Ansty Garden Community

Environmental Statement

Volume 4

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APPENDIX D: AIR QUALITY

temple

Appendix D1: Air Quality Monitoring Method

Appendix D Air Quality

D.1 Appendix D.1 – Air Quality Monitoring Method

Method

D.1.1 A three-month NO_2 diffusion tube survey was carried out in line with TG22. Diffusion tubes are an indicative monitoring method with an uncertainty of approximately ± 25%. The tubes contain the chemical reagent triethanolamine (TEA) to absorb the pollutant to be measured from ambient air.

D.1.2 The diffusion tubes were supplied and analysed by Gradko International Limited (Gradko), a UKAS certified laboratory accredited to the AIR Proficiency Testing Scheme. The tubes were prepared with a known volume of 20% TEA in acetone.

D.1.3 In accordance with TG22 guidance, five sets of duplicate tubes were installed at five locations adjacent to roads in the vicinity of the Site. An additional set of duplicate tubes were installed to assess background ambient air quality of the area within the Site, away from the local road network. All diffusion tubes were exposed to ambient air for a four or five-week period depending on the length of the calendar month between 26th August 2022 and 5th December 2022.

D.1.4 The tubes were then collected and sent back to the Gradko Environmental laboratory for analysis by U.V. spectrophotometry, which reported the time-weighted average NO_2 concentration (µg/m^3) over the four / five-week period registered for each tube at each location.

D.1.5 A travel blank was also carried to and from the site during the installation and collection site visits to demonstrate that tubes from the batch were not contaminated before use, as a method of quality assurance in agreement with TG22.

D.1.6 The monitoring locations are presented in **Figure D.1** and described in **Table D.1** below.

Table D.1: Description of air quality monitoring locations

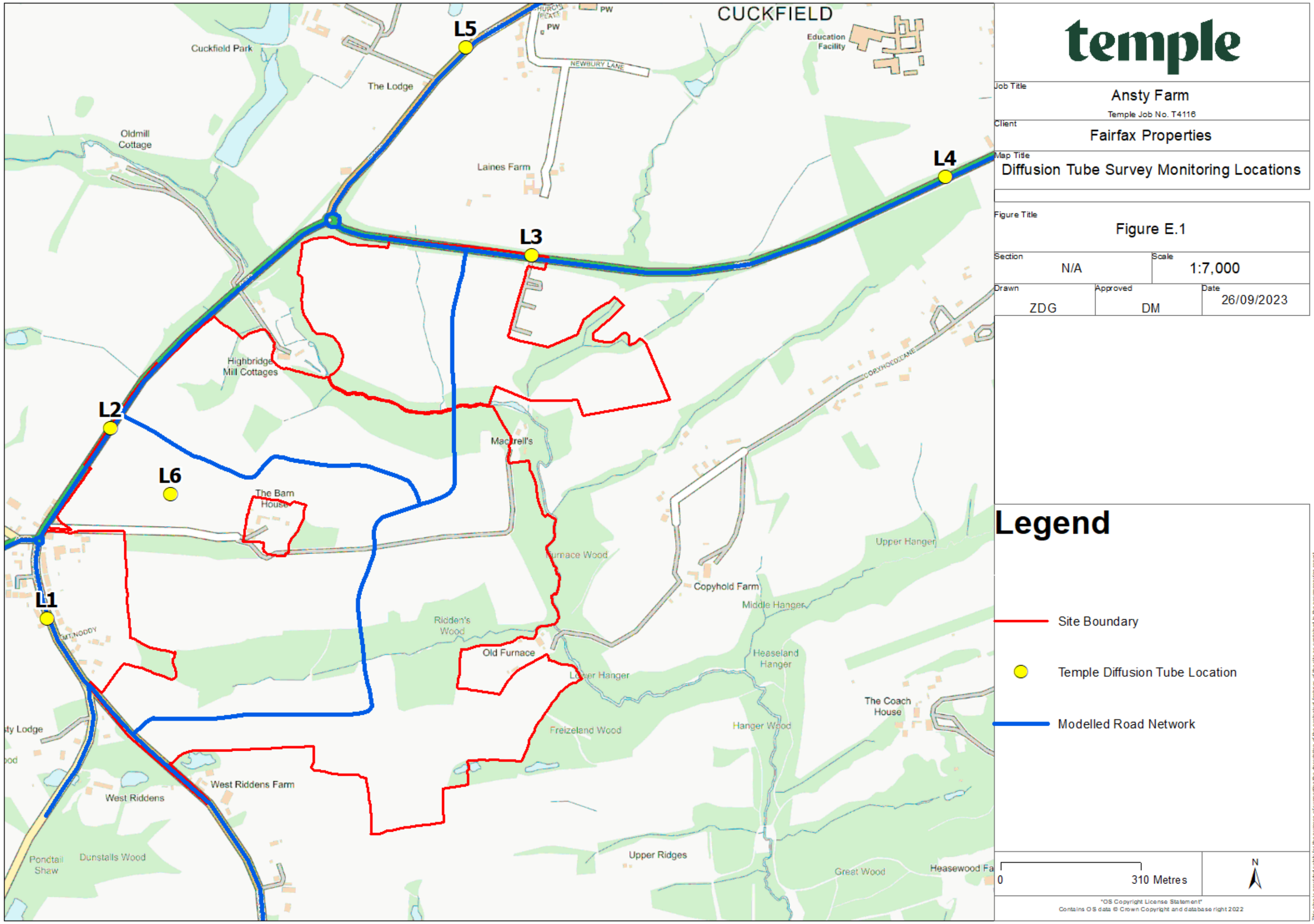
Site ID	X	Y	Site Type
Location 1a	529155	123115	Roadside
Location 1b	529153	123115	Roadside
Location 2a	529294	123537	Roadside
Location 2b	529294	123537	Roadside
Location 3a	530231	123921	Roadside
Location 3b	530231	123921	Roadside
Location 4a	531151	124095	Roadside
Location 4b	531151	124095	Roadside

Site ID	X	Y	Site Type
Location 5a	530084	124383	Roadside
Location 5b	530084	124383	Roadside
Location 6a	554089	279822	Background
Location 6b	554089	279822	Background

D.1.7 The following method was used to process monitoring data collected from the survey.

1. The precision of the duplicate diffusion tubes has been checked using the spreadsheet available on Defra's website; in each case, the diffusion tubes had a 'good' coefficient of variation;
2. The time-weighted average at each monitoring location was calculated as the tube changeover dates were not synchronised with the diffusion tube calendar, and the results from each duplicate averaged;
3. Monitoring data were 'annualised' in accordance with TG22, which outlines a method for converting shorter monitoring periods to an equivalent annual mean concentration by calculating a factor representing the proportion of the period mean to the annual mean (averaged from multiple monitoring sites) and multiplying the monitored data by the calculated factor. Annualisation was undertaken using the 2019 data at four background automatic monitoring locations within 50 miles of the Site, either affiliated to the AURN or suitable for local air quality management;
4. The diffusion tube results were converted from 2022 to 2019, using the roadside or background projection factors as appropriate (as per TG22); and
5. To reduce bias, the applicable national bias adjustment factor (0.91) was applied to the annualised averaged monitoring results. As diffusion tubes are an indicative monitoring technique, they do not offer the same accuracy as an automatic chemiluminescent analyser, which could lead to results under- or over-reading (leading to negative or positive bias).

Figure D-1: Survey monitoring locations



Appendix D2: Construction Dust Assessment Method

D.2 Appendix D.2 - Construction Phase Assessment Method

D.2.1 The criteria developed by the Institute of Air Quality Management for the assessment of air quality impacts arising from construction activities was used as the basis for the assessment methodology discussed in the following sections. The assessment is comprised of five steps as discussed below.

Step 1: Identify the need for a detailed assessment

D.2.2 An assessment would normally be required where there is:

- A human receptor within 250 metres of the proposed scheme; and/or within 50 metres of the access route(s) used by the construction vehicles on the public highway up to 500 metres from the study area site entrance(s); and / or
- An ecological receptor within 50 metres of the proposed scheme and/or within 50 metres of the access route(s) used by construction vehicles on the public highway up to 500 metres from the site entrance(s).

D.2.3 A human receptor refers to any location where a person or property may experience the adverse effects of airborne dust or dust-soiling, or exposure to particulate matter (PM_{10}) over a period relevant to the ambient air quality objectives.

D.2.4 An ecological receptor refers to any sensitive habitat affected by dust soiling. For locations with a statutory designation, such as a National Nature Reserve (NNR), Ramsar site, Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) or Special Protection Areas (SPA), consideration should be given as to whether the particular site is sensitive to dust. Some non-statutory sites may also be considered if appropriate, such as a Site of Importance for Nature Conservation (SINC).

D.2.5 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is 'negligible' and any effects would be 'not significant'.

Step 2: Assess the risk of dust impacts

D.2.6 A site is allocated a risk category on the basis of the scale and nature of the works (Step 2A) and the sensitivity of the area to dust impacts (Step 2B). These two factors are combined in Step 2C to determine the risk of dust impacts before the allocation of mitigation measures. Risks are described as low, medium or high for each of the four separate activities (demolition, construction, earthworks and trackout). Site-specific mitigation is required, proportionate to the level of risk.

Step 2A: Define the potential dust emission magnitude

D.2.7 The potential dust emission magnitude is based on the scale of the anticipated works and should be classified as small, medium or large. **Table D.2** presents the dust emission criteria outlined for each construction activity.

Table D.2: Potential dust emission magnitude criteria

Construction activity	Large	Medium	Small
Demolition	Total building volume >75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level.	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12 m above ground level.	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months.
Earthworks	Total site area >110,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height.	Total site area 18,000 m^2 – 110,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3 m – 6 m in height.	Total site area <18,000 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height.
Construction	Total building volume >75,000 m^3, on site concrete batching, sandblasting.	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching.	Total building volume <12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	>50 HDV (>3.5 t) outward movements[a] in any one day[b], potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.	20-50 HDV (>3.5 t) outward movements[a] in any one day[b], moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.	<20 HDV (>3.5 t) outward movements[a] in any one day[b], surface material with low potential for dust release, unpaved road length <50 m.

A vehicle movement is a one way journey. i.e. from A to B and excludes the return journey.

HDV movements during a construction project vary over its lifetime, and the number of movements is the maximum not the average.

Step 2B: Define the sensitivity of the area

D.2.8 The sensitivity of the area is described as low, medium or high. It takes into account a number of factors:

- The specific sensitivities of the receptors in the area;
- The proximity and number of those receptors;

- The local background PM_{10} concentrations; and
- Site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

D.2.9 **Table D.3** presents indicative examples of classification groups for the varying sensitivities of people to dust soiling effects and to the health effects of PM_{10}; and the sensitivities of receptors to ecological effects. A judgement is made at the site-specific level where sensitivities may be higher or lower, for example a soft fruit business may be more sensitive to soiling than an alternative industry in the same location. Box 6, Box 7 and Box 8 within the IAQM guidance outlines more detailed information on defining sensitivity.

Table D.3: Indicative examples of the sensitivity of different types of receptors

Sensitivity of receptor	Sensitivities of people and ecological receptors		
	Dust soiling effects [a]	Health effects of PM_{10} [b]	Ecological effects [c]
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.	Residential properties, hospitals, schools and residential care homes.	Locations with an international or national designation and the designated features may be affected by dust soiling (e.g. SAC/SPA/Ramsar). Locations where there is a community of a species particularly sensitive to dust such as vascular species included in the Red Data list for Great Britain.
Medium	Parks, places of work.	Office and shop workers not occupationally exposed to PM_{10}.	Locations where there is a particularly important plant species, where dust sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition (e.g. SSSIs).
Low	Playing fields, farmland, footpaths, short-term car parks and roads.	Public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition (e.g. Local Nature Reserves).

People's expectations would vary depending on the existing dust deposition in the area.

This follows the Department for Environment, Food and Rural Affairs (Defra, 2022) guidance as set out in Local Air Quality Management Technical Guidance (LAQM.TG (22)). Notwithstanding the fact that the ambient air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM_{10}. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

Only if there are habitats that might be sensitive to dust. A Habitat Regulation Assessment of the site may be required as part of the planning process if the site lies close to an internationally designated site i.e. Special Conservation Areas (SACs), Special Protection Areas (SPAs) designated under the Habitats Directive (92/43/EEC) and Ramsar sites.

D.2.10 The IAQM guidance advises consideration of the risk associated with the nearest receptors to construction activities.

D.2.11 Where there are multiple receptors in a single location, a worst-case representative receptor location is considered and the highest risk applicable is allocated.

D.2.12 The receptor sensitivity and distance are then used to determine the potential dust risk for each dust effect for each construction activity as shown in **Table D.4**, **Table D.5** and **Table D.6**. It is noted that distances are to the dust source and so a different area may be affected by trackout than by on-site works.

Table D.4: Sensitivity of the area to dust soiling effects on people and property [a]

Receptor sensitivity	Number of Receptors[b]	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Low	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

a. Estimate the total number of receptors within the stated distance. Only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 metres of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 metres is 102. The sensitivity of the area in this case would be high.

b. Estimate the number of receptors within each distance band. For example, a residential unit is one receptor. For receptors which are not dwellings, professional judgement should be used to determine the number of human receptors. For example, a school or hospital is likely to be within the >100 receptor category.

Table D.5: Sensitivity of the area to human health impacts [a b c]

Receptor sensitivity	Annual Mean PM_{10} Concentrations	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low

Receptor sensitivity	Annual Mean PM_{10} Concentrations	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Estimate the total within the stated distance (e.g. the total within 350 metres and not the number between 200 and 350 m), noting that only the highest level of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors <20 metres of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors <50 metres is 102. If the annual mean PM_{10} concentration is 29 µg/m³, the sensitivity of the area would be high.

Annual mean PM_{10} concentrations are most straightforwardly taken from the national background maps but should also take account of local sources. The values are based on 32 µg/m³ being the annual mean concentration at which an exceedance of the 24-hour objective is likely in England, Wales and Northern Ireland.

In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, simply include the number of properties.

Table D.6: Sensitivity of the area to ecological impacts

Receptor Sensitivity	Distance from the Source (m)[a]	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Only the highest level of area sensitivity from the table needs to be considered.

Step 2C: Define the risk of impacts

D.2.13 The dust emission magnitude is then combined with the sensitivity of the area to determine the overall risk of impacts with no mitigation measures applied. The matrices below (Table D.7) provide a method of assigning the level of risk for each activity. These can then be used to determine the level of mitigation that is required.

Table D.7: Risks of dust impacts

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	High Risk	Medium Risk	Medium Risk

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible

Step 3: Site-specific mitigation

D.2.14 Step three of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to whether the site is a low-, medium- or high-risk site. The highest risk category of a site (of all activities being undertaken) is recommended when considering appropriate mitigation measures for the site. Where risk is assigned as 'negligible', no mitigation measures beyond those required by legislation are required. However, additional mitigation measures may be applied as good practice.

D.2.15 A selection of these measures is specified as suitable to mitigate dust emissions from activities, based on professional judgement.

Step 4: Determine significant effects

D.2.16 Following Step 2 (definition of the proposed scheme and the surroundings and identification of the risk of dust effects occurring for each activity), and Step 3 (identification of appropriate site-specific mitigation), the significance of the potential dust effects can be determined. The recommended mitigation measures should normally be sufficient to reduce construction dust impacts to a not significant effect.

D.2.17 The approach in Step 4 of the IAQM dust assessment guidance has been adopted to determine the significance of effects with regard to dust emissions. The guidance states the following:

D.2.18 "*For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.*"

D.2.19 IAQM guidance also states that:

D.2.20 "*Even with a rigorous DMP [Dust Management Plan] in place, it is not possible to guarantee that the dust mitigation measures will be effective all the time, and if, for example, dust emissions occur under adverse weather conditions, or there is an interruption to the water supply used for dust suppression, the local community may experience occasional, short-term dust annoyance. The likely scale of this would not normally be considered sufficient to change the conclusion that with mitigation the effects will be 'not significant'*."

D.2.21 Step 4 of IAQM guidance recognises that the key to the above approach is that it assumes that the regulators ensure that the proposed mitigation measures are implemented. The management plan would include the necessary systems and procedures to facilitate on-going checking by the regulators to ensure that mitigation is being delivered, and that it is effective in reducing any residual effect to 'not significant' in line with the guidance.

Appendix D3: Air Quality Detailed Dispersion Modelling Assessment Method

D.3 Appendix D.3 - Detailed Dispersion Modelling Assessment Method (Air Quality Vehicle Emissions)

Modelling Software

D.3.1 The ADMS-Roads detailed dispersion model (version 5) was used to assess direct effects from the additional traffic on local air quality during 2019 and 2039.

D.3.2 The ADMS-Roads model considers the key variables that influence pollutant emission and dispersion (meteorology, surface roughness, diurnal traffic flows, predicted future traffic mixes and predicted future engine emission standard mixes). Annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ were predicted at a number of locations in the vicinity of the Proposed Development. The receptors chosen include those that are representative of worst-case exposure locations within the modelled study area.

D.3.3 Where the method used to assess impacts at ecological receptors differs from that used to assess human health impacts, further detail has been provided in **Appendix D.4**.

Assessment Scenarios

D.3.4 Predictions of NO_2, PM_{10} and $PM_{2.5}$ were made for the following scenarios:

- **Scenario 1 (S1):** base year, using 2019 traffic data and 2019 background pollutant concentrations and emissions factors;
- **Scenario 2 (S2):** traffic flows anticipated during 2039, without the Proposed Development in place but inclusive of committed / consented development traffic and committed infrastructure improvements; and
- **Scenario 3 (S3):** traffic flows anticipated during 2039, with the Proposed Development in place and inclusive of committed / consented development traffic and committed infrastructure improvements.

D.3.5 The Proposed Development is expected to fully open during 2032. Vehicle emissions factors and pollutant background concentrations, defined within **ES Volume 4, Appendix D3,** are for 2030. It is expected that traffic volumes during 2039 would be greater than those assessed during 2032. In addition, vehicle emissions per unit distance travelled are projected to fall as newer vehicles are progressively enter the road network, replacing older vehicles. This underpins part of the projected reduction in pollutant concentrations in background (see **Section 8.5.9**) with time. Therefore, the use of 2039 traffic data with 2030 emissions factors and background pollutant concentrations, is considered conservative.

Traffic Data

D.3.6 The AADT, the percentage of HDVs (%HDVs) and vehicle speeds for the local roads of interest were obtained from the Transport Consultants, Ardent Consulting Engineers[1]. Vehicle speeds were based on the speed limits on each road link, but sometimes adjusted with reference to the advice on modelling junctions and congestion provided within TG22, and professional judgement. **Table D.8** summarises the information used within the assessment (AADT and %HDVs). The roads and receptors included in the dispersion modelling assessment are also presented in **Figure D.2** and **Figure D.3** below.

Table D.8: Traffic Data for all modelled scenarios

Link Name	S1		S2		S3		Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
A272 (Between B2036 and Site Access Roundabout)	8621	2.64	10576	3.30	11,047	3.39	97
A272 (Between Site Access Roundabout and Antsy)	8621	2.64	10576	3.30	10,219	3.3	97
A272 (Between B2036 and B2184)	5865	3.30	7837	3.33	3,718	4.92	97
A272 (Tylers Green)	6660	2.30	7955	2.49	7,229	3.33	97
B2036 (South Street)	3061	3.25	3167	4.61	8,086	2.52	97
B2036 Harvest Hill (Between Antsy and Cuckfield Road)	8335	2.96	6691	3.15	6,124	3.15	48
B2036 Harvest Hill (Between Cuckfield Road and Southern site Access Roundabout)	2244	3.43	4371	3.08	4,723	3.23	48
B2036 Plains Flat	2244	3.43	4371	3.08	4,723	3.23	97
A272 Bolney Road	17451	4.74	11272	2.56	11,719	2.64	97
A272 Tylers Green	11761	2.94	15263	3.06	15,606	3.11	64
B2184 Broad Street	5312	1.89	6539	2.09	6,253	2.09	48
Cuckfield Road (Between B2036 and A2300)	3240	2.84	2320	3.28	2,774	3.62	48
Southern Site Access	0	0.00	0	0.00	1,104	2.1	32

[1] At the time of writing, it is understood that 2.1% of traffic derived from the Site was expressed as heavy-duty vehicles. However, the Traffic and Transport Team did not provide a breakdown indicating how this traffic would distribute along the local road network or on each road within the Site. It has therefore not been possible to account for those movements.

Link Name	S1		S2		S3		Speed (kph)
	AADT	%HDV	AADT	%HDV	AADT	%HDV	
Site Access (Onto A272)	-	0.00	-	0.00	1,841	2.1	32
Northern Site Access	0	0.00	0	0.00	1,311	2.1	32

Vehicle Emissions Factors

D.3.7 The ADMS-Roads model assesses the volume of pollutants generated along each stretch of modelled road based on inputted 'emissions factors' (g/km/s). Defra's emissions factors toolkit (2019 and 2030, as appropriate) was used to determine the emissions of NOx, PM_{10} and $PM_{2.5}$ from operational traffic along the affected links. Rural (not London) settings were selected, with reference to the 'Emissions Factors Toolkit v11.0 User Guide.'

Figure D-2: Roads and existing human receptors included in the modelling assessment – near Site (Ansty village)

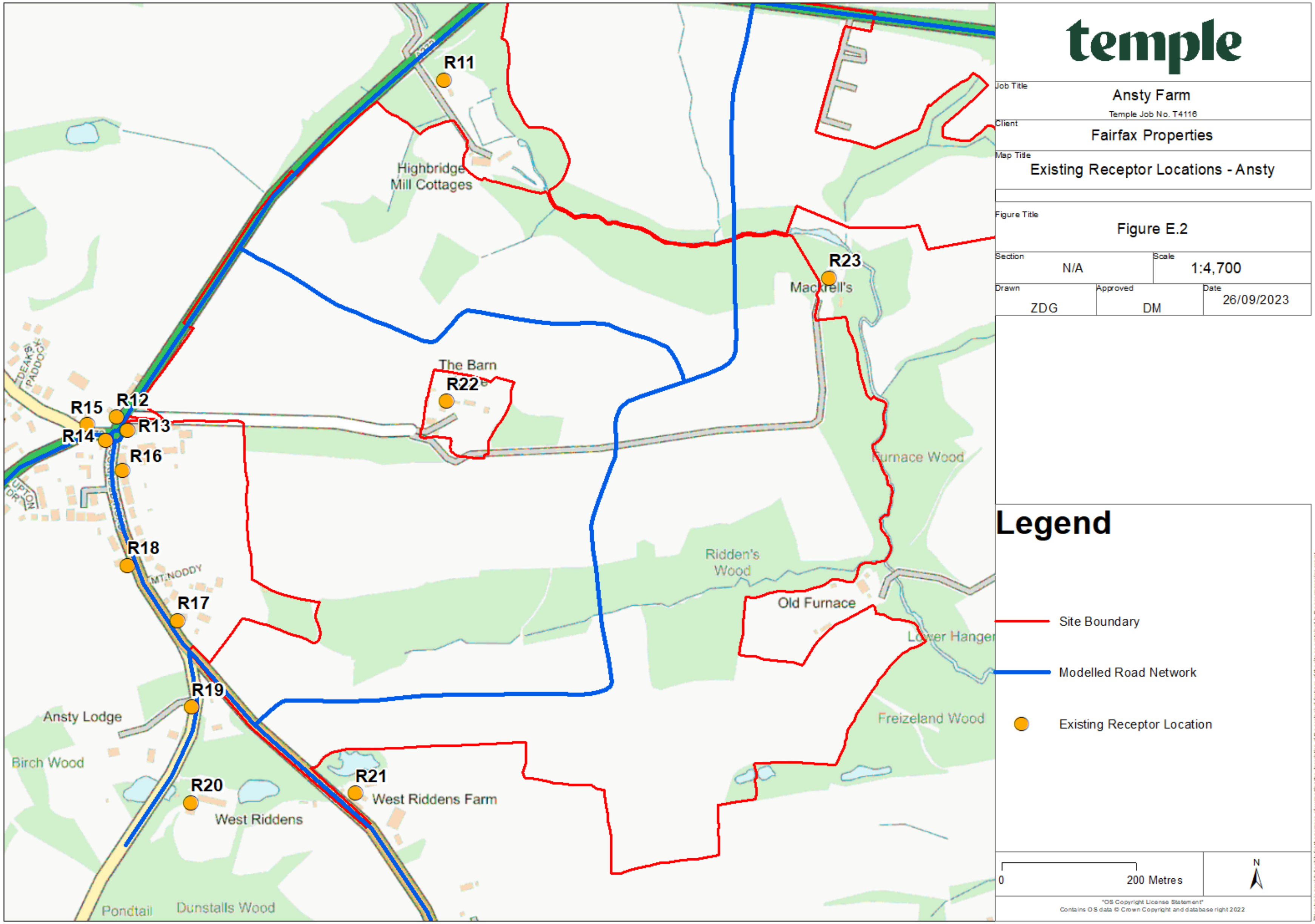


Figure D-3: Roads and existing human receptors included in the modelling assessment (Cuckfield)

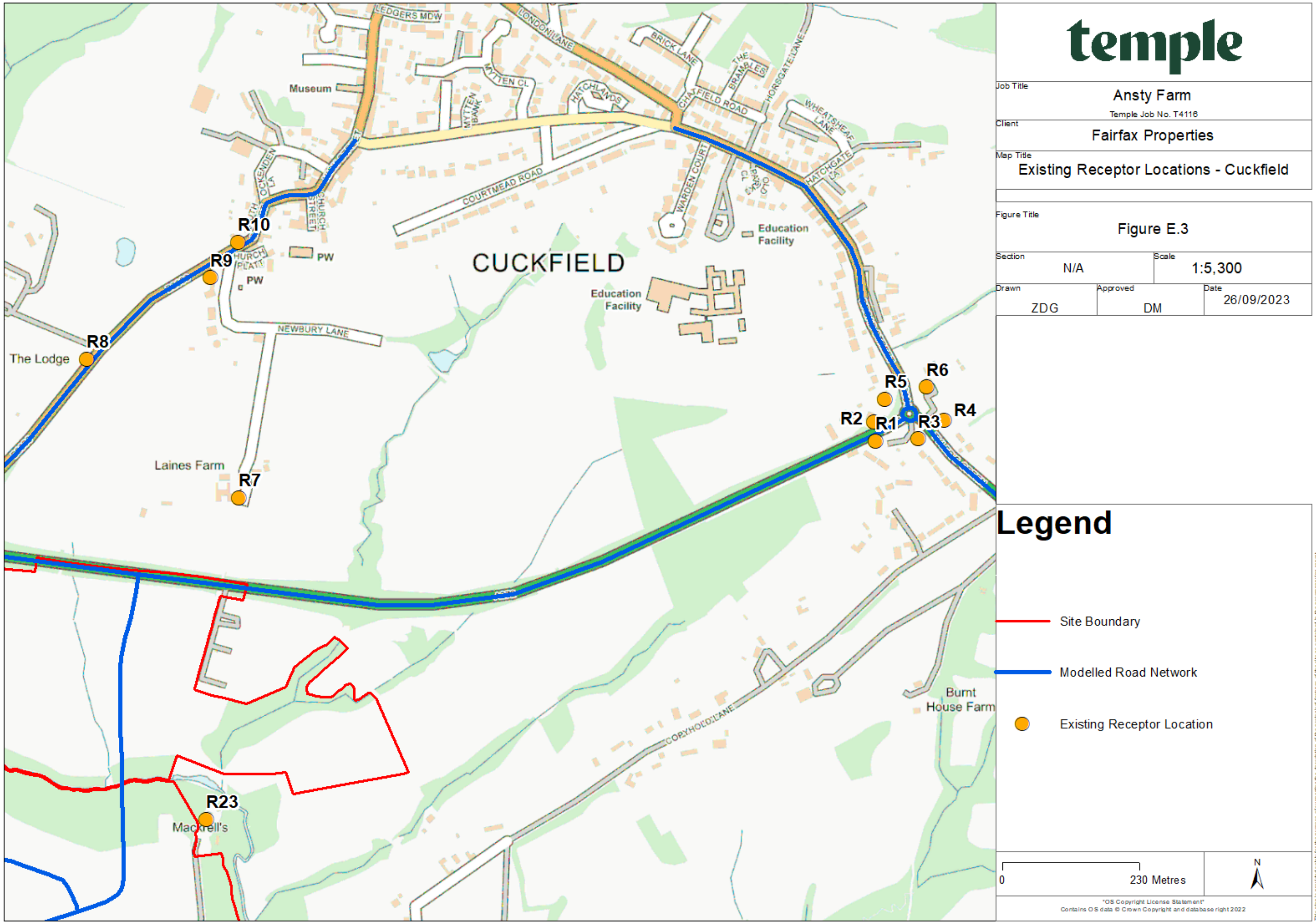
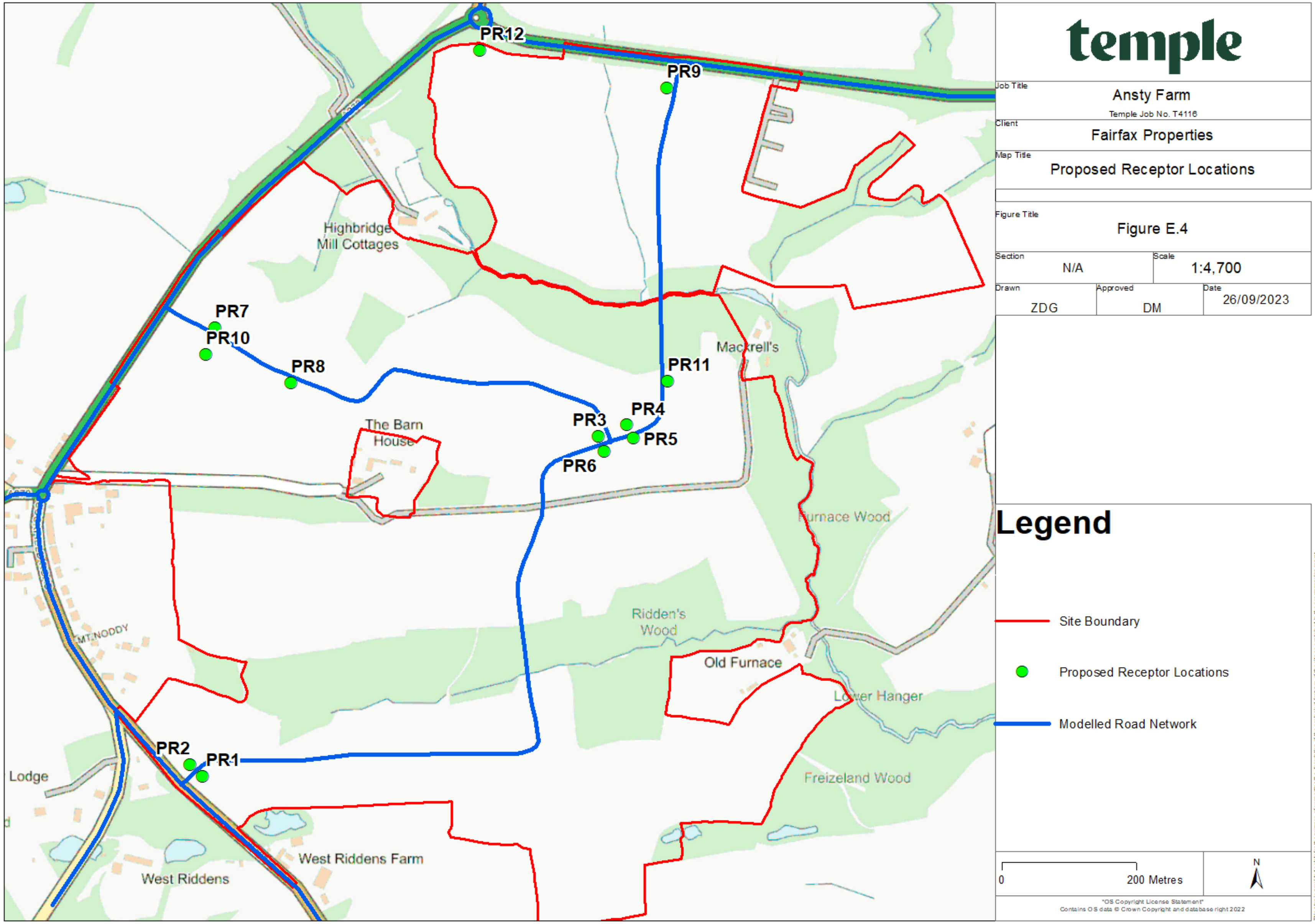


Figure D-4: Roads and proposed human receptors included in the modelling assessment



Modelled Receptors

D.3.8 Sensitive existing human and ecological receptors were selected at a range of locations (including worst-case ones) where members of the public and appropriate Ancient Woodlands are expected to be present and potentially regularly exposed to air pollutants. In addition, receptors were selected within the Site to assess whether future users may be exposed to poor ambient air quality when the Proposed Development is operational. The receptors included are shown in **Table D.9** below. Moreover, the human receptors are presented in **Figure D-2**, **Figure D-3** and **Figure D-4** above and the ecological receptors in **Figure D-7** to **Figure D-12** below.

D.3.9 The assessment has assumed that all human receptors at ground floor level are elevated to 1.5m, to represent the average breathing height for a human. The ecological receptors were modelled at ground level (0.0m). The Proposed Development elevation plans were used to elevate receptors at higher storeys to 1.5m above the height of each finished storey.

Table D.9: List of receptors modelled in all scenarios

Receptor ID	Receptor Type	X	Y	Z
R1	Existing Sensitive Receptors	531321.0	124158.0	1.5
R2		531319.0	124189.0	1.5
R3		531393.0	124161.0	1.5
R4		531436.0	124192.0	1.5
R5		531337.0	124228.0	1.5
R6		531407.0	124248.0	1.5
R7		530252.0	124062.0	1.5
R8		529997.0	124295.0	1.5
R9		530204.0	124432.0	1.5
R10		530251.0	124492.0	1.5
R11		529624.0	123817.0	1.5
R12		529136.0	123315.0	1.5
R13		529152.0	123296.0	1.5
R14		529120.0	123280.0	1.5
R15		529092.0	123304.0	1.5
R16		529144.0	123236.0	1.5
R17		529227.0	123012.0	1.5
R18		529152.0	123094.0	1.5
R19		529248.0	122883.0	1.5
R20		529247.0	122741.0	1.5
R21		529492.0	122755.0	1.5
R22		529627.0	123339.0	1.5
R23		530198.0	123522.0	1.5
PR1		529374.0	122870.0	1.5

Receptor ID	Receptor Type	X	Y	Z
PR2	Proposed Development Sensitive Receptors (at the boundaries of areas earmarked for residential end use closest to the existing local road network)	529356.0	122887.0	1.5
PR3		529964.0	123376.0	1.5
PR4		530006.0	123394.0	1.5
PR5		530016.0	123373.0	1.5
PR6		529972.0	123353.0	1.5
PR7		529393.0	123538.0	1.5
PR8		529505.0	123456.0	1.5
PR9		530067.0	123894.0	1.5
PR10		529379.0	123497.0	1.5
PR11		530068.0	123458.0	1.5
PR12		529787.0	123951.0	1.5
E1_11.75m	Highbridge Mill Ancient Woodland	529717.9	123945.8	0.0
E1_20m		529716.5	123937.7	0.0
E1_30m		529714.7	123927.8	0.0
E1_40m		529713.0	123918.0	0.0
E1_50m		529711.3	123908.1	0.0
E1_60m		529709.5	123898.3	0.0
E1_70m		529707.8	123888.4	0.0
E1_80m		529706.0	123878.6	0.0
E1_90m		529704.3	123868.7	0.0
E1_100m		529702.6	123858.9	0.0
E1_110m		529700.8	123849.0	0.0
E1_120m		529699.1	123839.2	0.0
E1_130m		529697.4	123829.3	0.0
E2_12.95m	Highbridge Mill North Ancient Woodland	529599.8	123883.8	0.0
E2_20m		529595.3	123889.2	0.0
E2_30m		529588.8	123896.9	0.0
E2_40m		529582.4	123904.5	0.0
E2_50m		529576.0	123912.2	0.0
E2_60m		529569.6	123919.8	0.0
E2_70m		529563.1	123927.5	0.0
E2_80m		529556.7	123935.2	0.0
E2_90m		529550.3	123942.8	0.0
E2_100m		529543.8	123950.5	0.0
E2_110m		529537.4	123958.1	0.0
E2_120m		529531.0	123965.8	0.0
E2_130m		529524.6	123973.5	0.0
E2_140m		529518.1	123981.1	0.0
E2_150m		529511.7	123988.8	0.0
E2_160m		529505.3	123996.4	0.0
E2_170m		529498.9	124004.1	0.0
E2_180m		529492.4	124011.8	0.0

Receptor ID	Receptor Type	X	Y	Z
E2_190m		529486.0	124019.4	0.0
E2_200m		529479.6	124027.1	0.0
E3_27.25m	Highbridge Mill Shaw Ancient Woodland	529617.4	123480.7	0.0
E3_30m		529617.4	123483.5	0.0
E3_40m		529617.4	123493.5	0.0
E3_50m		529617.4	123503.5	0.0
E3_60m		529617.4	123513.5	0.0
E3_70m		529617.4	123523.5	0.0
E3_80m		529617.4	123533.5	0.0
E3_90m		529617.4	123543.5	0.0
E3_100m		529617.4	123553.5	0.0
E3_110m		529617.4	123563.5	0.0
E3_120m		529617.4	123573.5	0.0
E3_130m		529617.4	123583.5	0.0
E4_130.75m	Mackrells Shaw Ancient Woodland	530188.5	123649.6	0.0
E4_140m		530197.8	123649.6	0.0
E4_150m		530207.8	123649.6	0.0
E4_160m		530217.8	123649.6	0.0
E4_170m		530227.8	123649.6	0.0
E4_180m		530237.8	123649.6	0.0
E4_190m		530247.8	123649.6	0.0
E4_200m		530257.8	123649.6	0.0
E5	Mackrells Farm Wood Ancient Woodland	530260.1	123505.2	0.0
E6_55.45m	Biddens Wood Ancient Woodland	529932.7	122923.9	0.0
E6_60m		529937.3	122923.9	0.0
E6_70m		529947.3	122923.9	0.0
E6_80m		529957.3	122923.9	0.0
E6_90m		529967.3	122923.9	0.0
E6_100m		529977.3	122923.9	0.0
E6_110m		529987.3	122923.9	0.0
E6_120m		529997.3	122923.9	0.0
E6_130m		530007.3	122923.9	0.0
E6_140m		530017.3	122923.9	0.0
E6_150m		530027.3	122923.9	0.0
E6_160m		530037.3	122923.9	0.0
E6_170m		530047.3	122923.9	0.0
E7_A	Dunstalls Wood Ancient Woodland	529383.3	122658.2	0.0
E7_B		529429.4	122668.2	0.0
E7_C		529208.3	122689.6	0.0
E7_2.7m		529114.9	122616.8	0.0

Receptor ID	Receptor Type	X	Y	Z
E7_10m		529119.6	122611.2	0.0
E7_20m		529126.0	122603.5	0.0
E7_30m		529132.4	122595.9	0.0
E7_40m		529138.9	122588.2	0.0
E7_50m		529145.3	122580.6	0.0
E7_60m		529151.7	122572.9	0.0
E7_70m		529158.2	122565.2	0.0
E7_80m		529164.6	122557.6	0.0
E7_90m		529171.0	122549.9	0.0
E7_100m		529177.4	122542.3	0.0
E7_110m		529183.9	122534.6	0.0
E7_120m		529190.3	122526.9	0.0
E7_130m		529196.7	122519.3	0.0
E7_140m		529203.2	122511.6	0.0
E7_150m		529209.6	122504.0	0.0
E7_160m		529216.0	122496.3	0.0
E8_2.4m	Birch Wood Ancient Woodland	529118.2	122641.7	0.0
E8_10m		529113.8	122647.9	0.0
E8_20m		529108.1	122656.1	0.0
E8_30m		529102.4	122664.3	0.0
E8_40m		529096.6	122672.5	0.0
E8_50m		529090.9	122680.7	0.0
E8_60m		529085.2	122688.9	0.0
E8_70m		529079.4	122697.1	0.0
E8_80m		529073.7	122705.3	0.0
E8_90m		529068.0	122713.5	0.0
E8_100m		529062.2	122721.6	0.0
E8_110m		529056.5	122729.8	0.0
E8_120m		529050.7	122738.0	0.0
E8_130m		529045.0	122746.2	0.0
E8_140m		529039.3	122754.4	0.0
E8_150m		529033.5	122762.6	0.0
E8_160m		529027.8	122770.8	0.0
E8_170m		529022.1	122779.0	0.0
E8_180m		529016.3	122787.2	0.0
E8_190m		529010.6	122795.4	0.0
E8_200m		529004.9	122803.6	0.0
E9_4m	Iholms Wood Ancient Woodland	528679.3	123017.1	0.0
E9_10m		528678.8	123023.1	0.0
E9_20m		528677.9	123033.0	0.0
E9_30m		528677.0	123043.0	0.0
E9_40m		528676.2	123053.0	0.0

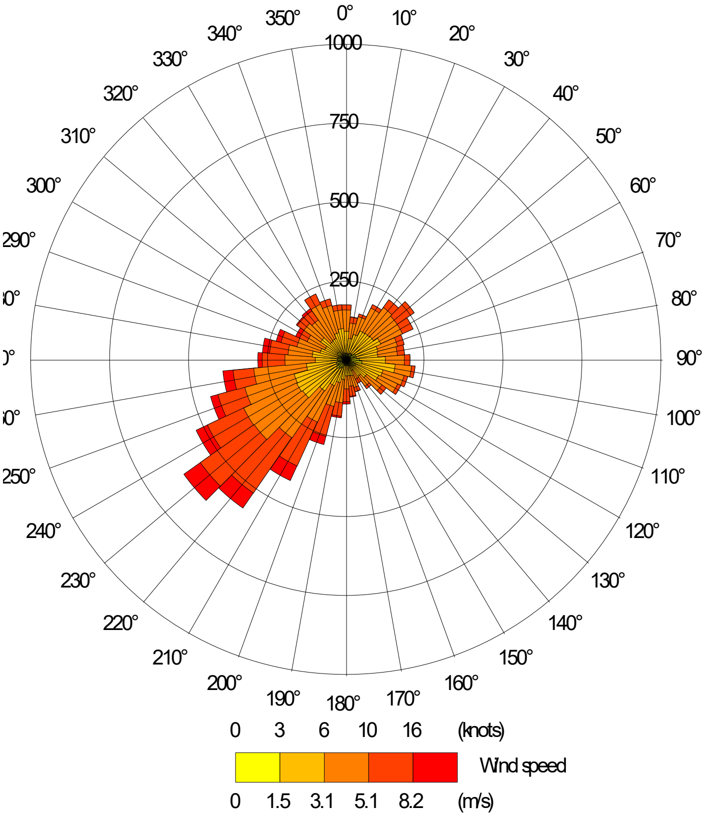
Receptor ID	Receptor Type	X	Y	Z
E9_50m		528675.3	123062.9	0.0
E9_60m		528674.4	123072.9	0.0
E9_70m		528673.5	123082.8	0.0
E9_80m		528672.7	123092.8	0.0
E9_90m		528671.8	123102.8	0.0
E9_100m		528670.9	123112.7	0.0
E9_110m		528670.1	123122.7	0.0
E9_120m		528669.2	123132.7	0.0
E9_130m		528668.3	123142.6	0.0
E9_140m		528667.4	123152.6	0.0
E9_150m		528666.6	123162.5	0.0
E9_160m		528665.7	123172.5	0.0
E9_170m		528664.8	123182.5	0.0
E9_180m		528664.0	123192.4	0.0
E9_190m		528663.1	123202.4	0.0
E9_200m		528662.2	123212.4	0.0
E10_7m	Pickwell Shaw Ancient Woodland	528591.8	123013.4	0.0
E10_10m		528591.5	123016.4	0.0
E10_20m		528590.7	123026.4	0.0
E10_30m		528589.8	123036.3	0.0
E10_40m		528588.9	123046.3	0.0
E10_50m		528588.1	123056.2	0.0
E10_60m		528587.2	123066.2	0.0
E10_70m		528586.3	123076.2	0.0
E10_80m		528585.4	123086.1	0.0
E10_90m		528584.6	123096.1	0.0

Meteorological data

D.3.10 This study utilised the 2019 year of modelled Numerical Weather Prediction data. The wind rose (showing the wind direction and speed) for each year of meteorological data used are set out in Figure 3-1, below. The wind rose for 2019 meteorological data used in our model is set out in **Figure D.5**.

D.3.11 The source of the meteorological data was used for consistency with the odour assessment. Data for 2019 was used to enable consistency with the year for which baseline traffic data were provided.

Figure D.5: Wind rose from the NWP meteorological data during 2019



Background Concentrations

D.3.12 The total concentration of a pollutant comprises those from the modelled local emission sources and background pollutant concentrations, which are transported into an area by the wind from further away.

D.3.13 The Defra UK-AIR concentration applicable to the assessed year and 1km^2 grid within which each receptor is located has been applied.

D.3.14 The annual mean NO_2, PM_{10} and $PM_{2.5}$ background concentrations applied (following adjustment) at each of the receptor locations is shown in **Table D.10**. As the Defra background mapping data only includes data up to 2030, this year has been used to represent the concentrations in the opening year, 2039, and is therefore considered to be conservative, as background concentrations of NO_2, PM_{10} and $PM_{2.5}$ are predicted to further decrease with time.

Table D.10: Background annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations applied at each of the modelled receptor locations

Grid Square	NO_2			PM_{10}			$PM_{2.5}$		
	2019	2027	2039 (2030)	2019	2027	2039 (2030)	2019	2027	2039 (2030)
531500, 124500	9.2	7.1	6.8	13.8	12.7	12.8	9.3	8.5	8.5

Grid Square	NO_2			PM_{10}			$PM_{2.5}$		
	2019	2027	2039 (2030)	2019	2027	2039 (2030)	2019	2027	2039 (2030)
530500, 124500	9.0	7.0	6.7	13.8	12.7	12.8	9.2	8.4	8.4
529500, 124500	8.5	6.6	6.2	13.7	12.6	12.6	9.0	8.2	8.2
529500, 123500	9.1	6.9	6.5	14.6	13.5	13.5	9.3	8.5	8.5
529500, 122500	8.8	6.8	6.5	14.2	13.1	13.1	9.2	8.3	8.4
530500, 123500	8.8	6.7	6.3	14.0	12.9	13.0	9.2	8.3	8.4
530500, 122500	8.4	6.5	6.2	13.8	12.7	12.7	9.1	8.2	8.3
528500, 123500	8.9	6.8	6.4	13.5	12.5	12.5	9.0	8.2	8.2

Summary of additional model inputs

A summary of the additional parameters considered in the dispersion modelling study are outlined in **Table D.11** below.

Table D.11: Summary of additional model input parameters

Parameter	Input into model
Road elevation	No terrain file used.
Road width	Road widths determined based on approximate measurement of roads using online measurement tools.
Canyon heights	The building configuration on both sides of the road did not lead to the formation of street canyons.
Surface roughness	A value of 0.5 at the dispersion site and 0.3 at the meteorological site.
Monin-Obukhov length	Assumed to be 10m at the site (representative of small towns <50,000). Was not set for meteorological data site and instead was calculated by the model.

Post-processing of modelled results

D.3.15 At each human receptor, the following method was used to estimate total annual mean pollutant concentrations:

- Modelled road NO_x, PM_{10} and $PM_{2.5}$ concentrations were adjusted (as part of model verification) using the method set out below, as per TG22;
- The road source NO_2 at each receptor was estimated from the modelled NO_x concentration using version 8.1 of the NO_x to NO_2 calculator; and,
- Adjusted annual mean road NO_2, PM_{10} and $PM_{2.5}$ concentrations were added to the applicable background contribution.

D.3.16 According to the EPUK-IAQM guidance, the 24-hour mean PM_{10} AQO will not be exceeded unless the annual mean PM_{10} AQO exceeds ~31μg/m^3. TG22 indicates that exceedances of the hourly mean NO_2 AQO should not be excepted if annual mean NO_2 concentrations are below 60µg/m^3. These criteria have been used to determine whether the Proposed Development is likely to expose human receptors into an area where the relevant short-term AQOs may be exceeded.

Model verification

D.3.17 Model verification refers to checks that are carried out on model performance in relation to roads modelling at a local level. Modelled concentrations are compared with the results of local monitoring and, where there is a disparity between modelled and monitored concentrations, an adjustment may be applied to the final model output.

D.3.18 Model verification for NO_2 was undertaken for this assessment using the 2022 data monitored at the 5 roadside duplicate diffusion tubes sites, obtained via surveys undertaken by Temple. These monitoring locations were selected as they are located on the nearest 'roadside' locations likely to be impacted by the Proposed Development site.

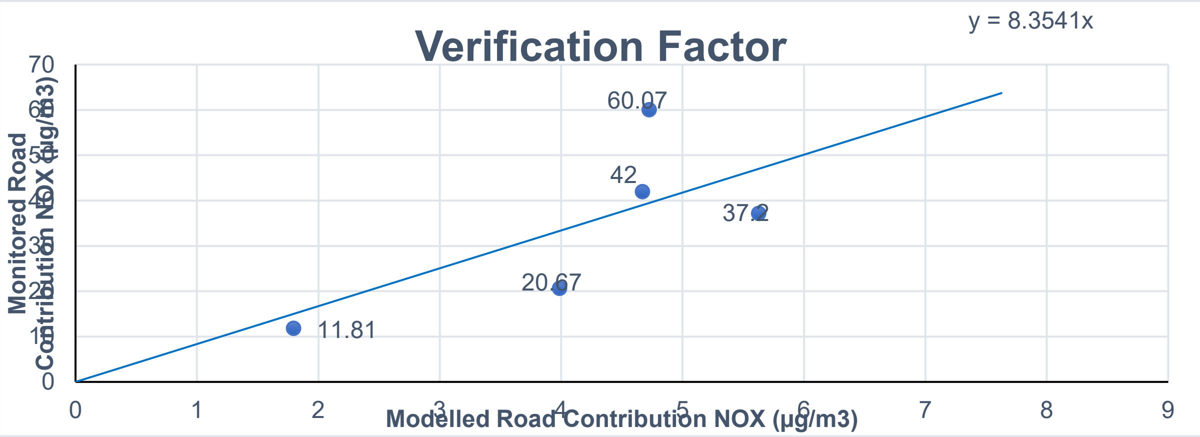
D.3.19 Model verification for PM_{10} and $PM_{2.5}$ was undertaken using the NOx verification factor. This approach is recommended in TG22 where there are no suitable 'roadside' verification sites within the vicinity of the Proposed Development site.

D.3.20 **Table D.12** and **Figure D.6** below summarises the comparison of monitored versus modelled NOx concentrations at the diffusion tube used for model verification and assessment purposes. The monitored road NOx was calculated by converting roadside NO_2 (i.e. monitored NO_2 – background NO_2) to NOx using the latest version of the NOx to NO_2 calculator. The model was identified as underpredicting modelled pollutant concentrations by a factor of 8.35. This adjustment factor was applied to all modelled road concentrations before being combined with background concentrations.

Table D.12: Verification Table for NOx in the study area

Site number	L1	L2	L3	L4	L5
Monitored total NO_2 (µg/m^3)	30.6	28.3	19.8	38.8	15.5
Background NO_2 (µg/m^3)	9.1	9.1	8.8	9.2	9.0
Modelled road contribution NOX (µg/m^3)	4.7	5.6	4.0	4.7	1.8
Monitored road contribution NOx (µg/m^3)	42.0	37.2	20.7	60.1	11.8
Monitored NOX / Modelled NOX (Correction Factor)	**8.3541**				

Figure D.6: Comparison of modelled and monitored Road NOx before and after adjustment at model verification locations considered in this assessment



D.3.21 To determine whether the unadjusted modelled NOx concentrations are suitable post-adjustment, the percentage difference between the total modelled NO_2 and total monitored NO_2 at each monitoring site is required to be within 25% or ideally within 10%.

D.3.22 **Table D.13** below compares the percentage difference between the total monitored and modelled NO_2 concentrations, the latter calculated by inputting the modelled road NOx and background NO_2 into the NOx to NO_2 calculator. The average percentage difference and root mean square error (RMSE, which measures the average error or uncertainty in a model, with an ideal value of 0 µg/m^3) was 30.23% and 5.52 µg/m^3 respectively. This means the model overpredicted following verification such that assessed impacts are conservative.

Table D.13: Comparison of the modelled and monitored annual mean NO_2 concentrations at the verification locations post-adjustment

Monitoring Location	Monitoring Result NO_2	Background NOx	Background NO_2	Post-adjustment modelled road NOx	Total modelled NO_2	% difference in monitored vs modelled NO_2
L1	30.56	11.8	9.1	50.79	29.16	-4.6
L2	28.30	11.8	9.1	58.78	32.87	16.2
L3	19.83	11.4	8.8	44.66	26.14	31.8
L4	38.84	12.0	9.2	51.50	29.53	-24.0
L5	15.47	11.7	9.0	26.74	17.15	10.9

Appendix D4: Assessment of Effects on Ecological Receptors

D.4 Appendix D.4 – Assessment of Effects on Ecological Receptors

Amendments to Model Assessment Approach

D.4.1 The dispersion modelling method outlined in **Appendix D.3** was followed, except where amended as follows:

D.4.2 The emissions factor toolkit was used to estimate annual mean NO_x concentrations at ten Ancient Woodlands adjacent to modelled road network, for comparison to the annual mean NOx Air Quality Standard (30µg/m^3). Following the guidance in LA 105, where needed, transects were utilised and started at the boundary of each of the Ancient Woodlands and were spaced every 10 metres, up to a distance of 200m. The transects modelled across each woodland are presented in **Figures D.7 to D.13** below. Some individual standards were also modelled.

D.4.3 Due to the potential effects of the Development on air quality, ammonia (NH_3) emissions were predicted using the Calculator for Road Emissions of Ammonia (CREAM) toolkit (version 1a, Air Quality Consultants, 2020).

Post-processing of modelled results

D.4.4 Data were processed as follows.

D.4.5 First, the verified modelled road NOx was added to background NOx concentrations for comparison against the annual mean NOx AQO. Where the process contribution (PC), i.e. contribution from the Proposed Development, exceeds one per cent of the critical level, the data will be passed to the project ecologists for further determination as significant or insignificant.

D.4.6 Second, the NH_3 concentration has been compared to the critical load of 1µg/m^3, as defined in Table 8.1 of the ES Volume 2: Chapter 8 (Air Quality). NH_3 concentrations were not verified. Where the process contribution (PC), i.e. contribution from the Proposed Development, exceeds one per cent of the critical level, the data will be passed to the project ecologists for further determination as significant or insignificant.

D.4.7 Third, the annual mean nitrogen and NH_3 deposition concentration were converted from the annual mean NOx and NH_3 PC using the method outlined in Environment Agency (2014)[2] guidance for woodlands, in relation to its potential to cause eutrophication. The PCs from each pollutant will be summed and compared to the nitrogen critical load. Where the PC exceeds one per cent of the critical load, the data will be passed to the project ecologists for further determination as significant or insignificant.

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[2] Environment Agency, 2013. *Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.*

D.4.8 Fourth, the annual mean nitrogen and NH_3 deposition concentration will be converted from the annual mean NOx and NH_3 PC using the method outlined in the Environment Agency 2014 guidance for woodlands. The PCs from each pollutant will be summed and compared to the critical load function. Where the PC exceeds one per cent of the critical load function, the data will be passed to the project ecologists for further determination as significant or insignificant. The contribution from road traffic to sulphur concentrations was not modelled as it is negligible.

D.4.9 Background concentrations of nitrogen and ammonia deposition; and critical loads, were taken from the Air Pollution Information System (APIS) website. The critical loads and levels were agreed with the project ecologists. Background deposition rates were obtained for the 1km^2 grid within which each receptor is located.

D.4.10 The results are presented in Table D.15 and Table D.16.

Figure D.7: Modelled transects for ecological receptors E1 and E2

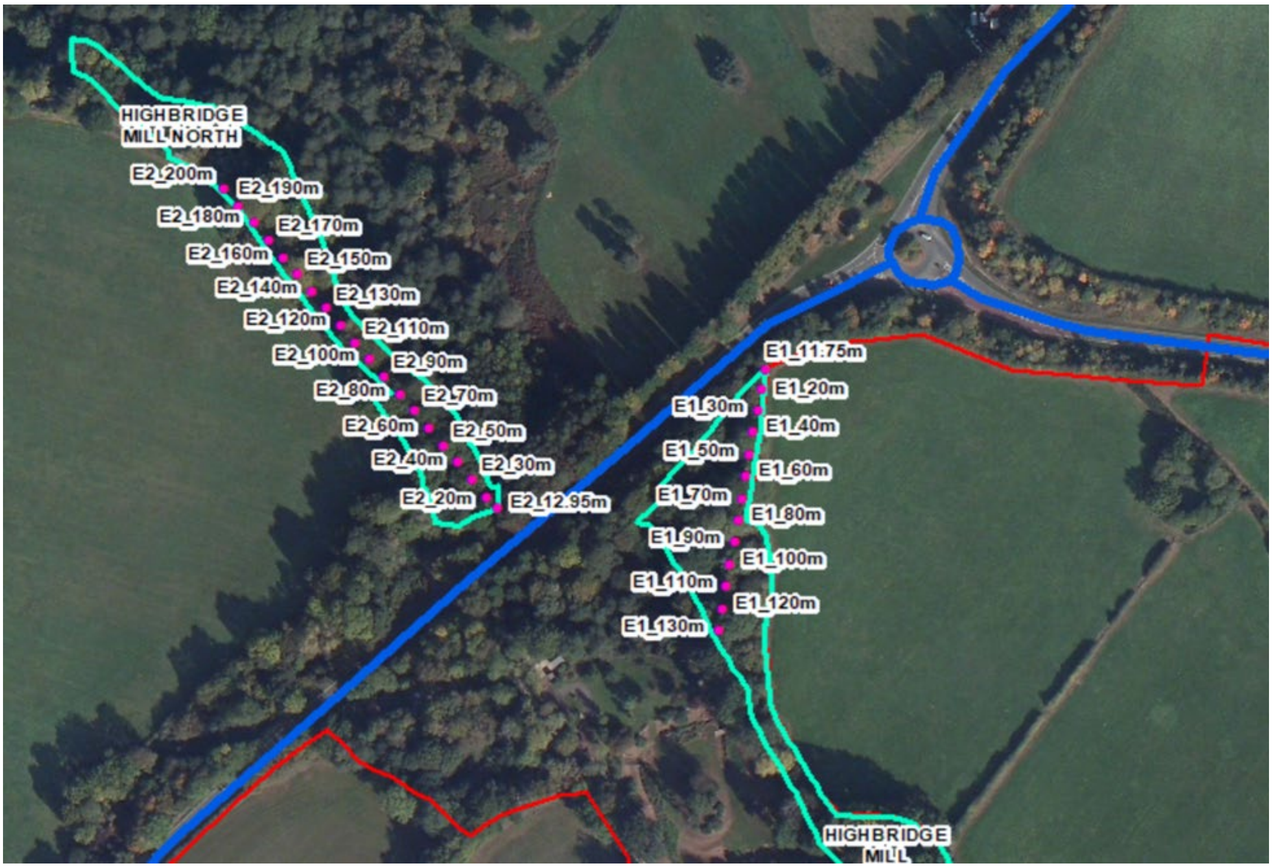

Figure D.8: Modelled transect for ecological receptor E3

Figure D.9: Modelled transect for ecological receptor E4

Figure D.10: Modelled transect for ecological receptor E5

Figure D.11: Modelled transect for ecological receptor E6

Figure D.12: Modelled transects for ecological receptors E7 and E8

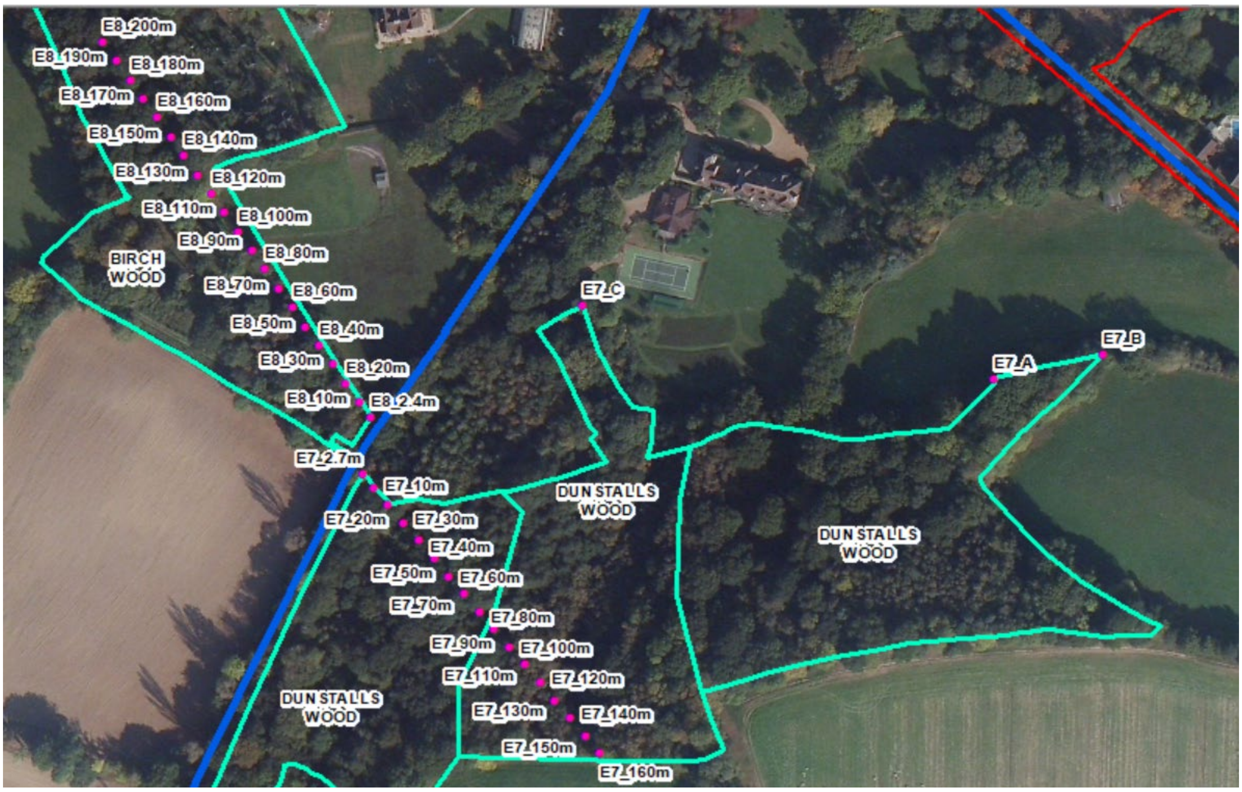

Figure D.13: Modelled transects for ecological receptors E9 and E10

Table D.15: Annual mean NO_x and NH_3 concentrations in S2 and S3 and comparison to critical levels

Receptor ID	X(m)	Y(m)	Z(m)	Annual Mean NO_x Concentrations (µg/m^3)					Annual Mean NH_3 Concentrations (µg/m^3)				
				Background	S2	S3	Critical Level	PC as % of Critical Level	Background	S2	S3	Critical Level	PC as % of Critical Level
E1_11.75m	529718	123946	0	8.29	20.83	20.57	30	-0.86	1.27	1.65	1.64	1	-0.92
E1_20m	529716	123938	0	8.29	17.94	17.77	30	-0.54	1.27	1.56	1.56	1	-0.62
E1_30m	529715	123928	0	8.29	15.83	15.74	30	-0.30	1.27	1.50	1.50	1	-0.41
E1_40m	529713	123918	0	8.29	14.48	14.44	30	-0.15	1.27	1.46	1.46	1	-0.27
E1_50m	529711	123908	0	8.29	13.55	13.54	30	-0.04	1.27	1.43	1.43	1	-0.17
E1_60m	529710	123898	0	8.29	12.87	12.88	30	0.04	1.27	1.41	1.41	1	-0.10
E1_70m	529708	123888	0	8.29	12.34	12.37	30	0.10	1.27	1.39	1.39	1	-0.04
E1_80m	529706	123879	0	8.29	11.92	11.97	30	0.16	1.27	1.38	1.38	1	0.01
E1_90m	529704	123869	0	8.29	11.59	11.65	30	0.20	1.27	1.37	1.37	1	0.04
E1_100m	529703	123859	0	8.29	11.31	11.38	30	0.24	1.27	1.36	1.36	1	0.08
E1_110m	529701	123849	0	8.29	11.08	11.16	30	0.27	1.27	1.35	1.36	1	0.11
E1_120m	529699	123839	0	8.29	10.88	10.97	30	0.30	1.27	1.35	1.35	1	0.13
E1_130m	529697	123829	0	8.29	10.71	10.81	30	0.33	1.27	1.34	1.35	1	0.16
E2_12.95m	529600	123884	0	8.29	18.45	18.25	30	-0.64	1.27	1.59	1.58	1	-0.74
E2_20m	529595	123889	0	8.29	15.55	15.45	30	-0.33	1.27	1.50	1.49	1	-0.44
E2_30m	529589	123897	0	8.29	13.48	13.45	30	-0.11	1.27	1.43	1.43	1	-0.23
E2_40m	529582	123905	0	8.29	12.34	12.34	30	0.01	1.27	1.40	1.39	1	-0.12
E2_50m	529576	123912	0	8.29	11.62	11.64	30	0.08	1.27	1.37	1.37	1	-0.05
E2_60m	529570	123920	0	8.29	11.12	11.15	30	0.12	1.27	1.36	1.36	1	0.00
E2_70m	529563	123928	0	8.29	10.75	10.80	30	0.15	1.27	1.35	1.35	1	0.03
E2_80m	529557	123935	0	8.29	10.47	10.52	30	0.17	1.27	1.34	1.34	1	0.05
E2_90m	529550	123943	0	8.29	10.25	10.31	30	0.18	1.27	1.33	1.33	1	0.07

Receptor ID	X(m)	Y(m)	Z(m)	Annual Mean NO_x Concentrations (μg/m^3)					Annual Mean NH_3 Concentrations (μg/m^3)				
				Background	S2	S3	Critical Level	PC as % of Critical Level	Background	S2	S3	Critical Level	PC as % of Critical Level
E2_100m	529544	123950	0	8.29	10.07	10.13	30	0.19	1.27	1.32	1.33	1	0.08
E2_110m	529537	123958	0	8.29	9.92	9.98	30	0.20	1.27	1.32	1.32	1	0.09
E2_120m	529531	123966	0	8.29	9.80	9.86	30	0.20	1.27	1.32	1.32	1	0.09
E2_130m	529525	123973	0	8.29	9.69	9.75	30	0.20	1.27	1.31	1.31	1	0.10
E2_140m	529518	123981	0	8.29	9.60	9.66	30	0.20	1.27	1.31	1.31	1	0.10
E2_150m	529512	123989	0	8.29	9.52	9.58	30	0.20	1.27	1.31	1.31	1	0.11
E2_160m	529505	123996	0	8.29	9.44	9.50	30	0.20	1.27	1.30	1.31	1	0.11
E2_170m	529499	124004	0	7.93	9.03	9.08	30	0.20	1.27	1.30	1.30	1	0.11
E2_180m	529492	124012	0	7.93	8.97	9.03	30	0.20	1.27	1.30	1.30	1	0.11
E2_190m	529486	124019	0	7.93	8.91	8.97	30	0.19	1.27	1.30	1.30	1	0.11
E2_200m	529480	124027	0	7.93	8.87	8.92	30	0.19	1.27	1.30	1.30	1	0.11
E3_27.25m	529617	123481	0	8.29	9.22	10.43	30	4.06	1.27	1.30	1.33	1	3.13
E3_30m	529617	123483	0	8.29	9.22	10.36	30	3.81	1.27	1.30	1.33	1	2.94
E3_40m	529617	123493	0	8.29	9.24	10.17	30	3.11	1.27	1.30	1.32	1	2.37
E3_50m	529617	123503	0	8.29	9.25	10.03	30	2.60	1.27	1.30	1.32	1	1.97
E3_60m	529617	123513	0	8.29	9.27	9.94	30	2.23	1.27	1.30	1.32	1	1.68
E3_70m	529617	123523	0	8.29	9.29	9.88	30	1.96	1.27	1.30	1.31	1	1.46
E3_80m	529617	123533	0	8.29	9.31	9.83	30	1.75	1.27	1.30	1.31	1	1.30
E3_90m	529617	123543	0	8.29	9.33	9.81	30	1.59	1.27	1.30	1.31	1	1.16
E3_100m	529617	123553	0	8.29	9.35	9.79	30	1.46	1.27	1.30	1.31	1	1.06
E3_110m	529617	123564	0	8.29	9.37	9.78	30	1.35	1.27	1.30	1.31	1	0.97
E3_120m	529617	123574	0	8.29	9.40	9.77	30	1.26	1.27	1.30	1.31	1	0.89
E3_130m	529617	123584	0	8.29	9.42	9.78	30	1.18	1.27	1.30	1.31	1	0.83

Receptor ID	X(m)	Y(m)	Z(m)	Annual Mean NO_x Concentrations (µg/m³)					Annual Mean NH_3 Concentrations (µg/m³)				
				Background	S2	S3	Critical Level	PC as % of Critical Level	Background	S2	S3	Critical Level	PC as % of Critical Level
E4_130.75 m	530189	123650	0	8.06	8.78	9.09	30	1.01	1.29	1.31	1.32	1	0.75
E4_140m	530198	123650	0	8.06	8.78	9.07	30	0.95	1.29	1.31	1.32	1	0.71
E4_150m	530208	123650	0	8.06	8.78	9.05	30	0.90	1.29	1.31	1.32	1	0.67
E4_160m	530218	123650	0	8.06	8.78	9.04	30	0.86	1.29	1.31	1.32	1	0.64
E4_170m	530228	123650	0	8.06	8.78	9.02	30	0.81	1.29	1.31	1.32	1	0.60
E4_180m	530238	123650	0	8.06	8.78	9.01	30	0.78	1.29	1.31	1.32	1	0.58
E4_190m	530248	123650	0	8.06	8.78	9.00	30	0.74	1.29	1.31	1.32	1	0.55
E4_200m	530258	123650	0	8.06	8.78	8.99	30	0.71	1.29	1.31	1.32	1	0.52
E5	530260	123505	0	8.06	8.59	8.79	30	0.67	1.29	1.31	1.31	1	0.51
E6_55.45m	529933	122924	0	8.24	8.65	9.02	30	1.22	1.27	1.28	1.29	1	0.95
E6_60m	529937	122924	0	8.24	8.65	8.99	30	1.13	1.27	1.28	1.29	1	0.88
E6_70m	529947	122924	0	8.24	8.64	8.94	30	0.99	1.27	1.28	1.29	1	0.77
E6_80m	529957	122924	0	8.24	8.64	8.90	30	0.88	1.27	1.28	1.29	1	0.68
E6_90m	529967	122924	0	8.24	8.64	8.87	30	0.80	1.27	1.28	1.29	1	0.62
E6_100m	529977	122924	0	8.24	8.63	8.85	30	0.73	1.27	1.28	1.29	1	0.56
E6_110m	529987	122924	0	8.24	8.63	8.83	30	0.67	1.27	1.28	1.29	1	0.52
E6_120m	529997	122924	0	8.24	8.62	8.81	30	0.63	1.27	1.28	1.29	1	0.48
E6_130m	530007	122924	0	7.87	8.24	8.42	30	0.59	1.28	1.29	1.30	1	0.45
E6_140m	530017	122924	0	7.87	8.24	8.41	30	0.55	1.28	1.29	1.30	1	0.43
E6_150m	530027	122924	0	7.87	8.24	8.39	30	0.53	1.28	1.29	1.30	1	0.40
E6_160m	530037	122924	0	7.87	8.23	8.38	30	0.50	1.28	1.29	1.29	1	0.38
E6_170m	530047	122924	0	7.87	8.23	8.37	30	0.48	1.28	1.29	1.29	1	0.37
E7_A	529383	122658	0	8.24	9.18	9.35	30	0.57	1.27	1.30	1.30	1	0.43

Receptor ID	X(m)	Y(m)	Z(m)	Annual Mean NO_x Concentrations (µg/m^3)					Annual Mean NH_3 Concentrations (µg/m^3)				
				Background	S2	S3	Critical Level	PC as % of Critical Level	Background	S2	S3	Critical Level	PC as % of Critical Level
E7_B	529429	122668	0	8.24	9.40	9.59	30	0.64	1.27	1.31	1.31	1	0.50
E7_C	529208	122690	0	8.24	9.79	10.09	30	0.99	1.27	1.32	1.32	1	0.81
E7_2.7m	529115	122617	0	8.24	14.90	16.22	30	4.42	1.27	1.46	1.50	1	3.89
E7_10m	529120	122611	0	8.24	12.00	12.73	30	2.46	1.27	1.38	1.40	1	2.15
E7_20m	529126	122604	0	8.24	10.68	11.15	30	1.57	1.27	1.34	1.35	1	1.35
E7_30m	529132	122596	0	8.24	10.09	10.45	30	1.18	1.27	1.32	1.33	1	1.01
E7_40m	529139	122588	0	8.24	9.77	10.06	30	0.96	1.27	1.31	1.32	1	0.81
E7_50m	529145	122581	0	8.24	9.56	9.80	30	0.82	1.27	1.31	1.32	1	0.69
E7_60m	529152	122573	0	8.24	9.41	9.63	30	0.72	1.27	1.30	1.31	1	0.60
E7_70m	529158	122565	0	8.24	9.31	9.50	30	0.65	1.27	1.30	1.31	1	0.54
E7_80m	529165	122558	0	8.24	9.22	9.40	30	0.59	1.27	1.30	1.30	1	0.49
E7_90m	529171	122550	0	8.24	9.16	9.32	30	0.55	1.27	1.30	1.30	1	0.45
E7_100m	529177	122542	0	8.24	9.10	9.25	30	0.51	1.27	1.30	1.30	1	0.42
E7_110m	529184	122535	0	8.24	9.06	9.20	30	0.48	1.27	1.29	1.30	1	0.39
E7_120m	529190	122527	0	8.24	9.02	9.15	30	0.45	1.27	1.29	1.30	1	0.37
E7_130m	529197	122519	0	8.24	8.98	9.11	30	0.43	1.27	1.29	1.30	1	0.35
E7_140m	529203	122512	0	8.24	8.96	9.08	30	0.41	1.27	1.29	1.29	1	0.33
E7_150m	529210	122504	0	8.24	8.93	9.05	30	0.39	1.27	1.29	1.29	1	0.32
E7_160m	529216	122496	0	8.24	8.91	9.02	30	0.38	1.27	1.29	1.29	1	0.31
E8_2.4m	529118	122642	0	8.24	14.07	15.22	30	3.85	1.27	1.44	1.47	1	3.38
E8_10m	529114	122648	0	8.24	11.35	11.96	30	2.02	1.27	1.36	1.38	1	1.75
E8_20m	529108	122656	0	8.24	10.27	10.65	30	1.28	1.27	1.33	1.34	1	1.09
E8_30m	529102	122664	0	8.24	9.81	10.10	30	0.96	1.27	1.32	1.32	1	0.81

Receptor ID	X(m)	Y(m)	Z(m)	Annual Mean NO_x Concentrations (µg/m^3)					Annual Mean NH_3 Concentrations (µg/m^3)				
				Background	S2	S3	Critical Level	PC as % of Critical Level	Background	S2	S3	Critical Level	PC as % of Critical Level
E8_40m	529097	122673	0	8.24	9.56	9.80	30	0.79	1.27	1.31	1.32	1	0.66
E8_50m	529091	122681	0	8.24	9.41	9.61	30	0.68	1.27	1.30	1.31	1	0.56
E8_60m	529085	122689	0	8.24	9.31	9.49	30	0.61	1.27	1.30	1.31	1	0.49
E8_70m	529079	122697	0	8.24	9.23	9.40	30	0.55	1.27	1.30	1.30	1	0.45
E8_80m	529074	122705	0	8.24	9.18	9.34	30	0.51	1.27	1.30	1.30	1	0.41
E8_90m	529068	122713	0	8.24	9.14	9.29	30	0.48	1.27	1.30	1.30	1	0.38
E8_100m	529062	122722	0	8.24	9.12	9.25	30	0.46	1.27	1.30	1.30	1	0.36
E8_110m	529057	122730	0	8.24	9.09	9.22	30	0.44	1.27	1.30	1.30	1	0.34
E8_120m	529051	122738	0	8.24	9.08	9.20	30	0.42	1.27	1.30	1.30	1	0.32
E8_130m	529045	122746	0	8.24	9.07	9.19	30	0.40	1.27	1.29	1.30	1	0.31
E8_140m	529039	122754	0	8.24	9.06	9.18	30	0.39	1.27	1.29	1.30	1	0.30
E8_150m	529034	122763	0	8.24	9.05	9.17	30	0.38	1.27	1.29	1.30	1	0.29
E8_160m	529028	122771	0	8.24	9.05	9.16	30	0.37	1.27	1.29	1.30	1	0.28
E8_170m	529022	122779	0	8.24	9.05	9.16	30	0.36	1.27	1.29	1.30	1	0.27
E8_180m	529016	122787	0	8.24	9.05	9.16	30	0.35	1.27	1.29	1.30	1	0.27
E8_190m	529011	122795	0	8.24	9.06	9.16	30	0.35	1.27	1.29	1.30	1	0.26
E8_200m	529005	122804	0	8.24	9.06	9.17	30	0.34	1.27	1.29	1.30	1	0.26
E9_4m	528679	123017	0	8.12	32.28	33.26	30	3.28	1.28	2.02	2.05	1	3.16
E9_10m	528679	123023	0	8.12	22.92	23.54	30	2.05	1.28	1.73	1.75	1	1.96
E9_20m	528678	123033	0	8.12	17.13	17.52	30	1.29	1.28	1.56	1.57	1	1.22
E9_30m	528677	123043	0	8.12	14.63	14.92	30	0.96	1.28	1.48	1.49	1	0.90
E9_40m	528676	123053	0	8.12	13.24	13.47	30	0.78	1.28	1.44	1.44	1	0.72
E9_50m	528675	123063	0	8.12	12.35	12.55	30	0.66	1.28	1.41	1.42	1	0.60

Receptor ID	X(m)	Y(m)	Z(m)	Annual Mean NO_x Concentrations (µg/m³)					Annual Mean NH_3 Concentrations (µg/m³)				
				Background	S2	S3	Critical Level	PC as % of Critical Level	Background	S2	S3	Critical Level	PC as % of Critical Level
E9_60m	528674	123073	0	8.12	11.73	11.91	30	0.58	1.28	1.39	1.40	1	0.52
E9_70m	528674	123083	0	8.12	11.28	11.43	30	0.52	1.28	1.38	1.38	1	0.46
E9_80m	528673	123093	0	8.12	10.93	11.07	30	0.47	1.28	1.37	1.37	1	0.42
E9_90m	528672	123103	0	8.12	10.65	10.78	30	0.43	1.28	1.36	1.36	1	0.38
E9_100m	528671	123113	0	8.12	10.42	10.54	30	0.40	1.28	1.35	1.35	1	0.35
E9_110m	528670	123123	0	8.12	10.23	10.35	30	0.38	1.28	1.34	1.35	1	0.32
E9_120m	528669	123133	0	8.12	10.07	10.18	30	0.36	1.28	1.34	1.34	1	0.30
E9_130m	528668	123143	0	8.12	9.94	10.04	30	0.34	1.28	1.34	1.34	1	0.29
E9_140m	528667	123153	0	8.12	9.82	9.92	30	0.32	1.28	1.33	1.33	1	0.27
E9_150m	528667	123163	0	8.12	9.72	9.81	30	0.31	1.28	1.33	1.33	1	0.26
E9_160m	528666	123173	0	8.12	9.62	9.71	30	0.29	1.28	1.33	1.33	1	0.24
E9_170m	528665	123182	0	8.12	9.54	9.63	30	0.28	1.28	1.32	1.33	1	0.23
E9_180m	528664	123192	0	8.12	9.47	9.55	30	0.27	1.28	1.32	1.32	1	0.22
E9_190m	528663	123202	0	8.12	9.41	9.48	30	0.26	1.28	1.32	1.32	1	0.22
E9_200m	528662	123212	0	8.12	9.35	9.42	30	0.26	1.28	1.32	1.32	1	0.21
E10_7m	528592	123013	0	8.12	25.74	26.47	30	2.42	1.28	1.82	1.84	1	2.32
E10_10m	528592	123016	0	8.12	22.10	22.69	30	1.94	1.28	1.71	1.73	1	1.85
E10_20m	528591	123026	0	8.12	16.35	16.71	30	1.18	1.28	1.53	1.54	1	1.11
E10_30m	528590	123036	0	8.12	13.95	14.20	30	0.86	1.28	1.46	1.47	1	0.80
E10_40m	528589	123046	0	8.12	12.64	12.84	30	0.69	1.28	1.42	1.42	1	0.64
E10_50m	528588	123056	0	8.12	11.81	11.99	30	0.58	1.28	1.39	1.40	1	0.53
E10_60m	528587	123066	0	8.12	11.25	11.40	30	0.51	1.28	1.38	1.38	1	0.46
E10_70m	528586	123076	0	8.12	10.84	10.98	30	0.45	1.28	1.36	1.37	1	0.40

Receptor ID	X(m)	Y(m)	Z(m)	Annual Mean NO_x Concentrations (µg/m³)					Annual Mean NH_3 Concentrations (µg/m³)				
				Background	S2	S3	Critical Level	PC as % of Critical Level	Background	S2	S3	Critical Level	PC as % of Critical Level
E10_80m	528585	123086	0	8.12	10.53	10.65	30	0.41	1.28	1.35	1.36	1	0.36
E10_90m	528585	123096	0	8.12	10.29	10.40	30	0.38	1.28	1.35	1.35	1	0.33

Table D.16: Annual nitrogen deposition and acid deposition in S2 and S3 and comparison to critical loads

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E1_11.75m	22.57	29.25	10	-1.12	-1.13	1.61	0.17	2.26	2.26	-0.01	3.128	-0.26	2.26
E1_20m	22.57	28.16	10	-0.72	-0.73	1.61	0.17	2.18	2.18	-0.01	3.128	-0.16	2.18
E1_30m	22.57	27.36	10	-0.46	-0.47	1.61	0.17	2.12	2.12	0.00	3.128	-0.11	2.12
E1_40m	22.57	26.85	10	-0.27	-0.31	1.61	0.17	2.09	2.09	0.00	3.128	-0.06	2.09
E1_50m	22.57	26.50	10	-0.16	-0.17	1.61	0.17	2.06	2.06	0.00	3.128	-0.04	2.06
E1_60m	22.57	26.24	10	-0.05	-0.06	1.61	0.17	2.04	2.04	0.00	3.128	-0.01	2.04
E1_70m	22.57	26.04	10	0.00	-0.01	1.61	0.17	2.03	2.03	0.00	3.128	0.00	2.03
E1_80m	22.57	25.88	10	0.09	0.08	1.61	0.17	2.02	2.02	0.00	3.128	0.02	2.02
E1_90m	22.57	25.76	10	0.12	0.11	1.61	0.17	2.01	2.01	0.00	3.128	0.03	2.01
E1_100m	22.57	25.65	10	0.18	0.16	1.61	0.17	2.00	2.00	0.00	3.128	0.04	2.00
E1_110m	22.57	25.57	10	0.23	0.22	1.61	0.17	1.99	1.99	0.00	3.128	0.05	1.99

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E1_120m	22.57	25.49	10	0.25	0.21	1.61	0.17	1.99	1.99	0.00	3.128	0.06	1.99
E1_130m	22.57	25.43	10	0.30	0.28	1.61	0.17	1.98	1.98	0.00	3.128	0.07	1.98
E2_12.95m	22.57	28.40	10	-0.86	-0.87	1.61	0.17	2.20	2.20	-0.01	3.128	-0.20	2.20
E2_20m	22.57	27.29	10	-0.49	-0.49	1.61	0.17	2.12	2.12	0.00	3.128	-0.11	2.12
E2_30m	22.57	26.48	10	-0.24	-0.24	1.61	0.17	2.06	2.06	0.00	3.128	-0.05	2.06
E2_40m	22.57	26.05	10	-0.09	-0.10	1.61	0.17	2.03	2.03	0.00	3.128	-0.02	2.03
E2_50m	22.57	25.76	10	-0.01	-0.02	1.61	0.17	2.01	2.01	0.00	3.128	0.00	2.01
E2_60m	22.57	25.57	10	0.06	0.02	1.61	0.17	1.99	1.99	0.00	3.128	0.01	1.99
E2_70m	22.57	25.43	10	0.08	0.07	1.61	0.17	1.98	1.98	0.00	3.128	0.02	1.98
E2_80m	22.57	25.32	10	0.13	0.12	1.61	0.17	1.98	1.98	0.00	3.128	0.03	1.98
E2_90m	22.57	25.23	10	0.14	0.13	1.61	0.17	1.97	1.97	0.00	3.128	0.03	1.97
E2_100m	22.57	25.16	10	0.15	0.14	1.61	0.17	1.96	1.96	0.00	3.128	0.03	1.96
E2_110m	22.57	25.10	10	0.15	0.15	1.61	0.17	1.96	1.96	0.00	3.128	0.04	1.96
E2_120m	22.57	25.05	10	0.16	0.15	1.61	0.17	1.96	1.96	0.00	3.128	0.04	1.96
E2_130m	22.57	25.01	10	0.16	0.16	1.61	0.17	1.95	1.95	0.00	3.128	0.04	1.95
E2_140m	22.57	24.98	10	0.17	0.16	1.61	0.17	1.95	1.95	0.00	3.128	0.04	1.95
E2_150m	22.57	24.94	10	0.20	0.16	1.61	0.17	1.95	1.95	0.00	3.128	0.04	1.95
E2_160m	22.57	24.92	10	0.20	0.16	1.61	0.17	1.95	1.95	0.00	3.128	0.05	1.95
E2_170m	22.61	24.85	10	0.20	0.16	1.62	0.17	1.95	1.95	0.00	3.135	0.05	1.95
E2_180m	22.61	24.83	10	0.17	0.17	1.62	0.17	1.95	1.95	0.00	3.135	0.04	1.95

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E2_190m	22.61	24.81	10	0.17	0.17	1.62	0.17	1.95	1.95	0.00	3.135	0.04	1.95
E2_200m	22.61	24.79	10	0.17	0.17	1.62	0.17	1.94	1.95	0.00	3.135	0.04	1.95
E3_27.25m	22.57	25.24	10	4.34	4.11	1.61	0.17	1.94	1.97	0.03	3.128	0.99	1.97
E3_30m	22.57	25.22	10	4.10	3.85	1.61	0.17	1.94	1.97	0.03	3.128	0.93	1.97
E3_40m	22.57	25.15	10	3.32	3.12	1.61	0.17	1.94	1.96	0.02	3.128	0.76	1.96
E3_50m	22.57	25.10	10	2.75	2.60	1.61	0.17	1.94	1.96	0.02	3.128	0.63	1.96
E3_60m	22.57	25.07	10	2.35	2.24	1.61	0.17	1.94	1.96	0.02	3.128	0.53	1.96
E3_70m	22.57	25.04	10	2.06	1.97	1.61	0.17	1.94	1.96	0.01	3.128	0.47	1.96
E3_80m	22.57	25.03	10	1.85	1.73	1.61	0.17	1.94	1.96	0.01	3.128	0.42	1.96
E3_90m	22.57	25.02	10	1.66	1.58	1.61	0.17	1.94	1.95	0.01	3.128	0.38	1.95
E3_100m	22.57	25.01	10	1.52	1.44	1.61	0.17	1.94	1.95	0.01	3.128	0.35	1.95
E3_110m	22.57	25.01	10	1.42	1.35	1.61	0.17	1.94	1.95	0.01	3.128	0.32	1.95
E3_120m	22.57	25.01	10	1.27	1.23	1.61	0.17	1.94	1.95	0.01	3.128	0.29	1.95
E3_130m	22.57	25.01	10	1.19	1.16	1.61	0.17	1.95	1.95	0.01	3.128	0.27	1.95
E4_130.75m	22.84	25.05	10	1.05	1.01	1.63	0.17	1.95	1.96	0.01	3.169	0.24	1.96
E4_140m	22.84	25.05	10	0.99	0.95	1.63	0.17	1.95	1.96	0.01	3.169	0.22	1.96
E4_150m	22.84	25.04	10	0.93	0.90	1.63	0.17	1.95	1.96	0.01	3.169	0.21	1.96
E4_160m	22.84	25.04	10	0.93	0.87	1.63	0.17	1.95	1.96	0.01	3.169	0.21	1.96
E4_170m	22.84	25.03	10	0.87	0.82	1.63	0.17	1.95	1.96	0.01	3.169	0.20	1.96
E4_180m	22.84	25.03	10	0.82	0.80	1.63	0.17	1.95	1.96	0.01	3.169	0.18	1.96

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E4_190m	22.84	25.03	10	0.80	0.75	1.63	0.17	1.95	1.96	0.01	3.169	0.18	1.96
E4_200m	22.84	25.02	10	0.75	0.70	1.63	0.17	1.95	1.96	0.01	3.169	0.17	1.96
E5	22.84	24.94	10	0.71	0.69	1.63	0.17	1.94	1.95	0.01	3.169	0.16	1.95
E6_55.45m	22.53	24.69	10	1.31	1.25	1.61	0.16	1.91	1.92	0.01	3.125	0.30	1.92
E6_60m	22.53	24.67	10	1.21	1.14	1.61	0.16	1.91	1.92	0.01	3.125	0.27	1.92
E6_70m	22.53	24.66	10	1.09	1.03	1.61	0.16	1.91	1.92	0.01	3.125	0.25	1.92
E6_80m	22.53	24.64	10	0.97	0.91	1.61	0.16	1.91	1.92	0.01	3.125	0.22	1.92
E6_90m	22.53	24.63	10	0.86	0.80	1.61	0.16	1.91	1.92	0.01	3.125	0.20	1.92
E6_100m	22.53	24.62	10	0.79	0.73	1.61	0.16	1.91	1.92	0.01	3.125	0.18	1.92
E6_110m	22.53	24.61	10	0.72	0.70	1.61	0.16	1.91	1.92	0.01	3.125	0.16	1.92
E6_120m	22.53	24.61	10	0.67	0.65	1.61	0.16	1.91	1.92	0.00	3.125	0.15	1.92
E6_130m	22.81	24.80	10	0.64	0.60	1.63	0.17	1.94	1.94	0.00	3.165	0.14	1.94
E6_140m	22.81	24.80	10	0.59	0.58	1.63	0.17	1.94	1.94	0.00	3.165	0.13	1.94
E6_150m	22.81	24.79	10	0.55	0.53	1.63	0.17	1.94	1.94	0.00	3.165	0.12	1.94
E6_160m	22.81	24.79	10	0.56	0.51	1.63	0.17	1.94	1.94	0.00	3.165	0.13	1.94
E6_170m	22.81	24.78	10	0.52	0.50	1.63	0.17	1.94	1.94	0.00	3.165	0.12	1.94
E7_A	22.53	24.82	10	0.59	0.62	1.61	0.16	1.93	1.93	0.00	3.125	0.14	1.93
E7_B	22.53	24.92	10	0.67	0.67	1.61	0.16	1.94	1.94	0.00	3.125	0.15	1.94
E7_C	22.53	25.11	10	1.12	1.10	1.61	0.16	1.95	1.95	0.01	3.125	0.26	1.95
E7_2.7m	22.53	27.45	10	5.08	4.83	1.61	0.16	2.08	2.12	0.04	3.125	1.16	2.12

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E7_10m	22.53	26.12	10	2.83	2.71	1.61	0.16	2.01	2.03	0.02	3.125	0.64	2.03
E7_20m	22.53	25.51	10	1.80	1.72	1.61	0.16	1.97	1.98	0.01	3.125	0.41	1.98
E7_30m	22.53	25.24	10	1.33	1.30	1.61	0.16	1.95	1.96	0.01	3.125	0.30	1.96
E7_40m	22.53	25.09	10	1.09	1.04	1.61	0.16	1.94	1.95	0.01	3.125	0.25	1.95
E7_50m	22.53	25.00	10	0.94	0.92	1.61	0.16	1.94	1.95	0.01	3.125	0.21	1.95
E7_60m	22.53	24.93	10	0.78	0.77	1.61	0.16	1.94	1.94	0.01	3.125	0.18	1.94
E7_70m	22.53	24.88	10	0.71	0.69	1.61	0.16	1.93	1.94	0.01	3.125	0.16	1.94
E7_80m	22.53	24.84	10	0.67	0.65	1.61	0.16	1.93	1.93	0.00	3.125	0.15	1.93
E7_90m	22.53	24.81	10	0.61	0.60	1.61	0.16	1.93	1.93	0.00	3.125	0.14	1.93
E7_100m	22.53	24.78	10	0.59	0.57	1.61	0.16	1.93	1.93	0.00	3.125	0.13	1.93
E7_110m	22.53	24.76	10	0.54	0.53	1.61	0.16	1.93	1.93	0.00	3.125	0.12	1.93
E7_120m	22.53	24.74	10	0.49	0.48	1.61	0.16	1.92	1.93	0.00	3.125	0.11	1.93
E7_130m	22.53	24.73	10	0.47	0.47	1.61	0.16	1.92	1.93	0.00	3.125	0.11	1.93
E7_140m	22.53	24.72	10	0.46	0.45	1.61	0.16	1.92	1.93	0.00	3.125	0.11	1.93
E7_150m	22.53	24.70	10	0.42	0.41	1.61	0.16	1.92	1.92	0.00	3.125	0.10	1.92
E7_160m	22.53	24.69	10	0.41	0.40	1.61	0.16	1.92	1.92	0.00	3.125	0.09	1.92
E8_2.4m	22.53	27.07	10	4.40	4.20	1.61	0.16	2.06	2.09	0.03	3.125	1.00	2.09
E8_10m	22.53	25.82	10	2.31	2.22	1.61	0.16	1.99	2.00	0.02	3.125	0.53	2.00
E8_20m	22.53	25.32	10	1.46	1.42	1.61	0.16	1.96	1.97	0.01	3.125	0.33	1.97
E8_30m	22.53	25.11	10	1.09	1.07	1.61	0.16	1.95	1.95	0.01	3.125	0.25	1.95

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E8_40m	22.53	24.99	10	0.89	0.84	1.61	0.16	1.94	1.95	0.01	3.125	0.20	1.95
E8_50m	22.53	24.92	10	0.75	0.74	1.61	0.16	1.94	1.94	0.01	3.125	0.17	1.94
E8_60m	22.53	24.87	10	0.67	0.66	1.61	0.16	1.93	1.94	0.00	3.125	0.15	1.94
E8_70m	22.53	24.84	10	0.61	0.60	1.61	0.16	1.93	1.93	0.00	3.125	0.14	1.93
E8_80m	22.53	24.81	10	0.55	0.54	1.61	0.16	1.93	1.93	0.00	3.125	0.13	1.93
E8_90m	22.53	24.80	10	0.53	0.52	1.61	0.16	1.93	1.93	0.00	3.125	0.12	1.93
E8_100m	22.53	24.78	10	0.51	0.51	1.61	0.16	1.93	1.93	0.00	3.125	0.12	1.93
E8_110m	22.53	24.77	10	0.47	0.46	1.61	0.16	1.93	1.93	0.00	3.125	0.11	1.93
E8_120m	22.53	24.76	10	0.45	0.45	1.61	0.16	1.93	1.93	0.00	3.125	0.10	1.93
E8_130m	22.53	24.76	10	0.44	0.44	1.61	0.16	1.93	1.93	0.00	3.125	0.10	1.93
E8_140m	22.53	24.75	10	0.41	0.43	1.61	0.16	1.93	1.93	0.00	3.125	0.09	1.93
E8_150m	22.53	24.75	10	0.40	0.40	1.61	0.16	1.93	1.93	0.00	3.125	0.09	1.93
E8_160m	22.53	24.75	10	0.39	0.39	1.61	0.16	1.93	1.93	0.00	3.125	0.09	1.93
E8_170m	22.53	24.75	10	0.39	0.38	1.61	0.16	1.93	1.93	0.00	3.125	0.09	1.93
E8_180m	22.53	24.75	10	0.38	0.38	1.61	0.16	1.93	1.93	0.00	3.125	0.09	1.93
E8_190m	22.53	24.75	10	0.38	0.38	1.61	0.16	1.93	1.93	0.00	3.125	0.09	1.93
E8_200m	22.53	24.75	10	0.37	0.37	1.61	0.16	1.93	1.93	0.00	3.125	0.08	1.93
E9_4m	22.30	33.92	10	3.84	3.70	1.59	0.16	2.55	2.58	0.03	3.128	0.87	2.58
E9_10m	22.30	30.19	10	2.45	2.36	1.59	0.16	2.29	2.31	0.02	3.128	0.56	2.31
E9_20m	22.30	27.84	10	1.53	1.47	1.59	0.16	2.13	2.15	0.01	3.128	0.35	2.15

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E9_30m	22.30	26.82	10	1.13	1.09	1.59	0.16	2.06	2.07	0.01	3.128	0.26	2.07
E9_40m	22.30	26.25	10	0.93	0.90	1.59	0.16	2.03	2.03	0.01	3.128	0.21	2.03
E9_50m	22.30	25.89	10	0.79	0.76	1.59	0.16	2.00	2.01	0.01	3.128	0.18	2.01
E9_60m	22.30	25.63	10	0.67	0.64	1.59	0.16	1.98	1.99	0.00	3.128	0.15	1.99
E9_70m	22.30	25.44	10	0.59	0.57	1.59	0.16	1.97	1.97	0.00	3.128	0.13	1.97
E9_80m	22.30	25.30	10	0.55	0.54	1.59	0.16	1.96	1.96	0.00	3.128	0.13	1.96
E9_90m	22.30	25.19	10	0.50	0.48	1.59	0.16	1.95	1.96	0.00	3.128	0.11	1.96
E9_100m	22.30	25.09	10	0.45	0.43	1.59	0.16	1.95	1.95	0.00	3.128	0.10	1.95
E9_110m	22.30	25.01	10	0.43	0.41	1.59	0.16	1.94	1.94	0.00	3.128	0.10	1.94
E9_120m	22.30	24.95	10	0.38	0.37	1.59	0.16	1.94	1.94	0.00	3.128	0.09	1.94
E9_130m	22.30	24.89	10	0.40	0.38	1.59	0.16	1.93	1.93	0.00	3.128	0.09	1.93
E9_140m	22.30	24.84	10	0.35	0.34	1.59	0.16	1.93	1.93	0.00	3.128	0.08	1.93
E9_150m	22.30	24.80	10	0.34	0.33	1.59	0.16	1.93	1.93	0.00	3.128	0.08	1.93
E9_160m	22.30	24.76	10	0.33	0.33	1.59	0.16	1.92	1.93	0.00	3.128	0.08	1.93
E9_170m	22.30	24.73	10	0.30	0.29	1.59	0.16	1.92	1.92	0.00	3.128	0.07	1.92
E9_180m	22.30	24.70	10	0.29	0.28	1.59	0.16	1.92	1.92	0.00	3.128	0.07	1.92
E9_190m	22.30	24.67	10	0.28	0.27	1.59	0.16	1.92	1.92	0.00	3.128	0.06	1.92
E9_200m	22.30	24.65	10	0.28	0.27	1.59	0.16	1.92	1.92	0.00	3.128	0.06	1.92
E10_7m	22.30	31.32	10	2.84	2.74	1.59	0.16	2.37	2.39	0.02	3.128	0.65	2.39
E10_10m	22.30	29.86	10	2.31	2.22	1.59	0.16	2.27	2.29	0.02	3.128	0.53	2.29

Receptor ID	Nutrient Nitrogen Deposition (kgN/ha/yr)					Acid Deposition (inclusive of ammonia)							
	Background N	S2	S3	Lower Critical Load	PC as % of Critical Load	Background N (keq/ha-1/year–1)	Background S (keq/ha-1/year–1)	S2 (keq/ha-1/year–1)	S3 (keq/ha-1/year–1)	PC (Deposited Nitrogen and Ammonia) (keq/ha-1/year–1)	CLMaxN	Diff. as % of Critical Load Function	Background N (keq/ha-1/year–1)
E10_20m	22.30	27.53	10	1.39	1.34	1.59	0.16	2.11	2.12	0.01	3.128	0.32	2.12
E10_30m	22.30	26.54	10	1.03	1.00	1.59	0.16	2.05	2.05	0.01	3.128	0.23	2.05
E10_40m	22.30	26.01	10	0.81	0.79	1.59	0.16	2.01	2.01	0.01	3.128	0.18	2.01
E10_50m	22.30	25.67	10	0.70	0.68	1.59	0.16	1.99	1.99	0.00	3.128	0.16	1.99
E10_60m	22.30	25.44	10	0.59	0.57	1.59	0.16	1.97	1.97	0.00	3.128	0.13	1.97
E10_70m	22.30	25.27	10	0.54	0.53	1.59	0.16	1.96	1.96	0.00	3.128	0.12	1.96
E10_80m	22.30	25.14	10	0.46	0.44	1.59	0.16	1.95	1.95	0.00	3.128	0.10	1.95
E10_90m	22.30	25.04	10	0.43	0.42	1.59	0.16	1.94	1.95	0.00	3.128	0.10	1.95

Appendix D5: Odour Assessment

Odour Dispersion Modelling Assessment

ANSTY GARDEN COMMUNITY, HAYWARDS HEATH

temple

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Document Control

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Contents

1 Introduction

Temple Group Limited (Temple) has undertaken an odour assessment at the land east of Ansty (i.e. Ansty Garden Community), near Haywards Heath, West Sussex, on behalf of Fairfax Acquisitions Limited. The Proposed Development comprises the construction of up to 1,450 new residential dwellings (including up to 90 retirement living / care home units), circa 25,000 m^2 of primary school area, circa 20,000 m^2 of special educational needs and disability (SEND) school area, and a local centre. The Site is located within the jurisdiction of Mid Sussex District Council (MSDC).

This report has been submitted to accompany the Environmental Statement. It reports on the assessment of odour effects on Site suitability in the vicinity of the Cuckfield Wastewater Treatment Works (WWTW), which is located adjacent to the north-eastern corner of the Site, based on results from olfactometric sniff tests and detailed dispersion modelling.

2 Legislation and Policy

2.1 National Legislation and Policy

Environmental Protection Act 1990

Odorous emissions and associated impacts are not covered by statutory standards in the UK. This is due to the subjective nature of odours and the issues surrounding measurement and assessment.

There are many activities which result in odour release and many of these odours have the potential to result in a loss of amenity for affected receptors (e.g. nearby residents, schools or places of work) or in some cases a statutory nuisance. It is up to the local authority or the Environment Agency to decide whether odorous emissions constitute a statutory nuisance. As defined in the Environmental Protection Act 1990[1], statutory nuisance is considered as:

"(c) fumes or gases emitted from premises so as to be prejudicial to health or a nuisance;

"(d) any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance;".

The Environmental Protection Act 1990**Error! Bookmark not defined.** specifies that:

"[...] it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 [which specifies that a local authority shall serve an abatement notice on statutory nuisance to impose various requirements] below and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint".

National Planning Policy Framework and Planning Practice Guidance (2021)

The National Planning Policy Framework (NPPF)[2] was published during July 2021.

Section 130 states that "*Planning policies and decisions should ensure that developments... create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience."*

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[1] Environment Protection Act 1990

[2] National Planning Policy Framework, 2021, Ministry for Housing, Communities and Local Government

Section 170 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".*

Section 185 states that *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."*

Moreover, paragraph 187 states: *"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*

The Planning Practice Guidance (PPG)[3] supports the NPPF[2] and was updated during 2019. Its stated purpose is to provide *"guiding principles on how planning can take into account the impact of new development on air quality"*. The PPG[3] specifies that "odour and dust can also be a planning concern, for example, because of the effect on local amenity".

2.2 Local Policy

Mid Sussex District Council Local Plan

Policy DP29 ("Noise, Air and Light Pollution") of the MSDC Local Plan[4], adopted during 2018, states that:

"The environment, including nationally designated environmental sites, nationally protected landscapes, areas of nature conservation or geological interest, wildlife habitats, and the quality of people's life will be protected from unacceptable levels of noise, light and air pollution by only permitting development where:

"It does not cause unacceptable levels of air pollution;

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[3] Planning Practice Guidance (PPG) -Air Quality, 2014, Department for Communities and Local Government. Online guidance available at: https://www.gov.uk/guidance/air-quality

[4] MSDC (2018), Mid Sussex District Council Local Plan 2014-2031

- *Development on land adjacent to an existing use which generates air pollution or odour would not cause any adverse effects on the proposed development or can be mitigated to reduce exposure to poor air quality to recognised and acceptable levels;*
- *Development proposals (where appropriate) are consistent with Air Quality Management Plans".*

2.3 Technical Standards and Guidance

Environment Agency Guidance

The Environment Agency (EA) has issued guidance[5] on odour which contains indicative benchmark levels for use in the assessment of potential impacts from facilities regulated under the Environmental Permitting (England and Wales) Regulations (2010)[6] and subsequent amendments (2016)[7].

Benchmark levels are stated as the 98th percentile (%ile) of hourly mean concentrations in European odour units (ou_E) over a year for odours of different offensiveness. In practice, this is the 175th highest hourly average recorded in the year. EA odour benchmark levels are summarised in **Table 2.1** below.

Table 2.1 Odour Benchmark Levels

Benchmark Level as 98th %ile of 1-hour Means (ou_E/m^3)	Offensiveness	Odour emission sources
1.5	Most offensive	Processes involving decaying animal or fish Processes involving septic effluent or sludge Biological landfill odours
3.0	Moderately offensive	Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting
6.0	Less offensive	Brewery Confectionery Coffee roasting Bakery

[5] Additional Guidance for H4 Odour Management, 2011. Environment Agency.

[6] The Environmental Permitting (England and Wales) Regulations 2010.

[7] The Environmental Permitting (England and Wales) Regulations 2016.

The guidance also describes the 'hedonic tone' of an odour, i.e. the generally accepted degree of pleasantness or unpleasantness (offensiveness) for a particular odour. Hedonic tones typically range from +4 for very pleasant odours (e.g. bakeries) to -4 for foul odours (e.g. rotting flesh). Neutral odours score 0. The hedonic tone score refers to the type of smell, irrespective of its intensity. This helps to decide how offensive an odour may be.

Department for Environment, Food and Rural Affairs Guidance

In order to provide some context to the odour benchmark values, the Department for Environment, Food and Rural Affairs (Defra) has provided the following descriptors through guidance[8], which whilst outdated, is still relevant to provide context to this assessment:

- $1ou_E/m^3$ is the point of detection;
- $5ou_E/m^3$ is a faint odour; and
- $10ou_E/m^3$ is a distinct odour.

An odour at a strength of $1ou_E/m^3$ is in reality so weak that it would not normally be detected outside the controlled environment of an odour laboratory by the majority of people (that is individuals with odour sensitivity in the 'normal' range – approximately 96% of the population). It is important to note that these values are based on laboratory measurements and in the general environment other factors affect our sense of odour perception. These include:

- The population is continuously exposed to a wide range of background odours at a range of different concentrations, and usually people are unaware of there being any background odours at all due to normal habituation. Individuals can also develop a tolerance to background and other specific odours. In an odour laboratory the determination of detection threshold is undertaken by comparison with non-odorous air, and in carefully controlled, odour-free, conditions. Normal background odours such as those from traffic, vegetation, grass mowing etc, can provide background odour concentrations from 5 to $60ou_E/m^3$ or more;
- The recognition threshold may be about $3ou_E/m^3$ although it might be less for offensive substances or higher if the receptor is less familiar with the odour or distracted by other stimuli; and
- An odour which fluctuates rapidly in concentration is often more noticeable than a steady odour at a low concentration.

[8] Odour Guidance for Local Authorities 2010. Defra.

Defra Guidance Nuisance Smells: How Councils Deal With Complaints

Defra published guidance[9] on nuisance smells and how councils deal with complaints in April 2015. The guidance outlines how councils assess and deal with nuisance odours from industrial, trade and business premises and makes reference to environmental permits as a means to control some potential smell nuisances.

Guidance on the assessment of Odour for Planning (Institute of Air Quality Management, 2018) ('the IAQM 2018 guidance)

This guidance, issued by the Institute of Air Quality Management (IAQM) in July 2018[10], advises that the perception of an odour is generally dependent on the relationship between odour sources, the number and sensitivity of any receptors, and the pathway connecting them. The effects of odour at individual receptors are dependent on the 'FIDOL' factors described below:

- *(F) Frequency of exposure;*
- *(I) Intensity: The individual's perception of the strength of the odour;*
- *(D) Duration: The overall duration that individuals are exposed to an odour over time;*
- *(O) Offensiveness: Odour unpleasantness or offensiveness describes the character of an odour as it relates to the 'hedonic tone' (which may be pleasant, neutral or unpleasant) at a given odour concentration/intensity. This can be assessed in the laboratory and when measured by the standard method and expressed on a standard nine-point scale, it is termed the hedonic score; and,*
- *(L) Location/ (R) Receptor Sensitivity: The type of land use and nature of human activities in the vicinity of an odour source. Tolerance and expectation of the receptor. The Location factor can be considered to encompass the receptor characteristics, receptor sensitivity, and socio-economic factors.*

The guidance suggests a method for field subjective olfactometric 'sniff test' assessments, dispersion modelling assessments and suggests approaches to assess the significance of odour effects, based on these FIDOL factors.

It suggests that receptor sensitivity can be defined by the definitions described in **Table 2.2**, regardless of the type of assessment completed.

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[9] Nuisance smells: how councils deal with complaints, 2015. Defra.

[10] Institute of Air Quality Management, 2018, *Guidance on the assessment of odour for planning 2018 v.1.1*

Table 2.2 Definitions of receptor sensitivity used in this assessment (derived from the IAQM 2018 guidance)

Receptor Sensitivity Category	Description of Receptor Sensitivity
High sensitivity receptor	Surrounding land where: • Users can reasonably expect enjoyment of a high level of amenity; and • People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools / education and tourist / cultural.
Medium sensitivity receptor	Surround land where: • Users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or • People wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low sensitivity receptor	Surrounding land where: • The enjoyment of amenity would not reasonably be expected; or • There is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

3 Odour Assessment Method

3.1 Outline

This odour assessment has been undertaken in accordance with the following outline scope:

- Description of relevant national and local legislation and policy;
- Detailed (quantitative) dispersion modelling assessing the potential odour effects of the WWTW on future Site users;
- Olfactometric sniff testing to corroborate the dispersion modelling assessment;
- Discussion of results; and
- Conclusion and recommendations.

The method used to complete the assessment is discussed further in the forthcoming subsections, as appropriate. It should be noted that the rural environs within which testing was undertaken does not show significant cumulative sources of odour requiring further consideration within this assessment.

3.2 Odour Dispersion Modelling Methodology

The ADMS-Roads model has been used to model odours connected with the current operation of the Cuckfield Wastewater Treatment Works on amenity (potential for odour related nuisance.

Odour Sources

Based on the planning application which was submitted to accompany a planning application for upgrades at the WWTW site (planning reference: WSCC/047/11/CU), the WWTW site comprises the following significant processes:

- 2 No. Primary Settlement Tanks,
- 2 No. Biological Trickling Filters,
- 2 Humus Tanks,
- 2 No. SAFF units,
- 2 No. 'Siltbuster' Clarifiers,
- 2 No. Stormwater Storage Tanks, and
- 2 No. Sludge Holding Tanks.

The emissions sources included in the dispersion model are included in **Table 3.1** below. All were modelled as area sources, which are shown in **Figure A.1** in **Annex A**.

Guidance on the emissions rates, temperatures and velocities for each potential on-site source were obtained from Michael Bull and Associates Limited (MBAL). Considering substantive variability exists between odour measurements which have historically been taken at different WWTW, MBAL were appointed to provide justification for the emissions rates adopted at the WWTW site; and also (in the absence of a WWTW site layout plan but relying on a list of processes at the WWTW site from a historically consented planning application) to identify the specific sources on-site generating odour and which required modelling.

MBAL state that *"Odour emission rates have been taken from the MBAL database*[11]*, this contains measured and estimated values of odour emission rate from over 50 works in the UK. The odour emission rates have been taken from odour assessment reports prepared for each works. A large majority of these assessments used on site measurements to obtain the odour emission rates. For each process, the values in the database have been extracted and sorted and the median value selected."*

It is understood that odour emission rates are also available from UK Water Industry Research (UKWIR)[12], however, these are derived from modelled values and the document itself states that *"it is not appropriate to treat these values… as the best to use""*. MBAL also sense-checked the validity of their odour emissions rates, having favourably compared them to the population equivalent, using the method identified in the UKWIR document.

According to MBAL, the Siltbuster Clarifiers appear to have been a temporary measure installed to treat a temporary increase in solids when the trickling filters had their media replaced. They would have been installed following the trickling filters and would be treating treated sewage which has a low odour emission rate. It is also understood that sludge is taken off-site for further treatment. Hence, these sources were not included.

Source heights were estimated based on-site photographs taken by Temple.

All sources were assumed to operate continuously throughout the year.

Table 3.1: Details of sources included in odour dispersion model

Odour-emitting process	Odour emissions rate (ouE/m²/s)	Height above ground level, m	Temperature (ºC)	Velocity (m/s)
Inlet works	15	0.5	15 (sewage typically warmer than average ambient	0 (Allows for passive diffusion)
Primary tanks	2.25	0.5		
Storm tanks	1.9	0.5		
SAFF unit	1.67	0.5		

[11] Bull, M., 2023. *Odour Emissions Database.* https://www.odourconsultant.co.uk/odour-emissions-database/

[12] Odour Control in Wastewater Treatment – Technical Reference Document 01/WW/13/3, 2001.

Odour-emitting process	Odour emissions rate (ouE/m²/s)	Height above ground level, m	Temperature (ºC)	Velocity (m/s)
Trickling filters	0.9	0.7	temperature)	
Humus tanks	0.65	0		
Sludge holding tanks	37.5	5		

Terrain

OS Terrain 50 data were applied within the dispersion model, applied using 10m * 10m grids.

Surface Characteristics

The surface roughness applied at the subject and meteorological site was 0.5 and 0.3 respectively. The minimum Monin-Obukhov length applied at the subject and meteorological site was 10 and 'use model calculated' respectively. These were selected with reference to the standard suggestions made in the ADMS model.

Receptors

Isopleth (contour) plots were produced by predicting concentrations at hypothetical (gridded) receptor locations at 1.5 m above ground level. Existing sensitive receptors near the Cuckfield Waste Water Treatment works were selected. Their locations are displayed in **Table 3.2** and **Figure A.2** in **Annex A**.

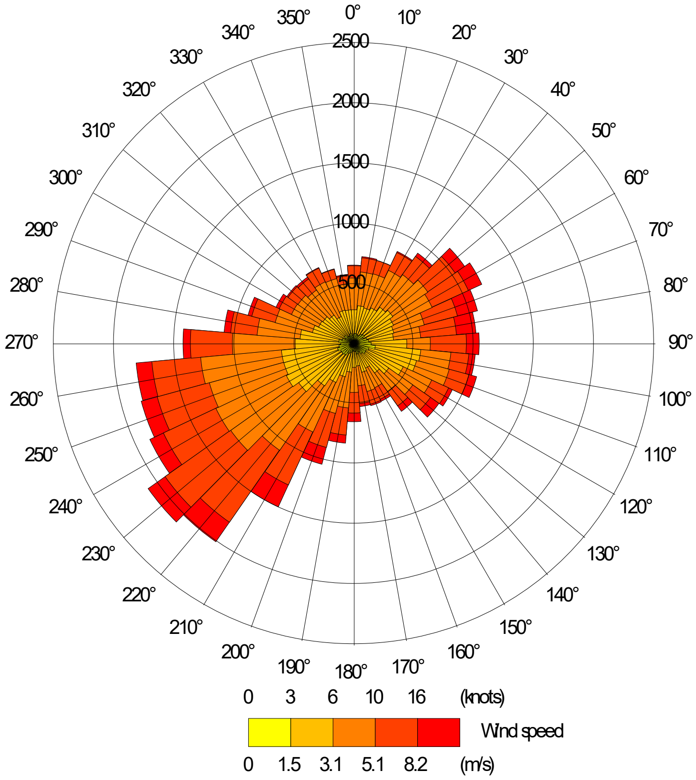
Table 3.2: Proposed Receptors located within Site Boundary modelled in the assessment

Receptor ID	Proposed Section of the Proposed Development	X	Y
F1	Sports Facility	530191	123863
F2	Sports Facility	530162	123748
R1	Residential	530021	123864
R2	Residential	530028	123767
R3	Residential	529975	123821
R4	Residential	530004	123678
R5	Residential	530155	123461
R6	Residential	529987	123469
R7	Residential	529730	123590

Meteorological Data

This study utilised five years (2017 - 2021) of modelled Numerical Weather Prediction data for a location centred over the WWTW. The wind rose (showing the wind direction and speed) for each year of meteorological data used are set out in **Figure 3.1**, below.

Figure 3.1: Windrose for Numerical Weather Prediction Data (2017 – 2021)



Additional limitations to the assessment

The assessment is subject to a number of limitations additional to those listed above, as follows:

- In the absence of on-site odour measurements or labelled WWTW site plans, the location and emissions rates from specific on-site processes have been judged and may be different in practice. Generally, the median odour emissions rate from the MBAL odour emissions database (collecting data from multiple odour assessments) has been used. However, it is noted that the MBAL database is taken from sites where an odour assessment has been carried out, arguably this may bias the odour emission rates to the higher end of the expected range as these would include sites where an odour problem has occurred and has required investigation. This factor provides more confidence that odour emission rates are unlikely to be underestimated if median values are selected (assuming that the subject site has no unusual odour issues).
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it is assumed that wind

conditions embedded in the Numerical Weather Predictions data are representative of wind conditions at the site. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution in order to simplify the real-world dilution and dispersion conditions.

- The model has used hourly sequential meteorological data to predict dispersion within different conditions. It is possible that short-term exposure could lead to elevated odour concentrations, but which then do not exceed the odour assessment criterion after being averaged over an hour. In this case, the situation can arise where, over the year, a C_{98} concentration of, 3 Ou_E/m^3 may be complied with but, over the period for which the odour is emitted, it may be exceeded.
- The IAQM 2018 guidance advises that calm wind conditions tend to lead to worst-case conditions for odour dispersion. Due to constraints of the model used, this could not be accounted for.
- The odour assessment criteria upon which the IAQM 2018 guidance criteria were based are derived from a dose-response relationship, which was carried out based on a limited number of processes using older-generation dispersion models. It is therefore possible that odours at concentrations below 3 OU_E/m^3, where odours would be predicted to exert a 'slight' or 'negligible' effect, may still lead to the generation of complaints or affect amenity, or vies versa.

Odour Assessment Criteria for planning

The IAQM 2018 guidance establishes odour impact descriptors to assess the impacts of odour at each modelled receptor. Therefore, impacts were assessed as being impacted by odour to a 'negligible', 'slight adverse', 'moderate adverse' or 'substantial adverse' extent, depending on the sensitivity of receptors where different odour concentrations were predicted on the Site masterplan (maximum of 98th percentile of hourly mean odour concentrations from the five meteorological years modelled at each gridded receptor).

Using the sensitivity definitions represented in **Table 2.2**, all residences (including their private outdoor space) of the Proposed Development were considered as being of high sensitivity. The sports pitches and allotments of the Proposed Development were considered as being of medium sensitivity. Footpaths and other spaces on the Site where exposure would be more transient were considered as low sensitivity receptors, for which exposure was not specifically assessed due to the transience of any impacts.

The 'New Connections Services Charging Arrangements 2023-24' guidance (Southern Water, n.d.) states that *"We would request that an odour assessment, using dispersion modelling tools, is carried out by an experienced odour specialist. The scope of the assessment is to be agreed in advance taking into account Southern Water's internal assessment protocol and technical standards. Due to the potential for odour emissions from wastewater processes, we recommend that all sensitive receptors should be located outside the 1.5ouEm3 (expressed as the 98th percentile of hourly averages on an annual basis)."*

The C98, 1-hour 1.5OUE/m3 concentration is equivalent to the benchmark odour criterion for the 'most offensive' types of odour cited in Table 5 of the IAQM 2014 guidance. The information in Table 5 is originally derived from guidance published by the Environment Agency and includes sources such as *'processes involving decaying animal or fish remains'* and *'processes involving septic effluent or sludge'*.

The IAQM 2018 guidance published thresholds to assess odour impacts predicted by modelling for '*most offensive*' and '*moderately offensive*' odour, based on its own review of criteria recommended in guidance published by others, including the Environment Agency and the Chartered Institute for Water and Environmental Management. It advises that *"odours from sewage treatment works plant operating normally, i.e. non-septic conditions, would not be expected to be at the 'most offensive' end of the spectrum (Table 5) and can be considered on par with 'moderately offensive' odours such as intensive livestock rearing."* It therefore recommends differentiating the sensitivity of odour detected based on the sensitivity of different land uses using the criteria replicated in Table 3.3, below. These criteria have been used in this assessment.

It shows that moderate or substantial adverse impacts (which, if predicted over a large area) would be considered as having a significant adverse effect) could arise at high sensitivity receptors if the C_{98}, 1-hour odour concentrations exceed a threshold of 3 OU_E/m^3; or if the C_{98}, 1-hour odour concentrations exceed a threshold of 5 OU_E/m^3 at medium sensitivity receptors.

Table 3.3 Odour impact descriptors for 'moderately offensive' odours predicted by modelling

Odour exposure level C_{98} (OU_E/m^3)	Receptor sensitivity		
	Low	Medium	High
≥10	Moderate	Substantial	Substantial
5 - <10	Moderate	Moderate	Substantial
3 - <5	Slight	Moderate	Moderate
1.5 - <3	Negligible	Slight	Moderate
0.5 - <1.5	Negligible	Negligible	Slight
<0.5	Negligible	Negligible	Negligible

3.3 Field Subjective Olfactometric Assessment 'sniff testing'

Field olfactometric 'sniff test' assessments were undertaken on four occasions during April to June 2023, in accordance with the method suggested in the IAQM 'Guidance on the assessment of odour for planning'. The method adopted in this assessment is summarised below.

Field Subjective Olfactometric Assessment Protocol

Sniff tests rate the impact which odours can have at future Site users, by considering the strength of odours generated and the receptor sensitivity. The odour strength considered its intensity on a standardised scale and pervasiveness over a test period lasting at least five minutes at a single location. They were undertaken with reference to the method outlined in the 'Guidance on the assessment of odour for planning' (IAQM, 2018).

Publicly available weather forecasts were taken into consideration before undertaking the site visit to ensure that tests were conducted when the Site was downwind of the WWTW. The weather was warm and dry on the day of olfactometric odour site surveys.

At each location, the start time of the observation period was recorded, and the following protocol was used to describe odours experienced:

i. The assessor breathed normally, inhaling ambient air through the nose at regular intervals (approximately every 10 seconds, to give circa 30 samples over a 5-minute observation period) at a given test location.

ii. For each observation, the odour intensity was recorded, with reference to the Intensity scale shown in Table 14 of the IAQM 2018 'Guidance on the assessment of Odour for Planning', and reproduced in **Table 3.5**, below.

iii. A description and assessment of 'offensiveness' of any perceptible odour was also noted.

iv. The pervasiveness/extent of odour at each location was assessed, as the percentage of observations in which odour was considered attributable to, a specific source, divided by the total number of samples (normally 30). Note that "recognisable odour" is where the odour strength exceeds the recognition threshold and is definitely recognisable by the assessor, i.e. the assessor is capable of definitely identifying its quality/character, which corresponds to VDI intensity of 4 or more.

- The average odour intensity, I_{mean}, over the test period was calculated and the maximum intensity observed noted.

The odour assessor was not affected by colds or other illness that could compromise their sensitivity to smell at the time that the assessments were carried out.

The wind speed, wind direction and temperature were recorded.

The locations at which odour was assessed are presented in **Table 3.4** and illustrated in **Figure A.2** in **Annex X**.

Table 3.4 Olfactometric Odour Site Assessment Locations

Odour Site Survey Location (Test no., location no.)	X (Easting)	Y (Northing)	Distance & direction from Trickling Filter at Cuckfield Waste Water Treatment Works
1,1	530114	123850	110m North-West
1,2	530121	123882	130 m North-West
1,3	530139	123864	100m North-West
1,4	530162	123843	75m North-West
1,5	530195	123802	25m North
1,6	530162	123908	130m North-West
1,7	530181	123887	105m North-West
1,8	530207	123849	65m North
1,10	530174	123740	40m South-West
1,11	530195	123802	20m North-West
2,12	530033	123696	180m South-West
2,13	530061	123700	150m South-West
2,14	530076	123716	135m South-West
2,15	530102	123743	105m West
2,16	530106	123728	100m South-West
2,17	530134	123732	75m South-West
2,18	530119	123760	80m West
2,19	530142	123769	60m West
2,20	530162	123784	40m West
2,21	530196	123798	20m North
2,22	530185	123765	15m West
2,23	530165	123800	45m West
2,24	530195	123813	30m North
3,1	530087	123678	145m North
3,3	530126	123708	100m South-West
3,4	530140	123723	75m South-West
3,5	530171	123741	40m South-West
3,6	530076	123725	130m South-West
3,7	530096	123732	110m South-West
3,8	530121	123751	85m West
3,10	530169	123773	30m West
3,11	530193	123786	15m North
3,12	530181	123762	20m West
3,13	530181	123741	30 m South-West

Odour Site Survey Location (Test no., location no.)	X (Easting)	Y (Northing)	Distance & direction from Trickling Filter at Cuckfield Waste Water Treatment Works
4,1	530092	123623	180m South-West
4,5	530177	123744	35m South-West
4,12	530157	123758	45m West
4,13	530170	123830	60m North-West
4,14	530185	123764	20m West

Table 3.5 Scale used to assess odour intensity (based on VDI 3940:1993, Determination of Odorants in Ambient Air by Field Inspection referenced in the IAQM 2018 guidance)

Odour Strength	Intensity level	Comments
No odour / not perceptible	0	No odour when compared to the clean site.
Slight / very weak	1	There is probably some doubt as to whether the odour is actually present.
Slight / weak	2	The odour is present but cannot be described using precise words or terms.
Distinct	3	The odour character is barely recognizable.
Strong	4	The odour character is easily recognizable.
Very strong	5	The odour is offensive. Exposure to this level would be considered undesirable.
Extremely strong	6	The odour is offensive. An instinctive reaction would be to mitigate against further exposure.

Estimation of Odour Exposure

The results of the assessment were interpreted to assess the odour impact at the time and place of sampling. The Odour Exposure experienced at each location will be dependent on the frequency, intensity, duration and unpleasantness of the odour and different combinations of the FIDOL factors can result in different exposures: for example, odours may occur frequently in short bursts ('acute' exposures), or for longer periods ('chronic' exposures).

Table 3.6 shows how the odour exposure was estimated (based on odour intensity and pervasiveness).

Table 3.6 Method used to assess odour exposure from odour intensity and pervasiveness

Average Intensity (I_{mean})	Pervasiveness, as Percentage Odour time				
	>10%	10-20%	21-30%	31-40%	>40%
6	Large	Very Large	Very Large	Very Large	Very Large

Average Intensity (I_{mean})	Pervasiveness, as Percentage Odour time				
	>10%	10-20%	21-30%	31-40%	>40%
5	Medium	Large	Large	Very Large	Very Large
4	Small	Medium	Medium	Large	Large
3	Small	Medium	Medium	Medium	Medium
2	Small	Small	Medium	Medium	Medium
1	Small	Small	Small	N/A	N/A

Assessment of significance of repeated tests and sensitivity to judge the odour effect

Table 3.7 indicates how the odour effects can be considered together, based on odour exposure (defined using **Table 3.6**) and receptor sensitivity (using **Table 2.2**). As noted from the table below, as residential uses are considered potentially 'high' sensitivity receptors, even if the olfactometric assessment detected only a very small odour, this would be considered a "slight adverse" impact, which is the lowest scale available for a residential receptor in this context.

Table 3.7 Matrix to assess the odour effect at individual receptors

Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
Very large	Moderate adverse	Substantial adverse	Substantial adverse
Large	Moderate adverse	Moderate adverse	Substantial adverse
Medium	Slight adverse	Slight adverse	Moderate adverse
Small	Negligible	Negligible	Slight adverse

Limitations to Odour Sniff Tests

The IAQM Odour guidance indicates that modelling can produce valuable results if it a *"good representation of the system in operation (the odour release and its dispersion in the atmosphere) and the assumptions and input data are reasonable"*. It is less effective where these *"criteria are not met (because for example odour impacts are dominated by unpredictable, unplanned or accidental releases), then we simply end up predicting the wrong answer very precisely."* The use of hourly sequential meteorological data and 'realistic conservative' assumptions regarding odour emissions rates in the dispersion modelling indicates that it would capture year-round conditions and thus the sniff test results serve predominantly to 'ground truth' modelling during four specific time periods. The sniff tests can only represent a 'snapshot' of detected odour in time (ignoring fluctuations in how much waste is processed at the WWTW; and changes in meteorological conditions) and is subjective, depending on the odour assessor.

4 Odour Assessment Results

Dispersion Modelling

Table 4.1 below presents the C_{98}, 1 hour odour concentrations predicted at the receptors modelled at the Proposed Development site and describes the impact magnitude at each assessed receptor location in accordance with the IAQM 2018 guidance for the average modelled odour concentrations. Each of the five years of meteorological data results have been represented for each site.

It shows that the maximum predicted odour concentration at any of the discrete receptors did not exceed 3 OU_E/m^3 in any of the modelled meteorological years. The maximum predicted odour concentration was 1.8 OU_E/m^3 at F2, using 2019 meteorological data. The maximum odour concentration predicted was one slight adverse impact, with the remaining receptors experiencing negligible impacts.

An odour contour map has been produced for 2019, which is the year of the highest point source concentration. This contour map is found in Figure A-4 in Annex A. Odour concentrations at the closest residential facades are similarly below the 3 OU_E/m^3 and 1.5 OU_E/m^3 criterion (indicating negligible effects). Moreover, at the closest medium sensitivity facades, the C_{98}-1hour odour concentrations were also <5 OU_E/m^3 and generally below <3 OU_E/m^3, indicating generally negligible effects but with a small portion of the sports facilities immediately west of the WWTW experiencing a slight adverse effect.

Table 4.1: C_{98}, 1-hour odour concentrations at modelled discrete receptors and assessment of impact magnitude in accordance with the IAQM 2018 guidance

Receptor ID	Odour Concentration C_{98}, 1 hour (OU_E/m^3)						Receptor Sensitivity	Odour Impact Magnitude
	2017	2018	2019	2020	2021	Maximum		
F1	1.3	1.3	1.2	1.3	0.9	1.3	Medium	Negligible
F2	1.5	1.6	1.8	1.0	1.3	1.8	Medium	Slight
R1	0.4	0.4	0.4	0.3	0.5	0.5	High	Negligible
R2	0.3	0.4	0.4	0.2	0.2	0.4	High	Negligible
R3	0.2	0.3	0.3	0.2	0.3	0.3	High	Negligible
R4	0.2	0.2	0.3	0.1	0.2	0.3	High	Negligible
R5	0.1	0.1	0.1	0.0	0.1	0.1	High	Negligible
R6	0.0	0.0	0.0	0.0	0.0	0.0	High	Negligible
R7	0.1	0.1	0.1	0.0	0.1	0.1	High	Negligible

Sniff Tests

The results of the sniff tests are shown in **Table 4.2** and **Figure A.3** in **Appendix A**.

Table 4.2: Results of the first survey and assessment of impact magnitude connected to each type of observation (assumed medium receptor sensitivity)

Date	Point	Description	Average Intensity (I) from source	Pervasiveness of relevant odour (I≥4) (%)	Odour Exposure	Odour Impact
04/04/2023	1,1	Sewage or ammonia	1	0	Negligible	Negligible
04/04/2023	1,2	Sewage or ammonia	2	23	Medium	Slight adverse
04/04/2023	1,3	Sewage or ammonia	3	30	Medium	Slight adverse
04/04/2023	1,4	Sewage or ammonia	4	67	Large	**Moderate adverse**
04/04/2023	1,5	Sewage or ammonia	4	67	Large	**Moderate adverse**
04/04/2023	1,6	Sewage or ammonia	2	67	Medium	Slight adverse
04/04/2023	1,7	Sewage or ammonia	1	0	Negligible	Negligible
04/04/2023	1,8	Sewage	3	57	Medium	Slight adverse
04/04/2023	1,10	Sewage	1	0	Negligible	Negligible
04/04/2023	1,11	Sewage	2	0	Negligible	Negligible
17/04/2023	2,12	Sewage	2	6	Negligible	Negligible
17/04/2023	2,13	Sewage	2	10	Small	Negligible
17/04/2023	2,14	Sewage	2	16	Small	Negligible
17/04/2023	2,15	Sewage	1	0	Negligible	Negligible
17/04/2023	2,16	Sewage	2	7	Negligible	Negligible
17/04/2023	2,17	Sewage	1	10	Error	Negligible
17/04/2023	2,18	Sewage	2	17	Small	Negligible
17/04/2023	2,19	Sewage	3	23	Medium	Slight adverse
17/04/2023	2,20	Sewage	3	20	Medium	Slight adverse
17/04/2023	2,21	Sewage	3	13	Medium	Slight adverse
17/04/2023	2,22	Sewage	3	34	Medium	Slight adverse
17/04/2023	2,23	Sewage	3	47	Medium	Slight adverse
17/04/2023	2,24	Sewage	3	45	Medium	Slight adverse
23/05/2023	3,1	Sewage	2	23	Medium	Slight adverse

Date	Point	Description	Average Intensity (I) from source	Pervasiveness of relevant odour (I≥4) (%)	Odour Exposure	Odour Impact
23/05/2023	3,2	Unsure: assumed potentially vegetation	N/A	N/A	N/A	None
23/05/2023	3,3	Sewage	3	60	Medium	Slight adverse
23/05/2023	3,4	Sewage	3	17	Medium	Slight adverse
23/05/2023	3,5	Sewage	4	60	Large	**Moderate adverse**
23/05/2023	3,6	No odour from sewage detected	N/A	N/A	N/A	None
23/05/2023	3,7	Sewage	2	14	Small	Negligible
23/05/2023	3,8	Sewage*	2	0	Negligible	Negligible
23/05/2023	3,10	Sewage	3	27	Medium	Slight adverse
23/05/2023	3,11	Sewage	2	7	Negligible	Negligible
23/05/2023	3,12	Sewage	2	3	Negligible	Negligible
23/05/2023	3,13	Sewage	2	10	Small	Negligible
06/06/2023	4,1	Sewage or potentially sewage	2	4	Negligible	Negligible
06/06/2023	4,5	Sewage	2	9	Negligible	Negligible
06/06/2023	4,11	Sewage	2	0	Negligible	Negligible
06/06/2023	4,12	Sewage	2	7	Negligible	Negligible
06/06/2023	4,13	Sewage	3	17	Medium	Slight adverse
06/06/2023	4,14	Sewage	2	17	Small	Negligible

The sniff tests were undertaken on land where the sports facilities will be constructed or adjacent to the WWTW boundary, meaning that the receptors were generally all medium or low sensitivity. Assuming all sniff tests represent medium sensitivity locations, the sniff tests showed odour would have resulted in negligible or slight adverse impacts on 36 of 39 discrete occasions. The three remaining tests (1,4; 1,5; and 3,5) showed 'moderate adverse' impacts although one of these was undertaken at a location immediately adjacent to the WWTW boundary, where greater impacts may be expected and which do not represent the Site at large.

Were it assumed that these tests were undertaken at high-sensitivity receptors, odour would have a negligible or slight adverse impact on 20 of the 38 discrete occasions. All but three of the remaining tests showed moderate rather than substantial adverse impacts.

As the design of the illustrative masterplan evolved, Temple recommended relocating high sensitivity land uses (residences including gardens) further from the WWTW than their original location. The closest residence is now located 138 metres from the WWTW. Re-interpreting the sniff test results for high sensitivity receptors would have led to moderate or substantial adverse effects occurring no more than 110 metres from the WWTW. Tests undertaken further from the WWTW boundary showed slight adverse or negligible impacts and were broadly downwind (i.e. within a few degrees of being directly downwind of at least one of the on-site sources).

Overall Significance of Effects

Based on the modelled pollutant concentrations, there were no moderate or substantial adverse impacts from WWTW odour across the Site, with the vast majority of the Site experiencing negligible impacts and only limited pockets of slight adverse impacts.

The sniff tests were undertaken during dry, warm weather conditions where receptors were downwind nor broadly downwind. At medium sensitivity receptors, the impacts were predominantly negligible or slight adverse. Had the sniff tests represented high sensitivity receptors, no moderate adverse impacts were identified at the monitoring points equidistant or further from the WWTW than the nearest proposed residences.

The effect of odour from the WWTW on the Site is therefore considered insignificant, such that no mitigation is considered necessary.

5 Discussion and Conclusions

The odour assessment has determined the following:

- The sniff tests were undertaken between April and June 2023 at various located to the west and south-west of the Cuckfield Waste Water Treatment site. There were three moderate adverse odour impacts on the proposed sport pitches (out of 39 tests). The odour impact would be not significant.
- The detailed dispersion modelling assessment shows that receptors at the proposed development site do not exceed 3 OU_E/m^3 criterion. The highest concentrations are located at the proposed sports facilities which have a medium sensitivity to odour. Therefore, the maximum impact from Cuckfield Waste Water Treatment works is slight adverse; this is not significant.
- In light of the above, this assessment has concluded that future Site users would not be exposed to odour concentrations exceeding prevailing assessment thresholds and amenity on-site would be acceptable.

Annex A: Odour Figures

temple

Job Title: Antsy Farm, Antsy, Haywards Heath

Temple Job No. T4166

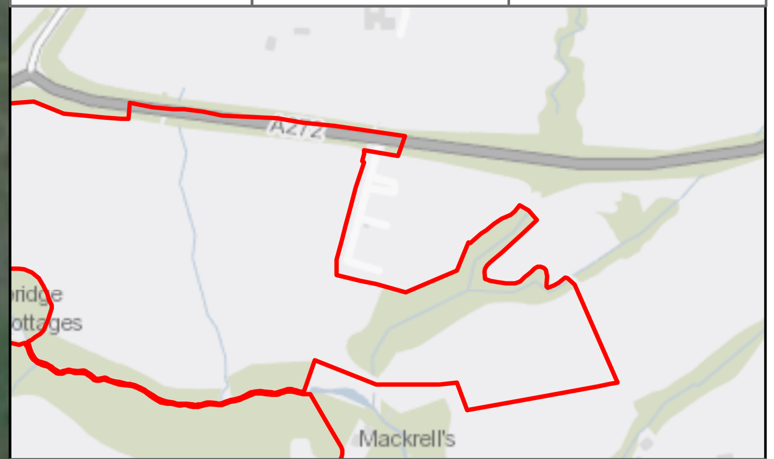
Client: Fairfax Properties (Buncton Barn)

Map Title: Buildings modelled as areas in Dispersion Model

Figure A-1

Section	Scale
N/A	1:500

Drawn	Approved	Date
JM	DM	31/05/2023



Legend

- Site Boundary
- Modelled Area Sources
- Proposed Receptors

0 — 20 Metres

N

temple

Job Title: Antsy Farm, Antsy, Haywards Heath

Temple Job No. T4166

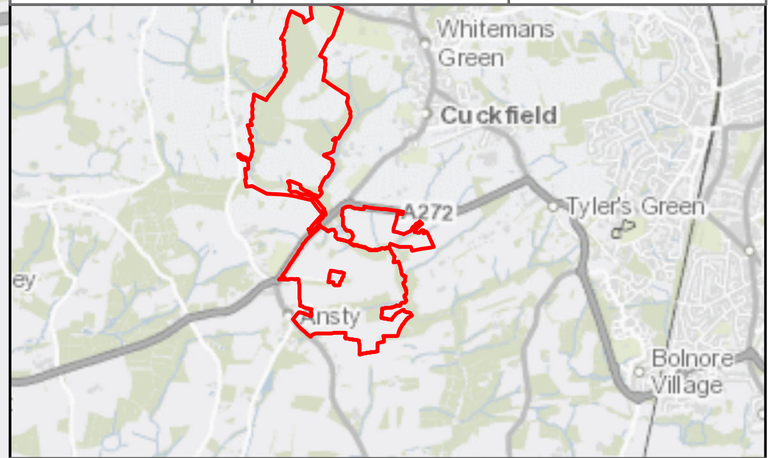
Client: Fairfax Properties (Buncton Barn)

Map Title: Odour Sensitive Receptors

Figure A-2

Section	Scale
N/A	1:3,500

Drawn	Approved	Date
JM	DM	31/05/2023

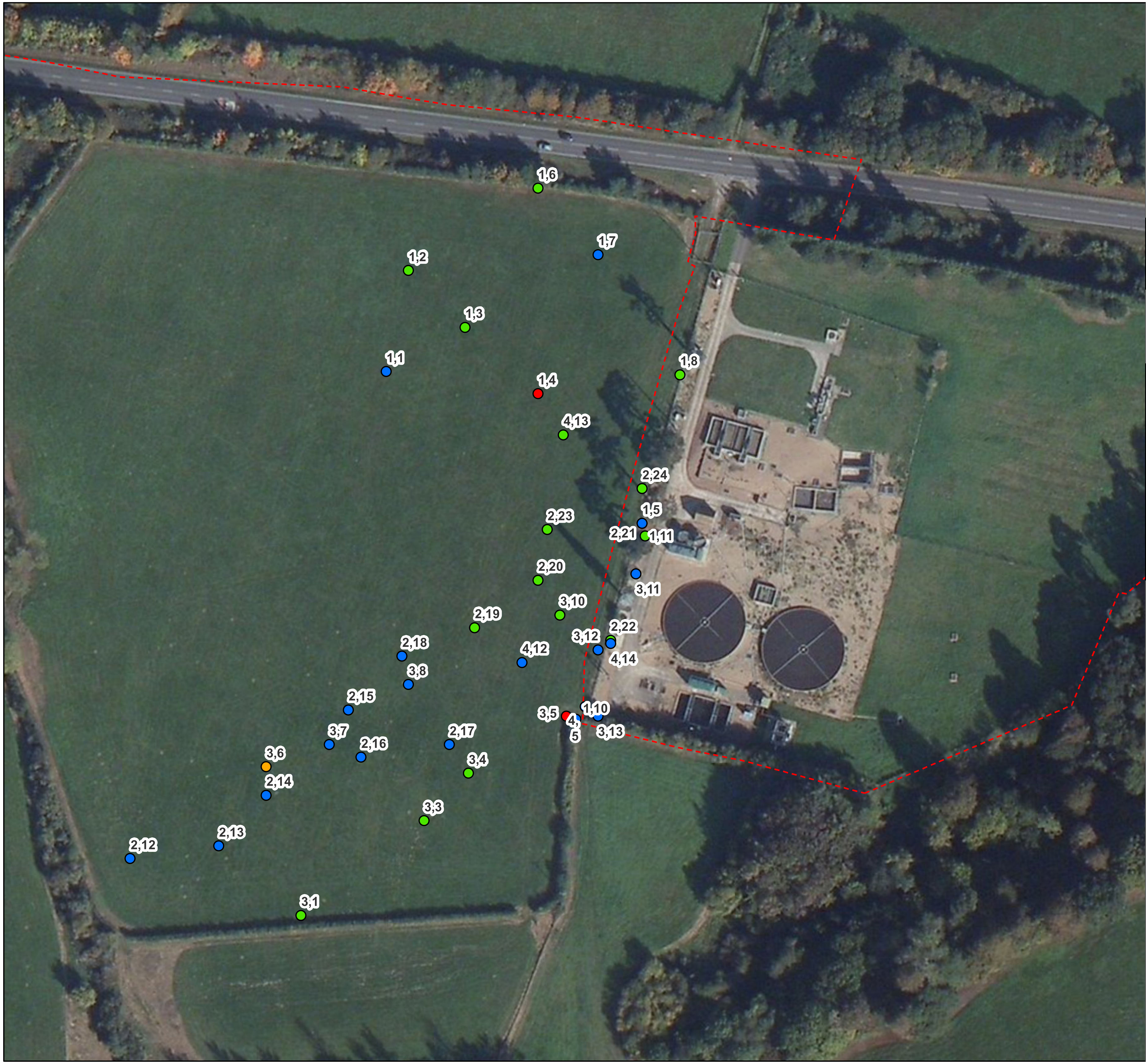


Legend

- Site Boundary
- Proposed Receptors
- RESIDENTIAL
- SCHOOL
- OPEN SPACE
- SPORTS FACILITY
- EXISTING WOODLAND
- LOCAL CENTRE
- INFRASTRUCTURE
- PROPOSED VEGETATED LANDSCAPE BUFFER

0 150 Metres

N



temple

Job Title: Antsy Farm, Antsy, Haywards Heath

Temple Job No. T4166

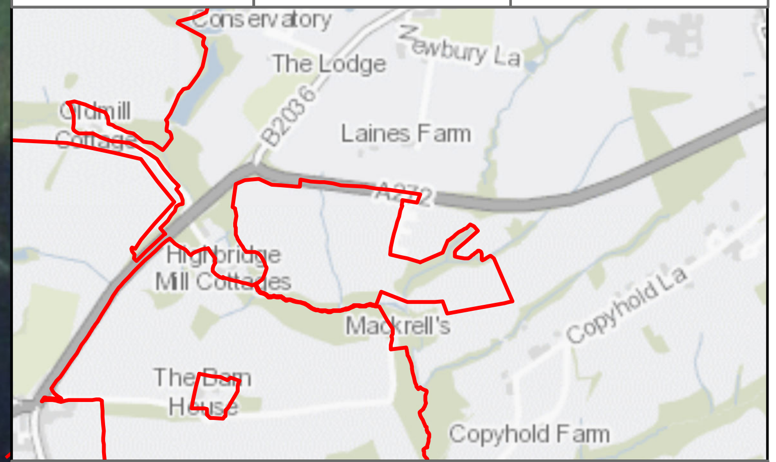
Client: Fairfax Properties (Buncton Barn)

Map Title: Sniff Test Results

Figure A-3

Section	Scale
N/A	1:1,152

Drawn	Approved	Date
JM	DM	07/06/2023



Legend

- - - Site Boundary

Medium Sensitivity Sniff Test Results

- Moderate Adverse
- Negligible
- No sewage odour detected
- Slight Adverse

0 50 Metres

N

temple

Job Title
Antsy Farm, Antsy, Haywards Heath
Temple Job No. T4166

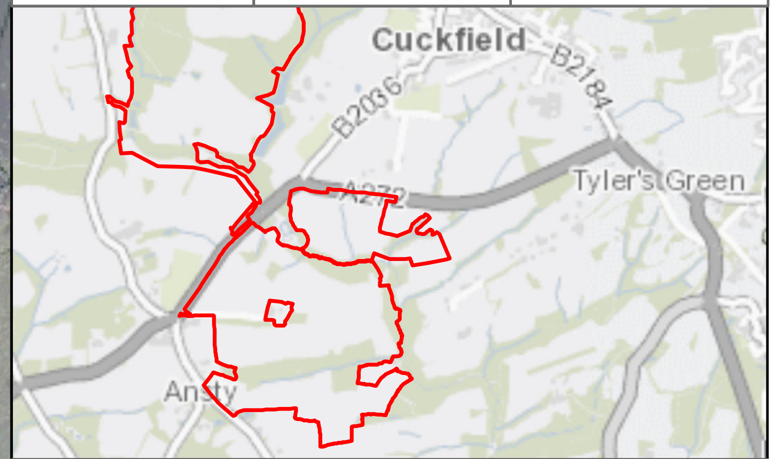
Client
Fairfax Properties (Buncton Barn)

Map Title
98th Percentile Odour Concentration Contours for 2019

Figure A-4

Section	Scale
N/A	1:2,000

Drawn	Approved	Date
JM	DM	31/05/2023



Legend

- Site Boundary
- 98th Percentile OU_E/m^3
- Proposed Receptors
- RESIDENTIAL
- SCHOOL
- OPEN SPACE
- SPORTS FACILITY
- EXISTING WOODLAND
- LOCAL CENTRE
- INFRASTRUCTURE
- PROPOSED VEGETATED LANDSCAPE BUFFER

0 80 Metres

N

temple

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