



Cross City Tunnel
Stack Emissions Monitoring Report
February 2021

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Report prepared by: Tim Allfrey

Norditech Pty Ltd
Unit 2/87 Station Road
Seven Hills NSW 2147

m: +61 403 248 038
p: + 61 2 9622 6327
f: +61 2 9622 6340
bruno.nourdine@norditech.com.au
www.norditech.com.au

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Prepared by



Tim Allfrey
 5 March 2021

Approved by



Bruno Nourdine
 5 March 2021

Distribution

Format	Recipient	Details	Quantity
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Contents

Document Control.....	ii
Distribution	ii
Contents	iii
Executive Summary.....	2
Monitored Parameters	3
Glossary	4
Summary of results.....	5
Validation Table.....	6

Executive Summary

Data capture rates can be found in the Summary of Results table on page 5. Explanations for missing data can be found in the Data Validation table on page 6.

All capture rates for the reporting period were above 90% with the exception of VOC parameters.

- VOC capture rates were 65.6% due to an instrument fault from 22/2/2021 through to 28/02/2021.

There were no readings over the specified limits for the reporting period.

February 2021 Exceedances						
	Unit of measurement	Averaging Period	Total CO	Total NO _x	Total PM ₁₀	Total VOC
Concentration Limit	mg/m ³	1 hour	109	19	1	11
Number of readings over limit			0	0	0	0

Monitored Parameters

The Cross City Tunnel Stack Emissions Monitoring System has been designed to continuously monitor for the following gaseous and particulate parameters:

- CO (Carbon Monoxide)
- NO (Nitrogen Oxide)
- NO₂ (Nitrogen Dioxide)
- NO_x (Total Oxides of Nitrogen)
- Methane
- TNMHC (Total Non-Methane Hydrocarbons)
- PM₁₀ (Particulate matter less than 10 microns in aerodynamic equivalent diameter)
- PM_{2.5} (Particulate matter less than 2.5 microns in aerodynamic equivalent diameter)

Atmospheric parameters also monitored in the stack are:

- Temperature (°C)
- Pressure (kPa)
- Velocity (m/s)
- Relative Humidity (%)

Data are recorded to a data logger at 5 minute averaging periods, calculated from 10 second samples. All data are retrieved periodically, at least once per 24 hours, over a private 3G network, to a central WinCollect database, where data validation is performed to remove any data not deemed as valid. Data validation is performed versus the relevant standard, and/or as per the instrument manufacturers recommended guidelines.

Nightly calibrations for the gaseous analysers are performed between 1:30am and 2:05am. This data is removed from the report automatically, and is not included in the Validation Table.

Parameter	Method	Last Calibration Date	Applicable Standard	Uncertainty
NO NO ₂ NO _x	Chemiluminescence	12/02/2021	AS 3580.5.1	± 0.008 mg/m ³ ± 0.005 mg/m ³ ± 0.005 mg/m ³
CO	Gas filter correlation non-dispersive infrared photometer	12/02/2021	AS 3580.7.1	± 0.029 mg/m ³
Methane TNMHC	Flame Ionisation Detection	12/02/2021	AS 3580.11.1	± 0.0164 mg/m ³
PM ₁₀	Tapered Element Oscillating Microbalance	12/01/2021	AS3580.9/8 AS 4323.2 – 1995	± 3.6% of reading or ± 5µg/m ³ whichever is greater
PM _{2.5}		12/01/2021		± 3.6% of reading or ± 5µg/m ³ whichever is greater
Stack Temperature	Vaisala HMP235a	15/10/2020	US EPA 454-99-005	± 0.25 °C
Stack Pressure	Pitot Tube	-		± 0.3 kPa
Relative Humidity	Vaisala HMP235a	15/10/2020		± 5%
Stack Velocity	Pitot Tube	-	ISO 10780	TBA

Glossary

The following terms may be found throughout this report:

NO – Nitric Oxide

NO₂ – Nitrogen Dioxide

NO_x – Total Oxides of Nitrogen

CO – Carbon Monoxide

CH₄ - Methane

PM₁₀ – Particulate Matter of 10 microns or less (aerodynamic equivalent diameter)

PM_{2.5} – Particulate Matter of 2.5 microns or less (aerodynamic equivalent diameter)

MET – Methane

TNMHC – Total Non Methane Hydrocarbons

VOC – Volatile Organic Compounds

ppb – Parts Per Billion

ppm – Parts Per Million

µg/m³ – micrograms per cubic meter

mg/m³ – milligrams per cubic meter

m/s – meters per second

m³/s – cubic meters per second

kg/hr – kilograms per hour

g/5min – grams per 5 minutes

Summary of results

February 2021 Summary

Tonnes per month (5 minute data)

	NO	NO ₂	NO _x	CO	PM _{2.5}	PM ₁₀	Met.	TNMHC
Tonnes (Corrected)	0.448	0.040	0.727	2.507	0.021	0.025	0.936	0.138
Tonnes (Measured)	0.397	0.036	0.644	2.396	0.021	0.025	0.578	0.085
Available Data Points	7148	7148	7148	7708	8041	8044	4980	4980
Total Data Points	8064	8064	8064	8064	8064	8064	8064	8064
Capture Rate (%)	91.0	91.0	91.0	98.0	99.7	99.8	64.2	64.2

Tonnes per month (1 hr data)

	NO	NO ₂	NO _x	CO	PM _{2.5}	PM ₁₀	Met.	TNMHC
Tonnes (Corrected)	0.440	0.040	0.715	1.976	0.021	0.025	0.934	0.134
Tonnes (Measured)	0.404	0.036	0.655	1.953	0.021	0.025	0.613	0.088
Available Data Points	616	616	616	664	672	672	441	441
Total Data Points	672	672	672	672	672	672	672	672
Capture Rate (%)	91.7	91.7	91.7	98.8	100.0	100.0	65.6	65.6

Average hourly concentrations

	NO(mg/m ³)	NO ₂ (mg/m ³)	NO _x (mg/m ³)	CO(mg/m ³)	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	Met. (mg/m ³)	TNMHC (mg/m ³)
Minimum	0.02	0.00	0.07	0.10	0.00	0.00	1.25	0.00
Maximum	1.57	0.18	2.47	7.80	90.02	224.11	2.27	0.79
Average	0.67	0.06	1.09	3.00	31.39	37.41	1.39	0.21

Validation Table

February 2021 Data Validation					
Start Date	End Date	Affected Parameters	Reason for Change	Changed By	Date
1/02/2021 00:00	22/02/2021 16:20	CH4, NMHC	Offset applied to data: Offset A: -0.3 Offset B: -0.3	TA	5/03/2021
1/02/2021 01:05	21/02/2021 20:40	CH4, NMHC	Intermittent data communication errors	TA	5/03/2021
1/02/2021 01:45	26/02/2021 02:35	PM2.5, PM10	Intermittent negative data < -10 μ g/m ³	TA	5/03/2021
12/02/2021 13:35	12/02/2021 17:45	CO, NO, NO2, NOx, CH4, NMHC	Maintenance	TA	5/03/2021
13/02/2021 02:10	15/02/2021 01:25	NO, NO2, NOx	Calibration out of tolerance	TA	5/03/2021
17/02/2021 10:25	17/02/2021 16:20	CO, NO, NO2, NOx, CH4, NMHC	Maintenance	TA	5/03/2021
17/02/2021 16:25	18/02/2021 01:10	CH4, NMHC	Instrument stabilisation after maintenance	TA	5/03/2021
22/02/2021 16:25	28/02/2021 23:55	CH4, NMHC	Instrument fault	TA	5/03/2021

This table identifies any data removed which is not automatically removed due to overnight calibration checks which are performed from 1:30 AM to 2:05 AM