



Cross City Tunnel
Stack Emissions Monitoring Report
October 2019

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Contents

Document Control.....	ii
Distribution	ii
Contents.....	iii
Executive Summary.....	4
Monitored Parameters	5
Glossary	6
Summary of results.....	7
Validation Table.....	8

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.

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

October 2019 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

There are no data for NO, NO2 and NOX from 29/10/2019 14:25 through to 31/10/2019 23:55 due to the instrument operating outside of its calibration tolerance.

All other parameters have data availability greater than 90% for the reporting period.

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	29/10/2019	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	29/10/2019	AS 3580.7.1	± 0.029 mg/m ³
Methane TNMHC	Flame Ionisation Detection	29/10/2019	AS 3580.11.1	± 0.0164 mg/m ³
PM ₁₀	Tapered Element Oscillating Microbalance	29/10/2019	AS3580.9/8 AS 4323.2 – 1995	± 3.6% of reading or ± 5µg/m ³ whichever is greater
PM _{2.5}		29/10/2019		± 3.6% of reading or ± 5µg/m ³ whichever is greater
Stack Temperature	Vaisala HMP235a	11/10/2016	US EPA 454-99-005	± 0.25 °C
Stack Pressure	Pitot Tube	-		± 0.3 kPa
Relative Humidity	Vaisala HMP235a	11/10/2016		± 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

October 2019 Summary

Tonnes per month (5 minute data)

	NO	NO ₂	NO _x	CO	PM _{2.5}	PM ₁₀	Met.	TNMHC
Tonnes (Corrected)	0.461	0.121	0.828	2.454	0.028	0.033	0.968	0.255
Tonnes (Measured)	0.392	0.102	0.703	2.267	0.026	0.032	0.864	0.227
Available Data Points	7580	7580	7580	8248	8493	8493	7964	7964
Total Data Points	8927	8927	8927	8927	8927	8927	8927	8927
Capture Rate (%)	87.3	87.3	87.3	94.8	95.1	95.1	91.6	91.6

Tonnes per month (1 hr data)

	NO	NO ₂	NO _x	CO	PM _{2.5}	PM ₁₀	Met.	TNMHC
Tonnes (Corrected)	0.449	0.118	0.807	1.914	0.028	0.033	0.965	0.250
Tonnes (Measured)	0.394	0.104	0.708	1.829	0.026	0.032	0.891	0.231
Available Data Points	652	652	652	710	710	710	686	686
Total Data Points	743	743	743	743	743	743	743	743
Capture Rate (%)	87.8	87.8	87.8	95.6	95.6	95.6	92.3	92.3

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	0.01	0.04	0.05	0.13	0.00	0.00	1.11	0.00
Maximum	1.70	0.43	3.03	6.57	216.54	237.36	1.80	2.00
Average	0.61	0.16	1.10	2.61	36.16	43.59	1.27	0.34

Validation Table

October 2019 Data Validation					
Start Date	End Date	Affected Parameters	Reason for Change	Changed By	Date
1/10/2019 00:00	31/10/2019 23:55	CH4	Offset applied to data; Offset A: 0.7, offset B: 0.7;	TA	7/11/2019
1/10/2019 15:00	22/10/2019 10:30	CH4, NMHC	Infrequent intermittent negative data	TA	7/11/2019
6/10/2019 02:00	6/10/2019 02:55	All parameters	Missing Data	TA	7/11/2019
19/10/2019 02:10	20/10/2019 01:25	CH4, NMHC	Instrument calibration outside of tolerance	TA	7/11/2019
25/10/2019 09:40	26/10/2019 16:15	All parameters	Data logger fault	TA	7/11/2019
29/10/2019 10:10	29/10/2019 14:20	CO, NO, NO2, NOx, CH4, NMHC, PM2.5, PM10	Maintenance	TA	7/11/2019
29/10/2019 14:25	31/10/2019 23:55	NO, NO2, NOx	Instrument calibration out of tolerance	TA	7/11/2019

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