

Bioaerosol Sampling Report

Bryn Lane IVC (Phase 1)

FCC Environment

20th May 2024

Approval Sheet

Customer: FCC Environmental

Site: Bryn Lane IVC,
Wrexham Recycling Park,
Bryn Lane, Wrexham
LL13 9UT



Project title: Bioaerosols Sampling

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Foreword

Enitial has used its best endeavours, experience and expertise to provide a meaningful, accurate and relevant representation of the works carried out. The works were based on a defined programme and scope of works and terms and conditions agreed with the Client.

Enitial cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outside the agreed scope of works.

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1.0 Scope of Work

Enitial was tasked with providing Bioaerosol monitoring for FCC Environment at Bryn Lane IVC (Phase 1) located within Wrexham Recycling Park, Bryn Lane, LL13 9UT.

Due to the potential health risks posed by the facility to nearby receptors, the testing was conducted to assess the amount of airborne bioaerosols being generated by the site that is released into the local environment. The monitoring is to ensure that this exposure is below the industry standard threshold set by the Environmental Agency.

Due to the complex layout and proximity of the site facility to other buildings an agreement has been made between the regulator NRM and FCC Environment Ltd. This is an amendment to the standards by the Environment Agency Technical Guidance Note (Monitoring) M9 to produce a modified site strategy.

FCC agree with NRW that the nearest sensitive receptor to the composting operation for sampling will be the Council Yard & Offices, which are approximately 70-80m from the emission stack.

The work was carried out on 20th May 2024. This document is a presentation of the resulting data.

2.0 Background

The bioaerosol monitoring was specifically undertaken to enumerate the quantity of micro-organisms that can be cultured from representative samples of ambient air, collected at pre-determined monitoring points in the locality of the site.

The monitoring was undertaken in accordance with Environment Agency Technical Guidance Note (Monitoring) M9 – Environmental monitoring of bioaerosols at regulated facilities – July 2018.

Pre-prepared agar sample plates for *Aspergillus fumigatus*, mesophilic micro-organisms (bacteria) were directly impacted with ambient air using an Andersen sampler at the four selected sampling locations.

In the UK no statutory limits have been set for ambient concentrations of bioaerosols. However, as per the Environmental Agency Technical Guidance Note M17, guideline levels have been set for acceptable levels at sensitive receptors as the following:

- Total bacteria: 1000 cfu/m³
- Aspergillus Fumigatus: 500 cfu/m³
- Gram Negative Bacteria: 300 cfu/m³

3.0 Methodology

3.1 Sampling Locations

Sample locations should be determined prior to the commencement of the sampling event where possible. The sampling locations have been set by NRW and FCC and were determined to achieve:

- Upwind sample location 001: One sampling location directly upwind of the centre of the IVC facility at the emissions stack.
- Downwind sample location 002: One location directly downwind of the IVC facility at the emissions stack.
- Sensitive Receptor sample location 003: One location at the nearest sensitive receptor, being the Council Yard and Offices.

The selection of appropriate locations should be made by consulting the site plan and in consultation with Enitial's account manager, the Client and/or Site/Facility Manager. Upwind sampling should be performed concurrently with downwind sampling. Locations can be adjusted if necessary if locations are unable to be used due to obstacles or health and safety issues as stated in the M9 document. Should a building, installation or structure intervene between the downwind site and the operational area, then sampling should be carried out upwind of that feature at a distance greater than twice its height.

3.2 Agar Plates

The types of Agar used were:

- *Mesophilic micro-organisms*: (Total Viable Count [TVC]) – Half Strength Nutrient Agar (also known as 93's – white in colour)
- *Aspergillus Fumigatus* / Total Fungi: (colony-forming unit [cfu]) – Malt Extract Agar (also known as 94's – light yellow in colour)
- *Gram Negative*: MacConkey (MAC) Agar + 0.2 g/L cyclohexamide (also known as VRBGA - pink in colour)

The impacted agar plates were subsequently delivered to a specialist laboratory within 24 hours via a cool box with ice packs where they were cultured and enumerated.

3.3 Equipment

3.31 List of Equipment

The equipment used is as follows:

- Continuous operation mobile weather station (wind speed, direction, temperature, humidity) and tripod
- Digital stopwatch
- GPS device
- 4 x single-stage Andersen samplers
- 4 x tripods
- 4 x hemicylindrical baffles
- 4 x stoppers for Andersen samplers
- 4 x fully charged vacuum pumps (individual capacity of at least 35l per min) and connecting tubing
- Rotameter to fit vacuum pump
- Agar plates – variety dependent on required test
- 2 x sealable airtight sterile plastic containers
- Cool box with ice packs for transport
- 70% v/v aqueous solution / wipes of ethanol or industrial methylated spirits cleaning solution or other suitable disinfectants

3.32 Cleaning of Equipment

All parts of the sampling equipment that were in contact with the samples, work surfaces or storage containers were cleaned with a 70% aqueous solution or wipes of ethanol or methylated spirits, or other suitable disinfectants prior to use. Equipment was completely dried, through air drying before the sampling exercise was commenced.

On completion of cleaning the Andersen single-stage samplers, a stopper was placed in the cone entrance to stop any contamination occurring before the sampling event.

3.33 Setup and Operation

- The pumps were Pre-run for a specified time at the required flow rate of 28.3l/min ($\pm 2\%$). This pump test was undertaken once before the start of the monitoring exercise.
- The Andersen single-stage samplers were mounted on to the tripods securely at a height of 1.5-1.8m above ground and the baffles were fitted on the tripod to form a rear shield when aligned to the desired sampling direction.
- The vacuum pump was connected to the rotameter using an appropriate length and diameter of the tubing. Using the rotameter, the flow rate was adjusted to ensure it is running at a constant flow of 28.3l/min ($\pm 2\%$) for each pump.
- On completion of the pump test, the tubing from the dry gas flow meters was disconnected from the rotameter then connected to the inlet on the corresponding Andersen single-stage sampler.
- Fresh sample plates were installed in turn by removing the lid and being placed within the Andersen single-stage sampler
- The stoppers in the inlet of the Andersen single-stage samplers were removed.
- When the Andersen single-stage samplers were fitted with plates the vacuum pumps were activated and the start time recorded on the stopwatch. All pumps were switched on/off at the same time or at a maximum interval of up to 10% of the total run time.
- When the sample duration was completed the pumps were stopped and the finish time recorded.
- The plates were carefully removed ensuring that no contact was made with the exposed agar surface,
- The dish cover was replaced on to the plate and secured with masking tape.
- Each plate was placed into an individual plastic bag and sealed.
- The plates were stored in an upright, protective and cooled container and transported to the laboratory within 24 hours.
- Control blank samples were taken at the site. The steps stated above were adhered to however the sample pump was not switched on. One of each sample media was inserted within the Andersen single-stage samplers, left in for the same period of sampling time, then packaged.
- Field blank samples were taken. The sample media were placed in re-sealable packaging without being opened.

The impacted agar plates were subsequently delivered to a specialist laboratory via a cool box with an ice pack. The analysis took place within 24 hours from sample collection

4.0 Presentation of Data

The following pages consist of meteorological conditions found on site, a presentation of the estimated concentrations of airborne micro-organisms, a plan displaying sample locations and the laboratory data.

4.1 Field Sampling Report

Site: Bryn Lane (Phase 1) IVC Facility

Site Operator: FCC Environmental

Date: 20th May 2024

Start Time: 09:30

Finish Time: 10:50

Monitoring Technician ID: L.Kiernan, S.Mullen, R.Chau

4.11 Meteorological Conditions

Table 1: Weather Conditions

Parameter	Wind Direction	Wind Speed (m/s)	Pressure (mb)	Temperature (°C)	Cloud Cover (0-8)
Start	SE	2.2	1016	13	7
Finish	ESE	2.2	1016	16	8

4.12 Site Description

FCC Bryn Lane (Phase 1) IVC facility is part of Wrexham Recycling Park in Wrexham Industrial Estate located on Bryn Lane, Wrexham in North Wales.

The Recycling Park also includes a Materials Recycling facility (MRF), (Phase 2) and a Household Waste Recycling Centre (HWRC) facility operated by FCC Environment. Wrexham Industrial Estate includes a nearby large food production facility and business park.

The IVC facility was fully operational during the sampling period and operating under normal conditions. The nearest sensitive receptor is the council yard and offices located Southwest of the IVC.

4.2 Field Sampling Comments

Samples were taken at an upwind, downwind location and at a sensitive receptor (council yard and offices) (see enclosed annotated image Appendix 'A') using Andersen samplers. Ambient air samples were collected by the technique of direct impaction, where a known quantity of air was directed onto an agar plate. The agar samples were then cultured and counted by a specialist laboratory. The count result provides a quantification of the potential health risks posed by the facility to nearby receptors.

Table 2: Sampling Locations

Location	Description	Comments
Upwind location 001	Top right near LV switch room	
Downwind location 002	Far corner of MRF	
Sensitive Receptor location 003	Grass area behind the IVC	

4.3 Deviations from Methods

Table 3: Deviations

Location	Deviation	Reason
Upwind Location	Limited distance from the facility and sample location.	No access beyond site boundary and site infrastructure.
Downwind Location	Limited distance from the facility and sample location.	No access beyond site boundary and site infrastructure.

The locations were assessed to take into account the effect of features and obstructions which may impact the effectiveness of the monitoring. The sampling locations were restricted to where safe physical access was possible along with being legally accessible. (see enclosed annotated image Appendix 'A'). Sampling locations were determined in agreement to the modified sampling strategy as agreed by the NRW regulator and FCC.

4.4 Field Sampling Record

Table 4: Field Sampling Results

Ambient Sampling: Estimated concentration of bioaerosols										
Site: Bryn Lane IVC (Phase 1)					Site Operator: FCC Environment					
Sampling Date: 20/05/2024					Monitoring Contractor: Enitial					
Estimated Mass of Materials: Unknown					Type of Materials Processed on Site: Green Waste and Compost					
Activities affecting the concentration of Bioaerosols: IVC activities, biofilter stack					Site Activity: Normal IVC operations					
Location and grid reference	Sample reference number	Distance from centre of active area (m)	Difference in bearing between location of samplers and mean direction wind blows to (°)	Sampling start/end times (HH:MM)	Concentration of bioaerosols (CFU/m ³) Total Count (TVC)	Concentration of bioaerosols (CFU/m ³) Aspergillus Fumigatus (YM)	Concentration of bioaerosols (CFU/m ³) Gram Negative Bacteria (GN)	Median of samples		
								TVC (CFU/m ³)	YM (CFU/m ³)	GN (CFU/m ³)
Upwind (1) SJ 38664 49901	UW001BIOAEM. Upwind of IVC emissions stack	48m	99°	09:55-10:00	14	-	-	21	<7	<7
				10:01-10:06	-	<7	-			
				10:07-10:12	-	-	<7			
				10:13-10:18	21	-	-			
				10:19-10:24	-	<7	-			
				10:25-10:30	-	-	<			
				10:31-10:36	28	-	-			
				10:37-10:42	-	<7	-			
10:43-10:48	-	-	<							

Location and grid reference	Sample reference number	Distance from centre of active area emission stack (m)	Difference in bearing between location of samplers and mean direction wind blows to (°)	Sampling start/end times (HH:MM)	Concentration of bioaerosols (CFU/m ³) Total Count (TVC)	Concentration of bioaerosols (CFU/m ³) Aspergillus Fumigatus (YM)	Concentration of bioaerosols (CFU/m ³) Gram Negative (GN)	Median of samples		
								TVC (CFU/m ³)	YM (CFU/m ³)	GN (CFU/m ³)
Downwind (2) SJ 38568 49972	DW002BIOAEM. Downwind of IVC emissions stack	130m	31°	09:55-10:00	21	-	-	21	<7	28
				10:01-10:06	-	<7	-			
				10:07-10:12	-	-	<7			
				10:13-10:18	21	-	-			
				10:19-10:24	-	<7	-			
				10:25-10:30	-	-	<7			
				10:31-10:36	56	-	-			
				10:37-10:42	-	<7	-			
10:43-10:48	-	-	28							
Receptor (3) SJ 38637 49887	SR001BIOAEM. Receptor location on grassy area south of IVC near boundary to council offices	76m	89°	09:55-10:00	560	-	-	56	<7	196
				10:01-10:06	-	<7	-			
				10:07-10:12	-	-	196			
				10:13-10:18	21	-	-			
				10:19-10:24	-	<7	-			
				10:25-10:30	-	-	280			
				10:31-10:36	28	-	-			
				10:37-10:42	-	<7	-			
10:43-10:48	-	-	<7							

Location and grid reference	Sample reference number	Distance from centre of active area (m)	Difference in bearing between location of samplers and mean direction wind blows to (°)	Sampling start/end times (HH:MM)	Concentration of bioaerosols (CFU/m ³)	Concentration of bioaerosols (CFU/m ³)	Concentration of bioaerosols (CFU/m ³)	Median of samples		
					Total Count (TVC)	Aspergillus Fumigatus (YM)	Gram Negative (GN)	TVC (CFU/m ³)	YM (CFU/m ³)	GN (CFU/m ³)
Control	ControlBIOAEM	N/A	N/A	N/A	<1	-	-	N/A	N/A	N/A
	At same location as Upwind				-	<1	-			
					-	-	<1			
Field	FieldBIOAEM.	N/A	N/A	N/A	<1	-	-	N/A	N/A	N/A
	Not removed from package. For QA/QC				-	<1	-			
					-	-	<1			

4.5 Process Contribution Results

The median is routinely used for statistics and probability theory as the results are less likely to be skewed by extremely high or low values that are not representative of the data set. The median is located by finding the middle value by evenly separating the data set. The median for each location has been calculated and then the highest result for the downwind locations identified. The process contribution has then been calculated by subtracting the upwind median value from the highest downwind median value. The process contribution shows the input the activity of the site has on the ambient bioaerosols concentrations. In the table below the process contribution is shown.

Table 5: Process Contribution Results

Process Contribution Results				
Sample type	Upwind median results	Downwind median highest results	Process Contribution	Sensitive Receptor
Total Bacteria viable Count (TVC)	21	21	0	28
Aspergillus fumigatus (YM)	<7	<7	0	<7
Gram Negative Bacteria (GN)	<7	28	28	196

5.0 Summary of Analytical Results

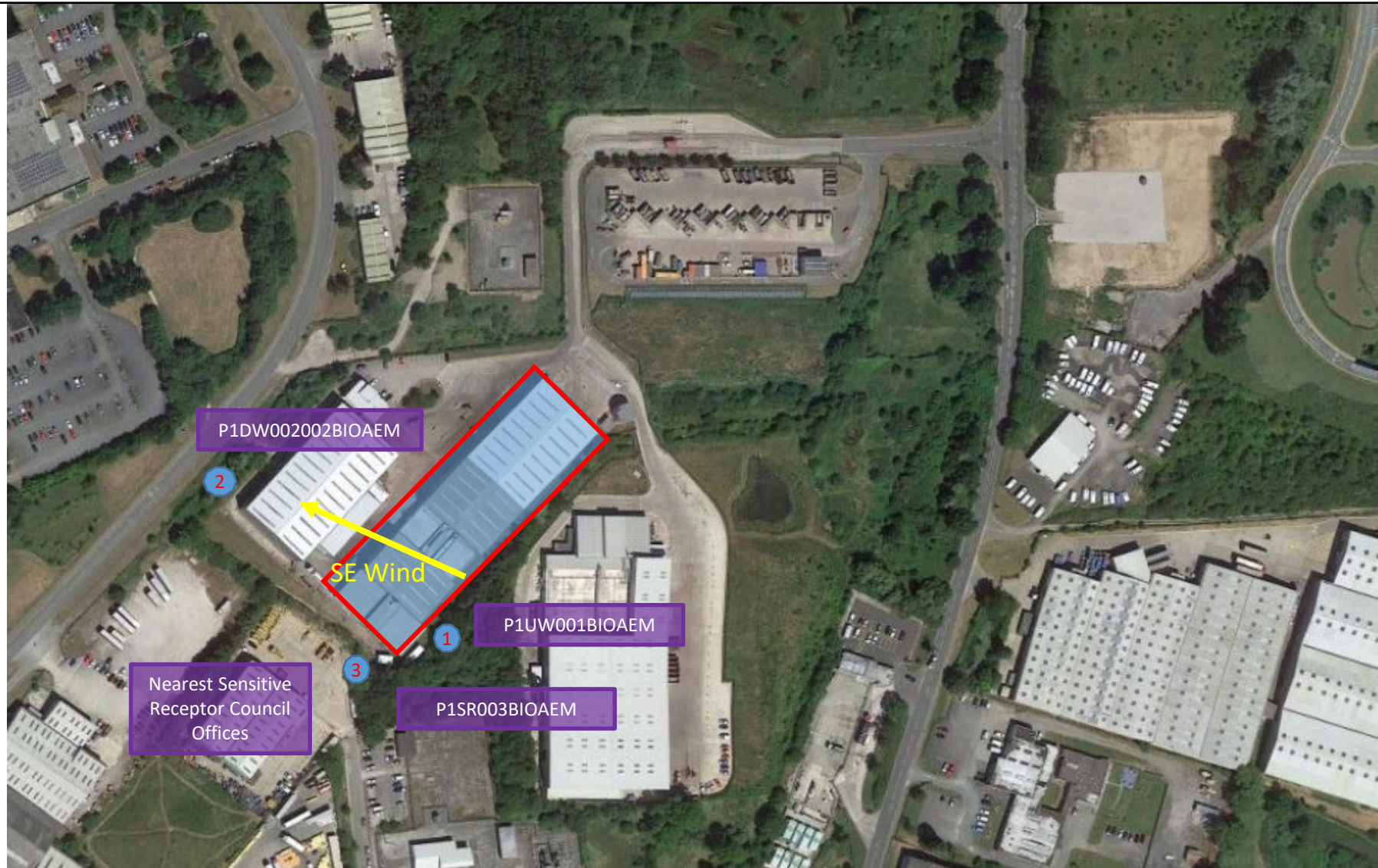
The above reports indicate that at the time of sampling:

1. Mesophilic micro-organisms - Total Viable Count (TVC) shows higher readings at the downwind location compared to the upwind location.
2. *Aspergillus fumigatus* readings were not detected at upwind, downwind or sensitive receptor sample locations.
3. Gram Negative bacteria readings were detected at downwind and sensitive receptor locations.
4. Upwind location median results remained below the industry standard threshold values of 1000cfu/m³ for Total Bacteria.
5. Downwind location median process contribution results of **28cfu/m³** remained below the industry standard threshold values of 1000cfu/m³ for Total Bacteria.
6. Sensitive receptor location median results remained below the industry standard threshold values of 1000cfu/m³ for Total Bacteria.
7. Upwind location median results remained below the industry standard threshold values of 300cfu/m³ for Gram Negative bacteria.
8. Downwind location median process contribution results of **28cfu/m³** remained below the industry standard threshold values of 300cfu/m³ for Gram Negative bacteria
9. Sensitive receptor location median results remained below the industry standard threshold values of 300cfu/m³ for Gram Negative bacteria
10. Upwind location median results remained below the industry standard threshold values of 500cfu/m³ for *Aspergillus Fumigatus*.
11. Downwind location median process contribution results of **0cfu/m³** remained below the industry standard threshold values of 500cfu/m³ for *Aspergillus Fumigatus*.
12. Sensitive receptor location median results remained below the industry standard threshold values of 500cfu/m³ for *Aspergillus Fumigatus*.
13. Control and Field blanks for QA/QC showed no significant evidence of contamination.

APPENDIX A
Aerial Plan

Key

- 1 – Upwind
- 2 – Downwind
- 3 – Sensitive Receptor
- Blue area – Emission source
- Red Box – Site area



FCC – Bryn Lane Phase 1 IVC 20/05/2024
Aerial Plan Showing Bioaerosol Sample Locations

APPENDIX B
Meteorological Conditions

METEOROLOGICAL CONDITIONS

SITE:	Bryn Lane IVC (Phase 1)	SITE OPERATOR:	FCC Environmental
SAMPLING DATE:	20/05/2024	COMMISSIONING LABORATORY:	Southern Microbiological Services
ESTIMATED MASS OF MATERIALS:	Unknown	TYPE OF MATERIALS PROCESSED ON SITE:	Green waste and compost

Location	Sample Reference Number	Bearing of samplers from boundary of operational area or turning/ screening operation (° from true north) - GPS	Mean direction the wind blows to during the sampling period (° from true north)	Difference in bearing between location of samples from boundary/ source and mean direction wind blows to (°)	Mean wind speed during sampling (m/s)	Arithmetic mean of air temperature (°C)	Arithmetic mean of relative humidity (%)
Upwind	UW001BIOAEM	216 SJ 38664 49901	315	99	2.2	14.5	80
Downwind	DW002BIOAEM	284 SJ 38568 49972	315	31	2.2	14.5	80
Sensitive Receptor	SR001BIOAEM	226 SJ 38637 49887	315	89	2.2	14.5	80

APPENDIX C
Photograph Sheet

MONITORING PHOTOGRAPH RECORD

Site: FCC Bryn Lane Phase 1—IVC

Date: 20/05/2024



Title: Bioaerosol Sampling

Ref: BLP1200524



Upwind 001 location looking towards site



Upwind 001 location looking away from site



Downwind 002 location looking towards site



Downwind 002 location looking away from site



Sensitive Receptor 003 location looking towards site



Sensitive Receptor 003 location looking away from site

APPENDIX D
Laboratory Certificate



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 WV10 7DE

TEST REPORT

Enitial Anderson Plates PO: ENI104542 Site: Bryn Lane Phase 1 IVC Client: FCC
Date Sampled: 20.05.24

Report Reference: 1240503389

Date Reported: 30 May 2024

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SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	TVC cfu/m3 (2 day pr)	Asp fumigatus cfu/m3	Gram neg Bacteria cf
1240520812	21/05/24	P1UW001BIO AEM (93.)	---	141.5	---	14 cfu/m3		
1240520813	21/05/24	P1UW001BIO AEM (94.)	---	141.5	---		< 7 cfu/m3	
1240520814	21/05/24	P1UW001BIO AEM (VR.)	---	141.5	---			7 cfu/m3
1240520815	21/05/24	P1UW001BIO AEM (93.A)	---	141.5	---	21 cfu/m3		
1240520816	21/05/24	P1UW001BIO AEM (94.A)	---	141.5	---		< 7 cfu/m3	
1240520817	21/05/24	P1UW001BIO AEM (VR.A)	---	141.5	---			< 7 cfu/m3

Enitial Anderson Plates PO: ENI104542 Site: Bryn Lane Phase 1 IVC Client: FCC
 Date Sampled: 20.05.24

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SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	TVC cfu/m3 (2 day pr)	Asp fumigatus cfu/m3	Gram neg Bacteria cf
1240520818	21/05/24	P1UW001BIO AEM (93.B)	---	141.5	---	28 cfu/m3		
1240520819	21/05/24	P1UW001BIO AEM (94.B)	---	141.5	---		< 7 cfu/m3	
1240520820	21/05/24	P1UW001BIO AEM (VR.B)	---	141.5	---			< 7 cfu/m3
1240520821	21/05/24	P1DW002BIO AEM (93.)	---	141.5	---	21 cfu/m3		
1240520822	21/05/24	P1DW002BIO AEM (94.)	---	141.5	---		< 7 cfu/m3	
1240520823	21/05/24	P1DW002BIO AEM (VR.)	---	141.5	---			< 7 cfu/m3
1240520824	21/05/24	P1DW002BIO AEM (93.A)	---	141.5	---	21 cfu/m3		
1240520825	21/05/24	P1DW002BIO AEM (94.A)	---	141.5	---		< 7 cfu/m3	
1240520826	21/05/24	P1DW002BIO AEM (VR.A)	---	141.5	---			< 7 cfu/m3
1240520827	21/05/24	P1DW002BIO AEM (93.B)	---	141.5	---	56 cfu/m3		
1240520828	21/05/24	P1DW002BIO AEM (94.B)	---	141.5	---		< 7 cfu/m3	
1240520829	21/05/24	P1DW002BIO AEM (VR.B)	---	141.5	---			28 cfu/m3

Enitial Anderson Plates PO: ENI104542 Site: Bryn Lane Phase 1 IVC Client: FCC
 Date Sampled: 20.05.24

Report Reference: 1240503389

Date Reported: 30 May 2024

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SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	TVC cfu/m3 (2 day pr)	Asp fumigatus cfu/m3	Gram neg Bacteria cf
1240520830	21/05/24	P1SR003BIOA EM (93.)	---	141.5	---	560 cfu/m3		
1240520831	21/05/24	P1SR003BIOA EM (94.)	---	141.5	---		< 7 cfu/m3	
1240520832	21/05/24	P1SR003BIOA EM (VR.)	---	141.5	---			196 cfu/m3
1240520833	21/05/24	P1SR003BIOA EM (93.A)	---	141.5	---	21 cfu/m3		
1240520834	21/05/24	P1SR003BIOA EM (94.A)	---	141.5	---		< 7 cfu/m3	
1240520835	21/05/24	P1SR003BIOA EM (VR.A)	---	141.5	---			280 cfu/m3
1240520836	21/05/24	P1SR003BIOA EM (93.B)	---	141.5	---	28 cfu/m3		
1240520837	21/05/24	P1SR003BIOA EM (94.B)	---	141.5	---		< 7 cfu/m3	
1240520838	21/05/24	P1SR003BIOA EM (VR.B)	---	141.5	---			< 7 cfu/m3

Enitial Anderson Plates PO: ENI104542 Site: Bryn Lane Phase 1 IVC Client: FCC
Date Sampled: 20.05.24

Report Reference: 1240503389

Date Reported: 30 May 2024

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<u>SMS Reference</u>	<u>Date Tested</u>	<u>Sample Code</u>	<u>Sample Details</u>	<u>Ltrs of Air filtered</u>	<u>Further Details 2</u>	<u>TVC cfu/m3 (2 day pr</u>	<u>Asp fumigatus cfu/m3</u>	<u>Gram neg Bacteria cf</u>
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Unless otherwise indicated, all samples were received in good condition, tests were performed at the above address and results apply to the sample as received. Date tested equals date received.

Where there is a greater than 40% difference in bacterial duplicates, these are genuine results.



Carol Macready

Technical Administration Manager

* Tests marked with a * in this report are not included in the UKAS Accreditation Schedule for our laboratory



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 Wolverhampton
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TEST REPORT

Enitial Anderson Plates Controls PO: ENI104542 Site: Bryn Lane Phase 1 IVC
Client: FCC Date Sampled: 20.05.24

Report Reference: 1240503390

Date Reported: 30 May 2024

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SMS Reference	Date Tested	Sample Code	Sample Details	Ltrs of Air filtered	Further Details 2	TVC/plate	Asp. Fumigatus Plate	Gram neg bacteria PI
1240520839	21/05/24	P1CONTROL BIOAEM (93-C)	---	-	---	< 1 cfu / plate		
1240520840	21/05/24	P1CONTROL BIOAEM (94-C)	---	-	---		< 7 cfu / plate	
1240520841	21/05/24	P1CONTROL BIOAEM (VR-C)	---	-	---			< 1 cfu / plate
1240520842	21/05/24	P1FIELDBIOAEM (93-F)	---	-	---	< 1 cfu / plate		
1240520843	21/05/24	P1FIELDBIOAEM (94-F)	---	-	---		< 1 cfu / plate	
1240520844	21/05/24	P1FIELDBIOAEM (VR-F)	---	-	---			< 1 cfu / plate

Enitial Anderson Plates Controls PO: ENI104542 Site: Bryn Lane Phase 1 IVC
Client: FCC Date Sampled: 20.05.24

Report Reference: 1240503390

Date Reported: 30 May 2024

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<u>SMS Reference</u>	<u>Date Tested</u>	<u>Sample Code</u>	<u>Sample Details</u>	<u>Ltrs of Air filtered</u>	<u>Further Details 2</u>	<u>TVC/plate</u>	<u>Asp. Fumigatus Plate</u>	<u>Gram neg bacteria PI</u>

Unless otherwise indicated, all samples were received in good condition, tests were performed at the above address and results apply to the sample as received. Date tested equals date received.



Carol Macready

Technical Administration Manager