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**Report for the Periodic Monitoring of Emissions to Air
From The Print Line Oxidisers**

Part 1: Executive Summary
Permit Number: N/A
Operator: Wyndeham Heron
Installation: Printworks



Monitoring dates: 17th April 2008

Address: Wyndeham Heron
The Bethnell Complex
Colchester Road
Maldon
Essex

Monitoring Organisation: Envirocare Technical Consultancy Ltd
St Blaise House
Vaughan Street
Bradford
West Yorkshire
BD1 2LL

Report Number: J-3487
Version Number: 1
Date of Report: 21/04/2008
Report Approved By: Mr Chris G Mann
MCERTS Registration Number: MM 06 695
Function: Environmental Consultant

Signed:

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Part 1: Executive Summary**1.1 Monitoring Objectives**

Wyndeham Heron operate several printing process lines that have the potential to release controlled substances to atmosphere, and are subject to authorisation under the Environmental Protection Act 1990 (EPA). Under the act, Local Authorities regulate the printing processes with guidance from the Process Guidance Note PG6/16(04): Printworks.

In order for Wyndeham Heron to comply with its annual emission limits Megtec requested that Envirocare Technical Consultancy undertake an emissions monitoring exercise on the two Lithoman units, the results of this monitoring form the basis of this report.

The two Lithoman print line units have only a single dryer. The stack that serves Lithoman 1 is accessed from a drilled a hole adjacent to the press and the stack that serves Lithoman 2 from a 3" port above the press..

The plant typically operates continuously, but with frequent interruptions in order to prepare for the next job. Depending on the job, the print run will be light, medium or heavy coverage; this relates to the amount of ink used on each product. The ink coverage can have an effect on the levels of emissions to atmosphere.

Emission Point Identification

Emission Point Reference	VOC's	Carbon Monoxide	Oxides of Nitrogen
Lithoman 1	✓	✓	✓
Lithoman 2	✓	✓	✓

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1.2 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Uncertainty	Units	Reference Conditions	Date of Sampling	Start and End Times	Monitoring Method Reference	Accreditation for use of Method	Operating Status
Lithoman 1	VOC's	20	8.2	5.96	mg/Nm ³	273K, 101.3kPa	17/04/08	12:10-13:46	BS EN 13526	MCERTS	Normal
	CO	100	85.0	10.05	mg/Nm ³	273K, 101.3kPa	17/04/08	12:12-13:47	ISO 12039	ISO	Normal
	NOx	100	68.3	8.0	mg/Nm ³	273K, 101.3kPa	17/04/08	12:12-13:47	ISO 10849	ISO	Normal
Lithoman 2	VOC's	20	2.9	1.85	mg/Nm ³	273K, 101.3kPa	17/04/08	15:40-16:45	BS EN 13526	MCERTS	Normal
	CO	100	64.1	9.14	mg/Nm ³	273K, 101.3kPa	17/04/08	15:40-16:46	ISO 12039	ISO	Normal
	NOx	100	69.3	8.1	mg/Nm ³	273K, 101.3kPa	17/04/08	15:40-16:46	ISO 10849	ISO	Normal

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1.3 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load
Lithoman 1	17/04/08	Drying Unit	Continuous with exception for paper and press changes	Natural Gas	N/A	N/A	31,000cph
Lithoman 2	17/04/08	Drying Unit	Continuous with exception for paper and press changes	Natural Gas	N/A	N/A	35,000cph

1.4 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Lithoman 1	None	None	No sampling port fitted, stack accessed via drilled hole in stack
Lithoman 2	None	None	None

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Part 2: Supporting Information

2.1 Appendix 1: General Information

2.1.1 Monitoring organisation staff details

Mr C. Mann	MCERTS Level 2 (TE1 & TE4)	MM 06 695
Mr M. Ropka	MCERTS Level 1 (TE1)	MM 06 761

2.1.2 Monitoring organisation method details

2.1.2.1 Volatile Organic Compounds (VOCs)

A portable organic vapour analyser (OVA) fitted with a flame ionisation detector (FID) and heated line from duct to analyser (Signal, Type 3030PM, Signal Instrument Company Ltd) was used to make these measurements.

When the instrument had warmed up and allowed to stabilise, it was zeroed electronically by drawing sampled air over a catalyst to remove organic species, and manually adjusting the analyser to read 0.0 ppm. Then the instrument was leak checked using a butane gas source at each of the seals/connections along the sample line whereby a positive response from the analyser demonstrates the presence of a leak. A response check was also undertaken by introducing some of the butane gas into the end of the heated line and noting that the analyser responded by the display rising rapidly.

A certified span gas (19.9ppm propane), traceable to National Standards, was then fed through the heated line to the analyser. The value displayed on the unit was adjusted to read the span value. The instrument response to zero gas and the same span gas was obtained at the end of sampling to ensure no significant baseline or linearity drift had occurred during the monitoring period. Details of the calibrations are incorporated into data tables.

The gaseous emissions were sampled directly from the stack through a stainless steel probe, usually with a sintered end to prevent particulate matter entering the sample line, and along the PTFE lined heated sample line to the instrument. An integral-heated PTFE filter in the input to the instrument removes any fine particulate matter material present in the sample gas.

Readings were recorded on custom Sigems data logging software at approximately 1-minute intervals for downloading later onto a computer.

In all cases, the VOC level was measured as parts per million (ppm) of propane. The data obtained were then converted to express the concentration as mg/Nm³, with respect to propane, and as carbon content (with respect to propane).

2.1.2.2 Combustion Gases

Combustion gases were monitored using a Horiba Combustion Gas Analyser (Model PG250) that monitors the gaseous emissions by appropriate systems for the gas in question. Carbon Monoxide, CO is assessed by NDIR (pneumatic) and NO_x by chemiluminescence. It has an internal pump to draw a sample of the gas through the analyser at a rate of 0.4litres per minute.

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A sample gases were drawn through a Titanium tube, inserted into the stack, connected to a heated line (150°C) containing a heated PTFE filter. The heated line was, in turn, connected to a Testoterm Gas Preparation Unit, GPU, (Model 339) which contained a Peltier Cooler to condition the gas by removing moisture from the sampled gas down to around 1%, to enable a dried gas stream to be presented to the analyser. A Tygon tube connected the output from the GPU to the input connection to the Horiba analyser.

A leak check was undertaken by blocking the input to the sample probe and reading the sample flow rate on the Horiba display, this was undertaken prior to and post- sampling. In all instances a leak rate of 0.00l/min was achieved (sampling rate typically 0.5l/min).

When the instrument had fully warmed up (60 mins), it was calibrated with certified gases corresponding to those of interest for the particular measurement to be under taken. In this case it was calibrated with CO at 79.3ppm and NO at 142.0ppm. Calibrations were carried out along the full sample line. Details of these calibrations are presented in the Appendices at the end of this report.

The analyser was connected to a portable laptop computer running custom EDA2000 data logging software, which enables the future processing of results. Readings were logged at 15-second intervals during calibration and 30-second intervals during monitoring periods.

2.1.2.3 Standard Reference Conditions

There is a requirement under the Environmental Protection Act that all pollutants should be expressed at standard reference conditions of 273 K and 101.3 kPa. Hence the temperatures and local barometric pressure should be measured in order to correct the data and thus to express them at the reference conditions. These parameters were measured as follows:

2.1.2.4 Temperature

The duct and ambient temperatures were monitored via a stainless steel sheathed Type K thermocouple (1.5 mm diameter) coupled to an electronic digital reader.

2.1.2.5 Local Atmospheric Pressure

A digital barometer (Speedtech Model) was used to measure the atmospheric pressure on the day of monitoring.

2.2 Appendix 2: General Results and Discussion

2.2.1 Lithoman 1 VOC's

The oxidiser that serves this press was monitored between 12:10 and 13:36 on 17th April 2008 whilst the press was printing T3 magazine at 31,000 cph. The average emission concentration of VOCs was 8.2mg/Nm³. Details of the VOC monitoring can be seen in Table 1 and are represented graphically in Figure 1. The associated uncertainties can be seen in Table 1a.

2.2.2 Lithoman 1 Combustion Gases

Monitoring for combustion gases on Lithoman 1 was performed between 12:12 and 13:47 and was performed in conjunction with the VOC monitoring. The average Concentrations of CO and NO_x were 85.0 mg/Nm³ and 68.3 mg/Nm³ respectively. Details of the monitoring can be seen in Table 2 and are represented graphically in Figure 2. Calibration data can be seen in Table 2a. Uncertainties for CO and NO_x can be seen in Table 2b and 2c respectively.

2.2.3 Lithoman 2 VOC's

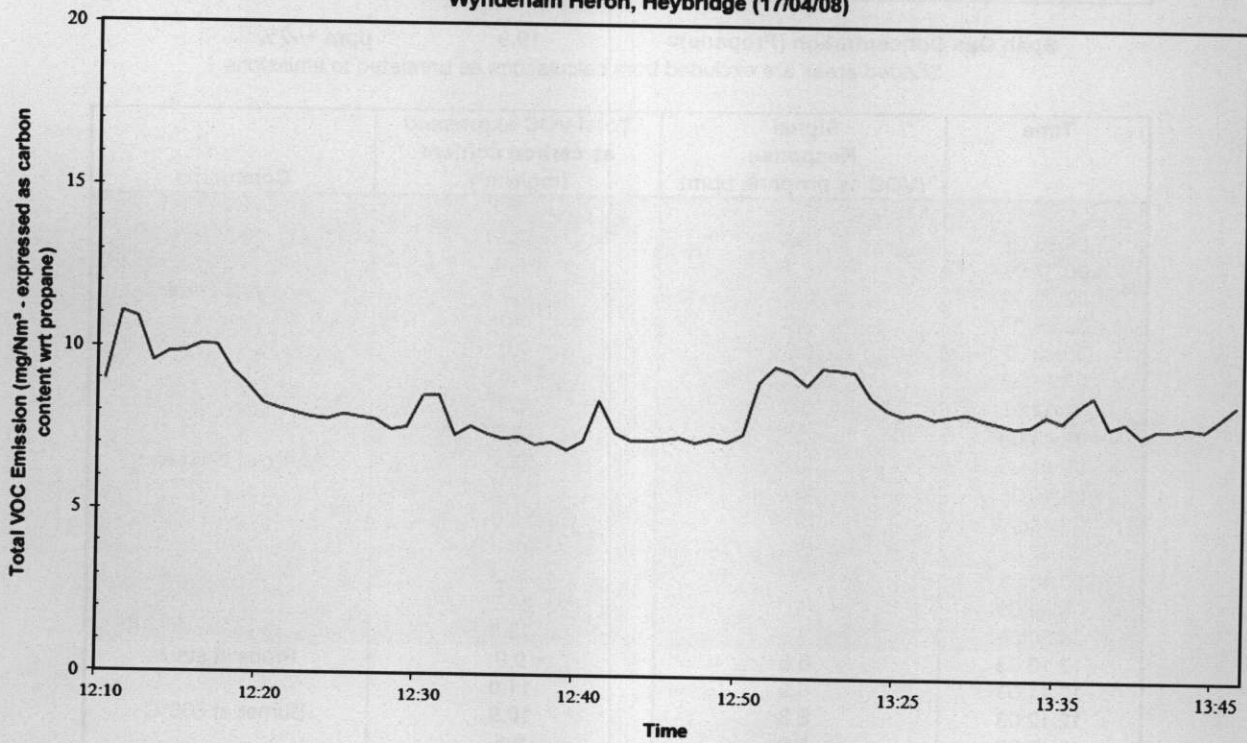
Monitoring was performed between 15:40 and 16:45 on 17th April 2008. The average measured concentration was 2.9 mg/Nm³. Details of the monitoring can be seen in Table 3 and are represented graphically in Figure 3. The associated uncertainties can be seen in Table 3a.

2.2.4 Lithoman 2 Combustions Gases

Monitoring was performed between 15:40 and 16:46 on 17th April 2008. The average measured concentrations of CO and NO_x were 64.1 mg/Nm³ and 69.3 mg/Nm³ respectively. Details of the monitoring can be seen in Table 4 and are represented graphically in Figure 4. Calibration data can be seen in Table 4a and uncertainties for CO and NO_x can be seen in Table 4b and 4c respectively.

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Figure 1
Total VOC Emissions From Lithoman 1
Wyndham Heron, Heybridge (17/04/08)



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TABLE 1
Total Volatile Organic Compound (VOC) Emissions
 Using Signal 3030PM no: Sig 1
 and Heated Line no: HL7

Client Name: Wyndeham Heron
Job No: J-3487

VOC Emissions from the Lithoman 1 Oxidiser (17/04/08)

	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)
AVERAGE	5.1	8.2
Maximum	6.9	11.0
Minimum	4.3	6.9

Span Gas Concentration (Propane)= 19.9 ppm +/-2%
 Shaded areas are excluded from calculations as unrelated to emissions

Time	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)	Comments
08:36:07	13.9	22.3	Analyser zeroed
08:37:07	9.3	15.0	
08:38:07	0.0	0.0	
08:39:07	0.0	0.0	
08:40:07	0.0	0.0	
08:41:08	0.0	0.0	
08:42:08	0.0	0.0	
08:43:08	12.8	20.6	
08:44:08	20.6	33.1	
08:45:08	20.0	32.2	
08:46:08	19.9	32.0	
08:47:08	19.8	31.8	
08:48:09	19.5	31.3	
08:49:09	14.1	22.7	
08:50:09	9.8	15.8	
12:10:03	5.6	9.0	Probe in stack
12:11:03	6.9	11.0	Burner at 800°C Press running at 31,000cph printing T3 magazine
12:12:03	6.8	10.9	
12:13:03	5.9	9.5	
12:14:03	6.1	9.8	
12:15:03	6.1	9.8	
12:16:03	6.3	10.0	
12:17:04	6.2	10.0	
12:18:04	5.8	9.2	
12:19:04	5.5	8.8	
12:20:04	5.1	8.2	
12:21:04	5.0	8.1	
12:22:04	5.0	8.0	

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Time	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)	Comments
12:23:04	4.9	7.8	
12:24:04	4.8	7.8	
12:25:05	4.9	7.9	
12:26:05	4.9	7.8	
12:27:05	4.8	7.8	
12:28:05	4.7	7.5	
12:29:05	4.7	7.6	
12:30:05	5.3	8.5	
12:31:05	5.3	8.6	
12:32:06	4.6	7.3	
12:33:06	4.7	7.6	
12:34:06	4.6	7.4	
12:35:06	4.5	7.2	
12:36:06	4.5	7.3	
12:37:06	4.4	7.0	
12:38:06	4.4	7.1	
12:39:07	4.3	6.9	
12:40:07	4.5	7.2	
12:41:07	5.2	8.4	
12:42:07	4.6	7.4	
12:43:07	4.5	7.2	
12:44:07	4.5	7.2	
12:45:07	4.5	7.2	
12:46:08	4.6	7.3	
12:47:08	4.5	7.2	
12:48:08	4.5	7.3	
12:49:08	4.5	7.2	
12:50:08	4.6	7.4	
13:16:02	5.6	9.0	
13:17:02	5.9	9.5	
13:18:02	5.8	9.4	
13:19:02	5.6	9.0	
13:20:02	5.9	9.5	
13:21:02	5.9	9.4	
13:22:02	5.8	9.4	
13:23:03	5.4	8.6	
13:24:03	5.1	8.2	
13:25:03	5.0	8.0	
13:26:03	5.1	8.1	
13:27:03	5.0	8.0	
13:28:03	5.0	8.0	
13:29:03	5.1	8.1	
13:30:04	5.0	8.0	
13:31:04	4.9	7.8	
13:32:04	4.8	7.7	
13:33:04	4.8	7.7	
13:34:04	5.0	8.1	
13:35:04	4.9	7.9	

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Time	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)	Comments
13:36:04	5.2	8.4	
13:37:05	5.4	8.7	
13:38:05	4.8	7.7	
13:39:05	4.9	7.9	
13:40:05	4.6	7.4	
13:41:05	4.8	7.7	
13:42:05	4.8	7.7	
13:43:05	4.8	7.7	
13:44:05	4.8	7.7	
13:45:06	5.0	8.0	
13:46:06	5.3	8.4	Probe out of stack
13:47:06	3.4	5.5	Analyser zeroed
13:48:06	0.3	0.4	
13:49:06	0.0	0.0	
13:50:06	0.0	0.0	
13:51:06	0.0	0.0	
13:52:07	0.0	0.0	
13:53:07	0.0	0.0	
13:54:07	14.0	22.5	Analyser calibrated
13:55:07	20.1	32.2	
13:56:07	20.3	32.7	
13:57:07	20.6	33.1	
13:58:07	20.6	33.1	
13:59:08	18.0	28.9	

TABLE 1a

UNCERTAINTY OF VOC BY SIGNAL 1 , 0-70ppm

Client Name: Wyndeham Heron

Job No: J-3487

VOC Emissions from the Lithoman 1 (17/04/08)

Reading = 5.1 ppm as C3H8
 Span Gas= 19.9 ppm +/-2%

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.051	0.0026
Zero Drift/ Detection	1.8ppm	1.8	3.24
Noise	0.1 ppm	0.1	0.01
Linearity	0.8% of value	0.0408	0.00166
Divider	3% of value	0.153	0.02341
Temperature Drift	1% of value	0.051	0.0026
Span Gas	2% of Value	0.398	0.1584

Sum U² 3.44

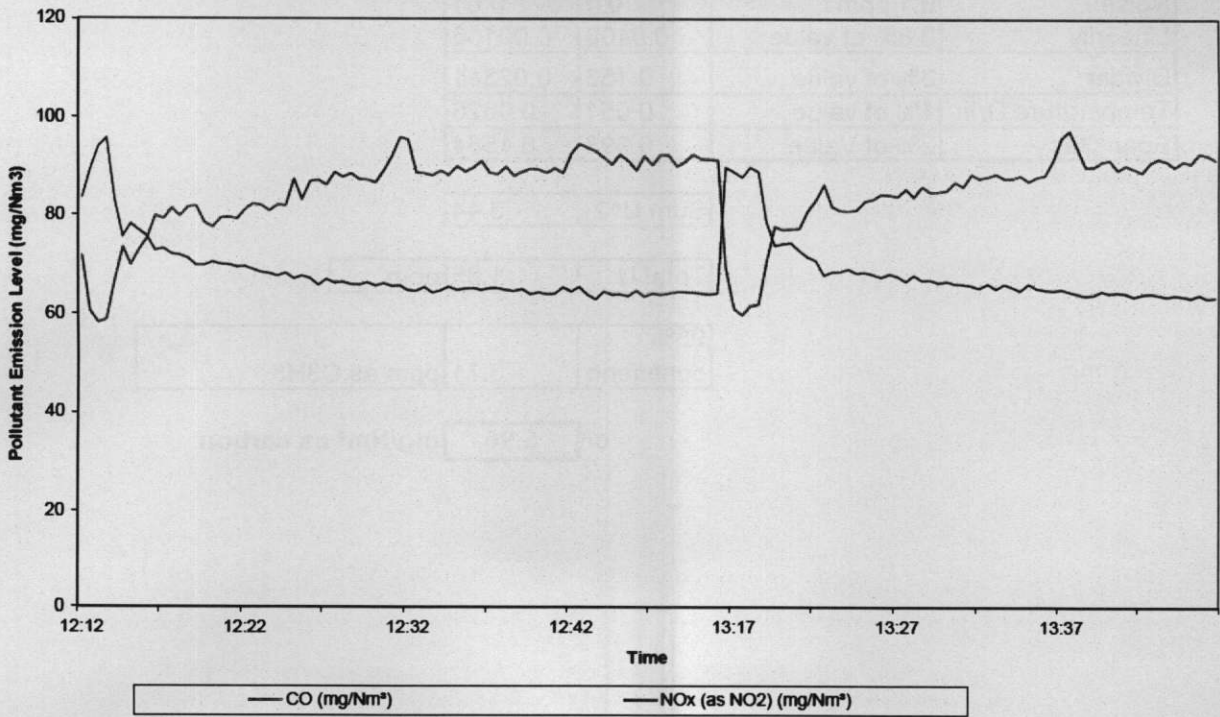
Total U 1.85 ppm

95%
confidenc 3.71 ppm as C3H8

or 5.96 mg/Nm³ as carbon

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Figure 2
Combustion Gas Emissions from Lithoman 1
Wyndeham Heron, Heybridge (17/04/2008)



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TABLE 2

Gaseous Analysis using Horiba (Model PG 250) Analyser

Client Name: Wyndeham Heron

Combustion Gas Emissions from the Lithoman 1 Oxidiser (17/04/08)

Mean Ambient Pressure = 1013 mbar
 Mean Ambient Temperature = 28 °C
 Stack Temperature = 350 °C

Job no: J-3487

Data entered by: MR

	CO (ppm)	NOx (ppm)	CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)
Average	68.0	33.3	85.0	68.3
Maximum	77.8	46.7	97.2	95.8
Minimum	46.4	30.7	58.0	63.0

Time	Carbon Monoxide CO (ppm)	Oxides of Nitrogen NOx (ppm)	Conversion from ppm to mg/Nm ³ at Ref Conditions(273K; 101.3kPa)		Comments
			CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)	
12:12:00	57.3	40.8	71.7	83.6	Probe in stack
12:12:30	48.3	43.5	60.4	89.3	
12:13:00	46.4	45.8	58.0	94.0	
12:13:30	47.0	46.7	58.7	95.8	Burner at 800°C
12:14:00	53.2	40.6	66.5	83.2	
12:14:30	58.8	36.8	73.4	75.6	
12:15:00	55.8	38.1	69.8	78.3	Press running at 31,000cph printing T3 magazine
12:15:30	58.3	37.5	72.8	76.9	
12:16:00	60.2	36.9	75.3	75.7	
12:16:30	63.8	35.5	79.8	72.8	
12:17:00	63.4	35.7	79.2	73.2	
12:17:30	65.1	35.1	81.3	72.1	
12:18:00	63.8	35.0	79.7	71.9	
12:18:30	65.3	34.7	81.7	71.2	
12:19:00	65.5	34.1	81.9	69.9	
12:19:30	62.8	34.0	78.5	69.8	
12:20:00	62.0	34.3	77.5	70.5	
12:20:30	63.5	34.1	79.3	70.0	
12:21:00	63.7	34.1	79.6	69.9	
12:21:30	63.3	33.9	79.2	69.5	
12:22:00	64.9	33.9	81.2	69.6	
12:22:30	65.8	33.6	82.3	69.0	
12:23:00	65.6	33.3	82.0	68.4	
12:23:30	64.7	33.2	80.9	68.2	
12:24:00	65.7	33.0	82.1	67.6	
12:24:30	65.5	33.2	81.9	68.2	
12:25:00	69.9	32.7	87.3	67.2	
12:25:30	66.5	33.0	83.2	67.6	
12:26:00	69.5	32.7	86.9	67.2	
12:26:30	69.7	32.1	87.1	65.8	
12:27:00	68.9	32.6	86.2	67.0	
12:27:30	71.0	32.3	88.8	66.3	
12:28:00	70.2	32.4	87.8	66.5	
12:28:30	70.8	32.2	88.5	66.0	
12:29:00	69.8	32.1	87.3	65.9	
12:29:30	69.8	32.3	87.2	66.3	
12:30:00	69.3	32.0	86.7	65.7	
12:30:30	71.3	32.3	89.2	66.2	
12:31:00	73.6	32.0	92.0	65.7	
12:31:30	76.7	32.0	95.8	65.7	
12:32:00	76.3	31.5	95.4	64.7	
12:32:30	71.0	31.5	88.7	64.6	
12:33:00	70.8	31.9	88.5	65.4	
12:33:30	70.5	31.3	88.2	64.3	
12:34:00	71.3	31.5	89.1	64.7	
12:34:30	70.6	31.9	88.3	65.5	
12:35:00	72.0	31.6	90.0	64.9	

Time	Carbon Monoxide CO (ppm)	Oxides of Nitrogen NOx (ppm)	Conversion from ppm to mg/Nm ³ at Ref Conditions(273K; 101.3kPa)		Comments
			CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)	
12:35:30	71.1	31.7	88.9	65.1	
12:36:00	71.8	31.8	89.7	65.2	
12:36:30	72.8	31.6	91.0	64.9	
12:37:00	70.9	31.8	88.6	65.2	
12:37:30	70.8	31.8	88.5	65.2	
12:38:00	71.9	31.6	89.9	64.8	
12:38:30	70.5	31.5	88.1	64.7	
12:39:00	71.1	31.7	88.9	65.0	
12:39:30	71.6	31.2	89.5	64.0	
12:40:00	71.5	31.4	89.3	64.4	
12:40:30	71.0	31.2	88.7	64.0	
12:41:00	71.7	31.2	89.6	64.1	
12:41:30	70.9	31.9	88.6	65.4	
12:42:00	74.1	31.5	92.7	64.6	
12:42:30	75.6	31.9	94.5	65.5	
12:43:00	75.0	31.1	93.8	63.9	
12:43:30	74.4	30.7	93.0	63.0	
12:44:00	73.5	31.5	91.8	64.6	
12:44:30	72.4	31.1	90.4	63.9	
12:45:00	73.9	31.2	92.4	64.0	
12:45:30	72.9	31.0	91.1	63.6	
12:46:00	71.3	31.6	89.1	64.8	
12:46:30	73.7	31.0	92.1	63.6	
12:47:00	72.2	31.3	90.3	64.2	
12:47:30	73.9	31.2	92.4	63.9	
12:48:00	73.8	31.3	92.3	64.2	
12:48:30	72.0	31.4	90.0	64.5	
12:49:00	72.7	31.4	90.9	64.5	
12:49:30	74.0	31.4	92.5	64.4	
12:50:00	73.2	31.3	91.5	64.1	
12:50:30	73.2	31.2	91.5	64.0	
12:51:00	73.1	31.3	91.4	64.2	
13:17:00	55.4	43.8	69.3	89.9	
13:17:30	48.8	43.4	60.9	89.0	
13:18:00	47.7	42.8	59.7	87.9	
13:18:30	49.2	43.8	61.5	89.9	
13:19:00	49.5	43.4	61.9	89.0	
13:19:30	56.4	38.4	70.5	78.8	
13:20:00	62.1	36.0	77.7	73.9	
13:20:30	61.6	36.2	77.0	74.3	
13:21:00	61.7	36.3	77.2	74.4	
13:21:30	61.9	35.5	77.3	72.8	
13:22:00	64.6	34.9	80.8	71.6	
13:22:30	66.4	34.5	83.0	70.9	
13:23:00	69.0	33.1	86.3	67.9	
13:23:30	65.5	33.4	81.8	68.6	
13:24:00	64.8	33.4	81.0	68.6	
13:24:30	64.7	33.7	80.8	69.1	
13:25:00	64.8	33.3	81.0	68.3	
13:25:30	66.3	33.4	82.9	68.5	
13:26:00	66.6	33.2	83.2	68.0	
13:26:30	67.4	32.9	84.3	67.5	
13:27:00	67.3	33.2	84.2	68.2	
13:27:30	67.0	33.0	83.8	67.7	
13:28:00	68.3	32.5	85.4	66.6	
13:28:30	66.9	33.1	83.7	67.9	
13:29:00	68.7	32.6	85.9	66.9	
13:29:30	67.8	32.6	84.8	66.9	
13:30:00	67.9	32.4	84.9	66.4	
13:30:30	68.1	32.5	85.1	66.7	

Time	Carbon Monoxide CO (ppm)	Oxides of Nitrogen NOx (ppm)	Conversion from ppm to mg/Nm ³ at Ref Conditions(273K; 101.3kPa)		Comments
			CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)	
13:31:00	69.5	32.3	86.9	66.2	
13:31:30	68.7	32.2	85.9	66.1	
13:32:00	70.7	32.1	88.4	65.8	
13:32:30	70.0	31.8	87.5	65.3	
13:33:00	70.3	32.2	87.9	66.1	
13:33:30	70.8	31.7	88.5	65.1	
13:34:00	70.0	32.2	87.5	66.1	
13:34:30	70.0	31.9	87.5	65.5	
13:35:00	70.5	31.6	88.2	64.8	
13:35:30	69.6	32.2	87.0	66.2	
13:36:00	70.3	31.8	87.9	65.3	
13:36:30	70.6	31.6	88.2	64.9	
13:37:00	73.0	31.6	91.3	64.8	
13:37:30	76.7	31.7	95.9	65.0	
13:38:00	77.8	31.5	97.2	64.6	
13:38:30	74.8	31.2	93.5	64.1	
13:39:00	72.0	31.1	89.9	63.7	
13:39:30	71.9	31.2	89.9	63.9	
13:40:00	72.8	31.5	91.0	64.7	
13:40:30	73.1	31.3	91.3	64.2	
13:41:00	71.4	31.4	89.3	64.4	
13:41:30	72.2	31.3	90.2	64.2	
13:42:00	71.7	31.0	89.6	63.6	
13:42:30	71.1	31.2	88.8	64.0	
13:43:00	72.6	31.3	90.8	64.1	
13:43:30	73.3	31.2	91.6	63.9	
13:44:00	72.8	31.0	91.0	63.5	
13:44:30	71.9	31.1	89.9	63.8	
13:45:00	72.8	31.0	91.0	63.6	
13:45:30	72.6	30.8	90.7	63.3	
13:46:00	74.1	31.2	92.6	63.9	
13:46:30	73.8	30.8	92.3	63.2	
13:47:00	73.1	30.9	91.4	63.3	Probe out of stack

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**TABLE 2a
ANALYSER CALIBRATIONS**

Client Name: Wyndeham Heron

Combustion Gas Emissions from the Lithoman 1 (17/04/08)

Job no: J-3487

Data entered by: MR

Type of Gas	CO	NO
Certified Calibration Values	79.3 ppm +/-2%	142.0 ppm +/-2%
Analyser	Period	
Horiba PG250	Before	79.1 ppm
	After	84.8 ppm
		142.0 ppm
		140.5 ppm

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TABLE 2b

UNCERTAINTY OF CARBON MONOXIDE BY HORIBA

Data entered by: MR

Reading =

68.0	ppm
------	-----

 Span Gas Certified Value

79.3	ppm +/-2%
------	-----------

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.68	0.4624
Zero Drift/Lower limit of detection	3.0ppm	3	9
Span Drift	2% of value	1.36	1.8496
Linearity	0.82% of value	0.5576	0.3109
Setting Gas Divider	0.25% of value	0.17	0.0289
Interference	2.9% of value	1.972	3.888784
Span Gas	1% of span gas certified value	0.793	0.628849

Sum U²

16.17

Total U

4.02	ppm
------	-----

95% confidence

8.04	ppm
------	-----

or

10.05	mg/Nm ³
-------	--------------------

TABLE 2c

UNCERTAINTY OF OXIDES OF NITROGEN BY HORIBA

Data entered by: MR

Reading =

33.3	ppm
------	-----

Span Gas Certified Value

142.0	ppm
-------	-----

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.33	0.11
Zero Drift/Lower limit of detection	1.0ppm	1.00	1.00
Span Drift	1.9% of value	0.63	0.40
Linearity	1.12% of value	0.37	0.14
Setting Gas Divider	0.25% of value	0.08	0.01
Interference	1.2% of value	0.40	0.16
Span Gas	1% of span gas certified value	1.42	2.02

Sum U²

3.8

Total U

2.0	ppm
-----	-----

95% confidence

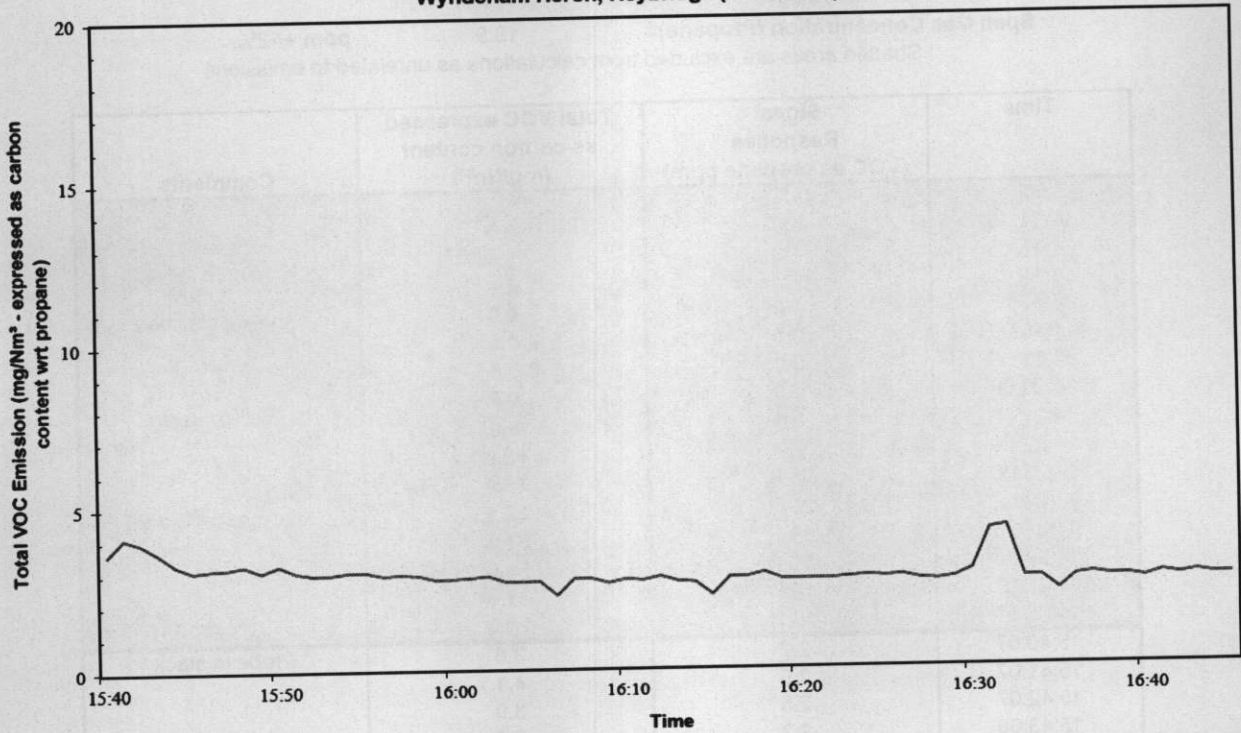
3.9	ppm
-----	-----

or

8.0	mg/Nm ³
-----	--------------------

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Figure 3
Total VOC Emissions From Lithoman 2
Wyndeham Heron, Heybridge (17/04/2008)



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TABLE 3
Total Volatile Organic Compound (VOC) Emissions

Using Signal 3030PM no: Sig 2
and Heated Line no: HL6

Client Name: Wyndeham Heron

Job No: J-3487

VOC Emissions from the Lithoman 2 Oxidiser (17/04/08)

	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)
AVERAGE	1.8	2.9
Maximum	2.6	4.2
Minimum	1.4	2.2

Span Gas Concentration (Propane)= 19.9 ppm +/-2%
Shaded areas are excluded from calculations as unrelated to emissions

Time	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)	Comments	
14:14:15	0.0	0.0	Analyser zeroed	
14:15:05	1.9	3.1		
14:16:05	1.2	1.9		
14:17:05	0.0	0.0		
14:18:05	0.0	0.0		
14:19:06	0.0	0.0		
14:20:06	0.0	0.0		
14:21:06	0.0	0.0		
14:22:06	9.9	15.9		
14:23:06	25.6	41.1		
14:24:06	20.0	32.1	Analyser calibrated	
14:25:06	19.7	31.6		
14:26:06	19.7	31.6		
14:27:07	19.7	31.6		
14:28:07	14.9	24.0		
15:40:07	2.2	3.6		Probe in stack
15:41:07	2.6	4.1		
15:42:07	2.5	3.9		Burner at 790°C
15:43:08	2.3	3.6		
15:44:08	2.0	3.2		
15:45:08	1.9	3.1		
15:46:08	1.9	3.1		
15:47:08	2.0	3.1		
15:48:08	2.0	3.2		
15:49:08	1.9	3.0		
15:50:09	2.0	3.2		
15:51:09	1.9	3.0		
15:52:09	1.8	2.9	Press running at 35,000cph printing YH magazine	
15:53:09	1.8	2.9		

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Time	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)	Comments
15:54:09	1.9	3.0	
15:55:09	1.9	3.0	
15:56:09	1.8	2.9	
15:57:10	1.8	2.9	
15:58:10	1.8	2.9	
15:59:10	1.7	2.8	
16:00:10	1.7	2.8	
16:01:00	1.8	2.8	
16:02:00	1.8	2.9	
16:03:00	1.7	2.7	
16:04:01	1.7	2.7	
16:05:01	1.7	2.7	
16:06:01	1.4	2.3	
16:07:01	1.7	2.8	
16:08:01	1.7	2.8	
16:09:01	1.6	2.6	
16:10:01	1.7	2.7	
16:11:01	1.7	2.7	
16:12:02	1.8	2.8	
16:13:02	1.7	2.7	
16:14:02	1.6	2.6	
16:15:02	1.4	2.2	
16:16:02	1.7	2.8	
16:17:02	1.7	2.8	
16:18:02	1.8	2.9	
16:19:02	1.7	2.7	
16:20:03	1.7	2.7	
16:21:03	1.7	2.7	
16:22:03	1.7	2.7	
16:23:03	1.7	2.7	
16:24:03	1.7	2.8	
16:25:03	1.7	2.7	
16:26:03	1.7	2.8	
16:27:04	1.7	2.7	
16:28:04	1.6	2.6	
16:29:04	1.7	2.7	
16:30:04	1.8	2.9	
16:31:04	2.6	4.1	
16:32:04	2.6	4.2	
16:33:04	1.7	2.7	
16:34:05	1.7	2.7	

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Time	Signal Response (VOC as propane ppm)	Total VOC expressed as carbon content (mg/Nm ³)	Comments
16:35:05	1.4	2.3	
16:36:05	1.7	2.7	
16:37:05	1.7	2.8	
16:38:05	1.7	2.7	
16:39:05	1.7	2.7	
16:40:05	1.6	2.6	
16:41:05	1.7	2.8	
16:42:06	1.7	2.7	
16:43:06	1.7	2.8	
16:44:06	1.7	2.7	
16:45:06	1.7	2.7	
16:46:06	9.1	14.5	Probe out of stack
16:47:06	7.8	12.5	
16:48:06	6.6	10.6	
16:49:07	6.2	9.9	
16:50:07	5.2	8.3	
16:51:07	0.0	0.0	
16:52:07	0.0	0.0	Analyser zeroed
16:53:07	0.0	0.0	
16:54:07	0.0	0.0	
16:55:07	0.0	0.0	
16:56:08	0.0	0.0	
16:57:08	0.0	0.0	
16:58:08	11.3	18.2	
16:59:08	17.3	27.8	Analyser calibrated
17:00:08	17.1	27.5	
17:01:08	17.1	27.5	
17:02:08	17.1	27.5	
17:03:08	15.8	25.4	
17:04:09	9.4	15.2	
17:05:09	7.9	12.7	
17:06:09	7.9	12.7	

TABLE 3a

UNCERTAINTY OF VOC BY SIGNAL2 , 0-70ppm

Client Name: Wyndeham Heron

Job No: J-3487

Reading = 1.8 ppm as C3H8
 Span Gas= 19.9 ppm+/-2%

Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.018	0.000324
Zero Drift/ Detection	0.4ppm	0.4	0.16
Noise	0.1 ppm	0.1	0.01
Linearity	0.5% of value	0.009	0.000081
Setting Gas Divider	3% of value	0.054	0.002916
Temperature Drift	1% of value	0.018	0.000324
Span Gas	2% of Value	0.398	0.158404

Sum U ²	0.33
--------------------	------

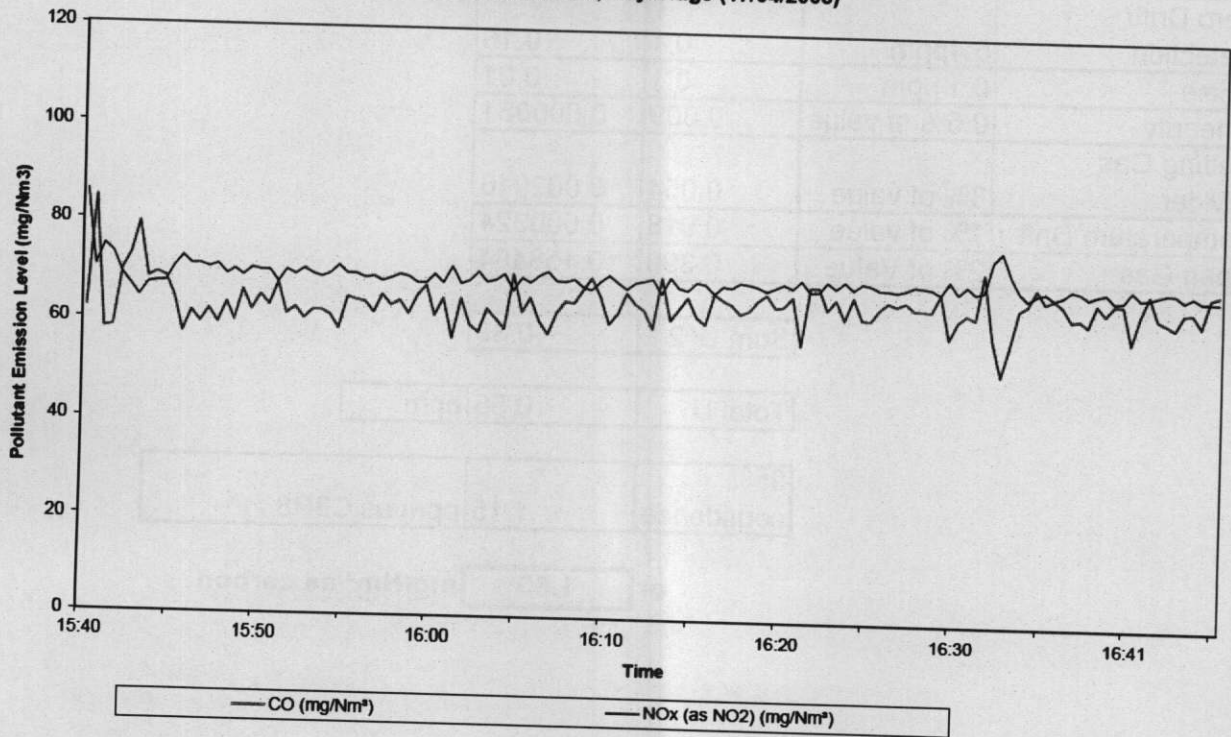
Total U	0.58 ppm
---------	----------

95% confidence	1.15 ppm as C3H8
----------------	------------------

or **1.85** mg/Nm³ as carbon

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Figure 4
Combustion Gas Emissions from Lithoman 2
Wyndeham Heron, Heybridge (17/04/2008)



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TABLE 4

Gaseous Analysis using Horiba (Model PG 250) Analyser

Client Name: Wyndeham Heron

Combustion Gas Emissions from the Lithoman 2 Oxidiser (17/04/08)

Mean Ambient Pressure = 1009 mbar
 Mean Ambient Temperature = 28 °C
 Stack Temperature = 361 °C

Job no: J-3487

Data entered by: MR

	CO (ppm)	NOx (ppm)	CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)
Average	51.3	33.8	64.1	69.3
Maximum	67.8	41.8	84.7	85.8
Minimum	41.2	31.4	51.5	64.5

Time	Carbon Monoxide CO (ppm)	Oxides of Nitrogen NOx (ppm)	Conversion from ppm to mg/Nm ³ at Ref Conditions(273K; 101.3kPa)		Comments
			CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)	
15:40:00	49.7	41.8	62.1	85.8	Probe in stack
15:40:30	67.8	34.3	84.7	70.5	
15:41:00	46.3	36.5	57.9	74.8	
15:41:30	46.6	35.7	58.3	73.2	Burner at 790°C
15:42:00	55.8	33.6	69.7	68.9	
15:42:30	58.4	32.5	73.0	66.7	
15:43:00	63.6	31.4	79.5	64.5	Press running at 35,000 cph printing YH magazine
15:43:30	54.6	32.7	68.3	67.1	
15:44:00	55.3	32.8	69.2	67.4	
15:44:30	54.8	32.9	68.4	67.5	
15:45:00	51.5	34.4	64.4	70.6	
15:45:30	45.8	35.4	57.2	72.6	
15:46:00	49.3	34.6	61.6	71.1	
15:46:30	47.4	34.7	59.3	71.2	
15:47:00	49.6	34.4	62.0	70.5	
15:47:30	47.4	34.7	59.2	71.2	
15:48:00	50.7	33.7	63.4	69.2	
15:48:30	47.7	34.2	59.6	70.3	
15:49:00	52.8	33.6	66.0	69.0	
15:49:30	49.6	34.3	61.9	70.5	
15:50:00	52.0	34.2	65.0	70.1	
15:50:30	50.4	34.2	63.0	70.1	
15:51:00	54.0	33.0	67.5	67.8	
15:51:30	49.0	34.3	61.3	70.3	
15:52:00	50.1	33.8	62.7	69.3	
15:52:30	48.3	34.4	60.4	70.6	
15:53:00	49.7	33.9	62.1	69.6	
15:53:30	49.7	33.6	62.2	69.0	
15:54:00	49.0	33.9	61.3	69.7	
15:54:30	46.8	34.8	58.5	71.3	
15:55:00	52.0	34.0	64.9	69.8	
15:55:30	51.5	34.0	64.3	69.7	
15:56:00	51.2	33.6	64.0	69.0	
15:56:30	49.4	33.8	61.8	69.3	
15:57:00	52.4	33.4	65.5	68.5	
15:57:30	50.7	33.6	63.4	69.0	
15:58:00	51.5	34.0	64.4	69.7	
15:58:30	49.4	33.8	61.8	69.4	
15:59:00	52.3	33.2	65.4	68.2	
15:59:30	54.1	33.2	67.6	68.2	
16:00:00	49.2	34.1	61.4	70.0	
16:00:30	52.0	33.2	64.9	68.2	
16:01:00	45.5	34.9	56.9	71.5	
16:01:30	52.0	33.2	65.0	68.2	
16:02:00	47.8	33.5	59.7	68.8	

Time	Carbon Monoxide CO (ppm)	Oxides of Nitrogen NOx (ppm)	Conversion from ppm to mg/Nm ³ at Ref Conditions(273K; 101.3kPa)		Comments
			CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)	
16:02:30	46.6	34.4	58.3	70.6	
16:03:00	50.5	33.4	63.1	68.6	
16:03:30	48.9	33.6	61.1	69.0	
16:04:00	47.2	34.2	59.0	70.2	
16:04:30	56.1	32.7	70.1	67.0	
16:05:00	50.0	33.9	62.5	69.6	
16:05:30	52.3	33.5	65.4	68.7	
16:06:00	48.6	34.1	60.7	70.0	
16:06:30	46.5	34.6	58.1	70.9	
16:07:00	50.1	33.6	62.6	69.0	
16:07:30	51.9	33.6	64.8	68.9	
16:08:00	51.7	33.8	64.6	69.5	
16:08:30	53.8	33.1	67.2	68.0	
16:09:00	55.8	32.8	69.7	67.4	
16:09:30	52.8	33.7	66.0	69.1	
16:10:00	48.3	34.3	60.4	70.4	
16:10:30	50.2	33.6	62.7	69.0	
16:11:00	53.5	33.0	66.9	67.7	
16:11:30	51.7	33.6	64.6	69.0	
16:12:00	50.7	33.8	63.4	69.4	
16:12:30	47.7	34.1	59.7	69.9	
16:13:00	56.1	32.6	70.1	66.8	
16:13:30	49.2	34.2	61.5	70.2	
16:14:00	51.0	33.2	63.7	68.2	
16:14:30	52.9	33.0	66.2	67.7	
16:15:00	49.8	33.8	62.2	69.3	
16:15:30	48.7	33.6	60.8	69.0	
16:16:00	53.6	32.7	67.0	67.2	
16:16:30	52.6	33.5	65.8	68.7	
16:17:00	52.0	33.3	65.0	68.4	
16:17:30	50.4	33.8	63.0	69.5	
16:18:00	51.0	33.7	63.8	69.2	
16:18:30	52.6	33.5	65.8	68.7	
16:19:00	53.7	33.1	67.1	67.9	
16:19:30	51.6	33.4	64.5	68.6	
16:20:00	51.8	33.8	64.7	69.4	
16:20:30	53.4	33.4	66.7	68.6	
16:21:00	45.4	34.2	56.8	70.2	
16:21:30	55.1	33.1	68.8	67.8	
16:22:00	55.0	33.1	68.8	68.0	
16:22:30	51.3	34.1	64.2	70.0	
16:23:00	53.1	33.5	66.4	68.7	
16:23:30	49.9	34.2	62.3	70.1	
16:24:00	53.5	33.4	66.9	68.5	
16:24:30	49.9	34.0	62.4	69.8	
16:25:00	49.8	33.8	62.3	69.5	
16:25:30	51.7	33.4	64.6	68.6	
16:26:00	52.8	33.4	66.0	68.6	
16:26:30	52.3	33.2	65.3	68.2	
16:27:00	52.8	33.5	66.0	68.8	
16:27:30	51.6	33.8	64.5	69.5	
16:28:00	51.6	33.8	64.4	69.3	
16:28:30	51.5	33.6	64.4	69.0	
16:29:00	54.4	33.1	68.0	68.0	
16:29:30	47.1	34.4	58.8	70.7	
16:30:00	49.9	33.2	62.4	68.1	
16:30:30	51.1	34.0	63.9	69.7	

Time	Carbon Monoxide CO (ppm)	Oxides of Nitrogen NOx (ppm)	Conversion from ppm to mg/Nm ³ at Ref Conditions(273K; 101.3kPa)		Comments
			CO (mg/Nm ³)	NOx (as NO ₂) (mg/Nm ³)	
16:31:00	50.4	33.3	63.0	68.3	
16:31:30	57.7	33.5	72.2	68.7	
16:33:00	47.1	36.5	58.8	75.0	
16:33:30	41.2	37.4	51.5	76.8	
16:34:00	46.3	35.1	57.9	72.0	
16:34:30	52.1	33.5	65.1	68.7	
16:35:00	52.8	32.7	66.0	67.1	
16:35:30	55.5	33.2	69.4	68.2	
16:36:00	53.3	33.5	66.6	68.8	
16:36:30	53.9	32.9	67.4	67.5	
16:37:00	52.8	33.1	66.0	68.0	
16:37:30	50.5	33.8	63.1	69.3	
16:38:00	50.7	33.6	63.3	68.9	
16:38:30	49.6	33.0	62.0	67.7	
16:39:00	53.3	33.3	66.6	68.4	
16:39:30	51.6	33.6	64.5	68.9	
16:40:00	53.2	32.7	66.5	67.1	
16:40:30	53.2	32.8	66.5	67.3	
16:41:00	46.9	33.9	58.7	69.6	
16:41:30	51.6	33.1	64.4	67.9	
16:42:00	54.9	33.2	68.6	68.1	
16:42:30	50.9	33.4	63.7	68.6	
16:43:00	50.3	33.7	62.9	69.1	
16:43:30	49.5	33.6	61.8	69.0	
16:44:00	52.0	33.0	65.0	67.7	
16:44:30	52.1	33.4	65.1	68.6	
16:45:00	50.0	32.9	62.4	67.6	
16:45:30	54.6	32.9	68.3	67.6	
16:46:00	55.1	32.9	68.9	67.5	Probe out of stack

Envirocare Technical Consultancy Ltd

**TABLE 4a
ANALYSER CALIBRATIONS**

Client Name: Wyndeham Heron

Combustion Gas Emissions from the Lithoman 2 (17/04/08)

Job no: J-3487

Data entered by: MR

Type of Gas		CO		NO	
Certified Calibration Values		79.3	ppm +/-2%	142.0	ppm +/-2%
Analyser	Period				
Horiba PG250	Before	79.8	ppm	142.4	ppm
	After	80.3	ppm	143.7	ppm

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E-mail:technical@envirocare.org

TABLE 4b

UNCERTAINTY OF CARBON MONOXIDE BY HORIBA

Data entered by: MR

Reading =

51.3	ppm
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 Span Gas Certified Value

79.3	ppm +/-2%
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Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.513	0.263169
Zero Drift/Lower limit of detection	3.0ppm	3	9
Span Drift	2% of value	1.026	1.052676
Linearity	0.82% of value	0.42066	0.1770
Setting Gas Divider	0.25% of value	0.12825	0.016448063
Interference	2.9% of value	1.4877	2.21325129
Span Gas	1% of span gas certified value	0.793	0.628849

Sum U²

13.35

Total U

3.65	ppm
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95% confidence

7.31	ppm
------	-----

or

9.14	mg/Nm ³
------	--------------------

TABLE 4c

UNCERTAINTY OF OXIDES OF NITROGEN BY HORIBA

Data entered by: MR

Reading =

33.8	ppm
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 Span Gas Certified Value

142.0	ppm
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Parameter	Uncertainty criteria	U	U ²
Repeatability	1% of value	0.34	0.11
Zero Drift/Lower limit of detection	1.0ppm	1.00	1.00
Span Drift	1.9% of value	0.64	0.41
Linearity	1.12% of value	0.38	0.14
Setting Gas Divider	0.25% of value	0.08	0.01
Interference	1.2% of value	0.41	0.16
Span Gas	1% of span gas certified value	1.42	2.02

Sum U²

3.9

Total U

2.0	ppm
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95% confidence

3.9	ppm
-----	-----

or

8.1	mg/Nm ³
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