JR HILLYER AND SON

QUALITATIVE BIOAEROSOL RISK ASSESSMENT FOR

ENVIRONMENTAL PERMIT EPR/GB3607SL

July 2023 v1

Introduction

This qualitative assessment of bioaerosol risks relates to the potential exposure due to Coombe Farm Lagoon operations undertaken by environmental permit EPR/GB3607SL.

JR Hillyer and Son is a farming business supplying septic tank disposal facilities to waste contractors within Somerset and Dorset

The site has operated as a lagoon for the acceptance of septic tank waste since approximately 2000, originally operating under an S3 exemption. Following a legislation interpretation by the Environment Agency in 2018, backed by a Hight Court ruling for this type of treatment, the site was deemed to require an environmental permit to continue operations. The permit requirement centred around the 800mm square grid used to screen out rags, cotton buds and other items unacceptable for injection onto land. These contraries are then removed from the grid with a fork, placed into a skip and disposed of at a local landfill.

The site is located some 250-400m distant from a collection of farm building, residential accommodation and industrial units in open countryside. Patson Hill Farm lies 480m to the northwest. To the southwest a small agricultural building is 870m distant. The town of Sherborne lies 2.6km to the southeast.

The site accepts deliveries from 8am to 4pm on weekdays. No deliveries are accepted at weekends and Bank Holidays. Deliveries per day vary, however it is rare that there are more than 5 deliveries in a day, mostly only 2-3.

1. Risk Screening

Risk screening Is essentially an early stage in this assessment and has been undertaken to identify the existence of potential hazards and receptors. No account is taken of the existence or non-existence of pathways or mitigation measures and the probability of consequences is assumed to be absolute. Hazards related to the lagoon operation are:

Hazard from delivery and storage
Releases of bioaerosol into the atmosphere
Potential consequences
Effects on human health;
Quality of life – nuisance and effects on property
Effects on water, air, soil, plants and animals.

Sensitive receptors associate with the site are detailed in Table 2.1.

Table 2.1 Sensitive Receptors

Receptor	Land use	Direction from site	Approximate distance to site boundary (m)	Sensitivity to odour
Coombe Lane track	Track	North	0	Low
April Cottage	House	South	255	High
Bungalow	House	South	255	High
Fairways	House	South	285	High
Units	Commercial	South	295	Medium
Coombe Farm	House	South	355	High
Patson Hill Farm	House	Northwest	480	High

The Risk Identification Matrix, Table 2.2, identifies the risks associated with the Coombe Farm Lagoon. The matrix includes the sensitive receptors associated with the site identified in Table 2.1.

Table 2.2 Risk Identification Matrix

Specific Receptors	Activities associated with potential hazards	
	Reception & offloading	Storage
Domestic dwellings (<250m)		
Domestic dwellings (>250m)	X	X
Industrial Premises	X	X
Public footpath or Bridleway	X	X

2. Potential hazards to Health from bioaerosols

Potential hazards to human health are summarised in Table 3.1. Research suggests activities associated with direct handling of materials are likely to be the most significant source of bioaerosols. Secondary sources include emissions from the lagoon.

Table 3.1 Conceptual model for health exposure assessment to bioaerosols

Primary source	Secondary source	Health hazard	Transport mechanism	Pathway	Medium of exposure	Receptor
Disturbed materials following agitation of lagoon due to deliveries.	Release of breakdown products prior to removal from lagoon.	Lung disease, allergies, irritation of mucus membranes, asthma	Carried with airborne moisture.	Inhalation via nose or mouth.	Air	Humans: Residents, occupiers and users of facilities.
		Fever, headache, diarrhoea, systemic infection		Ingestion – eating or swallowing	Air & deposited materials	
		Irritation of eye and mucus membranes, skin infection.		Absorption: Direct contact with airborne bioaerosol	Air & deposited materials	
				Indirect contact via clothing or surfaces		
		Skin infection, irritation of mucus membranes		Contact with eyes or skin	Air	
		Tissue damage, skin infection, systemic infection.		Injection by puncture, high pressure equipment or contaminated sharps	Deposited materials	

Table 3.1 lists the most likely effects to health. A wide range of health effects is possible from almost any exposure route.

3. Magnitude of Consequences

The magnitude of the potential consequences that the identified hazard represents are classified dependent upon a)the degree of the impact that the potential risk could have and b) the context in which the risk is being assessed.

Five categories from *negligible* to *extremely severe* are suggested by DEFRA as follows:

Table 4.1 DEFRA Risk Assessment Consequence Categories

Negligible	Sub lethal effects in individuals that do not cause a change in population or size.
Mild-Moderate	Effects occurring at the population level. Effects on ecosystems that are not regarded as being of high value for whatever reason.
Severe	Sun lethal effects on individuals with effects on population structure and size. Regionally important ecosystems affected.
Very Severe	Local extinction (depending on the species) and local dysfunction of communities and ecosystems.
Extremely Severe	Global Extinction (depending on the species) and widespread effects on the functioning od communities and ecosystems.

4. Generic Down Wind Concentrations

Using general generic categories for potential scales of releases and apportioning four cases of operation.

Table 5.1 Generic Release Categories

Low Case	Undisturbed slurry in small scale lagoon.
Moderate Case	Small scale disturbance of the lagoon occasioned by deliveries.
High Case	Large scale disturbance of the lagoon occasioned by many deliveries.
Very High Case	Large lagoon with large scale deliveries, incorporating air entrainment and active movement via stirring.

In reviewing the activities undertaken at the site it is considered that only the low and moderate cases need to be considered for the lagoon.

5. Assessment of the Magnitude of Consequences

Site specific factors will influence the assessment of the magnitude of consequences. Exposure concentration is a product of source emission rate, dispersion and decay.

Source emission rate – Depending upon the activity being undertaken the rate of emissions will vary. It is not considered that as a sludge the rate of emissions will be high, due to the liquid content.

Dispersion -There is a correlation between distance from the source to the receptor in the magnitude of exposure.

Decay – Micro-organisms are killed on exposure to ambient environmental conditions.

Concentrations have been estimated for the potential sensitive receptors in Table 2.1. The magnitude of consequences is expressed in risk terms (using the criteria in Table 4.1) and shown in Table 6.1

Table 6.1 Potential Magnitude of Consequences (Exposure Concentrations)

	Emission case from delivery and storage			
Receptor	**Very High**	**High**	**Moderate**	**Low**
Coombe Lane track	n/a	n/a	Mild-moderate	Negligible
April Cottage	n/a	n/a	Mild-moderate	Negligible
Bungalow	n/a	n/a	Mild-moderate	Negligible
Fairways	n/a	n/a	Mild-moderate	Negligible
Units	n/a	n/a	Negligible	Negligible
Coombe Farm	n/a	n/a	Negligible	Negligible
Patson Hill Farm	n/a	n/a	Negligible	Negligible

6. Assessment of the Probability of Occurrence

When considering the potential for the probability of occurrence further factors combine to reduce occurrence from initial estimates as follows:

Receptor occupancy. – The proportion of the time the receptor is present at the identified location. Clearly this is higher for residential property than for industrial premises.

Wind direction – The proportion of the time that the wind blows towards the receptor. The predominant wind direction for RNAS Yeovilton is from the South West through to the South, therefore away from the residential dwellings and industrial premises.

Frequency of release events - Factors as contained within Table 5.1.

When these are combined with the emission cases for the operations, the risk of bioaerosol exposure is identified at Table 7.1.

Table 7.1 Significant risk of Bioaerosol exposure at identified receptors

	Emission case from delivery and storage			
Receptor	**Very High**	**High**	**Moderate**	**Low**
Coombe Lane track	n/a	n/a	Negligible	Negligible
April Cottage	n/a	n/a	Negligible	Negligible
Bungalow	n/a	n/a	Negligible	Negligible
Fairways	n/a	n/a	Negligible	Negligible
Units	n/a	n/a	Negligible	Negligible
Coombe Farm	n/a	n/a	Negligible	Negligible
Patson Hill Farm	n/a	n/a	Negligible	Negligible

From Table 7.1 the potential risks from the lagoon operations would be likely to be as follows:

For all operations and at all times the risk to residents, industrial occupiers and users of the track are acceptable and are negligible.

The need for additional technical or design measures to reduce potential bioaerosols releases is not indicated.