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RED INDUSTRIES LIMITED

WALLEYS QUARRY LANDFILL SITE

ODOUR MANAGEMENT PLAN

JUNE 2019

Prepared for

Red Industries Limited

Prepared by

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Document Review

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1.0	27/07/2018	Anna Cole	Dave Wolstencroft	
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Contents

1.0 INTRODUCTION

This document outlines the system and operational procedures which Red Industries Ltd (the Site Operator) use to prevent and otherwise minimise potential odorous emissions from Walleys Quarry Landfill Site (the Site) in compliance with Environmental Permit EPR/BR9677IT. Condition 3.3 states:

Emissions from the activities shall be free from odour at levels likely to cause pollution outside he site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.

This Plan brings together the existing odour management provisions and serves as a working document to aid (i) decision making on the choice of control methods and operational procedures, in line with current industry best practice and (ii) facilitate the compliance process. The provisions of this Plan aim to ensure that:

- Odour control is integrated into the routine site management;
- Odour is primarily controlled through good housekeeping and operational procedures, and operator competence training;
- The control measures are taken to primarily prevent or, where not reasonably practicable, to reduce emissions to air that can result in odour events outside the Site boundary.

The Plan incorporates the relevant management provisions for landfill gas, leachate and waste relevant to odour, that are already adopted by the site operator, and reflects the industry best practice detailed in the following guidelines:

- IPPC H4: Horizontal Guidance for Odour
- LFTGN 03: Guidance on the management of landfill gas
- LFTGN 04: Guidance for monitoring of trace components of landfill gas
- LFTGN 07: Guidance for monitoring landfill gas surface emissions
- Environment Agency. Guidance for the Landfill Sector S5.02
- Best Practice for odour monitoring and community engagement at landfill sites. Sniffer Research Project ER31, January 2013.

2.0 GENERAL CONSIDERATIONS

Sources of odour

There are three main potential sources of odour associated with permitted landfill waste operations:

1) waste material;
2) landfill gas, and
3) landfill leachate.

The permitted activities at Walleys landfill site are listed in Schedule 1 (Operations) of the Site Permit and include the following operations that have a potential to generate odorous emissions:

- Landfill of non-hazardous and hazardous wastes[1];
- Landfill gas treatment by extraction, flaring or utilisation for energy recovery;
- Temporary storage, biological treatment of leachate and discharge to sewer.

Receptors to odour

The Site is located approximately 1.5km west from Newcastle-under-Lyme and 0.5km east of Silverdale, in Staffordshire. The Site is bounded by mixed agricultural, industrial and residential land uses and contain the following receptors to odour, within 500m radius from the Site:

	Odour Receptor	**Min Distance, m**	**Direction**
1	Silverdale Residential Dwellings 1	300	North
2	Knutton Residential Dwellings along the B5044	110	North
3	Garner's Garden Centre	20	North
4	Knutton St Mary's Primary School	260	North, NE
5	Warehouse/Depot	300	NE
6	Newcastle under Lyme residential areas	230	South, SE
7	Consented Residential Development	30	South, SE
8	Thistleberry Parkway	190	SE
9	Silverdale Holidays Park	30	South
10	Rosemary Wood Cottage	300	South
11	Recreational Grounds	250	SW
12	Silverdale Residential Dwellings 2	260	West
13	Allotments	80	West, SW
14	Cemetery	60	West
15	Silverdale Business Park	60	West
16	Silverdale Housing Estate	90	East
17	Keele Road & Orme Road Housing Estate	270	East

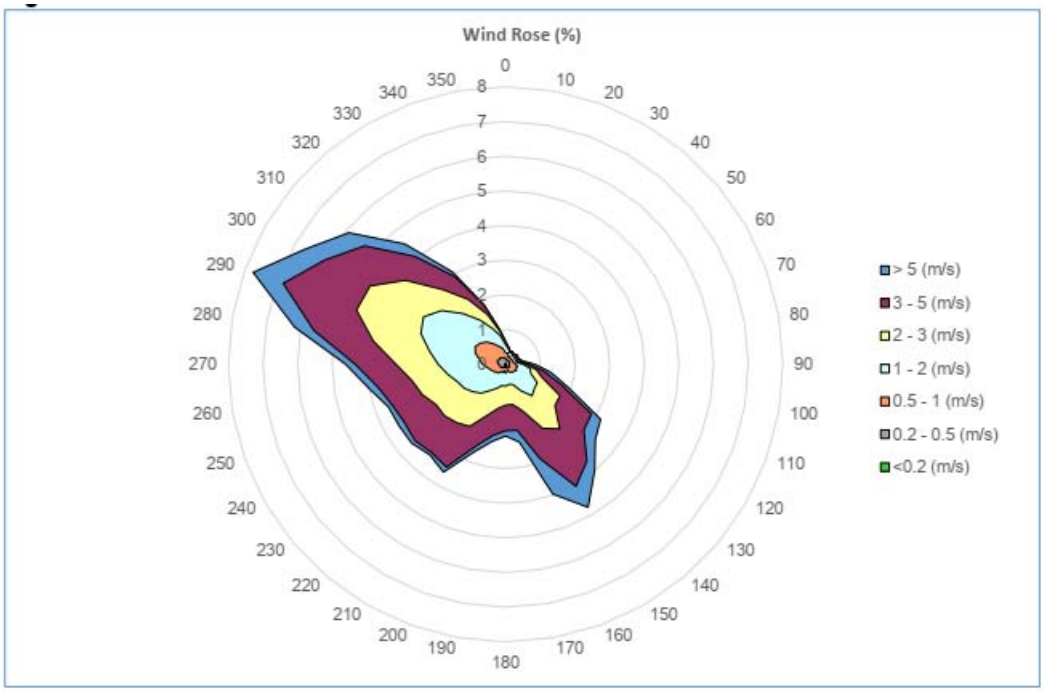
[1] Hazardous wastes are not accepted at the Site for commercial reasons.

	Odour Receptor	Min Distance, m	Direction
18	Industrial Area	220	NW
19	Silverdale Residential Area	400	North
20	Ironbridge Drive Residential Area	450	NE

These receptors are shown on the enclosed plan Walleys Landfill - Odour Sensitive Receptors (Appendix 1).

The other key factor in odour dispersion is the local wind conditions. At Walleys landfill site the prevailing wind directions are from 130-160° degrees (generally south easterly wind) for 16% of the time, and from 230-320° (SW to NW) for about 50% of the time. During about 15% of time there is light or no wind (0-1m/s). For most of the time the wind speed varies between 1ms/ to 5m/s.

The wind rose for July 2017- February 2018 (224 days) is shown below (source Environment Agency, AMU Report AAM/TR/2018/04).



3.0 LANDFILL ODOUR CONTROLS

3.1 Waste Materials

This Plan covers both normal operational activities in relation to waste acceptance and disposal, and those temporary/abnormal activities, that can result in odour emissions.

Waste Acceptance

Waste odour management at the Site is an integral aspect of operational management procedures, which are part of the Operator's Integrated Management System. The management system is externally certified to ISO9001:14001 and OHSAS 18001.

The Operator's adopted procedures for pre-acceptance assessment, receipt and acceptance of waste materials, are outlined below.

- Pre-acceptance assessment. Red/MS/MC009 procedure is followed to assess whether a waste material is suitable to be approved for receipt at the site. The procedure includes checks on the potential odour of the waste and any break-down products that may arise from the waste to cause an odour when landfilled. Inherently malodorous wastes and high sulphate bearing wastes e.g. gypsum, plasterboard etc are not approved for receipt at the facility. The Technical Assessment Team and the Site Manager will liaise with waste producers at the enquiry stage to assess acceptability of the waste at the Site.
- Receipt and Acceptance Verification. Red/MS/MC010 procedure is followed by the Site Manager and Team at the facility to ensure that the waste is conforming on receipt. This involves verification of the characteristics of the load, including its odour potential, both at the weighbridge and the tipping face. Should the delivered waste be found to be in breach with the pre-acceptance criteria, then the Non-conformances and Corrective Actions procedure SYS008 is followed. This may include the rejection of the load, contacting the client for more information to address the non-conformance or other measures deemed appropriate by the Site Manager.

Plant and Equipment

The Site Manager will ensure that sufficient plant and equipment are available at the tipping area to promptly and adequately place, bury, compact and cover all delivered waste.

Compaction of Waste

Suitable plant and equipment is used to cover and compact all waste delivered to the active tip area. The area size reflects operational requirements and is kept to the minimum to reduce the pathway for odorous emissions and minimise ingress of surface water into the waste prior to application of final capping.

Application of Daily and Intermediate Cover

The working area and the flanks will be covered with a layer of cover material (typically soils or fines) by the end of each working day. The daily cover is considered to be effective in controlling odour emissions from the fill. It is used to reduce the exposure of the waste to the elements, improve the stability of waste, minimise the risk of wind-blown litter and discourage vermin.

The Site Manager will ensure that there are adequate supplies of daily cover material available at the Site.

The cover is stored in stockpiles on the site as required. The amount stored is commensurate with the quantity anticipated to be needed based on forecast tonnages. This amount is communicated by the Site Manager to Red's sales team who facilitate delivery.

If in the unlikely event that adequate cover is not available, then site operations would be amended accordingly to reflect the volumes and types of materials being imported and cover available.

The working area will continue to be covered with the next layer of waste the following working day or after a short period of time, only. Where the site operations require that a working area will not be accepting waste for a period of three months or more, intermediate cover will be applied.

Progressive Landfill Capping

Landfill capping is recognised as one of the most effective methods of controlling fugitive emissions of landfill gas incl. odorous trace gases. It is most efficient when applied alongside active gas extraction.

A temporary capping system will be installed in 2019 covering approximately 50% of the active area of the site (this will likely comprise a combination of 1mm LLDPE geomembrane and compacted clay). From then further areas will be temporary capped until such time when areas of the site are ready to be permanently capped on completion of waste tipping in these areas. The completed landfill areas will be capped with an engineered cap (either geomembrane or compacted clay) to achieve full waste containment, prevent gas emissions and rainwater infiltration in the medium to long term.

Avoiding Disturbance to Previously Deposited Waste

Wherever possible, measures will be taken to ensure that previously emplaced waste is not disturbed, exposed or moved. Where such activities are necessary, e.g. during the installation of environmental management infrastructure, the excavated trenches will be covered as soon as practicable or waste will be removed and buried at the earliest opportunity. Any additional odour control

and/or monitoring measures that may be necessary during such operations, will be adopted and notified to the Environment Agency.

3.2 Landfill Gas Management

Landfill gas odour is typically associated with trace components in the gas, such as sulphides and mercaptans. Collection and treatment of the gas is the primary means of destroying trace gases and thus controlling the odour. The relevant operational procedures are outlined below.

The gas extraction system at the Site comprises an extensive abstraction network connected to the gas utilisation plant (combustion engines and back up gas flare). Where operationally practicable, gas abstraction infrastructure is progressively extended across the active tip areas. This includes "sacrificial gas installations" both Pin Wells and Horizontals being considered as an option and installed where necessary and practical. The latest temporary pin wells were installed in May 2019.

Balancing of the entire gas field (wells, manifolds and knockout pots) is currently carried out at fortnightly intervals, with Strategic Monitoring Points (SMPs) (typically manifolds) checks, undertaken daily. Gas wells are balanced to optimise the abstraction efficiency (gas quality and flow rates) for gas utilisation. Any anomalies such as the presence of oxygen in the system, large changes of methane levels etc, are investigated at the time of the balance.

The gas treatment approach is on an engine-led basis, with the capacity of the engines optimised (and new engines added as necessary) to ensure that the maximum sustainable gas flow from the landfill is maintained at all times. The backup gas flare treats the gas when the engine(s) are down for servicing thus ensuring that the level of gas extraction is not affected.

To ensure that the gas treatment system works efficiently, weekly operational performance checks, are undertaken on the gas plant. The gas plant is tested for compliance with the emissions standards set in the site permit for parameters such as total Volatile Organic Compounds.

CLP Envirogas Ltd is the gas management contractor at the Site. The company's management responsibilities are listed in the Landfill Gas Management Plan (Section 3.6). The company operates to a gas well monitoring and balancing protocol for undertaking gas field balancing and operational procedures for servicing the gas plant.

3.3 Leachate Management

Landfill leachate is a liquid produced as a result of infiltration of rainwater and decomposition of the waste. Leachate can emanate an odour due to presence of hydrogen, nitrogen, sulphurs and other chemicals produced in the waste degradation process. Leachate odour varies in strength depending on the

composition and the age of waste and may cause nuisance to those exposed to it.

At Walleys landfill, leachate is extracted and treated on-site before being disposed of into a local sewer. A leachate abstraction network is installed in each cell (9 in total), and leachate wells are raised in line with infilling progress. Leachate wells and pipework are adequately sealed and are connected to the gas abstraction network (where possible) to prevent a potential for fugitive odour release. Regular checks are undertaken by the Site Manager, the approved leachate system maintenance supplier and CLP Envirogas, to ensure that the leachate wells remain sealed and under adequate pressure from the gas abstraction system.

Raw leachate is treated on site via a sequential batch reactor type biological treatment plant. Leachate is pumped directly to the balancing tank which is enclosed and is fitted with a biofilter for air emissions. The treatment process is fully contained and regulated/monitored in terms of process optimisation. There are process control procedures in place to include Spillage Action Plan and Planned Preventative Maintenance Programme.

3.4 Odour Suppression System

The Site maintains an operational odour suppression spray system located along the site boundary. The system is designed to use odour masking or neutralising agents, as airborne odour controllers. The system is deployed on a daily basis to mitigate potential odour emissions from the Site towards local sensitive receptors.

The system runs 24 hours a day and is only off-line when undergoing maintenance/repair. The operation of the system is checked on a daily basis by either the Site Manager or his assistant.

4.0 LANDFILL ODOUR MONITORING

The above described operational measures are routinely inspected and monitored to ensure their effectiveness in minimising odour emissions from the Site. In instances when the outcome of the monitoring and inspection procedures that indicate an odour event, this will trigger the Odour Action Plan (see Section 5 below).

The Site Manager has an overall responsibility for implementation of the Odour Management Plan. In addition, all site operatives are responsible for reporting any significant odours on site immediately to the Site Manager.

4.1 Regular Monitoring

Proactive odour monitoring and inspection is part of the daily site management. Odour checks are carried out as part of waste acceptance procedures and implemented by the site operatives under the coordination of the Site Manager. Odour issues associated with certain waste streams are ascertained before the waste is delivered on site. Further checks are carried out on receipt of waste loads; these procedures are outlined in Section 3.1.

A daily site inspection is carried out under the oversight of the Site Manager, which include the general odour situation on site and performance of the odour suppression system. Operational procedures OPS006A Site Inspection and FRM195 Landfill Check List are followed daily. If odour is identified as an issue, then the Site Manager will instigate actions as part of the Odour Action Plan (Section 5.0). The Site Manager will also carry out weekly odour inspections of the local area.

When inspecting the odour on site, care will be taken regarding detection of hydrogen sulphide (H_2S) odours. The gas is toxic and can paralyse the olfactory nerves rendering the nose unable to detect odour, thus increasing the hazardous potential. All operatives wear H_2S monitors.

In addition, a weekly Sniff Testing Survey will be undertaken by the Site Manager at the site boundary to establish whether any odours are discernible at the perimeter of the Site. The survey methodology is as follows:

1. The surveyor should walk slowly along the site boundary and breath normally. If an odour cannot be detected in this way, the inspector should periodically stand still and inhale deeply facing upwind. No detectable odour is recorder as 1.
2. If odour is detected, the odour intensity should be recorded as 2 (faint) -5 (very strong). If odour is detected while walking, the intensity should be recorded as at least 3.
3. Following an odour survey at the site boundary, a surveyer should continue seeking to trace any observed odour back to the source so that the appropriate remedial measures can be identified. Attention should be paid

to the active tipping area, and places of maintenance and/or engineering works on landfill, gas and leachate management infrastructure. Observations including time, date, weather conditions, odour type, location, intensity, extent and sensitivity will be recorded on the Odour Survey Proforma (Appendix 2). 'Abnormal' site operating conditions at the time of the survey e.g. gas infrastructure installation/maintenance, engine/flare downtime, etc should be also recorded.

Records of all sniff testing surveys will be maintained on site including remedial measures taken.

4.2 Monitoring of Landfill Gas and Leachate Management Infrastructure

Landfill gas quality (bulk and trace gases) are monitored within the in-waste gas and leachate wells in compliance with the Site Permit (Schedule 3, Table S3.10). These include routine monitoring of concentrations of hydrogen sulphide in raw landfill gas and the annual monitoring of trace gases. The results are assessed in terms of permit compliance and to inform if odour action measures are required.

To minimise any fugitive emissions of landfill gas (thus odour) from the gas extraction and leachate management infrastructure, the integrity and efficiency of the infrastructure is monitored on a regular basis in accordance with the site Landfill Gas Management Plan. Any defects identified during routine gas balancing surveys, such as a loss of integrity of pipework, leaky bentonite seals, gas pressure drop etc, are remediated as soon as practicable. CLP Envirogas maintain the records of any required remedial works, timescales and responsibilities for their completion and report them to the Site Manager, who in turn will use this information to apply odour contingency measures and controls (if necessary). A liaison between CLP and the Site Manager will be carried out daily.

The results of the landfill gas (bulk and trace gases) monitoring are reported to the Environment Agency.

4.3 Monitoring of Gas Engines and Flare

Emissions of total VOCs and non-methane VOCs in the combustion gas are required by the Site Permit (Schedule 3 Table S3.2 Point source emissions to air), and the relevant emission limits are set. These aim to ensure a complete combustion of landfill gas and thus low potential for odour emissions.

CLP Envirogas is responsible for undertaking annual engine emission testing, flare emission testing and trace gas testing at the Site. In addition, the company carries out its own assessments of the efficiency of the gas plant at regular intervals to ensure optimal combustion. Results of the combustion emissions monitoring are reported to the Environment Agency.

4.4 Annual Methane Emissions Survey

In accordance with Site Permit Schedule 3 (Table S3.8 Landfill gas surface emissions), methane concentrations are measured across all permanently and temporarily capped areas, and the uncapped areas of the Site. Where the surveys show that surface emissions are elevated, the appropriate remedial measures are carried out as part of its Non-conformances and Corrective Actions Procedure SYS008. Re-testing of the affected area is undertaken following the remediation measures. Results of the surveys are submitted to the Environment Agency.

4.5 Monitoring of Meteorological Conditions

Monitoring of weather conditions on site is pertinent to effective odour control.

The Site benefits from access to the real-time meteorological data provided by the on-site Skylink Pro weather data system. It provides the following data: wind speed and direction, temperature and humidity, barometric pressure, rainfall measurement, dew point. All data is recorded at 30-min intervals and stored on the site computer for management purposes and for record purposes.

The Site Manager will assess this data as part of the daily site management and will use the information to proactively control and minimise odours at source. The relevant control measures (both operational and emergency remedial actions) will be implemented.

4.6 Responsibilities and staff competence

The Site Manager has an overarching responsibility for ensuring effective odour management at the site and odour monitoring, in line with this Odour Management Plan. The Site Manager is also responsible for resolving odour complaints.

The Site Manager will maintain suitable records for the site in order to have a good understanding of the factors such as the site activities, infrastructure, certain areas of the site and waste load types, certain abnormal situations and adverse weather conditions which could lead to an odour event on site and/or result in odour complaints. These records are an invaluable form of evidence of the proactive odour management on site and useful when discussing odour issues with the Regulators and the local community.

The Site Manager will be adept with carrying out odour inspections using sniff testing method (Section 4.1).

All site-based operatives are made aware of the importance of odour reporting and control. Odour matters are discussed at team meetings.

5.0 ODOUR ACTION PLAN

This Odour Action Plan will be actioned in the event of the following odour 'non-conformances' at the Site:

1) Receipt of an odour complaint;
2) In response to routine odour checks and surveys when significant landfill odour is detected;
3) Receipt of odorous waste loads;
4) Engineering works on site which have a potential to generate fugitive emissions of odour, such as well installation/maintenance, waste excavation etc;
5) Abnormal conditions, such as power failure, damage to or failure of the environmental management infrastructure, waste slip, in-waste fire etc accidents or incidents which have a potential to lead to an odour event.

5.1 Odour Complaint Investigation

The following procedures will be followed upon receiving a complaint about odour:

1. Any complaints received will be logged/recorded as received typically via the Environment Agency.
2. Details of the odour complaint (intensity, location, date and time, the name, address and telephone number of the caller (if available) are logged.
3. Odour Investigation.

   The Site Manager will initially undertake a:

   - Review of the waste operations at the Site prior to and at the time of the complaint aimed at determining the potential odour source;
   - Review of the environmental control systems (landfill gas and leachate) operative prior to and at the time of the complaint;
   - Review of the meteorological conditions (wind speed/direction/rainfall data) prior to and at the time of the complaint, to establish whether a pathway can be established between the Site and the complainant;
   - Review the previous history of complaints from that location.

If the Site Manager considers that a source and pathway may be present between the Site and the complainant, the Site Manager will visit the complaint location as soon as practicable to assess odour presence/absence and, if present, odour characteristics and intensity. The sniff testing survey methodology (Section 4.1 of this Plan) will be used to assess odour in ambient air at the receptor location.

The odour complaint will be substantiated (or otherwise) by the Site Manager by undertaking an odour investigation at the complaint location. The investigation will be carried out in the following circumstances:

a) If several complaints received from locations downwind from the Site or during other adverse weather conditions, as demonstrated by meteorological data recorded on the on-site weather station;

b) If the complaint occurred during a period of temporary works, unforeseen event and other abnormal site conditions.

c) The Environment Agency has visited the complaint location and confirmed that the odour exists and is potentially significant.

The Site Manager will use Sniff Test method when undertaking odour complaint investigations. If a complaint were substantiated the NCR procedure would be followed and a full report completed. The Site Manager will also follow Non-conformances and Corrective Actions Procedure SYS008 and will discuss this matter with the Group Technical Operations Director to identify the remedial action(s). The Site Manager will submit the results of the odour investigation to the Environment Agency.

5.2 Remedial Measures

In the event that any of the above odour 'non-conformances' are determined at the Site, the likely odour source(s) will be identified. The corresponding appropriate odour remedial measures will involve one or more of the followings:

Malodorous Waste

- Use waste pre-acceptance and acceptance procedures to identify potentially odorous waste inputs and refusal to accept malodorous waste at the Site;
- Reduce the size of the active tipping area;
- Discuss with the waste producer the possibilities of containing the waste in bags or other receptacles prior to landfill disposal or pre-treatment of the waste prior to acceptance at the landfill;
- Apply odour masking/neutralising sprays pending completion of remedial work.

Waste Excavation/Drilling

- Bury any excavated waste arisings immediately and/or terminate the drilling/excavation operations until favourable conditions prevail (in particular, the wind direction to ensure odour dispersion away from local receptors).
- Apply odour masking/neutralising sprays pending completion of the remedial work.

Inadequate Cover or Capping

- Review waste covering and compaction procedures;
- Additional temporary/daily cover will be applied to the identified area as soon as possible.
- Adequate stock of cover material will be available on site at all times.
- Plan and carry out progressive capping works. If necessary, bring the planned capping works forward to reduce odour potential from the area;
- Apply odour masking/neutralising sprays pending completion of remedial work.

Inadequate Gas Control

- Carry out a comprehensive audit on the gas extraction system to ensure its integrity and effectiveness. This should include a gas survey to assess fugitive gas emissions from the active landfill areas and gas infrastructure.
- Repair and/or replace any malfunctioning infrastructure e.g. gas pipes, wellheads, knock-out pots etc;
- Install additional gas wells to provide a representative area coverage for gas capture;
- Maintain the gas plant within the normal operational parameters at all times;
- Use of a gas flare in addition to the gas engines, if necessary to achieve full suction from the field;
- Apply odour masking/neutralising sprays pending completion of remedial work.

Damage to the Gas Collection System

As mentioned in para 4.2 above, the gas collection system is routinely checked for integrity, oxygen concentration as a sign of ingress of air, drop in methane concentration and/or vacuum pressure, all of which could lead to potential fugitive emissions of the gas from the system.

Damage to the gas system itself will trigger alarm on sensing high oxygen or excess suction. CLP Envirogas engineers are trained to operate and service all installed equipment, and have extensive gas field training and experience. The company holds a considerable stock of gas field equipment to remediate any such damage as soon as practicable.

Gas Engine/Flare Trip

In the event of a gas plant trip such as mains outage, the booster and flare will come on automatically. A gas plant trip will be indicated by an automated telemetry call to the appropriate engineering technician who operate on a 24/7 rota basis. Any extended un-planned loss of gas utilisation plant or electric

supply, CLP Envirogas will supply a standby engine unit and a second flare. Gas plant spares are held on site.

Leachate Wells/Monitoring Points

- Carry out a comprehensive audit on the leachate management system to ensure its integrity and effectiveness;
- Repair and/or replace any malfunctioning infrastructure;
- Consider applying additional suction to leachate wells;
- Any areas of leachate ponding will be removed;
- Apply odour masking/neutralising sprays pending completion of remedial work.

The effectiveness of the above odour remedial measures will be assessed in line with the procedures of the Operator's Quality Management System. The Site Operator holds regular management meetings to discuss current and planned site operations; these address potential nuisance issues including odour situation.

More frequent/detailed odour surveys will be carried during any odour prone site activity or to confirm the effectiveness of the remedial works undertaken.

In the event that it proves impracticable to carry out adequate remedial measures within two working days, the Site Manager will notify and agree with the Environment Agency, the proposed actions and the timetable for their completion.

If an odour survey records a score of 4 or more on two out of the three classification categories (intensity, sensitivity and extent), the Site Manager will investigate the odour in line with the procedure in Section 5.1 and where appropriate, take specific remedial measures to minimise the potential for further odour emissions.

Details of odour 'non-conformances' including subsequent investigations and remedial measures taken, and notifications to the Regulators, will be recorded by the Site Manager, and copies will be maintained in the site office, in compliance with Non-conformances and Corrective Actions Procedure SYS008.

The Odour Action Plan will remain in place for the duration of the conditions and activities which triggered it.

The provisions of the Odour Management Plan will be reviewed annually. As part of the review odour complaints and effectiveness of remedial actions taken, will be assessed. Odour management measures and/or monitoring procedures will be amended if necessary.

6.0 COMMUNICATING ODOUR ISSUES

As mentioned above, the site operator will carry out routine meetings to discuss odour control in relation to on-going site operations. Findings of odour checks, inspections and odour complaints investigation are discussed to learn what operational and remedial actions are most effective in minimising odour emissions from the site.

The site operator maintains regular means of communication with local stakeholders including regulators, councils, residents representatives etc. The scope of the public communication includes the following:

- Quarterly liaison meetings with representatives of the local councils (the liaison group) to update them on operational activities at the site and to discuss control of amenity related issues (incl. odour). The meetings are also used to communicate the information gathered from odour surveys carried out by the site operator, the Regulator and other stakeholders.
- Publish minutes of these meetings on the operator's website
- Notify the Environment Agency of the engineering works on site which have odour potential.
- The Site Manager will carry out face to face meetings with local residents, on request.
- Contact phone numbers are provided on a sign at the site entrance. These are used to report complaints to the EA and to contact the site operator.

APPENDICES

Appendix 1 Walleys Landfill - Odour Sensitive Receptors

Notes

1. OS data provided by Ordnance Survey.
2. Do not scale from this drawing.
3. Any anomalies on this drawing should be brought to the attention of Egniol Environmental Ltd.
4. Key.

Site Boundary.

250m and 500m from site boundary.

Consented residential development site.

Receptor area.

Rev	Modifications	By	Chk	App	Date

Red Industries Ltd.

Walleys Quarry Landfill Site

Odour Sensitive Receptors

Drawn by	Checked by	Approved by
GOJR	AC	AC
Date	Scale @ A3	Revision
27.07.2018	Not To Scale	-

Status: Final

Drawing Number: 7052.GA.D01

ENGINEERING ENVIRONMENTAL HEALTH & SAFETY

egniol

CAD File Ref:M:\CAD Projects\7052 Walleys Quarry Odour Management Plan\Drawings\Current Working Drawings\7052.GA.D01.dwg

Walleys Landfill Site – Local Receptors to Odour

	Odour Receptors	Min Distance, m	Direction
1	Silverdale Residential Dwellings 2	300	North
2	Knutton Residential Dwellings along the B5044	110	North
3	Garner's Garden Centre	20	North
4	Knutton St Mary's Primary School	260	North, NE
5	Warehouse/Depot	300	NE
6	Newcastle under Lyme residential areas	230	South, SE
7	Consented Residential Development Area	30	South, SE
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10	Rosemary Wood Cottage (residential)	300	South
11	Recreational Grounds	250	SW
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15	Silverdale Business Park	60	West
16	Silverdale Housing Estate	60	East
17	Keele Road & Orme Road Housing Estate	270	East
18	Industrial Area	220	NW
19	Silverdale Residential Area	400	North
20	Ironbridge Drive Residential Area	450	NE

Appendix 2 Odour Survey Proforma

Odour Survey Proforma – Walleys Landfill Site

Weather Conditions

Description	Wind Direction	Wind Force[1]	Temperature, Degree C	Atmospheric Pressure mb	Ground Conditions	Stability Air [2]

[1] Referenced to the Beaufort wind scale from 0/1 = calm/light air to 8/9 =gale/strong gale

[2] Referenced to Pasquill stability categories from A = very unstable to F/G = very stable

Reference Point (as per Plan 7052. GA.D01	Date	Time	Character Odour [3]	Intensity[3]	Extent[3]	Sensitivity[3]	Suspected Source	Comments

[3] See attached 'Classification Systems' for additional information

Classification Systems

Meteorological Data

The Beaufort Wind Scale			
Force	**Description**	**Observation**	**m.p.h.**
0	Calm	Smoke rises vertically	0
1	Light air	Smoke drifts in wind direction, wind vanes not moved	1 - 3
2	Light breeze	Wind felt on face, leaves rustle, wind vanes moved	4 - 7
3	Gentle breeze	Leaves and small twigs in constant motion	8 - 12
4	Moderate breeze	Raises dust and paper, small branches are moved	13 - 18
5	Fresh breeze	Small leafy trees swayed, medium branches moved	19 - 24
6	Strong breeze	Large branches moved, umbrellas used with difficulty	25 - 31
7	Near gale	Whole trees moving, walking against wind inconvenient	32 - 38
8	Gale	Twigs break off trees, walking generally impeded	39 - 46
9	Strong gale	Slight structural damage occurs	47 - 54

Assessment of Pasquill Stability Categories					
Surface wind speed	**Sunshine**			**Night Time**	
m.p.h.	Strong	Moderate	Slight	Thickly overcast or >1/2 cloud cover	<3/8 cloud cover
<4.5	A	A-B	B	-	G
4.5 - 6.7	A-B	B	C	E	F
6.7 - 11.2	B	B-C	C	D	E
11.2 - 13.4	C	C-D	D	D	D
>13.4	C	D	D	D	D

Notes
Strong sunshine corresponds to a sunny midday in midsummer
Slight sunshine corresponds to a sunny midday in midwinter
"Night time" is defined as the period one hour before sunset to one hour after dawn
Windspeed should be estimated by reference to the Beaufort scale
Pasquill categories are from A = very unstable to F/G = very stable

Descriptors	**Value**	**Intensity**
A acidic	1	No detectable odour
B acrid	2	Faint odour - need to stand still, face the wind and inhale to detect
C agricultural	3	Moderate odour - detectable when walking & breathing normally
D ammoniacal	4	Strong odour - bearable
E cabbagey	5	Very strong odour - possibly nauseous, wish you were elsewhere
F dustbin		
G eggy/sulpurous	**Value**	**Extent**
H fruity	1	Local and not persistant - detected during brief periods
I landfill gas	2	Impersistant as 1 but detected outside site boundary
J mains gas	3	Persistant but localised
K oily	4	Persistant and pervasive up to 50m away from site boundary
L putrid	5	Persistant and widespread - detected >50m away from site
M pungent		
N rotten	**Value**	**Sensitivity**
O sickly	1	remote - no premises within 500m of odour affected area
P sour	2	low - no premises within 100m of odour affected area
Q sweet	3	moderate - premises within 100m of odour affected area
	4	high - premises within odour affected area
	5	extreme - complaints arising from odour affected area