

Attachment J.1

Biofilter Monitoring Reports

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Matrix Environmental

BI-ANNUAL BIOFILTER MONITORING

AT THE

MILLTOWN COMPOST SITE,

MILLTOWNMORE, FETHARD,

CO. TIPPERARY.

MARCH 2016

W0270-01

For the Attention of:

Mr David Ronan
Milltown Compost
Milltownmore
Fethard
Co. Tipperary

Prepared by:

Mr. Craig Mallinson
Environmental Consultant

Ref: Biofilter Monitoring March 2016

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REGISTERED OFFICE: UNIT 12, OLD CONNELL WEIR, NEWBRIDGE, CO KILDARE; REGISTERED No: 329285

Executive Summary

Milltown Compost facility commissioned Matrix Environmental to undertake inlet and outlet sampling and analysis of the biofilter at their facility at Milltownmore, County Tipperary as per the requirements of their waste licence. This included testing of the biofilter media for pH, Ammonia, Percent Moisture and Total Viable Counts (TVC's) and testing the inlet (two inlet pipes) and outlet gases from the production buildings for Ammonia, Hydrogen Sulphide, Amines and Mercaptans. An Environmental Consultant subsequently visited the site on the 23rd March 2016 to undertake the biofilter media sampling and the gas analysis.

The results of the biofilter media monitoring are outlined in section 4.0. The results of the emission monitoring are also given in section 4.0. The outlet emission levels were compared to typical emission limit values for comparable facilities. All results are within licence limits as stipulated in W0270-01.

This report is certified as accurate and representative of the sampling and associated analysis carried out.

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1.0 INTRODUCTION

In compliance with the requirements of their waste licence (W0270-01) Milltown Compost are required to carry out monitoring of the inlet and outlet airstream of their biofilter and also the biofilter media itself.

Matrix Environmental was commissioned to undertake the sampling and reporting. An environmental consultant visited the site on the 23rd March 2016.

This report presents details of the sampling and analytical methodology carried out together with a broad interpretation of the results.

2.0 SCOPE OF MONITORING

The monitoring scope is outlined in Tables 2.1 and 2.2 below.

Table 2.1 Scope of Bed monitoring	
Parameters	Location
pH, Moisture, TVC's, Ammonia	A composite sample will be made from a number of locations on the biofilter bed

Table 2.2 Scope of inlet and outlet monitoring	
Parameters	Location
Ammonia, Mercaptans Hydrogen Sulphide, Amines	Biofilter inlet duct x 2
Ammonia, Mercaptans Hydrogen Sulphide, Amines	Biofilter surface

3.0 METHODOLOGY

3.1 Biofilter bed sampling

Table 3.1: Parameters and Limits of Detection			
Parameter	Method of Analysis	Volume Required	Sample Container
Moisture Content	P274	100 g	Plastic/Glass
pH _w (soils)	P233	20g	Plastic/Glass
Ammonia	P236	100g	Plastic/Glass
TVC's @ 30°C	IML 11	250g	Sterile Container

3.2 Biofilter emission sampling

Levels of the required parameters were determined calorimetrically using the appropriate Draeger tube and pump. Each analysis was carried out by placing the tube into the pump and pulling a known volume through the tube. The appearance of a discoloration indicates the presence of the species of interest. The results are expressed in ppm. The results for Amines are described as positive or negative

Milltown Compost site personnel confirmed that the biofilter was operating as normal on the day of sampling.

4.0 RESULTS

Table 4.1 presents the results of the Biofilter Media analysis

Table 4.1 Monitoring results from the Biofilter 1 media	
Parameter	Result
% Moisture	74.9
pH	7.8
Ammonia (mg/kg)	17.39
Total Viable Counts @ 30°C (Solid) cfu/g	2.2 x 10 ⁶

A composite sample of the biofilter media was taken from the surface of the biofilter. At four locations on the biofilter surface small pits were dug to a depth of 40 to 50cm. From these pits a sample was taken. All four samples were combined into a single sample on-site.

Table 4.2 presents the results of the inlet emission monitoring from Inlet 1 and 2.

Table 4.2 Inlet emission levels of required parameters (Inlet 1 and 2)		
Parameter	Inlet 1 Concentration (ppm)	Inlet 2 Concentration (ppm)
Hydrogen Sulphide	<0.2	<0.2
Ammonia	10	15
Mercaptans	0.5	<0.5
Amines	Negative	Negative

Table 4.3 presents the results of the emission monitoring from Biofilter Outlet

Table 4.3 Outlet emission levels of required parameters	
Parameter	Inlet Concentration (ppm)
Hydrogen Sulphide	<0.2
Ammonia	<5
Mercaptan	<0.5
Amines	Negative

Monitoring was carried out at a fixed location on the inlet ducting and over a number of points on the surface of the biofilter (outlet).

5.0 COMMENT

The limits associated with the sites waste licence are as follows:

- Ammonia – 50ppm
- Mercaptan – 5ppm
- Hydrogen Sulphide – 5ppm

The biofilter emission levels at the Milltown compost facility are within these limit values.

The results obtained reflect the conditions on the day of sampling and current site operations on that day.

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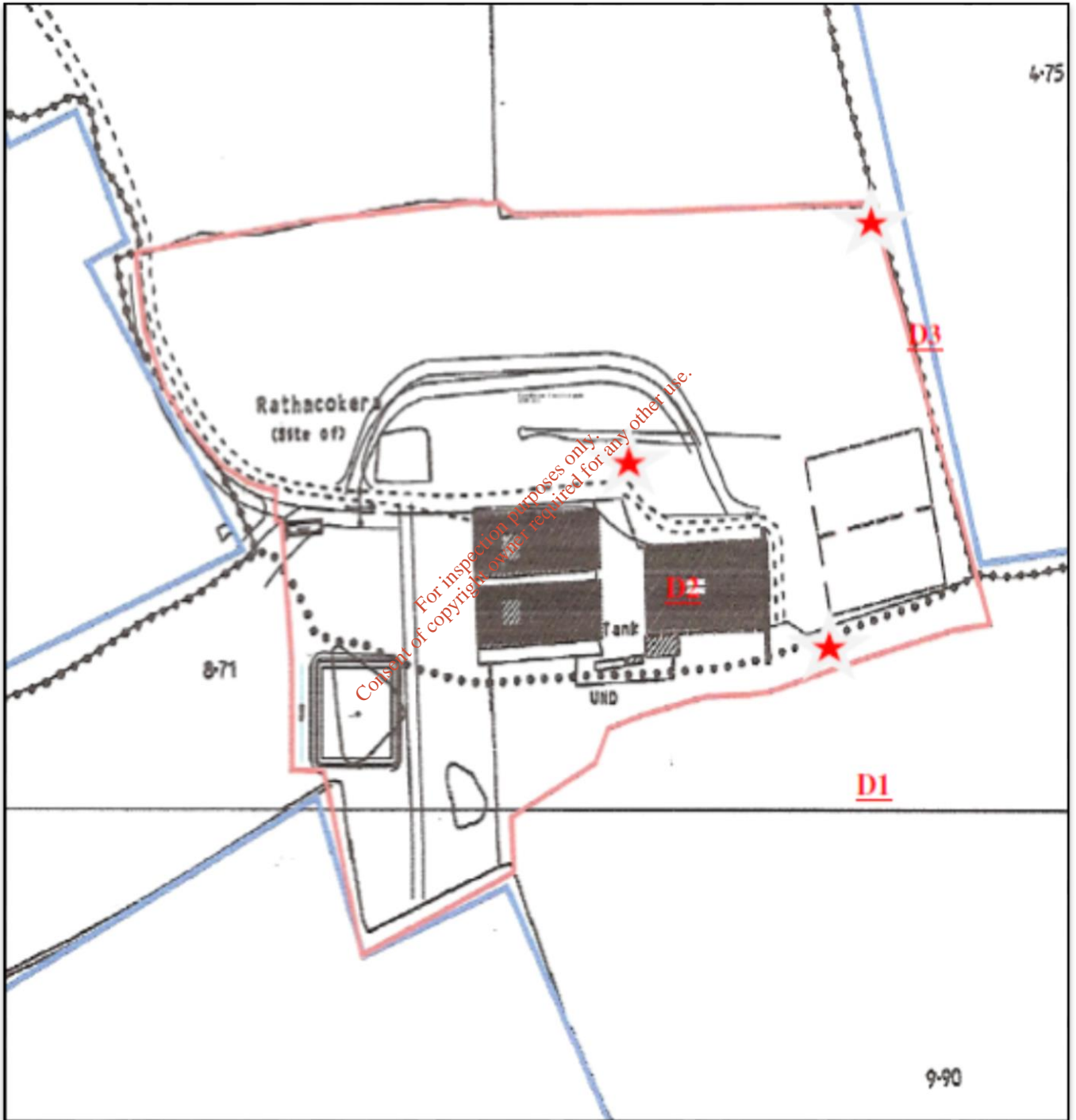
Attachment J.2

Dust Monitoring Locations Map

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Dust Monitoring Locations

Miltown Composting Systems Ltd.



Attachment J.3

Dust Report

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Matrix Environmental

***MONTHLY DUST MONITORING
AT THE
MILLTOWN COMPOST SITE,
MILLTOWN MOR, FETHARD,
CO. TIPPERARY.
SEPTEMBER 2015
W0270-01***

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For the Attention of:

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TABLE OF CONTENTS

- 1.0 INTRODUCTION
- 2.0 METHODOLOGY
- 3.0 RESULTS
- 4.0 DISCUSSION

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Executive Summary

Matrix Environmental was contracted by Milltown Compost to conduct a dust deposition survey of the site in Milltownmore in order to determine the dust levels at the facility. Dust bottles were installed on the 1st September 2015 and taken down on the 29th September 2015 . The dust gauges were collected by Matrix Environmental for subsequent analysis.

Three locations were chosen to assess the level of dust from the facility. The maximum dust result for the survey period was 70 mg/m²/day at location D3 located opposite on the northeastern boundary of the site. The results for location D1 and D2 were both 30mg/m²/day and 40 mg/m²/day. The results for all locations are within the licence limit value of 350 mg/m²/day.

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1.0 INTRODUCTION

Milltown Compost operates a composting site at Milltownmore, Fethard, Co. Tipperary. Matrix Environmental were contracted to carry out a dust deposition survey in order to assess the dust contribution from on site activities in the area of the compost. Dust bottles were installed on the 1st September 2015 and taken down on the 29th September 2015. The dust gauges were collected by Matrix Environmental for subsequent analysis.

This report presents details of both the methodologies employed and results obtained.

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2.0 **METHODOLOGIES**

2.1 **Dust Survey**

Dust monitoring was conducted using dust gauges conforming to the Standard Method VD12119 (Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Engineering Institute). Each dust-sampling bottle was securely capped after the recommended exposure period of between 28 and 31 days. The samples were then returned to the laboratory for gravimetric analysis. The collected sample material is rinsed into a pre weighed evaporating dish and evaporated down to dryness. The total dry residue, which comprises both insoluble and soluble dust, is then determined. Results are expressed in mg/m²/day.

The following is a detailed description of the dust monitoring points:

Measurement No.	Location
D1	On ditch south of the main processing area.
D2	Opposite site offices.
D3	On northeastern boundary of site.

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3.0 RESULTS

Tables 3.1 present the results of the dust deposition survey carried out at the Milltownmore site during September 2015.

TABLE 3.1: DUST MEASUREMENT RESULTS			
Location No.	Measurement Period (days)	Dust Deposition (mg/m ² /day)	Waste Licence Limit (mg/m ² /day)
D1	28	30	350
D2	28	40	350
D3	28	70	350

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4.0 DISCUSSION

Dust:

D1 – this monitoring point is located on the on the ditch, south of the main processing area.. The result of 30 mg/m²/day is within the dust deposition limit of 350 mg/m²/day.

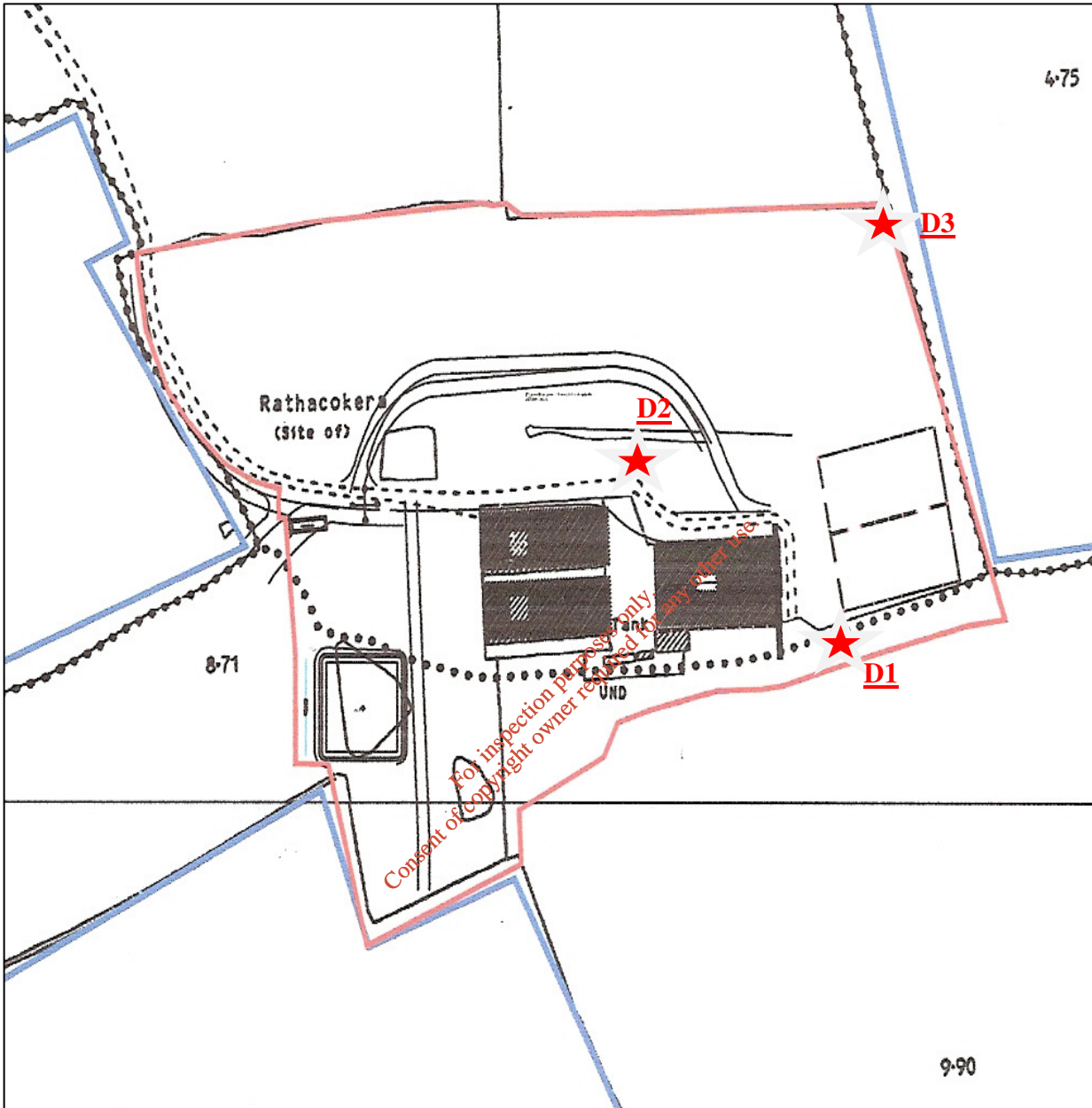
D2 - this monitoring point is located at opposite the site offices adjacent to the roadway. The result of 40 mg/m²/day is within the dust deposition limit of 350 mg/m²/day.

D3 – this monitoring point is located on the north-eastern boundary of the site. The result of 70 mg/m²/day is within the dust deposition limit of 350 mg/m²/day.

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Appendix 1
Dust Monitoring Location Map

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Attachment J.4

PM₁₀ Report

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Matrix Environmental

AN ASSESSMENT OF THE LEVELS OF PM₁₀
AT THE
MILLTOWN COMPOST SITE,
MILLTOWN MOR, FETHARD,
Co. TIPPERARY.
DECEMBER 2015
W0270-01

For the Attention of:

Mr David Ronan
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Executive Summary

In accordance with the requirements of Waste Licence No. W0270-01. Milltown Compost are required to monitor PM₁₀ adjacent to the biofilter unit located at the compost facility at Milltown Mor, Fethard, County Tipperary. Matrix Environmental was commissioned to undertake the sampling and analysis for 2015. The site was subsequently visited by an Environmental Consultant from Matrix Environmental on the 14th and 15th December 2015.

The results obtained for this monitoring event indicate that the level of particulate matter less than 10µm (PM₁₀) measured at the site is well below the 24 hour guide limit value of 50µg/m³ for the monitoring period (No specific limit applies for the site, the stated limit is based on S.I. No. 271 of 2002 Air Quality Standards Regulations 2002)

This report is certified as accurate and representative of the sampling and associated analysis carried out.

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1.0 INTRODUCTION

In compliance with the requirements of their waste licence W0270-01. Milltown Compost is required to carry out PM₁₀ monitoring on a bi-annual basis.

Matrix Environmental was commissioned to undertake the sampling and reporting. An environmental consultant visited the site on the 14th and 15th December 2015.

This report presents details of the sampling and analytical methodology carried out together with a broad interpretation of the results.

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2.0 METHODOLOGY

2.1 PM₁₀

Airborne particulate matter with an aerodynamic diameter equal or less than 10µm was monitored using a frmOmni Air Sampler. This sampler draws a measured volume of air through a chamber containing pre-conditioned and pre-weighed filters meeting the European Standard prEN12341, 1998 for PM₁₀ sampling.

2.2 Monitoring Location

Table 2.1 describes the PM₁₀ sampling locations.

TABLE 2.1: LOCATION OF PM₁₀ SAMPLING POSITIONS	
Sampling Station	Description
Location 1	Adjacent to biofilter unit entrance

2.3 Sampling

Sample air was drawn in from all directions onto a pre-conditioned and pre-weighed filter at a flow rate of 5 L/min. Monitoring was carried out over a 24 hour. The filter was then re-weighed and the weight gain determined. The result is expressed in ug/m³.

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3.0 RESULTS

Table 3.1 presents the results of the PM₁₀ monitoring for December 2015 carried out at the Milltown compost facility located at Milltown Mor, Fethard, Co. Tipperary.

TABLE 3.1: RESULTS OF PM₁₀ MONITORING			
Sampling Location	Date	Weight Gain (g)	Concentration (µg/m ³)
Location 1	14th and 15th Dec	<0.001	< 0.1
24 hour limit value for PM₁₀ matter (S.I. No 271 of 2002)			50 µg/m³

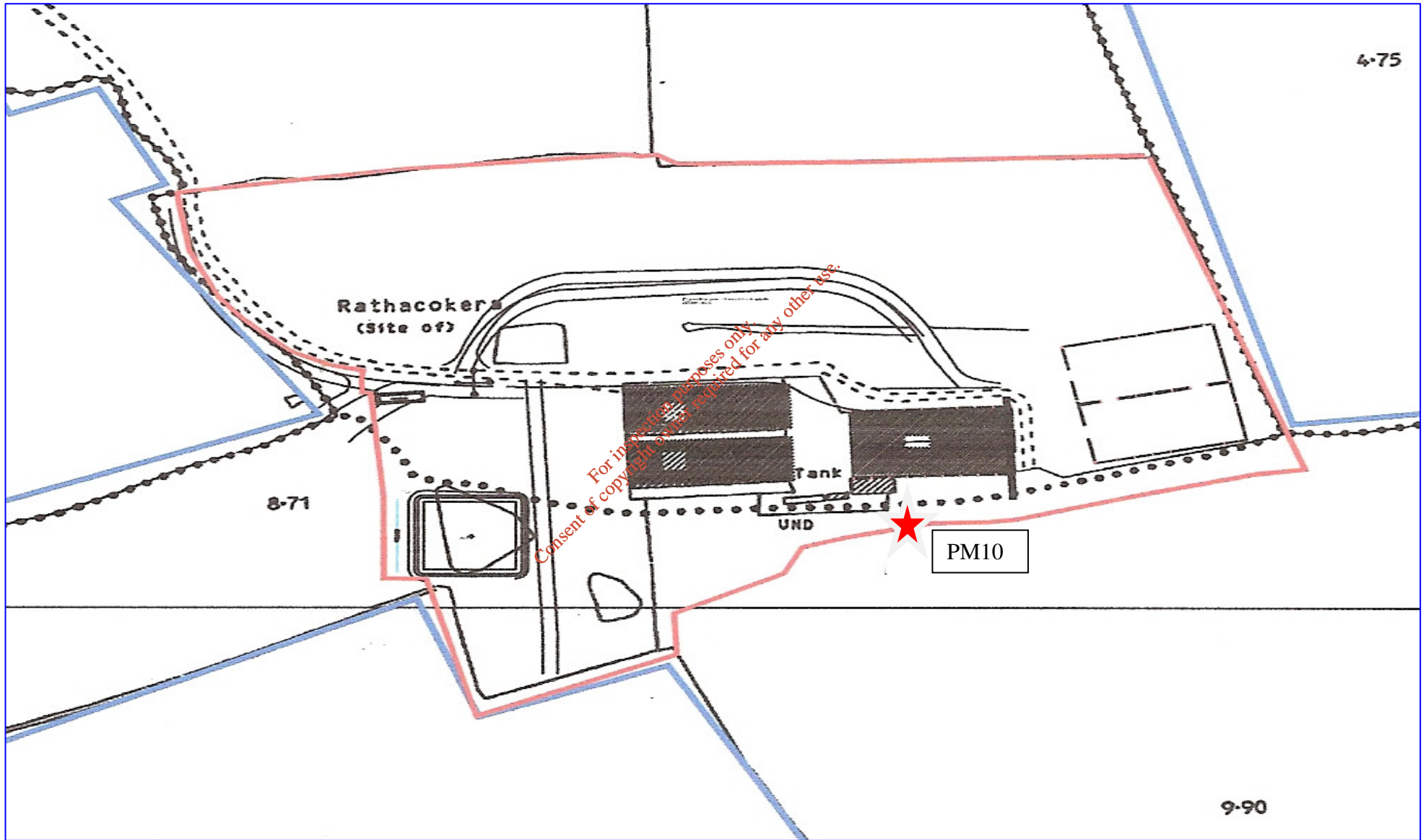
4.0 CONCLUSION

The results for the PM₁₀ monitoring for December 2015 are presented in Table 3.1. In the absence of a specific limit in the waste licence the results from the site are compared to the daily directive limit as laid down in S.I. No. 271 of 2002 Air Quality Standards Regulations 2002 of 50µg/m³. The result obtained for this monitoring event at the Milltown compost facility is within this stated limit value.

Appendix 1

Sample Location Map

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Attachment J.5

Bioaersols Monitoring Locations and Report

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Matrix Environmental

ANNUAL BIOAEROSOL MONITORING

AT THE

MILLTOWN COMPOST SITE,

MILLTOWN MOR, FETHARD,

CO. TIPPERARY.

NOVEMBER 2015

W0270-01

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For the Attention of:

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Executive Summary

Matrix Environmental was contracted by Milltown Compost to undertake bioaerosol sampling and analysis at their facility at in Milltown Mor, County Tipperary, in order to assess current levels of bioaerosols (*Total Fungi/Bacteria* and *Aspergillus fumigatus*) at the facility. An Environmental Consultant subsequently visited the site on the 10th November 2015 to conduct the monitoring event.

The bioaerosol sampling was undertaken at three locations in the vicinity of the facility (1) Nearest Sensitive Receptor, (2) 25 meters upwind of site boundary and (3) down wind of Site boundary. These locations were selected following a review of the prescribed sampling locations in the UK Composting Association's – *Standardized Protocol for the Sampling and Enumeration of Airborne Micro-organisms at Composting Facilities.1999*

The recorded levels reflect the on-site meteorological conditions during the sampling period.

This report is certified as accurate and representative of the sampling and associated analysis carried out.

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1.0 INTRODUCTION

In compliance with the requirements of their waste licence Milltown Compost facility are required to carry out bioaerosol monitoring on an annual basis.

Matrix Environmental was commissioned to undertake the sampling and reporting. An Environmental Consultant visited the site on the 10th November 2015.

This report presents details of the sampling and analytical methodology carried out together with a broad interpretation of the results.

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2.0 METHODOLOGY

Currently there is no specific methodology defined by the Environmental Protection Agency in Ireland for the sampling and analysis of Bioaerosols. In the absence of a specific methodology, Matrix Environmental utilized the UK Composting Association's – *Standardized Protocol for the Sampling and Enumeration of Airborne Microorganisms at Composting Facilities*.

2.1 Bioaerosol Sampling

2.1.1 Sampling Equipment

2 x Single Stage Biostage Samplers
2 x Vacuum Pumps
2 x Tripod
1 x Dry Gas Meter
18 x Agar Plates
Anemometer / Thermometer
Consumables – e.g. Ethanol, Indelible Pen.

2.1.2 Sampling Procedure

Two samplers were erected at each sampling location (see table 2.1 below for description of sampling locations). Following cleaning of samplers using ethanol swabs, the agar plates were inserted into the Biostage sampler. Vacuum pumps were started in parallel and ran for the specified time period. Throughout the sampling period climatic data was recorded at 5 minute intervals. Following the completion of the specified time period, the pumps were turned off and the plates removed from the Biostage samplers and stored in sealed plastic bags prior to transportation to laboratory. This process was repeated at each location giving a total of 4 samples from each location. (2 for *Aspergillus fumigatus* and 2 for *Total Bacterial Count*). The sample flow rate for all samples was 28.3 l/min. A total of 3 blanks are required per monitoring event. Blanks 1 and 2 are plates, which remain in a sealed bag throughout the day. Blank 3 is placed in the switched off sampling equipment for a period of 25 minutes at the downwind location.

2.2 Monitoring Location

Table 2.1 describes the Bioaerosol sampling locations.

TABLE 2.1: LOCATION OF BIOAEROSOL SAMPLING POSITIONS		
Sampling Station	Identity	Boundary Location
Location 1	SR 1/2	Sensitive Receptor
Location 2	UW 1/2	Upwind boundary
Location 3	DW 1/2	Downwind location *

* Typically the downwind location is located equal-distant from the site boundary, as the nearest sensitive receptor. The sensitive receptor is 600m from the facility therefore a location closer to the site downwind was chosen. On the day of sampling the wind was coming from a south westerly direction. The downwind location was located 300 meters from the site and therefore results are considered a worst case scenario as the downwind samples are taken much closer to the site than is required.

2.3 Sampling Time

A sampling period of 25 minutes was used as stipulated in UK Composting Association's – *Standardized Protocol for the Sampling and Enumeration of Airborne Micro-organisms at Composting Facilities. 1999*

2.4 Climatic Conditions

Weather conditions throughout the duration of the sampling period were cool and dry, the sky was partly cloudy throughout the sampling period. The relative humidity fluctuated between 73% and 88% averaging at 81% and wind speed ranged between 5 and 6 m/sec with wind direction steady from a south westerly direction.

3.0 RESULTS

Tables 3.1 - 3.4 present the results of the Bioaerosol Monitoring

TABLE 3.1: RESULTS OF TOTAL BACTERIA MONITORING			
Sampling Location	Time	Total No. of Colonies	Concentration cfu/m ³
SR1 B	10:38 - 11:03	89	126
SR2 B	11:08 - 11:33	65	92
UW1 B	08:11 - 08:36	77	109
UW2 B	08:40 - 09:05	43	61
DW1 B	09:22 - 09:57	87	124
DW2 B	10:01 - 10:26	105	148

TABLE 3.2: RESULTS OF ASPERGILLUS MONITORING			
Sampling Location	Time	Total No. of Colonies	Concentration cfu/m ³
SR1 A	10:38 - 11:03	0	0
SR2 A	11:08 - 11:33	0	0
UW1 A	08:11 - 08:36	0	0
UW2 A	08:40 - 09:05	0	0
DW1 A	09:22 - 09:57	0	0
DW2 A	10:01 - 10:26	0	0

TABLE 3.3: BLANK RESULTS – TOTAL BACTERIA			
Sampling Location	Time	Total No. of Colonies	Concentration cfu/m ³
Blank 1A	N/A	5	N/A
Blank 2 A	N/A	6	N/A
Blank 3 A (DW)	25 min	23	N/A

TABLE 3.4: BLANK RESULTS – ASPERGILLUS			
Sampling Location	Time	Total No. of Colonies	Concentration cfu/m ³
Blank 1 B	N/A	0	N/A
Blank 2 B	N/A	0	N/A
Blank 3 B (DW)	25 min	0	N/A

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4.0 DISCUSSION

Bioaerosols are constantly present in the ambient atmosphere as a consequence of dust from soil and the natural breakdown of vegetation. Measured ambient levels of bacteria and fungi vary over a wide range. A recent review reported on a number of studies that highlighted airborne fungi levels of 0 to 94,000cfu/m³ and airborne bacteria to range from 2 to 17,600cfu/m³ (1).

The results for the 2014 monitoring event for the Milltown compost site are detailed in tables 3.1, 3.2, 3.3 and 3.4. The concentration of bioaerosols is low with a similar level of total bacteria recorded at both the sensitive receptor location and downwind locations, the upwind results were slightly lower. No *Aspergillus* was detected at either location.

The results obtained for the site reflect the conditions on the day of sampling and time of year and current site operations.

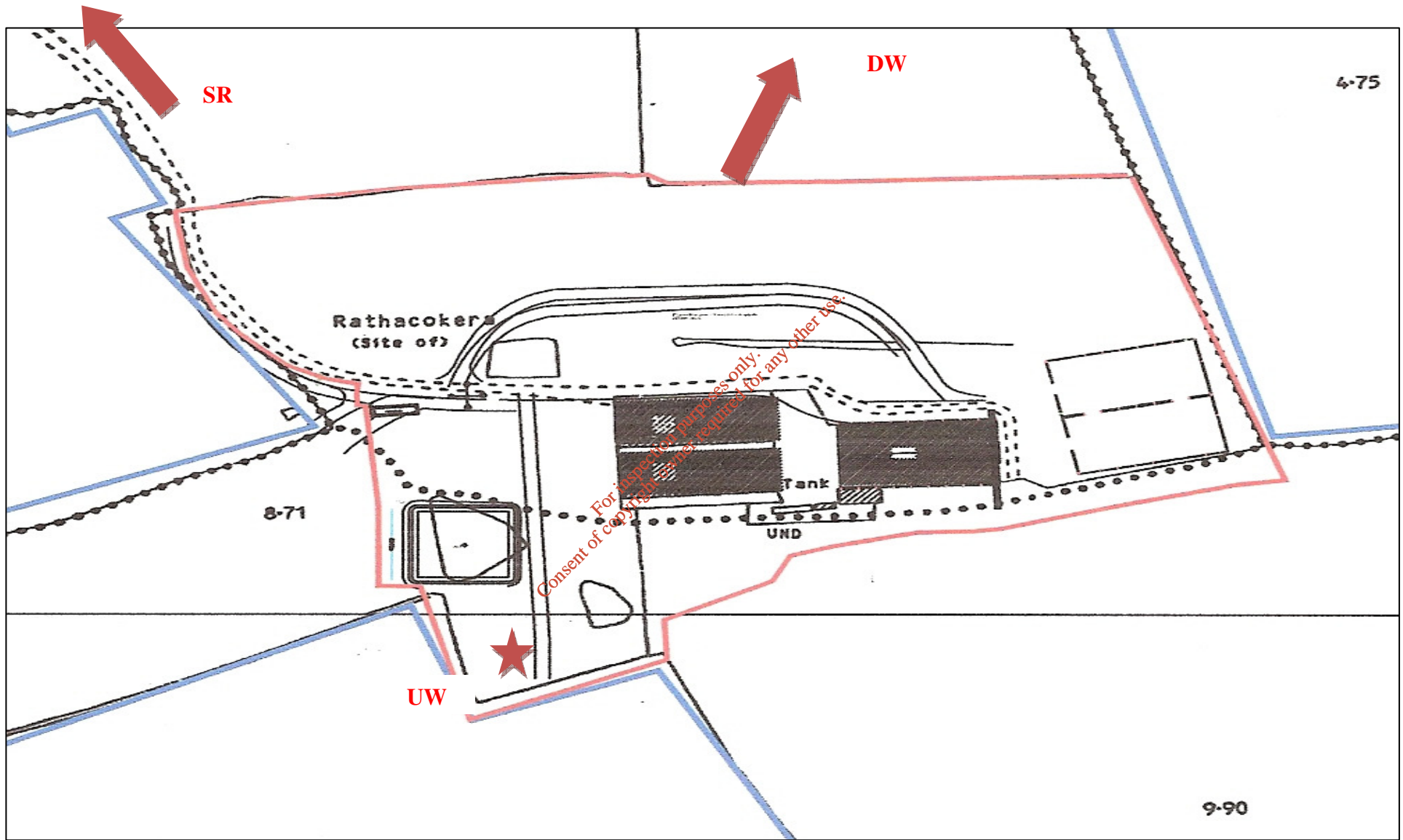
6.0 REFERENCES

- (1) Swan et al. Occupational and Environmental exposure to bioaerosols from composts and potential health effects- A critical review of published data. Research report 130C 2003

Appendix 1

Sampling Locations Map

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Attachment J.6

Odour Monitoring Report

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Matrix Environmental

***AMBIENT ODOUR MONITORING
AT THE
MILLTOWN COMPOST SITE,
MILLTOWNMORE, FETHARD,
Co. TIPPERARY.
Q4-2015
W0270-01***

For the Attention of:

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Executive Summary

Matrix Environmental was contracted by Milltown Composting to undertake ambient odour sampling and analysis at their facility at Milltown Mor, Fethard, County Tipperary. An Environmental Consultant subsequently visited the site on the 10th of November 2015 to conduct the monitoring event.

The ambient odour concentrations determined 300 meters downwind and at the biofilter unit were $45\text{ou}_E/\text{m}^3$ and $69\text{ou}_E/\text{m}^3$ respectively. On-site observations made during the monitoring event noted that there was no distinct odour associated with the compost facility at the downwind location.

The recorded levels reflect the on-site meteorological conditions during the sampling period.

This report is certified as accurate and representative of the sampling and associated analysis carried out.

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1.0 INTRODUCTION

In compliance with the requirements of their waste licence (W0270-01) Milltown Compost Ltd are required to carry out ambient odour monitoring on a bi-annual basis.

Matrix Environmental was commissioned to undertake the sampling and reporting. An environmental consultant visited the site on the 10th of November 2015.

This report presents details of the sampling and analytical methodology carried out together with a broad interpretation of the results.

2.0 SCOPE

Table 2.1 shows the scope of the monitoring survey. The scope outlined below was determined in conjunction with staff at the facility, Environmental Consultants within Matrix Environmental and with regards to Schedule C in the waste licence.

Table 2.1: Parameter - Location	
Parameter	Locations
Odour	Biofilter Unit OD 01
	300 meters downwind of compost yard OD 02

The wind direction on the day of the sampling was from a south westerly direction.

3.0 METHODOLOGY

Odour Sampling and Olfactometry

Odour Sampling

Samples of gas of approximately 60 litres were collected via Teflon tubing into Nalophane[®] gas sampling bags by means of the "lung principle" method. Using this method, the sample bag is housed in a sealed car buoy that is evacuated using a small air pump. The volume of air removed from the car buoy is replaced by sample gas entering the bag, thus avoiding contamination of sample by pumps or meters. Sampling shall be carried out in accordance with the standard I. S. EN 13725:2003 entitled 'Air Quality – Determination of Odour Concentration by Dynamic Olfactometry'.

Dynamic Olfactometry

The samples were analysed by Dynamic Olfactometry. The instrument used will be an Olfomat-e Olfactometer (Project Research Amsterdam) and the analytical procedures were in accordance with the I. S. EN 13725:2003 using a trained panel of assessors. The odour concentration of the sample is expressed in odour units per cubic metre of gas (ou_E/m^3). These values, sometimes referred to as "dilutions to threshold" are equivalent to the number of times the sample gas required dilution with odour free air to reach the panels odour threshold (i.e. the concentration at which there is a 50% probability of the panellists detecting the odour). The results are expressed in ou_E/m^3 .

Chemical Analysis

Levels of the required parameters were determined calorimetrically using the appropriate Draeger tube and pump. Each analysis was carried out by placing the tube into the pump and pulling a known volume through the tube. The appearance of a discoloration indicates the presence of the species of interest.

4.0 RESULTS

Table 4.1 Meteorological Conditions			
Parameter		Parameter	
Weather	Partly cloudy	Wind speed	18-22 km/hr
Temp	14°C	Wind Direction	South westerly
General Air Quality	Good	Bar Pressure	1012 mbar

Table 4.2: Odour Sampling Results		
Locations	Odour Character	Results
OD 01	No distinct odour	69 ou _E /m ³
OD 02	No distinct odour	45 ou _E /m ³

Table 4.3: Chemical Analysis				
Sample	Hydrogen Sulphide	Ammonia	Mercapten	Amines
OD 01	<0.2	<5	<0.5	Negative
OD 02	<0.2	<5	<0.5	Negative

5.0 COMMENT

Odour sampling was carried out at two locations in the vicinity of the facility. One sample was taken down wind of the site; one was taken at the biofilter unit. The ambient odour concentrations determined at biofilter unit and downwind location were 69ou_E/m³ and 45ou_E/m³ respectively. On-site observations made during the monitoring event noted that there was no distinct odour associated with the compost facility at the downwind location, a slight compost odour was noted at the biofilter unit.

The recorded odour levels represent the odour conditions in the vicinity of the facility on the day of sampling and under the specific meteorological conditions of that day. Ambient odour is a combination of both natural and anthropogenic odour emissions.

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Appendix 1

Sample Location Map

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