MOTT MACDONALD

Ashford Sludge Treatment Centre Environmental Permit Application

Bioaerosol risk assessment

December 2023

Mott MacDonald
10 Temple Back
Bristol BS1 6FL
United Kingdom

T +44 (0)117 906 9500
mottmac.com

Ashford Sludge Treatment Centre Environmental Permit Application

Bioaerosol risk assessment

December 2023

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	April 2021	J. Burnell	J. Brookes	A. Manns	Draft
B	June 2021	S.Oliver	C.Mills	A. Manns	Final Draft
C	December 2023	H.Whalley	J.Dicks	A.Manns	Third Issue

Document reference: 790101_ERA_BioaRA_ASH December 2023

Information class: Standard

Contents

1 Introduction

1.1 Overview

Southern Water is applying for a new environmental permit to operate their sludge treatment facility at the Ashford Wastewater Treatment Works (WTW) (hereafter referred to as 'the Site'). Sludge treatment activity is covered by the Environmental Permitting Regulations (EPR) 2016, which incorporates the application of the Industrial Emissions Directive (IED). The Site currently operates under a T21 exemption and has two environmental permits: one for operation of the Combined Heat and Power (CHP) unit (KP3736GS/V003) and one for the biological treatment facility at the Site (BP3296SB/V003).

Regulatory Position Statement 209[1], issued 23 January 2018 by the Environment Agency (EA), states that all sites that have a permit for the treatment of biological waste within 250 metres of a sensitive receptor (a place where people live or work for more than 6 hours at a time) must carry out a site-specific bioaerosol risk assessment. As sensitive receptors are found close to the boundary of the Site, the closest of which is approximately 110m from the nearest potential source of bioaerosols at the Site, a bioaerosol risk assessment has been undertaken to accompany the permit application for this Site.

This bioaerosol risk assessment has assessed the magnitude of risk from potential emissions of bioaerosols from the Site at nearby sensitive human health receptors. The assessment has been undertaken in accordance with the methods and principles outlined in Environment Agency's "*Guidance on the evaluation of bioaerosol risk assessments for composting facilities*" [2].

1.2 Site location

The Site is situated on Kinney's Lane, adjacent to the M20 in Ashford, Kent. The layout of the Site is shown in document reference 790101_MSD_SiteLayoutPlan_ASH December 2023. The Site includes four anaerobic digesters which are located at the centre of the Site.

[1] Environment Agency (2018) Bioaerosol monitoring at regulated facilities - use of M9: RPS 209. Available online at: https://www.gov.uk/government/publications/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209

[2] Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T. and Tyrrel, S.F. (2009). Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Environment Agency.

2 Methodology

2.1 Overview

Bioaerosols are naturally present in the air, but they are also associated with composting, anaerobic digestion and mechanical biological treatment, which are the main processes used to treat organic waste in the UK.

Bioaerosols are micro-organisms which are suspended in the air; these can include bacteria, fungi and viruses, or parts of living organisms, such as spores and plant pollen. Bioaerosols range in size from 0.02-100µm but are generally smaller than 10µm in diameter so can easily be breathed into the human respiratory system where they can cause adverse health impacts such as respiratory and gastrointestinal illnesses. Especially relevant to waste treatment facilities are infections of the respiratory system caused by *Aspergillus fumigatus*, which can be fatal, especially for at-risk and immuno-compromised patients. Bioaerosols can also cause eye irritation and dermatitis if they come into contact with the eyes and skin.[3]

2.2 Guidance

There is minimal regulatory guidance available for assessing bioaerosol emissions from anaerobic digestion facilities. Regulatory Position Statement (RPS) 031[4] states that bioaerosol concerns would normally be associated with composting activities, which are defined as: *'biological decomposition of biodegradable waste under conditions that are predominantly aerobic and that allow the development of thermophilic temperatures as a result of biologically produced heat'*.

This RPS also defines operations which are *'likely to result in the uncontrolled release of high levels of bioaerosols'* as including '*the shredding of waste and the turning of waste in the sanitisation, stabilisation and maturation stages of composting where these operations are not contained or are not subject to exhaust ventilation and scrubbing/filtering'*.

These activities do not occur at the Site as the biological decomposition of waste occurs under controlled, anaerobic conditions. Therefore, the Site is unlikely to be a high-risk site for bioaerosol emissions. This is supported by a 2012 Environment Agency guidance note[5] which states that the Environment Agency do not consider bioaerosols from anaerobic digestion to be of serious concern (provided composting activities are not undertaken at the facility).

Nonetheless, current Environment Agency guidance[6] requires any facility which could release bioaerosols to provide a site-specific bioaerosol risk assessment if there are sensitive receptors within 250m of activities. For new permits there is also a requirement to monitor bioaerosols if the site is within 250m of a sensitive receptor[7].

---

[3] Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T. and Tyrrel, S.F. (2009). Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Environment Agency.

[4] Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.

[5] Environment Agency. 2012. Guidance for developments requiring planning permission and environmental permits' (England)

[6] Environment Agency (2018) Bioaerosol monitoring at regulated facilities - use of M9: RPS 209. Available online at: https://www.gov.uk/government/publications/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209

[7] *"Sensitive receptor – any building, other structure or installation, in which at least one person normally lives or works, other than a building, structure or installation within the same ownership or control as the operator/owner of the composting facility."* Taken from 'Guidance on the evaluation of bioaerosol risk assessments for composting facilities.'

However, following a Schedule 5 notice from the Environment Agency for another similar WTW, a conservative approach has been undertaken and human receptors within 500m of the Site have been considered instead of the 250m specified in the Environment Agency guidance[8].

2.3 Methodology

The method used for this bioaerosol risk assessment is adapted from the Environment Agency's '*Guidance on the evaluation of bioaerosol risk assessments for composting facilities*'[9], which recommends using a Source-Pathway-Receptor model to help determine the magnitude of the risk associated with bioaerosol emissions from a facility.

The magnitude of risk is a function of both the probability of exposure and the consequences of the hazard. The probability of exposure to bioaerosols can be described as:

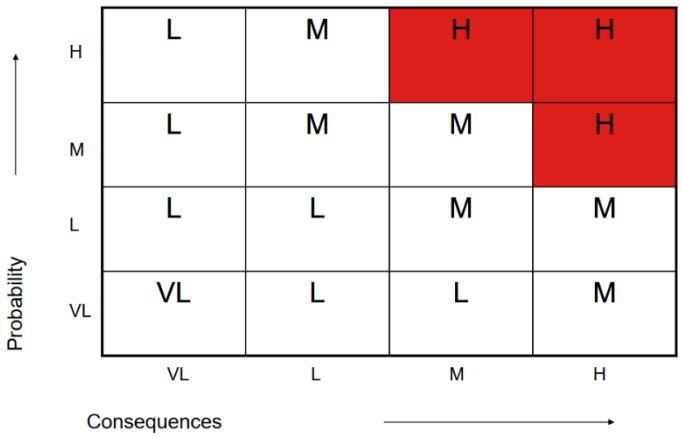
- High – exposure is probable, direct exposure likely with no/few barriers between source and receptor
- Medium – exposure is fairly probable, barriers less controllable
- Low – exposure unlikely, barriers exist to mitigate
- Very low – exposure very unlikely, effective and multiple barriers

The consequence of the hazard considers the nature of the source, the hazard and receptor. These consequences can be described as:

- High – severe consequences, evidence that exposure may result in serious damage
- Medium – significant consequences, evidence that exposure may result in damage that is not severe and is reversible
- Low – minor consequences, damage not apparent, reversible adverse changes possible
- Very low – negligible consequences, no evidence for adverse changes

The probability of exposure and consequence of the hazards are then combined to determine the overall magnitude of the risk, as demonstrated in Figure 2.1.

Figure 2.1: Magnitude of risk matrices



[8] Environment Agency (2018) Bioaerosol monitoring at regulated facilities - use of M9: RPS 209. Available online at: https://www.gov.uk/government/publications/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209

[9] Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T. and Tyrrel, S.F. (2009). Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Environment Agency.

Source: Environment Agency, 2009

For this bioaerosol risk assessment, a Source-Pathway-Receptor model has been used to help assess the probability of exposure associated with different processes at the Site (Section 3). Existing control measures have also been identified to help inform the probability of exposure (Section 4). This has then been combined with the consequence of the hazard in Section 5 to determine the overall magnitude of risk associated with the different sources of bioaerosols at the Site, using the risk matrix above.

3 Source – Pathway – Receptor model

3.1 Overview

This section provides a summary of the sources of bioaerosols at the Site and the potential pathways that the bioaerosols could travel to sensitive human health receptors.

3.2 Sources

3.2.1 Overview

The Site includes the following assets which could release bioaerosols:

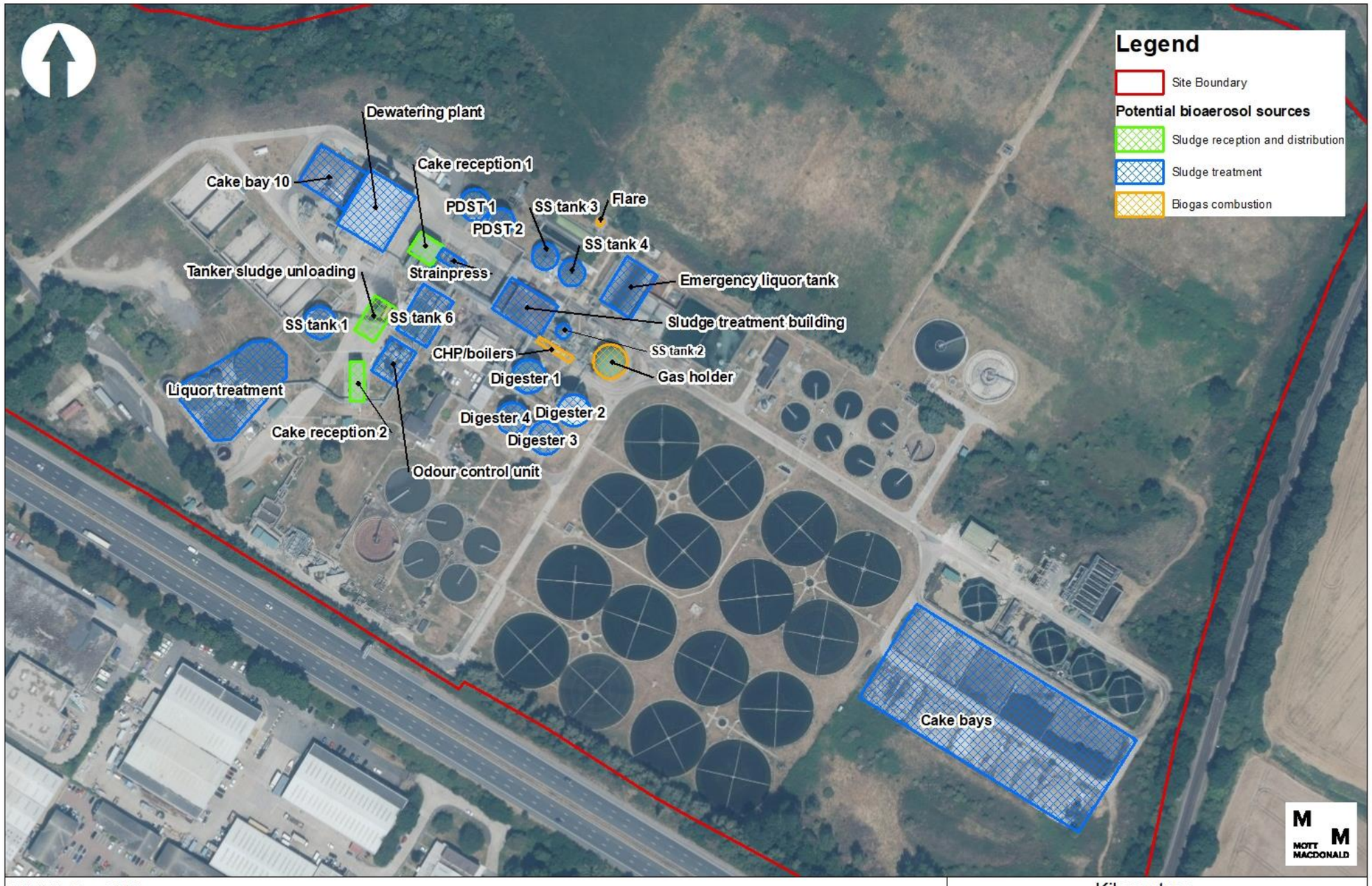
- Two cake reception areas
- One tanker sludge unloading area
- One sludge treatment building
- Ten covered sludge storage tanks (including three sludge reception tanks, one sludge blending tanks, two thickened sludge storage tanks, two post digestion storage tanks (PDSTs) and two post-screened sludge storage tanks)
- One emergency liquor tank (one uncovered tank used for liquors during maintenance activities/emergencies e.g. when the centrifuge is taken offline)
- Four anaerobic digesters
- One dewatering building
- One strainpress
- One liquor treatment works
- Two cake bay areas (one at the north-west of the Site, Cake Bay 10, and a second cake bay area at the east of the Site)
- One odour control unit (OCU)
- One gas holder
- One flare
- Two boilers
- One Combined Heat and Power (CHP) unit

The following processes undertaken at the Site involve these assets and therefore, have the potential to release bioaerosols:

- Sludge reception and distribution (Cake reception and sludge unloading area)
- Sludge treatment (sludge storage, digesters, dewatering and cake bays)
- Biogas combustion

Figure 3.1 shows the locations of these different processes and assets across the Site. A summary of the activities which occur at the Site involving these assets is presented in the subsequent sections.

Figure 3.1: Potential sources of bioaerosols at the Site



Kilometres
0 0.05 0.1 0.2

3.2.2 Sludge reception and distribution

The majority of liquid sludge and cake is imported to the Site from Broomfield Bank WTW and Weatherlees Hill WTW. The site does accept cake from additional sites as it is a key strategic reception centre. Liquid sludge is also accepted from a multitude of sites in the West Kent and East Sussex areas. The liquid sludge arrives onsite via tanker where it is pumped directly into the covered sludge reception tanks adjacent to the tanker sludge unloading area. Sludge cake arrives on site via covered tipper trucks where it is loaded into a cake silo within one of the cake reception buildings.

3.2.3 Sludge treatment

Imported liquid sludge and cake is blended with indigenous settled sludge from the primary settlement tanks (PSTs) and biological filters from the wastewater process in the sludge treatment centre. This blended sludge is then thickened before being fed into the anaerobic digesters. The anaerobic digestion process provides a controlled environment where micro-organisms (including bacteria and fungi) can grow, multiply and break-down organic material within the sludge to produce water, carbon dioxide and methane (biogas).

After anaerobic digestion, digested sludge passes to the PDSTs to cool. The digested sludge is then transferred to the dewatering plant where water is removed from the digested sludge using centrifuges and strain presses to create dried sludge cake. Lime is added to the sludge cake to kill any remaining pathogens before discharging the sludge cake into cake bay 10 via a conveyor belt. The sludge liquors removed during the dewatering process pass to the liquor treatment plant before returning to the PSTs for treatment.

Limed cake remains the cake bays for a period of less than 24 hours before being collected by covered trucks to be transported offsite for use on agricultural land.

All cake removed from site for use on agricultural land must meet the standard for enhanced treated sludge[10]. Cake that doesn't initially meet the enhanced treated sludge standards is stored for longer. Once met, the cake can be transported offsite.

3.2.4 Sludge treatment – Odour control

Odour control systems are attached to the liquor treatment plant, cake reception areas, dewatering building, strain presses, sludge treatment building, sludge reception tanks, and the sludge storage tanks. The PDSTs are the only sludge storage tanks not connected to the odour control system, they are covered and connected to the gas system. The control system extracts odorous air from these covered processes and treats the air within the OCU using a wet chemical biofilter scrubber to remove odorous compounds and bioaerosols. Treated air is then released to the atmosphere via an 18m stack to assist dispersion.

3.2.5 Biogas combustion

Biogas produced during anaerobic digestion is transferred to the gas holder and then to the CHPs and boilers where it is combusted to generate heat and/or electricity, which is used onsite to assist with the wastewater and sludge treatment processes. When more biogas is produced onsite than can be combusted within the boilers and CHPs, and there is insufficient space in the gas holder to store surplus biogas, excess biogas is sent to the flare to be burned. In 2020, the flare and a second flare that was in operation at the time (and has since been removed) were used for less than 6% of the year.

[10] greater than 6 log (99.9999%) reduction in Ecoli with less than 10^3 Ecoli/dry gram and with no salmonella in 2 grams

3.3 Pathways

Bioaerosols are very small and light in weight so can easily be transport by the wind from their source to a receptor. The 2018-2022 wind rose for the meteorological site at Gatwick airport, the nearest representative meteorological site to the Site, is shown in Figure 3.2.

This site is located approximately 74km west of the Site but is considered representative as Gatwick airport is located in a similar, inland environment with a similar elevation to the Site while other meteorological sites closer to the Site are at coastal locations.

The Gatwick airport meteorological site experiences frequent mild and strong winds from the southwest. This suggests that sensitive receptors located to the north east of the Site would be at the greatest risk from bioaerosol emissions from the Site as they would be downwind of the prevailing wind direction.

Given the distance between Gatwick airport and the Site, an atmospheric hindcast model (Vortex) has also been used to assess the wind conditions at the Site. The Vortex model uses historic ERA5 data from the European Centre for Medium-Range Weather Forecasts (ECMWF) and works by combining past meteorological data with current weather models. This allows meteorological parameters, such as wind speed and direction, to be predicted at any location for any time period from the past 40 years, accounting for some localised effects. The data from this model is a popular dataset for climate modellers and is used by the World Meteorological Organization for their annual State of the Climate report.

Figure 3.3 presents the wind rose generated for the Site from the Vortex model for the period from 2018-2022. The wind rose demonstrates that historically, this location experiences strong prevailing winds from the south west. Overall, the two datasets show general agreement with both the monitored and modelled data indicating the prevailing winds originate from the south west. Therefore, sensitive receptors located to the north east of the site would be at the greatest risk from bioaerosol emissions from the Site.

Figure 3.2: Average wind rose for Gatwick airport meteorological site, 2018-2022

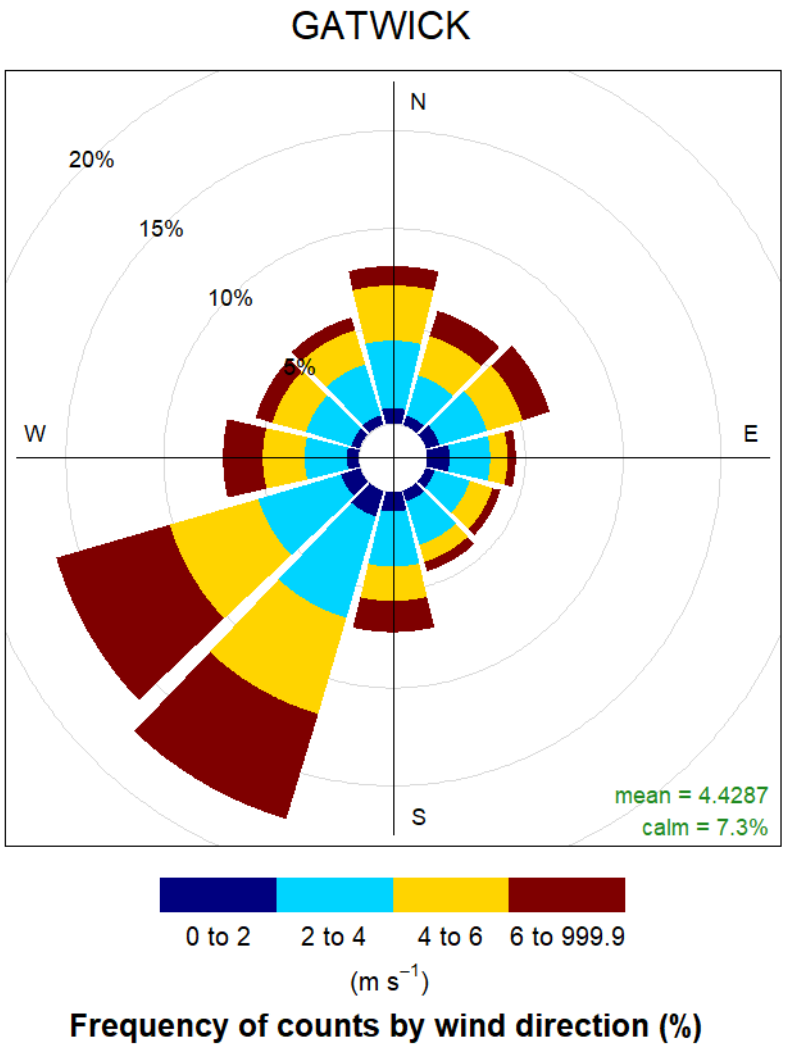
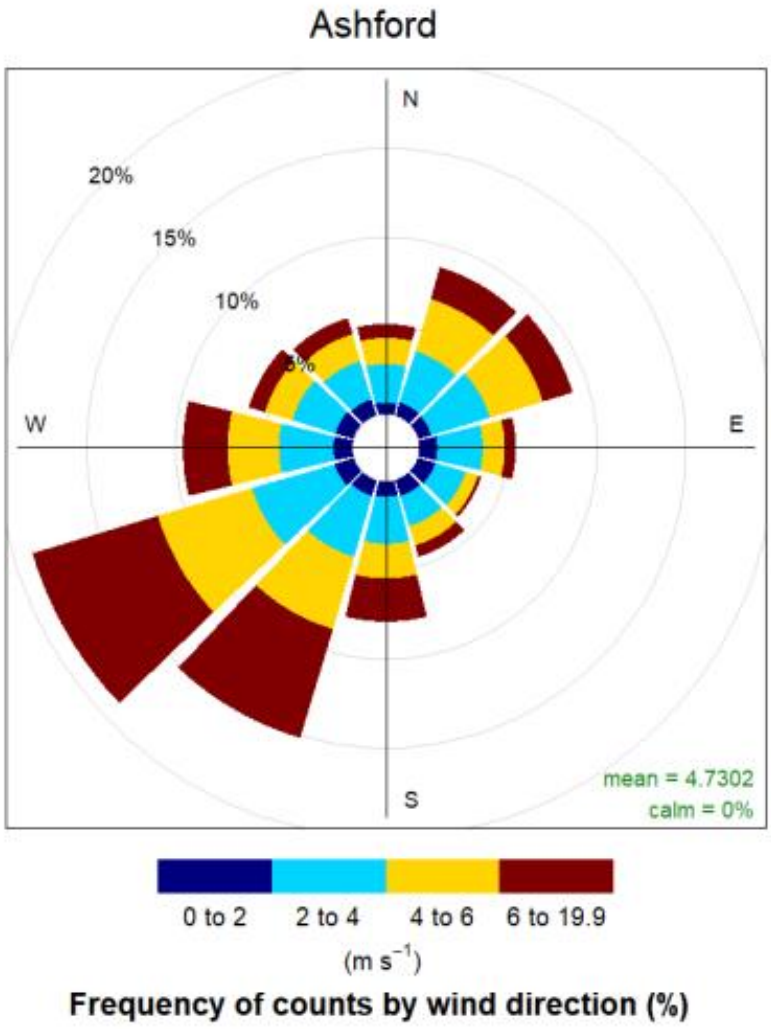


Figure 3.3: Average wind rose for the Site from the Vortex model, 2018-2022



Concentrations of bioaerosols decline rapidly within the first 100m from a source and generally decrease to background concentrations within 250m[11,12]. The local terrain in the 250m area surrounding the Site is relatively flat, with some low-lying trees bordering the Site on all sides (so there would be few obstacles to inhibit the pathway between source and receptor).

[11] Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.

[12] Health and Safety Executive, 2010. Bioaerosol emissions from waste composting and the potential for workers' exposure.

3.4 Receptors

Although Environment Agency guidance[13] recommends a screening distance of 250m from bioaerosol emission sources to static receptor locations, a screening distance of 500m has been used as a conservative approach. Sensitive receptors are defined as:

"*permitted activities where people are likely to be for prolonged periods. This term would therefore apply to dwellings (including any associated gardens) and to many types of workplaces. We would not normally regard a place where people are likely to be present for less than 6 hours at one time as being a sensitive receptor. The term does not apply to those controlling the permitted facility, their staff when they are at work or to visitors to the facility, as their health is covered by Health and Safety at Work legislation, but would apply to dwellings occupied by the family of those controlling the facility*."

There are eight areas of sensitive receptors found within 500m of potential bioaerosol emission sources at the Site. As demonstrated in Figure 3.4, four areas of residential receptors are located to the south-east, south and south-west and north-west, whilst an area of recreational land use is located to the north west and three areas of industrial land use are found to the north-east, south-east and south.

For these eight areas of receptors, the distance and direction from each potential bioaerosol emission source to a sensitive receptor within the area has been identified below in Table 3.1. Where multiple assets exist for the same process, such as digesters, only the closest asset has been presented.

[13] Environment Agency (2018) Technical Guidance Note (Monitoring) M9 – Environmental monitoring of bioaerosols at regulated facilities. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730226/M9_Environmental_monitoring_of_bioaerosols_at_regulated_facilities.pdf

Figure 3.4: Sensitive receptors within 500m

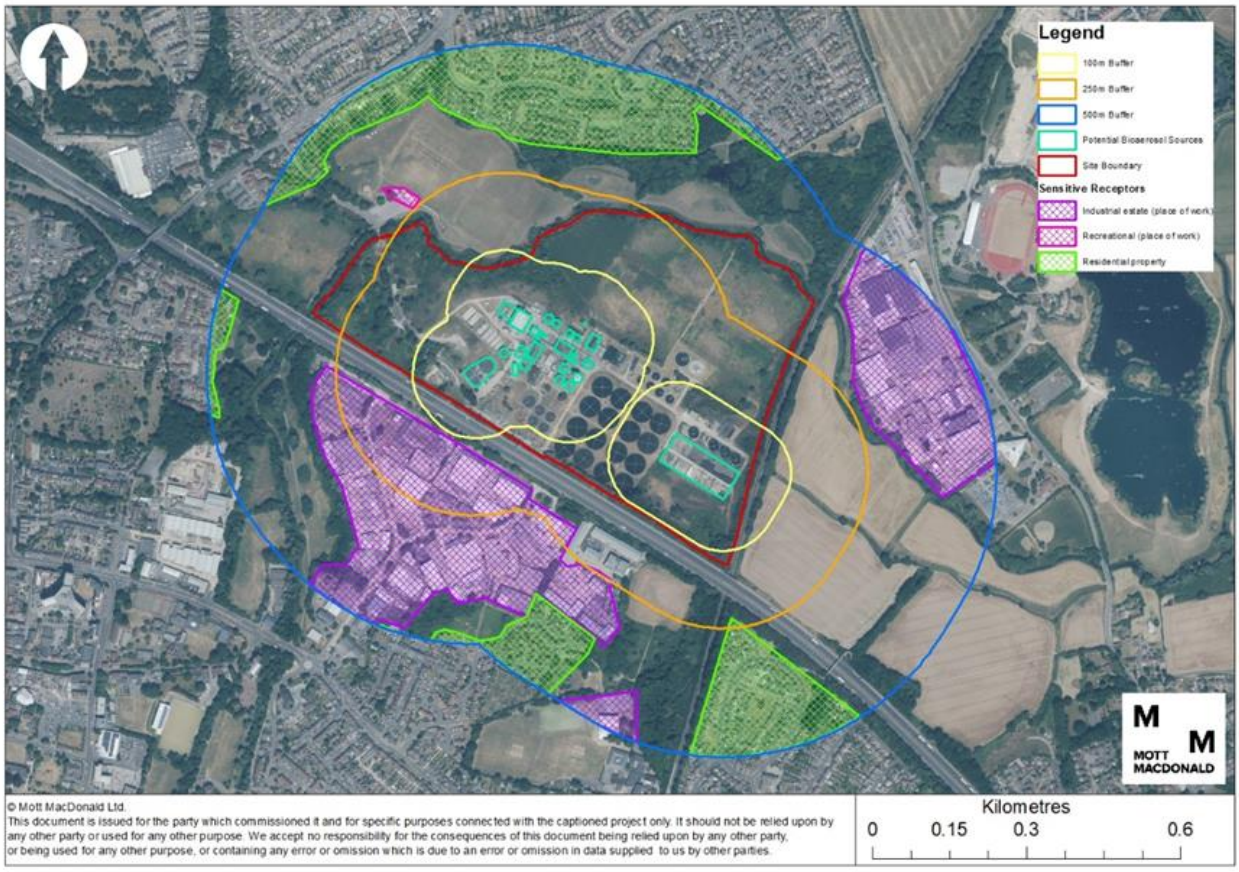


Table 3.1: Receptors within 500m of potential emission sources at the Site

Nearest potential emission source to receptor	Process	Distance (m) and direction of different receptors[a] from nearest potential emission source [b]							
		Industrial land use north east of the Site (m)	Industrial land use south east of the Site (m)	Industrial land use south west of the Site (m)	Recreational land use north west of the Site (m)	Residential properties south east of the Site (m)	Residential properties south of the Site (m)	Residential properties south west of the Site (m)	Residential properties north west of the Site (m)
Cake reception	Sludge reception and distribution	>500, North east	>500, South west	**170**, South west	325, North west	>500, South east	430, South east	>500, South west	355, North west
Tanker sludge unloading	Sludge reception and distribution	>500, North east	>500, South west	**205**, South west	340, North west	>500, South east	460, South east	>500, South west	390, North west
Sludge treatment building	Sludge treatment	>500, North east	>500, South west	**255**, South west	320, North west	>500, South east	465, South east	>500, South west	350, North west
Strainpress	Sludge treatment	>500, North east	>500, South west	**265**, South west	345, North west	>500, South east	500, South east	>500, South west	360, North west
Anaerobic digesters	Sludge treatment	>500, North east	>500, South west	**200**, South west	415, North west	>500, South east	400, South east	>500, South west	420, North west
Dewatering plant	Sludge treatment	>500, North east	>500, South west	**250**, South west	280, North west	>500, South east	>500, South east	>500, South west	325, North west
Liquor treatment	Sludge treatment	>500, North east	>500, South west	**110**, South west	320, North west	>500, South east	420, South east	460, South west	425, North west
Emergency liquor tank	Sludge treatment	475, North east	>500, South west	**290**, South west	420, North west	>500, South east	485, South east	>500, South west	355, North west
Sludge storage tank [b]	Sludge treatment	>500, North east	>500, South west	**185**, South west	320, North west	>500, South east	455, South east	>500, South west	350, North west
PDSTs	Sludge treatment	>500, North east	>500, South west	**295**, South west	330, North west	>500, South east	>500, South east	>500, South west	335, North west

Nearest potential emission source to receptor	Process	Distance (m) and direction of different receptors[a] from nearest potential emission source [b]							
		Industrial land use north east of the Site (m)	Industrial land use south east of the Site (m)	Industrial land use south west of the Site (m)	Recreational land use north west of the Site (m)	Residential properties south east of the Site (m)	Residential properties south of the Site (m)	Residential properties south west of the Site (m)	Residential properties north west of the Site (m)
OCU	Sludge treatment	>500, North east	>500, South west	**190**, South west	460, North west	>500, South east	435, South east	>500, South west	415, North west
Cake bay 10	Sludge treatment	>500, North east	>500, South west	**260**, South west	255, North west	>500, South east	>500, South east	>500, South west	315, North west
Cake bays	Sludge treatment	270, North east	410, South east	**210**, South west	>500, North west	230, South east	355, South west	>500, South west	>500, North west
Gas holder	Biogas combustion	>500, North east	>500, South west	**255**, South west	440, North west	>500, South east	450, South east	>500, South west	405, North west
CHPs/boilers	Biogas combustion	>500, North east	>500, South west	**250**, South west	415, North west	>500, South east	455, South east	>500, South west	405, North west
Flare	Biogas combustion	>500, North east	>500, South west	**325**, South west	400, North west	>500, South east	>500, South east	>500, South west	335, North west

Note: (a) Refers to the receptors presented within Figure 3.4. Distance from source to receptor is rounded to the nearest 5m
(b) Sludge storage tank includes sludge reception tanks, sludge blending tanks, thickened sludge storage tanks and post screened storage tanks (SS tanks 1-6 in Figure 3.1) Value in **bold** represents the nearest potential emission source for each process which is closest to a sensitive receptor

3.5 Summary

Table 3.2 below summarises the potential sources of bioaerosol emissions at the Site, the sensitive receptors most at risk and the pathways through which the bioaerosols could travel from source to receptor.

Table 3.2: Source-Pathway-Receptor model

Source process	Potential emission source	Pathway	Nearest receptor
Sludge reception and distribution	Cake reception	Air transport then: • Inhalation (through nose or mouth) • Ingestion (eating or swallowing) • Absorption/contact (through skin or eyes) • Injection (by high pressure equipment/ contaminated sharp objects)	170m south west – industrial estate
	Tanker sludge unloading		205m south west – industrial estate
Sludge treatment	Sludge treatment building		255m south west – industrial estate
	Strainpress		265m south west – industrial estate
	Anaerobic digesters		200m south west – industrial estate
	Dewatering plant		250m south west – industrial estate
	Liquor treatment		110m south west – industrial estate
	Emergency liquor tank		290m south west – industrial estate
	Sludge storage tank [(b)]		185m south west – industrial estate
	PDSTs		295m south west – industrial estate
	OCU		190m south west – industrial estate
	Cake bay 10		260m south west – industrial estate
	Cake bays		210m south west – industrial estate
	Gas holder		255m south west – industrial estate
Biogas combustion	CHPs/boilers		250m south west – industrial estate
	Flare		325m south west – industrial estate

4 Control measures

4.1 Overview

The three primary ways to mitigate emissions of bioaerosols[14] is to:

- Reduce emissions
- Contain emissions
- Enhance dispersion

The sections below outline the different control measures in place at the Site for sludge reception and distribution, sludge treatment and biogas combustion processes. These control measures aim to reduce and contain emissions of bioaerosols to prevent the source-pathway-receptor link associated with each of the potential emission sources identified in Section 3.2.5.

4.2 Control measures

4.2.1 Sludge reception and distribution

The transfer sludge cake from the covered tipper trucks has a short duration and takes place on average 9 times a day Monday-Friday and 4/5 times on Saturday. Closed on Sunday. Sludge cake can only be offloaded from the tipper lorry into the silo in the cake reception building once the doors to the building are closed. The silo lid must also be closed before the building door can open for the lorry to leave the building. If the door mechanism fails for the cake reception building, the building is taken out of use until the mechanism is fixed.

To further minimise emissions of bioaerosols, closed bins and sheeted skips are used for transportation of sludge cake across the site and lorry drivers are not permitted to remove the covers from the skip whilst parked waiting for loading or unloading.

The process of unloading liquid sludge from the tankers also has a short duration during which the tanker hose is securely connected directly to the reception point. Therefore, the potential for release of bioaerosols during unloading of liquid sludge and sludge cake is minimal. There are up to 1,000 m^3 of liquid sludge imports per day.

If a spillage of sludge or cake occurs, operators are required to carry out clean up as soon as possible (using disinfectant where necessary). If the spillage is caused by a lorry or tanker, the driver is responsible for cleaning up the spill before leaving site. If a lorry or tanker left a spillage behind, operators will log and report any incident observed and the driver or company involved will be asked to return to the site immediately to clean up. Significant spillage incidents will be recorded in the site diary.

4.2.2 Sludge treatment

4.2.2.1 Containment of emissions

To contain emissions of bioaerosols, all sludge treatment processes on the Site are covered except the emergency liquor tank and cake bays. The cake reception areas, centrifuges (dewatering building) and sludge thickening and blending activities (sludge treatment building)

[14] Wheeler P.A., Stewart, I., Dumitrean, P. and Donovan, B., 2001. Health Effects of Composting: A Study of Three Compost Sites and Review of Past Data. R&D Technical Report P1-315/TR, Environmental Agency, Bristol.

are also contained in enclosed, odour controlled buildings to prevent the uncontrolled release of bioaerosols and reduce the likelihood of exposure of receptors to bioaerosols. Across the site there is a ‘close door and hatches’ policy whereby hatches and doors covered processes are required to be kept closed unless entry is required for operation or maintenance purposes.

Additional odour control measures are in place within some of the enclosed buildings which further contain bioaerosol emissions. For example, the sludge thickeners are individually enclosed with glass-reinforced plastic (GRP) hoods and surrounded by plastic curtains.

4.2.2.2 Reduce emissions

Throughout the sludge treatment process, biological material which could give rise to emissions of bioaerosols is broken down. This primarily occurs during anaerobic digestion, with subsequent processes such as liming being undertaken to further remove microorganisms by raising the pH and temperature. Therefore, at each stage of the sludge treatment process, the quantity of bioaerosols decreases, reducing the risk of exposure; the concentration of bioaerosols that could potentially be emitted from the cake (at the end of the sludge treatment process) is much lower than sludge within the sludge treatment building (prior to anaerobic digestion).

Therefore, while the emergency liquor tank and cake bays are uncovered, these areas all contain digested sludge products which are near the end of the sludge treatment process so the bioaerosol content and associated risk of exposure is reduced. In addition, as the sludge products within the emergency liquor tank are wet, this minimises the likelihood of the resuspension of bioaerosols. The alternative liquor tank is rarely used. At the cake bays, once the cake is deposited within the bays, it is not handled further until it is loaded into trucks to be transported offsite to farmland. This reduces the risk of bioaerosol emissions as agitation of cake could facilitate the resuspension of any remaining bioaerosols into the air.

To further reduce potential bioaerosol emissions, sludge produced on site is processed immediately. This prevents processing of old sludge which is more odorous and difficult to process. Liquid sludge and cake arriving onsite is also processed immediately to help minimise bioaerosol emissions. Southern Water is committing to a programme of monitoring to confirm there are no fugitive emissions from the cake bays.

As discussed above in Section 4.2.2.1, to prevent emissions from wastewater and sludge treatment activities, processes with the greatest potential to release bioaerosols are covered and odour controlled. The odorous air is then treated within the OCU to remove odour and bioaerosols before it is released to the atmosphere. While the scrubbers are unable to remove 100% of bioaerosols, any bioaerosol emissions from odour control are anticipated to be negligible.

4.2.3 Biogas combustion

All tanks capable of producing biogas are sealed and connected to the biogas system. Biogas produced from these tanks are stored within the gas holder before being combusted at high temperatures within the boilers/CHPs or flare. The gas holder stores the biogas within an air-tight container which mitigates the release of bioaerosol emissions. During combustion, any bioaerosols present within the biogas would be destroyed. The biogas system is also carefully monitored so that any leaks can be immediately identified and sealed. Therefore, emissions of bioaerosols associated with biogas combustion and probability of exposure to bioaerosols would be de minimis.

4.3 Maintenance of control measures

Daily checks, measurements and sampling is conducted of the treatment processes on site to ensure the equipment is working correctly. The parameters measured include: sludge blanket thickness, dissolved oxygen content, turbidity, temperature, pH and alkalinity (full list of parameters monitored are found within the operating plan for the Site). The quality of the treated air from the OCU is also monitored for hydrogen sulphide (H_2S) concentrations and recorded on the site Supervisory Control and Data Acquisition (SCADA) system. Where desired operating parameters are not met, various corrective actions and operating procedures are in place to rectify the problem. Performance issues and equipment problems are also reported promptly to Process Scientists, M&E technicians, ICA technicians or Specialist Contractors as appropriate.

Daily, weekly and monthly maintenance tasks/servicing is also performed on key equipment across the site by Southern Water staff and specialist contractors. Southern Water has also issued generic maintenance task manuals for use across all their sites which include protocols for the maintenance of equipment such as absorbers, biofilters, odour extraction, fresh air supply ducting, wet scrubber (cleaning, pre-winter service, pH probe calibration, redox probe calibration), direct driven fan, belt driven fan and dryer exhaust ducting.

Currently bioaerosols are not directly monitored, however future monitoring will be accordance with M9 where appropriate. Alternatively, the Odour Management Plan requires routine sniff tests and mitigation to odours, and therefore the Plan will indirectly aid the prevention and monitoring of bioaerosol.

Odour from the STC tanks and process areas is controlled via one current OCU, a 2-stage chemical scrubbing plant with an odour removal efficiency of 60% and total flow rate of 46,000 Nm^3/hour. Filtered odour streams are discharged into the environment through the OCU stack as shown by A08 in 790101_MSD_SiteLayoutPlan_ASH December 2023 and are monitored hourly to ensure the absence of odorous compounds.

The OCU is maintained in accordance with manufacturer's requirements to ensure treatment of bioaerosols and odours are effective.

Most of the Site operations are fully enclosed or covered with the exception of the emergency liquor tank and cake bays which are uncovered. Nonetheless, as mentioned in Section 4.2.2.2, these areas all contain digested sludge products which are near the end of the sludge treatment process so the bioaerosol content and associated risk of exposure is reduced. In addition, as the sludge products within the emergency liquor tank are wet, this minimises the likelihood of the resuspension of bioaerosols. The alternative liquor tank is rarely used.

Diffuse emissions from the cake bays, are minimised by:

- Sludge cake is not handled once in the cake bay, until it is being removed from site;
- All sludge cake being exported is transported in covered lorries.

To minimise odour nuisance, it is important to ensure that the Ashford STC is operating as designed. Covers and hatches are replaced to maintain the integrity of enclosures provided to collect odorous air.

The effectiveness of measures to prevent and limit bioaerosols, as well as odour, is undertaken by reviewing the SCADA system to identify out of specification operation of assets. Whereby alerts are raised the measures within the Odour Management Plan will be followed to bring the operations in line with normal conditions.

Stocks of chemicals onsite are also carefully managed to ensure that the necessary treatment processes, control measures and maintenance activities can be undertaken when required.

4.4 Emergency procedures

In the event of plant failures or emergency situations, such as detection of a leak from the biogas system, an alarm would be raised on the site SCADA or telemetry systems, which will be reacted to by on-site or regional control room operators and Duty Managers. Depending upon the nature of the fault or emergency, a mechanical or electrical technician, both of whom are on-call 24-hours, would be contacted and would attend site as soon as practicable if required. Where the on-call technicians are already engaged upon other response work, there is the facility to access staff from other Southern Water geographic divisions, coordinated by the Duty Manager. All faults, breakdowns and emergencies are logged electronically together with records of the action taken and the solutions reached.

One such emergency event would be failure of the flare stack and/or CHP. Such an event would result in releases of biogas from the Whessoe Valves located on the roofs of the digesters and in the gas holder compound, which would release bioaerosols. This occurs to prevent over pressurisation of the digesters and gas systems. While the problem is rectified, biogas generation is managed by reducing the digester feed.

4.5 Monitoring

4.5.1 Overview

Bioaerosol emissions associated with the operation of the Site will be monitored in line with the Environment Agency Technical Guidance Note (TGN) M9[15] requirements to monitor effectiveness of control measures.

Sampling of bioaerosols using either impaction, filtration or impingement samplers will be undertaken by an MCERTS accredited organisation. The final approach would be determined prior to appointment in accordance with the requirements of TGN M9.

4.5.2 Monitoring Locations

As detailed in Section 3.3, the prevailing wind direction at the Site is from the south west, therefore, in accordance with TGN M9, three samplers will be positioned to the north east of the Site to capture downwind bioaerosol concentrations and one sampler will be located upwind, to the south west of the Site.

Figure 4.1 presents the indicative sampling locations identified for the Site. Locations 1, 2 and 3 represent the proposed locations for the three downwind samplers and are located at the same distance as the closest sensitive receptor (110m) from the nearest source of bioaerosols. The downwind samplers are arranged in a fan shape to ensure the maximum concentrations of bioaerosols are captured and variable wind directions will be accounted for.

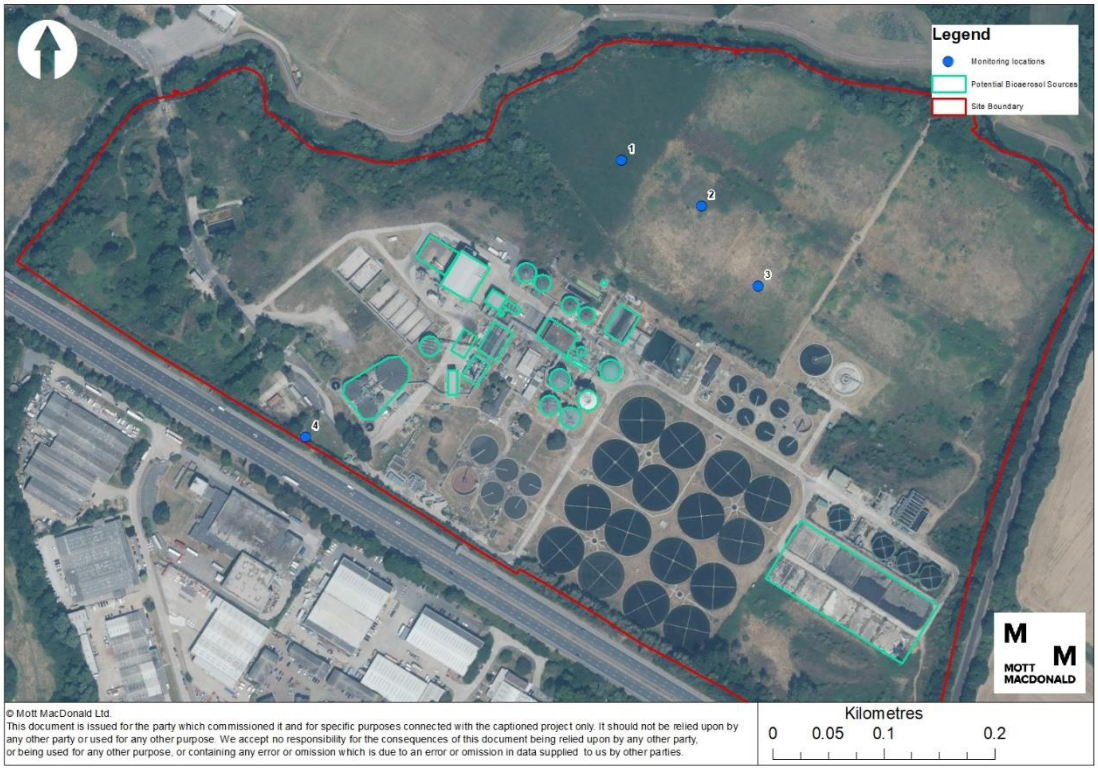
The indicative monitoring location 4 represents the upwind sampler and is positioned approximately 50m from the nearest bioaerosol source. This location will provide a baseline concentration of bioaerosols, representative of background concentrations and any

[15] Environment Agency (2018) Technical Guidance Note (Monitoring) M9 - Environmental monitoring of bioaerosols at regulated facilities. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730226/M9_Environmental_monitoring_of_bioaerosols_at_regulated_facilities.pdf

neighbouring sources of bioaerosols, such as agricultural activities, without contributions from the Site.

The exact sampling locations are dependent on the accessibility of each location and will be confirmed by the MCERTS accredited organisation that will conduct the sampling.

Figure 4.1: Indicative bioaerosol monitoring locations



4.5.3 Sampling methodology and frequency

Appropriate sampling of bioaerosols will be conducted by an MCERTS accredited organisation using procedures relevant to the sampler type, as described in TGN M9. Sampling at the upwind and downwind locations will be undertaken concurrently so that results can be compared. Monitoring will be undertaken on a quarterly basis for the first 12months after permit issue and then six monthly thereafter. Where the bioaerosol action limit is exceeded, then quarterly monitoring will resume until such time that is it demonstrated that the site has adequate mitigation for a 12month period. Where it is confirmed that the risk is very low or low, Southern Water will make the decision as to whether further monitoring will be needed and under what circumstances it may need to be resumed, if at all.

Sampling will be undertaken during appropriate weather conditions such as avoiding rain, sleet and snow, depending on the sampling technique, and will consider the wind speed and direction at the time of sampling. Meteorological conditions including wind speed, wind direction, cloud cover, temperature, relative humidity, and atmospheric conditions will be recorded by an automatic weather station with an integral data logger during monitoring periods and this data

will be recorded. The meteorological station will be positioned in a suitable location, away from anything which could influence measurements, such as at locations very close to buildings.

A minimum of three measurements of Aspergillus fumigatus and mesophilic bacteria will be taken from each sampler during each monitoring visit. Appropriate equipment and methodologies for each sampler type are described in TGN M9 and this guidance will be followed during the bioaerosol monitoring.

Following the measurements, samples will be stored and transported appropriately before being analysed in a laboratory.

Detailed and accurate records of the bioaerosol monitoring will be kept and the data will be recorded using the standard report forms provided in TGN M9 or an appropriate alternative.

4.6 Summary

As discussed above, there are a number of control measures in place at the Site to reduce and contain emissions of bioaerosols. These control measures are regularly maintained to sustain their efficacy and reduce the risk of equipment failure. The greatest probability of exposure from a potential source of bioaerosols from the Site is associated with the emergency liquor tank, which is uncovered. However, this uncovered process is a ‘wet’ process so the likelihood of resuspension of bioaerosols, and therefore the probability of exposure, is minimised.

Across the site, the potential for bioaerosol emissions which could result in significant consequences is limited. The greatest risk of significant bioaerosol emissions from the Site, and therefore the greatest consequence of the hazard, is associated with emergency situations such as a failure of the flare or CHP/boilers, which could result in uncontrolled emissions of bioaerosols. However, such an emergency event would be unlikely, temporary, and infrequent due to the extensive monitoring and maintenance programmes undertaken at the Site as well as the emergency procedures and warning systems in place.

5 Risk assessment

5.1 Overview

This section assesses the probability of exposure and consequence of the hazard associated with potential emissions of bioaerosols at the Site to determine the overall magnitude of risk. The descriptors used ('very low' to 'high') are based on the descriptors outlined in the EA guidance[16], as summarised in Section 2.3.

5.2 Probability of exposure

As described in Section 3, the main potential sources of bioaerosols at the Site are associated with:

- Sludge reception and distribution (cake reception and sludge unloading area)
- Sludge treatment (sludge storage, digesters, dewatering and cake bays)
- Biogas combustion

These processes have the potential to emit bioaerosols, which are transported through the air by the wind and could cause harm to nearby human health receptors. However, as discussed in Section 4, there are multiple control measures in place at the Site which restrict the Source-Pathway-Receptor link by reducing and containing emissions of bioaerosols from these processes. The overall probability of exposure of sensitive receptors to bioaerosols at the majority of sludge reception and distribution, sludge treatment and biogas combustion bioaerosol sources at the Site is therefore considered to be '**very low**' as exposure of the receptors to bioaerosols is "very unlikely" due to the "effective and multiple barriers" (control measures) in place.

The exception to this is the uncovered emergency liquor tank. However, it is a 'wet' process, so the probability of exposure is considered to be '**low**'; exposure of the receptors to bioaerosols is "unlikely" as some "barriers exist to mitigate".

The final probability of exposures to bioaerosols assessed for each emission source is presented below in Table 5.2.

Table 5.1: Probability of exposure to bioaerosols from different sources at the Site

Process	Potential source of bioaerosols	Probability of exposure	Justification
Sludge reception and distribution	Cake reception	Very Low	Building enclosed and odour controlled. Stringent loading and unloading procedures – uncontrolled release of bioaerosols very unlikely
	Tanker sludge unloading	Very Low	Stringent loading and unloading procedures – uncontrolled release of bioaerosols very unlikely
Sludge treatment	Sludge treatment building	Very Low	Sludge treatment activities covered, enclosed and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely

[16] Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T. and Tyrrel, S.F. (2009). Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Environment Agency.

	Strainpress	Very Low	Strainpress covered and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely
	Anaerobic digesters	Very Low	Digesters covered, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely
	Dewatering plant	Very Low	Dewatering activities covered, enclosed and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely
	Liquor treatment	Very Low	Liquor treatment tanks covered and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely
	Emergency liquor tank	Low	Uncovered, 'wet' process which is only used in emergencies – exposure to bioaerosol emissions unlikely
	Sludge storage tanks	Very Low	Sludge storage tanks covered and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely
	PDSTs	Very Low	PDSTs covered, process monitored and regularly maintained – exposure to bioaerosol emissions unlikely
	OCU	Very Low	OCU sealed and the air released from the unit has been treated to remove bioaerosols, process monitored and regularly maintained –uncontrolled release of bioaerosols very unlikely
	Cake bay 10	Very Low	Cake at the final stage of the sludge treatment process before being deposited on agricultural land –release of bioaerosols very unlikely as bioaerosol content of cake anticipated to be de minimis
	Cake bays	Very Low	Cake at the final stage of the sludge treatment process before being deposited on agricultural land –release of bioaerosols very unlikely as bioaerosol content of cake anticipated to be de minimis
Biogas combustion	Gas holder	Very Low	Gas holder sealed to prevent uncontrolled release of bioaerosols. SCADA system in place to detect leaks – uncontrolled release of bioaerosols very unlikely
	CHPs/boilers	Very Low	Combustion of biogas at very high temperatures which would destroy bioaerosols – uncontrolled release of bioaerosols very unlikely
	Flare	Very Low	Combustion of biogas at very high temperatures which would destroy bioaerosols – uncontrolled release of bioaerosols very unlikely

5.3 Consequence of hazard

While the probability of exposure of receptors to bioaerosols is 'very low' or 'low' as a result of the control measures in place or the nature of processes on site, there is still a risk that nearby receptors could be exposed to bioaerosols, for example if there was a failure of the control equipment. Should this occur, any exposure to bioaerosols would likely be temporary as faults would be detected by the SCADA system and the emergency protocols would be undertaken to rectify the fault as soon as possible.

However, if exposure to bioaerosols did occur, this could result in adverse health impacts at sensitive receptors. These impacts could include (but are not limited to):

- Respiratory infections and inflammation of the respiratory system
- Reduced lung function
- Allergic reactions
- Gastro-intestinal disorders

- Dermatitis
- Eye irritation

The consequence of the hazard at sensitive receptors (i.e. the severity of impacts on human health) is largely determined by the proximity of the receptor to the emission source; concentrations of bioaerosols decline rapidly within the first 50-100m from a source (and generally decrease to background concentrations within 250m) [17,18]. Therefore, receptors within 100m of bioaerosol emission sources will experience a greater hazard consequence than those more than 100m from the emission source.

For the purpose of this assessment, sources of bioaerosols within 100m of receptors are therefore considered to have a '**medium**' consequence of hazard. This is because within 100m of the source, concentrations of bioaerosols would be greatest so temporary exposure could result in "significant consequences" and potentially result in "damage that is not severe and is reversible". Beyond 100m, up to 250m, the consequence of the hazard is considered to be '**low**' as concentrations of bioaerosols would be lower so the consequence of the hazard would also be lower, resulting in "minor consequences" where damage is "not apparent, reversible adverse changes possible". Beyond 250m, up to 500m, the consequence is considered to be '**very low**' as concentrations of bioaerosols generally decrease to background concentrations at this distance so there would be "no evidence for adverse changes" at sensitive receptors at this distance. Beyond 500m, the consequence is not applicable (n/a). The final consequence of hazard assessed for each emission source is presented below in Table 5.2. Across all potential bioaerosol emission sources at the Site, the consequence of hazard is '**very low**' or '**low**'.

Table 5.2: Consequence of hazard from bioaerosols at the Site

Process	Potential source of bioaerosols	Nearest receptor	Consequence of hazard	Justification
Sludge reception and distribution	Cake reception	170m south west – industrial estate	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction
	Tanker sludge unloading	205m south west– industrial estate	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction
Sludge treatment	Sludge treatment building	255m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	Strainpress	265m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	Anaerobic digesters	200m south west – industrial estate	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction
	Dewatering plant	250m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	Liquor treatment	110m south west – industrial estate	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction

[17] Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.

[18] Health and Safety Executive, 2010. Bioaerosol emissions from waste composting and the potential for workers' exposure.

	Emergency liquor tank	290m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	Sludge storage tank	185m south west – industrial estate	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction
	PDSTs	295m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	OCU	190m south west – industrial estate	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction
	Cake bay 10	260m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	Cake bays	210m south west – industrial estate	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction
Biogas combustion	Gas holder	255m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	CHPs/boilers	250m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.
	Flare	325m south west – industrial estate	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction.

5.4 Magnitude of risk

Table 5.3 below summarises the probability of exposure, consequence of hazard and resulting magnitude of risk for each potential bioaerosol emission source at the Site. Across all sources, there is a ‘very low’ or ‘low’ probability of exposure due to the nature of the processes and control measures in place which would prevent uncontrolled releases of bioaerosols. The consequence of exposure is described as ‘very low’ to ‘medium’ depending on the proximity of the potential emission source to a sensitive receptor.

In accordance with Environment Agency guidance[19], across all potential bioaerosol emission sources, the magnitude of risk is described as ‘**very low**’ or ‘**low**’ and therefore operation of the Site is unlikely to lead to significant impacts at nearby sensitive receptors from bioaerosol emissions.

Nonetheless, due to the proximity of the Site to sensitive receptors, monitoring of bioaerosols should be undertaken at the Site[20]. The requirements for bioaerosol monitoring at the Site will need to be agreed with the Environment Agency within the Environmental Permit issued for the Site.

[19] Drew, G.H., Deacon, L.J., Pankhurst, L., Pollard, S.J.T. and Tyrrel, S.F. (2009). Guidance on the evaluation of bioaerosol risk assessments for composting facilities. Environment Agency.

[20] Environment Agency (2018) Bioaerosol monitoring at regulated facilities - use of M9: RPS 209. Available online at: https://www.gov.uk/government/publications/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209/bioaerosol-monitoring-at-regulated-facilities-use-of-m9-rps-209

Table 5.3: Magnitude of risk from bioaerosols at the Site

Process	Potential source of bioaerosols	Probability of exposure	Consequence of hazard	Magnitude of risk	Justification
Sludge reception and distribution	Cake reception	Very Low	Low	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction Building enclosed and odour controlled. Stringent loading and unloading procedures – uncontrolled release of bioaerosols very unlikely
	Tanker sludge unloading	Very Low	Low	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction Stringent loading and unloading procedures – uncontrolled release of bioaerosols very unlikely
Sludge treatment	Sludge treatment building	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. Sludge treatment activities covered, enclosed and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely.
	Strainpress	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. Strainpress covered and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely.
	Anaerobic digesters	Very Low	Low	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction Digesters covered, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely.
	Dewatering plant	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source,

				not downwind of the prevailing wind direction. Dewatering activities covered, enclosed and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely.
Liquor treatment	Very Low	Low	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction. Liquor treatment tanks covered and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely.
Emergency liquor tank	Low	Very Low	Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. Uncovered, 'wet' process which is only used in emergencies - exposure to bioaerosol emissions unlikely.
Sludge storage tank (b)	Very Low	Low	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction. Sludge storage tanks covered and odour controlled, process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely.
PDSTs	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. PDSTs covered, process monitored and regularly maintained - exposure to bioaerosol emissions unlikely
OCU	Very Low	Low	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction. OCU sealed and the air released from the unit has been treated to remove bioaerosols,

					process monitored and regularly maintained – uncontrolled release of bioaerosols very unlikely.
	Cake bay 10	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. Cake at the final stage of the sludge treatment process before being deposited on agricultural land –release of bioaerosols very unlikely as bioaerosol content of cake anticipated to be de minimis.
	Cake bays	Very Low	Low	Low	Nearest receptor >100m from potential source, not downwind of the prevailing wind direction. Cake at the final stage of the sludge treatment process before being deposited on agricultural land –release of bioaerosols very unlikely as bioaerosol content of cake anticipated to be de minimis.
Biogas combustion	Gas holder	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. Gas holder sealed to prevent uncontrolled release of bioaerosols. SCADA system in place to detect leaks – uncontrolled release of bioaerosols very unlikely.
	CHPs/boilers	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. Combustion of biogas at very high temperatures which would destroy bioaerosols – uncontrolled release of bioaerosols very unlikely.
	Flare	Very Low	Very Low	Very Low	Nearest receptor >250m from potential source, not downwind of the prevailing wind direction. Combustion of biogas at very high temperatures

		which would destroy bioaerosols – uncontrolled release of bioaerosols very unlikely.

6 Summary

At the Site, there is the potential for bioaerosol emissions from:

- Sludge reception and distribution (cake reception and sludge unloading area)
- Sludge treatment (sludge storage, digesters, dewatering and cake bays)
- Biogas combustion

Bioaerosol emissions associated with these processes could be transported by the wind to nearby sensitive human health receptors bordering the Site, resulting in adverse health effects. As these sensitive human health receptors are within 250m of a potential emission source at the Site, a bioaerosol risk assessment has been undertaken in accordance with Environment Agency guidance. However, based on comments from the Environment Agency on a bioaerosol risk assessment undertaken for another similar WTW, a conservative approach has been undertaken and human receptors within 500m of the Site have been considered instead of 250m in the bioaerosol risk assessment.

To inform the assessment, a Source-Pathway-Receptor model was developed and the control measures at the facility to reduce and contain bioaerosol emissions were reviewed. This was undertaken to determine the probability of exposure, consequence of hazard and overall magnitude of risk associated with different processes at the Site.

Based on the ‘very low’ to ‘low’ probability of exposure and ‘very low’ to ‘low consequence of hazards associated with different processes at the Site, the overall magnitude of the risk associated with bioaerosols emissions from the Site is considered to be ‘very low’ to ‘low’. Operation of the Site is therefore unlikely to lead to significant impacts at nearby sensitive receptors from bioaerosol emissions. This is in part because the majority of sensitive receptors are located more than 100m or 250m for a potential bioaerosol source. In addition, the ‘wet’ nature of several processes undertaken at the Site and the control measures in place are considered to be effective at reducing and containing emissions of bioaerosols which inhibits the pathway between source and receptor.