

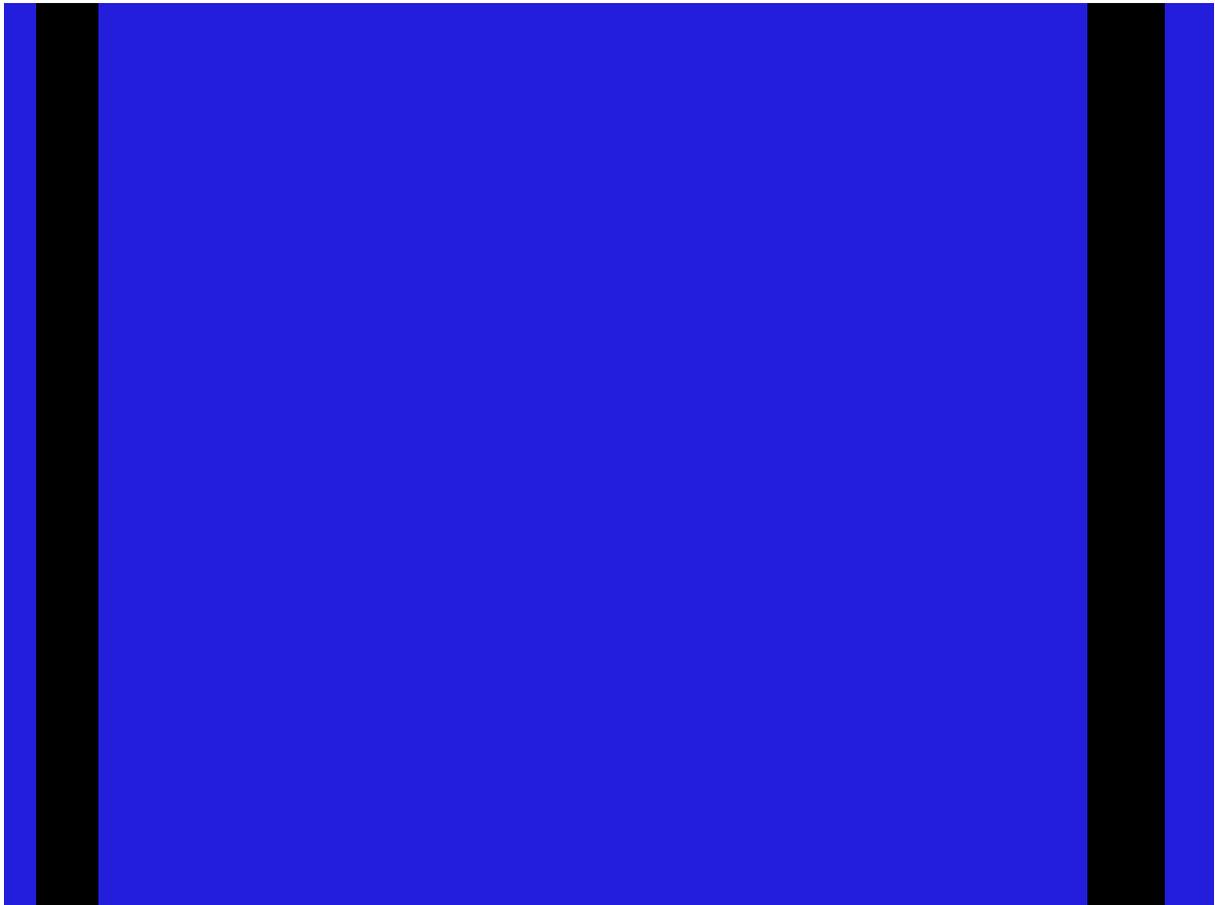


Minworth STW Bioaerosol Risk Assessment

Document no: 1
Revision no: V1

Severn Trent Water Ltd
EPR/BP3631SW/V009

IED Permitting
1 August 2024



Minworth STW Bioaerosol Risk Assessment

Client name: Severn Trent Water Ltd
Project name: IED Permitting
Client reference: EPR/BP3631SW/V009
Document no: 1
Revision no: V1
Date: 1 August 2024
Doc status: Draft

Project no: B19589DB
Project manager:
Prepared by: Tamsin Potter
File name: Minworth Bioaerosol Risk Assessment (draft) updated (1).docx

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
1	August 2024	Draft	TP			

Distribution of copies

Revision	Issue approved	Date issued	Issued to	Comments

Jacobs U.K. Limited

7th Floor, 2 Colmore Square
38 Colmore Circus, Queensway
Birmingham, B4 6BN
United Kingdom

T +44 (0)121 237 4000
www.jacobs.com

Copyright Jacobs U.K. Limited © 2024.

All rights reserved. The concepts and information contained in this document are the property of the Jacobs group of companies. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright. Jacobs, the Jacobs logo, and all other Jacobs trademarks are the property of Jacobs.

NOTICE: This document has been prepared exclusively for the use and benefit of Jacobs' client. Jacobs accepts no liability or responsibility for any use or reliance upon this document by any third party.

Contents

1. Introduction	4
1.1 Site description	4
1.2 Site Activities.....	4
1.3 Regulatory requirements	5
1.4 Bioaerosols	6
2. Bio aerosol risk assessment	8
2.1 Introduction.....	8
2.2 Processing equipment and techniques.....	8
2.3 Potential Sources	10
2.4 Risk.....	13
2.5 Pathways.....	13
2.6 Receptors.....	14
2.7 Risk Assessment.....	15
2.8 Risk Assessment.....	19
2.9 Abnormal Situations	19
3. Conclusions	20
3.1 Sampling.....	20

Appendices

Appendix A. Site boundary and emission points	21
Appendix B. Site plan showing static receptors within 250m of potential bioaerosol sources.....	22

Tables

No table of contents entries found.

Figures

No table of contents entries found.

1. Introduction

The purpose of this Bioaerosols risk assessment is to provide supplementary information to support the permit application for a bespoke installation permit for the Minworth Sewage Treatment Works (STW) as a response to a Regulation 61 notice at the installation.

1.1 Site description

Minworth works is approximately 11.5km northeast of the centre of Birmingham between the village of Minworth and Curdworth.

The surrounding land use generally comprises residential properties and industrial premises. The STW site is bounded to the north by the A4097 Kingsbury Road and Kingsbury Business Park. To the North West lies Minworth village which includes an Infant and Junior School and St George's Church within 500 metres of the permit boundary.

To the west of site is Minworth Parkway, leading to Midpoint Park (Commercial Park) and running alongside the railway line (Water Orton Junction West). This railway curves around the southern boundary of the site before arriving in the village of Water Orton to the south.

To the east sits Curdworth (residential area including Primary school and Church). Further east from Curdworth are the M42 and M6 Toll.

Along the southern boundary is the outfall channel for treated water from Minworth STW, which flows into the River Tame. A public footpath is adjacent to the River.

The site has variable flood risk, ranging from flood risk zone 1 (>1:1000 probability of flooding in any year), through to flood risk zone 3 (<1:100 probability of flooding in any year). The risk originates from the River Tame along the southern boundary of the site. There are no Special Area of Conservation (SACs), Special Protection Areas (SPAs), or RAMSAR sites with 10km of the site and no Sites of Special Scientific Interest (SSSI's) within 2km of the site boundary. There is a Site of Special Scientific Interest, Whitacre Heath approximately 2.4km East of the site. There are four Ancient Woodlands, approximately 500m South of the site, one called Parkhall Wood at 1.1km and 1.6km South West of the site there are two called Parkhill and Langley Woods. There is an Ancient Woodland, Dunton Coppice approximately 2.1km North East of the site, and another, Sych Wood approximately 2.1km East of the site. There are two Local Nature Reserves nearby, Plantsbrook Reservoirs approximately 1.6km West of the site and Beechcroft approximately 2km South West of the site. The site is within an Air Quality Management Area (AQMA) for NO_x and PM₁₀, which is an Authority wide AQMA.

The address of the installation is:

Severn Trent Water Limited
Minworth Sewage Treatment Works
Kingsbury Road
Sutton Coldfield
Birmingham
B76 9DP
NGR: SP 1631 9195.

1.2 Site Activities

The Minworth Sludge Digestion and Combined Head and Power Plant is located at the Minworth Sewage Treatment Works and is operated by Severn Trent Water Utilities Ltd (Severn Trent Water).

The Minworth Sludge Digestion and Combined Heat and Power Plant treats sewage sludge and trade waste by anaerobic digestion to produce a stabilised sludge product and biogas. The sludge product is taken off site for land spreading or to alternative outlets. Centrate is aerobically treated in a listed activity liquor treatment plant. The biogas is exported to the gas grid via gas to grid facilities, and also combusted to generate heat and power for use in the installation and the wider waste water treatment works (WwTW).

There are a number of directly associated activities at the site.

The site includes the following Directly Associated Activities (DAA):

- Physico-chemical treatment of non-hazardous waste;
- Gas upgrading
- Steam and electrical power supply
- Regeneration of Siloxane filter
- Raw material storage
- Surface water collection
- Sludge storage
- Gas flare
- Treatment and storage of digestate cake

The Thermal Hydrolysis Plant (THP) has an average daily throughput is 198 tDS (tonnes dry solids). The plant can facilitate upto 240 tDS per day if required. Minworth also has 12 digesters currently online running in conjunction with the THP plant that can process 330 m³ each per day (990 m³ total per day).

The site is covered by 2 Waste/Installation permits:

EPR/UP3392FB - permitted to accept 23,264,978 tonnes of non-hazardous waste to the head of the wastewater treatment works (excludes sewage sludges imported under CWR exclusion).

EPR/ BP3631SW - permitted to accept 23,264,978 tonnes of non-hazardous waste to the THP/digestion facilities, and 10,000 tonnes of digestate for dewatering and storage.

There is also a separately permitted sludge landfill at the site which is closed under the Landfill Directive.

Cake throughput is 120,000 tonnes, cake pad can hold 28,500 tonnes.

Indigenous and imported sewage sludge is subject to thickening on site and anaerobic digestion, prior to dewatering in centrifuges and storage on the cake pad at the site, pending offsite recovery to land. Some sludge is subject to THP treatment prior to digestion. Within the area covering the permitted activities, there are twelve Odour Control Units (OCU) linked to specific tanks and processes which produce potentially odorous air. The units treat the air through a variety of means, including use of dry chemical scrubbers and biofilters.

The anaerobic digestion process gives rise to biogas, a mixture of biomethane and carbon dioxide, in a mixture with trace components. This biogas is primarily treated via a biogas upgrading plant prior to injection into the local gas distribution network. Some biogas is combusted through the site's Combined Heat and Power engines, to generate electricity both for the site and for export. Additional biogas can be utilised in the site boilers, with excess biogas being subject to emergency flaring. The biogas handling system is equipped with a number of pressure relief valves (PRVs) which activate as a safety precaution when there is excess gas over what the boilers and emergency flare can handle.

1.3 Regulatory requirements

The sludge treatment activity has not previously required an environmental permit as the digested sewage sludge from the site is normally sent for recovery to land. However, a permit application has been submitted

based on the Environment Agency's recent conclusion that sewage sludge is a waste and therefore the treatment of sewage sludge by anaerobic digestion for recovery is a permissible activity under Schedule 1 of the EPR 2016, specifically Chapter 5, Section 5.4, Part A 1(b)(i).

For permits, if the site is within 250m of sensitive receptors then there is a requirement to monitor bioaerosols in accordance with the EA technical guidance note¹ '*M9: environmental monitoring of bioaerosols at regulated facilities*'. M9 describes bioaerosols and the risks that they pose, as well as identifying potential sources within biological treatment facilities.

The Minworth Sludge Treatment Centre installation is within 250m of sensitive receptors, as defined by M9. These are detailed in Section 2.5 of this report.

1.4 Bioaerosols

Bioaerosols are found naturally within the environment. They consist of airborne particles that contain living organisms, such as bacteria, fungi and viruses or parts of living organisms, such as plant pollen, spores and endotoxins from bacterial cells or mycotoxins from fungi. The components of a bioaerosol range in size from around 0.02 to 100 micrometres (μm) in diameter. The size, density and shape of a bioaerosol will affect its behaviour, survivability and ultimately its dispersion in the atmosphere.

Bioaerosols are easily breathed into the human respiratory system, potentially causing allergic responses and inflammation. They also have the potential to cause eye irritation, gastrointestinal illness and dermatitis.

Bioaerosols are associated with composting, anaerobic digestion and mechanical biological treatment, which are the main processes used to treat organic wastes in the UK. As organic waste material breaks down it goes through different temperature dependent stages that are dominated by certain groups of bacteria and fungi. Bacteria are the most numerous group of microorganisms. *Aspergillus fumigatus* is a mesophilic fungus that is thermotolerant and is present throughout the different stages of the organic breakdown process. This fungus can cause severe respiratory infection if inhaled.

The dependence on microorganisms to degrade organic material and the way in which the material is processed make biological treatment facilities a potential source of bioaerosols. However, we note that the 2012 EA guidance note² for developments requiring planning permission and environmental permits states that the EA do not consider bioaerosols from anaerobic digestion to be a serious concern. This is due to the fact, that anaerobic digestion is generally a wet process undertaken in enclosed tanks and equipment, whereas composting is often undertaken using open systems such as windrows and static piles.

The Minworth STW does not undertake any aerobic composting activities and the anaerobic digestion process on site, undertaken in the primary digesters, is an enclosed process with all produced gases captured within the biogas system.

1.4.1 High Risk Activities

The M17 guidance document, in section 3.3.3, outlines a number of potential sources and release mechanisms of particulate matter, including bioaerosols from waste management facilities. These potential sources are not graded for importance within M17 and include: the movement of waste to and from the facility; storage of waste (under certain conditions) on site; the handling and processing of waste materials e.g. shredding of green waste, turning of windrows, daily cover; and wind scouring of waste surfaces.

In terms of potential sources of bioaerosols release at Minworth STW, which meet the M17 guidance, only the biofilter based OCU would apply. There is no shredding of waste or turning of stockpiles as part of the management process and all sewage waste is contained and received via pipes.

¹ Environment Agency. July 2018. M9: Environmental monitoring of bioaerosols at regulated facilities v2, July 2018

² Environment Agency. October 2012. Guidance for developments requiring planning permission and environmental permits

1.4.2 Relevant Thresholds

Based on the accepted Levels at sensitive receptors as set out in the Environment Agency M17 guidance³ '*M17 Monitoring of particulate matter in ambient air around waste facilities*', and in line with the Governments regulatory position statement (RPS) 209 outlining when a specific bioaerosol risk assessment and/or monitoring is required and use of the Environment Agency Technical Guidance Note M9⁴; key bioaerosols of interest and their respective threshold Levels (including background) at sensitive receptors are outlined below:

- Total bacteria: 1000 cfu/m³
- *Aspergillus Fumigatus*: 500 cfu/m³

³ Environment Agency. 2013. Technical Guidance Note (Monitoring) M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities, v2, July 2013 <https://www.gov.uk/government/publications/m17-monitoring-of-particulate-matter-in-ambient-air-around-waste-facilities>

⁴ Environment Agency. 2018. Technical Guidance Note (Monitoring) M9: Environmental monitoring of Bioaerosols at regulated facilities, v2, July 2018.

2. Bio aerosol risk assessment

2.1 Introduction

A source-pathway-receptor risk assessment has been undertaken to appraise the potential for risk to human health at sensitive receptors within the relevant distance from operations at the Minworth STW. This risk assessment follows a standardised approach, namely:

- Hazard identification: what sources of bioaerosols are present on site.
- Exposure assessment: what are the mechanisms or pathways allowing bioaerosols to migrate off site and reach a sensitive receptor; and
- Risk evaluation: who is potentially exposed to bioaerosols; what is the probability, magnitude, and duration of that exposure.

The assessment describes:

- The processing techniques and equipment used within the installation.
- Feedstock, tonnages processed and any seasonal variations.
- Potential sources of bioaerosols.
- The site layout, including any screens, bunds, or trees around the site.
- What is beyond the site boundaries and the location of sensitive receptors.
- Local wind direction data.

2.2 Processing equipment and techniques

2.2.1 Waste Reception

Severn Trent Water accept tankered trade and domestic wastes into the head of the works. Raw sewage sludges (liquid and cake) are accepted into the AD treatment route. Raw cake may also be accepted in sealed skips on a dedicated separate cake pad within the site prior to treatment through the AD route.

The full list of EWC wastes that we are permitted to accept at the site can be found in Schedule 2 of the associated permit. This permit is available to site staff.

Sludge is produced throughout the sewage treatment process at Minworth STW from primary sludge settlement and surplus activated sludge (SAS). Primary sludge from the primary settlement tanks is pumped into the three balancing tanks, these tanks are covered and have a peacemaker odour control unit. In addition there is a deepwell for emergency use adjacent to here which also has a peacemaker module system.

A proportion of indigenous primary sludge is initially passed through the THP route. THP sludge is passed through three enclosed pressure sludge screens and then four thickening belts. The sludge thickening belts are enclosed and air is extracted from these enclosures, as well as from extraction points within the thickening building, to a dedicated Terminodour odour control unit.

Thickened sludge is held in a reception/blending tank prior to digestion in conventional digesters (A block). Digested sludge is then passed to the pre-raw-dewatering buffer tanks and onto the THP. Biogas from the conventional digesters is collected and stored in gas holders.

The remaining indigenous primary sludge is passed through three enclosed pressure sludge screens prior to transfer to two reception/ blending tanks. These tanks are covered and connected to a peacemaker odour control unit.

Indigenous SAS passes via an open balancing tank to ten SAS belt thickeners prior to transfer to the reception/ blending tanks. The SAS belts are enclosed in a building.

Imported liquid sludge is screened prior to discharge into the reception tanks, raw sludge passes through a CDE screen which has a peacemaker odour control unit and imported SAS passed through a Huber screen which also has a peacemaker unit.

Blended sludge is transferred into two dewatering buffer tanks (these are enclosed and vented to odour control) then to four dewatering centrifuges (which are enclosed and could be vented to odour control if

required) and finally to the three THP feed silos (which are enclosed and vented to odour control). Malodorous air is extracted from these locations on site, the THP Feed Silos, Cake Import Bunker and Dewatering Buffer Tanks and fed to the two stage biofilter and carbon filter. The vessel comprises of a single packed bed containing bio-inert pumice media containing odour neutralising bacteria. The air flow passes upwards through the bed and then exits vertically through the outlet. The partially cleaned air is then drawn through the duty/standby fans and sent through the carbon filter. Centrate from the raw dewatering centrifuges is fed to the head of works.

Sludge cake is imported via a cake bin (covered and odour controlled as discussed above) into the THP feed silos. The incoming cake wagons are also covered.

Mixed sludge is transferred from the THP feed silos to the three THP streams each with four reactors. A UV treatment plant is used to treat final effluent for use with the post THP sludge. After reaction, the sludge is fed through the six THP heat exchangers (one for each pair of primary digesters) and the sixteen primary digesters in blocks B, C and D.

Biogas is collect from the digesters and held in 2 biogas holders with 8000m³ total capacity. Biogas is utilised in either:

- Biogas to grid
- 7 x CHPs
- 3 x Steam Boilers

After digestion, the sludge is transferred to the fourteen post digestion tanks, then to ten Klampress dewatering belts, located in an enclosed dewatering building which is served by wall mounted ventilation fans. Some digested sludge is dewatered in a temporary centrifuge. Centrate from here goes to an additional post digestion tank before going back to head of work.

Once dewatered, the sludge cake is transferred to the existing cake pad and then off site for land spreading in agriculture or to alternative outlets.

Digested sludge liquors from the Klampress dewatering belts are treated in Anammox reactor (2 of), prior to being returned to the head of the works.

2.2.2 Digested cake

Occasionally digested sludges are imported from other Severn Trent STFs for dewatering/ storage. All sludge is treated in accordance with the site HACCP plan & is tested on a regular basis. Once at the reception site, imported digested sludge is discharged into storage tanks which feed the de-watering process & treated in the same way as indigenous sludge – the centrifuges are enclosed units & cake is stored on the pad in specific numbered bays and recorded on the site stock sheet. Cake movement on the pad is minimised to reduce odour.

If the imported cake does not meet the requirements for recycling, it will be quarantined on site for further sampling & investigation. Additional treatment may be required or disposal via other non-agricultural routes. Additional treatment may include mixing with lime. If this is required, odour management will be included as part of the RAMS (Risk Assessment / Method Statement) of the relevant contractor.

The “oldest” cake on site will generally be recycled first but this could be impacted by operational requirements or customer preference. For example, treated cake could be delivered directly from under the chute in preference to cake stored in bays which reduces cake movement on site providing operational benefits and reduced carbon emissions.

The cake pad at the site is over 350m from the site fenceline at its closest point (the southern boundary) and as such, falls outside the M9 distance.

2.2.3 Odour Control Units

Sewage treatment works have a number of potentially odorous sources within their boundary. Some of these sources may be linked to OCUs to treat potentially odorous compounds given off by the process. These units

take air extracted from above tanks or process areas and treat the odour compounds by means of different methodologies dependent upon the nature of the odour compounds. Treatment methodologies include activated carbon systems; biofilters or other biological treatment; and chemical scrubbing. Individual OCUs may use one or more of these methodologies in series.

Under the M9 guidance documents, the Environment Agency has identified that biofilters may give rise to bioaerosols during operation.

The raw dewatering buffer tanks, imported cake bin and THP feed silos are connected to an enclosed bio-trickling filter and an enclosed carbon filter for sulphur dioxide and odour removal. The bio-trickling filter contains a lava rock media that supports biomass for odour removal. Lava rock has the advantage that it is not consumed in the biological process. A carbon filter has been included as a polishing stage. This odour abatement system could be extended to treat air from the dewatering centrifuges if required in the future.

2.2.4 Seasonality

Sewage treatment is undertaken at the STW on a continuous basis, 24 hours a day 365 days of the year. Digested sludge cake is, therefore, produced daily and at similar levels across the whole year.

2.3 Potential Sources

There are 73 point-source emissions to air from the processes within the installation boundary, as presented in Table 1 and illustrated in Appendix B. The references and source descriptions match those in the permit:

Table 1: Point source emissions to air

Air emission reference	Source	In scope? (Yes/No)
A6, A7	Engines 6, 7 (2.606MW net thermal input each) - Engine Exhausts.	X
A9	Natural gas Boiler Stack	X
A13	Air virtual stack	X
A14a, A14b, A14c	Jenbacher Engines 10, 11 and 12 exhausts	X
A14d, A14e	Jenbacher Engines 13 and 14 exhausts	X
A14f, A14g, A14h	Composite boiler 3 off exhausts	X
A15	First unit of twin unit biogas flare	X
A16	Second unit of twin unit biogas flare	X
A17	PpTek siloxane filter exhaust stack	X
A20	Sludge Reception Well- Odour Control Unit	Y
A21	Balancing Tank No 1- Odour Control Unit	Y
A22	Balancing Tank No 2- Odour Control Unit	Y
A23	Balancing Tank No 3- Odour Control Unit	Y
A24	Sludge Thickening Centrifuge- Odour Control Unit	Y
A25	No 2 Sludge Facility- Odour Control Unit	Y

Air emission reference	Source	In scope? (Yes/No)
A26	Imported Tank Sludge Facility- Odour Control Unit	Y
A27	Reception Tanks, 1, 2, and 3- Odour Control Unit	Y
A28	Tanker trade (food) well and tanks- Odour Control Unit	Y
A29	Acetic acid- Odour Control Unit	Y
A30	Imported sludge thickening building- Odour Control Unit	Y
A31 to A46	Pressure Release Valves located on the roof of each digester	X
A49 to A64	Digester vent tubes	X
A65	Biofilter Exhaust Stack	Y
A66	Flare	X
A67, A68	Activated carbon filter purge vents	Y
A69, A70, A71, A72	Gas compressors	X
A73	Odour control plant emission stack	Y
A74	Pressure relief valve for existing biogas holder	X
A75	Pressure relief valve for existing biogas holder	X
A76	Biogas upgrading plant- exhaust for odour control system	Y
A77	Biogas upgrading plant- upgrading exhaust stack	X

2.3.1 Source Assessment

The CHP engines, boilers and emergency flare (points A6; A7; A9; A13; A14a-h; A15; A16; A66) combust the produced biogas at high temperatures (in excess of 450°C). Due to the combustion of the biogas, these points can be discounted as sources of bioaerosols emissions.

The ppTEK siloxane filter (A17) and gas compressors (A69-A72) are process release points for treated biogas, as are the biogas upgrading plant release points (A74; A75; A77) which do not release raw biogas.

Pressure relief valves (A31-A46) are emergency release points only and not in routine operation. Points A49-64) are vent tubes on the digesters and do not routinely emit.

There are 12 Odour Control Units (OCU) (points A20-A30; A73) serving the installation, plus the biofilter (A65), the carbon purge valves (A67,68) and a separate OCU for the biogas upgrading plant (A76).

Table 2: OCU types and media

Minworth STW Bioaerosol Risk Assessment
ST Classification: OFFICIAL SENSITIVE

Unit	OCU Type	System details	Media type
OCU Sludge Reception Well (A20)	GRP3000 Peacemaker	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Balancing Tank 1 (A21)	Double GRP3000 Peacemaker	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Balancing Tank 2(A22)	Double GRP3000 Peacemaker	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Balancing Tank 3 (A23)	Double GRP3000 Peacemaker	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Sludge Thickening Centrifuge (A24)	3 x P8000 CIF Units & 2 x P8000 Peacemakers Terminodour unit	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU No 2 Sludge Facility (A25)	2 x P8000 CIF Units & 2 x P8000 Peacemakers	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Imported Tanker Sludge Facility (A26)	2 x Single GRP3000 Peacemaker	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Reception Tanks 1, 2 and 3 (A27)	3 x GRP3000 Peacemaker	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Tanker trade (food) well and tanks (A28)	GRP 3000 Peacemaker	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
OCU Acetic acid (A29)			
OCU Imported sludge thickening building (A30)	P8000 Peacemakers Terminodour	Fully enclosed system, vents to atmosphere via a single exhaust point	Pellets impregnated with stabilised chlorine dioxide and absorptive (carbon) media
Biofilter Exhaust Stack (A65)	ERG Biofilter and carbon dry scrubber	Fully enclosed system, vents to atmosphere via a single exhaust point	Biofilter and activated carbon unit in series
Activated carbon filter purge vents (A67; A68)	Activated carbon	Fully enclosed system, vents to atmosphere via a single exhaust point	Activated carbon

Unit	OCU Type	System details	Media type
Odour control plant emission stack (A73)	Bio-trickling filter and carbon filter	Fully enclosed system, vents to atmosphere via a single exhaust point	Bio-trickling filter and carbon filter in series
Biogas upgrading plant-exhaust for odour control system (A76)	ERG Biofilter and carbon dry scrubber	Fully enclosed system, vents to atmosphere via a single exhaust point	Biofilter with carbon filter in series

Note points A28 (food waste import OCU) A29 (acetic acid OCU) A30 (Imported sludge thickening building OCU) are not currently operational as the associated processes are offline.

2.4 Risk

The overall treatment process is considered to be a very low source of bioaerosols.

Although the site has a large number of OCU's only those which biofilters present a risk of bioaerosols.

These are:

Table 3: OCU including biofilters

Unit	OCU Type	System details	Media type
Biofilter Exhaust Stack (A65)	ERG Biofilter and carbon dry scrubber	Fully enclosed system, vents to atmosphere via a single exhaust point	Biofilter and activated carbon unit in series
Odour control plant emission stack (A73)	Bio-trickling filter and carbon filter	Fully enclosed system, vents to atmosphere via a single exhaust point	Bio-trickling filter and carbon filter in series
Biogas upgrading plant-exhaust for odour control system (A76)	ERG Biofilter and carbon dry scrubber	Fully enclosed system, vents to atmosphere via a single exhaust point	Biofilter with carbon filter in series

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.

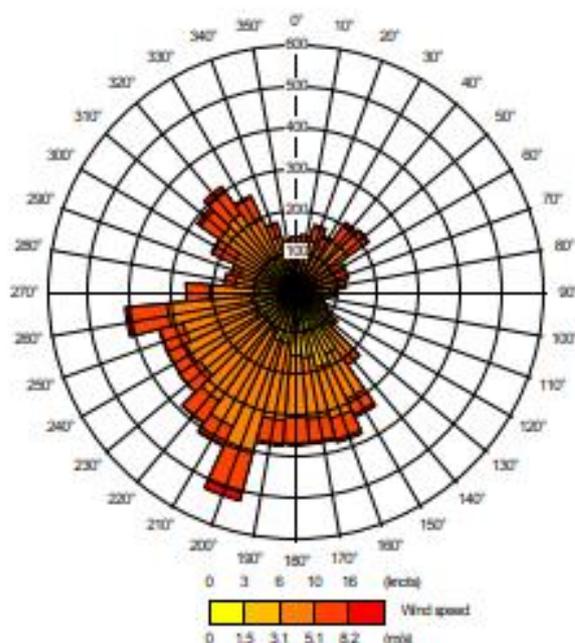
2.5 Pathways

Bioaerosols are very small and light in weight so can easily be transported by the wind from their source to a receptor.

Historical prevailing wind data below from the Met Office shows the predominant direction is South / South West. The site is located in a built up area, which may impact on dispersion patterns. Minworth STW is surrounded by sensitive receptors so the aim is to keep impacts to a minimum whatever the wind direction.

Figure 1 – Wind rose for Birmingham Airport meteorological station 2020

Birmingham Airport meteorological station, 2020



Because of the dilution effect in open air, bioaerosol concentrations fall away rapidly with distance from the source. It has been shown by research by the HSE⁵ that by 100 to 200m away, the bioaerosol concentration has mostly returned to background levels. Between 50m and 100m distances downwind of the process, bioaerosol concentrations were substantially reduced by comparison to those level measurements at source. RR786 confirmed previous published studies which showed that at a distance of 250m from composting activity, in most cases, the bioaerosol concentrations will be reduced to background levels. Note that this research was undertaken on aerobic composting sites, which generate higher levels of bioaerosols than anaerobic digestion sites, although the 250m separation distance has been retained.

At present, Severn Trent Water do not have any empirical evidence for the levels of bioaerosols that might be associated with the potential sources at all of their Sludge Treatment Centres, however, the data they do have from a number of sites indicates there are no bioaerosols given off by their processes.

As a responsible operator, Severn Trent Water are arranging for bioaerosol monitoring at a number of typical STW's in order to confirm that the understanding of the wider waste water treatment industry, that sewage sludge treatment processes do not give rise to elevated levels of bioaerosols, is correct. The sampling will be in accordance with the requirements of M9 and M17, and consist of a series of agar gel plates being placed downwind and upwind of the cake pad, including sampling points both directly upwind of the downwind sampling point and additional samples in the direction of the nearest sensitive receptors.

2.6 Receptors

Environment Agency guidance note M9 recommends a screening distance of 250m from bioaerosol emission sources to static receptor locations. 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

⁵ RR786 - Bioaerosol emissions from waste composting and the potential for workers' exposure
<https://www.hse.gov.uk/research/rrhtm/rr786.htm>

is covered by Health and Safety at Work legislation but would apply to dwellings, commercial or industrial premises nearby where people might be exposed for the requisite period.

There are a number of potentially sensitive receptors found within 250m of potential bioaerosol emission sources at the site.

Table 4: Static Receptors within 250m of Potential Bioaerosol Sources

Receptor	Description	Source	Distance from closest source (m)	Direction from the Source
R1	Residential: Mill House	Odour Control Plant Emission Stack (A73)	150m	South
R2	Recreational: Houses on Water Orton Lane	OCU Sludge Thickening Centrifuge (A24)	150m	West
R3	Commercial Properties: Prologis Park	Biofilter Exhaust Stack (A65)	150m	South

The nearest residential and commercial receptors are located approx. 100m south of the site, comprising Prologis Park industrial estate, which is not a receptor under M9 guidance. Therefore, the nearest residential receptors are on Water Orton Lane, specifically to the south of the site 'Mill House' located to the east of Prologis Park, and houses to the west of the site off Water Orton Lane, which are separated from the site by Minworth Parkway. These are all within the 250m radius of OCU's.

Due to the location of the cake pad, which is over 300m from the nearest part of the site boundary, it is not a potential source of bioaerosols within the impact distance.

2.7 Risk Assessment

The method used for this bioaerosol risk assessment is adapted from the EA's standard guidance on risk assessments for environmental permitting, which recommends using a Source-Pathway-Receptor model to help determine the magnitude of the risk associated with bioaerosol emissions from a facility.

There are potential sources of bioaerosols release within 250m of static receptors, namely OCU's:

- Odour Control Units A24; A65; A73

The receptors are situated to the west and south of the release points and the prevailing wind direction is from the South-west. There is potential for wind-borne transportation of bioaerosols, although all three receptors are downwind of the prevailing wind.

Most storage tanks, treatment tanks and associated pipework are enclosed. Where tanks are not gas tight and vent to atmosphere, these are either connected to an OCU, or the moisture content is not low enough that there is not considered to be a risk of release of bioaerosols.

The closest receptor is R3, the commercial premises of Prologis Park, closest to OCU A65. However, the majority of these do not have yards that are likely to have staff outside for over 6 hours at a time and are generally excluded under M9 guidance. The nearest applicable sensitive receptor is R1, the house to the south of the site located off Water Orton Lane, which are approximately 150m south of OCU at A73. The houses to the west off Water Orton Lane are closest to OCU A24.

Whilst the possibility of an OCU releasing bioaerosols cannot be ruled out, the likelihood and magnitude of any bioaerosol release is likely to be low. Given that the identified potential source is considered to represent a low risk and the intervening distance, the screening provided by the vegetation, and that the prevailing wind does not blow in this direction, it is considered that the probability of exposure at these locations from bioaerosols emitted from the site is also likely to be low (if releases occur at all).

The other potential source is the site cake pad, which is located in the centre of the site and over 300m from the site boundary and therefore, outside of the assessment distance in M9. This has not been assessed further as a source.

The likelihood of bioaerosols being emitted from the permitted processes on site is considered to be low, and taking into account the location of receptors, their distance from source, and the control measures in place the overall risk is considered to be low or minimal.

Planned monitoring of bioaerosol emissions by Severn Trent Water is expected to validate the assumption that process contributions from sewage sludge treatment works would comply with the 'acceptable level' thresholds.

Table 5: Risk Assessment of Potential Bioaerosols Sources

What has the potential to cause harm? Source	How can the source reach the receptor? Pathway	Who can be affected? Receptors	Assessing the risk Probability of Exposure	Consequence (what is the harm that can be caused)	Managing the risk (Control Measures)	Overall/residual risk
Biofilter Exhaust Stack A65	Inhalation via wind-borne transportation	R1 – R3	<p>The majority of receptors are >150m away, and screened by vegetation.</p> <p>The closest receptor, R1, is approximately 215m south east, however this is not in the direction of the prevailing which may provide some protection. Point R2 is approximately 275m from the source and therefore outside of the relevant distance.</p> <p>R3 is approximately 140m south west and are commercial properties.</p> <p>Probability of exposure from the OCU is considered to be low.</p>	Impact on human health (considered to be a sensitive receptor).	<p>Most storage tanks, treatment tanks and associated pipework are enclosed. Given the type of OCU, the likelihood of bioaerosol release is anticipated to be minimal.</p> <p>The OCU is maintained monthly by a Framework agreed contractor to reduce the risk of equipment failure.</p>	Low
Odour control plant emission stack A73	Inhalation via wind-borne transportation	R1; R3	<p>The majority of receptors are >150m away, and screened by vegetation.</p> <p>The closest receptor, R1, is approximately 150m South, however this is not in the direction of the prevailing which may provide some protection. R3 is approximately 240m south east and are commercial properties.</p> <p>Probability of exposure from the OCU is considered to be low.</p>	Impact on human health (considered to be a sensitive receptor).	<p>Most storage tanks, treatment tanks and associated pipework are enclosed. Given the type of OCU, the likelihood of bioaerosol release is anticipated to be minimal.</p> <p>The OCU is maintained monthly by a Framework agreed contractor to reduce the risk of equipment failure.</p>	Low
Biogas upgrading plant- exhaust for	Inhalation via wind-borne transportation	R1; R3	<p>The majority of receptors are >150m away, and screened by vegetation.</p>	Impact on human health	<p>Most storage tanks, treatment tanks and associated pipework are enclosed. Given the type of OCU, the likelihood of</p>	Low

Minworth STW Bioaerosol Risk Assessment
 ST Classification: OFFICIAL SENSITIVE

What has the potential to cause harm? Source	How can the source reach the receptor? Pathway	Who can be affected? Receptors	Assessing the risk Probability of Exposure	Consequence (what is the harm that can be caused)	Managing the risk (Control Measures)	Overall/residual risk
odour control system A76			The closest receptor, R1, is approximately 230m South, however this is not in the direction of the prevailing which may provide some protection. R3 is approximately 200m south east and are commercial properties. Probability of exposure from the OCU is considered to be low .	(considered to be a sensitive receptor).	bioaerosol release is anticipated to be minimal. The OCU is maintained monthly by a Framework agreed contractor to reduce the risk of equipment failure.	
Cake Pad	Inhalation via wind-borne transportation	R1-R3	Receptors downwind are >300m away from the cake pad and generally screened by vegetation on the site boundary. The prevailing wind is not in the direction of the closest receptor which is also over 250m from the source Probability of exposure from the cake pad is considered to be extremely low .	Impact on human health (considered to be a sensitive receptor).	The cake pad is over 300m from the site boundary and therefore, outside of the screening distance.	Not present

There are a number of potentially sensitive receptors found within 250m of potential bioaerosol emission sources at the site.

Sensitive receptors:

- Minworth Infants and Junior School (500 metres to the north east)
- Kingsbury Business Park (460 metres to the north)
- Midpoint Park (300 metres to the west)
- Water Orton railway Station (1.3 km to the south)
- Curdworth village (1.5 km to the east)

The nearest residential receptor (Mill House) is within 160 metres to the south west of the permit boundary. The next nearest residents are located 200 metres west of the boundary on Water Orton Lane.

Commercial and agricultural odour sources in the area:

- Minworth landfill site
- Minworth UWWT
- Coleshill STW and FWAD plant

2.8 Risk Assessment

The method used for this bioaerosol risk assessment is adapted from the EA's standard guidance on risk assessments for environmental permitting, which recommends using a Source-Pathway-Receptor model to help determine the magnitude of the risk associated with bioaerosol emissions from a facility.

There are no potential sources of bioaerosol releases within 250m of static receptors.

2.9 Abnormal Situations

In the event of plant failures or abnormal situations, an alarm would be raised on the Site Supervisory Control and Data Acquisition (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, where required, an operator would contact a mechanical or electrical technician, both of whom are on-call 24-hours, to attend site as soon as practicable.

If the on-call technicians are already engaged upon other response work, there is the facility to access staff from other STW 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 abnormal event would be failure of the flare stack and/or CHP. Such an event would result in releases of biogas from the PRV's located on the roofs of the digesters and in the gas holder compound, which could release bioaerosols. This occurs to prevent over pressurisation and minimise the likelihood of a catastrophic failure of the digesters and gas systems. While the problem is rectified, biogas generation is reduced by reducing or inhibiting the digester feed.

3. Conclusions

A source-pathway-receptor risk assessment has been undertaken to appraise the potential for risk to human health in dwellings and other nearby buildings from bioaerosols arising from operations at the Minworth Sludge Treatment Facility. The risk assessment followed a standardised approach, namely:

- Hazard identification: what sources of bioaerosols are present;
- Exposure assessment: what are the mechanisms or pathways allowing bioaerosols to migrate off site and reach a receptor; and
- Risk evaluation: what is the probability of exposure. This considered control measures in place to reduce the probability or magnitude of release.

No potential sources of bioaerosols within the site processes have been identified at the site, due to the location of cake storage and type of OCU installed, along with their distance to the nearest receptor.

Although only qualitative data is available, the overall bioaerosol risk to the identified, potential, receptors within 250m of potential bioaerosol sources associated with the sludge treatment process is considered to be a 'Very Low' risk based on the lack of source, probability of exposure and onsite management and maintenance, which would minimise the magnitude of any releases.

3.1 Sampling

Severn Trent Water confirms it will use MCERTS accredited providers for the sampling from location THP Feed Bio-trickling Filter (NGR: SP 1651 9184) and will sample OCUs on a bi-annual basis.

150m= nearest sensitive receptor

In line with M9, ambient sampling will be conducted to identify background emissions. A sampling round, consisting of four individual sampling points, each with its own agar plate will be carried out. One point will be located upwind of the biofilter give a background concentration, and three will be located in a fan like arrangement downwind:

Upwind sample location (approx.) which is approx. 50m SW of the biofilter: SP 1649 9179*

Downwind sample location 1 which is 150m N of the biofilter: SP 1648 9199*

Downwind sample location 2 which is approx. 150m NW of the biofilter: SP 1656 9198*

Downwind sample location 3 which is approx. 150m NE of the biofilter: SP 1662 9194*

* NGR's for sampling locations are only 8 digits at present, to allow the contractor flexibility as to precise location, taking into account the ability to safely locate and access (and security) of the sampling plates.

Appendix A. Site boundary and emission points

See Main ASD site layout drawing

Appendix B. Site plan showing static receptors within 250m of potential bioaerosol sources

