

Coombefield Quarry

Environmental Permit Application

Landfill Gas Screening Report

Portland Stone Limited

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PSL/B034779/PER/01 - Environmental Permit Boundary

PSL/B034779/REC/01 – Receptor Plan

1.0 INTRODUCTION

1.1 REPORT CONTEXT

- 1.1.1 This document has been prepared by Tetra Tech on behalf of the Operator, Portland Stone Limited (PSL) to support an environmental permit application for Coombefield Quarry (the site) at Southwell Road, Isle of Portland, Dorset, DT5 2EG.
- 1.1.2 PSL are seeking to gain a bespoke environmental permit to allow the operation of an inert landfill and a waste management facility that will include the following:-
- Inert waste recycling facility (including crushing and screening); and
 - Household, Commercial and Industrial (HCI) Waste Transfer Station (including waste electrical and electronic equipment (WEEE)) with treatment via manual sorting and separation (via a picking station), screening (with a vibrating screen separator), the shredding of specific non-hazardous waste streams to produce RDF and the baling of specific waste streams such as cardboard, plastics and RDF.
- 1.1.3 The aim of this document is to assess the potential risk of the inert landfill with regards to gas.
- 1.1.4 The potential source of landfill gas (LFG), potential pathways through the geosphere and atmosphere by which LFG can migrate and the potential receptors are identified.
- 1.1.5 The site will only accept wastes that are currently listed in the Environmental Permit. These waste types are strictly inert as classified under the Landfill Directive (1999/31/EC) and Council Decision (2003/33/EC) of 19th December 2002 'establishing criteria and procedures for the acceptance of waste landfills'.
- 1.1.6 Consequently, a quantitative gas risk assessment (for example using the Environment Agency's (EA) approved GasSim software)) is not considered appropriate and has not been used. However, this qualitative gas risk assessment uses a number of sources of guidance, which include:-
- Environment Agency (2007), 'Potential Gas Production From Landfilling Of Inorganic Wastes', Report reference SC030144/SR, March 2007;
 - Environment Agency (2007), 'Investigation And Quantification Of Gas Produced From Landfilling Of Inorganic Wastes' Report reference P1-516/2b, August 2007; and

- Environment Agency, Landfill Technical Guidance (LFTGN03) 'Guidance on the Management of Landfill Gas', September 2004.
- Environment Agency 'Landfill operators: environmental permits' guidance, February 2022

2.0 SITE DESCRIPTION

2.1 SITE SETTING

- 2.1.1 The site is located approximately 500m north east of Southwell, on the Isle of Portland in Dorset. The site is centred at approximate National Grid Reference (NGR) SY 69107 70631.
- 2.1.2 Access to the site is achieved via an unnamed access road off Southwell Road which is located to the south west of the site. The immediate surroundings of the site largely comprise disused quarry sites including Suckthumb Quarry to the north west, Duncroft Quarry to the south east, Pennsylvania Quarry to the north east and Freshwater Quarry to the south. The nearest residential receptor to the site is located approximately 67m north on Weston Street,
- 2.1.3 A 'Nature and Heritage Conservation Screen' (EPR/LB3202GS/A001) was requested from the EA. The screen determines the presence of any site of nature and heritage conservation, or protected species or habitats that may be impacted by the proposal. A copy of the results is in the Environmental Risk Assessment (ERA) (Appendix C of the Environmental Permit Application).
- 2.1.4 The results of the screen identified the following receptors:-
- Isle of Portland to Studland Cliffs (Special Area of Conservation) located approximately 45m east of the site;
 - Studland to Portland (Special Area of Conservation) located approximately 215m east of the site;
 - Isle of Portland (Site of Special Scientific Interest) located approximately 45m east of the site;
 - Pennsylvania Quarry (Local Wildlife Site) located approximately 60m north east of the site;
 - Deciduous Woodland located approximately 100m west of the site; and
 - Maritime Cliffs and Slopes located approximately 45m east of the site.
- 2.1.5 Further details regarding the environmental setting of the site are provided in the Environmental Setting and Site Design (ESSD) report that has been prepared to support this application. A copy of the ESSD is provided as Appendix D of the Environmental Permit Application.

3.0 CONCEPTUAL LANDFILL GAS MODEL

3.0.1 The source, pathway, receptor approach has been used to derive a conceptual model showing the proposed engineering arrangements and to assess the potential risks of landfill gas from the infilling at the site.

3.1 SOURCE

3.1.1 The main potential source for this gas risk assessment is the is the permanent deposit of waste to land at the site. In accordance with the current environmental permit, the site is only permitted to accept inert waste which is defined in Article 2 of the Landfill Directive 1999/31/EC as follows:-

'Inert waste' means waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. The total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and do not endanger the quality of any surface water and/or groundwater.

3.1.2 Table 1 lists the proposed permitted wastes to be accepted at the site.

Table 1: Permitted Waste Types

EWC Code	Description	Restriction
10	WASTES FROM THERMAL PROCESSES	
10 11	Wastes from manufacture of glass and glass products	
10 11 03	Waste glass-based fibrous materials	Without organic binders
15	WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED	
15 01	Packaging (including separately collected municipal packaging waste)	
15 01 07	Glass packaging	
17	CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)	
17 01	Concrete, bricks, tiles and ceramics	
17 01 01	Concrete	Selected C&D waste only ²
17 01 02	Bricks	Selected C&D waste only ²
17 01 03	Tiles and ceramics	Selected C&D waste only ²
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	Selected C&D waste only ²
17 02	Wood, glass and plastic	
17 02 02	Glass	
17 05	Soil (including excavated soil from contaminated sites), stones and dredging spoil	
17 05 04	Soil and stones other than those mentioned in 17 05 03 ¹	Excluding topsoil, peat; excluding soils and stones from contaminated sites.
19	WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTEWATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE	

19 12	Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified	
19 12 05	Glass	
20	MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	
20 01	Separately collected fractions (except 15 01)	
20 01 02	Glass	Separately collected glass only
20 02	Garden and park wastes (including cemetery waste)	
20 02 02	Soil and stones ¹	Only from garden and parks waste; excluding topsoil, peat.
<p>¹ For the purposes of waste acceptance, soil includes naturally occurring sands and clay.</p> <p>² Selected construction and demolition (C&D) waste only, with low contents of other types of materials (like metals, plastics, organics, wood, rubber, etc.). The origin of the waste must be known. There must be:</p> <ul style="list-style-type: none"> • No C&D waste from buildings, polluted with inorganic or organic dangerous substances, e.g. because of production processes in the construction, soil pollution, storage and usage of pesticides or other dangerous substances, etc, unless it is made clear that the demolished building was not significantly polluted; and • No C&D waste from buildings treated, covered or painted with materials, containing dangerous substances in significant amounts. 		

3.1.3 Landfill gas is produced by the biological degradation of organic components. Microbial processes degrade organic matter in the absence of oxygen and produce methane and carbon dioxide. In terms of landfill gas generation at the site, no organic matter will be present and it is therefore considered that the inert waste materials deposited at the site will not give rise to significant quantities of landfill gas. The potential for the generation of landfill gas is therefore considered to be negligible.

3.1.4 The site will have strict waste acceptance procedures in place to ensure that only inert wastes are accepted at the site. This will minimise the risk of acceptance of non-conforming wastes, such as biodegradable wastes, which would have the potential to cause the generation of landfill gas.

3.1.5 Taking into account the above, it is considered unlikely that there will be any source of significant landfill gas generation at the site.

3.2 PATHWAYS

3.2.1 A number of potential pathways exist which would provide a link between the sensitive receptors and landfill gas generated within the landfill site. The EA's guidance document LFTGN03 entitled 'Guidance on the Management of Landfill Gas' (September 2004) identifies the following generic potential pathways:-

- Direct release to atmosphere;
- Sub-surface migration, through the ground or along service ducts or pipelines;

- Indirect release to atmosphere e.g. from sub-surface landfill gas migration; and
- Direct release of combustion products to atmosphere e.g. from flares/engines.

3.2.2 It is considered that the primary pathway for landfill gas generated within the site would be vertically to atmosphere through unrestored areas of waste. Pathways that are considered to be less preferential would be vertically through the restored areas of the site or laterally through the boundary engineering.

3.2.3 The EA's Report 'Investigation and Quantification of Gas Produced from Landfilling of Inorganic Wastes' (August 2007) considers the potential for landfill gas to migrate from an inorganic or low carbon landfill site. The report acknowledges that inorganic waste does not generate substantial quantities of landfill gas, and that there will generally be an insufficient pressure differential to drive the landfill gas through low permeability waste. Thus, as there will be only inert wastes accepted and deposited, it is considered that there will be an insufficient driving pressure for the gas to create a viable pathway.

3.2.4 Furthermore, the waste will be deposited within a site, which has an engineered clay side slope liner (geological barrier) with a hydraulic permeability of less than $1 \times 10^{-7} \text{m/s}$. On completion of filling to final levels, the site will be capped with 1m of restoration soils comprising not less than 0.3m of topsoil. In accordance with the requirements of the Landfill Directive, an engineered cap (clay or plastic) is not required.

3.3 RECEPTORS

3.3.1 Technical Guidance Note LFTGN03 details the process of prioritising receptors which is a qualitative process based on consideration of the estimated impact, the sensitivity of the receptor and the likelihood of exposure.

3.3.2 The details of all receptors within 1km of the site are summarised in Table 2 below and are shown on Drawing Number PSL/B034779/REC/01.

Table 2: Location of Potential Receptors within 1km of the Site

ID	Receptor	Direction from Operational Area	Minimum Distance from the Permit Application Boundary (approx. m)
Domestic Dwellings			
1	Properties on Weston Street	N	67
2	Properties on Southwell Road	E	190
3	Properties in Southwell	S	250
4	Properties on Thumb Lane	NW	324
5	Properties on Weston Road	NW	540
6	Properties in Easton	N	671

7	Properties in Weston	NW	660
8	Properties in Wakeham	NE	645
Commercial and Industrial Premises			
9	Commercial properties in Southwell	S	265
10	Commercial properties on Pennsylvania Road	NE	280
11	Commercial and Industrial properties on Wakeham	NE	450
12	Commercial properties on Weston Road	NW	735
13	Sweet Hill Farm Wild Camping	S	906
14	Industrial units in Southwell Business Park	SW	920
15	Industrial units and commercial properties In Easton	N	670
Schools / Hospitals / Shops/Amenities			
16	Portland's first parish church, St Andrews Church	NE	440
17	Tesco Superstore	N	690
18	St Georges Primary School	NE	740
19	All Saints Church	N	923
20	Atlantic Academy Portland	SW	955
Designated ecological habitats e.g. RAMSAR, SAC, SPA, SSSI			
21	Isle of Portland SSSI	E	45
22	Studland to Portland SAC	E	45
23	Pennsylvania Quarry Local Wildlife Site	E	80
24	Portland Marine SAC (Marine Components GB)	E	180
25	Isle of Portland to Studland Cliffs SAC	NE	510
Priority Habitats			
26	Maritime Cliffs and Slopes (Protected Habitat)	E	45
26	Deciduous Woodland (Protected Habitat)	W	100
27	Lowland Calcareous Grassland	E	115
Highways or Minor Roads			
28	Easton Street (A354)	N	977
Groundwater (sensitivity)			
According to the Multi-Agency Geographic Information for the Countryside's (MAGIC) website, the site is situated in a High Vulnerability Groundwater Source Protection Zone (GSPZ). In terms of aquifers, the MAGIC website indicates that the site is in both a Principal Aquifer and a Secondary A Aquifer (Bedrock).			

4.0 LANDFILL GAS ASSESSMENT

- 4.0.1 Technical Guidance Note LFTGN03 provides guidance on the level of risk assessment that is considered appropriate for different types of sites and states that Tier 1 Hazard Identification and Risk Screening should be sufficient to deal with most of the risks from inert sites. However, this is also dependent on the level of risk and uncertainty specific to the site.
- 4.0.2 The infilling at the site is predicted to generate negligible quantities of landfill gas due to the inert nature of the waste accepted and deposited at the site. Furthermore, the site's detailed waste acceptance procedures and Environmental Management Plan will ensure that only inert waste is deposited at the site, thus removing any uncertainty with respect to the potential for the deposition of non-inert wastes.
- 4.0.3 Taking these factors into consideration, it is concluded that the overall level of risk associated with the site is low. A qualitative risk assessment is therefore considered appropriate in order to determine the level of risk from landfill gas at the site.

4.1 ACCIDENTS AND THEIR CONSEQUENCES

4.1.1 Technical Guidance Note LFTGN03 requires a number of accident and failure scenarios to be assessed in order to quantify the impact of given events. The reliability of landfill gas control measures and site engineering should be assessed in the risk assessment and the main hazards that could lead to accidental emissions should be identified. The guidance provides examples of general categories of accidents that may potentially affect landfill gas control:-

- Loss of containment e.g. leakage, liner failure, spillage;
- Loss of collection and/or treatment capability e.g. failure of pipework, control system, etc;
- Explosions and fires e.g. deep seated landfill fire; and
- Failure of leachate extraction system and the effect on landfill gas extraction.

4.1.2 These scenarios have been assessed as part of the gas risk screening process.

4.2 QUALITATIVE LANDFILL GAS RISK ASSESSMENT

4.2.1 The potential hazards that exist from landfill gas are:

- Toxicity (acute and chronic);
- Ecotoxicity;

- Fire and explosion;
- Asphyxiation; and
- Odour.

4.2.2 The trace components of landfill gas pose an odour and toxicity risk whilst the bulk gases pose a risk of explosion and asphyxiation, although carbon dioxide is also toxic and should be considered in the assessment of toxicity. Explosion and asphyxiation risk is generally related to sub-surface migration and accumulations in enclosed spaces, such as residential or commercial properties, or underground services. Technical Guidance Note LFTGN03 states that whilst this is more difficult to quantify, for the risk screening stage, the impact assessment should be based on:-

- The presence of potential pathways and site specific receptors; and
- A qualitative assessment of the severity of the consequences.

4.2.3 The qualitative assessment for each receptor is provided in Table 3.

Table 3: Qualitative Risk Assessment

Receptor	Hazard	Sensitivity of Receptor	Likelihood of Exposure
Occupiers of domestic dwellings and farmhouses listed in Table 2.	Odour, toxicity, asphyxiation	High	Very Unlikely
Workforce and customers in commercial and industrial properties listed in Table 2.	Odour, toxicity, asphyxiation	High	Very Unlikely
Priority Habitats, Local Wildlife Sites, Designated Sites and agricultural land listed in Table 2.	Eco-toxicity	Low	Very Unlikely

4.2.4 Table 4 details the qualitative risk assessment which has been undertaken for the accident and failure scenarios using the risk assessment process and scoring system set out within the Technical Guidance Note LFTGN03. Table 5 provides a justification of the 'likelihood' scores for each of the accident or failure scenarios set out in Table 4.

Table 4: Qualitative Risk Assessment for Accident and Failure Scenarios

Accident/Failure Scenario	Likelihood	Severity of Consequence	Score	Magnitude of Risk
Loss of containment (e.g. leakage, spillage)	Extremely unlikely (1)	Minor (1)	1	Insignificant
Explosions and fires	Very unlikely (2)	Significant (3)	6	Insignificant

Biodegradable Waste Input	Unlikely (3)	Significant (3)	9	Acceptable
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Table 5: Justification for assigned ‘likelihood’ scores

Accident/Failure Scenario	Justification for ‘likelihood’ score
Loss of containment (e.g. leakage, liner failure, spillage)	The site will be engineered to a high standard and the landfill containment system will be subject to Construction Quality Assurance (CQA) supervision and testing. It is therefore extremely unlikely that the containment system will fail or leak.
Explosions and fires	The proposed waste types are inert in nature and therefore will not be combustible or explosive. Waste acceptance procedures will ensure that potentially flammable or explosive materials are not accepted at the site.
Biodegradable Waste Input	<p>The proposed waste types are inert in nature. However, all wastes entering the site will be subject to detailed waste acceptance procedures. Wastes will only be accepted onto the site if they comply with the list of wastes included in the permit. Basic characterisation will ensure that the waste is suitable for acceptance at the regulated facility however if there is uncertainty regarding the acceptance of wastes at the site, testing may be required.</p> <p>No wastes will be accepted onto the site if there is uncertainty as to its source, conformance with the conditions in the permit and/or its suitability for the intended use. Consequently, it is considered unlikely that biodegradable waste will be accepted at the site.</p>

- 4.2.5 The results of the qualitative risk assessment show that the most significant accident /failure scenario is the acceptance of biodegradable waste into the landfill site which would arise from a failure in the operator’s waste acceptance procedures.
- 4.2.6 As set out in the Operating Techniques (Appendix B of the Environmental Permit Application), there will be strict waste acceptance procedures in place to minimise the risk of non-compliant wastes being accepted. All site staff will be made aware of the procedures and the requirements of the company Environmental Management System. Furthermore, the Operating Techniques details the measures to be taken in the event that unauthorised waste is identified within a load.
- 4.2.7 As such, is it considered unlikely that biodegradable waste will be deposited within the site.

5.0 GAS MANAGEMENT AND MONITORING

5.1 GAS MANAGEMENT

5.1.1 The risk assessment in Section 4 concludes that negligible quantities of landfill gas are predicted to be generated from the site. As such, it's considered that active gas management is not required for the site.

5.2 GAS MONITORING

5.2.1 According to the EA's 'Landfill Operators: Environmental Permits' guidance, monitoring data for background gases is only required for landfills that propose to accept hazardous and non-hazardous waste. In terms of inert landfills, the guidance does not indicate that monitoring for background gases is required however, the guidance notes that monitoring must commence once operations commence.

5.2.2 At present, background gas is not monitored at the site. However, in accordance with the aforementioned guidance, in-waste landfill gas monitoring infrastructure will be installed within each completed phase of filling. These monitoring points will also be monitored in accordance with the monitoring programme detailed in Table 6.

Table 6: Monitoring Programme

Parameter	Monitoring Frequency
Methane, carbon dioxide, oxygen, meteorological data, atmospheric pressure, differential pressure, temperature.	Quarterly

5.3 COMPLIANCE LEVELS

5.3.1 Compliance Levels will be set for each borehole following the completion of 12 months background monitoring. Limits will be set based on guidance set out in the Technical Guidance Note LFTGN03 and Industry Code of Practice for Perimeter Soil Gas Emissions.

5.3.2 This Landfill Gas Risk Screening Report has demonstrated that the potential for high concentrations of landfill gas is low. However, an appropriate Action Plan is required in the unlikely event that Action Levels set for each borehole are exceeded. Action Levels have been set at a level which enables the site management to take timely and appropriate action, so that Compliance Levels are not exceeded. Further actions are however documented, in the event that both Action Levels and Compliance Levels are exceeded. These actions are detailed in the Environmental Management & Monitoring Plan (Appendix H of

the Environmental Permit Application).

6.0 CONCLUSION

- 6.0.1 The proposed waste types will be inert in nature and will not give rise to significant quantities of landfill gas. The negligible quantities of landfill gas generated are unlikely to be under significant pressure which will minimise the likelihood of gas migration. Furthermore, the site will be engineered with a low permeability clay side slope and basal liner, which will further reduce the risk of lateral gas migration. The risk to nearby sensitive receptors associated with the generation and migration of landfill gas is therefore considered to be low.
- 6.0.2 Detailed waste acceptance criteria will be used to ensure that only inert wastes are accepted at the site. This will prevent unauthorised wastes being accepted. The absence of biodegradable material within the landfill site shall ensure that significant quantities of landfill gas are not produced within the site from waste and the risk to receptors remains low. Furthermore, this shall ensure that odour nuisance, vegetation stress and global atmospheric damage are also avoided.
- 6.0.3 This Landfill Gas Screening Report has determined that the site will not give rise to significant quantities of landfill gas due to the inert nature of the proposed waste types. The site will be engineered in accordance with the requirements of the Landfill Directive 1999/31/EC. It is considered that, with respect to landfill gas, the site will be compliant with the requirements of the Landfill Directive.

DRAWINGS

PSL/B034779/PER/01 - Environmental Permit Boundary

PSL/B034779/REC/01 – Receptor Plan