NORTH LINCOLNSHIRE COUNCIL

RECORD OF DETERMINATION REFERENCE 7884/2016

31-33 MIDLAND ROAD, SCUNTHORPE, DN16 1DQ

ENVIRONMENTAL PROTECTION ACT 1990

PART 2A

North Lincolnshire Council has determined **31-33 MIDLAND ROAD, SCUNTHORPE, DN16 1DQ IS CONTAMINATED LAND** as defined by section 78A(2) of the Environmental Protection Act 1990 (as amended by the Environment Act 1995 Section 57) because:

North Lincolnshire Council has identified the presence of a source of contamination, a pathway and a receptor which forms a significant contaminant linkage associated with the land and buildings. The council is satisfied of the existence of a Category 1 Significant Possibility of Significant Harm (SPOSH) to human health arising from the Single Significant Contaminant Linkage and that there are insufficient mitigation measures in place to prevent such harm occurring.

The extent of the land so determined is land within the commercial boundary outlined in red at 31-33 Midland Road Scunthorpe, DN16 1DQ identified on the plan at Schedule 1 of this record of determination.

A summary of the basis upon which this record of determination has been made is set out in Schedule 2 of this record.

Liability Considerations for all Notified Persons are contained within Schedule 3 of this record.

Schedule 4 of this record provides the Risk Summary supporting this determination.

Signed..[redacted]... Dated.....18.11.16.....

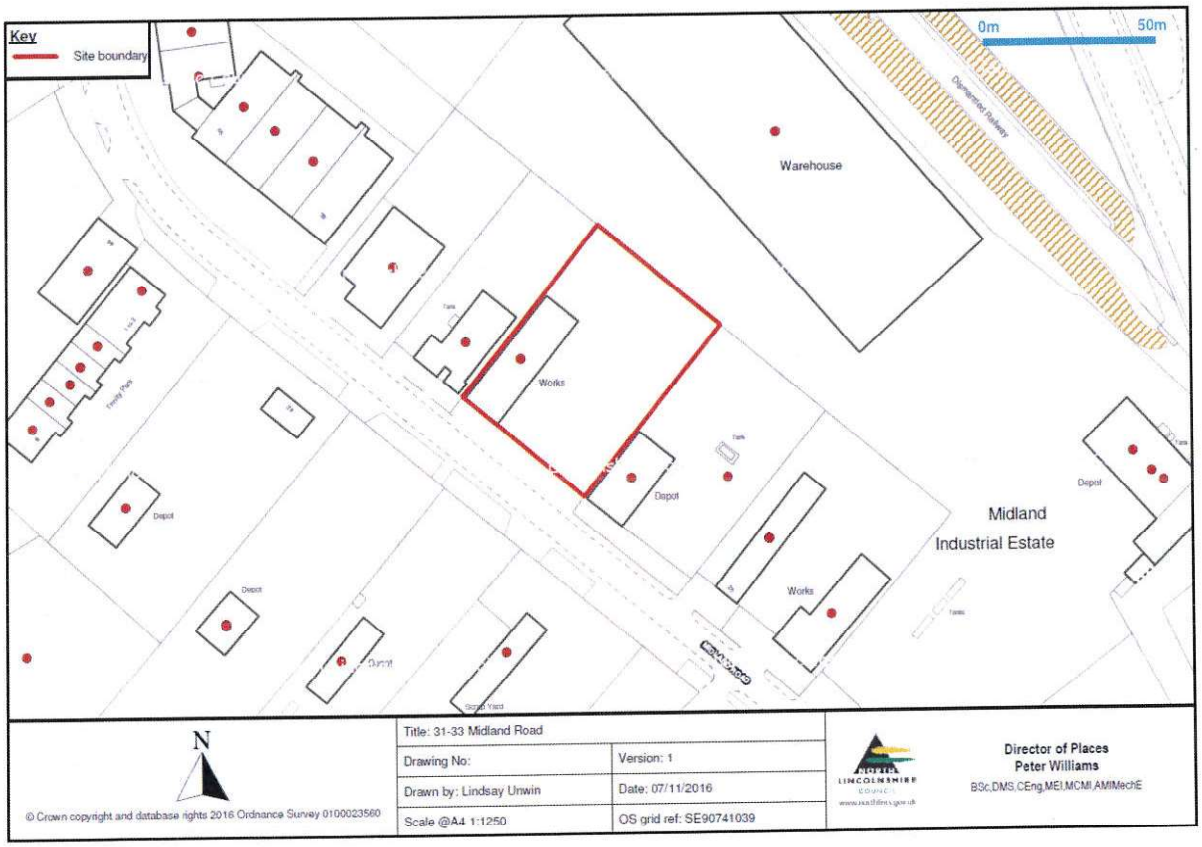
Peter Williams, Director of Places
Civic Centre
Ashby Road
SCUNTHORPE
North Lincolnshire
DN16 1AB

NORTH LINCOLNSHIRE COUNCIL

RECORD OF DETERMINATION REFERENCE 7884/2016 SCHEDULE 1

31-33 MIDLAND ROAD, SCUNTHORPE, DN16 1DQ

Land "Determined" as "Contaminated Land" at 31-33 Midland Road, Scunthorpe, DN16 1DQ is shown within the commercial boundary outlined in red detailed below.



NORTH LINCOLNSHIRE COUNCIL

RECORD OF DETERMINATION REFERENCE 7884/2016 SCHEDULE 2

31-33 MIDLAND ROAD, SCUNTHORPE, DN16 1DQ

1. Description of Significant Contaminant Linkage:

Source of contamination: Landfill gas (methane) associated with the decomposition of landfill material.

Pathway: Migration of landfill gas out of the ground and into buildings via floor slab cracks and service entry points (gas/electricity/water).

Receptor: Human occupants and visitors to the building

Significant Possibility of Significant Harm: Risk of death or serious injury associated with the accumulation of landfill gas within enclosed spaces which in the presence of an ignition source and oxygen has the potential to become explosive/flammable.

Level of Risk: The category of risk is determined as Category 1 as there is considered to be an unacceptably high probability, supported by robust science-based evidence, that significant harm would occur if no action is taken to stop it, as North Lincolnshire Council is aware that similar situations are known, or are strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere;

2. Summary of Evidence upon which the Determination is Based:

North Lincolnshire Council is satisfied that the identification of the Single Significant Contaminant Linkage described above is supported by a robust, appropriate, scientific and technical assessment of all the relevant and available evidence. This has ensured that the council has complied with Paragraph 5.6 and 5.7 of the Contaminated Land Statutory Guidance April 2012 (CLSG).

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223705/pb13735cont-land-guidance.pdf

The scientific and technical assessment is based upon the reports detailed below and the internal air monitoring carried out at the property to date.

1. North Lincolnshire Council Preliminary Risk Assessment Midland Road Former Landfill Site May 2012 Final
2. Geocore Site Investigation Factual Report 2013
3. EPG Contamination Assessment Report Midland Road Landfill November 2013 Final Version 2

Copies of the above documents can be downloaded directly from the following web link:

http://www.northlincs.gov.uk/planning-and-environment/environmental-health/pollution-air-land-and-water/contaminated-land/part-2a-midland-road-site-investigation-outcome/

Site specific internal air monitoring has also been carried out and the results of the monitoring is enclosed in Appendix 3 (Risk Summary).

3. Use of Generic Assessment Criteria and Other Technical Tools to Assess Risk:

It is common practice in contaminated land risk assessment to use "generic assessment criteria" (GACs) as screening tools to help human health risk assessors decide when land can be excluded from the need for further inspection and assessment, or when further work may be warranted. There are no government screening tools for landfill gas and therefore North Lincolnshire Council has acted in accordance with paragraph 3.28 of the CLSG and it has used other technical tools derived by reputable professionals. These have been applied in accordance with the CLSG and are based upon expert opinion.

North Lincolnshire Council used the expertly derived technical tools to first understand the possibility of significant harm to human health posed by the land, and the levels of certainty/uncertainty attached to that understanding, before it went on to decide whether or not that possibility is significant.

There is unavoidable uncertainty underlying some of the facts of the case (see Schedule 3 Risk Summary for further details), however North Lincolnshire Council has used its judgement to strike a reasonable balance between: (a) dealing with risks raised by landfill gas in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation (including the taxpayer where relevant), health and environmental impacts of taking action, property blight, and burdens on affected people.

North Lincolnshire Council has taken a precautionary approach to the risks raised by the landfill gas, whilst avoiding a disproportionate approach taking into account the circumstances of the case. The costs and benefits of taking action are considered to be able to produce net benefits. This approach is in accordance with section 1.6 of the CLSG.

The costs and benefits have been assessed via a Remediation Options Appraisal produced by the council's landfill gas experts EPG Ltd. Copies of this report have already been made available to you but can be obtained from the contact details set out in item 5 of the Notice of Identification.

NORTH LINCOLNSHIRE COUNCIL

RECORD OF DETERMINATION REFERENCE 7884/2016 SCHEDULE 3

31-33 MIDLAND ROAD, SCUNTHORPE, DN16 1DQ

Liability Considerations for all Notified Persons

Under the 1990 Act, Contaminated Land Statutory Guidance April 2012 (CLSG) has been issued by Defra. This sets out in section 7 a number of considerations that the Enforcing Authority must consider on completion of the consultation period, beginning by the issue of this notice.

North Lincolnshire Council will act in accordance with the 1990 Act and the CLSG in circumstances where two or more persons are liable to bear the responsibility for any particular thing by way of remediation. It deals with the questions of who should be excluded from liability, and how the cost of each remediation action should be apportioned between those who remain liable after any such exclusion. It is issued under section 78F(6) and (7) of the 1990 Act.

The process requires the following actions by North Lincolnshire Council:

1. **Identification of Appropriate Persons** (those responsible for payments for remediation)
2. **Identification of Orphan Linkages** in cases where Class A and Class B Persons cannot be identified.
3. **Identification of Remediation Actions** for the Single Significant Contaminant Linkages
4. **Attribution of Liability to Liability Groups** which results in apportionment of liability.
5. **Exclusions** that are relevant to the case. Persons are not treated as Appropriate Persons where the rules for exclusion set out in Section 7(c) with regard to Class A persons, and Section 7(e) with regard to Class B persons apply
6. **Apportion liability** between members of the liability group after the exclusions have been applied.

NORTH LINCOLNSHIRE COUNCIL

RECORD OF DETERMINATION REFERENCE 7884/2016 SCHEDULE 4

31-33 MIDLAND ROAD, SCUNTHORPE, DN16 1DQ

Risk Summary

This risk summary has been prepared in accordance with section 3.35 of the Contaminated Land Statutory Guidance (CLSG) dated April 2012.

It includes the following information:

(a) A summary of the The Enforcing Authority's understanding of the risks, including a description of: the contaminants involved; the identified contaminant linkage(s), or a summary of such linkages; the potential impact(s); the estimated possibility that the impact(s) may occur; and the timescale over which the risk may become manifest.

(b) A description of the The Enforcing Authority's understanding of the uncertainties behind its assessment.

(c) A description of the risks in context, for example by setting the risk in local or national context, or describing the risk from land contamination relative to other risks that receptors might be expected to be exposed to in any case. This need not involve a detailed comparison of relative risks, but the authority should aim to explain the risks in a way which is understandable and relevant to the layperson.

(d) A description of the The Enforcing Authority's initial views on possible remediation. A description of broadly what remediation might entail; how long it might take; likely effects of remediation works on local people and businesses; how much difference it might be expected to make to the risks posed by the land; and the authority's initial assessment of whether remediation would be likely to produce a net benefit, having regard to the broad objectives of the regime.

NORTH LINCOLNSHIRE COUNCIL

RISK SUMMARY FOR CONTAMINATED LAND

at

31-33 Midland Road Scunthorpe North Lincolnshire, DN16 1DQ

Schedule 4 Record of Determination Reference 7884/2016

1 Introduction

This Risk Summary has been prepared as required by the Contaminated Land Statutory Guidance issued by the Department for Environment, Food and Rural Affairs [DEFRA] in April 2012.

Its purpose is to explain in Plain English to those who have an interest in the site (e.g. the site owners/occupiers) why the council considers the land to be Contaminated Land, the contaminants involved, the risks associated with the contaminants and how the situation is intended to be resolved.

2 Site Details

Location

Land at 31-33 Midland Road, Scunthorpe, DN16 1DQ, North Lincolnshire which is located over an area of the former Midland Road landfill

National Grid Coordinates

490744 410388

Area [ha]

0.29 hectares

Current Use

Commercial unit occupied by an engineering and welding company

Number of Properties Affected [If Applicable]

One

Type of Properties

Detached commercial unit

Plan of site

Refer to Appendix A

3 History of the Site and Summary of Detailed Inspection of the Land

Before 1948 the land at 31-33 Midland Road, Scunthorpe formed part of a larger quarry in central Scunthorpe, where stone (ironstone) was removed for use in the iron and steel making industry.

Once the Ironstone had been removed, the council then used the quarry (by that time a large hole in the ground) to dispose of the household waste it collected from Scunthorpe and the surrounding areas.

Contamination: The council owned and operated the quarry as a household waste disposal site (landfill site) from 1945 until 1979 when it closed. The landfill waste has the potential to be a source of **contamination** as the natural breakdown (decomposition) of the waste produces landfill gas which can be harmful to health due to its explosive and toxic nature.

Receptors: As sections of the landfill site were filled with household waste some of the completed areas of the site were sold and some areas were retained by the council. The site was then developed as an industrial estate. Buildings were erected directly on top of the landfill site in the 1960's and 1970's at a time when the risks of placing buildings on former landfill sites was not well understood. Around 1974, buildings were erected on land at 31-33 Midland Road. The buildings were occupied by humans and therefore it was possible for these occupants to be affected by the contamination (landfill gas). The introduction of buildings onto the site in 1974 therefore also introduced sensitive **receptors** (humans) onto the site.

Pathway: Following complaints about the smell of gas inside a council building located on the old Midland Road landfill in 2010, Transco (the body responsible for gas supply emergencies at the time) identified levels of gases in the air that could easily set alight (flammable) inside the building that could not be associated with the mains natural gas supply. As a result of this information the council carried out a detailed assessment of the old landfill site in 2010 to try and understand whether or not the risks to human health from landfill gases were unacceptable. The assessment included internal air monitoring inside buildings to assess the levels of landfill gases. The assessment identified cracks in the floor slab of 31-33 Midland Road which could provide a **pathway** for landfill gas to easily enter the building and accumulate to unacceptable levels. A site investigation of the wider Midland Road landfill (including 31-33 Midland Road) took place in 2012 to try and understand the risks associated with the landfill gas production.

Contaminant Linkage: The assessment has identified that buildings located over the former landfill at 31-33 Midland Road are allowing landfill gas to enter the buildings via floor slab cracks and service entries. The buildings are also located over newer waste deposits (laid down after 1960). These newer waste deposits are now known to be producing landfill (methane) gas at significant levels. The council is satisfied that a **Significant Possibility of Significant Harm as defined under the Environmental Protection Act 1990 Part 2A** exists at 31-33 Midland Road associated with landfill gas.

Risk Management/Remediation: In order for the levels of landfill (methane) gas to be reduced to acceptable levels of risk, management controls need to be put in place which are practical, effective and durable. These risk management actions are known as remediation techniques.

4 The Legal Context

For a site to be considered as contaminated land there has to be a link between the following three elements:

- ***Contaminant*** [e.g. hazardous gas] which is in, on or under the land and has the potential to cause significant harm to a relevant receptor; and
- ***Pathway*** for the contaminants to travel and reach the receptor [e.g. movement of the gas through the ground and entry into building structures via floor cracks]; and
- ***Receptor***, which can be harmfully affected by the contamination [e.g. humans]

The relationship between the above three elements is known as a ***contaminant linkage.*** The link between each element has to be complete and significant for a site to be determined as 'Contaminated Land'. If an element or link is not present then the contaminant linkage is not complete. If the contaminant linkage is not significant, the site cannot be considered to be defined as 'Contaminated Land' under the Environmental Protection Act 1990 Part 2A.

The council is satisfied that a ***Significant Contaminant Linkage*** has been identified and exists at 31-33 Midland Road, Scunthorpe.

5 Information on Contamination at the Site

Methane within the landfill gas is the contaminant of concern which forms the Single Significant Contaminant Linkage. The table below describes how it is formed within a landfill site and why it is giving rise to unacceptable risks at 31-33 Midland Road, Scunthorpe.

Contaminant	What is the source of contamination?
Landfill gas	The site investigation has shown that waste deposited inside the landfill after 1960 is producing landfill gas in significant quantities. The landfill gas has been identified as being able to move upwards and out of the ground and enter the building at 31-33 Midland Road through cracks in the concrete floor slab and service entry points. Once inside the building the gas is able to build up to unacceptable concentrations, which have the potential to present an explosive risk. Landfill gas consists of methane, carbon dioxide and other trace gases. The potential explosive risk which forms the Significant Contaminant Linkage arising from landfill gas ingress is **methane** gas. Carbon dioxide and trace gases, which are known to be toxic, have not been identified at unacceptable levels and are not considered to form part of the Significant Contaminant Linkage.

Methane gas	Methane is a colourless, tasteless gas. Methane gas is created inside a landfill site from the natural breakdown (decomposition) of waste. The waste breaks down in the absence of oxygen (anaerobic decomposition) to produce **methane,** carbon dioxide and other trace gases. Methane is also produced naturally by volcanoes, animals such as cattle and sheep, decaying plants, extraction of natural gas, coal mining and waste disposal such as landfills. Because methane is present naturally in the atmosphere, the general public may be exposed to very low levels when breathing in air. Using gas appliances in the home may also increase exposure due to improper use or leakage. Exposure to methane may occur in the workplace where it is extracted, produced or used. Appendix C presents graphs which show the main sources of methane emissions and global emissions trends over time.

6 The Conceptual Site Model and Significant Contaminant Linkage

A Conceptual Site Model [CSM] is a written description or picture of how contamination can move in the environment to reach relevant receptors associated with a land contamination problem. It develops an understanding of the risks associated with a site and informs the process on what needs to be done to manage the risks associated with Contaminated Land. Appendix E presents a cross section picture of a CSM which represents the Significant Contaminant Linkage at 31-33 Midland Road.

Set out below is a written description of the Single Significant Contaminant Linkage which forms the Determination of the land as Contaminated Land.

Significant Contaminant Linkage 1	CONTAMINANT:	Production of landfill gas (methane) from the breakdown of landfill wastes.
	PATHWAYS:	Vertical migration of landfill gas (methane) through cracks in floor slabs and service entry points and accumulation inside buildings to present a potential explosive risk.
	RECEPTOR:	Occupants and visitors (humans) to the buildings.

The significant contaminant linkage is the migration of landfill gas (methane) arising from decomposition of waste underlying the site. The entrance of the landfill gas (methane) into the building is due to cracks in the floor slab and service entries. The accumulation of the landfill gas (methane) inside the building has reached levels which are considered to present a risk of death or injury to humans due to the explosive risks associated with landfill gas.

7 Contaminant Comparison

The following table is intended to show how the landfill gas (methane) concentrations inside the buildings compare to background [normal] concentration levels of contamination and other screening levels that have been used in the risk assessment process.

	Description/Source	Concentration in Parts per million or % volume in air
Background concentrations of methane in air	There are both natural and man-made sources of methane. As an example, wetland areas produce significant quantities of methane gas through natural decomposition of plant and animal materials. Agricultural and energy production practices contribute significantly towards man-made global emissions. It is a major part of natural gas, and therefore methane is used for cooking and heating. In industry, methane is used to refine petrochemicals and it is used in power stations to drive turbines to create electricity. Methane released into soil or water will eventually escape into the air where it will break down slowly in the atmosphere. Because methane is present naturally in the atmosphere, the general public are generally exposed to very low levels when breathing in air. This is known as a background concentration. Annual global emissions (from natural and man-made sources) of methane are estimated to be 598 million tonnes per year. Source: Environmental Change Institute: www.eci.ox.ac.uk/research/energy/downloads/methaneuk/chapter02.pdf (accessed 01/11/2016) In 2010 background concentrations were around 1.8 parts per million. Global emissions of methane have been rising significantly of the past 200 years or so. Source: Europa: http://www.eea.europa.eu/data-and-maps/figures/atmospheric-concentration-of-ch4-ppb-1 (accessed 01/11/16)	1.8 parts per million (ppm) or 0.00018 % by volume in air of methane in 2010
Background concentrations of methane in water	It has been estimated that UK water supply groundwater sources contribute 0.05 per cent to total UK methane emissions. Methane is almost insoluble in water. Measurements of waters used for drinking in the underlying rocks show methane concentrations of up to 500 micrograms per litre (µg l^{-1}) but a mean (average) value of less than 10 µg l^{-1}. For potable drinking water to become flammable a minimum dissolved methane concentration of 1600 µg l^{-1} would be required.SOURCE: National Baseline Methane Survey British Geological Society http://www.bgs.ac.uk/research/groundwater/quality/methane_groundwater.html#base (accessed 01/11/2016)	10 micrograms per litre

UK screening values for landfill gas	There are no UK screening values for landfill gas which can be used to define Contaminated Land; however Waste Management Paper 27 by the Department of the Environment (now replaced by newer Environment Agency technical guidance) provides a screening value at which it is recommended that ventilation and evacuation of a building takes place. It advises that ventilation and evacuation should take place when methane concentrations in enclosed spaces (buildings) reach 1% by volume in air. Methane becomes explosive at 5% by volume in air (50,000 ppm). Therefore it can be seen that this screening value provides a safety factor.	1% by volume in air (10,000 ppm)
Category 4 Screening Level	There are no UK Category 4 screening levels to describe when landfill gas concentrations do not meet the legal definition of Contaminated Land.	N/A
Lower Explosive Limit of Methane	Methane can become explosive/flammable in air when concentrations are greater than 5 % by volume in air. For an explosion to take place there also has to be enough oxygen in the air and the presence of a source of ignition (a spark).	5% by volume in air (50,000 ppm)
Upper Explosive Limit of Methane	Methane is no longer explosive/flammable when its concentration in air is greater than 15% (by volume in air). When the carbon dioxide concentration in air reaches 25%, methane is not flammable/explosive.	15% by volume in air (150,000 ppm)
Workplace Exposure Limit	EH40/2005 produced by the Health and Safety Executive provides workplace exposure limits for use in The Control of Substances Hazardous to Health Regulations 2002. None is provided for methane.	N/A
Drinking Water Quality Guidelines	None	N/A
Air Quality Guidelines	None	N/A
Health Criteria Guidelines	None	N/A
Short Term (Acute exposure) Guidelines	None	N/A
Emergency Response Planning Guidelines	None	N/A

Authoritative Reported Effect Levels	These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values. Levels of methane above 80% by volume may cause asphyxiation. Source: Public Health England https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/469410/Methane_IM_PHE_191015.pdf (accessed 01/11/2016)	80% by volume of methane (800,000 parts per million)
Measured Maximum (Peak) Readings 2013 to date at 31-33 Midland Road.	**Measured internal air monitoring results are presented on graphs in Appendix D. They show the measured concentrations in relation to the Category 1 and 2 Screening Levels being used to assess the level of risk and at which a Significant Possibility of Significant Harm is considered to exist. These are based upon the screening value from Waste Management Paper 27 described above.**	**10,000 ppm (1% by volume in air) which is defined as Category 1**

8 Possible Effects of Exposure to Methane

Human Health

It is extremely flammable in air (in the presence of oxygen and with a source of ignition). It reacts violently with various substances including halogenated compounds (fluorine, chlorine, bromine, iodine and astatine), hydrogen and oxygen. An explosive event may lead to death or serious injury.

Methane is mainly hazardous to health via the route of inhalation (breathing). High levels of methane can remove oxygen in the air, which can lead to suffocation. Breathing high levels of the gas can also result in euphoria, agitation, slurred speech, nausea, vomiting, flushing and headache. In severe cases breathing and heart complications, coma and death may occur. In severe cases respiratory depression, hypotension, myocardial infarction, cardiac dysrhythmias, seizures, coma and death may occur.

Source: Health Protection Agency
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/318336/hpa_Methane__General_Information_v1.pdf (accessed 01/11/2016)

Property

A theoretical risk exists for structural failure, substantial damage or substantial interference with the right of occupation following an explosive event associated with landfill gas accumulation inside the building at 31-33 Midland Road.

Controlled Waters

None

Ecological Systems

None

9 Likelihood that the effects described in section 8 above may occur

The evidence underpinning the likelihood of death or injury occurring as a result of an explosive incident at 31-33 Midland Road is considered to be moderate to high and is dependent upon the following main environmental factors:

Weather conditions (e.g. barometric pressure, temperature, moisture),

The design and use of the building (e.g. air changes, level of ventilation, and maintenance of the floor slab and service entries).

Human activities which either allow increasing levels of landfill gas accumulation (e.g. holiday periods, shutdowns), or activities which provide a spark ignition (e.g. smoking, hot work activities such as welding).

As the weather pressure falls (low pressure), landfill gas can move out of the ground more easily. This can lead to increasing concentrations of landfill gas building up inside enclosed spaces (buildings). Rapid or extreme drops in pressure will increase this effect. We know that the climate is changing and weather records (including low pressure events often associated with storms) are being exceeded all the time. There is considered to be a moderate to high probability of adverse climatic conditions arising in the future on a more frequent basis based upon the global scientific community view associated with climate change. This has the potential to increase the level landfill gas ingress to the building.

The building is leased to, and occupied by, an engineering and welding company and it has no landfill gas protection measures in place as part of the building design. The risks can be reduced by adequate ventilation of the building including the opening of roller shutter doors and windows. This is not a reliable long term solution for the building as there is no guarantee that day to day management of the site will ensure that windows and door remain open. Cold and windy weather conditions will increase the likelihood of doors and windows being closed. It is considered that there is a moderate to high probability that the building will not provide adequate ventilation of the landfill gas in the long term.

The nature of the business is such that it does not operate on a 24 hour 7 days a week basis. The building is therefore closed overnight, at weekends and during periods of shutdown (e.g. Christmas and Bank Holidays). This provides an opportunity for levels of landfill gas to increase as adequate ventilation of the building will not take place. There is considered to be a high level of probability that landfill gas will be allowed to accumulate to unacceptable levels due to a lack of ventilation within the building.

The likelihood of a spark ignition being present is considered to be high due to the nature of the business and the possible uncontrolled human activity, such as smoking, taking place without the knowledge of management.

An uncontrolled explosion/flammable event which may result in death or injury is more likely to take place in circumstances where each aspect of the three elements described above coincides.

There might for example be a period of fast falling barometric pressure associated with a period of shutdown and the presence of a spark e.g. smoking whilst opening up the building or turning the lights on. There is considered to be a medium to high probability of this scenario presenting itself in the future and therefore there is strong evidence for the presence of a significant possibility of significant harm to human health occurring in the future. The consequence of the harm is considered to be acute (short term) and severe (death or serious injury).

Asphyxiation via inhalation (in excess of 80% by volume of methane in air) is a low risk and is not considered more likely than not to happen.

10 Timescales

Describe how long it may take for the risk to manifest itself:

Only a broad indication of the timescale is possible. It is expected that it is more likely than not that an explosive event might occur within the operational life of the business, however equally an explosive event might occur within a much shorter timescale.

11 Uncertainty

Uncertainty is a key part of all risk assessments including those of potentially contaminated land. It is used to express how confident we are about the results and assumptions that are being drawn, and to characterise information that is, by nature, never black and white. Areas that should be considered are:

1. Scientific uncertainty and,
2. The assumptions that lie behind predicting what might happen in the future.

What has the Local Authority done to minimise uncertainty?

Scientific uncertainty is considered to be **low**. The reasons for this view are set out below:

1. The potential for the underlying waste deposits to produce landfill gas has been robustly characterised as part of the initial ground investigation and is well understood.
2. The levels of landfill gas (methane) within the building have been assessed and characterised via a programme of internal air monitoring and are well understood.
3. The building construction (floor slab design) which allows the landfill gas ingress is well understood.
4. The explosive levels of methane are well documented and understood. There is good evidence to demonstrate that death and injury has in the past, both in the UK and globally, been associated with high levels of methane inside buildings. Often these events have been associated with unusual weather conditions (rapidly falling air pressure). An appropriate factor of safety based upon Waste Management Paper 27 has been used when assessing the risks posed by the landfill gas.
5. The uncertainty associated with assumptions that lie behind the predictions for the future (weather conditions, building design, and human activities) are considered to be medium to low based upon uncertainties that cannot be removed. These are discussed in more detail below.

In built uncertainties remain associated with:

1. The timing of extreme weather events associated with low and falling atmospheric pressure.
2. The timing of human activities that might produce a spark.
3. The timing of an event that would allow the accumulation of an explosive mixture of landfill gas in conjunction with a spark ignition.

12 Comparing the Risks

This section attempts to compare the risks associated with landfill gas at 31-33 Midland Road relative to other risks that humans might be expected to be exposed to in any case.

There is however very limited data available which will enable the comparison of the risks being presented at 31-33 Midland Road with other risks that have occurred in relation to landfill gas. Therefore other risks which are considered most relevant have been presented. These risks are both involuntary risks (people do not have a choice to avoid) and voluntary risks (those that people choose to subject themselves to).

Risk	Number of Deaths Per Year	Type of Risk
Deaths from gas explosions UK	**2 per year in 2013/2014** Source: Co-gas http://www.co-gassafety.co.uk/wp-content/uploads/2016/04/CO-GAS-SAFETY-STATISTICS-ON-DEATHS-AND-INJURIES.pdf (accessed 10/11/16)	Involuntary
Deaths from cancer UK	**163,444 in 2014** Source: Cancer Research UK http://www.cancerresearchuk.org/health-professional/cancer-statistics (accessed 10/11/16)	Involuntary
Deaths from Lung cancer UK	**35,895 in 2014** Source: Cancer Research UK http://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/lung-cancer (accessed 10/11/16)	Involuntary
Deaths from diseases of the respiratory system	**75,531 in 2015** (England and Wales) Source: Office for National Statistics www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationssummarytablesenglandandwalesreferencetables (accessed 10/11/16)	Involuntary
Deaths from asthma	**757 in 2015** (England and Wales) Source: Office for National Statistics www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationssummarytablesenglandandwalesreferencetables (accessed 10/11/16)	Involuntary
Deaths from land transport accidents	**1,645 in 2015** (England and Wales) Source: Office for National Statistics www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationssummarytablesenglandandwalesreferencetables (accessed 10/11/16)	Involuntary
Deaths from exposure to smoke, fire and flames	**209 in 2015** (England and Wales) Source: Office for National Statistics www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationssummarytablesenglandandwalesreferencetables (accessed 10/11/16)	Involuntary
Deaths from accidental poisoning by, and exposure to, noxious substances	**3,115 in 2015** (England and Wales) Source: Office for National Statistics www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationssummarytablesenglandandwalesreferencetables (accessed 10/11/16)	Involuntary

Deaths from air pollution UK	**Approximately 40,000** Source: Every breath we take: the lifelong impact of air pollution – Royal College of Physicians. Working party report. February 2016 (accessed 10/11/16)	Involuntary
Deaths from accidental carbon monoxide poisoning UK	**Approximately 30 per year** (2010-2014) Source: GOV.UK https://www.gov.uk/government/news/reduce-the-risk-of-carbon-monoxide-poisoning-over-winter (accessed 10/11/16)	Involuntary
Deaths from smoking UK	**96,000 in 2015** Source: ASH. Action on smoking and health http://ash.org.uk/category/information-and-resources/fact-sheets/ (accessed 10/11/16)	Voluntary
Fatal injuries in the workplace 2013/2014 UK	**0.4 per 100,000 employees** (2013/2014). Source: HSE http://www.hse.gov.uk/statistics/european/european-comparisons.pdf (accessed 10/11/16)	Involuntary
Deaths from Radon Gas	**1,110** [UK, Source: Gray et all (2009)] 1 in 58,000	Involuntary
Deaths from drug misuse in England and Wales in 2015	**2,479** Source:http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathsrelatedtodrugpoisoningenglandandwalesreferencetable (accessed 10/11/16)	Voluntary

13 How does the Responsible Persons Intend to manage the risks identified?

Describe likely works:

Works will be carried out to the building that will block the pathway for landfill gas migration. This will take place via a detailed scheme of works which has been designed by the councils landfill gas experts. Briefly it involves raking out of floor slab joints and re-sealing with a suitable gas resistant compound. The works will be independently overseen in order to ensure that they are durable and robust.

How long will the works take?

2 weeks

Net Benefits

The repairs to the floor slab and service entries will reduce the level of anxiety upon occupants of the building, due to removal of the level of uncertainty associated with the timing of an explosive event.

The operational burdens upon the occupants will be removed, as currently operational practices are restricted due to spark ignition risks.

The financial burden upon the occupants will be reduced as currently an excess is required to be paid on their buildings insurance to cover the risks posed by the landfill gas ingress.

The level of blight associated with renting and occupation of the property will be removed.

Effects on local people and/or businesses:

The repairs to the floor slab will reduce the level of risk and anxiety associated with a potential explosive event as the blast zone has the potential to impact upon neighbouring businesses.

Describe how it will affect the risks posed by the land:

It is not possible to remove the source of the landfill gas (waste), however the repairs to the floor slab will ensure that the pathway between the source of the landfill gas and the receptor is interrupted and broken. The overall success of the repair work will be determined by:

- Verifying the standard of workmanship;
- Assessing overall compliance with the design specification for the remediation works;
- Measuring the concentration of methane at all locations where internal monitoring using a Flame Ionisation Detection (FID) is currently being undertaken. The remediation methods used should reduce the measured concentration of methane (that is coming from the ground) within the building to a gas concentration of less than 10 parts per million (ppm) at any point. Note that due consideration should be taken of background sources of methane and any interference this causes in the FID results.

14 Further Contact

If you require further clarification or explanation on the contents of the Risk Summary please contact Liz Hamer by:

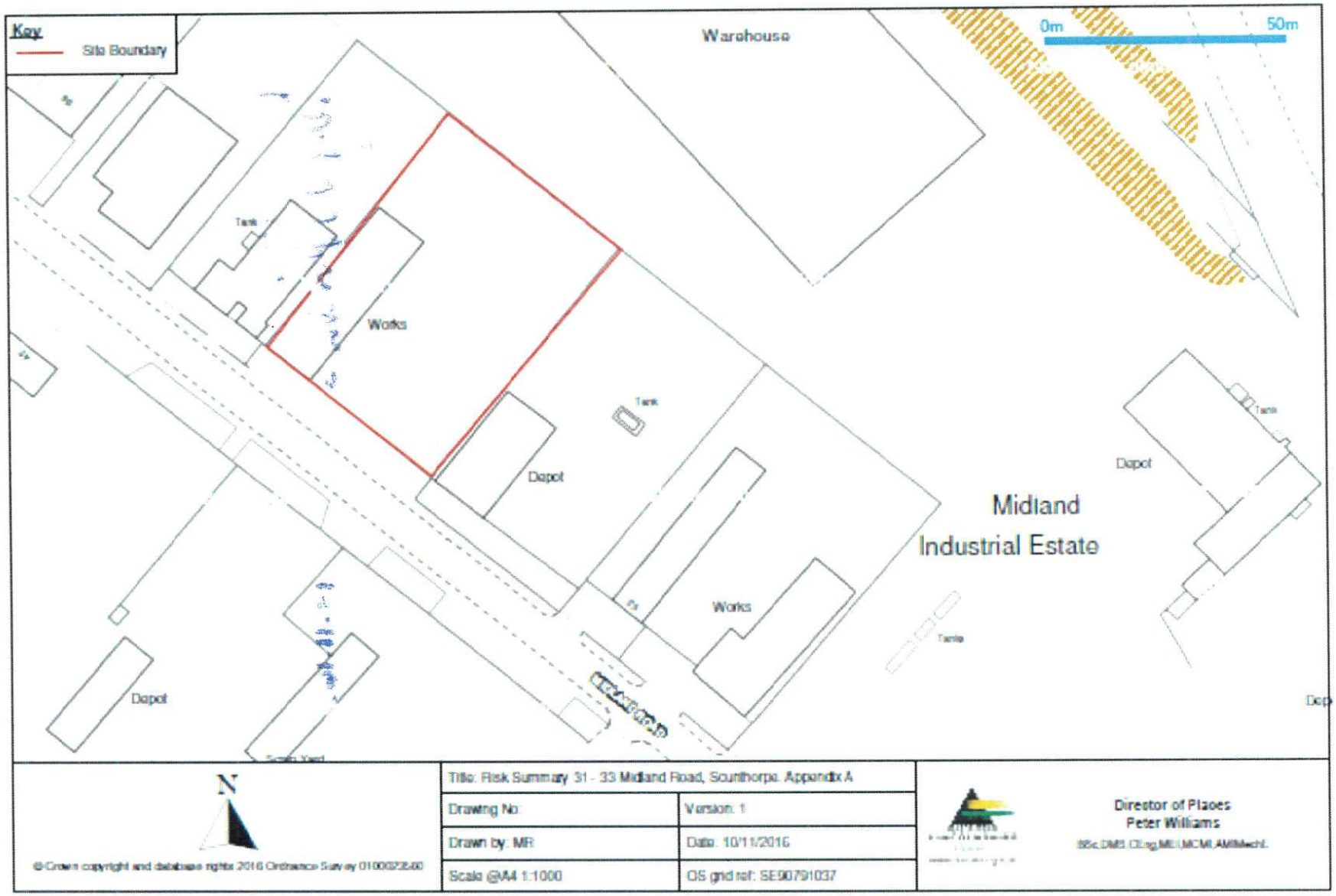
Email: environmental.health@northlincs.gov.uk

15 Authorisation

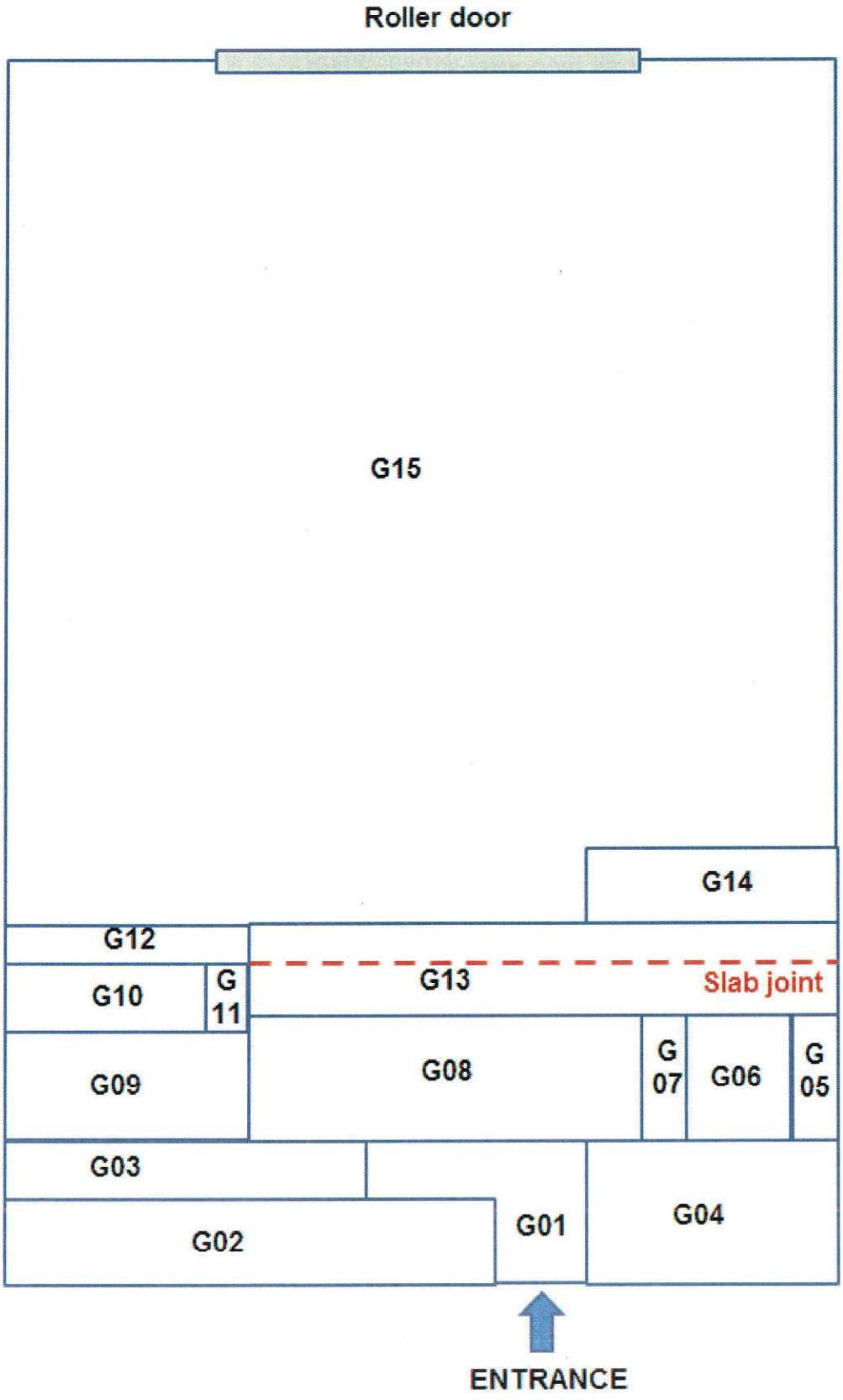
Signed… [redacted] … Dated 18.11.16.

Peter Williams, Director of Places
Civic Centre
Ashby Road
SCUNTHORPE
North Lincolnshire
DN16 1AB

Appendix A – Site boundary of 31-33 Midland Road

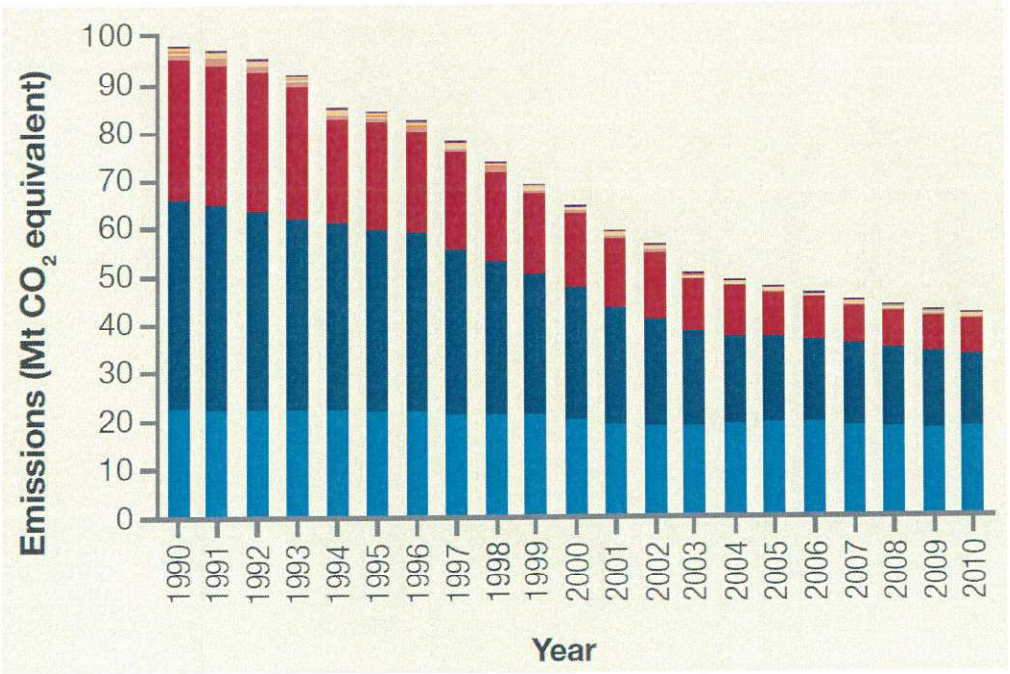


Appendix B- Building plan showing the sampling locations



Appendix C – Graphical representation of Methane emissions and concentrations.

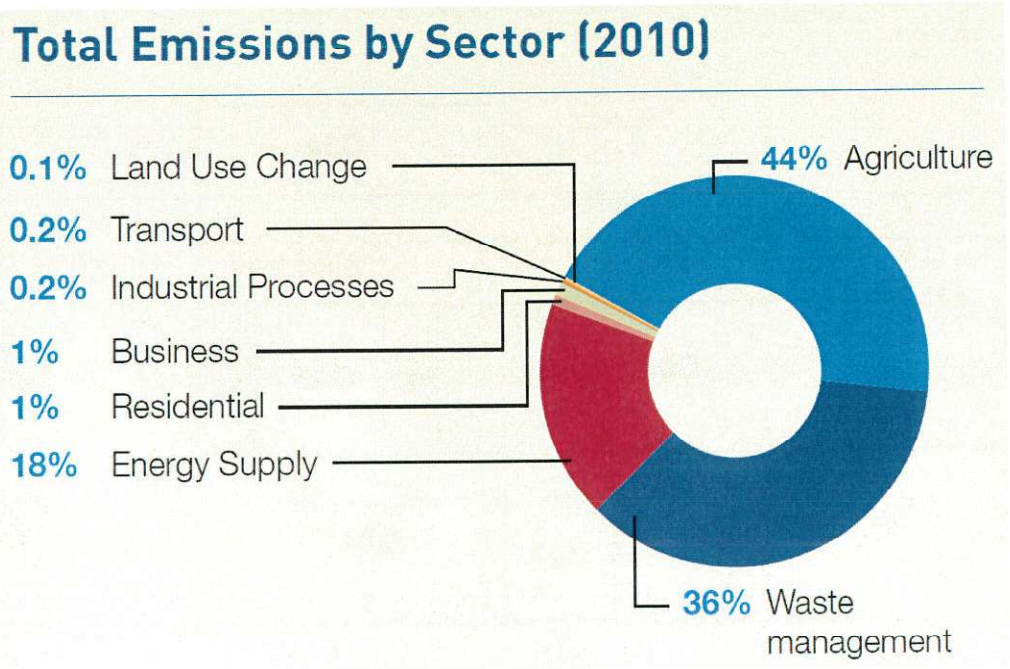
Figure C1: UK Methane Emissions by source (1990- 2010)



Source: UK GHG Inventory (UNFCCC coverage) (AEA, 2012)

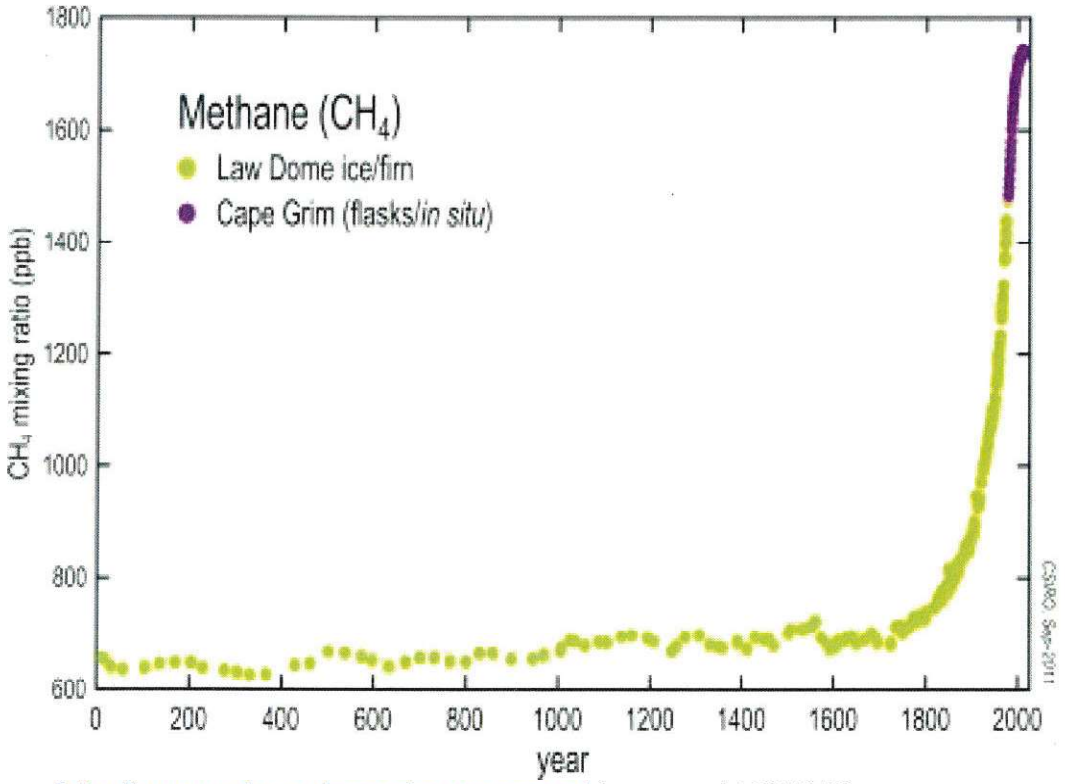
Note: Categories used as based on source emissions not end-user.

Figure C2: Total Methane Emissions by Sector (2010)



Source: AEA. Methane. GHG Inventory Summary Factsheet.

Figure C3- Methane Concentrations from the Year 0 until the Year 2000 showing that since industrialisation, methane concentrations have increased by more than 150 per cent to present day values (~1790 ppb in 2009).



Source: http://www.csiro.au/greenhouse-gases/ (accessed 10/11/16)

Appendix D - Internal Air Monitoring Results

Graphical representation of the data.

The following key is useful for giving a context to the data. Coloured horizontal lines have been added onto the graphs, where appropriate, at the lower limit for the screening levels shown below.

Key

Screening levels for landfill gas.

Serious – Above 10,000 ppm. 20% lower explosive limit (LEL). Immediate intervention required.

Category 1 – 5000 – 10000ppm. 10%-20% lower explosive limit (LEL). Evidence to suggest the presence of Significant possibility of significant harm to human health (SPOSH). There is considered to be an unacceptably high probability of death, disease or serious injury occurring if no action is taken to stop it.

Category 2 – 500- 5000ppm. 1-10% lower explosive limit (LEL). Evidence to suggest that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm SPOSH)

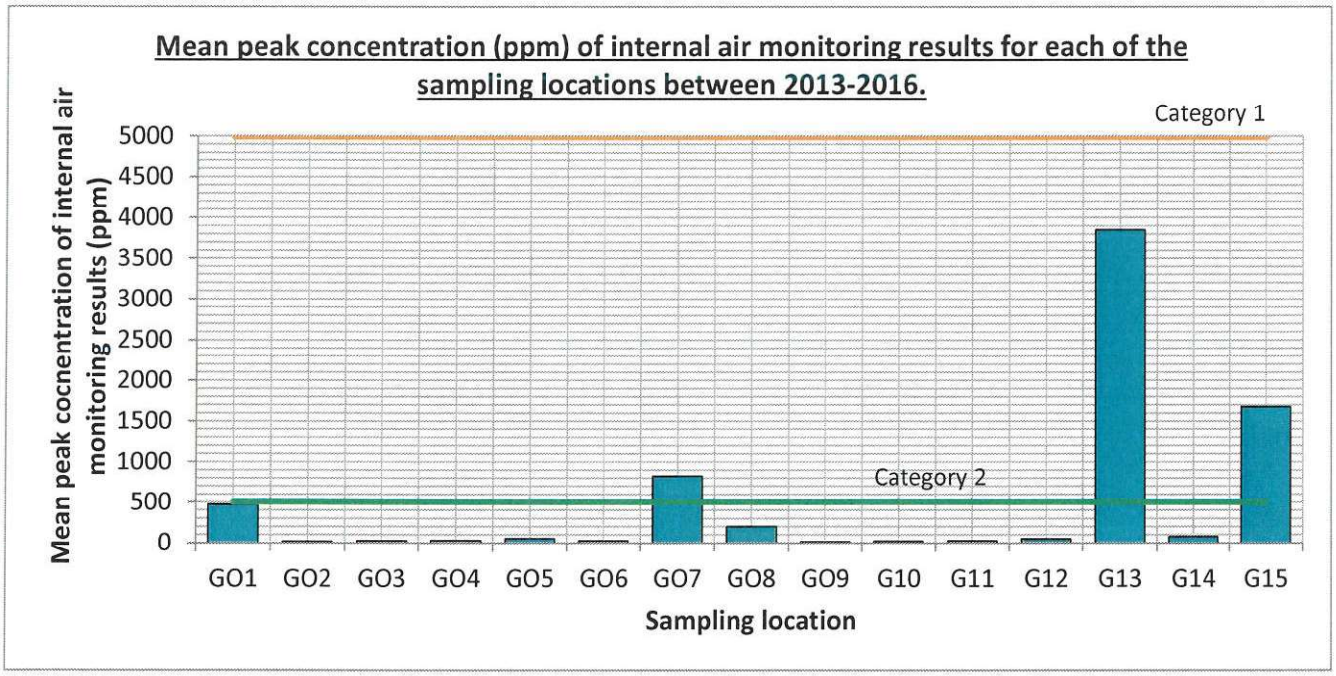


Figure D1 –The mean peak concentration of landfill gas measured at each sampling location. The mean peak concentration calculated from the peak concentrations from 15 readings taken periodically between March 2013 and October 2016. The graph clearly shows that locations G07, G13 and G15 exceed the lower limit for category 2 screening levels and G01 meets this level.

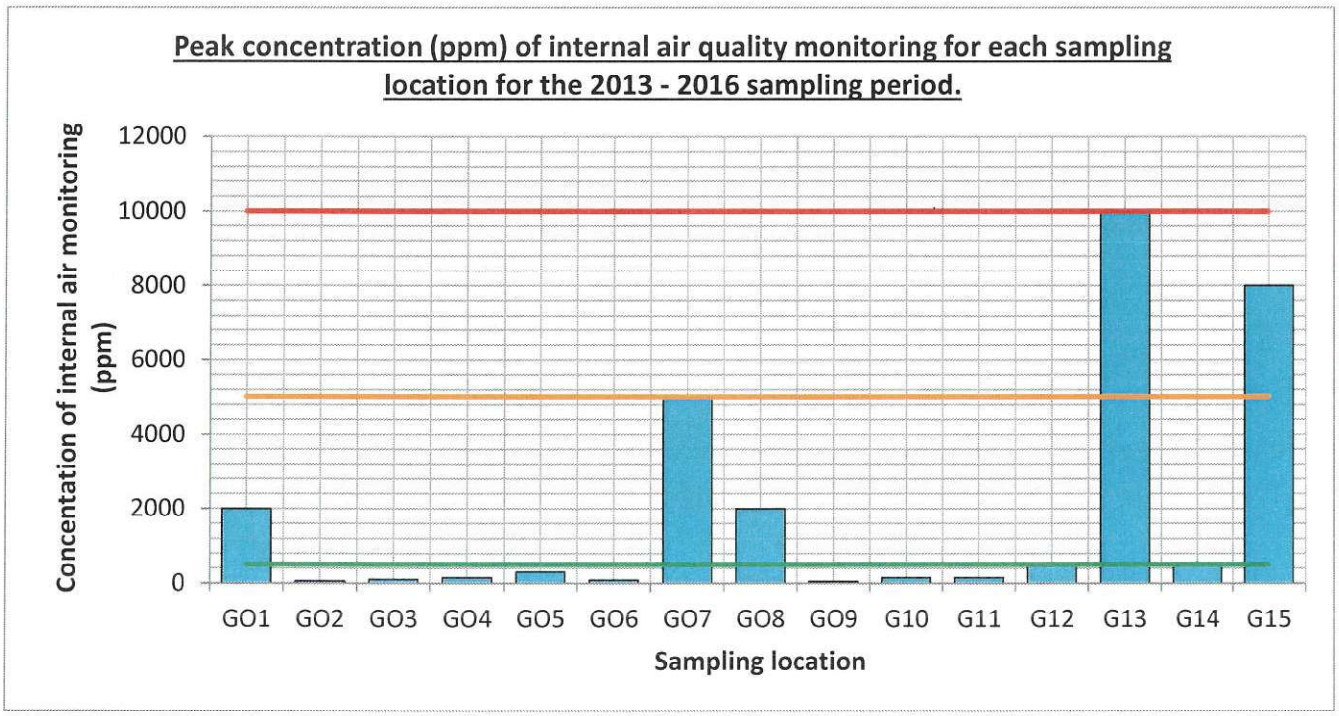


Figure D2 – The peak concentration of the landfill gas measured at each sampling location. The peak concentration for each location was identified from the peak concentrations from 15 readings taken periodically between March 2013 and October 2016. The graph clearly shows that the concentration of landfill gas at location G13 has reached the lower limit for the 'serious' screening level.

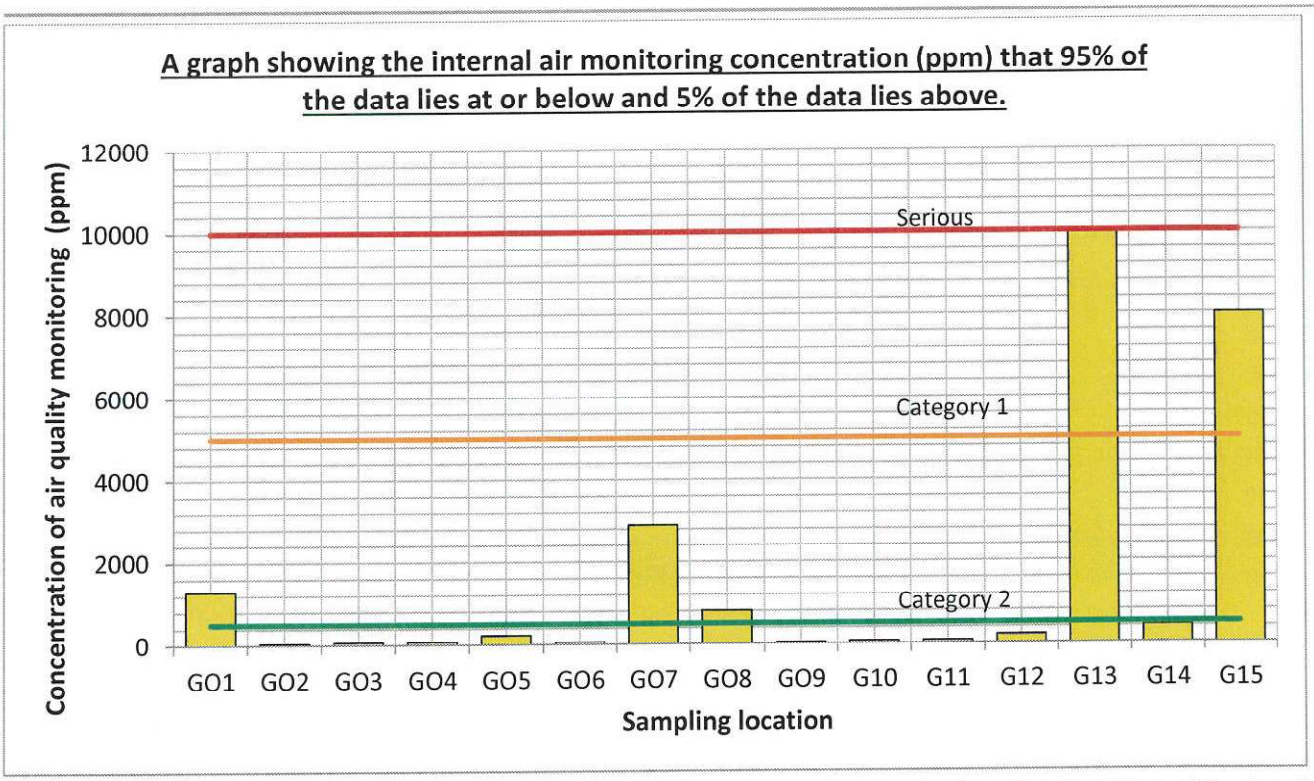


Figure D3 – The 95th percentile. The concentration of landfill gas at each sampling location that 95% of the data lies at or below and conversely 5% of the data lies above. The graph clearly shows that the concentration of landfill gas at location G13 has reached the lower limit for the 'serious' screening level even at the 95th percentile.

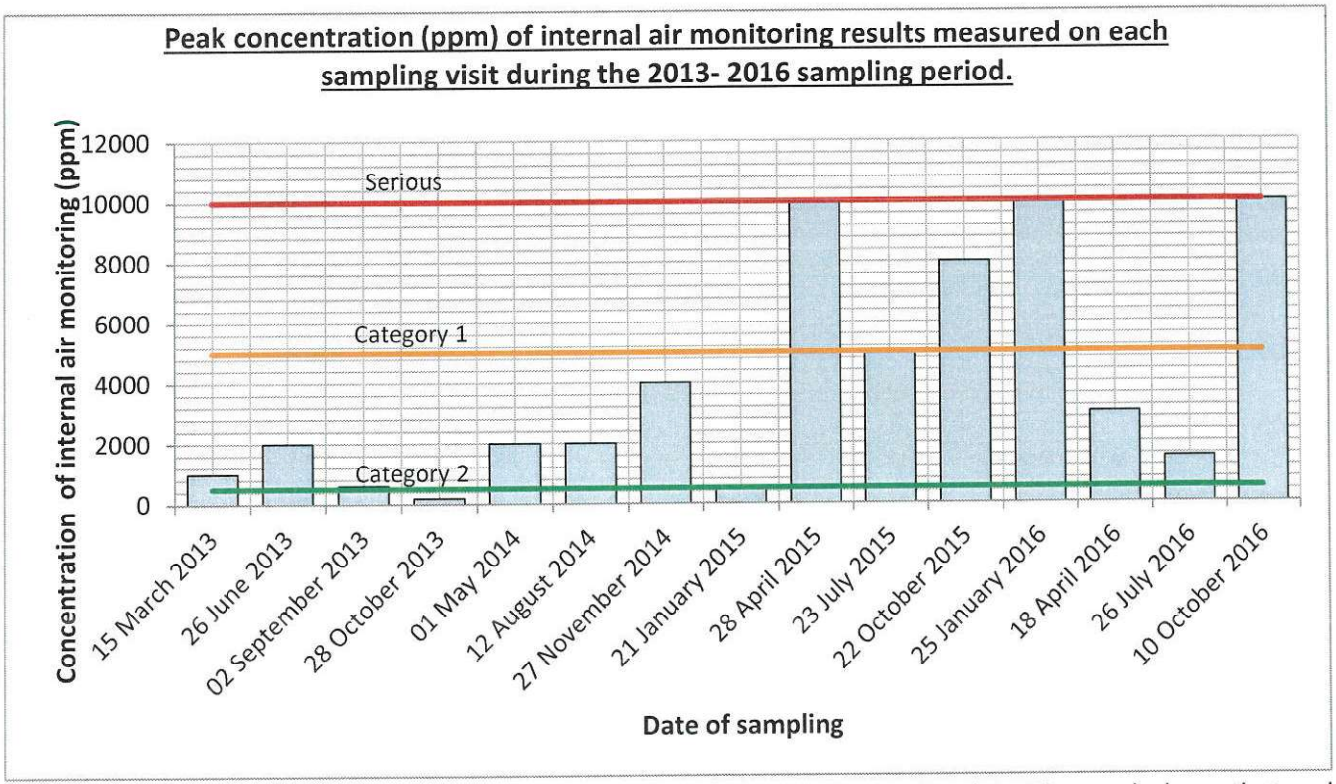


Figure D4 – The peak concentration of landfill gas recorded on each sampling date. The graph shows that peak concentrations within 31-33 Midland Road reached lower limit for the 'serious' screening values on three of the fifteen sampling occasions.

The graphs below represent the sampling locations where the peak concentrations of landfill gas meet or exceed one or more of the lower limits for the Category 2, Category 1 or Serious screening levels. These graphs have 5% error bars to show the variability of the data.

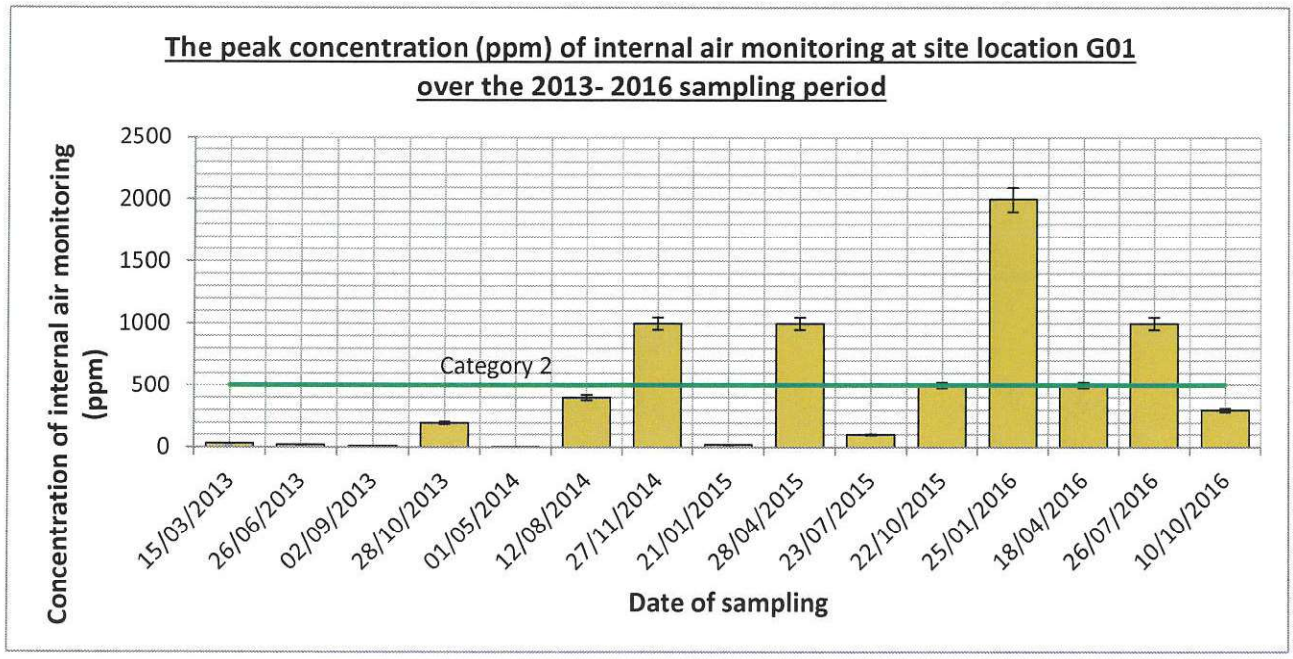


Figure D5 – The graph above shows that on six of the fifteen sampling occasions, the peak concentration of landfill gas met or exceeded the lower limit of the Category 2 screening level at site G01.

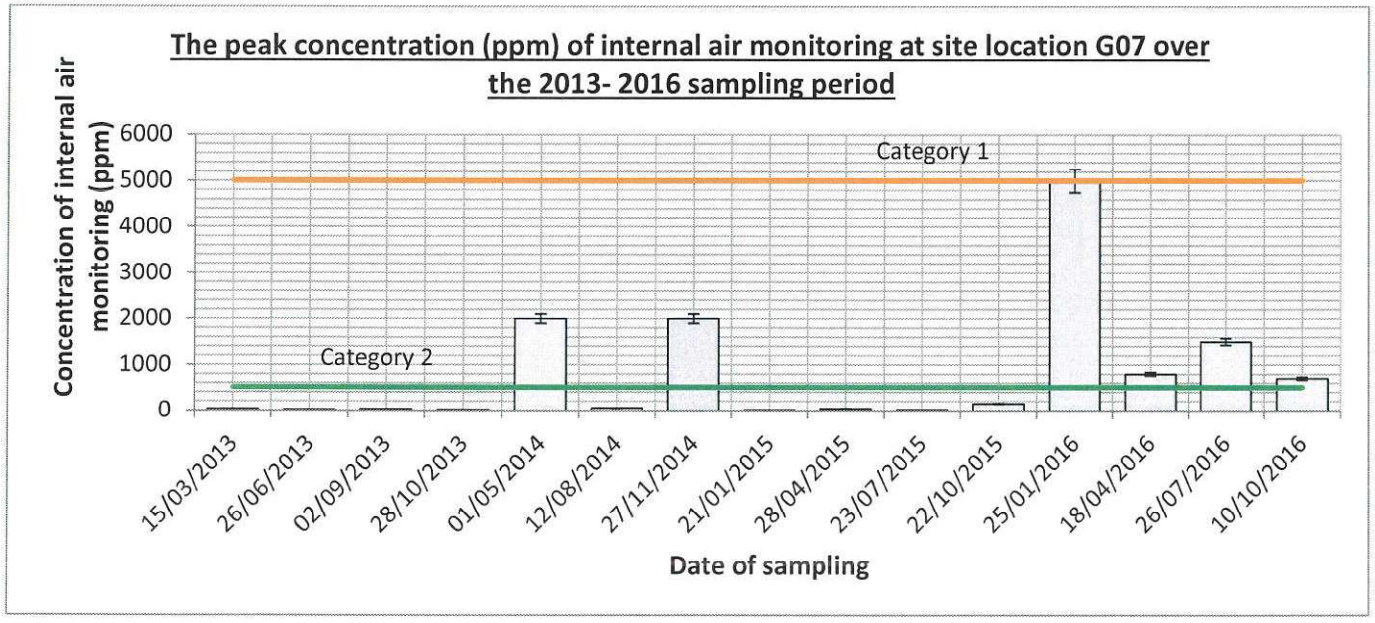


Figure D6 – The graph above shows that on six of the fifteen sampling occasions, the peak concentration of landfill gas met or exceeded the lower limit of the Category 2 screening level at site G07. On one sampling occasion the peak concentration of landfill gas met the lower threshold of the Category 1 screening level.

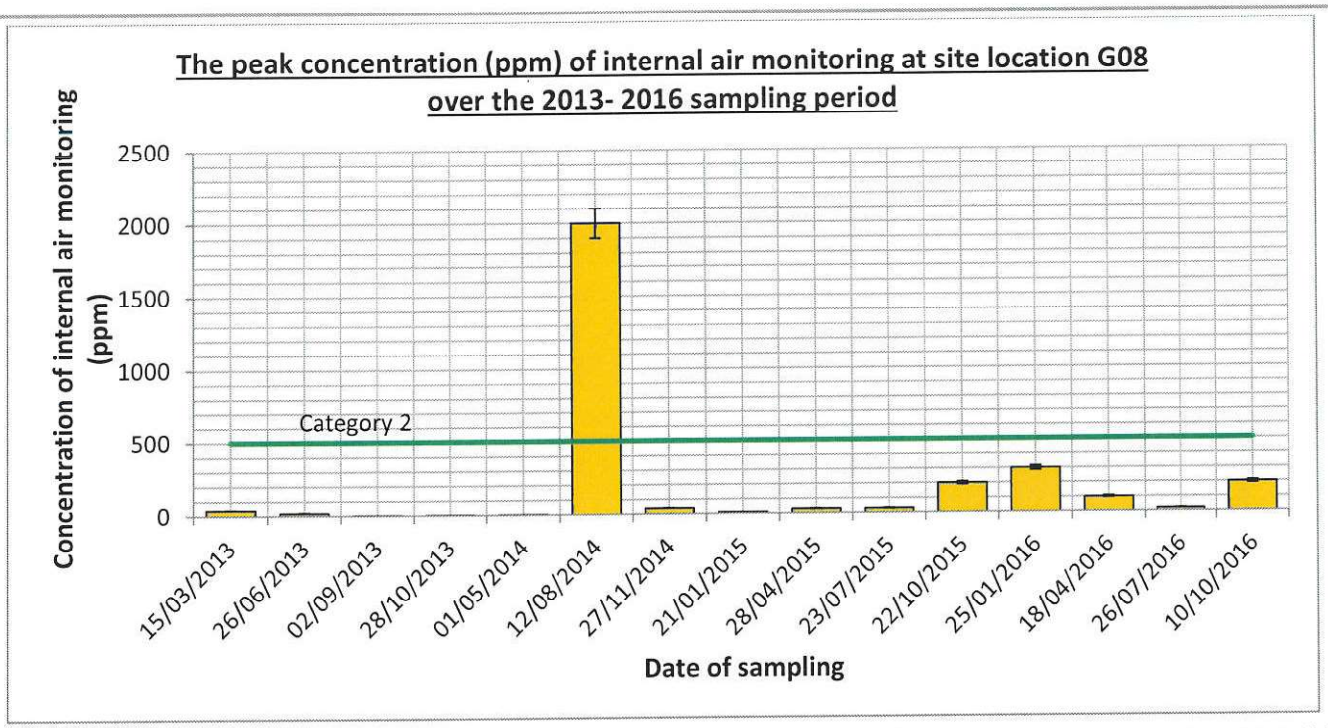


Figure D7 – The graph above shows that on one of the fifteen sampling occasions, the peak concentration of landfill gas exceeded the lower limit of the Category 2 screening level at site G08.

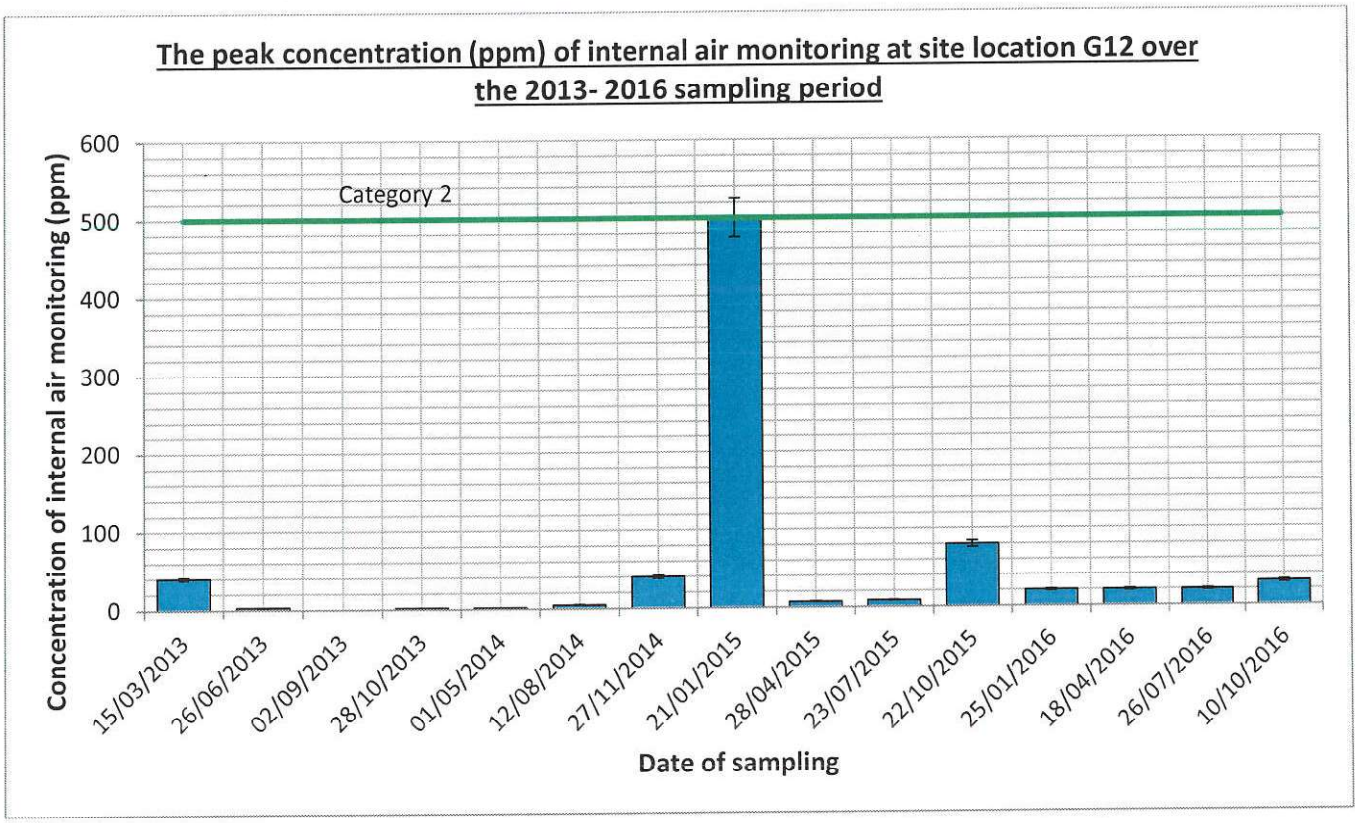


Figure D8 – The graph above shows that on one of the fifteen sampling occasions, the peak concentration of landfill gas met the lower limit of the Category 2 screening level at site G12.

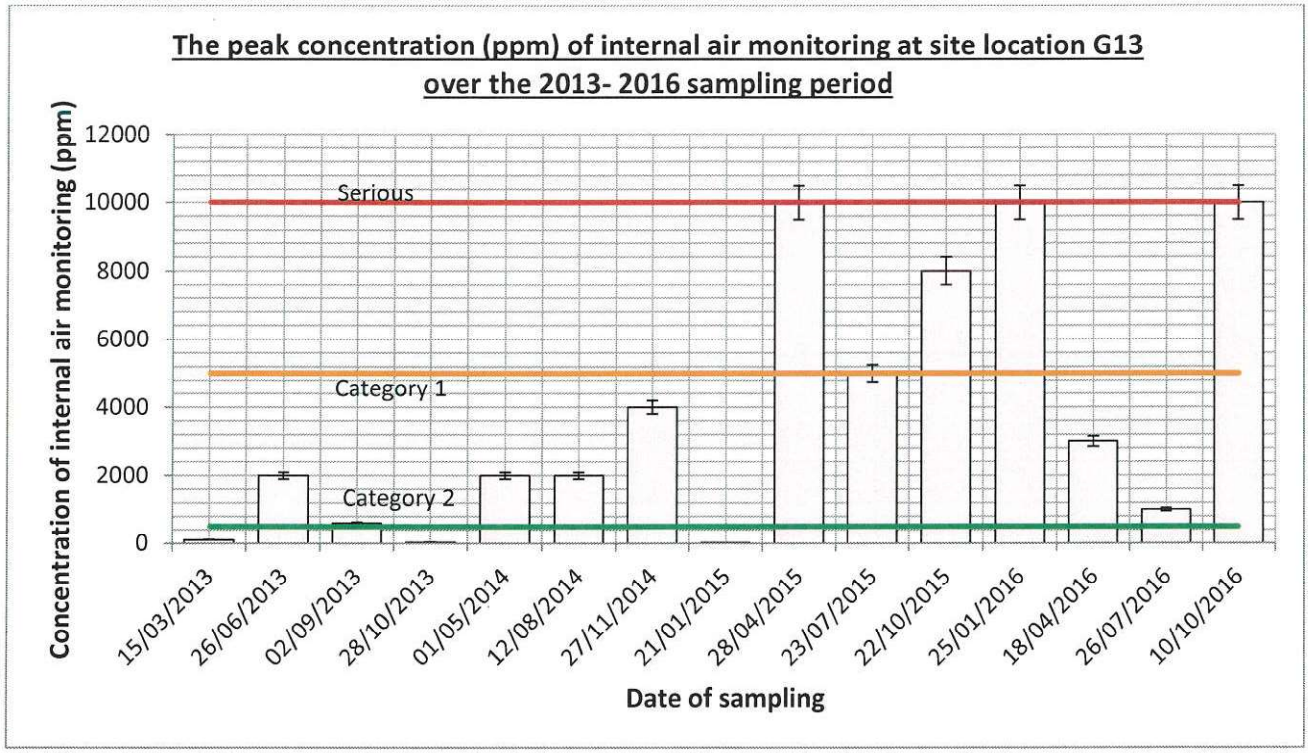


Figure D9 – The graph above shows that on three of the fifteen sampling occasions, the peak concentration of landfill gas met the lower limit of the 'serious' screening level at site G13.

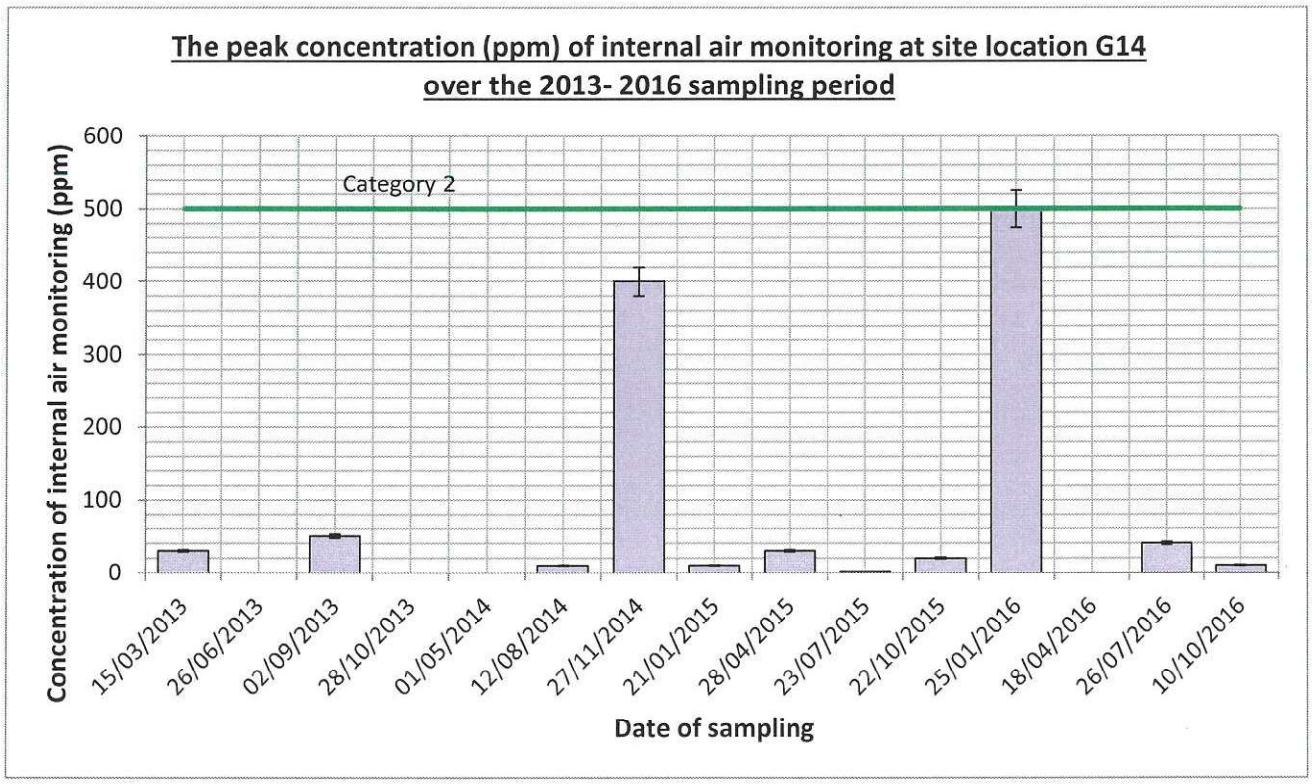


Figure D10 – The graph above shows that on one of the fifteen sampling occasions, the peak concentration of landfill gas met the lower limit of the Category 2 screening level at site G13.

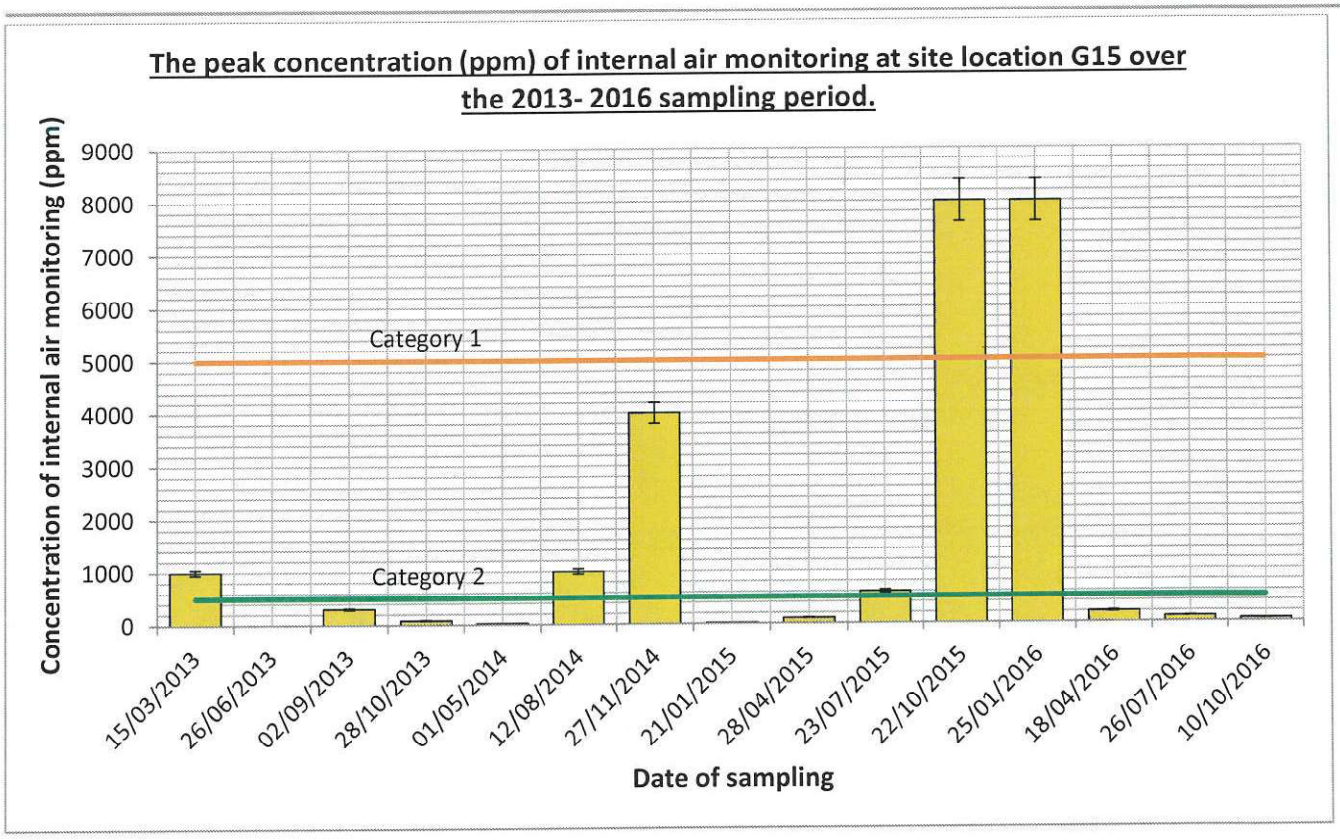
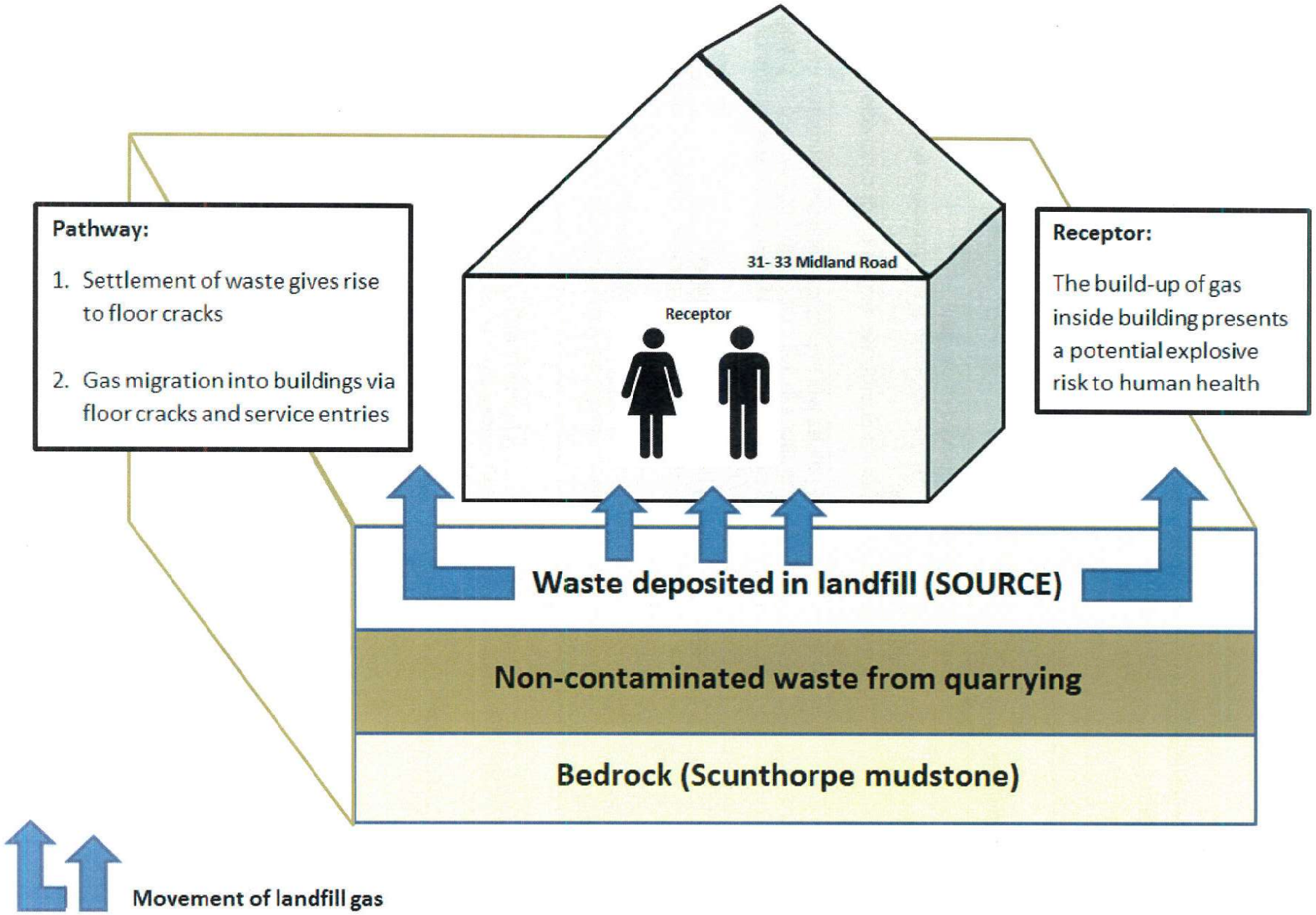


Figure D11 – The graph above shows that on two of the fifteen sampling occasions, the peak concentration of landfill gas exceeded the lower limit of the Category 1 screening level at site G15.

Appendix E – Conceptual Site Model for 31-33 Midland Road.



Glossary of terms.

Word or phrase	Definition
% volume in air	For example the % volume in air of carbon dioxide is 0.04%. This means in 100 litres of air, 0.04 litres of the air is carbon dioxide.
Accumulate	To build up or increase in number
Adverse	Harmful; unfavourable
Air quality guidelines	Guidance on thresholds and limits for key air pollutants that pose health risks.
Asphyxiation	Suffocation; being deprived of oxygen
Barometric pressure	Also known as Atmospheric pressure. It is pressure exerted by the earth's atmosphere.
Blast zone	A region or area where a destructive explosion or detonation has or may occur
Category 4 screening level	They are screening values which provide cautious estimates of contaminant concentrations in soil that are still considered to present an acceptable level of risk, within the context of the Environmental Protection Act 1990 Part 2A
Decomposition	Decaying; breaking down of organic matter
Drinking water quality	The condition of the water, including chemical, physical, and biological characteristics
Emergency response planning guidelines	Guidelines for responding to emergency situations which may include in certain circumstances involve potential releases of airborne substances
Euphoria	Intense happiness
Health criteria guidelines	Guidelines for protecting human health (obtained from toxicity data for the purposes of safeguarding human health)
Ingress	To enter
Lower Explosive Limit of methane	The minimum concentration of methane necessary for its combustion in air (5% by volume in air).
Mean	An average calculated from adding up the numbers and dividing this by the amount of numbers.
Microgram	One millionth of a gram
Parts per million	A way of expressing very dilute concentrations of substances. Just as per cent means out of a hundred, parts per million means out of a million.
Pathway	A route for the landfill gas to travel from a source of contamination to a receptor
Potable	Drinking water
Receptor	The environment and/or humans receiving exposure to a chemical from a particular source (in this case landfill gas).
Remediation	Reversing the damage

Short term (acute) exposure guidelines	These describe the sudden and rapid effects on human health from chemical exposure.
Significant Contaminant Linkage	A contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land
Toxic	Poisonous
Unfavourably	Likely to lead to a poor outcome
Upper Explosive Limit of methane	The maximum concentration of methane that will burn in air (15% by volume in air)
Workplace exposure limit	An upper limit on the acceptable concentration of a hazardous substance in workplace air