



Odour Management Plan

KERDIFFSTOWN LANDFILL REMEDIATION PROJECT



rps



Revision and Amendment Status Sheet

Original Issue Date:	11/11/2020
Tender Submission	

Further revisions since original issue date.

Page Number	Date of Amendment	Details of Amendment	Authorised by	Revision No.
4, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 19	18/12/2020	Revisions made based on ER and KCC comments	JS/KD	01
4, 5, 6, 13, 14, 16, 17, 18, 20, 23	02/02/2021	Revisions made based on ER comments	JS/KD	02
6, 12, 13, 17, 18, 20, Appendix C	04/11/2021	Updated to include change of staff on site and updates to current site conditions	J.S.	03

Contents

1.0 INTRODUCTION	4
1.1 Objectives.....	4
1.2 Project Overview	4
1.3 Contract Overview.....	4
1.4 Document Review	5
2.0 CONTACT DETAILS	6
3.0 LIMITING CRITERIA	7
3.1 Minimisation Requirements.....	7
3.2 Effects of Hydrogen Sulphide (H ₂ S)	7
4.0 ODOUR AND EMISSIONS SOURCES	9
4.1 Hydrogen Sulphide (H ₂ S) Gas	10
4.2 Trace gas Analysis.....	11
4.3 Risk assessment of Odour Emissions during foreseeable Site Phases	11
5.0 MANAGEMENT MEASURES	12
5.1 Introduction.....	12
5.2 Induction – Training and Awareness	12
5.3 Working Hours	12
5.4 Internal Reviews.....	13
5.5 Communication	13
6.0 ODOUR MANAGEMENT	14
6.1 High Risk Areas	14
6.2 Proposed Odour Mitigation Measure – Secondary Option	15
6.2.1 Odour Neutraliser.....	15
6.3 What happens if there is an odour issue during the works	16
7.0 PHASING OF WORKS	17
7.1 Bulk Earthworks	17
7.2 Drainage/ Services.....	17
7.3 Daily Conditions.....	17
7.4 Procedures During Works	17
7.5 Gas Management Infrastructure.....	18
7.6 Landfill Infrastructural Compound	18
7.7 Review of Measures	18
8.0 MONITORING, REPORTING AND RECORDING.....	19
8.1 Monitoring of Gases and Odours	19

**Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan**

November - 2021

8.2 Gas Detectors	20
8.3 Field Test Monitoring/ Odour Patrols	20
8.4 Odour Reporting and Recording	21
9.0 COMPLAINTS	22
9.1 Emergency/incident response planning.....	22
9.2 Site procedures for dealing with Odour Complaints.....	22
9.3 Lessons Learnt	23
10.0 RECORDS	23
11.0 REFERENCES	23

APPENDIX A – CONSTRUCTION ODOUR AND DUST MANAGEMENT INDICATION

APPENDIX B – MSDS AND TDS SHEET FOR PROPOSED ODOUR NEUTRALISER

APPENDIX C – EXAMPLE OF DAILY ODOUR REPORT SHEET

APPENDIX D – ODOUR COMPLAINT LOG

APPENDIX E – ODOUR MONITORING LOCATIONS

1.0 INTRODUCTION

This Odour Management Plan has been prepared by Wills Bros Limited to describe measures be taken to ensure that the activities will be carried out in a manner such that odours do not result in significant impairment of, or significant interference with amenities or the environment beyond the facility boundary.

Accordingly, Wills Bros Ltd will carefully plan works so as to minimise and mitigate any odour problems including limiting the amount of time that waste is left exposed and using appropriate measures. A trialling method will be initially carried out by WBL during the first phase of earthworks to determine the ground profile and give an indication of potential odours that could be encountered. Mitigation measures will be implemented following the trial holes exercise.

The Odour Management Plan will be revised as required to confirm/update the details of construction provided within the document.

1.1 Objectives

The objectives of this Odour Management Plan are:

- To comply with construction standards for odour control.
- To minimise odour emissions during the construction phase.
- Apply best practice odour management measures.
- Prevent complaints from sensitive receivers.

The management plan will be subject to approval by the Employer's Representative

1.2 Project Overview

The Project involves the remediation of the Kerdiffstown Landfill site and development of the site as a multi-use public park. This is to be achieved by clearing and reprofiling the existing site, installing an engineered capping system, improving the management of landfill gas, leachate and surface water and the provision of landscaped and recreational areas. The site is approximately 30 hectares in size and is located at Kerdiffstown, Naas, Co. Kildare.

1.3 Contract Overview

The Contract Overview (Scope of Work) for the Kerdiffstown Landfill Remediation Project includes the following:

- Reprofilng of waste mounds to ensure the capping system works effectively and to facilitate the use of the site as a public park;
- Preparation and placing of a regulation layer in areas to be capped
- Installation of a permanent capping system across all existing waste areas to prevent rainfall infiltration, to manage surface water runoff, to reduce the production of leachate and to capture landfill gas;
- Installation of new systems to manage and control leachate and landfill gas which will include the construction of a dedicated landfill infrastructure compound and landfill gas flares (where extracted landfill gas is burned off);
- Construction of a leachate pipeline from the site, which will cross under the Morell river and N7 into Johnstown Pumping Station;
- Construction of a foul/wastewater pipeline connecting the site with Johnstown Pumping Station. This pipeline will run parallel to the leachate pipeline and will carry foul/wastewater from the site office and changing room building;
- Installation of surface water drainage to manage water on, and draining from, the site including surface water ponds and a surface water outfall point to the Morell River;
- Decommissioning of existing services, in particular an underground storage tank approximately 20m³ in capacity. There are also a large number of concrete structures (walls of former buildings) to be demolished;
- Processing of demolished concrete and other waste materials on site to produce engineering grade materials for re use on site;
- Development of a public park with multi-use sports pitches, car parking, a changing room building, children’s playground and a network of paths across the site;
- Landscaping works across the site including grass seeding, planting of trees and shrubs, and ongoing maintenance period of the works.

1.4 Document Review

The Odour Management Plan will be regularly reviewed during the lifetime of this project and updated to reflect changing conditions on site. Changes will be made subject to review and monitoring of conditions on site, and the effectiveness of the mitigation measures implemented throughout the works. Any changes will be agreed with KCC and ER in advance through the normal communication channels.

2.0 CONTACT DETAILS

Wills Bros Limited site management team will be responsible for ensuring that this Odour Management Plan is correctly implemented on site.

Contact details for Wills Bros Limited and Kildare County Council are provided below.

Contractor: Wills Bros Limited			
Address	Wills Bros Limited Ballylahan Bridge Foxford Co. Mayo		
Telephone	094-9256221		
Contact	██████████ Project Manager	Mobile e-mail	██████████ ████████████████████
	██████████ EHS Manager	Mobile e-mail	██████████ ████████████████████
	██████████ EHS Officer	Mobile e-mail	██████████ ████████████████████

Client: Kildare County Council			
Address	Áras Chill Dara, Devoy Park, Naas, Co. Kildare, W9 X77F		
Contact	Ultan Downes KCC Senior Executive Scientist	Mobile e-mail	0879559494 udownes@kildarecoco.ie
	James Mulligan KCC Senior Executive Engineer	Mobile e-mail	0863841655 jmulligan@kildarecoco.ie

3.0 LIMITING CRITERIA

3.1 Minimisation Requirements

The following requirements (in accordance with 1.13 of Volume A1 – Works Requirements and EPA Industrial Emissions License) relating to dust and minimising air quality impacts during the Works:

Excerpt of 1.13 Volume A1 – Works Requirements

Constraints imposed through working in areas where landfill gases (methane, carbon dioxide, hydrogen sulphide, carbon monoxide) may be present at concentrations which are harmful to human health or above explosive limits. There is a significant risk of exposure to H₂S gas during the works, in particular during excavation works and works being carried out in trenches. The Contractor's attention is drawn in particular to the zone of high concentration H₂S (hydrogen sulphide) gas as shown in Drawing DG0114.

Hydrogen sulphide (H₂S) is a poisonous, irritating, flammable, and colourless gas, with a characteristic rotten-egg-like odour detectable by humans at low concentrations and a sweet odour at higher concentrations. The explosive limit of H₂S in air ranges from 4.3 to 46% v/v. H₂S is highly toxic.

3.2 Effects of Hydrogen Sulphide (H₂S)

H₂S Concentration (ppm = parts per million)	Symptom/ Effect
> 20 ppm	Loss of smell
20 to 150 ppm	Irritation to eyes and respiratory tract
> 400 ppm	Toxic effects occur
> 700 ppm	Life threatening

The 8hr Occupational Exposure Limit (OEL) for hydrogen sulphide (H₂S), set out in the Chemical Agents Code of Practice 2020 in 5ppm, and the 15min indicative occupational exposure limit value (IOELV) is 10ppm.

The license requires that measures be taken to ensure that the activities shall be carried out in a manner such that odours do not result in significant impairment of, or significant interference with amenities or the environment beyond the site boundary.

Excerpt of EPA Industrial Emissions License

5.1 No specified emission from the installation shall exceed the emission limit values set out in Schedule B: Emission Limits of this license. There shall be no other emissions of environmental significance.

5.2 No emissions, including odours, from the activities 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

**Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan**

November - 2021

of the environment beyond the installation boundary.

6.28 Nuisance Monitoring: The licensee shall, on a daily basis, inspect the installation and its immediate surrounds for nuisances caused by litter, vermin, birds, flies, mud, dust and odours. The licensee shall maintain a record of all nuisance inspections.

6.29 Odour Monitoring and Management

6.29.1 The licensee shall inspect the installation and its environs daily for nuisances caused by odours. This inspection shall include monitoring at the relevant locations specified in Schedule C8: Ambient Monitoring of this licence. This shall incorporate the use of an FID or alternative agreed by the Agency.

6.29.2 The licensee shall maintain and implement an Odour Management Plan (OMP) for the installation.

4.0 ODOUR AND EMISSIONS SOURCES

Work is taking place within a closed landfill site, a category “RED” Site as defined in the Specification for Ground Investigation, Site Investigation Steering Group, Thomas Telford, London, Part 4 Guidelines for the safe site investigation by drilling of landfills and contaminated land”. (See below)

Thomas Telford Site Classification	
Site Designation	Broad Description
GREEN	<p>Subsoil, topsoil, hard-core, bricks, stone, concrete, clay, excavated road materials, glass, ceramics, abrasives, etc.</p> <p>Wood, paper, cardboard, plastics, metals, wool, cork, ash, clinker, cement, etc.</p> <p>Note: There is a possibility that bonded asbestos could be contained in otherwise inert areas.</p>
YELLOW	<p>Waste food, vegetable matter, floor sweepings, household waste, animal carcasses, sludge, trees, bushes, garden waste, leather, etc.</p> <p>Rubber and latex, tyres, epoxy resin, electrical fittings, soaps, cosmetics, non-toxic metal and organic compounds, tar, pitch, bitumen, solidified wastes, fuel ash, silica dust, etc.</p>
RED	<p>All substances that could subject persons and animals to risk of death, injury or impairment of health</p> <p>Wide range of chemicals, toxic metal and organic compounds, etc.; pharmaceutical and veterinary wastes, phenols, medical products, solvents, beryllium, micro-organisms, asbestos, thiocyanates, cyanides, dye stuffs, etc.</p> <p>Hydrocarbons, peroxides, chlorates, flammable and explosive materials; materials that are particularly corrosive or carcinogenic.</p>

Measures to protect workers on site include the provision of steel toed and soled boots; helmets and where necessary goggles, face masks, breathing apparatus, gloves and suitable clothing. All workers who have the potential to be exposed to waste or to landfill leachate in the course of their work shall be suitably inoculated. Typical disease associated with inoculation programme include:

- Hepatitis A and B
- Polio
- Diphtheria
- Tetanus

- Typhoid

Good hygiene practices are to be implemented on site.

Landfill gas will be encountered across the site and in particular during any excavations within the landfill inhaling landfill gas (even in small doses) can cause workers to feel unwell. Any workers showing signs of nausea, headaches, dizziness or other symptoms should be removed from the works area and a medical professional consulted This will be communicated to workforce at induction stage.

During laying of the capping layers, landfill gas will try to escape from any unsealed edges, potentially exposing workers welding the final LLDPE panels to high levels of landfill gas. Gas monitoring and RPE (Respiratory Protective Equipment) will be utilised to reduce the exposure of workers to landfill gas. Membrane installers will have an individual monitor attached during all the works.

All WBL and site personnel will wear a Crowcon Gas-Pro PID gas detector at leachate chambers and borehole. Wills Bros Limited will take note of the presence of landfill gas and the potential for this to form an explosive mix with air. Any equipment installed shall be suitably designed, manufactured and installed to comply with the requirements of the ATEX regulations. The Industry Code of Practice ICoP “The Management of Landfill Gas”, March 2012 will be referenced when developing Risk Assessment Method Statements by Wills Bros Limited and its associated contractors.

4.1 Hydrogen Sulphide (H₂S) Gas

As outlined above, Hydrogen Sulphide (H₂S) gas is produced over time in the landfill as the waste material breaks down. Under anaerobic landfill conditions (absence of air), sulphate-reducing bacteria produce H₂S from the sulphate (SO₄²⁻) in gypsum and the organic carbon in waste material.

H₂S generated at the landfill currently vents through the placed material as a fugitive emission, i.e. it is uncontrolled. Air quality is a significant issue to be managed during the construction works. Odour emissions and odour producing gases have the potential to cause nuisance and ill health during the construction works.

There is a significant risk of exposure to H₂S gas during the works, in particular during excavation works and works being carried out in trenches which have the potential to release gases or uncover waste materials

Odours could potentially be released through the following activities:

- Site Preparation.
- Site Clearance

**Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan**

November - 2021

- Regrading and Re-profiling Works
- Excavations
- Earthworks

The activities identified above will result in emissions typically referred to as ‘fugitive’ emissions. That is, they arise from open ‘area’ or ‘volume’ sources and are often intermittent.

The potential for odour nuisance depends on the type of construction activity being carried out in conjunction with ambient conditions including rainfall, wind speed and wind direction. The potential for impact from odour also depends on the proximity to potentially sensitive locations. WBL are conscious of that fact that ambient temperature and pressure can have a significant bearing on potential for odour nuisance on landfills.

4.2 Trace gas Analysis

The trace gas monitoring of speciated VOC’s was carried out from four in-waste gas wells and boreholes on 24th April 2013. The assessment was undertaken in accordance with the EA Guidance on Trace gas Analysis. Gases such as hydrogen sulphide have very low odour detection thresholds. It is known from published studies that trace-gas concentrations in a landfill can vary significantly due to fluctuation of temperature, atmospheric pressure and humidity. The very low odour threshold of the compounds characterised in the landfill emissions highlight the importance of managing activities that may release potentially odorous emissions, as even very low levels of these gases can cause significant impacts.

Appendix E of this report shows the odour monitoring locations SKM Enviros in 2013.

4.3 Risk assessment of Odour Emissions during foreseeable Site Phases

When remediation works commence, involving waste material movement, the potential risk of odours being emitted from any working face at the site will be high. The risk of high odour emissions will be a temporary occurrence, for the duration of remediation works.

Table 3-1 below shows a quantitative air dispersion model (AERMOD) on potential impacts from the landfill flare emissions carried out in 2017.

Table 4-1 Odour Emissions

Qualitative Risk Assessment Site Phase	Current Dormant Site	Remediation Works Phase	After-use Phase
Diffuse Odour Emissions	Medium- Low	High	Very Low
Odours from Flare Emissions	Low	Low	Low
Odours from other sources (leachate/ stagnant water/ diesel fuel spillage)	Low	Medium	Low

5.0 MANAGEMENT MEASURES

5.1 Introduction

In order to manage odour during the capping works, Wills Bros Ltd will implement the following management and control and monitoring measures:

Table 5.1 summarises the activity, management measures and responsibility during the works.

Activity	Management Measure	Responsibility
Induction	Online inductions will be issued through electronic format to inductees, records will be retained on site. A copy will also be made available on site. A copy of the induction is shown in Appendix A.	Wills Bros Limited
Working Hours	Construction site working hours (refer to section 5.3)	Wills Bros Limited
Site Works	All reasonable and feasible odour source controls will be identified and controls shall be investigated	Wills Bros Limited
Monitoring	Carry out environmental odour monitoring and keep records	Wills Bros Limited Environmental Engineer & Employer
Complaints	Should complaints be made regarding odour nuisance from the work, they will be treated by Wills Bros Ltd in a constructive manner.	Wills Bros Limited & Employer

5.2 Induction – Training and Awareness

The site induction, health and safety and environment training programmes will reinforce Wills Bros Limited employees and subcontractors the need for controlling environmental performance at each works location. Odour control and Management will be specifically addressed during the online induction, daily briefings and toolbox talks. All Wills Bros Limited employees will have responsibility for reducing odour emission generation from their work activities. A copy of the Construction Odour Control Induction is included as Appendix A to this Plan.

All site personnel working on site will be required to sign the online induction document. This will be made available online through an online portal. In the event, that the online service is not accessible, a copy of the inductions will be made available on site and all site personnel will be required to sign this induction sheet. WBL will ensure that this induction sheet is to be read and signed by all site personnel.

5.3 Working Hours

Wills Bros Limited will comply with the working hours as set out in Appendix 1/13 programme of paragraph 3.b of Volume A1 – Works Requirements. WBL hours are from 08.00 to 18.00 Monday to Friday. Depending on the works during the project, WBL will work to the hours outlined in the contract as shown below on Monday to Friday.

Day	Time
Monday to Friday	07.00 to 19.00
Saturdays	08:00 to 14:00
Sundays and Bank Holidays	No Work Permitted

Wills Bros shall gain prior written approval for any intended out of hours works in accordance with the Contract requirements.

Saturday work is not routine and will be;

- Co-ordinated with KCC and RPS
- Is on a “needs-must” basis

5.4 Internal Reviews

Review of work practices and on-site equipment to identify where practices can be improved. This process will involve:

- Identifying possible odour sources within the site in advance of the works: and
- Random audits will be used to proactively anticipate odour issues and instigate a resolution process and to ensure that previously identified control measures continue to be implemented.

5.5 Communication

Damien Ryan is our Public Liaison Officer who will work with Kildare County Council (KCC) representatives to proactively engage with the Local Community Liaison Group and Residents. It is our understanding that KCC has already fostered good relationships with local community representatives and resident’s groups which will be continued throughout the remediation works by our Public Liaison Officer.

The nearby sensitive receptors including local residents, local community liaison groups and other stakeholders will be kept informed of the works phasing plan, locations of works planned and duration This action will be coordinated with KCC’s Landfill Site Management Team. We see the appointment of a site based Public Liaison Officer and effective advance communications as critical in assisting in enabling as understanding and tolerance by the local community, nearby residents and key stakeholders such as Clean Air Nass group for the short term impacts such as odour emissions that will arise during the site remediation works.

Where adverse metrological conditions coincide with works phasing that cannot be averted, residents will be informed of the heightened risk of short-term odour nuisances.

6.0 ODOUR MANAGEMENT

WBL will ensure the measures outlined below which will be the primary requirements for odour management during the works are followed. They set the precedence for the works to controlling potential odour issues.

- Where waste is encountered during the re-profiling works, the re-locating of the waste material will be carried out as a priority and a minimum of 300mm of subsoil material cover placed on it. The working area will be limited to minimise the release of odour and landfill gases from exposed waste.
- Haul distances will be kept to a minimum, with any waste excavated during the re-profiling works deposited as close as possible to its original location.
- Temporary cover material (soils, mulch or geosynthetics) maintained in each zone during waste regrading works to allow any exposed waste to be covered at the end of each working day to minimise odour.
- No freshly exposed waste allowed to remain exposed overnight.
- Major waste regrading movements during excessively hot weather will be avoided.
- Regrading works phased in each zone to ensure surface area of disturbance and exposure of odorous waste is kept to discrete areas for the minimum practical duration necessary.
- Waste not left exposed in direct sunlight which would increase potential for odour evaporation.
- Waste sprays/mists uses where required to lower the temperature of exposed waste and inhibit evaporation.
- Screening of materials containing waste, unless adequately contained, will be avoided.
- Cut and fill operations for waste containing material that has to be transported from one side of the site to another will be covered and contained during transport.
- The proposed approach for the remediation of Zone 3 to minimise odour emissions is to progressively remove the temporary cap. The proposed phased removal of the membrane followed by prompt, material covering in discrete areas will ensure Zone 3 waste will not be exposed following its removal which would heighten the risk of excess odour emissions.
- Hydrogen peroxide dosing system in accordance with 1.14 of the specification will be maintained and used to treat odorous leachates if they arise for short periods by turning the leachates aerobic and reducing the potential to cause odour.
- Odour monitoring at agreed locations along site boundary downwind of works to ensure permitted odour level are not exceeded.

6.1 High Risk Areas

WBL will ensure that high risk areas will be identified and all necessary precautions in place before works commence in the area. The site is an active landfill, therefore active gas is present on the site.

6.2 Proposed Odour Mitigation Measure – Secondary Option

6.2.1 Odour Neutraliser

WBL are considering this mitigation measure as a secondary option for odour management during the works. However, the implementation of this method will depend on the trial holes carried out initially on site and the effectiveness of the general mitigation measures outlined in 5.1. This method is subject to approval from the ER/KCC. A review of these measures will be accessed once the trial holes have been completed. The odour issues during the work will be accessed in-situ.

Chemical spraying for odour control is to be carried out on any exposed waste areas. Wills Bros Ltd will supply and spread the odour neutralizer using a designated towable bowser with spray cannon which will be on standby for use at all times during the construction activities, please see below for example photos of bowser. The extendable mist cannon facilitates directed application of the odour neutraliser to the source of the emission.



Wills Bros Ltd propose to use Airhitone A4S2 odour neutralising solution which will provide air treatment of malodorous volumes by spraying technique at a concentration of 1:100 in fresh water, please see Appendix B of this document for MSDS and TDS for this proposed product. Although the data states that it should be stored at room temperature. WBL are considering the options of storage and they will be incorporated into this plan. Wills Bros Ltd will ensure that adequate supplies of the product are kept on-site within a designated store. The odour neutraliser product will be kept in this designated store for the duration of the works. When WBL and site personnel are made aware of any odour issue on site, works will immediately cease. The odour will be addressed immediately with the appropriate measures.

A designated team will be site trained in the use of the equipment, the mixing procedures and the application procedures. This team will be deployed as necessary to carry out the spraying of exposed areas that are causing emissions. A site log will be maintained ensuring that the equipment is operating efficiently.

6.3 What happens if there is an odour issue during the works

Mitigation Measure

If an odour issue arises during the works, WBL will take all necessary actions to address this problem and following procedure will be carried out:

- Works will immediately cease in the event of any odours encountered.
- Site management will investigate the area and make an assessment on what measures should be taken.
- Following a review, the appropriate measures will be applied.

7.0 PHASING OF WORKS

7.1 Bulk Earthworks

The cut/fill operation and placing of waste material for the project is near completion. These works took place from February to October 2021. There is reshaping works outstanding in Zone 4 to be completed with the movement of waste material in preparation for 1R and lining. Earthworks and lining in Zone 2A and 2B will be undertaken in 2022.

All earthworks that could encounter waste material will be carefully executed and monitored to ensure odour nuisance is controlled. WBL will ensure that the mitigation measures outlined in section 6.0 are implemented. Daily cover will be used if waste material is encountered and ensured at the end of the working day, all waste is adequately covered, and no odours are present.

7.2 Drainage/ Services

The installation of drainage and services will continue to be ongoing for the remainder of 2021 and in 2022. These works could potentially encounter waste material in areas that is not lined. However, these areas will now be minimised.

7.3 Daily Conditions

Weather conditions will be noted every day during the works. This will be imperative as odour will potentially affect the sensitive receptors and WBL are very conscious of this. A windsock is positioned at the top of the Zone 1, the most elevated area of the site. By having this windsock, this will give a basic guide with regards to the wind direction and wind speed. The weather conditions on each day will play a major role in how the work proceeds, this information will be noted and recorded. The proximity of the residents will be vital to ensure they are not affected by the potential odour on site.

7.4 Procedures During Works

WBL and all site personnel will be made aware of the following procedures during the works. During the earthworks as the earth being shifted in the cut/fill process.

1. Operators and site personnel will be made fully aware of the potential odour issues during the works. This will be reiterated throughout all the work activities and the risk of gas on site.
2. During the earthworks, every operator will attach a Crowncon GasPro 5 gas detector during all works carried out.
3. Once the operators and site personnel are conscious and briefed on the odour risks on site, works can proceed very carefully.

**Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan**

November - 2021

4. When the gas detector is alerted, all site personnel will move back from that area.
5. Works will cease immediately, and the gas detected will be monitored to ensure works can continue safely.
6. Backfilling of the area will be carried out if there is an odour issue.
7. If works cannot proceed, the area will be demarcated following review and suitable measures will be put in place.

7.5 Gas Management Infrastructure

WBL will be liaising with Irish Biotech Systems during the works with regards to the existing gas management system in place on site. A high concentration of Hydrogen Sulphide (H₂S) was noted in Zone 1 and the cut/fill works in this area have now been completed and was carefully managed.

Gas extraction through the wells will be ongoing and the gas flare will be fully operational. The risk of odour is minimised when the gas infrastructure is operational so its imperative this system is running efficiently.

7.6 Landfill Infrastructural Compound

The gas monitoring well GM08 within the landfill Infrastructural Compound continues to be monitored by KCC for the detection of methane CH₄. During 2021, elevated levels of methane were detected in this area. It is imperative that all site personnel working in the vicinity of this area are to wear gas detectors to ensure the risk to human health and environment is minimised.

7.7 Review of Measures

Depending on the effectiveness of the measures implemented by WBL for the control of odour during the works, they will be under constant review. This will ensure that odour is treated very carefully during the works and the appropriate will be applied in dealing with any odour issues encountered.

8.0 MONITORING, REPORTING AND RECORDING

8.1 Monitoring of Gases and Odours

Wills Bros Ltd propose to utilise the Crowcon Gas-Pro PID for detecting trigger level for toxic gases (in particular hydrogen sulphide). This gas detector will be worn by all of WBL and subcontractor personnel during the works. The Crowcon Gas-Pro PID gas monitor takes worker protection to the next level by providing safety professionals wireless access to real-time instrument readings and alarm status (including man down alarm) from any location for better visibility and faster response. Crowcon's PID works with a 10.6 electron volt lamp. This sensor is the most stable on the market and offers the detection of a wide range of VOC's. the sensor has an internal UV light source, which the gas sample passes through. An electron is released for gases with an ionization potential of 10.6.

The Crowcon Gas-Pro PID gas monitor detects the following:

- Carbon Monoxide
- Hydrogen Sulphide
- Methane
- Carbon Dioxide
- Oxygen

All personnel are to be trained in the use of the PID units. In the event that a PID indicates that the levels are above the designated safety level, all personnel within the vicinity of the area will evacuate that area immediately and a quarantine zone established.



Figure 8-1 Crowcon Gas Pro PID

8.2 Gas Detectors

Wills Bros Ltd will provide an Instantaneous Portable Gas Analyser with trigger levels for toxic gases [specifically hydrogen sulphide (H₂S)] to be employed at all times during all excavation works, filling works and works being carried out in trenches or excavations.

Personnel will be trained in the use of the gas analysers and atmospheric monitoring will be carried out at all times during sensitive works. The analysers will be established at designated strategic locations whilst carrying out the works so that they can carry out their function whilst not impeding the works operations. In the event, that a location gas analyser indicates that the levels are above the designated safety level, all personnel within the vicinity of the area will evacuate that area immediately and a quarantine zone established. Any detection of Hydrogen Sulphide, all site personnel to leave the area immediately.

8.3 Field Test Monitoring/ Odour Patrols

Wills Bros Ltd will carry out field assessments throughout the project, this will be carried out by trained personnel such as our trained environmental manager and site management. The monitoring will consist of the following:

- Daily and weekly sniff sampling and logging of odour characteristics at the working face;
- Daily and weekly sniff tests at the site perimeter downwind from the working face;
- Daily and weekly sniff tests off site near sensitive receptor zones.
- Carry out odour patrols at designated receptors around the site and record these.

**Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan**

November - 2021

- Noting the wind direction, temperature and barometric pressure on a daily basis. Also, the locations of nearest sensitive receptors. WBL will be sensitised to the areas of work that could potentially have an odour impact on sensitive receptors.
- Daily Odour Report – can be found in Appendix C of this Odour Management Plan.
- Odour monitoring will be in accordance with EPA guidance AG5.
- Report finding to site management and where required implement further control measures.

8.4 Odour Reporting and Recording

All odour monitoring reports will be maintained and made available for inspection at all times.

Logs of gas and odour monitoring records will be carried out and made available for inspection by the Employer's Representative or any other authorised personnel at all reasonable times. All records required to be kept will be in a legible form, must be kept at the site and produced to any authorised person on request

9.0 COMPLAINTS

Should complaints be made regarding odour nuisance from the work, they will be treated by Wills Bros Limited in a constructive manner. The specific procedures shall include (but not be limited to):

- Inspection of the location from which the complaint originated;
- Comparison of the measured levels with limiting criteria;
- Identification of engineering control or management procedure (if appropriate) to be adopted to reduce the levels at the complainant location

Each complaint will be thoroughly investigated, and appropriate remedial action carried out promptly.

Where corrective measures have been taken, the complainant will be updated by Wills Bros Limited of the corrective action implemented.

An odour complaint log is found attached in Appendix D of this report.

9.1 Emergency/incident response planning

Wills Bros Ltd health and safety plan has detailed emergency and incident response procedures in place. These will be revised and amended to address all possible occurrences during the remediation phase. Unexpected odour is a consequence of an unplanned incident or mismanagement of an unforeseen event. As such, the management of odour arising from an incident will be intrinsic to the management of the source of emergency.

9.2 Site procedures for dealing with Odour Complaints

The site procedures for dealing with odour complaints will remain as current in place. This will include a procedure to log a complaint and notify the EPA on the Incident Form. The complaint will then be investigated by the site supervisor or other suitably trained site staff. The odour investigation will consist of a site walk-over assessment and sniff test, during which metrological conditions will be logged, as well as any odours characterised, odour strength determined, and locations of strongest odour impact identified. The sniff test will follow the EPA Guidance AG 5. The investigation will consider the following

- Are any unplanned activity occurring on site;
- Have the specified control measures been implemented correctly;
- Can control procedures be increased for the current activity;
- What are the metrological conditions on the day;
- Did the complaints arise from a downwind location from the days activities;
- Investigate results from the daily health indicator testing and VOC sampling, to ascertain that no health impacts are associated with the odours complained about

The complaint investigation will be made available for public viewing.

9.3 Lessons Learnt

WBL will adopt a lesson's learnt approach to the works. This will be vital to ensure repeat incidents are prevented.

10.0 RECORDS

All records and documents associated with monitoring of the Works shall be retained by Wills Bros Limited. On completion of the Works, Wills Bros Limited shall issue all this information to the Employer's Representative in electronic format on CD, compiled in a logically navigable document library. Information retained shall include:

- All monitoring data collected, including data files, and calculations used in processing the data;
- Maintenance schedules and records for the maintenance of the instrumentation and the monitoring system including calibration certificates; and
- Records of systems checks and testing and commissioning carried out.

11.0 REFERENCES

- Volume A Works Requirements, Book A1 Part 1 Specification
- Contract Drawings
- Method Statement for Management of Hydrogen Sulphide Gas
- TDS and MSDS Sheets for Odour Neutraliser
- P1063-01 Industrial Emissions License
- EPA Guidance Note AG5
- SKM Environs: Kerdiffstown Odour Control Plan August 2013

APPENDIX A

CONSTRUCTION ODOUR AND DUST MANAGEMENT INDUCTION

Dust and Air Quality Induction

Dust, emissions and odours can cause nuisance and health risks at very high concentrations

- **Avoid nuisance:** Poorly controlled emissions and odours from plant or works may give rise to valid complaints.
- **Avoid health problems:** Dust may cause eye irritation, respiratory difficulties or make existing respiratory ailments such as asthma worse. Landfill gases such as Hydrogen sulphide (H₂S) or Methane can be harmful to health when exposed, ensure that the gas monitors are being used at all times during the works, and in the event that the alarms on the monitors are set off, remove yourself and others from the area and inform a member of management so that the area may be quarantined and the neutralising spray can be applied.

DO

- √ Keep surfaces swept and damp down with water at regular intervals
- √ Minimise drop heights into haulage vehicles
- √ Ensure cutting and grinding operations are adequately wetted
- √ Identify if works are likely to expose waste or cause odour
- √ Utilise odour monitors at all times
- √ Ensure all parties are aware of likelihood of odours
- √ Watch out for release of 'rotten egg' smells
- √ Position stockpiles away from residential areas or watercourses
- √ Clean up or damp down any spillage of dry dusty materials
- √ Notify the Project Manager or EHS Officer if work activities are causing poor air quality

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project

Odour Management Plan

November - 2021

√ Working in accordance with permitted dimensions of working areas

DONT

- × Don't use poorly maintained plant. Black smoke may give rise to poor health and can cause nuisance.
- × Don't leave plant running if not in use
- × Don't ignore sources of poor air quality, notify the Project Manager or EHS Officer
- × Don't ignore complaints
- × Don't enter an area with potential for gases without carrying out gas/odour monitoring in advance

APPENDIX B

MSDS AND TDS SHEET FOR PROPOSED ODOUR NEUTRALISER

SAFETY DATA SHEET

AIRHITONE A4S2

1- Identification product and supplier

Name of the product	AIRHITONE A4S2
Supplier	WESTRAND INTERNATIONAL
Address	39, avenue du 8ème Hussards - 68130 Altkirch
Telephone	03 89 08 88 88
Fax	03 89 40 29 30
E-Mail	Westrand@wanadoo.fr

2 - Composition/ Information about compounds

Aqueous solution. O/W Emulsion.

Complex of natural and synthetic oils solubilised by a synergic mixture of non-ionic surfactants.

3 –Identification of the dangers

This product is not classified in regard to the European directive 1999/45 CE (law of 9 November 2004).

Contains eugenol, citral, geraniol, hexylcinnamic aldehyd : May cause an allergic reaction.

4 – First aid :

Cutaneous contact : wash the skin with water.

Ocular contact : Irrigate eyes with water. Consult a doctor if irritation persists.

5 – Measures in case of fire :

none

6 – Measures in case of accidents :

Individual precautions : none.

Cleaning : if liquid, cover the overflowing with an absorbent non combustible agent (sand).

7 – Manipulation and storage :

Manipulation : The wearing of gloves is recommended when the pure product is manipulated.

Storage : Keep the product in closed original packaging units, and stored at room temperature, without any temperature extremes.

8 – Exposition control . Individual protection.

Protection equipment :	respiration :	not required
	eyes :	not required
	hands :	yes

9 – Chemical and physical properties

Physical state	Liquid
Odor	characteristic
color	white milky
Solubility (water)	in all proportions
pH	6 +/- 1
pH (4% in H ₂ O)	7 +/- 0,5
specific gravity	1,0 +/- 0,1
Flash point	>100°C

10 – Stability and reactivity :

shelf life : 1 year. Original packaging units tightly closed and stored at room temperature, without extremes.

11 – Toxicological informations :

Primary cutaneous irritation :

French law 1999/33/CE: No-Irritant.

Ocular irritation :

French law 1999/33/CE: No-Irritant.

Toxicity by ingestion :

DL50 (rat) : ≥ 5000 mg / Kg (calculated)

12 – Information on ecological effects :

Biodegradability : This product is easily biodegradable in regard to the French law (T 90308 - NF ISO 9439).

13 – Elimination :

Product : comply with local regulations for waste disposal.

14 - Information for the transportation :

Product not under regulation.

15 – Regular information :

Contains: GERANIOL N°CAS 106-24-1.

May cause an allergic reaction.

16 Further information :

This information is based on our current level of knowledge and relates tot the product in the state in which it is delivered. They are intended to describe our products from the point of view of safety requirements and are not intended to guarantee any particular properties.

TECHNICAL DATA SHEET

AIRHITONE A4S2

DEFINITION:

Aqueous solution. W/O Emulsion.

Complex of natural and synthetic oils solubilised by a synergic mixture of non-ionic surfactants.

CHEMICAL AND PHYSICAL DATA:

ASPECT	Milky, opaque liquid
ODOUR	characteristic
COLOR	White
pH	8 +/- 1
pH (4% diluted)	7 +/- 0,5
DENSITY	1,0 +/- 0,1
SOLUBILITY	water, alcohol
FLASH POINT	>100°C

UTILISATIONS:

Air treatment of malodours as industries, chimneys, vulcanisation process...

DOSING AND DIRECTIONS FOR USE:

Air treatment of malodorous volumes by a spraying technique using specific spraying nozzles.

Concentration : 0.2-4% in fresh water.

STORAGE CONDITIONS:

Keep product in closed original packaging units, and stored at room temperature, without any temperature extremes.

REGULATORY INFORMATION :

Product Manufactured in:	France
Custom reference number:	33074900
Listed EINECS :	All ingredients are listed
European legislation :	Labelling : Contains: Geraniol N°CAS 106-24-1 May cause an allergic reaction.

APPENDIX C

EXAMPLE OF DAILY ODOUR REPORT



Kerdiffstown - Odour Monitoring Daily Report

The survey will take approximately 9 minutes to complete.

* Required

1

Monitored By (Enter Name) *

2

Date *

Format: M/d/yyyy

3

Time (use 24hr clock) *

4

Select Location *

- Zone 1
- Zone 1A
- Zone 2A
- Zone 2B
- Zone 3
- Zone 4

Please state the specific area being monitored? *

Bulk Earthworks Cut/Fill Reference Numbers

12.08.2021



www.willsbros.com • Ballylahan Bridge • Foxford • Co. Mayo • Ireland



- Zone 1A
- H2S Area - Zone 1
- Zone 1 - East
- Zone 1 - West
- Zone 2A
- Zone 2B
- Zone 3
- Zone 4

6

Wind Direction *



- North Direction
- South Direction
- East Direction
- West Direction
- North Easterly Direction
- South Easterly Direction
- South Westerly Direction
- North Westerly Direction
- None detected

7

If answer was 'Not Detected', please clarify with additional information

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan
November - 2021

8

Wind Strength *

- 0 Calm-smoke rises vertically
- 1 Light air - direction of wind shown by smoke drift
- 2 Light Breeze - Wind felt on face, leaves rustle
- 3 Gentle Breeze - Leaves and small twigs in constant motion
- 4 Moderate Breeze - Raises dust and loose paper
- 5 Fresh Breeze - Small trees and leaves begin to sway
- 6 Strong Breeze - Large branches in motion
- 7 Near gale - Whole trees in motion
- 8 Gale - Twigs break off trees
- 9 Strong Gale - Slight structural damage occurs

9

Temperature *

- Freezing (- to 4C)
- cold (5-9C)
- cool (10-20C)
- Warm (21-30C)
- Hot(31C+)

10

Odour Persistence *

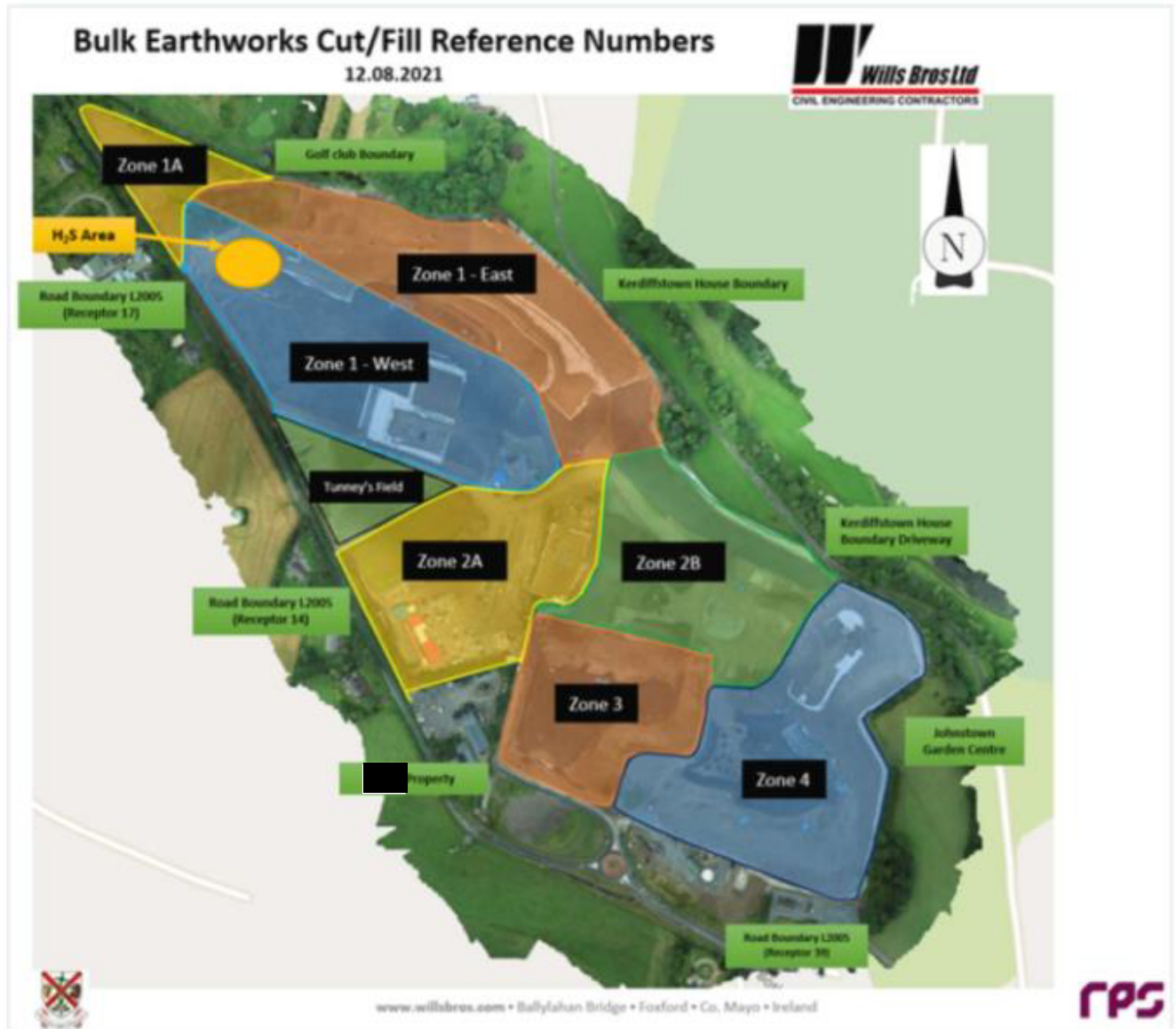
- No odour
- Intermittent (detected intermittently during assessment)
- Persistently (detected throughout period of assessment)

11

Odour Intensity - At moderate odour, action to be initiated *

- Not detectable
- Faint odour (barely detectable, need to stand still and inhale facing into wind)
- Moderate Odour (easily detectable while walking and breathing normally, possibly offensive)
- Strong Odour (bearable but offensive-might make clothes/hair smell)
- Very Strong Odour (unbearable, difficult to remain in area affected by odour)

Please state the boundary being monitored. Odour at boundary downwind of working face. *



- Road Boundary L2005 - Receptor 17
- Road Boundary L2005 - Receptor 14
- [Redacted] Property - Receptor 12
- Road Boundary L2005 - Receptor 39
- Boundary closest to Johnstown Garden Centre - Zone 4
- Boundary at Kerdiffstown House Driveway - Zone 4
- Boundary at Kerdiffstown House - Zone 1
- Golf Club Boundary - Zone 1A

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan
November - 2021

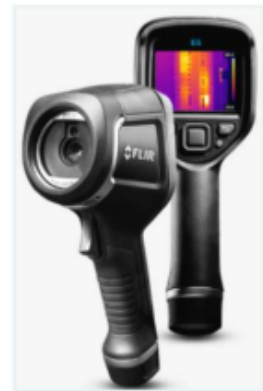
13

Please state odour intensity at selected boundary - At moderate odour, action to be initiated *

- Not detectable
- Faint odour (barely detectable, need to stand still and inhale facing into wind)
- Moderate Odour (easily detectable while walking and breathing normally, possibly offensive)
- Strong Odour (bearable but offensive-might make clothes/hair smell)
- Very Strong Odour (unbearable, difficult to remain in area affected by odour)

14

Was temperature monitoring undertaken? *



- Yes
- No

15

Is litter visible to be leaving the site? *

- Yes
- No

16

If question 15 was answered yes, please state reason?

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan
November - 2021

17

Are there areas of standing water or ponding? *

- No
- Yes

18

If question 17 was answered yes, please state reason?

19

Has daily cover being applied? *

- Yes
- No
- Other

20

If question 19 was answered no or other, please state reason? *

APPENDIX D

ODOUR COMPLAINT LOG

Annex B: Odour Complainant Log Sheet

Odour Log

Name: _____

Address: _____

Address of Suspected Odour Source: _____

Date	Start Time	Finish Time	Description of Odour (e.g. smelled like Bakery, Coffee, Paint, Mothballs, Wet Dog etc)	Other Comments (e.g. Intensity, or if odour detected at location other than your above address)

Do not forget to complete the declaration of record details (below).

Declaration of True Record

I (Name) _____ confirm that the above list is a true record of events recorded.

from (Date) _____ to (Date) _____.

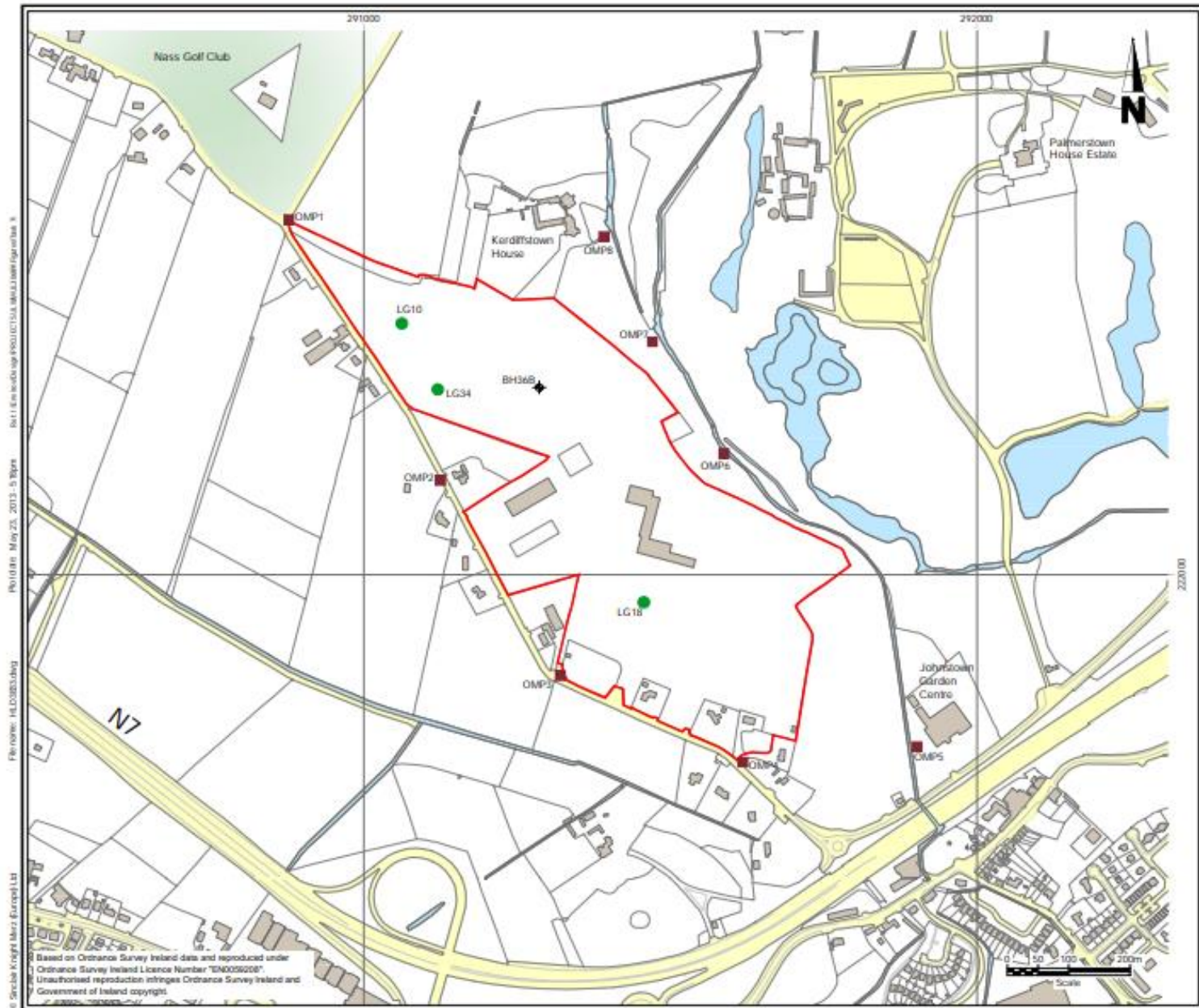
Signature: _____ Date: _____

I am/am not* prepared to appear in court to give evidence if required (*please delete as appropriate).

APPENDIX E

ODOUR MONITORING LOCATIONS

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
Odour Management Plan
November - 2021



KEY:

- Former WAO047-02 Waste Licence Boundary
- On-site Trace Gas Analysis Location
- Off-site Odour Monitoring Point

REV.	DESCRIPTION	DATE



**KERDIFFSTOWN LANDFILL
 SITE REMEDIATION PROJECT**

**DRAWING 2
 ODOUR MONITORING LOCATIONS**

SCALE	1:6,000 @ A3	PROJECT No.	JL30689
CONTENT	LD	DRAWN	HLD
CHECKED	DRAFT	DATE	11/05/2013



© Skm Knight Merz Europe Ltd
 File name: HLD003.dwg
 Plot Date: May 23, 2013 - 5:08pm
 Plot File location: H:\PROJECTS\154_161\154161.dwg of task 9

Based on Ordnance Survey Ireland data and reproduced under Ordnance Survey Ireland Licence Number "100005028". Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright.