GF Environmental Limited

Reliance Energy

Air Quality Assessment for the Proposed FlexGen Facility, Barugh, Barnsley

Version 2

July 2017

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Authorisation Sheet

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Project: *Air Quality Assessment for the Proposed FlexGen Facility, Barugh, Barnsley*

Version: **Version 2**

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Date: July 2017

DISTRIBUTION

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Glossary and Abbreviations

The following abbreviations and terms were used in this report:

Air Quality Management Area (AQMA)

If a local authority finds any places where the objectives are not likely to be achieved, it must declare an Air Quality Management Area there. This area could be just one or two streets, or it could be much bigger. Then the local authority will put together a plan to improve the air quality - a Local Air Quality Action Plan

Air Quality Objective

Objectives are policy targets generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences, within a specified timescale.

Air Quality Standard (AQS)

Standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive sub-groups.

Environmental Assessment Level (EAL)

Used to assess the potential impact of pollutant emissions in the absence of a statutory air quality standard or objective level. The most common EALs are those recommended by the Northern Ireland Environment Agency, or derived from Occupational Exposure Levels specified by the Health & Safety Executive.

Exceedence

A period of time where the concentration of a pollutant is greater than, or equal to, the appropriate air quality criteria. For air quality standards an exceedence is a concentration greater than the standard value. For air quality bands an exceedence is a concentration greater than, or equal to, the upper band threshold.

Microgramme per cubic metre (µg m^{-3})

A measure of concentration in terms of mass per unit volume. A concentration of 1 µg m^{-3} means that one cubic metre of air contains one microgramme (millionth of a gramme) of pollutant.

Predicted Environmental Concentration (PEC)

The overall impact of process emissions on local air quality taking into account the contribution of emissions from the process itself, and the existing concentration of a pollutant at a specific location.

Process Contribution (PC)

The contribution of emissions from a process to ground level pollutant concentrations at a specific location, disregarding the existing background concentration.

CERC	Cambridge Environmental Research Consultants
GFE	GF Environmental Ltd
CO	Carbon Monoxide
NO	Nitrogen Monoxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_3	Ozone
PM_{10}	Particulates (smaller than 10 microns in diameter)
$Am^3 h^{-1}$	Actual $m^3 h^{-1}$
ha	Hectare
hr	Hour
km	Kilometre
LT	Long Term
$m s^{-1}$	Metre per second
m	Metre
m^3	Cubic metre
min	Minute
mm	Millimetre
°C	Degrees centigrade
$\mu g/m^3$	Microgram per cubic metre (10^{-6} g m^{-3})
µ	micro 10^{-6}

Summary

A detailed assessment has been undertaken of the potential impact on local air quality of operations to be carried out at a Flexible Generation (FlexGen) power generation facility, to be installed on land within the Redbrook Industrial Estate, Barnsley. The FlexGen Facility incorporates twenty gas engines and associated electrical generators, and will generate ~20MW_e for supply to the National Grid during periods of peak demand.

Detailed atmospheric dispersion modelling of the potential impact on local air quality of emissions from the FlexGen Facility was undertaken using the ADMS Version 5.2 model. Emissions from the twenty gas engine powered generating units were considered in the modelling to determine the cumulative impact of the FlexGen Facility as a whole. Process information and pollutant emissions data for the facility were supplied by Reliance Energy.

Representative background pollutant concentrations were obtained from the DEFRA 2013 Background Maps website for the area covered by Barnsley Metropolitan Borough Council, as well as measured data from Council's extensive air quality monitoring programme. The modelling incorporated a number of conservative assumptions to determine the potential worse case impact, should the operation of the plant coincide with least favourable meteorological conditions (with respect to dispersion of emissions) and the frequency with which these conditions could occur within the operational periods of the FlexGen Facility.

The assessment was undertaken on the basis of the 4,645 hours of the year that the FlexGen Facility will be contracted to be available for operation, whereas in practice it will only be operational for up to ~3,000 hours of the year. The results from detailed modelling indicate that the hourly average NO_2 AQS objective value may be exceeded in the immediate vicinity of the development site, as a result of the operation of the FlexGen Facility. However, there will not be a breach of the Air Quality Regulations as a result of the operation of the FlexGen Facility, as the area affected is restricted to land within the development site and adjacent commercial premises, which are not considered to be relevant receptors, as members of the general public will only be present at these locations on an intermittent basis and for relatively short periods of time.

Air quality in the vicinity of the development site is typical of an urban environment, and the maximum hourly average and annual average NO_2 Predicted Environmental Concentrations at the nearest residential receptors, represent values equivalent to ~70% or less of the AQS objective values, and can be screened out as insignificant in relation to Environment Agency guidance.

The results from detailed modelling also showed that the operation of the FlexGen Facility would not result in an exceedence of the AQS objective values for PM_{10}, CO or VOCs.

1. Introduction

1.1 Background to the Study

1.1.1 GF Environmental Ltd was appointed by Reliance Energy to carry out an assessment of the potential impact on local air quality arising from the operation of a new Flexible Generation (FlexGen) Facility to be built on land within the Redbrook Industrial Estate, in the Barugh Green area of Barnsley. This report has been prepared to support an application for planning permission for the development of a natural gas-fired FlexGen Facility, for the generation of up to ~20MW_e of electricity on an "as required" basis for supply to the Local Distribution Network, which forms part of the National Grid. The plant is therefore a standby power plant, which will be called into operation on an intermittent, short-term basis, primarily during the winter months when demand may exceed the capacity of the National Grid.

1.1.2 The FlexGen Facility comprises twenty (20) Perkins 4016-61 TRS2 natural gas-fired engine power generation units, with a combined output of ~20MW_e, and the facility will operate for up to ~3,000 hours per year, to supply electricity to the national grid during periods of peak demand.

1.1.3 A detailed air quality assessment has been undertaken to support the planning application for the FlexGen Facility, which considers the potential impact of emissions from the natural gas-fired engines on sensitive receptors in the vicinity of the development site. The report describes the data used in the modelling, the methodology adopted, assumptions made and the results generated by the model. Modelling was based upon emissions and process data and site drawings supplied by Reliance Energy and its technology providers. The objective of the atmospheric dispersion modelling exercise was to assess the potential impact on local air quality of process emissions from the FlexGen Facility, in terms of ground level concentrations of pollutants designated by the UK Air Quality Regulations.

1.2 ADMS Version 5.2

1.2.1 The modelling software used in the air quality assessment was ADMS Version 5.2[1], one of a range of models available for modelling the impact on local air quality of pollutant emissions to atmosphere. The ADMS model can be used to assess ambient pollutant concentrations arising from a wide variety of emissions sources associated with an industrial process. It can be used for initial screening or more refined determination of ground level pollutant concentrations on either a short-term basis (up to 24 hour averages) or longer term (monthly, quarterly or annual averages).

[1] Cambridge Environmental Research Consultants Ltd, ADMS Version 5.2, November 2016

[2]

2. Operational Impacts

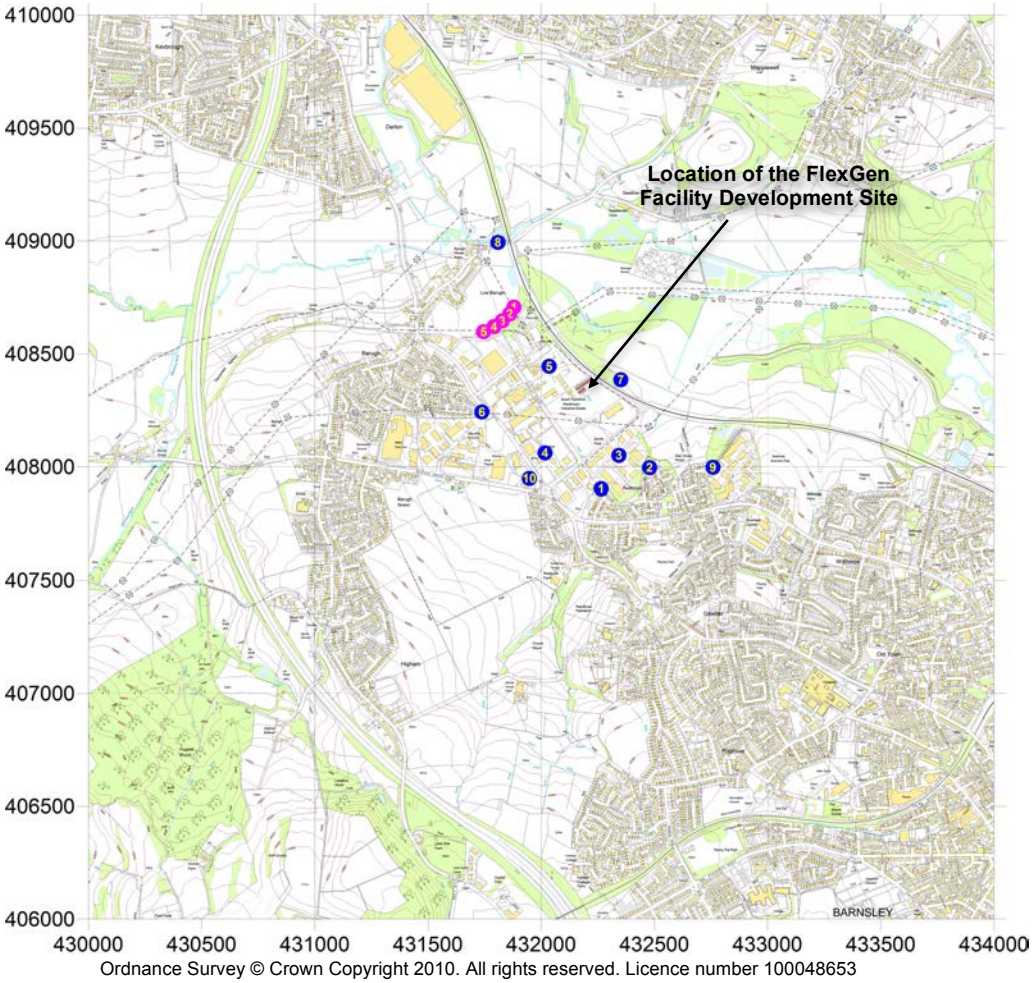
2.1 Introduction

2.1.1 The main focus of the assessment of operational activities relates to the potential impact on local air quality of emissions associated with the operation of the FlexGen Facility. Detailed atmospheric modelling has been undertaken of emissions from the twenty natural gas-fired engines, and this section provides a summary of the input data used in the ADMS model.

2.2 Site Location and Local Setting

2.2.1 The site where the FlexGen Facility is to be located on land within the Redbrook Industrial Estate, in the Barugh Green area of Barnsley, as shown below.

Figure 2-1 The Local Setting Showing the Location of the Development Site



2.2.2 The specific receptors included in the model are denoted by the blue circles and the magenta circles and represent locations where members of the general public may be present for significant periods of time. The magenta circles represent a new housing development to the north of the site. Receptor Nos.1 and 2 represent the locations of the

nearest residential properties, located ~430 metres to the south-east of the site.

2.2.3 The following aerial photograph of the site shows the local setting of the development site to the north-west of Barnsley, within the Redbrook Industrial Estate, but with significant areas of agricultural land and open ground to the north, east and west of the site.

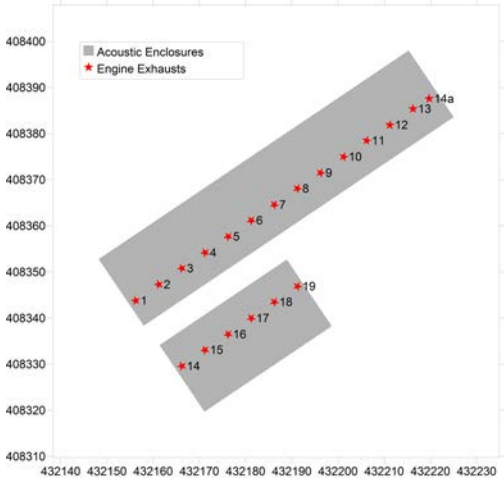
Figure 2-2 The Local Setting Showing the Location of the Development Site

2.3 Process Details

2.3.1 The ADMS model requires that sources of emissions are defined in terms of dimensions, location and physical characteristics of temperature and velocity. This atmospheric dispersion modelling study has been carried out to assess the potential impact on local air quality due to releases of atmospheric pollutants from the exhausts of the twenty natural gas-fired engines associated with the FlexGen Facility.

2.3.2 The locations of the exhaust discharge points, relative to the acoustic enclosures that house the twenty natural gas-fired engines, are presented in Figure 2-3.

Figure 2-3 Source Locations and Site Layout (As Modelled)



2.4 Emissions Data

2.4.1 The Process information and pollutant emissions data for the natural gas-fired engines associated with the FlexGen Facility were taken from information provided by Reliance Energy, and represent emissions from the twenty engine exhausts

Table 2-1 Emission Source Parameters for the Engine Exhausts

Parameter	Engine Exhaust
Release Height (m)	4.5
Flue Diameter (m)	0.35
Efflux Temperature (°C)	468
Efflux Velocity (m s^{-1})	35.9

Table 2-2 Modelled Pollutant Emissions Data

Substance	Emission Concentration (mg Nm^{-3})	100% Output (g/s)
NO_X	480	0.61
NO_2*	168	0.21
CO	870	1.11
Particulates	189**	0.0005
VOCs	1,410	1.79

Note: * For calculation of the number of exceedences of the hourly average AQS objective value the model was run on the basis of the equivalent NO_2 release based upon the Environment Agency approved empirical formula in Section 2.5.1
** Based upon an emission factor[2] of 189 mg/GJ

2.4.2 Emissions data for the Perkins 4016-61 TRS2 natural gas-fired engines were provided by the technology provider, Catalyst PWR, based upon data supplied by the manufacturers in the USA. The reference to the Danish study was included to provide a worst case basis for assessment of particulate emissions from the gas engines. Under normal circumstances there is virtually no particulate emission associated with the operation of gas engines, which will be the case for the proposed FlexGen facility, and the emission rates calculated on the basis of information taken from the Danish study, represent an absolute worst case scenario.

2.4.3 The FlexGen Facility will be required to be available to operate during the following time periods as part of the operational contract, as shown in the following table.

Table 2-3 Potential Operational Hours for the FlexGen Facility

Season	Weekday		Non-Weekday	
	Start Time	End Time	Start Time	End Time
1st April – 25th April	07:00	13:30	10:00	14:00
	19:00	22:00	19:30	22:00
25th April – 22nd August	07:30	14:00	09:30	13:30
	16:00	18:00	19:30	22:30
	19:30	22:30	-	-

[2] https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiyo-KU4bfSAhUDJMAKHVARB_AQFggdMAA&url=http%3A%2F%2Fwww.dgc.eu%2Fsites%2Fdefault%2Ffiles%2Ffilarkiv%2Fdocuments%2FC0402_emissions_factors.pdf&usg=AFQjCNGa8wi4Ir_eLde25Fk9Euw169dZ4A&sig2=wDNNvfrMONhasHQ3ZSXTWw&bvm=bv.148441817,d.ZGg

Season	Weekday		Non-Weekday	
	Start Time	End Time	Start Time	End Time
22nd August – 19th September	07:30	14:00	10:30	13:30
	16:00	21:30	19:00	22:00
19th September – 31st October	07:00	13:30	10:30	13:30
	16:30	21:00	17:30	21:00
31st October – 30th January	07:00	13:30	10:30	13:30
	16:00	21:00	16:00	20:30
30th January –1st April	07:00	13:30	10:30	13:30
	16:30	21:00	16:30	21:00

2.4.4 On the basis of the above operational pattern, an Emission Factor *.fac* file was created, so that the model only undertook dispersion calculations for those hours of the day when the FlexGen Facility may be operational throughout the year. This resulted in 13.5 hours of the day when the FlexGen Facility could potentially be operational during weekdays, and 11 hours of the day at weekends, resulting in 89.5 hours of the week, or 4,654 hours of the year. In practice, the FlexGen Facility is only expected to operate for ~3,000 hours of the year, between the hours of 07:00 and 23:00, so the above scenario represents an absolute worst case basis for assessment. The emissions factor file was also set up to model for every month of the year, to ensure that worst case meteorological conditions throughout the year were considered as part of the assessment.

2.5 Atmospheric Chemistry

2.5.1 The atmospheric chemistry module in ADMS was not used for the current assessment. Instead, an empirical approach recommended in the Environment Agency's guidance[3] on the modelling of NO_X emissions from combustion process, was used to calculate annual average and hourly average NO_2 ground-level concentrations from model reported average NO_X concentrations.

Equation 1 Calculation of Annual Average NO_2 Predicted Environmental Concentration (PEC)

$$(\text{Annual } NO_{X\ \text{Modelled}} \times 0.7) + \text{Annual } NO_{2\ \text{Monitored}}$$

Equation 2 Calculation of Hourly Average NO_2 Predicted Environmental Concentration (PEC)

$$(\text{Hourly } NO_{X\ \text{Modelled}} \times 0.35) + (\text{Annual } NO_{2\ \text{Monitored}} \times 2)$$

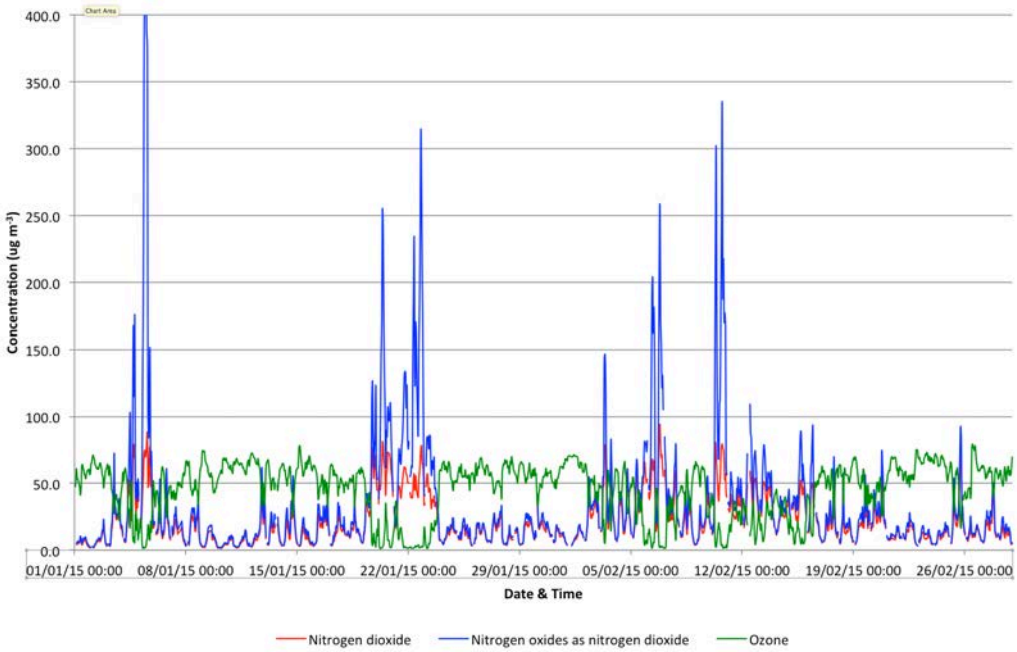
2.5.2 This method represents a worst case as it may overestimate the PEC for NO_2 in close proximity to the site as conversion of NO_X to NO_2 is unlikely to be instantaneous, as it requires a chemical reaction involving mixing of the plume with the ambient air and its associated oxidant species. For calculation of the number of exceedences of the hourly average NO_2 AQS objective value, the NO_X emissions data were converted to their NO_2 equivalents by multiplying by the 0.35 conversion factor.

[3] http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf

2.5.3 Local circumstances can also affect the availability of atmospheric oxidants required for the conversion of NO_X to NO_2. This conservative approach has been accepted by the EA.

2.5.4 Air quality in the vicinity of the development site is not constant, as shown by data recorded at the Barnsley Gawber Rural Background AURN monitoring station, ~2km to the south of the development site. Archive data for April 2015 show the variability of hourly average NO_2, NO_X and ozone concentrations, and indicate that the availability of atmospheric oxidants such as ozone may be significantly lower at certain times, and varies significantly on a daily basis.

Figure 2-4 Variation in Hourly Average NO_X & Ozone Concentrations at the Barnsley Gawber Urban Background AURN Site – January & February 2015



2.5.5 As can be seen, the NO_X and ozone curves tend to mirror one another, with ozone concentrations higher when the NO_X concentrations are lower and vice versa. Similar patterns are exhibited for other months throughout the year.

2.5.6 The NO_2 concentrations are significantly higher when ozone concentrations are lower, with higher levels of nitric oxide (NO). The data presented in the graph indicate the occurrence of localised, or regional, events where there are elevated concentrations of NO_X (high NO), and where ozone concentrations are virtually zero. This may coincide with the passage through the local "Airshed" of a plume from a nearby power station, with its associated elevated concentrations of NO_X.

2.5.7 Under these variable conditions, the atmospheric transformation of NO_X to NO_2, associated with emissions from the FlexGen Facility will be affected to a varying degree. Accordingly, there is likely to be a proportion of the year when the atmospheric chemistry in the vicinity of the development site may be restricted in its capacity to convert NO_X to NO_2

and the dispersion model predictions may overestimate the significance of annual average NO_2 predictions at receptors in the vicinity of the development site.

2.6 Background Air Quality

2.6.1 Estimates of background concentrations for NO_X, NO_2, PM_{10} and $PM_{2.5}$ are provided by DEFRA[4] at a resolution of 1km x 1km grid spacing. The development site is located within an area under the jurisdiction of Barnsley Metropolitan Borough Council (MBC), and data were obtained for 2017 for the locality around the development site. The data show that future estimates for background concentrations of the above pollutants, without any Process Contribution from the proposed development, are well below their respective Air Quality Standards.

2.6.2 Data for the grid square immediately adjacent to the FlexGen Facility development site were used to provide the basis for assessment for the general area around the site, relative to existing background concentrations. The air quality assessment for the FlexGen Facility was based upon the estimated background concentrations for 2017, when the background concentration for nitrogen dioxide was estimated to be 14.9 µg m^{-3}.

Table 2-4 Background Air Quality Data in the Vicinity of the Development Site (2016)

Pollutant	Annual Average Concentration (µg/m^3)*
NO_2	14.9
NO_x	21.3
PM_{10}	13.9
$PM_{2.5}$	10.1
* Concentrations at grid points 432500,408500	

2.6.3 The DEFRA estimates indicate that ambient pollutant concentrations in the vicinity of the FlexGen Facility development site are typical of an urban background location.

2.6.4 Barnsley MBC has declared seven Air Quality Management Areas (AQMAs) for nitrogen dioxide, primarily due to exceedences associated with vehicular emissions along major transport routes into and out of the area, predominantly the M1 motorway. The locations of the Barnsley AQMAs are shown in the following figure by the red lines, and the approximate location of the FlexGen Facility development site is indicated by the yellow star.

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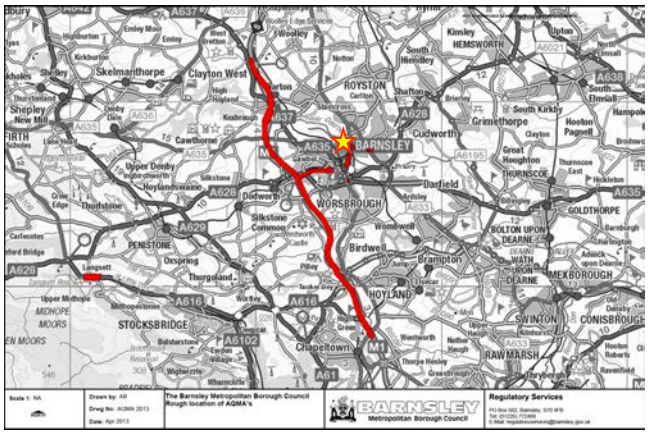
[4] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013

Figure 2-5 Location of the Barnsley Air Quality Management Areas



2.6.5 Barnsley MBC undertook air quality monitoring across the Borough at 120 locations in 2015, with the nearest location to the development site situated ~900 metres to the south-east at the Barnsley Gawber AURN urban background automatic monitoring station. There are two NO_2 diffusion tube monitoring locations in the Barugh Green area, DT84 (1.2km to the west), and DT93 (~800 metres to the north-west).

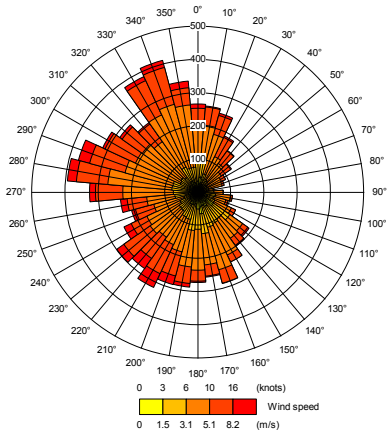
2.6.6 The annual average nitrogen dioxide concentration at the Barnsley Gawber AURN site was 19 µg m^{-3} in 2016, and the most recently published values at the two NO_2 diffusion tube monitoring sites were 34.1 µg m^{-3} (DT84) and 37.6 µg m^{-3} (DT93). The measured values at the two diffusion tube sites are roadside (DT84) and kerbside (DT93) monitoring locations and so will be influenced to a greater extent by vehicular emissions than the urban background location at the Barnsley Gawber AURN site, which is probably more typical of conditions at the FlexGen Facility development site. Accordingly, the measured value at the Barnsley Gawber AURN was used as the basis for the assessment for nitrogen dioxide.

2.7 Meteorological Data

2.7.1 Hourly average meteorological data from the Doncaster Sheffield Airport measurement station were used in the detailed modelling assessment. The measurement station is located approximately 27 kilometres to the east of the development site, and is considered to be the most representative available meteorological data for the area. LAQM.TG(09)[5] recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling. The prevailing and strongest winds in the area are from a predominantly westerly vector, as shown by the windrose in Figure 2-6.

[5] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

Figure 2-6 2010 Windrose for Doncaster Sheffield Airport



2.7.2 All meteorological data used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an accredited distributor of meteorological data within the UK. The meteorological data included nine parameters defined in Table 2-5.

Table 2-5 Modelled Meteorological Parameters

Parameter	Description
YEAR	Year of observation
TDAY	Julian Day (1 to 366) of observation
THOUR	Hour of Observation
T0C	Temperature (ºC)
U	Wind speed (m s^{-1})
PHI	Wind Direction (nearest 10 degrees)
P	Precipitation (mm)
CL	Cloud cover (Oktas)
RHUM	Relative Humidity (%)

2.8 Local Environmental Conditions

2.8.1 Local environmental conditions describe the factors that might influence the dispersion process (such as nearby structures, sharply rising terrain, etc.) and also describe the locations at which pollutant concentrations are to be predicted. These include:

Surface Roughness

2.8.2 Surface roughness defines the amount of near-ground turbulence that occurs as a consequence of surface features, such as land use *(i.e.* agriculture, water bodies, urbanisation, open parkland, etc.). A value of 0.2m is typical of open agricultural areas, while a value of 1.5m is typical of large urban areas.

2.8.3 A surface roughness factor of 0.5m was considered representative for the land use in the vicinity of the development site, and takes into account the fact that the development site is on the northern fringe of Barnsley with farmland directly to the north and north-east of the site. In view of the open aspect of the Doncaster Sheffield Airport meteorological data

measurement station, a surface roughness factor of 0.1m was selected.

Nearby Buildings and Structures

2.8.4 The proximity of solid structures, to an emission source can affect the dispersion of a plume, particularly in the vicinity of that structure. The potential impact of this occurring was assessed, based on the dimensions of the acoustic enclosures associated with the natural gas-fired engines, as presented in Figure 2-3. The dimensions were taken from site drawings provided by Reliance Energy. Adjacent enclosures were amalgamated into two larger structures based upon site plans provided by Reliance Energy.

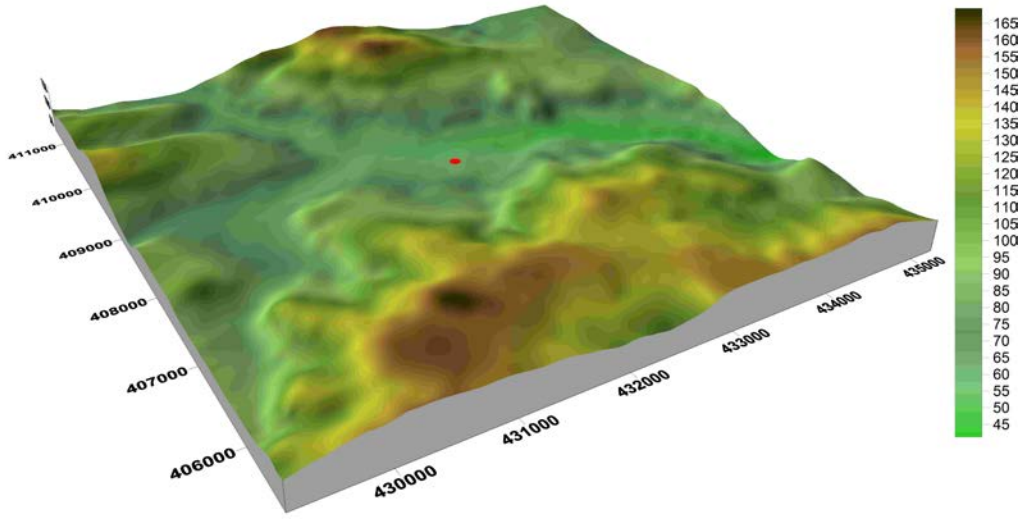
Table 2-6 Modelled Dimensions of the Acoustic Containers – As Modelled

	Height (m)	Length (m)	Width (m)	Angle (°)
Group 1	4.0	80.8	17.3	56
Group 2	4.0	33.1	17.3	56

Local Terrain

2.8.5 Local terrain can affect wind flow patterns and, consequently, can affect the dispersion of atmospheric pollutants. The effects of terrain are not normally noticeable where the gradient is less than 10%. Ordnance Survey mapping for the area shows the absence of significant terrain in the immediate vicinity of the FlexGen Facility development site, as shown in the following figure. Nevertheless, terrain effects were included in the preliminary sensitivity analysis.

Figure 2-7 Visual Representation of Terrain in the Vicinity of the FlexGen Facility Development Site



Output Grid

2.8.6 When setting up a receptor grid it is important to ensure that there are sufficient receptor points to be able to predict the magnitude and location of the maximum Process Contribution. If the grid of receptor points is too widely spaced, the maximum concentration may be underestimated.

2.8.7 Detailed modelling was undertaken for a 4km x 4km grid with 40m spacing to demonstrate dispersion from the exhausts associated with the twenty natural gas-fired engines.

2.9 Specific Receptors

2.9.1 Specific receptor locations in the vicinity of the development site were modelled, representing nearby residential and commercial premises, where members of the general population may be present for extended periods of time, and where they may be exposed to airborne pollutants released from the twenty natural gas-fired engines. Receptor locations included a nearby residential development which has received planning permission from Barnsley MBC, and the following extract from the associated Land Uses Plan[6] shows the extent of the housing within the proposed development in grey.

Figure 2-8 Layout Plan for the New Housing Development to the North-East of the FlexGen Facility Development Site

2.9.2 The proposed FlexGen facility development site is situated ~500 metres to the south-east of the residential development. The ADMS model was also configured to estimate the potential impact on background NO_2 concentrations at the five receptor locations illustrated above, due to NO_X emissions from the twenty gas engines associated with the FlexGen facility.

2.9.3 The locations of these specific receptors are shown in Figure 2-1, and identified in the following table.

Table 2-7 Specific Receptors Included in Modelling

Receptor No.	Ordnance Survey Coordinates		Distance from the Development Site (metres)
	X	Y	
1	432265	407904	437
2	432479	407997	427
3	432343	408051	312
4	432017	408062	346

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[6] https://wwwapplications.barnsley.gov.uk/PlanningExplorerMVC/Home/FileDownload/de9300bf-f64b-4bd9-8b57-144fe9d1ad08?ApplicationNumber=2013%2F0280

Receptor No.	Ordnance Survey Coordinates		Distance from the Development Site (metres)
	X	Y	
5	432035	408445	217
6	431738	408243	495
7	432352	408386	136
8	431809	408994	775
9	432759	407998	634
10	431948	407949	478
11	431880	408707	504
12	431861	408677	496
13	431828	408646	501
14	431792	408621	516
15	431746	408598	544
DT84	431046	408016	1,221
DT93	431468	408579	793
AM4	432525	407475	915

2.9.4 Receptor No.7 represents a footpath on the opposite side of the railway line where members of the public may be present due to outdoor activities.

2.9.5 The nearby air quality monitoring locations (DT84, DT93 and AM4) were also included as specific receptors. The other specific receptors represent locations where members of the general public may be present for significant periods of time, either through occupation of a residential property or through their employment at a nearby place of work.

2.10 Assessment Criteria

2.10.1 The assessment was undertaken for the following pollutants, which are the most significant emissions associated with the operation of natural gas-fired engines:

- Oxides of Nitrogen (NO_X);
- Particulates;
- Carbon Monoxide (CO); and,
- Volatile Organic Compounds (VOCs).

Nitrogen Dioxide

2.10.2 All combustion processes release a mixture of Oxides of Nitrogen (NO_X) which comprise varying proportions of nitric oxide (NO) and nitrogen dioxide (NO_2). The majority of the NO_X that is released from combustion processes is in the form of NO, which subsequently reacts with atmospheric oxidants such as ozone (O_3) to form NO_2.

2.10.3 The Air Quality Standards for NO_2 include two objectives to be achieved by 31 December 2005:

- An annual limit of 40 µg m^{-3}; and,
- A limit for the one-hour mean of 200 µg m^{-3}, not to be exceeded more than 18 times a year (equivalent to the 99.79th percentile).

Fine Particles (PM_{10})

2.10.4 Solid matter suspended in the atmosphere which has particles with a diameter of less than 10 µm, is referred to as PM_{10}. It should be noted that the particulate emission factor for the gas engine is associated with total particulate release, rather than the PM_{10} fraction, and the results from the assessment may overestimate the significance of the impact of

particulate emissions on ambient PM_{10} concentrations in the vicinity of the FlexGen Facility.

2.10.5 The Air Quality Standards include the following objectives for PM_{10}:

- An annual limit of 40 µg m^{-3}, to be achieved by 2004;
- A daily limit of 50 µg m^{-3}, not to be exceeded more than 35 times a year (the 90.41th percentile) to be achieved by 2004;
- A daily limit of 50 µg m^{-3}, not to be exceeded more than 7 times a year (the 98.08th percentile) to be achieved by 2010; and,
- An annual limit of 20 µg m^{-3}, to be achieved by 2010.

2.10.6 The 2010 objectives have yet to be formally incorporated into UK legislation.

Carbon Monoxide

2.10.7 Carbon monoxide (CO) is a gas formed by the incomplete combustion of any carbon containing fuels. In general, the more efficient the combustion process, the lower the carbon monoxide emission. The main outdoor source of carbon monoxide is currently emissions from road transport, in particular passenger vehicles, which in 2006 accounted for almost 44% of total emissions in the UK of ~2.27 million tonne.

2.10.8 In their 1994 report, EPAQS recommended an air quality standard of 11.6 mg m^{-3} (10ppm) as a running 8 hour mean. The EPAQS recommendation is intended to limit the exposure of the population, including susceptible individuals, and specifies levels at which harm is unlikely to occur.

2.10.9 The Air Quality Standards include an objective for CO to be achieved by 31 December 2003:

- A limit of 10 mg m^{-3} expressed as a maximum daily 8 hour running mean value.

Volatile Organic Compounds (VOCs)

2.10.10 There are no assessment levels for total VOC emissions as they comprise a mixture of volatile organic compounds. Furthermore, there is no information available about the proportion of benzene, or other potentially harmful hydrocarbon species, that may be present in the total VOC emission from the twenty gas engines associated with the FlexGen Facility, although, it is likely to be a very small percentage of the total.

- Accordingly, the assessment for VOCs is based solely on the maximum hourly average Process Contribution due to emissions from the twenty gas engine exhausts.

3. Detailed Modelling – Air Quality Assessment

3.1 Modelled Parameters

3.1.1 Detailed atmospheric dispersion modelling of emissions from the proposed natural gas-fired FlexGen Facility was undertaken on the basis of an earlier sensitivity analysis, as follows:

- Release height: 4.5 metres
- Building module: active
- Terrain effects: Inactive
- Surface roughness: 0.5 metres
- Meteorological data: Doncaster Sheffield Airport 2010

3.1.2 The detailed modelling assessment considered emissions from the exhausts of the twenty gas engines associated with the proposed FlexGen Facility to be installed on land within the Redbrook Industrial Estate, Barnsley. Emissions of NO_X, Fine Particles (PM_{10}), CO and VOCs were assessed in line with the Air Quality Regulations and their objective limits (where applicable), or against specific pollutant Environmental Assessment Limits (EALs) outlined in Environment Agency guidance.

3.1.3 Detailed assessment was undertaken on the basis of the discharge characteristics and emissions data for the twenty gas engines, as summarised in Table 2-1 and Table 2-2. The pollutant emission rates used in the detailed modelling represent a worst-case scenario with emissions at the maximum level likely to be released from the twenty gas engines.

3.2 Determining Significance.

3.2.1 The Environment Agency provides guidance for screening the significance of air quality impacts associated with the operation of industrial processes[7]. For long term impacts Environment Agency Guidance recommends a 1% significance threshold relative to a long term AQS or environmental assessment level, with a corresponding 10% significance threshold for the assessment of short term impacts.

Screen out insignificant PCs

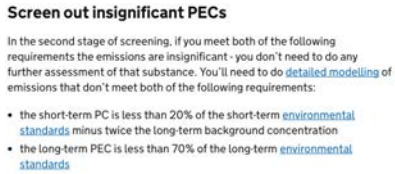
To screen out a PC for any substance so that you don't need to do any further assessment of it, the PC must meet both of the following criteria:

- the short-term PC is less than 10% of the short-term environmental standard
- the long-term PC is less than 1% of the long-term environmental standard

If you meet both of these criteria you don't need to do any further assessment of the substance.

If you don't meet them you need to carry out a second stage of screening to determine the impact of the PEC. Record the PCs for your insignificant emissions in your risk assessment.

[7] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit



Screen out insignificant PECs

In the second stage of screening, if you meet both of the following requirements the emissions are insignificant - you don't need to do any further assessment of that substance. You'll need to do detailed modelling of emissions that don't meet both of the following requirements:

- the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration
- the long-term PEC is less than 70% of the long-term environmental standards

3.2.2 For all other pollutants considered as part of this assessment the following assessment thresholds were used, as recommended by the Environment Agency guidance:

- A Process Contribution of less than 1% of the annual average objective limit should be considered insignificant.
- A Process Contribution of less than 10% of the short-term (hourly) average objective limit should be considered insignificant.

3.3 Nitrogen Dioxide (NO_2)

3.3.1 The results of the NO_2 modelling are presented in the following section, and represent the values at the nearest residential location (Receptor No.2 – approximately 430 metres to the south-east of the FlexGen Facility development site). The results of the NO_2 modelling are presented in Table 3-1. The data presented are for both the Process Contributions (PC) and the Predicted Environmental Concentration (PEC) for NO_2, and based upon the layout shown in Figure 2-3. The PEC values take into account the 2016 measured background NO_2 concentration of 19 µg m^{-3} at the Barnsley Gawber AURN monitoring location, and the conversion of the NO_X released from the process, based upon the empirical formula approved of by the Environment Agency[8].

3.3.2 The maximum reported values are predicted by modelling to occur within the development site, and reduce significantly with distance from the site. The results are discussed in the following sections.

Table 3-1 Results from Detailed Assessment for Nitrogen Dioxide at Receptor No.2 – 2010 Meteorological Data

Statistic	Concentration* (µg m^{-3})	Percentage of AQS Objective Value	Maximum No. of Exceedences**
Short Term 99.79% (PEC)	~90	~45%	0
Short Term 99.79% (PC)	~52	~26%	0
Annual Average PC**	~3.2	~8%	0
Annual Average PEC**	~22	~56%	0

* Based upon the 4,654 operational hours per year that the FlexGen facility is contracted be available.
** Annual average PC and number of exceedences pro-rated for an anticipated 3,000 operational hours per year.

3.3.3 The model predicted that the maximum hourly average NO_2 Process Contribution at Receptor No.2, ~430 metres to the south-east of the proposed development site, would be ~52 µg m^{-3}, or about 26% of the 200 µg m^{-3} hourly AQS objective value. It should be noted that this refers to the 99.79% value based upon the 4,654 potential hours that the FlexGen Facility could potentially operate, whereas the facility is only likely to operate for up to ~3,000 hours per year, which are unlikely to coincide with all of the worst case meteorological conditions for dispersion. No exceedences of the hourly average NO_2

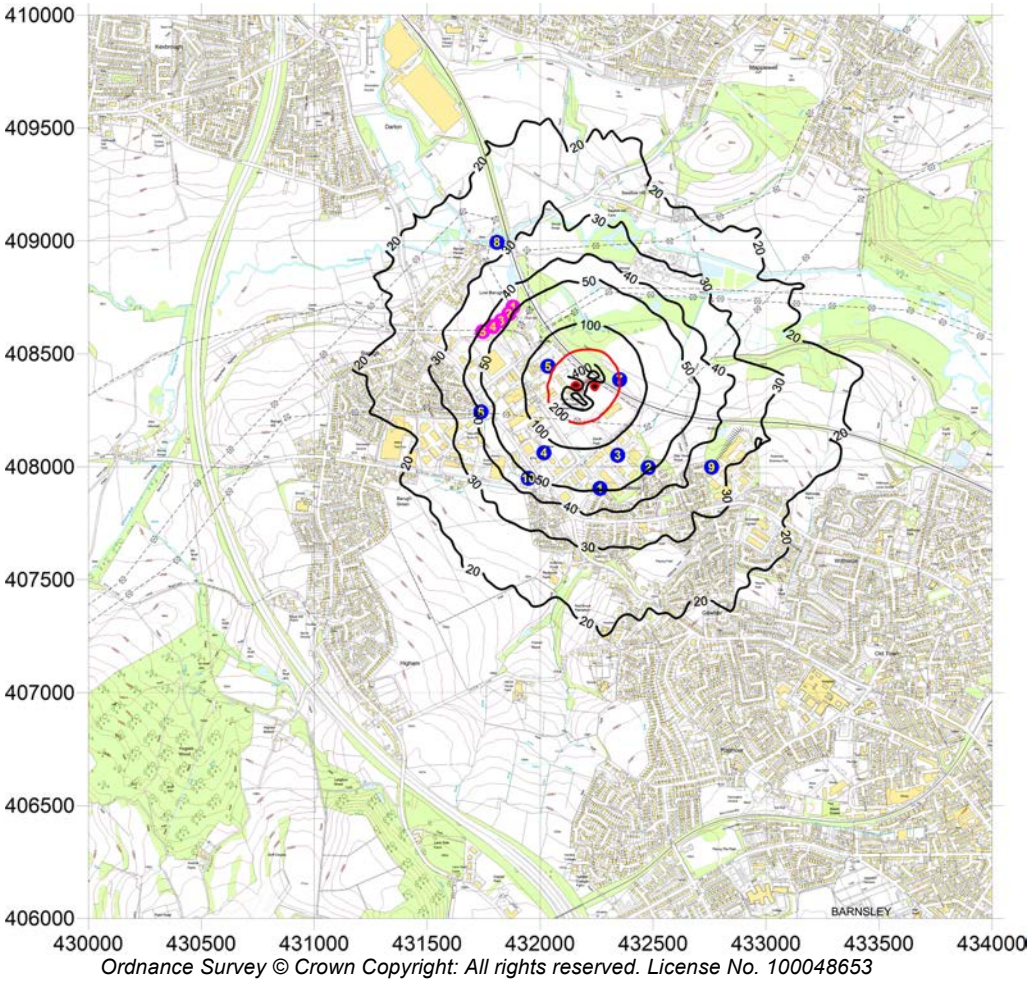
[8] http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf

objective value were predicted to occur at Receptor No.2.

3.3.4 When the 2016 measured background concentration of 19 µg m^{-3} is taken into account, the resulting Predicted Environmental Concentration is ~90 µg m^{-3}, or ~45% of the AQS objective value, with no exceedences predicted, and so fully compliant with the Air Quality Regulations for NO_2, and can be screened out as insignificant in relation to Environment Agency guidance.

3.3.5 The maximum 99.79% hourly average Process Contribution for NO_2, associated with the operation of the FlexGen Facility, and based upon 4,654 potential operational hours, is presented graphically in the following figure.

Figure 3-1 Maximum 99.79% Hourly Average Process Contribution for NO_2

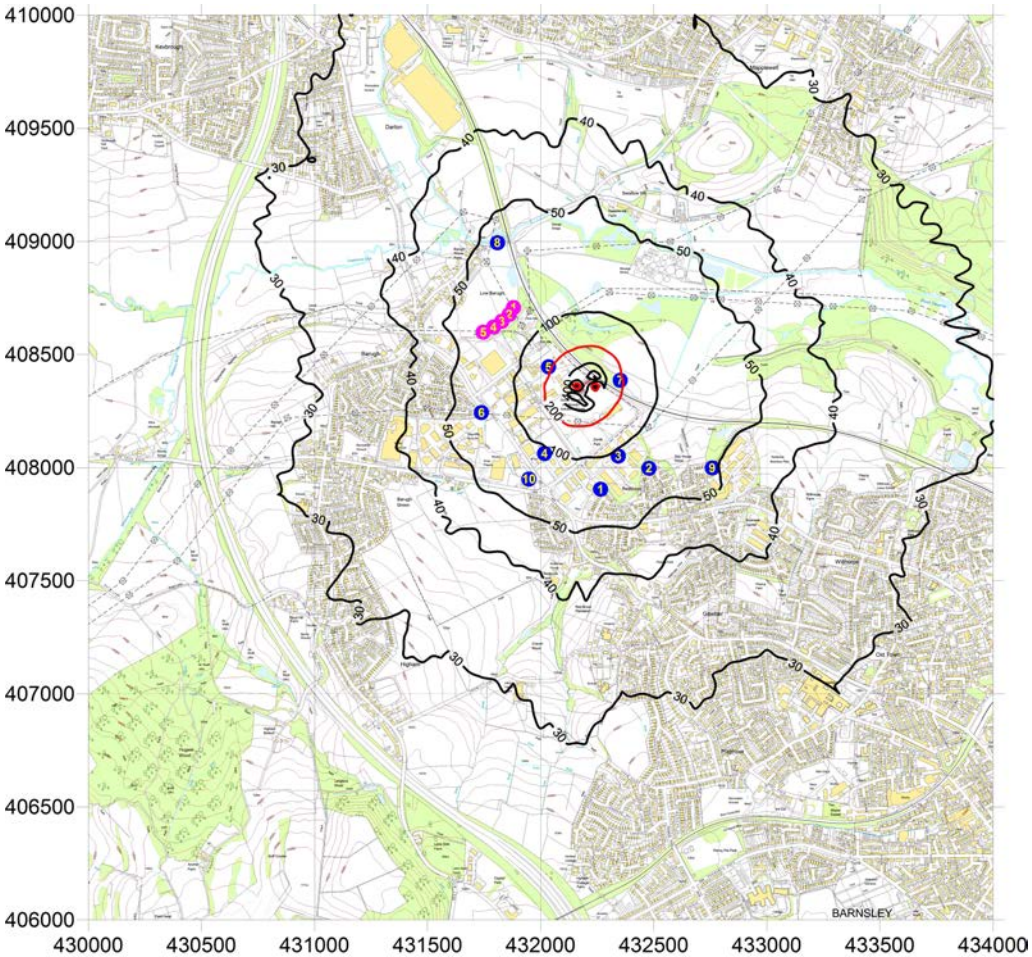


3.3.6 The red contour line represents a Process Contribution of 200 µg m^{-3}, equivalent to 100% of the hourly average NO_2 AQS objective value, and is based upon the 4,654 hours of the year when the FlexGen Facility could potentially be operational. Accordingly, in areas within this contour line the increase in hourly average NO_2 concentrations would exceed the AQS objective value. The area within the red contour line is restricted to land in the immediate vicinity of the FlexGen Facility development site.

3.3.7 The outer contour line corresponds to a Process Contribution of 20 µg m^{-3}, or 10% of the AQS objective value. Therefore, in all areas outside of this contour line, the increase in hourly average NO_2 concentrations due to emissions from the FlexGen Facility can be screened out as insignificant in relation to Environment Agency guidance. The maximum hourly average NO_2 process contribution at the nearest residential receptors to the south-east of the development site was predicted to be ~50 µg m^{-3}, with no exceedences predicted.

3.3.8 The corresponding figure for the hourly average NO_2 Predicted Environmental Concentration is shown below.

Figure 3-2 Maximum 99.79% Hourly Average Predicted Environmental Concentration for NO_2

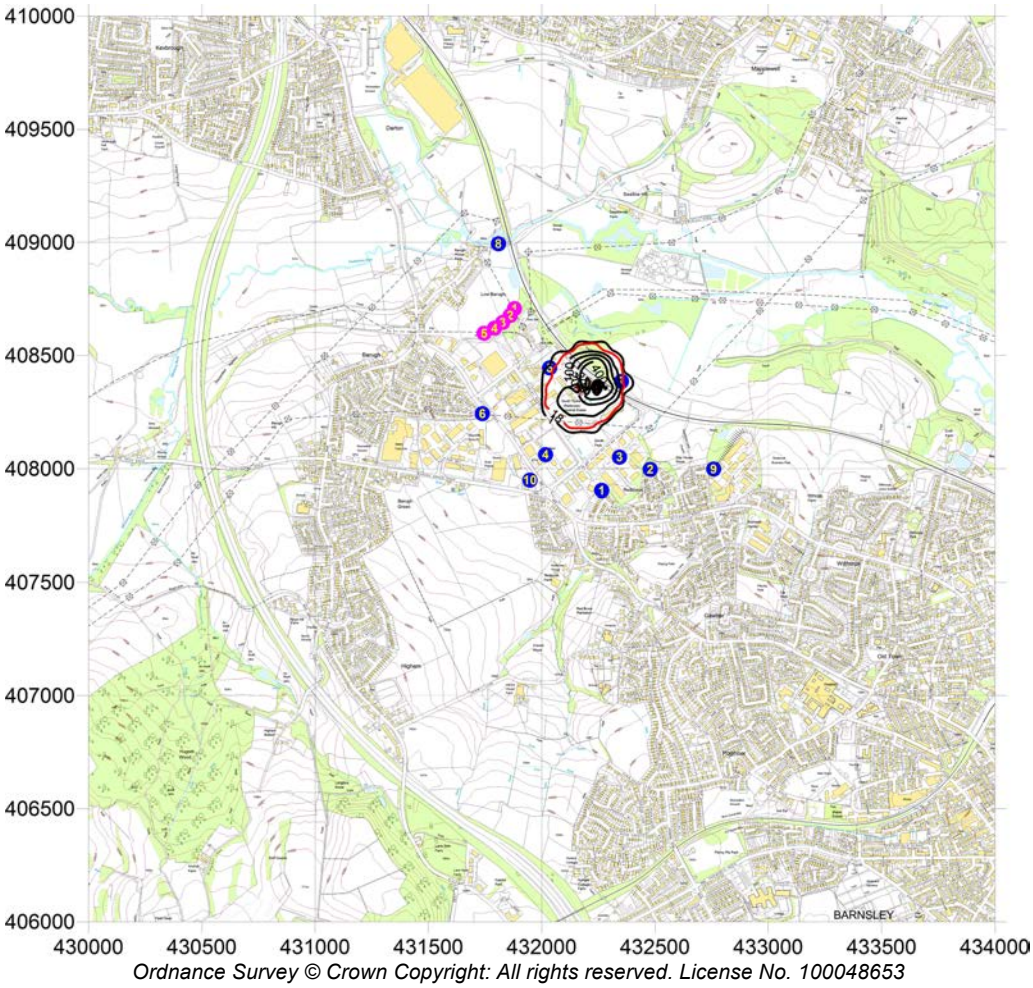


3.3.9 The red contour line represents a Process Contribution of 200 µg m^{-3}, equivalent to 100% of the hourly average NO_2 AQS objective value, and is based upon the 4,654 hours of the year when the FlexGen Facility could potentially be operational. Accordingly, in areas within this contour line the increase in hourly average NO_2 concentrations would exceed the AQS objective value.

3.3.10 The inclusion of the 19 µg m^{-3} background into the above representation of the hourly average NO_2 Predicted Environmental Concentration extends the area within the red contour line, but it is still restricted to land in the immediate vicinity of the FlexGen Facility development site. The maximum hourly average NO_2 Predicted Environmental Concentration at the nearest residential receptors to the south-east of the development site was predicted to be ~75 µg m^{-3}, with no exceedences predicted.

3.3.11 The following figure presents the data for exceedences based upon the hourly average NO_2 Predicted Environmental Concentration, and 3,000 operational hours per year.

Figure 3-3 Exceedences of the Hourly Average NO_2 Objective Value – PEC Values

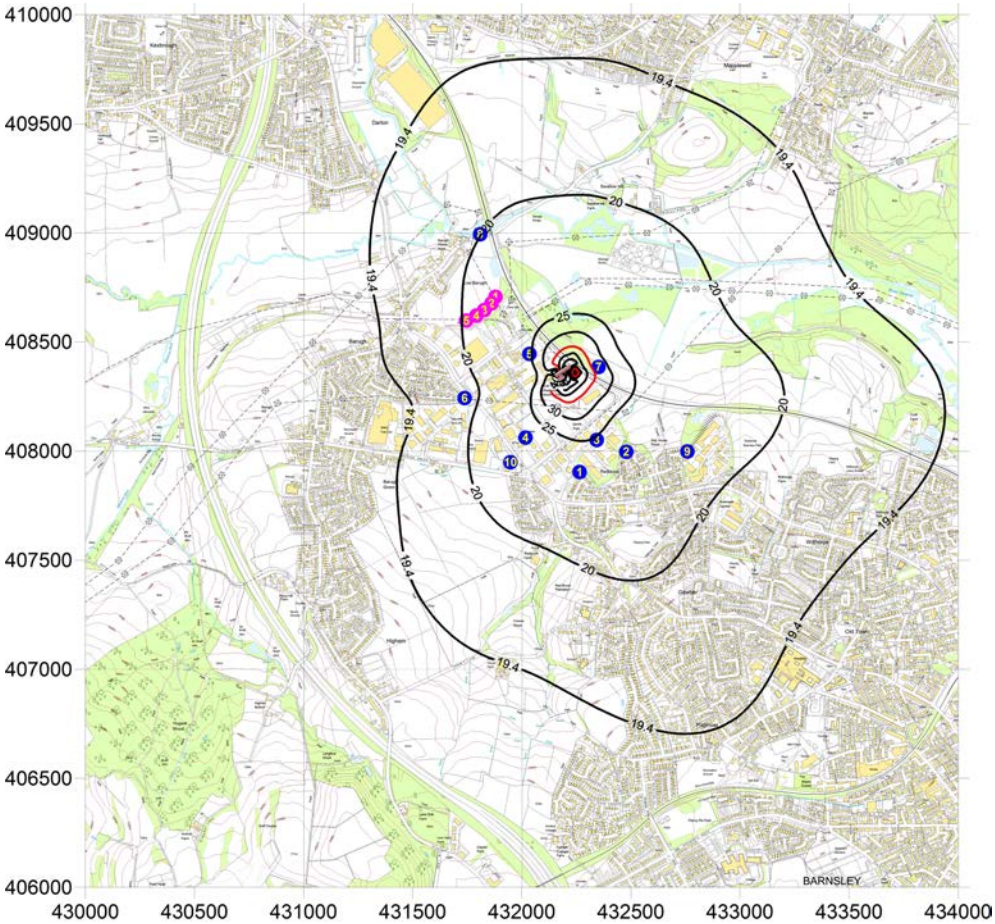


3.3.12 The red contour line represents a value equivalent to 18 exceedences per year, pro-rated for 3,000 operational hours. The area enclosed by the red contour line is restricted primarily to land in the immediate vicinity of the development site, including nearby commercial premises, although these are not considered to be relevant receptors, as members of the general public will only be present for relatively short periods of time. The outer contour line corresponds to a value equivalent to 1 exceedence per year of the hourly average NO_2 AQS objective value.

3.3.13 The results demonstrate that significant impacts of emissions from the FlexGen Facility are restricted to the immediate vicinity of the site, and so should not present a significant risk to the health of members of the general public living nearby.

3.3.14 The corresponding results for the annual average Process Contribution, assuming 3,000 operational hours per year, gave an estimated value of ~3 µg m^{-3}, or ~8% of the AQS objective value, rising to ~22 µg m^{-3}, or ~56% of the AQS objective when considered in relation to the 2016 measured background concentration of 19 µg m^{-3}. The maximum annual average Predicted Environmental Concentration for NO_2 arising from the operation of the FlexGen Facility is presented graphically in the following figure.

Figure 3-4 Maximum Annual Average Predicted Environmental Concentration for NO_2



3.3.15 The outer contour line corresponds to an increase in the annual average background NO_2 concentration of ~0.4 µg m^{-3}, equivalent to ~1% of the corresponding AQS objective value for NO_2, and is based upon the anticipated ~3,000 hours of the year when the FlexGen Facility is expected to be operational. Accordingly, the impact of emissions of NO_X from the FlexGen Facility on background annual average NO_2 concentrations outside the outer contour can be screened out as insignificant in relation to Environment Agency guidance.

3.3.16 Air Quality Standards have been developed to protect the health of the most vulnerable

members of the general population due to exposure to airborne pollutants. There is a general assumption that people in fulltime employment are in good health, and less likely to be affected adversely by exposure to airborne pollutants such as nitrogen dioxide, compared to young children, the elderly, and those with existing respiratory conditions. The annual average NO_2 Predicted Environmental Concentrations associated with the operation of the FlexGen Facility are dominated by the existing background, and should not pose a significant threat to the health of people living and working in the vicinity of the development site.

3.4 Carbon Monoxide (CO)

3.4.1 The results from detailed modelling of carbon monoxide are presented in Table 3-2, based upon model predictions for Receptor No.2, the nearest residential receptor ~220 metres to the west of the development site.

Table 3-2 Modelling Predictions for Carbon Monoxide at Receptor No.2

Statistic	Exceedence Threshold	Averaging Period	Process Contribution (µg m^{-3})	PC as %AQS (%)
Short Term PC 100%	10,000*	1hr	~200	~2

Note: * The AQS objective for CO relates to an 8 hour rolling average, but is included for comparative purposes.

3.4.2 Detailed modelling predicted that the maximum hourly average Process Contribution for CO associated with the emissions from the FlexGen Facility would be ~200 µg m^{-3}, or ~2% of the AQS objective value of 10,000 µg m^{-3}. However, the AQS objective for carbon monoxide is based upon an 8 hour rolling average, and as the FlexGen Facility is only likely to operate for a maximum of two hours at a time, then there is no likelihood of the objective being exceeded, and the impact of emissions of CO can be screened out as insignificant.

3.5 Particles (PM_{10})

3.5.1 The results from detailed modelling of particulates (PM_{10}) are presented in Table 3-3, in the context of the Process Contribution and the resultant Predicted Environmental Concentration, taking into account the estimated annual average background concentration for 2017 of 13.9 µg m^{-3}. The assessment is based upon a worst case assumption that all of the particulate released from the engine exhausts of the FlexGen Facility is 10 µm or less in size, and refers to the model predictions for Receptor No.2, the nearest residential receptor ~430 metres to the west of the development site.

Table 3-3 Maximum Process Contribution for Particles (PM_{10}) at Receptor No.2

Statistic	Exceedence Threshold	Averaging Period	Process Contribution (µg m^{-3})	PC/PEC as %AQS (%)
Maximum Short Term PC (100%)	50*	1 Hour	~0.1	~0.2
Maximum Short Term PEC (100%)			~14	~28

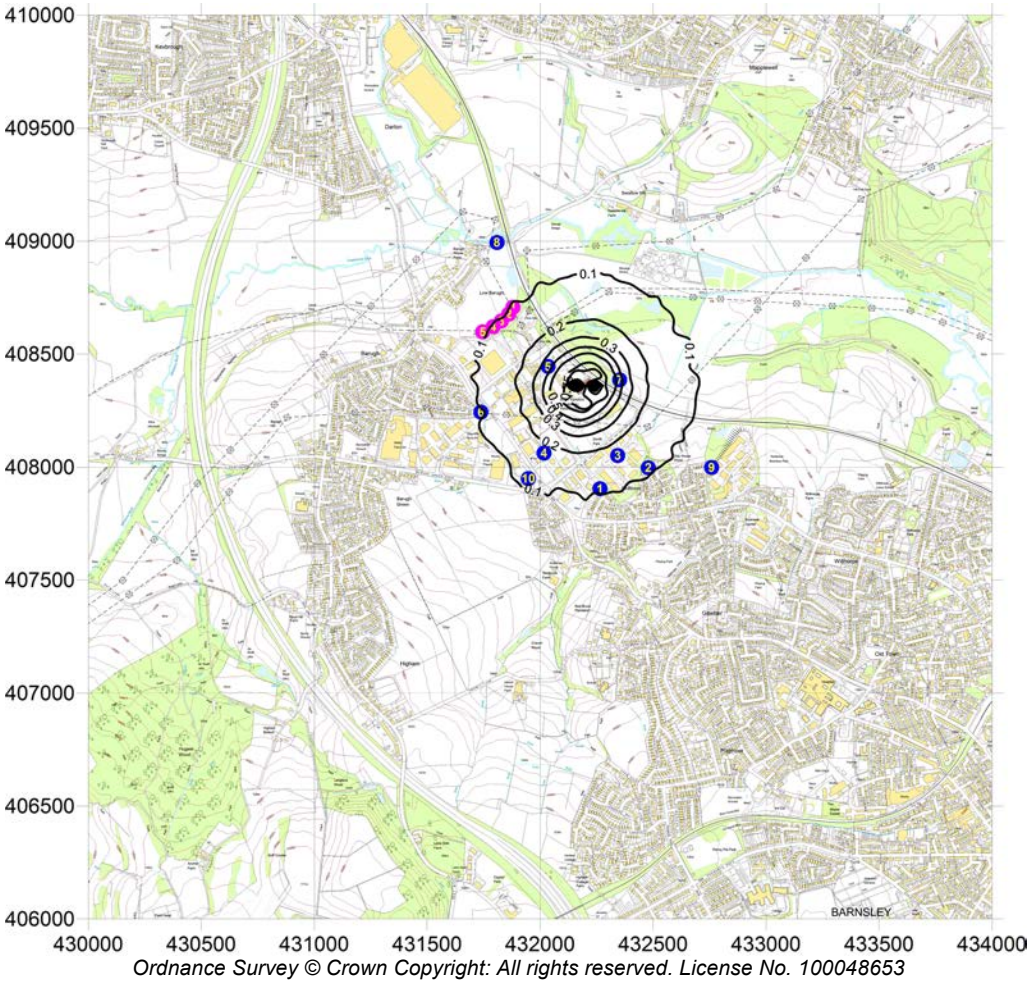
Note: * The AQS objective for PM_{10} relates to a daily average, but is included for comparative purposes.

3.5.2 Detailed modelling predicted that the maximum hourly average Process Contribution for Particles (PM_{10}) due to emissions from the twenty natural gas-fired engines associated with the FlexGen Facility would be ~0.1 µg m^{-3}, which is <1% of the 50 µg m^{-3} daily average AQS objective value. However, as the FlexGen Facility is only likely to operate for a few hours per day on a continuous basis, emissions will not give rise to an exceedence of the daily average objective value for PM_{10}, and the impact of particulate emissions can be screened out as insignificant.

3.5.3 Taking the background into consideration with the Process Contribution predicted by modelling, the maximum hourly average Predicted Environmental Concentration for PM_{10} due to emissions from the FlexGen Facility was predicted to be ~14 µg m^{-3}, or ~28% of the daily average AQS objective value of 50 µg m^{-3}. However, as stated previously, the FlexGen Facility will operate for only a few hours continuously, therefore, emissions cannot give rise to an exceedence of the daily average objective value for PM_{10}.

3.5.4 The maximum hourly average Process Contribution for Particles (PM_{10}), associated with the operation of the FlexGen Facility is presented graphically in Figure 3-5.

Figure 3-5 Maximum Hourly Average Process Contribution for Particles (PM_{10})



3.5.5 As can be seen, maximum hourly average increases in background concentration of PM_{10} due to emissions from the FlexGen Facility are ~0.1 µg m^{-3} at the nearest residential receptors. Existing background concentrations in the area are not high, therefore, particulate emissions from the FlexGen Facility will not result in an exceedence of the daily average AQS objective value for PM_{10}.

3.5.6 Similar conclusions would apply to $PM_{2.5}$, if it was assumed that all of the particulate emissions were <2.5 µm in size, as their dispersal characteristics are essentially the same as those for PM_{10}.

3.6 Volatile Organic Compounds (VOCs)

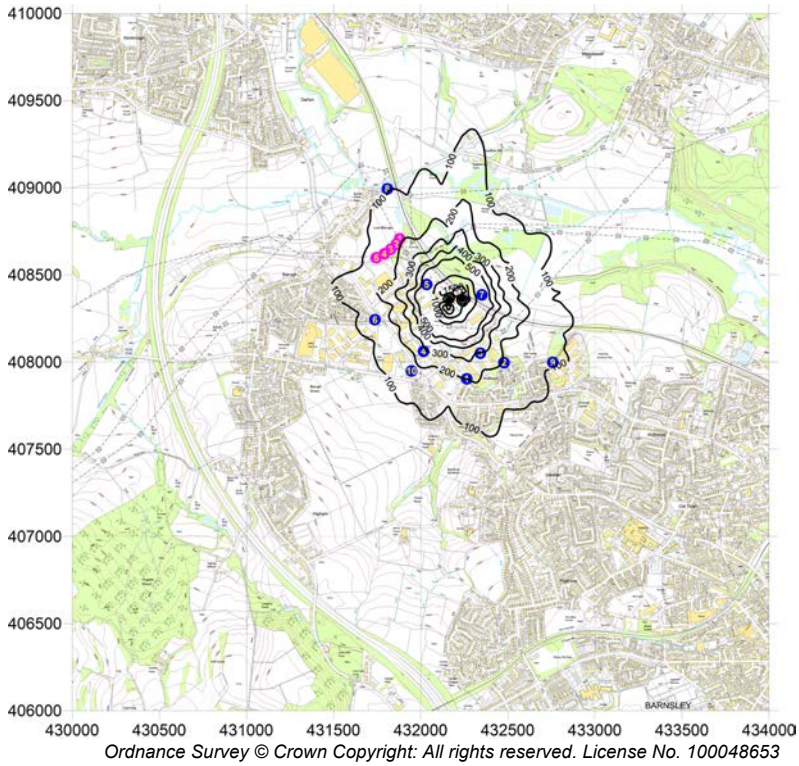
3.6.1 There are no assessment levels for total VOC emissions as they comprise a mixture of volatile organic compounds. Furthermore, there is no information available about the proportion of benzene, or other harmful hydrocarbon species, that may be present in the total VOC emission from the twenty gas engines, although, it is likely to be a very small percentage of the total. The results from detailed modelling are presented in Table 3-4, and relate to the maximum value at Receptor No.2.

Table 3-4 Maximum Process Contribution for VOCs – Receptor No. 2

Statistic	Averaging Period	Process Contribution (µg m^{-3})
Maximum Short Term (100%)	1hr	~190

3.6.2 The model predicted a maximum hourly average Process Contribution of ~190 µg m^{-3} for total VOC emissions from the twenty gas engines associated with the FlexGen Facility.

Figure 3-6 Maximum Hourly Average Process Contribution for VOCs



3.6.3 As can be seen, maximum hourly average increases in background concentration of VOCs due to emissions from the FlexGen Facility are ~200 µg m^{-3} at the nearest residential receptors to the south-east of the development site.

4. Air Quality Predictions at Nearby Specific Receptors

4.1 Introduction

4.1.1 Fifteen specific receptors were included in the detailed atmospheric modelling in order to assess the potential impact on local air quality of emissions from the FGF at locations where members of the general public may be present. Three additional receptors were also included to represent locations where the Council undertakes air quality monitoring for nitrogen dioxide. The location of the majority of the specific receptors is shown in Figure 2-1. The following discussion relates to issues associated with nitrogen dioxide only as it is the most significant pollutant associated with emissions from the twenty gas engines.

4.1.2 The sensitivity analysis undertaken earlier to assess the significance of local environmental aspects identified the 2010 meteorological data as providing worst case dispersion in relation to the majority of the receptor locations. When the results are considered in relation to all of the specific receptors shown in Table 2-7, the following pattern is observed for the maximum 99.79% hourly average Process Contribution associated with the operation of the twenty gas engines.

Table 4-1 Results from Meteorological Data Sensitivity Analysis at Nearby Sensitive Receptors – Maximum Hourly Average NO_2 Process Contribution

Receptor	Distance from Site (m)	Meteorological Data Year				
		2006	2007	2008	2009	2010
1	437	47	47	49	48	51
2	427	47	46	49	47	52
3	312	71	71	73	72	77
4	346	74	73	72	75	76
5	217	165 (11)	156 (14)	158 (8)	163 (7)	164 (5)
6	495	43	40	44	44	41
7	136	199	201	198	198	197
8	775	32	28	27	36	27
9	634	29	37	31	33	33
10	478	47	44	47	46	48
11	504	46	39	44	49	48
12	496	48	39	43	49	48
13	501	47	38	43	48	46
14	516	45	39	41	46	44
15	544	42	36	37	44	42

Note This run was based on: Surface Roughness – 0.5 metres; Downwash Effects Module – Active; Terrain Module – Inactive; Release Height – 4.5m; Meteorological Data – Robin Hood Airport various years.

4.1.3 Values in red indicate the highest value for the five years of meteorological data used in the assessment. As can be seen, the meteorological data for 2009 produced the highest values for six of the various specific receptor locations, followed by five for the 2010 meteorological data. The values in brackets relate to the pro-rated number of exceedences predicted to occur at Receptor No.5, which are within the 18 exceedences allowed under the Air Quality Regulations.

5. Air Quality Impacts at Locations of Air Quality Monitoring Within the Barnsley AQMAs

5.1 Introduction

5.1.1 As referred to earlier, Barnsley MBC has declared seven Air Quality Management Areas (AQMAs) across the Borough (See Figure 2-5), for nitrogen dioxide. Barnsley MBC undertook air quality monitoring across the Borough at 120 locations in 2015, with the nearest location to the development site situated ~900 metres to the south-east at the Barnsley Gawber AURN urban background automatic monitoring station. There are two NO_2 diffusion tube monitoring locations in the Barugh Green area, DT84 (1.2km to the west), and DT93 (~800 metres to the north-west).

5.1.2 The annual average nitrogen dioxide concentration at the Barnsley Gawber AURN site was 19 µg m^{-3} in 2016, and the corresponding values at the two NO_2 diffusion tube monitoring sites were 34.1 µg m^{-3} (DT84) and 37.6 µg m^{-3} (DT93). The measured values at the two diffusion tube sites are roadside (DT84) and kerbside (DT93) monitoring locations and so will be influenced to a greater extent by vehicular emissions than the urban background location at the Barnsley Gawber AURN site, which is probably more typical of conditions at the FlexGen Facility development site.

5.1.3 Specific receptors representing these nearby NO_2 monitoring locations (Receptor Nos. DT84, DT93 and AM4) were included in the detailed atmospheric modelling in order to assess the potential impact on annual average NO_2 concentrations due to emissions of NO_X from the FlexGen Facility. The results are presented in the table below, and relate to the maximum hourly average NO_2 process contribution for all of the 4,654 hours that the FlexGen Facility could potentially be operational, and the maximum annual average NO_2 Process Contribution, based upon the anticipated ~3,000 operational hours.

Table 5-1 Results for the Maximum Annual Average and Hourly Average NO_2 Process Contributions at Nearby Monitoring Sites

Location	X	Y	Distance from the Site (metres)	2014 Annual Average Background (µg m^{-3})	Annual Average NO_2 PC (µg m^{-3})	Annual Average NO_2 PEC (µg m^{-3})	Hourly Average NO_2 PC (µg m^{-3})	Hourly Average NO_2 PEC (µg m^{-3})
Diffusion Tube DT84	431046	408016	1,221	34.1	~0.2	~19.2	~12	~50
Diffusion Tube DT93	431468	408579	793	37.6	~0.5	~19.5	~24	~62
AURN Site AM4	432525	407475	915	19.0*	~1.1	~20.1	~23	~61
Note:	Data relate to measurements undertaken in 2016 [9]							

5.1.4 As can be seen, annual average NO_2 concentrations at the above monitoring locations are predicted to increase by ~1.1 µg m^{-3}, or less, as a result of NO_X emissions from the

[9] https://uk-air.defra.gov.uk/data_files/site_data/BAR3_2016.csv

FlexGen Facility development. When considered in relation to the measured background at these locations, the predicted increases will not result in an exceedence of the annual average AQS objective value.

5.1.5 Maximum hourly average NO_2 concentrations at the nearby NO_2 monitoring sites were predicted to increase by ~24 µg m^{-3}, or less, or about 10% or less of the AQS objective value, as a result of NO_X emissions from the FlexGen Facility.

5.1.6 Hourly average and annual average process contributions to background pollutant concentrations decrease markedly with distance from the site, as can be seen in Figure 3-1. This indicates that emissions from the FlexGen Facility are unlikely to have a significant impact on local air quality, apart from in the immediate vicinity of the development site, and should not adversely impact on Barnsley Metropolitan Borough Council's Air Quality Action Plans associated within the NO_2 AQMAs.

6. Conclusions

6.1 Introduction

6.1.1 A detailed assessment has been undertaken of the potential impact on local air quality of operations to be carried out at a Flexible Generation (FlexGen) power generation facility, to be installed on land within the Redbrook Industrial Estate, Barnsley. The FlexGen Facility incorporates twenty gas engines and associated electrical generators, and will generate ~20MW_e for supply to the National Grid during periods of peak demand.

6.1.2 Detailed atmospheric dispersion modelling of the potential impact on local air quality of emissions from the FlexGen Facility was undertaken using the ADMS Version 5.2 model. Emissions from the twenty gas engine powered generating units were considered in the modelling to determine the cumulative impact of the FlexGen Facility as a whole. Process information and pollutant emissions data for the facility were supplied by Reliance Energy.

6.1.3 Representative background pollutant concentrations were obtained from the DEFRA 2013 Background Maps website for the area covered by Barnsley Metropolitan Borough Council, as well as measured data from Council's extensive air quality monitoring programme. The modelling incorporated a number of conservative assumptions to determine the potential worse case impact, should the operation of the plant coincide with least favourable meteorological conditions (with respect to dispersion of emissions) and the frequency with which these conditions could occur within the operational periods of the FlexGen Facility.

6.1.4 The assessment was undertaken on the basis of the 4,645 hours of the year that the FlexGen Facility will be contracted to be available for operation, whereas in practice it will only be operational for up to ~3,000 hours of the year. The results from detailed modelling indicate that the hourly average NO_2 AQS objective value may be exceeded in the immediate vicinity of the development site, as a result of the operation of the FlexGen Facility. However, there will not be a breach of the Air Quality Regulations as a result of the operation of the FlexGen Facility, as the area affected is restricted to land within the development site and adjacent commercial premises, which are not considered to be relevant receptors, as members of the general public will only be present at these locations on an intermittent basis and for relatively short periods of time.

6.1.5 Air quality in the vicinity of the development site is typical of an urban environment, and the maximum hourly average and annual average NO_2 Predicted Environmental Concentrations at the nearest residential receptors, represent values equivalent to ~70% or less of the AQS objective values, and can be screened out as insignificant in relation to Environment Agency guidance.

6.1.6 The results from detailed modelling also showed that the operation of the FlexGen Facility would not result in an exceedence of the AQS objective values for PM_{10}, CO or VOCs.