides an indication of the accuracy of the primary laboratory results as compared to the secondary laboratory result.

The calculation used to determine the RPD is:

$$RPD = \frac{(Co - Cs)}{\left(\frac{Co + Cs}{2}\right)} x100$$

Where:

Co = Concentration of the original sample

Cs = Concentration of the duplicate sample

In calculating the RPD values the following protocols were adopted:

- Where both concentrations are above laboratory reporting limits the RPD formula is used;
- Where both concentrations are below the laboratory reporting limits, no RPD is calculated; and
- Where one or both sample concentrations are reported to be less than ten times (<10x) the laboratory reporting limit, the RPD is calculated but is not assessed against the adopted criterion.

In accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013, Stantec adopts an RPD acceptance criterion up to 30% of the mean concentration of the analyte. It should be noted that variations might be higher for organic analysis, due to the volatile nature of the components, and for low concentrations of analytes.

The adopted criterion will not apply to RPDs where one of both concentrations are less than 10 times the reporting limit, as this criterion would otherwise overestimate the significance of minor variations in concentrations at or near the laboratory reporting limit. Large RPDs returned for low concentrations of analytes near the reporting limit is not as indicative of a significant difference in the results as a small RPD is for larger concentrations.

This approach is employed by NATA-accredited laboratories when assessing internal duplicate sample RPDs. This approach acknowledges that concentrations at or around the reporting limit are too low for an accurate evaluation of the significance of the RPD.

This approach has been adopted when assessing the relevance (compliance) of RPDs during this investigation. RPDs will be calculated for sample sets where one or both concentrations are less than 10 times the reporting limit for discussion purposes, but will not be assessed as a pass or fail in relation to the criterion.

The RPD results for duplicate samples are presented in this appendix. Although two (2) RPD values (total phosphate and turbidity) were reported to be above the accepted 30% RPD criteria (refer to the

RPD table attached below), the breaches in RPDs are not considered to alter the overall outcome of the assessment. It can be concluded that the analytical data can be relied upon for the purposes of this factual report.

Laboratory QC and QCI Report Summary

The laboratories selected for undertaking the analysis (Eurofins mgt and ALS) are NATA-accredited for the analysis required, and undertook certain QA/QC requirements to demonstrate the suitability of the data that is obtained. The laboratory is required to undertake and report internal laboratory Quality Control (QC) procedures for all chemical analysis undertaken. The QC testing is required to include:

- Laboratory duplicate sample analysis at the rate of one duplicate analysis per ten samples
- Method blank at the rate of one method blank analysis per 20 samples
- Laboratory control sample at the rate of one laboratory control sample analysis per 20 samples
- Spike recovery analysis at the rate of one spike recovery analysis per 20 samples.

Compliance with the laboratory QA/QC requirements and non-conformance details are discussed in the internal Laboratory QA/QC reports included with the certificates of analysis in Appendix F. Laboratory QA/QC requirements were within acceptance limits.

Stantec concludes that the data reported by the NATA-accredited Eurofins mgt and ALS as presented in this report is suitable for interpretative purposes and to make conclusions/recommendations regarding water quality.

Appendix F LABORATORY REPORTS

Stantec

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zheng	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	JZ	Turnaround Requirements:	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.au; ContamNSW@cardno.com.au	Lab:	Eurofins |
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample Information						Analysis Required												Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	Chlorophyll-a (LOR Required - 2 ug/L)	TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							
WP1		6	ICE	22/02/2023	Water	1	1	1	1	1	1							Please reduce the detection limit of Chlorophyll a from 5 ug/L to 2 ug/L
WP2		6	ICE		Water	1	1	1	1	1	1							
WP2-DP1		6	ICE		Water	1	1	1	1	1	1							
WP2-DP2		6	ICE		Water	1	1	1	1	1	1							
QA100		4	ICE		Water		1	1	1	1	1							

Relinquished by:	Jiaqi Zhou	Received by:		Relinquished by:		Received by:	Laura Ayala Eurofins	Relinquished by:	966513
(name / company)	Stantec (former Cardno)	(name / company)		(name / company)		(name / company)		(name / company)	
Date & Time:	2/22/2023	Date & Time:		Date & Time:		Date & Time:	22-2-23 19:00	Date & Time:	
Signature:	JZ	Signature:		Signature:		Signature:		Signature:	
Received by:		Relinquished by:		Received by:		Relinquished by:		*Lab use:*	
(name / company)		(name / company)		(name / company)		(name / company)		Samples Received: Cool or Ambient (circle one)	
Date & Time:		Date & Time:		Date & Time:		Date & Time:		Temperature Received at: (if applicable)	15.8°C
Signature:		Signature:		Signature:		Signature:		Transported by: Hand delivered / courier	

eurofins | Environment Testing

www.eurofins.com.au EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 45 51
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Sample Receipt Advice

Company name:	Stantec Australia Pty Ltd (NSW/ACT)
Contact name:	Chong Zeng
Project name:	DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID:	NE30161
Turnaround time:	5 Day
Date/Time received	Feb 22, 2023 7:00 PM
Eurofins reference	966513

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Samples received by the laboratory after 5.30pm are deemed to have been received the following working day.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Hannah Mawbey on phone : or by email: HannahMawbey@eurofins.com

Results will be delivered electronically via email to Chong Zeng - chong.zeng@cardno.com.au.

Note: A copy of these results will also be delivered to the general Stantec Australia Pty Ltd (NSW/ACT) email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 45 51
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Order No.:
Report #: 966513
Phone:
Fax:

Received: Feb 22, 2023 7:00 PM
Due: Mar 2, 2023
Priority: 5 Day
Contact Name: Chong Zeng

Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Nitrogen (as N)	Total Suspended Solids Dried at 103 °C to 105 °C	Turbidity
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X		X		
Sydney Laboratory - NATA # 1261 Site # 18217								X		X	X
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	Feb 22, 2023		Water	S23-Fe0056182	X	X	X	X	X	X
2	WP2	Feb 22, 2023		Water	S23-Fe0056183	X	X	X	X	X	X
3	WP2-DP1	Feb 22, 2023		Water	S23-Fe0056184	X	X	X	X	X	X
4	WP2-DP2	Feb 22, 2023		Water	S23-Fe0056185	X	X	X	X	X	X
5	QA100	Feb 22, 2023		Water	S23-Fe0056186		X	X	X	X	X
Test Counts						4	5	5	5	5	5

Stantec Australia Pty Ltd
Level 22, 570 Bourke Street
Melbourne
VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Chong Zeng**

Report **966513-W-V2**
Project name DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID NE30161
Received Date Feb 22, 2023

Client Sample ID			**WP1**	**WP2**	**WP2-DP1**	**WP2-DP2**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**S23-Fe0056182**	**S23-Fe0056183**	**S23-Fe0056184**	**S23-Fe0056185**
Date Sampled			**Feb 22, 2023**	**Feb 22, 2023**	**Feb 22, 2023**	**Feb 22, 2023**
Test/Reference	LOR	Unit				
Chlorophyll a	2	ug/L	< 2	< 2	< 2	< 2
Oil & Grease (HEM)	10	mg/L	< 10	< 10	< 10	< 10
Phosphate total (as P)	0.01	mg/L	0.15	0.11	0.05	0.16
Total Nitrogen (as N)	0.2	mg/L	3.2	3.3	4.7	1.8
Total Suspended Solids Dried at 103 °C to 105 °C	5	mg/L	9.6	12	5.8	270
Turbidity	1	NTU	11	14	3.8	290

Client Sample ID			**QA100**
Sample Matrix			**Water**
Eurofins Sample No.			**S23-Fe0056186**
Date Sampled			**Feb 22, 2023**
Test/Reference	LOR	Unit	
Oil & Grease (HEM)	10	mg/L	< 10
Phosphate total (as P)	0.01	mg/L	0.11
Total Nitrogen (as N)	0.2	mg/L	3.1
Total Suspended Solids Dried at 103 °C to 105 °C	5	mg/L	12
Turbidity	1	NTU	14

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chlorophyll a	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-INO-4340 Chlorophyll a in Waters			
Oil & Grease (HEM)	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-INO-4380 Oil and Grease (APHA 5520B)			
Phosphate total (as P)	Sydney	Mar 01, 2023	28 Days
- Method: E052 Total Phosphate (as P)			
Total Nitrogen (as N)	Melbourne	Feb 27, 2023	7 Days
- Method: LTM-INO-4040 Phosphate and Nitrogen in waters			
Total Suspended Solids Dried at 103 °C to 105 °C	Sydney	Mar 01, 2023	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	Mar 01, 2023	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
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NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 45 51
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Company Name: Stantec Australia Pty Ltd (NSW/ACT)
Address: Level 22, 570 Bourke Street
Melbourne
VIC 3000

Order No.:
Report #: 966513
Phone:
Fax:

Received: Feb 22, 2023 7:00 PM
Due: Mar 2, 2023
Priority: 5 Day
Contact Name: Chong Zeng

Project Name: DOWNER SYDNEY METRO STATIONS-WILEY PARK
Project ID: NE30161

Eurofins Analytical Services Manager : Hannah Mawbey

Sample Detail						Chlorophyll a	Oil & Grease (HEM)	Phosphate total (as P)	Total Nitrogen (as N)	Total Suspended Solids Dried at 103 °C to 105 °C	Turbidity
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X		X		
Sydney Laboratory - NATA # 1261 Site # 18217								X		X	X
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	WP1	Feb 22, 2023		Water	S23-Fe0056182	X	X	X	X	X	X
2	WP2	Feb 22, 2023		Water	S23-Fe0056183	X	X	X	X	X	X
3	WP2-DP1	Feb 22, 2023		Water	S23-Fe0056184	X	X	X	X	X	X
4	WP2-DP2	Feb 22, 2023		Water	S23-Fe0056185	X	X	X	X	X	X
5	QA100	Feb 22, 2023		Water	S23-Fe0056186		X	X	X	X	X
Test Counts						4	5	5	5	5	5

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Oil & Grease (HEM)	mg/L	< 10			10	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	mg/L	< 5			5	Pass	
Turbidity	NTU	< 1			1	Pass	
LCS - % Recovery							
Oil & Grease (HEM)	%	81			70-130	Pass	
Phosphate total (as P)	%	105			70-130	Pass	
Total Nitrogen (as N)	%	124			70-130	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	%	101			70-130	Pass	
Turbidity	%	91			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103 °C to 105 °C	S23-Fe0056182	CP	%	91			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Oil & Grease (HEM)	M23-Ma0004027	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Total Nitrogen (as N)	M23-Fe0061081	NCP	mg/L	3.7	3.6	3.1	30%	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	S23-Fe0056182	CP	mg/L	9.6	9.6	<1	30%	Pass	
Turbidity	S23-Fe0056182	CP	NTU	11	11	1.8	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chlorophyll a	S23-Fe0056183	CP	ug/L	< 2	< 2	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Phosphate total (as P)	S23-Fe0056186	CP	mg/L	0.11	0.12	1.1	30%	Pass	

Comments

Report updated (V2) to correct previously omitted data.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Adam Bateup	Analytical Services Manager
Mary Makarios	Senior Analyst-Inorganic
Ryan Phillips	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Stantec

CHAIN OF CUSTODY AND ANALYSIS REQUEST

Contact Person:	Jiaqi Zhou	Project Name:	Downer Sydney Metro Stations - Wiley Park
Telephone Number:	0424 106 665	Project Number:	NE30161
Alternative Contact:	Chong Zheng	PO No.:	
Telephone Number:	0451 780 991	Project Specific Quote No. :	190408CDNN_1
Sampler:	JZ	Turnaround Requirements:	5 Days TAT
Email Address (results and invoice):	jiaqi.zhou@cardno.com.au; chong.zeng@cardno.com.qu; ContamNSW@cardno.com.au	Lab:	ALS | 277-289 Woodpark Rd, Smithfield NSW 2164
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065 Australia		Attn:	Sample Receipt

Sample information						Analysis Required												Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix		TSS	Turbidity	Oil and Grease	Total Phosphorus	Total Nitrogen							
QA200		4	ICE	22/02/2023	Water		1	1	1	1	1							

Environmental Division Sydney
Work Order Reference
ES2305945

Telephone : + 61-2-8784 8555

Relinquished by: (name / company)	Jiaqi Zhou Stantec (former Cardno)	Received by: (name / company)		Relinquished by: (name / company		Received by: (name / company)		Relinquished by: (name / company)	
Date & Time:	22/02/2023	Date & Time:		Date & Time:		Date & Time:		Date & Time:	
Signature:	JZ	Signature:		Signature:		Signature:	23/2/23 8:30	Signature:	
Received by: (name / company)		Relinquished by: (name / company)		Received by: (name / company		Relinquished by: (name / company)		*Lab use:* Samples Received: Cool or Ambient (circle one)	
Date & Time:		Date & Time:		Date & Time:		Date & Time:		Temperature Received at:	(if applicable)
Signature:		Signature:		Signature:		Signature:		Transported by: Hand delivered / courier	

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2305945**	Page	: 1 of 2
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 23-Feb-2023 08:30
Order number	: ----	Date Analysis Commenced	: 23-Feb-2023
C-O-C number	: ----	Issue Date	: 01-Mar-2023 17:14
Sampler	: ----		
Site	: ----		
Quote number	: EN/024/		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QA200**	**----**	**----**	**----**	**----**
			Sampling date / time	22-Feb-2023 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2305945-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**12**	**----**	**----**	**----**	**----**
EA045: Turbidity								
Turbidity	----	0.1	NTU	**16.3**	**----**	**----**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**2.22**	**----**	**----**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.9**	**----**	**----**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**3.1**	**----**	**----**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.13**	**----**	**----**	**----**	**----**
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	**----**	**----**	**----**	**----**

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2305945**	Page	: 1 of 3
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Contact	: Customer Services ES
Address	: Level 9 - The Forum, 203 Pacific Highway St Leonards 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 23-Feb-2023
Order number	: ----	Date Analysis Commenced	: 23-Feb-2023
C-O-C number	: ----	Issue Date	: 01-Mar-2023
Sampler	: ----		
Site	: ----		
Quote number	: EN/024/		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4896034)									
ES2305873-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	564	592	4.8	0% - 20%
ES2305983-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	3150	3300	4.8	0% - 20%
EA045: Turbidity (QC Lot: 4891459)									
ES2305942-004	Anonymous	EA045: Turbidity	----	0.1	NTU	0.9	1.0	0.0	No Limit
EW2300879-006	Anonymous	EA045: Turbidity	----	0.1	NTU	6.3	6.4	0.0	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4895725)									
ES2305882-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.24	0.24	0.0	0% - 20%
ES2305924-008	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	2.12	2.12	0.0	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 4895719)									
ES2305863-003	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.2	0.0	No Limit
ES2305924-009	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	5.9	6.6	11.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4895720)									
ES2305863-003	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.01	<0.01	0.0	No Limit
ES2305924-009	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.71	0.61	15.2	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4896034)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	102	83.0	129
				<5	1000 mg/L	97.5	82.0	110
				<5	987 mg/L	101	83.0	118
EA045: Turbidity (QCLot: 4891459)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	100	91.0	105
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4895725)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	99.0	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4895719)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	96.3	69.0	101
				<0.1	1 mg/L	98.4	70.0	118
				<0.1	5 mg/L	95.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4895720)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	94.4	71.3	126
				<0.01	0.442 mg/L	96.3	71.3	126
				<0.01	1 mg/L	99.3	71.3	126
EP020: Oil and Grease (O&G) (QCLot: 4900228)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	99.8	81.0	121
				<5	4000 mg/L	90.1	70.0	110

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4895725)							
ES2305882-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	102	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 4895719)							
ES2305889-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	100 mg/L	103	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4895720)							
ES2305889-001	Anonymous	EK067G: Total Phosphorus as P	----	20 mg/L	100	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2305945**	Page	: 1 of 4
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JIAQI ZHOU	Telephone	: +61-2-8784 8555
Project	: NE30161 Downer Sydney Metro Stations - WIley Park	Date Samples Received	: 23-Feb-2023
Site	: ----	Issue Date	: 01-Mar-2023
Sampler	: ----	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
QA200	**22-Feb-2023**	**----**	----	----	**27-Feb-2023**	01-Mar-2023	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
QA200	**22-Feb-2023**	**----**	----	----	**23-Feb-2023**	24-Feb-2023	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
QA200	**22-Feb-2023**	**----**	----	----	**27-Feb-2023**	22-Mar-2023	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
QA200	**22-Feb-2023**	**27-Feb-2023**	22-Mar-2023	✓	**27-Feb-2023**	22-Mar-2023	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
QA200	**22-Feb-2023**	**27-Feb-2023**	22-Mar-2023	✓	**27-Feb-2023**	22-Mar-2023	✓
EP020: Oil and Grease (O&G)							
Miscellaneous Sulfuric Preserved - glass (EP020)							
QA200	**22-Feb-2023**	**----**	----	----	**28-Feb-2023**	22-Mar-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	4	50	**8.00**	**8.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	3	50	**6.00**	**6.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

Appendix 3 – TL927-1-33F01 Campsie Station Electrical Works Report (r1)

16 November 2022
TL927-1-33F01 Campsie Station Electrical Works Report (r1)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road,
North Ryde NSW 2113

Sydney Metro Southwest - Station Upgrades – Campsie Station Noise Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise monitoring during the Station Upgrades electrical works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding OOHWA. This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Campsie Station on 14th November 2022.

2.1 Measurement location

The noise measurement was conducted at the monitoring location nominated in the OOHWA; 13-15 Anglo Road, Campsie. A photo of the monitoring setup is shown in Figure 2-1. A figure depicting the monitoring location is included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	13-15 Anglo Road, Campsie (Appendix A.1)	14.11.2022 10:09pm – 10:24pm	EWP & power hand tools	Noise	70m	No

Figure 2-1: Noise monitoring setup

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	A2A-13528-E0	4 February 2022
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	2677710	10 January 2022

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-3. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-3: Environmental conditions

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M1	13-15 Anglo Road, Campsie (Appendix A.1)	14.11.2022 10:09pm – 10:24pm	Partly cloudy; air temperature 24ºC, wind speed < 5m/s; relative humidity 65%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Measured noise levels $L_{Aeq(15min)}$

Meas. ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	13-15 Anglo Road, Campsie (Appendix A.1)	Hand tools and EWP	50^{T}	EWP & power hand tools	55	70	Yes ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is higher than the predicted noise level. However, this can be attributed to heavy road/foot/rail traffic nearby 13-15 Anglo Road. All construction activities on site were inaudible due to the heavy road/foot/rail traffic. Loud noise events were due to traffic passbys and activities at nearby residential properties.

Notes T: Predicted $L_{Aeq, 15min}$ for Typical activities.

4 Conclusion

Renzo Tonin & Associates has completed noise monitoring for the Station Upgrades electrical works for Sydney Metro Southwest.

The results of the noise measurements were above the predicted noise levels presented in the Gatewave model prepared for the works. However, all construction activities on site were inaudible at the nominated noise sensitive receiver due to the heavy road/foot/rail traffic. Loud noise events were due to traffic passbys and activities at nearby residential properties.

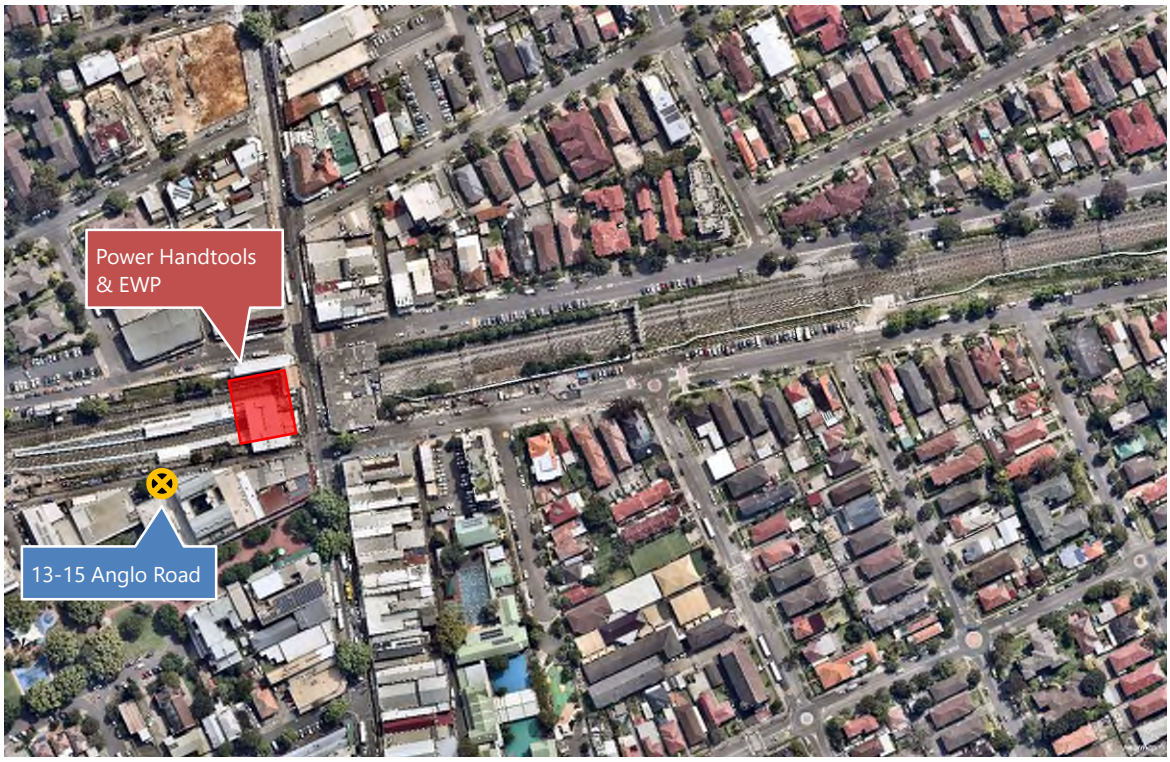
Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
16.11.2022	First issue	0	1	A. Hannelly	R. Zhafranata	M. Tabacchi

File Path: R:\AssocSydProjects\TL901-TL950\TL927 Southwest Metro - Stations Upgrades\1 Docs\33 14.11.2022 Electrical Works, Campsie Station\TL927-1-33F01 Campsie Station Electrical Works Report (r1).docx

APPENDIX A Monitoring location

A.1 Campsie Station: 13-15 Anglo Road



Appendix 4 – TL927-1-34F01 2023 WE32 Noise Monitoring Report (r2)

14 February 2023
TL927-1-34F01 2023 WE32 Noise Monitoring Report (r2)

Downer EDI Works Pty Ltd
Gate 99, Bridge Road
Belmore New South Wales 2192

Sydney Metro Southwest - Station Upgrades - 2023 WE32 Noise Monitoring Report

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise monitoring during the Station Upgrades WE32 possession works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding Gatewave model (Gatewave scenario ID: 6259). This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Campsie, Dulwich Hill, Hurlstone Park, Punchbowl, Belmore and Wiley Park Station on 4th February 2023.

It was noted that noise monitoring was attempted during the WK31 possession. However, the weather condition on 30thJanuary 2023 was not suitable for noise monitoring.

2.1 Measurement location

The noise measurements were conducted at the nominated monitoring locations from the Gatewave model. The measurement locations are listed in Table 2-1. Figures depicting the monitoring locations are included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	57a Ewart Street, Dulwich Hill (APPENDIX A.1)	04.02.2023 12:05pm – 12:20pm	Vacuum Truck, Telehandler and Delivery Truck	Noise	1m	No
M2	67-69 Ewart Street, Dulwich Hill (APPENDIX A.1)	04.02.2023 12:25pm – 12:40pm	Vacuum Truck and excavator with bucket attachment	Noise	5m	No
M3	71 Ewart Street, Dulwich Hill (APPENDIX A.1)	04.02.2023 12:43pm – 12:58pm	Vacuum Truck and Telehandler	Noise	10m	No
M4	5 Railway Street, Hurlstone Park (APPENDIX A.2)	04.02.2023 1:07pm – 1:22pm	Hand tools and Telehandler	Noise	20m	No
M5	2 Hopetoun Street, Hurlstone Park (APPENDIX A.2)	04.02.2023 1:28pm – 1:43pm	Hand tools and excavator with bucket attachment	Noise	27m	No
M6	105 Duntroon Street, Hurlstone Park (APPENDIX A.2)	04.02.2023 1:46pm – 2:01pm	Hand tools, delivery truck and excavator with bucket attachment	Noise	9m	No
M7	2 Wilfred Ave, Campsie (APPENDIX A.3)	04.02.2023 2:33pm – 2:48pm	Hand tools, delivery truck and excavator with bucket attachment	Noise	24m	No
M8	3 Wilfred Ave, Campsie (APPENDIX A.3)	04.02.2023 2:48pm – 3:03pm	Hand tools and excavator with bucket attachment	Noise	25m	No
M9	13-15 Anglo Road, Campsie (APPENDIX A.3)	04.02.2023 3:10pm – 3:25pm	Mobile crane and excavator with bucket attachment	Noise	40m	No
M10	30 Redman Pde, Belmore (APPENDIX A.4)	04.02.2023 3:42pm – 3:57pm	Hand tool works at site compound was not audible at this monitoring location	Noise	105m	No
M11	26 Redman Pde, Belmore (APPENDIX A.4)	04.02.2023 4:00pm – 4:15pm	Hand tool works at site compound was not audible at this monitoring location	Noise	80m	No
M12	1b Acadia Street, Belmore (APPENDIX A.4)	04.02.2023 4:25pm – 4:40pm	Power hand tools	Noise	26m	No

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M13	1/1 Cornelia Street, Wiley Park (APPENDIX A.5)	04.02.2023 5:02pm – 5:17pm	Hand tools, mobile crane and excavator with bucket attachment	Noise	35m	No
M14	2/1 Cornelia Street, Wiley Park (APPENDIX A.5)	04.02.2023 5:23pm – 5:38pm	Mobile Crane	Noise	73m	No
M15	2 Shadforth Street, Wiley Park (APPENDIX A.5)	04.02.2023 5:48pm – 6:03pm	Hi-rail excavator with bucket attachment, Handtools, and EWP	Noise	28m	No
M16	41 Urunga Pde, Punchbowl (APPENDIX A.6)	04.02.2023 6:22pm – 6:37pm	Vacuum truck	Noise	35m	No
M17	25 Urunga Pde, Punchbowl (APPENDIX A.7)	04.02.2023 6:42pm – 6:57pm	No construction work was observed during the monitoring period	Noise	N/A	No

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	#A2A-19156-E0	02 February 2022
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	#3027924	10 March 2022

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-3. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-3: Environmental conditions

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M1	57a Ewart Street, Dulwich Hill	04.02.2023 12:05pm – 12:20pm	Clear skies; air temperature 28ºC, wind speed < 5m/s; relative humidity 54%
M2	67-69 Ewart Street, Dulwich Hill	04.02.2023 12:25pm – 12:40pm	Clear skies; air temperature 30ºC, wind speed < 5m/s; relative humidity 53%
M3	71 Ewart Street, Dulwich Hill	04.02.2023 12:43pm – 12:58pm	Clear skies; air temperature 30ºC, wind speed < 5m/s; relative humidity 58%
M4	5 Railway Street, Hurlstone Park	04.02.2023 1:07pm – 1:22pm	Clear skies; air temperature 28ºC, wind speed < 5m/s; relative humidity 54%
M5	2 Hopetoun Street, Hurlstone Park	04.02.2023 1:28pm – 1:43pm	Clear skies; air temperature 26ºC, wind speed < 5m/s; relative humidity 50%
M6	105 Duntroon Street, Hurlstone Park	04.02.2023 1:46pm – 2:01pm	Clear skies; air temperature 30ºC, wind speed < 5m/s; relative humidity 48%
M7	2 Wilfred Ave, Campsie	04.02.2023 2:33pm – 2:48pm	Clear skies; air temperature 30ºC, wind speed < 5m/s; relative humidity 58%
M8	3 Wilfred Ave, Campsie	04.02.2023 2:48pm – 3:03pm	Clear skies; air temperature 28ºC, wind speed < 5m/s; relative humidity 59%
M9	13-15 Anglo Road, Campsie	04.02.2023 3:10pm – 3:25pm	Clear skies; air temperature 30ºC, wind speed < 5m/s; relative humidity 54%
M10	30 Redman Pde, Belmore	04.02.2023 3:42pm – 3:57pm	Clear skies; air temperature 27ºC, wind speed < 5m/s; relative humidity 50%
M11	26 Redman Pde, Belmore	04.02.2023 4:00pm – 4:15pm	Clear skies; air temperature 26ºC, wind speed < 5m/s; relative humidity 57%
M12	1b Acadia Street, Belmore	04.02.2023 4:25pm – 4:40pm	Clear skies; air temperature 29ºC, wind speed < 5m/s; relative humidity 53%
M13	1/1 Cornelia Street, Wiley Park	04.02.2023 5:02pm – 5:17pm	Clear skies; air temperature 27ºC, wind speed < 5m/s; relative humidity 64%
M14	2/1 Cornelia Street, Wiley Park	04.02.2023 5:23pm – 5:38pm	Clear skies; air temperature 25ºC, wind speed < 5m/s; relative humidity 54%
M15	2 Shadforth Street, Wiley Park	04.02.2023 5:48pm – 6:03pm	Clear skies; air temperature 25ºC, wind speed < 5m/s; relative humidity 48%
M16	41 Urunga Pde, Punchbowl	04.02.2023 6:22pm – 6:37pm	Clear skies; air temperature 25ºC, wind speed < 5m/s; relative humidity 49%
M17	25 Urunga Pde, Punchbowl	04.02.2023 6:42pm – 6:57pm	Clear skies; air temperature 27ºC, wind speed < 5m/s; relative humidity 46%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Noise monitoring results

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	57a Ewart Street, Dulwich Hill	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower, mobile crane, 5t excavator with hammer attachment, jackhammer and concrete saw	92^{H}	Vacuum Truck, Telehandler and Delivery Truck	67	84	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The predicted noise level also included multiple construction activities occurring concurrently, which included High impact activity (D/E/N) – Barrier, Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M2	67-69 Ewart Street, Dulwich Hill	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower, mobile crane, 5t excavator with hammer attachment, jackhammer and concrete saw	92^{H}	Vacuum Truck and excavator with bucket attachment	70	80	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The predicted noise level also included multiple construction activities occurring concurrently, which included High impact activity (D/E/N) – Barrier, Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M3	71 Ewart Street, Dulwich Hill	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower, mobile crane, 5t excavator with hammer attachment, jackhammer and concrete saw	95^{H}	Vacuum Truck and Telehandler	59	79	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The predicted noise level included high noise impact activities. No high noise impact activities were occurring during this measurement. • The predicted noise level also included multiple construction activities occurring concurrently, which included High impact activity (D/E/N) – Barrier, Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M4	5 Railway Street, Hurlstone Park	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower and mobile crane	83^{T}	Hand tools and Telehandler	59	77	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 20m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M5	2 Hopetoun Street, Hurlstone Park	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower and mobile crane	83^{T}	Hand tools and excavator with bucket attachment	56	76	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 26m away. In the prediction model, the distance between the closest work area and the most affected facade is 15m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M6	105 Duntroon Street, Hurlstone Park	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower and mobile crane	85^{T}	Hand tools, delivery truck and excavator with bucket attachment	67	81	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 9m away. In the prediction model, the distance between the closest work area and the most affected facade is 2m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M7	2 Wilfred Ave, Campsie	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema and EWP	69^T	Hand tools, delivery truck and excavator with bucket attachment	59	81	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 24m away. In the prediction model, the distance between the closest work area and the most affected facade is 10m. • It was noted that the measured works were intermittent.
M8	3 Wilfred Ave, Campsie	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema and EWP	69^T	Hand tools and excavator with bucket attachment	56	76	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 25m away. In the prediction model, the distance between the closest work area and the most affected facade is 20m. • It was noted that the measured works were intermittent.
M9	13-15 Anglo Road, Campsie	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema and EWP	79^T	Mobile crane and excavator with bucket attachment	61	88	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver. • It was noted that the mobile crane was only idling during the measurement period
He M10	30 Redman Pde, Belmore	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower and mobile crane	67^T	Hand tool works at site compound was not audible at this monitoring location	61	80	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • The closest work area to this monitoring location was 105m away (at Belmore Station site compound). • The hand tool works were not audible at this monitoring location.
M11	26 Redman Pde, Belmore	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower and mobile crane	68^T	Hand tool works at site compound was not audible at this monitoring location	59	89	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • The closest work area to this monitoring location was 80m away (at Belmore Station site compound). • The hand tool works were not audible at this monitoring location.
M12	1b Acadia Street, Belmore	15t hi-rail excavator, vacuum truck, hand tools, power hand tools, hi-rail flatbed truck, bored piling rig, street sweeper, wacker packer, compressor, delivery truck, concrete pump, 10t hi-rail hydrema, EWP, lighting tower and mobile crane	69^T	Power hand tools	49	78	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 26m away. In the prediction model, the distance between the closest work area and the most affected facade is 14m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M13	1/1 Cornelia Street, Wiley Park	15t hi-rail excavator, welding tools EWP, hand tools, power hand tools, 13t excavator with bucket attachment, skid steer, wacker packer, pressure washer and telehandler	83^T	Hand tools, mobile crane and excavator with bucket attachment	57	68	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 35m away. In the prediction model, the distance between the closest work area and the most affected facade is 1m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M14	2/1 Cornelia Street, Wiley Park	15t hi-rail excavator, welding tools EWP, hand tools, power hand tools, 13t excavator with bucket attachment, skid steer, wacker packer, pressure washer and telehandler	83^T	Mobile Crane	54	72	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 73m away. In the prediction model, the distance between the closest work area and the most affected facade is 1m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the mobile crane was only idling during the measurement period

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M15	2 Shadforth Street, Wiley Park	15t hi-rail excavator, welding tools EWP, hand tools, power hand tools, 13t excavator with bucket attachment, skid steer, wacker packer, pressure washer and telehandler	82[T]	Hi-rail excavator with bucket attachment, Handtools, and EWP	52	69	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 28m away. In the prediction model, the distance between the closest work area and the most affected facade is 5m. • The predicted noise level also included multiple construction activities occurring concurrently, which included Low impact activity (D/E/N) and Typical impact activity (D/E/N). This was not observed during the measurement. • It was noted that the measured works were intermittent.
M16	41 Urunga Pde, Punchbowl	15t hi-rail excavator, EWP, hand tools, power hand tools, 5t excavator with auger, hi-rail flatbed truck and telehandler	60[T]	Vacuum truck	67	72	Yes ($L_{Aeq, 15min}$)	Measured $L_{Aeq, 15min}$ is above predicted noise level. Note that in the prediction model, the typical activity was assessed with a temporary noise screen installed. However, this was not observed during the noise measurement.
M17	25 Urunga Pde, Punchbowl	15t hi-rail excavator, EWP, hand tools, power hand tools, 5t excavator with auger, hi-rail flatbed truck and telehandler	Not applicable	No construction work was observed during the monitoring period	59	84	Not applicable	No construction work was observed during the monitoring period.

Notes: T: Predicted $L_{Aeq, 15min}$ for Typical activities.
H: Predicted $L_{Aeq, 15min}$ for High impact activities.

4 Conclusion

Renzo Tonin & Associates has completed noise monitoring for the Station Upgrades WE32 possession works for Sydney Metro Southwest.

The results of the noise measurements were below the predicted noise levels presented in the Gatewave model prepared for the works, except for measurement M16. For measurement M16, it was noted that in the prediction model, the typical activity was assessed with a temporary noise screen installed. However, this was not observed during the noise measurement.

The difference between the measured $L_{Aeq,\ 15min}$ and the predicted noise level can be attributed to following:

- Less plant operating during the measurement compared to the modelled plants;
- Location of the measured works were further away than the modelled works;
- The predicted noise levels included multiple construction activities occurring concurrently. This was not always observed during the measurements;
- Some plant and equipment only idling during the monitoring period;
- Intermittent nature of the measured works, and
- The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
10.02.2023	First issue	0	1	A. Hannelly	R. Zhafranata	R. Zhafranata
14.02.2022	Report revised to address client's comment	-	2	A. Hannelly	R. Zhafranata	R. Zhafranata

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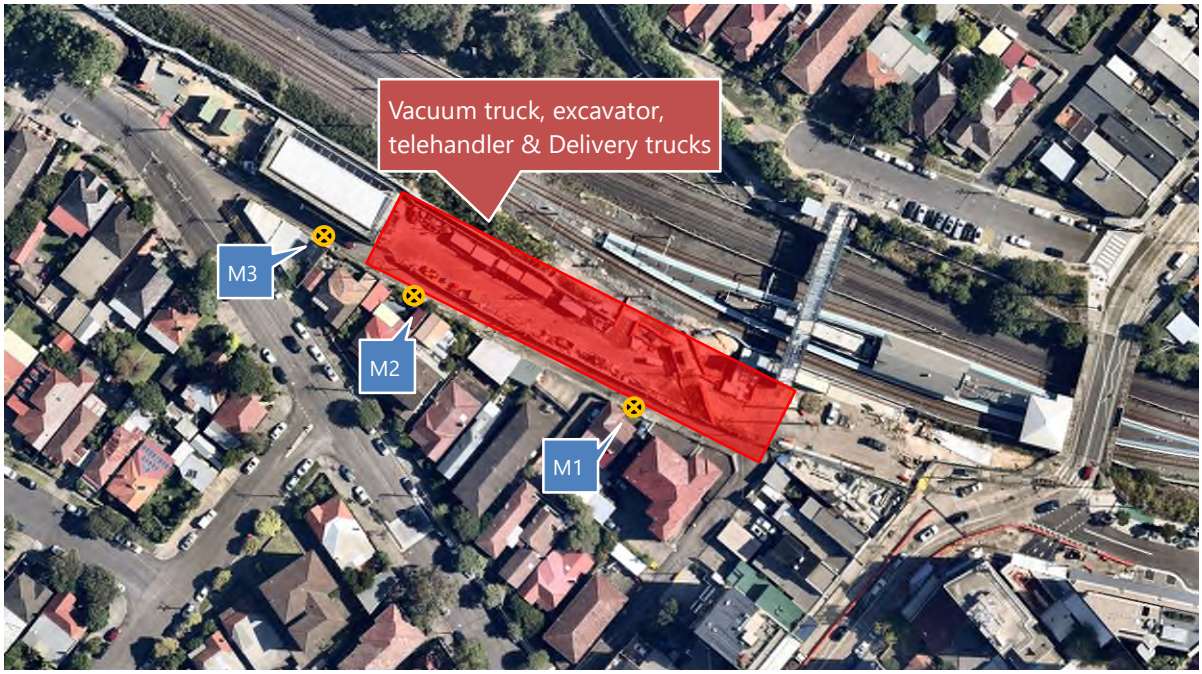
APPENDIX A Measurement locations

A.1 Dulwich Hill Station: 57a Ewart Street, 67-69 Ewart Street and 71 Ewart Street



A.2 Hurlstone Park Station: 5 Railway Street, 2 Hopetoun Street and 105 Duntroon Street

A.3 Campsie Station: 13-15 Anglo Road, 2 Wilfred Avenue and 3 Wilfred Avenue

A.4 Belmore Station: 26 Redman Parade, 30 Redman Parade and 1b Acadia Street

A.5 Wiley Park Station: 2 Shadforth Street, 1/1 Cornelia Street and 2/1 Cornelia Street

A.6 Punchbowl Station: 41 Urunga Parade

A.7 Punchbowl Station: 25 Urunga Parade

Appendix 5 – TL927-1-35F01 2023 WK32 Noise Monitoring Report (r1)

14 February 2023
TL927-1-35F01 2023 WK32 Noise Monitoring Report (r1)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road,
North Ryde NSW 2113

Sydney Metro Southwest - Stations Upgrades - 2023 WK32 Possessions

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise monitoring during the Station Upgrades WK32 possession works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding Gatewave model (Gatewave scenario ID: 6350). This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Campsie and Belmore Station between 8th February 2023 and 9th February 2023. It was noted that Dulwich Hill and Wiley Park stations were scheduled for monitoring. However, no construction works were observed at the stations during the monitoring period (works being cancelled due to weather condition).

2.1 Measurement location

The noise measurements were conducted at the nominated monitoring locations from the Gatewave model or at the closest representative noise impacted receiver. The measurement locations are listed in Table 2-1. Figures depicting the monitoring locations are included in APPENDIX A.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	20 Redman Parade, Belmore (Appendix A.1)	08.02.2023 11:16pm – 11:31pm	Hand tools, lighting tower	Noise	44m	No
M2	19 Redman Parade, Belmore (Appendix A.1)	08.02.2023 11:43pm – 11:58pm	100T mobile crane, lighting tower	Noise	64m	No
M3	18 Redman Parade, Belmore (Appendix A.1)	09.02.2023 12:00am – 12:15am	100T mobile crane, lighting tower	Noise	70m	No
M4	13-15 Anglo Road, Campsie (Appendix A.2)	09.02.2023 12:53am – 1:08am	Rattle gun, truck crane	Noise	75m	No
M5	5-9 London Street, Campsie (Appendix A.2)	09.02.2023 1:15am – 1:30am	Rattle gun, hand tools, truck crane	Noise	135m	No

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	A2A-19156-E0	2 February 2022
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	3027924	4 March 2022

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-3. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-3: Environmental conditions

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M1	20 Redman Parade, Belmore	08.02.2023 11:16pm – 11:31pm	Overcast; air temperature 23ºC, wind speed < 5m/s; relative humidity 75%
M2	19 Redman Parade, Belmore	08.02.2023 11:43pm – 11:58pm	Overcast; air temperature 23ºC, wind speed < 5m/s; relative humidity 75%
M3	18 Redman Parade, Belmore	09.02.2023 12:00am – 12:15am	Overcast; air temperature 23ºC, wind speed < 5m/s; relative humidity 75%
M4	13-15 Anglo Road, Campsie	09.02.2023 12:53am – 1:08am	Overcast; air temperature 23ºC, wind speed < 5m/s; relative humidity 74%
M5	5-9 London Street, Campsie	09.02.2023 1:15am – 1:30am	Overcast; air temperature 23ºC, wind speed < 5m/s; relative humidity 74%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Noise monitoring results

Measurement ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Above predicted noise level?	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	20 Redman Parade, Belmore	Hand tools Concrete Agi Lighting tower Non-powered hand tools Mobile crane (20t-250t)	54[T]	Hand tools, lighting tower	49	68	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. Notably, the 100T mobile crane was not operating during this measurement period. • It was noted that the measured works were intermittent.
M2	19 Redman Parade, Belmore	Hand tools Concrete Agi Lighting tower Non-powered hand tools Mobile crane (20t-250t)	56[T]	100T mobile crane, lighting tower	50	65	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The 100T mobile crane did not operate continuously under high load. Crane operation was a mixture of idling, slewing, and lifting. • It was noted that the measured works were intermittent.
M3	18 Redman Parade, Belmore	Hand tools Concrete Agi Lighting tower Non-powered hand tools Mobile crane (20t-250t)	54[T]	100T mobile crane, lighting tower	51	69	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is below with the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The 100T mobile crane did not operate continuously under high load. Crane operation was a mixture of idling, slewing, and lifting. • It was noted that the measured works were intermittent.
M4	13-15 Anglo Road, Campsie	Welding tools /oxy EWP Hand tools Handtool - rattle gun Forklift Hi-rail excavator Hi-rail hydrema	79[T]	Truck crane, rattle gun	58	77	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 75m away. In the prediction model, the distance between the closest work area and the most affected facade is 10m. • The truck crane was not operating under significant load during the measurement period. • The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver. • It was noted that the measured works were intermittent.
M5	5-9 London Street, Campsie	Welding tools /oxy EWP Hand tools Handtool - rattle gun Forklift Hi-rail excavator Hi-rail hydrema	66[T]	Rattle gun, hand tools, truck crane	53	70	No ($L_{Aeq, 15min}$)	The measured $L_{Aeq, 15min}$ is lower than the predicted noise level. This can be attributed to: • Less plants operating during the measurement compared to the modelled plants. • The measured works were located approximately 135m away. In the prediction model, the distance between the closest work area and the most affected facade is 40m. • The truck crane was not operating under significant load during the measurement period. • It was noted that the measured works were intermittent.

Notes: T: Predicted $L_{Aeq, 15min}$ for Typical activities.

4 Conclusion

Renzo Tonin & Associates has completed noise monitoring for the Station Upgrades WK32 possession works for Sydney Metro Southwest.

The results of the noise measurements were below the predicted noise levels presented in the Gatewave model prepared for the works.

The difference between the measured $L_{Aeq,\ 15min}$ and the predicted noise level can be attributed to following:

- Less plant operating during the measurement compared to the modelled plants.
- Location of the measured works were further away than the modelled works.
- The 100T mobile crane and truck crane not operating under high load for extended periods of time during monitoring.
- Intermittent nature of the measured works.
- The worst predicted noise level for a receiver included in the OOHWA was the highest noise level from each floor and each facade of a receiver building. The monitoring was conducted at ground level as access to the building was not provided. Sometimes this location might have not aligned with the most affected location for the receiver.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
14.02.2023	First issue	0	1	L. Woolf	R. Zhafranata	R. Zhafranata

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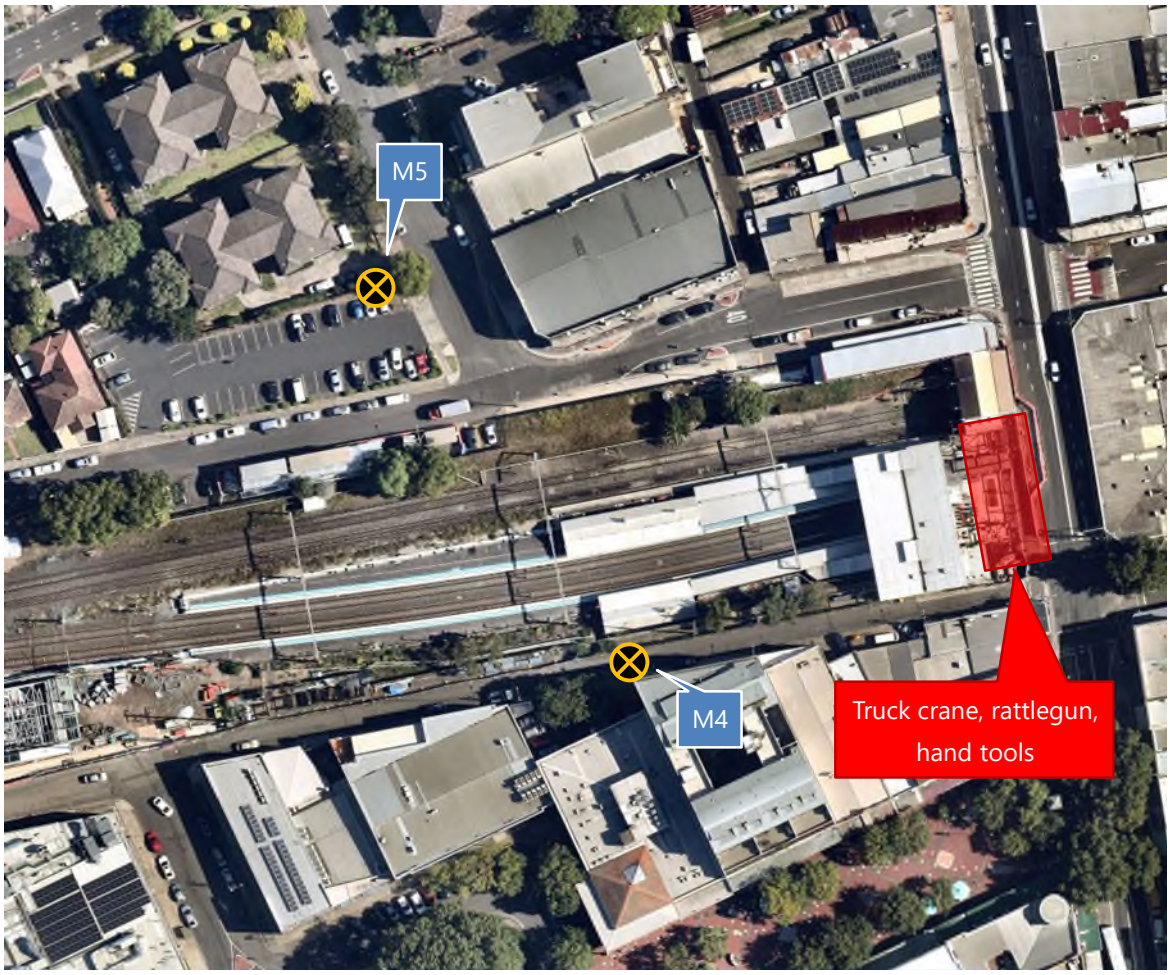
APPENDIX A Measurement locations

A.1 Belmore Station: 18 Redman Parade, 19 Redman Parade and 20 Redman Parade

A.2 Campsie Station: 5-9 London Street and 13-15 Anglo Road



Appendix 6 – TL927-1-37F01 Campsie Station Noise Monitoring Report (r1)

23 February 2023
TL927-1-37F01 Campsie Station Noise Monitoring Report (r1)

Downer EDI Works Pty Ltd
T3, Triniti Business Campus, 39 Delhi Road,
North Ryde NSW 2113

Sydney Metro Southwest - Station Upgrades – Campsie Station Noise Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise monitoring during the Station Upgrades works for Sydney Metro Southwest. The noise monitoring was undertaken to verify predicted noise levels in the corresponding Out of hours work application form[1] (OOHWA). This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Campsie Station on 20th February 2023.

2.1 Measurement location

The noise measurement was conducted at the monitoring locations nominated in the OOHWA. A figure depicting the monitoring locations are included in APPENDIX A. Photos of the monitoring setups are shown in APPENDIX B.

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	201 Beamish Street, Campsie	20.02.2023 10:00pm – 10:15pm	Angle grinder	Noise	31m	Yes
M2	13-15 Anglo Road, Campsie	20.02.2023 10:18pm – 10:33pm	Angle grinder	Noise	72m	Yes

[1] OOHW #30, Structural steel installation and welding in the Concourse; Application Date: 16 February 2023, Rev C

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2-2 summarises the details of noise measurement equipment.

Table 2-2: Summary of noise measurement equipment

Instrument	Make	Model	Serial Number	Last Calibrated
Type 1 Sound Level Meter	NTi	XL2	A2A-13528-E0	4 February 2022
Type 1 Sound Level Meter Calibrator	Bruel & Kjaer	Type 4231	2677710	10 January 2022

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-3. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-3: Environmental conditions

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M1	201 Beamish Street, Campsie	20.02.2023 10:00pm – 10:15pm	Partly cloudy; air temperature 18ºC, wind speed < 5m/s; relative humidity 57%
M2	13-15 Anglo Road, Campsie	20.02.2023 10:18pm – 10:33pm	Partly cloudy; air temperature 19ºC, wind speed < 5m/s; relative humidity 57%

3 Noise Monitoring results

The results of the noise monitoring are presented in Table 3-1 below.

Table 3-1: Noise monitoring results

Meas. ID	Assessment Point	Prediction assumption (plant and equipment)	Predicted noise level $L_{Aeq(15min)}$, dB(A)	Measured plant	Measured noise level dB(A)		Contribution from construction works $L_{Aeq(15min)}$, dB(A)	Comments
					$L_{Aeq(15min)}$	L_{Amax}		
M1	201 Beamish Street, Campsie	Hand tools (no impact), EWP, small forklift, welding	45	Angle grinder	72	94	60	The contribution from the angle grinder works $L_{Aeq, 15min}$ is above the predicted noise level. This can be attributed to: • Louder equipment operated during the measurement compared to the modelled plant and equipment. The observations below were made during the measurement: • The noise environment was dominated by road/pedestrian/rail traffic. • Angle grinder works were only audible when there was no road traffic. • Angle grinder works were intermittent.
M2	13-15 Anglo Road, Campsie	Hand tools (no impact), EWP, small forklift, welding	45	Angle grinder	56	72	55	The contribution from the angle grinder works $L_{Aeq, 15min}$ is above the predicted noise level. This can be attributed to: • Louder equipment operated during the measurement compared to the modelled plant and equipment. The observations below were made during the measurement: • The noise environment was dominated by road /rail traffic. • Angle grinder works were only audible when there was no road traffic. • Angle grinder works were intermittent.

4 Plant noise auditing results

A plant noise auditing was conducted on site, in order to better assess how plant and equipment operates in the field. The plant noise auditing locations are listed in Table 4-1. Figures depicting the plant noise auditing locations are included in APPENDIX A.

Table 4-1: Plant noise auditing locations

Measurement ID	Assessment Point	Date	Time	Measured plant	Measured distance
M3	Campsie Station	20.02.2023	09:32pm – 09:44pm	Optimum 8 electric scissor lift	5m and 7m

Based on the conducted plant noise auditing, the calculated sound power level for each measured plant and corresponding comments are shown in Table 4-2.

Table 4-2: Plant noise auditing results

Measurement ID	Measured plant	Calculated overall sound power level, dB(A)	Comments
M3	Optimum 8 electric scissor lift	86	Plant was raising and lowering throughout the monitoring period.

5 Conclusion

Renzo Tonin & Associates has completed noise monitoring for the Station Upgrades works for Sydney Metro Southwest.

The results of the noise measurements were above the predicted noise levels presented in the OOHWA prepared for the works. This can be attributed to louder equipment being operated during the measurement compared to the modelled plant and equipment in the OOHWA.

The results of the conducted plant noise auditing in Table 4-2 have shown that the measured plant is operating as expected.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
23.02.2023	First issue	0	1	A. Hannelly	R. Zhafranata	R. Zhafranata

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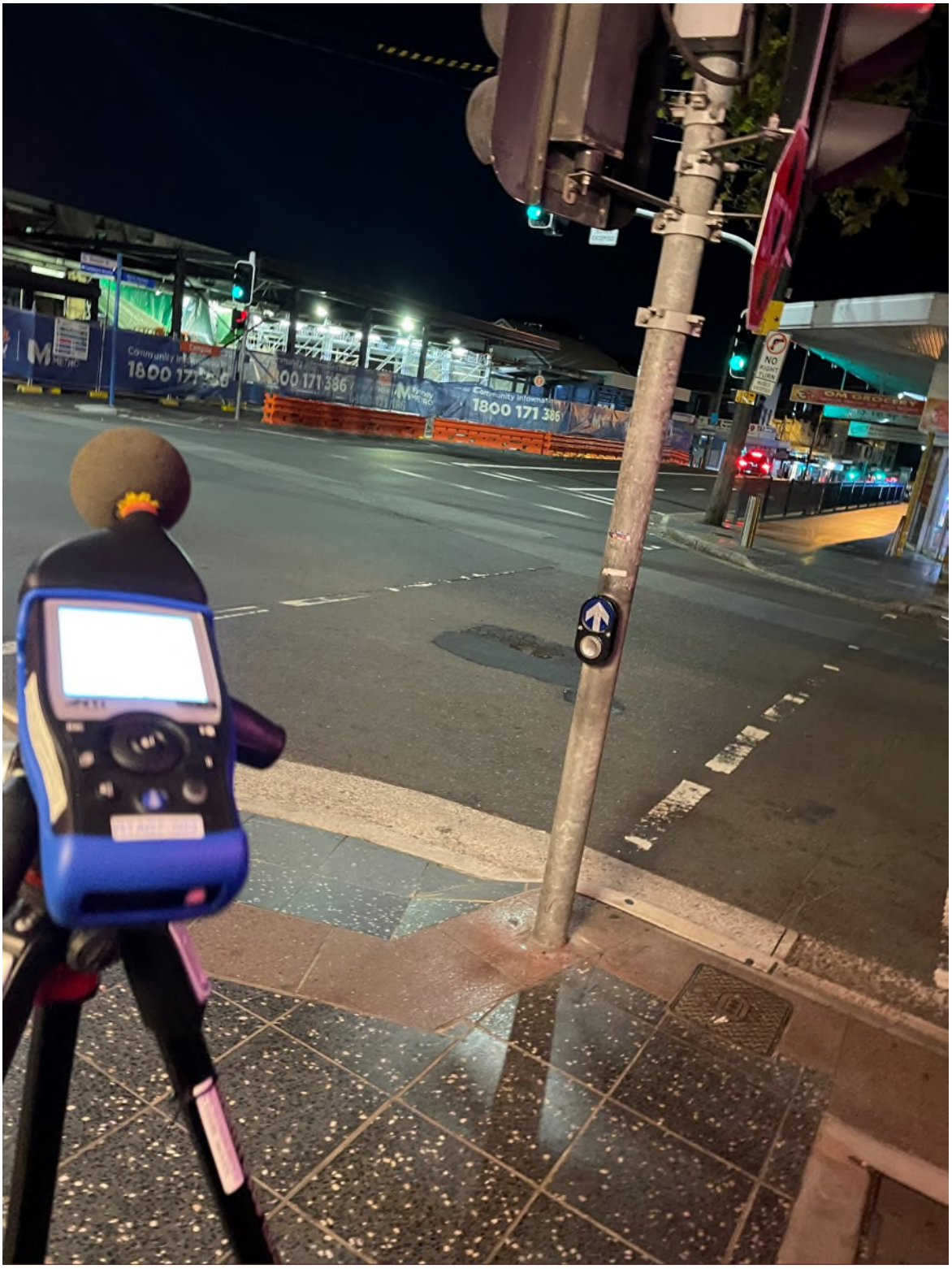
APPENDIX A Monitoring locations

A.1 Campsie Station: 13-15 Anglo Road & 201 Beamish Street

APPENDIX B Monitoring Setups

B.1 201 Beamish Street, Campsie



B.2 13-15 Anglo Road, Campsie

B.3 Campsie Station

Appendix 7 – TL927-038F01 Belmore Station Noise Monitoring Report (r1)

28 March 2023
TL927-038F01 Belmore Station Noise Monitoring Report (r1)

Downer EDI Works Pty Ltd
Gate 99, Bridge Road
Belmore New South Wales 2192

Sydney Metro Southwest - Station Upgrades - Belmore Station Noise Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct noise monitoring during the Station Upgrades works for Sydney Metro Southwest. The noise monitoring was undertaken to verify the predicted noise levels in the corresponding Out of hours work application form[1] (OOHWA). This report provides a summary of the monitoring results.

2 Details of monitoring

Noise monitoring was undertaken at Belmore Station during the night period on 23rd March 2023.

2.1 Measurement location

The noise measurement was conducted at the monitoring locations nominated in the OOHWA. The measurement locations are listed in Table 2-1. A figure depicting the monitoring locations is shown in Figure 1. Photos showing the monitoring setup for each location is shown in APPENDIX A.

[1] Downer_OoHWA 31_Belmore Rev B ER Endorsed + comms, dated 13 March 2023, revision B

Figure 1: Belmore Station Monitoring Locations

Table 2-1: Measurement locations

Measurement ID	Assessment Point	Date and time	Measured plant	Monitoring type	Approx. distance to measured plant	Temporary noise barrier between measured plant/receiver
M1	1 Acacia Street, Belmore	23.03.2023 10:07pm – 10:22pm	EWP & Handtools	Noise	65m	N/A
M2	26 Redman Parade, Belmore	23.03.2023 10:30pm – 10:45pm	EWP & Handtools	Noise	75m	N/A

2.2 Measurement equipment

Noise measurement equipment consisted of one NTi Audio XL2 Type 1 sound level meter and microphone calibrator. The microphone was checked prior and after measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 '*Electroacoustics – Sound Level Meters*' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

The instrumentation used for the noise measurement is summarised in Table 2-2.

Table 2-2 – Instrumentation

Type	Make / Model	Last Calibrated
Type 1 Sound Level Meter (XL2)	NTi XL2 (SN: A2A-19156-E0)	10 March 2022
Calibrator Type 4231	B&K (SN: 3027924)	4 April 2022

2.3 Environmental conditions

Environmental conditions recorded during the measurements are provided in Table 2-3. Environmental conditions did not have an adverse effect on the measured noise levels.

Table 2-3: Environmental conditions

Measurement ID	Assessment Point	Date and Time	Environmental Conditions
M16	1 Acacia Street, Belmore	23.03.2023 10:07pm – 10:22pm	Partly cloudy; air temperature 17ºC, wind speed < 5m/s; relative humidity 42%
M2	26 Redman Parade, Belmore	23.03.2023 10:30pm – 10:45pm	Partly cloudy; air temperature 16ºC, wind speed < 5m/s; relative humidity 58%

3 Noise monitoring results

The results of the noise monitoring are presented in Table 3-1.

Table 3-1: Belmore noise monitoring results

Measurement ID	Assessment Point	Measured plant	Distance to source	Predicted noise levels $L_{Aeq,\ 15\ minutes}$ dB(A)	Measured $L_{Aeq,\ 15\ minutes}$ dB(A)	Comments
M1	1 Acacia Street, Belmore	EWP & Handtools	65m	45[1]	44	The measured $L_{Aeq,\ 15min}$ is below the predicted noise level.

Measurement ID	Assessment Point	Measured plant	Distance to source	Predicted noise levels $L_{Aeq, 15\ minutes}$ dB(A)	Measured $L_{Aeq, 15\ minutes}$ dB(A)	Comments
M2	26 Redman Parade, Belmore	EWP & Handtools	75m	45[1]	52 (42)[2]	The measured $L_{Aeq, 15min}$ is above the predicted noise level. However, the construction noise was inaudible at this monitoring location. Given that the construction noise was inaudible at this monitoring location, the contribution from the construction works can be assumed to be 10 dB below the measured $L_{Aeq, 15\ minutes}$. As a result, the contribution from the construction works can be calculated to be 42 dB(A), which is below the predicted noise level of 45 dB(A).

Notes: 1: The corresponding predicted noise level in the OOHWA.

2: Calculated $L_{Aeq, 15\ minutes}$ contribution from the construction activity, given that the construction noise was not audible at the monitoring location.

It can be seen in Table 3-1, the noise monitoring results were below the predicted noise levels presented in the OOHWA.

4 Conclusion

Renzo Tonin & Associates has completed noise monitoring for the Station Upgrades works for Sydney Metro Southwest.

The results of the noise measurements were below the predicted noise levels presented in the OOHWA prepared for the works.

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
28.03.2023	First Issue	0	1	A. Hannelly	R. Zhafranata	R. Zhafranata

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APPENDIX A Measurement locations

A.1 1 Acacia Street, Belmore

A.2 26 Redman Parade, Belmore

Appendix 8 – TL927-1-36F01 Hurlstone Park Station Vibration Monitoring Report (r1)

21 April 2023
TL927-1-36F01 Hurlstone Park Station Vibration Monitoring Report (r1)

Downer EDI Works Pty Ltd
76 Berry Street
Nth Sydney NSW 2060

Sydney Metro Southwest - Station Upgrades – Hurlstone Park Station Vibration Monitoring

1 Introduction

Renzo Tonin & Associates was engaged by Downer EDI Works to conduct vibration monitoring during the Station Upgrades works for Sydney Metro Southwest. The vibration monitoring was undertaken to assess the potential vibration impacts on the garage structure at 3A Commons Street, Hurlstone Park. This report provides a summary of the monitoring results.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

2 Details of monitoring

One unattended vibration monitor was at the garage structure of 3A Commons Street between 16th February 2023 and 17th April 2023.

2.1 Monitoring location

The monitoring location is shown in Figure 2-1. Photos depicting the monitoring location are also included in APPENDIX A.

Figure 2-1: Vibration monitoring location

2.2 Monitoring methodology

The vibration monitor was installed as close as possible to the foundation of the garage structure at 3A Commons Street, assessing cosmetic damage. For monitoring on soils, in accordance with AS 2775-2004[1], a ground spike was planted into the surface and the accelerometers were mechanically mounted onto the ground spike.

The instrumentation used for the vibration monitoring are summarised in Table 2-1. The transducer used in the measurements have current calibration certificates.

Table 2-1: Summary of vibration instrumentation

Type	Make / Model
Triaxial Transducer	Sigicom C12 (SN: 70130)

[1] Australia Standard 2775-2004 Mechanical vibration and shock – Mechanical mounting of accelerometers

3 Vibration screening criteria

In accordance with the building inspection report[2] prepared by Lindsay Dynan Consulting Engineers, the established vibration screening criteria for the affected structure is shown below:

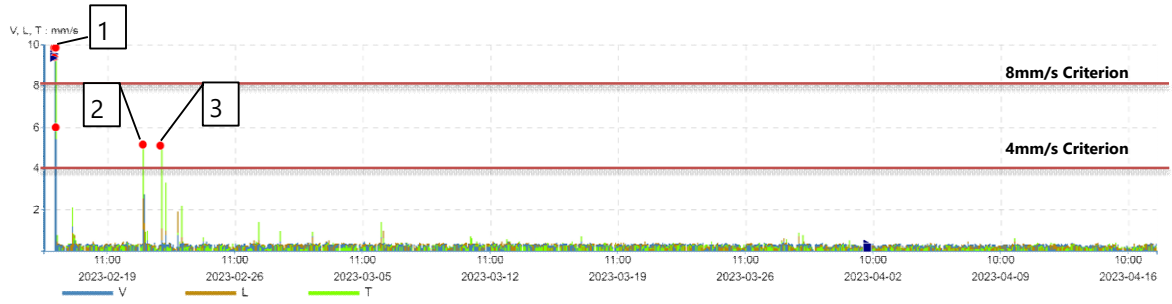
- Amber trigger level at the 4 mm/s (ppv)
- Stop works trigger level at the 8 mm/s (ppv)

4 Vibration Monitoring results

4.1 3A Commons Street garage structure vibration monitoring results

The results of the unattended vibration monitoring are shown in Figure 4-1.

Figure 4-1: Vibration monitoring results between 16th February 2023 and 17th April 2023



The discussion of the vibration monitoring results is summarised in Table 4-1 below.

Table 4-1: Vibration monitoring summary

Exceedance ID	Date and Time	Cause of exceedance
1	16.02.2023 12:29pm	At this time, the vibration monitor was being installed on the ground spike to commence the vibration monitoring. This exceedance was caused by the RT&A engineer mounting the monitor on the ground spike. No construction activities were occurring at this time.
2	21.02.2023 07:12am	At this time, it was confirmed by the Project team no construction works were occurring near the monitor. An extraneous event such as a worker inadvertently bumping the monitor was likely the cause of the exceedance. Therefore, the exceedance was deemed not construction related.

[2] Hurlstone Park Station Monitoring of Garage Wall (ref: EDS-00016589-HPS-18-0 - Garage Wall Monitoring), dated 31 August 2021

Exceedance ID	Date and Time	Cause of exceedance
3	22.02.2023 08:19am	At this time, it was confirmed by the Project team no construction works were occurring near the monitor. An extraneous event such as a worker inadvertently bumping the monitor was likely the cause of the exceedance. Therefore, the exceedance was deemed not construction related.

It can be seen in Figure 4-1 that the vibration levels produced from the nearby works are typically below 4 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 4 mm/s which have been deemed not construction related.

5 Conclusion

Renzo Tonin & Associates has completed vibration monitoring during the Station Upgrades works for Sydney Metro Southwest at Hurlstone Park Station. The results of the unattended vibration monitoring were typically below 4 mm/s. Note that there were events that resulted in an instantaneous vibration level of above 4 mm/s which have been deemed not construction related.

Document control

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21.04.2023	First issue	0	1	A. Hannelly	R. Zhafranata	R. Zhafranata

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APPENDIX A Monitoring location

A.1 Vibration monitoring location