Gas Networks Ireland Limerick Gasworks Remediation Project

EPA Licence W0281-01

AMBIENT AIR MONITORING SURVEY 06 FEBRUARY – 17 JUNE 2020

INTRODUCTION

The Environmental Protection Agency carried out ambient air monitoring in the surroundings of the Limerick Gasworks site in Limerick, Co Limerick on the dates 06/02/2020 to 19/05/2020. The operator of the site is licenced under waste licence reg. no. W0281-01 for the remediation of the former Limerick Gasworks site in Limerick City.

Coal gas manufacturing was carried out at the site from the 1830's to 1974. Gas manufacturing results in the production hazardous materials such as coal tar. Coal tar was stored in underground tanks, some of which leaked into the ground over many decades. This has resulted in the contamination of soils and groundwater at the site.

The activities carried out at the Limerick Gasworks site during the ambient air monitoring involved groundwater pumping, soil excavation, stabilisation and reuse at the site. It is possible that some hydrocarbons in gaseous phase, potentially odorous, may be released during the excavations.

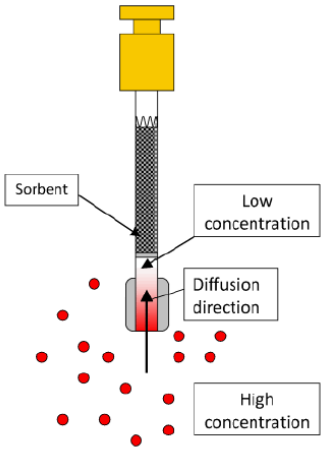
The licence includes conditions (5.2) to prevent the activity from causing impairment or interreference with amenities or the environment beyond the Installation boundary.

Licence condition 5.2 requires that “No emissions including odours from the activity carried on at the site shall result in an impairment of, or an interference with amenities or the environment beyond the installation boundary or any other legitimate uses of the environment beyond the installation boundary”.

METHODOLOGY AND EQUIPMENT

Ambient air quality monitoring was carried out using two different approaches, passive and active sampling. Passive diffusion tubes supplied by Gradko International Limited. These tubes contain sampling media where the pollutants (BTEX – Benzene, Toluene, Ethyl Benzene and Xylene) can be trapped. Passive sampling is designed for long-term monitoring, so that a sufficient concentration of compounds can be absorbed on to the tubes to be detected during analysis – a sample is collected after a 1-4 week period.

Passive sampling works by a process called molecular diffusion. During molecular diffusion, compounds will move from an area of high concentration to an area of low concentration. The compounds in the air are at a higher concentration than those in the tube, so the compounds diffuse into the tube and collect on the absorbent inside.



Because the compounds are absorbed, the low concentration at the sorbent surface is maintained, and therefore diffusion continues. The rate that the compounds move into the tube is called the uptake rate. This is a known rate, and is used in the calculations during analysis.

After exposure, the tubes were collected and sent to the supplier's laboratory for analysis. The results of the analysis were then compared against the Air Quality Standards (AQS) for each of the parameters tested.

Active monitoring was carried out by Axis Environmental on behalf the EPA and it involved the use of a handheld Photoionization Detector (PID) and sampling and analysis in accordance with methodology MDHS 96. The monitoring reports can be found in Appendix II and III.

MONITORING LOCATIONS

Two rounds of passive ambient air monitoring were carried out during the investigation. Efforts were made in finding suitable and representative locations without interfering with the works being carried out on site.

Round 1

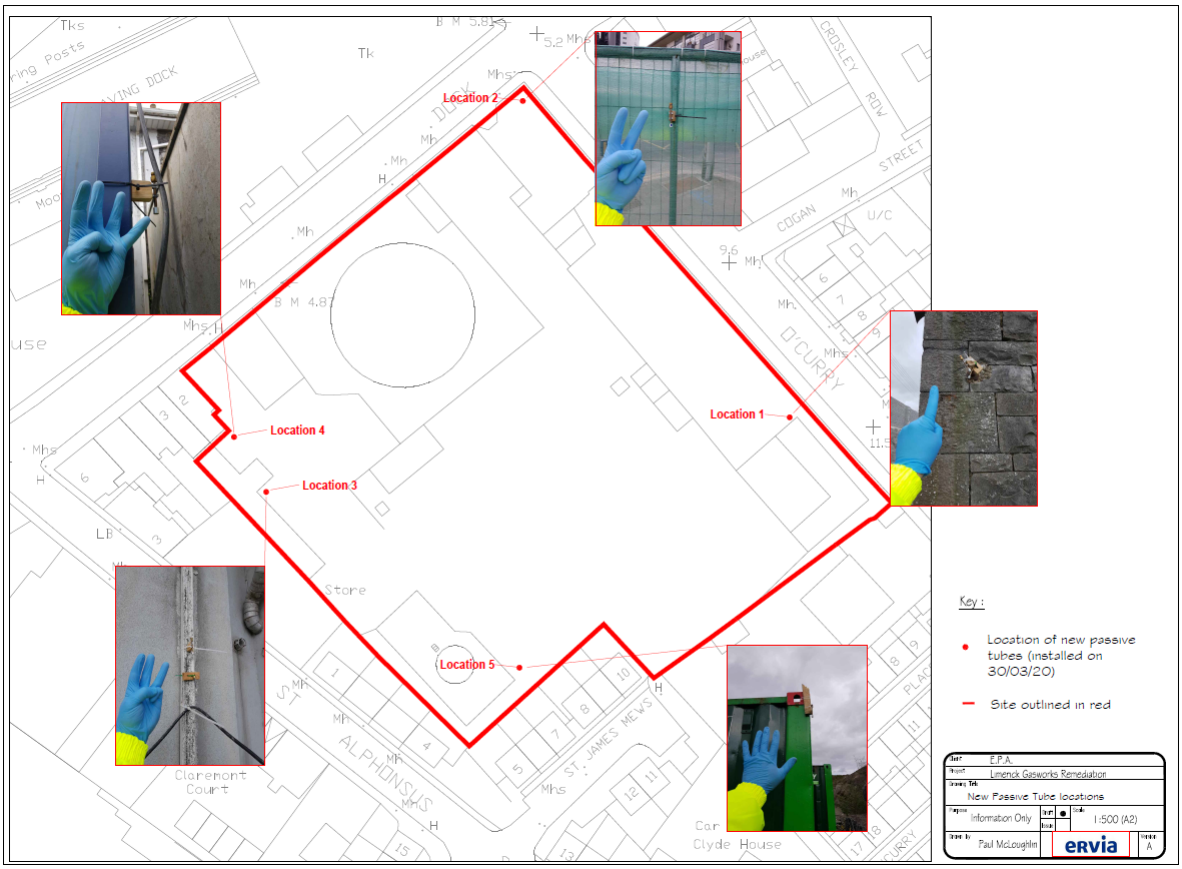
For the first round (from 06/02/2020 to 30/03/2020), a total of 6 tubes were deployed. Of those, 4 tubes were set up by the perimeter of the site but within the premises, and 2 tubes were set up off-site (Limerick harbour and a neighbour's house in St. Alphonsus). Due to the Covid-19 pandemic, these off-site tubes were not collected and therefore they are not part of the study. Tubes were set up by an EPA inspector and collected by the licensee, who labelled and stored the samples following the supplier's instructions before posting them to the attention of the EPA inspector who, subsequently, posted the samples to the Gradko premises in the UK for analysis.

Passive BTEX monitoring locations – Round 1

Round 2

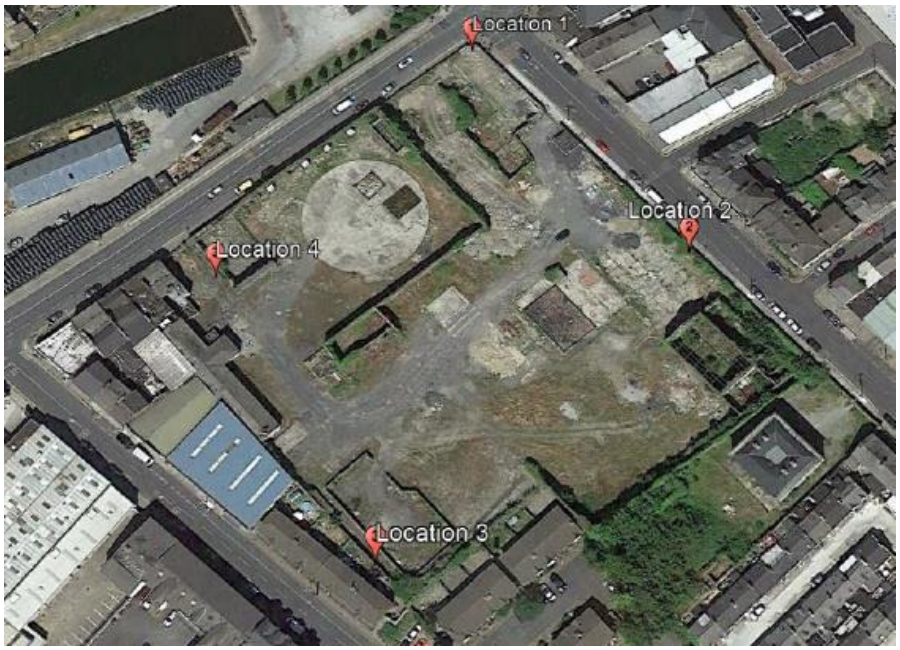
For the second round (from 30/03/2020 to 19/05/2020), a total of 5 tubes were deployed. All tubes were set up within premises. Due to the very dynamic conditions of the site, the monitoring locations were slightly different from the first round. Tubes were set up by the licensee and collected by an EPA inspector who, consequently, posted the samples to the Gradko premises in the UK for analysis.

Passive BTEX monitoring locations – Round 12



Active monitoring was carried out at 4 different locations on 06/02/2020.

Active monitoring was carried out at 4 different locations on 17/06/2020.



RESULTS

The below tables show the BTEX concentrations in ambient air during the passive monitoring investigation.

Round 1: From 06/02/2020 to 30/03/2020						
	Tube no	Benzene (µg/m³)	Toluene (µg/m³)	Ethyl Benzene (µg/m³)	mp-Xylene (µg/m³)	o-Xylene (µg/m³)
Location 1	004062	5.98	8.21	1.11	6.20	2.49
Location 2	004065	1.83	2.05	0.38	2.19	0.84
Location 3	004027	2.02	2.52	0.70	3.91	1.55
Location 4	003828	2.10	2.54	0.54	3.28	1.27
AQS (based on S.I. 180 of 2011)		5				
HSA Occupational Exposure Limit Value (8-hour reference period)		3250	192000	442000	221000	221000
EPA AG4 (hourly)			8000	88400	66200	66200
EPA AG4 annual mean			1910	4420	4410	4410

Round 2: From 30/03/2020 to 19/05/2020						
	Tube no	Benzene (µg/m³)	Toluene (µg/m³)	Ethyl Benzene (µg/m³)	mp-Xylene (µg/m³)	o-Xylene (µg/m³)
Location 1	003265	2.07	1.90	0.22	1.49	0.58
Location 2	GRA11686	1.00	1.24	0.18	1.02	0.42
Location 3	GRA06996	0.61	0.89	0.17	0.89	0.35
Location 4	003614	0.66	1.05	0.18	1.01	0.39
Location 5	GRA10331	0.96	1.50	0.24	1.52	0.59
AQS (based on S.I. 180 of 2011)		5				
HSA Occupational Exposure Limit Value (8-hour reference period)		3250	192000	442000	221000	221000
EPA AG4 (hourly)			8000	88400	66200	66200
EPA AG4 annual mean			1910	4420	4410	4410

The below table shows the Volatile Organics concentrations in ambient air during active monitoring (06/02/2020):

Volatile Organics (µg/m³)	Location 1	Location 2	Location 3	Location4	AQS	HSA Occupational Exposure Limit Value (8-hour reference period)	EPA AG4 (hourly)	EPA AG4 annual mean
Benzene	<13.38	<13.73	<15.84	<18.48	5	3250		
Toluene	93.63	48.06	55.43	46.19		192000	8000	1910
Ethyl Benzene	<13.38	<13.73	<15.84	<18.48		442000	88400	4420
mp-Xylene	<6.69	<6.87	<7.92	<9.24		221000	66200	4410
o-Xylen	<6.69	<6.87	<7.92	<9.24		221000	66200	4410
2-Butanone	<13.38	<13.73	<15.84	<18.48				
Total Hydrocarbons	<66.88	<68.66	<79.19	<92.39				
GCMS VOC screen	<34.33	<34.33	<39.59	<46.19				
PID	0.0	0.0	0.0	0.0				

The below table shows the Volatile Organics concentrations in ambient air during active monitoring (17/06/2020):

Volatile Organics (µg/m³)	Location 1	Location 2	Location 3	Location4	AQS	HSA Occupational Exposure Limit Value (8-hour reference period)	EPA AG4 (hourly)	EPA AG4 annual mean
Benzene	<16.05	<16.04	<16.28	<16.84	5	3250		
Toluene	104.33	56.15	32.56	193.60		192000	8000	1910
Ethyl Benzene	<16.05	<16.04	<16.28	<16.84		442000	88400	4420
mp-Xylene	8.03	16.04	<8.14	<8.42		221000	66200	4410
o-Xylen	<8.03	<8.02	<8.14	<8.42		221000	66200	4410
2-Butanone	<16.05	<16.04	<16.28	<16.84				
Total Hydrocarbons	<40.13	<40.11	<40.70	<42.09				
GCMS VOC screen	112.36	<40.11	<40.70	159.93				
PID	0.0	0.0	0.0	0.0				

PID monitoring results during an on-site survey on 17/06/2020 are presented below:

DISCUSSION

The results of the ambient air monitoring campaigns were compared against the Ambient Air Quality Standard (AQS) for that pollutant. The AQS were set down by legislation (S.I. 180 of 2011) in order to protect our health, vegetation and ecosystems.

It was found that the concentration in ambient air for Benzene at Location 1 exceeded the AQS for that parameter during the first round of monitoring. It must be taken into account that the AQS were set down for long term exposure (in the case of Benzene, annual mean) and a complete assessment would require continuous monitoring during a full year. That was not the purpose of this exercise since the activities on site are expected to be completed in a few months. Therefore, the results of this investigation should be taken as an indication of potential AQS breaches if the activity was extended to a full year.

The second rounds of both passive monitoring (30/03/2020 to 19/05/2020) and active monitoring 17/06/2020) provided lower ambient air concentrations for all parameters tested. Both of these monitoring events were undertaken within the period when site activities were suspended under the Covid-19 pandemic restrictions, which extended from 27/03/2020 to 18/06/2020.

It can be concluded that higher BTEX concentrations were found when the activity was carried out and lower concentrations were found when the activity ceased. There were no exceedances of the relevant Air Quality Standards or HSA Occupational Exposure Limit Values during the monitoring periods.

APPENDIX 1 – LABORATORY RESULTS

DETERMINATION OF AMBIENT AIR VOLATILE ORGANIC COMPOUNDS IN DIFFUSION TUBES BY THERMAL DESORPTION / GAS CHROMATOGRAPHY

Report number	Amendment to Report O03253R
Booking in reference no	S0538
Despatch note no	77396
Customer	Environmental Protection Agency Accounts Section PO Box 3000 Johnstown, Castle Estate Co Wexford Ireland
Date samples received	29/05/2020

Location	Tube no	Date exposed*	Date finished*	Exposure hours*	Benzene	Toluene	BTEX Ethyl Benzene	*mp*-Xylene	*o*-Xylene
					ng on Tube				
2	GRA11686	30/03/2020	19/05/2020	1200.00	42.6	50.3	5.8	33.6	13.8
3	GRA06996	30/03/2020	19/05/2020	1200.00	26.2	36.1	5.7	29.3	11.7
1	003265	30/03/2020	19/05/2020	1200.00	89	77	7.3	49.0	19.1
4	003614	30/03/2020	19/05/2020	1200.00	28.3	42.6	6.0	33.3	12.8
5	GRA10331	30/03/2020	19/05/2020	1200.00	41.0	60.8	8.0	50.2	19.3
Blank	003835				1.8	0.9	1.2	0.7	0.5
Laboratory Blank	004312				1.0	0.4	0.2	0.2	0.0

(RESULTS ARE BLANK CORRECTED)

Tube Type Carbograph 1TD

COMMENTS:

Tubes are outside the recommended shelf-life and results may be compromised.

The report was amended to include the comment outside the recommended shelf-life.

Overall M.U. ±16.2% **Reporting Limit** 5ng on tube

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Analyst name G.Aikman **Report checked by** K.Paldamova

Date of analysis 15/06/2020 **Date of Amended report** 30/06/2020

The analysis has been carried out in accordance with in-house method GLM4

DETERMINATION OF AMBIENT AIR VOLATILE ORGANIC COMPOUNDS IN DIFFUSION TUBES BY THERMAL DESORPTION / GAS CHROMATOGRAPHY

Report number	Amendment to Report O03253R1
Booking in reference no	S0538
Despatch note no	77396
Customer	Environmental Protection Agency Accounts Section PO Box 3000 Johnstown, Castle Estate Co Wexford Ireland
Date samples received	29/05/2020

Location	Tube no	Date exposed*	Date finished*	Exposure hours*	Benzene	Toluene	BTEX Ethyl Benzene	*mp*-Xylene	*o*-Xylene
					Values Reported in Parts per Billion (p.p.b.) in Air *				
2	GRA11686	30/03/2020	19/05/2020	1200.00	0.32	0.34	0.04	0.24	0.10
3	GRA06996	30/03/2020	19/05/2020	1200.00	0.20	0.24	0.04	0.21	0.08
1	003265	30/03/2020	19/05/2020	1200.00	0.66	0.52	0.05	0.35	0.14
4	003614	30/03/2020	19/05/2020	1200.00	0.21	0.29	0.04	0.24	0.09
5	GRA10331	30/03/2020	19/05/2020	1200.00	0.31	0.41	0.06	0.36	0.14
Blank	003835			1200.00	0.01	0.01	0.01	0.005	0.003
Laboratory Blank	004312			1200.00	0.01	0.002	0.001	0.001	0.000

(RESULTS ARE BLANK CORRECTED)
Tube Type Carbograph 1TD
COMMENTS:

Tubes are outside the recommended shelf-life and results may be compromised.
The report was amended to include the comment outside the recommended shelf-life.

Weeks exposed	7	**Uptake rates (ng.ppm^{-1}min^{-1})**	1.85	2.07	1.94	1.94	1.94

Analyst name	G.Aikman	**Report checked by**	K.Paldamova
Date of analysis	15/06/2020	**Date of Amended report**	30/06/2020

The analysis has been carried out in accordance with in-house method GLM4

DETERMINATION OF AMBIENT AIR VOLATILE ORGANIC COMPOUNDS IN DIFFUSION TUBES BY THERMAL DESORPTION / GAS CHROMATOGRAPHY

Report number	Amendment to Report O03253R2
Booking in reference no	S0538
Despatch note no	77396
Customer	Environmental Protection Agency Accounts Section PO Box 3000 Johnstown, Castle Estate Co Wexford Ireland
Date samples received	29/05/2020

Location	Tube no	Date exposed*	Date finished*	Exposure hours*	Benzene	Toluene	BTEX Ethyl Benzene	*mp*-Xylene	*o*-Xylene
					Values Reported in μgm^{-3} in Air *				
2	GRA11686	30/03/2020	19/05/2020	1200.00	1.00	1.24	0.18	1.02	0.42
3	GRA06996	30/03/2020	19/05/2020	1200.00	0.61	0.89	0.17	0.89	0.35
1	003265	30/03/2020	19/05/2020	1200.00	2.07	1.90	0.22	1.49	0.58
4	003614	30/03/2020	19/05/2020	1200.00	0.66	1.05	0.18	1.01	0.39
5	GRA10331	30/03/2020	19/05/2020	1200.00	0.96	1.50	0.24	1.52	0.59
Blank	003835			1200.00	0.04	0.02	0.04	0.02	0.01
Laboratory Blank	004312			1200.00	0.02	0.01	0.01	0.01	0.001

(RESULTS ARE BLANK CORRECTED)
Tube Type Carbograph 1TD
COMMENTS:

Tubes are outside the recommended shelf-life and results may be compromised.
The report was amended to include the comment outside the recommended shelf-life.

Weeks exposed	7	**Uptake rates ($ng.ppm^{-1}min^{-1}$)**	1.85	2.07	1.94	1.94	1.94

Analyst name	G.Aikman	**Report checked by**	K.Paldamova
Date of analysis	15/06/2020	**Date of Amended report**	30/06/2020

The analysis has been carried out in accordance with in-house method GLM4

gradko environmental
(A division of Gradko International Ltd.)
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LABORATORY ANALYSIS REPORT

DETERMINATION OF AMBIENT AIR VOLATILE ORGANIC COMPOUNDS IN DIFFUSION TUBES BY THERMAL DESORPTION / GAS CHROMATOGRAPHY

Report number O02788R
Booking in reference no S0488
Despatch note no 76990
Customer Environmental Protection Agency
Accounts Section
PO Box 3000 Johnstown, Castle Estate
Co Wexford Ireland
Date samples received 11/05/2020

Location	Tube no	Date exposed*	Date finished*	Exposure hours*	BTEX Benzene	Toluene	Ethyl Benzene	*mp*-Xylene	*o*-Xylene
					ng on Tube				
2	004065	06/02/2020	30/03/2020	1272.00	83	88	13.3	76	29.5
1	004062	06/02/2020	30/03/2020	1272.00	271	353	38.9	216	87
4	003828	06/02/2020	30/03/2020	1272.00	95	109	18.8	115	44.3
3	004027	06/02/2020	30/03/2020	1272.00	91	108	24.4	136	54.1
Blank	Not provided								
Laboratory Blank	003818				1.0	0.9	0.4	1.0	0.3

(RESULTS ARE NOT BLANK CORRECTED)
Tube Type Carbograph 1TD
COMMENTS:

Overall M.U. ±16.2% **Reporting Limit** 5ng on tube

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Analyst name Gavin Aikman **Report checked by** K.Paldamova

Date of analysis 02/06/2020 **Date of report** 10/06/2020

The analysis has been carried out in accordance with in-house method GLM4

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

LABORATORY ANALYSIS REPORT

DETERMINATION OF AMBIENT AIR VOLATILE ORGANIC COMPOUNDS IN DIFFUSION TUBES BY THERMAL DESORPTION / GAS CHROMATOGRAPHY

Report number O02788R1
Booking in reference no S0488
Despatch note no 76990
Customer Environmental Protection Agency
Accounts Section
PO Box 3000 Johnstown, Castle Estate
Co Wexford Ireland
Date samples received 11/05/2020

Location	Tube no	Date exposed*	Date finished*	Exposure hours*	BTEX Benzene	Toluene	Ethyl Benzene	*mp*-Xylene	*o*-Xylene
					Values Reported in Parts per Billion (p.p.b.) in Air *				
2	004065	06/02/2020	30/03/2020	1272.00	0.59	0.56	0.09	0.52	0.20
1	004062	06/02/2020	30/03/2020	1272.00	1.92	2.23	0.26	1.46	0.59
4	003828	06/02/2020	30/03/2020	1272.00	0.67	0.69	0.13	0.77	0.30
3	004027	06/02/2020	30/03/2020	1272.00	0.65	0.68	0.17	0.92	0.37
Blank	Not provided								
Laboratory Blank	003818			1272.00	0.01	0.01	0.003	0.01	0.002

(RESULTS ARE NOT BLANK CORRECTED)
Tube Type Carbograph 1TD
COMMENTS:

Weeks exposed	8	**Uptake rates (ng.ppm^{-1}min^{-1})**	1.85	2.07	1.94	1.94	1.94

Analyst name Gavin Aikman **Report checked by** K.Paldamova

Date of analysis 02/06/2020 **Date of report** 10/06/2020

The analysis has been carried out in accordance with in-house method GLM4

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

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tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

LABORATORY ANALYSIS REPORT

DETERMINATION OF AMBIENT AIR VOLATILE ORGANIC COMPOUNDS IN DIFFUSION TUBES BY THERMAL DESORPTION / GAS CHROMATOGRAPHY

Report number O02788R2
Booking in reference no S0488
Despatch note no 76990
Customer Environmental Protection Agency
Accounts Section
PO Box 3000 Johnstown, Castle Estate
Co Wexford Ireland
Date samples received 11/05/2020

Location	Tube no	Date exposed*	Date finished*	Exposure hours*	BTEX Benzene	Toluene	Ethyl Benzene	*mp*-Xylene	*o*-Xylene
					Values Reported in µgm^{-3} in Air *				
2	004065	06/02/2020	30/03/2020	1272.00	1.83	2.05	0.38	2.19	0.84
1	004062	06/02/2020	30/03/2020	1272.00	5.98	8.21	1.11	6.20	2.49
4	003828	06/02/2020	30/03/2020	1272.00	2.10	2.54	0.54	3.28	1.27
3	004027	06/02/2020	30/03/2020	1272.00	2.02	2.52	0.70	3.91	1.55
Blank	Not provided								
Laboratory Blank	003818			1272.00	0.02	0.02	0.01	0.03	0.01

(RESULTS ARE NOT BLANK CORRECTED)
Tube Type Carbograph 1TD
COMMENTS:

Weeks exposed	8	**Uptake rates (ng.ppm^{-1}min^{-1})**	1.85	2.07	1.94	1.94	1.94

Analyst name Gavin Aikman **Report checked by** K.Paldamova

Date of analysis 02/06/2020 **Date of report** 10/06/2020

The analysis has been carried out in accordance with in-house method GLM4

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

APPENDIX 2 – MONITORING REPORT BY AXIS ENVIRONMENTAL (06/02/2020)

Air I Noise I Water I Soil I Environmental Consultancy
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Environmental Protection Agency
Inniscarra, Co. Cork

Ambient Air Survey
Gas Networks Ireland
Limerick Gas Works, Dock Road, Limerick.
06-02-2020

Report Reference Number:	**4160-20-01**
Version:	**Version 1**
Date of Issue:	**20-07-2020**
Report Compiled by:	**Mark McGarry**

Contents

Document Sign Off			
Document Number:	4120-20-01		
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Issue Number:	1	**Date:**	20-07-2020
Originator:	**Signature:**	**Reviewer:**	**Customer Contact:**
Mark McGarry		Niamh McMahon	Peter Cunningham
Document History:			
Report Revision Number	**Revision Date**	**Section Revised**	**Reason for Revision**

Executive Summary

An ambient air monitoring survey was carried out in the vicinity of Gas Networks Ireland (Licence Number W0281-01), Dock Road, Limerick on the 06th February 2020 by Mark McGarry, BSc. PgD. The survey was carried out in the presence of Environmental Protection Agency (EPA) personnel to assess the impact of organic releases from this activity on ambient air quality. The following EPA personnel oversaw the sampling event:

- Peter Cunningham, Cork Office;
- Victor Olmos, Dublin Office.

This assessment was carried out to determine the impact, if any, on local air quality, from activities carried out on the day. Remediation process operations were on-going at the Gas Networks site.

A comprehensive review of the surrounding neighbourhood was carried out prior to sampling taking place to allow for a methodical survey to be completed. Samples were collected at four locations:

1. Location 1: (ITN 156672.80, 156465.33): A control sample for traffic contribution on the dock road;
2. Location 2: (ITN 156937.62, 156481.12): A local residence on the southern boundary of the activity;
3. Location 3 (ITN 156931.79, 156617.54): Along the northern boundary where there was a detectable odour;
4. Location 4: (ITN 156883.18, 156564.54): At the entrance gate to the site where there was an occasional detectable odour.

Monitoring was carried out by AXIS Environmental Services Ltd after proposal acknowledgement and agreement on all aspects of the project to be complete.

Main Activities:

Natural Gas Ireland's activity is located on the Dock Road in Limerick which is currently undergoing contaminated soil remediation. The site is surrounded by a mixture of commercial and residential properties. On the day of assessment, there was a range of diggers, generators and personnel operatives working on the site. Odour misting was in operation at the time and throughout the monitoring period at Locations 3 and 4. There was a period of c. 30 – 40 minutes at the start of monitoring at Locations 1 and 2 where misting was not in operation. Location 1 would have been considered a baseline sampling point for the survey as this was upwind of the installation but adjacent to the Dock Road. Location 2 was a residential dwelling at the southern boundary of the installation which was upwind on the day of monitoring. Location 3 was on the northern boundary of the installation immediately downwind of the activity and operations on site. Location 4 was in the entrance lane to the installation. There were high buildings either side of the sampling equipment channelling air from site to the Dock Road.

Purpose:

The objectives of this assessment were to:

- Assess the ambient concentrations of a range of organic compounds and polycyclic aromatic hydrocarbons as result activities at the installation;
- Assess baseline concentrations of a range of organic compounds in the area, upwind of the installation;
- Compare the measured concentrations with the current air quality standards as outlined in 2008/50/EC, 2004/107/EC and guideline values as applied in the EPA Guidance note AG4:2020.

Method Summary:

Sampling and analysis of organic compounds was carried out in accordance with methodology MDHS 96. Air was drawn through a sorbent tube and analysed in a UKAS accredited laboratory by gas chromatography mass spectrophotometry.

Samples were collected and transported to the laboratory under controlled chain of custody at the correct temperatures and conditions.

Photo Ionisation Detection was carried out using a calibrated MiniRAE 3000 PID. This was used to take spot readings both on and off site.

Summary of Findings:

None of the compounds assessed were detected above air quality standards on the day of assessment.

The air quality standards for Benzene (2008/50/EC) and Benzo[a]pyrene (2004/107/EC) are extremely low at 5 and 0.001 ug/m^3 respectively. To monitor below these limits on the day of assessment was not achievable, however neither compound was detected by the laboratory at their accredited limit of detection.

Toluene was detected in both Location's 3 and 4, which were downwind of activities at the installation at concentrations of 55.43 and 46.19 ug/m^3 respectively. The guideline limit for toluene in ambient air is 1,910 ug/m^3 for a long term (annual average) and 8,000 ug/m^3 for a short term (1 hour) period. Toluene was not detected at either the upwind or the baseline location.

There were concentrations of Naphthalene detected at Locations 3 and 4 downwind of the installation at concentrations of 352.18 and 427.9 ug/m^3 respectively (an average over the monitoring period). This was below a guideline AQS of 500 ug/m^3 for a long term average and 150,000 ug/m^3 for short term exposure to this compound. This guideline AQS was obtained by following the EPA guidance note AG4 (Appendix J) and limits applied in the 2020 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations (2001-2015). The odour detection threshold for this compound is quoted at approximately 440 ug/m^3.

1. Introduction

Ambient air monitoring was carried out near Gas Networks Ireland, Dock Road, Limerick, to determine the concentration of specific organic compounds and polycyclic aromatic hydrocarbons in the vicinity of the activity. A comprehensive site review was carried out prior to sampling taking place to allow for a methodical survey of the activity to be completed.

Monitoring was carried out by AXIS Environmental Services Ltd after proposal acknowledgement and agreement on all aspects of the project to be complete. Mark McGarry, BSc. PgD carried out sampling at four different locations on the 06th February 2020.

A sampling plan was devised on the day and agreed with the EPA after process operations and wind directions were assessed.

2. Terms of Reference

The objectives of this assessment were to:

- Assess the ambient concentrations of a range of organic compounds and polycyclic aromatic hydrocarbons as result of activities at the installation;
- Assess baseline concentrations of a range of organic compounds in the area, upwind of the installation;
- Compare the measured concentrations with the current air quality standards as outlined in 2008/50/EC, 2004/107/EC and guideline values as applied in the EPA Guidance note AG4:2020.

3. Summary of Methods Used

Table 1: Method Summary

Parameter	Method	Laboratory Status
Volatile Organic Compounds	MDHS 96 – Volatile Organic Compounds In Air	RPS UK
Polycyclic Aromatic Hydrocarbons	MDHS 96 – Volatile Organic Compounds In Air	RPS UK
Organic Compounds	Photo Ionisation Detector	RPS UK

Table 2: Equipment Summary

Item	ID Number	Calibration Status
Pump No 1	0512	All pumps are leak checked and calibrated on site Before and After sampling All pumps were determined within the acceptable drift status.
Pump No 2	0513	
Pump No 3	0514	
Pump No 4	0556	
Pump No 5	17523	
Pump No 6	17525	
MiniRAE PID	18992	Calibrated prior to site visit
Mass Flow Meter	19EQ501	Calibration Certificate: Attached in Appendix I

4. Map of Locations

Location 1

Location 2

Location 3

Location 4

5. Air Quality Standards

Table 3:

Individual Components	Air Quality Standard ug/m^3		Reference Location
Volatile Organic Compounds	**Annual Mean Limit**	**Hourly Limit**	
Benzene	5	-	2008/50/EC
Toluene	1,910	8,000	EPA AG4
Xylene m,p	4,410	66,200	EPA AG4
Xylene o	4,410	66,200	EPA AG4
2-butanone	-	-	No limit available
Ethylbenzene	4,420	88,400	EPA AG4*
Total Hydrocarbons	-	-	No limit available
GCMS VOC Screen	-	-	No limit available
Polycyclic Aromatic Hydrocarbons	***Annual Mean Limit***	**Hourly Limit**	
Acenaphthene	-	-	No limit available
Acenaphthylene	-	-	No limit available
Anthracene	-	-	No limit available
Benzo[a]anthracene	-	-	No limit available
Benzo[a]pyrene	0.001	-	2004/107/EC
Benzo[b]fluoranthene	-	-	No limit available
Benzo[ghi]perylene	-	-	No limit available
Benzo[k]fluoranthene	-	-	No limit available
Chrysene	-	-	No limit available
Dibenz[ah]anthracene	-	-	No limit available
Fluoranthene	-	-	No limit available
Fluorene	-	-	No limit available
Indeno[123cd]pyrene	-	-	No limit available
Naphthalene	500	150,000	EPA AG4*
Phenanthrene	-	-	No limit available
Pyrene	-	-	No limit available

*Derived from EPA Guidance on use of 2020 Code of Practice Limits for the Safety, Health and Welfare at Work (Chemical Agents) Regulations (2001 – 2015) and the Safety, Health and Welfare at Work (Carcinogens) Regulations (2001 – 2019).

6. Results and Observations

6.1: Location 1

6.1.1: Results

Volatile Organics	ug/tube	ug.m^{-3}	Uncertainty 95%ile	Annual Mean Limit	Hourly Limit
Benzene	<2	<13.38	1.98	5	-
Toluene	**14**	**93.63**	**13.86**	**1,910**	**8,000**
Xylene m,p	<1	<6.69	0.99	4,410	66,200
Xylene o	<1	<6.69	0.99	4,410	66,200
2-Butanone	<2	<13.38	1.98	-	-
Ethylbenzene	<2	<13.38	1.98	4,420	88,400
Total Hydrocarbons	<10	<66.88	9.90	-	-
GCMS VOC Screen	<5	<33.44	4.95	-	-
PID Organic Range	-	0.0*	-	-	-

*No organic compound registered on the equipment. The detection limit is 0.1 ppm

6.1.2: Location 1 Raw Data

Client:	EPA	
Test Date:	06/02/2020	
Test Start Time:	09:10	
Laboratory Used:	RPS	
Reference:	Location 1	
Leak Check Results	**VOCs**	
Prior to test:	0	l/min
Post Test:	0	l/min
Sample Volume Flow Rate:	0.445	l/min
Standard Requirement:	<5	%
Test Result:	0	%
Test Status	Pass	
Calibration Details	**VOCs**	
Pump Number:	512	
Calibration Unit:	19EQ501	
Calibration Unit Uncertainty:	<2	%
Calibration Rate Before Test:	0.44	l/min
Calibration Rate After Test:	0.45	l/min
Maximum allowed flow	0.5	l/min
Average sample Volume:	0.445	l/min
Sample Test Time:	336	minutes
Pump Gas Temperature:	8	^{O}C
Pump Sample Pressure:	101.2	kPa
Gas Volume:	0.14952	m^3
Tube Details	**VOCs**	
Tube Type:	226-01	
Tube Identification Number:	7898605143	
Blank Identification Number:	6697213563	
Main Adsorbent Layer	100	mg
Backup Adsorbent Layer	50	mg
Containment Material	Glass	
Breakthrough Occurred	No	
Tubes in Lab in <7 days	Yes	
Tubes >7 days were stored	<4	Deg C
Tubes >7 days were stored	Dark	-
Transport Container Airtight	Yes	
Exposed to Sunlight	No	
Transport Temp <20 Deg C	Yes	
Field Blank <10% Analyte Value	Yes	
Test Details		
Adsorption Tube Temperature:	8	^{O}C avg
Weather Detail		
Average Wind Speed	1.5	m/s avg
Direction	215	Degrees avg
Precipitation	0.0	mm
Cloud Cover	Overcast	
Average Temperature	8	Degrees avg

6.1.3: Monitor Location

6.1.4: Location Description

Location:	This location was accessed within the boundary of Limerick Docks. The monitor was placed c. 3 meters above ground level, c.3 meters back from the Dock Road.
Observation:	The rate of activity in the docks was low, occasional traffic movements, no heavy equipment in operation, sparsely populated with employees or contractors. The Dock Road was extremely busy with constant traffic flows, consisting mainly of cars but also high volumes of HGVs.
Co-ordinates:	ITN 156672.80, 156465.33
Evidence of tampering:	None
Climatic Conditions:	Overcast, dry low south westerly wind speeds.
Other Comments:	Upwind of the installation under assessment.

6.2: Location 2

6.2.1: Results

Volatile Organics	ug/tube	ug.m^{-3}	Uncertainty 95%ile	Annual Mean Limit	Hourly Limit
Benzene	<2	<13.73	2.38	5	-
Toluene	**7**	**48.06**	**8.32**	**1,910**	**8,000**
Xylene m,p	<1	<6.87	1.19	4,410	66,200
Xylene o	<1	<6.87	1.19	4,410	66,200
2-Butanone	<2	<13.73	2.38	-	-
Ethylbenzene	<2	<13.73	2.38	4,420	88,400
Total Hydrocarbons	<10	<68.66	11.89	-	-
GCMS VOC Screen	<5	<34.33	5.95	-	-
PID Organic Range	-	0.0*	-	-	-

*No organic compound registered on the equipment. The detection limit is 0.1 ppm

6.2.2: Location 2 Raw Data

Client:	EPA	
Test Date:	06/02/2020	
Test Start Time:	09:28	
Laboratory Used:	RPS	
Reference:	Location 2	
Leak Check Results	**VOCs**	
Prior to test:	0	l/min
Post Test:	0	l/min
Sample Volume Flow Rate:	0.44	l/min
Standard Requirement:	<5	%
Test Result:	0	%
Test Status	Pass	
Calibration Details	**VOCs**	
Pump Number:	513	
Calibration Unit:	19EQ501	
Calibration Unit Uncertainty:	<2	%
Calibration Rate Before Test:	0.44	l/min
Calibration Rate After Test:	0.44	l/min
Maximum allowed flow	0.5	l/min
Average sample Volume:	0.44	l/min
Sample Test Time:	331	minutes
Pump Gas Temperature:	8	^{O}C
Pump Sample Pressure:	101.2	kPa
Gas Volume:	0.14564	m^3
Tube Details	**VOCs**	
Tube Type:	226-01	
Tube Identification Number:	7898605147	
Blank Identification Number:	6697213563	
Main Adsorbent Layer	100	mg
Backup Adsorbent Layer	50	mg
Containment Material	Glass	
Breakthrough Occurred	No	
Tubes in Lab in <7 days	Yes	
Tubes >7 days were stored	<4	Deg C
Tubes >7 days were stored	Dark	-
Transport Container Airtight	Yes	
Exposed to Sunlight	No	
Transport Temp <20 Deg C	Yes	
Field Blank <10% Analyte Value	Yes	
Test Details		
Adsorption Tube Temperature:	8	^{O}C
Weather Detail		
Average Wind Speed	1.5	m/s avg
Direction	215	Degrees avg
Precipitation	0	mm
Cloud Cover	Overcast	
Average Temperature	8	Degrees avg

6.2.3: Monitor Location

6.2.4: Location Description

Location:	This location was at a residence adjacent to the southern boundary of the site. The monitor was placed c. 1.5 meters above ground level on the residence side of the boundary wall. This was c. 15 meters from St. Alphonsus street which had occasional traffic movements, mainly cars.
Observation:	There was no boiler, no oil or other notable source of interference within the boundary of the residence. This location was notably upwind of the activity.
Co-ordinates:	ITN 156937.62, 156481.12
Evidence of tampering:	None
Climatic Conditions:	Overcast, dry low south westerly wind speeds.
Other Comments:	Upwind of the installation under assessment.

6.3: Location 3

6.3.1: Results

Volatile Organics	**ug/tube**	**ug.m^{-3}**	**Uncertainty 95%ile**	**Annual Mean Limit**	**Hourly Limit**
Benzene	<2	<15.84	2.06	5	-
Toluene	**7**	**55.43**	**7.22**	**1,910**	**8,000**
Xylene m,p	<1	<7.92	1.03	4,410	66,200
Xylene o	<1	<7.92	1.03	4,410	66,200
2-Butanone	<2	<15.84	2.06	-	-
Ethylbenzene	<2	<15.84	2.06	4,420	88,400
Total Hydrocarbons	<10	<79.19	10.31	-	-
GCMS VOC Screen	<5	<39.59	5.16	-	-
PID Organic Range	-	0.0*	-	-	-
Polycyclic Aromatic Hydrocarbons	***ug/tube***	***ug.m^{-3}***	***Uncertainty 95%ile***	***Annual Mean Limit***	***Hourly Limit***
Acenaphthene	<5	<37.47	4.88	-	-
Acenaphthylene	<5	<37.47	4.88	-	-
Anthracene	<5	<37.47	4.88	-	-
Benzo[a]anthracene	<5	<37.47	4.88	-	-
Benzo[a]pyrene	<5	<37.47	4.88	0.001	-
Benzo[b]fluoranthene	<5	<37.47	4.88	-	-
Benzo[ghi]perylene	<5	<37.47	4.88	-	-
Benzo[k]fluoranthene	<5	<37.47	4.88	-	-
Chrysene	<5	<37.47	4.88	-	-
Dibenz[ah]anthracene	<5	<37.47	4.88	-	-
Fluoranthene	<5	<37.47	4.88	-	-
Fluorene	<5	<37.47	4.88	-	-
Indeno[123cd]pyrene	<5	<37.47	4.88	-	-
Naphthalene	**47**	**352.18**	**45.87**	**500**	**150,000**
Phenanthrene	<5	<37.47	4.88	-	-
Pyrene	<5	<37.47	4.88	-	-

*In general no organic compound registered on the equipment which has a detection limit of 0.1 ppm. On occasion the equipment would spike to 0.1 ppm indicating the presence of organics. This was only for 30 – 60 seconds on 2 occasions over a 30 minute period.

6.3.2: Location 3 Raw Data

Client:	EPA		
Test Date:	06/02/2020		
Test Time:	10:28		
Laboratory Used:	RPS		
Reference:	Location 3		
Leak Check Results	**VOCs**	**PAH**	
Prior to test:	0	0	l/min
Post Test:	0	0	l/min
Sample Volume Flow Rate:	0.44	0.47	l/min
Standard Requirement:	<5	<5	%
Test Result:	0	0	%
Test Status	Pass	Pass	
Calibration Details	**VOCs**	**PAH**	
Pump Number:	533	17EQ525	
Calibration Unit:	19EQ501	19EQ501	
Calibration Unit Uncertainty:	<2	<2	%
Calibration Rate Before Test:	0.44	0.46	l/min
Calibration Rate After Test:	0.44	0.47	l/min
Maximum allowed flow	0.5	0.5	l/min
Average sample Volume:	0.44	0.465	l/min
Sample Test Time:	287	287	minutes
Pump Gas Temperature:	8	8	^{O}C
Pump Sample Pressure:	101.2	101.2	kPa
Gas Volume:	0.12628	0.13346	m^3
Tube Details	**VOCs**	**PAH**	
Tube Type:	226-01	226-10-03	
Tube Identification Number:	7898605146	5358401845	
Blank Identification Number:	6697213563	6697213563	
Main Adsorbent Layer	100	100	mg
Backup Adsorbent Layer	50	50	mg
Containment Material	Glass	Glass	
Breakthrough Occurred	No	No	
Tubes in Lab in <7 days	Yes	Yes	
Tubes >7 days were stored	<4	<4	Deg C
Tubes >7 days were stored	Dark	Dark	-
Transport Container Airtight	Yes	Yes	
Exposed to Sunlight	No	No	
Transport Temp <20 Deg C	Yes	Yes	
Field Blank <10% Analyte Value	Yes	Yes	
	Yes		
Test Details			
Adsorption Tube Temperature:	8	^{O}C	
Weather Detail			
Average Wind Speed	1.5	m/s avg	
Direction	215	Degrees avg	
Precipitation	0	mm	
Cloud Cover	Overcast		
Average Temperature	8	Degrees avg	

6.3.3: Monitor Location

6.3.4: Location Description

Location:	This location was at the northern side of the installation placed against the boundary fence, approximately 1 meter above ground level. There was a detectable odour on occasion. There was odour abatement equipment was in operation within 10 meters of the point.
Observation:	There were diggers and other construction equipment in operation for the duration of the monitoring period. The Dock Road is extremely busy with constant traffic flows, consisting mainly of cars but also high volumes of HGVs.
Co-ordinates:	ITN 156931.79, 156617.54
Evidence of tampering:	None
Climatic Conditions:	Overcast, dry low south westerly wind speeds. The only difference was that this location would have had much higher humidity due to the presence of the misting equipment.
Other Comments:	Downwind of the installation under assessment. There was a detectable odour at this location and the PID on two occasions for a brief period detected 0.1ppm or 100 ppb of volatile organic compound at this location.

6.4: Location 4

6.4.1: Results

Volatile Organics	**ug/tube**	**ug.m^{-3}**	**Uncertainty 95%ile**	**Annual Mean Limit**	**Hourly Limit**
Benzene	<2	<18.48	1.90	5	-
Toluene	**5**	**46.19**	**4.74**	**1,910**	**8,000**
Xylene m,p	<1	<9.24	0.95	4,410	66,200
Xylene o	<1	<9.24	0.95	4,410	66,200
2-Butanone	<2	<18.48	1.90	-	-
Ethylbenzene	<2	<18.48	1.90	4,420	88,400
Total Hydrocarbons	<10	<92.39	9.48	-	-
GCMS VOC Screen	<5	<46.19	4.74	-	-
PID Organic Range	-	0.0*	-	-	-
Polycyclic Aromatic Hydrocarbons	***ug/tube***	***ug.m^{-3}***	***Uncertainty 95%ile***	***Annual Mean Limit***	**Hourly Limit**
Acenaphthene	<5	<42.79	4.88	-	-
Acenaphthylene	<5	<42.79	4.88	-	-
Anthracene	<5	<42.79	4.88	-	-
Benzo[a]anthracene	<5	<42.79	4.88	-	-
Benzo[a]pyrene	<5	<42.79	4.88	0.001	-
Benzo[b]fluoranthene	<5	<42.79	4.88	-	-
Benzo[ghi]perylene	<5	<42.79	4.88	-	-
Benzo[k]fluoranthene	<5	<42.79	4.88	-	-
Chrysene	<5	<42.79	4.88	-	-
Dibenz[ah]anthracene	<5	<42.79	4.88	-	-
Fluoranthene	<5	<42.79	4.88	-	-
Fluorene	<5	<42.79	4.88	-	-
Indeno[123cd]pyrene	<5	<42.79	4.88	-	-
Naphthalene	**50**	**427.90**	**45.87**	**500**	**150,000**
Phenanthrene	<5	<42.79	4.88	-	-
Pyrene	<5	<42.79	4.88	-	-

*No organic compound registered on the equipment. The detection limit is 0.1 ppm

6.4.2: Location 4 Raw Data

Client:	EPA		
Test Date:	06/02/2020		
Test Time:	10:40		
Laboratory Used:	RPS		
Reference:	Location 4		
Leak Check Results	**VOCs**	**PAH**	
Prior to test:	0	0	l/min
Post Test:	0	0	l/min
Sample Volume Flow Rate:	0.44	0.48	l/min
Standard Requirement:	<5	<5	%
Test Result:	0	0	%
Test Status	Pass	Pass	
Calibration Details	**VOCs**	**PAH**	
Pump Number:	514	17EQ525	
Calibration Unit:	19EQ501	19EQ501	
Calibration Unit Uncertainty:	<2	<2	%
Calibration Rate Before Test:	0.44	0.48	l/min
Calibration Rate After Test:	0.44	0.47	l/min
Maximum allowed flow	0.5	0.5	l/min
Average sample Volume:	0.44	0.475	l/min
Sample Test Time:	246	246	minutes
Pump Gas Temperature:	8	8	^{O}C
Pump Sample Pressure:	101.2	101.2	kPa
Gas Volume:	0.10824	0.11685	m^3
Tube Details	**VOCs**	**PAH**	
Tube Type:	226-01	226-10-03	
Tube Identification Number:	7898605150	5358401847	
Blank Identification Number:	6697213563	6697213563	
Main Adsorbent Layer	100	100	mg
Backup Adsorbent Layer	50	50	mg
Containment Material	Glass	Glass	
Breakthrough Occurred	No	No	
Tubes in Lab in <7 days	Yes	Yes	
Tubes >7 days were stored	<4	<4	Deg C
Tubes >7 days were stored	Dark	Dark	-
Transport Container Airtight	Yes	Yes	
Exposed to Sunlight	No	No	
Transport Temp <20 Deg C	Yes	Yes	
Field Blank <10% Analyte Value	Yes	Yes	
Test Details			
Adsorption Tube Temperature:	8	^{O}C	
Weather Detail			
Average Wind Speed	1.5	m/s avg	
Direction	215	Degrees avg	
Precipitation	0	mm	
Cloud Cover	Overcast		
Average Temperature	8	Degrees avg	

6.4.3: Monitor Location

6.4.4: Location Description

Location:	This location was at the entrance lane to the installation, placed against the boundary fence, approximately 1.5 meters above ground level. There was an occasional detectable solvent type odour.
Observation:	There were diggers and other construction equipment in operation on the site for the duration of the monitoring period. The Dock Road is extremely busy with constant traffic flows, consisting mainly of cars but also high volumes of HGVs.
Co-ordinates:	ITN 156883.18, 156564.54
Evidence of tampering:	None
Climatic Conditions:	Overcast, dry with south westerly winds.
Other Comments:	Downwind of some of the activities at the installation under assessment.

7. Conclusions

- Ambient air monitoring was carried out near Gas Networks Ireland, Dock Road, Limerick, to determine the concentration of specific organic compounds and polycyclic aromatic hydrocarbons in the vicinity of the activity;
- A comprehensive site review was carried out prior to sampling taking place to allow for a methodical survey of the activity to be completed;
- A sampling plan was devised on the day and agreed with the EPA after process operations and wind directions were assessed;
- None of the compounds assessed were determined above any legislative or guideline air quality standards (AQS) on the day of assessment, where applicable;
- The AQS for Benzene (2008/50/EC) and Benzo[a]pyrene (2004/107/EC) are extremely low at 5 and 0.001 ug/m^3 respectively. To monitor below these limits on the day of assessment was not achievable, however neither compound was detected by the laboratory at the accredited limit of detection. Compliance against these air quality standards cannot be confirmed;
- Toluene was detected at Location's 3 and 4, which were both downwind of activities at the installation with concentrations of 55.43 and 46.19 ug/m^3 respectively. The guideline limit for toluene in ambient air is 1,910 ug/m^3 for a long term (annual average) and 8,000 ug/m^3 for a short term (1 hour) period, therefore the concentrations detected did not breach an AQS. The odour threshold for toluene is variable in different sources, approximately 2,900 ug/m^3;
- Toluene was not detected at either the upwind residence (Location 2) or the baseline monitoring point (Location 2);
- There were concentrations of Naphthalene detected at Locations 3 and 4 downwind of the installation at concentrations of 352.18 and 427.9 ug/m^3 respectively, an average over the monitoring period. This was below a guideline AQS of 500 ug/m^3 for a long term average and 150,000 ug/m^3 for short term exposure to this compound. The guideline AQS was obtained by following the EPA guidance note AG4 (Appendix J) and limits applied by the 2020 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations (2001-2015). The odour detection threshold for this compound is quoted at approximately 440 ug/m^3.

Appendix I: Mass Flow Certificate (ISO 17025 Accredited Laboratory)

Certificate of Calibration

Date of issue: 5-Feb-19

Certificate Number N025913

0687

Chell Instruments Ltd
Folgate House
Folgate Road
North Walsham
NR28 OAJ
England

Telephone 01692 502003 direct line
Fax 01692 500088
e-mail pcm@chell.co.uk
web site www.chell.co.uk

Gas
Pressure
Vacuum
& Flow

Page 1 of 2 Pages

Approved Signatory

Name [ ] P.C.A. Marks [ ] J. Shanahan
[ ] P.J. Kerrison

Signature

CUSTOMER DETAILS

Name: Axis Environmental Services Ltd.

Address: Unit 5, Caherdavin Business Centre
Caherdavin Park, Ennis Road
Limerick, Ireland, V94 NT63

Purchase order No.: 19507

Chell Job No.: 28089/4

UNIT UNDER TEST DETAILS

Manufacturer: Siargo

Model & description: MF4008 mass flow meter

Serial / I.D. No.: C1M04126 **ID No:** ASLLK19EQ501

Full scale range: 10 slpm **User Gas:** Dry Air
Test gas: Dry Air

CALIBRATION DETAILS

Nominal Ambient Conditions: 20°C and 50%RH

Standards & equipment used: STD0052

Date of calibration: 5-Feb-19

Engineers note: The instrument was received with no obvious signs of damage or contamination. Instrument's resolution and response filter changed to match other calibrated units of the same model and range.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements. The uncertainty is true at the time observations were recorded and is not indicative of the instruments' ability to retain the calibrated value(s) with time.

UKAS is one of the signatories to the Multilateral Agreement of the European co-operative for Accreditation (EA) for the mutual recognition of calibration certificates issued by accredited laboratories.

Template number: LT009816 (MFM 5pt)

Certificate of Calibration

UKAS Accredited Calibration Laboratory No. **0687**

Certificate Number	N025913
Page	2 of 2 Pages

Method:

The UUT was calibrated using a series of precision mass flow elements (molblocs) located upstream of the meter inlet port. The outlet of the UUT was vented to atmosphere.
The following flow rates were generated using a precision needle valve connected to the inlet port of the UUT
The reported standard flow rates are an average value sampled over a minimum time of 10 seconds.

Volumetric flow units Q(m) are standardised to the ST&P values shown below.
After a minimum warm-up time of 30 minutes the UUT zero indication was recorded and a user adjustment performed as required. The quoted measurement uncertainty values include factors such as resolution and short ter term repeatability.

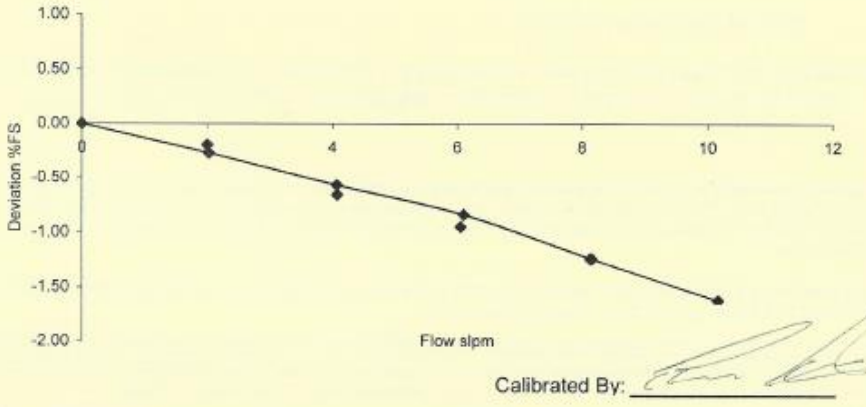
Results: As found

Standard temperature: 20.0 °C
Standard pressure: 101.325 kPa

Gas Correction Factor: 1.000

Dry Air Standard flow Q(m) l/min	Equivalent Dry Air flow slpm	UUT display flow slpm	Deviation from standard %Rdg	Deviation from standard %FS	Measurement uncertainty %FS
0.000	0.000	0.00	n/a	0.00	0.14
2.027	2.027	2.00	-1.3	-0.27	0.17
4.067	4.067	4.01	-1.4	-0.57	0.24
6.104	6.104	6.02	-1.4	-0.84	0.32
8.154	8.154	8.03	-1.5	-1.2	0.40
10.162	10.162	10.00	-1.6	-1.6	0.49
8.134	8.134	8.01	-1.5	-1.2	0.40
6.055	6.055	5.96	-1.6	-0.95	0.31
4.076	4.076	4.01	-1.6	-0.66	0.24
2.000	2.000	1.98	-0.98	-0.20	0.17
0.000	0.000	0.00	n/a	0.00	0.14

NMM
08/02/19.



Calibrated By: _____

Template number: LT009816 (MFM 6pt)

Appendix II: PID Calibration

Approved Signatory	Mark McGarry
Serial Number	592-900931
Description	MiniRAE 3000
Job Reference	EPA Dock Road
Date of Calibration	05-02-2020
Time	16:00
Calibration Summary	Pass
Deviation / Limitation	None
Equipment	4146 Mass flow controller
Calibration Gas	Isobutylene 100 ppm in air
Actual value from Calibration Cylinder	99.1
Recorded ppm Value of Isobutylene (+/- 2ppm)	99.2
Instrument calibration	Pass
Zero gas	0.0

Appendix III: Certificates of Analysis

Test Certificate

Date 05/03/2020

Client	AIR SCIENTIFIC (LK)**NEW** Unit 5 Caherdavin Business Centre Caherdavin Ennis Road Limerick V94 NT63	**Order No.**	EPA Dock Road
		Certificate No.	**WK20-02498**
		Issue No.	1
Contact	axisenviro	**Date Received**	12/02/2020
Description	8 Tubes for various analytes	**Technique**	GC-FID

Sample No. **1111503** **Location 1**

			Method
Benzene	2 µg		O8 (MCERTS)(U)
Toluene	14 µg		O8 (MCERTS)(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8 (MCERTS)(U)
Total hydrocarbons	<10 µg		M104(N)
			M109(N)

GCMS Screen

<5 µg

Sample No. **1111504** **Location 2**

			Method
Benzene	<2 µg		O8 (MCERTS)(U)
Toluene	7 µg		O8 (MCERTS)(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8 (MCERTS)(U)
Total hydrocarbons	<10 µg		M104(N)
			M109(N)

GCMS Screen

<5 µg

UKAS TESTING 0605

Date 05/03/2020

Test Certificate

Client AIR SCIENTIFIC (LK)**NEW**

Certificate No. WK20-02498

Issue No. 1

Sample No. 1111505 **Location 3- 7898605146**

			Method
Benzene	<2 µg		O8 (MCERTS)(U)
Toluene	7 µg		O8 (MCERTS)(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8 (MCERTS)(U)
Total hydrocarbons	<10 µg		M104(N)
			M109(N)

GCMS Screen

<5 µg

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Test Certificate

Date 05/03/2020

Client	AIR SCIENTIFIC (LK)**NEW**	**Certificate No.**	**WK20-02498**
		Issue No.	1

Sample No.	**1111506**	**Location 3- 5358401845**	**Method**

PAH screen — Subcontract(N)

Acenaphthene	<5 ng
Acenaphthylene	<5 ng
Anthracene	<5 ng
Benzo[a]anthracene	<5 ng
Benzo[a]pyrene	<5 ng
Benzo[b]fluoranthene	<5 ng
Benzo[ghi]perylene	<5 ng
Benzo[k]fluoranthene	<5 ng
Chrysene	<5 ng
Dibenz[ah]anthracene	<5 ng
Fluoranthene	<5 ng
Fluorene	<5 ng
Indeno[123cd]pyrene	<5 ng
Napthalene	47 ng
Phenanthrene	<5 ng
Pyrene	<5 ng

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Test Certificate

Date 05/03/2020

Client	AIR SCIENTIFIC (LK)**NEW**	**Certificate No.**	**WK20-02498**
		Issue No.	1

Sample No. **1111507** **Location 4- 7898605150**

			Method
Benzene	<2 µg		O8 (MCERTS)(U)
Toluene	5 µg		O8 (MCERTS)(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8 (MCERTS)(U)
Total hydrocarbons	<10 µg		M104(N)
			M109(N)

GCMS Screen

<5 µg

Test Certificate

Date 05/03/2020

Client	AIR SCIENTIFIC (LK)**NEW**	**Certificate No.**	**WK20-02498**
		Issue No.	1

Sample No. **1111508** **Location 4- 5358401847** **Method**

PAH screen Subcontract(N)

Acenaphthene
<5 ng

Acenaphthylene
<5 ng

Anthracene
<5 ng

Benzo[a]anthracene
<5 ng

Benzo[a]pyrene
<5 ng

Benzo[b]fluoranthene
<5 ng

Benzo[ghi]perylene
<5 ng

Benzo[k]fluoranthene
<5 ng

Chrysene
<5 ng

Dibenz[ah]anthracene
<5 ng

Fluoranthene
<5 ng

Fluorene
<5 ng

Indeno[123cd]pyrene
<5 ng

Napthalene
50 ng

Phenanthrene
<5 ng

Pyrene
<5 ng

Test Certificate

Date 05/03/2020

Client	AIR SCIENTIFIC (LK)**NEW**	**Certificate No.**	**WK20-02498**
		Issue No.	1

Sample No.	**1111509**	**Blank- 5358401851**	**Method**
Benzene	<2 µg		O8 (MCERTS)(U)
Toluene	<1 µg		O8 (MCERTS)(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8 (MCERTS)(U)
Total hydrocarbons	<10 µg		M104(N)
			M109(N)

GCMS Screen

<5 µg

Test Certificate

Date 05/03/2020

Client	AIR SCIENTIFIC (LK)**NEW**	**Certificate No.**	**WK20-02498**
		Issue No.	1

Sample No.	**1111566**	**Blank- 6697213563**	**Method**

PAH screen — Subcontract(N)

Acenaphthene	<5 ng
Acenaphthylene	<5 ng
Anthracene	<5 ng
Benzo[a]anthracene	<5 ng
Benzo[a]pyrene	<5 ng
Benzo[b]fluoranthene	<5 ng
Benzo[ghi]perylene	<5 ng
Benzo[k]fluoranthene	<5 ng
Chrysene	<5 ng
Dibenz[ah]anthracene	<5 ng
Fluoranthene	<5 ng
Fluorene	<5 ng
Indeno[123cd]pyrene	<5 ng
Napthalene	<5 ng
Phenanthrene	<5 ng
Pyrene	<5 ng

UKAS TESTING 0605

Date 05/03/2020

Test Certificate

Client	AIR SCIENTIFIC (LK)**NEW**	**Certificate No.**	**WK20-02498**
		Issue No.	1

Tested By	Subcontract	Date	28/02/2020
	Tammy Illingworth		04/03/2020
Approved By		Date	05/03/2020

Lora McKerracher
Senior Chemist

For and on authority of RPS Laboratories Ltd.

Method Symbols
(U) Analysis is UKAS Accredited
(N) Analysis is not UKAS Accredited

Concentration values reported as mg/m3 and ppm where air volumes are supplied by the customer are not covered by the scope of UKAS accreditation.

Results stated as ml are refering to the sample volume.

RPS Laboratories terms and conditions apply - a copy is available on request.

Analysis carried out on samples 'as received'

RPS Environmental Management Ltd trading as RPS laboratories. Unit 12. Waters Edge Business Park. Modwen Road. Salford. M5 3EZ

APPENDIX 3 – MONITORING REPORT BY AXIS ENVIRONMENTAL (17/06/2020)

Air I Noise I Water I Soil I Environmental Consultancy
www.axisenv.ie

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Limerick.
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00353 61 324587

Environmental Protection Agency
Inniscarra, Co. Cork

Ambient Air Survey
Gas Networks Ireland
Limerick Gas Works, Dock Road, Limerick
17-06-2020

Report Reference Number:	**4160-20-02**
Version:	**Version 2**
Date of Issue:	**21-07-2020**
Report Compiled by:	**Mark McGarry**

Contents

Document Sign Off			
Document Number:	4120-20-02		
Reason for Issue:	Compliance Assessment		
Issue Number:	2	**Date:**	21-07-2020
Originator:	**Signature:**	**Reviewer:**	**Customer Contact:**
Mark McGarry		Niamh McMahon	Peter Cunningham
Document History:			
Report Revision Number	**Revision Date**	**Section Revised**	**Reason for Revision**
2	21-07-2020	6.4.1	Included < signs in results

Executive Summary

An ambient air monitoring survey was carried out in the vicinity of Gas Networks Ireland (Licence Number W0281-01), Dock Road, Limerick on the 17th June 2020 by Mark McGarry, BSc. PgD. The survey was carried out in the presence of Environmental Protection Agency (EPA) personnel to assess the impact of organic releases from this activity on ambient air quality. The following EPA personnel oversaw the sampling event:

- Denise O'Riordan;
- Joe Hunter.

This assessment was carried out to determine the impact, if any, on local air quality, from activities carried out on the day. Remediation process operations were on-going at the Gas Networks site, however there were very little activity at the installation on the day of this monitoring event. Activities had more or less ceased waiting on approval from head office to recommence works pending a risk assessment carried out for an underground tank.

A comprehensive review of the surrounding neighbourhood was carried out prior to sampling taking place to allow for a methodical survey to be completed. Samples were collected at four locations, all of which were within the confines of the installation boundary:

1. Location 1 (Easting: 156931.79, Northing: 156617.54): Along the northern boundary where there had previously been a detectable odour;
2. Location 2 (Easting: 157006.46, Northing: 156573.52): Along the eastern boundary perimeter wall;
3. Location 3 (Easting: 156933.85, Northing: 156490.14): Along the western boundary perimeter wall;
4. Location 4: (Easting: 156883.18, Northing: 156564.54): At the entrance gate to the site.

Monitoring was carried out by AXIS Environmental Services Ltd after proposal acknowledgement and agreement on all aspects of the project to be complete.

Main Activities:

Natural Gas Ireland's activity is located on the Dock Road in Limerick which is currently undergoing contaminated soil remediation. The site is surrounded by a mixture of commercial and residential properties. On the day of assessment, there was a range of diggers, generators and personnel operatives at the site, however there were minimal activities taking place.

Odour misting was in operation at the time and throughout the monitoring period at a range of locations at the installation.

Purpose:

The objectives of this assessment were to:

- Assess the ambient concentrations of a range of organic compounds and total hydrocarbons as result activities at the installation;
- Compare the measured concentrations with the current air quality standards as outlined in 2008/50/EC, 2004/107/EC and guideline values as applied in the EPA Guidance note AG4:2020.

Method Summary:

Sampling and analysis of organic compounds was carried out in accordance with methodology MDHS 96. Air was drawn through a sorbent tube and analysed in a UKAS accredited laboratory by gas chromatography mass spectrophotometry.

Samples were collected and transported to the laboratory under controlled chain of custody at the correct temperatures and conditions.

Photo Ionisation Detection was carried out using a calibrated MiniRAE 3000 PID. This was used to take spot readings on site.

Summary of Findings:

None of the compounds assessed were detected above air quality standards on the day of assessment. This was not to be expected as there was very low level odour in the vicinity of the sample areas and minimal activities underway within the installation boundary.

The air quality standards for Benzene (2008/50/EC) and Benzo[a]pyrene (2004/107/EC) are extremely low at 5 and 0.001 ug/m^3 respectively. To monitor below these limits on the day of assessment was not achievable, however neither compound was detected by the laboratory at their accredited limit of detection.

Toluene was detected at all four locations on the day. The guideline limit for toluene in ambient air is 1,910 ug/m^3 for a long term (annual average) and 8,000 ug/m^3 for a short term (1 hour) period. The concentrations detected did not breach an AQS.

There were trace concentrations of xylene detected. Concentrations were well below guideline AQS for exposure to this compound.

1. Introduction

Ambient air monitoring was carried out near Gas Networks Ireland, Dock Road, Limerick, to determine the concentration of specific organic compounds and total hydrocarbons in the vicinity of the activity. A comprehensive site review was carried out prior to sampling taking place to allow for a methodical survey of the activity to be completed.

Monitoring was carried out by AXIS Environmental Services Ltd after proposal acknowledgement and agreement on all aspects of the project to be complete. Mark McGarry, BSc. PgD carried out sampling at four different locations on the 17th June 2020.

A sampling plan was devised on the day and agreed with the EPA after process operations and wind directions were assessed.

2. Terms of Reference

The objectives of this assessment were to:

- Assess the ambient concentrations of a range of organic compounds and total hydrocarbons as result of activities at the installation;
- Compare the measured concentrations with the current air quality standards as outlined in 2008/50/EC, 2004/107/EC and guideline values as applied in the EPA Guidance note AG4:2020.

3. Summary of Methods Used

Table 1: Method Summary

Parameter	Method	Laboratory Status
Volatile Organic Compounds	MDHS 96 – Volatile Organic Compounds In Air	RPS UK
Total Hydrocarbons	MDHS 96 – Volatile Organic Compounds In Air	RPS UK
Organic Compounds	Photo Ionisation Detector	RPS UK

Table 2: Equipment Summary

Item	ID Number	Calibration Status
Pump No 1	0553	All pumps are leak checked and calibrated on site Before and After sampling All pumps were determined within the acceptable drift status.
Pump No 2	0513	
Pump No 3	0514	
Pump No 4	0512	
Pump No 5	AX43	
Pump No 6	AX44	
MiniRAE PID	-	EPA Equipment
Mass Flow Meter	18EQ511	Calibration Certificate: Attached in Appendix I

4. Map of Locations

Location 1

Location 2

Location 3

Location 4

5. Air Quality Standards

Table 3:

Individual Components	Air Quality Standard ug/m^3		Reference Location
Volatile Organic Compounds	**Annual Mean Limit**	**Hourly Limit**	
Benzene	5	-	2008/50/EC
Toluene	1,910	8,000	EPA AG4
Xylene m,p	4,410	66,200	EPA AG4
Xylene o	4,410	66,200	EPA AG4
2-butanone	-	-	No limit available
Ethylbenzene	4,420	88,400	EPA AG4*
Naphthalene	500	150,000	EPA AG4*
GCMS VOC Screen	-	-	No limit available

*Derived from EPA Guidance on use of 2020 Code of Practice Limits for the Safety, Health and Welfare at Work (Chemical Agents) Regulations (2001 – 2015) and the Safety, Health and Welfare at Work (Carcinogens) Regulations (2001 – 2019).

6. Results and Observations

6.1: Location 1

6.1.1: Results

Volatile Organics	ug/tube	ug.m^{-3}	Uncertainty 95%ile	Annual Mean Limit	Hourly Limit
Benzene	<2	<16.05	2.28	5	-
Toluene	**13**	**104.33**	7.97	**1,910**	**8,000**
Xylene m,p	**1**	**8.03**	2.28	**4,410**	**66,200**
Xylene o	<1	<8.03	1.14	4,410	66,200
2-Butanone	<2	<16.05	2.28	-	-
Ethylbenzene	<2	<16.05	2.28	4,420	88,400
Naphthalene	<5	<40.13	5.69	500	150,000
GCMS VOC Screen	**14**	**112.36**	5.69	**-**	**-**
PID Organic Range	-	0.0*	-	-	-

*No organic compound registered on the equipment. The detection limit is 0.1 ppm

6.1.2: Location 1 Raw Data

Title:	***Determination of Speciated Volatile Organic Compounds***	
Method:	Based on MDHS 96	
Client:	Environmental Protection Agency	
Test Date:	17/06/2020	
Test Time:	10:13	
Laboratory Used:	RPS	
Reference:	Location 1	

Leak Check Results	**VOCs**	
Prior to test:	0	l/min
Post Test:	0	l/min
Sample Volume Flow Rate:	0.45	l/min
Standard Requirement:	<5	%
Test Result:	0	%
Test Status	Pass	

Calibration Details	**VOCs**	
Pump Number:	553	
Calibration Unit:	18EQ512	
Calibration Unit Uncertainty:	<2	%
Calibration Rate Before Test:	0.45	l/min
Calibration Rate After Test:	0.45	l/min
Maximum allowed flow	0.5	l/min
Average sample Volume:	0.45	l/min
Sample Test Time:	280	minutes
Pump Gas Temperature:	14	^{O}C
Pump Sample Pressure:	100.2	kPa
Gas Volume:	0.12600	m^3

Tube Details	**VOCs**	
Tube Type:	226-01	
Tube Identification Number:	8388002293	
Blank Identification Number:	8078905656	
Main Adsorbent Layer	100	mg
Backup Adsorbent Layer	50	mg
Containment Material	Glass	
Breakthrough Occurred	No	
Tubes in Lab in <7 days	Yes	
Tubes >7 days were stored	<4	Deg C
Tubes >7 days were stored	Dark	-
Transport Container Airtight	Yes	
Exposed to Sunlight	No	
Transport Temp <20 Deg C	Yes	
Field Blank <10% Analyte Value	Yes	

Test Details		
Adsorption Tube Temperature:	14	^{O}C

Weather Detail		
Average Wind Speed	<1	m/s
Direction	315	Degrees
Precipitation	0	mm
Cloud Cover	Yes	
Average Temperature	14	Degrees

6.1.3: Monitor Location

6.1.4: Location Description

Location:	This location was at the northern side of the installation placed against the boundary fence, approximately 1 meter above ground level. There was a very faint to no odour detected. There was odour abatement equipment was in operation within 10 meters of the point.
Observation:	There was very little equipment activity in operation for the duration of the monitoring period. The Dock Road is extremely busy with constant traffic flows, consisting mainly of cars but also high volumes of HGVs.
Co-ordinates:	Easting: 156931.79, Northing: 156617.54
Evidence of tampering:	None
Climatic Conditions:	Dry day, with cloud cover and a slight occasional NW breeze. This location was adjacent to the site and wind direction.
Other Comments:	-

6.2: Location 2

6.2.1: Results

Volatile Organics	ug/tube	ug.m^{-3}	Uncertainty 95%ile	Annual Mean Limit	Hourly Limit
Benzene	<2	<16.04	2.28	5	-
Toluene	**7**	**56.15**	7.97	**1,910**	**8,000**
Xylene m,p	**2**	**16.04**	2.28	**4,410**	**66,200**
Xylene o	<1	<8.02	1.14	4,410	66,200
2-Butanone	<2	<16.04	2.28	-	-
Ethylbenzene	<2	<16.04	2.28	4,420	88,400
Naphthalene	<5	<40.11	5.69	500	150,000
GCMS VOC Screen	<5	<40.11	5.69	-	-
PID Organic Range	-	0.0*	-	-	-

*No organic compound registered on the equipment. The detection limit is 0.1 ppm

6.2.2: Location 2 Raw Data

Title:	***Determination of Speciated Volatile Organic Compounds***	
Method:	Based on MDHS 96	
Client:	Environmental Protection Agency	
Test Date:	17/06/2020	
Test Time:	10:26	
Laboratory Used:	RPS	
Reference:	Location 2	

Leak Check Results	**VOCs**	
Prior to test:	0	l/min
Post Test:	0	l/min
Sample Volume Flow Rate:	0.455	l/min
Standard Requirement:	<5	%
Test Result:	0	%
Test Status	Pass	

Calibration Details	**VOCs**	
Pump Number:	516	
Calibration Unit:	18EQ512	
Calibration Unit Uncertainty:	<2	%
Calibration Rate Before Test:	0.45	l/min
Calibration Rate After Test:	0.46	l/min
Maximum allowed flow	0.5	l/min
Average sample Volume:	0.455	l/min
Sample Test Time:	274	minutes
Pump Gas Temperature:	14	^{O}C
Pump Sample Pressure:	100.1	kPa
Gas Volume:	0.12467	m^3

Tube Details	**VOCs**	
Tube Type:	226-01	
Tube Identification Number:	7009371788	
Blank Identification Number:	7009371781	
Main Adsorbent Layer	100	mg
Backup Adsorbent Layer	50	mg
Containment Material	Glass	
Breakthrough Occurred	No	
Tubes in Lab in <7 days	Yes	
Tubes >7 days were stored	<4	Deg C
Tubes >7 days were stored	Dark	-
Transport Container Airtight	Yes	
Exposed to Sunlight	No	
Transport Temp <20 Deg C	Yes	
Field Blank <10% Analyte Value	Yes	

Test Details		
Adsorption Tube Temperature:	14	^{O}C

Weather Detail		
Average Wind Speed	<1	m/s
Direction	315	Degrees
Precipitation	0	mm
Cloud Cover	Yes	
Average Temperature	14	Degrees

6.2.3: Monitor Location

6.2.4: Location Description

Location:	This location was located along the eastern boundary wall. This was the area in which the EPA had detected an odour prior to the survey taking place and was downwind of installation activities.
Observation:	This location was notably downwind of the activity. There was very little activity on-going during the monitoring period.
Co-ordinates:	Easting: 157006.46, Northing: 156573.52
Evidence of tampering:	None
Climatic Conditions:	Dry day, with cloud cover and a slight occasional NW breeze.
Other Comments:	None.

6.3: Location 3

6.3.1: Results

Volatile Organics	ug/tube	ug.m^{-3}	Uncertainty 95%ile	Annual Mean Limit	Hourly Limit
Benzene	<2	<16.28	2.65	5	-
Toluene	**4**	**32.56**	**5.31**	**1,910**	**8,000**
Xylene m,p	<1	<8.14	1.33	4,410	66,200
Xylene o	<1	<8.14	1.33	4,410	66,200
2-Butanone	<2	<16.28	2.65	-	-
Ethylbenzene	<2	<16.28	2.65	4,420	88,400
Naphthalene	<5	<40.70	6.63	500	150,000
GCMS VOC Screen	<5	<40.70	6.63	-	-
PID Organic Range	-	0.0*	-	-	-

*No organic compound registered on the equipment which has a detection limit of 0.1 ppm.

6.3.2: Location 3 Raw Data

Title:	***Determination of Speciated Volatile Organic Compounds***	
Method:	Based on MDHS 96	
Client:	Environmental Protection Agency	
Test Date:	17/06/2020	
Test Time:	10:40	
Laboratory Used:	RPS	
Reference:	Location 3	

Leak Check Results	**VOCs**	
Prior to test:	0	l/min
Post Test:	0	l/min
Sample Volume Flow Rate:	0.455	l/min
Standard Requirement:	<5	%
Test Result:	0	%
Test Status	Pass	

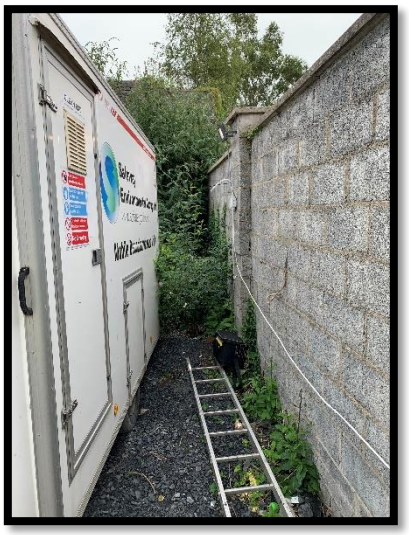
Calibration Details	**VOCs**	
Pump Number:	513	
Calibration Unit:	18EQ512	
Calibration Unit Uncertainty:	<2	%
Calibration Rate Before Test:	0.45	l/min
Calibration Rate After Test:	0.46	l/min
Maximum allowed flow	0.5	l/min
Average sample Volume:	0.455	l/min
Sample Test Time:	270	minutes
Pump Gas Temperature:	14	^{O}C
Pump Sample Pressure:	100.2	kPa
Gas Volume:	0.12285	m^3

Tube Details	**VOCs**	
Tube Type:	226-01	
Tube Identification Number:	7009371786	
Blank Identification Number:	7009371781	
Main Adsorbent Layer	100	mg
Backup Adsorbent Layer	50	mg
Containment Material	Glass	
Breakthrough Occurred	No	
Tubes in Lab in <7 days	Yes	
Tubes >7 days were stored	<4	Deg C
Tubes >7 days were stored	Dark	-
Transport Container Airtight	Yes	
Exposed to Sunlight	No	
Transport Temp <20 Deg C	Yes	
Field Blank <10% Analyte Value	Yes	

Test Details		
Adsorption Tube Temperature:	14	^{O}C

Weather Detail		
Average Wind Speed	<1	m/s
Direction	315	Degrees
Precipitation	0	mm
Cloud Cover	Yes	
Average Temperature	14	Degrees

6.3.3: Monitor Location



6.3.4: Location Description

Location:	This location was at the western side of the installation placed against the boundary fence, approximately 1.5 meters above ground level. There was no detectable odour on this occasion.
Observation:	There was very little activity in the area on the date of monitoring.
Co-ordinates:	Easting: 156933.85, Northing: 156490.14
Evidence of tampering:	None
Climatic Conditions:	Dry day, with cloud cover and a slight occasional NW breeze.
Other Comments:	None.

6.4: Location 4

6.4.1: Results

Volatile Organics	ug/tube	ug.m^{-3}	Uncertainty 95%ile	Annual Mean Limit	Hourly Limit
Benzene	<2	<16.84	1.90	5	-
Toluene	23	193.60	**4.74**	**1,910**	**8,000**
Xylene m,p	<1	<8.42	0.95	4,410	66,200
Xylene o	<1	<8.42	0.95	4,410	66,200
2-Butanone	<2	<16.84	1.90	-	-
Ethylbenzene	<2	<16.84	1.90	4,420	88,400
Naphthalene	<5	<42.09	9.48	500	150,000
GCMS VOC Screen	**19**	**159.93**	**4.74**	-	-
PID Organic Range	-	0.0*	-	-	-

*No organic compound registered on the equipment. The detection limit is 0.1 ppm

6.4.2: Location 4 Raw Data

Title:	***Determination of Speciated Volatile Organic Compounds***	
Method:	Based on MDHS 96	
Client:	Environmental Protection Agency	
Test Date:	17/06/2020	
Test Time:	10:40	
Laboratory Used:	RPS	
Reference:	Location 4	

Leak Check Results	**VOCs**	
Prior to test:	0	l/min
Post Test:	0	l/min
Sample Volume Flow Rate:	0.45	l/min
Standard Requirement:	<5	%
Test Result:	0	%
Test Status	Pass	

Calibration Details	**VOCs**	
Pump Number:	514	
Calibration Unit:	18EQ512	
Calibration Unit Uncertainty:	<2	%
Calibration Rate Before Test:	0.45	l/min
Calibration Rate After Test:	0.45	l/min
Maximum allowed flow	0.5	l/min
Average sample Volume:	0.45	l/min
Sample Test Time:	264	minutes
Pump Gas Temperature:	14	^{O}C
Pump Sample Pressure:	100.2	kPa
Gas Volume:	0.11880	m^3

Tube Details	**VOCs**	
Tube Type:	226-01	
Tube Identification Number:	7009371782	
Blank Identification Number:	7009371781	
Main Adsorbent Layer	100	mg
Backup Adsorbent Layer	50	mg
Containment Material	Glass	
Breakthrough Occurred	No	
Tubes in Lab in <7 days	Yes	
Tubes >7 days were stored	<4	Deg C
Tubes >7 days were stored	Dark	-
Transport Container Airtight	Yes	
Exposed to Sunlight	No	
Transport Temp <20 Deg C	Yes	
Field Blank <10% Analyte Value	Yes	

Test Details		
Adsorption Tube Temperature:	14	^{O}C

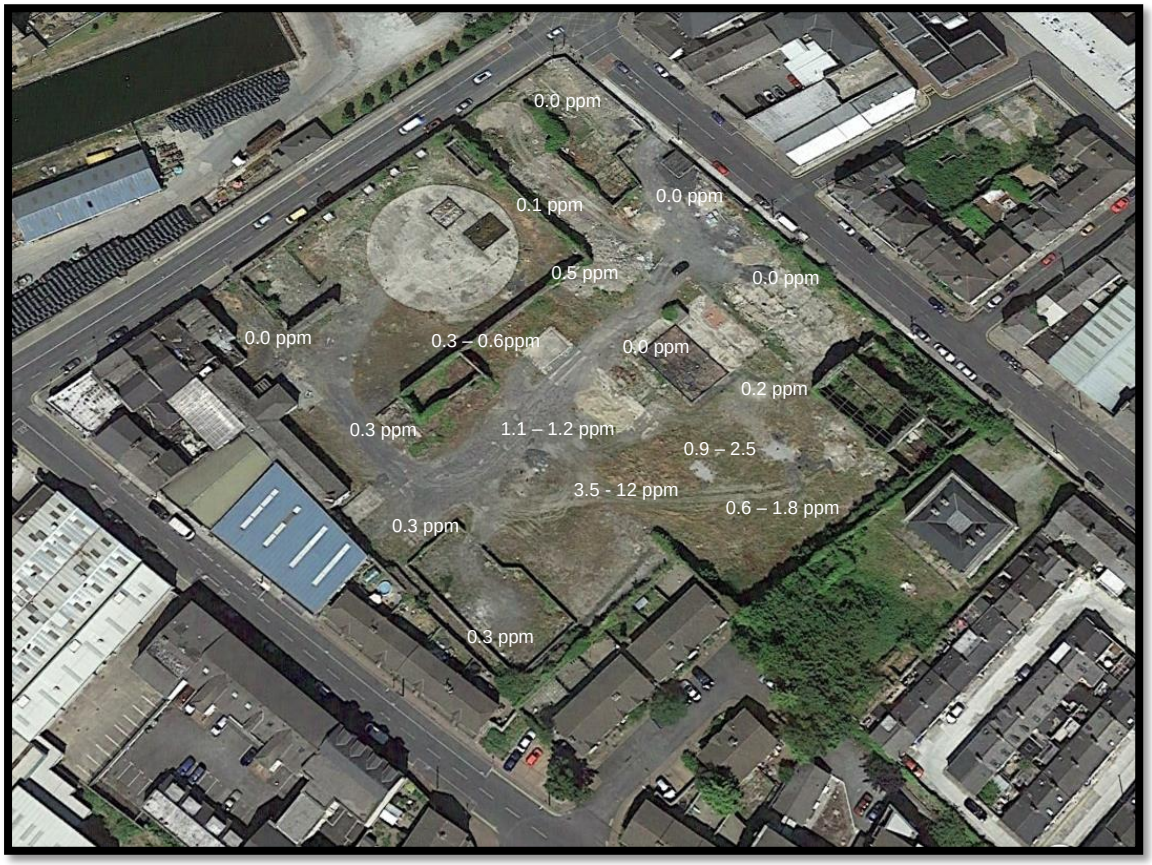
Weather Detail		
Average Wind Speed	<1	m/s
Direction	315	Degrees
Precipitation	0	mm
Cloud Cover	Yes	
Average Temperature	14	Degrees

6.4.3: Monitor Location

6.4.4: Location Description

Location:	This location was at the entrance lane to the installation, placed against the boundary fence, approximately 1.5 meters above ground level.
Observation:	There were very little activity or equipment in operation on the site for the duration of the monitoring period. The Dock Road is extremely busy with constant traffic flows, consisting mainly of cars but also high volumes of HGVs.
Co-ordinates:	Easting: 156883.18, Northing: 156564.54
Evidence of tampering:	None
Climatic Conditions:	Dry day, with cloud cover and a slight occasional NW breeze.
Other Comments:	None.

7. PID Results Across Site



A direct assessment of on-site organic concentrations was completed using a MiniRae3000 (SN: 592 916829) Photo ionisation detector (PID). There was a varied range of results with the highest concentrations detected in the centre of the site along by some contaminated stones and clay. The site range was 0.0 – 1.2 ppm for most areas, with elevated levels observed near the storage piles. A peak momentary detection of 12 ppm was observed near a storage area, however this was a spike and brief measurement. Concentrations were taken from a restricted area on the day at an exposed underground tank which contained contaminated materials. The concentrations ranged from 0.6 – 1.8 ppm around this tank.

8. Conclusions

- Ambient air monitoring was carried out near Gas Networks Ireland, Dock Road, Limerick, to determine the concentration of specific organic compounds in the vicinity of the activity;
- A comprehensive site review was carried out prior to sampling taking place to allow for a methodical survey of the activity to be completed;
- A sampling plan was devised on the day and agreed with the EPA after process operations and wind directions were assessed;
- None of the compounds assessed were determined above any legislative or guideline air quality standards (AQS) on the day of assessment, where applicable;
- Toluene was detected at all four locations on the day. The guideline limit for toluene in ambient air is 1,910 ug/m^3 for a long term (annual average) and 8,000 ug/m^3 for a short term (1 hour) period. The concentrations detected did not breach an AQS;
- There were trace concentrations of xylene detected. Concentrations were well below guideline AQS for exposure to this compound.

Appendix I: Mass Flow Certificate (ISO 17025 Accredited Laboratory)

CERTIFICATE OF CALIBRATION

UKAS CALIBRATION 0625

Labcal Ltd

Unit 265
Ampress Park
Lymington
Hampshire SO41 8JU
United Kingdom
Tel: +44 (0)1590 670146
contact@labcal.co.uk
Web: www.labcal.co.uk

Date of Issue

23 OCT. 2019

Certificate Number

K44435F

Page 1 of 2 Pages

Approved Signatory

J. RIVETT (✓)

Client	: AXIS ENVIRONMENTAL SERVICES LTD
Address	: UNIT 5 CAHERDAVIN BUSINESS CENTRE ENNIS ROAD LIMERICK V94 NT63 IRELAND
Order No.	: 19553
Equipment Tested	: MASS FLOW METER
Type / Type No.	: MF4008-10-R-CV-A
Equipment Serial No.	: ASLLK18EQ511
Range / Scale	: 0.1 – 10.0 l/min AIR 20°C 1013 mbar abs
Resolution	: 0.01 l/min
Manufacturer	: SIARGO
Date Calibration Completed	: 22 OCT. 2019
Calibration Fluid	: AIR
Laboratory Temperature	: 20.9 ± 2.0°C
Humidity	: 52 ± 10% RH
Reference No.	: K44435F138/39

Certified by

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No. 0625

Certificate Number
K44435F

THE METER WAS CALIBRATED USING VOLUME AND TIME PRINCIPLE. ALL VOLUMES ARE FOR 1013.25 mbar abs AND 20°C. ALL MEASUREMENTS ARE TRACEABLE TO NATIONAL STANDARDS. THE RESULTS BELOW ARE THE AVERAGE OF THREE READINGS PER POINT.

ATMOSPHERIC PRESSURE : 1022.77 mbar abs
METER PRESSURE : 1024.24 mbar abs

Av. TEMPERATURE OF THE GAS AT THE METER : 21.2°C ± 0.5°C

INDICATED READING OF INSTRUMENT UNDER TEST UNITS : l/min	MEASURED FLOW RATE UNITS : l/min
0.00	0.000
2.00	2.026
4.00	4.046
6.00	6.076
8.00	8.102
10.00	10.143

THE UNCERTAINTY OF THE ABOVE MEASURED FLOW RATES IS [0.32% OF THE FLOW RATE (+ RESOLUTION OF THE INSTRUMENT OF 0.01 l/min)]

Test Engineer m Heard **END**

The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements. The results on this certificate relate only to this instrument.

Appendix II: Certificates of Analysis

Test Certificate

Date 14/07/2020

Client	AIR SCIENTIFIC (LK)**NEW** Unit 5 Caherdavin Business Centre Caherdavin Ennis Road Limerick V94 NT63	**Order No.**	EPA Gas Works 170620
		Certificate No.	**WK20-06793**
		Issue No.	1
Contact	axisenviro	**Date Received**	25/06/2020
Description	Tubes for VOCs & Top 10/PAH	**Technique**	Various

Sample No.	**1129347**	**Location 1 VOC 7009371780**	**Method**
Benzene	<2 µg		O8(U)
Toluene	13 µg		O8(U)
Xylene m,p	1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8(U)
			M109(N)

GCMS Screen

2-[(trimethylsilyl)oxy]-2-{4[(trimethylsilyl)oxy]phenyl}ethylamine

8 µg

cyclotetrasiloxane, octamethyl-

6 µg

Naphthalene	<5 µg		G8(N)

Sample No.	**1129349**	**Location 2 VOC 7009371788**	**Method**
Benzene	<2 µg		O8(U)
Toluene	7 µg		O8(U)
Xylene m,p	2 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8(U)
Naphtha	<5 µg		G5(N)
			M109(N)

GCMS Screen

<5 µg

UKAS TESTING 0605

Date 14/07/2020

Test Certificate

Client AIR SCIENTIFIC (LK)**NEW**

Certificate No. WK20-06793

Issue No. 1

Sample No. 1129351 **Location 3 VOC 7009371786**

			Method
Benzene	<2 µg		O8(U)
Toluene	4 µg		O8(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8(U)
Naphtha	<5 µg		G5(N)
			M109(N)

GCMS Screen

<5 µg

Sample No. 1129352 **Location 4 VOC 7009371782**

			Method
Benzene	<2 µg		O8(U)
Toluene	23 µg		O8(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8(U)
Naphtha	<5 µg		G5(N)
			M109(N)

GCMS Screen

2-[(trimethylsilyl)oxy]-2-{4-[(timethylsilyl)oxy]phenyl)ethylanime

7 µg

cyclohexasiloxane, dodecamethyl-

5 µg

cyclotetrasiloxane, octamethyl-

6 µg

Test Certificate

Date 14/07/2020

Client	AIR SCIENTIFIC (LK)**NEW**	**Certificate No.**	**WK20-06793**
		Issue No.	1

Sample No. **1129353** **Location 5 VOC 7009371781**

			Method
Benzene	<2 µg		O8(U)
Toluene	<1 µg		O8(U)
Xylene m,p	<1 µg		O8(U)
Xylene o	<1 µg		O8(U)
2-butanone	<2 µg		O8(U)
Ethylbenzene	<2 µg		O8(U)
Naphtha	<5 µg		G5(N)
			M109(N)

GCMS Screen

<5 µg

Tested By Jun Huan Zhao Date 01/07/2020
Tammy Illingworth 08/07/2020

Approved By Date 14/07/2020

Joanne Dewhurst
Operational

For and on authority of RPS Laboratories Ltd.

Method Symbols (U) Analysis is UKAS Accredited
(N) Analysis is not UKAS Accredited

Concentration values reported as mg/m3 and ppm where air volumes are supplied by the customer are not covered by the scope of UKAS accreditation.
Results stated as ml are refering to the sample volume.

RPS Laboratories terms and conditions apply - a copy is available on request.

Analysis carried out on samples 'as received'

RPS Environmental Management Ltd trading as RPS laboratories. Unit 12. Waters Edge Business Park. Modwen Road. Salford. M5 3EZ