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NORTHCONNEX: QUARTER 1 COMPLIANCE EMISSIONS MONITORING

TRANSURBAN

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Table 1: History of Revisions

Revision	Date	Issued to	Changes
R_0	8/06/2021	David Arbuckle	Initial Release.

ACCREDITED FOR COMPLIANCE TO ISO/IEC 17025 (TESTING)

The results of the tests, calibrations and/or measurements included in this document is traceable to Australian/national standards.

Accreditation number: 19703

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EXECUTIVE SUMMARY

Over the course of February 2021, Assured Environmental (AE) performed quarterly one (Q1) air emissions monitoring for Transurban in accordance with New South Wales Environmental Protection Licence (Licence number – 21386) and Condition E18 of Infrastructure Approval SSI 6136. Monitoring was performed at two locations as listed below for the accompanying parameters.

Table 2: Scope of works

EPA identification no.	Location description	Frequency	Scope IA[a]	Scope EPL[b]
1	Pennant Hills ventilation Facility (VS01)	Quarterly	Total PM, PM_{10} & $PM_{2.5}$	Total PM, PM_{10} & $PM_{2.5}$
2	Woonona avenue ventilation facility (VS04)	Quarterly	Total PM, PM_{10} & $PM_{2.5}$	Total PM, PM_{10} & $PM_{2.5}$

There is only one relevant limit condition for Solid Particles (1.1mg/m^3) there are no emission concentration limits for PM_{10} and $PM_{2.5}$ in the Infrastructure Approval or EPL, only the requirement to perform specific quarterly and annual monitoring. A summary of the tests is presented below, with further detail available in the body of this report.

Neither VS01 or VS04 were in excess of their relevant licence limits.

Table 3: Test summary results for VS01

Parameter	Unit of measure	Test result	Test result	Licence limit
Site	-	North Connex VS01	North Connex VS01	-
Source	-	Large	Large	-
Date	dd/mm/yyyy	10/02/2021	8/02/2021	-
Time start	hh:mm	12:51	11:09	-
Time end	hh:mm	16:27	13:57	-
Exhaust air velocity	m/sec	14.10	13.99	-
Exhaust air temperature	°C	30.3	29.7	-
Exhaust air absolute pressure	mbar	1009	1015	-
Exhaust air moisture content	% v/v	1.102	1.20	-
Exhaust air density	kg/Nm^3	1.29	1.29	-
Exhaust air volume flow	Nm^3/sec-dry	365	21908	-
Total Particulate Matter - PM	mg/Nm^3	n/a	0.311	1.1 [1]
- emission rate	g/sec	n/a	0.114	-
Particulates - PM_{10}	mg/Nm^3	0.348	-	-
- emission rate	g/sec	0.127	-	-
Particulates - $PM_{2.5}$	mg/Nm^3	0.0166	-	-
- emission rate	g/sec	0.00606	-	-

[1] – Special averaging time 1 means: 1 hour, or the minimum sampling period specified in the relevant test method, whichever is the greater.

[a] Condition E18 of Infrastructure Approval SSI 6136
[b] Condition E18 of Infrastructure Approval SSI 6136

Table 4: Test summary results for VS04

Parameter	Unit of measure	Test result	Test result	Licence limit
Site	-	NorthConnex VS04	NCX -VS04	-
Source	-	Large	Large	-
Date	dd/mm/yyyy	15/02/2021	22/02/2021	-
Time start	hh:mm	10:20	12:36	-
Time end	hh:mm	14:16	14:42	-
Exhaust air velocity	m/sec	12.93	8.17	-
Exhaust air temperature	°C	31.8	35.0	-
Exhaust air absolute pressure	mbar	1012	1007	-
Exhaust air moisture content	% v/v	0.775	0.741	-
Exhaust air density	kg/Nm^3	1.288	1.288	-
Exhaust air volume flow	Nm^3/sec-dry	290.02	10831	-
Total Particulate Matter - PM	mg/Nm^3	n/a	0.694	1.1 [1]
- emission rate	g/sec	n/a	0.125	-
Particulates - PM_{10}	mg/Nm^3	0.643	-	-
- emission rate	g/sec	0.109	-	-
Particulates - $PM_{2.5}$	mg/Nm^3	0.282	-	-
- emission rate	g/sec	0.0477	-	-

[1] – Special averaging time 1 means: 1 hour, or the minimum sampling period specified in the relevant test method, whichever is the greater.

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GLOSSARY

Conversion of ppm to mg/Nm^3	Where R is the ideal gas constant; T, the temperature in kelvin (273.16 + T°C); and P, the pressure in mm Hg, the conversion is as follows: µg m^3 = (P/RT) x Molecular weight x (concentration in ppm) $= \frac{P \times \text{Molecular weight} \times (\text{concentration in ppm})}{62.4 \times (273.2 + T°C)}$ For the purposes of the air quality assessment all conversions were made at 0°C unless stated otherwise. Particulate matter is referenced to 0°C.
m^3/sec	Volume flow of exhaust gas in cubic meters per second. No normalisation has been performed, i.e. velocity in m/sec multiplied by the sample plane area in m^2.
Nm^3/sec	Volume flow of exhaust gas in cubic meters per second. Normalisation has been performed to dry, 273.16 °K and 101.325 kPa.
g/sec	Grams of a pollutant emitted every second.
mg/Nm^3	Milligrams (10-3) per cubic metre. Conversions from mg/m^3 to parts per volume concentrations (i.e., ppm) are calculated at 0 °C.
µg/Nm^3	Micrograms (10-6) per cubic metre. Conversions from µg/m^3 to parts per volume concentrations (i.e., ppb) are calculated at 0 °C.
ppb	Parts per billion.
ppm	Parts per million.
PM_{10} & $PM_{2.5}$	Fine particulate matter with an equivalent aerodynamic diameter of less than 10 or 2.5 micrometres, respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
PM	Particulate matter, meaning total solid particles, regardless of size fraction, that can enter the isokinetic sampling system.
100th percentile	The value exceeded for 100 % of the time.
VOCs	Volatile organic compounds, excluding methane
PAHs	Polycyclic aromatic hydrocarbons

LOWER	Sum of only those individual compounds that were detectable in the sample.
MEDIUM	Sum of the individual compounds detectable, plus half the limit of detection values.
UPPER	Sum of all compounds, including 100% of the limit of detection values.

ABBREVIATIONS

US EPA	United State Environmental Protection Authority
AS	Australian Standard
CARB	California Air Resources Board
NSW	New South Wales
TM	Test Method

1 INTRODUCTION

Assured Environmental (AE) was appointed Transurban to conduct the Annual compliance monitoring as required by the Licence 21386 and Condition E10 of Infrastructure Approval SSI-6136, on the VS01 (Pennant Hills Road) and VS04 (Woonona Ave) ventilation facility release points.

The scope of work at the two facilities is the same with the following measurements performed:

- Solid particles (Total Particulate Matter (PM))
- Particulate matter (PM_{10})
- Particulate matter ($PM_{2.5}$)

Once setup on the relevant exhaust duct release points the fan settings were placed in manual for the duration of the test to ensure a constant emission with no changes to the flow paths.

2 METHODOLOGY

The methodology for this project was selected based on the requirements of the Licence and with reference to the '*Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*' document. The methodology is listed in Table 5 below along with AE's NATA accreditation scope in relation to the work.

Table 5. Test Scope

Parameter	Unit	Reference test method	NSW EPA TM	NATA
Sample point selection	-	AS 4323.1	TM-1	Yes
Velocity	m/sec	USEPA Method 2	TM-2	Yes
Volume flow	m^3/sec	USEPA Method 2	TM-2	Yes
Temperature	°C	USEPA Method 2	TM-2	Yes
Gas molecular weight	g/g mole	USEPA Method 3	TM-23	Yes
Moisture content	% v/v	USEPA Method 4	TM-22	Yes
Solid Particles	mg/Nm^3	USEPA Method 201A	TM-15	Yes
Solid particles – PM_{10}	mg/Nm^3	USEPA Method 201A	OM-5	Yes
Solid particles – $PM_{2.5}$	mg/Nm^3	USEPA Method 201A	OM-5	Yes

The total PM (solid particles) sampling trains were run separately from the PM10 & 2.5 sampling trains. Therefore, correlation of the fractional concentrations to the reported total PM are not relevant.

2.1 Subcontracted laboratories

To achieve a lower limit of detection, particulate filters and sample rinses were analysed using a 5-point (0.01mg) balance. Sample weighing was performed by Envirolab Group (NATA ID. 2901).

2.2 Measurement uncertainty

There is an inherent uncertainty associated with any scientific measurement, including stack emissions monitoring. The measurement uncertainty can be controlled with adherence to the reference methodology which includes utilising appropriate calibration standards with corresponding acceptable uncertainty reports.

Many source sampling methods do not outline exact procedures for establishing direct measurement uncertainty. In the absence of a defined procedure, the uncertainty budgets presented are based on estimations using ISO-GUM method.

Each individual source and test may have a unique associated uncertainty, due largely to the stack sample location in relation to the positioning requirements of AS4323.1 and whether it meets the ideal or non-ideal descriptions.

Table 6: Uncertainty budget

Parameter	Reference method	Uncertainty	Coverage factor	Confidence coefficient
		± %		%
Velocity	USEPA Method 2	10	2	95
Temperature	USEPA Method 2	5.0	2	95
Moisture content	USEPA Method 4	5.0	2	95
PM_{10} & $PM_{2.5}$	USEPA Method 201A	20	2	95
Solid particles	AS4323.2	10	2	95

3 PROCESS DESCRIPTION

NorthConnex is a 9-kilometre twin-tube motorway tunnel in northern Sydney. The tunnel is vented through a ventilation stack at either end of the tunnel; VS01 at the Southern end and VS04 and the Northern.

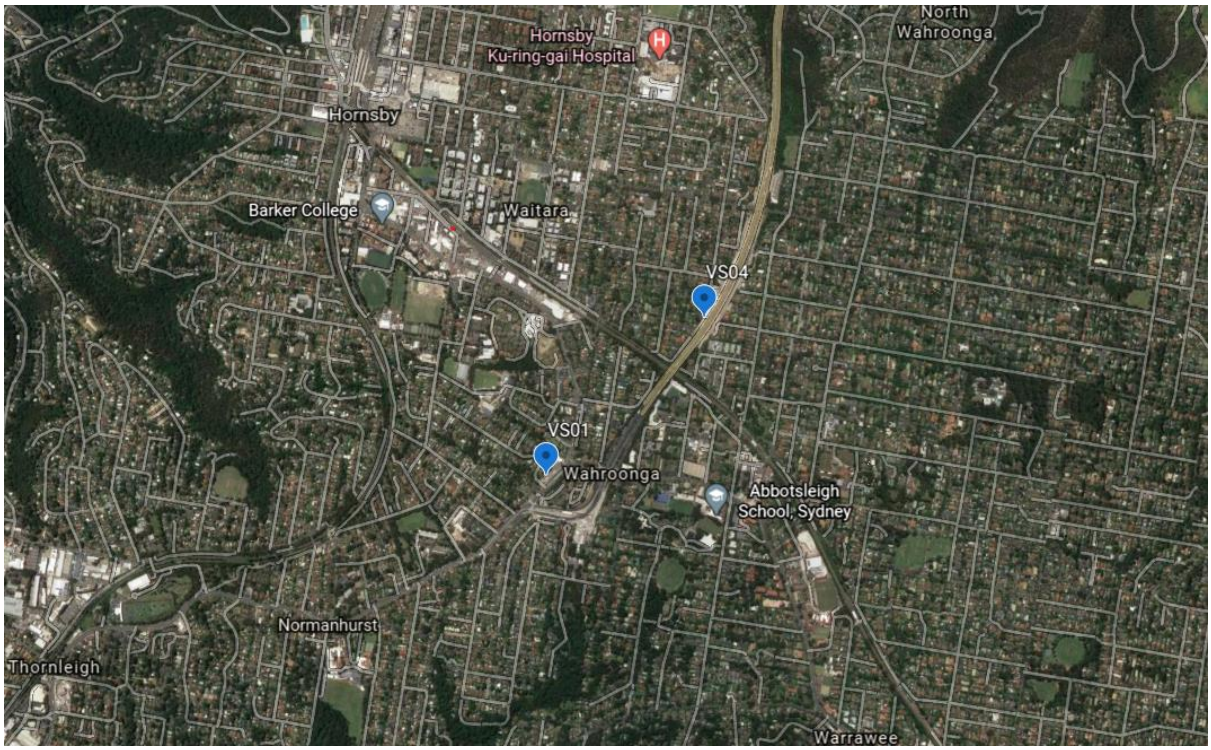

Figure 1: NCX Ventilation locations

3.1 EPA release Point 1 - Pennant Hills Road (VS01)

Access to the VS01 (large stack) sampling planes is via a common set of stairs which leads through the building to an outdoor opening at the very top of the building. Fourteen 150mm diameter flanged sampling ports are positioned along two faces of the ducts (7 oppositely opposed ports). Refer to Table 7 for the sample plane description.

Due to the size of the ducts traversing was conducted by sampling in half traverses and utilising all 14 of the sampling ports. Therefore, standard sampling probes were used. The sampling probes housed the pitot tube, thermocouple, gas sample probe, filter housing and sampling nozzle. The pitot lines, sample vacuum line, thermocouple lead & gas sampling line were contained inside the pipe which were attached to our sampling console and gas analyser system.

Figure 2. AE Reference Method CEMS trailer at VS01

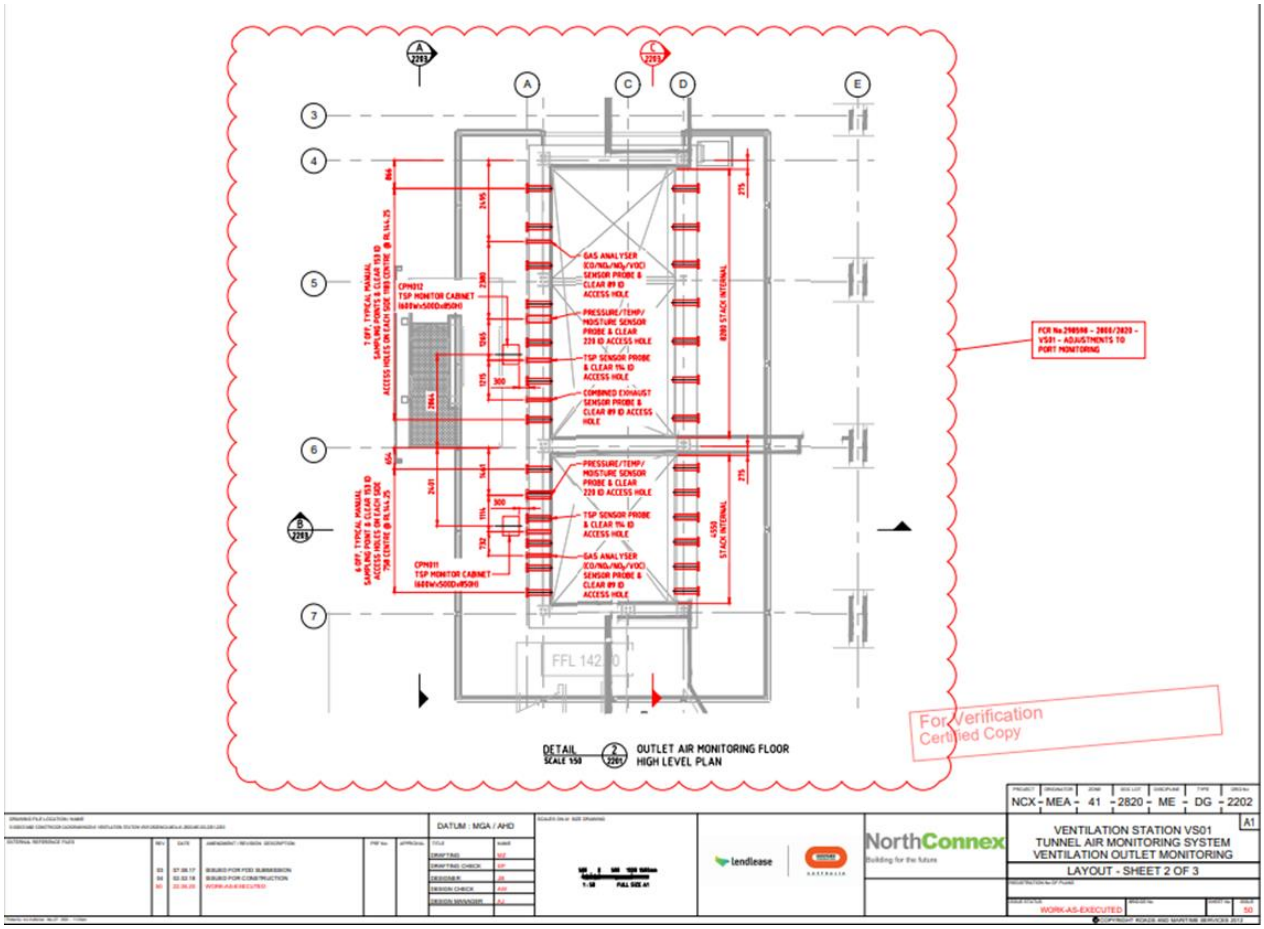

Figure 3. VS01 Sampling plane-top view

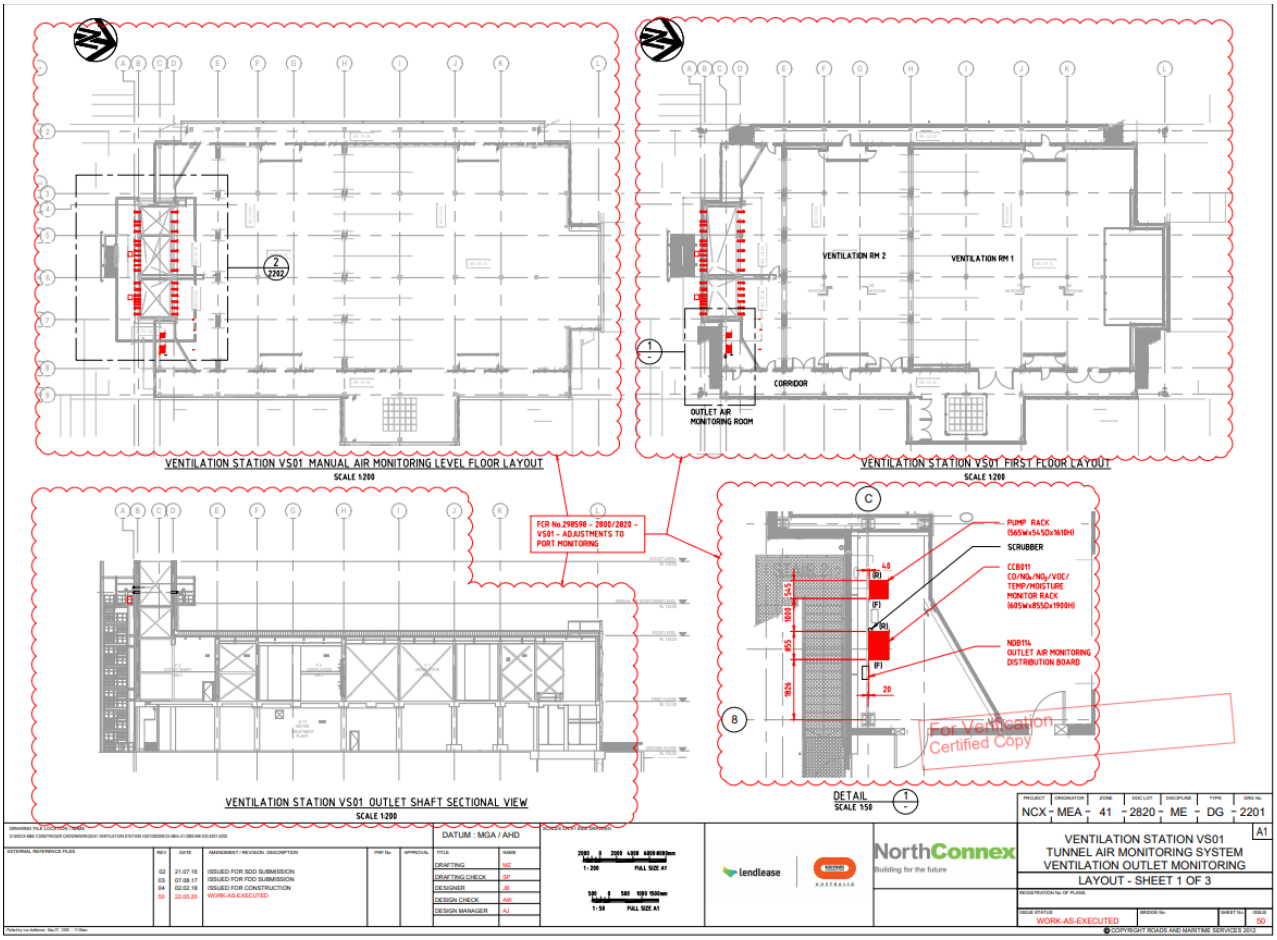

Figure 4. VS01 Sampling plane – side view

The sampling position was evaluated in accordance with AS 4323.1 to determine the total number sampling points, based on the cross-sectional area and effective distance from disturbances. It is noted that given the design of the structure and required exhaust duct size, meeting each requirement of the method is not possible. The assessment is summarised in the following table.

Table 7: Source description – VS01

Sample location	VS01 Large
Stack coordinates	UTM
Easting	LAT -33.738106
Northing	LONG 151.071823
Stack Exit point from ground (m)	23
Stack Shape	RECTANGULAR
Stack Diameter (m) (equivalent)	4.95
Stack Cross Section Area (m^2)	29.23
Distance to upstream disturbance (m)	23
Diameters (D)	4.65
Distance to downstream disturbance (m)	5
Diameters (D)	1.01
Total traverse point factors	1.10
Port size (mm)	150
Port Thread Type	Flange
Number of traverses	7 x 2 = 14
Number of points per traverse	3
Total number of traverse points	42
Flow & temperature compliance check	YES
Condition check requirements (Section 4 – AS4323.1)	
(a) The gas flow is basically in the same direction	Yes
(b) The gas velocity at all points greater than 3 m/sec	Yes
(c) Gas flow profile is steady with <15° cyclonic flow component	Yes[c]
(d) Temperature difference between points <10% of mean	Yes
(e) The highest to lowest pitot pressure and velocity < 9:1 and 1.6:1 respectively	Yes
(f) Gas temperature above dew point	Yes

[c] The sample ports proximity is not compliant to AS4323.1 to avoid the effects of cyclonic flow testing during period of mid-range winds were avoided and during high winds was totally avoided.

3.2 EPA release Point 2 – Woonona Avenue (VS04)

Access to the VS04 (large stack) sampling planes is via a common set of stairs which leads through the building to an outdoor opening at the very top of the building. Sixteen 150mm diameter flanged sampling ports are positioned along two faces of the ducts (8 oppositely opposed ports). Refer to Table 8 for the sample plane description.

Due to the size of the ducts traversing was conducted by sampling in half traverses and utilising all 16 of the sampling ports. Therefore, standard sampling probes were used. The sampling probes housed the pitot tube, thermocouple, gas sample probe, filter housing and sampling nozzle. The pitot lines, sample vacuum line, thermocouple lead & gas sampling line were contained inside the pipe which were attached to our sampling console and gas analyser system.

Figure 5. AE Reference Method CEMS trailer at VS04

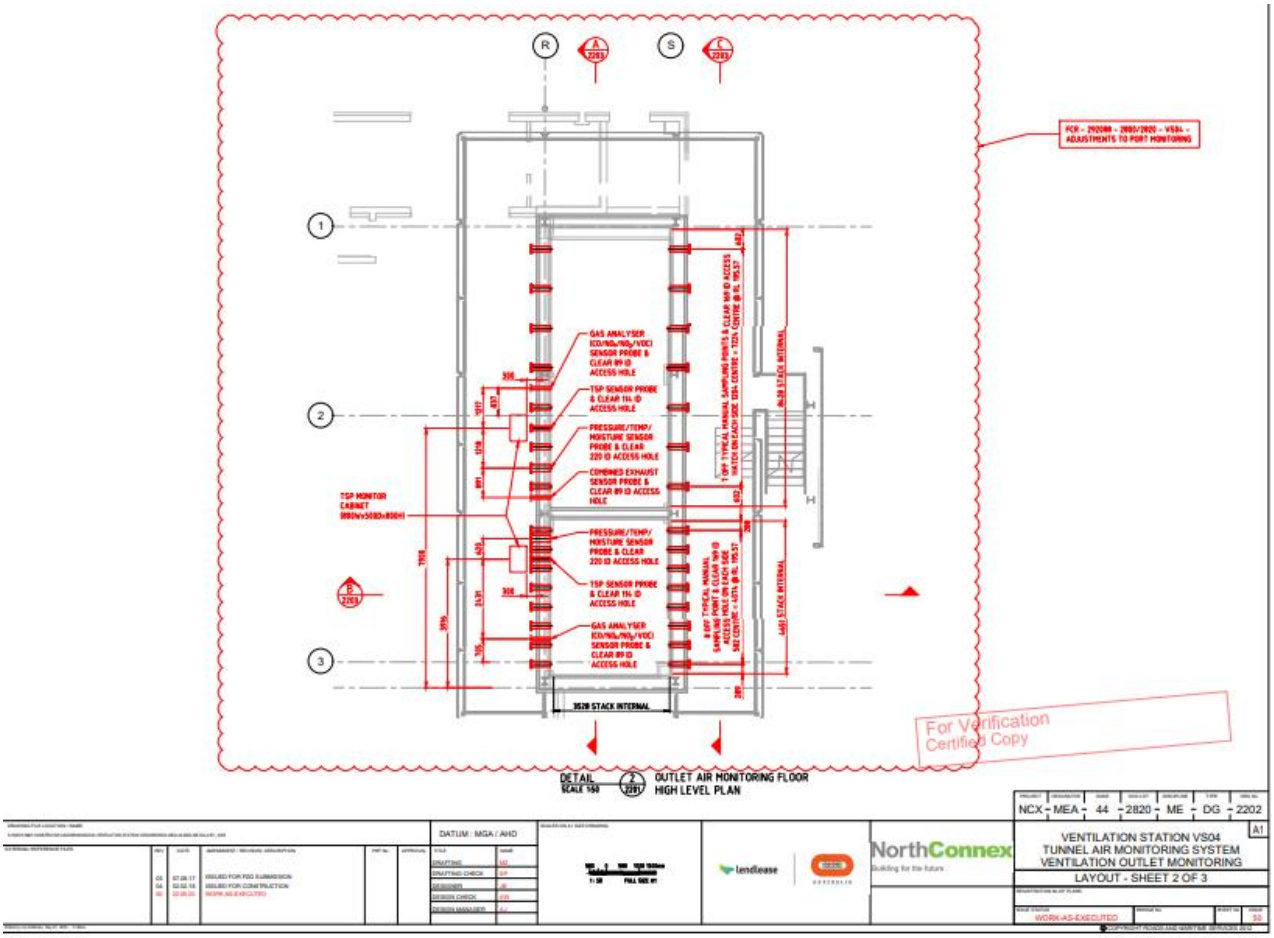

Figure 6.VS04 sampling plane – top view

The sampling position was evaluated in accordance with AS 4323.1 to determine the total number sampling points, based on the cross-sectional area and effective distance from disturbances. It is noted that given the design of the structure and required exhaust duct size, meeting each requirement of the method is not possible. The assessment is summarised in the following table.

Table 8: Source description – VS04

Sample location	VS04 Large
Stack coordinates	UTM
Easting	LAT -33.71134123760864
Northing	LONG 151.11489145548467
Stack Exit point from ground (m)	43
Stack Shape	RECTANGULAR
Stack Diameter (m) (equivalent)	4.42
Stack Cross Section Area (m^2)	25.27
Distance to upstream disturbance (m)	23
Diameters (D)	5.2
Distance to downstream disturbance (m)	5
Diameters (D)	1.13
Total traverse point factors	1.05
Port size (mm)	150
Port Thread Type	Flange
Number of traverses	7 x 2 = 14
Number of points per traverse	3
Total number of traverse points	42
Flow & temperature compliance check	YES
Condition check requirements (Section 4 – AS4323.1)	
(a) The gas flow is basically in the same direction	Yes
(b) The gas velocity at all points greater than 3 m/sec	Yes
(c) Gas flow profile is steady with <15° cyclonic flow component	Yes
(d) Temperature difference between points <10% of mean	Yes
(e) The highest to lowest pitot pressure and velocity < 9:1 and 1.6:1 respectively	Yes
(f) Gas temperature above dew point	Yes

4 QUALITY ASSURANCE & QUALITY CONTROL (QA/QC)

Assured Environmental operates within a quality system based upon the requirements of ISO17025. Our quality system defines specific procedures and methodologies to ensure any project undertaken by Assured Environmental is conducted with the highest level of quality given the specific confines of each project. The overall objective of our QA/QC procedures is to representatively sample and accurately analyse components in the gas streams and therefore report valid measurements of emission concentrations.

To ensure representativeness of field work, our quality procedures target:

1. Correct sampling locations
2. Sample time
3. Frequency of samples and
4. Method selection & adherence

To ensure representativeness of lab work, our quality procedures target:

1. Sample preservation
2. Chain of custody (COC)
3. Sample preparation and
4. Analytical techniques

Assured Environmental maintains strict quality assurance throughout all its sampling programs, covering on-site 'field work' and the analytical phase of our projects. Our QA program covers the calibration of all sampling and analytical apparatus where applicable and the use of spikes, replicate sample and reference standards. The test methodologies used for this project are outlined in the methods section of this document. Field test data has been recorded and calculated using direct entry into Microsoft Excel spreadsheets following the procedures of the appropriate test methods. Determination of emission concentrations has been performed using the same Microsoft Excel spreadsheets which are partially supplied as an attachment to this report. More detailed information can be supplied upon request.

QA/QC checks for this project will use validation techniques and criteria appropriate to the type of data and the purpose of the measurement to approve the test report. Records of all data will be maintained. Complete chain of custody (COC) procedures have been followed to document the entire custodial history of each sample. The COC forms also served as a laboratory sheet detailing sample ID and analysis requirements.

Table 9: Sampling data QA/QC checklist

Sampling Data QA/QC Checklist	Comment
Use of appropriate test methods	Yes
'Normal' operation of the process being tested	Yes – as instructed by client
Use of properly operating and calibrated test equipment	Yes
Use of high purity reagents	Yes
Performance of leak checks post sample (at least)	Yes

Table 10: Laboratory data QA/QC checklist

Laboratory Data QA/QC Checklist	Comment
Use of appropriate analytical methods	Yes
Use of properly operating and calibrated analytical equipment	Yes
Precision and accuracy comparable to that achieved in similar projects	Yes
Accurate reporting	Yes

5 RESULTS

The results of the measurements are presented below along with other pertinent data associated with the tests.

Table 11: VS01 results

Source Data			VS01 PM10 & 2.5	VS01 PM
Client			Transurban	Ecotech
Site			North Connex VS01	North Connex VSO1
Sample Point			Large	Large
Reference Method			USEPA M201A	AS4323.2 - ISOKINETIC
Test Parameters			PM10 & 2.5	PM
Historical Data & Hardware Information - Manual Sample				
Run Start Date		dd-mm-yy	10/02/2021	8/02/2021
Project ID			13500	13500
Run ID			-37	-9
Run Start Time	Ti	hh:mm	12:51	11:09
Run Stop Time	Tf	hh:mm	16:27	13:57
Meter Calibration Factor	(Y)		0.97	0.97
Orifice Coefficient		(DH@)	45.367	45.367
Pitot Tube Coefficient	(Cp)		0.84	0.84
Actual Nozzle Diameter	(Dna)	mm	4.56	4.59
Stack Test Data				
Actual Sampling Time	(Q)	minutes	216	168
Average Meter Temperature	(tm)avg	°C	22	21
Average Stack Temperature	(ts)avg	°C	30	30
Barometric Pressure	(Pb)	mb	1008	1014
Stack Static Pressure	(Pstatic)	mm H_2O	4.0	6.0
Absolute Stack Pressure	(Ps)	mb	1008.6	1014.9
Sample Volumes				
Actual Meter Volume	(Vm)	m^3	3.273	2.244
Standard Meter Volume	(Vm)std	Nm^3	3.015	2.090
Moisture Content Data				
Total Water Volume Collected	(Vlc)	ml	5.0	19.0
Calculated Stack Moisture	(Bws(calc))	%	1.1	1.2
Stack Gas Density Analysis Data				
Carbon Dioxide Percentage	(%CO_2)	%	0.04	0.04
Oxygen Percentage	(%O_2)	%	20.9	20.9
Carbon Monoxide Percentage	(%CO)	%	0.00	0.00
Nitrogen Percentage	(%N_2)	%	79.07	79.07
Dry Gas Density	(Md)	kg/Nm^3	1.29	1.29
Dry Gas Molecular Weight	(Md)	g/g-mole	28.84	28.84
Wet Stack Gas Molecular Weight	(Ms)	g/g-mole	28.71	28.71
Volumetric Flow Rate Data (at Sample Plane)				
Average Stack Gas Velocity	(vs)	m/sec	14.1	14.0
Stack Diameter	Ds	m	4.95	4.95
Stack Cross-Sectional Area	(As)	m^2	29.2	29.2
Upstream distance (from disturbance)	B	m	23.0	23.0
Downstream distance (from disturbance)	A	m	5.0	5.0
Actual Stack Flow Rate	(Qaw)	m^3/sec	412	24539
Wet Standard Stack Flow Rate	(Qsw)	$Nm^3/sec\text{-}wet$	369	22173
Dry Standard Stack Flow Rate	(Qsd)	$Nm^3/sec\text{-}dry$	365	21908
Percent of Isokinetic Rate	(I)	%	101.8	100.3
Particulate Matter (PM) Concentration				
Total Mass of Particulates	(mn)	g	0.00305	0.00065
Stack PM Concentration	(cs)	mg/Nm^3	1.012	0.311
Particulate Emission Rate	(E)	g/sec	0.369	0.114
USEPA Method 201A				
D50		µm	10.1	-
D50 Criteria check	9µm < x < 11µm	µm	D50 OK	-
% Isokinesticity		**%**	101.8	-
Isokinetic compliance to USEPA M201A	80% < x< 120%		**% Iso OK**	**-**
Total Mass of PM_{10}	(mn)	g	0.0011	-
Stack PM_{10} Concentration	(cs)	mg/Nm^3	0.35	-
PM_{10} Emission Rate	(E)	g/sec	0.13	-
Total Mass of $PM_{2.5}$	(mn)	g	0.0001	-
Stack $PM_{2.5}$ Concentration	(cs)	mg/Nm^3	0.017	-
$PM_{2.5}$ Emission Rate	(E)	g/sec	0.006	-

Table 12: VS04 results

Source Data			PM10 ISOCALC VERSION - 2. Stack SDS version - 3.26	
Client			Transurban	ECOTECH
Site			NorthConnex VS04	NCX -VS04
Sample Point			Large	Large
Reference Method			USEPA M201A	AS4323.2 - ISOKINETIC
Test Parameters			PM10 & 2.5	PM
Historical Data & Hardware Information - Manual Sample				
Run Start Date		dd-mm-yy	15/02/2021	22/02/2021
Project ID			13500	13500
Run ID			-38	-35
Run Start Time	Ti	hh:mm	10:20	12:36
Run Stop Time	Tf	hh:mm	14:16	14:42
Meter Calibration Factor	(Y)		0.97	0.97
Orifice Coefficient		(DH@)	45.367	45.367
Pitot Tube Coefficient	(Cp)		0.84	0.84
Actual Nozzle Diameter	(Dna)	mm	4.56	4.59
Stack Test Data				
Actual Sampling Time	(Q)	minutes	240	126
Average Meter Temperature	(tm)avg	°C	22	27
Average Stack Temperature	(ts)avg	°C	32	35
Barometric Pressure	(Pb)	mb	1011	1007
Stack Static Pressure	(Pstatic)	mm H2O	4.0	5.0
Absolute Stack Pressure	(Ps)	mb	1011.7	1007.0
Sample Volumes				
Actual Meter Volume	(Vm)	m3	3.438	0.988
Standard Meter Volume	(Vm)std	Nm3	3.186	0.893
Moisture Content Data				
Total Water Volume Collected	(Vlc)	ml	5.0	5.0
Calculated Stack Moisture	(Bws(calc))	%	0.8	0.7
Stack Gas Density Analysis Data				
Carbon Dioxide Percentage	(%CO2)	%	0.04	0.00
Oxygen Percentage	(%O2)	%	20.9	20.9
Carbon Monoxide Percentage	(%CO)	%	0.00	0.00
Nitrogen Percentage	(%N2)	%	79.07	79.07
Dry Gas Density	(Md)	kg/Nm3	1.29	1.29
Dry Gas Molecular Weight	(Md)	g/g-mole	28.84	28.84
Wet Stack Gas Molecular Weight	(Ms)	g/g-mole	28.75	28.76
Volumetric Flow Rate Data (at Sample Plane)				
Average Stack Gas Velocity	(vs)	m/sec	12.9	8.2
Actual Stack Flow Rate	(Qaw)	m3/sec	327	12385
Wet Standard Stack Flow Rate	(Qsw)	Nm3/sec-wet	292	10912
Dry Standard Stack Flow Rate	(Qsd)	Nm3/sec-dry	290	10831
Percent of Isokinetic Rate	(I)	%	96.9	99.8
Particulate Matter (PM) Concentration				
Total Mass of Particulates	(mn)	g	0.00729	0.00062
Stack PM Concentration	(cs)	mg/Nm3	2.288	0.694
Particulate Emission Rate	(E)	g/sec	0.664	0.125
USEPA Method 201A				
D50		µm	10.1	
D50 Criteria check	9µm < x < 11µm	µm	D50 OK	
% Isokinesticity		**%**	99.4	
Isokinetic compliance to USEPA M201A	80% < x< 120%		**% Iso OK**	
Total Mass of PM10	(mn)	g	0.00196	
Stack PM10 Concentration	(cs)	mg/Nm3	0.64	
PM10 Emission Rate	(E)	g/sec	0.11	
Total Mass of PM2.5	(mn)	g	0.0009	
Stack PM2.5 Concentration	(cs)	mg/Nm3	0.282	
PM2.5 Emission Rate	(E)	g/sec	0.048	

6 ADDENDUM

6.1 Condition E10 of Infrastructure Approval application number SSI-6136

Table 9 — Ventilation Outlet Emission Monitoring Methodologies

Pollutant	Units of measure	Frequency	Method[1]
Solid particles	mg/m^3	Continuous	Special Method 1[4]
Solid particles	mg/m^3	Quarterly	TM-15
PM_{10}	mg/m^3	Quarterly	OM-5
$PM_{2.5}$	mg/m^3	Quarterly	OM-5
NO_2 or NO or both, as NO_2 equivalent	mg/m^3	Continuous	CEM-2
NO_2	mg/m^3	Continuous	CEM-2
CO	mg/m^3	Continuous	CEM-4
VOC[2]	mg/m^3	Continuous	CEM-8
Speciated VOC	mg/m^3	Annual	TM-34
PAH	$\mu g/m^3$	Annual	OM-6
Parameter	**Units of measure**	**Frequency**	**Method[1]**
Velocity	m/s	Continuous	CEM-6
Volumetric flow rate	m^3/s	Continuous	CEM-6
Moisture	%	Continuous	TM-22
Temperature	°C	Continuous	TM-2
Other	**Units of measure**	**Frequency**	**Method[1]**
Selection of sampling locations	N/A	N/A	TM-1

Notes

1. *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (EPA 2007) *or an alternative method approved by the Secretary in consultation with the EPA.*
2. *Must include, but not be limited to: Benzene, Toluene, Xylenes, 1,3-Butadiene, Formaldehyde and Acetaldehyde.*
3. *Must include, but not limited to; 16 USEPA priority PAHs, namely; Naphthalene, Phenanthrene, Benz(a)anthracene, Benzo(a)pyrene, Acenapthylene, Anthracene, Chrysene, Indeno(1,2,3-cd)pyrene, Acenaphthene, Fluoranthene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Fluorene, Pyrene, Benzo(k)fluoranhtene, Benzo(g,h,i)perylene.*
4. *Special Method 1 means a method approved by the Secretary in consultation with the EPA.*

6.2 EPL-21386 M2.2 Air Monitoring Requirements

POINT 1,2

Pollutant	Units of measure	100 percentile concentration limit	Reference conditions	Oxygen correction	Averaging period
Carbon monoxide	milligrams per cubic metre	40	Dry, 273K 101.3 kPa		1 hour rolling
Nitrogen Oxides	milligrams per cubic metre	20	Dry, 273K,101.3 kPa		1 hour block
Nitrogen dioxide	milligrams per cubic metre	2.0	Dry, 273K,101.3 kPa		1 hour block
volatile organic compounds as n-propane equivalent	milligrams per cubic metre	4.0	Dry, 273K,101.3 kPa		1 hour rolling
Solid Particles	milligrams per cubic metre	1.1	Dry, 273K,101.3 kPa		1 hour block

M2.3 Monitoring Conditions

a) For the purpose of the Table in M2.2, Special Method 1 means US EPA Performance Specification 11 or any modification thereof approved in writing by the EPA and USEPA Procedure 2.

b) For the purpose of the Table in M2.2, Special Method 2 means any moisture monitoring method approved in writing by the EPA, and USEPA Procedure 1.

c) For the purpose of the Table in M2.2, CEMS means Continuous Emission Monitoring System.

d) For the purpose of the Table in M2.2, Speciated Volatile Organic Compounds must include, but is not limited to, Benzene, Toluene, Xylenes, 1,3-Butadiene, Formaldehyde and Acetaldehyde

e) For the purpose of the Table in M2.2, Speciated polycyclic aromatic hydrocarbons (PAH) must include, but is not limited to, 16 USEPA priority PAHs, namely: Naphthalene, Phenanthrene, Benz(a)anthracene, Benzo(a)pyrene, Acenapthylene, Anthracene, Chrysene, Indeno(1,2,3-cd)pyrene, Acenaphthene, Fluoranthene, Benzo(b)fluoranthene Dibenz(a,h)anthracene, Fluorene, Pyrene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene