

Pandora Limited
Land East of Southam Road, Banbury
Air Quality Assessment

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Executive Summary

This Air Quality Assessment Report has been prepared in support of the planning application on behalf of Pandora Limited for the proposed development of land to the east of Southam Road, Banbury for residential purposes. The Air Quality Assessment was undertaken, using ADMS-Roads dispersion model to assess the impact of the ambient air quality on the proposed development at the site and the impact of the development on the existing air quality.

The assessment results were compared against the objectives set out in the Air Quality Limit Value Regulations of 2000 and the Environmental Protection UK guidance document entitled 'Development Control: Planning for Air Quality (2010 Update)'. The Environmental Protection UK document was produced as a guide for both consultants and local planners to assist with the use of air quality assessment in the local development control process.

The results of the assessment indicate:

- The annual mean pollution concentration limit of 40µg/m³ for NO₂, as set out in the Air Quality Limit Value Regulations was exceeded in year 2020 for receptors located within 35m from the edge of the motorway. Consequently, it is recommended that these defined areas are only used for garaging, car parking or informal recreational type use.
- The Environmental Health Officer responsible for industrial emissions at Cherwell District Council had indicated that the emission from the cemetery had not exceeded the permitted levels. Furthermore, the combined impacts of the PM₁₀ emissions from the cemetery and the traffic are shown to be below the limit as set out in the Air Quality Limit Value Regulations.
- The maximum percentage changes in the level of NO₂ and PM₁₀ at the existing sensitive receptors located near the site as a result of the proposed development in year 2020 are 3.49% and 1.13% respectively. Thus, the magnitude of change caused by the proposed development is considered small in accordance with the guidelines published by Environmental Protection UK (2010).

Overall, it is considered that the impact of proposed development on the ambient air quality near the development site will be small. The NO₂ pollution concentration within a strip of land 35m parallel to the motorway is shown to be above the Objective value for NO₂ and it is recommended that this defined area is only used for garaging, car parking or informal recreational use.

Limitations and Exceptions

- 1** This report and its findings should be considered in relation to the terms and conditions proposed and scope of works agreed between MLM Consulting Ltd and the client.
- 2** The Executive Summary, Conclusions and Recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon until considered in the context of the whole report.
- 3** This report provides available factual data for the site and the surrounding area at the time of the study and as obtained by the means described in the text. The data is related to the site on the basis of the site location information provided by the Client.
- 4** It should be appreciated that the information that has been made available to date, is not necessarily exhaustive and that further information relevant to the proposed site usage may be provided which could change the overall findings.
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1 Introduction

1.1 General

This Air Quality Assessment Report has been prepared in support of the planning application on behalf of Pandora Limited for the proposed development of land to the east of Southam Road, Banbury for mainly residential purposes.

Pandora Limited is proposing to develop the land to the west of Southam Road. This report considers the impact of the combined development as well. The impact of the land to the west of Southam Road is discussed in a separate report.

The Local Authority responsible for determining a planning application at the Land East of the Southam Road site is Cherwell District Council. Discussions were held with Sean Gregory of the Cherwell District Council (CDC) Environmental Science's team in March 2012, and the objectives of the air quality assessment were agreed with him.

The air quality assessment considers the impact from road traffic emissions and the adjacent crematorium.

1.2 Report Structure

The structure of the report is summarised below:

- A brief description of the site and proposed development
- A brief description of the legislation governing air quality in England
- Details of the method and the input data used for the assessment
- Results of the assessment
- Conclusions

1.3 Objectives

The objectives of this report are:

- To use Gaussian based ADMS-Roads software developed by Cambridge Environmental Research Consultants (CERC) to assess the impact of the existing air quality on the proposed development. The assessment will be based upon historical monitoring data and Local Authority data, as available in the public domain for nitrogen dioxide (NO₂) and the Particulate Matter (PM₁₀, i.e. particles which are less than 10µm in diameter).
- To assess the impact that the proposed development may have on the existing air quality.

1.4 Proposed Development

The proposed development is for the construction of up to 510 residential units (Class C3), 2.2 ha of land for a primary school, and associated access, parking, open space. The proposed outline scheme details are shown on Collado Collins Architects drawings 11028/P0-226 dated 20 November 2012.

2 The Site

2.1 Location and Description

The site is situated east of Southam Road, Banbury and the National Grid Reference for the approximate centre of the site is 445814E, 243170N.

The site is triangular in shape and covers an area of approximately 25.44 ha and comprises arable fields with associated field margins and boundary hedgerows in the north of the site and areas of grassland with tall ruderal vegetation in the south of the site.

The site is bound to the west by the main Southam Road, south by Noral Way and to the north east by the M40.

Figure 1 shows the location of the site relative to the surrounding area.

2.2 Historic Air Quality Assessment

The Cherwell District Council (CDC) undertook a detailed assessment of the air quality along Hennef Way under the principles set out in the Environment Act of 1995. The assessment indicated that the air quality, in particular the levels of the nitrogen dioxide (NO₂) along the Hennef Way, was above the air quality standards set out in the Environment Act of 1995. CDC therefore declared an area along Hennef Way as Air Quality Management Area (AQMA) in 2010. The location of the AQMA is shown on Figure 2. The site is located some 1.5km to the north of the Hennef Way AQMA. As the traffic from the proposed development will travel through Hennef Way, this air quality assessment considers the impact of the proposed development on the AQMA.

3 Air Quality Standards

3.1 General

The national air quality objectives for nitrogen dioxide (NO₂), as set by Air Quality Regulations (England) (Wales) 2000 and Air Quality Amendment Regulations (2002) are:

- An annual average of 40µg/m³ to be achieved by 31 December 2005;
- 200µg/m³ as an hourly average with a maximum of 18 exceedances in a year, to be achieved by 31 December 2005.

The national air quality objectives for particulate matter (PM₁₀), as set by Air Quality Regulations (England and Wales) 2000, are:

- An annual average of 40µg/m³ to be achieved by 31 December 2004;
- 50µg/m³ as an hourly average with a maximum of 35 exceedances in a year, to be achieved by 31 December 2004.

For the assessment undertaken in this report, the following generally stringent standards were adopted:

- For the analysis of NO₂, the annual mean was used.
- For PM₁₀, the 24 hour standard is adopted. In addition, the annual mean was calculated to assess the rate of increase in the level of PM₁₀ at existing receptors.

Since December 1997 each Local Authority in the UK has been carrying out a review and assessment of air quality within their areas. These periodic reviews are used to assess whether the national air quality objectives will be achieved throughout the UK by the relevant deadlines. The process is known as 'Local Air Quality Management' (LAQM). Air Quality Management Areas (AQMAs) are declared in areas or zones where the objectives are not likely to be achieved.

3.2 European Law on Air Quality

The European Directive (2008/50/EC) sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂). The European Directive is implemented in the UK under the Air Quality Standards Regulations 2010. The obligations under the Air Quality Standards Regulations 2010 are separate from those of the 2000 and 2002 UK Regulations because local authorities in the UK will only have powers to manage some of the pollutants in the Air Quality Standards Regulations 2010 as most of the source pollutants will be managed by the Environment Agency under the IPPC Regime. Therefore the obligation to meet the Air Quality Standards Regulations 2010 rests with the Secretary of State for Environment.

4 Input for ADMS Roads Dispersion Modelling

4.1 General

Atmospheric dispersion modelling has been undertaken using ADMS-Roads software suite (version 3.1) developed by Cambridge Environmental Research Consultants (CERC). The model uses a number of input parameters to simulate the dispersion of emissions and predictions of pollutant concentration at specified receptors across the area of interest. The details of the input parameters are describe in the next section.

Generally, for air quality assessment two different scenarios are analysed. The first scenario considers the pollution effect of the traffic without the proposed development. The second scenario determines if there will be deterioration in the air quality as a result of the proposed development by considering the effect of the traffic from the proposed development as well as the existing volumes on the selected receptors.

The model was analysed for two time periods:

- Year 2010. This was selected as the base year to validate the model.
- Year 2020. In year 2020, two scenarios, with and without the proposed development, were analysed.

The following parameters are required to determine the air pollution concentration using the ADMS-Roads model:

- Receptor(s) location(s) details;
- The road network details;
- Meteorological data
- Traffic data.

The details of the parameters used in the analysis for Land East of Southam Road are presented below.

4.2 Receptor Locations

Potentially sensitive receptor points were selected within the proposed developments that have the potential to be affected by the adjacent M40 and the crematorium. In addition, potentially sensitive receptor points were selected to represent existing dwellings that were most likely to be affected by the increased traffic flow from the proposed development.

The locations of potentially sensitive existing receptors and receptors within the proposed development are shown on Figures 2 and 3 respectively. The details of the sensitive receptors are presented in Table 4.1.

Table 4.1: Receptor Locations

Receptor No	Receptor Name/Description
R1	Hardwick Hill
R2	Foxhill
R3	Existing house
R4	Lodge
R5	Banbury office
R6	No 3 Lord Grandison Way
R7	No 7 Lord Grandison Way
R8	No 8 Lord Grandison Way
R9	Retail Park
R10	The Bungabow
R11	Grimbury Manor
R12	25 Stroud Close-Ground Floor Front Window
R13	25 Stroud Close- Ground Floor Rear Window
R14	21 Fisher Close-Ground Floor
R15	22 Fisher Close-Ground Floor
R16	25 Stroud Close-First Floor Front Window
R17	25 Stroud Close- First Floor Rear Window
R18	21 Fisher Close-First Floor
R19	22 Fisher Close-First Floor
R20-R36	Proposed Developments

4.3 The Assessment Year

The selected assessment years are 2010 and 2020. The year 2010 was chosen as the base year to assess the existing conditions and validate the modelling. The year 2020 represent the year when the site is likely to be in operation.

4.4 Background Pollution

Background nitrogen dioxide (NO₂) concentrations published by Defra in their website for the site, Banbury Town Centre and along Hennef Way were found to be higher than the background levels measured in the diffusion tubes near Hennef Way and Banbury Town Centre. Therefore for the assessment, the averages of the lowest measured nitrogen dioxide concentration were used in the assessment to avoid double counting issues. The details of the Defra derived, diffusion tube measured and the selected values for background NO₂ are presented in Table 4.2.

The background levels of NO_x and PM₁₀ were derived from the Defra website and are presented in Table 4.3.

Table 4.2: Background Levels Sourced from LAQM Website for year 2010

	Annual mean value of NO ₂ (µg/m ³) for Year 2010		
	Site	Hennef Way	Banbury Town Centre
Defra Predicted Annual mean value (Grid Reference in Brackets)	22.46 (445500,243500)	32.01 (446500,241500)	26.17 (445500,240500)
Diffusion Tube Measured Value (Tubes details in Brackets)	-	21.9 (Longworth Close)	17.1 (Cranleigh Close) & 21.9 (Sinclair Avenue)
Value used for Modelling	21.9	21.9	21.9

Table 4.3: Background levels of NO_x and PM₁₀ Sourced from LAQM Website for Year 2010

Pollutant	Annual mean value (µg/m ³) for year 2010		
	Site	Hennef Way	Banbury Town Centre
NO _x	34.58	56.55	42.58
PM ₁₀	19.18	18.78	17.57

The Defra LAQM website contains information on the background monitoring undertaken in year 2010 as well as projected values for future years. For the opening year scenarios, the background NO₂ concentration was assumed to remain unchanged from the base year. This is in line with advice published on Defra's LAQM Helpdesk, which describes a disparity between the measured concentrations and the projected decline in concentrations associated with emissions forecasts.

4.5 Emissions Calculations

Roads are the main source of pollution in this area. The road source emissions are calculated from traffic flow data using the in-built database of traffic emission factors. For this particular modelling, Defra Emission Factor Toolkit (EFT v4.2, 2010) was used. The toolkit calculates emission rate for selected pollutants for each modelled road for input in to the atmospheric dispersion modelling.

In addition, at the request of CDC, the impact of the emission from the adjacent cemetery was assessed by considering the emission from the cemetery as a point source. For the assessment, the emission of PM₁₀ was only considered as the Environmental Health Officer responsible for industrial emissions at CDC had indicated that the emission from the cemetery had not exceeded the permitted levels. Though the permitted level had not been exceeded, the emission rate was set at this rate for assessing the worst case scenario. A summary of the stack parameters and emissions data used in the assessment is presented in Appendix A.

The existing street car parks within Banbury town centre at North Street and Horse Fair Roads were modelled as area sources. The emission rates were calculated based on CERC Modelling Car Park Guidance Notes (2004). At each park it was assumed there will be hourly movement for each of the car park spaces for eight hours a day. Cold engine excess emissions and cold start emissions were not modelled.

4.6 The Road Networks

The following road networks were selected for the assessment, for the reasons provided:

- Southam Road was chosen as it is the route in to the site and also traverses the western site boundary.
- Dukes Meadow Road and Heneff Way were chosen as it is used by vehicles travelling to this and the adjacent sites.
- M40 motorway was chosen as it traverses the eastern site boundary.
- North Bar Street, Horse Fair and South Bar Street were chosen as they are located adjacent to the diffusion tubes used to validate the ADMS modelling.

4.7 Traffic Data

The traffic flow in terms of Annual Average Daily Traffic (AADT) for roads for the year 2010 were sourced from the Department of Transport (DTp) automatic counter survey presented on the DTp website.

The traffic data used for verifying the in the analysis in year 2010 are presented in Table 4.4

Traffic flows in terms of AADT along the main roads around the sites with and without developments in Year 2020, provided by David Tucker Associates the Transport Planning Consultants for the scheme, are presented in Table 4.5. The full details are presented in the Transport Assessment Report compiled by David Tucker Associates.

Table 4.4 Measured Annual Average Daily Traffic (AADT) Flow Data for Years 2010

Link	AADT in Year 2010	
	Light Goods Vehicle	Heavy Goods Vehicle
Henneff Way by continuous analyser	45287	2101
Southam Road north of Castle Street	18194	418
North Bar Street	18194	418
Horse Fair	18194	418

Table 4.5: Annual Average Daily Traffic (AADT) Traffic Data for Year 2020

Link	Without the Scheme		With Land to the East in year 2020		With both schemes in Year 2020	
	Light Goods Vehicle	Heavy Goods Vehicle	Light Goods Vehicle	Heavy Goods Vehicle	Light Goods Vehicle	Heavy Goods Vehicle
Southam Road north of Site	10077	400	10168	400	10236	400
Southam Road south of Site	10404	451	12749	451	13543	451
Dukes Meadow Road-East of site access	5759	38	6300	38	6804	38
Dukes Meadow Road-West of site access	5759	38	5945	38	6086	38
Southam Road south of Dukes Meadow Road	20078	838	21736	838	22973	838
Hennef Way by continuous analyser	47362	2306	48011	2306	48495	2306

The vehicle speed was taken as 60km/h for Southam Road and Dukes meadow Road. The vehicle speed along Hennef Way was reduced to 40km/h due to the change in level of the road. The speed along Horse Fair, North Bar Street and Southam Road in town was taken as 20km/h.

4.8 Meteorological Data

ADMS roads utilises sequential meteorological data to calculate atmospheric dispersion. The minimum metrological data that must be entered are: wind speed and direction, and cloud cover. The meteorological data collected at Little Rissington in year 2010 (NGR = 421244E 218058N) were used in the analysis. The wind rose illustrating the data is presented in Appendix B.

4.9 Surface Roughness

The surface roughness was taken as 0.5, the value recommended for open suburbia.

4.10 Street Canyon and Barrier

The following roads were modelled as street canyons:

- North Bar Street – 8m high canyon
- Horse Fair – 8m high canyon

A barrier was modelled along the southern edge of Hennef Way with a height of 2.5m.

5 Model Output

5.1 General

The modelling predicted total oxides of nitrogen (NO_x) at the selected continuous analyser locations and at the selected receptor locations within the development site. The base year of 2010 was chosen to predict the NO_x levels at the diffusion tube locations and these values were compared with monitored NO_x results to verify the model predictions. An adjustment factor was determined for the modelling and the factor was applied to predicted values for the opening year in Year 2020. The details of the process are presented below.

5.2 Baseline Conditions

5.2.1 Method

The modelled adjustment was undertaken using the methodology given in the publication 'Local Air Quality Management Technical Guidance LAQM. TG (09) Annex 3: Modelling published by Department for Environment, Food and Rural affairs'. LAQM TG (09) requires the determination of the ratio between monitored road contribution NO_x to modelled road contribution NO_x at each comparison sites. Where more than one comparison site is available, TG (09) recommends the use of graphs to determine the ratio. The statistically determined ratio between the monitored road contributed NO_x and the modelled road contribution NO_x is then referred to as the adjustment factor. This adjustment factor is applied to the modelled road contribution NO_x . The modelled road contributed NO_2 is then determined using the Defra NO_x/NO_2 calculator.

5.2.2 Model Verification

As noted previously, Cherwell District Council monitors the air quality in the borough using a series of diffusion tubes and a continuous analyser located on Heneff Way. The continuous analyser is located adjacent to fencing and previous modelling undertaken by AEA Technology Plc for Cherwell District Council indicated a very high adjustment factor, probably caused by the turbulence at the barrier. Therefore the assessment was extended into Banbury Town centre to model the diffusion tubes for verification purposes.

The model road contributed NO_x values at the tube locations together with the monitored road contributed NO_x values and the ratios between them are given in Table 5.1. The monitored road contributed NO_x was calculated from the measured NO_2 using the Defra NO_x/NO_2 calculator. The ratios varied between 1.23 and 1.59.

Technical Guidance LAQM.TG (09) recommends the derivation of an adjustment factor based on linear trend line between observed and predicted values. Figure 4 shows the modelled and monitored road contributed NO_x and the linear trend line gives a factor of 1.3.

The road source contributed NO_x for the receptors located around and within the site were adjusted using the factor of 1.3 as stated in Technical Guidance LAQM.TG (09).

Table 5.1: Ratio of the monitored road contribution to modelled contribution for NO_x

Diffusion Tube	Year	Monitored road contribution NO _x (excluding background)	Modelled road contribution NO _x (excluding background)	Ratio between monitored and modelled NO _x
Average of Horse Fair Triplicate	2010	71.26	57.88	1.23
South Bar	2010	23.46	14.7	1.59
North bar	2010	52.1	34.15	1.52
Southam Road	2010	43.24	34.35	1.25

Cherwell District Council has started to monitor the levels of NO₂ in the vicinity of the AQMA area from middle of year 2010. The ADMS predicted values and the observed values are presented in Table 5.2. The values indicate that with the adjustment factor of 1.3, the model predicted values at the diffusion tube locations are higher than the observed values and hence indicating that the ADMS modelled values are on the cautious side.

Table 5.2: Modelled and Monitored Diffusion Tube NO₂ near the AQMA area

Diffusion Tube	Monitored NO ₂ (µg/m ³)	Modelled NO ₂ (µg/m ³)
Dean Close	24.2	28.08
Grimbury Green	27.3	28.96
Stroud Close 1	29.8	33.12
Stroud Close 2	28.7	31.12

5.3 Modelled Results

The modelled NO₂ levels were calculated from adjusted modelled road NO_x values using the Defra NO_x/NO₂ calculator with background values derived from the diffusion tubes. The modelled NO₂ and PM₁₀ values are presented in Table 5.3 for without development and Table 5.4 for proposed development to the Land to the East of Southam Road and proposed development to the Lands to the East and West (the combined) of Southam Road.

Table 5.3 Modified NO₂ Pollution Concentrations: Year 2020: Without Developments

No	Receptor Name	NO ₂ Annual Mean (µg/m ³)	PM ₁₀ Annual Mean (µg/m ³)
R1	Hardwick Hill	27.16	20.01
R2	Foxhill	24.35	19.71
R3	Existing house	27.32	20.27
R4	Lodge	28.05	20.43
R5	Banbury office	26.5	20.11
R6	No 3 Lord Grandison Way	23.33	19.52
R7	No 7 Lord Grandison Way	22.93	19.42
R8	No 8 Lord Grandison Way	22.7	19.36
R9	Retail Park	31.03	21.05
R10	The Bungabow	28.21	20.40

No	Receptor Name	NO ₂ Annual Mean (µg/m ³)	PM ₁₀ Annual Mean (µg/m ³)
R11	Grimbury Manor	31.11	21.04
R12	25 Stroud Close-Ground Floor Front Window	38.6	22.82
R13	25 Stroud Close- Ground Floor Rear Window	34.19	21.75
R14	21 Fisher Close-Ground Floor	39.69	23.11
R15	22 Fisher Close-Ground Floor	39.29	23.01
R16	25 Stroud Close-First Floor Front Window	34.54	21.84
R17	25 Stroud Close- First Floor Rear Window	31.92	21.24
R18	21 Fisher Close-First Floor	35.16	21.99
R19	22 Fisher Close-First Floor	34.71	21.88

**Table 5.4 Modified NO₂ Pollution Concentrations Year 2020:
With Developments**

No	Receptor Name	Year 2020: East Developments		Year 2020: Combined Developments	
		NO ₂ Annual Mean (µg/m ³)	PM ₁₀ Annual Mean (µg/m ³)	NO ₂ Annual Mean (µg/m ³)	PM ₁₀ Annual Mean (µg/m ³)
R1	Hardwick Hill	27.91	20.16	27.91	20.16
R2	Foxhill	24.76	19.73	24.76	19.73
R3	Existing house	28.07	20.39	28.21	20.44
R4	Lodge	28.86	20.59	29.03	20.66
R5	Banbury office	27.04	20.19	27.15	20.24
R6	No 3 Lord Grandison Way	23.46	19.52	23.47	19.53
R7	No 7 Lord Grandison Way	23.05	19.42	23.05	19.42
R8	No 8 Lord Grandison Way	22.8	19.36	22.8	19.36
R9	Retail Park	31.17	21.09	31.31	21.14
R10	The Bungabow	28.29	20.42	28.32	20.43
R11	Grimbury Manor	31.21	21.06	31.25	21.08
R12	25 Stroud Close-Ground Floor Front Window	38.73	22.86	38.8	22.90
R13	25 Stroud Close- Ground Floor Rear Window	34.3	21.78	34.36	21.81
R14	21 Fisher Close-Ground Floor	39.82	23.16	39.9	23.19
R15	22 Fisher Close-Ground Floor	39.42	23.05	39.5	23.09
R16	25 Stroud Close-First Floor Front Window	34.65	21.86	34.7	21.89
R17	25 Stroud Close- First Floor Rear Window	32.02	21.26	32.06	21.28
R18	21 Fisher Close-First Floor	35.27	22.02	35.33	22.05
R19	22 Fisher Close-First Floor	34.82	21.91	34.88	21.94
R20	Proposed Receptor	49.45	22.36	49.42	22.37
R21	Proposed Receptor	44.63	21.70	44.6	21.70
R22	Proposed Receptor	40.62	21.20	55.11	23.24
R23	Proposed Receptor	46.91	22.08	46.9	22.08
R24	Proposed Receptor	42.75	21.53	42.74	21.54
R25	Proposed Receptor	40.57	21.27	40.56	21.27

No	Receptor Name	Year 2020: East Developments		Year 2020: Combined Developments	
		NO ₂ Annual Mean (µg/m ³)	PM ₁₀ Annual Mean (µg/m ³)	NO ₂ Annual Mean (µg/m ³)	PM ₁₀ Annual Mean (µg/m ³)
R26	Proposed Receptor	49.27	22.31	46.39	22.61
R27	Proposed Receptor	42.09	21.34	41.74	21.82
R28	Proposed Receptor	44.09	21.59	39.96	21.54
R29	Proposed Receptor	28.47	20.11	28.47	20.12
R30	Proposed Receptor	32.02	20.27	32.01	20.28
R31	Proposed Receptor	26.75	19.96	26.79	19.98
R32	Proposed Receptor	27.35	19.79	27.32	19.80
R33	Proposed Receptor	35.43	20.58	35.36	20.59
R34	Proposed Receptor	24.69	19.62	24.69	19.64
R35	Proposed Receptor	28.5	19.85	28.25	19.87
R36	Proposed Receptor	26.06	19.61	25.74	19.64

6 Discussion of Results

6.1 Guidance used for The Review

The results of the analysis were compared against the national objectives described in the Air Quality Regulations, presented in Section 3 of this report and the Environmental Protection UK produced guidance document entitled 'Development Control: Planning for Air Quality (2010 Update)'.

6.2 Comparison with the National Objectives

The predicted adjusted assessment results presented in Table 5.4 were compared against the objectives described in the Air Quality Regulations and the following points can be deduced:

- The annual mean pollution concentration limit of 40 µg/m³ for NO₂, as set out in the Air Quality Limit Value Regulations, was not exceeded in any of the existing receptors with and without proposed development in year 2020.
- The annual mean pollution concentration limit of 40 µg/m³ for NO₂, as set out in the Air Quality Limit Value Regulations were not exceeded at any of the existing receptors considered within the AQMA area on Stroud and Fisher Close without and with the proposed development. The proposed developments do not introduce new exposure to breach the regulations. Furthermore the modelling confirmed the findings of the monitoring undertaken along Stroud and Fisher Close in that the NO₂ levels along these roads are below the objective values.
- The annual mean pollution concentration limit of 40 µg/m³ for NO₂, was exceeded in the proposed receptors numbers R20 to R28. These receptors are located between 20m and 35m from the edge of the motorway. Furthermore the maximum predicted annual mean pollution concentration of 49.45 µg/m³ for receptor R20, which is located 20m from the edge of the motorway is comparable with monitored values of 47.9 µg/m³ and 49.7 µg/m³ near the hard shoulder of M4 and M60 respectively (Pittman et al 2011). Hence it can be concluded that the predicted values are within the expected range.
- The annual mean pollution concentration limit of 40µg/m³ for PM₁₀, as set out in the Air Quality Limit Value Regulations, was not exceeded in any of the receptors either before or after the proposed development.
- None of the modelled levels of PM₁₀, at the assessed receptors, either with or without the development, exceed the 50 µg/m³ limit more than 35 times a year as permitted in the Air Quality Limit Value Regulations in year 2020.
- The maximum percentage change for NO₂ and PM₁₀ concentrations between the "without development" and "with combined development" scenarios for 2020 at the receptors located near the site are 3.49% and 1.13% respectively. The details of the percentage increases are given in Table 6.1. The magnitudes of change as a result of the proposed development are considered small in accordance with the guidelines published by Environmental Protection UK.

Table 6.1 Increase in Pollution Concentration between Without Development and Combined Development Presented as Percentages

Recep. No.	Receptor Name	% increase in NO ₂ for Year 2020	% increase in PM ₁₀ for Year 2020
1	Hardwick Hill	2.76	0.44
2	Foxhil	1.68	0.08
3	Existing house	3.26	0.86
4	Lodge	3.49	1.13
5	Banbury office	2.45	0.65
6	No 3 Lord Grandison Way	0.60	0.02
7	No 7 Lord Grandison Way	0.52	0.00
8	No 8 Lord Grandison Way	0.44	0.02
9	Retail Park	0.90	0.40
10	The Bungabow	0.39	0.12
11	Grimbury Manor	0.45	0.17
12	25 Stroud Close-Ground Floor Front Window	0.52	0.32
13	25 Stroud Close- Ground Floor Rear Window	0.50	0.23
14	21 Fisher Close-Ground Floor	0.53	0.34
15	22 Fisher Close-Ground Floor	0.53	0.33
16	25 Stroud Close-First Floor Front Window	0.46	0.24
17	25 Stroud Close- First Floor Rear Window	0.44	0.19
18	21 Fisher Close-First Floor	0.48	0.25
19	22 Fisher Close-First Floor	0.49	0.24

6.3 Sensitivity Analysis

A sensitivity analysis was undertaken to establish the effect of taking in to consideration that the motorway passes the site partly within a cutting and partly on a shallow embankment. The analysis was undertaken by rerunning the model with complex terrain across the whole of the site. The level of the motorway varies from 115m AOD at the northern part to a level of 105m AOD at the southern point. The site is falling from east to west, with the level of 119 m AOD at the north eastern end by the cutting with a level of 103m AOD at the south eastern corner. On average, with the exception of cutting, the motorway is approximately between 1m and 2m above the site. The model predicted concentrations are presented in Appendix C.

The sensitivity analysis indicates that by including the topography in the analysis, the predicted NO₂ values close to the motorway have decreased by a maximum of 46%. The predicted values near the motorway are below the objective values.

7 Conclusions and Recommendations

7.1 Conclusions

The results of the analyses undertaken as part of this assessment indicate the following:

- The annual mean pollution concentration limit of 40µg/m³ for NO₂, as set out in the Air Quality Limit Value Regulations was exceeded within the site in year 2020 for receptors located within 35m from the edge of the M40 motorway. Therefore it is recommended that this defined areas is only used for garaging, car parking or informal recreational type use.
- The maximum percentage increase in the level of NO₂ and PM₁₀ at the existing sensitive receptor locations, as a result of the proposed development in year 2020, are 3.49% and 1.13% respectively. Thus, the magnitude of change caused by the proposed development is considered small in accordance with the guidelines published by Environmental Protection UK (2010).
- The annual mean pollution concentration limit of 40 µg/m³ for NO₂, as set out in the Air Quality Limit Value Regulations were not exceeded at any of the existing receptors considered within the AQMA area on Stroud and Fisher Close without and with the proposed developments. The proposed developments do not introduce new exposure to breach the regulations.

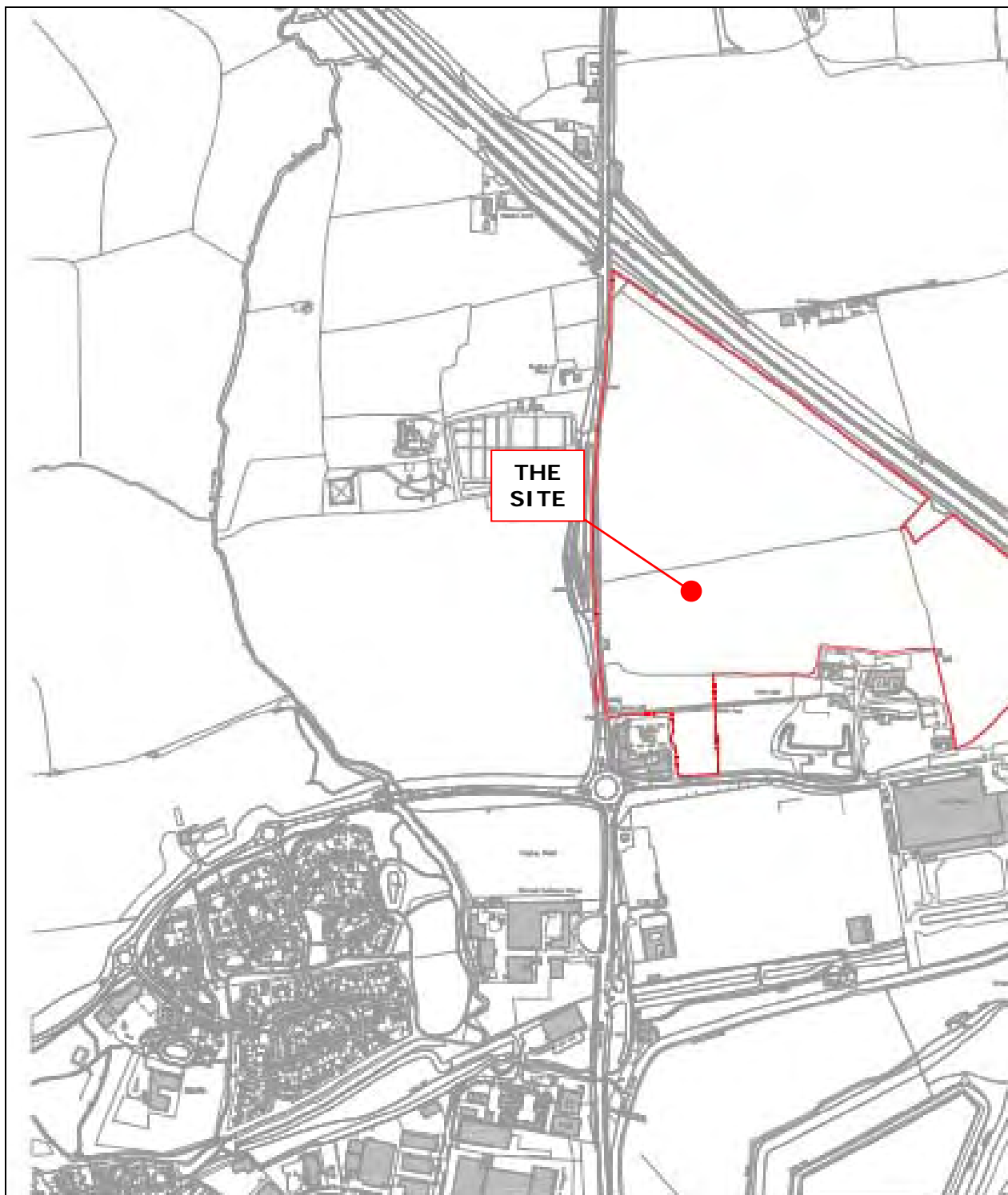
Overall, it is considered that the impact of proposed development on the ambient air quality near the development site will be small.

7.2 Recommendations

The NO₂ pollution concentration within a strip of land 35m parallel to the motorway are shown to be above the Objective value for NO₂ and that this defined area is only used for garaging, car parking or informal recreational use.

8 References

- 1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland; Addendum, Department of Environment Food and Rural Affairs 2003.
- 2 Local Air Quality Management, Technical Guidance, LAQM.TG (09), Department of Environment Food and Rural Affairs (2009).
- 3 Air Quality Environmental Assessment Techniques, Design Manual for Roads and Bridges (DMRB), Highways Agency, Volume 11, Section 3 (2007).
- 4 National Road Traffic Forecasts (Great Britain) (1997), Department of the Environment, Transport and the Regions.
- 5 Development Control: Planning for Air Quality (2010 Update), Environmental Protection UK (2010).
- 6 Lexden D, Mamer B, and Donovan S, (2007) Deriving NO_2 from NO_x for Air Quality Assessment of Roads – Updated to 2006. Air Quality Consultants Ltd.
- 7 Air Quality and Planning Guidance, London Councils, The London Air Pollution Planning and the Local Environment (APPLE) Working Group. (2007)
- 8 Planning Policy Statement 23(PPS23), (2004) Department for Environment Food and Rural Affairs (defra).
- 9 Pittman, J, Gardiner, D and Anderson, E (2011). The Highways Agency Roadside Air Pollution Monitoring Network-2010 Volume 1, CPR1095(I), Project Report, TRL.



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Project

Land East of Southam Road, Banbury

Job No.

723855

Figure No.

1

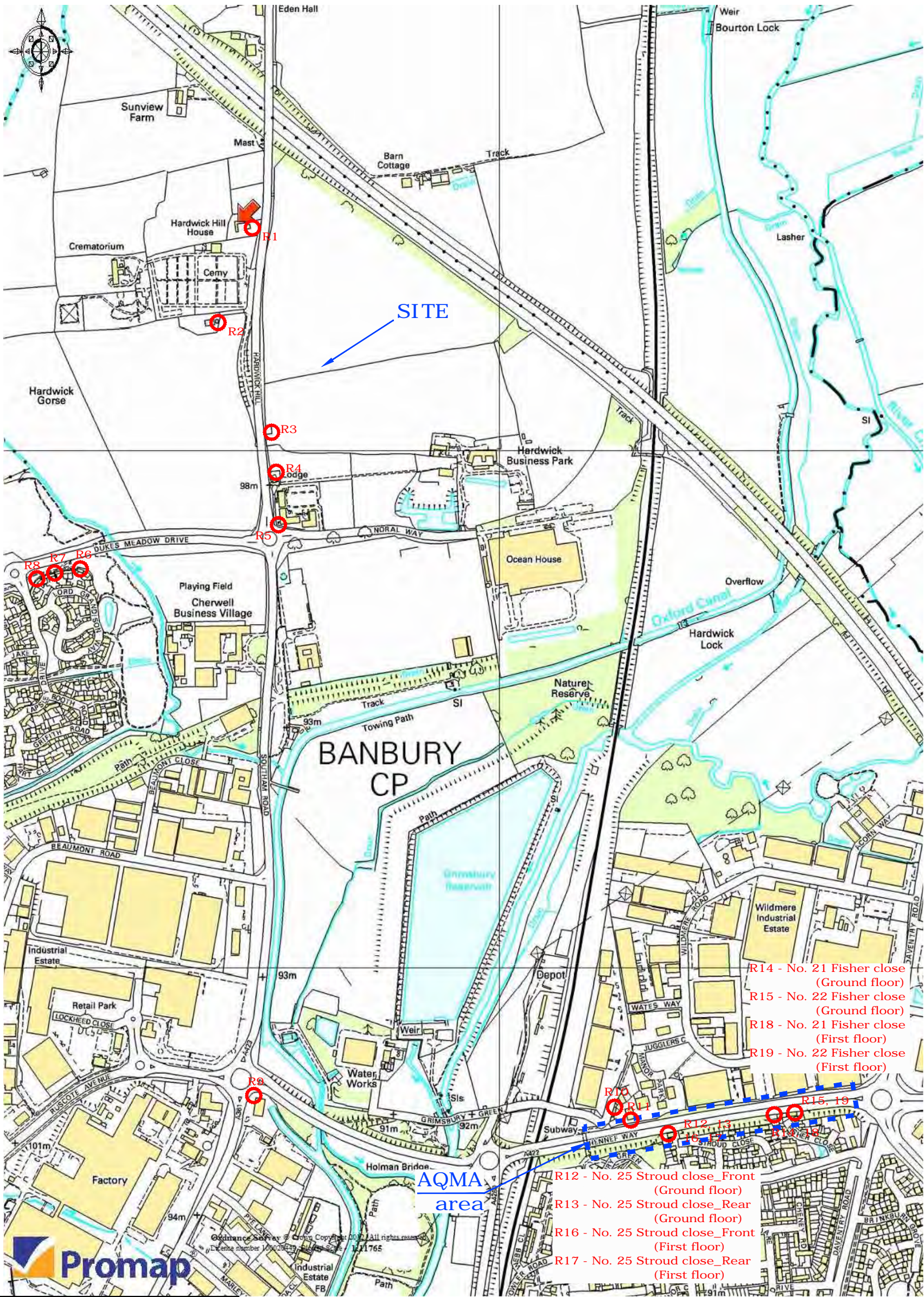
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Rev	Date	Description	Made	Ckd
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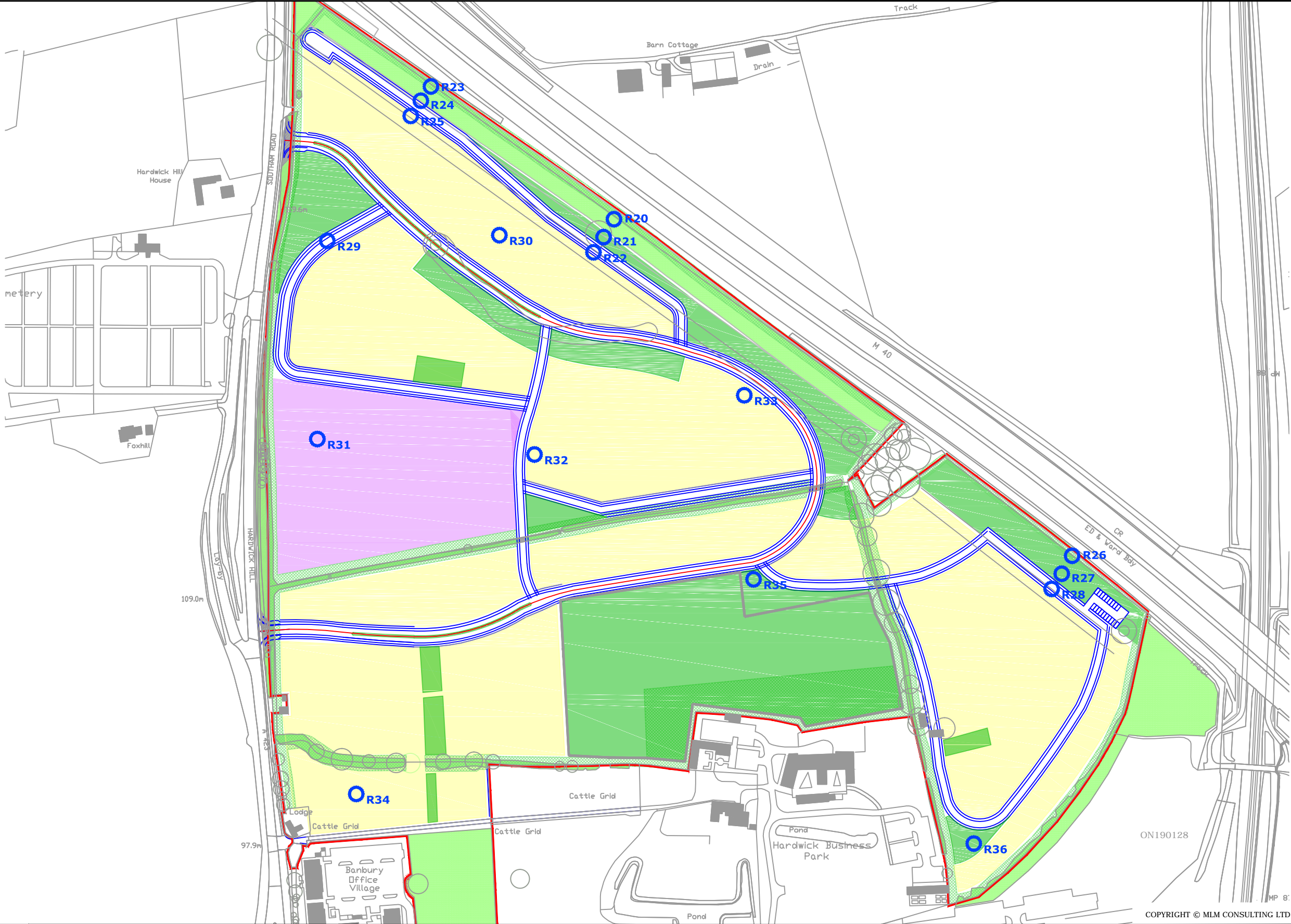
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LEGEND :

-  PROPOSED RECEPTOR
-  RESIDENTIAL
-  SCHOOL SITE (2.2ha)
-  RETAINED VEGETATION
-  PROPOSED OPEN SPACE/GREEN INFRASTRUCTURE
-  PRIMARY VEHICULAR/ BUS/CYCLE ROUTE
-  SECONDARY VEHICULAR/ CYCLE ROUTES



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LAND EAST OF SOUTHAM ROAD

Drg Title

PROPOSED RECEPTORS
REPORT 1

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AM/SC

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SC

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SC

Date

JULY 2012

Scales

N.T.S

@ A3

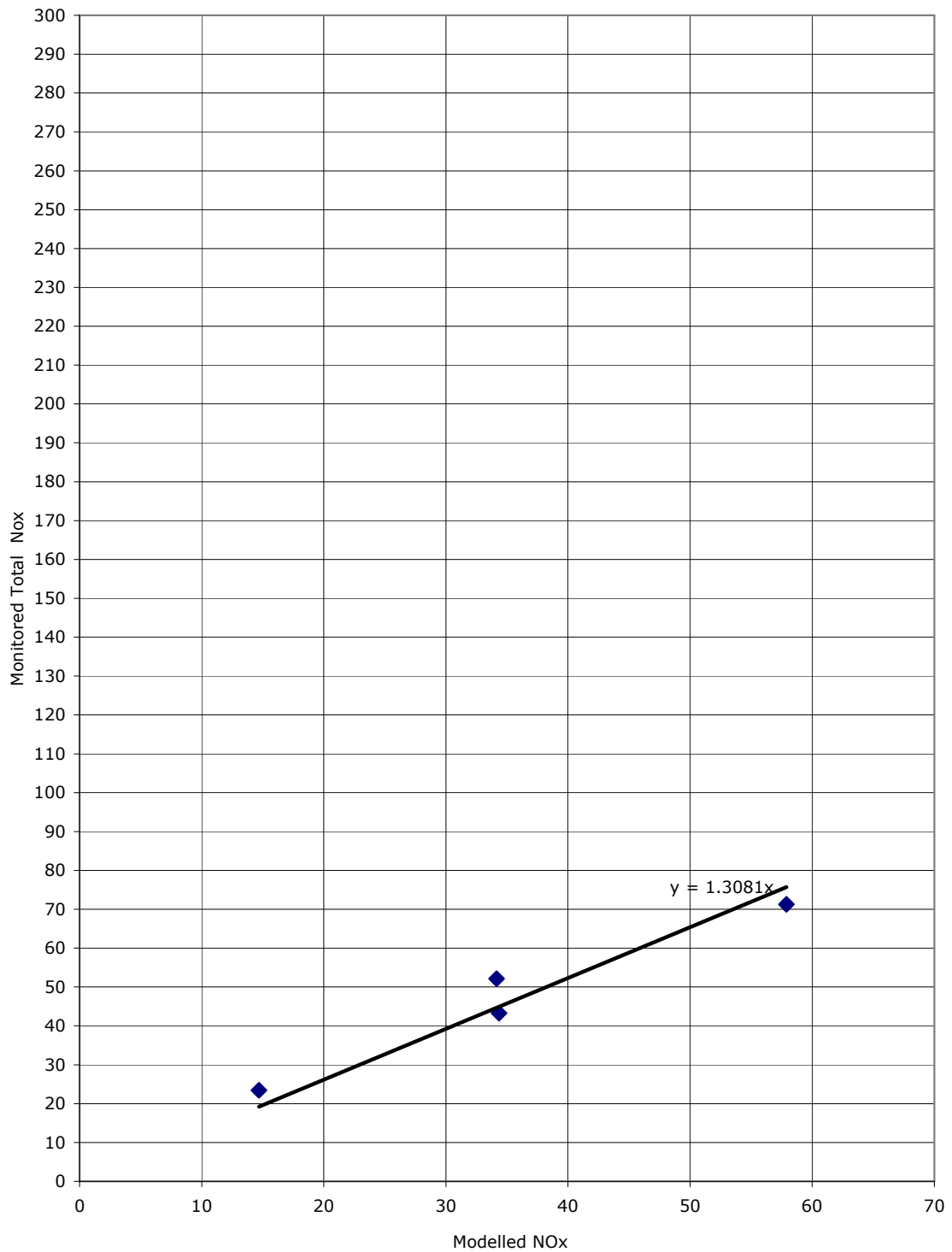
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Rev

A

A	08.01.13	REVISED SCHEME PLAN	ARM	SC
Rev	Date	Description	Made	Ckd



Appendix

Appendix A – Cemetery Stack Details and Emissions Data

Appendix B – Wind Rose

Appendix C – Results of Sensitivity Analysis

Appendix A

Cemetery Stack Details and Emissions Data

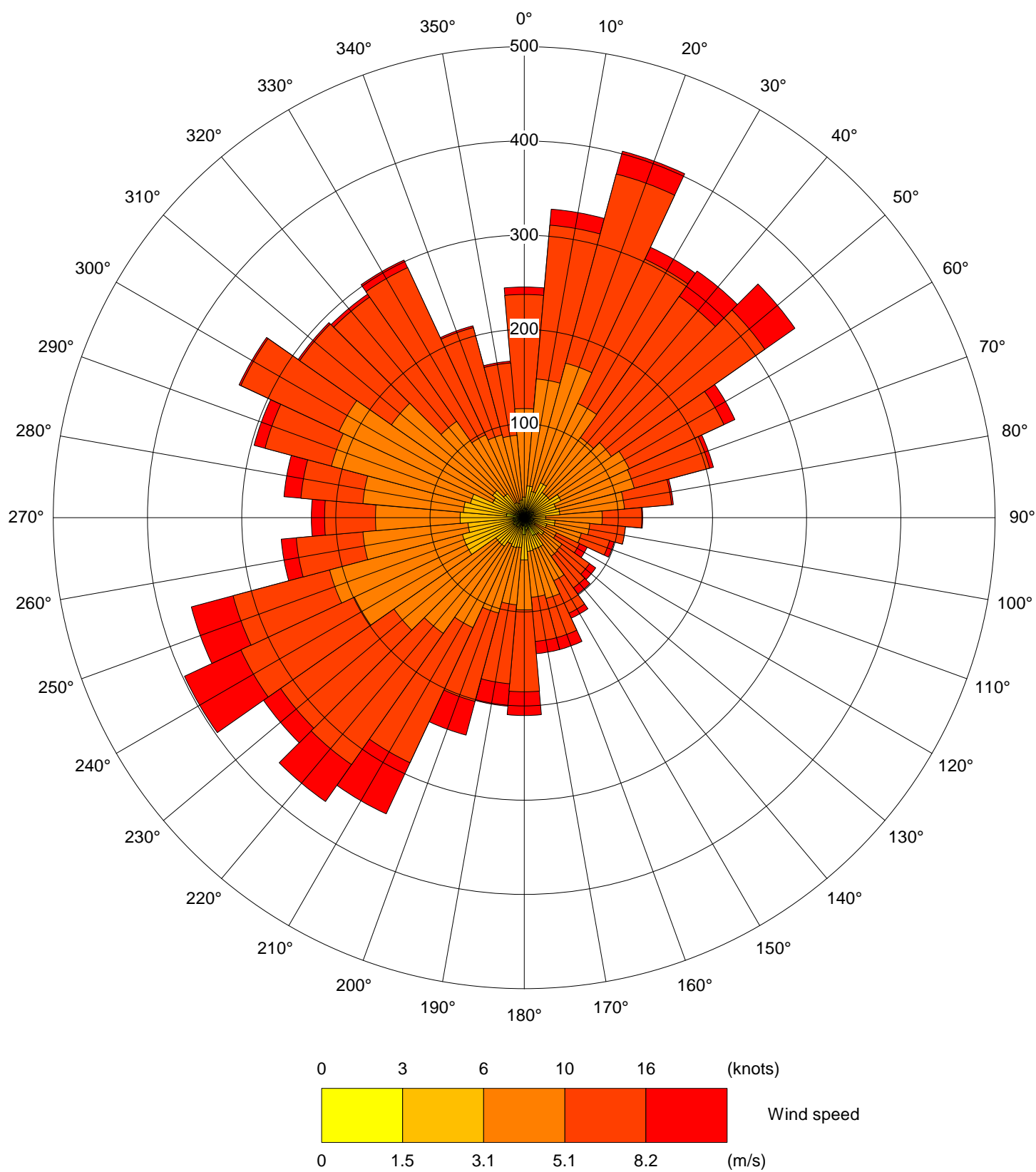
Cemetery Stack Details and Emission Details

- Stack Height = 11m
- PM₁₀ emission = 3.3E-2g/s
- Diameter = 0.5m
- Velocity = 15m/s

Appendix B

Wind Rose

C:\Seera\Temp_6\723855-Southam_Road_Banbury\Met_Data\littlerissadms10.met



Appendix C

Results of Sensitivity Analysis

Results of Sensitivity Analysis

NO₂ emission levels at receptors within the site following complex terrain analysis.

Receptor Name	NO ₂ Annual Mean (µg/m ³)
R20. Proposed Rec	26.59
R21. Proposed Rec	26.27
R22. Proposed rec	26.7
R23. Proposed Rec	24.79
R24. Proposed Rec	24.73
R25. Proposed Rec	24.68
R26. Proposed Rec	27.27
R27. Proposed Rec	26.7
R28. Proposed Rec	27.08
R29. Proposed Rec	23.34
R30. proposed Rec	24.3
R31. Proposed Rec	22.74
R32. Proposed Rec	23.26
R34. Proposed Rec	22.59
R35. Proposed Rec	23.62