Angus Energy Plc

Balcombe 2z Hydrocarbon Well Testing

Air Quality Assessment

Project 443943

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RSK GENERAL NOTES

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Summary

RSK Environment Ltd (RSK) was commissioned by Angus Energy Plc to undertake an air quality assessment as part of the re-application for planning permission for the proposed Balcombe 2z hydrocarbon well testing at the Lower Stumble Exploration Site off London Road, near Balcombe, Haywards Heath.

An overview of the planning history and works that have been undertaken on-site to date is included within this report. Angus Energy is now re-applying to West Sussex County Council (WSCC) for a new temporary planning permission.

The borehole is already located at the application site and there will be no significant construction works. Odour and dust associated with this type of development are typically minimal and given the closest residential receptor is approximately 350m from the site, emissions are considered to be insignificant and assessment of odour and dust has been scoped out of the air quality assessment.

The assessment therefore focused on the potential operational phase impacts on local air quality as follows:

- Exhaust emissions from traffic associated with the proposed development;
- Emissions to air from flaring; and
- Emissions to air from generator used to power equipment on site.

The proposed development will not generate a significant amount of traffic once operational, therefore using 2017 Environmental Protection UK / Institute of Air Quality Management (EPUK-IAQM) guidance, the impact of operational phase traffic on local air quality have been considered to be negligible.

The main potential air quality impact once the proposed development is operational is considered to be emissions from two flares (PW flare and AEREON flare) and two generator engines. Only two emission sources (one flare and one generator) are considered to be operational at any time. A realistic scenario where one flare and one generator would be in operation is assessed and presented in this report. The assessment of operational impacts has been undertaken using AERMOD, an advanced atmospheric dispersion model developed for regulatory purposes, with the use of meteorological data measured between 2014 and 2018 at the Gatwick airport weather station. Concentrations of key air pollutants (oxides of nitrogen (NO_x), nitrogen dioxide (NO_2) particulate matter (PM_{10} and $PM_{2.5}$) and carbon monoxide (CO)) have been predicted at discrete receptor locations.

In order to assess the potential impact of increases in pollutant concentrations attributable to the development on existing sensitive receptors, the results have been interpreted using the 2017 EPUK-IAQM guidance. The proposed development was found to have negligible impact on local air quality in terms of all pollutants assessed.

The proposed development was also assessed as having a minimal impact at nearby sites designated for their ecological importance, with regards to nitrogen and acid deposition, and ambient annual mean NO_x concentrations.

The assessment has concluded that the air quality impact of the proposed development is not significant. As this assessment has determined that the operational phase impacts on local air quality are not significant, additional mitigation measures have not been recommended and the residual impacts are considered to be acceptable.

Abbreviations

APIS	Air Pollution Information System
AQAL	Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon dioxide
Defra	Department for Environment, Food and Rural Affairs
EC	European Commission
EPUK	Environmental Protection UK
EQS	Environmental Quality Standard
EU	European Union
GHG	Greenhouse Gases
GWP	Global Warming Potential
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MSDC	Mid-Sussex District Council
N_2O	Nitrous oxide
NAQS	National Air Quality Strategy
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM_{10}	Particulate matter of size fraction approximating to <10mm diameter
$PM_{2.5}$	Particulate matter of size fraction approximating to <2.5mm diameter
RSK	RSK Environment Limited
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WSCC	West Sussex County Council
UK-AIR	UK Atmospheric Information Resource

Contents

1 INTRODUCTION

This report has been prepared on behalf of Angus Energy Weald Basin No.3 Ltd (hereafter 'Angus Energy') for the proposed removal of drilling fluids and Extended Well Test (EWT) on land at Lower Stumble Wood, Hydrocarbon Exploration Site, London Road, Balcombe, Haywards Heath, RH17 6JH (hereafter 'the site').

Figure 1.1 shows the location of the application site, for which the approximate grid reference of the centre of the site is 531022, 129238.

Figure 1.1: Location of Application Site

A brief description of the site's previous planning history and the proposed works are provided below, but further details can be found in the Planning Statement, which forms part of the planning application package.

1.1 Summary of Site History and Proposed Works

The site has an established planning history, having been first used for exploratory drilling from 1986-1987 with the pad subsequently retained for use by Balcombe Estate (the current landowners) for forestry product storage.

The Balcombe 2z Hydrocarbon Borehole was established in 2013 for gas and oil exploration, and the site has since been subject to several planning applications.

More recently, Angus Energy submitted an application for planning permission (planning ref. WSCC/071/19) in September 2019 for a two-stage activity, firstly to remove previously used drilling fluids from the wellbore, followed by an EWT to be carried out over a period of three years. This application was subsequently withdrawn.

The proposed work on the Balcombe 2z Well will take place in four distinct phases, with planning and regulatory approvals at each phase. These are as follows:

- **Phase 1 – Removal of Wellbore Fluids:** phase 1 of the works has been designed to remove wellbore fluids which are currently preventing the natural formation fluids from entering the well. This phase would effectively clean up the well in preparation for undertaking an EWT.
- **Phase 2 – Pad Membrane:** For the site to meet established onshore oil and gas standards, a site-wide impermeable membrane will be installed by a civil engineering contractor.
- **Phase 3 – Extended Well Test:** The objective of the EWT is to enhance subsurface data so Angus Energy can start estimating potential production reserves, assess the commerciality of the well and obtain empirical data e.g. water cut data, flow rates and hydrocarbon composition. The EWT is a continuation of the exploration phase to prove that a hydrocarbon resource exists.
- **Phase 4 – Plug and Site Restoration:** Phase 4 involves removing all of the surface plant and equipment from the site as well as plugging the wellbore to the prevailing HSE standards. Upon completion the site will be restored, with 50% of the pad to become deciduous woodland in accordance with the High Weald AONB Management Plan 2019-2024.

In order to demonstrate exceptional circumstances and ensure that the development does not compromise the landscape qualities of the High Weald AONB, the proposal has been modified to decrease impact to visual amenity, and a habitat restoration plan will be implemented during Phase 4 of the operation. Please refer to the Landscape and Visual Appraisal and associated plans and drawings for further details.

1.2 Air Quality Assessment

As part of the 2017 planning permission a detailed air quality assessment was prepared. Given the time that passed since this application and the change of proposed timeline, a revised air quality assessment was prepared using latest guidance and data for the 2019 planning applications. Due to changes in the proposed work an updated air quality assessment has been prepared for the re-application.

Odour and dust associated with this type of development are typically minimal and given the closest residential receptor is approximately 350m from the site, it is assumed

that these emissions will be insignificant and assessment of odour and dust has been scoped out of the air quality assessment.

The assessment will therefore focus on the assessment of potential operational phase impacts on local air quality as follows:

- Exhaust emissions from traffic associated with the proposed development;
- Emission to air from flaring; and
- Emission to air from generator used to power equipment on site.

2 LEGISLATION, PLANNING POLICY AND GUIDANCE

2.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy (NAQS). The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The EU Air Quality Framework Directive (1996) established a framework under which the EU could set limit or target values for specified pollutants. The directive identified several pollutants for which limit or target values have been, or will be set in subsequent 'daughter directives'. The framework and daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates ($PM_{2.5}$).

2.1.1 Air Quality Objectives and Standards

The air quality standards and objectives in the United Kingdom are derived from European Commission (EC) directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) Amendment Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the EU Air Quality Framework Directive into English Law. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant[1] Air Quality Strategy (AQS) objectives for England and Wales to protect human health and for the protection of vegetation and ecosystems are summarised in Table 2.1.

Table 2.1: Air Quality Objectives/Standards Relevant to the Proposed Development

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (µg/m^3)
AQS Objectives for Protection of Human Health			
Nitrogen dioxide (NO_2)	Annual	-	40
	1 hour	18	200
Carbon Monoxide (CO)	8-hour	-	10,000

[1] Relevance, in this case, is defined by the scope of the assessment.

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (μg/m³)
Particulate Matter (PM_{10})	Annual		40
	24-hour	35	50
Particulate Matter ($PM_{2.5}$)	Annual	-	25
AQS Objectives for Protection of Vegetation and Ecosystems			
Oxides of nitrogen (NO_x)	Annual	-	30

2.1.2 The Environment Act

The set objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an air quality management area (AQMA) under Section 83 of the Act, and produce an air quality action plan (AQAP) to outline how air quality is to be improved to meet the objectives under Section 84 of the Act.

2.2 Planning Policy and Guidance

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.2.1 National Planning Policy

National Planning Policy Framework

In 2019 the revised National Planning Policy Framework (NPPF) was published, superseding the previous NPPF with immediate effect. The NPPF includes a presumption in favour of sustainable development.

Section 15 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent '*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*' and goes on to state that '*new development* [should be] *appropriate for its location' and 'the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account*.'

With specific regard to air quality, the NPPF states that: *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual*

sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

2.2.2 Local Planning Policy

Mid Sussex District Plan 2014-2031

The 2018 Mid Sussex District Council Local Plan includes Policy DP29: Noise, Air and Light Pollution, which states the following:

> *"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:*
>
> *…Air Pollution:*
>
> - *It does not cause unacceptable levels of air pollution;*
> - *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…."*

Sussex Air: Air Quality and emissions mitigation guidance for Sussex (2019)

The air quality and emissions mitigation guidance produced by Sussex air partnership provide guidance on how to assess and mitigate the impacts that new developments may have on local air quality.

High Weald Area of Outstanding natural Beauty (AONB) Management Plan 2019-2024

The AONB Management Plan sets out long term objectives for conserving the landscape and the local authorities' ambitions for how the High Weald will be looked after. The plan includes Objective FH3: To enhance the ecological function of field and heath as part of the complex mosaic of High Weald habitats, which states the following proposed action:

'…

- *Strategies implemented to reduce the nutrient input via air pollution to vulnerable habitats such as heathland'*

The plan also includes Objective OQ4: To protect and promote the perceptual qualities that people value, which states the following:

'To ensure that the special qualities people value, such as tranquillity, dark skies, sense of naturalness and clean air, are recognised and taken account of in AONB management.'

2.3 Best Practice Guidance Documents

2.3.1 Land-Use Planning & Development Control: Planning for Air Quality

Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) jointly published a revised version of the guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' in 2017 (herein referred to as the '2017 EPUK-IAQM' guidance) to facilitate the consideration of air quality in the land-use planning and developmental control process. It includes screening criteria for determining the likelihood of an air quality assessment being required and criteria for determining the significance of any air quality impacts associated with a development proposal. Details of these criteria within the guidance are replicated in Annex A of this document.

2.3.2 Guidance Document - Air Emissions Risk Assessment for your Environmental Permit

This guidance issued by the Environment Agency and Defra in 2016, has replaced the revoked horizontal guidance 'H1 Annex F – Air Emissions' (Environment Agency, 2011) for assessing industrial emissions in the UK under the Environmental Permitting Regulations. This guidance is primarily related to air quality assessments for Environmental Permit applications, however it has been referred to within this assessment, where appropriate.

3 ASSESSMENT SCOPE & METHODOLOGY

3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Baseline characterisation of local air quality;
- Qualitative assessment of air quality impacts relating to traffic during the operational phase of the proposed development using 2017 EPUK-IAQM guidance;
- Quantitative assessment of air quality impacts during the operational phase of the proposed development using detailed dispersion modelling assessment of exhaust emissions from the proposed flare and generator engine on human receptors and at ecologically sensitive sites;
- Recommendation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised; and,
- Identification of residual impacts resulting from the proposed development.

3.2 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. A desk based study has been undertaken including a review of monitoring data available from MSDC and estimated background data from the LAQM Support website maintained by Defra. Background concentrations have been mapped by Defra at a grid resolution of 1x1km for the whole of the UK.

3.3 Operational Impact Assessment

3.3.1 Operational Phase Emissions from Traffic

Once operational, the proposed development will generate additional traffic on the surrounding road network; the emissions to air associated with this traffic have the potential to impact on nearby sensitive receptors. The EPUK-IAQM 2017 guidance provides indicative criteria for when an air quality assessment is required, if none of the criteria are exceeded, it is considered unlikely that there will be any significant impacts on air quality during the operational phase. A simple screening level assessment against these criteria has been undertaken.

3.3.2 Operational Phase Emissions from Flaring and Generator Engine

As the proposed development includes two emission sources (a flare and a generator) detailed dispersion modelling was considered appropriate to assess the potential impacts on local air quality at sensitive receptors, once operational. The key air

pollutants of concern for the operation of the proposed development are NO_x, NO_2, and CO from both the flare and the generator, and also PM_{10} and $PM_{2.5}$ from the generator engine which is diesel fuelled. It is understood that the gas being burnt during flaring is predominantly methane and does not contain sulphur or benzene, therefore sulphur dioxide and benzene have not been considered in this assessment.

RSK are not aware of any committed or consented developments in the area with significant emissions to air, and therefore the potential air quality impacts of this proposed development during the operational phase are considered in isolation.

The following subsections provide further information regarding input to the dispersion model including emissions sources, meteorological data and receptors/study area included.

3.3.3 Modelling Software

The impact assessment of the proposed site was undertaken using the latest version of BREEZE AERMOD with a Geographical Information System (GIS) capability (Version 9.0.0.23).

3.3.4 Emission Sources

Two flare sources are proposed. However, only one flare will be operating at any one time. The gas flaring activity is proposed to operate whenever the well is flowing. For a conservative assessment, it has been assumed that the flare will operate continuously.

Two generators (each approximately 220ekW) are expected to be on-site. One of the generators is for redundancy purposes, therefore only one generator will be operating at any one time. The generator will operate continuously.

As there will be two flares and two generators on site, but the intention is to only operate one flare and one generator at any one time, the following realistic operation scenario has been modelled:

- Operating one generator and one flare

Tables 3.1 to 3.3 present the physical and emission characteristics of the proposed flares and generator engine based on data provided by Angus Energy.

The location of the generator have been provided by the client, and are located to the south of the linear pump.

The NO_x and CO emission rates are based on data from the UK Offshore Operators Association guidance document and the upper volume of gas flared per day (5000m^3 as allowed by the Environmental Permit).

Table 3.1: Physical and Emission Characteristics of PW Flare Emission Source Included in the Assessment

Description - Flare	Parameters Included in the Air Dispersion Model per stack
Operation	Operating 24 hours per day
Fuel	Natural gas
Stack height	13.72m above ground
Heat release, calories per second	617417
Radiation loss	10%
Stack exhaust temperature	800°C
Actual stack velocity	20 m/s
Nitrogen oxides (NO_x) emission rate	0.059 g/s
Carbon monoxide (CO) emission rate	0.331 g/s
Number of flare stacks	1
Stack Position	Easting (m) Northing (m) 531010 129196

Table 3.2: Physical and Emission Characteristics of AEREON Flare Emission Source Included in the Assessment

Description - Flare	Parameters Included in the Air Dispersion Model per stack
Operation	Operating 24 hours per day
Fuel	Natural gas
Stack height	5.5m above ground
Heat release, calories per second	617417
Radiation loss	10%
Stack exhaust temperature	982°C
Actual stack velocity	8.8 m/s
Nitrogen oxides (NO_x) emission rate	0.03 g/s
Carbon monoxide (CO) emission rate	0.02 g/s
Number of flare stacks	1
Stack Position	Easting (m) Northing (m) 531011 129197

Table 3.3: Physical and Emission Characteristics of Generator Emission Source Included in the Assessment

Description – per Generator Engine	Parameters Included in the Air Dispersion Model per stack	
Operation	Operating 24 hours per day	
Fuel	Diesel	
Stack height	2m above ground	
Stack diameter	0.2m	
Stack exhaust temperature	543.1°C	
Actual stack velocity	23.7 m/s	
Nitrogen oxides (NO_x) emission rate	0.932 g/s	
Carbon monoxide (CO) emission rate	0.158 g/s	
Particulate Matter (PM) emission rate	0.008 g/s	
Number of generator stacks	2 (only one operating at any time)	
Stack positions	Easting (m) 531039 531040	Northing (m) 129236 129237

3.3.5 Buildings

There are no high-rise buildings within the site or in the vicinity.

3.3.6 Meteorological Data

Hourly sequential meteorological data measured between 2014 and 2018 at the Gatwick Airport meteorological station, located approximately 12km southeast of the site, has been utilised in this model and is considered to be representative of local conditions.

The maximum predicted pollutant concentrations for each of the five years have been reported. The windroses for the meteorological station are presented in Annex B.

3.3.7 Terrain

Ordnance Survey digital terrain data were included in the assessment to account for topographical features of the land covering the model domain.

3.3.8 Background Air Quality Data Used in the Modelling

Background NO_2, PM_{10} and $PM_{2.5}$ concentrations for the study area have been taken from the national maps provided by Defra. These maps provide estimated background concentrations for the whole of the UK at a grid resolution of 1km x1km. The maps assume that background concentrations will improve (i.e. reduce) over time, in line with the predicted reduction in vehicle emissions as well as reductions in emissions from other sources. Due to the current uncertainty in the assumed reductions, background concentrations for 2019 have been considered rather than the anticipated opening year of the proposed development. This is considered a conservative approach.

Annual mean CO concentrations have been taken from the 2001 LAQM Support / UK-AIR background maps, as these are the latest datasets available for CO. For this assessment it has been assumed that there has been no reduction in the background concentration since 2001 to provide a worst-case assessment.

The approach for background NO_x concentrations at ecological receptors is described in Section 3.3.13.

Background concentrations used within the assessment are presented in the baseline section in Table 4.

3.3.9 Receptor Locations and Model Domain

Pollutant concentrations were predicted at a number of receptors at existing sensitive locations. Details of all specific receptors included in the modelling study are summarised in Table 3.4 and shown in Figures 3.1 and 3.2 for human receptors and ecological receptors, respectively. Human receptors were modelled at a height of 1.5m and ecological receptors at a height of 0m.

A review of Defra's MAGIC website was undertaken to identify the designated ecological sites and the Project Ecological Consultants were consulted regarding locations of Local Wildlife Sites (LWS) within 2km of the proposed site. Ecological receptors include sites that are Special Protected Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites (protected wetlands) within 10km of the site, as well as Sites of Special Scientific Interests (SSSIs) and local nature sites (ancient woodlands, local wildlife sites, national and local nature reserves) within 2km of the site, as per the Environment Agency & Defra (2016) guidance. The closest point within each of the designated ecological sites was selected as detailed by the co-ordinates presented in Table 3.4.

Furthermore, for the purpose of considering potential impacts at a greater number of locations by producing isopleths (pollution concentration contours), for the predicted annual and short-term concentrations for NO_2, hypothetical grid receptors spaced at 25m covering approximately a domain of 2km x 2km approximately centred over the proposed site have also been included. Concentrations were modelled at ground level for this grid of receptors.

Table 3.4: Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid reference	
		X	Y
Residential Receptors			
R1	Kemps Farm 1	530740	129554
R2	Kemps Farm 2	530832	129578
R3	Brook Cottage	530586	129882
R4	Holt's Cottages (24 Haywards Heath Road)	531653	129576
R5	Glebe's Farm	531510	129993
R6	Haywards Heath Road	531583	129788
R7	Bowders Farm	531791	129259
R8	Bowder's Cottage	531627	129167
R9	Norfolk Cottages	530257	129479
R10	Upper Pilstye Cottages	530475	128700
R11	Pilstye Farm	530663	128411
Ecological Receptors			
E1	Rowhill Copse LNR	530649	129954
E2	Ardingly Reservoir LNR	531997	129857
E3	Rowhill and Station Pastures LWS	530649	129954
E4	Balcombe Marsh LWS*	531485	128474
E5	Balcombe Estate Rocks LWS	531744	130039
E6	Ardingly Reservoir and Loder Valley Nature Reserve LWS	531997	129857
E7	Balcombe Lake and Associated Woodlands LWS	531933	130403
E8	Ashdown Forest SAC	539803	131298

Note: *Not found to be sensitive to acid deposition according to APIS.

Figure 3.1: Proposed Site Location with Human (Residential) Receptors

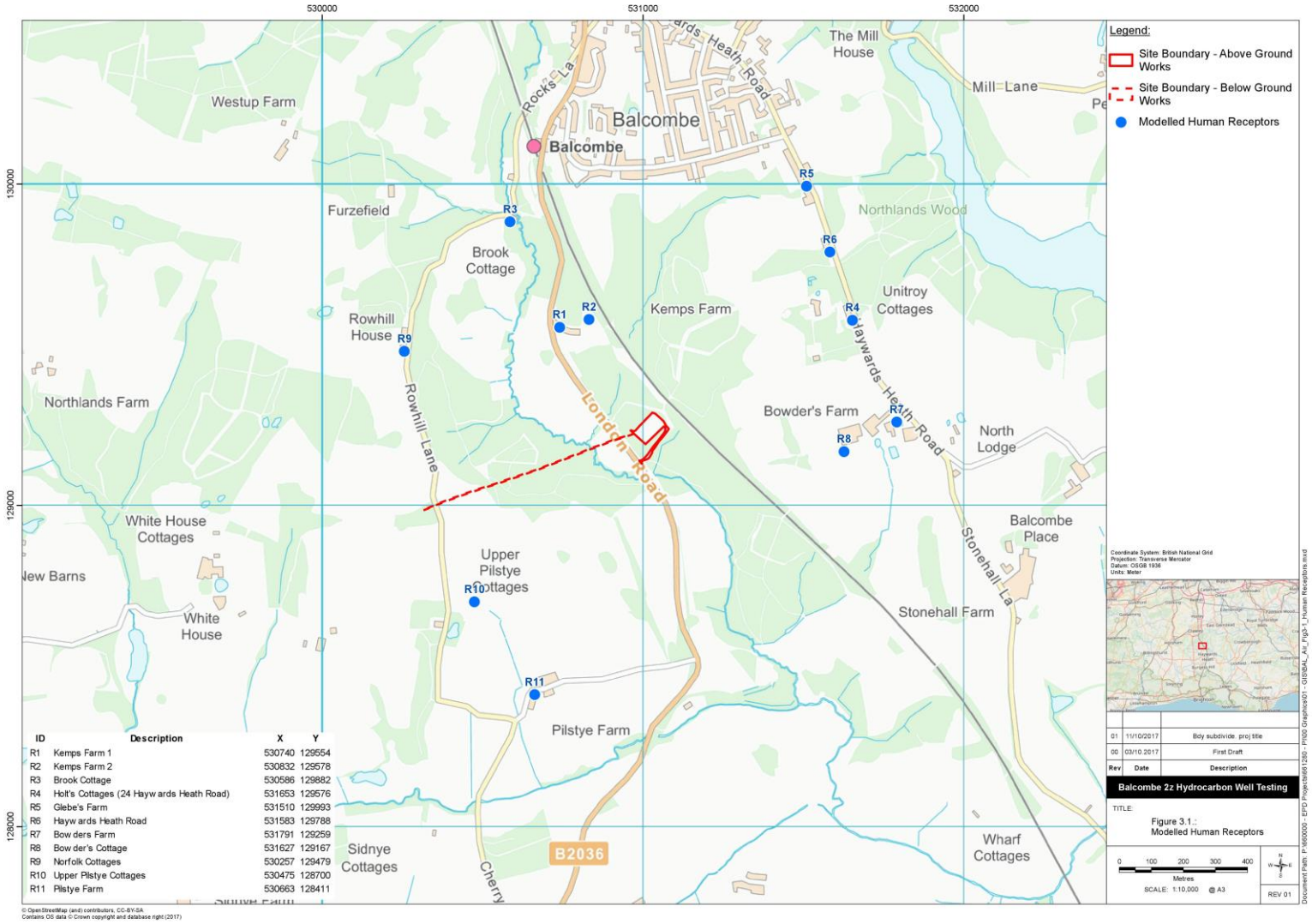
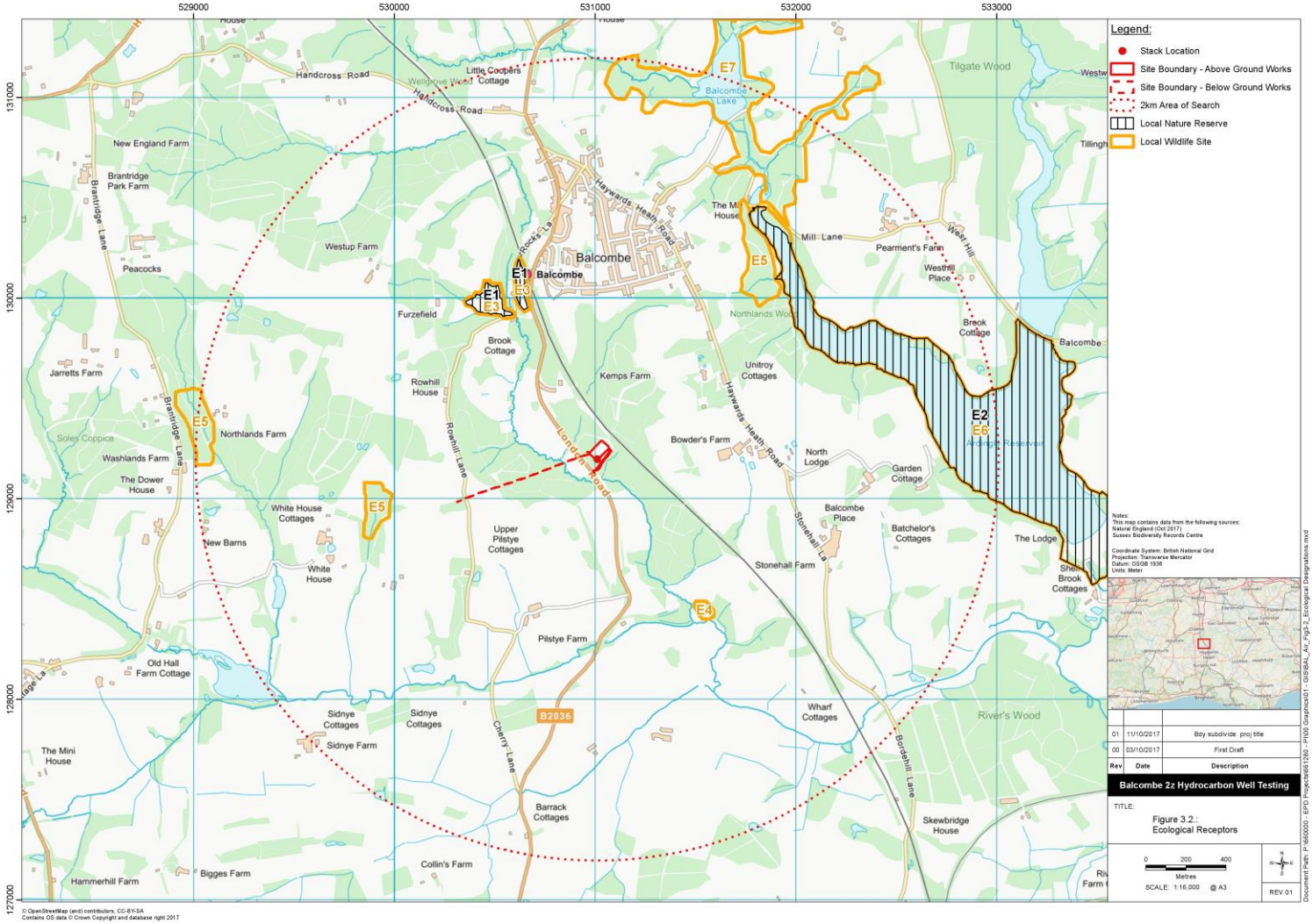


Figure 3.2: Proposed Site Location with Ecological Receptors



3.3.10 NO_x/NO_2 Chemistry

NO_x emitted to the atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2, which is of concern with respect to health and other impacts. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as O_3. The dispersion modelling exercise predicts concentrations of NO_x which subsequently require conversion to NO_2.

The conversion rate of NO_x to NO_2 used in this assessment followed Environment Agency guidance, as follows:

- Long-term: Predicted NO_2 annual average concentration = 70% of the predicted annual average NO_x concentration plus annual average background NO_2 concentration; and
- Short-term: Predicted NO_2 99.79th percentile of hourly average concentrations = 35% of the predicted 99.79th percentile of hourly average NO_x concentrations plus twice the annual average background NO_2 concentration.

3.3.11 Predicted Pollution Concentrations

The results of the dispersion modelling assessment are presented and discussed in Section 5.

Isopleths (i.e. pollution concentration contours), for the predicted annual and hourly mean NO_2, are presented in Annex C, for the meteorological year in which the maximum concentrations was modelled at any of the off-site discrete receptor locations.

3.3.12 Significance Criteria

The 2017 EPUK-IAQM guidance includes significance criteria which have been used for the operational phase assessment, as detailed within Annex A.

3.3.13 Nitrogen and Acid Deposition Calculations

Total annual mean NO_x concentrations and acid and nitrogen deposition rates, were calculated at discrete ecological receptor locations within Local Nature Reserves (LNRs) and LWSs within 2km of the proposed development site and SACs/SPAs within 10km. No SSSIs, ancient woods or National Nature Reserves were identified within 2km nor were any Ramsar sites identified within 10km of the proposed development site.

The broad habitat types identifiable at each identified ecological site were provided in consultation with the Project Ecological Consultants and information available on the Air Pollution Information System (APIS) for the purpose of the nitrogen and acid deposition calculations. Where more than one habitat type was identified within each ecological

site, it has been assumed that the habitat most sensitive to the proposed development is represented at the modelled discrete receptor location, for a conservative assessment.

Background NO_x concentrations, the critical nitrogen deposition loading capacities, the nitrogen and sulphur acid deposition loading capacities, and background nitrogen and acid deposition rates, were obtained from the APIS website.

The total NO_x concentrations have been compared to the annual mean environmental quality standard (EQS). The nitrogen deposition process contributions (PCs) were compared to the applicable minimum deposition critical loads. The acid deposition process contributions (PCs) were compared to the critical load functions (dependent on the nitrogen and sulphur deposition loading capacities), using the "Critical Load Function tool" on the APIS website.

3.4 Uncertainties and Assumptions

The following uncertainties and assumptions were made in the air quality assessment:

- Estimated background data from the Defra LAQM website was used in the assessment for human receptors;
- For ecological receptors, the APIS website was used to determine the estimated annual mean NO_x concentrations likely to be applicable at each of the ecological receptors locations. It is assumed that these background concentrations are likely to be applicable for the lifetime of the development;
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at Gatwick Airport in 2014-2018 were 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;
- Hourly NO_2 concentrations, 24-hour PM_{10} concentrations and 8-hour mean CO concentrations have been predicted for the 99.79th, 90.4th and 100th percentile, respectively, assuming the plant is operational all hours of the year. In reality, the flare will operate whenever the well is flowing and therefore the results presented are considered to be very conservative; and
- There is an element of uncertainty in all measured and modelled data. All values presented in this report are best possible estimates.

4 BASELINE AIR QUALITY CHARACTERISATION

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources. Baseline air quality data employed in this study have been obtained from data provided by MSDC and the LAQM Support website operated by Defra.

4.1 Local Authority Review and Assessment of Air Quality

As directed by the Environment Act 1995, local authorities are required to review and assess air quality with respect to the standards and objectives for the pollutants specified in the Government's National Air Quality Strategy (2007). Local Authorities are required to undertake annual reporting of the concentrations of defined pollutants in their area.

Where objectives are not predicted to be met, local authorities must declare an AQMA. In addition, local authorities are required to produce an AQAP, which outlines measures aimed at improving air quality within the designated AQMA. MSDC has declared one AQMA, but the site is not located within or near to the AQMA (the AQMA is nearly 14km south of the site).

4.2 Baseline Monitoring Data

A review of the monitoring data available from the MSDC 2019 Air Quality Annual Status Report shows there are no monitoring locations located in the vicinity of the site. The closest monitoring location is diffusion tube MSAQ6 Smugglers End Handcross, approximately 4.9km west of the site. The annual mean concentrations measured at MSAQ6 have consistently been below the UK Air Quality Strategy (AQS) objective between 2012 and 2018, with latest results for 2018 being 26.2µg/m^3.

4.3 LAQM Background Data

An explanation of the source of the background data has been provided in section 3.3.8 of this assessment.

The background concentrations used within this assessment, and which are considered to represent the site and the nearby environs, are presented in Table 4.1. The study area falls into several grid squares and therefore an average of these background concentrations have been used to calculate concentrations across the modelled area for the pollution concentration contour plots presented in Annex C.

Background concentrations do not exceed the relevant annual average air quality objectives.

Table 4.1: LAQM Estimated Annual Average NO_2, PM_{10}, $PM_{2.5}$ (2019) and CO (2001) concentrations at the Proposed Development Site

Grid Square	Estimated Annual Average Background Pollutant Concentrations Derived from the LAQM Support website			
	Annual Average NO_2 ($\mu g/m^3$)	Annual Average PM_{10} ($\mu g/m^3$)	Annual Average $PM_{2.5}$ ($\mu g/m^3$)	Annual Average CO ($\mu g/m^3$)
530500, 129500	8.3	14.4	9.3	256
531500, 129500	8.1	14.0	9.2	256
530500, 128500	8.3	14.8	9.4	252
531500, 128500	8.1	14.2	9.3	253
531500, 130500	8.6	14.3	9.4	258
539500, 131500	7.7	13.9	9.2	239
Air Quality Objective	**40**	**40**	**25**	**10,000***
*Maximum daily running 8 hour mean				

5 ASSESSMENT OF IMPACTS

5.1 Operational Phase

5.1.1 Emissions to Air from Operational Phase Traffic

The traffic consultant for the development has advised that the maximum traffic flows associated with the proposed development, in any one day, will be:

- 22 cars; and
- 23 Heavy Goods Vehicles (HGVs).

Table 5.1 presents a comparison of the relevant EPUK-IAQM screening criteria for traffic generation and the traffic flows related to the proposed development. The traffic flows generated by the proposed development are well below the EPUK-IAQM screening criteria; therefore no significant impacts are expected and further assessment of the operational phase traffic is not required.

Table 5.1: Air Quality Screening Criteria from EPUK-IAQM Guidance and Comparison with the Proposed Development

EPUK-IAQM Screening Criteria	Comparison of proposed development to screening criteria
A change of Light Duty Vehicles (LDVs) of: – More than 500 Annual Average Daily Traffic (AADT)	**Criteria not exceeded:** The maximum daily car trip generated by the proposed development is estimated to be 22 car trips, well below 500 AADT.
A change of Heavy Duty Vehicles (HDVs) of: – More than 100 AADT	**Criteria not exceeded:** The maximum daily car trip generated by the proposed development is estimated to be 23 HGV trips, well below 500 AADT.

5.1.2 Operational Phase Emissions from Flaring and Generator Engine Operation

The main potential impact of the proposed development is considered to be emissions from the proposed enclosed ground flares and the generator engine on the sensitive receptors in the area surrounding the proposed development site. The results of the modelling exercise are summarised in the following subsections.

5.1.2.1 Dispersion Modelling Results

Source groups have been created in the dispersion model to identify the contribution from the flare and generator separately. The process contribution from both flares together is negligible when compared to that from the generator. Furthermore, the ground level NOx concentration from the PW flare is marginally higher than that from AEREON flare. Hence modelling is undertaken by assuming the operation of the PW flare.

Human Receptors

The predicted annual and hourly NO_2 concentrations, annual and 24-hour mean PM_{10}, annual mean $PM_{2.5}$ and maximum 8-hourly rolling mean carbon monoxide (CO) concentrations at each of the defined human receptor locations are presented below.

The contour plots, for predicted annual and hourly mean NO_2 concentrations are presented in Annex C, for the predicted concentrations were predicted to be largest at the discrete off-site receptor locations modelled.

Annual Mean Nitrogen Dioxide

The maximum predicted annual mean NO_2 concentrations resulting from the operation of the proposed development at each of the assessed discrete human receptor locations for any of the five meteorological data years are presented in Table 5.2.

The highest process contribution (PC) for annual mean NO_2 concentrations at the receptor locations was predicted to be 1.19µg/m^3, at R2 (Kemps Farm 2). The highest total annual mean concentration was also predicted at R2 and was 9.47µg/m^3 which is well below the objective for annual mean NO_2 concentrations of 40µg/m^3. Concentrations higher than the long-term NO_2 air quality objective were predicted at locations near the site boundary (as shown in contour plots placed in Annex C of this report), however, no fixed habitation and exposure is expected at these locations. Hence these are not considered to be exceedances and presented in the report for reference only. No such exceedances are predicted at sensitive receptor locations.

Therefore, no exceedances of the objective for annual mean NO_2 concentrations were predicted at any modelled receptor locations. A comparison of the results with the 2017 EPUK-IAQM criteria (see Annex A), shows the changes in pollutant concentrations (i.e. the PCs) are <5% and the impact on annual mean NO_2 concentrations is predicted to be negligible at all assessment receptors.

Table 5.2: Maximum Predicted Annual Mean NO_2 Concentrations at Discrete Human Receptors

Receptor ID	Receptor Description	Annual Mean NO_2 Concentration			
		PC	PC as % AQAL	Total Concentration	Total Concentration as % of AQAL
R1	Kemps Farm 1	0.71	0.71	8.98	22.5%
R2	Kemps Farm 2	1.19	1.19	9.47	23.7%
R3	Brook Cottage	0.39	0.39	8.66	21.7%
R4	Holt's Cottages (24 Haywards Heath Road)	0.55	0.55	8.70	21.7%
R5	Glebe's Farm	0.55	0.55	8.70	21.7%
R6	Haywards Heath Road	0.71	0.71	8.86	22.1%
R7	Bowders Farm	0.24	0.24	8.39	21.0%
R8	Bowder's Cottage	0.32	0.32	8.47	21.2%
R9	Norfolk Cottages	0.09	0.09	8.36	20.9%
R10	Upper Pilstye Cottages	0.32	0.32	8.60	21.5%
R11	Pilstye Farm	0.36	0.36	8.64	21.6%
Air Quality Objective		40 µg/m^3			

Hourly Mean Nitrogen Dioxide

The maximum predicted 99.79th percentile of the hourly mean NO_2 concentrations resulting from the operation of the proposed development at each of the discrete human receptor locations for any of the five meteorological years (2014 – 2018) are presented in Table 5.3.

The highest PC for the 99.79th percentile of the hourly mean NO_2 concentrations at the receptor locations, was predicted to be 38.79µg/m^3 at R2. Concentrations higher than the short-term NO_2 air quality objective were predicted at locations near the site boundary (as shown in contour plots placed in Annex C of this report), however, no fixed habitation and exposure is expected at these locations. Hence these are not considered as exceedances and presented in the report for reference only. No such exceedances are predicted at sensitive receptor locations. The total predicted annual mean concentration at R2 was 55.34µg/m^3 which is well below the objective for 1 hour mean NO_2 concentrations of 200µg/m^3. The PC at R2 is 19% of the relevant AQS objective which would be classed as a 'moderate adverse' magnitude of change using the EPUK-IAQM criteria.

Table 5.3: Maximum Predicted 99.79th Percentile of Hourly Mean NO_2 Concentrations at Discrete Human Receptors

Receptor ID	Receptor Description	99.79th Percentile 1 Hour Mean NO_2 Concentration			
		PC	PC as % AQAL	Total Concentration	Total Concentration as % of AQAL
R1	Kemps Farm 1	18.84	9%	35.38	17.7%
R2	Kemps Farm 2	38.79	19%	55.34	27.7%
R3	Brook Cottage	10.03	5%	26.58	13.3%
R4	Holt's Cottages (24 Haywards Heath Road)	5.02	3%	21.32	10.7%
R5	Glebe's Farm	4.70	2%	21.00	10.5%
R6	Haywards Heath Road	5.05	3%	21.35	10.7%
R7	Bowders Farm	4.80	2%	21.10	10.5%
R8	Bowder's Cottage	5.94	3%	22.24	11.1%
R9	Norfolk Cottages	3.68	2%	20.23	10.1%
R10	Upper Pilstye Cottages	6.57	3%	23.13	11.6%
R11	Pilstye Farm	8.09	4%	24.65	12.3%
Air Quality Objective		200 µg/m^3			

Annual Mean Particulate Matter

The maximum predicted annual mean PM_{10} and $PM_{2.5}$ concentrations resulting from the operation of the proposed development at each of the assessed discrete human receptor locations for any of the five meteorological data years are presented in Table 5.4 and 5.5 respectively.

The highest PC for annual mean PM_{10} and $PM_{2.5}$ concentrations at the receptor locations, was predicted to be 0.0136µg/m^3 at R2. The highest total annual mean PM_{10} and $PM_{2.5}$ concentrations were predicted at R10 and R11 and were 14.76µg/m^3 and 9.41µg/m^3 respectively, which are well below the relevant objectives.

A comparison of the results with the 2017 EPUK-IAQM criteria (see Annex A), shows are changes in pollutant concentrations (i.e. the PCs) are imperceptible (i.e. <0.5%) and the impact on annual mean PM_{10} and $PM_{2.5}$ concentrations are predicted to be negligible at all assessment receptors.

Table 5.4: Maximum Predicted Annual Mean PM_{10} Concentrations at Discrete Human Receptors

Receptor ID	Receptor Description	Annual Mean PM_{10} Concentration			
		PC	PC as % AQAL	Total Concentration	Total Concentration as % of AQAL
R1	Kemps Farm 1	0.0081	0.0%	14.40	36.0%
R2	Kemps Farm 2	0.0136	0.0%	14.41	36.0%
R3	Brook Cottage	0.0044	0.0%	14.40	36.0%
R4	Holt's Cottages (24 Haywards Heath Road)	0.0059	0.0%	14.04	35.1%
R5	Glebe's Farm	0.0060	0.0%	14.04	35.1%
R6	Haywards Heath Road	0.0077	0.0%	14.04	35.1%
R7	Bowders Farm	0.0026	0.0%	14.04	35.1%
R8	Bowder's Cottage	0.0035	0.0%	14.04	35.1%
R9	Norfolk Cottages	0.0009	0.0%	14.40	36.0%
R10	Upper Pilstye Cottages	0.0036	0.0%	14.76	36.9%
R11	Pilstye Farm	0.0041	0.0%	14.76	36.9%
Air Quality Objective		40 µg/m^3			

Table 5.5: Maximum Predicted Annual Mean $PM_{2.5}$ Concentrations at Discrete Human Receptors

Receptor ID	Receptor Description	Annual Mean $PM_{2.5}$ Concentration			
		PC	PC as % AQAL	Total Concentration	Total Concentration as % of AQAL
R1	Kemps Farm 1	0.0081	0.0%	9.35	37.4%
R2	Kemps Farm 2	0.0136	0.1%	9.35	37.4%
R3	Brook Cottage	0.0044	0.0%	9.34	37.4%
R4	Holt's Cottages (24 Haywards Heath Road)	0.0059	0.0%	9.25	37.0%
R5	Glebe's Farm	0.0060	0.0%	9.25	37.0%
R6	Haywards Heath Road	0.0077	0.0%	9.25	37.0%
R7	Bowders Farm	0.0026	0.0%	9.25	37.0%
R8	Bowder's Cottage	0.0035	0.0%	9.25	37.0%
R9	Norfolk Cottages	0.0009	0.0%	9.34	37.4%
R10	Upper Pilstye Cottages	0.0036	0.0%	9.41	37.6%
R11	Pilstye Farm	0.0041	0.0%	9.41	37.6%
Air Quality Objective		25 µg/m^3			

24 Hour Mean Particulate Matter

The maximum predicted 90.4th percentile of the 24 hour mean PM_{10} concentrations resulting from the operation of the proposed development at each of the discrete human receptor locations for any of the five meteorological years (2014 – 2018) are presented in Table 5.6.

The highest PC for the 90.4th percentile of the 24 hour mean PM_{10} concentrations at the receptor locations, was predicted to be 0.031µg/m^3 at R2 for scenario 1 and 2, as it is only generator contributing to PM_{10} release. The highest total 24 hour mean PM_{10} concentrations was predicted at R10 and R11 and were 14.76µg/m^3, which is well below the objective for 24 hour mean PM_{10} concentrations of 50µg/m^3.

The highest PC for the 90.4th percentile of the 24 hour mean PM_{10} concentrations at the receptor locations, was predicted to be 0.05µg/m^3. The highest total 24 hour mean PM_{10} concentrations was predicted at R10 and R11 and were 14.77µg/m^3, which is well below the objective for 24 hour mean PM_{10} concentrations of 50µg/m^3.

A comparison of the results with the 2017 EPUK-IAQM criteria (see Annex A), shows are changes in pollutant concentrations (i.e. the PCs) are imperceptible (i.e. <0.5%) and the impact on 24 hour mean PM_{10} concentrations is predicted to be negligible at all assessment receptors.

Table 5.6: Maximum Predicted 90.4th Percentile of 24 Hour Mean PM_{10} Concentrations at Discrete Human Receptors

Receptor ID	Receptor Description	90.4th Percentile 24 Hour Mean PM_{10} Concentrations			
		PC	PC as % AQAL	Total Concentration	Total Concentration as % of AQAL
R1	Kemps Farm 1	0.026	0.1%	14.42	28.8%
R2	Kemps Farm 2	0.050	0.1%	14.45	28.9%
R3	Brook Cottage	0.015	0.0%	14.41	28.8%
R4	Holt's Cottages (24 Haywards Heath Road)	0.017	0.0%	14.05	28.1%
R5	Glebe's Farm	0.017	0.0%	14.05	28.1%
R6	Haywards Heath Road	0.019	0.0%	14.05	28.1%
R7	Bowders Farm	0.008	0.0%	14.04	28.1%
R8	Bowder's Cottage	0.011	0.0%	14.04	28.1%
R9	Norfolk Cottages	0.002	0.0%	14.40	28.8%
R10	Upper Pilstye Cottages	0.013	0.0%	14.77	29.5%
R11	Pilstye Farm	0.015	0.0%	14.77	29.5%
Air Quality Objective		50 µg/m^3			

8-Hour Mean Carbon Monoxide

The maximum predicted 8-hour rolling mean CO concentrations resulting from the operation of the proposed development at each of the discrete human receptor locations for any of the five meteorological years (2014 – 2018) are presented in Table 5.7.

The highest PC for the 8 hour-rolling mean CO concentrations at the receptor locations, was predicted to be 12.15µg/m^3 at R2. The total predicted annual mean concentration at R2 was 524.15µg/m^3 which is well below the objective for 8 hour-rolling mean CO concentrations of 10,000µg/m^3. A comparison of the results with the 2017 EPUK-IAQM criteria (see Annex A), shows are changes in pollutant concentrations (i.e. the PCs) are imperceptible (i.e. <0.5%) and the impact on 8 hour mean CO concentrations is predicted to be negligible at all assessment receptors.

Table 5.7: Maximum Predicted 8-hour Mean CO Concentrations at Discrete Human Receptors

Receptor ID	Receptor Description	8 Hour Mean CO Concentrations			
		PC	PC as % AQAL	Total Concentration	Total Concentration as % of AQAL
R1	Kemps Farm 1	7.69	0.1%	519.69	5.2%
R2	Kemps Farm 2	12.15	0.1%	524.15	5.2%
R3	Brook Cottage	3.76	0.0%	515.76	5.2%
R4	Holt's Cottages (24 Haywards Heath Road)	6.76	0.1%	518.76	5.2%
R5	Glebe's Farm	5.78	0.1%	517.78	5.2%
R6	Haywards Heath Road	6.32	0.1%	518.32	5.2%
R7	Bowders Farm	4.00	0.0%	516.00	5.2%
R8	Bowder's Cottage	4.11	0.0%	516.11	5.2%
R9	Norfolk Cottages	4.22	0.0%	516.22	5.2%
R10	Upper Pilstye Cottages	3.51	0.0%	515.33	5.2%
R11	Pilstye Farm	3.06	0.0%	514.53	5.1%
Air Quality Objective		10,000 µg/m^3			

Annual Mean NO_x Concentrations

Table 5.8 presents the maximum annual mean NO_x concentrations predicted at the designated ecological sites considered in the assessment, for any of the meteorological years (2014 -2018).

The highest maximum PC is 1.5µg/m^3, predicted at E5 Balcombe Estate Rocks to the northeast of the proposed development. The PCs at all of the ecological receptors are <5% of the AQS objective and impacts are considered to be negligible.

Table 5.8: Maximum Predicted Annual Mean NO_x Concentrations at Designated Ecological Sites

Receptor ID	Receptor Description	Annual Mean NO_x Concentration				
		Background NO_x Concentration ($\mu g/m^3$)	PC ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	PC as % Objective	Total Concentration as % of Objective
E1	Rowhill Copse LNR	10.96	0.60	11.56	2%	39%
E2	Ardingly Reservoir LNR	10.79	1.07	11.87	4%	40%
E3	Rowhill and Station Pastures LWS	10.74	0.60	11.34	2%	38%
E4	Balcombe Marsh LWS	10.96	0.44	11.41	1%	38%
E5	Balcombe Estate Rocks LWS	11.44	1.50	12.94	5%	43%
E6	Ardingly Reservoir and Loder Valley Nature Reserve LWS	11.44	1.07	12.51	4%	42%
E7	Balcombe Lake and Associated Woodlands LWS	10.79	1.02	11.81	3%	39%
E8	Ashdown Forest SAC	10.18	0.04	10.22	0%	34%
Air Quality Objective		30µg/m^3				

Nitrogen Deposition

Results obtained from the dispersion modelling have been used to calculate nitrogen deposition at each ecological receptor location within the assessment and the results are summarised in Table 5.9.

It is noted that, existing background deposition exceeds the lower critical loads for all the assessed ecological sites (except E4), without the operation of the proposed development. However, the PC to nitrogen deposition are predicted to be minimal, with the highest PC of 0.3 kgN/ha/yr predicted at E5; this equates to 3.0% of the lower critical load for this site. The results show that the contribution of nitrogen deposition resulting from the proposed operation is less than 1% of the background concentration for all but one receptor (R5) where it is 1.3% of the background concentration. Hence impacts in terms of nitrogen deposition are considered to be not significant.

Acid Deposition

The results obtained from the dispersion modelling have been used to calculate acid deposition and then input into the Critical Load Function Tool provided on the APIS website along with the critical load data for the habitat; results are presented in Table 5.10. The PC and predicted environmental concentration (PEC) generated by the proposed development have been presented as a percentage of the relevant critical load function.

The PC to acid deposition are predicted to be minimal, with the highest PC of 0.02 keq/ha/yr (0.6% of Critical Load Function) predicted at E5 and total PECs are all below the critical loads. Therefore, the operation of the proposed development is considered to have had a minimal contribution to acid deposition at the sensitive ecological sites and no significant impacts are predicted.

Table 5.9: Nitrogen Deposition Contribution at Nearby Ecological Sites

Receptor ID	Receptor Location	Broad Habitat Type	Critical Load Range kg N/ha/yr	PC (kg N/ha/yr)	Total N Deposition keq/ha-yr	Process Contribution as a % of lower critical load	PC as a % of background Deposition Rate
E1	Rowhill Copse	Broadleaved, Mixed and Yew Woodland	10-20	0.121	23.5	1.2	0.52
E2	Ardingly Reservoir	Broadleaved, Mixed and Yew Woodland	10-20	0.216	23.6	2.2	0.92
E3	Rowhill and Station Pastures	Broadleaved, Mixed and Yew Woodland	10-20	0.121	23.5	1.2	0.52
E4	Balcombe Marsh	Fen, Marsh and Swamp: Rich fen	15-30	0.089	14.6	0.6	0.61
E5	Balcombe Estate Rocks	Broadleaved, Mixed and Yew Woodland	10-20	0.303	23.7	3.0	1.30
E6	Ardingly Reservoir and Loder Valley Nature Reserve	Broadleaved, Mixed and Yew Woodland	10-20	0.216	23.6	2.2	0.92
E7	Balcombe Lake and Associated Woodlands	Broadleaved, Mixed and Yew Woodland	10-20	0.206	23.6	2.1	0.88
E8	Ashdown Forest	Northern Atlantic wet heath	10-20	0.009	15.1	0.1	0.06

Table 5.10: Acid Deposition Contribution at Nearby Ecological Sensitive Sites:

Receptor ID	Receptor Location	Broad Habitat Type	Background S Deposition (keq/ha-yr)	Background N Deposition (keq/ha-yr)	CLmaxS	CLMinN	CLMaxN	PC as a % of critical load function	Process Environmental Contribution as a % of critical load function
E1	Rowhill Copse	Broadleaved, Mixed and Yew Woodland	0.240	1.670	2.752	0.357	3.109	0.3	61.8
E2	Ardingly Reservoir	Broadleaved, Mixed and Yew Woodland	0.240	1.670	2.961	0.142	3.103	0.6	62.2
E3	Rowhill and Station Pastures	Broadleaved, Mixed and Yew Woodland	0.240	1.670	2.752	0.357	3.109	0.3	61.8
E4	Balcombe Marsh	Fen, Marsh and Swamp: Rich fen	0.21	1.04	This habitat is not sensitive to acidity according to APIS				
E5	Balcombe Estate Rocks	Broadleaved, Mixed and Yew Woodland	0.26	1.67	2.961	0.142	3.103	0.6	62.8
E6	Ardingly Reservoir and Loder Valley Nature Reserve	Broadleaved, Mixed and Yew Woodland	0.240	1.670	2.961	0.142	3.103	0.6	62.2
E7	Balcombe Lake and Associated Woodlands	Broadleaved, Mixed and Yew Woodland	0.26	1.67	2.961	0.142	3.103	0.3	62.5
E8	Ashdown Forest	Northern Atlantic wet heath: Dwarf Shrub Heath	0.24	1.08	0.96	0.499	1.459	0.0	90.5

5.1.3 Significance of Impacts Identified

As identified above:

- There are no predicted exceedances of the annual and short-term mean AQSs for NO_2, PM_{10}, $PM_{2.5}$ or CO at any of the discrete modelled human receptor locations; and
- The impacts on background concentrations of annual mean NO_x concentrations, nitrogen and acid deposition at the designated ecologically sensitive sites are considered to be negligible.

Following the EPUK & IAQM guidance and in light of the above, the air quality impact is not considered to be significant.

6 MITIGATION MEASURES & RESIDUAL IMPACTS

6.1 Operational Phase

As this assessment has determined that the operational phase impacts on air quality are not significant, additional mitigation measures have not been recommended and the residual impacts are considered to be acceptable.

7 CONCLUSIONS

An air quality assessment of a proposed hydrocarbon well testing at Lower Stumble Hydrocarbon Exploration Site off London Road, near Balcombe has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

The proposed development will not generate a significant amount of traffic once operational, therefore using EPUK-IAQM guidance, the impact of operational phase traffic on local air quality have been considered to be negligible.

The main potential air quality impact once the proposed development is operational is considered to be emissions from the proposed flare and the generator engine. An assessment of operational impacts has been undertaken using AERMOD, an advanced atmospheric dispersion model developed for regulatory purposes, with the use of meteorological data measured between 2014 and 2018 at the Gatwick airport weather station. Concentrations of key air pollutants (NO_x, NO_2 PM_{10}, $PM_{2.5}$ and CO) have been predicted at discrete receptor locations.

Concentrations higher than the short-term NO_2 air quality objective were predicted at locations near the site boundary, however, no fixed habitation and exposure is expected at these locations. Hence these are not considered as exceedances. The highest predicted impacts at the modelled off-site discrete receptor locations in any of the five meteorological years have been reported and compared to the relevant AQS objectives. There were no predicted exceedances of any of the AQS objectives for human or ecological at the modelled discrete receptor locations in any of the modelled meteorological years. The proposed development was also assessed as having a minimal impact at nearby sites designated for their ecological importance, with regards to nitrogen and acid deposition.

The assessment has concluded that the air quality impact of the proposed development is not significant. As this assessment has determined that the operational phase impacts on local air quality are not significant, additional mitigation measures have not been recommended and the residual impacts are considered to be acceptable.

ANNEX A
OPERATIONAL IMPACT ASSESSMENT METHODOLOGY

This appendix contains the methodology used in the assessment for the operational impact assessment to include reference to the 2017 EPUK-IAQM guidance.

The significance of impacts can be determined using professional judgement. This judgement should be based on the magnitude of effects identified at each receptor. The magnitude of impacts for long-term annual mean NO_2 concentrations can be derived by the percentage of change in pollutant concentration relative to an Air Quality Assessment Level (AQAL) and long term average pollutant concentration predicted at the receptor, as presented in Table A1.

Table A1: Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% of less of AQAL	Negligible	Negligible	Slight	Moderate
79 – 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

To assess the magnitude of impacts at each receptor with regards to short-term changes in concentrations, the following method is recommended:

- Process contribution is 10 to 20% of air quality standard or objective – small magnitude;
- Process contribution is 21 to 50% of air quality standard or objective – medium magnitude; and
- Process contribution is greater than 50% of air quality standard or objective – large magnitude.

The EPUK/IAQM guidance notes that the criteria in Table A1 and above should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

ANNEX B - WINDROSES

This appendix contains the windroses for the Gatwick Airport Station from 2014 to 2018.

Figure B1 Windrose for the Gatwick Airport Station – 2014

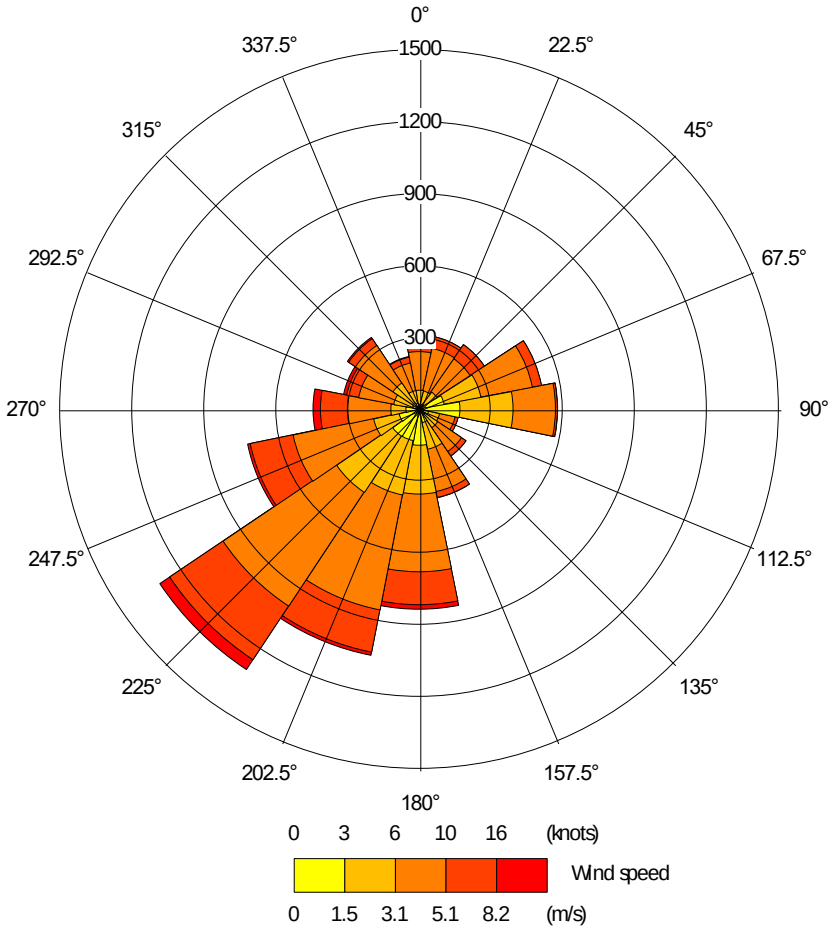


Figure B2 Windrose for the Gatwick Airport Station – 2015

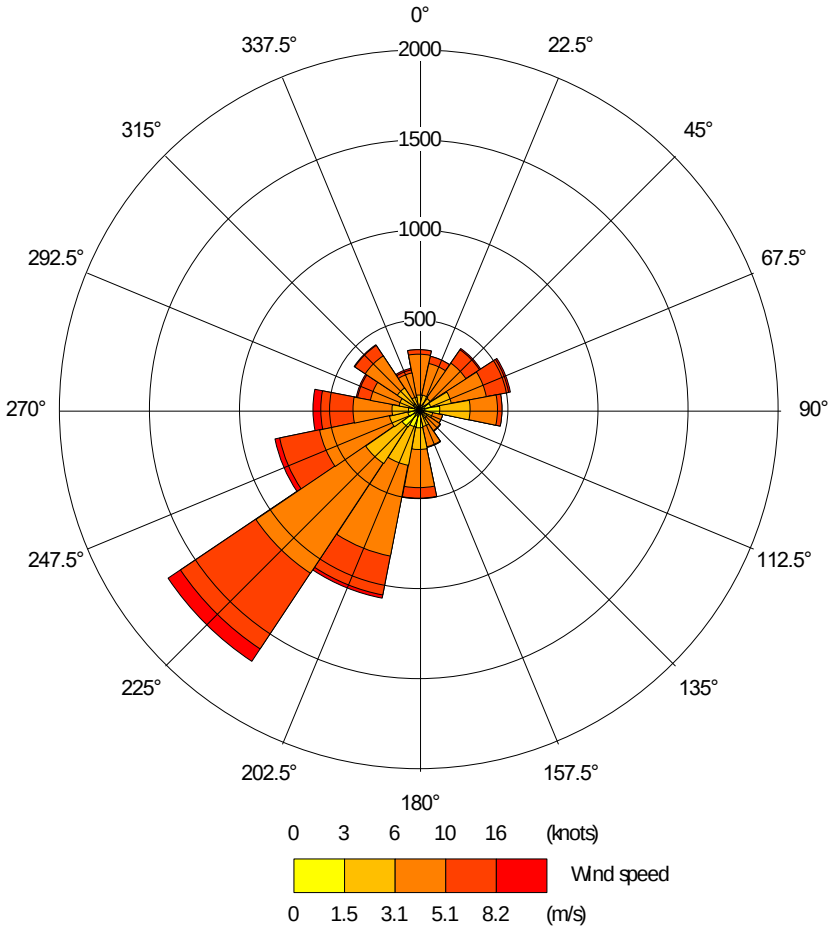


Figure B3 Windrose for the Gatwick Airport Station – 2016

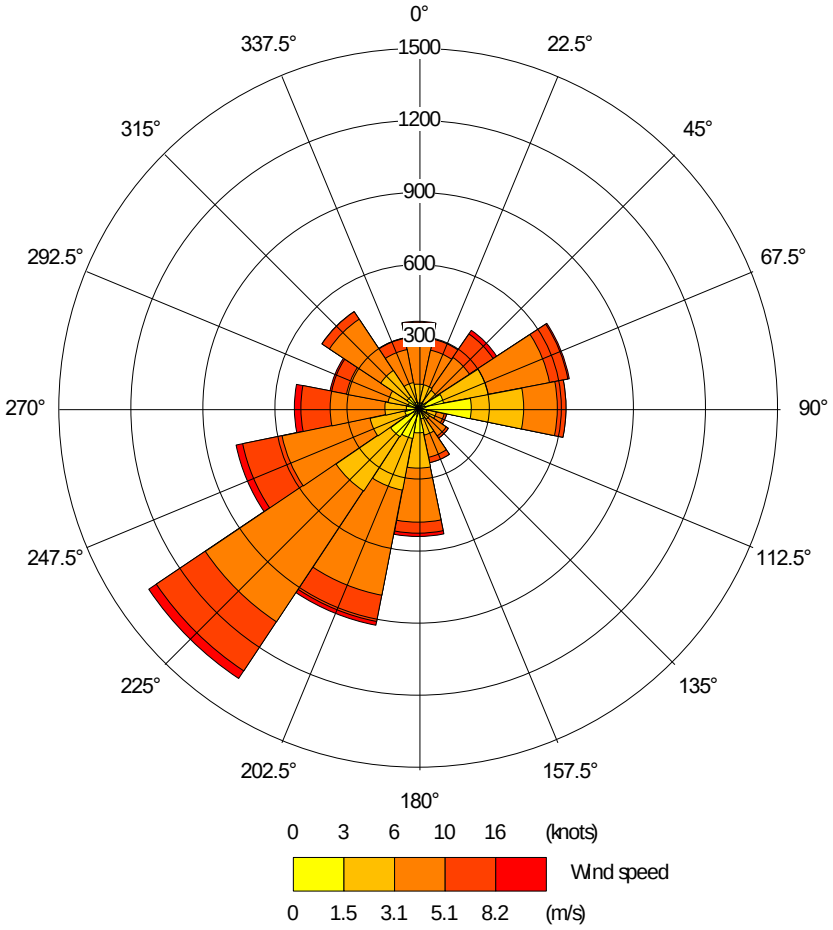


Figure B4 Windrose for the Gatwick Airport Station – 2017

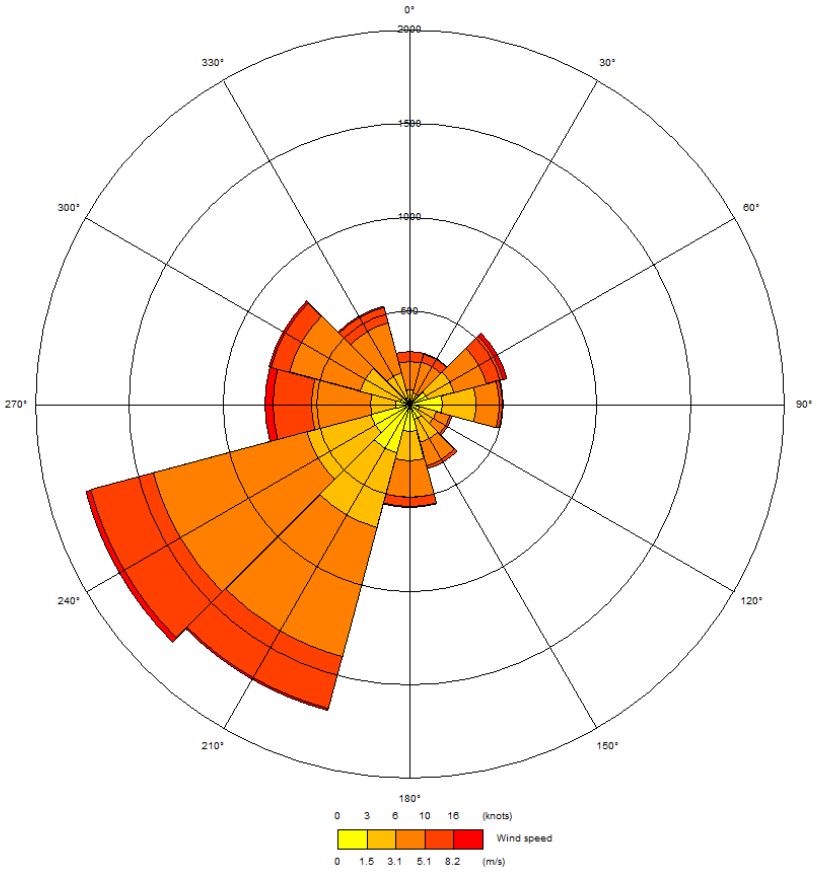
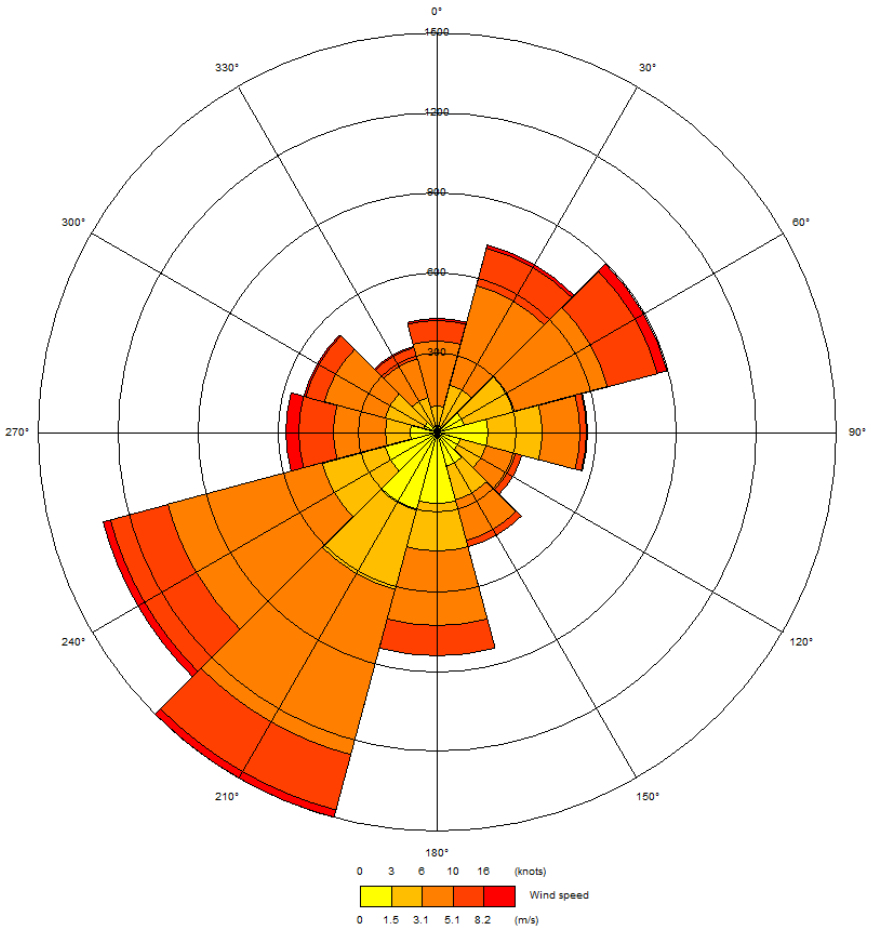


Figure B5 Windrose for the Gatwick Airport Station – 2018



ANNEX C
CONTOUR PLOTS SHOWING PREDICTED NO_2 CONCENTRATIONS

This annex contains contour plots (isopleths) illustrating the total predicted NO_2 concentrations (i.e. process contribution and background concentrations) when the proposed development is operational. The maximum predicted concentrations resulting from the operation of the proposed development at each of the grid locations for any of the five meteorological years (2014 – 2018) are used for the contours.

No exceedance of any of the air quality objectives was predicted at any of the locations where residential receptors exist.

Figure C1 Predicted Annual Average NO_2 Concentrations (µg/m^3) including Background Concentration

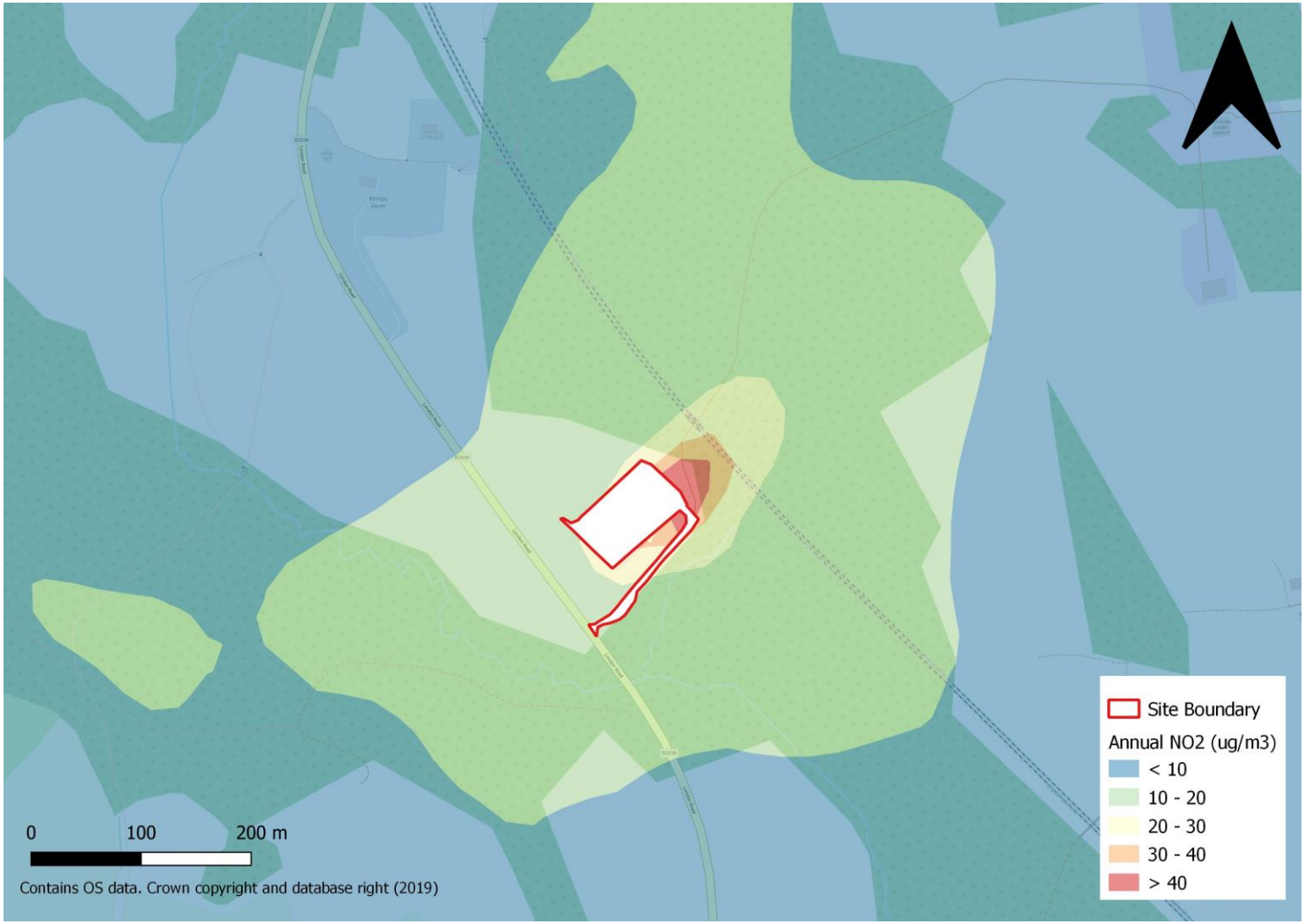


Figure C2 Predicted 99.79th Hourly NO_2 Concentrations (µg/m^3) including Background Concentrations