



Landfill Gas Management Plan

KERDIFFSTOWN LANDFILL REMEDIATION PROJECT



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Wills Bros Ltd
CIVIL ENGINEERING CONTRACTORS

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
 Landfill Gas Management Plan
 January - 2021
 Revision and Amendment Status Sheet

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Tender Submission	

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APPENDIX D – PROPOSED LANDFILL GAS MONITORING

1.0 INTRODUCTION

This Landfill Gas Management Plan has been prepared by Wills Bros Limited in conjunction with Irish Biotech Systems. This plan forms part of a comprehensive suite of environmental controls within the Construction Environmental Management Plan (CEMP) for the remediation phase of Kerdiffstown Landfill Remediation Project.

The Landfill Gas Management Plan addresses the potential adverse environmental effects resulting from remediation works in zones where there is a landfill gas system in place. The principal purpose of this plan is to highlight the minimum standards that must be complied with as well as best practicable options for management of landfill gas for the Project. WBL will ensure along with Irish Biotech Systems that the Landfill Gas Management Plan will be fully implemented. WBL will be responsible for the active gas regions on site. KCC will be responsible for the perimeter monitoring on the site. This Landfill Gas Management Plan will be updated, with the necessary approval, throughout the course of the Project to account for changes to construction techniques or the natural environment and consent conditions. A copy of any revisions of a material nature will be passed to Kildare County Council and the Employers Representative for comment.

1.1 Objectives

Accordingly, Wills Bros Ltd will carefully plan works with Irish Biotech Systems so as to minimise and mitigate any landfill gas issues occurring on site. The Landfill Gas Management Plan will be revised as required to confirm/update the details of construction provided within the document (e.g. actions and control measures). The main objective is to ensure that landfill gas is properly managed on site in accordance with EPA best practice at all times. All activities are fully documented and kept on file in the site office.

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:

- Reprofiling 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

This Landfill Gas 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. Any changes will be agreed with KCC, ER and IBSL in advance through the normal communication channels.

2.0 CONTACT DETAILS

Wills Bros Limited site management team will be responsible for ensuring that this Landfill Gas Management Plan in tandem with our appointed expert, Irish Biotech Systems Ltd.

Contact details for Wills Bros Limited, Irish Biotech System Ltd and Kildare County Council are provided below.

Contractor: Wills Bros Limited			
Address	Wills Bros Limited Ballylahan Bridge Foxford Co. Mayo		
Contact	PQ EHS Manager	Mobile	xxx-xxxxxxx
	YG EHS Officer		xxx-xxxxxxx
Telephone	xxx-xxxxxxx	e-mail	<hr/> <hr/>

Landfill Gas Specialist: Irish Biotech Systems			
Address	Irish Biotech Systems, Unit W10C, Tougher Business Park, Naas, Co. Kildare		
Contact	GF Managing Director	Mobile	xxx-xxxxxxx
Telephone	xxx-xxxxxxx	e-mail	info@irishbiotechsystems.ie

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

3.0 MANAGEMENT MEASURES

3.1 Introduction

Wills Bros Ltd in conjunction with Irish Biotech Systems will have the following procedures in place in order to protect the landfill gas management system during the Contract of works.

Table 3.1 summarises the activity, management measures, responsibility, and timing of the procedures.

Activity	Management Measure	Responsibility
Induction/ Daily Briefings/ Toolbox Talks	WBL online induction will highlight the landfill gas management on site and the protection around this system throughout the works. Daily briefings and toolbox talks will reinstate the environmental importance and protection of the gas management on site.	Wills Bros Ltd – PM, EHS Officer, Environmental Eng.
Working Hours	Construction site working hours. See 3.3 Working Hours	Wills Bros Ltd
Site Works	All reasonable and feasible gas management controls will be implemented and any required to ensure compliance with the Licence/EIAR	Wills Bros Ltd Irish Biotech Systems Ltd
Monitoring	Daily checks to be carried out by WBL and weekly checks to be carried out by IBSL. IBSL to remotely monitor flare output daily. Records to be kept and retained. Data to be sent to KCC weekly via email. KCC to continue the perimeter monitoring on the site.	Wills Bros Limited - PM & Environmental Engineer (JS). Irish Biotech Systems Ltd KCC
Complaints	Should complaints be made regarding landfill gas issues from the work, they will be treated by Wills Bros Ltd in a constructive and cooperative manner. Response time as per the call-out arrangements. See Section 5.3. A monthly review between WBL/IBSL/KCC to discuss the rate of change scheduled to occur throughout the year. The entire system to be kept under review.	Wills Bros Ltd Irish Biotech Systems Ltd
Timing of procedures	WBL and IBSL will work in tandem as per the construction programme.	Wills Bros Ltd Irish Biotech Systems Ltd

3.2 Induction – Training and Awareness

The WBL online induction, health and safety and environment training programs will reinforce the Wills Bros Limited employees and subcontractors the need for controlling environmental performance at each works location. Landfill gas management and its environmental importance will be specifically addressed during the daily briefings and toolbox talks. All Wills Bros Ltd employees will have responsibility for protecting the landfill gas management system throughout the works.

3.3 Working Hours

Wills Bros Limited will comply with the working hours as set out in Appendix 1/13 program of works 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

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

3.4 Internal Reviews

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

- Identifying the issue relating to the active landfill gas system particular to the site.
- Random audits will be used to proactively anticipate landfill gas issues and instigate a resolution process and to ensure that previously identified control measures continue to be implemented.
- A walkaround between WBL and KCC was undertaken in January 2021 to assess and identify the existing gas infrastructure on site. This enabled what was to be retained and what can be removed prior to works commencing.

3.5 Communication

Communication with local residents and local community liaison groups will be coordinated with the KCC Landfill Site Management Team. Any serious issues arising from landfill gas management will be communicated to the public by KCC.

4.0 Landfill Gas On-Site

Active gas extraction occurs in two areas of the site; the lined cell and the north-western section. Only a small part of the overall site is lined (the lined cell), where the wastes have been covered with a temporary heavy-duty membrane to assist with odour management and to reduce air from being drawn in during gas extraction operations.

Gas extraction is accomplished via a network of gas extraction wells and pipework. Gas is removed and burnt in specially manufactured stainless-steel high temperature gas flares. The flare on site has a capacity of 250m³/hr. Valves are incorporated within pipework which enable gas from both fields to go to the flare. The flow of gas entering the 250 flare is controlled through the booster unit which is currently set to 70m³/hr to maximize gas extraction from both areas while ensuring little or no air is drawn in across uncapped areas. Based on gas yields the extraction of gas from the North-Western area compared to the lined cell area is approximately 3:1.

Within the lined cell there are 14 gas wells, installed to depths between 3m to 6m. Within the north-western area there are 25 gas wells installed to depths between 6m and 20m. The shallow wells (6m deep) are labelled LG1 to LG10 while the deeper wells (20m deep) are labelled LG25 to LG39.

The drawings showing the existing landfill gas management system in place at Kerdiffstown are shown in Appendix A.

The drawings showing the proposed landfill gas management system to be installed at Kerdiffstown are shown in Appendix B.

The drawings highlighting gas monitoring points to be removed/retained are shown in Appendix C.

Finally, the drawings indicating the proposed landfill gas monitoring points are shown in Appendix D.

4.1 Daily Checks

WBL Environmental Engineer will be responsible for the daily checks. IBSL to guide WBL Environmental Engineer on the necessary checks and inspections to be carried out daily. If WBL Environmental Engineer identifies an issue, he will ask for assistance from IBSL or KCC. Flare outputs will be monitored remotely online by IBSL. The enclosed flare is monitoring the following parameters continuously Ch₄, CO₂ and O₂. This will be a daily remote check to see nothing has gone awry in the previous 24hrs. If flare temperature is noted to be below 1000°C, oxygen above 1% or methane below 20%, then the active gas well field will be checked for any signs of leaks or damage to the gas well heads and connecting pipework. This will involve inspection and monitoring of individual wells at the gas sampling port and adjustment of the well head control valve to re-

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balance the well field where necessary. Results are recorded in the landfill gas monitoring database and these records will be maintained by WBL/IBSL. The active gas well balance results gathered will be provided to KCC/ER on a weekly basis via email.

4.2 Weekly Checks

A weekly site visit will be carried out by IBSL. Records will be maintained by IBSL and the gas data gathered will be provided to KCC/ER on a weekly basis via email. As a minimum, both well fields should be inspected weekly. This will involve visually checking pipework, paying particular attention to joints between pipe and individual well heads. Pipework is to be checked for damage and for possible leaks (visual appraisal and listening for air being sucked into pipework) and condensate build up.

4.3 Monitoring

Monitoring of the active gas extraction wells in the lined cell area and the north-western area of the site is carried out using a GA5000 hand-held gas analyser on a weekly basis as a minimum by IBSL. Parameters to be checked are levels of CH₄, CO₂, O₂, H₂S balance (nitrogen) and atmospheric pressure.

WBL will not be responsible for the licence reporting. KCC will continue to remain responsible for all licence constraints, which includes reporting. Any data from the active gas regions gathered will be given directly to KCC to allow them to upload it to the EPA portal.

IBSL and WBL will ensure maintenance and any repair to the flare is undertaken during the project.

4.4 Flare Emissions Testing

WBL will not undertake the flare emissions testing. KCC will remain responsible for the flare emissions testing. As and when emissions testing is scheduled, WBL and IBSL shall make themselves available to KCC and their appointed contractor as required.

5.0 Gas Management Plan

5.1 Odour Management During Capping Works

Prior to any disturbance of the existing gas management infrastructure a portable 'Open' pre-aerated flare and generator will be on-site to manage areas in isolation (subject to EPA agreement) while ground works are being carried out.

The use of this type of flare is necessary as it is not as sensitive to gas variations as the existing installed system. In IBSL experience this is the only type of flare available on the market to handle the variations in gas quality during the planned works. The unit will be trailer mounted and fully portable. The connections to wells will be via temporary piping which can be adjusted and moved around to suit planned development of the site.

The regulation and operation of this equipment will be via a local control panel during standard hours and via remote control after hours and during weekends to ensure stringent odour control is maintained at all times during the planned works.

5.2 Flare Shutdown

In the event of an unplanned flare shutdown an automatic text message from the flare will be sent to nominated people from KCC, WBL and IBSL. A reset can be done remotely by WBL/IBSL after a sufficient resting period has elapsed. If the flare fails to respond to a restart a site visit by IBSL will be triggered.

5.3 Call-Out Arrangement

The Call-Out arrangement with KCC and Irish Biotech Systems Ltd are:

- IBSL and KCC have agreed to respond within 8hrs to an official call to site by members of KCC and nominated members of WBL.
- IBSL also have agreed to hold sufficient spares to carry out emergency repairs.
- If the call is received after normal working hours or on a non-working day the response will be first thing the following morning. (As Kerdiffstown is so low on available gas this is more than sufficient for a site at this stage in its life).

5.4 Pumping trial

The pumping trial for this contract will be broken down into a series of trials where four to five wells at a time will be selected based on drilling logs and static gas testing results. Each batch of selected wells will be connected to a temporary flare and run through the testing regime as per the attached trial procedure A-029.

The pumping trial objective is two-fold. Firstly, it serves as a tool to model just where the gas production is in its life cycle. This feature is crucial as it shows whether the gas is in decline or at a point where it could increase

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in the future. Using this information, the present and future flare sizing requirements can be determined. The sequencing of each trial stage will be determined by the progress once the exercise gets underway. If it is relatively easy to exhaust regions and their recovery is slow, this indicates low activity/production and the trial can move quickly into a new area.

If Kerdiffstown were a typical landfill the records of waste input would play a very important role in the modelling of the gas production curve into the future and the pumping trial would act as a calibration technique for the model to corroborate the results provided. However, the records do not exist that can be relied upon for this purpose. Ideally a decade worth of data from the flare could have been used to inform the pumping trial.

The trial itself is estimated to take up to eight weeks and all data collected will be issued for modelling purposes. IBSL will liaise with Gregory Environmental Consulting, the architect of the GASSIM Modelling software, during the trial and request a review of the data gathered at the mid-point approximately. The results of the review may alter the approach during the second half of the trial.

Careful planning will be required in advance of each trial stage to ensure the main contractor has no works planned for the respective zone as the trial cannot be interrupted once it gets underway.

Based on our knowledge of the site we anticipate some difficulty in retaining a flame throughout the duration of the pumping trial. This will be due to low gas quality in certain regions and will require very careful policing due to odour potential. We would plan to dilute these portions of the trial with higher quality gas from other regions to act as a supplementary fuel to maximise the duration of the flare burn interval. Dilution during the trial is necessary or we will not be able to manage odour. IBSL envisage stages of this exercise where maintaining a flame will be near impossible without adding supplementary fuel. It will not compromise the end results at all. Flow and quality readings will be taken directly from the wells under test and not from the overall volume/quality entering the flare.

This again will necessitate careful planning between IBSL and WBL as it may impede progress with their works due to additional piping requirements.

The pumping trial will be pushed out as far as possible as the gas behaviour within the waste will change during the reprofiling works.

5.5 Decommissioning, relocation & commissioning of flares

Prior to decommissioning the existing flaring system, the following items need to be in place and all associated works completed:

- New location slab, power supply, gas supply, dewatering systems and condensate return pump fully commissioned.
- Adequate wells to provide sufficient gas to maintain continuous flaring, post commissioning.
- Temporary open flare on-site and installed to provide cover during downtime of permanent flare.
 - This item is listed purely to provide cover in the event the commissioning of the new plant takes longer than anticipated.
- Telemetry to allow remote monitoring after hours and throughout weekends.
- The existing flare will be excess to requirement when the new unit(s) are sized, ordered, installed and ready to go into service

With the above measures in place and suitable wind speed for crane use the flare relocation and recommissioning should be completed in one working day. Two new flares are to be provided at the compound are per Appendix 32/1AR of the Works Requirements. This is fully understood and again if the timing of the trial, gas modeling, and arrival of the new plant all dovetail the existing flare will be considered scrap. However, if the above sequence does not dovetail due to circumstances outside of anyone's direct control the existing flare may be a better stop-gap than continuing the operation of the open flare which for all intents and purposes is a raw emission.

5.6 Gas well installation including manifolds & pipework

Correct gas well installation is crucial to ensure a free-flowing well is achieved. The following sequence must be adhered to, to achieve this aim:

5.6.1 Gas well installation

- The well should be drilled using rotary auger (min 450mmØ, ideally 650mm) and not percussion
- Support casing should be installed where wet materials are encountered.
- Water sprays/mists can be used in the drilling zone where highly odorous spoils are being drawn up.
- Once drilled and the depth checked the well pipe should be assembled and installed.
- The 20mm single sized non-calcareous round stoned is now to be carefully fed into the well while the pipe is held centrally.
- The stone is brought up to within a meter of ground level.
- The well pipe is capped, and the gravel pack is allowed to settle for a minimum of 24 hours.
- After the settlement period has expired the gravel pack is topped up again to within a meter of the surface.
- A bentonite plug is now installed on-top of the gravel pack up to ground level.

- This well is now complete and ready to have the head works fitted

5.6.2 Manifolds and Pipework

The manifolds will arrive on-site ready to be installed. They need to be installed as part of the liner works. Once they are settled into position after the specified foundation has been prepped the liner will need to be welded to the outer skin of the manifold prior to any pipework connections being made-off.

All piping will be run out on top of the liner as per the drawing provided. This allows future maintenance to be carried out without disturbing the liner skin. The final connections to the newly installed gas wells will only happen after completion of the pumping trial and only when the new mainline is fully commissioned and ready to transport gas to the flare. The portable flare(s) will take up the shortfall until all associated works are completed.

Once each well is drilled it will receive a temporary head-works to allow it to be connected to the open flare. Removal of spoils during the drilling is key to good odour control in conjunction with intermittent bowser dousing of the drilling zone.

Careful planning of the entire transition will be key to good gas management and in-turn good odour control.

5.6.3 Decommissioning the old & connection of the new gas collection system

Once the works commence an assessment of the existing gas wells and associated pipework will be carried out. This will take the form of quality, suction and flow measurement to determine if some wells can be decommissioned straight off and not hamper works unnecessarily. The remainder wells will form the backbone of the gas management system until the entire network has been replaced.

Weekly planning meetings with WBL and Irish Biotech Systems will be used to allow the landfill gas specialist adequate time to make alterations to the piping to ensure control is maintained and allow the proposed works to run as smoothly as possible. If re-profiling is necessary wells will be extended in low regions and height reduced in areas where levels are lowered and reconnected straightaway.

The use of temporary 'Open' type flare(s) and sacrificial surface piping is key to maintaining gas management control until the new collection network is completed and ready to be phased into operation.

The existing installed flare (High-temperature elevated technology) only survives thanks to the cover material preventing excessive oxygen ingress into the collection system. Once this cover material is disturbed on a large scale the gas is no longer manageable in a conventional flare. Hence the need for a 'Pre-Aerated Open Flare' The EPA are familiar with this type of device as it is the only safe way of managing situations like the

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planned works.

Sequence of Operations: (include sketches if required)	Procedure Identity:	A-029	Basic LFG Pumping Trial in compliance with Certificate of Authorisation (COA)
	Prepared By:	IBSL.	
	<ol style="list-style-type: none"> 1. A suitable location is to be selected to lay out the flare & power generation equipment. <ul style="list-style-type: none"> • Level dry ground suitable for the loading required. • Away from direct site traffic. • Sufficient space to allow the pipe extensions to be run out to individual wells. • IBSL to decide on the most suitable pipe layout. 2. Assemble the equipment as per the manufacturer’s instruction and the operator’s experience. 3. Inspect the work area immediate and surrounding prior to commencement to ensure slips, trips and fall potential are assessed and minimised. 4. Once the three well heads are fixed and all interconnecting pipes are in position the flare can be switched on in vent mode with the inlet valve firmly closed. 5. Once the flare has come up to speed and settled out in vent mode the inlet valve should be partially cracked open. 6. Each well head in turn now needs to be partially opened whilst being monitored using a handheld gas analyser. 7. When the above step is completed for all three well heads an overall gas reading needs to be taken back at the inlet point of the flare including a total gas flow reading to the flare. 8. If the overall quality reading is below 26% Ch₄ no further action needs to be taken at the flare at this point and a second set of readings need to be taken at each well head. 9. If the reading at the flare is 27% Ch₄ or greater, then the flare should be switched to continuous mode to attempt to establish a flame and reduce any potential odour. 10. Every thirty minutes during the initial set-up a set of readings should be recorded at each of the three well heads and back at the flare inlet. 11. During the collection of gas results a judgement needs to be made by the operator, based on the readings to assess whether the well in question can deliver more gas. 12. Ideally the output demand placed on a gas well should be positioned such that the quality remains consistent for the duration of the assessment (in this case 7 days) Reduction in quality shows over-demand while increase in quality allows for the demand to be increased via the control valve on the extraction line from each well head. 13. Once a steady state output is established from each extraction well the reading and data collection will be reduced to three times per day to include a flow measurement at the flare inlet. 14. If the overall quality to the flare remains below 26% Ch₄ the flare will remain in vent mode throughout the trial 15. Upon the completion of the 7-day run the equipment will be decommissioned and removed from site. Each extraction well will be fitted with a cap to prevent passive venting. 16. All gathered data will be presented to the appointed gas modelling company in excel format. 		

6.0 COMPLAINTS

Where there are complaints, albeit from an external source or from the ER/KCC, relating to any landfill gas management issue, will be treated by Wills Bros Ltd in a constructive and cooperative manner. WBL will consult our landfill gas expert, Irish Biotech Systems Ltd in the event of any complaints. The specific procedures will 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. WBL will notify ER and KCC of any complaints.

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

7.0 RECORDS

All records and documents associated with monitoring of the Works will be retained by Wills Bros Limited. On completion of the Works, Wills Bros Ltd will issue all this information to the Employer and Employer's Representative in electronic format.

Information retained will 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.
- Records of systems checks and testing, and commissioning carried out.

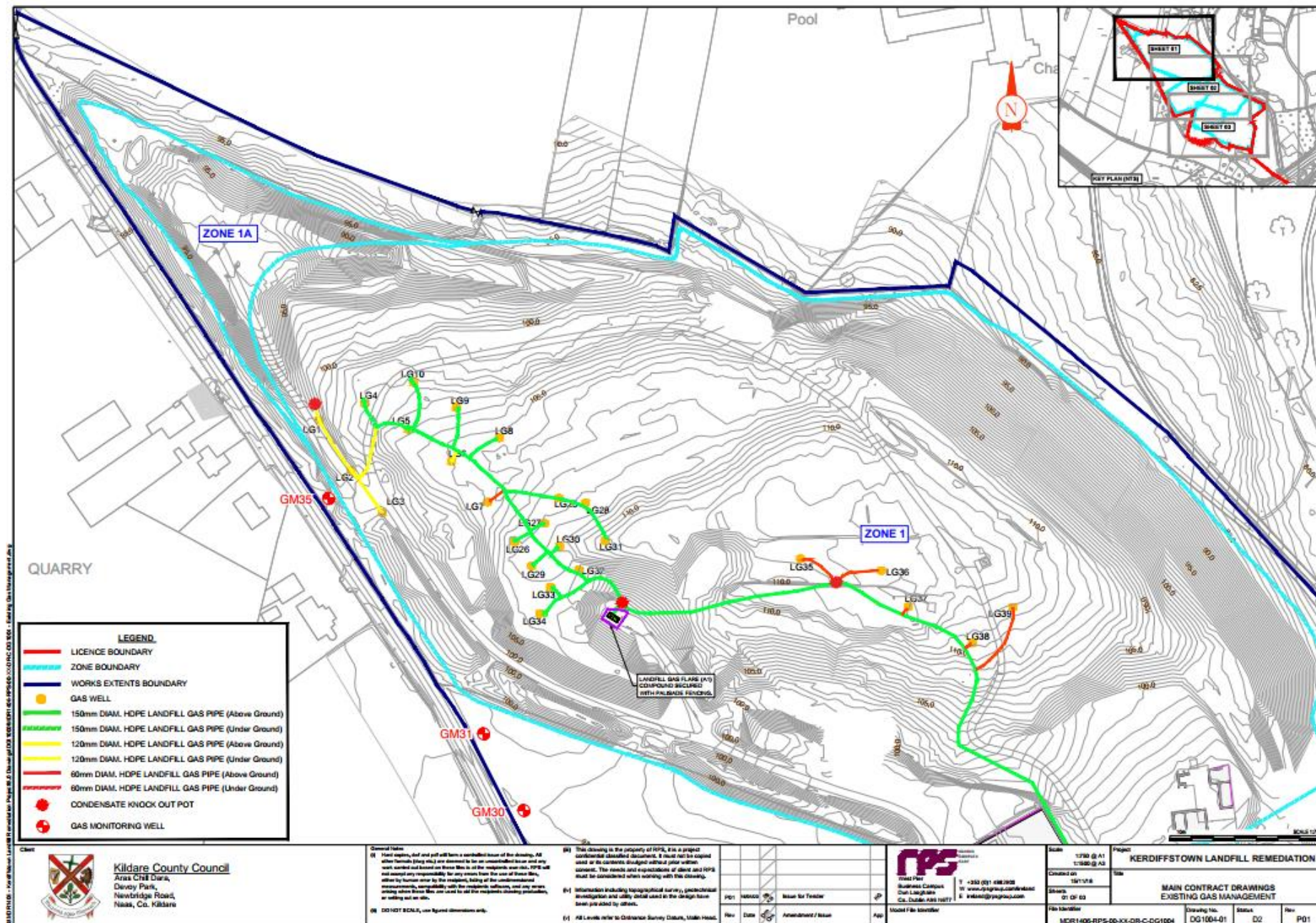
8.0 REFERENCES

- Volume A Works Requirements, Book A1 Part 1 Specification
- P1063-01 Industrial Emissions Licence
- EIAR Volume 2 of 4: Main Report, 2017

APPENDIX A

EXISTING LANDFILL GAS MANAGEMENT

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LEGEND	
	LICENCE BOUNDARY
	ZONE BOUNDARY
	WORKS EXTENTS BOUNDARY
	GAS WELL
	150mm DIAM. HDPE LANDFILL GAS PIPE (Above Ground)
	150mm DIAM. HDPE LANDFILL GAS PIPE (Under Ground)
	120mm DIAM. HDPE LANDFILL GAS PIPE (Above Ground)
	120mm DIAM. HDPE LANDFILL GAS PIPE (Under Ground)
	60mm DIAM. HDPE LANDFILL GAS PIPE (Above Ground)
	60mm DIAM. HDPE LANDFILL GAS PIPE (Under Ground)
	CONDENSATE KNOCK OUT POT
	GAS MONITORING WELL

Client: **Kildare County Council**
 Aras Ché Dúra,
 Devoiry Park,
 Newbridge Road,
 Naas, Co. Kildare

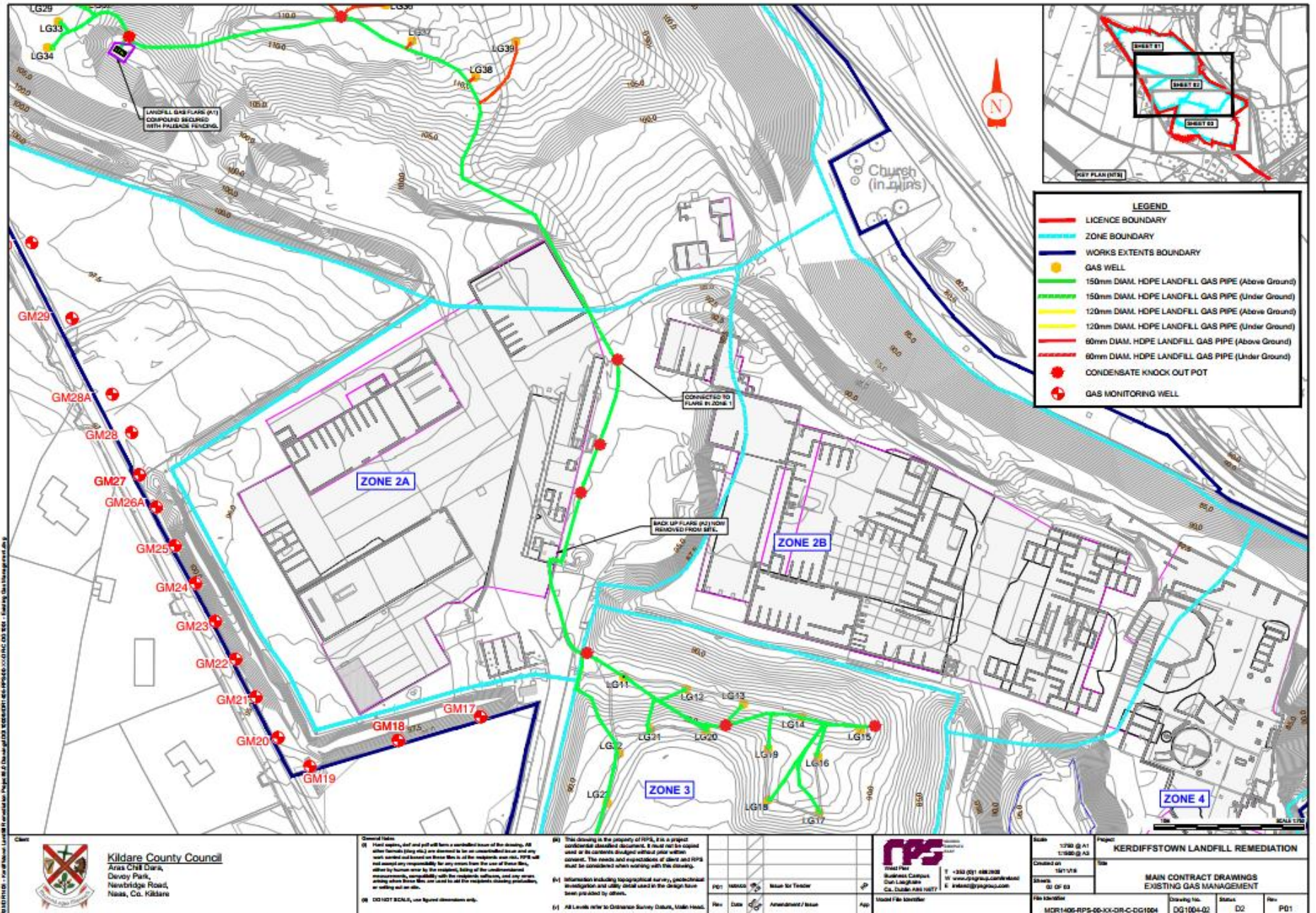
Rev	Date	Amendment / Issue
P01		Issue for Tender

Rev	Date	Amendment / Issue

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Scale: 1:750 @ A1 1:1250 @ A3	Project: KERDIFFSTOWN LANDFILL REMEDIATION
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File Location: MCR1406-RPS-00-XX-DR-CG-01004	Drawing No: DG1004-01
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LEGEND

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- ZONE BOUNDARY
- WORKS EXTENTS BOUNDARY
- GAS WELL
- 150mm DIAM. HDPE LANDFILL GAS PIPE (Above Ground)
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- CONDENSATE KNOCK OUT POT
- GAS MONITORING WELL

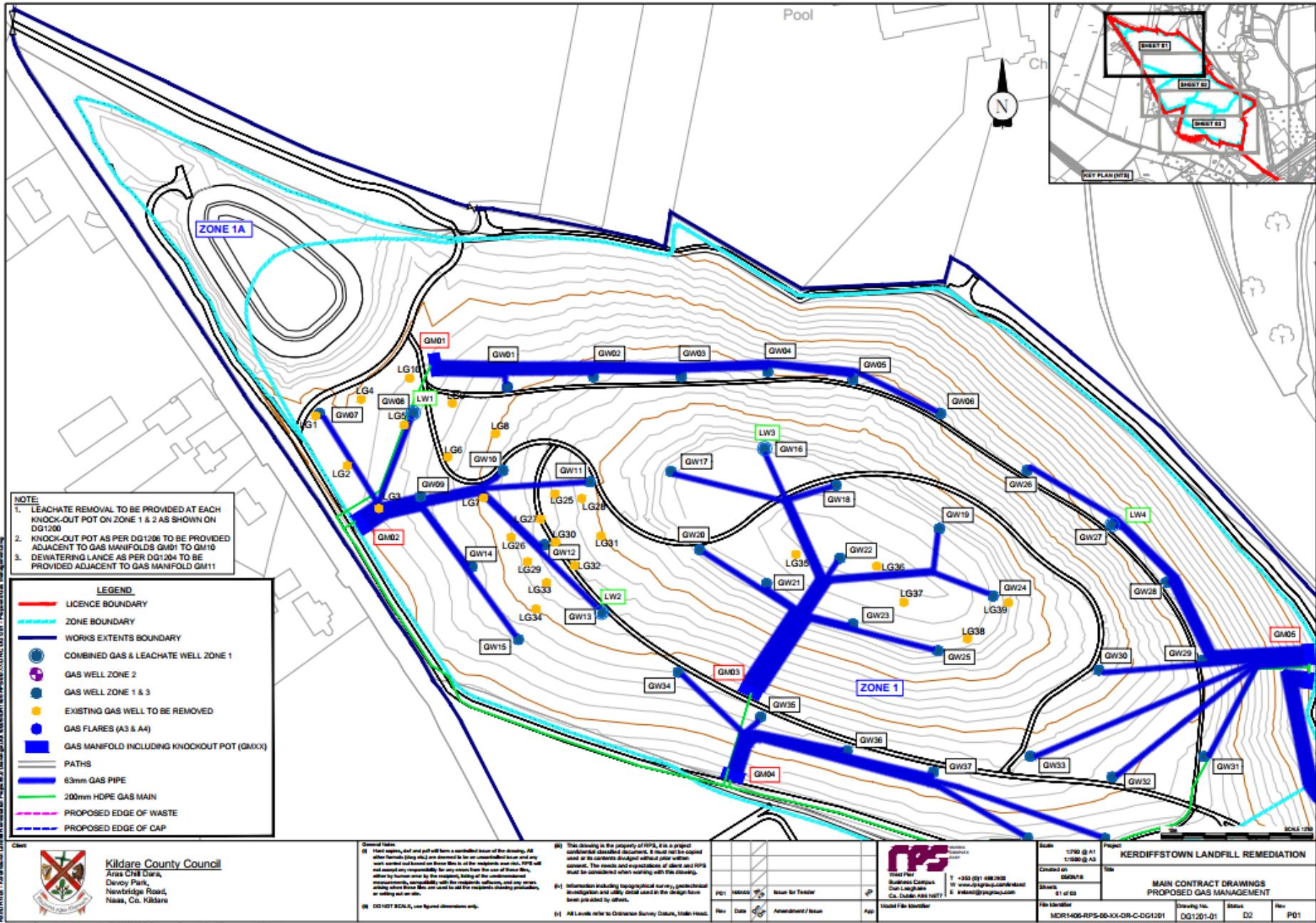


<p>General Notes</p> <p>01) Field notes, data and all other information is contained within the drawings. All other forms (plans and sections) shall be an integral part of the drawings and are not to be used out of context. The design and construction of all work shall be in accordance with the relevant codes of practice and standards. The design and construction of all work shall be in accordance with the relevant codes of practice and standards. The design and construction of all work shall be in accordance with the relevant codes of practice and standards.</p> <p>02) DO NOT SCALE, use figured dimensions only.</p>	<p>03) This drawing is the property of Wills Bros Ltd. It is a project confidential document. It must not be copied, reproduced or distributed without prior written consent. The design and construction of all work shall be in accordance with the relevant codes of practice and standards. The design and construction of all work shall be in accordance with the relevant codes of practice and standards. The design and construction of all work shall be in accordance with the relevant codes of practice and standards.</p> <p>04) Information including topographical survey, geotechnical investigation and utility detail used in the design have been provided by others.</p> <p>05) All Levels refer to Ordnance Survey Datum, Mean Sea Level.</p>	<p>Wills Bros Ltd</p> <p>1 +353 (0)1 4962000 11 www.willsbros.com/naas Co. Dublin, A98 10977 E info@willsbros.com</p> <p>Scale 1:250 @ A1 1:500 @ A2 1:1000 @ A3</p> <p>Created on 18/12/20 Drawn by 03 OF 03</p> <p>Project KERDIFFSTOWN LANDFILL REMEDIATION Title MAIN CONTRACT DRAWINGS EXISTING GAS MANAGEMENT</p> <p>File Identifier MDR1405-RPS-00-XX-DR-C-DG1004 Drawing No. DG1004-03 Status D2 Rev P01</p>
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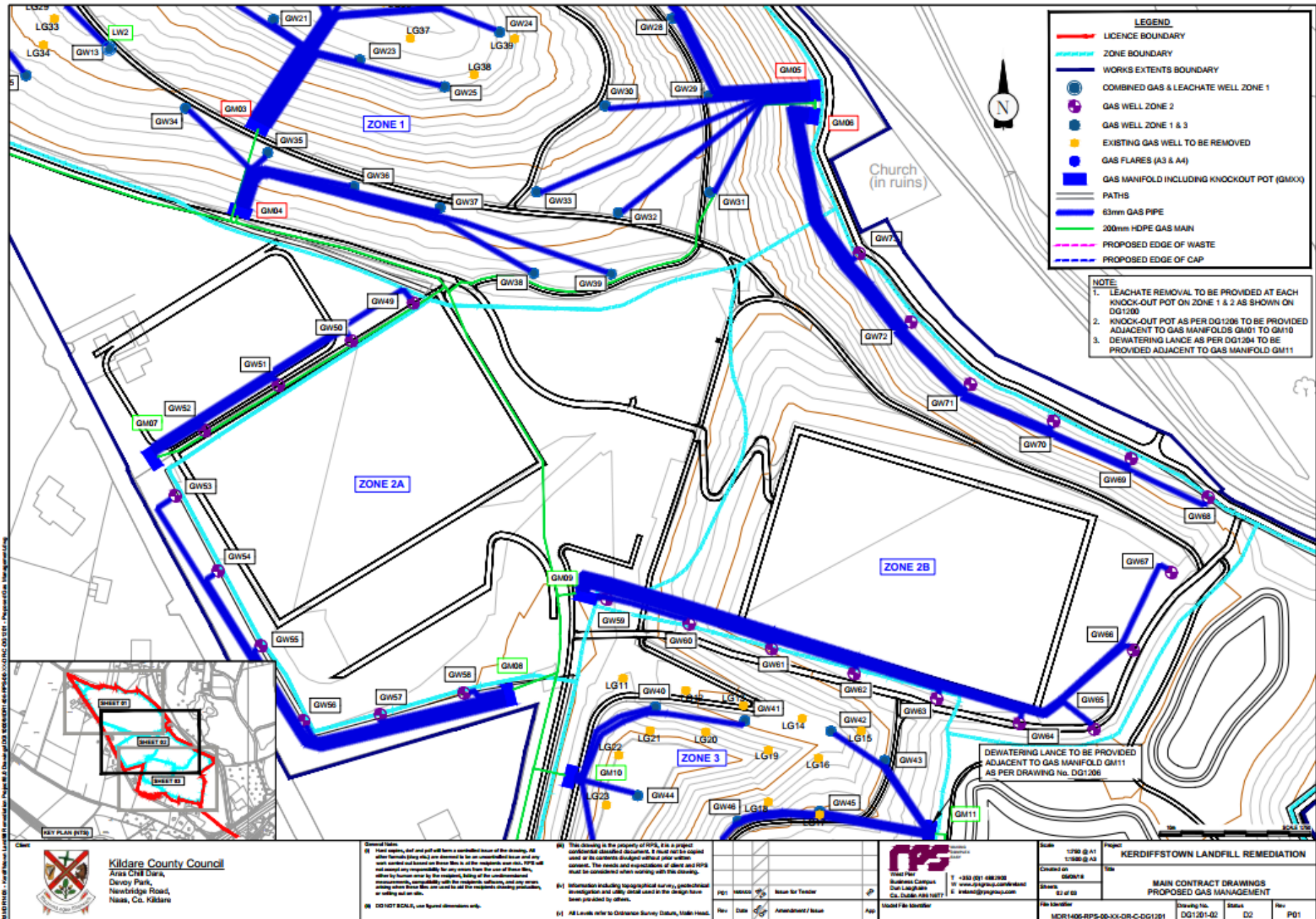
APPENDIX B

PROPOSED LANDFILL GAS MANAGEMENT

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
 Landfill Gas Management Plan
 January - 2021



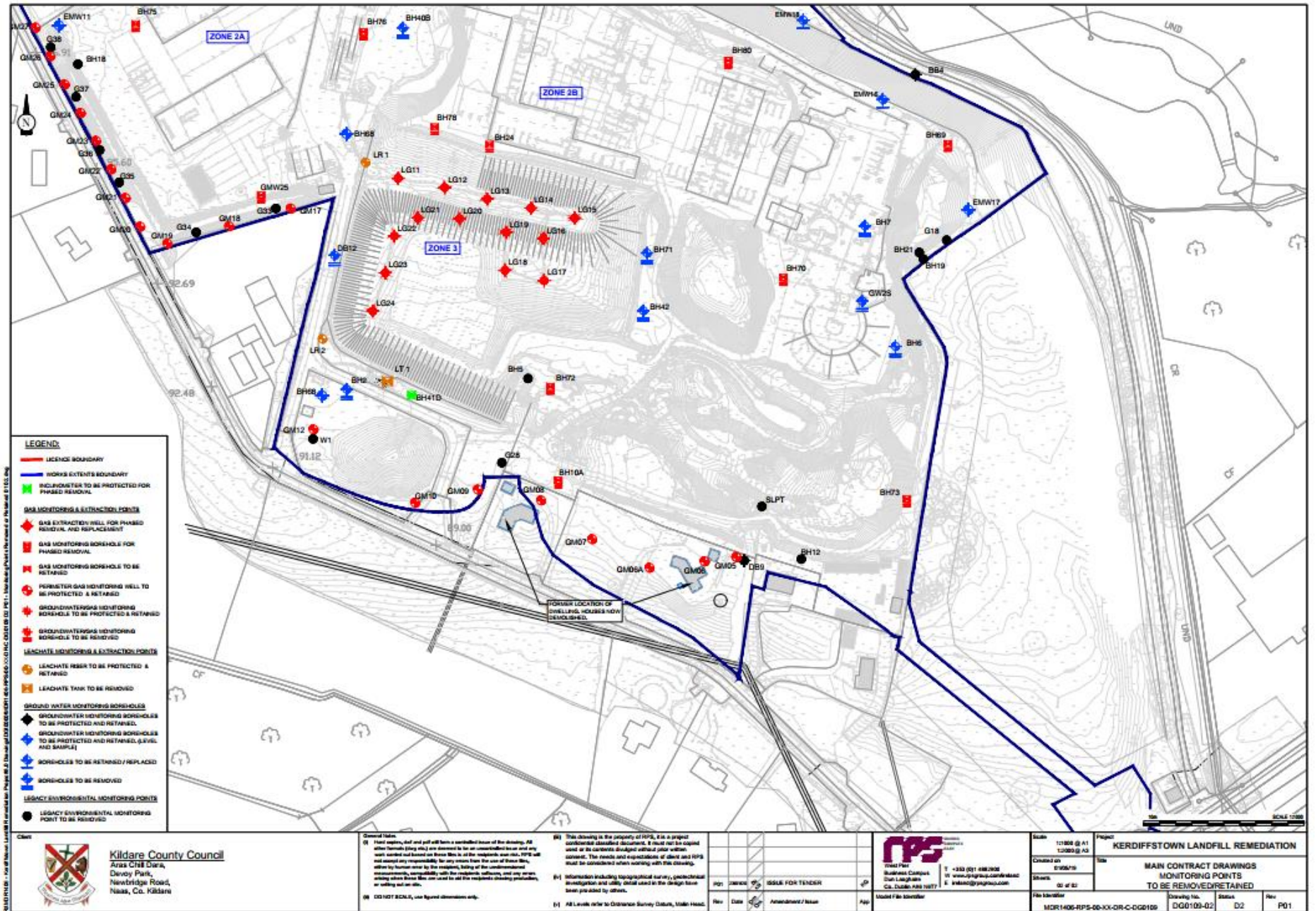
Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
 Landfill Gas Management Plan
 January - 2021



APPENDIX C

GAS MONITORING POINTS TO BE REMOVED/RETAINED

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
 Landfill Gas Management Plan
 January - 2021



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 1:1000 @ A1
 1:2500 @ A3
 01 of 02
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APPENDIX D

PROPOSED LANDFILL GAS MONITORING

Wills Bros Ltd – Kerdiffstown Landfill Remediation Project
 Landfill Gas Management Plan
 January - 2021

