

# Consultation on our draft decision document recording our decision-making process

## This is a change

The Permit Number is:	<b>EPR/DP3734DC</b>
The Variation Number is:	<b>EPR/DP3734DC/V003</b>
The Operator is:	<b>Walleys Quarry Ltd</b>
The Installation is located at:	<b>Walleys Quarry Landfill Cemetery Road Silverdale Newcastle under Lyme Staffordshire ST5 6DH</b>
Draft decision consultation commences on:	<b>21/02/2022</b>
Draft decision consultation ends on:	<b>21/03/2022</b>

## Environment Agency permitting decisions

### What this document is about

This is a draft decision document, which accompanies a draft variation and consolidation notice.

It explains how we have considered the Operator's application, and why we have included the specific conditions in the draft variation and consolidation notice we are proposing to grant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Operator's proposals.

We try to explain our draft decision as accurately, comprehensively, and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

This draft decision document relates purely to the Application we have received and is limited to addressing the changes proposed in that. Any further action that may be required to address other issues in relation to the site will be addressed separately.

## Preliminary information and use of terms

We gave the application the reference number EPR/DP3734DC/V003. We refer to the application as “the **Application**” in this document in order to be consistent.

The Application was duly made on 29 October 2020.

The Operator is Walleys Quarry Ltd. We refer to Walleys Quarry Ltd as “the **Operator**” in this document.

The facility is located at Cemetery Road, Silverdale, Newcastle under Lyme, Staffordshire, ST5 6DH. We refer to this as “the **Installation**” in this document.

## Purpose of this document

This draft decision document:

- explains how the Application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- justifies the specific conditions in the draft consolidated Permit other than those in our generic permit template.

Unless the draft decision document specifies otherwise, we have accepted the Operator’s proposals.

## Structure of this document

Glossary of acronyms used in this document  
Our proposed draft decision and legal framework  
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How we reached our draft decision  
Key issues of the draft decision  
Other decision considerations  
Benefit of the variation

DRAFT

## Glossary of acronyms used in this document

CQA	Construction Quality Assurance
DAA	Directly Associated Activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision Document
FoS	Factor of Safety – describing the structural capacity of a system beyond the expected loads or actual loads
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) as amended
IED	Industrial Emissions Directive (2010/75/EU)
LFD	Landfill Directive (1999/31/EC)
LLDPE	Linear low-density polyethylene
MRF	Materials Recycling Facility
PPS	Public participation statement

## **Our proposed draft decision and legal framework**

We are minded to grant the variation to the Operator. We have accepted the Operator's proposal to use a geosynthetic capping system, and changes to perimeter gas monitoring limits and requirements.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the variation will ensure that a high level of protection is provided for the environment and human health.

The variation will be granted, under Regulation 20 of the Environmental Permitting (England & Wales) Regulations 2016. A variation may comprise a consolidated permit reflecting the variations and a notice specifying the variations included in that consolidated permit (schedule 5, part 1, paragraph 19).

## **Background to the Application**

### **The Installation – description and related issues**

#### **The permitted activities**

The Installation is subject to the Permitting Regulations because it carries out activities listed in Part 2 of Schedule 1 of those regulations, namely:

- Section 5.2 Part A(1) (a), the disposal of waste in a landfill for non-hazardous waste with a separate landfill cell for stable non-reactive hazardous, gypsum-based or other high sulphate bearing and asbestos waste.
- Section 5.4, Part A(1)(a)(i), biological treatment of non-hazardous waste. Treatment of leachate in a facility with a capacity of >50 tonnes/ day.

The Operator receives more than 10 tonnes of waste per day and treats more than 50 tonnes of leachate per day at the Installation, so falls within the activities mentioned above.

An installation may also comprise “directly associated activities (DAAs)” which at this Installation include:-

- Pre-treatment and utilisation of landfill gas for energy recovery in an appliance with a rated thermal input < 50MW.
- Flaring of landfill gas for disposal in an appliance.
- Discharging of surface water run-off and pumped groundwater to Silverdale Brook.
- Storage of fuel for operation of plant and equipment.
- Discharge of leachate from the installation
- Temporary storage of waste (leachate)
- Recovery of waste for restoration

Together, these listed and directly associated activities comprise the Installation. The changes made as a result of this Application are limited and do not change the way the Installation operates.

## **The site location and surroundings**

Walleys Quarry Landfill (hereafter referred to as the 'Site') is located in Silverdale, Newcastle under Lyme, Staffordshire, approximately centred at National Grid Reference SJ 831460.

The Operator does not seek to increase the footprint of its landfilling waste activity at the site, nor wishes to increase the total landfill void capacity. Therefore, there is no need to revise the site plan for this Application. The site plan is included in Schedule 7 to the Permit, and the Operator is required to carry out the permitted activities within the Installation boundary.

The potentially sensitive receptors in the area surrounding the Installation are:

- over 20 commercial and residential properties within 500m of the Installation boundary; and
- two RAMSAR Sites within 10km of the Installation boundary; and
- twelve other nature conservation sites within 2km such as an Ancient Woodland, Local Nature Reserve and Local Wildlife Sites (LWS).

## What the Installation does and site design

The Operator owns and operates Walleys Quarry Landfill. The landfill site has been accepting waste since 2007 and the permit was transferred to Red Industries RM Ltd on 3 November 2016. The company name was changed to Walleys Quarry Ltd on 14 May 2021.

The Installation is permitted to accept a variety of non-hazardous wastes, such as Materials Recycling Facility (MRF) residual waste, commercial, industrial and inert waste materials. The Operator is also permitted to accept stable non-reactive hazardous waste for example wastes from the physico-chemical treatment of wastes and wastes in the form of asbestos containing material and gypsum, provided this is deposited in a separate cell. No such hazardous waste can currently be accepted at the Installation as there is no engineered separate cell required to deposit this type of waste.

The site is a former clay quarry and covers an area of approximately 23.5 hectares. The site is divided into four distinct areas called cells which are engineered to contain the waste infill. Engineering work for landfill operations commenced in 2006 and waste was first accepted in Cell 1 in January 2007. Since then, the waste disposal operations have continued progressively in Cells 1, 2 and 3 with Cell 4 becoming operational in 2011. To date waste placement has taken place in all cells to varying depths. Areas of Cell 1 that have achieved final levels have been permanently capped with LLDPE geomembrane. Temporary capping has been placed over parts of Cell 2.

The engineered lining system in the basal sections of Cells 1 to 4 comprise of 3m of engineered clay with a hydraulic conductivity of  $1 \times 10^{-10} \text{m/s}$  to  $8.9 \times 10^{-11} \text{m/s}$  based on Construction Quality Assurance (CQA) reports for Cells 1 to 4. The sidewall construction of each cell comprises 1m engineered clay liner with a maximum permeability of  $1 \times 10^{-9} \text{m/s}$ . Each cell has a leachate collection and extraction system comprising of a 300mm gravel drainage blanket together with collection pipework, however some leachate collection and monitoring wells have been lost and need to be replaced. Under the clay lining system, there is a groundwater drainage system, which collects groundwater flowing to the landfill by finger drains leading to the basal sump from which water is pumped out to the surface water management system. On the side slopes the drains are located specifically where there are permeable sandstone strata in the subgrade. During landfilling operations groundwater pressures are thus controlled on the sidewall and basal lining systems. Groundwater levels are maintained below 79 mAOD which is 1m below the elevation of the top of the lowest part of the basal liner, and the input of water from groundwater to the landfill is minimised. When the landfill is closed, groundwater management will cease. Groundwater levels will then rise to approximately 117 mAOD, forming an inward hydraulic gradient relative to leachate levels which will be maintained at a level below groundwater by extraction from leachate wells in the waste. Groundwater levels and leachate levels are monitored at borehole locations in and around the landfill.

The landfilling base is around 85mAOD and the final site restoration height will be approximately 145mAOD, this is approximately 20m above existing ground level.

As of September 2021, approximately 1,512,640 m<sup>3</sup> of the initial 3,803,400 m<sup>3</sup> waste void remains unfilled.

The annual waste inputs at this site are a maximum of 400,000 tonnes.

## **How we reached our draft decision**

### **The proposed changes**

The Application proposed the following changes to the permit:

- Increase in leachate level limits to 14 m above the cell base in Cells 1-4;
- Removal of CO<sub>2</sub> compliance limits in perimeter gas monitoring boreholes and application of borehole specific action levels; and increase of methane compliance limit in borehole BH17D;
- Inclusion of use of geosynthetic capping system;
- Suspension of monitoring requirements in leachate chambers within Cell 1 until the re-drilling can be facilitated; and
- Addition of a 4<sup>th</sup> gas engine.

### **Receipt of Application**

The Application was received on 7 July 2020; however, we required further information from the Operator in order for us to consider the Application duly made. This information was requested on 9 October 2020. The Operator submitted additional information in response to our request on 22 October and 29 October 2020. The additional information was deemed sufficient to enable us to duly make the Application.

This means we considered it was in the correct form and contained sufficient information for us to begin our determination; but not that it necessarily contained all the information we would need to complete that determination.

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it, therefore we issued requests for further information. A full list of all the information requested and received (including prior to duly making the Application) is set out in Table 1 'Summary of the requests for further information' below.



<b>Table 1 Summary of requests for further information</b>		
<b>Description</b>	<b>Date</b>	<b>Comments</b>
Not Duly Made Request for Further Information sent 09/10/2020	Information received 22/10/2020 and 29/10/2020	Responses received relating to Environmental Setting and Installation Design (ESID), Hydrogeological Risk Assessment (HRA) and monitoring boreholes and data including receipt of the following documents: Site Layout Plan ECL.6246.D02.001 Electronic copies of raw monitoring data and graphical plots Electronic copies of Landsim files and hydraulic containment spreadsheet Annual Environmental Monitoring Report, 2019 review period, Doc ref. 5883.R03.001, January 2020 Groundwater borehole logs and construction details
Schedule 5 Notice requesting further information issued 03/03/2021	Information received 13/04/2021	Additional information received relating to Hydrogeological Risk Assessment (HRA), leachate management plan, Stability Risk Assessment (SRA), perimeter gas monitoring, gas engine and noise risk assessment including receipt of the following documents: Letter of 13 April 2021, ref 7745/Red/DAW295-21 SRAR Letter of 9 April 2021, ref 00733/200625 Document DQRA (HRA)v2 Response to EA Schedule 5 Questions, April 21-1.0 Revised Hydrogeological Risk Assessment, Final Report v2, Report fc37217-1, April 2021 Noise Assessment Report Ref. R21.11050/1/AP, 24 March 2021 Stability Risk Assessment for Geosynthetic Capping, March 2021, Report date 9 <sup>th</sup> April 2021, Document Ref. 00733/200625/RSW r2 Annual Monitoring Report, Appendix 2, Landfill Gas in Perimeter Monitoring Points Electronic copies of Landsim files Hydraulic containment models ICoP CO <sub>2</sub> Assessment ICoP CH <sub>4</sub> Assessment
Additional information requested 30/04/2021	Information received 26/05/2021	Submission of updated Noise Assessment, R21.11050/2/AP, dated 18 May 2021, and associated data files.

<b>Table 1 Summary of requests for further information</b>		
<b>Description</b>	<b>Date</b>	<b>Comments</b>
Additional information requested 04/05/2021	Information received 06/05/2021 and 23/06/2021	Submission of Q1 Monitoring Report, Ref.5883, dated 28 April 2021, with associated data. Submission of groundwater analysis results.
Additional information requested 27/05/2021	Information received 03/06/2021	Submission of Stability Risk Assessment Report for Geosynthetic Capping, Interface Testing Results Addendum, May 2021.
Additional information requested 09/06/2021	Information received 02/07/2021	Further information in relation to the methane and carbon dioxide limits.
Additional information requested 10/06/2021	Information received 02/07/2021	Further information in relation to groundwater drainage system beneath the sidewall lining system including a submission of groundwater drainage plan.
Additional information requested 11/06/2021	Information received 02/07/2021	Submission of updated Stability Risk Assessment for Geosynthetic Capping, Rev 3, April 2021 and Stability Risk Assessment Report for Geosynthetic Capping, Interface Testing Results Addendum, Rev 1, May 2021.
Additional information requested 03/09/2021	Information received 24/01/2022	Submission of updated Landfill Gas Management Plan: Walleys Quarry Landfill, Landfill Gas Management Plan, 21 January 2022 and associated plans.

## Consultation

We did not carry out consultation on the Application. This was in accordance with the Environmental Permitting (England and Wales) Regulations (2016) and our public participation statement (PPS). We consult the public and relevant organisations on proposed changes to bespoke permits for installations that, in our opinion, may have significant negative effects on humans or the environment. We did not consider that applied to this Application. We have discretion to consult in other cases.

We initially considered that this Application would not be of high interest to the public as the changes were technical in nature and they did not pose a significant risk to humans or the environment. However, subsequent developments at the site meant that we reviewed our position and notwithstanding the limited nature of the changes, considered the public would be interested in the Application. As a result, we have decided to consult on our draft decision.

## **Amendments to the Application after submission**

The original Application was to increase leachate level limits, make changes to perimeter gas compliance limits, and allow use of geosynthetic capping system at Walleys Quarry Landfill, as submitted on 7 July 2020. The Application was subsequently amended to include the addition of a 4<sup>th</sup> gas engine and suspension of monitoring requirements within leachate chambers in Cell 1 on 15 January 2021. We accepted the proposed amendment to the Application since we did not consider the changes were significant, they did not affect the variation type and we had not commenced our full technical review of the Application.

The Application was also amended on 17 August 2021 by removal of the following aspects from the Application;

- Increase in leachate level limits to 14 m above the cell base and suspension of monitoring requirements in leachate chambers within Cell 1; and
- Addition of a 4<sup>th</sup> gas engine.

We have accepted the Operator's request and determined the remaining aspects of the Application. These are the inclusion of use of geosynthetic capping system and changes to perimeter gas monitoring requirements.

## **Key issues of the draft decision**

### **Inclusion of geosynthetic capping system**

The Operator proposed as part of their Application to use a geosynthetic capping system (an engineered impermeable 1mm geomembrane) in place of or in combination with, the currently approved one meter compacted clay cap. The Operator later confirmed that the use of geosynthetic capping was to replace the clay cap.

The Operator planned to carry out capping using the geosynthetic cap in March/April 2021. It was not possible to determine the Application in time for the planned start of capping works.

We considered that capping as quickly as possible would assist the site to manage the landfill gas in the immediate future, which in turn would prevent fugitive odour emissions. On this basis, we granted a Local Enforcement Position to allow the Operator to cap a specific part of the site using the geosynthetic capping material prior to completion of the determination of the Application.

Prior to commencement of any capping works, landfill operators are required to submit a Construction Quality Assurance (CQA) Plan for our approval. The CQA Plan sets out a comprehensive set of checks, tests and procedures to be followed throughout the capping works. It details the cap specification and installation method. The works are undertaken under the full-time supervision of an independent third-party engineer who ensures that the correct methods are employed and correct tests are undertaken. We

have assessed the CQA Plan that the Operator submitted to us prior to commencing capping with the geosynthetic material. We are satisfied with the plan and that it conforms to current industry best practice.

In support of the Application for the use of a geosynthetic capping system the Operator submitted relevant risk assessments (Stability Risk Assessment (SRA) and Hydrogeological Risk Assessment (HRA)) to demonstrate that the capping system would be stable and remain intact and would not increase the risk of pollution. We have carried out a detailed review of these risk assessments to ensure that they take into account all relevant aspects, and that they reflect the actual capping system already installed, and the capping proposed for future cells. Our assessment and findings are detailed below.

## **Stability Risk Assessment (SRA)**

The Operator submitted a SRA (Stability Risk Assessment Report for Geosynthetic Capping, July 2020) in which they assessed the stability of the proposed geosynthetic capping system.

The Operator concluded that the proposed geosynthetic capping system is considered to be stable provided that the final soil profile is made shallower than currently proposed and that site specific interface shear testing is undertaken to determine the shear strength of the surfaces between the materials in the capping system where they are in contact. These are called the interface shear strengths. The capping system currently being constructed consists of a soil regulating layer on which a 1mm thick LLDPE geomembrane is placed. Then cover soils are placed on top of this. The interfaces to be tested are between the regulating layer and the textured 1mm LLDPE geomembrane, and between the cover soils and the textured 1mm LLDPE geomembrane.

Based on our review of the Operator's original SRA, we required further clarifications. Therefore, via issue of a Schedule 5 Notice, we required the Operator to provide the following additional information:

- Actual specifications of the components of the landfill infrastructure that had been constructed by referring to the information in CQA validation reports;
- The types of waste placed in each cell, and to take account of this in the waste parameters in the SRA, for example in the settlement calculations;
- Clarification and confirmation of whether or not strains in the basal and side slope lining system were taken into account in assessing the factors of safety (FoS) for the proposed capping system, and if not a revision to the SRA was required;
- Clarification of the proposed capping design where the two capping systems (clay and geomembrane) would be joined in the southwest of the landfill, and associated modelling, and assessment of the stability and integrity at this junction;
- Clarification and confirmation of the values for each of the geological and geosynthetic parameters in the capping system so that these represented the

conservative mean for each parameter and represented the range of properties that geological and geosynthetic materials display;

- Clarification on how the interface properties for the two surfaces had been derived in the model paying particular attention to the residual strengths, since they were higher than we would have expected;
- Explanation on how the model used to simulate conditions accounts for plasticity, and secondary settlement due to, for example, waste degradation;
- Assessment of the effects of the groundwater drainage system beneath the sidewall lining system on the capping system;
- Assessment of the effects of differential settlement on capping stability, and on tension in the capping system components and its integrity; and
- Assessment of the stability of the capping system due to construction traffic loading and landfill gas pressure on the underside of the cap.

The Operator submitted an updated SRA (Stability Risk Assessment Report for Geosynthetic Capping, Revision 2, April 2021) to address the above issues and a covering letter (Ref: 00733/200625, dated 09/04/2021) to summarise how the items had been addressed in the updated SRA.

We reassessed the updated SRA in order to ascertain that the Operator had adequately addressed each item.

The revised SRA confirmed that there is no Stable Non-Reactive Hazardous Waste cell, and all waste types are non-hazardous and modelled as such. Different properties are assumed related to the period of time waste has laid in the landfill. The covering letter confirmed that there will not be a clay cap in any part of the landfill, and it will all be geosynthetic. The SRA had been revised to reflect this. We are satisfied with these responses.

However, the revised SRA presented three options for the geosynthetic capping system components. It was not clear to us which one had been selected as the proposed design for Cell 1 and going forward.

The covering letter indicated that the worst case of slope (steepest and longest) had been selected to derive the minimum interface strengths which is the minimum shear strength of surfaces between the materials in the capping system where they are in contact, however, it was not clear to us how these results had been used to determine the actual capping system that had been placed on Cell 1.

As a part of the CQA process for the capping of Cell 1 the Operator had prepared a SRA addendum report (Stability Risk Assessment Report for Geosynthetic Capping, Interface Testing Results Addendum, May 2021) which included interface testing results using installed material parameters for the capping works at the site. The Operator submitted this report to us in order to clarify which modelled scenario reflected the actual capping in Cell 1. The information within the addendum report confirmed to our

satisfaction that the updated SRA modelling is of Capping System 1 which had been used for Cell 1.

The Operator also confirmed that the Capping Systems 2 and 3 are options for future capping. We do not have concerns over these options provided the cover material quality remains closely aligned to that used for Cell 1, and any deviation is supported with some additional stability calculations including site specific interface testing during the CQA validation as stated in the recommendations of the addendum report. Capping Systems 2 and 3 can only be installed once we have approved the additional stability calculations.

The updated SRA and the addendum report also provided satisfactory responses to our questions about geotechnical parameters associated with the materials used and their interface properties. They also explained how the model simulates conditions that account for plasticity and secondary settlement. The results of the geomembrane integrity analysis were presented. The updated SRA also accounted for construction plant loadings and gas pressures on the capping stability.

Regarding the possible effect of artesian groundwater in the underdrainage system at the cap edge, the Operator stated this assessment had not been undertaken, and no other explanation was given.

We requested the Operator to provide further explanation for their response given that at the edges of the capping system the presence of groundwater in the drainage system is an important consideration in the overall capping slope stability. We explained that if this aspect was not considered as a risk to the capping stability, they needed to provide an explanation, including any relevant engineering drawings.

The Operator responded explaining that the proposed geosynthetic capping system ties in by anchor trench to the top of the engineered low permeability sidewall liner. Therefore, the groundwater drainage system is separated from the capping system by an engineered low permeability barrier together with any additional cohesive fill required to achieve the 1:3 slope for the sidewall liner. Based on this additional information we are satisfied that the Operator has demonstrated that the groundwater drainage system does not sit beneath the capping system at its edges. It also does not reach a height anywhere near that of the anchor trench for the capping system to have an impact should it experience any artesian pressures.

Having assessed all the information submitted to us we are satisfied with the proposed cap design and details, and that its stability and integrity will not be affected by the various stresses and strains it will be subject to and that it will provide a satisfactory means of preventing fugitive emissions from the surface of the landfill.

The Operator is required to install the cap in accordance with one of the three options proposed. However, only the Capping System 1 has been fully approved, use of the Capping Systems 2 and 3 will require further stability calculations during the CQA validation stage in accordance with the Operator's proposal. This is required to demonstrate that equivalent protection is provided.

To ensure that the Operator will install the Capping System 1 in accordance with our approval and will provide the required further stability calculations for Capping Systems

2 and 3 in the future, we have incorporated Revision 3 of the SRA (Stability Risk Assessment Report For Geosynthetic Capping, Rev 3, April 2021) and Revision 1 of the addendum report (Stability Risk Assessment Report For Geosynthetic Capping, Interface Testing Results Addendum, Rev 1, May 2021) in table S1.2 Operating Techniques of the permit. These are the latest approved versions that correct some minor errors to the model sections and landfill phasing.

## **Hydrogeological Risk Assessment (HRA)**

The Operator submitted a HRA (Revised Hydrogeological Risk Assessment Report, June 2020) in which they assessed the potential risk to groundwater and surface water from the temporary and long-term increase in leachate levels, use of geosynthetic liner on the upper side walls and use of geosynthetic cap.

In line with our guidance, the Operator used LandSim modelling to assess the risks to groundwater whilst the groundwater abstraction system is in place. Our Hydraulic Containment spreadsheet model (v.1.0) was used to model the risk to groundwater arising after groundwater extraction has ceased and hydraulic containment achieved.

This section of the draft decision document covers only the HRA aspects that relate to the use of geosynthetic cap as the other aspects of the HRA are no longer included in the Application.

The Operator concluded that from a perspective of risk to groundwater there is no increased risk when a geosynthetic cap is used in place of a 1m clay cap. Modelling the cap as 1m clay cap or a geosynthetic cap do not make a difference to the modelling results or conclusions.

Based on our review of the Operator's HRA, we agree with the Operator's conclusions and are satisfied that a geosynthetic cap can replace the current permitted 1m clay cap with no adverse effect on groundwater quality. There is no increase in generation of leachate as a result of the use of geosynthetic cap as we are satisfied that it provides at least equivalent or better protection from rainwater ingress. Timely construction of the capping system will reduce infiltration by rainfall, thereby further reducing the quantity of leachate produced. Furthermore, importantly the installation of capping will prevent fugitive gas emissions and odour.

In the long term, as with all landfills, the Operator is required to review the water balance for the landfill in the Hydrogeological Risk Assessment review every 6 years which is submitted to the Environment Agency for approval.

## **Removal of CO<sub>2</sub> compliance limits and the setting of borehole specific CO<sub>2</sub> action levels in gas perimeter boreholes, and increase of the CH<sub>4</sub> compliance limit in gas perimeter borehole BH17D**

The Operator proposed as part of their Application the following changes in relation to methane and carbon dioxide limits in the perimeter gas monitoring boreholes (table S3.5 in the permit):

- Increase the methane compliance limit in borehole BH17D from 1.0%v/v to 6.7%v/v; and
- Remove the 7%v/v carbon dioxide compliance limit from the boreholes BH03D, BH04S, BH05S, BH05M, BH05D, BH16S, BH17S, BH17D, BH18S, BH19S, BH20S, BH22D, BH23S and apply borehole specific action levels.

All other compliance limits in the remaining boreholes were to remain unchanged.

The Operator justified these changes by providing information about potential alternative methane and carbon dioxide sources and recorded background gas levels. The Operator carried out statistical analysis of the monitoring dataset in accordance with the Industry Code of Practice on Perimeter Soil Gas (ICoP) to derive appropriate borehole specific action levels. The ICoP presents best available approach to establishing background methane and carbon dioxide concentrations on a borehole-by-borehole basis. With this approach an action level is set at a point when management reactions are required because exceedance may mean an operational loss of gas control. A predefined action plan is instigated. However, at this stage when the data have not been confirmed or investigated, and there is no risk, the Environment Agency does not need to be informed. A higher compliance limit is also set which should not be exceeded. Taking action if an action level is reached should prevent the compliance level being breached.

Borehole-specific action levels relating to methane and carbon dioxide concentrations will be used to determine whether a landfill is performing as designed. They are levels that are intended to draw attention of site management to the development of adverse, or unexpected, trends in the monitoring data. While such trends could result from a failure of the site's engineering or management systems, early identification and assessment of such variations could simply reflect natural variation between actual conditions and those assumed within the site's conceptual model. Therefore, the action level is treated primarily as an early warning system to enable appropriate investigative or corrective measures to be implemented, particularly where there is potential for a compliance limit to be breached. The action level will not be included in the perimeter gas monitoring table of the permit but it is required as an integral part of a site's gas management plan which is incorporated to the permit. So, an operator is required to take appropriate action if an action level is reached.

Methane concentrations below the action level indicate that the performance of the site's gas containment system and gas collection system is good with respect to subsurface migration. An exceedance of an action level will mean to the operator that some gas might have been lost. The consequence of this will be an investigation into factors such as trends in monitoring data, gas field balance, weather, and performance of gas engines.



The action level should allow for naturally occurring variation in methane concentrations from baseline conditions; and give sufficient time to take corrective or remedial action before regulatory risk levels (compliance limits) are breached.

The removal of carbon dioxide compliance limits is standard across the landfill sector. Carbon dioxide is now recognised as being an unreliable indicator of gas migration due to its widespread occurrence in the subsurface as a result of a number of natural processes. However, carbon dioxide data must continue to be collected and assessed against an action level because it provides some useful information on the overall performance of the site. It informs the conceptual model and processes such as potential methane oxidation. The Environment Agency can still regulate carbon dioxide through the gas management plan if, for example, the operator did not react when carbon dioxide concentrations exceeded an action level.

We have carried out a detailed review of the Operator's ICoP assessment and supporting information to ensure that they take into account all relevant aspects and follow the requirements of ICoP. Our assessment and findings are detailed below.

### **Methane (CH<sub>4</sub>) limit in BH17D**

Based on the information submitted in the Application, Walleys Quarry Landfill lies in an area of historic coal mining (the North Staffordshire Coalfield) which may provide an alternative methane source. Also, elevated methane levels were recorded in BH17D prior to the commencement of waste disposal at the site, suggesting that a non-landfill source is present. Furthermore, the current methane limit of 1%v/v is regularly breached in BH17D but the levels detected are consistent with 'pre-tipping' levels and therefore unlikely to be indicative of subsurface landfill gas migration.

The Operator provided gas monitoring data for the period 15/04/2008 to 16/10/2019 in support of the Application. The data set shows that elevated methane has been periodically detected in BH17D since August 2008. The 2008-2019 data set also shows that methane is not present in the borehole on a continuous basis and there are significant periods when no methane is present. Monitoring data from Quarter 1 & Quarter 2 of 2020 shows no methane present in the borehole during this monitoring period.

The Operator carried out statistical analysis of the 2008-2019 monitoring dataset in accordance with the Industry Code of Practice on Perimeter Soil Gas (ICoP). The maximum methane concentration recorded in the dataset was 6.2%v/v. Statistical analysis identified that the value of 6.2%v/v is not an outlier and therefore represents the highest numerical value of standardised dataset (Tmax value).

We acknowledge the location of Walleys Quarry Landfill within the area of the North Staffordshire Coalfield. Historical maps of the site show that part of the site was occupied by the former Millbank Colliery and a number of old shafts are shown in the northeast corner of the site in proximity to borehole BH17D. Given the number of historical mine workings in the area, there is a localised geological baseline of ground gas at borehole BH17D.

The Operator stated in the Application that the presence of methane in BH17D predates waste disposal operations at the site. Waste disposal operations are known to have

commenced in Cell 1 in 2007 therefore gas data from 2008 does not pre-date the commencement of waste disposal operations. However, the construction of Cell 3 – adjacent to borehole BH17D – was not completed until October 2008 so it is apparent to us that methane was present in BH17D prior to waste disposal operations commencing in the adjacent cell.

We also note that the first detection of methane in BH17D – in August 2008 – coincides with the engineering works in Cell 3. Engineering works are known to affect pre-existing ground gas regimes – possibly by blocking existing emission pathways. A rise in methane and/or carbon dioxide concentrations in perimeter boreholes in landfills generally is commonly observed as a result of such works.

The proposed methane compliance limit of 6.7%v/v exceeds the lower explosive limit (LEL) of 5%v/v. There are sensitive residential receptors to the east of the site that could potentially be at risk from subsurface gas migration. If sensitive receptors are potentially at risk, it is prudent to impose an action level that is below the LEL even if elevated background concentrations are present.

The borehole BH17D lies within sandstone of the Etruria formation. It is separated from the Salop formation to the east by the Apedale fault. The Apedale fault essentially follows the eastern boundary of the landfill. The Salop Formation to the east of the Apedale Fault comprises a sequence of mudstone and discontinuous sandstone beds that dip at approximately 20 degrees to the south-west in the vicinity of the Walleys Quarry Landfill Site.

Any continuous sandstone bed that outcropped at the surface (123mAOD) below the nearest properties (Barnacle Place) would dip to approximately 85mAOD at its intersection with the Apedale Fault. (Note: No significant sandstone outcrop is shown on the geological sheet). 85mAOD corresponds with the base level of Cell 3, so a pathway is plausible.

The Etruria Formation west of the Apedale Fault comprises a series of mudstones and lenticular sandstones. The strata dips to the west south-west at approximately 10 degrees. It is possible that the more permeable sandstone layers of the Etruria and Salop formations could abut each other across the Apedale Fault creating a potential pathway.

The Apedale Fault itself is a significant fault with a downthrow of approximately 500m to the east of the fault. The fault was partially reactivated in 1963 as a result of mining subsidence, causing damage to a road and pavement at a new housing estate in Knutton (approximately 700-750m north of the landfill). It is likely that the fault acts as a barrier to horizontal migration by creating a vertical pathway but this cannot be guaranteed.

The housing estate to the east of the site does not sit directly on the Salop Formation as the area is overlain by glacial till. Glacial till is often of low permeability but there is insufficient information available on local till thickness to determine whether the till would create an effective barrier to gas movement.

Taking all the above information into account we conclude that there is a potential (although unlikely) migration pathway between the landfill site and the residential properties to the east.

We are satisfied that there is sufficient evidence to conclude that the methane levels detected in BH17D are influenced by external gas sources and therefore have no objection to the proposal in principle to increase the methane compliance limit; the limit having been derived in accordance with the Industry Code of Practice on Perimeter Soil Gas (ICoP).

However, given that the proposed compliance limit (6.7%v/v) exceeds the lower explosive limit of 5%v/v and that there is the potential for a gas migration pathway to exist between the strata penetrated by the borehole BH17D and the nearest residential properties at Barnacle Place, a precautionary approach must be taken. This means that a lower action level needs to be set within the Landfill Gas Management Plan which is below the lower explosive limit. This action level is the point when management actions are required in accordance with the action plan set in the Gas Management Plan. This ensures that action is initiated at the first signs of a possible gas migration event. The Operator's Gas Management Plan confirms that in the event of an exceedance of the action level in borehole BH17D, the Operator will immediately start investigating the reason and nature of the action level breach. Relative gas pressure will be monitored in the affected borehole and long-term monitoring data reviewed, and the risks associated with the breach assessed. A review of the gas control system will be carried out and immediate measures to remediate any problems identified. If the gas control system has failed, the failure of gas extraction system action plan will be instigated. Sudden changes in leachate will also be reviewed and pumping increased, if required. Whilst the investigation is underway, the borehole will be monitored weekly until the gas readings are below the action level and increased gas suction will be applied to wells in the vicinity of the affected borehole.

A mean methane concentration of 1.21%v/v was calculated for the dataset used to determine the Tmax value with a standard deviation of 1.59. An action level based on the mean + 2 standard deviations give a value of 4.4%v/v. This is below the lower explosive limit and therefore we are satisfied that it provides a reasonable safeguard.

We have also decided the compliance limit be set lower than proposed at 6.2% v/v as the further analysis of the data set showed the data to be unstable. With unstable datasets the ICoP states that the Tmax value (6.2%v/v) should be used for compliance purposes. A limit of 6.7%v/v based on the Tmax (background) value of 6.2% + 0.5% would only be appropriate for stable datasets.

The Operator agreed to the action level of 4.4%v/v and the compliance limit of 6.2%v/v for the borehole BH17D. The Operator updated the Gas Management Plan to reflect these changes. The Landfill Gas Management Plan, V6, dated 21/01/2022 that includes the approved action level, and the compliance limit has been incorporated to the permit in table S1.2 Operating Techniques, and the compliance limit imposed in table S3.5 of the permit.

## **Carbon dioxide (CO<sub>2</sub>) compliance limits**

The Operator justified the removal of carbon dioxide compliance limit of 7%v/v by stating that the boreholes are likely to be affected by mine gas due to the presence of coal measures strata and abandoned mine workings. The CO<sub>2</sub> compliance limit of 7%v/v is currently set for all boreholes. This limit has been breached in a number of boreholes on a periodic basis. The Operator stated that current limits do not take account of the

variability in background levels between boreholes. Furthermore, the presence of alternative gas sources makes CO<sub>2</sub> concentrations unreliable for the purpose of assessing compliance.

The Operator carried out statistical analysis on monitoring data covering the period January 2018-October 2019 to determine appropriate action levels based on T-max values in accordance with the Industry Code of Practice on Perimeter Soil Gas (ICoP).

The data used for the purpose of statistical analysis only covers the 22 month period between January 2018 and October 2019. Ideally background data (i.e. pre-waste disposal data) should be used for the determination of baseline levels and the establishment of action levels. However, there is nothing in the data to lead to a conclusion that the CO<sub>2</sub> levels observed in the perimeter boreholes are the result of landfill gas migration from the site rather than natural background. We therefore have no objection to the data range used for determining the borehole specific action levels.

Tmax values have been calculated from the dataset in accordance with the methodology set out in our R&D document P1-471 'Techniques for the Interpretation of Landfill Monitoring Data'. We therefore have no objection to the CO<sub>2</sub> action levels that have been derived for the perimeter boreholes.

We have noted that for the majority of boreholes, the derived action levels are lower than the current compliance limit of 7%v/v. The Operator only appeared to have requested to remove the compliance limits on those boreholes that regularly exceed the 7%v/v compliance limit. This is an unusual application of the Industry Code of Practice on Perimeter Soil Gas, as it is more typical to remove CO<sub>2</sub> compliance limits entirely and set borehole specific action levels for all boreholes. In accordance with ICoP, carbon dioxide is not used for regulating the sub-surface strata outside a landfill. However, carbon dioxide data should continue to be collected and assessed against an action level because it informs the conceptual model and processes such as potential methane oxidation.

It was, however, not entirely clear to us what the Operator was requesting as there was some confusion in the submitted Gas Management Plan between compliance limits and action levels. Therefore, we requested the Operator to clarify whether they proposed to remove the CO<sub>2</sub> compliance limits entirely and replace them with borehole specific action levels, and whether the boreholes 201S and 201D are to be removed from the monitoring schedule.

The Operator responded confirming that the Application seeks to adopt borehole specific action levels for CO<sub>2</sub> where the Industry Code of Practice assessment showed that Tmax exceed the current compliance limit of 7%v/v. The majority of the monitoring points can still be assessed using the compliance limit and therefore these boreholes should continue to be assessed using the current CO<sub>2</sub> limit of 7%v/v. We have accepted this and only removed the compliance limit for CO<sub>2</sub> for the boreholes BH03D, BH04S, BH05S, BH05M, BH05D, BH16S, BH17S, BH17D, BH18S, BH19S, BH20S, BH22D and BH23S which exceed the current compliance limit of 7% v/v - in table S3.5 of the permit.

The Operator also confirmed that the boreholes 201S and 201D have been reinstated after the Application was submitted and that these monitoring points have been monitored since March 2021. However, given the fact that no data was collected from these

monitoring locations during a period of several years, the Operator cannot propose any borehole specific action levels but will adopt for the time being the site general limits of 1%v/v for methane and 7%v/v for carbon dioxide. We are satisfied with this and have incorporated these boreholes and the proposed limits to Table S3.5 of the permit.

## **Other decision consideration**

### **Financial provision**

This facility is required to have financial provision. It is not appropriate to reassess the financial provision as part of this variation because the changes proposed by this variation will have no material impact on the value of the current financial provision.

### **Growth duty**

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit variation.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

## **Benefit of the variation**

### **Geosynthetic capping system**

Whilst clay is a widely used and acceptable means of capping, geosynthetic caps are effective in controlling landfill gas emissions and the use of a geomembrane rather than clay for a capping system is often a better alternative. The geosynthetic cap is more able to cope with the differential settlements encountered as the waste mass settles, thereby reducing the potential for uncontrolled emissions. The geomembrane panels will be welded together to afford a gas tight seal that has long-term proven effectiveness. The geomembrane can also be welded to the landfill gas extraction pipework to create an airtight seal in the potentially vulnerable location where the wells protrude the

surface of the landfill. Geomembrane is practically impermeable therefore it is better able to contain the landfill gas and reduce rainwater infiltration thereby minimising leachate generation which is an additional benefit. Capping with geomembranes often allows a greater area to be capped in a shorter space of time for the purposes of increasing gas capture.

The risk assessments submitted in support of the Application have demonstrated that the geosynthetic capping system will be stable and remain intact, and its use does not cause adverse effect on groundwater quality. The use of geosynthetic capping provides a satisfactory means of preventing fugitive emissions from the surface of the landfill. The issue of the variation will regularise the capping that has already been installed under a Local Enforcement Position and ensure that the future capping is carried out in accordance with the varied permit.

## **Perimeter gas monitoring**

The variation clarifies the compliance position with regard to the occasional methane detections in borehole BH17D. An action level is set at the point that ensures that action is initiated at the first signs of a possible gas migration event. The action level is treated as an early warning system to enable appropriate investigative or corrective measures to be implemented before there is potential for a compliance limit to be breached. This will prevent unnecessary action being instigated whilst retaining a high degree of confidence that any significant landfill gas migration will be identifiable and can be acted upon.

The removal of carbon dioxide compliance limits is standard across the landfill sector. Carbon dioxide is now recognised as being an unreliable indicator of gas migration due to its widespread occurrence in the subsurface as a result of a number of natural processes, and therefore it is not recommended to be used for regulating subsurface monitoring data outside a landfill. However, assessment of carbon dioxide monitoring data against action level is required for each borehole which will inform the conceptual model and processes such as potential methane oxidation. Removal of some carbon dioxide compliance limits therefore presents a low risk to the environment and human health and allows for compliance activities to be targeted against substances that provide a more reliable indication of gas migration.

This variation does not change any of the gas monitoring parameters or frequency of the monitoring, and the changes have no negative impact on site's odour potential or risk of fugitive emissions.