



Ricardo
Energy & Environment



Octagon House

Proposed boiler and CHP energy centre - Air Quality Impact Assessment

Report for Vital Energi

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08 December 2020

Ricardo Energy & Environment reference:

Ref: ED12832120- Issue Number 1

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1 Introduction

Ricardo Energy & Environment have been commissioned by Vital Energi to undertake an air quality impact assessment for a proposed installation of a new energy centre at Octagon House in Manchester. The assessment has been conducted using atmospheric dispersion modelling and aims to provide information to support both the planning application and environmental permitting application.

The main aims of the assessment are:

- Assess the future air quality impacts associated with the new, proposed energy centre, which includes two boilers, a 3.3MW CHP unit, and 4.5MW CHP unit. No existing energy units are present on the site.
- Assess impacts on human health

This assessment considers the atmospheric pollutants nitrogen dioxide (NO₂), oxides of nitrogen (NO_x); and Particulate Matter (in the PM₁₀ and PM_{2.5} fractions) from the proposed energy installations.

1.1 General Approach Taken

The approach taken in this study was to:

- Collect and interpret the proposed boiler and CHP specifications and emissions data for input to an atmospheric dispersion model.
- Obtain local background pollutant concentrations in the study area from either local measurements or background mapping.
- Using five consecutive years of relevant meteorological data, model concentrations of NO₂, NO_x, PM₁₀ and PM_{2.5} in the study area. A sensitivity analysis of inter-year variability in meteorological conditions will identify the worst-case met year to use when assessing the impact of the proposed energy centre.
- Report the predicted worst-case annual mean and short-term concentrations at nearby sensitive receptor locations; and present the predicted spatial variation in pollutant concentrations across the study area using contour plots.
- Describe the air quality impacts and magnitude of change associated with the proposed energy centre using the method prescribed in the current IAQM/EPUK¹ guidance.

2 Air Quality Standards and Guidelines

2.1 Assessment of human health impacts

2.1.1 Air Quality Strategy and Objectives

The pollutants of potential concern with regard to this assessment comprise of NO₂, NO_x, PM₁₀ and PM_{2.5}. Local Authorities are required under the Environment Act 1995 to assess air quality in their areas on an annual basis against air quality objectives set out in regulation; these pollutants are normally included in such assessments. The current UK air quality objectives are presented in Table 1 which

¹ EPUK & IAQM (2017) Land-Use Planning & Development Control: Planning For Air Quality; Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes; January 2017

includes the standards in micrograms per cubic metre ($\mu\text{g.m}^{-3}$) with the number of exceedances that are permitted where applicable.

Table 1: Objectives included in the Air Quality Regulations and subsequent Amendments, for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective	
	Concentration	Measured as
Nitrogen dioxide for protection of human health	200 $\mu\text{g.m}^{-3}$ not to be exceeded more than 18 times a year	1-hour mean
	40 $\mu\text{g.m}^{-3}$	annual mean
PM ₁₀	50 $\mu\text{g.m}^{-3}$ not to be exceeded more than 35 times a year	24-hour mean
	40 $\mu\text{g.m}^{-3}$	annual mean
PM _{2.5}	25 $\mu\text{g.m}^{-3}$	annual mean
Long term critical level for Oxides of Nitrogen (NO _x) for the protection of vegetation	30 $\mu\text{g.m}^{-3}$	annual mean
Short term critical level Oxides of Nitrogen (NO _x) for the protection of vegetation*	75 $\mu\text{g.m}^{-3}$	24hr daily mean

2.1.2 Sensitive locations for protection of human health

The locations where objectives apply are defined in the UK Air Quality Strategy (AQS) as locations outside buildings or other natural or man-made structures above or below ground where members of the public are regularly present and might reasonably be expected to be exposed over the relevant averaging period of the objectives. Typically, these include residential properties, hospitals and schools for the longer averaging periods (i.e. annual mean) pollutant objectives and the above locations recreational facilities, shopping areas etc. for short-term (i.e. 1-hour) pollutant objectives. Table 2 lists examples of where the AQS objectives should and should not apply.

2.1.3 Description of Air Quality Impacts

Qualitative impact descriptors are required to assist with determining the significance of the results of the air quality assessment. The approach to determining impact descriptors developed by the IAQM, which has been incorporated into the latest IAQM and Environmental Protection UK (EPUK) guidance document on planning and air quality² has been used.

In summary, the approach involves quantifying the magnitude of change in annual mean NO₂, PM₁₀ and PM_{2.5} concentrations attributable to the proposed development; then expressing the magnitude of incremental change as a proportion of each respective air quality standard. An impact descriptor can

² EPUK & IAQM (2017) Land-Use Planning & Development Control: Planning For Air Quality; Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes; January 2017

then be assigned. The impact descriptors from the latest guidance are presented in Appendix 1. This approach is widely used throughout the UK and considered as current best practice when assessing air quality impacts for planning applications.

Table 2: Objectives Examples of where the Air Quality Objectives should and should not apply

Averaging Period	Pollutants	Objectives <i>should</i> apply at ...	Objectives <i>should not</i> generally apply at ...
Annual mean	NO ₂ , PM ₁₀ , PM _{2.5}	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean, 24 -hour mean	NO ₂ , PM ₁₀	All locations where the annual mean objective is applied. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks and railway stations etc. which are not fully enclosed. Any outdoor locations to which the public might reasonably be expected to have access.	Kerbside sites where the public would not be expected to have regular access.

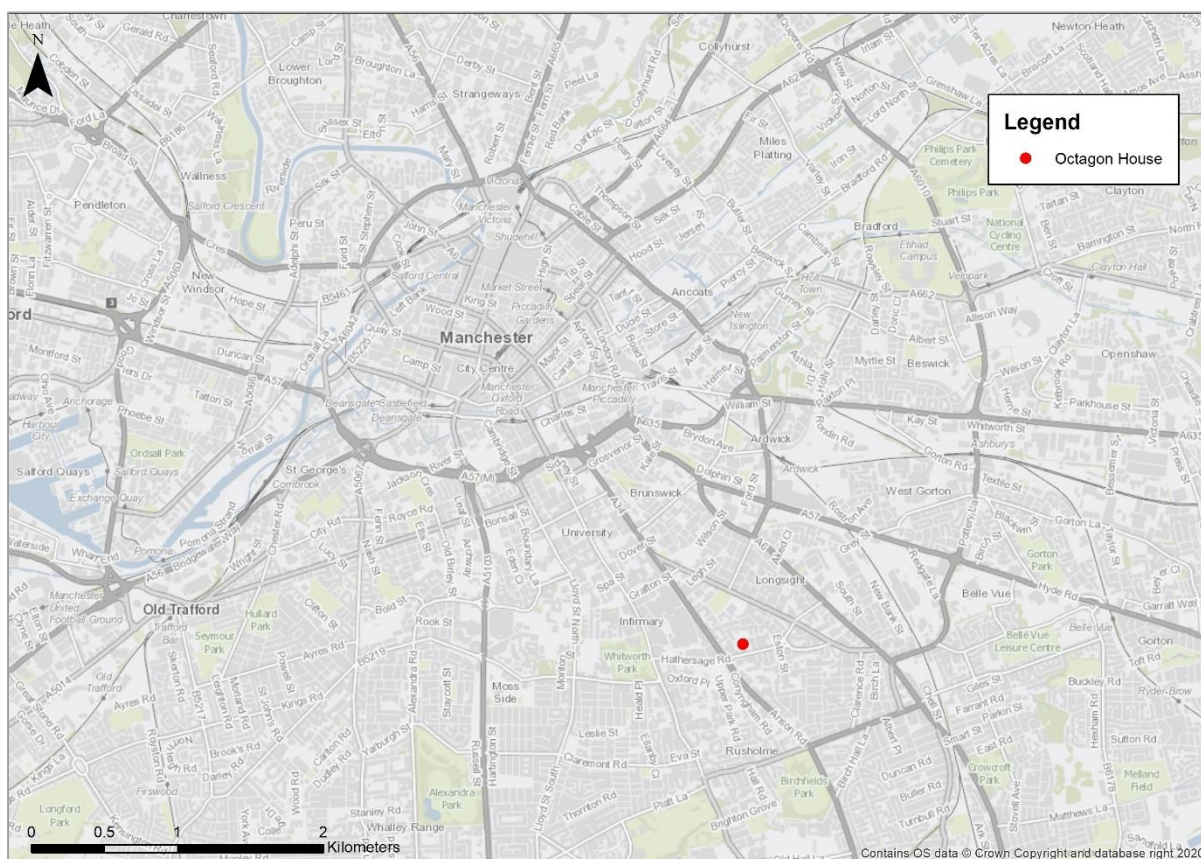
3 Study Area

3.1 Site Description and Location

The proposed energy plant is to be located at Octagon House, Manchester. Octagon House is located in a densely populated area of the southern side of Manchester.

The site location relative to the surrounding area is presented in Figure 1.

Figure 1: Octagon House site location



3.2 Baseline Air Quality

3.2.1 Local air quality management and pollutant measurements.

Manchester City Council declared an air quality management area (AQMA) for exceedances of the NO₂ annual mean objective in 2010. The AQMA covers the whole of Greater Manchester. The Greater Manchester Air Quality Strategy and Action Plan (2006) sets out a package of measures to address air pollution from road transport, with a particular focus on meeting EU Limit Values for nitrogen dioxide.

Greater Manchester conducted automatic (continuous) monitoring at 17 measurement sites and non-automatic (passive) monitoring of NO₂ at 400 sites across the Combined Authority during 2019.

3.2.2 Background Pollutant Concentrations

Background pollutant concentrations for a dispersion modelling study can be derived from either local monitoring data conducted at a background site or from the background maps provided by Defra at the

LAQM support website³. The current background mapping data provides estimates of annual mean background concentrations of key pollutants at a resolution of 1 x 1 km across the UK projected from a base year of 2018.

The closest automatic urban background measurement site is located at Manchester Piccadilly, approximate 2.8km NW of Octagon House. The measurement site location is out-with the impact assessment study area so is unlikely to be representative of background pollutant concentrations at receptors close to the dispersion site.

There are two urban background NO₂ diffusion tube sites located approximately 1km east and north east of Octagon House. Details of each site and the NO₂ annual mean concentration measured in 2019 are presented in Table 3. Each of the urban background diffusion tube sites are located adjacent to, and within 30m of the railway line south of the Longsight rail depot. It is uncertain if background NO₂ concentrations will be influenced by emissions from passing diesel locomotives associated with the maintenance activities at the Longsight depot or any other non-electrified rail activity. It is therefore also uncertain if these background NO₂ measurements are representative of conditions at receptors closer to the dispersion site at Octagon House.

For PM₁₀ and PM_{2.5} there is no background measurement data available

Table 3: Nearby urban background NO₂ diffusion tube site measurements 2019

Site ID	Site type	Location (OSGB1936)	Approx. Distance from dispersion site (m)	Measured NO ₂ annual mean 2019 (µg.m ⁻³)
MAN78	UB	386289, 396828	1.1 km NE	33.0
MAN79	UB	386875, 395861	1.3 km E	29.3

The 1km resolution Defra background maps were used to access current estimated background concentrations of NO₂, PM₁₀, and PM_{2.5} in a 3km x 3km area surrounding the dispersion site; the maximum values within the surrounding 1km squares for each pollutant are presented in Table 4.

Table 4: Defra mapped estimates of 2020 annual mean NO₂, PM₁₀ and PM_{2.5} background concentrations

Pollutant	Maximum 2020 mapped background concentration* (µg.m ⁻³)	1km grid square co-ordinates (OSGB1936)
NO ₂	22.3	384500, 396500
PM ₁₀	12.9	386500, 395500
PM _{2.5}	8.7	386500, 395500

* Max value within a 3x3km area surrounding the dispersion site – from Defra 1km resolution background map for 2020

In this case, due to uncertainties with the available NO₂ background measurements the maximum Defra mapped background estimates for each pollutant have been used throughout the assessment.

Short-term concentrations have been assumed to be twice the long-term concentrations, as recommended in the TG16 LAQM technical guidance⁴. Background concentrations in the study area are below the air quality objectives for each pollutant.

³ <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

⁴ Defra(2018) Local Air Quality Management Technical Guidance (TG16); February 2018 version.

4 Modelling Methodology

4.1 Model Description

The air quality impact assessment has been conducted using the Atmospheric Dispersion Modelling System ADMS 5.2.

ADMS 5.2 is the latest version of a new generation dispersion model developed by Cambridge Environmental Research Consultants Ltd (CERC) which has been extensively validated to international standard dispersion modelling standards.

New generation dispersion models describe the atmospheric boundary layer in terms of the boundary layer depth, the Monin-Obukhov length and a skewed Gaussian distribution to calculate dispersion under convective meteorological conditions. The model is applicable up to about 60km downwind of the source.

4.2 Model input data

4.2.1 Model domain

This dispersion modelling study aims to assess the impact of atmospheric pollutant emissions from the proposed CHP and boiler upgrade on the receptors in the area surrounding the Octagon building. Pollutant dispersion was calculated over a regular Cartesian grid pattern and at a selection of specified receptor points. The modelled domain covers an area of approximately 3km x 3km grid which predicts pollutant concentrations at a resolution of 10m; the grid was centred on the proposed boiler flue location. A grid height of 1.5m was modelled to represent ground level human exposure.

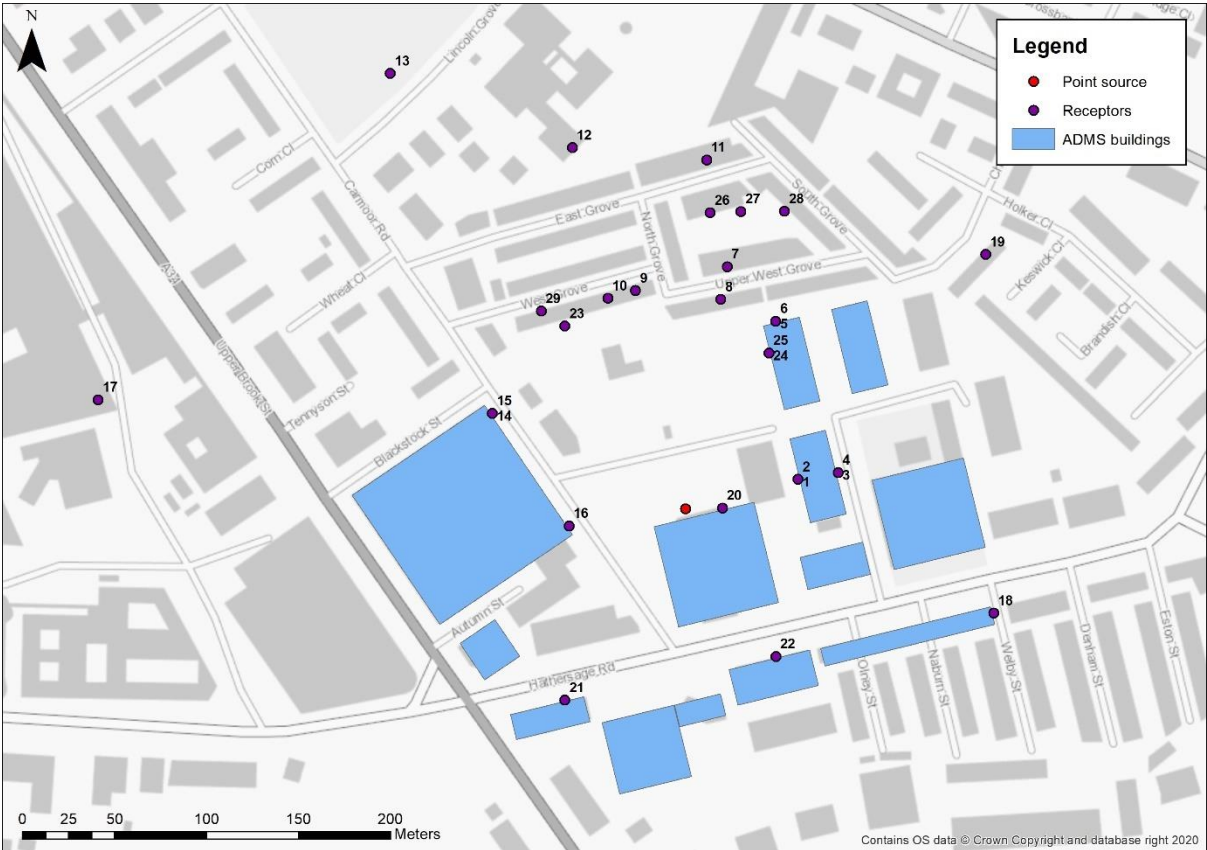
4.2.2 Specified receptor locations

Sensitive receptor locations have been specified within the model domain to represent locations where humans may be exposed to pollutant emissions from the proposed CHP units and boilers. The receptors are located at the façade of buildings in the model domain where relevant human exposure is present, these include residential properties, schools and hospitals. Where relevant, receptors have been modelled at height to represent exposure on floors above ground level. Details of the receptor locations are presented in Table 5 and Figure 2.

Table 5: Modelled sensitive receptor locations

ID	Receptor	OS Grid reference		Height (m)	Description
		X	Y		
1	5 Victoria Point- 1	385659.5	395971.4	1.5	Student accommodation
2	5 Victoria Point- 2	385659.5	395971.4	22	Student accommodation
3	5 Victoria Point- 3	385681.3	395975.1	1.5	Student accommodation
4	5 Victoria Point- 4	385681.3	395975.1	18	Student accommodation
5	4 Victoria Point- 1	385647.4	396057.5	1.5	Student accommodation
6	4 Victoria Point- 2	385647.4	396057.5	14	Student accommodation
7	Upper W Grove- 1	385621	396087.1	1.5	Residential
8	Upper W Grove- 2	385617.6	396069.3	4	Residential
9	W Grove 1-	385571.1	396074.1	1.5	Residential
10	W Grove 2-	385556.2	396069.9	4	Residential
11	E Grove	385609.9	396145.2	1.5	Residential
12	St Chrysostom Primary	385536.9	396151.9	1.5	Primary school
13	Swinton Park	385437.9	396192.3	1.5	Recreation ground
14	Unite Hall- 1	385493.4	396007.3	1.5	Student accommodation
15	Unite Hall- 2	385493.4	396007.3	8	Student accommodation
16	Carmoor Rd nursery	385535.1	395946	1.5	Nursery
17	Manchester Infirmary	385279.1	396014.7	1.5	Hospital
18	Welby St	385765.9	395898.6	1.5	Residential
19	Chelford Close	385761.5	396093.8	1.5	Residential
20	Octagon - roof	385618.5	395955.8	25.5	Site roof access
21	Hathersage Rd	385532.8	395851.2	1.5	Residential
22	Tatton house	385647.5	395875	26	Residential
23	W Grove- 3	385532.8	396054.8	1.5	Residential
24	4 Victoria Point- 3	385643.7	396040.2	14	Residential
25	4 Victoria Point- 4	385643.7	396040.2	1.5	Residential
26	East Grove 2	385611.8	396116.5	1.5	Residential
27	East Grove 3	385628.5	396117.2	1.5	Residential
28	South Grove 1	385652.2	396117.3	1.5	Residential
29	W Grove 4	385520	396063	1.5	Residential

Figure 2: Receptor Locations



4.2.3 Meteorology

ADMS 5.2 uses a range of hourly sequential meteorological data to calculate atmospheric dispersion. The main meteorological parameters used are wind speed and direction, near-surface temperature, cloud cover, relative humidity and precipitation.

Hourly sequential meteorological data for the nearest suitable meteorological station with adequate data capture, Manchester Airport, was obtained for five calendar years 2015 - 2019. Wind roses for each meteorological dataset are presented in Appendix 2. Examination of the wind roses indicates that winds are predominantly observed to be from the directions of between 180° and 210° i.e. south-westerly winds. This is typical of the conditions experienced generally in this part of the UK.

A minimum Monin-Obukhov Length of 30m was used for both the site domain and meteorological site location. The Monin-Obukhov Length is the height above ground, where mechanically produced (by vertical shear) turbulence is in balance with the dissipative effect of negative buoyancy.

4.2.4 Terrain and Land Use

The topographical features surrounding a site will have an influence on the dispersion of pollution in that area. This is accounted for in the surface roughness length specified in the model input.

A surface roughness value of 1m was used as the model guidance indicated that this is appropriate for City/Woodland areas, as the site is located on the southern side of Manchester in a densely populated residential area. Model default values were used for surface albedo (0.23) and the Priestley Taylor parameter (1).

In particular, slopes with a gradient of greater than 1:10 can impact on this dispersion. From examination of digital terrain data, terrain within the study area did not appear to have gradients greater than 1:10; complex terrain effects were not therefore included in the model set up.

4.2.5 Building Parameters

ADMS contains an option to model algorithms that account for building downwash effects. Nearby buildings (within five stack heights from the stack; and with a height of more than one third of the stack height) can affect the dispersion of emissions from a stack. The main effect can be to increase concentrations in the immediate vicinity of the building, while reducing concentrations further away.

For this assessment Vital Energi provided dimensions for all surrounding hospital buildings meeting the criteria for inclusion in the modelling, including Octagon House (site layout is reproduced in Appendix 3). Buildings should be included in the model if located within a distance of 5 chimney heights and if their heights are at least one-third of the chimney height. The model requires the height, length, width and orientation of the buildings as input data. Building locations and dimensions were added using the ADMS Mapper utility using a base map to ensure correct location and orientation.

The site is made up of multiple buildings of various height and orientation. When calculating building effects during a model run, ADMS simplifies similar neighbouring buildings into single idealised rectangular-cuboidal buildings, this typically uses the maximum building height within the group and orientates the idealised building based on the wind direction during the hour being modelled. The CERC ADMS 5 user guide (Section 4.9.4,⁵) recommends that wherever possible, a complicated site with a large number of buildings should be simplified.

The simplified buildings layout used in the model and the relevant input data are presented in Table 6. A plan view of the buildings modelled superimposed on a map of the study area is presented in Figure 3. To provide context we have also presented a 3D visualisation of the actual building layout available using the google earth 3D buildings layer (Figure 4).

⁵ https://www.cerc.co.uk/environmental-software/assets/data/doc_userguides/CERC_ADMS_5_2_User_Guide.pdf

Table 6: Buildings parameters modelled

ID	Building name	Building type	Centroid location (X)	Centroid location (Y)	Height (m)	Width (m)	Length (m)	Angle (m)
1	Octagon House	Rectangular	385615.1	395925	24	56	56	76.2
2	Hello Student Accom.	Rectangular	385670.4	395973	20	18	35	76.2
3	Manchester Camp. No1	Rectangular	384745.3	392656.5	24	47	20	76.2
4	Manchester Camp No2	Rectangular	385656.2	396034.5	16	47	20	76.2
5	Manchester Camp No3	Rectangular	385693.1	396043.3	16	47	20	76.2
6	Unite Students Hall	Rectangular	385477	395952	24	85	87	55.8
7	Coniston Hall 1	Rectangular	385577.3	395824.3	12	40	40	76.2
8	Tatton house	Rectangular	385646.4	395863.5	28	20	45	76.2
9	Hathersage houses 1	Rectangular	385524.8	395841.4	12	14	41	76.2
10	Coniston Hall 2	Rectangular	385606.3	395845.7	10	12	25.8	76.2
11	Victoria Baths	Rectangular	385730.6	395952.7	18	50	51	76.2
12	Hathersage houses 2	Rectangular	385719.2	395885.9	10	10	95	76.2
13	Hathersage houses 3	Rectangular	385492	395878.6	12	24	23	55.8

Figure 3: Simplified buildings layout used in the ADMS 5 set up.

Figure 4: 3D imagery of existing buildings surrounding Octagon House (Google Earth 2020)

4.3 Source Emission Data

4.3.1 Plant and stack specifications

Proposed stack location/dimensions and all boiler and CHP emission parameters were provided to Ricardo Energy & Environment by Vital Energi⁶; this included technical specification documents from the boiler and CHP manufacturers⁷.

The proposed energy centre consists of two 8.0MWth boilers, one 2.4MWth CHP unit, and one 2.9MWth CHP unit. During normal operation all CHP and boilers use natural gas fuel. Multiple, separate flues will discharge through a single stack outside of Octagon House.

The location of the proposed new stack relative to Octagon House is presented in Figure 3 above.

4.3.2 Emission parameters

The stack emissions data, pollutant concentrations at both test and actual conditions; and pollutant emission rates at actual conditions for the boiler operating at nominal output as provided by Vital Energi are presented in Table 7, Table 8 and Table 9.

The following assumptions have been made when modelling emissions:

- The boilers and CHP have been assumed to be operational continuously at full load 24 hours per day 365 days per year. This is considered to be a conservative approach to assessing emissions to air from the proposed boilers; it is more likely that the boiler will operate at variable loads throughout the year depending on demand.
- Pollutant emission rates remain constant throughout the year i.e. no time varying emission rates have been modelled.

⁶ Vital Energi (2020) Email communication from J Chamberlain (Vital Energi) to A Lewin (Ricardo Energy & Environment) titled "RE: Octagon Project Energy Network - Flue dispersion modelling - Fixed Price agreement" - Received 20/10/2020 at 17:03.

⁷ Bosch (2020), Technical data and description of delivery scope, project 211062/1; Jenbacher (2020), Technical description, JMS620GSNL; Jenbacher (2020), Technical description, JMS624GSNL; Jenbacher (2020), Emission data sheet, J620GSJ12.

- In accordance with the current dispersion modelling guidance from the Environment Agency⁸, it was assumed that 70% of NO_x is converted to NO₂ for comparison with the annual mean objective, and 35% of the NO_x is converted to NO₂ for comparison with the short-term objective.

Table 7: Boiler and CHP stack emission parameters

Stack emission parameters		Proposed Boiler No 1,2	Proposed 3.3MW CHP	Proposed 4.5MW CHP
Flue location grid reference	Easting	385598	385598	385598
	Northing	395954	395954	395954
Stack height (m)		33	33	33
Inner flue diameter (m)		0.55	0.74	0.75
Flue cross sectional area (m ²)		0.24	0.43	0.44
Exit temp. (°C)		200	120	120
Exit velocity (m.s ⁻¹)		19.42	13.84	17.45
Volume flow rate (actual)(m ³ .s ⁻¹)		4.61	5.95	7.71
Volume flow rate (reference) (Nm ³ .s ⁻¹)		2.38	2.56	3.32

Table 8: Flue gas pollutant concentrations (provided at reference conditions)

Pollutant	Proposed Boiler No 1,2	Proposed 3.3 MW CHP	Proposed 4.5MW CHP
NO _x as NO ₂ (100%) (mg.Nm ⁻³)	100	250	250
PM ₁₀ (mg.Nm ⁻³)	-	10	10
PM _{2.5} (mg.Nm ⁻³)	-	2.5	2.5

Table 9: Pollutant emission rates (g.sec⁻¹)

Pollutant	Proposed Boiler No 1,2	Proposed 3.3 MW CHP	Proposed 4.5MW CHP
NO _x (g.sec ⁻¹)	0.2375	0.6406	0.8297
PM ₁₀ (g.sec ⁻¹)	-	0.0256	0.0332
PM _{2.5} (g.sec ⁻¹)	-	0.0064	0.0083

4.4 Assessment Scenarios

The proposed energy centre at Octagon House is new i.e. it is not replacing any existing energy plant at the site. The assessment is therefore based on a comparison of the process contribution for the proposed plant vs background concentrations. This requires modelling of one scenario only:

1. Proposed boiler and CHP energy centre scenario – the proposed plant consists of two 8.0MW boilers, one 3.3MW CHP unit and one 4.5MW CHP unit.

⁸ Defra/Environment Agency (2019) Guidance Environmental permitting: Air dispersion modelling reports;

5 Model Results: Human Health Impacts

5.1 Sensitivity analysis of meteorological conditions

The results of dispersion modelling assessments are sensitive to the input parameters used. In particular, models are sensitive to the emission parameters, meteorological conditions, grid resolution, terrain data and building parameters. This assessment included a sensitivity analysis of meteorological conditions measured at Manchester Airport over five consecutive years. The sensitivity analysis was used to determine the meteorological dataset that predicted the worst-case ambient pollutant concentrations and to assess the variability in predicted concentrations attributable to inter-year variability in meteorological data sets.

Results of the met sensitivity analysis are presented in Table 10. The results have been presented in accordance with the guidelines for presenting the variability of dispersion modelling results published by the UK Atmospheric Dispersion Modelling Liaison Committee⁹ as a five year mean value $\pm$ twice the standard deviation. This represents a variability range within which 97.5% of the values are expected to be found over the likely range of meteorological conditions that could occur in any year.

The sensitivity analysis indicates that the model predicts the worst-case pollutant concentrations when using the 2015 meteorological dataset. The 2015 dataset has therefore been used to present the results at specified receptors including background concentrations and for the contour plots showing the spatial variation in predicted pollutant concentrations. The analysis also indicates that the largest range of values predicted, and hence estimated uncertainty attributable to variation in meteorological effects is for the predicted NO₂ hourly mean concentration ($\pm 2.0 \mu\text{g.m}^{-3}$) which is 1.0% of the $200 \mu\text{g.m}^{-3}$ hourly mean objective.

⁹ ADMLC (2004) Guidelines for the Preparation of Dispersion Modelling Assessments for Compliance with Regulatory Requirements – an update to the 1995 Royal Meteorological Society Guidance; UK Atmospheric Dispersion Modelling Liaison Committee. Document ref. ADMLC/2004/3

Table 10: Meteorological sensitivity analysis – Process Contribution (PC) ($\mu\text{g.m}^{-3}$)

Pollutant objective	2015	2016	2017	2018	2019	Min	Max	Mean	Range value	Range %	Uncertainty value (2xSD)
70 % NOx as NO ₂ annual mean ($\mu\text{g.m}^{-3}$)	3.65	2.87	3.24	2.78	2.87	2.8	3.65	3.08	0.88	24%	0.73
35% NOx as NO ₂ 99.79th percentile of 1-hour mean	17.28	18.63	16.59	16.40	16.25	16.3	18.63	17.03	2.38	13%	1.95
PM ₁₀ annual mean ($\mu\text{g m}^{-3}$)	0.16	0.12	0.14	0.12	0.12	0.1	0.16	0.13	0.04	24%	0.03
PM ₁₀ 98th percentile of 24hr mean ($\mu\text{g.m}^{-3}$)	0.49	0.41	0.34	0.31	0.32	0.3	0.49	0.4	0.17	36%	0.15
PM _{2.5} annual mean ($\mu\text{g.m}^{-3}$)	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.01	24%	0.01

5.2 Assessment Scenario 1: Proposed boiler and CHP energy centre

Scenario 1 assesses the impact of the proposed boiler and CHP energy centre.

The process contribution (PC) represents the modelled impact of the proposed new boilers and CHP units. The existing background air quality (i.e. arising from other sources) is added to calculate the total Predicted Environmental Concentrations (PEC).

The maximum predicted PC and PEC for NO₂, PM₁₀ and PM_{2.5} are presented in Table 11, Table 12 and Table 13 respectively.

For the proposed energy centre, none of the predicted annual mean or relevant percentiles of short-term average concentrations at receptors are in excess of each respective NO₂, PM₁₀ or PM_{2.5} objectives.

The process contribution (PC) for PM₁₀ and PM_{2.5} from the new configuration of combustion plant are very small.

Contour plots showing the predicted spatial variation in NO₂ annual mean; and the 99.8th percentile of 1-hour mean NO₂ concentrations are presented in Figure 5 and Figure 6.

We have not presented contour plots for PM₁₀ or PM_{2.5} as the predicted process contribution is so low at all receptors locations. As a result, the PEC when rounded to one decimal place is mainly representative of the background concentration only.

Table 11: Predicted NO₂ concentrations – Proposed energy centre

Receptor Name	Height (m)	NO ₂ Annual mean PC (µg.m ⁻³)	NO ₂ Annual mean PEC (µg.m ⁻³)	NO ₂ 99.8 th %ile of 1-hr mean PC (µg.m ⁻³)	NO ₂ 99.8 th %ile of 1-hr mean PEC (µg.m ⁻³)
5 Victoria Point 1	1.5	2.3	24.6	9.1	53.7
5 Victoria Point 2	22	2.5	24.8	10.2	54.8
5 Victoria Point 3	1.5	2.0	24.3	9.7	54.3
5 Victoria Point 4	18	2.0	24.3	9.7	54.3
4 Victoria Point 1	1.5	2.6	24.9	10.9	55.5
4 Victoria Point 2	14	4.2	26.5	15.3	59.9
Upper W Grove 1	1.5	3.5	25.8	12.5	57.1
Upper W Grove 2	4	3.2	25.5	11.6	56.2
W Grove 1	1.5	2.3	24.6	13.5	58.1
W Grove 2	4	1.9	24.2	15.0	59.6
E Grove	1.5	3.2	25.5	11.6	56.2
St Chrysostom Prim	1.5	1.9	24.2	11.5	56.1
Swinton Park	1.5	0.8	23.1	9.3	53.9
Unite Hall 1	1.5	0.9	23.2	11.9	56.5
Unite Hall 2	8	1.0	23.3	13.2	57.8
Carmoor Rd nursery	1.5	0.8	23.1	9.2	53.8
Manchester Infirmary	1.5	0.4	22.7	7.9	52.5
Welby St	1.5	1.3	23.6	8.5	53.1
Chelford Close	1.5	1.9	24.2	14.5	59.1
Octagon - roof	25.5	0.1	22.4	2.3	46.9
Hathersage Rd	1.5	0.1	22.4	6.4	51.0
Tatton house	26	0.7	23.0	16.8	61.4
W Grove 3	1.5	1.2	23.5	16.3	60.9
4 Victoria Point 3	14	3.7	26.0	14.7	59.3
4 Victoria Point 4	1.5	1.5	23.8	8.0	52.6
East Grove 2	1.5	3.5	25.8	12.5	57.1
East Grove 3	1.5	3.6	25.9	12.5	57.1
South Grove 1	1.5	3.5	25.8	12.3	56.9
W Grove 4	1.5	1.2	23.5	16.4	61.0

Table 12: Predicted PM₁₀ concentrations – Proposed energy centre

Receptor Name	Height (m)	PM ₁₀ Annual mean PC (µg.m ⁻³)	PM ₁₀ Annual mean PEC (µg.m ⁻³)	PM ₁₀ 90.4th %ile of 24-hr means PC (µg.m ⁻³)	PM ₁₀ 90.4th %ile of 24-hr mean PEC (µg.m ⁻³)
5 Victoria Point 1	1.5	0.1	13.0	0.3	26.1
5 Victoria Point 2	22	0.1	13.0	0.3	26.1
5 Victoria Point 3	1.5	0.1	13.0	0.3	26.1
5 Victoria Point 4	18	0.1	13.0	0.3	26.1
4 Victoria Point 1	1.5	0.1	13.0	0.4	26.2
4 Victoria Point 2	14	0.2	13.1	0.6	26.4
Upper W Grove 1	1.5	0.2	13.1	0.5	26.3
Upper W Grove 2	4	0.1	13.0	0.4	26.2
W Grove 1	1.5	0.1	13.0	0.3	26.1
W Grove 2	4	0.1	13.0	0.3	26.1
E Grove	1.5	0.1	13.0	0.4	26.2
St Chrysostom Prim	1.5	0.1	13.0	0.3	26.1
Swinton Park	1.5	0.0	12.9	0.1	25.9
Unite Hall 1	1.5	0.0	12.9	0.1	25.9
Unite Hall 2	8	0.0	12.9	0.1	25.9
Carmoor Rd nursery	1.5	0.0	12.9	0.1	25.9
Manchester Infirmary	1.5	0.0	12.9	0.1	25.9
Welby St	1.5	0.1	13.0	0.2	26.0
Chelford Close	1.5	0.1	13.0	0.3	26.1
Octagon - roof	25.5	0.0	12.9	0.0	25.8
Hathersage Rd	1.5	0.0	12.9	0.0	25.8
Tatton house	26	0.0	12.9	0.1	25.9
W Grove 3	1.5	0.1	13.0	0.1	25.9
4 Victoria Point 3	14	0.2	13.1	0.5	26.3
4 Victoria Point 4	1.5	0.1	13.0	0.2	26.0
East Grove 2	1.5	0.1	13.0	0.5	26.3
East Grove 3	1.5	0.2	13.1	0.5	26.3
South Grove 1	1.5	0.2	13.1	0.5	26.3
W Grove 4	1.5	0.1	13.0	0.2	26.0

Table 13: Predicted PM_{2.5} concentrations - Proposed energy centre

Receptor Name	Height (m)	PM _{2.5} Annual mean PC $\mu\text{g.m}^{-3}$	PM _{2.5} Annual mean PEC $\mu\text{g.m}^{-3}$
5 Victoria Point 1	1.5	0.03	8.7
5 Victoria Point 2	22	0.03	8.7
5 Victoria Point 3	1.5	0.02	8.7
5 Victoria Point 4	18	0.02	8.7
4 Victoria Point 1	1.5	0.03	8.7
4 Victoria Point 2	14	0.05	8.7
Upper W Grove 1	1.5	0.04	8.7
Upper W Grove 2	4	0.03	8.7
W Grove 1	1.5	0.02	8.7
W Grove 2	4	0.02	8.7
E Grove	1.5	0.03	8.7
St Chrysostom Prim	1.5	0.02	8.7
Swinton Park	1.5	0.01	8.7
Unite Hall 1	1.5	0.01	8.7
Unite Hall 2	8	0.01	8.7
Carmoor Rd nursery	1.5	0.01	8.7
Manchester Infirmary	1.5	0.00	8.7
Welby St	1.5	0.01	8.7
Chelford Close	1.5	0.02	8.7
Octagon - roof	25.5	0.00	8.7
Hathersage Rd	1.5	0.00	8.7
Tatton house	26	0.01	8.7
W Grove 3	1.5	0.01	8.7
4 Victoria Point 3	14	0.04	8.7
4 Victoria Point 4	1.5	0.02	8.7
East Grove 2	1.5	0.04	8.7
East Grove 3	1.5	0.04	8.7
South Grove 1	1.5	0.04	8.7
W Grove 4	1.5	0.01	8.7

Figure 5: Predicted spatial variation in NO₂ Annual Mean Concentrations (PEC) - Proposed energy centre

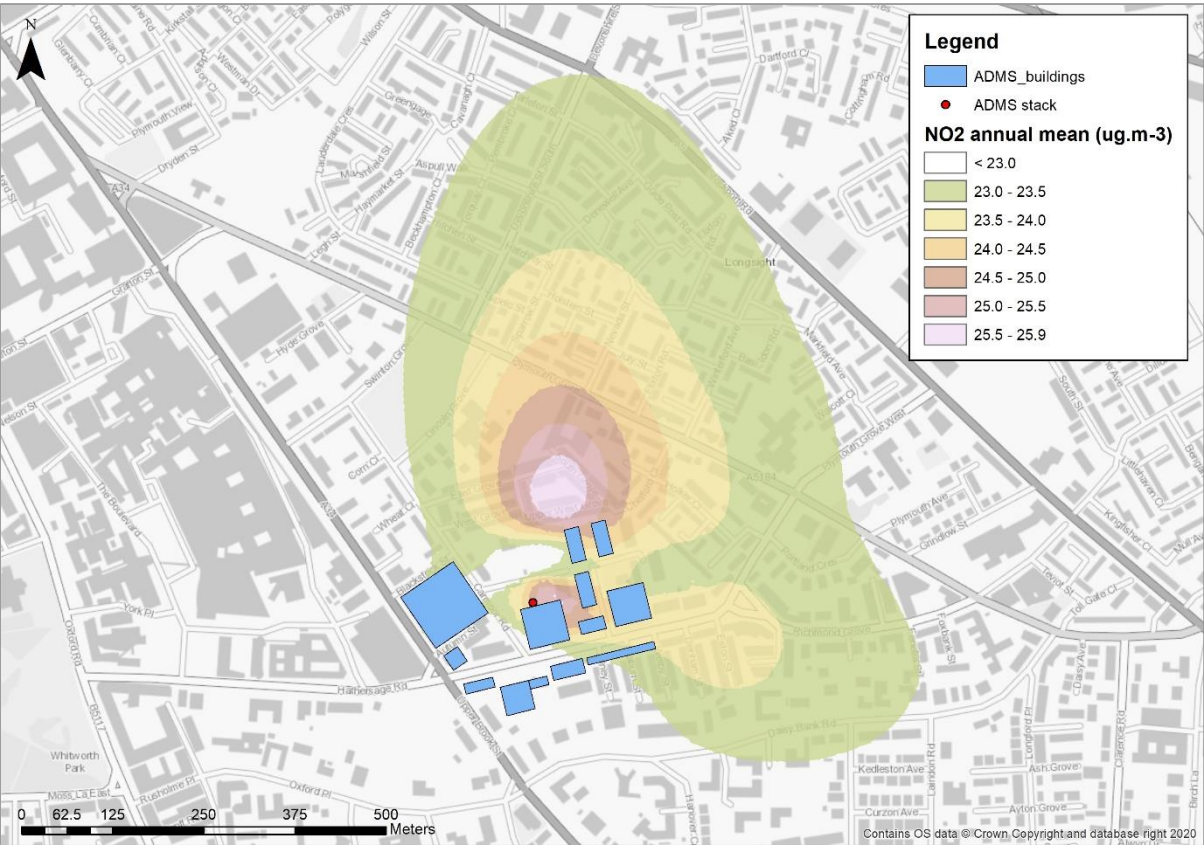
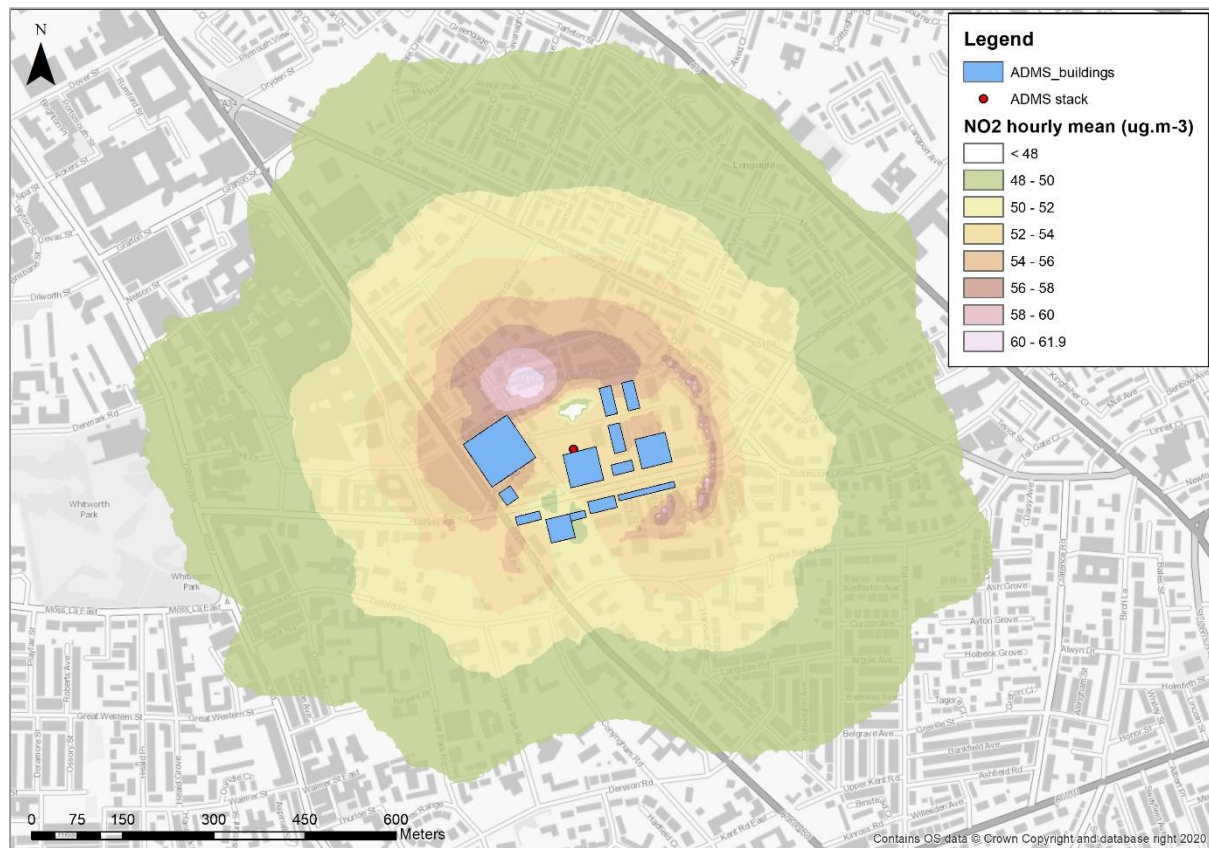


Figure 6: Modelled spatial variation in the 99.79th %ile of 1-hour mean NO₂ concentrations (PEC) - Proposed energy centre



5.3 IAQM/EPUK Impact Assessment

5.3.1 Impact on Annual Mean NO₂, PM₁₀ and PM_{2.5} Concentrations

The magnitude of change in pollutant concentrations predicted by this assessment have been described using impact descriptors as defined in the latest (Jan 2017) update to the EPUK and IAQM Development Control guidance¹⁰. This guidance provides a standard method for describing air quality impacts, ranging from 'negligible' to 'substantial'; and is widely used and accepted as best practice throughout the UK.

In summary, the approach involves quantifying the magnitude of change in annual mean NO₂, PM₁₀ and PM_{2.5} concentrations attributable to the proposed boiler and CHP upgrade; then expressing the magnitude of incremental change as a proportion of each respective air quality standard; then finally examining this change in the context of the new total concentration relative to the UK air quality objectives. An impact descriptor can then be assigned.

An extract from the IAQM/EPUK guidance explaining the method for deriving impact descriptor is presented in Appendix 1. These impact descriptors are usually applicable to adverse impacts, but can also be used to describe beneficial impacts.

A comparison of predicted annual mean NO₂, PM₁₀ and PM_{2.5} concentrations, and the associated impact descriptors for the 'Proposed energy centre scenario' vs baseline background concentrations are presented in Table 14, Table 15 and Table 16 respectively.

In summary, comparison of the proposed energy centre scenario to the baseline indicates that NO₂, PM₁₀ and PM_{2.5} annual mean concentrations are predicted to increase by a negligible amount at some receptor locations, and NO₂ annual mean concentrations are predicted to increase by a slight amount at other receptor locations. The predicted impacts are therefore described as '**negligible**' or '**slight**' for the NO₂, PM₁₀ and PM_{2.5} annual mean. Annual mean concentrations are also significantly less than each of the respective objectives for each pollutant.

The NO₂ annual mean concentrations at receptor locations with impacts described as '**slight**' are 61-66% of the AQAL of 40 µg.m⁻³, which is considerably less than the annual mean objective. The impacts at these locations are not expected to be significant.

¹⁰ EPUK & IAQM (2017) Land-Use Planning & Development Control: Planning for Air Quality; Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes; January 2017

Table 14: NO₂ annual mean IAQM/EPUK Impact descriptors - Proposed energy centre

Receptor	Height (m)	NO ₂ annual mean baseline (µg.m ⁻³)	NO ₂ annual mean with proposed energy centre (µg.m ⁻³)	Magnitude of Change (µg.m ⁻³)	% of AQAL (40 µg.m ⁻³)	% change relative to AQAL (µg.m ⁻³)	Impact Descriptor
5 Victoria Point 1	1.5	22.3	24.6	2.3	62%	6%	Slight
5 Victoria Point 2	22	22.3	24.8	2.5	62%	6%	Slight
5 Victoria Point 3	1.5	22.3	24.3	2.0	61%	5%	Negligible
5 Victoria Point 4	18	22.3	24.3	2.0	61%	5%	Negligible
4 Victoria Point 1	1.5	22.3	24.9	2.6	62%	6%	Slight
4 Victoria Point 2	14	22.3	26.5	4.2	66%	10%	Slight
Upper W Grove 1	1.5	22.3	25.8	3.5	65%	9%	Slight
Upper W Grove 2	4	22.3	25.5	3.2	64%	8%	Slight
W Grove 1	1.5	22.3	24.6	2.3	61%	6%	Slight
W Grove 2	4	22.3	24.2	1.9	61%	5%	Negligible
E Grove	1.5	22.3	25.5	3.2	64%	8%	Slight
St Chrysostom Prim	1.5	22.3	24.2	1.9	61%	5%	Negligible
Swinton Park	1.5	22.3	23.1	0.8	58%	2%	Negligible
Unite Hall 1	1.5	22.3	23.2	0.9	58%	2%	Negligible
Unite Hall 2	8	22.3	23.3	1.0	58%	2%	Negligible
Carmoor Rd nursery	1.5	22.3	23.1	0.8	58%	2%	Negligible
Manchester Infirmary	1.5	22.3	22.7	0.4	57%	1%	Negligible
Welby St	1.5	22.3	23.6	1.3	59%	3%	Negligible
Chelford Close	1.5	22.3	24.2	1.9	60%	5%	Negligible
Octagon - roof	25.5	22.3	22.4	0.1	56%	0%	Negligible

Receptor	Height (m)	NO ₂ annual mean baseline (µg.m ⁻³)	NO ₂ annual mean with proposed energy centre (µg.m ⁻³)	Magnitude of Change (µg.m ⁻³)	% of AQAL (40 µg.m ⁻³)	% change relative to AQAL (µg.m ⁻³)	Impact Descriptor
Hathersage Rd	1.5	22.3	22.4	0.1	56%	0%	Negligible
Tatton house	26	22.3	23.0	0.7	58%	2%	Negligible
W Grove 3	1.5	22.3	23.5	1.2	59%	3%	Negligible
4 Victoria Point 3	14	22.3	26.0	3.7	65%	9%	Slight
4 Victoria Point 4	1.5	22.3	23.8	1.5	59%	4%	Negligible
East Grove 2	1.5	22.3	25.8	3.5	64%	9%	Slight
East Grove 3	1.5	22.3	25.9	3.6	65%	9%	Slight
South Grove 1	1.5	22.3	25.8	3.5	64%	9%	Slight
W Grove 4	1.5	22.3	23.5	1.2	59%	3%	Negligible

Table 15: PM₁₀ annual mean IAQM/EPUK Impact descriptors - Proposed energy centre

Receptor	Height (m)	PM ₁₀ annual mean baseline (µg.m ⁻³)	PM ₁₀ annual mean with proposed energy centre (µg.m ⁻³)	Magnitude of Change (µg.m ⁻³)	% of AQAL (40 µg.m ⁻³)	% change relative to AQAL (µg.m ⁻³)	Impact Descriptor
5 Victoria Point 1	1.5	12.9	13.0	0.1	33%	0%	Negligible
5 Victoria Point 2	22	12.9	13.0	0.1	33%	0%	Negligible
5 Victoria Point 3	1.5	12.9	13.0	0.1	32%	0%	Negligible
5 Victoria Point 4	18	12.9	13.0	0.1	32%	0%	Negligible
4 Victoria Point 1	1.5	12.9	13.0	0.1	33%	0%	Negligible
4 Victoria Point 2	14	12.9	13.1	0.2	33%	0%	Negligible
Upper W Grove 1	1.5	12.9	13.1	0.2	33%	0%	Negligible
Upper W Grove 2	4	12.9	13.0	0.1	33%	0%	Negligible
W Grove 1	1.5	12.9	13.0	0.1	32%	0%	Negligible
W Grove 2	4	12.9	13.0	0.1	32%	0%	Negligible
E Grove	1.5	12.9	13.0	0.1	33%	0%	Negligible
St Chrysostom Prim	1.5	12.9	13.0	0.1	32%	0%	Negligible
Swinton Park	1.5	12.9	12.9	0.0	32%	0%	Negligible
Unite Hall 1	1.5	12.9	12.9	0.0	32%	0%	Negligible
Unite Hall 2	8	12.9	12.9	0.0	32%	0%	Negligible
Carmoor Rd nursery	1.5	12.9	12.9	0.0	32%	0%	Negligible
Manchester Infirmary	1.5	12.9	12.9	0.0	32%	0%	Negligible
Welby St	1.5	12.9	13.0	0.1	32%	0%	Negligible
Chelford Close	1.5	12.9	13.0	0.1	32%	0%	Negligible
Octagon - roof	25.5	12.9	12.9	0.0	32%	0%	Negligible

Receptor	Height (m)	PM ₁₀ annual mean baseline (µg.m ⁻³)	PM ₁₀ annual mean with proposed energy centre (µg.m ⁻³)	Magnitude of Change (µg.m ⁻³)	% of AQAL (40 µg.m ⁻³)	% change relative to AQAL (µg.m ⁻³)	Impact Descriptor
Hathersage Rd	1.5	12.9	12.9	0.0	32%	0%	Negligible
Tatton house	26	12.9	12.9	0.0	32%	0%	Negligible
W Grove 3	1.5	12.9	13.0	0.1	32%	0%	Negligible
4 Victoria Point 3	14	12.9	13.1	0.2	33%	0%	Negligible
4 Victoria Point 4	1.5	12.9	13.0	0.1	32%	0%	Negligible
East Grove 2	1.5	12.9	13.0	0.1	33%	0%	Negligible
East Grove 3	1.5	12.9	13.1	0.2	33%	0%	Negligible
South Grove 1	1.5	12.9	13.1	0.2	33%	0%	Negligible
W Grove 4	1.5	12.9	13.0	0.1	32%	0%	Negligible

Table 16: PM_{2.5} annual mean IAQM/EPUK Impact descriptors - Proposed energy centre

Receptor	Height (m)	PM _{2.5} annual mean baseline (µg.m ⁻³)	PM _{2.5} annual mean with proposed energy centre (µg.m ⁻³)	Magnitude of Change (µg.m ⁻³)	% of AQAL (40 µg.m ⁻³)	% change relative to AQAL (µg.m ⁻³)	Impact Descriptor
5 Victoria Point 1	1.5	8.70	8.73	0.0	35%	0%	Negligible
5 Victoria Point 2	22	8.70	8.73	0.0	35%	0%	Negligible
5 Victoria Point 3	1.5	8.70	8.72	0.0	35%	0%	Negligible
5 Victoria Point 4	18	8.70	8.72	0.0	35%	0%	Negligible
4 Victoria Point 1	1.5	8.70	8.73	0.0	35%	0%	Negligible
4 Victoria Point 2	14	8.70	8.75	0.0	35%	0%	Negligible
Upper W Grove 1	1.5	8.70	8.74	0.0	35%	0%	Negligible
Upper W Grove 2	4	8.70	8.73	0.0	35%	0%	Negligible
W Grove 1	1.5	8.70	8.72	0.0	35%	0%	Negligible
W Grove 2	4	8.70	8.72	0.0	35%	0%	Negligible
E Grove	1.5	8.70	8.73	0.0	35%	0%	Negligible
St Chrysostom Prim	1.5	8.70	8.72	0.0	35%	0%	Negligible
Swinton Park	1.5	8.70	8.71	0.0	35%	0%	Negligible
Unite Hall 1	1.5	8.70	8.71	0.0	35%	0%	Negligible
Unite Hall 2	8	8.70	8.71	0.0	35%	0%	Negligible
Carmoor Rd nursery	1.5	8.70	8.71	0.0	35%	0%	Negligible
Manchester Infirmary	1.5	8.70	8.70	0.0	35%	0%	Negligible
Welby St	1.5	8.70	8.71	0.0	35%	0%	Negligible
Chelford Close	1.5	8.70	8.72	0.0	35%	0%	Negligible
Octagon - roof	25.5	8.70	8.70	0.0	35%	0%	Negligible

Receptor	Height (m)	PM _{2.5} annual mean baseline (µg.m ⁻³)	PM _{2.5} annual mean with proposed energy centre (µg.m ⁻³)	Magnitude of Change (µg.m ⁻³)	% of AQAL (40 µg.m ⁻³)	% change relative to AQAL (µg.m ⁻³)	Impact Descriptor
Hathersage Rd	1.5	8.70	8.70	0.0	35%	0%	Negligible
Tatton house	26	8.70	8.71	0.0	35%	0%	Negligible
W Grove 3	1.5	8.70	8.71	0.0	35%	0%	Negligible
4 Victoria Point 3	14	8.70	8.74	0.0	35%	0%	Negligible
4 Victoria Point 4	1.5	8.70	8.72	0.0	35%	0%	Negligible
East Grove 2	1.5	8.70	8.74	0.0	35%	0%	Negligible
East Grove 3	1.5	8.70	8.74	0.0	35%	0%	Negligible
South Grove 1	1.5	8.70	8.74	0.0	35%	0%	Negligible
W Grove 4	1.5	8.70	8.71	0.0	35%	0%	Negligible

5.3.2 Impact on relevant short term mean NO₂ and PM₁₀ concentrations

The IAQM/EPUK guidance also provides a method of describing impacts when assessing short-term average concentration. In this case, the maximum predicted 1-hour mean NO₂ and 24-hour mean PM₁₀ have been considered. Where peak short-term process contributions (PC) are in the range of 11–20% of the relevant AQAL, the severity of the impact can be described as ‘Slight’; those in the range of 21–50% can be described as ‘moderate’; and those above 51% as ‘substantial’. For a process contribution or less than 10% of the associated AQAL, the severity of the impact can be defined as ‘Negligible’.

Impact descriptors relevant to the NO₂ 1-hour mean objective are presented in Table 17, and impact descriptors relevant to the PM₁₀ 24-hour mean objective are presented in Table 18.

For the proposed energy centre scenario, the process contributions to the 1-hour maximum NO₂ concentration are less than 10% of the 200 µg.m⁻³ 1-hour mean objective at all but two receptors. All process contributions to the 24-hour maximum PM₁₀ concentration are less than 10% of the 50 µg.m⁻³ 1-hour mean objective. On this basis the impact of the proposed energy centre on peak short-term concentrations can be considered as **‘negligible’**.

The PC at two receptors are 11-12% of the 1-hour mean NO₂ objective which leads to short-term impacts described as **‘Slight’**. The maximum i.e. 100th percentile of predicted 1-hour mean PEC (67.9 µg.m⁻³) at the receptor location with the highest PC (Chelford Close) is 34% of the AQAL and is significantly less than the 200 µg.m⁻³ objective. There is therefore very little risk that the 1-hour mean objective will be exceeded.

Table 17: NO₂ 1-hour mean IAQM/EPUK Impact descriptors - Proposed energy centre

Receptor	Height (m)	NO ₂ max predicted 1-hour energy centre PC (µg.m ⁻³)	% of AQAL (200 µg.m ⁻³)	Impact Descriptor
5 Victoria Point 1	1.5	9.5	5%	Negligible
5 Victoria Point 2	22	12.4	6%	Negligible
5 Victoria Point 3	1.5	11.6	6%	Negligible
5 Victoria Point 4	18	11.6	6%	Negligible
4 Victoria Point 1	1.5	11.9	6%	Negligible
4 Victoria Point 2	14	16.6	8%	Negligible
Upper W Grove 1	1.5	13.1	7%	Negligible
Upper W Grove 2	4	12.5	6%	Negligible
W Grove 1	1.5	14.5	7%	Negligible
W Grove 2	4	16.1	8%	Negligible
E Grove	1.5	11.9	6%	Negligible
St Chrysostom Prim	1.5	11.9	6%	Negligible
Swinton Park	1.5	10.0	5%	Negligible
Unite Hall 1	1.5	14.5	7%	Negligible
Unite Hall 2	8	15.9	8%	Negligible
Carmoor Rd nursery	1.5	12.3	6%	Negligible
Manchester Infirmary	1.5	8.5	4%	Negligible
Welby St	1.5	9.3	5%	Negligible
Chelford Close	1.5	23.3	12%	Slight
Octagon - roof	25.5	9.1	5%	Negligible
Hathersage Rd	1.5	8.4	4%	Negligible
Tatton house	26	21.3	11%	Slight
W Grove 3	1.5	17.2	9%	Negligible
4 Victoria Point 3	14	15.9	8%	Negligible
4 Victoria Point 4	1.5	9.3	5%	Negligible
East Grove 2	1.5	13.0	7%	Negligible
East Grove 3	1.5	13.1	7%	Negligible
South Grove 1	1.5	12.6	6%	Negligible
W Grove 4	1.5	17.6	9%	Negligible

Table 18: PM₁₀ 24-hour mean IAQM/EPUK Impact descriptors - Proposed energy centre

Receptor	Height (m)	PM ₁₀ max predicted 24-hour energy centre PC (µg.m ⁻³)	% of AQAL (50 µg.m ⁻³)	Impact Descriptor
5 Victoria Point 1	1.5	0.4	1%	Negligible
5 Victoria Point 2	22	0.5	1%	Negligible
5 Victoria Point 3	1.5	0.5	1%	Negligible
5 Victoria Point 4	18	0.5	1%	Negligible
4 Victoria Point 1	1.5	0.7	1%	Negligible
4 Victoria Point 2	14	1.1	2%	Negligible
Upper W Grove 1	1.5	0.9	2%	Negligible
Upper W Grove 2	4	0.8	2%	Negligible
W Grove 1	1.5	0.9	2%	Negligible
W Grove 2	4	0.9	2%	Negligible
E Grove	1.5	0.8	2%	Negligible
St Chrysostom Prim	1.5	0.6	1%	Negligible
Swinton Park	1.5	0.5	1%	Negligible
Unite Hall 1	1.5	0.6	1%	Negligible
Unite Hall 2	8	0.6	1%	Negligible
Carmoor Rd nursery	1.5	0.3	1%	Negligible
Manchester Infirmary	1.5	0.4	1%	Negligible
Welby St	1.5	0.4	1%	Negligible
Chelford Close	1.5	0.7	1%	Negligible
Octagon - roof	25.5	0.2	0%	Negligible
Hathersage Rd	1.5	0.2	0%	Negligible
Tatton house	26	0.9	2%	Negligible
W Grove 3	1.5	1.2	2%	Negligible
4 Victoria Point 3	14	1.0	2%	Negligible
4 Victoria Point 4	1.5	0.5	1%	Negligible
East Grove 2	1.5	0.9	2%	Negligible
East Grove 3	1.5	0.8	2%	Negligible
South Grove 1	1.5	0.8	2%	Negligible
W Grove 4	1.5	1.1	2%	Negligible

5.3.3 Significance of impacts

The IAQM/EPUK guidance provides advice on assessing the significance of air quality impacts after the severity of the impacts have been calculated and described. The air quality impacts of the proposed boiler and CHP upgrade should be assigned as either significant or insignificant.

The rationale for assigning significance is presented in Table 19. In summary, as the predicted impact descriptors are classified as '**Negligible**' or '**Slight**' at all receptors when assessing annual mean concentrations as well as short-term averaging periods, the impact of the proposed development is considered to be '**not significant**'.

Table 19: IAQM/EPUK Impact Descriptors and Outcome Associated with the Proposed energy centre

Factor	Outcome Based on Air Quality Assessment
The magnitude of the changes and the descriptions of the impacts at the receptors.	The magnitude of change in annual mean NO ₂ , PM ₁₀ and PM _{2.5} concentrations when compared with the baseline background concentrations is described as a negligible or slight impact at all receptor locations.
Whether or not an exceedance of an objective or limit value is predicted to arise in the study area where none existed before or an exceedance area is substantially increased.	No exceedances of the annual mean or short-term air quality objectives for NO ₂ , PM ₁₀ or PM _{2.5} are predicted.
The extent to which an objective or limit value is exceeded.	N/A as no exceedances of the air quality objectives are predicted
A judgement on the overall significance of the air quality impacts associated with the proposed development.	Not significant

6 Conclusions

This report describes an air quality impact assessment for a proposed energy centre at Octagon House in Manchester. The assessment has been conducted using atmospheric dispersion modelling and aims to provide information to support both the planning application and environmental permitting application.

The main aims of the assessment were to:

- Assess the future air quality impacts associated with a new energy centre at Octagon House.
- Assess impacts on human health at nearby receptor locations.

The assessment has considered the atmospheric pollutants nitrogen dioxide (NO₂), oxides of nitrogen (NO_x); and Particulate Matter (in the PM₁₀ and PM_{2.5} fractions) from the proposed energy centre.

One emission scenario has been assessed and compared to baseline background conditions.

1. Proposed energy centre scenario - the proposed energy centre consists of two boilers and two CHP units

When assessing air quality impacts on human health the dispersion modelling results indicate:

- For the 'Proposed energy centre scenario', the predicted annual mean or relevant percentiles of short-term average concentrations at receptors are significantly less than each of the respective NO₂, PM₁₀ or PM_{2.5} air quality objectives.
- The process contribution towards ambient PM₁₀ and PM_{2.5} concentrations from the new configuration of combustion plant is very small.
- Comparison of the dispersion modelling results for the 'Proposed energy centre scenario' vs the baseline background concentrations indicates that NO₂, PM₁₀ and PM_{2.5} annual mean concentrations are predicted to increase by a negligible or slight amount at receptor locations. The predicted impacts using the IAQM/EPUK method of assessment are therefore described as '**negligible**' or '**slight**' for the NO₂ annual mean, and '**negligible**' for the PM₁₀ and PM_{2.5} annual mean. Annual mean concentrations are also significantly less than each of the respective objectives for each pollutant.
- For the 'Proposed energy centre' all but two process contributions to the maximum (100th percentile) 1-hour mean NO₂ concentration are less than 10% of the 200 µg.m⁻³ 1-hour mean objective i.e. '**negligible**' impact; the remaining two process contributions were described as '**slight**' impacts. All process contributions to the 24-hour maximum PM₁₀ concentration are less than 10% of the 50 µg.m⁻³ 1-hour mean objective, or '**negligible**' impact.

The impact of the proposed energy centre at Octagon House is deemed to be not significant to nearby human receptors.

Appendices

Appendix 1: IAQM/EPUK Air Quality Significance Method

Appendix 2: Meteorological Data

Appendix 3: Site Plan Extract

Appendix 1 - IAQM/EPUK Air Quality Impact Descriptors

The following method for determining the significance of air quality impacts in the area surrounding the proposed development at is outlined in the 2017 IAQM/EPUK Land-Use Planning & Development Control: Planning for Air Quality¹¹. This method is used throughout the UK and compares the impact with the change in annual mean concentration in the context of the objective being considered.

Please note that these descriptors are intended for use when comparing to the annual mean objectives only. Figure A1.1 below details the method used and is taken directly from the IAQM/EPUK Guidance.

Figure A1. 1: 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% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% 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

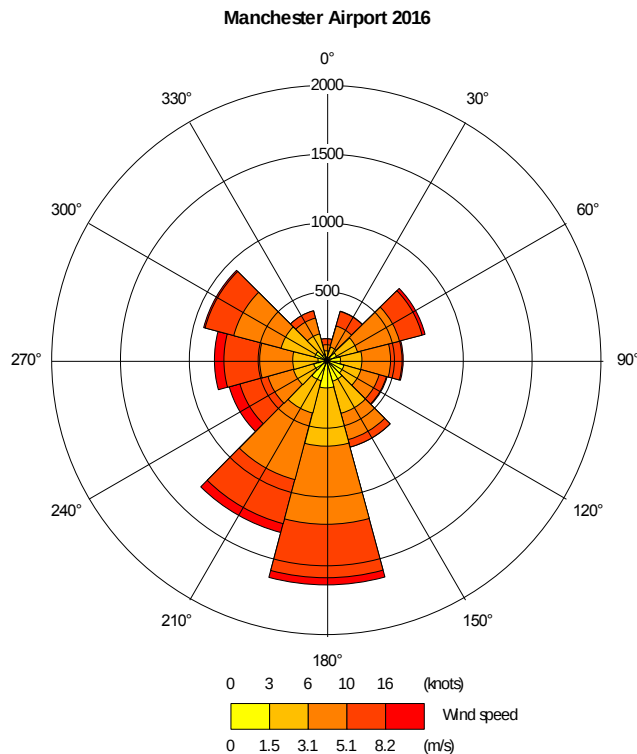
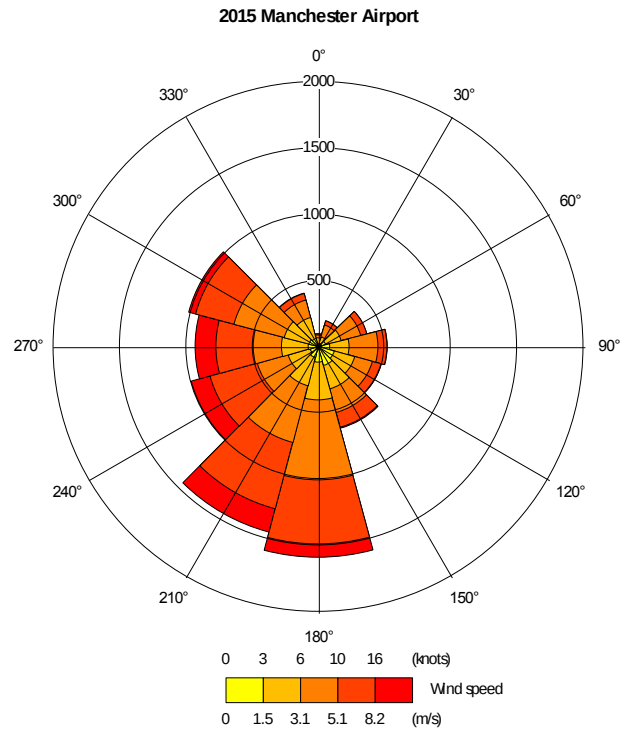
Explanation

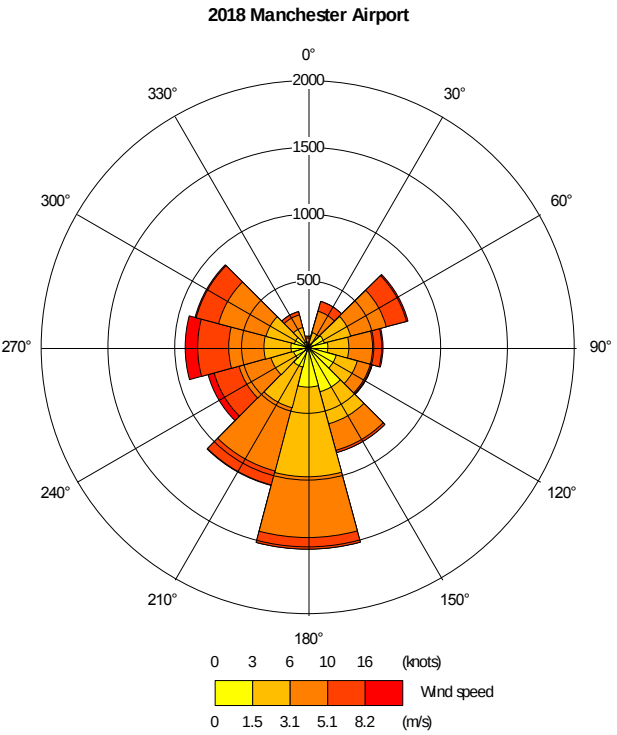
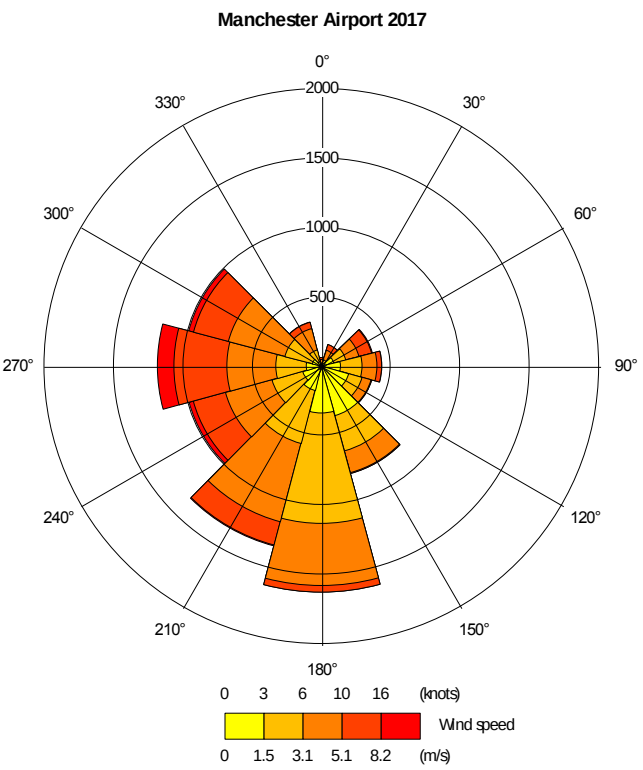
1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The Table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5%, will be described as Negligible.
3. The Table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement (see Chapter 7). For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

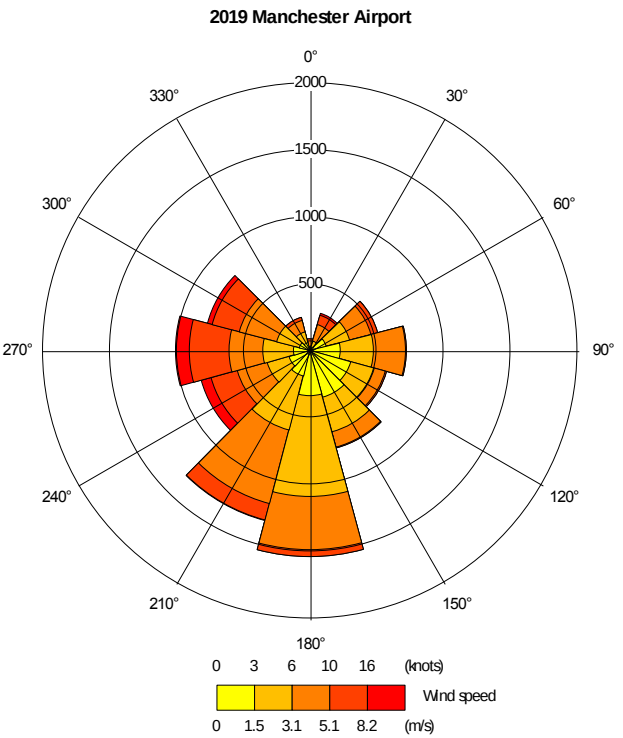
¹¹ Available to download at: <https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

Appendix 2: Meteorological Data

Wind roses







Appendix 3: Site Plan Extract





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