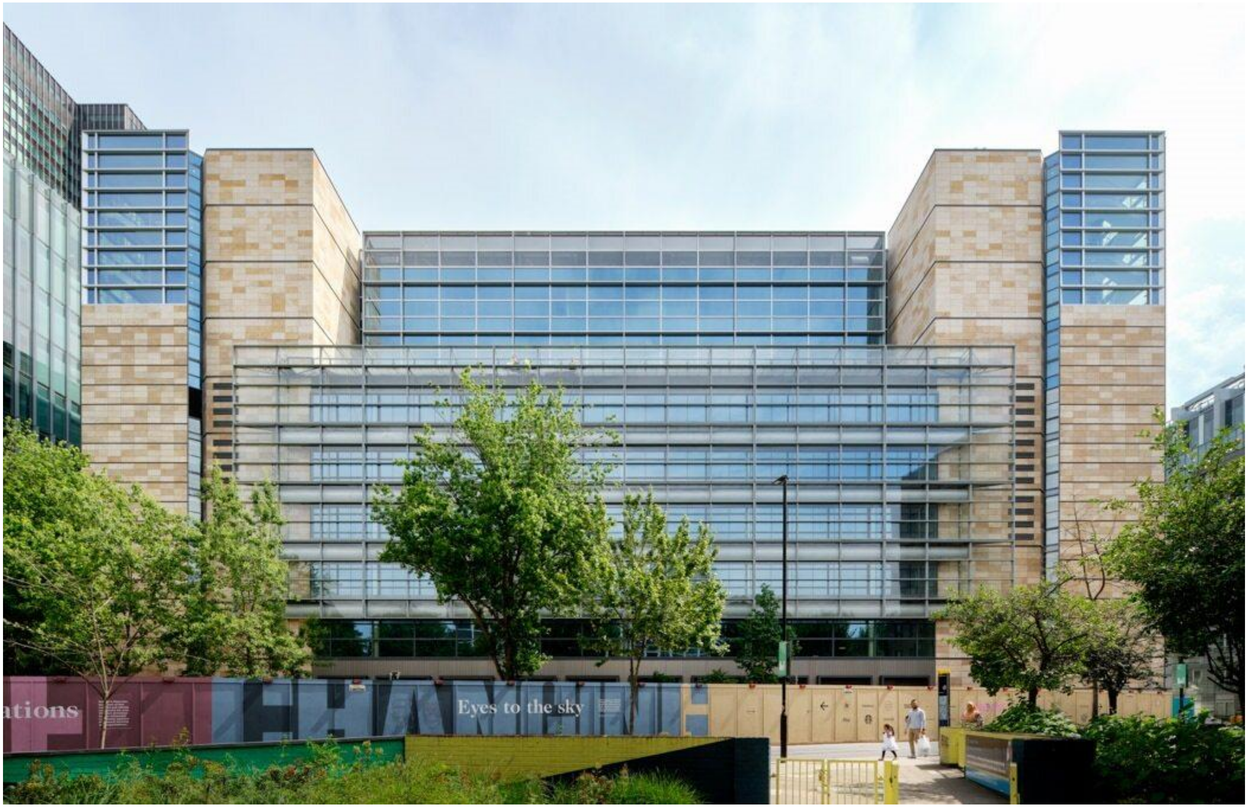
1 Triton Square Life Science

Laboratory Feasibility Emissions Study

Reference: 297393

Final | 18 January 2024



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1. Introduction

Ove Arup and Partners Ltd (Arup) has been commissioned to prepare a laboratory feasibility emissions study for 1 Triton Square. The development proposal is for a repositioning within the existing envelope of 1 Triton Square to create an eco-system for different sized life science businesses with the potential for a third-party operator to manage the space. The location of Triton Square is shown in Figure 1.

In order to support the life science businesses, a fume extract system will be required. This study addresses the new flue discharges from two strobic fans at roof level for the Proposed Development, not covered by the original conditions or previous air quality assessments.

This assessment outlines the relevant air quality standards and policies (Sections 2 and 3), outlines the methodology in detail (Section 4), describes the existing air quality conditions in the vicinity of the Proposed Development (Section 5) and then determines the emission rates to minimise the short-term and long-term effect of emissions from the Proposed Development (Section 6).

1.1 Site information

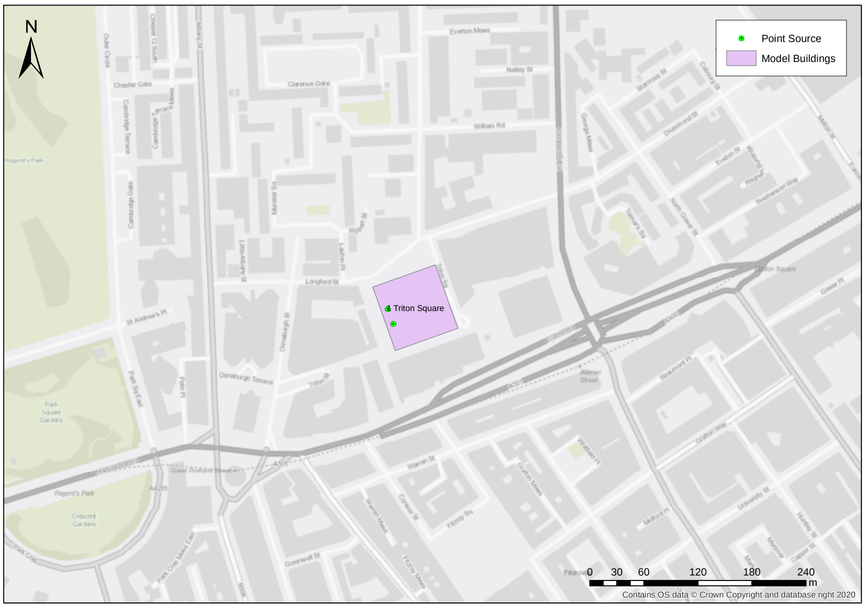
The laboratory emissions will be discharged into the atmosphere via two strobic fans at the roof level. Details of the strobic fans were obtained from the design team.

The exact details of the laboratory operations are not yet known during the preparation of this report, which is based on currently available information provided by the project team.

1.2 Scope of assessment

The assessment has considered laboratory emissions from two strobic fans associated with the life science laboratories. At the time of preparing this report, the exact pollutants from the laboratories are unknown, therefore, the assessment has considered two commonly used solvents in laboratories: benzene and formaldehyde. These solvents can become airborne and directly lead to, or contribute to, adverse impacts on heath and the environment, by reacting with other air pollutants outdoors in the presence of sunlight to produce tropospheric ozone. The assessment has considered both solvents when determining the maximum allowable emission of substances to the air from the strobic fans in connection with the proposed laboratory use. If other pollutants with more stringent standards are emitted, these will need to be considered to identify the allowable emission rate. Appendix B considers environmental standards for additional pollutants defined by the Environment Agency, including those with more stringent standards.

Figure 1: Site Location



2. Air quality standards

The Environment Bill became an Act [1] (law) in November 2021. The Environment Act 2021 amends the Environment Act 1995 [2]. It also amends the Clean Air Act 1993 [3] to give local authorities more power at reducing local pollution, particularly that from domestic burning. It also amends the Environmental Protection Act 1990 [4] to reduce smoke from residential chimneys by extending the system of statutory nuisance to private dwellings. The following sections of the Environment Act 1995 [5] have been transposed into the Environment Act 2021.

- For the Secretary of State to develop, implement and maintain an Air Quality Strategy. This includes the statutory duty, also under Part IV [6] of the Environment Act 1995, for local authorities to undergo a process of local air quality management and declare an Air Quality Management Area (AQMA) where pollutant concentrations exceed the national air quality objectives. Where an AQMA is declared, the local authority needs to produce an Air Quality Action Plan (AQAP), which outlines the strategy for improving air quality in these areas.
- The Act will implement key parts of the government's Clean Air Strategy and include targets for tackling air pollution in the UK.
- The requirements relevant to air quality are:
  - for the Secretary of State for Defra to set long-term legally binding targets on air quality; these targets must be of at least 15 years in duration, and be proposed by late 2022;
  - for the Secretary of State to publish a report reviewing the Air Quality Strategy every five years;
  - for the government to set two targets by October 2022: the first on the amount of $PM_{2.5}$ pollutant in the ambient air (the figure and deadline for compliance remain unspecified) and a second long-term target set at least 15 years ahead to encourage stakeholder investment;
  - for the Office for Environmental Protection to be established to substitute the watchdog function previously exercised by the European Commission;
  - for local authorities' powers to be extended under the current Local Air Quality Management framework, including responsibilities to improve local air quality and to reduce public exposure to excessive levels of air pollution;
  - for "air quality partners" to have a duty to share responsibility for dealing with local air pollution among public bodies; and
  - the introduction of a new power for the government to compel vehicle manufacturers to recall vehicles and non-road mobile machinery if they are found not to comply with the environmental standards that they are legally required to meet.

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[1] Environment Act 2021. [Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted.]

[2] Environment Act 1995, Chapter 25, Part IV Air Quality

[3] Clean Air Act 1993. [Available at: https://www.legislation.gov.uk/ukpga/1993/11/contents].

[4] Environmental Protection Act 1990. [Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents]

[5] Environment Act 2021. Part 4 Air Quality and Environmental Recall.

[6] Environment Act 2021. Chapter 2. The Office for Environmental Protection.

2.1 UK Environmental Assessment Levels

Environmental Assessment Levels (EALs) are defined by the Environment Agency[7] for a greater range of pollutants than covered by the Air Quality Standards Regulations 2010[8], in terms of annual average (long-term) levels and short-term average levels. If EALs are exceeded by emissions from a process, the operator may need to take further action in order to obtain a permit. The long and short-term EAL for formaldehyde and benzene is presented in Table 1.

Formaldehyde and benzene have been chosen as representative pollutants in this study. If other pollutants with more stringent EALs are emitted, these will need to be considered to identify the allowable emission rate. Appendix B considers environmental standards for additional pollutants defined by the Environment Agency, including those with more stringent EALs.

Table 1: Environmental assessment level (EAL) for formaldehyde and benzene

Pollutant	Averaging period	EAL ($\mu g/m^3$)
Formaldehyde	Annual mean	5
	30 minute mean	100
Benzene	Annual mean	5*
	Daily	30
Note: *Benzene annual mean EAL is based on a limit value[9]		

2.2 Assessment criteria used in this study

Predicted formaldehyde and benzene process contributions will be compared with 10% of the relevant EALs, as presented in Table 2. The 10% has been selected to provide a robust limit which avoids risks of exceeding relevant EALs. The aim will be for all stacks to have cumulative impact on concentrations of less than 10% of the EAL.

Table 2: Assessment criteria for formaldehyde and benzene process contributions in this study

Averaging period	10% of EAL ($\mu g/m^3$)
Annual mean	0.5
Daily mean	3.0
30 minute mean	10.0

[7] Environment Agency (2016) Air emission risk assessment for your environmental permit [Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions]

[8] Air Quality Standards Regulations 2010. [Available at: https://www.legislation.gov.uk/uksi/2010/1001/contents/made]

[9] Environment Agency (2016) Air emission risk assessment for your environmental permit [Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions]

3. Planning policy and guidance

3.1 National policy

3.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[10] was updated in December 2023 with the purpose of planning to achieve sustainable development. Paragraph 192 of the NPPF on air quality states that:

> *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

In addition, paragraph 105 states that:

> *"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making."*

Paragraph 180 discusses how planning policies and decisions should contribute to and enhance the natural and local environment. In relation to air quality, NPPF notes that this can be achieved by:

> *"e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."*

3.2 Planning Practice Guidance

National Planning Practice guidance (PPG) [11] on various topics, including air quality was developed in order to support the NPPF. The guidance provides a concise outline as to how air quality should be considered in order to comply with the NPPF and states when air quality is considered relevant to a planning application. This includes factors such as the introduction of new point sources of air pollution, exposure of people to existing sources of air pollutants, and the potential to give rise to air quality impacts at nearby sensitive receptors.

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[10] Department for Levelling Up, Housing and Communities (2023) National Planning Policy Framework

[11] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2023) Planning Practice Guidance

3.3 Regional policy

3.3.1 London Plan 2021

The London Plan 2021 [12] forms part of the development strategy for the Greater London Authority, and integrates all economic, environmental, transport and social frameworks. This has been amended to be consistent with the NPPF.

Policy SI 1 Improving air quality states:

> A. "*Development Plans, through relevant strategic, site-specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or borough's activities to improve air quality.*
>
> B. *To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed*
>
> > *1. Development proposals should not:*
> >
> > > *a. Lead to further deterioration of existing poor air quality;*
> > >
> > > *b. Create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance in exceedance of legal limits; and*
> > >
> > > *c. Create unacceptable risk of high levels of exposure to poor air quality.*
> >
> > *2. In order to meet the requirements in Par 1, as a minimum:*
> >
> > > *a. Development proposals must at least be air quality neutral;*
> > >
> > > *b. Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to pose-design or retro-fitted mitigation measures;*
> > >
> > > *c. Major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should know who the development will meet the requirements of B1; and*
> > >
> > > *d. Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.*
>
> *C. Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:*
>
> > *1. how proposals have considered ways to maximise benefits to local air quality; and*
> >
> > *2. what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.*
>
> *D. In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.*

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[12] Greater London Authority. The London Plan 2021. [Available at: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf].

E. Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development."

Policy GG3 Creating a healthy city states:

"To improve Londoners' health and reduce health inequalities, those involved in planning and development must:

F. Seek to improve London's air quality, reduce public exposure to poor air quality and minimise inequalities in levels of exposure to air pollution."

3.3.2 London Environment Strategy

The London Environment Strategy (LES) [13] was published in May 2018 and sets out the Mayor's vision for London's environment in 2050. It is a strategy that brings together approaches from multiple aspects of London's environment in an integrated document. The key aim is to ensure that emissions and exposure to pollution are reduced and emphasises the importance of considering air quality very early in the design process. This assessment has fed into the design process to help minimise the short-term and long-term effect of formaldehyde and benzene emissions from the Proposed Development.

3.4 Local policy

3.4.1 Camden Local Plan

The Camden Local Plan [14] was adopted in 2017 replacing the Core Strategy and the Development Policies planning document and sets out policies from 2016 to 2031. Air quality is mentioned specifically in the following two policies.

Policy A1 Managing the impact of development states:

"*The Council will seek to protect the quality of life of occupiers and neighbours. We will grant permission for development unless this causes unacceptable harm to amenity."… "The factors we will consider include:" "… odour, fumes and dust;*".

Policy CC4 Air Quality states:

"The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough.

The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact.

[13] Greater London Authority (2018) The London Environment Strategy

[14] Camden (2017) Local Plan

Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan."

4. Methodology

The overall approach to the air quality assessment comprises:

- A review of the existing formaldehyde and benzene concentrations in the vicinity of the Proposed Development;
- An assessment of the potential changes in air quality arising from the operation of the laboratory at the Proposed Development; and
- Determination of the emission rates which will keep process contribution at less than 10% [15] of the relevant air quality standard, odour threshold, long-term and short-term EALs.

4.1 Methodology of baseline assessment

Existing or baseline ambient air quality refers to the concentrations of relevant substances that are already present in the environment. These are present from various sources, such as industrial processes, commercial and domestic activities, road traffic and natural sources.

Although the pollutants which may be emitted from the laboratory stacks are unknown at present, formaldehyde and benzene have been used as representative pollutants in this study. The assessment has considered both solvents when determining the maximum allowable emission of substances to the air from the strobic fans in connection with the proposed laboratory use. If other pollutants with more stringent standards are emitted, these will need to be considered to identify the allowable emission rate. Appendix B considers maximum allowable emission rates for additional pollutants defined by the Environment Agency, including those with more stringent environmental standards.

A review of existing formaldehyde and benzene concentrations in the vicinity of the Proposed Development has been included in the report for context. A desk-based review of the following data sources was undertaken:

- the Defra Local Air Quality Management website [16];
- the UK Air Information Resource website [17]; and
- Defra background pollutant maps [18].

The review identified the local air quality monitoring data for recent years and local background pollutant concentrations within a radius of 1km around the Proposed Development.

4.2 Methodology of operational assessment

The operational assessment inputs were as follows:

- information on the stack parameters and locations were obtained as detailed in Section 4.2.1;
- the study area and sensitive receptors likely to experience a significant change in pollution concentrations were identified as shown in Section 4.3;
- a dispersion-model was set-up and appropriate data to describe meteorological conditions in the vicinity of the Proposed Development as detailed in Section 4.3.2;

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[15] 10% is selected to provide a robust limit which avoids risks of exceeding air quality standard, odour threshold and short-term EAL.

[16] Defra, Air Quality Management Areas website [Available at: https://uk-air.defra.gov.uk/aqma/list]

[17] Defra, UK Air Information Resource [Available at https://uk-air.defra.gov.uk/interactive-map]

[18] Defra, Pollutant background maps [Available at: https://uk-air.defra.gov.uk/data/laqm-background-home]

- a dispersion model was run with an emission of 1g/s (1g/s from each stack); and
- the predicted process contributions from the dispersion model were used to determine suitable emission rates to minimise the short-term (Daily and 30 minute-mean) and long-term (annual mean) effect of emissions from the Proposed Development, as described in Section 6;

4.2.1 Laboratory emissions

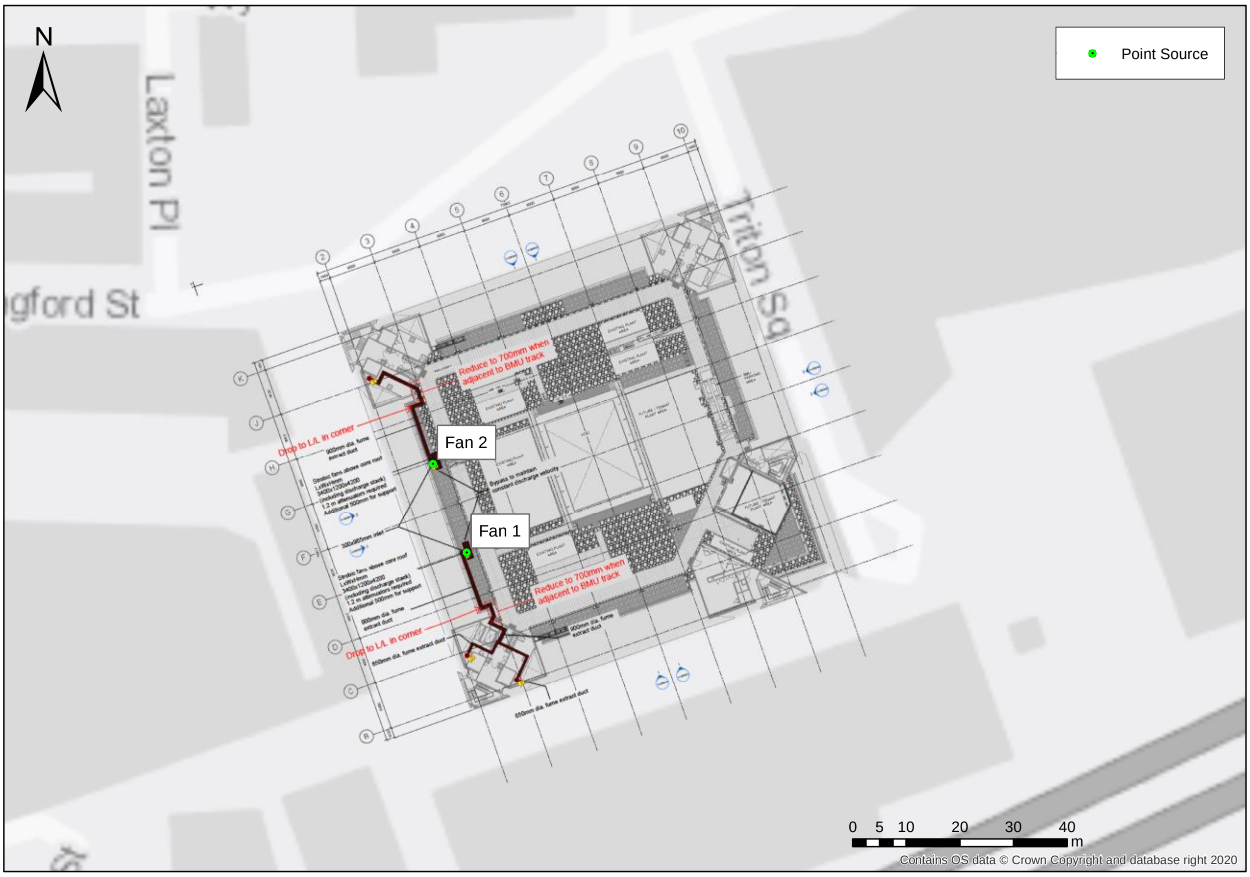
Laboratory emissions from the Proposed Development are planned to discharge via strobic fans placed on the roof. The locations of the strobic fans are based on information from the design team.

Stack locations and parameters are included in Table 3, there were obtained from the design team and strobic fan specifications. One point source per strobic fan has been used, the locations are shown in Figure 2.

Table 3: Modelling parameters of the strobic fans

Parameter	Unit	Stacks	
Number of strobic fans	-	2	
Location of point source	National Grid Reference (NGR)	1	529037, 182338
		2	529030, 182354
Stack height	m (from ground level)	51.5*	
Diameter of point source	m	0.6	
Exit temperature	˚C	21	
Exit velocity	m/s	32	
Modelled emission rate	g/s	1.0 (per stack)	
Modelled operating hours	-	24 hours, 365 days in year	
Note - * height based on effective height of 13m in the strobic fan technical specifications			

Figure 2: Strobic fan locations



4.3 Study area and receptors

Sensitive human and gridded receptors have been selected for the assessment.

4.3.1 Sensitive human receptors

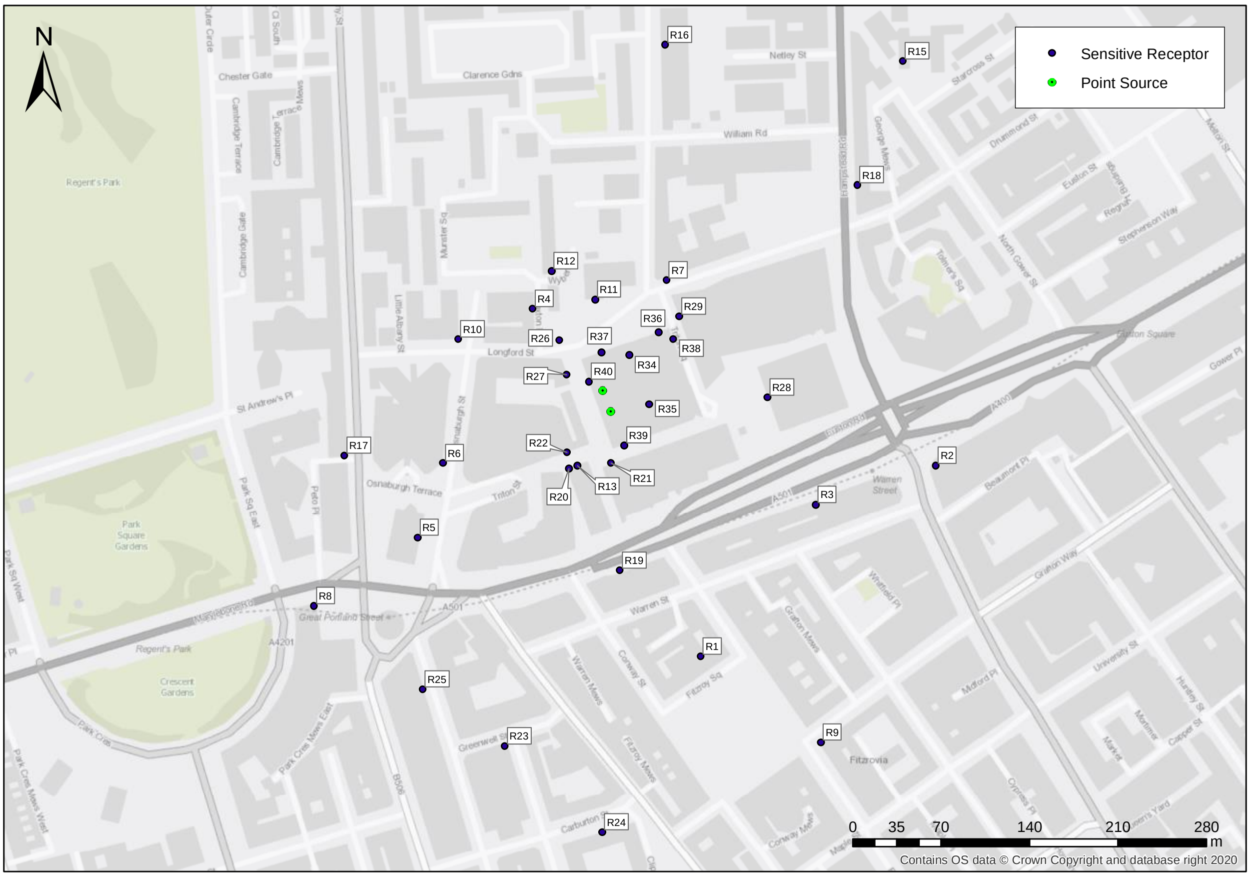
Sensitive human receptors are defined as those residential properties, schools, hospitals or care homes that could experience a change in pollutant concentrations. The sensitive human receptors closest to the Proposed Development are detailed in Table 4 and shown in Figure 3. It is not required to model all receptors, worst case locations are selected and where receptors are further from the site the concentrations will be lower due to the increased distance for dispersion to take place. As the flues are at height, a variety of heights were modelled on the façade of each receptor building to ensure the highest impact was captured.

Table 4: Details of sensitive human receptors

ID	Name	Type	NGR (m)		Height (m)
R1	Fitzrovia	Hospital	529108	182144	1.5, 9.0, 16.5
R2	University College Hospital	Hospital	529294	182295	1.5, 27.0, 52.5
R3	UCLH Clinical Microbiology and Virology Department	Hospital	529199	182264	1.5, 7.5, 13.5
R4	St Mary Magdalene, Regents Park	Church	528975	182419	1.5
R5	Holy Trinity Church	Church	528884	182238	1.5
R6	Melia White House	Hotel	528904	182297	1.5, 13.5, 25.5
R7	Schafer House	Hotel	529081	182444	1.5, 13.0, 24.5
R8	International Students House	Hotel	528802	182184	1.5, 5.5, 9.5

ID	Name	Type	NGR (m)		Height (m)
R9	YMCA Indian Student Hostel	Hotel	529203	182076	1.5, 9.5, 17.5
R10	Residential flats - Albany Street	Residential	528916	182395	1.5, 5.5, 9.5
R11	Westminster Kingsway College	Residential	529024	182427	1.5, 5.5, 9.5
R12	Residential flats - Munster Square	Residential	528990	182449	1.5, 5.5, 9.5
R13	338 Regents place	Commercial	529011	182294	1.5, 93.5
R16	Netley Primary School and Centre for Autism	School	529080	182628	1.5, 8.0, 14.5
R17	Albany Street	Residential	528826	182303	1.5, 6.25, 11
R18	Hampstead Road	Residential	529232	182517	1.5, 6.25, 11
R19	355 Euston Road	Commercial	529044	182212	1.5, 26.75, 52
R20	Regents Place 350 Euston Road	Commercial	529004	182292	1.5, 35.5, 69.5
R21	Regents Place 2 Triton Square	Commercial	529037	182297	1.5, 33.5, 65.5
R22	Regents Place 3 10 Triton Street	Commercial	529002	182306	1.5, 35.5, 69.5
R23	Holiday Inn Regents Park	Hotel	528953	182073	1.5, 10.5, 19.5
R24	Holcroft Court	Residential	529030	182005	1.5, 9.0, 16.5
R25	Central Park Lodge	Residential	528888	182118	1.5, 9.0, 16.5
R26	Residential flats - Longford Street	Residential	528996	182395	1.5, 15.0, 28.5
R27	Residential flats - Triton Square	Residential	529002	182367	1.5, 10.5, 19.5
R28	Euston Tower	Commercial	529161	182349	1.5,22,44,66,88,133
R29	Brock Street Offices	Commercial	529091	182413	1.5,22,44
R34	1TS Roof AHU Intake – North	Commercial	529051	182383	42
R35	1TS Roof AHU Intake – South	Commercial	529067	182344	42
R36	1TS North Elevation Intake	Commercial	529075	182401	20
R37	1TS North Elevation Intake	Commercial	529030	182384	4
R38	1TS East Elevation Intake	Commercial	529086	182395	15
R40	1TS West Elevation Intake	Commercial	529021	182362	3

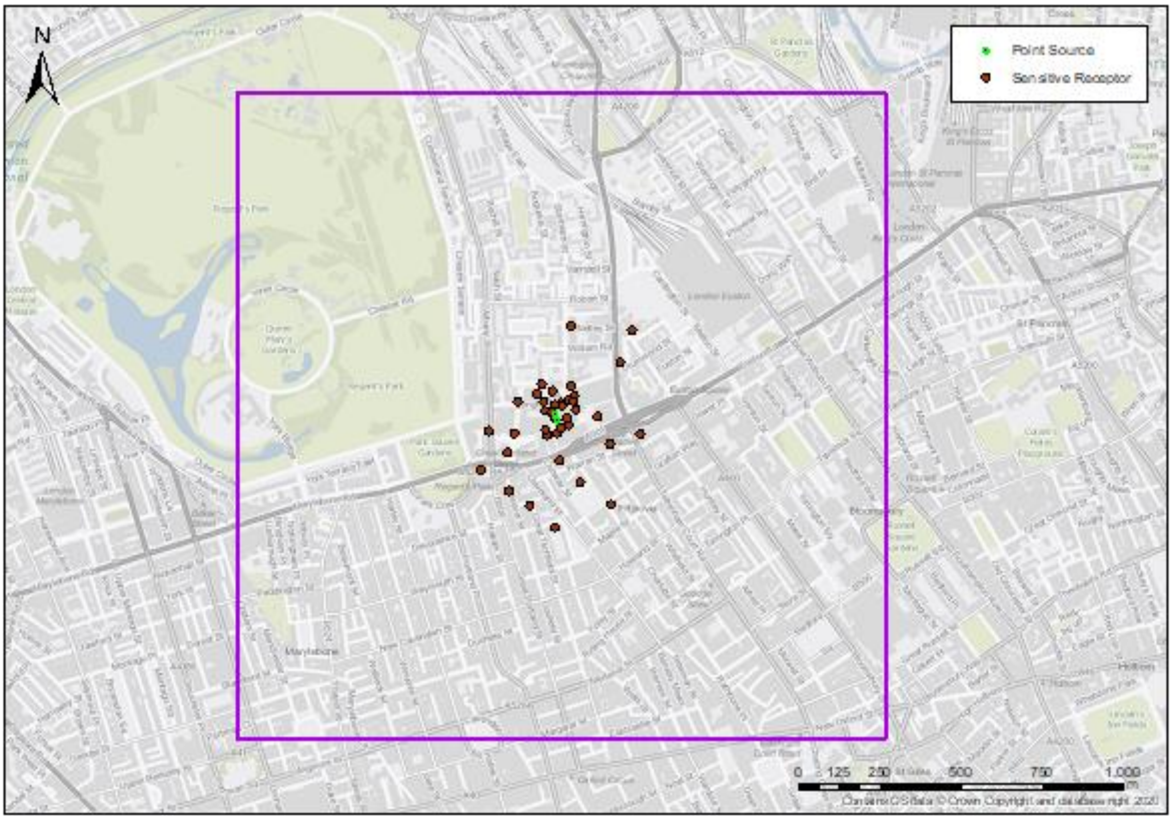
Figure 3: Sensitive receptors included in the assessment



Gridded domain

Process contributions were calculated at gridded receptors covering a 2km x 2km domain with 20m grid spacing. The modelled grid extent was (528050, 181350) to (530050, 183350) and the stacks are located at the centre of the grid, presented in Figure 4. This method provides an assessment of potential impact across the entire study area, in particular to assess any short-term impacts. The gridded receptors were modelled at the representative inhalation height of a human (1.5m above ground level).

Figure 4: Modelled grid included in the assessment



4.3.2 Dispersion model set-up

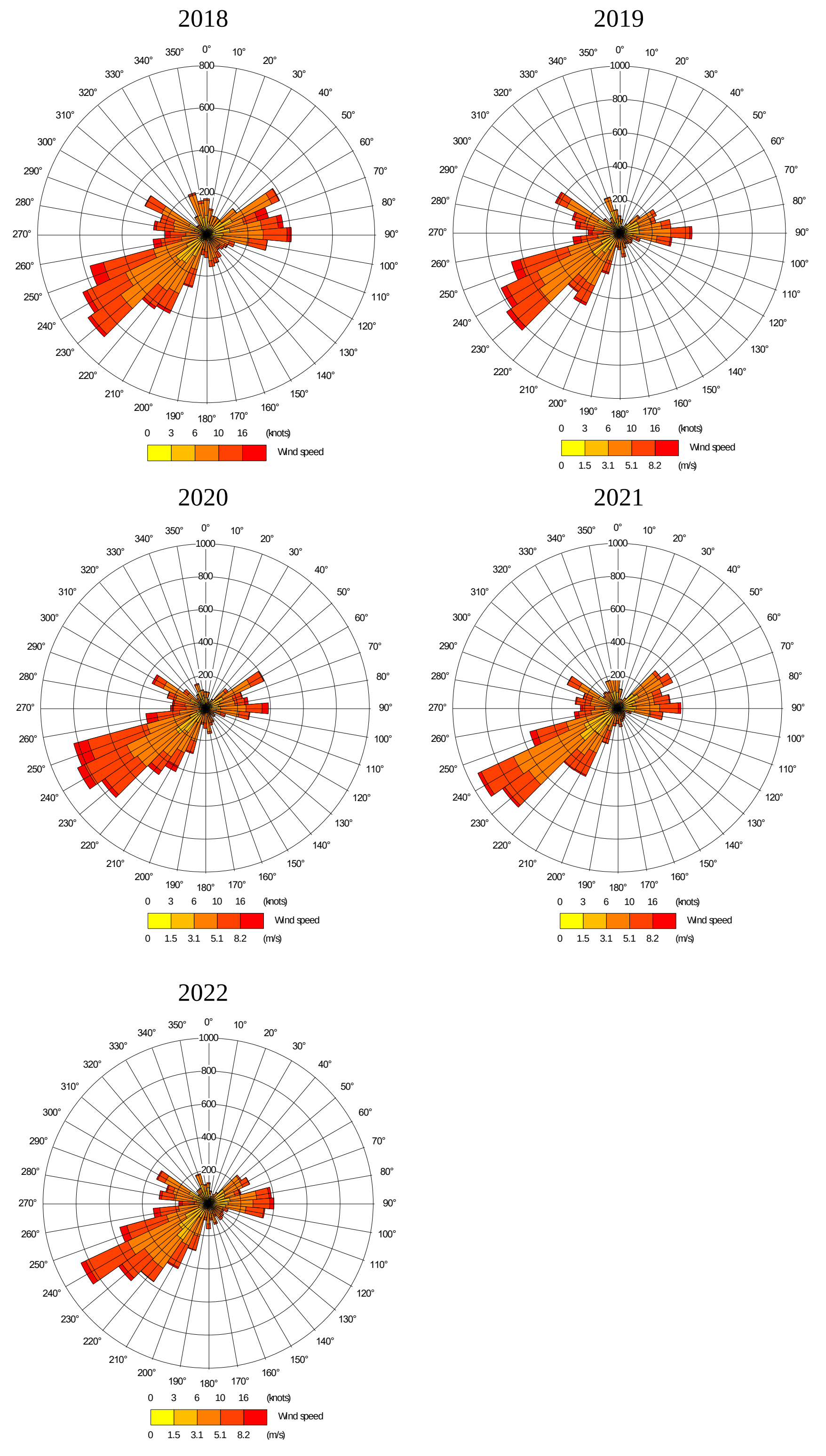
The ADMS 6 dispersion model (version 6.0.0.1) has been used for this study. This is the most up-to-date version of the model at the time of the assessment.

The ADMS model has been widely validated for point sources and is accepted by the industry as being 'fit-for-purpose' for air quality assessments of stack releases. The model incorporates the latest understanding of boundary layer meteorology and dispersion.

Meteorological data

To account for inter-annual variation in meteorological conditions five years of meteorological data have been used in this assessment. The model requires hourly sequential meteorological data as an input. Data from London City airport meteorological station for five years (1st January 2018 to 31st December 2022) was obtained for this assessment. Figure 5 presents the wind roses across the five years; it can be observed that the prevailing wind direction is from the south-west. The dataset included 97% of usable data for the dispersion model.

Figure 5: Wind roses for London City Airport meteorological station (2018 to 2022)



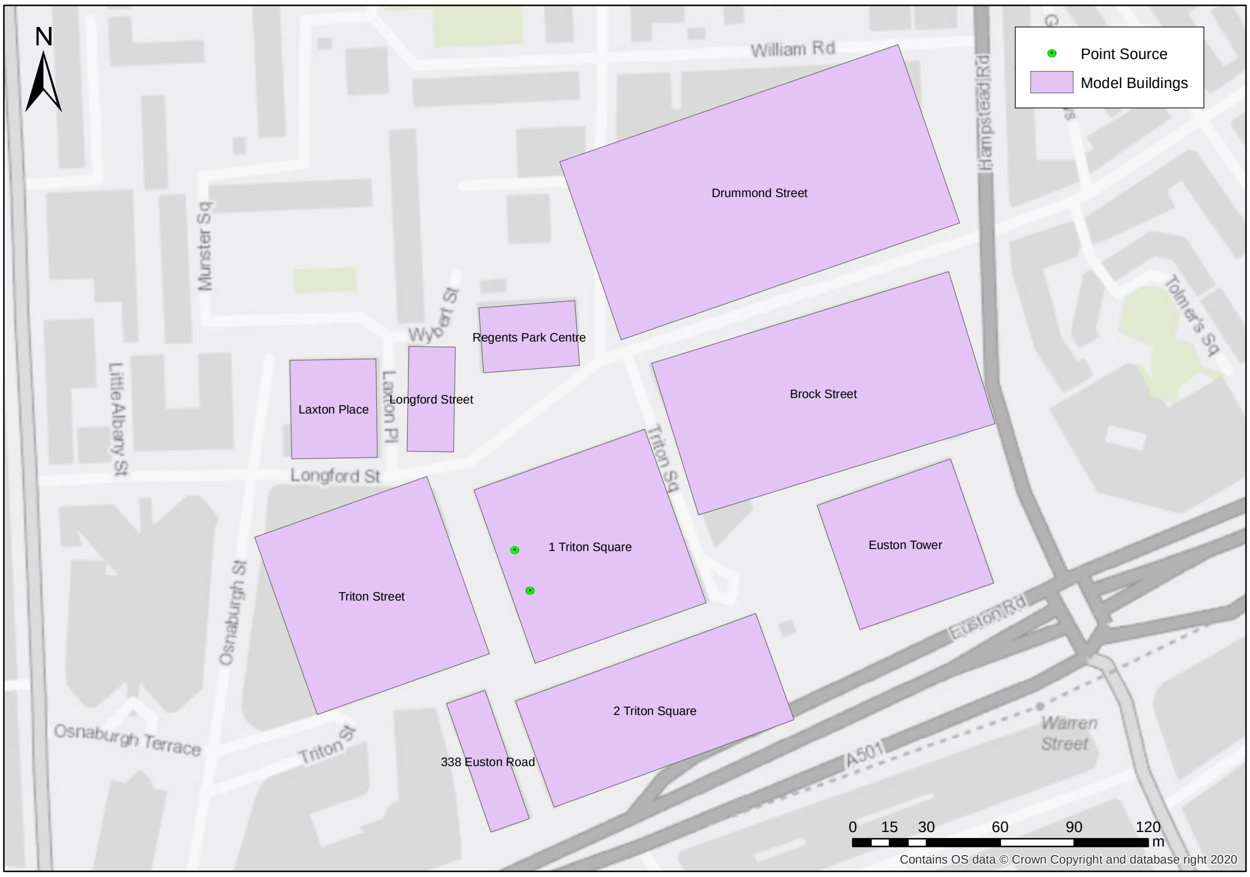
Modelled buildings

Buildings can have a significant effect on the dispersion of pollutants and can increase the maximum predicted ground level concentrations. The main effect of a building is to entrain pollutants into the cavity region in the immediate leeward side of the building, bringing them rapidly down to ground level. Therefore, buildings were included within the model. The buildings included in the assessment are presented in Table 5 and Figure 6.

Table 5: Details of modelled buildings

Building Name	NGR (m)		Height (m)	Length (m)	Width (m)
	X	Y			
1 Triton Square	529061	182356	42	74	75
2 Triton Square	529087	182289	33	46	104
338 Euston Road	529020	182269	61	17	55
Euston Tower	529189	182357	134	57	53
Brock Street	529156	182418	85	126	64
Triton Street	528973	182336	63	76	74
Drummond Street	529130	182499	27	145	76
Regents Park Centre	529036	182441	20	26	39
Laxton Place	528957	182412	18	35	40
Longford Street	528997	182416	11	19	43

Figure 6: Modelled buildings included in the assessment



Other model parameters

In this assessment, a surface roughness of 1.5m was applied for the site which is representative of the urban nature of the area. Similarly, a surface roughness of 0.75m was applied for the meteorological station.

For this model, a minimum length of 75m was used for the Proposed Development and a minimum length of 30m was applied for the meteorological station.

4.3.3 Calculate emission rates

The predicted process contributions that come from a dispersion model including formaldehyde and benzene emissions of 1g/s, will likely be higher than the 10% of the relevant air quality standard, odour threshold and short-term EAL. Therefore, an adjustment will be needed to calculate what the controlled emission rate should be. The equation below shows the method used in this assessment to calculate the controlled emission rate needed to ensure the 10% targets are achieved to minimise the short-term and long-term effect of emissions from the Proposed Development.

$$C = ME * \frac{S}{MC}$$

C = controlled emission rate needed to achieve target

ME = Modelled emission rate

S = 10% of relevant air quality standard, odour threshold and short−term EAL

MC = Maximum modelled concentration at receptor for relevant averaging period

5. Baseline assessment

5.1 Local monitoring data

Formaldehyde and benzene have been used as a representative pollutant in this study as they are commonly used solvent in laboratories.

A desk-based review was undertaken, and the review identified formaldehyde and benzene are not currently measured by any of the UK's air quality monitoring network.

Baseline data for formaldehyde and benzene were not found to be available. However, a pilot study was conducted that considered formaldehyde monitoring in ambient air completed in 2000 by the Centre for Optical and Environmental Metrology National Physical Laboratory. The study considered six monitoring locations across the UK for three months; the Marylebone Road roadside monitoring site was the nearest to the Proposed Development and was considered representative of an urban environment. The average concentration obtained by the continuous analyser at the sites were 13.4µg/m3 (7-day mean), which is relatively high compared to the current short-term and long-term EALs.

Table 6 presents the details and monitoring data for Marylebone Road.

Table 6: Local monitoring sites

Site	OS coordinates (m)		Location type	Formaldehyde 7 day mean (µg/m^3)
	X	Y		200
London Marylebone	528126	182015	Roadside	13.7

This pilot study states the major formaldehyde emissions to ambient air in 2000 are from motor vehicles not fitted with catalytic converters and stationary combustion of fossil fuel in coal burning for domestic heating. Catalytic converters have been fitted in the exhaust of the majority of petrol cars manufactured since 1992 and diesel cars since 20012, so ambient concentrations should now be significantly lower than the measured concentrations included in the study. Therefore, this monitoring site is considered not representative and has not been used in this assessment.

6. Operational assessment

6.1 Predicted process contribution

The dispersion model was run with emissions of 1g/s per strobic fan to determine the annual mean, and maximum daily and 30-minute mean process contributions across the study area.

The maximum predicted process contributions of pollutants for the relevant averaging periods have been used to calculate the emission rates required to achieve 10% of relevant EALs. For each scenario, the short-term (Daily and 30 minute-mean) and long-term (annual mean) impacts were compared to the EALs. The emission factor from the averaging period with the highest process contribution, and therefore worst air quality impacts was used to calculate the results.

Formaldehyde and benzene have been chosen as representative pollutants in this study. The controlled emission rate required and the maximum predicted process contribution of formaldehyde and benzene for relevant EALs across all assessed receptors (both human and gridded receptors) are shown in Table 7 for both sources assessed cumulatively.

The calculated maximum cumulative allowable emission rate for formaldehyde and benzene was:

- 0.004g/s per strobic fan for formaldehyde, which is equivalent to an annual total of 134kg per year or 15g per hour
- 0.003g/s per strobic fan for benzene, which is equivalent to an annual total of 106kg per year or 12g per hour.

Maximum predicted process contributions for annual, daily and 30-minute means across the assessed receptors are below 10% of the EAL. At these levels it is considered any effects would be negligible and not significant at all human receptor locations.

The predicted cumulative impact for formaldehyde and benzene process contributions at selected receptors using five years of meteorological data are presented in Appendix A.

If the laboratory is intended to be used with emissions of other pollutants with more stringent limits or alter the containment level, these will need to be considered to identify the allowable emission rate. Appendix B considers maximum allowable emission rates for additional pollutants defined by the Environment Agency, including those with more stringent environmental standards.

Table 7: Predicted process contribution of formaldehyde and benzene across all assessed receptors for all sources cumulative

Pollutant		Annual mean	Year of maximum predicted impact	Daily mean (provided as the 100th percentile)	Year of maximum predicted impact	Maximum 30-minute mean (provided as the 100th percentile)	Year of maximum predicted impact
Formaldehyde	Controlled emission rate needed to achieve assessment criteria (g/s)	(0.010*)	-			0.0043	-
	Maximum process contribution across human and gridded receptors (µg/m^3) using the controlled emission rate	0.21 (receptor R21 at 65.5 m)	2021			10.0 (receptor R21 at 65.5 m)	2018
Benzene	Controlled emission rate needed to achieve assessment criteria (g/s)	(0.010*)	-	0.003	-		
	Maximum process contribution across human and gridded receptors (µg/m^3) using the controlled emission rate	0.17 (receptor R21 at 65.5 m)	2021	3.00 (receptor R21 at 65.5 m)	2021		
*This emission factor is included for information only, as the lower emission rate is required to meet 10% of the EAL.							

7. Summary

This study addresses the new flue discharges from two strobic fans at roof level for the Proposed Development, not covered by the original conditions or previous air quality assessments. The strobic fan locations were provided by the project team and assessed through atmospheric dispersion modelling.

As the exact laboratory emissions are unknown at this stage, the assessment has considered formaldehyde and benzene, commonly used solvents in laboratories, as representative pollutants to determine compliance.

The assessment used dispersion modelling to determine the controlled emission rates of the strobic fans for that would result in compliance with 10% of the EALs cumulatively and for each individual strobic fan, to ensure the risk of exceeding the EAL would be negligible.

Results have been provided for strobic fans with an effective height of 8m above building height, with an exit velocity of 32m/s.

The calculated maximum cumulative allowable emission rate for formaldehyde and benzene was:

- 0.004g/s per strobic fan for formaldehyde, which is equivalent to an annual total of 134kg per year or 15g per hour
- 0.003g/s per strobic fan for benzene, which is equivalent to an annual total of 106kg per year or 12g per hour.

Maximum predicted process contributions for annual, daily and 30-minute means across the assessed receptors are below 10% of the EAL. At these levels it is considered any effects would be negligible and not significant at all human receptor locations.

The predicted cumulative impact for formaldehyde and benzene process contributions at selected receptors using five years of meteorological data are presented in Appendix A.

If the laboratory is intended to be used with emissions of other pollutants with more stringent limits or alter the containment level, these will need to be considered to identify the allowable emission rate. Appendix B considers maximum allowable emission rates for additional pollutants defined by the Environment Agency, including those with more stringent environmental standards.

Appendix A

Predicted process contribution

A.1 Annual mean process contribution

Table A.1: Predicted formaldehyde and benzene annual mean process contribution (µg/m^3), modelled using five years of meteorological data

ID	X	Y	Height (m)	Formaldehyde annual mean process contribution (µg/m^3)					Benzene annual mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
R1	529108	182144	1.5	0.0038	0.0029	0.0021	0.0037	0.0027	0.0030	0.0023	0.0017	0.0029	0.0021
R1	529108	182144	9.0	0.0039	0.0031	0.0022	0.0038	0.0028	0.0031	0.0024	0.0017	0.0030	0.0022
R1	529108	182144	16.5	0.0042	0.0034	0.0024	0.0042	0.0031	0.0033	0.0027	0.0019	0.0033	0.0025
R2	529294	182295	1.5	0.0075	0.0082	0.0072	0.0073	0.0079	0.0060	0.0065	0.0057	0.0058	0.0063
R2	529294	182295	27.0	0.0082	0.0092	0.0081	0.0080	0.0089	0.0065	0.0073	0.0064	0.0064	0.0071
R2	529294	182295	52.5	0.0120	0.0143	0.0121	0.0127	0.0150	0.0095	0.0114	0.0096	0.0101	0.0119
R3	529199	182264	1.5	0.0069	0.0083	0.0075	0.0070	0.0076	0.0055	0.0066	0.0059	0.0056	0.0060
R3	529199	182264	7.5	0.0071	0.0086	0.0077	0.0073	0.0078	0.0056	0.0069	0.0061	0.0058	0.0062
R3	529199	182264	13.5	0.0077	0.0094	0.0084	0.0079	0.0085	0.0061	0.0075	0.0067	0.0063	0.0067
R4	528975	182419	1.5	0.0060	0.0060	0.0048	0.0045	0.0059	0.0048	0.0047	0.0038	0.0036	0.0047
R5	528884	182238	1.5	0.0059	0.0036	0.0049	0.0059	0.0046	0.0047	0.0028	0.0039	0.0046	0.0036
R6	528904	182297	1.5	0.0111	0.0091	0.0095	0.0106	0.0100	0.0088	0.0073	0.0075	0.0084	0.0079
R6	528904	182297	13.5	0.0118	0.0098	0.0102	0.0112	0.0106	0.0094	0.0077	0.0081	0.0089	0.0084

ID	X	Y	Height (m)	Formaldehyde annual mean process contribution (µg/m^3)					Benzene annual mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
R6	528904	182297	25.5	0.0153	0.0124	0.0131	0.0144	0.0135	0.0122	0.0098	0.0104	0.0115	0.0107
R7	529081	182442	1.5	0.0227	0.0219	0.0227	0.0259	0.0230	0.0180	0.0174	0.0180	0.0206	0.0183
R7	529081	182442	13.0	0.0228	0.0221	0.0229	0.0260	0.0232	0.0181	0.0176	0.0182	0.0207	0.0184
R7	529081	182442	24.5	0.0244	0.0239	0.0245	0.0276	0.0248	0.0194	0.0190	0.0195	0.0219	0.0197
R8	528802	182184	1.5	0.0082	0.0053	0.0069	0.0088	0.0067	0.0065	0.0042	0.0055	0.0070	0.0053
R8	528802	182184	5.5	0.0083	0.0054	0.0070	0.0089	0.0068	0.0066	0.0043	0.0056	0.0071	0.0054
R8	528802	182184	9.5	0.0084	0.0055	0.0072	0.0091	0.0069	0.0067	0.0044	0.0057	0.0072	0.0055
R9	529203	182076	1.5	0.0038	0.0039	0.0031	0.0046	0.0038	0.0030	0.0031	0.0025	0.0037	0.0030
R9	529203	182076	9.5	0.0038	0.0040	0.0032	0.0047	0.0039	0.0030	0.0032	0.0026	0.0037	0.0031
R9	529203	182076	17.5	0.0041	0.0043	0.0035	0.0049	0.0043	0.0032	0.0034	0.0028	0.0039	0.0034
R10	528916	182395	1.5	0.0077	0.0074	0.0062	0.0059	0.0074	0.0061	0.0059	0.0049	0.0047	0.0059
R10	528916	182395	5.5	0.0078	0.0074	0.0063	0.0059	0.0074	0.0062	0.0059	0.0050	0.0047	0.0059
R10	528916	182395	9.5	0.0079	0.0075	0.0063	0.0060	0.0075	0.0063	0.0060	0.0050	0.0048	0.0060
R11	529024	182427	1.5	0.0181	0.0179	0.0178	0.0192	0.0184	0.0144	0.0142	0.0142	0.0152	0.0146
R11	529024	182427	5.5	0.0182	0.0180	0.0178	0.0192	0.0184	0.0144	0.0143	0.0142	0.0152	0.0146
R11	529024	182427	9.5	0.0182	0.0180	0.0179	0.0192	0.0184	0.0144	0.0143	0.0142	0.0152	0.0146
R12	528990	182449	1.5	0.0022	0.0020	0.0016	0.0015	0.0019	0.0017	0.0016	0.0013	0.0012	0.0015
R12	528990	182449	5.5	0.0022	0.0020	0.0016	0.0015	0.0019	0.0018	0.0016	0.0013	0.0012	0.0015

ID	X	Y	Height (m)	Formaldehyde annual mean process contribution (µg/m³)					Benzene annual mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
R12	528990	182449	9.5	0.0023	0.0021	0.0017	0.0015	0.0020	0.0018	0.0016	0.0013	0.0012	0.0016
R13	529010	182295	1.5	0.0446	0.0446	0.0447	0.0467	0.0448	0.0354	0.0354	0.0355	0.0371	0.0356
R13	529010	182295	93.5	0.0030	0.0033	0.0024	0.0015	0.0025	0.0024	0.0026	0.0019	0.0012	0.0020
R15	529268	182615	1.5	0.0133	0.0150	0.0142	0.0160	0.0147	0.0106	0.0119	0.0113	0.0127	0.0117
R15	529268	182615	6.0	0.0135	0.0152	0.0144	0.0162	0.0149	0.0107	0.0120	0.0114	0.0128	0.0118
R15	529268	182615	10.5	0.0138	0.0156	0.0147	0.0166	0.0153	0.0110	0.0123	0.0117	0.0132	0.0121
R16	529080	182628	1.5	0.0048	0.0049	0.0050	0.0044	0.0052	0.0038	0.0039	0.0040	0.0035	0.0041
R16	529080	182628	8.0	0.0049	0.0051	0.0052	0.0045	0.0053	0.0039	0.0040	0.0041	0.0036	0.0042
R16	529080	182628	14.5	0.0053	0.0054	0.0055	0.0049	0.0057	0.0042	0.0043	0.0044	0.0039	0.0045
R17	528826	182303	1.5	0.0093	0.0084	0.0081	0.0087	0.0086	0.0074	0.0066	0.0064	0.0069	0.0068
R17	528826	182303	6.3	0.0095	0.0085	0.0082	0.0088	0.0087	0.0075	0.0067	0.0065	0.0070	0.0069
R17	528826	182303	11.0	0.0098	0.0088	0.0084	0.0091	0.0090	0.0078	0.0070	0.0067	0.0072	0.0072
R18	529232	182517	1.5	0.0150	0.0172	0.0171	0.0190	0.0170	0.0119	0.0136	0.0136	0.0151	0.0135
R18	529232	182517	6.3	0.0153	0.0175	0.0174	0.0194	0.0174	0.0122	0.0139	0.0139	0.0154	0.0138
R18	529232	182517	11.0	0.0160	0.0184	0.0183	0.0203	0.0182	0.0127	0.0146	0.0145	0.0161	0.0144
R19	529044	182212	1.5	0.0023	0.0013	0.0013	0.0022	0.0013	0.0018	0.0010	0.0010	0.0017	0.0011
R19	529044	182212	26.8	0.0041	0.0026	0.0023	0.0039	0.0025	0.0033	0.0020	0.0018	0.0031	0.0020
R19	529044	182212	52.0	0.0222	0.0155	0.0140	0.0230	0.0147	0.0176	0.0123	0.0111	0.0183	0.0117

ID	X	Y	Height (m)	Formaldehyde annual mean process contribution (µg/m³)					Benzene annual mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
R20	529004	182293	1.5	0.0409	0.0405	0.0411	0.0433	0.0409	0.0325	0.0321	0.0327	0.0344	0.0325
R20	529004	182293	35.5	0.0422	0.0411	0.0420	0.0442	0.0418	0.0335	0.0326	0.0333	0.0351	0.0332
R20	529004	182293	69.5	0.0776	0.0623	0.0625	0.0637	0.0761	0.0616	0.0495	0.0497	0.0506	0.0604
R21	529037	182297	1.5	0.0444	0.0442	0.0432	0.0465	0.0445	0.0353	0.0351	0.0343	0.0369	0.0353
R21	529037	182297	33.5	0.0447	0.0445	0.0433	0.0467	0.0447	0.0355	0.0353	0.0344	0.0371	0.0355
R21	529037	182297	65.5	0.2082	0.1832	0.1778	0.2094	0.1920	0.1653	0.1455	0.1412	0.1663	0.1525
R22	529002	182306	1.5	0.0442	0.0447	0.0448	0.0462	0.0449	0.0351	0.0355	0.0355	0.0367	0.0357
R22	529002	182306	35.5	0.0450	0.0452	0.0454	0.0467	0.0455	0.0358	0.0359	0.0360	0.0371	0.0361
R22	529002	182306	69.5	0.1009	0.0876	0.0862	0.0913	0.1022	0.0801	0.0696	0.0684	0.0725	0.0812
R23	528953	182073	1.5	0.0032	0.0015	0.0017	0.0028	0.0017	0.0026	0.0012	0.0013	0.0022	0.0013
R23	528953	182073	10.5	0.0034	0.0016	0.0018	0.0029	0.0018	0.0027	0.0013	0.0014	0.0023	0.0015
R23	528953	182073	19.5	0.0039	0.0020	0.0022	0.0032	0.0022	0.0031	0.0016	0.0017	0.0025	0.0017
R24	529030	182005	1.5	0.0037	0.0023	0.0022	0.0038	0.0023	0.0030	0.0018	0.0017	0.0030	0.0018
R24	529030	182005	9.0	0.0038	0.0024	0.0023	0.0038	0.0024	0.0030	0.0019	0.0018	0.0031	0.0019
R24	529030	182005	16.5	0.0041	0.0026	0.0025	0.0040	0.0026	0.0032	0.0020	0.0020	0.0032	0.0021
R25	528888	182118	1.5	0.0037	0.0018	0.0022	0.0037	0.0027	0.0029	0.0015	0.0018	0.0030	0.0022
R25	528888	182118	9.0	0.0039	0.0020	0.0024	0.0039	0.0029	0.0031	0.0016	0.0019	0.0031	0.0023
R25	528888	182118	16.5	0.0042	0.0022	0.0027	0.0042	0.0032	0.0034	0.0018	0.0021	0.0033	0.0026

ID	X	Y	Height (m)	Formaldehyde annual mean process contribution (µg/m^3)					Benzene annual mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
R26	528996	182394	1.5	0.0331	0.0341	0.0333	0.0345	0.0342	0.0262	0.0270	0.0264	0.0274	0.0271
R26	528996	182394	15.0	0.0331	0.0341	0.0333	0.0345	0.0342	0.0263	0.0271	0.0264	0.0274	0.0271
R26	528996	182394	28.5	0.0333	0.0343	0.0335	0.0346	0.0343	0.0264	0.0273	0.0266	0.0275	0.0273
R27	529002	182367	1.5	0.0460	0.0459	0.0457	0.0474	0.0460	0.0365	0.0364	0.0363	0.0377	0.0366
R27	529002	182367	10.5	0.0460	0.0459	0.0457	0.0474	0.0460	0.0365	0.0364	0.0363	0.0377	0.0366
R27	529002	182367	19.5	0.0460	0.0459	0.0457	0.0474	0.0460	0.0365	0.0364	0.0363	0.0377	0.0366
R27	529002	182367	26.0	0.0460	0.0459	0.0457	0.0474	0.0460	0.0365	0.0364	0.0363	0.0377	0.0366
R28	529161	182349	1.5	0.0153	0.0158	0.0153	0.0145	0.0156	0.0121	0.0126	0.0122	0.0115	0.0124
R28	529161	182349	22.0	0.0175	0.0179	0.0177	0.0165	0.0178	0.0139	0.0142	0.0141	0.0131	0.0141
R28	529161	182349	44.0	0.0226	0.0234	0.0253	0.0233	0.0238	0.0179	0.0186	0.0201	0.0185	0.0189
R28	529161	182349	66.0	0.0404	0.0471	0.0465	0.0481	0.0490	0.0321	0.0374	0.0369	0.0382	0.0389
R28	529161	182349	88.0	0.0096	0.0107	0.0106	0.0107	0.0112	0.0076	0.0085	0.0084	0.0085	0.0089
R28	529161	182349	133.0	0.0004	0.0004	0.0004	0.0003	0.0004	0.0003	0.0003	0.0004	0.0003	0.0003
R29	529091	182413	1.5	0.0307	0.0300	0.0318	0.0335	0.0308	0.0244	0.0238	0.0252	0.0266	0.0245
R29	529091	182413	22.0	0.0314	0.0307	0.0325	0.0341	0.0314	0.0249	0.0244	0.0258	0.0271	0.0249
R29	529091	182413	44.0	0.0447	0.0515	0.0509	0.0518	0.0492	0.0355	0.0409	0.0404	0.0412	0.0391
R34	529051	182383	42.4	0.0067	0.0075	0.0074	0.0065	0.0070	0.0053	0.0060	0.0058	0.0052	0.0055
R35	529067	182344	42.4	0.0038	0.0040	0.0041	0.0031	0.0034	0.0030	0.0032	0.0033	0.0025	0.0027

ID	X	Y	Height (m)	Formaldehyde annual mean process contribution (µg/m^3)					Benzene annual mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
R36	529075	182401	19.8	0.0417	0.0409	0.0415	0.0438	0.0413	0.0331	0.0325	0.0330	0.0347	0.0328
R37	529030	182385	3.5	0.0471	0.0468	0.0467	0.0487	0.0470	0.0374	0.0372	0.0371	0.0387	0.0373
R38	529086	182395	15.0	0.0429	0.0420	0.0424	0.0450	0.0422	0.0341	0.0334	0.0337	0.0358	0.0335
R39	529048	182311	14.6	0.0486	0.0482	0.0477	0.0504	0.0482	0.0386	0.0383	0.0379	0.0400	0.0382

A.2 Daily mean process contribution

Table A.2 Predicted Benzene daily mean process contribution (µg/m^3), modelled using five years of meteorological data

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022
R1	529108	182144	1.5	0.13	0.09	0.08	0.10	0.14
R1	529108	182144	9.0	0.13	0.09	0.08	0.10	0.14
R1	529108	182144	16.5	0.14	0.09	0.08	0.09	0.14
R2	529294	182295	1.5	0.12	0.14	0.13	0.11	0.12
R2	529294	182295	27.0	0.09	0.11	0.10	0.09	0.09
R2	529294	182295	52.5	0.21	0.20	0.21	0.20	0.18
R3	529199	182264	1.5	0.16	0.14	0.18	0.11	0.16

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022
R3	529199	182264	7.5	0.16	0.14	0.19	0.12	0.16
R3	529199	182264	13.5	0.16	0.14	0.19	0.12	0.16
R4	528975	182419	1.5	0.14	0.12	0.13	0.08	0.10
R5	528884	182238	1.5	0.18	0.15	0.19	0.19	0.19
R6	528904	182297	1.5	0.17	0.16	0.20	0.17	0.18
R6	528904	182297	13.5	0.18	0.17	0.20	0.18	0.19
R6	528904	182297	25.5	0.19	0.18	0.21	0.20	0.21
R7	529081	182442	1.5	0.11	0.11	0.12	0.11	0.11
R7	529081	182442	13.0	0.13	0.12	0.14	0.11	0.11
R7	529081	182442	24.5	0.17	0.14	0.17	0.13	0.11
R8	528802	182184	1.5	0.09	0.10	0.08	0.09	0.09
R8	528802	182184	5.5	0.09	0.10	0.08	0.09	0.09
R8	528802	182184	9.5	0.09	0.10	0.08	0.09	0.09
R9	529203	182076	1.5	0.07	0.07	0.06	0.06	0.08
R9	529203	182076	9.5	0.07	0.07	0.06	0.06	0.08
R9	529203	182076	17.5	0.07	0.07	0.06	0.06	0.07
R10	528916	182395	1.5	0.16	0.15	0.18	0.10	0.12
R10	528916	182395	5.5	0.16	0.15	0.18	0.11	0.12

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022
R10	528916	182395	9.5	0.16	0.16	0.18	0.11	0.12
R11	529024	182427	1.5	0.10	0.10	0.11	0.11	0.11
R11	529024	182427	5.5	0.10	0.10	0.11	0.11	0.11
R11	529024	182427	9.5	0.10	0.10	0.11	0.11	0.11
R12	528990	182449	1.5	0.15	0.15	0.13	0.07	0.11
R12	528990	182449	5.5	0.15	0.15	0.14	0.07	0.11
R12	528990	182449	9.5	0.15	0.15	0.14	0.07	0.11
R13	529010	182295	1.5	0.10	0.10	0.11	0.11	0.11
R13	529010	182295	93.5	0.77	1.34	0.48	0.30	0.49
R15	529268	182615	1.5	0.14	0.09	0.11	0.14	0.11
R15	529268	182615	6.0	0.14	0.09	0.11	0.14	0.11
R15	529268	182615	10.5	0.14	0.09	0.11	0.14	0.11
R16	529080	182628	1.5	0.10	0.12	0.14	0.09	0.12
R16	529080	182628	8.0	0.10	0.12	0.14	0.09	0.12
R16	529080	182628	14.5	0.11	0.12	0.14	0.09	0.12
R17	528826	182303	1.5	0.14	0.14	0.15	0.12	0.16
R17	528826	182303	6.3	0.14	0.14	0.15	0.12	0.16
R17	528826	182303	11.0	0.14	0.14	0.15	0.12	0.16

ID	X	Y	Height (m)	Benzene daily mean process contribution (μg/m^3)				
				2018	2019	2020	2021	2022
R18	529232	182517	1.5	0.16	0.11	0.11	0.12	0.12
R18	529232	182517	6.3	0.16	0.11	0.11	0.12	0.12
R18	529232	182517	11.0	0.16	0.11	0.11	0.12	0.12
R19	529044	182212	1.5	0.13	0.14	0.10	0.12	0.14
R19	529044	182212	26.8	0.16	0.16	0.13	0.14	0.17
R19	529044	182212	52.0	0.28	0.27	0.28	0.28	0.28
R20	529004	182293	1.5	0.11	0.09	0.11	0.11	0.11
R20	529004	182293	35.5	0.24	0.23	0.21	0.18	0.19
R20	529004	182293	69.5	2.67	2.67	2.65	2.54	2.65
R21	529037	182297	1.5	0.10	0.10	0.11	0.11	0.11
R21	529037	182297	33.5	0.15	0.16	0.11	0.15	0.17
R21	529037	182297	65.5	3.59	3.54	3.54	3.52	3.55
R22	529002	182306	1.5	0.10	0.10	0.11	0.11	0.11
R22	529002	182306	35.5	0.23	0.20	0.21	0.16	0.18
R22	529002	182306	69.5	3.26	3.33	3.34	3.31	3.26
R23	528953	182073	1.5	0.08	0.10	0.09	0.07	0.08
R23	528953	182073	10.5	0.08	0.10	0.09	0.07	0.07
R23	528953	182073	19.5	0.07	0.10	0.09	0.07	0.07

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022
R24	529030	182005	1.5	0.07	0.09	0.06	0.06	0.06
R24	529030	182005	9.0	0.07	0.09	0.06	0.06	0.06
R24	529030	182005	16.5	0.07	0.09	0.06	0.06	0.07
R25	528888	182118	1.5	0.09	0.08	0.09	0.08	0.10
R25	528888	182118	9.0	0.08	0.08	0.09	0.08	0.10
R25	528888	182118	16.5	0.08	0.08	0.09	0.08	0.10
R26	528996	182394	1.5	0.10	0.10	0.11	0.11	0.11
R26	528996	182394	15.0	0.11	0.11	0.11	0.11	0.11
R26	528996	182394	28.5	0.17	0.15	0.16	0.11	0.13
R27	529002	182367	1.5	0.10	0.10	0.11	0.11	0.11
R27	529002	182367	10.5	0.10	0.10	0.11	0.11	0.11
R27	529002	182367	19.5	0.10	0.10	0.11	0.11	0.11
R27	529002	182367	26.0	0.10	0.10	0.11	0.11	0.11
R28	529161	182349	1.5	0.11	0.13	0.15	0.08	0.11
R28	529161	182349	22.0	0.14	0.15	0.16	0.11	0.13
R28	529161	182349	44.0	0.18	0.16	0.16	0.17	0.16
R28	529161	182349	66.0	0.85	0.91	0.88	0.87	0.93
R28	529161	182349	88.0	0.48	0.55	0.55	0.57	0.54

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022
R28	529161	182349	133.0	0.06	0.10	0.12	0.16	0.14
R29	529091	182413	1.5	0.10	0.10	0.11	0.11	0.11
R29	529091	182413	22.0	0.14	0.15	0.13	0.13	0.11
R29	529091	182413	44.0	0.25	0.22	0.23	0.22	0.23
R34	529051	182383	42.4	0.15	0.23	0.21	0.17	0.12
R35	529067	182344	42.4	0.19	0.15	0.20	0.15	0.20
R36	529075	182401	19.8	0.10	0.11	0.11	0.11	0.11
R37	529030	182385	3.5	0.10	0.10	0.11	0.11	0.11
R38	529086	182395	15.0	0.10	0.10	0.11	0.11	0.11
R39	529048	182311	14.6	0.10	0.10	0.11	0.11	0.11

A.3 Maximum 30-minute mean process contribution

Table A.3: Predicted formaldehyde 30-minute mean process contribution (µg/m³), modelled using five years of meteorological data

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022
R1	529108	182144	1.5	0.11	0.07	0.07	0.08	0.12

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022
R1	529108	182144	9.0	0.11	0.07	0.07	0.08	0.12
R1	529108	182144	16.5	0.11	0.07	0.06	0.08	0.12
R2	529294	182295	1.5	0.10	0.11	0.11	0.09	0.10
R2	529294	182295	27.0	0.07	0.09	0.09	0.07	0.08
R2	529294	182295	52.5	0.22	0.21	0.21	0.20	0.18
R3	529199	182264	1.5	0.13	0.12	0.15	0.09	0.13
R3	529199	182264	7.5	0.13	0.12	0.15	0.09	0.13
R3	529199	182264	13.5	0.13	0.12	0.15	0.10	0.13
R4	528975	182419	1.5	0.11	0.10	0.10	0.06	0.08
R5	528884	182238	1.5	0.15	0.12	0.15	0.16	0.16
R6	528904	182297	1.5	0.14	0.13	0.16	0.14	0.15
R6	528904	182297	13.5	0.14	0.14	0.16	0.15	0.16
R6	528904	182297	25.5	0.15	0.14	0.17	0.16	0.17
R7	529081	182442	1.5	0.09	0.09	0.10	0.09	0.09
R7	529081	182442	13.0	0.11	0.10	0.11	0.09	0.09
R7	529081	182442	24.5	0.14	0.11	0.14	0.10	0.09
R8	528802	182184	1.5	0.07	0.08	0.07	0.08	0.08
R8	528802	182184	5.5	0.07	0.08	0.07	0.08	0.08

ID	X	Y	Height (m)	Benzene daily mean process contribution ($\mu g/m^3$)				
				2018	2019	2020	2021	2022
R8	528802	182184	9.5	0.07	0.08	0.07	0.08	0.08
R9	529203	182076	1.5	0.06	0.06	0.05	0.05	0.07
R9	529203	182076	9.5	0.06	0.06	0.05	0.05	0.07
R9	529203	182076	17.5	0.06	0.06	0.06	0.06	0.06
R10	528916	182395	1.5	0.13	0.12	0.15	0.08	0.10
R10	528916	182395	5.5	0.13	0.12	0.15	0.09	0.10
R10	528916	182395	9.5	0.13	0.13	0.15	0.09	0.10
R11	529024	182427	1.5	0.08	0.08	0.09	0.09	0.09
R11	529024	182427	5.5	0.08	0.08	0.09	0.09	0.09
R11	529024	182427	9.5	0.08	0.08	0.09	0.09	0.09
R12	528990	182449	1.5	0.12	0.12	0.11	0.06	0.09
R12	528990	182449	5.5	0.12	0.12	0.11	0.06	0.09
R12	528990	182449	9.5	0.12	0.12	0.11	0.06	0.09
R13	529010	182295	1.5	0.08	0.08	0.09	0.09	0.09
R13	529010	182295	93.5	0.63	1.18	0.41	0.23	0.40
R15	529268	182615	1.5	0.12	0.08	0.09	0.12	0.09
R15	529268	182615	6.0	0.12	0.08	0.09	0.12	0.09
R15	529268	182615	10.5	0.12	0.08	0.09	0.12	0.09

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022
R16	529080	182628	1.5	0.09	0.10	0.12	0.07	0.10
R16	529080	182628	8.0	0.09	0.10	0.12	0.07	0.10
R16	529080	182628	14.5	0.09	0.10	0.12	0.07	0.10
R17	528826	182303	1.5	0.12	0.11	0.12	0.10	0.13
R17	528826	182303	6.3	0.11	0.11	0.12	0.10	0.13
R17	528826	182303	11.0	0.11	0.11	0.12	0.10	0.13
R18	529232	182517	1.5	0.13	0.09	0.09	0.10	0.10
R18	529232	182517	6.3	0.13	0.09	0.09	0.11	0.10
R18	529232	182517	11.0	0.13	0.09	0.09	0.11	0.10
R19	529044	182212	1.5	0.11	0.12	0.08	0.10	0.11
R19	529044	182212	26.8	0.13	0.13	0.11	0.11	0.14
R19	529044	182212	52.0	0.25	0.24	0.25	0.25	0.25
R20	529004	182293	1.5	0.09	0.08	0.09	0.09	0.09
R20	529004	182293	35.5	0.19	0.19	0.17	0.15	0.15
R20	529004	182293	69.5	2.68	2.68	2.67	2.52	2.65
R21	529037	182297	1.5	0.08	0.08	0.09	0.09	0.09
R21	529037	182297	33.5	0.12	0.13	0.09	0.12	0.14
R21	529037	182297	65.5	3.51	3.48	3.48	3.44	3.48

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m^3)				
				2018	2019	2020	2021	2022
R22	529002	182306	1.5	0.08	0.08	0.09	0.09	0.09
R22	529002	182306	35.5	0.19	0.16	0.17	0.13	0.15
R22	529002	182306	69.5	3.17	3.25	3.26	3.23	3.18
R23	528953	182073	1.5	0.06	0.08	0.08	0.06	0.06
R23	528953	182073	10.5	0.06	0.08	0.08	0.06	0.06
R23	528953	182073	19.5	0.06	0.08	0.08	0.06	0.06
R24	529030	182005	1.5	0.06	0.07	0.05	0.06	0.06
R24	529030	182005	9.0	0.06	0.07	0.05	0.06	0.06
R24	529030	182005	16.5	0.06	0.07	0.05	0.06	0.06
R25	528888	182118	1.5	0.07	0.07	0.07	0.07	0.08
R25	528888	182118	9.0	0.07	0.07	0.07	0.07	0.08
R25	528888	182118	16.5	0.07	0.07	0.07	0.06	0.08
R26	528996	182394	1.5	0.08	0.08	0.09	0.09	0.09
R26	528996	182394	15.0	0.09	0.09	0.09	0.09	0.09
R26	528996	182394	28.5	0.14	0.12	0.13	0.09	0.10
R27	529002	182367	1.5	0.08	0.08	0.09	0.09	0.09
R27	529002	182367	10.5	0.08	0.08	0.09	0.09	0.09
R27	529002	182367	19.5	0.08	0.08	0.09	0.09	0.09

ID	X	Y	Height (m)	Benzene daily mean process contribution (µg/m³)				
				2018	2019	2020	2021	2022
R27	529002	182367	26.0	0.08	0.08	0.09	0.09	0.09
R28	529161	182349	1.5	0.09	0.11	0.12	0.07	0.09
R28	529161	182349	22.0	0.11	0.13	0.13	0.09	0.10
R28	529161	182349	44.0	0.15	0.14	0.13	0.15	0.14
R28	529161	182349	66.0	0.83	0.90	0.89	0.88	0.92
R28	529161	182349	88.0	0.49	0.56	0.57	0.59	0.56
R28	529161	182349	133.0	0.05	0.08	0.10	0.14	0.12
R29	529091	182413	1.5	0.08	0.08	0.09	0.09	0.09
R29	529091	182413	22.0	0.12	0.12	0.11	0.10	0.09
R29	529091	182413	44.0	0.21	0.18	0.19	0.18	0.19
R34	529051	182383	42.4	0.13	0.18	0.17	0.14	0.10
R35	529067	182344	42.4	0.16	0.12	0.16	0.12	0.16
R36	529075	182401	19.8	0.08	0.09	0.09	0.09	0.09
R37	529030	182385	3.5	0.08	0.08	0.09	0.09	0.09
R38	529086	182395	15.0	0.08	0.08	0.09	0.09	0.09
R39	529048	182311	14.6	0.08	0.08	0.09	0.09	0.09

Appendix B

Table B.1 provides maximum allowable emission rates for additional pollutants defined by the Environment Agency[7], including those with more stringent environmental standards than the representative pollutants formaldehyde and benzene used in this assessment. Maximum emission rates are defined for short-term (daily and 30-minute mean) and long-term (annual mean) averaging times. A small number of pollutants have other uncommon averaging times (15-minute, 8-hour, weekly and monthly means). These averaging times have not been considered in the study, however these pollutants are represented by the other short and long-term averaging times modelled.

Table B.1: Calculated maximum allowable emission rates for environmental standards defined by the Environment Agency

Pollutant	Target Type	Time Period	Target Value (µg/m^3)	Controlled Emission Rate needed to achieve assessment criteria for compliance with 10% of EAL	
				g/s	kg/yr
1, 3-butadiene	EAL	daily mean	2.25	< 0.001	8
1,3-butadiene	Objective	annual mean	2.25	0.005	144
1,2,4-trichlorobenzene	EAL	annual mean	76	0.154	4867
1,2,4-trichlorobenzene	EAL	hourly mean	2280	0.375	11829
1-propanol	EAL	annual mean	5000	10.152	320166
1-propanol	EAL	hourly mean	62500	10.282	324266
2-propanol	EAL	annual mean	9990	20.284	639691
2-propanol	EAL	hourly mean	125000	20.565	648531
Acetaldehyde	EAL	annual mean	370	0.751	23692
Acetaldehyde	EAL	hourly mean	9200	1.514	47732
Acetic acid	EAL	annual mean	250	0.508	16008
Acetic acid	EAL	hourly mean	3700	0.609	19197
Acetic anhydride	EAL	annual mean	1	0.002	64
Acetic anhydride	EAL	hourly mean	40	0.007	208
Acetone	EAL	annual mean	18100	36.752	1159000
Acetone	EAL	hourly mean	362000	59.556	1878147
Acetonitrile	EAL	annual mean	680	1.381	43543
Acetonitrile	EAL	hourly mean	10200	1.678	52920
Acrylamide	EAL	annual mean	0.05	< 0.001	3

Pollutant	Target Type	Time Period	Target Value (µg/m^3)	Controlled Emission Rate needed to achieve assessment criteria for compliance with 10% of EAL	
				g/s	kg/yr
Acrylic acid	EAL	annual mean	300	0.609	19210
Acrylic acid	EAL	hourly mean	6000	0.987	31130
Acrylonitrile	EAL	annual mean	8.8	0.018	563
Acrylonitrile	EAL	hourly mean	264	0.043	1370
Allyl alcohol	EAL	annual mean	48	0.097	3074
Allyl alcohol	EAL	hourly mean	970	0.160	5033
Ammonia	EAL	annual mean	180	0.365	11526
Ammonia	EAL	hourly mean	2500	0.411	12971
Aniline	EAL	annual mean	8	0.016	512
Aniline	EAL	hourly mean	240	0.039	1245
Antimony and compounds (as antimony) except antimony trisulphide and antimony trioxide	EAL	annual mean	5	0.010	320
Antimony and compounds (as antimony) except antimony trisulphide and antimony trioxide	EAL	hourly mean	150	0.025	778
Arsenic	Target Value	annual mean	0.006	< 0.001	0.38
Arsine	EAL	annual mean	1.6	0.003	102
Arsine	EAL	hourly mean	48	0.008	249
Benzene	Limit Value	annual mean	5	0.010	320
Benzene	EAL	daily mean	30	0.003	106
Benzylchloride	EAL	annual mean	5.2	0.011	333
Benzylchloride	EAL	hourly mean	158	0.026	820
Beryllium (total in the PM10 fraction)	EAL	annual mean	0.0002	< 0.001	0.01
Boron trifluoride	EAL	hourly mean	280	0.046	1453
Bromine	EAL	hourly mean	70	0.012	363
Bromomethane	EAL	annual mean	200	0.406	12807
Bromomethane	EAL	hourly mean	5900	0.971	30611
Butane	EAL	annual mean	14500	29.442	928480
Butane	EAL	hourly mean	181000	29.778	939073

Pollutant	Target Type	Time Period	Target Value (µg/m^3)	Controlled Emission Rate needed to achieve assessment criteria for compliance with 10% of EAL	
				g/s	kg/yr
Cadmium	Target Value	annual mean	0.005	< 0.001	0.32
Cadmium	EAL	daily mean	0.03	< 0.001	0.11
Carbon disulphide	EAL	annual mean	64	0.130	4098
Carbon disulphide	EAL	daily mean	100	0.011	355
Carbon monoxide	EAL	hourly mean	30000	4.936	155648
Carbon tetrachloride	EAL	annual mean	130	0.264	8324
Carbon tetrachloride	EAL	hourly mean	3900	0.642	20234
Chlorine	EAL	hourly mean	290	0.048	1505
Chloroform	EAL	daily mean	100	0.011	355
Chromium (III) and its compounds (as chromium)	EAL	daily mean	2	< 0.001	7
Chromium VI	EAL	annual mean	0.00025	< 0.001	0.02
Copper and its compounds (as copper)	EAL	daily mean	0.05	< 0.001	0.18
Dibutyl phthalate	EAL	annual mean	50	0.102	3202
Dibutyl phthalate	EAL	hourly mean	1000	0.165	5188
Diethyl ether	EAL	annual mean	12300	24.975	787608
Diethyl ether	EAL	hourly mean	154000	25.336	798991
Diethyl ketone	EAL	annual mean	7160	14.538	458477
Diethyl ketone	EAL	hourly mean	89500	14.724	464348
Diisobutyl phthalate	EAL	annual mean	50	0.102	3202
Diisobutyl phthalate	EAL	hourly mean	1500	0.247	7782
Diisopropyl ether	EAL	annual mean	10600	21.523	678751
Diisopropyl ether	EAL	hourly mean	131000	21.552	679661
Dimethyl sulphate	EAL	annual mean	0.52	0.001	33
Dimethyl sulphate	EAL	hourly mean	15.6	0.003	81
Dimethylformamide	EAL	annual mean	300	0.609	19210
Dimethylformamide	EAL	hourly mean	6100	1.004	31648
Dioxane	EAL	annual mean	910	1.848	58270

Pollutant	Target Type	Time Period	Target Value (µg/m^3)	Controlled Emission Rate needed to achieve assessment criteria for compliance with 10% of EAL	
				g/s	kg/yr
Dioxane	EAL	hourly mean	36600	6.021	189890
Ethyl acrylate	EAL	annual mean	210	0.426	13447
Ethyl acrylate	EAL	hourly mean	6200	1.020	32167
Ethylbenzene	EAL	annual mean	4410	8.954	282386
Ethylbenzene	EAL	hourly mean	55200	9.081	286391
Ethylene dibromide	EAL	annual mean	7.8	0.016	499
Ethylene dibromide	EAL	hourly mean	234	0.038	1214
Ethylene dichloride	EAL	annual mean	3	0.006	192
Ethylene oxide	EAL	annual mean	0.002	< 0.001	0.13
Formaldehyde	EAL	annual mean	5	0.010	320
Formaldehyde	EAL	30-minute mean	100	0.004	134
Hydrazine	EAL	annual mean	0.06	< 0.001	4
Hydrazine	EAL	hourly mean	2.6	< 0.001	13
Hydrogen bromide	EAL	hourly mean	700	0.115	3632
Hydrogen chloride	EAL	hourly mean	750	0.123	3891
Hydrogen cyanide	EAL	daily mean	2	< 0.001	7
Hydrogen fluoride	EAL	hourly mean	160	0.026	830
Hydrogen iodide	EAL	hourly mean	520	0.086	2698
Hydrogen sulphide	EAL	annual mean	140	0.284	8965
Hydrogen sulphide	EAL	daily mean	150	0.017	532
Lead	Limit Value	annual mean	0.5	0.001	32
Lead	Objective	annual mean	0.25	0.001	16
Manganese and compounds (as manganese)	EAL	annual mean	0.15	< 0.001	10
Manganese and compounds (as manganese)	EAL	hourly mean	1500	0.247	7782
Mercury and its inorganic compounds (as mercury)	EAL	hourly mean	0.6	< 0.001	3
Mercury and its inorganic compounds (as mercury)	EAL	daily mean	0.06	< 0.001	0.21
Methanol	EAL	annual mean	2660	5.401	170328

Pollutant	Target Type	Time Period	Target Value ($\mu g/m^3$)	Controlled Emission Rate needed to achieve assessment criteria for compliance with 10% of EAL	
				g/s	kg/yr
Methanol	EAL	hourly mean	33300	5.478	172769
Methyl chloride (chloromethane)	EAL	daily mean	18	0.002	64
Methyl chloroform	EAL	daily mean	5000	0.563	17746
Methyl ethyl ketone	EAL	annual mean	6000	12.183	384199
Methyl ethyl ketone	EAL	hourly mean	89900	14.790	466424
Methyl propyl ketone	EAL	annual mean	7160	14.538	458477
Methyl propyl ketone	EAL	hourly mean	89500	14.724	464348
Methylene chloride (dichloromethane)	EAL	annual mean	770	1.563	49306
Methylene chloride (dichloromethane)	EAL	daily mean	2100	0.236	7453
Mono-ethanolamine (MEA)	EAL	hourly mean	400	0.066	2075
Mono-ethanolamine (MEA)	EAL	daily mean	100	0.011	355
Naphthalene	EAL	daily mean	3	< 0.001	11
N-hexane	EAL	annual mean	720	1.462	46104
N-hexane	EAL	hourly mean	21600	3.554	112066
Nickel	Target Value	annual mean	0.02	< 0.001	1
Nickel and its compounds, except nickel hydride (as nickel)	EAL	hourly mean	0.7	< 0.001	4
Nitric acid	EAL	annual mean	52	0.106	3330
Nitric acid	EAL	hourly mean	1000	0.165	5188
Nitrogen dioxide	Limit Value	annual mean	40	0.081	2561
Nitrogen dioxide	Limit Value	hourly mean	200	0.033	1038
Nitrogen monoxide	EAL	annual mean	310	0.629	19850
Nitrogen monoxide	EAL	hourly mean	4400	0.724	22828
N-nitrosodimethylamine (NDMA)	EAL	annual mean	0.0002	< 0.001	0.01
Orthophosphoric acid	EAL	hourly mean	200	0.033	1038
Para-dichlorobenzene	EAL	annual mean	1530	3.107	97971
Para-dichlorobenzene	EAL	hourly mean	30600	5.034	158760
Particulates (PM10)	Limit Value	annual mean	40	0.081	2561

Pollutant	Target Type	Time Period	Target Value (μg/m^3)	Controlled Emission Rate needed to achieve assessment criteria for compliance with 10% of EAL	
				g/s	kg/yr
Particulates (PM10)	Limit Value	daily mean	50	0.006	177
Particulates (PM2.5)	Limit Value	annual mean	20	0.041	1281
Phenol	EAL	annual mean	200	0.406	12807
Phenol	EAL	hourly mean	3900	0.642	20234
Phosgene	EAL	annual mean	0.8	0.002	51
Phosgene	EAL	hourly mean	25	0.004	130
Phosphine	EAL	hourly mean	42	0.007	218
Polyaromatic hydrocarbons (benzo(a)pyrene)	Objective	annual mean	0.00025	< 0.001	0.02
Polyaromatic hydrocarbons (benzo(a)pyrene)	Target Value	annual mean	0.001	< 0.001	0.06
Polychlorinated biphenyls (PCBs)	EAL	annual mean	0.2	< 0.001	13
Polychlorinated biphenyls (PCBs)	EAL	hourly mean	6	0.001	31
Propylene oxide	EAL	annual mean	24	0.049	1537
Propylene oxide	EAL	hourly mean	720	0.118	3736
Selenium and compounds, except hydrogen selenide (as selenium)	EAL	daily mean	2	< 0.001	7
Sodium hydroxide	EAL	hourly mean	200	0.033	1038
Styrene	EAL	hourly mean	800	0.132	4151
Sulphur dioxide	Limit Value	hourly mean	350	0.058	1816
Sulphur dioxide	Limit Value	daily mean	125	0.014	444
Sulphur hexafluoride	EAL	annual mean	60700	123.250	3886811
Sulphur hexafluoride	EAL	hourly mean	759000	124.869	3937882
Sulphuric acid	EAL	annual mean	10	0.020	640
Sulphuric acid	EAL	hourly mean	300	0.049	1556
Tetrachloroethylene	EAL	daily mean	40	0.005	142
Tetrahydrofuran	EAL	annual mean	3000	6.091	192099
Tetrahydrofuran	EAL	hourly mean	59900	9.855	310776
Toluene	EAL	hourly mean	8000	1.316	41506
Trichloroethylene	EAL	annual mean	2	0.004	128

Pollutant	Target Type	Time Period	Target Value ($\mu g/m^3$)	Controlled Emission Rate needed to achieve assessment criteria for compliance with 10% of EAL	
				g/s	kg/yr
Trimethylbenzenes, all isomers or mixture	EAL	annual mean	1250	2.538	80041
Trimethylbenzenes, all isomers or mixture	EAL	hourly mean	37500	6.169	194559
Vanadium	EAL	daily mean	1	< 0.001	4
Vinyl acetate	EAL	annual mean	360	0.731	23052
Vinyl acetate	EAL	hourly mean	7200	1.185	37355
Vinyl chloride	EAL	annual mean	10	0.020	640
Vinyl chloride	EAL	daily mean	1300	0.146	4614
Xylene (o-, m-, p- or mixed isomers)	EAL	annual mean	4410	8.954	282386
Xylene (o-, m-, p- or mixed isomers)	EAL	hourly mean	66200	10.891	343462
Zinc oxide	EAL	annual mean	50	0.102	3202
Zinc oxide	EAL	hourly mean	1000	0.165	5188