Woodlands Composting Facility, Whitesmith

Odour Dispersion Modelling Assessment

February 2013

47065614

Prepared for:
Veolia Environmental Services (UK) plc.

UNITED KINGDOM & IRELAND

Rev	Date	Details	Prepared by	Checked by	Approved by
1	12/02/2013	Final	**Pauline Jezequel** Assistant Air Quality Specialist	**Danny Duce** Principal Air Quality Consultant	**Garry Gray** Associate – Air Quality

URS
12 Regan Way
Chetwynd Business Park
Chilwell
Nottingham NG9 6RZ
United Kingdom

Telephone: +44(0)115 907 7000
Fax: +44(0)115 907 7001

Limitations

URS Infrastructure & Environment UK Limited ("URS") has prepared this Report for the sole use of **Veolia** ("Client") in accordance with the Agreement under which our services were performed **(Job No. 47065614 ref Veolia Woodlands 2013)**. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by URS. This Report is confidential and may not be disclosed by the Client nor relied upon by any other party without the prior and express written agreement of URS.

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by URS has not been independently verified by URS, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between 02/01/2013 and 12/02/2013 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

URS disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to URS' attention after the date of the Report.

Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. URS specifically does not guarantee or warrant any estimate or projections contained in this Report.

TABLE OF CONTENTS

1. INTRODUCTION

This air quality dispersion modelling report quantifies the predicted odour impacts associated with the proposed future operation of the Woodlands Composting Facility, situated in Whitesmith, East Sussex. Emissions of odour have the potential to affect amenity of nearby residents and businesses in the vicinity of the facility. This report details the results of a dispersion modelling assessment of emissions from the process.

Veolia proposes to vary Condition 22 of the current planning permission WD/457/CM. The planning application will seek approval for the increase in permitted throughput of the Woodlands Composting Facility from 46,000 to 60,000 tonnes per annum, including an increased maximum limit on the throughput of food waste of 15,000 tonnes, which was previously set at 1,000 tonnes by the planning condition. To accommodate the increase in throughput and food waste volumes, it is proposed that the odour emissions limit from the biofilter stack is increased from the current 1,600 OU_E m^{-3} to 2,600 OU_E m^{-3}. Other than this, the facility would be operated in a similar manner to that which is currently the case.

The impact of odour emissions is considered with regard to Environment Agency criteria for predicting the likelihood that odour emissions would lead to complaints from surrounding residents and businesses.

The assessment considers emissions from the proposed facility during normal operational conditions. Non-routine emissions, such as those which may occur during the commissioning process or other short-term events, typically only occur on an infrequent basis. Such events are detected and rectified within a short time period as detailed in the facility Odour Management Plan (OMP) and are tightly regulated by the Environment Agency. For this reason, no detailed consideration of impacts associated with non-routine events is included within this assessment.

2. LEGISLATION AND POLICY

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) published in March 2012 (Department for Communities and Local Government, 2012a), paragraph 109 of the NPPF states that:

"The planning system should contribute to and enhance the natural and local environment by:

preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"

Annex 2 of the NPPF defines 'Pollution' as *"Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light".*

There are both national and local policies for the control of air pollution and local action plans for the management of local air quality within the Wealdon area. The effect of the proposed development on the achievement of such policies and plans are matters that may be a material consideration by planning authorities, when making decisions for individual planning applications. Paragraph 124 of the NPPF states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

The different roles of a planning authority and a pollution control authority are addressed by the NPPF in paragraph 122:

"... local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.'

2.2 Local Planning Policy

Consideration has been given to relevant policies of the development plan and the emerging development plan. Policy WLP 35 'General Amenity Considerations' of the adopted East Sussex and Brighton & Hove Waste Local Plan (February 2006) states:

"All proposals shall satisfy the following criteria:

a) the development is of a scale, form and character appropriate to its location; and

b) there is no unacceptable adverse effect on the standard of amenity appropriate to the established, permitted or allocated land uses likely to be affected by the development; and

c) adequate means of controlling noise, dust, litter, odours and other emissions are secured; and

d) there is no unacceptable adverse effect on the recreational or tourist use of an area, or the use of existing public access or rights of way;

and

e) there is no unacceptable adverse effect on areas or features of demonstrable landscape, archaeological, architectural, geological, ecological, or historical importance."

Policy WMP 24, General Amenity, of the East Sussex, South Downs and Brighton & Hove Draft Waste and Minerals Plan (October 2011) states:

"All proposals shall satisfy the following criteria:

a. there is no unacceptable effect on the standard of amenity appropriate to the established, permitted or allocated land uses likely to be affected by the development including transport links;

b. adequate means of controlling noise, dust, litter, odours and other emissions, including those arising from traffic generated by the development, are secured;

c. there is no unacceptable effect on the recreational or tourist use of an area, or the use of existing public access or rights of way; and *d. there will be no unacceptable adverse impact on human health"*

2.3 Environmental Permitting

The composting facility will require a variation to its Environmental Permit under the provisions of the Environmental Permitting (England and Wales) Regulations 2010 (H.M. Government, 2010a). This permitting regime is separate from but complementary to the planning regime. In order to be issued with an operating permit, the operator will need to demonstrate to the satisfaction of the Environment Agency that Best Available Techniques (BAT) are being used to minimise emissions to all environmental media.

2.4 Assessment Criteria for Odour Sensitive Receptors

The criteria, at which odour emissions from the odour abatement plant stack would cause "no reasonable annoyance", have been set within this assessment at 3.0 OU_E m^{-3}, as a 98th percentile of 1-hour means. 3.0 OU_E m^{-3} is the benchmark level set within the Horizontal Guidance note H4 for 'moderately offensive' odours, and has been adopted in this case[1].

Horizontal Guidance note H4 does not specifically categorise residual biofilter odours from an IVC facility handling mixed green and food wastes as of most, moderately, or less offensiveness. Research commissioned by the EA[2] does however note that the hedonic tone of odours are changed by most abatement processes, and that biofilters reduce the annoyance potential of an odour in addition to reducing the overall odour concentration by altering the hedonic tone. Research from New Zealand estimates the default guideline of 5 OU_E m^{-3} for odour from biofilters should be increased to 25 OU_E m^{-3} to account for reduced unpleasantness. For this reason, the H4 indicative odour exposure standard of 1.5 OU_E m^{-3} for 'most offensive' odours is considered to be too conservative to apply in this case, and the most appropriate criteria is 3.0 OU_E m^{-3}, as a 98th percentile of 1-hour means, as considered within the previous application and agreed with the EA.

[1] Environment Agency (2011), H4 Odour Management, How to comply with your environmental permit, March 2011.
[2] Environment Agency, 2007, Review of odour character and thresholds, Science Report SC030170/SR2

3. METHODOLOGY

3.1 Overview

This section describes the approach taken to the assessment of odour emissions from the abatement stack associated with the operation of the composting facility. Waste odours are contained within the facility buildings using a ventilation system to maintain negative pressure, virtually eliminating emissions through open doors. The air from the enclosed waste reception area, composting tunnels and maturation area plant is extracted and fed to an odour control system consisting of a humidifier and dual biofilter system. The biofilters are fitted with a stack containing two flues (one for each biofilter bed). Emissions to air occur at a height of 17.5 m above ground level.

The area around the facility is rural in nature. There are fields on three sides of the installation boundary, with a timber yard and the A22 immediately to the south west. The nearest residential properties are approximately 200 m away, along the A22 to the north west.

Other than the change to the total throughput and proportion of food waste to be accepted into the facility, the operation of the composting process would remain essentially comparable to the currently permitted operation, as detailed within the revised Odour Management Plan (OMP), and enclosed within the permit application variation for approval by the EA.

3.2 Dispersion model selection

The assessment of odour emissions from the facility has been undertaken using the latest version of ADMS (V5), supplied by Cambridge Environmental Research Consultants Limited. ADMS is a modern dispersion model that has an extensive published validation history for use in the UK[3]. This model has been extensively used throughout the UK to demonstrate regulatory compliance.

Various parameters can affect the degree of dispersion from a source, and these are accounted for in the modelling scenario where appropriate. The presence of elevated or complex terrain in the vicinity of the source can affect the flow pattern of the wind field, which can in turn bring a plume to ground more rapidly. Buildings of sufficient height located close to the emissions sources can affect dispersion – inducing downwash in the emitted plume and entraining pollutants towards ground level.

ADMS 5 utilises site-specific hourly sequential meteorological data to enable a realistic assessment of dispersion from point sources to be conducted for weather conditions that are directly applicable to the site.

Two main scenarios have been evaluated within the modelling assessment, namely

- Scenario 1 – Current Emissions. Odour emissions have been modelled with the process operating at the current emission limit concentration of 1,600 OU_E m^{-3}; and
- Scenario 2 – Proposed Future Emissions. Odour emissions have been modelled with the process operating at the at the proposed future emissions limit concentration of 2,600 OU_E m^{-3}.

[3] CERC (2011), ADMS Validation Papers Available from: http://www.cerc.co.uk/environmental-software/model-documentation.html

3.3 Odour Sensitive Receptors

The assessment focuses on predicted odour concentrations in the vicinity of the closest residential properties and businesses to the site boundary, including the timber yard. This has been achieved through the use of a modelled receptor grid. In addition, odour has been quantified at the discrete sensitive receptors used in the assessment of combustion emissions. These receptors are listed in Table 3.1.

Table 3.1: Selected Odour Sensitive Receptors

Receptor/Location	National Grid Reference	
	x	y
R1 – East Haven Cottages	552923	113600
R2 – Providence House	552892	113519
R3 – Randalls Farm	552865	113623
R4 – Building within SE section of timber yard	553092	113436
R5 – Timber yard outdoor area (SE section)	553102	113436
R6 - Timber yard outdoor area (SE section)	553106	113419
R7 – Timber yard outdoor area (NE section)	553075	113469
R8 – Timber yard outdoor area (NE section)	553062	113492
R9 – Timber yard building close to site entrance	553015	113462

Emissions from the facility have also been modelled on a receptor grid, in order to determine the location and magnitude of maximum ground level impacts, and to enable the generation of pollutant contour plots. The receptor grid is centred on the biofilter stack, and the details are presented in Table 3.2. As with discrete receptors, the flagpole height of receptors within the grid has been set at 1.5 m.

Table 3.2: Modelled Domain, Selected Receptor Grid

Spacing (m)	Dimensions (m)	No. of nodes	National Grid Reference of SW Corner
21	1,500 x 1,500	71	552425, 112767

3.4

3.4 General Model Inputs

Dispersion modelling has been carried out for emissions of odour from the bio-filter exhaust stacks. The approach taken to the assessment of odour impacts is outlined further within the remainder of Section 3.4.

The general model conditions used in the odour assessment are summarised in Table 3.3. Other more detailed data used to model the dispersion of emissions is considered below.

Table 3.3: Odour Assessment - General ADMS 5 Model Conditions

Variable	Input
Surface Roughness at source	0.3 m
Receptors	Selected discrete receptors Receptor grid, regular spacing
Receptor location	x,y co-ordinates determined by GIS, z = 1.5 m
Source location	x,y co-ordinates determined by GIS
Emissions	Data provided by Veolia
Sources	Odour abatement system bio-filter stack (2 flues)
Meteorological data	5 years of hourly sequential data, Hertsmonceux (1999 to 2003 inclusive)
Terrain data	Flat terrain
Buildings that may cause building downwash effects	Woodlands composting facility building
Outputs	Odour, OU_Em^{-3}, 98^{th} percentile of hourly means

The bio-filter exhaust stack is the only source of odour emissions considered by the model. The physical properties of the odour emission sources, as represented within the model, are presented in Table 3.4. This data has been provided by Veolia. The location of the bio-filter stack is also shown on the odour contour plots in Section 4.

The assessment assumes constant operation of the odour abatement system. No time-based variation in emissions has therefore been accounted for within the model.

3.4.1 *Emission Data*

Physical properties of the odour abatement system, as represented within the model, are presented in Table 3.4 below. Ground level odour concentrations have been predicted for emissions at the current emission limit concentration of 1,600 OU_E m^{-3}, and emissions at the proposed future emissions limit concentration of 2,600 OU_E m^{-3}.

Table 3.4: Physical Properties and Odour Emission Rates - Odour Abatement System Stacks

Parameter	Unit	Value	
Stack position	(NGR) m	Flue 1: 553175, 113517 Flue 2: 553178, 113517	
Stack height	m	17.5	
Internal flue diameter	m	1.1	
Stack temperature	°C	Ambient	
Stack gas exit velocity	$m\ s^{-1}$	20.46 (max)	10.23 (min)
Stack flow (actual, per flue)	$m^3\ s^{-1}$	19.44 (max)	9.72 (min)
Odour emission concentration	$OU_E\ m^{-3}$	1,600 (current emission limit) 2,600 (proposed emission limit)	
Odour emission rate per flue (current operation)	$OU_E\ s^{-1}$	31,104 (max)	15,552 (min)
Odour emission rate per flue (proposed operation)	$OU_E\ s^{-1}$	50,544 (max)	25,272 (min)

The main modelled scenarios for current and proposed future operations have considered emissions from the process at the maximum air flow rate for the facility of 140,000 m^3 hr^{-1} (70,000 m^3 hr^{-1} per flue). At the proposed emission limit concentration of 2,600 OU_E/m^3, this results in a total odour emission rate of 50,544 OU_E s^{-1}. The air extraction system is controlled by computer in order to maintain optimum conditions within the composting tunnels, and the air extract rate may also be reduced at times when the facility is operating at reduced throughput. A minimum air flow rate scenario of 70,000 m^3 hr^{-1} has also been modelled as a sensitivity test, in order to evaluate odour dispersion at the reduced efflux velocity during such times. The results of the modelling of the low flow scenario are presented in Section 5.

The biofilter substrate is maintained at a temperature of between 30 °C and 40 °C, and in practice the temperature of the gas emitted from the biofilter stacks would be above ambient temperature (between 20 to 30 degrees), throughout the year. As the temperature of the gas emitted from the stack does however fluctuate depending on the temperature inside the building envelope, a worst case approach has been taken by assuming that the emission from the stacks occurs at the same temperature as the surrounding air. This conservative assumption means that for much of the time the plume has been modelled with reduced thermal buoyancy over what would be achieved in reality.

3.4.2 *Meteorological Data*

The dispersion of emissions from a point source is largely dependent on atmospheric stability and turbulent mixing in the atmosphere, which in turn are dependent on wind speed and direction, ambient temperature, cloud cover and the friction created by buildings and local terrain.

Actual measured hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the site that is modelled. This is usually achieved by selecting a meteorological station as close to the site as possible, although other stations may be used if the local terrain and conditions vary considerably or if the station does not provide sufficient data.

Hourly sequential data from Hertsmonceux for the years 1999 to 2003 were used in the odour assessment. The station is approximately 10km to the east of the application site and experiences similar meteorological conditions to those at the facility. The datasets were supplied by ADM Ltd, the UK agent for Trinity Consultants.

A visual representation of the wind speed and direction data used in the assessment is shown in the wind roses presented in Figure 3.1. The assessment does not use the wind roses to infer the magnitude or frequency of impacts at any receptor. Instead, the hourly sequential observation data are used in the dispersion model to calculate robust estimates of impacts.

A sensitivity analysis of the variation in the maximum off site process contribution with different years of met data has been completed, and results are presented in Section 5.

3.4.3 *Building Downwash Effects*

The building that makes up the Facility has the potential to affect the dispersion of emissions from the main stack. The ADMS buildings effect module has therefore been used to incorporate building downwash effects as part of the modelling procedure.

The building dimensions, as represented within the model, are presented in Table 3.5. As buildings within ADMS must be defined as rectangular or circular structures, the shape of the building structure has been simplified. The dimensions used in the modelling were specified by Veolia and were taken from the design drawings for the facility.

Table 3.5: Building Dimensions – Compost Facility Building

Building Centre		Height (m)	Length (m)	Width (m)	Angle
x	y				
553137	113495	15	120	102	147°

3.4.4 *Terrain*

The presence of elevated or complex terrain in the vicinity of the source can affect the flow pattern of the wind field. The terrain in the area around the composting facility, between the building and sensitive receptors can be considered to be gently undulating, with no steep gradients or pronounced changes in height. For this reason, therefore, terrain data has not been used in the modelling assessment

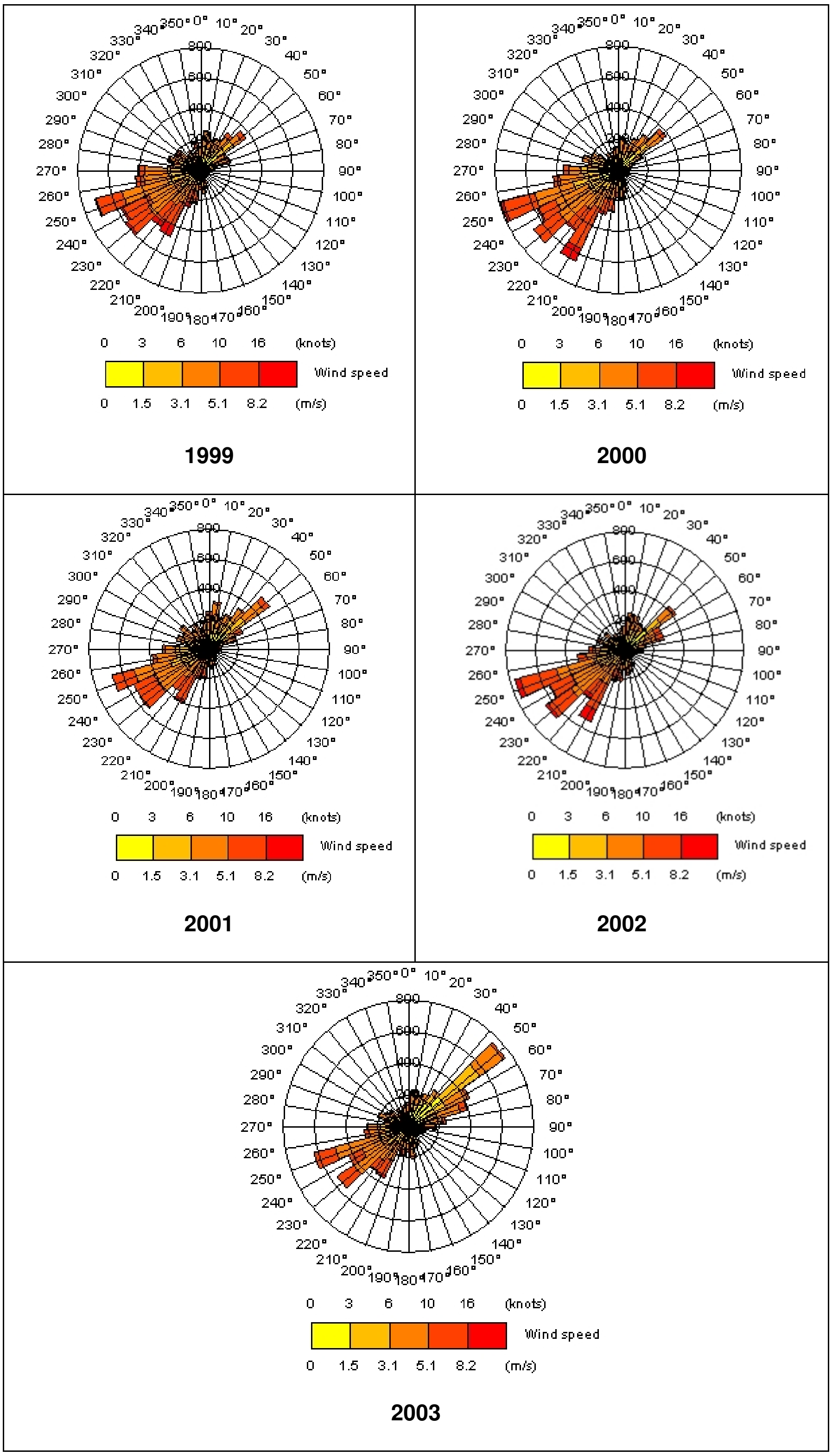
3.4.5 *Surface Roughness*

The facility is situated in a rural area. The odour model used a surface roughness of 0.3 m. This is considered to be representative of the agricultural nature of the landscape around the proposed facility.

3.4.6 *Specialised Model Treatments*

As the biofilter flues are located adjacent to one another and will act as a single plume with combined source characteristics, the ADMS model option to combine the two flues into a single stack has been activated for the model runs within this assessment. The model calculates the combined emissions parameters and models the stack as a single source.

Figure 3.1: Wind Roses for Herstmonceux (1999 to 2003 inclusive)



4. ODOUR MODELLING RESULTS

The results of the modelling of odour from the biofilter system stack are summarised in Table 4.1, which shows predicted odour impacts at the selected sensitive receptors near to the composting facility site. Results are presented for:

- Scenario 1: Emissions at the current emission limit concentration of 1,600 OU_E m^{-3}; and
- Scenario 2: Emissions at the proposed future emissions limit concentration of 2,600 OU_E m^{-3}.

The 98th percentile of hourly means concentrations reported in the tables for each receptor are the maximum predicted concentrations from the 5 meteorological data years used in the study. The variation in results at each receptor for the different meteorological datasets are evaluated in Section 5.

Contour plots illustrating the distribution in predicted odour impacts in the proposed future emission scenario, for each meteorological data year considered within the assessment, are shown in Figures 4.1 to 4.5.

Table 4.1: Predicted 98th percentile of 1 hour Means Odour Concentrations at Selected Sensitive Receptors (OU_E m^{-3})

Receptor	Description	98th %ile Odour Concentration (OU_E m^{-3})	
		Emissions at 1,600 OU_E m^{-3}	Emissions at 2,600 OU_E m^{-3}
R1	East Haven Cottages	0.81	1.32
R2	Providence House	0.84	1.36
R3	Randalls Farm	0.59	0.96
R4	Building within timber yard	1.63	2.64
R5	Timber yard outdoor area	1.61	2.61
R6	Timber yard outdoor area	1.57	2.54
R7	Timber yard outdoor area	1.68	2.73
R8	Timber yard outdoor area	1.70	2.77
R9	Timber yard building close to site entrance	1.77	2.87
Assessment Criteria		**3.00**	

The model results in Table 4.1 show that predicted ground level 98th percentile odour concentrations would increase over baseline conditions with the facility operating at the proposed emissions limit of 2,600 OU_Em^{-3}. They are, however, predicted to remain within the selected 3.0 OU_Em^{-3} benchmark level set within Horizontal Guidance note H4 for 'moderately offensive' odours at the selected locations chosen within the timber yard close to the site boundary. Predicted concentrations would be lower further from the site in the vicinity of the selected sensitive residential receptors.

The contour plots of predicted 98th percentile odour concentrations presented as Figures 4.1 to 4.5, with the facility operating at the proposed emission limit of 2,600 OU_E m^{-3}, show that there is no predicted exceedance of the 3.0 OU_E m^{-3} criteria at sensitive receptor locations with each of the five hourly sequential meteorological data sets used in the modelling. This includes all parts of the timber yard to the south west of the facility boundary.

All plots show a small area to the north east of the site boundary where the 98th percentile concentration is predicted to exceed 3.0 OU_E m^{-3}, but this is agricultural land and it is not expected that people will be present for extended periods of time. As with the modelled predictions at selected discrete receptors, it is therefore considered that the contour plots show that odour complaints, due to emissions from the biofilter stack, would be unlikely.

There is no history of odour complaints regarding the existing operation of the facility. It is understood that the operators of the adjacent timber yard (the nearest sensitive receptors) have been consulted on the proposed changes to the operation of the process, and that they have not expressed any objections. Given the results presented above, it is therefore considered that the existing situation would remain, namely that odour complaints from the selected sensitive receptors in the vicinity of the facility, due to emissions from the biofilter stack, would be unlikely to occur during the proposed operation of the process with increased throughput.

5. SENSITIVITY TESTS

5.1 Overview

A sensitivity analysis has been carried out to assess the variation in predicted 98th percentile odour concentrations with different model input data, compared to the main scenario presented in Section 4.

The meteorological data year and the stack flows were the two parameters modified in the sensitivity tests.

The model was run:

- with meteorological data from Herstmonceux, for the years 1999 to 2003 inclusive;
- with identical parameters to the main scenario, but with a stack flow of 9.72 $m^3 s^{-1}$ per flue; and
- with and without building downwash effects

The results of the sensitivity analysis are presented in sections 5.2 to 5.4.

5.2 Variation with Meteorological Data Year

Predicted 98th percentile odour concentrations at the selected receptor locations, for each meteorological data year between 1999 and 2003 are presented in Table 5.1 below.

Table 5.1: Variation in Predicted 98th Percentile Odour Concentrations with Meteorological Data Year

Receptor	98th percentile odour concentration (OU_E/m^3)				
	1999	2000	2001	2002	2003
R1	1.06	1.24	1.12	1.23	1.32
R2	1.17	1.18	1.13	1.29	1.36
R3	0.78	0.94	0.82	0.89	0.96
R4	2.64	2.55	2.61	2.32	2.47
R5	2.61	2.56	2.61	2.36	2.43
R6	2.54	2.43	2.38	1.79	1.40
R7	2.59	2.03	2.56	2.60	2.73
R8	2.38	0.96	2.13	2.55	2.77
R9	2.67	1.76	2.43	2.71	2.87

The model results show that there is a variation in predicted odour impacts at receptors with each individual meteorological dataset. The highest modelled outcome for residential receptors are with the 2003 dataset (R1, R2 and R3). The highest results for the timber yard receptors are split between the 1999 and 2003 datasets.

The sensitivity of the model to meteorological data has been taken into account in the results presented within Table 4.1. The highest result obtained from the modelling of each of 5 years meteorological data has been presented in Table 4.1, so the variation in meteorological conditions in the vicinity of the facility has been accounted for in the assessment.

5.3 Variation with Stack Flow

Predicted 98th percentile odour concentrations at the selected receptor locations, showing a comparison between predicted impacts with the maximum and minimum flow scenarios, are presented in Table 5.2 below.

Table 5.2: Variation in Predicted 98th Percentile Odour Concentrations with Stack Flow

Receptor	98th percentile odour concentration (OU_E m^{-3})	
	Stack flow = 9.72 m^3 s^{-1}	Stack flow = 19.44 m^3 s^{-1}
R1	0.87	1.32
R2	0.99	1.36
R3	0.68	0.96
R4	2.61	2.47
R5	2.61	2.43
R6	2.19	1.40
R7	2.63	2.73
R8	2.63	2.77
R9	2.54	2.87

The concentrations obtained are higher at receptors R1, R2 and R3 with the maximum stack flow of 19.44 m^3/s, which represent residential properties located near to the site, and also at receptors R7, R8 and R9 within the timber yard. Despite the lower odour emission rate, the reduced efflux velocity in the low flow scenario results in slightly higher predicted concentrations at receptors R4, R5 and R6 within the southern section of the timber yard.

As for the main model scenario, predicted 98th percentile odour concentrations at the selected receptor locations are all within the selected 3.0 OU_Em^{-3} benchmark level set within Horizontal Guidance note H4 for ‘moderately offensive’ odours at sensitive receptors, for both the considered stack flow scenarios.

5.4 Variation with Building Downwash Effects

The model has been run with and without a consideration of building downwash effects, to determine the effect of buildings on predicted maximum ground-level concentrations. Predicted 98th percentile odour concentrations at the selected receptor locations, showing a comparison between predicted impacts with and without building downwash effects, are presented in Table 5.3 below.

Table 5.3: Variation in Predicted 98th Percentile Odour Concentrations with Building Downwash Effects

Receptor	98th percentile odour concentration ($OU_E\ m^{-3}$)	
	No Building Downwash	With Building Downwash
R1	1.26	1.32
R2	1.46	1.36
R3	1.09	0.96
R4	0.68	2.47
R5	0.49	2.43
R6	0.49	1.40
R7	0.88	2.73
R8	1.04	2.77
R9	1.68	2.87

The results show that predicted impacts are much lower at receptors in close proximity to the facility building (the timber yard represented by R4 to R9 inclusive), where building downwash effects would be most pronounced. Further from the site, at the closest residential receptors, very similar results are obtained, with little variation in predicted 98th percentile ground level concentrations.

It can therefore be assumed that the consideration of building effects was worst-case with respect to predicted impacts reported in the main assessment

6. CONCLUSIONS

This dispersion modelling assessment has evaluated the odour impact on surrounding sensitive receptors of the operation of the Woodlands Composting Facility, taking into account the proposed increased throughput and tonnage of food waste processed at the facility. The assessment has used the dispersion model ADMS 5.

The modelled outcome predicts 98^{th} percentile of hourly means odour concentrations, with the plant operating at the proposed emission limit concentration of 2,600 $OU_E\ m^{-3}$, which would be within the assessment criteria at the closest residential properties, as well as at locations within the timber yard located next to the composting facility.

It can therefore be concluded that the operation of the Woodlands Composting Facility, with a proposed increase in permitted throughput from 46,000 to 60,000 tonnes per annum, including an increased maximum limit on the throughput of food waste of 15,000 tonnes, is not likely to lead to complaints from residents and businesses near to the facility.

NOTES

- Receptors
- Stacks
- 98th %ile of Hourly Means ($OU_E\ m^{-3}$)

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: Final

Client: Veolia

Project Title: Woodlands Composting Facility

Drawing Title: Modelled Odour Concentrations
98th Percentile of Hourly Means
2,600 $OU_E\ m^{-3}$
1999 Meteorological Data

Drawn	Checked	Approved	Date
GH	DD	DD	11/02/13

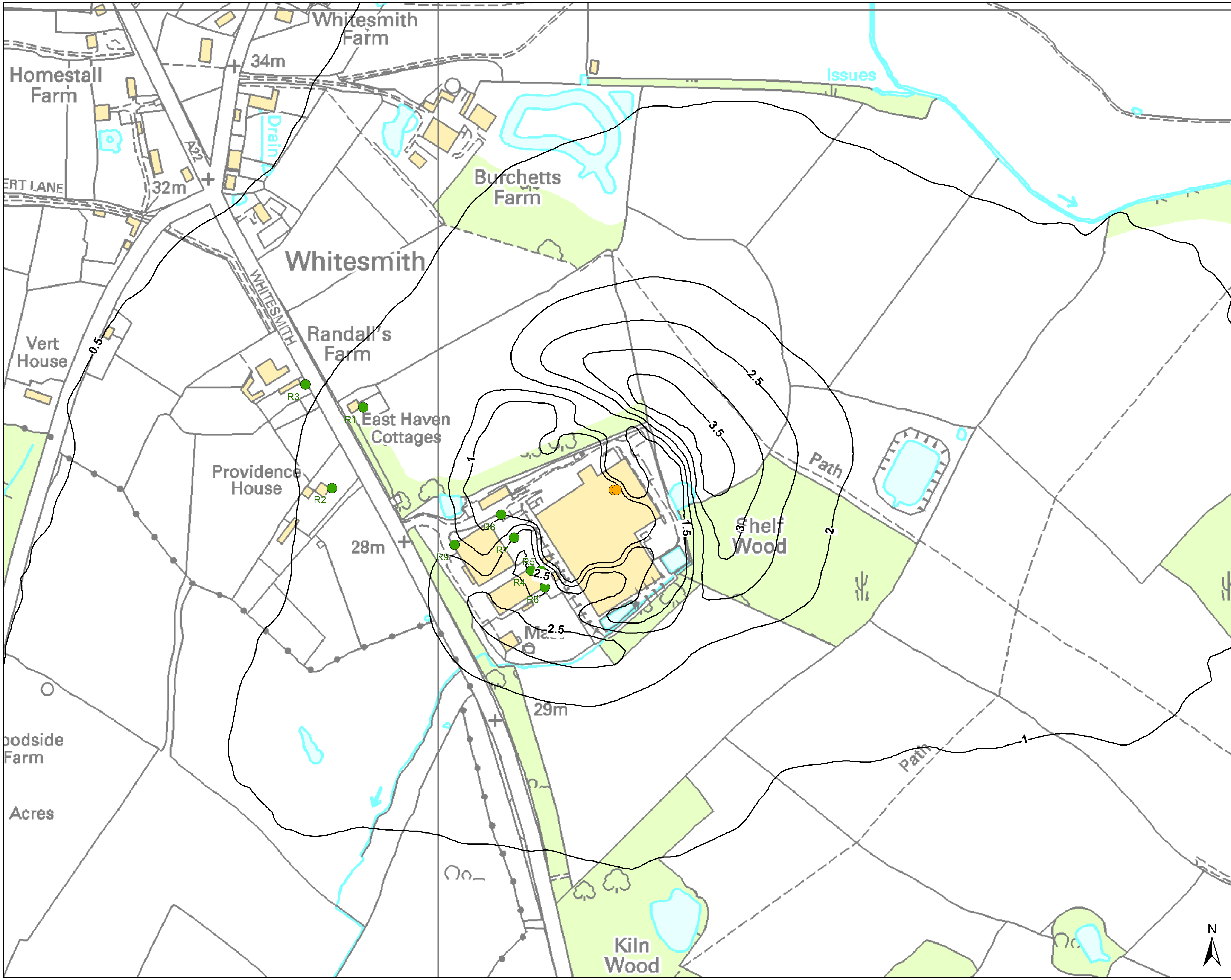
URS Internal Project No. 47065614

Scale @ A3 1:3,500

URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: Figure 4.1

Rev: 01



NOTES

Receptors

Stacks

98th %ile of Hourly Means (OU$_E$ m^{-3})

Copyright

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: Final

Client: Veolia

Project Title: Woodlands Composting Facility

Drawing Title: Modelled Odour Concentrations 98th Percentile of Hourly Means 2,600 OU$_E$ m^{-3} 2000 Meteorological Data

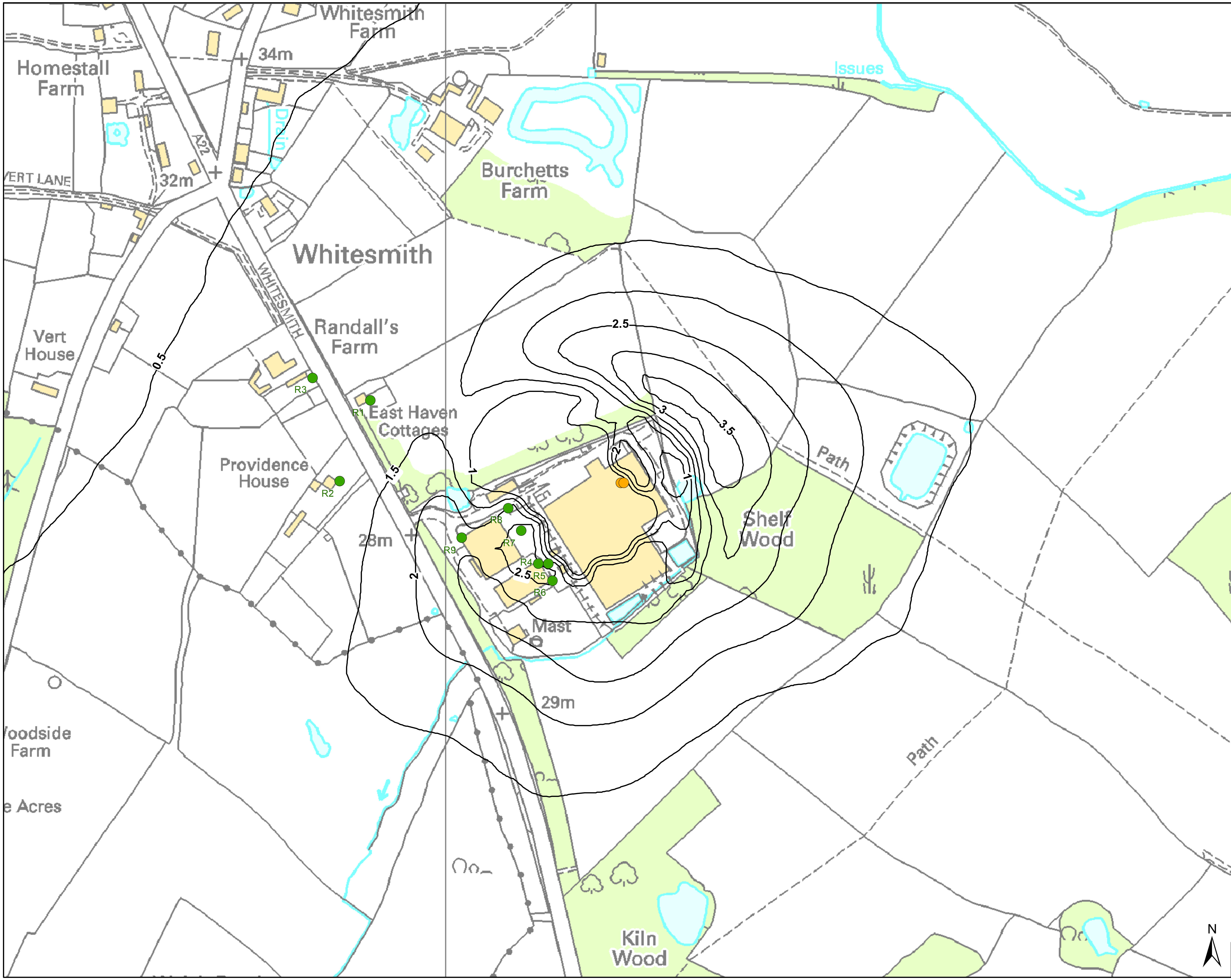
Drawn	Checked	Approved	Date
GH	DD	DD	11/02/13

URS Internal Project No.	Scale @ A3
47065614	1:3,500

URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

URS

Drawing Number	Rev
Figure 4.2	01



NOTES

- Receptors
- Stacks
- 98th %ile of Hourly Means ($OU_E\ m^{-3}$)

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue

Final

Client

Veolia

Project Title

Woodlands Composting Facility

Drawing Title

Modelled Odour Concentrations
98th Percentile of Hourly Means
2,600 $OU_E\ m^{-3}$
2001 Meteorological Data

Drawn	Checked	Approved	Date
GH	DD	DD	11/02/13

URS Internal Project No.	Scale @ A3
47065614	1:3,500

URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number	Rev
Figure 4.3	01

NOTES

- Receptors
- Stacks
- 98^{th} $\%^{ile}$ of Hourly Means ($OU_E\ m^{-3}$)

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: Final

Client: Veolia

Project Title: Woodlands Composting Facility

Drawing Title: Modelled Odour Concentrations
98^{th} Percentile of Hourly Means
2,600 $OU_E\ m^{-3}$
2002 Meteorological Data

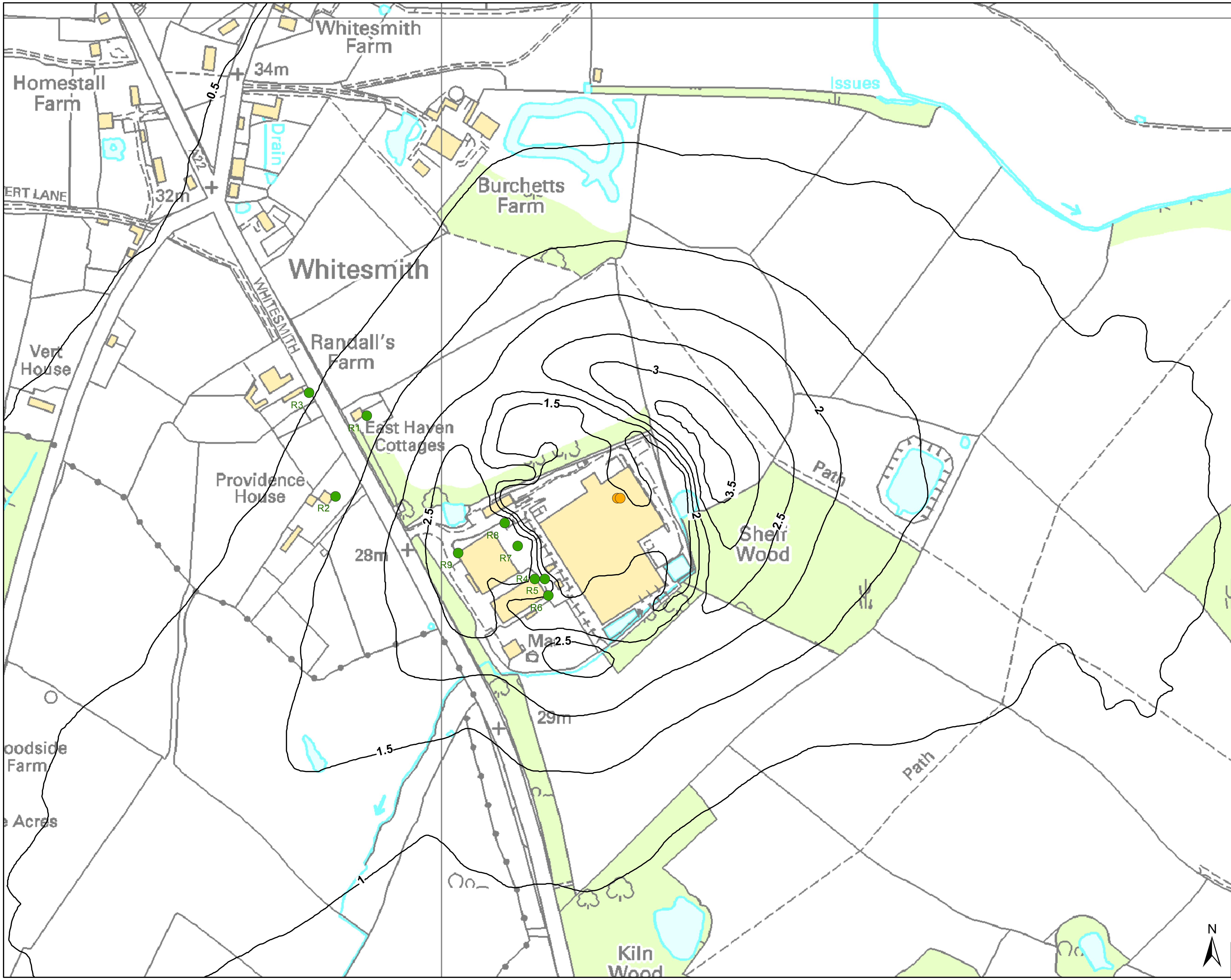
Drawn	Checked	Approved	Date
GH	DD	DD	11/02/13

URS Internal Project No.	Scale @ A3
47065614	1:3,500

URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

URS

Drawing Number	Rev
Figure 4.4	01



NOTES

- Receptors
- Stacks
- 98th %ile of Hourly Means ($OU_E\ m^{-3}$)

Copyright

Revision Details	By	Check	Date	Suffix

Purpose of Issue

Final

Client

Veolia

Project Title

Woodlands Composting Facility

Drawing Title

Modelled Odour Concentrations
98th Percentile of Hourly Means
2,600 $OU_E\ m^{-3}$
2003 Meteorological Data

Drawn	Checked	Approved	Date
GH	DD	DD	11/02/13

URS Internal Project No.	Scale @ A3
47065614	1:3,500

URS Infrastructure & Environment UK Limited
Scott House
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number	Rev
Figure 4.5	01