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Alfreton STW Bioaerosol Risk Assessment

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Alfreton STW Bioaerosol Risk Assessment

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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 Alfreton STW, EPR/GP3690CH/V002.

1.1 Site description

The site is located in a semi-rural setting on the outskirts of Alfreton, with the town situated to the immediate South of the site. To the immediate East is open arable farmland for approximately 730m to a railway track heading North to South. There is a small track which runs parallel to the Northern site boundary that gives access to the farmers field to the East. Immediately West of the site is more open arable farmland for approximately 420m to Chesterfield Road which also runs North to South. The Alfreton Brook runs 40m from the site and runs parallel to the Northern boundary. The B6025 lies approximately 70m from the Brook and also runs parallel to the Northern boundary. A small road provides access to the site from the B6025 and includes a bridge over the Brook. The majority of the land beyond the B6025 is more farmland with a small power station adjacent to the road 140m from the site, and farm buildings approximately 400m and 520m from site. Industrial and commercial buildings are immediately South of the site for approximately 1km South East to the railway mentioned earlier. There is a patch of allotments 70m South of the site and is separated by trees for screening. Alfreton lies beyond the allotments approximately 230m South of the site. This includes schools 240m and 340m from the site, playing fields 380m away and a cemetery 450m South of the site.

The site sits entirely within a flood zone 1, indicating that it has a low probability of flooding having less than 1:1000 annual probability of river or sea flooding in any year. The Alfreton Brook immediately North of the site lies in flood zone 3 (high probability of flooding, greater than 1:100 annual probability of flooding), with a small buffer in land zone 2 (medium probability of flooding, between 1:100 and 1:1000 annual probability of flooding). The site is not located within a designated source protection zone (SPZ). There are nine Local Woodland sites and one area of ancient woodland within 2km of the site. Carnfield Wood ancient woodland is 1.2km south east and also forms part of a local wildlife site – Carnfield Wood and Outseats Alfreton Tunnels. The closest ecologically sensitive areas are Pond Wood, Alfreton and Alfreton Parkway Railway Land Carnfield Hill, which are 610m west and 840m east respectively. The other seven local wildlife sites lie within 1,100m and 1,500m south east to north east of the site. There are no LNRs, NNRs or SSSIs within 2km of the site and there are no SACs, SPAs, MPAs or Ramsar Sites within 10km. The site is located directly adjacent to the South Normanton Air Quality Management Area (AQMA), Barlborough AQMA no.1 and Barlborough AQMA No. 2.

The address of the installation is:

Severn Trent Water Limited

Alfreton Sewage Treatment Works

Rodgers Lane,

Alfreton,

DE55 6AW

Grid reference: SK 41257 56715

1.2 Site Activities

Alfreton Sludge Treatment Centre (STW) is located at the Alfreton Sewage Treatment Works and is operated by Severn Trent Water Utilities Ltd (Severn Trent Water). The STW undertakes the biological treatment of sewage sludge, both indigenous and imported from other wastewater treatment sites, by anaerobic digestion, with a capacity above the relevant thresholds for requiring an environmental permit (which is greater than 100 tonnes of waste per day). There is also a listed activity for a liquor treatment plant, which treats returns liquor post digestion, prior to transfer back to the head of works for further treatment.

It also includes the importation of specified wastes to the works inlet for treatment through the Urban Wastewater Treatment Directive regulated works.

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

- Import of sewage sludge, cess and septic tank wastes, and digested sludge;
- Storage of digestate prior to dewatering;
- Dewatering of digested sewage sludge;
- Transfer of centrate back to the head of the sewage treatment works;
- Storage of dewatered sewage cake prior to offsite recovery;
- Storage of biogas;
- Combustion of biogas in MCPD and SG compliant biogas CHP unit and auxiliary boilers;
- Emergency flare; and
- Storage of raw materials.

The STW can treat up to 163,702.5m^3 of sludge per year (equating to approximately 163,702.5 wet tonnes). There are two operational primary digesters, which accept sludges for treatment. The STW has a total maximum treatment input of 448.5m^3 per day (equating to approximately 448.5 wet tonnes per day).

Some of the treatment throughput is sludge which is subject to dewatering as treated sludge cake, deposited on the cake pad pending to application to land offsite. Within the area covering the permitted activities, there are three Odour Control Unit (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 combusted through the site's Combined Heat and Power engine, 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 permittable 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 note[1] '*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 Alfreton 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.

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

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 note[2] 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 Alfreton 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 Alfreton STW, which meet the M17 guidance, only the temporary storage of sludge cake on the cake pad and one of the OCUs which is a biofilter unit is relevant. 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.

1.4.2 Relevant Thresholds

Based on the accepted Levels at sensitive receptors as set out in the Environment Agency M17 guidance[3] '*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 M9[4]; key bioaerosols of interest and their respective threshold Levels (including background) at sensitive receptors are outlined below:

- Total bacteria: 1000 cfu/m^3
- Aspergillus Fumigatus: 500 cfu/m^3

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

[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 Alfreton 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

Sludge from the UWWTD treatment processes on site is thickened and transferred to one of four sludge storage tanks. Imported sludge is offloaded into these tanks passing through a logger to record the incoming volume of sludge, with the imported sludge being blended with thickened indigenous SAS and indigenous primary sludges prior to the biological treatment process in one of three pre-digestion blend tanks. Blended, dewatered sludge is treated in one of two above ground primary anaerobic digesters which are of concrete construction. Each of the primary digesters are fitted with two pressure relief valves (PRVs), which operate in an emergency only. The digesters operate on a continual basis with incoming sludge added to the process as digested sludge is removed. Digested sludge is transferred to one of 4 open topped, above ground, steel, post digestion tanks (pathogen kill tanks) at the site for additional pathogen kill.

The sludge storage tanks are connected to OCU1, while the imported sludge is screened at import screens which are connected to OCU2. The pre-digestion tanks are connected to OCU3, which is a biofilter unit.

2.2.2 Digested cake

Following this, fully digested sludge is transferred to site dewatering equipment, where, following the addition of polyelectrolyte based coagulant, it is dewatered and stored on the sites open cake pad. Centrate from the dewatering process is transferred to the liquor treatment plant for further treatment, prior to return back to the works inlet for treatment in the UWWTD process.

The sludge cake Is transferred to the cake pad for storage following dewatering. The sludge is analysed to check compliance with Sludge (Use in Agriculture) Regulations 1989 (SUiARs), in accordance with the Biosolids Assurance Scheme (BAS) and once the sludge is confirmed to be compliant it is removed from storage for land spreading.

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.

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 eleven 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?
A1	CHP engine 1	X
A2	Auxiliary Boiler 1	X
A3	Auxiliary Boiler 2	X
A4	Auxiliary Boiler 3	X
A5	Emergency Flare	X
A6	Gas storage pressure relief valves	X
A7	Digester storage tanks pressure relief valve	X
A8	Digester storage tanks pressure relief valve	X
A9	Odour Control Unit (imported sludge)	✓
A10	Odour Control Unit (sludge transfer)	✓
A11	Odour Control Unit (sludge tanks)	✓

2.3.1 Source Assessment

The CHP engine, boilers and emergency flare (points A1; A2-A4; A5) 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.

There are three Odour Control Units (OCU) (points A9-A11) serving the STW.

Unit	OCU Type	System details	Media type
OCU 1 Imported Sludge Area (A9)	2 x P1000 peacemakers in parallel	Fully enclosed system, vents to atmosphere via a single exhaust point	Chemical impregnated pellets with carbon polishing stage

Unit	OCU Type	System details	Media type
OCU 2 Sludge Transfer Area (A10)	2 x P1000 peacemakers in parallel	Fully enclosed system, vents to atmosphere via a single exhaust point	Chemical impregnated pellets with carbon polishing stage
OCU 3 Pre-digestion Sludge Tanks (A11)	Biofilter	Fully enclosed system, vents to atmosphere via a single exhaust point	Calcified seaweed

One of the three OCU's within the permit scope is a biofilter and therefore potentially poses a risk of bioaerosols.

The Pressure Relief Values (PRVs) (points A6 – A8) are normally closed and do not emit to atmosphere. However, in the event of an abnormal situation such as the failure of the flare stack and/or boilers, the PRVs would open to relief excess biogas pressure, potentially resulting in the release of bioaerosols, while the problem is rectified. While the problem is rectified, biogas generation is reduced by reducing or inhibiting the digester feed. These abnormal events are unlikely, temporary, and infrequent due to the extensive monitoring and maintenance programmes undertaken at the site as well as the procedures and warning systems in place.

Dewatered digested sludge cake is stored on the cake pad at the site pending pending offsite application to land.

2.3.2 Risk

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

Sewage cake is stored on the site on the open cake pad. It is not subject to turning or maturation on the pad.

The OCU's in use for the permitted activities at the site, include one biofilter based unit, OCU3 (A11) which may pose a risk of bioaerosols.

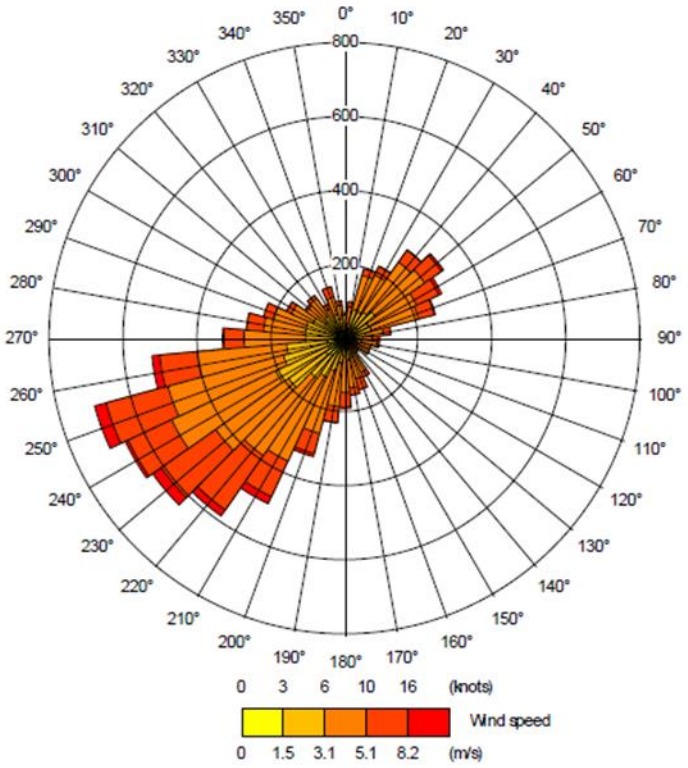
As discussed above, there are a number of control measures in place at the site to reduce and contain emissions of bioaerosols. These control measures are regularly maintained to sustain their efficacy and reduce the risk of equipment failure.

In addition waste treatment tanks and associated pipework are enclosed. The wet wells and tanks used to receive incoming sludge are either below ground and covered or above ground, covered and abated. Sludge screening and dewatering takes place in enclosed tanks and units that are located within a building. In addition, the PRVs are only open in abnormal situations which are temporary and unlikely.

2.4 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 West / South West. The site is located in a semi rural area, which may impact on dispersion patterns. Alfreton STW is north of most sensitive receptors so the aim is to keep impacts to a minimum whatever the wind direction.

Figure 1 – Wind rose for Nottingham / Watnall station 2016 – 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 HSE[5] 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 has empirical evidence for the levels of bioaerosols that might be associated with the potential sources at the Alfreton works, based on monitoring of emissions. This data shows that there are no emissions at levels exceeding the relevant thresholds in M9 and M17.

The sampling was in accordance with the requirements of M9 and M17, and consisted 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.

2.5 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 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.

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

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

Table 2: Static Receptors within 250m of Potential Bioaerosol Sources

Receptor	Description	Source	Distance from closest source (m)	Direction from the Source
R1	Residential: Farm off A61	Cake pad	330m	North- East
R2	Recreational: Rodgers Lane Allotments	OCU 3	150m	South
R3	Residential: Rodgers Lane properties (nearest)	OCU 3	280m	South
R4	Commercial Properties off Lydford Road	OCU 3	100m	South-East
R5	Educationall: Christ the King School	OCU 3	280m	South

The nearest residential and commercial receptors are located approx. 150m south of the site off, comprising allotments off Rodgers Lane. There are trees and scrub between the site and the receptors adjacent to operational areas and other receptors in this direction are over 250m away (the school and houses). There are industrial premises including a depot for mobile cranes located within 100m of the site to the south east. However, these sites would not have staff outside for over 6 hours.

2.6 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 is one potential sources of bioaerosols release within 250m of static receptors:

- Odour Control Unit 3

The receptors are situated to the North-East, South and South-East of the release points and the prevailing wind direction is from the South-west. There is potential for wind-borne transportation of bioaerosols, more so in the direction of Receptors R1, less so for R2 - R5.

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 maximum daily throughput of sludge is 448.5m^3/day.

The closest receptor is R4, the commercial premises off Lydford Road. 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 R3, the allotments located off Rodgers Lane, which are approximately 150m south of OCU3. 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 north of the site much further from the offsite receptors to the south and south east. The nearest receptor to the cake pad to the north is a farmhouse, R1, which is 330m away and therefore, outside of the assessment distance in M9.

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 3: 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
Odour Control Unit - Pre-digestion Sludge Tanks	Inhalation via wind-borne transportation	R2, R3, R4, R5	The majority of receptors are >150m away, and also screened by vegetation. The closest receptor is approximately 100m South East, however this is not in the direction of the prevailing which may provide some protection and are commercial properties excluded under M9. Probability of exposure from the OCU is considered to be **low**.	Impact on human health (considered to be a sensitive receptor).	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. The OCU is maintained monthly by a Framework agreed contractor to reduce the risk of equipment failure.	Low
Cake Pad	Inhalation via wind-borne transportation	R1	Receptors downwind are >330m 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 **low**.	Impact on human health (considered to be a sensitive receptor).	The cake pad is enclosed on all sides by a low level wall to protect from the wind. Digested sludge cake retains a high moisture content and is not prone to being dusty. Digested cake is removed from the pad every few days.	Low

2.7 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 Alfreton Sewage Treatment Works. 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.

Potential sources of bioaerosols within the site processes have been identified at the site, due to open cake storage and type of OCU installed at one points.

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 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 OCU3 biofilter (NGR: SK 41298 56598) and will sample OCUs on a bi-annual basis.

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: SK 4130 5668*

Downwind sample location 1 which is 60m S of the biofilter: SK 4130 5653*

Downwind sample location 2 which is approx. 85m SW of the biofilter: SK 4124 5653*

Downwind sample location 3 which is approx. 80m N of the biofilter: SK 4135 5654*

* 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 around the site