Berry Hill Bioresource Centre (BC)
Site ID: 13018

Odour Management Plan

(Version 3)

No changes or modifications are to be made to this Odour Management Plan without informing the Regional Process Scientist (Odour Management Co-ordinator).

Relevant Documentation:

ENVS120 15: Odour Policy.
TRTWG669: Odour impact and odour risk assessment procedure for existing WRCs/STC/SPS, proposed new expansion/development of a site and potential encroachment around/near a site.

Contents

1. Document Control

Document Control Ref:	Version 3
Document Location:	TRTWP525
Document Custodian:	Site Manager/ Regional Scientist/Odour Management Co-ordinator
Review Period:	This OMP will be reviewed and updated at a minimum annually.

Version	Date	Revised By	Reviewed By	Amendment Details
1	31/10/23	Jim Humphries	Dan Selby and Antony Saunders (Stantec)	First version

2. Introduction

This site specific odour management plan (OMP) has been produced to comply with the environmental permit and covers the Berry Hill BC site.

The OMP has been written using the following documents for guidance.

Environment Agency: Additional guidance for H4 Odour Management; How to comply with your environmental permit (March 2011).

Environment Agency: Appropriate measures for the biological treatment of waste

The Institute of Air Quality Management (IAQM): Guidance on the assessment of odour for planning (2018).

2.1. Environmental Permitting

Berry Hill BC is subject to Environmental Permitting Regulations. This is regulated by the Environment Agency.

The following documents should be consulted in relation to Environmental Permitting in Wessex Water;

ENVS 120/7: Environmental Permit Plan
EPP001: Environmental Permit Procedure

Where the regulated facility has an environmental permit to treat organic waste the following documents must be consulted:

- Appropriate measures for the biological treatment of waste:
- Additional guidance for H4 Odour Management; How to comply with your environmental permit (March 2011). Environment Agency.

"The provisions of the OMP are treated as part of your permit and must be complied with. H4 informs that the effectiveness of the odour control measures should be reviewed once a year".

Detailed in the H4 guidance an OMP should:

- *Employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution*
- *Prevent unacceptable odour pollution at all times; and*
- *Reduce the risk of odour releasing incidents or accidents by anticipating them and planning accordingly.*

2.2. Statutory Nuisance

"A statutory nuisance is defined as a premises which are deemed to be detrimental to health or a nuisance, or are emitting dust, steam, smells, effluvia or noise with this effect. Every Local authority has to inspect the area it covers to check for statutory nuisances, if a complaint of statutory nuisance is made by a resident then the local authority must investigate. If a statutory nuisance is deemed to exist, then a notice will be served requiring the abatement of the nuisance and this notice shall include a list of steps that should be taken to reduce the nuisance."

Under the statutory nuisance regime there is a defence available in the event of either an appeal against an abatement notice, or prosecution for having contravened, or failed to comply with, an abatement notice, for statutory nuisance on industrial, trade or business premises, of having used "best practicable means" to abate the nuisance.

The interpretation of "best practicable means" is described at section 79(9) of the Environmental Protection Act 1990:

a) "practicable" means reasonably practicably having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications:
b) the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures:
c) the test is to apply only so far as compatible with any duty imposed by law;
d) the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances:

From webpage Gov.UK Guidance: Nuisance smells; how councils deal with complaints.

"Councils must look into complaints about smells from industrial, trade and business premises that could be a 'statutory nuisance' (covered by the Environmental Protection Act 1990).

The Environment Agency (EA) controls some potential smell nuisances with environmental permits as part of pollution control.

Councils need to work closely with EA to make sure that people aren't penalised twice for the same activity. If a facility has an environmental permit councils must get the Secretary of State's permission before prosecuting for breach of an abatement notice"

2.3. Wessex Water Odour Management

Wessex Water has adopted the following Odour Policy (ENVS120/15)

Wessex Water shall ensure that new assets are assessed for odour risk and shall be designed and operated to minimise risk of causing odour nuisance to receptors in consultation with planning authorities and environmental regulators.

Existing assets with the potential to generate odours must comply with either generic or site-specific odour management plans to limit risk of causing an odour nuisance.

All Water Recycling Centres (WRCs), Bioresource Centres (BC), Sludge Treatment Centres (STCs) and Sewage Pumping Stations (SPSs) are allocated an Odour Management Plan. The type allocated will be dependent on the type of site and regulations applicable to the site.

There are two types of odour management plan within Wessex Water to demonstrate "best practicable means", or BAT where applicable is being applied:

Generic odour management plan: Applicable to all sites which have a small source odour potential and have low levels of odour complaints. These sites are generally small in size and have a small source odour potential. They would usually include small to medium WRCs and SPSs where there is a small source odour potential and there have been low levels of odour complaints received

Site specific odour management plan: Applicable to the following:

- Sites that have an environmental permit and BAT compliance is applicable.
- Sites that have a large source odour potential where there is the high potential for odour complaints to be received.
- Sites that have received an odour abatement order.
- Sites that have planning restrictions applicable to odour where specific operational measures have to be applied.
- A review of the history of odour complaints requires additional mitigation/management above that stated in a generic odour management to prevent further odour complaints being received.

All Bioresources Centres (BC) which are subject to Environmental Permitting Regulations and BAT are to be categorised as Odour Management Plan Site Specific Category 1:

The odour management plan will define what odour management exists and ensure that "best practice" occurs to minimise odours. Where the site has an Environmental Permit BAT compliance will be detailed. A copy of this odour management plan will be held on site and on the intranet.

Site specific odour management plan sites are identified by an odour sensitive site poster being displayed on site.

The type of odour management plan given to a site is reviewed on an annual basis:

Site specific odour management plan sites are placed into one of three categories depending on a number of factors. The specific category for a site is reassessed on a yearly basis.

- **Category 1**:

- All sites that are subject to Environmental Permitting Regulations and associated BAT requirements.
- All sites that have received an odour abatement order.
- Sites that have a history of odour complaints (>20 complaints per year or previous complaint history deems it necessary)

There must be a review of the odour management plan at a minimum twice a year, which includes a meeting to discuss odour complaints received. Site Manager/Area Scientist must minute the site meeting. At a minimum a boundary sniff test/H_2S survey must completed once a year.

Note: Bioresource Centres with Industrial Emissions Directive Environmental Permits require <u>weekly boundary sniff tests</u> to be carried out. There will also be further monitoring requirements. Please see chapter 6 of the OMP.

- **Category 2**:

- Sites that have a history of odour complaints (>10 but <20 complaints per year or previous complaint history deems it necessary).

There must be a review of the odour management plan at a minimum once a year, which includes a meeting to discuss odour complaints received. Site Manager/Area Scientist must minute the meeting. At a minimum a boundary sniff test/H_2S survey must completed once a year.

- **Category 3**:

- Sites that have less then <10 complaints per year but previous complaint history requires more than a generic odour management plan to be in place.
- Site has Odour Control Units (OCUs) on site extracting via a fan from wastewater or sludge assets.
- Planning restrictions applicable to odour where specific operational measures have to be applied.
- Sites that have a large odour source potential. (For example "*large STW, material usage hundreds of thousands of tonnes/m^3 per year, area sources of thousands of m^2. The compounds involved are very odorous having very low Odour Detection Thresholds." extract* from IAQM Guidance on the assessment of odour for planning)

There must be a review of the odour management plan at a minimum once a year.

Berry Hill BC

This site has been categorised as category 1:

Reason: Environmental Permit

2.4. Background

There are four steps generally required to create an odour nuisance. These are:

1) The formation of odorous compounds
2) The transport of odorous compounds in the liquid phase
3) The transfer of odours to the atmosphere
4) The transport of odours to potential complainants.

The most common reason for the formation odours at a Water Recycling Centre (WRC)/ BC is due to the formation of septicity. Septicity occurs as a result of the action of micro-organisms on a sewage, effluent or sludge (see Odour Control Operation Manual: TRTMAN007 section 2.1.1.1).

Dissolved sulphide, which forms when septic conditions occur, produces hydrogen sulphide (H_2S) gas. H_2S is a colourless gas which is highly odorous and smell like rotten eggs. It can be smelt at very low concentrations. H_2S is often the compound most responsible for odour nuisance from a WRC/BC. The amount of sulphide which stays in solution and the amount which is released as H_2S gas are primarily determined by:

- The pH of the effluent or sludge: the lower the pH the more H_2S which will be formed
- The amount of turbulence: the greater the degree of turbulence the more H_2S (and other gases) will be released to atmosphere.

It is important to remember that there are many other odorous compounds and sometimes odours do not contain H_2S at all. Other odours could include:

- Mercaptans (cabbage-like odour)
- Ammonia (urine-like odour)
- Amines (urine, rotten fish-like odour)
- Organic Acids (vinegar-like odour).

The ability of the released odour to cause an odour nuisance will depend on:

- How much and where they are released.
- The volume of air in which they become dispersed.
- The proximity and sensitivity of potential complainants.
- The frequency, duration and time of day of such a release.

2.5. List of Waste Codes

Table 2.5.1 Berry Hill BC

Waste Code	Waste description
19 02 06	sludges from physico/chemical treatment other than those mentioned in 19 02 05
19 08 05	sludges from treatment of urban waste water
19 06 06	sludges from treatment of urban waste water
20 03 04	Septic tank sludge

3. Site Location

3.1. Site Location Description

The Berry Hill site is located in Dorset, approximately 5.8km North East of Bournemouth Town Centre. The site is approximately 1.0km South West of Bournemouth International Airport The site is surrounded by agricultural land and there is no sensitive receptor within 250m of the site boundary. Figure 3.1.1 shows the regional setting of the BC.

Figure 3.1.1 Site Setting - Regional

3.2 Site Receptors

Figure 3.2.1 Location of Sensitive Receptor - Residential

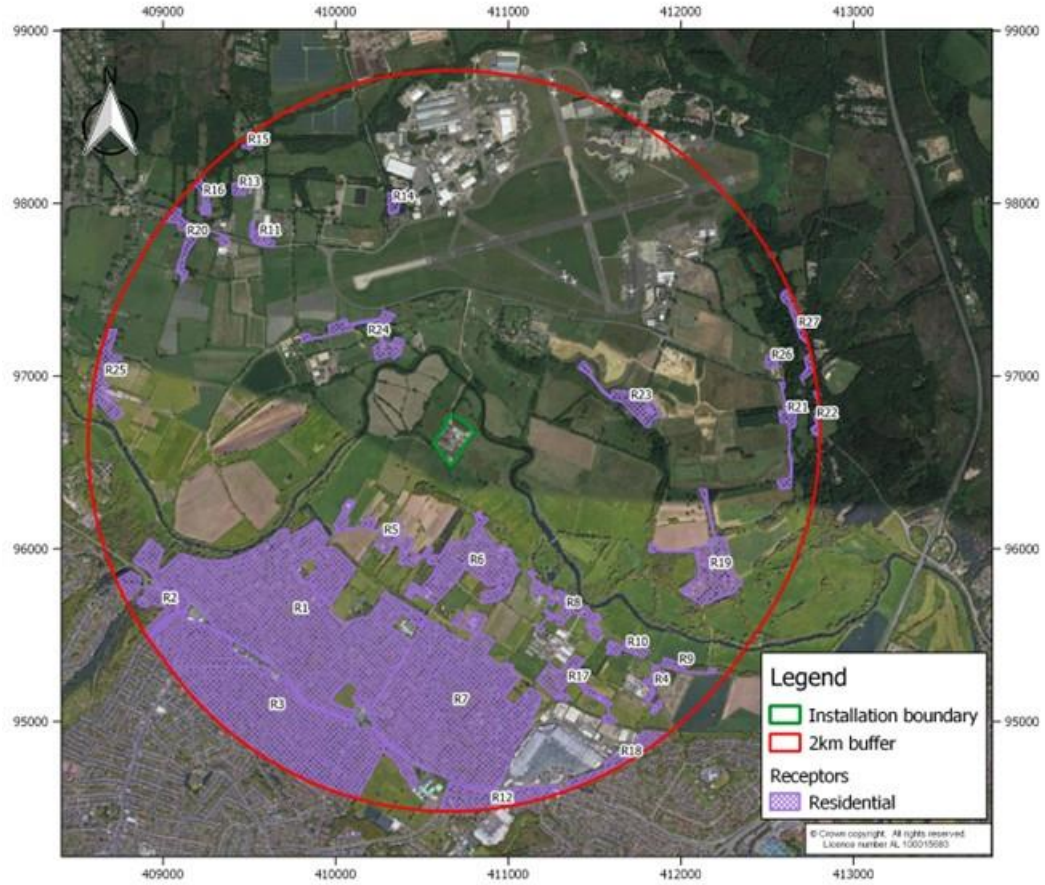


Figure 3.2.2 Location of Sensitive Receptor – Commercial/Industrial

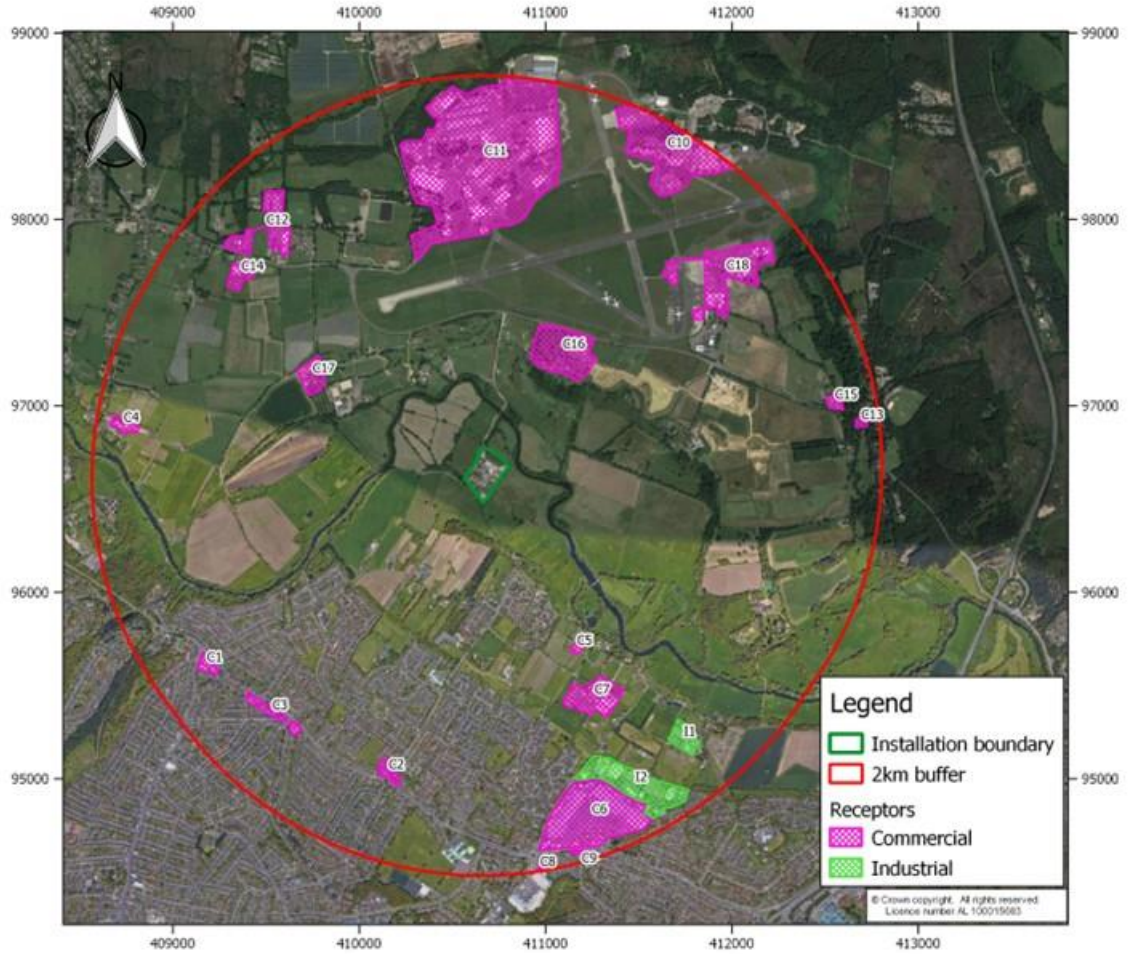


Figure 3.2.3 Location of Sensitive Receptor – Education/Healthcare/Leisure

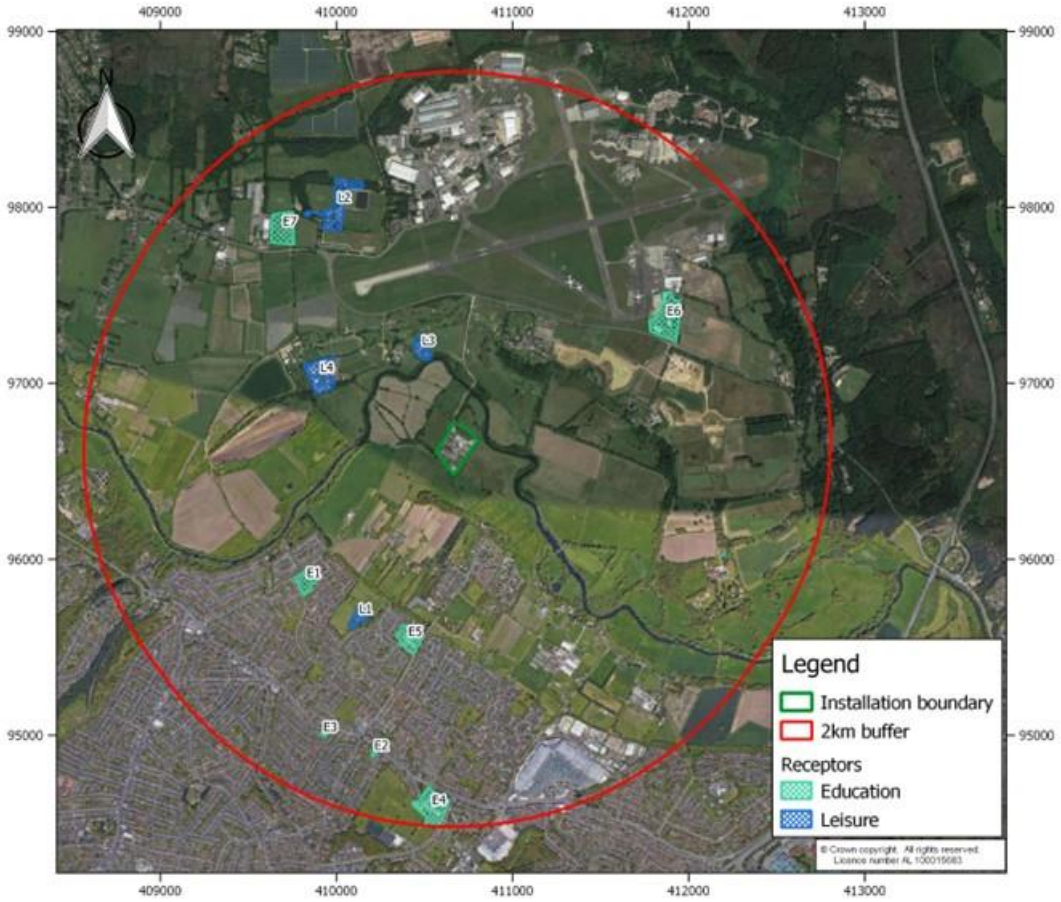


Table 3.2.1 Berry Hill BC Surrounding Receptors

Receptor Name	Receptor Map Reference	Distance from Site (m): From the nearest receptor block boundary	Receptor Type	Receptor Sensitivity
Residential properties to south-west	R1	810	Residential	High
Residential properties to south-west	R2	1,700	Residential	High
Residential properties to south-west	R3	1,580	Residential	High
Residential properties to south-east	R4	1,660	Residential	High
Residential properties to south	R5	445	Residential	High
Residential properties to south	R6	315	Residential	High
Residential properties to south	R7	865	Residential	High
Residential properties to south-east	R8	770	Residential	High
Residential properties to south-east	R9	1,665	Residential	High
Residential properties to south-east	R10	1,380	Residential	High
Residential properties to north-west	R11	1,415	Residential	High
Residential properties to south	R12	1,840	Residential	High
Residential properties to north-west	R13	1,740	Residential	High
Residential properties to north-west	R14	1,215	Residential	High

Receptor Name	Receptor Map Reference	Distance from Site (m): From the nearest receptor block boundary	Receptor Type	Receptor Sensitivity
Residential properties to north-west	R15	1,915	Residential	High
Residential properties to north-west	R16	1,805	Residential	High
Residential properties to south-east	R17	1,290	Residential	High
Residential properties to south-east	R18	1,900	Residential	High
Residential properties to east	R19	1,210	Residential	High
Residential properties to north-west	R20	1,625	Residential	High
Residential properties to east	R21	1,765	Residential	High
Residential properties to east	R22	1,950	Residential	High
Residential properties to north-east	R23	705	Residential	High
Residential properties to north-west	R24	455	Residential	High
Residential properties to west	R25	1,910	Residential	High
Residential properties to north-east	R26	1,750	Residential	High
Residential properties to north-east	R27	1,920	Residential	High
Commercial businesses to south-west	C1	1,670	Commercial	Medium
Commercial businesses to south	C2	1,475	Commercial	Medium
Commercial businesses to south-west	C3	1,550	Commercial	Medium

Receptor Name	Receptor Map Reference	Distance from Site (m): From the nearest receptor block boundary	Receptor Type	Receptor Sensitivity
Commercial businesses to west	C4	1,775	Commercial	Medium
Commercial businesses to south-east	C5	900	Commercial	Medium
Commercial businesses to south-east	C6	1,585	Commercial	Medium
Commercial businesses to south-east	C7	1,090	Commercial	Medium
Commercial businesses to south-east	C8	1,975	Commercial	Medium
Commercial businesses to south-east	C9	1,915	Commercial	Medium
Commercial businesses to north-east	C10	1,640	Commercial	Medium
Commercial businesses to north	C11	1,075	Commercial	Medium
Commercial businesses to north-west	C12	1,475	Commercial	Medium
Commercial businesses to east	C13	1,880	Commercial	Medium
Commercial businesses to north-west	C14	1,525	Commercial	Medium
Commercial businesses to east	C15	1,750	Commercial	Medium
Commercial businesses to north	C16	520	Commercial	Medium
Commercial businesses to north-west	C17	900	Commercial	Medium
Commercial businesses to north-east	C18	1,265	Commercial	Medium
Industry to south-east	I1	1,580	Industrial	Low
Industry to south-east	I2	1,490	Industrial	Low
Schools to the south-west	E1	950	Education	High

Receptor Name	Receptor Map Reference	Distance from Site (m): From the nearest receptor block boundary	Receptor Type	Receptor Sensitivity
Schools to the south	E2	1,625	Education	High
Schools to the south	E3	1,620	Education	High
Schools to the south	E4	1,775	Education	High
Schools to the south	E5	900	Education	High
Schools to the north-east	E6	1,145	Education	High
Schools to the north-west	E7	1,365	Education	High
Leisure to the south	L1	910	Leisure	High
Leisure to the north-west	L2	1,275	Leisure	High
Leisure to the north-west	L3	370	Leisure	High
Leisure to the north-west	L4	695	Leisure	High

3.3 Odour Complaints

Table 3.3.1 shows the odour complaints data received by Wessex Water in respect of Berry Hill BC that have been recorded over the last 5 years. Please note that odour complaints received may not be associated with the BC and may be due to other Wessex Water assets or due to external reasons outside Wessex Water control. For further odour complaint information for the site please contact the Wessex Water Odour Management Co-ordinator.

Table 3.3.1 Berry Hill BC Complaint Frequency

Year	No. of Complaints
2023 (update to date of publication of OMP)	5
2022	2
2021	2
2020	4
2019	4

The majority of the odour complaints 2020-2023 are reported by customers to be actually for the drains/sewers around their properties.

3.4 Meteorological Conditions

In the UK, the prevailing wind directions are commonly from the west and south-west. The wind direction and speed will impact the dispersion of odour emissions from site. Wind direction is continually monitored on site. If an odour complaint is received for the site this data should be checked to see if the wind was in the correct direction for an odour nuisance to be caused from site.

Bournemouth Airport (Hurn) meteorological station is the closest representative station for Berry Hill BC at a height of 11.6m above sea level. The meteorological station is located approximately 1km NE of the Site which has a height of 10m above sea level. The meteorological data for Bournemouth Airport is adopted for the site for any odour risk assessments that incorporates metrological conditions whereby wind direction and frequency are used to determine the ”pathway effectiveness” from source to receptor. The wind rose plot for Bournemouth Airport (Hurn) meteorological station for 2022 and 2021 are included in Figure 3.4.1 and Figure 3.4.2.

Figure 3.4.1 Wind Rose Plot for Bournemouth Met Station 2022 data.

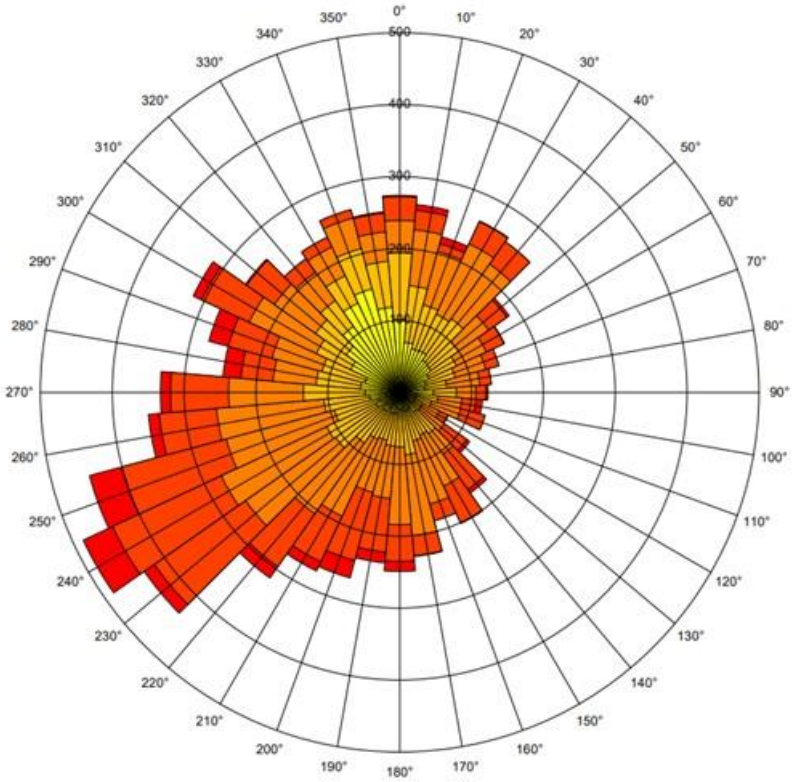
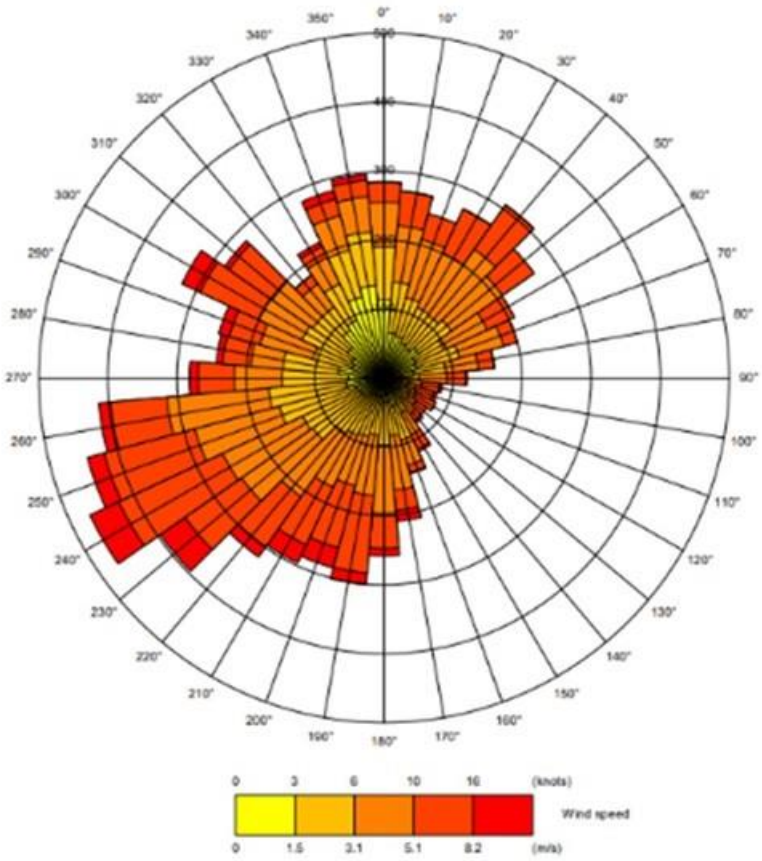


Figure 3.4.2 Wind Rose Plot for Bournemouth Met Station 2021 data.



3.5 Process Description

Sludge Treatment Process

The following provides a summary description of the sludge treatment process at Berry Hill BC. In both the description and the diagram the primary routes for processing are shown and described. There are, in some instances, alternatives that exist but due to the complexity of the site and for clarity in the diagram not all of these routes are depicted.

Each asset in the summary description is provided with a corresponding letter which is referenced in the diagrams to show its location within the process and physically within the installation.

- Raw Primary sludge is received via a pumped main from Holdenhurst WRC at SLTH01 Raw Sludge Reception Tank (E) before being screened via two strain presses (J). Additional capacity is provided by SLTH03 Raw Sludge Reception Tank (F), operating in parallel with (E).

- Sludge is then passed to SLTH04 Primary Buffer Tank (H), thickened by two Gravity Belt Thickeners (GBT) (K) operating duty / duty regime, before being passed on to the Sludge Blending/Digester Feed Tank (D).

Additionally, sludge can be pumped from SLTH04 (H) via two sludge transfer pumps and passed forwards to SLTH02 (G) and mixed with SAS to aid thickening performance and provide an assist thickening stream.

- SAS sludge from Holdenhurst WRC is received into SLTH02 (SAS & Sludge Reception Tank) (G), with additional holding capacity provided by SLTH05 SAS Reception Tank (I), operating in parallel.

From SLTH02 (G) the sludge is thickened by two GBTs (L) before being pumped to the Sludge Blending Digester Feed Tank (D).

- The liquors from the GBTs are discharged directly to the Return Liquor PS (M) to be sent to Holdenhurst WRC for treatment.

- Sludge imports arriving by tanker import point (X) are received in Howard Tank 2 (B2) or Howard Tank 3 (B3). Under normal operation the sludge imports are received via Howard Tank 3 (B3) and are transferred to Howard Tank 2 (B2) under gravity.

Sludge from Howard Tank 3 & 2 is screened by two strain presses (X) before being passed on to Howard Tank 1 (B1). From Howard Tank 1 the primary process route is to pass forwards to SLTH04 (H) or SLTH02 (G) and process through either / or Raw GBT (K) and SAS GBT (L) to achieve design loading and consistent feed stock to the digestion process. Alternatively imported sludge from Howard tank 1 (B1) can be passed forwards direct to the Digester Feed Tank (D).

- From the Digester Feed Tank (D) the sludge is pumped to Primary Digesters 1-4 (N1 - N4) before being passed on to Secondary Digesters 4 – 12 (O1 – O9) where it is held for 7 days.

Alternatively, flow can gravitate from the Primary Digesters to the Secondary Digested Buffer Tank (P) and then on to Secondary Digesters 1 - 3 (A1 - A3) where it is held for 7 days.

All secondary sludge tanks are filled individually, once full they are closed and held for 7 days as per Berry Hill HACCP plan. Once the sludge has achieved sufficient retention it is passed forwards to the Centrifuge Feed Tank (R).

- From the Centrifuge Feed Tank (R) the secondary digested sludge is pumped to three Centrifuges (S) to be dewatered to sludge cake. The cake from the centrifuges is stored in skips (U) before being transported off site for disposal to land.

- Water is abstracted from the Borehole (AD) and used to backwash both GBTs (K and L) and the Centrifuges (S). All liquors from the centrifuges are pumped to Centrate Tank (C) before being treated by a Demon plant (V).

- The biogas produced by the Primary Digesters 1- 4 (N1 – N4) is stored in the Gas holder (Q) before being passed through a Siloxane Carbon Filter (AC). After the Siloxane Carbon Filter (AC) the gas is either passed on to the Combined Heat and Power engine (CHP) (AF), Boilers (Y), the Flare (shrouded) (Z) or Demon Plant Boiler (W).

Figure 3.5.1 Sludge Treatment Process Flow Diagram

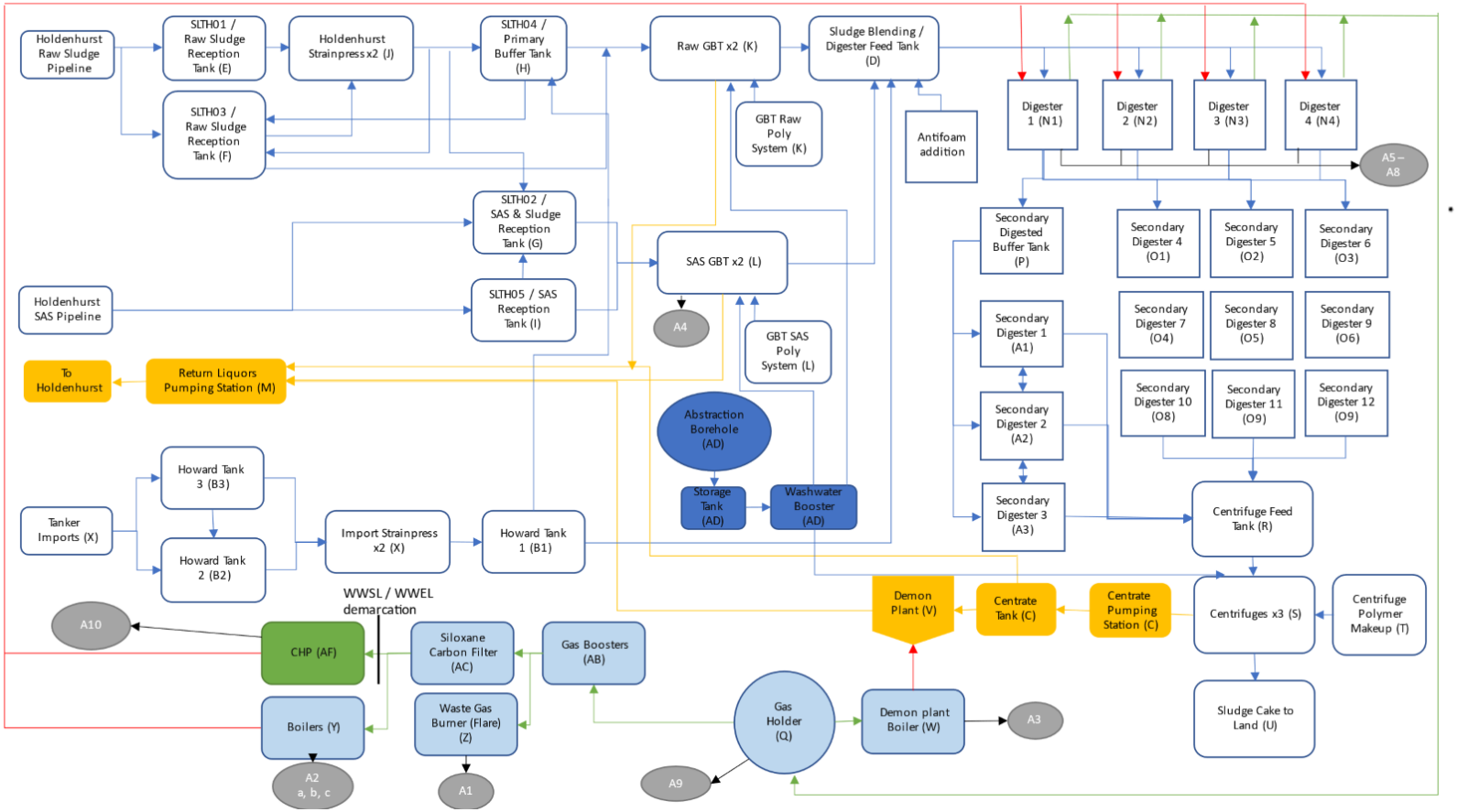


Figure 3.5.2 Schematic of Current BC Assets.

3.6 Process Odour Sources

The odour potential of a source can be broken down into three key considerations:

How inherently odorous the compounds present are.
The unpleasantness of the odour.
The magnitude of the odour release.

When trying to determine the offensiveness of an odour source, site-specific odour sampling should be considered in the first instance. In the absence of source odour emission data, the assessment criteria will consider the Environment Agency's Horizontal Guidance Note (H4). H4 looks to categorise how offensive odours are with sources/processes/activities that are considered 'most offensive' odours include septic effluent or sludge and biological landfill odours. All raw sludge treatment processes would be considered to have a high odour offensiveness unless source-specific odour sampling is undertaken demonstrating a low level of odorous compounds. Processes containing the below material are considered to represent a high odour offensiveness:

- Raw indigenous sludge.
- Raw sludge imports.
- Raw sludge liquors.

Processes containing the below material are considered to represent a medium odour offensiveness:

- Rags and screenings.
- Digested sludge.
- Digested sludge liquors.
- Digested sludge cake (stored)
- Digested sludge liquors.

No processes on Berry Hill BC are considered to store material that represents a low odour offensiveness unless supported by source-specific odour sampling.

The unpleasantness of an odour can be used in defining the source odour offensiveness. This is typically achieved through source material hedonic tone assessments, however; these types of assessments are not typically available for a site without source-specific sampling.

The risk source odour potential critical risk scoring for odour offensiveness and mitigation / control adopted is summarised in Table 3.6.1.

Table 3.6.1 Source Odour Potential Risk Scoring.

Source	Risk Rating		
	High	**Medium**	**Low**
Odour Offensiveness	Very odorous compounds (H_2S, Mercaptans) with low odour threshold. Unpleasant odour - "Most Offensive". Unpleasant hedonic tone. Large, permitted process / Surface Area.	Compounds involved are moderately odorous. Unpleasantness - process classed in H4 as "Moderately Offensive" or where odours have neutral or slightly unpleasant hedonic tone. Smaller permitted process / Surface Area.	Compounds involved are only mildly offensive. Unpleasantness - process classed in H4 as "Less Offensive". Neutral to positive hedonic tone.
Emission Risk (Mitigation / Control)	Open air operation with no containment. Reliance solely on good management techniques and best practice.	Some mitigation measures in place but significant residual odour remains.	Effective mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.

Table 3.6.2 Berry Hill BC Sludge Inventory of Odorous Materials.

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
SLTH01 (Raw Sludge Reception Tank)	E	Raw Sludge	245	0.5 day	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Covered (Odour Improvement Plan Requirement Number 2)	Diffuse	Medium
Holdenhurst strain presses (x2)	J	Raw Sludge	N/A	N/A	Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Holdenhurst strain press skips (x2)	J	Screenings	6 (x2)	Every 2 weeks.	Continuous	Screening musty smell	-1/-2 Mildly/Moderately unpleasant	Medium	Open atmosphere	Diffuse	High
SLTH04 (the Primary Buffer Tank)	H	Raw Sludge	300	0.5 day	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Covered (Odour Improvement Plan Requirement Number 2)	Diffuse	Medium
SLTH03 (Raw Sludge Reception Tank)	F	Raw Sludge	450	0.5 day	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Covered (Odour Improvement Plan Requirement Number 2)	Diffuse	Medium
STLH05 (SAS Reception Tank)	I	SAS	720	Combined retention time with SLTH02: 3.4 days	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Covered (Odour Improvement Plan Requirement Number 2)	Diffuse	Medium

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Raw GBT (x2)	K	Raw Sludge	N/A	N/A	Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered (see odour improvement plan requirement number 2)	Diffuse	Medium
SLTH02 (SAS and Sludge Reception Tank)	G	Raw Sludge/SAS	300	Combined retention time with SLTH05: 3.4 days	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Covered (see odour improvement plan requirement number 2)	Diffuse	Medium
SAS GBT (x2)	L	Raw Sludge/SAS	N/A	N/A	Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered with extraction to vent in side of building. (see odour improvement plan requirement number 2)	Point	High
Howard Tank 2 and 3	B2, B3	Raw Sludge	1,100 (each tank)	5.5day (combined)	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Open to atmosphere (Odour Improvement Plan Requirement Number 1)	Diffuse	High
Import Strain presses (x2)	X	Raw Sludge	N/A	N/A	Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Import Strain press skips (x2)	X	Screenings	6 (x2)	Every 2 weeks.	Continuous	Screening musty smell	-1/-2 Mildly/Moderately unpleasant	Medium	Open to atmosphere	Diffuse	High

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Howard Tank 1	B1	Raw Sludge	1,100	2.7 day	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Open to atmosphere (Odour Improvement Plan Requirement Number 1)	Diffuse	High
Sludge Blending /Digester Feed Tank	D	Raw Sludge/SAS	300	0.6 day	Continuous	Septic Sludge, Sulphide	-3/-4 Unpleasant/Very Unpleasant.	High	Covered (Odour Improvement Plan Requirement Number 2)	Diffuse	Medium
Primary Digestors (x4)	N1-N4	Digested Sludge	2,364 (each)	19.9 days	Continuous	Biogas, Methane/sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered and extracted to biogas storage	Abnormal – fugitive only as biogas I collected for use on site.	Low
Biogas Relief Valves	N1-N4	Digested Sludge	N/A	N/A	Emergency Operation	Biogas, Methane/sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered and extracted to biogas storage	Abnormal – fugitive only as biogas I collected for use on site.	Low (Used in emergency only)
Secondary Digesters	O1 – O9	Digested Sludge	850 each	7 days	Continuous	Digested sludge/Earthy	-1/-2 Mildly Moderately Unpleasant	Medium	Open to atmosphere (see odour improvement plan requirement number 3)	Diffuse	High
Secondary digester buffer tank	P	Digested Sludge	53	0.08days	Continuous	Digested sludge/Earthy	-1/-2 Mildly Moderately Unpleasant	Medium	Open to atmosphere (see odour improvement	Diffuse	High

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
									plan requirement number 3)		
Secondary Digesters	A1-A3	Digested Sludge	1,100 each	7 days	Continuous	Digested sludge/Earthy	-1/-2 Mildly Moderately Unpleasant	Medium	Open to atmosphere (see odour improvement plan requirement number 3)	Diffuse	High
Centrifuge feed tank	R	Digested Sludge	529	1.1 days	Continuous	Digested sludge/Earthy	-1/-2 Mildly Moderately Unpleasant	Medium	Open to atmosphere (see odour improvement plan requirement number 4)	Diffuse	High
Dewatering Centrifuges (x3)	S	Digested Sludge	N/A	N/A	Intermittent Daily	Digested sludge/Earthy	-1/-2 Mildly Moderately Unpleasant	Medium	Covered	Diffuse	Medium
Digested Sludge Cake Skips	U	Digested Sludge Cake	15 tonnes (x15)	1 day	Continuous	Earthy	-1/-2 Mildly Moderately Unpleasant	Medium	Open to atmosphere	Diffuse	High
Flare	Z	Combusted Biogas	N/A	N/A	Emergency Operation	Combustion	Neutral	Low	Biogas is combusted	Point	Low
Centrate Pumping Station	C	Digested sludge	N/A	N/A	Intermittent Daily	Earthy	-1/-2 Mildly Moderately Unpleasant	Covered	Diffuse	Medium	Medium
Centrate Tank	C	Digested Sludge Liquors	415	1-2 days	Continuous	Earthy	-1/-2 Mildly/Moderately unpleasant	Medium	Covered (see odour improvement plan requirement number 4)	Diffuse	Medium

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Demon plant	V	Digested Sludge Liquors	1,250	5 days	Continuous	Earthy / treated effluent	-1/-2 Mildly/Moderately unpleasant	Medium	Covered (see odour improvement plan requirement number 4)	Diffuse	Medium
Return Liquors PS	M	Raw/Digested Sludge Filtrate/ Liquors	N/A	N/A	Intermittent Daily	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium

3.7 Odour Control Units

Odour control units being installed on site are required to be designed to Wessex Water Design Standards DS464 Odour Management and DS429 Enclosed Treatment Works to make sure these systems have sufficient capacity and are appropriately designed to effectively treat the odorous air streams. Odour Control Units are designed on the following parameters in Wessex Water:

- Extraction rate required to be treated by the Odour Control Unit.
- Expected Odour Concentration (OU_Em^3) and H_2S (ppm) levels going onto the Odour Control Unit.
- Required stack performance for Odour Concentration (OU_Em^3) and H_2S (ppm).

There are currently no odour control units at Berry Hill BC. Please see Odour Improvement Plan Chapter 12.

4 Odour Critical Plant Operation

4.1 Odour Critical Sources

Given the control measures that are in place during operation of the facility, these contributions (if any) are unlikely to increase the odour impact on the receptors outside of the site boundary.

Management of releases includes reducing turbulence, containment and abatement. Where odorous gasses are finally released, controlling the height of release through a stack or the timing of releases through management of activities can influence dispersion before there is an impact on people. Potential on site odour releases associated with Berry Hill BC are given in Table 4.1.1.

Table 4.1.1 Berry Hill BC Odour Critical Sources- Operational Mitigation

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
SLTH01 (Raw Sludge Reception Tank)	E	Raw sludge	Covered	Unlikely given control measures in place.	Access hatch removed/ unable to close.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed.	Site Manager/Site Operator.
					Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed.	Site Manager/Site Operator.
Holdenhurst Strain presses (x2)	J	Raw sludge	Covered. Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed.	Site Manager/Site Operator.
					Damage to cover with missing sections.	Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed.	Site Manager/Site Operator.
STLH04 (Primary Buffer Tank)	H	Raw sludge	Covered	Unlikely given control measures in place.	Access hatch removed/ unable to close.	Cover access hatch with temporary cover (e.g. tarpaulin).	Same day as observed.	Site Manager/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
					Damage to cover with missing sections.	Arrange for a permanent fix. Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed.	Site Manager/Site Operator.
STLH03 (Raw Sludge Reception Tank	F	Raw sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix. Cover damaged section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
STLH05 (SAS Reception Tank)	I	SAS	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix. Cover damaged section with temporary cover (e.g. tarpaulin).	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
						Arrange for a permanent fix.		
Raw GBT (x2)	K	Raw Sludge	Covered	Unlikely given control measures in place.	Access hatch removed/unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for permanent fix. Cover damage section with temporary cover (e.g. tarpaulin) Arrange for permanent fix.	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
STLH02 (SAS and Sludge Reception Tank)	G	SAS and Raw Sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix. Cover damaged section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
SAS GBT(x2)	L	Raw/SAS Sludge	Covered and contained within	Point source	Increase in complaint frequency and	Failures are investigated and reactive	Same day as incident.	Site Manager/Areas Scientist/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
			building. There is extraction to vent in side of building.		odour sniff test identifies asset O to be the cause of the complaint.	maintenance undertaken.		
Howard Tank 1,2 and 3	B1,B2, B3	Raw Sludge	Odour management techniques in use rather than specific containment	No containment on tanks	Increase in complaint frequency and odour sniff test identifies asset B1, B2 and B3 to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Areas Scientist/Site Operator.
Import strain presses	X	Raw Sludge	Covered. Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
Sludge Blending Tank/Digester Feed Tank	D	Raw sludge	Covered	Unlikely given control measures in place.	Access hatch removed/ unable to close.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed.	Site Manager/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
					Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix.	Same day as observed.	Site Manager/Site Operator.
Primary Digesters	N1-N4	Digested Sludge	Tank is covered and biogas extracted	Unlikely given control measures in place.	Loss of digester performance (see table 7.2.1 for monitor parameters).	Investigate Digester performance and schedule reactive maintenance.	Same day as incident.	Area Scientist/Site Manager.
Biogas Relief Valves	N1-N4	Biogas	Planned maintenance on equipment. Monitoring of digester pressures. Flare available to burn excess gas.	Unlikely given the control measures in place. Critical safety system.	Prolonged/frequent use of safety valve.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.
Secondary digester buffer tank	P	Digested Sludge	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type.	Increase in complaint frequency and odour sniff test identifies asset L to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Secondary Digesters	O1-O9 A1-A3	Digested Sludge	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type.	Increase in complaint frequency and odour sniff test identifies asset K1-K9 or A1-A3 to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.
Flare	Z	Combusted Biogas	Planned maintenance on equipment.	Unlikely given the control measures in place. Critical safety system.	Prolonged / frequent use of safety valves.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.
Centrifuge feed tank	R	Digested Sludge	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type.	Increase in complaint frequency and odour sniff test identifies asset G to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.
Dewatering Centrifuges	S	Digested Sludge	Centrifuges are contained assets.	Unlikely given the control measures in place.	Damage to centrifuge covers.	Arrange for repair. Review the digester performance	Same day as incident. Immediately.	Site Manager/Site Operator. Area Scientist/Site Manager.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Centrate Pumping Station	C	Digested Sludge Liquors	Covered wet well.	Unlikely given the control measures in place, its size and location on site.	Damage to wet well covers.	Arrange for repair	Same day as incident.	Site Manager/Site Operator.
Centrate Tank	C	Digested Sludge Liquors	Covered	Unlikely given control measures in place.	Access hatch removed/unable to close.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for permanent fix.	Same day as observed.	Site Manager/Site Operator.
					Damage to cover with missing sections.	Cover damage section with temporary cover (e.g. tarpaulin) Arrange for permanent fix.	Same day as observed.	Site Manager/Site Operator.
DEMON: Liquor Treatment Plant	V	Sludge Liquors	Covered.	Unlikely given the control measures in place.	Access cover removed/ unable to close.	Cover access with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed.	Site Operator/Site Manager.
					Damage to cover with missing sections.	Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed.	Site Manager.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Return Liquor PS	J	Sludge filtrate/liquor	Covered wet well.	Unlikely given the control measures in place, its size and location on site.	Damage to wet well covers.	Arrange for repair	Same day as incident.	Site Manager/Site Operator.

5 Odour Impact

5.1 Odour Dispersion Model

Odour modelling can be a way to establish a sensitive receptor(s) potential exposure to odours from a site. Dispersion modelling is inherently uncertain but is nonetheless a useful tool to predict potential odour risk. Odour modelling is only likely to characterise normal conditions. It will not usually consider unexpected events (e.g., breakdowns) and abnormal operations which can account for a number of odour episodes.

An odour dispersion model has not been developed for Berry Hill BC as part of this OMP due to the infrequent nature of odour complaints within the last 5 years (see chapter 5.4). An odour dispersion model(s) will be produced as part of schemes to demonstrate requirement numbers 1-4 in Odour Improvement Plan to demonstrate the odour emissions do not impact on sensitive receptors from the odour control unit stacks. Please see Odour Improvement Plan requirement number 5.

Odour dispersion modelling including site specific olfactometric surveys shall be undertaken in the event of increased frequency of odour complaints or operational changes with a perceived increase in odour impact risk.

5.2 Olfactometry Surveys

Olfactometry sampling of a Raw Howard Tank is carried out on a six monthly basis due to the risk identified by the Preliminary Odour Risk Assessment (PORA) (see chapter 5.4).

5.3 Odour Risk Assessment

All EA permit areas must have a Preliminary Odour Risk Assessment (PORA) and odour radius calculation completed as detailed in TRTWG669.

The PORA assesses potential odour impact and odour risk of the BC site on sensitive receptors. The PORA appraises the following information:

- The type of Odour Management Plan in place.
- Specific odour prevention already in place (see table 3.6.2).
- Historical odour complaints for the site (see table 3.3.1)
- The odour radius calculation for the site. The odour radius calculation will list the following information:
    - Each process stage of the site.
    - Indicates process stages with potential hedonic tones scores of -3/-4 (See table 3.6.2).

- Number of units within each process stage (see table 3.6.2)
- The exposed surface area per unit.
- Specific odour emission rate for each unit (library values are used, see TWTG669).
- Whether the emission rate is low, typical or high (typical values are used unless there is has been specific olfactometry sampling carried out on the site that demonstrates a low or high value can be used).
- Total odour emission rate (see 5.4).
- Expected radius distance odour may be detectable (see 5.4).

  (note: This does not necessary mean a complaint will be received as this will also depend on the offensiveness and hedonic tone of the odour)
- Details the % of total BC emission rate that has a hedonic tone score of -3/-4)
- Source-Pathway-Receptor Model (see table 5.4.2).

The odour radius calculation is a “worse case” prediction under normal operating conditions. It is a simple calculation not using meteorological data to predict potential odour risk. The higher the percentage emission rate at predicted hedonic tone -3/-4 the greater the risk of a sensitive receptor is of being impacted by odour if within the odour radius calculated contour.

(Note: The PORA is only assessing potential risk of odour complaints. BAT conclusions are assessed in chapter 5.5)

The completion of the PORA identifies whether further odour modelling of the site with different scenarios is required. It also identifies to the business where there is potential odour risk and indicates where there is the potential for future odour improvements. The identified odour risks can be then placed on the corporate risk system. The corporate risk system is used operationally to manage risk at sites and their related processes.

5.4 Preliminary Odour Risk Assessment (PORA) Results

Table 5.4.1 Berry Hill BC PORA results

Type of Odour Management Plan	Site Specific
2023 (up to the end of September) received odour complaint locations.	R5: 5 complaints. All the odour complaints received were for the drains/sewers and not the BC site.
Predicted total library odour emission rate for site (ou_E/s^{-1})	23,623
Higher Warren Spring Laboratory Constant 2.2 (m)	675
Lower Warren Spring Laboratory Constant 0.7 (m)	339
Predicted % that is potentially hedonic tone -3/-4 odours	79.5%
Largest odour emission source on the BC site.	Howard Tanks 1,2,3: Asset B1-B3

Table 5.4.2 Berry Hill BC Source-Pathway-Receptor Model

Receptor	Source of Odour Potential	Pathway effectiveness	Receptor Sensitivity	Risk of Odour Exposure	Likely magnitude
R1	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R2	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R3	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R4	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R5	High	Moderately Effective	High	Medium	Moderate Adverse Effect
R6	High	Moderately Effective	High	Medium	Moderate Adverse Effect
R7	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R8	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R9	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect

R10	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R11	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R12	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R13	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R14	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R15	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R16	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R17	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R18	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R19	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R20	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R21	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R22	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R23	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R24	High	Moderately Effective	High	Medium	Moderate Adverse Effect
R25	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R26	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R27	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
C1	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C2	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C3	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C4	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C5	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect

C6	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C7	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C8	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C9	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C10	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C11	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C12	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C13	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C14	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C15	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C16	High	Moderately Effective	Medium	Low	Slight Adverse Effect
C17	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C18	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
I1	High	Ineffective Pathway	Low	Negligible Risk	Negligible Effect
I2	High	Ineffective Pathway	Low	Negligible Risk	Negligible Effect
E1	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
E2	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
E3	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
E4	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
E5	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
E6	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
E7	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
L1	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
L2	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect

L3	High	Moderately Effective	Medium	Low	Slight Adverse Effect
L4	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect

The PORA is predicting there is a **Moderate Adverse Effect** of odour complaints potentially being received for the BC under normal operating conditions when following this OMP at some receptor locations. This PORA has identified the Howard Tanks 1-3 (asset B1-B3) as the highest odour emission risk. On completion of Odour Improvement Plan Requirement Number 1 the PORA would predict a Negligible Effect of odour complaints potentially being received. The number of odour complaints received for the site are low and reviewing customer comments/notes and investigation carried out the odour source was potentially identified as private drains and the sewer network. The actual odour complaint risk of odour complaints being received is reduced from the outcome of the PORA due to the following two reasons:

- Sensitive receptors being not downwind of the prevailing wind direction.
- The potential pathway for odour flux to receptor is further reduced due to the height of the sides of the tanks compared to the sludge level. The sides of the tank block wind stripping across the surface of the sludge contained within the tank.

Due to the result of this specific assessment, there is currently a requirement to periodically monitor odour emissions (BAT 10). Therefore, every 6 months a duplicate olfactometry sample from one of the Howard Tanks (B1-B3) in accordance with EN 13725 will be taken in order to determine the odour concentration if safe to complete. Monthly sniff testing will be carried out at the following receptor locations R5/R6/R24. An action has been recorded on the company risk management system to cover/replace these tanks. This has also been identified in the odour improvement plan. A reassessment will be required if:

- Odour complaints are received for the BC site.
- If there is planned new process or site expansion.
- Proposed encroachment around the site.

5.5 BAT Conclusions

BAT Conclusion 14 describes specific measures which may be appropriate for the prevention or reduction of diffuse emissions to air. BAT Section 14d is associated with the “containment, collection and treatment of diffuse emissions” and includes techniques such as:

- Storing, treating, and handling waste and materials that may generate diffuse emissions in enclosed buildings and/or enclosed equipment (e.g. conveyor belts);
- Maintaining the enclosed equipment or buildings under adequate negative pressure;
- Collecting and directing emissions to an appropriate abatement system via an air extraction system and/or air suction systems close to the emission sources.

In terms of the applicability of this technique it is noted that: “The use of enclosed equipment or buildings may be restricted by safety considerations such as the risk of explosion or oxygen depletion. The use of enclosed equipment or buildings may also be constrained by the volume of waste.”

An assessment of BC processes carried out at Berry Hill BC has been undertaken against BAT 14d. Table 5.5.1 provides a summary of compliance for diffuse and untreated odour sources. Abnormal / fugitive only release (associated with failure of the OCU or off gas collection system) have not been considered here.

Table 5.5.1 BAT 14d Compliance/Alternative Techniques

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
SLTH01 (Raw Reception Tanks)	E	Tank covered.	N/A	None	Yes Required Action 2
Holdenhurst strain presses (x2)	J	Strain press contained process without foul air extraction. Strain press although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Enclosed process, but without extraction and abatement of process air, small size of source, intermittent use. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	No
STLH04 (Primary Buffer Tank)	H	Tank covered.	N/A	None	Yes Required Action 2
STLH03 (Raw Sludge Reception Tank)	F	Tank covered.	N/A	None	Yes Required Action 2
Raw GBT (x2)	K	Enclosed.	N/A	None	Yes Required Action 2
STLH05 (SAS Reception Tank)	I	Tank covered.	N/A	None	Yes Required Action 2
STLH02 (SAS and Sludge Reception Tank)	G	Tank covered.	N/A	None	Yes Required Action 2
SAS GBT(x2)	L	Point Source Emission (Vent in side of building)	Odour management techniques in use rather than specific BAT containment measures.	None	Yes Required Action 2

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Howard Tank 1,2 and 3	B1, B2, B3	Tanks open to atmosphere with no treatment of emissions	Odour management techniques in use rather than specific BAT containment measures.	None	Yes Required Action 1
Import strain presses	X	Strain press contained process without foul air extraction. Strain press although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Enclosed process, but without extraction and abatement of process air, small size of source, intermittent use. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	No
Sludge Blending/Digestion Feed Tank	D	Tank Covered	N/A	None	Yes Required Action 2
Primary Digesters (x4)	N1-N4	Tanks covered and gas collected.	N/A	None	No
Secondary digester buffer tank	P	Tank open to atmosphere with no containment or treatment of emissions.	Tanks contains digested sludge only which is inherently less odorous than raw sludge.	Risk of creating an explosive atmosphere if covered without foul air extraction, attributed to residual methane post digestion.	Yes Required action 3
Secondary Digesters	O1-O9 A1-A3	Tank open to atmosphere with no containment or treatment of emissions.	Tanks contains digested sludge only which is inherently less odorous than raw sludge.	Risk of creating an explosive atmosphere if covered without foul air extraction, attributed to residual methane post digestion.	Yes Required action 3
Centrifuge feed tank	R	Tank open to atmosphere with no containment or treatment of emissions.	Tanks contains digested sludge only which is inherently less odorous than raw sludge.	Risk of creating an explosive atmosphere if covered without foul air	Yes Required action 4

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
				extraction, attributed to residual methane post digestion.	
Dewatering Centrifuges	S	Centrifuges, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	No
Centrate Tank	C	Tank covered.	N/A	None	Yes Required Action 4
DEMON: Liquor Treatment Plant	Z	Tank covered	N/A	None	Yes Required Action 4
Digested sludge skips	U	Cake skips open to atmosphere with no containment or treatment of emissions. Covered before they leave site.	Odour management techniques in use rather than specific BAT containment measures. Digested sludge only, which is inherently less odorous, during normal operating conditions. Adequate measures considered to be in operation, as supported by odour measurements and impact assessment.	Risk of creating a corrosive atmosphere if covered without extraction.	No

Of the sources on site, the screening skips, sludge cake skips, centrifuges treating digested sludge do not adopt the specific conclusions outline in BAT 14d. All these assets are considered small area sources and would not typically be considered to be a significant source of overall site odours. The sludge cake skips are also exported from site in a timely manner to minimise the storage time of odorous materials on site.

At the time of writing this OMP it is recognised a number of sources on site are currently only partially compliant with BAT 14d as they currently have containment of emissions only and there is no extraction or treatment of odours. The Raw Howard Tank (B1-B3) and Secondary Digesters O1-O9, A1-A3, Centrifuge Feed Tank (R) are currently not covered. SAS GBTs (L) are extracted via a vent in the building. Please see Odour Improvement Plan (Chapter 12).

6 Monitoring and Control of Odours

All monitoring should clearly relate to the assessment of odour control and complete records must be kept in an auditable format. The only way to determine whether the processes on site are under control, and to keep them under control, is to do appropriate monitoring.

As far as possible, Berry Hill BC is operated to minimise odour generation and release. As long as the treatment process satisfies the normal design criteria, odour should be minimal. To minimise odour nuisance, it is important to ensure that Berry Hill BC is operating at its optimum.

6.1 Sniff Testing

The approach Wessex Water adopts is fundamentally based on the approach as outlined in H4 Odour Management Guidance.

Sniff testing is recognised by Wessex Water as a useful technique to build up a picture of the impact the odour has on the surrounding environment over time. Sniff testing shall be used to support profiling site odour impact, investigate odour complaints and to introduce temporary odour mitigation measures.

Sniff testing shall be undertaken on site on a weekly basis by site operational staff. It is accepted that operational staff may not be ideal for sniff testing of site odours as they have adapted to odours from the site. However, this will provide a baseline for routine observations. The weekly operator sniff tests shall assess the site boundary and focus on the detection of any odours that could potentially be leaving site. If as part of the boundary sniff test an odour intensity of 4 or greater is recorded at any of the sampling points, then three off site downwind sampling points will be included as part of the assessment.

Monthly sniff tests shall be carried out by non-site-based staff (Regional Scientist/Graduate Scientist/Area Scientist) who are not adapted to site odours. If the sniff test that is required to be carried out on a weekly basis by site operational staff is actually being carried out by non-site operational staff there is no requirement for the monthly sniff test by non-site-base staff as the weekly sniff testing has been carried out by staff that should not be adapted to odours from the site.

In the event of odour complaints being received, site operators shall undertake a sniff test including off-site sniff testing local to the complaint location(s) if possible and the nearest key receptor(s) to the complainant. In the occurrence of a significant odour event or repeated complaints a Regional Scientist/Graduate Scientist will carry out a sniff test including off-site sniff testing local to the complaint location(s) and within the identified sensitive receptors locations listed below. If a level of complaints received continue and a reason for the complaints cannot be determined a third-party shall be engaged for an additional odour investigation including on and off-site sniff testing.

A third-party odour sniff test is scheduled to be undertaken once every 6 months for comparison with Wessex Water observations. The third-party sniff test shall include both on and off-site locations based on surrounding sensitive receptors and complaint locations. The off-site locations shall be reviewed prior to any third-party testing to ensure any recent changes to sensitive receptors are considered. The location of the off-site sniff tests that occur every 6

months should be completed as close to the centre of the following receptor locations or as close as possible.

- R5
- R6
- R24

These receptor locations have been chosen as they are the residential receptors within 1km of the site or gave a result of “Slight Adverse Effect” or higher in the PORA assessment.

All results will be recorded electronically on the Wessex Water sharepoint system so it can be viewed by the relevant members of staff.

The location of weekly and monthly on-site sniff testing locations has been included in Figure 6.1.1.

Figure 6.1.1 Weekly/Monthly Sniff Testing Locations

Sampling will be conducting as close to the sampling points as is practicably possible. There may be times for safety or access reasons that a specific sampling point can not be used. This should be recorded in the results and a sample taken as close as is possible.

6.2 Hydrogen Sulphide and Sniff Test Survey

On an annual basis a hydrogen sulphide survey and sniff test of Berry Hill BC will be completed by a Regional Process Scientist/Graduate Scientist. If there is wet weather or low temperatures when the hydrogen sulphide and sniff test is due to be completed the survey will be conducted at a later date when conditions have improved. Hydrogen Sulphide and sniff test sampling will only be completed if it is safe to complete. The results of this survey will be used to identify potential odour sources. The completed survey will be forwarded to the Site Manager and Area Process Scientist for the site. A hydrogen sulphide and sniff test will be completed (where safe and meets DSEAR requirements) if odour complaints are received for the site and no reason can be detected for the odour complaints being generated.

Wessex Water acknowledge that there is no EN standard for measuring hydrogen sulphide however, will adopt the use of the Jerome 613X meter for measuring atmospheric hydrogen sulphide concentrations as an information gathering exercise only.

6.3 Source Odour Monitoring

Odour Emissions can be monitored using:

- EN standards (e.g. dynamic olfactometry according to EN 13725 in order to determine the odour concentration or EN 16841-1 or -2 in order to determine the odour exposure);
- When applying alternative methods for which no EN standards are available (e.g. estimation of odour impact), ISO, national or other international standards that ensure the provision of data of an equivalent scientific duality.

The applicability of BAT10, that is, to periodically monitor odour emissions, is restricted to cases where odour nuisance at sensitive receptors is expected and/or has been substantiated. Due to the results of the PORA every 6 months a duplicate olfactometry sample from one of the Howard Tanks (B1-B3) in accordance with EN 13725 will be taken in order to determine the odour concentration

An olfactometry sampling survey may be completed if there is an increase in number of odour complaints being received for the site and this would be triggered by the customer complaint procedure if no reason for the increase in odour complaints can be referred from other monitoring assessments.

The PORA will assess the requirement for future olfactometry sampling to be carried out on an annual basis. Olfactometry sampling must be carried out to the procedure set out in Wessex Water procedure TRTWG669 and only if it is safe to do so.

6.4 Channelled Emissions

BAT 8 is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards.

Table 6.4.1 BAT 8 Channelled Emission Parameters.

Substance / Parameter	Standards	Minimum Monitoring Frequency	Monitoring in association with
Ammonia	No EN standard available	Once every six months	BAT 34
Hydrogen Sulphide	No EN standard available	Once every six months	BAT 34
Odour Concentration	EN 13725	Once every six months	BAT 34

Table 6.4.2 BAT 34 BAT-AELS for channelled emissions to air.

Parameter	Units	BAT-AEL (Average over the sampling period)
Ammonia (1)	mg/Nm^3	0.3 - 20
Odour Concentration	ou_E/m^3	200 – 1,000

(1) Either the BAT-AEL for NH3 or the BAT-AEL for the odour concentration applies

There is currently no channelled emission to stacks at Berry Hill BC. It is recognised that the SAS GBTs (L) are extracted to a vent in the side of the building. Please see Odour Improvement Requirement Number 2 which will include the action to put in place the sampling points required.

6.5 Housekeeping

A lack of good housekeeping can result in elevated levels of residual odour, and at times, more serious emissions. Measures constituting to Best Practicable Means for housekeeping that are adopted at Berry Hill BC are listed below.

6.5.1 General

- Ensure that doors to buildings that may contain odours are kept closed except for access. Maintain signage on doors for operational, visiting and contract personnel.
- Ensure that inspection covers or hatches fitted to contain odours are closed immediately after use.
- Where possible covers should be sealed.
- Where sealing strips are fitted to covers check for integrity.
- Retention of sludge should be minimised as much as possible.
- Spillages must be avoided. Ensure the immediate clear up of any spillage.
- Where plant failures may lead to increase in odour emissions repairs should be done as soon as possible.
- New and temporary plant must be assessed for odour and there is a requirement for this Odour Management Plan to be updated. The Odour Management Co-ordinator must be contacted if new or temporary plant is proposed. A Pre Odour Risk Assessment and Process Risk Assessment must be completed before temporary plant is used on site. This Process Risk Assessment must consider possible odour complaint risk that could be caused by the new or temporary plant in question. Plant must be assessed that it will be BAT compliant before it is installed. Environment Agency: Appropriate measures for the biological treatment of waste must be consulted at the design stage.
- Report any raised odour levels to the Site Manager immediately who will liaise with the Area Scientist and Odour Management Co-ordinator.

6.5.2 Sludge Storage and Treatment

- Sludge storage, particularly of primary or mixed primary and biological sludges: allows odour generation, which will be emitted when the sludges are disturbed by a discharge into the tanks, mixing or during subsequent treatment. Therefore, sludge should be processed as soon as is possible. Any mixing should be at low speed and operated continuously. Where possible sludges should be discharged at low level in the tank and, wherever possible, below normal liquid level.

- Equipment for mechanical thickening and dewatering should be operated continuously where practicably possible. This is to ensure that sludges are rapidly handled and provide a continuous stream of return liquor, rather than intermittently with consequent high odour emissions. If not continuous operation, the plant should be cleaned after use. This will remove sludges retained on equipment that may continue to produce malodours.

- Returned liquors can be highly odorous. Aim to minimise turbulence when discharging or discharge under liquor level where possible.

- Aim at balancing the flow of sludge liquors to even the load over the day where process loading allows.

- Aim to minimise turbulence when sludge pumping. Where possible discharges to sumps should be at low level to minimise turbulence and hence odour emissions.

- Ensure that skips containing dewatered sludge cake are not overfilled and removed from site as soon as is practicable.

- Vehicles for skip removal must be kept as clean as is practicable.

- Ensure within digesters that there is good mixing. This is to ensure all sludge is digested and that no short-circuiting occurs.

- Check emergency release valves on the digesters for leaks on a regular basis.

6.6 Pre-Acceptance, Acceptance and Rejection of Waste Procedure

Wessex Water have the following procedure in place:

TRTWP549: Wessex Water Pre Acceptance, Acceptance and Rejection Procedure.

These documents should be read alongside the Berry Hill BC Waste Management Plan (BIOP015) which includes details on the scope of the procedure and operations of the site.

6.7 Changing Dispersion Conditions

The site is operated in accordance with this Odour Management Plan to minimise the risk of odour complaints being received. It is recognised there are dispersion conditions where the potential risk of odour complaints being received increases. The three major factors which determine when poor dispersion conditions have been reached would be:

- Wind direction.
- Wind speed.
- Temperature.

The PORA detailed in chapter 5.4 combined with previous odour complaints received identifies R5, R6 and R24 locations potentially to be at a higher risk than other receptors if there are

poor dispersion conditions being experienced. To reduce this risk the following must be completed:

1. The weather forecast for the week ahead will be checked on a Monday morning by site staff and recorded for the week ahead. The predicted weather for the day must be check at the start of each day and recorded.
2. Where the following poor dispersion condition parameters are met on checking the predicted weather forecast all Site Staff, Site Manager, Area Scientist and the Odour Management Co-ordinator must be notified that it is predicted there is the potential for poor dispersion conditions and the risk of an odour complaint being received is higher than normal.

- **Wind direction: N-NE and SE**
- **Wind speed: Beaufort wind scale 0 (Wind speed 0ms^{-1}) Wind descriptive = Calm to Beaufort wind scale 3 (Wind speed 4-5ms^{-1}) Wind descriptive = Gentle Breeze**
- **Temperature: Day time temperatures to go above 28^{o}C**

3. Site should be checked that housekeeping set out in section 6.5 of this Odour Management Plan is in place by the Site Operator. Check should be recorded.
4. Key process monitoring set out in section 7.1 of this Odour Management Plan should be checked by the Area Scientist.
5. Weekly Operator sniff test assessment may need to be increased and coincide with day(s) of poor dispersion conditions. Site Manager/Area Scientist to discuss with Odour Management Co-ordinator. The number of sniff test assessments required will be dependent on the predicted duration of poor dispersion condition being present.
6. The fullness of the sludge screening skips must be checked by the Site Operator. If close to full where possible the skip should be arranged by the Site Manager to be removed from site before the onset of poor dispersion conditions.
7. The Site Operator should check on the number of full digested sludge cake skips awaiting removal. The number of full skips should be reported to the Site Manager who will where possible arrange early removal of full skips so the level of full skips onsite is at the very minimum possible at the predicted time of poor dispersion conditions.
8. Where there are pre-planned maintenance activities outside the normal BC operation detailed in this Odour Management Plan these should be where possible not be completed at the identified time of the predicted poor dispersion conditions. There will be events where it is not possible to change the date and time of planned maintenance or emergency maintenance.
9. Where it is not possible to change planned maintenance or emergency maintenance then community engagement described in chapter 9.1 may need to be carried out.

If an odour complaint(s) are received this chapter of the odour management plan should be reviewed to whether poor dispersion conditions trigger points require changing including whether further mitigation actions during poor dispersion need considering.

7 Inspection / Monitoring / Maintenance Schedules and Records.

7.1 Key Process Monitoring

The site is operated under PLC control with data logging and interrogation of key parameters to maintain safe, efficient, and low emissions operation. Table 7.1.1 includes the key process monitoring provisions for processes associated with emissions to air.

Key process monitoring trigger levels will be reviewed on a six monthly basis at the sites odour management meeting.

Table 7.1.1 Key Process Monitoring

Monitoring described in this table is to make sure the abatement system is effective in treating odours and other emissions.

Emission Point / Description	Parameter	Monitoring Approach	Monitoring Frequency	Trigger level	Action	Timescale
SLTH01 (E) SLTHO3 (F)	High Tank Level	On-line	Continuous	High Level	Holdenhurst sludge discharge inhibited.	Immediate
Howard Tank 2 (B2). Howard Tank 3 (B3).	High Tank Level	On-line	Continuous	High Level	Operator to stop further sludge imports,	Immediate
SLTHO4 (H)	High Tank Level	On-line	Continuous	High Level	Feed from Holdenhurst Strain press (J) inhibited.	Immediate
SLTH02,SLTH 05,	High Tank Level	On-line	Continuous	High Level	Feed from Holdenhurst SAS inhibited and feed from raw strain press(J) inhibited.	Immediate
Howard Tank 01 (B1)	High Tank Level	On-line	Continuous	High Level	Feed from import strain press (x) inhibited	Immediate
RAW Gravity Belt Thickeners x2 (K)	% dry solids	Manual	Daily Sample including visual inspection. Results of sample available on data storage system and reviewed weekly.	<5.0%->6.0%	Operator intervention if outside parameters.	Same working day
SAS Gravity Belt Thickener (x2) (L)	% dry solids	Manual	Daily Sample including visual inspection. Results of sample available on data storage system and reviewed weekly.	<5.0%->6.0%	Operator intervention if outside parameters.	Same working day

Sludge Blending Digestion Feed Tank (D)	Intake volume	On-line	Continuous	600 m3 in total	max 150m3 per Digester	Same working day
	% dry solids	Manual	On-site daily sample and visual inspection. Weekly lab sample.	5%-6 %	Optimise thickening	Same working day
Digesters (N1-N4)	Volume	On-line	Continuous	Tank level 90-95%	Operator intervention/ PLC	Immediate
	Foaming	Manual – visual-online	Continuous	High level	Modulate the feedstock- Dose antifoam	Immediate
	Volatile Fatty Acids (VFAs)	Manual (Lab samples)	Weekly	>300 mg/l	Modulate feedstock in line with HACCP CCP in line with HACCP CCP	Next working day
	Alkalinity	Manual (Lab samples)	Weekly	>3000mg/l-<6000mg/l	Increase monitoring and add alkalinity where required.	Next working day
	Process temperature	On-line	Continuous	<32.7-38> degrees	Digesters automatically inhibit feed rate on temperature set-points	Same working day
	Organic Loading rate	Manual (Lab sample)	Weekly	1.5-3.5 kg.VS/m3 /d	Modulate feedstock with HACCP CCP	Same working day
	pH	Manual (Lab sample and on-site spot reading)	Weekly	<6.9-<9	Check VFA/Alkalinity ratio Modulate feed to digester in line with HACCP CCP	Same working day
	Hydraulic Retention Time (hours)	On-line (flow meter)	Continuous monitoring but daily check trends.	Refer to HACCP CCP	Modulate feedstock if outside CCP	Same working day
	Heat exchanger Sludge temperatures (deg. C)	On-line	Continuous	<40 degrees	Modulate the feedstock	Same working day
	Biogas methane (%)	On-line gas composition monitor.	Continuous	<60%	Check OLR-VFA.PH Modulate feed	Same working day
	Oxygen Level	On-line gas composition monitor.	Continuous	<2%	Modulate feed	Immediate
	Digestate Ammonia	Manual (Lab sample)	Weekly	<1,500mg/l	Modulate the feedstock- Reduce OLR, CHECK PH, ALKALINITY AND VFA	Same working day

	ALK/VFA ratio	Manual (Lab sample)	Weekly check of trends	>0.5	Monitor VFA and PH Test Alkalinity Modulate feedstock within HACCP CCP* volumes accordingly.	Same working day
Centrifuges (x3) (S)	Dry solids (%)	Manual (Operator takes sample and complete analysis)	Periodic	Centrifuge <25%	Operator intervention if falls below.	Same working day
CHP (AF)	Operating hours	On-line	Continuous	Gas Holder level /gas pressure initiate shutdown - or fixed gas detection trigger will perform controlled shutdown	- Biogas holder level low – Generator controlled shutdown, will restart once biogas holder level increase to enable level - Gas booster low pressure – Hard wired trip, will require operator intervention to restart all biogas consumers - Fixed gas detection (CHP / boiler house) – If triggered – hard wired trip, emergency slam shut valve(s) will initiate close sequence and fail gas boosters. Requiring operator intervention to restart all biogas consumers.	Same working day
	Electricity generated	On-line	Continuous	>300Kw- 1mw/hr< max 150 hours average weekly maintenance shut down and major service 1000 hr	Engine shutdown Check gas production/ check Engine Check alarms	Immediate
	Load required / actual (%)	On-line	Continuous	level will depend on feed and gas production 10,000 m3	Check gas production- modulate feed	Immediate
	Biogas pressure to CHP	On-line	Continuous	Pressure sensor record, pressure transducer. Low pressure hardwire	Low pressure - Gas holder high, operator intervention - flare will called to run.	Immediate

				trip. High pressure will trigger alarm		
	Heat circuit temperatures (deg. C)	On-line	Continuous	<48- 80> degrees	Boilers starts	Immediate
Demon Plant (Liquor Treatment) (V)	Ammonia	On-line	Continuous	<50-200>	Adjust Feed Adjust PH level	Same working day
	NH4-N removal	Manual	Continuous	85%	Adjust feed, check pH	Same working day
	Nitrate	On-line	Continuous	<0-230>	Increase SAS volume	Same working day
	Nitrite	On-line	Continuous	<0-50>	Reduce Aeration	Same working day
	pH	On-line	Continuous	>7	Increase aeration	Immediate
	Alkalinity	On-line	Continuous	<3500->5000	Reduce feed Increase aeration	Immediate
	Temperature	Online	Continuous	25-32 degrees	Boilers on/off	Immediate
Boilers (Y)	Biogas / natural gas flow / water pressure to boiler	On-line	Continuous	3bar- secondary circuit- >50-90< degrees centigrade	Boiler automatically shut down – High or Low temperature - high / low water pressure and flame failure Dual fuel - check boilers, will only run when CHP isn't	Immediate
Gas Holder (Q)	Biogas Holder/ LEL/System pressure	On-line	Continuous	10 -24 MBAR	High system pressure will generate alarms, controlled shutdown of air blowers. Fixed gas detection within outer membrane will generate an alarm for operator intervention	Immediate

7.2 Maintenance

Berry Hill BC has a comprehensive maintenance and repair programme set up. This covers both routine and reactive work. Operational Asset maintenance is governed by the (OPSS001) Operational Asset maintenance strategy. A Work Management System is available for operations to schedule work, raise ad-hoc and emergency work, and also provides a record of work completed and outcomes.

8 Emergency and Incident Response

This section addresses the issue of appropriate response to odour incidents caused by process failure or equipment breakdown. These emergency procedures include the:

- Foreseeable situations that may compromise the ability to prevent and minimise odorous releases from the process.
- Actions to be taken to minimise the impact.
- Person responsible for initiating the action.

Table 8.1.1 summarises emergency/incident control measures in place. The Wessex Water odour emergency contact details for Berry Hill BC are available in Appendix 1.

Where abnormally high odour levels are observed from either general observations, routine sniff testing or odour complaint being received the following measure should be undertaken:

- Investigating the odour incident and its cause(s).
- Bringing the process back under control; and
- Minimising exposure or annoyance effects.

All failures of a site process should be reported to Site Manager and Area Scientist. If the failure of the site process has the potential to cause an odour impact the Odour Management Co-ordinator and management of the WRC and Gas to Grid must be informed.

In the event of a failure of a site process or an odour control system, that may give rise to odour, it is the Site Managers responsibility to inform the local EA Officer for the area/ Environmental Health Practitioner.

If the event is a critical failure of plant/process that will mean the plant/process is out of operation for an extended period of time a PORA is required to be ran to assess the potential odour impact. It may be that the PORA indicates that the critical failure and change of process is low impact due to the potential odour emission rate and hedonic tone score. Therefore, further odour impact mitigation may not be required. The local EA Officer for the area/ Environmental Health Practitioner are to be informed of the outcome of the PORA and whether further odour impact mitigation is to be put in place and likely timeframes involved. This may include the following:

- Updating potential sensitive receptors.
- Informing Wessex Water CSU department that odour complaint may be received so correct information can be relayed.
- Setting up odour monitoring.
- If critical failure is a spillage report how quickly repair can be made and clean up ASAP.
- Temporary covering of plant (H&S risk must be assessed before any covering is completed).
- Temporary odour control plant installed.
- Further odour modelling and odour risk assessment required.
- Raise risk on company risk management system.

- Odour Management Plan may require updating.

At each stage it must be documented by the Site Manager for the site the actions put in place to minimise the odour impact.

Table 8.1.1 Berry Hill; BC Incident/Emergency Control Measures:

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
Liquid sludge spillage	Liquid sludge	Medium – low volume spillage would require manual clearing up.	Pipework and tanks undergo regular inspections. Planned maintenance on equipment	Stop source of spill and immediately wash down area.	Immediate	Site Operator
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken.	Same day as incident	Site Operator
GBT	Sludge tanks due to increased retention time	Medium-High	Sludge imports and indigenous sludge to be inhibited and sludge can be exported if thickener down for long period	EMI to repair	Same working day	Team leader/ Site Manager
Sludge cake spillage	Sludge Cake	Medium to High depending on volume of spill	Regular inspection and planned maintenance	Stop source of spill and immediately wash down area.	Immediate	Tanker Driver
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken.	Same day as incident	Site Operator
				If there is likely to be any offsite impact inform site manager and Odour Management Co-ordinator immediately.	Same day as incident	Site Operator

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
Failure of digestion process (treatment)	Partially treated sludge odours Increased odours from post-digestion sources	Medium	Performance monitoring of key parameters Laboratory sampling (see key process monitoring 7.1.1)	Initial investigation by Area Scientist. Changes made to bring digester back into operational parameters.	Immediate	Area Scientist/Site Operator
High pressure conditions in digesters	Release from Pressure Relief Valve	Medium - Biogas would be vented at high pressure to aid dispersion	Roof level alarms on digester.	Diversion of biogas to Waste Gas Burner	Immediate	Site Operator
				Investigate roof level alarm on digester and resolve.	Immediate	Site Operator
Dewatering Centrifuges	Sludge tanks as increase retention as digester unable to be fed.	Low	Sludge to be exported if thickeners down for long period	EMI to repair	Same working day	Team leader/ Site Manager
Staff unavailability	Risk of increase to site odours due to limited operational resources	Low	Staff replacement	Operator replacement from another site Reduce site activities to only critical jobs Remote monitoring from Control Room / off-site /	Same day / For next working day	Site Manager
Asset Fire	Risk of increase to site odours due to limited	Medium	Regular inspection and planned maintenance	Remote monitoring from Control Room / off-site / another site	Immediate	Site Manager

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
	access and inability to operate assets					
Power Failure	Risk of increase to site odours due to inability to operate assets	Medium	Standby generator on site	Mains power failure alarm and switch over to generator. Site Operator to check and make sure plant has reset.	Immediately	Site Operator
Very high rainfall	Flooding	Low	Assets unlikely to flood.	Plan put in place to remove floodwater from assets.	Immediately	Site Operator

9 Customer Communications

Complaints are the primary indicator of nuisance and other community dissatisfaction. It is important that complaints are properly and systematically recorded and acted upon.

Complaints of odour are dealt with and recorded by the Customer Support Unit (CSU). The complaint details are placed onto the Ops Contact Reporting System and a unique rapid reference number is created. Customer odour complaints are allocated by CSU/scheduling team to the most relevant Wessex Water department based on initial information provided by the customer when they first contact Wessex Water. There are a number of mechanisms of how a customer can contact Wessex Water. These include telephone, email, letter, social media or via a third party (EA, EHO, Councillor, MP). There are occasions when initially a sewerage crew, sewage pumping station crew, WRC operator is dispatched to investigate the odour complaint as it is believed the source of the odour is from other Wessex Water assets and not the BC in the first instance on information provided by the customer. If on investigation by these other departments, it is identified the source of the odour may be the BC site it will be reallocated to the BC site for investigation.

The initial odour complaint action is to be completed within 24hrs of the complaint being allocated by CSU/scheduling team to the BC site.

Note: There may be occasions when the initial action cannot be completed in full within 24hrs. For example, the customer has informed in the initial complaint information the odour only occurs on a certain day and time. Investigation must be therefore completed when the odour is most likely to be occurring. Sniff test assessments should be scheduled in for the most appropriate time that the odour is likely to be present.

It is the Site Manager responsibility to make sure there is liaison with the local stakeholders (including the complainant) and CSU on progress. Any complaints made directly to site staff must be reported to CSU so they can be placed on the Ops Contact Reporting system. It is important that communication between all interested parties at all times is maintained.

The initial odour complaint action following a complaint will be as follows:

- The Site Operator will check wind direction on Prism for the time and date of when the odour was detected.
- The Site Operator will perform a general check of the site.
- The Site Operator will check that there are no on-going process issues or activities that would give rise to odour emissions.
- The Site Operator will check that levels of ‘Good Housekeeping’ are being maintained (see chapter 6.5).

- The Site Operator/Area Scientist will check the Key Process Monitoring are within limits (see chapter 7.1)

- The Site Operator will complete a Sniff Test Assessment (see section 6.1 and appendix 2)

- The Site Operator will perform a sniff test (if access possible) at the location the odour complaint has been reported for. If the wind direction has changed a sniff test should also be completed downwind of the BC site. In some cases the customer does not provide details of the actual location of the odour. This is quite often the case in email, social media and 3rd party contacts. If this is the case CSU should request whether more information can be gained from the customer so a sniff test assessment can be carried out.

- As part of the overall investigation the following should be reported to the Site Manager, Area Scientist and Odour Management Co-ordinator where the Site Operator has investigated and found the following.

  - The odour is being generated in a remote part of the sewage network. This may require a job to be raised for a sewerage crew, pumping station crew to carry out odour investigations on other Wessex Water assets outside the BC boundary.

  - There were other known sources of odour in the vicinity at the time.
    - Private issue on customer property.
    - Environmental, especially coastal areas and rotting seaweed, tide times may need to be checked.
    - Muckspreading.
    - Other industry.
    - Other 3rd party e.g. Landfill site.

  - There are good grounds for believing a complaint is frivolous or vexatious.
    - This is rare but has happened where odour complaints have been received for particular sites where the customer does not reside or is in the area when the complaint was made. If this is the case then the odour complaint should still be investigated as normal and boundary sniff testing carried out.

- Even if the odour is believed to be coming from another source Sniff Test Assessment as detailed in section 6.1 must be completed

- The customer complaint form in appendix 3 must be completed.

- The results of this initial action and the customer complaint form will be reported to the Site Manager, Area Scientist and Odour Management Co-ordinator.

There is the potential for *"no reason to be found*" for the customers reported odour complaint as there is no detectable odour present at the time when the initial odour complaint action was carried out. Further sniff tests may be required to be carried out at a later date and the customer should be informed of timescales for their completion. If the customer is complaining that they are detecting an odour on a regular occurrence the customer should complete an odour diary (appendix 4). The completed odour diary should be sent by the customer to be reviewed by the Site Manager and Area Scientist.

Following the completion of the customer complaint form in appendix 3 it must be decided whether the odour management plan is being followed. If the plan is not being followed then the Site Manager will need to complete an action plan to make sure the plan is followed, which is to be briefed out to site staff. The action plan shall be audited by the Odour Management Co-ordinator on the 6 monthly review meeting that this has been completed. If the odour management plan is being adhered to and investigations demonstrate the BC is the cause of the odour complaint the following will need to be conducted. This will be initiated by the Site Manager, Area Scientist and Odour Management Co-ordinator.

Further investigations that could involve the following:

- Site Manager, Area Scientist and Odour Management Co-ordinator perform general check of the site.
- "Sniff test" survey
- H_2S Survey.
- Measure the performance of abatement equipment.
- Process diagnosis.
- Asset investigations.
- Olfactometry surveys.

Following investigation further action may be required to abate odour emissions. It may require the following.

- Operational solutions.
- Process solutions.
- Maintenance procedures.
- Investment solutions.

If operational solutions and maintenance procedures are required the Site Manager must put together an implementation plan. It is the Site Managers responsibility to action and review the implementation plan. If process solutions or investment solutions are required a action must be raised on the companies risk system. This should be completed by the Area Scientist. If process solutions or investment solutions are required the Odour Improvement Plan must

be updated by the Odour Management Co-ordinator and reviewed by the Site Manager for the site.

Communication with the customer will be via the mechanism that they originally made contact with Wessex Water. They will be informed of the outcome of the initial odour complaint investigation, whether further investigation should be carried out and what action has been taken where it has been required. Wessex Water aim to respond within 5 working days of the complaint being made unless the customer has requested they do not wish further contact. Following contacting the customer the rapid reference will be closed out unless there are further odour investigations required. The customer will be updated on the results of these odour investigations before the complaint can be closed out.

In the event of an odour issue affecting multiple customers within the community Wessex Water site management team will decide the level of response that is required. This could include, but not be restricted to, stakeholder liaison (communication through local councillors and local resident representatives), community engagement meetings to discuss the odour issues being experienced and actions that will be undertaken, site open days, local media liaison and writing to local residents via a letter drop. Customers may also be requested to complete odour diaries (see appendix 4).

10 Training

Every Operator is trained on all processes with which they are associated. The training is supported by a number of process manuals. Upon completion of the training, every operator is assessed on each process as well as a 'basic' site assessment.

Staff at all levels having duties related to the management, operation, maintenance or repair of odour-critical plant will be trained, competent and have documented training records. All Wessex Water staff involved with odour-critical plant will have access to the Wessex Water Operating Manual on Odour Control and undertake associated training and competency assessments.

A copy of the Odour Control Operation Manual is kept on the odour page of the Wessex Water intranet for reference. Odour Control Operation Manual: TRTMAN007.

Records for training received by all employees are held electronically.

11.0 Encroachment by External Developers

Where potential new development falls within the Wessex Water consultation zone TRTWG669 is to be followed. The potential developer must request a copy of the procedure from Wessex Water Planning Liaison Team. The procedure provides guidance on how to assess the odour impact from Water Recycling Centres (WRC) or Sewage Pumping Stations (SPS) and other Wessex Water Assets. The following policies and guidance below must also be consulted.

The National Planning Policy Framework (NPPF) (2012)

The NPPF describes the policy context in relation to pollutants, including atmospheric pollution.

'The Government's objective is that planning should help to deliver a healthy natural environment of the benefit of everyone and safe places which promote well being.

To achieve this objective, the planning system should aim to conserve and enhance the natural and local environment by:

[…]preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of land, air, water or noise pollution or land instability.'

Where pollution is defined as:

'Any consideration of the quality of land, air, water, soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam and odour.'

The NPPF specifically requires consideration of pollution on health and the natural environment as part of the planning decision process:

'To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.

The Institute of Air Quality Management (IAQM): Guidance on the assessment of odour for planning

The Institute of Air Quality Management (IAQM) published guidance on the assessment of odour for planning in 2014 (updated 2018). The guidance is for assessing odour impacts for planning purposes.

The guidance states that "*IAQM is of the opinion that the practitioner should observe, from the various scientific studies, case law and practical examples of the investigation of odour*

annoyance cases that in any specific case, an appropriate criterion could lie somewhere in the range of 1 to 10ou$_E$m^{-3} as a 98th percentile of hourly mean odour concentrations."

The guidance states that *"Loss of amenity or disamenity does not equate directly to nuisance and significant loss of amenity will often occur at directly lower levels of emission then would constitute a statutory nuisance"*

CIWEM Policy Position Statement (2011)

"*CIWEM considers that the following framework is the most reliable that can be defined on the basis of the limited research undertaken in the UK at the time of writing:*

• C98, 1-hour >10 ou$_E$/m^3 - complaints are highly likely and odour exposure at these levels represents an actionable nuisance;

• C98, 1-hour >5 ou$_E$/m^3, - complaints may occur and depending on the sensitivity of the locality and nature of the odour this level may constitute a nuisance;

• C98, 1-hour <3 ou$_E$/m^3, - complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution or significant detriment to amenity unless the locality is highly sensitive or the odour highly unpleasant in nature."

EA Horizon Guidance Document H4 (2012)

Benchmark levels

"The benchmarks are based on the 98th percentile of hourly average concentrations of odour modelled over a year at the site/installation boundary. The benchmarks are:

- *1.5 odour units for **most offensive** odours:*
- *3 odour units for **moderately offensive** odours;*
- *6 odour units for **less offensive** odours.*

(caution should be used as these benchmarks were not from a sewage treatment works and the benchmarks were designed to be applied to those industrial processes regulated by an Environmental Permit. It is generally considered that sewage treatment works odours fall into the middle category (3 *ou$_E$/m^3*) unless there is septic wastewater or sludge on the site, in which case the most stringent criterion may apply).

Examples of previous decisions in statutory nuisance cases and planning appeals are listed below (caution should be exercised as decisions will have been based solely on the evidence presented at the time, which may have been incomplete or of a different standard to current best practice).

- Newbiggin appeal (1993) reference APP/F2930/A/92/206240; adoption of a level of 5ou/m^3 ($C_{98,1hr}$) (caution required as units are given as ou/m^3 and not ou$_E$/m^3) is both reasonable and cautious.

- Leighton Linslade appeal (2010) reference APP/P0240/A/09/2110667. At a threshold of 5, evidence of no harm is not convincing and there could be a risk of regular and unacceptable odour annoyance to such an extent that it would detract from the future resident's living conditions.

- Mogden case (statutory nuisance) [2011] EWHC 3253 (TCC). Nuisance certainly established at $5ou_E/m^3$

- Cockermouth appeals (2012) references APP/G0908/E/11/2152403 and A/11/2151737. $3ou_E/m^3$ for medium offensiveness.
- Stanton appeal (2012) reference APP/E3525/A/11/2162837. More appropriate threshold $3\text{-}5ou_E/m^{3.}$

- Gillingham (Dorset) (2016) appeal APP/N1215/W/15/3005513. I conclude that the appropriate parameter to apply in this case is the $3ou_E/m^3$ contour line.

12.0 Odour Improvement Plan

This section is to be completed by the Odour Management Co-ordinator if improvements are required to meet BAT, or customer odour complaints are received and further process and investment solutions are required to prevent further complaints. Each entry must be reviewed by the Site Manager for the site.

Table 12.1.1 Berry Hill BC Odour Improvement Plan.

The odour improvement plan will be updated including any expected completion dates as schemes are designed, developed and progressed. It is the relevant schemes project manager responsibility to update the Site Manager and Odour Manager Co-ordinator so the Odour Improvement Plan can be updated.

Requirement Number	Requirement	Reviewed by Site Manager
1	Cover/replace and extract to an odour control unit(s) Howard Tanks (Raw Sludge) (B1-B3) meeting BAT and Appropriate Measures requirements. This is to include the relevant sampling points and monitoring requirements as required for BAT 8 and BAT 34.	Dan Selby
2	SLTH01(E), SLTH02 (G), SLTH03 (F) SLTH04 (H), SLTH05 (I), Raw GBTs (K), SAS GBTs and SAS GBT Building (L), Sludge Blending/Digester Feed Tank (D) to be extracted to an odour control unit(s) meeting BAT and Appropriate Measures requirements. This is to include the relevant sampling points and monitoring requirements as required for BAT 8 and BAT 34.	Dan Selby
3	Covering of the secondary digesters (O1-O9 and A1-A3) and Secondary Digested Buffer Tank (P). An assessment of residual biogas potential to determine whether the secondary digesters are extracted to an OCU or biogas removal installation. This will also inform what type of covering is required.	Dan Selby
4	Centrifuge feed tank (R) to be covered. Centrifuge Feed Tank (R), DEMON plant (V), Centrate Tank (C) require an assessment of residual biogas potential to determine whether these plant are extracted to an OCU or biogas removal installation. This will also inform what type of covering is required.	Dan Selby
5	Odour dispersion modelling to be completed to demonstrate where odour control unit stacks are constructed in Odour Improvement Requirement Number 1-4 that odour emissions do not impact on sensitive receptors.	Dan Selby

References

Wessex Water Documents

- DS464 - Odour Management
- DS 540 - Sewage Pumping Stations and Pumping Mains
- TRTWP102 – Generic Odour Management Plan
- TRTMAN007 - Odour Control
- TRTWG669 - Odour impact and odour risk assessment procedure for existing WRCs/STC/SPSs, proposed new expansion/development of a site and potential encroachment around/near a site.
- WECEP004 - Preliminary Odour Risk Assessment
- NTKWP222 – Pumping Station Generic Odour Management Plan

Applicable regulation

- Environmental Protection Act 1990
- Public Health Acts 1936, 1961, 1969
- The National Planning Policy Framework (NPPF) (2012)

Further Guidance

- Appropriate measures for the biological treatment of waste: Consultation daft July 2020. Environment Agency
- Best Practical Means (BPM), A Guidebook for Odour Control at Wastewater Treatment Works, UKWIR 06/WW/13/8
- BS – EN 12255-9:2002 – Waste Water Treatment Plants – Part 9: Odour Control and Ventilation
- Code of Practice on Odour Nuisance from Sewage Treatment Works (DEFRA, 2006) (withdrawn September 2017)
- Guidance on the assessment of odour for planning (Institute of Air Quality Management, 2014)
- H4 Odour Management Guidance (How to comply with your Environmental Permit), Environment Agency

Appendix 1: Emergency Contacts

Table Appendix 1 Berry Hill BC Contacts:

Area	Contact
Environment Agency	Email: Wessex.Waste@environment-agency.gov.uk
Environmental Health	Email: environmentalhealth@bcpcouncil.gov.uk Tel 01202 123 789
OCU Supplier and maintenance provider	Wessex Water Procurement Department should be consulted first before contacting the below examples of OCU suppliers. Air Technology Systems Ltd 01527 833383 ERG 01403 290000 OSIL 01543 506855
Berry Hill BC odour related contacts	**Wessex Water 03456 004600** James Lovell: Head of Bioresources. Dan Selby: Site Manager Harriet Edwards: Technical and Compliance Manager Jamie Bezer: Lead Scientist Hafedh Benamor: Area Scientist Jim Humphries/Kostas Vardas: Regional Scientist/Odour Management Co-ordinator.

Appendix 2: Sniff Testing Record Sheet

Test by		Start Time	
Date		End Time	
Weather Condition		Temperature	
Wind Strength		Wind Direction	

Location No. / Name	Intensity	Hedonic Tone	What does it smell like?	Frequency of odour?	Is the source of the odour evident?	Other comments / observations
Figure 0.1 Weekly / Monthly Sniff Testing Locations	**0 No odour 1 Very faint 2 Faint odour 3 Distinct odour 4 Strong odour 5 Very strong odour 6 Extremely strong odour.**	**+4 Very pleasant +3 Pleasant +2 Moderately pleasant +1 Mildly pleasant 0 Neutral or no odour -1 Mildly unpleasant -2 Moderately unpleasant -3 Unpleasant -4 Very unpleasant**	**Rotten eggs Rotten cabbage Musty Earthy Urine "fishy" Sweet Vinegar**	**Constant / Intermittent**	**Yes / No Source area / name to be provided.**	**Was there evidence of poor housekeeping? (if yes where possible take photographs and send to Site Manager and Odour Management Co-ordinator)**
1						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12						

Appendix 3 Customer Complaint Form:

Wessex Water Rapid reference number (Customer complaint name and address to be kept on rapid system for GDP)	
Receptor location using location of sensitive receptors figures 3.2.1/3.2.2/3.2.3. (E.G. R18)	
Receptor sensitivity (High, Medium, Low)	
Date of odour	
Time of odour	
Wind direction (e.g. from the NE)	
Wind strength (none, light, steady, strong, gusting)	
Weather conditions i.e. dry, rain, fog, snow)	
Temperature (very warm, warm, mild, cold or degrees if known)	
Complainants description of odour: • What does it smell like?	
Intensity (see below)	
Duration (time)	
Constant or intermittent in this period.	
Does the complainant have any other comments about the odour?	
Are there any other complaints relating to the installation (permit area), or to that location? (either previously or relating to the same exposure)	
Operating conditions at time the odour occurred: See Housekeeping (Chapter 6.5) Key Performance Monitoring (7.1)	
Were there were other known sources of odour in the vicinity at the time?	
Any other relevant information	
Sniff Testing Assessment Completed Y/N: Reason to be provided if not completed.	
Action take:	
Does a corporate risk system action require raising? Date corporate risk system action raised if required:	
Form completed by:	
Date	

Intensity

0 No odour
1 Very faint odour
2 Faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour

Appendix 4 Odour Diary

Odour Diary					
Name Telephone number	Address				Sheet Number
Date of odour					
Time of odour					
Location of odour if not at above address (inside/outside)					
Weather conditions (dry, rain, fog, snow etc)					
Temperature (very warm, warm, mild, cold or degrees if known:)					
Wind strength (none, light, steady, strong, gusting).					
Wind direction (e.g. from NE)					
Describe the Odour (rotten eggs, musty, earthy, fishy, urine, sweet, vinegar)					
Intensity: How strong was it? See below 0-6					
How long did it last for (time)?					
Was it constant or intermittent in this period?					
Comments					

Intensity

0 No odour
1 Very faint odour
2 Faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour